Alapocas Park Pedestrian Bridge (Bancroft Bridge) over Brandywine Creek
Wilmington, Delaware

Bridge Alternatives Report

Submitted to:
Delaware Department of Natural Resources and Environmental Control (DNREC)

Submitted by:
Greenman-Pedersen Inc. (GPI)
550 South DuPond Boulevard,
Suite F
Milford, DE 19963

January 2022

TABLE OF CONTENTS

1. INTRODUCTION

This bridge alternatives report was prepared for the Department of Natural Resources and Environmental Control (DNREC) to evaluate preliminary options for the repair, rehabilitation and replacement of the Alapocas Park Pedestrian Bridge (Bancroft Bridge) over Brandywine Creek located in Wilmington, Delaware. This report is based on the flood damage report developed by Century Engineering, damage inspection report by DNREC, existing site conditions, site visits by GPI on October 20th, 2021 and December 7th, 2021, review of available inspection reports and as-builts.

The primary goals of the Bancroft bridge project are to eliminate deficiencies, improve safety and bring the structure back to service and current standards, addressing the following key issues:

- Fast-track opening of the bridge to pedestrians
- Improve bridge resiliency and durability
- Minimize design and construction cost
- Work within the constraints of access and constructability
- Improve bridge aesthetics
- Improve bridge functionality

The following options were evaluated to address the above key issues. Further details for each option are provided within this report:

- Option 1 – Bridge repairs and rehabilitation: This option explores the feasibility of repairs and rehabilitation of the existing bridge
- Option 2 – Bridge replacement with a 300ft. historic bridge in DNREC's possession: This option explores the feasibility of replacement of the existing bridge with a 300ft. historic bridge that DNREC has in its storage.
- Option 3 – Bridge replacement with a new prefabricated pedestrian bridge: This option explores the feasibility of replacement of the existing bridge with a new prefabricated pedestrian bridge.

All options were studied to understand the issues related to fast-track opening of the bridge to pedestrians, bridge resiliency and durability, design and construction cost, working within the constraints of access and constructability, bridge aesthetics and bridge functionality as detailed in Section 4 of this report. Based on studying these issues, recommendations are made in Section 5 of this report.

2. BACKGROUND

After heavy rains from the remnants of Hurricane Ida (August 26th, 2021 through September 4th, 2021) moved through Wilmington, DE, officials reported historic flooding across the city. The Wilmington Fire Department and other agencies performed more than 200 water rescues and many streets and bridges were affected. Much of the flooding was along the Brandywine Creek, and one of the bridges affected by the flooding and accumulation of debris was the Alapocas Park Pedestrian Bridge also known as Bancroft Bridge.

The Department of Natural Resources and Environmental Control (DNREC) conducted a preliminary damage inspection of the Bancroft bridge on September 7th, 2021 and developed a document highlighting the site visit observations (see Appendix A). They noted that the bridge appeared to have deformed with

the center of the span pushed downstream. They also noted new cracking at the concrete piers, broken tie rods in the deck truss, and timber debris caught at the bottom chord of the truss.

Subsequently, DNREC asked the engineering firm, Century Engineering Inc. (Century), to conduct a site visit to examine the damage to the bridge and provide recommendations for further action. Century conducted the site visit on September 13th, 2021 and developed a damage assessment report (see Appendix B). Century noted extensive damage to the pedestrian bridge due to the flooding and recommended that the bridge remain closed to the public and that an in-depth inspection of the bridge be performed to identify other suspected deficiencies and possible failures.

Following the recommendations of the damage assessment report, Greenman Pedersen Inc. (GPI) was contacted by DNREC to conduct a cost and feasibility study to rehabilitate or replace the pedestrian bridge. GPI conducted a site visit on October 20th, 2021 to confirm the findings of the damage (see Appendix C), and to understand DNREC's priorities for the study.

This report details the evaluation of the following three options:

Option 1: Bridge repair and rehabilitation;
Option 2: Bridge replacement with a 300ft. historic bridge in DNREC's possession;
Option 3: Bridge replacement with a new prefabricated pedestrian bridge.

3. EXISTING CONDITIONS OVERVIEW

3.1 Bridge Existing Conditions

The existing bridge consists of three sections as shown in the photos:

- Photos 1 and 2 – A short approach span on south side of the Brandywine Creek with a span of approximately 45ft. supported on a series of reinforced concrete vertical columns/drilled shafts.

Photos 1 and 2: Approach spans on South side of the bridge

- Photos 3 and 4 – A main deck truss bridge spanning over the Brandywine Creek with a span of approximately 145ft.

Photos 3 and 4: Main deck truss bridge

- Photo 5 – A series of short spans on the north side of the deck truss consisting of steel beams and timber decking and totaling approximately 75ft. The series of short spans are part of the flooring of the covered pavilion and are supported on concrete piers independent of the bridge piers.

Photos 5: Series of short spans on North side of the bridge

Prior to the 2021 flood event, the bridge was last inspected in 2001 by Orndorf & Associates Inc. (see Appendix D) and a report was developed. This report details the conditions and provides very limited as-built drawings. No other as-builts were available during the development of this report.

The bridge is currently closed to the public due to extensive damage caused by floods from Hurricane Ida. The damages are primarily on the deck truss portion of the bridge, since this is the section crossing the Brandywine Creek.

Hurricane Ida flood impacts: Appendix A, B and C provide photos and details regarding the damage to the bridge due to the floods. Some of the critical findings found during the damage inspection were –

- Photo 6 – Pier 1 East post has sheared off at the anchor bolts and has moved by 4.5 inches
- Photo 7 – Pier 1 bottom horizontal is separated from the west post

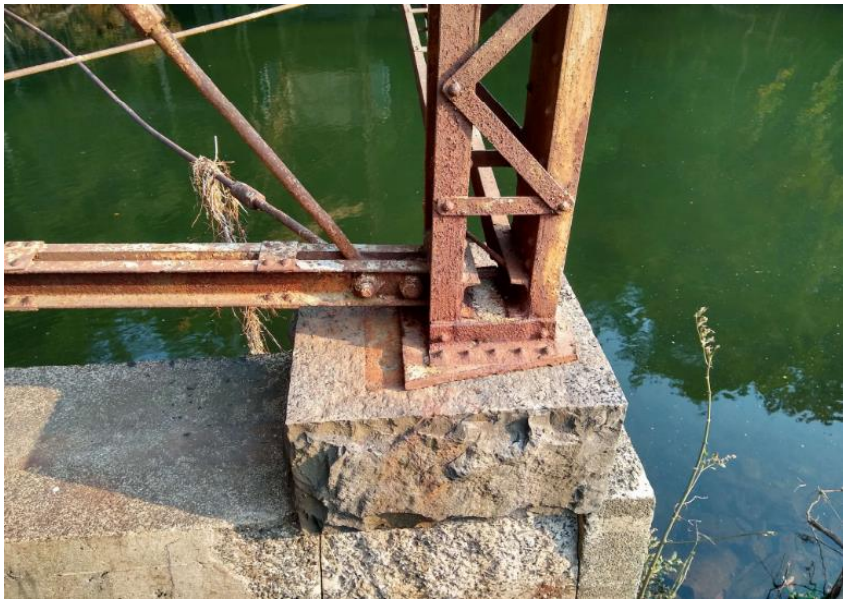


Photo 6: Pier 1 East post sheared of at the anchor bolts and has moved 4.5 inches

Photo 7: Pier 1 Bottom horizontal separated from west post

- Photo 8 – Bowing of the upstream and downstream trusses
- Photo 9 – Large tree limbs and debris stuck at bottom chord of the trusses with broken tie-rods
- Photo 10 – Pier 1 West post has shifted towards East

Photo 8: Bowing of the upstream and downstream trusses due to debris damage

Photo 9: Large tree limbs and debris stuck at bottom chord of the deck trusses with broken tie-rods

Photo 10: Pier 1 West post shifted towards East

3.2 Hydrology and Hydraulics

The Bancroft bridge carries the pedestrian crossing over Brandywine Creek. Due to the buildup of debris from storm flow during Hurricane Ida and associated damage to the bridge, DNREC's preference is to raise the bottom chord of the bridge above the 100-yr storm event with as much additional freeboard as can be easily achieved.

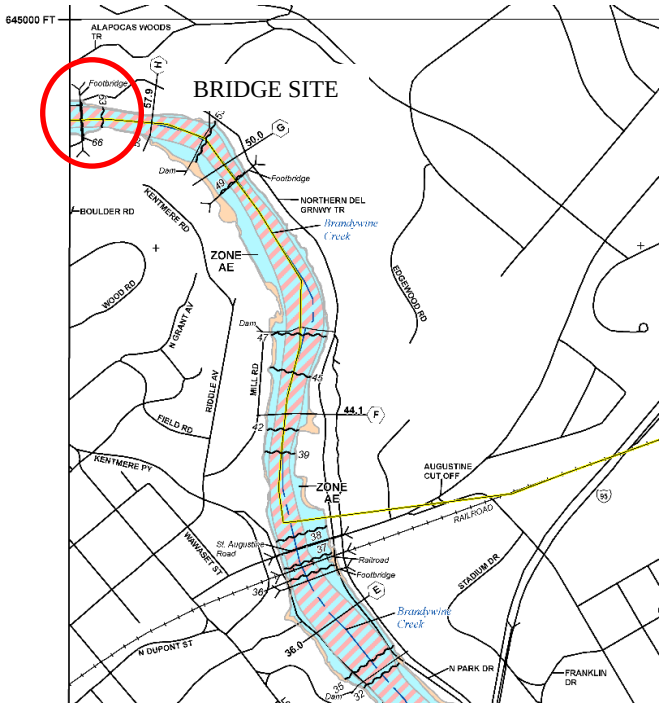


Photo 11: FEMA flood map for Brandywine Creek near the pedestrian bridge

A preliminary search on FEMA's website shows that the base flood elevation is approximately EL.66.0 with a 1% annual chance (100-yr storm) of exceedance (see Photo 11 above and Appendix E). Ideally, any rehabilitation or replacement of the existing bridge should bring the bottom of the bridge above this elevation. This strategy will ensure that future floods in the region will not impact the bridge. The increase in freeboard will prevent debris buildup, and the bridge will be serviceable immediately after the storm. GPI conducted a LiDAR survey and Hydro survey of the existing pedestrian bridge (see Appendix F) on December 9th, 2021 and found that the bottom chord of the existing bridge is at EL.62.54 (NAVD) which is below the 100-yr storm elevation of EL 66.0 (NAVD). The deck of the existing bridge is at EL.82.71 (NAVD) which is above the 100-yr storm elevation. If the bridge is being repaired and rehabilitated (as detailed in Section 4.2 of this report) it would be beneficial to raise the bridge by a minimum of 4.5ft. to provide a freeboard of 1ft. above the 100-yr storm elevation. However, connecting the raised existing bridge to the tie-in spans on south end and north end would be problematic and add substantial cost to the project. If the bridge is replaced with a new span (as detailed in Sections 4.3 and 4.4 of this report), the deck can be maintained at the existing elevation, and the bridge superstructure depth can be reduced significantly, thus providing adequate free board above the 100-yr storm elevation. This will also eliminate any need for modifications to the tie-in spans on south end and north end.

3.3 Geotechnical Existing Conditions

A geotechnical exploration program has not been conducted in the vicinity of the bridge. Historic

information regarding the soils at the bridge site was not available at the time of development of this report. Hence geotechnical existing conditions were not established for this report. The preliminary rehabilitation or replacement options detailed in this report were developed based on substructure and foundation layouts that are typical to a pedestrian bridge of current size. The permitting process for a geotechnical exploration program must be completed and performance of the test borings will follow the permit approvals. Deep foundations such as drilled shafts are assumed for developing preliminary cost estimates for Options 2 and 3.

3.4 Environmental Existing Conditions

No historic information regarding the potential environmental impacts at the bridge site exists at the time of development of this report. An environmental impact study area large enough to accommodate all Options under consideration has not been developed. The following resources need to be identified within the study area and impacts for each Option need to be evaluated.

- Wetlands and Waters of the US
- Floodplains
- Rare, threatened and endangered species
- Cultural and Historic resources
- Park and recreational resources
- Section 4(f) and 6(f) resources, and
- Potential hazardous materials concerns

3.5 Utilities

Based on discussions with DNREC, it is our understanding that an abandoned pipe runs along the South edge of the creek (see Photos 12 and 13) and is behind the bridge pier at the deck truss bridge location. Further investigation will need to be done in coordination with Utility companies and the pipe will need to be removed after proper approvals.

Photos 12 and 13: Water main along the South edge of the creek

3.6 Access and Constructability

Due to the location of the bridge site and limited access to the site through city streets, paved trails and no navigable waterways, we anticipate issues related to mobilizing large construction equipment such as –

pile driving equipment, erection cranes; issues related to shipping, hauling and erection of large bridge structure elements; issues related to non-availability of large construction layout area etc. Any practical solution related to repairs, rehabilitation and/or replacement of the existing pedestrian bridge has to take into account these issues related to access and constructability. Following are some of the details pertaining to access to the site and site constraints.

The existing bridge site is located near the heart of Wilmington, DE close to the Alapocas Run State Park as shown in Photos 14 and 15. The project location is accessible by roadway through Interstate I-95 east via the State Route SR-52 at Exit 7. It is also accessible by roadway through State Route SR-141 on the west side via the SR-52 Kennett Pike exit. After these exits, the bridge site is accessible through city streets

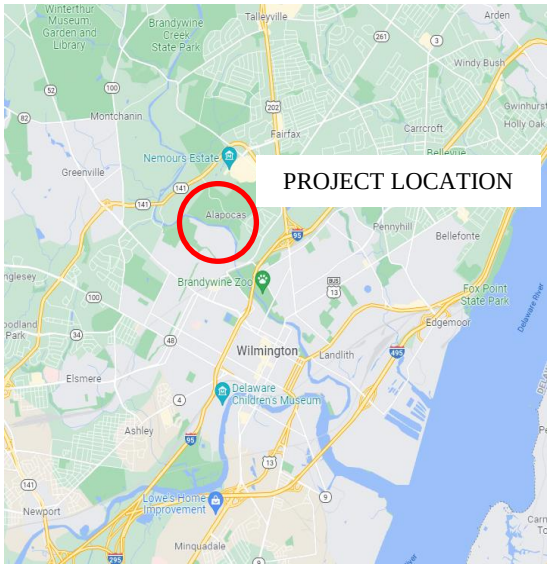


Photo 14: Project Location

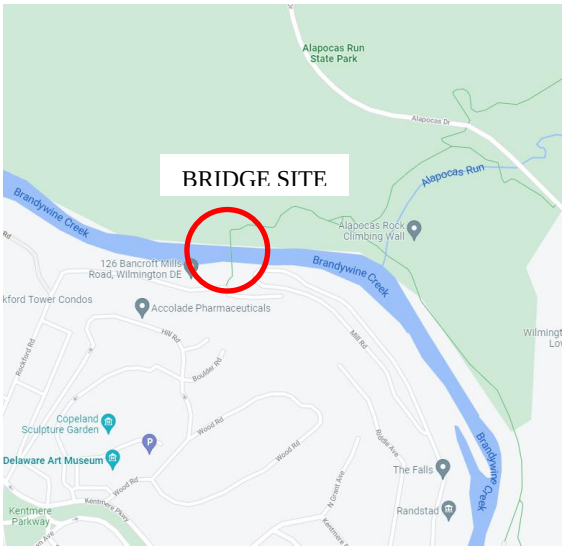


Photo 15: Bridge Site

and accessing the Bancroft Mills Road as seen in Photo 16. The Bancroft Mills road is a paved single lane road located close to the condominiums on the south end of the pedestrian bridge, and is fenced off from the condominiums. It is also barricaded adjacent to the bridge for on-going construction work on the east side of the bridge. The on-going construction work involves construction of gabion retaining walls along the Brandywine creek and land development on east side of the bridge.

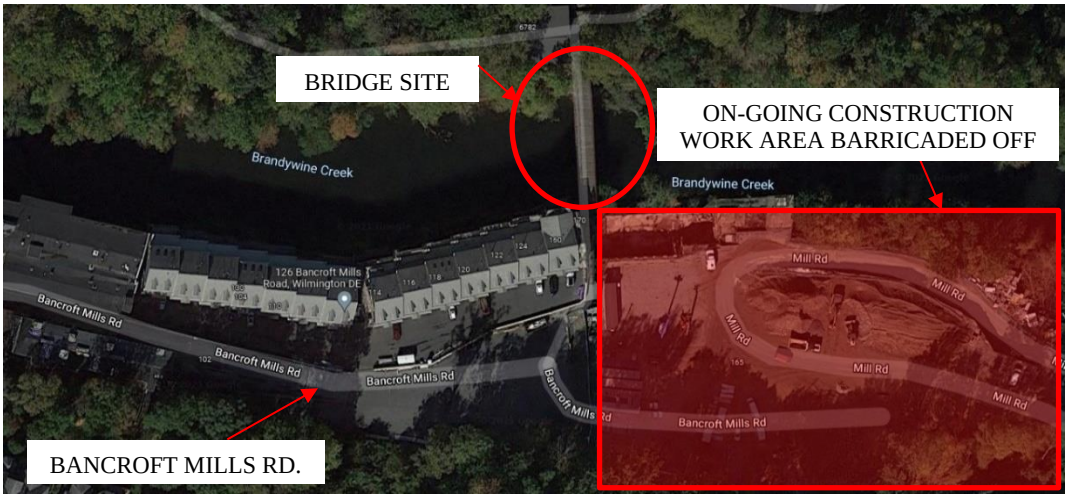


Photo 16: Bancroft Mills Rd. at South end of the pedestrian bridge

The bridge site is also accessible from the north through the Alapocas Run State Park as shown in Photo 17. The state park is accessible by roadway through State Route SR-141 via the Alapocas Drive exit. Alapocas Drive is a paved two-lane road with several single lane paved trails leading up to north end of the bridge site.

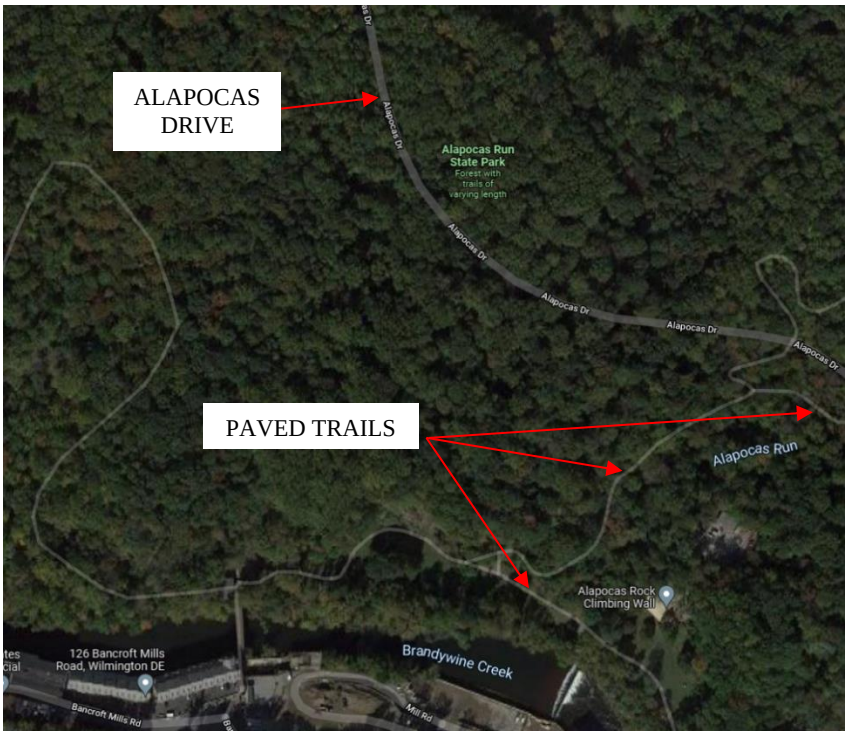


Photo 17: Alapocas Run State Park at North end of the pedestrian bridge

Photo 18: Weirs in Brandywine Creek

Furthermore, Brandywine creek is not a navigable waterway due to presence of weirs upstream and downstream of the bridge site as shown in Photo 18. Therefore construction equipment cannot be barged in through the creek.

4. BRIDGE ALTERNATIVES ANALYSIS

To determine the appropriate solution to address all key issues associated with the current Bancroft bridge, GPI developed three (3) options for evaluation.

- Option 1 – Bridge repairs and rehabilitation
- Option 2 – Bridge replacement with a 300'-0" historic bridge in DNREC's possession
- Option 3 – Bridge replacement with a new prefabricated pedestrian bridge

Each option provides its own unique benefits, opportunities, and challenges. The studied options will be evaluated based on the parameters in the decision matrix. These parameters were selected based on our discussion with DNREC and understanding of their priorities to address the key issues.

4.1 Decision Matrix

Each key issue was assigned a percentage weight based on the relevance to the overall project. For each key issue, a rating from (0) to (3) was assigned. A rating of (0) denotes that the Option does not address the issue, rating (1) is not favorable, rating (2) is favorable and a rating of (3) is the most favorable.

Fast-track opening of the bridge to pedestrians

- Minimize design schedule
- Minimize construction schedule

WEIGHT = 25%

Improve Bridge Resiliency and Durability

- Raise bridge profile above the 100-yr flood level
- Maximize service life
- Minimize future maintenance costs
- Eliminate or minimize bridge painting costs

WEIGHT = 25%

Minimize design and construction cost

- Minimize repairs and rehabilitation work
- Minimize modifications to pavilion and trails on north end, and Right-of-way acquisition on south end
- Use of one span versus multiple spans for replacement

WEIGHT = 15%

Work within the constraints of access and constructability

- Work within limited right-of-way
- Work with limited access to the site
- Constructability issues

WEIGHT = 15%

Bridge aesthetics

- Context sensitive aesthetics in harmony with the trails, pavilion, and condominiums
- Preservation of Historic viewshed

WEIGHT = 10%

Improve Bridge Functionality

- Upgrade to current AASHTO standards
- ADA compliance
- Pedestrian fence

WEIGHT = 10%

0 **NOT ADDRESSED** 1 **NOT FAVORABLE** 2 **FAVORABLE** 3 **MOST FAVORABLE**

These ratings are then weighted to produce an overall score for each option. See Page 25 for a comprehensive decision matrix.

4.2 Option 1: Bridge repairs and rehabilitation

This option was investigated to understand the feasibility of repairing all deficiencies in the existing bridge identified during the post-flood inspection. The repairs will be followed by rehabilitation to extend the service life of the bridge by 20 years.

Design scope of work: Due to lack of any information (such as as-builts, plans, detailed inspection reports) available about the existing structure, significant effort will be needed to perform a preliminary analysis of the bridge. The following design scope is anticipated for repair and rehabilitation efforts to bring the bridge back to serviceability:

- Conduct in-depth inspection of the existing bridge to gather as-built information. This will involve measurement of each member of the deck truss span to understand the member sizes and section loss due to corrosion. Collect material coupons to determine strength properties and conduct testing on coupons
- Calculate the section properties based on in-depth inspection data and develop an analysis model of the deck truss using structural software.
- Analyze the model for current AASHTO pedestrian design code stipulated loadings
- If load carrying capacity is not obtained after repairs and rehabilitation, then develop retrofit options to various members to upgrade the deck truss span load capacity to meet the current AASHTO standards.
- Development of drawings, specifications, and cost estimates for repair and rehabilitation with deliverables at 30%, 60%, 90% and PS&E design stages.
- Bid phase support, construction phase support in the form of shop drawing reviews and answers to RFI's, and construction inspection.

Design cost: Based on the above design scope of work, we anticipate that the engineering cost for this option will range anywhere between $0.6 million to $0.7 million.

Construction scope of work: The following construction scope is anticipated for repair and rehabilitation efforts to bring the bridge back to serviceability:

- Mobilization and remove all debris near the bottom chord
- Horizontally jack the entire deck truss bridge back to its original position and remove the kink in alignment. Erection of temporary reaction towers in the creek may be needed for jacking operations.
- Replace any damaged truss members during horizontal jacking
- Repair the piers supporting the end posts of the deck truss bridge
- Replace all four end posts of the deck truss span and associated anchor bolts
- Replace all bottom horizontal lateral bracings and connections
- Replace all vertical lateral bracings and connections
- Retrofit all members of the deck truss span as needed to upgrade the load capacity to meet current AASHTO standards
- Install containment system and blast clean entire bridge superstructure
- Install 3-coat paint system on entire bridge superstructure
- Install pedestrian safety fence to improve safety
- Utility relocation

Construction cost: Based on the above construction scope of work, we anticipate that the construction cost for this option will range anywhere between $2.2 million to $2.6 million. An approximate breakdown of the costs for each scope item is provided below. The total construction cost includes a contingency of 20%, a construction inspection cost of 10% and is adjusted for inflation assuming procurement in one year.

GPI Engineering | Design | Planning | Construction Management

DNREC Alapocas Pedestrian Bridge (Bancroft Bridge) CTP Estimate
Construction Cost - Option 1: Repairs and Rehabilitation

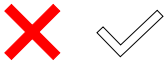
Date Prepared: January 14, 2022

Scope of Work	Cost		Construction Schedule	
Mobilization and remove all debris near the bottom chord	$	50,000	1	month
Horizontally jack the entire deck truss back to its original position	$	200,000	2	months
Replace truss members that are damaged during horizontal jacking	$	100,000	2	months
Repair the piers supporting the end posts of the deck truss	$	50,000	1	month
Replace all four end posts and anchor bolts of the deck truss span	$	150,000	3	months
Replace all bottom horizontal lateral bracings and connections	$	100,000	3	months
Replace all vertical lateral bracings and connections	$	200,000	3	months
Retrofit all members of deck truss to upgrade the load capacity	$	350,000	3	months
Install containment system, blast clean entire bridge superstructure and Install 3-coat pain system on entire bridge superstructure	$	550,000	3	months
Install pedestrian safety fence	$	50,000	1	month
Utility relocation	$	100,000	Concurrent work	
Sub-Total	$	1,900,000		
Contingency (20%)	$	380,000		
Total	$	2,280,000	1.8	years
Construction Inspection Cost (10% of Total)	$	228,000		
Inflation (assuming procurement in 1 year)		3%		
Total Construction Cost (With contingency)	$	2,583,240		
Total Construction Cost (Without contingency)	$	2,152,700		

Design and Construction schedule: Based on the design and construction scope of work, we anticipate this option to take approximately 2.5 to 3.0 years for completion from start of design to end of construction.

Access and constructability: This option is favorable from the perspective of access and constructability. The construction scope of work will involve removal of debris, horizontal jacking of the bridge to its original position, repair work on piers, replacement of some structural elements of the bridge, blast cleaning and painting of the bridge etc. All work can be accomplished without the need for large construction equipment and material pieces.

Weighted score: 1.25 / 3.00

Recommended Alternative ? 

Ratings and Discussion:

1 **Fast-track opening of the bridge to pedestrians** – This option will is not favorable due to long design and construction schedule involving repairs and rehabilitation.

0 **Improve bridge resiliency and durability** – This option does not raise the profile of the bridge above flood levels, hence leaving the bridge susceptible to future floods and associated damage. Future painting may be needed as part of the maintenance and may impact the creek. Modifications to the existing timber deck are not proposed and may need replacement in the future.

2 **Minimize design and construction cost** – This option has the second highest design and construction cost of all options.

2 **Work within the constraints of access and constructability** – This option is favorable to working within the constraints since most of the repairs and rehabilitation work will not involve large construction equipment and material pieces.

2 **Improve bridge aesthetics** – This option involves cleaning and painting of the existing bridge and improves the aesthetics.

2 **Improve bridge functionality** – This option will upgrade the existing bridge's functionality by meeting current AASHTO standards after retrofits and installation of pedestrian fence.

4.3 Option 2: Bridge replacement with a 300'-0" historic bridge in DNREC's possession

Based on discussions with DNREC, it is our understanding that they would consider repurposing the 300ft. historic bridge, currently in storage, as a pedestrian bridge for the replacement of the existing bridge. This option was investigated to evaluate the feasibility of reusing this historic bridge for a service life of 20 years.

As-builts: The plans for the historic bridge (see Appendix G) indicate that it is approximately 300ft. through truss span, and 15ft.± wide between the upstream and downstream trusses. The overall height of the truss at the highest point is approximately 40ft. The historic bridge consists of a two-stringer, floorbeam floor system with stringer bracings and bottom lateral bracings. The trusses are in the Pratt truss configuration with built-up top chord in compression, fracture critical tension eye bars as bottom chord, built-up vertical members, fracture critical tension tie bars as diagonals and pin connected at panel points. The upstream truss and downstream truss are connected through portal frames that have struts and diagonals. The member sizes of the trusses and floor system are not provided in the plans for this historic bridge. Hence a preliminary analysis of the historic bridge for code specified pedestrian loadings could not be made at the time of development of this report.

As-stored condition evaluation: The historic bridge is located in Fort Dupont State Park in Delaware City. On December 7th, 2021, GPI conducted a site visit to assess the condition and evaluate feasibility of using it for replacement. The bridge has been dismantled from its original truss configuration (see Appendix H for photos) and the pieces are stacked on the ground. DNREC indicated that the bridge has been stored at this location for the last 3 years.

The historic bridge members are overall in FAIR CONDITION (NBI rating of 5) since all structural elements are sound but have minor corrosion and pack rust. Most of the structural elements exhibit some level of paint failure along the length of the members with complete paint failure at connections. All pins at all connection points, and all surfaces interfacing with the pins are in advanced stage of corrosion and section loss. Since connections are the critical points in a truss, it is recommended that these pins are not to be reused. Further, cleaning and painting of the historic bridge is recommended to provide a service life of 20 years.

New decking system: The plans of the historic bridge show that the bridge originally carried utility pipes supported on brackets installed on floorbeams. These brackets and utility pipes have since been removed prior to storage at the Fort Dupont site. If this historic bridge is eventually used for replacement, a new decking system will need to be installed. The decking system could potentially be composite boards or a concrete deck supported on the existing stringer-floorbeam floor system. Further analysis of the historic bridge is needed to understand if the truss and floor system have adequate capacity to carry these additional dead loads.

Feasibility of fit within the alignment and modifications needed: To understand the feasibility of fitting this historic bridge span along the alignment of the existing bridge, a distance of 300ft. (equal to the span of historic bridge) was measured using google maps along the alignment as shown in Photo 18 as a red line. On the south end, it is seen that the end of the span will encroach onto the right of way of the condominiums. On the north end, the span will go past the pavilion by approximately 50ft. If the south end of the historic bridge is moved north to eliminate right of way impacts, the north end of the bridge will go well beyond the pavilion.

If the historic bridge is used as a replacement, acquisition of right of way may be necessary at the south end. In addition, the new abutment at the north end of the bridge will necessitate modifications to the pavilion and tie-in to the bridge end, for better connection to the park trails and pavilion users.

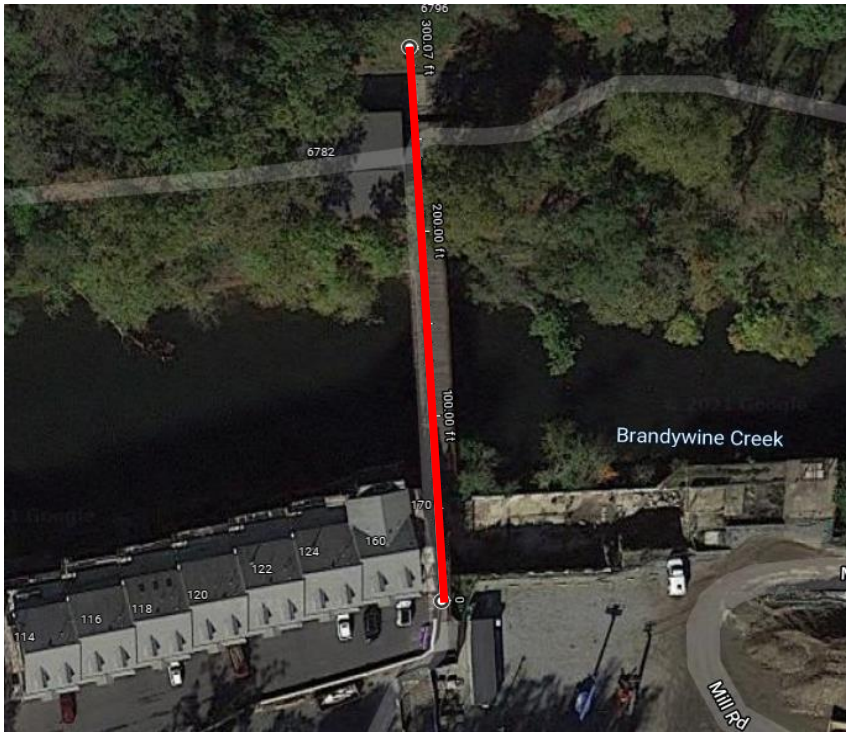


Photo 18: Water main along the South edge of the creek

Design scope of work: The following design scope is anticipated for replacing the existing bridge with the 300ft. historic bridge:

- Conduct in-depth inspection of the historic bridge to gather as-built information. This will involve measurement of each member of the span to understand section loss due to corrosion.
- Calculate the section properties based on in-depth inspection data and develop an analysis model of the historic bridge using structural software.
- Analyze the model for current AASHTO pedestrian design code stipulated loadings and explore the feasibility of replacement.
- If load carrying capacity is not obtained for the historic bridge, then develop various retrofit options to various members, to upgrade the historic bridge capacity to meet the current AASHTO standards.
- Geotechnical borings and engineering to determine new foundation options for replacement bridge
- Development of drawings, specifications, and cost estimates for replacement, with deliverables at 30%, 60%, 90% and PS&E design stages.
- Bid phase support, construction phase support in the form of shop drawing reviews and answers to RFI's, and construction inspection.

Design cost: Based on the above design scope of work, we anticipate that the engineering cost for this option will range between $0.6 million to $0.7 million.

Construction scope of work: The following construction scope is anticipated for replacing the existing bridge with the 300ft. historic bridge:

- Mobilization and remove all debris near the bottom chord of the existing bridge
- Demolition of existing deck truss span, short tie-in spans at north and south ends of the alignment
- Demolition of piers supporting the existing deck truss span and tie-in spans
- Fabricate new connection pins and any other structural member retrofits as needed per design
- Blast clean the 300ft. historic bridge and new fabrication elements at the fabrication facility
- Install 3-coat paint system on the entire superstructure of the 300ft. historic bridge at the fabrication facility
- Install new foundations for the historic bridge as per design
- Install new abutments for the historic bridge as per design
- Erect temporary shoring towers in the creek to erect the historic bridge
- Erect the historic bridge
- Install new decking system on the historic bridge
- Install pedestrian safety fence to improve safety
- Modify the pavilion on the north end for better tie-in to the historic bridge
- Utility relocation

Construction cost: Based on the above construction scope of work, we anticipate that the construction cost for this option will range between $3.4 million to $4.1 million. An approximate breakdown of the costs for each scope item is provided below. The total construction cost includes a contingency of 20%, a construction inspection cost of 10% and is adjusted for inflation assuming procurement in one year.

GPI Engineering | Design | Planning | Construction Management

DNREC Alapocas Pedestrian Bridge (Bancroft Bridge) CTP Estimate
Construction Cost - Option 2: Replacement with 300ft. Historic bridge

Date Prepared: January 14, 2022

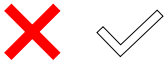
Scope of Work	Cost	Construction Schedule
Mobilization and remove all debris near the bottom chord	$ 50,000	1 month
Demolition of existing deck truss span, tie-in spans, piers and trail on north end	$ 150,000	3 months
Fabricate new connection pins and any other structural retrofits	$ 100,000	Concurrent work
Blast clean the bridge superstructure and new fabrications at the fabrication facility, and install 3-coat pain system at the fabrication facility	$ 1,650,000	Concurrent work
Install new foundations and abutments	$ 150,000	4 months
Erect temporary shoring towers	$ 100,000	2 months
Erect the historic bridge	$ 262,500	6 months
Install new deck system	$ 100,000	2 months
Install new pedestrian safety fence	$ 50,000	1 month
Modifications to pavilion and tie-in to the bridge	$ 150,000	3 months
Utility relocation	$ 100,000	Concurrent work
Sub-Total	$ 2,862,500	
Contingency (20%)	$ 572,500	
Total	$ 3,435,000	1.83 years
Construction Inspection Cost (10% of Total)	$ 343,500	
Potential Right Of Way acquisition cost on South end	$ 200,000	
Inflation (assuming procurement in 1 year)	3%	
Total Construction Cost (With contingency)	$ 4,097,855	
Total Construction Cost (Without contingency)	$ 3,449,213	

Design and Construction schedule: Based on the design and construction scope of work, we anticipate

this option to take anywhere between 2.5 to 3.0 years for completion from start of design to end of construction.

Access and constructability: This option is not favorable from the perspective of access and constructability. Due to the size of the historic bridge and the 300ft. span, the construction scope of work will involve installation of new drilled shaft foundations, installation of new abutments for the bridge, erection of temporary shoring towers in the creek and assembling the through truss one piece at a time. This will require mobilization of heavy construction cranes on either side of the creek for bridge erection and for installation of large drilled shafts.

Weighted score: 1.35 / 3.0

Recommended Alternative ? 

Ratings and Discussion:

1 **Fast-track opening of the bridge to pedestrians** – This option involves demolition of existing bridge, installation of new foundation and abutments, rehabilitation of historic bridge components, erection of bridge, and modifications to pavilion which results in a less favorable design and construction schedule.

2 **Improve bridge resiliency and durability** – Since the historic bridge is a through truss, this option will raise the profile of the bridge above flood levels, thus eliminating the susceptibility to future floods and associate damage. New decking system is proposed in this option, which will reduce the maintenance cost.

1 **Minimize design and construction cost** – This option has the highest total cost of all options.

1 **Work within the constraints of access and constructability** – This option is not favorable to working within the constraints since temporary showing towers will be needed to erect the bridge. Further, larger foundations needed for the single span may necessitate larger construction equipment.

1 **Improve bridge aesthetics** – This option involves cleaning and painting of the historic bridge which improves the aesthetics. However, the bridge is 40ft. high and will be taller than adjacent condominiums which is not favorable. Additionally, this bridge is too long for the site

2 **Improve bridge functionality** – This option will meet the current AASHTO standards after retrofits and installation of pedestrian fence.

4.4 Option 3: Replace the existing bridge with a new prefabricated pedestrian bridge

This option explores the replacement of the existing bridge with a prefabricated pedestrian bridge. Based on discussions with DNREC, the following priority items were used for development of preliminary cost and schedule.

Preliminary Design Parameters:

- Span arrangement – To understand the feasibility of fitting a new prefabricated pedestrian bridge span along the alignment of the existing bridge, a span arrangement of 50ft.-140ft.-50ft. was measured using google maps along the alignment as shown in Photo 19 as a blue-red-blue line. This distance was also confirmed through the data from the LiDAR survey. The three new simple spans will be supported on abutments and piers. Minor modifications to the pavilion floor system along the alignment, are necessary to isolate it from the new bridge. The seat elevations for the new spans can be adjusted to maintain the current deck elevation, and the new spans will be through Pratt trusses. This will raise the bottom of the new bridge above future flood elevation and will eliminate the susceptibility to debris related damage (see Photos 20 and 21 for comparison).

Photo 19: Simple span arrangement of 50ft.-140ft.-50ft. at the bridge site

- Structural materials – Steel for superstructure, Concrete for substructure, Steel or Concrete for foundations
- Structural system – Truss type (Pratt Truss) is the most efficient configuration for simple spans.
- Bridge cross section – 12ft. width is preferred by DNREC with pedestrian railing, fencing and climb guards to improve pedestrian safety and deter park users from jumping off the bridge.
- Bridge design criteria – The bridge will be designed for pedestrian loads. In addition, DNREC would like the new bridge to be designed for a Ford F250 park maintenance vehicle.

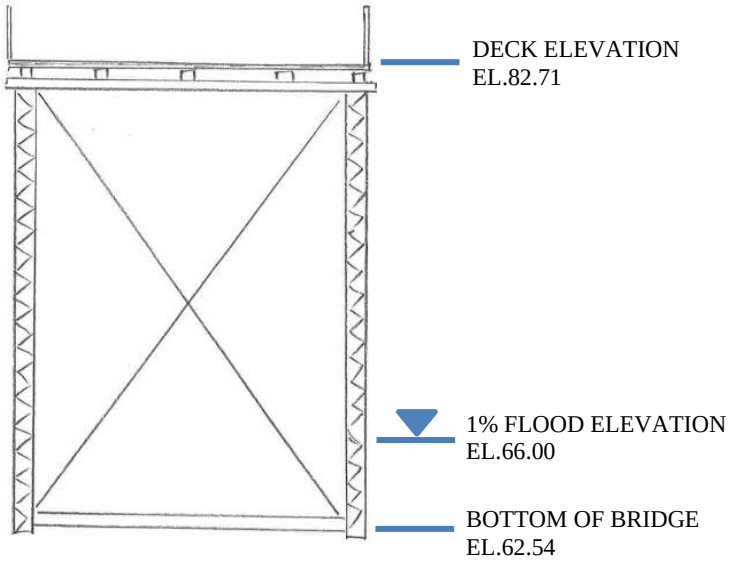


Photo 20: Existing bridge cross section

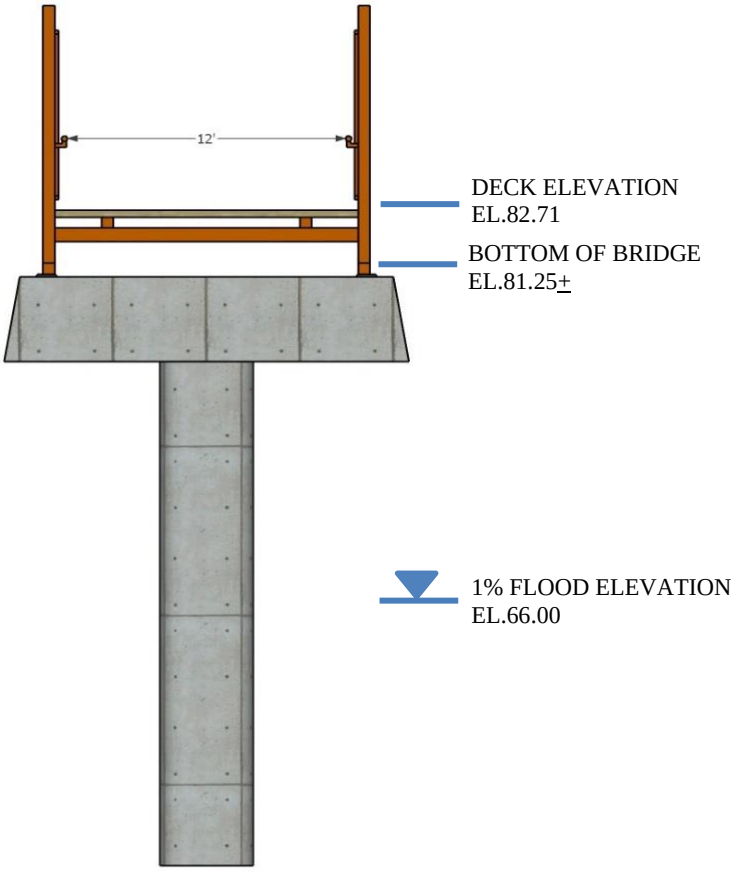


Photo 21: Proposed bridge cross section

- Design codes – Based on DNREC's design criteria, it is recommended that the new bridge be designed as per the requirements of *AASHTO LRFD Guide Specifications for the Design of*

Pedestrian Bridges with 2015 interims. In addition to the pedestrian loads, the above code also specifies a H10 truck loading for design of new bridges. The H10 truck is very similar to the Ford F250 park maintenance vehicle loads in terms of axle spacings and axle loads, with a total load more than that of a loaded Ford F250 vehicle. Hence the new bridge design will satisfy all DNREC design criteria if designed to the AASHTO code.

- Bridge decking – Composites or Concrete decking for improved durability and minimizing future maintenance costs.
- Railing – Vertical pickets with meshing to improve pedestrian safety.
- Finish – Weathering steel to improve durability, enhanced context sensitive aesthetics in harmony with the trails, pavilion and condominiums, and to minimize future painting costs.
- Miscellaneous components – ADA grab rails, toe kick and, fencing or climb guards.

Design scope of work: We anticipate the following design scope for replacing the existing bridge with a prefabricated pedestrian bridge:

- Establish a design criterion for new bridge superstructure based on DNREC's preference.
- Contact prefabricators and evaluate various systems available for the new bridge. Compare costs of the new bridge and delivery schedule across all prefabricators.
- Evaluate access to the site and constructability aspects of the new bridge
- Geotechnical borings, engineering to determine new foundation options for replacement bridge and coordination
- Development of drawings, specifications, and cost estimates for new bridge substructure and foundations with deliverables at 30%, 60%, 90% and PS&E design stages.
- Bid phase support, construction phase support in the form of shop drawing reviews and answers to RFI's, and construction inspection.
- Superstructure design and deliverables will come from the prefabricator during the design development phase and the shop drawing review phase.

Design cost: Based on the above design scope of work, we anticipate that the engineering cost for this option will range between $0.3 million to $0.4 million.

Construction scope of work: We anticipate the following construction scope for replacing the existing bridge with a prefabricated pedestrian bridge:

- Remove all debris near the bottom chord of the existing bridge
- Demolition of existing deck truss span, north and south tie-in spans of the alignment
- Demolition of abutments and piers supporting the existing deck truss span, north and south tie-in spans
- Install new foundations for the replacement bridge piers and abutments as per design
- Install new abutments and piers for the replacement bridge as per design
- Erect the new bridge. Based on our conversation with prefabricated bridge manufacturers, temporary shoring towers may not be necessary to erect the new bridge if cranes can be placed either side of the creek.
- Install new decking system and all miscellaneous items on the new bridge
- Minor modifications to pavilion and tie-in to the bridge
- Utility relocation

Construction cost: Based on the above construction scope of work, we anticipate that the construction cost for this option will range between $1.5 million to $1.8 million. An approximate breakdown of the costs for each scope item is provided below. The total construction cost includes a contingency of 20%, a construction inspection cost of 10% and is adjusted for inflation assuming procurement in one year.

GPI Engineering | Design | Planning | Construction Management

DNREC Alapocas Pedestrian Bridge (Bancroft Bridge) CTP Estimate
Construction Cost - Option 3: Replacement with new Prefabricated bridge

Date Prepared: January 14, 2022

Scope of Work	Cost	Construction Schedule
Mobilization and remove all debris near the bottom chord	$ 50,000	1 month
Demolition of existing deck truss span, north and south tie-in spans and piers	$ 100,000	3 months
Install new foundations	$ 150,000	3 months
Install new piers and abutments	$ 100,000	3 months
Erect the new bridge	$ 700,000	2 months
Install new deck system	$ 50,000	1 month
Install new pedestrian safety fence	$ 25,000	1 month
Modifications to pavilion and tie-in to the bridge	$ 50,000	Concurrent with above
Utility relocation	$ 100,000	Concurrent with above
Sub-Total	$ 1,325,000	
Contingency (20%)	$ 265,000	
Total	$ 1,590,000	1.167 years
Construction Inspection Cost (10% of Total)	$ 159,000	
Inflation (assuming procurement in 1 year)	3%	
Total Construction Cost (With contingency)	$ 1,801,470	
Total Construction Cost (Without contingency)	$ 1,501,225	

Design and Construction schedule: Based on the design and construction scope of work, we anticipate this option to take anywhere between 1.5 to 2.0 years for completion from start of design to end of construction.

Access and Constructability: This option is favorable from the perspective of access and constructability. The construction scope of work will involve the demolition of existing span and substructure, removal of debris, installation of new foundation and piers, and erection of new bridge. Based on our conversation with prefabricated bridge manufacturers, strategies that can be used to navigate through access and constructability constraints are as follows:

- Reduce the dead load of the bridge superstructure by using composite decking system rather than concrete. By not using concrete, the dead load of the bridge can be decreased significantly. This reduces the sizing of the bridge superstructure elements, sizing of piers and foundations, which in turn will require smaller construction equipment such as pile driving rigs, lifting cranes etc. Based on the preliminary design parameters, the manufacturers anticipate the total dead load of the 140ft. and 50ft. span bridge superstructure with composite decking to be between 55 to 65 Tons, and 20 to 25 Tons respectively.
- Transport the 140ft. span and 50ft. span bridges in multiple pieces and assemble the bridges in the field using truss splices. A typical splice detail utilizing simple bolted connection for the 140ft. Pratt truss is shown below in Photo 22. By utilizing smaller pieces, the bridge can be transported easily through the city streets and will require a reduced staging area. Smaller pieces may also

mitigate the need for oversize load special permits during transportation.

- Erect the bare steel superstructure only using cranes to reduce the crane pick weights and thus reducing the crane size. After installing the steel superstructure, then install decking components and miscellaneous components such as railings, ADA grab rails, toe kick, fencing or climb guards.
- Erect the bridge using two cranes placed on either side of the creek. After the demolition of the south tie-in span and foundation, and removal of floor system of the pavilion on north end in the vicinity of the new alignment, there will be sufficient space for cranes to be placed in these areas, for erection of the new bridge spans. A typical erection scheme with two cranes is shown below in Photo 23. As discussed previously, if composite decking is used for the bridge, the total dead load will vary between 55 to 65 Tons. With two cranes and a factor of safety of 2.0 on crane capacity, a 55 to 65 Ton crane on both sides of the creek will suffice.

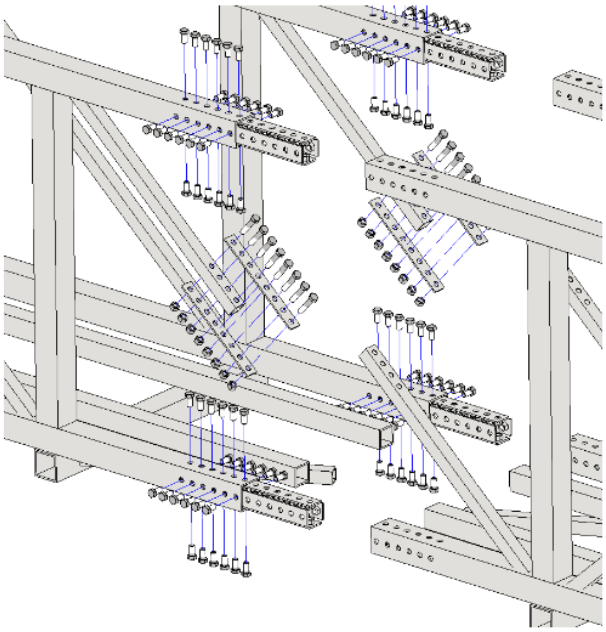


Photo 22: Splice detail for Pratt Truss bridge

Photo 23: Bridge erection using two cranes on either side of the creek

- Use the above cranes to install foundation and substructure elements. Due to the modest weight of the bridge, they can be utilized to lift and install foundation and substructure elements such as steel/concrete piling, pile driving equipment, concreting equipment, formworks, rebar placement etc.

Weighted score: 2.85 / 3.0

Recommended Alternative ? ✗ ✓

Ratings and Discussion:

3 **Fast-track opening of the bridge to pedestrians** – This option has the shortest design and construction schedule of all options.

3 **Improve bridge resiliency and durability** – This option will raise the profile of the bridge above flood levels, thus eliminating the susceptibility to future floods and associate debris damage. The new bridge has a weathering steel finish, thus not needing painting in the future over the creek. New decking system will be of composites or concrete, which will reduce the maintenance cost.

3 **Minimize design and construction cost** – This option has the lowest design and construction cost of all options, and hence is most favorable to DNREC.

2 **Work within the constraints of access and constructability** – This option is less favorable to working within the constraints. One crane on each side of the creek may be needed to erect the bridge.

3 **Improve bridge aesthetics** – The new bridge has a weathering steel finish, thus neatly fitting to the aesthetics context of the site.

3 **Improve bridge functionality** –The new bridge can be designed to meet all current code provisions and safety standards.

5. CONCLUSIONS AND RECOMMENDATIONS

Below table shows a summary of the decision matrix for all options. After researching, developing, and evaluating each option, the decision matrix below was developed to compare each one based on the previously discussed key issues for DNREC.

Key Issue	Weight	Option 1		Option 2		Option 3	
Fast-track opening of the bridge to pedestrians	25%	Not favorable	1	Not Favorable	1	Most favorable	3
Improve bridge resiliency and durability	25%	Not addressed	0	Favorable	2	Most favorable	3
Minimize design and construction cost	15%	Favorable	2	Not favorable	1	Most favorable	3
Work within the constraints of access and constructability	15%	Favorable	2	Not favorable	1	Favorable	2
Improve bridge aesthetics	10%	Favorable	2	Not favorable	1	Most favorable	3
Improve bridge functionality	10%	Favorable	2	Favorable	2	Most favorable	3
Weighted score (out of 3.0)	100%	1.25		1.35		2.85	

Cost and Schedule	Option 1	Option 2	Option 3
Design Cost	$0.6 to $0.7 Million	$0.6 to $0.7 Million	$0.3 to $0.4 Million
Construction Cost[1]	$2.2 to $2.6 Million	$3.4 to $4.1 Million	$1.5 to $1.8 Million
Total Cost	$2.8 to $3.3 Million	$4.0 to $4.8 Million	$1.8 to $2.2 Million
Time to reopen the bridge[2]	2.5 to 3.0 years	2.5 to 3.0 years	1.5 to 2.0 years

1 – See Page 13, 17 and 22 of this report for breakdown of construction cost for each option
2 – See Page 13, 17, 22 and Appendix I of this report for breakdown of construction and engineering schedule for each option

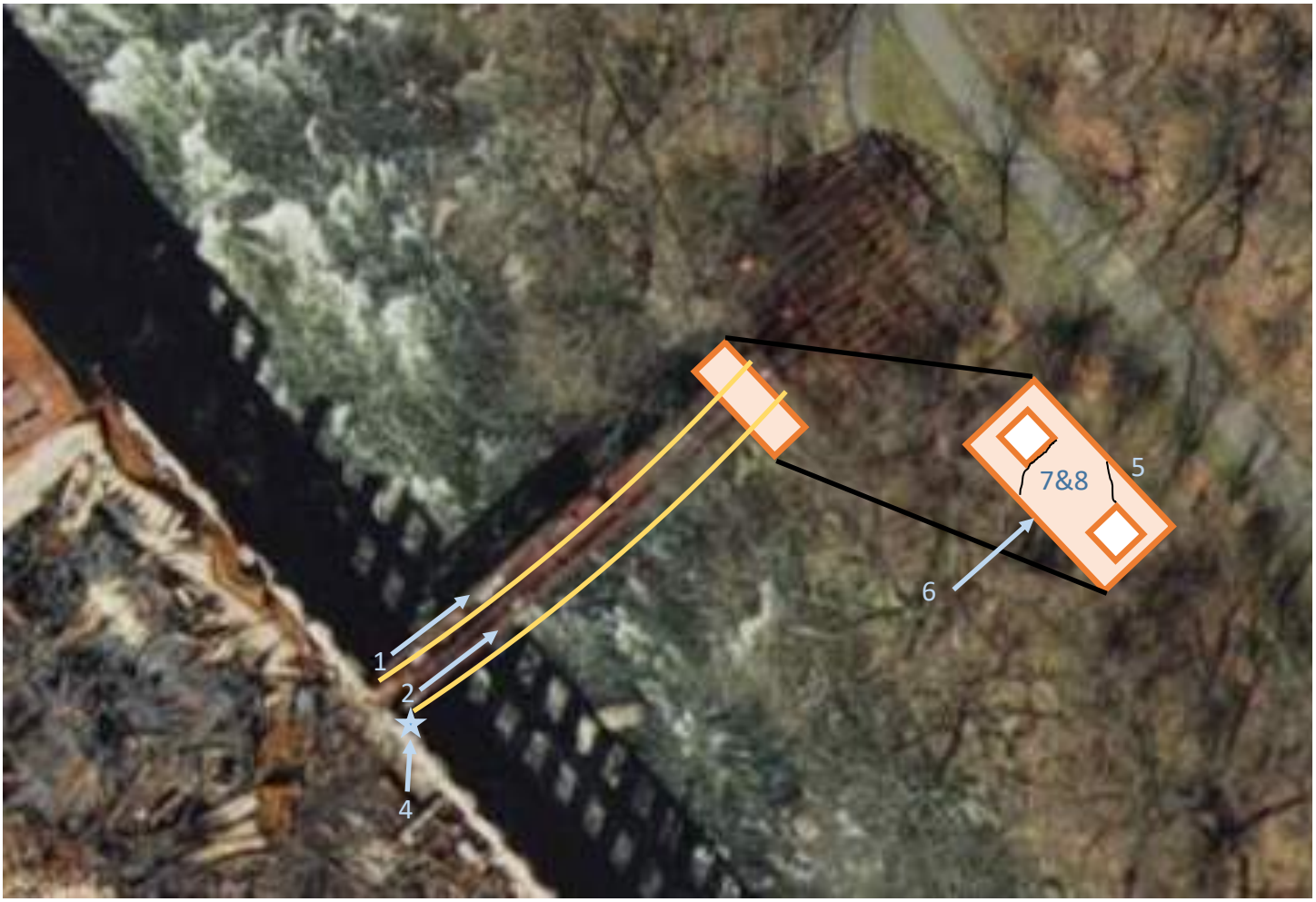
Option 1 does not fast-track the opening of the bridge due to long schedule involving repairs and rehabilitation. In addition, it does not address issues related to bridge resiliency and durability. Option 2 improves address and improves key issues related to bridge resiliency and durability, but has the highest total cost due to painting and assembly costs, modifications to the pavilion and trail, and potential right of way acquisition costs that may be incurred. Option 3 addresses all the key issues and is suited to work within the constraints of access and constructability. It is also the least total cost option and has the shortest schedule. After evaluating various parameters, **Option 3 – Bridge replacement with a new prefabricated pedestrian bridge is the recommended option.**

APPENDIX A

SITE VISIT OBSERVATIONS BY DNREC

Brandy Creek Bridge at Bancroft Mills

Site Visit Observations following Hurricane IDA 9/7/2021

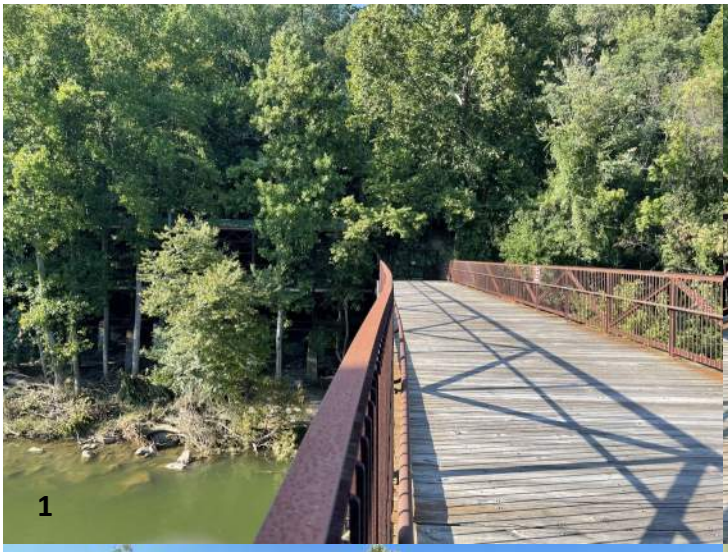


The bridge appears to have deformed with the center of the span pushing down stream. No measurements were taken but it appears to be displaced approximately 6 inches. Shown by the yellow lines above (NTS). Pictures 1,2, & 4.

The deck appears to be slightly twisted. (picture 5). This is difficult to see in the picture.

There is what appears to be new cracking at the piers on the left (NE) bank. Pictures 5,6,7, & 8

There is a broken tie rod and woody debris in the truss structure. Pictures 9 and 10


1


2


3


4


5


6


7


8


9


10

APPENDIX B

STORM DAMAGE ASSESSMENT REPORT BY CENTURY ENGINEERING

CENTURY ENGINEERING

550 Bay Road
Dover, DE 19901
t 302.734.9188 centuryeng.com

September 16, 2021

DNREC State Parks, Office of Design and Development
Attn.: Brooks Cahall, Capital Program Administrator
89 Kings Highway
Dover, DE 19901

RE: Bancroft Bridge over the Brandywine River
Storm Damage Assessment

Dear Brooks:

In accordance with your request, Century Engineering conducted a site visit to the Bancroft Bridge over the Brandywine River on September 13, 2021. The purpose of this visit was to examine the damage the structure sustained on September 1st and 2nd from flooding caused by Hurricane Ida. This assessment was cursory in nature and conducted from the banks of the river and from the top side of the bridge deck.

The Bancroft Bridge is comprised of three distinct sections consisting of:

- The main steel box truss spanning over the river, with a span of approximately 142 linear feet,
- A short approach span on the south side of the river, supported on a series of reinforced concrete pedestals,
- A series of spans on the north side of the river connecting with the covered steel pavilion.

All superstructure elements are steel trusses and frames with timber stringers and timber decking. Both approach spans were found in satisfactory condition with minor deficiencies identified. Deficiencies for the approach spans and main span are listed below. Spans are numbered from South to North and trusses are numbered from West to East.

North Approach:

1. Large 10-foot wide by 18-inch deep scour hole on the bank beneath the approach span. This scour does not affect the structure and requires no action.
2. Large open crack on the reinforced concrete pier foundation. This crack is not new as is evident from the vegetation growing in it. Sealing this crack should be performed to prevent water intrusion and prevent further deterioration.

South Approach:

1. No damage observed.

Main Span:
Deficiencies observed in the Main Span of the bridge are included on the following sheets with photos and descriptions to better illustrate the current condition of the bridge. The damaged areas presented are representative and are not all-inclusive of the damage and deterioration contained on the bridge.

Century Engineering recommends the Bancroft Bridge remain closed to the public and an in-depth inspection of the bridge be performed to identify other suspected deficiencies and possible failures. Following a thorough inspection of the structure it will be possible to evaluate the structural integrity of the bridge and provide remediation options to provide continued service of the structure.

Please feel free to contact me if you have any questions regarding this report or the Bancroft Bridge.

Sincerely,
Century Engineering, Inc.

Walter J. Hoey, III, P.E.
Sr. Engineer

cc: Alex Schmidt, P.E. (Century)
File: (G:\Projects\175013.00 (DNREC 2017 Engineering OE)\175013.77 2021 Brandywine Bridges Inspection\DESIGN\CommentsSubmissions\DNREC\2021-9-14BancroftBridge.docx)

	Figure 1: Bottom diagonal tie-rod in fifth bay is broken on one end and hanging down.
	Figure 2: Bottom diagonal tie-rod in first bay is severely bent from compression caused by the west truss shifting to the east.
	Figure 3: Diagonal tie-rod in 4th bay connecting top west chord to bottom east chord is broken at the bottom and hanging from the top.

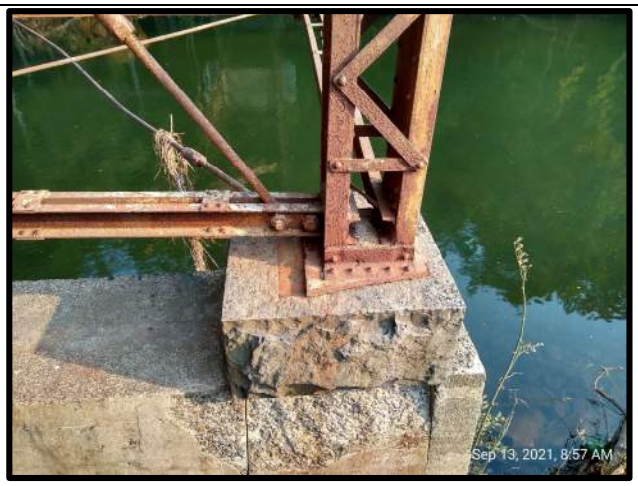
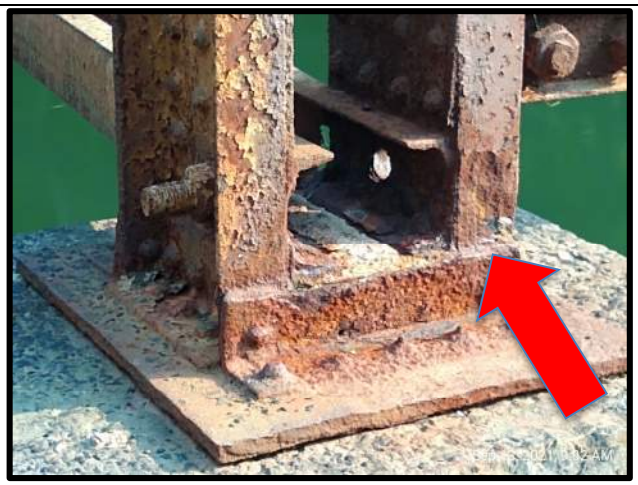
	Figure 4: Pier 1, east vertical post has shifted 4.5 inches to the east on the masonry pad. Anchor bolts are not visible and appear to be completely corroded away.
	Figure 5: Pier 1, bottom horizontal double channel is cracked and separated from the west post.
	Figure 6: Pier 1, west vertical post displays severe section loss and cracks in bottom of the easterly C-Channel.

	Figure 7: Pier 1, west vertical post contains open crack at the top gusset plate. Diagonal lattice bracing is missing rivets in several locations.
	Figure 8: Pier 1 west vertical post is leaning to the east.
	Figure 9: Pier 1 east vertical post is leaning to the east.

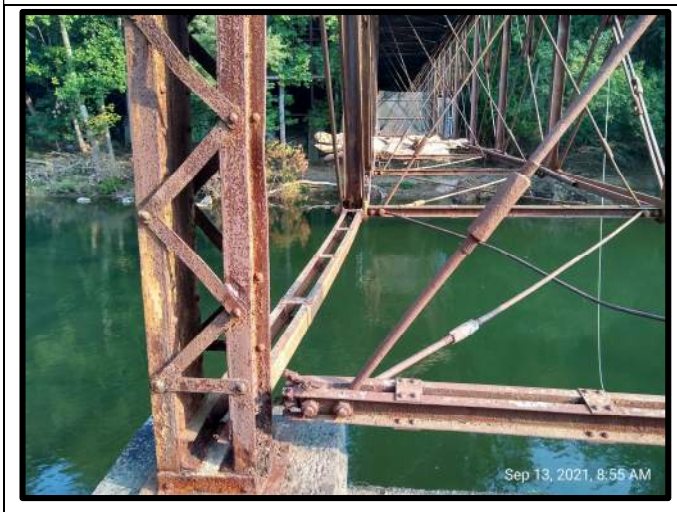
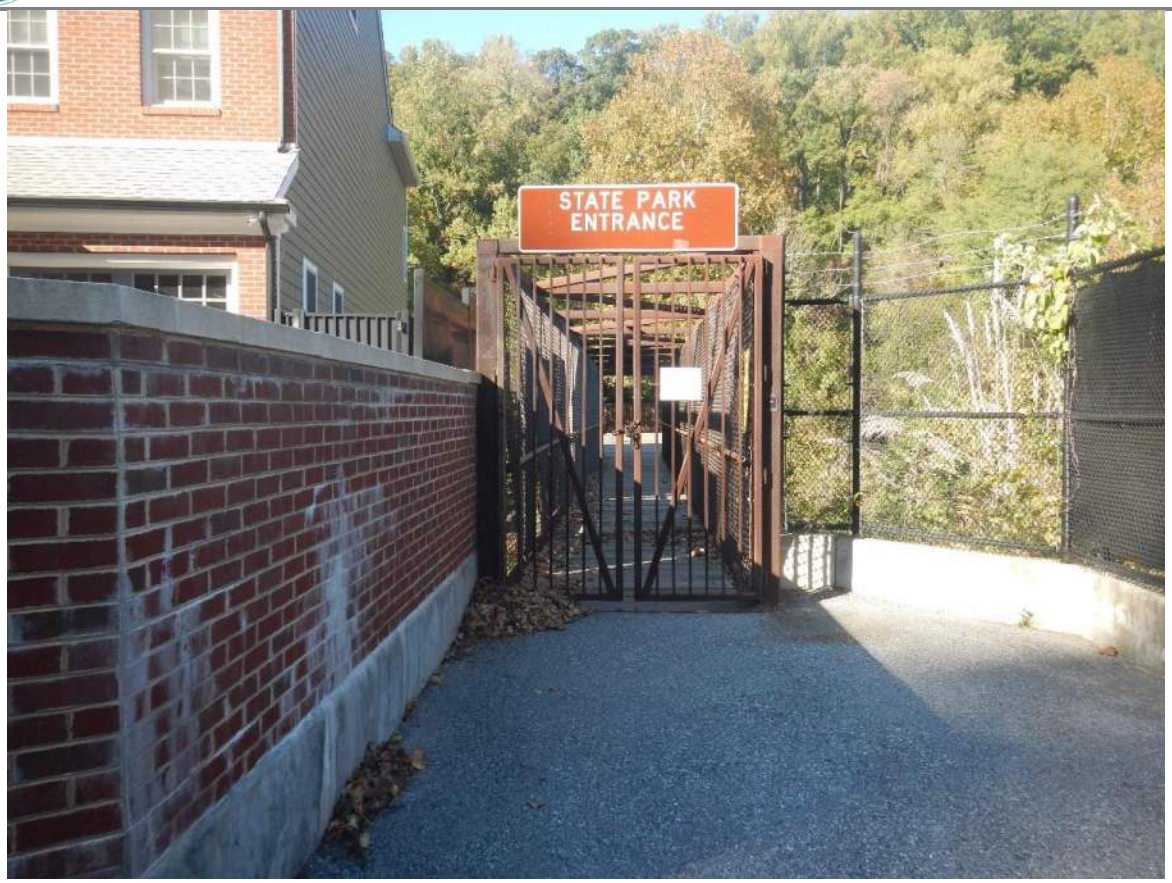
	Figure 10: Large tree limbs and debris are hung-up in truss.
	Figure 11: The south end of Main Truss top horizontal member is severely rusted with extreme section loss. This element provides no structural support.
	Figure 12: The East and West Trusses are bowing to the east. West Truss shown, West Truss similar.

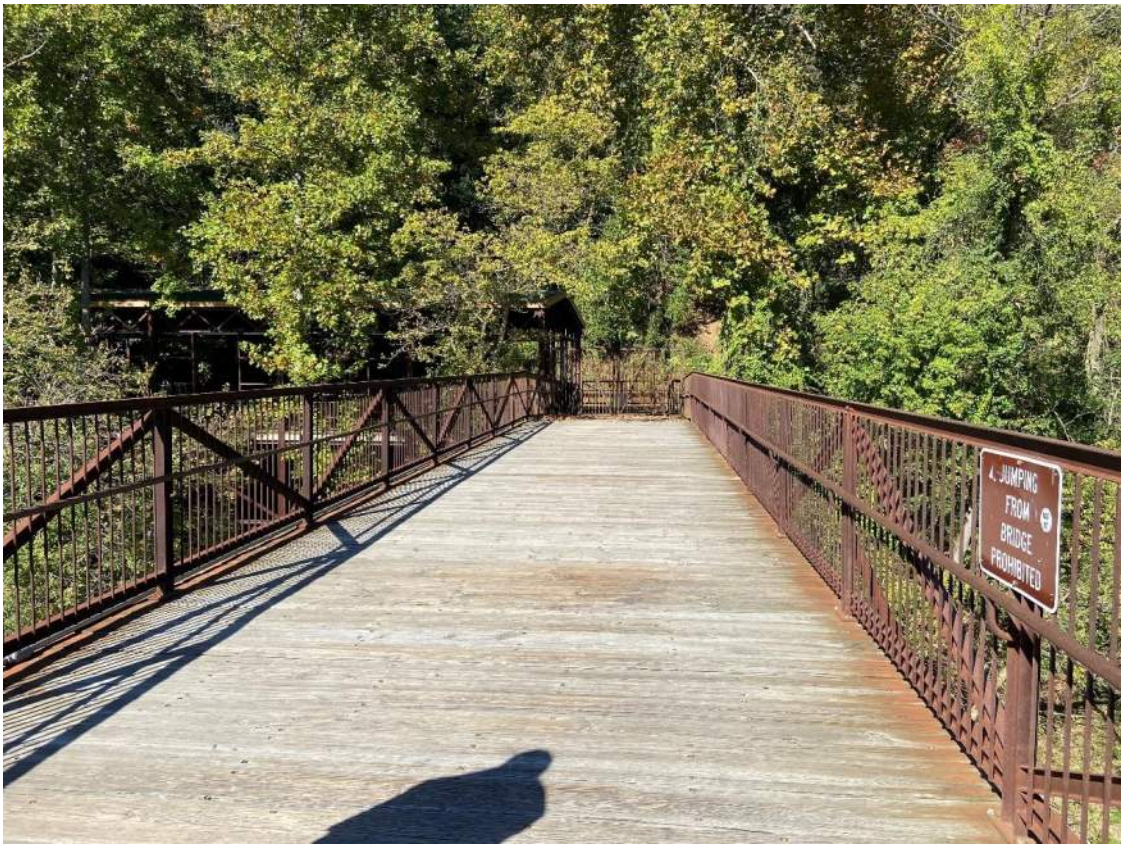
	Figure 13: Pier 1, contains a large spall in concrete pedestal under the east masonry pad.
	Figure 14: Pier 1, stone masonry is dislodged on the north side of pier.

APPENDIX C

SITE VISIT PHOTOS BY GPI


STATE PARK
ENTRANCE


GPI


4. JUMPING
FROM
BRIDGE
PROHIBITED


GPI

APPENDIX D

BRIDGE INSPECTION REPORT BY ORNDORF & ASSOCIATES

CONDITION ASSESSMENT
of the
ALAPOCAS PARK PEDESTRIAN BRIDGE
ELEVATED APPROACH

December 12, 2001
Orndorf & Associates Project Number 138.004

Prepared for:

The State of Delaware
Department of Natural Resources
and Environmental Control
Division of Parks and Recreation

Orndorf & Associates, Inc.
P.O. Box 448
Ardmore, PA 19003
Phone (610) 896-4500 Fax: (610) 896-4503

December 12, 2001

Mr. K. Wayne Rust
State of Delaware
DNREC
Division of Parks and Recreation
Office of Design and Development
89 Kings Highway
Dover, Delaware 19901

RE: Alapocas Park Pedestrian Bridge Approach
Orndorf & Associates Project No. 138.004

Wayne,

In accordance with our proposal dated October 1, 2001, we have prepared this letter report summarizing our observations, findings and recommendations for the project referenced above. The information contained in this letter report was obtained during a site visit to Alapocas Park on October 31, 2001. The purpose of our site visit was to review the existing conditions of the elevated approach to the Bancroft Mills Pedestrian Bridge. This site visit consisted of visual observations and selective probing of those areas that were accessible from the ladder provided at the site. Items including, but not limited to, the truss bridge and the existing concealed foundation system were not part of this review. Therefore, no opinion is offered with respect to such items.

For the purposes of this letter report, we shall consider the Brandywine Creek to flow west-to-east. Therefore the pin-connected truss bridge spans north south. The elevated approach is located on the south bank and extends from a parking area to the south end of the truss bridge. It is our understanding that the truss bridge and elevated approach are subjected to pedestrian traffic and an occasional vehicle crossing approximately the size of a pick-up truck.

OBSERVATIONS

The truss bridge and elevated approach are located in the Bancroft Mills area. The surrounding site consists of old mill buildings, some of which now serve as office space. The approach to the truss bridge is an elevated structure consisting of a concrete deck and a steel frame (Photo #1). At the west edge of the approach, the construction of the deck is visible. The existing deck consists of an 8" (±) reinforced concrete slab spanning approximately 8 feet in the north-south direction between wide flange beams. The existing wearing course is approximately 3 inches of concrete. No reinforcing is visible in the wearing course. Sandwiched between the structural slab and the wearing course is

approximately 1-1/2" of asphalt. The asphalt layer likely served as the wearing course for the approach prior to the existing 3" (±) concrete wearing surface. Abandoned drainpipes are visible on the underside of the structural deck.

The existing wide flange members that support the approach deck span approximately 12'-7" in the east-west direction. The existing beams are approximately 10 inches in depth with a flange width of 4-1/2" (±). The east end of the beams "pocket" into the exterior brick masonry wall of the existing mill building adjacent to the approach. A wide flange girder member supports the west ends of the beams. The existing girder members span in the north south direction with varying lengths. The depth of the girder members is approximately 14 inches while the flange width is 6-1/4" (±).

Wide flange columns, in turn, support the wide flange girder members. The column heights vary from approximately 21 to 25 feet. The column depth is approximately 12 inches with a flange width of 4-7/8" (±). Two angle sections (6" x 3") 7-1/2 inches long connect the column section to a base plate approximately 12 inches square and 1/2" in thickness. Reinforced concrete walls support the northern-most and southern-most columns. Two of the three intermediate columns are supported on concrete piers. The existing foundations were concealed by a slab-on-grade and subsequently not reviewed.

FINDINGS AND RECOMMENDATIONS

The existing concrete wearing slab is in fairly good condition with only minor deterioration. Localized scaling occurs at the beginning of the approach. This is typically caused by chloride salts (typically used in de-icing products) absorbed into a concrete surface. The salts re-crystallize, exerting forces on the concrete surface large enough to detach small patches. Some water stains are also visible at the locations of the deteriorated down spouts on the adjacent mill building.

While the wearing slab has experienced only minor deterioration, the structural slab is in poor condition. Along the west edge of the approach, the joint between the wearing slab and structural slab is exposed allowing moisture to infiltrate and become trapped. The presence of moisture is indicated by the vegetation growth along the west edge (Photo #2). As trapped moisture penetrates the structural slab the reinforcing corrodes. Evidence of this corrosion is visible on the underside of the slab. The underside of the slab has cracked and a white residue (efflorescence) has been deposited in the pattern of the slab reinforcing. At several locations the corrosion of the reinforcing is so advanced it has caused the concrete cover to spall and expose the existing reinforcing steel (Photo #3). Once the concrete spalls, the bond of the reinforcing steel to the concrete is lost, compromising the structural integrity of the deck.

The existing steel structure supporting the approach deck is also in poor condition. The beams supporting the deck are in an advanced state of deterioration due to the long-term exposure to moisture. The top and bottom flanges, as well as the web of the beams have corroded and delaminated (Photo #4). Pieces of the beam flanges measuring 6" to 1'-0" are

visible on the ground below the structure (Photo #5). The bottom flange of the fifth beam from the north has completely deteriorated at the east bearing, where the beam "pockets" into the masonry wall. The advanced stages of corrosion cause a significant loss of the original cross-sectional area of the members thereby compromising the structural integrity of the beams. The existing steel girders and column sections show similar signs of deterioration, although not to the extent of the beam members. In addition to the corrosion, the columns appear to be damaged and holes in the flanges exist from connections of demolished members. At column B-4, (reference the attached sketches) the flange is bent near the top row of rivet/bolt holes (Photo #6). The web of the southern-most column (C-5) is "ripped" at the bottom of the column, where a piece of steel plate is connected. The column section is also bent and twisted at this location. Vacant rivet/bolt holes and ripped sections of the column web decrease the cross-sectional area of the existing members thereby reducing the load carrying capacity of the columns.

The existing structure was analyzed to determine the load carrying capacity of the structure in its original, as-built condition. The engineering analysis indicates that the existing beam members supporting the deck limit the live load capacity of the approach. The analysis further indicates that the addition of the wearing courses (concrete topping and asphalt) have reduced the live load capacity of the approach to 0 psf (pounds per square foot). The BOCA Building Code recommends a live load capacity of 60 psf for walkways and elevated platforms. AASHTO recommends a slightly higher live load capacity of 85 psf for bridges subjected to pedestrian and/or bicycle traffic.

Given that the approach appears to be performing in its current condition under typical pedestrian traffic, closing the approach to all forms of traffic is not necessary. However, based on the results of the engineering analysis, it is imperative to prohibit vehicular traffic and conditions conducive to public assembly on the elevated approach in its existing condition. Also, given the substantial amount of deterioration of the existing structure, certain components, such as the wide flange beam members and portions of the structural slab are beyond repair. Therefore, it is recommended that the existing elevated approach be demolished and replaced with a new structural system. This recommendation is based on our experience involving renovation of structures in similar conditions of disrepair. This experience indicates such renovation programs are cost-prohibitive and time-consuming. A program for construction of a new elevated approach provides an opportunity for studying alternative designs. One such alternative can incorporate an engineered lumber deck system, complimenting the existing truss bridge deck, supported on a galvanized steel structure.

Any program developed for future work should incorporate items such as soil borings to develop soil bearing capacities, a topographic survey to determine existing elevations and an H-20 design live load criteria (as described in AASHTO) to accommodate occasional vehicular traffic, such as a pick-up truck or emergency vehicle. A rough order of magnitude cost for demolition of the existing system and construction of a new approach is provided with exclusions as noted.

BUDGET ESTIMATE FOR REPLACEMENT STRUCTURE

ITEM	UNITS	QUANTITY	UNIT COST	TOTAL COST
MOBILIZATION	l.s.	1	$ 5,000.00	$ 5,000.00
EROSION CONTROL	l.s.	1	$ 4,000.00	$ 4,000.00
NEW FOOTING EXCAVATION	l.s.	1	$ 5,000.00	$ 5,000.00
REMOVAL OF EXISTING STRUCTURES	l.s.	1	$ 30,000.00	$ 30,000.00
GLUE-LAMINATED TIMBER DECK	l.s.	1	$135,000.00	$135,000.00
PORT. CEMENT CONCRETE FOOTINGS.	l.s.	1	$ 25,000.00	$ 25,000.00
STRUCTURAL STEEL (GALVANIZED)	l.s.	1	$ 35,000.00	$ 35,000.00
REMOVE & RE-INSTALL EXIST. STEEL FENCE	l.s.	1	$ 2,500.00	$ 2,500.00
MISCELLANEOUS APPROACH WORK	l.s.	1	$ 5,000.00	$5,000.00
MAINTENANCE OF TRAFFIC	l.s.	1	$ 2,000.00	$2,000.00
MISCELLANEOUS REPAIRS TO EXIST BLDG.	l.s.	1	$ 2,500.00	$ 2,500.00
DE-MOBILIZATION	l.s.	1	$ 2,500.00	$2,500.00
			SUBTOTAL =	$ 253,500.00

Design Contingency @ 25% = $ 63,375.00

BUDGET TOTAL = $316,875.00

Basis of Estimate:

1. The above estimate represents a Rough Order of Magnitude (R.O.M.) cost for a replacement structure based on historical costs for similar construction.

2. It is based entirely on average unit costs without the benefit of detailed design or quantity take-offs.

3. Excluded from this estimate are ancillary project costs such as professional design fees, soils sampling and testing, building and environmental permits, and construction management/administration fees.

We trust this letter report addresses your concerns at this time and provides you with the information required to assist you in developing a program for future work. Please contact us if we can be of any further assistance to you on this project or any future projects.

Sincerely,

ORNDORF & ASSOCIATES

John R. Davis, P.E.

Enclosures: SK-1-Temporary Column Stabilization (Issued 9/25/01)
SK-2-Foundation Plan-Existing Conditions
SK-3-Framing Plan-Existing Conditions

CC: Tom Faranda, P.E.-Orndorf & Associates

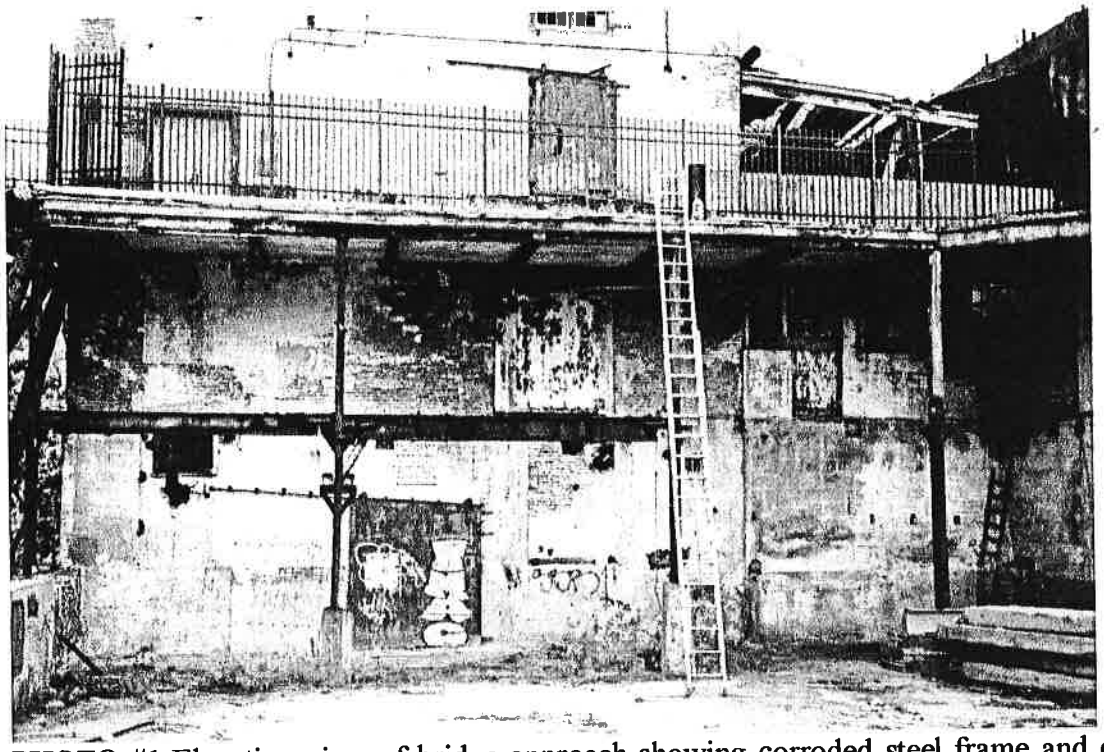


PHOTO #1-Elevation view of bridge approach showing corroded steel frame and existing mill building beyond.

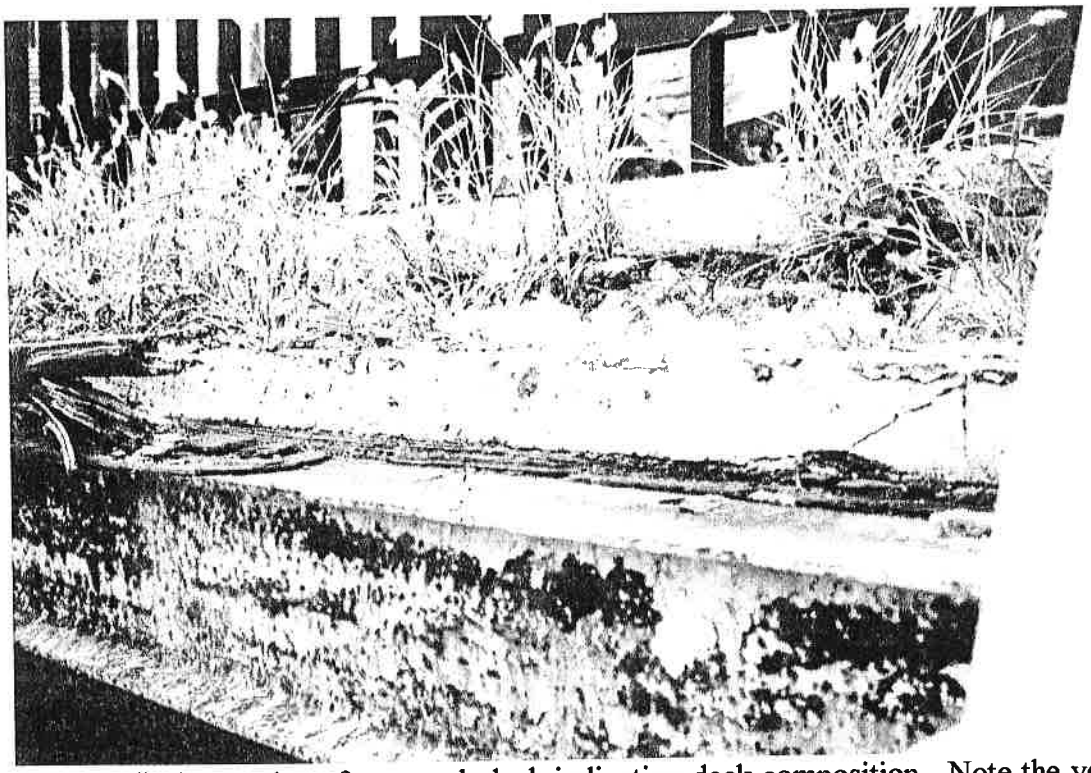


PHOTO #2-West edge of approach deck indicating deck composition. Note the vegetation growth.

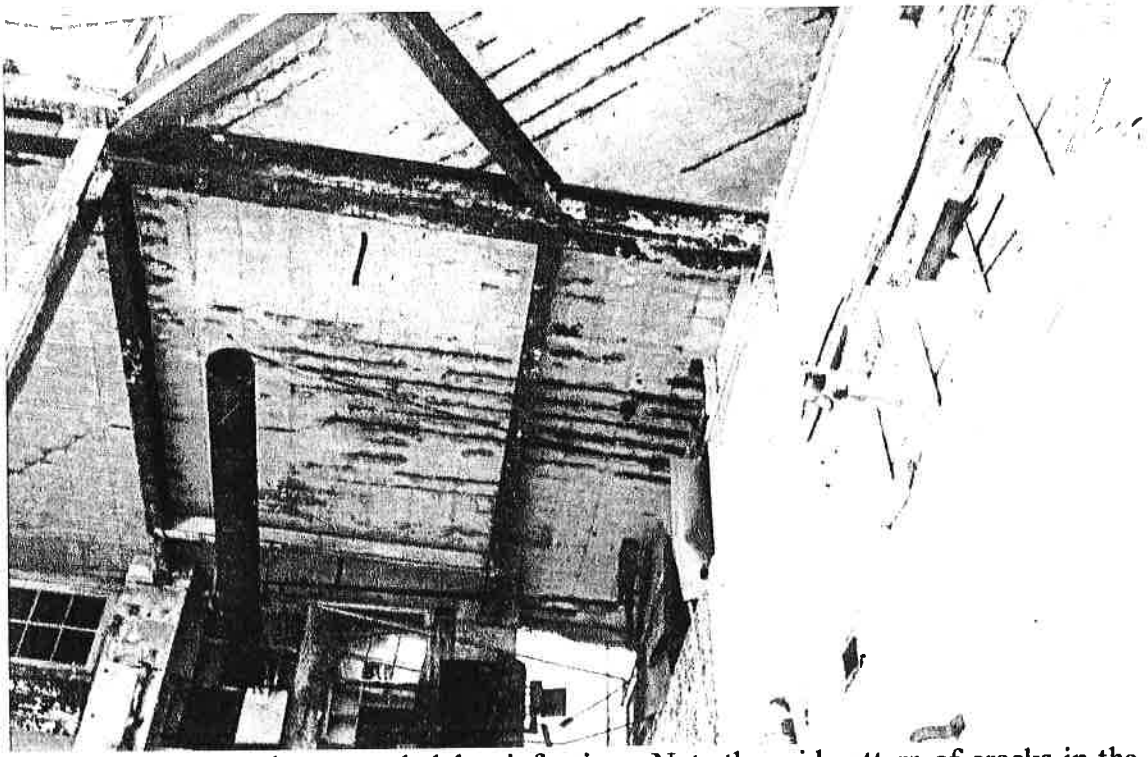


PHOTO #3-Exposed structural slab reinforcing. Note the grid pattern of cracks in the slab at the reinforcing.

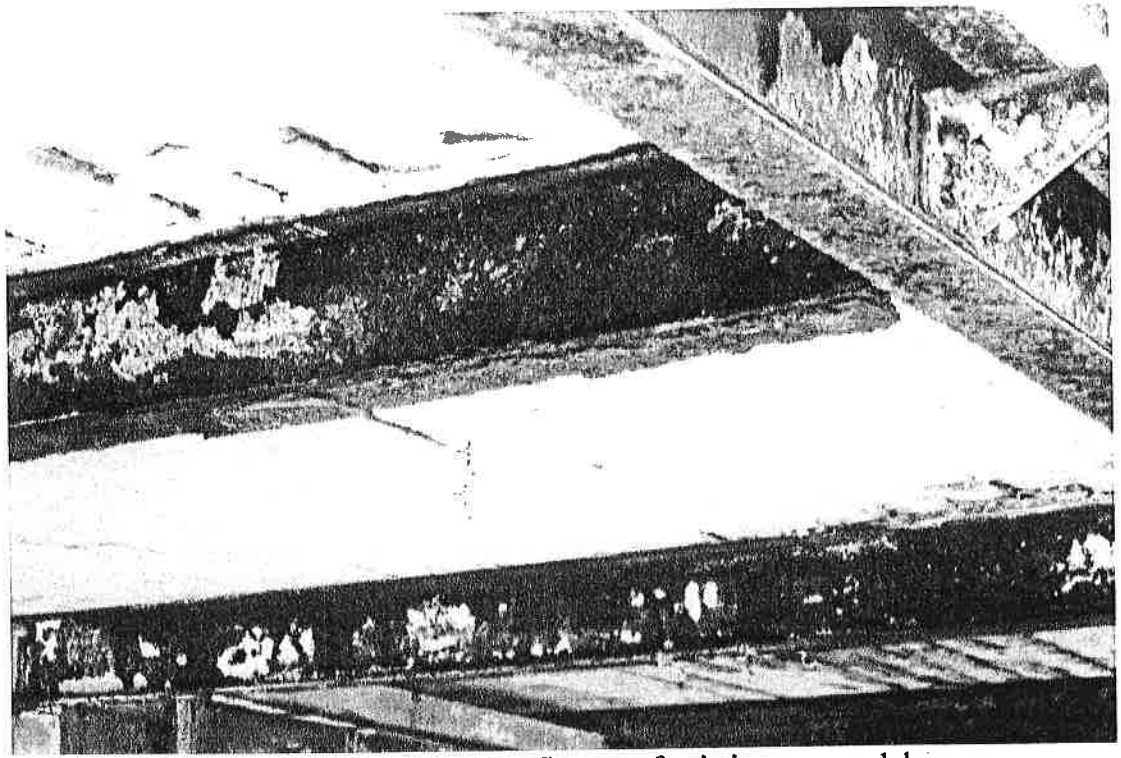


PHOTO #4-Corrosion and delaminating flanges of existing approach beams.

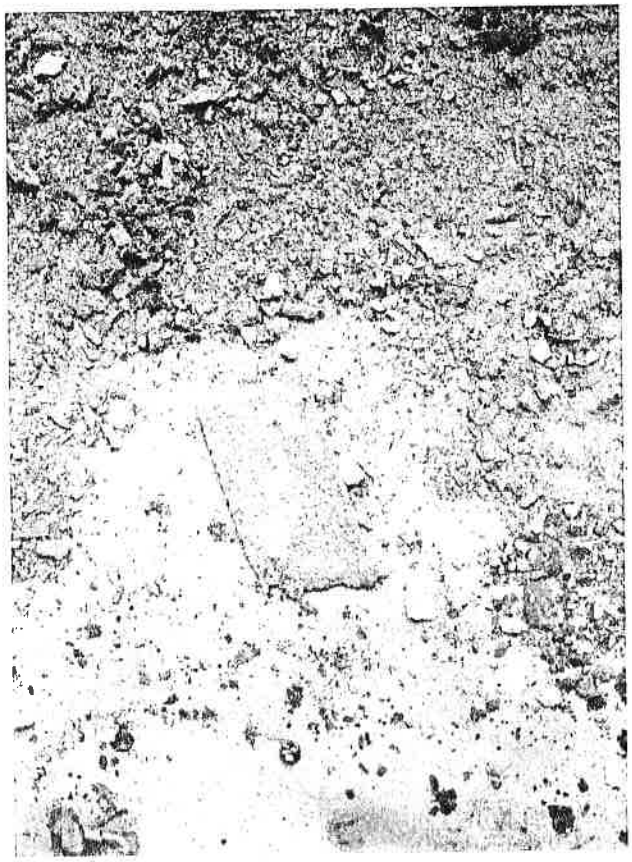


PHOTO #5-Portion of delaminated beam flange that has fallen from structure above.

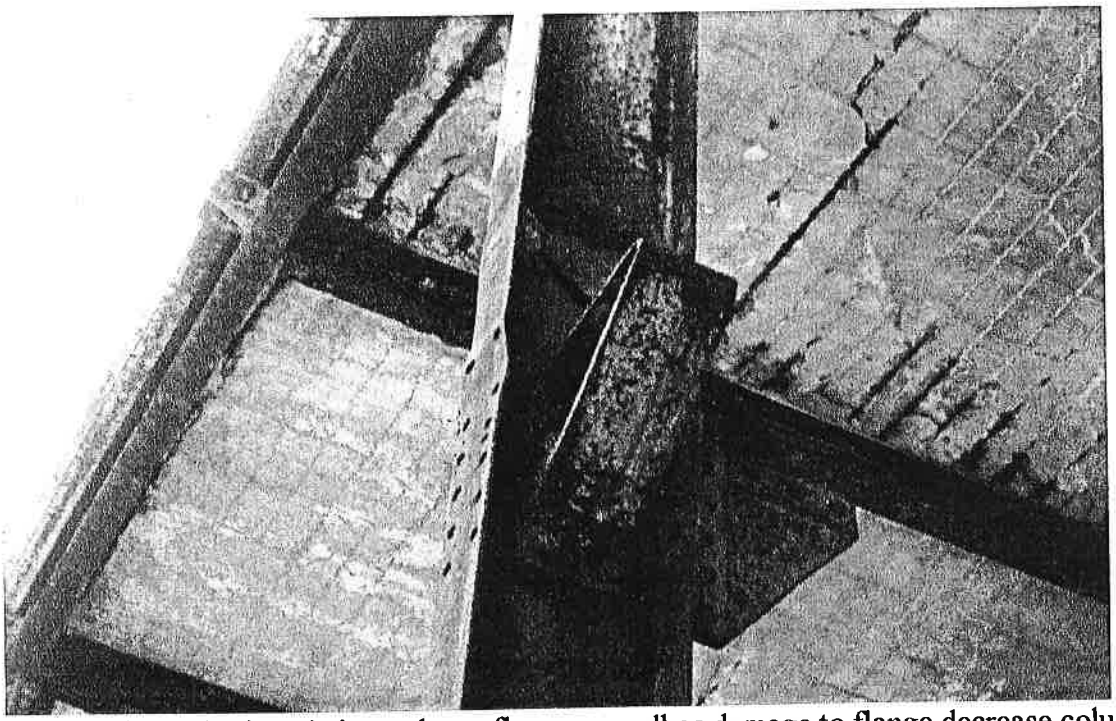
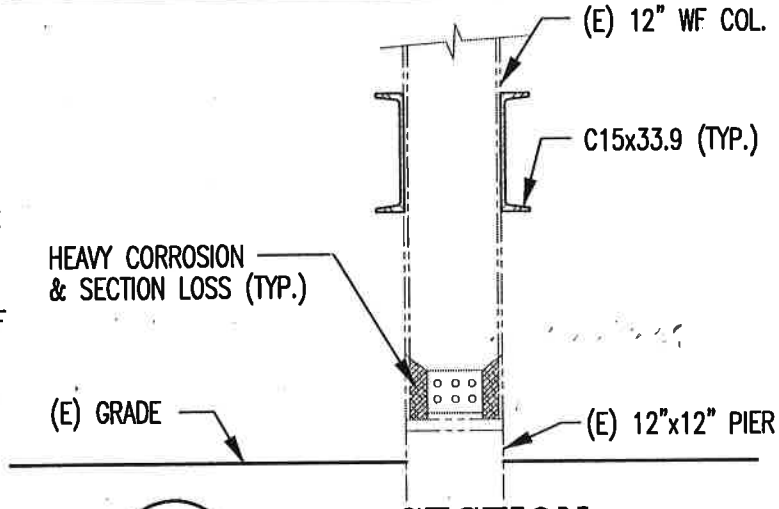
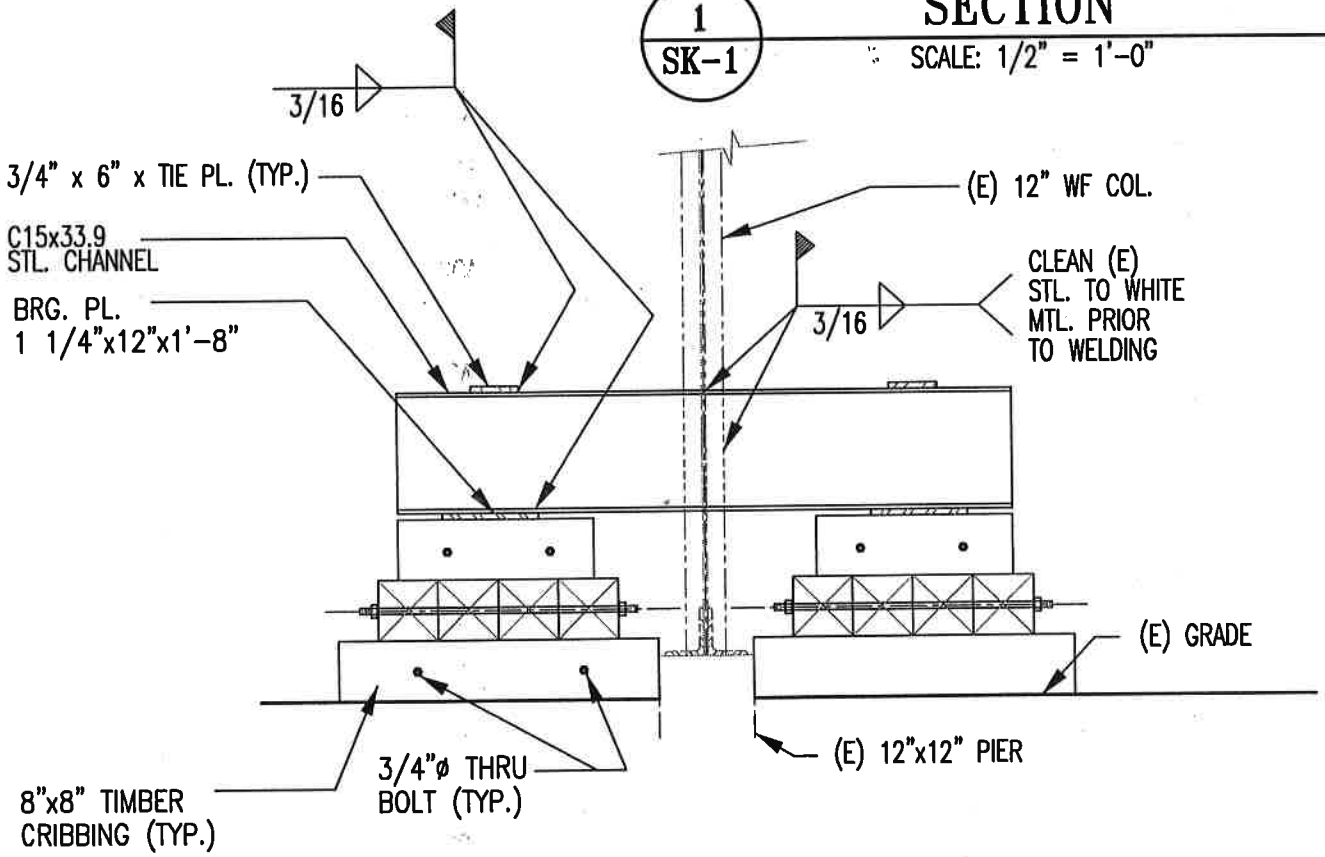


PHOTO #6-Holes in existing column flange as well as damage to flange decrease column capacity.

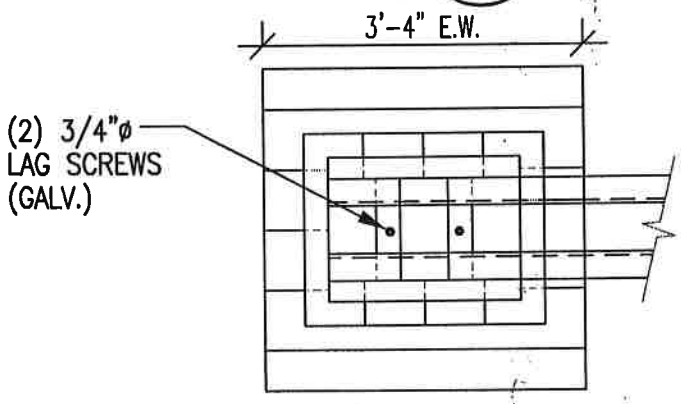
NOTES:
1. PREPARE A CLEAN AND LEVEL BEARING SURFACE FOR NEW TIMBER CRIBBING.
2. SET THE NEW STEEL CHANNELS ON THE CRIBBING AND WELD TO THE EXISTING COLUMNS FOLLOWING SURFACE PREPARATION.
3. DO NOT JACK OR OTHERWISE IMPART VERTICAL OR LATERAL LOADS TO THE COLUMN DURING THE PROGRESS OF THE WORK.
4. COAT WELDS AND BARE METAL WITH (2) COATS OF ZINC RICH PRIMER/PAINT.



1 / SK-1 SECTION
SCALE: 1/2" = 1'-0"



2 / SK-1 ELEVATION
SCALE: 1/2" = 1'-0"



PLAN OF CRIBBING

STATE OF DELAWARE - DENREC - DIVISION OF PARKS AND RECREATION

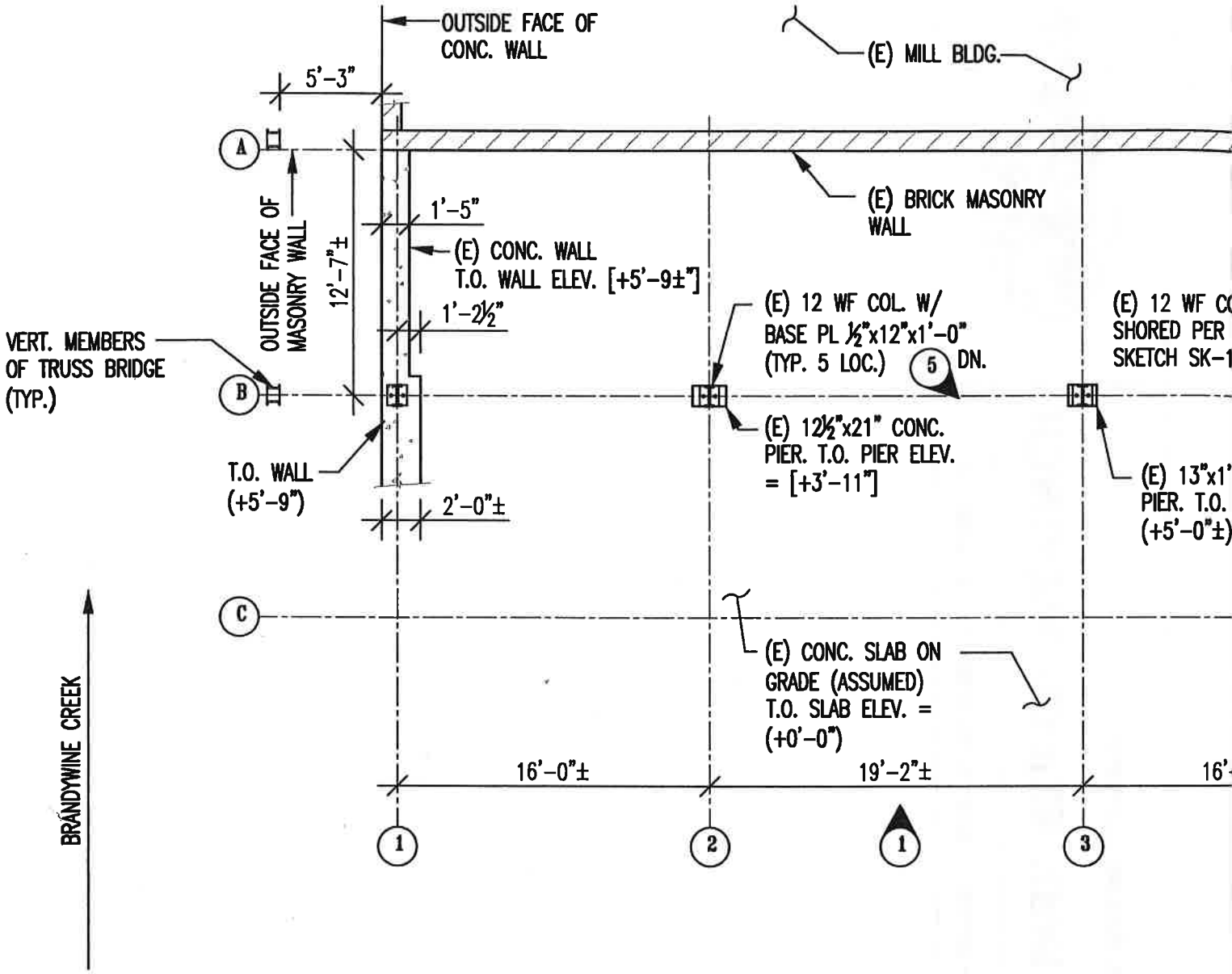
ALAPOCAS PARK PEDESTRIAN BRIDGE

TEMPORARY COLUMN STABILIZATION

ORNDORF & ASSOCIATES INC.
Structural Engineers
PO Box 448
Ardmore, PA 19003
610.896.4500
fax 610.896.4503
email www.orndorf.com
Project No. 138.P1

PROJECT NO.: 138.P1
DATE: SEPT. 25, 2001
DRAWN BY: RRF
CHECKED BY: TCF

SK-1



PROJECT NORTH

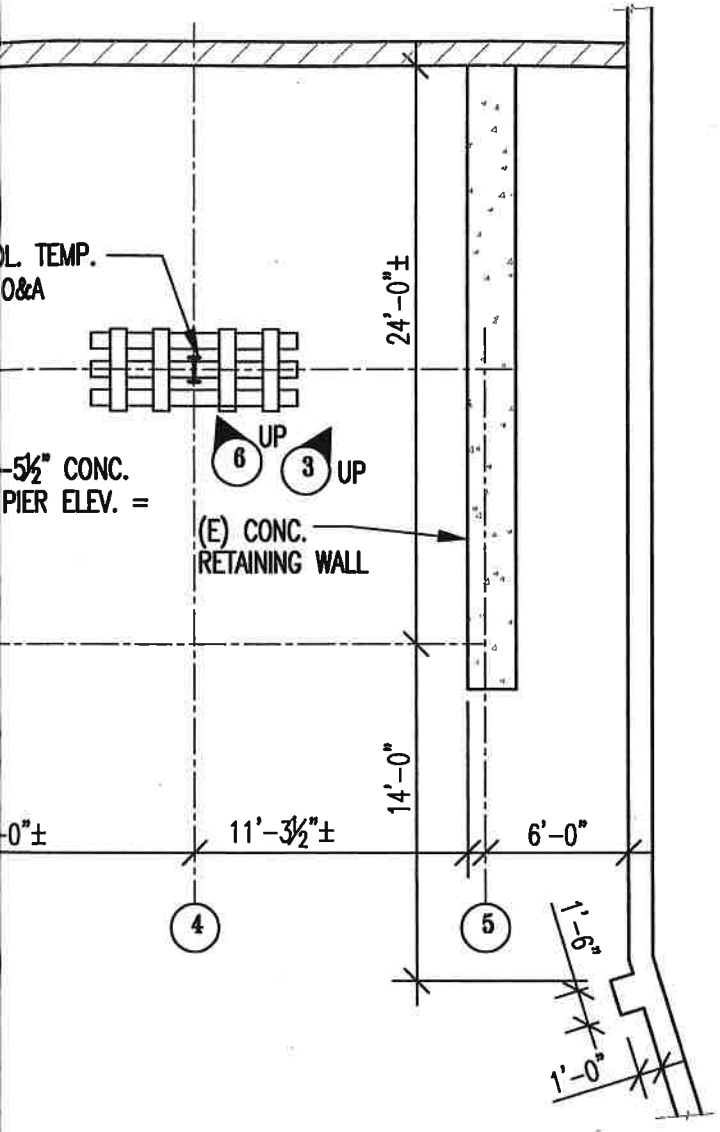
1
SK-2

FOUNDATION PLAN – E

SCALE: ⅛" = 1'-0"

NOTE:

1. EXISTING CONCRETE SLAB BELOW APPROACH IS ASSU
2. THE (ASSUMED) SLAB-ON-GRADE SERVED AS REFERE EXISTING CONDITIONS.
3. [+X'-XX"] INDICATES TOP OF WALL/PIER ELEVATIONS (0'-0").
4. (X) INDICATES APPROXIMATE LOCATION AND DIRECT PROVIDED IN REPORT DATED 12-12-01.



XISTING CONDITIONS

IED TO BE SLAB-ON-GRADE.
NCE ELEVATION POINT (0'-0") FOR THE OBSERVED

WITH RESPECT TO REFERENCE ELEVATION POINT

ION OF PHOTOGRAPH WITH CORRESPONDING NUMBER

P.O. Box 448
Ardmore, PA 19003
610.896.4500
fax 610.896.4503
email www.ormdorf.com
ORNDORF & ASSOCIATES INC.
Structural Engineers
Project No. 318.004

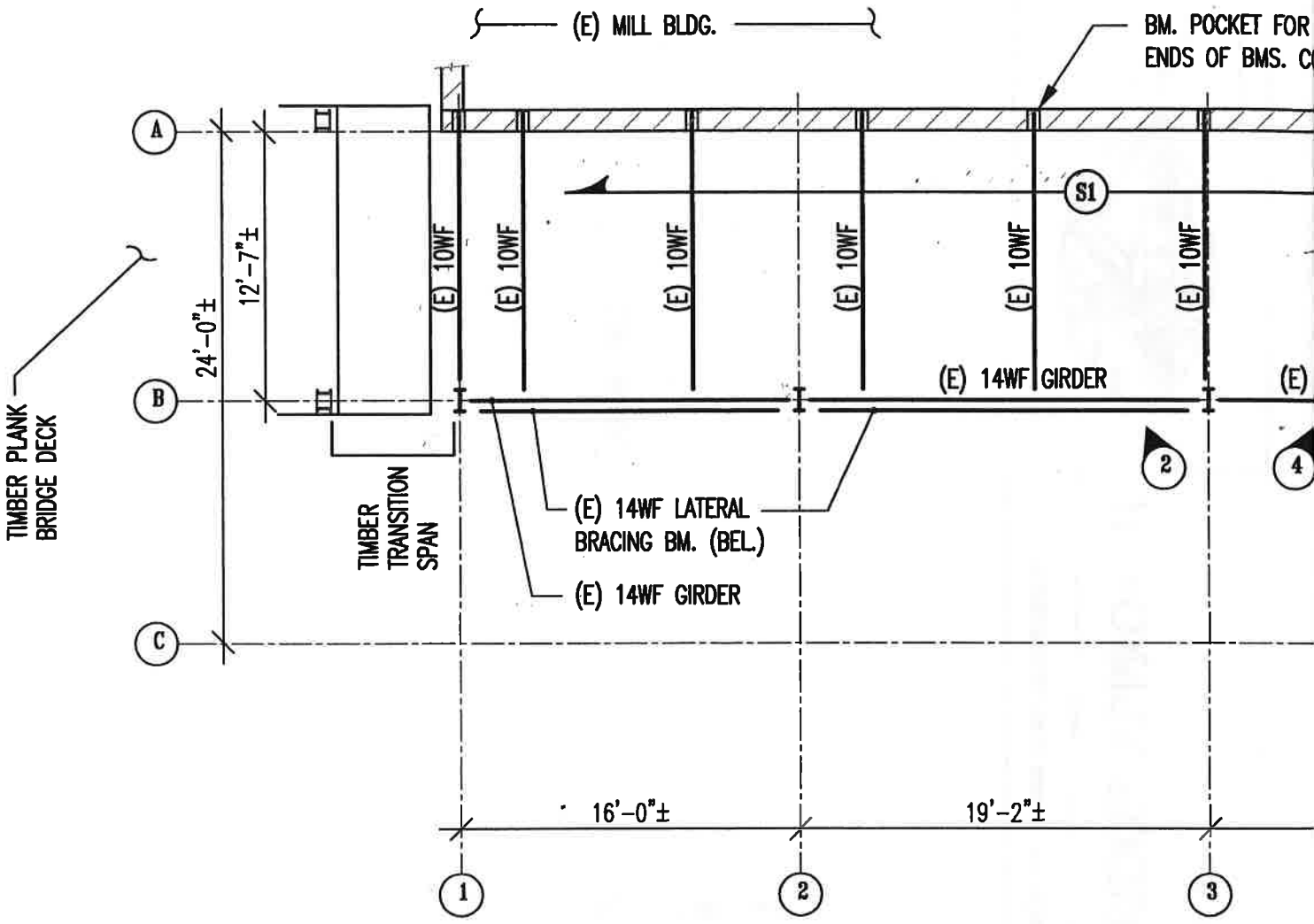
STATE OF DELAWARE - DENREC - DIVISION OF PARKS AND RECREATION

ALAPOCAS PARK BRIDGE APPROACH

WILMINGTON, DELAWARE

PROJECT NO. :
138.004
DATE :
DEC. 12, 2001
DRAWN
RRF
CHECKED
JRD

SK-2



PROJECT NORTH

1
SK-3

FRAMING PLAN-EXIS

SCALE: 1/8" = 1'-0"

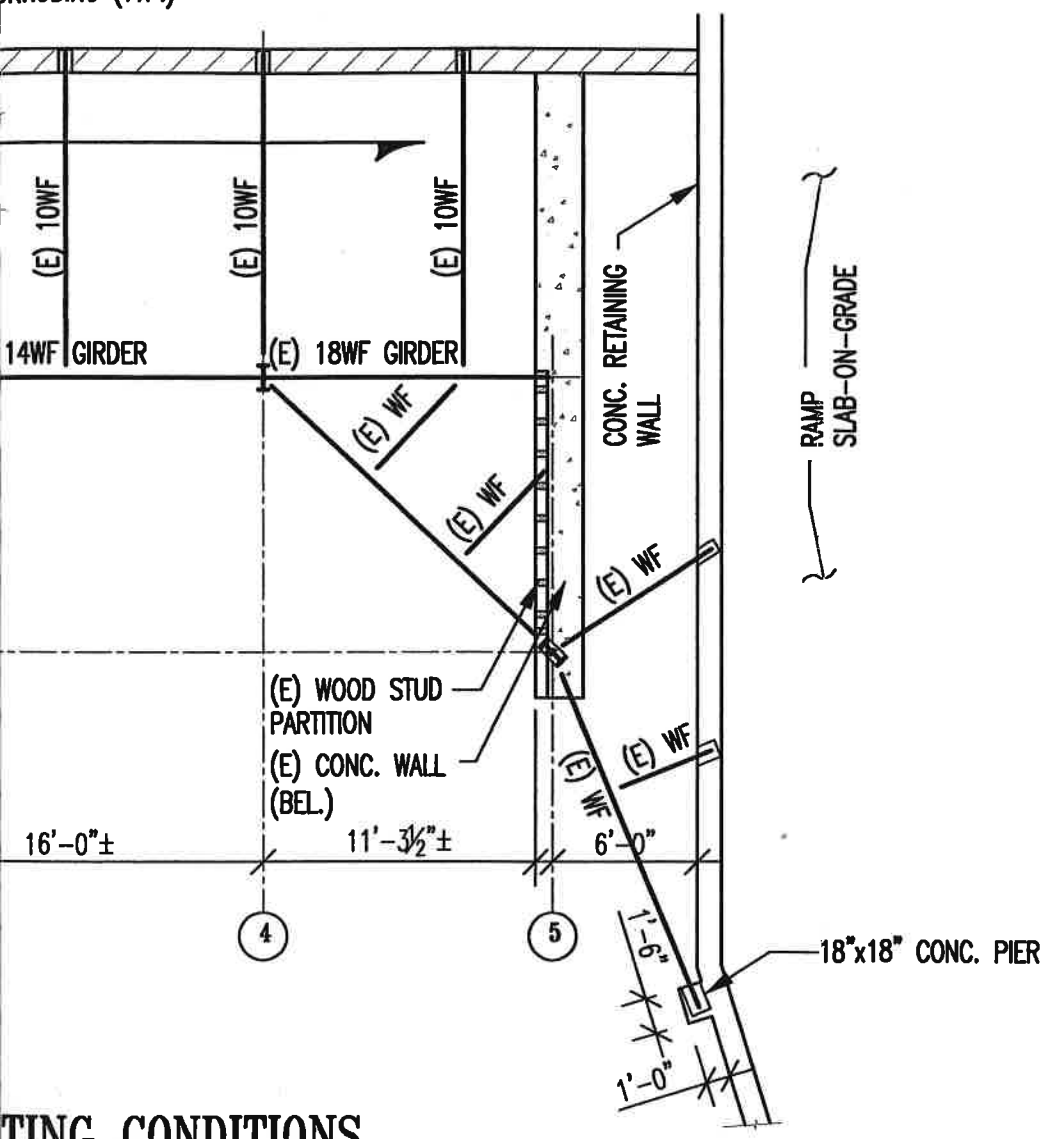
GENERAL OBSERVATION NOTES:

1. (S1) INDICATES 3" CONCRETE WEARING SLAB ON 1½"± ASPHALT LAYER ON 8"± REINFORCED CONCRETE SLAB.

2. TOP OF STEEL ELEVATION OF EXISTING 14WF GIRDERS = (+26'-3"±) WITH RESPECT TO REFERENCE ELEVATION POINT.

3. (X) INDICATES APPROXIMATE LOCATION AND DIRECTION OF PHOTOGRAPH WITH CORRESPONDING NUMBER PROVIDED IN REPOR
DATED 12-12-01.

10WF (TYP.)
ORRODING (TYP.)



TING CONDITIONS

P.O. Box 448
Ardmore, PA 19003
610.896.4500
fax 610.896.4503
email www.orndorf.com
ORNDORF & ASSOCIATES INC.
Structural Engineers
Project No. 318.004

STATE OF DELAWARE - DENREC - DIVISION OF PARKS AND RECREATION

ALAPOCAS PARK BRIDGE APPROACH

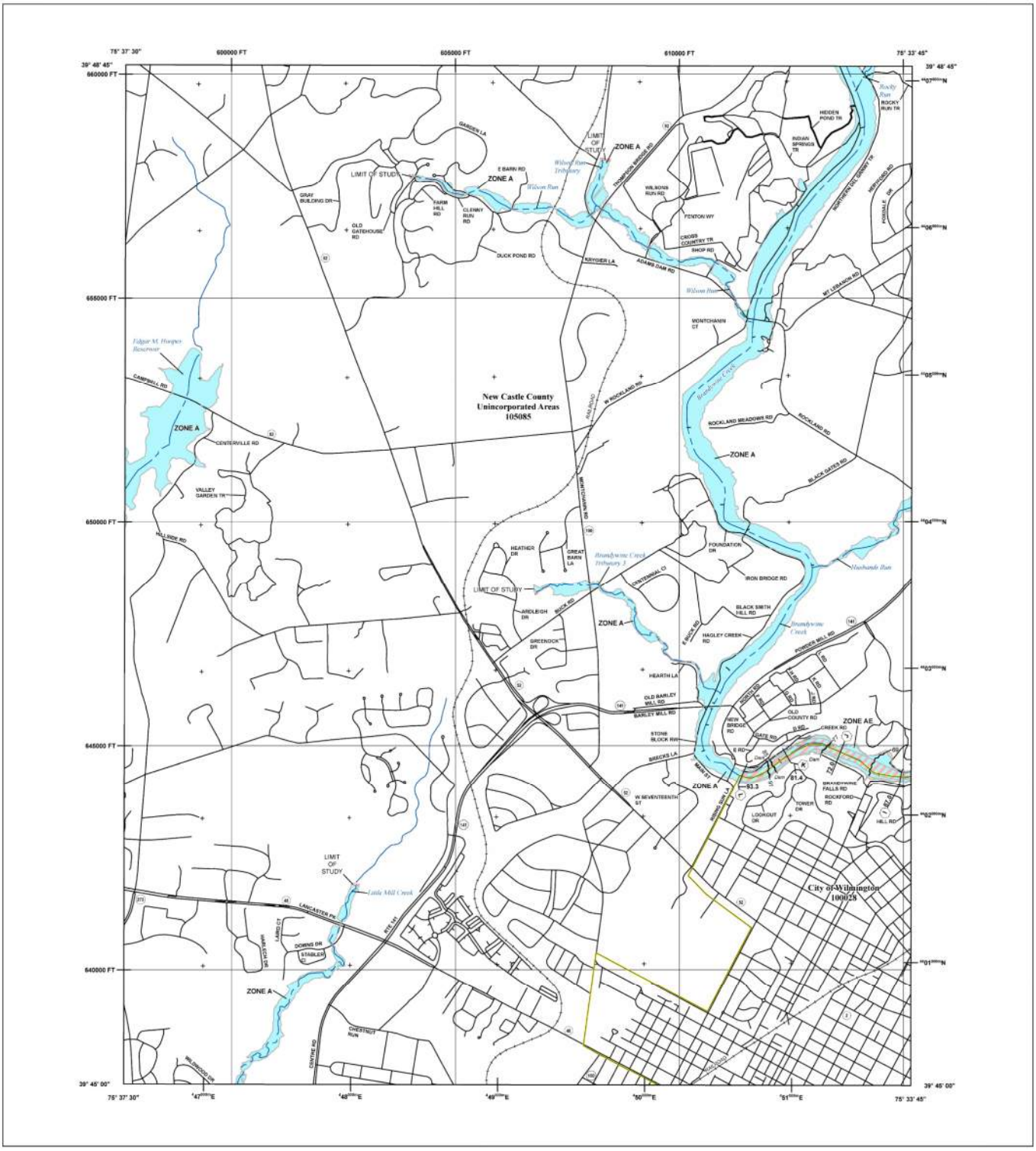
WILMINGTON, DELAWARE

PROJECT NO. :
138.004
DATE :
DEC. 12, 2001
DRAWN
RRF
CHECKED
JRD

SK-3

APPENDIX E

FEMA MAPS NEAR THE BRIDGE SITE



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT HTTP://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, AX, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee See Notes *Zone X*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- Cross Sections with 1% Annual Chance Water Surface Elevation (BFE)
- Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study (FIS) Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates refer to the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Base map information shown on this FIRM was provided in digital format by New Castle County GIS Department in 2016. For information about base maps, refer to Section 6.2 "Base Map" in the FIS Report.

SCALE

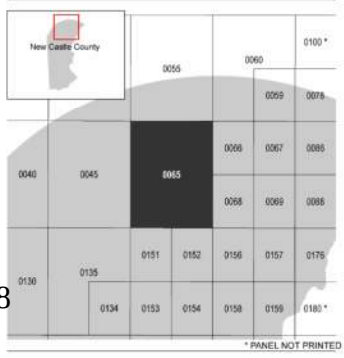
Map Projection: NAD 1983 StatePlane Delaware FIPS 0700 Feet; Western Hemisphere. Vertical Datum: NAVD 88

1 inch = 1,000 feet 1:12,000

0 1,000 2,000 4,000 Feet

0 250 500 1,000 Meters

PANEL LOCATOR



* PANEL NOT PRINTED

FEMA National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

NEW CASTLE COUNTY, DELAWARE and Incorporated Areas

PANEL 65 OF 0475

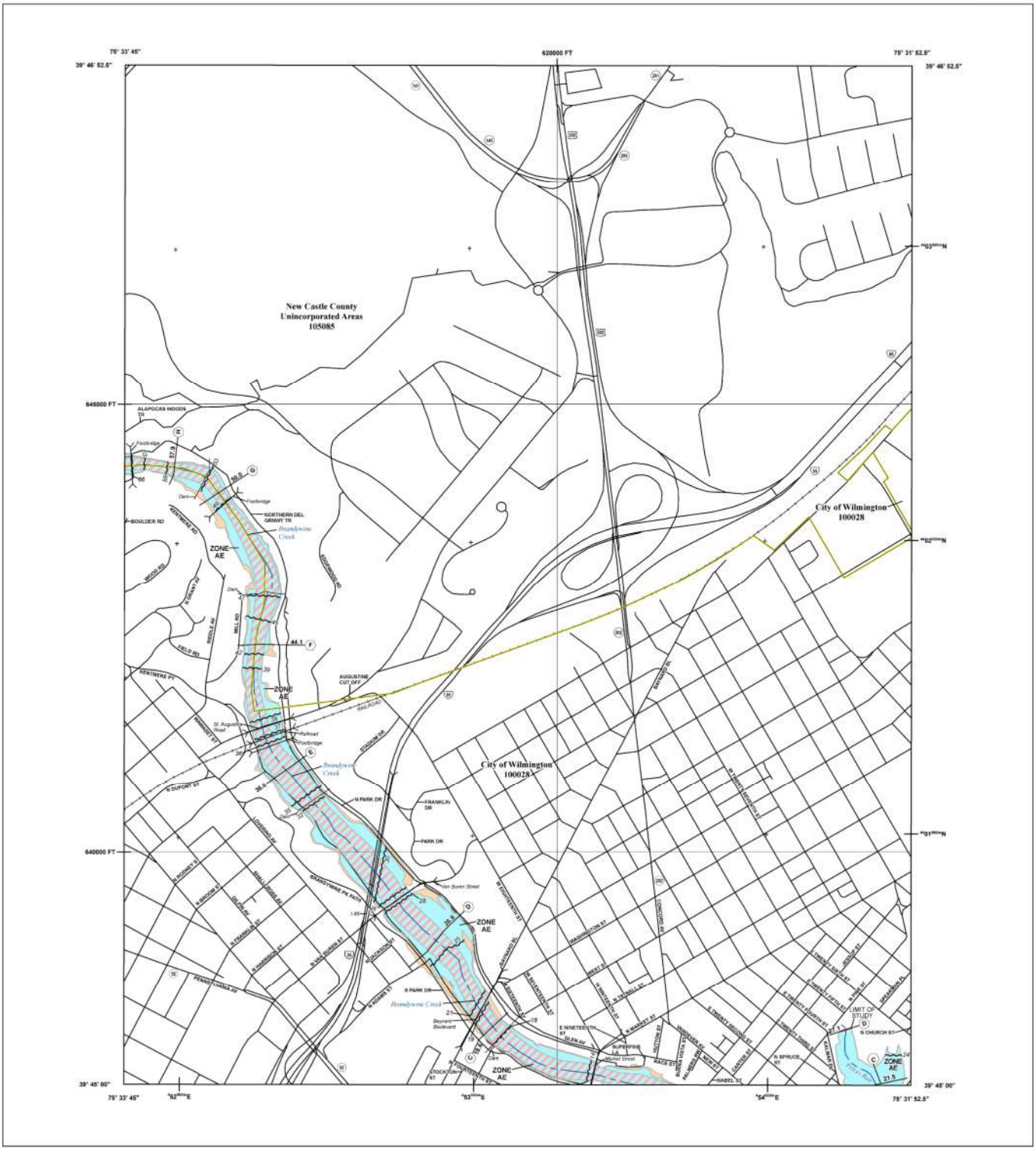
Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
NEW CASTLE COUNTY	105085	0065	K
WILMINGTON, CITY OF	100029	0065	K

VERSION NUMBER 2.3.3.3

MAP NUMBER 10003C0065K

MAP REVISED JANUARY 22, 2020



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT HTTP://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A,V,A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee See Notes *Zone X*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- Cross Sections with 1% Annual Chance Water Surface Elevation (BFE)
- Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study (FIS) Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates refer to the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Base map information shown on this FIRM was provided in digital format by New Castle County GIS Department in 2016. For information about base maps, refer to Section 6.2 "Base Map" in the FIS Report.

SCALE

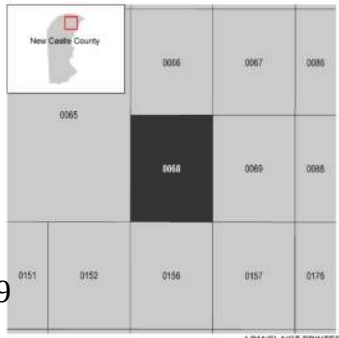
Map Projection:
NAD 1983 StatePlane Delaware FIPS 0700 Feet
Western Hemisphere, Vertical Datum: NAVD 88

1 inch = 500 feet 1:6,000

0 500 1,000 2,000 Feet

0 125 250 500 Meters

PANEL LOCATOR



* PANEL NOT PRINTED

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

NEW CASTLE COUNTY, DELAWARE
and Incorporated Areas

PANEL 68 OF 0475

Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
NEW CASTLE COUNTY	105085	0068	K
WILMINGTON, CITY OF	100028	0068	K

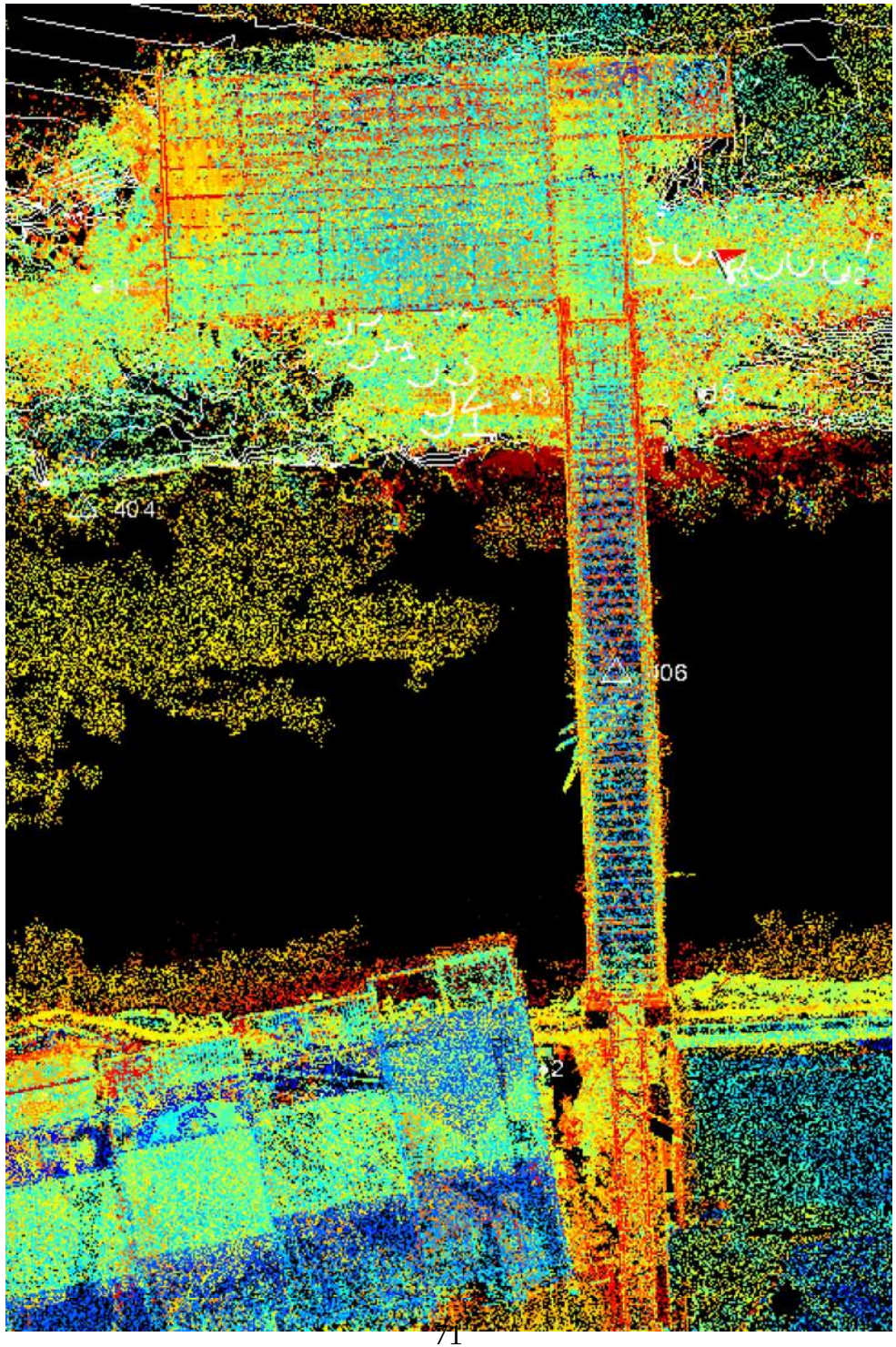
VERSION NUMBER
2.3.3.3

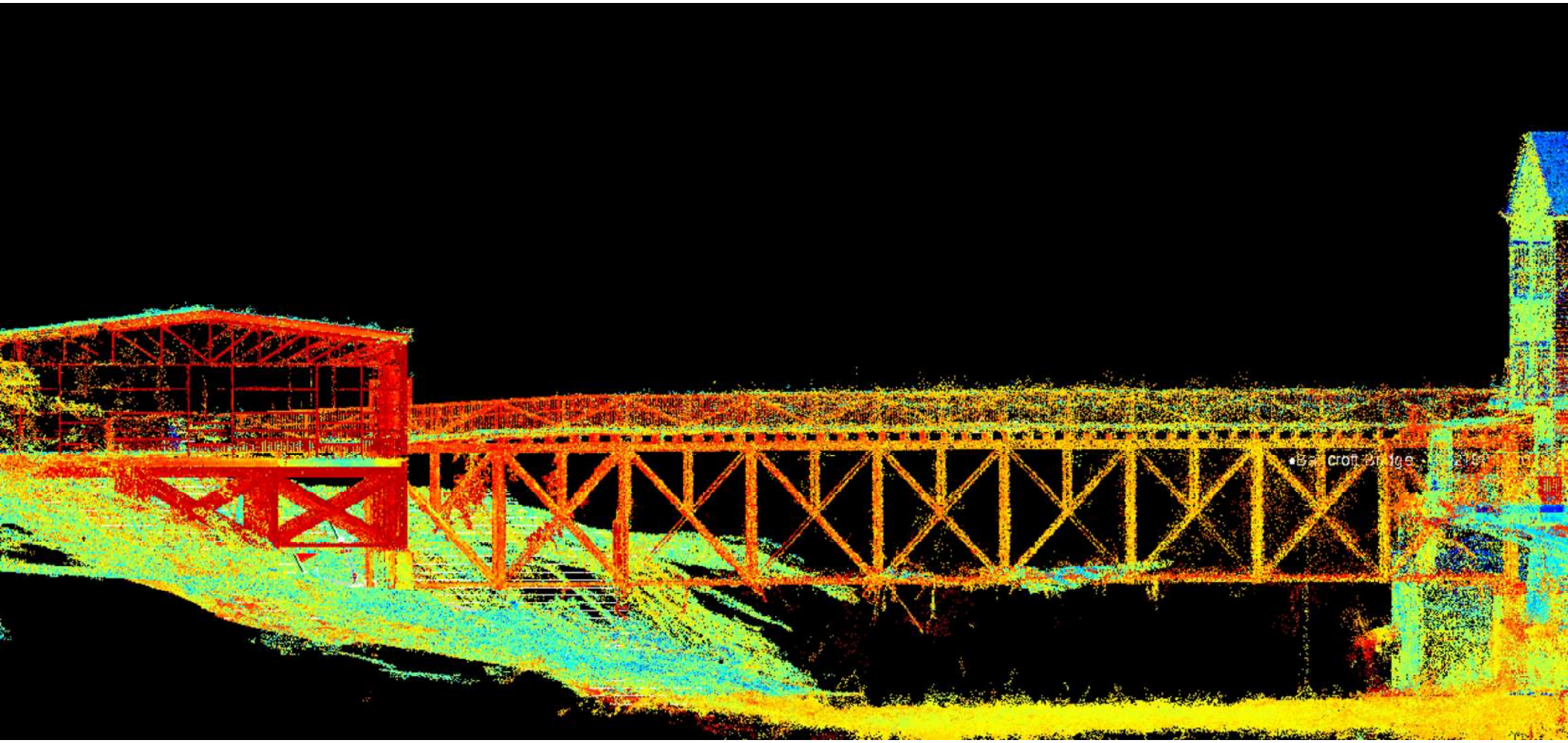
MAP NUMBER
10003C0068K

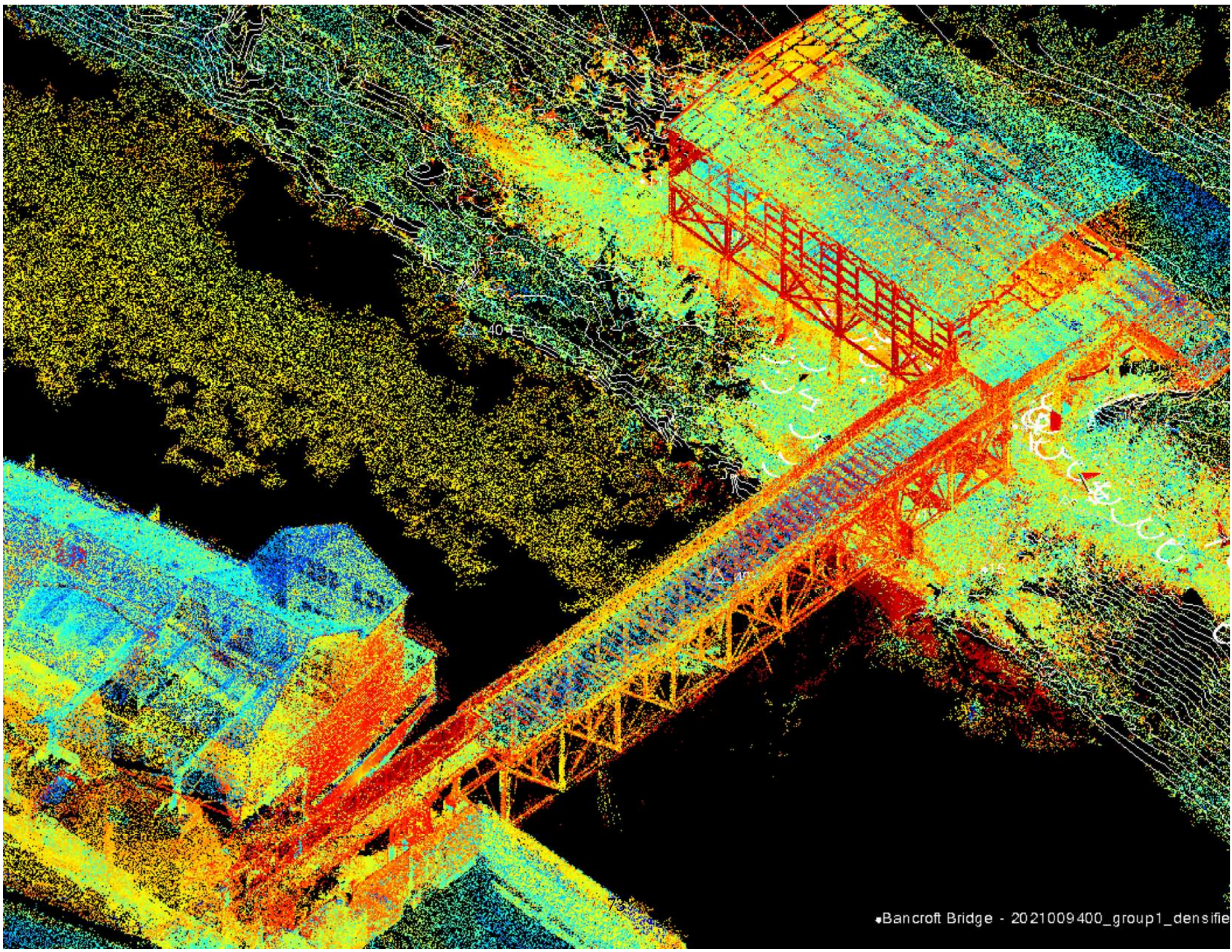
MAP REVISED
JANUARY 22, 2020

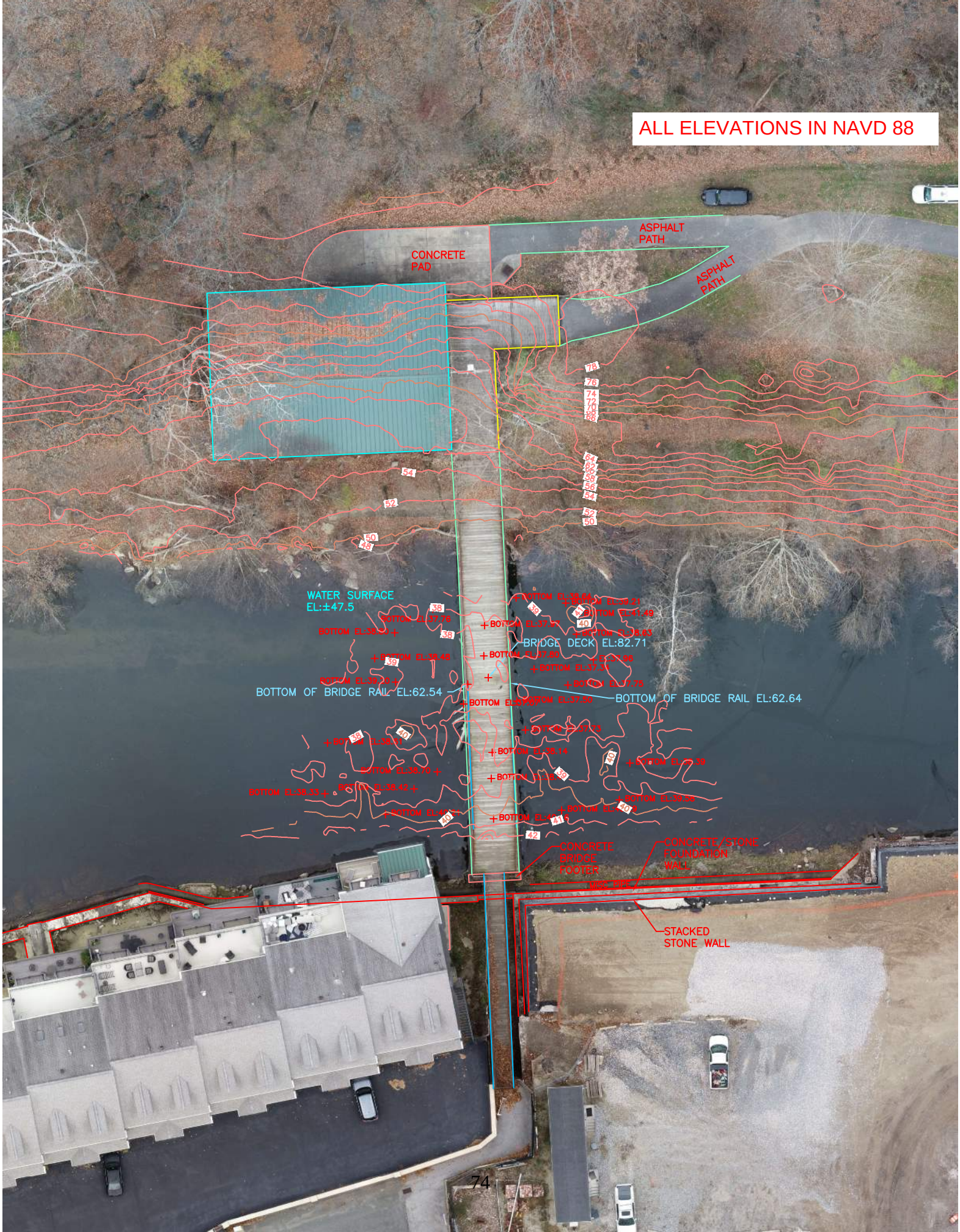
APPENDIX F

LiDAR and Hydro SURVEY RESULTS






Bancroft Bridge - 2021009400_group1_densifie

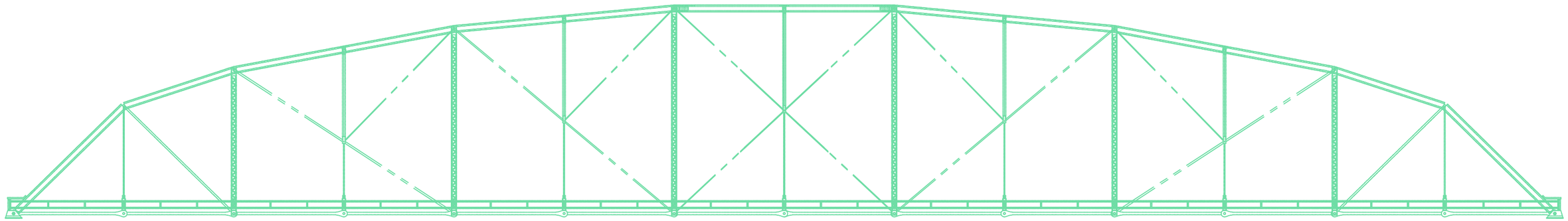

ALL ELEVATIONS IN NAVD 88
ASPHALT PATH
CONCRETE PAD
ASPHALT PATH
WATER SURFACE EL:±47.5
BRIDGE DECK EL:82.71
BOTTOM OF BRIDGE RAIL EL:62.54
BOTTOM OF BRIDGE RAIL EL:62.64
CONCRETE BRIDGE FOOTER
CONCRETE/STONE FOUNDATION WALL
STACKED STONE WALL

APPENDIX G

PLANS FOR THE 300 FT. HISTORIC BRIDGE

SANDY RIVER CONDUIT RELOCATION PROJECT

BRIDGE DISASSEMBLY/ASSEMBLY TAGGING PLAN

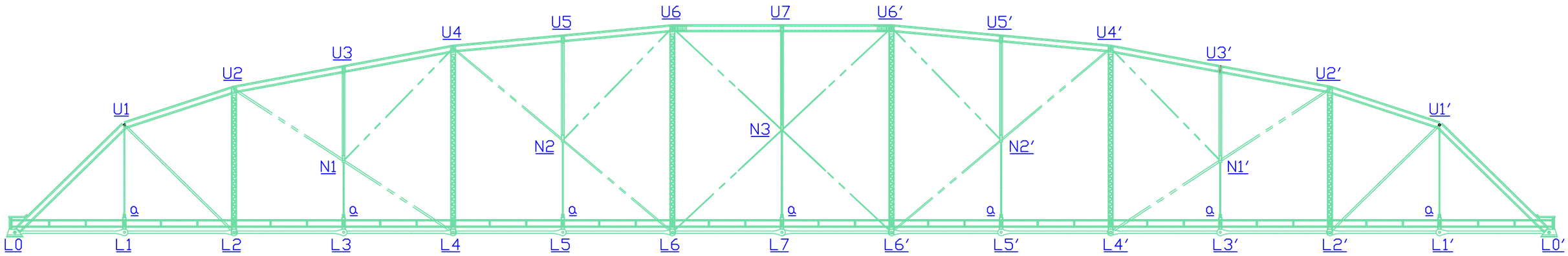


WESSLEN CONSTRUCTION, INC.

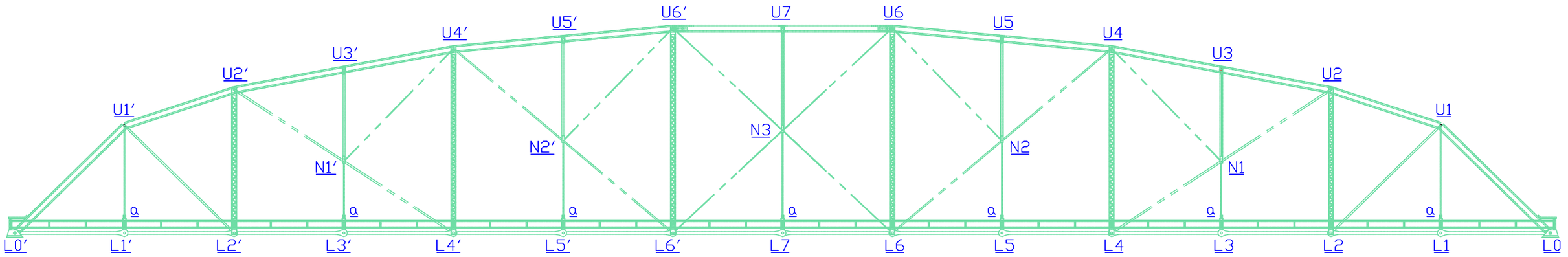
4217 E. Main

SPOKANE, WA 99202

PHONE (509) 534-4346 FAX (509) 536-4031

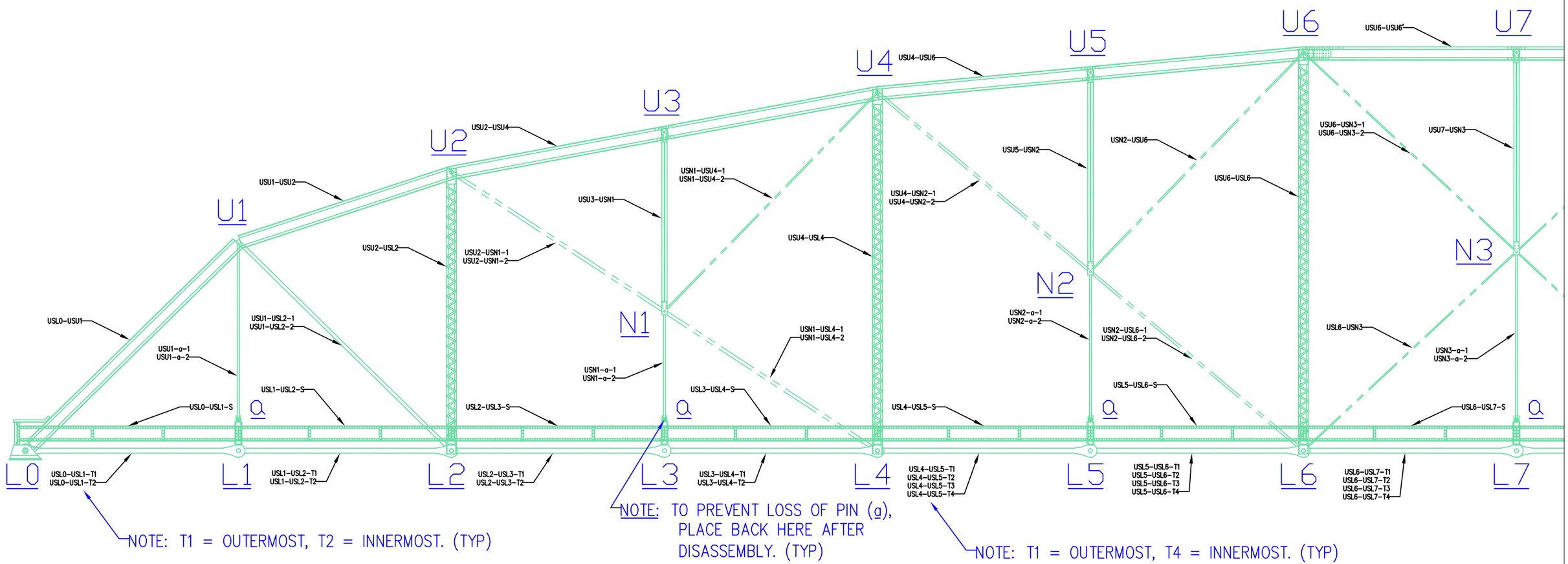


ELEVATION VIEW - UPSTREAM



ELEVATION VIEW - DOWNSTREAM

	SCALE	WESSLEN CONSTRUCTION, INC.	PROJECT	SUBJECT	SHEET
	HORIZONTAL: _____ HORIZONTAL: _____	4217 E. Main SPOKANE, WA 99202 PHONE (509) 534-4346 FAX (509) 536-4031	SANDY RIVER BRIDGE PORTLAND, OREGON	ELEVATIONS	1 OF 15



NOTE: T1 = OUTERMOST, T2 = INNERMOST. (TYP)

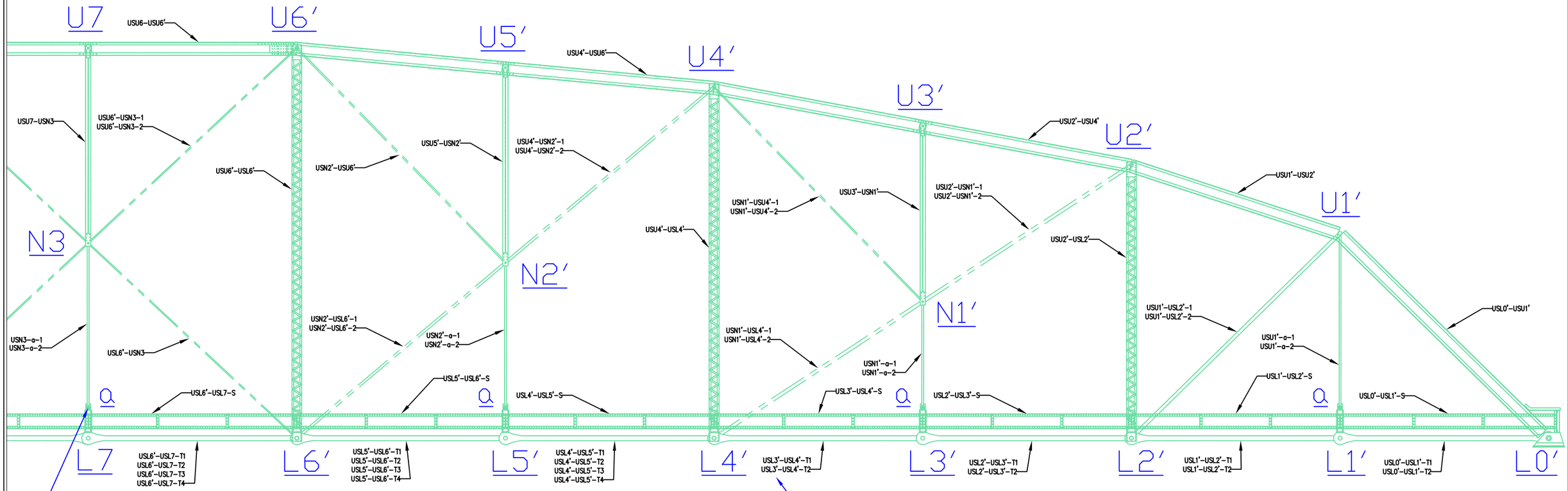
NOTE: TO PREVENT LOSS OF PIN (g), PLACE BACK HERE AFTER DISASSEMBLY. (TYP)

NOTE: T1 = OUTERMOST, T4 = INNERMOST. (TYP)

NOTES:
1. –T = TIEBAR.
2. –S = STRINGER.
3. –1 = OUTER, –2 = INNER.

PART MAP – UPSTREAM

	SCALE		PROJECT	SUBJECT	SHEET
	HORIZONTAL: _____ HORIZONTAL: _____	WESSLEN CONSTRUCTION, INC. 4217 E. Main SPOKANE, WA 99202 PHONE (509) 534–4346 FAX (509) 536–4031	SANDY RIVER BRIDGE PORTLAND, OREGON	PART MAP UPSTREAM	2 OF 15



NOTE: T1 = OUTERMOST, T4 = INNERMOST. (TYP)

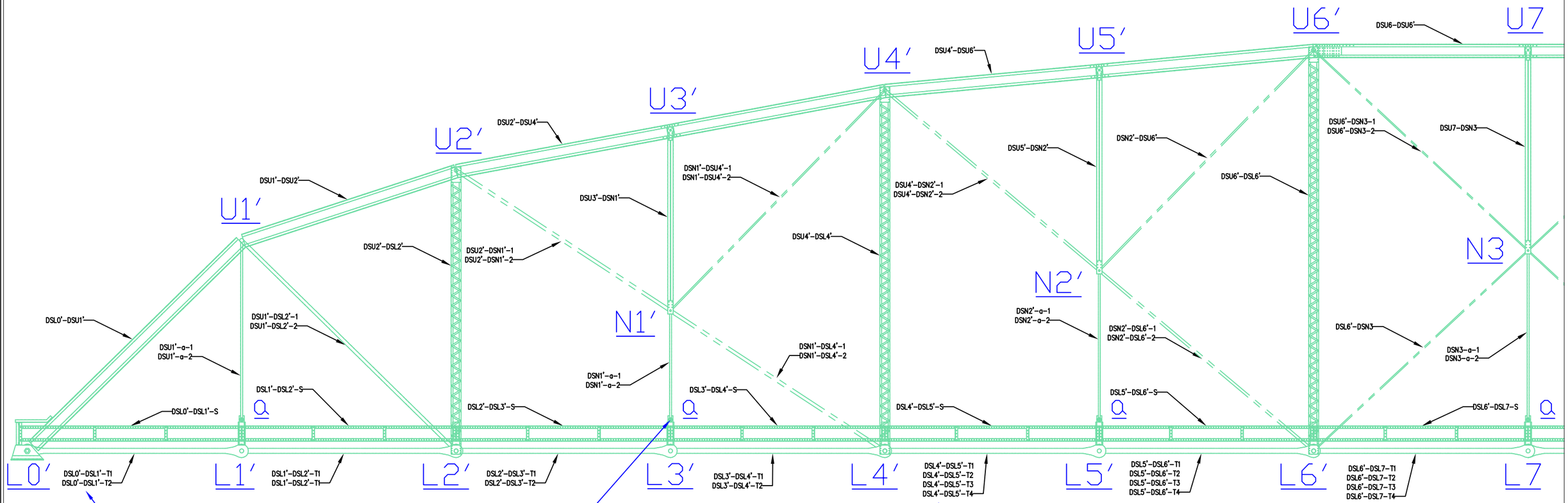
NOTE: T1 = OUTERMOST, T2 = INNERMOST. (TYP)

NOTE: TO PREVENT LOSS OF PIN (g), PLACE BACK HERE AFTER DISASSEMBLY. (TYP)

PART′ MAP – UPSTREAM

NOTES:
1. –T = TIEBAR.
2. –S = STRINGER.
3. –1 = OUTER, –2 = INNER.

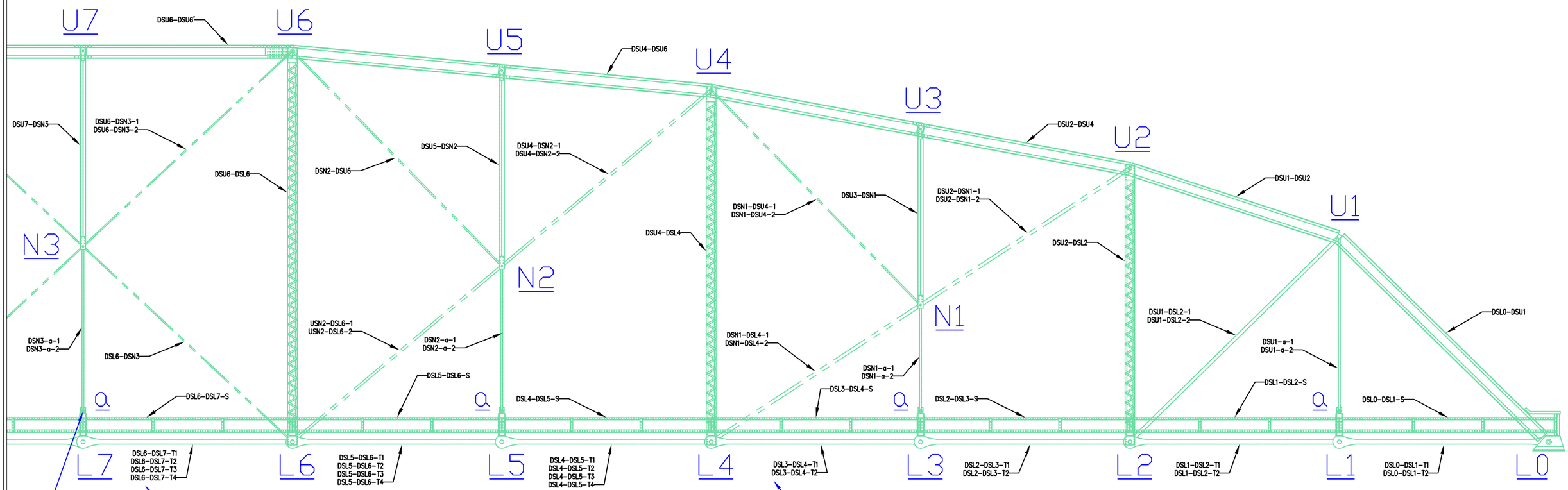
	SCALE		PROJECT	SUBJECT	SHEET
	HORIZONTAL: _____ HORIZONTAL: _____	WESSLEN CONSTRUCTION, INC. 4217 E. Main SPOKANE, WA 99202 PHONE (509) 534–4346 FAX (509) 536–4031	SANDY RIVER BRIDGE PORTLAND, OREGON	PART MAP(′) UPSTREAM	3 OF 15



NOTES:
1. –T = TIEBAR.
2. –S = STRINGER.
3. –1 = OUTER, –2 = INNER.

PART′ MAP – DOWNSTREAM

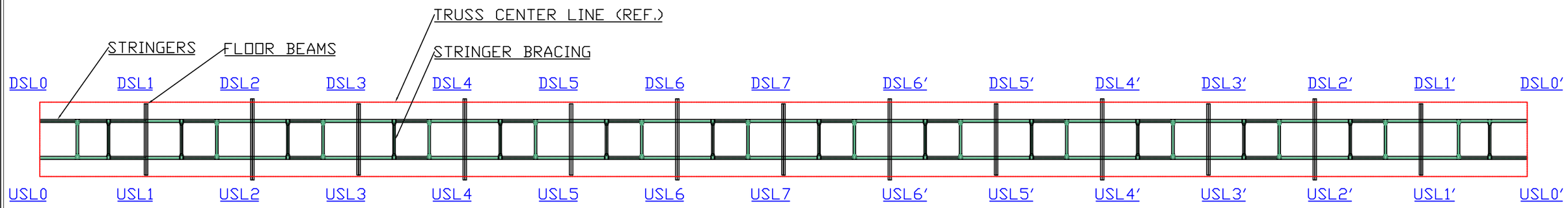
	SCALE		PROJECT	SUBJECT	SHEET
	HORIZONTAL: _____ HORIZONTAL: _____	WESSLEN CONSTRUCTION, INC. 4217 E. Main SPOKANE, WA 99202 PHONE (509) 534–4346 FAX (509) 536–4031	SANDY RIVER BRIDGE PORTLAND, OREGON	PART MAP(′) DOWNSTREAM	4 OF 15



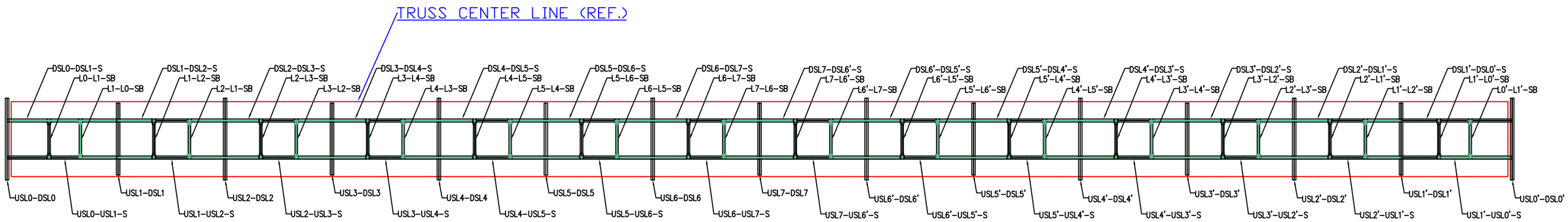
NOTES:
1. –T = TIEBAR.
2. –S = STRINGER.
3. –1 = OUTER, –2 = INNER.

PART MAP – DOWNSTREAM

	SCALE		PROJECT	SUBJECT	SHEET
	HORIZONTAL: _____ HORIZONTAL: _____	WESSLEN CONSTRUCTION, INC. 4217 E. Main SPOKANE, WA 99202 PHONE (509) 534–4346 FAX (509) 536–4031	SANDY RIVER BRIDGE PORTLAND, OREGON	PART MAP DOWNSTREAM	5 OF 15



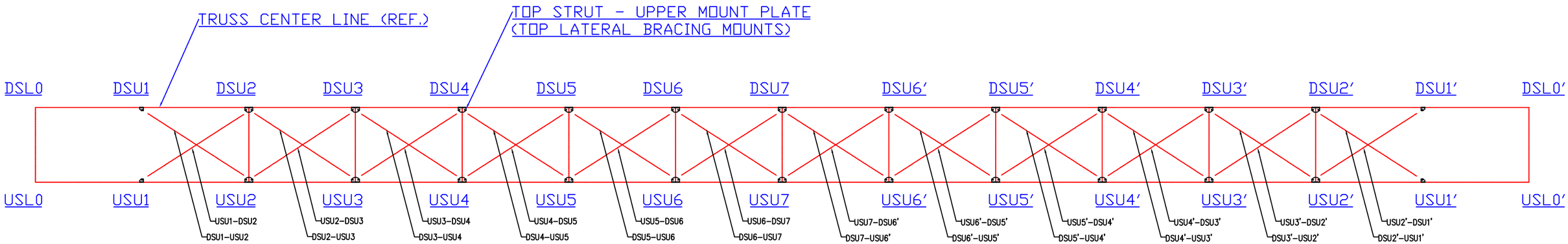
PLAN VIEW



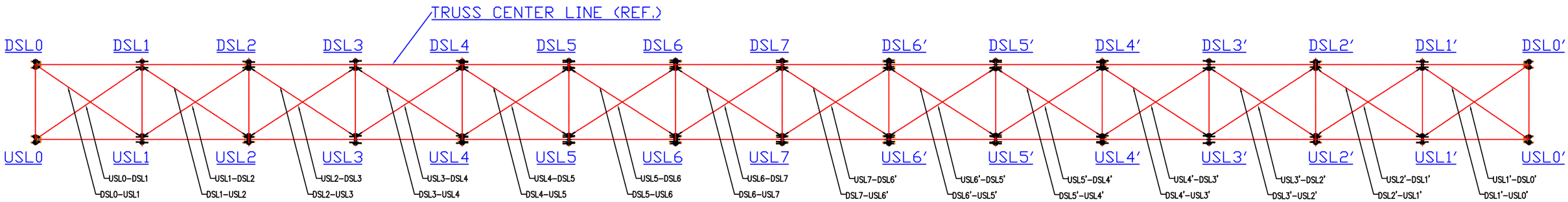
NOTES:
1. -S = STRINGER.
2. -SB = STRINGER BRACE.

PLAN VIEW

	SCALE	WESSLEN CONSTRUCTION, INC.	PROJECT	SUBJECT	SHEET
	HORIZONTAL: _____ HORIZONTAL: _____	4217 E. Main SPOKANE, WA 99202 PHONE (509) 534-4346 FAX (509) 536-4031	SANDY RIVER BRIDGE PORTLAND, OREGON	PLAN VIEWS BEAMS & STRINGERS	6 OF 15

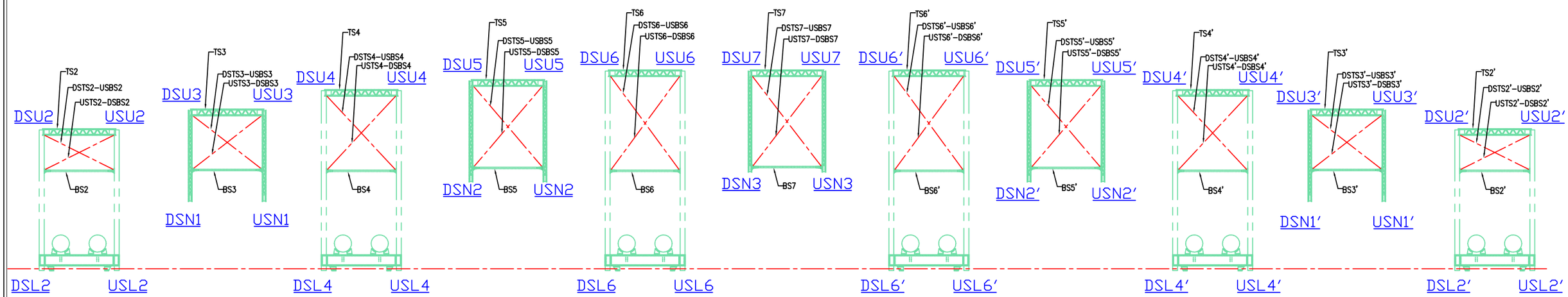


PLAN VIEW - UPPER
TOP LATERAL BRACING

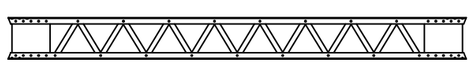


PLAN VIEW - LOWER
BOTTOM LATERAL BRACING

	SCALE		PROJECT	SUBJECT	SHEET
	HORIZONTAL: _____ HORIZONTAL: _____	WESSLEN CONSTRUCTION, INC. 4217 E. Main SPOKANE, WA 99202 PHONE (509) 534-4346 FAX (509) 536-4031	SANDY RIVER BRIDGE PORTLAND, OREGON	PLAN VIEWS LATERAL BRACING	7 OF 15



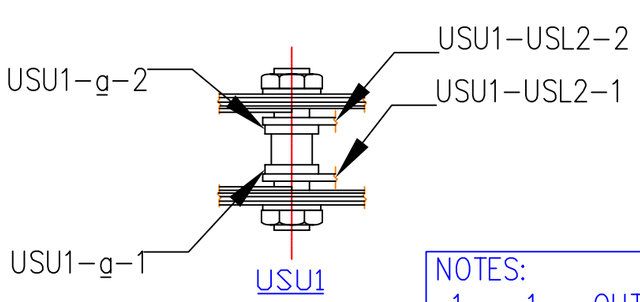
INTERIOR STRUT & CROSS TIE DETAIL VIEWS



TOP STRUT
SCALE: 4:1

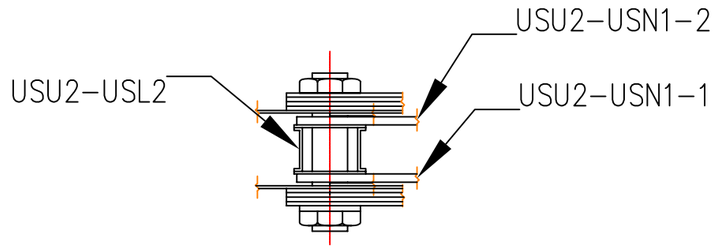
BOTTOM STRUT
SCALE: 4:1

	SCALE		PROJECT	SUBJECT	SHEET
	HORIZONTAL: _____ HORIZONTAL: _____	WESSLEN CONSTRUCTION, INC. 4217 E. Main SPOKANE, WA 99202 PHONE (509) 534-4346 FAX (509) 536-4031	SANDY RIVER BRIDGE PORTLAND, OREGON	STRUT LOCATIONS	8 OF 15

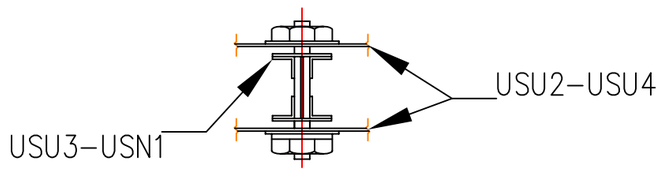


USU1

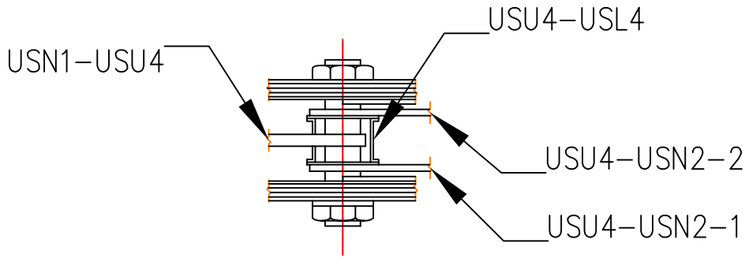
NOTES:
1. –1 = OUTER.
2. –2 = INNER.
3. REVERSE ORDER FOR DS SIDE.



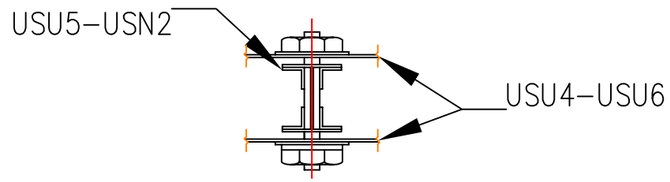
USU2



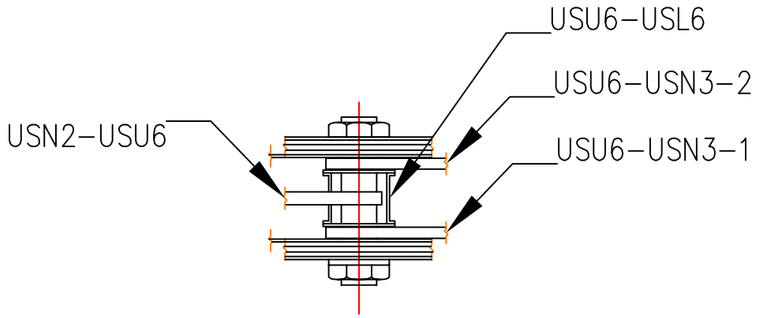
USU3



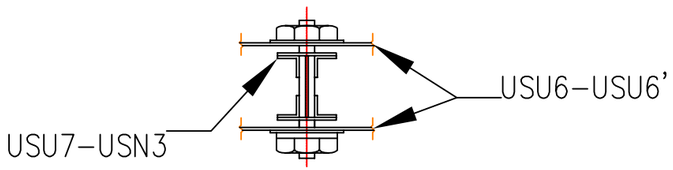
USU4



USU5

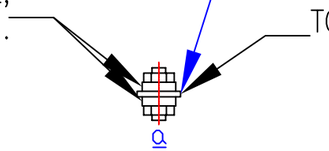


USU6



USU7

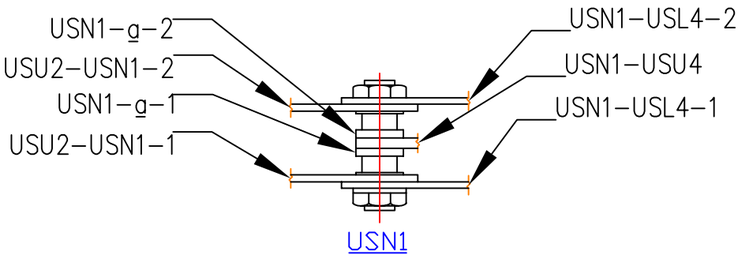
TO: USU1, USN1, USN2, USN3
USN2', USN1', USU1', DSU1',
DSN1', DSN2', DSN3, DSN2,
DSN1, & DSU1.



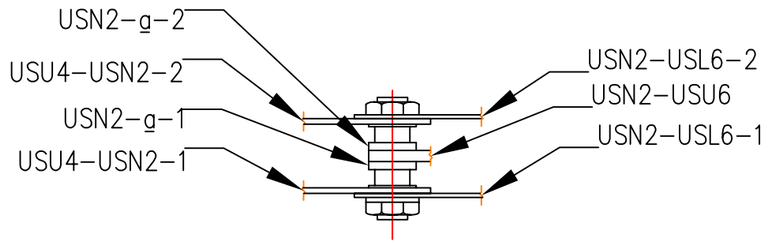
g

PIN DETAILS

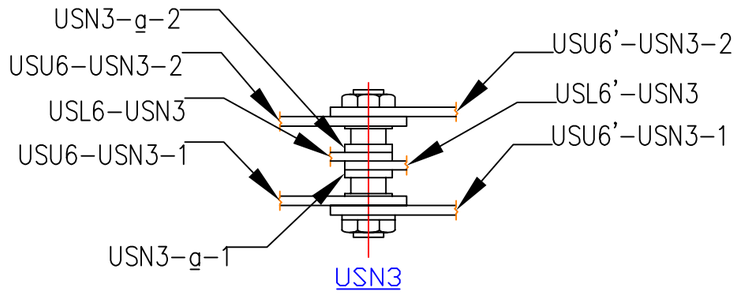
	SCALE	WESSLEN CONSTRUCTION, INC.	PROJECT	SUBJECT	SHEET
	HORIZONTAL: _____ HORIZONTAL: _____	4217 E. Main SPOKANE, WA 99202 PHONE (509) 534–4346 FAX (509) 536–4031	SANDY RIVER BRIDGE PORTLAND, OREGON	PIN DETAILS	9 OF 15



USN1

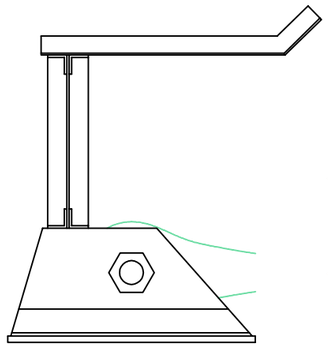


USN2

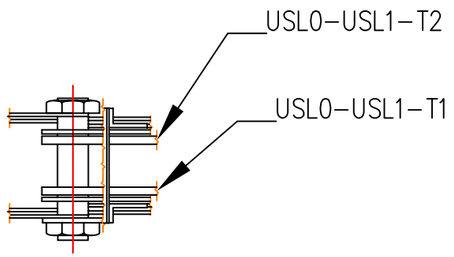


USN3

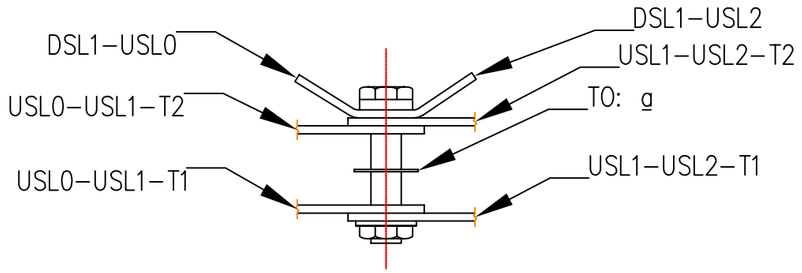
NOTES:
1. –1 = OUTER.
2. –2 = INNER.
3. REVERSE ORDER FOR DS SIDE.



USL0



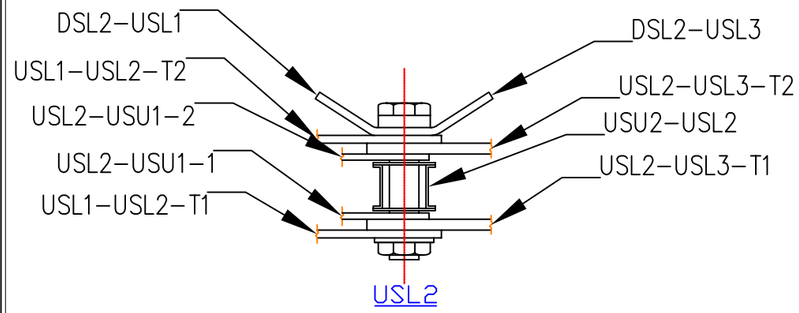
USL0

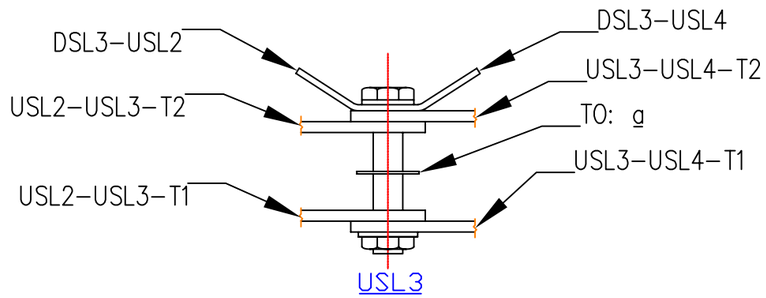


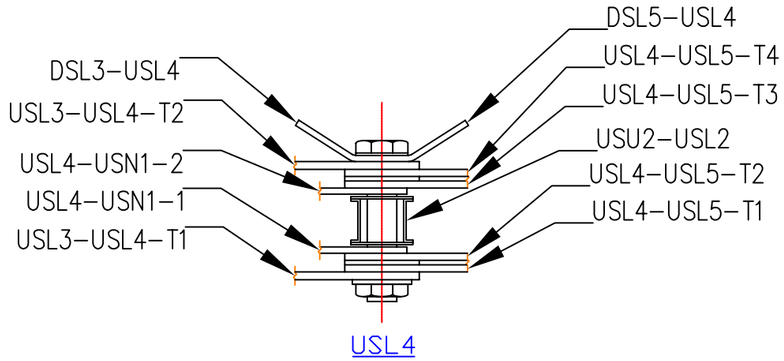
USL1

PIN DETAILS

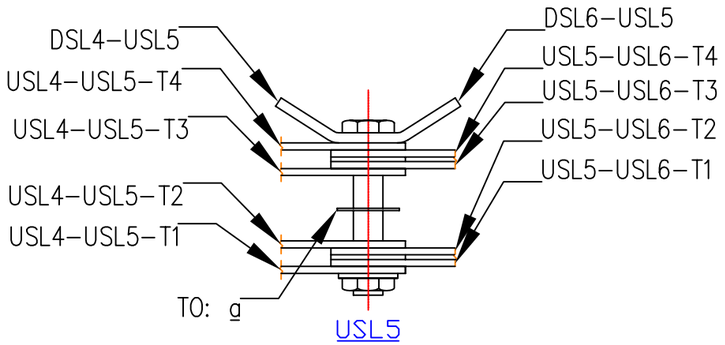
	SCALE		PROJECT	SUBJECT	SHEET
	HORIZONTAL: _____ HORIZONTAL: _____	WESSLEN CONSTRUCTION, INC. 4217 E. Main SPOKANE, WA 99202 PHONE (509) 534–4346 FAX (509) 536–4031	SANDY RIVER BRIDGE PORTLAND, OREGON	PIN DETAILS	10 OF 15

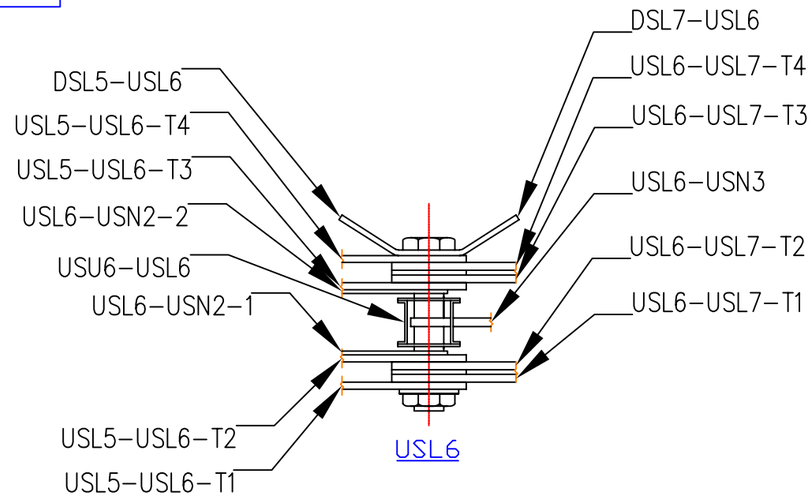


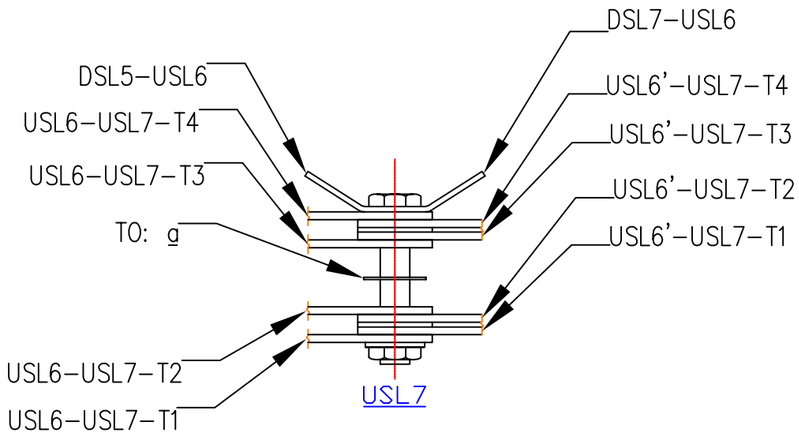




NOTES:
1. –1 = OUTER.
2. –2 = INNER.
3. –T1 = OUTERMOST, –T4 = INNERMOST.
4. REVERSE ORDER FOR DS SIDE.

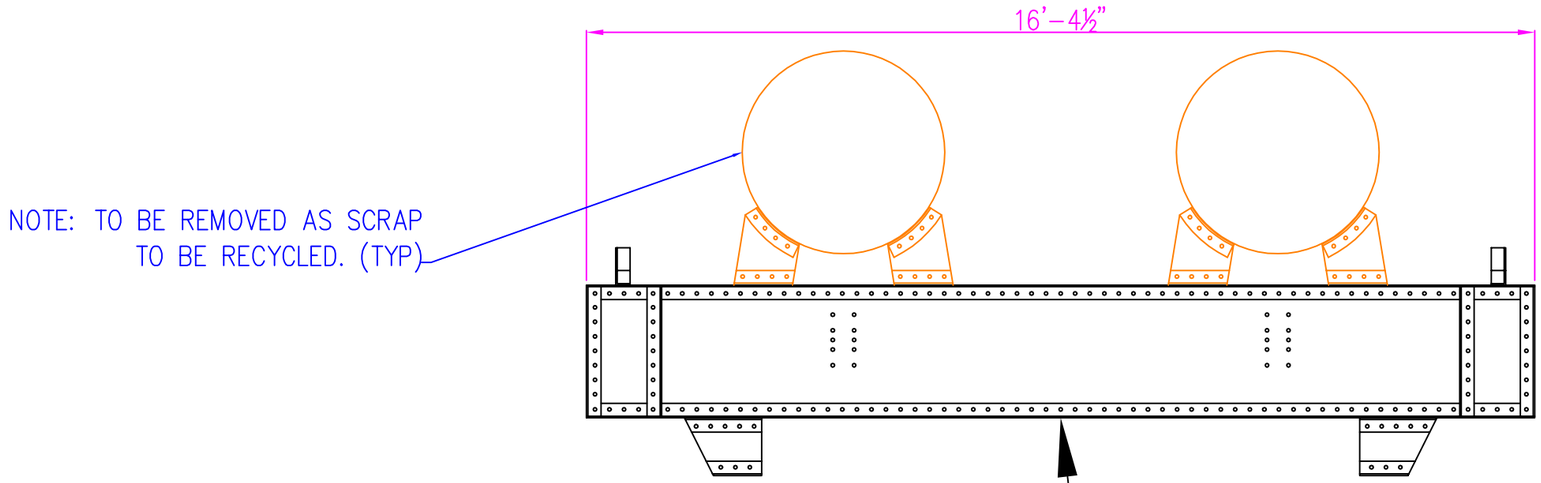


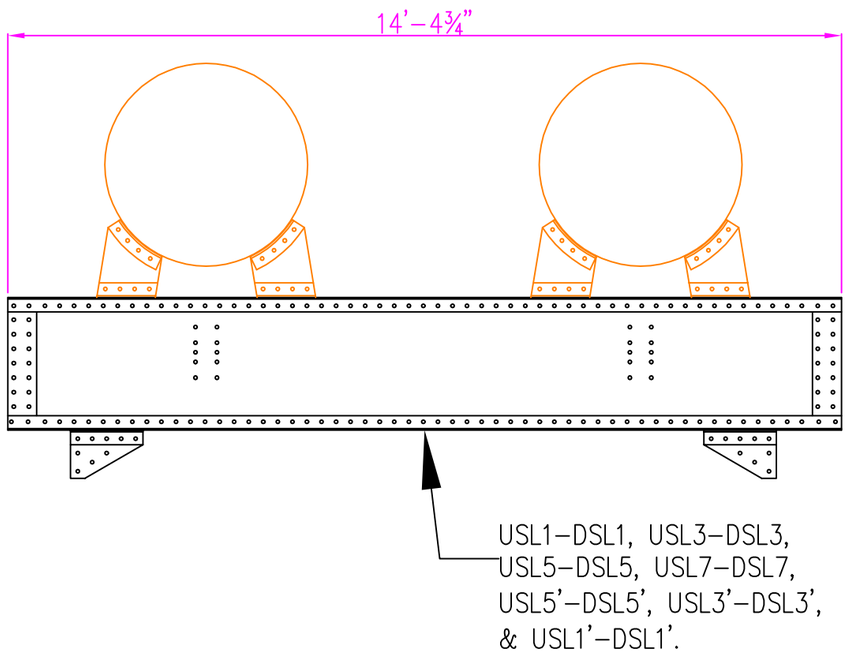




PIN DETAILS

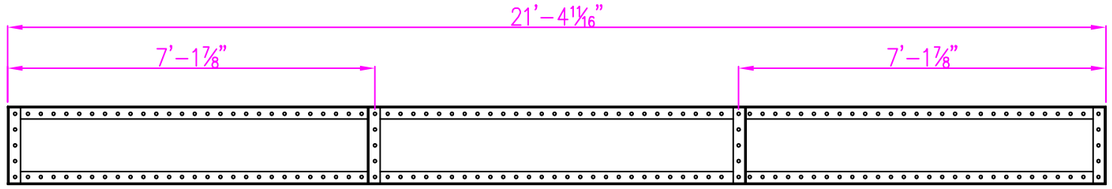
	SCALE	WESSLEN CONSTRUCTION, INC.	PROJECT	SUBJECT	SHEET
	HORIZONTAL: _____ HORIZONTAL: _____	4217 E. Main SPOKANE, WA 99202 PHONE (509) 534–4346 FAX (509) 536–4031	SANDY RIVER BRIDGE PORTLAND, OREGON	PIN DETAILS	11 OF 15

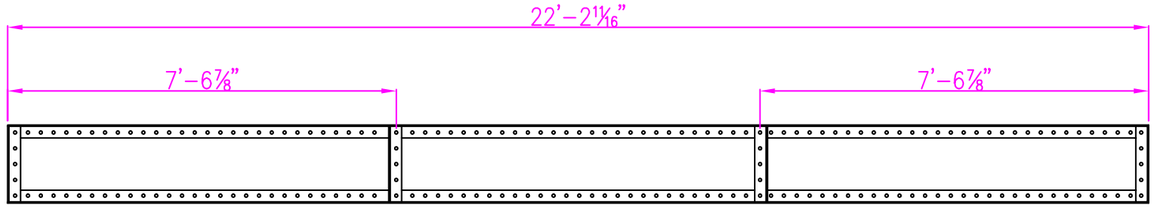


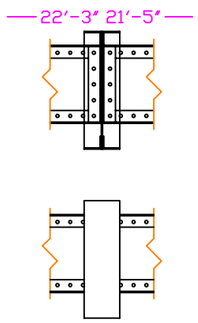


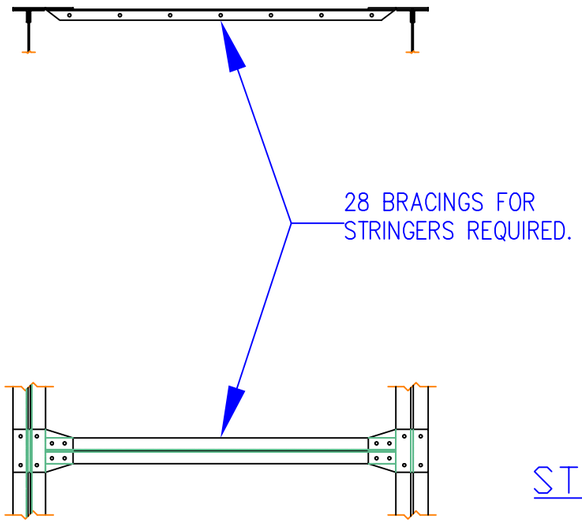
FLOOR BEAMS

	SCALE	WESSLEN CONSTRUCTION, INC.	PROJECT	SUBJECT	SHEET
	HORIZONTAL: _____ HORIZONTAL: _____	4217 E. Main SPOKANE, WA 99202 PHONE (509) 534-4346 FAX (509) 536-4031	SANDY RIVER BRIDGE PORTLAND, OREGON	FLOOR BEAMS	12 OF 15



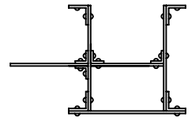






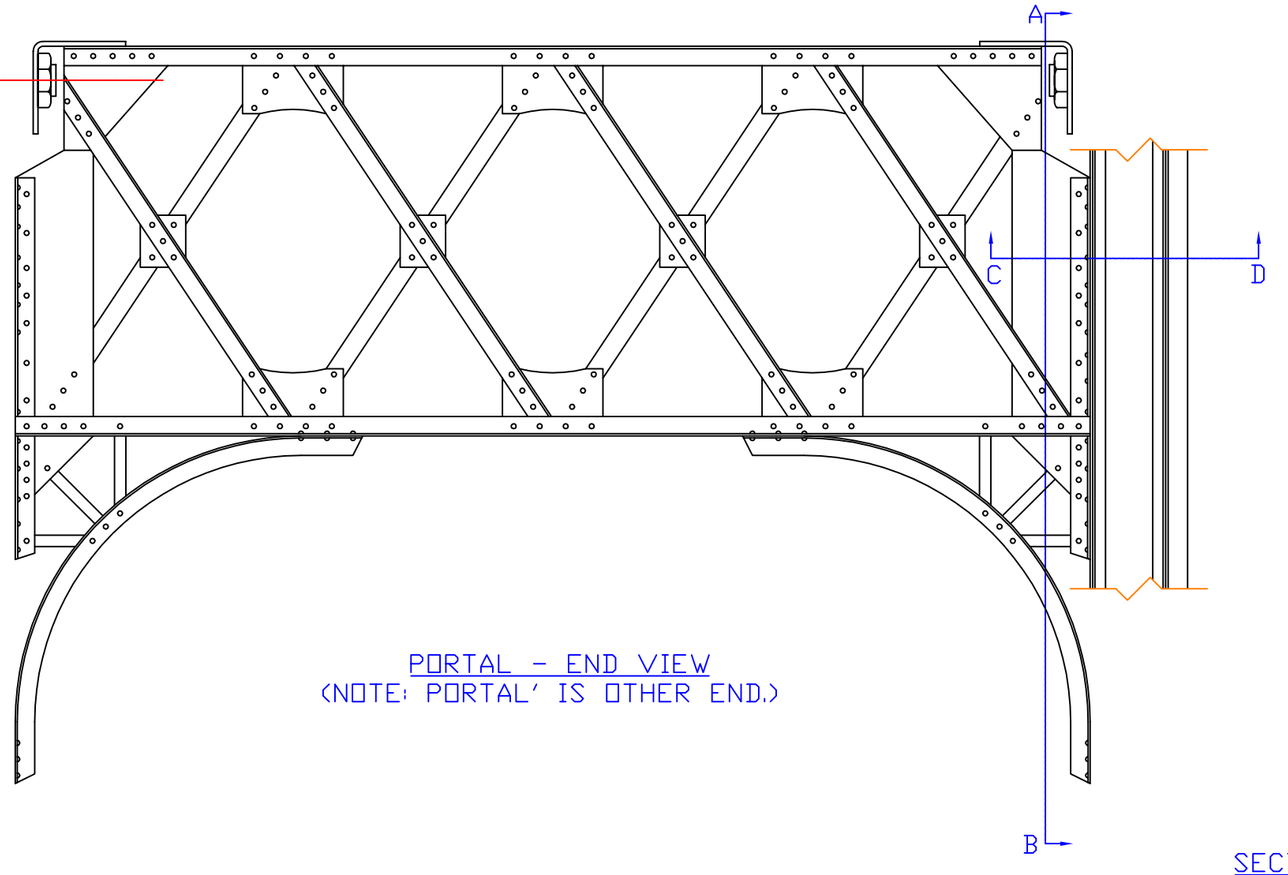
STRINGER & BRACE DETAIL VIEWS

	SCALE		PROJECT	SUBJECT	SHEET
	HORIZONTAL: _____ HORIZONTAL: _____	WESSLEN CONSTRUCTION, INC. 4217 E. Main SPOKANE, WA 99202 PHONE (509) 534-4346 FAX (509) 536-4031	SANDY RIVER BRIDGE PORTLAND, OREGON	STRINGERS	13 OF 15

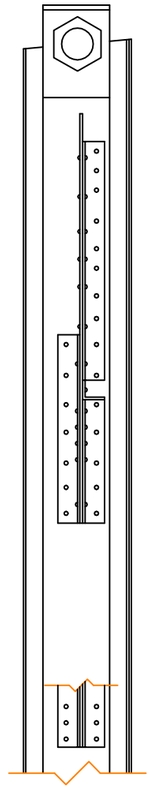


SECTION VIEW - CD

CENTER LINE
OF PIN. (TYP)



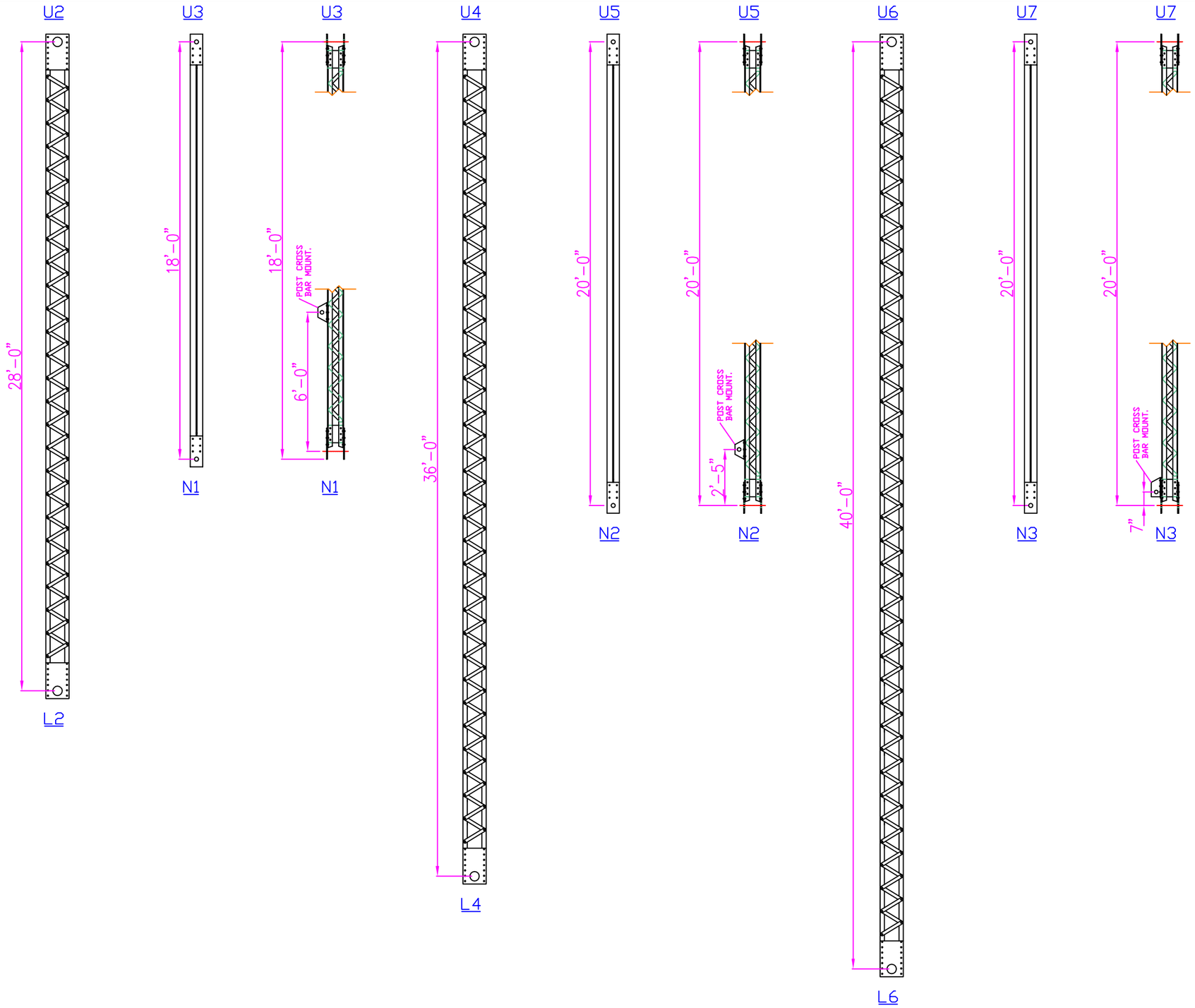
PORTAL - END VIEW
(NOTE: PORTAL' IS OTHER END.)



SECTION VIEW - AB

NOTE: PORTALS TO BE REMOVED & STORED AS SINGLE UNIT.

	SCALE	WESSLEN CONSTRUCTION, INC.	PROJECT	SUBJECT	SHEET
	HORIZONTAL: _____ HORIZONTAL: _____	4217 E. Main SPOKANE, WA 99202 PHONE (509) 534-4346 FAX (509) 536-4031	SANDY RIVER BRIDGE PORTLAND, OREGON	PORTALS	14 OF 15



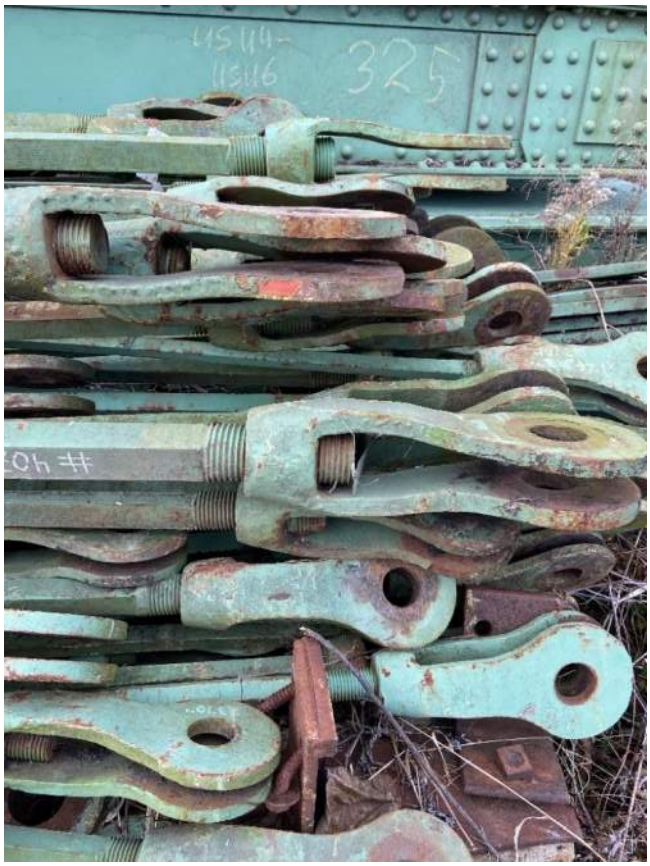
NOTE: DUPLICATE POSTS FOR U' SIDE.

	SCALE	WESSLEN CONSTRUCTION, INC.	PROJECT	SUBJECT	SHEET
	HORIZONTAL: _____ HORIZONTAL: _____	4217 E. Main SPOKANE, WA 99202 PHONE (509) 534-4346 FAX (509) 536-4031	SANDY RIVER BRIDGE PORTLAND, OREGON	POSTS	15 OF 15

APPENDIX H

HISTORIC BRIDGE SITE VISIT PHOTOS BY GPI


325


325

APPENDIX I

SCHEDULE DETAILS

Approximate Design and Construction Schedule	Option 1	Option 2	Option 3
In-depth inspection of existing bridge	1.5 months	1.5 months	-
Calculate section properties and develop analysis model	1 month	1.5 months	-
Analyze the model for design loadings	1 month	1 month	-
Permit approvals for soils exploration, borings and engineering	-	Concurrent with above work	1 month
Additional survey work	-	Concurrent with above work	Concurrent with above work
Design work and Development of repair and rehabilitation design contract drawings, specifications and cost estimates	4 months	-	-
Design work and Development of historic bridge design contract drawings, specifications and cost estimates	-	4 months	-
Design work and Development of new bridge design contract drawings, specifications and cost estimates	-	-	4 to 6 months
Reviews and comments by DNREC on Contract drawings, specifications, and cost estimates at various stages of design work	1 to 2 months	1 to 2 months	1 to 2 months
Approvals related to Cultural resources	Concurrent with above work	Concurrent with above work	Concurrent with above work
Approvals related to Environmental resources	-	-	Concurrent with above work
Approvals from SHPO, FEMA and DNREC Facilities management	-	Concurrent with above work	Concurrent with above work
Permit approvals for relocation/removal of utilities in the vicinity of the bridge	Concurrent with above work	Concurrent with above work	Concurrent with above work
Right of way acquisition on South end	-	Concurrent with above work	-
Advertisement and procurement	2 to 4 months	2 to 4 months	2 to 4 months
Construction of repairs and rehabilitation of the existing bridge (see Page 13 of report)	1.8 years	-	-
Construction of historic bridge (see Page 17 of report)	-	1.83 years	-
Construction of new prefabricated bridge (see Page 22 of report)	-	-	1.17 years
Approximate Total Time to reopen the bridge	2.5 to 3 years	2.5 to 3 years	1.5 to 2 years