

# DICK HENDERSON BRIDGE

STATE PROJECT S220-P25-0.05 00  
FEDERAL PROJECT BR-0025(102)E

ST. ALBANS, WV AND NITRO, WV

## PUBLIC INFORMATIONAL WORKSHOPS

March 7, 2011 – St. Albans High School

March 8, 2011 – Nitro High School

4:00 - 7:00 PM

*Brief Project Overview Presentation at 5:30 PM Each Day*



## Introduction

The West Virginia Division of Highways (WVDOH), in cooperation with the Federal Highway Administration (FHWA), is considering alternatives for rehabilitating or replacing the Richard J. “Dick” Henderson Memorial Bridge, also known as the St. Albans-Nitro Bridge or Dick Henderson Bridge. This bridge provides access over the Kanawha River connecting West Virginia Route 25 (WV 25) in the city of Nitro to US 60 (Maccorkle Avenue) in the city of St. Albans, in Kanawha County, West Virginia (Figure 1). The roadway crossing the bridge is the WV 25 Spur, known locally also as Center Street or 3<sup>rd</sup> Street.

The Dick Henderson Bridge was constructed in 1934 by the McClintic Marshall Corporation of Bethlehem, Pennsylvania, and is eligible for listing on the National Register of Historic Places. The structure consists of a three span cantilever Warren through truss with an overall length of 1,367 feet. It is comprised of two principal components: the piers, which are the main supports founded on ground below the river mud; and the truss superstructure, which carries the traffic across the piers. The Dick Henderson Bridge has two 10-foot lanes, one northbound and one southbound, with no shoulders and a 4-foot wide sidewalk on the downstream side. The bridge’s functional capacity is approximately 15,000 vehicles per day, while year 2000 traffic data indicated an average volume of 19,100 vehicles per day crossing the bridge.

## Project Purpose and Need

### *Project Need*

The replacement of the Dick Henderson Bridge is necessitated by its current condition. Deterioration of the Dick Henderson Bridge has warranted the placement of a 12-ton weight restriction for vehicles using the bridge. The weight restriction limits use to cars and light commercial trucks and excludes heavy trucks and buses. As the bridge further deteriorates, additional weight restrictions would likely be required to further restrict usage of the bridge. These restrictions would seriously hamper the flow of goods and services (e.g., first responders, EMS, and fire departments) between St. Albans and Nitro.

Eventually, deterioration would likely result in the closing of the Dick Henderson Bridge, necessitating detours - employing either the Kanawha River Interstate 64 bridge between Nitro and Teays Valley, West Virginia, approximately five miles downstream to the west, or the Dunbar Bridge between Spring Hill and Dunbar, approximately six miles upstream to the east.

Travel, both vehicular and pedestrian, across the existing bridge is restricted by the narrow travel lanes, narrow sidewalk, lack of shoulders, and weight restriction. Specifically:

- To facilitate heavy truck traffic, current design standards require that travel lanes be at least 11 feet wide, and even wider lanes would improve traffic flow; however, the Dick Henderson Bridge currently has two 10-foot travel lanes;
- Current design standards require a 5-foot wide sidewalk to provide safe passage, particularly for wheelchairs; the sidewalk on the Dick Henderson Bridge is only 4 feet wide;
- With no shoulders alongside the travel lanes, the bridge is not conducive to bicycle use, and does not provide areas for disabled vehicles to avoid blocking a travel lane;
- The 12-ton weight limit imposed in 2008 on the Dick Henderson Bridge for safety reasons also limits the usefulness of the bridge. Full size fire trucks generally weigh at least 14 tons, and full-sized school buses can be over 14 tons as well.

Engineering design standards are addressed in greater detail in the “Preliminary Comparison of Alternatives” section.



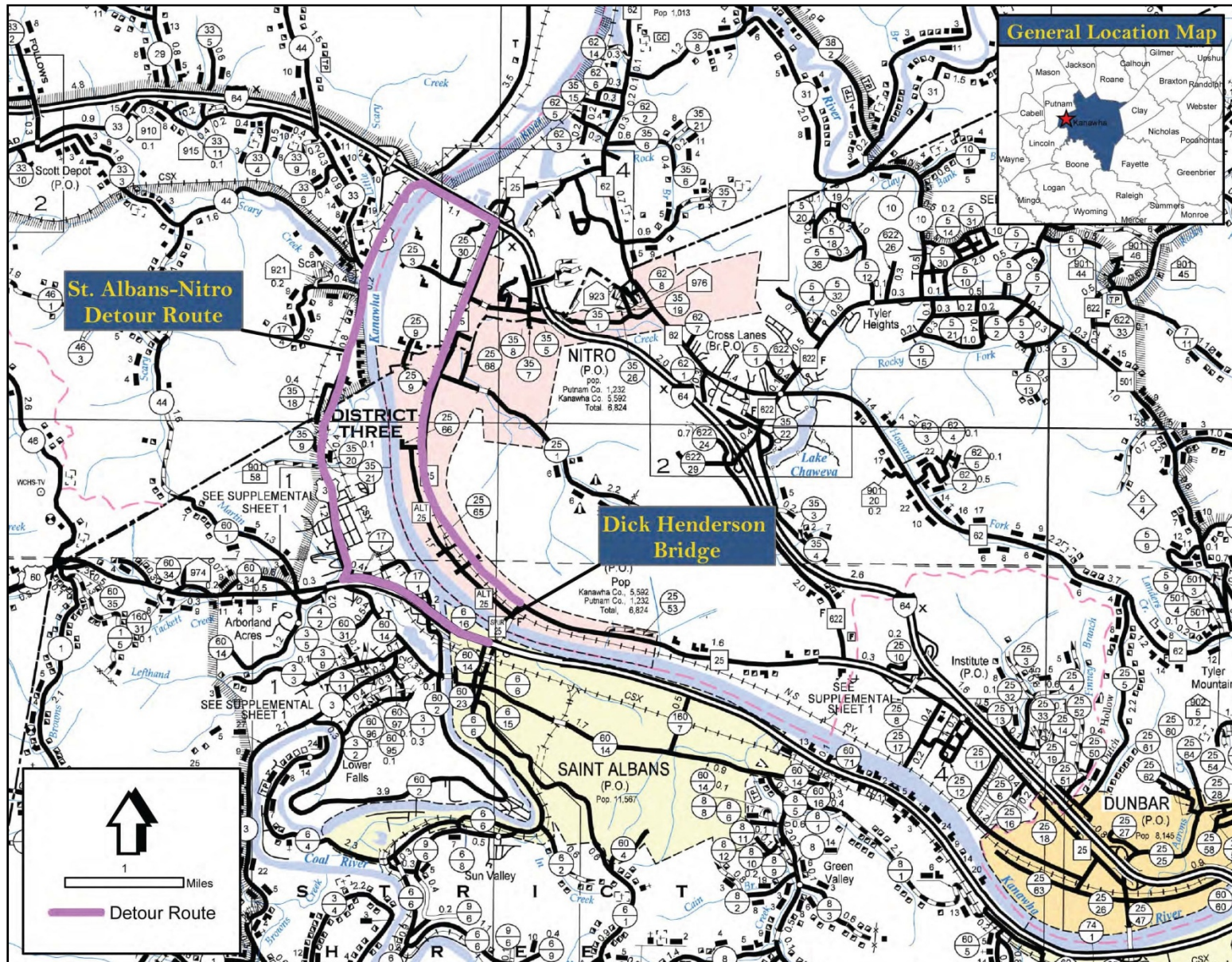


Figure 1: Project Area

While the piers of the Dick Henderson Bridge were not designed to current standards, their condition was not what necessitated the existing 12-ton weight limit. Rather, the superstructure has deteriorated to a point where the weight limit needed to be imposed. Current studies have confirmed that the bridge piers could remain in use without a weight restriction and do not require replacement. Therefore, while the bridge piers could be improved to meet current design standards, complete replacement of the bridge piers is not a project need.

In summary, the Nitro and St. Albans communities have the following needs related to the Dick Henderson Bridge:

- Avoidance of permanent bridge closure.
- Improved safety of the bridge, through such measures as providing shoulders and wider travel lanes.
- Maintained or improved service of the bridge, through such measures as avoiding additional weight limits or removing the weight limit and providing a wider sidewalk.

### ***Project Purpose***

Based on the needs discussed in the previous section, a project purpose has been developed. The purpose of the project is to rehabilitate or replace the existing Dick Henderson Bridge utilizing the existing river piers so that the rehabilitation or replacement meets current design standards to efficiently and effectively serve the transportation needs of first responders (e.g., fire trucks, ambulances, and hazardous materials response vehicles), through travelers, and the residential, commercial, and business communities of the cities of St. Albans and Nitro, West Virginia.

## **Preliminary Comparison of Alternatives**

WVDOH has developed six alternatives for analysis and consideration. The project study process under the National Environmental Policy Act (NEPA) requires additional detailed studies to assess the environmental impact of each of the alternatives. However, for this workshop some general means of comparing the preliminary alternatives have been developed; these factors are discussed below and are addressed in a comparison table for your consideration.

### ***Projected Time of Closure***

Because there are no other crossings of the Kanawha River for approximately five miles to the west and six miles to the east of the Dick Henderson Bridge, closing of this bridge for construction would impose a substantial inconvenience to residents and businesses. Therefore, the length of time that detours would be required during construction of an alternative is an important project issue. The estimated number of calendar days the river crossing would be closed is shown in Table 1 for each alternative.

### ***Projected Cost***

Project cost is obviously an important consideration. However, because the alternatives are in the very early stages of engineering design and because of unknown external issues (e.g., cost of materials and inflation), it is not possible to develop an absolute cost at this time. Therefore, costs for each alternative presented in Table 1 are expressed as a range of estimated cost. As the project develops, these costs will be continually refined.

### ***Risk (Added Construction Cost and Project Schedule)***

Despite the best efforts of engineers at developing preliminary estimates for project cost and time required for construction, these elements can unpredictably change because of external events (such as labor costs, material costs, weather, etc.) not under the control of WVDOH. The risk of this happening for any given alternative is

different based on uncertainties associated with each of the alternatives. For example, in the truss rehabilitation alternatives, it may not be known which elements of the current superstructure can be re-used until the superstructure is being removed, and, therefore, more time and cost may be incurred to complete those alternatives. In Table 1, risks are rated for each alternative as “High, “Medium,” or “Low.”

### ***Design Standards***

Over time, engineering design standards have been developed to assure safe and consistent standards are applied to transportation projects. The most current design standards are required by WVDOH and FHWA and are contained in the WVDOH publications *Design Directives* (2006) and *Bridge Design Manual* (2004) and the American Association of State Highway and Transportation Officials (AASHTO) publications *A Policy on Geometric Design of Highways and Streets* (2004) and *AASHTO LRFD Bridge Design Specifications, 5th ed.* (2010). Design standards applicable to the Dick Henderson Bridge are those specific to bridges and to roadways classified as a Principal Arterial, Urban roadway.

There are many design standards that would have to be incorporated to any of the alternatives, but two of the more general design standards that will assist in the comparison among the alternatives are lane width and shoulder width. To meet current design standards, the rehabilitated or new roadway must have at least 11-foot travel lanes for allowing heavy trucks and shoulders that are a minimum of two feet wide. An additional element is the height of the truss bridge structure above the travel lanes (the vertical clearance), which is required to be 17.5 feet by current design standards.

With regard to sidewalks, the WVDOH Design Directives require 5-foot wide areas for pedestrians and wheelchairs to safely pass one another at least every 200 feet. Therefore, in order to meet current design standards, the bridge would either have to have a 5-foot wide sidewalk or have areas of 5-foot wide sidewalk at 200-foot intervals along its entire length (over 1,300 feet, including approaches).

WVDOH is aware that the current grade (steepness) of the bridge approaches has been a concern for some travelers. The current maximum grade on the bridge is 7% and meets current design standards, which can actually range from 7% to 11% at this location. However, care is being taken in the design of alternatives to minimize the grade as much as possible.

### ***Other Factors***

Among other factors for comparing the alternatives are possible impacts to property of residences or businesses and possible impacts to traffic flow. Specifically:

- whether or not the alternative would require relocation of a residence or business;
- whether or not the alternative would require the temporary or permanent use of right-of-way not currently used for transportation; and
- whether or not the alternative provides an additional lane to improve the flow of traffic.

## **No Build Alternative**

The No Build Alternative would involve taking no action other than routine maintenance activities, allowing the Dick Henderson Bridge to continue to operate under existing conditions. Allowing the deterioration to continue would eventually result in posting additional weight restrictions on the bridge and ultimately its permanent

closure. As discussed above, closing the bridge would require the diversion of traffic over detour routes and would result in lost time and additional costs.

The No Build Alternative would not provide a structure that meets current design standards and would not be able to maintain or improve the services the bridge currently provides travelers. Therefore, the No Build Alternative would not meet the project purpose and need. However, environmental regulations (NEPA) require that it be retained in the environmental assessment process as a basis for comparison with other alternatives.

## **Build Alternatives**

WVDOH has developed six preliminary Build Alternatives for improving conditions of the Dick Henderson Bridge crossing. Each of these alternatives is summarized in the following paragraphs and shown graphically at the end of this handout. Alternatives 1 and 2 rehabilitate the existing superstructure (bridge truss), and Alternatives 3, 4, 5, and 6 replace the superstructure. All alternatives involve rehabilitating the existing river piers and removing and replacing the approach structures (abutments) on both sides of the river. All alternatives eliminate the bridge's weight restriction.

### **Alternative 1: Rehabilitate Current Truss Superstructure with Sidewalk to Inside**

This alternative was designed to provide minimal changes to the Dick Henderson Bridge while improving conditions and eliminating the weight restriction. The truss bridge is one of the oldest types of modern bridges, and consists of vertical and horizontal connected elements (members). Alternative 1 raises the cross-bracing of the bridge's truss to achieve 17.5 feet of vertical clearance (see "Design Standards" above). This alternative reduces the sidewalk width to 3 feet, 5 inches, which would not meet current design standards, and reduces the vehicle lanes to 9 feet, 10 inches. Alternative 1 does not include shoulder improvements or an additional vehicle lane.

This alternative does not require any relocations or any additional right-of-way for construction. The estimated cost for Alternative 1 is \$27-30 million, and its construction requires closing the river crossing for 360-520 calendar days. The risk for the cost and closure days to increase is high.

Although Alternative 1 provides some improvements to service, including removal of the weight restriction, Alternative 1 does not meet current design standards; therefore, Alternative 1 does not fulfill the project's purpose and need.

### **Alternative 2: Rehabilitate Current Truss Superstructure with Sidewalk Cantilevered to Outside**

This alternative also rehabilitates the existing truss of the Dick Henderson Bridge. Alternative 2 raises the cross-bracing of the bridge's truss to achieve 17.5 feet of vertical clearance (see "Design Standards" above), and widens the sidewalk to 5 feet, which meets current design standards. To allow for the increased sidewalk width and to maintain the current 10-foot wide travel lane, this alternative includes cantilevering the sidewalk to the outside of the bridge truss. Alternative 2 does not include shoulder improvements or an additional vehicle travel lane.

Alternative 2 does not require any relocations or any additional right-of-way for construction. The estimated cost for Alternative 2 is \$29-32 million, and its construction requires closing the river crossing for 410-570 calendar days. The risk for the cost and closure days to increase is high.



Although Alternative 2 provides some improvements to service, including removal of the weight restriction, Alternative 2 does not meet current design standards; therefore, Alternative 2 does not fulfill the project's purpose and need.

**Alternative 3: Plate Girder Superstructure**

This alternative replaces the existing superstructure of the Dick Henderson Bridge and transforms the bridge into a bridge type called a plate girder. A plate girder bridge is a bridge supported by two or more plate girders, which are typically I-beams made up from separate structural steel plates that are bolted or welded together. In this alternative, the two main river piers are reinforced and strengthened. This alternative provides three 12-foot wide travel lanes, two 6-foot shoulders, and a 5-foot wide sidewalk.

This alternative does not require any relocations. However, approximately 0.37 acre (16,000 square feet) of right-of-way is required for permanent conversion to transportation use, and approximately 0.046 acre (2,000 square feet) is required for temporary conversion during construction. The estimated cost for Alternative 3 is \$25-28 million, and its construction requires closing the river crossing for 320-460 calendar days. The risk for the cost and closure days to increase is low.

Alternative 3 improves the service of the bridge, including removal of weight limit, and allows the bridge to meet current design standards. Therefore, Alternative 3 fulfills the purpose and need of the project.

**Alternative 4: Through Truss Superstructure**

This alternative replaces the existing superstructure of the Dick Henderson Bridge and transforms the bridge into a bridge type called a through truss, which is somewhat similar in appearance to the current bridge. In this alternative, the two main river piers are reinforced and strengthened. This alternative provides three 12-foot wide travel lanes, two 6-foot shoulders, and a 5-foot wide sidewalk.

This alternative does not require any relocations. However, approximately 0.37 acre (16,000 square feet) of right-of-way is required for permanent conversion to transportation use, and approximately 0.046 acre (2,000 square feet) is required for temporary conversion during construction. The estimated cost for Alternative 4 is \$26-29 million, and its construction requires closing the river crossing for 380-520 calendar days. The risk for the cost and closure days to increase is medium.

Alternative 4 improves the service of the bridge, including removal of weight limit, and allows the bridge to meet current design standards. Therefore, Alternative 4 fulfills the purpose and need of the project.

**Alternative 5: Cable Stayed Superstructure**

This alternative replaces the existing superstructure of the Dick Henderson Bridge and transforms the bridge into a bridge type called a cable stayed bridge. A cable stayed bridge is a bridge that consists of one or more columns (often referred to as towers or pylons), with cables supporting the bridge deck. In this alternative, the two main river piers are reinforced and strengthened. This alternative provides three 12-foot wide travel lanes, two 6-foot shoulders, and a 5-foot wide sidewalk.

This alternative does not require any relocations. However, approximately 0.37 acre (16,000 square feet) of right-of-way is required for permanent conversion to transportation use, and approximately 0.046 acre (2,000 square feet) is required for temporary conversion during construction. The estimated cost for Alternative 5 is \$32-35 million, and its construction requires closing the river crossing for 320-460 calendar days. The risk for the cost and closure days to increase is low.

million, and its construction requires closing the river crossing for 540-680 calendar days. The risk for the cost and closure days to increase is high.

Alternative 5 improves the service of the bridge, including removal of weight limit, and allows the bridge to meet current design standards. Therefore, Alternative 5 fulfills the purpose and need of the project.

**Alternative 6: Extradosed Superstructure**

This alternative replaces the existing superstructure of the Dick Henderson Bridge with an extradosed superstructure. An extradosed superstructure is frequently described as a cross between a girder and a cable stayed structure. In this alternative, the two main river piers are reinforced and strengthened. This alternative provides three 12-foot wide travel lanes, two 6-foot shoulders, and a 5-foot wide sidewalk.

This alternative does not require any relocations. However, approximately 0.37 acre (16,000 square feet) of right-of-way is required for permanent conversion to transportation use, and approximately 0.046 acre (2,000 square feet) is required for temporary conversion during construction. The estimated cost for Alternative 6 is \$32-35 million, and its construction requires closing the river crossing for 460-600 calendar days. The risk for the cost and closure days to increase is high.

Alternative 6 improves the service of the bridge, including removal of weight limit, and allows the bridge to meet current design standards. Therefore, Alternative 6 fulfills the purpose and need of the project.

**Comments**

WVDOH, in cooperation with FHWA, will be preparing an Environmental Assessment (EA) for the Dick Henderson Bridge Project to help with the selection of an alternative and evaluate the environmental impacts and mitigation. Once the EA is complete, another series of informational workshop public meetings will be held, and the EA will be available for comment.

The purpose of this informational workshop public meeting is to afford participants an opportunity to ask questions and state their views and opinions on the alternatives for the project.

Those wishing to file written comments may send them to Gregory Bailey, P.E., Director, Engineering Division, West Virginia Division of Highways, Capitol Complex Building Five-Room 450, 1900 Kanawha Boulevard East, Charleston, WV 25305-0430 on or before April 11, 2011.



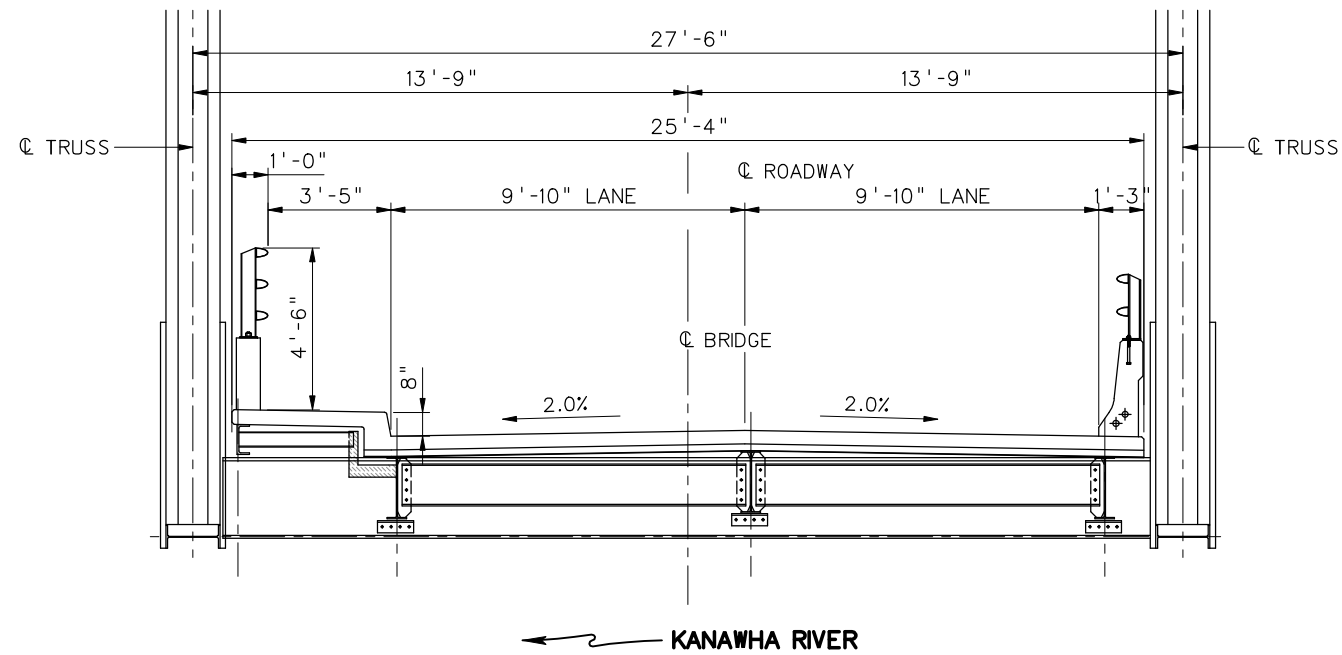
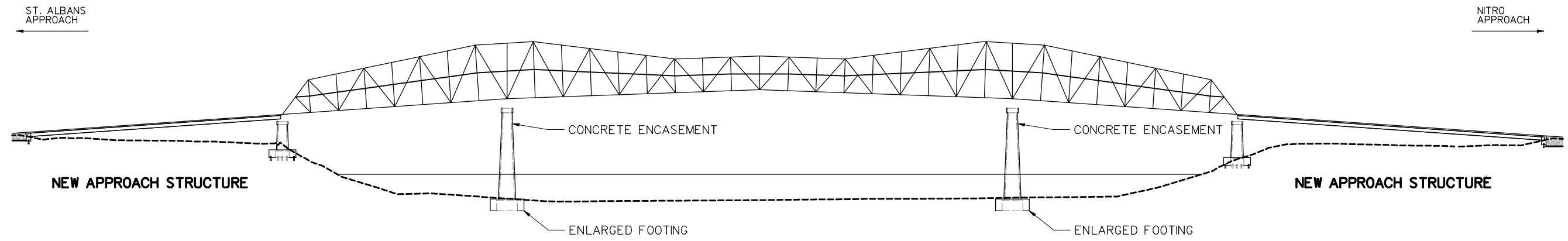
**Table 1: Preliminary Alternatives Screening**

	No Build	Alternative 1 Rehab. Truss, Sidewalk to Inside	Alternative 2 Rehab. Truss, Sidewalk to Outside	Alternative 3 Plate Girder	Alternative 4 Through Truss	Alternative 5 Cable Stayed	Alternative 6 Concrete Extradosed
<b>Estimated Cost (million \$)</b>	N/A	27 – 30	29 - 32	25 - 28	26 - 29	32 - 35	32 - 35
<b>Estimated Time of Bridge Closure (calendar days)</b>	N/A	360 - 520	410 - 570	320 - 460	380 - 520	540 - 680	460 - 600
<b>Relative Risk of Added Cost and Delay</b>	N/A	High	High	Low	Medium	High	High
<b>Residential and Commercial Relocations</b>	0	0	0	0	0	0	0
<b>Temporary ROW Required (square feet)</b>	0	0	0	2,000	2,000	2,000	2,000
<b>Permanent ROW Required (square feet)</b>	0	0	0	16,000	16,000	16,000	16,000
<b>Number of Lanes</b>	2	2	2	3	3	3	3
<b>Lane Width (feet)</b>	10	9.8	10	12	12	12	12
<b>Shoulder Width (feet)</b>	0	0	1.4	6	6	6	6
<b>Sidewalk Width (feet)</b>	4	3.4	5	5	5	5	5
<b>Maximum Grade</b>	7.0%	7.0%	7.0%	7.6%	7.0%	7.3%	7.5%
<b>Weight Restriction</b>	Yes (12 tons)	No	No	No	No	No	No
<b>Meets Current Design Standards</b>	No	No	No	Yes	Yes	Yes	Yes
<b>Extends Bridge Service Life</b>	No	Yes	Yes	Yes	Yes	Yes	Yes
<b>Fulfills Purpose and Need</b>	No	No	No	Yes	Yes	Yes	Yes

Notes: ROW = Right of Way; Design Standards include those contained in WVDOH's *Design Directives* (2006) and *Bridge Design Manual* (2004), and AASHTO's *A Policy on Geometric Design of Highways and Streets* (2004) and *AASHTO LRFD Bridge Design Specifications, 5<sup>th</sup> ed.* (2010).

**Profiles and Typical Sections  
for the  
Dick Henderson Bridge  
Preliminary Build Alternatives**

State Project No.	Federal Project No.	State Dist. No.	Fiscal Year	County	Sheet No.	Total Sheets
S220-P25-0.05 00	BR-0025(102)E	1	2010	KANAWHA		



TYPICAL SECTION THROUGH TRUSS

NO.	REVISION	DATE	BY

W. VA. DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS

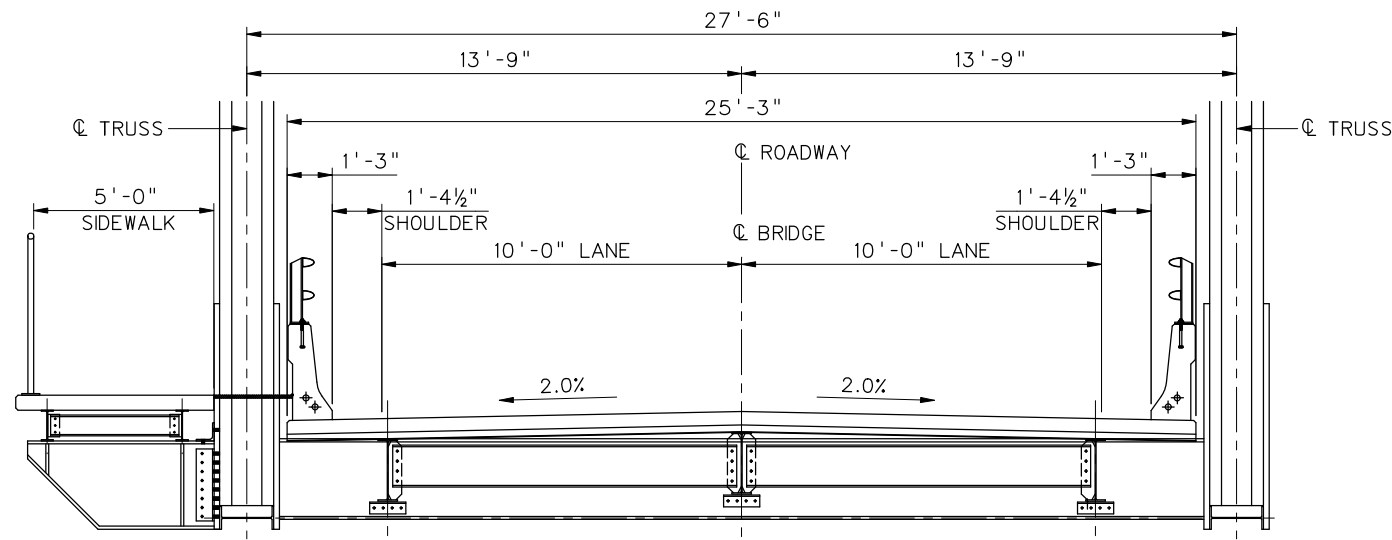
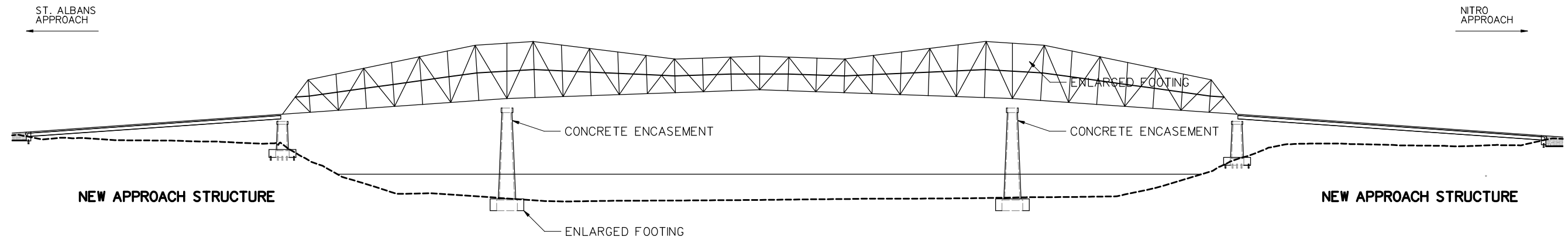
DICK HENDERSON BRIDGE  
TRUSS REHABILITATION  
ALTERNATIVE NO.1  
SIDEWALK BETWEEN TRUSSES

**Baker**  
Michael Baker Jr., Inc. Charleston, W.Va.

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BRIDGE NO. 1341

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← KANAWHA RIVER  
**TYPICAL SECTION THROUGH TRUSS**

NO.	REVISION	DATE	BY

W. VA. DEPARTMENT OF TRANSPORTATION  
 DIVISION OF HIGHWAYS

**DICK HENDERSON BRIDGE  
 TRUSS REHABILITATION  
 ALTERNATIVE NO. 2  
 SIDEWALK OUTSIDE DOWNSTREAM TRUSS**

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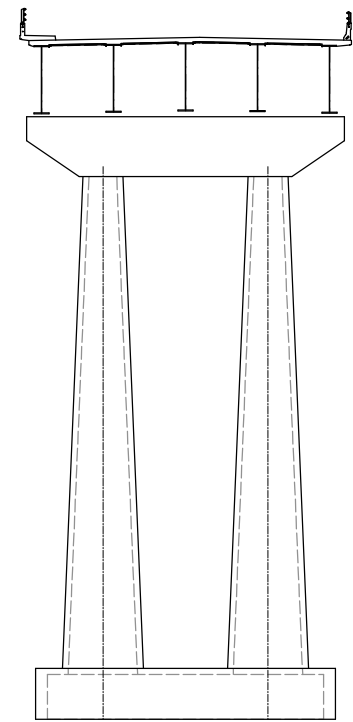
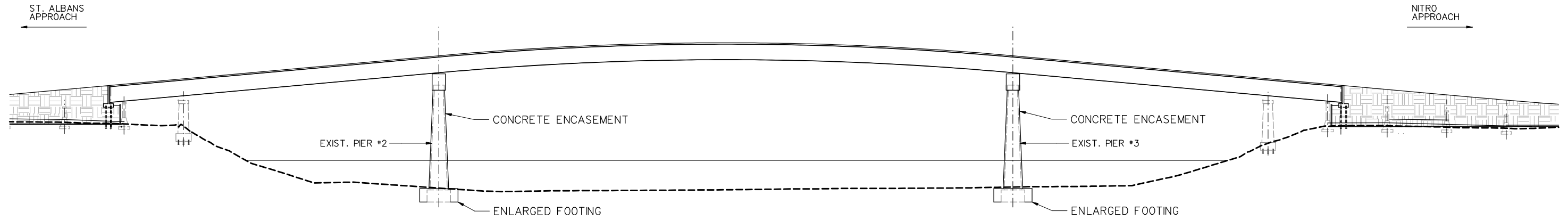
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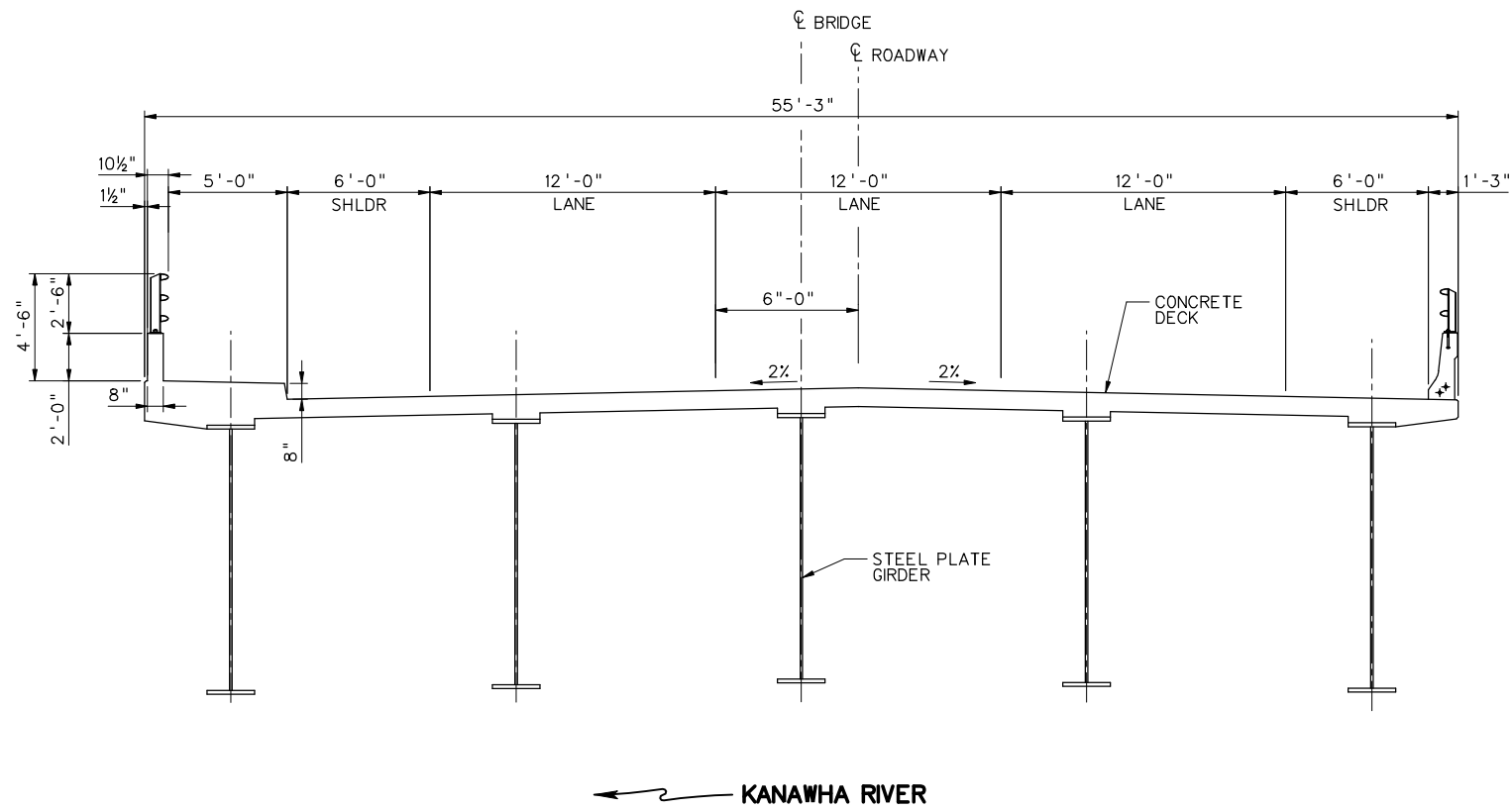
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SECTION AT PIERS  
PLATE GIRDER OPTION



TYPICAL SECTION NEW STEEL PLATE GIRDER  
3 LANE ALTERNATIVE

← KANAWHA RIVER

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DIVISION OF HIGHWAYS

**DICK HENDERSON BRIDGE  
COMPLETE SUPERSTRUCTURE REPLACEMENT  
MAIN SPAN & APPROACHES  
3 LANE ALTERNATIVE NO. 3  
STEEL PLATE GIRDER**

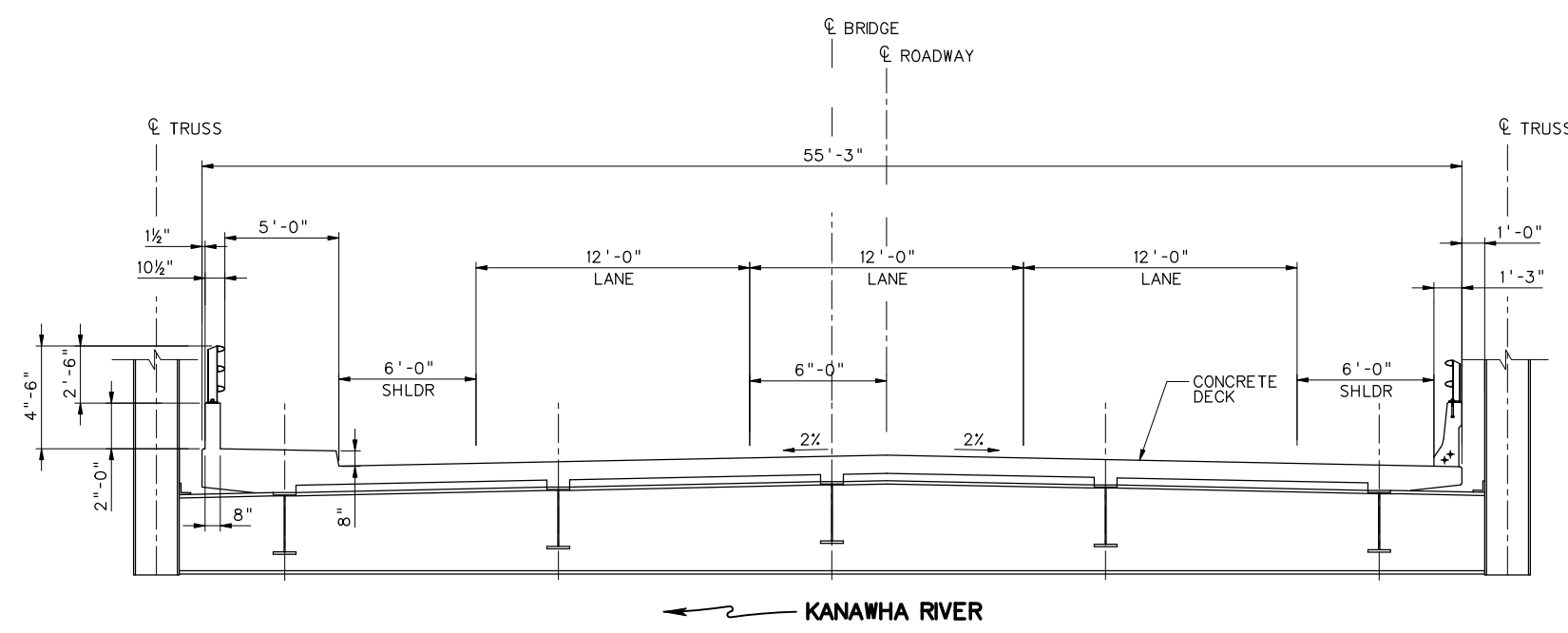
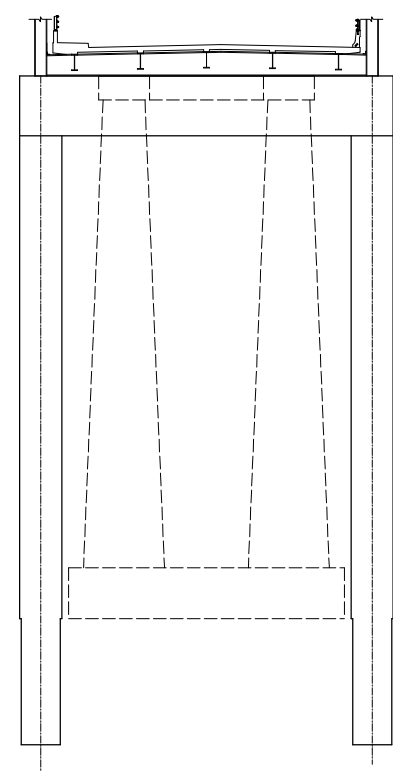
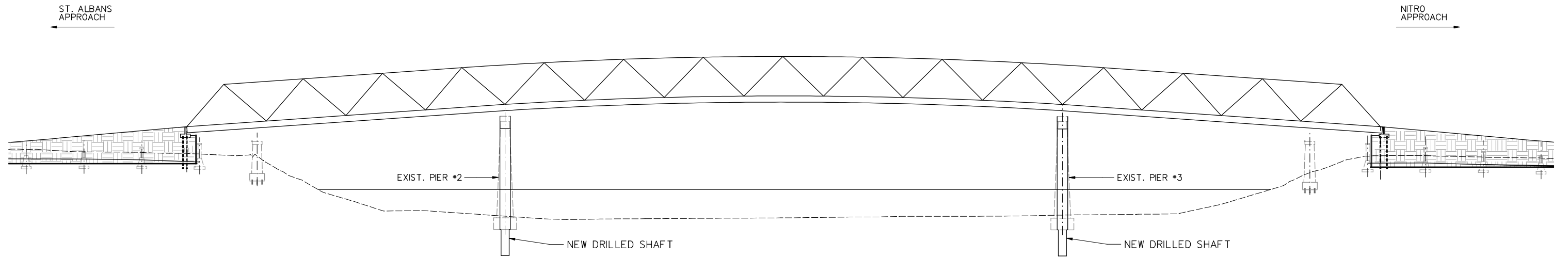
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TYPICAL SECTION STEEL TRUSS ALTERNATIVE  
3 LANE ALTERNATIVE

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DICK HENDERSON BRIDGE  
COMPLETE SUPERSTRUCTURE REPLACEMENT  
MAIN SPAN & APPROACHES  
3 LANE ALTERNATIVE NO. 4  
STEEL THROUGH TRUSS

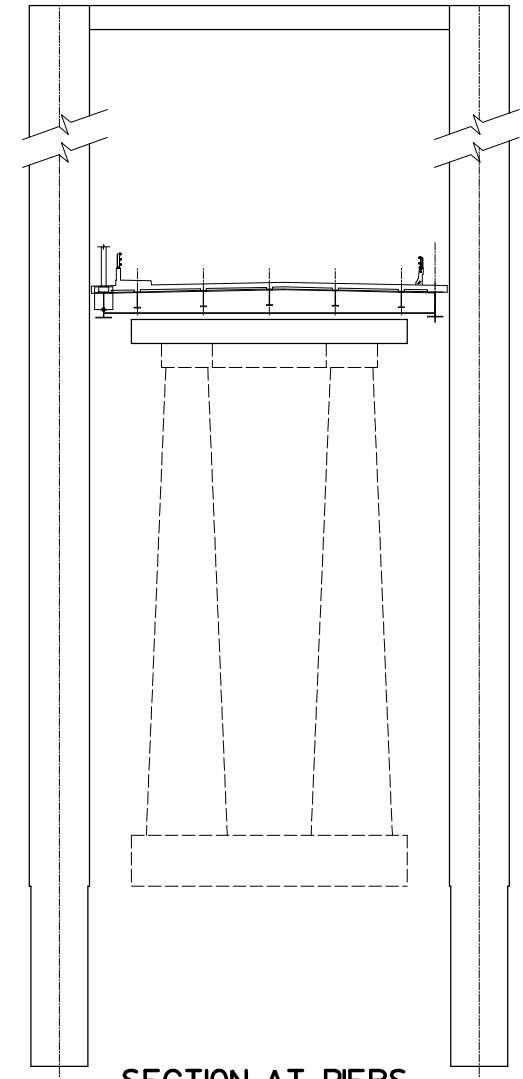
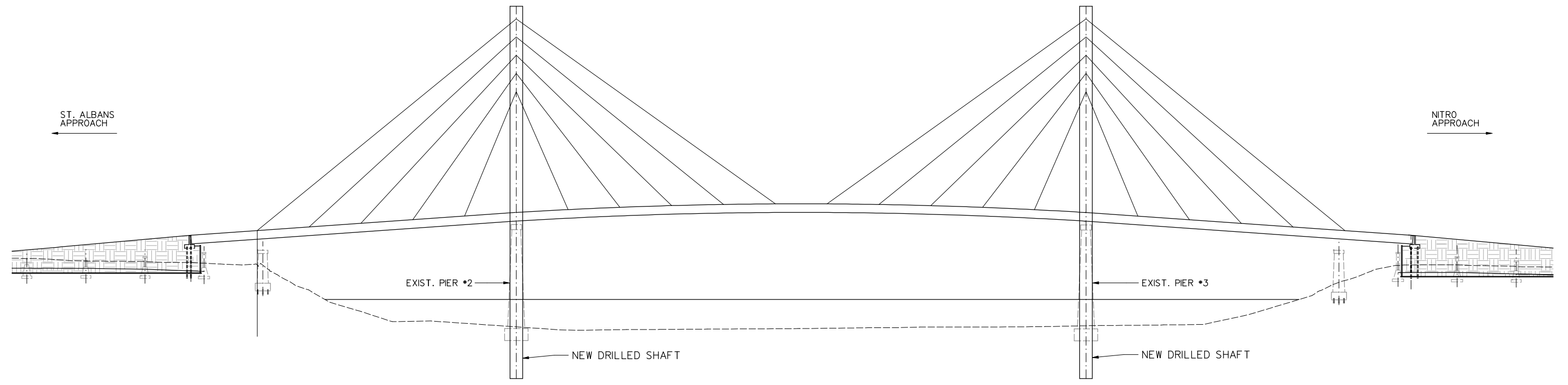
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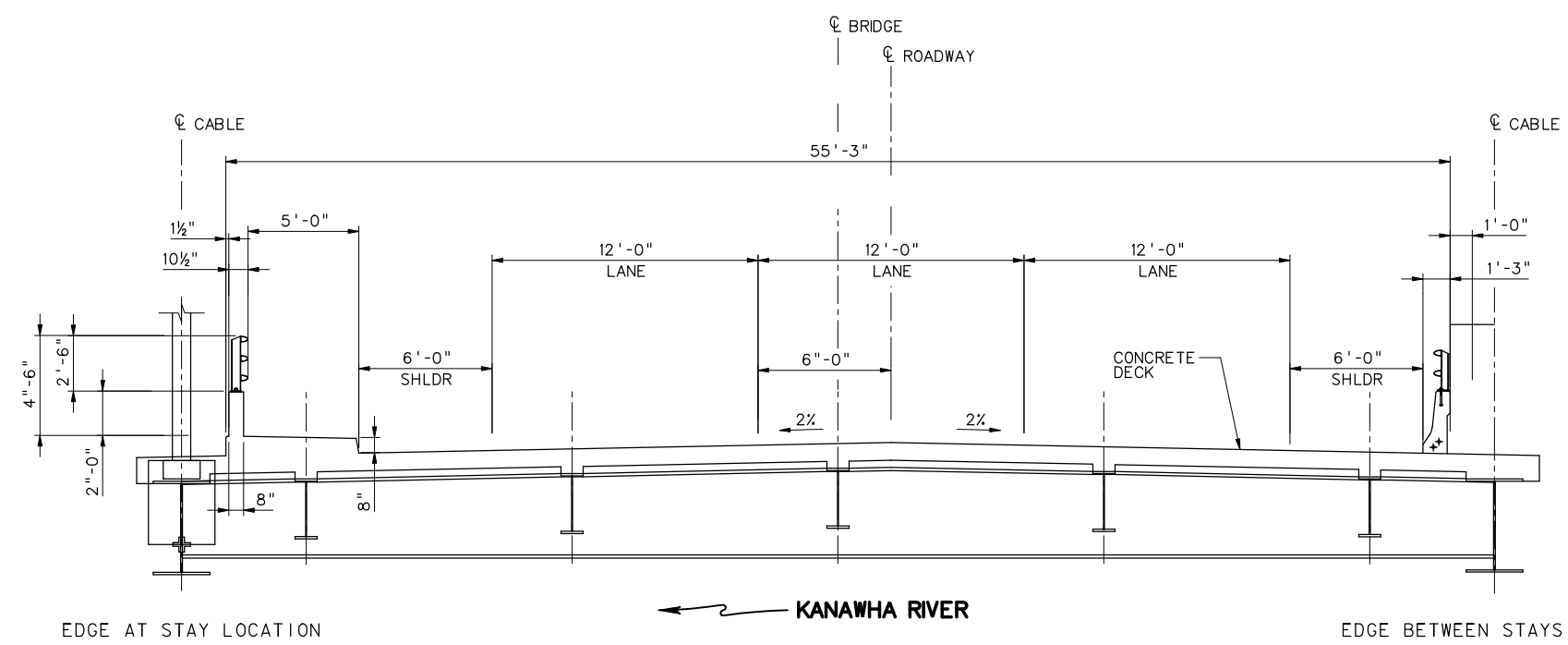
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SECTION AT PIERS  
CABLE STAY OPTION



TYPICAL SECTION STEEL CABLE STAY ALTERNATIVE  
3 LANE ALTERNATIVE

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 DIVISION OF HIGHWAYS

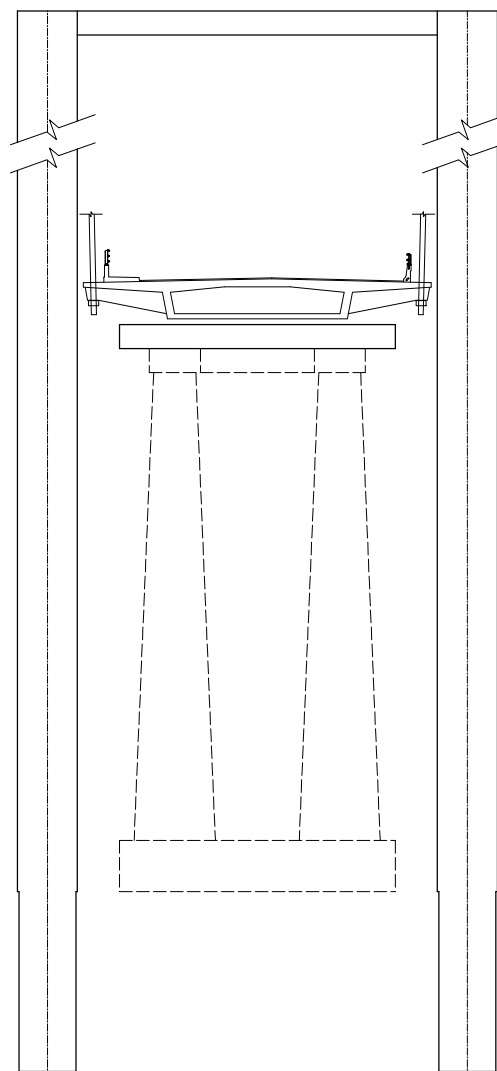
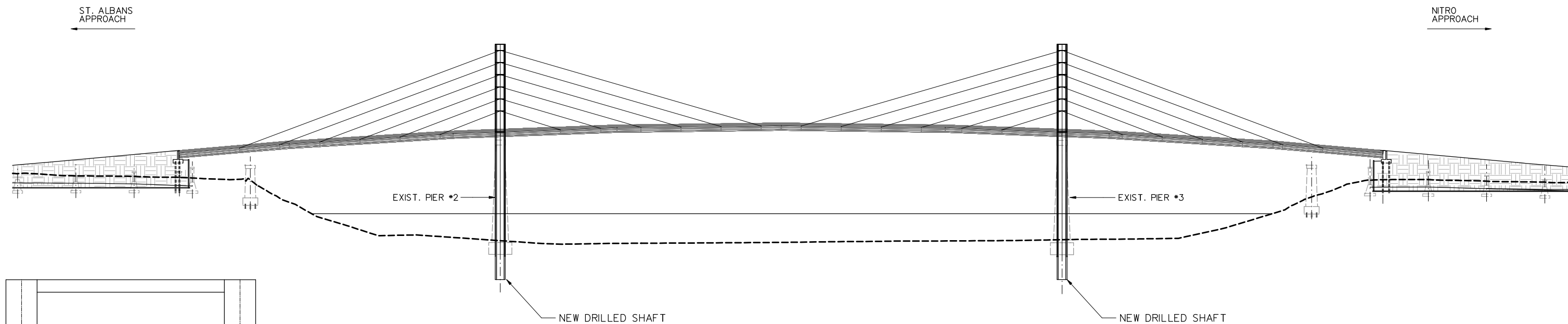
**DICK HENDERSON BRIDGE**  
**COMPLETE SUPERSTRUCTURE REPLACEMENT**  
**MAIN SPAN & APPROACHES**  
**3 LANE ALTERNATIVE NO. 5**  
**CABLE STAY**

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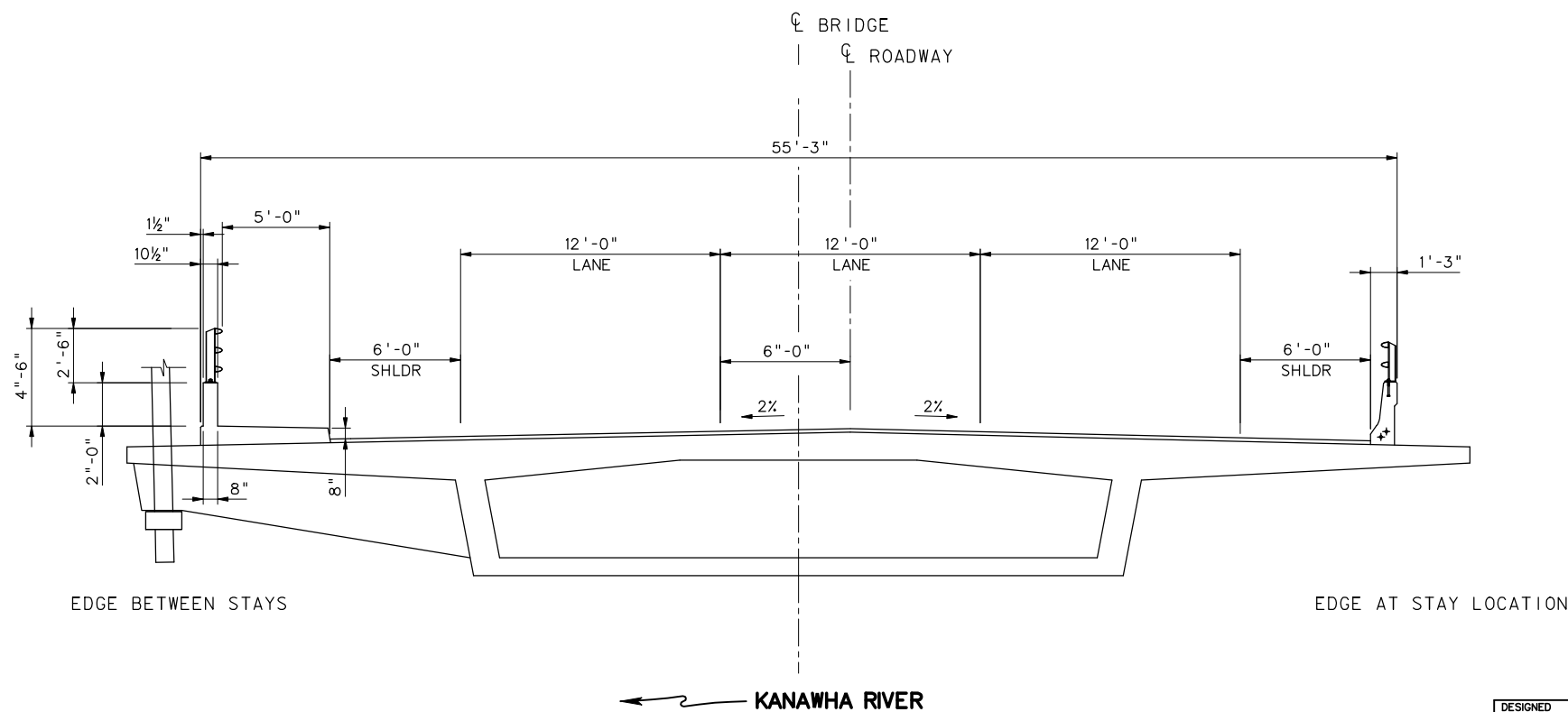
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 Michael Baker Jr., Inc.      Charleston, W.Va.

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SECTION AT PIERS EXTRADOSED OPTION



TYPICAL SECTION CONCRETE EXTRADOSED ALTERNATIVE 3 LANE ALTERNATIVE

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W. VA. DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS

**DICK HENDERSON BRIDGE  
COMPLETE SUPERSTRUCTURE REPLACEMENT  
MAIN SPAN & APPROACHES  
3 LANE ALTERNATIVE NO. 6  
EXTRADOSED BRIDGE**

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