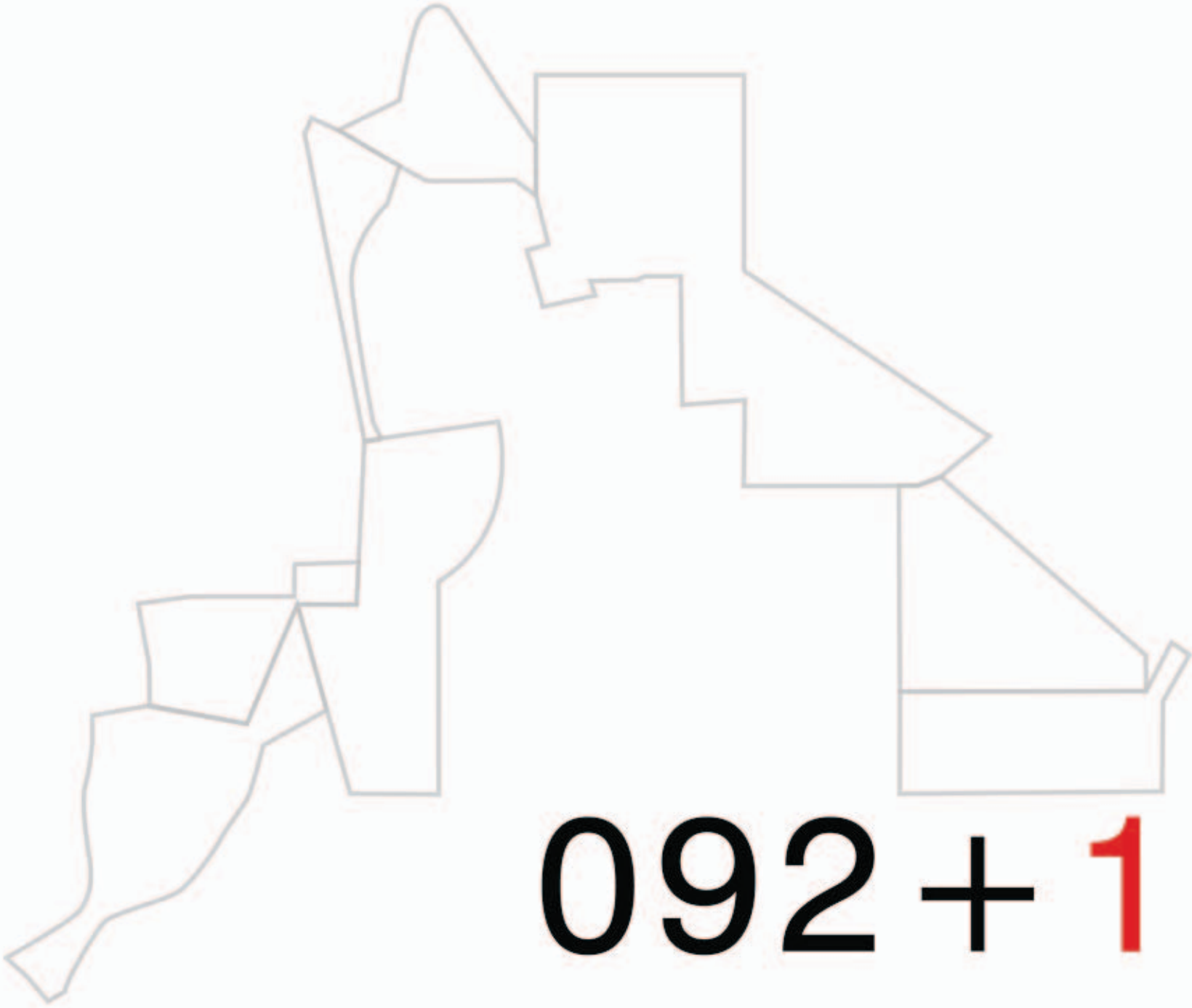

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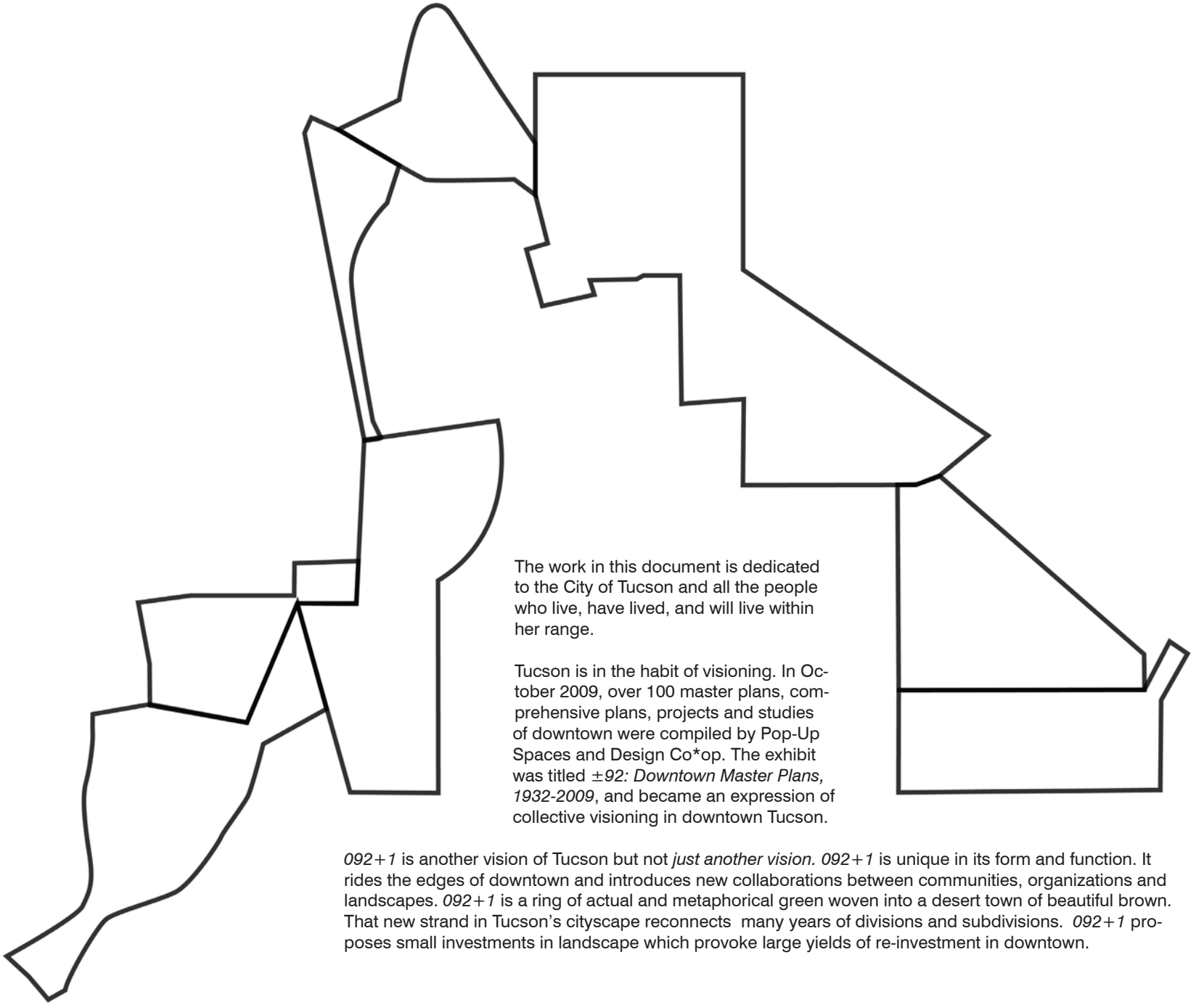

The work in this document is dedicated to the City of Tucson and all the people who live, have lived, and will live within her range.

Tucson is in the habit of visioning. In October 2009, over 100 master plans, comprehensive plans, projects and studies of downtown were compiled by Pop-Up Spaces and Design Co*op. The exhibit was titled *±92: Downtown Master Plans, 1932-2009*, and became an expression of collective visioning in downtown Tucson.

092+1 is another vision of Tucson but not *just another vision. 092+1* is unique in its form and function. It rides the edges of downtown and introduces new collaborations between communities, organizations and landscapes. *092+1* is a ring of actual and metaphorical green woven into a desert town of beautiful brown. That new strand in Tucson's cityscape reconnects many years of divisions and subdivisions. *092+1* proposes small investments in landscape which provoke large yields of re-investment in downtown.

Acknowledgements

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MS Urban Planning, U of A 1982, has worked as a professional planner in Pima County for 21 years. He currently has worked for 4 years with the City of Tucson's Planning and Development Services on land use planning policy development. Jim is a member of the American Institute of Certified Planners, as well as a former Peace Corps Volunteer (Micronesia and Thailand).

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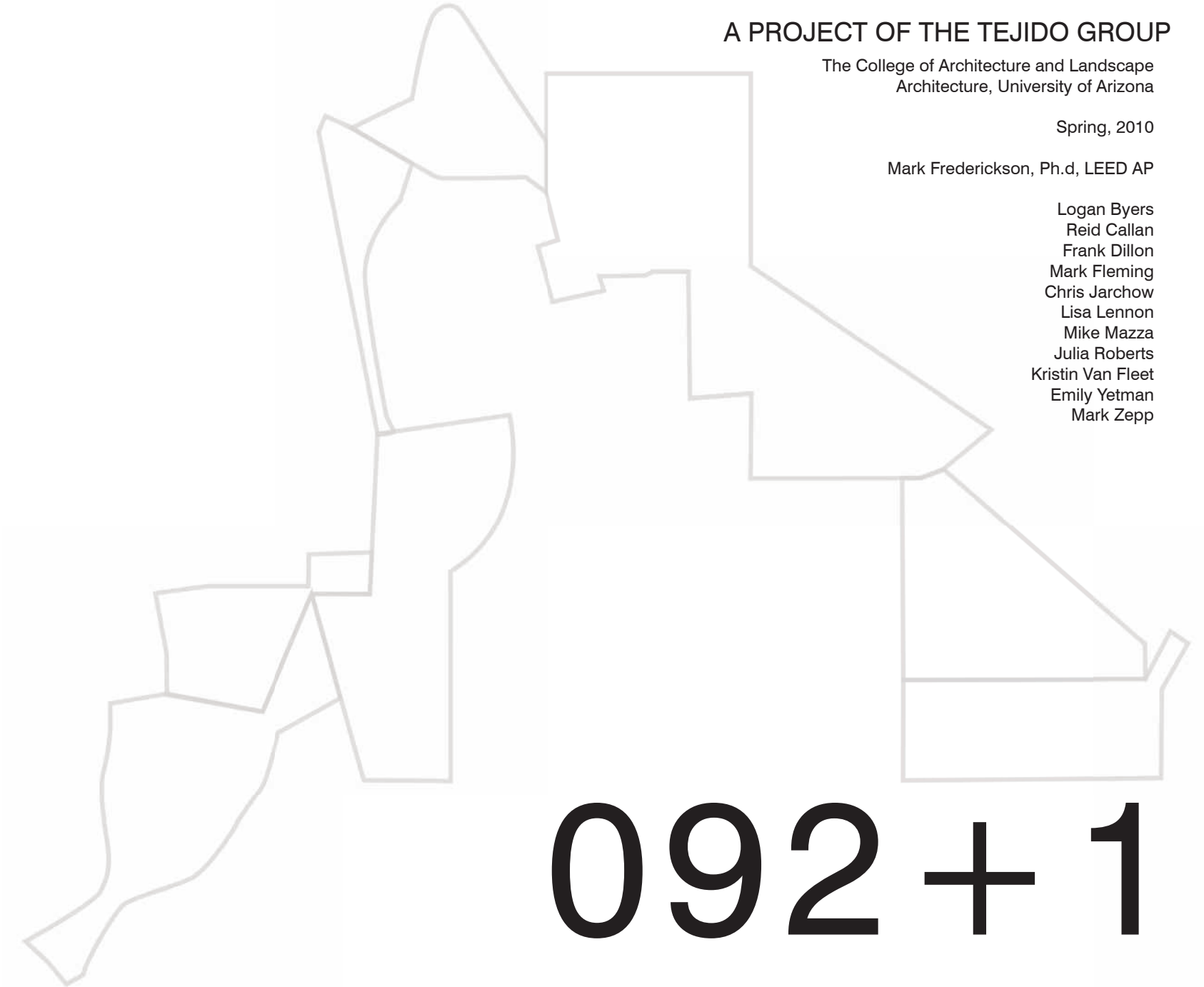

A PROJECT OF THE TEJIDO GROUP

The College of Architecture and Landscape
Architecture, University of Arizona

Spring, 2010

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092+1

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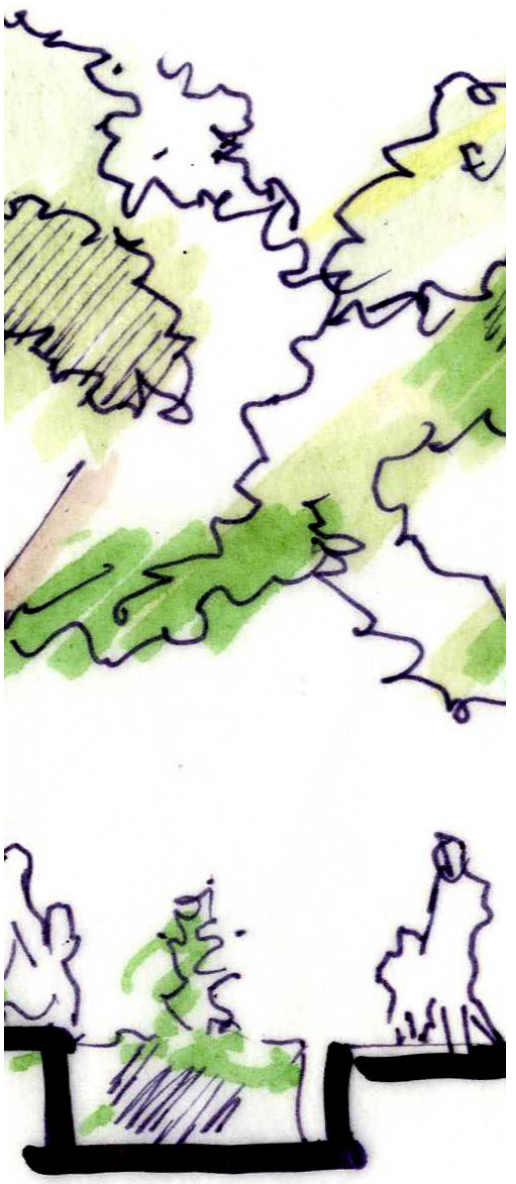


The Tejido Group

By Mark Frederickson Ph.D. LEED AP

For the past nineteen years the University of Arizona's Tejido Group has developed into an interdisciplinary and collaborative applied research program in which faculty and professionals in Landscape Architecture, Architecture and Planning work side by side with University graduate and undergraduate students in an apprenticeship-style professional learning environment. Tejido is also an international and multi-cultural experience, and has collaborated on projects throughout the United States, the Caribbean, Latin America and the Middle-East.

Tejido selects projects in which it wishes to participate based on several criteria: 1) project uniqueness and pedagogic value in developing our students into exceptional practicing professionals; 2) the project's potential impact on society and the environment; 3) and, client need.

We work within a wide range of project types including: carbon-neutral community planning, urban design, small town revitalization, coastal planning, urban waterfront design, sustainable tourism planning and design, themed environments, and campus master planning. During the design process, we concentrate our efforts on developing innovative concepts through the application of research initiative. Tejido believes that designers gain insight and inspiration from a variety of sources. An essential part of our design and planning process occurs during pre-design research. During this phase, our interdisciplinary teams of Landscape Architects, MBA's, Planners, and Architects review and synthesize information garnered through a variety of analytical operations into alternative design and planning concepts. These alternatives are then reviewed in extensive design synthesis sessions. Focus is maintained on idea-building activities where reviewers, including the clients and consultants, are charged

with the task of making each concept “better”.

One of the more useful and perhaps unusual urban revitalization strategies we have developed requires the engagement of Landscape Architectural design processes and planning strategies during the initial concept-development phases of our projects. We have come to understand and embrace Landscape Architecture as an effective catalyst of consequential economic, environmental, social and aesthetic change in urban environments. It is a remarkably effective tool for urban and small town revitalization. Although our process inevitably varies according to project type, client, site, budget, etc., we find that with most complex planning projects, landscape architectural organizational criteria and sources of form prove quite effective as design tools. Accordingly, in our more complex projects we evaluate the relative merit of our ideas according to the following design and planning ordering systems:

Economy; is the design economically sustainable? Does it create jobs and income sources for the community?
Environment; is the design environmentally sensitive? Does it connect and enhance existing ecosystems?
Culture; does the design create opportunities for meaningful social exchange and learning?
Function; does the design circulate effectively? Is it safe? Is it easily maintained?
Aesthetic; has the design identified and created an aesthetic sensibility appropriate to the history and culture of the region and its vision of the future?

These systems are a form of checklist deeply embedded in our design process, and we believe that an idea’s relevance and usefulness increases according to the number of different ordering systems that it engages.
In summary:

- It is our experience that Landscape Architecture has the capacity to effect profound change in urban environments. And, it places an array of revitalization tools at our disposal.
- It can stimulate economic development with modest initial investment.
- It can purify and preserve our precious air, land and water resources.
- It can preserve and remediate wildlife habitat. It can encourage meaningful socialization and recreation.
- It can focus growth and reduce sprawl. And, it can offer an urban respite to soothe an otherwise stressful existence.

Replace grey with green and blue.
Replace cars with shoes.
Replace garage doors with front porches.
Replace noise with sound.
Replace concrete with parks and children playing

Introduction

What is Tucson?

This is the question we find ourselves faced with as we try to describe a place that is truly unique and can never and will never be like anywhere else. Tucson is a bit timid. Like the Sonoran Desert in which it resides, Tucson is not a grand gesture. Rather its character and its voice lie in its subtleties, much like the burst of red cactus flower amid an otherwise beige and sage landscape. It reminds us to delight in the details and offers respite from a modern culture that is over-stimulated and anxious.

Tucson is raw. In this arid climate of survival, what is not essential soon fades away and is outlived by what is real and what is true. It is a constant reminder that we are indeed not in control and that the land will surely outlast us.

Tucson is Arizona, and Mexico, and the land that was here before names were able to label it. It echoes a rich and diverse history of peoples who knew much more intimately than we do now, what Tucson really is. It is a railroad, and a mission, and a river that once ran cool and wide. It is good people - really good people - learning to relate to one another under the sun's purifying rays.

Tucson is hot and cleansing. In the late summer it becomes an ocean. It is full of contradictions and juxtapositions that keep us from becoming over-serious in life. Instead it reminds us to be amused, to be humble, and to laugh at ourselves now and then.

Tucson today is the Hotel Congress, the Fox Theater, the Loft Cinema, the San Javier Mission, St. Augustine Cathedral, Barrio Viejo, El Presidio, Cushing Street Bar, the University of Arizona, Pima Community College, the Sonoran Desert Museum, the DeGrazia Gallery in the Sun. It is the skyline of the Rincon,

the Catalina, the Santa Rita, and the Tucson Mountains.

Tucson is rich.

All of that being said, this project hopes to build upon what truly is Tucson. Through a dedicated response to the very delicate and intricate details that make this place a whole, we are hoping to reinvigorate the urban core of the City. We are hoping that in doing so, we can capitalize on the character of this place, making it recognizable and easily interpreted by all.

What is Downtown?

The evolution of this place called Tucson begins with a river – the Santa Cruz. Amid dry creosote flats and valleys of cactus, the river once ran year-round, providing the things most needed in a desert: water, shade, and cooler microclimates. Its veining pattern was scattered with Arizona Cottonwoods, visible from distant mountains. Naturally, it became an area ripe for human development, first by Native Americans, secondly by Spanish missionaries, and lastly by American settlers. What is now downtown Tucson is one of the oldest continuously inhabited areas in the southwest, and is where Tucson established its roots. It is the soul of the city, reflected over time by its people's tireless determination to carry it into the future.

It has been a challenge to manifest that sentiment into a built environment. As reflected

recently in Bill Mackey's show ±92: Downtown Master Plans, 1932-2009, every generation has struggled with the desire to make downtown a vibrant and vital urban core. Most recently, the now abandoned Rio Neuvo (literally New River) plan sought to revitalize the downtown area by marrying its rich history with its hopeful future.

Downtown suffers from three major landscape changes that occurred in the 19th and 20th centuries; I) its division and segregation from the rest of the city to the northeast by the foundation of the Union Pacific Rail line, II) its division from the west side of the city and the Santa Cruz River bed by the development of Interstate 10, and lastly, III) the immense demolition of its original layout and many of its oldest pueblos during urban revitalization projects in 1970s.

Nonetheless, memories of downtown lay everywhere, scattered about. This project seeks to connect and unify those pieces. It seeks to break the barriers that have severed downtown over time by building new connections and physical relationships between downtown and its wayward communities.

How can Downtown represent Tucson?

The overarching approach of this project focuses on the principles of Landscape Urbanism and suggests that a "green network" can begin to intertwine disparate nodes of vitality. For the purposes of downtown Tucson, our design will place intense focus on the perimeter of the urban core. The idea behind this strategy is that permeating, bridging, and revitalizing peripheral areas it will begin to unify the city as a whole. We hope to create a city within a park.

The project responds to the very unique and specific needs of the Sonoran Desert and of-

fers recommendations that function on multiple levels to increase the vitality of the downtown area. Rain and water are considered incredibly precious resources and design responses utilize every drop to its fullest capacity.

Not surprisingly, sustainability is one of the driving ideals of the group. With this in mind, the project focuses on strategies of Smart Growth and the LEED guidelines for Neighborhood Development in order respond to all realms of sustainability; environmental, social, and economic. Further, in the belief that collaborative and interdisciplinary work yields a stronger and more cohesive solution, the team considers recommendations made by students from the University of Arizona's Eller College of Management and Planning Graduate Program.

Smart Growth

"Smart growth is an urban planning and transportation theory that concentrates growth in the center of a city to avoid urban sprawl; and advocates compact, transit-oriented, walkable, bicycle-friendly land use, including neighborhood schools, complete streets, and mixed-use development with a range of housing choices. Smart growth values long-range, regional considerations of sustainability over a short-term focus. Its goals are to achieve a unique sense of community and place; expand the range of transportation, employment, and housing choices; equitably distribute the costs and benefits of development; preserve and enhance natural and cultural resources; and promote public health." (Wikipedia)

Principles of Smart Growth

- Create a range of housing opportunities and choices
- Create walkable neighborhoods
- Encourage community and stakeholder collaboration
- Foster distinctive, attractive communities with a strong sense of place
- Make development decisions predictable, fair and cost effective
- Mix land uses
- Preserve open space, farmland, natural beauty and critical environmental areas
- Provide a variety of transportation choices
- Strengthen and direct development towards existing communities
- Take advantage of compact building
- design

ANALYSIS

HISTORY, PRECEDENT STUDIES, EXISTING CONDITIONS AND INTERVIEWS

History

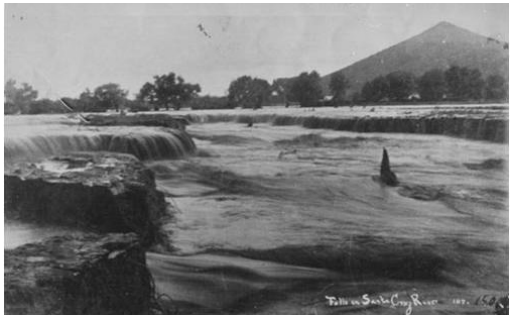
Europeans first set foot in what is now southern Arizona around 1539, inaugurating what historians fittingly refer to as the region's "historical" period. 10,000 years prior to their arrival, pre-historic Paleo-Indian hunter-gatherer groups were interacting with a variety of animals now extinct, including species of mammoths, bison and camel, all within a landscape dominated by marshes, juniper-oak woodlands and open grasslands. Between the markings of prehistoric and historic periods, a succession of cultures left distinct patterns on the landscape, constituting a regional history that moves beyond any question about when prehistory ends and history begins.

Patterns of landscape transformations are now much easier to observe and compare thanks to aerial photography, written documents and GIS. Specific to Tucson, the most recent period of alteration to the natural and built environments began in the mid- to late-19-th century, with the advent of water-intensive farming practices and the arrival of the railroad, which allowed for the easy importation of new building materials like milled lumber and brick. Around the same time, water levels within the sedimentary aquifers of the Tucson Basin began to drop, a trend which has persisted to date. Photographs taken in 1889 and 1904 show a flowing, perennial Santa Cruz River, flush with Fremont's cottonwood, Goodding's willow, Arizona ash and sycamore. Fauna included beavers, lowland leopard frogs, coatimundi and Swainson's hawks, all of which are now locally extirpated, endangered, or protected. Further disruptions followed in the 1920s with the channelization of the Arroyo Chico and several secondary water courses (washes), followed by a 368% population increase in Tucson between 1950 and 1959.

However, perhaps the most disruptive series of transformative events took place in the 1960s

with an urban renewal program aimed at transforming Tucson into a modern city, enlivened by highway access points, international architectural forms and ample space for the maneuvering and storing of privately owned cars. Erased in the process of this renewal were the social bonds of traditional, walkable neighborhoods, local economic networks and a dense, mixed-use urban form. As Juan Gomez-Novy and Stefanos Polyzoides state, "…the promise of urban renewal collided with the historic urban and building fabric of the Barrio and Presidio neighborhoods, and with the people whose families had had their homes and businesses there for generations."

There have been a multitude of comprehensive plans and governmental programs set up in an attempt to revitalize all or parts of downtown Tucson, even before the implementation of urban renewal in the 1960s, with an array of successes and failures. Addressing the current situation in downtown Tucson will require an in- depth look at these programs and others like them, as well as the present existing conditions. With the expected increase in Tucson's population from roughly 550,000 in 2010 to nearly 800,900 people by 2030, the revitalization of Tucson's downtown is a critical step in the direction of preserving and restoring the region's unique and irreplaceable urban, cultural and natural landscapes.



1886

1919

1960's

2002

Precedent studies

The vocabulary of a project can be informed and expanded through the study of existing and proposed solutions. Although a multitude of precedent studies exists that are focused on downtown Tucson as a whole or components thereof, we decided to concentrate on eight key studies which were already slated for implementation and/or provided the most opportunity from which to obtain design ideas. For a full list of text and image sources, see Appendix C, beginning on page 143.

CONTENTS

Congress Street Study

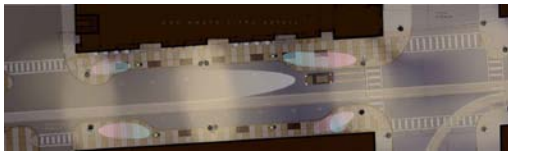
COMMARTS, 2009

This study uses the block of Congress Street between 5th Avenue and Arizona Avenue as an example of how a Tucson block might be converted to be more progressive and pedestrian-friendly. It responds to the needs and goals identified by a citizens and city employees working group. The goals for their design addressed:

shade, light, respite seating, orientation, curb-side water harvesting including tree pits and swaled planters, climate appropriate plants, root trenches to help trees thrive, recycled material use, storefronts (see details below), appropriate Public Art, historically reflective furnishings, historic paving materials, engagement, Tucson's heritage, historic information panels, contiguous feel with 4th Ave and the University, maintenance, flexibility, and affordability.

DESIGN IMPLICATIONS

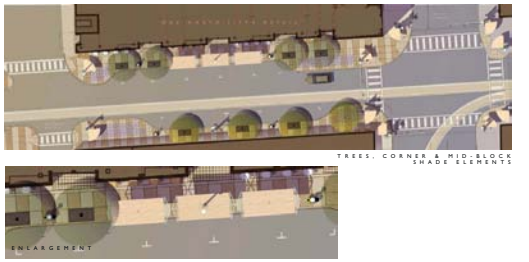
- The Congress Street plan serves as a great approach for designing streetscapes in downtown Tucson
- Our design should address/consider all of their design goals (in addition to our own)
- Tucson/Downtown specific conditions should be addressed in our approach such as: dark-skies compliance, urban heat island, lack of shade, native and/or low-water use vegetation types, storefront character, existing inconsistent pedestrian experience
- Their Storefront Specifications will be avaluable reference for detailing our designs



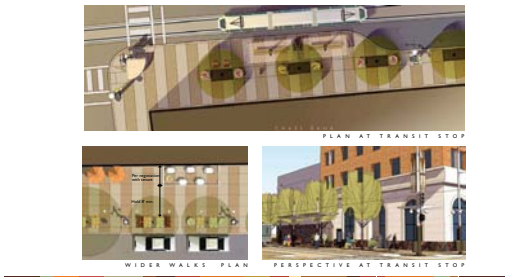
EXISTING CONDITIONS

OPPORTUNITY AREAS

SHADE

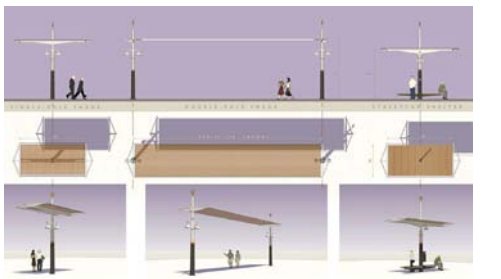


ADDITIONAL CONDITIONS



ONE NORTH FIFTH

SHADE AND SHELTER ELEMENTS WITH REVISED LIGHT FIXTURES



The Modern Streetcar

The City of Tucson plans to develop a 3.9 mile, high capacity Modern Streetcar (MSC) line which will connect the University of Arizona, Arizona Health Services Center, University Main Gate Business District, 4th Avenue Business District, Downtown Tucson and the Rio Nuevo redevelopment zone. 19 stations have been planned, which will be serviced on average every ten minutes during the day and every twenty minutes in the evening. Estimated ridership is approximately 3,600 passengers per weekday. Overall, the MSC will serve as both an economic and transportation development investment.

DESIGN IMPLICATIONS

- Building additional connectivity options in conjunction with the MSC line will promote success of improvements to downtown circulation
- Improving non-vehicular connectivity will have economic, functional, environmental and socio-cultural impacts on downtown Tucson
- Fixed transit routes have been proven to increase office and retail development within a quarter mile and residential development within a half mile of transit stations
- Fixed transit systems can restructure market demand to take advantage of increased foot traffic, the desire for mixed use housing types, and proximity to cultural, retail and entertainment venues, as well as reduce parking needs
- Utilization of existing street right-of-ways is an effective approach to improving infrastructure

El Paso Greenway

DRACHMAN INSTITUTE, 2009

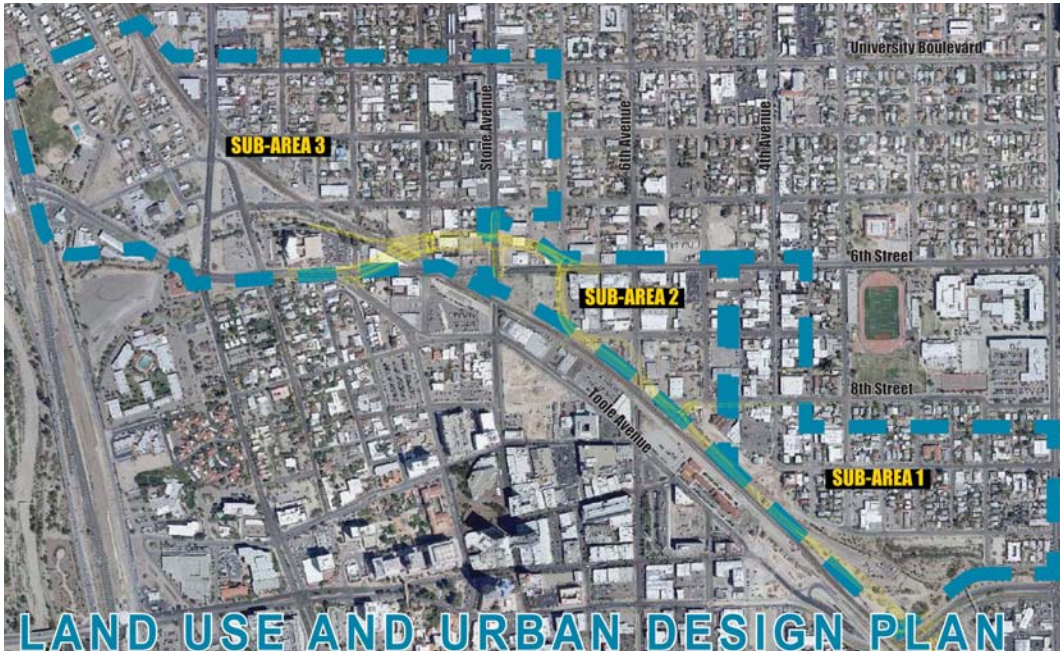
The project would transform the derelict historic railroad corridor into a modern pedestrian/bike-oriented urban greenway. It would reconnect fragmented neighborhoods and provide an alternative transportation route to downtown attractions and amenities. In addition, it could provide linkages to existing trail systems, such as the Santa Cruz River Park, as well as forming a continuous greenway between Tucson and South Tucson.

DESIGN IMPLICATIONS

- Much of the original tracks remain and are eligible for the National Register of Historic Places
- Greenways in urban environments, such as Tucson, help to reduce noise, pollution, and help increase public health by offering convenient access to recreational opportunities.
- May boost the economy through tourism, enhanced quality of life downtown, and positive development.
- Can enrich regional identity by protecting and celebrating a valuable cultural resource. There are several cultural places of interest along the route to attract locals as well as tourists.
- The original depot (currently vacant) is a historic site and could be restored as a rest stop or visitors center addressing the historic significance of the railroad and depot to Tucson's history.
- The neighborhoods it crosses are largely in favor of the development, seeing it as a potential amenity for circulation, recreation, and beautification.

Downtown Links

POSTER-FROST WITH WHEAT-SCHARF, 2009



Downtown Links is an improvement project that will provide multi-modal 'links'--pedestrian, vehicle, transit, and bike--between Barraza-Aviation Parkway and I-10, Broadway Boulevard and the 4th Avenue shopping district, and downtown and the neighborhoods to its north. The project will be a modest, four-lane roadway north of the railroad tracks that will connect Barraza-Aviation Parkway to I-10, offering alternative access to downtown, plus new and safer underpasses, railroad crossings, and sidewalks. The major benefits include: I) railroad-related improvements including the elimination of hazardous crossings and the creation of a Downtown no-whistle zone II) new roadway drainage system & reconstruction of the Arroyo Chico, removing parts of downtown from the 100-year flood plain III) more connections via different modes of transportation, including construction of a new bike-pedestrian deck at Ninth Avenue, connections to existing bike-pedestrian paths such as the Barraza-Aviation Multi-Use Path, and connection to future multi-use paths like the El Paso Greenway project.

DESIGN IMPLICATIONS

- Develop innovative housing concepts along the northern edge of El Presidio on St. Mary's
- Redevelop the Davis School, Oury Park, El Paso and Southwestern Greenway area to improve safety, connectivity and land-use.
- Develop appropriately-scaled affordable homeownership housing on City-owned lots in Barrio Anita
- Develop a safe bike/pedestrian crossing Main St. at University

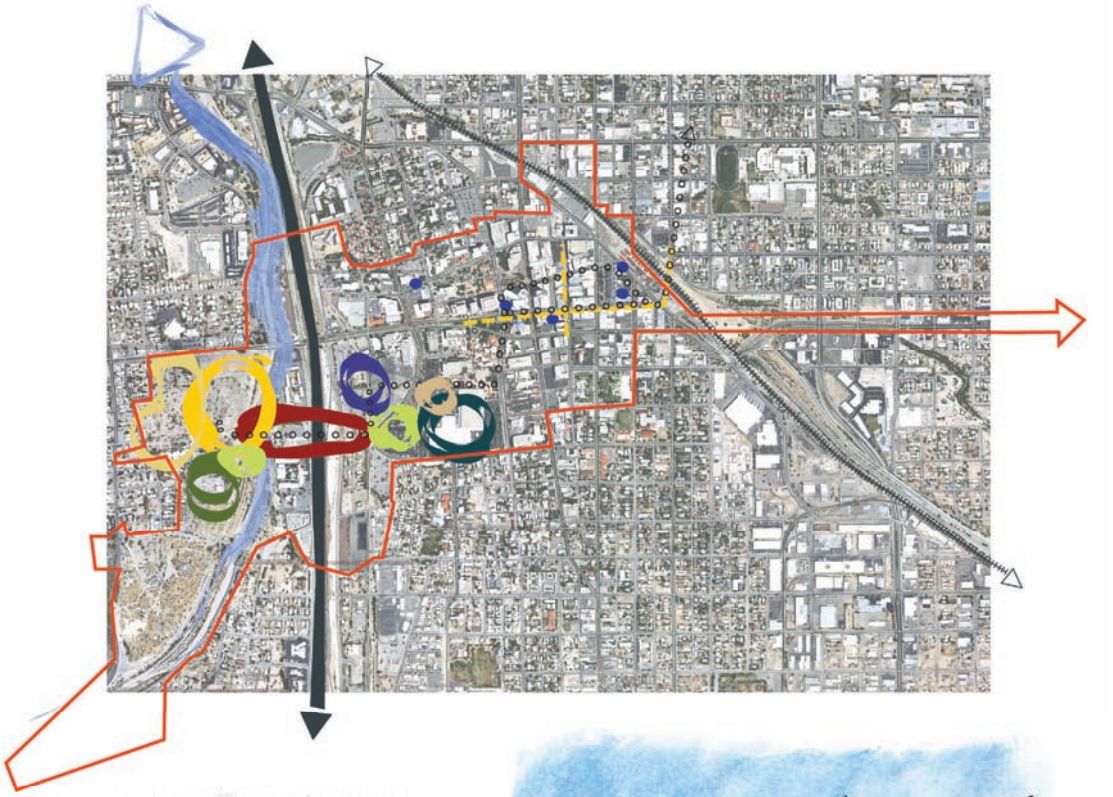
Rio Nuevo

VARIOUS FIRMS, 2000-2009

In the late 1990's a special sales tax fund diversion was established to fund a reshaping of downtown Tucson. The plan went through various forms over the course of ten years, encompassing large public projects (museums, parks, a proposed arena and amendments to TCC) meant to leverage private investment in housing and business. The central idea was to connect the West side with the existing CBD through a cutural and civic experience. Unfortunately, although a number of significant projects have been completed--including Scott Avenue streetscape improvements and the new street-car compatible 4th Avenue Underpass--and others such as the Mercado Developement are still in progress, the economic downturn of recent years has placed many other projects on indefinite hold.

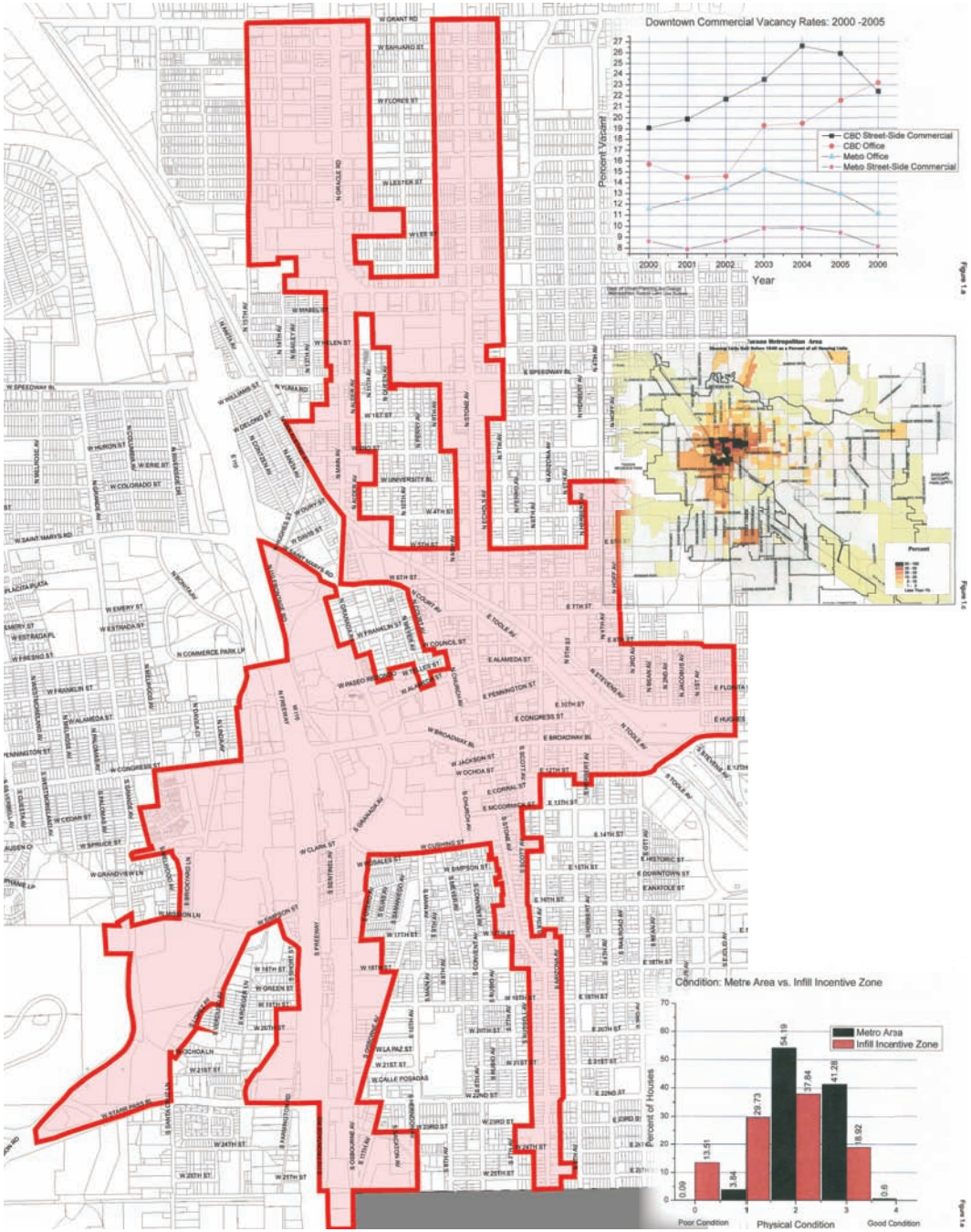
DESIGN IMPLICATIONS

- Invest in infrastructure, streetscape; large effect for smaller investment
- Focus on residents and daily users, rather than tourism?
- Address public transportation, traffic movement and parking early in the process
- Grant authority to non-profit community groups or independent commissions, rather than city government
- Potential for revising scale downward toward barrio, as well as/rather than upward to meet TCC
- Independent development modules, rather than sequential plans
- What IS Tucson, and what makes it unique?



Infill Incentive District

CITY OF TUCSON



What are the incentives?

- City fees reduced or waived
- Modified development standards
- Zoning exceptions and modifications
- Help with assembling parcels
- Expedited procedures and planning
- Assisted contamination clean-up
- Infrastructure improvements

Goals

- Affordable housing
- More urban housing
- Improved infrastructure
- Transit oriented development
- Improved pedestrian environment
- Enhanced streetscapes
- Environmental clean up
- Improved parking
- Public/private partnerships

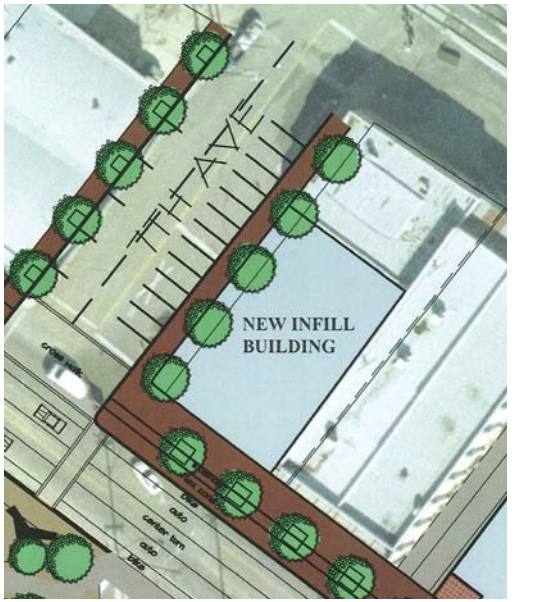
DESIGN IMPLICATIONS

- Incentives exist for developers throughout the majority of our project boundaries
- Streetscape improvements coupled with development incentives
- Incentives should promote pedestrian-oriented urban neighborhoods
- Regulation modifications include building height, setbacks and parking requirements
- Incentives should promote public-private partnerships
- Incentive projects must contribute to Tucson's rich historic, cultural, and artistic heritage

Historic Warehouse District

POSTER-FROST WITH WHEAT-SCHARF, 2004

In August of 2002, the City of Tucson contracted with the Tucson Arts District Partnership, Inc. to produce a Public Participation Plan and a Master Plan for the Tucson Historic Warehouse Arts District. The plans were to focus on the Toole Avenue portion of the District between Stone Avenue and 6th Avenue. The goal of this plan was to develop the Tucson Historic Warehouse Arts District "as a center for incubation, production and exhibition of the arts, with artists at its heart." As a product of an intensive community planning effort in downtown Tucson between 2003 and 2004, the plan grew out of the existing community of artists, artist organizations, and public officials dedicated to preserving and growing a "thriving and productive arts district."



DESIGN IMPLICATIONS

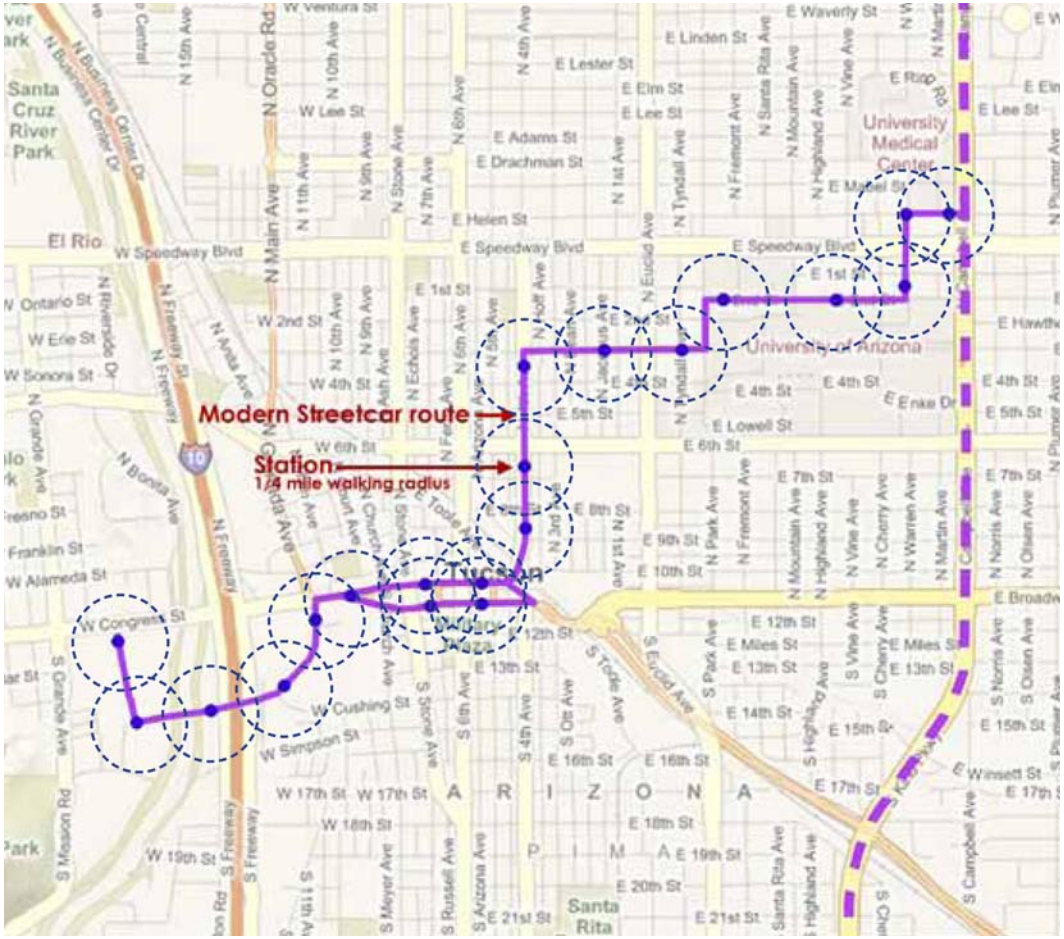
- Community involvement can enhance direct design decisions
- Management, marketing and programming schemes can enhance the perception of feasibility of a master plan
- Graphics can detract from good ideas, unless intentionally left conceptial
- Vacant areas called out are relevant to our CBD project
- Energy, water, and ecosystem considerations, when left out of a plan, can make the plan feel anthropocentric

University Campus Plan

2009

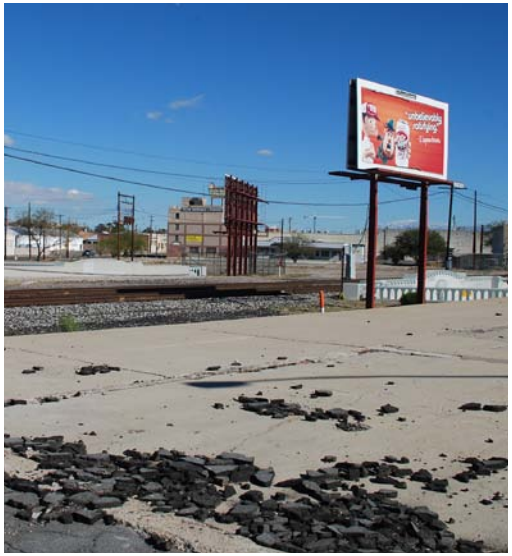
"There is strong support for The University of Arizona to have a meaningful and demonstrable presence in downtown Tucson."

Every few years, the University of Arizona Campus Planning Department is charged with reviewing and updated the Comprehensive Campus Plan. The 2009 edition had a number of sections referring to opportunities for collaboration outside of the University area. The first of these opportunities focused on the progression of the Modern Streetcar (set to open its first phase in 2011) and its eventual linking of the UA Agricultural campus and UMC North on Campbell Avenue with Downtown Tucson.



DESIGN IMPLICATIONS

- The University should identify programs appropriate to a downtown location or along the Modern Streetcar line which might spur new University programs and uses:
  - Public Administration
  - Media and Communications, related to local TV and radio stations
  - professional programs, especially continuing education programs;
  - Architecture, Planning, Landscape Architecture and Urban Design
- Engage growth and development downtown and along the streetcar line by seeking out appropriate public-private partnerships
- Student housing project that could serve as a model for high quality developments



Existing conditions

This chapter provides an overview, or inventory, of downtown Tucson's existing conditions. It is a compilation of the pertinent data relative to the CBD, including current land use, vacant/public land, the green network, vehicular and pedestrian circulation patterns, and washes and water flow. In addition, precedent studies were thoroughly studied, with the goal of gleaning relevant information about past and future projects that will directly affect the downtown area.

The most important goal of evaluating the city's existing conditions was to derive design guidelines. With a city as rich in history, ecology and culture as Tucson, a comprehensive site analysis study contributes an exhaustive collection of outstanding facts and figures. While the initial site analysis we performed was quite exhaustive, our attempt here is to provide only the most salient conditions as they relate to important design implications.

In addition to gathering design guidelines, we assessed the existing condition of downtown Tucson from particular points of views in hopes of creating a baseline portrait of the city. Once created, applying lessons learned from case studies and literature reviews became a more focused endeavor, versus applying such knowledge to an ambiguous set of observations and beliefs.

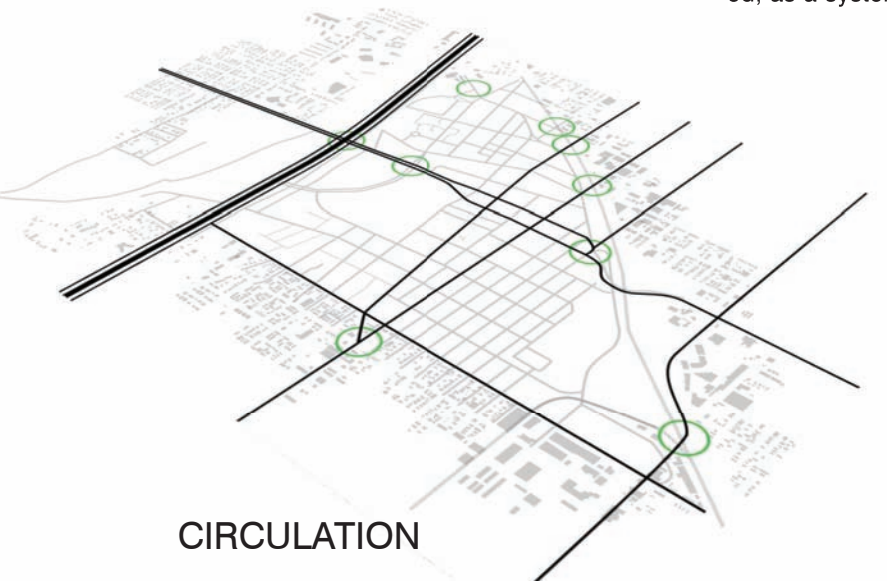
CONTENTS

LAND USE

Generally segregated, and lacking a true commecial center.

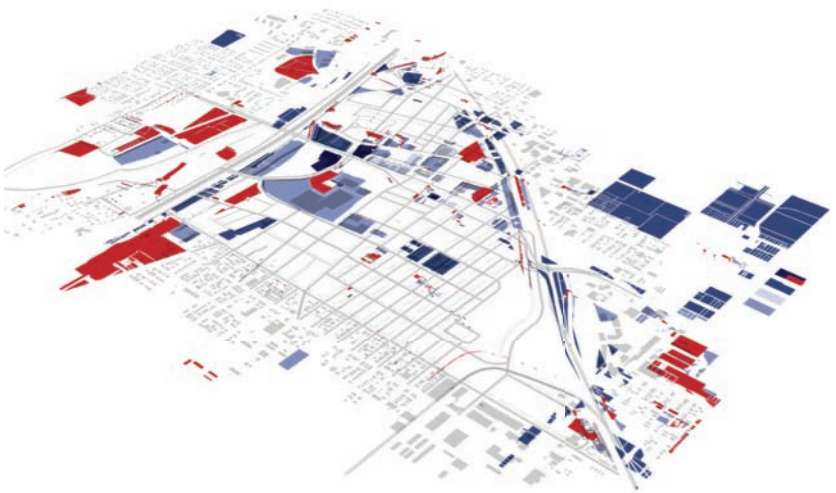
GREEN NETWORK

Green space is present, but poorly connected, as a system and to potential users.



CIRCULATION

Although vehicles are prioritized over other forms of transportation, even the vehicular network lacks a hierarchy or organization.

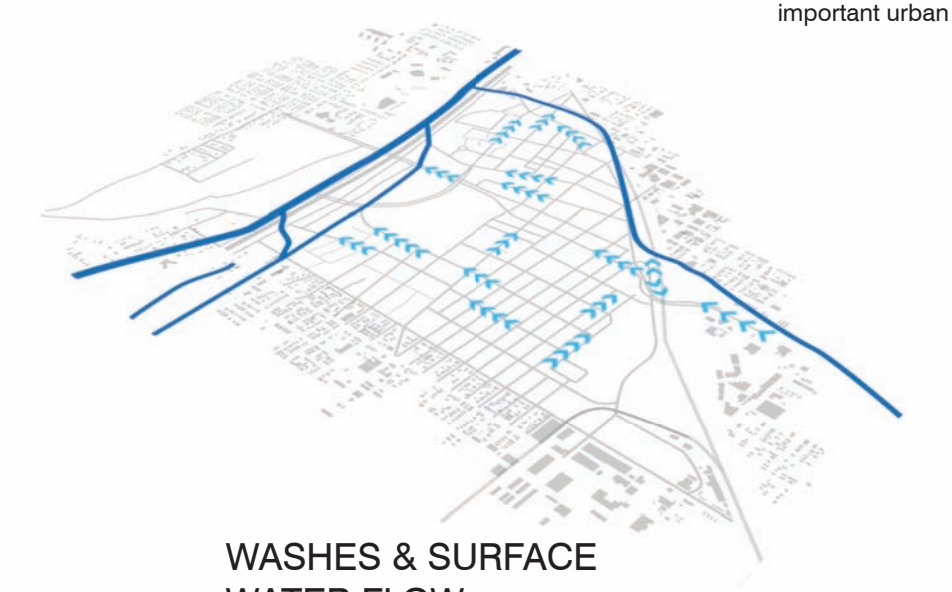


VACANT & PUBLIC LAND

Abundant in the project area, and a source of opportunity.

PRECEDENT IMPLICATIONS

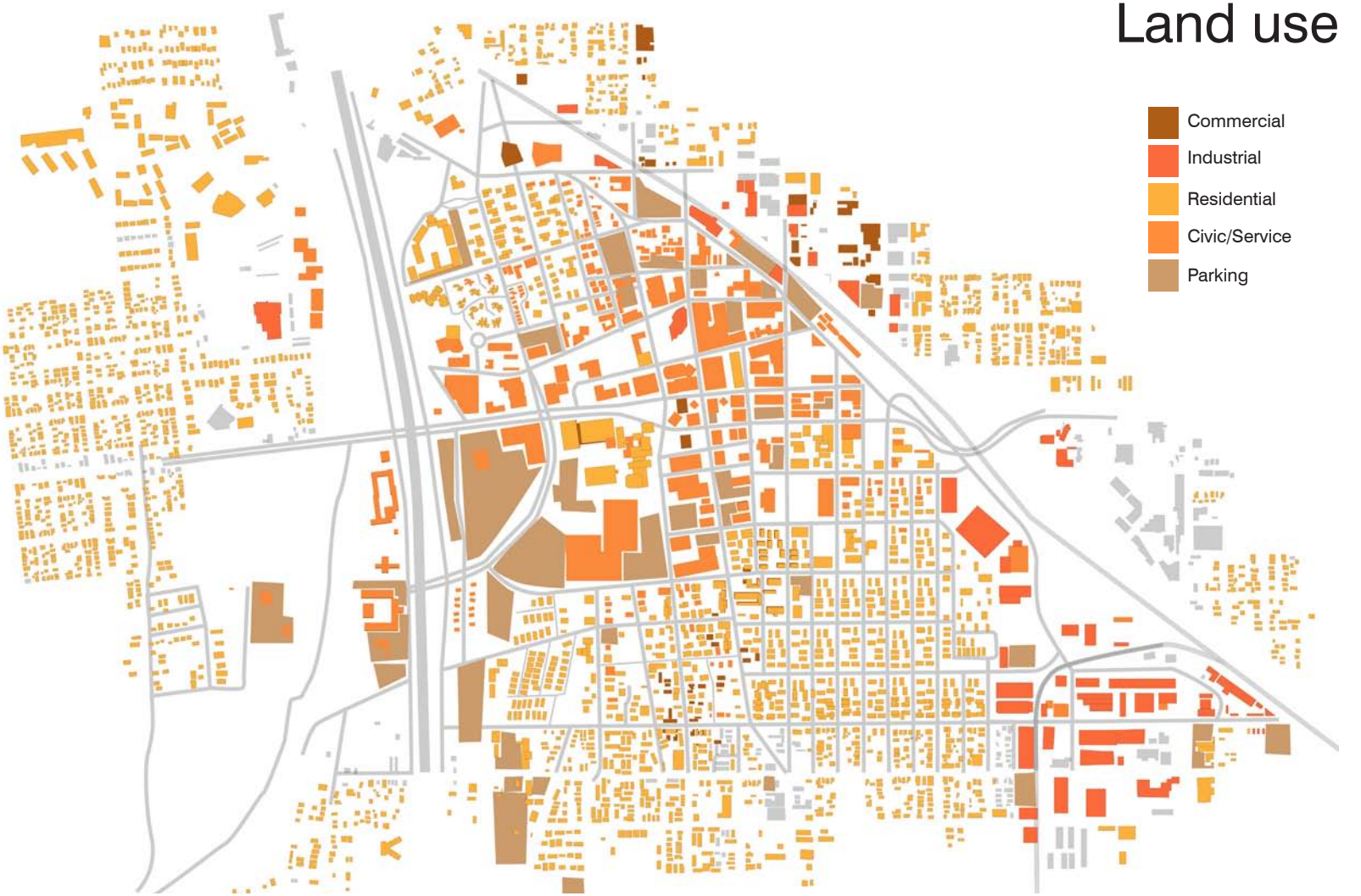
As yet to be completed projects that provide important urban form.



WASHES & SURFACE WATER FLOW

Opportunities for daylighting, reconnecting neighborhoods, and creating downtown water features.

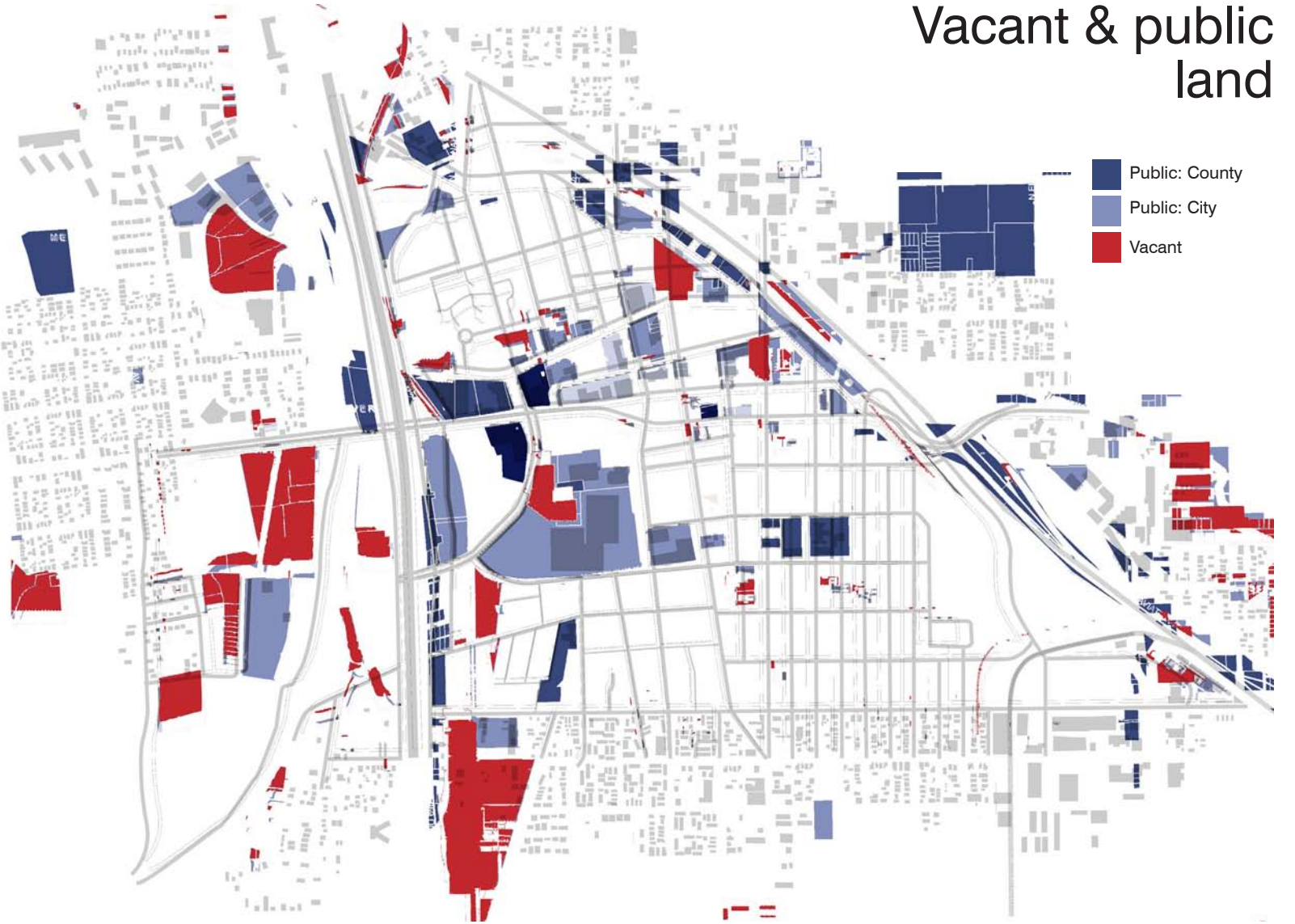
Land use



In general, land uses in the greater downtown area are segregated from each other, and although the Central Business District does have a heavy concentration of civic uses, it lacks real commerical density, as is shown in the map above. The outer ring of downtown—including the brownfields west of the Santa Cruz River(1), the warehouse districts to the northeast and southeast of the CBD(2,3), and the large tracts of surface parking immediately west of TCC (4)—is characterized by vacant or low density uses which segregate downtown from the greater city. Aggravating this situation—in spite of their highly valued and attractive character—are the nearby low density historic residential districts, including El Presidio (5), Barrio Viejo (6), Armory Park, and Menlo Park (7). Finally, within the CBD itself, many commercial properties on main streets are currently empty (8), and pedestrian scale shopfronts are interspersed with large parking garages (9) or massive & impermeable office buildings. In combination these characteristics suggest a need for a) greater mixing of uses to promote various kinds of infill development, b) increased density in the outer ring of downtown, as density is unlikely to increase

in the historic neighborhoods, and c) infill and improved walkability both within the CBD and in connections to nearby neighborhoods.

Vacant & public land



Downtown Tucson currently suffers from an abundance of vacant, neglected land. Most vacant parcels are paved or have completely bladed and compacted surfaces. This significantly contributes to urban heat island effect, while the imperviousness of the surfaces contribute to stormwater flooding during monsoon seasons. Downtown's vacant land is composed of both public and private parcels. The annual Gem & Mineral Show grounds cover numerous lots that sit unused for the remainder of the year (1). Similarly, the Union Pacific Railroad right-of-way varies along the course of the line and is typically unused for any purpose other than to act as a buffer (2). Other parcels are owned by the city and have great potential for development (3). Although not considered "vacant" many publicly owned surface parking lots have potential for higher density development (4).


1


2


3


4

Green network

Downtown Tucson lacks a “green network” in its current state. There are a number of schools, parks (1, Armory Park), and public spaces that exist but they lack any sort of connection or cohesiveness (2, Echo Park). Streetscapes in the downtown area are completely random from one block to the next (3), making way-finding from one open space to the next difficult. While many schools have “park” type spaces, grounds are typically off limits to surrounding communities. Also, most public/open spaces lack much “green” and instead consist primarily of hardscape (4, Library Plaza).

The City of Tucson has made recent efforts to begin establishing better connections between public open spaces. This is reflected in the recent streetscape redesign of sections of Scott Avenue (5) and Congress Street (6), and in the completion of the first section of the El Paso Southwestern Greenway (7). Downtown has many similar pedestrian-scale streets which have the potential to serve as green connections in the future (8).

Schools Include:

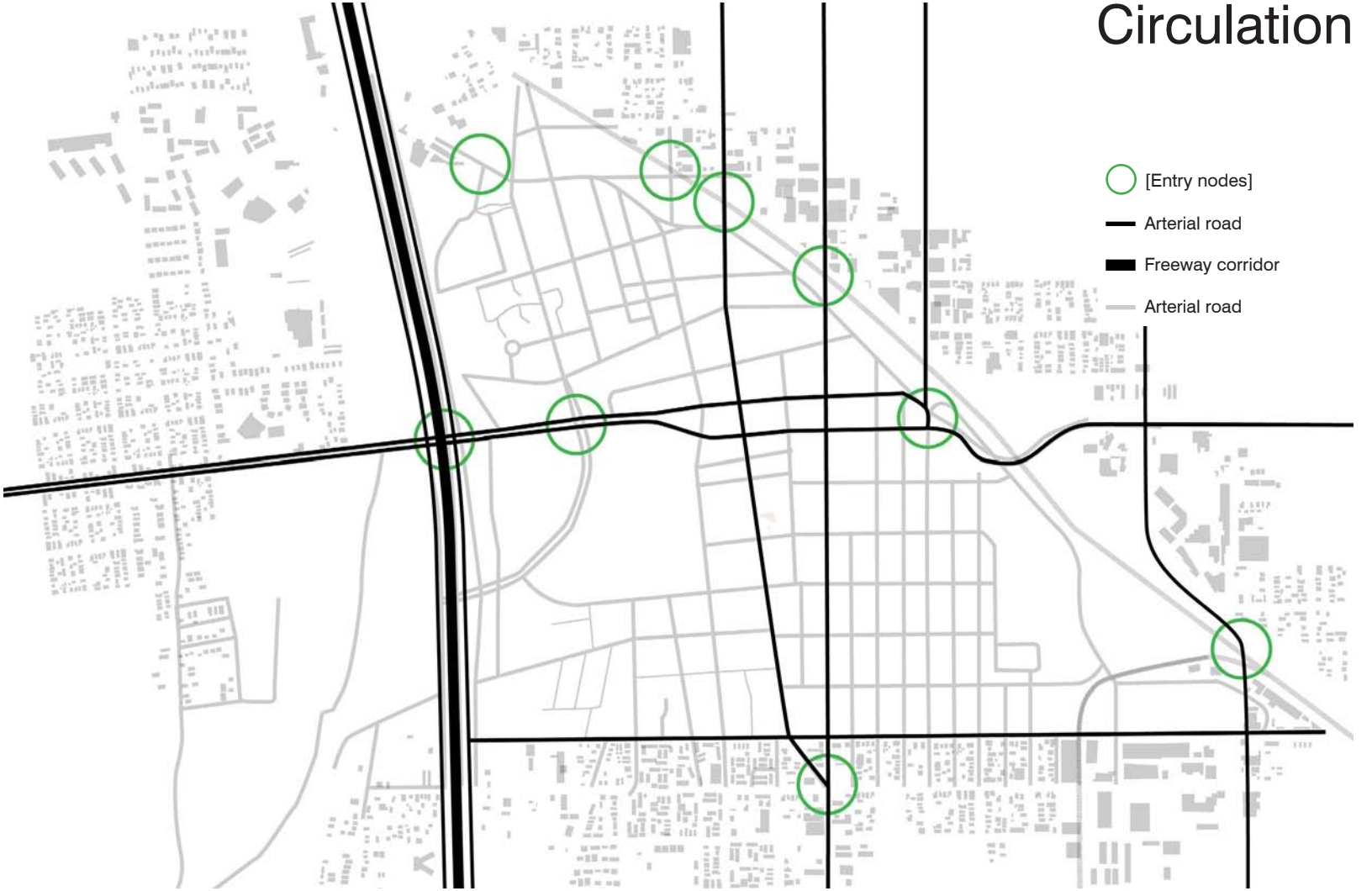
- Drachman Primary School
- City High School
- Safford Elementary School
- Carrillo Intermediate School
- Davis Bilingual Learning Center
- Tucson High School
- Roskruge Middle School
- Calli Ollin Academy School

Parks/Public Spaces Include:

- Armory Park
- Tucson Children's Museum
- Tucson Museum of Art
- Santa Rita Park
- Santa Cruz River Park
- Tucson Mountain Park
- Menlo Park
- Oury Park

- La Placita Park
- Echo Park
- 5 Points Park
- Santa Rosa Park
- El Presidio Park
- Tucson/Pima Public Library Plaza
- Tucson Mountain Park

Circulation



Transportation in downtown is largely dominated by cars. This, however, is beginning to change. Typically, streetscapes have consisted of little more than narrow sidewalks along numerous traffic lanes (1). With recent projects such as the Congress Street redevelopment, downtown has slowly begun to accommodate pedestrians and a light rail system (to be activated in 2012). Other projects, such as the El Paso & Southwestern Greenway, have given bicycles a precedent by providing a mixed-use path for commuters (see “Green Network” section.)

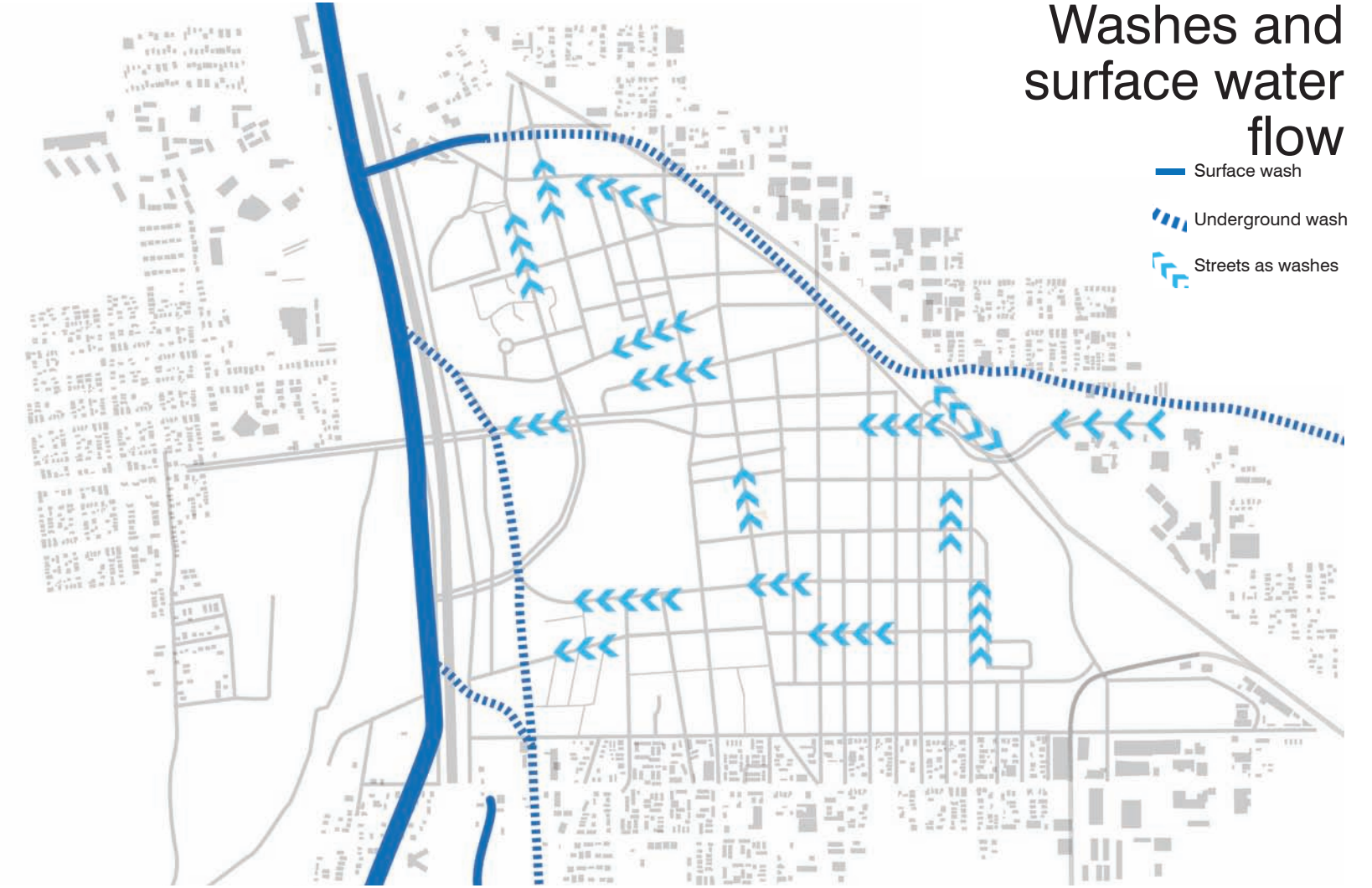
Interstate 10 serves as the main barrier to traffic flows moving west from downtown. There are a limited number of underpasses, some of which are not permeable by vehicle (2). Similarly, the combination of Aviation Parkway , the railroad line, and South Park Avenue - to the north and east of downtown – have severed the ties between numerous residential communities and has made accessing downtown difficult for those communities (3,4).

Parking in downtown is abundant and includes on-street parking, surface lots and parking ga-

rages (5). Many surface lots and garages are utilized during business hours and sit vacant at all other times (6).

The Historic Train Depot offers various rail trips to other cities through Amtrak, but train schedules and frequencies are quite limited (7). The Ronstadt Transit Center is located within downtown and offers city-wide connections (8). It is typically busy and well used. Bicycle lanes and/or designations do not exist in downtown other than south of Broadway on Stone Avenue and 6th Avenue, and on Congress St and Broadway St, east of 4th Avenue (9).

Washes and surface water flow



The entire area of land that composes downtown drains to the Santa Cruz Riverbed (1,2). It once contained smaller natural washes and creeks, but those have typically been channelized and hidden underground with the development of the urban environment (3). Instead, most water flow today exists through infrastructure that mimics natural waterways both above ground (through the design of roads), 4) and underground (in stormwater tunnels, and sewer systems) (5, 6). A few sections of remnant washes do, however, exist in parts of downtown. The Arroyo Chico, for example, alternates between natural and channelized as it makes its way towards the Santa Cruz (7,8). These remnant washes have great potential for creating linear greenways and connecting open spaces. On a smaller scale, techniques of water harvesting have the potential to utilize stormwater runoff from roads for landscape irrigation and/or enhancement.


3

4


5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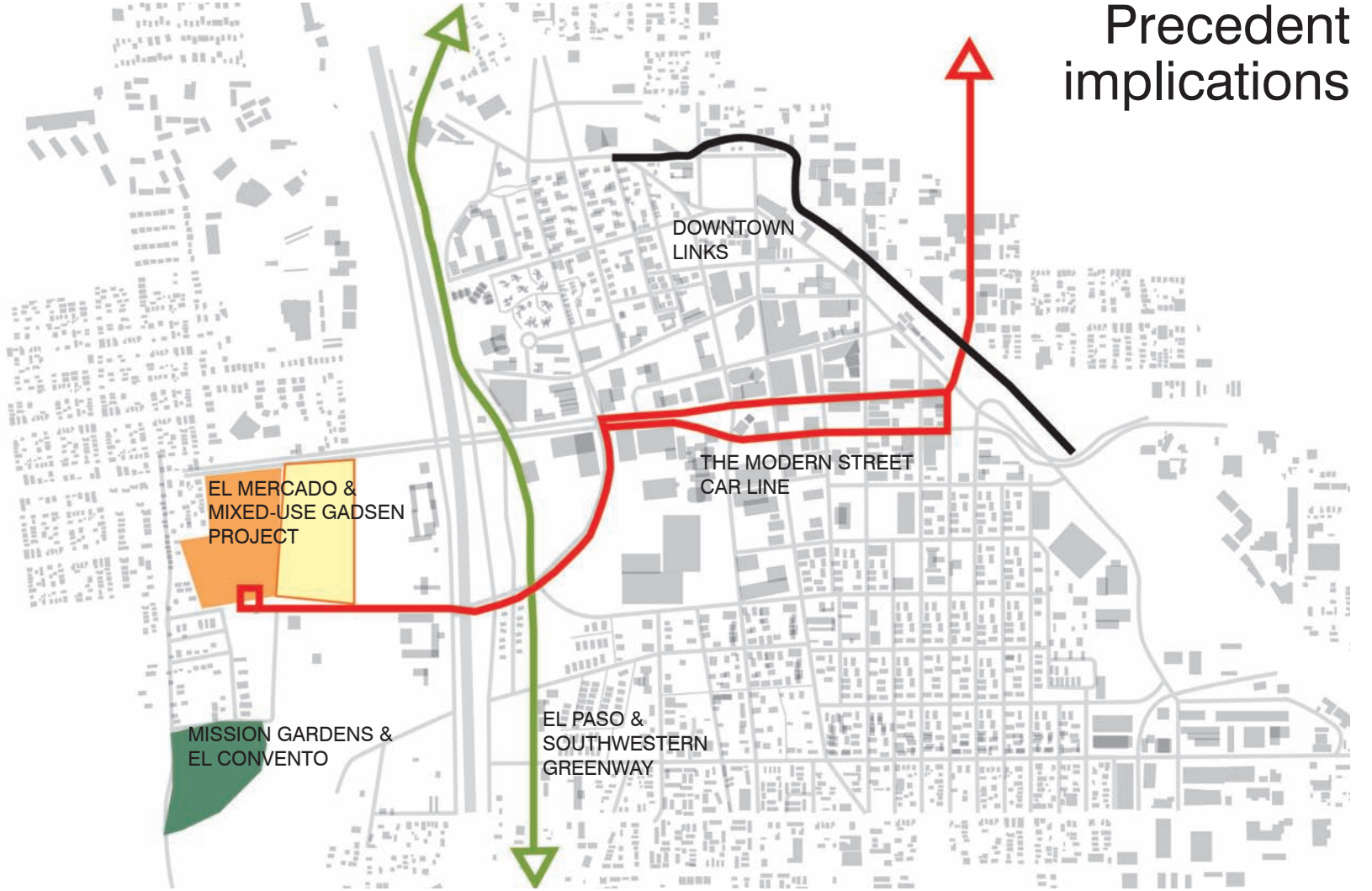
8

Precedent implications



For the purposes of this project we chose to include part or all of the plans for the Modern Streetcar, the El Paso & Southwestern Greenway, Downtown Links (Barraza-Aviation), and the Mission Gardens and the Convento (from Rio Nuevo). This decision was based on the fact that significant sections of each of the plans have already been implemented and that we view them as being beneficial to the development of downtown Tucson.

EL PASO & SOUTHWESTERN GREENWAY

The El Paso & Southwestern Greenway offers a safe and vehicle-free opportunity for bicycles and pedestrians to move through the downtown area. To date, the first section has been completed adjacent to the brand new Fire Central station, south of the Convention Center. The greenway will be essential to establishing the connections that will designate a large city-wide network of bicycle routes and multi-use paths.

DOWNTOWN LINKS

The Downtown Links plan is scheduled to begin implementation of Phase I at the end of 2010. This section will greatly improve the length of St. Mary's Road between the interstate and Main Avenue through the designation of bicycle lanes, the planting of street trees, and additional sidewalk improvements. Once completed, the roadway will offer a quick and direct route for through traffic moving west towards I-10. This will alleviate the drive-through traffic and congestion that is currently typical of downtown. Instead, downtown Tucson will become a destination.
Barazza Aviation Roadway will also establish new mixed-use paths along its route, increasing possible connections for the Green Network. Additionally, it will offer a safer pedestrian and bicycle crossing at 9th Avenue.

THE MODERN STREET CAR

The City of Tucson has gone to great lengths to support the implementation of the Modern Street Car. This effort has been rewarded recently through the project's receipt of a federal TIGER Grant.

The Street Car offers environmental benefits through street improvements implemented as the tracks are laid and through the carbon emissions saved by people using mass transportation (as oppose to individual automobiles). It also offers economic benefits through the dense infill typical of transit oriented design along its route. Also, it will strengthen ties between downtown and the University of Arizona.

RIO NUEVO: THE MISSION GARDENS & CONVENTO

Both the Mission Gardens and the Convento offer an important contemporary link to Tucson's history. We see great opportunity in linking open space and urban agriculture with these areas to create a district that alludes to Tucson's heritage. At the same time, as in the Rio Nuevo plan, many other cultural amenities can be concentrated in this area to help make it a cultural destination for residents and visitors alike.

MIXED USE PROJECTS

Partially complete or soon to begin construction, El Mercado and the adjacent Gadsen project both bring mixed use housing and other important investments to the previously vacant stretch of brownfields along Congress, and fit well with the aims of this project.

Interviews

Downtown Tucson has an extensive history of master plan proposals and visions. In order to prevent redundancy, we conducted fixed interviews with a range of stakeholders for their insights as to why plans of the past did or did not work, and what ought to be considered in the making of a new downtown plan. By talking with people who have been involved in downtown through the years we hoped to gain a better understanding of what works and why, as well as areas and challenges to avoid.

The interviews were done over a period of roughly 2 weeks. A few members of our team volunteered for each interview so that more information could be recorded during the course of the interview.

QUESTIONS

- What do you view as economic opportunities for development in downtown Tucson?
- How could quality of life be improved in downtown?
- What do you view as challenges to development in downtown Tucson?
- What incentives would entice you to invest in downtown Tucson?
- What will it take to get people to live in downtown Tucson?
- In your opinion, what are downtown Tucson's main assets?
- How could transportation in and around downtown be improved?

PARTICIPANTS

Thank you to everyone who spoke with us during this stage of the project, including: Albert Elias & John Beall of the City of Tucson Department of Housing and Community Development; Grant McCormick & John Fey of University of Arizona Campus and Facilities Planning Department; Corky Poster of Poster-Frost, also Former Director of the Drachman Institute; Gary Pivo of the University of Arizona Department of Geography & Regional Development; Joe Snell, President & CEO of TREO (Tucson Regional Economic Opportunities); Liz Burden, President, Armory Park Neighborhood Association; Rob Paulus & Bill Mackey of Rob Paulus Architects; Peggy Hutchison, Executive Director, Primavera Foundation; Shellie Ginn of RTA; and Arlen Colton, Director of Pima County Planning and Community Services.

DESIGN IMPLICATIONS

What do you view as economic opportunities for development in downtown Tucson?

- High portion of vacant and publicly owned land
- Links to university, university interest in developing downtown; "Communiversity"
- Housing: a growing trend of people wanting to be urban again (lifestyle); "café culture"; young, educated citizen base
- Transportation: Streetcar, transit oriented development, high speed rail in the future
- There is not yet a "heart" of Tucson , no central gathering place, and downtown could become this

How could quality of life be improved in downtown?

- Remove surface parking; move the bus station to the highway
- Housing: create policy for wide choice of housing; more student housing
- Not "be like" but "do like" other cities/ communities that have been successful in their downtown revitalization processes: identify what our unique qualities are and build on those
- We need more activities downtown; "café culture"; Quality of life = density at 6 stories (world's favorite cities)
- More mixed use; schools, groceries and retail are needed to support residential
- More green space: community gardens, market places, plazas, water; walkability to green space
- More pedestrian and bicycle friendly corridors with TREES; improved streetscape

What do you view as challenges to development in downtown Tucson?

- Urban renewal phase destroyed too much history - avoid any more
- There are too many plans for everyone to keep track of; we need to be clear about what we want – developers are put off by uncertainty; expectations: they need to be re-established; citizens need to commit to putting money and time into downtown over the long term and stick to it; need to re-think what progress is; Tucson lacks leadership; Tucson does not set up realistic expectations; too government driven and thus projects/plans are susceptible to the ups and downs of the political climate; lack of cohesive vision, failure to generate consensus, government accountability for plans even if they aren't plans generated by that particular elected official; Inclusivity of plan. Downtown Tucson Partnership's lack of community organizing skills; there is a huge lack of communication between the city and county development services: Avoid the "The Big New Idea" – the city lacks confidence and the public doesn't trust the city
- Desert-downtown: conflict of uniqueness
- Water scarcity
- I-10 is a huge physical divide and inhibits connectivity
- Historic Neighborhood (community) involvement; [Public] community input /buy in can really slow down or stop possible developments
- Financing for affordable or new housing
- Downtown needs the expanded demographic of "young families with children"; There is a major disconnect in what it takes to attract and retain talent/creative class; misjudged priorities
- The railroad is a HUGE challenge… it needs to be buried
- Homelessness
- Lack of retail services
- Heat
- That it [downtown] shuts down at night
- Downtown is not in the center of Tucson so it's not essential for most Tucsonans to move through it on a day to day basis
- Parking, spill over, minor urban issues like tagging, a little bit of gang activity
- Land use codes need to be updates; Not a lot of private market opportunities (although this is going to change)

What incentives would entice you to invest in downtown Tucson?

- University has land and buildings associated with downtown
- Business incentives: low interest loans; businesses may need to be subsidized until enough people come; no parking requirement for developers
- A vision
- Better process for developers; clear expectations of what a developer needs to do in order to move through the process; we need guidelines and standards; public/private partnerships are the fastest way to affordable housing; a better process for development wherein you are assigned ONE person to walk you through the

entire process; everything being in place [that is conducive] for development (e.g. zoning, etc.); clear information on existing infrastructure
- Tucson's modern street project is shovel ready

What will it take to get people to live in downtown Tucson?

- Critical mass – need to see people that are diverse on a daily basis
- Housing! - Add the middle demographic – young families with children; Add more affordable housing
- Create distinction – how can we be Tucson – not Portland
- The streetcar for people moving and as a show of confidence
- Mend the urban fabric with neighborhoods - downtown is disjointed
- Downtown needs stuff to do – people want to be here but need stuff to do; We need an urban experience – too long dependant of our natural world attractions; make downtown interesting enough to get people to look for parking; downtown needs gentrification to some extent in order to build confidence of others
- A shared consistent vision makes a big difference
- City's role to encourage local enterprise, small scale businesses, and non-profit economic activity, rather than just large for profit enterprise; grocery store: "small Safeway vs. mega-Safeway" on stone and 16th or 17th
- Address the day/night dichotomy; We need to keep people downtown with day & night life; there needs to be more "stuff" happening downtown on a regular basis; Entertainment!
- More mixed use development; nodes of activity (e.g. East Congress St.) – build on them and place housing around them; density and diversity
- DENSITY – this becomes a great neutralizer amongst various sectors of society; transit oriented development will create the density needed to revitalize downtown; no open space within 2 blocks of the streetcar; critical mass of business

In your opinion, what are downtown Tucson's main assets?

- The PEOPLE – everyone who is here wants to be here
- The University of Arizona (and its proximity to downtown)
- Sonoran Desert
- Tucson has MYSTIQUE
- Historical and cultural features: historic neighborhoods, barrio-style architecture, "Sonoran heritage" not just physical and biotic but cultural as well. . .artistic, creative, historic
- Keep the scale of downtown
- Tucson's only "urban" experience
- The convention center (and the shows it brings), Congress St. (where it abuts Toole Ave.)
- The modern street car is a great opportunity – put everything along the line
- 4th Avenue
- Library
- The YMCA
- The [Joel Valdez] Public Library
- Small businesses

How could transportation in and around downtown be improved?

- Develop the Streetcar connection to the airport
- Walkability – Connected green space; combined with biking and public transit
- Need to improve bicycle friendliness…El Paso greenway will be great for this; look into a bicycle and car sharing program; a bicycle exchange/rental program (kind of like a time-share) that would allow one to rent a bike to run an errand and then leave it at a kiosk for the next person
- Improve at-grade railroad crossings
- Slow down traffic
- Surface parking: Convert surface parking into structures; get rid of surface parking along main streets in downtown
- Streetcar – Streetcar – Streetcar!; look at the effects on density and ridership of streetcars everywhere; the Modern Streetcar is critical to the University plan's for a downtown campus
- Expands the boundaries of campus
- Removes barriers
- Addressing the housing shortage and economic limits (partnerships)
- Expands the university's public/private partnerships

Other notes/recommendations:

- Go for the vacant buildings and open spaces – we are one of the few cities in America with so much infill potential.
- "Market rational" over "rules of preservation"
- Look at "Imagine Greater Tucson"
- Congestion and lack of parking is a good thing?!
- Do Not Bulldoze
- Study the old master plans Modern Streetcar plan

INFLUENCES

CASE STUDIES AND LITERATURE REVIEW

Case studies

Case studies provide a systematic way of looking at events, collecting data, analyzing information, and reporting the results. They lend themselves to both generating and testing design ideas. An iterative approach to case study selection helped focus, establish and expand our initial and final conceptual design ideas. Ultimately, the case studies we chose found creative ways in dealing with downtown urban revitalization, brownfield remediation, river and wetland restoration, arid climate design, mixed use housing, urban agriculture and greenway connectivity. For a full list of text and image sources, see Appendix C, beginning on page 143.

CONTENTS

Albuquerque, NM

Arcadia Land Co.'s redevelopment

Like many American cities, many of Albuqueque's historic buildings were razed in the 1960s and 1970s to make way for new plazas, high-rises, and parking lots as part of the city's urban renewal phase. Only recently has downtown come to regain its urban character, mainly through the construction of new loft apartment buildings and the renovation of historic structures. New buildings now make the downtown more appealing and have surpassed financial goals. Local government and foundations have joined in to fill empty spaces to the southwest. Where there was surface parking and empty buildings there is now a mix of entertainment, restaurants, shopping, offices and housing.

HIGHLIGHTS

- Transportation Center brings together train service, local buses, and long-distance buses, near the new entertainment district
- A multiplex was the first sizable building to be built and it was placed in the center of the new development. A new restaurant placed next to the multiplex became the 3rd largest grossing restaurant in town
- 350 rental and for-sale housing units, mainly lofts
- 10 story vacant building becomes condos
- Partnership between public, private and NPOs – private/public not public/private
- The city receives a share of the transportation center profits - keeping them interested for 20 years
- High quality construction with long-term payback- "patient capital"
- "The market is hungry for special places" with walk to restaurants and work

DOWNTOWN
NEIGHBORHOOD ASSOCIATION
Albuquerque, New Mexico

DESIGN IMPLICATIONS

- Pedestrian oriented details
- Movies are the central activity, surrounded by stores, restaurants & offices
- Mixed use development
- Loft offices rather than buildings or towers: high demand for loft office space with windows that open
- Restaurants and retail at ground level and offices on the 2nd level
- Character of development varies from street to street
- Main Street: a neon splash of clubs, bars and live music
- Gold Avenue: funky or upscale boutiques, restaurants and lofts
- Focus on revitalizing empty spaces, vacant buildings and surface parking lots
- Parking garages at regular intervals throughout downtown

Denver, CO

Mixed-use renovations encourage downtown living

Denver is growing everyday and will continue to grow for the next 20 years. City planners are persuading city officials to channel that growth into Downtown to revitalize the region. New urbanists believe those people moving to Denver would be willing to live, work and play in Downtown if the city would provide the resources to do so. The City has responded by building a pedestrian mall through the middle of downtown, high-rise lofts, and a Light Rail commuter train cuts across Downtown. However, the same qualities that bring people to Denver- it's proximity to the Rocky Mountains- also pull people away from Downtown. Realizing the need to provide recreational opportunities in Downtown, the City of Denver, along with other private and public partnerships have transformed the South Platte River, once polluted, maligned and forgotten into one of the most successful greenway systems in the United States. Denver now has over 400 miles of interconnected trails and greenways.

DESIGN IMPLICATIONS

- Eliminate parking as "use by right" Once downtown is more than 1/3 parking, it loses its character and "sense of place"
- Provided housing financing on unconventional projects
- Changed zoning to encourage housing, T.O.D's, and protect historic buildings
- All buses into Downtown are routed to a station at the end of a pedestrian mall, where riders can make easy connections to the free shuttles
- City strives to be a "city in a park" through a strong theme of connectivity and open-space access

HIGHLIGHTS

- Development of 3 distinct districts: residential, commercial, hospitality
- Outdoor pedestrian mall running through the middle of downtown
- The Light Rail commuter train cuts across Downtown bringing thousands of workers into the city each day
- New convention center and several new sports facilities
- Union Station is being rebuilt to be the Metropolitan Region's Transit Hub.
- River front greenway and open space plan

Chattanooga TN

Drastic environmental measures drive overall downtown health

By integrating the ecological, economic, and equity aspects of sustainability, Chattanooga sets the standard for sustainable community development. Chattanooga's objectives in revitalizing their city were to:

- Focus on its natural green and "walkable" beauty
- Commit to issues of conservation, archaeology, and history
- Develop a world-class tourist destination
- Maintain a natural attraction to the river, above and below its surface
- Appreciate art, both informal and formal, in natural settings

As a result, Chattanooga has demonstrated determination and creative vision in addressing issues of environmental sustainability and livability.

HIGHLIGHTS

- Beautification efforts directed at improving environmental quality (including tree planting and stormwater management)
- Parking kept to perimeter of downtown, garages subsidizing public electric vehicles, minimizing traffic and auto pollution
- A countywide network of greenways protect natural areas along creek corridors leading to the Tennessee River
- Rather than pitting economic development against environmental protection, Chattanooga effectively combined them to generate some highly productive and profitable new industries
- Public sculpture and fountains also displayed the city's commitment to making downtown an attractive place for residents

DESIGN IMPLICATIONS

- Create network of neighborhoods bordering the Central Business District and engage in a visioning process for future of downtown Tucson
- Plant street trees along pedestrian corridors
- Educate public about the Sonoran Desert, Santa Cruz River, water conservation, and the delicate balance of desert ecosystems
- Consider sustainability measures as a potential economic driver rather than just worthwhile for their own sake

West Philadelphia, PA

The University and urban revival

The University of Pennsylvania (Penn) campus is surrounded by the neighborhood of West Philadelphia. Prior to the beginning of the redevelopment project, West Philadelphia had been in serious decline since the 1950's. Relationships between the community and the University were poor. Penn managed commercial property in West Philadelphia without much regard for the non-student residents. Campus security became so bad that Penn was forced to improve relationships with the greater community, and chose to do this by taking on the revitalization of the neighborhood as a whole.

HIGHLIGHTS

- Campus police integrated with city police.
- 90 + outreach programs between the neighborhoods and the campus colleges (schools)
- Greater, high quality, diverse housing choices, both ownership & rental.
- Significant renewal of retail activity and options (groceries) directed toward neighbors
- Broader group of investors, developers, NGOs & service providers (university leveraged)
- Skyrocketing academic success at the university including awards and increase in standing.

DESIGN IMPLICATIONS

- A realistic strategy involves social, economic and political assessment.
- Most urban areas in older U.S. cites are poor and heavily populated by minorities, and design must consider this factor
- Retail amenities that encourage pedestrian traffic also discourage crime
- Business won't relocate without significant [public] effort to correct problems
- Network with every community organization available

Santana Row

SAN JOSE, CA

Mixed use high density urban village = vibrant street life

Santana Row is a mixed use, high density urban village made up of restaurants, shops and a hotel that are located around a main street that is divided by a linear park. Multistory low-rise buildings surround outdoor spaces filled with public art work. The rental units were design to convert to owner occupied condos. 200 units have already converted. The stores focus on high-end fashion and lifestyle products. Difficult economic times set in late in the development and the developer lowered rents and invested in restaurants to keep the project on track.

HIGHLIGHTS

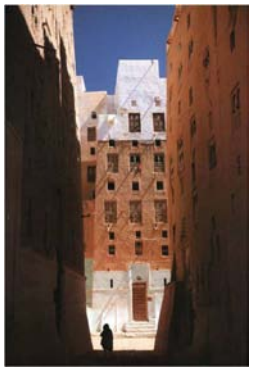
- A state of the art movie theater is central to the concep.
- The coming & goings of residents is part of the sidewalk experience
- Linear park down the center of main street is extremely important
- Wide sidewalks with seating that connects to the shops
- Parking is generous but never intrudes; sitting behind and beside the main cluster of mixed use buildings; the majority of parking is in garages that are ringed with shops
- All surface parking is slated for future development
- The developer worked hard at community relations throughout the process, as well as satisfying various environmental requirements, including relocation of plants and animals, and designing to reduce light pollution

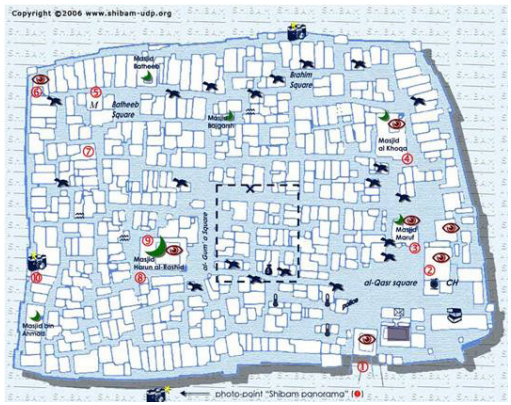
DESIGN IMPLICATIONS

- Maintain clarity of the relationships between all uses
- Don't group luxury tenants into one area—mixing things up creates a livelier street
- Great street life placed a premium on views of the street

Shibam

YEMEN





Climate appropriate urban fabric

Shibam is known as the “Manhattan of the desert”. Its ancient centre, which still comprises 400 inhabitable clay towers, is unique in the world and was declared a World Cultural Heritage site by UNESCO in 1982. Situated in an age-old cultural landscape, the city had been a junction of caravan trade routes since ancient times. But in the course of the 20th century, Shibam lost its historic economic base, and most of its population slid into poverty. An urban development plan aimed at preservation and economic self-sufficiency and based on the potential and skills of its inhabitants and local government is intended to benefit the population and avert the decline of the old city. The Urban Development Project has approached the city as a living community rather than as a historical artifact frozen in time.

HIGHLIGHTS

- Building restoration coupled with community organization
- Buildings as shading devices
- Mixed use housing
- Self-imposed urban growth boundary
- Built on a raised earth dais thought to be the rubble of an ancient city
- Buildings have been repeatedly reconstructed over the centuries
- The vertical expansion of the buildings was driven by topography and the need to preserve surrounding agricultural land
- All structural elements are made from ilb, a local hardwood, except in extreme cases where the upper floors are supported by steel tubes

DESIGN IMPLICATIONS

- Urban development plans can be developed despite age of community
- Historic urban areas can be dynamic and not just artifacts frozen in time
- Maximize passive energy systems and inward looking architecture
- Integrate different scales of native environment into design
- Minimize the discomfort at the microclimatic scale while planning the macro-level to be responsive
- Passive open space should not exist within the arid city; areas left “in reserve” should be designed and treated as active spaces until their eventual primary use is determined

SE False Creek

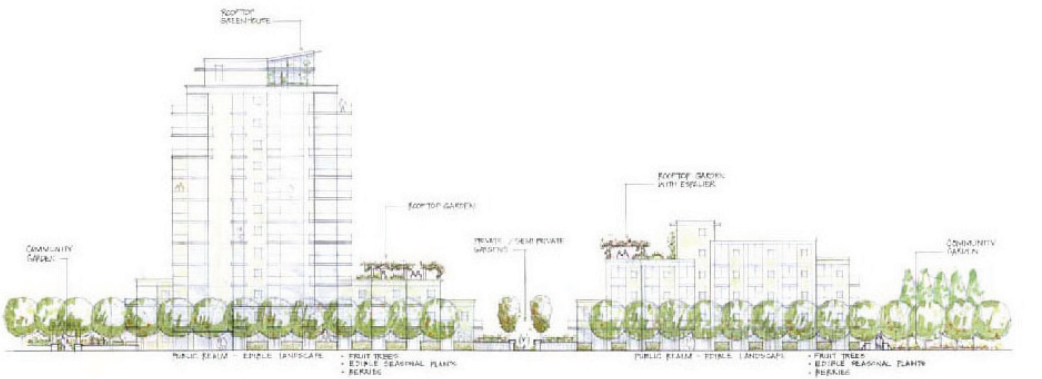
VANCOUVER, BC, CANADA

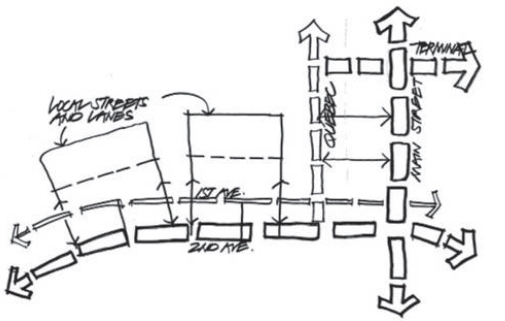
Livable density, community self-sufficiency

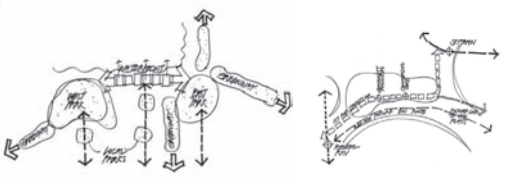
The build-up to the 2010 Olympics has created an opportunity for the city of Vancouver to develop one of the few remaining vacant areas of significant size in its downtown core. In the planning stages for many years, the neighborhood of SE False Creek is the next generation of a planning strategy that explicity combats sprawl through the development of the urban center. Like much of downtown Vancouver, SE False Creek offers both extreme density and a lifestyle that residents choose for its own merits, rather than logistical or environmental reasons.

HIGHLIGHTS

- An urban residential development on reclaimed industrial land in Vancouver
- An ambitious sustainability agenda, including green building, mixed use and community building agendas, including plans for integrated urban agriculture opportunities, extensive green roofs and neighborhood energy generation
- Meets LEED ND standard
- An example of Vancouver's long term planning efforts toward densification of the urban fabric
- Phase 2 of build out is being loaned to Vancouver's Olympic committee (VANOC) for the duration of the 2010 Winter Games, but all planning and design were done with the needs of the end user—the eventual permanent residents—in mind
- Expected to house 12,000 to 16,000 people, and encompass the full range of community services (self-contained neighborhood)



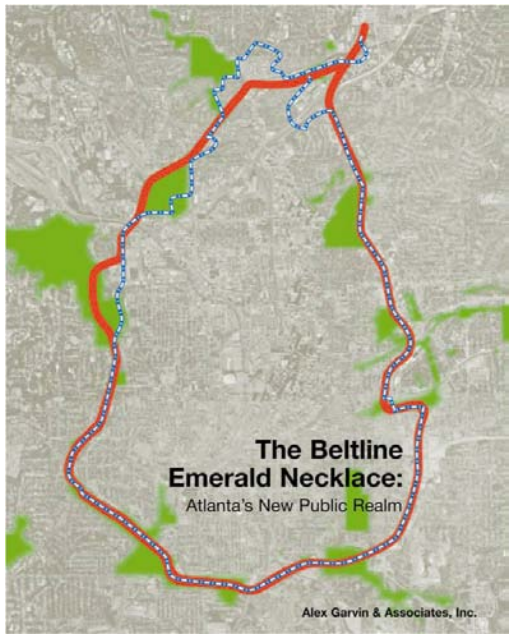




DESIGN IMPLICATIONS

- Sprawl can be reduced through development of a downtown that attracts residents who might otherwise chose a suburban lifestyle
- The opportunities for sustainability measures can increase with increasing density
- Neighborhood planning in an urban environment should actively address both neighborhood function and the relationship with surrounding urban fabric
- One time or period events (in this case the Olympics) can leverage investment in long term infrastructure if handled appropriately

The Beltline
ATLANTA, GA



Green corridor on an abandoned railroad right-of-way

The Atlanta Beltline project is the most comprehensive economic development effort ever undertaken in Atlanta and the most wide-ranging urban redevelopment currently underway in the U.S. The Beltline will combine greenspace, trails, transit, and new development along 22 miles of historic rail segments encircling the urban core.

Over the past 20 years, metro Atlanta's growth has occurred in widely spread and disconnected pockets of development which have strained the region's quality of life. By attracting and organizing some of the region's future growth around parks, transit, and trails, the Beltline will help change the pattern of regional sprawl in the coming decades and lead to a vibrant and livable Atlanta with an enhanced quality of life.

HIGHLIGHTS

- Trails are designed to allow for a diversity of uses (strolling, jogging, rollerblading, cycling)
- Many trails follow old railroad right of ways
- In total, 2,544 acres of "emerald necklace" will be created
- A light rail system has been designed to complement plans for the green beltway
- Most of the property used in the Beltline is vacant, abandoned, or underutilized
- Concept for the beltway originated after the distribution of a thesis by Ryan Gravel, a student at Georgia Tech at the time
- In December, 2009 groundbreaking for the first trail took place, with full build-out estimated to take 25 years

DESIGN IMPLICATIONS

- Student work can have real-life results
- Improving circulation and connectivity in/around the urban area can have positive effects on the entire system
- Creating connections to open spaces can create a powerful synergy in the areas between the points of connection
- The creation of parks and parkways can lead to widespread economic development in urban environments
- Improving the core urban environment can help reduce sprawl and decrease the cost of expanding infrastructure
- The repurposing of right-of-ways can work towards the creation of open space or trails/greenways
- A combined light rail and "emerald necklace" strategy can vastly improve an urban framework

The High Line

NEW YORK CITY, NY

A little green can go a long way!

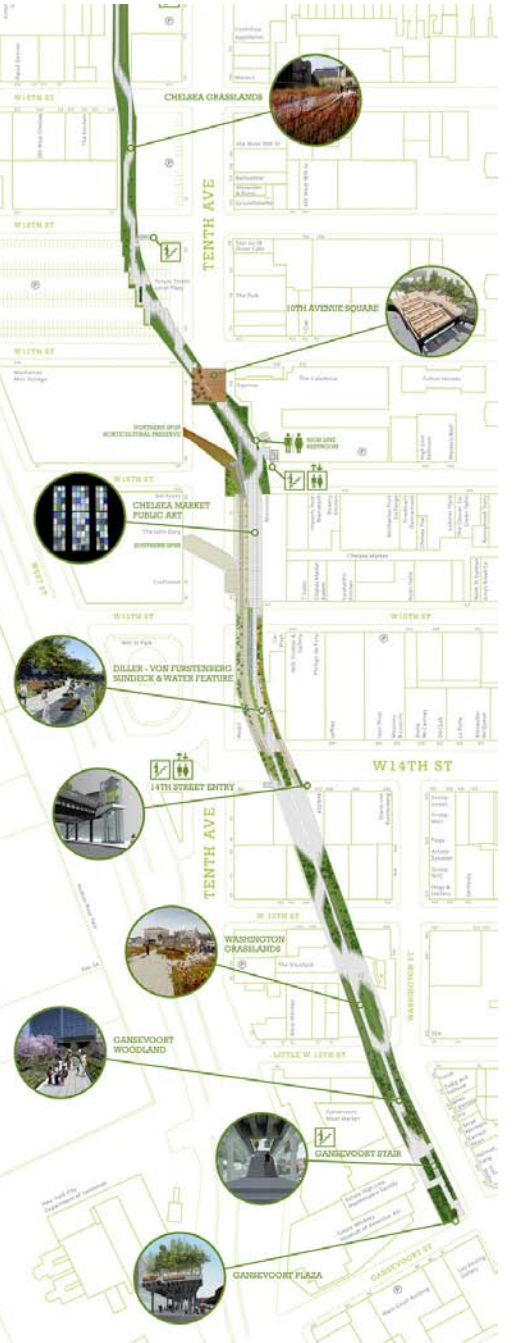
The original High Line was constructed between 1929-1934 to support fully loaded frieght trains. It occupied 6.7 acres of elevated rail deck, spanning 1.45 miles and connected directly to factories and warehouses, allowing trains to pass through buildings. Use of the line declined beginning in the 1950's, and it was abandoned in 1980.

In the late '90's a group of citizens attempted to prevent demolition of the High Line. Through community and civic involvement, the High Line project gained support, and in 2003 an international competition was launched to attract visionary design proposals for the High Line's reuse. The winning designs were developed by Field Operations and Diller Scofidio + Renfro.

Phase 1 opened in June 2009, with Phase 2 scheduled for 2010. It will connect 3 of Manhattan's dynamic neighborhoods: Hell's Kitchen/Hudson Yards, West Chelsea, and the Gansevoort Market Historic District.

HIGHLIGHTS

- Ramps and stairways leading up from the street
- Walkways
- Multiple planting schemes
- Varied topography of main path (e.g. paths raised above vegetation, some below, etc.)
- Reveals and preserves original structure: replace "artifacts" after initial renovation
- Environmental sustainability: low water use plants, native plants, etc.
- Connecting 3 distinct communities

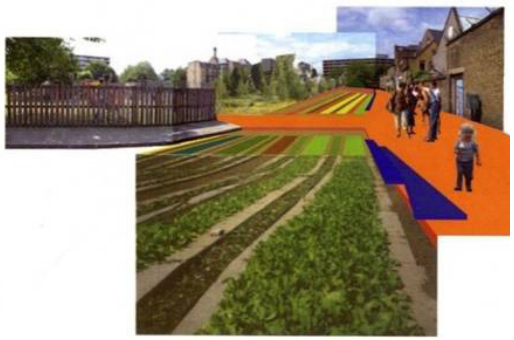


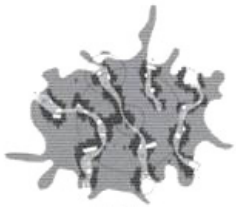
DESIGN IMPLICATIONS

- Connect distinct communities
- Utilize existing infrastructure
- Maintain historical and cultural memory while building for the future
- New perspective/experience
- Green belt brings nature into city
- Separation from cars = Safe
- This increases property values for adjacent properties
- Programming – year round use
- High Line project was economically rational: New tax revenues created by the public space would be greater than the costs of construction
- A little green can go a long way!

CPULs

VARIOUS CITIES





DESIGN IMPLICATIONS

- Productive in economic, sociological, and environmental terms
- Vegetation, air, the horizon, as well as people, will be able to flow into the city and out of it
- Well-connected walking landscapes
- Build on and over characteristics inherent to the city by overlaying and interweaving a multi-user landscape strategy
- Urban land becomes productive and consumption becomes local

Connectivity through multi-purpose open space

Continuous productive urban landscapes are urban spaces combining agricultural and other landscape elements within a strategy of continuous, open space linkages. It is intended to create multimodal connections across neighborhoods, while also serving various greenspace uses, from urban agriculture to city parks. While there is as yet no built example that demonstrates an entire city planned or reconfigured around the CPUL model, smaller projects have been implemented in a number of communities around the world.

HIGHLIGHTS

What is a CPUL? It is a highly integrated system of continuous landscape connecting city and countryside, containing:

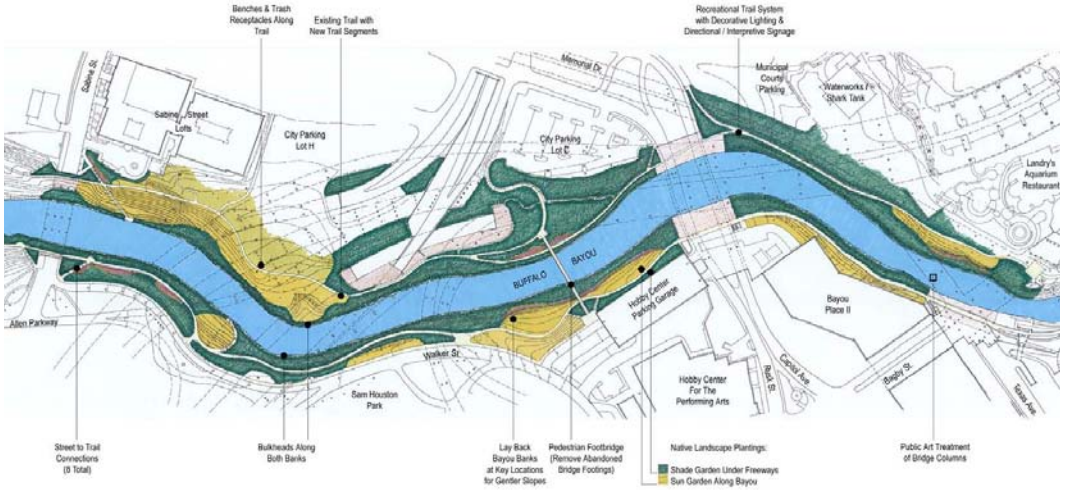
- Green footpaths
- Productive urban agricultural fields (for large-scale food production)
- Individual and community urban agricultural plots
- Local farmstores with wholesale markets
- Local markets and shops
- Flexible outdoor “office” space to be used by business people during the day and youth during non-business hours
- “Open space” for recreation
- Adjacent housing with producer and customer base
- Multi-functional water systems
- Pocket forests

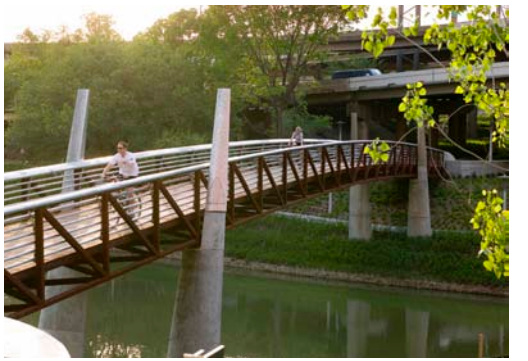
Sabine-Bagby Promenade

HOUSTON, TX

Balancing conservation and development re-connects a city with nature

As one of the largest investments in public parkland the City of Houston has ever carried out, the Promenade invites Houstonians to explore a deeper relationship between nature and the city. The restoration of the Bayou will build value into the urban economy, a better quality of life to sustain and attract residents to the area, and celebrates the wetlands and waterways integrated throughout the city. It is helping the city to begin to realize the civic and recreational potential the waterway can provide.





HIGHLIGHTS

- Developed a neglected, trash-strewn section of the Buffalo Bayou waterfront as gateway park into Downtown Houston
- 3,000 linear feet of parks (23 acres of parkland)
- Component of 20 year vision to transform district into active waterfront with housing and commercial opportunities
- The 1.2 mile long Buffalo Bayou Promenade was a critical missing link, tying the pastoral Buffalo Bayou Park to the west with the Theater District and Houston's Downtown to the east
- Public/Private partnership enabled funding

DESIGN IMPLICATIONS

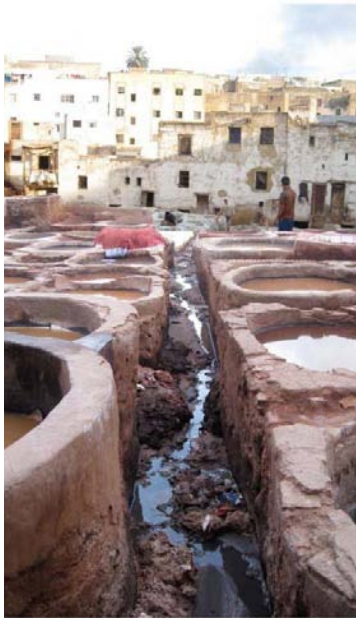
- Tucson's remnant washes are similar to Houston's bayou system, supplying water to the Santa Cruz
- Creating connections to the Santa Cruz opens up endless opportunities for recreation (active & passive), education, and entertainment
- The Park will reconnect neighborhoods to the waterway, thereby reclaiming former sites and restore damaged environmental resources
- Restoring the waterway to an ecologically functional system—the centerpiece of a pedestrian-oriented, mixed-use green corridor linking other urban amenities and creating a sense of place, providing a focal point for a sprawling city
- "What many competitive cities have is a central, regional-scale amenity that creates a vivid impression of the place and offers opportunities for recreation, urban living, and entertainment"

River remediation scheme

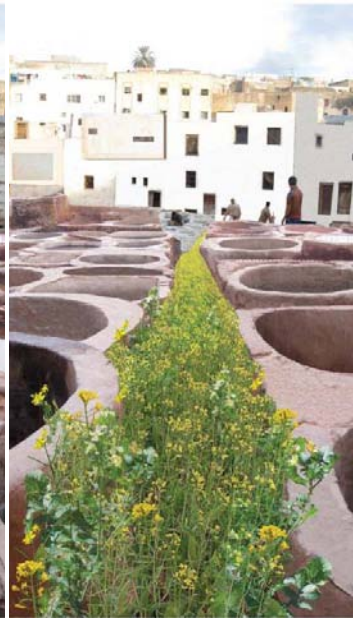
FEZ, MOROCCO

Integrated multiscale planning for urban water quality

The most prominent feature of this project consists of the comprehensive approach to environmental revitalization and urban renewal. The Fez River, a historic lifeline traversing the medina of Fez, is now faced with a diminished role due to serious pollution and risks drying up. The future water-diversion to a new sewage treatment plant allows the mostly covered river to be laid open again and thus regain its potential as a public amenity. This project, a Regional Holcim Award winner, proposes interventions at city-scale master plan and site-scale projects for cleaning the degraded water as well as the remediation of heavily polluted sites such as the tannery at Chouarra.



Existing condition

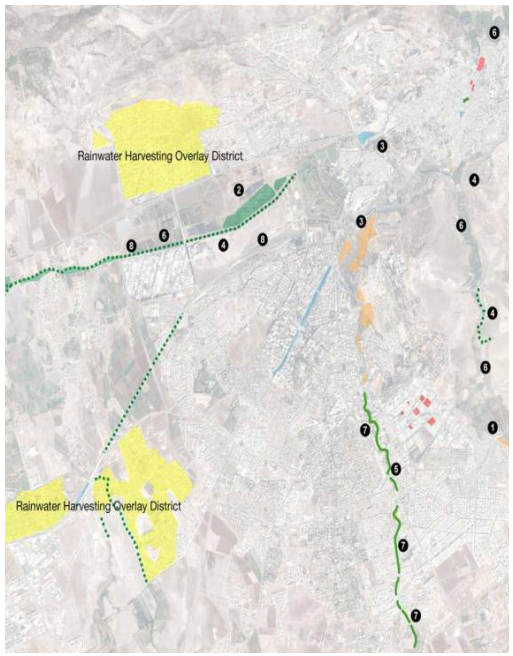


Path remediation with mustard

Future condition

DESIGN IMPLICATIONS

- Lack of open public spaces and infrastructure adapted to contemporary needs of residents affects quality of life
- Comprehensive plans should work at several, complementary scales
- Careful interventions can help urban areas evolve to meet dwellers' needs while preserving its historic integrity
- Phasing of a brownfield redevelopment can meet environmental, social and economic long-term demands
- Rivers can be a powerful form of urban infrastructure
- New public spaces, strategies for economic development and health and safety advances by the conservation and treatment of water and soil can enhance the social, economic, and physical well-being of local residents



HIGHLIGHTS

- Project coupled of a comprehensive socio-cultural and economic program to an environmental remediation initiative
- Project approach works at two scales: city and site
- City master plan focused on recommended measures for improving regional water quality
- Site scale worked towards water quality, economic development, open space reuse, and remediation of former tannery spaces
- Strategic plan addresses the ecology of the river and the social and economic concerns of the city
- Brownfield remediation was coupled with economic and public space development

Menomonee River Valley

MILWAUKEE, WI

Flood zones, industry and recreation coexist

Wenk Associates competition winning plan for the 140-acre site has restarted industrial development, reconnected surrounding communities with the river and job resources, created natural amenities in parks and trails and is reestablishing a social and economic framework absent for nearly two decades.

The plan proposed a framework of “green infrastructure” that integrated flood detention and stormwater treatment with recreation and open space. The community gained an invaluable amenity in a riverfront park and open space system linking the downtown and adjacent neighborhoods to the Valley with a network of trails. Final buildout of the project is scheduled for 2012.

HIGHLIGHTS

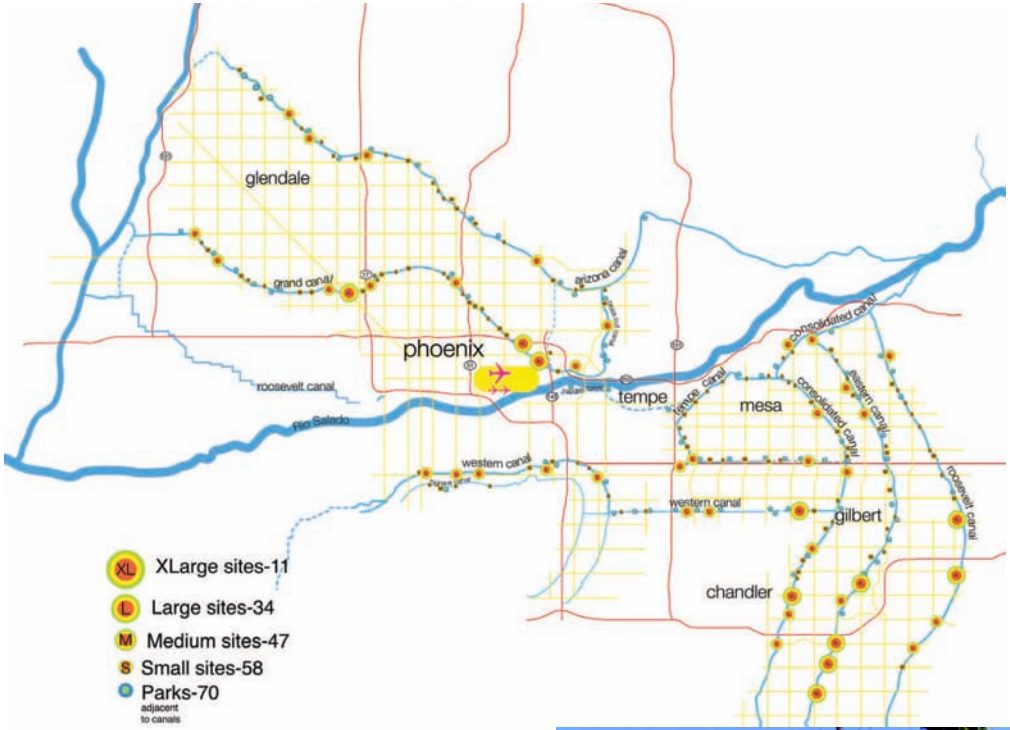
- Concepts were prepared for the space below highway viaducts, including skateparks and a concession and movie screen
- Enhanced habitat in 15 acres of restored wetlands and meadows
- Wetlands were designed as an integral part of stormwater treatment/management
- Nearly 80% of the park now complete
- Over 50 acres of the redevelopment area has been purchased while the construction of new businesses is ongoing
- Harley-Davidson built a $75 million 130,000 square-foot museum nearby after redevelopment began
- Guidelines for sustainable design for the area were developed in tandem with the redevelopment of the river valley

DESIGN IMPLICATIONS

- Environmental, functional and aesthetic improvements can help revitalize local industrial development
- Created natural amenities can help establish previously non-existent social and economic networks
- Reestablishing riparian and wetland areas can help in stormwater management and to improve overall system water quality
- Opportunities for open space can come from unexpected sources
- Innovative storm water management can be improved by using native plant selections
- Redevelopment based on sustainable principles can provide a predictable climate for future investment

Canalscape

METRO PHOENIX, AZ



Intersections of canals and streets as lively urban nodes

An interdisciplinary project originating at ASU and involving a variety of civic and university based groups, Canalscape is a design encouraging the urbanization of key nodes within Metro Phoenix, at the juncture of major streets and the system of canals that delivers water to the city. Typically neglected, and long since stripped of all their vegetation in the interest of efficient water delivery, the canals are a unique and ubiquitous part of the Phoenix landscape that, according to the project, should be better utilized as a placemaker, urban organizing system, and water feature. The Canalscape nodes would serve as a both a city-wide unifier, and a distinguishing feature for individual districts. Ideally, every neighborhood would have an attachment to and use for their own Canalscape, but also have various reasons to visit others around the city.

HIGHLIGHTS

- Lateral linkages: designed corridors connecting interior neighborhoods with canal fronts
- Incorporation of green infrastructure, utilizing canals and canal right of ways for energy generation.
- Analogy and park-based connections to the Hohokam canal system that in various places parallels or coincides with the modern system
- Proposed temporary diversion of canal water into side projects
- Focusing of development on key locations and intersections of circulation


Existing


Proposed

DESIGN IMPLICATIONS

- Identify creative sources of water as a focal feature and climate control for “desert urbanism”
- Identify unique and underutilized or ignored features of the Tucson landscape to highlight
- Consider ways downtown can be visually linked to the rest of Tucson through design, while still maintaining a unique character
- Consider illuminating rather than hiding the unsustainable aspects of dense desert settlement

Rosslyn-Ballston Corridor

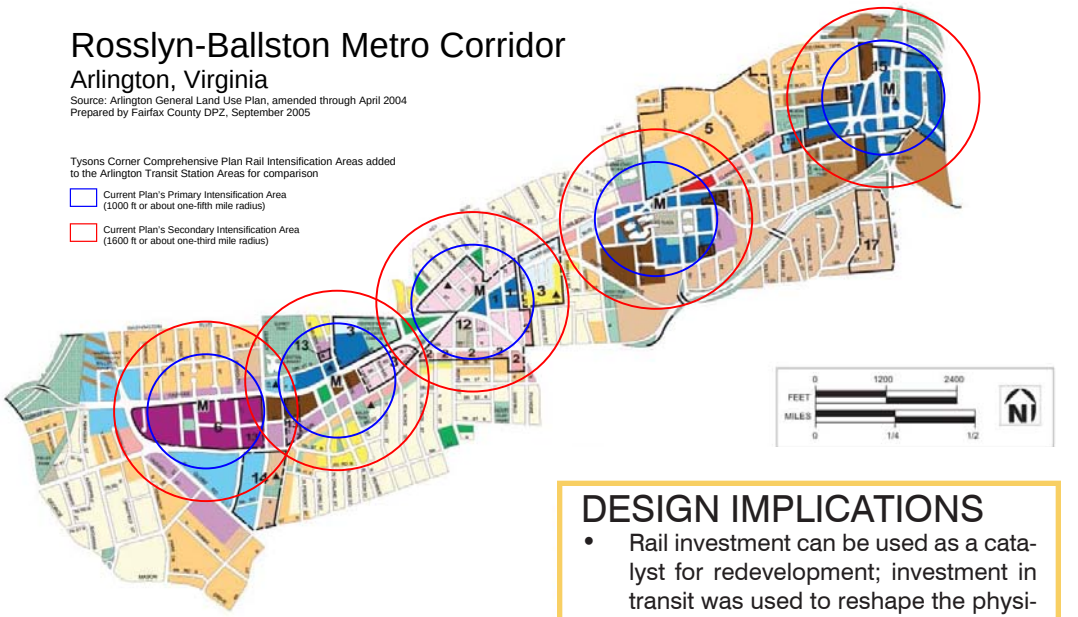
ARLINGTON, VA

Transit oriented development

The shift to transit oriented redevelopment in Arlington County, Virginia occurred over 30 years, from 1972 to 2002. From the beginning, the intent was to use public monies to build a “Metrorail” and let that act as a catalyst for redevelopment, as decline of the area in the 1960’s was due to suburbanization that drew businesses away from the existing mixed use arrangement along the main thoroughfare, Wilson Boulevard.

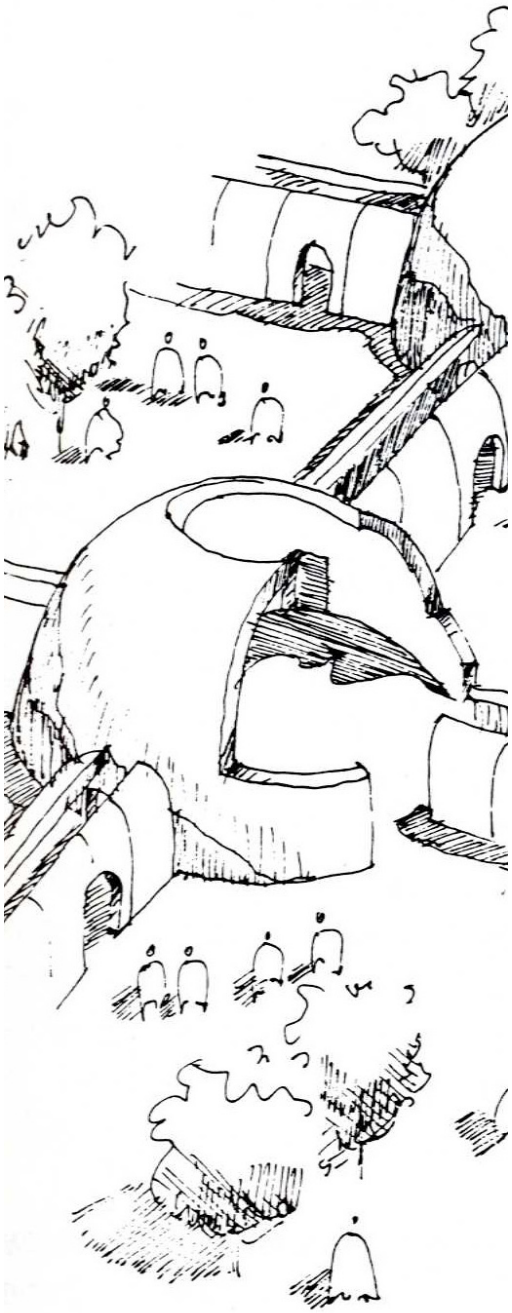
HIGHLIGHTS

- 3 mile long corridor shifted from an unincorporated low density commercial corridor into a development power center
- Continued to grow even during recessions and in spite of high development fees used to build the necessary public infrastructure
- Reversed significant declines in both population and commercial activity inherent to the area
- Occupied only 3 square miles where standard densities would have required 14 square miles
- The development process produced significant mixed use development, becoming one of the densest urban centers in the United States:
- 11,000 housing units
- 16 million square feet of office
- 950,000 square feet of retail
- 1,900 hotel rooms
- 81% increase in the assessed value of land and improvements
- The lowest vacancy rates in the region except for the District of Columbia



DESIGN IMPLICATIONS

- Rail investment can be used as a catalyst for redevelopment; investment in transit was used to reshape the physical, social, commercial, residential and economic life of the corridor
- A predictable development and review process is important for both developers and the community
- A rich mix of uses promotes a balanced use of transportation systems
- Public involvement is critical
- Density supports transit
- Design is important and so are pedestrians; attractive and functional pedestrian environments are necessary to creating coherent urban environments, as are diverse and interesting transit stations
- Historic preservation maintains community character; historic buildings not only need to be preserved but they also to be integrated into the new urban fabric
- Economic diversity is important but escalating land values are limiting; proactive and protective policies are needed to protect, renew and expand affordable housing



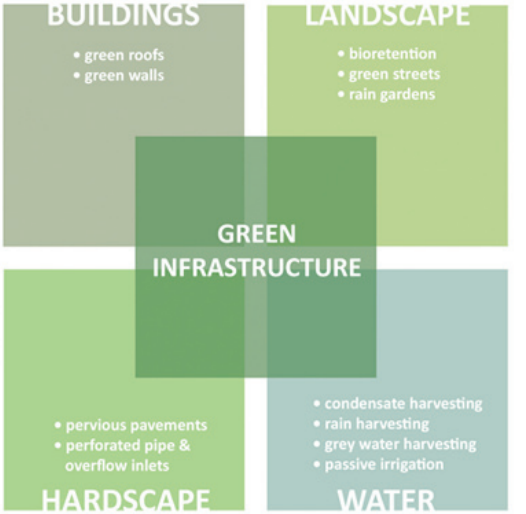
Literature review

A literature review is an analysis of current knowledge and theory pertaining to a specific topic or field. In this case, our field is design. The literature review presented here explores ten subjects and their relationship to urban renewal and design. The review begins with a study of the tenets and guidelines of Landscape Urbanism, New Urbanism, LEED Neighborhood Development and the Sustainable Sites Initiative. Next, we investigated Urban Open Space Design, Green Street Design, Urban Design in Urban Climates, and City Comforts for insight into how they might inform a site specific design approach. Finally, we explored different Affordable Housing strategies, and made comparisons of different City Morphologies from around the world. Sources of information reviewed include: books, journals, academic articles, and various on-line resources. For a full list of text and image sources, see Appendix C, beginning on page 143.

CONTENTS

Landscape urbanism

Landscape Urbanism is a theory of urbanism arguing that landscape, rather than architecture, can be the organizing element of the city, enhancing the urban experience. Landscape Urbanism has emerged as a theory in the last ten years and is far from being a coherent doctrine. Charles Waldheim, James Corner, and Mohsen Mostafavi are among the instructors, practitioners, and theorists who have been most responsible for articulating the terms of landscape urbanism. Interestingly, an early and influential landscape urbanism project, Paris's Parc de la Villette, has been influential for both its actual built environment, designed by architect Bernard Tschumi, as well as the runner-up's (unbuilt) design, by Rem Koolhaas. Still, most of the important projects related to this theory have yet to be built, so design competitions have been an influential stage for the development of the theory. Almy, Dean, "Center 14: On Landscape Urbanism", The Center for American Architecture and Design, The University of Texas at Austin, 2007



DESIGN IMPLICATIONS

- concentrate on clean up and improvement of public lands
- relocate businesses around parks
- maintain old economies and attract new – avoid a single preferred future
- maintain a healthy mix of social consumption and housing
- airports are critical for business' quick response to orders (light rail)
- integration of shipping and retailing points
- unique stores – goods are unavailable on the internet
- quality neighborhood stores and services that support residents

New urbanism

The Jackson-Taylor plan (left) inserts a mixed-use core of high- and medium-density housing, office and retail uses into an existing light industrial area (top) surrounded by residential neighborhoods (above). Larger buildings close to the center (opposite) gradate to smaller housing elements (center of illustration) near the edges of the plan. These reflect the scale of nearby single-family homes.

"A growing movement, New Urbanism recognizes walkable, human-scaled neighborhoods as the building blocks of sustainable communities and regions. The Charter of New Urbanism articulates the movement's principles and defines the essential qualities of urban places from the scale of the region to the individual building."
- Congress for the New Urbanism official website (www.cnu.org)

Basic principles:

- Advocate for the restructuring of public policy and development practices to support diversity of neighborhoods, communities designed for pedestrians and transit (not just cars), towns physically defined by public spaces and institutions, context-sensitive architecture and landscape design
- Sprawl, separation by race and income, loss of important lands (agricultural and wilderness), loss of society's built heritage, environmental degradation, and flight from the city as being an interrelated challenge
- Believe in the restoration of town centers, the creation of real community within sprawling suburbs, historical preservation, and environmental conservation
- Committed to reestablishing the relationship between building and community

Current focuses include:

- Creating enduring neighborhoods
- Making urbanism legal again
- Making connections a priority
- Celebrating shared spaces
- Sustainability – from building to region
- Reclaiming urban places once thought lost

DESIGN IMPLICATIONS

- New urbanism gives very specific guidelines for how to compose an ideal urban block – this should be reviewed and referenced when developing concepts for block layout in the master plan
- Design solutions should be an integrated approach, addressing both physical (built) and societal (community) needs/challenges
- Try to preserve culturally significant buildings and spaces whenever possible
- Buildings/spaces that can be, should be retrofitted or readapted to serve new and necessary functions

Urban open space

Urban open space is defined as publicly accessible open spaces such as parks, plazas, streets, community gardens and greenways. User needs are defined as those amenities and experiences that people seek in enjoying public open spaces.

Qualities of successful urban open spaces:

- accessibility- linkages, walkability, connectedness, and convenience
- activities – uses, celebration, usefulness, and sustainability
- comfort- safety, good places to sit, attractiveness, and cleanliness
- sociability- dimensions of friendliness, interactivity, and diversity

Qualities of unsuccessful urban open spaces:

- Over-emphasis on art and aesthetics
- Lack of gathering points
- Poor entrances and visually inaccessible spaces
- Dysfunctional features
- Paths that go where people don't
- Domination of a place by vehicles
- Blank walls or dead zones around the edges of a place
- Inconveniently located transit stops
- Nothing going on

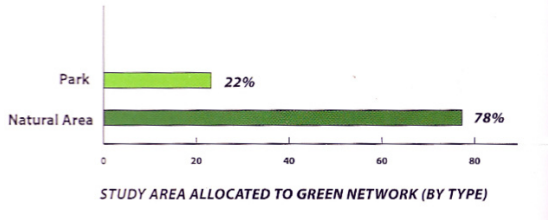
Urban open spaces:

- provide residents with a venue for participation in, and attachment to their communities
- provide a sense of place and offer essential life-enhancing qualities that aid community and individual well-being
- create a sense of place by connecting residents to one another and their larger environment

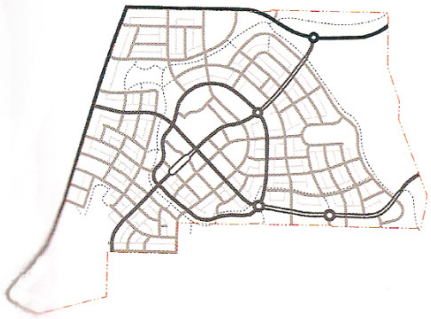
DESIGN IMPLICATIONS

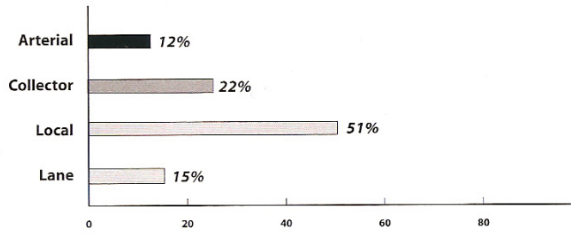
- Plan for **uses and activities** that: support desired activities; create focal points where people gather; include a variety of community-oriented programs
- Providing for **comfort and image** of the space through seating, waste receptacles, information booths, food vendors, community-oriented public art, flowers, and fountains in carefully considered locations; creating a management presence, and upgrading maintenance; promoting activity to increase security; establishing a community-policing program
- Establishing **access and linkage**s by widening sidewalks or providing extensions at crosswalks; balancing pedestrian uses with other uses; constructing clearly marked and/or conveniently located crosswalks; making accommodations for bicyclists; balancing on-street parking with other uses; changing traffic signal timing to improve pedestrian access
- Increasing sociability by developing focal points—gathering places that accommodate a variety of activities; arranging amenities to encourage social interaction, such as grouped benches and moveable seating; staging special events and activities to draw people

Green street design



STUDY AREA ALLOCATED TO GREEN NETWORK (BY TYPE)

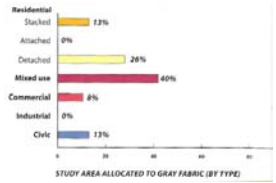




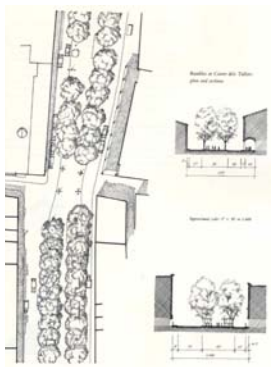
STUDY AREA ALLOCATED TO GRAY NETWORK (BY TYPE)

DESIGN IMPLICATIONS

- Streets should be considered a multi-layered functioning system of networks and designed to capitalize on this
- Each streetscape section should respond to a variety of factors such as density of the area, building height, tree canopy type, length of block, etc.
- Maintaining a relatively uniform street design in an area can help create a sense of place; districts are defined by a common "character" or "feel" that is consistent throughout the its blocks
- Sreetscapes should function on multiple levels and respond to environmental needs (heat island, water harvesting, native vegetation, etc.) as well as human needs (shade, microclimates, wind, visibility, etc.)



STUDY AREA ALLOCATED TO GRAY FABRIC (BY TYPE)



Skinny Streets & Green Neighborhoods: Design for Environment and Community by Cynthia Girling & Ronald Kellett
Focuses on assessing, evaluating, and designing through the use of…

- Green Network: a city's public open space; geography of open spaces, such as parks, greenways, and natural areas; interconnected network of green space that conserves natural ecosystem values and functions and provides associated benefits to human populations
- Gray Networks: urban circulation systems – streets, transit ways, bikeways, and pedestrian pathways
- Gray Fabric: the built-up urban fabric including commercial, civic, and industrial uses
- Green Fabric: a city's vegetated lands
- Urban Water: all the water that lives under, falls upon, and flows through a city

Great Streets by Allan B. Jacobs

- Trees "Given a limited budget, the most effective expenditure of funds to improve a street would probably be on trees."
- Climate related comfort
- Vertical and horizontal definition (Height to horizontal ration of 1:4 or less is preferable)
- Spacing of buildings is an important factor in defining a street
- Movement (of light and people) is essential
- Transparency is important
- Should be easy to maintain and made of quality materials (longevity)
- Beginning and Endings
- Many Buildings: Diversity (but complementary)

Urban design for arid climates

Unique Challenges to Arid-Urban Design

- Wind, dust, radiation, lack of soil cover, lack of precipitation
- Isolation (psychological factor)
- Most urban patterns are imports from temperate climates, which lead to higher taxes, maintenance, construction, energy consumption
- Physical characteristics influence design approach (soil, landform, resources, and vastness of space)

Gideon S. Golany, "Urban Form Design for Arid Regions"

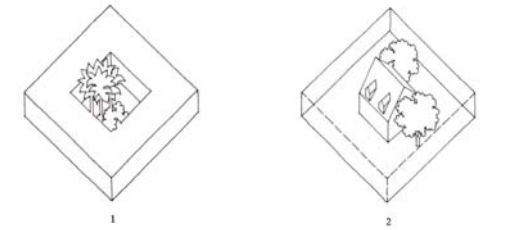
Goals of Urban Design in Aris Regions

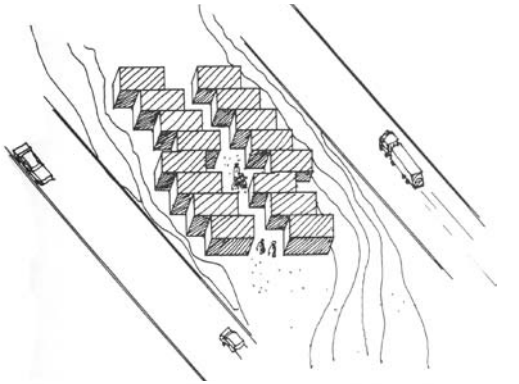
- Minimize / eliminate the discomfort at the microclimatic scale (house/street) while planning the macro environment to be responsive.
- Maximize passive energy systems, conserve energy
- Create a pleasing urban environment to stimulate and afford a high quality of life
- Integrate different scales of native environment into design
- Counteract psychological loneliness of vast areas

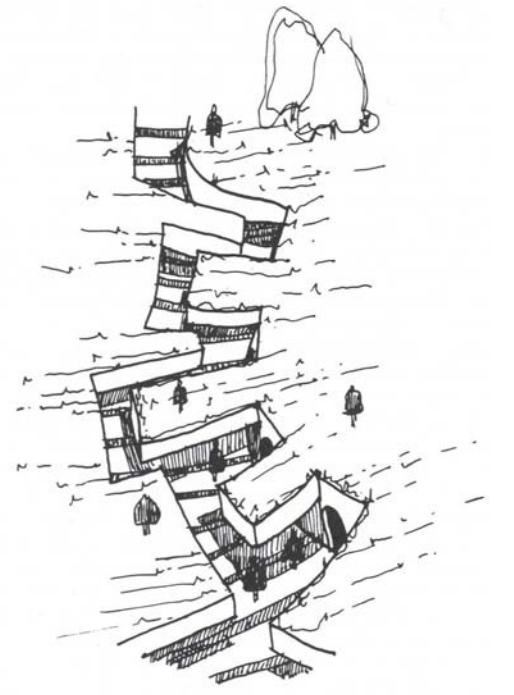
Basic Urban Form is a form to manage heat loss/gain, and consists of form, configuration, street patterns and orientation, building materials, color, morphology of city, exposure to radiation, vegetative density

Elements of urban form:

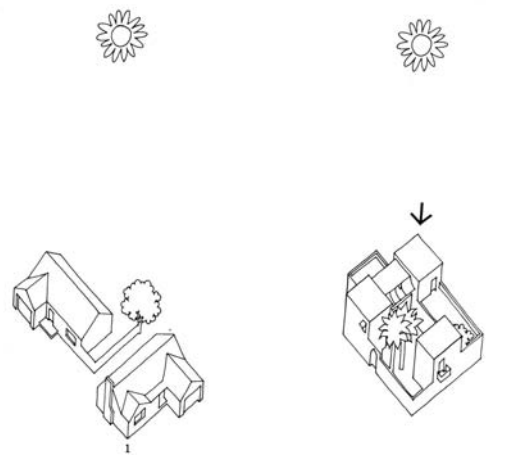
- regional clustering of settlements
- proximity of land uses
- urban configuration: "the city is an immense artificial and man-made project which penetrates its environment"







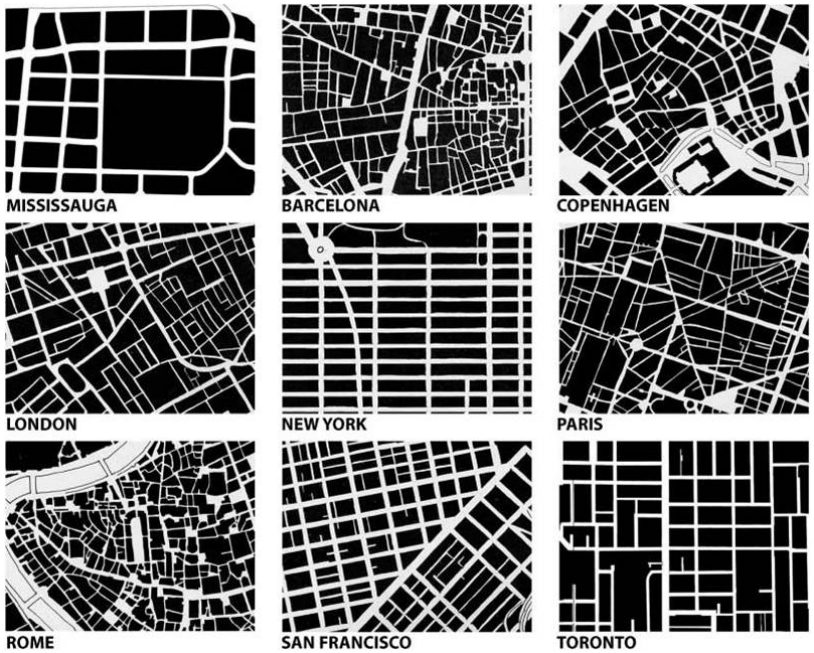
"The future ecological approach to desert living will be roughly equivalent to the old natural approach." Garrett Eckbo - "Directions for Arid-Zone Urban Planning in North America" - Design for Arid Regions



DESIGN IMPLICATIONS

- Most urban patterns are imports from temperate climates, which lead to higher taxes, maintenance, construction, energy consumption
- Goals include minimizing / eliminating the discomfort at the microclimatic scale (house/street) while planning the macro to be responsive
- Maximize passive energy systems, conserve energy
- Create a pleasing urban environment to stimulate and afford a high quality of life
- Integrate different scales of native environment into design
- Address the psychological loneliness of vast areas by designing "destinations" within the city
- Design for "compactness" concentrated and firmly united in its buildings, with consolidated land uses in close relationship with each other

Urban morphologies



Urban morphology is the study of the form of human settlements and the process of their formation and transformation. The study of a city's unique urban morphology can help explain the processes behind the condition of a city as it exists today, facilitate a comparison between different cities and help predict urban changes. A detailed study seeks to understand the spatial structure and character of a city by examining the patterns of its component parts and the process of its development.

A useful way in which to study a particular city's urban morphology is by the use of a figure-ground study. A figure-ground drawing is a graphic tool for illustrating mass-void relationships. Their construction begins with a two-dimensional generalization, drawn in plan view, demonstrating the structure and order of spaces. A figure-ground study focuses on the portrayal of land coverage in terms of solid masses (buildings) and open voids (parks, streets, corridors). The result is often a monochrome map representing the masses and voids that compose a city's "urban fabric".

Utilizing a figure-ground study can aid in the thoughtful manipulation of an area's solid-void relationships by adding to, subtracting from, or changing the physical geometry of existing urban patterns. In allowing a designer to better understand a city's underlying patterns, spatial relationships (spaces within a space, interlocking space, adjacent spaces, spaces linked by common space) and path-space relationships (paths that pass by, pass through, or terminate in space) can be more easily improved upon.

DESIGN IMPLICATIONS

- A comparison of Tucson's historical and current urban morphology reveals many of downtown's existing issues (lack of density, closeness, connectivity, human scale structures) as well as possible solutions
- Much of downtown Tucson's historic pattern of land use was demolished during the 1960s
- Downtown Tucson's existing morphology is more appropriate for vehicular than bicycle or pedestrian traffic
- Several opportunities to increase density, open space and connectivity through infill exist within downtown Tucson.
- A uniform morphology suggests a greater absorption of radiation by limiting shade from other buildings.

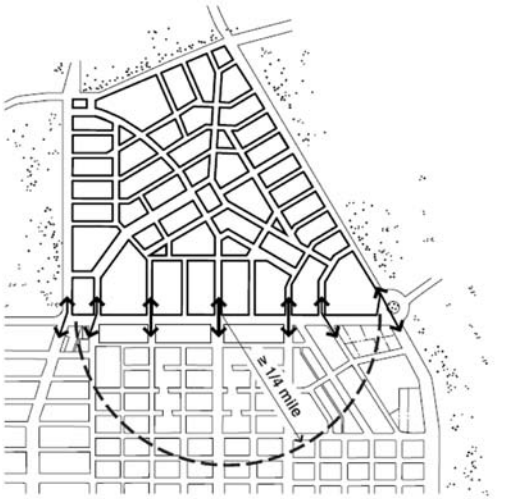
LEED Neighborhood Development

LEED for Neighborhood Development Rating System

1. Smart Location & Linkage
(Smart location, Proximity to water and wastewater infrastructure, Imperiled species and ecological communities, Wetland and water body conservation, Agricultural land conservation, Floodplain avoidance, Brownfield redevelopment, High priority brownfields redevelopment, Preferred locations, Reduced automobile dependence, Bicycle network, Housing and jobs proximity, School proximity, Steep slope protection, Site design for habitat or wetlands conservation, Restoration of habitat or wetlands, Conservation management of habitat or wetlands)

2. Neighborhood Pattern & Design
(Open community, Compact development, Diversity of uses, Diversity of housing types, Affordable rental housing, Affordable for-sale housing, Reduced parking footprint, Walkable streets, Street network, Transit facilities, Transportation demand management, Access to surrounding vicinity, Access to public spaces, Access to active public spaces, Universal accessibility, Community outreach and involvement, Local food production)

3. Green Construction & Technology
(Construction activity pollution prevention, Certified green buildings, Energy efficiency in buildings, Reduced water use, Building reuse and adaptive reuse, Reuse of historic buildings, Minimize site disturbance through site design, Minimize site disturbance during construction, Contaminant reduction in brownfields remediation, Stormwater management, Heat island reduction, Solar orientation,



SLL p1: Smart Location
OPTION 2

On-site energy generation, On-site renewable energy sources, District heating and cooling, Infrastructure energy efficiency, Wastewater management, Recycled content in infrastructure, Construction waste management, Comprehensive waste management, Light pollution reduction

4. Innovation & Design Process
(Innovation in design, LEED accredited professional)

NRDC
THE EARTH'S BEST DEFENSE

U.S. GREEN BUILDING COUNCIL
LEED
USGBC

CONGRESS FOR THE NEW URBANISM

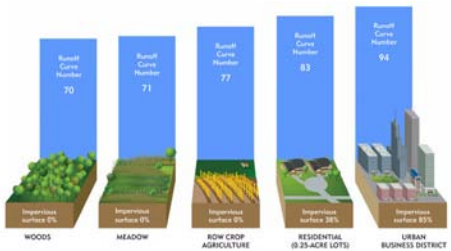
DESIGN IMPLICATIONS

- Even if LEED ND certification is at first out of reach—either technically or financiall—the guidelines can serve as a good checklist when developing new neighborhoods
- The principles still apply when retrofitting existing neighborhoods.
- LEED can go beyond technological or structure-based solutions to look at a larger scale of ecological responsibility in development

Sustainable Sites Initiative

"The Sustainable Sites Initiative is an interdisciplinary effort by the American Society of Landscape Architects, the Lady Bird Johnson Wildflower Center and the United States Botanic Garden to create voluntary national guidelines and performance benchmarks for sustainable land design, construction and maintenance practices." (www.sustainablesites.org)

- Based on the Guidelines and Performance Benchmarks 2009 which took 4 years to produce
- "The Initiative developed criteria for sustainable land practices that will enable built landscapes to support natural ecological functions by protecting existing ecosystems and regenerating ecological capacity where it has been lost"
- Focuses… "on measuring and rewarding a project that protects, restores and regenerates ecosystem services – benefits provided by natural ecosystems such as cleaning air and water, climate regulation and human health benefits"
- Currently in the Pilot Project phase which will test the rating system that has been established before it is formally released to the market place
- The rating system covers all stages of a site from initial selection through development and on to maintenance
- Roughly 15 prerequisites and 51 credits possible in the rating system
- The Initiative was created to apply to both open spaces (state parks, conservation easements, etc.) and sites with buildings (industrial, retail, plazas, residential, etc.)
- Areas of focus include: hydrology, soils, vegetation, materials, and human health and well-being



DESIGN IMPLICATIONS

- The Sustainable Sites Initiative will be an important metric for evaluating the success of a landscape in the future and should be taken into consideration when designing our project area
- Our master plan should have a major goal of restoring and connecting ecosystems when possible
- Compliance with the Initiative will likely lead to economic sustainability as well by creating places that are of value to the public and that function well over the time (reducing maintenance costs)

Affordable housing

The current affordable housing trend across the US is away from single purpose high rise projects, and toward mixed use, mixed income development and creative financing.

This strategy:

- avoids the segregation of lower income people into particular areas
- increases overall public investment in neighborhoods including public housing
- allows for innovative approaches to affordable housing development
- can be used as an infill strategy in existing neighborhoods, occupying dispersed vacant lots and serving as a tool in neighborhood redevelopment
- can work as as one component in large mixed use co-op in dense neighborhoods

Potential issues:

- conversion of exclusively affordable housing into mixed income communities reduces the total number of units available
- densities are declining slightly
- retention rates of residents from the previous housing are typically low, due to delay times between demolition and occupancy of the new structures, and greater regulation of who is accepted

As of 2004, Tucson was near its target number of affordable housing units in downtown Tucson—10% of the total available units—though a substantial portion of those were in the MLK building on Congress and 5th Avenue, which has since been converted to market rate housing (One North Fifth.) The city is partially compensating for this loss through the construction of a new supportive housing building for seniors nearby.

VIEW FROM NORTHEAST CORNER

VIEW FROM SOUTHWEST CORNER

DESIGN IMPLICATIONS

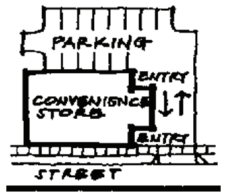
- Plan for a range of scales as well as prices of housing within the downtown area, relying on multistorey mixed use building in the denser areas, and diffuse redevelopment of smaller structures within the existing residential neighborhoods and along boundaries
- New housing may be used to bridge scale gaps between commercial/high rise areas and the primarily one storey single family homes of the residential areas
- Development of multiple diffused small lots as one overall development can aid in the integration of new housing into existing residential neighborhoods
- A well planned mixed-use building or group of buildings earmarked for affordable housing can do as much to add to the vitality of a downtown street as a market rate development

"City Comforts"

David Sucher's *City Comforts: How to build an urban village* offered a huge variety of human scale details for urban environments to make people feel at home. Main themes included:

- Create a mix of intimacy and anonymity
- Concentrate on the immediate environment
- Make it work at the personal level
  - Meeting places
  - Tame cars
  - Good neighbors
  - Locations with art infused personality
  - Small details – almost invisible
  - Reclaim the parking lot
  - Combine bus shelters with public services
  - Allow strangers to sit together
  - Use sound to permit conversation
  - Promote community gardening
  - Bus stop seating
  - Provide meeting spaces
  - Use movable chairs
  - Public clocks
  - Multi-lingual signage
  - Audible traffic lights
  - Street trees
  - Indentify plants
  - Allow memorials
  - Create gateways
  - Provide views from bridges
  - Explain rules
  - Reveal the global framework
  - Build bulletin boards
  - Identify watersheds
  - Remind people where the water goes
  - Put maps on the sidewalks
  - Inform the disturbance
  - Divulge bus schedules

Build to the sidewalk



Put parking behind, under, above or to the side

Make the street front permeable

Overlap shops and transport

Mixed Use Development

Overlap housing and shopping

Provide seating

Offer conversation pieces

Put public space in the ~~sun~~ shade

Let people purchase food and drink

- Make workspaces visible
- Explain unusual equipment
- Place play grounds in shopping districts
- Build-in baby sitting
- Build to child scale
- Provide playgrounds at restaurants
- Offer playgrounds in unlikely places
- Put cops on bicycles
- Scatter police
- Allow street vendors
- Make entrances visible
- Shelter public phones
- Create public water fountains
- Build public toilets
- House the garbage can
- Keep your head dry
- Keep your feet dry
- Provide for pets
- Celebrate gas stations
- Provide public ash trays

DESIGN

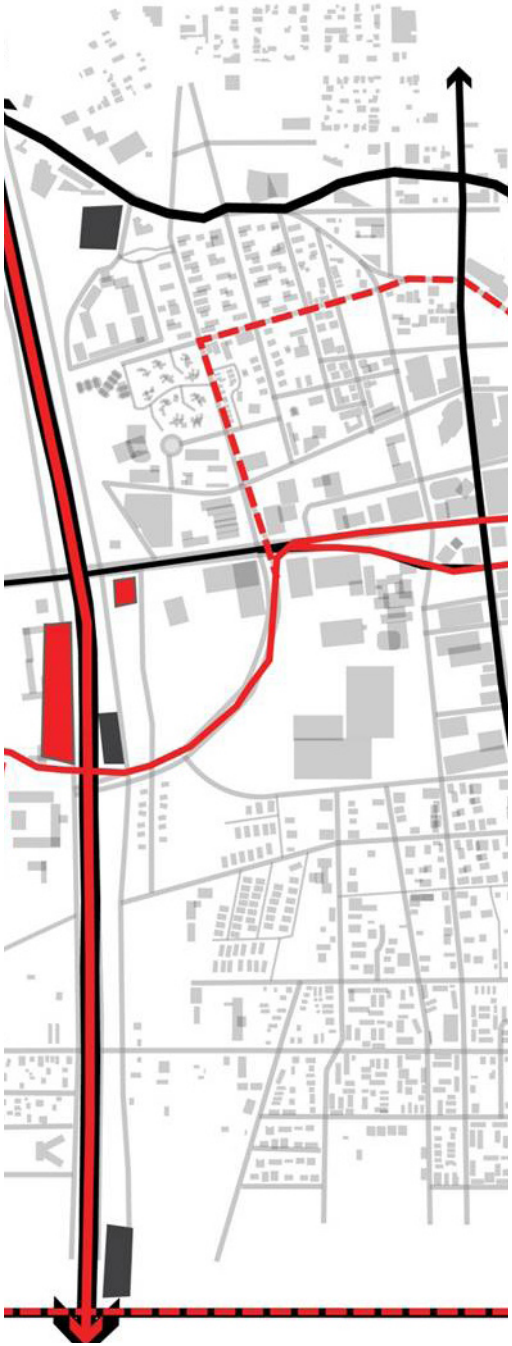
MASTER PLAN AND FOCUS AREAS

DESIGN PROCESS

The process leading to the master plan is one of the most important aspects of the project. It was conducted collaboratively, involving rigorous discussions and charettes within our studio team, combined with periodic input from students from the Planning program and the Eller College of Management.

The project began with a flexible boundary around most of the downtown area, which evolved as part of the process. Initially, each team member was charged with doing a specific piece of analysis and research. Subsequently, we began conceptual design of the area as a whole, allowing for the boundary to be expanded and altered. Individual ideas were presented to the group at the end of each week and refined until a general project area was developed. This is how the boundary of "the triangle" seen throughout the design chapter was settled. In addition to the group's gravitation towards this shape, another contributing factor was the fact that the interior core of the Central Business District has been addressed in master plans for nearly 80 years with very few of the plans ever resulting in actual physical changes. It was a conscious decision of the group to take a new approach by addressing areas that have received little attention to date.

Once the project area had been established, smaller groups began generating specific ideas for various sections of the triangle. As in the first phase, each sub-group presented their work to the team at the end of each week, making refinements based on group comments. Eventually, consensus was reached as to the general uses and concepts to be included in each "focus area". Each of these "focus areas" was finally adopted by an individual team member and developed in detail. The culmination of these efforts is presented in the following section of this document.



Master plan

The master plan chapter shows the overall workings of the designed project area, in terms of land use, the open space network, and transportation. This is done so that the focus areas—explored in greater detail in the following chapter—can each be understood as a part of a project-wide plan. The master plan employs the principles developed in the previous chapter, but the design solutions are more abstract and planning-oriented than the site scale schematic designs found in the focus area chapter.

CONTENTS

LAND USE

Congress Street and Broadway Blvd

5 Points

Tucson Convention Center

GREEN NETWORK

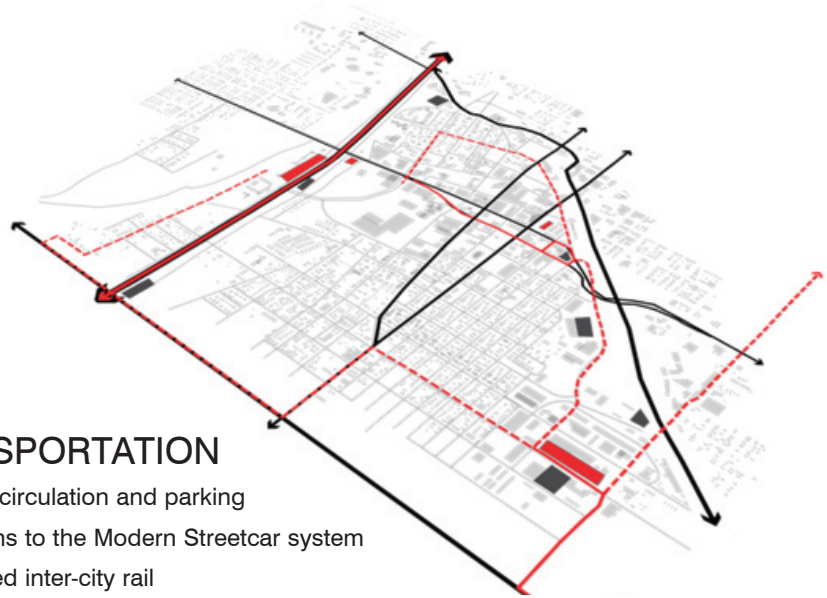
Parks

Urban plazas

Green streets

Daylighting

Car-free connections



TRANSPORTATION

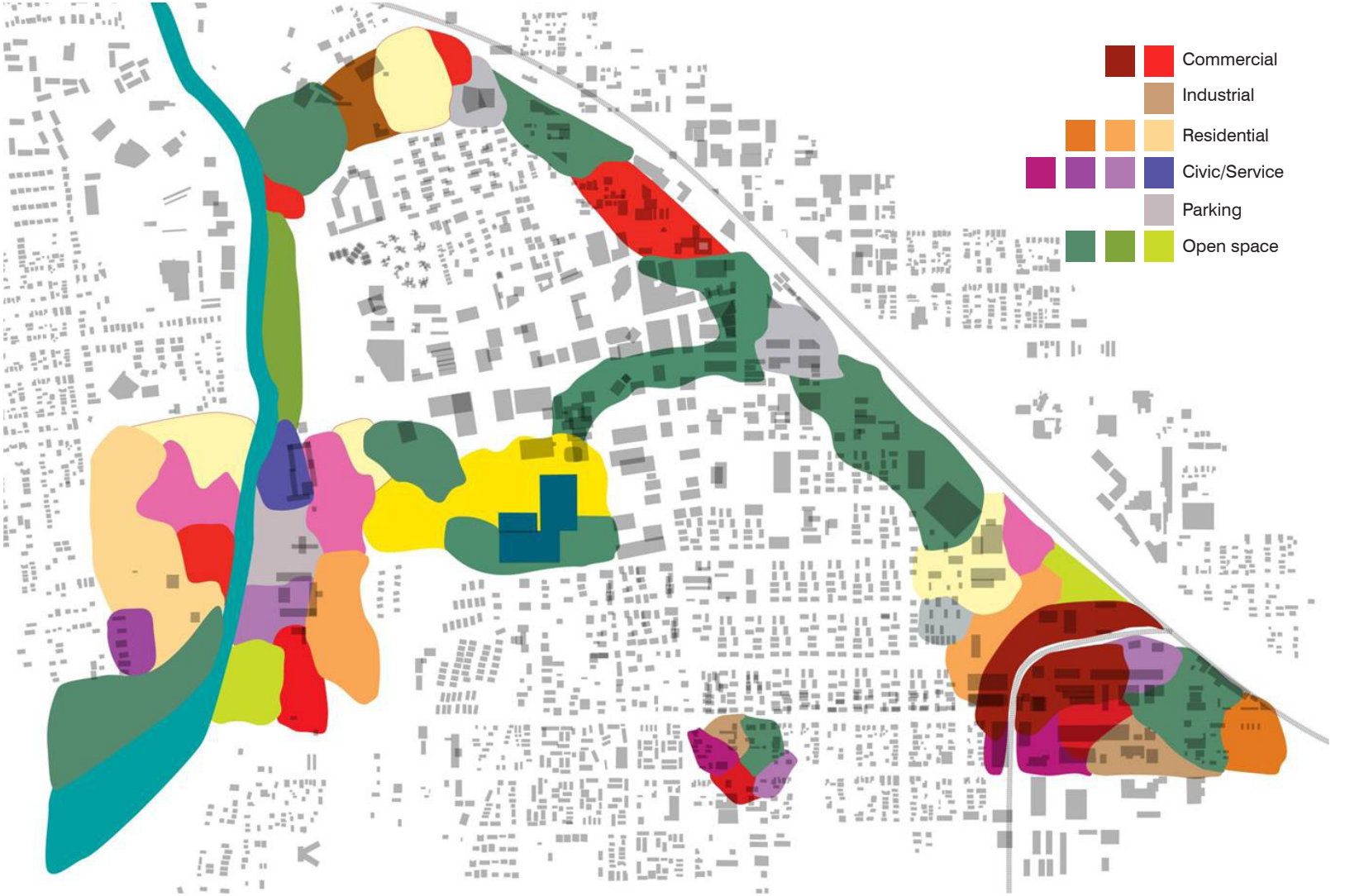
Vehicular circulation and parking

Expansions to the Modern Streetcar system

High speed inter-city rail

Transit hubs and parking

Land use


Commercial
Industrial
Residential
Civic/Service
Parking
Open space

The master plan proposes an extensive change in land use around downtown. The overall strategy for planned land use here is one of encouraging the mixing of uses. As the actual distribution of land use in specific areas of focus will be reviewed in detail in the next section of this document, in this section we describe some of the connections or areas that fall in between.

CONGRESS STREET & BROADWAY BOULEVARD

As part of the general circulation plan, Broadway and Congress will both receive streetscape upgrades. These new streetscapes are designed to prioritize the pedestrian experience and include such things as extended sidewalk widths, shade structures, trees, additional landscaping, way-finding signage and other public amenities (kiosks, newspaper stands, etc.). Density is promoted along these roadways, and to this end the infill development of any and all surface parking lots is encouraged. Additionally, a number of small vacant or neglected areas are utilized to create pocket parks and urban plazas.

5 POINTS

The length of 6th Avenue between 18th Street and 22nd Street is ripe with opportunities for revitalization. A number of old cafes, markets, and small businesses are located along its edges, many of them abandoned. While not currently as vital as it once was, the corridor still has plenty of character and charm and is surrounded by healthy, well populated residential neighborhoods. With minor changes in zoning. as well as tax incentives for reinvesting in the area, it can become active once again.

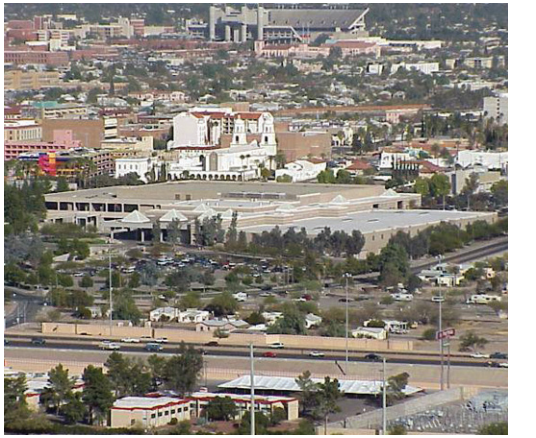
The master plan encourages the revitalization of this area through the rehabilitation of some of its older buildings and minor infill in between. It will be a small yet vibrant destination shopping district, housing locally owned and operated restaurants, shops, and business, as well as non-profit agencies. It will be easily accessible as the streetcar route runs directly

through it.

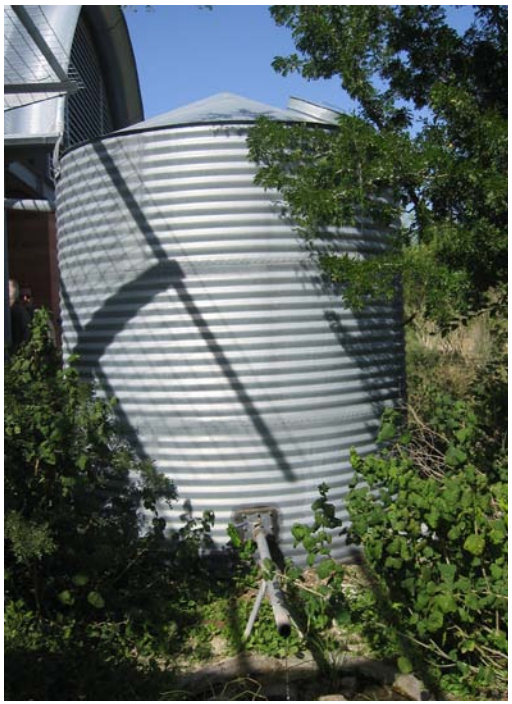
TUCSON CONVENTION CENTER

The area between Granada Ave., Broadway Blvd., Church Ave. and Cushing St is made up of several important downtown cultural and economic locales, including the Tucson Convention Center (TCC), La Placita Village, the Leo Rich Theater and several other urban fabric-defining buildings and landscapes. It also contains nearly 500,000 sq. ft. (~ 12 acres) of surface parking and 167,000 sq. ft. (nearly 3.8 acres) of impermeable surfacing. Around the fringes of this 40 acre site, less than 2 acres of "green space" exist, comprised largely of turf and water intensive vegetation.

Needless to say, our vision for this area is much different than the existing configuration. The most comprehensive concept for this area begins with the retrofitting of the 7.5 acres of TCC roof into a massive 3.5 million gallon per year urban water collector. The water harvested could feed urban agriculture and/or desert appropriate orchards, which would replace large swaths of surface parking and hardscape in and around the TCC perimeter. Major cultural and economic amenities would thus displace wasteful uses of space. Solar



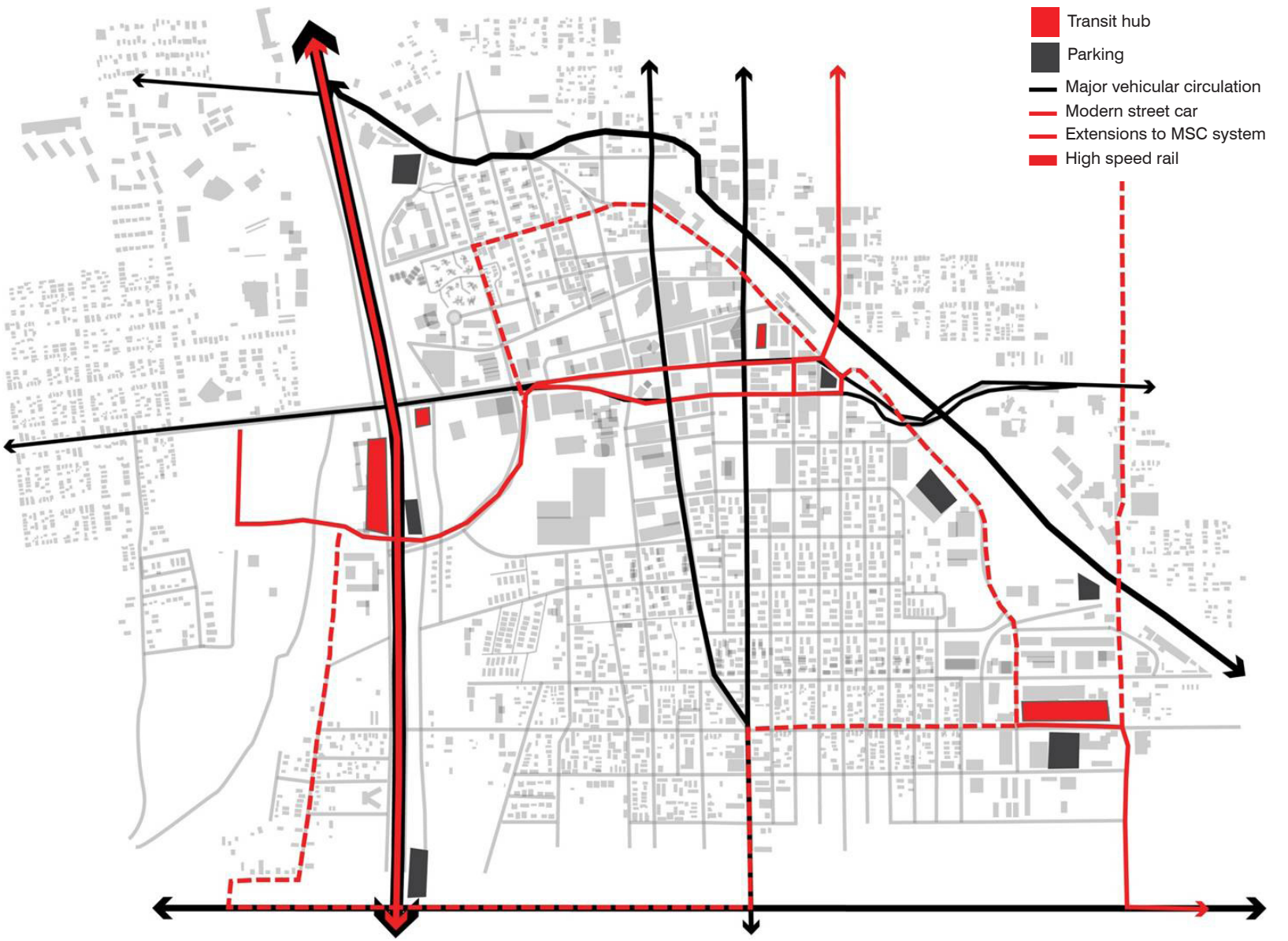
collectors atop all buildings would generate energy for the TCC and nearby businesses, as well as create a showplace for new sustainable practices developed in the southeast section of our project area. Efficient and multi-use structures would address the need for parking. Additional space for such structures could be located amidst the plethora of surface parking to the west of Granada Ave., or included in conjunction with future plans for new hotel(s) in the adjacent area. Furthermore, the future



addition of Tucson's Modern Streetcar is expected to reduce the parking requirements of this area.

All of these combined changes would add up to a massive reconfiguration of the area, which over time would have great positive impact on the TCC and local businesses. The TCC would attract sustainable energy, water harvesting and arid/urban agriculture conferences and attendees from around the world, bolstering the economic influx that presently occurs, for the most part, once a year during the Gem Show. Visitors would be drawn by sustainable practices, as well as the restored natural areas to the west of the area and research and development / light industry to the east.

Transportation

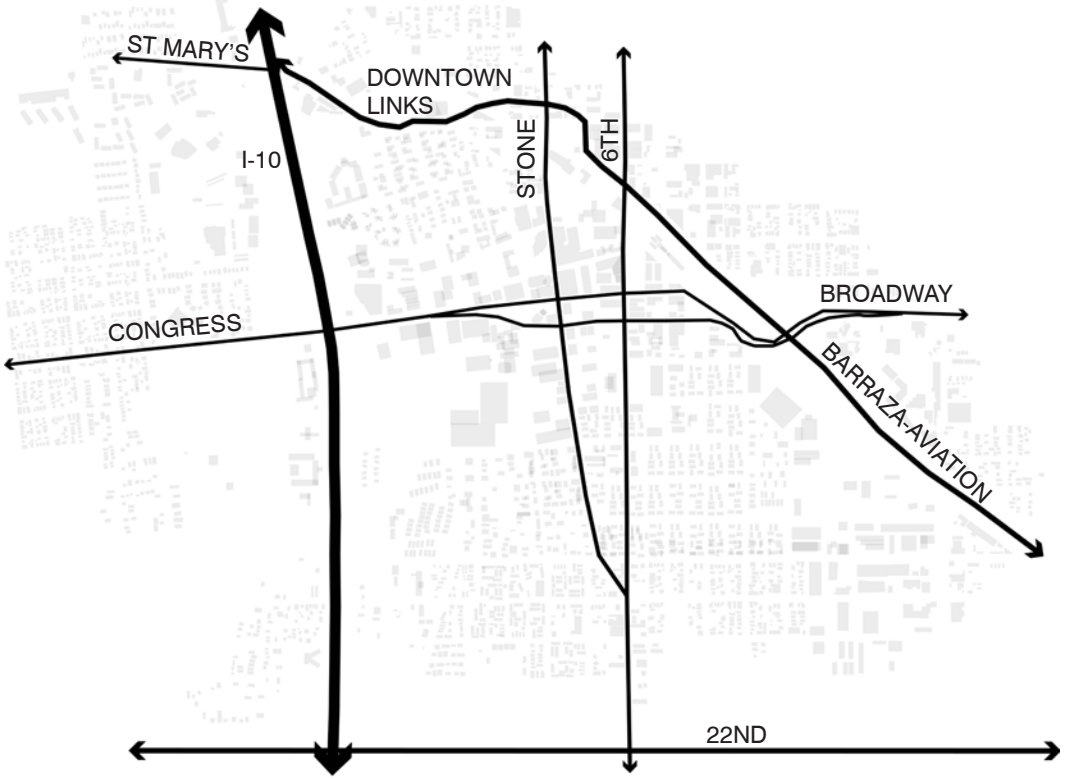


VEHICULAR CIRCULATION

The master plan gives priority to pedestrian needs and public transportation. This does not, however, mean that cars will not play a vital role in the greater transportation scheme in the area. The plan designates 6th Street, 22nd Street, Congress, and Broadway as major east/west vehicular corridors through downtown. Stone Avenue and 6th Avenue will be the primary north/south vehicular corridors through downtown, while Euclid will offer an easy bypass due east of downtown.

With the coming of the Barazza Aviation Roadway, cut-through traffic – which currently uses Congress Street as a means of accessing Interstate 10 – will be diverted around the Central Business District. This, in of itself, will begin to make roadways in downtown more enjoyable due to decreased vehicular congestion, slower speeds of traffic, and the fact that the majority of traffic will then be treating downtown as a destination (as opposed to a short cut). This decrease in traffic will allow another major change in vehicular circulation in downtown: the repurposing of the frontage roads between St. Mary's Road and 22nd Street.

The existing frontage roads do little to actually support or contribute to the vitality of the downtown area. They allow additional high speed traffic to move through the area, widening the physical barrier that the Interstate creates. By eliminating and/or repurposing the frontage roads, a number of opportunities will be created. It will allow the areas where the roads have been removed to be developed, or will allow those same roads to be converted into "local" roads with slower speeds, traffic calming amenities, and two-way circulation. In either case, the interstate will still be accessible at Speedway Boulevard, Congress and at 22nd Street, but the changes will promote destination and/or local traffic in between.



PARKING AND TRANSIT HUBS

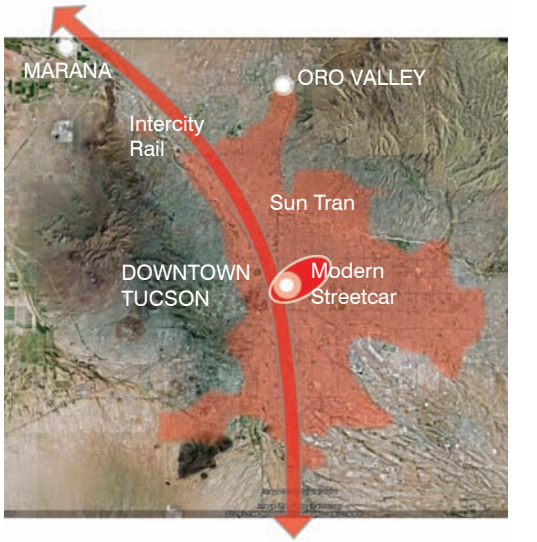
As mentioned in the analysis section of this document, downtown Tucson is currently plagued by underutilized surface parking lots. The master plan proposes addressing this problem by building up and creating mixed-use parking garages over surface lots whenever possible. It specifies close spatial relationships between parking garages and transit hubs in order to maximize ridership and make it convenient to transition from individual vehicle to bus to light rail, etc. While parking in downtown will still be an option, this design aims to alleviate parking pressures that the downtown area is currently suffering from by making it easy to park on the periphery and enter into downtown via public transportation.

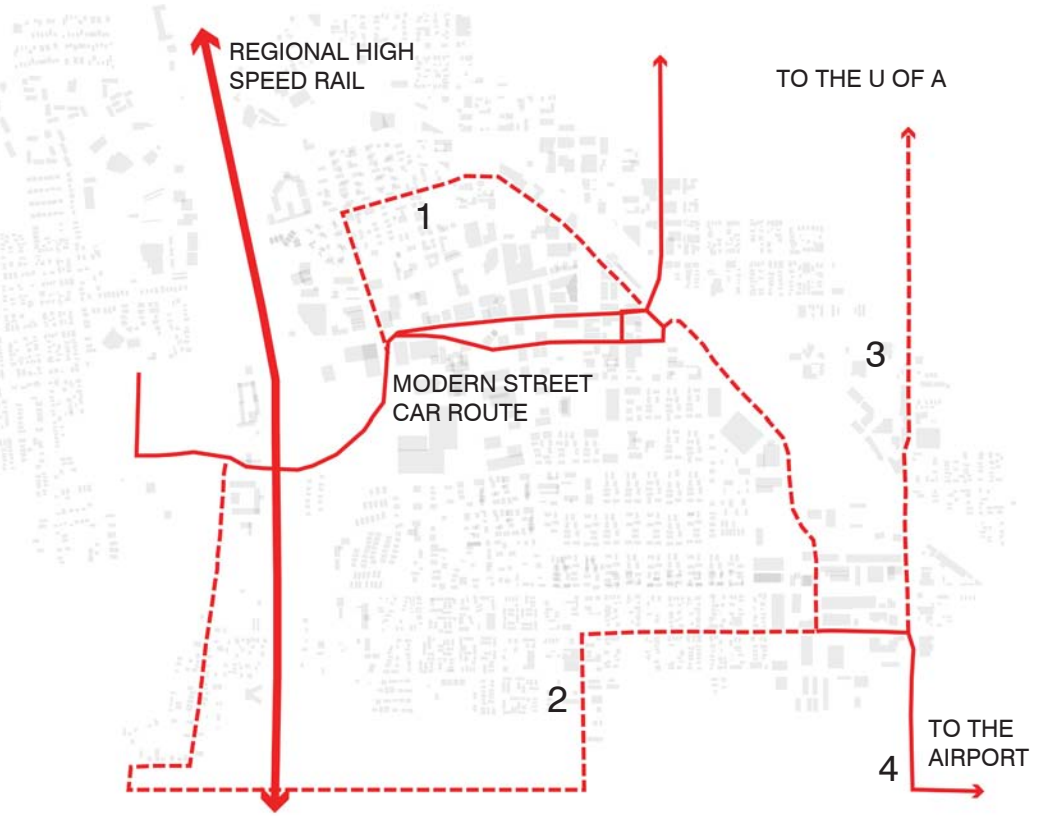
MASS TRANSIT

The design team believes that mass transit is essential to a vital and functional urban environment. As such, the master plan calls for not only the implementation of the already improved Modern Streetcar, but in addition, proposes that further routes be laid through and around downtown to facilitate multiple light rail systems in the future. These routes could be served by any number of mass transit systems, including rubber-tired metro systems.

The first of extensions expands north from Congress Street, along Toole Avenue and Franklin St. and eventually returns to Congress Street via Granada Avenue (1). The second addition turns south from Cushing Street between I-10 and the Santa Cruz River to 22nd Street, heads east on 22nd to 6th Avenue, and then continues north on 6th Avenue to "5 points," at which point it heads east along 18th Street, moves north along Toole until it finally connects to Congress Street (2). Both of these routes run along the periphery of the Central Business District and the greater downtown area promoting growth and infill along their paths. Initially, however, these routes can be served by some other form of mass transit – such as SunTran – to get riders used to the patterns and options of the routes. (Also, it is important to note that the master plan supports the continued use of Tucson's bus system. particularly to connect to the outer parts of the city.)

Two additional routes help create rapid connections outside of the downtown area. The first connects to the University of Arizona via Park Avenue (3), and the connects to the Airport (4). Creating direct linkages between these three entities will have great economic and social benefits.





HIGH SPEED, INTER-CITY RAIL

The final piece of the new transportation network in downtown is the establishment of a high speed, inter-city rail line from Tucson to Phoenix, with a terminus in downtown. This master plan proposes that the most efficient route would run in the median of I-10, between the two veins of traffic. The high speed rail line would allow greater infill around various stops located along its route, as proven by Calthorpe's transit oriented development. Additionally, it would help strengthen downtown's economy by encouraging traveling entrepreneurs to make a quick and easy day business trip to Tucson, while visiting Phoenix. Further, the terminus station in Tucson would have a direct link to local transportation systems such as the Modern Streetcar and SunTran, making it easy to visit downtown Tucson without needing a car.

It is likely that the 2nd phase of the high speed rail would be an extension to Nogales, Arizona. This would help Sonorans make their monthly shopping trips to Tucson with ease, while alleviating any need to expand I-19 any further to accommodate automobile traffic.

Green network

The new master plan proposes a variety of parks, plazas, and riparian areas connected by a series of green streets, water-ways, and mixed-use paths. These combined components will utilize strategies for rainwater harvesting, urban agriculture, and ecological restoration to benefit Tucsonans. As a result, this "green network" will serve multiple functions by:

- Helping combat urban heat-island effect
- Creating continuous habitat for wildlife
- Managing and utilizing stormwater and urban run-off
- Establishing safe routes to schools for children
- Directly connecting the Sonoran Desert to downtown Tucson
- Enhancing route options for pedestrians and cyclists
- Making public spaces for various user types
- Creating a visual connection between food production and consumption
- Restoring sections of dried or forgotten waterways
- Reclaiming forgotten and/or underutilized public spaces

PARKS

A number of parks and public spaces will be established throughout downtown. These will range from dog parks to skate parks, with the goal of creating a public outdoor space that accommodates the unique interests of everyone who lives in or visits downtown.

URBAN PLAZAS

Tucson's climate makes outdoor dining and activity possible during the majority of the year. The master plan capitalizes on this by establishing a number of pocket parks and urban plazas, intricately interwoven along many of

the green streets. While not large enough to house large, active activities, these areas provide important public spaces for rest and quiet, shade, and leisurely activities.

GREEN STREETS

City streets were once dominated by pedestrians. In the 21st century it rarely occurs to citizens that roads are their public space. Our proposal aims to balance the scales and restore many of downtown's roads to a state that is friendly to pedestrians and alternative modes of transportation. Many roads have plenty of potential to become "linear parks," such as:

- 18th Street
- Cushing/14th Street
- Broadway Boulevard
- Congress Street
- Pennington Street
- Toole Avenue

- 4th Avenue
- Scott Avenue
- Church/9th Avenue
- Main/Granada Avenue

These green streets will become the main corridors connecting various parks and public spaces and will enhance adjacent properties. A "green street" typically gives equal value to pedestrians, bicycles, cars, and public transportation, through its physical design. It also offers tremendous environmental benefits in the form of an extensive tree canopy integrated into the design and the increased capacity for rain-water harvesting in the right-of-way.

DAYLIGHTING

Two of downtown Tucson's forgotten washes will be brought to life in the green network. Arroyo Chico will be revitalized from 9th Avenue to where it joins the Santa Cruz River, as will the 18th Street wash, west of I-10. Each day-

lighting effort will entail restoration of a riparian ecosystem with the addition of mixed-use paths running parallel. In the case of Arroyo Chico, this will give users a chance to move freely along the wash without the interference of traffic.

CAR-FREE CONNECTIONS

Beyond the “green streets” planned for downtown, the master plan will create better motor-free, mixed-use path connections in, through, and out of downtown. New pedestrian bridges will cross the Santa Cruz River at 18th Street, Cushing Street, Alameda Street, and at the Arroyo Chico, establishing safer pedestrian connections between the east and west sections of the project. On the east perimeter, a special mixed-use bridge/tunnel combination will be created to link the Market district with the Lost Barrio at S. Park Avenue (which is currently severed by Barraza-Aviation, the railroad, and Euclid Avenue).

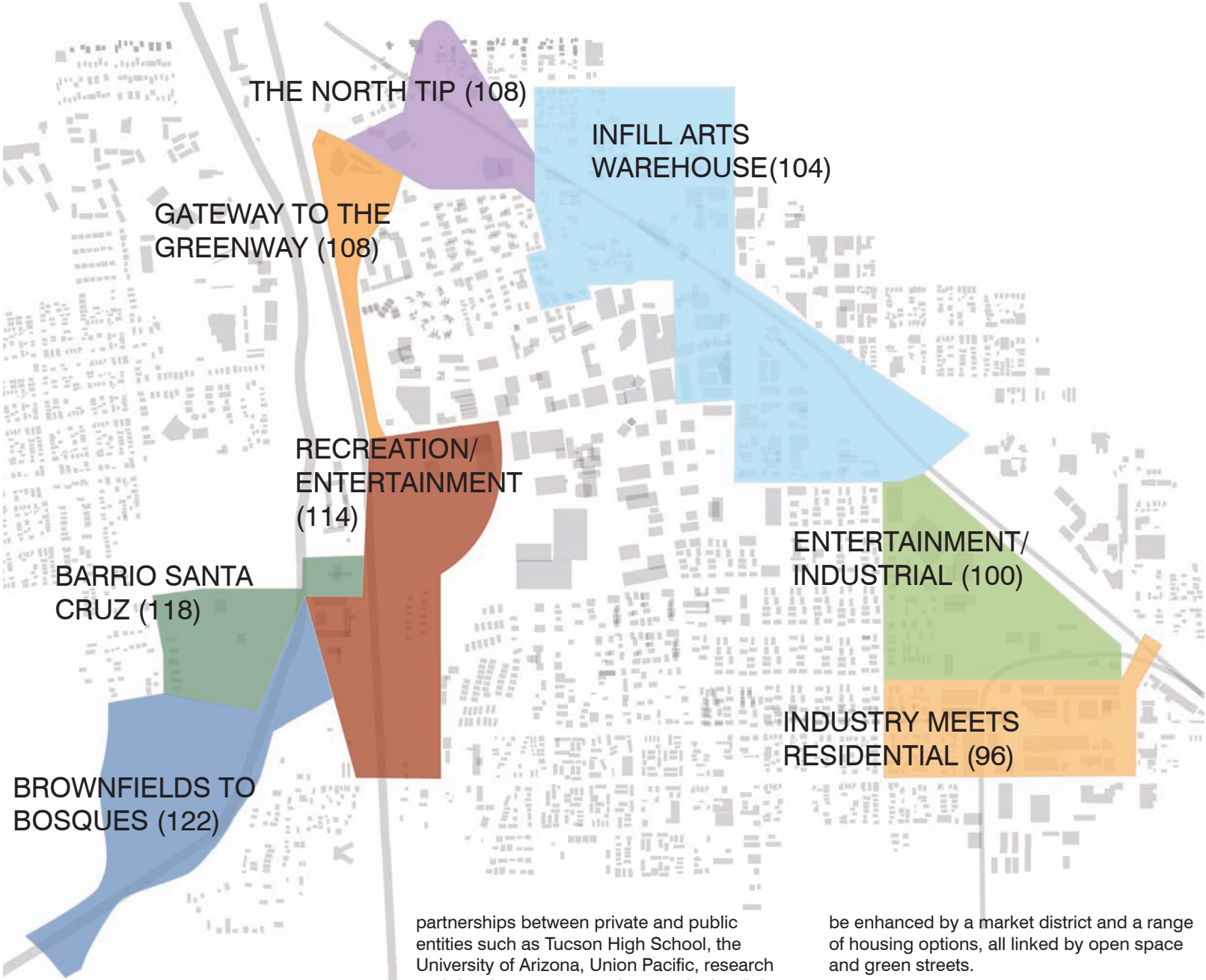
Focus areas

The following section looks in depth at a number of “Focus Areas” within the plan. The three main areas include the West Side (west of the Santa Cruz River), the East Side (currently the Industrial/17th Street Market District) and the Northern gateway (where the two sides meet). These focus areas were selected based on creating connections and infill potential, as well as improving overall quality of life.

In its current state, the West Side is composed predominately of brownfields and the first phases of the Mercado District Development. The Rio Nuevo Master Plan designated much of this area as being a cultural district. Elements of the Rio Nuevo plan are echoed or retained in ours, although this project adds various types of housing and a large “natural” component. The natural component includes the restoration of the Santa Cruz River and adjacent ecosystems in the area. It also integrates historic and non-traditional agricultural practices, to serve as an educational component as well as to develop strategic partnerships with outside organizations.

The Northern Gateway is all about convergence. It will deal with linking various waterways, wildlife corridors, mixed-use paths and open spaces. In addition to these connections, graduate student and family housing will serve as a bridge between the adjacent Dunbar Spring, Barrio Anita, and El Presidio neighborhoods.

The East Side is currently composed of large industrial warehouses and surface parking lots. Our design proposes that—like the north side —it will help link the Lost Barrio (Barrio San Antonio) with the Armory Park and Santa Rita Park neighborhoods by providing better mixed-use connections and a range of amenities and uses in the area. It will be vibrant, active and alive. It will encourage strategic



partnerships between private and public entities such as Tucson High School, the University of Arizona, Union Pacific, research and development enterprises, and other light-industry manufacturers. The area will further be enhanced by a market district and a range of housing options, all linked by open space and green streets.

Industry and Urban Agriculture Meet New and Existing Residential

Within this section of the project is a preponderance of small industrial and commercial buildings used for light manufacturing, warehousing and distribution. The railroad is a key feature here. The section has minimal retail and service outlets but it does contain one grocery and a brewpub. Sophisticated new housing in the form of condos dot the area but otherwise there is a stark contrast between existing industry and adjoining residential neighborhoods.

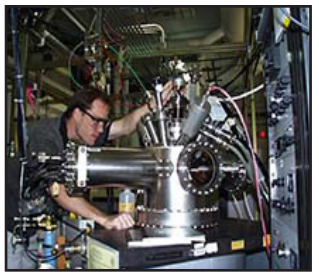
Our intent here is adaptive reuse of older buildings, the addition of affordable housing and the blending of urban agriculture with clean manufacturing and R&D entities involving public private partnerships. Older buildings provide certain elements that most new buildings cannot afford to duplicate – high ceilings, well proportioned layouts, old brick walls, the patina of old wood floors and metal work. If the circumstances are right, reusing an existing building can satisfy a users locational, timing, program or financial needs better than new construction.

Urban agriculture adds jobs and desperately needed green infrastructure in the form of shade, storm water management and open space. The addition of housing brings in people needed to support the additional mixed-use retail and enlivens the area beyond its 9 to 5 current use. Initially the mixed-use retail and service business additions are in support of residence and workers in the area. As the development evolves, destination shopping comes online.

Bird's eye view of a new industrial configuration that adds mother-in-law housing to existing condos, new luxury condos and rowhouses with garage apartments. New streets and alleys create access to future developments and a new multi-use bridge connects these improvements to the Lost Barrio and San Antonio neighborhoods

Urban agriculture creates unique park-like surroundings for light clean industry and mixed-use retail and services (section 1)

Commercial greenhouse productions, sheltered by date palm groves, provide park-like character and interest to residents, workers and shoppers (1)



High tech green R&D

Manufactured housing

Shade from a solar grid

Green industry

Commercial date groves and industry mixture

Industrial buildings no longer turn their backs on neighborhoods; instead they contribute to the streetscape with their own back porches which provide workers with break areas and contribute in interactions among all who live, work and play here (2)

KEY DESIGN POINTS

Economic

- Private/public Partnerships (Sematech/ UA), Light Manufacturing (Solar Panels, Wind Turbine, Bicycle Frame, Modular Housing, Fine Furniture)
- Mixed-Use Parking Structures, Urban Agriculture (Greenhouse, Urban Date Palm Production)

Environmental

- Mixed-Use Transportation (Parking Structures, Park-Once and Walk, Pedestrian and Bike Friendly Streets, Traffic Calming
- Water Harvesting and Storage, Solar Power, Decentralized Wastewater Treatment, Urban Heat Island Remediation

Socio-Cultural

- Appropriate Zoning, Open Space
- Cultural Amenities (Museum), Park, Alley, Play and Arts Space, Festivals
- Mix of Housing Densities, Affordable Housing (Mother-in-Law Housing, Manufacturing High-Tech Housing

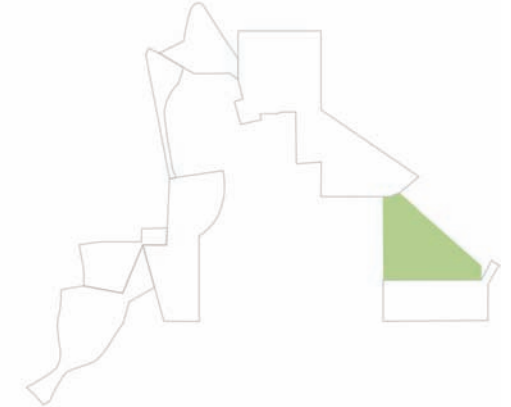
Aesthetic

- Public Art, Quality Landscape Materials and Construction, Comfortable Streetscapes
- Landscape-Centric Design

Functional

- Rain Harvesting Landscapes, Park and Ride to the Airport
- Proper Solar Orientation and Design
- Mutli Use Structures
- Multi-Functional Transportation

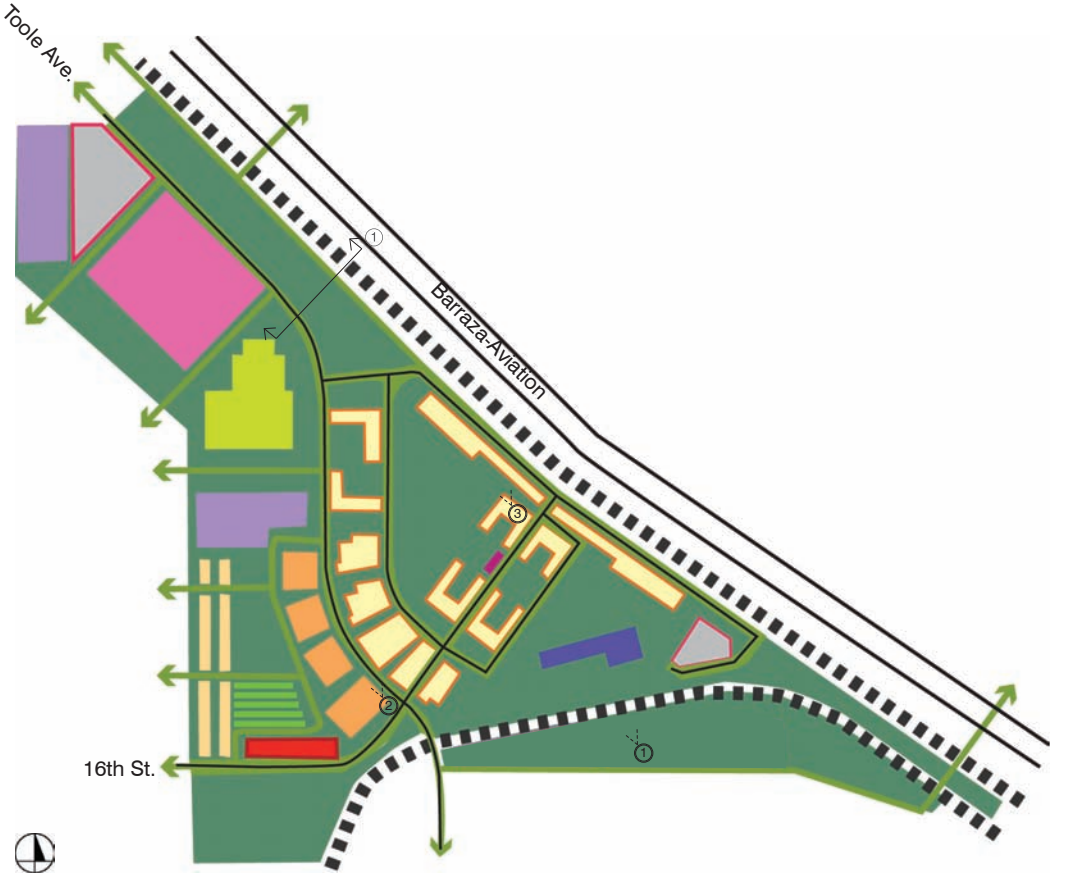
Entertainment / Industrial District



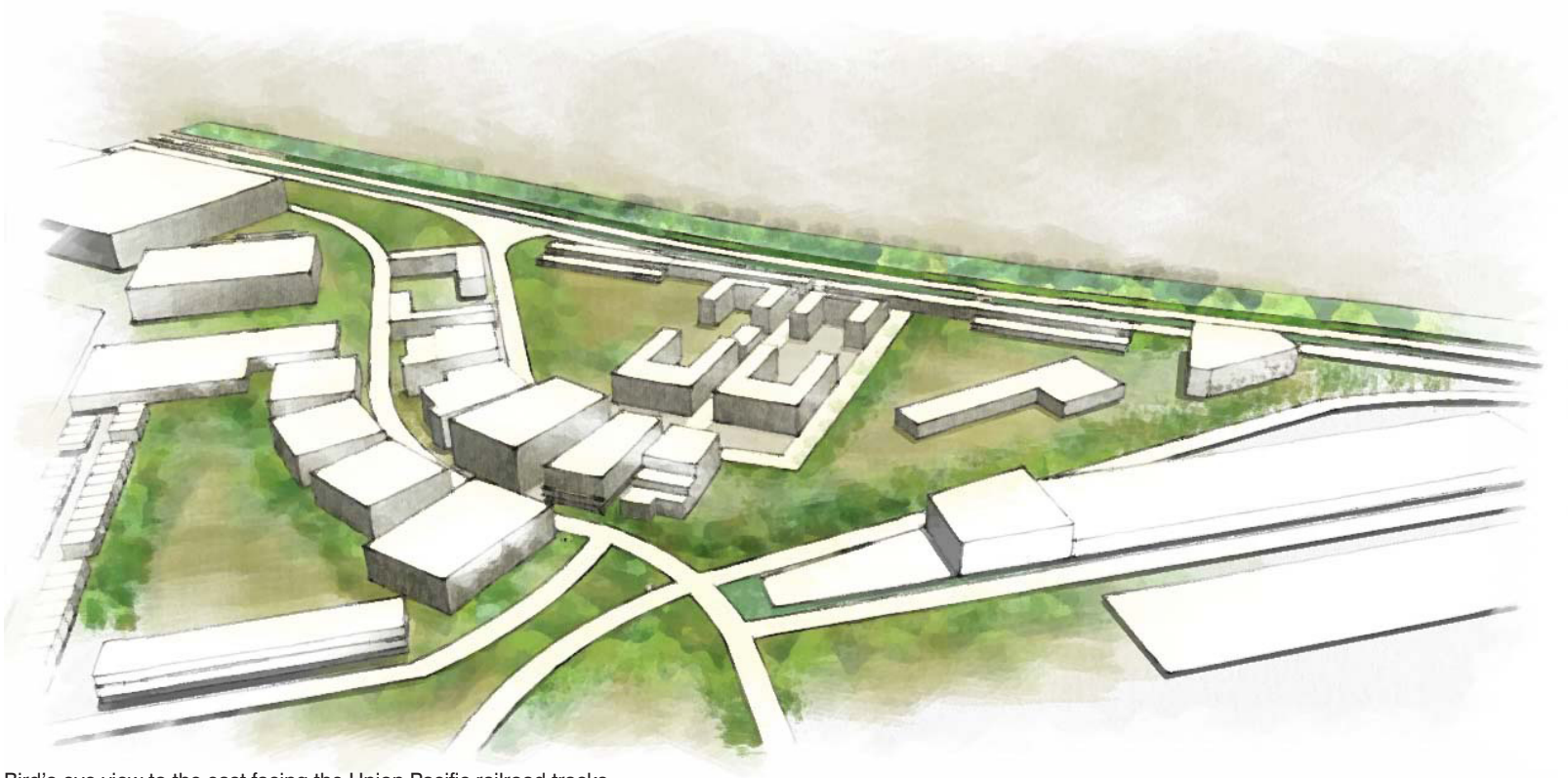
The Entertainment/Industrial District combines recreational and entertainment amenities to create a unique destination for its residents and visitors alike. The mission is to heal the social separations resulting from major vehicular infrastructure and out-dated zoning laws.

The District includes a diversity of land use and housing options, blending in to adjacent neighborhoods with architecture, greenways, and amenities. Bridging the Barraza-Aviation Highway with pedestrian links is imperative to repair the urban fabric and connect the marginalized neighborhoods to the east.

A cineplex, climbing gym, and mixed use retail developments provide economic incentive to bridge the gap. Higher density housing attracts U of A students. The District parallels Park Avenue which provides a direct link to the University. Dense development creates functional utility for large swaths of open space and networks of transportation options.



- Entertainment
- Museum
- Proposed Park / Open Space
- Urban Agriculture
- Indoor Recreation
- Medium Density Housing
- Low Density Housing
- Mixed Use-Housing
- Community Center
- Business / Retail
- Mixed-Use Business
- Mixed-Use Parking Structure
- Transportation Hub
- Secondary Vehicular Circulation
- Proposed Mixed Use Path
- Local Rail Line
- (1) Section
- (1) Perspective



Bird's eye view to the east facing the Union Pacific railroad tracks

Section view of Entertainment / Industry District (section 1)

View north to the Catalina Mountains from the third floor roof terrace of a mixed-use commercial and residential lofts (1)

View of Toole Avenue mixed-use development (2)

View north to the Union Pacific Railroad Museum (3)

View west into Congress Street from the east gateway downtown illustrating and entry sequence into the Toole Avenue Greenbelt

KEY DESIGN POINTS

Economic

- Mixed-Use Residential (Housing, Office Space, Entertainment, Indoor Recreation, Cafes, Pubs, Day Care, Laundry, Museum)
- Existing Jobs Left in Place

Environmental

- Mixed-Use Transportation (Mixed Use Parking Structures, Park-Once and Walk Feasibility,)
- Water Harvesting and Storage, Solar Power, Decentralized Wastewater Treatment, District Heating and Cooling

Socio-Cultural

- Appropriate Zoning, Open Space, Park Space, Festivals
- Cultural Amenities (Train Museum, Community Center), Connections to Armory Park and Lost Barrio

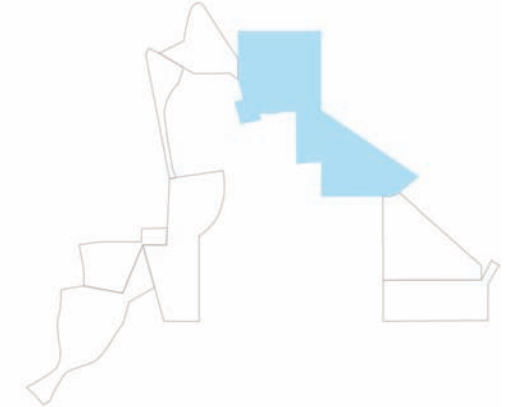
Aesthetic

- Public Art, Comfortable Street-Scapes, Park and Walk Encouraged
- Quality Materials and Construction, Landscape-Centric Design

Functional

- Multi-Use Structures, Pedestrian and Bicycle Friendly Streets, Traffic Calming Measures
- Transit Oriented Design, Park and Ride to Airport

Infill Arts Warehouse



The Art's Warehouse District possesses tremendous potential for the demonstration and implementation of infill strategies. The strategies employed are based on LEED Guidelines and from examples of case studies on sustainable urban developments.

The two case studies that helped develop the main ideas for the Art's Warehouse District were from the Brewery Blocks in Portland, OR and Greenwich Millennium Village in London, U.K. These two projects dealt with creating mixed-use development focusing on infill strategies aimed at provide housing, business and retail opportunities, open space, public services and entertainment all within the same area.

The Art's Warehouse District has already laid the groundwork for this type of development, expressing the desire to create more mixed-use activities and "thinking green" by developing open space that create a balance of indoor and outdoor living spaces.

Civic
Entertainment
Mixed-Use Business
Business / Retail
Office

High Density Housing
Medium Density Housing
Low Density Housing
Mixed-Use Residential
Existing Park

Proposed Park / Open Space
Transportation Hub
Mixed-Use Parking
Secondary Vehicular Circulation
Local Rail Line
Proposed Mixed Use Path
① Section
① Perspective

Bird's eye view looking southeast into the downtown provide new ideas for sustainable living spaces and green linear parks

Section view of Arts Warehouse District streetscape for mixed-use development and open space (section 1)

Entrance to the Arts Warehouse District from the railroad off of 6th Street and Stone Avenue, with mixed-use open space for recreational, commercial and residential use (1)

Section view of an interior courtyard with space for mixed-use activities. Ground level buildings provide opportunity for business and retail, while upper stories offer residential housing with private porches (section 2)

Courtyards proved flexible open space for daytime and evening activities (2)

KEY DESIGN POINTS

Economic

- Research and Development Entities (Public/Private Partnerships, Art Studios, Fine Dining, Cafes, Entertainment
- Urban Agriculture (Green Roof Production)

Environmental

- Mixed-Use Transportation (Mixed-Use Parking Structures, Bicycle Park and Store)
- Water Harvesting and Storage, Solar Power, Decentralized Wastewater Treatment, District Heating and Cooling, Urban Heat Island Remediation

Socio-Cultural

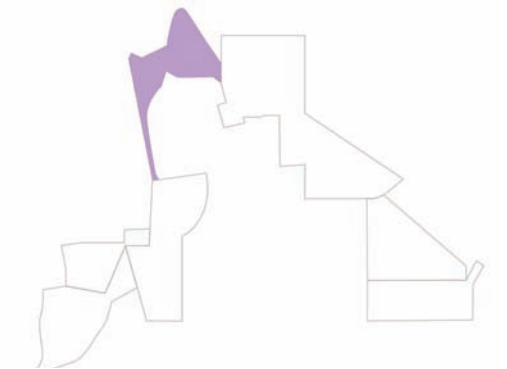
- Appropriate Zoning, Open Space, Park Space, Festivals, Affordable Housing
- Cultural Amenities (Community Art, Community Center), Transportation Hubs (Grey Hound and Union Station)

Aesthetic

- Public Art, Pedestrian Oriented Streetscapes
- Quality Materials and Construction, Landscape-Centric Design

Functional

- Multi-Use Structures, Pedestrian and Bicycle Friendly Streets, Traffic Calming Measures
- Transit-Oriented Design, Park and Ride to Airport
- Rain Harvesting Landscapes



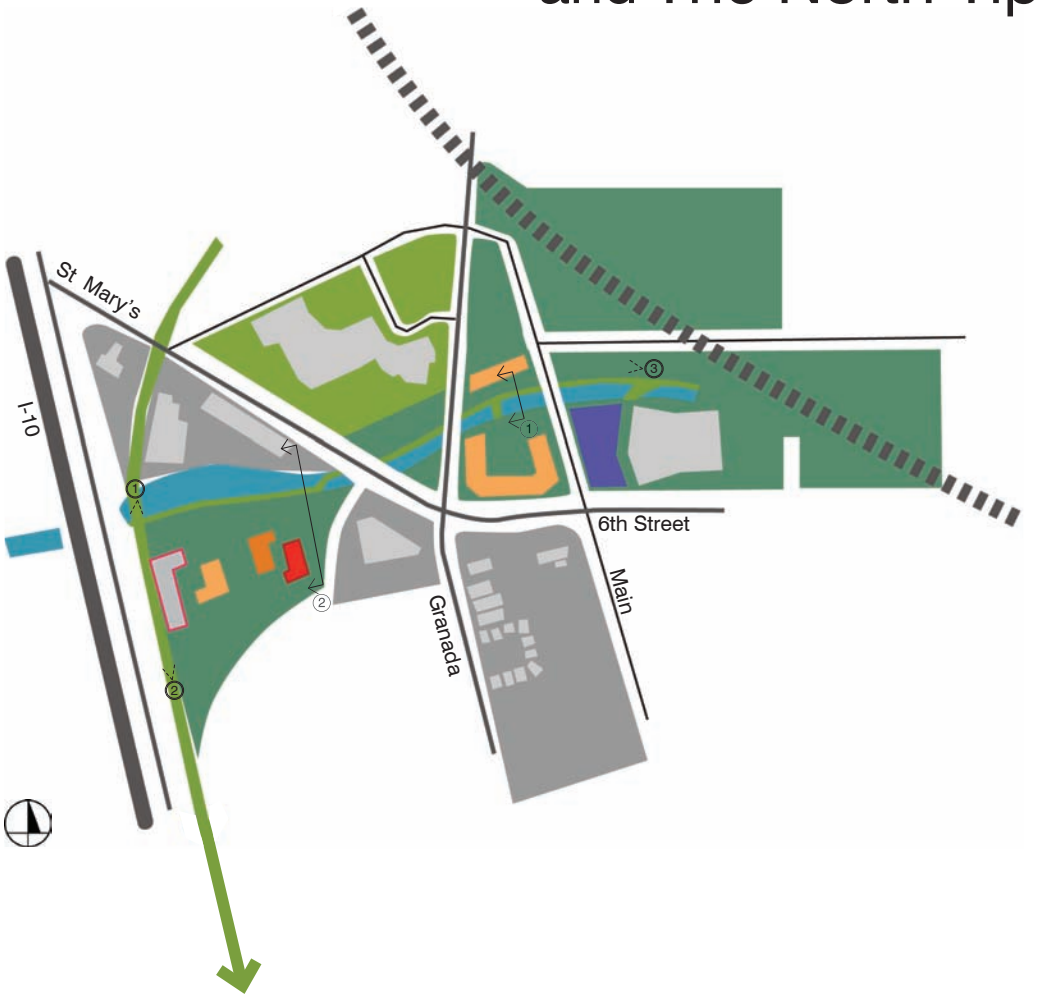
Gateway to the Greenway and The North Tip

The North Tip is at the confluence of the Downtown Links project which will see an increase in traffic flow due to the diversion of traffic from downtown to the I-10 Freeway.

The North Tip also acts as a gateway to downtown where Granada Ave. runs through the historic Presidio neighborhood before it curves into the area surrounding the Tucson Convention Center.

The north end of our project site also will see an increase in bicycle traffic to Gate's Pass/Starr Pass and will be a gateway for the new El Paso / Southwestern Greenway. Housing opportunities will include affordable apartments, lofts, and condos to house artists, students, and will house professionals working downtown.

Mixed use parking includes housing and retail amenities for surrounding neighborhoods and people on recreational excursions. There is also an economic incentive for a UA partnership with graduate family housing, visitors and a science museum.

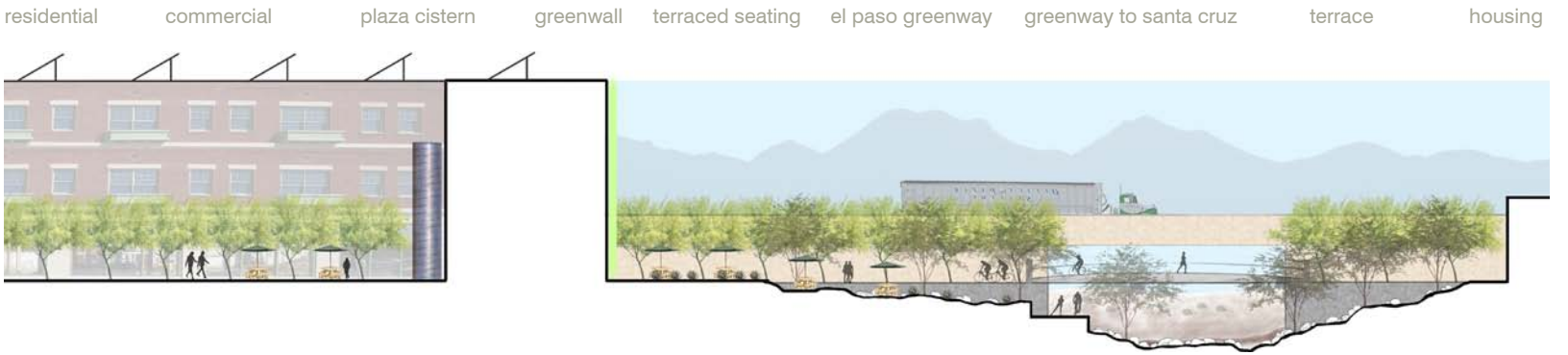


- Riparian Restoration
- Proposed Open Space / Park
- Existing Park Space
- Museum
- High Density Housing
- Medium Density Housing
- Mixed-Use Business
- Mixed-Use Parking Structure
- Major Vehicular Circulation
- Secondary Vehicular Circulation
- Local Rail Line
- Proposed Mixed Use Path
- ① Section
- ① Perspective

The North Tip welcomes visitors downtown through a series of parks, green buildings and the restored Arroyo Chico wash

Graduate family housing overlooking restored Arroyo Chico wash (section 1)

Bird's eye view looking north of Gateway Greenway urban village, I-10 and the restored Arroyo Chico wash



Gateway Greenway urban village looking west showing the Arroyo Chico, greenway, solar powered mixed-use housing and water-harvesting cisterns (section 2)

Scene of the Gateway Greenway looking south as it crosses the Arroyo Chico and on to the mixed-use parking facility (1)

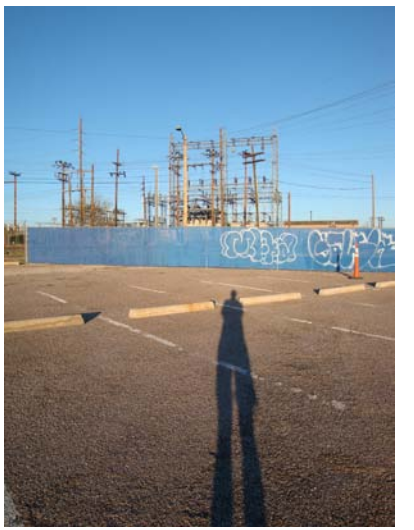
Bridge over restored wash

Greenway bridge

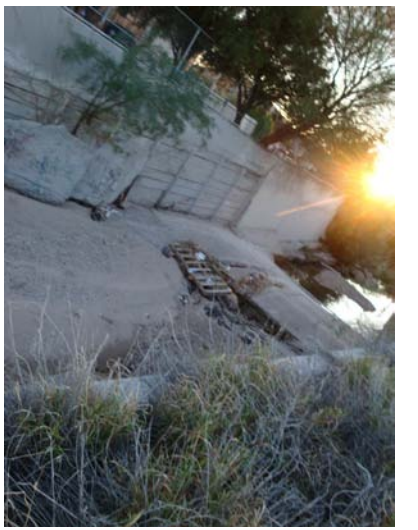
Bridging a multi-use path

Scene of Greenway looking north, showing glimpses of the water-harvesting cisterns and gathering spaces under the tree canopies (2)

Existing parking lot



Transmission station



Channelized Arroyo Chico

El Paso and Southwestern Greenway bridge over the restored Arroyo Chico wash, en route to downtown Tucson (3)

KEY DESIGN POINTS

Economic

- Mixed-Use Community (Graduate Family Housing, Live/Work Studios, Outdoor Recreation, Cafes, Day Care, Laundry, Museum)
- UA Partnership, Mixed-Use Parking

Environmental

- Arroyo Chico Wash Revitalization, Decentralized Wastewater Treatment
- District Heating and Cooling, Solar Power, Park and Bike

Socio-Cultural

- Bike Trail / Multi-Use El Paso and Southwestern Greenway, Park Space along Wash, Connection to Citywide Bike Network
- Cultural Amenities (Science Museum TUSD/UA Partnership), Community Center), Gem Show Space, High, Medium and Low Density Housing Options

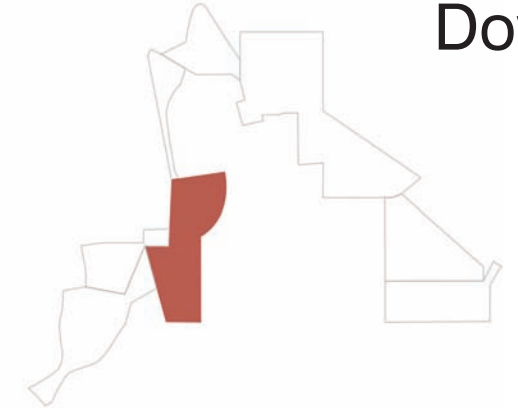
Aesthetic

- Public Art, Comfortable Streetscapes Encourage Park and Walk/Ride
- Quality Materials and Construction, Landscape-Centric Design

Functional

- Multi-Use Structures, Pedestrian and Bicycle Friendly Streets, Traffic Calming Measures
- Quiet District, Rain Harvesting

Downtown Recreation and Entertainment District



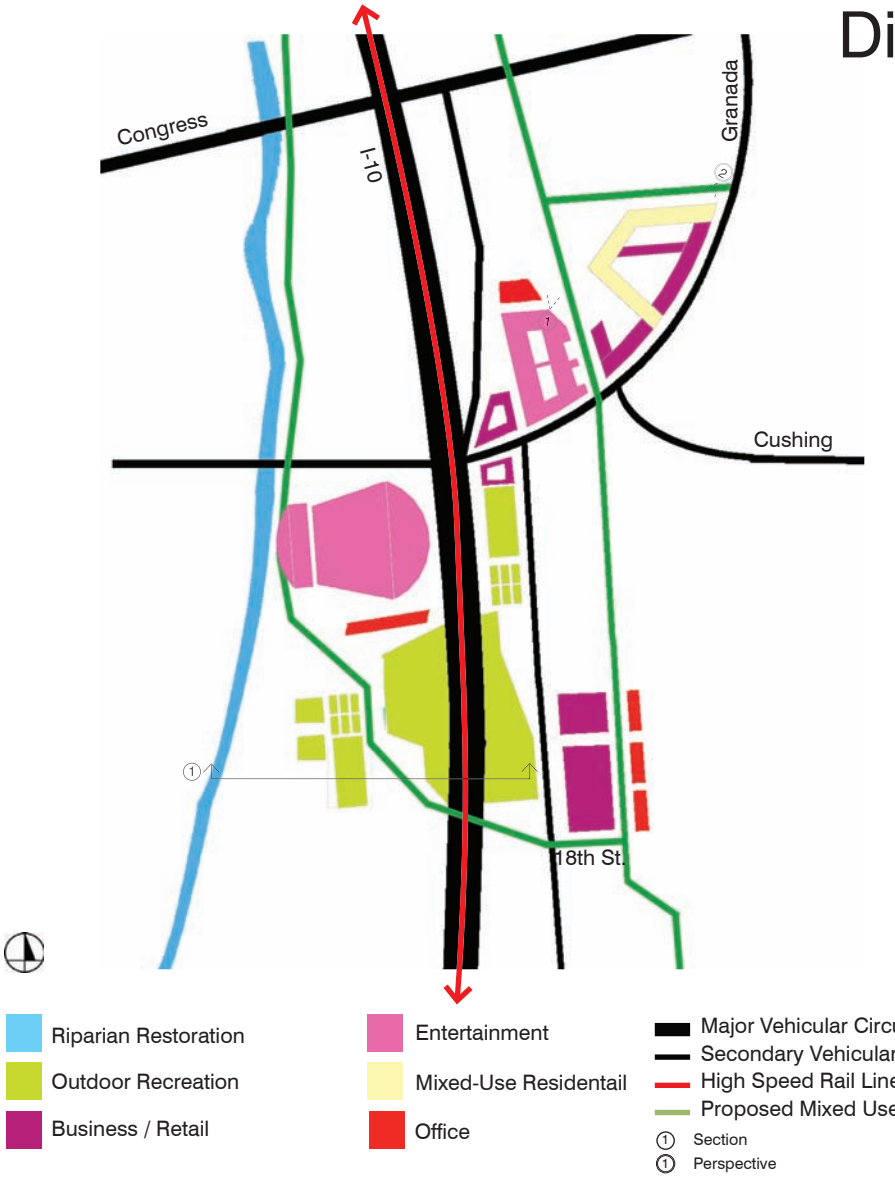
The Downtown Recreation and Entertainment District occupies formerly marginalized and underutilized spaces between the Tucson Convention Center and the Santa Cruz River. Providing numerous activities for residents of adjacent neighborhoods, it also serves as a destination for the population of greater Tucson and visitors to the city.

Bisected by I-10, the district provides a bridge across this barrier, linking neighborhoods as well as urban and natural spaces. In addition, it is situated at a prominent convergence of many circulation patterns; the regional rail station, metro bus station, I-10 off ramps, major urban greenways and bike paths, and modern streetcar stops are included within its boundary.

The program for this district includes both active and passive outdoor recreation; pocket parks, shaded picnic areas and foot and bike paths mingle with soccer fields, basketball and tennis courts, and BMX and skate parks.

An open-air performing arts center, capable of accommodating 8,000 - 10,000 people, frames sunset and river views, offering a variety of season-specific events.

East of I-10, adjacent to the TCC, hotels and downtown neighborhoods, a mixed-use complex of transportation, entertainment, retail and residences offers an additional array of activities: dining, nightlife, live-work spaces, indoor recreation (bowling, arcades, etc.) and shopping.



Bird's eye view to the southwest of indoor entertainment and mixed use buildings in the foreground, an outdoor recreation and performing arts center to the rear, west of I-10

Spatial relationship of outdoor recreation area to Santa Cruz River and I-10, with outdoor performing arts center in the background (section 1)

View from fourth story restaurant in Transportation and Entertainment mixed-use building, looking northeast towards downtown, with El Paso Greenway and residential / retail mixed-use complex in the foreground (1)

View from Granada Avenue southwest towards residential and retail mixed-use complex and daylighted Cushing Street wash connecting to the El Paso Greenway (2)

KEY DESIGN POINTS

Economic

- Integrated Retail, Recreation and Entertainment (Performing Arts Center, Open Space, Active Outdoor Recreation, Entertainment Center, Greenways)
- Adjacency to Major Transportation Routes (Bus Station, Regional Rail Station, Prominent Bicycle/Pedestrian Paths)
- Adjacency to Tucson Convention Center and Associated Hotels

Environmental

- Integration of Built Environment with Open Space and Natural Features (Residential and Retail Courtyards, El Paso Greenway, Wash Restoration)
- Green Building Practices (Solar Orientation, Seasonal Shading, Passive Cooling)

Socio-Cultural

- Connection of El Paso Greenway to Santa Cruz River Park to Create Green Loop
- Outdoor Recreation (Basketball and Tennis Courts, BMX/Skate Park, Soccer Fields, Picnic Area, Pocket Parks)
- Cultural Amenities (Performing Arts Center, Mixed-Use Residential Development)

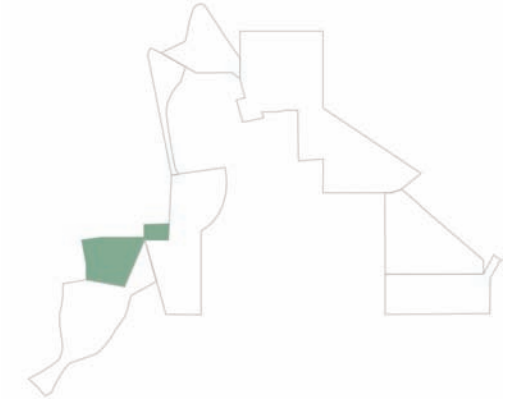
Aesthetic

- Visual and Aural Buffers of I-10
- Vegetated Courtyards, Bike Paths, Urban Trails
- Views of Santa Cruz River Restoration from New Open Spaces and Open Air Theater

Functional

- Directly Connected to Variety of Major Circulation Routes
- Flexible, Multi-Use Buildings and Open Spaces
- Visually and Functionally Connects Areas East and West of I-10
- Adjacent to Tucson Convention Center

Barrio Santa Cruz



Increasing the population of Tucson's urban center is a key catalyst for revitalizing the downtown. Barrio Santa Cruz addresses this issue by developing brownfields west of the river into a bustling, mixed-use community that will attract residents to the downtown area.

Barrio Santa Cruz is an active, transit-oriented neighborhood that provides a range of housing options, including lofts, mid-rise apartments and condominiums, townhouses, and attached single-family housing. Housing density ranges from 50 dwelling units per acre (du/acre) on the street-car line, to 15 du/acre near the parklands to the south. Housing blocks are very permeable, and each has a unique layout, giving the neighborhood the charm that comes with exploring the nooks and crannies of a varying landscape.

One of the key elements in this plan is its high connectivity. The development takes full advantage of its location on the new modern street-car line, with a network of mixed pedestrian and bike pathways permeating the site and leading directly to streetcar stops and main arterials. This proximity to highly effective modes of public transportation will reduce inhabitants' reliance on the automobile and promote active lifestyles.

In addition, Barrio Santa Cruz is located only a 5 minute walk from the major regional transit hub. The regional hub and its associated hotels are an ideal location for accommodating conventioneers, since they are only a 10-minute walk from the Tucson Convention Center, and a 20-minute walk from the heart of downtown.

- Riparian Restoration
- Existing Park
- Proposed Open Space / Park
- Urban Agriculture
- Outdoor Recreation
- Cultural / Historical
- Archaeology
- ① Section
- ① Perspective

- High Density Housing
- Medium Density Housing
- Low Density Housing
- Mixed-Use Housing
- Hotel
- Mixed-Use Business
- Business / Retail
- Streetcar Station

- Office
- Civic (Other)
- Entertainment
- Mixed-Use Parking Structure
- Surface Parking
- Major Vehicular Circulation
- Secondary Vehicular Circulation
- High Speed Rail Line
- Proposed Water Harvesting
- Proposed Mixed Use Path

Bird's eye view of Barrio Santa Cruz looking north

Section view of outdoor entertainment venue, surrounding restaurants and retail, underground parking, midrise apartments and modern streetcar stop (Section 1)

Parks and playgrounds between apartment buildings (1)

Hotel and regional transit hub (2)

Urban agriculture and tree-lined allee (3)

KEY DESIGN POINTS

Economic

- Mixed-Use Retail and Office Space Along Street Car Line, Hotel, Farmer's Market
- Outdoor Entertainment Venue

Environmental

- Trees and Building Overhangs Provide Shade
- Urban Agriculture, Sonoran Vegetation

Socio-Cultural

- Variety of Housing Options
- Community Center
- Mission San Agustin Archeological Exhibit
- Modern Interpretation of Convento
- Post Office Along Streetcar Line

Aesthetic

- Variety of Architectual Forms Give Unique Character to Neighborhood
- Views of Santa Cruz River and Tucson and Catalina Mountains
- Quality Materials and Construction, Landscape-Centric Design

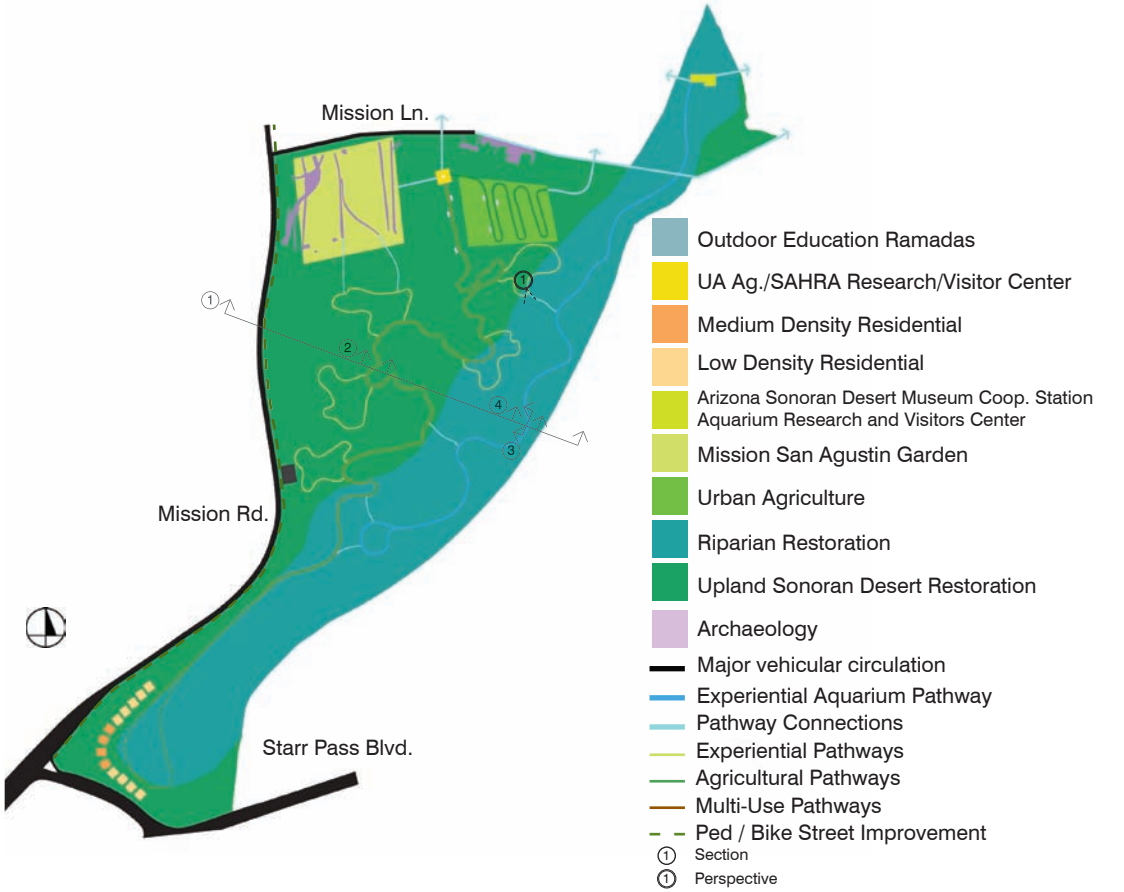
Functional

- Water Harvesting Along Main Roads
- Hight Connectivity (Streetcar, Regional Rail Line, Pedestrian and Bridges and Paths
- Narrow Streets and Landscape Buffers
- (4) New Road Alignments.
- Realign Proposed Avenida Acequia Primera to Run Parallel to Avenida del Convento
- Extend Avenida del Convento South to Join Brickyard Lane
- Extend Nearmont Drive East, to Intersects New Extension of Avenida Acequia Primera
- Extend Avenida del Palo Fiero South to New Farmer's Market

Riparian and Arizona Upland Restoration and Experiential Aquarium: Brownfields to Bosques

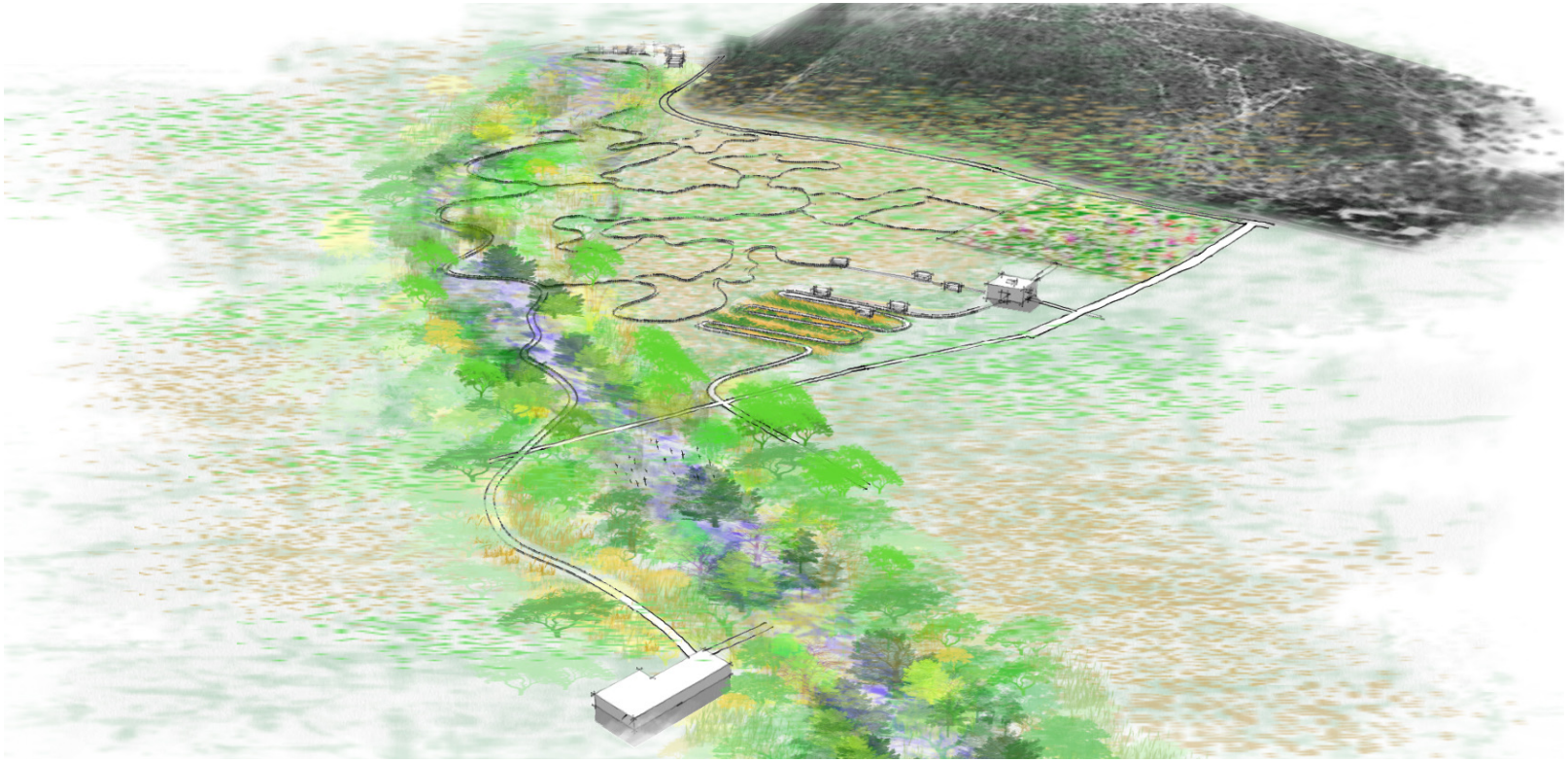
The southwestern portion of the project area, currently characterized by expansive brownfields, will connect the public to Tucson's past and bridge the gap into the future. Cottonwoods, slow flowing Central Arizona Project (CAP) recharge water in the Santa Cruz River, wildlife, and archaeological remains of Native American agriculture connect the user with Tucson's unique ecological and cultural history. Modern housing in the southern-most portion of the site provides a welcoming single family university housing development for families looking for open space, grand views, riparian flora and fauna, and potential employment in the neighboring U of A Sonoran restoration area.

A partnership between the Arizona-Sonora Desert Museum and the University of Arizona facilitates the addition of a regionally appropriate experiential aquarium meandering through the restored Santa Cruz River, providing an economically viable and educational opportunity truly unique to southern Arizona. This private/public partnership ensures a functionally sound and experience-based approach to the establishment of a Sonoran-based natural aquarium. Additionally, the University of Arizona provides public outreach to K-12 schools within the region to promote an understanding and appreciation for the region's unique ecosystem and wildlife.



After extending infrastructure to facilitate the recharge of the Santa Cruz River with CAP and reclaimed water, another partnership with the City of Tucson and the University of Arizona's Sustainability of Semi-Arid Hydrology and Riparian Areas (SAHRA) integrates groundbreaking research with public outreach. The result is the reestablishment of a unique riparian ecosystem and neighboring Arizona Upland plant communities made accessible to the public.

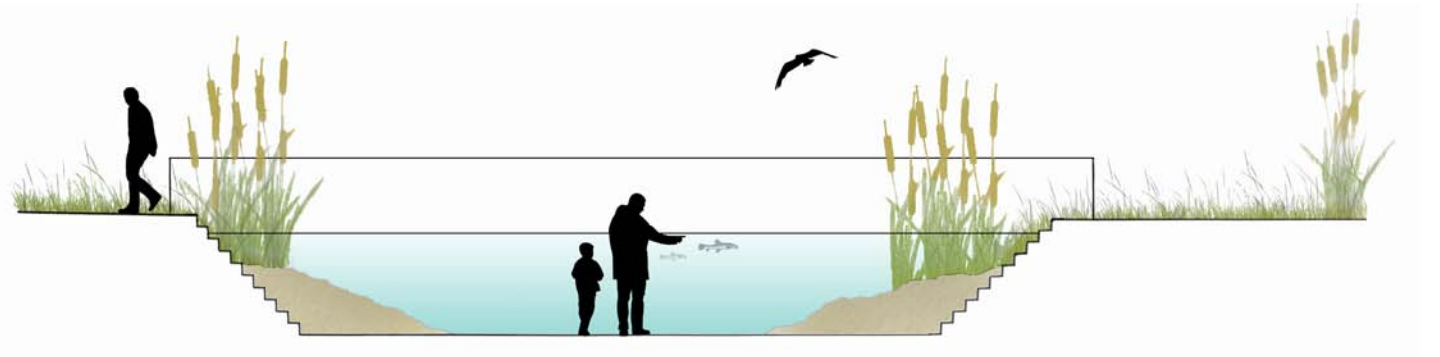
Native American/early Spanish agricultural history is prominent around the Santa Cruz River. The last partnership suggested in this area is a cooperative extension between U of A agricultural research and the city. Early agricultural canals are still present within the Mission Gardens and to the northeast of the area; these early forms of agriculture will be used as tools to allow the public to embrace the past, and move into modern forms of urban agriculture made possible by the latest research.



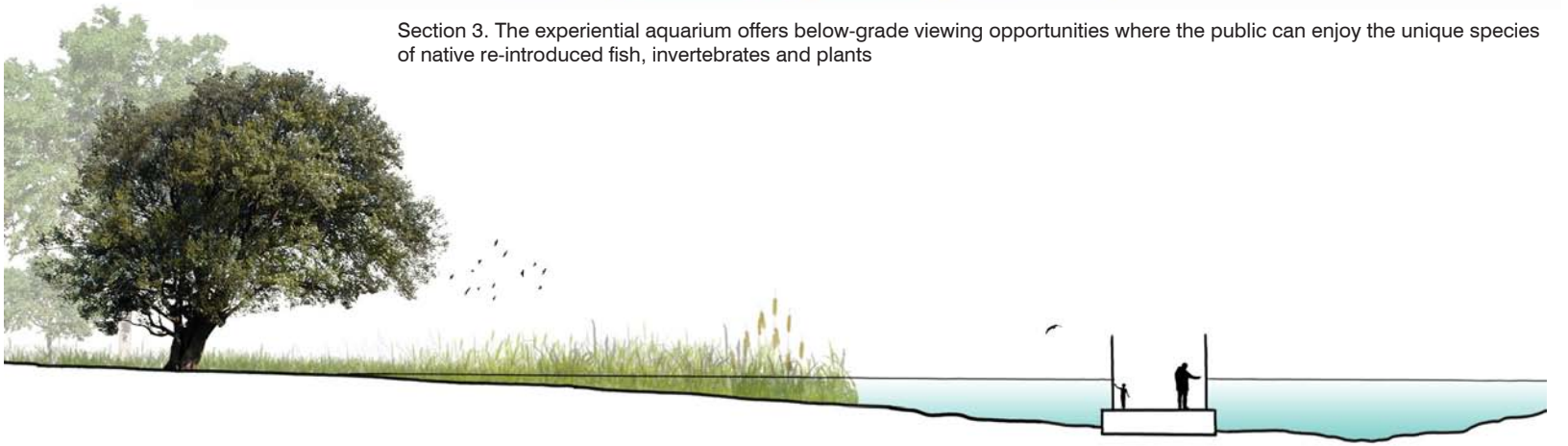
Bird's eye view looking southwest. The restored Santa Cruz River creates a lush riparian ecosystem bordered by experiential pathways, modern and historical agriculture, San Agustin mission gardens, housing, an experiential aquarium and centers for research and community outreach

Section 1. Spanning the width of the restored brownfields, the restored Santa Cruz River transitions from aquatic and emergent vegetation to large shade trees characteristic of southern Arizona's riparian areas, and continues to the smaller trees, shrubs, grasses, and cacti associated with the neighboring typical Arizona Upland Sonoran Desert

Section 2. A multi-use path allows pedestrians and bicyclists to enjoy areas such as the restored arizona upland plant community - unique and characteristic of the region



Section 3. The experiential aquarium offers below-grade viewing opportunities where the public can enjoy the unique species of native re-introduced fish, invertebrates and plants



Section 4. The integrated experiential aquarium and restored Santa Cruz river immerses users into a unique ecosystem, allowing the public an opportunity to enjoy native plants and wildlife up close

Previously absent, mesquite bosques are now a realization people can enjoy while using the experiential pathways for walking, bird watching or viewing the restored Santa Cruz River (1)

KEY DESIGN POINTS:

Economic

- UA/Arizona Sonora Desert Museum Partnership (Sonoran Experiential Aquarium)
- UA Student Family Housing (Desirable Living/Employment Opportunities For Young Student Families)

Environmental

- UA/City Partnership (Restoration Of The Santa Cruz River Ecosystem)
- UA/City Partnership (Restoration Of The Arizona Upland Plant Communities From The Santa Cruz River to Upland Desert

Socio-Cultural

- Recreational And Educational Opportunities Are Afforded To The Community (The Reestablished Santa Cruz Ecosystem)
- UA/City Partnership (Historically Significant Native American Agricultural Practices Adapted to Sustainable Urban Agriculture)
- Bike-Friendly Connection (Mission Road)

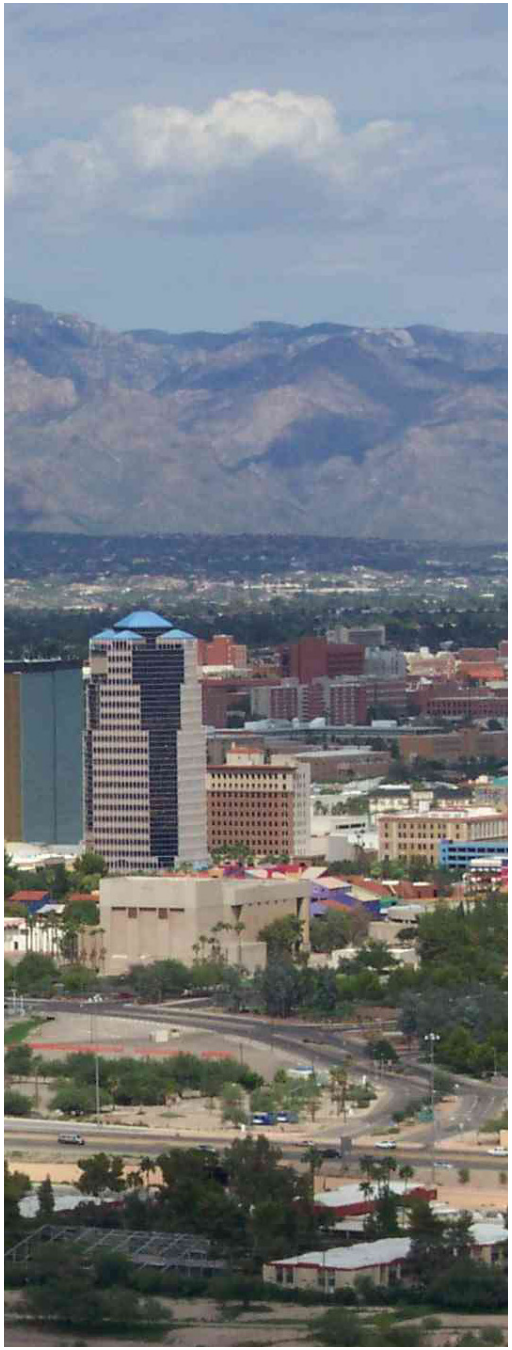
Aesthetic

- Views of Restored Santa Cruz River and Water Meandering Through The Site
- Riparian Vegetation(Arizona Cottonwoods, Mesquite Trees, Arizona Ash)
- Arizona Upland Plant Community (Cacti, Mesquite Trees, Palo Verde Trees and Other Locally Native Plants)
- Agriculture Area Showcases Historic Agricultural Practices Integrated With Modern Agricultural Research Through Strategically Placed Linear Pathways Derived From On-Site Historical Agriculture Canals.

Functional

- Connectivity To The Greater Surrounding Areas (Pedestrian And Bicycle Trails)
- Ecological Productivity Is Re-Established Providing Integral Environmentally Services (Hydro-Riparian Ecosystem)
- Local Aquifer Recharge (Central Arizona Project Water To The Santa Cruz River)

APPENDICES



A: Financial feasibility report

Concurrently with the work of the Tejido Group on this project, a group of students from the Eller College of Management at the University of Arizona completed a feasibility study for downtown Tucson, focusing on the west side of the project area. Their report is included here both because of its role in Tejido's design process, and as an example of the depth of financial analysis that could be pursued for other districts of downtown as needed. An additional deliverable in the Eller group's project was an Excel spreadsheet developed by the team to test proposed densities and land uses as to overall financial feasibility. Although that tool cannot be provided with the print format of this planning document, it will be available with the digital version.

CONTENTS

"2010 City of Tucson Downtown Revitalization"

by Katie Tunsky, Derek Gersdorf, Ryan Michelson & Joshua Spencer

Eller College of Management, University of Arizona

EXECUTIVE SUMMARY

The College of Architecture and Landscape Architecture (CALA), in conjunction with the City of Tucson, is revising the Downtown Tucson Master Development Plan to incorporate responsible, mixed-use development, and promote Central Business District living. Additionally, their endeavor addresses economic revitalization in the downtown Tucson area. The Eller College of Management, over the course of the past semester, worked alongside CALA's designers and planners to determine the financial feasibility of the proposed designs.

This report serves to:

- Provide insight into the success factors of other downtown revitalization projects and to determine if these success factors are applicable to Downtown Tucson.
- Analyze the financial feasibility of a mixed-use development by using a comprehensive discounted cash flow analysis.
- Present a sensitivity analysis for the baseline financial feasibility study that comments on effect of market conditions, loan repayment terms, parking assumptions, and developer incentives.

After determining the size and scope of the mixed-use development on the chosen site, a comprehensive baseline Net Present Value (NPV) analysis was conducted assuming that the apartments would be rented at the current average Tucson rental rate of $700 per month. The outcome of this analysis indicates that the baseline project is financially unfeasible, with a projected NPV of negative $2.28 million.

The sensitivity analysis conducted presents nine alternative economic scenarios. Predictions from this analysis indicate that residential rent revenue per unit must be greater than Tucson's current market rate of $700/unit in order for the development to be profitable. Higher rents are likely to be feasible, even under distressed economic conditions, because the proposed development is designed with better than average quality and because the surrounding infrastructure of parks will make the apartments attractive to a higher-income demographic.

Scenario	NPV	IRR
Rent of $700/unit	($2,280,543)	9.52%
Rent of $1,000/unit	$4,577,231	12.40%

The chart above compares the results of two rental scenarios.

Projected rental rates for the proposed development could rise as high as $1,000/unit. Increased residential rent results in a profitable and financially feasible development with an NPV of $4.58 million and Internal Rate of Return of 12.40%. Therefore, given the right development model, the opportunity exists in Downtown Tucson to build a mixed-use development with positive returns over a long-term holding period.

EVALUATION PROCESS

Research Methodology

Both primary and secondary research was conducted to gain a thorough understanding of the current economic conditions in Tucson and the demand for mixed-use real estate development in this area. Core research objectives included:

- Determine current developer and government plans to minimize competition or overlap with existing plans and to select the development site with the highest potential for success.
- Identify market demand for mixed-use residential and commercial development and the associated statistics including market rents and vacancy rates.
- Examine trends in successful revitalization projects, such as transit-oriented development and the plans for the construction of the Modern Streetcar in Tucson and its impact on development.
- Calculate maximum potential square footage utilization for a site based on acreage and the resultant property type and unit mix for the selected project.
- Estimate development costs, revenue streams, operating expenses, and other non-operating expenses.

Resources

Project analysis is based on information obtained from University of Arizona faculty and several Tucson real estate developers and professionals. Additionally, secondary resources included market reports, demographic information, development plans and impact studies.

Research Findings

Revitalization Success Factors

The team identified factors contributing to the success of revitalization efforts in cities comparable to Tucson. Albuquerque's Central Avenue renewal plan was identified as the most successful comparable revitalization project to Tucson. Both cities are located in the desert terrain of the Southwest. They share similar population sizes, histories, and geographies (U.S. Census, 2000). Moreover, both experienced a decline and deterioration of their respective downtown areas.

Albuquerque's Central Avenue renewal project is regarded as a success for the following reasons:

- Collaboration amongst the city, a non-profit think tank, and private developer in the formation of the Historical District Improvement Company (HDIC).
- Incorporation of a long-term development strategy.
- Addition of features to attract people downtown.
- Development of a variety of property types near Central Avenue & 3rd Street.

The most influential factor in Albuquerque's success was the HDIC developer arrangement in which the city, a private developer, and a non-profit organization invested millions of dollars in the downtown renewal plan. Initially, the city contributed $14 million, the non-profit $7 million, and the U.S. Federal government provided an $8 million grant, respectively (Villani, February 2000). This arrangement was unique because Arcadia Land Company, the private developer, was named managing partner, allowing its initiatives to outlast the rotating administration of local government (Steutville & Langdon, 2006). The goal of the HDIC was to produce a pedestrian-oriented, mix-use renewal plan. To help support the planning and implementation process, a Downtown Action Team comprised of downtown property and local business owners was organized in an effort to strengthen the relationships between the city, developer and community (Steutville & Langdon, 2006).

While conventional developers typically look to recover their investment within five to seven years, the HDIC alliance focused on building a product that would generate tax returns for 25 years and beyond. The long-term perspective of the HDIC allowed for the development of a much higher-quality product than is typically found in the private sector (Steutville & Langdon, 2006). The HDIC was also responsible for the inclusion of attractive features downtown such as pedestrian accessibility, public transportation, and an entertainment district (Grubb & Ellis)

Albuquerque's Application to Tucson

The City of Tucson has recently taken significant strides toward promoting a successful downtown revitalization. For instance, the Rio Nuevo Board was reinstated in March of 2010 and the Downtown Tucson Partnership was established to represent downtown property and business owners, similar to Albuquerque's Downtown Action Team. Like Albuquerque, Tucson has a similar goal of creating a walk-able, pedestrian-oriented downtown district. Although downtown Tucson possesses unique and noteworthy attractions, it lacks overall appeal. With the reinstatement of the Rio Nuevo Board and through the intelligent use of mixed-use development, the revitalization of downtown Tucson has the potential to excel in coming years.

Site Selection

The team was assigned the responsibility of selecting a development location from three potential client-chosen sites. The team selected two parcels of land, totaling approximately 18 acres in the El Mercado District, immediately west of interstate-10. This location was chosen in conjunction with CALA based on success factors identified in the team's research. These considerations included the potential for a grocery store, existing city and private developer plans, and land ready for development.

The two remaining sites were eliminated because they were incompatible with development goals. The site, located in the Northwest corner of the downtown area, had limited access and is located in close proximity to the Interstate. These attributes detract from the site's usefulness for residential development. High-tension power lines also run directly overhead and would require removal prior to development. The site located along the railroad tracks was initially favored due to its superior location; with complimentary infrastructure already in place. However, further research revealed city plans to extend Aviation Highway through the site, thereby rendering the site impractical for development.

Square footage calculation

After selecting the site, it was necessary to determine the appropriate size of the development. The team decided that the square footage needed to include green space and provide for walkability. By utilizing approximately 50% of the total developable area, the team calculated the total size of the mixed-use property at 619,000 square feet.

The square footage was calculated using two methods. The first method utilizes a 30 residential unit per acre development ratio where the units per acre should not exceed 30 units for two or three story development. With a property size of approximately 18 acres, a maximum of 540 residential units is acceptable. By utilizing 50% of total developable area, the maximum number of residential units is reduced to 270 units. The second method calculates the number of units based on total property square footage. The result is a total developable area of approximately 784,080 SF. Utilizing 50% of total developable area, the maximum development square footage is approximately 392,040 SF. Given the mixed-use property requirements, a range of 50-60% residential SF in relation to the total property was then used to determine the square footage designated for residential development. The resultant unit range at 1,000 SF per unit is 196 – 235 residential units. The team considered the second method as a more conservative estimate of the appropriate unit quantity and selected an upper tier value of

225 residential units with an average square footage of 1,000 SF.

Approximately 140,000 SF of remaining developable area was allocated to retail and office development. The total development of 365,000 SF requires an additional 254,000 SF of surface parking, resulting in a total development of 619,000 SF.

Baseline Analysis

The value of an investment in the development of commercial real estate must take into consideration all cash inflows and outflows, otherwise known as revenues and expenses, resulting from the operation of that property. A baseline analysis was created that portrays the value of the property under stable economic conditions. This baseline analysis was further used as a "control" to assess the impact of altered market conditions, development costs, and property cash flows. All analyses include the following development phases:

- Phase #1 – 50% of residential, retail, and office units.
- Phase #2 – the remaining 50% of residential, retail, and office units plus the supermarket.

Each phase is anticipated to take approximately two years to complete, resulting in a development timeframe of four years.

Development Costs

Marshall and Swift Valuation Service was used to determine the development costs of the proposed commercial mixed-use property. These costs are based on actual end costs and are therefore designed to provide accurate present-day replacement costs. Final costs of buildings are based on fair market value defined as "the most probable price which a property should bring in a competitive and open market under all conditions requisite to a fair sale, the buyer and seller each acting prudently and knowledgeably, and assuming the price is not affected by undue stimulus" (Marshall & Swift/Boeckh, LLC, 2009). Building structures are divided into five different construction classes – A, B, C, D and S. These classes compare workmanship and quality of materials used. Additional considerations include building interior and exterior features. Each class is further subdivided into five unique quality types – low cost, fair, average, good and excellent. These subdivisions represent the quality of material being used for that building class and the quality and extent of additional features. For the purpose of this analysis, the construction class of the development was "D", which is characterized by stucco exterior. Additionally, the quality of exterior materials and interior features are of "good" quality.

Chart #1

Exterior Walls	Interior Finish	Lighting and Plumbing	Heat
Good stucco or siding, some brick or stone trim, good roof	Good plaster or drywall, painted, hardwood, vinyl composition, carpet	Good lighting, one bath per bedroom, TV antenna	Package A.C.

Land Acquisition

The development requires the acquisition of the two parcels located to the west of Interstate-10. According to the Pima County Assessor, Full Cash Value is typically 75% of Fair Market Value. The total Full Cash Value of the two parcels under consideration is $1,222,777, resulting in a Fair Market Value, or purchase price, of $1,630,369 (Pima County, Arizona, 2008). Using market assumptions regarding the financing obtainable for such property, a 70% loan-to-value (Riccio, 2010) results in a mix of $1,141,259 financed and $489,111 out-of-pocket.

Residential

Marshall & Swift Valuation Services were also used to compute the cost of residential development for the determined area of 225,000 SF. These costs are based on the occupancy type, building class, and building quality. It was determined a successful development incorporates architecture consistent with its surrounding environment and sensitive to existing historical design. The resulting criteria for the downtown spaced allowed for multiple residences of no higher than three stories with stucco exterior. Chart #1 outlines the proposed building characteristics.

Base Square Foot Cost was altered to include an upgraded Heating & Cooling system for an extreme climate and the addition of balconies and patios in order to be competitive in the southwest market. Further adjustments derived from a Current Cost Multiplier and a Local Multiplier provided by Marshall & Swift, produced a Square Foot Cost of $89.68. This adjusted Base Square Foot cost multiplied by the residential square footage, plus costs for Architect's fees, elevators, and appliances, phased over four years at an annual inflation rate of 3% (Marshall & Swift/Boeckh, LLC, 2009) result-

Chart #2

Exterior Walls	Interior Finish	Lighting & Plumbing	Heat
Stucco, siding, plain storefronts, minimum fenestration	Average retail mix and finishes, few extras, standard offices above	Adequate lighting, some plumbing per unit	Package A.C.

Chart #3			
Exterior Walls	Interior Finish	Lighting & Plumbing	Heat
Good stucco or siding, some trim, metal and glass front	Plaster or drywall, acoustic tile, few partitions, vinyl composition	Adequate market lighting and outlets, small restrooms, few extras	Package A.C.

ed in a total residential development cost of $23,040,493. Using market assumptions regarding the financing obtainable for such property, a 75% loan-to-value (Riccio, 2010) results in a mix of $17,280,370 financed and $5,760,123 out-of-pocket.

Retail/Office

A similar method was used to calculate the development cost of 90,000 square feet of mixed office and retail units. A similar building class and quality were chosen to determine the Base Square Foot Cost. Chart #2 outlines the building characteristics.

This Base Square Foot Cost was then adjusted to include an upgraded Heating & Cooling system, Architect's fees, a Floor Area/Perimeter Multiplier, Current Cost Multiplier, and Local Multiplier. The resultant total development cost for the retail/office portion of the development was $5,779,598, phased over four years and grown at inflation of 3% annually (Marshall & Swift/Boeckh, LLC, 2009). Using market assumptions regarding the financing obtainable for such property, a 65% loan-to-value for office units and 70% loan-to-value for retail units (Riccio, 2010), results in a mix of $3,901,229 financed and $1,878,369 out-of-pocket.

Supermarket

The appropriate timing for the introduction of a supermarket into downtown Tucson is difficult to determine. In order for a grocery store to be successful, the downtown area must house a significant number of local residents. Conversely, the introduction of a grocery store in the downtown area would provide critical infrastructure necessary to entice new residents. Therefore, a dilemma exists in overcoming the critical threshold of development. Given this information, it was decided the grocery store would be developed upon completion of Phase #1 of the residential, retail, and office units in conjunction with Phase #2. Using Marshall & Swift Valuation Services, the Base Square Foot Cost was determined based on a stucco exterior. Chart #3 outlines the building characteristics.

Parking and Landscaping

Parking needs for any development are determined based on a ratio of square feet required for parking to square feet of property type. Using the average of high and low ratios given by Marshall & Swift, it was determined that a total of 254,000 square feet of parking (736 spaces) was necessary for the development. The Baseline Analysis only utilizes surface parking whereas the sensitivity analysis includes 50% underground parking. At a total cost per parking space of $1,023, the cost of 736 surface parking spaces is $792,631. This calculation is phased over four years in accordance with the needs of planned development phases and grown at an annual inflation rate of 3% (Marshall & Swift/Boeckh, LLC, 2009).

The total development area that requires landscaping has been determined subtracting the ground level square footage from the total square footage of the entire development. By only utilizing approximately 50% of our total land for development, abundant room remains for open space, pedestrian-oriented walkways, and recreational area. However, landscaping of the remaining land is required and should be considered as an additional cost. Chart #4 outlines the landscaping characteristics and costs.

Landscaping is phased equally over the development timeframe and when adjusted for inflation results in a total cost of $2,234,774. Using market assumptions regarding the financing obtainable for such property, a 70% loan-to-value for total parking and landscaping costs (Riccio, 2010)results in a mix of $2,119,183 financed and $908,221 out-of-pocket.

Subdivision Development Costs

Chart #4				
Classification	Characteristics	Cost/SF	Square Footage 50% / 50%	Total Cost
Low-Cost (Open Areas)	• 1-5 gallon shrubs • Small trees and ground cover plants • Seeded lawn	$4.05	191,631 SF	$776,106
High-Cost (Surrounding Structures)	• High visual content • 5-15 gallon shrubs • Greater proportion of large trees • Automatic irrigation • Seeded lawn	$7.10	191,631 SF	$1,360,580

Subdivision development costs include residential street improvements, lighting, and public utilities. These costs are determined as a per linear foot cost of total street length (Marshall & Swift/Boeckh, LLC, 2009). This measurement is dependent upon and can only accurately be determined by the project's Landscape Architects and Planners. These costs were therefore excluded in the development costs of our project, and although significant to the development, are minimal in relation to the remaining total costs. Subdivision development costs may also be the responsibility of the community or refundable to the developer depending upon local requirements and codes.

Developer Fees
Comparable to subdivision developments costs, developer fees take into consideration the capital provided by the city for the infrastructure necessary to support development. Developer fees are dictated by the City of Tucson on either a per square foot or per unit basis and are charged to the developer. Fees account for the impact of development on roads, parks, police, fire, and public facilities. Total developer fees are $1.51 million.

Revenue Streams
Revenues include all cash inflows from the property as well as the outflows related to revenue such as vacancy. Overall, revenue streams include residential rent, office and retail rent, expense reimbursements, and a reduction in overall revenue based on vacancy rates.

Residential Rent
The residential portion of the development includes both affordable and market rent units. According to the U.S. Census Bureau, average market rent in Tucson is approximately $700/month – which is representative of 202 of our 225 residential units (U.S. Census Bureau, 2008). The remaining units are considered affordable housing according to U.S. Department of Housing and Urban Development, which defines "affordable" as any rent less than 30% of household income. The 2008 American Community Service data released by the U.S. Census Bureau reports a Tucson median household income of$36,640 (U.S. Census Bureau, 2008). Deducting taxes at a rate of 30% and applying HUD's 30% principle, affordable rent is calculated to be approximately $640/month or less. This analysis assumes $640/month for 23 affordable units. Residential rents increase at an annual inflation rate of 3%.

Office and Retail Rent
Rental rates for office and retail units in Downtown Tucson were obtained from CB Richard Ellis' quarterly MarketView Reports and are reported to be$20.40/SF and $19.54/SF for office and retail, respectively. These rental rates were also grown at an annual inflation rate of 3% (CB Richard Ellis, 2009).

Vacancy
Industry standard vacancy rates for all property types are typically 5%. However, given this project is a new development, the success of which is dependent on many external factors, a 10% vacancy rate has been incorporated for the first 2 years of operation, with a 5% vacancy rate applied in the years thereafter.

Expense Reimbursements
Expense reimbursements are included in the terms of some leases and require the tenant to reimburse the landlord for certain expenses such as utilities and common area maintenance. In this analysis, expense reimbursements for common area maintenance charges are billed only to retail tenants. These reimbursements are deducted as an expense but added back to revenues.

Operating Expenses
All assumptions related to operating expenses were obtained from industry professionals interviewed and represent national averages standard to the industry. The majority of the following information was provided by Michael Riccio, Senior Vice President of CBRE Capital Markets.

Repairs and Maintenance
Repairs and maintenance (R&M) provide an allowance for any ordinary repairs made to the property over the course of a year and are calculated differently depending on property type. For residential units, R&M is forecasted at $250/unit/year and increases at a rate of $50/year until the budget caps at $450/unit. For office property, R&M is budgeted to be equal to $1.50/SF. Retail R&M is included in common area maintenance charges that are reimbursed by the tenant to the landlord.

Common Area Maintenance (CAM)
CAM refers to the maintenance of any common areas within the property – hallways, sidewalks, and courtyards. CAM is expensed to residential property at a rate of $0.50/SF and to retail property at a rate of $1.00/SF which is reimbursed to the landlord by the tenant. Office property is not charged a CAM expense because it is included in the $1.50/SF R&M charge.

Administrative Costs
Administrative fees for all property types are calculated at a rate of 0.5% effective gross income (EGI) or total revenue and include any costs related to the administrative responsibilities of property management.

Management Costs
Similar to administrative costs, management fees are calculated at a rate of 3.0% effective gross income (EGI) or total revenue for all property types. The management costs include the fee paid to a property manage-

Chart #5			
Property Type	Loan Amount	Interest Rate	Annual Payment
Land	$1,141,259	6.33%	$85,890
Residential	$17,280,370	6.00%	$1,255,400
Office	$1,878,369	6.75%	$147,588
Retail	$4,184,020	6.25%	$312,140
Parking/Landscaping	$2,119,183	6.33%	$159,487
Total/Average	$26,603,201	6.33%	$1,960,505

ment company for the management responsibilities of the property.

Utilities
Utility expenses include those applicable to specific tenants, not property common areas. Residential and retail utility expenses are billed directly to the tenant from the utility company and are therefore not included in this analysis. However, office leases are typically on a "gross" basis, meaning their rent/SF includes an allowance for expenses such as utilities and are therefore the responsibility of the landlord when billed to the property. Utility expenses related to property common areas are included in CAM charges.

Insurance
Insurance expense includes both property and liability insurance and is calculated at a straight rate of $0.40/SF across all property types – residential, office, and retail.

Taxes
Property taxes are charged to the property at a rate of 10% of the assessed property value. The assessed property value is calculated at a rate of 16% full cash value, which includes the value of both land and improvements depreciated over the life of the buildings.

Other Expenses

Non-Operating Expenses
Including expenses that cannot be charged directly to the tenants such as legal or marketing fees, non-operating expenses are calculated at a rate of $0.10/SF for all property types. Since these costs cannot be billed directly to the tenants, they are included as non-operating expenses in the cash flow analysis.

Debt Service
Debt service is the amount paid annually in order to maintain financing on the property and includes both interest and principal payments where applicable. For this analysis, financing was applied to each property type separately at the respective loan-to-values obtainable and associated interest rates. For all property types, loans were amortized over a 30-year period with no prepayment. Chart #5 outlines annual loan payments for each property type inclusive of interest and principal.

The total initial loan amount obtained for the property is $26,603,201. The sensitivity analysis includes a scenario where the loan is prepaid after ten years, leaving the property debt-free. However, loan prepayment typically involves the refinancing of debt from another source. For this reason, 30-year amortization was used as being representative of actual operating practices in the baseline analysis.

Capital Expenditures
Capital expenditures include tenant costs, leasing commissions paid to leasing brokers, and costs associated with property upgrades. Capital expenditures are charged at a rate of $0.25/SF and $0.50/SF for residential and retail/office property, respectively.

Baseline NPV Analysis

Cash Flows
The cash flows for the baseline analysis consist of the monetary results of all revenues less all expenses previously discussed. The potential selling price at the end of the "hold" period can now be calculated and all cash flows are discounted to determine the development's Net Present Value (NPV) and Internal Rate of Return (IRR). The following sections discuss the discount and cap rates used in the analysis.

Cap Rate
The capitalization rate is the rate at which cash flows are converted into value. When valuing commercial real estate, industry standard is to hold a property for a certain period of time and then sell the property. The cap rate is the rate at which cash flow from net operating income, in the year following the expected sale, is converted into a discounted net present value. Capitalization rates vary depending on property type and the associated risk of each. Higher rates result in lower selling prices, and alternatively, lower rates result in higher selling prices. Chart #6 outlines current industry standards

Chart #6		
Property Type	Cap Rate	Discount Rate
Residential	6.75%	10.50%
Office	8.00%	10.50%
Retail	7.50%	10.50%

Chart #7		
Discount Rate	NPV	IRR
7.00%	$9,535,413	9.52%
7.50%	$7,103,890	9.52%
8.00%	$4,977,704	9.52%
8.50%	$3,117,471	9.52%
9.00%	$1,489,119	9.52%
9.50%	$63,147	9.52%
10.00%	($1,186,012)	9.52%
10.50%	($2,280,543)	9.52%

for capitalization rates and discount rates by property type, with cap rates varying from 6.75% for residential property to 8.00% for office property.

Discount Rate
The discount rate is the rate at which cash flows are discounted back to time zero in order to calculate the property's net present value. Cash flows include the cash flows expected during the "hold" period and the sale price at the end of the hold period. In the analysis, the property is held for a typical period of 30 years and then sold. The cash flow in year 30 includes the cash flow on the property plus the selling price from the disposition of the property. The discount rate chosen based on industry standards is 10.50%.

Chart #6 outlines current national industry standards for cap rates and discount rates by property type.

NPV Results
The baseline analysis with a discount rate of 10.50% leads to a NPV of negative $2.28 million, with an IRR of 9.52%. The discount rate at which the NPV of the project is zero would be 10.50%. This breakeven discount rate is also known as the internal rate of return (IRR). Therefore, the baseline analysis results in an unfeasible development. Chart #7 outlines the NPV of our baseline scenario at different discount rates and the impact of each on the NPV in relation to the baseline

The following sensitivity analysis will calculate the NPV and IRR of the development in scenarios that are slightly different from the baseline analysis, in order to determine what stimuli could potentially make this development profitable.

Sensitivity Analysis

While the baseline analysis incorporates the conditions of a stable market, there are many other factors that could potentially affect the profitability of this development. The purpose of the sensitivity analysis is to model those factors that are most likely to occur and analyze their impact on the financial feasibility of the development. Six scenarios were selected for analysis. The implications of these scenarios are summarized and compared to the baseline analysis in the chart at the end of this section.

Optimal Market Conditions
The team built a development of "good" quality that likely will lead to the ability to charge higher than average market rents. In a strong market, the apartments could rent for as much as $1,000 per month. It is also possible under optimal market conditions that absorption will be higher, resulting in lower vacancy.

Two scenarios were considered to be representative of optimal market conditions:
- Market rents of $1,000/unit instead of $700/unit and vacancy rates of 5% over all years.
- Market rents of $1,000/unit instead of $700/unit and vacancy rates to remain at (10% for the first two years and 5% thereafter) as in the baseline analysis.

Several factors may lead to higher market rents for the selected property. These include the abundance of green space that makes the area more attractive, the higher quality development compared to existing inventory, and the surrounding development that provides the potential to spur economic growth as well as increase the attractiveness of the area.

The resultant NPV and IRR of these two scenarios are outlined in Chart #8. Both optimal market scenarios create feasible developments with positive NPVs and IRRs that exceed the discount rate.

Poor Market Conditions
Due to poor economic and market conditions and the expected completion of several major development projects in downtown Tucson, the vacancy rates would be higher than in an optimal market setting.
The following two scenarios were used to portray poor market conditions:
- Market rents of $700/unit for residential

Chart #8		
Scenario	NPV	IRR
Market rent $1,000/unit and 5% vacancy	$4,577,231	12.40%
Market rent $1,000/unit and 5-10% vacancy	$4,425,028	12.32%

Chart #9		
Scenario	NPV	IRR
Market rent $700/unit and 10-30% vacancy	($4,202,462)	8.70%
Market rent $1,000/unit and 10-30% vacancy	$2,139,172	11.38%

Chart #10		
Scenario	NPV	IRR
Loan prepayment at the end of 10 years	($4,530,116)	8.90%

space and vacancy rates of 30%, 20%, and 10% in years 1, 2, and thereafter, respectively, for all property types.

- Market rents of $1,000/unit for residential space and vacancy rates of 30%, 20% and 10% in years 1, 2, and thereafter, respectively, for all property types.

Possible causes of poor market conditions would be an economic downturn, the hesitancy of Tucson residents to move downtown, or the competitive impact of surrounding development causing saturation and the inability to lease space in a timely manner.

The resultant NPV and IRR of these two scenarios are outlined in Chart #9. Poor market conditions with market rents at $700/unit result in a negative NPV and an unfeasible development. However, poor market conditions with market rents at $1,000/unit result in a positive NPV and a feasible development.

Loan Repayment in 10 Years

Typical financing on commercial property will require the repayment of debt after ten years. At this time, owners or operators usually choose to refinance their property and repay the original loan with new debt. However, in order to model the impact of repayment on the profitability of the property, this scenario strictly includes the repayment of the outstanding loan balance at the end of 10 years.

The resultant NPV and IRR of loan prepayment are outlined in Chart #10. Loan prepayment results in a negative NPV and creates an unfeasible development.

Underground and Surface Parking

As a recommendation provided by the project's Architects and Planners, underground parking was considered as an option for 50% of the development's parking requirements. There are two major impacts associated with the inclusion of underground parking: 1) An additional $5.8 million in development costs ($16,250 per space), and; 2) Reduce the utilization of available land and therefore increase total landscaping costs.

The resultant NPV and IRR of a development including underground parking are outlined in Chart #11. The cost to develop underground parking is approximately 16 times greater than that of surface parking. This increase in development costs causes the development to be unfeasible with a negative NPV.

Developer Incentives

Development incentives play an important role in the decision-making of Real Estate developers and in shaping the economic development of a city and/or Business District. Developers often rely on incentives to develop new projects that will bring in valuable tax revenues. Incentives are monetary- or regulatory-based and range from tax incentives to subsidized assistance to renters of affordable housing. The impact of these incentives can have a considerable positive effect on the feasibility of a project.

For the sensitivity analysis, two ways in which the City of Tucson could offer incentives to developers were examined, and chosen for relevance, applicability, and probability. The following three developer incentives are considered in the sensitivity analysis:

- Elimination of development impact fees.
- Elimination of land acquisition costs.
- Elimination of both development impact fees and land acquisition costs.

The resultant NPV and IRR of these two scenarios are outlined in Chart #12. Developer incentives alone do not create a feasible development based on the resultant negative NPVs for all three scenarios.

Alternative NPV Analyses

The sensitivity analysis using alternative sce-

Chart #11		
Scenario	NPV	IRR
50% underground parking	($6,996,321)	7.83%

Chart #12		
Scenario	NPV	IRR
Elimination of development impact fees	($1,110,166)	10.00%
Elimination of land acquisition costs	($1,837,908)	9.70%
Elimination of both development impact fees and land acquisition costs	($667,532)	10.19%

Chart #13		
Scenario	NPV	Difference from Baseline
Baseline	($2,280,543)	$0
Market rent $1,000/unit and 5% vacancy	$4,577,231	$6,857,774
Market rent $1,000/unit and 5-10% vacancy	$4,425,028	$6,705,571
Market rent $700/unit and 10-30% vacancy	($4,202,462)	($1,921,919)
Market rent $1,000/unit and 10-30% vacancy	$2,139,172	$4,419,715
Loan prepayment at the end of 10 years	($4,530,116)	($2,249,573)
50% underground parking	($6,996,321)	($4,715,778)
Elimination of development impact fees	($1,110,166)	$1,170,377
Elimination of land acquisition costs	($1,837,908)	$442,635
Elimination of both development impact fees and land acquisition costs	($667,532)	$1,613,011

narios to the baseline model provides the ability to determine the impact of physical or conceptual changes on the net present value of the development. Chart #13 summarizes the NPV of each scenario in the sensitivity analysis and compares each directly to the baseline model.

The scenario with the largest positive monetary difference from baseline NPV is the scenario producing the highest return to the developer. In this analysis, an optimal market environment where average market rent of $1,000 per unit is obtainable and vacancy rates do not exceed 5%, provides the most return to the developer. Even with vacancy of 5%-10%, returns remain significantly positive. It is also important to consider that while the economy is currently in a downturn, the timing of development plays a significant role in the rents attainable at the time of completion.

Even in the current market environment (baseline), given the quality and location of the new development, research indicates that residential market rents of $1,000 per unit are obtainable for the proposed property with two- and three-bedroom apartments and an average square footage of 1,000 SF. This establishes that due to the high quality of the building and active development adjacent to the location, the proposed project is financially feasible.

Graph #1 on the following page provides a comparative analysis of the sensitivity scenarios.

CONCLUSION

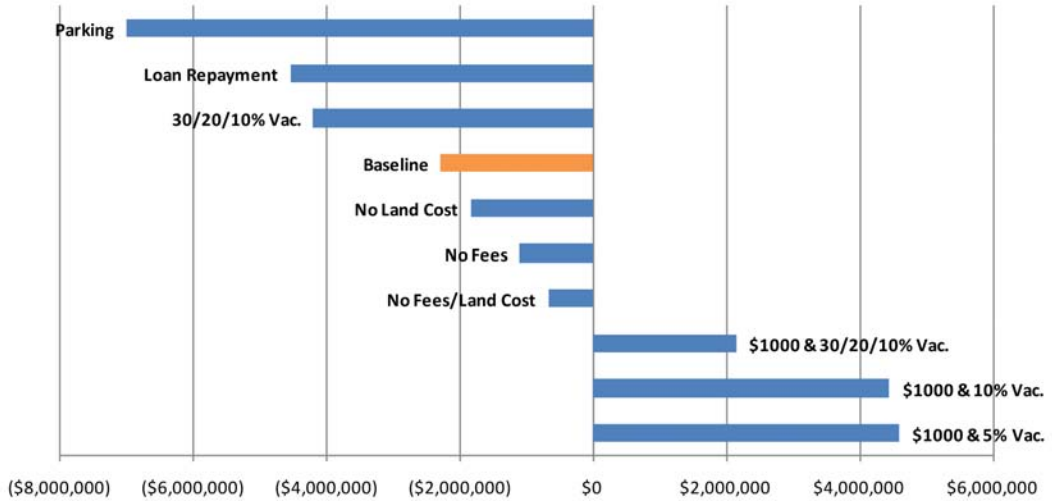
After completing a thorough analysis of development potential for Downtown Tucson and conducting an NPV analysis for multiple scenarios, several conclusions have been formulated regarding Tucson's opportunity for development.

First, successful and profitable development is possible under the right circumstances, as evidenced by the enthusiasm of several key developers in moving development downtown. Our team identified several key factors leading to successful development in the Downtown Tucson area. Based on comparative development studies of strategies used by cities similar to Tucson, local government support plays a key role in incentivizing new, progressive development. Additionally, developments with attractive features and supportive neighboring infrastructure increased property value. Developments committed toward a long-term revenue generating strategy received substantially higher returns with less risk. Lastly, mixed-use property types with a significant amount of developing or existing infrastructure in close proximity to the locale benefited from higher rent revenue and lower vacancy rates.

The proposed development based on current market conditions and standard attributes is not profitable. Higher than average market rent, or alternatively developer incentives, are necessary to make the project feasible.

The team performed a sensitivity analysis in order to determine scenarios that lead to profitable returns. The only scenarios generating positive returns were those in which market rent was higher than the current Tucson average. The baseline analysis assumes that market rent obtained from new residential development, with an average unit size of 1,000 SF, is $700/month. The team was tasked with building an attractive development of good quality that would appeal to higher income tenants. Given the development is new and of a higher quality than the majority of inventory in Tucson, and that the proposed development provides ample green space and is a mixed use property, an average rent of $1,000/unit is both attainable and realistic. Support for this hypothesis exists in the fact that other developers have planned construction in adjacent plots. These plans demonstrate developer confidence in the ability to obtain higher rents and create positive return.

In conclusion, a development that receives the current Tucson average market rent and incurs costs associated with "good" quality construction will not generate positive returns. In order to breakeven, $803 per residential unit must be obtained. With proper utilization of previously identified develop-



ment techniques, residential rent revenue is likely to be high enough for the project to break even and earn a positive Net Present Value. Since the ability to obtain higher than average market rents at the development location is achievable, it is recommended the City of Tucson take the opportunity to intelligently design and build a mixed-use development in the El Mercado District with the expectation to hold the investment over the long-term (30yrs). In doing so, the city, developer, or partnership formed between the two, can reasonably expect a positive and profitable return on the investment.

WORKS CITED

CB Richard Ellis. (2009). MarketView Report.

City of Tucson DOT. (2009). Development Impact Fee Schedule. Tucson, AZ.

Developers Tax Incentives. (2010). Retrieved April 10, 2010, from City of New York: http://www.nyc.gov/html/hpd/html/developers/j51.shtml

Downtown San Angelo, I. (2009). Downtown San Angelo Historic District Economic Incentive Policy. Retrieved April 10, 2010, from http://www.downtownsanangelo.com/incentives.html

Grubb & Ellis. (n.d.). New Mexico. Retrieved March 2010, from 100 Gold Avenue SW Albuquerque, New Mexico: http://100goldabq.com/office_space.htm

Historical District Improvement Company (HDIC). (n.d.). Century Theatres Block. Retrieved March 2010, from http://www.nmdowntown.com/century.html

Marshall & Swift/Boeckh, LLC. (2009). Marshall Valuation Service.

Pima County, Arizona. (2008). Office of the Pima County Assessor. Retrieved April 2010, from Bill Staples, Assessor: http://www.asr.pima.gov/index.aspx

Riccio, M. (2010, April). Senior Vice President, CBRE Capital Markets. (K. Tunsky, Interviewer)

Seattle, C. o. (2006). Bonus Density.

Steutville, R., & Langdon, P. (2006). New Urbanism: Comprehensive Report & Best Practices Guide, Third Edition. New Urban Publications Inc.

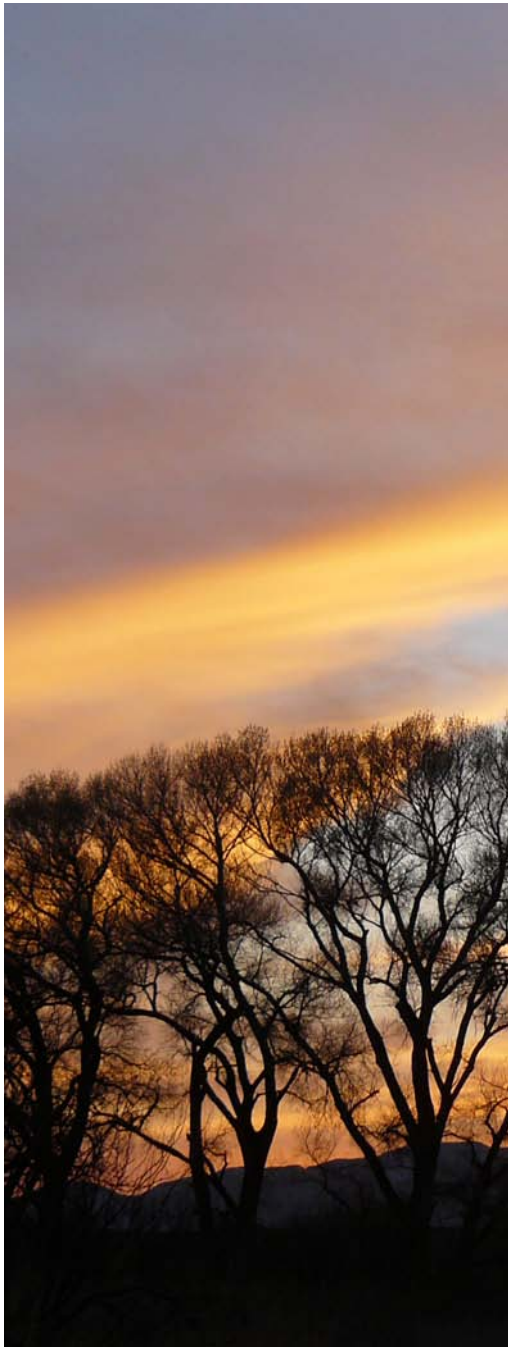
Tax and Incentives. (2010). Retrieved April 10, 2010, from Albuquerque, City of: http://www.abq.org/regional/tax.html#business

U.S. Census. (2000). Retrieved March 2010, from Table DP-1. Profile of General Demographic Characteristics: 2000 Geographic area: Albuquerque, NM MSA: http://censtats.census.gov/data/NM/390350200.pdf

U.S. Census Bureau. (2008). American FactFinder. Retrieved April 2010, from Tucson, AZ Metropolitan Statistical Area: http://www.census.gov/acs/www/

Villani, J. (February 2000). Urban Land - February 2000 - Feature.

APPENDICES



B: Species list

While important for certain areas of this plan, particularly the riparian restoration and open space areas on the west side, the historical/current wildlife and vegetation list did not fit into the structure of the analysis chapter. The full list is provided here for reference.

Downtown Tucson is home to some species native to the Sonoran Desert that have gained significant recognition, including the red tailed hawk, Harris' hawk, Cooper's hawk, and great horned owl. The American kestrel, merlin, peregrine falcon, and prairie falcon can also be found in this region during the cooler months.

HISTORICAL CONDITIONS (SANTA CRUZ RIVER)

Flora

- Fremont Cottonwood
- Gooding Willow
- Mesquite
- Netleaf hackberry
- elderberry
- seepwillow
- acacia

Wildlife

- bobcat
- mule deer
- javelina
- gila chub
- gila topminnow
- Mexican garter snake
- leopard frog
- beaver
- American kestrel
- Harris' hawk
- great blue heron
- peregrine falcon
- Swainson's hawk
- merlin
- prairie falcon

HISTORICAL CONDITIONS (NON SANTA CRUZ DOWNTOWN)

Flora

- Ironwood
- Triangle–leaf bursage
- Bush muhly
- Creosote
- Desert marigold
- Desert zinnia
- Fluffgrass
- Whitethorn
- Prickly pear
- Cholla
- Pima pappus grass
- Honey mesquite
- Sideoats grama
- Black grama
- Wolfberry
- Giant sacaton
- Soaptree yucca
- Little leaf paloverde
- Blue paloverde

Fauna

- Coyote
- Javelina
- Mule deer
- Bobcat
- Diamond back rattlesnake
- Gopher snake
- Couch's spadefoot toad
- Sonoran Desert toad
- Swainson's hawk

CURRENT CONDITIONS (SANTA CRUZ AND DOWN-TOWN)

Flora

- Mesquite
- Paloverde
- Pine
- African Sumac
- Date palms
- Olive
- Saguaro
- Yucca spp
- Santa rita prickly pear
- Columnar
- Golden barrel
- Blue paloverde
- Honey mesquite
- Bottletree
- Mexican palm
- Indian rosewood
- Honey mesquite

Fauna

- Coyotes (urban)
- Cooper's Hawk (urban)
- Pigeons (urban)
- Gray-horned owls (urban)
- Red-tailed hawk (Santa Cruz flats)
- Feral cats (urban)
- Western burrowing owl
- Swainson's hawk*

SPECIES OF CONCERN IN AREA

- Lowland leopard frog
- Aberts towhee (Santa Cruz)
- Bells vireo
- Pygmy owl
- Southwestern willow flycatcher
- Swainson's hawk
- Western burrowing owl
- Arizona shrew
- California leaf-nosed bat
- Lesser long-nosed bat
- Pale townsends big eared bat
- Western yellow bat
- Acuna cactus
- Tumamoc globeberry
- Giant spotted whiptail
- Mexican garter snake
- Tucson shovel nosed snake

SPECIES OF THE SANTA CRUZ (HISTORICAL)

- Gila topminnow (endangered)
- Gila chub (proposed endangered)

C: Citations

In the course of this project we have referred to or cited a number of text resources. We have also included in the book certain images which we have not created ourselves, mainly to graphically illustrate what works in other places and might prove to be helpful models for Tucson. Text and image sources are presented together in sequential order for ease of reference.

INTRODUCTION: 7-9

Images this section:

7: De Grazia Gallery: http://www.u.arizona.edu/~alotto/Sarah%20Webpage/DeGrazia%20Mission.JPG;
Fox Theater: http://onethousandthingstodo.com/post_images/tucson/2008/12/dsc011402.jpg;
8: Barrio house http://www.u.arizona.edu/~bsmith/barrio2.jpg; Skyline: Lisa Lennon/Tejido Group
9: St Augustine's Cathedral: http://upload.wikimedia.org/wikipedia/commons/5/53/St._Augustine_Cathedral,_Tucson,_Arizona_(3440267859).jpg;
Saguaro flowers: http://www.edupic.net/Images/Plants/saguaro_flowers494.JPG;
Barrio Festival: Emily Yetman/Tejido Group.

HISTORY: 15-16

Text sources this section:

http://www.pagnet.org/RegionalData/Population/
http://www.census.gov/
http://rfcd.pima.gov/projects/arroyochico/
Gomez-Novy, J., and S. Polyzoides. 2003. "A Tale of Two Cities: The Failed Urban Renewal of Downtown Tucson in the Twentieth Century." *Journal of the Southwest.* 45: 87-120.
Powell, B.F. 2010. "Climate Change and Natural Resources in Pima County: Anticipated Effects and Management Challenges." Report to the Pima County Board of Supervisors, Tucson, AZ. 1 – 30.
"Historic Summary of Pima County." 2001. Report to the Pima County Board of Supervisors, Tucson, AZ. 2 – 17.
O'Mack, Scott and Rebeccas S. Toupal. 2000. "Cultural Landscapes of History in Southern Arizona." Pima County Sonoran Desert Conservation Plan. 8 – 81.

Images this section:

15: Owls: http://www.wildlifenorthamerica.com/ylang/it/Bird/Great-Horned-Owl/Bubo/virginianus.html; Beaver: http://dnr.state.il.us/orc/wildlife/virtual_news/images/beaver/beaver_looking_camera.jpg; Cooper's hawk: http://www.stanislausbirds.org/Photos/images/coopers-hawk.jpg
16: Historic Santa Cruz photos: http://www.geo.arizona.edu/Tucson/image_archive/historic/historic.html
Tucson historic morphology images: Gomez-Novy, J., and S. Polyzoides as cited above. Images: Figure grounds in chronological order: pgs. 96, 100, 106, 108.

PRECEDENTS: 17-25

17: Plan: Poster Frost Associates (under subcontract to HDR, Inc., with Wheat Scharf Associates, Landscape Architects). 2009. "Downtown Links: Land Use and Urban Design Plan." Streetscape: Commarts.
18: Commarts. 2010. " Congress St. Concept Design: Commarts Design for the City of Tucson, Arizona." 1-41. Images p. 19, 22, 7, 10, 14, 25, 29, 16
19: Regional Transit Authority and Tucson Department of Transportation. 2004. " Tucson Modern Streetcar: Mercado District to University Health Science Center." 1-4. Images p. 1, 2.
Taunton, Matthew. "Tucson Planning Modern Streetcar Line" TransitLine, February 2008: 13-15. Image p. 14.
20: The Drachman Institute, University of Arizona. 2005. "The El Paso & Southwestern Greenway Master Plan." Images, this document: Plan overview (upper center), plan detail (lower right), rendering (upper right.)
Images: abandoned tracks and EP & S depot building: Lisa Lennon/Tejido Group.
21: Poster Frost Associates (under subcontract to HDR, Inc., with Wheat Scharf Associates, Landscape Architects). 2009. "Downtown Links: Land Use and Urban Design Plan." i-77. Images: i, 44, 55, 73.
22: Moule & Polyzoides Architects and Urbanists, et al. 2004. " Master Plan for Mercado Neighborhood, Rio Nuevo, Tucson AZ." 1-81. Image: 10.
Images: Tucson Origins Park: City of Tucson Rio Nuevo Master Planning document.
Conference center hotel rendering: http://azbigmedia.com/sites/default/files/azre/2009/sept-oct/tucson_convention_center.jpg
Scott Avenue rendering: http://wheatscharf.com/files/Scott-Ave-Perspective.jpg
23: City of Tucson. 2006. "Resolution 20487: Relating to Development; Establishment of the Downtown Infill Incentive District; and Declaring an Emergency." 1-16. Images, this document: Downtown Area Infill Incentive District map (Attachment A, 5); Downtown Commercial Vacancy (Figure 1.a, 10); Housing Built before 1940 as a Percentage of Total Housing Units (Figure 1.c, 12); Condition: Metro Area vs. Infill Incentive Zone (Figure 1.e, 14.)
24: Poster-Frost Associates, and Wheat-Scharf. 2004. "Tucson Historic Warehouse Arts District Master Plan." 1-27. Images: General Study area, 2; Master Plan overview, 14; Infill and Streetscape, 27.
25: University of Arizona. 2009. "The University of Arizona Comprehensive Campus Plan Update." 1-50. Images: map, 22.
Images: Walgreens building (L): http://media.photobucket.com/image/downtown%20tucson,%20walgreens/kaneui/Walgreens-today.jpg

EXISTING CONDITIONS: 27-41

Existing land use data in this chapter courtesy of Pima County GIS Library. Shape file: pararegion.shp
All photos this section by Tejido Group, except 37: Flooded Santa Cruz river, http://www.arizona-vacation-planner.com/images/drs-coverpass.jpg

INTERVIEWS: 43-45

Image: 43: Ice House Lofts: Tejido Group.

CASE STUDIES: 49-64

49:Title page: Images: Albuquerque (upper): Bressi, Todd W. 2000. “The Promise of New Urbanism - Urbanism Downtown: Strategies for Albuquerque and Milwaukee”. Places. 13 (2): 32
Chattanooga aquarium (lower): http://www.frbatlanta.org/publica/econ_south/1999/q3/Aquarium
50: Albuquerque, NM.
Text: Gupta, Prema Katari, and Kathryn Terzano. 2008. *Creating great town centers and urban villages.* Washington, DC: Urban Land Institute.
Images: KiMo Theater (upper center): http://www.virtualalbuquerque.com/VirtualABQ/KimoTheater/
NM RailRunner in station (center): http://www.nmrailrunner.com/news_older_releases.asp
Building (lower center): http://www.toddwilliamsarchitects.com/PROJECTS.htm
Downtown Albuquerque logo (upper right): http://abqdna.com/
51: Denver:
Text: Hahn, Brad, Joe Shoffner, and Paul Workman. *Revitalizing Downtown Denver.*
Erickson, Donna. 2006. *Metro Green.* Washington: Island Press.
Images: Renderings (2): http://www.denverinfill.com.
Denver skyline: http://www.law.du.edu/library/LITA2007/images/denverskyline.
Night view: http://www.downtowndenver.com/DNN/Portals/0/BID%20at%20Night.jpg
52: Chattanooga:
Text: “Chattanooga’s Adventure in Revitalization” http://www.co-intelligence.org/S-Chattanooga.html.
Images: Fountain (upper center) http://www.chattanooga-charm.com;
Aquarium (lower center) http://www.travelwatch.com/;
Bird’s eye view of downtown (upper right) http://www.waterfrontcenter.org/Awards/Images/Chatanooga21;
Crowd from above (center right) tncommunities.holrob.com
53: Santana Row, San Jose, CA:
Text and images: Gupta, Prema Katari, and Kathryn Terzano. 2008. *Creating great town centers and urban villages.* Washington, DC: Urban Land Institute.
54: West Philadelphia, PA:
Text: *New urbanism: comprehensive report & best practices guide.* 2003. Ithaca, N.Y.: New Urban Pub.
Images: Domus housing: http://i227.photobucket.com/albums/dd289/edcobec/projects/Domus1.jpg
Student housing rendering (upper center): http://www.newswise.com/articles/view/559669?print-article
Mixed use housing (center) http://www.domuspa.com/
Theater rendering (bottom center): http://www.worldcafelive.com/
55: Shibam:
Text: http://www.gtz.de/en/praxis/6296.htm
http://www.shibam-udp.org/udp/index.php
Aga Khan Award for Architecture (Organization). *Intervention Architecture: Building for Change.* London: I.B. Tauris & Co Ltd, 2007.
Varanda, Fernando. 1984. “Shibam.” In *Development and Urban Metamorphosis*; V. 2: Background Papers. Ahmet Evin (ed). Singapore: Concept Media/The Aga Khan Award for Architecture.
Images: http://whc.unesco.org/en/list/192;
http://www.shibam-udp.org/
56: SE False Creek:
Text: City of Vancouver. 2007. “Southeast False Creek: Official Development Plan.” 1-52. Images: Functional diagrams p 8, 9.)
Holland Barrs Planning Group, Inc. with Lees + Associates, and Sustainability Ventures Group. 2002. “Southeast False Creek: Urban Agriculture Strategy.” 1-207.
Holland Barrs Planning Group, Inc. “Designing Urban Agriculture Opportunities for Southeast False Creek.”
Images: Aerial Photo of SEFC Site with boundary: www.city.vancouver.bc.ca
Plan view: http://vancouver.ca/olympicvillage/about.htm [Accessed 1/30/2010 4:50:31 PM]
Urban Agriculture-Production options section, Holland Barrs Urban Agriculture strategy document as cited above: 51
57: The Beltline. Text and images:
Alex Garvin & Associates, Inc. for The Trust for Public Land. 2004. “The Beltline Emerald Necklace: Atlanta’s New Public Realm.” 1-141.
http://www.beltline.org/; http://www.atlantada.com/media/beltline_final.pdf
58: The High Line. Text and images: The Friends of the High Line website: http://www.thehighline.org/
59: CPULs.
Başer, Bahar, and Ayşe Sema Kubat. “A New Landscape Design Strategy for Creating Continuous, Perceptible and Productive Urban Green: a case study of Kadıköy - İstanbul.” Proceedings, 6th International Space Syntax Symposium, İstanbul, 2007. (2007): 114-01 - 114-08.
Viljoen, Andre, Katrin Bohn, Joe Howe. 2005. *Continuous Productive Urban Landscapes: Designing Urban Agriculture for Sustainable Cities.* Oxford, UK: Architectural Press
Images: All from Viljoen book: Perspective, 255; Diagrams, 13; Map, 252.
60: Sabine-Bagby:
Text:
Jost, Daniel, ASLA. “Under the Interstate”. *Landscape Architecture Magazine*. (October 2009). 78-89.
Lockwood, Charles. “Bagby-to-Sabine, A New Beginning” . *Urban Land Magazine.* (October 2006). p. 110-113
Snyder, Mike. “Bridging the City and Nature-Beautifying Buffalo Bayou,” *Houston Chronicle*, June 4, 2006.
Viani, Lisa Owens. “Houston, We Have a Solution—Putting the Bayou Back in Bayou,” *Landscape Architecture Magazine* (February

2004). p. 24-34
Urban Land Institute. 2008. "Sabine-to-Bagby Promenade" *ULI Development Case Studies*. http://casestudies.uli.org/
Thompson Design Group, Inc. /EcoPlan. "Buffalo Bayou & Beyond—Visions, Strategies, Actions for the 21st Century." Prepared for Buffalo Bayou Partnership, City of Houston, Harris County, Harris County Flood Control District
Images: Flood (bottom center): Houston Chronicle.
Bike on bridge (center): Tom Fox, SWA Group.
Plan (upper right): http://www.asla.org/2009awards/104.html
61: Fez: Text and images: http://www.holcimfoundation.org/T856/A08AMgo.htm
62: Menomenee River Valley: Text and images: http://www.wenkla.com/
63: Canalscape: Text and images:
Ellin, Nan, (ed.) 2009. "Canalscape: An authentic and sustainable desert urbanism for Metro Phoenix." 1-50. Image: map p.8. proposed/existing p 10-11.
64: Rosslyn-Ballston.
Text: Dittmar, Hank & Gloria Ohland. 2004. *The New Transit Town.* Washington and Covelo: Island Press.
"Arlington General Land Use Plan." Amended through April 2004, Prepared by Fairfax County DPZ, September 2005 Images: Map p.1. http://www.fairfaxcounty.gov/dpz/tysonscorner/nofind/arlingdoc.pdf
"Rosslyn-Ballston Corridor, RETAIL ACTION PLAN, Arlington County, Virginia." http://www.arlingtonvirginiausa.com/docs/retail_action_plan.pdf
Images: Apartment buildings in Ballston (center): http://upload.wikimedia.org/wikipedia/commons/5/53/Ballston4355454.jpg;
Bird's eye with density lines (bottom center): http://www.vatransit.com/practices/task3.htm

LITERATURE REVIEW: 65-75

65: Title page. Image: Golany, Gideon. 1983. *Design for Arid Regions.* New York: Van Nostrand Reinhold.
66: Landscape urbanism.
Text: Waldheim, Charles. 2006. *The landscape urbanism reader.* New York: Princeton Architectural Press.
Images: Birds eye of campus (lower left): http://ase.tufts.edu/uep/blogs/post/2008/11/Going-Green-While-Seeing-Red.aspx
Urban swale (center right) http://www.land8lounge.com/profiles/profile/show?id=JasonKing
Birds eye view, Chicago City Hall Green Roof (center) http://ase.tufts.edu/uep/blogs/post/2008/11/Going-Green-While-Seeing-Red.aspx
Water park (upper right): http://www.dnrec.delaware.gov/GI/Pages/WhyNeedGI.aspx
Types of green infrastructure (lower center) http://1.bp.blogspot.com/_Ymx9e66vrGc/R6aVz-TtQ3I/AAAAAAAAAXg/bgFl169XLJM/s400/Pages+from+gi_action_strategy.jpg
Green infrastructure diagram (upper center) http://hpigreen.com/tag/green-street/
67: New urbanism.
Text: Congress for the New Urbanism official website: www.cnu.org
Images:Katz, Peter, et al. 1994. *The new urbanism : toward an architecture of community.* New York : McGraw-Hill
68: Urban open space.
Text: Francis, Mark. 2003. *Urban Open Space: Designing for User Needs.* Washington: Island Press.
Images: Bryant Park (upper center): http://casinader.files.wordpress.com/2009/06/bryant-park.jpg;
Outdoor movie (center): http://www.popcornreel.com/jpgimg/bpark11ab.jpg;
La Placita (bottom center) and Echo Park (upper right): Tejido Group.
69: Green street design:
Text and images:
Girling, Cynthia and Ronald Kellett. 2005. *Skinny Streets & Green Neighborhoods: Design for Environment and Community.* Washington: Island Press.
Jacobs, Allan B. 1993. *Great Streets.* Cambridge, MA: MIT Press.
70: Urban design for arid climates: Golany, Gideon. 1983. *Design for Arid Regions.* New York: Van Nostrand Reinhold.
71: Urban morphologies.
Text and images:
Gomez-Novy, J., and S. Polyzoides. 2003. "A Tale of Two Cities: The Failed Urban Renewal of Downtown Tucson in the Twentieth Century." *Journal of the Southwest.* 45: 87-120.
http://en.wikipedia.org/wiki/Urban_morphology
http://en.wikipedia.org/wiki/Figure-ground_in_map_design
Images: http://designnotes.info/?p=1242
72: LEED ND.
Text and images:
Congress for New Urbanism, Natural Resources Defense Council and the U.S. Green Building Council. 2007. "Pilot Version: LEED for Neighborhood Development Rating System."1-155.
Images: Walkable street in Back Bay, Boston (upper center) http://blogs.nationaltrust.org/preservationnation/wpcontent/uploads/2008/11/2008_0313image0110.jpg;
Smart Location (center): Karen Connor: http://blogs.nationaltrust.org/preservationnation/wp-content/uploads/2008/11/sll-graphic-page-6.jpg;
Toronto Development—LEED Gold (upper right): http://shalinisookar.files.wordpress.com/2009/12/parkside-aerial-view.jpg;
73: SSI.
Text and images:
American Society of Landscape Architects, Lady Bird Johnson Wildflower Center at The University of Texas at Austin and the United States Botanic Garden. 2009. "The Sustainable Sites Initiative: The Case for Sustainable Landscapes." 1-52. Images: 3 circles: p 10; Logo: cover; Ecosystem services p32, runoff curves p 15. Accessible at www.sustainablesites.org

Images: Sidwell Friends School, (Andropogon Associates) http://www.sustainablesites.org/cases/enlarge.php?id=27&image=1;
74: Affordable housing
Text: City of Tucson Community Services Department. 2004. "Affordable Housing in Downtown Tucson." 1-15.
Center for Neighborhood Technology for the Drachman Institute. 2009. "Housing + Transportation Affordability in Tucson Metropolitan Area, Pima County, and Pinal County."1-36.
Davis, Sam. *The Architecture of Affordable Housing.* 1995. University of California Press.
Marin Environmental Housing Collaborative. 2007. "Affordable Housing Finance Basics."
Myerson, Deborah, Michael Etienne and George Kelly. 2007. *The Business of Affordable Housing: Ten Developers' Perspectives.* ULI-The Urban Land Institute.
North Carolina Housing Collaborative. 2009. "Affordable Housing Primer." 1-122. www.nchousing.org
Tarnay, Stella for ULI-Urban Land Institute. "Erie Ellington Homes." Development Case Studies 33(13), July-September 2003: 1-9. http://casestudies.uli.org/CSFrameset.aspx?i=C033013, accessed 1/25/2010 3:59:39 PM Image: project plan p. 2.
Takesuye, David for ULI-Urban Land Institute. "Renaissance Plaza." Development Case Studies 33(10), April-June 2003 : 1-8. http://casestudies.uli.org/CSFrameset.aspx?i=C033010, accessed 1/25/2010 4:19:46 PM. Images: exterior view, p. 1.
Images: MLK Section: http://www.lloydconstruction.com/images/portfolio/government/mlk1.jpg
MLK Renders: http://dot.tucsonaz.gov/projects/pictures/50.jpg;
75: City Comforts
Text and images: Sucher, David, and Kevin Kane. 1995. *City comforts: how to build an urban village.* Seattle: City Comforts Press.
Images: All line drawings from Sucher and Kane.
Photos: Gupta, Prema Katari, and Kathryn Terzano. *Creating great town centers and urban villages.* 2008. Washington, DC: Urban Land Institute.
Except: "Overlap transport and shops" image: Tucson Railroad Depot, Tucson, Arizona by thornydalemapco http://www.flickr.com/people/10461908@N03/

MASTER PLAN: 79-93

All citations this chapter are for images only.
83: All images by Tejido Group
84: TCC: http://www.tucsonshow.com/reports/tucson2000/images/Mvc-069f.jpg
85: Cistern: http://www.vastbluesky.com/wp-content/uploads/2009/06/oct202820048.jpg
Desert botanical garden: http://upload.wikimedia.org/wikipedia/commons/c/c2/Huntington_Desert_Garden_Cactus_(etc).jpg
87: Pennington parking garage & Poca Cosa: Tejido Group.
88: Montreal rubber-tired Metro: http://en.wikipedia.org/wiki/File:MontrealMetro7035.JPG
89: Renfe AVE train: http://www.spanish-rail.co.uk/media/images/AVE/AVE103a.JPG
Boarding the Rail Runner (upper right): http://www.lightrailnow.org/news/n_abq_2006-07a.htm;
Rail Runner in highway median (2): http://www.nmrailrunner.com/
91: Skate park: http://santaclaritacitybriefs.files.wordpress.com/2009/02/skatepark-construction.jpg;
Dog park: http://phoenixwaterfronttalk.com/files/2009/04/cosmo-dog-park-300x194.jpg;
Paley Park (pocket park): http://www.pps.org/graphics/gpp/nyc_Paley_park_nyc_large;
92: Scott Avenue improvements: Tejido Group.
93: Cheonggyecheon Stream, Seoul. http://dianhasan.files.wordpress.com/2009/10/seoul-cheonggyecheon-11.jpg
Typical mixed-use path: http://www.hmhca.com/images/projects/parks/embarc.jpg

FOCUS AREAS: 94-125

All content this chapter by Tejido Group, except the following images
96:High tech green R & D: http://www.chee.arizona.edu/research/images/semiconductor.jpg
Manufactured housing: http://channel.nationalgeographic.com/series/man-made/2805/Photos#tab-Photos/0
Shade from a solad grid: http://img.archiexpo.com/images_ae/photo-g/transparent-membrane-cable-tensile-structure-157945.jpg
Green industry: http://cache4.asset-cache.net/xc/EB0035-002.jpg?v=1&c=IWSAsset&k=2&d=F5B5107058D53DF5406C33C3D5383FF6EE89A859FC95EBB673C9B99789E4BDE6E30A760B0D811297
Commercial date grove/industry: momoy.com
111: Bridge over wash: http://www.gvalley.com/municipal_infrastructure.html
Greenway bridge: http://www.movingtoeugene.net/wp-content/images/WBankBikePath/GreenwayBridge1.jpg
Bridge over multi-use path: http://k43.pbase.com/g4/80/372780/2/62361242.VKLKsg7p.jpg

APPENDICES: 127-139

A: Eller College
Text: All citations follow the main body of the report text within the appendix.
Image:129: Overview of Tucson: http://ecobarons.files.wordpress.com/2009/03/tucson.jpg
B: Species list
Text: http://www.santacruzheritage.org/bird-habitats
http://wc.pima.edu/Bfiero/tucsonecology/animals/animals_home.htm
http://www.arizonensis.org/sonoran/fieldguide/
http://www.usbr.gov/lc/phoenix/biology/azfish/statustable1.html
Image:133: Cottonwoods: Wick Prichard
C: Citations:
Image:135: Black and white review: Tejido Group