IOWA DOT

Getting You There

Improving the Council Bluffs Interstate System

GETTING YOU THERE: IMPROVING THE COUNCIL BLUFFS INTERSTATE SYSTEM | IOWA DOT

Council Bluffs Interstate System Improvement Program: A Modernized Gateway Reaches Completion

The Council Bluffs Interstate System Improvement Program nears completion following more than a decades-long endeavor by the Iowa Department of Transportation (DOT) to modernize and improve over 14 miles of interstate, including I-80, I-29, and I-480. This multi-stage project has transformed the transportation landscape of the Council Bluffs area, with a focus on safety, efficiency, and future growth.

A testament to long-term planning, collaboration, and engineering expertise, the Program serves as a model for large-scale infrastructure projects. It showcases how thoughtful planning and execution can significantly improve a region's transportation network and economic vitality. By addressing traffic congestion and enhancing mobility, the Program will benefit residents, commuters, and visitors for years to come, ultimately improving the overall quality of life in the Council Bluffs metropolitan area.

IOWA DOT

Council Bluffs Interstate System Improvement Program

IOWA DOT

Contents


Bass Pro Shops

> A Program like this brings progress. Community infrastructure is a sign of progress, and I think we've done that with this Program"
>
> —SCOTT SCHRAM, IOWA DOT DISTRICT 4 ENGINEER

As your friends and neighbors, the Iowa DOT is committed to making your life better through transportation. We connect communities, support economic activity, and provide pathways for you to fully enjoy opportunities available to you. We are driven to provide the safest and most technologically advanced experiences to support your mobility with as little disruption as possible.

SECTION 01

MAKING LIVES BETTER

Program Goals

29

80

480

511 IA

MODERNIZE & IMPROVE 14 MILES OF INTERSTATE

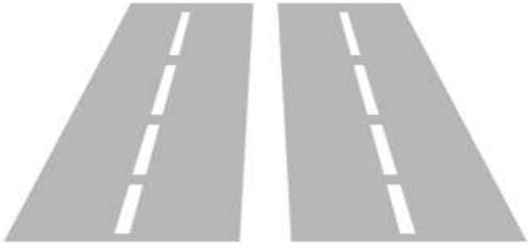
REDUCE TRAFFIC CONGESTION

ACCOMMODATE PLANNED DEVELOPMENTS ALONG TRANSPORTATION CORRIDORS

47
Bridges

12
Interchanges

14
Centerline Miles*



146
Highway Lane Miles*

As the Council Bluffs Interstate System Improvement Program nears the end of construction, it is important to reflect on the significant investment that the Iowa Division of the Federal Highway Administration (FHWA) and Iowa Transportation Commission has made to the local transportation infrastructure. This investment has had a profound impact on our community, both in terms of physical improvements to the interstate system and the resulting economic and social benefits.

The $1.5 billion Council Bluffs Interstate System Improvement Program was designed to –

- Modernize and improve 14 miles of interstate
- Accommodate planned developments
- Reduce congestion
- Improve mobility
- Increase traveler safety

It included the state's most innovative transportation solutions – the area's first Dual, Divided Freeway; Iowa's largest, most complex interstate reconstruction program to date; first project to use tiered environmental permitting; first use of critical path method (CPM) scheduling; and the first Iowa DOT project to use a Program Manager/General Engineering Contractor (PM/GEC). The new widened lanes and shoulders, new bridges and interchanges, improved drainage and lighting, and aesthetic enhancements have all made our interstate system safer, more efficient, and visually appealing.

Implementing this Program was a true feat of engineering. Efforts included relocating multiple Class I railroads, management through multiple flood events, designing complex bridge structures, traversing multiple waterways, moving an astronomical quantity of material, and maintaining traffic on one of America's most vital transportation corridors. Several phases of the Program were completed under budget and ahead of schedule – providing a blueprint for large-scale interstate rehabilitation and modernization efforts within a dense urban corridor, requiring coordination with dozens of agencies and ongoing communication with stakeholders and the traveling public.

This investment has transformed our community. Commuters, visitors, and freight travel through this area safely and more efficiently. Transportation system improvements have helped the local economy attract both new businesses and residents.

*Centerline Miles represent the total length of a given road from its starting point to its end point. Lane Miles measure the total length and lane count of a given highway or road (Lane Miles = Centerline Miles X number of lanes).

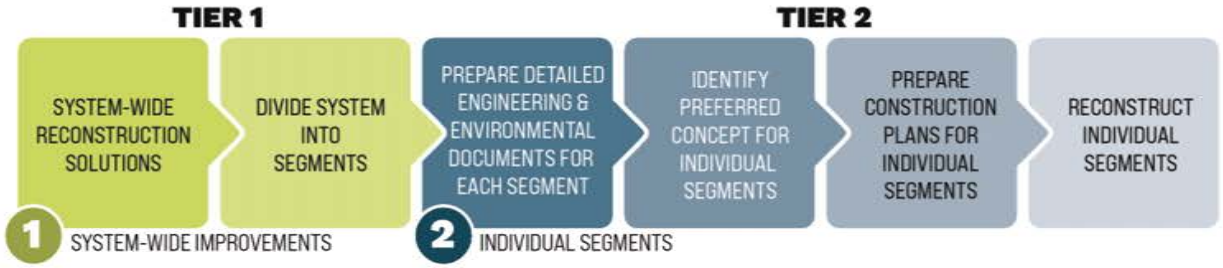
The Council Bluffs Interstate System was constructed as part of the Eisenhower Interstate System and was developed to the design standards of the 1960s. Apart from routine maintenance in the 1980s and 1990s, it remained virtually unchanged until the early 2000s.

SECTION 02

HISTORY

Construction of the Missouri River Bridge between Omaha and Council Bluffs, November 1964

In 2008, the interstate system in Council Bluffs carried 75,000 vehicles a day, but was designed for half that amount. Packed with traffic and frequent crashes, the corridor no longer met current design standards, guidelines or operational criteria; lacked operational capacity; and could not accommodate expected growth. It needed an overhaul.



Studies, Planning, and More Studies

NEEDS ASSESSMENT

In 1997, the city of Council Bluffs and Metropolitan Area Planning Agency (MAPA) conducted a study of the interstate system in Council Bluffs. The Council Bluffs Interstate System Needs Study, completed in 1999, indicated that many interstate features were outdated and did not meet today's design standards, guidelines, or operational criteria. Additionally, the system did not provide adequate vehicle capacity for current and future traffic.

ENVIRONMENTAL STUDIES AND PRELIMINARY DESIGN

In 2002, Iowa DOT initiated the Council Bluffs Interstate System Improvement Program to address issues raised by the Council Bluffs Interstate System Needs Study and developed solutions for improving the interstate system in the metro area.

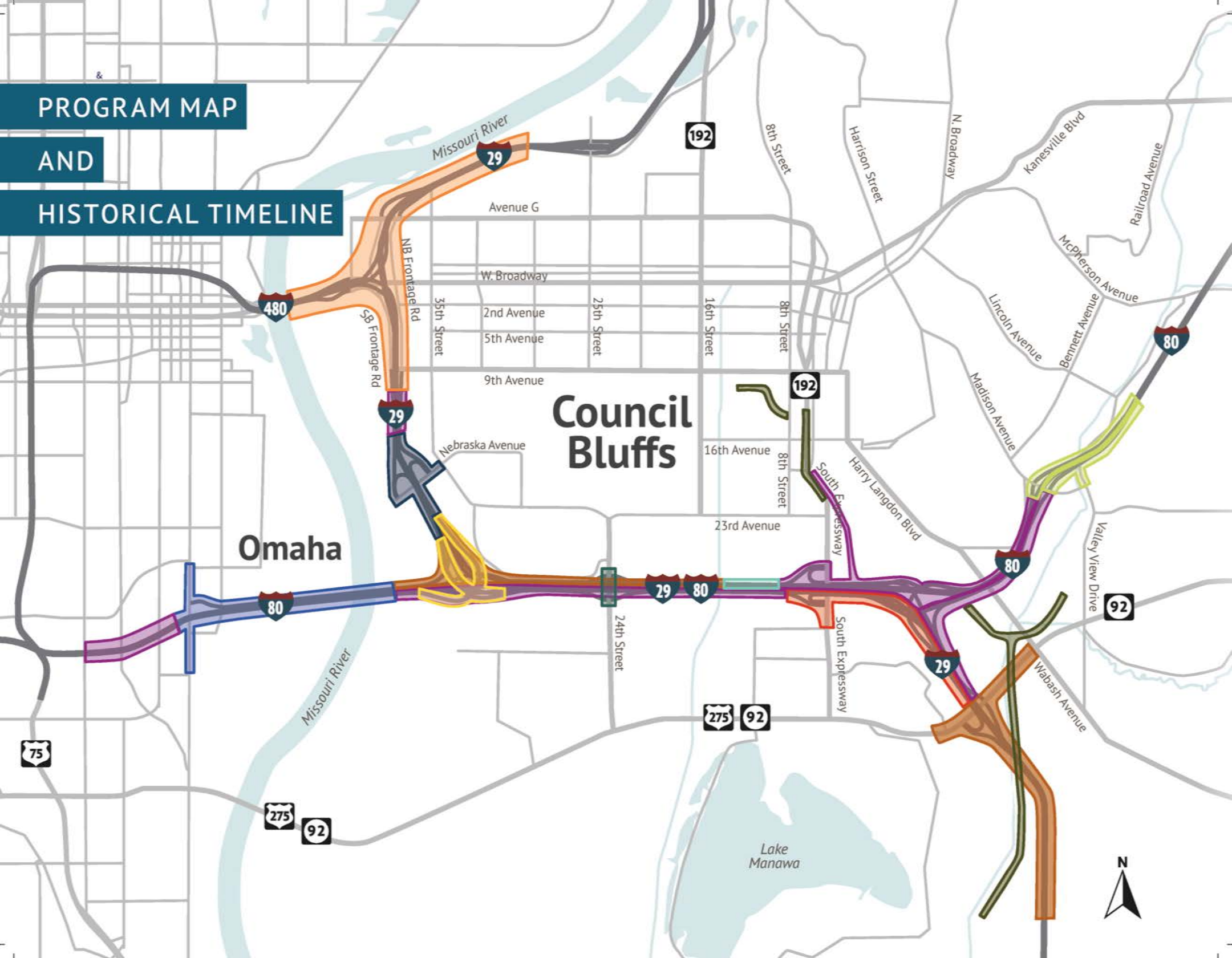
In 2006, Iowa DOT constructed an interim project on the overlapping section of I-80/I-29 to add a third lane in the eastbound direction to ease congestion that occurred when eastbound I-80 and southbound I-29 merged into one roadway. The interim project was a short-term solution to congestion problems in the area.

TIERED ENVIRONMENTAL PERMITTING

Due to the Program's size and complexity – and its more than 20-year timeframe – Iowa DOT and FHWA developed a rigorous, tiered National Environmental Policy Act (NEPA) process – the first in Iowa. NEPA is the federal legislation that established a national policy to consider environmental impacts while planning projects using federal funding or requiring federal permit approvals. This helped balance engineering requirements with environmental constraints and community needs. Federal, state, and local environmental procedures helped guide the evaluation of possible solutions.

Starting in 2002, Tier 1 examined overall interstate improvements, including transportation needs, alternatives and broad considerations for the environment and social impacts. It included a draft and final Environmental Impact Statement (EIS), signed in 2005, with a Record of Decision shortly after. The team developed five Tier 2 sections, one for each segment of the project area, assessing its impacts. The two-tiered approach allowed the project to proceed without delays.

PROGRAM MAP AND HISTORICAL TIMELINE



1960s **ORIGINAL CONSTRUCTION –** Council Bluffs Interstate System originally developed and constructed to the design standards of that time.

1997 **INTERSTATE ASSESSMENT –** City of Council Bluffs and Metropolitan Area Planning Agency conduct a study of the interstate system.

1999 **NEEDS STUDY –** Council Bluffs Interstate System Needs Study completed. Many interstate features were found to be outdated and did not meet design standards, guidelines, or operational criteria. Additionally, the system could not provide adequate travel capacity for future traffic.

2002 **ENVIRONMENTAL STUDIES AND PRELIMINARY DESIGN –** Iowa DOT initiated the Council Bluffs Interstate System Improvement Program to address the issues and developed solutions for improving the interstate system in the Council Bluffs metro area.

2006 **INITIAL CONSTRUCTION –** Iowa DOT constructed an interim project on the overlapping section of I-80/I-29 to add a third lane in the eastbound direction to ease congestion that occur when eastbound I-80 and southbound I-29 merged onto one roadway. The interim project was a short-term solution.

2008 **24TH STREET BRIDGE –** The 24th Street Bridge replacement was the first completed project to improve capacity. A project of this magnitude is typically constructed over two consecutive construction seasons, but due to the critical location of this interchange, traffic restrictions on 24th Street were completed in a single season.

2012 **I-80 MISSOURI RIVER BRIDGE –** Iowa DOT completed construction on the I-80 bridge from the east end of the bridge to the west end of bridge approach in Nebraska. Additional construction on I-80 between 24th Street and 13th Street in Nebraska was led by Nebraska Department of Transportation.

2013 **PROGRAM FUNDING AND ACCELERATION –** Iowa DOT Transportation Commission committed to funding the Program for the full build out of all improvements. Seventy projects were consolidated into 13 contract packages for efficiency and competitive bidding. The overall project schedule was accelerated, reducing the design and construction schedule from over 20 to 16 years.

2014 **WEST SYSTEM INTERCHANGE, PHASE I –** Construction completed.

2015 **DUAL, DIVED FREEWAY, PHASE I –** Construction completed.

2016 **RAILROAD RELOCATION –** The Railroad relocation project, consolidated the CBEC Railway and BNSF Railway railroad operations into a new common corridor west of Mosquito Creek under I-29 and Iowa 92. Rail consolidation improved operations at the South Expressway Interchange and greatly reduced roadway/railway conflicts.

2017 **U.S. 275 / IOWA 92 INTERCHANGE –** Construction completed.

WEST SYSTEM INTERCHANGE, PHASE II – Construction completed.

2019 **I-80 / I-29 DUAL, DIVIDED FREEWAY, PHASE II –** Construction was completed along the westbound overlapping segments of I-80 and I-29 through Council Bluffs. The new design improved traffic flow and motorist safety.

EAST SYSTEM INTERCHANGE – Construction completed.

I-80 MISSOURI RIVER BRIDGE – Nebraska DOT completed construction on I-80 between 24th Street and 13th Street

UNION PACIFIC RAILROAD BRIDGE – Construction completed.

2006 **I-80 / I-29 DUAL, DIVIDED FREEWAY, PHASE III –** Eastbound dual, divided freeway opened to traffic.

2022 **NEBRASKA AVENUE INTERCHANGE –** Construction completed.

2024 **I-29 / I-480 / WEST BROADWAY INTERCHANGE –** Construction was completed, providing direct access to West Broadway from I-29.

2025 **MADISON AVENUE INTERCHANGE –** Construction completed.

2026 **CONCLUSION –** The Council Bluffs Interstate System Improvement Program concludes under budget by $140 million.

Nebraska-Iowa I-480 Bridge construction, October 1965

Left: A historic look at the entrance into Council Bluffs from I-480 eastbound

Top center: The Federal-Aid Highway Act of 1956 paved the way for the largest public works project in U.S. history, establishing the interstate highway system. Shown here, construction of I-70 in suburban St. Louis, Missouri was one of the first projects created under the act.

Top right: A historic birds-eye view of the interstate system in Council Bluffs

Bottom right: I-480 Bridge entering Council Bluffs

Bottom center: Moving dirt for progress. Early construction of Iowa's interstate system.

Iowa's Gateway: it's not just hard hats and pavement; transportation can be beautiful. From aerial perspectives, even a simple interchange can transform into a work of art.

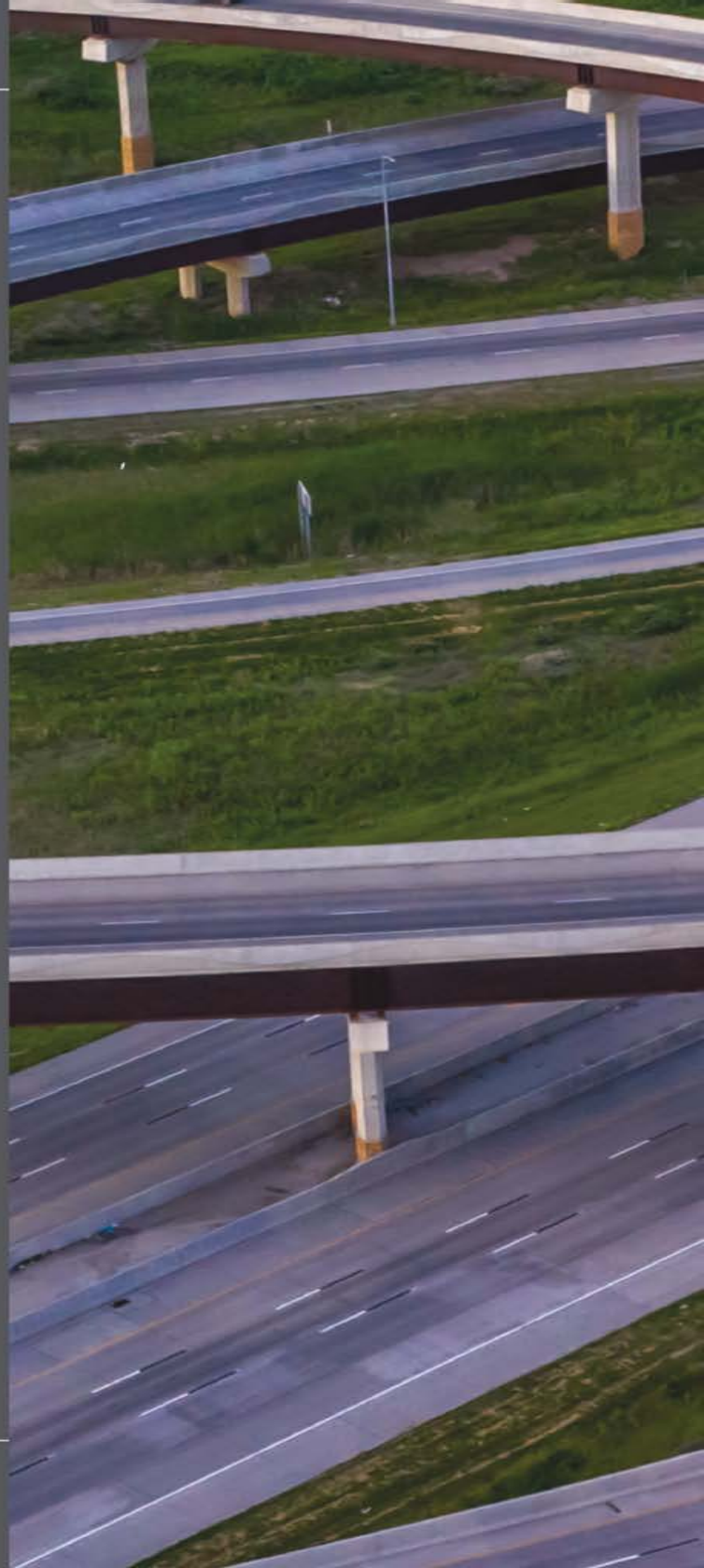
SECTION 03

HIGHLIGHTS

Consider the Program's many system interchanges. At ground level, it appears to be just another convergence of highways, but through the lens of a drone, it reveals a hidden elegance.

Mesmerizing road layouts, adorned with gentle curves and balanced lines. The varying widths of the roadways add visual intrigue, with the number of vehicle lanes fluctuating. A blend of expansive rectangles and gentle, angled bends fosters a sense of order and flow for geometric harmony.

Transportation, when approached with intention, transcends infrastructure, and can become a statement piece that is appreciated from both practical and artistic viewpoints.



West System Interchange, June 2016

Since 2010, the 24th Street Bridge in Council Bluffs has been home to the artist Albert Paley's "Odyssey." Four sculptures, created with three different metals (stainless steel, weathering steel and bronze plate) make up "Odyssey." Bringing "Odyssey" to Council Bluffs was a partnership between the Iowa West Foundation and Iowa DOT. The Iowa West Foundation commissioned and purchased the artwork, and Iowa DOT engineers designed sculpture platforms and made sure the sculptures were structurally sound and able to withstand the wind, ice and snow common in Iowa winters.

24th Street Bridge

Innovative design, creative contracting and accelerated construction techniques kept one of the busiest interchanges in Council Bluffs open while drastically expanding its capacity. The 24th Street Bridge replacement, completed in 2008, served as the first step in a series of upgrades to the city's interstate system. The interchange serves major attractions, including a casino, arena and conference/event center, hotels and major shopping outlets. To serve the heavy daily traffic volumes created by these nearby businesses, 24th Street and I-80/I-29 remained open during construction of the new bridge.

A project of this magnitude is typically constructed over two consecutive construction seasons, but due to the critical location of this interchange, traffic restrictions on 24th Street needed to be limited to a single season. The use of precast concrete deck panels and cost-plus-time bidding cut the construction duration in half while assuring the lowest price. Well-planned construction staging and intelligent transportation systems ensured that traffic capacity was maintained throughout the process.

By incorporating various creative solutions, the Iowa DOT received partial funding for the project through the Highways for Life and Innovative Bridge Research and Development Programs, freeing up state funding for other critical projects. The striking aesthetic features that were incorporated into the bridge design mimic the surrounding Loess Hills, creating a landmark for residents and a welcoming gateway into Iowa.

This award-winning project garnered recognition in 2009 and 2010.

PROJECT SCHEDULE

» Construction completed fall 2008

HIGHLIGHT

» Construction completed in just one construction season.

RECOGNITION & AWARDS

» **Associated General Contractors of Iowa:** Iowa Quality Initiative Structure, 2009

» **American Council of Engineering Companies:** National Recognition Award, 2010

» **American Council of Engineering Companies:** Iowa Grand Place Award, 2010


FedEx
FedEx
HYUNDAI
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I-80 Missouri River Bridge

The Council Bluffs Interstate System Improvement Program initiated its first project with the expansion of the I-80 bridge over the Missouri River. This critical upgrade set the stage for subsequent phases to integrate seamlessly. This project required extensive collaboration between Iowa DOT, Nebraska Department of Transportation (NDOT), FHWA, the city of Council Bluffs, and U.S. Army Corps of Engineers. Each state DOT also had to agree to commit funds to the project, ensuring its completion within a designated time frame and needed coordination of contractors. Iowa DOT was the lead for the Missouri River Bridge and construction in Iowa, while NDOT led all construction work on the Nebraska side from just west of 24th Street to the west end of the Missouri River Bridge approach.

The widened bridge has significantly improved interstate travel by facilitating a smooth transition between Iowa and Nebraska, alleviating the congestion that previously plagued motorists during peak travel hours.

PROJECT SCHEDULE

» The Missouri River Bridge segment began in 2008 and was fully completed and opened to traffic in 2019.
  - Iowa DOT-led construction completed in 2012.
  - Nebraska DOT-led construction completed in 2019.

RECOGNITION & AWARDS

» **Associated General Contractors of Iowa:** Iowa Quality Initiative Structure, 2010

Railroad Relocation

The Railroad Relocation Project consolidated the CBEC Railway, Inc. (CBEC) and Burlington Northern Santa Fe (BNSF) railroad operations into a new common corridor west of Mosquito Creek under I-29 and Iowa 92. The innovative project, which began in late 2015, was substantially completed in fall 2016.

This railroad consolidation effort improves traffic operations at the South Expressway Interchange. Railroad tracks and at-grade rail crossings were eliminated so the new bridges over South Expressway could be shorter with lower incline ramps, allowing drivers to get up to speed more easily. The project also greatly reduced roadway/railroad conflicts by consolidating the railroad corridors and eliminating numerous at-grade rail crossings and the CBEC rail corridor that bisected Lewis Central High School. Improved railroad operations allow select BNSF trains to bypass Council Bluffs.

Securing railroad cooperation was a key feat in itself. Coordinating with multiple railroad companies and having them agree to consolidate existing infrastructure presented a unique challenge. However, through open communication, a focus on mutual benefits, and a commitment to long-term efficiency, Iowa DOT was able to present a solution that served the needs of both the railroads and the city.

CBEC Railway Inc.

BNSF Railway

Council Bluffs

PROJECT SCHEDULE

» Construction occurred between 2015 and 2016.

HIGHLIGHT

» $7 million under projected budget

RECOGNITION & AWARDS

» **American Council of Engineering Companies:** National Recognition Award, 2017

» **American Council of Engineering Companies:** Iowa Grand Place Award, 2017

» **American Council of Engineering Companies:** Nebraska Grand Place Award, 2017

I-29/U.S. 275/Iowa 92 Interchange

The I-29/U.S. 275/Iowa 92 Interchange underwent a significant transformation between 2014 and 2017. To accommodate the new railroad corridor created by the Railroad Relocation Project, the entire interchange, including portions of I-29 and U.S. 275/ Iowa 92, was raised. This ambitious project also involved constructing new roadway embankments, a walking trail, and rebuilding six bridges.

Throughout the project, extensive public outreach ensured residents were informed about construction impacts. Program staff partnered with local schools, churches, and businesses to effectively communicate detours and closures, minimizing disruption. Additionally, close collaboration with the city of Council Bluffs and the U.S. Army Corps of Engineers proved crucial. Addressing levee concerns and ensuring access for construction activities ultimately led to the project's successful completion within its allotted timeframe before the railway work needed to commence.

PROJECT SCHEDULE

» Phase I Construction: 06/2014 – 06/2016
» Phase II Construction: 04/2015 – 05/2017

HIGHLIGHT

» Adhered closely to contract deadlines as the first project overseen by the Program Management Team using Critical Path Method scheduling.

Union Pacific Railroad Bridge

Reconstruction of the Union Pacific Railroad Bridge began in September 2017 and was completed August 2019. Bridge reconstruction was necessary to allow for increased capacity on I-29. Partnering with Union Pacific Railroad, Iowa DOT rebuilt the existing bridge from five tracks to three tracks due to improvements made to the local yard operations. Bridge design was optimized so the roadway grade did not need to be altered during construction.

Iowa DOT worked with the city of Council Bluffs during design to extend the bridge span to allow for a possible, local street on the west side of I-29 in the future.

PROJECT SCHEDULE

» September 2017 – August 2019

HIGHLIGHT

» $12 million under projected budget

Securing railroad cooperation was a key feat in itself. Coordinating with multiple railroad companies and having them agree to consolidate their existing infrastructure presented a unique challenge. However, through open communication, a focus on mutual benefits, and a commitment to long-term efficiency, Iowa DOT was able to present a solution that served the needs of both the railroads and the city.

East System Interchange

The East System Interchange underwent almost a decade of significant reconstruction, transforming this key transportation hub. The project improves safety, traffic flow, and overall efficiency. I-80 westbound and I-29 southbound previously experienced congestion nearly every day during morning and afternoon commutes. Opening the new East System Interchange has added capacity and reduced congestion and delays during peak travel times.

Reconstruction included straightening I-80 and eliminating left entrances and exits allowing highway users to move through the area with fewer lane changes. The South Expressway interchange was also enhanced and rebuilt to modern standards and capacity needs. The folded-diamond interchange was rebuilt with two loop ramps and two diagonal ramps west of South Expressway for efficient movement. The decommissioning of the rail line east of South Expressway further improves traffic operations and safety by minimizing potential hazards.

Construction of this interchange had many complexities and required significant coordination with the city, railroads, businesses, residents, motorists and others.

Construction unfolded in several phases, starting with interim capacity improvements completed along South Expressway in 2011. The improvements included lengthening and adding turn lanes, upgrading the I-29 southbound ramp terminal intersection to accommodate larger trucks and upgraded traffic signal communication and equipment. Phase I, completed in late 2015, focused on extending 23rd Avenue and reconstruction of 29th Avenue, removing rubble and other materials from the former large industrial park, and placing the base groundwork for the future lane construction.

Phase IIa construction began in late 2015 and was completed in early 2018, ahead of schedule. Construction crews were able to accomplish early completion through an accelerated schedule and collaboration between

multiple contractors and Program staff. This project included construction of three large bridges totaling over 8,200 feet in length. Phase IIb began in June 2016 and included the I-80 westbound/I-29 northbound lanes and bridges over South Expressway. This phase was completed in mid-2018.

Phase III began in late 2017 and was completed in late 2019. This phase involved the construction of four major bridges and the opening of the first phase of the Dual, Divided Freeway (I-80 Westbound Express and I-29 Northbound/I-80 Westbound Local) in March 2019.

The new interchange design has garnered national recognition for its contribution to improved safety, traffic flow, and overall efficiency. In 2018 the American Council of Engineering Companies (ACEC) awarded it with a national recognition award and an Iowa Honor award.

PROJECT SCHEDULE:

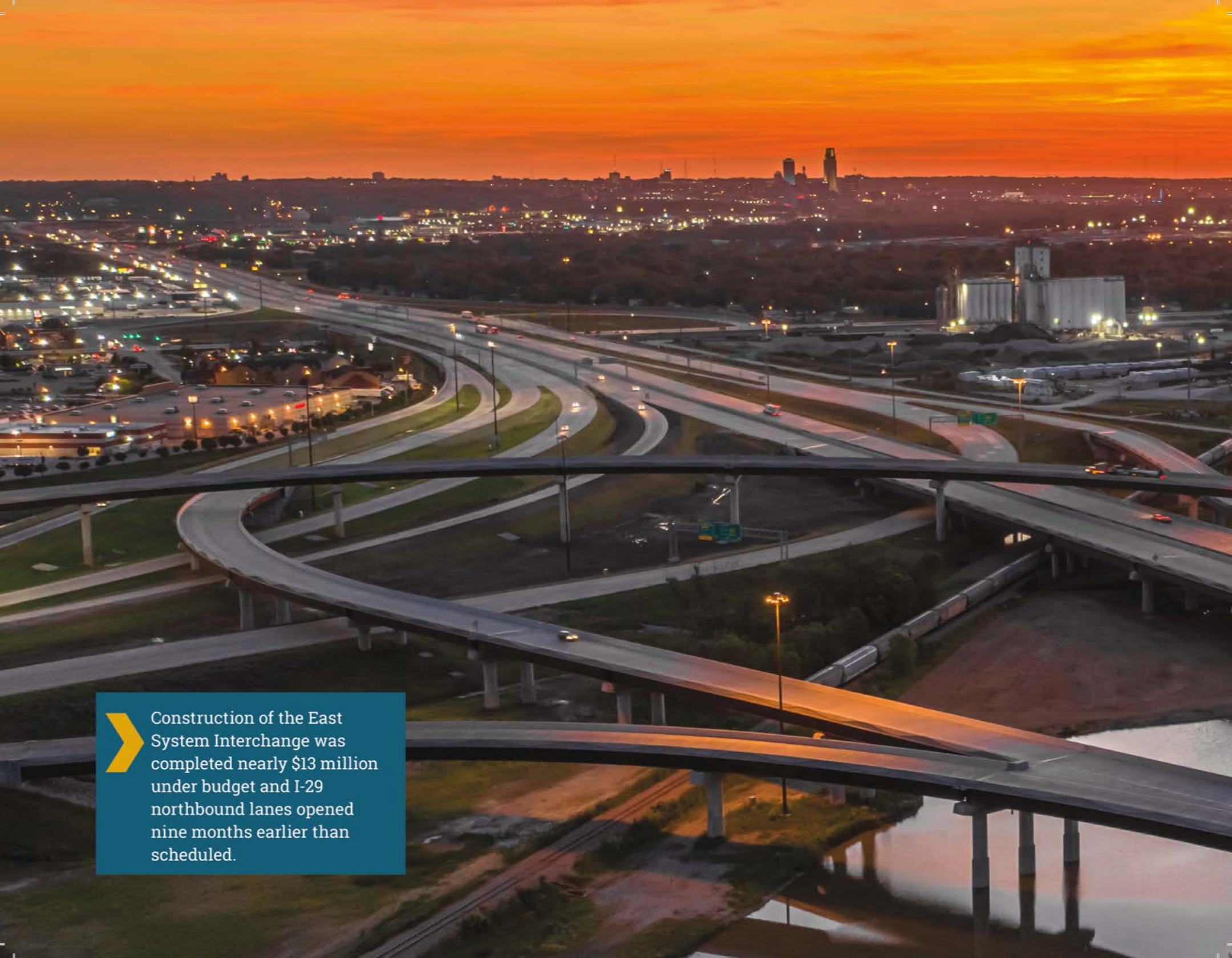
- Phase I Construction: 07/2014 – 12/2015
- Phase IIa Construction: 11/2015 – 12/2017
- Phase IIb Construction: 06/2016 – 06/2018
- Phase III Construction: 11/2017 – 09/2019

HIGHLIGHTS:

- Phase I – $4 million under projected budget.
- Phase III – $8.6 million under projected budget.
- I-29 northbound lanes opened nine months ahead of schedule.

RECOGNITION & AWARDS

- **American Council of Engineering Companies:** National Recognition Award, 2018
- **American Council of Engineering Companies:** Iowa Honor Award, 2018



Construction of the East System Interchange was completed nearly $13 million under budget and I-29 northbound lanes opened nine months earlier than scheduled.

Lower left: Looking west, West System Interchange, 2012, prior to the interstate reconstruction.

Upper right: Looking east, West System Interchange, 2013, prior to the interstate reconstruction.

Lower right: Looking east, West System Interchange, 2019

Opposite page, left: To eliminate left-hand entrances and exits, the West System Interchange was redesigned with multi-level lanes, allowing drivers to enter the interstate from the right.

Opposite page, right: Overhead signage provides important system navigation assistance as drivers approach the I-80/I-29 Dual, Divided Freeway.

Google Earth Pro

West System Interchange

The West System Interchange, with its four-level design, dramatically transformed the visual landscape for motorists entering Iowa from the west. A key improvement in the interchange's design was the elimination of left-hand entrances and exits, which were historically associated with a higher incidence of crashes. The redesign also increased the number of travel lanes and provided distinct separation for both I-80 and I-29, enabling motorists to minimize lane changes when navigating between the two interstates.

The reconstruction of this system-to-system interchange now ensures seamless access from I-80 to I-29 to the I-80 Express lanes and the I-80/I-29 Local lanes within the Dual, Divided Freeway. Initiated in 2009, the construction of the West System Interchange reached completion in 2019, marking a decade of construction and innovation.

PROJECT SCHEDULE

- Phase Ia Construction: 07/2009 – 11/2014
- Phase Ib Construction: 06/2012 – 11/2014
- Phase II Construction: 06/2015 – 07/2017
- Additional Construction to Connect Roadways: 01/2017 – 10/2019

HIGHLIGHT

- $1.5 million under projected budget

West System Interchange, 2019

I-80/I-29 Dual, Divided Freeway

The marquee feature of the Council Bluffs Interstate System Improvement Program is the three-mile Dual, Divided Freeway – the area's first. This innovative design completely transforms the traffic flow, offering numerous benefits for both local and long-distance travelers.

The I-80/I-29 Dual, Divided Freeway was constructed along the overlapping section of I-80 and I-29 between the West and East System interchanges. It includes at least six lanes in each direction, three on I-80 Express and three on I-29/I-80 Local. The design separates interstate through-traffic from local traffic with a concrete barrier. Express lanes provide an exit-free journey through the city, while local lanes offer the ability to exit onto local roads. This separation eliminates the dangerous weaving and merging maneuvers that cause congestion and crashes, especially during peak hours.

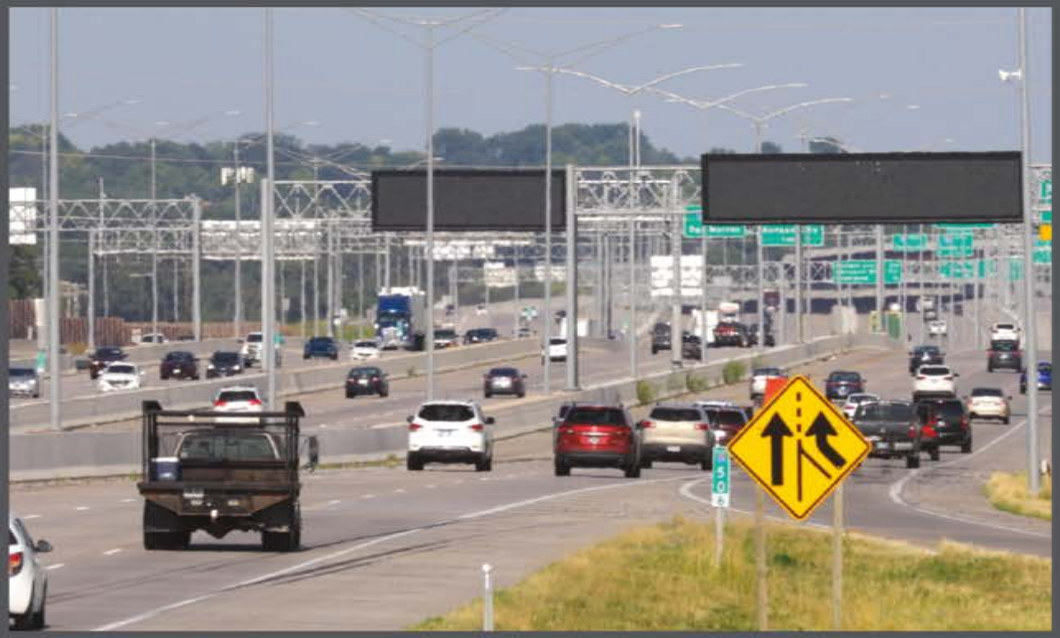
The Dual, Divided Freeway offers travelers greater flexibility, reduces congestion and improves safety and efficiency. It keeps traffic moving, even if lanes are closed because of a crash or maintenance. Special gates within the Dual, Divided Freeway section can move traffic between lanes when needed. The new design also eliminated left exits and entrances from the system, which are not typical, contradict driver expectations and are less safe.

> **"The Dual, Divided Freeway is the marquee project in the Council Bluffs Interstate System Improvement Program. Its completion marks a milestone for the Program and will greatly improve the travel experience for the tens of thousands who drive Council Bluffs roads every day. This achievement means the end of this modernization effort is in sight. I'm thrilled to be part of this project, proud of our team and thankful for the partners who have helped us get to this point."**
>
> **—SCOTT SCHRAM, IOWA DOT DISTRICT 4 ENGINEER**

The Dual, Divided Freeway was constructed through several phases over eight years. Early phases added interstate lanes where right of way was purchased north of the existing interstate. This was critical in following phases when traffic was shifted to allow contractors to work in the clear. As each phase was completed, more capacity was added to the system, significantly reducing congestion as the Program progressed.

Constructing this marvel required extensive coordination. The Iowa DOT, city, United States Army Corps of Engineers, and countless other stakeholders worked together to bring this vision to reality. This dedication, coupled with exceptional performance by contractors, even led to the project's early completion.

The innovative and unique project hasn't gone unnoticed by outside entities. This project received accolades for its innovation and effectiveness in 2021, 2022, and 2023, solidifying its position as a game-changer in the Council Bluffs transportation landscape.



PROJECT SCHEDULE

- Phase Ia Construction: 07/2013 – 06/2015 (I-29 Northbound/I-80 Westbound Local lanes from Indian Creek to the West System Interchange)
- Phase Ib Construction: 11/2013 – 07/2015 (I-29 Northbound/I-80 Westbound Local on-ramp at South Expressway and lanes to Indian Creek)
- Phase II Construction: 01/2017 – 01/2019 (I-80 Eastbound Express lanes from the Missouri River Bridge to Indian Creek; and I-29 Southbound/ I-80 Eastbound Local lanes from the West System Interchange to Indian Creek)
- Phase III Construction: 08/2019 – 06/2021 (I-29 Southbound/I-80 Eastbound Local lanes from Indian Creek to the East System Interchange)

HIGHLIGHTS

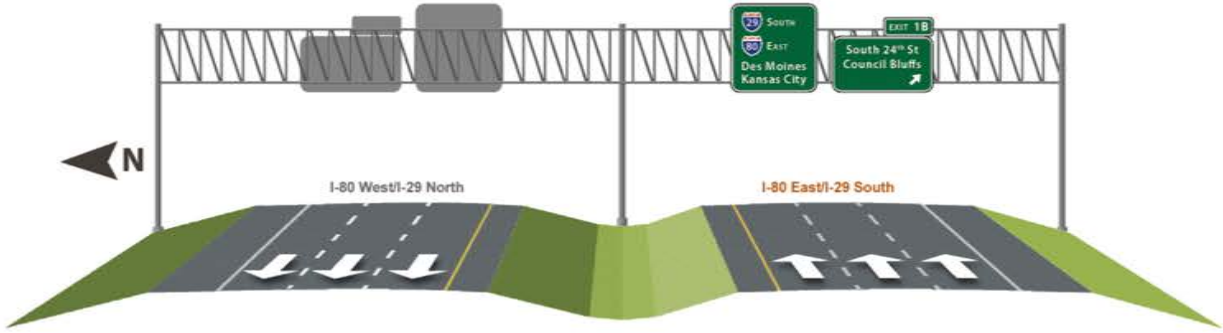
- $10 million under projected budget.
- Construction completed and opened nearly six months ahead of schedule.

RECOGNITION & AWARDS

- **Roads & Bridges:** Top 10 Roads, #4 Road, 2021
- **American Council of Engineering Companies:** National Recognition Award, 2022
- **American Council of Engineering Companies:** Iowa Grand Conceptor and Grand Place Awards, 2022
- **American Council of Engineering Companies:** Nebraska Honor Award, 2022
- **MAASTO's America's Transportation Awards:** Operational Excellence – Large Category, 2022
- **Engineering News-Record Merit Award:** Highway/Bridge Category, 2022
- **American Infrastructure Magazine:** Peninsula Publishing Pubby Award for Road Project of The Year, 2023
- **American Society of Civil Engineers:** Outstanding Civil Engineers Achievement Award, 2023

ORIGINAL CONFIGURATION

Eastbound near 24th Street



ULTIMATE LANE CONFIGURATION

Eastbound near 24th Street

Because the Dual, Divided Freeway was a first for in the region, when the westbound lanes of the Dual, Divided Freeway opened, the Iowa DOT produced a short "how to" video so drivers would understand how the freeway operates. To view the video, scan this code with a smart device.

The Dual, Divided Freeway (DDF) was constructed to include three lanes in each direction for I-80 Express and three lanes in each direction for I-29/I-80 Local.

Iowa DOT chose a DDF design because it offers greater flexibility to travelers, reduces congestion and will improve safety and efficiency. For example, it allows traffic to keep moving in both directions, even if lanes are closed because of a crash. Breaks and gates in the barrier will provide access for emergency response vehicles and will allow traffic to shift if lanes need to be closed for a crash.

This design allows through traffic to utilize both Express and Local lanes, offering more lanes overall. The previous design caused through traffic to merge with local traffic at on and off ramps, creating congestion during peak traffic hours. The DDF separates through traffic from local traffic, eliminating delay and conflict. The DDF will also reduce the number of crashes caused by merging traffic between interchanges.

In 2021, the Iowa DOT celebrated the completion of the I-80 / I-29 Dual, Divided Freeway, nearly six months ahead of schedule and $10 million under budget.


EXIT 53 A
9th Ave
Harrahs Blvd
W Broadway
¼ MILE
EXIT 52
Nebraska Ave
Mid-America
Center
30

Nebraska Avenue Interchange

The Nebraska Avenue Interchange Reconstruction Project involved rebuilding the folded diamond interchange to enhance its alignment with current design and capacity standards. Reconstruction resulted in improved sight distances at the Nebraska Avenue intersection. Additionally, the reconstructed interchange now provides additional through lanes on I-29, accommodating the expanded interstate.

PROJECT SCHEDULE

» Initiated in late 2020, the Nebraska Avenue Interchange Reconstruction Project reached on-time completion in 2022.

I-29/I-480/West Broadway System Interchange

The I-29/I-480/West Broadway System Interchange Project addressed multiple challenges, including capacity, safety, and design functionality at the interchange and surrounding areas of 41st Street, North 35th Street, Avenue G, and 9th Avenue. Reconstruction involved creating one-way frontage roads on each side of I-29, allowing for direct access to West Broadway and streamlining traffic flow on both I-29 and I-480.

An interim project was completed in 2016/2017 to improve access to Playland Park and the River's Edge development area north of the I-480 interchange. This project extended Benson Street from Avenue D to Avenue B along with pavement marking channelization at the existing 40th Street interchange with I-480. The project provided localized operational improvements and alternate accessibility during interchange reconstruction.

Construction began in spring 2021 focusing on the frontage road system first. Local roadways, West Broadway, 40th Street, and Dodge Riverside Drive, 2nd Avenue, and 9th Avenue, were also reconstructed. In November 2021, I-29 northbound was closed between 9th Avenue and Avenue G and traffic is diverted to the Northbound Frontage Road and in November 2022, I-29 southbound was also closed and diverted to the Southbound Frontage Road. Both directions of the interstate were reopened in August 2023 and the final interchange ramp was opened in fall 2023. Notably, construction was completed about six months earlier than scheduled.

Significant coordination was required by the Program team with adjacent jurisdictions and included a comprehensive outreach strategy for travelers, businesses and residents in the project area. To minimize traffic disruptions, global detours directed traffic away from the project limits, and real-time updates were provided through online navigation services like Waze and Google Maps.

The construction contract relied heavily on a contractor-developed project schedule that was updated monthly. This information was used to help identify delays and impacts to upcoming milestone dates. This is a testament to their hard work and dedication to completing the project on time and within budget.

The re-imagined interchange stands as a beacon of efficiency and safety for vehicle movement on I-480 and I-29. It offers seamless traffic flow, reduced lane changes, and direct access to West Broadway from I-29, significantly benefiting the surrounding community.

PROJECT SCHEDULE

- Interim Project: 2016/2017
- Interchange Construction: 04/2021 – 12/2023

HIGHLIGHT

- Construction completed six months ahead of schedule.
- $14 million under projected budget.

To mark the end of construction and to extend heartfelt gratitude to area residents for their understanding and support throughout the project, the Iowa DOT produced a short "thank you" video. To view the video, scan this code with a smart device.

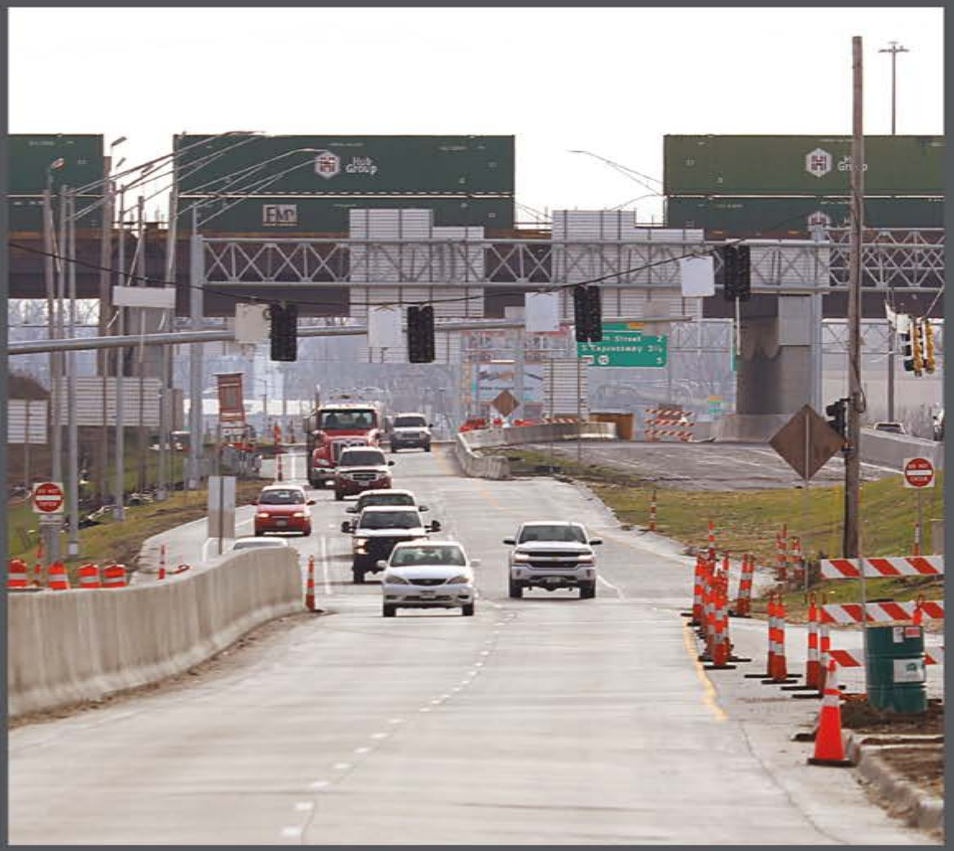
I-29 / I-480 / WEST BROADWAY SYSTEM INTERCHANGE

Frontage Road System

Throughout the Council Bluffs Interstate System Improvement Program, maintaining traffic on the interstate system was prioritized to minimize disruptions to drivers and businesses. Long-term interstate system closures were avoided by strategically scheduling projects and using existing right of way. However, the I-29/I-480/West Broadway Interchange presented a unique challenge due to its proximity to a residential area. To address this, engineers determined a full closure of I-29 for up to two years was necessary. Although this would be a long closure, it allowed the contractor to complete the project almost two years earlier than if the interstate had remained open to traffic.

Minimizing the construction duration and impact remained a top priority and several measures were implemented by the Iowa DOT to ensure a smooth closure. When designing the I-29/I-480/West Broadway Interchange, engineers evaluated many options for constructability, schedule, budget, and impacts to traffic. Iowa DOT identified detour routes for local traffic and built frontage roads to keep traffic moving and off residential streets when the interstate closed in November 2021.

High traffic volumes were anticipated. However, traffic volumes were lower than expected. This is likely due to planned communications about the closure and providing drivers with advanced notice and options to plan their routes. By working closely with the public and stakeholders, the team was able to minimize impacts from the closure and complete the project ahead of schedule and within budget.



NB Frontage Road opened in November 2021. At the same time, northbound I-29 was closed to traffic, and construction crews began demolition of the old roadway. Frontage roads kept high traffic volumes moving and off residential streets during construction.

I-29/I-480/West Broadway Interchange, 2024

PROJECT SCHEDULE

- Eastbound Construction: 09/2022 – 06/2024
- Westbound Construction: 01/2024 – 12/2025

HIGHLIGHTS

- $9.6 million under projected budget.
- Eastbound lanes opened nearly two months ahead of schedule.

Madison Avenue Interchange

The Madison Avenue Interchange Reconstruction Project marks the culmination of the larger interstate reconstruction Program in Council Bluffs, Iowa. This project modernizes the interchange and its bridges over Mosquito Creek, ensuring they meet current design standards and serve traffic volume needs.

Initially delayed to 2026 due to COVID-19's impact on state funding, the 2021 Congressional Infrastructure Investment and Jobs Act allowed Iowa DOT to fund the project and commence construction in late 2022.

The new, reconstructed interchange will resemble the previous one, in a tight urban diamond formation. Four lanes will be constructed on Madison Avenue for through traffic and additional turn lanes to enhance traffic flow. A new bike/pedestrian path along Madison Avenue will be constructed as part of the project. The existing multi-use trail on Valley View Drive will also be rebuilt. Other benefits will include longer acceleration lanes for vehicles merging onto I-80, allowing drivers to turn right from Madison Avenue onto the I-80 westbound ramp without stopping.

Constructing a bridge over a navigable waterway poses inherent challenges, but building one that spans a creek, railroad track, and a city street is particularly challenging. Stakeholder management is crucial, addressing diverse interests from each. Obtaining permits and plan approvals is merely the first step, requiring the submission of multiple detailed work plans well in advance to avoid delays. Maintaining the functionality of the interstate, ramps, and city streets is crucial, demanding constant adjustments to staging, worker protection, equipment placement, and material management. Material deliveries often face long lead times, necessitating ongoing reevaluation and adjustments to schedules, highlighting the critical role of clear and consistent communication throughout the project.

Despite the challenges, the eastbound contract is currently exceeding expectations. With only minor median grading and paving remaining in the final stage, completion is anticipated by late Spring 2024. Taking advantage of the favorable winter weather, the westbound contract commenced in early 2024 and is scheduled to be finished by Summer 2025.

The Madison Avenue Interchange Reconstruction Project represents a significant investment in the future of Council Bluffs. By overcoming inherent complexities and maintaining clear communication, this project will deliver modern, safe, and efficient transportation infrastructure for years to come.

I-80 eastbound bridge over BNSF Railroad, Mosquito Creek, and Valley View Drive completed as part of the I-80/Madison Avenue interchange reconstruction.

Systemwide Technology Updates

In addition to modernizing the interstate to today's standards, Iowa DOT added innovative, long-term technology updates throughout the system to improve traffic flow, respond faster to traffic conditions and improve customer satisfaction.

ITS AND DYNAMIC MESSAGE SIGNAGE

The new intelligent transportation system (ITS) uses sensors, traffic monitoring cameras and the state's first full-color dynamic message signs to monitor and manage the corridor.

ELECTRONIC SIGNAGE

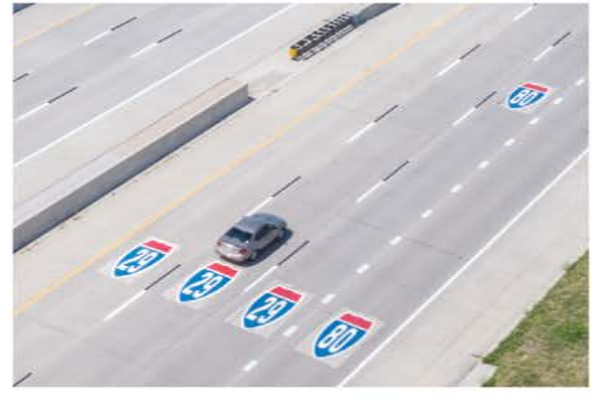
Electronic signs alert drivers entering traffic so they have time to merge and continue at highway speeds. Other devices alert the Iowa DOT of vehicle queues on interstate ramps so that signals can be adjusted to allow traffic to clear.

FIBER OPTICS

The system – connected by more than seven miles of fiber-optic cables – allows the DOT to respond dynamically to changes in weather, traffic incidents or construction and provide timely information to motorists.

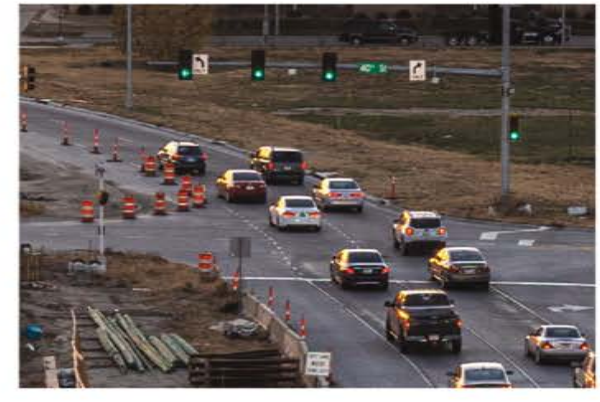
LIGHTING, GATES AND SPEED CONTROLS

LED lighting, median gates and increased speed limits contribute to safe, reliable, and smooth travel through the corridor.



PAVEMENT MARKINGS

Enhanced pavement markings support new vehicle safety features, such as lane-keeping assist. In the future, these wider, more visible paint markings will help autonomous vehicles detect road boundaries better.



ADAPTIVE TRAFFIC SIGNALS

An adaptive traffic signal system has also been implemented at several intersections. The technology allows traffic signals to adjust the timing of red, yellow and green lights automatically and adapt to changing traffic patterns, which improves traffic flow and safety.

At the heart of the Program was collaboration. Strong relationships were key to project successes.

SECTION 04

GETTING YOU THERE

In August 2023, Program team members from Iowa DOT, the PM/GEC, design consultants, contractors and subcontractors gathered on the I-29 northbound bridge before it opened to traffic to celebrate the milestone.


Ames
TO
SOUTH EAST
29
6
TO
WEST WEST

As work began, we quickly learned we needed to partner on challenges and face them together. Staff held monthly partnership meetings, including the Program Manager, contractors and designers, to overcome issues that could impact schedules and budgets. By creating dialogue, the team developed a foundation of trust that served the Program well.

The Program brought together a long list of stakeholders, each with different needs, to implement a holistic approach to improve transportation in Council Bluffs. This started with the railroads, industrial customers, the city, and Iowa DOT. It progressed as the Program expanded to include the U.S. Army Corps of Engineers, the Iowa West Foundation, MAPA, multiple design consultants, contractors, and support firms. Partnering was key to help transition through early years and get to a point where the Program and its projects were firing on all cylinders.

Our contractors were tremendous partners for this large Program. They staffed projects with the right resources which allowed them to deliver on their commitments. Each of our contractors represented larger, regional construction companies that have the experience and expertise to manage complex, multi-disciplined construction projects like those in the Council Bluffs Interstate Program. This allowed them to leverage additional resources for the Program projects, when needed, to advance the schedule or meet deadlines.

Strong relationships with contractors were incredibly valuable as projects moved through constructability reviews. Individual meetings with contractors produced workable solutions for difficult design challenges that were incorporated into final plans and led to a better understanding among designers of what the contractors needed and what challenges they faced during construction. That, in turn, allowed designers to anticipate contractor needs and incorporate efficiencies into design packages, saving time and money.

IOWA DOT'S FIRST PROGRAM MANAGEMENT PROJECT

The magnitude of improvements through the corridor necessitated a Program Management approach. Taking one project at a time would take too long and increase costs. "It wasn't just addressing one deficiency; it was a corridor approach," Schram said. "If you're going to reconstruct a corridor, it's going to be a multi-year Program. And you can't accomplish that without the Program Management piece."

The massive construction effort began in 2008, with the I-80 Missouri River bridge connecting Council Bluffs to Omaha. Leveraging this, the Iowa Transportation Commission committed to fund the Program's ultimate build-out in 2013.

Originally parsed into roughly 70 small construction projects, the team used a design charette to develop an efficient construction plan that combined projects into large, multi-disciplined packages that reduced impacts on travelers, increased safety and improved traffic management during reconstruction. The effort also reduced risk for the Iowa DOT by more accurately forecasting costs and plans for future programming, while cutting the construction schedule in half.

The contracts included redeveloping two system interchanges and combining rail operations, which spanned multiple years and required coordinating construction and traffic shifts between adjacent project teams. The team developed the packages alongside local contractors to identify efficiencies and support a competitive bidding environment.

With so many individual projects, parts and pieces, the team quickly focused on timing design to match the construction schedule. Keeping the Program on schedule required constant attention to what was under construction and what came next. Final design plans often take time, and that timeline expands with complexity and agency and stakeholder involvement. Understanding and anticipating approvals remained critical for maintaining the Program schedule.

The Program management team coordinated early with other design teams, the DOT, and project stakeholders to verify packages were ready when needed. They learned from each package and applied those lessons to the next, reducing future risks to cost and schedule. The design schedule meant walking a fine line of completing tasks in time to meet the construction schedule, while also leaving enough time to incorporate lessons learned from previous work.

Repackaging individual contracts was necessary to the schedule based on efficiencies and impacts, as well as available funding. State funding shifted from year to year, and in Iowa, project funding only becomes available as budgets allow. This required the team to combine small projects in some years while breaking down larger ones in others.

> **"It took dedicated funding from the Iowa Transportation Commission to commit to the corridor. And when you get buy-in from stakeholders, you need to propose a budget, and you've got to keep your promises. That speaks to the Programmatic funding side of things. And when you're doing it in an urban area, you have many more stakeholders and many more local, vested partners. The Program Manager piece really helped usher the project along, gaining buy-in every step of the way."**
>
> **—SCOTT SCHRAM, IOWA DOT DISTRICT 4 ENGINEER**

DESIGN TEAM

ACCELERATED SCHEDULE

After the Program Management Team held the design charette and parsed the smaller projects into larger contract packages, it was clear that the design schedule would need to be accelerated to meet scheduled letting dates. Iowa DOT design staff developed most of the early project designs, but with acceleration, it was clear that outside help would be needed to supplement their efforts. Several firms contributed to the design plans across the various packages, minimizing letting delays. As the Program progressed, design teams outpaced the letting schedule, and in some cases, plans were ready on the shelf when additional funds were identified to accelerate construction letting.

CURVED, SKEWED BRIDGES

To construct the east system interchange bridges, the design team conducted a first-of-its-kind study. The railroads, ponds and roadways present in the landscape forced large bridge skews and long spans – an uncommon and often avoided layout. By examining a staggered cross-frame layout vs. a contiguous layout, and how they influence structure cost, the study changed the future of heavily skewed bridge design.

Publications previously suggested skewed bridges with staggered cross-frame layouts would be more cost-efficient but lacked conclusive data from a completed design for comparison. The design team turned to a 3D finite element analysis to account for cross-frame stiffness, relative deformations and flange lateral moments. Additionally, they evaluated recent AASHTO Load and Resistance Factor Design (LRFD) specification changes for cross frames.

The team concluded that contiguous cross-frame layouts reduced structural steel weight, costs, fatigue stress, primary and lateral flange bending moments in the girders, and future maintenance costs. The lowered bending forces will extend the life of the bridges while the 3% reduction in weight – 77,160 pounds – resulted in a 2% cost savings.

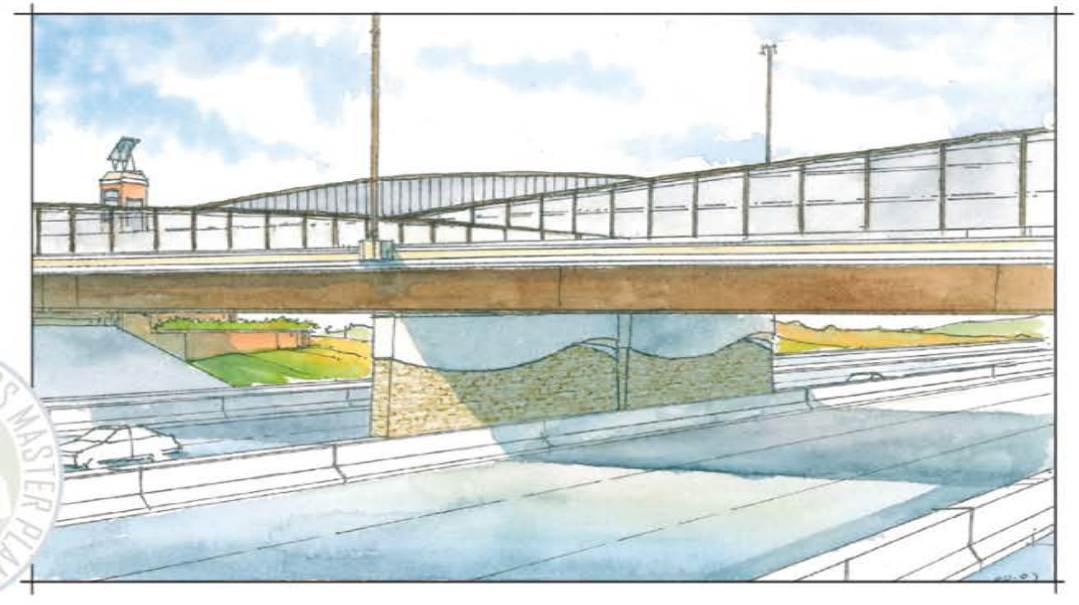
East System Interchange, June 2021

Many of the bridge components feature high-performance concrete for longevity and durability. They reduce the frequency of replacing or repairing decks, resulting in less permeability, and protecting against salt intrusion.

AESTHETICS AND LANDSCAPING

Iowa DOT understood the Council Bluffs Interstate System Improvement Program would change the look of the interstate system and the Council Bluffs entrance into Iowa. Reconstructing Council Bluffs' primary interstate after more than a half-century provided an opportunity to deliver an attractive, distinctive corridor. An aesthetics subcommittee composed of community members, Iowa DOT, and consultants worked together on visual enhancements. Visual design plans for the Program included bridges, retaining walls, sound walls, and native landscaping that features natural curves representing the rolling Loess Hills surrounding Council Bluffs. The design integrates community planning, incorporates community interests and considers safety, ease of maintenance and economy of aesthetic treatments.

Using weathering steel girders on bridges proved economical, environmentally beneficial and sustainable. The steel forms a protective patina, eliminating painting and saving millions of dollars due to the bridge sizes and limited access.



The Council Bluffs Interstate System Aesthetics Master Plan implemented a comprehensive and cohesive design for the 18-mile I-29/I-80 corridor running through Council Bluffs that is attractive and inviting for first time visitors as well as daily commuters.

Dominant forms for the corridor included natural curves, intended to represent the rolling hills surrounding the city. Simple curves, in various forms are found in all aesthetic treatments, both in built elements and landscape design. Structures incorporate curved forms reminiscent of the loess hills in warm, natural earth tones to convey the idea of natural materials and to blend into the surrounding countryside. Interchange landscape design picks up the natural theme by layering native prairie grasses, shrubs and trees into a natural, flowing design.

The Aesthetics Master Plan integrated these features while taking into account the financial feasibility and long-term maintainability of all the aesthetic enhancements.

The team proactively monitored progress and mitigated potential issues by holding regular communication channels open with contractors, including check-in meetings both on-site and off-site in the Program office.

CONSTRUCTION MANAGEMENT AND CONTRACTOR COORDINATION

Managing a multi-million-dollar interstate reconstruction Program while minimizing traffic disruption and staying within budget is a complex feat that required a collaborative approach. For the Council Bluffs Interstate System Improvement Program, Iowa DOT and the Program Management team worked as a cohesive unit to accomplish this challenge through meticulous teamwork, planning and execution.

By actively observing construction sites and consulting with contractors, the team stayed on top of progress and addressed potential issues before they escalated. Monthly schedule reviews and weekly coordination meetings fostered open communication and allowed for swift adjustments when necessary. Careful coordination across the separate adjacent construction zones, each managed by different contractors, in most cases, was crucial to keep contractors and drivers safe throughout the area and minimize driver frustrations resulting from multiple, confusing detours. Addressing concerns with creativity, the team collaborated with traffic engineers and public involvement specialists to find solutions that met both contractor needs and minimized public inconvenience.

This collaborative approach, with Iowa DOT providing leadership and the Program Management team offering specialized expertise, was vital for the successful completion of the Council Bluffs Interstate System Improvement Program. Their combined efforts aimed to minimize disruption to travelers, ensure efficient project execution, and ultimately deliver a modern and improved transportation network for the Council Bluffs community.

IOWA DOT'S FIRST CRITICAL PATH METHOD SCHEDULE

To keep everything on schedule, the team developed a critical path method (CPM) schedule – another first for Iowa DOT. The CPM scheduling required contractors to commit to a specific timeline and provided more schedule transparency, allowing parties to understand work progressions, delays and their causes. Updated monthly, this method offered early alerts when schedules did not match reality, allowing proactive actions to adjust work and to get back on track sooner.

This approach was also beneficial for contractors. It allowed them to precisely monitor the schedule and prioritize work and resources to meet contract requirements. They were able to better forecast resource needs, assess impacts of delays and minimize traffic impacts.

Scheduling also impacts drivers and stakeholders. The team added capacity as the Program continued to serve the area's needs, prioritizing traffic flow through a philosophy that once capacity is added, it cannot be taken away except for low-impact changes, such as overnight closures. For stakeholders, such as the Class I railroads, detailed scheduling helped maintain access throughout construction.

> **"On typical projects, we wouldn't make contractors submit detailed scheduling, but on a Program this size, where schedule is critical and each contract depends on the one previous, the scheduling specification helps us track progress and make sure that our next package gets let on time because other projects are on schedule."**
>
> **—SCOTT SCHRAM, IOWA DOT DISTRICT 4 ENGINEER**

Left: Emergency responders were trained on the operation of the gates in the I-80/I-29 Dual, Divided Freeway so they could act if an incident occurred and traffic would need to be shifted through them.

Upper right: Iowa representatives of the Metro Traffic Incident Management Group

Lower right: Working together and creating a TIM memorandum of understanding, area agencies, first responders and the Iowa and Nebraska DOTs continue to improve inter-agency communication and develop best practices for crash and incident responses.

TRAFFIC INCIDENT MANAGEMENT

In the Council Bluffs/Omaha metro area, Traffic Incident Management (TIM) is a powerful collaboration between first responders, Iowa and Nebraska DOT personnel, tow companies, media, and 911 communications. This dedicated team works together to ensure safe and efficient clearance of traffic incidents, minimizing delays and keeping the roadways safe for everyone.

Through a memorandum of understanding and collaboration, all agencies involved in TIM continue to improve inter-agency communication and have developed best practices for crash and incident response. This group also collaboratively maintains and updates TIM plans that include alternate routes, messaging, contacts and clearly defined roles and responsibilities of each responding agency.

A public outreach campaign was launched in fall 2016 to increase TIM awareness and communicate the role of the traveling public. The team continuously strives to improve response capabilities through focused initiatives. In 2018, the group worked together to design and install ramp signs at system interchanges to help travelers, emergency responders and 911 communications better understand where crashes have occurred to efficiently dispatch help to the scene. Radio communications protocols and other communications best practices have been improved to allow everyone working on a scene to communicate and coordinate more efficiently. This group continues to build relationships and partnerships to improve TIM through media training, public information officer partnerships, construction coordination, safety and technology equipment, and ongoing TIM training.

This partnership also allowed the Program team to employ a unique approach to safety that goes above and beyond industry standards. Through the collaboration, we were able to inform first responders of changes that could impact response times. The team work closely with the Council Bluffs Fire Department to provide emergency response maps that highlighted any new or changing access routes. This ensured that residents would receive a response that was not hindered by ongoing construction.

> **“We have come a long way since the inception of the TIM group and have continued to improve. It has really become an open forum where we truly take on tough issues with open discussion, in an effort to improve response – from trying to truly use Unified Command as it is intended, to taking on interstate signage issues, or just forecasting what future response will look like.”**
>
> **—CHIEF JUSTIN JAMES, CITY OF COUNCIL BLUFFS FIRE DEPARTMENT**

PUBLIC OUTREACH

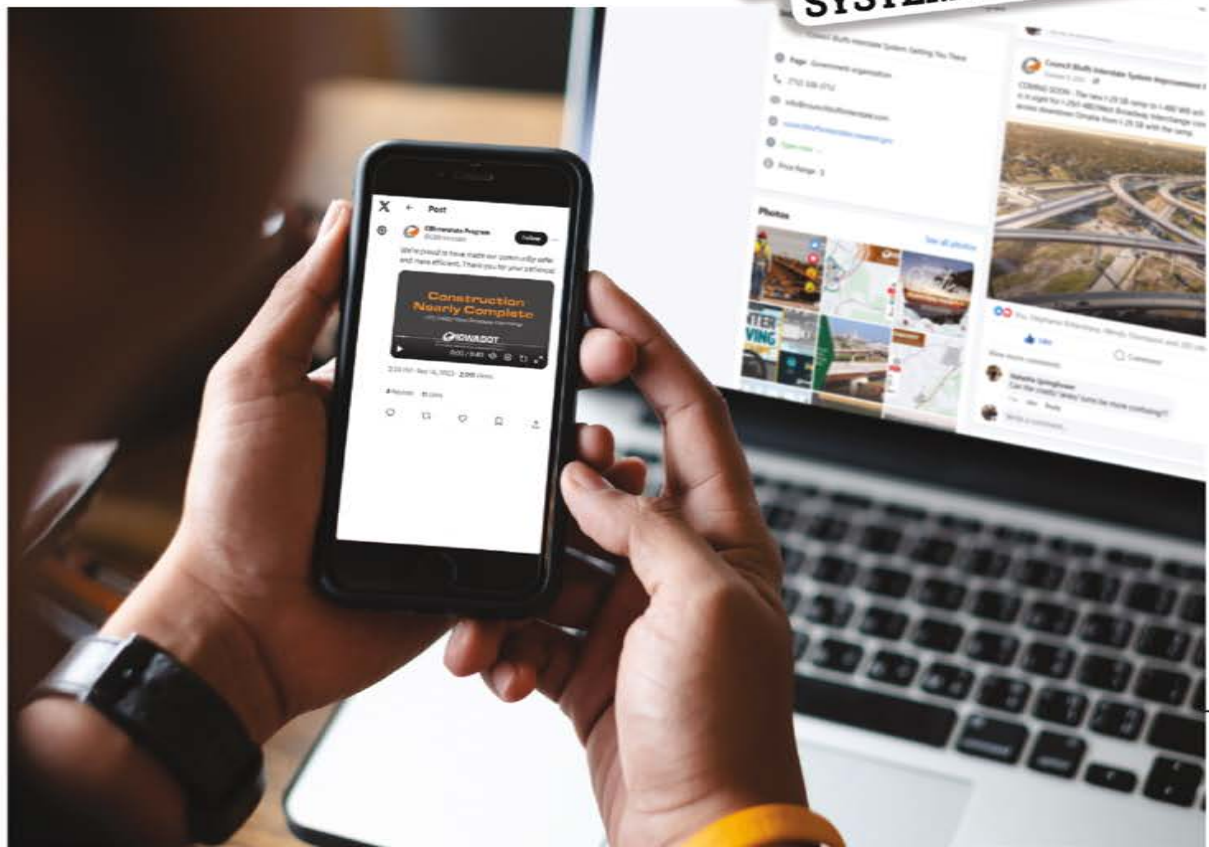
Stretching from California to New York and Canada to Kansas City, I-80 and I-29 intersect in Council Bluffs. Carrying more than 90,000 vehicles per day, the I-80/I-29 corridor is a haven for long-distance travelers and freight. It also connects Council Bluffs and Omaha, where more than 90% of residents in both cities commute in personal vehicles. That meant a significant portion of daily traffic would be reliant on the changing corridor, and the Program team emphasized proactive, regular communications. Keeping all drivers apprised of the latest work and what to expect was important to Program success.

The team developed Program updates and construction alerts through meetings, social media and email, monitored a construction hotline, created graphics and easy-to-understand annual reports, and regularly briefed officials on progress.

Videos were developed to explained the Dual, Divided Freeway concept since it was unfamiliar to the region. The design changes meant that motorists would need to make decisions far in advance. These videos highlighted decision points where drivers must choose which lane to enter – sometimes miles before their intended entrance or exit. These efforts positioned the DOT as the first, best source for information and epitomized the Program's tagline of **Getting You There**.

Nearly every deliverable integrated communication. This perspective provided opportunities to continually consider how to get the right information to the right audiences at the right time. HDR, serving in a Program Management role, worked alongside Iowa DOT to provide timely, accurate information and helped travelers avoid construction-related surprises.

In 2021, the Iowa DOT celebrated the completion of the Dual, Divided Freeway, the first in the area. In lieu of a formal ribbon cutting, a short video was produced for social media and the Program website, showing progress from the previous 12 years and to announce construction completion in the area. The video features key project team members and drone footage of the completed project. To view the video, scan this code with a smart device.



Left: Commemorative stickers distributed to the public, 2023

Lower right: Public meetings kept local residents and stakeholders informed about construction activities, 2017

Lower left: The Program's social media channels provided timely, accurate information and helped travelers avoid construction-related surprises.

Opposite page: Members of the Program Management Team interacted and engaged with the with the public about the Program at events like Loess Fest, 2014 (left) and Celebrate Council Bluffs, 2014 (right).

COLLABORATION AND COORDINATION

UTILITY COORDINATION

As part of the PM/GEC role, HDR worked as an extension of Iowa DOT staff, tackling the complex task of utility coordination. The Program had thousands of intricate utility conflicts, each with their own infrastructure challenges. Through comprehensive coordination and meticulous planning, this helped pave the way for reconstruction to begin in the various project areas.

Even with careful planning and analysis, there were several occurrences where underground utilities were found to be in conflict with proposed construction that was unknown before construction started. In each case, coordination with the utility owner was conducted to resolve the conflict, the majority of the time the resolution was to relocate the utility as expeditiously as possible to minimize any potential delays to the contractor's work schedule.

TRAFFIC COORDINATION

Maintaining smooth traffic flow on the interstate throughout construction and minimizing disruptions to local roads were top priorities for the Iowa DOT and the city of Council Bluffs. To achieve these goals, the Program team's traffic engineers went above and beyond traditional mitigation strategies.

Multi-faceted coordination was necessary to make sure traffic could flow smoothly throughout the construction zone. Several different departments within Iowa DOT worked with consultants HDR and HNTB. Together, they planned all work to be completed and collaborated with city offices, the Army Corps of Engineers, first responders, and others, while actively communicating with those

Traffic flowed continuously throughout construction of the I-29 / I-480 / West Broadway Interchange.

who depend on the interstate every day. Each entity had multiple offices that contributed to coordination efforts.

Innovative staging and traffic plans allowed the contractor to close several interstate system ramps and mainline roadways allowing for extended closures. By allowing major interstate closures, like on the I-29/I-480/West Broadway Project, reconstruction occurred at a faster pace, reducing construction from five and a half years to just over three years, and a safer work zone was provided for the contractor and the traveling public. Additionally, regional and local detours were developed, and the team collaborated with mapping services, such as Waze, Google and Apple, throughout the reconstruction process to ensure real-time traffic information reached drivers.

Further enhancing traffic flow, engineers deployed real-time monitoring to proactively address congestion and implemented adaptive traffic signal technology, which optimized traffic flow during peak periods. This technology, rarely used in active construction projects, proved highly effective in keeping traffic moving efficiently and safely.

Additionally, the team developed the suite of files used for the first-in-the-state color DMS boards with clear and concise messaging to inform drivers of upcoming closures, detours and delays.

The Program worked closely with local law enforcement to ensure smooth traffic flow and address any safety concerns within the construction zones and partnered with first responders to develop emergency access plans and ensure their unimpeded access during construction.

By implementing these comprehensive strategies, traffic engineers successfully mitigated the impact of construction on the interstate and surrounding roadways, ensuring a safer and more efficient travel experience for everyone.

First-in-the-state, color DMS boards with clear and concise messaging inform drivers of upcoming closures, detours and delays.


STOP

RAILROAD COORDINATION

A fourth of all trains crossing the United States pass through Council Bluffs making it one of the Midwest's most important railroad gateways. Five Class I railroads have nine main lines that converge in Council Bluffs, each feeding into two regional classification yards.

Trains have long impacted local traffic around Council Bluffs. Iowa DOT and city of Council Bluffs saw the Council Bluffs Interstate System Improvement Program as an opportunity to consolidate, streamline and reduce impacts of rail lines. Coordinating with BNSF, Iowa Interstate Railroad and CBEC Railway, the team performed an analysis to consolidate four main lines into a common corridor and eliminate nine at-grade crossings. This effort improved rail operations while reducing traffic congestion, provided future rail capacity, and eliminated switching across streets.

With bridges and pier locations spanning rail lines, the team's diligence reorganized a contract to construct piers in the rail yard for the freeway's eastbound structure at the same time as the westbound structure, interrupting rail operations just once, saving time, money and minimizing railroad impacts.

The constrained site also influenced bridge design. Spans around the rail lines considered current and future track locations. To improve future access, the team incorporated inspection catwalks and access safety cables as part of bridge designs. The extensive network provides access to the underside of the bridges for maintenance inspections and allows rail operations to continue uninterrupted.

New railroad constructed between U.S. 275 / Iowa 92 and the I-80/I-29 East System Interchange, May 2017

Securing railroad cooperation was a key feat in itself. Coordinating with multiple railroad companies and having them agree to consolidate their existing infrastructure presented a unique challenge. However, through open communication, a focus on mutual benefits, and a commitment to long-term efficiency, Iowa DOT was able to present a solution that served the needs of both the railroads and the city.

CBEC Railway Inc.

UNION PACIFIC

BNSF RAILWAY

COUNCIL BLUFFS

"What we usually consider as impossible
are simply engineering problems...
there's no law of physics preventing them."

—MICHIO KAKU

SECTION 05

CHALLENGES

CONFRONTING CHALLENGES

MAINTENANCE OF TRAFFIC DURING CONSTRUCTION

Perhaps the biggest challenge was keeping a minimum of two lanes of traffic moving with minimal disruptions while working in tight confines. The team accomplished both with extensive planning.

Adding technology like Intelligent Work Zone devices improved safety and traffic flow. Electronic signs alert drivers of trucks entering the interstate so they have time to merge and continue at highway speeds. Other devices alert Iowa DOT of vehicle queues on interstate ramps so they can adjust signals to clear traffic.

In addition, the team erected multi-level bridges within short detour windows, overnight and on weekends. HDR's traffic engineers worked alongside Iowa DOT, Nebraska DOT, first responders and stakeholders to establish an active, engaged incident management team. This team improved inter-agency communication and developed best practices for crash response.

> **"We try to build as much as possible in the clear so that workers do not have to be near traffic. However, some areas are unavoidable, especially at the interchanges near local roads. Overnight closures were utilized when working traffic lanes couldn't be avoided."**
>
> **—SCOTT SCHRAM, IOWA DOT DISTRICT 4 ENGINEER**

Keeping traffic moving, especially on the local roadways, was important to the City of Council Bluffs and Iowa DOT.

Construction near U.S. 275/Hwy 92 over Mosquito Creek required many safeguards for the levee to ensure its integrity was not impacted.

LEVEES

Council Bluffs, Iowa, faces the constant threat of flooding from the mighty Missouri River. Levees, crucial to property and life safety, presented a significant challenge to interstate construction. A breach during construction or even after completion could cause catastrophic damage to infrastructure, surrounding areas, and endanger lives. Careful planning, engineering solutions, and collaboration with various stakeholders were essential to overcome these challenges and ensure the safety and integrity of both the levee system and the interstate functionality.

Deep excavations and heavy construction activities posed a significant threat to levee stability. Implementing additional reinforcement measures increased Program complexity and costs. Furthermore, designs had to consider the intricate balance of future levee maintenance and the interstate's functionality. They needed to allow for potential repairs without hindering the interstate's operation. Environmental regulations further added to the timeline by requiring thorough reviews and design adjustments. However, collaboration allowed the Iowa DOT, the Army Corps of Engineers, and the city to streamline the review process, minimizing delays.

Additionally, construction crews navigated the complexities of multiple flood events, adapting to changing situations while ensuring safety and progress.

Despite these obstacles, the Program successfully navigated them all. This accomplishment is a testament to the dedication and collaboration of all involved parties, paving the way for a vital transportation artery while maintaining the city's flood protection.

POOR SUBSOIL

Due to the corridor's proximity to the Missouri River and its surrounding wetlands and deciduous forest, the area has sandy subsoils and poor drainage. These soil conditions retain significant moisture and posed a construction challenge. The team used geotechnical engineering to their advantage. By monitoring settlement and using modern materials – such as wick drains, mechanically stabilized earth (MSE) and retaining walls, lightweight cellular concrete, and a subsurface ground improvement technique called "rigid inclusions" – they accelerated or eliminated long-term settlement times, creating opportunities to advance critical-path construction stages and keep the Program on schedule and under budget.

For the East System Interchange, designers extended bridge lengths, which minimized embankment heights near the abutments, which in turn minimized soil settlement times.

For the Railroad Relocation, where the team sought to limit vertical track deflection to less than 0.30 inches, a unique study showed that geogrid reinforcement not only achieved the desired sub-grade environment, but accelerated construction, reduced delay risks and decreased costs.

For the Madison Avenue Reconstruction Project, white Styrofoam™-like blocks, known as rigid geofoam, were used as a lightweight, yet durable, alternative to traditional dirt or concrete fill. Because soils in the project area are highly compressible, traditional fill would be prone to compact and settle significantly over time. Ultimately, this would shorten the lifespan of both pavement and structures. The rigid geofoam blocks can handle the weight of the interstate and its traffic for decades, alleviating long-term settlement issues and helping us design an interstate system that is built to last for generations.

Rigid geofoam was used as a lightweight, yet durable, alternative to traditional dirt or concrete fill on the Madison Avenue Interchange Reconstruction Project.

Extensive clean-up efforts were needed to clear debris from I-29, north of Council Bluffs, following flooding events, April 2019

FLOODING

Council Bluffs has levees that can be difficult to work with, and when widespread flooding impacted the area, many additional challenges were encountered by the full Program team.

The Missouri River floods of 2011 will go down in history as the longest duration flooding event Iowa has seen to date. In western Iowa, approximately 54 miles of primary roads were closed due to flooding, including 54 miles of interstate. Although the interstate was not directly impacted in Council Bluffs during this flood, Missouri River bridge construction was underway and work near the river was dangerous due to homes and other large debris coming down the river.

Flooding in 2019 devastated thousands of people and caused more than $2 billion in economic damages across Iowa. Due to high flow rate, flood waters over-topped and damaged interstates, highways, and local roads around Council Bluffs.

Throughout each disaster, the Program team maintained focus and worked together to restore mobility. The Program made ongoing changes to detour routes, modified work zones to accommodate increased traffic due to closed roads, evaluated project schedules, advanced project designs, and monitored fluctuating water levels. Additionally, they continued to provide communication to area stakeholders and the traveling public regarding closed roads due to construction activity and flooding.

While the magnitude of the flood event was far reaching and long lasting, only one project, the Nebraska Avenue Interchange, was ultimately delayed. In fact, the Program was able to open the westbound portion of the Dual, Divided Freeway during this critical period.

In response to the recurring flood threat, the existing pavement on I-29 was raised between 14 and 28 inches between 16th and 25th Streets.

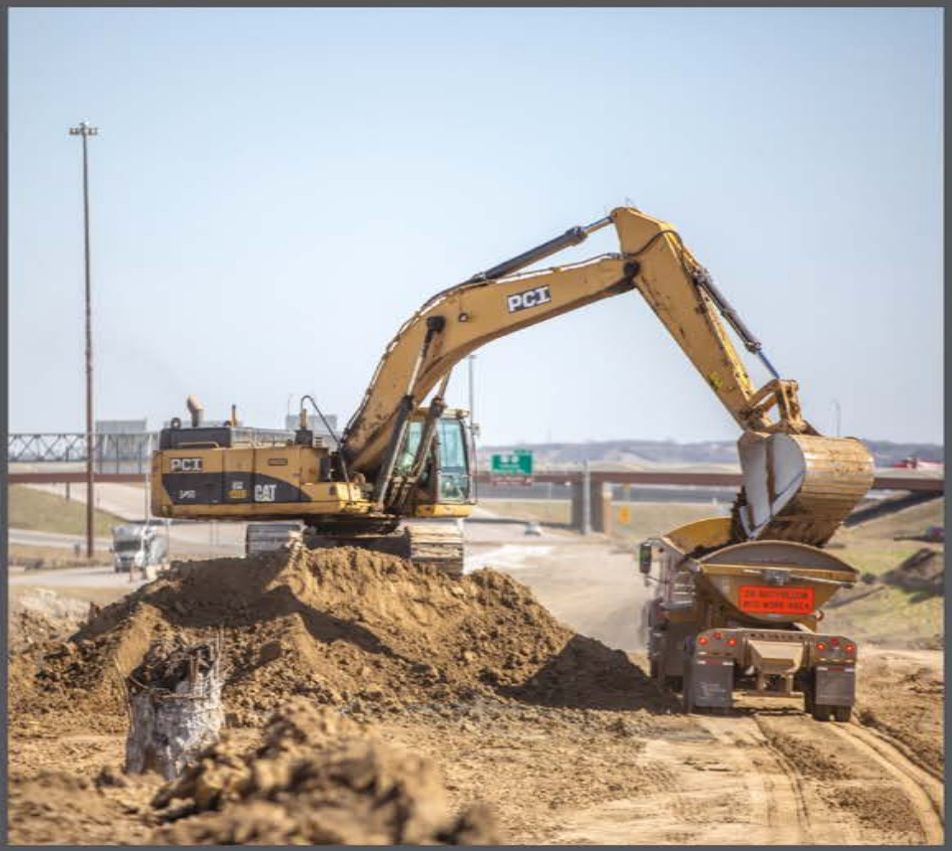
While the grade raise will not flood-proof the roadway, it will limit future flood impacts by allowing Iowa DOT to keep roads open longer and re-open flooded areas quicker, increasing overall resiliency of the transportation network.

The experience during the floods equipped the team with invaluable skills and knowledge to tackle future unforeseen challenges, demonstrating their dedication to building a more robust and adaptable infrastructure.

COVID-19 PANDEMIC

In March 2020 when the COVID-19 pandemic began to shut down most U.S. businesses, the team quickly adjusted to virtual meetings between the design team, partners and stakeholders. Exposures and quarantines challenged construction schedules. However, school closures and work from home arrangements reduced commuter traffic by up to 40%. This allowed the contractor to close more lanes and revise overnight closures, providing flexibility to keep the Program on schedule.

As suppliers struggled to provide material and costs skyrocketed, lower transportation revenues hit the state. The Program team built "ground up" cost estimates for remaining construction packages, developed cash-management levels to support multi-year construction and facilitated key decision making to keep the goals in sight. Most importantly, the Program kept moving on schedule.



With less commuter traffic to contend with due to the impacts of the COVID-19 pandemic, contractors were able to make adjustments – closing more lanes and revising overnight closures – to maintain continuity with project schedules and construction.

ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

While the majority of the Program involved reconstructing a previous corridor through an urban environment, it was not without complex environmental considerations. There are 11 potential threatened or endangered species that may be found in this area. To reduce construction impacts, the team conducted habitat surveys and limited clearing and grubbing activities to avoid roosting and foraging times.

The Indian Creek Trail parallels its namesake creek and in reconstructing the Dual, Divided Freeway, the team was forced to move the trail to account for the new pier configuration. With a temporary trail connection to bypass the site, the team mitigated the challenges and coordinated alongside the Council Bluffs Parks and Recreation Department to keep users informed.

There are 11 threatened and endangered species found in the area of the Council Bluffs Interstate System, including the piping plover (far left), bald eagle (center left), pallid sturgeon (center right), and the western prairie fringed orchid (right).

Opposite page: During construction, cars on the interstate weren't the only ones impacted. Trail users, such as the ones that used Mosquito Creek Trail, also had to be informed about changes.

Stretching from California to New York and Canada to Kansas City, I-80 and I-29 intersect in Council Bluffs. Carrying more than 90,000 vehicles per day, the I-80/I-29 corridor is a haven for long-distance travelers and freight.

SECTION 06

BY THE NUMBERS

Funding Through the Years

In 2013, the Iowa DOT Transportation Commission committed to funding the Program for the full build out of all improvements for the Council Bluffs Interstate System Improvement Program.

Repackaging individual contracts was necessary for the schedule and available funding. State funding shifts from year to year, and in Iowa, project funding only becomes available as budgets allow. This required the team to combine small projects to make larger contracts in some years while breaking down larger ones in others. The overall project schedule was accelerated, reducing the design and construction schedule from over 20 years to 16 years. Additionally, Iowa DOT was able to incorporate I-29/I-480/West Broadway improvements without significant impacts to other project schedules.

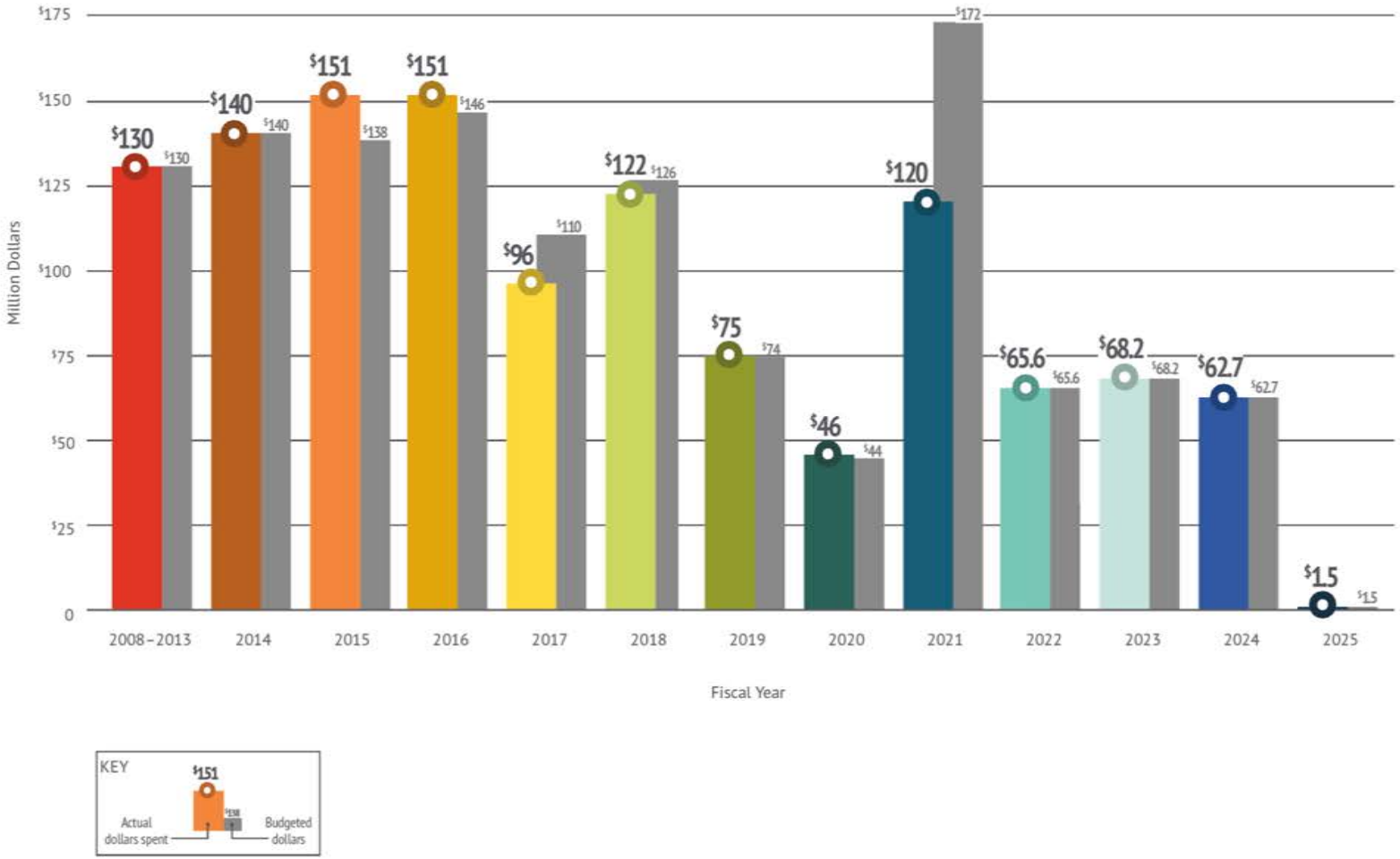
In collaboration with the Program Management team, Iowa DOT developed comprehensive cost estimates for all-in costs required for the Program in 2014. Estimates for remaining right of way, construction, utility relocations, railroad payments, and design were developed. By factoring in potential contingencies and future unknowns, the Program was able to establish a realistic budget of $1.58 billion, nearly $500 million less than earlier projections.

External factors like the 2019 flood and the COVID-19 pandemic required adjustments to Program funding. Consequently, contract schedules were adapted accordingly. Conversely, the 2021 Infrastructure Investment and Jobs Act (IIJA) provided additional resources, enabling an earlier start for the Madison Avenue Interchange Reconstruction Project.

While the Program team benefited from competitive bids, partially due to repackaged contracts, the under budget and ahead of schedule delivery also came from anticipating risk and project unknowns. Constant value engineering on individual projects helped minimize change orders and kept the project moving. Despite a 40% increase in construction material prices from 2008 to 2020, the contract repackaging strategy helped mitigate impacts from inflation. This approach contributed to the completion of the Dual, Divided Freeway's $10 million under budget and 17 months ahead of schedule.

Through strategic planning, proactive adjustments, and efficient execution, the Iowa DOT and the Program Management team anticipates completing the Council Bluffs Interstate System Improvement Program for under $1.4 billion. This translates to over $140 million in savings for taxpayers compared to the 2014 estimate.

Actual Dollars Spent Vs. Budgeted Dollars

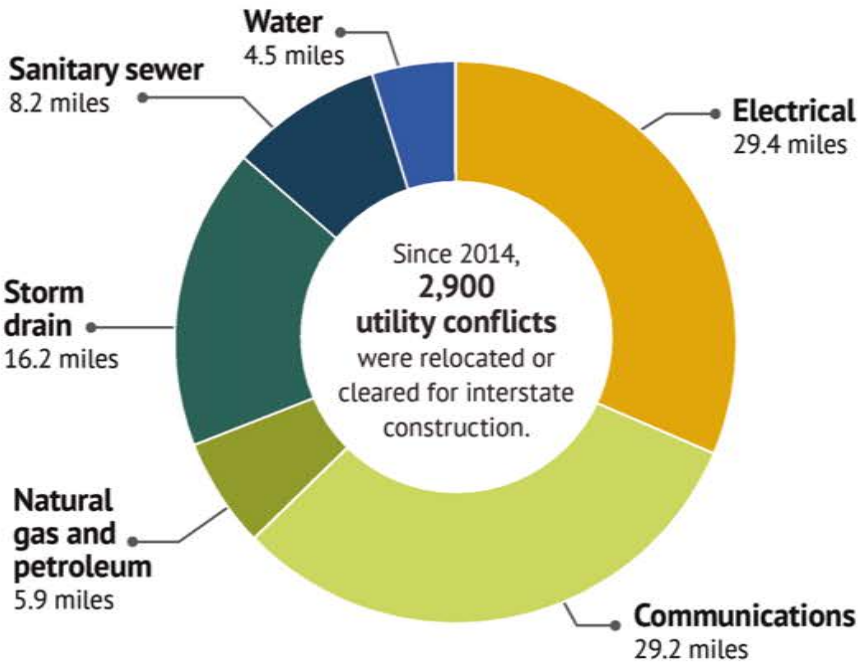


CONSTRUCTION AND SYSTEM IMPROVEMENTS

Construction of the Council Bluffs Interstate System Improvement Program has been active since 2008. These statistics provide a snapshot of the magnitude of work that has gone into reconstruction of the interstate.

23 Construction contract packages

212 Right-of-way parcels purchased



47 bridges

12 interchanges

14 interstate centerline miles

146 highway lane miles

1 public art installation

23,250 square yards of recreational trails

20,317 linear feet of noise wall

384,670 linear feet of retaining wall

15,590,000 cubic yards of earthwork moved

825,600 cubic yards of concrete

2,500,000 square feet of bridge deck

4 miles of new railroad track

63,300 cubic yards of geofoam blocks

200,500 linear feet of pipe

250,000 linear feet of conduit and fiber-optics

880 new tower and street lights

42,600 cubic yards of structural concrete

24,550 tons of reinforcing steel

55,700 tons of structural steel for bridges

93,800 linear feet of permanent fencing

3,165 tons of crushed gravel

593,500 linear feet of steel pile to support bridges and other roadway structures

15 dynamic message signs

77 prestressed-precast concrete beams

I-80/I-29 Dual, Divided Freeway, 2023

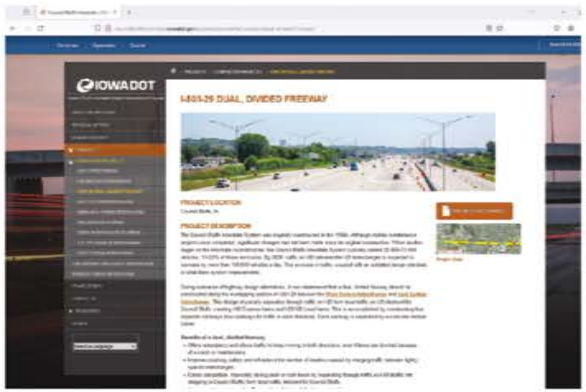
One of the main culprits of Council Bluffs' crash rate – 17% higher in total and 9% more fatal accidents than the state average – was tightly spaced interchanges. This forced traffic to merge in short distances. Anytime a crash occurred, traffic backed up, increasing the likelihood of secondary crashes.

The new freeway will reduce crashes by an expected 21%. New, separated interchanges provide greater length for merging, while the dual, divided design separates through-traffic from local traffic and additional lanes accommodate more traffic. However, if a crash occurs, new parallel routes and special gates provide flexibility to reduce traffic impacts.

OUTREACH

To ensure as many people possible were informed about the Program and to minimize disruption to residents and businesses, a comprehensive outreach campaign was implemented, targeting the community, emergency responders, and elected officials. This multi-channel approach utilized a variety of communication methods to reach a vast audience.

Since 2014, over 90,000 pieces of informative materials were distributed, including emails, postcards, and letters, to elected officials, emergency responders, residents, and businesses within the impacted area. This general outreach provided crucial details about upcoming closures, traffic shifts, and other program information.



PROGRAM WEBSITE

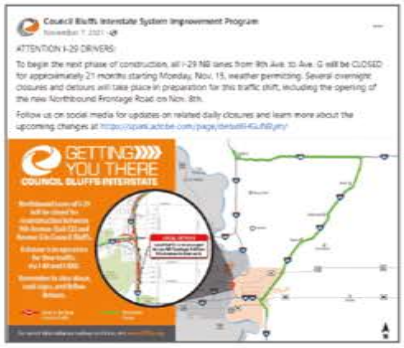
The Dual, Divided Freeway webpage is one of the most popular pages on the Program website. It consistently ranks among the top ten most viewed pages each month, following closely behind the Home page and closure information.

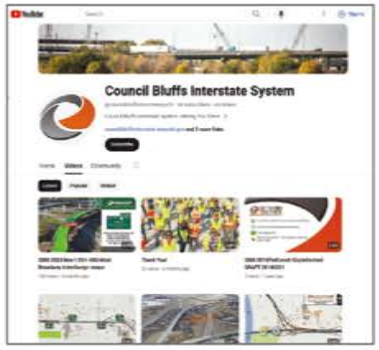
ONLINE MEETINGS

To increase accessibility, online meetings were developed, allowing over 3,700 people to access meeting information on-demand, at their convenience, rather than requiring attendance at a specific time.

OFFICE VISITORS

Since 2014, almost 400 curious minds have seized the opportunity to meet with PM/GEC staff, voice their construction concerns, and unearth answers to their burning questions about the Program. With the power of visual maps, staff painted a vivid picture of how each project puzzle piece fits into the grand vision.





SOCIAL MEDIA PLATFORMS

By the end of April 2024, the Program's X (formerly Twitter) page had 823 followers and its Facebook page had 2,834 followers. The most popular posts, shown here, had nearly 800 engagements on X and over 5,200 engagements on Facebook. The Program's YouTube channel hosts 46 videos with 4,600 views.

PUBLIC HEARINGS

To ensure public participation, hearings are held when key decisions need community feedback. For instance, in 2017, a public hearing allowed Council Bluffs residents to weigh in on design alternatives for the I-29/I-480/West Broadway Interchange Project.

COMMUNITY EVENTS

Committed to community engagement, PM/GEC staff actively participated in local events like LoessFest and Celebrate CB. These events provided opportunities to speak directly with residents about how the interstate construction project might affect them.

GUEST SPEAKER PRESENTATIONS

The Program garnered significant interest from diverse groups, like the Kiwanis club, community organizations, and industry representatives like the local ACEC chapter. Over 2,100 people attended the various presentations delivered by Iowa DOT or PM/GEC staff.

I-80/I-29 Dual, Divided Freeway – South Expressway Interchange, June 2021

A key goal of the Council Bluffs Interstate System Improvement Program is to reduce traffic congestion in the Council Bluffs/ Omaha metro. Historically an area that was impacted almost daily during both the morning and evening commute was the westbound lanes of I-80/I-29 west of the South Expressway Interchange.

As the Program progressed through its various stages, traffic patterns were dynamically adjusted to maintain a steady flow, enabling motorists to benefit from the enhanced road capacity and the overall improved driving experience.

AWARDS AND RECOGNITION

2023	American Society of Civil Engineers	Outstanding Civil Engineering Achievement Honor Award	I-80/I-29 Dual, Divided Freeway
2023	American Infrastructure Magazine	Peninsula Publishing Pubby Award for Road Project of the Year	I-80/I-29 Dual, Divided Freeway
2022	Engineering News-Record Merit Award	Highway/Bridge Category	I-80/I-29 Dual, Divided Freeway
2022	MAASTO's America's Transportation Awards	Operational Excellence – Large Category	I-80/I-29 Dual, Divided Freeway
2022	American Council of Engineering Companies	National Recognition Award	I-80/I-29 Dual, Divided Freeway
2022	American Council of Engineering Companies	Iowa Grand Conceptor and Grand Place Awards	I-80/I-29 Dual, Divided Freeway
2022	American Council of Engineering Companies	Nebraska Honor Award	I-80/I-29 Dual, Divided Freeway
2021	Roads & Bridges	Top 10 Roads, #4 Road	I-80/I-29 Dual, Divided Freeway
2018	American Council of Engineering Companies	National Recognition Award	East System Interchange Bridges
2018	American Council of Engineering Companies	Iowa Honor Award	East System Interchange Bridges
2017	American Council of Engineering Companies	National Recognition Award	Railroad Relocation Project
2017	American Council of Engineering Companies	Iowa Grand Place Award	Railroad Relocation Project
2017	American Council of Engineering Companies	Nebraska Grand Place Award	Railroad Relocation Project
2010	Associated General Contractors of Iowa	Iowa Quality Initiative Structure	I-80 Westbound Missouri River Bridge
2010	American Council of Engineering Companies	National Recognition Award	24th Street Bridge
2010	American Council of Engineering Companies	Iowa Grand Place Award	24th Street Bridge
2009	Associated General Contractors of Iowa	Iowa Quality Initiative Structure	24th Street Bridge

The Council Bluffs Interstate System – Dual, Divided Freeway Project received a 2022 National Recognition Award from the American Council of Engineering Companies. The project was recognized for excellence in engineering, with significant contributions made to civil engineering progress and society. (L-R) Mark Pohlman, PM/GEC from HDR; Jeanne McClure, Director of ACEC Nebraska; Wes Mayberry, Iowa DOT – District 4 Engineer; and John Selmer, former Iowa DOT – District 4 Engineer and former Nebraska DOT Director were in attendance for the award presentation.

"Success is best when it's shared."

—HOWARD SCHULTZ

SECTION 07

PROGRAM PARTNERS

Program Partners

This ambitious Program wouldn't have been possible without the power of collaboration. We formed a true partnership, bringing together a diverse range of skills. Each partner leveraged their strengths and through open communication and mutual respect for each other's expertise, we were able to overcome challenges and achieve a remarkable outcome together.

HDR

Ames Construction

Commonwealth Electric Company of the Midwest

hgm ASSOCIATES INC.

benesch

Council Bluffs

HNTB

BNSF Railway

Cramer & Associates Inc.

HRGreen. Building Communities. Improving Lives.

CBEC Railway Inc.

U.S. Department of Transportation Federal Highway Administration

Iowa IAIS Interstate

ch2m

Hawkins Construction Company

Iowa DOT

PARSONS

iteris®

Jacobs

MAPA

HONORING THE TRAILBLAZERS

Former Team Members Who Shaped the Program

The Council Bluffs Interstate System Improvement Program stands as a testament to human ingenuity and collaboration. But behind this vast network lies a story woven by countless individuals. Here we pay tribute to those who are no longer on the team, but played a vital role in shaping the Program's development.

Here we celebrate former Iowa DOT staff for their dedication, expertise, and passion to overcoming challenges, that laid the groundwork for the interstate redesign we know today. Through their contributions, they left an indelible mark on the legacy of the Council Bluffs interstate system.

IN MEMORIAM

Schmidt Family Funeral Home

JOHN A. CARNS
July 7, 1949 – April 19, 2020

In May 1983, John graduated from the University of Iowa with a civil engineer degree and went to work immediately with the DOT in New Hampton, Iowa.

After moving to several Iowa locations with his career, John retired in December 2012 from the DOT as the Council Bluffs Interstate System Project Coordinator. John missed knowing what the next phase of the project was but managed to keep in contact with many colleagues who gave him personal tours of the project.

IN MEMORIAM

Sioux City Journal

TRACY ROBERTS
June 12, 1960 – August 20, 2005

For 21 years, Tracy was a loyal and devoted employee for the Iowa Department of Natural Resources and the Iowa Department of Transportation. He lived and worked in the Des Moines and Sioux City area. His last job position was District Transportation Engineer in the Atlantic Office where he held the position of coordinator of the Council Bluffs Interstate Project.

IN HONOR OF

JIM MUETZEL

Jim spent 11 years at Iowa Department of Transportation in Atlantic, Iowa. There, he served as Transportation Engineering Specialist and Council Bluffs Interstate System Improvement Coordinator, with responsibilities including project plan development, improvement and preservation programming, engineering consulting and accountability towards reconstruction of a major interstate corridor. Jim left Iowa DOT for a position in the private sector, but returned to the DOT before retiring in 2024.