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Automated Shipping Container Transfer System Design

I-PRO 307

Fall 2005

Team Members

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Project Aspect	Task Leader	Major
Team Leader	Paul Prusa	Mechanical Engineering
Thruport	Christopher Tyson	Physics
Volume Mapping	Patrick Folz	Aerospace Engineering
Website	Brian Neiswander	Mechanical Engineering
Fresh Site Evaluation	Alija Hubjer	Architecture
Brown Field Evaluation	Joshua Vogt	Mechanical Engineering
Recycled Site Evaluation	Douglas Meyer	Computer Science
Animations	Alan “Hugh” Whitmore	Architecture
Environmental Evaluation	Purvi Patel	Computer Science

Advisors

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Peter Mirabella, MiJack Products

Ariel Iris, Chicago Area Transportation Study

Gerald Rawling, Chicago Area Transportation Study

Background

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- Chicago is third largest intermodal shipping container hub in the world.
- Approximately 2000 rubber tire transfers take place in Chicago each day, burning roughly 15,000 gallons of fuel a day. These transfers congest the roads and highways, pollute the environment, and burn significant amounts of fuel.
- There are six major companies that deal with the intermodal traffic in the Chicagoland area; BNSF, UP, CN, NS, CP, and CSX.
- These companies run approximately 20 rail yards in the area.

Abstract

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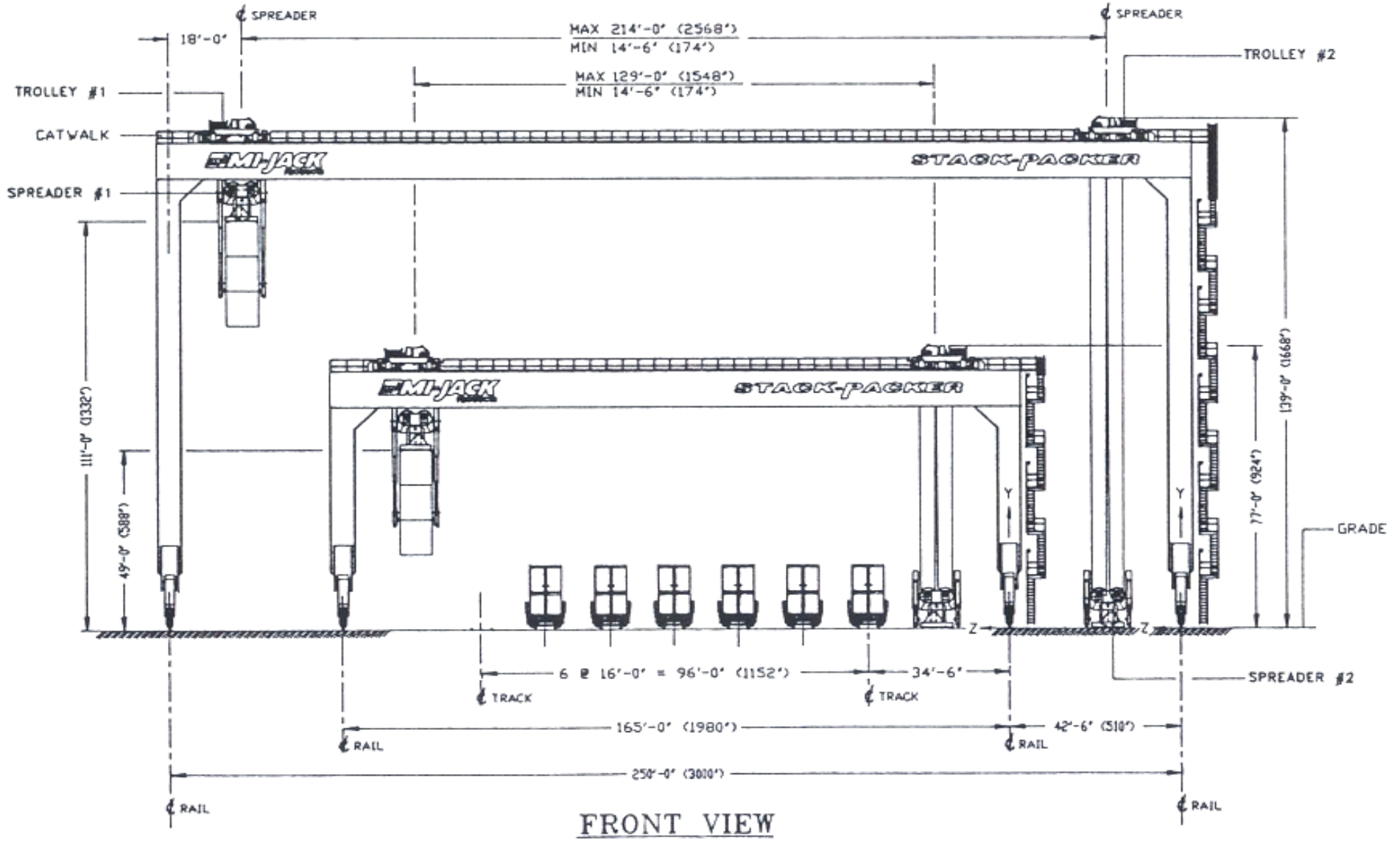
The project was separated into 8 different tasks

- Thruport- Understand and evaluate the Thruport concept and the gantry cranes
- Animations- Modify existing gantry crane animations and create a real time walk through animation
- Volume Mapping- Present volume data and rail road connections in a map
- Fresh Site Evaluation- Evaluate a previously undeveloped site for Thruport
- Brownfield Site Evaluation- Evaluate a polluted site that previously had industrial activity for Thruport
- Recycled Site Evaluation- Evaluate a site that previously operated as a rail yard for Thruport
- Environmental Evaluation- Determine environmental concerns for evaluated sites and surrounding area
- Website Development- Organize and manage the creation and maintenance of the web site

The Thruport concept is a rail yard operated by computer controlled gantry cranes for intermodal container transfer between the major rail road companies.



FRONT VIEW

Thruport

Thruport's Unique Features

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- There are three main attributes that make Thruport unique.
  - Thruport uses conventional technology that allows the cost of the hardware to remain low
  - The operating scheme relies on the cooperation of the major rail companies. The trains come to a central facility to exchange containers, like an airport hub.
  - Thruport strives on location. Thruport requires a good location to fully optimize the solution for both the costumer and the owner.


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Cost Evaluation of Thruport

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- 200 employees to run Thruport
  - 30 Materials Handling Supervisor: $52000 per employee
  - 70 Materials Handling III: $41000 per employee
  - 10 Inventory Control Manager: $78000 per employee
  - 20 Logistics Analyst IV: $82000 per employee
  - 10 Electronics Technician III: $57000 per employee
  - 20 General Maintenance: $45000 per employee
  - 10 Maintenance Supervisor: $63000 per employee
  - 10 Engineer III: $77000 per employee
  - 20 Field Service III - Rep Electro/Mechanical: $54000 per employee
- $11,000,000 annual payroll estimate
- $100,000,000 for the four cranes in Thruport
- At $100 per transfer doing 2,000 transfer per day it will take approximately two years to get a return on the investment

Volume Mapping

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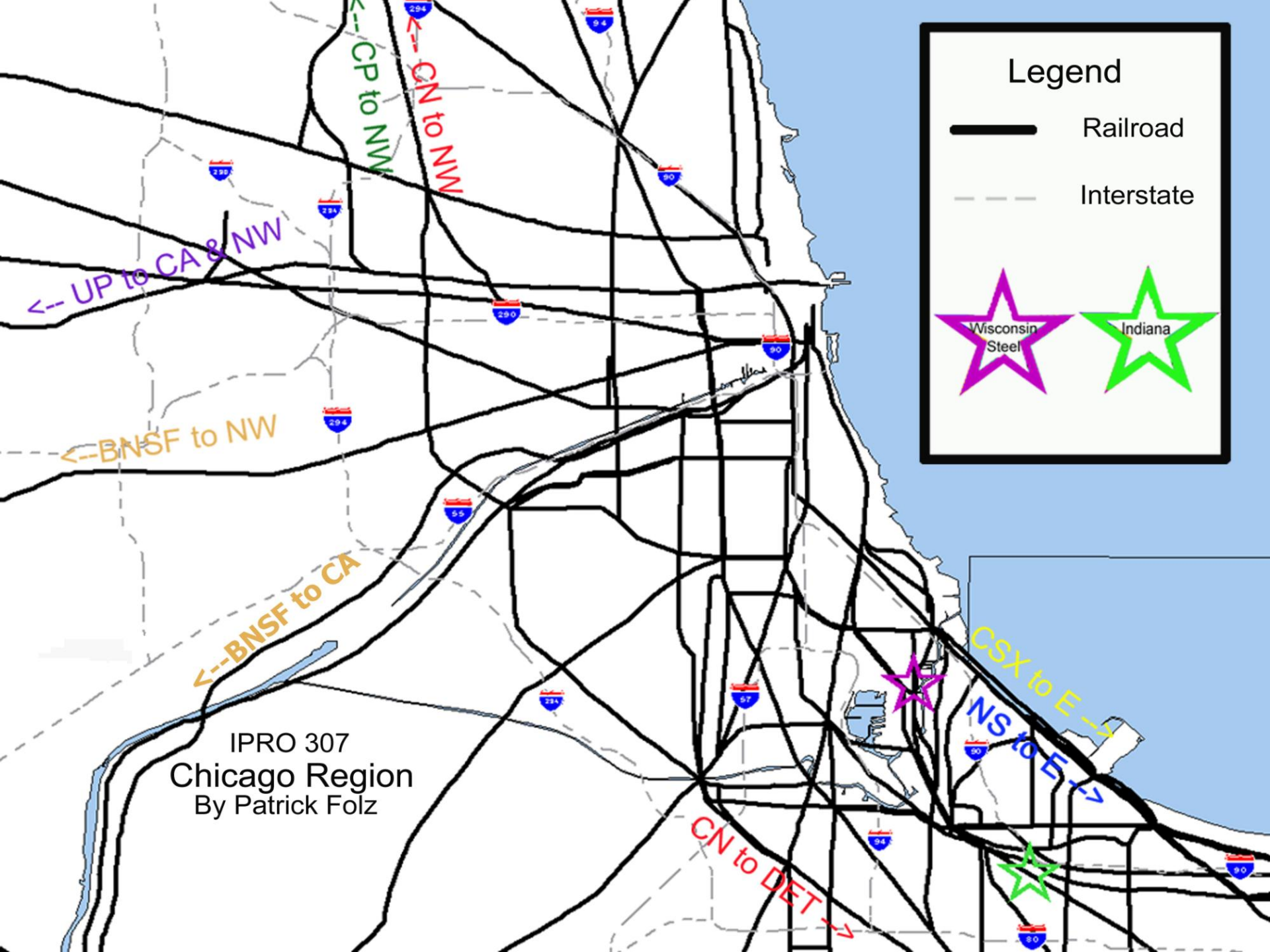
- Volume mapping is necessary in deciding the location of possible sites to know the location of high volumes of traffic.
- Volume data can be used to predict the travel routes of intermodal containers to the potential Thruport site.
- The areas zoning classifications can be easily viewed and recorded using a map.


Legend
Railroad
Interstate
Wisconsin Steel
Indiana
<-- CP to NW
<-- CN to NW
<-- UP to CA & NW
<--BNSF to NW
<--BNSF to CA
CSX to E -->
NS to E -->
CN to DET -->
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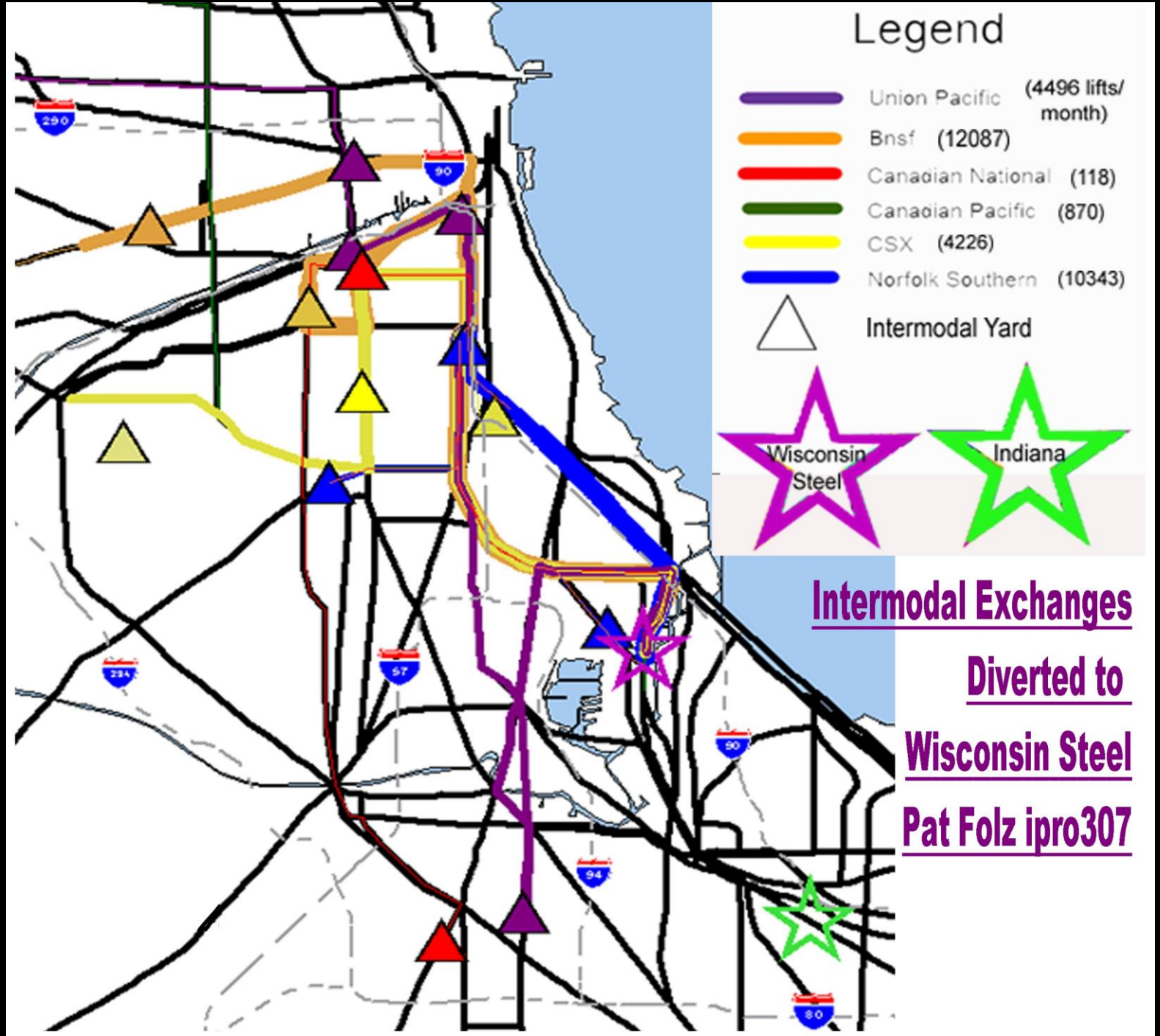
Chicago Region
By Patrick Folz



Intermodal Exchanges Diverted to Wisconsin Steel

Pat Folz ipro307

South Chicago Zoning

Pat Folz ipro307

Fresh Site

A fresh site is a site that previously was undeveloped.

Advantages

- The site requires no clean up or major rehabilitation
- Zoning is often not an issue because undeveloped land is located in rural areas
- Land cost are relatively cheap in comparison to city property
- Large land area is available

Disadvantages

- Long travel distances from intermodal hubs
- High costs to make the site accessible to all the major lines
- High cost to bring utilities to the site

Rochelle Site (fresh site)

Thruport concept

Rochelle UP Rail Yard

Site Dimensions: Length: 2 mile Width: ½ -1 mile
Area Zoning: None
Rail Access: Located on Union Pacific main line

Brownfield Site

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A brownfield site is a polluted site that was previously an industrial site.

Advantages

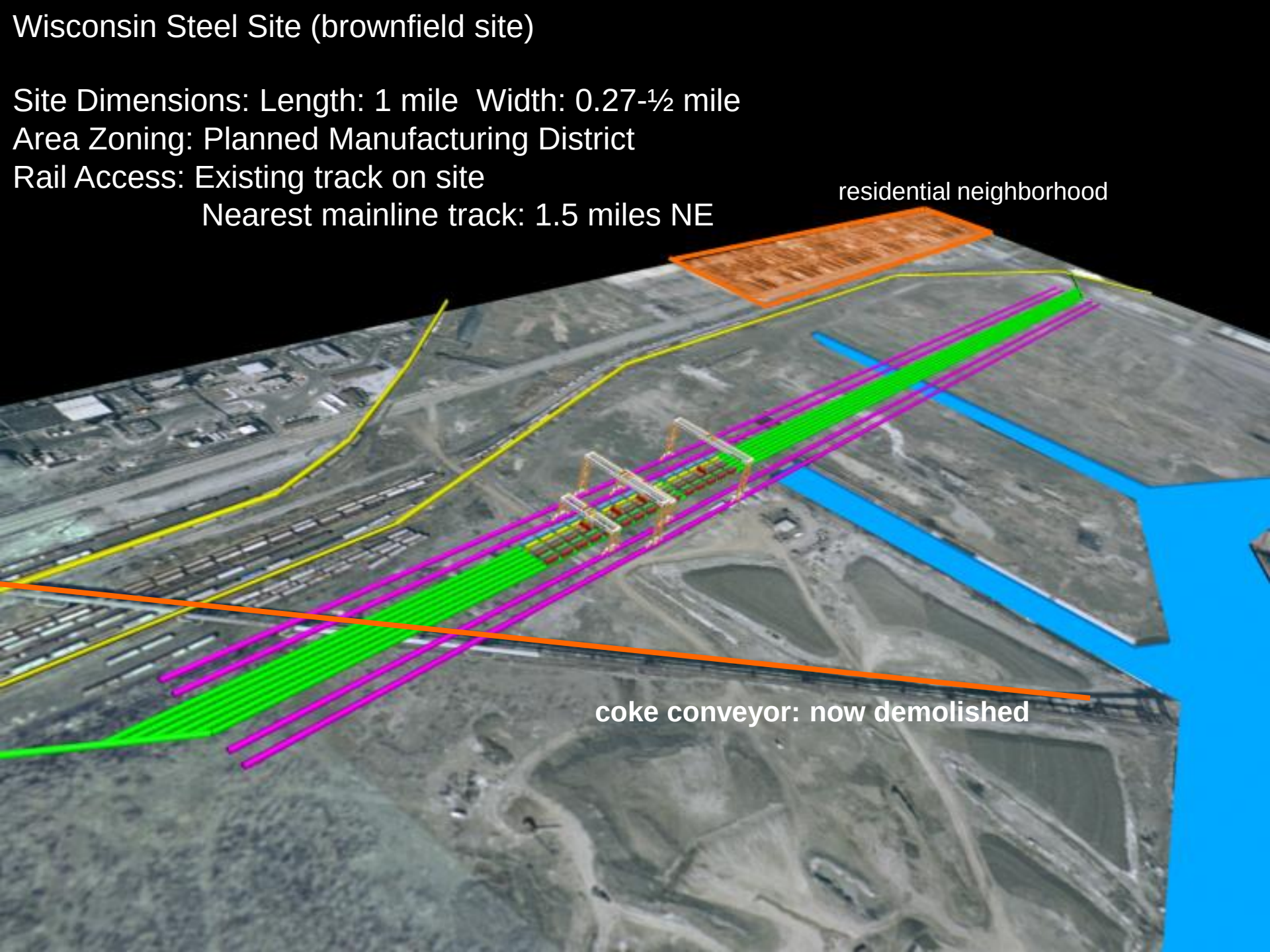
- Accessible from main rail lines
- New developers of the site will not incur the cost of recycling the site
- Accessible to utilities

Disadvantages

- Possible zoning issues
- Long time to make the site clean and usable
- High land cost for city property
- Large amounts of land capable of containing Thruport may be unavailable

Wisconsin Steel Site (brownfield site)

Site Dimensions: Length: 1 mile Width: 0.27-½ mile
Area Zoning: Planned Manufacturing District
Rail Access: Existing track on site
Nearest mainline track: 1.5 miles NE



Recycled Site

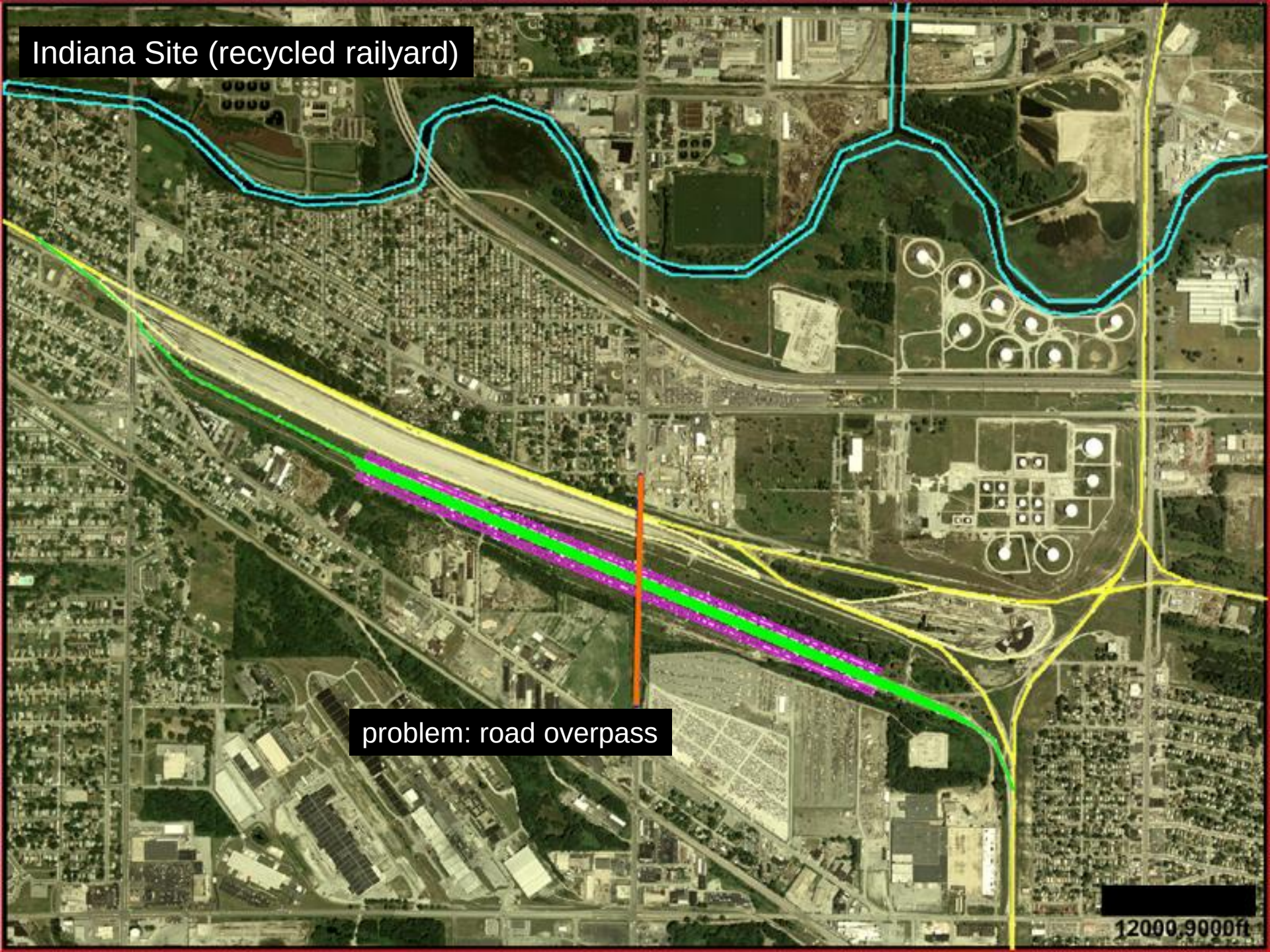
A recycled site is a site that was previously a rail yard.

Advantages

- Accessible from main rail lines
- No zoning issues
- Large land dimensions for Thruport
- Accessible to utilities

Disadvantages

- High land cost for city property
- Mild cost to rebuild site


Indiana Site (recycled railyard)
problem: road overpass
12000,9000ft

Environmental

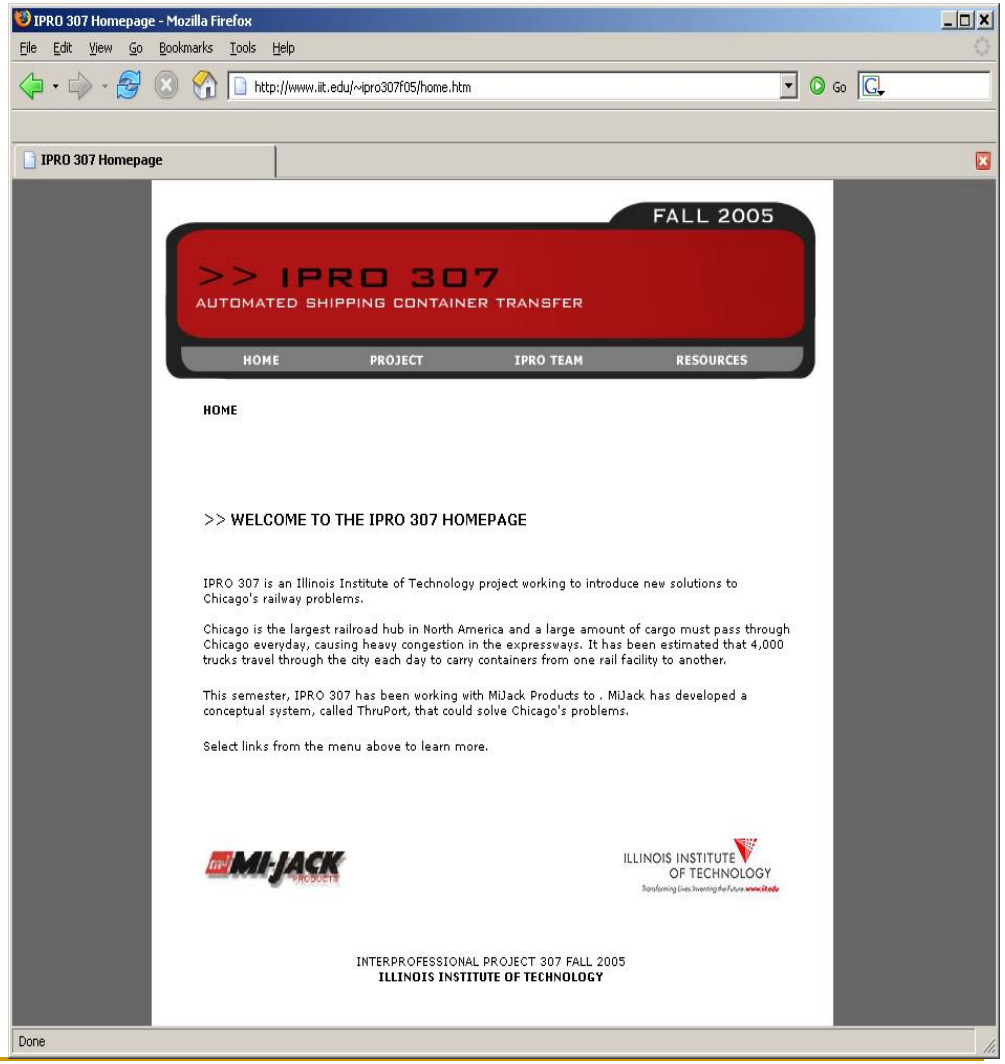
- The environmental concerns that were considered important in evaluating a site for the Thruport concept are as follows;
  - Noise
  - Wetland location
  - Air quality
  - Height restrictions
- These are not as restrictive where the land has already been zoned for industrial or rail road use

Three Site Evaluation

Title	Description	Locations		
		Rochelle (Fresh)	Gibson (Recycled)	Wis. Steel (Brownfield)
Land	**Cost of actual land**	**$$**	**$$**	**$**
Rail Access	**Cost to bring rail from a main service line to site; repairing or upgrading existing rail to site**	**$$$**	**$**	**$**
Site Preparation	**Cost for any site cleanup, existing structures demolition, dirt work**	**$**	**$$**	**$$**
Utilities	**Cost to bring utilities such as water and electricity to the site**	**$$**	**$$**	**$$**
Total		**8x$**	**7x$**	**6x$**

Project Website

- **Simple menu system for easy navigation**
- **No frames, white background, small text**
- **Consistent color scheme**
- **Flash animation intro**



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Website Flow Chart

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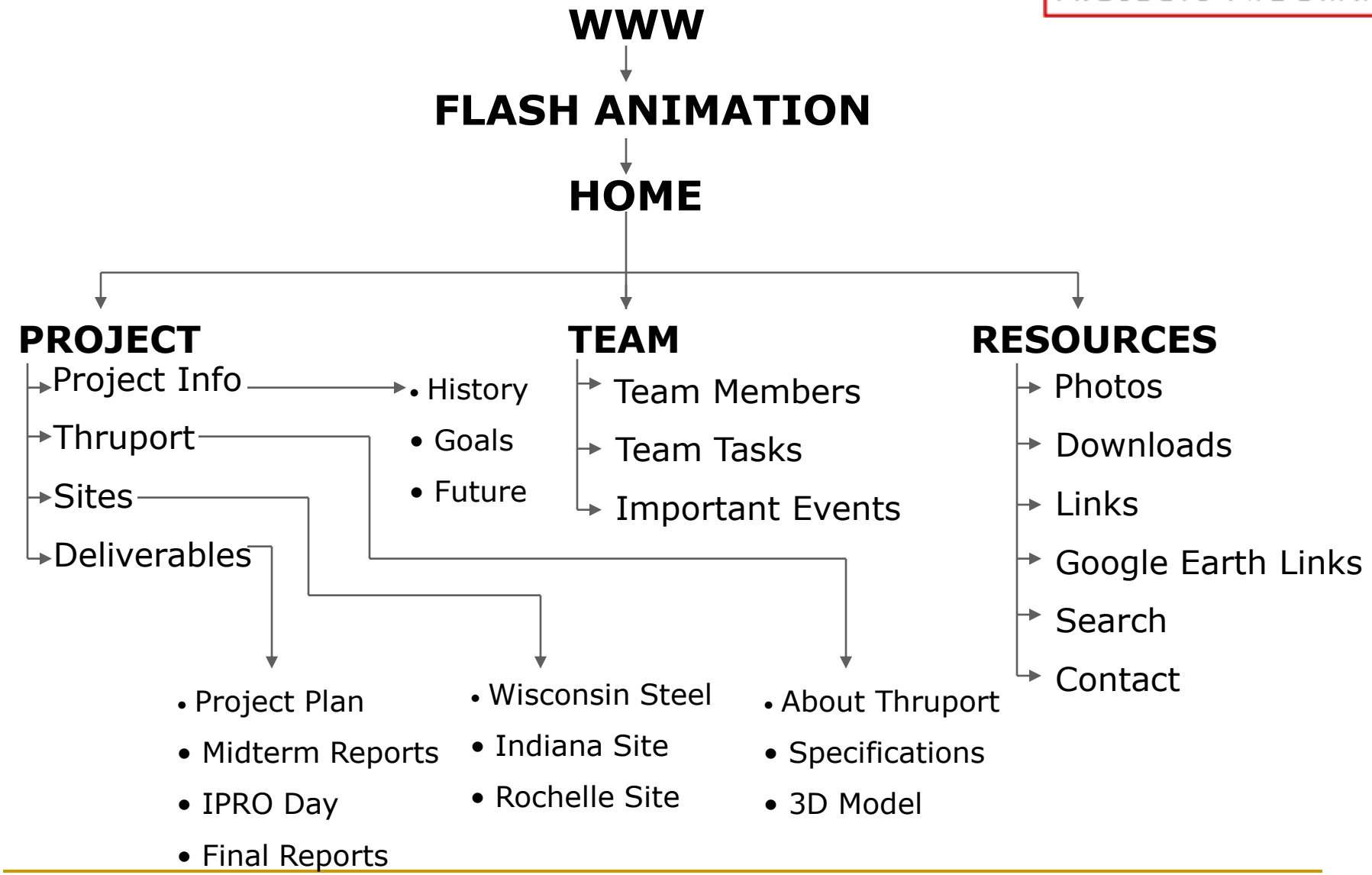

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Next Semester's Plan

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- Create a more in depth site comparison criteria
- Find land cost for site comparison
- Do further evaluation of the recycled site in Indiana
- Do an expandability evaluation of rail yards for Thruport
- National operating and refined regional plan

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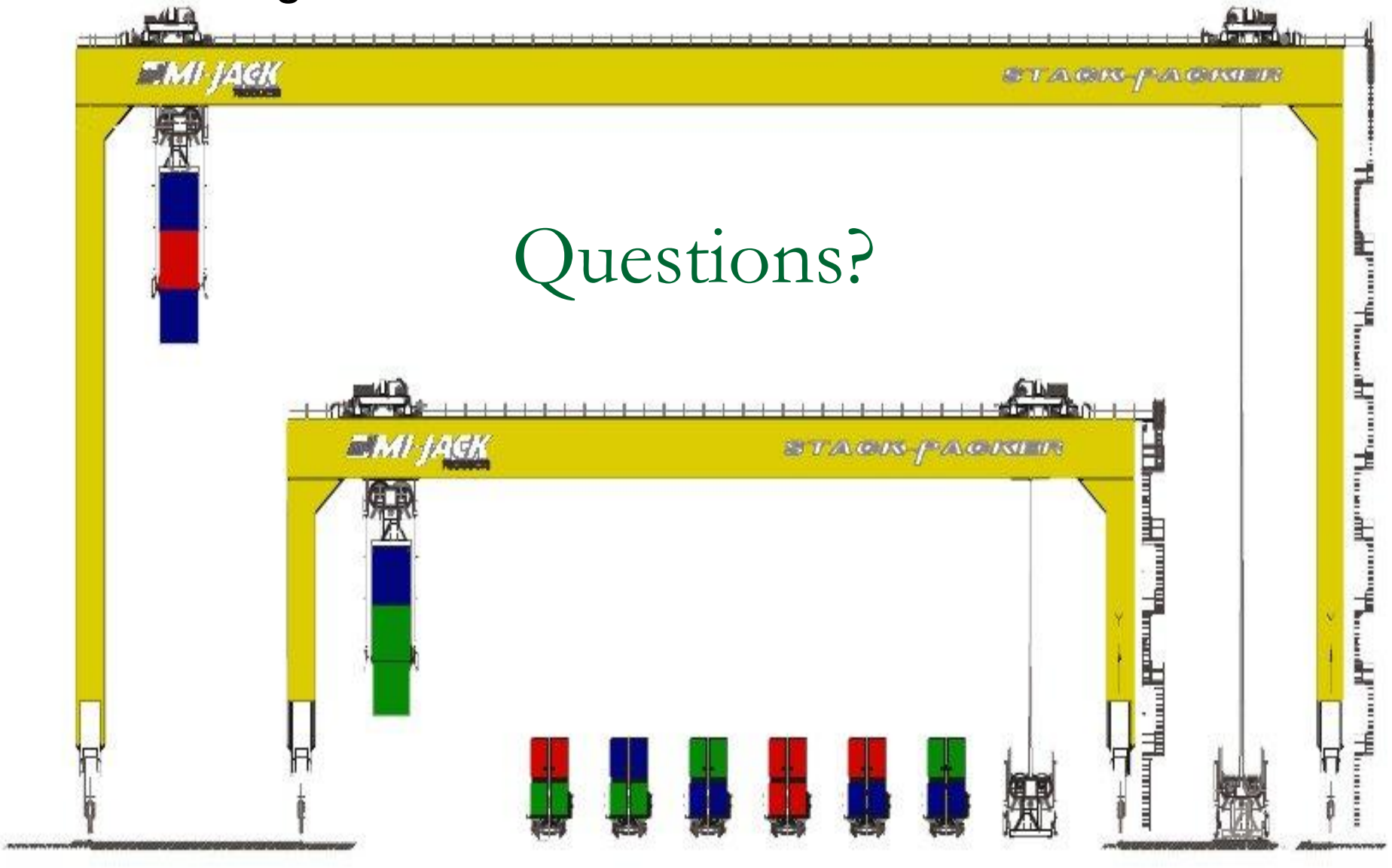

Questions?