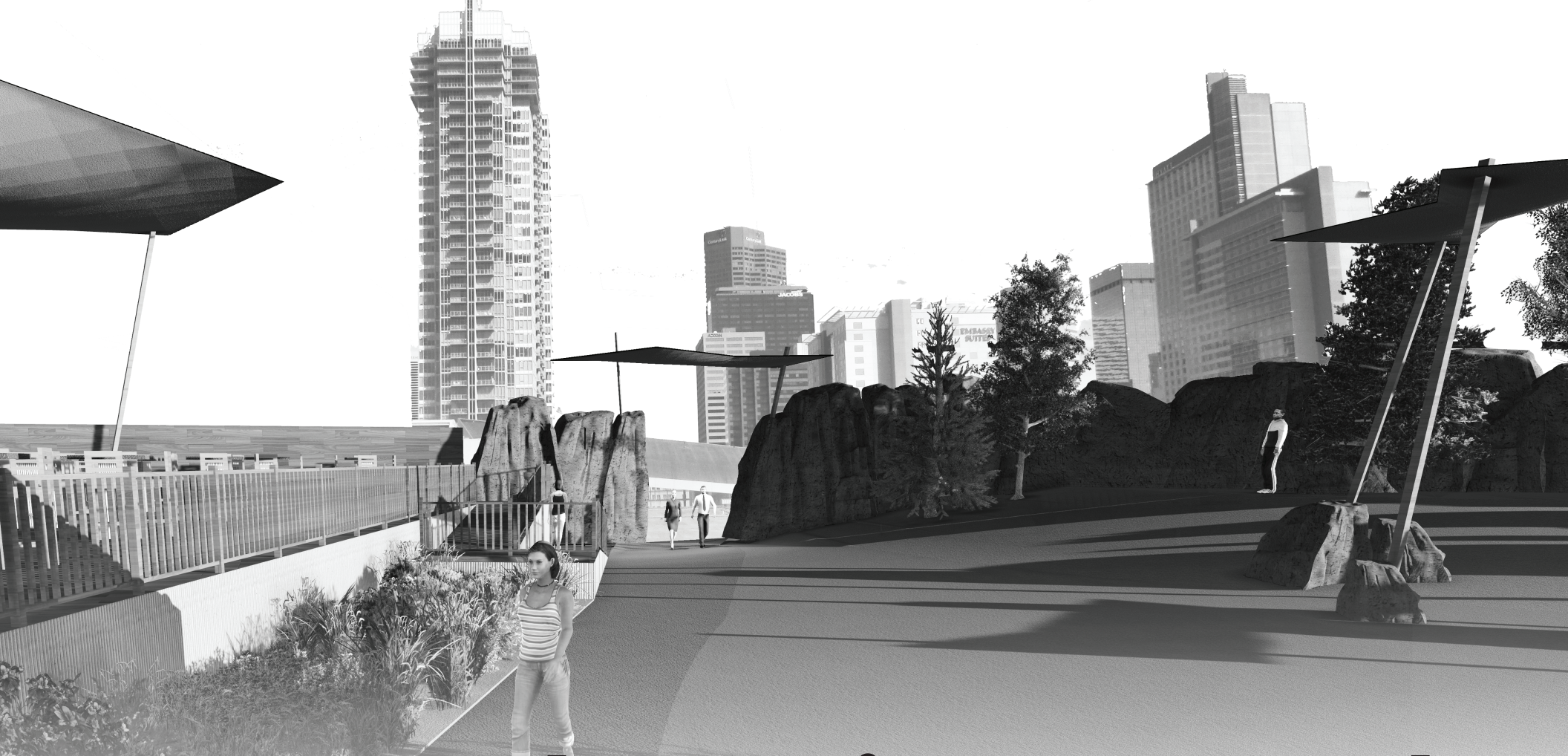

.parks reinvented

an elevated park in an urban setting
.denver co

.amanda ahrenholz
.department of architecture and landscape architecture
.north dakota state university
.advisor: matthew kirkwood
.spring 2014

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degree in bachelor of landscape architecture

for the department of architecture and landscape architecture

submitted may 9th, 2014

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an elevated park in an urban setting
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a design thesis submitted to the
department of architecture and landscape architecture
of north dakota state university

by .amanda ahrenholz

in partial fulfillment of the requirements
for the degree of
bachelor of landscape architecture

primary thesis advisor

secondary thesis advisor

may 2014
fargo, north dakota

.contents

.abstract

This urban park project is centered on user interaction with the site, as well as how green spaces are integrated into urban settings, specifically utilizing rooftop spaces.

Bringing an elevated park to downtown Denver interests me because the residents of Denver are very active people. With urban populations being dense spaces and with limited room to save for green space, using what space we have available is crucial. The space we have is atop existing buildings and with using the rooftops of these buildings; we can create a whole new type of park system that is still connected with parks outside of the direct urban areas.

.chapter 1

.project typology

urban, park system, elevated, physical activity, recreation

Introducing an elevated park system to the city of Denver improves the residents' and users' quality of life, promoting a more connected and active lifestyle in the urban setting of downtown Denver, CO. Utilizing and reconstructing Denver's existing park system and with the integration of elevated parks allows for more green space in the urban environment, gives the residents more options to be active in an urban setting, as well as improves air quality through vegetation in densely populated urban areas. In this park, users can interact with the landscape and take in views of mountainous Colorado among other things.

Denver was recently ranked by Men's Health Magazine as number nine in the Top Ten Active Cities in America. (Roberson, 2011). This shows that there is a market of active people that are already using the existing park system.

.introduction

Throughout my education at North Dakota State University, I have had exposure to many different aspects of Environmental Design and Landscape Architecture. In discovering my true passions in the field, I have become interested in projects that focus on urban design, planning and how people interact with the landscape.

Exploring the possibility of introducing an elevated park system that focuses on views in the city of Denver can open possibilities to how we as landscape architects and environmental designers can alter urban park systems in other cities.

The research in this thesis adds to the field of landscape architecture, architecture, the future of parks, urban design, policies and planning and enhances how parks have an influence on overall city culture.

Transportation and accessibility play a major role in a park's success.

Throughout this thesis, the term success is used. Success means that an achievement was reached or a gaol was met with satisfaction, particularly referring to parks being utilized by many people.

.site information, opportunities and challenges

v
The density of buildings in the downtown Denver area also gives opportunity to build on top of buildings, rather than alongside or in front of them.

Denver is making efforts to reduce their footprint by introducing “Greenprint Denver” to the city. “Greenprint Denver” has a unified goal of “building a sustainable city together, today.” (“Greenprint Denver,” 2009). Introducing more parks into the Denver area is a part of “Greenprint Denver” and help improve air and emissions quality and rate. The Greenprint Denver website states that it will provide “support for growth patterns that de-emphasize reliance on cars.” The introduction of a more connected park system can be a part of this growth that reduces reliance on vehicular transportation. Giving the option of connections through trails and bike paths through the city will aid in these efforts. (“Air and Emissions,” 2009).

“The Greenprint Denver initiative aims to connect people with nature and promote biodiversity within the city.” (“Greenprint Denver,” 2009)

.criteria

- access to mountain views and views of amenities
  - feeding off of the culture of Colorado, people like to take time to enjoy the beautiful views that the state has to offer
- the building(s) are in an urban area
  - building up, not out. utilizing rooftop spaces is an opportunity to introduce more green space into the urban environment
- have visual connections or flow to other existing urban parks
  - with visual connections to other parks,
- have public access to the rooftops of buildings
  - users will have public and full access to the rooftop site so it is easily used
- the building is not smaller than 10,000 square feet
- parks or proposed park sites are closer than 1 square mile from each other
  - this allows walkable times from park to park
- a city with an existing park system
  - the Denver park system is currently utilized, will aid in success of this park
- a building with a load weight over 350 PSF
  - the building can sustain the weight of the plant life and activity on the rooftop

- will have year round seasonal uses
  - allowing for a more utilized park. takes into consideration changing seasons and activities in Denver.
- public transportation nearby
  - as stated in the literature reviews, this is crucial in park success. residents of other neighborhoods have access to the park
- a building surrounded by both mixed use and office buildings
  - different demographics have an impact on park use and peak times
- visual connections to other surrounding buildings
  - ensuring you can see other rooftops and ammenities in the surrounding area
- an area with existing heavy pedestrian circulation
  - more pedestrian traffic indicates more park visitors
- the building is taller than 5 stories high
  - allows visual access and connections to surrounding buildings
- park use and physical activity
  - how visitors interact with their suroundings
- area with poor urban air quality
  - urban parks help reduce carbon emissions with use of vegetation

image courtesy of RockyMountainMagazine.com

.literature reviews

Park Use and Physical Activity

Recent studies suggest that the built environment has an impact on physical activity. (McCormack, 2010). In a study from March 2010, characteristics of urban parks and their association of physical activity and park use were evaluated. The study found qualities of parks such as playground equipment, shade, garbage cans, signage, natural settings, access to public transportation, proper maintenance, a sense of fresh air, grass, even ground and safety of parks to have a positive impact on how often a park is used and conversely, how users benefit from the parks. The study showed that users of parks that had these qualities had a positive effect. The users had reduced anxiety, healthy weight, improved mental health and that park users reached a recommended level of physical activity.

The study also explained how neighborhoods have an effect on users' physical activity. Mixed-use land, pedestrian connections and interesting scenery proved to be important as to whether participants used the parks.

Taking inventory of these qualities will help me in further developing what makes a park useable and successful to its users. Choosing a site that is accessible to public transportation, is within a walkable proximity or on the way to different amenities around the city of Denver, is most suitable. One thing this study has also brought to attention is the maintenance of the park. A participant in the study said "…You do not need more, you just need nice. Just fix it up." (McCormack, 2010, p. 716). Keeping the park properly maintained throughout the course of the life of the park will be crucial to the ending success in the use of the park.

Vegetation and Air Quality in Urban Areas

Air quality can be improved by implementation of vegetation into urban parks. This was demonstrated in a study conducted in March 2011. (Yin, 2011). In this study, researchers used trees and crown cover to exhibit trees' ability to remove pollutants from the air in urban settings. There were six parks that were selected for review in this study and all of them had at least 80% vegetation cover and were all surrounded by traffic roads. They also identified three air pollutants to be total suspended particles (TSP), sulfur dioxide (SO2), and nitrogen dioxide (NO2). The results of this study showed that vegetation successfully removed "9.1% of TSP, 5.3% of SO2 and 2.6% of NO2." (Yin, 2011).

This evidence supports that this thesis cannot only help the users of the park become more active and promote a healthy lifestyle, but that urban vegetation helps improve air quality within areas that vegetation is implemented.

Year Round Parks

In 2007, Denver Parks and Recreation reached out to form a partnership with Winter Park, a mountain ski resort. Their goal was to “bring the thrill of winter sports to an urban setting.” (“Rethinking its Urban Parks,” 2011). The Parks and Recreation department wanted to know how they could improve their urban parks by incorporating their enjoyable winter activities. The outcome of their study and survey conducted to the residents and businesses about what they would like to see brought to downtown Denver, showed that an ice rink was one of the top ideas.

Showing that the city of Denver is interested in implementing year round parks into their urban setting shows an opportunity for the elevated park system to do the same. Capitalizing on Denver’s beautiful winters within this new park system will bring residents and visitors of Denver a full range of activities, even when the cold weather starts to set in.

.research questions and hypothesis

.how can a connected, elevated park system give visitors and residents of Denver a better quality of life?

.what aspects of a park encourage people to use them?

.how can you measure the use within a park?

.how can you measure what elements and qualities make a park successful?

.how park systems and park use benefit a city’s culture?

.how can park systems aid in the future plans of the city to reduce their ecofootprint?

.does accessibility and transportation affect the use of the site?

.can a city’s culture be affected by park systems and how does that relate to the success of parks?

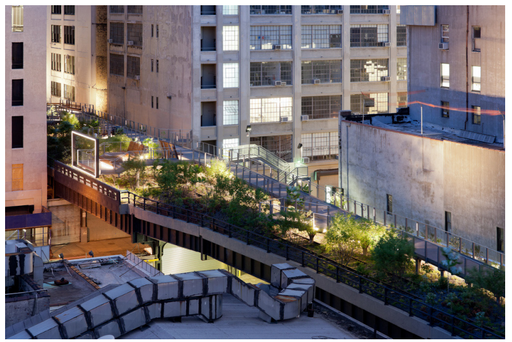
.hypothesis: Park systems and green space can have a positive effect on users’ levels of physical activity, city culture and a city’s ecofootprint.

.case studies

location: New York City, New York
year: 2009
size: 1.45 miles long
client: City of New York
designers: Landscape Architecture firm James Corner Field Operations, architecture firm Diller Scofidio + Renfro and planting designer Piet Oudolf
consultants: many experts in horticulture, engineering, lighting, public art, cost estimating, maintenance planning and security.

James Corner Field Operations served as the project lead and the principal-in-charge. He was assisted by lead project designers Lisa Tziona Switkin and Nahyun Hwang. The architectural firm that was involved in the design was Diller Scofidio + Renfro, lead by project designer Matthew Johnson and assisted by six project team members. The two firms also consulted Buro Happold, a Structural and MEP Engineering company with principal Craig Schwitter and 14 team members. Many other firms were consulted in addition to the main lead teams. Structural Engineering and Historic Preservation firm Robert Silman Associates, lighting experts L'Observatoire International, signage specialists Pentagram Design, Inc., irrigation experts Northern Designs, site remediation and environmental engineers GRB Services, Inc., civil and traffic engineering and zoning and landuse specialists Phllip Habib & Associates, soil scientists Pine & Swallow Associates, Inc., public space management was handled by ETM Associates and water feature engineers CMS Collaborative. There were cost estimating specialists VJ Associates, code consultants Code Consultants Professional Engineers, site surveyors Control Point Associates and expediting experts Municipal Expediting. ("Design Team," 2013).

.the high line



photos courtesy of thehighline.org

There are currently two sections to the High Line, totaling $152.3 million. The third stage of the High Line, the rail yard is in the design stage. There were several organizations and government groups that made the completion and funding for the high line possible. The funding breakdown looks like this: $112.2 million from the City of New York, $20.3 million from the Federal Government, the State of New York contributed $400,000, with the rest of the funds to be provided by Friends of the High Line who have already raised $44 million for costs of completing and maintaining High Line Park. ("The High Line," 2013).

In August of 1999, Joshua David and Robert Hammond co-found "Friends of the High Line," an organization made to save the High Line from demolition. Friends of the High Line, along with involvement from several other organizations, finally saved the disheveled rail line and showed what potential it had to thrive with the city.

Since the completion of High Line park, it is now a place where millions of people go to have picnics, take walks, and read books among other leisure activities. (David & Hammond, 2011). It relates to this project because it is an elevated park system in an urban setting. It is a place for people to go and take a break, above the busy, crowded and sometimes hectic city of New York.

Having been to High Line Park myself, I noted some key things that seemed to draw and keep visitors there. Several people looked out to the waterfront, just gazing at scenery on the river. Many people came there just to visit with a friend, sitting at the various gathering spaces and benches created by the paths. Other people were just strolling, looking at the plantings and patterns of railroad influences that were integrated into the park.

Using the successful High Line Park as a case study brings up several valid points to be considered in this thesis. Having access to the park, both pedestrian and ADA, a definite pathway or options of pathways to wander down. A park should have a theme or several different themes and views to keep users engaged while visiting the site.

High Line park is in an urban area, has public access, access to views and amenities of the city, in a city with an existing park system, has public transportation nearby, surrounded by mixed-use buildings, has visual connections to surrounding buildings, is elevated and promotes park use and physical activity. High Line Park showed that having a walking path along it, attributed to it's success.

transbay transit center

location: San Francisco, California
year: 2017 (projected)
size: 5.4 acres
client: Transbay Transit Center
designers: Pelli Clarke Pelli Architects

The Transbay Transit Center "City Park" will be on top of the new transit center. It is a part of a large plan to bring San Francisco a new transit center, downtown redevelopment plan, park and downtown rail extension. The park is a green roof and has a walking trail, vegetation garden, lily ponds, an amphitheater and stores.

The rooftop is the "heart of Transbay's design." It will include multiple entry points for visitors to have easy access to the park. There is even talk of connecting the rooftop park to other area buildings with bridges or walkways that are perched over the roadways. Providing active and passive uses of the park will allow for spaces for picnicking, reading or even playing catch. The new "City Park" will also explore several different ecologies that are similar to its surrounding ecologies, everything from oak trees to marshes and wetlands. (Pelli Clarke Pelli Architects, 2013).

This project is on track to receive a high "Gold" LEED certification with it's efforts to be sustainable and environmentally friendly. With the new rooftop and building, the Transbay Transit Center, the energy consumption will be up to 25 percent lower than the energy efficiency standards.

This project has a similar idea to this thesis; to make a park atop a roof in the middle of an urban downtown. The Transbay Transit Center website says that the City Park will "reduce the urban heat island effect of the area thus contributing to lower cooling loads…" ("City Park," 2013). This project also demonstrates how we can benefit from rooftop parks. It explains how air quality is improved due to the added vegetation and how the building benefits from the green roof.

According to the San Francisco Planning Department, the Transit Center will be the heart of their new downtown. ("Transit Center District Plan," n.d.). The Transbay Transit Center will be, in my opinion, a model for urban sustainability. With it's rooftop "City Park," the building will lower building operation costs, provide a place for long term visitors to explore ecologies in an urban setting and therefore, based on the findings and model of this case study, an urban park needs access to public transportation, multiple entry points, connections to surrounding buildings, several options for passive and active activities, and explore native ecologies.

Transbay Transit Center proved to connect to criteria of this thesis by having public access, access to views, was in an urban area, has public transportation nearby, being elevated on a rooftop, will be atop a building that is surrounded by mixed use facilities, will have visual connections to surrounding buildings, on a building larger than 10,000 square feet and is in a city with an existing park system. Since the transit center "City Park" is not yet built, it is difficult to know if it will be a success in downtown San Francisco.

image courtesy of pelli clarke pelli architects

.transbay city park

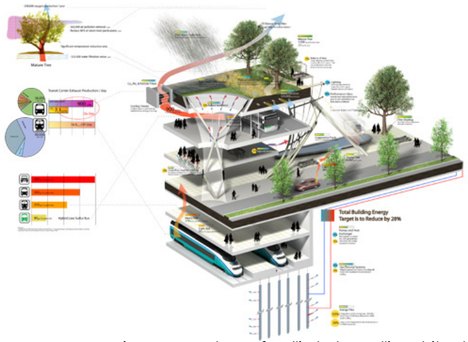


image courtesy of pelli clarke pelli architects

image courtesy of TransbayTransitCenter.org

image courtesy of Future Transport News

.chapter 2

.methodology

Methods used in this thesis include information from case studies, literature reviews, city data such as demographics, weather patterns and averages, existing park information and insight to city culture based on research and experience.

Information from these sources, explanation and discussion help to strengthen research methods and outcomes of this thesis in regards to results and design.

.measures

- demographics
- views
- private/public space
- existing parks and trails
- parking
- public transportation
- uses of other surrounding parks
- existing greenery
- stormwater management

In finding information about Denver's demographics, I will need to look into the latest Census data and contact the city of Denver. I need this information because I need to know what kind of people live in Denver and how old the residents are. Will there be enough people to make this park successful? To make the park successful, there must be a sufficient amount of people to support it as stated in the literature reviews.

To find information about Denver's existing parks, trails, greenery and what the parks are used for, I need to contact the Denver parks department. I need to know this information so I can see what is needed for parks in the area. What makes these other parks successful in the existing park system. How are the parks connected to each other? What activities are being done in these parks?

For information on what views there are from the site, I will visit the site. I need to figure out what views there will be from my site and looking into my site. Who can see it? What will future users be looking at from the park? Views and view connections to the outside expanses as well as the city will be important, as proved in the case study of High Line Park.

Public and private space information will need to be discussed with the city. Google Earth Pro and ArcGIS will also be helpful in finding this information. I need to know what types of buildings are around my site and what they are used for.

To find information on public transportation and parking in Denver, I will contact the department of transportation. Are there buses and bike lanes? How do people get around? How people get to the site and how accessible the site is will be important to the park's success, shown in the literature reviews.

Stormwater management information is important because I need to know what Denver has in place and what I will need to implement being my site will be a rooftop of a building.

.site introduction

city: denver, co
area: downtown

There will essentially be two sites to the thesis. The first part of the site is generalized downtown Denver, serving as the setting for an entire connected park system. This park system will integrate street level parks and connect them to elevated, rooftop parks and allow users to move about them easily.

The second site selection will be what is designed, transforming a rooftop into a useable park. This is what the research and inventory are focused on.

There are two possible sites in downtown Denver that this design could be placed.

The first is located atop the U.S. Department of Health building, about seven blocks southeast of Coors Field at 1961 Stout St, Denver. The building is about six stories high and the area of the rooftop is 34,064 square feet. It is a prospective location because of the surrounding apartment buildings, mixed-use buildings and offices. It is also ideal for this thesis because it has access to views of Coors baseball field, plazas, is within one mile of another park, is in an urban area, is surrounded by several different types of buildings, has a heavy pedestrian circulation count. It is a challenging site because it is a shorter building in height and is a government owned building, so public access may be limited.

.downtown denver

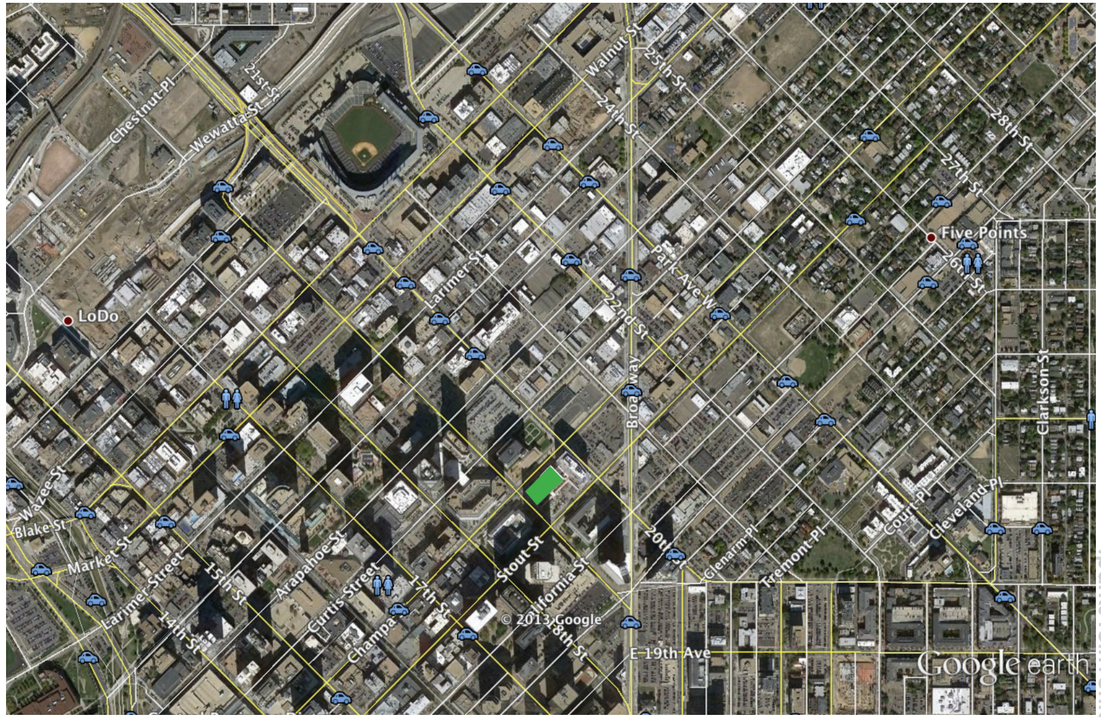


image courtesy of google earth pro

The second site that is a prospective location is atop the Colorado Convention Center at 700 14th St, Denver. The building is about 489 feet tall and the area of the rooftop is 594,057 square feet. The convention center serves as a potential location for this project because it is near several hotels, restaurants, shopping and theatres. Apartment buildings, mixed-use buildings and offices also surround it. The convention center has views of Coors Field, the Rocky Mountains and central downtown. It is within one mile of another park, is in an urban area, is surrounded by several different types of buildings.

The convention center was built in 1990 and renovated and expanded in 2005. With these recent updates, the building would likely be able to sustain the load of what a rooftop park would contain. This site would be a challenge. Is it okay to add onto something that is already an attraction or should it be separate? People who will be using this proposed project would be users of the city of Denver, business professionals on a break from the office, tourists (since it will be a unique attraction to the city), students and families.

.downtown denver

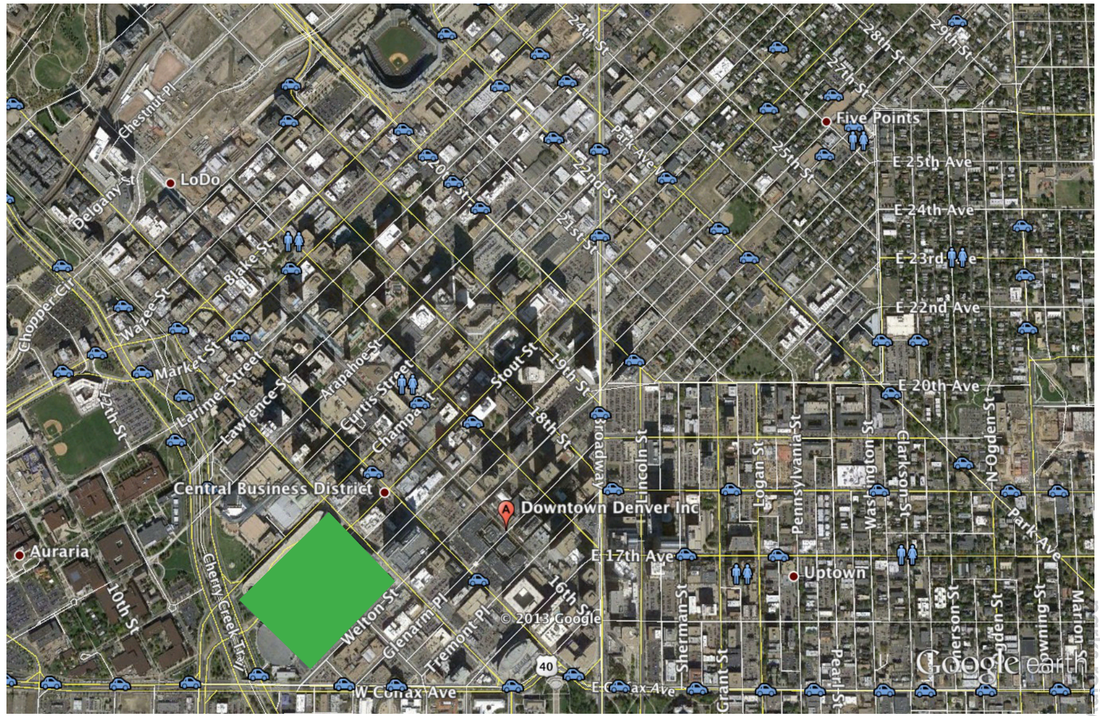


image courtesy of google earth pro

.figure 2.1

criteria	colorado convention center	u.s. department of health
building is in an urban area	yes, downtown	yes, downtown
surrounded by mixed use and office buildings	yes	yes
access to mountain views and views of ammenities	yes	yes
visual connections or flow to existing urban parks	yes, 5 parks	yes, 3 parks
public access to rooftop of building	no	no
building is not smaller than 10,000 square feet	600,000 sq ft	35,000 sq ft
city with an existing park system	yes, denver	yes, denver
will have year round seasonal use	yes, big enough	maybe
nearby public transportation	yes, light rail and bus system	yes, bus system
visual connections to other surrounding buildings	yes	yes
existing heavy pedestrian circulation	yes, tourist attraction	yes, business traffic
building is taller than 5 stories high	yes	yes
ability for park to have use of physical activity	yes, large enough	yes, small scale activity
area with poor urban air quality	yes	yes

chart courtesy of amanda ahrenholz

** big enough meaning there is enough square footage to sustain activity

Taking into consideration the criteria, my preference and comparing both sites in figure 2.1, I chose the Colorado Convention Center rooftop for this thesis site. The Colorado Convention Center is in an urban area, surrounded by mixed use and office buildings, has access to mountain views and views of city amenities. The building is larger than 10,000 square feet, at 600,000 square feet. It is located in Denver, where there is already an existing park system with over 200 city parks, is large enough to sustain both physical activity and year round seasonal use. The Colorado Convention Center is taller than five stories, at approximately 40 stories tall. Additionally, there is heavy pedestrian circulation and a nearby light rail and bus system.

.user/client description

.residents

Residents within the area of this park will have access to it and it's connection to other surrounding parks. They can use this space as a place to escape from the immersion of being in the city. With the views to the mountains that this project proposes, users can use this elevated park as a place to get away and take in the beautiful views of Colorado and the Rockies. (# of residents downtown) Residents would include the elderly, middle aged adults, teenagers and children. Because the Convention Center holds various events that draw different age groups of both residents and visitors, there will be more age groups present. This group requires access, restrooms, public transportation and parking.

.business professionals

Since the Colorado Convention Center is located in the Central Business District of downtown Denver, business professionals who work in the area benefit from this elevated park system. Their peak usage would be during short breaks or lunches during the workday. With this park they have somewhere to eat their lunch or take a breath of fresh air and unwind before continuing on with their day. A recent survey said that over 110,000 people work in downtown Denver. Among these 110,000 people that work downtown Denver are business professionals, retail associates, restaurant servers, school teachers, performing artists and hotel staff. (Brooke, 1998). Business professionals require access, parking, public transportation and restrooms.

.visitors

Visitors will also want to visit this park system because it is one of few. The park will become a main attraction that will give visitors who have a limited time frame, a taste of the Colorado wilderness and views without having to leave the downtown area. (# of visitors/year) There will be ample parking for visitors. Visitors would include tourists visiting for leisure, work related visitors on business trips, long term visitors that are in the city for more than 4 hours and short term visitors that are here for a few hours at a time. This group also requires public transportation, restrooms and access.

.chapter 3

.site inventory

Address: 700 14th St, Denver, CO 80202

.history

.city of denver

In 1858 at the base of the Rocky Mountains in Colorado Territory, prospectors from Gerogia discovered gold. This discovery caused many fortune-seekers to settle in what is now Denver, Colorado. Other settlers like General William H. Larimer made a living from settling on the land, laying out the city and then selling the lots of land to people that arrived after him. Larimer claimed what is now downtown and Larimer Square, which is named after him. He also named the city Denver, after Kansas Territorial governor James Denver, hoping to catch political attention. (Visit Denver, n.d.).
Other gold rushes soon left the city of Denver almost deserted until harsh mountainous weather conditions forced fortune seekers back into the mild climate of Denver. Then, in 1863 a fire torched the business district to the ground. After many other hardships, Denver was left to the citizen's ability to thrive and survive.
Denver was built on many gold and silver strikes making it a boomtown and it continues to be a boomtown today. (Visit Denver, n.d.).

.history

.colorado convention center

The Colorado Convention Center opened in 1990 on 14th Street in the Central Business District in Downtown Denver. The convention center is a “state of the art facility” that has a “user friendly meeting facilities” was designed by lead architect, Curtis W. Fentress of Fentress Architects. (Colorado Convention Center, n.d.).
In 2005 the CCC was expanded to 2.4 million square feet. The expansion also included the addition of two spectacularly improved building facades: the west and east. On the western side of the building, there is a high peaked roofline that showcases an 800 foot glass curtain wall that becomes lit at night, showing the western side of downtown a more pleasant view that still feels like downtown. The eastern side faces the center of downtown and also features an 800 foot glass curtain wall accented by the angled roof structures. This addition gave the CCC a more recognizable identity that still draws visitors in today. (Urban Land Institute, 2006).

.community

.colorado convention center artwork

I See What You Mean
Lawrence Agent
Along 14th Street, there is a blue bear peeking inside the Colorado Convention Center glass wall. The 40 foot tall bear has become an iconic symbol not only to the CCC but also to the identity of the city of Denver. The bear symbolizes curiosity and how a resident of Denver might be when an event at the CCC is taking place. There are several other art pieces to be explored at the CCC, 11 in all. (Colorado Convention Center, n.d.).

Stone Garden
Jonathan Bonner
These twelve pieces of seating stones create a “Zen” space outside of the Convention Center. The seating stones are made of granite and are near the main entrance so visitors can sit and enjoy each other’s company between center events. (Colorado Convention Center, n.d.).

Colorado Panorama: A People’s History
Barbara Jo Revelle
This 600 foot long tile mural was made of thousands of grey scale tiles that depict faces of people crucial to Colorado’s history. When you are close to the mural, it is blurry but if you step back, the faces become clear. (Colorado Convention Center, n.d.).

images courtesy of Denver Convention

Wood Water Rock
Trine Bumiller
Paintings of Colorado's landscape are made from techniques known to the Renaissance period to form Wood Water Rock. In all, there are eighteen wooden door panels that are hung on a white curved wall inside the CCC. (Colorado Convention Center, n.d.).

Indeterminate Line
Bernar Venet
A rusted, twisting and bending line made from rods of steel with a COR-TEN steel surface represent "non-conformity" and "show moments of vitality." This sculpture is located on the south west side of the CCC. (Colorado Convention Center, n.d.).

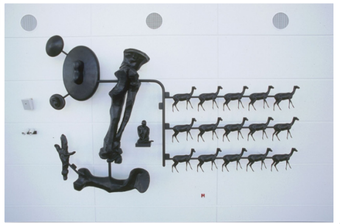
Doing the Denver Dance
Dwight Atkinson
This sculpture is located near the light rail station of the Convention Center. It is a combination of light, steel mirrors and illustrations that allow visitors to create their own "Dance of Denver." (Colorado Convention Center, n.d.).

Tail Spin
Erick C. Johnson
Steel and fiberglass structures inside the CCC are suspended above the escalators. The pieces were placed so they force the viewer to follow and chase the forms that surround the buildings columns like "dust devils." (Colorado Convention Center, n.d.).

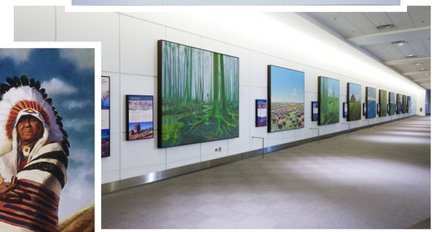
images courtesy of Denver Convention

Laughing Escalator
Jim Green
As you ride up and down the escalator inside the CCC there comes a rise of laughter from your feet. Every eight feet you climb or descend the escalator, creating a one-sided dialogue to "engage the public with humor and surprise." (Colorado Convention Center, n.d.).

Model State: A Local Cosmology
John McEnroe
This black fiberglass and polyester sculpture illustrates three topics of the state of Colorado. McEnroe hopes that Model State "is a successful mingling of pride, history and contemporary issues." (Colorado Convention Center, n.d.).



Ancient Colorado Paintings
Kirk Johnson and Jan Vriesen
A series of ten paintings illustrates the landscape evolution of Colorado. Everything from parks and environmental changes to rainforests and deserts can be found beautifully painted in hallways of the Convention Center. (Colorado Convention Center, n.d.).



Colorado Pioneers
William Matthews
Twelve beautiful watercolor paintings depict historical figures of Colorado's past. Among these twelve paintings are Farmers, Railroad Men, Native Americans, Trappers, Soldiers and Pilots. (Colorado Convention Center, n.d.).

images courtesy of Denver Convention

.site, function and context

.use

The Colorado Convention Center is a widely used venue. Everything from America's Got Talent to New Year's Eve Celebrations, college graduations and design shows, travel shows, car shows, boat shows, bridal shows, professional conventions, music competitions, and religious meetings are held here. Annually, the Colorado Convention Center holds more than 250 events. Because the CCC has so many levels and meeting rooms, multiple events can be held at once. The fact that there are so many events held and that the events are attended by not only residents of Denver but out of town visitors makes the convention center a tourist attraction. (Colorado Convention Center, n.d.a).

.lighting

On the actual site, the rooftop of the CCC, there is currently no lighting as operations occur during the daylight.

.contaminants

Although light rail transit is more common in this area, running every 15 minutes, there are still air pollutants from gasoline and diesel powered vehicles and public busses. (Regional Transportation District, 2013). Pollutants that vehicles leave in the air include Nitrogen oxide, volatile organic compounds, and carbon monoxide. (Puchalsky, 2005). Because there currently is not soil atop the roof, there are no soil contaminants to name.

.building facade

The Colorado Convention Center has a modern design. It is made up of glass and steel.

.circulation

The CCC currently provides parking for 1,000 parking spaces, on site. (casestudies.uli.org).
Since the building is connected to the Denver Performing Arts Complex, pedestrians have access to the building without having to cross busy streets once they enter either the CCC or DPAC.
Along the north side of the building a light rail and public transportation busses run daily every 15 minutes, giving easy access of the convention center to visitors. With the public transportation being so close, it gives visitors another option of ease to visit the site.
Roads that surround the CCC are 14th Street (North East side), Stout Street (North West side), Speer Boulevard (South West side), and Welton Street (South East side).

.solar access

In November 2008, the Convention Center installed a renewable energy project. The project is a 300 kilowatt solar power system that covers 30,000 square feet on top of the lower rooftop. In all there are 1310 high efficiency solar panels that power day-to-day operations inside the Convention Center. (Solar Panel Fact Sheet, 2009).

image courtesy of amanda ahrenholz

.long range plans of city

Over the four years from 2005 to 2009 following the completion of the expansion of the CCC, drastic improvements were made to 14th Street, which runs along the Convention Center's north east side. With these improvements, 14th Street became Denver's "Ambassador Street" which welcomes visitors to downtown. The improvements made 14th Street more walkable, increasing sidewalk widths on the north side to 19 feet and on the south side to 16 feet as well as inlaying granite in the sidewalks. Bicycle friendly amenities like a bike lane and new bike racks were introduced. More seating along sidewalks, introduction of planters, and the installation lighting and way-finding monuments completed the 14th Street Initiative, making it more pedestrian friendly and inviting. (Denver, 2013b).

.weather

.average rainfall by month in denver

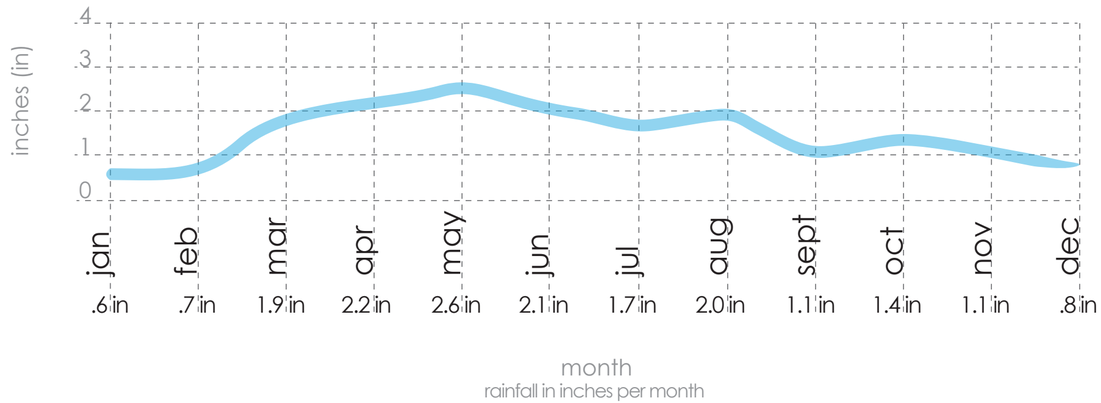


image created by amanda ahrenholz

.average snowfall by month in denver

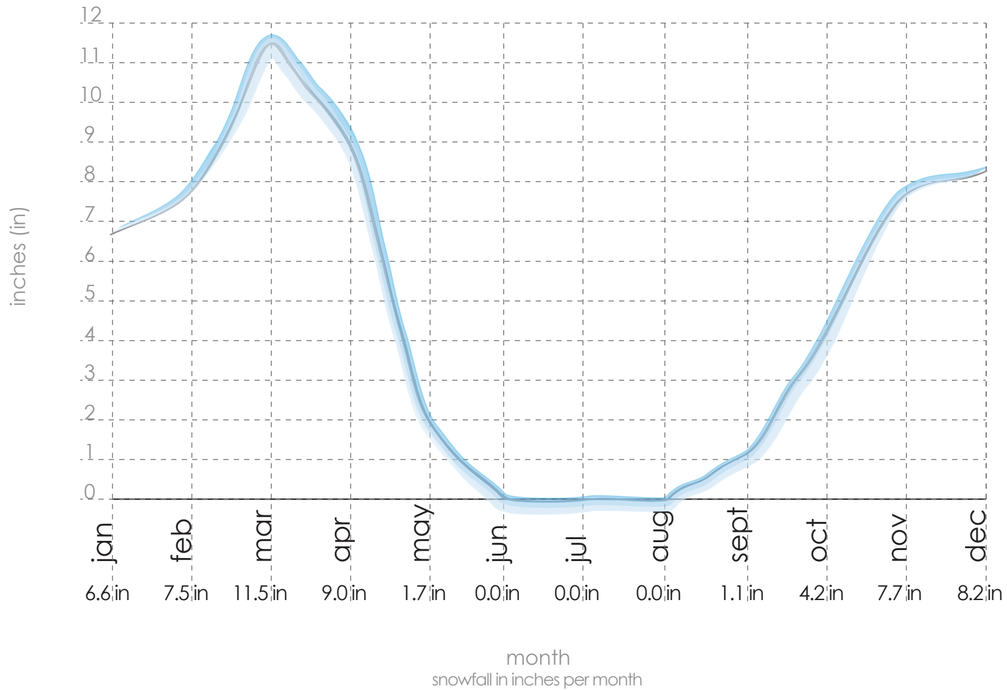


image created by amanda ahrenholz

.average temperature by month [high and low]

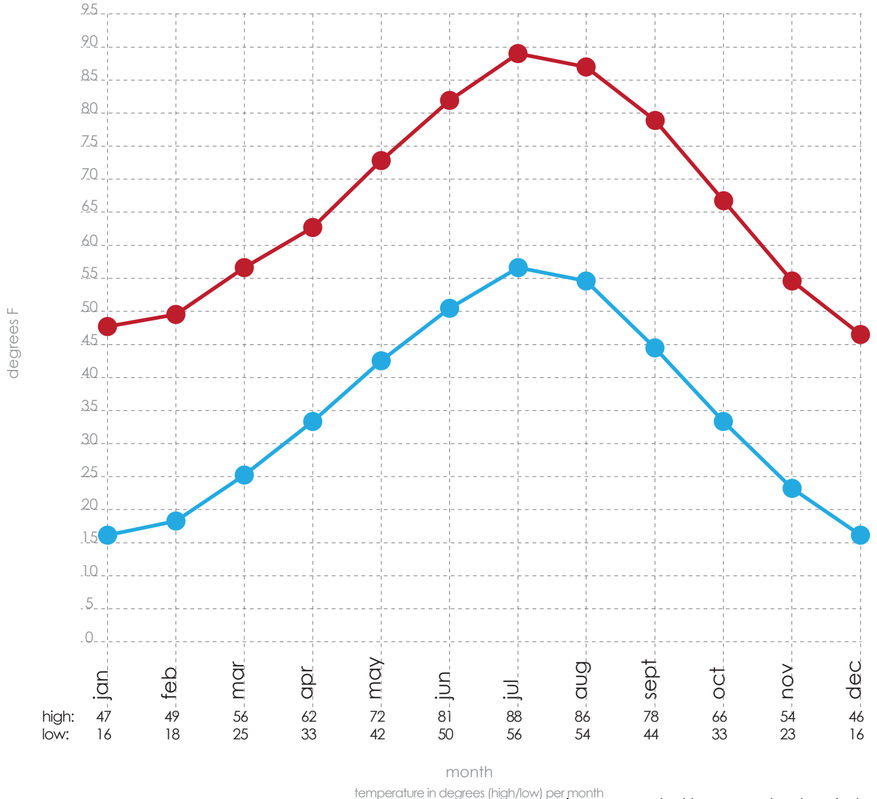
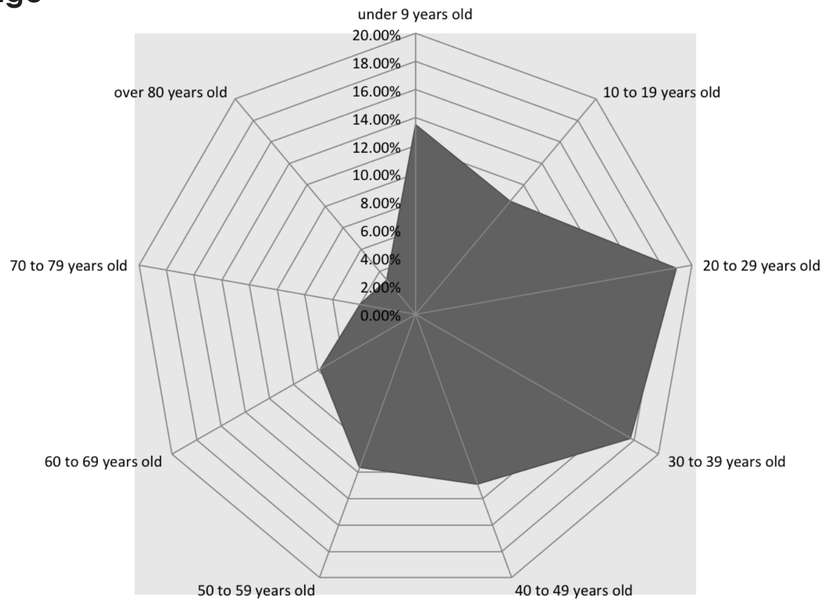


image created by amanda ahrenholz

.demographics

.age



.race

image created by amanda ahrenholz

image created by amanda ahrenholz

.access

Access to the rooftop of the CCC is currently private, only allowing access to authorized personnel. People who have access to the rooftop are employees that conduct daily maintenance on the engineering systems throughout the building.

.views

Looking to the northwest of the convention center from the rooftop you can see the Rocky Mountains in the background, with the skyline of downtown still in view.
To the northeast, you can see the heart of downtown Denver and tall multi use buildings.
Looking southwest, you can see a better view of the Rocky Mountains.
Finally looking southeast, there are more industrial buildings on the outskirts of downtown with the mountain views in the background.

.parking

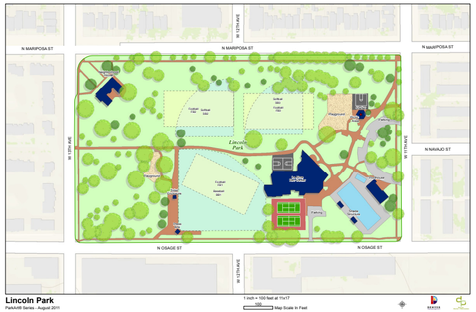
The Colorado Convention Center offers 1,000 covered parking spaces on site that allow access to the CCC and the Denver Performing Arts Complex. Among the 1,000 parking spaces are three designated “green” parking spaces, which are made for hybrid and electric cars. These three “green” spaces allow specific cars to park for up to eight hours, free.

Other options for parking include on-street metered parking, which you can pay for using a credit card, coins or ParkSmart cards that you can purchase from the city of Denver. ParkSmart cards are preloaded cards that are only accepted at Denver’s Smart Meters. (Denver, 2013a).

Even another parking option includes off-street parking. There are nine parking structures within a one-block radius of the Convention Center. All of these parking structures offer daily rates, ranging from $9 to $31 hours a day. (Downtown Denver Partnership, 2013).

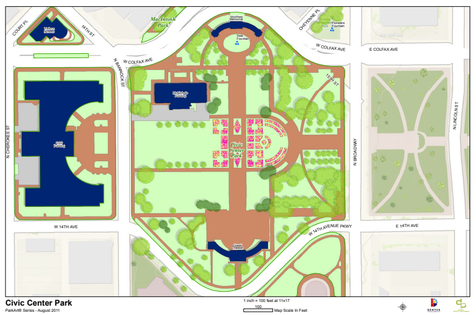
.existing parks

Many city parks surround the Colorado Convention Center. They all offer different amenities that make them widely used throughout downtown for different reasons. Here are eight parks within a ten blocks either direction of the Convention Center.



.lincoln park
1325 w 11th avenue

recreation center, playground, amphitheater, outdoor pool, basketball court, picnic shelter, picnic tables, benches, football field, tennis court, baseball/ softball field



.civic center park
101 w 14th avenue parkway

voorhies memorial, greek amphitheater, benches, drinking fountain, fountain, flower beds, public art

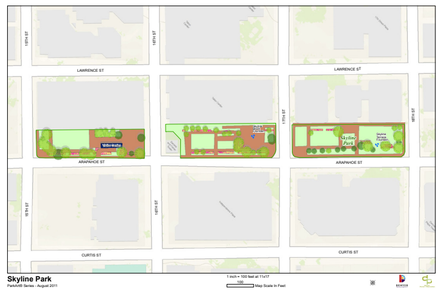
images courtesy of denver parks and recreation

.pioneer monument park
1501 n broadway

monument, fountain, benches

.benedict fountain park
401 e 20th avenue

benches, picnic tables, fountain, passive open space



.skyline park
1701 arapahoe street

plaza, fountain, picnic tables, restroom, benches, drinking fountain

.downtown children's playground
1800 n speer boulevard

playground, benches, picnic shelter, picnic tables, just off the cherry creek trail

.lawson (sonny) park
2301 welton street

drinking fountain, playground, restroom, basketball court, baseball / softball Field, benches

.sunken gardens park
800 n delaware street

benches, playground, picnic tables, basketball court, multi-purpose field [lacrosse, rugby, soccer], bike/ pedestrian path

images courtesy of denver parks and recreation

.findings from research

.typology research

Typologies within this project are urban, elevated, park system, physical activity and recreation. With this park being urban and elevated, there are many issues and opportunities.

Safety: The park must be safe, since it is on the rooftop of a 40 story building. It must be safe for people to engage in activities in the park. This could either mean including an additional barrier, taller than a normal fence and another barrier from other sections of the park. This also means lighting, fencing, restricted activities, pathways and maintenance will be addressed.

Connections: The park must be well connected, both to other parks, visually and with public transportation. Findings from the research show that parks should be connected with signage, accessible by various age groups and visually connected to the city and outside views.

.research questions

.how can a connected, elevated park system give visitors and residents of Denver a better quality of life?

.what aspects of a park encourage people to use them?

.how can you measure the use within a park?

.how can you measure what elements and qualities make a park successful?

.hypothesis: An elevated park system can have a positive effect on users' levels of physical activity, urban air quality and addition of urban green space.

New questions came about during the research and findings
.How park systems and park use benefit a city's culture?

.How can park systems aid in the future plans of the city to reduce their ecofootprint?

.Does accessibility and transportation affect the use of the site?

.Can a city's culture be affected by park systems and how does that relate to the success of parks?

.criteria

Criteria has not changed based on the research.

- access to mountain views and views of amenities
  - feeding off of the culture of Colorado, people like to take time to enjoy the beautiful views that the state has to offer
- the building(s) are in an urban area
  - building up, not out. utilizing rooftop spaces is an opportunity to introduce more green space into the urban environment
- have visual connections or flow to other existing urban parks
  - with visual connections to other parks,
- have public access to the rooftops of buildings
  - users will have public and full access to the rooftop site so it is easily used
- the building is not smaller than 10,000 square feet
- parks or proposed park sites are closer than 1 square mile from each other
  - this allows walkable times from park to park
- a city with an existing park system
  - the Denver park system is currently utilized, will aid in success of this park
- a building with a load weight of 340 PSF
  - the building can sustain the weight of the plant life and activity on the rooftop

- will have year round seasonal uses
  - allowing for a more utilized park. takes into consideration changing seasons and activities in Denver.
- public transportation nearby
  - as stated in the literature reviews, this is crucial in park success. residents of other neighborhoods have access to the park
- a building surrounded by both mixed use and office buildings
  - different demographics have an impact on park use and peak times
- visual connections to other surrounding buildings
  - ensuring you can see other rooftops and ammenities in the surrounding area
- an area with existing heavy pedestrian circulation
  - more pedestrian traffic indicates more park visitors
- the building is taller than 5 stories high
  - allows visual access and connections to surrounding buildings
- park use and physical activity
  - how visitors interact with their suroundings
- area with poor urban air quality
  - urban parks help reduce carbon emissions with use of vegetation

.case studies

I chose High Line Park and the Transbay Transit Center as case studies because of their relation to the criteria of this thesis.
Other factors that also contribute to High Line's success include the fact that it is close to public transportation, has ADA accessibility and has various types of seating throughout it.

Both case studies that were chosen for examination in this thesis project fit the majority of criteria listed previously. The case studies are High Line Park in New York, NY and the Transbay Transit Center in San Francisco, CA. Based on the research of these case studies, views, transportation, walking paths and seating all contribute to both parks' success. High Line Park has views to the city as well as views to the Hudson River and New Jersey, just across the river. Transbay Transit Center "City Park" has views to the urban city while being immersed in native ecologies.

Transportation has made High Line Park successful and will, in the future, make Transbay "City Park" successful. Since New York City has a widely used public transportation system, it is beneficial to the High Line because the park is so long. It has 10 access points from the light rail as well as bus service. ("The High Line," 2013b). In Transbay's case, transportation will be the underlying reason that people may be visiting the "City Park," as it is atop the Transit Center in what will be San Francisco's new downtown.

High Line Park and Transbay Transit Center are both surrounded by mixed-use buildings. This adds economic benefit to both cities.

.literature reviews

In farther looking at the literature reviews studied in this research, I found that pedestrian connections, mixed use land and scenery were important to park use. Maintenance along with walkability in context to surrounding parks also proved to be key in whether visitors used their city parks. Introducing vegetation into this thesis project will help improve the City of Denver's air quality. Denver's Park and Recreation Department discovered that the residents of Denver want to be able to enjoy their winter activities in a downtown setting. Using this information will farther help me to design for year round seasonal park use.

.research methods

Through my research, I found certain methods to be more effective than others in finding information. While internet is most accessible with the site being so far away, I found that during my visit it was easier to ask questions to an actual person and get answers.

Demographics: I looked at the demographics of the city of Denver in the latest Census data. The census data was very helpful in showing race, age, marital status, education and household size. I found that the population of the city of Denver was 600,158 people with half of residents being never married. Denver is 85% white, 8% Hispanic and 5% african american. The most populated age range is 25 to 29 year olds, holding 10% of the population of Denver. Over half the population of Denver holds a bachelor's degree, showing that Denver is an educated community.

Parks: In finding information about Denver's parks, their Parks and Recreation was very useful. You can easily find information about the location and amenities of any park in the city and county of Denver. Research shows there are over 200 city parks, five of them within a 10 block radius of the Colorado Convention Center.

Views: Through the site visit and being able to access the rooftop of the Colorado Convention Center, I was able to see what views the site has to offer, better than I would have been able to with information from GIS or Google Earth Pro. I found that two sides of the convention center offer views to the Rocky Mountains, while the other two directions have views to the expanses of the city.

Transportation: Denver has a widely used public transportation system that was easily found online. Although I could have used the information from the Transportation websites, I found that the site visit was beneficial to finding this information and realizing how actively used public transportation is in downtown Denver. The light rail and bus system both have stops next to the CCC.

Stormwater: Online research did not prove to be successful in looking at the stormwater systems of Denver or the Colorado Convention Center. During my visit to the CCC, I visited with Ed Narey, lead engineer at the CCC. Narey is helping me seek information on stormwater management from other engineers at the site.

.user/client

Throughout this research, I have found that the park will need to have public access and ADA accessibility for people to access it. Currently the rooftop of the Colorado Convention Center has many entrances. I have also found through the research that the park may need to include a food or beverage service, since this may be a place where visitors take lunch breaks and where they may spend long periods of time. Building hours and how long users are able to access the park will need to be taken into account. Although parking will be a large part of the elevated parks success, there are currently sufficient amounts of parking nearby the Convention Center, an advantage to choosing the convention center as the site for this thesis project.

.applicable values for site and research

From my findings and time spent in Denver, I have come to realize that the city of Denver and the State of Colorado have their own culture. I have noticed that people in Denver enjoy the outdoors; they care about their environment and like to stay active.

In this thesis there are several ways to discuss the context and the implications of my research. They include:
History of parks, landscape architecture, policies, planning and urban design, culture, physical activity, politics, ecological, architecture, circulation and economics.
Let me discuss a few of them farther in depth and explain how the following fields influenced them and how they influence the following fields.

The history of parks has an influence on this thesis. Rooftop parks started out as green roofs and were considered one of the "Seven Wonders of the Ancient World." (Lawrence Technological University, 2013). Thanks to technology and acceptance of other views, parks are now evolving from the ground level, up. People are starting to see how parks fit into the urban city system and the importance of green space.

Landscape architecture is influencing this thesis because of the fact that rooftop parks bring together so many aspects of design within landscape architecture. There are mechanical and built systems that are being used, different plant palettes being explored and tested, circulation being taken into consideration and accessibility, all showing the success of parks. No matter what, this thesis fits into the field of landscape architecture. It shows our field that fitting parks onto buildings that we already utilize can have endless benefits to consider.

Being these parks are atop buildings, the field of architecture becomes important. The research in the previously stated case studies shows that not only do humans and the environment benefit from parks, but also that buildings are beneficiaries. As stated previously, buildings can have 25 percent lower than average energy consumption. This affects the field of architecture and how future buildings are built. Future buildings might start to become able to withstand the load of a rooftop park.

.plan for proceeding

In the beginning, when looking at what I wanted my thesis to be based on and what I was interested in, in the field of landscape architecture and design, I was a little confused. The project started out with interest in two completely different areas. The first was focused on rooftop spaces and how we can fit ourselves into dense cities; the second was waterfront development and how visitors interact with their spaces. From the initial two ideas, I realized my strong interest in urban design and designing in dense cities, so I moved focus to pedestrian circulation and how it changes public policy in downtown settings. Changing my focus even more, the last idea moved towards pedestrian circulation and crime in urban neighborhood parks. Taking all of these ideas, I was unsatisfied with my selection and went back to the drawing board, developing my current thesis topic, rooftop parks in urban settings.

After going back and forth over thesis topics for about three and a half months, I settled on my current topic. Finally I was satisfied and eager to get going to find out more about park systems in urban settings and how they fit into the city grid and city culture.

Researching many cities and taking into account my interests, I selected Denver, Colorado for my thesis location and took a trip there to seek options for a site for this project and get a feel for the city of Denver and culture of Colorado. The first night of my visit, stayed just outside of Denver, in Golden, CO and I hiked Mount Evans, which is just an hour outside of downtown Denver. I hiked for over 5 hours, taking in the beautiful scenery around me, in the mountains. I also stayed downtown Denver during this trip. Walking around downtown you are able to see the mountains in the distance at certain points and I noticed that a lot of the residents enjoyed being outside and people liked to stay active. There were many pedestrians downtown and limited vehicular use. As a result of this trip and research done, I came up with two possible options as a site for this thesis, the Colorado Convention Center and the U.S. Department of Health.

Bringing together my experiences and research, I narrowed down the two buildings to one, choosing the Colorado Convention Center. In addition to completing research online, I took yet another trip to Denver for inventory of the Convention Center. I spent the duration of this trip downtown and made arrangements to visit the Convention Center. I spoke with Ed Narey, the lead engineer at the Convention Center and he allowed me access to the roof. Visiting the CCC rooftop gave me great insight to what this thesis project could be.

Each time I visited Denver, I learned more and more about the culture of the city and the mindset of the people there. Visiting Colorado more can give me even more ideas for the design and outcome of this project. I think that because I had the opportunity to experience downtown Denver and the people that live there, it has and will continue to influence my interpretation of Denver and it's needs for more green space.

September 2013

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3	4	5	6 work [A1] ———	7
8 work [A1] ——→	9 edited [A1] Assignment 1 Due	10	11	12	13	14
15	16	17	18 changed project	19	20	21
22	23	24	25	26 trip research	27 denver trip ———	28
29 ——→	30					

DATES

September 9: Assignment 1
introduction, statement of intent, list of secondary advisor(s)

September 27-29: Trip to Denver

[A1] = Assignment 1

images created by amanda ahrenholz

October 2013

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1	2 work [A2] ———	3	4	5
6 work [A2] ——→	7 Assignment 2 Due	8 layout [A2] ———	9 plan	10 writing	11 writing	12
13 ** Assignment 2 Due	14	15	16	17	18	19
20	21	22	23	24 research [A3] ——→	25	26
27	28	29	30 work [A3] ——→	31		

DATES

October 7: Assignment 2
introduction, chapters 1 and 2, 3,000 words minimum

October 13: Turned in Assignment 2
due to certain circumstances, I turned in Assignment 2 late upon professor's approval

[A2] = Assignment 2

images created by amanda ahrenholz

November 2013

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1 denver trip	2
3	4 work [A3o]	5	6 Assignment 3 [optional] Due	7 work [A3o]	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27 Thanksgiving break	28	29	30

DATES

November 1-3: Denver trip

November 27-30: Thanksgiving Break

November 6: Assignment 3 [optional]
introduction, chapters 1, 2 and 3,
10,000 word minimum

[A3o] = Assignment 3 [optional]

December 2013

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2 work [A4]	3 write/graphics	4	5 write	6 write	7 write
8	9 write	10 edit/layout	11 Assignment 4 Due	12	13	14
15	16	17	18	19	20	21 holiday break
22	23	24	25	26	27	28
29	30	31				

DATES

December 11: Assignment 4
introduction, chapters 1, 2, 3, 4 and 5,
20,000 words minimum

December 21- January 14: Holiday Break

January 2014

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	holiday break		1	2	3	4
5	6	7	8	9	10	11
12	13	14 class begins	15	16	17	18
19	20	21	22	23	24	25
26	27	28 denver trip	29	30	31	

DATES

December 21-January 14: Holiday Break

January 28-February 2: Denver trip
possible site visit

February 2014

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1
2	3	4	5	6	7	8
9	10	11	12 Assignment Due	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	

DATES

Week of February 10-14: Assignment Due
possible assignment due

March 2014

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1
2	3	4	5	6	7	8
9	10	11	12 Assignment Due	13	14	15
16	17 spring break →	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

DATES

March 17-21: Spring Break

Week of March 10-14: Assignment Due
possible assignment due

Dolor sit amet
Sed egestas molestie elit. Mauris urna mi, scelerisque vitae, ultrices vel, euismod vel, eros.

April 2014

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23 Assignment Due	24	25	26
27	28	29	30			

DATES

Week of April 21-22 or Week of April 28-30: Assignment Due
possible final assignment due

.design goals

Although urban design and park design have clear differences, there are several possibilities that come about from the research and study of parks, urban spaces, rooftop connections, park connections and creating strong views.

One of these goals is to connect the park to other parks within Denver's existing park system. Whether that be through actual trails, view connections, or both.

Accessibility becomes another broad goal. The park will be accessible from the inside of the building, maybe through a staircase, or from the outside sidewalk, through another staircase or elevator. Accessibility also means meeting ADA standards and allowing the park to be accessible by everyone.

Creating strong views will also be a goal of the coming design. Since this research focused heavily on the culture and people of Denver and how they use their city, views to the Rockies are important. How other buildings and parks see this rooftop will be considered because there are taller buildings than the Colorado Convention Center within downtown Denver that will be able to see the rooftop.

Due to the fact that this park is atop a building, safety becomes a strong design goal in the coming discussions. Safety may mean keeping users away from the edges of the building or creating some sort of barrier.

.chapter 4

Through my research, criteria and exploration of connections between the two, I have come to realize there are a few big ideas of this thesis. For me, they include making connections to existing park systems, park use, a city's culture, accessibility, transportation, circulation, city goals and green space within a city.

Although research questions have changed throughout this process, research has helped me to answer initial questions of this thesis.

New research questions include:
.How park systems and park use benefit a city's culture?

.How can park systems aid in the future plans of the city to reduce their ecofootprint?

.Does accessibility and transportation affect the use of the site?

.Can a city's culture be affected by park systems and how does that relate to the success of parks?

.park systems, use and culture

Park systems help benefit a city's culture based on how often they are used, what they are used for and how close they are in proximity to one another. A well-connected park system has an impact on users of parks in that system. Amenities either make or break a park's success and overall affect the entire park system. Opportunities that park systems offer are connections to one another through bike or walking trails as well as promote physical activity through these connections. On the other side, how do you make these park systems connect? One challenge could be through cohesive signage and themes. For example, if one park has wooden signage and another park of the same park system has plastic signage, it can be confusing to the user. Another thing that poses a challenge in connecting park systems is their hours of operation. If hours conflict and do not overlap at all, users may forget about the park that has odd hours. Taking these discussions and research into consideration, the rooftop park will need to somehow connect to Denver's existing parks. This may be through similar materials, signage, and regulation of park hours.

In exploring park systems, a balance needs to be made between selecting how urban parks connect within a system, yet still allow each park to be unique and offer different amenities.

In visiting a city, you can tell a lot about its culture by observing the residents and experiencing their activities for yourself. Whether a city's culture is active, or not, will have an impact on park use. In an active city culture people like to keep moving and take part in various activities. In turn, a well-connected and used park system can have an impact on a city's culture. Culture also influences many aspects of the outcomes of this design. It brings up challenges of hours of operation against hours users are available to use it. Surrounding the Convention Center are many diverse user groups ranging from business professionals to families, middle school aged children to college students and plenty of visitors travelling for leisure and business. All of these user groups call for different hours of operation as well as different amenities.

These user groups bring up safety, especially the families and younger children that will be using this site. Safety in the form of barriers from the edges of the rooftop may be used. Although safety is important, I don't want that to limit access to views on the site. Still allowing views to be accessed without getting to close to the edge of the 40 story high building becomes a challenge.

User groups bring up a challenge of activities within the site. How can I design, taking load weight into consideration, activities for all types of users to interact? Activities might include walking, a private place to meet or reflect, running and tossing a ball just to name a few. These also key in safety. Throwing a ball might not be an option or farther safety measures would need to take place in order for a ball not to be thrown off the side of the building, down onto the street

.park accessibility, transportation and circulation

Available transportation and circulation within and around a park attribute to a park's success. Being this thesis is focused specifically on rooftop parks, how users are able access the park becomes a key challenge. Public transportation and parking will also be taken into consideration for how accessible the park is within the city.
In exploring park accessibility, a question of how users are brought into the site comes into play.

In applying these to the current site, accessibility is in question. Currently the park is only accessible by stairway, not meeting ADA regulations. To meet these regulations, the integration of an outdoor elevator may become part of the design. This could become an attribute to the site since the distance travelled up to the rooftop is about 40 stories high.

Ample parking is needed to accommodate users traveling by vehicle to the site. Since the Colorado Convention Center is a widely visited venue, there is adequate parking around the site. This aids in the success of the possible site. The already provided parking brings opportunity for people to park nearby and either visit the site for a long or short period of time.

The building itself also provides access. It provides access in the form of more people using the building, therefore bringing people to the site is halfway accomplished. Public transportation is something that is also established in this area. The light rail and bus system allow for access near the building every 15 minutes. With this public transportation being available, it gives the opportunity of many people being on the site at one time. This is also a challenge. Walkways and weight loads of the building need to be farther evaluated to support the number of visitors at one time.

Circulation on the site poses several challenges. If there are too many paths or trails it will make awkward spaces in areas that could be used for other activities. On the other hand, if there are not enough paths, pedestrian circulation could get piled up, causing what might be private areas to be overpopulated and no longer secluded. In exploring circulation, a balance needs to be made between choosing the number of pathways for proper movement about the site, yet still allowing the park to be accessible by various user groups and their activities.

.city plans and green space

Future and current plans of the city have an impact on how much green space will be present, long term. This gives opportunity for the integration of different types of parks into the city. Since rooftop parks provide benefits for the buildings that they are atop, a city's move to be more ecologically conscious is addressed. A challenge that this poses is introducing rooftop parks to cities. For the rooftop parks to be accepted, there needs to be a cultural change and education about rooftop parks and their benefits. Denver has a plan to go green with "Greenprint Denver" and the 14th street initiative. With these two things already established, introducing the idea of rooftop parks, as green spaces will be easier, if it is shown that Denver's plans can benefit.

Since the Colorado Convention Center is along 14th street, the initiative helps guide some of this design. The initiative was creative to help welcome visitors to the downtown area of Denver with an enhanced pedestrian experience, which with connections to sidewalks and pathways, connects to this thesis. With this initiative, seating, lighting plantings and proper signage were important to creating a cohesive street design. We can use this initiative to help guide any farther design of the rooftop park.

The Denver Arts Performing Complex (DAPC) right next door brings even more people to the site. There are several different events occurring at this venue each day, attributing to the culture and number of people that would potentially use this park. This also brings up the point of too many people being in the site at one time. Since this is a park, I want people to be able to come and go as they please, but the weight load of the building might not be able to hold as many people than could be at this site at one time.

.chapter 5

.opportunities and challenges of the site

Taking aspects from the 14th street initiative, there could include (to coincide with the street design) granite seating areas, way finding monuments, lighting and annual plantings. Since granite is a very heavy material, an alternative may have to be considered because the load weight of granite on a rooftop might not be possible.

Safety and views can start to make influences on the overall design possibilities in the site. There will be barriers, maybe in the form of railings around the perimeter of the building. In tying the safety aspect in with connections, the railing could become a clear plexiglass barrier, or it could be a metal fence. A metal fence might not work because of the young children that will be using this site. Children like to stick their hands and legs through things so plant barriers might have to be used in addition to another form of perimeter fencing.

Activities may start to look like open grassy areas for resting or for children to run around on.

Walkways could start to take shape using similar concrete paths, yet the weight of the building might not support it. With the initiative coming into play, sidewalk widths were enhanced to 19 and 16 feet wide. This might influence the overall design and width of the pathways and walkways in the site.

.project transition

over the course of the semester, this thesis project has evolved from becoming a park system that is closely connected to exisitng park systems, to an urban park in the middle of downtown Denver. the change occured because of my interests in urban design and what I saw fit to bring to the downtown Denver area based on its needs combined with my experiences.

this oasis from the city is atop the Colorado Convention Center in downtown Denver, CO on 14th Street-right in the heart of the hustle and bustle. Because cities are becoming more and more dense, there is less space to save for urban green space and using space atop buildings is both a innovative and green solution. With framing the views of the beautiful Rocky Mountains, site users can experience the views of Denver while still remaining in an urban setting.

the colorado convention center is located within walking distance of many hotels, restaurants, shopping and college campuses. the convention center holds more than 250 events annually, bringing both tourists and residents to the site.

in the second semester, an extensive amount of research was completed to ensure the structure of the building was able to hold the weight of the thesis. in working with an architect and strucutral engineer, they helped create a structure that is able to withstand 340 pounds per square foot on the rooftop.

during the design of this project, the outcome was a strategy plan that utilizes all six acres of the colorado convention center rooftop and a site plan that is detailed down to half an acre.

information pertaining to most aspects of research aside from information about surrounding parks and park systems is still relevant to the thesis.

.chapter 6

programs used to create this project:

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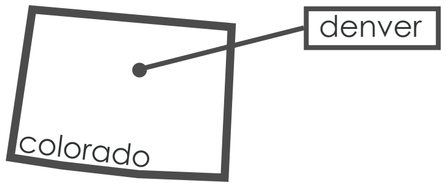
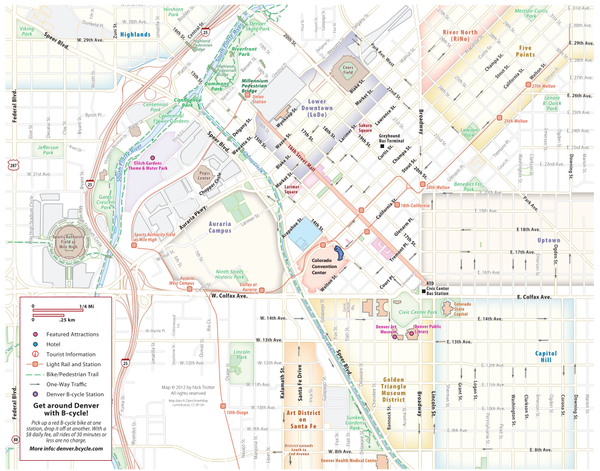
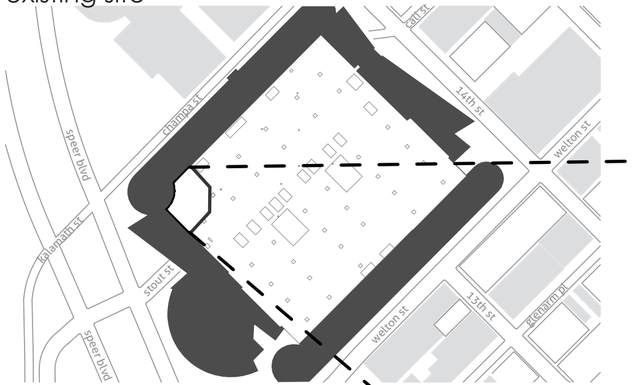
.location



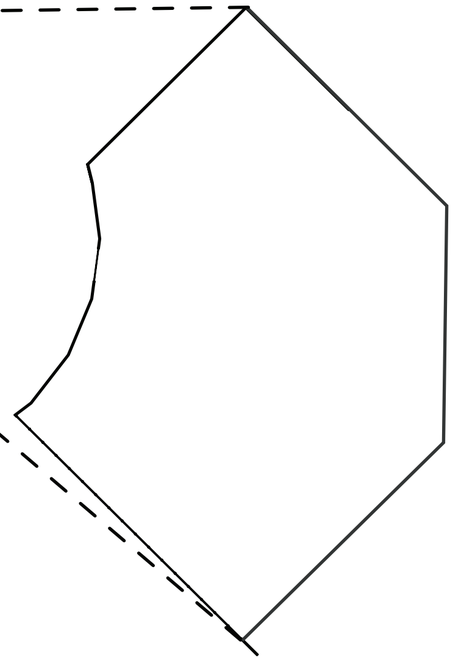
downtown denver



existing site



designed site



a strategy plan was created to plan the six acre site of the rooftop of the colorado convention center. to illustrate a design, a half acre site was then selected and detailed out.

the designed site is a place where visitors can go to escape the busy city life without leaving the city. the stage provides the opportunity to have large gatherings such as concerts, small parties and performances.

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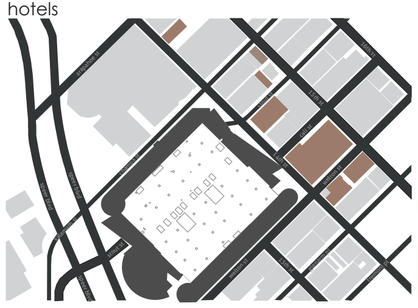
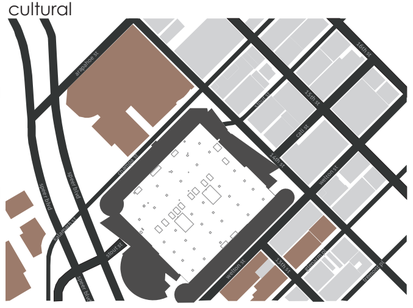
.context analysis

hotels



cultural



cultural
- denver performing arts complex
- emily griffith technical college

hotel
- the curtis
- embassy suites denver
- bradshaw hotel
- hilton garden inn denver downtown
- hampton inn and suites denver
- hyatt downtown denver

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parking

city of denver ramps and lots
privately owned ramps and lots

residential

spire condos
auraria student lofts

commercial

a and d data recovery
telecommunications history group
us west commercial
denver gas and electric
denver laser solutions llc

dining

row 14 bistro and wine bar
bubba gump shrimp company
oceanaire seafood room
starbucks
crave dessert bar and lounge
organic pizza company

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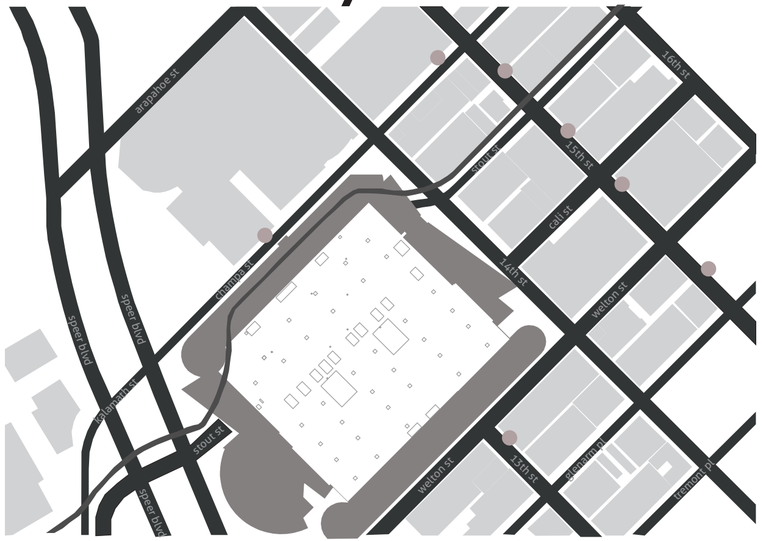
.circulation analysis



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light rail

runs every 15 minutes
stops along stout street
lines D, F and H
serves all of downtown
theatre district/convention center station

bus stops

runs every 15 minutes
stops at eight different places within a block of the convention center
busses 8, 48, 10, 28, 28B, 32, 6, 52, 9, 15, 15L, 20, 1, 30L, 36L,
serves all of downtown and surrounding neighborhoods

one way streets

southeast bound: 14th street
northwest bound: 15th street
south bound: speer boulevard
north bound: speer boulevard
southwest bound: champa street, california street
northeast bound: welton street, stout street, curtis street

two way streets

glenarm place, arapahoe street

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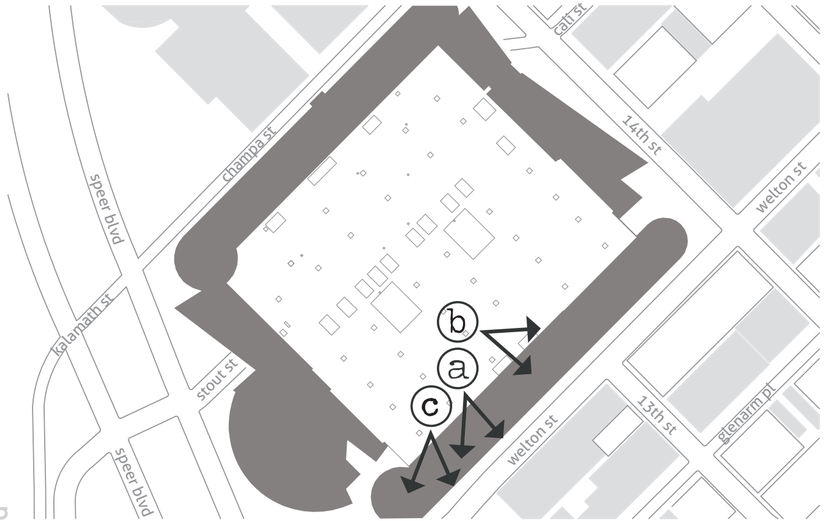
.site photos



looking southwest

residential

mountains in the distance

solar panels existing

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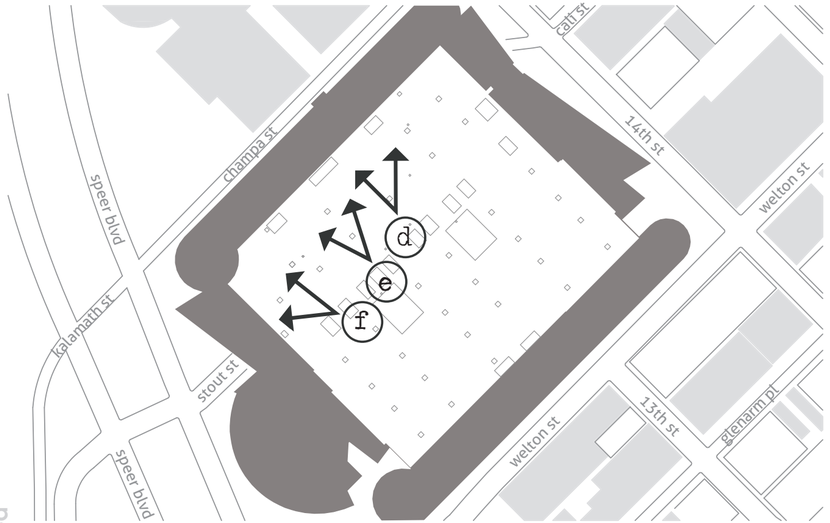
.site photos



looking northeast and northwest

mountain views

city views

residential and college campus

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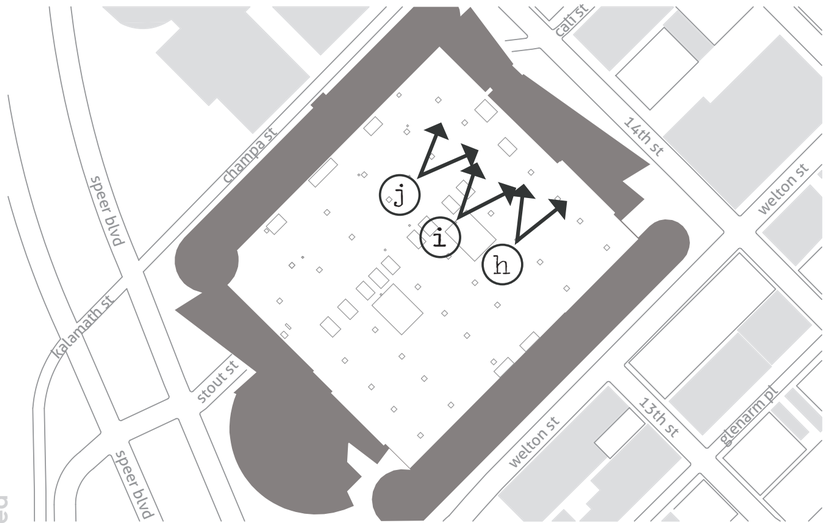
.site photos



looking east

city views

height of buildings

downtown skyline

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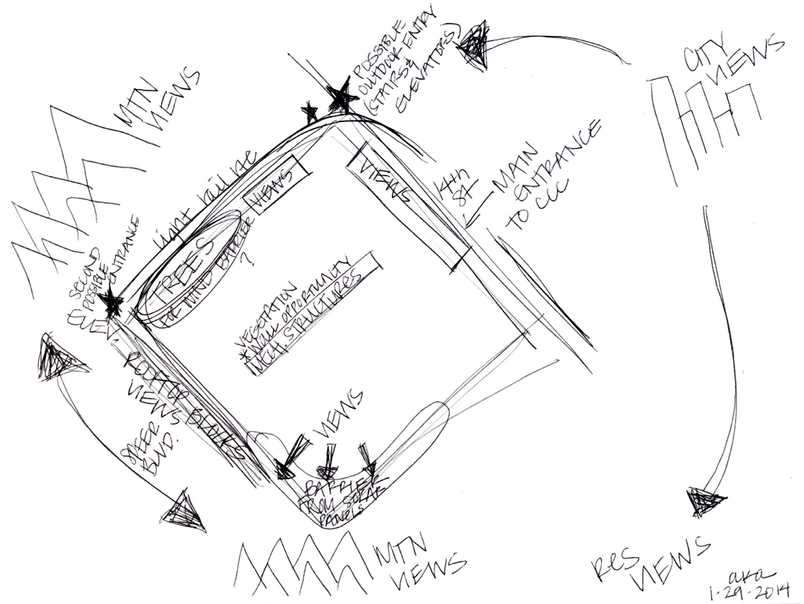
.strategy concept plan a



showcases city views to the northwest

frames mountain views to the south and southeast

builds around maintenance structures

creates entry from street

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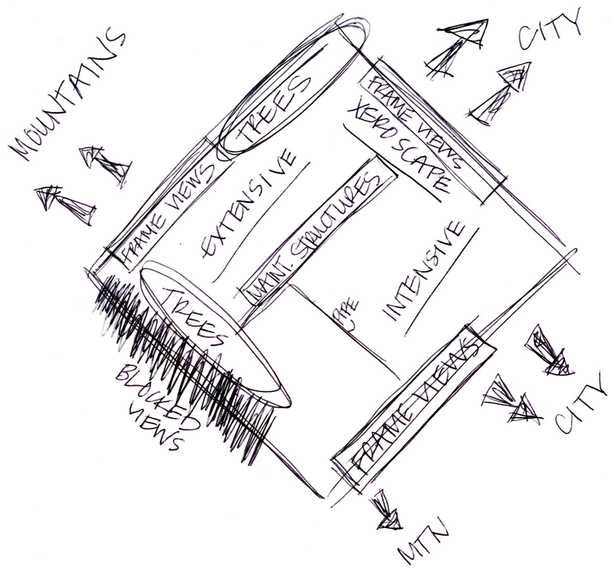
.strategy concept plan b



showcases city views to the northwest and southwest

barriers around atrium

two types of green roofs

frames views with vegetation

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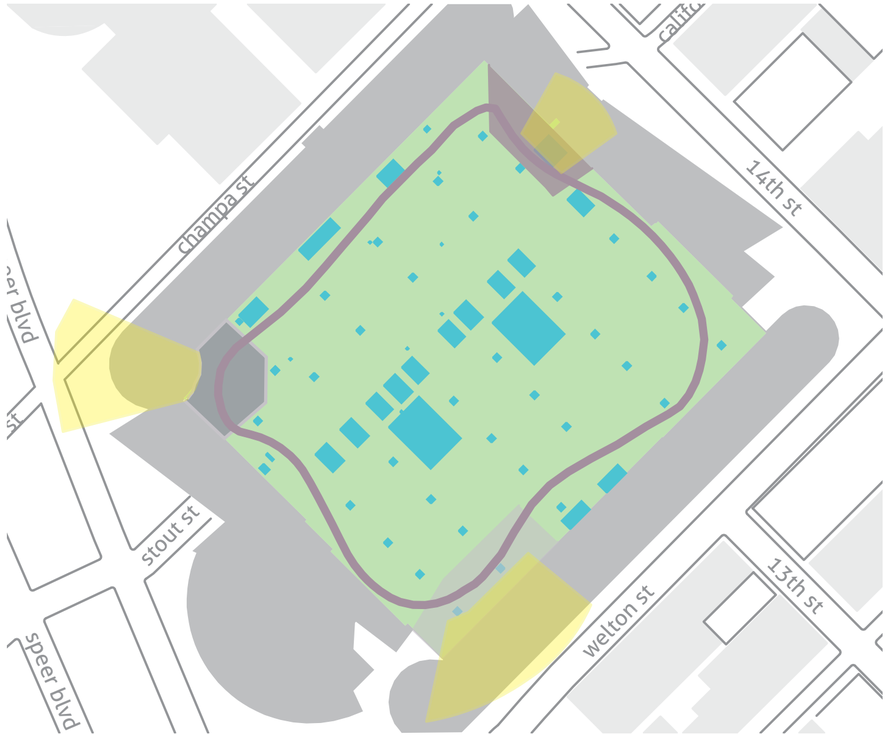
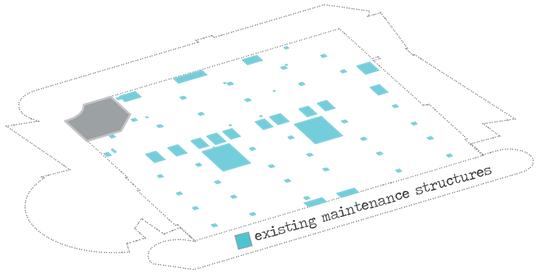
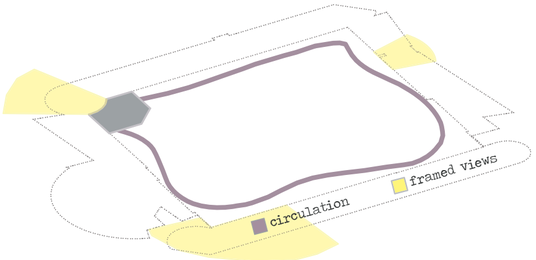
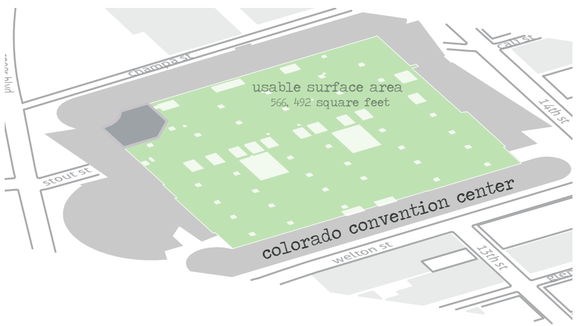
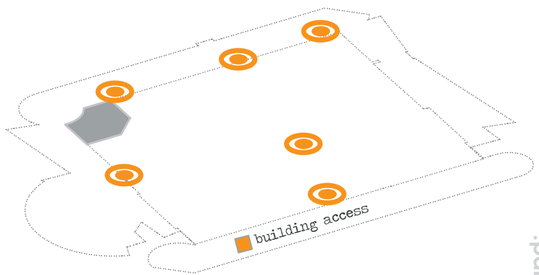
.overall site analysis











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.strategy plan

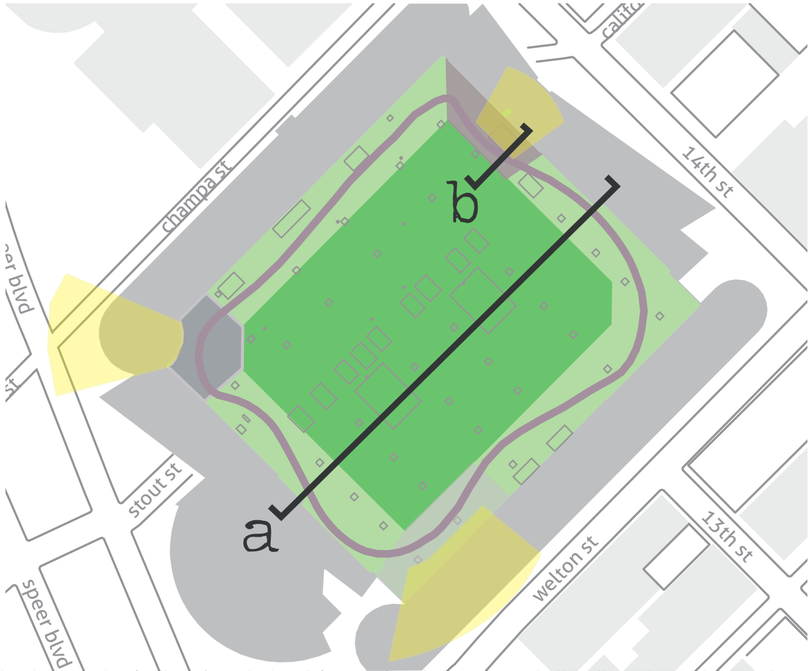
city confluence
immersed views

outsider influence
intensified inspirations

the gridwork
new connections

intensive rooftop
350 psf

extensive rooftop
140 psf



the strategy plan for the reinvented park frames views in three areas to the city and mountains and separates it into two different types of green roofs -- extensive and intensive.

intensive green roofs require more maintenance and have a wide variety of plantings, grasses and trees.

extensive green roofs are more low maintenance and have grasses with small root systems

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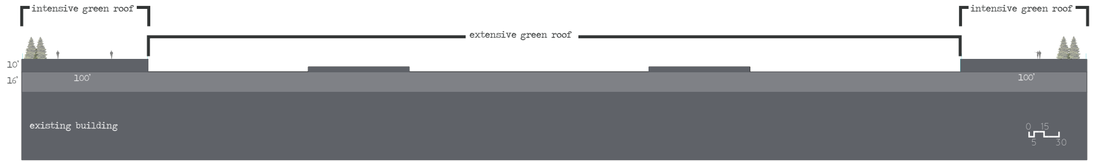
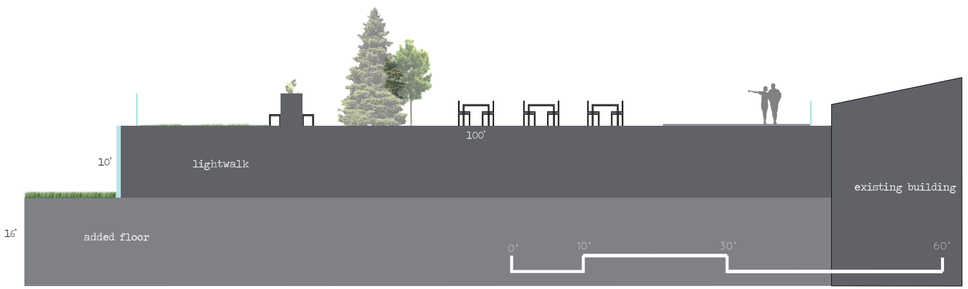


section a -- strategy plan

the existing building was not strong enough to hold the load capacity of this project so an additional two floors were added. the first addition is 16 feet tall, with the potential for adding more meeting space to the convention center. the second added floor is a lightwalk which is a large square hallway along the perimeter of the building. adding the two floors will allow the building to sustain the load capacity of the project.



section b -- strategy plan

in the strategy plan, there are spaces for seating, a path that circulates through the whole site as well as five different access points. various plantings, based on the views are also featured in this strategy plan. outside views determine the theme of the immediate site.

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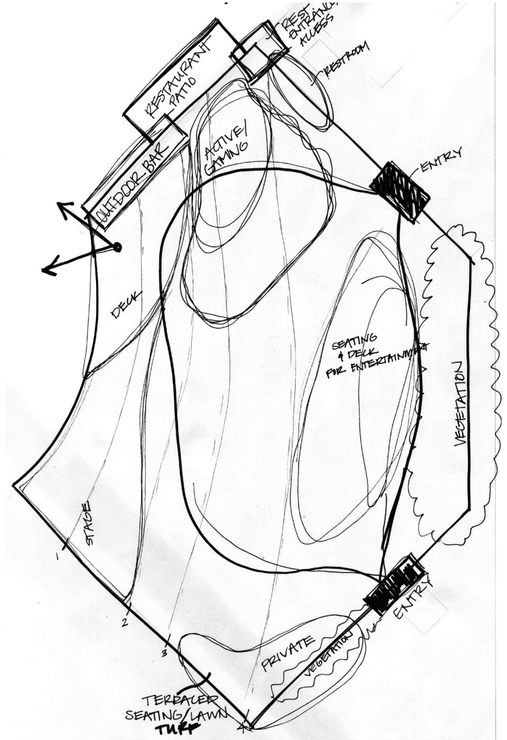
.site plan concepts

elements
1. seating
2. stage
3. turf
4.path
5. bar
6. restaurant
7. privacy
8. railing
9. ada
10. vegetation
11. deck
12. restroom
13. organized games

accomplish:
1. views
2. relax
3. entertain
4. active
5. social



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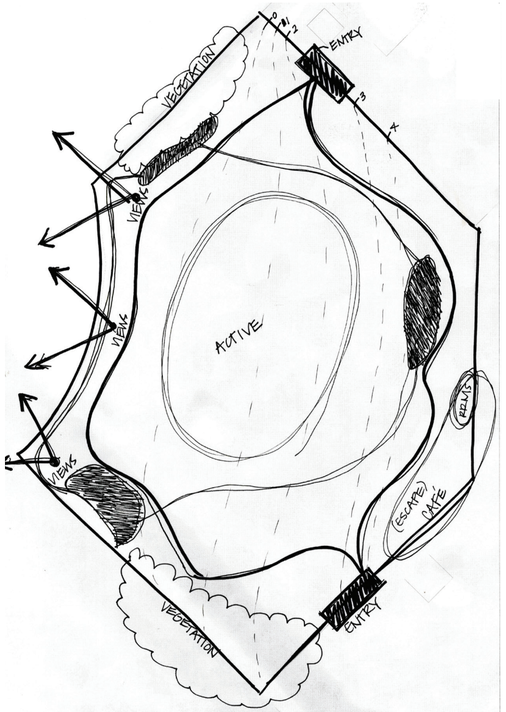
elements
1. seating
2. railing
3. path
4. vegetation
5. boulders
6. turf
7. stone
8. water/stream
9. elevation
10. ada
11. cafe

accomplish:
1. views
2. escape
3. relax
4. active/passive

active:
green space
path
stream

passive:
seating
views



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.master plan

1. artificial turf
2. walkway
3. wooden deck
4. outdoor bar and cafe
5. tensile canopy
6. stage
7. boulder seating
8. ada accesible ramp
9. south entrance
10. north entrance
11. planting beds

N

1/16" = 1' 0"

0' 5' 10' 15' 20'

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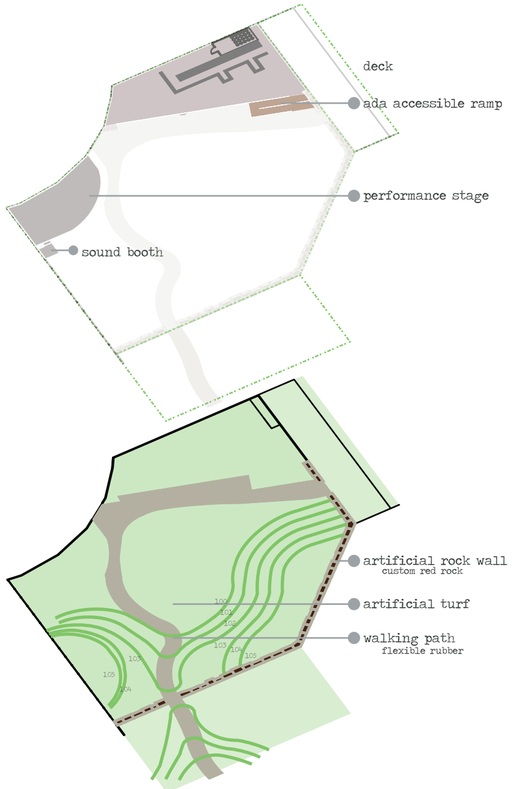

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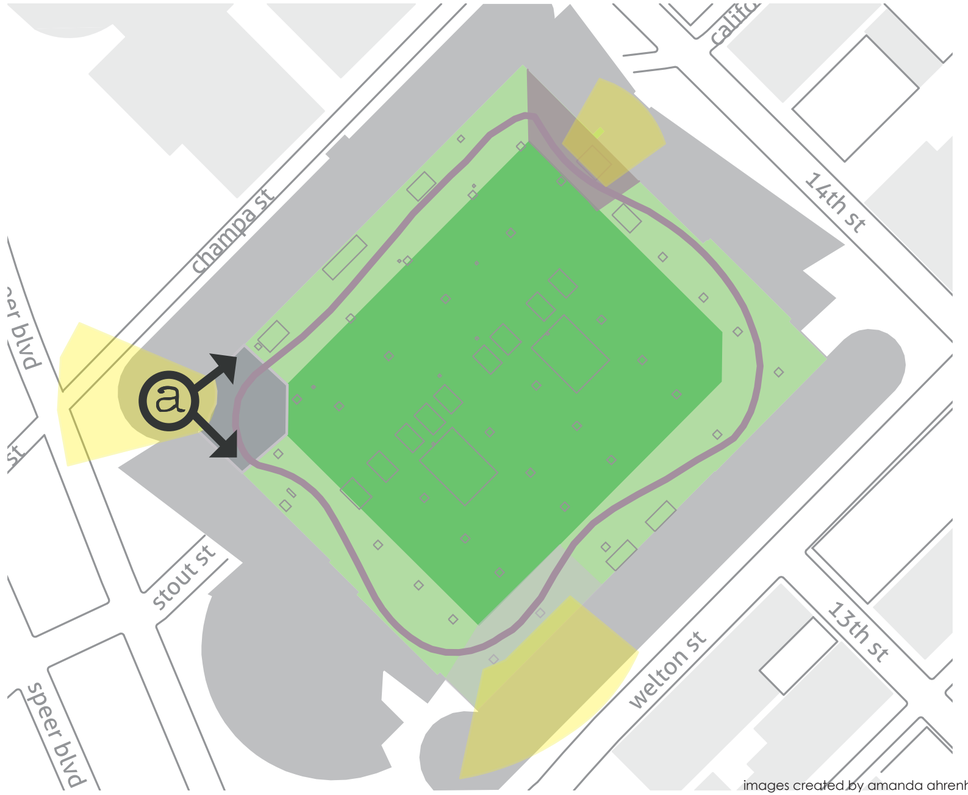
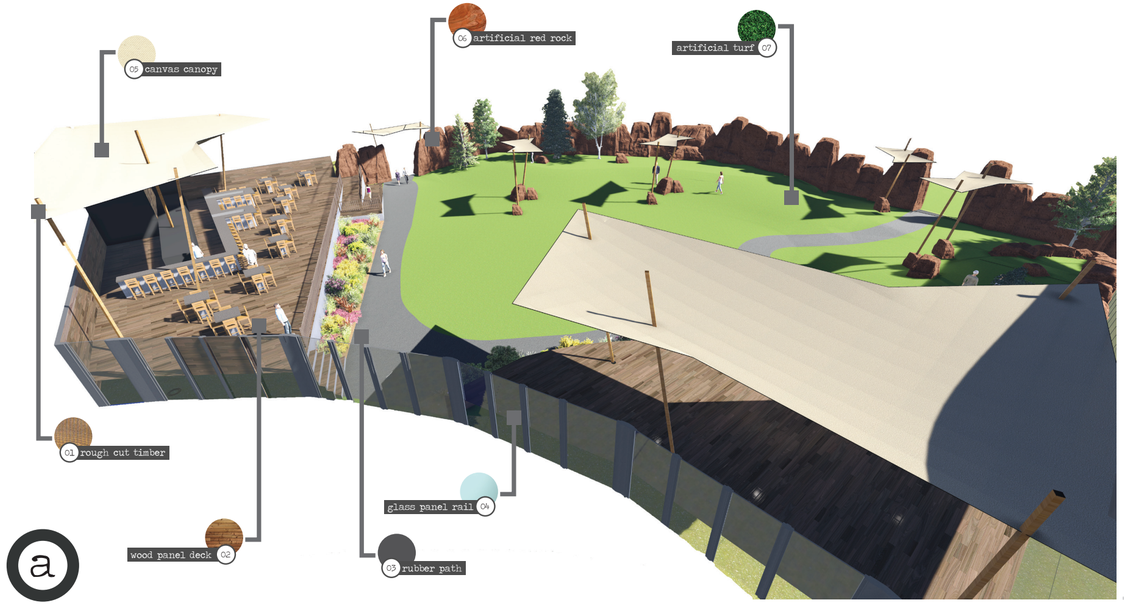
.site plan





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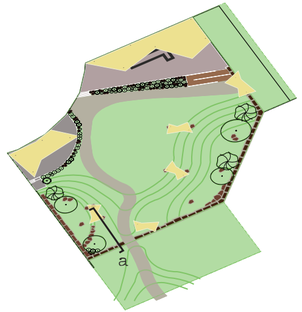
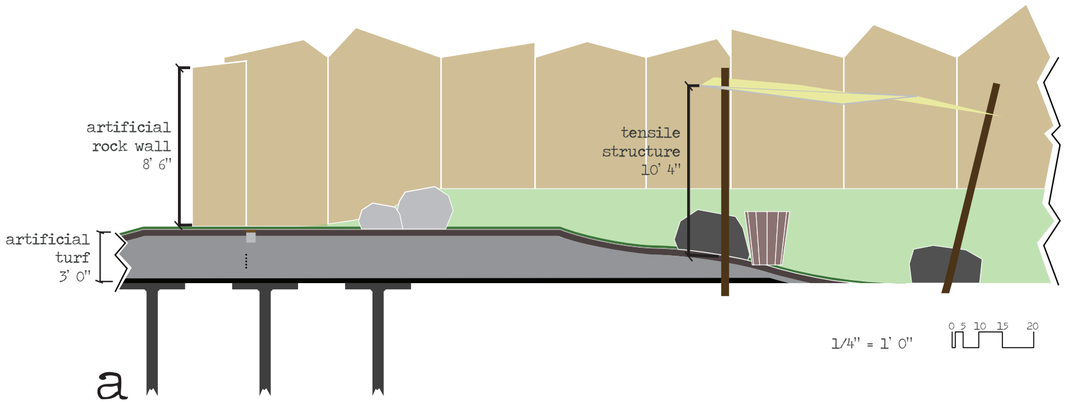
.section





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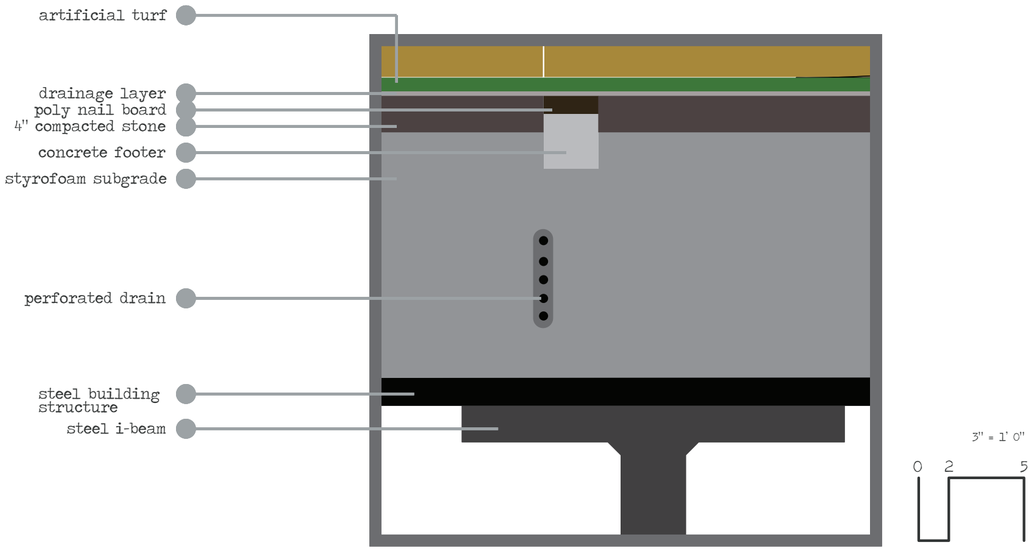
.artificial turf detail



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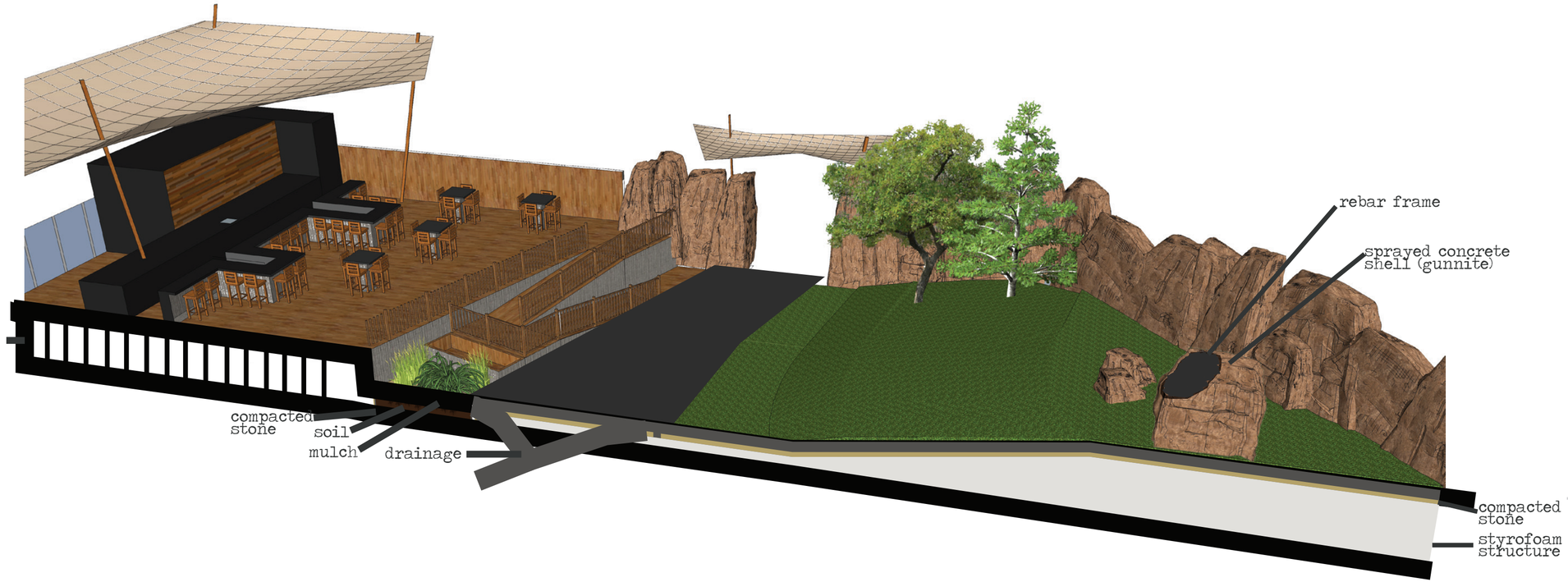
.section perspective



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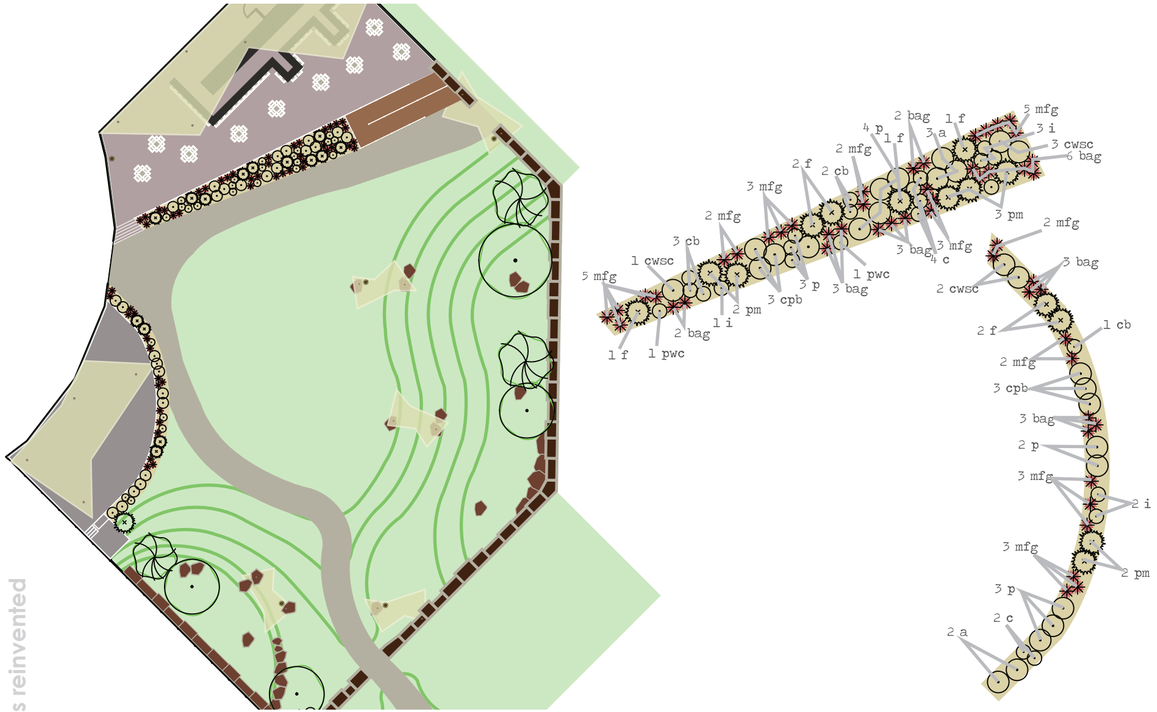
.planting plan



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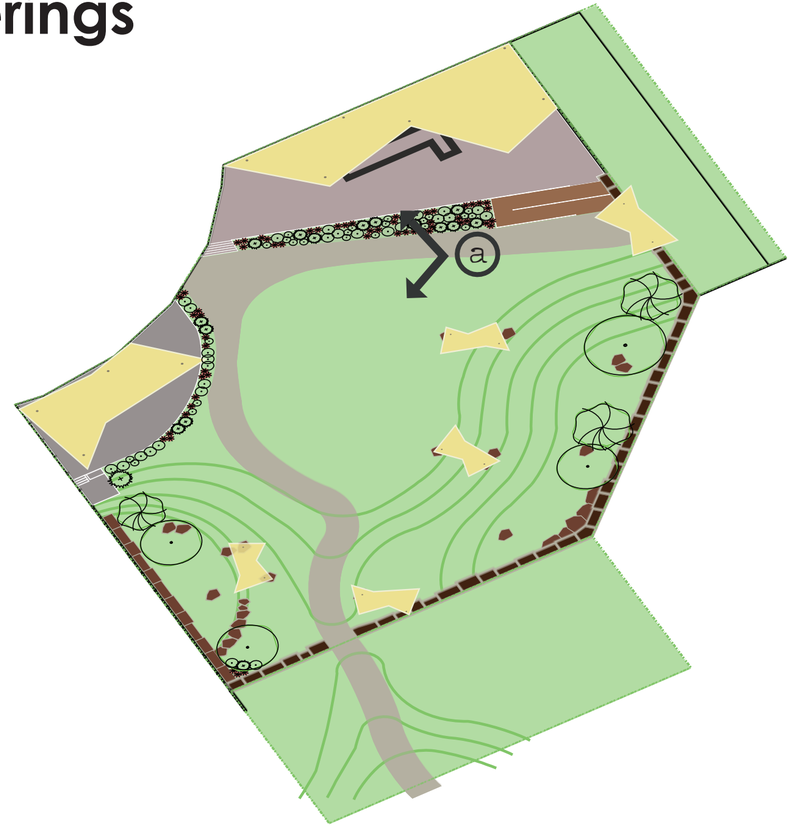
.plant list

qty	symbol	common name
5	a	agastache
22	bag	blue avena grass
6	c	catmint
6	cb	coral bells
6	cpb	crimson pygmy barberry
6	cwsc	creeping western sand cherry
6	f	fernbush
6	i	iceplant
30	mfg	mexican feather grass
8	p	penstemon
7	pm	panchito manzanita
4	pwc	prairie wine cup

.renderings



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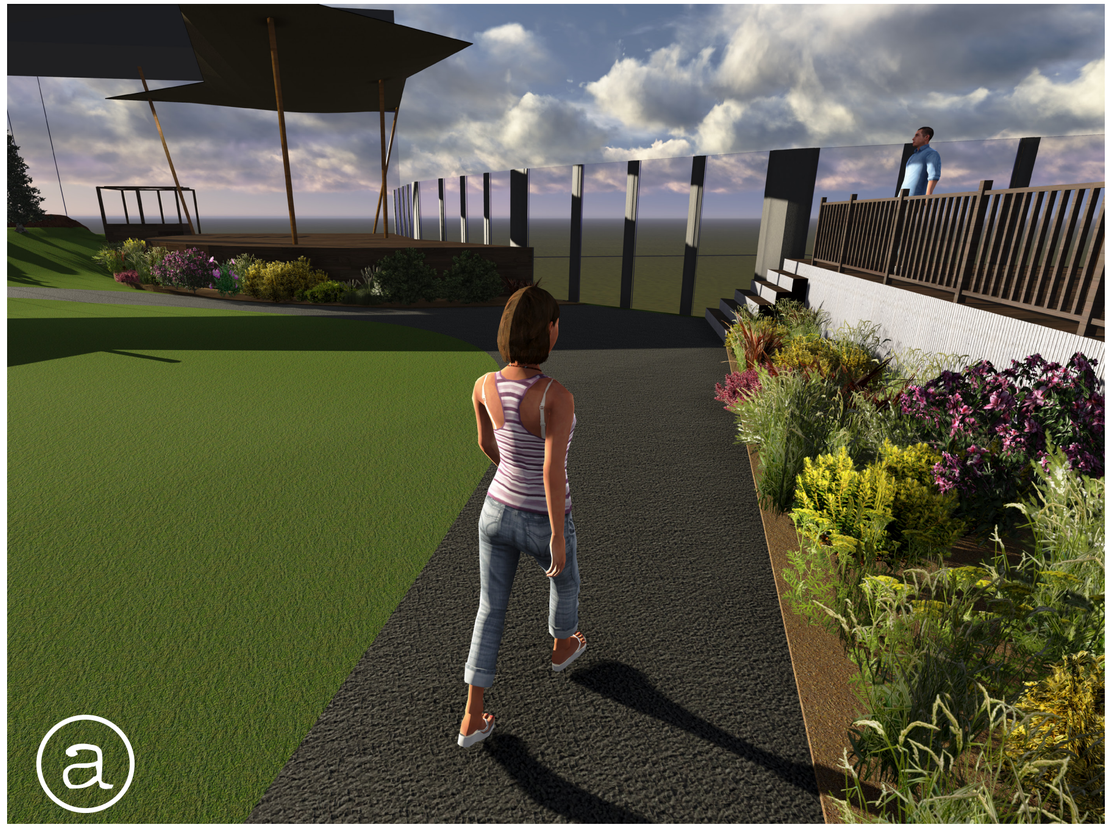

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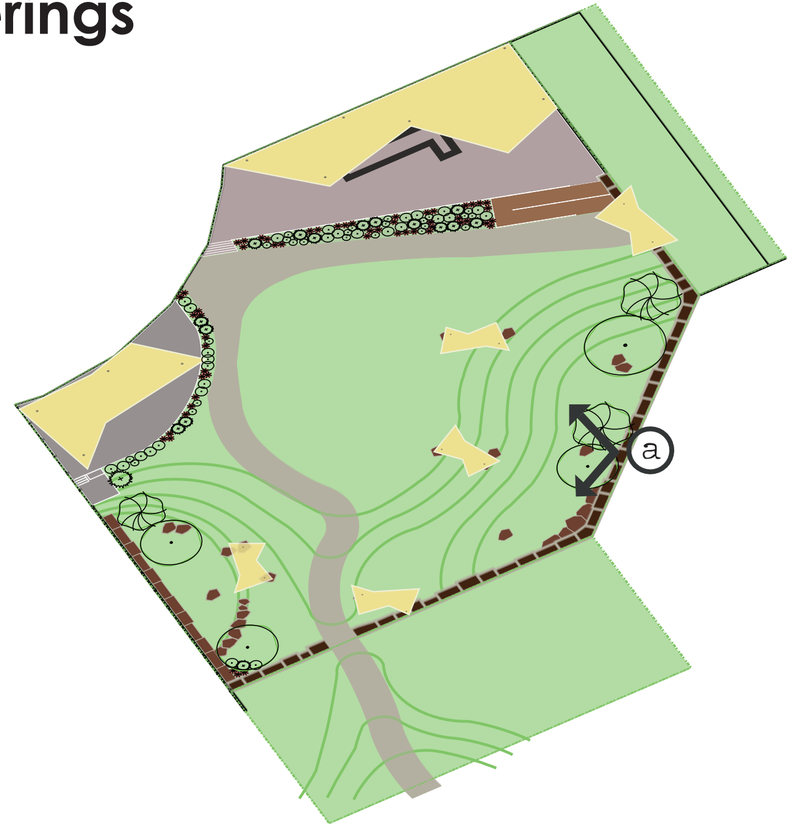

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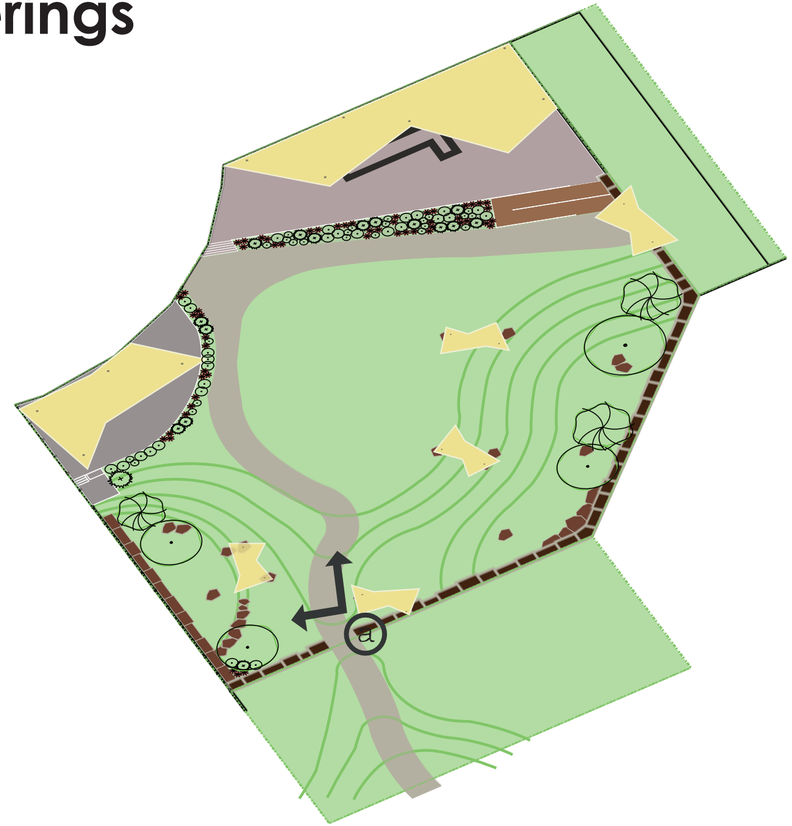

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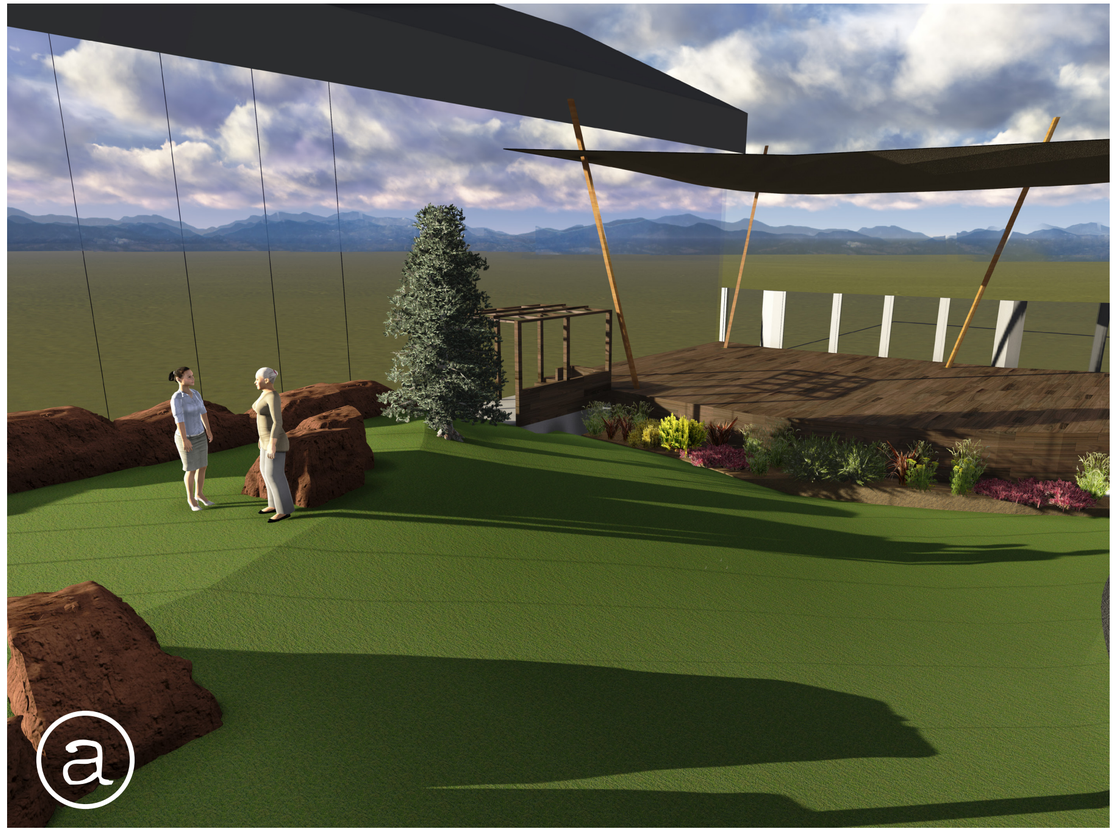

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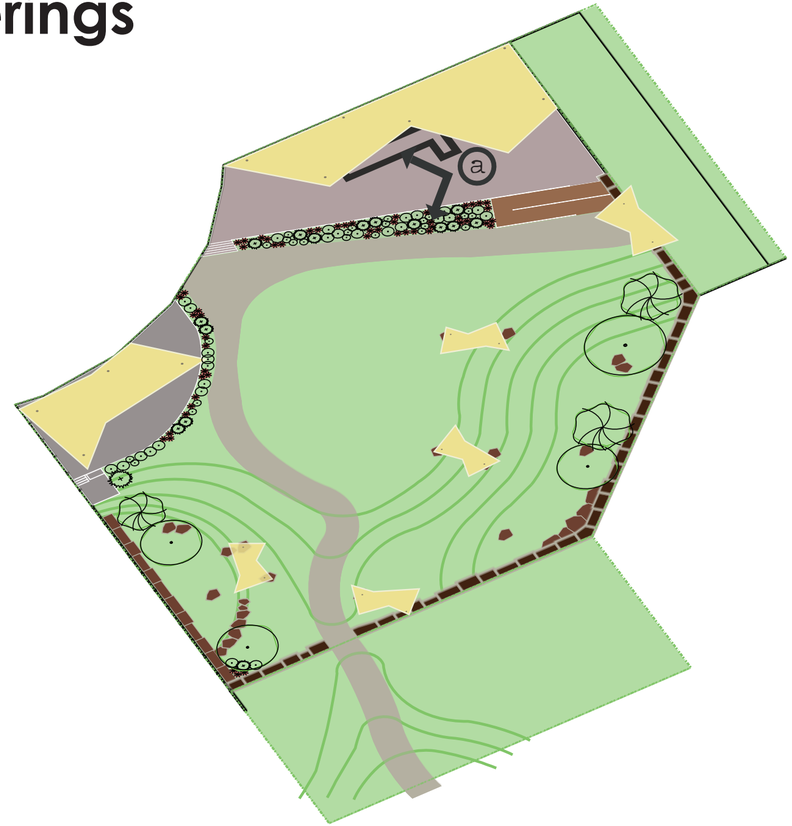
.renderings



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.reference list

Brooke, J. (1998, December 29). Denver Stands Out in Mini-Trend Toward Downtown Living. *The New York Times, online edition.*

Canvas. (n.d.o). Starbuck Canvas. Retrieved from http://www.angelfire.com/sk/starbuck/canvas.jpg

City Design Group. (n.d.). *Transit Center District Plan.* Retrieved from http://www.sf-planning.org/ftp/CDG/CDG_transit_center.htm

Colorado Parks and Recreation. (2011, February). Rethinking its Urban Parks: Denver capitalizes on winter climate to activate its parks year round. *Parks & Recreation, 46 (2) 11-13.*

Colorado Convention Center. (n.d.a). *Our story.* Retrieved from http://denverconvention.com/about-us/our-story/

Colorado Convention Center. (n.d.b). *I See What You Mean.* Retrieved from http://denverconvention.com/about-us/public-art/i-see-what-you-mean/

Colorado Convention Center. (n.d.c). *Stone Garden.* Retrieved from http://denverconvention.com/about-us/public-art/stone-garden/

Colorado Convention Center. (n.d.d). *Colorado Panorama: A People's History.* Retrieved from http://denverconvention.com/about-us/public-art/colorado-panorama-a-peoples-history/

Colorado Convention Center. (n.d.e). *Wood Water Rock.* Retrieved from http://denverconvention.com/about-us/public-art/wood-water-rock/

Colorado Convention Center. (n.d.f). *Indeterminate Line.* Retrieved from http://denverconvention.com/about-us/public-art/indeterminate-line/

Colorado Convention Center. (n.d.g). *Doing the Denver Dance.* Retrieved from http://denverconvention.com/about-us/public-art/doing-the-denver-dance/

Colorado Convention Center. (n.d.h). *Tail Spin*. Retrieved from http://denverconvention.com/about-us/public-art/tail-spin/

Colorado Convention Center. (n.d.i). *Laughing Escalator.* Retrieved from http://denverconvention.com/about-us/public-art/laughing-escalator/

Colorado Convention Center. (n.d.j). *Model State: A Local Cosmology.* Retrieved from http://denverconvention.com/about-us/public-art/model-state-a-local-cosmology/

Colorado Convention Center. (n.d.k). *Ancient Colorado Paintings.* Retrieved from http://denverconvention.com/about-us/public-art/ancient-colorado-paintings/

Colorado Convention Center. (n.d.l). *Colorado Pioneers.* Retrieved from http://denverconvention.com/about-us/public-art/colorado-pioneers/

David, J., & Hammond, R. (2011). *High Line: The Inside Story of New York City's Park in the Sky*. New York, NY: Farrar, Straus and Giroux.

Denver. (2013a). *Denver parking smart cards or cash keys.* Retrieved from http://www.denvergov.org/trafficandparking/TrafficandParking/Parking/MeterParking/SmartCardsCashKeys/tabid/437782/Default.aspx)

Denver. (2013b). *14th Street Sidewalk/Streetscape*. Retrieved from http://www.denvergov.org/Projects/1DStreetsandPublicWorks/14thStreetSidewalkStreetscape/tabid/437297/Default.aspx

Diviant Art. (n.d.q). Smooth Glass Wall. Retrieved from http://fc09.deviantart.net/fs19/f/2007/270/a/a/Smooth_Glass_Wall_by_dimage.jpg

Downtown Denver Partnership. (2013). *Business Directory & Map.* Retrieved from http://www.downtowndenver.com/map-directory/

Evergreen Tennis Courts. (n.d.t). Plexi. Retrieved from http://evergreentenniscourts.com/AnimatedImages/8/plexi.58.JPG

Fire When Ready Pottery. (n.d.v). Red Rocks Texture. Retrieved from http://firewhenreadypottery.com/wp-content/uploads/2009/06/red-rocks-texture-225x300.jpg

Greenprint Denver. (2009). *Air and Emissions.* Retrieved from http://www.greenprintdenver.org/air-and-emissions/

Impala Black. (n.d.n). Jade color downloads. Retrieved from http://www.topsandmore.com/images/Jade%20Color%20Downloads/Impala%20Black.jpg

Little Alley. (n.d.s). Wood Background. Retrieved from http://littlealleysteak.fhfoodtradinggroup.com/wp-content/themes/lasteak/images/wood-background.jpg

McCormack, G., Rock, M., Toohey, A., Hignell, D. (2010, March 3). Characteristics of urban parks associated with park use and physical activity: A review of qualitative research. *Health & Place, 16 (2010) 712-726.*

New York City Economic Development Corporation. (2013.) *The High Line.* Retrieved from http://www.nycedc.com/project/high-line

Pelli Clarke Pelli Architects. (2013). *Transbay Transit Center.* Retrieved from http://pcparch.com/project/transbay-transit-center-and-tower

Regional Transportation District. (2013). *System map.* Retrieved from http://www3.rtd-denver.com/elbert/SystemMap/index.cfm

Retail Displays. (n.d.r). Faux Rock Cliff Face Panel. Retrieved from http://retaildisplaysandprops.com/images/catalog/RP44/Faux%20Rock%20Cliff%20Face%20Panel%202b.jpg

RR Landscape Supply. (n.d.u). Hardwood mulch. Retrieved from http://www.rrlandscapesupply.com/wp-content/uploads/2012/03/hardwood-mulch.jpg

Textures. (n.d.m). iPad wallpaper deck. Retrieved from http://versporttvonline.com/wp-content/uploads/2013/05/Textures-ipad-wallpaper-deck-mywalls-hd.jpg

Timber. (n.d.p). Custom timber images. Retrieved from http://www.mrtimbers.com/images/custom/timber/timber_wprs3.jpg

The High Line. (2013). *Design Team.* Retrieved from http://www.thehighline.org/design/design-team

The High Line. (2013b). *Park Information, directions.* Retrieved from http://www.thehighline.org/about/park-information

Theorig, T. C., & Stern, J. D. (2013). *Advisory Services Panel Impact Assessment Special Report: 1948-2011.* Report from Urban Land Institute, an Executive Summary, Washington, DC. Retrieved from http://www.uli.org/wp-content/uploads/ULI-Documents/ASImpact2013_Flo-2.pdf

Transbay Transit Center. (2013). *City Park.* Retrieved from http://transbaycenter.org/project/transit-center/transit-center-level/city-park

Urban Land Institute. (2006). *Colorado Convention Center Expansion*. Retrieved from http://casestudies.uli.org

Visit Denver, The Convention & Visitors Bureau. (n.d.). *History of the Mile High City.* Retrieved from http://www.denver.org/metro/history

Yin, S., Shen, Z., Zhou, P., Zou, X., Che, S., Wang, W. (2011, March 13). Quantifying air pollution attenuation within urban parks: An experimental approach in Shanghai, China. *Environmental Pollution, 159 (2011) 2155-2163.*

.annotated bibliography

Brooke, J. (1998, December 29). Denver Stands Out in Mini-Trend Toward Downtown Living. *The New York Times, online edition.*

This New York Times article gave valuable information and statistics in who lives in downtown Denver and their reasons why.

Canvas. (n.d.o). Starbuck Canvas. Retrieved from http://www.angelfire.com/sk/starbuck/canvas.jpg

Canvas image for material callout.

City Design Group. (n.d.). *Transit Center District Plan.* Retrieved from http://www.sf-planning.org/ftp/CDG/CDG_transit_center.htm

This website gives detailed information about the plan to turn the transit center into their new downtown. It also has schedules, plans and contracts for the project.

Colorado Parks and Recreation. (2011, February). Rethinking its Urban Parks: Denver capitalizes on winter climate to activate its parks year round. *Parks & Recreation, 46 (2) 11-13.*

This article gave insight to what residents of Denver want to see in their urban parks.

Colorado Convention Center. (n.d.a). *Our story.* Retrieved from http://denverconvention.com/about-us/our-story/

The Convention Center Website Our Story page was helpful in providing information about what the center provides and host through the year.

Colorado Convention Center. (n.d.b). *I See What You Mean.* Retrieved from http://denverconvention.com/about-us/public-art/i-see-what-you-mean/

Information and photos on art piece I See What You Mean were found at this webpage.

Colorado Convention Center. (n.d.c). *Stone Garden.* Retrieved from http://denverconvention.com/about-us/public-art/stone-garden/

Insight to what art piece Stone Garden is, was found at this page.

Colorado Convention Center. (n.d.d). *Colorado Panorama: A People's History.* Retrieved from http://denverconvention.com/about-us/public-art/colorado-panorama-a-peoples-history/

Photography public art installment, Colorado Panorama: A People's History, was found along with photos at this webpage operated by the Colorado Convention Center.

Colorado Convention Center. (n.d.e). *Wood Water Rock.* Retrieved from http://denverconvention.com/about-us/public-art/wood-water-rock/

Art installment, Wood Water Rock information was found at this website.

Colorado Convention Center. (n.d.f). *Indeterminate Line.* Retrieved from http://denverconvention.com/about-us/public-art/indeterminate-line/

Information on Indeterminate Line and photos were found at this page.

Colorado Convention Center. (n.d.g). *Doing the Denver Dance.* Retrieved from http://denverconvention.com/about-us/public-art/doing-the-denver-dance/

Doing the Denver Dance art installment information and photos were found here.

Colorado Convention Center. (n.d.h). *Tail Spin*. Retrieved from http://denverconvention.com/about-us/public-art/tail-spin/

Information on Tail Spin along with photos were found at this website.

Colorado Convention Center. (n.d.i). *Laughing Escalator.* Retrieved from http://denverconvention.com/about-us/public-art/laughing-escalator/

Laughing Escalator information and photos were found here.

Colorado Convention Center. (n.d.j). *Model State: A Local Cosmology.* Retrieved from http://denverconvention.com/about-us/public-art/model-state-a-local-cosmology/

Art piece, Model State, information and photos were found at this webpage.

Colorado Convention Center. (n.d.k). *Ancient Colorado Paintings.* Retrieved from http://denverconvention.com/about-us/public-art/ancient-colorado-paintings/

Ancient Colorado Paintings done at the CCC information was found at this page.

Colorado Convention Center. (n.d.l). *Colorado Pioneers.* Retrieved from http://denverconvention.com/about-us/public-art/colorado-pioneers/

Information on Colorado Pioneers and photos were found on this Convention Center operated page.

David, J., & Hammond, R. (2011). *High Line: The Inside Story of New York City's Park in the Sky*. New York, NY: Farrar, Straus and Giroux.

High Line is a book about the development of High Line Park in New York City. It was written by the co-founders of Friends of the High Line and the authors each take turns talking about their view of how the High Line came about.

Denver. (2013a). *Denver parking smart cards or cash keys.* Retrieved from http://www.denvergov.org/trafficandparking/TrafficandParking/Parking/MeterParking/SmartCardsCashKeys/tabid/437782/Default.aspx)

Denver's parking information and rates can be found at this city webpage.

Denver. (2013b). *14th Street Sidewalk/Streetscape*. Retrieved from http://www.denvergov.org/Projects/1DStreetsandPublicWorks/14thStreetSidewalkStreetscape/tabid/437297/Default.aspx

Denver's initiative to go green with streetscape design is farther explained by this website.

Diviant Art. (n.d.q). Smooth Glass Wall. Retrieved from http://fc09.deviantart.net/fs19/f/2007/270/a/a/Smooth_Glass_Wall_by_dimage.jpg

Material callout image for glass panel wall.

Downtown Denver Partnership. (2013). *Business Directory & Map.* Retrieved from http://www.downtowndenver.com/map-directory/

Buildings surrounding the Colorado Convention Center were found at this site.

Evergreen Tennis Courts. (n.d.t). Plexi. Retrieved from http://evergreentenniscourts.com/AnimatedImages/8/plexi.58.JPG

Path callout image for materials.

Fire When Ready Pottery. (n.d.v). Red Rocks Texture. Retrieved from http://firewhenreadypottery.com/wp-content/uploads/2009/06/red-rocks-texture-225x300.jpg

Red rock texture image for material callouts.

Greenprint Denver. (2009). *Air and Emissions.* Retrieved from http://www.greenprintdenver.org/air-and-emissions/

The Greenprint Denver website is maintained and operated by the city and county of Denver, CO. It is a resource for everything related to Denver's new initiative, Greenprint Denver. It is also to inform the residents of Denver about how they can help the city to leave a lighter ecological footprint.

Impala Black. (n.d.n). Jade color downloads. Retrieved from http://www.topsandmore.com/images/Jade%20Color%20Downloads/Impala%20Black.jpg

Granite material callout image.

Little Alley. (n.d.s). Wood Background. Retrieved from http://littlealleysteak.fhfoodtradinggroup.com/wp-content/themes/lasteak/images/wood-background.jpg

Wood image for material callouts.

McCormack, G., Rock, M., Toohey, A., Hignell, D. (2010, March 3). Characteristics of urban parks associated with park use and physical activity: A review of qualitative research. *Health & Place, 16 (2010) 712-726.*

How users access and use city parks plus insight to why they continue to use parks was found here. Specific information about park amenities were noted.

New York City Economic Development Corporation. (2013.) *The High Line.* Retrieved from http://www.nycedc.com/project/high-line

The New York City Economic Development Corporation website was helpful for statistics and numbers on budget for the High Line.

Pelli Clarke Pelli Architects. (2013). *Transbay Transit Center.* Retrieved from http://pcparch.com/project/transbay-transit-center-and-tower

Pelli Clarke Pelli Architects are the masterminds behind the design of the new Transbay Transit Center and City Park. Graphics and information about the city park were found here.

Regional Transportation District. (2013). *System map.* Retrieved from http://www3.rtd-denver.com/elbert/SystemMap/index.cfm

Light rail and bus schedule information and routes were found here.

Retail Displays. (n.d.r). Faux Rock Cliff Face Panel. Retrieved from http://retaildisplaysandprops.com/images/catalog/RP44/Faux%20Rock%20Cliff%20Face%20Panel%202b.jpg

Artificial rock callout for materials.

RR Landscape Supply. (n.d.u). Hardwood mulch. Retrieved from http://www.
Theorig, T. C., & Stern, J. D. (2013). *Advisory Services Panel Impact Assessment Special Report: 1948-2011.* Report from Urban Land Institute, an Executive Summary, Washington, DC. Retrieved from http://www.uli.org/wp-content/uploads/ULI-Documents/ASImpact2013_Flo-2.pdfrrlandscapesupply.com/wp-content/uploads/2012/03/hardwood-mulch.jpg

Wood mulch callout for materials.

Textures. (n.d.m). iPad wallpaper deck. Retrieved from http://versporttvonline.com/wp-content/uploads/2013/05/Textures-ipad-wallpaper-deck-mywalls-hd.jpg

Wooden decking texture image for callout.

The High Line. (2013). *Design Team.* Retrieved from http://www.thehighline.org/design/design-team

The High Line website is operated by Friends of the High Line, the organization that began and continues to maintain High Line Park in New York City. Information about the lead designers and consultants are found at this page.

The High Line. (2013b). *Park Information, directions.* Retrieved from http://www.thehighline.org/about/park-information

Information about park access, buss routes and light rail were found at this website that is operated by Friends of the High Line.

Urban Land Institute put together this special report and addressed the significance and importance of Denver's downtown revitalization.

Timber. (n.d.p). Custom timber images. Retrieved from http://www.mrtimbers.com/images/custom/timber/timber_wprs3.jpg

Rough cut timber callout image for materials.

Transbay Transit Center. (2013). *City Park.* Retrieved from http://transbaycenter.org/project/transit-center/transit-center-level/city-park

The Transbay Transit Center website has helpful information about the redevelopment plan and their new transit center plan, which is currently under construction.

Urban Land Institute. (2006). *Colorado Convention Center Expansion*. Retrieved from http://casestudies.uli.org

Information about the expansion and remodel of the Colorado Convention Center was found here.

Visit Denver, The Convention & Visitors Bureau. (n.d.). *History of the Mile High City*. Retrieved from http://www.denver.org/metro/history

Historical information about Denver's first founders and why people came to Denver were found at this city website.

Yin, S., Shen, Z., Zhou, P., Zou, X., Che, S., Wang, W. (2011, March 13). Quantifying air pollution attenuation within urban parks: An experimental approach in Shanghai, China. *Environmental Pollution, 159 (2011) 2155-2163.*

This report explains how the research done in parks and urban space in China was proven to have positive effects on air pollution.