Complete Drawing Prototypes For Urban Complete Streets

by

James Ira Winder

Submitted to the Department of Architecture in Partial Fulfillment of the Requirements for the Degree of

Bachelor of Science in Art and Design in Architectural Design

at the

Massachusetts Institute of Technology

June 2010

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Department of Architecture
May 21, 2010

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ABSTRACT

A study was performed to determine how drawings for streets may be tailored to a broad range of viewers and agendas, yet still be viewed as a credible design tool for architects. With a growing number of cities designing their own guidelines according to the Complete Streets movements, it's necessary to develop a graphic style that not only appeals to the typical engineering aspect of streets, but is also robust enough to include details for various design components and spatial qualities not before considered in street design.

New drawings and information graphics were invented to better describe multi-modal streets, spatial qualities, and a fully conceived taxonomy of urban street types. It was discovered that three drawing types are especially useful for conveying this type of information: Perspective-Sections, Overhead Views, and Transects.

Thesis Supervisor: John A. Ochsendorf
Title: Associate Professor, Building Technology


How can street drawings be tailored to a broad range of viewers and agendas, yet still be a credible design tool?

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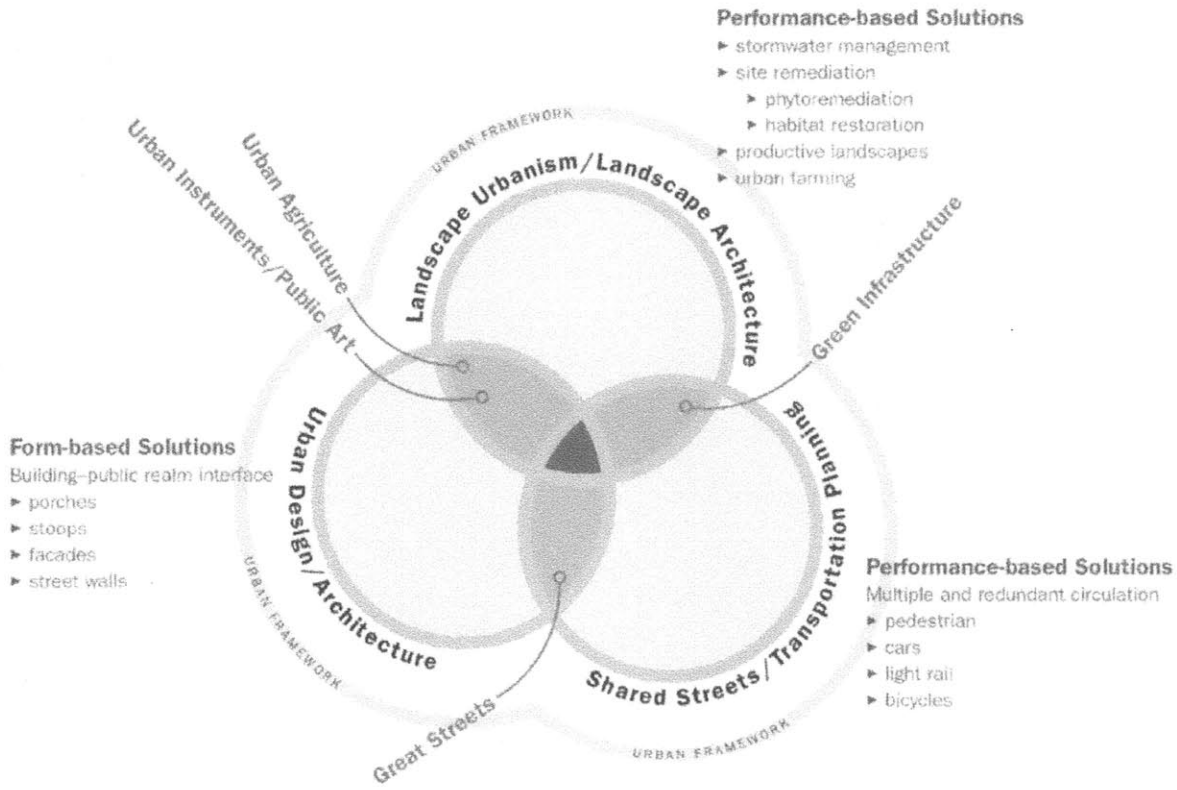
CONTENTS



This study began as a work-study with Utile Design Inc. in February of 2010. With the Boston Transporation Department as its client, Utile was comisioned to design the booklet and graphics for the new Boston Complete Streets Guidelines. In order to complete the task, a research-based analysis of appropriate street graphics seemed an appropriate way to ensure Boston's complete streets guidelines outshined that of any other city.

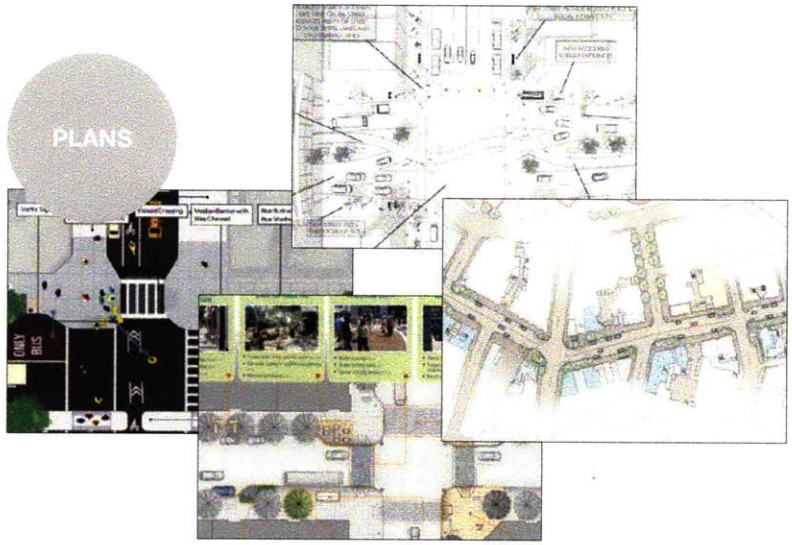
COMPLETE DRAWINGS introduction

what are complete streets?

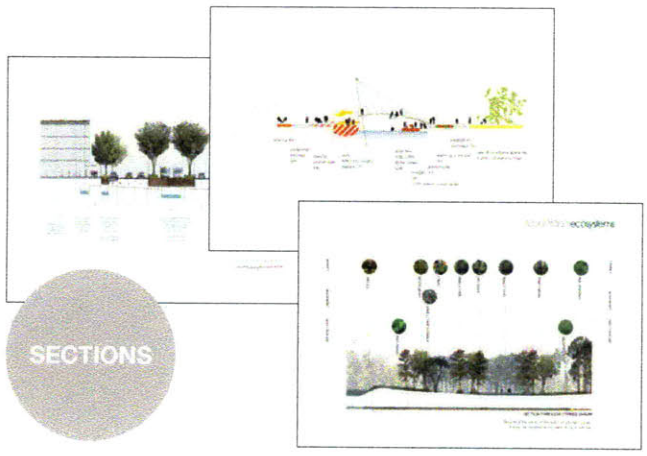
As definied by the BTD, complete streets are multimodal, green, and smart. Essentially, it means that all mode-types, ecological methods for storm water drainage, and real-time traffic sensing are utilized in street design.

what are complete drawings?

Complete drawings are robust enough to handle all the different kinds of data and spatial information of streets. They are also accessible enough to be legible to a broad audience of designers, engineers, lobbyist, politicians, and every-day street users.

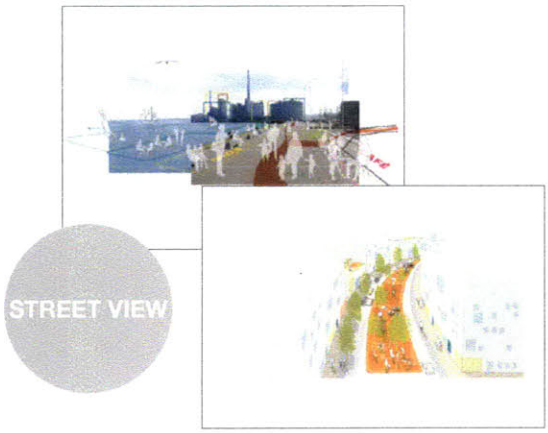

PLANS

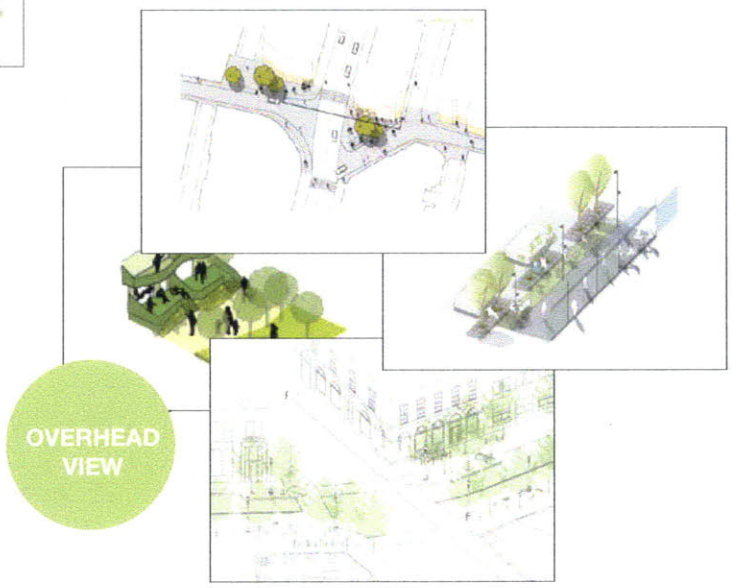

PERSPECTIVE
SECTIONS

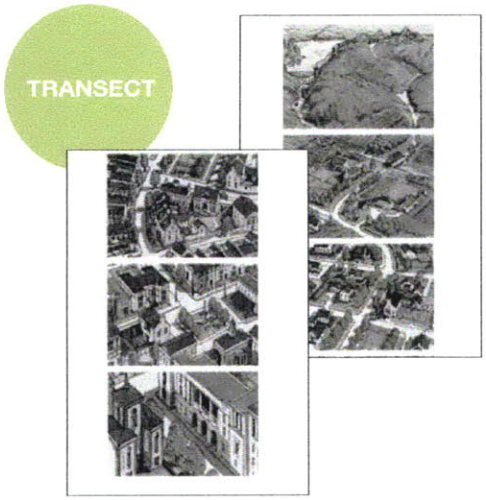

SECTIONS

GRAPHIC PRECEDENTS research

Initially, a number of existing graphic precedents are researched to identify the current scope of street representation. These include plans, sections, street perspectives, icons, section perspectives, overhead views, and transects. Green dots denote drawings especially useful for representing complete streets.



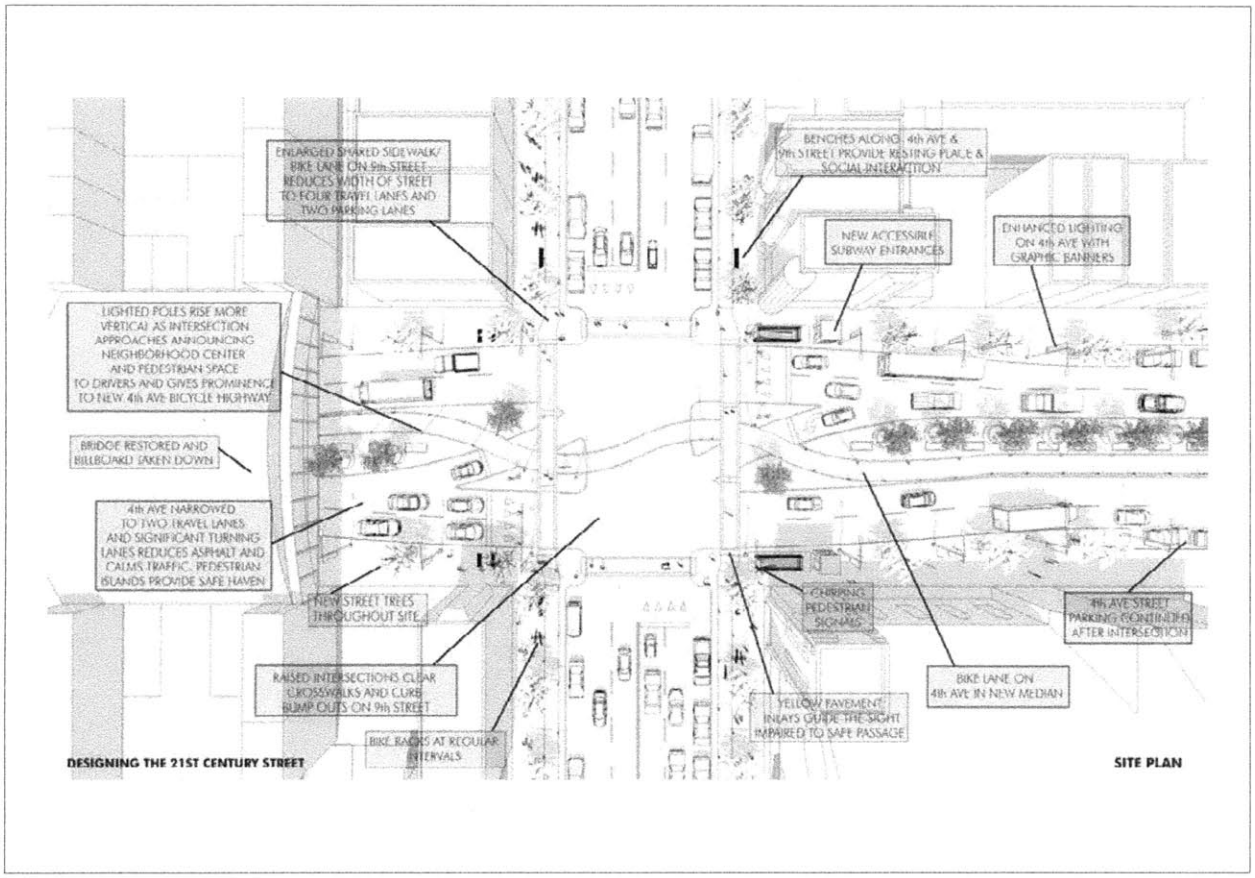




PLANS

Level of detail must be appropriate to the drawing's scale

Linework should be avoided due to legibility and printing issues. Simplify linework radically and use fields as much as possible.

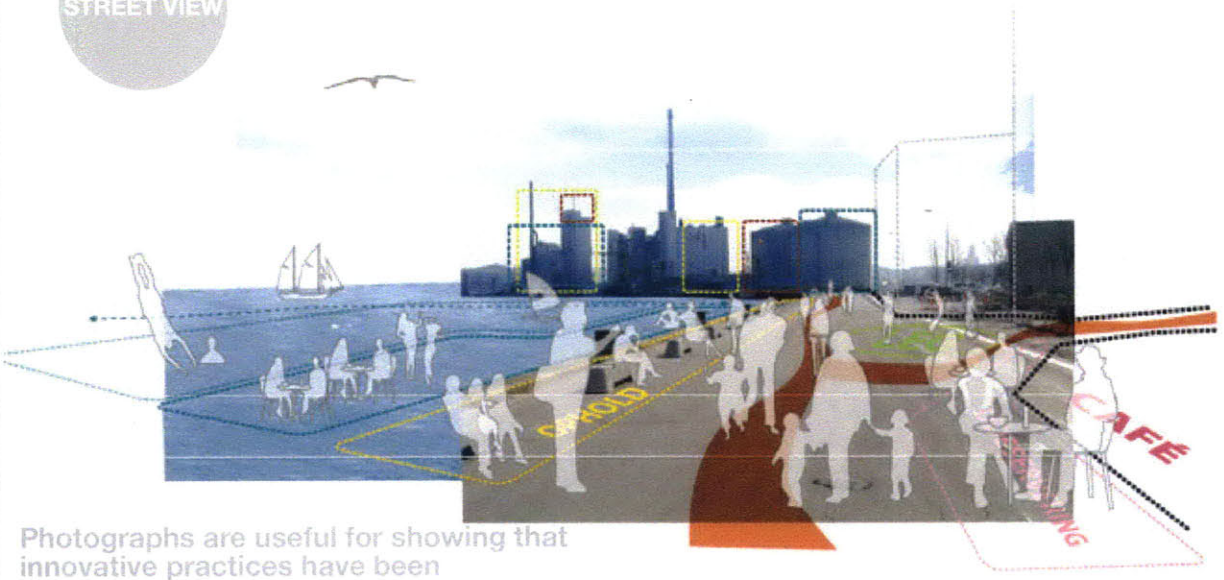



PLAN HIGHLIGHTS
DISTINCTIVE, UNIFIED OVERALL DESIGN
SPACE FOR PUBLIC LIFE
PEDESTRIAN SAFETY
PEDESTRIAN PRIORITY
UNIVERSAL DESIGN
CREATIVE USE OF PARKING LANE
ECOLOGY
EXTENSIVE GREENING
INTEGRATING PEDS AND TRANSIT
RECLAIMING EXCESS STREET SPACE
CHAPTER 1.0


ONLY
BUS
2813
Pedestrian Ramps
Bike Lane
Curb Extension with Bicycle Parking
Furnishing Zone with Square Pavers
Traffic Signal
Untinted Concrete (Residential District)
Raised Crossing
Median Barrier with Bike Channel
Bus Bulb with Bus Shelter

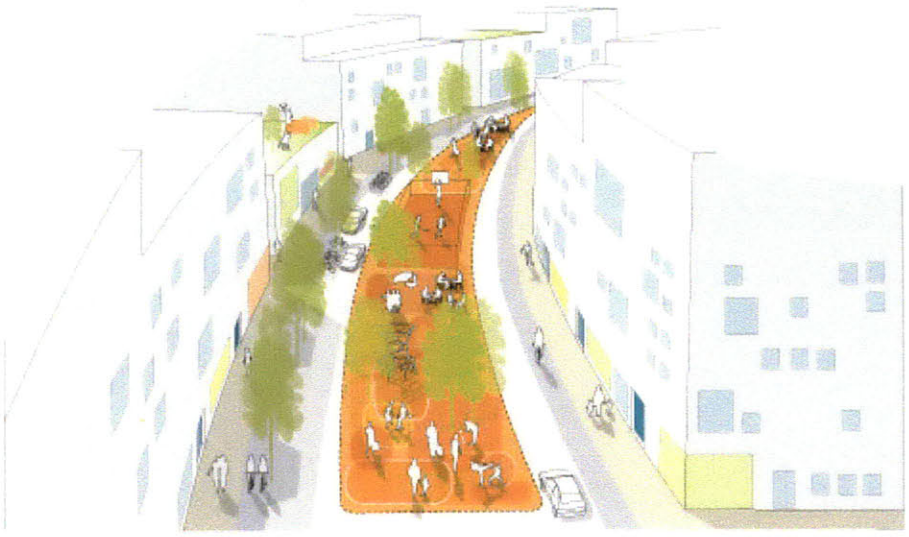
PLANS

STREET VIEW



Photographs are useful for showing that innovative practices have been implemented, BUT they have two major drawbacks; use drawings or photomontage techniques instead of photographs.

Eye-level perspective drawings should be used to describe the pedestrian experience and details that are not legible in other drawing types.



SECTIONS

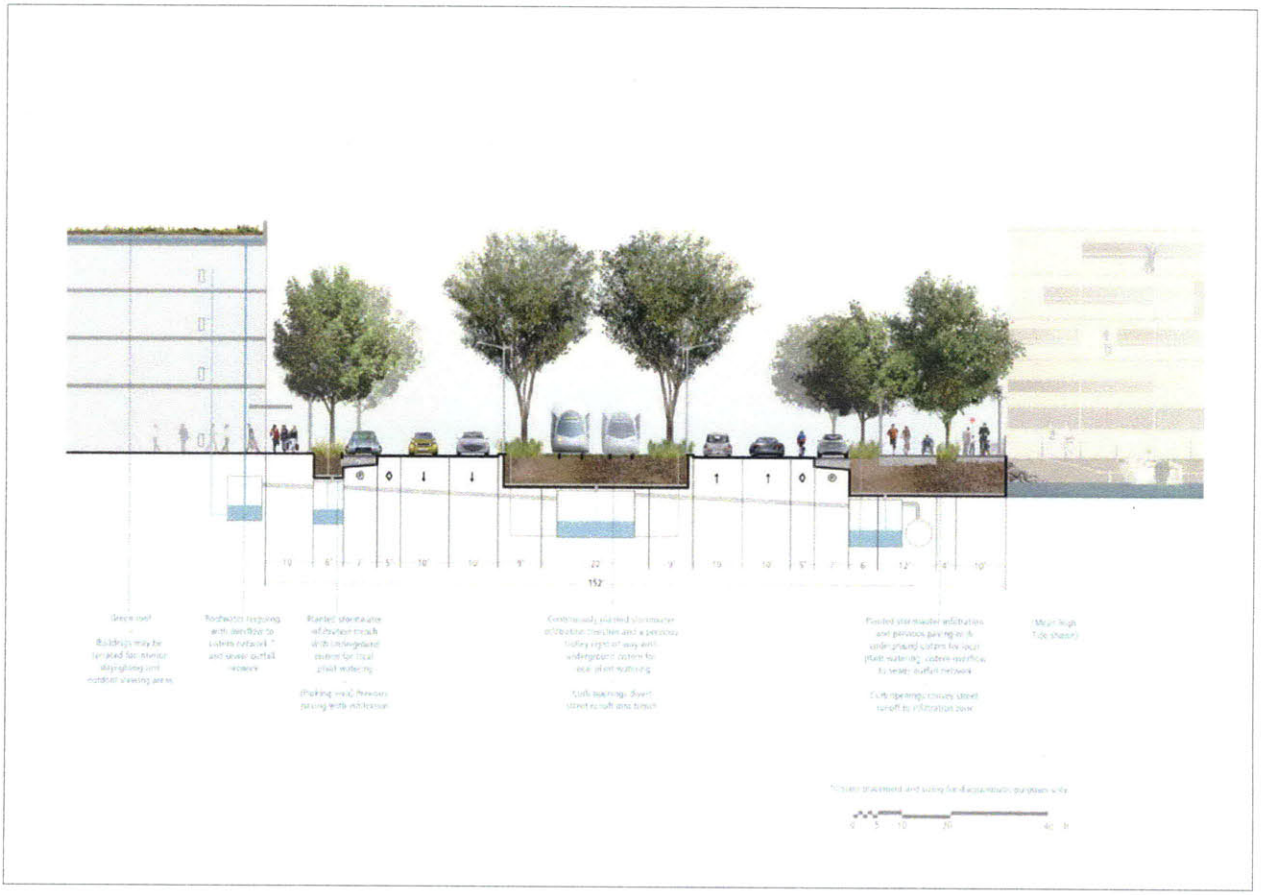
Superior drawing type for describing underground features such as drainage

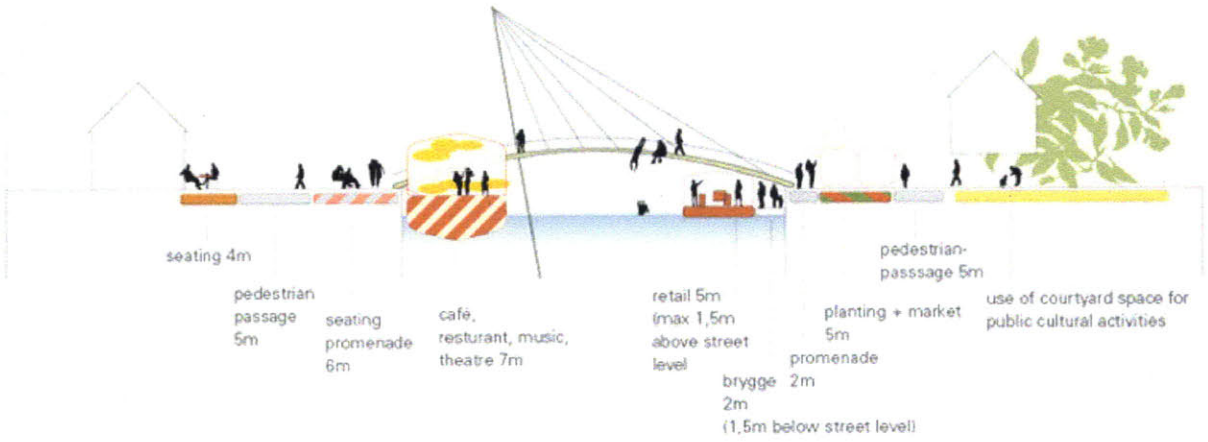
Detail and color should be used to focus on the drawing's primary content, all other elements should be radically simplified (but are critical for orienting the reader)

Most valuable drawing type for describing the defining characteristics of a street

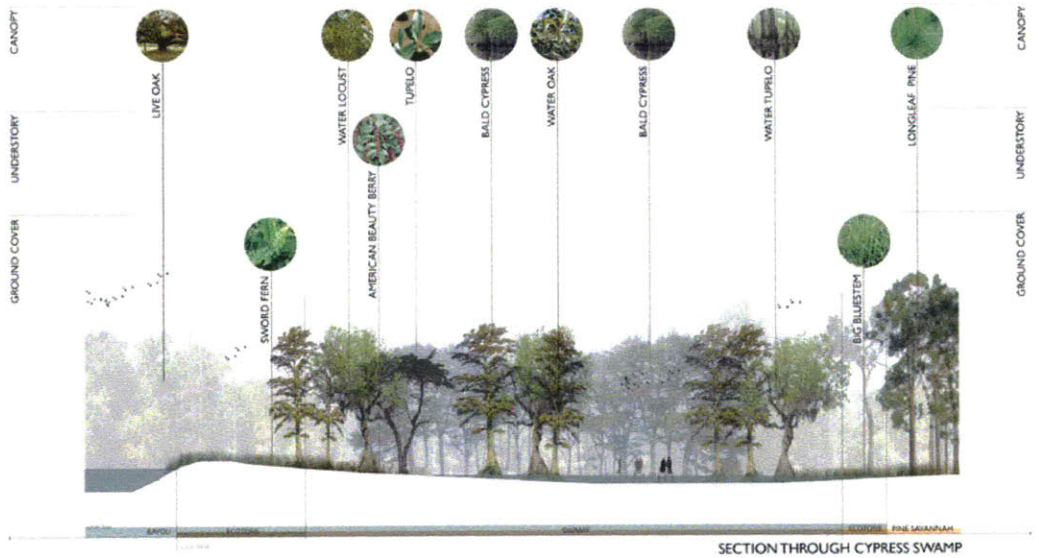
Markers and icons can be used in conjunction with a section drawing to organize the entire document

Simple, diagrammatic sections of multiple streets, aligned vertically, enable quick comparison of street types.





scout island ecosystems



SECTION THROUGH CYPRESS SWAMP

Because of the salinity of the water on site, the Cypress Swamp was designed to use water falling on the site.

12

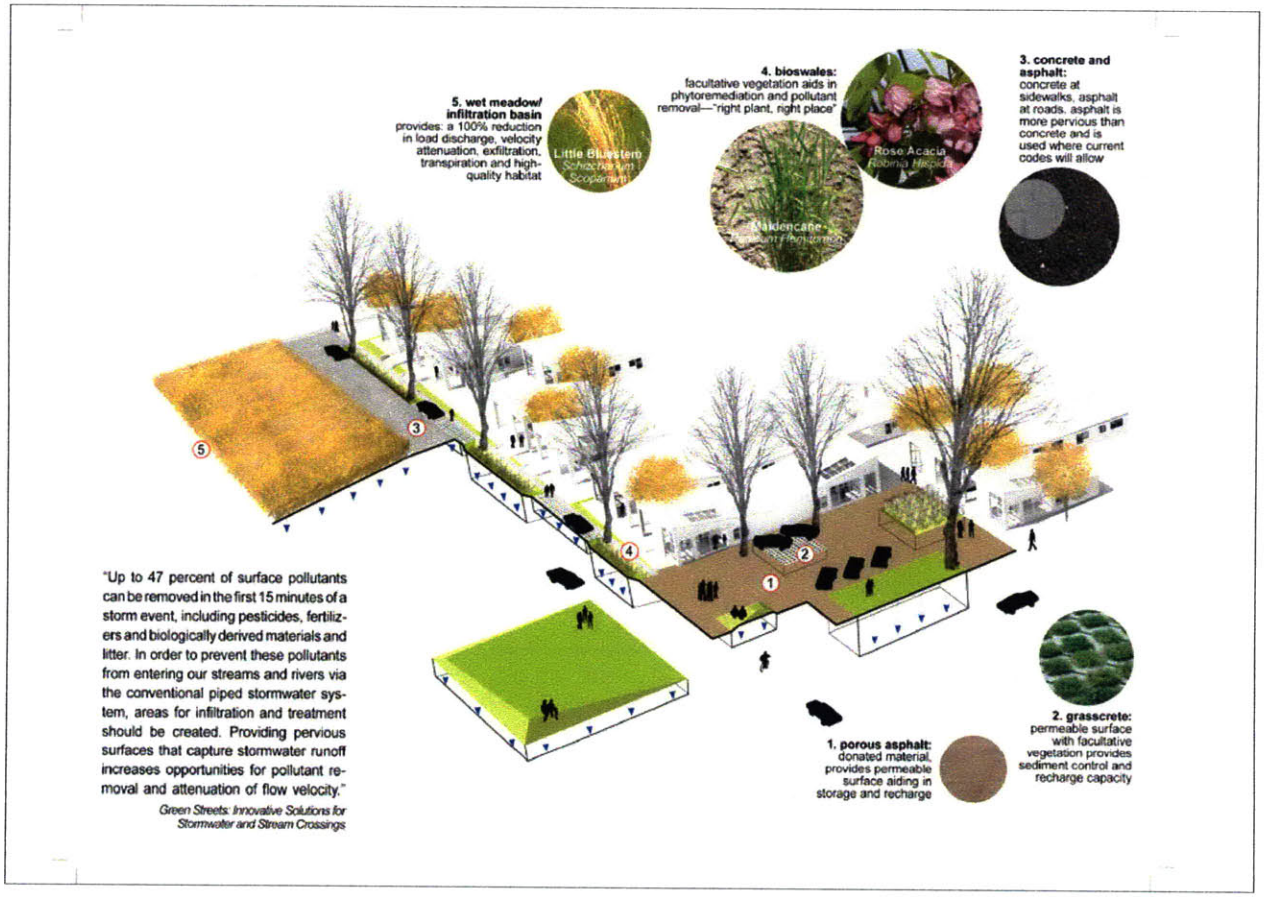
PERSPECTIVE SECTIONS

Even a minimal amount of receding space can have a significant impact in aiding legibility

Use lineweights, color and masks to create hierarchy and highlight the drawing's primary content

Orient dimension strings and numbers with the perspective

Enables the reader to orient themselves more easily; less abstract than traditional section




Cafe
Allora
building frontage zone
3-10 feet
clear zone
5-15 feet
furnishing zone
4-8 feet


8'
8'
5'
11'
12'
11'
5'
8'
12'
80'

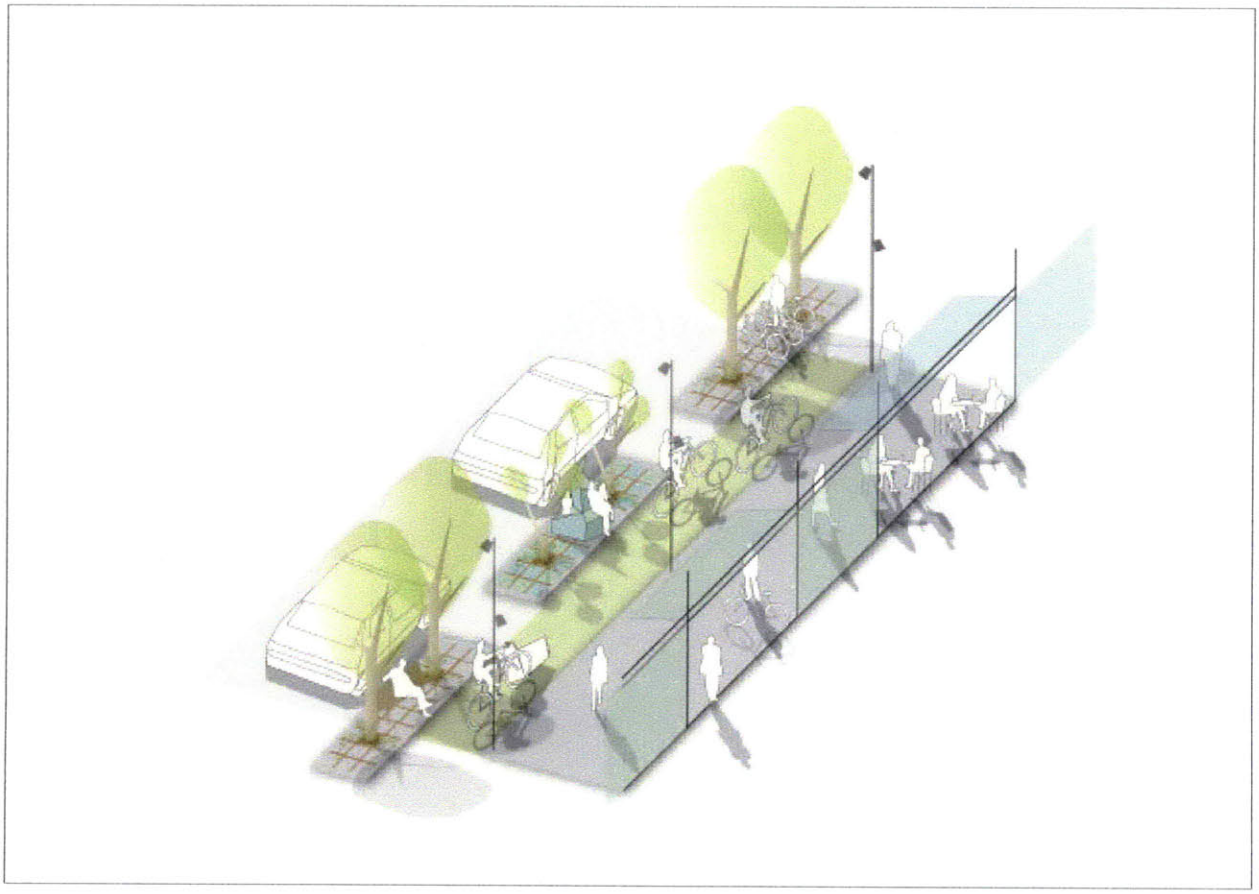
OVERHEAD VIEW

Drawings in 3D tend to be more interactive and captivating because they can contain more information than 2D drawings

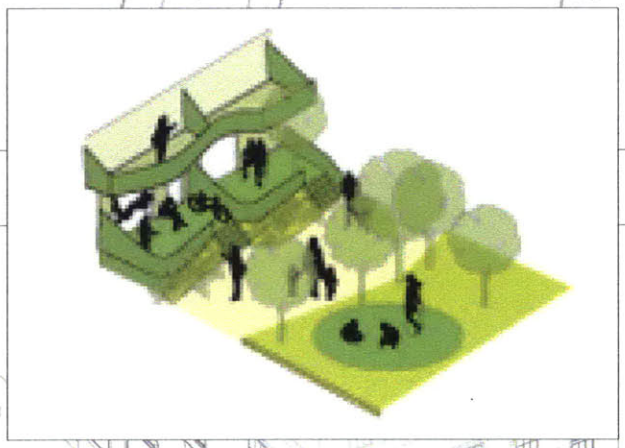
Choose a view/angle that maximizes exposure of ground plane

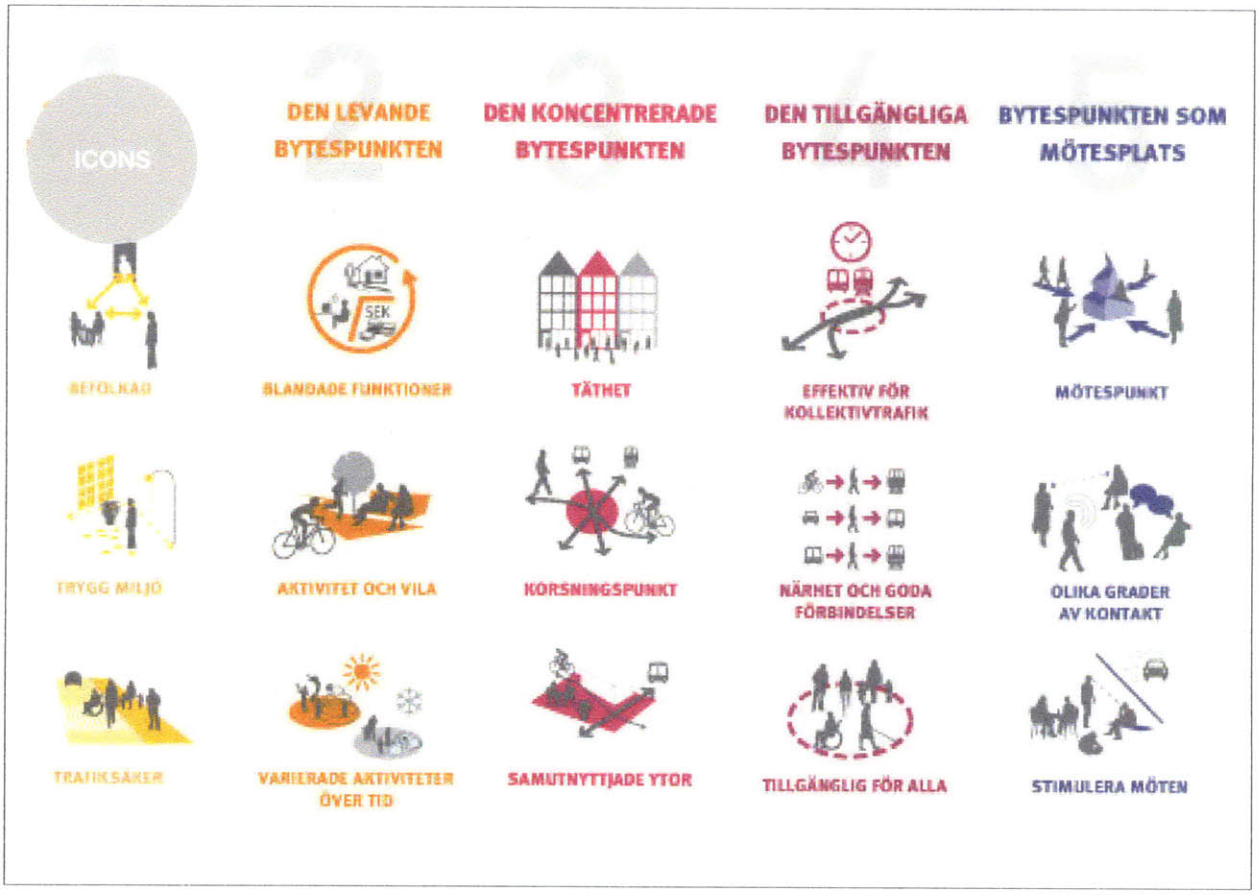
Especially useful for describing intersections

Simple three-dimensional representations can allow reader to orient themselves much more quickly




>> Landscape Projects



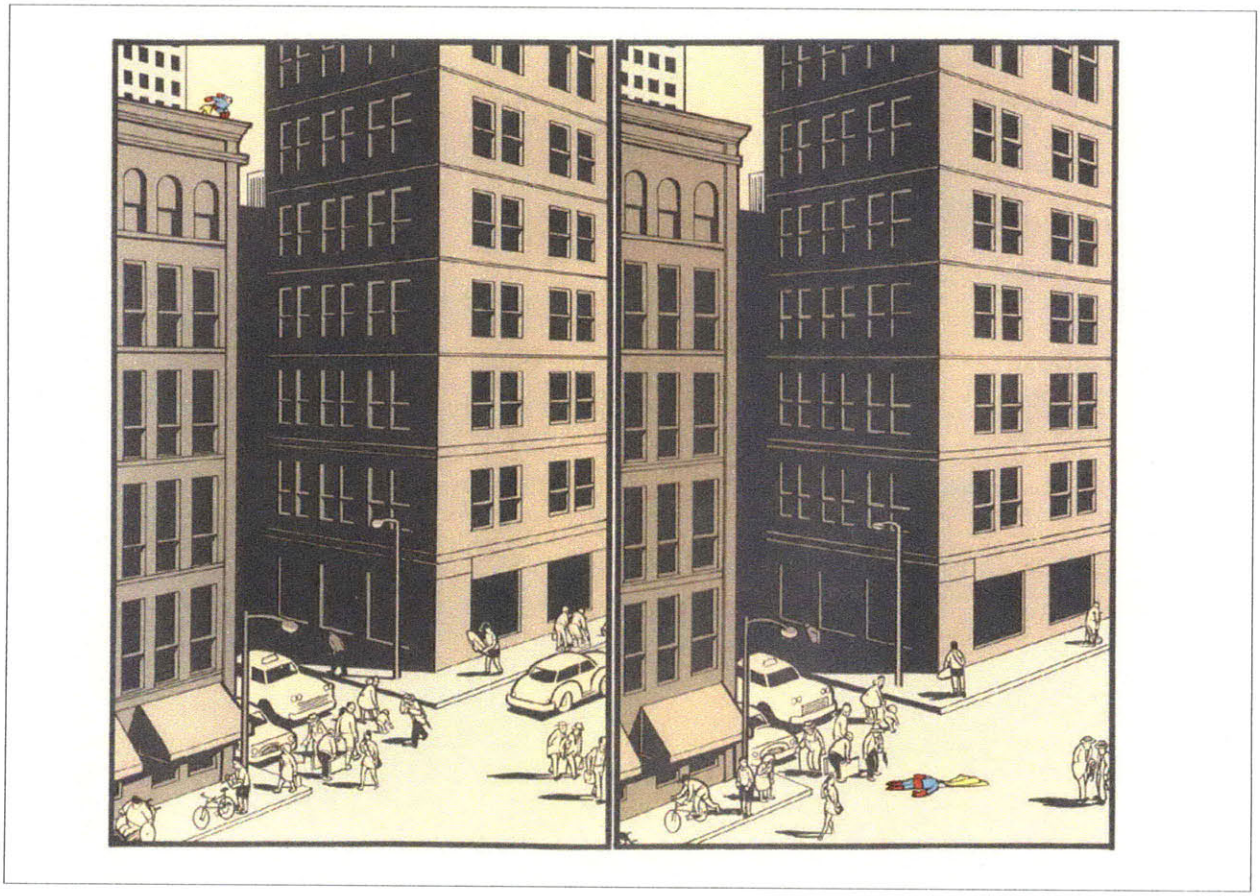

ICONS
DEN LEVANDE BYTESPUNKTEN
DEN KONCENTRERADE BYTESPUNKTEN
DEN TILLGÄNGLIGA BYTESPUNKTEN
BYTESPUNKTEN SOM MÖTESPLATS
BEFOLKAD
BLANDADE FUNKTIONER
TÄTHET
EFFEKTIV FÖR KOLLEKTIVTRAFIK
MÖTESPUNKT
TRYGG MILJÖ
AKTIVITET OCH VILA
KORSNINGSPUNKT
NÄRHET OCH GODA FÖRBINDELSER
OLIKA GRADER AV KONTAKT
TRAFIKSÄKER
VARIERADE AKTIVITETER ÖVER TID
SAMUTNYTTJADE YTOR
TILLGÄNGLIG FÖR ALLA
STIMULERA MÖTEN

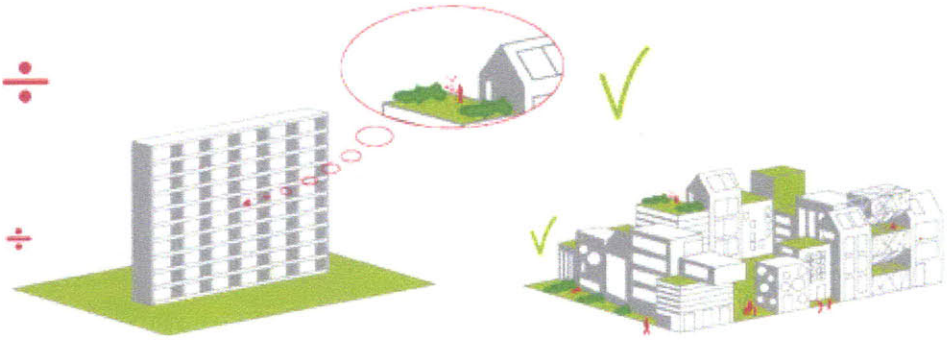

SPECIAL FEATURE
Water feature in constant change.
A spectacular attraction.
ACTIVITY SPACE
Open space for public events and activity.
COMMERCIAL ACTIVITIES
Outdoor cafés and outdoor commercial spaces
PASSIVE RECREATION
Public seating
ACTIVE RECREATION
Sports and leisure activities.
DESIRE LINES
Clear space for pedestrian acces and flows.
FUNCTIONS & ENTRANCES

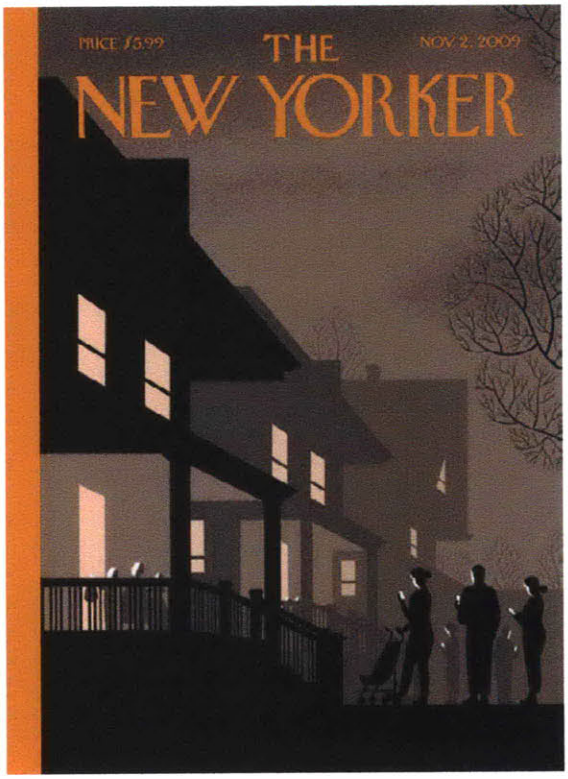
TRANSECT

Seek out opportunities to represent systems, networks and processes visually in order to enhance the reader's comprehension

Minimize cross-referencing



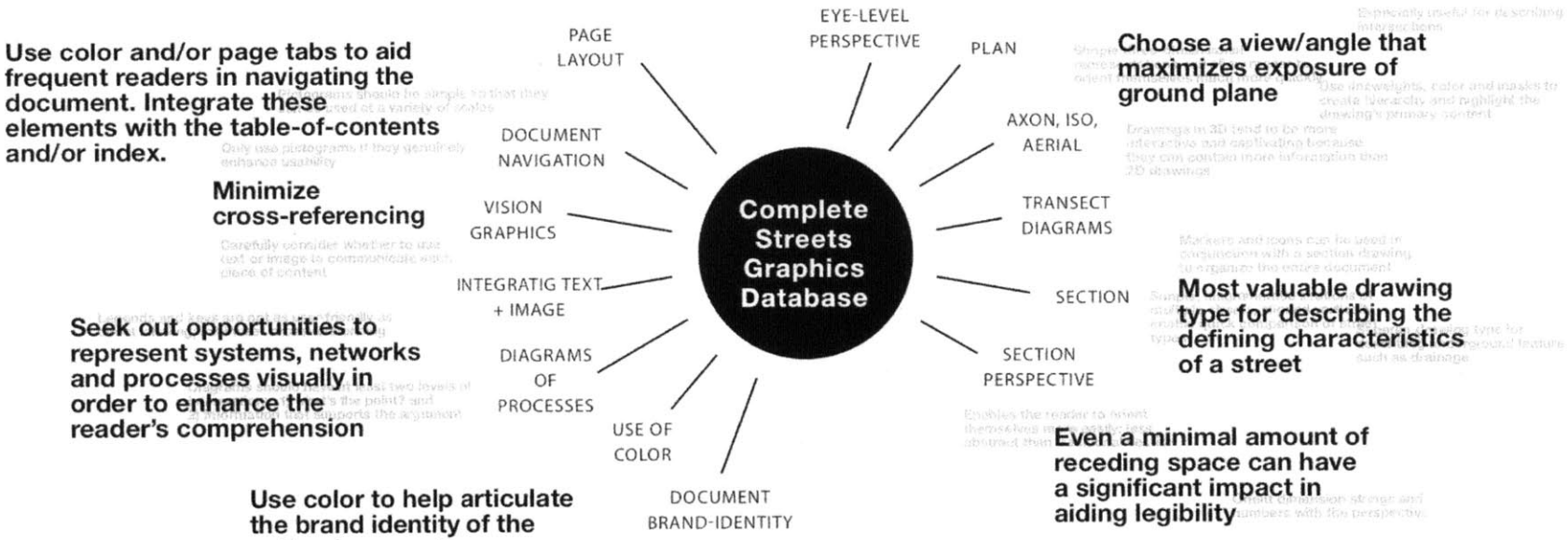



PRICE $5.99
THE
NEW YORKER
NOV. 2, 2009

GRAPHIC PRECEDENTS observations

Below - When designing the guideline book for complete streets, it's important to note the following organizational hierarchies. The focus of this study will be on section 1, the drawings and diagrams of streets.

Right - The infographic Describes the various lessons learned concerning design of graphics for streets.


Complete Streets Graphics Database
PAGE LAYOUT
EYE-LEVEL PERSPECTIVE
PLAN
AXON, ISO, AERIAL
TRANSECT DIAGRAMS
SECTION
SECTION PERSPECTIVE
DOCUMENT BRAND-IDENTITY
USE OF COLOR
DIAGRAMS OF PROCESSES
INTEGRATIG TEXT + IMAGE
VISION GRAPHICS
DOCUMENT NAVIGATION
Use color and/or page tabs to aid frequent readers in navigating the document. Integrate these elements with the table-of-contents and/or index.
Minimize cross-referencing
Seek out opportunities to represent systems, networks and processes visually in order to enhance the reader's comprehension
Use color to help articulate the brand identity of the entire document
The document should be engaging and easy-to-use; it should not look like a manual or final report. It must function as both a storytelling piece and a reference guide.
Level of detail must be appropriate to the drawing's scale
Choose a view/angle that maximizes exposure of ground plane
Most valuable drawing type for describing the defining characteristics of a street
Even a minimal amount of receding space can have a significant impact in aiding legibility

What is Everyone's Graphic Common Ground?

PLANS

SECTIONS

2D Space

Accurate Dimension Specification

Engineering and Design Tool

PERSPECTIVE SECTIONS

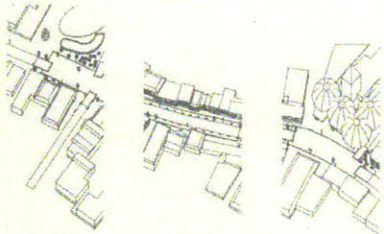
Two-Point

OVERHEAD VIEW

Parallel Projection, Perspective

COMPLETE DRAWING

TRANSECT



Parallel Projection

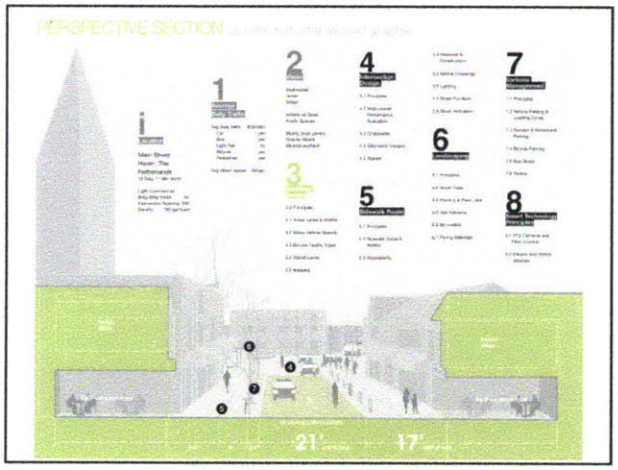
3D Space

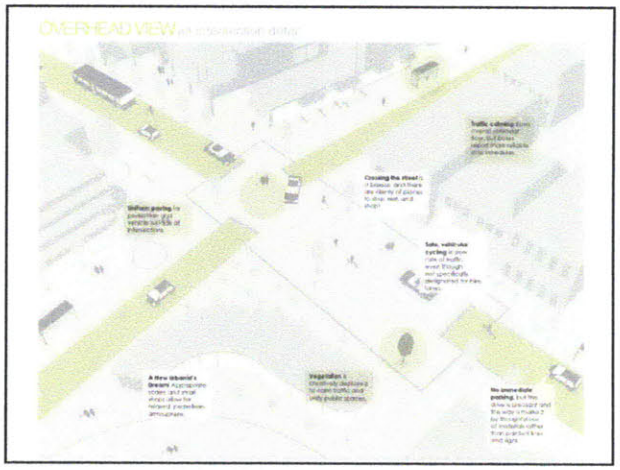
Immediate Experiential Street View

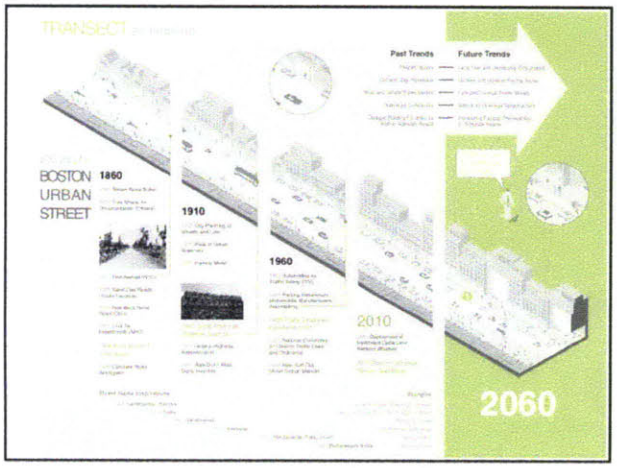
Enticing Spatial Understanding

STREET VIEW


Viewing Preferences
PLANS
SECTIONS
PERSPECTIVE SECTIONS
OVERHEAD VIEW
TRANSECT
STREET VIEW
Cyclist
Pedestrian
Motorist
Urban Planner
Architect
Transit Engineer
Landscape Urbanist


PERSPECTIVE SECTION
21'
17'


OVERHEAD VIEW


TRANSECT
BOSTON URBAN STREET
1860
1910
1960
2010
2060
Past Trends
Future Trends


Case Studies in
BOSTON COMPLETE STREETS
Optimizing Use of Street Space
Minimum Lane Width
25

COMPLETE DRAWINGS prototypes

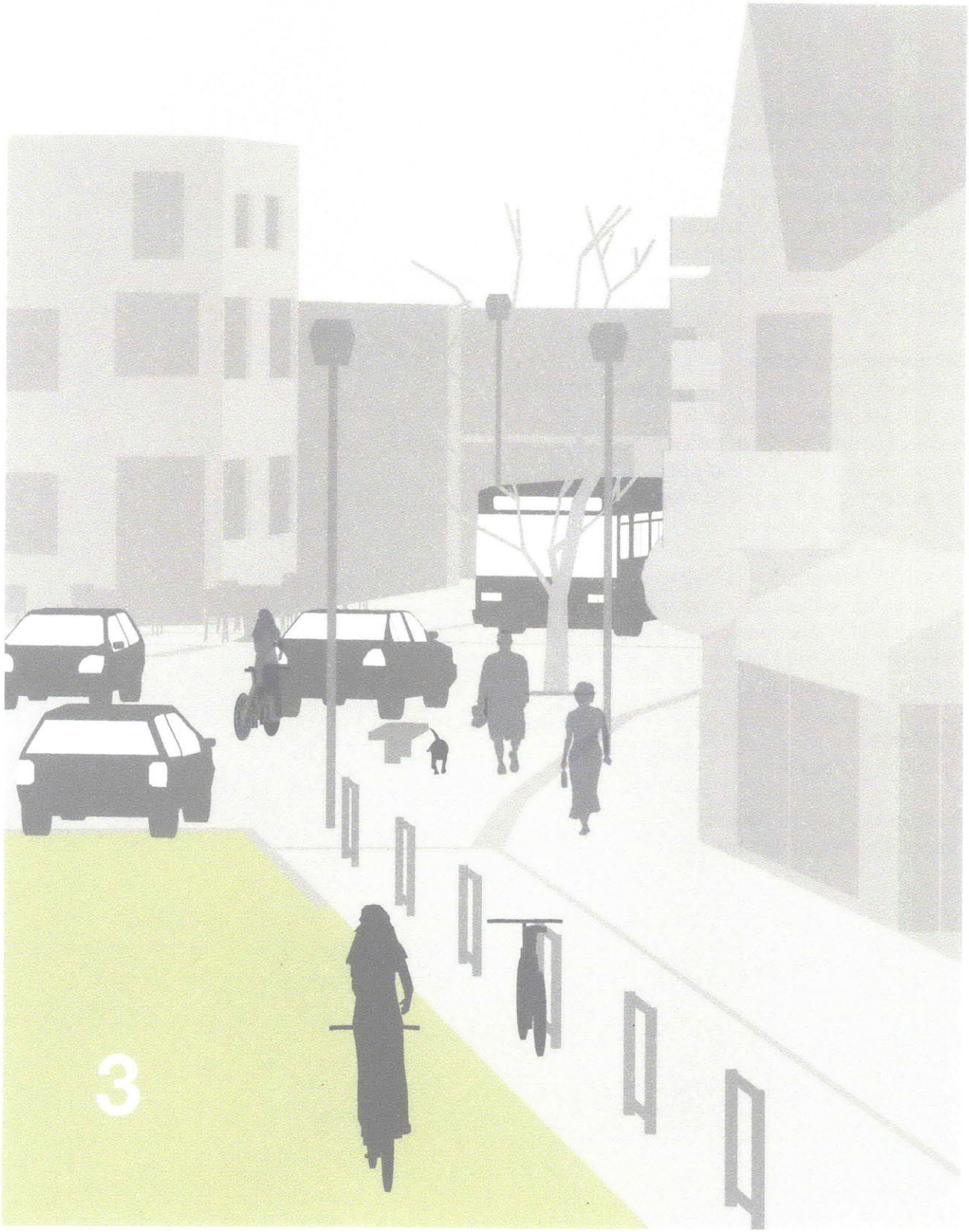
The following graphics demonstrate isolated, hypothetical representations of different street configurations, all tailored to show different information regarding streets. The drawings are derived from the lessons learned from the precedent studies. (Graphics were created with Google Sketchup 7 and Adobe Illustrator and Indesign CS4.)

Section-Perspective
-minimal amount of receding space can have significant impact on legibility
-legend shows range of possibilities for street items that could be called out
-graphic is sensitive to facade permeability

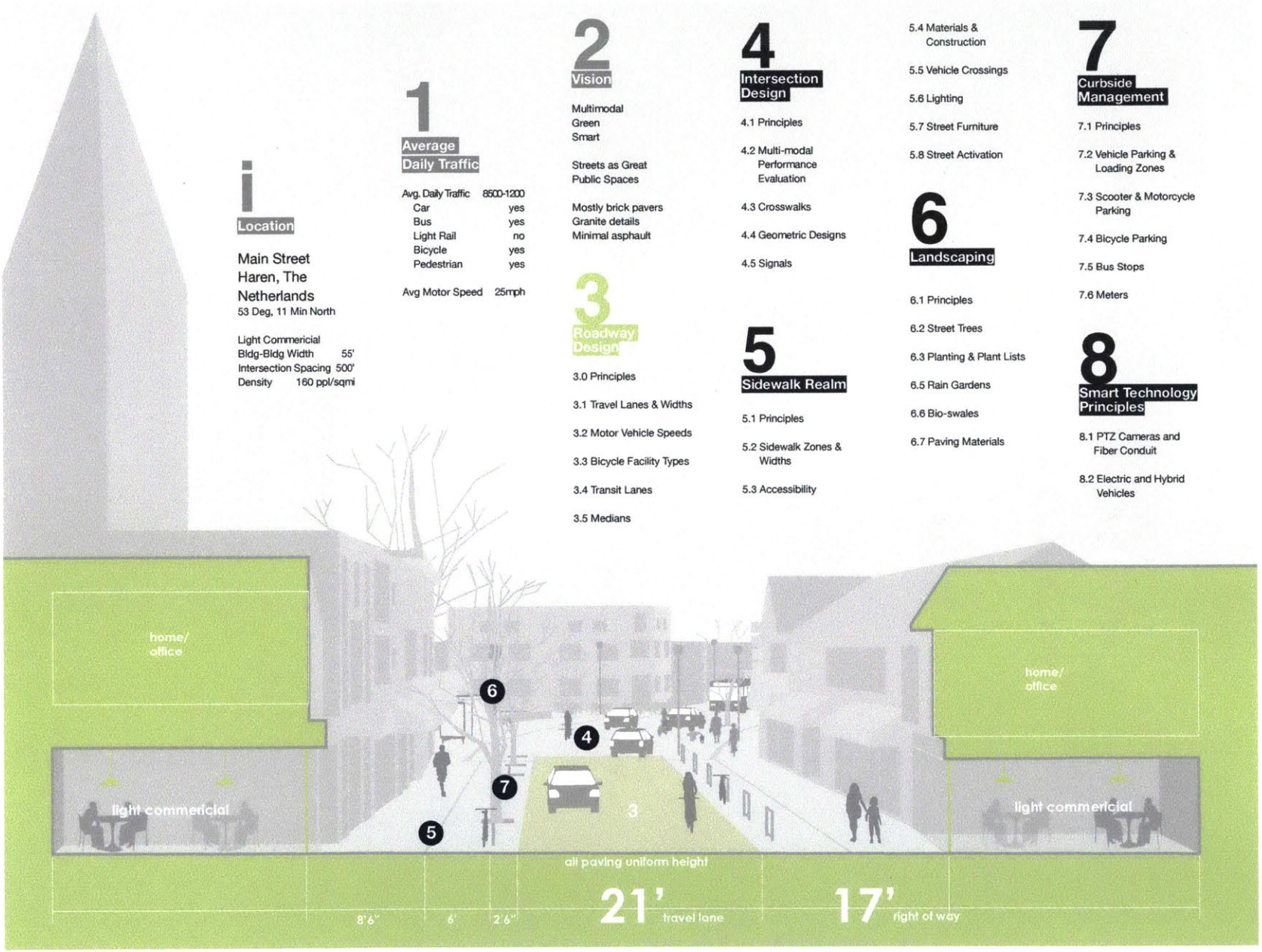
Overhead View
-great for intersection detailing
-information called out directly on drawing
-cabable of showing travel mode densities
-linework generally avoided for legibility/ scalability concerns

Transect
-gradient across time

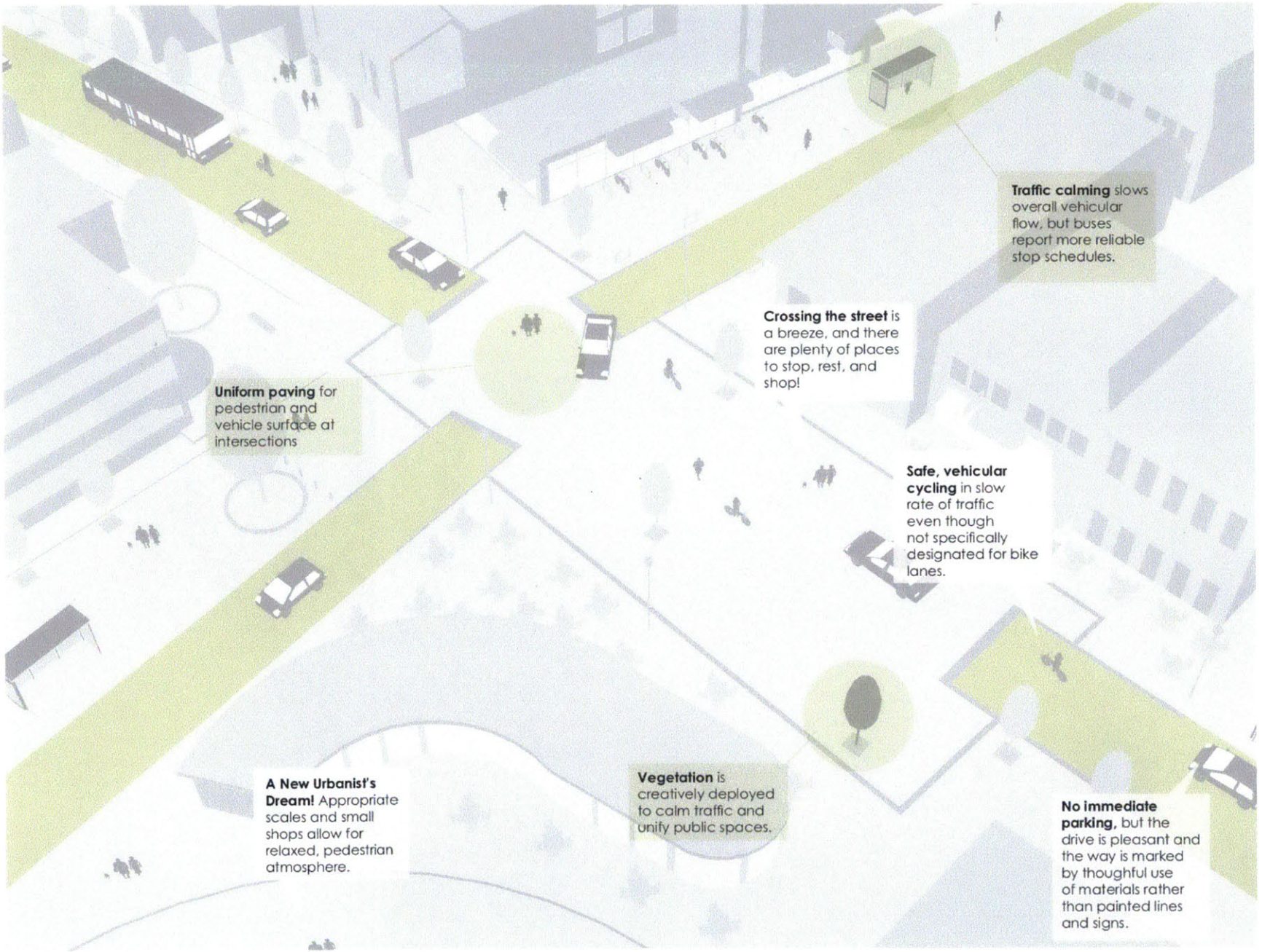
Boston Complete Streets
-various highlighting strategies

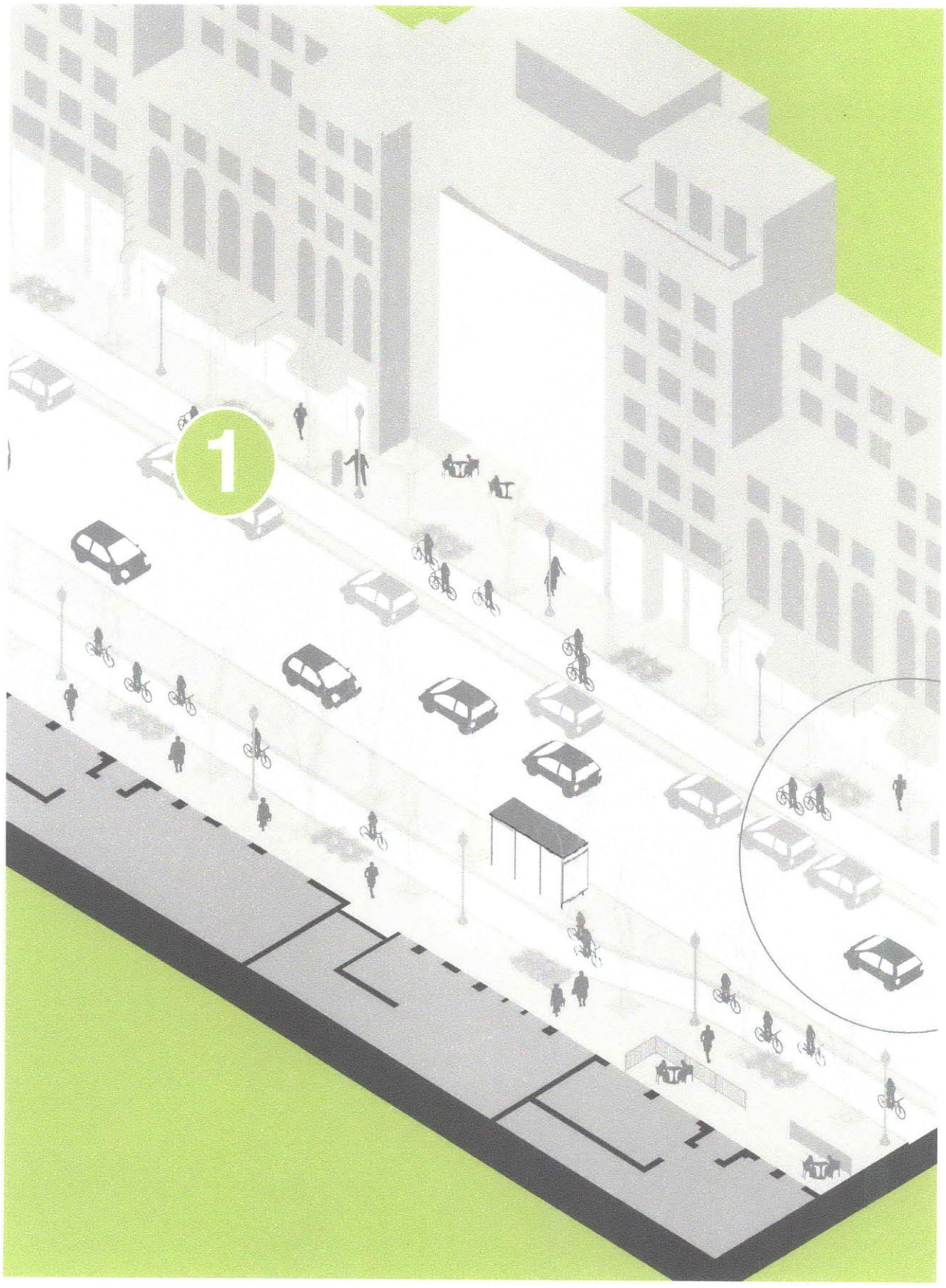

3

PERSPECTIVE SECTION as informational legend graphic



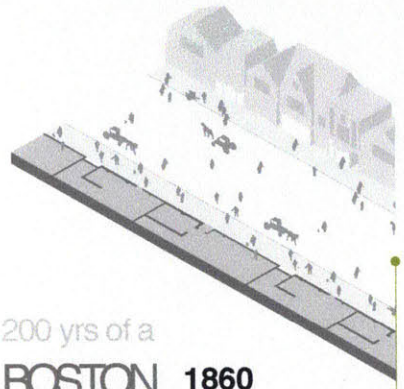
OVERHEAD VIEW as intersection detail




1

TRANSECT as timeline

200 yrs of a
BOSTON URBAN STREET



1860

1869 Steam Road Roller

1869 Tree Shade As Ornamentation (Ottawa)

1872 First Asphalt (NYC)

1889 Sand Clay Roads (South Carolina)

1893 First Brick Rural Road (Ohio)

1905 Coal Tar Experiments (NYC)

1908 Ford Model T Introduced

1909 Concrete Road (Michigan)

1910

1916 City Planning of Streets and Lots

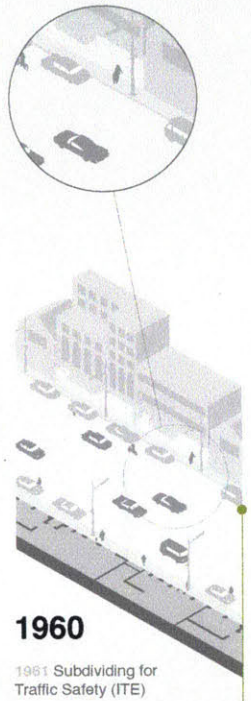
1932 Peak in Urban Greenery

1935 Parking Meter

1943 Great American Streetcar Scandal

1949 Federal Highway Administration

1952 Walk/Don't Walk Signs Invented



1960

1961 Subdividing for Traffic Safety (ITE)

1961 Parking Dimensions (Automobile Manufacturers Association)

1965 Traffic Engineers Handbook (ITE)

1967 National Committee on Uniform Traffic Laws and Ordinance

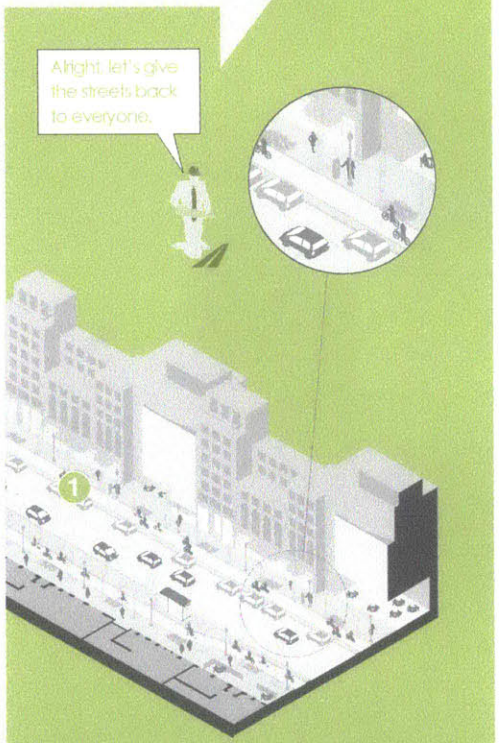
2006 New York City Street Design Manual

2010

2010 Deployment of Dedicated Cycle Lane Network (Boston)

2011 Boston Complete Streets Guidelines

Past Trends	Future Trends
Shared Streets	Lane Use and Ownership Designated
Dirt and Clay Pavement	Diverse and Durable Paving Types
Slow and Simple Travel Modes	Fast and Diverse Travel Modes
Nature as Commodity	Nature as Drainage Infrastructure
Opaque Building Facades as Wall to Sidewalk Realm	Increasing Facade Permeability to Sidewalk Realm



2060

Street Name Inspirations

1800 Landmarks , Heroes
1850 Trees
1860 Developers
1880 Avenues
1910 Boulevards, Park, Court
1940 Picturesque Drive

Examples

Church Street, Washington Street
Chestnut Street, Elm Street, Walnut Street
Richards Street
Commonwealth Avenue
Onteora Blvd
Storrow Drive

Case Studies in BOSTON COMPLETE STREETS

Roadway design in Boston is a complex endeavor due to narrow rights-of-way and competing needs of users. This study primarily covers street design between curbs—that is, travel lanes that are used by bicycles, automobiles, trucks, and transit vehicles.

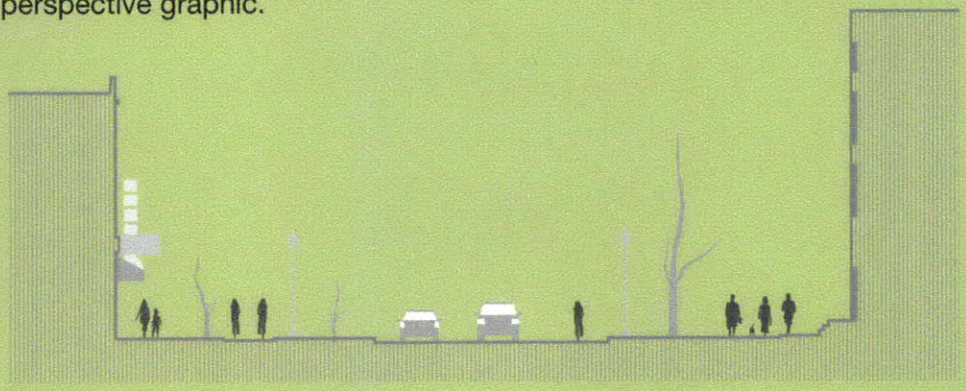
Principle 1

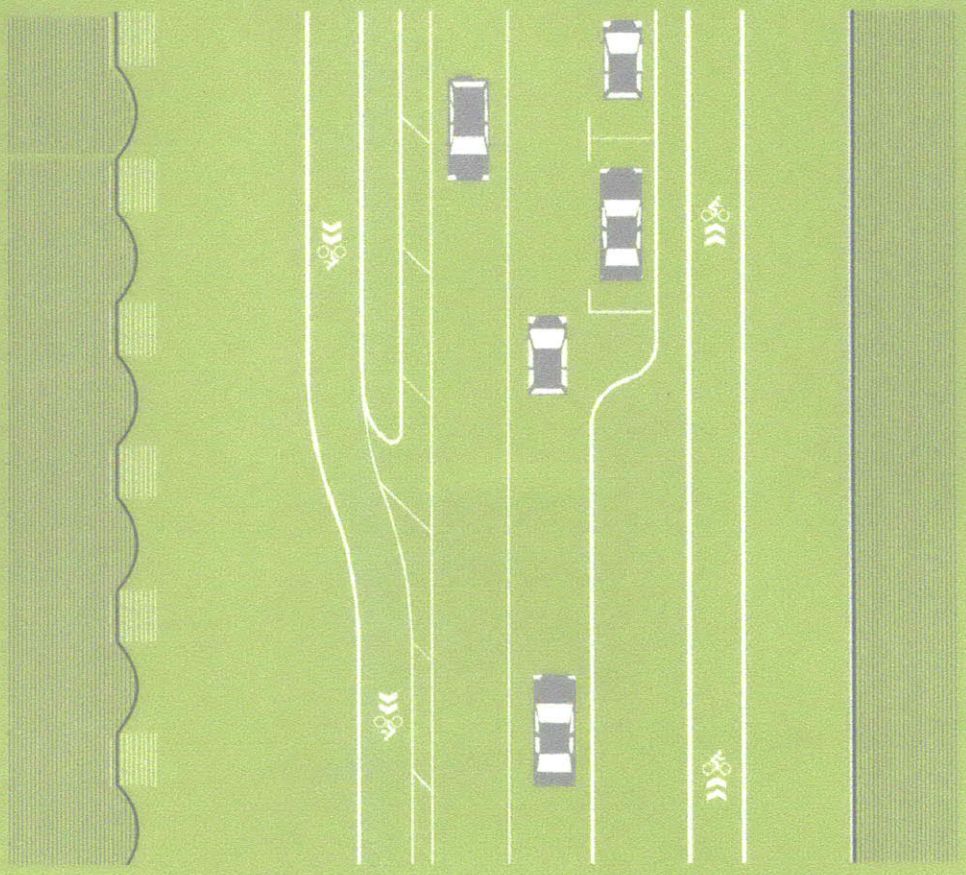
Street space shall be optimized, with a priority on reducing

Principle 2

Streets will be designed to

For a standard of comparison, a boston complete street design is represented by traditional two-dimensional drawings. The next page demonstrates the same information reproduced in a single, section-perspective graphic.

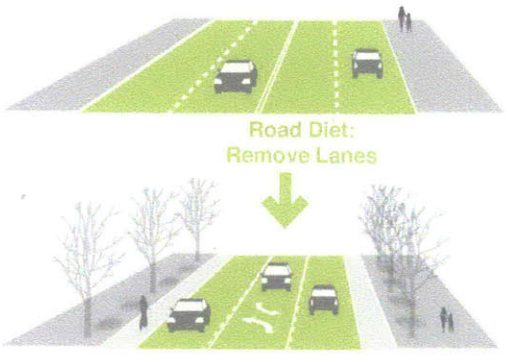




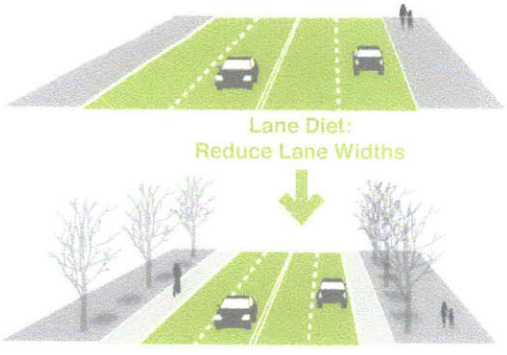
Plan and Sectional information of a hypothetical cycle track configuration in Boston

Optimizing Use of Street Space

1. Determine if the street is a candidate for a **road** diet:



2. Determine if the street is a candidate for a **lane** diet:



Minimum Lane Width

25 MILES PER HOUR

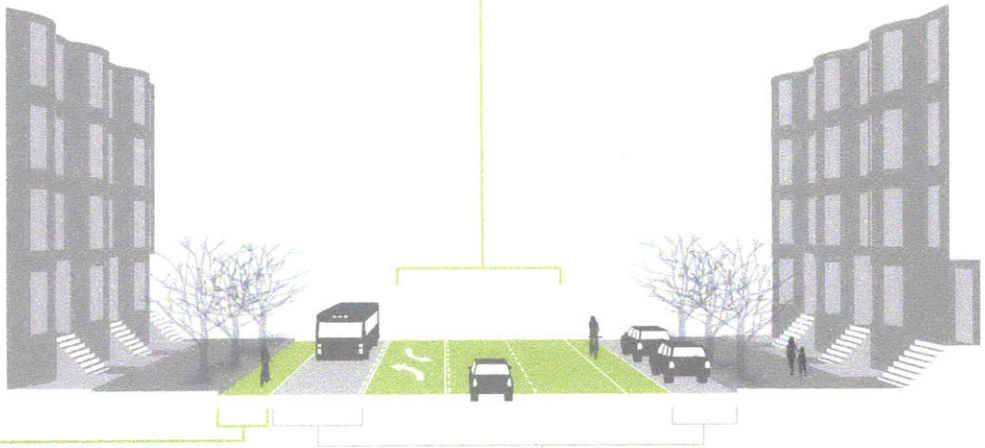
Most City streets should be designed to produce an operating speed

Collector / Arterial

Motor Vehicle Travel

Two-way left turn lane (TWLTL)	10ft / 10ft
Peak hour restricted parking lane	12ft / 12ft
Inside travel Lane	10ft / 10ft

Travel lane adjacent to on-street parking:	
Shared use lane	10ft / 12ft
Adjacent bicycle lane available	10ft / 10ft
Travel lane adjacent to curb, no parking:	
Shared use lane Adjacent bicycle lane available	10ft / 12ft



Bicycle Lanes

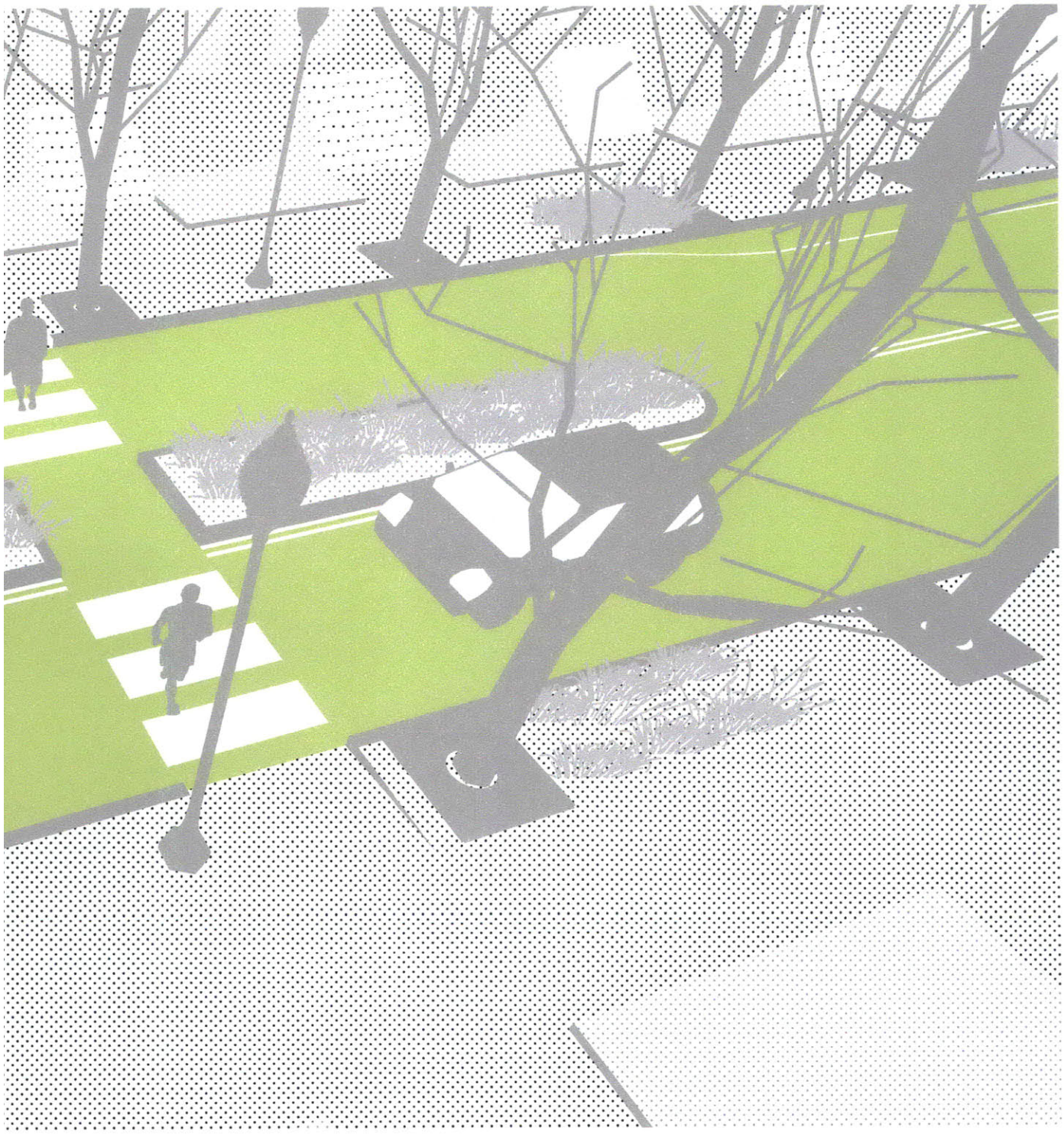
Bicycle lane - parking permitted	5ft / 10ft
Bicycle lane - parking not permitted, curb	4ft / 5ft
Bicycle lane - parking not permitted, no curb	4ft / 10ft

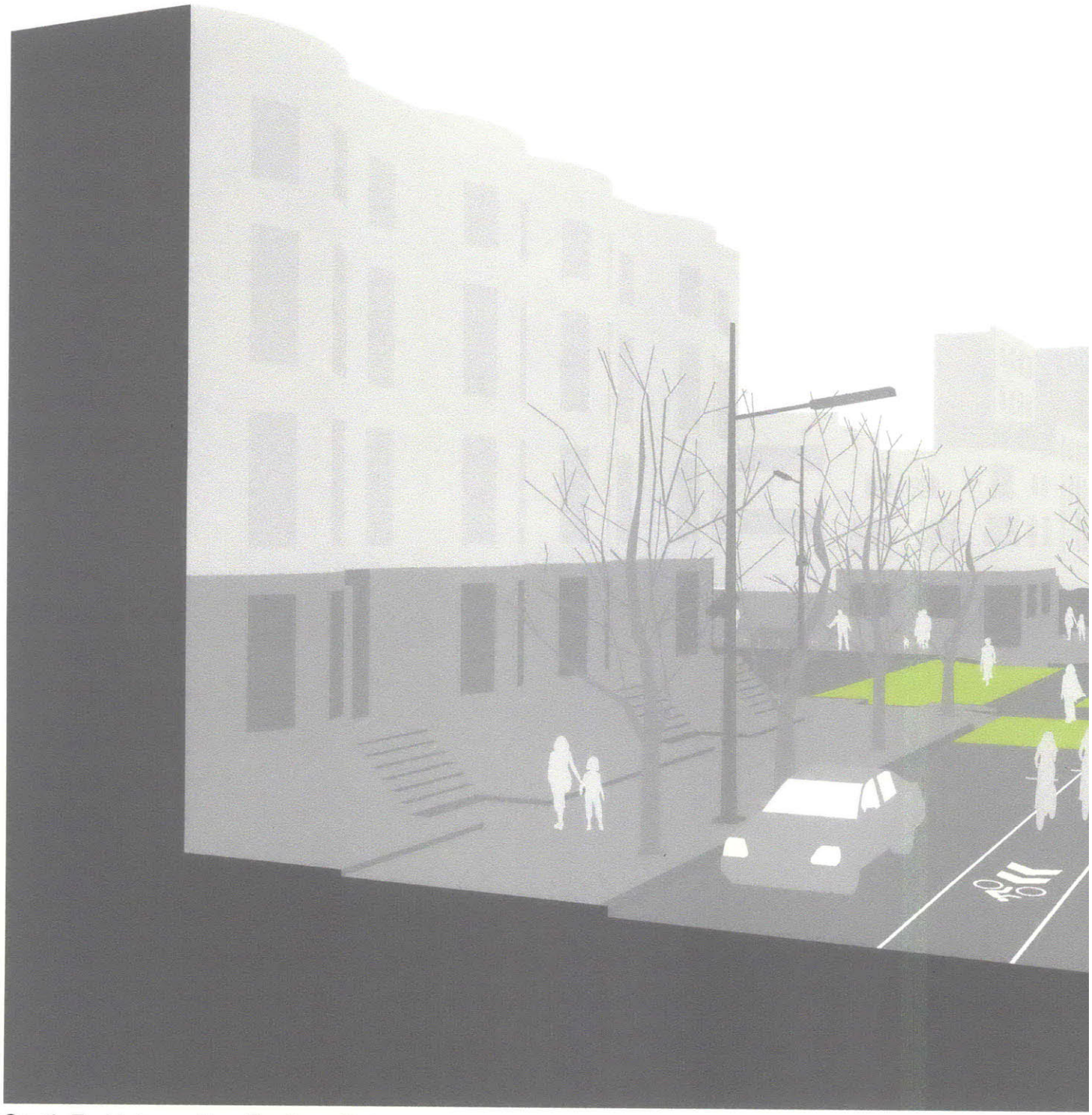
Other Lanes

Parking lane	7ft / 7ft
Bus-only lanes	NA / 11ft
Bus and bicyle lanes	NA / 12ft

Mid-Block Bioswales Configuration

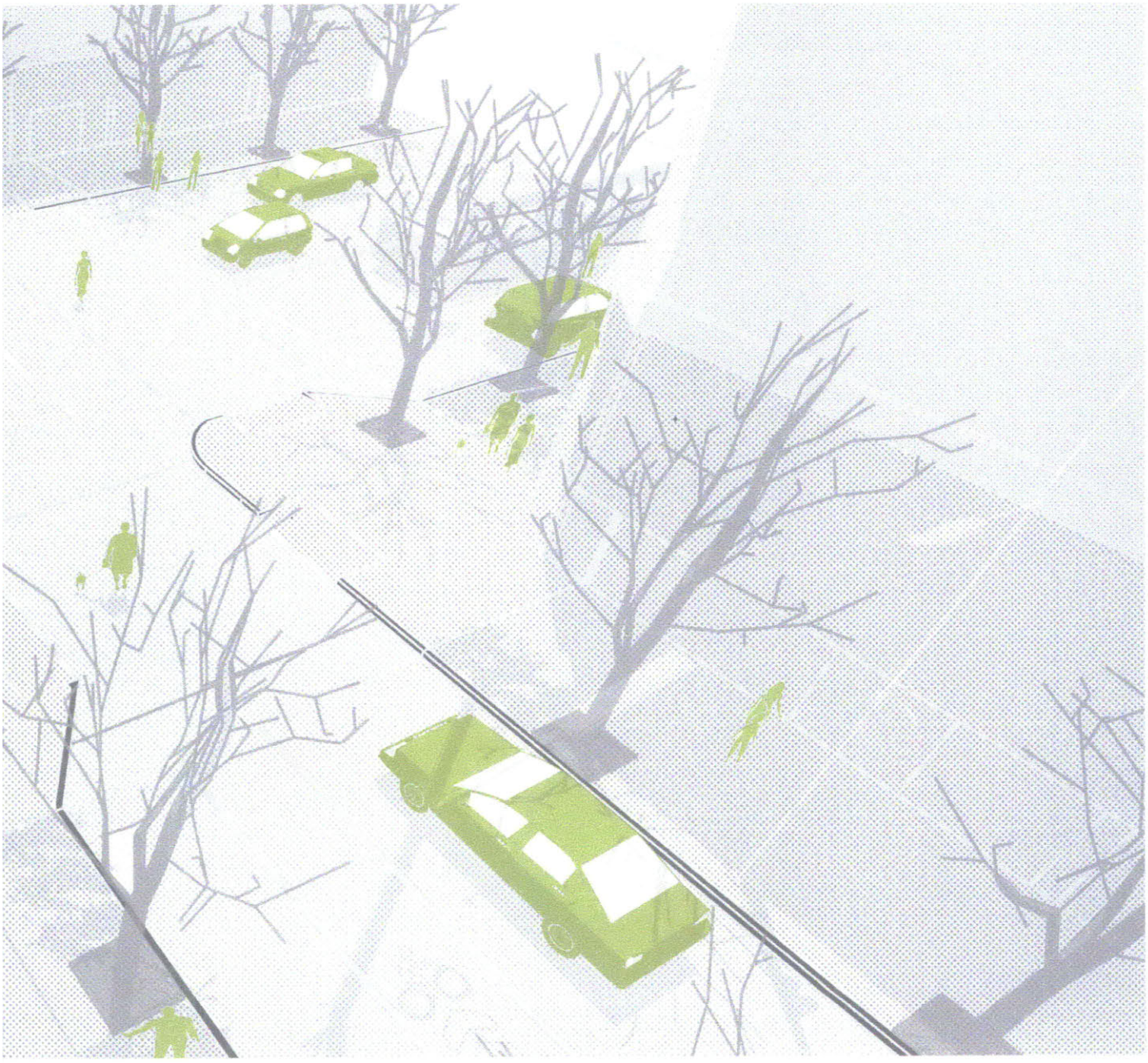
Mid-Block Center Median Configuration





South End Intersection Configuration

Intersection Travel Mode Study



Complete Drawing Prototypes For Urban Complete Streets

by

James Ira Winder

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Partial Fulfillment of the Requirements for the Degree of
Bachelor of Science in Art and Design in
Architectural Design

CONCLUSIONS

The graphics derived in this study are useful for designers engaging in discussions about Complete Streets with any combination of other designers, engineers, politicians and street users.

Software like Sketchup and Illustrator can be used to easiliy swap library components and share street design ideas.

As an Architectural Design student, this street space study was incredibly useful for understanding a building's street context, an aspect often ignored in architecture education.