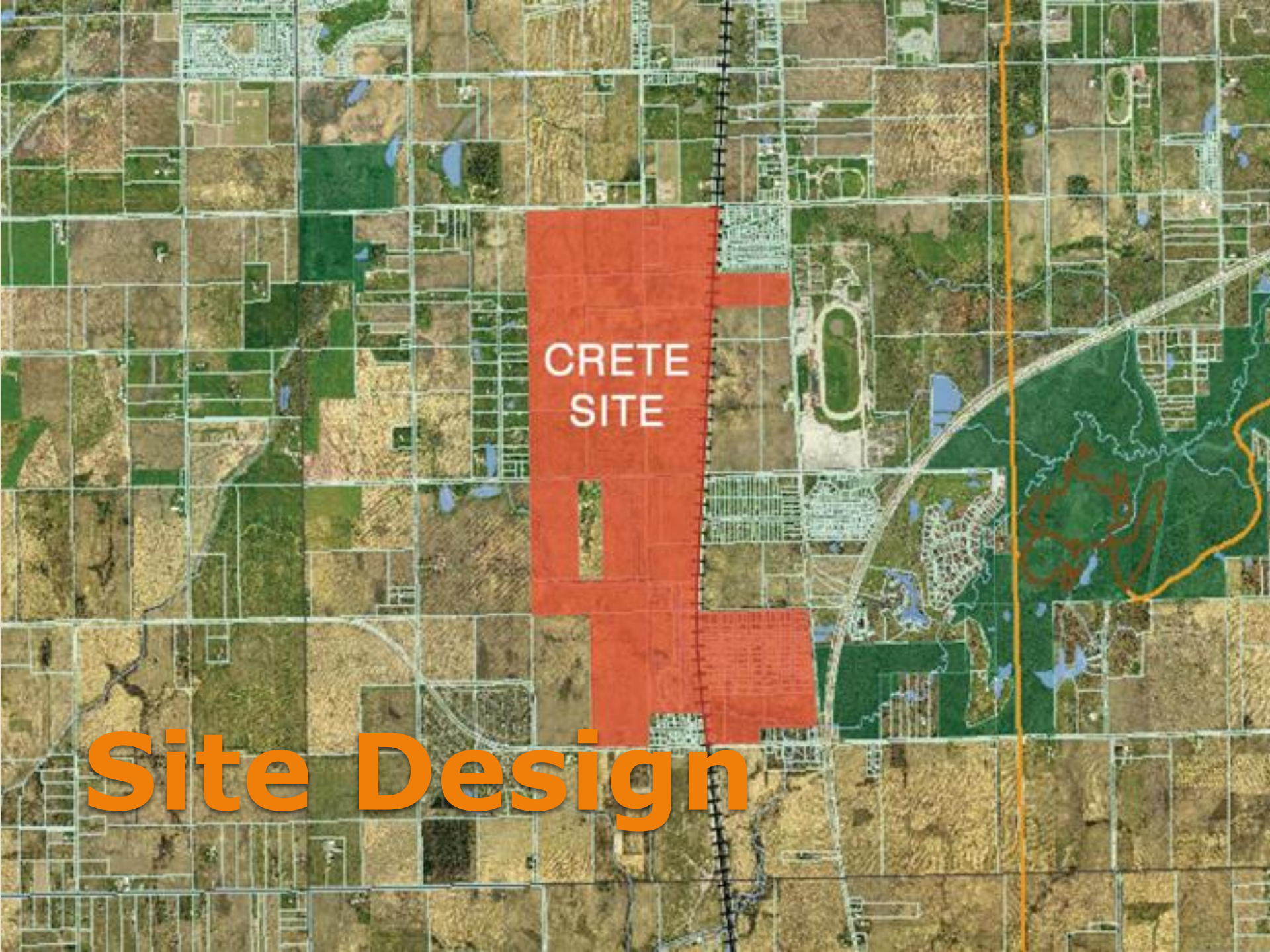
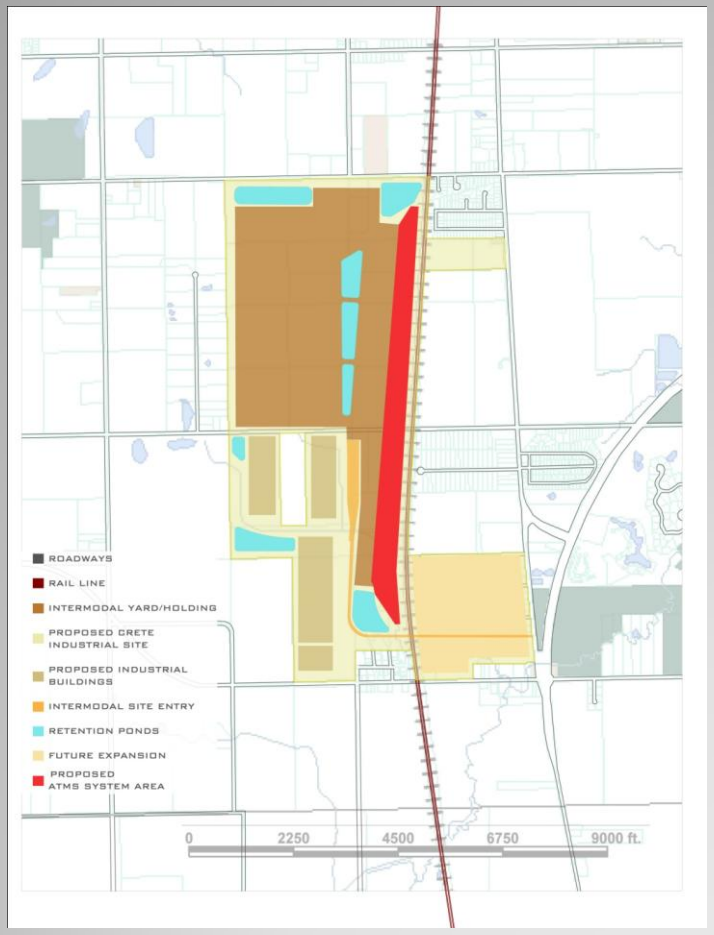
# IPRO 307

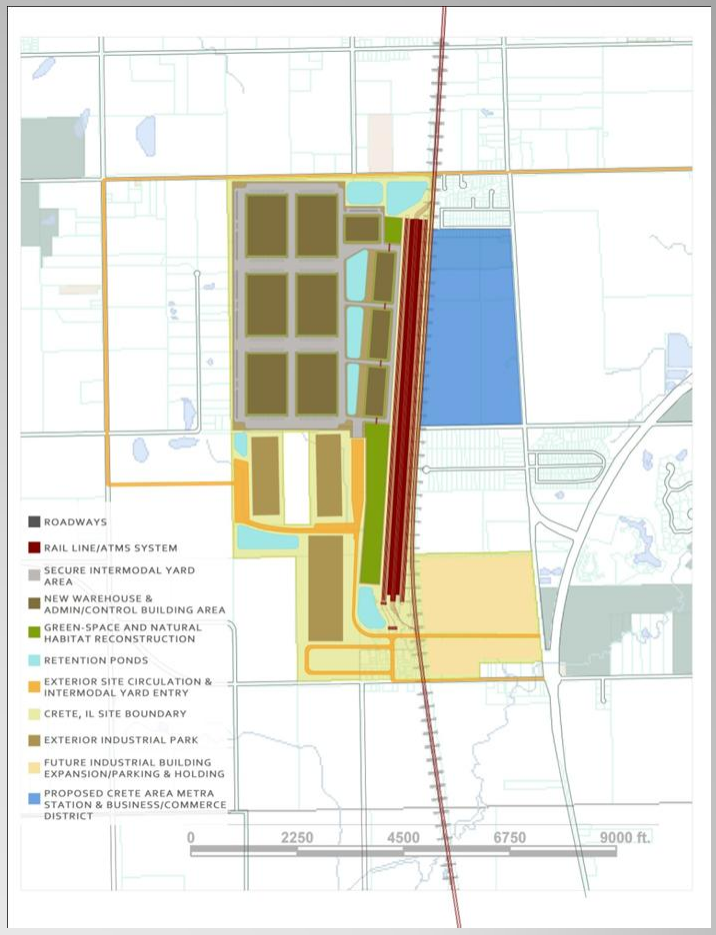
Presented by:
Aaron Pollack Jessica Roth
and Izydor Radzik

Advisor: Prof. Lawrence Rohter




# Site Design



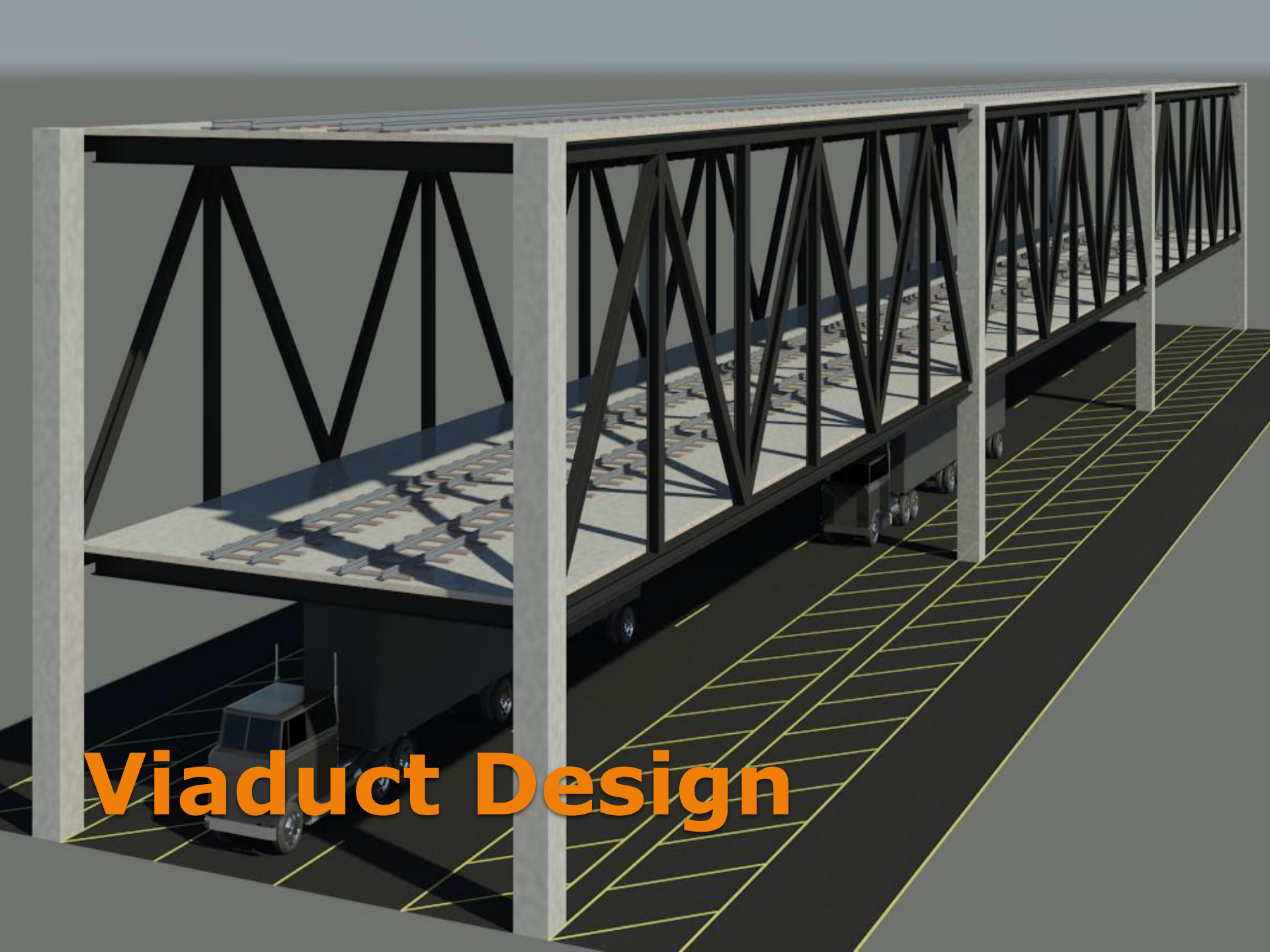




# Initial Layout VS Final Design

| CRETE SITE CHARACTERISTIC COMPARISONS | Old Site Design | New Site Design |
|---|---|---|
| Site Size in Acres | 1000 Acres | 1000 Acres |
| Site Size in Million SqFt | 43.5 Million SqFt | 43.5 Million SqFt |
| Intermodal Area in Acres | 300 Acres | 86.8 Acres |
| Intermodal Area in Million SqFt | 13 Million SqFt | 3.75 Million SqFt |
| Total Building in Acres | 137.75 Acres | 220.5 Acres |
| Total Building in Million SqFt | 6 Million SqFt | 9.6 Million SqFt |
| Acres of Intermodal to one Acre of Building | 2.17 Acres per building Acre | .39 Acres per building Acre |

Notes:
The capacity of the intermodal area (in lifts per day) stays the same in both designs
The orginal designs has no  room for future alterations
The original design had no room for trucks on site to alleviate traffic issues
The ratio of intermodal to building acres was made 5.5 times better

# Comparisons & Improvements


Viaduct Design

| | |
|---|---|
| Decks | $ 6,000,000.00 |
| Beams | $ 5,000,000.00 |
| Columns | $ 600,000.00 |
| Contractor fees | 28% |
| Architectural fees | 10% |
| Misc. | 15% |
| Total per mile: | $ 17,500,000 |

# Viaduct Cost Per Mile

- Prevent strain on current highway capacity.
- Uses limited amount of land.
- Ease of transport for complete intermodal process.

# Benefits

- Current codes for bridge design of high-speed trains haven’t been written yet.
- No discernable difference in forces between passenger and freight at high speeds.

# Difficulties Encountered

- Davis Equation
- $f = ma$
- $a = \frac{d}{t^2}$
- $\mathrm{v} = \frac{d}{t}$
- $nP = Fv$
- $n = \frac{d^2\, m}{t^2 p}$

# High Speed Rail

- Using the Acela high speed train
  - Used on the North-East Coast
  - Each car has 6000 hp
    - $n = \frac{d^2 m}{t^2 p}$
    - d = 110 miles
    - m = 12088237kg
    - t = 3600s
    - p = 6,000HP = 4,474,200W
    - n = 1.8 cars at no friction
    - n = 4 cars after .35 - .5 coefficient of friction

# Equations

## Chicago • St. Louis

| Train Name ▸ | | | Lincoln Service | Lincoln Service | Texas Eagle | Lincoln Service | Lincoln Service |
|---|---|---|---|---|---|---|---|
| Train Number ▸ | | | 301 | 303 | 21 64 | 305 | 307 |
| Normal Days of Operation ▸ | | | Daily | Daily | Daily | Daily | Daily |
| On Board Service ▸ | | | R B | R B | R B | R B | R B |
| | Mile | ▼ | | | | | |
| Chicago, IL (CT) Rockford, Madison—see back | 0 | Dp | 7 00A | 8 25A | 1 45P | 5 15P | 7 05P |
| Summit, IL | 12 | | 7 10A | 8 35A | 1 55P | 5 25P | 7 15P |
| Joliet, IL | 37 | | 7 30A | 9 55A | 2 15P | 5 45P | 7 35P |
| Dwight, IL | 74 | | 7 55A | 9 20A | 2 40P | 6 10P | 8 00P |
| Pontiac, IL | 92 | | 8 10A | 9 35A | 2 55P | 6 25P | 8 15P |
| Bloomington–Normal, IL Davenport, Indianapolis—see back | 124 | | 8 35A | 10 00A | 3 20P | 6 50P | 8 40P |
| Lincoln, IL | 156 | | 9 00A | 10 25A | 3 45P | 7 15P | 9 05P |
| Springfield, IL | 185 | | 9 20A | 10 45A | 4 05P | 7 35P | 9 25P |
| Carlinville, IL | 224 | | 9 45A | 11 10A | 4 30P | 8 00P | 9 50P |
| Alton, IL | 257 | | 10 10A | 11 35A | 4 55P | 8 25P | 10 15P |
| St. Louis, MO–Gateway Station | 284 | Ar | 10 25A | 11 50A | 5 10P | 8 45P | 10 30P |

## St. Louis • Chicago

| Train Name ▸ | | | Lincoln Service | Texas Eagle | Lincoln Service | Lincoln Service | Lincoln Service |
|---|---|---|---|---|---|---|---|
| Train Number ▸ | | | 300 | 22 64 | 302 | 304 | 306 |
| Normal Days of Operation ▸ | | | Daily | Daily | Daily | Daily | Daily |
| On Board Service ▸ | | | R B | R B | R B | R B | R B |
| | Mile | ▼ | | | | | |
| St. Louis, MO–Gateway Station | 0 | Dp | 6 40A | 8 00A | 10 35A | 3 05P | 6 05P |
| Alton, IL | 27 | | 7 00A | 8 20A | 10 55A | 3 25P | 6 25P |
| Carlinville, IL | 60 | | 7 25A | 8 45A | 11 20A | 3 55P | 6 55P |
| Springfield, IL | 99 | | 7 50A | 9 10A | 11 45A | 4 15P | 7 15P |
| Lincoln, IL | 128 | | 8 10A | 9 30A | 12 05P | 4 35P | 7 35P |
| Bloomington–Normal, IL Davenport, Indianapolis—see back | 160 | | 8 35A | 9 55A | 12 30P | 5 00P | 8 00P |
| Pontiac, IL | 192 | | 9 00A | 10 20A | 12 55P | 5 25P | 8 25P |
| Dwight, IL | 210 | | 9 15A | 10 35A | 1 10P | 5 40P | 8 40P |
| Joliet, IL | 247 | | 9 40A | 11 00A | 1 35P | 6 05P | 9 05P |
| Summit, IL | 272 | | 10 00A | 11 20A | 1 55P | 6 25P | 9 25P |
| Chicago, IL (CT) Rockford, Madison—see back | 284 | Ar | 10 05A | 11 25A | 2 00P | 6 30P | 9 30P |

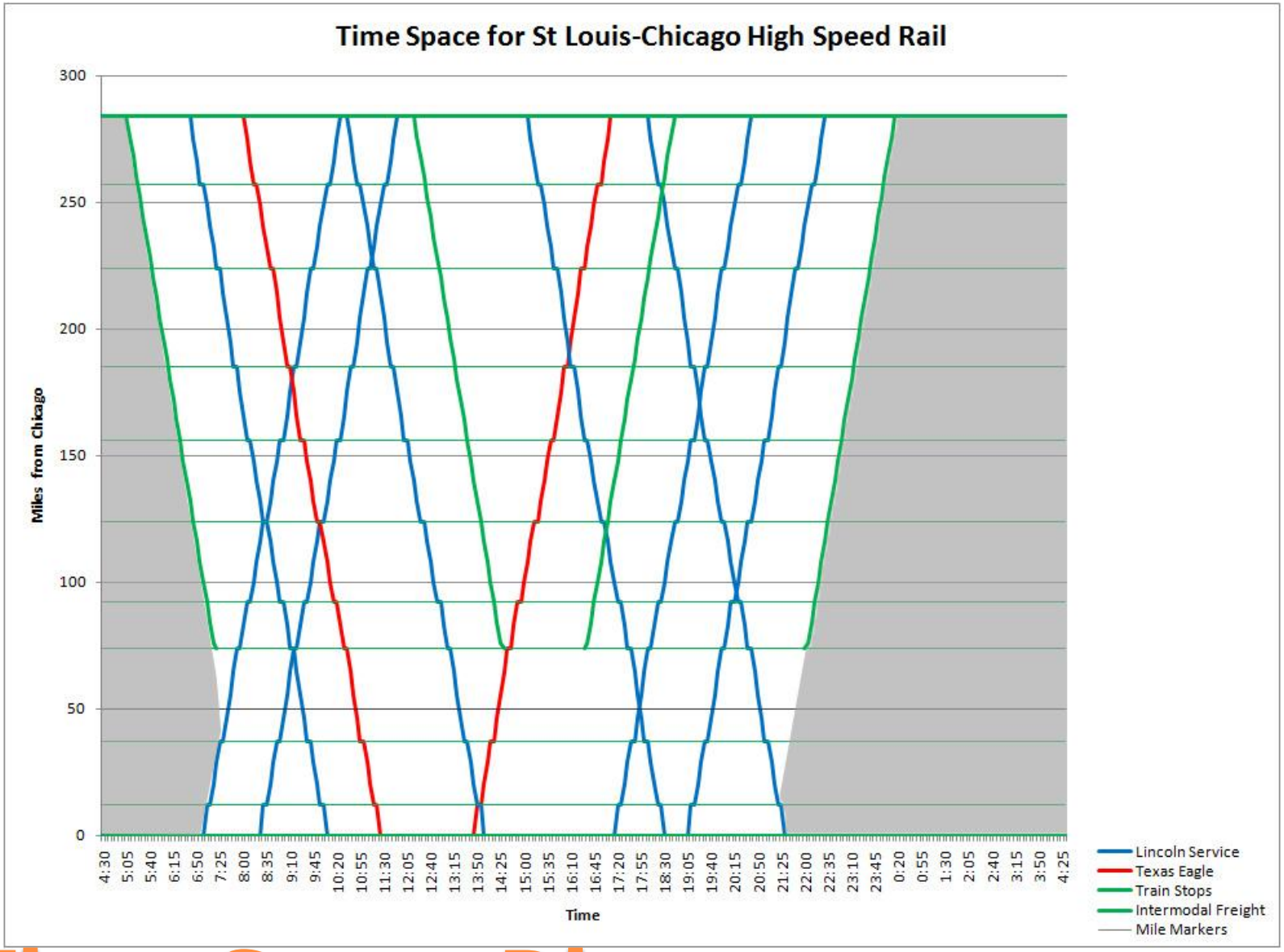
## St. Louis • Dwight

| Train Number ▸ | | | 308 | 310 |
|---|---|---|---|---|
| Normal Days of Operation ▸ | | | Daily | Daily |
| | Mile | ▼ | | |
| St. Louis, MO–Gateway Station | 0 | Dp | 5 05A | 12 15P |
| Dwight, IL | 210 | Ar | 7 20A | 2 30P |

## Dwight • St. Louis

| Train Number ▸ | | | 309 | 311 |
|---|---|---|---|---|
| Normal Days of Operation ▸ | | | Daily | Daily |
| | Mile | ▼ | | |
| Dwight, IL | 0 | Dp | 4 30P | 10 00P |
| St. Louis, MO–Gateway Station | 210 | Ar | 6 45P | 12 10A |

# High Speed Train Schedule




# Time-Space Diagram

# Questions?
# Comments?