Fracture Critical Bridge Inspection Report

NBI Bridge No.: 04085

Route U.S. 281 over S. CANADIAN RIVER
Canadian County

Prepared for:

Oklahoma Department of Transportation

Field Division 04

Inspection Date:

10/16/2019

Report Prepared By:

BURGESS & NIPLE, INC.

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Mr. Wes Kellogg, P.E.
Field Service Engineer
Oklahoma Department of
Transportation
200 Northeast 21st Street
Oklahoma City, OK 73102-3204

Re: Fracture Critical Bridge Inspection Report
Structure No.: 0902 0000 X
NBI No.: 04085
U.S. 281 over South Canadian River
Canadian County, ODOT Field Division 4

November 15, 2019

Dear Mr. Kellogg:

Burgess & Niple (B&N) performed a fracture critical and routine inspection of the above referenced bridge on October 14 through 16, 2019. Route 281 is not a National Highway System (NHS) route. The bridge is a 40-span structure **(photos 1 and 2)** with spans numbered south to north and consisting of:

Spans 1 and 40:	36-foot long steel multi-beam approach spans
Spans 2-39:	100-foot long riveted pony truss spans

The limits of the inspection were from the south abutment to the north abutment. Inspection team members included Mike Kronander, PE (Team Leader), Brendan Prendeville, PE, Dale Poorman, PE, Chris Villier, PE, Todd Barker, EI, John Bowie, and Roger Aker.

The posting was lowered to 9 tons after cracks were discovered in the east U4 inboard gusset plates of spans 32 and 37 during April 2019 OS inspection **(photos 3 and 4)**. It was also discovered that the latest load rating report, dated March 25, 2014, used 8 rivets per gusset plate for the U1L0 and U4L3 panel points where only 6 exist. Note: numerous overweight vehicles were noted passing over the bridge during the inspection.

This report includes appendices containing:

- Significant Findings
- FC/Truss Rating Form
- Condition Photographs
- Oklahoma DOT Bridge Inspection Form/BrM element report
- Appendix A – Stringer Cope Cracks
- Appendix B – Stringer Connection Cracks
- Appendix C – Missing Stringer Rivets
- Appendix D – Stringer Loss
- Appendix E – Floor Beam Sweep
- Appendix F – Floor Beam Loss
- Appendix G – Floor Beam Cracks
- Appendix H – Gusset Plate Cracks

The current and previous NBI ratings for the bridge are:

NBI Item	Current Rating (2019)	Previous Rating (2018)
NBI Item 58 (Deck)	4 = Poor	5 = Fair
NBI Item 59 (Superstructure)	4 = Poor	4 = Poor
NBI Item 60 (Substructure)	5 = Fair	5 = Fair
NBI Item 61 (Channel)	5 = Bank Eroded	5 = Bank Eroded
NBI Item 113 (Scour)	(7 = Countermeasures Installed)	(7 = Countermeasures Installed)
Sufficiency Rating	21.1 (SD)	21.1 (SD)

The bridge is structurally deficient.

RECOMMENDED ACTIONS, in order of decreasing priority, are as follows:
Priority Code **CX** – *Bridge condition is bad enough that there is a possibility of failure of a major structural component if repairs are not completed within the next few days.*

- There are no CX repair items required at this time.

Priority Code **PX** – *Bridge condition is such that immediate repair is not necessary, but should be completed within the next several weeks or months.*

- Reinforce/replace the damaged concrete bridge railing in spans 1 and 40. Consider installing approach railing with transitions and terminations compliant with current standards in both approach roadways.
- Seal cracks in the asphalt in both the bridge and approach wearing surfaces. Consider removing the asphalt wearing surface on the bridge and the built-up elastomeric concrete header to remove dead load and prevent damage to structure from drainage trapped in the wearing surface.
- Remove loose elastomeric concrete and patch the joint headers as necessary to provide a smooth riding surface across the bridge.
- Reseal the poured seal expansion joints. Consider replacing the deteriorated joints and joint headers due to deteriorated concrete adjacent to the joint opening.
- Install elastomeric pads or steel shims at missing locations on the supplemental pier beams over piers 1 and 39.
- During future inspections, compare lengths of cracks in stringer and floor beam webs with Appendix A table values. Drill crack tips that grow significantly.
- Repair cracks in stringer connection angles noted in Appendix B by adding seat brackets below the stringer.
- Repair section loss in stringer and floor beam webs where corrosion holes and/or heavy section loss exists with welded plates and/or angles.
- Remove broken rivets for the stringer connections at the locations noted in Appendix C and replace with bolts.
- Replace sheared rivets in the vertical connection, upper chord, and end post with bolts at west U1 in spans 31 and 37.
- Remove pack rust and apply caulking and paint along the edges of the gusset plates at L0 and L5. Consider strengthening gusset plates where bowing is occurring.
- Clean and paint the stringer ends and floor beams adjacent to the joints above the piers and the lower chord panel points including the splice locations.
- Add rip rap around piers near the current channel to protect against scour.
- Repave the south approach near the bridge to provide a smooth transition.
- Install full depth pressure relief joints in both approaches to mitigate ongoing effects of pavement pressure.

Priority Code **FX** – *Bridge condition is such that repair should not be necessary any time soon, monitor during future inspections.*

- Monitor cracks in the inboard gusset plates at east U4, spans 32 and 37, and at west U1 span 37 for growth.
- Monitor the channel for further movement.
- Monitor the beam connections to the original pier beams at piers 1 and 39 for further cracking.
- Monitor notches and cuts in inboard flange and gusset plate at west U1L2, span 31 for cracks or signs of distress. Consider strengthening member if further distress is noted.
- Monitor collision damage to west U1L2 in span 6, west U1L0 in spans 7 and 37, and east U1L0 in spans 14 and 39 for distress.
- Monitor pack rust and section loss in truss web members and end posts at railing connections.
- Monitor spalls and corroding reinforcing steel in soffit for further deterioration.
- Monitor the lower chord gusset plates over the bearings for the development of horizontal cracks.
- Monitor cracks at floor beam copes for growth and further deterioration.
- Monitor the horizontal cracks in the web of the end floor beams at span 6 in floor beam 0, span 11 in floor beam 5, and span 20 in floor beam 0.
- Monitor fatigue prone stitch welds of angle strengthening at floor beam 0, span 2 for cracking.
- Monitor corrosion holes through the floor bracing system gusset plates for the development of cracks.
- Monitor the 1/4-inch bow in west U1U2 due to collision damage for further distress and development of cracks.
- Monitor bowed gusset plates near bearings for distress.
- Monitor section loss of the inboard lower chord at the floor system bracing connections, splices, and adjacent to stay/batten plates.
- Monitor bullet strike damage to east truss span 4 members/gusset plates for crack development.
- Monitor the cracking/spall of the east column capital, pier 3 for conditions which would undermine the bearing.
- Monitor the expansion bearing pins for signs of additional wear or distress.

In addition to these recommendations, it is recommended that this structure remains on a 12-month Routine/Fracture Critical Inspection Frequency and a 12-month Other Special Inspection Frequency.

We thank you for the opportunity to provide our engineering services. Please contact me if you have any questions or comments.

Sincerely,

BURGESS & NIPLE, INC.

Michael Kronander

Mike Kronander, PE
Team Leader
Attachments

SIGNIFICANT FINDINGS are as follows:

NBI Item 36 – Traffic Safety (5 = Fair condition)

- **PX** – Collision damage exists to the concrete railing in spans 1 and 40. One section of the east bottom rail has been severed in span 1 **(photo 5)**. The concrete post at the north abutment for the east rail is spalled and is severed from the base **(photo 6)**. The adjacent post has spalling with exposed reinforcing steel. Four of the concrete posts for the west rail in span 40 are leaning outward and the deck is cracked on the outside edge of the posts.
- Pack rust is typical between the metal bridge railing and the truss end posts and web members. No significant section loss was noted to the railing.
- Small cracks exist in the railing where the flange and web have been coped around the end post. Collision damage has caused minor bends in the steel railing at numerous locations. These conditions have not significantly affected the strength of the railing.
- None of the traffic safety items meet current standards for a non-National Highway System roadway.

NBI Item 58 – Deck (4 = Poor condition)

Driving Surface – (4 = Poor condition)

- **PX** – The asphalt wearing surface has unsealed longitudinal and transverse cracks throughout the spans **(photo 7)**. Raveling and patching of the asphalt pavement exists along the outside wheel lines at isolated locations and along the roadway centerline **(photo 8)**. The aging wearing surface does not effectively shed drainage, allowing the drainage to infiltrate cracks in the deck.
- The deck appears to be growing from the center of each truss span as evidenced by the distress in the floor system at the end floor beams (cracking and web rotation of the floor beams, cracks in the stringer connection angles, and broken rivet heads at the stringer connection angles). These conditions were observed in nearly all of the truss spans.
- Evidence of significant approach pavement growth was noted at the deck/abutment backwall interface**.** The deck at the abutment seats has pushed towards the channel up to 3 1/4 inches **(photo 9)**.
- Deterioration of the curbs and edges of the deck are typical throughout the bridge **(photo 10)**. These conditions are promoted by deck drainage held against the concrete by the porous asphalt wearing surface. Spalls in the curb have been patched at isolated locations throughout the deck.

Soffit – (5 = Fair condition)

- **FX** – Spalls exposing corroded reinforcing steel are common in the underside of the deck along the edge of the deck and floor beams **(photos 11 and 12)**. The spalls appear to be the result of deck drainage leaking through cracks in the deck.
- The deck is lifting from the exterior stringers and end floor beams due to pack rust on the top flange **(photos 13 and 14)**. A transverse crack is common in the underside of the deck between 4 and 6 feet from the expansion joints because of the lifting deck. This

lifting of the deck is beginning to produce a ramping effect for traffic over each floor beam.

- The deck soffit exhibits transverse cracks with light efflorescence and discolored concrete **(photo 15)**. Full depth patches exist adjacent to many of the joints and along the east curb at isolated locations. At a few locations, the timber formwork remains in place. A deck repair utilizing timber boards occurs on the south face of floor beam 3 between stringers 4 and 5 in span 34.

Joints – (4 = Poor condition)

- **PX** – Joint headers consisting of elastomeric concrete were installed to maintain a joint opening with the asphalt wearing surface. These headers are only as deep as the asphalt wearing surface and exhibit past patching using asphalt, concrete and elastomeric concrete. Spalling of the headers was observed along the joints at piers 1, 2, 13, 27, 33, 35, and 39 **(photos 16 and 17)**. Several of these spalls have occurred since the 2016 inspection when the joint headers were patched with asphalt concrete.
- **PX** – The poured seal joints typically are deteriorated or missing and show evidence of leaking **(photos 18 and 19)**. The poured seal was never installed at many of the repaired header locations, leaving only the form board to fill the joint. Spalling of the underside of the deck at the expansion joints is common and a direct result of the leaking joints.
- The joints are typically closed near the ends of the bridge as a result of approach pavement growth. The joints above the expansion bearings further from the ends of the bridge are not closed, though many of the truss expansion bearings are at or near their limits of movement. Joints over the fixed bearings typically are closed.
- The void between floor beam 5, span 20, and floor beam 0, span 21, over pier 20 has been filled with asphalt from the top of the floor beam bottom flanges to the underside of the deck **(photo 20)**. The asphalt retains moisture which accelerates corrosion and section loss on the floor beams.
- Joint armor and supports at pier 1 are heavily twisted. This is caused by pavement pressure and pack rust.
- Several of the fixed joints and the abutment joints have been paved over with a transverse crack observed over the joint.

NBI Item 59 – Superstructure (4 = Poor condition)

Fracture Critical Member Rating Summary	
Floor Beams	4 = Poor condition
Pier Beams	4 = Poor condition
Truss Lower Chord	5 = Fair condition
Truss Web Members	5 = Fair condition

Steel Beams – (5 = Fair condition)

- **FX** – The connection angles for the beams to pier beam 39 are deformed due to the apparent approach pavement growth and pier beam rotation and sweep. The beams are still supported by the original pier beams at piers 1 and 39; however, the added pier beam will support the beams should the connection angles fail.
- The elastomeric bearing pads between the beams and the additional pier beam are missing beneath beams 1 through 4 at pier 1 and beam 3 at pier 39 **(photo 21)**. The bearing pad beneath beams 4 and 5 at the pier beam at pier 39 has moved but is still supporting the beam**.**
- Surface corrosion exists along the top flanges of exterior beams and on the end 1-3 feet of the beams.

Stringers – (4 = Poor condition)

- **PX** – Significant section loss, including corrosion holes, exists through the exterior stringer webs at the end floor beams at 61 locations with 1 location added and 10 with noted change (see **Appendix D** for locations and sizes) **(photos 22 through 25)**. Multiple corrosion holes exist through the web adjacent to the connection angle. Section loss was noted at stringers 1 and 5 with a higher concentration (84%) noted at the end floor beams due to deck drainage passing through the joints. Stringer 5 has the majority of the loss locations (68%) compared to stringer 1 (32%). Numerous through holes also have cracks extending from the holes due to very thin remaining web thickness adjacent to the holes. Exceptionally severe section loss was observed at several locations and repaired with a welded plate.
- **PX** – Cracks were observed in the web of numerous stringers at the top flange cope **(photos 26 through 29)**. There is a total of 100 locations (see **Appendix A**) and 36 locations where cracks extend from section loss (see **Appendix D**). One new crack and four cracks with growth were noted during the 2019 inspection. The cracks range in length from 1/8 inch to 2 1/2 inches. The cracks are well distributed throughout the truss spans with only two spans (spans 22 and 24) having no cracks observed. All but two cracks exist in the exterior stringers (67 at stringer 1 and 31 at stringer 5). A definitive cause for the cracks could not be determined during the inspection; however, differential movements between the deck and floor beam during flexure of the floor beams is a likely

cause. The end floor beams no longer exhibit visible deflection during passage of truck loads due to the presence of the stiff leg repairs.

- **PX** – Cracks were observed in 61 stringer connection angles (see **Appendix B** for locations and lengths) **(photos 30 through 33)**. No new cracks were found, and 1 crack with growth were noted during the 2019 inspection. The connection angle cracks were at the end floor beams (33 at floor beam 0 and 28 at floor beam 5). Cracks range from 1 1/4 inches to 7 inches in length with an average length of 3 1/2 inches. The cracks occur at the odd numbered piers where the expansion bearings/joints exist. More cracked connection angles were observed in the north half of the bridge and all but 3 cracked connection angles exist at the interior stringers (stringers 2, 3 and 4). Floor beam 0 has the highest concentration of cracks in stringers 2 and 3 (78%) and floor beam 5 has the highest concentration of cracks in stringers 3 and 4 (85%), suggesting that the cracks are related to the direction of traffic approaching the floor beam. The vertical cracks start at the top of the connection angle, propagating down through the angle leg adjacent to the floor beam web at the fillet. These cracks typically have a horizontal offset as if the floor beam web is being pushed away from the stringer.
- **PX** – A total of 127 broken rivets at 93 stringer connections (see **Appendix C** for locations and number of rivets) **(photos 34, 35, and 36)**. A total of 37 rivets were no longer considered to be in the shear plane between the floor beam web and the connection angle. One location is new for 2019. Thirty-five connections were noted to have 2 rivet heads missing (A total of 8 rivets in single shear exist between the connection angles and floor beam web). The broken rivets are between the connection angle and the floor beam web and at the top rivet of the connection angle. The number of broken rivets are highest at the end floor beams and become less progressive for each floor beam further away from the end of each span (only two rivets broken at floor beam 3 for the entire bridge). The number of broken rivets are greatest at stringers 2 and 3 for floor beams 0, 1 and 2 (all but one head broken on the north face) and stringers 3 and 4 for floor beams 4 and 5 (all heads broken on the north face). These conditions appear to be the result of live load induced stringer end rotation causing the rivet shank to fatigue at the head.

[FCM] Floor Beams – (4 = Poor condition)

- **PX** – Active section loss is common in the end floor beams and the floor beams at the east truss connection. Corrosion holes were observed through the web of the floor beams at 58 locations (see **Appendix F** for locations and dimensions) **(photos 37 through 40)**. Several areas have cracks that extend from the corrosion holes in the copes due to very thin remaining section.
- **FX** – Cracks were observed in the web of the end floor beams between the top flange and the truss connection angle (see **Appendix G** for locations and lengths) **(photos 41 through 45)**. Horizontal cracks ranging from 5/8 inch to 9 3/16 inches in length were noted at 71 locations. The cracks are nearly evenly distributed between east and west truss locations and between floor beams 0 and 5. The cracks in floor beam 0 were 42% larger than those in floor beam 5 and the cracks at the east truss were 73% larger than those at the west truss. Several of these cracks have a horizontal offset between the faces of the crack with the top flange being pushed towards the joint. The cracks exist in

every span except span 28 and most commonly occur over the odd number piers where the expansion bearings exist. New growth in existing cracks was noted at two locations ranging from 1/8-inch to 1/2-inch growth. No new cracks were noted during this inspection.

- **FX** – Cracks were observed in the web cope at the truss connection of the intermediate floor beams at 39 locations and range in size from 1/8 inch to 1 1/2 inches long with an average length of 7/16 inch (see **Appendix G** for locations and lengths). The cracks have slightly higher occurrence at floor beams 1 and 4 than floor beams 2 and 3. Section loss at the cope appears to contribute to the cracking.
- **FX** – Longitudinal cracks were noted in the floor beam web above the stiff leg repairs at:
  - Span 6, floor beam 0 – 8 3/4-inch long crack (previously 8 1/4-inch) **(photo 42)**
  - Span 11, floor beam 5 – 30 1/4-inch (previously 30-inch) long crack including a 6-inch x 1 1/2-inch corrosion hole **(photo 38)**
  - Span 20, floor beam 0 – previously noted 14 1/2-inch long crack is now a 21-inch long x 1-inch high corrosion hole near the stiff leg repair
- **FX** – Floor beam 0 of span 2 has been strengthened using an angle stitch welded to the web and bottom flange. This condition creates a category E fatigue prone detail at the termination of the welds at the end of the member. No signs of cracking or distress were observed at these locations.
- **Member Alignment** – The end floor beams for the truss spans exhibit a sweep of the bottom flange away from the joint at the majority of the piers (see **Appendix E** for locations and dimensions). Stiff leg repairs have been installed at all end floor beams to mitigate the sweep. The bottom flange sweep ranges from 1/4 inch to 7/8 inch. The floor beam top flange is bent towards the joint causing the bottom flange to have a sweep in the opposite direction. It could not be determined if the floor beam distortion is caused by the deck expanding against the top flanges of the floor beam or pack rust developing between the deck and the joint armor pushing down and eccentrically on the floor beam top flange.
- The stiff leg shim plate under floor beam 5, span 26 at pier 26 is rotating out from under the floor beam bottom flange. Floor beam 0, span 8 at pier 7 impacts the stiff leg under truck loads. The stiff leg repairs are intended to catch the floor beam should it fail and do not need to be in contact with the floor beam.
- Pack rust exists between the floor beam bottom flange and the lower lateral bracing gusset plates causing section loss to the floor beam. This loss occurs at a location of low stress and does not significantly affect the load carrying capacity of the member.

[FCM] Pier Beams – (4 = Poor condition)

- **PX** – **Member Alignment** – The pier beams at piers 1 and 39 have been retrofitted with a supplemental pier beam due to severe sweep and rotation as a result of approach pavement growth **(photo 46)**. Longitudinal forces act through the deck to distort the pier beam. Most of the elastomeric pads between the supplemental pier beam and the beam bottom flange are missing, allowing the original pier beam to still carry the beam reactions. The supplemental pier beam currently acts as a catcher beam to support the

beams should the original pier beam fail. No signs of distress from vehicular live loads were observed in either the original pier beam or the supplemental pier beam.

- The lower portion of the supplemental pier beam at pier 1 is rolled approximately 3 degrees to the south, and upper section is rolled approximately 1 degree south. Pier beam 39 is rolled approximately 1 degree over the lower portion of the web. This is likely an as-built condition and does not significantly affect the load carrying capacity of the supplemental pier beam.
- The bottom flange of the original pier beam at pier 1 is in contact with the stiff leg at pier 1. During higher temperatures they are in contact with each other, resulting in 1/16-inch wear on the north face of the original pier beam **(photo 47).**

Floor System Bracing – (5 = Fair condition)

- **FX** – Corrosion holes were observed at numerous lower lateral bracing gusset plates **(photo 48)**. The corrosion holes typically are less than 4 inches in diameter and occur adjacent to the interface with the floor beam bottom flange, though some of the holes are up to 14 inches long adjacent to the inboard flange of the lower chord. The corrosion holes do not significantly affect the functionality of the bracing. Up to 1/2-inch thick pack rust with adjacent pitting is also common at the floor system bracing gusset plates.
- Many hanger rods which support the floor system bracing near their mid-lengths are broken due to repetitive loading/vibration. The missing rods allow the lower lateral bracing to oscillate under live loads.

Truss Upper Chord – (5 = Fair condition)

- **PX/FX** – **Member Alignment** – Vehicular collision damage was observed at numerous locations in the upper chord:
  - **PX** – Impact damage resulting in multiple sheared rivets for the bottom lacing bars exists at east U3U4, span 9 and west U1U2, span 31 **(photos 49 and 50)**. No signs of local buckling were observed at this location.
  - **FX** – West U1U2 in span 37 is bowed globally to the east 1/4 inch. This damage does not significantly affect the load carrying capacity of the member and appears to be the result of vehicular collision. Multiple rivet heads are also sheared away on the stay plate and lacing bars along the inboard bottom flange.
  - Five failed lacing bars exist on the underside of east U3U4, span 9.
  - Impact damage exists on the inboard flanges of the upper chord at several additional locations. The damage does not significantly affect the load carrying capacity of the members.
- Outboard gusset plate at east U3, span 13 is bowed locally approximately 1/8 inch between the upper chord and the diagonal**.**

[FCM] Truss Lower Chord – (5 = Fair condition)

- **PX** – Corrosion of the lower chord is common at the floor beam/floor system bracing gusset plate connection. The corrosion has caused section loss of less than 1/4-inch to the inboard channel top flange. Corrosion also occurs around the inboard splice plates at

L2 and L3 under the floor beams. The corrosion and resulting section loss is due to deck drainage passing through the deck joints above the interior floor beams and expansion joints. Several areas of the lower chord have corrosion holes through the inboard bottom flange of the channels **(photo 51).** Corrosion is typically heavier at the east truss.

- **PX** – Corrosion is common around the inboard splice plates at L2 and L3 and appears to be the result of deck drainage splashing over the edge of the deck **(photo 52)**. Pack rust is developing at the bottom flange splice; however, no significant distress was observed in the web splice plates. Pack rust and corrosion are significantly less on the west truss.
- **FX** – Horizontal cracks were observed in the inboard truss gusset plate between the bearing pin and the end floor beam **(photos 53 and 54)** (see **Appendix H** for locations and sizes of cracks). All ten locations have been strengthened with the addition of a welded steel angle on the inboard face**.** The distortion and cracks are a result of section loss and pack rust occurring between the gusset plate and the top edge of the lower chord channel. The crack is within the horizontal shear plane between the end post and the lower chord. Numerous locations exist where the gusset plate exhibits paint cracks indicating eminent development of cracks.
- **FX** – Lower chord gusset plates are typically bowed at L0 and L5 due to pack rust. The inboard gusset plate is bowed up to 1 inch between the end post and the lower chord with the outboard gusset plates typically bowed less than the inboard. The end of the end post is in contact or near contact with the top of the lower chord making the likelihood of a buckling failure remote. Section loss of the gusset plate is up to 50% of the plate thickness (gusset plate is 3/8 inch thick) and occurs at multiple locations. This loss affects the horizontal shear capacity of the gusset plate.
- Section loss up to 3/8 inch deep is common on the channel webs at the bearings**.** The channels are developed into the truss gusset plates at the location of the loss and the loss does not significantly affect the load carrying capacity of the truss.
- Pack rust exists between the channels of the lower chord and the stay and batten plates. The corrosion has produced 1/8-inch deep section loss of the channel web for the lower chord beneath the stay and batten plates **(photo 55)**. The localized loss does not significantly affect the load carrying capacity of the member.
- Wear is evident in the truss pins and/or pin plates at panel points L0 and L5. Up to 3/16-inch gaps were noted between the bottom of the pin and the pin hole at many end panel points. This is normal wear due to the repeated rotations that the end bearings experience due to live load deflection.

[FCM] Truss Web Members – (5 = Fair condition)

- **PX/FX** – **Member Alignment** – Vehicular collision damage was observed at numerous locations on the above deck truss members. The following are the most significant:
  - **FX** – Span 4, west U1L2 – Inboard flange bent 2 inches over a 9-inch length below the bottom rail.
  - **FX** – Span 6, west U1L2 – Inboard flange bent inward 2 1/8 inch near U1.
  - **FX** – Span 20, west U1 – Inboard gusset plate has a 3/8-inch tear with adjacent impact damage to U1L2 causing the flange to bow upward **(photo 56)**.

  - **FX** – Span 31, west U1L2 – Inboard flange has a tear near U1 resulting in an approximate 50% loss of the flange **(photo 57)**. The adjacent gusset plate has two tears measuring 1 7/8 inches deep at the upper chord and 1-inch deep at connection to U1L2. The 1 7/8-inch deep tear occurs in the shear plane between the diagonals and upper chord and will affect the shear strength of the gusset plate. The 1-inch deep tear occurs near the corner of the gusset plate and does not significantly affect the capacity of the gusset plate. The gusset plate is also bowed approximately 2 inches to the west due to the collision damage. This has not changed since the previous inspection.
  - **PX** – Span 37, west U1L1 – U1L1 carries the floor beam reaction only. Two sheared rivet heads exist at the inboard gusset plate at U1 **(photo 58)**. The shank still exists through the rivet hole of the gusset plate and there is no sign of movement or distress from loading.
  - **FX** – Span 37, west U1 gusset plate – A 5/16-inch long crack exists in the bottom edge of the inboard gusset plate between U1L1 and U1L2 near U1L2 **(photo 59)**.
  - **FX** – Span 37, west U1L2 – Inboard bottom flange is bent 1-inch near U1.
- **FX** – Pack rust developing under the corner of the upper chord gusset plates has caused cracks to develop in the edge of the gusset plate at east U4 in spans 32 and 37 **(photos 60 and 61)**. The cracks exist near the first row of rivets, reducing the capacity of the gusset plate for U4L3.
- **FX** – Bullet strike damage exists at the outboard gusset plate between east U2L3 and L2U3 in span 4 and the outboard flange of east U2L3 in span 3. This condition does not significantly affect the connection's capacity.
- Slight bows of 1/8-inch are typical in the horizontal edges of the U1, L2 and L3 gusset plates. This appears to be an as-built condition as the verticals are approximately 9 7/8 inches deep and the diagonals are 10 inches deep with no fill plates utilized at the panel point connections.
- Pack rust 1/4-inch thick is common between the diagonals and the mid gusset plates with minimal section loss. Isolated locations exhibited pack rust up to 1 inch thick with 1/8-inch deep section loss. Similar conditions exist at the bridge railing connections to the truss web members.

Truss End Posts – (5 = Fair condition)

- **PX** – Pack rust is common at the end post connection to the inboard gusset plate at the lower chord connection **(photo 62)**. Deck drainage which splashes over the curb travels down the end post promoting corrosion.
- **FX** – Pack rust is forming at many of the bridge railing to inboard end post channel connections. Up to 3/4-inch section loss was noted along the full height of the inboard channel webs **(photo 63)**.
- **FX** – Vehicular collision damage exists at numerous locations to the end posts. The following are the most significant:
  - Span 7, west L0U1 – Bent inboard channel bottom flange and edge damage to top cover plate at U1**.**

- Span 14, east L0U1 – Top inboard flange is bent down approximately 4 inches, and 5 rivet heads are sheared off **(photo 64)**.
- Span 20, west L0U1 – Inboard bottom flange bowed upward and has minor scrapes.
- Span 37, west L0U1 – Three lacing bars are detached on the bottom face and the member is also bowed globally 1/4-inch to the west. The inboard bottom flange is bowed west 5/8-inch and up 2 3/4-inch and is torn 1 3/8 inches wide over 4 1/4 inches in length at top railing **(photo 65)**.
- Span 39, east L0U1 – Inboard flange bent down approximately 2 inches near U1.

This damage does not significantly affect the load carrying capacity of the end posts.

- The top cover plate of east L0U1 over the bearing exhibits a 3 1/2-inch x 1 1/2-inch corrosion hole.

Paint/Coating System – (4 = Poor condition)

- **PX** – Corrosion and significant section loss are occurring at many locations on the lower chord, floor beams and stringers due to deck drainage passing through joints. Widespread section loss and corrosion holes exist in the exterior stringers and end floor beams **(photos 22 through 25, 37 through 40)**.
- Minor to moderate pack rust and minor section loss at the gusset plate seams are common on the above deck truss members with weathered and chalking paint throughout.

Load Deflection – (6 = Satisfactory condition)

- Slight deflections of the end floor beams were observed during passage of truck loads.
- The global live load response is adequate.

NBI Item 60 – Substructure (5 = Fair condition)

Abutments – (6 = Satisfactory condition)

- No significant deficiencies were noted in the abutments, except for moderate debris on the bearing seats of both abutments and map cracking exposing a few reinforcing bars at the ends of the south abutment.

Piers – (5 = Fair condition)

- **FX** – A 7/8-inch wide crack exists in the capital of the east column of pier 3 which is emanating from the span 3 bearing anchor bolt **(photo 66)**. The crack has led to a large portion of the column capital shifting to the south approximately 1 1/4 inches (previously 1-inch). The truss bearing appears to be adequately supported and brackets have been added to stabilize the capital. A definitive cause of the crack could not be determined during the inspection.
- **FX** – The top one to five feet of the pier column foundation are exposed at many piers, generally in the floodplain north of the river and on some piers in the south floodplain. This may be indicative of general scour of the sandy soils and/or may be an as-built condition **(photo 67)**.

- Map cracking with efflorescence and delaminations are common throughout many of the piers. It could not be determined if the cracks in the pier columns are the result of Alkali-Silica Reactivity.
- Vertical and horizontal cracks which mirror the reinforcing steel exist in the web walls at several locations. Spalls exposing reinforcing steel exist in the face and corners of the web walls due to inadequate cover. The cracks and spalls are most prevalent on the south face of the piers and do not affect the load carrying capacity.
- Shallow spalls due to gunshot damage are typical on the columns and web walls of piers 1 through 8.

Bearings – (5 = Fair condition)

- **PX** – Elastomeric pads are missing at the supplemental pier beams under beams 1 through 4 at pier 1 **(photo 68)** and at beams 2 and 3 at pier 39 with heavy pack rust forming at beam 5, pier 1. The bearing pads appear to be walking from beneath the beams at pier 1 under beam 5 and pier 39 under beams 4 and 5. This condition limits the supplemental pier beams to act only as a catcher beam, available to carry the beams should the original pier beam fail.
- **FX** – Wear causing grooving in the expansion bearing pins and enlarging of the pin hole in the connecting gusset plates are common throughout the spans **(photo 69)**. The wear is a result of bearing rotation under live loads. This condition is most severe at L0 span 38 over pier 37, which has 3/16-inch total wear to the pin and gusset plate.
- Heavy pack rust with minor associated pitting is widespread on and between the bearing components, more so at the expansion bearings **(photo 70)**. Much of this deterioration is caused by debris accumulating on and around the bearing seats.
- Expansion bearings are rotated up to 3/4-inch towards the joint with pack rust filling the gap between the masonry plate and sole plate. The expansion bearings are generally centered on the masonry plate with no signs of recent movement observed, though many are in or near full expansion. The bronze sliding plate has slid slightly towards the center of the truss span and is fractured into pieces at a few locations. One bronze sliding plate has slid to the north 3 inches under the west truss at pier 5 in span 6. It is speculated that the bearings became frozen, and then rotated in expansion during warm weather, allowing pack rust to incrementally fill the gap between the plates.
- Exterior beams at both abutments have sheared anchor bolts at the bearings (the interior beam anchor bolts do not extend into the abutment seat concrete) **(photo 71)**. This most likely is a result of pavement pressure from the approach roadway pushing the bridge deck; up to 3 1/3 inches (previously 2 inches) of movement to the north was noted at the south abutment. The beam bearings at the north abutment are pushed to the south up to 4 inches, also due to pavement pressure.
- Approximately 25-percent of the anchor bolts are broken or have corroded through within the slotted holes of the truss expansion bearing assemblies **(photo 72)**. This condition is more common at the expansion bearings. The remaining anchor bolts should be capable of resisting lateral forces on the truss spans. The anchor bolts are failing due to a combination of shear, pack rust-induced tension, and corrosion.

NBI Item 61 – Channel and Channel Protection (5 = Bank Eroded condition)

Flowline Stability – (5 = Fair condition)

- **PX** – The channel has moved south and is now flowing under spans 5 and 6 **(photo 67)**. Channel flows were previously under span 11 during the October 2018 inspection and under span 10 during the May 2018 inspection. A current flowline of 27.3 feet was taken to the top of curb at west L4, span 6. This measurement represents a 2.4-foot increase since the 2016 flowline taken at west L4, span 10 (2017 flowline not taken due to high water).

Channel Bank Damage – (5 = Fair condition)

- **FX** – The previous north channel bank in span 11 is slumping.

Debris – (6 = Satisfactory condition) *The following condition is considered minor deterioration.*

- **PX** – Drift consisting of large trees exists on the west flood plain under and around spans 5 through 10. Heavy debris accumulation exists against the upstream face of piers 11 and 12 **(photo 73)**. This does not significantly affect the high-water flow characteristics under the bridge.

Vegetation – (6 = Satisfactory condition)

- The banks are well vegetated north of pier 11 with large trees and vegetation in the floodplain. The floodplain south of pier 10 contains sparse vegetation.

NBI Item 72 – Approach (5 = Fair condition)

Approach Roadway Condition – (5 = Fair condition)

- **PX** – A patched area exists in the northbound lane approximately 50 feet south of the bridge **(photo 74)**. These conditions create a rough riding surface for traffic approaching the bridge.
- **FX** – The concrete approach roadway is overlaid with asphalt which has unsealed joints and cracks. Obvious signs of pavement growth were observed at both abutments. This has caused longitudinal movement of the approach spans resulting in the severe sweep and rotation in the pier beams at piers 1 and 39.

Approach Roadway Settlement – (6 = Satisfactory condition)

- No significant settlement was observed.

NBI Item 113 – Scour Rating (7 = Countermeasures Installed) No change to scour rating is recommended.

- Local scour was observed around piers 5 through 10, and pier 23. Column footings were exposed up to 4 1/2 feet.
- Riprap has been installed around the north abutment and a drift fence consisting of tripods fabricated from railroad rails and cable exists northwest of pier 38.

Truss/FC Bridge Rating Form

NBI	04085
Structure	0902 0000 X
County	Canadian
Division	4

Facility Carried
U.S. 281
Feature Intersected
South Canadian River

NBI Item #	Rating	Previous
36 - Traffic Safety	5, PX	5, PX
58 - Deck	4, PX	5, PX
a. Driving Surface	4, PX	5, PX
b. Soffit	5, FX	5, FX
c. Joints	4, PX	4, PX
59 - Superstructure*	4, PX	4, PX
a. Beams	5, FX	5, FX
b. Stringers**	4, PX	4, PX
c. Floor Beams	4, PX	4, PX
d. Pier Beams	4, PX	4, PX
e. Floor Bracing System	5, FX	5, FX
f. Truss Upper Chord***	5, PX	5, PX
g. Truss Lower Chord***	5, PX	5, PX
h. Truss Web Members	5, PX	5, PX
i. Truss End Posts	5, PX	5, PX
j. Truss Bracing	N/A	N/A
k. Paint/Coating	4, PX	4, PX
l. Load Deflection	6	6
60 - Substructure****	5, PX	5, PX
a. Abutments	6	6
b. Piers	5, FX	5, FX
c. Bearings	5, PX	5, PX
61 - Channel & Channel Protection	5, PX	5, PX
a. Flowline Stability	5, PX	5, PX
b. Channel Bank Damage	5, FX	5, FX
c. Debris	6, PX	6, PX
d. Vegetation	6	6
Approach Roadway	5, PX	5, PX
a. Approach Roadway Condition	5, PX	5, PX
b. Approach Roadway Settlement	6	6
113 - Scour	7	7
Flowline/Notes	27.3	N/A

Rating	Description (For 36, 58, 59, 60, 72)
N/A	NOT APPLICABLE
9	EXCELLENT CONDITION
8	VERY GOOD CONDITION - no problems noted.
7	GOOD CONDITION - some minor problems.
6	SATISFACTORY CONDITION - structural elements show some minor deterioration
5 (FX,PX)	FAIR CONDITION - all primary structural elements are sound but may have minor section loss, cracking, spalling or scour.
4 (PX)	POOR CONDITION - advanced section loss, deterioration, spalling or scour.
3 (PX,CX)	SERIOUS CONDITION - loss of section, deterioration, spalling or scour have seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.
2 (CX)	CRITICAL CONDITION - advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1 (CX)	IMMINENT FAILURE CONDITION - major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement affecting structure stability. Bridge is closed to traffic but corrective action may put back in light service.
0	FAILED CONDITION - out of service - beyond corrective action.

* - Members with fatigue cracks in compression zones (top flange stringer copes, clip angles, etc.) are to be coded as a 5 unless the crack turns toward a tension zone, then code 3.
* - Members with fatigue cracks in tension zones (cover plate ends, etc.) are to be coded as a 3.
** - Includes connection angles.
*** - Includes gusset plates. Missing rivets in connections are coded as a 3.
**** - Elements with superficial cracking are coded as 6, spalls with exposed rebar 5, spalls with exposed rebar with section loss 4.

Rating	Description (For 61)
N/A	NOT APPLICABLE
9	There are no noticeable or noteworthy deficiencies which affect thecondition of the channel.
8	Banks are protected or well vegetated. River control devices such as spur dikes and embankment protection are not required or are in a stable condition.
7	Bank protection is in need of minor repairs. River control devices and embankment protection have a little minor damage. Banks and/or channel have minor amounts of drift.
6	Bank is beginning to slump. River control devices and embankment protection have widespread minor damage. There is minor stream bed movement evident. Debris is restricting the channel slightly.
5	Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	Bank and embankment protection is severely undermined. River control devices have severe damage. Large deposits of debris are in the channel.
3	Bank protection has failed. River control devices have been destroyed. Stream bed aggradation, degradation or lateral movement has changed the channel to now threaten the bridge and/or approach roadway.
2	The channel has changed to the extent the bridge is near a state ofcollapse.
1	Bridge closed because of channel failure. Corrective action may putback in light service.
0	Bridge closed because of channel failure. Replacement necessary.

Measured to top of curb at west L4, span 6.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 1 - Looking south at the bridge end view.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 2 - Looking southwest at the bridge elevation.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 3 - Looking north at the 9-ton load posting sign at the south approach.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 4 - Looking south at the 9-ton load posting sign at the north approach.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 5 - Looking southeast at the east bridge rail at the south abutment. Note: one section of the bottom rail has been severed.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 6 - Looking northwest at the north end of the east bridge rail in span 40. Note: concrete post is spalled and is severed from the base.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 7 - Looking south at the deck top in span 23. Note: unsealed longitudinal and transverse cracks in the asphalt wearing surface.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 8 - Looking south at the deck top in span 39. Note: raveling of the asphalt pavement along the roadway centerline.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 9 - Looking east at the west fascia of the span 1 deck at the south abutment. Note: deck has moved north 3 1/4 inches.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 10 - Looking south along the west curb in span 18. Note: typical spalling with exposed reinforcement to the curb.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 11 - Looking east at the deck soffit in between stringers 4 and 5 on the north side of floor beam 2 in span 30. Note: 3-foot wide x 6-foot long area of spalling with exposed reinforcement.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 12 - Looking south along the west deck soffit overhang near floor beam 4 in span 32. Note: full overhang width spalling with exposed reinforcement.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 13 - Looking east at the stringer 5 top flange at floor beam 0 in span 35. Note: pack rust up to 1 1/4-inch thick between the stringer top flange and deck soffit lifting the deck.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 14 - Looking southeast at the floor beam 4 connection to the east truss in span 36. Note: pack rust up to 1 1/4-inch thick between the floor beam top flange and deck soffit lifting the deck.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 15 - Looking north at the deck soffit in span 13. Note: typical transverse cracking with light efflorescence and discolored concrete.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 16 - Looking east along the expansion joint at pier 27. Note: spalling and patching to the joint header.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 17 - Looking west at the expansion joint at pier 35. Note: spalling and patching to the joint header.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 18 - Looking east along the expansion joint at pier 13. Note: joint seal is deteriorated and missing.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 19 - Looking east along the expansion joint at pier 29. Note: joint seal is missing.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 20 - Looking northeast between the floor beams over pier 20. Note: void between floor beams filled with asphalt from the top of the floor beam bottom flanges to the underside of the deck.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 21 - Looking northeast at the supplemental pier beam at pier 39. Note: bearing pad for beam 3 in span 40 is missing.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 22 - Looking northeast at the stringer 1 connection to floor beam 5, span 18. Note: 2 1/2-inch long x 5/8-inch wide corrosion hole. No longer cracked and web below has 25% loss.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 23 - Looking east at stringer 5 connection to floor beam 5, span 19. Note: 7 1/2-inch wide x 4-inch high corrosion hole to lower web with 1/2-inch (1/8-inch growth) long crack from top of hole and 2-inch high knife edge loss above hole.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 24 - Looking west at the stringer 1 connection to floor beam 5, span 27. Note: 4 1/2-inch high x 1-inch wide (previously 3 3/4-inch high x 1-inch wide with a 1/4-inch crack) corrosion holes.

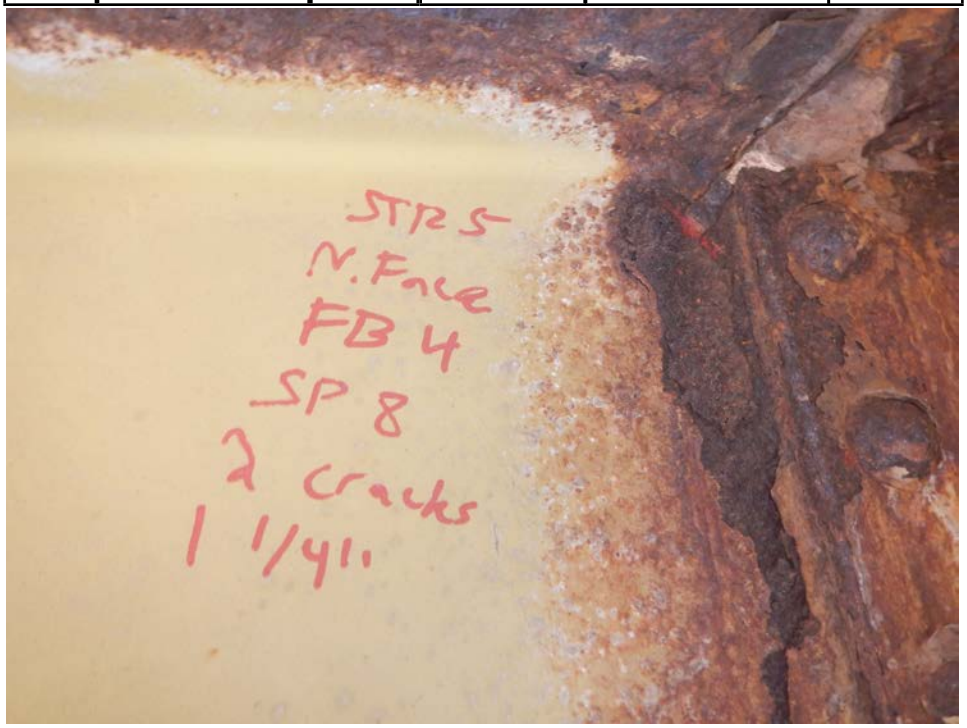
NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 25 - Looking east at the stringer 5 connection to floor beam 5, span 35. Note: 6 1/4-inch wide x 1 3/4-inch high corrosion hole with 6-inch wide x 1-inch high x 1/4-inch deep adjacent section loss. 1-inch diameter corrosion hole to west bottom flange.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 26 - Looking west at the stringer 1 connection to the north face of floor beam 0, span 3. Note: two cracks, no change to 1 1/4-inch diagonal crack and new 1 1/2-inch long crack adjacent to top flange.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019



Photograph 27 - Looking east at the stringer 5 connection to the north face of floor beam 4, span 8. Note: no change to 1 1/4-inch and 7/8-inch long cracks to the exterior face and 1 1/4-inch and 1 1/4-inch long cracks to the interior face.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 28 - Looking west at the stringer 1 connection to the north face of floor beam 0, span 10. Note: 1-inch long (3/8-inch growth) crack in top flange cope.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 29 - Looking west at the stringer 1 connection to the south face of floor beam 4, span 17. Note: new 1/4-inch crack at the top flange cope.

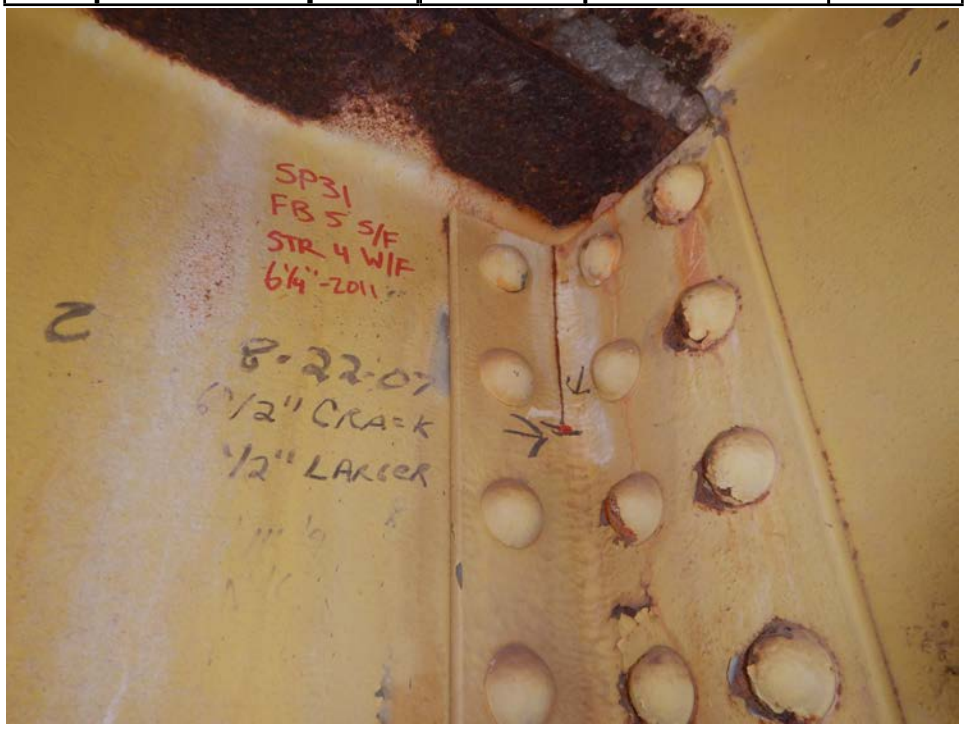
NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 30 - Looking southeast at the stringer 3 connection to the north face of floor beam 0, span 8. Note: no change to 3 1/2-inch long crack in the west connection angle.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 31 - Looking northeast at the stringer 3 connection to floor beam 5, span 25. Note: no change to 4 3/4-inch long crack in the west connection angle.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019



Photograph 32 - Looking northeast at the stringer 4 connection to floor beam 5, span 31. Note: no change to 6 1/8-inch long crack in the west connection angle.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 33 - Looking northeast at the stringer 4 connection to floor beam 5, span 33. Note: no change to 7-inch long crack in the west connection angle.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 34 - Looking southwest at the stringer 2 connection to the north face of floor beam 2, span 22. Note: no change to sheared rivet head at the top of the stringer connection.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 35 - Looking southeast at the west connection angle for the stringer 3 connection to the north face of floor beam 0, span 32. Note: new missing rivet head at the top rivet.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 36 - Looking southwest at the stringer 1 connection to the north face of floor beam 1, span 37. Note: new sheared rivet head in the connection angle.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 37 - Looking north at the floor beam 1 connection to the east truss, span 9. Note: 2 3/4-inch diameter corrosion hole with a 1 1/8-inch long crack that has self-arresting into the corrosion hole.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 38 - Looking northeast at floor beam 5 near stringer 3 over the stiff leg repair, span 11. Note: 6-inch x 1 1/2-inch corrosion hole with a 30 1/4-inch long (1/4-inch growth) crack with slight offset.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 39 - Looking southeast at floor beam 0 at the east truss connection, span 35. Note: new 1-inch x 1/2-inch corrosion hole adjacent to the connection angle.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 40 - Looking northeast at floor beam 5 at stringer 3 over the stiff leg repair, span 37. Note: 3/8-inch high x 1-inch wide corrosion hole with a 1/2-inch (1/8-inch growth) crack to east side and 1 1/2-inch (1/4-inch growth) long crack to west side above stiff leg.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 41 - Looking south at the floor beam 0 connection to the east truss, span 6. Note: no change to 8-inch long crack at the top flange cope.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 42 - Looking south at floor beam 0 over the stiff leg retrofit, span 6. Note: 8 3/4-inch (1/2-inch growth) long crack in the floor beam web.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 43 - Looking south at the floor beam 0 connection to the west truss, span 10. Note: 3 1/8-inch (1/8-inch growth) long crack at top flange cope.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 44 - Looking north at the floor beam 5 connection to the west truss, span 35. Note: no change to 3 1/8-inch long crack at top flange cope.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 45 - Looking south at the floor beam 0 connection to the east truss, span 38. Note: no change to 9 3/16-inch long crack at the top flange cope with 3/8-inch offset.

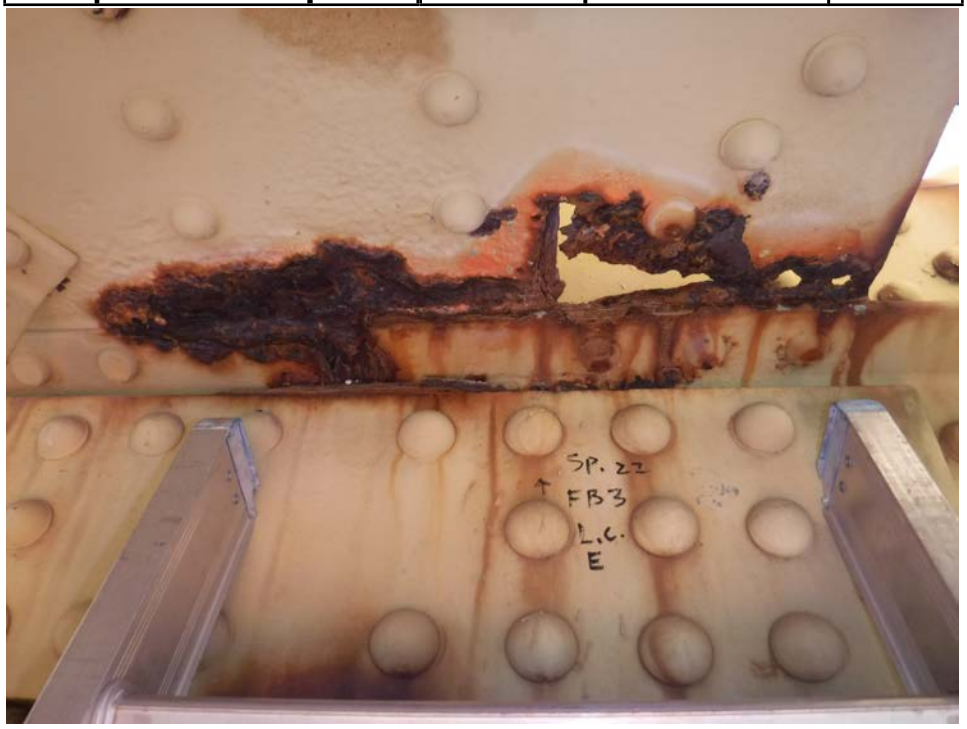
NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 46 - Looking east at the pier beam at pier 1. Note: severe sweep and rotation to pier beam due to approach pavement growth.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 47 - Looking west at the bottom flange of the pier beam at pier 1. Note: stiff leg repair at pier 1 is in contract with original pier beam with minor wear to the pier beam.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019



Photograph 48 - Looking up at the lower lateral bracing gusset plate at the floor beam 2 connection to the east truss in span 22. Note: three corrosion holes up to 5 inches x 4 inches in the gusset plate.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 49 - Looking northeast at the underside of east U3U4, span 9. Note: collision damage to inboard channel and lacing bars with multiple sheared rivet heads.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 50 - Looking southwest at the underside of west U1U2, span 31. Note: multiple sheared rivets for the bottom lacing bars.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 51 - Looking up at the lower chord at east L3, span 20. Note: 1-inch x 1 1/2-inch corrosion hole in the inboard lower chord channel bottom flange.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 52 - Looking east at the lower chord splice at east L3, span 25. Note: typical corrosion and pack rust to the inboard splice plates due to deck drainage splashing over the edge of the deck.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 53 - Looking northwest at the inboard gusset plate of east L0, span 1. Note: 18-inch long (3/8-inch growth) horizontal crack along the top of the lower chord channel. This location has been strengthened.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 54 - Looking west at the inboard gusset plate of east L0, span 8. Note: 9 3/4-inch (1/2-inch growth) long crack in the gusset plate.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 55 - Looking north at the lower chord batten plate of east L4L4, span 17 near L4. Note: typical pack rust between the lower chord channel top flanges and batten plate causing the batten plate to bow.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 56 - Looking west at the inboard gusset plate of west U1, span 20. Note: 3/8-inch tear to gusset plate with adjacent impact damage to U1L2 causing the flange to bow upward.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 57 - Looking southwest at west U1L2, span 31. Note: inboard flange has a tear near U1 resulting in an approximate 50% loss of the flange and adjacent gusset plate has two tears up to 1 7/8 inches at the upper chord and connection to U1L2.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 58 - Looking southwest at the inboard gusset plate of west L1U1, span 37. Note: two sheared rivet heads with shanks still in the shear plane.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 59 - Looking west at the inboard gusset plate of west U1, span 37. Note: 5/16-inch long crack in the bottom edge of the gusset plate between L1U1 and U1L2 near U1L2.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 60 - Looking east at the inboard gusset plate of east U4, span 37. Note: pack rust developing under the corner of the upper chord gusset plate causing a 5/16-inch long crack.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 61 - Looking northeast at the inboard gusset plate of east U4, span 32. Note: pack rust developing under the corner of the upper chord gusset plate causing a 1/2-inch long crack.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 62 - Looking northeast at the east truss expansion bearings at pier 21. Note: typical pack rust at the end post connection to the inboard gusset plate at the lower chord connection.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 63 - Looking northeast at east U4L5, span 35. Note: 3/16-inch deep section loss to the web of the inboard channel at the railing connection.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 64 - Looking northeast at east L0U1, span 14. Note: top inboard flange is bent down approximately 4 inches, and 5 rivet heads are sheared off.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 65 - Looking southwest at west L0U1, span 37. Note: three lacing bars detached on the bottom face and member is globally bowed 1/4-inch to the west. The inboard bottom flange torn 1 3/8 inches wide over 4 1/4 inches in length at top railing.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 66 - Looking northeast at the east column capital of pier 3. Note: fractured capital has moved south 1 1/4 inch and 7/8-inch wide crack emanating from the span 3 bearing anchor bolt.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 67 - Looking northeast at the pier 5 column caissons. Note: top one to five feet of the pier column foundation are exposed. The channel has moved south and is now flowing under spans 5 and 6.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 68 - Looking west at the beam 1 through 4 bearings at the supplemental pier beam at pier 1 in span 1. Note: elastomeric pad has fallen away at beams 1 through 4.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 69 - Looking east at west L0, span 38. Note: wear causing grooving in the expansion bearing pins and enlarging of the pin hole.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 70 - Looking northeast at the east truss fixed bearings at pier 12. Note: heavy pack rust with minor associated pitting is widespread on and between the bearing components.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 71 - Looking northeast at the beam 5 bearing at the north abutment. Note: typical exterior beam bearing at the abutment with sheared anchor bolts.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 72 - Looking west at the expansion bearing of east L0, Span 6. Note: typical broken anchor bolt due to heavy section loss.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 73 - Looking north at the upstream end of pier 12. Note: heavy debris accumulation.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/16/2019

Photograph 74 - Looking northwest at the south approach roadway. Note: patched area in the northbound lane approximately 50 feet south of the bridge creating a rough riding surface for traffic approaching the bridge.

Oklahoma Dept. of Transportation - Bridge Inspection Report

NBI No.:	Structure No.:	Local ID:	Suff. Rating:	
04085	0902 0000 X	-1	5.00	SD

IDENTIFICATION

Bridge Description:

38-100ft. PONY TRUSS & 2-36ft. I-BM. SPANS(BRIDGEPORT BR.)

1. State: Oklahoma
2. Division: Division 4
3. County: CANADIAN
4. City: Unknown
Admin Area: L/T Truss
5a. On/Under: Route On Structure
5b. Kind of Hwy: U.S. Hwy
5c. Lvl of Srvc: Mainline
5d. Route No.: 00281
5e. Dir. Sufx: N/A (NBI)

7. Facility Carried : U.S. 281
6. Feat. Intersect: S. CANADIAN RIVER
9. Location: CADDO CANADIAN CL
11. Mile Post: NA
13. LRS Inv. / Sub Rte: 0902 0000 / 01
16. Latitude: 35° 32' 25.00"
17. Longitude: 098° 19' 22.00"
98. Border Brdg: Unknown (P)
% Responsible: 0.00
99. Border Brdg #: Unknown

INSPECTION

Type	Insp. Req.	Insp. Done	Freq.	Insp. Date	Next Insp.
NBI:		1	12 months	10/16/2019	10/16/2020
FC:	Y	1	12 months	10/16/2019	10/16/2020
UW:	N	0		NA	NA
OS:	Y	0	12 months	4/6/2019	4/16/2020

CLASSIFICATION

12.Base Hwy Net.: On Base Network
20. Toll Facility: On free road
21. Custodian: State
22. Owner: State
26. Function Class: 06 Rural Minor Arteria
37. Historical Sig.: Br eligible for NRHP
100. Def. Hwy: Not a STRAHNET hwy

101. Parallel Str.: No || bridge exists
102. Traffic Dir.: 2-way traffic
103. Temp. Str.: Not Applicable (P)
104. Hwy System: Not on NHS
105. Fed Land Hwy: N/A (NBI)
110. Defense Hwy: Not a STRAHNET hwy
112. NBIS Length: Long Enough

STRUCTURE TYPE AND MATERIALS

43a/b. Main Span: Steel / Truss-Thru
44a/b. Appr. Span: Steel / Stringer/Girder
45. # of Main Spans: 38
46. # of Appr. Spans: 2
107. Deck Type: Concrete-Cast-in-Place
108a. Wearing Surface: Bituminous
108b. Membrane: Unknown
108c. Deck protection: Unknown

CONDITION

58.Deck: 4 Poor
59.Sup.: 4 Poor
60.Sub: 5 Fair
62.Culvert: N/A (NBI)
61.Chan./Chan. Prot.: 5 Bank Prot Eroded

Flowline Notes

OCT-2019: 27.3' TOC at west L4, span 6. Channel now in span 6.
OCT-2018: Flow too high to measure. Channel now in span 11.

AGE AND SERVICE

19. Detour Length: 11.8 mi
27. Year Built: 1933
28a/b. Lanes on/und: 2 / 0
29. ADT: 1,100
30. Year of ADT: 2017
42a/b. Type of Svc on/und: Highway / Waterway

106. Year Reconst.:
109. Truck ADT: 16%

LOAD RATING AND POSTING

31. Design Load: M 13.5 (H 15)
41. Post. Status: P Posted for load
70. Posting: 2 20.0-29.9%below
Date Rated: 03/25/2019
63.Op / 65.Inv. Rating Meth.: 1 LF Load Factor / 1 LF Load Factor

	H	HS	3-3	EV3	SHV
64. Operating Rating (tons):	9.00	9.10	9.00	9.00	9.00
66. Inventory Rating (tons):	8.00	8.10	8.00	8.00	

GEOMETRIC DATA

10. Vert. Clearance: 99.99 ft
32. Appr Rwy Width: 30.00 ft
33. Median: No median
34. Skew: 0.00°
35. Struct. Flared: No flare
47Horizontal Clr: 24.00 ft
48. Length Max Span: 100.07 ft
49. Struct. Length: 3,937.01 ft

50a. Curb/Sdwlk Width L: 1.00 ft
50b. Curb/Sdwlk Width R: 1.00 ft
51. Width Curb to Curb: 24.00 ft
52. Width Out to Out: 26.00 ft
Deck Area: 102,364.79 sq. ft
53. Min.Vert.Cl.Ovr Brg: 99.99 ft
54a.Min.Vt.Undclr.Ref.: N Feature not hwy c
54b. Min. Vert. Undclr.: 0.00 ft
55a. Min.Lat.Undclr.Ref: N Feature not hwy
55. Min.Lat.Underclr. R: 99.90 ft
56. Min.Lat.Underclr. L: 99.90 ft

APPRAISAL

36a. Brdg Rail: 0 Substandard
36b. Transition: 0 Substandard
36c. Appr. Rail: 0 Substandard
36d. Appr.Rail Ends: 0 Substandard
67. Str Evaluation: 2 Intolerable - Repl

68. Deck Geom.: 4 Tolerable
69. Vert./Horiz. Undclr: Not applicable (NB
71. Waterway Adeq: 5 Above Tolerable
72. Appr. Alignment: 6 Equal Min Criteria
113. Scour Critical: 7 Countermeasures

PROPOSED IMPROVEMENTS

94. Bridge Cost: $6,781,689
95. Roadway Cost: $4,500,000
96. Total Cost: $11,920,275
97. Yr.of Cost Est.: 2015

75. Type of Work: 31 Repl-Load Capacity
76. Lngth of Improvement: 3,937.0 ft
114. Future ADT: 1,760
115. Yr.of Future ADT: 2037

NAVIGATION DATA

38. Nav. Control: Permit Not Required
39. Vert. Clearance: 0.0 ft
40. Horiz. Clearance: 0.0 ft

111. Pier Protect.: 1 Not Required
116. Lift Bridge Vert. Clr.: 0.0 ft

OKLAHOMA ITEMS

200c. Temperature: 75
200d. Weather: Clear
201. Struc.Stl. ASTM Desig.: -1 / -1
202. Waterprf.Membrane: -1
Date Installed: 01/01/1901
203. Type Exp. Device: Sliding Plate
Open Joint-No Device _
204. Type of Railing: Metal Railing (other)
205. Material Quantity: 10.00
208a. Type of Abutment: Pedestal
b. Type of Found.: Bears on Natural Found.
209. Type of Pier/Found.: 2 / Yes
No Piling/Drilled Shaft
210. Foundation Elev.: -1.00 -1.00 -1.00 -1.00 -1.00
211. Wear.Surf.Prot.Sys: None
Date Installed: 01/01/1901
213. Utilities Attached: Communication

214a. Posted Weight Limit: 090909
b. Posted Speed Limit:
c. Narrow/1way Brdg Sign: NA
d. Vertical Clr. Sign: No
Adv. Warning Sign: No
e. Navigation Lights?: No
Working/Not Working: No
215. Overpass: U.S. HIGHWAY
221. Substr.Cond.(U/W):
222. Fill Over RCB:
223. Appr.Slab/Rwy Cond.: 3
225. Paint Type/Ovrct: Red Lead 3 Coat System
N/A
226. Date Painted: 1933
227. Paint Color: Silver
233. Deck Forming: Conventional Forming
238. School Bus Rte.: Current & Desired route
240. Appr. Rwy Type.: Concrete
243. Grdr Spacing/No.: /

244. Span Lengths:
245. Girder Depth: 48.00
246a. Type of Ovelay: AC Overlay
b. Overlay Thickness: 3.00
c. Overlay Date: 12/04/2003
d. Ovly Depth Changed >1": _
247. Protective Systems:
248. # Field Splices w/ Corrosion:
249. Scour Crit. POA Exists?: _
250. Headwall:
254. Thru Truss Type:
257a. OkiePROS Truck Routing: Yes
258. Plans w/Found.in ODOT File:
259. Scour Eval. in ODOT File:
263. Interchange at Intersection: No
264. Interstate Milepoint:

Oklahoma Dept. of Transportation - Bridge Inspection Report

NBI No.:	Structure No.:	Local ID:	Suff. Rating:	
04085	0902 0000 X	-1	5.00	SD

Inspection Date: 10/16/19 Mike Kronander

Invoice No.: 877392 Inspected With: -1

Michael Kronander

Digitally signed by Michael Kronander
DN: cn=Michael Kronander, o=Burgess and Niple, Inc., ou, email=mike.kronander@burgessniple.com, c=US
Date: 2019.11.26 08:48:45 -05'00'

BRIDGE NOTES:

(38) 100-foot long riveted pony trusses with (2) 36-foot long steel beam approach spans. The bridge was posted for a 9-ton load restriction at the time of the inspection. The posting was lowered to 9 tons after cracks were discovered in the east U4 inboard gusset plates of spans 32 and 37 during the inspection. It was also discovered that the latest load rating report, dated March 25, 2014, used 8 rivets per gusset plate for the U1L0 and U4L3 panel points where only 6 exist.
OS Inspection Items: See Appendix tables in 2018-10-14 FC report for list of the following: Inspect cracks in stringer web copes, stringer connection angles, floor beams web copes, lower chord gusset plates above bearings for growth, stringer connections at end floor beams for additional loss or broken rivets; pier beams and supplemental pier beams at piers 1 and 39 for distress; misalignment of W U1U2 sp 37; floor beam section loss; gusset plate cracks at east U4 spans 32 and 37; scour from stream in spans 10 and 11; areas of collision damage on deck to steel trusses; east bearing at pier 3 for any undermining.

INSPECTION NOTES: **10/16/19**

PX – Reinforce/replace the damaged concrete bridge railing in spans 1 and 40. Consider installing approach railing with transitions and terminations compliant with current standards in both approach roadways.
PX – Seal cracks in the asphalt in both the bridge and approach wearing surfaces. Consider removing the asphalt wearing surface on the bridge and the built-up elastomeric concrete header to remove dead load and prevent damage to structure from drainage trapped in the wearing surface.
PX – Remove loose elastomeric concrete and patch the joint headers as necessary to provide a smooth riding surface across the bridge.
PX – Reseal the poured seal expansion joints. Consider replacing the deteriorated joints and joint headers due to deteriorated concrete adjacent to the joint opening.
PX – Install elastomeric pads or steel shims at missing locations on the supplemental pier beams over piers 1 and 39.
PX – During future inspections compare lengths of cracks in stringer and floor beam webs with Appendix A table values. Drill crack tips that grow significantly.
PX – Repair cracks in stringer connection angles noted in Appendix B by adding seat brackets below the stringer.
PX – Repair section loss in stringer and floor beam webs where corrosion holes and/or heavy section loss exists with welded plates and/or angles.
PX – Remove broken rivets for the stringer connections at the locations noted in Appendix C and replace with bolts.
PX – Replace sheared rivets in the vertical connection upper chord and end post with bolts at west U1 in spans 31 and 37.
PX – Remove pack rust and apply caulking and paint along the edges of the gusset plates at L0 and L5. Consider strengthening gusset plates where bowing is occurring.
PX – Clean and paint the stringer ends and floor beams adjacent to the joints above the piers and the lower chord panel points including the splice locations.
PX – Add rip rap around piers near the current channel to protect against scour.
PX – Repave the south approach near the bridge to provide a smooth transition.
PX – Install full depth pressure relief joints in both approaches to mitigate ongoing effects of pavement pressure.

FX – Monitor:
Cracks in the inboard gusset plates at east U4 spans 32 and 37 and at west U1 span 37 for growth.
The channel for further movement.
Beam connections to the original pier beams at piers 1 and 39 for further cracking.
Notches and cuts in inboard flange and gusset plate at west U1L2 span 31 for cracks or signs of distress. Consider strengthening member if further distress is noted.
Collision damage to west U1L2 in span 6 west U1L0 in spans 7 and 37 and east U1L0 in spans 14 and 39 for distress.
Pack rust and section loss in truss web members and end posts at railing connections.
Spalls and corroding reinforcing steel in soffit for further deterioration.
Lower chord gusset plates over the bearings for the development of horizontal cracks.
Cracks at floor beam copes for growth and further deterioration.
Horizontal cracks in the web of the end floor beams at span 6 in floor beam 0 span 11 in floor beam 5 and span 20 in floor beam 0.
Fatigue prone stitch welds of angle strengthening at floor beam 0 span 2 for cracking.
Corrosion holes through the floor bracing system gusset plates for the development of cracks.
1/4-inch bow in west U1U2 due to collision damage for further distress and development of cracks.
Bowed gusset plates near bearings for distress.
Section loss of the inboard lower chord at the floor system bracing connections spliceS and adjacent to stay/batten plates.
Bullet strike damage to east truss span 4 members/gusset plates for crack development.
Cracking/spall of the east column capital pier 3 for conditions which would undermine the bearing.
Expansion bearing pins for signs of additional wear or distress.

ELEMENT CONDITION STATE DATA

Elem. / Env	Description	Unit	Total Qty	% 1	Qty. 1	% 2	Qty. 2	% 3	Qty. 3	% 4	Qty. 4
12 / 1	Re Concrete Deck	sq.ft	94,488.00	0%	0.00	0%	0.00	100%	94,488.00	0%	0.00

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04085	0902 0000 X	-1	5.00	

The deck appears to be growing from the center of each truss span as evidenced by the distress in the floor system at the end floor beams (cracking and web rotation of the floor beams, cracks in the stringer connection angles, and broken rivet heads at the stringer connection angles). These conditions were observed in nearly all of the truss spans.
Evidence of significant approach pavement growth was noted at the deck/abutment backwall interface. The deck at the abutment seats has pushed towards the channel up to 3 1/4 inches.
Deterioration of the curbs and edges of the deck are typical throughout the bridge. These conditions are promoted by deck drainage held against the concrete by the porous asphalt wearing surface. Spalls in the curb have been patched at isolated locations throughout the deck.

510 / 1	Wearing Surfaces	sq.ft	94,488.00	79%	74,488.00	11%	10,000.00	11%	10,000.00	0%	0.00

PX – The asphalt wearing surface has unsealed longitudinal and transverse cracks throughout the spans. Raveling and patching of the asphalt pavement exists along the outside wheel lines at isolated locations and along the roadway centerline. The aging wearing surface does not effectively shed drainage, allowing the drainage to infiltrate cracks in the deck.

107 / 1	Steel Opn Girder/Beam	ft	259.00	67%	174.00	33%	85.00	0%	0.00	0%	0.00

Surface corrosion exists along the top flanges of exterior beams.

113 / 1	Steel Stringer	ft	9,501.00	0%	0.00	63%	6,001.00	37%	3,500.00	0%	0.00

Section loss of the top flange is typical in the exterior stringers. Pack rust is lifting the deck from the exterior stringers.

120 / 1	Steel Truss	ft	7,600.00	0%	0.00	64%	4,840.00	36%	2,760.00	0%	0.00

Truss Upper Chord
PX/FX – Member Alignment – Vehicular collision damage was observed at numerous locations in the upper chord.
Truss Lower Chord
PX – Corrosion of the lower chord is common at the floor beam/floor system bracing gusset plate connection. The corrosion has caused section loss of less than 1/4-inch to the inboard channel top flange. Corrosion also occurs around the inboard splice plates at L2 and L3 under the floor beams. The corrosion and resulting section loss is due to deck drainage passing through the deck joints above the interior floor beams and expansion joints. Several areas of the lower chord have corrosion holes through the inboard bottom flange of the channels. Corrosion is typically heavier at the east truss.
PX – Corrosion is common around the inboard splice plates at L2 and L3 and appears to be the result of deck drainage splashing over the edge of the deck. Pack rust is developing at the bottom flange splice; however, no significant distress was observed in the web splice plates. Pack rust and corrosion are significantly less on the west truss.
FX – Horizontal cracks were observed in the inboard truss gusset plate between the bearing pin and the end floor beam (see Appendix H for locations and sizes of cracks).
FX – Lower chord gusset plates are typically bowed at L0 and L5 due to pack rust. The inboard gusset plate is bowed up to 1 inch between the end post and the lower chord with the outboard gusset plates typically bowed less than the inboard. The end of the end post is in contact or near contact with the top of the lower chord making the likelihood of a buckling failure remote. Section loss of the gusset plate is up to 50% of the plate thickness (gusset plate is 3/8 inch thick) and occurs at multiple locations.
Truss Web Members
PX/FX – Member Alignment – Vehicular collision damage was observed at numerous locations on the above deck truss members.
FX – Pack rust developing under the corner of the upper chord gusset plates has caused cracks to develop in the edge of the gusset plate at east U4 in spans 32 and 37. The cracks exist near the first row of rivets, reducing the capacity of the gusset plate for U4L3.
FX – Bullet strike damage exists at the outboard gusset plate between east U2L3 and L2U3 in span 4 and the outboard flange of east U2L3 in span 3.
Truss End Posts
PX – Pack rust is common at the end post connection to the inboard gusset plate at the lower chord connection (photo 66). Deck drainage which splashes over the curb travels down the end post promoting corrosion.
FX – Pack rust is forming at many of the bridge railing to inboard end post channel connections. Up to 3/4-inch section loss was noted along the full height of the inboard channel webs.
FX – Vehicular collision damage exists at numerous locations to the end posts.

515 / 1	Steel Protective Coating	sq.ft	406,533.00	0%	0.00	0%	0.00	100%	406,533.00	0%	0.00

PX – Corrosion and significant section loss are occurring at many locations on the lower chord; floor beams and stringers due to deck drainage passing through joints. Widespread section loss and corrosion holes exist in the exterior stringers and end floor beams.
Minor to moderate pack rust and minor section loss at the gusset plate seams are common on the above deck truss members with weathered and chalking paint throughout.

152 / 1	Steel Floor Beam	ft	6,155.00	0%	0.00	59%	3,655.00	41%	2,500.00	0%	0.00

PX – Section loss with corrosion holes is common in the end floor beams and floor beams at the east truss connection (57 locations - See Appendix F).
FX – Horizontal cracks in the end floor beams between the top flange and connection angle range between 5/8 inch to 9 3/16 inches (71 locations - See Appendix G)

162 / 1	Stl Gus Plate	each	1,672.00	0%	0.00	45%	757.00	55%	915.00	0%	0.00

PX- Horizontal cracks in the inboard truss gusset plates above the bearings range in length between 6 3/4 inches to 17 5/8 inches long (10 locations - See Appendix H); Noted cracks have been strengthened; Numerous locations where paint cracks exists at this location suggesting eminent development of cracks.
FX- Cracks in edge of E U4 in spans 32 and 37 due to pack rust (NEW 2018) and W U1 span 37 due to collision damage; LC inboard gusset plates typically bowed at L0 and L5 due to pack rust; West U1 span 31 has tears (1 7/8 inch and 1 inch) in edge of inboard gusset plate Bullet strike damage to E M2.5 span 4.

205 / 1	Re Conc Column	each	78.00	0%	0.00	99%	77.00	1%	1.00	0%	0.00

NBI No.:	Structure No.:	Local ID:	Suff. Rating:	SD
04085	0902 0000 X	-1	5.00	

FX – A 7/8-inch wide crack exists in the capital of the east column of pier 3 which is emanating from the span 3 bearing anchor bolt. The crack has led to a large portion of the column capital shifting to the south approximately 1 1/4 inches (previously 1-inch). The truss bearing appears to be adequately supported and brackets have been added to stabilize the capital. A definitive cause of the crack could not be determined during the inspection.
FX – The top one to five feet of the pier column foundation are exposed at many piers, generally in the floodplain north of the river and on some piers in the south floodplain. This may be indicative of general scour of the sandy soils and/or may be an as-built condition.
Map cracking with efflorescence and delaminations are common throughout many of the piers. It could not be determined if the cracks in the pier columns are the result of Alkali-Silica Reactivity.
Vertical and horizontal cracks which mirror the reinforcing steel exist in the web walls at several locations. Spalls exposing reinforcing steel exist in the face and corners of the web walls due to inadequate cover. The cracks and spalls are most prevalent on the south face of the piers and do not affect the load carrying capacity.
Shallow spalls due to gunshot damage are typical on the columns and web walls of piers 1 through 8.

215 / 1	Re Conc Abutment	ft	49.20	50%	24.60	50%	24.60	0%	0.00	0%	0.00

No significant deficiencies were noted in the abutments, except for moderate debris on the bearing seats of both abutments and map cracking exposing a few reinforcing bars at the ends of the south abutment.

301 / 1	Pourable Joint Seal	ft	495.00	0%	0.00	0%	0.00	25%	123.75	75%	371.25

PX – Joint headers consisting of elastomeric concrete were installed to maintain a joint opening with the asphalt wearing surface. These headers are only as deep as the asphalt wearing surface and exhibit past patching using asphalt, concrete and elastomeric concrete. Spalling of the headers was observed along the joints at piers 1; 2; 13; 27; 33; 35; and 39. Several of these spalls have occurred since the 2016 inspection when the joint headers were patched with asphalt concrete.
PX – The poured seal joints typically are deteriorated or missing and show evidence of leaking. The poured seal was never installed at many of the repaired header locations, leaving only the form board to fill the joint. Spalling of the underside of the deck at the expansion joints is common and a direct result of the leaking joints.
The joints are typically closed near the ends of the bridge as a result of approach pavement growth. The joints above the expansion bearings further from the ends of the bridge are not closed, though many of the truss expansion bearings are at or near their limits of movement.

310 / 1	Elastomeric Bearing	each	14.00	50%	7.00	0%	0.00	14%	2.00	36%	5.00

PX – Elastomeric pads are missing at the supplemental pier beams under beams 1 through 4 at pier 1 and at beams 2 and 3 at pier 39 with heavy pack rust forming at beam 5; pier 1. The bearing pads appear to be walking from beneath the beams at pier 1 under beam 5 and pier 39 under beams 4 and 5. This condition limits the supplemental pier beams to act only as a catcher beam; available to carry the beams should the original pier beam fail.

311 / 1	Moveable Bearing	each	86.00	0%	0.00	67%	58.00	33%	28.00	0%	0.00

FX – Wear causing grooving in the expansion bearing pins and enlarging of the pin hole in the connecting gusset plates are common throughout the spans. The wear is a result of bearing rotation under live loads. This condition is most severe at L0 span 38 over pier 37; which has 3/16-inch total wear to the pin and gusset plate.
Heavy pack rust with minor associated pitting is widespread on and between the bearing components; more so at the expansion bearings. Much of this deterioration is caused by debris accumulating on and around the bearing seats.
Expansion bearings are rotated up to 3/4-inch towards the joint with pack rust filling the gap between the masonry plate and sole plate. The expansion bearings are generally centered on the masonry plate with no signs of recent movement observed; though many are in or near full expansion. The bronze sliding plate has slid slightly towards the center of the truss span and is fractured into pieces at a few locations. One bronze sliding plate has slid to the north 3 inches under the west truss at pier 5 in span 6. It is speculated that the bearings became frozen; and then rotated in expansion during warm weather; allowing pack rust to incrementally fill the gap between the plates.
Approximately 25-percent of the anchor bolts are broken or have corroded through within the slotted holes of the truss expansion bearing assemblies. This condition is more common at the expansion bearings. The remaining anchor bolts should be capable of resisting lateral forces on the truss spans. The anchor bolts are failing due to a combination of shear; pack rust-induced tension; and corrosion.

313 / 1	Fixed Bearing	each	84.00	0%	0.00	75%	63.00	25%	21.00	0%	0.00

Exterior beams at both abutments have sheared anchor bolts at the bearings (the interior beam anchor bolts do not extend into the abutment seat concrete). This most likely is a result of pavement pressure from the approach roadway pushing the bridge deck; up to 3 1/3 inches (previously 2 inches) of movement to the north was noted at the south abutment. The beam bearings at the north abutment are pushed to the south up to 4 inches; also due to pavement pressure.

330 / 1	Metal Bridge Railing	ft	7,600.00	0%	0.00	95%	7,220.00	5%	380.00	0%	0.00

Pack rust is typical between the metal bridge railing and the truss end posts and web members. No significant section loss was noted to the railing.
Small cracks exist in the railing where the flange and web have been coped around the end post. Collision damage has caused minor bends in the steel railing at numerous locations. These conditions have not significantly affected the strength of the railing.

331 / 1	Re Conc Bridge Railing	ft	144.00	50%	72.00	25%	36.00	25%	36.00	0%	0.00

PX – Collision damage exists to the concrete railing in spans 1 and 40. One section of the east bottom rail has been severed in span 1. The concrete post at the north abutment for the east rail is spalled and is severed from the base. The adjacent post has spalling with exposed reinforcing steel. Four of the concrete posts for the west rail in span 40 are leaning outward and the deck is cracked on the outside edge of the posts.

859 / 1	Soffit	(EA)	1.00	0%	0.00	0%	0.00	100%	1.00	0%	0.00

NBI No.:	Structure No.:	Local ID:	Suff. Rating:	SD
04085	0902 0000 X	-1	5.00	

FX – Spalls exposing corroded reinforcing steel are common in the underside of the deck along the edge of the deck and floor beams. The spalls appear to be the result of deck drainage leaking through cracks in the deck.
The deck is lifting from the exterior stringers and end floor beams due to pack rust on the top flange. A transverse crack is common in the underside of the deck between 4 and 6 feet from the expansion joints because of the lifting deck. This lifting of the deck is beginning to produce a ramping effect for traffic over each floor beam.
The deck soffit exhibits transverse cracks with light efflorescence and discolored concrete. Full depth patches exist adjacent to many of the joints and along the east curb at isolated locations. At a few locations, the timber formwork remains in place. A deck repair utilizing timber boards occurs on the south face of floor beam 3 between stringers 4 and 5 in span 34.

863 / 1	Steel Pier Beam	(LF)	104.00	50%	52.00	0%	0.00	50%	52.00	0%	0.00

PX – Member Alignment – The pier beams at piers 1 and 39 have been retrofitted with a supplemental pier beam due to severe sweep and rotation as a result of approach pavement growth. Longitudinal forces act through the deck to distort the pier beam. Most of the elastomeric pads between the supplemental pier beam and the beam bottom flange are missing; allowing the original pier beam to still carry the beam reactions. The supplemental pier beam currently acts as a catcher beam to support the beams should the original pier beam fail. No signs of distress from vehicular live loads were observed in either the original pier beam or the supplemental pier beam.
The lower portion of the supplemental pier beam at pier 1 is rolled approximately 3 degrees to the south; and upper section is rolled approximately 1 degree south. Pier beam 39 is rolled approximately 1 degree over the lower portion of the web. This is likely an as-built condition and does not significantly affect the load carrying capacity of the supplemental pier beam.
The bottom flange of the original pier beam at pier 1 is in contact with the stiff leg at pier 1. During higher temperatures they are in contact with each other; resulting in 1/16-inch wear on the north face of the original pier beam.

865 / 1	St.Open Gird End(5Ft	(LF)	100.00	0%	0.00	80%	80.00	20%	20.00	0%	0.00

FX – The connection angles for the beams to pier beam 39 are deformed due to the apparent approach pavement growth and pier beam rotation and sweep. The beams are still supported by the original pier beams at piers 1 and 39; however; the added pier beam will support the beams should the connection angles fail.

877 / 1	St. Stringer End(5Ft)	(LF)	9,501.00	0%	0.00	47%	4,501.00	53%	5,000.00	0%	0.00

PX - Significant loss including corrosion holes through exterior stringer webs at end floor beams (59 locations - See Appendix D); Cracks in the web at the top flange cope range from 1/8 inch to 2 1/2 inches long (98 locations - See Appendix A); Cracks in the stringer connection angles at the end floor beams range from 1 1/4 inches to 7 inches long (61 locations - See Appendix B); Broken rivets at the stringer connections to the end floor beams (121 rivets at 92 locations - See Appendix C).

909 / 1	Pourable Fix Jt.Seal	(LF)	495.40	0%	0.00	100%	495.40	0%	0.00	0%	0.00

Several of the fixed joints and the abutment joints have been paved over with a transverse crack observed over the joint.
Joints over the fixed bearings typically are closed.
The void between floor beam 5; span 20; and floor beam 0; span 21; over pier 20 has been filled with asphalt from the top of the floor beam bottom flanges to the underside of the deck. The asphalt retains moisture which accelerates corrosion and section loss on the floor beams.
Joint armor and supports at pier 1 are heavily twisted. This is caused by pavement pressure and pack rust.

916 / 1	St.Bearing Assembly	(LF)	4.00	0%	0.00	100%	4.00	0%	0.00	0%	0.00

Surface corrosion with no significant deficiencies.
Note: Bearing assemblies do not exist between beams and supplemental pier beams

956 / 1	St. Cracking/Fatigue	(SF)	1.00	0%	0.00	0%	0.00	100%	1.00	0%	0.00

PX- Cracks in the stringer web at the top flange cope range from 1/8 inch to 2 1/2 inches long (98 locations - See Appendix A); Cracks in the stringer connection angles at the end floor beams range from 1 1/4 inches to 7 inches long (61 locations - See Appendix B).
FX- Cracks in edge of E U4 in spans 32 and 37 due to pack rust and W U1 span 37 due to collision damage; Horizontal cracks in the end floor beams between the top flange and connection angle range between 5/8 inch to 9 3/16 inches (71 locations - See Appendix G).

957 / 1	Pack Rust Smart Flag	(EA)	1.00	0%	0.00	0%	0.00	100%	1.00	0%	0.00

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04085	0902 0000 X	-1	5.00	

PX – Corrosion is common around the inboard splice plates at L2 and L3 and appears to be the result of deck drainage splashing over the edge of the deck. Pack rust is developing at the bottom flange splice; however; no significant distress was observed in the web splice plates. Pack rust and corrosion are significantly less on the west truss.

PX – Pack rust is common at the end post connection to the inboard gusset plate at the lower chord connection. Deck drainage which splashes over the curb travels down the end post promoting corrosion.

FX – Pack rust is forming at many of the bridge railing to inboard end post channel connections. Up to 3/4-inch section loss was noted along the full height of the inboard channel webs.

FX – Horizontal cracks were observed in the inboard truss gusset plate between the bearing pin and the end floor beam (see Appendix H for locations and sizes of cracks). All ten locations have been strengthened with the addition of a welded steel angle on the inboard face. The distortion and cracks are a result of section loss and pack rust occurring between the gusset plate and the top edge of the lower chord channel. The crack is within the horizontal shear plane between the end post and the lower chord. Numerous locations exist where the gusset plate exhibits paint cracks indicating eminent development of cracks.

FX – Lower chord gusset plates are typically bowed at L0 and L5 due to pack rust. The inboard gusset plate is bowed up to 1 inch between the end post and the lower chord with the outboard gusset plates typically bowed less than the inboard. The end of the end post is in contact or near contact with the top of the lower chord making the likelihood of a buckling failure remote. Section loss of the gusset plate is up to 50% of the plate thickness (gusset plate is 3/8 inch thick) and occurs at multiple locations. This loss affects the horizontal shear capacity of the gusset plate.

FX – Pack rust developing under the corner of the upper chord gusset plates has caused cracks to develop in the edge of the gusset plate at east U4 in spans 32 and 37. The cracks exist near the first row of rivets; reducing the capacity of the gusset plate for U4L3.

Heavy pack rust with minor associated pitting is widespread on and between the bearing components; more so at the expansion bearings

Pack rust exists between the floor beam bottom flange and the lower lateral bracing gusset plates causing section loss to the floor beam. This loss occurs at a location of low stress and does not significantly affect the load carrying capacity of the member.

Pack rust 1/4-inch thick is common between the diagonals and the mid gusset plates with minimal section loss. Isolated locations exhibited pack rust up to 1 inch thick with 1/8-inch deep section loss. Similar conditions exist at the bridge railing connections to the truss web members.

Pack rust is typical between the metal bridge railing and the truss end posts and web members. No significant section loss was noted to the railing.

961 / 1	Scour SF	(EA)	1.00	0%	0.00	0%	0.00	100%	1.00	0%	0.00

FX – The top one to five feet of the pier column foundation are exposed at many piers; generally in the floodplain north of the river and on some piers in the south floodplain. This may be indicative of general scour of the sandy soils and/or may be an as-built condition.

962 / 1	Super.Traffic Impact	(EA)	1.00	0%	0.00	0%	0.00	100%	1.00	0%	0.00

PX/FX – Member Alignment – Vehicular collision damage was observed at numerous locations in the upper chord:

PX – Impact damage resulting in multiple sheared rivets for the bottom lacing bars exists at east U3U4; span 9 and west U1U2; span 31. No signs of local buckling were observed at this location.

FX – West U1U2 in span 37 is bowed globally to the east 1/4 inch. This damage does not significantly affect the load carrying capacity of the member and appears to be the result of vehicular collision. Multiple rivet heads are also sheared away on the stay plate and lacing bars along the inboard bottom flange.

Five failed lacing bars exist on the underside of east U3U4; span 9.

Impact damage exists on the inboard flanges of the upper chord at several additional locations. The damage does not significantly affect the load carrying capacity of the members.

PX/FX – Member Alignment – Vehicular collision damage was observed at numerous locations on the above deck truss members. The following are the most significant:

PX – Span 37; west U1L1 – U1L1 carries the floor beam reaction only. Two sheared rivet heads exist at the inboard gusset plate at U1. The shank still exists through the rivet hole of the gusset plate and there is no sign of movement or distress from loading.

FX – Span 4; west U1L2 – Inboard flange bent 2 inches over a 9-inch length below the bottom rail.

FX – Span 6; west U1L2 – Inboard flange bent inward 2 1/8 inch near U1.

FX – Span 20; west U1 – Inboard gusset plate has a 3/8-inch tear with adjacent impact damage to U1L2 causing the flange to bow upward.

FX – Span 31; west U1L2 – Inboard flange has a tear near U1 resulting in an approximate 50% loss of the flange. The adjacent gusset plate has two tears measuring 1 7/8 inches deep at the upper chord and 1-inch deep at connection to U1L2. The 1 7/8-inch deep tear occurs in the shear plane between the diagonals and upper chord and will affect the shear strength of the gusset plate. The 1-inch deep tear occurs near the corner of the gusset plate and does not significantly affect the capacity of the gusset plate. The gusset plate is also bowed approximately 2 inches to the west due to the collision damage. This has not changed since the previous inspection.

FX – Span 37; west U1 gusset plate – A 5/16-inch long crack exists in the bottom edge of the inboard gusset plate between U1L1 and U1L2 near U1L2.

FX – Span 37; west U1L2 – Inboard bottom flange is bent 1-inch near U1.

FX – Vehicular collision damage exists at numerous locations to the end posts. The following are the most significant:

Span 7; west L0U1 – Bent inboard channel bottom flange and edge damage to top cover plate at U1.

Span 14; east L0U1 – Top inboard flange is bent down approximately 4 inches, and 5 rivet heads are sheared off.

Span 20; west L0U1 – Inboard bottom flange bowed upward and has minor scrapes.

Span 37; west L0U1 – Three lacing bars are detached on the bottom face and the member is also bowed globally 1/4-inch to the west. The inboard bottom flange is bowed west 5/8-inch and up 2 3/4-inch and is torn 1 3/8 inches wide over 4 1/4 inches in length at top railing.

Span 39; east L0U1 – Inboard flange bent down approximately 2 inches near U1.

963 / 1	Steel Section Loss SF	(EA)	1.00	0%	0.00	0%	0.00	100%	1.00	0%	0.00

NBI No.:	Structure No.:	Local ID:	Suff. Rating:	SD
04085	0902 0000 X	-1	5.00	

PX - Significant loss including corrosion holes through exterior stringer webs at end floor beams (59 locations - See Appendix D); Section loss with corrosion holes is common in the end floor beams and floor beams at the east truss connection (57 locations - See Appendix F).
FX- Corrosion of the lower chord has caused section loss on inboard top flange.

965 / 1	Debris SF	(EA)	1.00	0%	0.00	100%	1.00	0%	0.00	0%	0.00

The banks are well vegetated north of pier 11 with large trees and vegetation in the floodplain. The floodplain south of pier 10 contains sparse vegetation.

969 / 1	OutOfPlane Dist./Load	(EA)	1.00	0%	0.00	100%	1.00	0%	0.00	0%	0.00

FX – Pier beams 1 and 39 have severe sweep and have been sistered.

973 / 1	Horizontal Force SF	(EA)	1.00	0%	0.00	0%	0.00	100%	1.00	0%	0.00

PX- Significant approach pavement pressure occurs at both abutments pushing inward from both ends as evidenced by the movement of the deck, and sheared rivets and cracks in stringer to floor beam connections.

975 / 1	Supplemental Support	(EA)	76.00	100%	76.00	0%	0.00	0%	0.00	0%	0.00

The stiff leg shim plate under floor beam 5; span 26 at pier 26 is rotating out from under the floor beam bottom flange. Floor beam 0; span 8 at pier 7 impacts the stiff leg under truck loads. The stiff leg repairs are intended to catch the floor beam should it fail and do not need to be in contact with the floor beam.

Appendix A - Stringer Cope Cracks

	B	C	D	E	F	H	I	J
1	Span	Floor beam	Floor beam face/ Location	Stringer	Stringer face	Length	2019 FC Comment	Photo
2	2	0	North	5		1 1/2 vertical, 1 horizontal		
3	2	2	South	1	East	3/8		
4	2	4	South	1	Both	1/8		
5	2	5	South	1		1/2		
6	3	0	North	1		1 1/4 and 1 1/2	Two cracks, no change to 1 1/4-inch diagonal crack and new 1 1/2-inch long crack adjacent to top flange.	26
7	3	0	North	5		1/2		
8	3	5	South	1		3/8		
9	4	0	North	1		3/4	Previously 5/8-inch (1/8-inch growth)	
10	4	2	South	5	West	1/4		
11	4	5	South	5		1 1/4	Arrested by drilled hole.	
12	5	0	North	5		1/2		
13	6	2	North	1	West	1/8		
14	6	3	North	1	East	1/4		
15	6	3	North	1	West	1/8		
16	7	0	North	5		2 1/4		
17	7	5	South	5		3/4	Adjacent 50% section loss to the web 3 inches high	
18	8	4	North	5		1 1/4, 7/8 (exterior), 1 1/4, 1 1/4 (interior)		27
19	8	5	South	1		1 3/8		
20	9	1	North	1	East	1/4		
21	9	3	North	1	West	3/8	Two 3/8-inch cracks on east face of stringer	
22	9	3	South	1	West	3/8		
23	9	4	North	1	East	3/8		
24	10	0	North	1		1	Previously 5/8-inch (3/8-inch growth)	28
25	10	1	South	2		3/4	Crack not found during this inspection cycle.	
26	10	2	North	1	West	5/8		
27	10	5	South	5		1		
28	11	0	North	1		3/4		
29	11	0	North	5		9/16		
30	12	5	South	1		1 1/2, 1 1/2		
31	13	5	South	5		5/8		
32	14	5	South	1		1 1/4		
33	15	0	North	1		5/8	Previously 3/8-inch (1/4-inch growth)	
34	16	1	South	5		1 5/8		
35	16	4	North	5		1/2		
36	17	0	North	5		1 3/8		
37	17	4	South	1	East	1/4	New cope crack.	29
38	18	0	North	1		7/8		
39	18	2	North	1	West	1/4		
40	18	2	South	1	West	3/8		
41	19	0	North	5		1/2		
42	19	5	South	1		3/4		
43	19	5	South	3		5/16		
44	19	5	South	5		1 1/4		
45	20	0	North	1		1		
46	20	1	North	5		1/8		
47	20	2	North	1	West	3/8		
48	20	2	South	1	West	3/4		
49	20	4	North	1	West	3/16		
50	20	4	North	5		1/8		
51	20	5	South	1		1/8		
52	21	0	North	5		7/8		
53	21	3	North	1		1/8		
54	21	4	South	1	East	1/8		
55	23	0	North	5		1/4		
56	23	1	South	5		3/16		
57	25	0	North	5		3/4		
58	25	2	South	1	East	1/4		
59	26	3	North	1	West	3/16		
60	26	5	South	1		2 1/2		
61	27	1	North	1	West	1/2 and 1 1/16	Heavy corrosion.	
62	27	1	South	1	West	1 1/4	Heavy corrosion.	
63	27	1	South	5		1/4		
64	27	2	South	1	East	3/16		
65	28	1	North	1	West	3/16		
66	28	2	North	1	West	5/8		
67	28	2	South	1	East	1/4		
68	28	3	North	5		3/8		
69	28	5	South	1		5/8		
70	29	4	South	5		1 3/4 and 1/4		
71	30	1	South	5	East	3/4		
72	30	1	South	5	West	3/8, 5/8		
73	30	1	South	5		1/2		

Yellow Highlighted - New Deficiency
Red Highlighted - Changed Deficency

Appendix A - Stringer Cope Cracks

	B	C	D	E	F	H	I	J
1	Span	Floor beam	Floor beam face/ Location	Stringer	Stringer face	Length	2019 FC Comment	Photo
74	30	4	North	5		1/2		
75	31	1	North	1	West	1/4		
76	31	2	North	1	West	1/4		
77	32	0	North	5		5/8		
78	32	2	South	1	East	1/4		
79	32	4	North	1	West	1/8		
80	32	5	South	1		1/4		
81	33	2	South	1	East	1/8		
82	33	3	South	1	East	1/4		
83	33	5	South	1		1 1/4		
84	34	1	South	1	East	1/4		
85	34	2	South	1	East	5/16		
86	34	5	South	1	East	1/2		
87	35	0	North	1		1/2		
88	35	4	South	1	East	1/8		
89	36	0	North	1		1/2		
90	36	1	North	1	West	3/8		
91	36	2	South	1	West	3/8		
92	36	4	North	1	West	1/8		
93	36	5	South	1		2 1/4 and 1/2	2 1/4-inch crack in top flange and 1/2-inch crack at cope.	
94	37	0	North	5		1/2		
95	37	3	North	1	East	1/4		
96	38	2	North	1	West	3/4		
97	38	2	South	1	West	5/8		
98	38	5	South	1		1/2		
99	39	1	North	1	West	1/8		
100	39	1	South	1	West	1/2		
101	39	3	South	1	East	3/8		

Appendix B - Stringer Connection Angle Cracks

Span	Floor beam	Floor beam face/ Location	Stringer	Stringer face	Length	2019 FC Comment	Photo
2	0	North	2	West	3 1/4		
3	5	South	4	West	2 1/2		
4	0	North	2	West	3		
5	5	South	3	East	3 1/4		
8	0	North	3	West	3 1/2		30
9	5	South	3	East	2 1/4		
9	5	South	3	West	3 5/8		
10	0	North	3	West	3		
12	0	North	2	East	3		
12	0	North	2	West	2 7/8		
13	5	South	4	West	4		
15	5	South	4	West	3 7/8		
17	5	South	4	East	4 3/4	Previously 4 1/2-inch (1/4-inch growth).	
18	0	North	3	East	2 3/4		
18	0	North	4	East	2 3/4		
22	0	North	1	East	3 3/4		
22	0	North	3	East	4		
22	0	North	4	East	2 3/4		
23	5	South	4	West	3 1/2		
24	0	North	2	West	2 3/4		
24	0	North	3	East	4		
24	0	North	3	West	4		
24	0	North	4	East	3 1/4		
25	5	South	2	West	3 1/2		
25	5	South	3	East	1 1/4		
25	5	South	3	West	4 3/4		31
25	5	South	4	West	3 5/8		
25	5	South	5	West	5 1/2		
26	0	North	2	East	2 7/8		
26	0	North	2	West	3 1/4		
26	0	North	3	East	5 3/8		
26	0	North	3	West	2 5/8		
26	0	North	4	East	3 1/2		
27	5	South	3	East	2 1/2		
27	5	South	3	West	3 3/4		
27	5	South	4	West	4 1/4		

Yellow Highlighted - New Deficiency
Red Highlighted - Changed Deficency

Appendix B - Stringer Connection Angle Cracks

Span	Floor beam	Floor beam face/ Location	Stringer	Stringer face	Length	2019 FC Comment	Photo
28	0	North	2	East	4 1/4		
28	0	North	3	East	3 7/8		
29	5	South	3	West	4		
29	5	South	4	East	1 1/2		
29	5	South	4	West	2 1/8		
30	0	North	2	East	5 3/4		
30	0	North	3	East	4 5/8		
30	0	North	4	East	3 3/4		
30	1	South	5	West	9/16	9/16-inch long paint crack in connection angle.	
31	5	South	4	East	3 3/4		
31	5	South	4	West	6 1/8		32
33	5	South	3	West	4		
33	5	South	4	West	7		33
34	0	North	2	East	3 1/2		
34	0	North	2	West	2		
34	0	North	3	West	2 1/4		
34	5	South	5	West	3 1/2		
35	5	South	3	West	4 1/4		
35	5	South	4	West	4		
35	5	South	2	West	1 1/4		
36	0	North	2	West	3		
36	0	North	3	West	2		
36	0	North	4	East	4 1/8		
38	0	North	2	West	2 1/8		
38	0	North	3	West	2 1/2		
39	5	South	4	West	4 5/8		

Appendix C - Missing Stringer Rivets

Span	Floor beam	Floor beam face/ Location	Stringer	Stringer face	Number	2019 FC Comment	Photo
2	0	North	2		1	All shanks still in shear plane unless noted otherwise.	
2	0	North	3		2		
4	0	North	2		1	Shanks not in shear plane.	
4	1	South	2	East	1		
4	3	South	3	West	1		
5	1	North	2		1		
5	1	North	3		1		
5	2	North	2		1		
5	4	South	4		1		
5	5	South	4	East	1		
6	0	North	2		2	East shank not in shear plane	
6	0	North	3	East	1	Shank not in shear plane.	
6	1	North	2		1		
6	2	North	2	Both	2		
7	1	North	2	East	1		
7	2	North	2	Both	2		
7	2	North	3	West	1		
7	5	South	3		2	Shanks still in shear plane (previously noted as not in shear plane).	
7	5	South	4		2	Shanks still in shear plane (previously noted as not in shear plane).	
8	0	North	2		2	Shanks not in shear plane.	
8	0	North	3	East	1	Rivet shank is welded to connection angle, weld has broken away from rivet. Rivet shank no longer in shear plane.	
8	1	North	2	East	1		
9	1	North	2	Both	2	1 missing rivet each connection angle. 2 total	
9	4	South	4		1		
9	5	South	4		2		
10	0	North	2		2		
10	0	North	3	East	1	Shank not in shear plane.	
10	1	North	2		2		
10	1	North	3		2		
10	4	South	4		1		
11	1	North	2		1		
11	4	South	4		2		
11	5	South	3		2	Shanks not in shear plane.	
11	5	South	4		2		
12	0	North	2	East	1		
12	0	North	3		2	Shanks not in shear plane.	
12	0	North	4	Both	2		
13	2	North	2		2		
13	2	North	3		1		
14	0	North	2		2	Shanks not in shear plane.	
14	1	North	2		1		
15	5	South	3		2	West shank not in shear plane.	
15	5	South	4	East	1	Shank not in shear plane.	
16	0	North	2		2	Shanks not in shear plane.	
16	0	North	3	West	1		
17	5	South	4	West	1		
18	0	North	2		2	Shanks not in shear plane.	
18	0	North	3	West	1	Shank not in shear plane.	
18	4	South	3		1		
20	0	North	1	West	1	Shank not in shear plane.	
20	0	North	2	West	1		
22	0	North	2		2	Shanks not in shear plane.	
22	0	North	3	West	1	Shank not in shear plane.	
23	2	North	2		1		34
23	4	South	4		1		
24	0	North	2		2	East shank not in shear plane.	
24	4	South	4		2		
25	2	North	2		1		
25	5	South	4	East	1	Shank not in shear plane.	
26	0	North	2	East	1		
28	1	North	2		1		
29	1	North	2		2		
29	2	North	2		1		
30	0	North	3	West	1		
31	2	North	2	West	1		
31	5	South	3		2		
32	0	North	2		2	East rivet shank not in shear plane.	
32	0	North	3	Both	2	East rivet shank not in shear plane. Additional rivet lost on west face in 2019.	35

Yellow Highlighted - New Deficiency
Red Highlighted - Changed Deficency

Appendix C - Missing Stringer Rivets

Span	Floor beam	Floor beam face/ Location	Stringer	Stringer face	Number	2019 FC Comment	Photo
33	1	North	2		1		
33	5	South	3	East	1	Shank not in shear plane	
34	0	North	3	East	1	Shank not in shear plane	
34	1	North	2		1		
34	1	North	3		1		
35	2	North	2		2		
35	4	South	4		1		
35	5	South	3	East	1	Shank not in shear plane.	
35	5	South	4	East	1	Shank not in shear plane.	
36	0	North	2	East	1	Shank not in shear plane.	
36	0	North	3	East	1	Shank not in shear plane.	
36	1	North	2		2		
36	1	North	3		2		
36	4	North	3		1		
36	4	South	3		1		
37	1	North	1	East	1	New missing rivet.	36
37	1	North	2	West	1		
37	2	North	2	Both	2		
37	5	South	3		2		
37	5	South	4	West	1		
38	0	North	2		2	East shank not in shear plane.	
38	0	North	3	East	1	East shank not in shear plane.	
38	1	North	2		1		
39	5	South	3	West	1		
39	5	South	4	East	1		

Appendix D - Stringer Loss

Span	Floor beam	Floor beam face/ Location	Stringer	2019 FC Comment	Photo
2	0	North	1	3/4-inch diameter corrosion hole with 1/4-inch crack and 3-inch tall knife edge loss below hole.	
4	0	North	5	1 1/2-inch (1/4-inch growth) diameter corrosion hole with 1/2-inch and 5/8-inch horizontal crack and 3-inch high x 3/16-inch remaining below hole.	
5	5	South	5	1-inch diameter corrosion hole with 1/2-inch horizontal crack and 3/8-inch vertical crack.	
6	0	North	1	1 1/2-inch diameter corrosion hole with 1 1/8-inch vertical crack and 2-inch tall knife edge loss below hole.	
6	0	South	5	1 3/8-inch diameter corrosoin hole with 1/2-inch vertical crack and 3-inch tall knife edge loss below hole.	
7	5	South	1	3/4-inch (1/4-inch growth) diameter corrosion hole with 3/8-inch (1/8-inch gworth) crack	
8	0		5	3-inch long x 2 1/2-inch high corrosion hole.	
9	1	South	5	2 3/8-inch x 1-inch corrosion hole	
9	5	South	1	2 7/8-inch high x 1 1/4-inch wide corrosion hole with 1-inch vertical crack and 2-inch tall x 50% web loss below hole.	
9	5	South	5	1-inch wide x 1 1/4-inch high corrosion hole with 1/8-inch crack.	
10	0	North	5	1/2-inch diameter corrosion hole with 3-inch high x 3/16-inch deep, 4-inch high x 1/8-inch deep, and 3-inch high x 1/16- inch deep pitting extending below the hole. Two cracks, 3/4-inch and 1/2-inch above the hole and one crack, 1/2-inch below hole.	
10	5	South	5	4-inch wide x 1 1/8-inch high corrosion hole with 1/2-inch knife edging adjacent in lower web.	
11	5	South	1	3-inch high x 25% web loss at cope.	
11	5	South	5	5/8-inch diameter corrosion hole with 7/8-inch long crack and 3-inch high knife edge loss below hole.	
12	0	North	1	1-inch diameter corrosion hole with 3/4-inch (7/16-inch growth) vertical crack.	
12	0	North	5	1 1/8-inch high x 5/8-inch wide corrosion hole with 3/4-inch vertical crack.	
12	1	North	5	1-inch high x 3/4-inch wide corrosion hole.	
13	5	South	1	1 5/8-inch high x 1/2-inch wide corrosion hole with 1/4-inch crack and 2-inch high knife edge loss below hole	
14	0	North	5	1/2-inch diameter corrosion hole with 1 3/4-inch vertical crack. 10% average loss full web height.	
14	5	South	1	5/16-inch diameter corrosion hole with 3-inch high knife edge loss below hole	
15	1	South	5	1 1/2-inch high x 1-inch wide corrosion hole.	
15	5	South	5	Repaired with welded plate. Previously noted, 1 1/4-inch diameter corrosoin hole at cope with 3/8-inch crack. 2-inch high x 5-inch wide corrosion hole below connection angle.	
15	5	South	1	5/8-inch (1/8-inch growth) diameter corrosion hole adjacent to cope with 1/8-inch deep x 3-inch high x 1 1/2-inch wide adjacent loss.	
16	0	North	5	Repaired with welded plate. Previously noted, 5-inch high x 1 1/2-inch wide corrosion hole with 3/4-inch crack below hole. 5-inch wide x 1-inch high corrosion hole below connection angle.	
17	4	North	5	2 1/2-inch x 1-inch corrosion hole with 1 1/8-inch long crack.	
17	5	South	1	Two corrosion holes: 1 3/4-inch high x 1/4-inch wide and 3/4-inch high x 1 3/4-inch wide with 3/16-inch crack.	
17	5	South	5	2 1/4-inch high x 1-inch wide corrosion hole with 5/8-inch long crack.	
18	0	North	5	2 1/4-inch diameter corrosion hole with 7-inch high x 3/16-inch deep adjacent pitting.	
18	5	South	1	2 1/2-inch long x 5/8-inch wide corrosion hole. No longer cracked and web below has 25% loss.	22
19	5	South	1	5/8-inch diameter corrosion hole with 3/4-inch crack.	
19	5	South	5	7 1/2-inch wide x 4-inch high corrosion hole to lower web with 1/2-inch (1/8-inch growth) long crack from top of hole and 2-inch high knife edge loss above hole. Approx 50% total web loss.	23

Yellow Highlighted - New Deficiency
Red Highlighted - Changed Deficency

Appendix D - Stringer Loss

Span	Floor beam	Floor beam face/ Location	Stringer	2019 FC Comment	Photo
20	0	North	5	1 1/4-inch diameter corrosion hole.	
21	5	South	1	1 1/4-inch wide x 1/4-inch high corrosion hole with 1/4-inch vertical crack.	
21	5	South	5	Repaired with welded plate. Previously noted, 2 1/2-inch high x 1 1/2-inch wide corrosion hole with 4 1/2-inch long crack.	
22	0	North	1	2 1/4-inch wide x 1/2-inch high corrosion hole.	
23	5	South	5	2 3/4-inch high x 5/8-inch wide corrosion hole.	
24	0	North	1	1 1/4-inch high x 3/4-inch wide corrosion hole with 3/16-inch deep max loss over 6-inch high below hole	
24	0	North	5	Repaired with welded plate. Previously noted, 10 1/2-inch wide x 2-inch high corrosion hole with 1/16 to 1/8-inch remaining section for the full height at edge of connection angle. 1-inch and 3/4-inch diameter corrosion holes in web adjacent to connection angle with multiple holes emanating from lower holes, 1/4-inch max L.	
24	5	South	5	1-inch x 2-inch (previously 1-inch diameter) corrosion hole in web adjacent to bottom flange, approx. 10 inches from end.	
25	1	North	1	1-inch diameter corrosion hole at stringer cope.	
25	2	North	5	Heavy section loss on south stringer end around floor beam connection. North stringer end exhibits a 1-inch x 1/2-inch corrosion hole with 1/2-inch crack at top cope.	
25	5	South	1	2-inch high x 5/8-inch wide corrosion hole with 5/8-inch crack.	
25	5	South	5	1/8-inch deep section loss, full height.	
26	0	North	1	1/2-inch diameter corrosion hole with 3/8-inch crack and 3-inch high knife edge loss below hole.	
26	0	North	5	3-inch high x 1-inch wide (previously 2-inch high x 5/8-inch wide) corrosion hole with 2-inch high x 1-inch wide x 3/16-inch deep adjacent loss.	
27	5	South	1	4 1/2-inch high x 1-inch wide (previously 3 3/4-inch high x 1-inch wide with a 1/4-inch crack) corrosion holes.	24
29	4	South	5	5/8-inch diameter corrosion hole with 1 3/4-inch long crack.	
29	5	South	5	1 1/2-inch high x 1-inch wide corrosion hole with two cracks. One 1-inch crack extends from the top cope to hole and one 2 1/4-inch (1 1/4-inch growth) crack below hole. Two additional corrosion holes: 1/2-inch and 5/8-inch diameter in lower web.	
30	0	North	5	1 1/2-inch x 1 1/2-inch corrosion hole and 1 1/4-inch vertical crack. Remainder of web has 1/16-inch deep section loss along connection angle.	
31	5	South	5	Repaired with welded plate. Previously noted, three corrosion holes: 1-inch high x 1-inch wide (top), 1 1/2-inch high x 1/8-inch wide (mid height of web), and 1 3/4-inch high x 1 1/4-inch wide (near bottom flange). Total web section loss = approx 75%, with 5-inch vertical crack extending below top crack.	
33	5	South	5	6 1/4-inch wide x 2 1/2-inch high corrosion hole at base of stringer web. Severe section loss to east connection angle with near 100% section loss to top two rivet heads (no loss to west connection angle).	
34	0	North	5	1/16-inch average loss to web over 9-inch height.	
34	3	South	5	2 3/4-inch high x 1/2-inch wide corrosion hole with 1/2-inch crack at bottom of hole.	
34	4	South	5	1-inch high x 1 1/4-inch wide corrosion hole with 3/4-inch vertical crack at bottom of hole. Additional two corrosion holes in lower web, 2-inch wide x 1-inch high and 3/4-inch diameter.	
35	5	South	5	6 1/4-inch wide x 1 3/4-inch high corrosion hole with 6-inch wide x 1-inch high x 1/4-inch deep adjacent section loss. 1-inch diameter corrosion hole to west bottom flange.	25

Appendix D - Stringer Loss

Span	Floor beam	Floor beam face/ Location	Stringer	2019 FC Comment	Photo
36	0	North	5	Repaired with welded plate. Previously noted, 2 1/2-inch high x 1 1/2-inch wide corrosion hole at cope with 1 3/4-inch vertical crack and 3-inch high x 1/4-inch deep pitting below hole. 1/8-inch deep loss to remaining web height. Approx 50% section loss to this location. Heavy rivet head loss on stringer connection rivets on outside face due to laminating corrosion. Additional corrosion holes in lower web up to 8-inch wide x 1 1/4-inch high.	
38	0	North	5	Repaired with welded plate. Prevoiusly noted, 1-inch diameter corrosion hole in stringer cope with up to 1/4-inch deep section loss to full web height. Up to 90% section loss to top two rivets on both faces of stringer.	
38	5	South	5	1 1/2-inch high x 4 1/2-inch wide corrosion hole below connection angle with 1/2-inch cope crack.	
39	0	North	5	1 3/4-inch high x 1-inch wide (previously 1 1/4-inch high x 1/2-inch wide) corrosion hole below connection angle.	
39	1	South	5	1/2-inch high x 1/4-inch wide corrosion hole with 1/2-inch long crack extending below corrosion hole and 1/8-inch deep section loss over the full height of the beam.	
39	5	South	1	Multiple corrosion holes over 5 1/8-inch wide x 2-inch tall area under stringer connection angle with significant loss along edge of connection angle.	

Appendix E - Floor Beam Sweep

Span	Floor Beam	Sweep (in.)	Sweep Direction	Stiff Leg Installed	Description
1	Pier 1			Yes	Sister pier beam added due to severe sweep
2	0	-	-	Yes	
2	5	-	-	Yes	
3	0	1/2	North	Yes	
3	5	1/4	South	Yes	
4	0	1/4	North	Yes	
4	5	1/4	South	Yes	
5	0	3/4	North	Yes	
5	5	-	-	Yes	
6	0	-	-	Yes	
6	5	1/2	South	Yes	
7	0	1/2	North	Yes	
7	5	-	-	Yes	
8	0	1/4	North	Yes	
8	5	1/2	South	Yes	
9	0	3/8	North	Yes	
9	5	-	-	Yes	
10	0	-	-	Yes	
10	5	1/2	South	Yes	
11	0	5/8	North	Yes	
11	5	-	-	Yes	
12	0	1/4	North	Yes	
12	5	5/8	South	Yes	
13	0	1/2	North	Yes	
13	5	3/16	South	Yes	
14	0	5/8	North	Yes	
14	5	1/2	South	Yes	
15	0	5/8	North	Yes	
15	5	3/16	South	Yes	
16	0	3/16	North	Yes	
16	5	3/4	South	Yes	
17	0	1/2	North	Yes	
17	5	1/4	South	Yes	
18	0	5/16	North	Yes	
18	5	3/4	South	Yes	
19	0	5/8	North	Yes	

Yellow Highlighted - New Deficiency
Red Highlighted - Changed Deficency

Appendix E - Floor Beam Sweep

Span	Floor Beam	Sweep (in.)	Sweep Direction	Stiff Leg Installed	Description
19	5	-	-	Yes	
20	0	-	-	Yes	
20	5	7/8	South	Yes	
21	0	5/8	North	Yes	
21	5	-	-	Yes	
22	0	1/4	North	Yes	
22	5	3/8	South	Yes	
23	0	1/2	North	Yes	
23	5	-	-	Yes	
24	0	1/4	North	Yes	
24	5	3/4	South	Yes	
25	0	3/8	North	Yes	
25	5	7/16	North	Yes	
26	0	3/8	North	Yes	
26	5	1/2	South	Yes	
27	0	3/4	North	Yes	
27	5	5/8	South	Yes	
28	0	1/2	North	Yes	
28	5	3/4	South	Yes	
29	0	3/4	North	Yes	
29	5	-	-	Yes	
30	0	-	-	Yes	
30	5	7/8	South	Yes	
31	0	1/2	North	Yes	
31	5	-	-	Yes	
32	0	-	-	Yes	
32	5	3/4	South	Yes	
33	0	3/8	North	Yes	
33	5	-	-	Yes	
34	0	-	-	Yes	
34	5	3/4	South	Yes	
35	0	1/2	North	Yes	
35	5	-	-	Yes	
36	0	-	-	Yes	
36	5	5/8	South	Yes	
37	0	1/2	North	Yes	
37	5	-	-	Yes	
38	0	-	-	Yes	
38	5	3/8	South	Yes	
39	0	3/8	North	Yes	
39	5	-	-	Yes	

Yellow Highlighted - New Deficiency
Red Highlighted - Changed Deficency

Appendix E - Floor Beam Sweep

Span	Floor Beam	Sweep (in.)	Sweep Direction	Stiff Leg Installed	Description
40	Pier 39				Sister pier beam added due to severe sweep

Appendix F - Floor Beam Loss

Span	Floor beam	Floor beam face/ Location	2019 FC Comment	Photo
2	0	Between stringer 2 and 5	4-inch x 8-inch x 3/8-inch angle added to bottom of web and bottom flange with stitch welds.	
3	5	Between stringers 3 and 4	Two corrosion holes: 1 1/2-inch diameter and 1/2-inch diameter	
4	0	Between stringer 4 and 5	14-inch long x 1-inch high	
5	5	Between stringers 1 and 2	3/4-inch diameter and 1-inch high x 2-inch wide	
5	5	Between stringers 3 and 4	2-inch high x 1-inch wide	
6	0	Between stringers 1 and 2	6-inch wide x 1-1/4-inch high	
6	0	Between stringers 3 and 4	1-inch high x 16 1/2-inch wide	
7	2	At East Truss	2-inch wide x 3/4-inch tall corrosion hole with 1 1/2-inch horizontal crack	
7	3	At east truss cope	5/8-inch x 5/8-inch with 5/16-inch vertical crack	
8	3	At east truss	3/4-inch high x 1/2-inch wide corrosion hole	
9	0	Under stringer 3	3/4-inch and 3/8-inch corrosion holes just in lower web above stiff leg.	
9	1	At East truss	2 3/4-inch diameter corrosion hole with a 1 1/8-inch long crack that has self-arresting into the corrosion hole.	37
9	1	West Truss	3/4-inch corrosion hole with adjacent knife edging in cope.	
10	1	At east truss cope	5/8-inch high x 3/16-inch wide	
11	5	Between stringers 4 and 5	5 corrosion holes, one 4-inch high x 1-1/2-inch and four 3/8-inch diameter.	
11	5	Near stringer 3, over stiff leg	6-inch x 1 1/2-inch corrosion hole with a 30 1/4-inch long (1/4-inch growth) crack with slight offset. Crack ends are turning down into bottom flange fillet.	38
12	0	Near stringer 4	Multiple corrosion holes over a 48 1/2-inch long x 1 5/8-inch high area.	
12	3	At E Truss	1 3/8-inch high x 1-inch wide.	
13	5	Near stringer 2	1 3/8-inch wide x 1-inch high corrosion hole	
15	3	At E Truss	9/16-inch diameter with 1/4-inch corrosion crack	
15	4	At E Truss	1/2-inch wide x 1/4-inch high corrosion hole in floor beam cope. Corrosion crack starting to form.	
15	5	Between stringers 1 and 2	Multiple holes over 21-inch length, max size 6-inch wide x 2-inch high	
16	4	East truss	3-1/2-inch high x 4-1/4-inch wide	
18	2	At E Truss	1-inch high x 5/8-inch wide and 1/4-inch diameter corrosion holes with 1-inch horizontal crack extending between holes.	
19	3	At east truss	Section loss up to knife edging in cope. Crack forming.	
19	5	Below stringer 5 connection angle	3/8-inch deep section loss adjacent to connection angle beneath stringer for 3-inch length.	
19	5	Between stringers 3 and 4	6 1/4-inch long horizontal crack along the base of the web with heavy corrosion and corrosion holes.	
20	0	Between stringers 1 and 2	Two corrosion holes, 3/4-inch diameter and 1 1/4-inch wide x 3/4-inch high.	
20	0	Between stringers 3 and 4	Multiple corrosion holes up to 1-inch high over 21-inch length (no crack detected)	
20	3	At east truss connection	1 1/8-inch wide x 9/16-inch high corrosion hole with adjacent knife edging.	
22	5	Near stringer 4	1 1/2-inch wide x 3/4-inch high in lower web adjacent to bottom flange	
22	5	Near west truss connection	1-inch wide x 3-inch high corrosion hole	
23	0	At E truss	2 3/4-inch high x 5/8-inch wide in lower web.	
24	0	Between stringer 1 & west truss	3/4-inch diameter in lower web	

Yellow Highlighted - New Deficiency
Red Highlighted - Changed Deficency

Appendix F - Floor Beam Loss

Span	Floor beam	Floor beam face/ Location	2019 FC Comment	Photo
24	2	At east truss connection	3/4-inch high x 3/4-inch wide hole at cope with 1/4-inch diagonal crack.	
25	2	At E Truss	3 1/2-inch high x 2-inch wide corrosion hole in floor beam cope, with adjacent knife ending.	
26	3	At E Truss	1/2-inch corrosion hole in floor beam cope	
26	5	Between stringer 1-2	1 3/4-inch wide x 1-inch high	
27	1	At E Truss	3/4-inch diameter corrosion hole near cope and a 3/16-inch crack at cope on north face.	
27	1	At W Truss	2-inch high x 2 1/2-inch wide.	
27	2	At east truss connection	1 1/4-inch high x 1 1/4-inch wide corrosion hole with 3/4-inch (1/4-inch growth) vertical crack below hole.	
27	5	Between stringer 1 & 2	1 1/2-inch corrosion hole.	
28	0	Between stringers 4-5	1 1/4-inch wide x 5/8-inch high corrosion hole.	
28	2	At E Truss	Two corrosion holes: 3/4-inch diameter and 1-inch wide x 3/4-inch high with 1/4-inch crack emanating from hole at cope.	
28	3	At E truss	4 1/2-inch high x 1-inch wide corrosion hole	
29	1	At W Truss	6-inch high x 3 1/2-inch wide x 1/4-inch deep section loss to floor beam web. Laminating corrosion on both faces of floor beam.	
29	5	Between stringers 2 and 3	2 1/4-inch wide x 3/4-inch high	
30	1	At west truss	1/2-inch x 1/2-inch corrosion hole with knife edging for 3 1/4-inch vertically	
30	2	At E Truss	1-inch high x 1/2-inch wide corrosion hole with 1/2-inch vertical crack. Additional section loss 8-inch high x 1-inch wide x 3/16-inch deep below corrosion hole	
31	1	At W Truss	5-inch high x 2-inch wide x 1/4-inch deep loss to floor beam web over adjacent to truss connection at top of web.	
33	2	At east truss connection	2-inch high x 5/16-inch wide corrosion hole at cope.	
33	3	At east truss connection	3/4-inch diameter corrosion hole	
33	5	Between stringers 4 and 5	5 1/4-inch wide x 1 1/8-inch high corrosion hole.	
33	5	Under Stringer 5 Conn. Angle	10-inch wide x 6-inch high x 1/4-inch deep section loss to floor beam web adjacent to stringer 5 connection angle.	
34	3	At east truss connection	Repaired with a welded plate. Heavy web section loss over top 15-inch with 2 1/2-inch high x 1/2-inch wide and 1/2-inch diameter holes. Approx 33% total web loss. Crack has now become corrosion hole.	
34	4	At east truss connection	Heavy laminating corrosion to top flange near stringer 5 with 7-inch long x 2-inch wide area of near complete section loss.	
35	0	Adjacent to Str 5 Conn Angle	1-inch x 1/2-inch corrosion hole adjacent to connection angle.	39
35	5	Between stringers 4 and 5	1-inch (previously 1/2-inch) diameter corrosion hole in floor beam web adjacent to bottom flange.	
37	5	At stringer 3, over stiff leg	Corrosion hole measuring 3/8-inch high x 1-inch wide with 1/2-inch (1/8-inch growth) crack to east side and 1 1/2-inch (1/4-inch growth) long crack to west side above stiff leg.	40
37	5	Between stringers 4 and 5	Multiple 3/4-inch high x 2-inch wide corrosion holes in a 3/4-inch high x 12-inch wide area.	
38	0	At east truss connection	1 1/4-inch high x 3/4-inch wide corrosion hole.	
38	0	Between stringers 4 and 5	Four corrosion holes: 1-inch high x 5-inch wide, 1-inch high x 1-inch wide, 1-inch high x 1 1/2-inch wide, 1 1/2-inch diameter	
39	0	At east truss connection	4-inch high x 1 3/8-inch wide corrosion hole with adjacent knife edging below the hole along the connection angle.	
39	1	At east truss connection	3/4-inch high x 1/2-inch wide corrosion hole at cope with 3/16-inch horizontal crack	
39	3	At east truss connection	3/8-inch high x 1/4-inch wide corrosion hole with 1/2-inch diameter corrosion holes below cope	

Appendix G - Floor Beam Cracks

Span	Floor beam	Floor beam face/ Location	Length	2019 FC Comment	Photo
2	0	East Truss	2 1/4		
2	0	West Truss	2		
2	5	West Truss	1 3/8		
3	5	East Truss	3 1/2		
3	5	West Truss	1 1/2		
4	0	East Truss	5		
4	0	West Truss	3		
5	3	West Truss, north face	5/16		
5	5	East Truss	3 1/8		
5	5	West Truss	1		
6	0	East Truss	8		41
6	0	NA Truss	8 3/4	Previously 8 1/4-inch (1/2-inch growth). Crack through web over stiff leg repair and below stringer 3	42
6	0	West Truss	1 1/2		
7	0	West Truss	1		
7	2	East Truss, north face	1 1/2		
7	3	East Truss, south face	5/16		
7	5	East Truss	3 1/8		
7	5	West Truss	1 5/8		
8	0	East Truss	6 1/4		
8	0	West Truss	4 1/4		
8	3	East Truss	3/16		
9	1	East Truss	1 1/8		
9	5	East Truss	3 1/4		
9	5	West Truss	2 1/2		
10	0	East Truss	6 5/8		
10	0	West Truss	3 1/8	Previously 3-inch (1/8-inch growth)	43
11	5	East Truss	2 5/8		
11	5	West Truss	2 1/2		
12	0	East Truss	1 7/8		
12	0	West Truss	1 7/8		
13	5	East Truss	2 1/2		
13	5	West Truss	1 1/4		
14	0	East Truss	5 7/16		
14	0	West Truss	3		
14	1	East Truss	7/16		
15	3	East Truss	1/4		
15	4	West Truss	5/16		
15	5	East Truss	4 7/8		
16	0	East Truss	4		
16	0	West Truss	3 5/8		
16	1	East Truss	3/8		
16	1	West Truss	1/2		
16	3	West Truss	1		
17	1	West Truss	1/8		
17	4	East Truss	3/8		
17	4	West Truss	1/2		
17	5	East Truss	3 1/8		
17	5	West Truss	3 1/8		
18	0	East Truss	5 1/8		
18	0	West Truss	3 3/8		
18	1	West Truss	5/16		
19	5	East Truss	1 3/8		
19	5	West Truss	2 1/8		
20	0	East Truss	6 3/8		
20	0	West Truss	1 3/4		
20	2	East Truss	3/16		
21	4	West Truss	3/4		
21	5	East Truss	1 1/4		
21	5	West Truss	1 3/4		
22	0	East Truss	3 3/4		
22	0	West Truss	5 3/4		
22	1	West Truss	1/2		

Appendix G - Floor Beam Cracks

Span	Floor beam	Floor beam face/ Location	Length	2019 FC Comment	Photo
23	3	East Truss	1/2		
23	4	West Truss	3/8		
23	5	East Truss	4		
23	5	West Truss	1 3/4		
24	0	East Truss	4 1/8		
24	0	West Truss	4 3/4		
24	1	East Truss	3/4	1 1/4" x 3/8" wide corrosion hole	
25	5	East Truss	6 3/4		
26	0	East Truss	4 1/4		
26	0	West Truss	3 1/2		
27	5	East Truss	1 1/4		
29	4	East Truss	1/2	1-inch high x 1/2-inch wide corrosion hole and a 1/2-inch vertical crack. Additional section loss 8-inch high x 1-inch wide x 3/16-inch deep below corrosion hole	
29	5	East Truss	5		
29	5	West Truss	5/8		
30	0	East Truss	1 5/8		
30	0	West Truss	5/8		
30	1	West Truss	9/16		
31	5	East Truss	4 1/4		
31	5	West Truss	1		
32	0	East Truss	2		
32	0	West Truss	5/8		
33	3	East Truss	3/8	3/8-inch crack with 3/8-inch diameter corrosion hole.	
33	4	West Truss	5/16		
33	5	East Truss	3 1/4		
34	0	East Truss	2 1/8		
34	1	East Truss	1/2		
35	3	East Truss	1/4		
35	5	East Truss	2 13/16		
35	5	West Truss	3 1/8		44
36	0	East Truss	2 3/8		
36	0	West Truss	1 3/8		
36	1	East Truss	1/4		
36	1	West Truss	3/8		
36	4	East Truss	5/8	3/4-inch x 1/2-inch section loss with 1/4-inch crack.	
36	4	West Truss	1/8		
37	4	West Truss	3/8		
37	5	East Truss	2		
37	5	West Truss	1 3/4		
38	0	East Truss	9 3/16		45
38	0	West Truss	3 1/2		
38	1	West Truss	1/2		
38	2	East Truss	5/8	5/8-inch crack with through hole 9/16-inch high x 3/8-inch wide.	
38	3	West Truss	7/16		
38	4	West Truss	1/8		
39	4	East Truss	1/4		
39	4	West Truss	1/4		
39	5	East Truss	3		
39	5	West Truss	1 1/2		

Appendix H - Gusset Plate Cracks

Span	Truss	Panel Point	Length of Crack (in.)	Strengthened (Y/N)	Comment	Photo
2	East	L0	18	Yes	Previously 17 5/8-inch (3/8-inch growth)18" in 2019	57
7	East	L0	Paint Crack	No		
8	East	L0	9 3/4	Yes	Previously 9 1/4-inch (1/2-inch growth)	58
13	East	L5	Paint crack	No		
14	West	L0	4 3/4	Yes		
17	East	L5	9 3/4	Yes		
19	West	L5	9 1/2	Yes		
20	East	L0	9 3/4	Yes		
20	East	L5	Paint Crack	No		
22	East	L0	Paint Crack	No		
23	East	L0	Paint Crack	No		
23	West	L0	Paint Crack	No		
24	East	L0	9 1/4	Yes		
27	East	L5	Paint Crack	No		
27	West	L5	Paint Crack	No		
28	East	L0	Paint Crack	No		
29	East	L5	11 1/2	Yes		
30	East	L0	6 3/4	Yes		
33	East	L5	14	Yes		
38	East	L0	Paint Crack	No		