The Sustainable Theme Park: Designing a net-zero expansion to Holiday World & Splashin' Safari

An Honors Thesis (LA404)

by

Dan Buis

Thesis Advisor
Meg Calkins

Ball State University
Muncie, Indiana

April 2012

Expected Date of Graduation
May, 2012
ABSTRACT

Theme parks use a vast amount of resources over the course of just one day of operation. Visitors need to eat and drink, which produces wastes that needs to be handled. Armies of people clean the park, tend the landscaping and keep things running. It takes power to keep the rides running and lit throughout the day. Vast quantities of water are used to hydrate visitors, maintain plant material and run a water park. Immense parking lots create a huge volume of runoff and contribute to the heat island effect.

This project explores how the operation and construction of a theme park can be made more sustainable through the design of a sustainable expansion to Holiday World & Splashin’ Safari in Santa Claus, Indiana. Holiday World names all of its areas in the park after holidays, the new sustainable area will be referred to as “Earth Day.”

The design of a feasible net-zero facility will assist in proving that theme parks can be green, environmentally friendly and educational while still remaining fun.
would like to acknowledge the following people and their assistance to me, without which I would have found this project much more difficult.

My studio instructors, Carla Corbin and Johniotloch, who continuously pushed our class to stay on top of things and to work diligently and effectively. Without their lectures of how far behind we all were I would have undoubtedly stalled during the process much more than I actually did.

My advisor, Meg Calkins, who regularly took time out of her day to make sure I was on track. Her continual nudging made sure that this project developed in the correct direction.

My classmates, particularly Greta Peterson, Jennica McClain, Doug Shannon, and Chad Miller. The four of them would regularly look over my shoulder and give me a tidbit of advice. Additionally they would always give me feedback when I asked for it.

Recycling containers at Six Flags, part of a company-wide effort to make the parks more green.

http://greatadventurehistory.com/GAEvents/Big%20Wheel%20Refurbishment/P1300446.jpg
SIGNIFICANCE OF THE PROJECT
Currently in the United States there is a push to make things environmentally friendly to the point where it is trendy to have labels like "green" and "sustainable." This project studies how to apply these labels to a typical American theme park. Enabling facilities like theme parks to be more sustainable is not only beneficial to the environment, it is our responsibility to the Earth as the population continues to grow and consume resources at increasing rates.
TABLE OF CONTENTS

Abstract 3
Acknowledgements and significance 4

INTRODUCTION TO THE PROJECT 8
Problems, assumptions & delimitations 10

RESEARCH 12
Literature review 14
Case studies 18
Alternative green buildings and farming practices 22
Earth day 24
Holiday world & splashin' safari 26

DESIGN PROCESS 30
Holiday world and surrounding context 32
Program 36
Site selection process 40
Site inventory 44
Site analysis 46
Concepts 48
master plan

FINAL DESIGN

earth day
plaza & west side
plaza & west side
north side
east side
south side

APPENDICES

timeline
holiday world resources
bibliography
INTRODUCTION

TO THE

PROJECT
INTRODUCTION: problems, assumptions & delimitations

PROBLEMS

How are theme parks designed?
Understanding the basic principles and processes behind the design of theme parks will assist the design process for this project.

What is the definition of "sustainability"?
Knowing what the term means and represents will better inform the final design.

What are theme parks currently doing to be more environmentally friendly?
The Sustainable Sites Initiative (SITES) is a great starting point for sustainable practices, but theme parks are likely to have more specific practices that are being implemented.

How can sustainability education be made more appealing?
A sustainable theme park will have a plethora of opportunities to educate visitors about why facilities are constructed a certain way or how to apply a particular practice at home.

"The Legend" the mid-size wooden roller coaster at Holiday World, located in the Halloween section of the park.

http://www.holidayworld.com/sites/holidayworld.com/files/legend_01.jpg
THE SUSTAINABLE THEME PARK

dan buis

ASSUMPTIONS

- A “green theme park” will attract people and serve as a positive advertising platform.
- The owners and operators of Holiday World & Splashin’ Safari are interested in both expanding their park as well as making that expansion sustainable.
- The park will hire additional laborers to maintain the elements installed as demonstration pieces.
- Additional land for the project can be acquired.
- Strategies Americans are currently unwilling to implement on a large scale will become more appealing in the future due to the increased push for sustainability and green infrastructure. For example Tivoli Gardens in Denmark attaches a larger price to beverages, but upon return of the cup the deposit is refunded to the customer, similar to locker keys.

DELIMITATIONS

- This project will not look at the maintenance for the installation.
- This project will not look at the cost of construction.
Holiday World began as "Christmas Town" when founder Bill Koch found out how sad kids were to travel to Santa Claus, Indiana and not find Santa present.

acoupes of accomplishing this; controlling when and where the visitor experiences aspects of the park, and controlling what the visitor can see and how that affects their experience. Sea World takes great care to control where the visitor is at a given time. Shows are scheduled in such a way that there is adequate down time between shows to spend money and ensure the visitor feels relaxed. The goal is that each visitor spends at least six hours in the park (Davis 1997). On the other hand Disney designs with the intent of crafting what the visitor experiences visually during their stay within the park. Their designs start with sketches and models which in turn generate the construction documents (Marling 1997). The merit of this approach.
THE SUSTAINABLE THEME PARK

dan buis

is evident in the inherent believability of Disney's scenery and structures. All theme parks have an underlying design intent to "lengthen the customer's stay and expand their spending" (Davis, 1997). At Sea World this is accomplished through their deliberately slow and unhurried schedule. A typical tactic of theme parks is to position themed gift shops near, or in the case of Disney, at, the exit to major attractions. For example after watching an Indiana Jones performance, visitors are led to an area featuring Indiana Jones themed merchandise.

Theme parks want to keep their visitors happy because happy visitors are more likely to spend money. Two major methods to accomplish this are designing for specific demographics and employing an excellent staff. Sea World determined that a large percentage of their demographic is families of 3 or 4, which led to the park putting in a plethora of small spaces for groups of that size. The staff is responsible for maintaining the spotless image of the park, running the attractions, and interacting with visitors. Disney refers to its staff as "cast members" to remind them that they are always on stage while out in public.

Dolphin show at Sea World

DEFINITION OF SUSTAINABILITY

According to the dictionary, sustainability is defined as “the quality not being harmful to the environment or depleting natural resources, and thereby supporting long-term ecological balance” (sustainability 2011). The phrasing of this definition implies that sustainability is not necessarily a good and helpful concept, but rather one that is “not harmful.” This definition is not very explicit when a particular practice crosses the line between sustainable and not sustainable. The nature of this project requires a very clear demarcation between the two; it must be quantitatively clear when a process is sustainable. Many EPA regulations have language such as “... must be less than 3 PPM” which makes it very clear what quantities of that chemical are acceptable. That is the clarity of definition that will prove most useful to this project.

During a session of LA 312 at Ball State University, the professor, Meg Calkins, shared a different definition of sustainability with us. She said that sustainability is “meeting the needs of the present without compromising the needs of the future.” This is a decent definition, it is worded positively and it is clearer than the previous definition. By using various metrics such as EPA guidelines it is clear if a practice is environmentally friendly in the present. The one downfall to this definition is that the needs of the future can not be completely predicted. Their needs must be estimated by extrapolating on what the needs of today are and by making assumptions about how technology will progress.
Calkins spent time working on the Sustainable Sites Initiative (SITES) Guidelines and Performance Benchmarks (2009), a document that outlines principles for sites to make them sustainable, similar to what LEED does for buildings. The definition for sustainability put forth by that report is "enabling natural and built systems to work together to meet the needs of the present without compromising the ability of future generations to meet their own needs." (American Society of Landscape Architects, 2009). This definition is very similar to the previous one with a single major addition, it explicitly states that natural and built systems need to work together. Using natural systems as an integral part of a development allows the built systems to capitalize on the inherent resilience of nature and the self-balancing properties it has.

SITES cites the Brundtland Report as the source of their definition. The Brundtland Report is a document detailing the happenings of the Brundtland Commission, which dealt with sustainable development and the change in politics needed to accomplish this. The report defines "needs" as the needs of the poor, which are very basic in comparison to what Americans tend to think of as "needs." The implication from the definition put forth by SITES is that sustainable practices can affect luxury items as long as basic needs like food, water, air and shelter are left viable for future generations.

http://www.sustainablesites.org/
In June 18, 2009 Six Flags announced a “company-wide green initiative to reduce electricity, fuel use and waste while helping to protect the watersheds and ecosystems across theme parks and water park locations” (“Six Flags launches”, 2009). Some specific methods mentioned to accomplish this include powering vehicles with used vegetable oil from the kitchens on-site rather than diesel fuel, using LED bulbs throughout the park, various recycling programs, and replacing existing appliances, vehicles, fixtures etc with newer, more efficient models. The park also plans to allot existing available land to solar energy to supply the parks with a portion of clean energy. In an article written in September of the same year, after replacing the lights on a 15 story Ferris-wheel with 7,924 LED bulbs, the park is reducing carbon emissions by 8.5 million pounds (Jenn, 2009).

The most useful aspect of this case study is the reuse of vegetable oil, typically thought of as a waste product, within the park.
Green Wood Forest Park in Wales takes a different approach to sustainability. What makes this park unique is using human power for the rides rather than electricity or fossil fuels. Their original roller coaster, The Green Dragon, is entirely human powered. The passengers climb up a flight of stairs and enter a cart that resembles a large elevator. As the cart descends, the combined weight of the cart and the passengers pull the train to the top of the first hill through a series of cables and pulleys. The passengers then disembark the cart and climb another set of stairs to the train that will take them on the rest of the ride. In addition to the roller coaster, the park has a water adventure ride where instead of moving the boat using traditional motors, the boat is moved by the riders reaching out and pulling on a series of vines hanging over the river, creating a really unique interactive experience.

The concept of using riders to provide power to the rides is a unique aspect of this park and will be beneficial to the design of a net-zero theme park.
TIVOLI GARDENS

According to Matt Hickman, alogger of the “Mother Nature Network,” Tivoli Gardens in Copenhagen, Denmark is one of the greenest theme parks in the world (Hickman, 2010). The park is not expressly concerned with being sustainable as perceived here in the states, but rather with being environmentally aware in much of what they do. This goal drives much of the innovation they apply within the park and number of the decisions they make. The wholistic fashion with which Tivoli approaches sustainability makes this park unique and serves as a fantastic example of a sustainable theme park.

To achieve that 10% reduction in electrical costs, the park has taken steps to reduce the need for electricity. A huge amount of energy goes into illuminating the park, enough to power 120,000 bulbs. Of that number 2,800 are located on the Japanese Pagoda. After being changed from 15W bulbs to 1.6W LED bulbs, the park saved 60,000kWh in electricity usage, which is approximately 0.6% of the park’s total annual electricity usage. Changing all the lights over to energy efficient LED bulbs would yield a total energy savings of almost 2.5 million kWh, or approximately 25.7% (“Welcome to Tivoli”, Climate, Electricity).
Tivoli is taking steps to minimize its impact on the environment due to its daily interactions. The park readily admits that it is not certain about all the technologies it is trying out, but does test them for their effectiveness. One item is the usage of a particular type of biofuel, rapeseed oil, as a substitute for diesel. The rapeseed oil is so superior that all the fork-lift trucks use the biofuel rather than the typical diesel. It is estimated that this simple switch saves the park 30% in fuel costs and decreases the associated carbon output by 72% (“Welcome to Tivoli”, Climate, Workshop).

A number of other strategies round out Tivoli’s green approach. The transit system within the park is an electrical shuttle system that is recharged via solar power. One ride is estimated to reclaim 20% of the electricity that goes into the ride by recapturing it as the ride brakes. Beverages are served in plastic cups and upon return of the cup to appropriate vending machines, a deposit is refunded. The cups are then washed on site and returned to circulation. Tivoli estimates that 1.2 million plastic cups are kept out of the landfill this way (“Welcome to Tivoli”, climate, recycling). The use of fertilizers and other landscape maintenance chemicals is kept to an absolute minimum. Lastly, according to the standards of the Nordic eco-label over half of the cleaning products used in the park are eco-friendly.

Cup recycling station
http://www.tivoli.dk/media(7518,1030)/2009_KLIMA_Genbrugsautomat.jpg
ALTERNATIVE BUILDING TYPES

A straw bale house can use bales of straw as the structural load bearing element of the walls, but they are more commonly used as an insulator within a traditional post and beam structure. After the walls are constructed, plaster is applied to the walls to seal the surface and ensure water does not cause rot and mildew. Straw bale homes are about 75% more energy efficient due to the thick walls and plethora of dead air spaces (Morrison).

Perhaps the most compelling green building type is the “earth ship.” Earth ships are made entirely out of refurbished materials and other waste, using tires as a structural material for walls. Earth ships are typically off the grid with no connection to sewer, water, TV or electricity. The buildings collect their own water and electricity and deal with their own waste. Choosing to live one is not a casual decision (Bradley).

Numerous other green natural building materials are in use including bamboo, rock, cordwood, cob and rammed earth (Edmonds).
THE SUSTAINABLE THEME PARK

ALTERNATIVE FARMING METHODS
Farming as it is practiced in America is not sustainable or maximized in terms of yield per acre. What it is good at however is allowing a single person to work a large area. The farming methods outlined here are more efficient in how they use resources, but are also specialized and more labor intensive.

Bio intensive farming uses systems of plants to create a more efficient growing area. It seeks to pair plants together for their mutual benefit. For example plants that prefer to grow in shade are planted under plants that will grow tall and provide shade.

Hydroponics grows plants in water instead of dirt. The water contains the nutrients that the plant requires rather than the soil as is typical. This allows for a very efficient and predictable method of delivering nutrients to the plant as it is entirely controlled by the grower.

Vertical farming uses the surfaces of buildings to grow food on. A series of trellises or shelves are the most common methods to get plants to grow vertically. It is by far the most efficient ratio for footprint to crop yield.
EARTH DAY 1970

Earth Day at its inception was not the happy fuzzy plant-a-tree holiday that it is today. The event grew out from the frustration that Senator Gaylord Nelson had regarding the lack of concern political leaders had for the environment.

In the late 60s Nelson had the notion to host a “teach-in” about environmental concerns. Teach-ins had been very popular methods of anti-vietnam war protesting, particularly on college campuses.

“I was satisfied that if we could tap into the environmental concerns of the general public and infuse the student anti-war energy into the environmental cause, we could generate a demonstration that would force this issue onto the political agenda. It was a big gamble, but worth a try.”

- Senator Nelson

The remarkable success of Earth Day was due to being organized at a grassroots level. Nelson did not have the time or the resources to organize 20 million protestors at thousands of locations across the country. According to Senator Nelson “That was the remarkable thing about Earth Day. It organized itself.”

EARTH DAY NOW
Earth Day today is still a grassroots holiday, with most cities and towns organizing their own celebrations with unique events and activities. Common threads between them include promoting environmental awareness and planting trees.

Today’s cheery and optimistic celebrations are a far cry from the emotionally charged teach-ins from 1970 but still accomplish the same purpose. Americans today are more aware of the environment and the impact they have on it than they were in the 1960s.

Photos from the 2011 Earth Day Arborfest celebration in Anderson, Indiana. Activities included a mini marathon, planting trees in the parks, and displays about different ways to help the environment.

Photos taken by Anderson Parks and Recreation Department
Indiana Holiday World and Splashin' Safari sits on approximately 120 acres within the small town of Santa Claus, Indiana at the junction of IN 162 and IN 245. The east side of the park is devoted to employee parking and facilities. Beyond the employee lot are detached single family residences and farm fields. Immediately north and south of the park are woodlands that appear to be developed, but are not owned by the park. The western side of the park is immediately adjacent to Lake Rudolph campground and RV Park.

The park is a family owned venture, operated by the Koch family, since it opened in 1946. Bill Koch had the idea for the park in 1941 after visiting Santa Claus and hearing the children's disappointment at not finding Santa in town. The park grew gradually and in 1984 the Kochs decided to have other holiday themed sections in the park beyond Christmas; adding Halloween and the 4th of July. In 1993 the park added Splash Safari, the water park associated with Holiday World.

During a visit to the park it is quite common to see Dan and Pat Koch roaming the park
https://www.holidayworld.com/ holishop/bobblehead-pat-koch

An early photograph from Santa Claus Land.
THE SUSTAINABLE THEME PARK

dan buis

The park covers about 100 acres of land, 35 of which are allocated for parking and other services. The areas within the park are themed after different holidays, specifically Christmas, Thanksgiving, Halloween, and the 4th of July.
WHY HOLIDAY WORLD?

Holiday World is an actively growing theme park, unlike Disney which has essentially maximized its land use. In 2006 the park opened up its most recent section, themed around Thanksgiving, which featured a brand new wooden roller coaster, The Voyage. In addition to the new section a number of rides were added to Splashin' Safari, the water park side of Holiday World, marking the largest expansion since the park opened in 1946. Every year since 2006 the park has opened up a new ride. In 2012 the park is slated to open “The Mammoth,” which is being touted as the longest water roller coaster in the world (“Mammoth” 2011). An actively growing theme park will be able to implement green strategies in any new facilities, facilitating the transition to a sustainable theme park.

Although Holiday World is smaller than theme parks like Cedar Point and King’s Island it provides the same, if not a superior quality of experience. The park has consistently placed well in the competition held by Amusement Today that compares parks directly based on various criteria, awarding Golden Tickets to the winner of each category, winning 4 of the 8 Golden Tickets including “Best Wooden Coaster,” “Best Waterpark Ride,” “Cleanest Park,” and “Friendliest Park” (“Golden Ticket Bonus Issue” September 2011). It has held “Cleanest Park” since 2000 and “World’s Friendliest Park” since the inception of the contest in 1998 (Werne September 17, 2011).
Holiday World has a comparatively short operating season as well, operating for 13 full weeks and an additional 8 weekends ("Holiday World & Splashin' Safari 2011 Operating Schedule" November 05, 2010). In 2010 the park had a record setting year in terms of park attendance, topping out at just over 1,180,000. Park President Dan Koch said it was the 5th year in a row that attendance has been above one million (Werne October 10, 2010). The park was open for 112 days giving an average attendance rate of about 10,500 visitors per day. During the peak of the operating season visitor counts were close to 20,000 people over the course of a single day, giving a peak density level of 167 people/acre.

<table>
<thead>
<tr>
<th></th>
<th>Holiday World</th>
<th>King's Island</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating season</td>
<td>112 days</td>
<td>154 days</td>
</tr>
<tr>
<td>Annual attendance</td>
<td>1,180,000</td>
<td>3,110,000</td>
</tr>
<tr>
<td>Average daily</td>
<td>10,500</td>
<td>20,000</td>
</tr>
<tr>
<td>attendance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estimated peak</td>
<td>20,000</td>
<td>40,000</td>
</tr>
<tr>
<td>attendance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Built area</td>
<td>120 acres</td>
<td>364 acres</td>
</tr>
<tr>
<td>Peak visitor density</td>
<td>167 people/acre</td>
<td>110 people/acre</td>
</tr>
</tbody>
</table>

This table compares attendance figures of Holiday World, and King's Island, a popular theme park in the region.
DESIGN

PROCESS
Early conceptual sketch for "The Raven," Holiday World's first roller coaster.

http://2.bp.blogspot.com/-M0hxlcJfGA/TidRfS_P_/AAAAAAAAM5g/25Xcjsjqa0/s1600/NPRaven%289%29.jpg
REGIONAL CONTEXT
Holiday World & Splashin' Safari (Holiday World) is located within the limits of Santa Claus, Indiana. Santa Claus is a small town with a population of about 2000 located about 4 miles south of I 64. The closest large metropolitan area is Evansville, Indiana, located 35 miles to the west. Holiday World is by far the largest attraction in Santa Claus, and the region surrounding.

The park is located between Interstate 64 and the Ohio River. The State Roads in the area are laid out such that traffic to and from the park will be using the interstate and approaching the park from the north.
THE SUSTAINABLE THEME PARK

Huntingburg
pop. 5598

Ferdinand
pop. 2277

Dale
pop. 1953

Holiday World

Santa Claus
pop. 2041

Jansville 35 miles
pop. 358 676

Louisville 60 miles
pop. 741 096

0 1 2 3 6 Miles
State Road

dan buis

PAGE 33
LAYOUT OF HOLIDAY WORLD

Holiday World currently occupies roughly 115 acres, all of which is located within the city limits of Santa Claus. Roughly 35 acres are devoted to visitor parking and another 25 devoted to backstage activities such as loading docks, parking, and maintenance.

The park is surrounded primarily by forest and farmland. State Roads 162 to the east and 245 to the west are the main approaches to the park.

Holiday World is organized thematically by holiday. Immediately through the main entrance is "Christmas," a plaza and kid rides themed around Christmas. Moving deeper into the park visitors encounter Halloween, The 4th of July, and Thanksgiving. The water park, Splashin' Safari, occupies the northern corner of the park.

Overall the main paths of the park form a series of loops through each holiday. Thanksgiving is the exception to this pattern due to the space occupied by the employee parking lot.
GOAL #1: Assemble a collection of sustainable strategies to aid in designing sustainable theme parks
Determine points from SITES that are relevant to theme park design. Determine what theme parks are already doing to be more sustainable

GOAL #2: Promote Green Practices and Sustainability
- Provide demonstration areas
  - Alternative farming practices
  - Alternative building materials
    - Straw bale building (completed & in-process)
    - “Earth ship” (completed & tire wall)
    - Earth bag
    - Cob building
    - Interactive cob building/play area
      - Facility to wash off feet and legs
  - Examples of waste reclamation
    - Materials recycling (ie milk jugs into fleece sweatshirts)
    - Alternatives to landfills
      - burning, recycling, something super “out there” like black holes etc.
- Provide educational opportunities
  - Signage explaining why areas are constructed/operated a certain way
  - Signage explaining how a strategy being implemented in the park can be used at home
  - Central area demonstrating storm water management
GOAL #3: Mend “backdoor” view of park on east side
• Provide signage about park
• Keep development at least 65' from the highway
• Ensure that rides are clearly visible from the highway.

GOAL #4: Facilitate circulation
• Build path as a loop
  • Connection to thanksgiving land by Pilgrim’s Plunge
  • Connection to 4th of July by Raging Rapids and Picnic Area
• Make paths accessible
  • topo changes handicap accessible
• Provide queues for rides
  • Out of main circulation path
  • Do not obscure view of ride
  • Use otherwise wasted space
• Maintain backstage connection between access drive on south and lot to the north
  • Use area occupied by roller coaster

GOAL #5: Provide amenities similar to rest of park
• Provide a drink station
  • On main loop
• Provide restrooms
  • On main loop
  • Access to backstage circulation
  • Waiting area
• Provide a food shop
  • On main loop
  • Near farming demonstration area
  • Access to backstage circulation
  • Area for queue outside of circulation
  • Outside eating area
    • Tables, chairs, shade
    • Different pavement
• Provide a game/arcade building
  • Located on main loop
  • Access to backstage circulation
• Provide a smoking area (Removing one from its present location)
  • Out of the way
  • Seating,
  • Shade
• Create a circular bounce house race
  • Generates energy
    • Visual cue of energy generated
• Queue
  • Backpack storage
DESIGN PROCESS: program

GOAL #6: Provide 3 rides that require little to no energy inputs
Create a zip line
- Queue
- Sheltered area
- Backpack storage
- Prep area
- 3 Tower route
- Landing zones
Create a human powered roller coaster
- Queue
- Sheltered area
- Backpack storage
- Infrastructure to handle elevator/pulley system
- stairs and sidewalk
- 2-4 acres of space for trackage
- Access to backstage circulation for maintenance
Create an interactive water safari ride
- Queue
- Sheltered area
- Backpack storage area
- 2-3 acres for path
- Water safety infrastructure (life rings etc.)

GOAL #7: Food shops provide vegetables grown on-site
- Demonstrate alternative, more efficient farming practices
  - verti-gro and other hydroponics
  - intensive farming
  - vertical farming

GOAL #8: Reduce/remove the need for energy within the expansion
- Reduce energy requirements
  - Low energy rides
  - Low energy fixtures
  - Use lights only when necessary
  - Not all on at night when closed
  - Less “flashy” rides
- Produce energy on-site
  - Solar panels on top of lights and buildings
  - Recapture energy from rides
- “Borrow” energy from elsewhere within the park
  - Used vegetable oil from food facilities for combustion engines
GOAL #9: Handle water on-site efficiently
- Capture runoff for use on-site
  - rain barrels
  - underground storage
  - detention/retention ponds
- Implement low water plantings
- Effectively manage storm water
  - rain gardens
  - demonstration garden by the roller coaster
  - retention ponds (Used for "water safari" ride)

GOAL #10: Reduce/eliminate waste
- Promote recycling
  - Well marked recycling containers
- Serve beverages and food in non-disposable containers
- Create compost heap for organic material
  - Space required backstage
- Utilize old vegetable oil for energy

GOAL #11: Education about Earth Day
- Inlay a timeline in the ground plane
  - Metal and different paving material
    - Events leading up to Earth Day
      - Earth Day 1970
        - Significant cities
      - Events up to 2010
      - Space designated for 2010-2050
- Use flags as a central element
DESIGN PROCESS: site selection process

SITE LOCATION #1

This site is proposed based on its geographical proximity to the rest of the property. It is logical that the park would choose to develop in a direction that it has in the past. Topography for the park indicates that water from the southern parking lot drains to the east, through this site.

Pros
- Opportunity to rejuvenate degraded forest
- Opportunity to handle stormwater from parking lot
- Site already bounded by park on two sides.

Cons
- Backstage areas between site and rest of the park
- Not necessarily in line with SITES 1.4 (Avoid removing habitat of endangered species)

Top: location of the site within larger context of the park
Bottom: aerial image of the site (Google Earth)
SITE LOCATION #2

This site is currently the employee parking lot, which is currently bounded on three sides by various park areas such as the picnic area and the most recent addition to the park, Thanksgiving. This site has the potential to fix some awkward circulation patterns within the park, including a dead end by “Pilgrim’s Plunge.” Topography for the park indicates that about 350 acres drain to the ditch that bisects the site, including about two thirds of the park.

Pros
- Does not remove forest
- Opportunity to fill in backstage areas
- Opportunity to handle stormwater from majority of the park

Cons
- Need to relocate parking lot

Top: location of the site within larger context of the park
Bottom: aerial image of the site (GIS)
SITE LOCATION #3

This site begins to send a finger of the park into the campground. The environment of this site is what brings it to mind as a candidate; it makes sense to have a green, sustainable theme park in the middle of a healthy forest.

Pros
- Strengthen connection with campground
- Fantastic environment for a green park

Cons
- No connection to rest of park
- Disruptive to campers
- Circulation within space will be awkward
- Not in line with SITES 1.4 (Avoid removing habitat of endangered species)

Top: location of the site within larger context of the park
Bottom: aerial image of the site (Google Earth)
The big idea for the final site is a blend of locations 1 and 2. The new area for visitors utilizes the space currently occupied by the employee parking lot. The parking lot is relocated south of the park to location 1, which fits in well with the existing parking lot and the existing backstage areas across the highway.

Pros
- Opportunity to heal awkward circulation created by the Thanksgiving area
- Opportunity to change view of park from the highway
- Hides employee area more effectively

Cons
- Little existing vegetation
- Little to no existing topography

Top: location of the site within larger context of the park
Bottom: street view of the site (Google Earth)
The site occupies about 10 acres in the eastern portion of the park. Its primary feature is a large parking lot for the employees. Currently the parking lot is bounded on three sides by areas frequented by visitors, giving them an undesired look into the behind the scenes portions of the park.

From the parking lot tendrils of employee only areas snake their way to the rest of the park passing behind and between rides.

The only existing vegetation of significance is the stand of trees to the north of the picnic area. These trees appear to be mature specimens about 30-40 feet in height.

A small ditch flows across the site and is responsible for draining about 350 acres, including about 70% if the park. The ditch is about 12 feet wide, 5 feet deep and appears to always have water.
DESIGN PROCESS: site analysis

The main gathering space for the site should be in the south west corner of the site since that is where the majority of visitors will be coming from. It should have a tall structure of some sort to act as a landmark so visitors can navigate to the area and use it as a reference point within the area.

The parking lot serves as a conduit for employees to travel north and south through this region of the park. An employee path should be installed to facilitate this flow.

A buffer between the highway and the visitors should be installed. The buffer will serve primarily to screen the road from visitors so they do not feel compelled to leave upon seeing the highway.
THE SUSTAINABLE THEME PARK

Potential entrance
Landmark as a reference point
Maintain existing backstage areas
Create connection between backstage areas
Utilize shade from existing trees
Buffer along SR 152

Picnic area should be adjacent to relatively quiet things
Maintain existing backstage areas
**DESIGN PROCESS: concepts**

**THE THROUGH STREET**

This concept focuses on reconnecting circulation within the park by connecting what are functionally two dead ends. The resulting path serves as a thoroughfare through Earth Day.

**Pros**
- Development pulled back from the road
- Backstage access facilitated using existing infrastructure

**Cons**
- Does not use entire site
- No space for demonstration areas
- Does not engage the water’s edge well
THE SUSTAINABLE THEME PARK

THE LOOP
This concept creates a loop to carry visitors throughout Earth Day. The main entrance from the south facilitates views of most of the site either down the paths or across the water to the roller coaster.

Pros
• Utilizes entire site
• Backstage access facilitated using existing infrastructure
• Fully engages water’s edge

Cons
• Underutilized space along the path on the east side
• Difficult to keep water ride out of sight
THE "T"

This concept takes the main street idea from THE THROUGH STREET and adds a spur leading to the roller coaster. The spur allows buildings to access the existing service drive and also allows opportunities for shading visitors.

Pros
Development pulled back from the road
Space used for rides located out of the way
Backstage access facilitated using existing infrastructure

Cons
Site is underutilized
Does not engage the water’s edge well.
Dead end
THE SUSTAINABLE THEME PARK

dan buis

PAGE 51
DESIGN PROCESS: master plan

The final design is based off "THE LOOP." The area is divided into a number of zones, with the main entrance at the south west corner.

As the visitor crosses the bridge into "Earth Day" the first thing they encounter is a plaza featuring food, shopping, a zipline, and the primary informational component about Earth Day the holiday.

Following the timeline engraved into the pavement leads to a large tree representing Earth Day 2010, the 40th anniversary of the holiday. Adjacent to this symbolic tree is the building housing the loading/unloading and queue for the water safari ride. On the west side of the path is the zone demonstrating a number of alternative farming practices.

Following the loop around to the west visitors encounter the restrooms as well as a number of games to play, one of which is a race that also generates energy for the park.

Making the turn to the south takes the visitor to the plaza devoted to the roller coaster. Centrally located in the plaza is a rain garden both functional and a demonstration to visitors.

After crossing the plaza the visitor enters the primary educational zone within the area. First the visitor is exposed to a number of displays about trash; what happens to it in landfills, alternatives to landfills, odd recycled materials etc. After making the turn back to the west the visitor sees a number of alternative building types that are more sustainable than typical construction including cob, straw bale, rammed earth, and "earth ships." Leaving this zone brings the visitor full circle, back to the plaza where they began.
THE SUSTAINABLE THEME PARK

- Drink station
- Vertical farming
- Vertigo system
- Hydroponics beds
- Bio-intensive farming
- Food shop
- Eating areas
- Earth day timeline
- Starting point for zip line circuit
- Retail shop
- Pedestrian bridge
- DIY cob area
- Cob building
- "Earth ship"
- Tire wall
- Rammed earth building
- Straw bale process building
- Straw bale building
- Picnic area
- Maintenance path
- Rain garden
- Recycled materials display
- Landfill alternatives displays
- Game "wheel race"
- Restrooms
- Smoking area
- Maintenance areas
FINAL DESIGN
Rendering based off the master plan. This is the bridge just north of the plaza.
As visitors enter the new Earth Day area the first thing they see is a timeline on the ground. This portion of the timeline depicts events leading up to the first Earth Day, which took place in 1970.

Just across the bridge the path is flanked by three sets of flags, each of which represents Earth Day in some fashion, including an image of the Earth on a navy blue field and a flag depicting the Greek symbol theta (θ).

When the timeline reaches the center of the main plaza several rays radiate out across colored concrete pointing to cities that were significant to the first Earth Day in 1970 including San Francisco, Philadelphia, Savannah, and New York. At the terminus of each ray is a display showing the significance to each city.

As the timeline crosses the bridge to the north it depicts events related to Earth Day for the next 40 years. In the next plaza the timeline terminates at a large specimen tree arching over the plaza. This tree represents Earth Day 2010, the 40th anniversary of the holiday. The timeline may continue in the future, terminating at the north entrance to the area with Earth Day 2050.
The water safari ride is accessed from the Earth Day 2010 plaza by entering the building on the east side of the plaza and following the ramp down to water level. The riders paddle the catamaran along, which allows the ride to require zero energy input. Below the surface of the water a pair of guides work in conjunction with several rollers to keep the catamaran on the given path.
After entering the plaza the visitor can visit any of three main attractions surrounding the plaza. On their right is a retail shop selling the usual Holiday World merchandise and an assortment of inventory themed around Earth Day. On their left is the start of the zip-line course. Across the plaza is the restaurant where famished visitors can purchase food where a portion of their meal is grown on the other side of the bridge. The restaurant has two outdoor eating areas, one to the left nestled under the shade of the trees, and one to the right on a deck cantalevered over the water.

The zip line course starts from the main plaza and proceeds clockwise. At the first tower riders are ushered into a preparation area where staff help them into a harness and deliver a safety lecture. Riders then climb a flight of stairs to the top of the tower where a staff member clips them onto the line. At the bottom of the line, 600 feet later, the rider's own weight acts as a braking mechanism and a large inflatable cushion will rid the rider of any excess motion. Repeat the process two more times and the rider arrives back at the starting tower gliding over the south leg of the loop and the plaza for their final approach.
THE SUSTAINABLE THEME PARK

Preparation area for departing riders

Queue

Landing area for returning riders
Bridge to the north of the plaza crossing the ditch. In the background is the main ascent for "The Voyage," the wooden rollercoaster in the Thanksgiving section of the park. A variety of plants and textures surround the new body of water. Bridges and decks give a wealth of access points for visitors to enjoy the water.
THE SUSTAINABLE THEME PARK

don buis

On the facing page is an image of the bridge that crosses from the main plaza to the area where the Earth Day 2010 tree is located. The image gives a good idea of the general character of the area, particularly the bridges, banks, overlooks and the variety of vegetation. In the background of the picture is the back of Thanksgiving. “Gobbler Getaway” sits against the vertical farming of Earth Day. Rising over its surroundings is the main ascent for “The Voyage,” Holiday World’s premiere wooden roller coaster.

After passing the restaurant and crossing the bridge visitors find themselves next to the farming demonstration area. The adjacency of growing and buying food enables the visitor to understand where the food they eat everyday might come from. Ambling through the alternative farming demonstration area will instruct the visitor in why these farming methods are more efficient than typical farming methods and how they can be applied at home.
Crossing the second bridge brings the visitor to the north entrance of Earth Day, accessed by the path to "Pilgrim's Plunge." The building at this entrance is an additional location where visitors can get a free soft drink, one of Holiday World's big selling points. The building uses several drink dispensers accessed by doors on two sides of the building. Across the plaza from the drink building is a pair of games visitors can participate in. The first one is a typical carnival game with an Earth Day spin, the other is a multi-player race that is described more on the facing page.

Midway across the north leg of the loop the path widens in front of the restrooms. A deck across from the restrooms gives a location for visitors to wait for loved ones out of the flow of traffic and also provides an opportunity to engage the water's edge. The roof of the restroom and the drink building have solar panels in order to provide green energy to the park.

Just before the path curves back to the south a smoking area has been provided since the drink building occupies roughly the same location as the smoking area did prior to construction.
THE SUSTAINABLE THEME PARK

dan buis

The principle attraction on the northern leg of the loop is essentially a human-sized hamster wheel. A 25' diameter wheel has bounce-house type obstacles spread around the rim. Three or four such wheels are lined up alongside one another. Participants will enter each wheel and race to see who can complete a number of laps the quickest. As the wheels turn energy is generated and fed back into the grid powering the park. A portion of that energy is used to light a column of lights corresponding to their respective wheel to show how fast the participant is moving.
The two main features of the plaza on the east side of the loop are the rain garden and the human powered roller coaster.

The rain garden handles runoff from this region of the site and the maintenance areas to the north. It is intended as a demonstration piece to educate visitors about what a rain garden looks like and how they work.

The human powered roller coaster works by harvesting its energy from energy generated by its riders, rather than through energy generated through traditional means such as combustion. The riders climb a flight of stairs and enter an elevator. The elevator is connected to the train through a series of cables and pulleys. As the elevator descends the train is pulled to the top of the track, gathering potential energy as it ascends. The riders disembark the elevator and climb the stairs to board the train and enjoy their ride.
As visitors move south from the plaza they pass by a number of displays about waste management. One set of displays has information about recycling, specifically what materials can be recycled into. One example of this is milk jugs being recycled into fleece sweatshirts. Another set of displays provides information on alternatives to landfills. Included in this display are conventional methods such as composting, recycling and incineration. Additionally one "out there" concept is included, using the future space elevator to jettison our garbage into a black hole.
As the visitors round the corner and make their way to the main plaza at the beginning of their time in Earth Day they pass by the area dedicated to demonstrating alternative building methods. Demonstrated methods include cob, "earthship," rammed earth and straw bale. Each building has both a completed structure as well as an "in-process" display to explain how each method is implemented.

Dominating the west end of this path is an opportunity for visitors to experience building a cob house. Cob, being very similar to mud, is a very pro-kid material and as such it is more than appropriate to give parents and kids a chance to mix some cobs. After leaving the do-it-yourself cob area visitors are back at the main plaza and free to travel wherever they desire, whether that is somewhere else in the park, or back to their favorite part in Earth Day.
The do-it-yourself cob making area at the eastern end of this leg of the loop. In the foreground are several people mixing straw and mud to make cobs used in the construction of a cob building. On the right of the path is a series of buildings highlighting several alternative building materials.
CONCLUSIONS
Looking back this project was a lot of fun to complete. Drawing rides, researching roller coasters and theme parks were all big contributors to the level of fun. As a designer it is amazing to see how much this project changed since the beginning of the school year when I pitched it to my professors for the first time. The scope of the project ended up heading in a completely different direction than I anticipated.

The million dollar question: Is this facility sustainable? Net-zero?

The answer to both of those is the same: “yes-ish”. The expansion is significantly more sustainable than the rest of the park, requires much less input, and generates a lot less waste. The biggest strike against the park for sustainability is its location, 35 miles away from the nearest metropolitan area.

The nature of a theme park makes it impossible to be net-zero, but the design and program outlined in this document goes a long way to closing the gap. A theme park can become much more sustainable by implementing green strategies in a wholistic manner rather than focusing efforts into a single approach.
Conceptual rendering for "Pilgrim's Plunge," a flume ride in Thanksgiving that opened in 2010.

## APPENDICES: timeline

<table>
<thead>
<tr>
<th>week</th>
<th>task</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Assemble binder</td>
</tr>
<tr>
<td>2</td>
<td>Binder due</td>
</tr>
<tr>
<td></td>
<td>Carry out additional research</td>
</tr>
<tr>
<td>3</td>
<td>Progress presentations</td>
</tr>
<tr>
<td></td>
<td>site selection</td>
</tr>
<tr>
<td>5</td>
<td>conceptual design</td>
</tr>
<tr>
<td>6</td>
<td>Refine concepts</td>
</tr>
<tr>
<td>7</td>
<td>Generate sketches</td>
</tr>
<tr>
<td>8</td>
<td>Generate master plan</td>
</tr>
<tr>
<td>9</td>
<td>Spring break</td>
</tr>
<tr>
<td>10</td>
<td>Generate supporting materials</td>
</tr>
<tr>
<td>11</td>
<td>Present project at student symposium</td>
</tr>
<tr>
<td>12</td>
<td>Revisions</td>
</tr>
<tr>
<td>14</td>
<td>Final presentation</td>
</tr>
<tr>
<td>15</td>
<td>Generate final deliverables</td>
</tr>
<tr>
<td></td>
<td>board</td>
</tr>
<tr>
<td>17</td>
<td>booklet</td>
</tr>
</tbody>
</table>
Holiday World & Splashin' Safari
2011 Operating Schedule

Holiday World & Splashin' Safari operate on Central Daylight Time (CDT).

MAY

<table>
<thead>
<tr>
<th>S</th>
<th>M</th>
<th>T</th>
<th>W</th>
<th>T</th>
<th>F</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td>15</td>
<td>16</td>
<td>17</td>
<td>18</td>
<td>19</td>
<td>20</td>
<td>21</td>
</tr>
<tr>
<td>22</td>
<td>23</td>
<td>24</td>
<td>25</td>
<td>26</td>
<td>27</td>
<td>28</td>
</tr>
<tr>
<td>29</td>
<td>30</td>
<td>31</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

JUNE

<table>
<thead>
<tr>
<th>S</th>
<th>M</th>
<th>T</th>
<th>W</th>
<th>T</th>
<th>F</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td>15</td>
<td>16</td>
<td>17</td>
<td>18</td>
<td>19</td>
<td>20</td>
<td>21</td>
</tr>
<tr>
<td>22</td>
<td>23</td>
<td>24</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

JULY

<table>
<thead>
<tr>
<th>S</th>
<th>M</th>
<th>T</th>
<th>W</th>
<th>T</th>
<th>F</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
<td>17</td>
<td>18</td>
<td>19</td>
</tr>
<tr>
<td>20</td>
<td>21</td>
<td>22</td>
<td>23</td>
<td>24</td>
<td>25</td>
<td>26</td>
</tr>
<tr>
<td>27</td>
<td>28</td>
<td>29</td>
<td>30</td>
<td>31</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

AUGUST

<table>
<thead>
<tr>
<th>S</th>
<th>M</th>
<th>T</th>
<th>W</th>
<th>T</th>
<th>F</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
<td>17</td>
<td>18</td>
<td>19</td>
</tr>
<tr>
<td>20</td>
<td>21</td>
<td>22</td>
<td>23</td>
<td>24</td>
<td>25</td>
<td>26</td>
</tr>
<tr>
<td>27</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SEPTEMBER

<table>
<thead>
<tr>
<th>S</th>
<th>M</th>
<th>T</th>
<th>W</th>
<th>T</th>
<th>F</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
<td>17</td>
</tr>
<tr>
<td>18</td>
<td>19</td>
<td>20</td>
<td>21</td>
<td>22</td>
<td>23</td>
<td>24</td>
</tr>
<tr>
<td>25</td>
<td>26</td>
<td>27</td>
<td>28</td>
<td>29</td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

OCTOBER

<table>
<thead>
<tr>
<th>S</th>
<th>M</th>
<th>T</th>
<th>W</th>
<th>T</th>
<th>F</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>16</td>
<td>17</td>
<td>18</td>
<td>19</td>
<td>20</td>
<td>21</td>
<td>22</td>
</tr>
<tr>
<td>23</td>
<td>24</td>
<td>25</td>
<td>26</td>
<td>27</td>
<td>28</td>
<td>29</td>
</tr>
<tr>
<td>30</td>
<td>31</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Holiday World opens at 9:30 a.m. CDT
Splashin' Safari opens at 10:30 a.m. CDT

Holiday World opens at 9:00 A.M. CDT (Only May 13 & 16-20, 2011)

Holiday World Closes at 5:30 CDT
Splashin' Safari NOT open today

Splashin' Safari Closes at 4:30 CDT
Holiday World Closes at 6:30 CDT

Splashin' Safari Closes at 6:30 CDT
Holiday World Closes at 9:30 CDT

Closed for Private Outing
May 12, September 10, 11 and 18

Update 11-5-10
PLAZA LAYOUT

1" = 30'

0' 15' 30' 60'

UNLESS OTHERWISE NOTED CONTROL JOINTS OCCUR:
-IN CONCENTRIC CIRCLES 5' APART
-IN 5 DEGREE ARCS

TIMELINE ELEMENTS HAVE WIDTH OF 2'

SEE DRAWING 2.1 (PLAZA CENTER)
SEE DRAWING 3.1 (EXPANSION JOINT)
SEE DRAWING 4.1 (SIGNAGE ELEVATION)
SEE DRAWING 3.2 (ASPHALT CONCRETE JOINT)

FOOD SHOP

DECK

SEE DRAWING 2.1

ZIP LINE TOWER

13'-9"

26'

10'-6"

68'-9"

10'

6'-9"

2'

68'-9"

36'

31'-3"

2' 

15'

30'

60'

COLOR CONCRETE

PLAZA CENTER

EXPANSION JOINT

SIGNAGE ELEVATION

ASPHALT CONCRETE JOINT

RETAIL

PLAZA LAYOUT

1

PAGE 76
THE SUSTAINABLE THEME PARK

BLACK GRANITE W/ BRASS INLAY AND EDGING

CREME COLORED CONCRETE

ROSE COLORED CONCRETE

PLAZA CENTER

0'  5'  10'

1" = 5'

PAGE 77
1/2" EXPANSION JOINT WITH SEALANT
1/2" SS DOWEL
WWM - 2 IN CLR
CONCRETE SLAB
AGGREGATE BASE
PREPARED SUBGRADE
-95% PROCTOR

EXPANSION JOINT

1" = 2'

0' 1' 2' 4'

ASPHALT SURFACE COURSE
CONCRETE SLAB
(SEE DRAWING 3-1 EXPANSION JOINT)
WWM - 2 IN CLR
AGGREGATE BASE
CONCRETE BASE
PREPARED SUBGRADE
-95% PROCTOR

ASPHALT CONCRETE JOINT

1" = 2'

0' 1' 2' 4'

AGGREGATE BASE
CONCRETE BASE
PREPARED SUBGRADE
-95% PROCTOR
THE SUSTAINABLE THEME PARK

dan buis

1X6 FASCIA BOARD
- 1X6 FASCIA BOARD
  (LAP JOINT)

1/2" SS BOLT

36X42 SIGNAGE

1/2" SS BOLT

2X4 WOOD UPRIGHT
  (LAP JOINT INSIDE)

6X6 WOOD BEAM

CONCRETE SLAB
  (SEE DRAWING 3-1
  EXPANSION JOINT)

UNLESS OTHERWISE
NOTED ALLWOOD
USED SHALL BE IPÊ

SIGNAGE ELEVATION

1" = 1'

0'  1'  2'


THE SUSTAINABLE THEME PARK
dan buis


