

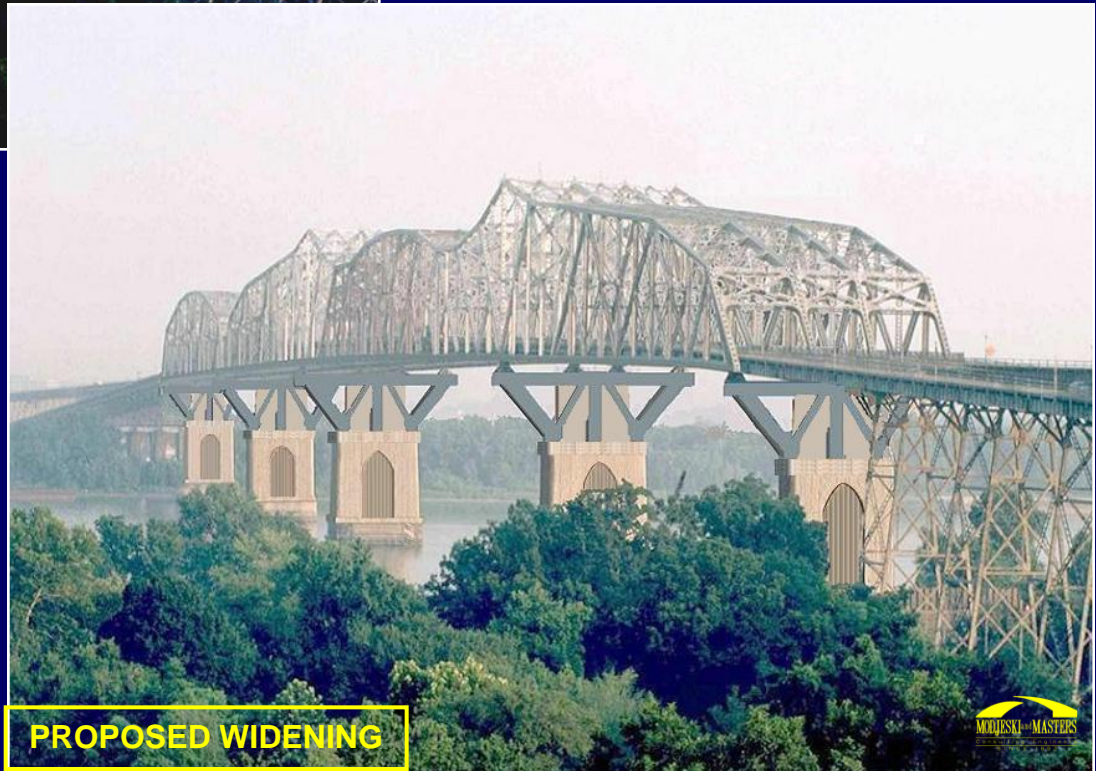
# Widening of the Huey P. Long Bridge



EXISTING



## 2008 LTRC Seminar Series – Bridge Structures



PROPOSED WIDENING



# Introduction

- Background
- Final Design Features
  - Main Bridge – Substructure
  - Main Bridge – Superstructure
  - Truss Widening
  - Railroad Modifications
  - Approaches and Main Bridge Deck Widening
- Project Status
  - Project Timeline
  - Construction Photographs
  - Design Work Completed – Letting Pending



# Location



# Before the Bridge

Southern Pacific Barge crossing Mississippi River, largest barge in the world.



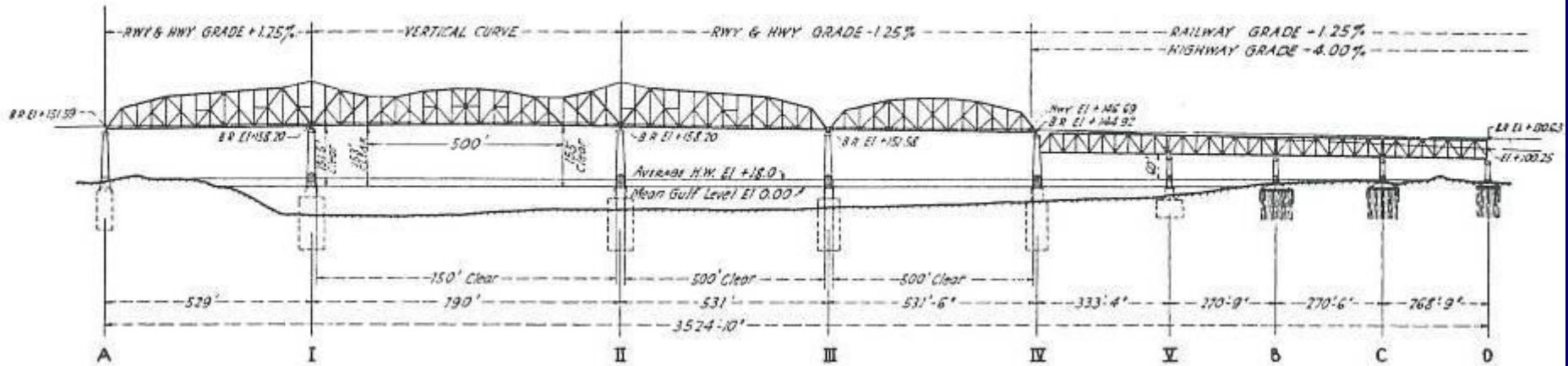
THE "MASTODON" SOUTHERN PACIFIC RAILWAY BARGE. THE LARGEST OF ITS CLASS IN THE WORLD.



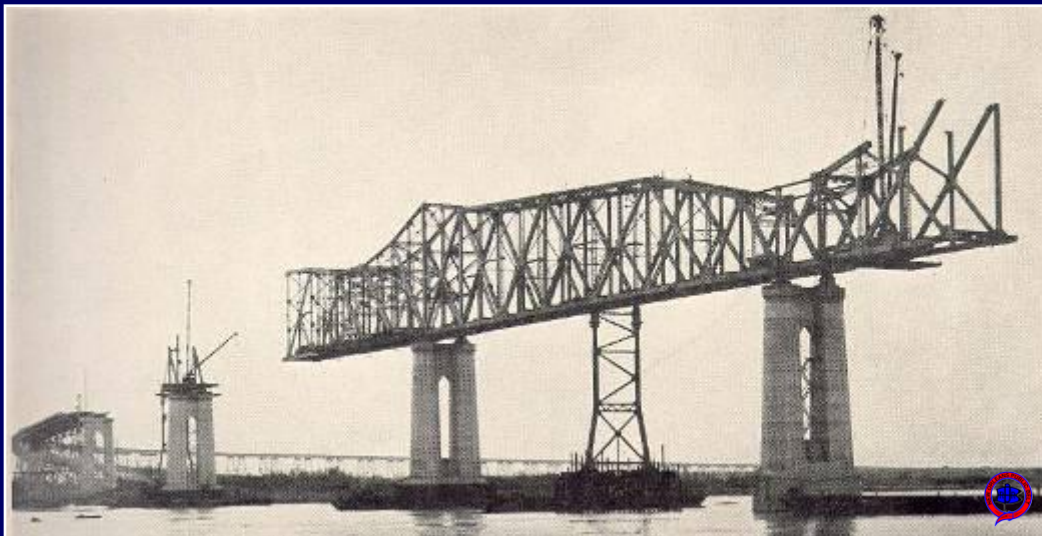
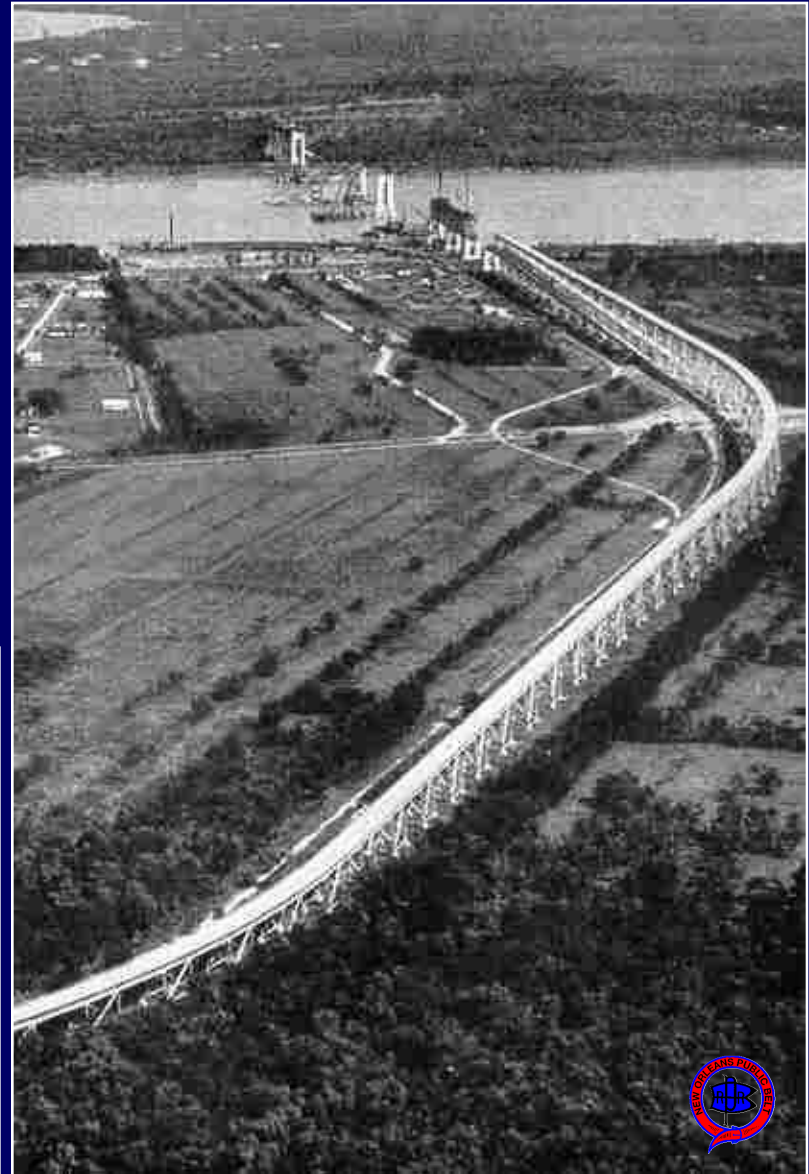
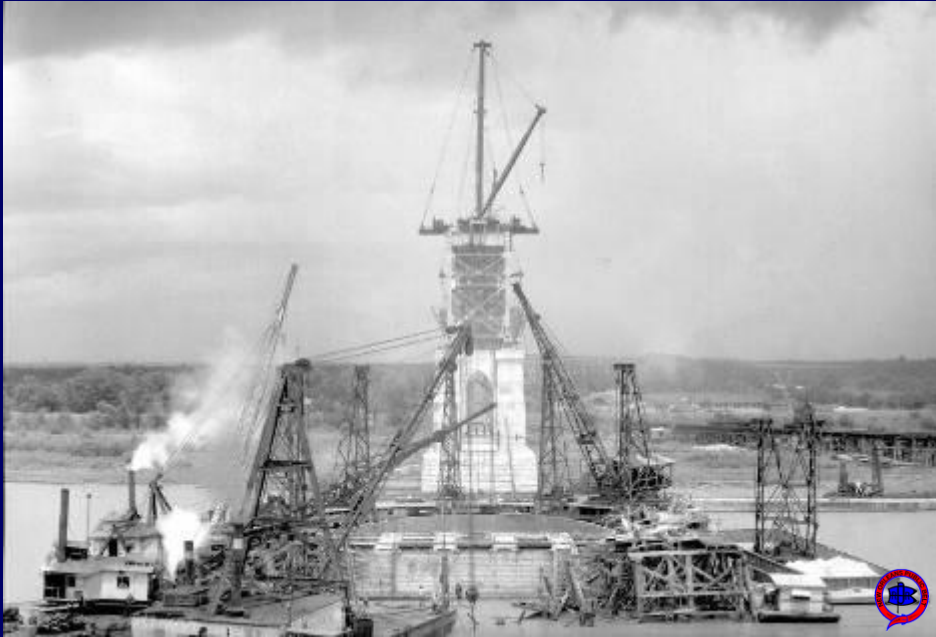
CROSSING MISSISSIPPI RIVER AT AVONDALE, TEN MILES ABOVE NEW ORLEANS, LA.



# Construction of The Existing Bridge



# Construction of The Existing Bridge



# Background – Huey P. Long Bridge

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- Combined railroad – highway bridge
  - 2 tracks
  - 4 lanes – 9 ft. width



# Background – Huey P. Long Bridge

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- Very heavily built
- Carries largest modern RR load without distress
- Many years of service life remaining

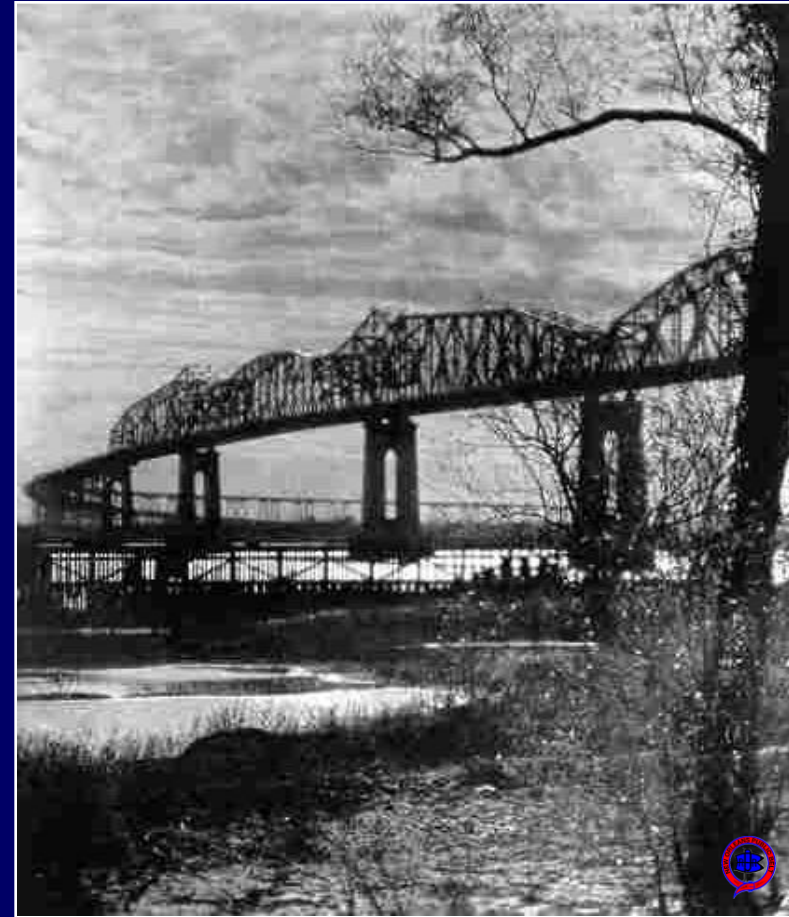




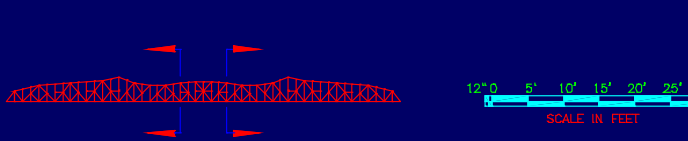
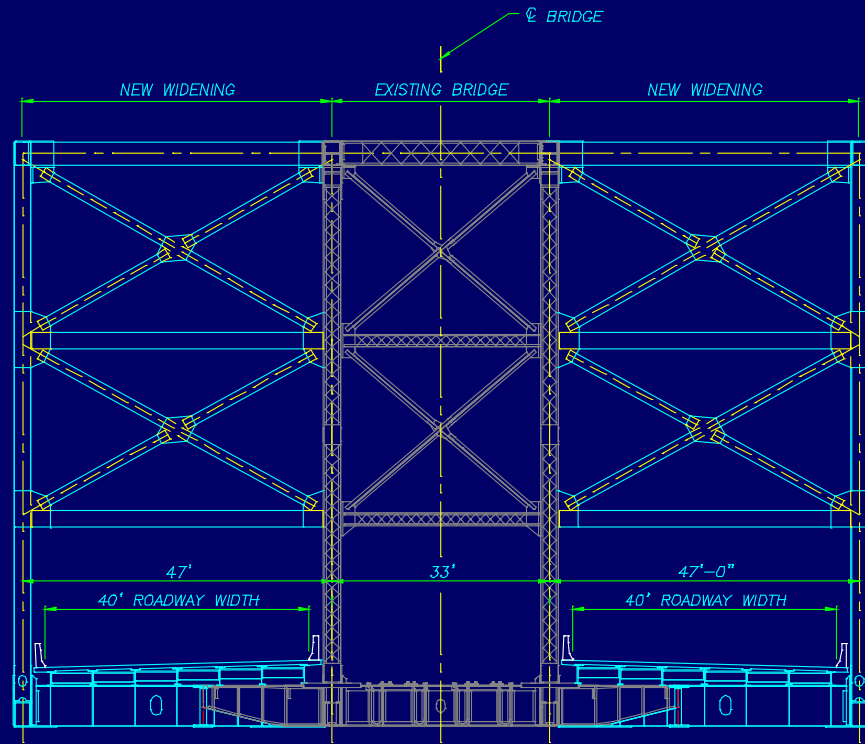
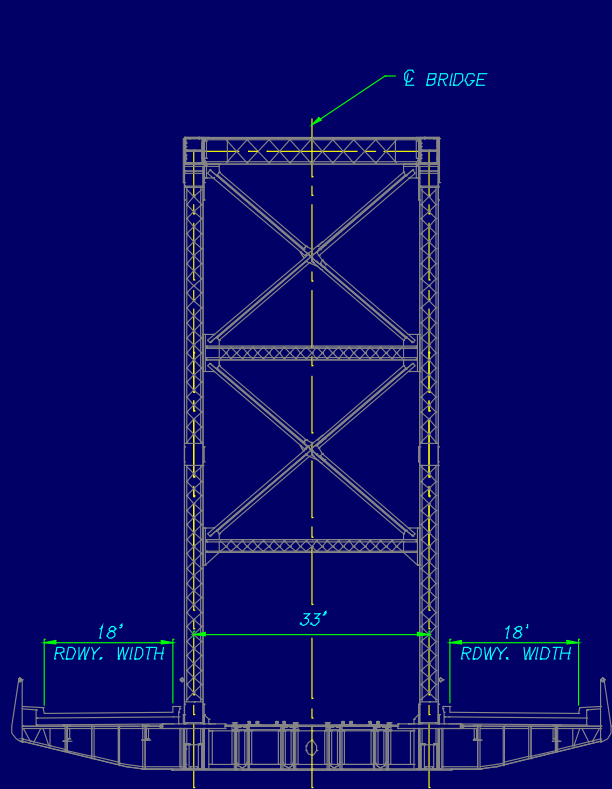
# Project Background

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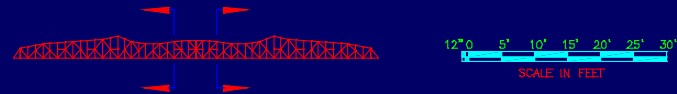
- By widening the existing structure rather than constructing a new river crossing:
  - Reduce environmental impact, property takings.
  - Reduce project cost.
  - Reuse existing right-of-way and traffic corridors.
- Final report published April 1988.



# Project Background



**EXISTING**

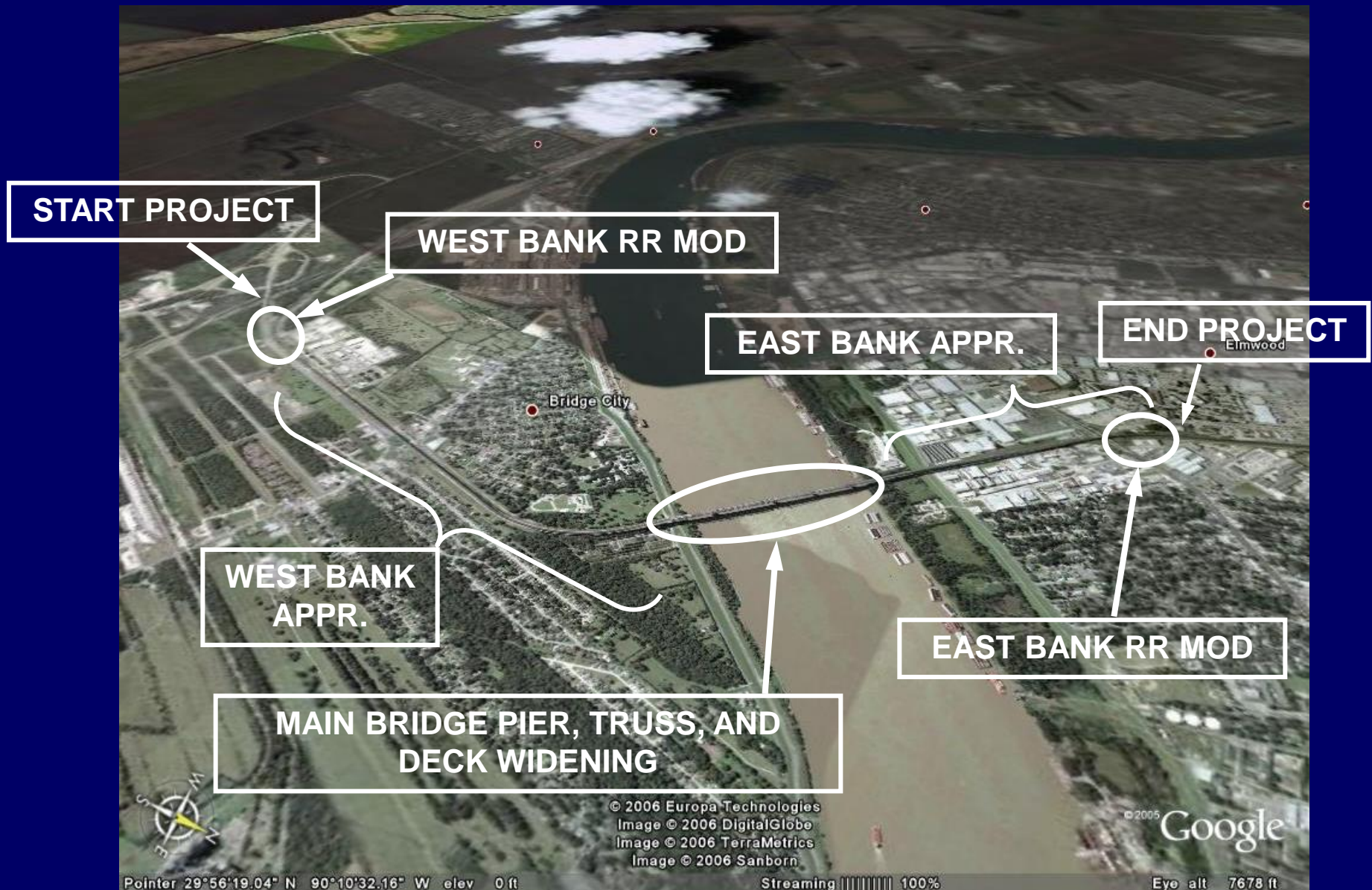


**PROPOSED WIDENING**

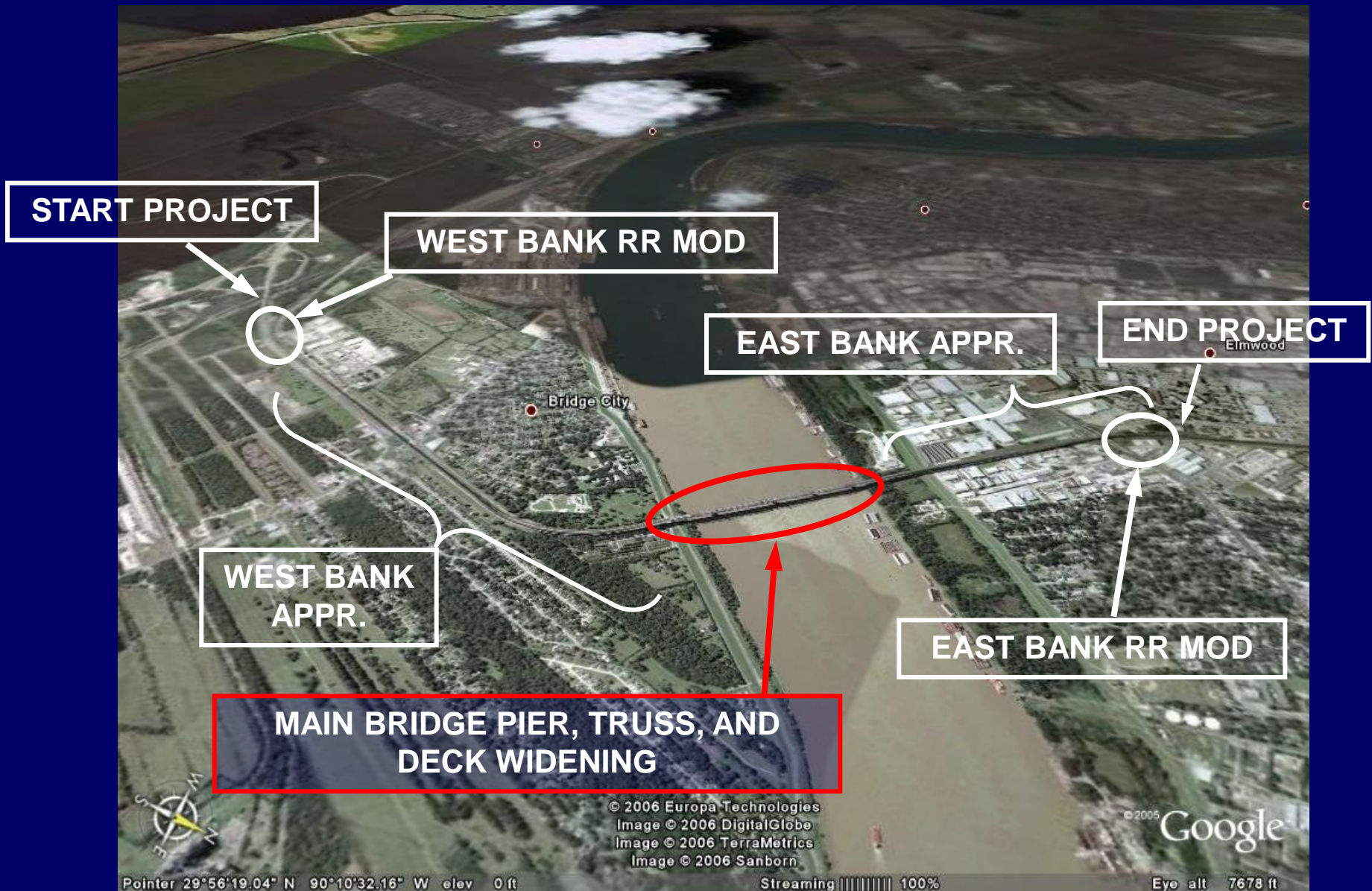
# Project Background

<b>1982</b>	Study of new bridge in corridor; 5 alternates considered. High cost and large amount of ROW; project dropped.
<b>1986</b>	LADOTD authorized M&M to perform conceptual widening study. 3 widening alternates considered.
<b>1990</b>	Geotechnical investigation of soil capacity under cussions.
<b>1992- 1996</b>	Preliminary Design Main Bridge; Fatigue Evaluation. Line and Grade Study Approaches.
<b>1999- 2000</b>	Environmental Processing Agency Consensus
<b>2000- 2007</b>	Completion of final design plans; main bridge widening, railroad modifications, and approaches,
<b>2006- Present</b>	Construction main bridge substructure widening, railroad modifications, and main bridge superstructure widening.

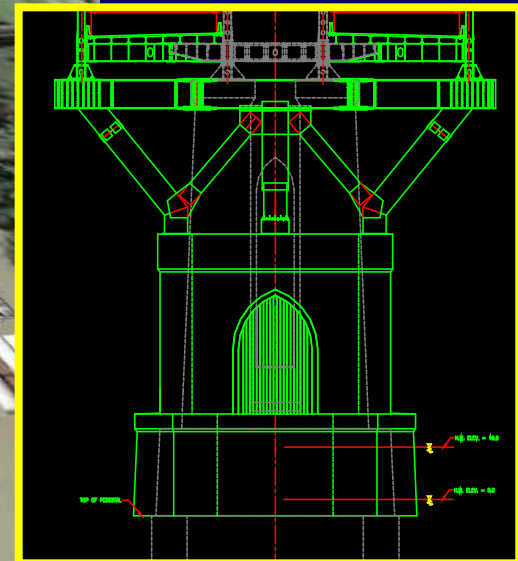
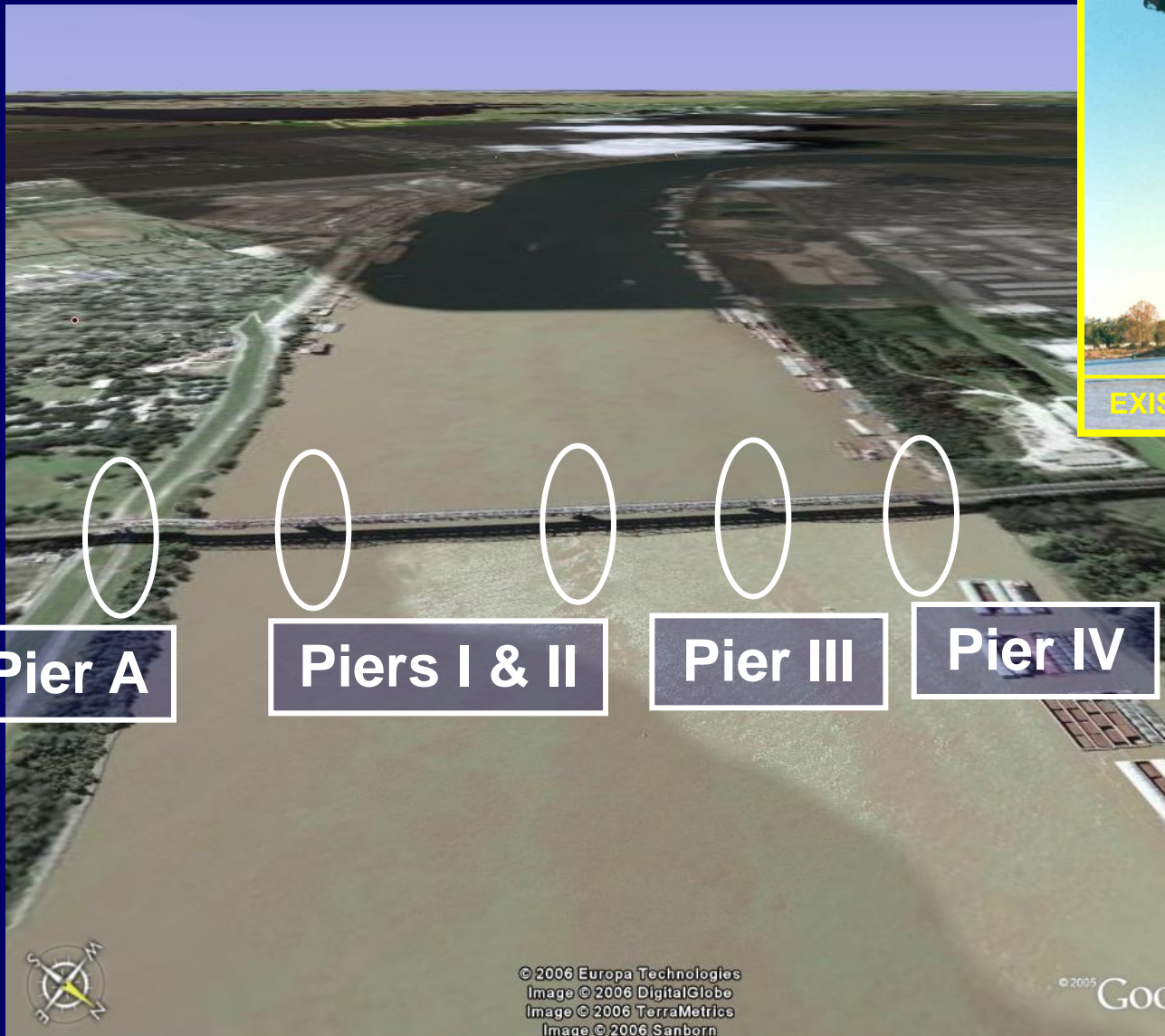
# Huey P. Long Widening Project



# Main Bridge Pier Widening



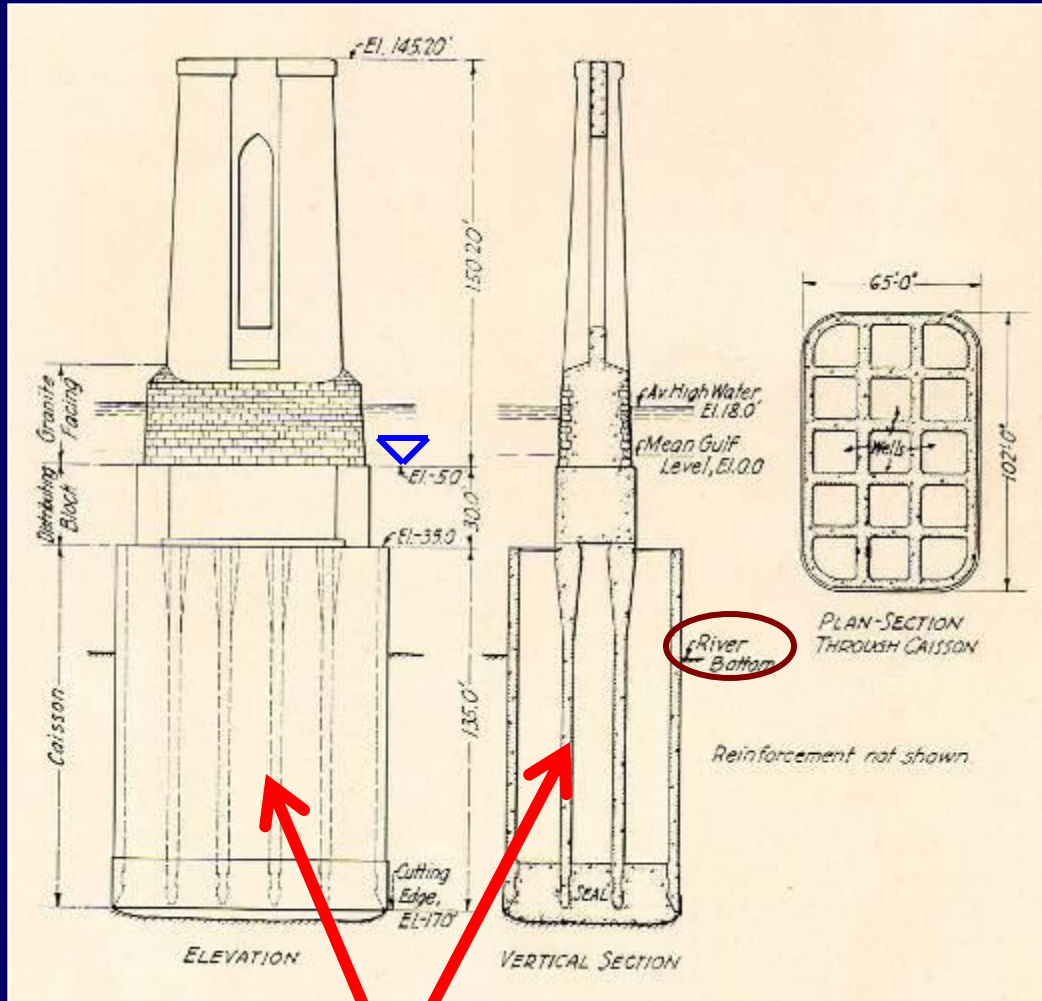
# Main Bridge Pier Widening



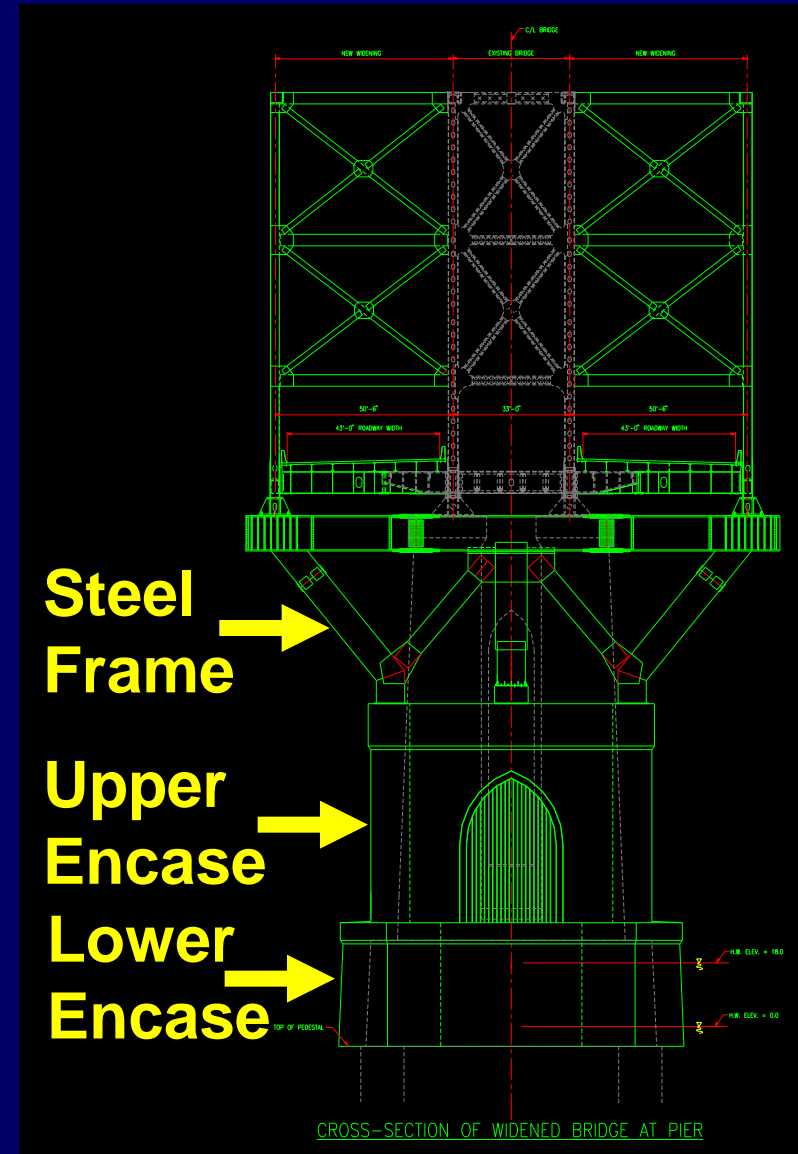
© 2006 Europa Technologies  
Image © 2006 DigitalGlobe  
Image © 2006 TerraMetrics  
Image © 2006 Sanborn

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# Widened Pier



Caisson



# Widened Pier - Design

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## Load Factor Design

- SLD “typically” used for the design of railroad bridges
- Normally LFD is disadvantageous for railroad live loads
- Large dead loads in this case make LFD more economic

## Additional Loading Groups

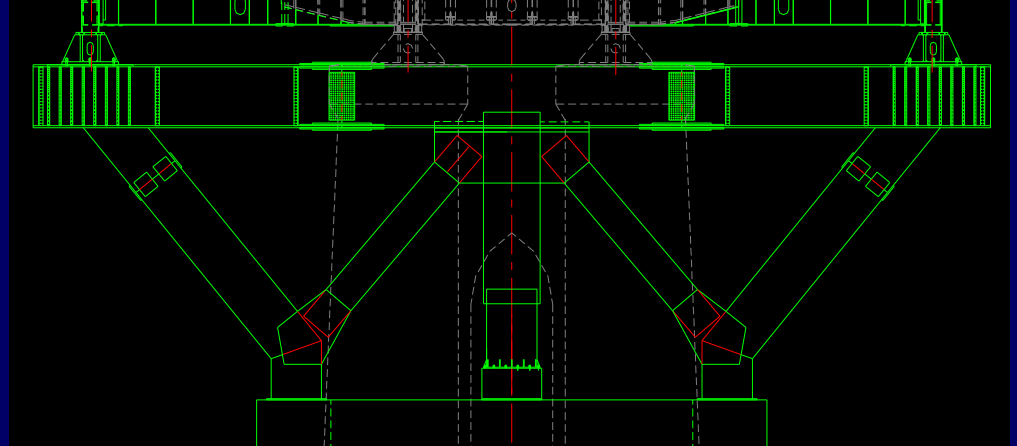
- Construction loads
- Hurricane wind
- Substructure jacking to shift dead load



# Widened Pier - Details

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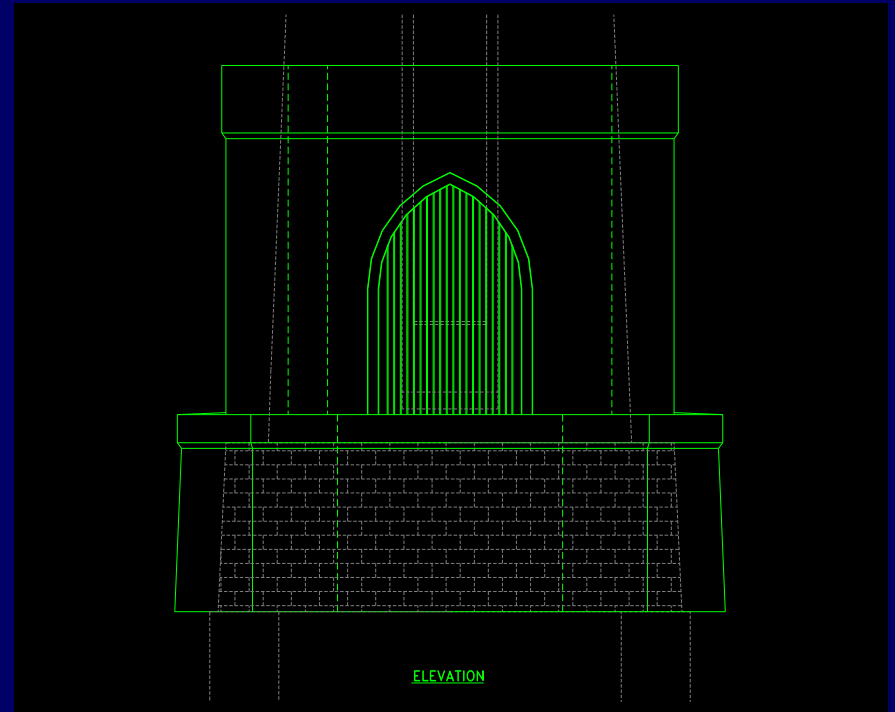
- The upper portion of the pier widening is composed of a steel frame.
- The steel frame significantly reduces the loads on the pier by eliminating concrete and permits the center bearing to be jacked, relieving load from the exterior bearings.
- This is beneficial by reducing load on the end faces of the existing concrete distribution block on top of the existing caisson.



# Widened Pier - Details

The lower portion of the pier widening serves several functions

- The nose areas are columns to support the widening truss support bearings.
- The remainder confines the existing pier concrete and granite masonry blocks which currently has minimal reinforcing.



# Existing Pier Conditions

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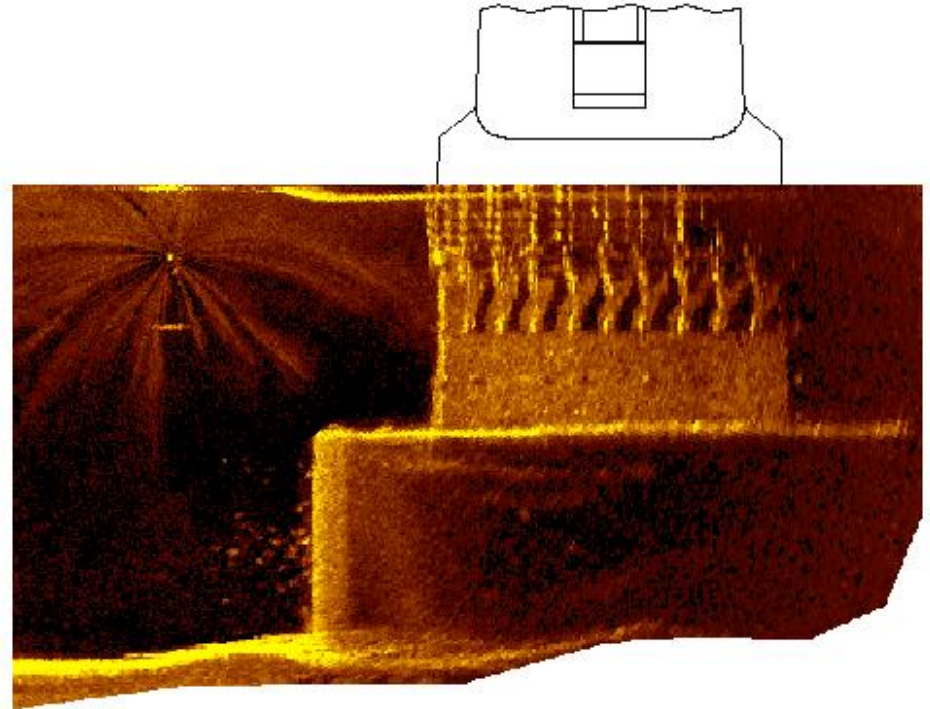
Underwater Acoustic Inspection performed April 2006 by C. H. Fenstermaker & Associates.

Piers I, II, III, & IV examined and found to be in good condition.

The equipment provided detailed information of the existing conditions.

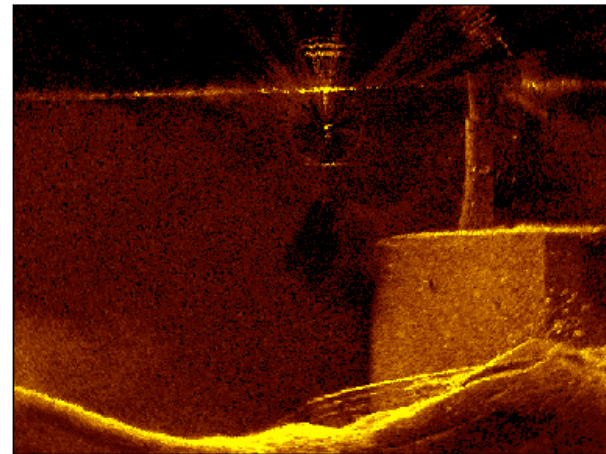
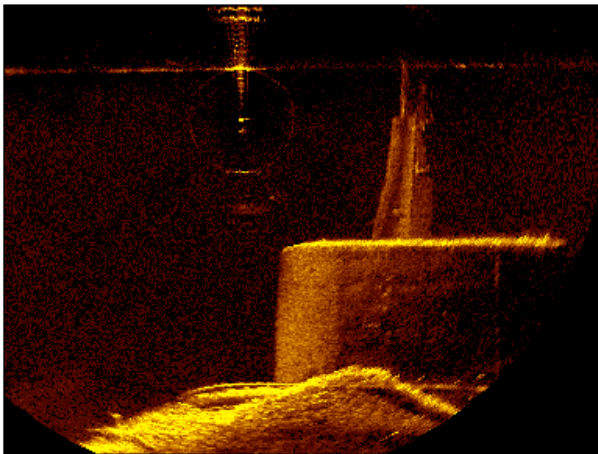
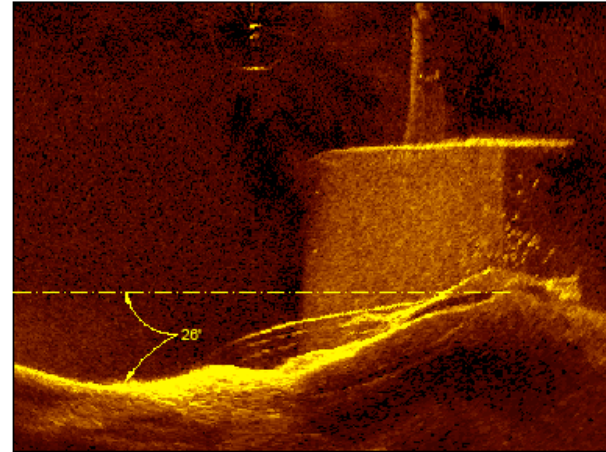
Examination though the use of a diver would be more costly, must be performed in extreme low to no visibility, and is dangerous.

# Existing Pier Conditions



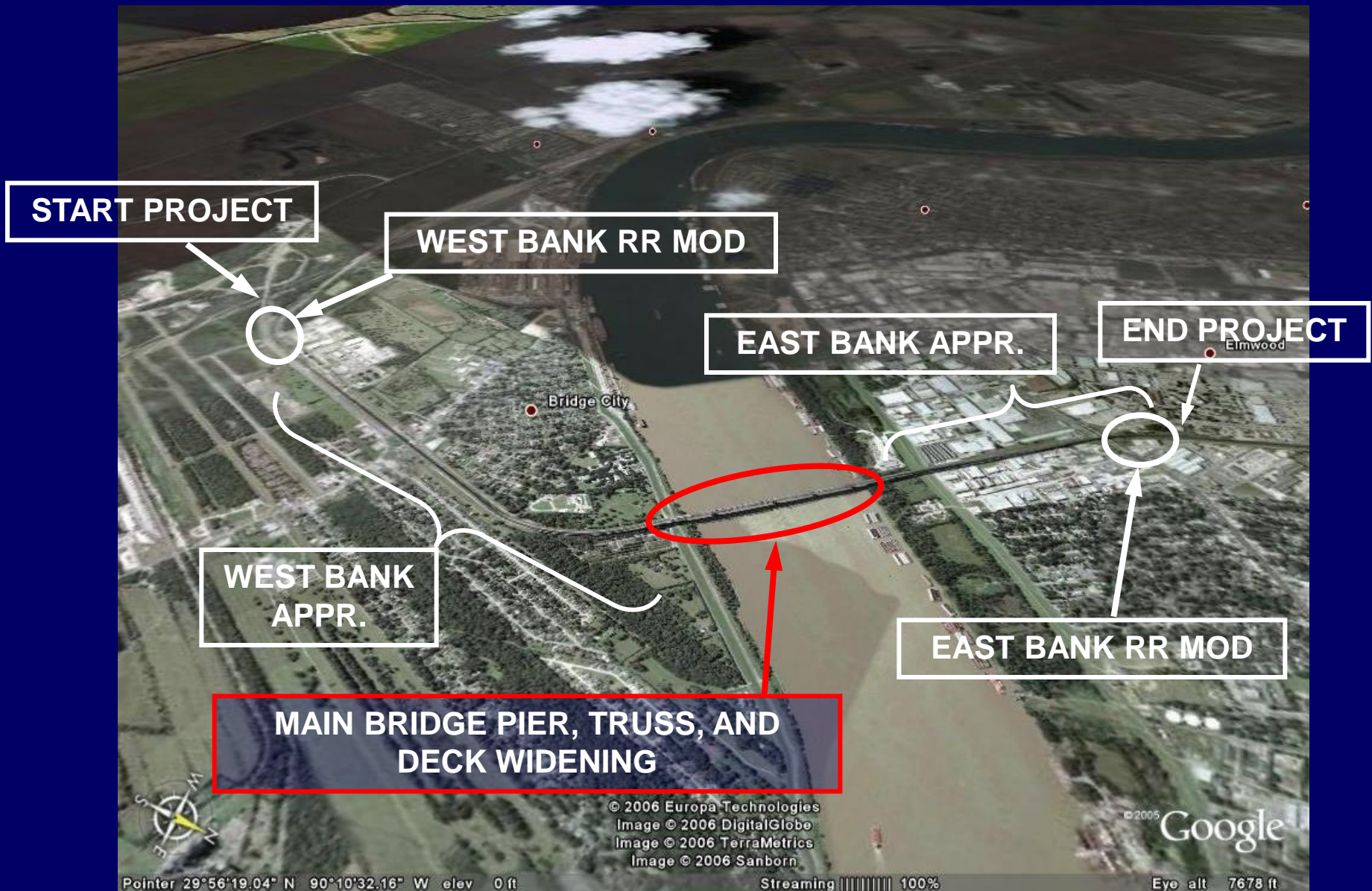
Pier I – North Face

# Existing Pier Conditions



Pier II – West Nose

# Main Bridge Truss Widening



START PROJECT

WEST BANK RR MOD

EAST BANK APPR.

END PROJECT

WEST BANK APPR.

EAST BANK RR MOD

MAIN BRIDGE PIER, TRUSS, AND DECK WIDENING

© 2006 Europa Technologies  
Image © 2006 DigitalGlobe  
Image © 2006 TerraMetrics  
Image © 2006 Sanborn

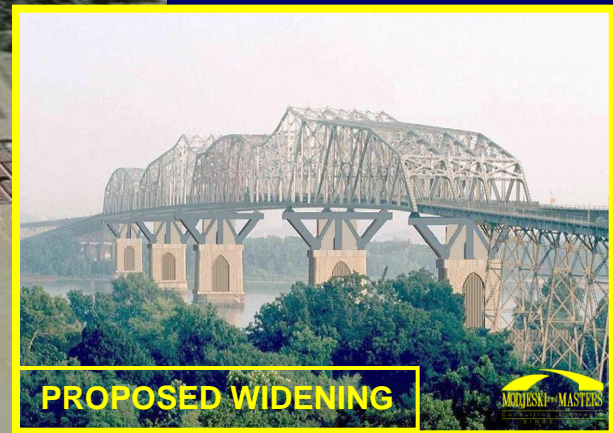
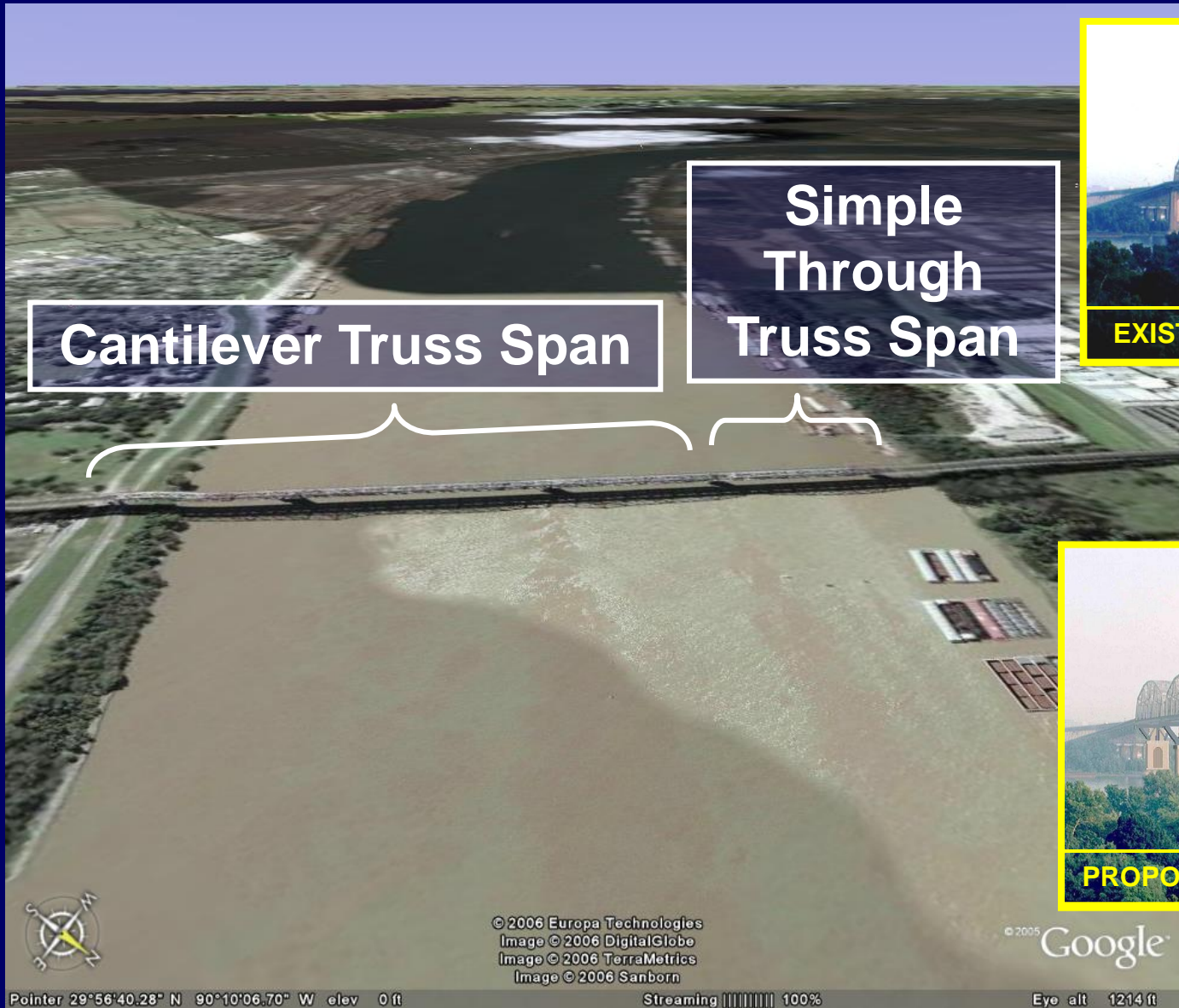
© 2005 Google

Pointer 29°56'19.04" N 90°10'32.16" W elev 0 ft

Streaming 100%

Eye alt 7678 ft

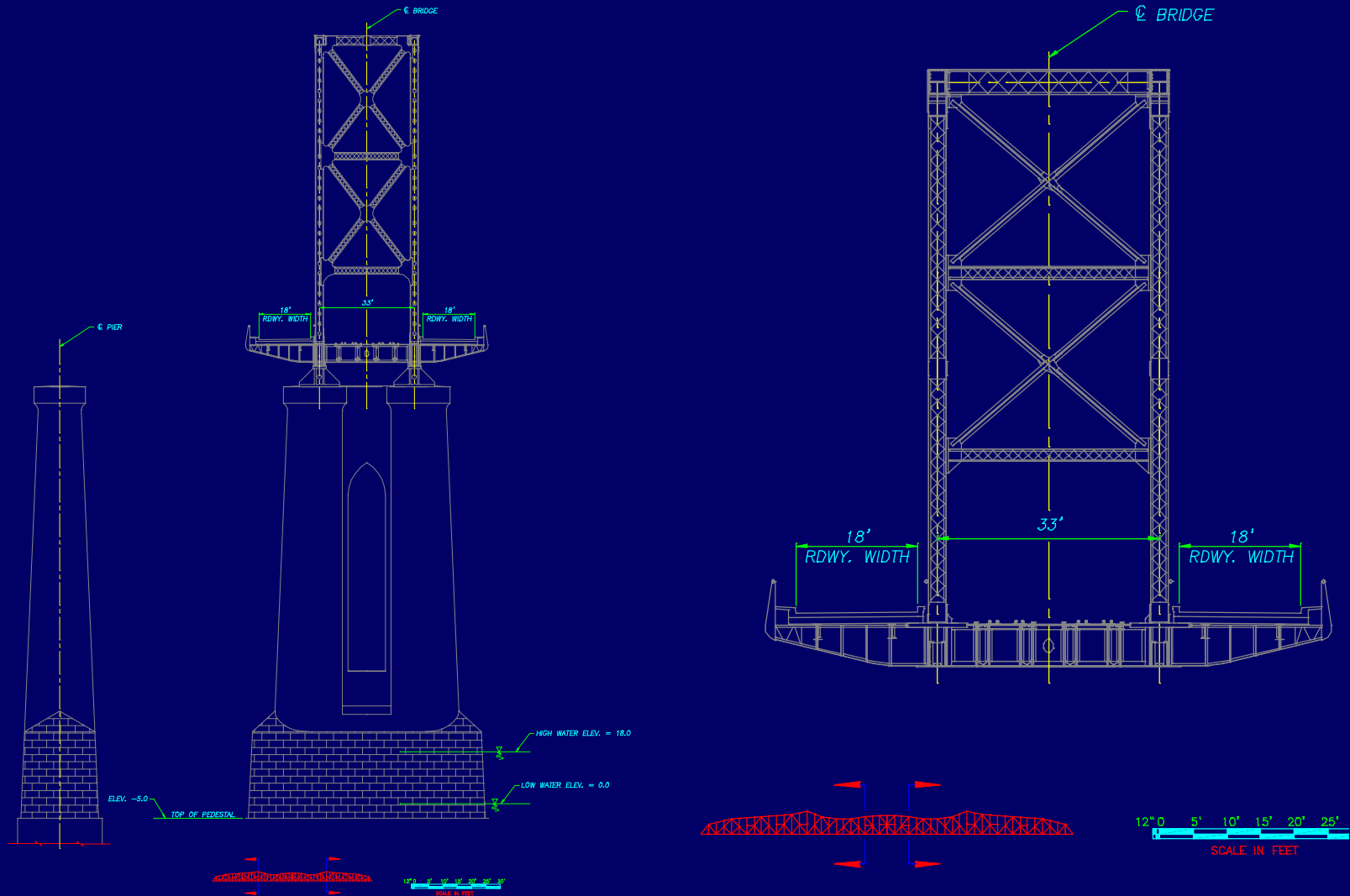
# Main Bridge Truss Widening



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Image © 2006 DigitalGlobe  
Image © 2006 TerraMetrics  
Image © 2006 Sanborn

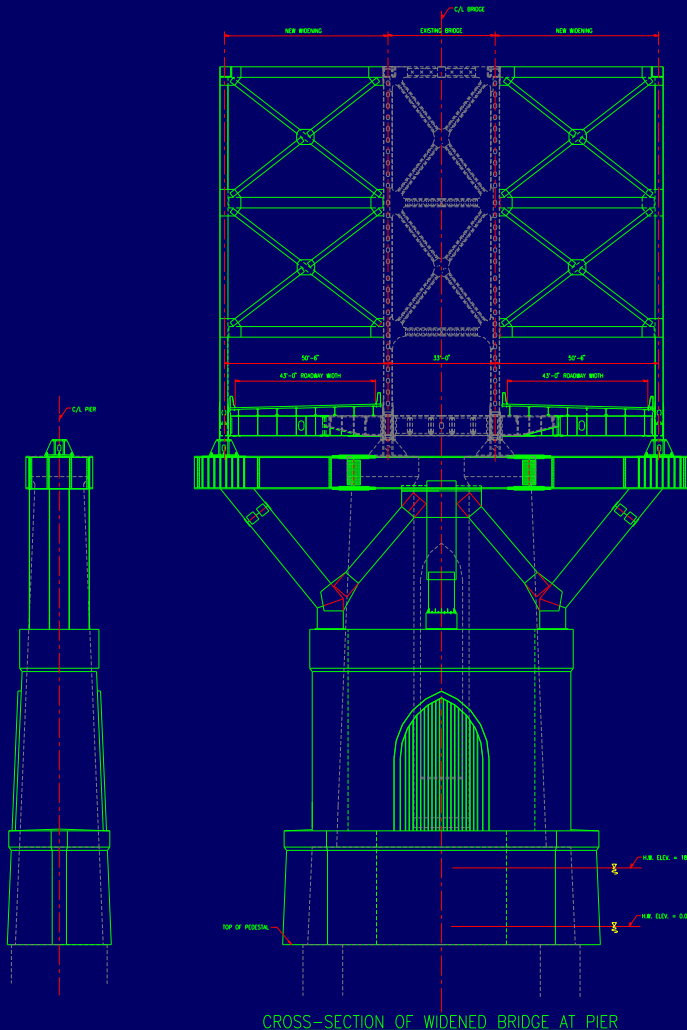
© 2005 Google

# Cross Sections – Existing Bridge



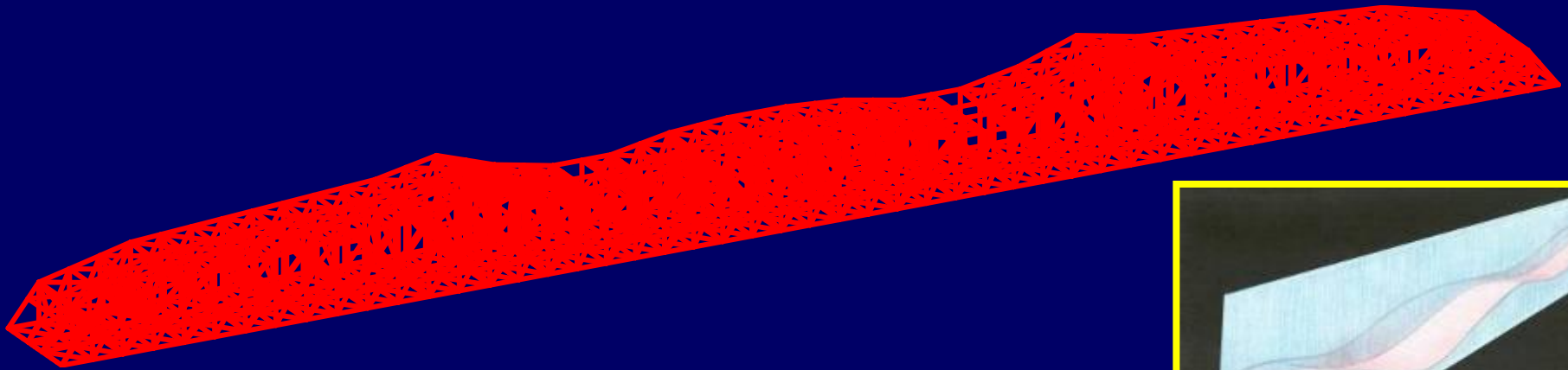


# Widened Main Bridge Features

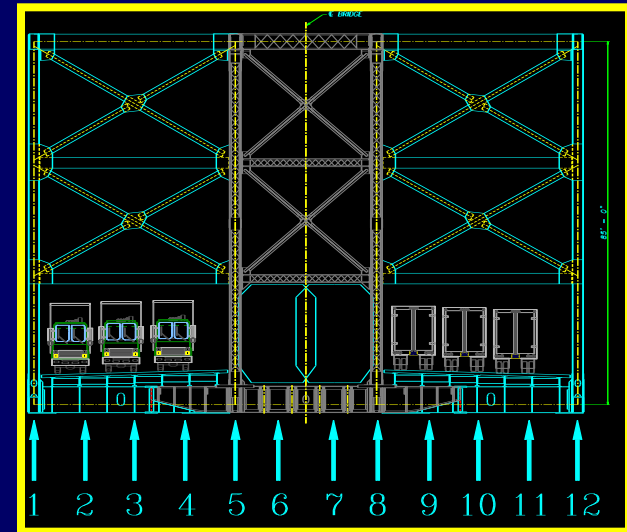
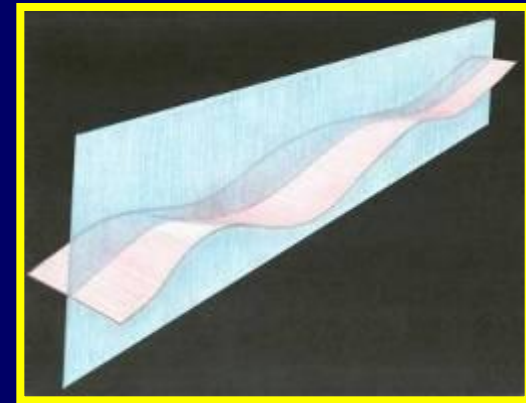


- 2 new trusses added, parallel to existing trusses.
- Roadways widened from 18 ft. to 43 ft.
- Currently: 2 – 9 ft. lanes  
No offset
- Proposed: 3 – 11 ft. lanes  
8 ft. shoulder  
2 ft. offset

# Widened Main Bridge - Design

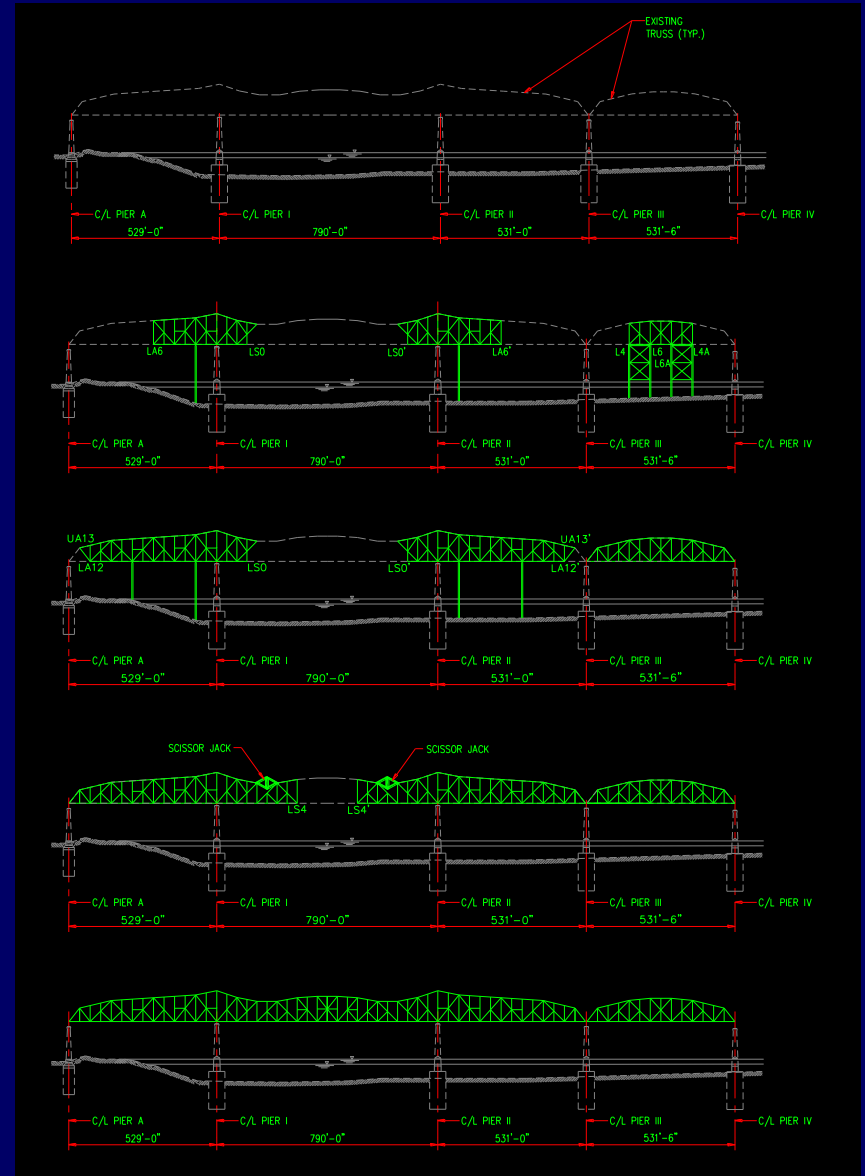


- 3-D analysis used to obtain loads in final structure
- Obtain the coordinates of the influence surface along an influence profile line (“slice”) taken through the influence surface
- 12 influence profile lines established for the structure
- Assign loads to influence surface using simple beam distribution
- Is an approximate method, but is simple and slightly conservative



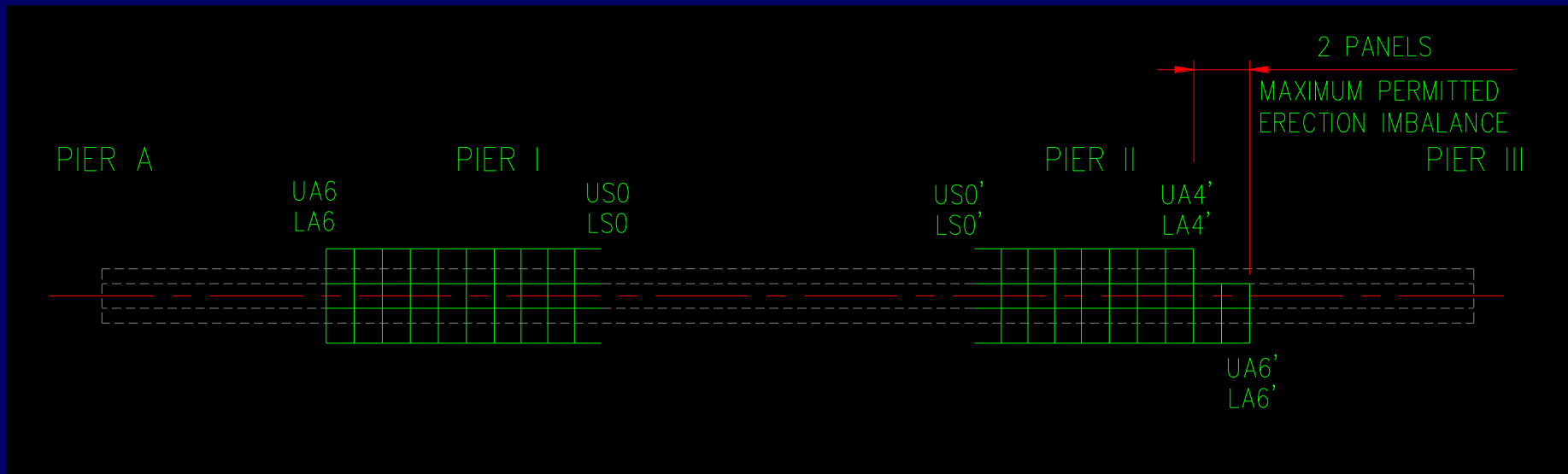
# Construction and Erection

- Sequence of construction
  - Widening Truss
    - Imbalance
  - Widened Floor System



# Construction and Erection

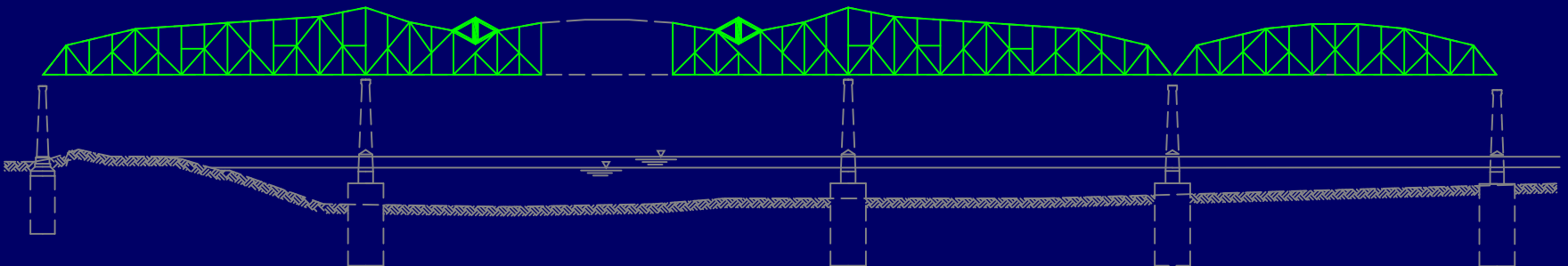
- Maximum Permitted Imbalance
  - 2 panel points on one side of truss
  - Only 1 location on the structure



# Deflection Issues

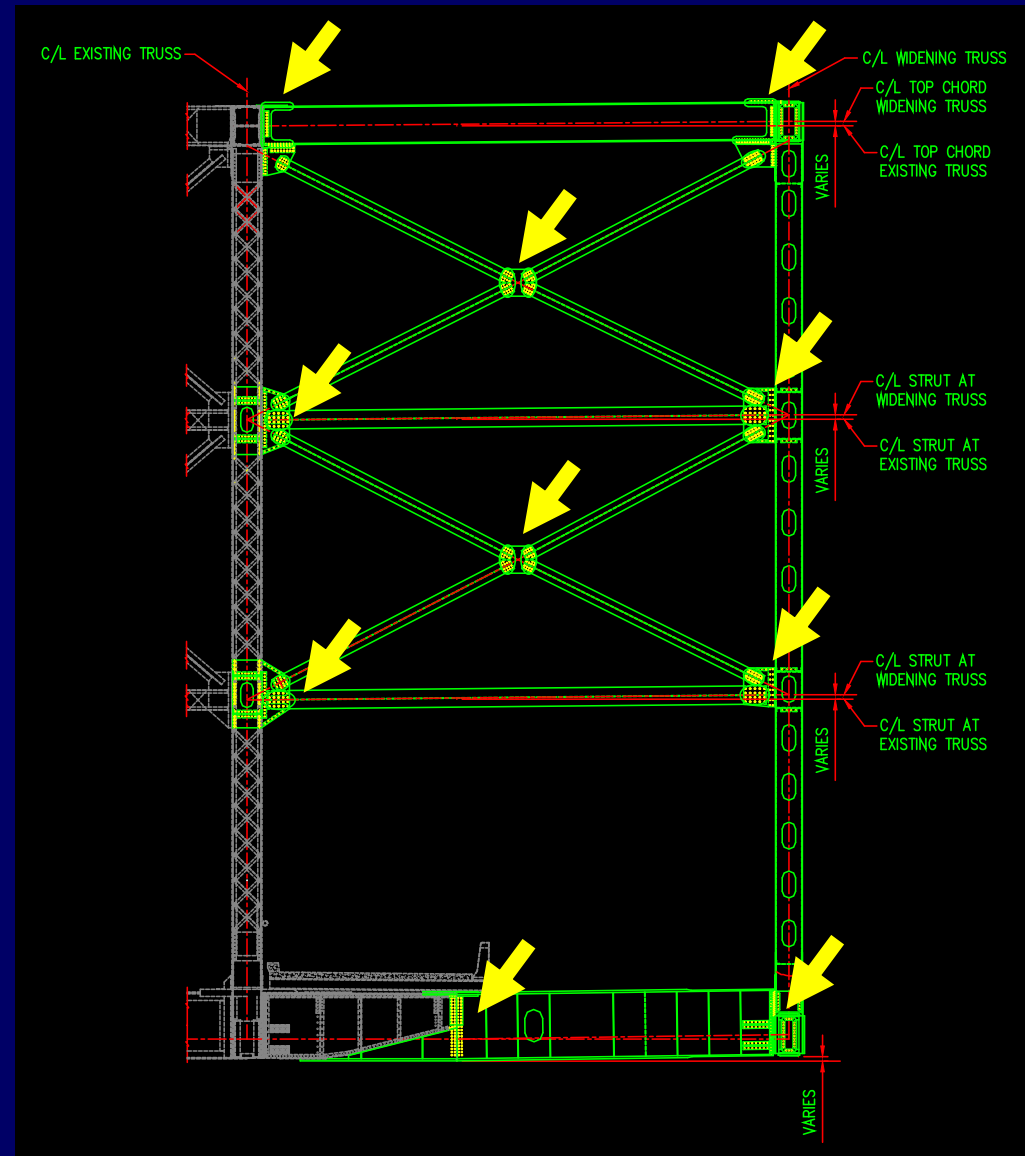
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- Camber of widening truss versus existing truss elevation plus changes due to widening
- Anchor arms erected as cantilever spans
- Main span of the widening truss is erected as a long cantilever span
- After closure main span converted to a short cantilever span supporting a simple span



# Deflection Issues

- Top laterals, bottom laterals, sway frames, and portal frames must hinge to permit movement
- Erect rigid part over roadways open to traffic; hinge remaining part.



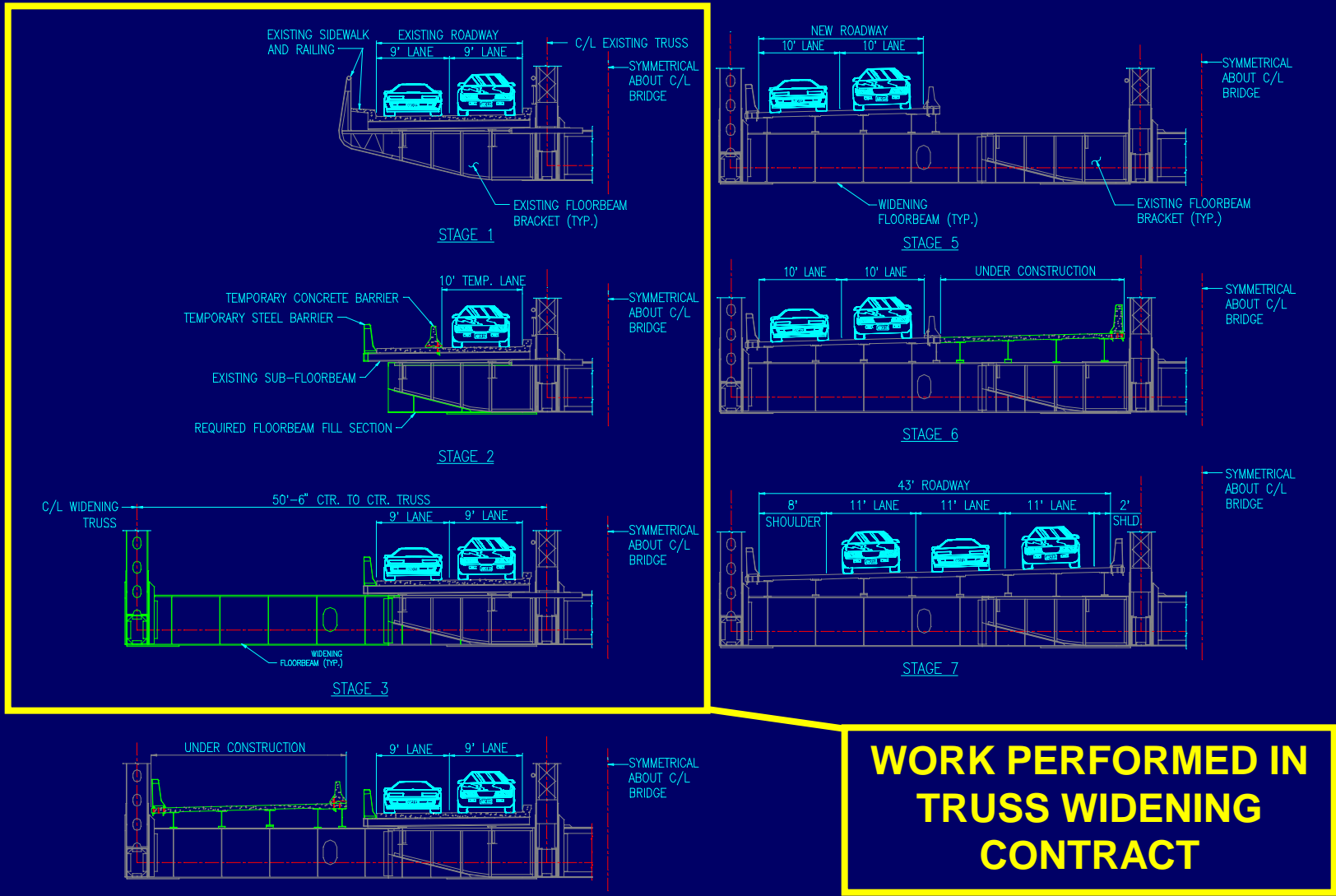
# Maintenance of Traffic Through Construction

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- Marine Traffic Maintained
  - same vertical and horizontal clearances
- Rail Traffic Maintained
- Vehicular Traffic Maintained
  - by use of staged construction

# Main Bridge

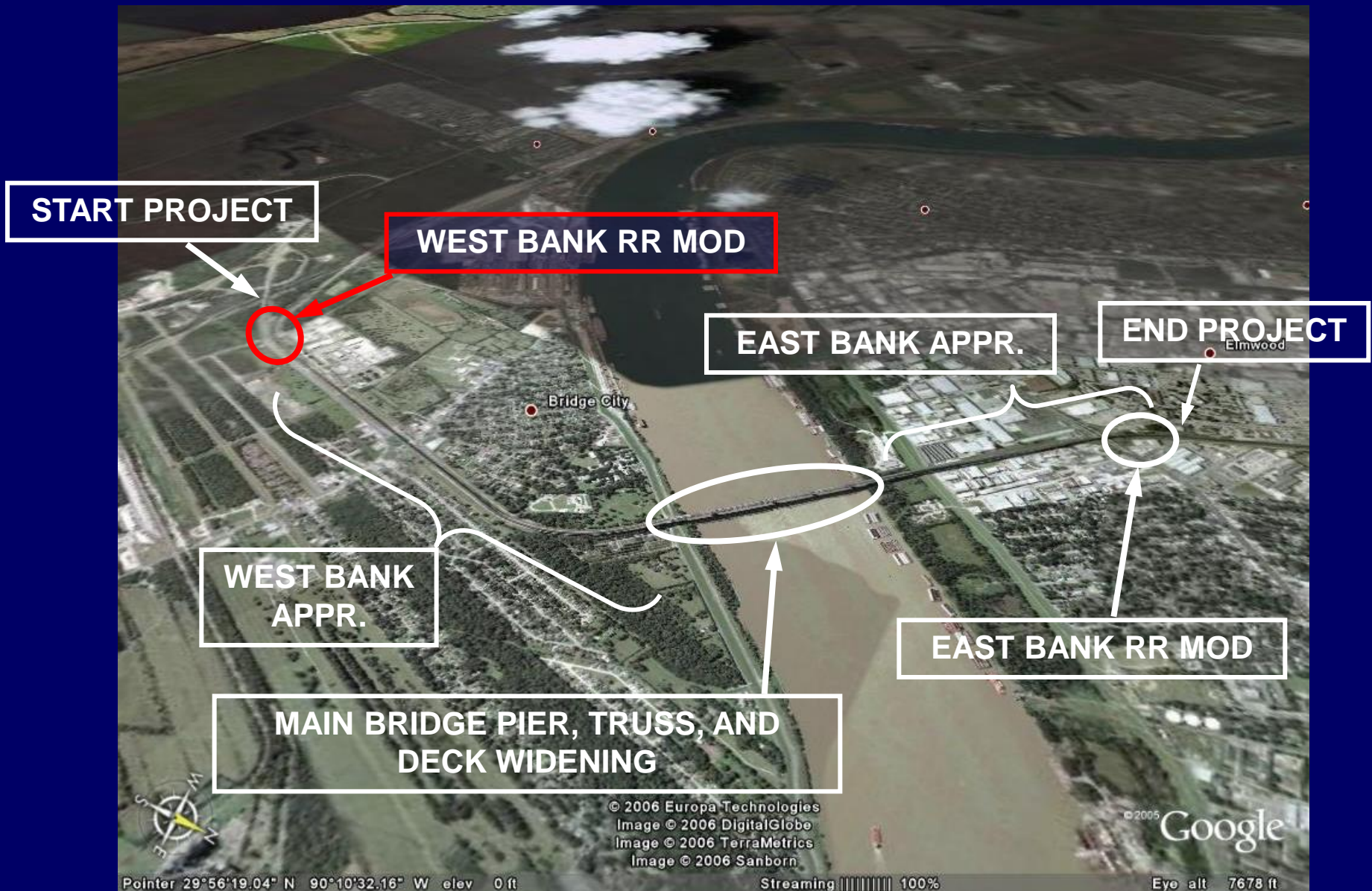
## Maintenance of Traffic



**WORK PERFORMED IN TRUSS WIDENING CONTRACT**



# Railroad Modifications - Westbank



# Railroad Modifications - Westbank

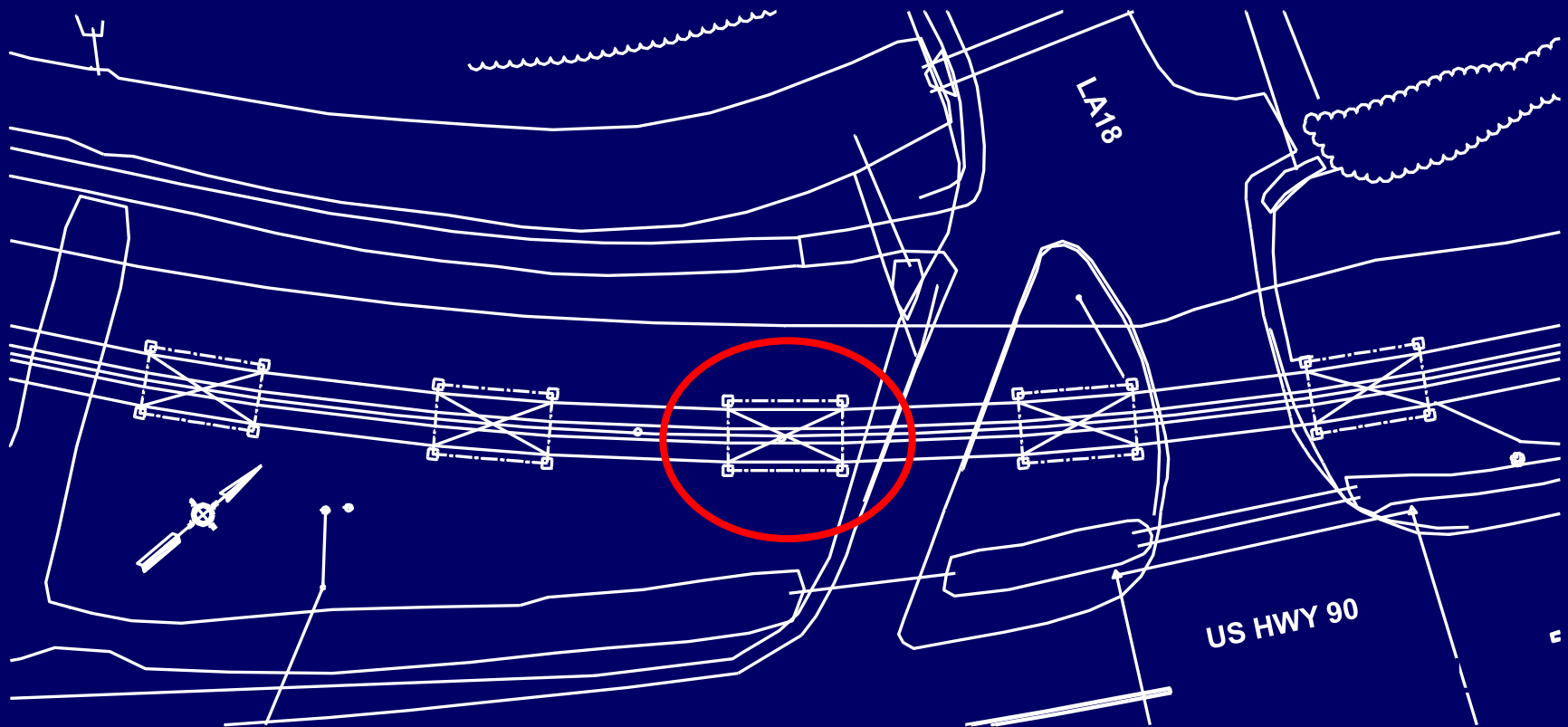


**EXISTING**

**MURJESKI • MASTERS**

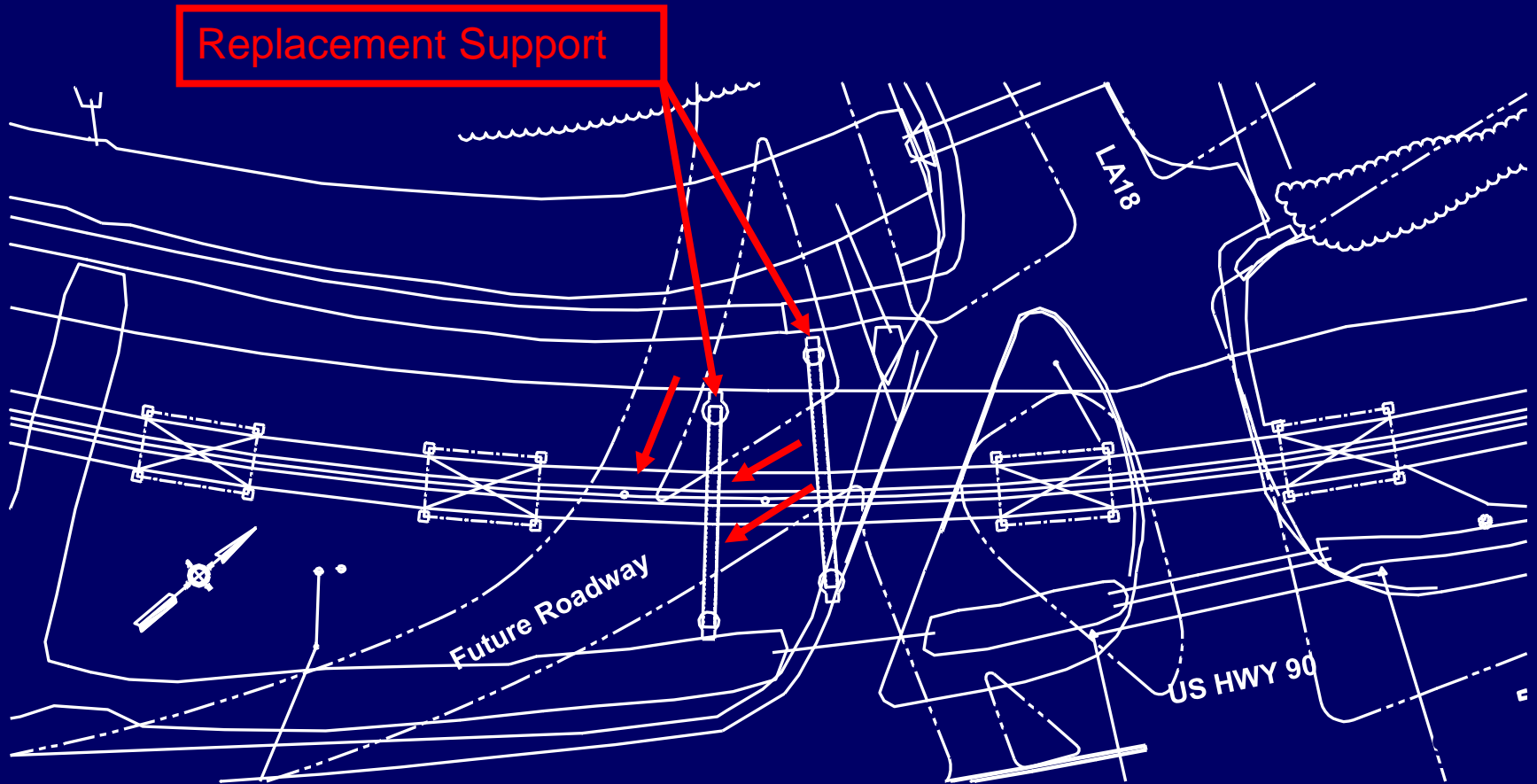
# Huey P. Long Widening Project Westbank Railroad Modifications

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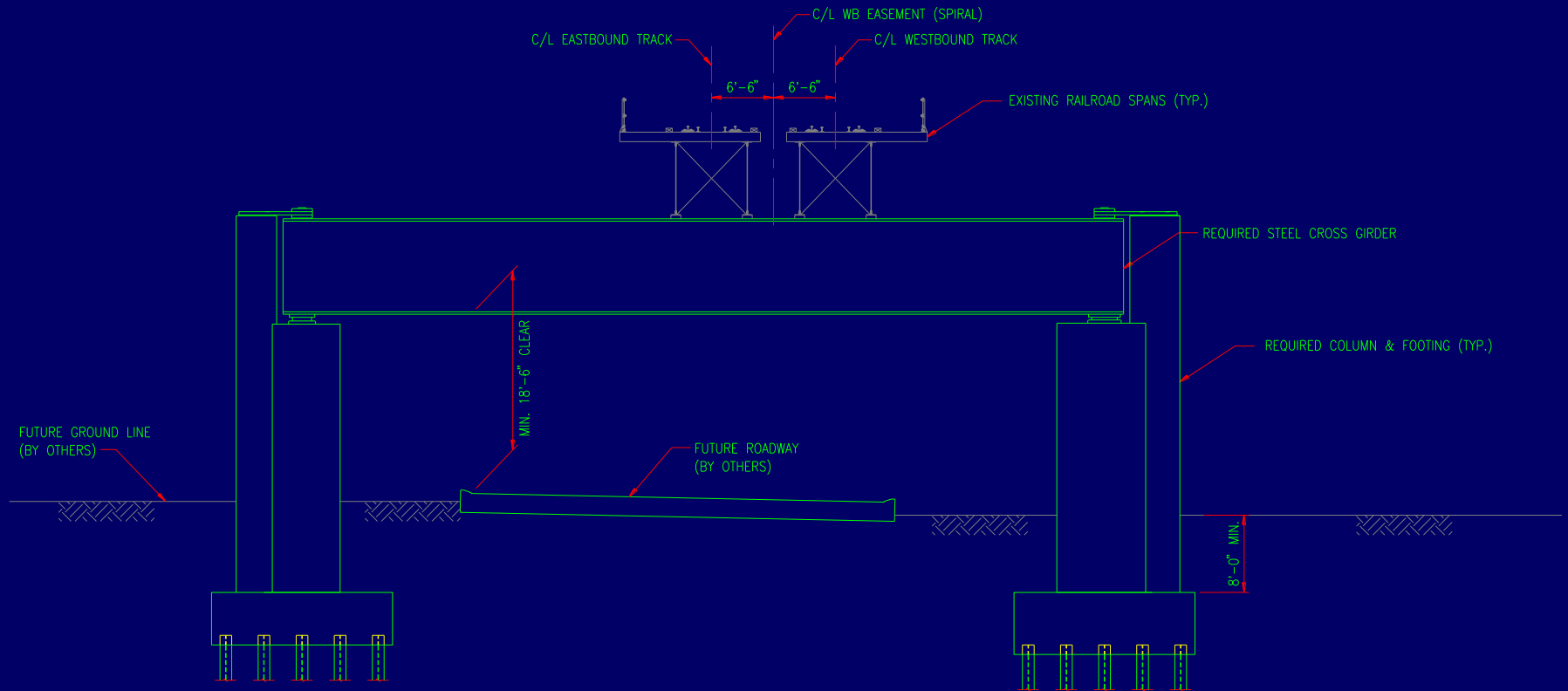
**Existing Site Conditions**

# Huey P. Long Widening Project Westbank Railroad Modifications

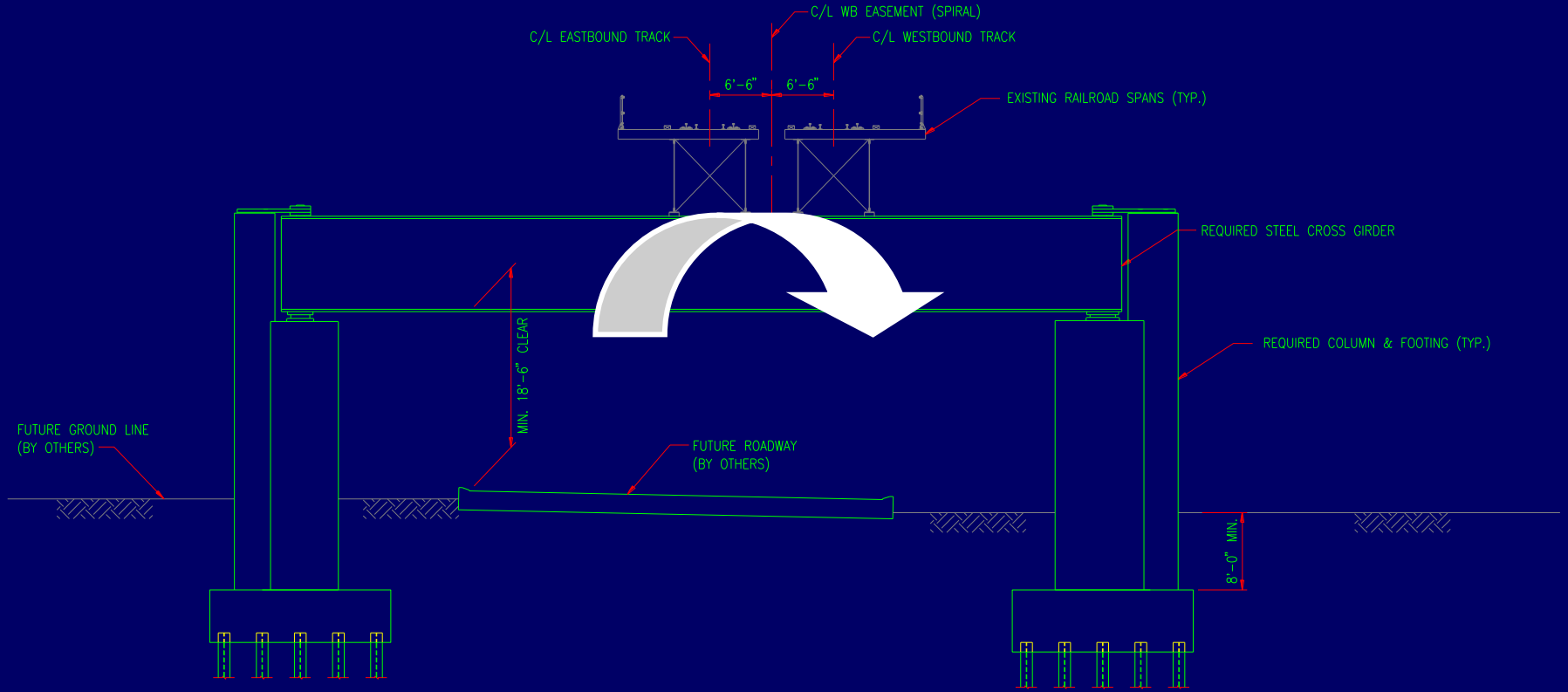


**Final Site Conditions**

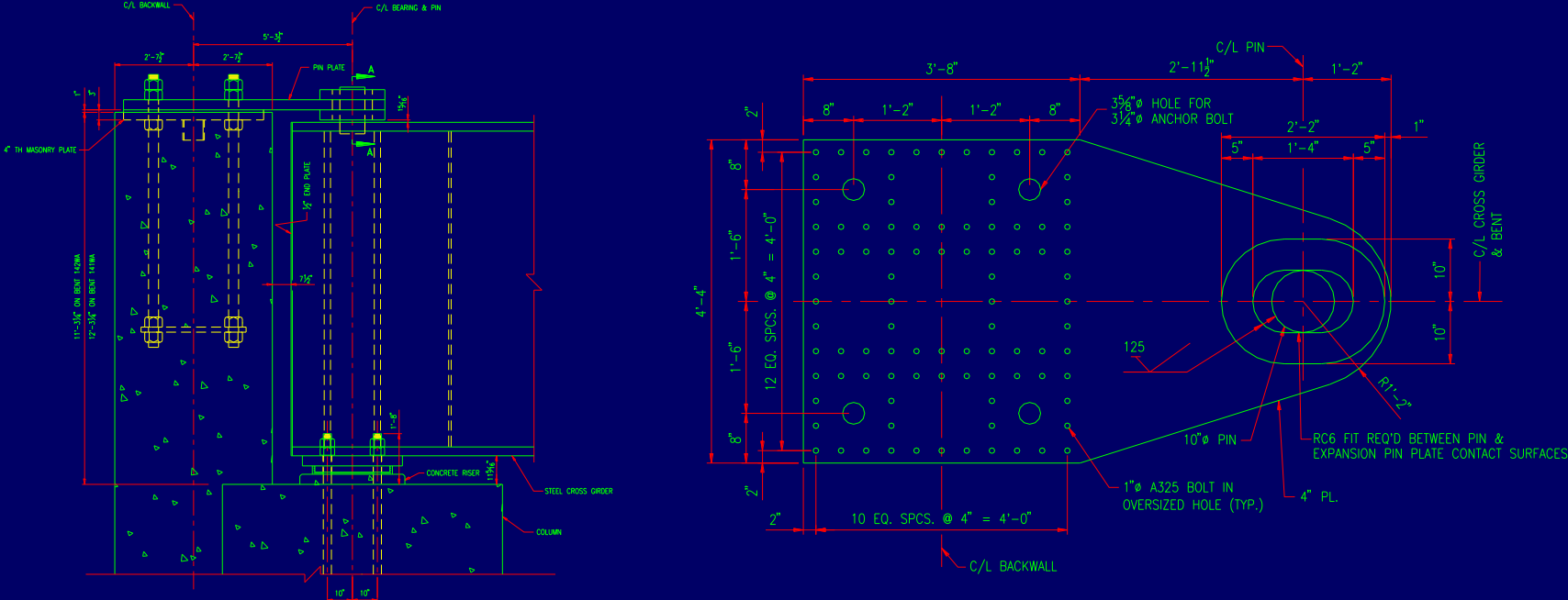
# Huey P. Long Widening Project Westbank Railroad Modifications



# Huey P. Long Widening Project Westbank Railroad Modifications

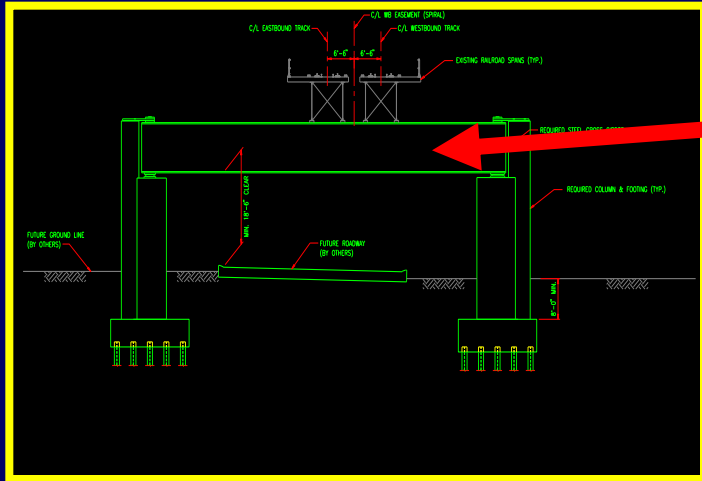


# Huey P. Long Widening Project Westbank Railroad Modifications



# Westbank

## Sequence of Construction

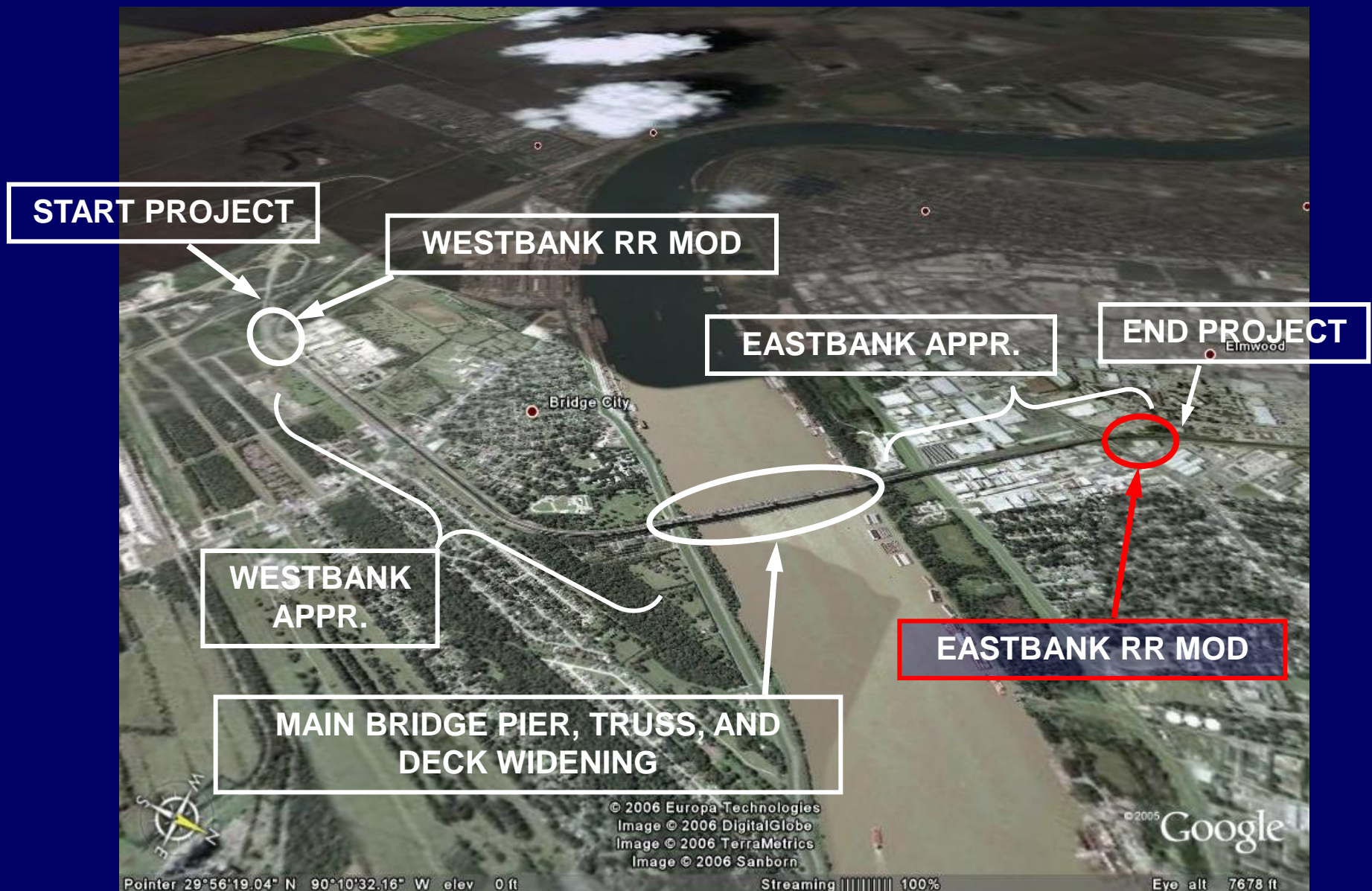


1. Construct foundations for new cross girders
2. Install falsework to lift existing girder spans
3. Begin 24 hour rail traffic closure
4. Lift existing girder spans off steel tower
5. Remove upper portion steel tower
6. Erect cross girders
7. Lower existing girder spans onto new cross girders
8. Restore rail traffic
9. Remove remaining portion of steel tower

24 HOUR RAIL CLOSURE



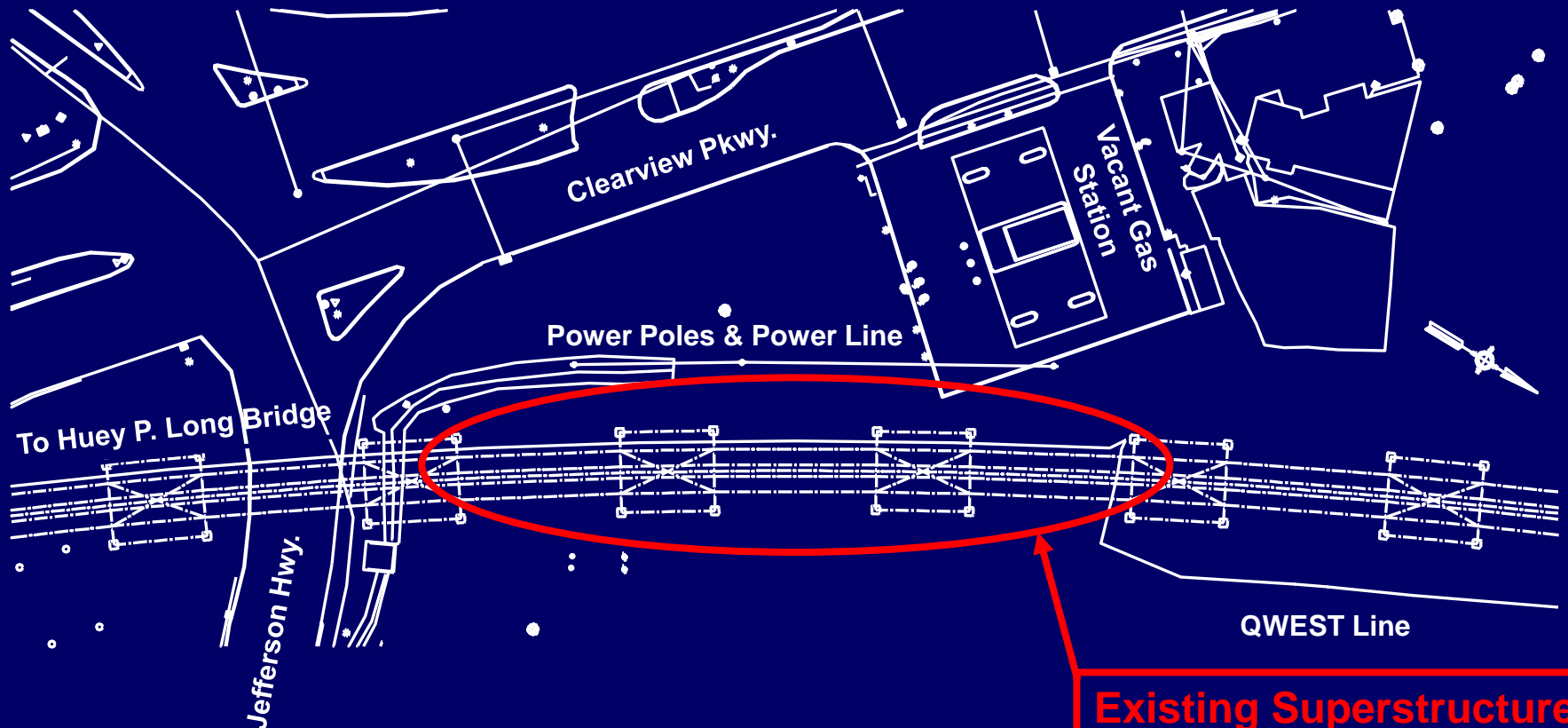
# Railroad Modifications - Eastbank



# Railroad Modifications - Eastbank



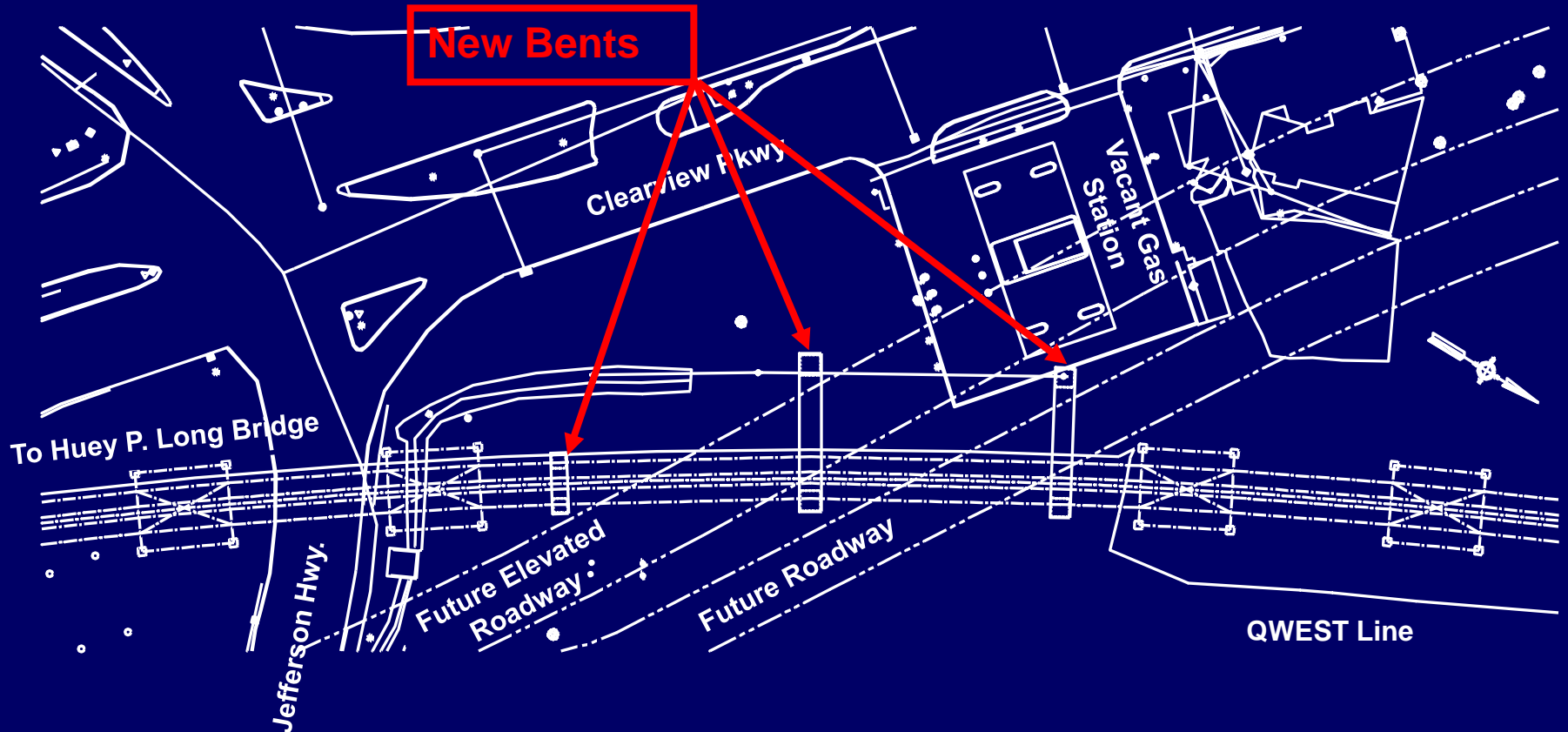
# Huey P. Long Widening Project Eastbank Railroad Modifications



**Existing Site Conditions**

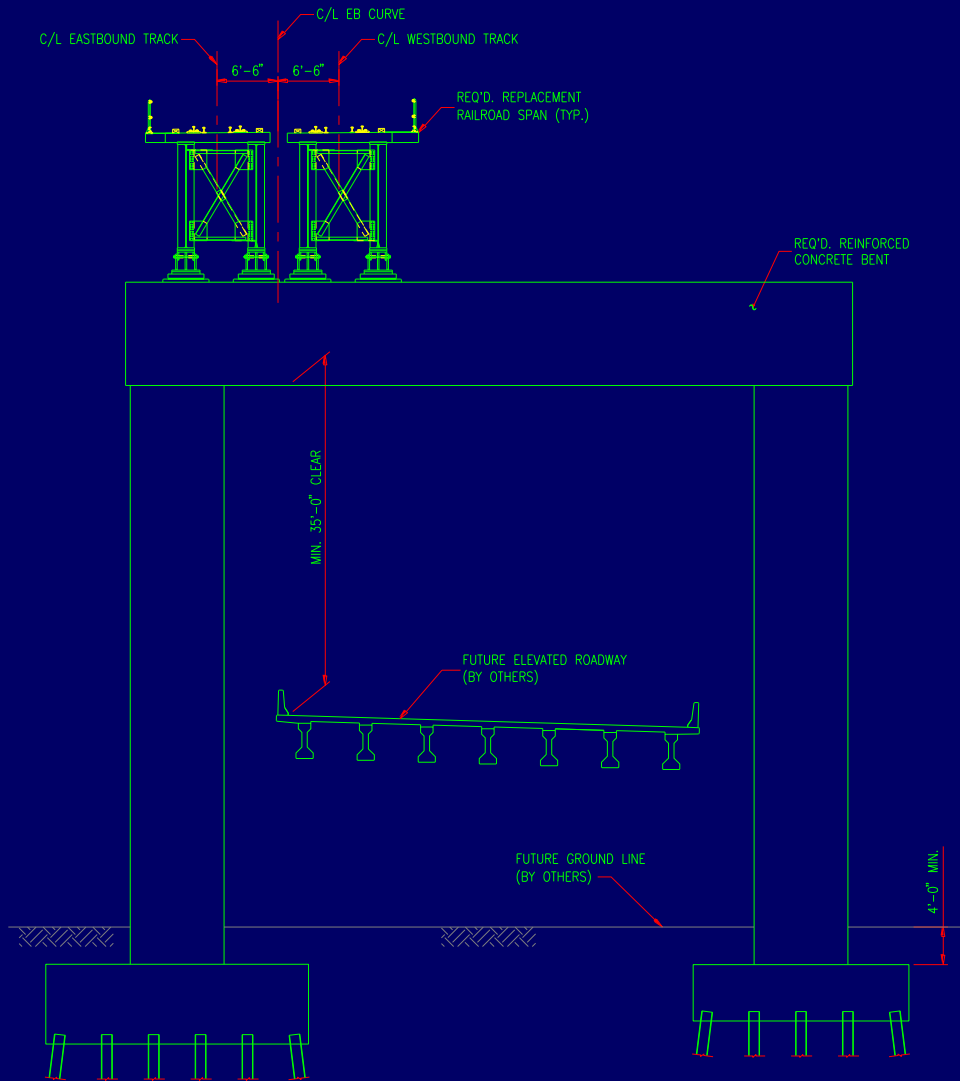
**Existing Superstructure  
and Towers to be  
Replaced**

# Huey P. Long Widening Project Eastbank Railroad Modifications



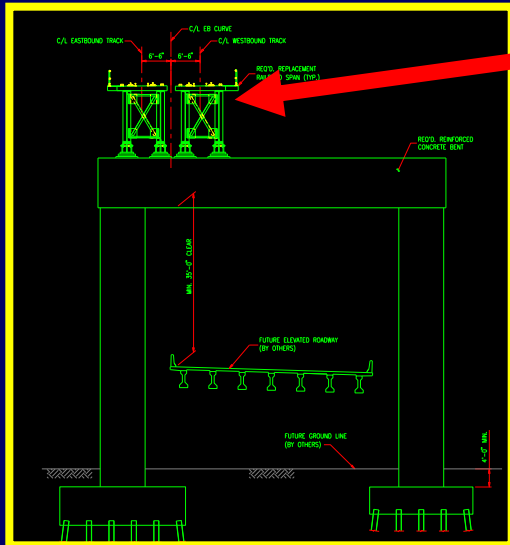
**Final Site Conditions**

# Huey P. Long Widening Project Eastbank Railroad Modifications



# Eastbank

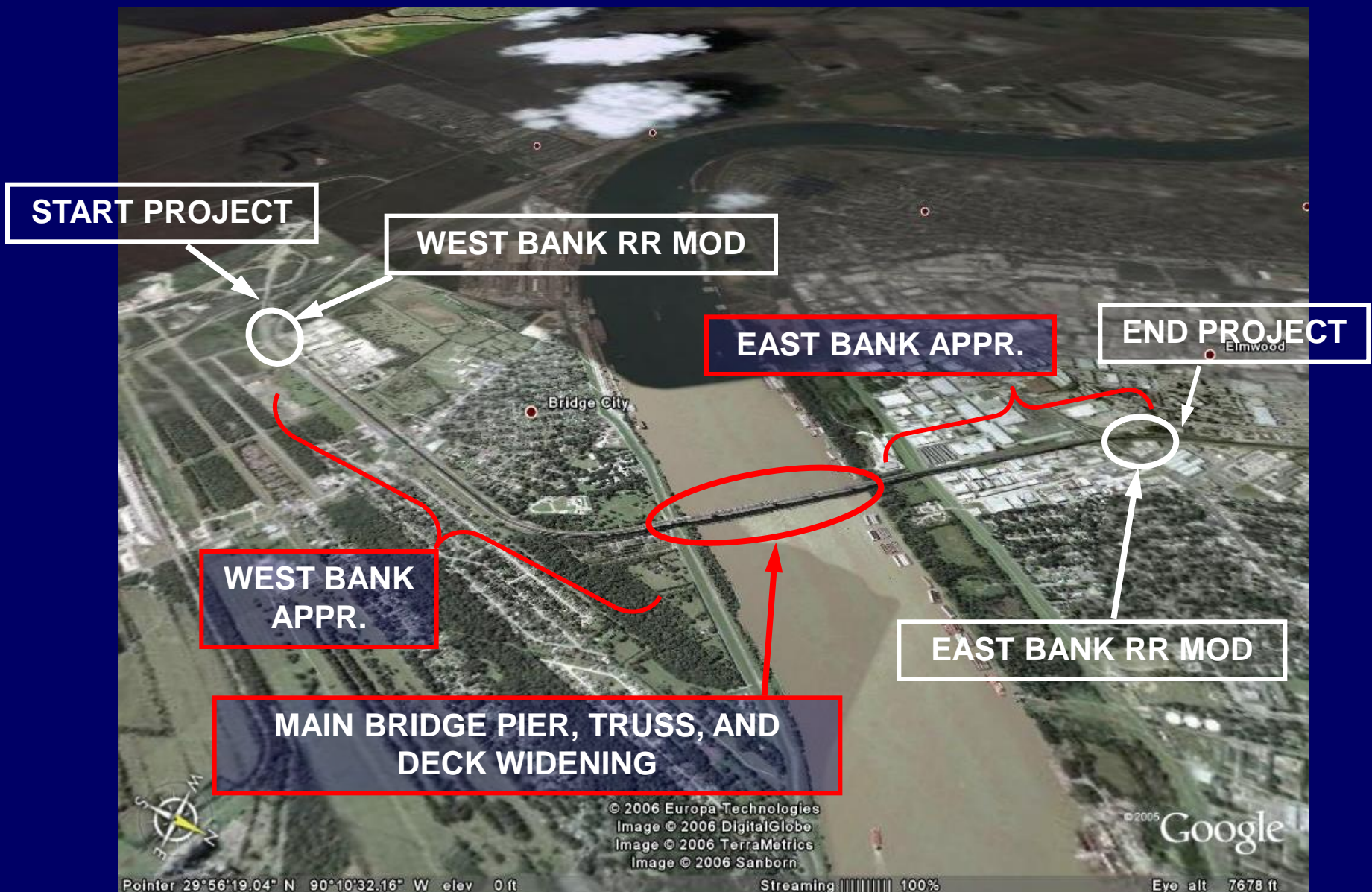
## Sequence of Construction



1. Construct new concrete straddle bents
2. Prepare steel tower and other falsework
3. Begin 24 hour rail traffic closure
4. Remove girders under one of the tracks
5. Erect new girders for one track
6. Re-establish track
7. Restore rail traffic
8. Repeat girder replacement for other track
9. Remove steel tower

**24 HOUR RAIL  
CLOSURE**

# Approaches & Deck Widening



# Approaches & Deck Widening



Start Project

Bridge City Ave.  
Interchange

WEST BANK  
APPROACH

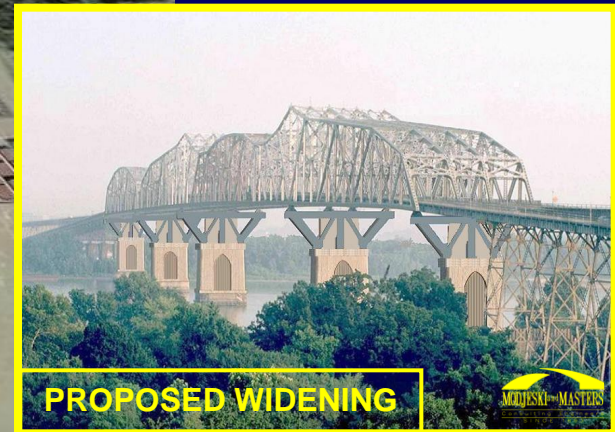
Conflict w/  
Existing Rdwy



# Approaches & Deck Widening

Cantilever Truss Span

Simple Through Truss Span



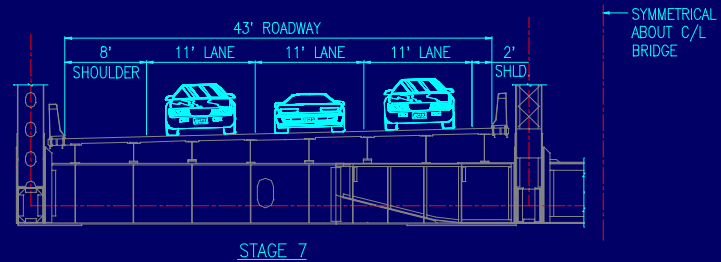
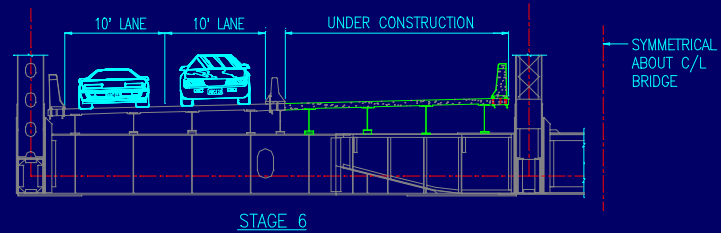
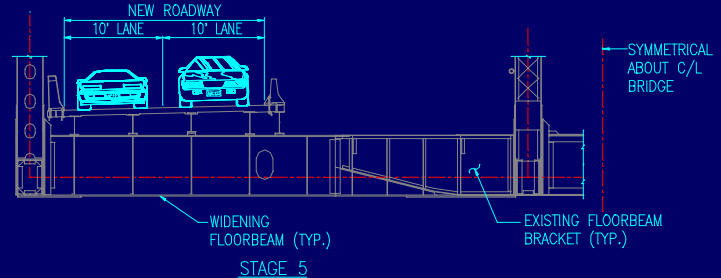
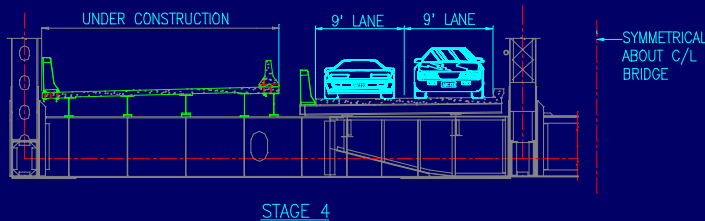
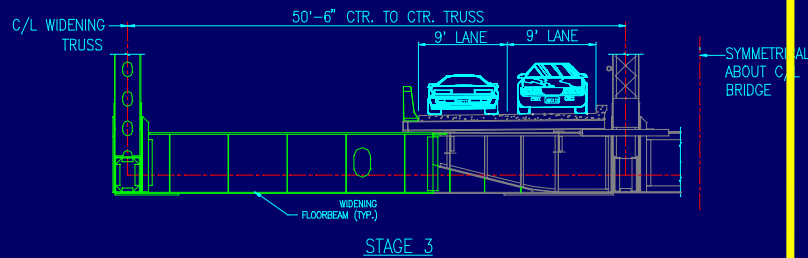
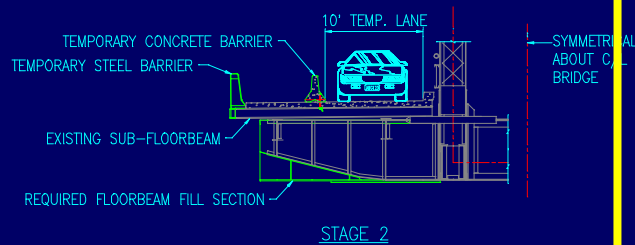
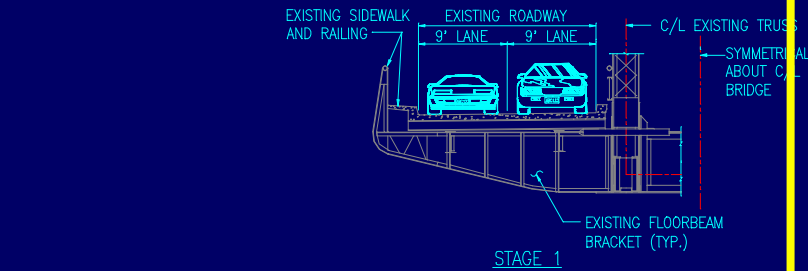
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Image © 2006 Sanborn

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# Approaches & Deck Widening

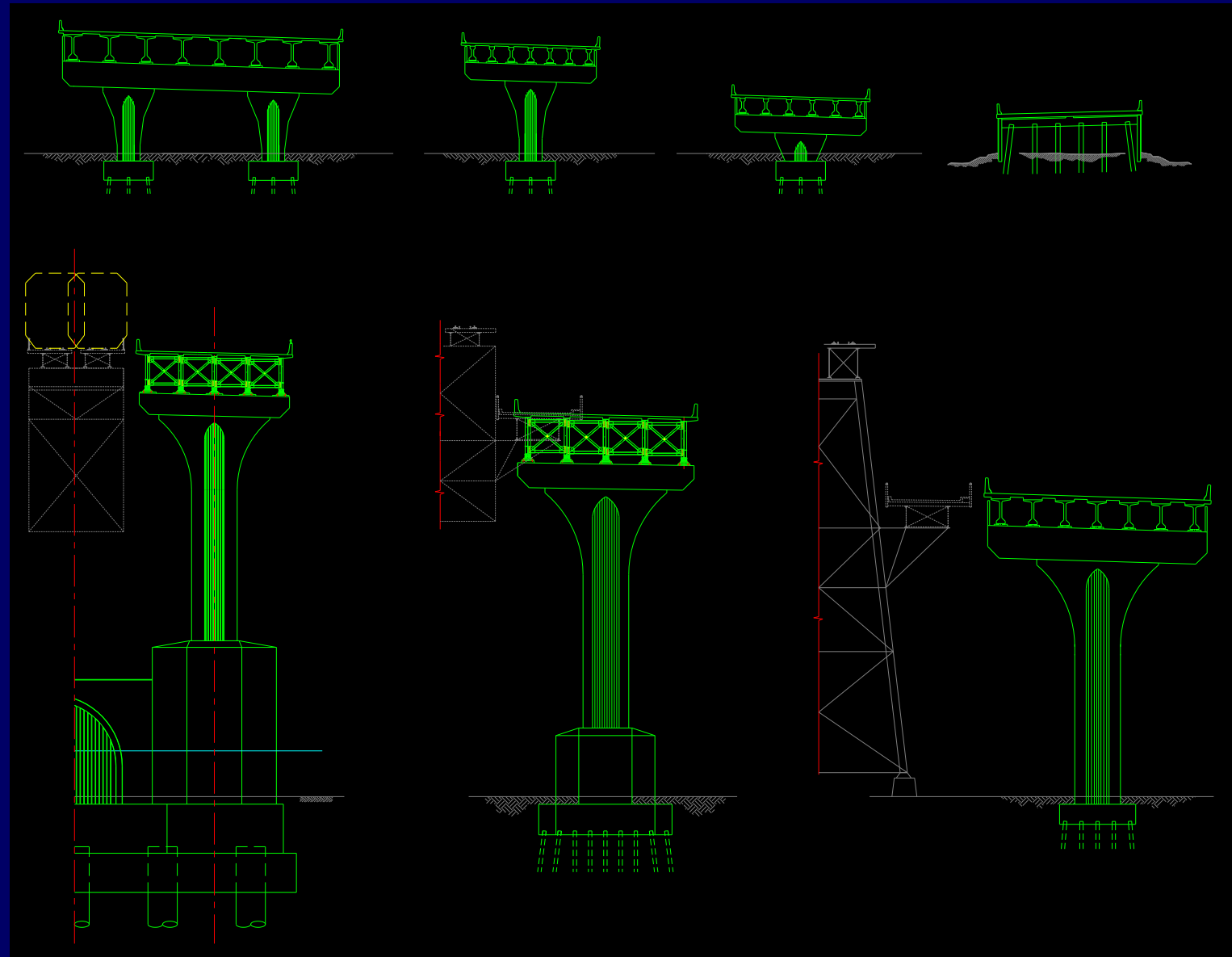


# Main Bridge Deck Widening

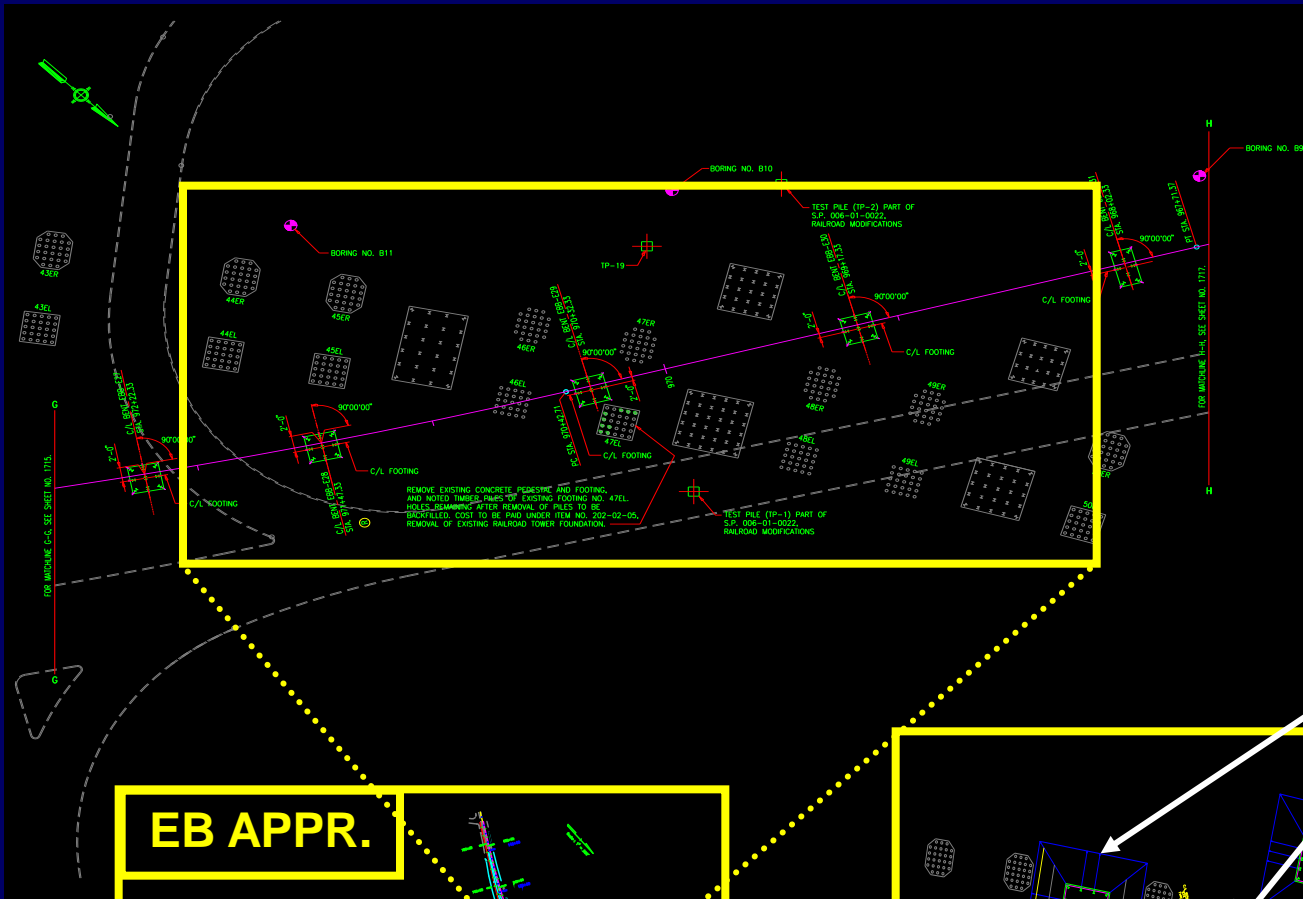


**WORK PERFORMED IN  
APPROACH CONTRACT**

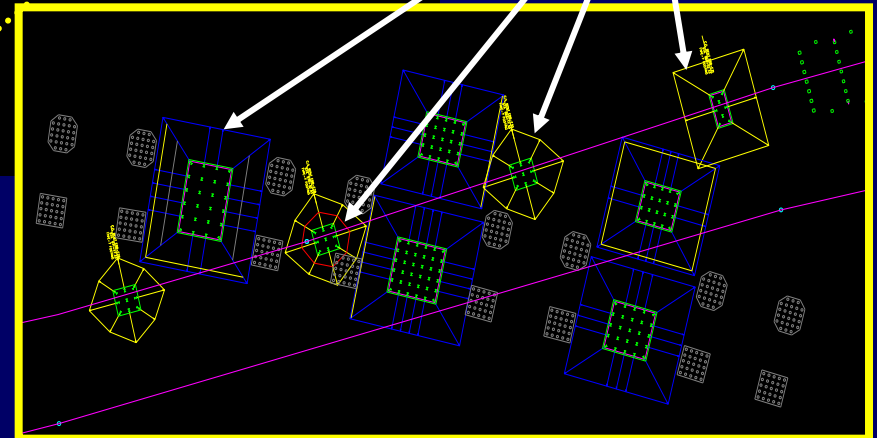
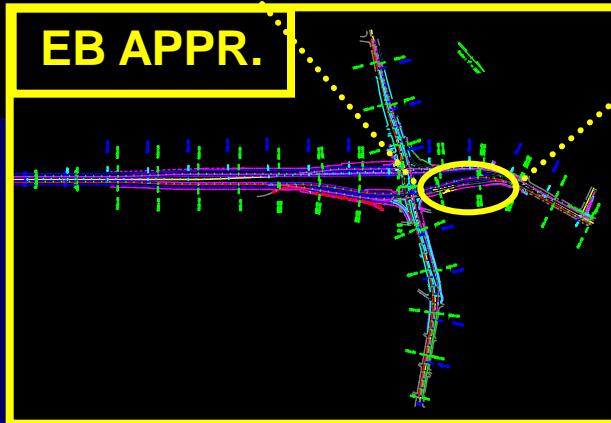
# Approaches & Deck Widening



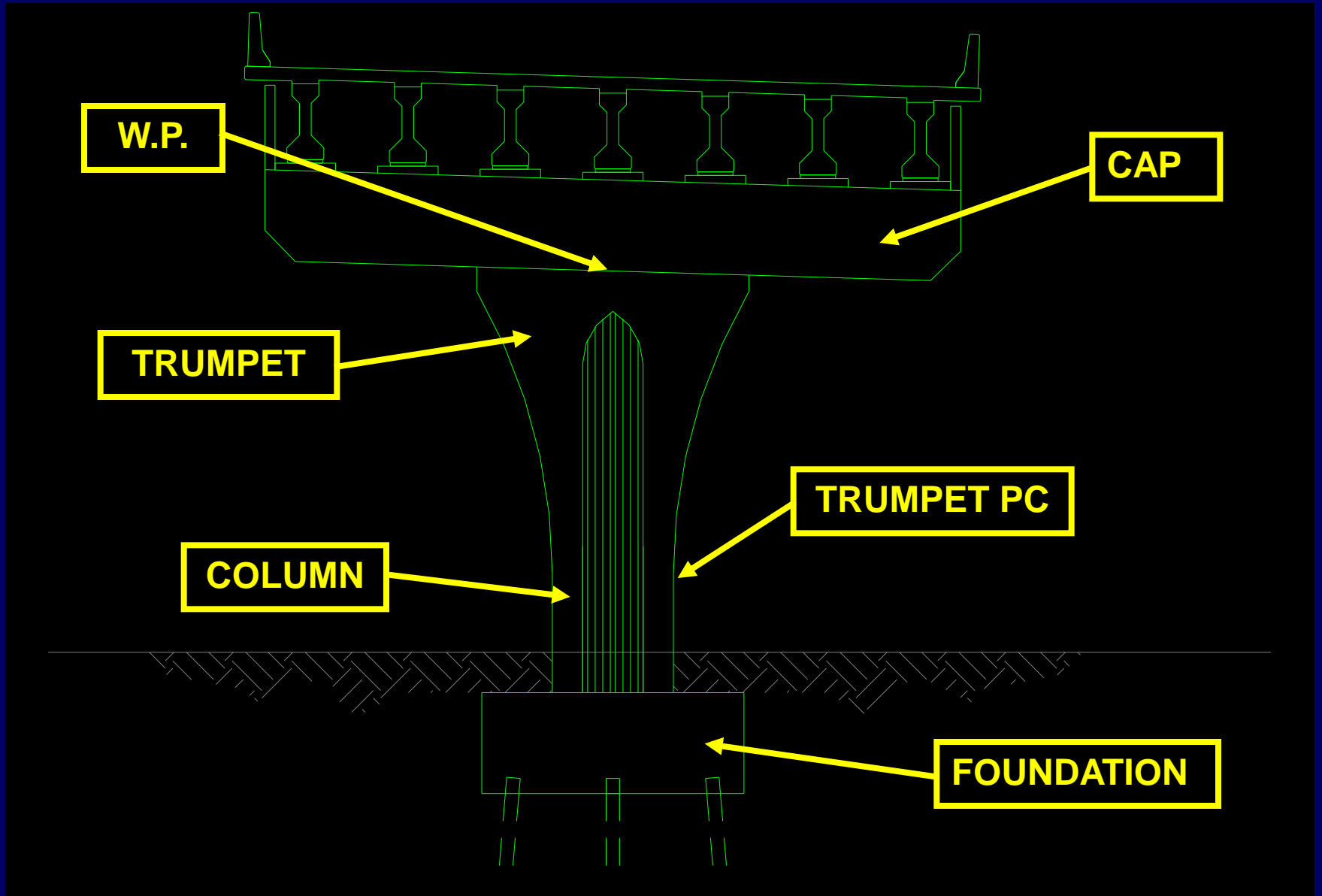
# Approaches & Deck Widening



**Pile  
Contour  
Lines at  
Various  
Elevations**

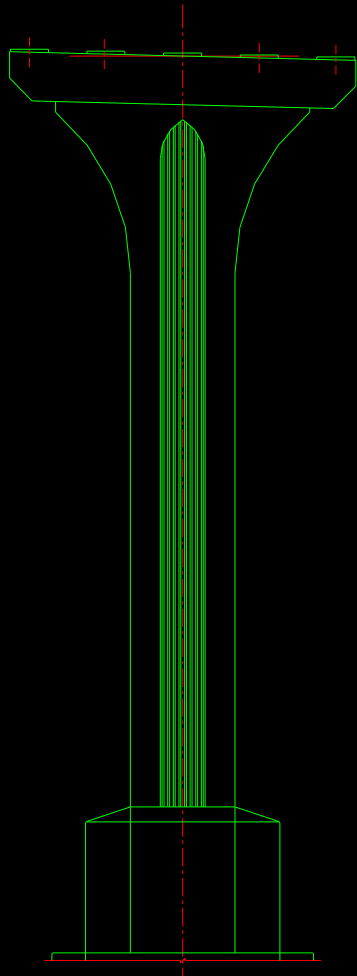


# Approaches & Deck Widening

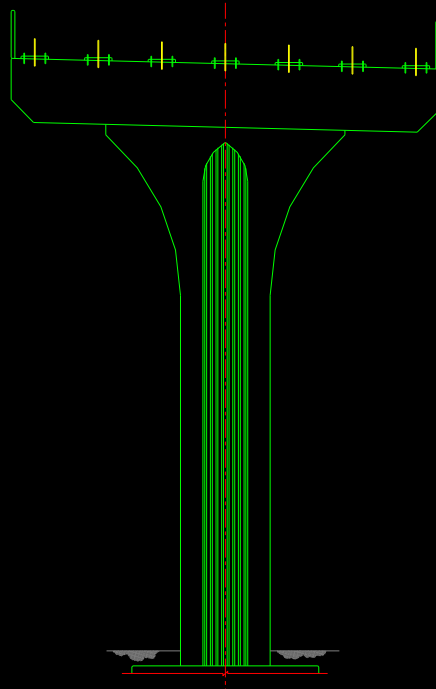


# Approaches & Deck Widening

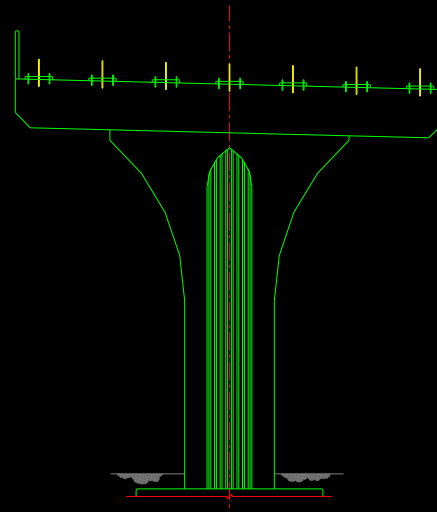
184 - TOTAL SUBSTRUCTURE UNITS  
123 - 4' X 6' COLUMN BENTS



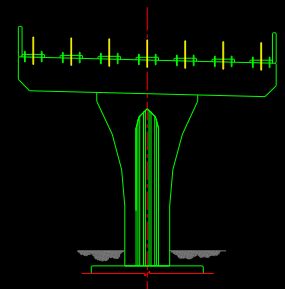
8' x 14'



8' x 12'



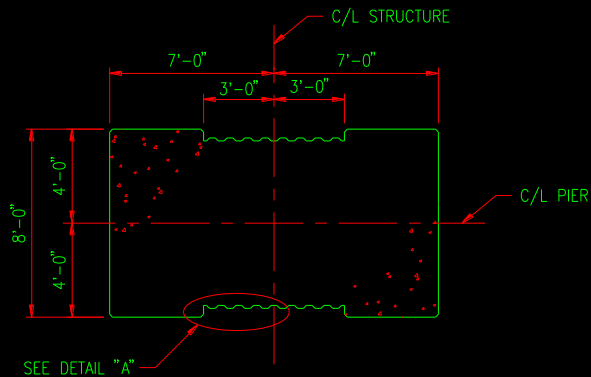
6' x 12'



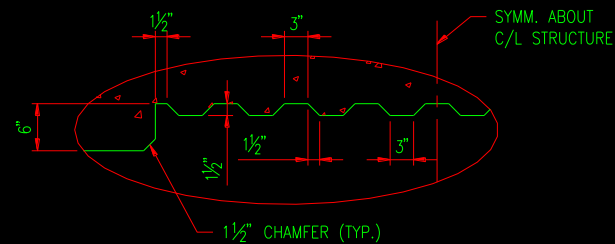
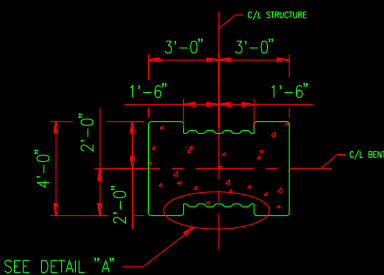
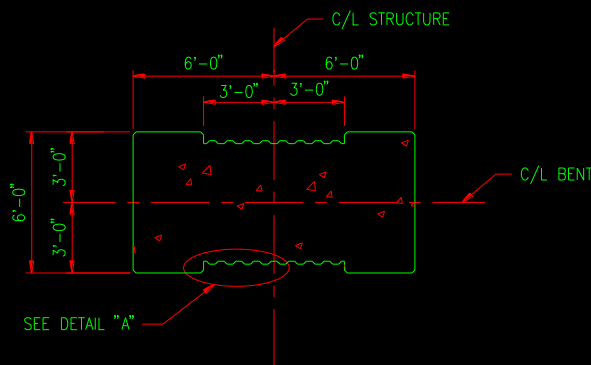
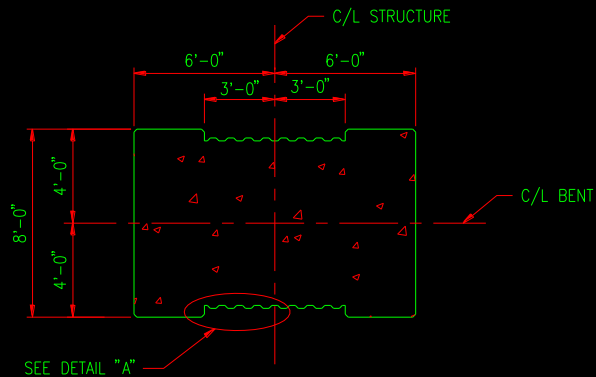
4' x 6'

# Approaches & Deck Widening

**Column Type 4: 8' x 14'**



**Column Type 3: 8' x 12'**

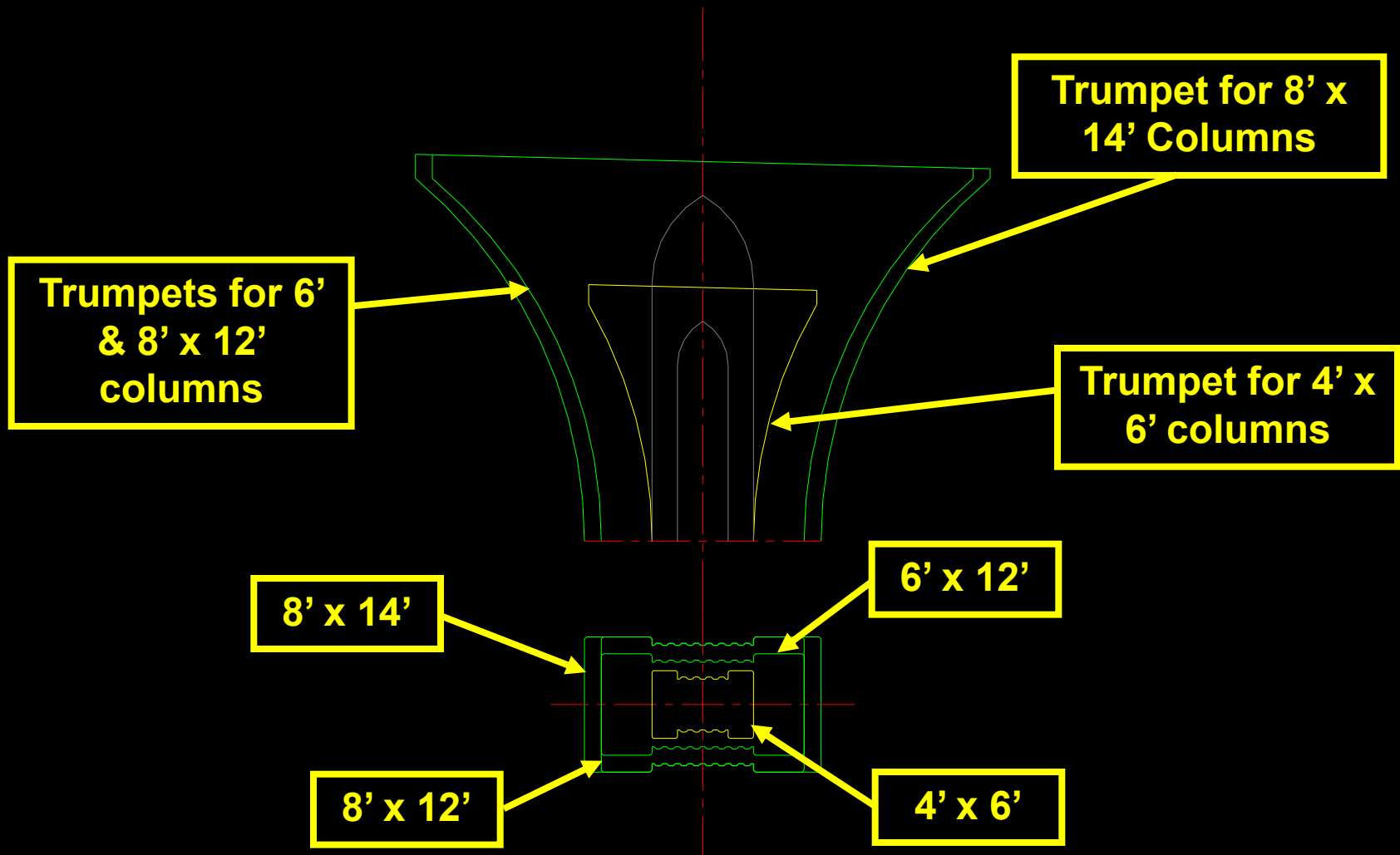


**Column Type 2: 6' x 12'**

**Column Type 1: 4' x 6'**

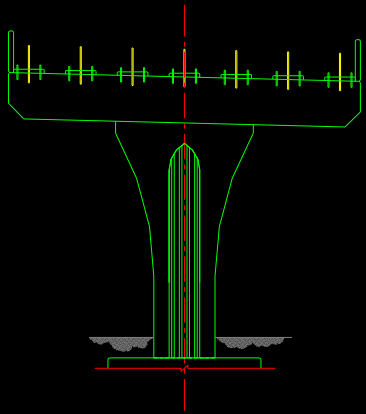


# Approaches & Deck Widening

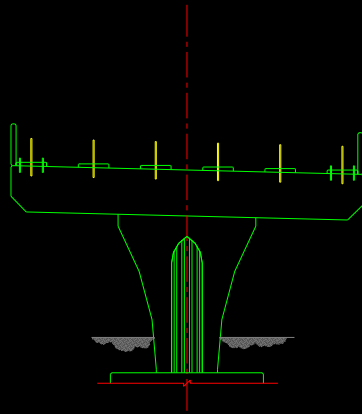


# Approaches & Deck Widening

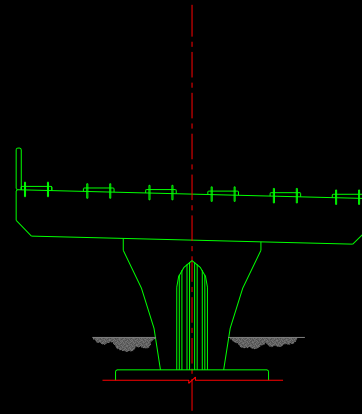
Adjust Footing Depth As Necessary



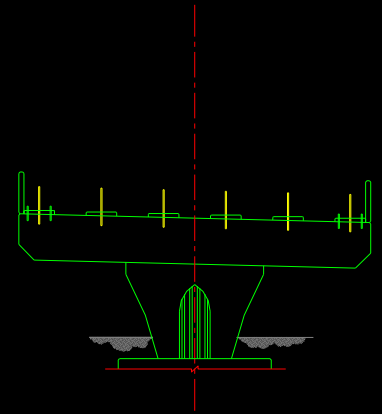
Typical Bent



Full Height Trumpet

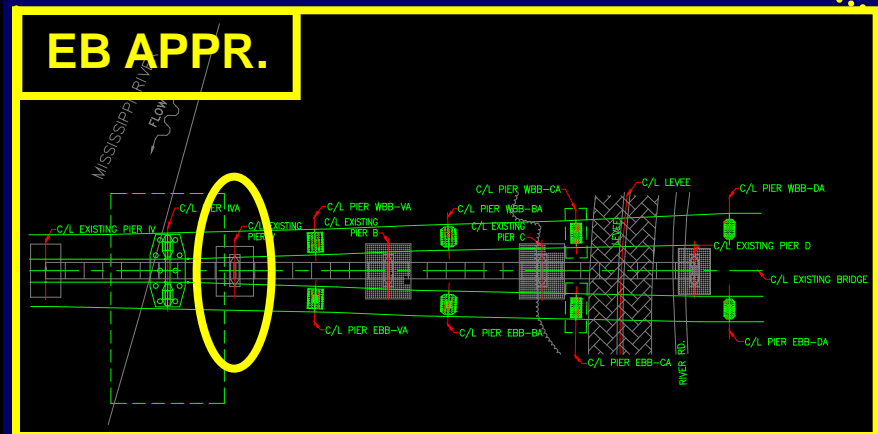
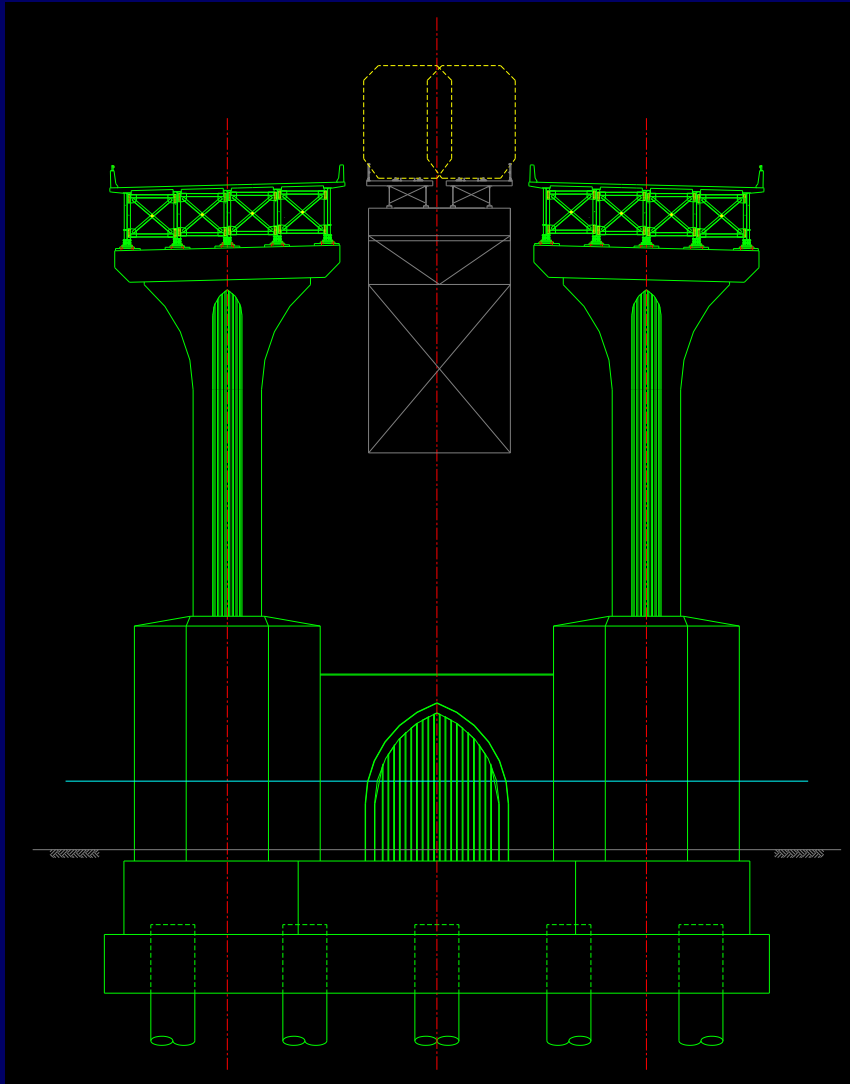


Sub-Trumpet Size 1

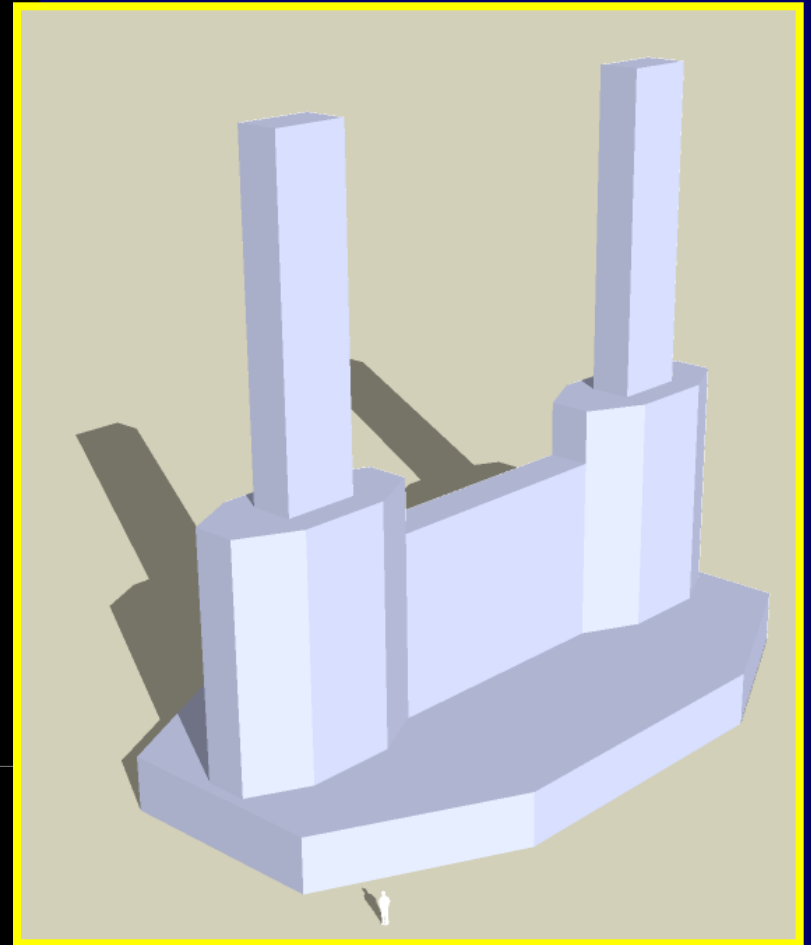
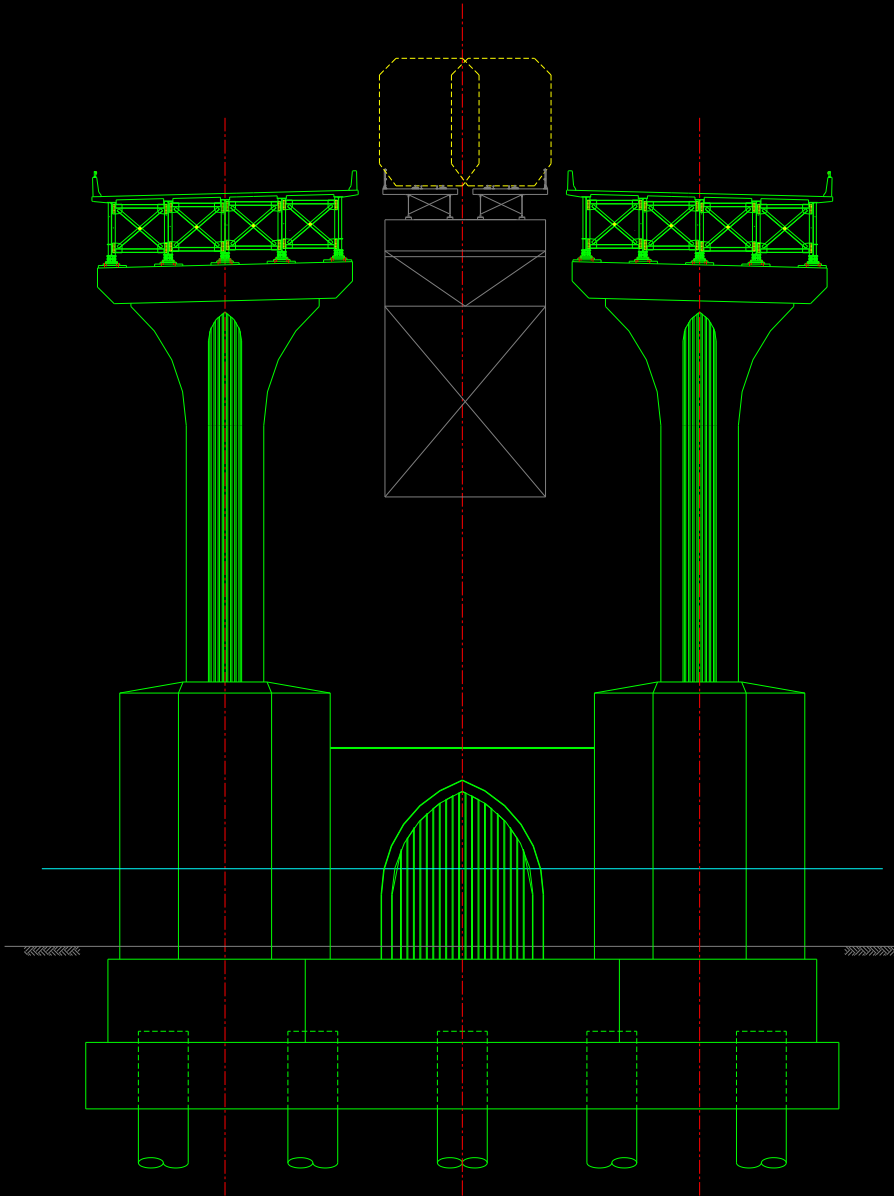


Sub-Trumpet Size 2

# Approaches & Deck Widening

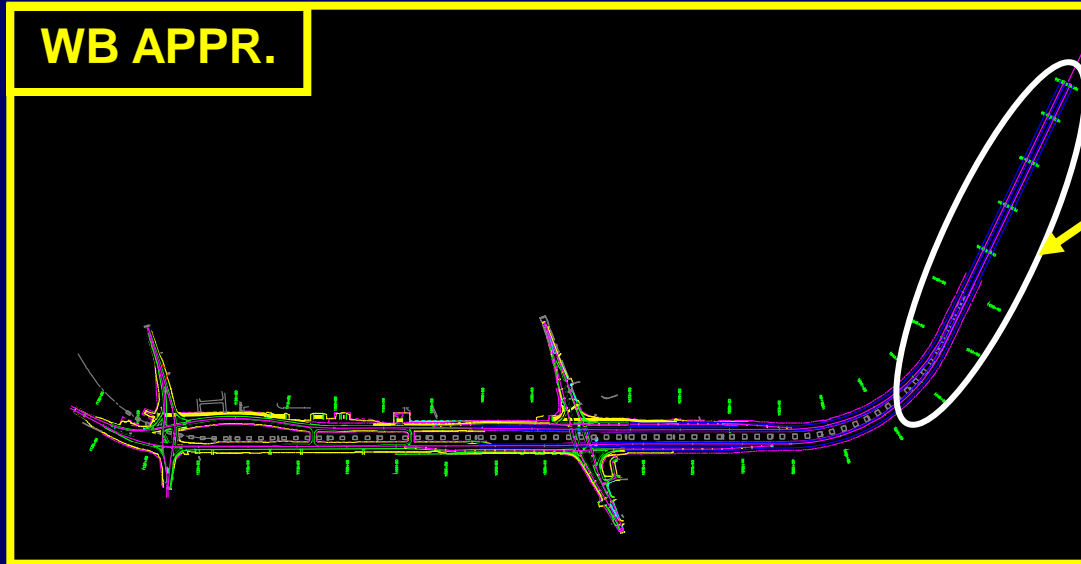


# Approaches & Deck Widening

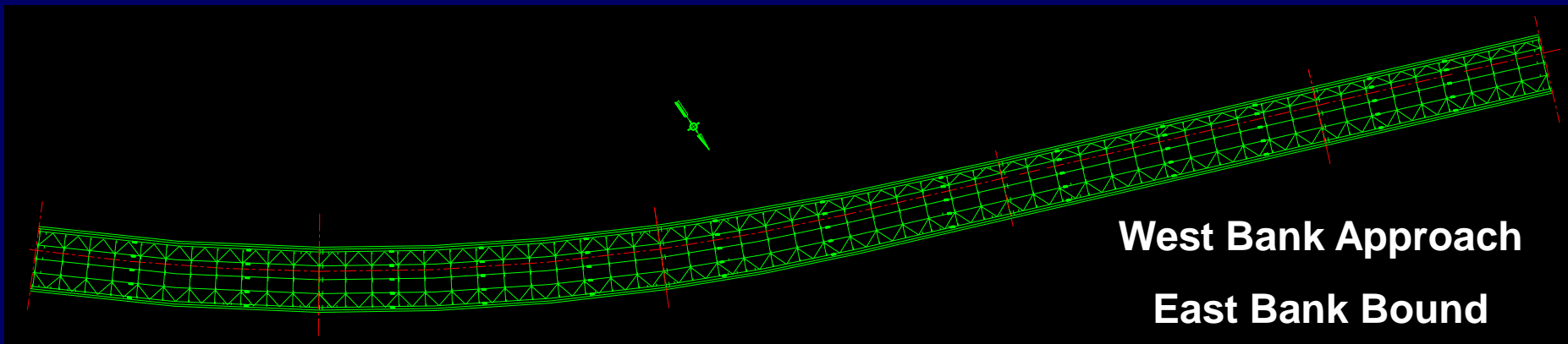


Created using Google SketchUp

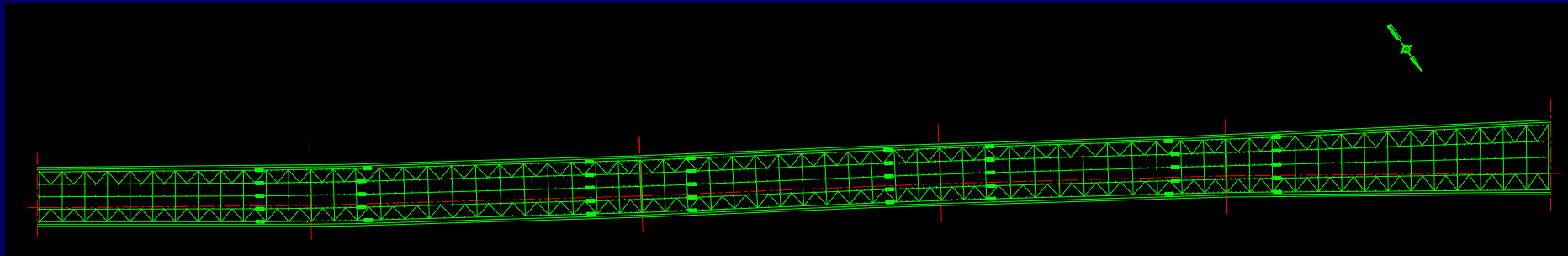
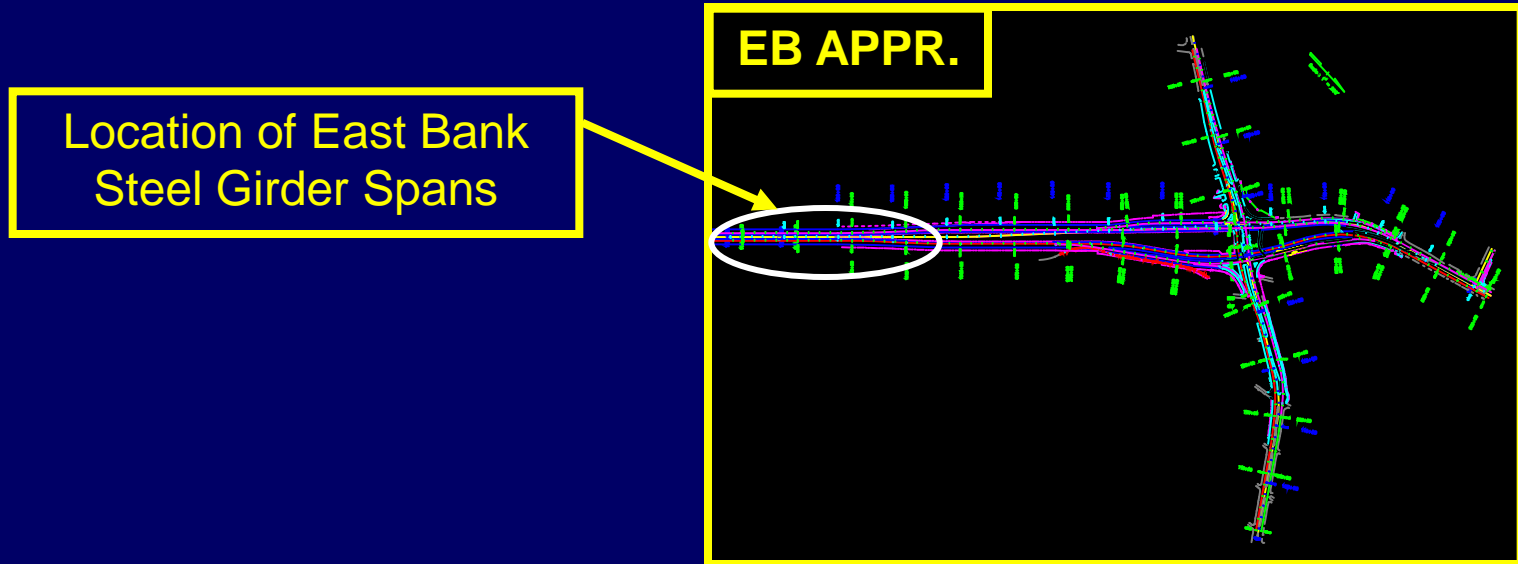
# Approaches & Deck Widening



Location of West Bank  
Steel Girder Spans



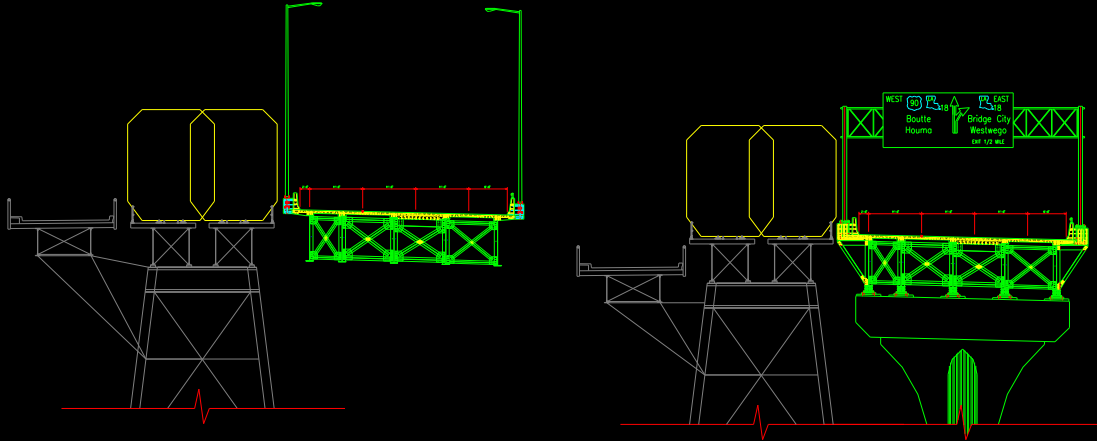
# Approaches & Deck Widening



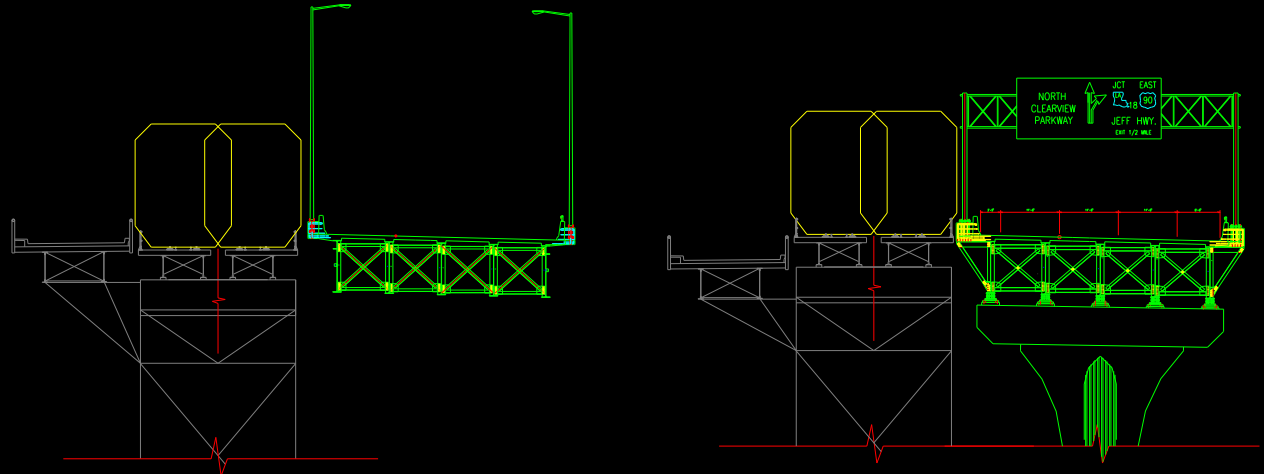
East Bank Approach

West Bank Bound

# Approaches & Deck Widening

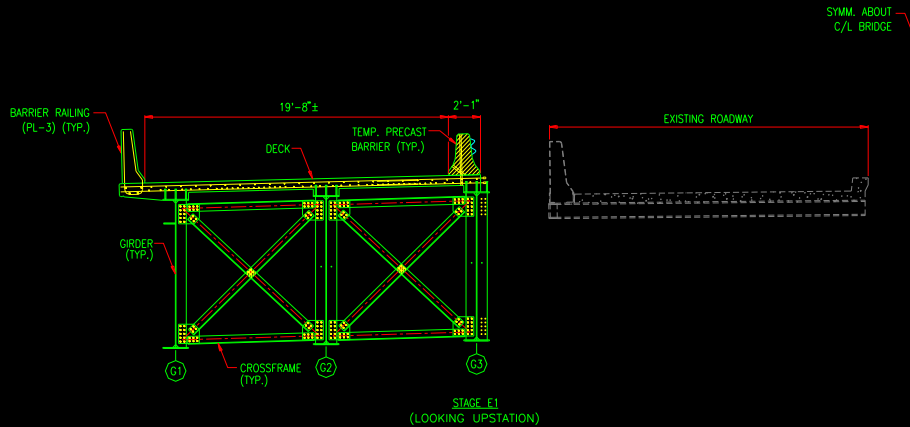


**West Bank Approach - West Bank Bound**



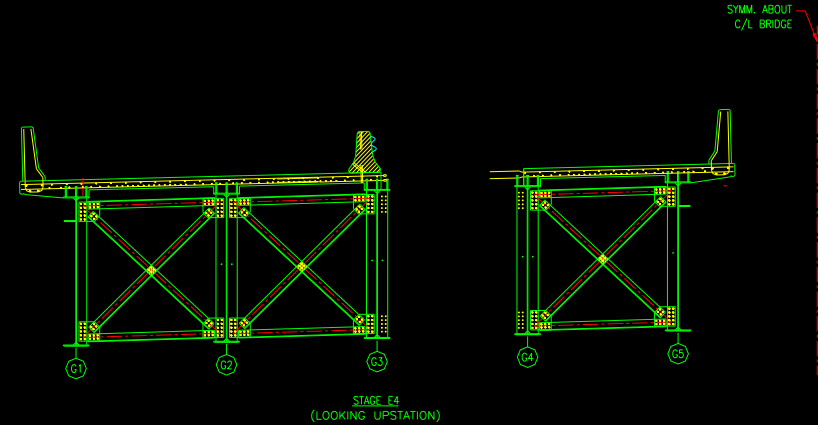
**East Bank Approach - East Bank Bound**

# Approaches & Deck Widening



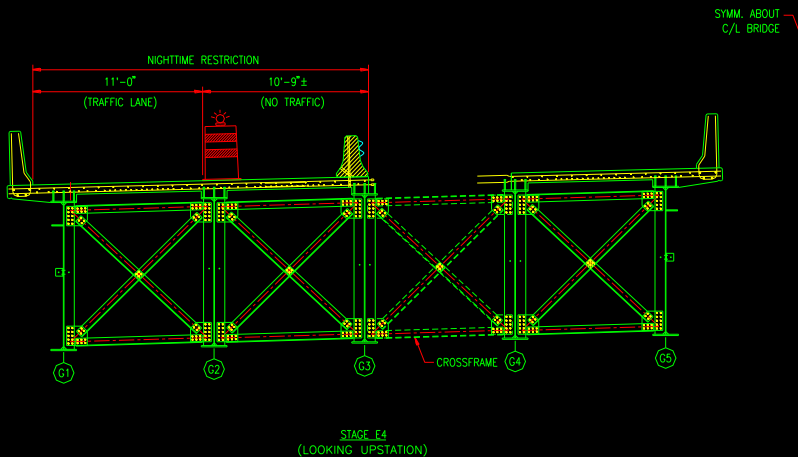
SUGGESTED SEQUENCE OF CONSTRUCTION

1. ERECT THREE (3) GIRDER UNIT (G1, G2, G3) WITH CROSSFRAMES.
2. INSTALL LATERAL BRACING BETWEEN G1 & G2.
3. POUR THREE (3) GIRDER DECK SECTION.



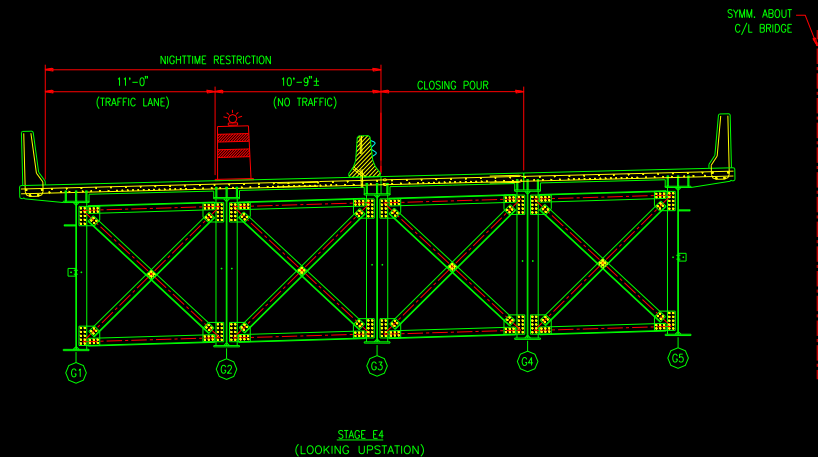
SUGGESTED SEQUENCE OF CONSTRUCTION

1. DEMOLISH EXISTING ROADWAY.
2. ERECT TWO (2) GIRDER UNIT WITH CROSSFRAMES BETWEEN G4 & G5.
3. INSTALL LATERAL BRACING BETWEEN G4 & G5.
4. POUR TWO (2) GIRDER DECK SECTION.



SUGGESTED SEQUENCE OF CONSTRUCTION

1. PROVIDE CROSSFRAMES BETWEEN G3 AND G4 DURING NIGHTTIME RESTRICTION.

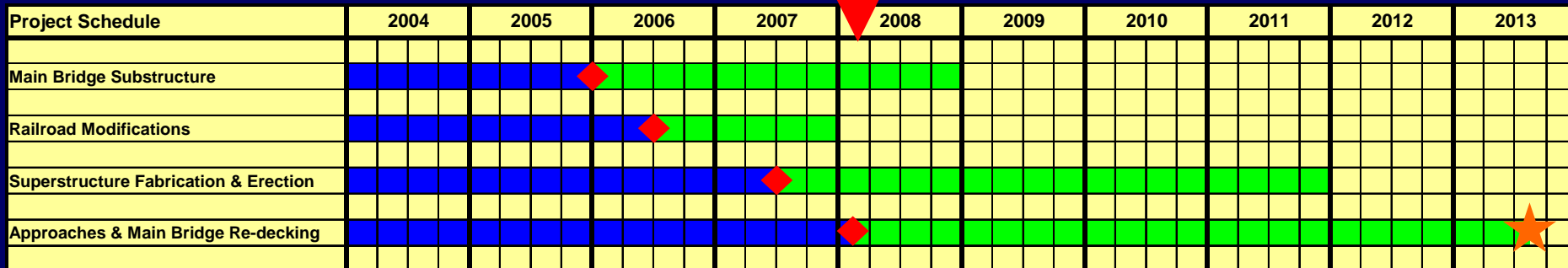


SUGGESTED SEQUENCE OF CONSTRUCTION

1. PROVIDE CLOSING POUR DURING NIGHTTIME RESTRICTION.



# Project Timeline



- Work Under Construction

- Main Bridge Pier Widening
- Railroad Modifications
- Main Bridge Truss Widening

- Work To Be Let 2008

- West Bank Approach, Main Bridge Deck Widening, East Bank Approach



# Project Status

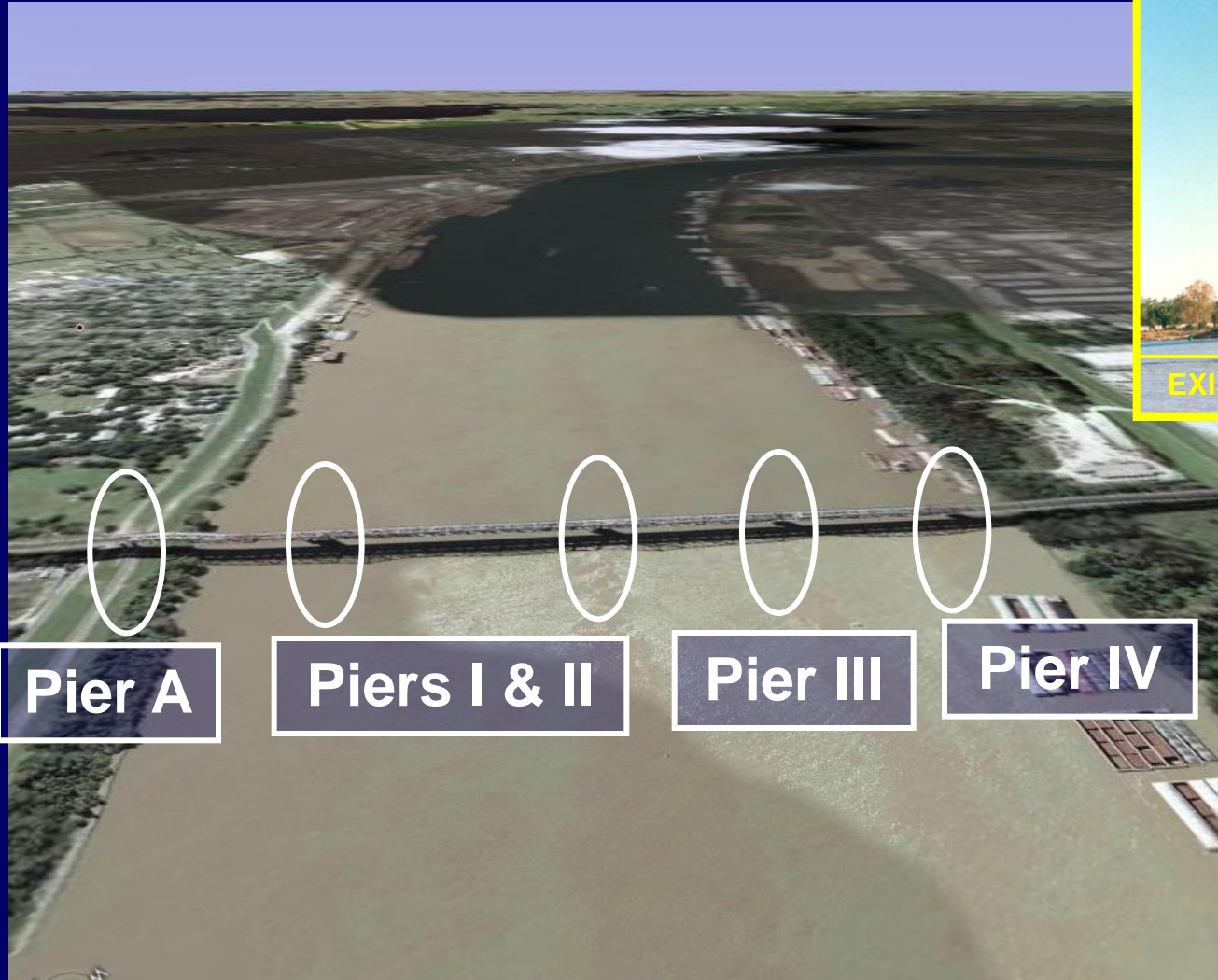
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## Main Bridge Pier Widening

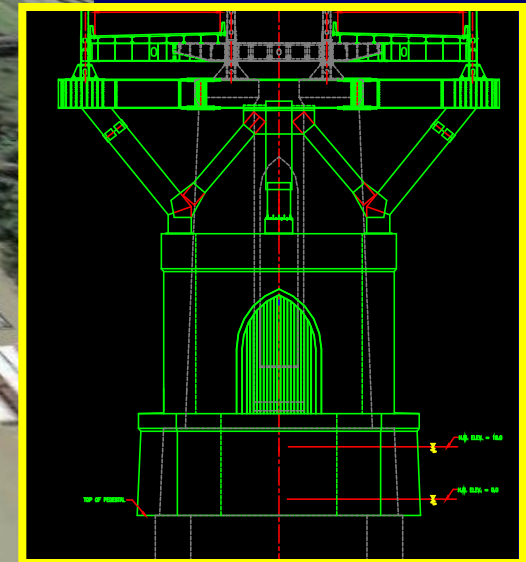
- Letting Date:
  - December 14, 2005
- Notice To Proceed Date:
  - April 10, 2006
- Construction Bid:
  - \$ 98,826,907
- Contractor:
  - Massman Construction Co.



# Main Bridge Pier Widening



EXISTING



PROPOSED WIDENING



© 2006 Europa Technologies  
Image © 2006 DigitalGlobe  
Image © 2006 TerraMetrics  
Image © 2006 Sanborn

© 2005 Google

# Main Bridge Pier Widening

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05/02/2006



# Main Bridge Pier Widening



07/01/2006



# Main Bridge Pier Widening



# Main Bridge Pier Widening



06/03/2006



# Main Bridge Pier Widening





# Main Bridge Pier Widening



# Main Bridge Pier Widening



# Main Bridge Pier Widening

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# Main Bridge Pier Widening



07/26/2006

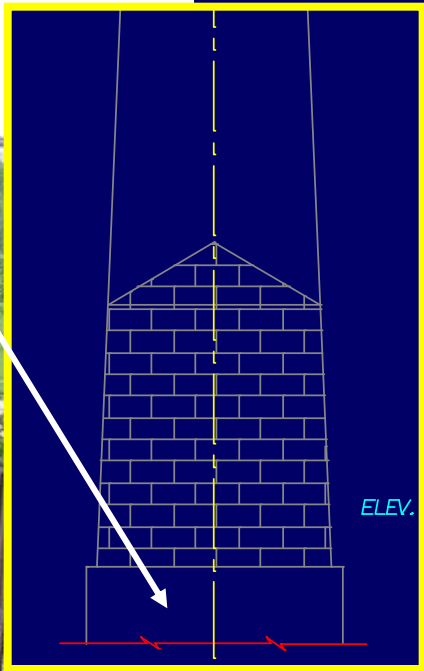
# Main Bridge Pier Widening



# Main Bridge Pier Widening



Distribution Block



# Main Bridge Pier Widening



# Main Bridge Pier Widening

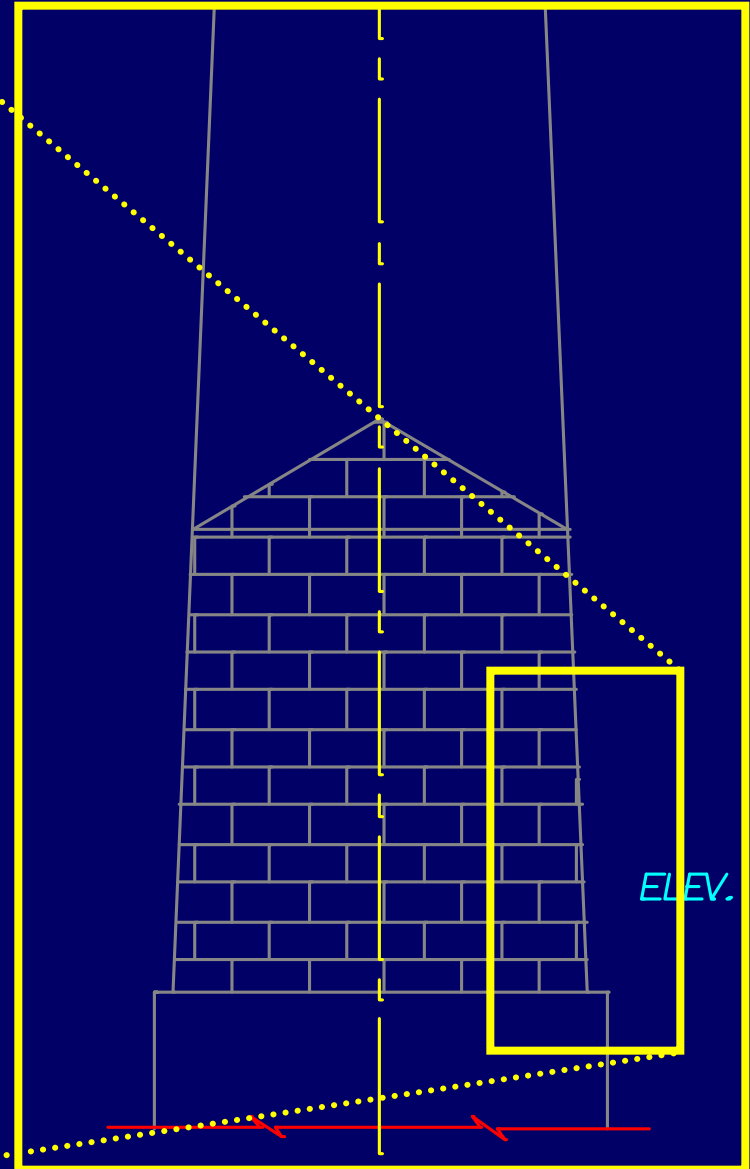




# Main Bridge Pier Widening



# Main Bridge Pier Widening



# Main Bridge Pier Widening

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08/04/2006



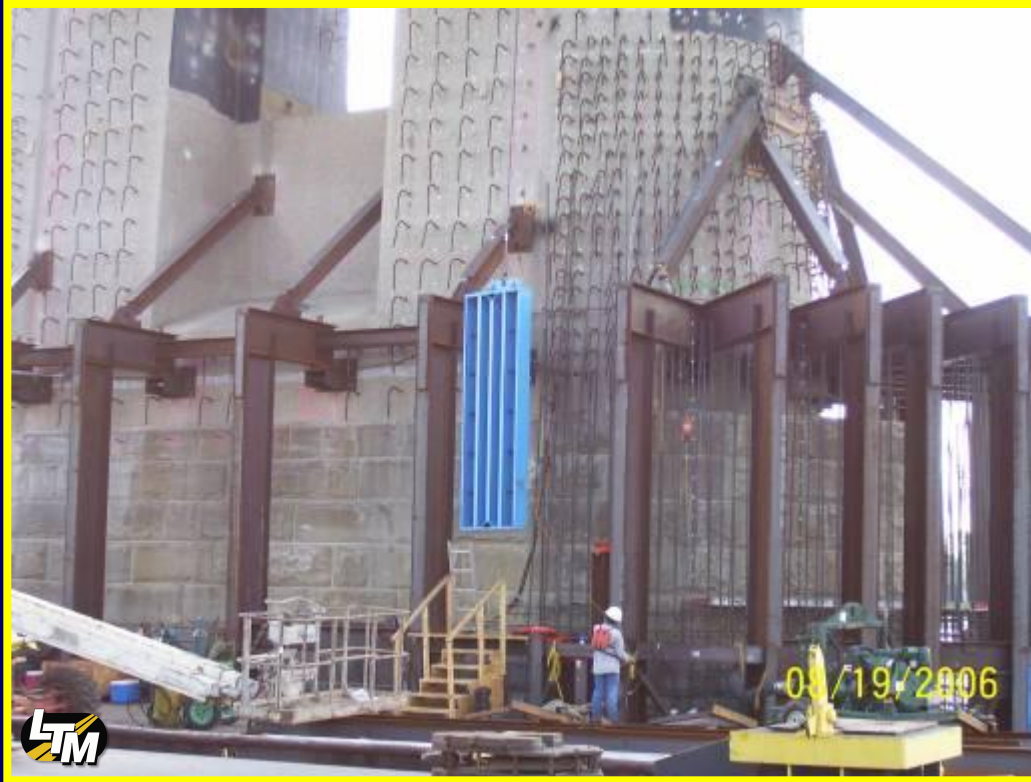
# Main Bridge Pier Widening



# Main Bridge Pier Widening



# Main Bridge Pier Widening



# Main Bridge Pier Widening



08/25/2006



# Main Bridge Pier Widening

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05/24/2006





# Main Bridge Pier Widening



# Main Bridge Pier Widening

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# Main Bridge Pier Widening



# Main Bridge Pier Widening



01/24/2007



# Main Bridge Pier Widening



09/23/2006



# Main Bridge Pier Widening



# Main Bridge Pier Widening

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09/26/2006



# Main Bridge Pier Widening

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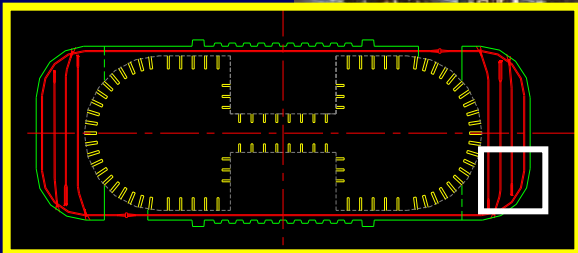
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# Main Bridge Pier Widening



# Main Bridge Pier Widening



08/07/2007



# Main Bridge Pier Widening



# Main Bridge Pier Widening



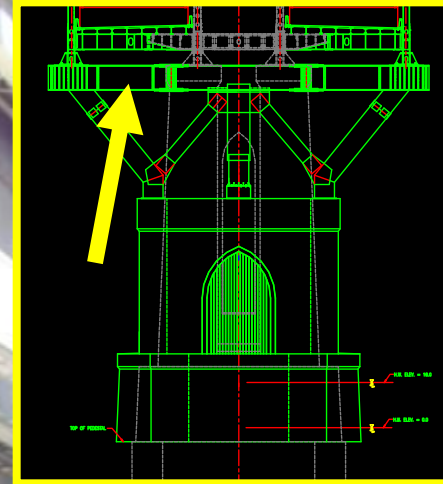
07/17/2007



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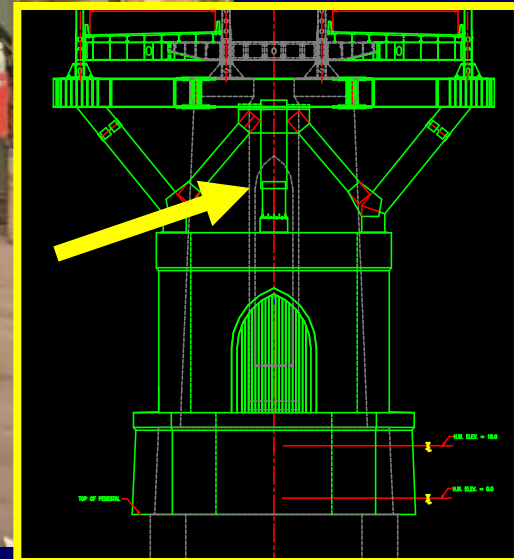


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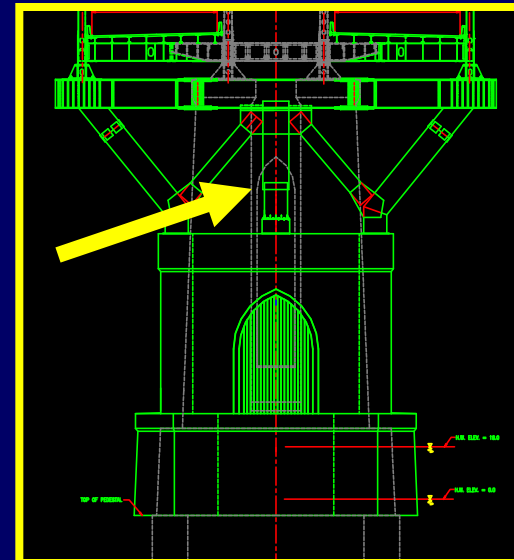




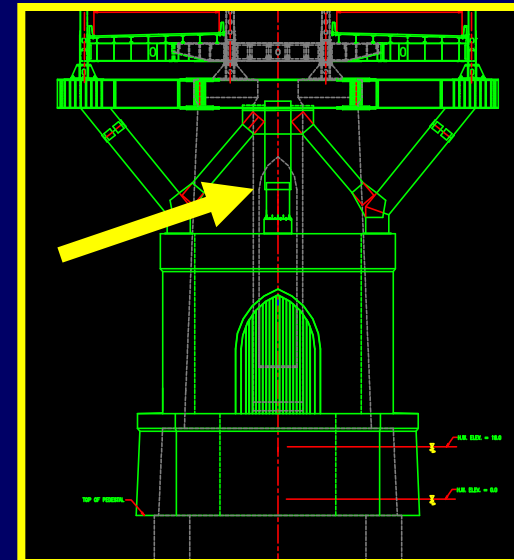
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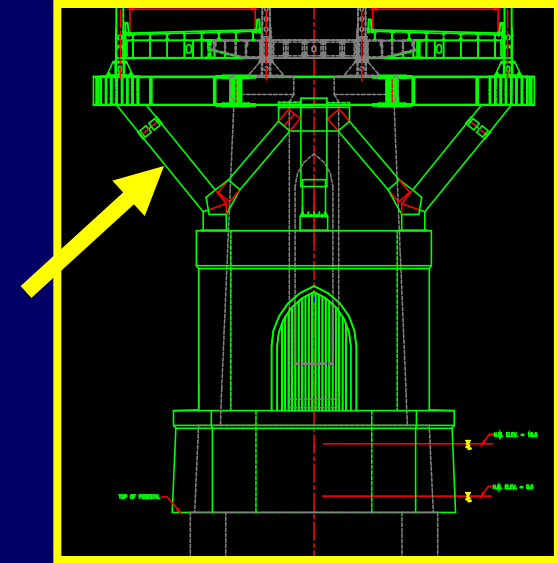
# Main Bridge Pier Widening



# Main Bridge Pier Widening



# Main Bridge Pier Widening



# Main Bridge Pier Widening



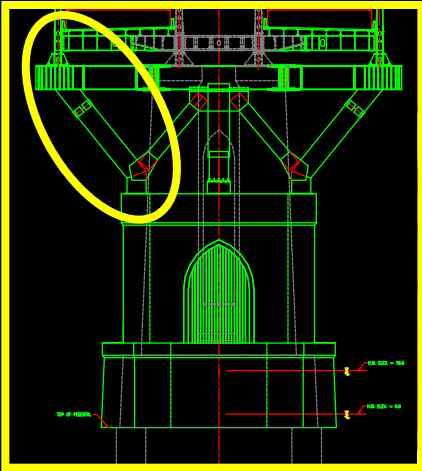
05/09/2007



# Main Bridge Pier Widening



# Main Bridge Pier Widening



# Main Bridge Pier Widening



09/12/2007  
LTM



LTM

LTM



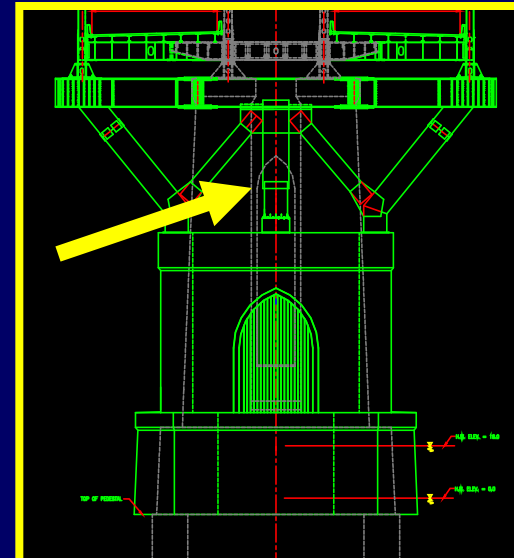
09/27/2007  
LTM



# Main Bridge Pier Widening



# Main Bridge Pier Widening

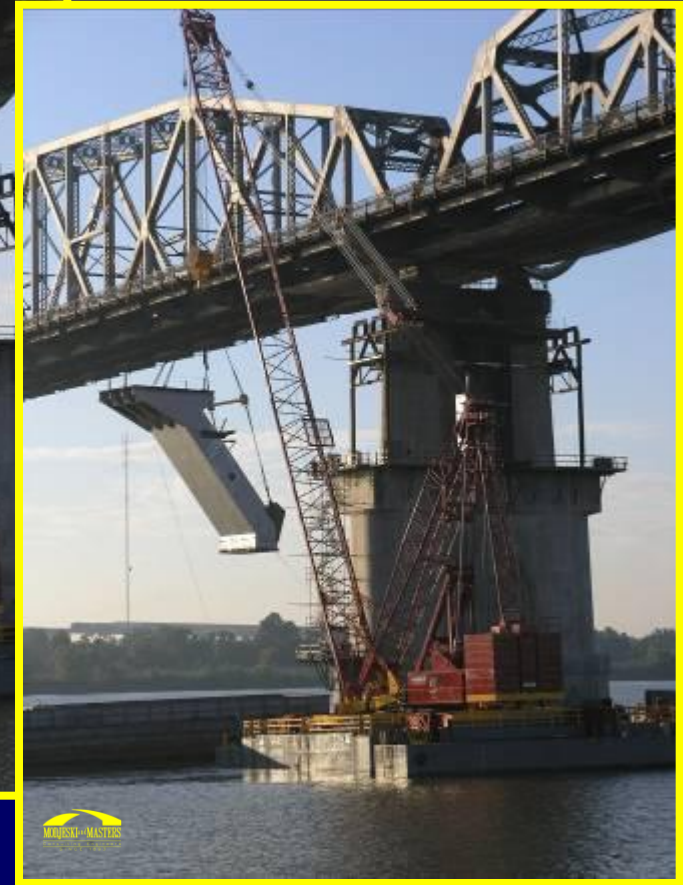
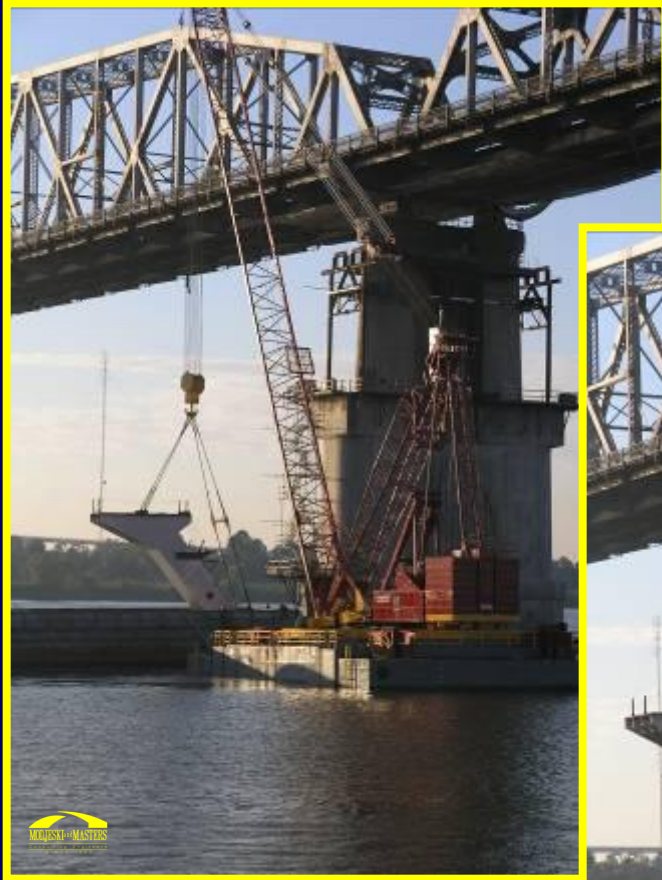


# Main Bridge Pier Widening

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# Main Bridge Pier Widening



# Main Bridge Pier Widening

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# Main Bridge Pier Widening



# Main Bridge Pier Widening



# Main Bridge Pier Widening

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# Main Bridge Pier Widening



# Main Bridge Pier Widening



# Main Bridge Pier Widening

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# Main Bridge Pier Widening

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# Main Bridge Pier Widening



# Main Bridge Pier Widening



12/07/2007



# Main Bridge Pier Widening

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# Main Bridge Pier Widening

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# Project Status

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## Railroad Modifications

- Letting Date:
  - May 10, 2006
- Notice To Proceed Date:
  - August 28, 2006
- Construction Bid:
  - \$ 13,782,713
- Contractor:
  - Boh Bros. Construction Co.



# Railroad Modifications - Westbank



**Project Site**

**Railroad**

**LA 18**

**Hwy. 90**



**EXISTING**



# Railroad Modifications - Westbank



# Railroad Modifications - Westbank



# Railroad Modifications - Westbank

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# Railroad Modifications - Westbank



# Railroad Modifications - Westbank

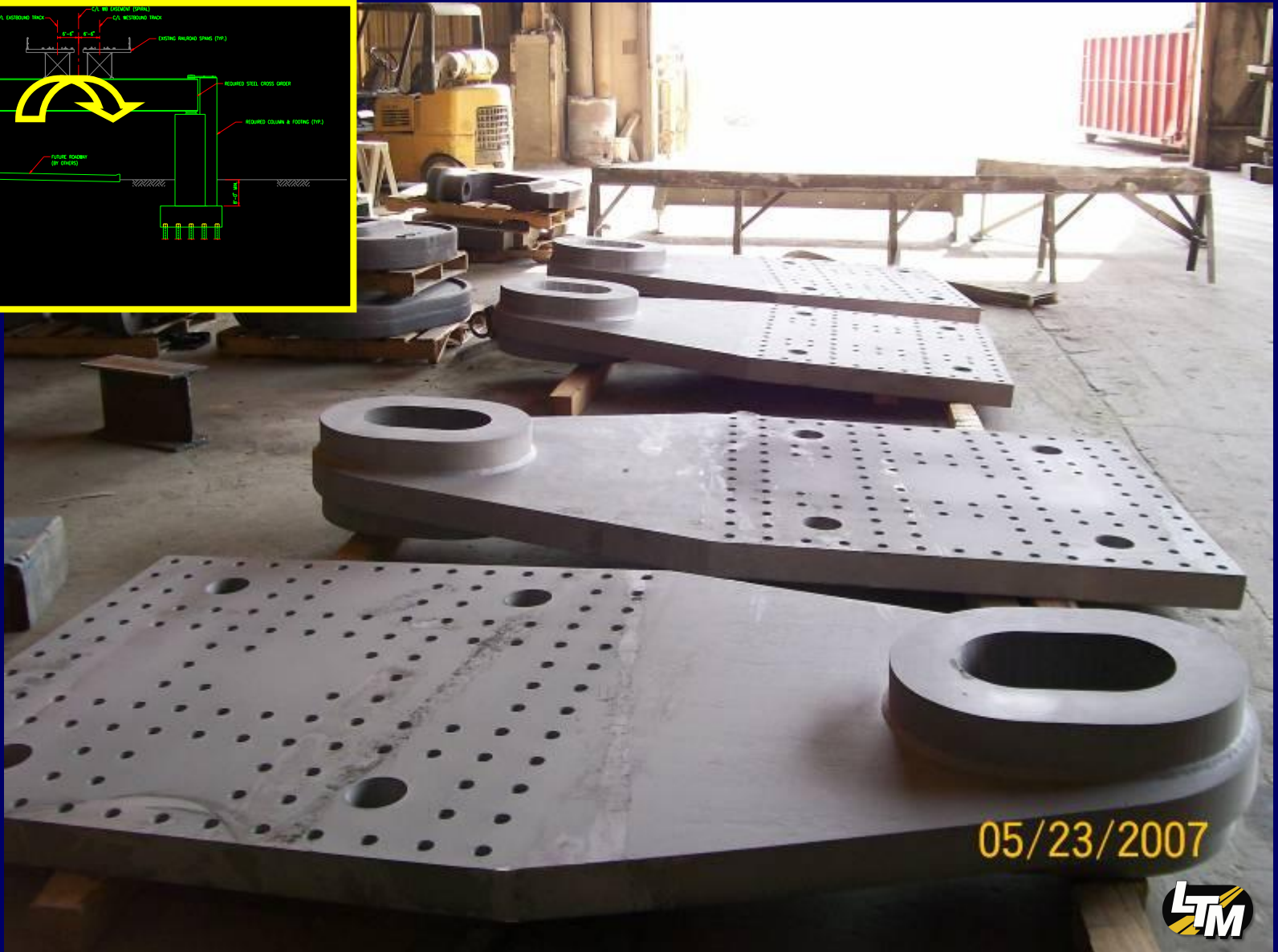
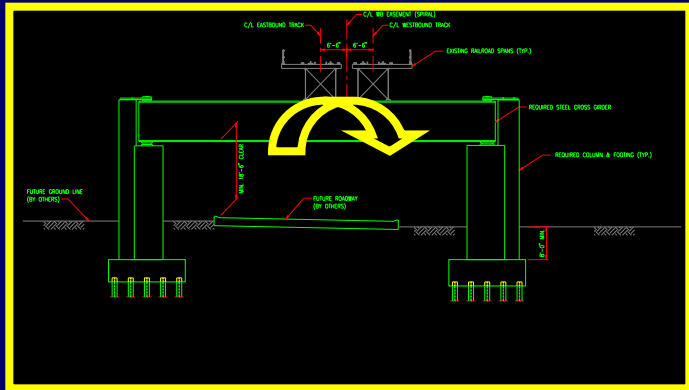








# Railroad Modifications - Westbank



05/23/2007



# Railroad Modifications - Eastbank



# Railroad Modifications - Eastbank

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# Railroad Modifications - Eastbank

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# Huey P. Long Widening Project Eastbank Railroad Modifications



# Huey P. Long Widening Project Eastbank Railroad Modifications



# Railroad Modifications - Eastbank





# Railroad Modifications - Eastbank



# Railroad Modifications - Eastbank



# Railroad Modifications - Eastbank



# Project Status

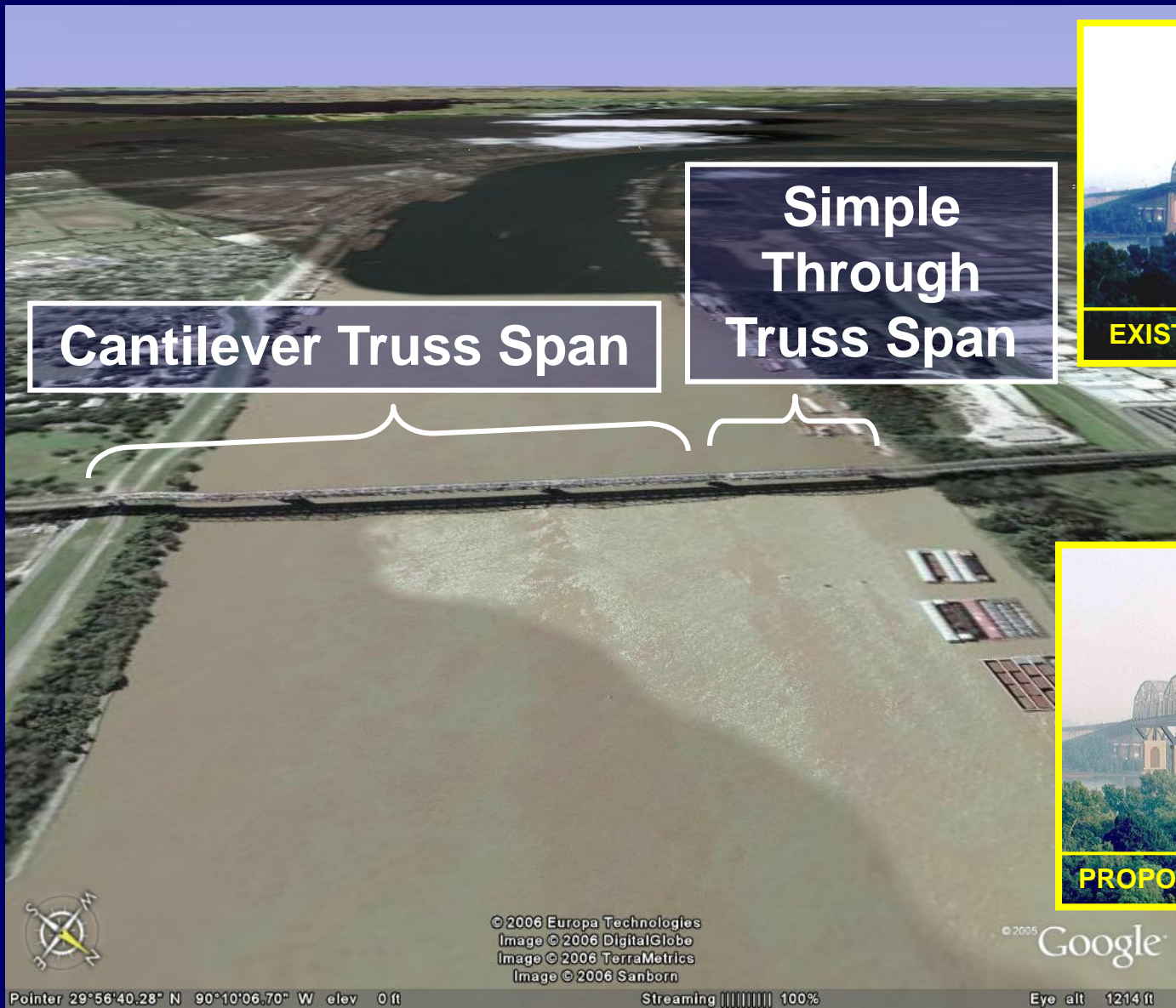
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## Main Bridge Truss Widening

- Letting Date:
  - March 28, 2007
- Notice to Proceed Date:
  - November 5, 2007
- Construction Bid:
  - \$ 452,605,568
- Contractor:
  - Massman Construction Co., Traylor Brothers Inc., and IHI, Inc.



# Main Bridge Truss Widening



# Main Bridge Truss Widening



# Project Status

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## West Bank Approach, Main Bridge Deck Widening, East Bank Approach

- Letting Date:
  - March 19, 2008
- Estimated Construction Cost:
  - \$ 400 to \$ 425 Million

# Acknowledgements

---



**Ray Mumphrey**

Project Manager, Bridge Engineer  
Manager

**Jan Grenfell**

Environmental Representative

**Hossein Ghara**

Bridge Engineer

**Tony Ducote**

Project Management Administrator



# Acknowledgements

---



J. Bridger

General Manager

A. Marinello

Chief Engineer

R. Kollmar

Assistant Chief Engineer

S. Sponsel

General Superintendent,  
Bridge

M. Dumas

Bridge Supervisor

# Acknowledgements

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Juan Murillo

D. McDaniels

B. Frederick

T. Todd

W. Aymond

# Design Team

---

## EUSTIS ENGINEER (Geotechnical)

- Gwen Sanders
- William Gwyn

## COASTAL ENVIRONMENTS (Environmental)

- Karen Wicker
- Ed Fike
- D.Kelley

## Coco Architects (HAER / HABS)

- Wayne L. Coco, AIA

## GCR & Associates (Real Estate)

- Gregory Rigamer
- Mona Nosari

## Riverlands Surveying

- Stephen Flynn

# Design Team – M & M

---



- W. B. Conway
- D. F. Sorgenfrei
- Z. Prucz
- N. Soong
- B. E. Peterson
- M. L. Sternitzke
- Y. Ouyang
- S. P. Carr
- D. A. Kanger
- C. J. Ledet
- G. P. Doyle
- G. P. Taravella
- T. A. Cole
- J. A. Martin
- J. J. Moore
- R. Mertz
- R. Jackson
- A. Temeles
- J. E. Schade
- B. T. Martin
- L. V. Borden
- G. L. Fasick

# Widening of the Huey P. Long Bridge

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2008 LTRC Seminar Series

Bridge Structures