BIG CAT CRAWL

OBJECTIVES
CONTRIBUTE to conservation efforts through a movement in zoo design that generates a feeling of animal appreciation for enclosed species
DESIGN an aesthetic enclosure that has a balance for zoo care operation, viewer appreciation, and benefits animal welfare
DISCOVER a connectivity system between enclosures suitable for large cats which allows migration between exhibits
INCORPORATE successful exhibit enrichment elements as well as introduce advanced models for animal stimulation and welfare
CREATE stimulating exhibits for the cats at the San Diego zoo that helps mitigate abnormal behaviors
PROVIDE viewers with new and exciting ways to experience large cats through innovative landscape immersion

EVOLUTION OF ZOO DESIGN

- Medieval design approach: natural habitats, moats, and animal katkı
- 1868: First Zoological Gardens opened in London
- 1874: Zoo in Philadelphia
- 1889: World's first zoo in the open style in Chicago
- 1896: The Los Angeles Zoo opens
- 1934: The New York Zoological Society opens
- 1972: The San Diego Zoo opens
- 2010: The Houston Zoo opens

EYE FOR DESIGN

ENTERTAINMENT AND EDUCATION

ECOLOGICAL

ECONOMIC

THE CATS

HABITATS

MOUNTAIN GRASSLAND
- Taiga is the largest land biome on earth. It is characterized by coniferous forests that provide shelter and food for a variety of animals. The taiga is home to some of the world's largest mammals, including grizzly bears, wolves, and moose. It is also home to a wide variety of birds, such as raptors, owls, and songbirds.

TROPICAL CONIFEROUS FOREST
- Tropical rainforests are some of the most diverse ecosystems on Earth. They are home to a wide variety of plants and animals, including many that are not found anywhere else on the planet. The forests are also home to a wide variety of insects, such as butterflies and ants.

DESERT
- Deserts are characterized by extreme temperatures and low levels of rainfall. They are home to a wide variety of plants and animals, including some that are adapted to surviving in extreme conditions. The desert is home to many species of reptiles, such as snakes and lizards.

MARSHES
- Marshes form where water is very close to, or above, the surface of the land. They are home to a wide variety of plants and animals, including many that are adapted to living in wet environments. The marsh is home to many species of birds, such as herons and egrets.

MANGROVES
- Mangroves are trees that grow in coastal areas. They are home to a wide variety of plants and animals, including many that are adapted to living in salty environments. The mangrove is home to many species of fish, such as schools of clownfish.

TUNDRA
- Tundra is the cold, treeless zone near the poles that has permafrost. It is home to a wide variety of plants and animals, including many that are adapted to living in cold environments. The tundra is home to many species of birds, such as ptarmigans.

TROPICAL DRY FOREST
- Tropical dry forests are characterized by low levels of rainfall and high levels of temperature. They are home to a wide variety of plants and animals, including many that are adapted to living in arid environments. The forest is home to many species of butterflies, such as monarchs.

THE CATS

- The lion is the king of the jungle, and is known for its bright orange coat and distinctive black mane. The lion is a large, powerful predator that is found across Africa.

- The tiger is a large, powerful predator that is found across Asia. It is known for its distinctive black stripes and is often referred to as the “king of the jungle.”

- The cheetah is a large, powerful predator that is known for its incredible speed. It is the fastest land animal on Earth.

- The clouded leopard is a small, stealthy predator that is known for its distinctive cloud-like markings.

- The jaguar is a large, powerful predator that is found across South America. It is known for its distinctive black spots and is often referred to as the “king of the jungle.”

- The leopard is a large, powerful predator that is found across Africa. It is known for its distinctive black spots and is often referred to as the “king of the jungle.”

- The clouded leopard is a small, stealthy predator that is known for its distinctive cloud-like markings.

- The jaguar is a large, powerful predator that is found across South America. It is known for its distinctive black spots and is often referred to as the “king of the jungle.”

- The leopard is a large, powerful predator that is found across Africa. It is known for its distinctive black spots and is often referred to as the “king of the jungle.”

- The clouded leopard is a small, stealthy predator that is known for its distinctive cloud-like markings.

- The jaguar is a large, powerful predator that is found across South America. It is known for its distinctive black spots and is often referred to as the “king of the jungle.”

- The leopard is a large, powerful predator that is found across Africa. It is known for its distinctive black spots and is often referred to as the “king of the jungle.”
PHILADELPHIA ZOO

EXHIBIT DESIGN

Bill Catfalls, was chosen to phone interview and during a behind the scene tour of the Big Cat Falls exhibits in Philadelphia, Pennsylvania.

Big cats are social and require adequate space to allow for social interaction. The lion and jaguar have access to hundreds of square feet of space that allow for the cats to be able to run. The exhibits are designed to give the cats the ability to move freely through exhibit space, allowing them to explore new areas and to be in the presence of other cats.

The exhibits are designed to accommodate and enrich the cats and provide a space where they can interact with each other. The exhibits are designed to simulate the cats’ natural habitat and provide a stimulating environment for the cats. The exhibits are designed to be functional and a very large structure. From 1950-2004 this space was functional and a very large structure. From 1950-2004 this space was a functional and a very large structure.

San Diego Safari Park

EXHIBIT DESIGN

Bill Catfalls, was chosen to phone interview and during a behind the scene tour of the Big Cat Falls exhibits in Philadelphia, Pennsylvania.

Big cats are social and require adequate space to allow for social interaction. The lion and jaguar have access to hundreds of square feet of space that allow for the cats to be able to run. The exhibits are designed to give the cats the ability to move freely through exhibit space, allowing them to explore new areas and to be in the presence of other cats.

The exhibits are designed to accommodate and enrich the cats and provide a space where they can interact with each other. The exhibits are designed to simulate the cats’ natural habitat and provide a stimulating environment for the cats. The exhibits are designed to be functional and a very large structure. From 1950-2004 this space was functional and a very large structure. From 1950-2004 this space was a functional and a very large structure.

San Diego Safari Park

EXHIBIT DESIGN

Bill Catfalls, was chosen to phone interview and during a behind the scene tour of the Big Cat Falls exhibits in Philadelphia, Pennsylvania.

Big cats are social and require adequate space to allow for social interaction. The lion and jaguar have access to hundreds of square feet of space that allow for the cats to be able to run. The exhibits are designed to give the cats the ability to move freely through exhibit space, allowing them to explore new areas and to be in the presence of other cats.

The exhibits are designed to accommodate and enrich the cats and provide a space where they can interact with each other. The exhibits are designed to simulate the cats’ natural habitat and provide a stimulating environment for the cats. The exhibits are designed to be functional and a very large structure. From 1950-2004 this space was functional and a very large structure. From 1950-2004 this space was a functional and a very large structure.

San Diego Safari Park

EXHIBIT DESIGN

Bill Catfalls, was chosen to phone interview and during a behind the scene tour of the Big Cat Falls exhibits in Philadelphia, Pennsylvania.

Big cats are social and require adequate space to allow for social interaction. The lion and jaguar have access to hundreds of square feet of space that allow for the cats to be able to run. The exhibits are designed to give the cats the ability to move freely through exhibit space, allowing them to explore new areas and to be in the presence of other cats.

The exhibits are designed to accommodate and enrich the cats and provide a space where they can interact with each other. The exhibits are designed to simulate the cats’ natural habitat and provide a stimulating environment for the cats. The exhibits are designed to be functional and a very large structure. From 1950-2004 this space was functional and a very large structure. From 1950-2004 this space was a functional and a very large structure.

San Diego Safari Park

EXHIBIT DESIGN

Bill Catfalls, was chosen to phone interview and during a behind the scene tour of the Big Cat Falls exhibits in Philadelphia, Pennsylvania.

Big cats are social and require adequate space to allow for social interaction. The lion and jaguar have access to hundreds of square feet of space that allow for the cats to be able to run. The exhibits are designed to give the cats the ability to move freely through exhibit space, allowing them to explore new areas and to be in the presence of other cats.

The exhibits are designed to accommodate and enrich the cats and provide a space where they can interact with each other. The exhibits are designed to simulate the cats’ natural habitat and provide a stimulating environment for the cats. The exhibits are designed to be functional and a very large structure. From 1950-2004 this space was functional and a very large structure. From 1950-2004 this space was a functional and a very large structure.
The San Diego Zoo has evolved within downtown San Diego. As a result, the zoo benefits from a large amount of tourism passing through the area. This, along with the existing conditions of the zoo, has influenced the site analysis and context of the zoo.

**EXISTING CONDITIONS**

The San Diego Zoo's location within downtown San Diego has influenced the site analysis and context of the zoo. The zoo is situated in an area with high pedestrian traffic, which has impacted the site selection and context of the zoo.

**SITE SELECTION AND CONTEXT**

The San Diego Zoo's location within downtown San Diego has influenced the site analysis and context of the zoo. The zoo is situated in an area with high pedestrian traffic, which has impacted the site selection and context of the zoo.

**CONNECTION**

The San Diego Zoo's location within downtown San Diego has influenced the site analysis and context of the zoo. The zoo is situated in an area with high pedestrian traffic, which has impacted the site selection and context of the zoo.

**SITE ANALYSIS**

The San Diego Zoo's location within downtown San Diego has influenced the site analysis and context of the zoo. The zoo is situated in an area with high pedestrian traffic, which has impacted the site selection and context of the zoo.

**SAN DIEGO CATS**

The San Diego Zoo has a variety of cat exhibits, including the Bobcat, Cheetah, and Jaguar. Each exhibit has its unique features and characteristics, making them popular with visitors.

**OBSERVATIONS**

The San Diego Zoo's location within downtown San Diego has influenced the site analysis and context of the zoo. The zoo is situated in an area with high pedestrian traffic, which has impacted the site selection and context of the zoo.

**SAN DIEGO ZOO: DOWNTOWN SAN DIEGO**

The San Diego Zoo's location within downtown San Diego has influenced the site analysis and context of the zoo. The zoo is situated in an area with high pedestrian traffic, which has impacted the site selection and context of the zoo.

**CAT EXHIBIT LOCATION**

The San Diego Zoo's location within downtown San Diego has influenced the site analysis and context of the zoo. The zoo is situated in an area with high pedestrian traffic, which has impacted the site selection and context of the zoo.

**OBSTACLES/FACTORS**

The San Diego Zoo's location within downtown San Diego has influenced the site analysis and context of the zoo. The zoo is situated in an area with high pedestrian traffic, which has impacted the site selection and context of the zoo.

**TOPOGRAPHY**

The San Diego Zoo's location within downtown San Diego has influenced the site analysis and context of the zoo. The zoo is situated in an area with high pedestrian traffic, which has impacted the site selection and context of the zoo.

**THREATS**

The San Diego Zoo's location within downtown San Diego has influenced the site analysis and context of the zoo. The zoo is situated in an area with high pedestrian traffic, which has impacted the site selection and context of the zoo.

**MARKETS**

The San Diego Zoo's location within downtown San Diego has influenced the site analysis and context of the zoo. The zoo is situated in an area with high pedestrian traffic, which has impacted the site selection and context of the zoo.

**DRAWBACKS**

The San Diego Zoo's location within downtown San Diego has influenced the site analysis and context of the zoo. The zoo is situated in an area with high pedestrian traffic, which has impacted the site selection and context of the zoo.

**PEOPLE**

The San Diego Zoo's location within downtown San Diego has influenced the site analysis and context of the zoo. The zoo is situated in an area with high pedestrian traffic, which has impacted the site selection and context of the zoo.

**PARKS**

The San Diego Zoo's location within downtown San Diego has influenced the site analysis and context of the zoo. The zoo is situated in an area with high pedestrian traffic, which has impacted the site selection and context of the zoo.

**DRAWBACKS**

The San Diego Zoo's location within downtown San Diego has influenced the site analysis and context of the zoo. The zoo is situated in an area with high pedestrian traffic, which has impacted the site selection and context of the zoo.

**SYSTEMS**

The San Diego Zoo's location within downtown San Diego has influenced the site analysis and context of the zoo. The zoo is situated in an area with high pedestrian traffic, which has impacted the site selection and context of the zoo.

**CONSTRUCTION**

The San Diego Zoo's location within downtown San Diego has influenced the site analysis and context of the zoo. The zoo is situated in an area with high pedestrian traffic, which has impacted the site selection and context of the zoo.

**HUMANIZATION**

The San Diego Zoo's location within downtown San Diego has influenced the site analysis and context of the zoo. The zoo is situated in an area with high pedestrian traffic, which has impacted the site selection and context of the zoo.

**DISADVANTAGES**

The San Diego Zoo's location within downtown San Diego has influenced the site analysis and context of the zoo. The zoo is situated in an area with high pedestrian traffic, which has impacted the site selection and context of the zoo.

**ADVANTAGES**

The San Diego Zoo's location within downtown San Diego has influenced the site analysis and context of the zoo. The zoo is situated in an area with high pedestrian traffic, which has impacted the site selection and context of the zoo.

**CONCLUSIONS**

The San Diego Zoo's location within downtown San Diego has influenced the site analysis and context of the zoo. The zoo is situated in an area with high pedestrian traffic, which has impacted the site selection and context of the zoo.

**DOWNTOWN SAN DIEGO ZOO MAP**

The San Diego Zoo's location within downtown San Diego has influenced the site analysis and context of the zoo. The zoo is situated in an area with high pedestrian traffic, which has impacted the site selection and context of the zoo.
BIG CAT CRAWL MASTERPLAN

**HABITAT ENRICHMENT**

SNOW LEOPARD

Making large leaps over ravines, are highly adapted to their harsh environment in mountainous areas of central Asia. They have thick body hair, and enlarged nasal cavities which heat inhaled cold air keeping them comfortable. These cats are critically endangered due to fur trade and their natural prey declining.

JAGUAR & COUGAR

Subspecies sharing the space, and unique viewing opportunities. A variety in substrate enrichment comes from the plant material and rushing stream with live fishing. Small pools of swirling water. This space is suitable for the Jaguar, Cougar, Leopard and the Tiger. Enrichment comes naturalistic falls and pool within naturalistic habitat immersion.

**RAINFOREST**

and enrichment elements meet the differing preferences of the individual cats. Species sharing the space, and unique viewing opportunities. A variety in substrate enrichment comes from the plant material and rushing stream with live fishing. Small pools of swirling water. This space is suitable for the Jaguar, Cougar, Leopard and the Tiger. Enrichment comes naturalistic falls and pool within naturalistic habitat immersion.

**TROPICAL GRASSLAND**

Adapted to their harsh environment in the mountainous areas of central Asia. Their long, thick body hair, and enlarged nasal cavities which heat inhaled cold air keep them comfortable. These cats are critically endangered due to fur trade and their natural prey declining.

**PLAN ENLARGEMENT**


SNOW LEOPARD

Adapted to their harsh environment in the mountainous areas of central Asia. Their long, thick body hair, and enlarged nasal cavities which heat inhaled cold air keep them comfortable. These cats are critically endangered due to fur trade and their natural prey declining.

**RAINFOREST**

and enrichment elements meet the differing preferences of the individual cats. Species sharing the space, and unique viewing opportunities. A variety in substrate enrichment comes from the plant material and rushing stream with live fishing. Small pools of swirling water. This space is suitable for the Jaguar, Cougar, Leopard and the Tiger. Enrichment comes naturalistic falls and pool within naturalistic habitat immersion.

**TROPICAL GRASSLAND**

Adapted to their harsh environment in the mountainous areas of central Asia. Their long, thick body hair, and enlarged nasal cavities which heat inhaled cold air keep them comfortable. These cats are critically endangered due to fur trade and their natural prey declining.

**PLAN ENLARGEMENT**


SNOW LEOPARD

Adapted to their harsh environment in the mountainous areas of central Asia. Their long, thick body hair, and enlarged nasal cavities which heat inhaled cold air keep them comfortable. These cats are critically endangered due to fur trade and their natural prey declining.

**RAINFOREST**

and enrichment elements meet the differing preferences of the individual cats. Species sharing the space, and unique viewing opportunities. A variety in substrate enrichment comes from the plant material and rushing stream with live fishing. Small pools of swirling water. This space is suitable for the Jaguar, Cougar, Leopard and the Tiger. Enrichment comes naturalistic falls and pool within naturalistic habitat immersion.

**TROPICAL GRASSLAND**

Adapted to their harsh environment in the mountainous areas of central Asia. Their long, thick body hair, and enlarged nasal cavities which heat inhaled cold air keep them comfortable. These cats are critically endangered due to fur trade and their natural prey declining.

**PLAN ENLARGEMENT**


DESIGN ANALYSIS

INTEGRATED successful exhibit enrichment elements and introduced advanced models for animal stimulation and wellness by a connectivity system which allows access to a variety of enrichment elements and habitats.

CREATED stimulating exhibits for the cats at the San Diego Zoo that help mitigate abnormal behaviors by increasing activity levels and providing programmed enrichment opportunities.

PROVIDED viewers with new and exciting ways to experience large cats through innovative landscape immersion by use of specific plant species and multiple viewing opportunities.

This enclosure presents an exciting and educational experience for our guests. As the exhibit’s square footage is small, the design focus is on minimizing the space needed for each element. The exhibit is designed to be a unique and memorable experience. There is limited space for each element, and each element could cater for a long time going for a event. Unlike the common. Design’s goal, the majority of the exhibit spaces are excluded from the normal floor area. The design serves as a functional exhibit that provides a unique space for visitors to experience. The exhibit also demonstrates how rare species exhibit can work by including many ornamental fish species and provide them with protection. Viewers are also able to view the other small marine life, as the root system of the trees provides privacy for fish from other aquarium tanks and creates an underwater environment experience for the viewer. The water feature may include additional enrichment with live feeding and an emotional opportunity to bring the fish closer to the viewer.

TROPICAL GRASSLANDS are inhabited by all of the cat species except the Snow Leopard. The exhibit’s shape provides personal space for companionship, companionship species during the space, and unique viewing opportunities. A variety in substrate and enrichment elements meets the differing preferences of the individual cats.

HABITAT SELECTION

TROPICAL GRASSLANDS are inhabited by all of the cat species except the Snow Leopard. The exhibit’s shape provides personal space for companionship, companionship species during the space, and unique viewing opportunities. A variety in substrate and enrichment elements meet the differing preferences of the individual cats.

BROADLEAF FOREST

CONCLUSION

CONTRIBUTED to conservation efforts through a movement in zoo design that generates a feeling of animal appreciation for enclosed species by bringing people closer to and stimulated animals and immersing them into the endangered habitats.

BROADLEAF FOREST

This enclosure presents an exciting and educational experience for our guests. As the exhibit’s square footage is small, the design focus is on minimizing the space needed for each element. The exhibit is designed to be a unique and memorable experience. There is limited space for each element, and each element could cater for a long time going for a event. Unlike the common. Design’s goal, the majority of the exhibit spaces are excluded from the normal floor area. The design serves as a functional exhibit that provides a unique space for visitors to experience. The exhibit also demonstrates how rare species exhibit can work by including many ornamental fish species and provide them with protection. Viewers are also able to view the other small marine life, as the root system of the trees provides privacy for fish from other aquarium tanks and creates an underwater environment experience for the viewer. The water feature may include additional enrichment with live feeding and an emotional opportunity to bring the fish closer to the viewer.
nocturnal world at the tulsa zoo
introduction

introduction of project
project vision
benefits and program of nocturnal exhibits
conservation efforts for bat habitat production

case studies
world of darkness - Bronx Zoo
congress street bridge - Austin, TX

site analysis

site location
geographical and political context
existing conditions
tree inventory - grading - flood plain - light analysis
current programming
nocturnal animals
20-year master plan concept

site design

site location
overall plan and site features
exhibits
nocturnal house "into DARKNESS"
exhibitry - forest - wings - swamp - cafe and retail
outdoor walk
 cats at night
 mounded exhibit
world of BATS
exploration of caves
in the depths of darkness exhibits
wildBATS

conclusion

benefits of additional nocturnal exhibits
educational
biological
bat conservation and habitat revitalization efforts
locally, regionally, nationwide, and worldwide
INTRODUCTION
introduction

“When the sun sets and night approaches, we city-dwellers continue our activities only by making our own light...The country dweller knows better. Sunset, not sunrise, is the wake-up signal for much, if not most, of the planet’s life.”

- William G. Conway
introduction

**EDUCATE**

The general public about the importance of nocturnal houses in our zoos and how the animals benefit from proper lighting conditions.

To relay the importance of bats to our environment and how they are vital pollinators. The fear of bats has been diluting their positive benefits for far too long.

**CREATE**

The creation of new bat caves and habitats in zoos around the world would contribute to the offsetting of human bat habitat destruction.

To create new homes is to create new opportunities for many of the endangered bat species around the world.

**POPULATE**

To repopulate bat species around the world through the new zoo bat exhibits would benefit our environment and general outlook on bats.

An increased population of bats would lead to an increased level of pollinators, and a decreased level of unwanted pests.

**INNOVATE**

Zoos have began to strive towards a more naturalistic design approach. The future of zoos lies in not only the physical realm of design, but in the biological realm as well.

The introduction of more substantial and functioning nocturnal exhibits that not only educate the public but also create useable habitats for species is vital in the future of our captive and wild animals alike.
introduction

**project vision - nocturnal world at the tulsa zoo**

Native plantings from Africa are found within the lion and giraffe's African savanna, as well as the humidity levels being increased to a maximum inside the howler monkey's rainforest jungle.

Although these attempts to recreate the savannas of Africa and jungles of Costa Rica are steps in the right direction, further implementations of design must be enforced in order to achieve these natural states.

This need in zoo design has pushed me into designing a functional and accurate nocturnal exhibit that is open in the night hours of the summer at the Tulsa Zoo.

The current state of zoos around the world is enhancing in their efforts to recreate the natural environments of those animals held captive inside exhibit spaces.

Nocturnal houses do currently exist in zoos around the world, with the numbers hovering around 20 exhibits. Nocturnal houses such as "The World of Darkness" that opened in 1969 in the Bronx Zoo have since then shut down to lack of funding and interest for the particular exhibit.

By increasing visitor's awareness at how important the night is for wildlife and by also experiencing these animals at night, zoos could begin to receive sufficient funding for their nocturnal exhibits and habitats.

The driving concept for Nocturnal World was to recreate an environment that not only simulates a true natural state for the animals in the physical setting, but in a biological fashion as well. As the vast majority of animals are most active after the sunsets, it is difficult to show visitors and animals alike a true experience of the animal's actual character.

Nocturnal World will be divided into two main experiences: interior exhibits and exterior exhibits. The interior exhibits will simulate varying night habitats. From forests, swamps, tree tops, and below the ground, these exhibits will all mimic environments through feel, look, sound, and even smell.

Upon leaving the interior space, visitors will travel along a dimly lit boardwalk to experience lions, tigers, and snow leopards in rotating habitats through night vision goggles. There will also be an outdoor aviary that will be know as the "Flying Range". This will be a demonstration area for bats, owls, and flying squirrels to soar from end to end and allow the visitors to view them doing so in the night skies.

The outdoor experience ends as it leads into the World of Bats - a wildlife effort implanted in the middle of the Nocturnal World’s exterior exhibit.
The World of Darkness as located in the Bronx Zoo in New York. Designed by Morris Ketchum, Jr. and Associates, this exhibit was the first Nocturnal Animal exhibit in the world.

The building itself was originally built as the Rocking Stone, which stood until 1942. It took over 20 years for the building to be reestablished as a part of the Zoo when it became the World of Darkness in 1969. The exhibit eventually shutdown in 2009 due to a stifling in funds to both the zoo and the Wildlife Conservation Society. The building remains unused today.

The building itself was a large, dark, windowless fortress on the southern portion of the zoo. A horseshoe shape allowed for one-way visitor circulation as well as optimal square footage and usage of interior space by avoiding corners. The exterior entrance was heavily vegetated and had an overgrown appearance.

The aesthetics alone allow for an eerie feeling upon entering the exhibit, but also work fluidly with the functional goals of the nocturnal house. The simulation of true night-time environments was crucial to the enrichment of both the visitors and animals alike.

The goals of the World of Darkness were to create an environment that essentially reversed day and night, thus allowing visitors to experience animals in their true nocturnal state.

Prior nocturnal exhibits tried to implement the strategy of using dim lighting or even moon-lighting effects, however the animals were still showing nocturnal habits while the zoo visitors just watched them sleep. The World of Darkness wanted to truly reverse the sleep cycle of these animals by lighting their holding cages at night, and then turning the lights off when the visitors arrived. This allowed the visitors to view the animals in their most active state.

Not all of the lights were turned off when the animals awoke... Joseph A. Davis, Jr., of the New York Zoological Society, tested a theory of using bright red visible light with nocturnal animals, and his experiments proved successful. This technique of using bright red visible light in nocturnal animal exhibits works due to the biological nature of nocturnal animal's rhodopsin (light sensitive pigment in retina of eye) absorbs all the visible light except red, which is reflected. (Conway 1969)

This discovery led to the basis for lighting in the World of Darkness and as the standard for nocturnal lighting throughout zoos across the world.
introduction

case study - “the world of darkness” - bronx zoo, new york

Visitors would enter the World of Darkness first through a light baffle to orient there vision into a drastic change of lighting. The first signage is then apparent, and it reads “Day and Night”. Two models of a jungle with chipmunks and flying squirrels are displayed. They are identical in every single way but one... One is a night scene, the other a day scene.

This model set the theme for the entire building. Visitors then see an owl display titled “Colors at Night”. This exhibit has different colored glass panes for the visitors to stand in front of, and informs the viewer that when standing behind the red pane, he or she is virtually invisible to the nocturnal owls.

The next experience is the “Life in the Tree Tops, Another Dimension in Living.” The feel simulates that of being amongst the tops of the trees surrounded by tree-top vignettes and a variety of reptile, mammal, and bird exhibits. The visitor then enters a swamp-themed area where the chorus of frogs echoes throughout the misty room. Alligators and skunks are amongst a few of the species in this area.

The next experience will take you through a “Wings in the Night” exhibit, showing owls and goatsuckers. One of the more intriguing displays was the 30 foot long enclosure where visitor’s could witness bats swooping back and forth trying to scoop fish out of a small pond. The enclosure allowed for other flying animals (different species of bats, owls, flying squirrels) to be displayed and researched for future exhibit design implementation. The idea of allowing an optimal amount of flying space (in comparison with the average sized avairy enclosure) is an exponential step in enhancing animal exhibits.

The “Refuge Underground” is the final hall of the building, and it simulates the world beneath our feet. Burrowing insects and critters will be crawling around through their underground networks with aardvarks and badgers popping their heads up in their associated exhibits. The underground area ends with a small North American cave with a small family of bats above your head as you enter and blind salamanders accompanied by crickets in small pooled exhibits.

The final exhibit, and arguably the most experimental and innovative exhibit was the tropical cave. This cave mimicked the scenery of Trinidad, with stalactite covered ceilings and stalagmatie covered floors. A flowing stream split the exhibit and exited outside of the building. This stream entices bats to congregate and vocalize.

This exhibit had a large variety of animals on the forest floors as well as a number of species flying overhead. The variation in nocturnal species was tested regularly and the animals were observed in order to ensure zero or at least very low levels of hostility towards another.

Shown above are a few species within the World of Darkness. These included (in numerical order) geckos, frogmouths, flying squirrels, cat snakes, phalangers, porcupines, and lorises.

The World of Darkness unfortunately was shut down in 2009 due to a large budget cut by the city to zoos in the area. This trend of nocturnal houses closing has recently continued (Woodland Park Zoo, Los Angeles Zoo) and the importance of night for our animals must be reconsidered and expressed.
introduction

project vision - world of bats - habitat reformation

Centuries of folklore, myths, and misinformation have led to countless numbers of fears concerning bats. These fears have led to an increased threat to bat populations and habitats across the globe, thus a continuing decrease in overall bat population.

These fears should be diluted with the natural benefits bats provide to our everyday life. Bats are crucial to the pollination cycle and are in charge of seed and pollen dispersal for countless plants that cannot be accounted for by other pollinators in the animal kingdom.

My design will be an integrated bat cave within Nocturnal World that acts as a functional bat cave for migratory bats. This exhibit will be known as the World of Bats.

For my study, I have chosen three species of bats on which my design will be focused. Two of the three species are endangered, these being Myotis grisescens (Gray bat) and Myotis sodalis (Indiana myotis). The third is the common and highly abundant Tadarida brasiliensis (Mexican free-tailed bat).

The decisions to incorporate two endangered species and one abundant species was to evaluate and observe the differences and impacts that creating a habitat will induce on both present species and species that we are trying to reintroduce to the area.

My goals and intentions of this project are to create a model for bat habitats that can be implemented into current and future zoos around the globe. Just as humans have decreased the bat habitat through fear and misinformation, humans can also recreate habitats through knowledge and proper design intent.

Proper research of bat caves will be necessary in order to successfully create a suitable habitat for bats to breed and utilize the provided shelter.

SPEdIES

Tadarida brasiliensis Myotis grisescens Myotis sodalis
The summer nights in Austin are always full with evenings of live music, happy hours, art shows, and bat watching. The Congress Avenue Bridge in Austin, Texas, is home to nearly 1.5 million Mexican Free-Tailed bats. These bats live in crevices underneath the bridge that was reconstructed in 1980.

Located right in downtown Austin, the Congress Avenue bridge is right in the middle of the largest concentration of tourists and locals alike during the peak season of bats.

The public immediately begin to argue for a proper disposal strategy for the bat colony due to the proximity of the colony to the heart of downtown. After being informed about the true nature and benefits of our flying furry friends, citizens of Austin slowly began accepting these bats as a part of their city as well.

These Mexican free-tailed bats migrate each spring from central Mexico to sites all across the southwestern U.S. and southern U.S. states. While being active pollinators, these bats also consume around 20-20,000 pounds of insects on a nightly basis (batcon.org).

A fiscal impact survey was conducted for the city on the impact of the bat colony. The survey showed that 65% of returning visitors had a more positive outlook towards bats after seeing them emerge from the bridge. The viewers who had a neutral impact after their return for the most part (68%) already had a positive attitude towards bats (see graphs below).

The majority of bats start arriving in March and April, and are settled in completely by June when the mothers give birth to nearly 750,000 pups. The next few months are excellent times to view the bats, with the peak season around late August to mid-September.

Although this is not an annual sight-seeing event, and the peak season is just a mere 6-8 weeks, the fiscal impact survey also estimated that the bat colony has an average yearly direct impact of approximately $3.2 Million dollars, and an overall impact of around $8 million dollars.

The map to the left shows the proximity of the bridge to the heart of downtown Austin. This nearness to the citizens and tourists alike was the primary cause for the uproar, but also the primary cause for the fiscal and educational impact the bat colony has provided Austin.

This positive impact on the economy is just one reason that bat colonies should be established and protected, let alone the environmental benefits that a colony of bats this size provides the region.
These maps are graphic representations of the three species looked at in this study. The national map is also indicating the Tadarida brasiliensis' grouping characteristics and the extensive southern migratory routes that certain groups take.

**LEGEND**

- Tadarida brasiliensis (Mexican free-tailed bat)
- Myotis sodalis (Indiana myotis)*
- Myotis grisescens (Gray bat)*
- Tadarida brasiliensis Migration Routes

* endangered species
Introduction

Nationwide Bat Hubs to Connect AZA Accredited Zoos

The implementation of nation-wide bat hubs within AZA accredited zoos would allow for secure habitats along the bat’s migratory routes and within our nation’s top zoos. This system of bat caves across the nation could be used for environmental enhancements in the bat population as well as a variety of increased opportunity in bat research.

The shades of gray are the current habitat ranges of the three bat species listed in the previous section, and the location of these bat hubs was coordinated with those habitat ranges in order to promote efforts of repopulation in the areas in which shades of gray are not present.

These hubs will also act as additional shelters in habitat ranges that are populated with bats. Although migratory patterns will shift, and these current migratory paths will not always be the path most taken, this model is a start for an approach to the bat hub concept for future design implementation.
nocturnal world

SITE ANALYSIS
Mohawk Park

Located in one of Oklahoma’s largest municipal parks, the Tulsa Zoo finds its home in North Tulsa with Mohawk Park. Mohawk Park as a whole is a lush green landscape with numerous amounts of reservoirs, lakes, and streams. These copious amounts of water sources within the park along with the transitioning pattern of vegetation across the park, this site can be considered an ecological playground.
site analysis

tulsa county

The City of Tulsa Park Department oversees 8,200 acres of park land and 140 parks (cityof-tulsa.org). The graphic to the left shows the distribution of major parks within the Tulsa area.

Mohawk Park can easily be identified as the largest park in the city, and by an expansive amount. The park is nearly 2,800 acres, and contains two large lakes (Lake Yahola and Lake Sherry)

Mohawk Park is situated about 10 miles from the central core of Downtown Tulsa. The park itself is in a low-income area of Tulsa, and this has caused for a somewhat increased level of loitering and criminal activity in and around Mohawk Park.

The wind rose below shows that nearly 15% of Tulsa County's wind comes from the South and South-Southeast (22%), and the third strongest direction is blowing from the North at 10%.
Mohawk Park is currently home to the Mohawk Park Golf Course, the 350 acre Oxley Nature Center, the Tulsa Zoo, a shooting range, equestrian riding trails, multiple wooded picnic areas, a reservoir with boating and fishing, and countless opportunities to explore nature. The Tulsa Zoo is the most visited site of all the site’s programs combined.

There is currently a design for a proposed master plan that will redefine the central area of the park, as well as provide for additional expansion opportunities for existing programs.

Mohawk Park is right in the path of the 100 year flood plain, and considerations must be taken in the site design in order to provide positive drainage and maintain a higher elevation at the FFE than that of the flood plain.
The Oxley Nature Center provides a variety of activities and programs for visitors.

Located in the center of Mohawk Park on the Northern edge, the center consists of nearly 9 miles of hiking trails which send visitors on loops around lakes and through forested areas of the park (a few of the main trails are highlighted below).

Along with the nature trails, Oxley Nature Center provides a spacious visitors center and observation deck. The attached observation deck allows for panoramic views of the surrounding area and offers a great spot for wildlife viewing and picnics.

The interior of the Oxley Nature center is full of interpretive exhibits and signage to educate visitors about the natural wildlife and plant life in the park.

In 2001, a detached observation deck was built that allows for excellent views of the adjacent Lake Sherry. There is also an covered shelter that can be used as an outdoor classroom.

Interpretive exhibit design is crucial for the education of our youth and by creating a fun and interactive atmosphere in what could otherwise be just "another nature center", Oxley has provided a setting for natural learning and creativity.
The proposed master plan for Mohawk Park highlights areas that will be programmed towards specific events or activities. The map shows an additional 35 acre expansion for the Zoo which has yet to be discussed or programmed.

Also included in the master plan:

- Day Camp
- Dog Park
- Disc Golf
- Central Lawn
- Events Pavilion
- Nature Area
- Soccer Fields
Mohawk Park is currently home to the Mohawk Park Golf Course, the 350 acre Oxley Nature Center, the Tulsa Zoo, a shooting range, equestrian riding trails, multiple wooded picnic areas, a reservoir with boating and fishing, and countless opportunities to explore nature. The Tulsa Zoo is the most visited site of all the site’s programs combined.

The current zoo map is shown below, and although the orientation is opposite of true north, the map does a good job of simplifying the zoo for the visitor’s experience and ease of use.
site analysis

nocturnal world site location

My direct site consists of a much smaller portion compared with that of Mohawk Park as a whole, however still rich with diversity.

This site sits directly adjacent, and even on in some locations, the central man-made body of water that houses the Siamang exhibit.

The existing trees are all deciduous, and therefore will open up for brighter winter moonlighting conditions.

Centrally located, the site for Nocturnal World will allow visitors the opportunity to have access to reduced scaled exhibits while walking to the new night exhibit. It is also directly in the middle of the entrance and the Macaw Landing Grille as well as the new children’s proposed play area. This will allow for additional opportunities that will be highlighted in the night programming section.

My site is fairly flat, however starts with an 8% slope directly from the sidewalk, and then levels out to a 3% slope flowing into the lake from West to East. The panoramic picture shown below is one taken from the Western edge of the site.
These site photos were taken at 9:30 in the morning and show the condition of the project site towards the end of Oklahoma’s winter season. The letter corresponds with the figure to left.
site analysis

foot candle grid study

The two diagrams shown are representative of the 100' x 100' plot within our project site split in 10' x 10' cubes. The perspective below shows the foot candle grid in context after being extruded appropriately. This image also shows where the light sources are focusing their foot candles on the given area.

After taking the foot candle grid out of context and extruding into a three-dimensional model, color was added to enhance the graphic. Red for high-intensity light, yellow for medium-intensity light, and blue for low-intensity light. These colors are contextually related only within this 1000 sq. ft. site.

This grid was interpolated to acquire an average foot candle reading for each 10' x 10' grid.

The light meter gave ranges from nearly 0 foot candles up to 0.35 foot candles. This range had to do with multiple factors:

- Light source and distance from site
- Trees and vegetation diluting the light
- Cloud coverage was at nearly 50%
- Humidity was at 65%

Ideally for my project's purpose, the range of light within the site should be anywhere from 0 foot candles to no more than 0.05 foot candles in the animal areas, and 0.25 foot candle on the visitor's walkway.
nocturnal world

SITE DESIGN

C
site design

proposed zoo master plan

The proposed master plan for the Tulsa Zoo enhances visitor circulation by streamlining visitor paths and allowing a more natural flow of direction between exhibits. This master plan was laid out by PGAV, a zoo design firm based out of St. Louis. The master plan has separated the zoo into 6 different regions. North America, The Lost Kingdom, Sheepy Hollow, Rainforest, Wild Islands, and African Plains.

Working with PGAV, I was able to determine the most appropriate location for my site for Nocturnal World. Key components in my sites location were:

1. Proximity to Body of Water
2. Adjacent to proposed cat exhibits
3. Centrally located in “Heart of Zoo”
4. Direct access to Restaurant and Play Area

These key components are critical for the success of a nocturnal exhibit with my desired programming at the Tulsa Zoo.
The concept for the shape of the building went through a variety of shapes and forms, and eventually came to its final form with the inspiration of Chinese language and culture. In the Chinese language the word for bat is “fu”, which is the name of the character that means “happiness”. (Griffin 1969)

The figure of the bat then came to stand for good luck, or happiness, in the Chinese culture. Bats are still implemented into many Chinese designs and decor to represent good fortune/happiness and long life.

The term “Wu-Fu” means “Five Luck” in the Chinese language. It is represented by a talisman of five bats in a radial pattern. The five lucks, represented by five bats, include longevity, wealth, health and peace, good morals; and good death.

The final design uses the bat’s body as the main portion of the building with a concrete base and structural exterior wall. The wings of the bat will be open-air canopies that will provide both exhibit space for the visitors as well as a shaded seating area during the day time when Nocturnal World is not open.

The canopy itself will be Foiltec in order to maintain a light yet structural composition, and allow for a modern look and feel for the new exhibit building.

This discovery of the symbolic meaning of bats in Chinese history allowed me to interpret my building, and the overall theme of bats, as a positive experience that brings happiness... contrary to the popular American standard fear of bats.

Although Japanese in origin, the art of Origami is representative of Asian cultures and I wanted to explore the art of origami in relation to bats for my building concept.
site design

**overall site plan**

The overall site for Nocturnal World is approximately 2 acres. The design consists of three different regions for various visitor experiences. Visitors enter through the bat-shaped building and into the interior exhibits of Nocturnal World. After wandering through the interactive exhibits on the inside, the visitors then walk onto the exterior boardwalk.

Along the boardwalk, visitors will pass 2 large cat exhibits as well as the flying range. The boardwalk also surrounds the rounded earth berm that has the bat's entrance into their shelter. This boardwalk is ideal for sunset views of the bats as the exit for the nightly feeding.

As the boardwalk exhibits come to an end, visitors will then have the option to enter the World of Bats underground exhibit. These exhibits will be further outlined in their specific sections to follow.
The largest challenge for this site's grading is the ability to maintain positive drainage from the new nocturnal house building, as well as keeping a flow of water through the interior bat cave and berm.

By creating a natural swale that begins just North of the flying range exhibit, the water will follow a directional path that leads in the existing pond. This swale will capture the majority water on the north part of my site.

I will be raising the FFE of my building three feet above the ground level in order to stay above the 50 year flood plain line. In doing this, a large retaining wall will need to be built at the foundation of the building, as well as some cantilevered construction for the part of the building extending over the pond.

The south face of the building will have a slight ramp up to the entrance, and the visitors will be walking over another swale that flows directly underneath the entrance ramp and into the pond.

Catch basins have been placed in areas where water may tend to pool on the site and in the exhibits. The exhibits will be primarily flat, but will still need areas for the keepers to wash the dirty water while cleaning the area.

The West face of the building has a 2% slope on the patio, which leads the water into two designed rain gardens. All plantings in these rain gardens, natural swales, and on the extensive green roof bat cave will be native to the area if possible. These plantings will also have filtering characteristics in order to help reduce runoff pollution from the roof and the pathways.
site design

water runoff
The night hours of the Tulsa Zoo start after Memorial Day and end around Labor Day and are open for the public’s viewing Thursday through Sunday. These hours will extend normal operating hours from 5 PM until 9 PM, with the restaurant staying open until 10 PM. During the weekdays, the Nocturnal World will be available for special events and bookings only.

The alternative exhibit showing during evening hours will include a reduced scale exhibit in the chimpanzee, elephant, and lost kingdom exhibit. Visitor’s will be able to walk through the park and experience these animals under night-lit conditions while on their way into the the Nocturnal World.

The circles on the diagram represent walking times with a stroller and children to certain exhibits during the evening hours. The design will accommodate the visitors by allowing no more than 3-5 minutes of walking time without experience an exhibit.

The ability to leave existing exhibits open will not only increase the experience during the night hours, but also allow for other animal exhibits to go through research and development with nocturnal exhibity. The Zoo will maintain a minimum number of appropriate staff on hand to properly run and maintain the active parts of the zoo.

The evening hours will also accommodate season pass holders and special permission guests to have a Southern access into the Nocturnal World. This circular drop-off zone will allow for families and guests to be dropped off while either a valet or a member of the car goes and parks the car in the Southern staff parking lot.

This will allow much quicker access for repeat visitors coming to primarily eat or just view the Nocturnal World and the bat cave.
site design

proposed lighting concept - overall plan

The current light conditions are good for proper night lighting conditions such as open events, concerts, and fundraisers, however for the purpose of my project, the current lighting will not be ideal.

My project to design a night exhibit at the Tulsa Zoo, and help reduce animal’s stress by reducing the amount of natural light in their environment. By reducing the flood lamp and single overhead lamp and adding low wattage path lights and two overhead wall lamps there will still be a greatly enhanced site.

The new site will feature a soft lit landscape with dim path lighting mimicking that of the moon. The exhibits will be lit purely by moonlight and the visitors will be offered night-vision goggles to obtain an “animals eye view” of the world at night.

Zoos will primarily shut their doors to the public for viewing around 5pm, 7 days a week. The lighting in zoos is put together as an effective, but more importantly, in an efficient design solution. As long as it passes code for visitor circulation safety standards, the permit will be passed.

The current site lighting proves more than adequate for safety purposes, but is also designed with nothing more than standards in mind.

Transitioning this site analysis to a potential redesign, there are a few particular images that represent the feel I am trying to achieve in my design.

I would ideally like to capture enough light to enhance the artistic features of the natural beauty surrounding the site, however I do not want to emit large amounts of light pollution.

The feel of the area should remain natural and organic, but also intriguing and tempting as the lighting pulls you to a certain path. Experimenting with colorful LED’s would be ideal interesting and create a thrilling effect open the viewers.
site design

aerial night rendering of nocturnal world
site design

axonometric exhibit diagram

The three separate areas are all constructed as one complete entity, pieced together with four major parts.

- Vector Foiltec Bat Canopy
- Bat Cave Entrance and Green Roof Structure
- Interior Exhibits
- Outdoor Boardwalk
- Below Grade Bat Exhibit
site design

north to south site section
site design

east to west site section
site design

interior exhibits overall plan

Nocturnal World
Exit Tunnel
Spotlight Scavenger Exhibit
Animal Holding and Back of House Exhibit Space
Nocturnal World Exit Tunnel
Owl Exhibit
To Play Area and Macaw Landing Grill
Entrance to Forest Exhibit
Entry Hall for Nocturnal World
Covered Patio and Seating
Snack and Beverage Hut
Rain Garden Bioswale

Firefly Tunnel and Wings at Night
Lemur Exhibit
Spotlight Return
Jungle Nights Entrance
Lagoon Exhibit
Amphibian Exhibit
Spotlight Pickup
Entry Ramp to Nocturnal World

Maintenance and Mechanical
Exterior Boardwalk extending over pond with mist effects
Visitors will be allowed to use spotlights only in the forest area to investigate the surrounding exhibits for critters and creepy crawlers. Species within these exhibits will be completely nocturnal and the majority of the species will have limited to no vision whatsoever, so as the spotlights will not harm them.
nocturnal world

EXTERIOR EXHIBITS

C.2
Entering the exterior exhibits, visitors will walk onto the wooden boardwalk that extrudes over the existing pond for a great view of the Lost Kingdom Exhibits as well as an ideal viewing deck for bats emerging from their cave.

Traveling along the boardwalk, visitors will experience five different encounters.

1. The Bat Viewing Deck and Pond Overlook
2. The Savanna Exhibit
3. The Woodlands Exhibit
4. The Flying Range
5. Entrance to the World of Bats

All of these exhibits will introduce the visitors to animals in their nocturnal habitat, while not disturbing these animals with artificial lighting, but rather implementing Infrared Stands for the visitors.

Each section will be discussed in further detail in the sections to follow.
The Savannah exhibit will be the first of the big cat exhibits that visitors will encounter. By mimicking the physical appearance of a grassy savanna plain, this exhibit will allow the visitors to feel like they are viewing into the night of the African Savanna. Malaysian tigers, lions, and snow leopards will all be rotating through this exhibit.

This rotation of cats will allow for increased enrichment and greatly benefit the biological nature of the cats.

Visitors will be able to see the cats by either moonlight alone, or with the use of the six infrared camera stands set up on the designated viewing decks.

By witnessing how these animals act in their natural state and their ability to navigate and interact in pitch black, visitors will gain more of an appreciation for the importance of the world that comes alive at night.
site design

boardwalk renders
The woodlands exhibit is similar in function to the Savanna exhibit in terms of nocturnal benefits to the cats, however the aesthetic feel and enrichment techniques are varied.

Rather than the African Savanna, this exhibit represents the woodlands of Asia where tigers roam through the trees and shallow bodies of water.

A large shallow shotcrete pool with running miniature waterfalls allows for the cats to cool off in the summer's evening heat. The ground will be covered with a variation of ferns and tough grasses, along with natural logs for scratching.

The evergreen tree groves will allow the cats to gain a bit of privacy and rummage through the vegetation.

This exhibit contains five infrared camera stands as well as a shaded area that overlooks the central berm and bioswale.
site design

flying range enlarged plan

Existing Tree
Stairs to lower viewing
Upper Viewing Platform
Natural Bioswale
Extensive Green Roof
Entrance to World of Bats
Planetarium
Tunnel to World of Bats

Natural Boulders
Deadfall Standing Perch Branch
25' Mesh Enclosure
Dipping Pool
2" Acrylic Viewing Glass Barrier
Crushed Aggregate Surfacing
Deadfall Standing Perch Branch
Columnar Steel Support Beams

20 ft
10
5
0
20 ft
site design

site details - shotcrete barriers and earth berms

#######

[Diagram of site design with shotcrete barriers and earth berms]
site design

site details - cat service gate and enrichment items
nocturnal world

WORLD OF BATS

c.3
site design

world of bats overall plan

# # # # #
site design

Bat cave section

#####

site design
References

Quotes:

World of Darkness

Websites

GOOD DISTRIBUTION OVERALL WEBSITES FOR ALL BATS

Gray bat migration distribution: http://www.animalinfo.org/species/bat/myotis.htm

Mexican free tailed distribution map http://icwdm.org/handbook/mammals/Bats/BatBiology.aspx

IMAGE REFERENCES
congress st bats https://www.utexas.edu/cola/insts/southasia/conferences/Visiting-Austin.php


congress bat sculpture http://www.texastripper.com/blog-photos/uploaded_images/austin-bat071-782386.JPG

gray bat head http://www.batcon.org/vrcdb/adhour/images/830000/8322109.jpg

Indiana myotis in flight black background http://www.auburn.edu/academic/classes/biol/5090/boyd/indianaBat/bats1.jpg

World of Darkness – Images
http://www.timtsoter.com/blog/world-of-darkness/


ANIMAL IMAGES


MALAYAN TIGER http://www.turtlehurtled.com/6-subspecies-of-tiger-that-are-still-alive-today/

LION AT NIGHT http://blog.africageographic.com/africa-geographic-blog/files/2012/12/lionatnight_abonora_o-05.jpg

tiger at night http://images.nationalgeographic.com/wpf/media-live/photos/000/202/cache/tiger-reflected-pool-night_20247_990x742.jpg

SNOW LEOPARD AT NIGHT http://s.ngm.com/2008/06/snow-leopards/img/cat-walking-615.jpg
View of Boathouse and Rentals
View of Gift Shop under the bridge
Winter View of Skating Rink looking to West
Inspiration

MRDC | Stoss Landscape Urbanism: STREAMLINES
The project re-imagines 5.5 miles of Mississippi Riverfront in Minneapolis, from the cultural riverfront in downtown north to the city limit.

Streamlines is also a project about working ecologies, ecological systems and dynamics put to work to clean, to re-constitute this working riverfront, and to guide a longer-term transformation of the city fabric.
HIGHWAY 77 GUTHRIE, OK: A COMPLETE STREET PROJECT
HIGHWAY 77 GUTHRIE, OK: A COMPLETE STREET PROJECT

Leslie A. Novotny
17 April 2013

A graduate creative project submitted to fulfill the requirements for the degree of Master of Landscape Architecture
Division of Landscape Architecture
College of Architecture
University of Oklahoma

Graduate Project Committee

Chair Advisor: Leehu Loon, RLA, MLA, ASLA
Associate Professor and Graduate Liaison
Division of Landscape Architecture,
College of Architecture, University of Oklahoma
830 Van Vleet Oval, Gould Hall, Room 255
Norman, Oklahoma 73019-6141
Phone: 405.325.1519
Fax: 405.325.7558
Email: lloon@ou.edu

Advisor: Dr. Thomas Woodfin, PhD
Professor and Graduate Director
Division of Landscape Architecture,
College of Architecture, University of Oklahoma
830 Van Vleet Oval, Gould Hall, Room 254
Norman, Oklahoma 73019-6141
Phone: 405.325.2299
Fax: 405.325.7558
Email: twoodfin@ou.edu

Advisor: Blair Humphreys
Adjunct Professor and Executive Director
Institute for Quality Communities, Urban Design
College of Architecture, University of Oklahoma
830 Van Vleet Oval, Gould Hall, Room 165
Norman, Oklahoma 73019-6141
Phone: 405.445.4477
Fax: 405.325-7558
Email: blairhumphreys@ou.edu
## TABLE OF CONTENTS

1.0. Design Introduction .......................................................................................................................... 1
  1.1. Introduction and Overview............................................................................................................... 2
  1.2. Statement of the Creative Project .................................................................................................... 3
  1.3. Precedent Study .......................................................................................................................... 4-5

2.0. Background Information: Inventory and Analysis ......................................................................... 7
  2.1. City Context ................................................................................................................................ 8-9
  2.2. Hydrology .................................................................................................................................... 10
  2.3. Land Use and Destinations ........................................................................................................... 11
  2.4. Existing Circulation Conditions .................................................................................................. 12-13
  2.5. Project Boundary-Highway 77 ................................................................................................. 14-15
  2.6. Project Boundary Existing Conditions ...................................................................................... 16-17

3.0. Methodology: Intent/Objective of Design ..................................................................................... 19
  3.1. Project Master Plan .................................................................................................................... 20-21

4.0. Design Description: Focus Points and Areas .............................................................................. 23
  4.1. Historical Character Zone Design ............................................................................................. 24-26
  4.2. Transitional Character Zone Design ........................................................................................... 27-28
  4.3. Automobile-Oriented Retail Character Zone Design .................................................................. 29

5.0. Design Conclusion: Summary and Evaluation ............................................................................. 31
  5.1. Evaluation ..................................................................................................................................... 32
  5.2. Summary and Conclusion ........................................................................................................... 33
  5.3. Bibliography .................................................................................................................................. 34
  5.4. Image Sources ............................................................................................................................. 35
LIST OF FIGURES

1-1. Guthrie, Oklahoma Complete Street Resolution .................................................. 2
1-2. Transportation Improvement Plan in Guthrie Comprehensive Plan ......................... 3
2-1. Project Location Maps .......................................................................................... 8
2-2. City Quick Facts .................................................................................................. 9
2-3. Guthrie’s Aquatic Features ................................................................................ 10
2-4. Guthrie’s Existing Land Use ............................................................................. 11
2-5. Destination Locations Maps .............................................................................. 11
2-6. Functional Classification of Guthrie’s Current Street System ......................... 12
2-7. Proposed Improvements for Guthrie’s Transportation System ....................... 12
2-8. Existing Circulation Conditions ....................................................................... 13
2-9. Project Boundary Maps ...................................................................................... 14
2-10. Comprehensive Destination Locations ............................................................ 15
2-11. Historical Character Zone Existing Conditions .............................................. 16
2-12. Transitional Character Zone Existing Conditions ........................................... 16
2-13. Automobile Oriented Retail Character Zone Existing Conditions ................... 16
2-14. Project Boundary Analysis .............................................................................. 16
2-15. Project Boundary Existing Conditions ............................................................. 17
3.1. Project Master Plan ............................................................................................. 21
4-1. Historical Character Zone Plan View: Street and Intersection ........................... 24
4-2. Elevation 1: Historical Character Zone ............................................................... 25
4-3. Historical Character Zone Plan View: Trolley Pull-Out ..................................... 26
4-4. Transitional Character Zone Plan View: Trolley Pull-Out .................................. 27
4-5. Elevation 2: Transitional Character Zone ........................................................... 28
4-6. Elevation 3: Automobile Oriented Retail Character Zone ............................... 29
5-1. Project Master Plan (Repeated) .......................................................................... 32
5-2. Street Character and Conditions Comparison .................................................... 33
A COMPLETE STREET IS AS COMPLICATED AS A SOCIETY ITSELF,
YET AS SIMPLE AS THE BASIC NEED.
DESIGN INTRODUCTION

HIGHWAY 77 GUTHRIE, OK - A COMPLETE STREET PROJECT
INTRODUCTION AND OVERVIEW

HIGHWAY 77 GUTHRIE, OK: A COMPLETE STREET PROJECT

The Request. An elderly Guthrie woman confined to a wheelchair approaches the city council to request access to her community. This is a sensible request made by many citizens who desire to create association, obtain necessities, satisfy wants, and function overall in a social environment. However, this woman finds difficulties accessing her community. Even though this woman can "throw a stone" to many different services the community has to offer her, her ability to safely and securely arrive at these destinations is hampered by a dangerous situation. This dangerous situation is her communities' streets, which are a direct effect of designing communities around the automobile. When venturing out of her home, she experiences firsthand how dangerous these design flaws are. She must navigate in her wheelchair through extended intersections, inadequate sidewalks, and threatening traffic. Despite the danger, the need to enjoy common experiences pushes her to venture past her front yard so that she may have a nice meal at Roma's Italian Restaurant or keep an appointment with her physician. These are all experiences that seem effortless to those of us with the ability to hop into our vehicles and drive to our destinations that stand as islands in a sea of parking lots, but to someone like this woman; it is much like playing Russian Roulette. So living with such circumstances, she brought her case in front of the city council to demand better access.

It is not only those with disabilities that long for a change in our street infrastructure and community development. An owner of Roma's Italian Restaurant expressed his desire to be able to navigate through his community by other means than a motor vehicle. He spoke of walkability of past places that his new community lacked and the empathy he felt for the elderly woman in the wheel chair. Expanding beyond this smaller community, Americans nationally are also expressing desire for multi-user focused development. "The 2011 Community Preference Survey reveals that, ideally, most Americans would like to live in walkable communities where shops, restaurants, and local businesses are within an easy stroll from their homes and their jobs are a short commute away" (2011).

The City of Guthrie, Oklahoma has taken consideration of its citizens' mobility capabilities and has decided to incorporate Complete Streets standards, as outlined by the National Complete Streets Coalition. By signing a Complete Streets Resolution, Guthrie will promote "feasible" development that "provide safe and convenient transportation facilities for all modes of travel, including pedestrians, bicyclists, public transit riders, and motorists that are accessible for users of all ages and all ability levels" (Resolution No. 2011-02). With these principles, Guthrie will be able to create streets that incorporate all users and give their citizens the ability to choose their preferred mode of transportation.
Project Intent. This project addresses the community's interest in developing its street by using complete street and smart growth development guidelines. The design will focus on a street infrastructure that is accommodating to every user with any physical abilities and will include elements that will allow pedestrians, bicyclists, and motorists equal opportunity to navigate safely through the city. Additionally, streetscape will perform for its aesthetic qualities along with functional qualities. Proposed streetscape will create an inviting atmosphere by developing street buffers, microclimates, and traffic calming systems. The project boundaries only cover a portion of the city’s major north-south corridor, but the design will serve as a model for street development on the entire city's major thoroughways by addressing the three distinct character zones of the city.

Project Method. "A Comprehensive Plan for the City of Guthrie, Oklahoma" was completed in 2002. In the document, it was recommended that the city develop a "balanced transportation system" to increase usability, connection, capacity, and circulation (RDG, 77). A "Transportation Improvement Plan" seen in Figure 1-2 was outlined and rendered in Chapter 6 of this document illustrating proposed improvement needed for Guthrie's infrastructure. This plan covers the entire city and does not specify recommended phases of development. A part of this project's objective is to identify the first priority section of the city to recommend for phase one construction.

To begin the design process, an inventory and analysis of the entire city will identify the project boundaries. Information collected from official city documents and sources, Geographic Information System, and physical analysis will assist in defining boundaries. Research methods will define existing land use, existing transportation patterns, social behaviors, and urban context. The variety of sources will also allow an evaluation of population, significant locations, and other relevant data to access density, usage, and proximity. An analysis of this data will reveal which section of the city will benefit the most from smart growth development and will lead to an informative decision on what the project boundaries should be.

A comprehensive site analysis on both the city and the project boundary will reveal the physical and social environment. The findings will develop an understanding of deficiencies and advantages in the current infrastructure and assist in developing a comprehensive design for Guthrie's complete streets.

The complexity of this design will require meticulous planning and collaboration of different disciplines. Smart growth development is complex because of the many elements that must be considered to create a successful design. Social, economic, policy, and function all play a role in the direction of the design. To completely understand all these elements, it requires input from different groups and disciplines to propose a comprehensive plan. Direction given from regional and city planners, city leaders, landscape architects, and citizens will ensure an in-depth understanding on how a Complete Street design will work successfully in the City of Guthrie.

FIGURE 1-2: TRANSPORTATION IMPROVEMENT PLAN IN GUTHRIE COMPREHENSIVE PLAN

STATEMENT OF THE CREATIVE PROJECT

HIGHWAY 77 GUTHRIE, OK: A COMPLETE STREET PROJECT

DESIGN INTRODUCTION
PRECEDENT STUDY
HIGHWAY 77 GUTHRIE, OK: A COMPLETE STREET PROJECT
COMPLETING A DISTRICT

The Plaza District is not classified as a "Complete Street", but the district has many elements to make a street complete.

VISION
Mission Statement: "The Plaza District Association works to develop the Plaza District as a vibrant commercial district where arts, local business and neighborhood community thrives" (Plaza District).

SPECIFIES ALL USERS
Users of any age and ability can use the district. ADA specifications have been meet and street calming techniques create a safer environment for all users. All forms of mobility is encouraged in the district, allowing the user to choose their mode of transportation.

ALL PROJECTS
The entire boundaries of the district has been included in the reconstruction by extending streetscape, street repair, and sidewalk considerations. Though some improvements could be made, like creating a bike lane to accommodate for the narrower sidewalks in the neighborhood district, the entire district has made vast improvements to "reconstruction, rehabilitation, and repair" the district. (Elements of an Ideal Complete Streets Policy).

CREATES A NETWORK
The Plaza District has successfully balanced the needs of all users. Pedestrians, cyclists, and motorists can all utilize the district. With the accommodation of the surrounding neighborhoods, the district has been able to handle the large amount of vehicular traffic during events. Though this approach may not be considered perfect, the lack of excessive parking lots and smaller sidewalks does "provide quality accessibility for everyone" (Elements of an Ideal Complete Streets Policy).

ALL AGENCIES AND ALL ROADS
The Plaza District Association had the difficult task of getting the participations of many groups, including residents, business owners, and city officials. Coordination of such magnitude takes careful preparation and compromise.

CONTEXT-SENSITIVE
The design is "sensitive to the community context" (Elements of an Ideal Complete Streets Policy). Elements of the sidewalk complement the existing architecture and style. The street widths could function at a 11' to 12' widths, but are very functional as they are According to the current traffic volume. The sidewalks' size function well for the plaza's events and serves the local community on an daily basis. The off-street parking does not hinder traffic flow and efficiently performs in slowing traffic down inside the district.

PERFORMANCE MEASURES
The sidewalks before the reconstruction were in poor condition and were not clearly defined in the commercial district. The sidewalks now provide plenty a space for the user and are functional. A survey of the area could be conducted to determine linear feet added to have a comprehensive performance measures.

Factual data should be collected to officially determine the amount of usage from surrounding communities and the modes of transportation utilized. However, with observation, a hypothesis can be derived that foot traffic has increased within the district. With increase pedestrian use, the assumption can be made that vehicular traffic has decreased.

IMPLEMENTATION
With construction completed, others can take lessons from the development of this district. The district can serve as a visual example for others to experience and study how creating space for all users can benefit a community. The district can also serve to promote further development extending past the boundaries of the Plaza District. This could lead to consideration between nearby communities, such as Oklahoma City University. The improvement of sidewalks and crosswalks, the installation of bike lanes, and the use of traffic calming techniques could create a connection between other areas in close proximity and broaden the user base.
Urban Character. Guthrie was established in 1887 as a Southern Kansas Railway station called Deer Creek in Oklahoma Indian Territory. At the time of the Land Run in 1889, the town of Guthrie was formed by the rush of non-Native American settlers staking claim to land in the open prairie. Guthrie later became the Oklahoma's territorial capital and was named the state's capital during Oklahoma's statehood in 1907. Guthrie remained the state's capital until the governmental role was moved to Oklahoma City in 1910 based on majority vote. However, during this short time of organization to governmental relocation, a wealth of architectural and cultural attributes was created that is still evident today in Guthrie's well-preserved historical downtown district.

Guthrie, Oklahoma is located in central Oklahoma approximately 30 miles north of Oklahoma City. It is the county seat of Logan County, Oklahoma and is steadily becoming more of a part of the Oklahoma City Metropolitan area. Guthrie's municipal city limits cover “over 17 square miles” which incorporates a treasure of urban history and open spaces as seen in the adjacent photos (RXG, 2). Despite the richness of this city, Guthrie has experienced a fluctuation of population throughout its lifetime mostly caused by economic factors. As of 2010, Guthrie's population was recorded to at 10,191. This number of residents is roughly what the population was during the Land Run establishment and indicates the struggles the city of Guthrie has experienced. However, population has increased 2.7 percent in the first decade of the 21st century and is projected to continually grow (Census, 2010).

GUTHRIE, OKLAHOMA
COUNTY SEAT OF LOGAN COUNTY, OKLAHOMA
POPULATION (CENSUS 2010): 10,191

HISTORY
1887-RAILROAD ESTABLISHED POST
1889-LAND RUN: POPULATION 10,000 TO 12,000 PEOPLE SETTLED OKLAHOMA FIRST CAPITAL
1910-STATE CAPITAL WAS MOVED TO OKLAHOMA CITY
1974-THE GUTHRIE HISTORIC DISTRICT WAS PLACED ON THE NATIONAL HISTORIC PLACES

OPPORTUNITIES
HISTORICAL DISTRICT
1998-NATIONAL HISTORICAL LANDMARK
“CONTAINING THE LARGEST AND BEST PRESERVED COLLECTION OF PRE-STATEHOOD COMMERCIAL, RESIDENTIAL AND CULTURAL BUILDINGS IN THE STATE” (SHUKERT, 6)
HIGH DENSITY DEVELOPMENT
NOTABLE PARKS
MINERAL WELLS PARK
HIGHLAND PARK

ATTRACTIONS
DOWNTOWN HISTORICAL DISTRICT
BLUE GRASS FESTIVAL
UNIQUE RETAIL/SERVICE
HOTELS/BEAD AND BREAKFASTS

CONSTRAINTS
ECONOMIC
PROPERY RATE
FINANCIAL INVESTMENT

CONTEXTUAL BARRIERS
ENVIRONMENTAL BARRIERS
AUTOMOBILE ORIENTATED STREETS
LOW DENSITY DEVELOPMENT
Factors of why Guthrie, Oklahoma would benefit from street infrastructure development by using Complete Street strategies and Smart Growth principles.

**Economic opportunity and prosperity** can be created through well-planned streets. Residents can reduce the amount spent on transportation by having the ability to choose alternative options. In 2006, the average amount of the household income spent on transportation was 20.1% (Lipman, 1). Considering past economic hardships of the city, the 21% of residents under the poverty level, and the country’s recession, the ability for Guthrie’s residents to increase their probability of remaining stable in economic uncertainty only strengthens the city as a whole.

**More transportation choices** create more than just economic opportunity and prosperity. Having more choices has the potential to create more efficient and less congested roadways. According to 2010 US Census, 88% of Guthrie's residents rely on personal vehicles for transportation. With such large percentages, congestion can become a problem and will only increase if the population increases as projected. Those without vehicles will also benefit from having well-organized, less crowded streets. The 10.5% of residents that do not own personal vehicles and have no other choice than to walk, bike, or use transit will have the opportunity to travel more safely throughout their city.

**Safer roads** benefit all both motorists to pedestrians. The methods used in Complete Streets, such as traffic-calming techniques, decrease speeds and decreases the chances of injury for drivers and pedestrians in an accident alike. However, pedestrian have more of a chance to be injured or seriously injured in an automobile accident and out of these types of accidents, children and older adults have a higher chance of suffering injury or death. The National Highway Traffic Safety Administration shows that “children 15 and under account for 7 percent of pedestrian fatalities and 23 percent of pedestrian injuries” and pedestrians 65 years or older account for the highest fatality rate in automobile accidents (Traffic Safety Facts, 2010). Since Guthrie’s children and elderly account for 40% of its population, then creating Complete Streets in Guthrie will be creating a safer environment for a large portion of its citizens.

**Investment in smart growth** is promoted through Complete Street development and decreases the repercussions of low density development. Studies have shown a high correlation between automobile related development and deterioration of public health and “the highest per capita demands on natural systems and habitats” (Farr, 25). Low density development has been believed to be a main culprit of increase obesity, pollution, and habitat loss and threatens to decrease quality of life in general. Despite the density level of the historical district, Guthrie only has a density level of 542.8 persons per square mile. A comparison to Norman, Oklahoma, which has a density level of 620.5 persons per square mile, one can have a better understanding the development occurring in the contemporary part of Guthrie and how smart growth could benefit Guthrie’s citizens.

**CITY CONTEXT**

HIGHWAY 77 GUTHRIE, OK: A COMPLETE STREET PROJECT
**HYDROLOGY**

**HIGHWAY 77 GUTHRIE, OK: A COMPLETE STREET PROJECT**

**Rural Character.** Guthrie's naturalistic qualities distinctly come from the creeks, lakes, and ponds within the city limits and create an exceptional character to the city. "Images of a community that has a unique sense of place" is definitely created by the attractiveness of the winding Cottonwood Creek embraced by the rolling hills, the peacefulness the Guthrie and Country Club Lake bring to surrounding residential, and the sense of remoteness visitors feel near Lake Liberty (RDG, 14).

These features, both natural and man-made, create opportunity and challenges for the progression of the city. Greenways created by floodplains provide a place for potential pedestrian trails connecting the entire city. However, developing in floodplains can be costly and will need careful planning, designing, and maintaining to make these projects successful. A list of opportunities and challenges can be viewed above, but despite the risk, smart development in these areas can increase Guthrie's unique character and desirability.
**Layout.** Most of the development extending from the northern portion of Cottonwood Creek is characterized as the traditional urban form. Residential areas are based around the activity centers and urban core where downtown, community services, and housing are within reasonable distances from each other. This area of the city is why Guthrie has received a walkability score of 71 out of 100 from the private company Walk Score. According to the amenities’ locations portion of the city, the company states that “most errands can be accomplished on foot” because they are within a mile radius.

Development beyond the traditional development is more contemporary in nature, eventually becoming completely automobile oriented development. As seen in figure 2-4, as the city expands south from the downtown area, the distances between different land uses increase. This area has a completely different urban form and character that is included in “a composite of development patterns” that make up the entirety of the city (RDG, 37).

Complete Streets work best when there are destinations in a close proximity. Studies have shown the average person will walk about 1/2 to 3/4 miles to get somewhere and the average bicyclist will travel about 2 miles (Cermak, 2007). When amenities are over the distance most pedestrians are willing to travel, then sidewalks built will remain unused. In figure 2-5, the location of the services specified in the The 2011 Community Preference Survey as most desired to walk to are shown. The final comprehensive map shows where most of the locations are concentrated and a general idea where a Complete Street project would be most successful.

*Walk Score does not base score on the condition or availability of sidewalks, crosswalks, street widths, and other contributing factors to walkability. Score is only based on the proximity of services of certain criteria.*

**COMMERCIAL IS CONCENTRATED DOWNTOWN, NEAR INTERSTATE 35, AND SOUTHERN HIGHWAY 77.**

**HIGH DENSITY DEVELOPMENT OCCURS IN HISTORICAL DISTRICT.**

**DENSITY DECREASES AS CITY SPREADS SOUTH OF THE DOWNTOWN DISTRICT.**

**OPEN SPACE, EMPTY BUILDINGS, AND EMPTY LOTS CREATE THE ABILITY FOR FURTHER GROWTH TO INCREASE MIX USE.**

**LAND USE CLOSEST TO INTERSTATE 35 CATERS TO INTERSTATE TRAVELERS, DOWNTOWN IS PROMOTED AS A TOURIST ATTRACTION.**

**SOUTHERN PORTION OF THE CITY IS DEVELOPED TO PROVIDE AUTOMOBILE ORIENTED RETAIL SERVICES.**

**Figure 2-4: Guthrie’s Existing Land Use Provided in the Guthrie Comprehensive Plan, 2002**

**Figure 2-5: Destination Locations Maps**

**LAND USE AND DESTINATIONS**

**Highway 77 Guthrie, OK: A Complete Street Project**
**Network System.** Most of Guthrie’s street network lies on a traditional grid. Highway 33 serves as the grid’s major axis as it extends from east to west. Streets become irregular around the lakes, but for the most part, stay true to the grid unless their form is governed by topographical or natural elements. There are only two major arterial extending off of Interstate 35 into Guthrie that support most of the daily traffic throughout the city. These two arterials are US Highway 33 and US Highway 77, also known as Noble Avenue and Division Street. The 2011 ODOT Traffic Count shows that within a 24 hour count, 11,728 vehicles travel on the east portion of US Highway 33 through Guthrie and 14,433 vehicles travel on the south portion of US Highway 77 through Guthrie. Traffic observed on these roads ranged from motorcycles to semi-trucks.

Guthrie’s current transportation system is automobile oriented and the city does not have many alternative modes of transportation. The city has the First Capital Trolley System, but it is focused around tourist-related routes. There are sidewalk systems with the city’s infrastructure, which is mostly concentrated along the original development and downtown area, but deficiencies and outlying system breakdowns limit usage of pedestrian paths. A photographic inventory in figure 2-8 illustrates circulation conditions and some of the conditions that discourage pedestrian use. With these limitations, the high concentration of automobile use, single directional primary arterial, potential use increase, capacity limitation and access issues have the potential to become a threat to the character of the streets and the city.

According to the Guthrie Comprehensive Plan, congestion occurs mostly in the a.m. and p.m. peak times and “supplemental transportation modes” would help relieve the current and potential “functional transportation problems” (RDG, 84). Strategies such as more public transportation with safe and convenient stops accompanied by accessible and safe pedestrian and bike paths can make transportation more efficient and the roadways less congested. With smart growth transportation system, more routes and options will be available to the traveler to lessen the burden on the two major routes currently available to citizens and visitors of Guthrie.

**GUTHRIE COMPREHENSIVE PLAN TRANSPORTATION GOALS, 2002**

1. Maintain a balanced transportation system that provides all residents with safe and convenient mobility.
2. Assure that the transportation system provides both adequate access and capacity.
3. Use the transportation network to support desirable patterns of community development.
4. Develop a transportation system that respects streets as important features within the public environment.

**EXISTING CIRCULATION CONDITIONS**

**HIGHWAY 77 GUTHRIE, OK: A COMPLETE STREET PROJECT**
EXISTING CIRCULATION CONDITIONS

HIGHWAY 77 GUTHRIE, OK: A COMPLETE STREET PROJECT
PROJECT BOUNDARY - HIGHWAY 77
HIGHWAY 77 GUTHRIE, OK: A COMPLETE STREET PROJECT

PROJECT BOUNDARY DESCRIPTION
RUNS NORTH-SOUTH ON US HIGHWAY 77 (DIVISION STREET)
NORTHERN LIMITS: EAST OKLAHOMA AVENUE
SOUTHERN LIMITS: ENTRY ROAD OF WALMART
BOUNDARY LENGTH: ABOUT 1.25 MILES
BOUNDARY LINES ARE EXTENDED TO SHOW SURROUNDING CONTEXT
BOUNDARY IS DIVIDED INTO THREE CHARACTER ZONES
1. HISTORICAL CHARACTER ZONE
2. TRANSITIONAL CHARACTER ZONE
3. AUTOMOBILE ORIENTED RETAIL CHARACTER ZONE
HISTORICAL CHARACTER ZONE

TRANSITIONAL CHARACTER ZONE

AUTOMOBILE ORIENTED RETAIL CHARACTER ZONE

PROJECT BOUNDARY EXISTING CONDITIONS

HIGHWAY 77 GUTHRIE, OK: A COMPLETE STREET PROJECT
Inventory and Analysis. An inventory and analysis was conducted mostly on the character, circulation, roadway conditions, and existing conditions within the project boundary. A lot of information was discovered in the city's inventory and analysis, but further investigation into the project boundary gave more detail description of the human scale experience. Overall, there were many conditions that created opportunities available to yield a successful complete street, such as adequate right-of-way and desirable destinations. Some of the disadvantages evident in the project boundaries were the lack of access control to surrounding amenities and inconsistency in sidewalk quality.

Character Zones. Within the 1.25 miles of the project boundary, there are three distinctive character zones. The zones can be identified according to the development Guthrie has experience during different time periods. Below is a description of each zone and what was discovered from the inventory and analysis.

The Historical Character Zone is part of the original development in Guthrie and is high density development. The zone has the traditional focus on the pedestrian. The historic buildings are at human scale and the 10 foot sidewalks provide plenty of room for safe travel. Crosswalks are lighted, have curbs, and are marked, and have a slightly reasonable cross length of 55 feet. Modern infrastructure has been added to accommodate the automobile, such as parking lots have replaced a spot where a building once stood, but sometimes this infrastructure serves as a barrier to the pedestrian. Such a case is the on-street parking that also serves as a buffer for the sidewalks from the street. Speed limits are also posted at 25 miles per hour for the pedestrian's safety. This area is visually interesting as the user can enjoy the historic value, people watching, entertainment and shopping venues. However, improvements could still be made in this zone for there are some ADA standards that need to be adhered to in the crosswalks and intersections of alleyways, there are no bike lanes, and there is a lack of access control to the parking lots and additional entrances of the downtown buildings.

The Transitional Zone is a mixture of development ranging from the traditional to contemporary. There is still history in this area as a collection of older buildings still grace this zone. Some of these buildings are in good condition and are occupied; others are abandoned and are in need of repair. Closer to the downtown area, the sidewalks are adequate for capable users, but deteriorate as the path progresses south. There is still a mixture of residential tucked in between and around the businesses and most of the public structures are set closer to the roadway so to accommodate the pedestrian. Parking lots in this area have a tendency of being less defined, especially in the northern section of the zone. During one of the physical visits to the site, a vehicle was parked in the sidewalk's path most likely because the boundary for the walk and lot was clearly undefined. Despite this, this zone has a lot to offer. There are desirable destinations, such as restaurants, specialized grocery, and historic park. The increase amount of vegetation develops the rural atmosphere in an urban setting, and there are plenty of room to accommodate wider walks, buffers, and other elements of a complete street.

The Automobile Oriented Retail Zone is entirely contemporary development. There are many sought-after destinations and services provided in this area. However, the distance between these facilities have increased to make room for the surrounding parking lots. The land use is more specialized and consists of mostly restaurants, goods distribution, and other public services. On the other hand, this does leave room for improvement as empty space could be revamped to include mixed-use facilities and trails and other smart growth development. Speeds have increased 10 miles per hour in the transitional zone and remain at 25 miles per hour in this zone. However, the major difference in this zone is the structures and lots are setback further from the street. This creates the illusion that the street is wider and more dominant in this zone than in the other zones. Along with the lack of sidewalks, buffers, access control, and high traffic noise, this zone can be very intimidating for a pedestrian. This zone also does not have any lighted or marked cross walk, which makes crossing Division Street very dangerous.

PROJECT BOUNDARY EXISTING CONDITIONS

HIGHWAY 77 GUTHRIE, OK: A COMPLETE STREET PROJECT
METHODOLOGY: INTENT/OBJECTIVE OF DESIGN

HIGHWAY 77 GUTHRIE, OK - A COMPLETE STREET PROJECT
Guidelines. The use of external guidelines will assist in the design of the streets for Guthrie, Oklahoma. These resources will include the National Complete Street Coalition, the American Public Transportation Association, American Association of Retired Persons (AARP), Urban Street Design Guidelines (USDG), and the Alliance for Biking and Walking. From these resources, guidance will be taken into consideration of how to create streets that are available for multi-users. Some of the concepts from these resources that will be implemented into the completed design will be bike lanes, street buffers, traffic calming measures, and safer pedestrian crossings. Both qualitative and quantitative methods will be used in accordance to how they correlate with existing or expected conditions.

The National Complete Street Coalition has created the "Elements of an Ideal Complete Streets Policy" from which a check list is created to ensure a successful design. The following list is elements most relevant to Guthrie's complete street design:

- Includes a vision for how and why the community wants to complete its streets.
- Specifies that "all users" includes pedestrians, bicyclists and transit passengers of all ages and abilities, as well as trucks, buses, emergency vehicles, and automobiles.
- Encourages street connectivity and aims to create a comprehensive, integrated, connected network for all modes.
- Applies to both new and retrofit projects, including design, planning, maintenance, and operations, for the entire right of way.
- Makes any exceptions specific and sets a clear procedure that requires high-level approval of exceptions.
- Directs the use of the latest and best design criteria and guidelines while recognizing the need for flexibility in balancing user needs.
- Directs that Complete Streets solutions will complement the context of the community.
- Establishes performance standards with measurable outcomes.

One of the most important aspects of the final design will be a connection for the people to their community. This design must be receptive to the needs and wants of the community. Some methods that work well in another city may not be appropriate for the community of Guthrie. Another connective quality will be the link the citizens will have with every aspect the community. This plan should be able to give the user options and continuity throughout the whole section allowing each user the ability to maintain their navigation throughout the community unchallenged. The last element that will be considered is the ability to connect to surrounding areas. Since only one section of the city will be concentrated on, it is important to relate to the adjacent context.

GUTHRIE'S COMPREHENSIVE PLAN VISION: “MAINTAIN A BALANCED TRANSPORTATION SYSTEM THAT PROVIDES ALL RESIDENTS WITH SAFE AND CONVENIENT MOBILITY” (RDG, 78)

WAYS TO ACCOMPLISH A COMPLETE STREET

CONNECTION: LINK LAND USE WITH TRANSPORTATION OPTIONS
SAFE PEDESTRIAN CONNECTIONS
• COMPREHENSIVE TRAIL AND LANE SYSTEM
• ACCESSIBLE/SAFE/CONVENIENT TRANSIT STOPS

SAFETY: INCREASE SAFETY AND AWARENESS BY DESIGN OF INFRASTRUCTURE
• TRAFFIC CALMING TECHNIQUES
• SAFE AND VISIBLE CROSSINGS

PROJECT MASTER PLAN

HIGHWAY 77 GUTHRIE, OK: A COMPLETE STREET PROJECT

METHODOLOGY: INTENT/OBJECTIVE OF DESIGN
**PROJECT GOALS**

1. CREATE A DESIGN TO CONSTRUCT STREETS FOR ALL USERS, INCLUDING SAFE ROUTES FOR EVEN THE MOST VULNERABLE — CHILDREN, OLDER ADULTS, AND THOSE WITH DISABILITIES.

2. CREATE A DESIGN THAT ALLOWS CONTINUITY BETWEEN THE THREE DISTINCT CHARACTER ZONES TO PROVIDE EACH ZONE THE SENSE OF BELONGING TO AN UNINTERRUPTED CITY.

3. CREATE A DESIGN THAT WILL SERVE AS A MODEL FOR STREET DEVELOPMENT ON THE ENTIRE CITY'S MAJOR THROUGHWAYS.

**The Design.** With information discovered through a site inventory and analysis, research, and external guidelines, a propose design will incorporate Complete Street principles by using the suggested implications that will benefit the city and its citizens the most. Elements, such as sidewalk widths, bicycle lanes, shared-used paths, and pedestrian safe crossings, will be included and reflective of the context of the city. The main objective of the design will be to include a "common denominator" by balancing safety and convenience for everyone using the road" (Smith, 2010).

Overall, the Complete Street design will address transportation context, urban and rural context, objectives, and most importantly, the desire for streets that satisfy the citizens' and officials' desires to have means of multiple mobility possibilities. The City of Guthrie is considered a small town, with a population of 10,191 (U.S. Census Bureau). The design will complement the trends of a smaller town's traffic density and patterns. Even though the traffic can be heavier than most rural roads, the guidelines of designing a Complete Street for rural areas will be used in certain conditions. To the addition of the city's context, the design will address objectives of the city council members and citizens. This will consist of economic stimulus, mobility advantages, and street aesthetics.

The project master plan in figure 3-1 illustrates Guthrie's complete street design. The different modes of transportation are shown to be continuous throughout the entire project boundaries. Included in this layout are proposed trolley stops. These trolley stops are space accordingly so that a pedestrian on foot does not have to travel past the ideal distance of ¼ to ½ of a mile. The stops are also placed so that the passenger is dropped off at or near ideal destinations and where there is available space so to minimize cost. In addition to the trolley stops, a proposed lighted crosswalk is placed in the vicinity of the stops so there are safe crossing points for pedestrians at a reasonable walking distance.

Two other design features of the plan are the proposed Water Works Building renovation and relocation of the lane transition relocation. Transportation enhancement funds could be used to renovate the historic Water Works Building located south of Mineral Wells Park to accommodate tourists and citizens alike. The building could contain a café with indoor/outdoor seating, a bike rental service, and a tourist center. This building would provide refreshments, mobility options, information, and a place of rest for those entering the city or for those utilizing the trails or neighboring park. Just south of the Water Works building on Division Street is where the transition between the four lanes to two lanes street should occur. This is also the boundary line between the automobile oriented character zone and the transitional character zone. In the automobile oriented character zone, the streetscape and pedestrian trails are an introduction of the city's new character. As the motorists passes into the transitional character zone, raised center medians are introduced to further enhance the traffic calming techniques to slow down the driver and to entice them to become more aware of the surroundings. By having the lane transition at the character zone boundary, it will reinforce the traffic calming methods and the intent of the design.
DESIGN DESCRIPTION: FOCUS POINTS AND AREAS

HIGHWAY 77 GUTHRIE, OK: A COMPLETE STREET PROJECT
Sidewalks and Intersections. The sidewalks along Oklahoma Avenue currently are made of brick pavers. This material is not continued on the sidewalks along Division Street. To include this historical section with the rest of the district and to notify the user they have reached the downtown area, the sidewalks in this zone will receive the same treatment. This treatment will continue throughout the crosswalks to indicate the pedestrian's right-of-way and develop the access characteristics of the intersections. To further call attention to the intersection and to make the motorists more aware of its importance, a marker will be stamped and colored into the concrete. This intersection marker will include a shape resembling the dentils found on the Victorian architecture of the downtown buildings. This will make the intersection inclusive to its surrounding context. Other features of this intersection will be the landscaped curb-bump outs. Along with creating aesthetic attributes, the bump-outs will decrease the distance of the crosswalk to forty feet. The intersections of sidewalk and alleyways will also be designed according to the pedestrian's right-of-way. To decrease the hazard of the limited view created by the buildings' and alleyway's close proximity, a raised crosswalk will be constructed to slow the motorists approaching the intersection. A sidewalk and street illuminating light will also be placed near this intersection to properly light the path for safety.

The streetscape planted in the sidewalks and curb bump-outs will enclose the street to create a sense of place, to buffer pedestrians from traffic, and to produce a more pleasing atmosphere. The streetscape will be a common dominator throughout all zones to create a connection and to define the limits of the roadway. The definition of the roadway will also create a sense of safety for pedestrians because they will not feel exposed to the oncoming traffic. Beyond the characteristics, the streetscape will create shade in the hot summer months and soften the hard lines of the structures.

HISTORICAL CHARACTER ZONE DESIGN

HIGHWAY 77 GUTHRIE, OK: A COMPLETE STREET PROJECT
Street. The traffic lanes in this zone will be reduced from the varying width up to fifteen feet to be a constant width of ten feet. The remaining five feet will become a bike lane. Since the traffic speeds are slower in this zone and the sidewalks should remain a path for those on foot to enjoy outdoor seating, window shopping, or other downtown activities, the bike lanes would function more properly in the roadway. The turning lanes will also remain, but will also be reduced to ten feet. The empty space in between the turning lanes will be converted into raised center medians to perform as traffic calming mechanisms to ensure slower speeds are adhered to. The center medians will contain planted beds to increase the character of the zone and define the limits of the street. Along with the limited lane widths, the motorists will not feel the option to drive beyond the speed limits to make this zone a safer place for all that use the road.

HISTORICAL CHARACTER ZONE DESIGN
HIGHWAY 77 GUTHRIE, OK: A COMPLETE STREET PROJECT
**Trolley Pull-out.** Trolley pull-outs are designed to create a safe zone for passenger loading and to “minimize impacts on traffic flows” caused by trolley stops (Bus Stop Specification Guidelines). The space allotted for on-street parking around the pull-out will be designated for adequate exiting and re-entering space for the trolley to increase safety and flow. A “minimum fifty foot clear zone” around the stop will increase visibility and a transparent bus shelter placed on the far side of sidewalk will increase awareness and safety of the transit riders (Bus Stop Specification Guidelines).

The historic trolley pull-out will be near Jelsma Sports Field. The space required for the pull-out will be taken from a large undefined parking area that has no access control or definition. Along with the sidewalk, the adjacent parking lot boundaries will become more defined and decrease the possibility of stray parked vehicles blocking sidewalk. The pull-out is placed on the eastern side of Division Street so that it is on the far side of the alleyway intersection. With the center median preventing left hand turns out of the alleyway onto Division Street, these design elements will eliminate possible conflicts and increase the efficiency of the trolley system.
**Trolley Pull-out.** The transitional trolley pull-out will adhere to the same design guidelines explained in the historic pull-out on page 26. The differences occurring at the pull-out shown in figure 4-4 will be the characteristic of the streetscape and landscape around the trolley stop and structure. This stop will be adjacent to Mineral Wells Park, so the landscape will develop the park-like atmosphere of the surrounding context. The vegetation around the fifty foot pull-out should be placed so not to obscure the view of incoming and outgoing trolley, especially since this stop does not have space created by on-street parking. Also, passengers have a larger landing pad because the trolley structure can be placed off the pedestrian and bike trail. This will allow enough room for passage of bicyclists and pedestrians along with the loading and unloading passengers of the trolley. The shared trail in this zone will be lined with a brick paver to create a transition from the walls that are brick paver in the historical character zone.
Street and Mix-Use Trails. The traffic lanes still include directional traffic and a turning traffic in the transitional character zone, but the traffic lanes have increased to eleven feet to accommodate for the increase speed limit. There will still be a raised center median to include landscape to define the street. A welcome sign will be placed within the median to make it more visible to passing traffic. Oklahoma Department of Transportation approval will dictate the sign design and placing, which may differ from what is seen in figure 4-5. The streetscape in this zone will remain the defining boundaries of the street, create a buffer zone between pedestrian and vehicle, and create a more acceptable atmosphere along the trail. The pedestrian trails will differ on each side of the street. On the west side of the street, cyclists and pedestrians will share a ten foot trail. Since speeds have increased and the surrounding context is becoming more open, the bicyclists would be safer off the road and would not have to compete with traffic. On the east side of the street, a five foot sidewalk would accommodate the pedestrian so they could reach desired destinations that fall between crosswalks.

TRANSITIONAL CHARACTER ZONE DESIGN

HIGHWAY 77 GUTHRIE, OK: A COMPLETE STREET PROJECT
Street and Mix-Use Trails. The automobile oriented retail character zone is an introduction into what the city has to offer. The streetscape lining the street will be more formal than in the transitional character zone but will still be the common element that runs throughout the entire project. The vegetation will serve as boundaries to the street and give the pedestrian a sense of protection. The street has four lanes and only the outer lanes will be at eleven feet to accommodate for the higher speeds. The inner lanes will be at ten feet to entice the motorists to not exceed the speed limits. The trail along the west side of the street will remain the shared pedestrian and bike trail and the sidewalk along the east side of the street will be kept at five feet to accommodate the destinations on this side.
DESIGN CONCLUSION: SUMMARY AND EVALUATION

HIGHWAY 77 GUTHRIE, OK: A COMPLETE STREET PROJECT
Project Goals. To understand if the design is successful, an evaluation of the project goals will reveal measurable outcomes.

1. Create a design to construct streets for all users, including safe routes for even the most vulnerable – children, older adults, and those with disabilities.
   The elements of a complete street seen in figure 5-1 illustrate the continuous nature of access for each user; pedestrian, bicyclists, and motorists. Their unharpered navigation is determined by complete and uninterrupted corridors throughout the entire site. Detail was placed on the throughways’ design to ensure that each user has a designated and adequate route to travel. Bike lanes, sidewalks, and shared trails were designed at a proper width and logical placement to ensure accommodation with traffic lanes. Transit riders were also included in this thought process by ensuring transit stops were safe and efficient by designing pull-outs and reasonable stop spacing.
   This design also set out to create safe routes for the most vulnerable. ADA standards were met at every sidewalks and crosswalk. Sidewalk widths are more than accommodating to handle any user and curb cuts with detectable tile ensure that any pedestrians’ safety is priority. Also, measures such as traffic calming techniques and decrease traffic lanes increase the motorists’ awareness and to stabilize the speeds of traffic. These measures have been revealed in studies conducted by the Department of Transportation to decrease injuries and fatalities of those most susceptible to automobile and pedestrian accidents, therefore, creating a safer atmosphere for these users (Traffic Safety Facts, 2010).

2. Create a design that allows continuity between the three distinct character zones to provide each zone the sense of belonging to uninterrupted city.
   The streetscape vegetation is one of the constant themes throughout the entire design. The repetition of street trees lining the edges of the street define street’s boundaries and character. Beforehand, the structures and their urban form were the major defining features of the character zones. With the addition of a common dominator, the differences between the character zones can be tied together by an element of consistency.
   The sidewalks and shared trails will also be a constant element throughout the design. Even though the user may adjust throughout the character zones, the reliability of a ten foot wide path along the street establishes the usability of each zone. The character of the paths created by design features such as material and accessibility also continues a common atmosphere through the changing context.

3. Create a design that will serve as a model for street development on the entire city’s major throughways.
   Since the project boundaries include three different character zones that are commonly found through Guthrie, the possibility of incorporating the design guidelines throughout the entire city is more likely. The other major arterial in Guthrie is US Highway 33 and this route also includes both traditional and contemporary development. However, further analysis of this roadway would determine if all standards could be met according to right-a-ways, surrounding context and other existing conditions.

Improvement of Mobility and Community. One of complete street agenda’s is to improve mobility and the community for all users. With the inclusion of continuous user routes for pedestrians, bicyclists, and transit riders would complete improvement for the existing infrastructure. Existing sidewalks within the project boundary are for the most part in need of improvement. There are no noticeable bike routes and the transit system is not accommodating to all users. However what is currently evident within the boundary is the street is mostly accommodating only to the automobile. With this plan, all users can now be inclusive to the community and the project boundary’s context.

Economic Feasibility. The major downfall of this design is the economic feasibility of all of the design elements. Ten foot wide sidewalks lined with a brick pavers or raised crosswalks can become very expensive and appropriate funds may not be available to smaller communities such as Guthrie. Despite this, the basic principles of the design can still be achieved through budget evaluation and design specification. An example could be discovered in the historic character zone. The width of the street currently has ample room to accommodate proposed traffic lanes and bike lanes. A technique as simple as repainting of lane markers to the design’s placement would create a shared transportation system in this district.
Values Derived From Design. The figure 5-2 above depicts the change the street will experience through the design and the value derived from the design. Instead of a street dominated by the automobile, the streets will be an inclusive setting that accommodates a variety of users with the ability to choose their desired mode of transportation. This also creates a level of increased visibility as users are able to be seen outside of their encompassing vehicles. The harshness of the existing environment will similarly be softened by the surrounding streetscape by breaking the hard lines of the urban form and will create a more desirable climate underneath its canopy. With all these elements, a character develops for the city that cannot be found in an automobile oriented system. A street that includes the many elements of a complete street is more visibly defining than a street full of vehicles. With this design, a street can be defined as an inclusive, community oriented element that is a part of the city and its context.

CONCLUSION
HIGHWAY 77 GUTHRIE, OK: A COMPLETE STREET PROJECT
BIBLIOGRAPHY


