

Intermodal Container Transport System Solutions for Chicago

I PRO - 307



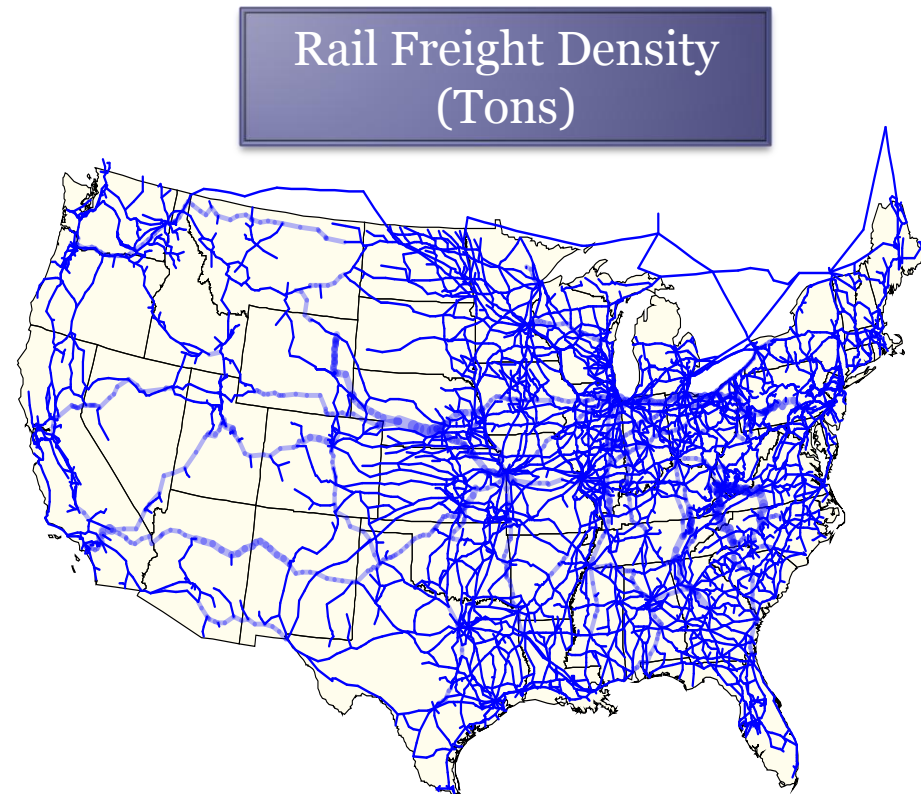
Introduction

THE NEED:

- Transportation of Tonnage
 - Truck, 69%
 - Rail, 13.3%
 - Rail Intermodal, 1.3%
- Demand, Tonnage is Up
- Environmental

THE VALUE:

- Reducing:
 - Trucks on highways
 - Carbon footprint



Introduction

PROJECTION: +50% Demand in 10yrs
Capacity needs to improve in order to meet the demand

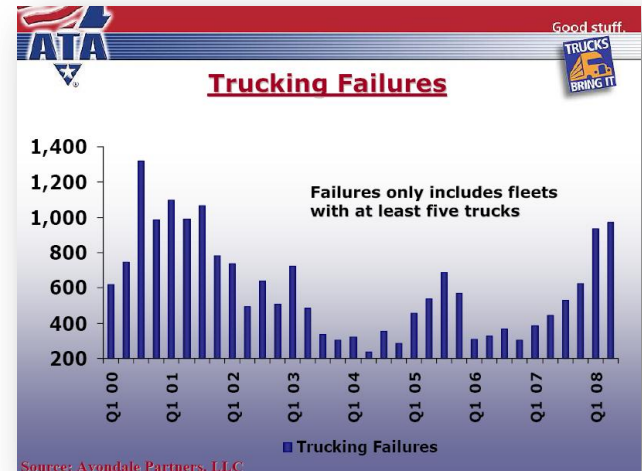
PROBLEM:

- Supply, Trucking Fleet is Down
 - 2007, -2.6%
 - Company Failures
 - Hard Life Style
- Lack of Transportation Capacity
 - Land Limits

OBJECTIVES:

+50% Capacity = +50% Pollution

- “Increase capacity with out increasing pollution”
 - Improve Slip Seating
 - Maximize Land Capacity
 - Utilize New Technologies to Improve Efficiencies



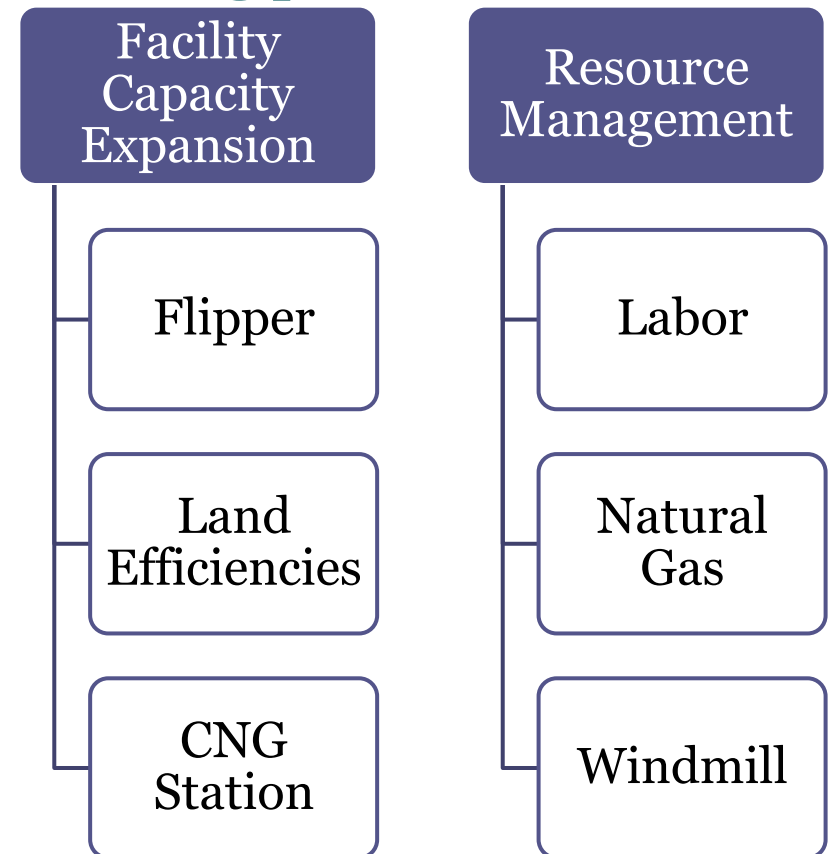
Team Development & Performance

VALUES & MISSION:

- Ethics Test
 - “What Permits Do We Need”
 - “Increase capacity with out increasing pollution”
- Communication
 - Honest Feedback

ORGANIZATION:

- Two Teams
 - Assign Responsibilities
 - Not Tasks
- Peer Review
 - Utilize Diversity
 - Discussions



Responsibilities

Name	Major	Task Responsibility
Xavier Alacron	Civil Engineering	Sub-Group 2 Team Leader; CNG station design, along with safety and efficiency improvements.
Kwong Cheung	Civil Engineering	Research and collection of data for transportation nationwide
Michal Kaska	Mechanical Engineering	Sub-Group 1 Team Leader; In charge of emission mandates, wind turbine implementation, and project management.
Irina Magdel	Civil Engineering	CNG distribution and storage research.
Linh Nguyen	Architecture	In charge of obtaining permit requirements for construction of wind turbine.
Bradley Suik	Mechanical Engineering	Development of the "flipper" for yard truck traffic improvement.
Daniel Fuentes	Architecture	Site analysis -zoning and habituation- to increase yard capacity
Andrew Kedzuch	Architecture Mechanical Engineering	Wind turbine assembly and circuit design as well as intermediary with Zero Energy IPRO.
Plamen Marinov	Mechanical Engineering	Design of new locking mechanism or coupling device for joining stacked containers together.
Christopher Brewin	Mechanical Engineering	Wind turbine assembly and installation; CNG engine conversion research for yard equipment.
Krzysztof Slomiany	Mechanical Engineering	In charge of emission mandates, wind turbine implementation, project management, master schedule maker
Tomasz Lis	Architecture	Expansion process for the facility; 'leveling floor space' concepts and design

History

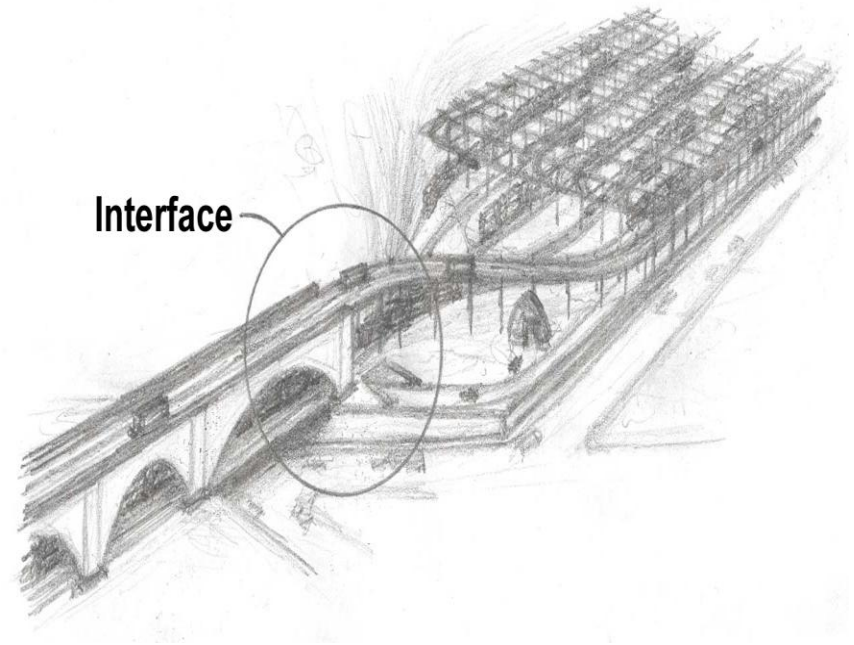
Since Fall 2004

A series of horizontal lines in teal and white colors, extending from the left side of the page towards the right, positioned below the text 'Since Fall 2004'.

Automated Shipping Containers

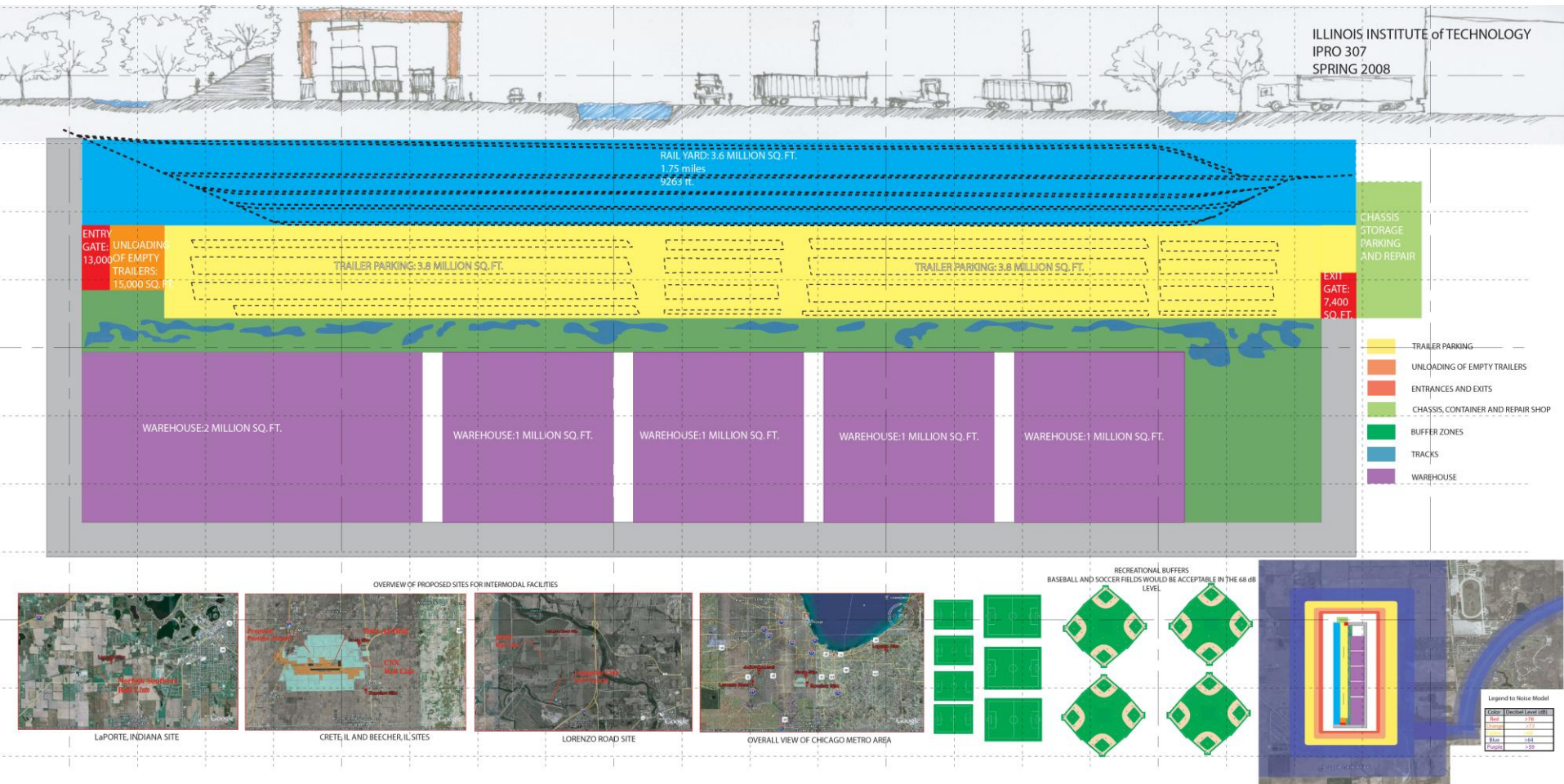


**Grid-Rail (GRAIL) Over Head
Lattice Concept**



Inter-Yard Structure Concept

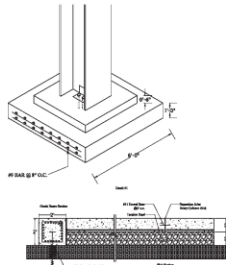
Buildout



- Recommended environmentally friendly intermodal design
- Uses grid structure with quantifiable layout

Warehouse and Energy Solutions

Zero Excavation/ Energy Conscious Proposals



Zero Excavation Warehouse Design

Zero Excavation/Warehouse Design is the way of the future. This design introduces a new way for having zero disposal of contaminated material by designing the foundation system to be designed to support the loads. Each site has different conditions and the design will take into account the site conditions and make small changes. Overall, this design will be very useful for the renovation or new build in brown sites.

Zero Excavation Process

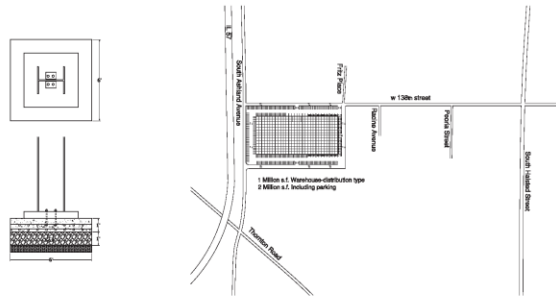
General Site Prep will be needed. A site survey will be needed to ensure that the proposed design complies with local site conditions and any restrictions for the proposed design. The design will be based on the site conditions and the design will be based on the site conditions. The design will be based on the site conditions and the design will be based on the site conditions.

A building plan is an assembly of materials, connected and used with a specific design and construction. The design will be based on the site conditions and the design will be based on the site conditions. The design will be based on the site conditions and the design will be based on the site conditions.



IPROC07: Intermodal Transport Facility

Zero Excavation/ Energy Conscious Proposals

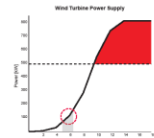


Parameter	Value
Capacity	4.8 MW
Height	147m
Hub Height	80m
Rotor Diameter	123m
Tip Speed Ratio	7.5
Rated Wind Speed	11.5 m/s
Cut-out Wind Speed	25 m/s
Annual Energy Production	10,000 MWh
Capacity Factor	35%
Grid Connection	110kV
Construction Cost	\$2.5 million
Operating Cost	\$0.05/kWh
Payback Period	5-7 years
Life Cycle	20-25 years

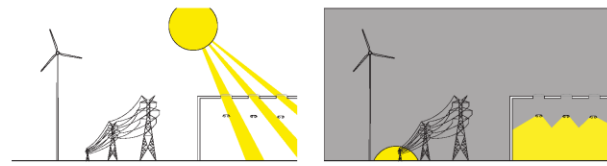
Energy Strategy

Through a combination of electricity and engineering wind power, the design seeks to increase the energy use of the warehouse.

This proposal is based on a 1,000,000 sq. ft. warehouse operating 24 hours a day, using 10,000,000 kWh a year.



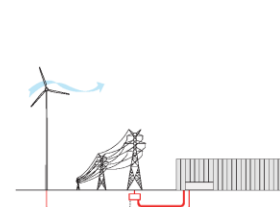
This graph illustrates the power supply of the E48 turbine for 1,000,000 sq. ft. of warehouse usage. In the Pacific region, average wind speeds are 10-15 mph. In the Midwest, average wind speeds are 10-15 mph. In the Southeast, average wind speeds are 10-15 mph. In the West, average wind speeds are 10-15 mph.



Lighting Conservation
To conserve energy in the interior of the warehouse, skylights are used to provide natural lighting. The skylights are designed to provide natural lighting and to reduce the need for artificial lighting.

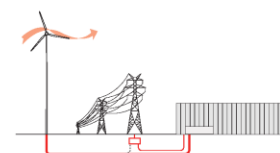
IPROC07: Intermodal Transport Facility

Zero Excavation/ Energy Conscious Proposals



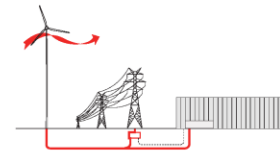
Average Wind Speed Supply

This diagram illustrates power supply from wind turbines using average wind speeds of about 10 to 15 mph. In this scenario, wind power provides 10 to 20 percent of the electricity to the warehouse. The rest is supplied by the grid.



High Wind Speed Supply

This diagram illustrates power supply from wind turbines using high wind speeds of 15 to 20 mph. In this scenario, wind power provides 20 to 30 percent of the electricity to the warehouse. The rest is supplied by the grid.



Very High Wind Speed Supply

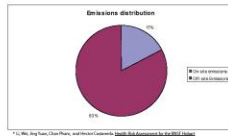
At an average greater than 20 mph, wind power will supply 30 percent of the electricity to the warehouse. The rest is supplied by the grid. Careful of electricity supply to be made at times for increased power supply.

IPROC07: Intermodal Transport Facility

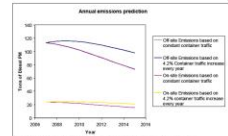
- Zero excavation-no dirt is moved offsite due to possible contaminations
- Energy reducing features including wind power, skylights and light sensors

Environmental Improvements

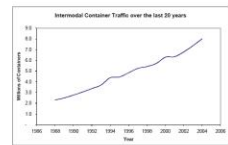
Air Emissions



Emissions distribution
The chart shows the most probable number emissions distribution of a typical commercial facility. The chart is broken into two parts: CO2 and CH4 emissions. CO2 emissions are shown in the top part, and CH4 emissions are shown in the bottom part. CO2 emissions are broken down into CO2e from on-site fossil fuels, CO2e from on-site electricity, and CO2e from on-site natural gas.



Emissions Model
The graph is a model for annual on-site and off-site emissions based on data from the 2007-2014 period. It shows annual container yard emissions, the average rate of emissions, and EPA emissions regulations for design engineers.



Intermodal Container Traffic over the last 20 years
The graph indicates intermodal container traffic has increased over the last 20 years. Despite the increase in intermodal container traffic, the average rate of emissions is decreasing. This is due to the fact that the graph shows a steady increase in emissions over the 20-year period.

Environmental Improvements

case study CSXI - Bedford Park, IL



~675,228 sq. ft. in 2007
~270 acres (2,500,000 sq. ft.) of container storage
~8 tracks (102,000 sq. ft.)
~1 M-JACK Capacity
~1.5 million cubic yards (2007)
~300 trailers (2007)



Legend:
 - orange: paved area
 - red: paved area
 - blue: paved area
 - green: paved area
 - yellow: paved area
 - purple: paved area
 - grey: paved area

Retention improvements to CSXI - Bedford Park, IL



Benefits of Improvements
 - reduced water retention area
 - 1,200% increase in water retention
 - improved water quality
 - 4% increase in storm storage capacity

Cost of Improvements
 - \$1,100,000
 - \$500,000
 - \$200,000
 - \$400,000

Water retention capacity
 - 100,000 gallons of water
 - 100,000 gallons of water
 - 100,000 gallons of water
 - 100,000 gallons of water

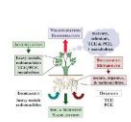
Stage 1



Payment Reduction

The on-site retention system allows site owners to reduce water retention costs. This is achieved by reducing the amount of water that is retained on-site, which in turn reduces the amount of water that is sent to the sewer system.

Stage 2



On-site Retention

The on-site retention system allows site owners to reduce water retention costs. This is achieved by reducing the amount of water that is retained on-site, which in turn reduces the amount of water that is sent to the sewer system.

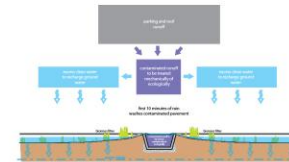
Stage 3



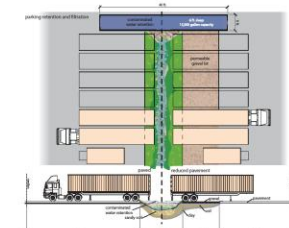
Constructed Wetlands

According to the EPA, an acre of wetland can remove 1.2 tons of sediment or silt, 100 lbs of phosphorus, and 1,000 lbs of nitrogen annually. This is a significant improvement over traditional water retention systems.

Water Retention

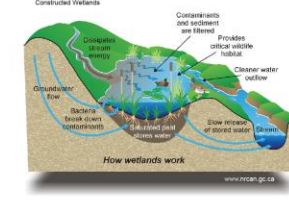


On-site Retention Diagram
The EPA states that the most cost-effective way to reduce water retention costs is to use permeable pavement. This is because permeable pavement allows water to infiltrate the ground, which reduces the amount of water that is retained on-site.



Water retention capacity
 - 100,000 gallons of water
 - 100,000 gallons of water
 - 100,000 gallons of water
 - 100,000 gallons of water

Constructed Wetlands



- Improved water retention
- Site specific improvements
- Improvements in air quality based on current standards

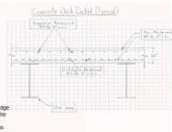
Bridge Design

City of Gary, Clark Rd. Bridge



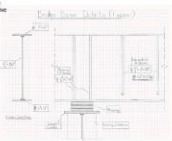
Clark Road Site Context

The Gary Bridge design was inspired by the growing number of alternative requests and the necessity for a better solution to create connectivity. The alternative requests to create an elevated bridge over the IPR307 rail line are an opportunity to improve the image of intermodal by providing an environmentally positive bridge structure. Improvements are planned for Clark Road and the walking corridor that along the site to both be adding to the aesthetic aspects of the area. One of the transportation improvements in the plan presented is the Gary Clark yard and the US 30 bridge and complex access back to the site. The 1.2 mile walking corridor. The bridge would provide a solution which would cater to the transportation of the passengers as well as vehicular traffic, thus addressing the project.



Structure

The concept behind the structure of the bridge stems from the Gary steel culture. Due to the close proximity of the steel site the bridge design based on inspiration in the steel bridge design. The steel structure for the structure was a natural result for the intermodal facility. The new transport hub emphasizing the IPR307 goal of IPR307, use environmentally positive improvements to intermodal parts.



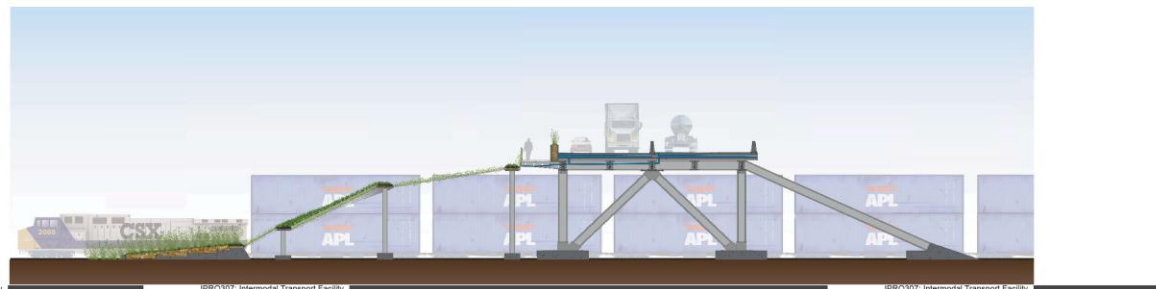
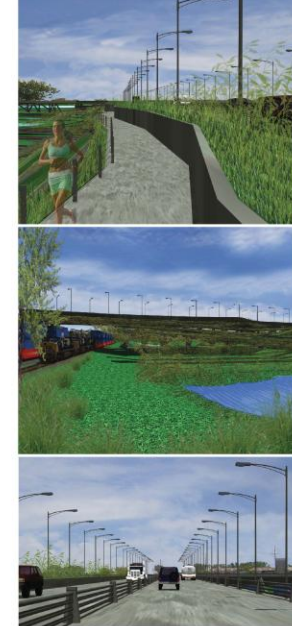
Nature

The second part of the bridge design focused on addressing the needs of the community as well as the bridge's impact on the site, a solution to the project was to create a bridge in the form of a walkway, which supports the area. The second bridge structure acts as a walkway connecting the bridge to the walkway, creating an all-terrain walkway which would connect the bridge to the walkway. The bridge structure was designed through an innovative use of materials, and new materials. A steel distribution system was developed to meet the needs of the bridge structure. The bridge structure was designed to meet the needs of the IPR307. Clark's path was created which allowed pedestrians access to the newly created outdoor habitat.

Site Plan and Typical Section



Detail Images



IPRO307: Intermodal Transport Facility

IPRO307: Intermodal Transport Facility

IPRO307: Intermodal Transport Facility

- Meets needs of people and cars
- Two sided concept based design

Project Work



Preliminary Investigation

Norfolk Southern Yard Visit:

- Gathered Hard Data
- Discussed Future Projections
 - 5yr Plan
- Observed Processes

- General Yard Layout
- & Functions



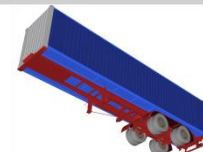
Trucking Time-space Diagram



Location



proprietary concept

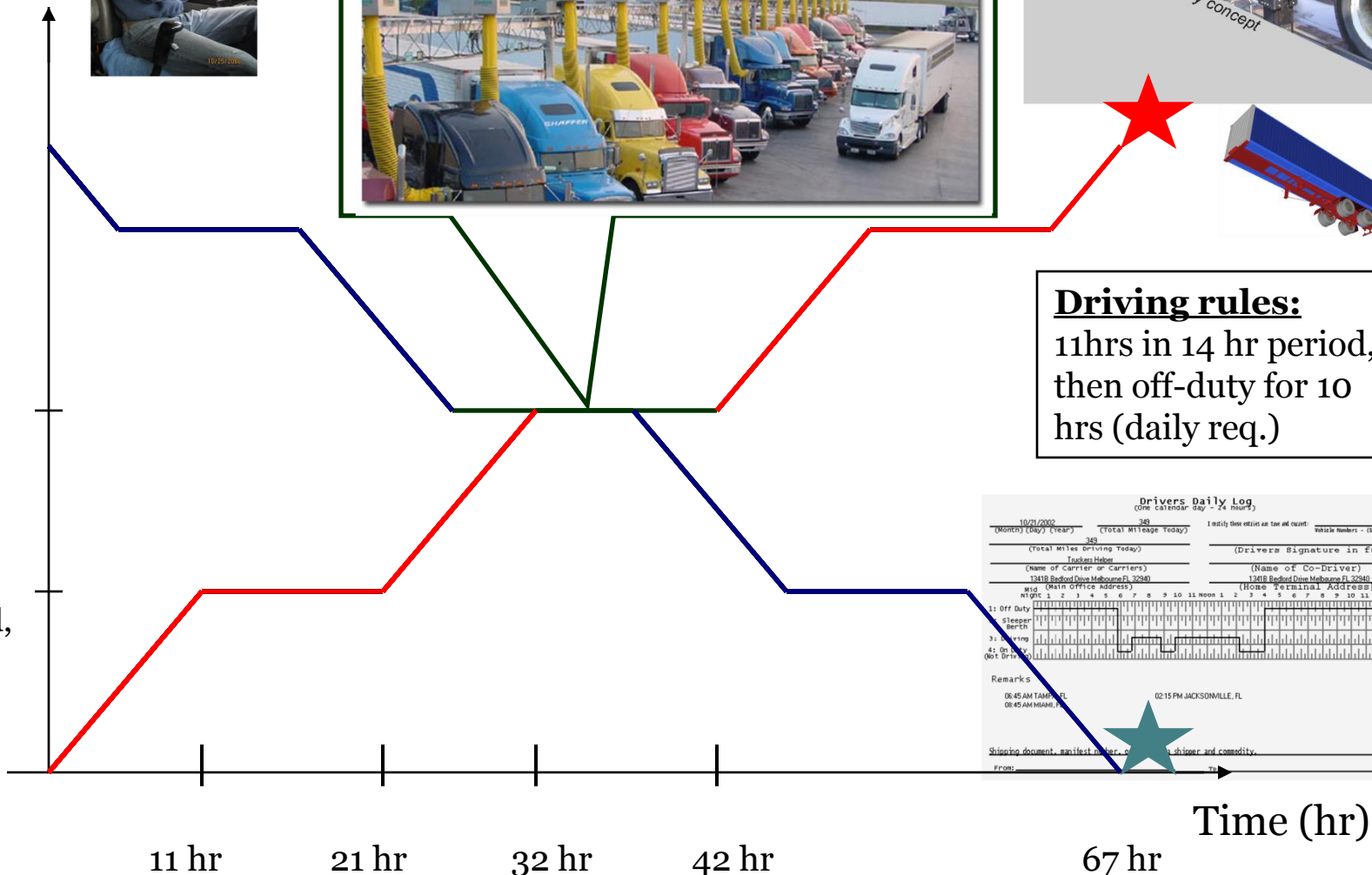


Los Angeles
2,018 miles

Denver
1,006 miles

Grand Island,
Nebraska
604 miles

Chicago



Driving rules:
11hrs in 14 hr period,
then off-duty for 10
hrs (daily req.)

Drivers Daily Log
(One calendar day - 24 hours)

10/11/2002
(Month) (day) (Year)

368
(Total Mileage Today)

I certify these entries are true and correct.

340
(Total Miles Driving Today)

Multiple Numbers - (State each unit)

Truckers Huber
(Name of Carrier or Carriers)

Drivers Signature in full

1218 Richard Dean Huber, Jr. 2290
(Name of Co-Driver)

1218 Richard Dean Huber, Jr. 2290
(Home Telephone Address)

Hour	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total Hours
1: Off Duty																									11.75
2: Sleeper Berth																									0.00
3: Driving																									4.50
4: On Duty (not driving)																									3.75
Remarks																								24.0	
06:45 AM TAMPA, FL																								02:15 PM JACKSONVILLE, FL	
Shipping document, manifest number, of shipper and commodity.																									
From:																								73	

Flipper

Independent Container Removal

- Improves Machinery Time Management
 - Live Lift (Ideal)
 - Next best thing
- Improved Slip Seating
 - Live in your own bed
- Speeds Up Yard Processes



Trucker

- Unaided



Flipper

- Container Release from chassis

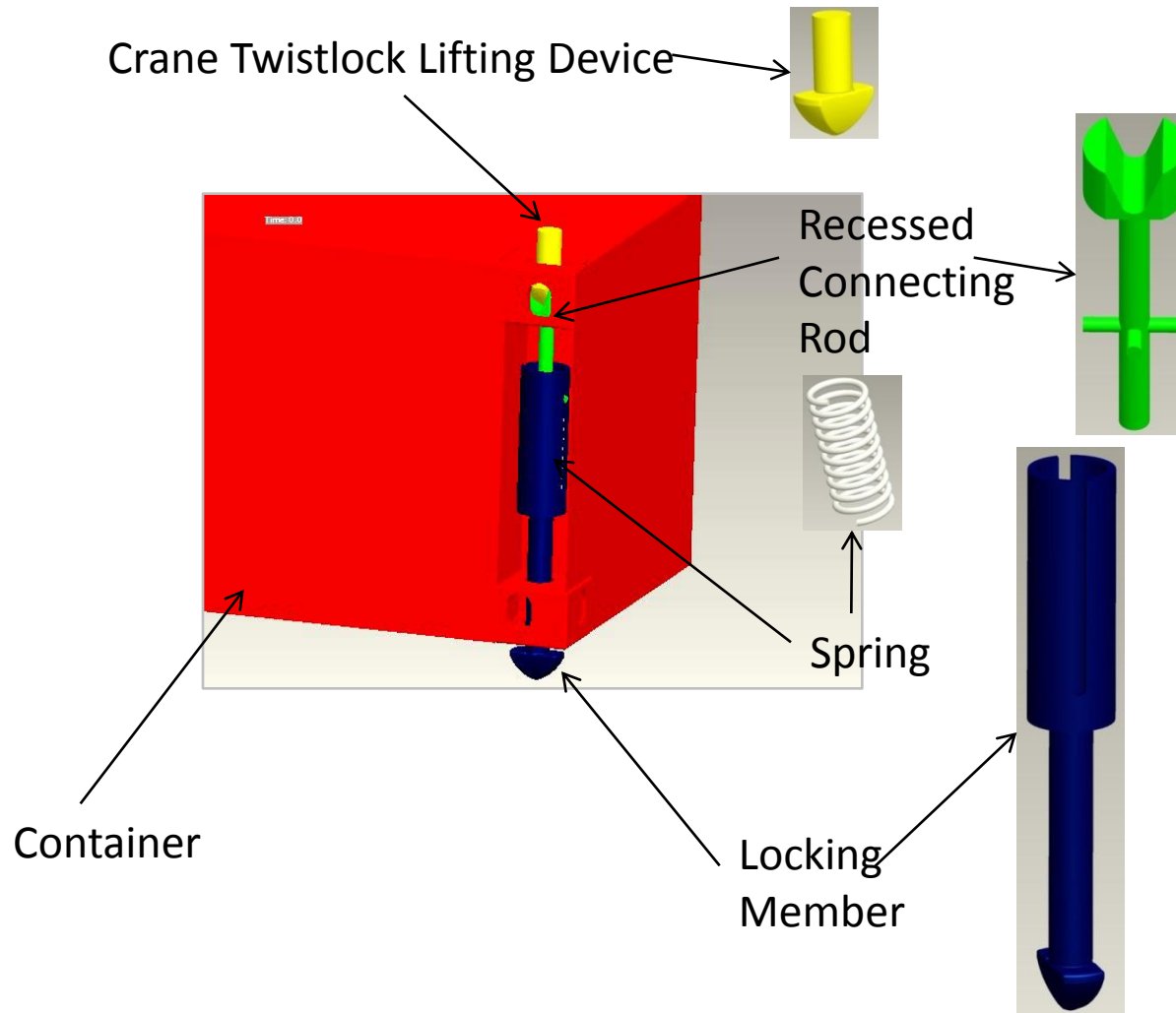


Final Transfer

- Crane
- Rail

Reduces Idle Time

IBC



- Reduced Labor Costs
- Improved Traffic Flow

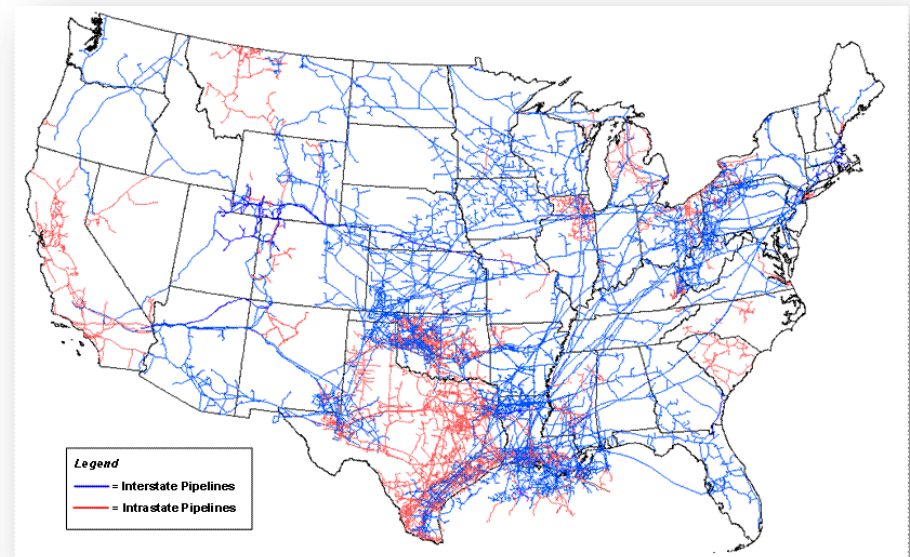
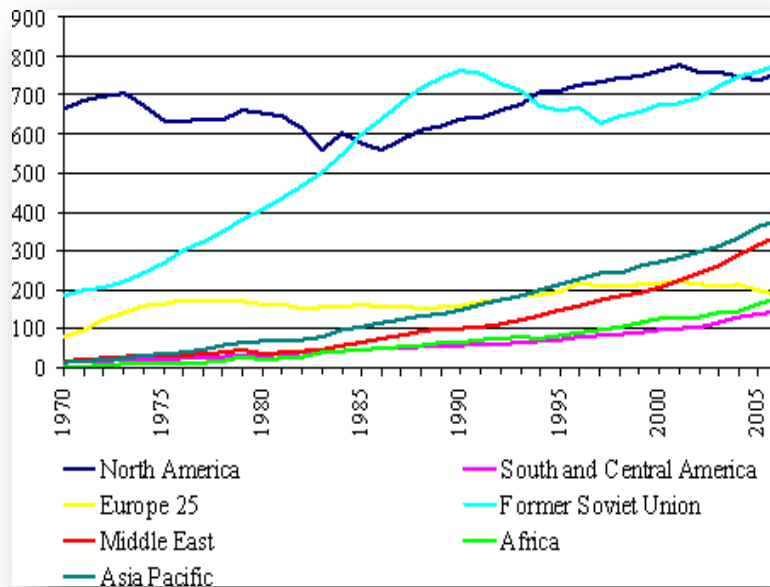
Inter-Box Connector

Natural Gas

- Environmentally Friendly
- Availability
 - Energy Independence
- Minimizes Disruption

Other Fuels:

- Diesel
- Bio Fuel



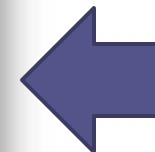
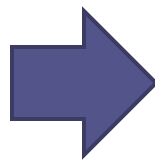
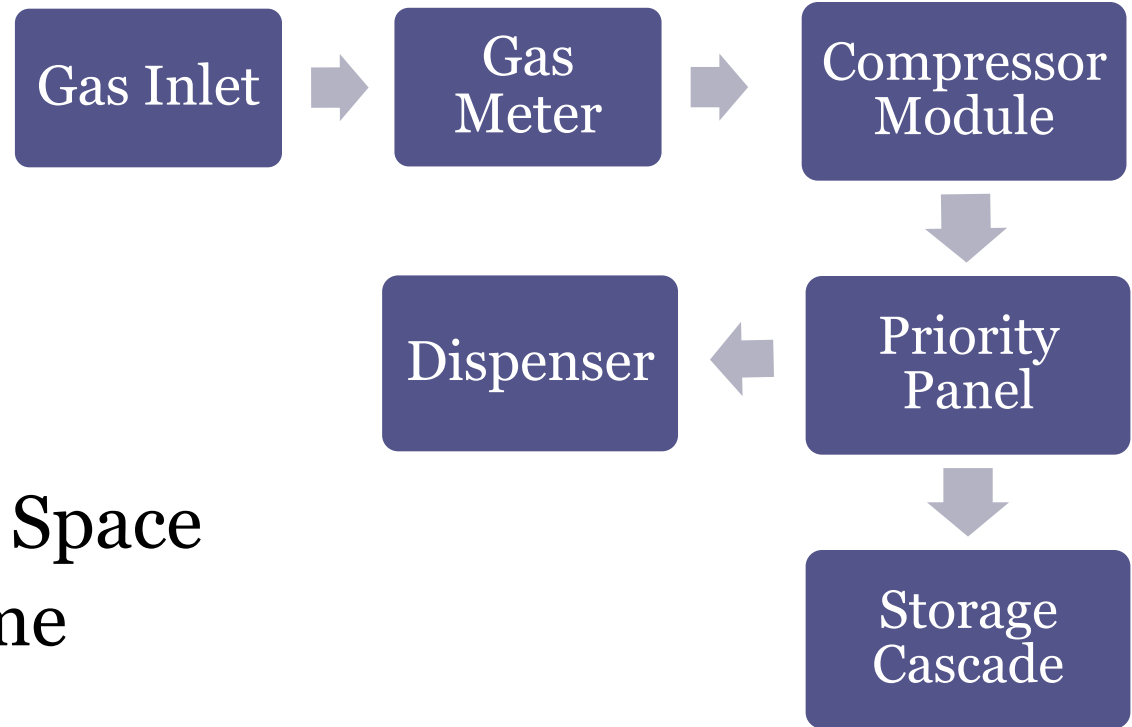
Source: Energy Information Administration, Office of Oil & Gas, Natural Gas Division, Gas Transportation Information System

CNG Station

Benefits:

- Road Tax - License
- No Interference
- Availability
- Rebates

- LNG vs. CNG
- Utilizes Parking Space
- Generates Income



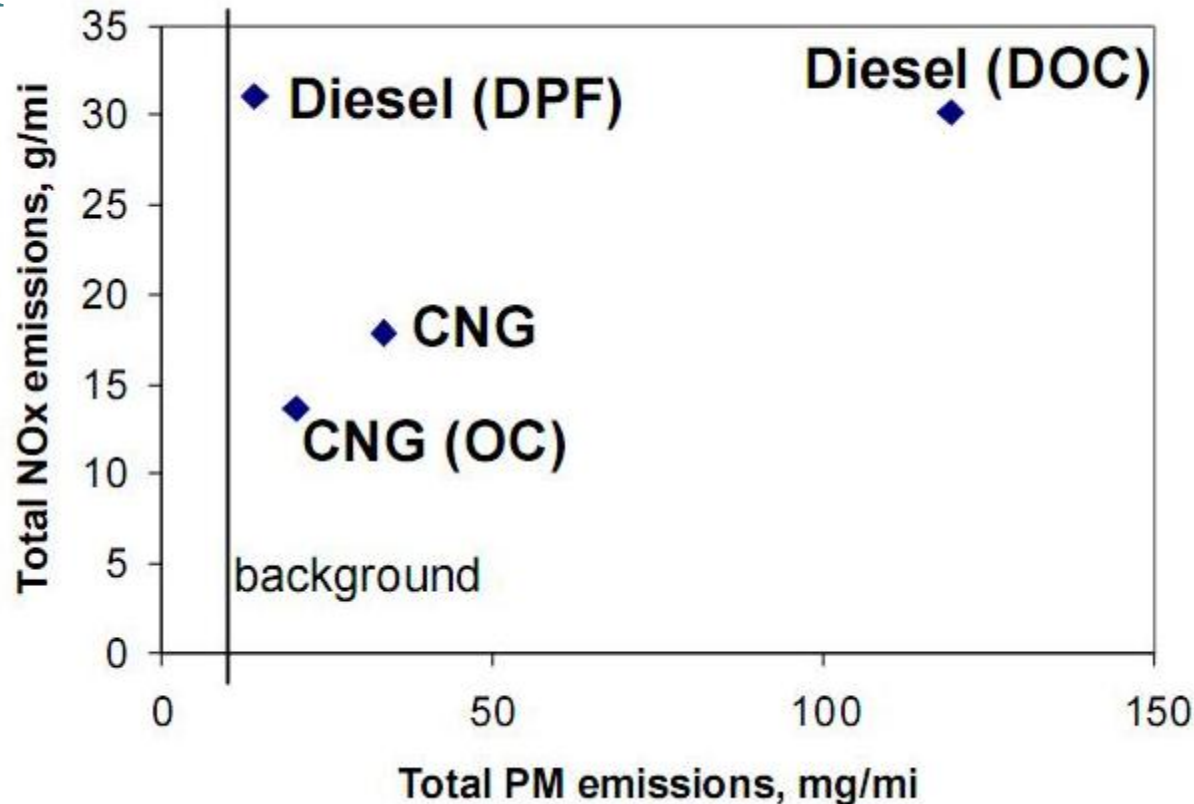
CNG Engines

RATIONALITY:

- Cost
- Cleaner emissions
- Made in the USA
- On site refueling
- Simplicity
- Future

PROCEDURE:

- Engines
- Fuel system:



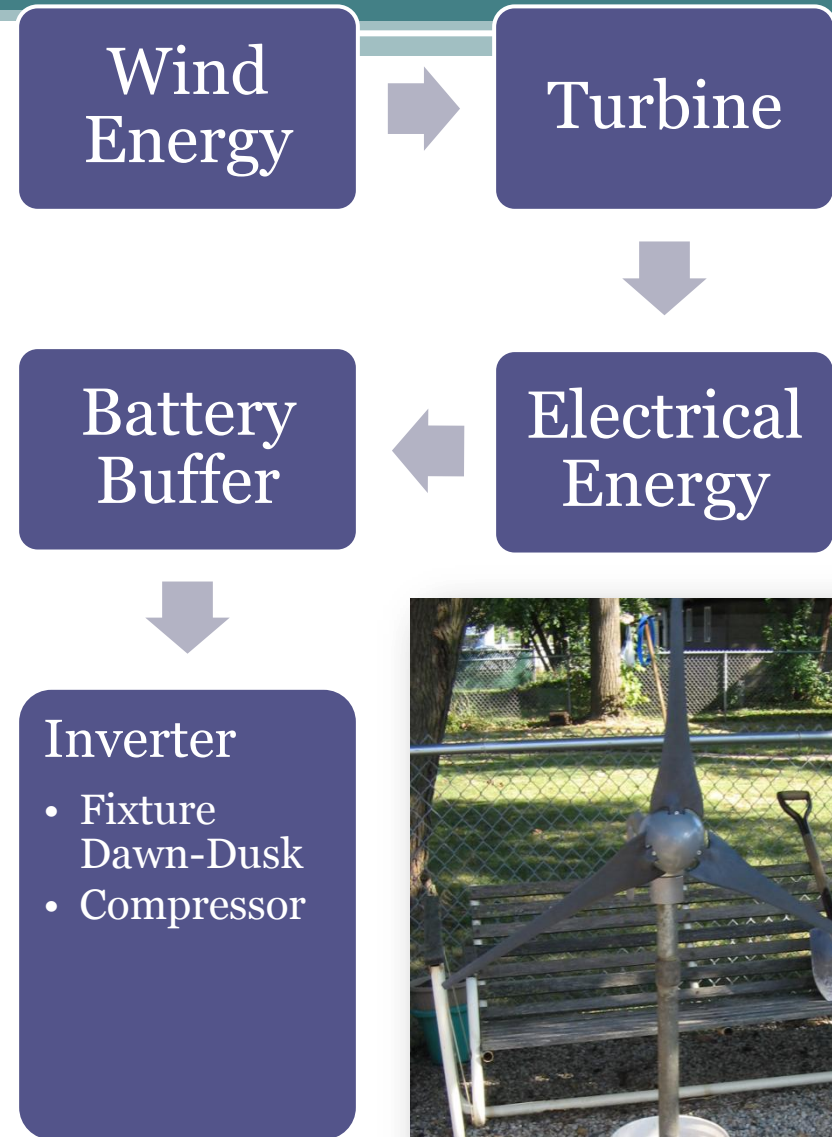
Windmill

Integration:

- Light Towers
 - Power Lights
 - 100ft

Collaboration:

- Zero Energy Lab
 - Implementation
 - Grid Interconnection
 - Wind Velocity Test



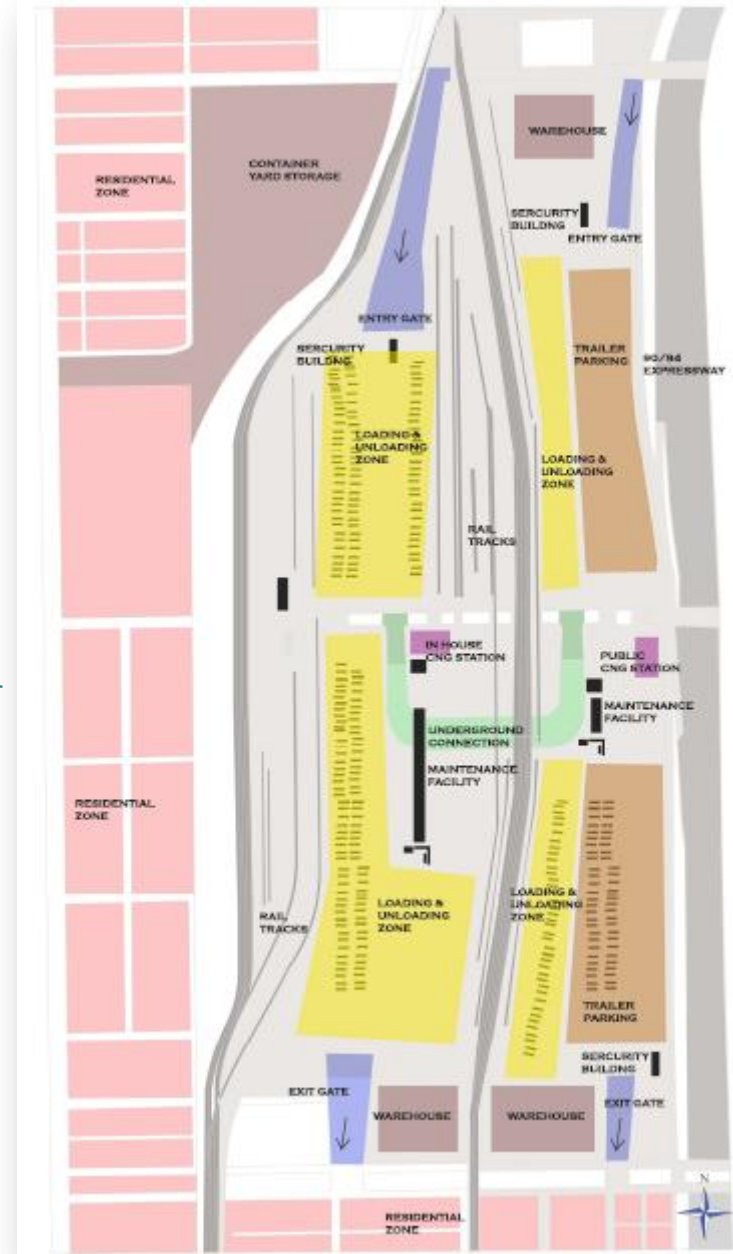
Land Capacity

- Improved Traffic Flow
 - 50% Yard Expansion
 - Added Entrance / Exit
 - 2 Proposals
- Land Limitations
 - Vertical vs. Horizontal Growth
 - Austell Facility
 - (1/2 Traffic & 2x Size)

Floored Parking:

- Not feasible
- Cost & Strength

Don't Miss Our Model



Conclusions

“Increase capacity with out increasing pollution”

Flow capacity can be increased through innovation and growth with out damaging the environment and its resources.

- Flipper, IBC, CNG Station, CNG Engines, Windmills

FUTURE WORK:

- Look into Solar Power
- Monitor Lighting Opportunities
- Develop Ideal Site Conditions

Accomplishments

- IBC Model
 - 3D in PRO-E
 - Animation
- Flipper Model
 - Physical Model
 - 3D cutting software
- Working Windmill
 - Collaboration with Zero Energy
- Over 17 Presentation
 - Peer Reviewed
- CNG Proposal
 - Station & Engine
- Land Expansion Proposal (x2)

IMPACTS:

- Environmental
 - Energy Independence
 - Pollution Particulate
- Community
 - Traffic
- Market
 - Supply & Demand
 - 10yr Projection
- Norfolk Southern
 - Land Expansion

Thanks To:

- MiJack (Sponsor)
- Norfolk Southern
- Zero Energy Lab
- Advisors:
 - Laurence Rohter, P.E.
 - Peter Mirabella
 - Professor Sid Guralnick



Fin

Questions?