CONPREHENSIVE MASTER PLAN FOR PARK 10

Systematic Design Approaches in Urban Development

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This final report presents a service-learning project focusing on the comprehensive Master Plan for Park 10, Houston, TX, completed by a design team with seven graduate students through the direction of the advisor, Dr. Jun-Hyun Kim in the Department of Landscape Architecture & Urban Planning at Texas A&M University. The design team had one year (from May 2015 to April 2016) to prepare proposed planning and design solutions including one interim review by the clients, Mr. Clark Martinson, General Manager, and Mr. David W. Hightower, President of The Energy Corridor District in September 2015.

This project proposes to develop a comprehensive master plan incorporating key principles of sustainable urbanism for Park 10, a highly developed business district located in The Energy Corridor District, Houston, TX. The central business sector and the ECD innovation center are chosen as the individual concentration design sites. The main goal of the proposed master plan is to guide the future development of The Energy Corridor District, while providing the means for opportunity and growth. This proposed master plan will create sustainable urban development and healthy living and working environment. The proposed plan will also help create a sense of identity for the area so that it will become a place where people will want to come and spend time. This plan contains diverse streetscapes promoting walkability and land uses including restaurants, offices, shopping, and green network systems including parks that can be accessed by people within and outside of the district though multiple transportation modes.

The Energy Corridor District will benefit by the proposed master plan to explore potential development of the district regarding how the existing built environment could be renovated and improved as well as how public space around the district could be effectively managed by The Energy Corridor District. These design products also benefit The Energy Corridor District by helping to develop an understanding of the process of the district property inventory, analysis, conceptual design formulation, and design refinement as a precursor to action for planning and designing the district.

The first part of this report describes the project and outline what it entails. The scope of work details what this product produces in terms of solutions and amenities that will benefit The Energy Corridor District’s future development. This report includes an introduction and site analysis that describes the project location and identifies the social, natural and built environments of the project site. The case studies were conducted based on similarities to the project as well as how successful these case studies could be in identifying and achieving some of the solutions that have been proposed for the future development of the site. The project applied system-oriented design concept and spatial programming plan, and developed five main design goals based on site analysis and prior projects. The proposed master plan includes a preliminary comprehensive plan and concentration area design solutions. The proposed design systems reflect street connectivity, multiple transportation options, economic development, low impact and sustainable development, and analyze economic and landscape performance benefits. All of these goals and deliverables are represented through high aesthetic quality.
INSTRUCTOR

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ACKNOWLEDGEMENTS

We would like to express our sincere appreciation for the generous support from the leaders of The Energy Corridor District, Mr. Clark Martinson, General Manager, and Mr. David W. Hightower, President. They provided us with the great opportunity to learn and further our education with such a progressive and inspirational site. Our appreciation is also extended to The Energy Corridor District Board members. Their gracious support included providing the students involved with the Urban and Landscape Design Service Learning Scholarship in 2015.

NOTES

The proposed design won the Merit Award of the 2016 Texas Chapter American Society of Landscape Architects (TX ASLA) Student Design Competition.
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I. INTRODUCTION
The 1,700 acre Energy Corridor District is located 17 miles from downtown Houston. It is currently a master-planned business district and home to more than 300 multi-national, national and local companies, employing over 84,000 people. The suburban environment within the district offers living options for different types of needs and lifestyles. Surrounded by two large reservoirs, the Energy Corridor District enjoys over 26,000 acres of open natural areas, and more than 50 miles of green trails linking office parks, campuses, and neighborhoods (Energy Corridor District, 2013). The ECD has been experiencing remarkable growth and rapid urbanization with large areas still being developed.

With the growing needs for sustainable urban development and healthy living and working environment, the ECD is looking for future development plans and visions to support the continuous population expansion and economic growth. The first phase of the comprehensive master plan for the ECD was completed in 2015 summer in the urban design studio instructed by Dr. Jun-Hyun Kim in the Department of Landscape Architecture & Urban Planning at Texas A&M University, including a transit center development plan of the Addicks Park & Ride, a waterfront preservation strategy of the Terry Hershey Park, and walkable streetscape design on the Park Row. This proposed study thus focusses on the renewal of the urban commercial and industry district of the Park 10 based on the first phase plan.
SOCIAL ENVIRONMENTS - POPULATION & URBANIZATION

Population

Urbanization in Houston

Reference: City-data.com, Houston GIS data
SOCIAL ENVIRONMENTS - EMPLOYMENT CENTERS

Reference: 2014 the Energy Corridor District Land Use and Demographics
Temperature

Collectable Rainwater on Site

Over 1.23 billion gallons of infiltrable water fell on the 908.4 acre site, enough to fill 1,860 Olympic sized swimming pools.

1" rain over 1 acre = 27,000 GAL
Site Averages 50" of rain per year; 1.23 BILLION GAL

Houston
US
Texas

1.0" = 27K gallons
1.0" = 1.4M gallons
90.6" = 1.338 gallons
NATURAL ENVIRONMENTS - FLOOD PLAIN

NATURAL ENVIRONMENTS - WILD LIFE HABITAT

Woodland
- White-tailed Deer
- Feral Hog
- Raccoon
- Woodpecker

Wetland
- White Ibis
- Duck
- Frog
- Turtle
- Snake

Open Land
- Rabbit
- Red-tailed Hawk
- Quail
- Bluebird
- Butterfly

Plants:
- Salix nigra
- Fraxinus pennsylvanica
- Pinus taeda
- Cephalanthus occidentalis
- Muhlenbergia capillaris
- Iris brevicaulis
- Hymenoxys texana
- Ranolla simplex
- Thelypteris korshii
- Tripsacum dactyloides
BUILT ENVIRONMENTS - IMPERVIOUS SURFACE

2001

2006

TIA = 1,752.48 ac
% TIA = 43.16%

2011

TIA = 1,908.33 ac
% TIA = 47.00%

TIA = 2,261.59 ac
% TIA = 55.70%

% Imperviousness

07.01.2011
Enact Drainage Utility Ordinance & begin collection of drainage charges

Annual Rate per sq.ft of Impervious Surface
- Residential curb & gutter, non residential = 3.20 $/sf
- Residential open ditch = 2.60 $/sf
BUILT ENVIRONMENTS - TRAFFIC ACCIDENTS & TRAFFIC NOISE

Reference: Houston Regional Traffic Count Map
H-GAC’s Transportation Department
Reference: Energy Corridor District Unified Transportation Plan
Reference: Energy Corridor District Unified Transportation Plan, Energy Corridor District Bicycle Master Plan
II. CASE STUDY
SUMMARY OF CASE STUDIES

WALKABLE/BIKABLE/LIVABLE COMMUNITY
1. Measuring the Street, New York, USA, 2013
2. Bicycling Benchmark in the U.S., USA, 2007
3. Bike City, Copenhagen, Denmark, 2015
4. Portland Bicycle Master Plan, OR, USA, 1996
5. MLK & Reading Road Corridor, OH, USA, 2016
6. Nannie Helen Burroughs Avenue Great Street, DC, USA, 2011
7. New Road, UK, 2007
8. South Grand Boulevard Great Streets Initiative, MI, USA, 2011
9. Cleveland Euclid Avenue Healthline BRT, OH, USA, 2008
10. Darling Quarter, Australia, 2011
11. Lincoln Road Mall, FL, USA, 2010

ENVIRONMENT (LID AND INNOVATIVE ENERGY APPLICATION)
1. Phoenix Downtown Civic Space, AR, USA, 2009
2. Erie Street Plaza, WI, USA, 2010
3. Darling Quarter, Australia, 2011
4. The Third Street Promenade & Santa Monica Downtown Specific Plan, CA, USA, 2010
5. The Avenue, DC, USA, 2011

DESIGN IMPLICATION
1. For land use, promoting a mix of uses will support the long-term vision of the district.
2. Shared space street can be part of street redesigns that greatly boost retail performance. And paving can be used to emphasize pedestrian priority.
3. Transit system design is not only about the functions, but also a way to create characteristics of a region. Several design elements could take into consideration, such as bus stations, plants, paving, art works and signage.
4. Sustainable design strategies can bring both environmental and economic value.
5. LID techniques like LED lights, green buildings, solar energy system, water recycle plant, can be applied with a focus on place making, good control of scales, and decorative visual effect.
III. SITE INVENTORY & ANALYSIS
PARK 10 LOCATION

Addicks Reservoir

Barker Reservoir

PARK 10

ECD

Bufflo Bayou
EXISTING ROADS

• Limited roads create big blocks and reduce the walkability and bikeability
• Natural view of the reservoirs blocked by dams

SITE INVENTORY & ANALYSIS

• Major roads provide good external accessibility
EXISTING SIDEWALK

- Sidewalk is not well connected
- Some parts of sidewalk is well developed

Addicks Reservoir
PROJECTED BICYCLE LANE

- Established workplace-based cycling culture
- No connection to the dam
• Low amount of mixed-use development
• Little to no attractions or walkable destinations

• Existing vacant and available lots for development
- The lack of noticeable skyline
- No landmark within the site

- Some structures to block the traffic noise
SWOT ANALYSIS

**S**
- **Good accessibility** provided by major roads
- **Good natural conditions** provided by reservoirs
- **Vacant and available lots** for development
- High job opportunities from existing companies
- Established workplace-based cycling culture

**W**
- **Little to no attractions** or walkable destinations
- **Low amount of mixed use** development within site
- **Lack of sense of place** and identity
- No connectivity between existing neighborhoods and future development plans
- No buffers or signage for walking and biking safety
- Lack of public transit and amenities
- Noise pollution from I-10
- Natural view of the reservoirs blocked by the dam

**O**
- **Diversifying transportation options**, accessibility and connections
- **Green network** improving microclimate to support recreational activities
- Coordination with City of Houston Parks and Recreation Master Plan and City of Houston Bikeway Program
- Highly educated and high income employees in ECD
- LID features under the influence of Houston’s green movements
- Engagement of surrounding residential communities

**T**
- **Potential environmental hazard with increasing impervious surface**
- **Increasing traffic** on I-10 and Park Row
- Engagement of surrounding residential communities
IV. DESIGN GOALS & SPATIAL PROGRAMMING
**Design Goals and Objectives**

### Livable Community
- Provide diverse and attractive destinations
- Create safe pedestrian and cycling network
- Develop complete street on Park Row
- Utilize local art to celebrate cultural diversity
- Improve sense of place and identity
- Encourage vibrant community events

### Socio-Economic Hub
- Promote mixed-uses
- Provide diverse land uses within the site
- Encourage the collaboration and participation of private land owners
- Create live & work space for employees
- Attract companies to headquarter on site

### Multi-Modal Transit System
- Provide alternative transportation modes
- Create multifunctional, inviting and safe transportation nodes
- Enhance the connection for pedestrian and cycling use
- Provide connectivity plan linking open spaces

### Environmentally Responsive Development
- Provide pleasant and easy access to natural areas
- Utilize vegetation to achieve a high quality living environment
- Implement functional, aesthetic and environmental design
- Preserve and protect wildlife habitats
- Promote Low Impact Development practices

### Energy-Wise Design
- Minimize vehicular noise and pollution
- Highlight the identity of the Energy Corridor District
- Encourage high-tech applications
- Use eco-friendly materials
SPATIAL PROGRAMMING - LIVABLE COMMUNITY

- LIVABLE COMMUNITY
- SOCIO-ECONOMIC HUB
- MULTI-MODAL TRANSIT SYSTEM
- ENVIRONMENTALLY RESPONSIVE DEVELOPMENT
- ENERGY-WISE DESIGN

Destinations
Diversity
Safety
West Entry Recreation Retail
Community Center
Main Entry Convention Transit Recreation Retail
Office Center
Mxed-use Center
East Entry Recreation Retail
LIVABLE COMMUNITY

SOCIO-ECONOMIC HUB

MULTI-MODAL TRANSIT SYSTEM

ENVIRONMENTALLY RESPONSIVE DEVELOPMENT

ENERGY-WISE DESIGN

SPATIAL PROGRAMMING - ECONOMIC HUB

Mixed-use
Economic Value
Attractions

Innovation Center
Retail & Restaurant
Grocery
Convention
Mall & Hotel
Retail Cluster
Mixed-use

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SPATIAL PROGRAMMING - ENVIRONMENTALLY RESPONSIVE DEVELOPMENT

LIVABLE COMMUNITY

SOCIO-ECONOMIC HUB

MULTI-MODAL TRANSIT SYSTEM

ENVIRONMENTALLY RESPONSIVE DEVELOPMENT

ENERGY-WISE DESIGN

- Preservation
- Accessibility
- Green Space
SPATIAL PROGRAMMING - ENERGY-WISE DESIGN

LIVABLE COMMUNITY

SOCIO-ECONOMIC HUB

MULTI-MODAL TRANSIT SYSTEM

ENVIRONMENTALLY RESPONSIVE DEVELOPMENT

ENERGY-WISE DESIGN

- LID
- Noise Reduction
- Energy Saving
SPATIAL PROGRAMMING - CONCEPT PLAN

LIVABLE COMMUNITY
- Destinations
- Diversity
- Safety

SOCIO-ECONOMIC HUB
- Mixed-use
- Economic Value
- Attractions

MULTI-MODAL TRANSIT SYSTEM
- Connectivity
- Transit System
- Transit Nodes

ENVIRONMENTALLY RESPONSIVE DEVELOPMENT
- Preservation
- Accessibility
- Green Space

ENERGY-WISE DESIGN
- LID
- Noise Reduction
- Energy Saving
V. MASTER PLAN & DESIGN SYSTEMS
Reservoir

LEGEND
2. Transit Center  6. ECD Innovation Center
3. Hotel  7. Retail
4. Shopping Mall  8. Office

2. Transit Center  6. ECD Innovation Center
3. Hotel  7. Retail
4. Shopping Mall  8. Office

N

500 1000 2000 ft
PROPOSED ROADS
PROPOSED ROADS

- Big blocks with limited walking experience
- Smaller blocks create a sense of place
- Easy circulation promotes high accessibility
PROPOSED PEDESTRIAN NETWORK

-Disconnected sidewalks with limited accessibility
-Natural view of the reservoirs blocked by dams
-Well connected sidewalks and pedestrian friendly road
-Pedestrian trails providing easy access to the dam
PROPOSED BICYCLE NETWORK

- Little to no bike lane within the site

![Before Image](image1.png)

![After Image](image2.png)

- Well connected bike lanes
- Recreation routes taking advantage of the dam
GREEN SYSTEM

- No connection to the dam
- Green network with easy access to the reservoir
- LID design for the attractive streetscape
PROPOSED LAND USE

- Low amount of mixed-use development
- Little to no attractions or walkable destinations

- Proposed mixed-use residential and mixed-use office
- Central commercial area to highlight the identity
- Attractive destinations for livable living experience

BEFORE

AFTER
PROPOSED BUS & SHUTTLE ROUTES

- Automobile dominant transit mode
- Parking lots take a large amount of land

- A transit center supports the multi-modal transit system
- Shuttle route could reach all office area
PROPOSED BUILDINGS

COMMERCIAL & INSTITUTION

ECD Innovation Center

Central Business Sector

Shopping Mall
Convention Center
Hotel
Transit Center

Commercial
Office
Industrial
Institution
Residential
PROPOSED BUILDINGS

Well Designed Garage

Attractive Office Space
PROPOSED BUILDINGS

INDUSTRIAL

Industry with Tech / Research & Development
PROPOSED BUILDING HEIGHTS

- No noticeable skyline
- Lack of landmark within the site

- Central commercial buildings up to 20 stories
- Office buildings 4-10 stories
- Residential buildings 3-5 stories
DESIGN IMPROVEMENT

BICYCLE NETWORK
BEFORE
0 ft
AFTER
124,979 ft

BIKE LANE
BEFORE
100,656 ft
AFTER
15,934 ft

GREEN TRAIL
BEFORE
15,934 ft
AFTER
8,389 ft

DAM TRAIL
BEFORE
138,542 ft
AFTER
15,934 ft

PEDESTRIAN NETWORK
BEFORE
17,835 ft
AFTER
162,865 ft

SHEET

DAM TRAIL
BEFORE
8,389 ft
AFTER
8,389 ft
DESIGN IMPROVEMENT

RAIN GARDEN: 679,918 sf
URBAN PARK: 282,320 sf
COURTYARDS & GARDEN: 701,802 sf
STREET GREEN: 1,610,496 sf
NEIGHBOURHOOD GREEN: 3,502,297 sf
TRAIL GREEN: 2,114,449 sf
PARKING GREEN: 191,279 sf
### BEFORE & AFTER – BUILDING AREA

<table>
<thead>
<tr>
<th>Category</th>
<th>BEFORE</th>
<th>AFTER</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TOTAL BUILDING</strong></td>
<td>9,780,181 sf</td>
<td>19,738,880 sf</td>
</tr>
<tr>
<td>RETAIL</td>
<td>931,089 sf</td>
<td>1,932,858 sf</td>
</tr>
<tr>
<td>INDUSTRIAL</td>
<td>2,941,933 sf</td>
<td>669,506 sf</td>
</tr>
<tr>
<td>INSTITUTION</td>
<td>408,427 sf</td>
<td>1,239,705 sf</td>
</tr>
<tr>
<td>OFFICE</td>
<td>9,648,913 sf</td>
<td>11,525,596 sf</td>
</tr>
<tr>
<td>HOTEL</td>
<td>26,408 sf</td>
<td>342,073 sf</td>
</tr>
<tr>
<td>RESIDENTIAL</td>
<td>2,445,655 sf</td>
<td>4,029,142 sf</td>
</tr>
</tbody>
</table>

RETAIL: 37.7% of the BEFORE area, 26.5% of the AFTER area
INDUSTRIAL: 17.9% of the BEFORE area, 4.4% of the AFTER area
INSTITUTION: 2.6% of the BEFORE area, 3.5% of the AFTER area
OFFICE: 58.8% of the BEFORE area, 53.9% of the AFTER area
HOTEL: 0.2% of the BEFORE area, 5.4% of the AFTER area
RESIDENTIAL: 14.9% of the BEFORE area, 20.4% of the AFTER area
### BEFORE & AFTER - BUILDING AREA

<table>
<thead>
<tr>
<th>Before</th>
<th>After</th>
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</thead>
<tbody>
<tr>
<td><strong>Building Area (sf)</strong></td>
<td><strong>Building Area (sf)</strong></td>
</tr>
<tr>
<td>9,648,913</td>
<td>11,525,596</td>
</tr>
<tr>
<td>2,941,933</td>
<td>669,506</td>
</tr>
<tr>
<td>2,445,655</td>
<td>4,029,142</td>
</tr>
<tr>
<td>931,089</td>
<td>1,932,858</td>
</tr>
<tr>
<td>408,427</td>
<td>1,239,705</td>
</tr>
<tr>
<td>26,408</td>
<td>342,073</td>
</tr>
<tr>
<td><strong>Percentage (%)</strong></td>
<td><strong>Percentage (%)</strong></td>
</tr>
<tr>
<td>58.8</td>
<td>58.4</td>
</tr>
<tr>
<td>17.9</td>
<td>3.4</td>
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</tr>
<tr>
<td>2.5</td>
<td>6.3</td>
</tr>
<tr>
<td>0.2</td>
<td>1.7</td>
</tr>
</tbody>
</table>
**Office – Katy Freeway Class A & B**

- Office A: Buildings represent highest quality appearance and construction. Also, they are well located, and have good access.
- Office B: Buildings are generally a little older, but still have good quality management.

**Industry – Houston Citywide**

- Warehouse: Focuses on storing, sorting, and moving products between destinations.
- Flex: Includes a mix of office and industrial uses, and is often found clustered in industrial parks.

**Retail – Houston Citywide**

- Strip Center: Indicates a shopping center that is not enclosed and that its stores' entrances typically face the parking lot.
- Lifestyle Center: Upscale national-chain specialty stores with dining and entertainment, usually in an outdoor setting.

**Multifamily – Bear Creek Class A & Houston Citywide**

- Multifamily A: Newer properties with highest quality buildings and top amenities. Also, well located and professionally managed.
- Multifamily B: Generally older than Class A, but still well maintained.
### BEFORE & AFTER – ECONOMIC ANALYSIS

#### BEFORE

<table>
<thead>
<tr>
<th>AREA (sf)</th>
<th>ASKING RENTAL RATE ($/sf)</th>
<th>IMPROVEMENT ($)</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>9,648,913</td>
<td>24.10 (CLASS B) / 37.06 (CLASS A)</td>
<td>320,073,742.04</td>
<td>356,571,089.11</td>
</tr>
<tr>
<td>931,089</td>
<td>15.20 (GENERAL)</td>
<td>14,152,552.80</td>
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</tr>
<tr>
<td>2,941,933</td>
<td>6.34 (WAREHOUSE)</td>
<td>18,651,855.22</td>
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</tr>
<tr>
<td>2,445,655</td>
<td>1.51 (CLASS A)</td>
<td>+ 3,692,939.05</td>
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</tbody>
</table>

#### AFTER

<table>
<thead>
<tr>
<th>AREA (sf)</th>
<th>ASKING RENTAL RATE ($/sf)</th>
<th>IMPROVEMENT ($)</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>11,525,596</td>
<td>37.06 (CLASS A)</td>
<td>427,138,587.76</td>
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</tr>
<tr>
<td>2,274,931</td>
<td>40.00 (STRIP CENTERS &amp; LIFESTYLE CENTERS)</td>
<td>90,997,240.00</td>
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</tr>
<tr>
<td>669,506</td>
<td>13.10 (with Tech/ R &amp; D)</td>
<td>8,770,528.60</td>
<td></td>
</tr>
<tr>
<td>4,029,142</td>
<td>1.51 (CLASS A)</td>
<td>+ 6,084,004.42</td>
<td></td>
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</tbody>
</table>

TOTAL IMPROVEMENT: $532,990,360.78
PHASING

PHASE I

PHASE II

PHASE III

PHASE II

PHASE III

PHASE I

PHASE III

PHASE II
VI. CONCENTRATION AREA

CENTRAL BUSINESS SECTOR
LOCATION & DESIGN CONCEPT

create a **vibrant** center
A complete grid street system and attractive streetscape is addressed to encourage walking and biking activities. Street-level retail will be added to make destination and raise the land value.

enhance **accessibility**
A business hub will be located at the main intersection of Park Row and Park Ten Blvd, with diverse functions including convention, transportation, recreation, and retail.

grow **green**
A linear park will be introduced into the pedestrian shared street, linking open spaces together to reinforce the green network.
CREATE A VIBRANT ECONOMIC HUB

Create a **vibrant** economic hub

- Commercial
- Convention Center
- Hotel
- Transit Center
- Office
CREATE A VIBRANT ECONOMIC HUB - CONVENTION CENTER

CENTRAL BUSINESS SECTOR
CREATE A VIBRANT ECONOMIC HUB - PEDESTRIAN BRIDGE
ENHANCE ACCESSIBILITY

CENTRAL BUSINESS SECTOR

Enhance accessibility
ENHANCE ACCESSIBILITY - MAIN INTERSECTION
ENHANCE ACCESSIBILITY - MAIN INTERSECTION

CENTRAL BUSINESS SECTOR
ENHANCE ACCESSIBILITY - TRANSIT CENTER ON PARK ROW

CENTRAL BUSINESS SECTOR

- street light
- bench
- bus shelter
- rain garden
- bike lane & sidewalk
- bike rack

CONVENTION CENTER
GROW GREEN - LINEAR PARK MODULES

SOCIABILITY

ART AND ACTICITIES
GROW GREEN - LINEAR PARK MODULES

CENTRAL BUSINESS SECTOR

COMFORT AND IMAGE

ACCESS AND LINKAGES
GROW GREEN - LINEAR PARK STREET

- sociability
- art and activities
- comfort & image
- access & linkages

10' vehicle lane
20' park area
10' vehicle lane
GROW GREEN - LINEAR PARK SOCIABILITY SECTION

CENTRAL BUSINESS SECTOR
GROW GREEN - EXHIBITION PARK

- Central Business Sector

- Entry Plaza
- Sunken Stage
- Tree Plaza
- Fountain Square
- Pocket Garden
- Transit Square
- Multi-Functional Field
- Sculpture Garden
- Rain Garden
LOCATION & DESIGN CONCEPT

Create An Attractive Sub-center
- Diverse Attractions
- Mixed Land Use
- Improved Sense of Place & Identity

Provide Welcoming Spaces
- Appealing Outdoor Spaces
- Reasonable Building Height to Street Width Ratio

Enhance A Pedestrian & Bicycle Network
- Complete Streets (Access to Destinations)
- Pleasant Trails (Access to Natural Area)
FORMATION / DESIGN EVOLUTION

1. SPOTS
   - Welcome

2. ENCLOSURE
   - Social Gathering

3. TRANSFORMATION
   - Auto Access

4. SPLIT
   - Pedestrian Access

5. DIVISION
   - Flow & Activities

6. VARIATION
   - Attractions
DESIGN SYSTEM – WEST ENTRANCE

Retail: 313,300 sf
1,550 parking spaces

Office: 1,479,500 sf
3,960 parking spaces

Residential: 228 units
1,830 parking spaces

Industry: 539,000 sf
1,430 parking spaces

Barker Cypress Rd (To Neighborhood)

ECD Innovation Center

I-10

Park Row
DESIGN SYSTEM – ECD INNOVATION CENTER

- Tensile Steel Shade Structure

- Functional Buildings
  - Office: **401,440 sf**
  - Gallery: **123,450 sf**
  - Exhibition Hall: **57,350 sf**
  - Retail: **155,490 sf**

- Green Space & Waterscape
  - Green Area: **153,470 sf**
  - Water Surface Area: **50,570 sf**

- Underground Parking
  - 2 Entrances
  - 1,940 Parking Spaces
CREATE AN ATTRACTIVE SUB-CENTER

Aerial View of the ECD Innovation Center
PROVIDE WELCOMING SPACES

Main Welcoming Plaza of the ECD Innovation Center
PROVIDE WELCOMING SPACES

Secondary Entry Plaza of the ECD Innovation Center
ENHANCE A PEDESTRIAN & BICYCLE NETWORK

Before

Intersection of Barker Cypress Rd & Park Row Dr
ENHANCE A PEDESTRIAN & BICYCLE NETWORK
ENHANCE A PEDESTRIAN & BICYCLE NETWORK

Sidewalk Along Barker Cypress Rd

Elevation Difference

No Space for Expansion

Before
VIII. DESIGN IMPACT
Reference: The Value of Green Infrastructure, Center for Neighborhood Technology (CNT);
National Tree Benefit Calculator;
Houston Office, Retail, Industry Research & Forecast Report, Colliers International;
Houston Multifamily Market Watch, Transwestern.
IX. APPENDIX I

GRISBY SQUARE REVITALIZATION
This site is located in the Energy Corridor District, Houston, and surrounded by the Interstate Highway 10, State Highway 6, and Grisby Road. This proposed design project is for transforming the Grisby Square into a sustainable and pedestrian-oriented district.

Site Context

Median Housing Price

Population Density

Unemployment Rate

Surrounding Land Use

Average Rainfall (in)

Rainfall

Average Temperatures °F

Temperature

Surrounding Habitat

Woodland

White-tailed Deer

Tall Hog

Raccoon

Woodpecker

Weedland

White Bais

Duck

Snake

Open Land

Baller

Ruffed Grouse

Swat

Blackbird

Bee-Eater
1. Increasing the cultural identity for enhancing social interaction by revitalizing the retails and restaurants.

2. Creating a well-arranged multi-model transportation system to promote walkability and bikability.

3. Implementing ecological friendly design approaches improving the quality of both natural and built environments.
Building Layout Change

Pre-development

Post-development

Pre- & Post-development Land Use Change (Acre)

Green

Street

Hotel

Parking

Gathering

Retail

Mixed-use

Institution

Parking Spaces

Total Parking Space: 1786

Eco Parking

Noneco-Parking

Total Parking Space: 643

IX

APPENDIX I - GRISBY SQUARE REVITALIZATION
CIRCULATION

Circulation System
- Vehicle Road
- Bus Route
- Pedestrian
- Bike Trail

Vehicle Road
Bus Route
Pedestrian
Bike Trail

Walking
Bike
Multi-modal Transportation
Public Transit

Private Cars
APPENDIX I - GRISBY SQUARE REVITALIZATION

LOW IMPACT DEVELOPMENT

Existing Condition

Post-development Annual Runoff Reduction (cfs)

Stormwater Management Area
Ground level (25.3ac) Roof Top (3.8ac)

LID Application

Runoff Reduction

Peak Discharge Rate (cfs)

Reduction

Pre-Development
Post-Development
X. APPENDIX II

CASE STUDY
PHOENIX DOWNTOWN CIVIC SPACE

Location: Phoenix / Arizona  
Landscape Architect: AECOM  
Completion Date: 2009  
Size: 2.5 acres  
Budget: $13.2 million

Civic Space Park is a unique and innovative addition to downtown Phoenix. Weaving together an urban oasis with the downtown fabric, it is distinguished by elements that are versatile and forward-thinking.

Elements
The project created a park that accommodates a variety of users and events, a major artist commission, and various interactive water features and lighting elements.

Connection
The location of the park is also central to Arizona State University’s downtown campus, with a focus on pedestrian passages, bus routes, and light rail connections. Directly adjacent to the Downtown Central Station, the park blends public realm with mass transit. The park sits between the north and south lines of the new Valley Metro Light Rail and, as a part of the park design, created a mid-block crossing from the Taylor Street pedestrian corridor.

Sustainable Design
Porous concrete paving and landscape design provide for stormwater collection and filtration, allowing every drop of water that lands on this site to recharge surrounding groundwater. Solar panels on the top of the park’s shade structures will generate 75 kilowatts of power, enough to power 8-9 residential homes and offset the park’s lighting and electrical needs. When its trees and vegetation reach maturity, more than 70 percent of the park will be shaded from the desert sun.

Features
One of the park’s most exciting features is a field of white columns beneath an undulating canopy that come alive at night with light and color responding to the movements of visitors. An interactive water feature is another favorite activity in the park, especially for children.

Landscape Performance Benefits

Environmental
Collects and infiltrates up to 9,600 c. ft. of water per storm event in underground chambers located on-site. Impervious surfaces are reduced by using 39,247 sf of permeable concrete paving, concrete unit pavers, and stabilized granite. Reduces air temperatures in the park by an average of 1.8°F compared to a typical urban landscape. Trees and shade structures lower mid-day surface temperatures by 12.4°F in turf areas and 23.4°F in hardscape areas.

Social
Attracts an average of 559 visitors on a weekday morning in the low summer season. Of these, 63% engaged in optional activities and 12% also engaged in social activities. Hosts an average of 43 free public events per year, including movie screenings, concerts, art galleries, and wellness events like community yoga.

Design Implementation
1. LID Implementation – The case succeeded in usage of permeable paving, stormwater management, solar energy system, while create vivid and attractive civic activity space.  
2. Night Features – The field of white columns and net that become alive at night with light and color responding to the movements of visitors can be an exciting feature for the ECD area, which also match the “Energy” theme.  
3. Pedestrian Friendly Design – Trees and undulating canopy were used to get shade, and adjacent roads were paved for pedestrian crossing.

http://www.landezine.com/index.php/2013/05/phoenix-downtown-civic-space-by-aecom/  
http://landscapeperformance.org/case-study-briefs/phoenix-civic-space-park
The design for 1111 Lincoln Road bridges the urban dweller with nature, affording vantage points and multi-functional areas for the users of this foremost pedestrian mall in Florida. The roadway turned greenway and waterway is an Everglades-inspired aquatic-infused environment where specimen Cypress trees anchor the “urban glade” within the pedestrian plaza. The re-pedestrianized block of Lincoln Road has created an unparalleled variant of civic space in Miami Beach.

**Landscape Performance Benefits**

**Environmental**
- Sequesters approximately 8,900 lbs. of CO2 annually through 71 trees, 61 of which are newly planted.
- Reduces air temperatures on the streetscape by an average of 1.4°F when compared to the adjacent 1200 block, which closely resembles the state of the 1100 block prior to the redevelopment.

**Social**
- Attracts 4,600 people on a typical weekday and 8,570 people on a typical weekend day during the summer.
- Makes shopping, dining, and lingering experiences more comfortable compared to the other blocks of Lincoln Road Mall for 91% of the 71 survey respondents visiting the streetscape.
- Provides a safe and secure environment for 96% of survey respondents visiting the streetscape. Main reasons cited were the open design and fact that it is well-lit at night.
- Improves perception of the City of Miami Beach for 63% of the survey respondents.

**Economic**
- Contributed to an 85% increase in the total assessed value of properties within a half-block of the streetscape from 2010 to 2013. This led to a $1,211,480 (80%) increase in property tax revenues. During the same period, gross property values for the entire City of Miami Beach increased by only 12%.

**Design Implementation**

1. **Place Making** – Use curvy lines for water gardens, planting areas to break the linear character of the Lincoln Road Mall and create a sense of nature while providing an inviting gathering space. The stripe pavement defines pedestrian movement and visibility for the existing retail businesses, restaurants and entertainment venues. The design cultivates an atmosphere of native Florida without losing a sense of distinction as a pedestrian mall.

2. **Planting** – Wetland planted areas have been utilized to aid in biofiltration and reduction of waste, with water intakes under the wetlands to encourage slow flow through plant media. The native trees, palms and grasses used provide a local and unique experience for visitors.

**Before & After**

The 1100 block of Lincoln Road, with its steady sun exposure through ubiquitous palm tree lined sidewalks and constant car traffic, was unwinviting to locals and tourists alike. Now, the space is in motion with people, plant life and sound. It is an inviting green space exclusively for the living and breathing. 1111 Lincoln Road is structured by water gardens, planting areas and varying width stripes of Pedra Portuguesa pavement that act as an interface by extending and defining pedestrian movement and visibility for the existing retail businesses, restaurants and entertainment venues. The design cultivates an atmosphere of native Florida without losing a sense of distinction as a pedestrian mall.

**Design Elements**

A central open space is defined by a slightly raised platform, unique in architectural form and integrated in function, which creates flexible space for public gatherings, presentations and events. A variety of Florida recreate a sense of nature while providing a smooth transition between the building and human scale. The promenade, complete with commercial aspects of outdoor restaurant seating and retail stores, creates a unique visitor experience. Many shoppers find themselves spending more time browsing below the surface of the verdant water gardens than through store windows.

http://www.archdaily.com/168515/1111-lincoln-road-raymond-jungles

Location: Milwaukee, Wisconsin  
Landscape Architect: Stoss  
Completion Date: 2010  
Size: 0.25 acres  
Budget: $850,000

Milwaukee’s new waterfront plaza is the result of an international design competition won by Stoss. The proposal is for a flexible social space that can accommodate large gatherings and day-to-day activities, built on sustainable design principles. It is one of a series of public space activators along the Milwaukee River walk, a three-mile pedestrian and bicycle corridor that connects downtown Milwaukee to the emerging and redeveloping Third Ward and Beerline Districts, and to the lakefront beyond.

The plaza is conceived as a flexible field that fosters social and environmental activity and appropriation. It activates and registers environmental cycles of stormwater by collecting runoff to support a reconstituted marsh/wetland, re-charges the groundwater tables, and utilizes river water for irrigation. Socially, the plaza is designed to accommodate a wide array of potential activities, including art festivals, gatherings, concerts, movies, weddings, festivals, farmer’s markets, and winter carnivals, as well as less intense, every-day activities like boat-watching, fishing, sunbathing, and simply hanging out.

**Design Implementation**

1. **Place Making** – Transformed a former parking lot into a flexible social space used for strolling, jogging, reading, viewing, biking and kayaking, which could be applied to the detention pond near Grisby as a resting space and connection to the bike trails.

2. **LID** - The plaza collects stormwater runoff to support a reconstituted marsh/wetland and utilizes river water for irrigation. Wood decking, pavers, and lawn surfaces provide flexible spaces for recreation, with luminous yellow benches offering ample seating and projecting light after dark. The lighting creating attractive landmark effects can be used in the ECD project.

**Landscape Performance Benefits**

**Environmental**
- Saves 495 gallons of potable water and $220 annually by using river water for irrigation of planted areas.
- Reduces surface temperatures by an estimated 5° by replacing 100% of the asphalt on the site with concrete pavers and plantings. The 121 poplar trees will also cool the plaza by providing approximately 4,840 sf of shade when they reach half-maturity.

**Social**
- Serves 100 weekend adult patrons of the neighboring Sail loft bar and restaurant by providing an outdoor space for games. On a typical Saturday, an estimated 400 restaurant patrons also spend time in the plaza as a stop on a local river boat tour.

**Economic**
- Contributes to the economic development of the expanding Third Ward district, with 243 condominium units planned and adjacent mixed-use development attracting more than $120 million in investment capital within a previously derelict area.
Location: Cleveland, OH  
Landscape Architect: SASAKI ASSOCIATES, INC.  
Completion Date: October 2008  
Size: 4,480 acres  
Cost: 18 million

Project Description
Sasaki redesigned the street to integrate the bus rapid transit system into the Euclid Avenue corridor, which connects the central business district with University Circle. It has helped Cleveland regain its footing and changed the perception of the city as a place to work, live, and reinvest. The Corridor opened for service as the Euclid HealthLine in October 2008, and ridership has increased over 54%.

Sasaki’s design transforms the public realm of the corridor into a linear green space that provides unique place-making and branding that integrates the HealthLine into the surrounding urban context.

Design Elements
Sasaki ensured that the corridor accommodates multiple modes of transit by incorporating exclusive bike lanes and pedestrian-friendly sidewalks and street crossings. Elements of the design include BRT system, parking, utilities, sidewalks, street lights, and street trees. Key features of the BRT system include prominent, safe, and visually attractive stations in the median of the street, low floor boarding, real time updates, off-vehicle fare collection, and signal prioritization at intersections. Parking was integrated back into the street to support developer efforts to revitalize vacant retail storefronfts. The number of stations is reduced to improve travel times and median platforms reduce encroachments on the sidewalks. Seasonal plantings provide splashes of color in the medians, colorful and rhythmic pavement striping in the sidewalks provide human scale, and distinctive lighting elements provide visual interest. Public art is both integrated into the design elements along the corridor, such as paving and site furnishings, as well as stand-alone projects.

A comprehensive signage program for the BRT and the street provides wayfinding along the corridor while also creating a unique brand for the corridor and BRT.

Design Goals
Providing improved transit service, supporting economic development initiatives, and improving the pedestrian environment for residents, securing funds from the Federal Transit Authority (FTA), maintaining a thorough community design process, and establishing a clear brand for the Bus Rapid Transit (BRT).

Sustainable Design
Sasaki integrated sustainable solutions into the corridor landscape. Nearly 1,500 trees create an urban forest—planted in ideal growing environments to ensure survival the harsh urban environment of Cleveland. The BRT system itself is also sustainable. The diesel hybrid-electric vehicles have a 25% reduction in fuel consumption over the Regional Transit Authority (RTA) standard vehicles, as well as reduced fuel emissions.

Findings
Besides of the public transit system, multiple choice of transit should be provided. Transit system design is not only about the functions, but also a way to create characteristics of a region. Several design elements could take into consideration, such as bus stations, plants, paving, art works and signage.
The project revitalizes Darling Harbor by upgrading ground plane materials, lighting, public furniture and planting. A range of destination place making initiatives have been implemented including an enlarged park, table tennis tables, moveable public seating and rugs, and a lighting master plan which enriches the night-time experience.

Darling Quarter is an example of successful urban renewal and place making. It has been visited by millions of families and tourists from opening in September 2011 to 2013.

Safety at night-time is maximized through low energy public domain and building lighting with dimming switches, which also maximize energy efficiency. Changes to roads, parking and pedestrian walkways at the site have improved the safety for pedestrians and cyclists.

These pedestrian routes include the civic connector, the pedestrian boulevard and a pedestrian bridge over Harbor Street, one of Sydney’s busiest roads. The redevelopment also included upgrades to roads to allow clear sight lines and underground public parking, making the ground plane safer for pedestrians and cyclists.

Darling Quarter has re-shaped the southern end of Darling Harbor into a functional, attractive and sustainable precinct. Today, the precinct is activated by over 6,500 workers in the new commercial buildings and the millions of families and tourists.

The project exemplifies design excellence and leading sustainable design initiatives creating an inclusive, free, public place used by the community day and night. Lend Lease with the Sydney Harbor Foreshore Authority have created a plan to encourage activity in the precinct and also to ensure its on-going maintenance needs are met.

**Design Implementation**

**Place Making** - The Site condition resembles the situation on Park 10 with relationship to the freeway. The Harbor Quarter provide vibrant civic space as well as popular destinations for families, workers, and visitors. The main facilities in this project could be applied to the ECD project to create a concentration space.

**Connection** - The Harbor Quarter takes great care of the easy connection and safety for pedestrians and cyclists with the civic connector, the pedestrian boulevard and a pedestrian bridge, which can be used in the ECD project to encourage walking and biking, as well as provide pleasant destination and resting space.

**LID Implementation** - The Project take good use of the LID techniques with LED lights, green buildings, solar energy system, water recycle plant, which builds a character and creates attractions. The LID techniques can be applied with a focus on place making, good control of scales, and decorative visual effect.
Location: Sydney, NSW, Australia
Landscape Architect: ASPECT Studios
Year: 2007–2011
Budget: $13 million
Size: 1.5 hectare

ASPECT Studios has completed a transformation of the public domain of Darling Harbor South, one of Australia’s most visited destinations. A major 1.5-hectare place-making project for Sydney with a retail terrace, public park, two 6-star commercial buildings and an innovative children’s playground as its center piece.

Playground—the largest inner city playground in Sydney with challenging play equipment for all ages.
Retail Terrace—a mix of bars, restaurants, cafes and convenience stores to cater for families and workers.
Children’s Theatre—the first dedicated theatre for children.
Community Green—an open turfed area for people to picnic and relax with programmed initiatives.
Illuminated Façade—the entire western façade of the buildings becomes an interactive digital canvas with low energy lights and solar power.
Feature Lighting—throughout the Darling Quarter, feature lighting creates a vibrant night time precinct, dining experience and the first illuminated playground with low energy lighting.

Darling Quarter is a mixed-use precinct that integrates a vibrant public domain with a commercial development. There are various attractions for families at the site including retail facilities, the children’s theatre, the playground and the community green. The campus-like environment at Commonwealth Bank Place and the community green are popular with nearby workers.

The buildings and their fit-outs are capable of achieving a 72 percent reduction in carbon emissions in operation when compared to the average performance of typical existing office buildings in Australia. The project also included the development of the Darling Quarter Recycled Water Plant which treats 245 kiloliters of wastewater a day to produce high quality recycled water for use in the precinct.

Darling Quarter provides a new east-west pedestrian street, which connects Darling Harbor South to the City, and a north-south pedestrian boulevard, which runs along the building’s western edge and features al fresco dining spaces, retail tenancies, a children’s theatre, grassed areas and a state-of-the-art playground.
The development included underground public parking and upgrades to roads and pedestrian crossings to allow clear sight lines, making the ground plane safer for pedestrians and cyclists.
Location: St. Louis, Missouri
Landscape Architect: Design Workshop, Inc.
Completion Date: 2011
Size: 6-block corridor
Budget: $3 million

Project Description
The South Grand redevelopment transformed a six-block corridor into a vibrant destination, improving the pedestrian experience, enhancing safety, and providing opportunities for continued economic development. The final boulevard design enhances walkability, incorporates innovative stormwater management, and creates a memorable public realm which builds on the character of the community.

Design Elements
In order to reduce traffic speeds and improve pedestrian and driver safety, the road width was reduced and bulb-outs were added at intersections, shortening crosswalk distances from 56 to 37 ft. The project is close to the Missouri Schools for the Deaf and Blind. Tactile crosswalk striping, accessible ramps, visual and audio cues, and detectable warnings and signalization improve ADA accessibility.

Sidewalk widths were increased from 6.5 to 15 feet, adding around 1,000 square feet of outdoor dining space that accommodates 337 seats. The expanded sidewalk also makes room for significantly larger tree boxes.

Sustainable Design
Nearly all of the materials removed from the site during construction were reused, reducing landfill waste. The percentage of pervious surfaces increased from 2% to 50% along the street. This corridor was one of the first in St. Louis to feature rain gardens. In Phase 2, rain gardens will be placed at all intersection bulb-outs, along with tree boxes containing native perennials and forbs that will filter and infiltrate stormwater.

The soil volume for each tree was increased from 100 to 1,000 cubic feet, which will enhance tree growth, health, and longevity.

All planting materials are native to Missouri and locally available. Designed with seasonal interest, the new vegetation can withstand the harsh street conditions and is expected to increase the populations of birds and butterflies.

Landscape Performance Benefits
ENVIRONMENTAL
Projected to reduce vehicle emissions by 50% as a result of reducing delays by reconfiguring the street and improving signal timing.
Projected to reduce the peak ground-level temperature by 7.8°F in areas where asphalt was replaced with high-albedo pervious concrete. Large planted areas and tree canopy help to further cool the streetscape.

SOCIAL
Expected to reduce average traffic speed by 17 mph, which is projected to result in a 85% drop in accidents, saving $3 million in estimated costs and damages. This also reduces the probability of pedestrian fatality upon vehicular impact from 40% to 5%.
Projected to reduce the noise level from an average of 68dB to below 60dB by reducing traffic speeds. This falls within the range that allows a comfortable conversation, improving the environment for pedestrians and outdoor dining.

Expected to increase satisfaction with the street aesthetics. 81% of survey respondents felt that the proposed design would have a good or very good appearance. Only 22% said this about the former streetscape.

ECONOMIC
Increased annual sales tax revenue by 14% in the first year after redevelopment. The project was initially projected to increase revenue by 19% over a 10-year period.

Findings
Use planting materials to reduce noise level and increase wildlife population.
Sustainable design strategies bring both environmental and economic value.

http://landscapeperformance.org/case-study-briefs/south-grand-boulevard-great-streets-initiative
NEW ROAD

Location: Brighton, UK
Architect: Gehl Architects
Landscape Architect: Landscape Projects
Year: Autumn 2005 - Summer 2007
Cost: £1.75m

Project Description
The seaside city of Brighton & Hove on the south coast of England attracts millions of visitors every year. New Road lies at the heart of Brighton’s ‘Cultural Mile’. Over the last century, New Road became increasingly run-down – dominated by the needs of vehicles rather than people.
The initial idea from the client was to close the street to all vehicles. Designers responded to the pedestrianization of New Road project by creating a new type of street—shared space street—where cars are welcome – but on people’s terms.

Benefits
Traffic levels have dropped by 93%, the number of pedestrians has increased by 62%, the cycling numbers has risen by 22%, and there has been a massive 600% increase in lingering activities. People apparently enjoy being here. Today 86% would like to see more areas like New Road in their city.

Findings
Shared space street concept. Use paving to emphasize pedestrian priority.
Lighting design to support night activities.
Paving combined with wayfinding measures and space change reminding.

Design Goals
The goal is to create a more walkable, relaxed, attractive and accessible street. The new plan for the street incorporated the needs of all the different user groups: encouraging cycling, sitting, standing and walking activities based on people-focused public space programming.

Design Elements
The design of the street reinforces pedestrian priority and encourages defensive driving and low speeds: the visual quality of the street is markedly different from the conventional approach, forcing all users of the street to become much more aware of their environment and encouraging eye contact between people. The new bespoke paving, seating and lighting have invited people into the space, made interaction possible, and changed the dynamic of the street.
Reimagined the street as a natural stone surface where rigid features like curbs and crossings were removed, inviting pedestrians to move freely over the entire area, and giving them priority over all other users.
The team consulted with groups including Guide Dogs for the Blind, and included wayfinding measures for the visually impaired throughout – a tactile guidance strip along one side of the street; a contrasting strip along the other; and textured paving areas to mark thresholds, potential hazards and movement onto the shared surface.
Drivers are transitioned to the street across a textured rumbled strip, whilst the surface was carefully detailed to hint at how people should arrange themselves, changes in the tone, module and finish of the paving working alongside the arrangement of the street furniture to provide an extra layer of information.
Identified a natural ‘back’ to the street along the edge of the park, which is where we placed New Road’s new centerpiece – a finely crafted, long wooden bench looking onto the public space.
NANNIE HELEN BURROUGHS AVENUE GREAT STREET

Size: 1.5 mile
Location: Washington, DC
Designer: EE&K Architects
Design completed: Spring 2010
Construction date: Nov. 2010 – May. 2011
Cost: $15 million

Project Description
Nannie Helen Burroughs Avenue, NE, is a 1.5 mile long minor arterial and multi-modal corridor that accommodates regional commuters, transit riders, local auto travel, pedestrians, and bicyclists. Nannie Helen Burroughs runs roughly parallel to Watts Branch, the largest tributary to the Anacostia River within the District with a drainage area of 3.75 Square miles. Because of its context in this critical watershed, District Department of Transportation plans to redesign the Nannie Helen Burroughs Avenue Corridor as a model of innovative, environmentally-progressive practices, in order to improve the local environment and quality of life. Proposed improvements include additional street trees, rain gardens, permeable pavement, a “road diet” reduction of impervious asphalt, bioretention cells, multi-chamber catch basins and other Low Impact Development Practices.

Design Solutions
- Pedestrian access and safety: Sidewalk will run along both sides of NHB from Minnesota Ave. to Eastern Ave. and have a 6’ standard minimum width; Pedestrian crossing distances have been shortened using curb bump-outs at intersections where possible; New mid-block pedestrian crossing added near Holy Christian Missionary Church; New paved path at 46th Street providing access to NHB Ave.
- Bicycle access and safety: Bike lane or shared bike lanes provided along both sides of the street from Minnesota Ave. to Eastern Ave. The Watts Branch Bike Trail will be connected with a 10 foot wide path between 49th and 50th streets.
- Lighting improvements: Improved lighting for roadway, sidewalk, and bike path using Washington Globes and teardrop fixtures.
- Street trees: Approximately 159 new street trees will be planted, 9 dying trees in the median will be replaced; Double row of columnar trees; New strategies for healthier trees will be used: (1) soil amendments in the medians (2) structural soil and permeable pavement pilots.
- Low Impact Development: Bioswale; Bioretention cell; Permeable pavement; Vegetated filter strip; Street trees.

Benefits
Environmental benefits: The LID concept proposes sustainable solutions within the Right-of-Way, and manage the storm water on site, reduce heat island effect, conserve energy, recycle material and improve air quality.
Social benefits: The design provides traffic safety, accessible sidewalks and ramps, shade, good connectivity between built environment and natural environment. And it also brings aesthetic and educational benefit.
Economic benefits: The project provides more opportunities for green collar jobs, delays replacement costs for long life span materials, reduces electricity bills by using energy efficient lighting, and reduce flooding.

Design Implementation
Similar with the ECD project, this project is also a corridor area located in big city, and it is also facing with speeding traffic, lack of shading, discontinuous sidewalks and flooding problem. By using LID technologies, the design proposes sustainable solutions and brings social and economic benefits at the same time. Those LID concepts and facilities are worthwhile. The project highlights the importance of connectivity. To connect sidewalks, bike lanes is one the main goals of this design. Moreover, the Nannie Helen Burroughs Avenue will be well connected to Watts Branch Creek, and it will be helpful for surrounding community.
Size: 344 acre  
Location: City of Cincinnati, OH  
Designer: Sasaki group  
Design completed: June, 2014  
Construction date: fall, 2016

Project Description
With over 55,000 employees, Uptown is Southwest Ohio’s second largest employment center and home to the region’s center of learning and healthcare. Uptown Cincinnati is also infused with the energy of vibrant and diverse neighborhoods with a collective population of over 51,000. All told, Uptown Cincinnati is where people come to get well, stay healthy, learn, live, work, and play.

Design Guild lines
Improve pedestrian and bicycle connectivity with the public spaces along and across the MLK and Reading corridors. Establish a unified identity for the corridors and anchor the MLK intersection at Eden, Burnet, and Reading as catalytic mixed-use gateways, the Core of which is at MLK and Burnet Avenue. Increase pedestrian accessibility and visual connection to actively used open spaces to foster collegiality and neighborhood connections. Define an urban street edge along the frontage of both corridors including amenities in the public realm. Stabilize existing housing fabric and Neighborhood Business Districts with appropriately scaled residential infill to increase connectivity to and around the Uptown. Improve access to the Uptown through transit coordination.

Main Programs
The design takes a holistic and integrated Three - Tiered Approach:  
Transportation Management, Planning and Urban Design, and economic Development. Through analysis of the projected traffic increase created by the new interchange, the design identifies the primary opportunities and challenges to achieve the aims of the Vision.

The design considers the under utilized and deteriorated impression of the physical environment along MLK and Reading Road (dominated by surface parking and poor pedestrian connections, providing limited open space, and with and overall lack of identity), and assessed the Uptown’s economic position in the region (using demographic, employment, retail and housing market data).

Findings And Suggestions
There are many stakeholders collaborating together, which includes City of Cincinnati (Planning, Community and Economic Development, and Transportation and Engineering Departments), UCI (Cincinnati Children’s Hospital, University of Cincinnati, UC Health, TriHealth, and Cincinnati Zoo), and Avondale, Clifton, Coryville, CUF, Mt. Auburn, and Walnut Hills Community, Christ Hospital, local small business owners, and Metro transportation service. And it is similar to ECD project. As the design pointed out, community stakeholders within Uptown should join forces to create an identity and brand campaign for the area(s). And the design should balance the benefits and make the whole area act as a unifying force.

Uptown Cincinnati is a large employment center and neighborhood center (similar to ECD district), the design highlights the importance of economic development. Basing on the current and future neighborhood units, the design forecasts that 870,000 sf retail area is needed. Providing a specific number is a good way to illustrate the future vision. For land use, promoting a mix of uses will support the long-term vision of the district. The design locates residential infill and new development in neighborhoods of viability and within a 10 minute walking radius of the existing neighborhood centers and mixes the green open spaces, commercial areas and institutions with neighborhood centers to create walkable, livable communities.

Providing pedestrian-friendly streetscape is crucial for a vibrant, diverse and healthy corridor.

http://www.cincinnati.com/story/money/2014/06/06/grand-vision-remaking-uptown-revealed/10077219/
Location: Portland, Oregon, USA  
Developer: City of Portland  
Construction time: 1995-2015

Project Description
Portland is considered as one of the most bicycle-friendly cities in state. Portland’s first Bicycle Plan was developed in 1973 by a residents’ task force. The Bicycle Master Plan (1996) was created over a two and a half year period with input from over 2,000 residents from different background with a common wish to bicycling. Additional input came from staff from organizations and department such as the Portland Office of Transportation, Tri-Met, Multnomah County, Washington County, Clackamas County, Metro, the Oregon Department of Transportation etc. This Plan provided guidance over a 20-year period for improvements that encouraged more people to ride more frequently for daily needs. The mission of the Master Plan was to make bicycling an integral part of daily life in Portland.

Key Elements & Objectives:
policies and objectives that form part of Portland’s Comprehensive Plan Transportation Element;  
developing a recommended bikeway network;  
providing end-of-trip facilities;  
improving the bicycle-transit link;  
promoting bicycling through education and encouragement and;  
providing bikeway design and engineering Guidelines.

Benefits:
High return in personal mobility. The replacement cost for 300-mile bikeway network is approximate $60 million. This network provides for the commuting needs of 6% of Portlanders. The highest return among the investment into bikeway, roadway and transit is the bikeway.

Helps preserve mobility. Bicycle transportation handles the 12% increase in the number of vehicles on bridge, and it is the most cost-effective way to provide for personal mobility in an urban transportation system.

Helps local economies Portland region annually spend $1.2 billion less than the national average cost on automobile, and $800 million then circulates through local economy in other field. In addition, reducing fuel consumption keeps more money in the local economy.

Healthy for individuals and communities Bicycling increases physical activity in communities and can offer the most practical approach to prevent obesity or reduce its co-morbidities. Replacing automobile trips with bicycle trips results in less of the exhaust gases and particulate matter that contributes to diseases.

Findings and Suggestions
Bicycle parking
Calls for a public-private partnership to install higher levels of bicycle parking; provide for long-term bicycle parking to serve commuters, students, and others needing longer-term bicycle storage; and provide other end-of-trip services like showers, changing rooms, and clothing storage.

Bicycle-transit link
Riders can take their bicycles aboard buses and light-rail, and they can also “bike-and-ride,” making use of long-term bicycle parking at transit centers and light-rail stations.

Event
More events be hold by different organization to attract people to ride bike.
Location: Copenhagen, Denmark  
Year: 2002-2015  
Size: 390 km of designated bike lanes

Copenhagen is world famous for its biking culture and now officially the first Bike City in the World. It really is biking heaven for the cyclist in Copenhagen with over 390 kilometres of designated bike lanes.

In 2002 Copenhagen published its first Cycle Policy. The city keep documenting the latest development in cycling in Copenhagen City of Cyclists- Bicycle Account. The Bicycle Account is an instrument for Copenhagen politicians to keep an eye on whether the measures taken are satisfactory in relation to the political objectives and whether the focus areas set forth in the Cycle Policy should be adjusted.

Benchmark

TARGETS STATED IN GOOD, BETTER, BEST. THE CITY OF COPENHAGEN'S BICYCLE STRATEGY 2011-2025

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*Copenhageners who think cycling affects urban life and atmosphere

Cycle journeys on the Nørrebrogade route on a weekday (count point: Nørrebrogade)

**Other Researches**


It costs the same to build parking for 75 bikes as it does for just 4 cars. Tran, V., 2010 - “Student Commuter Trends: More students are biking, less driving." The Daily Vanguard Online, 5 February 2010 2013.

In Copenhagen, as bicycling has grown, the number of seriously injured bicyclists has decreased steadily with injuries dropping from 252 in 1996 to 92 in 2010 (City of Copenhagen, 2011).
THE THIRD STREET PROMENADE & SANTA MONICA DOWNTOWN SPECIFIC PLAN

Location: Santa Monica, CA, USA
Size: Third Street-0.4 mile;
   Downtown-1/2 mile square
Design team: Third Street-Roma Design Group;
Downtown-Francie Stefan etc.
Construction time: Third street-1989;
   Downtown-from 2010

Project Description
The Third Street Promenade was a typical street with automobile traffic. In 1965, the City converted it into a pedestrian mall called the Santa Monica Mall. Over the years it had become neglected and had fallen into disrepair. In 1984, the Santa Monica City Council created a city-funded nonprofit agency called the Third Street Development Corporation, now Downtown Santa Monica, Inc. (DTSM, Inc.), to revitalize the area. The mall is redesigned and opened on September 16, 1989.

In 2007, the city proposed the Property-Based Assessment District to revitalize the downtown area. The Downtown Specific Plan (DSP) is guided by the 2010 Land Use and Circulation Element (LUCE) vision of a thriving, mixed-use urban environment that provides multiple opportunities for living, working, entertainment and enrichment.

Objectives
- Prioritize the pedestrian experience;
- Provide circulation network for driving, bicycling, taking the train or a bus, and walking;
- Preserve and enhance Downtown’s identity;
- Integrate the Expo Light Rail into Downtown and encourage people to ride transit;
- Address vehicle congestion in the Downtown;
- Provide the framework for maintaining Downtown’s economic success;
- Continue to support new housing in the Downtown.

Benefit
The good pedestrian experience and historic character of the street attract both the local people and tourists which revitalized this street, and made it become one of the few successful examples of pedestrian mall in state.

Reconnecting the street grid with green streets, quality pedestrian, biking, gathering and open spaces helps improve the community health.

Arts and cultural facilities, public art and gallery space within building as well as the preserved historical structure creates the cultural atmosphere in this district.

Findings
Using trees, benches, structures etc. to create good qualified pedestrians and open spaces in both commercial and residential spaces.
Preserve or build the building facade with historical character could help create the unique identity for the district.

www.xplorela.com
www.santamonicawalkingtours.com
www.smgov.net
www.wikipedia.org
www.family-vacation-getaways-at-los-angeles-theme-parks.com/
Location: Washington, DC, USA  
Size: 72,000 SF  
Landscape architecture: Sasaki Association  
Built time: 2011

Project Description
The Avenue is a dynamic mixed-use development bordered by Washington Circle, 23rd Street and Pennsylvania Avenue. It locates near to the White House, George Washington University and a major public transportation hub. The complex includes office, residential, and retail elements, and abundant green public spaces, streetscapes, terraces, and courtyards with innovative stormwater management strategies implemented throughout. These spaces afford visitors, office building employees, and residents a pleasurable outdoor experience in all seasons.

Design Element
• Streetspace:
The surrounding streetscape includes wide sidewalk promenades bordered by rows of shade trees.
• Planting:
large planting beds filled with mixed perennials, low shrubs and flowering trees, and a series of architectural planters filled with colorful seasonal plantings.
• Water feature:
The central courtyard is anchored by a water feature that expresses the intersection of the historic Washington city grid and the axis of Pennsylvania Avenue.

Sustainable Design
Stormwater management
The water feature functions as part of the larger stormwater management system that collects all rainwater that falls within the property. Rainwater is filtered and stored in a 7,500 gallon cistern underground. This water is continuously recirculated and treated by the water feature that includes aquatic plantings, which offer supplemental filtration. The stored water is also used to provide all irrigation for the courtyard plantings throughout the growing seasons.

Green roof
The roof of the development contains 8,000 square feet of extensive green roof, which forms a microclimate that reduces the local heat island effect, provides avian habitat, insulates the building, and minimizes the roof’s runoff. Excess rainwater is filtered through the green roof layers before being collected in the water feature and cistern below.

Finding
Creating the well designed green open space for people in the commercial or business area. Introducing the Low impact development tools to manage the rainwater which could help achieve ecological goals.
BICYCLING BENCHMARK IN THE U.S.

When the first Bicycling and Walking in the U.S.: Benchmarking Report was released in 2007, only 16 states had a published goal to increase bicycling and walking mode share. Today, city and state leaders are competing for bicycle-and pedestrian-friendly status, prioritizing more of their transportation dollars to non-motorized transportation infrastructure. Public support, too, has dramatically increased as more and more people experience improved access to multiple transportation options.

Condition

Levels of Bicycling and Walking to Work in the U.S.

Healthy Benefits Research Background

Primary Reason for Trail Use by Gender

- Bicycling to work significantly reduces absenteeism due to illness. Regular bicyclists took 7.4 sick days per year on average, while non-bicyclists took 8.7 sick days per year. The difference saves the U.K. economy an estimated £128 million or $204 million per year (London School of Economics, 2013).

- Every $1 spent on bicycle and pedestrian trails in Lincoln, NE, (including construction, maintenance, equipment, and travel) yields $2.94 in direct medical benefits (Wang et al., 2005).

- Every $1 invested in bicycling yields $3.40 in health care cost savings. When the statistical value of lives is considered, every $1 invested yields nearly $100 in benefits (Dobosh, 2011).

Economic Benefits

Increasingly, states, cities, and individuals are realizing the many ways active transportation influences a healthy economy. Recent studies have shown that communities that invest in bicycling and walking have higher property values, create new jobs, and attract tourists. (AAA, 2012; Drennan, 2003).

- Biking and hiking trails in Teton County, Wyoming create an annual economic benefit of more than $18 million. The trail system cost $1.7 million to build over the last decade. (Kaczukowski, N., 2011 - Jackson Hole Trails Project Economic Impact Study, University of Wyoming)

- Places with higher walkability perform better commercially and have higher housing values. Office and retail spaces in areas with good walkability rented for $8.88/sq. ft. and $6.92/sq. ft. more per year. (Washington, DC; Brookings Institute, 2012)

- Bicyclists in the United States save $4.6 billion each year by bicycling instead of driving. (League of American Bicyclists, 2012)

- Pedaling to Prosperity: Bicycling will save Americans $4.6 billion in 2012

Infrastructure and Design

The National Association of City Transportation Officials’ (NACTO) Urban Bikeway Design Guide (2012) and Urban Street Design Guide (2013) are paving the way towards safer, more economically vibrant streets for cities across the U.S. NACTO recognizes that each city comes with its own set of unique challenges and that implementation must be tailored to each individual setting.

For more information:

Reference

The League of American Bicyclists [http://bikelaneleague.org/]
Bicycling and Walking in the United States, 2014 Benchmarking Report
Bicycle Account Guidelines, by Urban Systems and The League of American Bicyclists
New York, Measuring the Street

**Goals**
- Design for safety
- Design for all users of the street
- Design great public spaces

**Strategies**
- Designing safer streets, to provide safe and attractive options for all street users
- Building great public spaces to create economic value and neighborhood vitality
- Improving bus service to bring rapid transit beyond the subway
- Reducing delay and speeding to allow for faster, safer travel
- Efficiency in parking and loading to improve access to businesses and neighborhoods

**Metrics**
- Crashes and injuries for motorists, pedestrians, and cyclists
- Volume of vehicles, bus passengers, bicycle riders, and users of public space
- Traffic speed, aiming to move traffic not too slowly, but also not too fast
- Economic vitality, including growth in retail activity
- User satisfaction
- Environmental and public health benefits

**Events**

**Bike to Work Day**: National Bike to Work Day is when cyclists across the country show solidarity and ride together for their health, their cities and the environment.

**Open Streets**: On three consecutive Saturdays in August, nearly seven miles of New York City’s streets are opened to the public to play, run, walk and bike.

**Local Rides**: Created in the summer of 2013, Local Rides are casual, small-scale, community-oriented affairs.

**Economic Impacts of Improving Bicycling and Walking**

Businesses located within an improvement area saw sales increase at higher levels than the surrounding area (up to 172% increase in retail sales at locally-based businesses after a pedestrian plaza was constructed). Commercial vacancies fell 49% in one district after a protected bicycle lane was installed (NYC DOT, 2012).

Pedestrian and bicyclists reported spending more money over the course of a week than users of any other transportation mode (Transportation Alternatives, 2012).

Protected bike lanes can be part of street redesigns that greatly boost retail performance. After the construction of a protected bike lane on 9th Avenue, local businesses saw a 49 percent increase in retail sales. On other streets in the borough, the average was only 3 percent. (NYC DOT, 2012 - Measuring the Street)

**Data about Bike System, NYC**

<table>
<thead>
<tr>
<th>Content</th>
<th>Ranking</th>
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<tbody>
<tr>
<td>12,750 miles of sidewalk</td>
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<tr>
<td>42.1 miles of sidewalk per square mile</td>
<td>2nd</td>
</tr>
<tr>
<td>1,800 miles planned bicycle facilities</td>
<td>1st</td>
</tr>
<tr>
<td>6,000 bicycles available, Citi Bike program</td>
<td>1st</td>
</tr>
<tr>
<td>Over 300 automated self-service docking stations, Citi Bike program</td>
<td>1st</td>
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<tr>
<td>56% transit commuting rate</td>
<td>1st</td>
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<tr>
<td>100% city buses have bicycle racks installed</td>
<td>1st</td>
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<tr>
<td>Allow an unlimited number of bicycles</td>
<td>1st</td>
</tr>
<tr>
<td>6,332 bicycle parking spaces near transit</td>
<td>1st</td>
</tr>
</tbody>
</table>

Reference
Bike New York <http://www.bikeny.org/events>
Measuring the Street, New Metrics for 21st Century Street
World Class Streets: Rethinking New York City’s Public Realm