Unknown Foundation Bridges Pilot Study

Federal Highway Administration & Florida Department of Transportation

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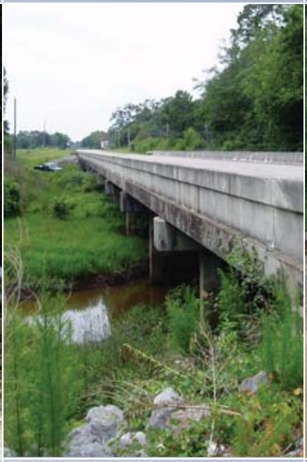

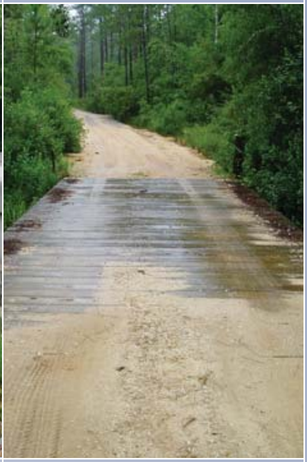

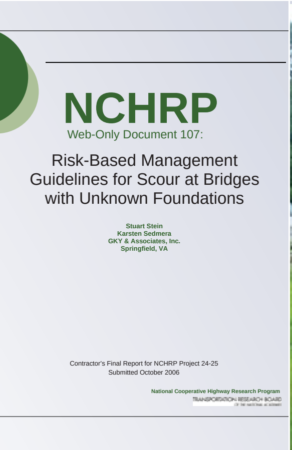
NCHRP
Web-Only Document 107:

Risk-Based Management Guidelines for Scour at Bridges with Unknown Foundations

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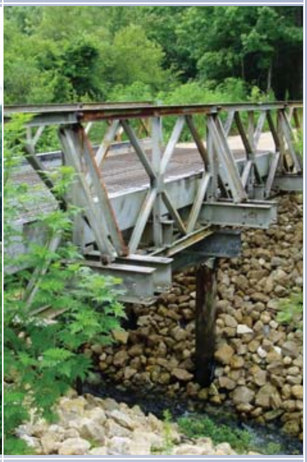

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Executive Summary

Introduction

Over the past two decades, growing concerns for the scour susceptibility of bridges across the United States have led to the Federal Highway Administration (FHWA), in cooperation with the state DOTs across the country, to develop standardized systems to identify bridges which may be Scour Critical. The National Bridge Inventory (NBI) recognizes 86,133 bridges in the United States that exist over water and have no foundation data on record. It is evident that an unknown percentage of the 86,133 bridges identified by NBI with missing foundation data could also be highly vulnerable to scouring induced by water flow coupled with erodible soils.

In January 2008, the Federal Highway Administration (FHWA) released a technical memorandum on a suggested process for the federal, state and local agencies across the country to identify unknown foundation bridges. The overall goals of this process are to: 1) reduce or eliminate the number of unknown foundation bridges over waterways in the NBI database, and; 2) evaluate unknown foundation bridges for scour vulnerability.

There has been a growing concern that unknown foundation bridges may be Scour Critical and need a Plan of Action as required by National Bridge Inspection Standards regulations. Additionally, there is a concern with the limited amount of accurate information to assess the structural and geotechnical load capacity in both the short and long term.

Florida has approximately 8,200 bridges over water and approximately 2,500 bridges are classified as unknown foundations. Of these 2,500 bridges only 8.8% of Florida's unknown foundation bridges are on principal arterial roadways, and 51% are on local roads. It should be also noted that these unknown foundation bridges in Florida are typically lower value bridges, both in terms of construction costs and benefits to the traveling public. The age of these unknown foundation bridges span almost 100 years, with the oldest unknown foundation bridge built in 1912.

After receipt of the January 2008 memorandum from FHWA, the Florida Department of Transportation (FDOT) took an aggressive position to reduce or eliminate their bridges with unknown foundations (bridges coded as "U" for item 113) from the National Bridge Inventory by November 2010. After this date, the FHWA is considering classifying the remaining unknown foundation bridges as Scour Critical and subject to the Plan of Action requirements. With a clear understanding of the FHWA's goals, FDOT developed a series of objectives to develop risk-based guidelines to assist bridge owners in evaluating and prioritizing Plans of Action – including investigation, countermeasures, monitoring, rehabilitation, or replacement – for managing bridges with unknown foundations.

Unknown Foundation Bridges Pilot Study

The outcome of these objectives was the preparation of this Unknown Foundation Bridges Pilot Study that investigates and researches methods to accurately and economically evaluate the potential risk of scour failure for unknown foundation bridges in Florida, and to develop guidelines and procedures to perform the evaluations.

Several other potential methods other than those suggested by the FHWA were included in the Study and have proven useful in the evaluation process. Artificial Neural Networks (ANNs) were developed to predict design pile loads and pile embedment lengths. Reverse engineering methods were also developed to determine pile loads to be used to predict pile embedment lengths.

A Workshop was held on October 29-30, 2008, with representatives from FDOT and FHWA that will be involved in implementing the Pilot Study. The group developed a series of methods to be investigated in the Pilot Study.

The overall concept of this Pilot Study is to collect data on known foundation bridges and use the data to assess and calibrate predictive methods to estimate the foundation dimension and other methods to determine the risk of scour failure. The results were then used to develop guidelines and procedures to evaluate unknown foundation bridges. Then the procedures were applied to a group of test cases to validate and adjust the procedures. These procedures and guidelines are published in a separate document titled *Procedural Manual: Reclassify Unknown Foundation Bridges*. This report will document the development and validation of the procedures.

The biggest change to the Pilot Study initial approach involves the group of known foundation bridges used in the sample. Originally, two counties were selected for the study: Alachua and Collier Counties. After the project began, it became apparent that data could be obtained quicker if the sample was expanded beyond the two counties. Expanding the sample area also makes the Pilot Study more applicable to the entire state of Florida.

As a result of this Study, a recommended procedure has been developed. First, there are initial steps to gather data and determine if there is enough information in the data to reclassify the bridge. Next, a risk analysis is made based on (Stein, S. and Sedmera, K. (2006)). The procedures in (Stein, S. and Sedmera, K. (2006)) have been modified. Some of the bridges can be reclassified based on the risk analysis alone, while others will need additional evaluation. For those needing further evaluation, the next step is to estimate a pile embedment. Several procedures to estimate the embedment of the foundation included Reverse Engineering, Artificial Neural Networks (ANN), ANN for Pile Embedment Prediction, ANN for Design Pile Load and Embedment Prediction. The estimated embedment will be used to complete the Florida Scour Evaluation Process, with a few modifications to determine if further evaluation using Non-Destructive Testing is warranted.

Embedment Prediction Methods

The majority of unknown foundation bridges in Florida are classified as unknown because the pile driving records for all or a portion of the piles on the bridge are missing. A number of potential methods were considered during the workshop to estimate or predict unknown pile embedment depths.

- Reverse Engineering
- Artificial Neural Networks (ANN)
- Inference from historical practices and site conditions

In order to use any of the recommended procedures, the design pile load must first be determined, and then used in the pile embedment depth prediction process. Two separate ANNs have been developed, one to predict the design pile load and one to predict the pile embedment depth. Section 4 discusses pile load estimation using reverse engineering, along with the embedment depth prediction after the design pile load has been determined. If the design pile load is not available in the plans, then the embedment prediction methods can use design pile loads estimated by either reverse engineering or PLOAD (the design pile load estimation ANN). The advantage of the reverse engineering estimate is that the predicted pile load will likely be more accurate. The advantage of PLOAD is the pile load can be predicted with less effort.

Scour Evaluation Process

After the pile embedment depths have been predicted, the embedment predictions can be used to complete Florida's Scour Evaluation Process for existing bridges.

Phase 1 Scour Evaluation

Most of the unknown foundation bridges in Florida have already had a Phase 1 Evaluation. If not, then the evaluation should have been done during the initial steps of the unknown foundations evaluation process. The Phase 1 Evaluation and the recommendations should be updated with the information determined from the unknown foundations evaluation process. The team of hydraulic, structural and geotechnical engineers must use the predicted embedment depths, the knowledge of the types of soil in the area, the potential scour at the site, and the approximate embedment that will be needed for the bridge to remain stable to determine risk and decide if further quantitative evaluation is needed. If the risk is low, then item 113 can be recoded into one of the categories indicating the bridge is stable. Otherwise, a Phase 2 Scour Evaluation should be recommended.

Phase 2 Scour Evaluation

Computations of the scour depths will be made in the Phase 2 Scour Evaluation. A hydrologic and hydraulic analysis may be necessary if this information is not available from other sources. The scour predictions are made using the Florida Scour Manual.

Phase 3 Scour Evaluation

If this Phase is needed, then SPT borings are needed for the stability computations. If SPT borings are not available from the existing data, then at least one boring must be obtained. The geotechnical engineer should determine the number and location of borings needed. If the bridge is stable, then item 113 can be recoded as such. If the bridge is not stable then a Phase 4 Evaluation will be needed.

Phase 4 Scour Evaluation

The result of the traditional Phase 4 Evaluation is a countermeasure recommendation; see Section 6.0 of this Pilot Study. For unknown foundation bridges, Non-Destructive Testing (NDT) should also be considered to improve the estimate of the pile embedment depths. Selecting an NDT is discussed in Section 7 of this Study. If an NDT is the recommended alternative, then the results of the NDT will be used to reevaluate each phase of the scour evaluation.

Countermeasures

At some point during the evaluation process, if the risk of scour failure is considered too great then something must be done to reduce the risk. This is accomplished by implementing a countermeasure to:

- Reduce the scour depth expected at the structure
- Strengthen the structure to resist the effects of the expected scour
- Monitor the site more closely to either:
    - Prevent loss of life by closing the bridge before failure
    - Delay installing a more expensive countermeasure until conditions worsen and failure is more imminent

Another option that can be considered is to replace the bridge. Bridge replacement can address other issues besides scour vulnerability, including structural obsolescence, roadway capacity problems, or safety concerns.

Non-Destructive Testing

As part of this Pilot Study, the most current and widely used non-destructive testing (NDT) methods for determining the embedment depth of bridge foundations were identified. The Study includes considerations that must be made when selecting the most appropriate NDT, along with general guidelines to provide guidance to the FDOT personnel or consultant in selecting the proper NDT method. This study was based on extensive research of existing literature, contact with experts in the field of NDT testing, and the various Department of Transportation agencies throughout the country.

NDT methods can be categorized into one of two general categories; surface non-destructive testing and subsurface non-destructive testing. A surface NDT does not require the installation of a soil boring or probe and can be performed with only minimal intrusion. The advantage to surface NDT is that it is typically quicker to perform, requires less equipment and requires access only to the top of the substructure element thereby reducing traffic disruption. Drawbacks to surface NDT are its inability to provide foundation data below a subsurface pile cap (if one exists) and its reliance on uniform wave propagation, the more stratified the subsurface conditions, the less accurate the results. For this reason surface NDT methods work best with piles driven in fairly homogeneous soils. Due to these problems, surface NDT methods are best used in conjunction with subsurface tests.

Subsurface NDT methods are the methods which require the installation of at least one soil boring or probe to analyze the unknown foundation. One major benefit to using a subsurface method is the ability to detect foundations below a subsurface pile cap (i.e. "complex foundations"). If the bridge foundation is truly unknown, then it may be unclear whether a subsurface pile cap exists or not. Although subsurface NDT methods are slightly more expensive and take longer to implement, they offer greater reliability and versatility.

Conclusions

The problem posed by bridges with unknown foundations in Florida is real and significant. This Pilot Study required a flexible approach, sensitivity to the importance of FHWA's time frame and a constant awareness of the need to provide effective and implementable procedures. The close interaction of the study team, FDOT and FHWA allowed the flexible approach to be effective. Some of the main points that came out of the study include:

- A risk based evaluation will identify a large percentage of unknown foundation bridges with a relatively low risk such that further evaluation is not justified. A minimal Plan of Action that includes a bridge closure plan can be prepared to conclude the evaluation of the bridge.

- Artificial Neural Networks work well in certain situations and can be used to estimate design pile loads and predict embedment depths reliably and with minimal input and effort.

- Reverse Engineering, generally, slightly underestimates design pile loads that can be used to predict a conservative minimum pile embedment depth.

- If site specific soil borings are not available, a depth verses capacity curve using N=15 can be used to reliably predict minimum pile embedment depths.

- Non-Destructive Testing methods work well under certain conditions. The bridge design and material, and the local site conditions must be considered when selecting a method.

Section 1: Introduction

The Federal Highway Administration (FHWA) has issued a memorandum requesting each state to eliminate their bridges with unknown foundations (bridges coded as "U" for item 113) from the National Bridge Inventory (NBI) by November 2010. After that date, FHWA is considering classifying the remaining unknown foundation bridges as Scour Critical and subject to the Plan of Action requirements. FHWA's memorandum is included in Appendix A. The objective of this Pilot Study is to develop risk-based guidelines to assist bridge owners in evaluating and prioritizing Plans of Action — including investigations, countermeasures, monitoring, rehabilitation, or replacement — for managing bridges with unknown foundations.

Florida has approximately 8,200 bridges and bridge culverts over water and about 2,514 bridges are classified as unknown foundations. Table 1.1 shows how these unknown foundation bridges are distributed on the roadway system.

Table 1.1: Unknown Foundation Bridges Roadway System Distribution

	Rural	Urban
Principal Arterial – Interstate	0	0
Principal Arterial – Other Freeways or Expressways	NA	32
Principal Arterial – Other	106	84
Minor Arterial	112	163
Major Collector	218	NA
Minor Collector	193	NA
Collector	NA	316
Local	841	449

Only 8.8% of Florida's unknown foundation bridges are on principal arterial roadways, and 51% are on local roads. Other statistics also indicate unknown foundation bridges in Florida are lower value bridges, both from construction cost and benefit to the traveling public.

- The bridge length is 25 feet or less for 5% of the unknown foundation bridges, 50 feet or less for 34%, and 100 feet or less for 66%.
- The Average Daily Traffic is 50 vehicles or less for 14% of the unknown foundation bridges, 100 or less for 25%, and 500 or less for 39%.
- The maximum span length is 15 feet or less for 17%, 20 feet or less for 34%, and 30 feet or less for 60%.
- The oldest unknown foundation bridge in Florida was built in 1912. While more recent bridges are fewer in number on the list than the peak years from 1960 through the 1980s, an unknown foundation bridge was built last year by a local agency. The distribution of unknown foundation bridges by decade of construction is shown in Table 1.2.

Table 1.2: Distribution of Unknown Foundation Bridges by Decade of Construction

Decade	Bridges Built	Percent
1910s	3	0.10%
1920s	58	2.30%
1930s	56	2.20%
1940s	144	5.80%
1950s	302	12.10%
1960s	595	23.80%
1970s	470	18.80%
1980s	435	17.40%
1990s	311	12.50%
2000s	121	4.80%

Bridges in general can be grouped in the following categories and these categories could affect how they were designed and constructed:

- State/Federal designed and constructed.
- Local government (city, county, forest service, water management district, etc.) designed and constructed. These bridges may not have been built to State/Federal standards.
- Private design and construction. An example would be a bridge built by a logging company to get their trucks across a stream. These bridges may also not have been built to State/Federal standards.

Most of the unknown foundation bridges in Florida, about 89%, are locally owned bridges.

Another important characteristic of unknown foundation bridges is the type of piling used for the foundations. The type of pile will affect the methods used to evaluate the unknown foundations. The distribution is:

- 62% with concrete piles
- 27% with timber piles
- 7% with steel piles

Compared to the distribution of pile types for known foundation bridges, a higher percentage of unknown foundation bridges have timber piles. A small percentage of the unknown foundation bridges have spread footings. None of the unknown foundation bridges in Florida have drilled shafts.

Unknown Foundation Bridges Pilot Study

The Florida Department of Transportation conducted this Pilot Study to investigate methods to accurately and economically evaluate the potential risk of scour failure for unknown foundation bridges in Florida, and to develop guidelines and procedures to perform the evaluations. FHWA's memorandum has a number of recommendations that have been investigated in this study for use in Florida. These recommendations include:

- Locate historical standard sheets, construction specifications, and design guidance
- Consider information from nearby bridges
- Consider non-destructive testing tools
- Consider a risk-based evaluation based on (Stein, S. and Sedmera, K. (2006))

Several other potential methods were included in the study and have proven useful in the evaluation process. Artificial Neural Networks (ANNs) were developed to predict design pile loads and pile embedment lengths. Reverse engineering methods were also developed to determine pile loads to predict pile embedment lengths.

A Workshop was held on October 29-30, 2008, with representatives from the Florida Department of Transportation (FDOT) and FHWA that will be involved in implementing the Pilot Study. The minutes of the Workshop are included in the Appendix A. The group developed a series of methods to be investigated in the Pilot Study and also developed the framework of the scope of the project. Some of the concepts changed during the scope development, and the project approach has continued to change even after the project began.

The primary concept of the Pilot Study was to collect data on known foundation bridges and use the data to assess and calibrate predictive methods to estimate the foundation dimension and other methods to determine the risk of scour failure. The results were then used to develop guidelines and procedures to evaluate unknown foundation bridges. Then the procedures were applied to a group of unknown foundation bridges to validate and adjust the procedures. These procedures and guidelines are published in a separate document titled *Procedural Manual: Reclassify Unknown Foundation Bridges*. This report will document the development and validation of the procedures.

The biggest change to the Pilot Study approach involves the group of known foundation bridges used in the sample. Originally, two counties were selected for the study: Alachua and Collier Counties. After the project began, it became apparent that data could be obtained quicker if the sample was expanded beyond the two counties. Expanding the sample area also makes the study more applicable to the entire state of Florida.

The Unknown Foundations Evaluation Process

As a result of this Pilot Study, a recommended procedure has been developed to evaluate unknown foundation bridges. First, there are initial steps to gather data and determine if there is enough information in the data to reclassify the bridge. Next, a risk analysis is made based on (Stein, S. and Sedmera, K. (2006)). The procedures in (Stein, S. and Sedmera, K. (2006)) have been modified and the modifications will be described in the following sections. Some of the bridges can be reclassified based on the risk analysis alone, but others will need additional evaluation. For those needing further evaluation, the next step is to estimate a pile embedment. Several procedures to estimate the embedment of the foundation will be described. The estimated embedments will be used to complete the Florida Scour Evaluation Process, with a few modifications to determine if further evaluation using Non-Destructive Testing is warranted.

Initial Steps in the Process

The recommended initial steps in the process of evaluating unknown foundation bridges includes:

- Collect Data
- Check for Scour Design
- Determine Foundation Dimensions, if possible

Collect Data

Attempt to locate the following information:

- Bridge Inspection Reports
- Pile Driving Records/Construction Field Book
- Scour Evaluation Reports
- Plans (Original Plans and Widening/Reconstruction Plans)

The District Bridge Maintenance Office should have the Bridge Inspection Reports and the Scour Evaluation Reports available in their files. Obtain at least the most recent Bridge Inspection Report. Obtain all other Bridge Inspection Reports that contain soundings. The sounding information gives an indication of bed elevation changes at the bridge. Most of the Unknown Foundation Bridges in Florida have completed a Phase 1 Scour Evaluation. A few have had Phase 2, Phase 3, or even Phase 4 Scour Evaluations. If the Phase 1 Evaluation has not been completed, then perform a Phase 1 Scour Evaluation now.

If the District Bridge Maintenance Office does not have the Plans, the local agency may have them. When the local agency is contacted, also obtain Pile Driving Records or other Construction records or Field Books. Check the Phase 1 Report for a reference to the Plans. If Plans were referenced, the firm that prepared the report may have a copy of the Plans in their files.

Most bridges in Florida are classified as Unknown Foundations because the Pile Driving Records are missing. However, some bridges may only be missing part of the Pile Driving Records. This will often be the case for bridges that have been widened. Useful information can be gleaned from the partial Pile Driving Records. Even if Pile Driving Records are not available, the Construction Field Books may be available.

Verify a Scour Design

The Federal Highway Administration issued Technical Advisory TA 5140.20, *Scour at Bridges*, in September 1988. By 1991, scour design requirements were included in the *FDOT Structures Design Manual* and the *FDOT Drainage Design Manual*.

Even if the exact implementation date was established for scour design requirements, there would still be some uncertainty about the date of construction implementation that would ensure that the bridge was designed for scour. Not all state-owned bridges were designed for scour since the bridge might have changed ownership some time after construction. If the bridge was built by a local agency, it may not have been designed for scour.

Most of the Unknown Foundation Bridges in Florida are local bridges, not state bridges. While many local agencies use FDOT design criteria, the Florida Greenbook did not require bridges to be designed for scour until 2005. For bridges designed prior to this date, it is difficult to be certain that the bridge was designed for scour without proper documentation.

For all the reasons cited above, the only way to be relatively sure that a scour design was properly done and the bridge was constructed according to scour requirements is to find Pile Data Tables in the Plans with Scour Design Criteria shown. Table 1.3 shows an example Pile Data Table with Scour Criteria.

Table 1.3: Typical Pile Data Table

PILE DATA TABLE															
INSTALLATION CRITERIA								DESIGN CRITERIA							
BENT NO.	PILE SIZE (in)	NOMINAL BEARING CAPACITY (tons)	TENSION CAPACITY (tons)	MIN. TIP ELEV. (ft)	TEST PILE LENGTH (ft)	REQ'D JET ELEV. (ft)	REQ'D PREFORM ELEV. (ft)	FACTORED DESIGN LOAD (tons)	DOWN DRAG (tons)	TOTAL SCOUR RESIST. (tons)	NET SCOUR RESIST. (tons)	100 YR. SCOUR ELEV. (ft)	LONG-TERM SCOUR ELEV. (ft)	Φ	PILE CUT-OFF ELEV. (ft)
1	18	131	N/A	*	115	N/A	+8	85	N/A	0	0	0	0	0.65	+29.6
2	18	163	N/A	*	110	N/A	+8	85	N/A	21	21	+8.6	+4.8	0.65	+29.6
3	18	163	N/A	*	80	N/A	+8	85	N/A	21	21	+8.6	+4.8	0.65	+29.6
4	18	163	N/A	*	80	N/A	+8	85	N/A	21	21	+8.6	+4.8	0.65	+29.6
5	18	163	N/A	*	80	N/A	+8	85	N/A	21	21	+8.6	+4.8	0.65	+29.6
6	18	131	N/A	*	80	N/A	+8	85	N/A	0	0	0	0	0.65	+29.6

* THE MINIMUM TIP ELEVATION IS CONTROLLED BY SECTION 455 OF THE SPECIFICATIONS.

If a Pile Data Table with Scour Design Criteria is shown in the Plans, then the Bridge Inspection Reports and the Scour Evaluation Reports should be reviewed to determine if the site has changed significantly since construction. If the general bed elevation (not including a scour hole near a pile or pier) is at or below the long-term scour elevation given in the Pile Data Table, then significant scour has occurred at the site.

Determine Foundation Dimension

Check the data collected to see if the foundation dimensions can be determined. New data may have been obtained, or occasionally a piece of information may have been overlooked during the original scour evaluation. If the foundation dimensions cannot be determined, go to the risk screening procedure.

If the dimensions can be determined, complete the original scour evaluation process as a Known Foundation Bridge. Update the Phase 1 Scour Evaluation with the new information and update Item 113. Complete Phase 2, 3, and 4 Scour Evaluations if needed.

Modifications to the NCHRP Procedure

The recommended Unknown Foundations Evaluation Procedure will be based on the process (Stein, S. and Sedmera, K. (2006)). The flow chart for the procedure is shown in Figure 1.1 below.

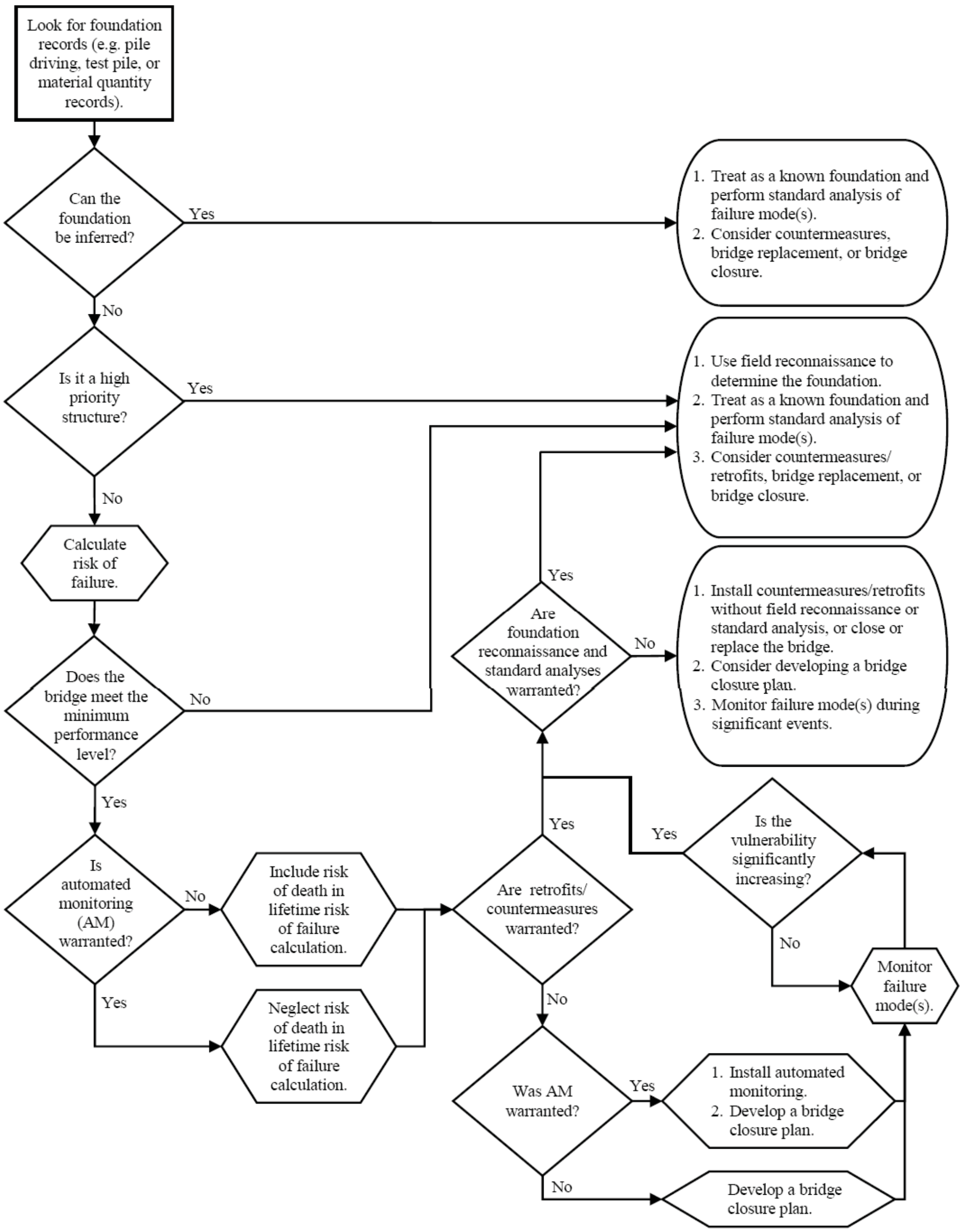

Figure 1.1: Unknown Foundations Evaluation Procedures Flow Chart-NCHRP

The flow chart will be modified as shown in Figure 1.2 on the following page.

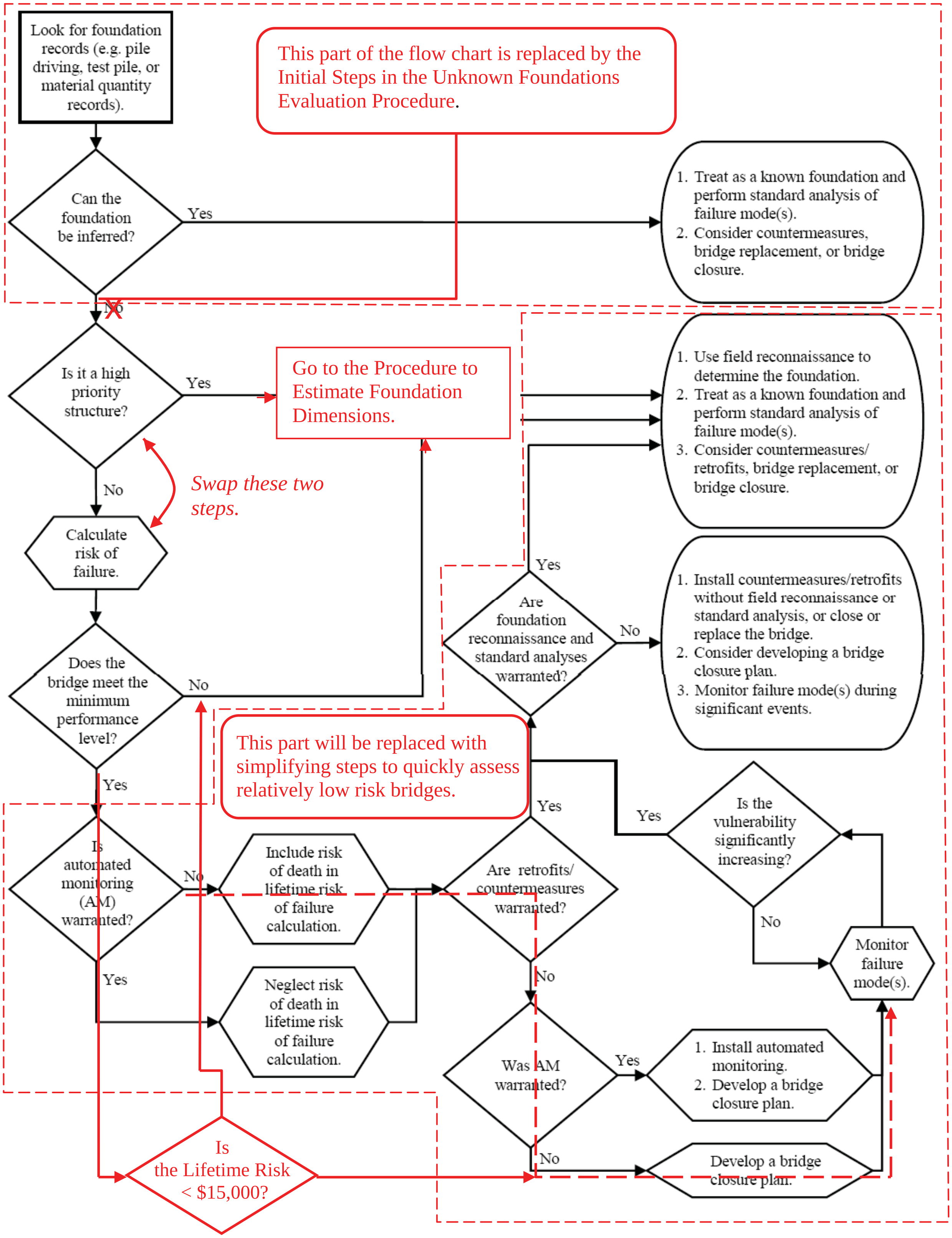

Figure 1.2: Unknown Foundations Evaluation Procedures Flow Chart - Revised

The flow chart above has two areas outlined with a red dashed line. Each area will be replaced with new, but similar, recommended steps in the *Procedural Manual: Reclassify Unknown Foundation Bridges*. The outlined area at the top of the flow chart will be replaced with the 3 initial steps discussed in the previous section of this report. The addition of these 3 steps is shown in the Figure 1.3 on the following page.

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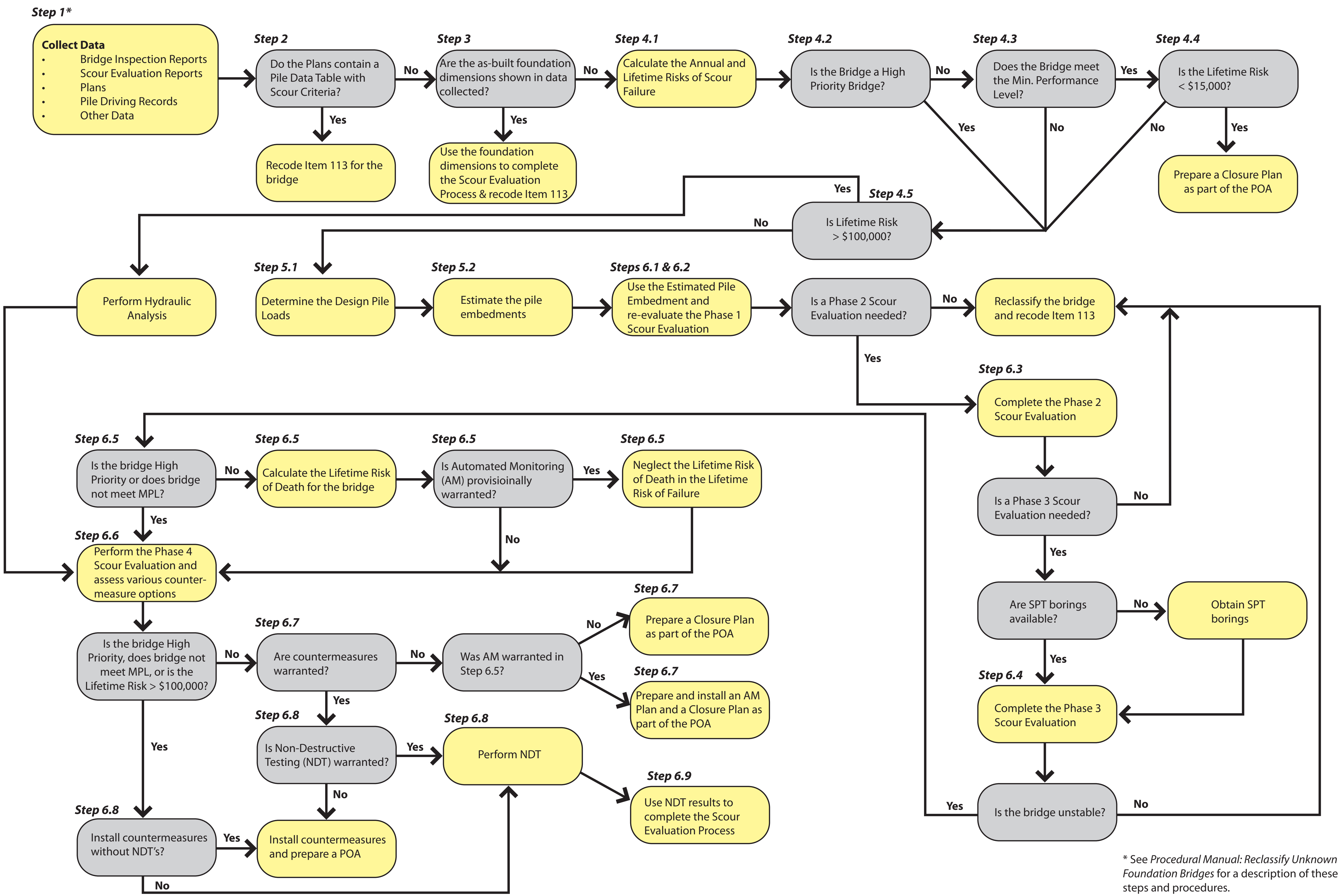

* See *Procedural Manual: Reclassify Unknown Foundation Bridges* for a description of these steps and procedures.

Figure 1.3: Unknown Foundation Evaluation Process

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Our recommendation is to swap the next two steps and calculate the risk of failure next, before determining if the bridge is a High Priority Bridge. The annual risk of failure can be used to further prioritize the High Priority bridges. Refer to Section 2 for more information on modifications to the determination of the risk of failure.

High Priority bridges are defined as:

- Bridges on principal arterials
- Evacuation routes
- Bridges that provide access to local emergency services such as hospitals
- Bridges that are defined as critical in a local emergency plan (i.e., bridges that enable immediate emergency response to disasters)
- Bridges on STRAHNET

High priority bridges automatically require additional investigation (Stein, S. and Sedmera, K. (2006)). This is because the importance of these bridges goes beyond the cost estimates made in this procedure.

Principal arterials have a Code of 01, 02, 11, 12, or 14 in the FUNCLASS field of the ROADWAY table in the PONTIS Database. Critical travel routes are identified in the CRIT_TRAVEL field of the ROADWAY table in the PONTIS Database.

Next, the annual risk of failure is compared to the Minimum Performance Level (MPL). The MPL is a probability of failure that a bridge with a certain functional classification must outperform. Table 1.4 below is from (Stein, S. and Sedmera, K. (2006)) and can be used to determine the MPL.

Table 1.4: MPL Description

NBI Item 26	Description	Minimum Performance Level (Threshold Probability of Failure)
Rural		
01, 02	Principal – All	0.0001
06, 07	Minor Arterial or Major Collector	0.0005
08	Minor Collector	0.001
09	Local	0.002
Urban		
11, 12, 14	Principal – All	0.0001
16	Minor Arterial or Major Collector	0.0002
17	Minor Collector	0.0005
19	Local	0.002

If the bridge's probability of failure is greater than the MPL, then further evaluation is automatically required in (Stein, S. and Sedmera, K. (2006)).

The rest of the (Stein, S. and Sedmera, K. (2006)) flow chart outlined by the red dashed box will be replaced with subsequent steps proposed in Florida's *Procedural Manual: Reclassify Unknown Foundation Bridges*. First, a step will be added to determine a relatively low lifetime risk of failure (<$15,000). The other procedures of the *Procedural Manual* will be followed to estimate the embedment, complete the scour evaluation process, and determine if countermeasures or further evaluation of the foundations are needed.

Florida's Scour Evaluation Process

Florida's Scour Evaluation Process for existing bridges is a four phase process. The phases are:

- Phase 1 – A qualitative evaluation
- Phase 2 – Hydraulic and scour computations
- Phase 3 – Geotechnical and structural stability computations
- Phase 4 – Countermeasure recommendations

Phase 1

A standard form is used to make a qualitative, but systematic evaluation of the bridge features and the surrounding site conditions considered important for scour and the bridge stability. The standard form and the instructions for the qualitative evaluation are in Appendix B. Although not shown on the standard form, the length of pile embedment was determined from the pile driving records and reported in the Phase 1 Evaluation. Whether the piles are deep or shallow is one of the considerations listed in the instructions when selecting a level of risk for the bridge.

About 3,090 existing known foundation bridges over water in Florida have been evaluated using the four phase process. Of these, the process has been ended for 2,181 bridges with the Phase 1 qualitative evaluation. The process has been ended with the Phase 2 quantitative scour evaluation for another 453 bridges, leaving 456 bridges that needed a Phase 3 quantitative stability analysis.

Phase 1

Reports for some of the known foundation bridges were examined to see how the pile embedments were used in the subjective evaluation. In District 3, the minimum pile embedment on the whole bridge was given in the report. Eighty-six Phase 1 Reports from District 3 were reviewed, and the following was noted:

- If the minimum pile embedment was less than 18 feet, a Phase 2 Evaluation was always recommended.
- If the minimum pile embedment was greater than 26 feet, a Phase 2 Evaluation was never recommended.
- For the range between 18 feet and 26 feet, the recommendation varied depending on the subjective evaluation of the aggressiveness of the stream, i.e., the scour potential.

Of these bridges, the greatest minimum pile embedment needing countermeasures was 19.9 feet. The minimum pile embedment that did not need countermeasures was 10.5 feet. It is important to realize that the embedment depths cited above are not criteria. The decision to perform or not perform a Phase 2 Evaluation depended on the review of all the site conditions, not just the embedment depths. The values cited above are only the results of these 86 evaluations.

Reports from some of the other districts were also reviewed. Precise numbers were not determined because the total number of reports was too small to be significant. District 5 did not use the minimum embedment for the bridge in their Phase 1 Evaluations. Instead, they used the average embedment at each bent in their subjective Phase 1 Evaluation. District 1 and 7 provided a range of embedment lengths in their Collier County Phase 1 reports. District 2 also generally cited a range of actual embedments in the Phase 1 report.

Phase 2

Scour computations are performed in this phase. Scour computations should be based on the Florida Scour Manual. The scour depths are subtracted from the pile embedment depths to determine the embedment after scour. A subjective evaluation of the stability of the bridge is made to decide if the scour evaluation process can end or if a Phase 3 Evaluation is needed.

Phase 3

The bridge stability is analyzed in this phase. Several memorandums discussing analysis considerations during the Phase 3 Evaluation are included in Appendix B. If the calculations show that the bridge is stable, then the scour evaluation process can end. A Phase 4 Evaluation is needed if the bridge is shown to be unstable.

Phase 4

Countermeasures are evaluated and recommended in the Phase 4 Evaluation. Countermeasures are discussed further in Section 6.0. A Plan of Action is also required.

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Section 2: Calculation of Risk

Risk-based methods provide an inexpensive and easy procedure for selecting a management plan for bridges. With these methods, one employs available data to estimate the monetary risk associated with failure due to scour. This is then weighed against the cost of mitigation such as installation of automated monitoring systems or scour countermeasures. (Stein, S. and Sedmera, K. (2006)) provides just such a methodology. The report contains methodologies for estimating the total cost of failure for a bridge, as well as the probability of failure, given readily available data. Additionally, it provides a procedure to calculate both the annual and lifetime risks of failure associated with a bridge. These methodologies were investigated for application to Florida's bridges with unknown foundations. This section details the results of this investigation, which includes modifications to the original procedure, as well as recommendations for application.

For the purposes of this investigation, the current 2009 National Bridge Inventory (NBI) for Florida was obtained from the FDOT Central Office. The NBI was then filtered to identify only bridges (i.e. no culverts) over water according to the following:

- Item 42B > 4 — Bridge is over water;
- Item 43B ≠ 19 — Structure is not a culvert; and
- Item 5A = 1 — Structure carries highway traffic "on" the inventory route (eliminates multiple bridge number listings).

This resulted in 6,290 bridges over water. From this data set, the bridges with unknown foundations were identified through Item 113; i.e., those with a rating of U (structure has unknown foundations). This resulted in 2,482 bridges with unknown foundations over water.

Interviews with District Representatives

As part of this investigation, contact was made with representatives at each of FDOT's eight District Structures and Maintenance Offices. Each representative was asked about bridge failures due to scour in their District. Failure was defined as any movement (settlement) or collapse of the bridge. To identify a rate of failure during their tenure, they were also asked how many years they have with the District. Finally, District representatives were also asked about the average and maximum lengths of time that bridges remained closed after any type of failure. Table 2.1 summarizes the responses during these interviews.

From the interviews, the representatives reported only seven occurrences of failure (settlement) due to scour during the terms of experience of the individual representatives. As will be demonstrated later, this failure rate is lower than the national failure rate reported in the NCHRP document of 1 in 5,000 bridges per year. Additionally, the reported closure durations are significantly less in Florida than the range given in the report of three months to three years (as a function of ADT).

Table 2.1: District Structures and Maintenance Office Interview Summary

District	Representative	Experience With District (yrs)	Bridge Closure Durations	Number of Bridge Failures Due to Scour	Description
1&7	Mr. Jose "Pepe" Garcia	20	Longest on the order of 1 month.	2	Settlement at Clearwater Pass Bridge, undermining at Johns Pass Bridge. Also reported several culvert washouts and severe scour at several locations.
2	Mr. Scott Hamilton	13	Recent closures on order of 3 weeks to 1.5 months.	1	Settlement at bridge #764031, subsequently replaced.
3	Mr. Edward Gassman	16	Averages on the order of weeks, longest approx. 6 months.	4	Settlement of US-90 over East Pass Bridges, I-10 over Choctawhatchee, Bridge 480017, also reported several culvert washouts.
4	Mr. Brian O'Donoghue	10	Longest less than 1 year.	0	Scour issues, but no settlement/failures.
5	Mr. Ron Meade	7	Averages on order of weeks, longest on order of months.	0	Reported culvert and approach washouts, but no bridge settlement/ failure.
6	Mr. Frank Guyamier	20	On the order of hours to days.	0	No pile settlement issues.
8	Ms. Giuliana Cox	10	Longest on order of 3 weeks to 1.5 months.	0	No pile settlement issues.

Total Cost of Failure

The first step in assessing the risk of failure for a bridge is to determine the total cost of failure. (Stein, S. and Sedmera, K. (2006)) provides tables and equations for developing this cost. The total cost is the sum of 1) the bridge replacement cost, 2) the detour costs, and 3) the "loss of life" (fatalities) costs. (Stein, S. and Sedmera, K. (2006)) present the following equation for calculating these costs:

$$Cost = \{C_1 eWL\}_1 + \left\{\left[C_2\left(1-\frac{T}{100}\right)+C_3\frac{T}{100}\right]DAd + \left[C_4 O\left(1-\frac{T}{100}\right)+C_5\frac{T}{100}\right]\frac{DAd}{S}\right\}_2 + \{C_6 X\}_3$$

where

Cost	=	total cost of bridge failure ($),
C_1	=	unit rebuilding cost ($/ft^2),
e	=	cost multiplier for early replacement based on average daily traffic from Table 10 of NCHRP report,
W	=	bridge width from NBI item 52 (ft),
L	=	bridge length from NBI item 49 (ft),
C_2	=	cost of running automobile,
C_3	=	cost of running truck,
D	=	detour length from NBI item 19 (mi),
A	=	average daily traffic (ADT) from NBI item 29,
d	=	duration of detour based on ADT (days),
C_4	=	value of time per adult in passenger car ($/hr),
O	=	average occupancy rate,
T	=	average daily truck traffic (ADTT) from NBI item 109 (% of ADT),
C_5	=	value of time for truck,
S	=	average detour speed (typically 40 mph),
C_6	=	cost for each life lost, and
X	=	number of deaths resulting from failure from Table 11 of NCHRP report.

The items in the {} with the subscript 1 represent the bridge replacement costs, in the {} with the subscript 2 represent the detour costs, and in the {} with the subscript 3 represent the loss of life costs. (Stein, S. and Sedmera, K. (2006)) provides tables and recommendations for determining all the listed variables. Several of the costs (Stein, S. and Sedmera, K. (2006)) were updated to Florida specific values and 2009 dollars. The following Tables 2.2 through 2.9 below, show the updated costs as well as the references from which they were obtained.

The information in Table 2.2 was simplified to the following unit rebuilding cost, C_1:

- $145/ ft^2 if the main span < 150 ft
- $175/ ft^2 if the main span > 150 ft
- For movable spans
  - $2000/ ft^2 for the main span
  - $150/ ft^2 for the other spans

Table 2.2: Revised Unit Rebuilding Cost

C1	
Unit Rebuilding Cost ($/ft^2)	
Bridge Type	**Cost (Low - High)**
Short Span Bridges	
Reinforced concrete flat slab - Simple Span*	$122 - $160
Pre-cast concrete slab - Simple Span*	$115 - $200
Reinforced concrete flat slab - Continuous Span*	NA
Medium and Long Span Bridges	
Concrete deck/Steel Girder - Simple Span*	$110 - $135
Concrete deck/Steel Girder - Continuous Span*	$125 - $155
Concrete deck/Pre-stressed Girder - Simple Span	$75 - $140
Concrete Deck/Pre-stressed Girder - Continuous Span	$95 - $155
Concrete deck/Steel Box Girder - Span Range from 150′ to 280′ (for curvature, and a 15% premium)	$145 - $175
Segmental Concrete Box Girders - Cantilever construction, Span Range from 150′ to 280′	$145 - $175
Movable Bridge - Bascule Spans and Piers	$1800 - $2000
Bridge Demolition	
Typical Bridge Removal	$20 - $50
Movable Span Bridge - Bascule	$55 - $70
Project Type	
Bridge Widening Construction	$95 - $175
* Increase the cost by twenty percent for phased construction	
Source: http://www.dot.state.fl.us/planning/policy/costs	

Table 2.3: Revised Cost of Running an Automobile and a Truck

C2 & C3		
Cost of Running automobile and Truck ($/mile)		
Cost Category	**Automobiles [1]**	**Trucks [2]**
Total per Mile	$0.57	$2.13
Driver Costs	NA	$0.59
Total Vehicle Cost per Mile	$0.57	$1.54
Variable Cost per Mile	$0.18	$0.51
Variable as % of Total	31.50%	33%
[1] Escalated from 2007 to 2009 data at below website and using CPI.		
[2] Escalated Truck Values from 2006 to 2009 using CPI.		
Source: http://www.bts.gov/publications/national_transportation_statistics/html/table_03_14.html		

Table 2.4: Revised Value of Time per Adult in Passenger Car

C4		
Mean Wage / Value of Time ($/hr)		
State	Mean Wage [1]	Value of Time [2]
Florida	$19.05	$7.81
Sources: [1] FL. Agency for Worforce Innovation, Labor Market Statistics Center. Feb. 2009 escalated from 2008 to 2009. [2] The Value of time is assumed to be 41% of the mean wage as suggested by Jose A Gomez-Ibanez, William B. Tye, Clifford Winston, "Essays in Transportation Economics and Policy: A Handbook in Honor of John R Meyer", 1999.		

Table 2.5: Revised Average Occupancy Rate

O		
Occupancy per Vehicle Mile by Daily Trip Purpose (Persons)		
Trip Purpose	Mean	Standard Error
All personal vehicle trips	1.63	0.012
Work	1.14	0.007
Work – Related	1.22	0.02
Family/Personal	1.81	0.016
Church/School	1.76	0.084
Social/Recreational	2.05	0.028
Other	2.02	0.13
Source: National Household Travel Survey http://nhts.ornl.gov/index.shtml		

Table 2.6: Revised Value of Time for Truck

C5				
Estimates of the Value of Travel Time ($/HR)				
	Automobile		**Truck**	
Travel Purpose	**Small**	**Medium**	**4-Tire**	**6-Tire**
Business Travel				
Value per Person [1]	$22.29	$22.29	$22.29	$18.10
Average Vehicle Occupancy [2]	1.43	1.43	1.43	1.18
Vehicle Depreciation [2]	$1.23	$1.64	$2.15	$3.00
Total Business	$33.10	$33.51	$34.02	$24.36
Personal Travel				
Value per Person [3]	$11.15	$11.15	$11.15	NA
Average Vehicle Occupancy	1.57	1.57	1.57	NA
Total Personal	$17.51	$17.51	$17.51	NA
Sources:				
[1] Concas, Sisinnio. *Synthesis of Research on Value of Time and Value of Reliability,* Florida DOT, January 2009, pp. 21-23. Value of Person is 100% of mean wage (C4) plus fringe benefits (below website). [2] Taken from 2006 HERS report. [3] Given in above reference [1] as 50% of mean wage Fringe Benefits: http://www.dol.gov/whd/contracts/sca/sf98/memo_204.htm				

Table 2.7: Revised Loss of Life Costs

C6
Cost of Life Lost ($) [1]
$576,750
Source: [1] "Plan of Action for Scour Critical Bridges", Idaho DOT, 2004 and escalated to 2009 using CPI.

In addition to adjusting the costs, the detour duration (d) was also adjusted from the recommendations provided in the report. Based on the information obtained in the interview of District representatives, a conservative upper limit of the detour duration was set equal to 1 year (365 days). The detour duration times versus ADT for the bridge as listed in Table 3 of (Stein, S. and Sedmera, K. (2006)) were then adjusted downward proportionally, as shown in Table 2.8 and Figure 2.1 below:

Table 2.8: Revised Detour Duration versus ADT

ADT	Duration of Detour in Days (NCHRP)	Duration of Detour in Days (Proposed)
ADT < 100	1,095	365
100<= ADT < 500	730	292
500<= ADT < 1000	548	256
1000<= ADT < 5000	365	219
ADT >= 5000	183	183

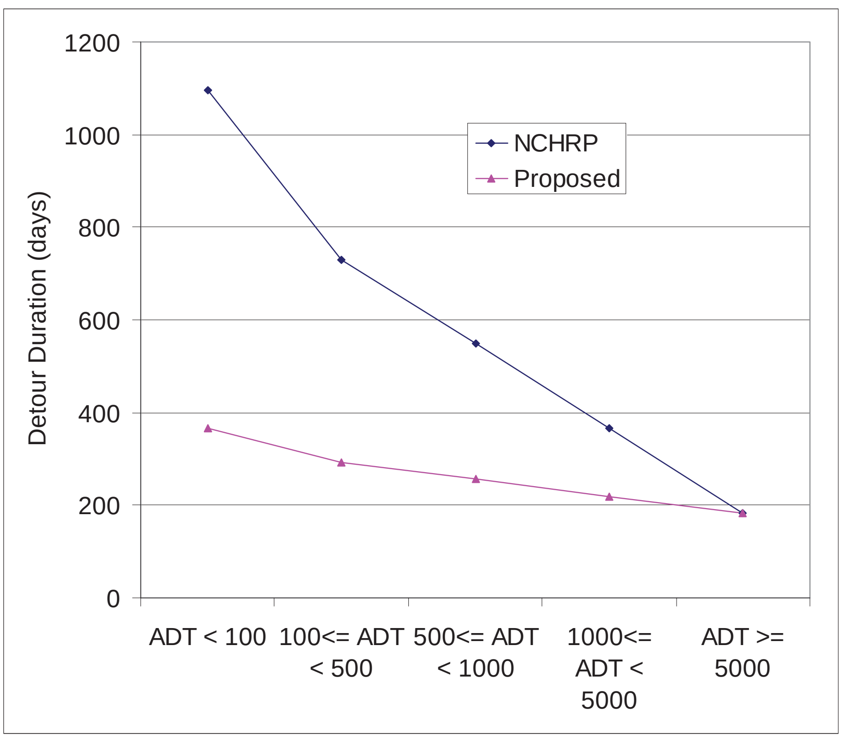

Figure 2.1: NCHRP and Proposed Detour Durations

From the revised quantities, failure costs were calculated for all 6,290 bridges. These cost estimates are summarized in the following Table 2.9. The table contains costs for all bridges over water and just the unknown foundation bridges over water. The statistics reported in the table are skewed toward lower values for the following reason. Several of the detour lengths reported in the NBI (Item 19) were coded as 199. According to (Federal Highway Administration, FHWA-PD-96-001 (1988)), a listing of 199 in Bypass, Detour Length (NBI Item 19) can correspond to either a detour length of 199 km or more or a structure on a dead end road (i.e., there is no detour). For example, if the bridge is the only access to an island, the bridge will be coded as 199. For these bridges, the detour costs were not calculated. These bridges (234 unknown foundation bridges and 204 known foundation bridges) will require individual analyses to develop alternative detour costs; for example, installation of temporary bridges, ferry service, etc. Calculation of these costs was outside the scope of this Study. As such, the detour costs, and subsequent total costs of failure, are lower than they will be once these additional costs are incorporated. The average and maximum costs associated with unknown foundation bridges are generally lower than those associated with the entire data set (all bridges). This is likely attributed to the fact that the unknown foundation bridges are, on average, half as long and carry half as much traffic. Shorter structure length reduces the bridge replacement costs and lower ADT reduces both the detour costs and the loss of life costs.

Appendix C contains a table of the calculated total cost of failure for all of Florida's unknown foundation bridges over water. Notably, the bridges contained in this table are only those identified employing the screening methodology described in the introduction to this section. The table contains costs associated with bridge replacement, detour costs, and loss of life costs as well as the total cost (the sum of the three). For the bridges with a detour length (NBI Item 19) listed as 199, the detour costs are listed in the table as NA. Additionally, the total cost of failure associated with those bridges does not include any detour costs.

Table 2.9: Summary of Costs of Failure for All Bridges & Unknown Foundation Bridges

All Bridges				
	Bridge Replacement Cost	Detour Cost*	Loss of Life Cost	Total Failure Cost
Average	$5,784,579	$6,392,931	$1,855,564	$14,033,074
Standard Deviation	$22,566,327	$22,010,450	$1,086,965	$34,827,142
Minimum	$35,227	$0	$0	$44,733
Maximum	$728,514,535	$709,260,330	$2,900,000	$993,749,733
Unknown Bridges				
	Bridge Replacement Cost	**Detour Cost***	**Loss of Life Cost**	**Total Failure Cost**
Average	$2,069,138	$2,829,586	$1,322,802	$6,221,526
Standard Deviation	$7,026,356	$7,600,895	$1,070,173	$11,925,531
Minimum	$40,424	$0	$0	$44,733
Maximum	$116,124,250	$136,563,484	$2,900,000	$139,942,702

*Detour costs not calculated for bridges with NBI Item 19 = 199.

Probability of Failure

The next step in calculating the risk of failure is determining the probability of failure. (Stein, S. and Sedmera, K. (2006)) recommends employing the HYRISK methodology for determining the probability of failure. The original development of this methodology is found in (Elias (1994)). This report provided a methodology for estimating relative annual risk of bridge failure due to scour from data in the NBI database as well as user-specified economic data. This methodology was incorporated into the software application HYRISK. (Pearson, et al. (2002)) updated the original methodology to take advantage of "scour analyses performed at the majority of the Nation's bridge sites and incorporates a new methodology for determining economic feasibility of alternative scour countermeasures available." (Stein, S. and Sedmera, K. (2006)) further extends the methodology by altering the probabilities of failure to better reflect nationwide averages as well as include costs associated with loss of life. This section first presents the original methodology for calculating the probability of failure followed by the revised methodology for calculating probability of failure.

Original Methodology

The HYRISK methodology for determining probability of failure requires several inputs readily available from the NBI database. These include:

- Functional Classification (NBI Item 26)
- Substructure Condition (NBI Item 60)
- Channel Protection (NBI Item 61)
- Waterway Adequacy (NBI Item 71)

With this procedure, the probabilities of failure are a function of the scour vulnerability of a bridge and the overtopping frequency. Scour vulnerability, a rating of the potential for damage or failure due to a scour event, is a function of substructure condition (NBI Item 60) and Channel Protection Rating (NBI Item 61). The scour vulnerability is calculated in Table 2.10 below. The logic behind the table is that the substructure condition is a qualitative evaluation of the scour that has already occurred at the bridge and that the channel protection code is a qualitative measure of the stream stability. Note that lower scour vulnerability values correspond to potential for failure and higher values correspond to lower potentials.

Table 2.10: Scour Vulnerability Table (Source: Stein and Sedmera (2006))

	Substructure Condition (NBI Item 60)											
Channel Protection (NBI Item 61 Code)	**Description**	**(0) Failed**	**(1) Imminent Failure**	**(2) Critical Condition**	**(3) Serious Condition**	**(4) Poor Condition**	**(5) Fair Condition**	**(6) Satisfactory Condition**	**(7) Good Condition**	**(8) Very Good Condition**	**(9) Excellent Condition**	**(N) Not Applicable**
0	Failure	0	0	0	0	0	0	0	0	0	0	0
1	Failure	0	1	1	1	1	1	1	1	1	1	N
2	Near Collapse	0	1	2	2	2	2	2	2	2	2	N
3	Channel Migration	0	1	2	2	3	4	4	4	4	4	N
4	Undermined Bank	0	1	2	3	4	4	5	5	6	6	N
5	Eroded Bank	0	1	2	3	4	5	5	6	7	7	N
6	Bed Movement	0	1	2	3	4	5	6	6	7	7	N
7	Minor Drift	0	1	2	3	4	6	6	7	7	8	N
8	Stable Condition	0	1	2	3	4	6	7	7	8	8	N
9	No Deficiencies	0	1	2	3	4	7	7	8	8	9	N
N	Not Over Water	0	1	N	N	N	N	N	N	N	N	N

Overtopping frequency is a measure of the likelihood of a scour producing event at the bridge. This is a function of the Waterway Adequacy (NBI Item 71) and the Functional Class (NBI Item 26). The overtopping frequency is calculated in Table 2.11 below. In the table, R = remote, S = slight, O = occasional, F = frequent, and N = never.

Table 2.11: Bridge Overtopping Frequency

<table>
<tr><th rowspan="2"></th><th colspan="11">Waterway Adequacy</th></tr>
<tr><th colspan="11">(NBI Item 71)</th></tr>
<tr><th>Functional Class (NBI Item 26)</th><th>0</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>N</th></tr>
<tr><td>1</td><td rowspan="12">Bridge Closed</td><td rowspan="12">Unused</td><td>O</td><td>O</td><td>O</td><td>O</td><td>S</td><td>S</td><td>S</td><td>R</td><td>N</td></tr>
<tr><td>2</td><td>F</td><td>O</td><td>O</td><td>O</td><td>S</td><td>S</td><td>S</td><td>R</td><td>N</td></tr>
<tr><td>6</td><td>F</td><td>O</td><td>O</td><td>O</td><td>S</td><td>S</td><td>S</td><td>R</td><td>N</td></tr>
<tr><td>7</td><td>F</td><td>O</td><td>O</td><td>O</td><td>S</td><td>S</td><td>S</td><td>R</td><td>N</td></tr>
<tr><td>8</td><td>F</td><td>F</td><td>O</td><td>O</td><td>O</td><td>S</td><td>S</td><td>R</td><td>N</td></tr>
<tr><td>9</td><td>F</td><td>F</td><td>O</td><td>O</td><td>O</td><td>S</td><td>S</td><td>R</td><td>N</td></tr>
<tr><td>11</td><td>O</td><td>O</td><td>O</td><td>O</td><td>S</td><td>S</td><td>S</td><td>R</td><td>N</td></tr>
<tr><td>12</td><td>F</td><td>O</td><td>O</td><td>O</td><td>S</td><td>S</td><td>S</td><td>R</td><td>N</td></tr>
<tr><td>14</td><td>F</td><td>O</td><td>O</td><td>O</td><td>S</td><td>S</td><td>S</td><td>R</td><td>N</td></tr>
<tr><td>16</td><td>F</td><td>O</td><td>O</td><td>O</td><td>S</td><td>S</td><td>S</td><td>R</td><td>N</td></tr>
<tr><td>17</td><td>F</td><td>O</td><td>O</td><td>O</td><td>S</td><td>S</td><td>S</td><td>R</td><td>N</td></tr>
<tr><td>19</td><td>F</td><td>F</td><td>O</td><td>O</td><td>O</td><td>S</td><td>S</td><td>R</td><td>N</td></tr>
</table>

The overtopping frequency and the scour vulnerability provide the inputs to calculate the probability of failure. See Table 2.12 on the following page. The probabilities in Table 2.12 are the same as those published in (Stein, S. and Sedmera, K. (2006)). The original work (Elias (1994)) developed probabilities based on the overtopping frequency and whether the bridge opening was "full of water." This full condition represents an estimate of maximum depth since higher flows will overtop the embankments without large depth increases. The methodology employs USGS regression equations and Manning's Equation to derive frequencies of less than full flow depths. Relating relative flood frequencies (e.g., Q_2/Q_{100}) to relative depth frequencies (e.g., D_2/D_{100}), and employing the Virginia USGS regression equations, the researchers developed probabilities associated with five relative depth ranges for each of the overtopping frequencies. Depth was then eliminated from the probability calculation by weighting the probabilities over the five ranges.

Further development of the probabilities was reported in (Pearson, et al. (2002)). Rather than employ the Virginia USGS regression equations, the methodology was altered to employ equations with nationwide applicability. These were found in (Fletcher, J. E., et al. (1977)). The probabilities reported in (Pearson, et al. (2002)) were also a function of the overtopping frequency and scour vulnerability. However, the scour vulnerability is estimated directly from the NBI Item 113 code. The probabilities associated with a scour vulnerability of 6/U (unknown foundations) or 7 (scour countermeasures installed) were adjusted upward to reflect the higher risk associated with these bridges. Thus, the probabilities for a given overtopping frequency did not decrease with increasing scour vulnerability. Rather, the probability decreased from a vulnerability rating of 1 to 5, then increased for 6 and 7, and then decreased again for 8 and 9. (Stein, S. and Sedmera, K. (2006)), the probabilities were altered once more. The details of this adjustment are contained in Appendix D of the NCHRP report. First, it was noted that the probabilities contained in the (Pearson, et al. (2002)) resulted in a prediction of 60,511 failures per year if applied to all the nation's 356,378 bridges (as of the end of 2005). This corresponds to an average annual probability of failure of 0.17, or 1 failure out of every 6 bridges per year. Based on interviews by the authors of (Pearson, et al. (2002)), the current probability of failure is closer to 0.000205, or 1 failure out of every 5,000 bridges per year. As such, the researchers adjusted the probabilities by multiplying the original probabilities by a proportionality constant (0.000205/0.17 = 0.00121). Next, the probabilities associated with scour vulnerabilities 1 though 4 were then adjusted upward to reflect the assumption that bridges with a lower scour vulnerability are more likely to fail than was reflected following the proportionality constant adjustment. The final probabilities are those reported in Table 2.12 below. Note that the probabilities reported still contain the same behavior in probability for a given overtopping frequency: i.e., there is an increase in the probability of failure from a scour vulnerability of 5 to 6.

Table 2.12: Annual Probability of Failure Due to Scour

	Overtopping Frequency/Scour Event Frequency			
Scour Vulnerability	Remote (R)	Slight (S)	Occasional (O)	Frequent (F)
0	1	1	1	1
1	0.01	0.01	0.01	0.01
2	0.005	0.006	0.008	0.009
3	0.0011	0.0013	0.0016	0.002
4	0.0004	0.0005	0.0006	0.0007
5	0.000007	0.000008	0.00004	0.00007
6	0.00018	0.00025	0.0004	0.0005
7	0.00018	0.00025	0.0004	0.0005
8	0.000004	0.000005	0.00002	0.00004
9	0.0000025	0.000003	0.000004	0.000007

Modified Methodology

Review of (Elias (1994)) methodology indicated two areas where the methodology could be altered to specifically address Florida's bridges. The first area relates to the treatment of tidal bridges subject to hurricane induced flows. The second area addresses the lower rate of failure due to scour encountered within the state. This section describes these recommended adjustments.

(Elias (1994)) developed probabilities of failure by relating overtopping frequency and scour vulnerability. The inclusion of overtopping frequency followed the logic that scour is proportional to shear stress and shear stress is proportional to depth of flow. Therefore, the waterway has a maximum scour potential at full flow depth and less potential at lesser depths. For tidal bridges, however, scour potential is not necessarily correlated to the number of high water surface elevation events. Rather, it is a function of not only the bridge's exposure to hurricane generated storm surges (both magnitude of the surge and frequency) but also the way the surge propagates from the ocean through the waterway to the bridge and the storage area behind the bridge. For example, a bridge located on the coast over a tidal inlet and one located nearby but farther inland, may experience the same number of hurricane generated flow events, but the severity of those events may be significantly different. Additionally, bridges located in coastal regions are often built to accommodate navigation. As such, the frequency of overtopping (as implied through NBI Item 71, Waterway Adequacy) as a measure of the likelihood of a scour event is diluted. As such, for tidal bridges, the scour event frequency should replace the overtopping frequency in the procedure for evaluating a bridge's probability of failure.

The recommended procedure for determining scour event frequency relies on readily available data as well as sound engineering judgment from a qualified coastal engineer with familiarity with the bridge locations. From the PONTIS database, one can identify the mode of flow at the subject bridges. The bridge should be coded (Florida Department of Transportation (2009)) as one of the following:

- @ — Unknown
- ! — Not applicable
- R — Riverine
- M — Tidal/Riverine
- T — Tidal

If the rating is @, M, or T, a qualified coastal engineer should assess the scour event frequency. Since this assessment relies on sound engineering judgment, the coastal engineer should have demonstrable experience with tidal circulation and storm surge propagation in the state. The coastal engineer should consult the following reference materials (at a minimum): aerials of the area, topographic/bathymetric maps, hurricane history at the bridge site, FEMA flood maps, FEMA flood insurance studies (FIS), storm surge hydraulic modeling studies for nearby locations. Based on these materials, one can rate the scour event frequency employing the guidelines in Table 2.13. Associated with each frequency are a return period and a description detailing reasons for rating. The engineer responsible for rating should weigh all factors and not simply hurricane history when assigning a scour event frequency rating. For example, a bridge located at the back of a bay with very little water storage behind it may experience frequent flooding, but since the storage area behind it is low, the scour event frequency may be slight. Illustrating the effects of storm surge propagation, a bridge to a small isolated island off the coast may experience storm surges on a relatively frequent basis (greater than once every three years). However, if the storm surge propagates to the bridge equally on both sides, flow through the bridge may be minimal, thus deserving a lower scour event frequency rating than the hurricane history might imply. Conversely, a bridge across a tidal inlet is located in an area that experiences infrequent surge events (return periods of 11 to 100 years). When a surge affects the bridge, significant flows result. However, due to the infrequency of surge events, the scour event frequency is rated as slight.

Table 2.13: Scour Event Frequency Guidelines

Scour Event Frequency	Return Period (yr)	Reasons for Rating
Never (N)	Never	The bridge never experiences scour producing flows due to tidal circulation or hurricane induced storm surge.
Remote (R)	> 100	The bridge is located in an area that rarely (> 100 years) experiences storm surges. The surge will attenuate significantly before it reaches the bridge site. The storage area behind the bridge is small (example: bridges on dead end canals, or near the backs of bays).
Slight (S)	11 to 100	The bridge is located in an area that experiences significant hurricane generated surge every 11 to 100 years. The bridge is located relatively far from the coast and significant attenuation of the surge is expected. The storage area behind the bridge is small to moderate (example: bridge located far from an inlet across a tidal creek with narrow floodplains).
Occasional (O)	3 to 10	The bridge is located in an area that experiences hurricane generated surge every 3 to 10 years. The bridge is located relatively near to the coast and significant attenuation of the surge is not expected. The storage area behind the bridge is moderate to large (example: bridges on the Intracoastal Waterway near tidal inlets, or bridges across bays).
Frequent (F)	< 3	The bridge is located in an area that frequently experiences hurricane generated flows. The potential for high flows through the bridge during surge events is high and the storage area behind the bridge is large (example: bridges on the open coast over tidal inlets).

Following determination of a scour event frequency for a particular bridge, for bridges rated M, @, or left blank (i.e., bridges where riverine runoff may be the dominant mode for scour), the engineer should compare the rating selected above with the overtopping frequency previously developed (Elias (1994)). The more frequent value should be the one employed for the calculation of annual probability of failure.

During the interviews of FDOT District personnel (see page 2-2), each representative was asked about bridge failures due to scour in their District. Failure was defined as any movement (settlement) or collapse of the bridge. To identify a rate of failure, they were also asked how many years they have been with the District. Table 2.14 below presents the results of these questions:

Table 2.14: Rate of Failure Due to Scour Summary

District	# of Bridges	# of Failures	Period (years)	Rate (failures/#bridges/year)	Weighted Rate
1	1,317	2	20	7.6 E-5	2.1 E-5
2	811	1	13	9.5 E-5	1.1 E-5
3	1,175	4	16	2.1 E-4	4.2 E-5
4	1,057	0	10	0	0
5	641	0	7	0	0
6	595	0	20	0	0
7	513	0	20	0	0
8	181	0	10	0	0

Rates were weighted according to the number of bridges in the District and the length of experience of the District representatives. In other words, the rates in the Districts with the greater number of bridges and the longer lengths of experience were given more weight. The weights were calculated via the following equation:

$$Weight_i = \frac{\#of\ Bridges_i Period_i}{\sum_{j=1}^{8} \#of\ Bridges_j Period_j}$$

The statewide failure rate is the sum of the weighted rates and equaled 7.4E-05 failures per bridge per year. This translates to 0.4649 failures per year for the 6,290 bridges over water, which, in turn, translates to an annual failure frequency of 1 failure in 13,530 bridges per year, or roughly 2.7 times less than the average of 1 in 5,000 employed in (Stein, S. and Sedmera, K. (2006)).

Based on this result, an adjustment of the probabilities of failure (Stein, S. and Sedmera, K. (2006)) is recommended to reflect a failure rate of 1 in 10,000 failures per year for Florida. This rate was considered to be more representative of the conditions in Florida yet still conservative; especially given the stated definition of failure as any movement or settlement of the bridge.

This adjustment follows the same procedure (Stein, S. and Sedmera, K. (2006) Appendix D). The first step requires calculating the number of failures predicted by the current procedure. This involved computing the scour vulnerability for each of the 6,290 bridges over water. The scour vulnerability is a function of substructure condition (NBI Item 60) and Channel Protection Rating (NBI Item 61) as mentioned previously. The next step involves calculating the overtopping frequencies. As before, this is a function of the Waterway Adequacy (NBI Item 71) and the Functional Class (NBI Item 26).

Next, the bridges are grouped by scour vulnerability and overtopping frequency. They are then multiplied by the probabilities (Stein, S. and Sedmera, K. (2006)) and summed to find the annual number of failures. Table 2.15 below illustrates this procedure in a series of tables. Tables A through C are the calculations associated with the current procedure. Table A shows the probabilities listed by scour vulnerability rating and overtopping frequency (Stein, S. and Sedmera, K. (2006)). Table B shows the number of bridges by scour vulnerability rating and overtopping frequency for Florida. Note that the number of bridges has been reduced to 6,244 from 6,290. This occurred because 46 bridges were missing information for either NBI Item 60, 61, or 71. As such, it was not possible to calculate either the scour vulnerability or overtopping frequency for these bridges. Table C is the product of the first two tables. This represents the calculated annual number of failures by scour vulnerability rating and overtopping frequency. Summing the values in the table yields the number of failures per year for the entire population. This led to a prediction of 1.5 bridges per year or a rate of 1 failure in 4,239 bridges per year (1/4,239=0.000236). Following the same procedure (Stein, S. and Sedmera, K. (2006)), adjusting the probabilities involves employing a straight multiplication factor times the report's probabilities. The multiplication factor is the proposed rate (1 failure in 10,000 bridges = 0.0001) divided by the computed rate (0.000236). This yielded a multiplication factor of 0.4329 (=0.0001/0.000236). This adjustment is only applied to bridges with scour vulnerabilities of 5 and higher. Table D shows the adjusted probabilities rounded to two significant figures. Following this row across, the number of failures per year (Table F) is found by multiplying the Table E by Table D. The total number of failures is found by summing the values in the third table of the bottom row. This yields 0.73 failures per year for the 6,244 bridges or 1 failure per 8,586 bridges per year. Comparing this number with the number calculated from the interviews (1 in 13,530) illustrates that there is still conservatism built into the probability of failure calculations.

Note that this procedure did not perform the adjustment from the overtopping frequencies to a scour event frequency for the tidal bridges. The adjustment only involves a multiplication factor on the probabilities associated with scour vulnerabilities greater than 4. The rest of the calculations (i.e., creation of the Tables E and F) serve to illustrate how the adjustment changes the overall failure rate for the state's bridges. Following reclassification of the tidally influenced bridges, the distribution of the bridges within the table will change, and the overall failure rate will change. However, it is expected that, in general, scour event frequencies will be greater than the overtopping frequencies. This will act to increase the overall probability of failure and increase the demonstrated conservatism when compared to the failure rate based on the interviews.

The final adjustment to the annual probability of failure involves addressing the inconsistency associated with the scour vulnerability of 5. In (Elias (1994)), scour vulnerability is set equal to the NBI Item 113. Thus, it is reasonable to attach higher annual probabilities of failure to the scour vulnerabilities of 6 and 7. However, when addressing unknown foundation bridges, the scour vulnerability ratings must be developed from other sources (NBI Items 60 and 61). Given this, there is no longer a special meaning attached to a rating of 6 or 7. Rather, progressing from a rating of 5 to 6 simply reflects an increase in the vulnerability to failure due to scour. Therefore, for a given overtopping frequency, it is reasonable to expect the annual probability of failure to be monotonically decreasing with increasing scour vulnerability.

Figure 2.2 displays the annual probabilities of failure (Stein, S. and Sedmera, K. (2006)) as a function of scour vulnerability for each overtopping frequency. The probabilities are plotted on a semi-log plot to increase clarity. From the figure, the solid lines show the annual probabilities of failure (Stein, S. and Sedmera, K. (2006)). The inconsistency in probabilities occurring at a scour vulnerability of 5 is readily apparent. To address this inconsistency, rather than adjusting the annual probabilities of failure associated with a scour vulnerability of 6 or 7 downward, it is more conservative to adjust the annual probabilities of failure associated with a rating of 5 upward. This is illustrated in the figure by the dashed lines. Development of these probabilities involved interpolating from a rating of 4 to 6 along the semi-log plot. The final recommended probabilities of failure are contained in Table 2.16. The recommended probabilities for a scour vulnerability of 5 change the overall failure rate for the State's bridges from 1 failure per 8,586 bridges per year to 1 failure per 8,126 bridges per year.

Appendix C contains a table with the annual probability of failure associated with the identified unknown foundation bridges over water. These probabilities reflect the adjustment described above. They do not, however, reflect a change in the overtopping/scour event frequency recommended for tidal bridges.

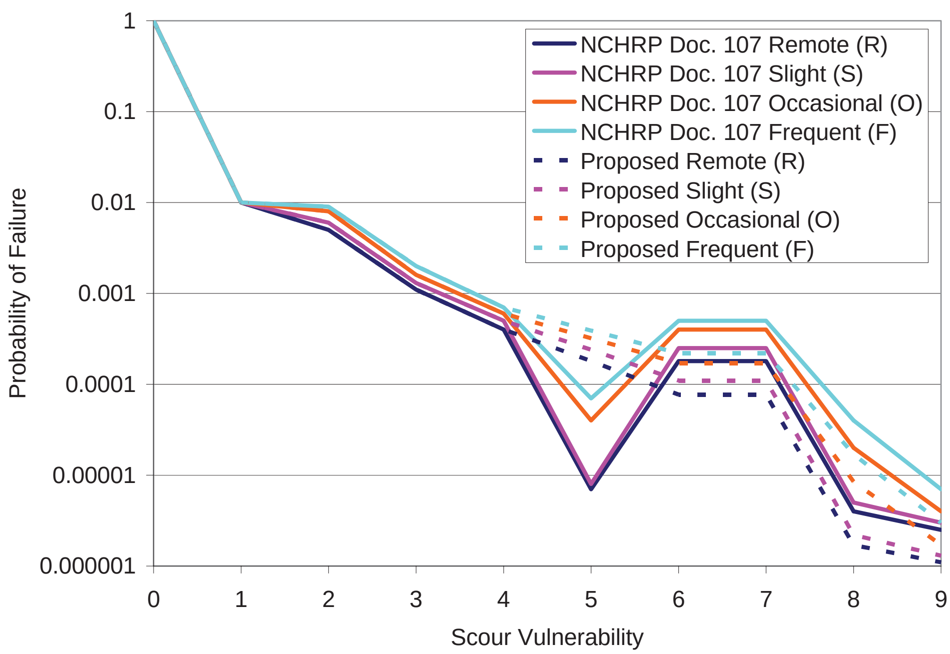

Figure 2.2: Existing NCHRP and Proposed Probability of Failure vs. Scour Vulnerability

Table 2.15: Procedure for Adjustment of Probabilities of Failure

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Table A

Probability of Failure

	Overtopping Frequency			
Scour Vulnerability	Remote (R)	Slight (S)	Occasional (O)	Frequent (F)
0	1	1	1	1
1	0.01	0.01	0.01	0.01
2	0.005	0.006	0.008	0.009
3	0.0011	0.0013	0.0016	0.002
4	0.0004	0.0005	0.0006	0.0007
5	0.000007	0.000008	0.00004	0.00007
6	0.00018	0.00025	0.0004	0.0005
7	0.00018	0.00025	0.0004	0.0005
8	0.000004	0.000005	0.00002	0.00004
9	0.0000025	0.000003	0.000004	0.000007

Computed P(f)	0.000236
One in	4239
Proposed P(f)	0.0001
One in	10000
Scaling Adjustment	0.4239

X

Table B

2009 Bridge over Water Population

	Overtopping Frequency				
Scour Vulnerability	Remote (R)	Slight (S)	Occasional (O)	Frequent (F)	Total
0					0
1		1			1
2		4			4
3		29	7		36
4	7	100	17	2	126
5	8	136	25		169
6	140	1356	127	2	1625
7	571	2936	169		3676
8	152	399	31		582
9	10	13	2		25
Total	888	4974	378	4	6244

=

Table C

Number of Failures

	Overtopping Frequency				
Scour Vulnerability	Remote (R)	Slight (S)	Occasional (O)	Frequent (F)	Total
0	0	0	0	0	0
1	0	0.01	0	0	0.01
2	0	0.024	0	0	0.024
3	0	0.0377	0.0112	0	0.0489
4	0.0028	0.05	0.0102	0.0014	0.0644
5	0.000056	0.001088	0.001	0	0.002144
6	0.0252	0.339	0.0508	0.001	0.416
7	0.10278	0.734	0.0676	0	0.90438
8	0.000608	0.001995	0.00062	0	0.003223
9	0.000025	0.000039	0.000008	0	0.000072
Total	0.131469	1.197822	0.141428	0.0024	1.473119

Direct Scaling to Vulnerability 5 through 9 only (scaling = 0.0001/0.000236) and Rounding

Table D

Probability of Failure

	Overtopping Frequency			
Scour Vulnerability	Remote (R)	Slight (S)	Occasional (O)	Frequent (F)
0	1	1	1	1
1	0.01	0.01	0.01	0.01
2	0.005	0.006	0.008	0.009
3	0.0011	0.0013	0.0016	0.002
4	0.0004	0.0005	0.0006	0.0007
5	0.0000030	0.0000034	0.000017	0.000030
6	0.000077	0.00011	0.00017	0.00022
7	0.000077	0.00011	0.00017	0.00022
8	0.0000017	0.0000022	0.0000085	0.0000170
9	0.0000011	0.0000013	0.0000017	0.0000030

Computed P(f)	0.000116475
One in	8586

X

Table E

2009 Bridge over Water Population

	Overtopping Frequency				
Scour Vulnerability	Remote (R)	Slight (S)	Occasional (O)	Frequent (F)	Total
0					0
1		1			1
2		4			4
3		29	7		36
4	7	100	17	2	126
5	8	136	25		169
6	140	1356	127	2	1625
7	571	2936	169		3676
8	152	399	31		582
9	10	13	2		25
Total	888	4974	378	4	6244

=

Table F

Number of Failures

	Overtopping Frequency				
Scour Vulnerability	Remote (R)	Slight (S)	Occasional (O)	Frequent (F)	Total
0	0	0	0	0	0
1	0	0.01	0	0	0.01
2	0	0.024	0	0	0.024
3	0	0.0377	0.0112	0	0.0489
4	0.0028	0.05	0.0102	0.0014	0.0644
5	0.000024	0.0004624	0.000425	0	0.0009114
6	0.01078	0.14916	0.02159	0.00044	0.18197
7	0.043967	0.32296	0.02873	0	0.395657
8	0.0002584	0.0008778	0.0002635	0	0.0013997
9	0.000011	0.0000169	0.0000034	0	0.0000313
Total	0.0578404	0.5951771	0.0724119	0.00184	0.7272694

Table 2.16: Final Recommended Annual Probability of Failure Due to Scour

	Overtopping Frequency/Scour Event Frequency			
Scour Vulnerability	Remote (R)	Slight (S)	Occasional (O)	Frequent (F)
0	1	1	1	1
1	0.01	0.01	0.01	0.01
2	0.005	0.006	0.008	0.009
3	0.0011	0.0013	0.0016	0.002
4	0.0004	0.0005	0.0006	0.0007
5	0.00018	0.00024	0.00032	0.00039
6	0.000077	0.00011	0.00017	0.00022
7	0.000077	0.00011	0.00017	0.00022
8	0.0000017	0.0000022	0.0000085	0.0000170
9	0.0000011	0.0000013	0.0000017	0.0000030

Risk of Failure

Following determination of the annual probability of failure and the total cost of failure, the annual risk of failure ($Risk_A$) is determined via the following equation:

$$Risk_A = K_1 K_2 P_A Cost$$

where K_1 and K_2 are risk adjustment factors, P_A is the annual probability of failure, and Cost is the total cost of failure. The risk adjustment factors allow adjustments to the risk for the structure foundation and/or design. As defined by (Stein, S. and Sedmera, K. (2006)), K_1 is a bridge type factor and K_2 is a foundation type factor.

(Stein, S. and Sedmera, K. (2006)) recommends the following for K_1 and K_2:

K_1 = 0.67 for rigid continuous spans with lengths in excess of 100 ft (NBI Item 43=2,4, or 6 and Item 48>100 feet); and
= 1.0 for all others.

K_2 = 0.2 for bridges on massive rock;
= 0.8 for all wood foundation bridges or pile foundation bridges; and
= 1.0 for all others.

According to (Stein, S. and Sedmera, K. (2006)), the K_1 factor "reflects the benefit of structural continuity which can compensate for loss of intermediate supports… The influence of rigidity, type of structure, etc., has significant effects on the tolerable movement criteria, which may be defined as an increase in maximum stress to a point below yield, therefore precluding collapse." The reference also notes that even structures founded on massive rock may still incur damage attributed to an inadequate waterway opening or other causes, and as such, the K_2 factor cannot equal zero by definition. The information needed to ensure that the foundation is resting on massive rock, and in fact properly keyed or embedded into rock, would mean that the foundations would be known. K_2 = 0.2 should not be used for unknown foundations.

In addition to the costs of failure, scour vulnerability, overtopping frequency, and annual probability of failure (not adjusted for tidal bridges), the table in Appendix A also contains unadjusted annual risk. These values are the product of the probability of failure and the total cost of failure. They do not include the risk adjustment factors K_1 and K_2.

Calculation of the lifetime risk first involves calculation of the lifetime probability of failure (P_L). This is done via the following equation:

$$P_L = 1 - (1 - P_A)^L$$

where P_A is the annual probability of failure and L is the provisional remaining life of the bridge. For the provisional remaining life, it is recommended to subtract the bridge's current age from 75 years or set equal to 15 years, whichever is greater. Exceptions to this are bridges currently designated for replacement within a known time frame (i.e., within the Five Year Work Program). From the lifetime probability of failure, it is possible to calculate the lifetime risk of failure ($Risk_L$) via the following equation:

$$Risk_L = K_1 K_2 P_L Cost$$

where K_1 and K_2 are the same risk adjustment factors described above, P_L is the lifetime probability of failure, and Cost is the total cost of failure.

Application of the Unknown Foundations Evaluation Process to Alachua and Collier Counties

The initial steps of the unknown foundations evaluation process and the risk screening were performed for most of the bridges in Alachua and Collier Counties.

Bridge No. 035252 had a set of plans in the files, but was missing the pile driving records, therefore the bridge had been classified as unknown during the Phase 1 Evaluation. However, the plans did have a Pile Data Table with the scour criteria shown. This bridge should be reclassified as a low risk bridge.

A construction field book is available for Bridge No. 030087, and a page from the book is shown in Figure 2.3. The field book shows that the structure has spread footings founded on rock. The depth to rock is shown. Enough information is provided in the field book to determine the foundation dimensions. This bridge can be treated as a known foundation bridge and the scour evaluation process can be completed. Two other bridges, (030088 and 030092) have similar field books and can also be treated as known foundation bridges.

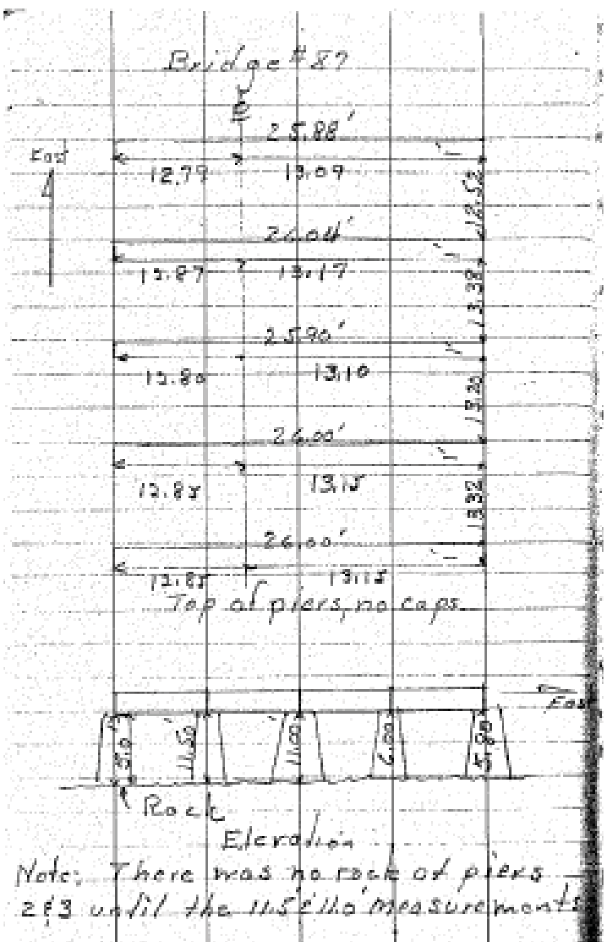

Figure 2.3: Construction Field Book for Bridge No. 030087

Table 2.17 shows a summary of the bridges in the two counties.

Table 2.17: Summary of Unknown Foundation Bridges in the Pilot Study Counties

	Unknown Foundations Bridges	Unknown Foundations Bridges after Initial Steps	High Priority Bridges	Additional not meeting Min. Performance Level (HYRISK)	Additional not meeting MPL with Pilot Study adjustments
Collier	86	82	24	5	0
Alachua	9	9	2	0	0
Total	95	91	26	5	0

Table 2.18 shows calculations of the costs of failure determined by the original method (Stein, S. and Sedmera, K. (2006)) and by the proposed changes to the method. The screening process shows that 26 of the bridges would be high priority bridges that automatically require further consideration. Using (Stein, S. and Sedmera, K. (2006)), another 5 bridges would not have met the minimum performance level (MPL), and would also automatically have required further evaluation. Using the proposed changes to the (Stein, S. and Sedmera, K. (2006)), no additional bridges, and high risk bridges, would have failed to meet the MPL.

Besides the high risk bridges, there are 15 additional bridges with a lifetime risk of failure greater than $15,000. These bridges should also receive further evaluation, bringing the total number of bridges needing further evaluation to 41. There are eleven bridges with NA for the detour cost, which means there are no detour routes for these bridges. An individual detour cost must be determined for these eleven bridges, and may raise the total number of bridges needing further evaluation to as high as 52.

The number of bridges that do not need further evaluation in the unknown foundations process is 95 – 52 = 43 bridges. A Plan of Action that includes a closure plan can be prepared for these bridges.

Table 2.18: Unknown Foundation Bridges in Alachua and Collier Counties Risk Analysis

Bridge #	Bridge Replace Cost[1]	Detour Cost[1]	Detour Cost Proposed[1,2]	Loss of Life Cost[1]	Failure Cost[1]	Failure Cost (revised)[1]	Probability of Failure (Hyrisk)	Probability of Failure (Proposed)	Annual Risk (Hyrisk)	Annual Risk Proposed	Minimum Performance Level	High Priority	Meets MPL?	Remain Life	Probability Life[4]	K_1	K_2	Lifetime Risk
030061	$323,945	$18,210,747	$10,926,448	$1,160,000	$19,694,692	$12,410,393	0.00025	0.00011	$2,482.08	$1,092.11	0.0001	Yes	No	18	0.001978	1	0.8	$19,639.69
030065	$432,715	$18,210,747	$10,926,448	$1,160,000	$19,803,462	$12,519,163	0.00025	0.00011	$2,503.83	$1,101.69	0.0001	Yes	No	18	0.001978	1	0.8	$19,811.82
030066	$326,310	$18,210,747	$10,926,448	$1,160,000	$19,697,057	$12,412,758	0.00025	0.00011	$2,482.55	$1,092.32	0.0001	Yes	No	18	0.001978	1	0.8	$19,643.44
030067	$323,945	$18,210,747	$10,926,448	$1,160,000	$19,694,692	$12,410,393	0.00025	0.00011	$2,482.08	$1,092.11	0.0001	Yes	No	18	0.001978	1	0.8	$19,639.69
030068	$432,715	$18,210,747	$10,926,448	$1,160,000	$19,803,462	$12,519,163	0.00025	0.00011	$2,503.83	$1,101.69	0.0001	Yes	No	18	0.001978	1	0.8	$19,811.82
030069	$326,310	$18,210,747	$10,926,448	$1,160,000	$19,697,057	$12,412,758	0.00025	0.00011	$2,482.55	$1,092.32	0.0001	Yes	No	18	0.001978	1	0.8	$19,643.44
030070	$430,350	$18,210,747	$10,926,448	$1,160,000	$19,801,097	$12,516,799	0.00025	0.00011	$2,503.36	$1,101.48	0.0001	Yes	No	18	0.001978	1	0.8	$19,808.08
030071	$430,350	$18,210,747	$10,926,448	$1,160,000	$19,801,097	$12,516,799	0.00025	0.00011	$2,503.36	$1,101.48	0.0001	Yes	No	19	0.002088	1	0.8	$20,907.38
030072	$430,350	$18,210,747	$10,926,448	$1,160,000	$19,801,097	$12,516,799	0.00025	0.00011	$2,503.36	$1,101.48	0.0001	Yes	No	18	0.001978	1	0.8	$19,808.08
030073	$430,350	$18,210,747	$10,926,448	$1,160,000	$19,801,097	$12,516,799	0.00025	0.00011	$2,503.36	$1,101.48	0.0001	Yes	No	18	0.001978	1	0.8	$19,808.08
030074	$323,945	$18,210,747	$10,926,448	$1,160,000	$19,694,692	$12,410,393	0.00025	0.00011	$2,482.08	$1,092.11	0.0001	Yes	No	18	0.001978	1	0.8	$19,639.69
030075	$326,310	$18,210,747	$10,926,448	$1,160,000	$19,697,057	$12,412,758	0.00025	0.00011	$2,482.55	$1,092.32	0.0001	Yes	No	18	0.001978	1	0.8	$19,643.44
030078	$401,976	$31,429,669	$18,857,802	$1,160,000	$32,991,645	$20,419,777	0.00025	0.00011	$4,083.96	$1,796.94	0.0001	Yes	No	16	0.001759	1	0.8	$28,727.34
030083	$1,430,677	$31,429,669	$18,857,802	$1,160,000	$34,020,346	$21,448,479	0.00025	0.00011	$5,362.12	$2,359.33	0.0001	Yes	No	15	0.001649	1	1	$35,362.75
030086	$678,863	$37,332,356	$22,399,414	$1,160,000	$39,171,219	$24,238,277	0.00025	0.00011	$4,847.66	$2,132.97	0.0001	Yes	No	21	0.002307	1	0.8	$44,743.10
030087	$425,621	$37,332,356	$22,399,414	$1,160,000	$38,917,977	$23,985,035	0.00025	0.00011	$5,996.26	$2,638.35	0.0001	Yes	No	15	0.001649	1	1	$39,544.85
030088	$215,175	$37,332,356	$22,399,414	$1,160,000	$38,707,531	$23,774,589	0.00025	0.00011	$5,943.65	$2,615.20	0.0001	Yes	No	15	0.001649	1	1	$39,197.88
030092	$279,089	$37,332,356	$22,399,414	$1,160,000	$38,771,445	$23,838,502	0.00025	0.00011	$5,959.63	$2,622.24	0.0001	Yes	No	7	0.001649	1	1	$39,303.26
030100	$465,233	$17,725,300	$10,635,180	$1,160,000	$19,350,533	$12,260,413	0.00025	0.00011	$3,065.10	$1,348.65	0.0001	Yes	No	15	0.001649	1	1	$20,214.11
030101	$228,309	$17,725,300	$10,635,180	$1,160,000	$19,113,609	$12,023,489	0.00025	0.00011	$3,005.87	$1,322.58	0.0001	Yes	No	15	0.001649	1	1	$19,823.49
030123	$1,719,341	$5,879,878	$5,879,878	$2,900,000	$10,499,219	$10,499,219	0.00025	0.00011	$2,099.84	$923.93	0.002			37	0.004062	1	0.8	$34,117.86
030125	$884,955	$1,786,013	$1,786,013	$2,900,000	$5,570,968	$5,570,968	0.00018	0.000077	$1,002.77	$428.96	0.002			41	0.003152	1	1	$17,560.49
030135	$1,141,732	$898,946	$539,367	$1,160,000	$3,200,678	$2,841,100	0.00025	0.00011	$568.22	$250.02	0.0005			37	0.004062	1	0.8	$9,232.33
030136	$195,533	$21,272,808	$12,763,685	$1,160,000	$22,628,341	$14,119,218	0.00025	0.00011	$2,823.84	$1,242.49	0.0005			14	0.001649	1	0.8	$18,623.02
030137	$278,597	$14,686,729	$8,812,037	$1,160,000	$16,125,325	$10,250,634	0.000008	0.00024	$65.60	$1,968.12	0.0005			14	0.003954	1	0.8	$29,472.28
030138	$642,763	$14,686,729	$8,812,037	$1,160,000	$16,489,491	$10,614,800	0.00025	0.00011	$2,122.96	$934.10	0.0005			14	0.001649	1	0.8	$14,000.75
030139	$572,739	$13,134,941	$7,880,965	$1,160,000	$14,867,681	$9,613,704	0.00025	0.00011	$1,922.74	$846.01	0.0005			14	0.001649	1	0.8	$12,680.32
030140	$762,279	$13,134,941	$7,880,965	$1,160,000	$15,057,220	$9,803,243	0.00025	0.00011	$1,960.65	$862.69	0.0005			14	0.001649	1	0.8	$12,930.32
030141	$370,464	$13,134,941	$7,880,965	$1,160,000	$14,665,405	$9,411,429	0.00025	0.00011	$1,882.29	$828.21	0.0005			14	0.001649	1	0.8	$12,413.52
030145	$2,001,777	$284,431	$170,659	$1,160,000	$3,446,209	$3,332,436	0.00025	0.00011	$666.49	$293.25	0.0001	Yes	No	35	0.003843	1	0.8	$10,244.73
030146	$2,001,777	$284,431	$170,659	$1,160,000	$3,446,209	$3,332,436	0.00025	0.00011	$666.49	$293.25	0.0001	Yes	No	35	0.003843	1	0.8	$10,244.73
030147	$555,227	$1,407,315	$562,926	$580,000	$2,542,542	$1,698,153	0.00025	0.00011	$339.63	$149.44	0.002			37	0.004062	1	0.8	$5,518.25
030149	$2,834,852	$1,102,477	$1,102,477	$2,900,000	$6,837,330	$6,837,330	0.00025	0.00011	$1,367.47	$601.68	0.0002		No / Yes[3]	35	0.003843	1	0.8	$21,019.64
030157	$168,001	$7,130,276	$4,278,165	$1,160,000	$8,458,277	$5,606,166	0.00025	0.00011	$1,121.23	$493.34	0.0005			21	0.002307	1	0.8	$10,348.81
030158	$249,080	$322,510	$129,004	$580,000	$1,151,589	$958,084	0.00025	0.00011	$191.62	$84.31	0.0005			19	0.002088	1	0.8	$1,600.33
030160	$1,418,425	$4,045,355	$4,045,355	$2,900,000	$8,363,780	$8,363,780	0.00025	0.00011	$1,672.76	$736.01	0.0005			21	0.002307	1	0.8	$15,439.27
030161	$1,470,945	NA	NA	$1,160,000	$2,630,945	$2,630,945	0.000008	0.00024	$16.84	$505.14	0.0005			21	0.005028	1	0.8	$10,582.55
030174	$3,906,038	$6,574,538	$6,574,538	$2,900,000	$13,380,576	$13,380,576	0.00025	0.00011	$2,676.12	$1,177.49	0.0002		No / Yes[3]	39	0.004281	1	0.8	$45,826.29
030207	$1,997,282	$3,401,511	$3,401,511	$2,900,000	$8,298,793	$8,298,793	0.00025	0.00011	$1,659.76	$730.29	0.0002		No / Yes[3]	45	0.004938	1	0.8	$32,783.82
030208	$631,642	$1,885,809	$1,885,809	$2,900,000	$5,417,451	$5,417,451	0.00025	0.00011	$1,083.49	$476.74	0.0002		No / Yes[3]	29	0.003185	1	0.8	$13,804.07
030209	$631,642	$754,323	$754,323	$2,900,000	$4,285,966	$4,285,966	0.00025	0.00011	$857.19	$377.16	0.0002		No / Yes[3]	37	0.004062	1	0.8	$13,927.51
030210	$659,170	NA	NA	$1,160,000	$1,819,170	$1,819,170	0.00025	0.00011	$363.83	$160.09	0.002			51	0.005595	1	0.8	$8,142.03
030940	$436,999	$18,203,609	$10,922,166	$1,160,000	$19,800,608	$12,519,165	0.00025	0.00011	$2,503.83	$1,101.69	0.0001	Yes	No	21	0.002307	1	0.8	$23,109.99
030951	$428,431	$18,203,609	$10,922,166	$1,160,000	$19,792,040	$12,510,596	0.00025	0.00011	$2,502.12	$1,100.93	0.0001	Yes	No	20	0.002198	1	0.8	$21,995.65
034006	$368,263	$62,654	$25,062	$580,000	$1,010,917	$973,324	0.00025	0.00011	$194.66	$85.65	0.002			33	0.003624	1	0.8	$2,821.57
034008	$556,000	$55,026	$22,011	$580,000	$1,191,026	$1,158,010	0.00025	0.00011	$231.60	$101.90	0.002			33	0.003624	1	0.8	$3,356.95
034009	$120,711	$58,406	$23,362	$580,000	$759,117	$724,074	0.00018	0.000077	$130.33	$55.75	0.002			33	0.002538	1	1	$1,837.61
034011	$587,531	$118,606	$55,407	$1,160,000	$1,866,137	$1,802,938	0.00025	0.00011	$360.59	$158.66	0.002			44	0.004829	1	0.8	$6,964.49
034012	$264,784	$0	$0	$1,160,000	$1,424,784	$1,424,784	0.00025	0.00011	$284.96	$125.38	0.002			31	0.003404	1	0.8	$3,880.40

Table 2.18: Unknown Foundation Bridges in Alachua and Collier Counties Risk Analysis (continued)

Bridge #	Bridge Replace Cost[1]	Detour Cost[1]	Detour Cost Proposed[1,2]	Loss of Life Cost[1]	Failure Cost[1]	Failure Cost (revised)[1]	Probability of Failure (Hyrisk)	Probability of Failure (Proposed)	Annual Risk (Hyrisk)	Annual Risk Proposed	Minimum Performance Level	High Priority	Meets MPL?	Remain Life	Probability Life[4]	K_1	K_2	Lifetime Risk
034014	$382,802	$3,078,502	$1,847,101	$1,160,000	$4,621,303	$3,389,903	0.00025	0.00011	$677.98	$298.31	0.002			26	0.002856	1	0.8	$7,745.44
034017	$587,531	$118,606	$55,407	$1,160,000	$1,866,137	$1,802,938	0.00025	0.00011	$360.59	$158.66	0.002			44	0.004829	1	0.8	$6,964.49
034019	$682,211	$233,121	$108,903	$1,160,000	$2,075,333	$1,951,115	0.00025	0.00011	$390.22	$171.70	0.002			31	0.003404	1	0.8	$5,313.87
034020	$262,747	NA	NA	$1,160,000	$1,422,747	$1,422,747	0.00025	0.00011	$284.55	$125.20	0.002			31	0.003404	1	0.8	$3,874.86
034021	$704,663	NA	NA	$1,160,000	$1,864,663	$1,864,663	0.00025	0.00011	$372.93	$164.09	0.002			31	0.003404	1	0.8	$5,078.42
034026	$614,084	$1,132,449	$679,469	$1,160,000	$2,906,533	$2,453,553	0.00025	0.00011	$490.71	$215.91	0.002			26	0.002856	1	0.8	$5,606.02
034028	$302,477	$1,132,449	$679,469	$1,160,000	$2,594,926	$2,141,946	0.00025	0.00011	$428.39	$188.49	0.002			26	0.002856	1	0.8	$4,894.04
034030	$570,655	$644,151	$300,917	$1,160,000	$2,374,807	$2,031,573	0.00018	0.000077	$292.55	$125.14	0.002			31	0.002384	1	0.8	$3,875.01
034032	$352,226	$2,858,609	$1,715,165	$1,160,000	$4,370,835	$3,227,391	0.00025	0.00011	$645.48	$284.01	0.002			26	0.002856	1	0.8	$7,374.13
034036	$694,057	$444,025	$266,415	$1,160,000	$2,298,082	$2,120,472	0.00025	0.00011	$424.09	$186.60	0.002			32	0.003514	1	0.8	$5,961.08
034042	$511,551	$245,167	$98,067	$580,000	$1,336,718	$1,189,618	0.00025	0.00011	$237.92	$104.69	0.002			31	0.003404	1	0.8	$3,239.93
034044	$575,221	$860,550	$516,330	$1,160,000	$2,595,771	$2,251,551	0.00025	0.00011	$450.31	$198.14	0.002			31	0.003404	1	0.8	$6,132.11
034046	$362,878	NA	NA	$1,160,000	$1,522,878	$1,522,878	0.00025	0.00011	$304.58	$134.01	0.002			26	0.002856	1	0.8	$3,479.56
034048	$1,022,615	$2,295,519	$2,295,519	$2,900,000	$6,218,133	$6,218,133	0.00025	0.00011	$1,243.63	$547.20	0.002			31	0.003404	1	0.8	$16,935.11
034050	$347,730	$102,153	$40,861	$580,000	$1,029,882	$968,591	0.00025	0.00011	$193.72	$85.24	0.002			31	0.003404	1	0.8	$2,637.96
034052	$319,973	$65,706	$21,902	$0	$385,679	$341,875	0.00025	0.00011	$68.37	$30.08	0.002			31	0.003404	1	0.8	$931.10
034054	$279,190	$144,627	$48,209	$0	$423,817	$327,399	0.00025	0.00011	$65.48	$28.81	0.002			31	0.003404	1	0.8	$891.67
034073	$1,362,620	NA	NA	$1,160,000	$2,522,620	$2,522,620	0.000005	0.0000022	$10.09	$4.44	0.002			69	0.000152	1	0.8	$306.32
034101	$2,178,331	$4,850,900	$4,850,900	$2,900,000	$9,929,231	$9,929,231	0.00018	0.000077	$1,429.81	$611.64	0.0005			23	0.00177	1	0.8	$14,055.83
034102	$589,783	$236,037	$141,622	$1,160,000	$1,985,819	$1,891,405	0.00025	0.00011	$378.28	$166.44	0.0005			38	0.004172	1	0.8	$6,312.00
034103	$589,783	$219,645	$131,787	$1,160,000	$1,969,428	$1,881,570	0.00025	0.00011	$376.31	$165.58	0.0005			33	0.003624	1	0.8	$5,454.47
034105	$490,986	$448,333	$269,000	$1,160,000	$2,099,319	$1,919,986	0.00025	0.00011	$480.00	$211.20	0.0005			33	0.003624	1	1	$6,957.30
034106	$573,582	$408,612	$245,167	$1,160,000	$2,142,194	$1,978,749	0.00025	0.00011	$395.75	$174.13	0.002			33	0.003624	1	0.8	$5,736.18
034107	$380,476	$404,895	$189,148	$1,160,000	$1,945,371	$1,729,624	0.00025	0.00011	$345.92	$152.21	0.002			46	0.005047	1	0.8	$6,984.22
034108	$502,567	$448,407	$209,475	$1,160,000	$2,110,974	$1,872,042	0.00025	0.00011	$374.41	$164.74	0.002			34	0.003733	1	0.8	$5,590.99
034112	$1,877,678	NA	NA	$580,000	$2,457,678	$2,457,678	0.00025	0.00011	$491.54	$216.28	0.002			39	0.004281	1	0.8	$8,417.14
034113	$711,710	$1,225,835	$735,501	$1,160,000	$3,097,545	$2,607,211	0.00025	0.00011	$521.44	$229.43	0.002			33	0.003624	1	0.8	$7,558.03
034116	$525,257	NA	NA	$1,160,000	$1,685,257	$1,685,257	0.000008	0.00024	$10.79	$323.57	0.002			38	0.00908	1	0.8	$12,241.20
034117	$951,116	$523,754	$314,252	$1,160,000	$2,634,870	$2,425,368	0.00025	0.00011	$485.07	$213.43	0.002			38	0.004172	1	0.8	$8,093.95
034118	$834,456	$523,754	$314,252	$1,160,000	$2,518,210	$2,308,709	0.00025	0.00011	$461.74	$203.17	0.002			38	0.004172	1	0.8	$7,704.63
034119	$685,021	NA	NA	$1,160,000	$1,845,021	$1,845,021	0.00025	0.00011	$369.00	$162.36	0.002			38	0.004172	1	0.8	$6,157.21
034120	$939,691	$419,003	$251,402	$1,160,000	$2,518,694	$2,351,093	0.00025	0.00011	$470.22	$206.90	0.002			38	0.004172	1	0.8	$7,846.08
034122	$209,642	NA	NA	$0	$209,642	$209,642	0.00025	0.00011	$41.93	$18.45	0.002			33	0.003624	1	0.8	$607.73
034124	$3,174,038	$3,307,432	$3,307,432	$2,900,000	$9,381,470	$9,381,470	0.00025	0.00011	$1,876.29	$825.57	0.002			51	0.005595	1	0.8	$41,988.46
034127	$473,147	NA	NA	$1,160,000	$1,633,147	$1,633,147	0.000008	0.00024	$10.45	$313.56	0.002			52	0.012404	1	0.8	$16,205.94
035250	$1,499,835	$1,278,874	$1,278,874	$2,900,000	$5,678,708	$5,678,708	0.00018	0.000077	$817.73	$349.81	0.0002			31	0.002384	1	0.8	$10,831.55
035252	$253,383	$282,576	$169,546	$1,160,000	$1,695,959	$1,582,928	0.00002	0.0000085	$25.33	$10.76	0.002			71	0.000603	1	0.8	$764.01
260006	$2,208,173	$32,490,840	$32,490,840	$2,900,000	$37,599,013	$37,599,013	0.00025	0.00011	$9,399.75	$4,135.89	0.0001	Yes	No	-2	0.001649	1	1	$61,990.62
260017	$585,522	$7,522,979	$4,513,787	$1,160,000	$9,268,501	$6,259,309	0.000008	0.00024	$40.06	$1,201.79	0.0005			21	0.005028	1	0.8	$25,177.06
260024	$779,744	$5,367,409	$3,220,446	$1,160,000	$7,307,153	$5,160,189	0.000008	0.00024	$33.03	$990.76	0.001			24	0.005744	1	0.8	$23,712.64
260027	$581,542	$2,826,885	$1,320,589	$1,160,000	$4,568,427	$3,062,130	0.00025	0.00011	$612.43	$269.47	0.0005			6	0.001649	1	0.8	$4,038.90
260033	$1,980,301	$9,878,373	$9,878,373	$2,900,000	$14,758,674	$14,758,674	0.00025	0.00011	$2,951.73	$1,298.76	0.0005			25	0.002746	1	0.8	$32,426.26
260038	$2,799,080	$5,121,640	$5,121,640	$2,900,000	$10,820,719	$10,820,719	0.00025	0.00011	$2,164.14	$952.22	0.0001	Yes	No	23	0.002527	1	0.8	$21,874.66
260086	$1,831,872	$2,190,814	$1,023,446	$1,160,000	$5,182,686	$4,015,318	0.00025	0.00011	$803.06	$353.35	0.0005			16	0.001759	1	0.8	$5,648.91
262501	$686,051	$2,434,215	$1,460,529	$1,160,000	$4,280,266	$3,306,580	0.00025	0.00011	$661.32	$290.98	0.001			51	0.005595	1	0.8	$14,799.19
264126	$121,140	$352,708	$141,083	$580,000	$1,053,849	$842,224	0.0004	0.00017	$336.89	$143.18	0.002			-10	0.002547	1	1	$2,145.12

Notes:

1. All Costs based on updated costs for Florida in current year dollars.
2. Based on reduced replacement time from Florida Survey.
3. The first response is based on (Elias (1994)) probability. The second response is based on the adjusted probability from the Florida Survey.
4. The remaining life was estimated as 75 minus the age of the bridge. If this estimate was less than 15 years, then 15 years was used to calculate the lifetime probability.

Recommended Procedure for Calculating Risks

The recommended procedure for calculating risk is summarized in four steps in the following list and briefly discussed below. A more detailed description of the recommended procedure is contained in the document *Procedural Manual: Reclassify Unknown Foundation Bridges*.

- Step 1: Calculate Cost of Failure
- Step 2: Determine Whether Bridge Is Tidally Influenced
- Step 3: Calculate the Risk Adjustment Factors
- Step 4: Calculate Annual and Lifetime Risks of Failure

Step 1, costs of failure for all the identified unknown foundation bridges over water are listed in the table in Appendix A. If the bridge has a listing of NA for detour costs, a detour cost must be developed and added to the listed total cost of failure. Step 2, if the mode of flow for the bridge is listed as tidal, tidal/riverine, or unknown in PONTIS, then a qualified coastal engineer must develop a new scour event frequency rating. This rating serves as a substitute for the overtopping frequency and a new probability of failure is calculated. Step 3, the risk adjustment factors are calculated based on site and structure properties. Finally, in Step 4 the annual and lifetime risks are calculated via the equations presented in previous sections.

Section 3: Data Collection

Data Collection for Embedment Prediction Methods

Data was collected for bridges with pile driving records. The other raw data that was obtained, pending availability:

- Bridge Inspection Report
- Scour Evaluation Reports
- Plans

The following data was also obtained from the PONTIS database.

- Bridge Number
- District
- Owner
- Bridge Design and Material for the main span and approach spans
- Road Name
- Water body name
- Year Built
- Year Reconstructed
- Bridge Length
- Deck Width
- Maximum span length
- Number of main spans
- Number of approach spans
- Average Daily Traffic (ADT) count
- Year of ADT count
- Waterway Adequacy rating
- Latitude and Longitude
- Detour Length
- Detour Speed
- Parallel Structure
- Critical Route indicator
- Pile Driving Record indicator
- Channel Depth
- Scour Mode
- Deck Rating
- Superstructure Rating
- Substructure Rating
- Channel Rating
- Highest Phase Scour Evaluation
- Scour Evaluation Results
- Critical Scour Elevation
- Action Elevation

A project database was developed and PONTIS data was entered directly into the project database. Indicators were added to the project database to show if plans were available, if soil borings were available and the type of borings. Additional data concerning each bent on the bridge, each pile on each bent, and each boring was extracted from the raw data.

Bent, pile, and boring locations were referenced by the stations and offsets found in the plans. Often, different baselines were used for the borings and the bridge component stations and offsets. Everything was converted to a common baseline so that distances between the piles and borings could be determined. Occasionally, two sets of plans were available; one for the original bridge construction and one for the widening or reconstruction. If no plans were available, information from the inspection reports, scour evaluation reports, and pile driving records was used to invent a baseline.

Fields and codes were also added to the project database to indicate the type of bent and the pile size and material. The pile tip elevation and the embedment depth were entered into the database for each pile. Each pile also had an indicator for the year it was driven.

For wash borings, the elevation and soil type of each layer was entered into the database. For SPT borings, the average N value of each layer was also entered into the database.

Some of the plans were in metric units. Data was converted to English units to enter into the project database.

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Section 4: Embedment Prediction Methods

Introduction

The majority of unknown foundation bridges in Florida are classified as unknown because the pile driving records for all or a portion of the piles on the bridge are missing. A number of potential methods were considered during the October 2008 workshop to estimate or predict unknown pile embedment depths. Three prediction methods have been selected:

- Reverse Engineering
- Artificial Neural Networks (ANN)
- Inference from historical practices and site conditions

The concept of reverse engineering is to work the design process backwards to estimate the embedment depth of the pile. Reverse engineering and inference from historical practices and site conditions have been blended together in the recommended evaluation procedures. Portions of reverse engineering primarily performed by the structural engineer and a geotechnical engineer will be discussed. The concepts of historical practices and site conditions have also been blended into the procedures in this section. Following reverse engineering, ANN will be discussed.

In order to use any of the recommended procedures, the design pile load must first be determined, and then used in the pile embedment depth prediction process. If the design pile load can be found in the plans, then the plan value should be used with any of the embedment prediction methods. Two separate ANN have been developed, one to predict the design pile load and one to predict the pile embedment depth. The first ANN primarily addresses pile load estimation using reverse engineering. The second ANN primarily addresses the embedment depth prediction after the design pile load has been determined. If the design pile load is not available in the plans, then the embedment prediction methods can use design pile loads estimated by either reverse engineering or PLOAD (the design pile load estimation ANN). The advantage of the reverse engineering estimate is that the predicted pile load will likely be more accurate. The advantage of PLOAD is the pile load can be predicted with less effort.

End bents have been omitted from the investigations described in this section. End bent piles should be protected against scour by an abutment with the proper abutment protection. The abutment protection can be observed in the field and addressed as a known condition rather than an unknown condition. Follow the existing evaluation techniques to ensure the abutments and end bents are protected against scour.

Literature Review

A portion of the process development included a review of historical design memoranda and guidelines, construction specifications, and bridge data issued by or available from FDOT.

The FDOT *Standard Specifications for Road and Bridge Construction* was originally published in 1954. This publication includes criteria required for driving piles. Between 1959 and 1996, the specification stated:

"While the pile head is above grade, driving shall not be stopped and the pile cut off at minimum computed bearing; but rather, the driving shall be continued until the pile head is driven to grade"

It was permitted to cut the pile off if "the maximum practical resistance" was reached. From 1959 through 1972, the maximum practical resistance was determined by the Engineer. From 1973 until 1996, the Specifications allowed that bearing piles be driven until the required bearing was continuously maintained for five feet or to practical or absolute refusal. Practical and absolute refusal were defined in the Specifications from that point forward, as opposed to being determined by the Engineer.

In 1996, the Specification was changed to read that piles should be driven to provide the bearing capacities required for carrying the loads shown in the plans. The Specifications indicated several methods of determining pile bearing, including blow count criteria, practical refusal, set-checks and pile redrive, and other methods.

The literature review also revealed that the FDOT began requiring that bridge foundations be designed for scour in 1992. Bridges designed after 1992 were required to take into account scour considerations and address the lateral stability of the structure by providing a minimum pile tip elevation in the plans.

It is anticipated that a large number of bridges with unknown foundations will not have construction plans available. In this case, the design truck for the structure may be unknown. In conducting the literature review, it was learned that the District Offices of the FDOT have "bridge records" for state-owned bridges constructed through the mid-1950s. These records include span lengths, substructure type, and design truck, all of which may be useful in the reverse engineering process. Copies of the bridge records can be obtained from the FDOT District Offices, through either the Structures or Maintenance Departments. If a bridge record is not available, a second method of determining the design live load is to visit the bridge site. For bridges with post-and-rail barriers, the design truck is generally stamped on the railing end post on the left side of the bridge as the bridge is approached. It was not until 1986 that the FDOT issued a memorandum indicating the use of the HS20-44 for the design of all bridges.

The FDOT also has a library of available archived standards, a list is included in Appendix D. Many older bridges had standard span lengths and roadway widths, and the standard drawings are available from the FDOT. As plans may not be available for the unknown foundation bridges, some deduction may be required to ascertain whether or not a structure is a standard or not. Appendix D of archived standards is in order by year, also the year the bridge was constructed, as well as the roadway width, span length, and superstructure type that would be required to determine if the structure is a standard or not. The substructure standard drawings indicate the design pile load.

Reverse Engineering Process and Results

Initially, this process was to include reverse engineering calculations for approximately 150 bridges. This number was reduced significantly, after it was determined that the bridges chosen generally had the design pile load shown on the plans. As a result, 69 bridges were selected and evaluated using the reverse engineering procedure.

Of those 69 bridges, the majority had the design pile load listed in the plans and the plans were legible enough to read the pile load. One additional bridge had a pile load shown in the plans, but the pile load was illegible. Six of the bridges did not have plans and the inspection reports did not have enough data to perform a structural analysis to determine design pile loads. One bridge did not have plans, but the span lengths, clear roadway width, and year of construction indicate that the bridge is a standard structure, and a pile load was ascertained from the standard drawing. The breakdown of pile type is shown in Table 4.1. Some bridges utilized more than one pile type.

Table 4.1: Pile Types in Reverse Engineering Bridges

Pile Type	Number of Bridges
Timber	9
Steel	8
Concrete	33

Structural analysis was performed on five bridges to determine a conservative and reliable method for determining pile loads. Two of the bridges are beam bridges, two are cast-in-place slab bridges and one is a combination of beam and cast-in-place slab superstructures. Three of the bridges utilize prestressed concrete piles, one is founded on steel piles with concrete jackets, and one is founded on timber piles. Only three of the bridges for which calculations were performed show pile loads in the plans. Table 4.2 shows a comparison of the results of reverse engineering with the design pile load.

Table 4.2: Design Pile Load Comparison for Reverse Engineering Bridges

Bridge No.	Superstructure Type	Design Pile Load (Ton)	Reverse Engineering Pile Load (Ton)
110055	Prestressed Beams Centered over Piles	45	52.25
110077	Prestressed Beams Not Centered over Piles	70	73.037
600021	Cast-in-Place Slab	20	19.391

Table 4.2 shows that reverse engineering provides a fairly accurate method of determining the design pile load. There are discrepancies, however, due to the multitude of methods available for calculating pile loads. The procedures described and Pile Design Load Flow Chart shown in the *Procedural Manual: Reclassify Unknown Foundation Bridges* are generally conservative methods of determining pile loads and should be reasonable for the purpose of determining a pile embedment. The analysis techniques described in the *Procedural Manual: Reclassify Unknown Foundation Bridges* may not be acceptable for new construction, as they may under-predict the pile load. This under-prediction should, however, lead to a conservative estimate of pile embedment.

Conclusions

The multitude of analysis techniques available for the calculation of design pile loads makes it nearly impossible to precisely predict the design pile load for a bridge that has been constructed. Using certain methods to calculate those loads will, however, almost always yield a conservative pile load, which should, in turn, underestimate the pile embedment.

Recommendations

The most accurate pile load to use in determining pile embedment is the design load as stated on the construction plans or standards. Barring the availability of those plans, using the Artificial Neural Network for Determining Pile Loads (PLOAD) to determine a pile load is a less time-consuming method of calculating pile loads than reverse engineering, especially if no bridge plans are available, as PLOAD uses data from the PONTIS database. Therefore a good starting point in determining pile loads would be to utilize the PLOAD program.

If reverse engineering is required, the design pile load should be determined using the same design criteria used when the bridge was originally designed. This is because no definitive correlations have been made between loads and capacity curves for Allowable Stress Design (ASD) vs. Load Factor or Load and Resistance Factor Design (LFD and LRFD, respectively). Without plans, however, it is difficult to ascertain exactly what design method was used for the original design. Engineering judgment should be exercised in determining a design method. Generally speaking, bridges designed prior to the 1990s utilized ASD, and the FDOT mandated the use of LRFD for bridges designed after 2002, except for curved steel girder bridges, which were designed using LFD through 2006. Regardless of the design methodology utilized, it should be noted that any capacity curves should match the design methodology used for determining the pile load, i.e. Davisson Capacity should be used for LRFD loads and Allowable Capacity should be used for ASD loads.

Artificial Neural Networks (ANN)

Artificial Neural Networks (ANN) have been successfully used in a number of fields to obtain solutions to complex problems where there is sufficient information for training (Lingireddy and Brion (2005)); (Dowla and Rogers (1996)); (Hudson and Cohen (1999)). Since there are many bridges with known foundations it seemed reasonable that ANN could be useful in predicting pile penetration depths for bridges with unknown foundations. There is significant flexibility in the way these networks can be configured and there is little guidance in the literature regarding which architecture will work best for a given situation. The development of an optimal network therefore requires a systematic approach involving numerous sensitivity studies and iterations.

There are limitations on the types of problems for which ANN are suitable. In order for the ANN to produce accurate predictions the dependent variable or variables must have a consistent dependence on the independent variables. For the unknown foundation problem the criterion for actual pile embedment can change over time as long as there is consistency within these time intervals. Problems are introduced when piles are driven deeper or less deep than the design requirements in a somewhat random fashion.

As with any predictive scheme it is essential that all pertinent independent variables be identified and included in the analysis. The unknown foundation problem is one that requires expertise in several disciplines including geotechnical and structural engineering, geology, etc. The independent variables are inputs to the ANN and the output is the pile penetration depth. Some of the input parameters have integer values (e.g. year constructed) while others are real numbers (e.g. pile dimensions). These have to be normalized so as to span a range from -1 to 1 or 0 to 1. There are several other important aspects to the ANN development including the number of nodes and layers.

The pile penetration prediction problem has many challenging aspects. In many cases, not only are the pile penetrations unknown but important input information is missing as well. In particular, borings are either limited or nonexistent. There is also the fact that, in some cases, piles are driven deeper than required to avoid pile cut-off. This practice is somewhat random making it difficult to predict. In spite of these difficulties the ANN for predicting pile penetration depths for concrete piles, CPILE, produces a conservative but relatively good prediction for the cases tested.

One of the inputs to CPILE is the design load per pile. Since this information is missing for some of the unknown foundation bridges, an ANN system was developed for its prediction. The ANN for the load per pile is called PLOAD. PLOAD was trained with concrete, steel and timber piles and works equally well for all three. The predictions are conservative (i.e. tend to under-predict) but good and can be used to estimate loads per pile when this information is missing from the records.

The data used to train and test CPILE came from 113 concrete pile bridges with known foundations located in four FDOT Districts. Data for training and testing PLOAD was from 89 bridges with concrete piles, 11 bridges with steel H-beam piles and 11 bridges with timber piles from the same four FDOT Districts. The properties of the bridges used for training and testing as well as those for the unknown bridges in Florida are shown in Figure 4.1.

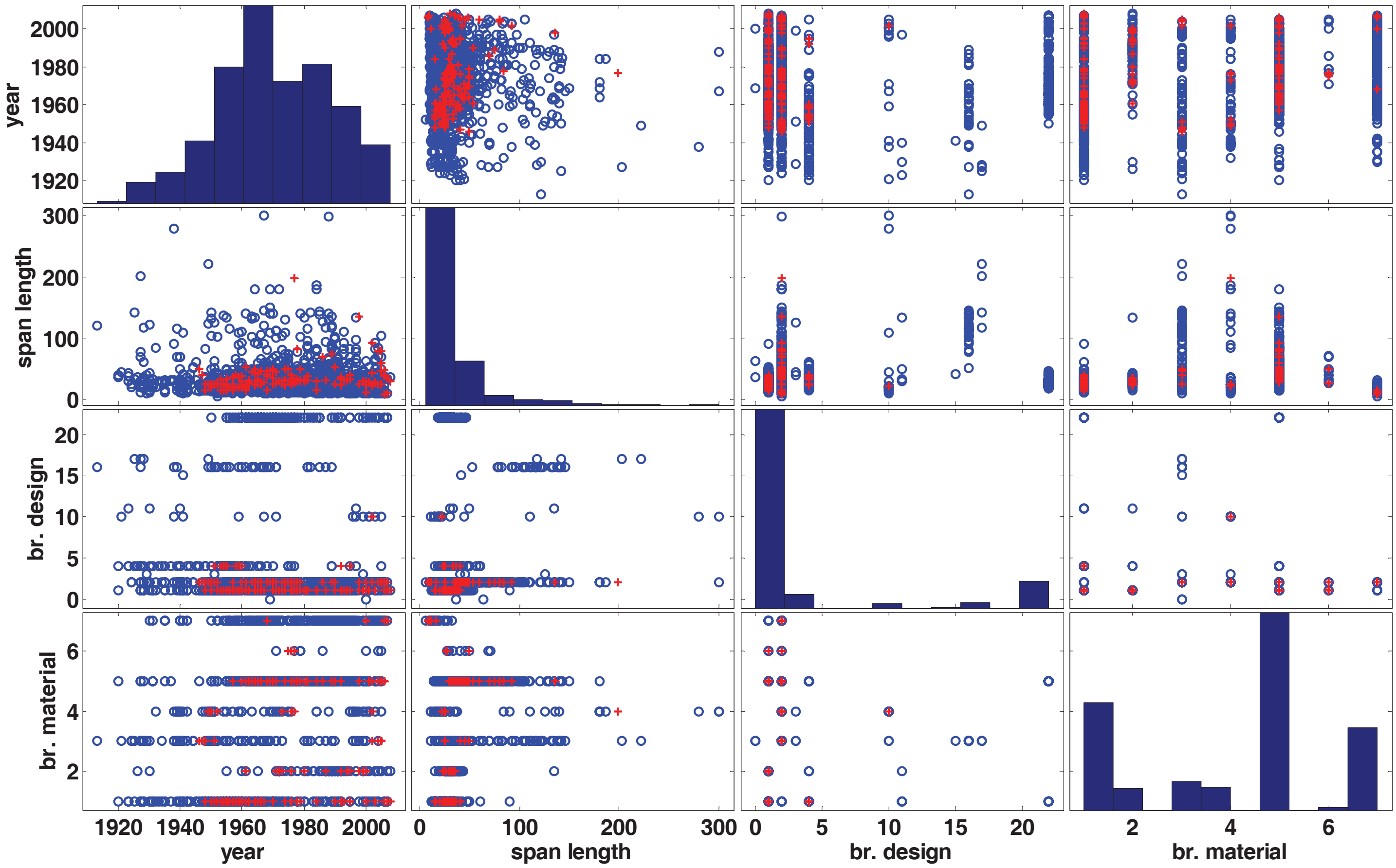


Figure 4.1: Distribution of Various Parameters for Known & Unknown Foundation Bridges

Histograms along the diagonal show the distributions (for the combined known and unknown foundation bridges in the data sets) for the parameter in that row and column. The known foundation bridges are shown in red. The codes for bridge design and bridge material are given in Table 4.3.

Table 4.3: Bridge Material and Bridge Design Codes

Bridge Material	Bridge Design
1 = Concrete 2 = Concrete continuous 3 = Steel 4 = Steel continuous 5 = Prestressed concrete 6 = Prestressed concrete continuous 7 = Wood or Timber	1 = Slab 2 = Multi-beam or Multi-girder 3 = Girder-Floorbeam (GF) or Girder-Floorbeam-Stringer 4 = Tee Beam, or Double Tee Beam 5 = Box Beam or Girders - Multiple 6 = Box Beam or Girders - Single or spread 7 = Frame (except frame culverts) 8 = Orthotropic 9 = Truss - Deck 10 = Truss - Thru or Pony 11 = Arch - Deck 12 = Arch - Thru 13 = Suspension 14 = Cable Stayed Girder 15 = Movable - Lift 16 = Movable - Bascule 17 = Movable - Swing 18 = Tunnel 19 = Culvert (includes frame culverts) 21 = Segmental Box Girder

There are a number of commercial ANN programs available for purchase. These programs provide the code to develop the neural network and apply it to new cases. Matlab's Artificial Neural Network Toolbox (Demuth and Beale (1997)) was used for the development of CPILE and PLOAD.

A brief description of artificial neural networks is presented first, followed by descriptions of CPILE and PLOAD with plots showing their performance with test cases.

Artificial Neural Networks

Neural networks can be customized in many ways, including: the network architecture, number of layers and nodes, input and output parameters, etc. This makes for a powerful tool with many applications. At the same time the wide number of options makes choosing the best combination difficult. Development of the network progresses as follows. First the input parameters are chosen, then the network architecture and then the learning algorithm. However some test runs are needed when choosing the network architecture. A training algorithm is used in these runs. The development process is slow and tedious and involves many sensitivity tests and iterations. A schematic diagram of an ANN is shown in Figure 4.2.

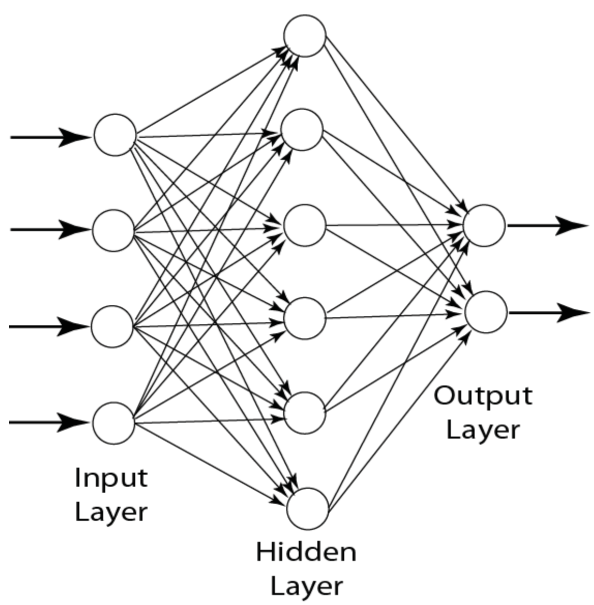


Figure 4.2: Schematic Diagram of ANN Showing 4 Inputs, 2 Outputs, One Hidden Layer with 6 Nodes

The choice of input parameters can be the most critical part of the neural network development process. All pertinent input parameters need to be identified and included. On the other hand, having too many input parameters can make the network unnecessarily complex and reduce its generalization power. Preliminary sensitivity analyses can aid in the choice of the proper input parameters. Once created, the input parameters can be systematically removed one by one to determine its impact on the results. Once trained and tested with additional known data, the ANN can be a very effective means of predicting the behavior of complex systems.

ANN for Pile Embedment Prediction

Choice of Input Parameters

Knowledge of design practices and the thought processes associated with pile penetration design and construction is essential to identifying the pertinent input parameters for a pile penetration ANN. Bridge foundation design involves a number of disciplines including geotechnical, structural and construction engineering, geology, etc. Input from knowledgeable and experienced people in these fields as well as those familiar with historical design practices, provided the basis for the input parameters used in the development of CPILE, the ANN for predicting concrete pile penetration depths.

The parameters on which the pile driving process depends can be arranged into four groups. All of the parameters considered in the analysis, and the ones finally selected, are listed and discussed below. They are also summarized in Table 4.4.

Pile Properties

A pile can be characterized by its shape, size and material. Pile shape can be a standalone field or implied indirectly by specifying pile width and circumference. Information for three different pile materials was available in the database: concrete, steel and timber. Initial trials focused on creating an ANN covering all material types, using material type as an input. However this approach did not give satisfactory results, because the initial database did not contain sufficient numbers of steel and timber piles to train the ANN. As a result the ANN was limited to use with only concrete piles.

Superstructure Properties

Design load and pile size are determined by such superstructure properties as span length, deck width, bridge material, etc. The superstructure properties only impact the design pile penetration depth through the design load per pile and the pile size. Initial tests with the ANN showed that using superstructure properties in addition to design load per pile did not improve the results. As a result pile design load was chosen as the only superstructure parameter input.

Soil Properties

Information on the soil is provided in terms of SPT borings or wash borings at one or more locations at each bridge site. Each SPT boring gives the soil type and SPT N value at various depths. Wash borings only have soil type information. Since it is not practical to input all of the boring log information into the ANN, bearing capacity curves were developed and used to characterize the soil conditions. The bearing capacity curves were developed using the same methodology as that used in the FB-Deep software. The FB-Deep methodology was integrated into CPILE. The code was tested to insure that it produced results that were consistent with those from FB-Deep. Various methods of representing the bearing capacity curves in the ANN were investigated. The slopes of two linear curve fits to the bearing capacity curve where chosen as inputs to the ANN. The ranges of 0 to 20 feet and 20 feet to 40 feet for the two linear regression curves were found to yield the best results.

SPT Boring data does not exist for some bridge locations and some locations only have wash borings. Bearing capacity curves cannot be calculated for these situations. An assumed constant N value of 12 yielded the best results in the ANN for these cases.

The presence of rock presents additional challenges for any predictive scheme due to the variability in rock hardness. Additionally FB-Deep cannot model rocks with an SPT N value greater than 50, so they are capped at 50. These challenges require a more conservative approach when rock is present. A number of methods for treating rock were attempted before deciding to stop the embedment at the top of the first rock layer regardless of the thickness or SPT N value for the rock. Note that the 10 feet minimum embedment feature in CPILE applies to this case as well.

Additional Factors

Design practices, pile driving hammer types and sizes, construction techniques, etc. have changed over the years. There are also differences in design practices between different government agencies and between government agencies and private enterprises. Some of the differences can be detected in the ANN by having the year constructed and bridge owner as inputs.

As noted in the introduction there are also factors that impact pile penetration depths that are more random in nature. The not so uncommon practice of driving piles deeper than required by the design in order to eliminate having to cut the pile introduces randomness that cannot be predicted by ANNs.

Table 4.4: List of Investigated and Chosen Input Parameters to CPILE

Type of Parameter	Investigated Parameters	Chosen Parameters
Pile Properties	• Pile size • Pile tip area • Pile tip circumference • Pile shape • Pile material	• Only concrete piles used • Pile size
Superstructure Properties	• Pile design load • Span length • Deck width • Bridge material	• Pile design load
Soil Properties	• Full SPT record with depth, SPT N value and soil type • Depth of first rock layer	• Slope 1 of bearing capacity curve (0-20 ft) • Slope 2 of bearing capacity curve (20-40 ft)
Additional Factors	• Construction/Reconstruction year • Bridge Latitude • Bridge Longitude • Embedments at nearby bridges • Bridge owner	• Construction/Reconstruction year • Bridge owner

A number of input parameters for CPILE were attempted during the study. The best performance was obtained using the ones listed below. These are also the input parameters for the final version of CPILE.

- Pile size
- Pile Design Load
- Slope of the bearing capacity curve between 0 and 20 ft
- Slope of the bearing capacity curve between 20 and 40 ft
- Pile construction year

A flowchart summarizing the input parameters and the way they are calculated is shown in Figure 4.3.

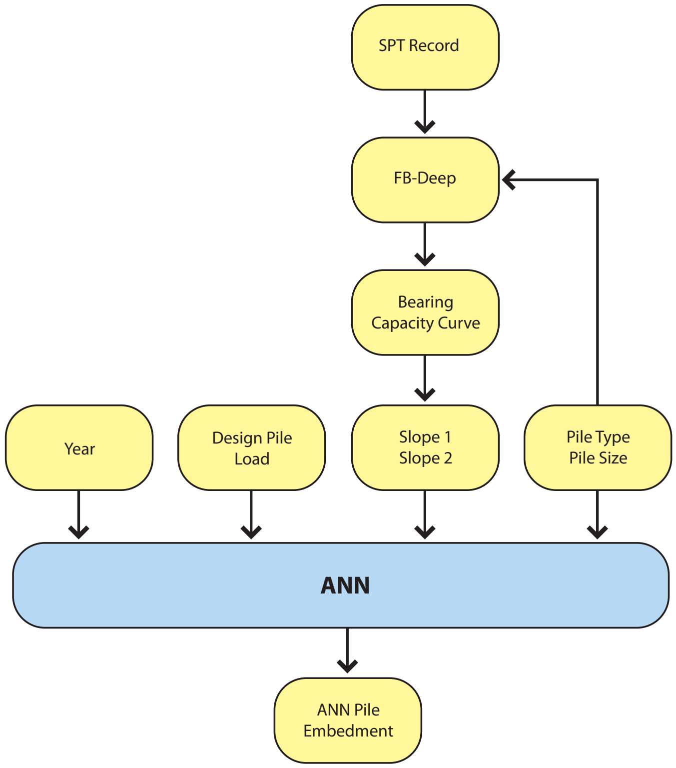


Figure 4.3: Flowchart for CPILE, ANN Pile Embedment Prediction Process

Choice of Network Architecture

The choice of the network architecture depends on the form of the input parameters and their relationship with the output. In this study the inputs are concurrent as opposed to sequential. The inputs from one bridge to the next are independent and there is no order among bridges. This can be compared to a case where both the input and output are a time series of data where the inputs are said to be sequential. A static, feed-forward network was used in this study.

A network with two non-linear hidden layers and a linear output layer can be used to fit any function with a finite number of discontinuities to an arbitrary level of accuracy, given enough nodes and iterations. Various combinations of one and two hidden layer networks with different numbers of nodes were tested during the design of CPILE. A network with one hidden layer and nine nodes in that layer was found to give the best results.

Hyperbolic tangent transfer functions were used in the hidden layers. Log-sigmoid transfer functions were also tested, but there were no improvements in the results.

Training Methodology

There are two main modes of training neural networks: incremental and batch. In incremental training the network is updated after each new data set is input to the network. In batch training the network is updated only after all the data is input. Batch training was used in this study since the data points are independent and there is no ordering among the bridges.

The basic training algorithm for neural networks is the back-propagation method. The derivative of the performance function of the network is calculated with respect to all the network weights and biases. They are modified in the direction of steepest gradient. The performance function (i.e. the performance criterion) used in these analyses is the sum of the squared errors between predicted and known. The computation process is repeated until the error is reduced to some specified level, or no further improvement is possible. The basic method is generally very slow and can be trapped in local minima. Various alternative methods, such as Conjugate-gradient, Quasi-Newton and Levenberg-Marquardt (LM) have been developed (Hagan et al. (1996)) to overcome these problems.

The data set, which consists of all the known input and output values for the known foundation bridges used in the analysis, was randomly divided into three groups, one for training, one for validation and one for testing. When doing the training on a per bent basis it was made sure that bents from the same bridge were in the same group. This made sure that the success rate of the test cases was not artificially elevated. In general, the error in the training process decreases with increasing iterations. This, however, is not the case for the validation set which goes through a minimum then starts to increase. This phenomenon is due to network over-fitting. For this reason the validation set was used to establish the optimum number of iterations for the training process. Figure 4.4 shows typical performance tests for CPILE.

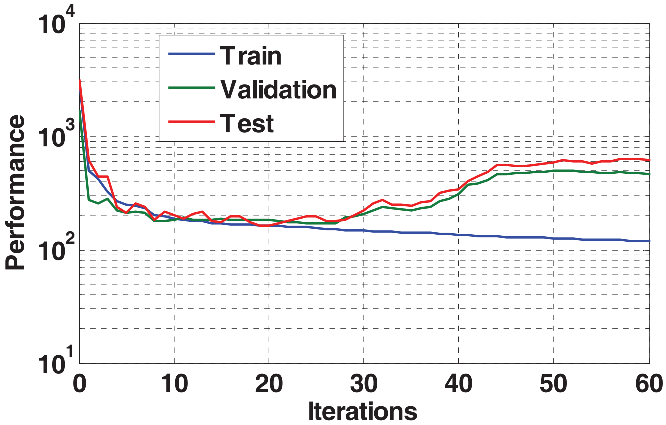


Figure 4.4: Example Showing the Performance of Test Training & Validation Tests as a Function of Iterations

Various training algorithms that depend on early-stopping were tested but none significantly improved the performance. Another option for improving performance is "regularization". This procedure reduces the likelihood of over-fitting. Using this procedure the performance of the test set does not decrease significantly beyond a certain point as the result of over-fitting, see Figure 4.5. This means that the iteration stopping point is not critical and therefore a validation set is not required for this application. Note that the magnitudes of the performance function in Figure 4.4 are not directly comparable to Figure 4.5 since a different function is used. In the final analyses Bayesian regularization back-propagation was used for training the network with 80% of the data.

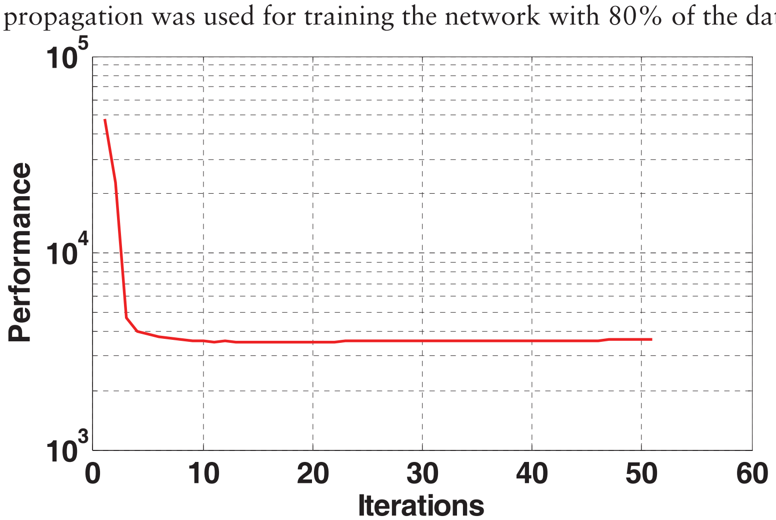


Figure 4.5: Example Showing the Performance of the Test Set Using the Bayesian Regularization Algorithm

Several methods for transferring soil information from the borings to the piles were investigated. Sophisticated interpolation schemes exist but all require adequate data. In general the number of borings per site compared to the natural variability of soils was not sufficient to justify a complex approach. Instead soil at each pile location was assumed to be represented by its closest boring. Assumptions of horizontal soil layers and soil layers following the surface contours were tested for transforming information from the boring to the pile. The method that worked best was the horizontal layer model. When the pile elevation is higher than the boring elevation the top layer at the boring is assumed to extend upward. Note that even though two piles use the same boring, the slope of their bearing capacity curves can be different due to the differences in bed elevation at the two piles. This approach resulted in the most accurate predictions and is the one used in the final version of CPILE.

Results

Initially the ANN for predicting pile penetration depth, CPILE, was trained to predict mean and minimum embedments for 1) the entire bridge, 2) for each bent , 3) for each pile and 4) for each boring. Even though there might be significant differences in pile embedment within a bent generally there is not sufficient information to identify these variations. Making predictions for each boring is straight forward, but it implicitly predicts embedment for a hypothetical pile at the boring location. This was deemed to be of less value from the point of view of bridge stability analysis. Mean as compared to minimum embedment is a more robust parameter and is easier to predict, however minimum embedment is more conservative and perhaps more useful for this application. Additionally, as seen in Figure 4.6, there is very little difference between measured mean and minimum pile embedment for the more critical shallow penetration depths. The final version of CPILE was trained to compute two parameters; the minimum pile embedment for the entire bridge and the minimum pile embedment for each bent on the bridge.

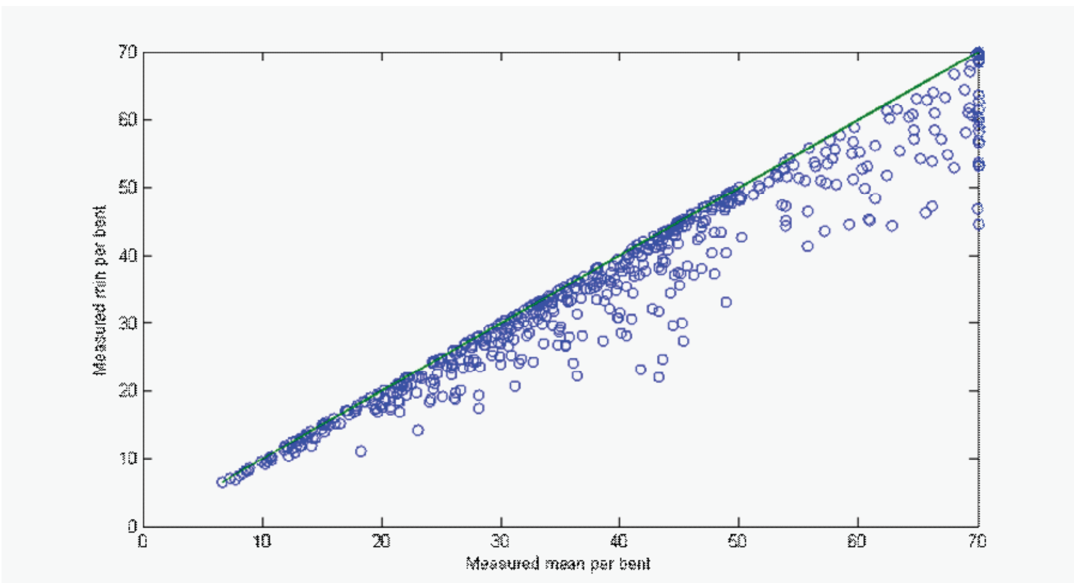


Figure 4.6: Comparison of Measured Mean and Minimum Pile Embedments Per Bent

CPILE was trained using 80% of the bridges in the database and then tested using the remaining 20%. The bridges used in the training were randomly sampled. This procedure was repeated 300 times, each time producing a different network. Note that each data point in the database was part of the test group approximately 60 of the 300 training sessions. The result of this procedure is 300 different ANNs all of which are contained in CPILE. When CPILE is used to predict pile embedments for a particular bridge all 300 ANNs are executed and the median prediction used. For the purposes of determining estimates of the prediction errors with the test data, only 60 of the 300 ANNs are used for each test data point. The 60 ANNs used are those that were trained without the data point in question. Note that the 60 ANNs used will differ for each data point.

Predictions of minimum embedment per bridge using CPILE versus measured values are shown in Figurs 4.7 and 4.8. The embedment length was capped at 70 feet since for this application, penetrations greater than 70 feet are outside the range of interest. Since a trained ANN will approach a best fit to the data, a correction factor is needed to obtain a conservative prediction that encompasses most, if not all of the data. A correction factor of 0.7 was chosen for CPILE based on the test data. Also a minimum embedment prediction of 10 feet was built into CPILE. It was determined that stopping the pile embedment at the top of the first rock layer improved the accuracy of the predictions as can be seen in Figures 4.7 and 4.8. Figure 4.7 uses CPILE to predict all of the cases while the pile embedment is stopped at the top of the first rock layer in Figure 4.8. Note that by stopping the pile embedment at the top of the first rock layer only 2 data points are more than minimally over-predicted. The final predictions for minimum embedment per bent using the same correction factor are shown in Figure 4.9.

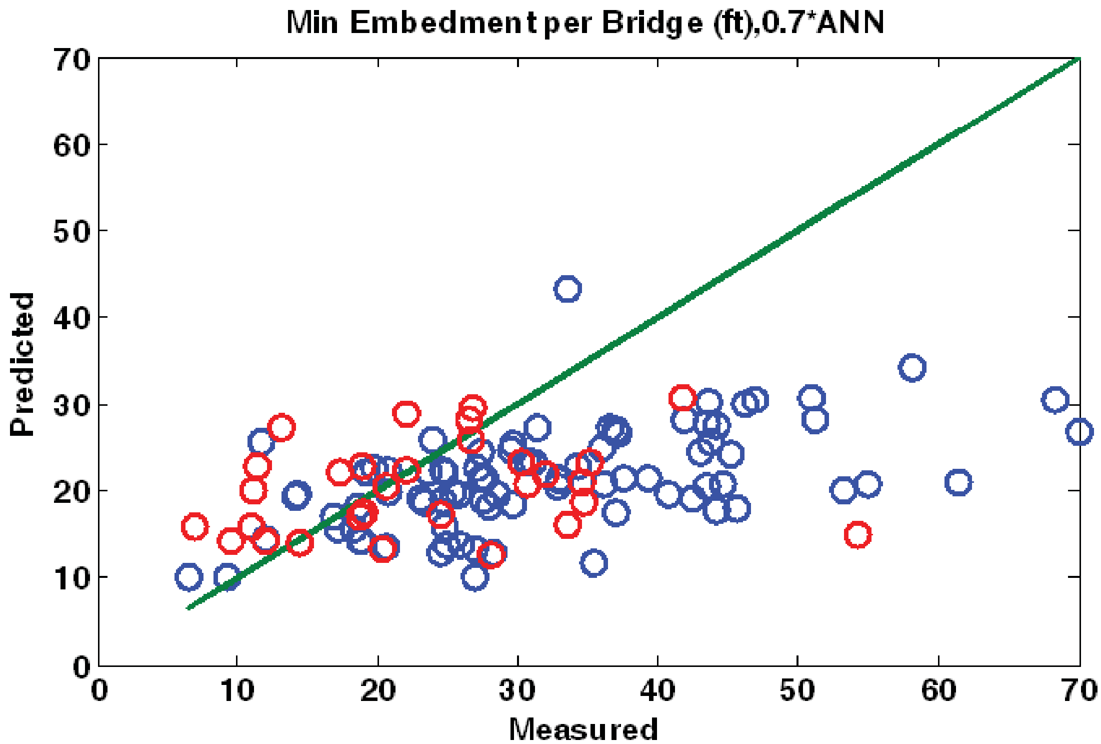


Figure 4.7: CPILE Predictions versus Measured Minimum Pile Embedment Per Bridge. The red circles indicate cases where rock is encountered

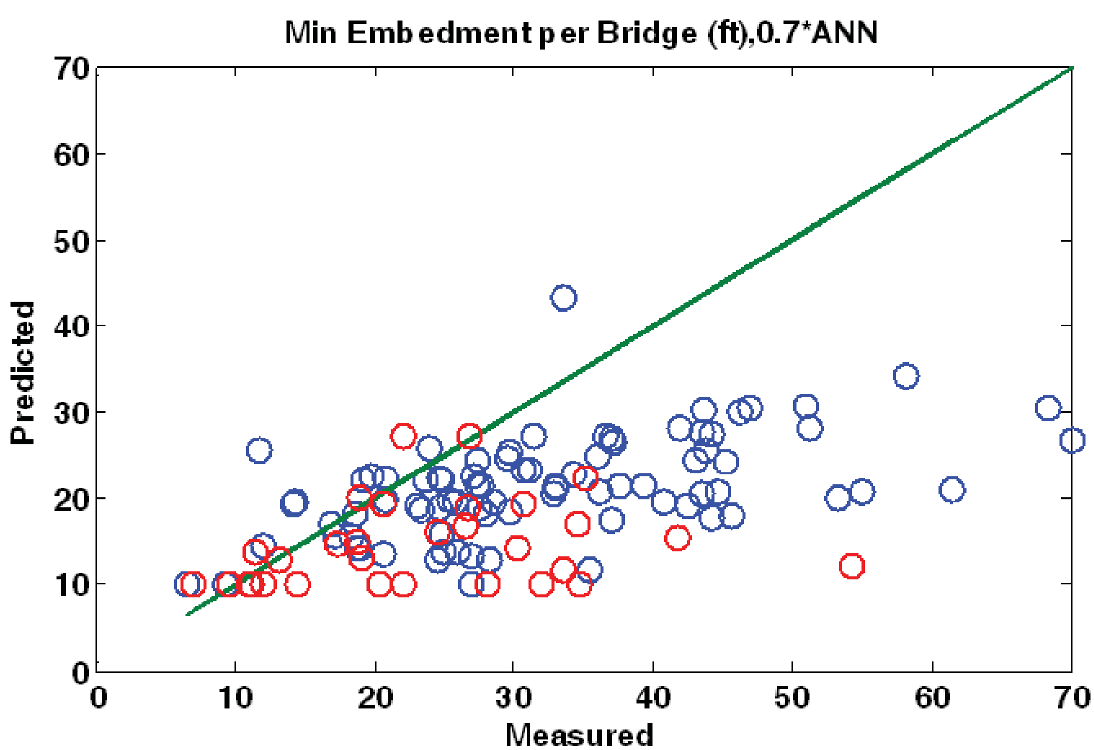


Figure 4.8: CPILE Predictions (limiting embedment to top of rock) versus Measured Minimum Pile Embedment Per Bridge. The red circles indicate cases where rock is encountered

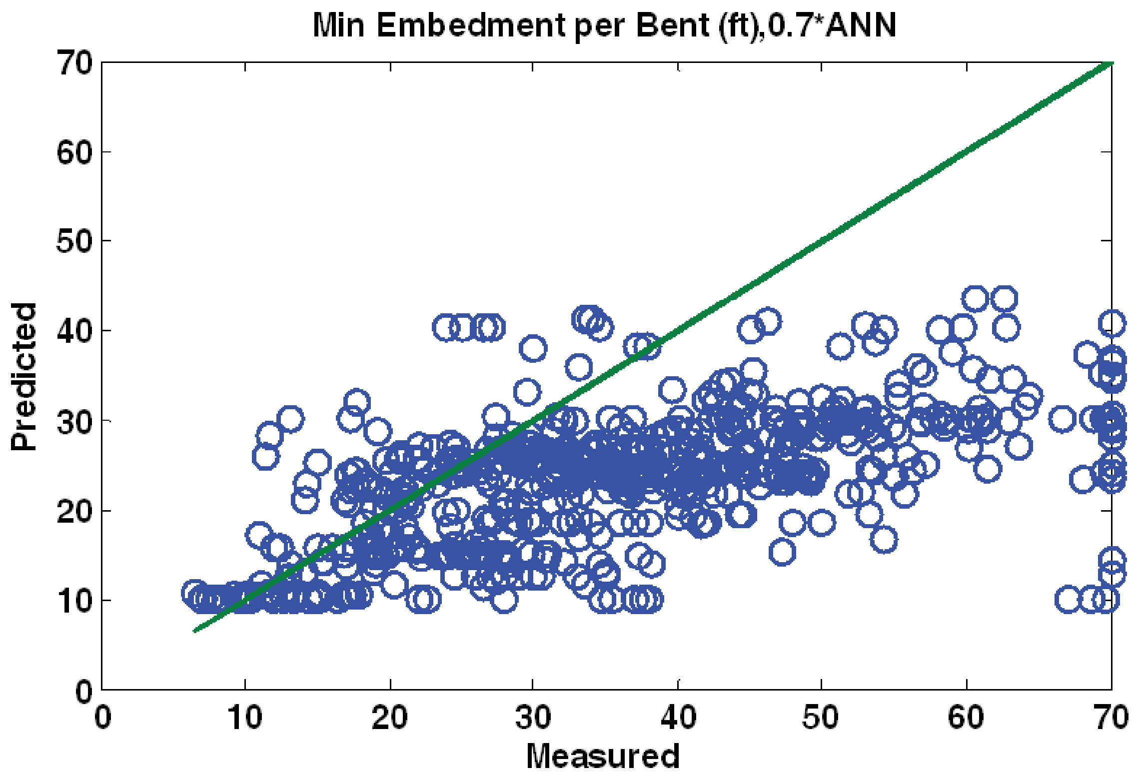


Figure 4.9: CPILE Predictions versus Measured Minimum Pile Embedment Per Bent

After the initial development phase a new set of pile embedment data was collected. There were 13 new concrete pile brides in this data set. Figure 4.10 is a plot of CPILE predictions (using all 300 ANNs) versus measured minimum pile embedment per bent for all of the data including piles on the 13 new bridges. The bents for the new bridges are shown with red pluses. The accuracy of the predictions for the piles on the new bridge bents is consistent with that for the previous data. This exercise serves as an additional test for CPILE.

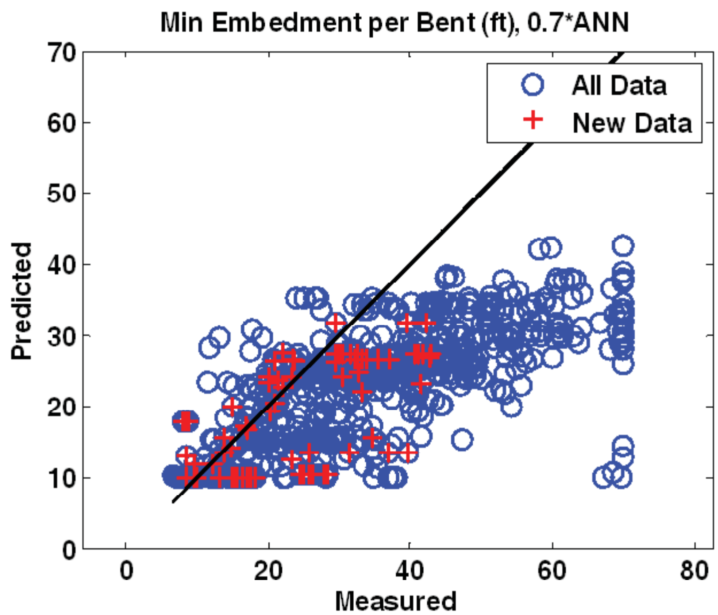


Figure 4.10: CPILE Predictions (using all 300 ANNs) versus Measured Minimum Pile Embedment Per Bent for All of the Data including the 13 new concrete pile bridges

With the new data set the total number of bridges with steel piles increased to 48 which allowed the development of a separate neural network for steel piles possible. A new ANN was developed, SPILE, using the same logic as that used to develop CPILE. SPILE predictions versus measured minimum embedment depths per bent are shown in Figure 4.11. Most of the over-predictions shown in the figure are cases with rock. By limiting the predicted embedment to the top of the rock greatly reduces the number of over-predictions. However, as is evident in Figure 4.11, the ANN predictions are completely unacceptable for the steel piles as suspected. Steel piles are usually used when the soil conditions are unusual and/or highly variable. This coupled with the fact that steel piles are often driven deeper than required make their embedment difficult to predict with ANNs. It is not recommended that ANNs be used for estimating pile embedment depths for steel piles.

There was not sufficient data in the database to develop an ANN for timber piles.

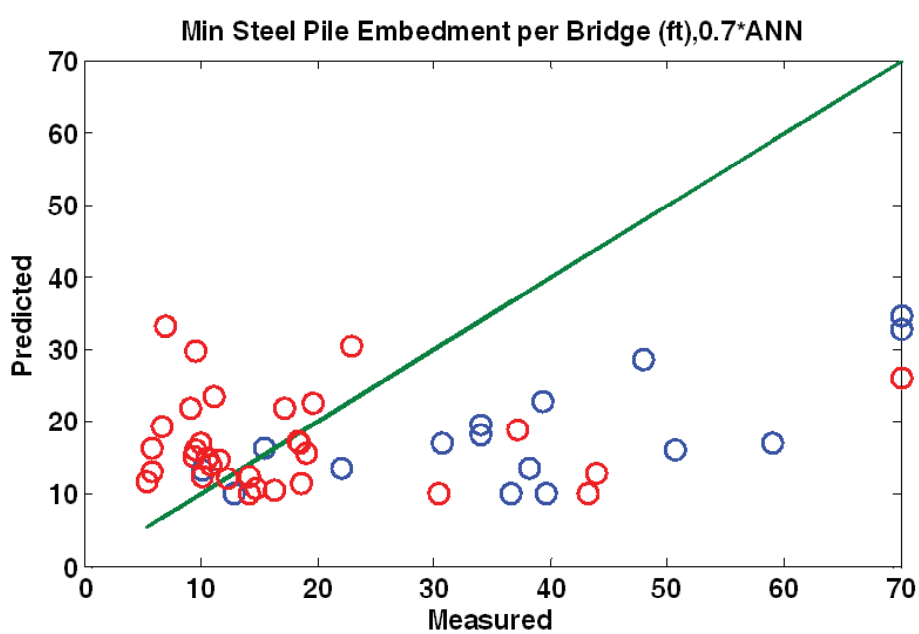


Figure 4.11: SPILE Predictions versus Measured Minimum Pile Embedment Per Bent for Steel Piles. Red circles show cases where the initial predictions were deeper than the top of the first rock layer

ANN for Design Pile Load

A separate ANN was developed for the predition of design pile loads. A similar process to that used in the development of CPILE was followed here. A neural network using a single hidden layer with nine nodes was used. Bayesian regularization back-propagation was used as the training algorithm. Unlike CPILE which is only applicable for concrete piles this neural network, called PLOAD can be used to predict design loads for concrete, steel and timber piles.

The input parameters used are listed below and illustrated in the following flow chart (Figure 4.12):

- Span Length
- Bridge Deck Width
- Bridge Material
- Bridge Design Type
- Pile Type
- Pile Size
- Piles per Bent
- Year

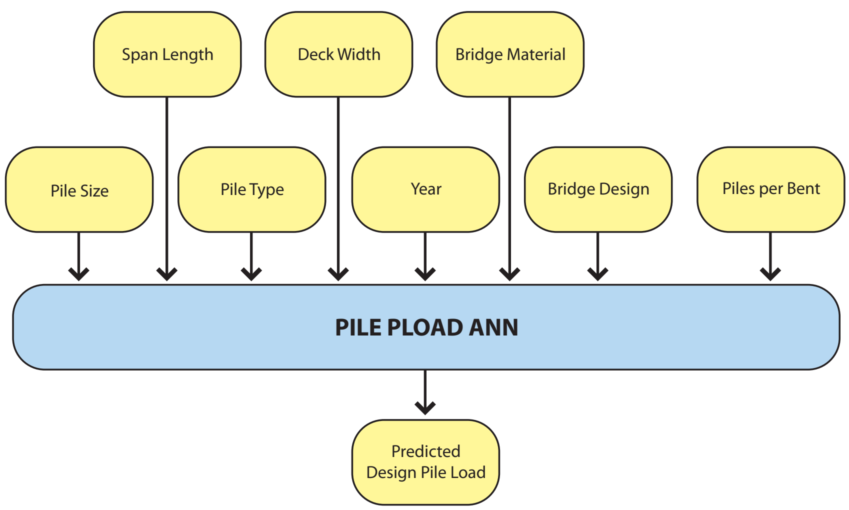


Figure 4.12: Flowchart for PLOAD, the ANN for Predicting Design Pile Loads

Predicted versus known design pile loads are shown in Figure 4.13. Note that the performance of PLOAD is quite good. This is to be expected since design loads are computed using procedures that are systematic and consistent. Note that the accuracy of the predictions for the different pile material types is about the same. PLOAD can be used for concrete, steel and timber pile bridges.

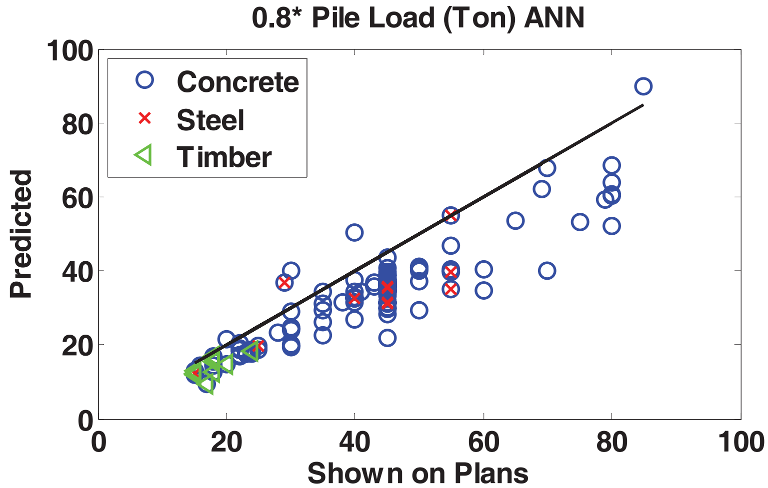


Figure 4.13: Final ANN Predictions of Design Pile Load Compared to Values Given in Plans

Embedment Prediction Using the Geotechnical Method

To evaluate bridge stability under scour conditions, the embedment of the pile is a key factor. However, unknown foundation bridges do not have as-built pile data to determine pile embedment. Therefore, this section provides a methodology to estimate pile embedment for unknown foundations.

The approach is to first evaluate the known foundations which have available pile driving records to determine pile embedment; followed by using available soils information and the computer program FB-Deep (or SPT-97) to develop the bearing capacity curve for the corresponding pile type and size. Then, the pile embedment was estimated from the bearing capacity curve and the required design load. Lastly, the process compared the estimated pile embedment with the known pile embedment from the pile driving record, and developed a general methodology for estimating the pile embedment of unknown foundations.

The process started with collecting data of known foundation bridges throughout the state. The data includes but is not limited to, pile driving records, scour evaluation reports, bridge inspection reports, construction plans and soil borings.

A total of 63 known foundation bridges were identified throughout the state. The bridge information is shown in Table 4.5 on the following page. The table presents three types of pile foundations, i.e. concrete, steel and timber piles, with varied sizes. Of the 63 bridge sites, 20 have SPT borings available and the rest either have wash borings or no soils information.

Table 4.5: Summary of Pile Embedment from Pile Driving Records and FB-Deep Analyses

							Minimum Pile Embedment Length (ft)				
ID	Bridge No.	Rd	City/ County	Design Load (tons)	Pile Size (inch)	Pile Type	Pile Driving Record	SPT-Boring	Standard Curve w/ N=10	Standard Curve w/ N=15	Standard Curve w/ N=20
1	030050	US 41 over Drainage Canal	Collier	23	12	Precast	13	-	23	15	11
2	030052	US 41 over Drainage Canal	Collier	23	12	Precast	10	-	23	15	11
3	110055	SR 25 over Helena Run	Lake	45	18	Precast	21	15	30	19	14
4	110077	SR 40 over St. Johns River	Lake	70	20	PPCP	46	41	43	28	21
5	110084	SR 500 (US 441) over Dead River	Lake	132	24	PPCP	37	30	35	46	69
6	110085	SR 500 (US 441) over Dead River	Lake	132	24	PPCP	42	30	35	46	69
7	260016	CR 2082 over Lochloosa Creek	Alachua	38	14	PPCP	11	-	34	22	17
8	260032	CR 1493 over Santa Fe River	Alachua	40	18	PPCP	13	-	26	17	12
9	260055	I-75 over Hogtown Creek	Alachua	45	18	PPCP	18	-	30	19	14
10	260103	SR 20 over Prairie Creek	Alachua	79	18	PPCP	40	28	56	37	28
11	260105	SR 200 over Orange Creek	Alachua	80	18	PPCP	37	39	57	38	29
12	260940	SR 121 over Hogtown Creek	Alachua	35	14	PPCP	35	42	31	20	15
13	264875	SW 20 Ave over Hogtown Creek	Alachua	30	18	PPCP	22	-	18	11	7
14	280024	CR 299 over Gum Creek	Bradford	17	-	Timber	19	-	27	18	-
15	460014	CR 2311 over Deer Point Lake	Bay	25	18	PPCP	59	11	15	9	5
16	460030	SR 75 over Bear Creek	Bay	24	12	PPCP	16	10	24	16	12
17	460052	CR 388 over Burnt Mill Creek	Bay	22	12	Precast	34	43	22	14	10
18	460070	CR 2293 (John Pitts Rd) over Bayou George Creek	Bay	45	18	PPCP	31	-	30	19	14
19	460940	SR 52 over North Bay	Bay	18	-	Timber	33	-	29	20	-
20	464004	SR 77A over Gainer Bayou	Bay	35	14	PPCP	34	-	31	20	15
21	470030	SR 73 over Juniper Creek	Calhoun	16	12	Precast	25	-	15	9	7
22	480016	SR 30 (US 98) over Herrion Bayou	Escambia	43	18	PPCP	29	-	28	18	13
23	480028	Kingsfield Rd over Eleven Mile Creek	Escambia	15	-	Timber	32	-	24	16	-
24	480044	CR 184 over Escambia River	Escambia	45	18	PPCP	36	-	30	19	14
25	480093	CR 99 over McDavid Creek	Escambia	18	-	Timber	28	-	29	20	-
26	480097	CR 99 over Pine Barren Creek	Escambia	18	-	Timber	18	-	29	20	-
27	480098	CR 99 over Pine Barren Creek	Escambia	18	-	Timber	37	-	29	20	-
28	490002	CR 376 over Postun Bayou	Franklin	45	18	Precast	28	-	30	19	14
29	500023	CR 269 over Flat Creek	Gadsden	15	12	PPCP	12	-	12	9	6
30	500032	CR 159 over Swamp Creek	Gadsden	22	12	PPCP	13	-	22	14	10
31	500038	CR 274 over Telogia Creek	Gadsden	18	-	Timber	22	-	29	20	-
32	500040	CR 161 over Willacoochee Creek	Gadsden	24	12	Precast	16	-	24	16	12
33	500116	SR 12 over Tallahassee Creek	Gadsden	50	18	PPCP	44	-	34	22	15
34	510005	16 Street over St Joe Bay	Gulf	20	14	Precast	29	-	16	10	7
35	510010	CR 387 over Indian Creek	Gulf	25	14	Precast	27	25	21	13	10
36	510014	SR 30 (US 98) over St Joe Bay	Gulf	45	18	PPCP	32	-	30	19	14
37	520007	CR 179A over Parrot Creek	Holmes	22	12	Precast	19	-	22	14	10
38	520061	SR 179 over Wrights Creek	Holmes	30	10HP42	H-Pile	54	30	64	44	39

Table 4.5: Summary of Pile Embedment from Pile Driving Records and FB-Deep Analyses (continued)

							Minimum Pile Embedment Length (ft)				
ID	Bridge No.	Rd	City/ County	Design Load (tons)	Pile Size (inch)	Pile Type	Pile Driving Record	SPT-Boring	Standard Curve w/ N=10	Standard Curve w/ N=15	Standard Curve w/ N=20
39	520910	SR 10 over Sandy Creek	Holmes	40	18	PPCP	25	-	26	17	12
40	540028	SR 20 over Burnt Mill Creek	Jefferson	45	18	Precast	20	-	30	19	14
41	540029	SR 20 over Aucilla River	Jefferson	40	14	Precast	48	22	36	24	18
42	540044	CR 158 over Branch of Lloyd Creek	Jefferson	22	12	Precast	25	-	22	14	10
43	550002	SR 263 over Munson Slough	Jefferson	45	18	PPCP	42	-	30	19	14
44	550065	SR 20 over St Marks River	Leon	35	18	Precast	28	20	22	14	10
45	554050	CR 12 Ochlockonee Relief Bridge	Leon	55	14HP89	H-Pile	17	23	90	62	49
46	560053	SR 65 over Black Creek	Liberty	45	18	PPCP	24	-	30	19	14
47	570075	SR 123 over Toms Creek	Okaloosa	50	18	PPCP	20	-	34	22	15
48	570081	SR 20 over Sanders Creek	Okaloosa	40	18	PPCP	32	34	26	17	12
49	580026	CR 191 over Big Juniper Creek	Santa Rosa	18	-	Timber	30	-	29	20	-
50	580028	SR 281 over Indian Bayou	Santa Rosa	45	18	Precast	26	-	30	19	14
51	580063	CR 399 over Tom King Bayou	Santa Rosa	35	14	Precast	25	-	31	20	15
52	580065	SR 281 over Trout Bayou	Santa Rosa	45	18	Precast	55	40	30	19	14
53	594049	SR 372 over Ottor Creek	Wakulla	25	18	PPCP	31	-	15	9	5
54	600021	CR 83A over Four Mile Creek	Walton	20	12	Timber	37	-	32	22	-
55	600023	CR 181 over Natural Bridge Creek	Walton	22	12	Precast	35	-	22	14	10
56	600024	CR 181 over Eight Mile Creek	Walton	22	12	Precast	30	-	22	14	10
57	600069	CR 2 over Chestnut Creek	Walton	22	12	Precast	41	-	22	14	10
58	600076	SR 187 over Pine Log Creek	Walton	30	14	Precast	19	-	26	17	12
59	600100	SR 83 over Gum Creek	Walton	55	18	PPCP	38	43	37	25	18
60	610001	SR 10/US90 over Holmes Creek	Washington	40	18	Precast	30	-	26	17	12
61	740068	CR 115A over Little St Marys River	Nassau	20	-	Timber	12	-	32	22	-
62	780089	SR 312 over Matanzas River	Lake	50	18	PPCP	27	35	34	22	15
63	780100	SR 312 over Matanzas River	Lake	50	18	PPCP	33	35	34	22	15

Next, the process included the calibration of known foundations. Driven piles are the main foundation type used on Florida bridges. However, many pile driving records for bridges built prior to 1970 are not available. In evaluating the scour potential of a water-crossing bridge, the as-built pile embedment is a key factor. Therefore, a methodology to estimate the conservative as-built pile embedment for unknown foundations is necessary.

Calibration of bridges with complete pile driving records and SPT borings was performed in order to develop and validate a methodology or approach to estimate a conservative pile embedment for unknown bridge foundations. The procedure included:

1. Perform FB-Deep (or SPT-97) analyses for every SPT boring for the specific bridge site. Adjustments to the borings were made only if the plans indicated that the channel was excavated after the borings were done or if the borings were done up in the embankment. For example, if the plans indicated that the soil was excavated out to an elevation of +20 feet then all of the soil above that elevation would be discarded from the soil boring when analyzing the pile capacity. Also if the borings were performed in the embankment the embankment portion would be discarded. If elevation information for the borings was available the SPT curves were then plotted by elevation and minimum penetration is then estimated from that.
2. Determine the upper bound pile capacity curve from the set of allowable pile capacity curves. It should be noted that the bridge foundations in this report were designed prior to the use of Load Resistance Factor Design (LRFD); therefore, the "Allowable" pile capacity as determined from Allowable Stress Design (ASD) rather than the "Davisson" pile capacity is used in this procedure.
3. According to the design load (service load), the shortest possible pile length is estimated from the upper bound capacity curve.
4. Summarize the shortest pile lengths for the study bridge from the pile driving records.

The FB-Deep analysis results for different bridges using SPT boring data are shown in Table 4.5, and the bearing capacity curves for each bridge are in Appendix E. The pile tips obtained from the pile driving records are also plotted in the bearing capacity curves.

As mentioned previously, most of the bridge sites only have wash borings or no soils information available. To estimate the pile capacity for these bridge foundations, a uniform soil profile with constant SPT N-value was used. FB-Deep (SPT-97) analyses were performed with different SPT N-values and soil type 2 (clay, silt and sand mix) for different pile types and sizes. Soil type 2 (clay, silt and sand mix) was selected due to the variability of soils encountered throughout Florida.

The results of the FB-Deep (or SPT-97) analyses using uniform soil profile and constant SPT N-values are also presented on Table 4.5. The bearing capacity curves in conjunction with the pile embedment data from pile driving records for each bridge are presented in Appendix F.

- The first set of analyses performed used bridges with SPT boring data. The data included bridge foundations utilizing concrete, steel and timber piles. A comparison of the shortest pile embedment of each bridge obtained from the pile driving records and FB-Deep analyses are presented on Figure 4.14. Although the amount of data is limited, the figure shows that 40% of the estimated pile embedment lengths from the FB-Deep analyses, using SPT borings, are deeper than from the pile driving records. It is not surprising to see this conclusion since the design methodology of FB-Deep (SPT-97) is based on the average results of pile load tests, i.e., theoretically the results of the FB-Deep (SPT-97) analyses has a 50% possibility of overestimating the pile embedment length compared to load test results. Using the upper bound of the bearing capacity curves of the study site may reduce the possibility of overestimating the pile depth.

- The second set of analyses was performed for bridges with only wash borings or without soils information, and used a uniform soil profile with constant SPT N-value. Figures 4.15 through 4.17 present the pile embedment length versus design load from pile driving records for 12, 14, and 18-inch concrete piles, respectively. Bearing capacity curves for SPT N-values of 5, 10, 15 and 20 are also plotted in the figures. Figures 4.18 through 4.20 compare the pile embedment length from pile driving records to that from FB-Deep analyses using constant SPT N-Values of 10, 15, and 20, respectively. As can be seen from the figures, 45% of the estimated pile embedment lengths using a SPT N-value of 10 are deeper than those from the pile driving records, while the SPT N-value of 15 overestimated by 20% and the SPT N-value of 20 overestimated by 4%. As shown in the bridge data, many bridge sites encountered a shallow hard rock layer. This could be one of the reasons that some of the estimates resulted in deeper pile embedment compared to those from the pile driving records. Although results of using a SPT N-value of 20 indicate that 96% of the estimated pile embedment lengths are shorter than that from the pile driving record, they are too conservative. Therefore, the SPT N-value of 15 is considered the optimum value and is recommended for establishing the Standard Bearing Capacity curve for concrete piles.

- In the analyses for timber piles, the computer program DRIVEN developed by FHWA was performed in addition to FB-Deep. DRIVEN calculates pile capacity with an option to analyze timber piles while FB-Deep has not been calibrated to analyze timber piles. A comparison of pile embedment lengths to design loads for timber piles is presented in Figure 4.21. Also, bearing capacity curves for SPT N-values of 5, 10 and 15 obtained from FB-Deep and DRIVEN were plotted. As shown on Figure 4.21, FB-Deep computes shorter pile embedment lengths than DRIVEN which for this study is more conservative. Therefore, it is recommended that FB-Deep is used to calculate the capacity of timber piles. A comparison of the pile embedment lengths from pile driving records to that from FB-Deep analyses using constant SPT N-Values of 10, and 15, respectively is presented on Figures 4.22 and 4.23. According to the figures, 50% of the estimated pile embedment lengths using SPT N-value of 10 are deeper than that from the pile driving records while the SPT N-value of 15 resulted in an overestimate of 20%. As shown in the bridge data, many bridge sites encountered a shallow hard rock layer which could be one reason that deeper pile embedments were computed compared to that from the pile driving records. Therefore, the SPT N-value of 15 is considered as the optimum value to establish the Standard Bearing Capacity curve for timber piles.

- In this category, a separate analysis was also performed for bridges utilizing steel H-piles. Pile embedment lengths versus design load for various sizes of steel H-piles were evaluated and are presented on Figures 4.24 through 4.27. The bearing capacity curves for SPT N-values of 5, 10, 15 and 20 are also plotted on the figures. The comparison of pile embedment lengths from pile driving records and from FB-Deep analyses using constant SPT N-values of 10, 15, and 20, respectively are presented on Figures 4.28 through 4.30. As can be seen from the figures, the estimated pile embedment depths were overestimated by 82%, 82% and 73% for SPT N-values of 10, 15 and 20, respectively. The results show an unacceptable conclusion. In general, steel H-piles are used under extreme soil conditions of a shallow hard layer or very soft soil layer. It is very difficult, if not impossible, to generalize these extreme soil conditions. Therefore, for this preliminary study, it is recommended that the SPT N-value of 20 is used to establish the Standard Bearing Capacity curve for steel H-piles. Specific site conditions should be carefully reviewed to identify extreme soil conditions.

It should be noted that relatively shallow hardpan and/or limestone layers were encountered in many portions of Florida, especially South Florida. In such conditions, the estimates using Standard Curves would result in deeper pile embedment. Therefore, it is critical to review the study bridge site for shallow hardpans and/or limestone layers before evaluating the pile bearing capacity and embedment.

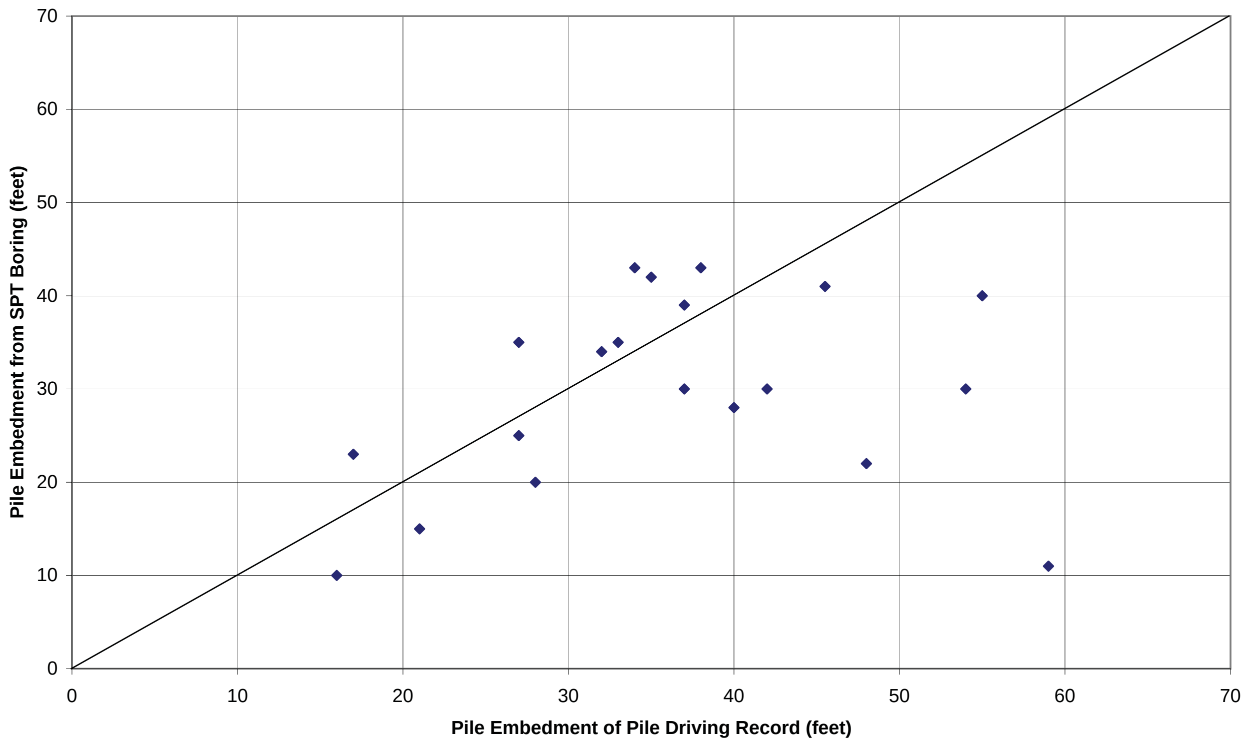


Figure 4.14: Comparison of Pile Embedment from Pile Driving Record and FB-Deep Analysis and SPT Boring

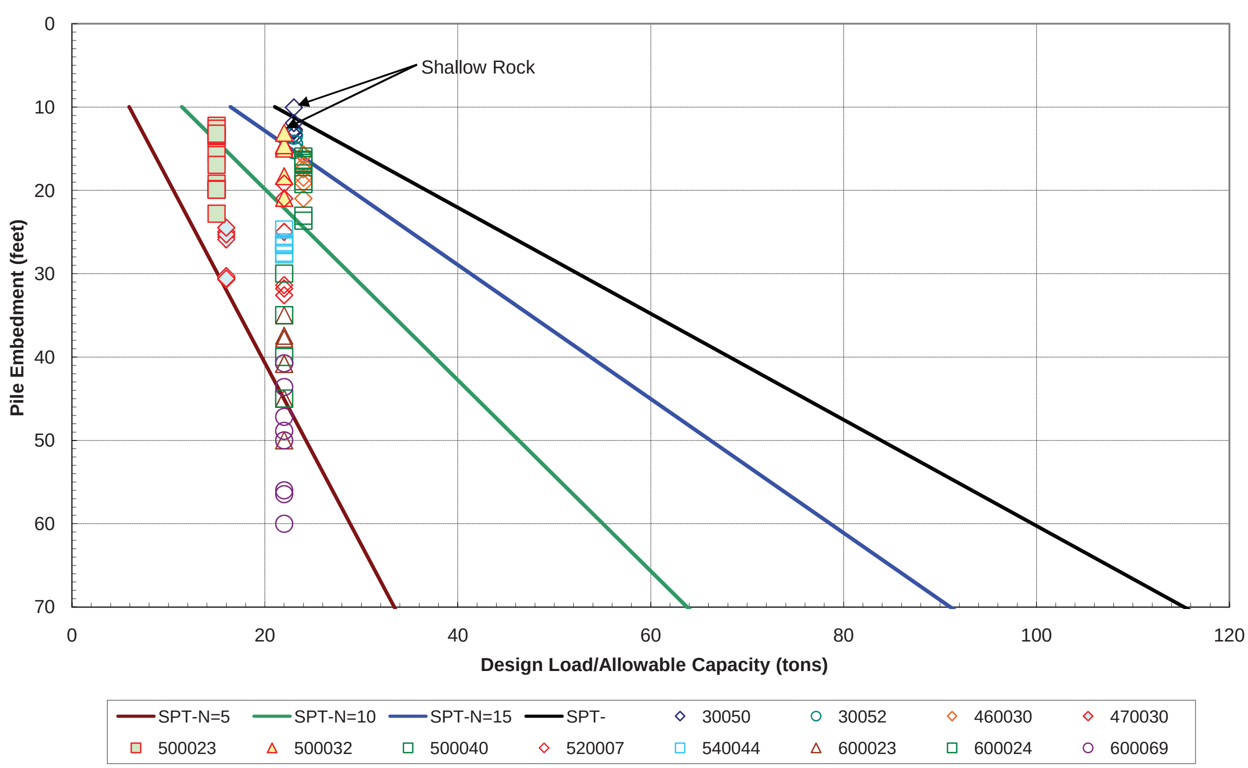


Figure 4.15: Pile Embedment vs. Design Load from Pile Driving Record for 12-inch Concrete Piles

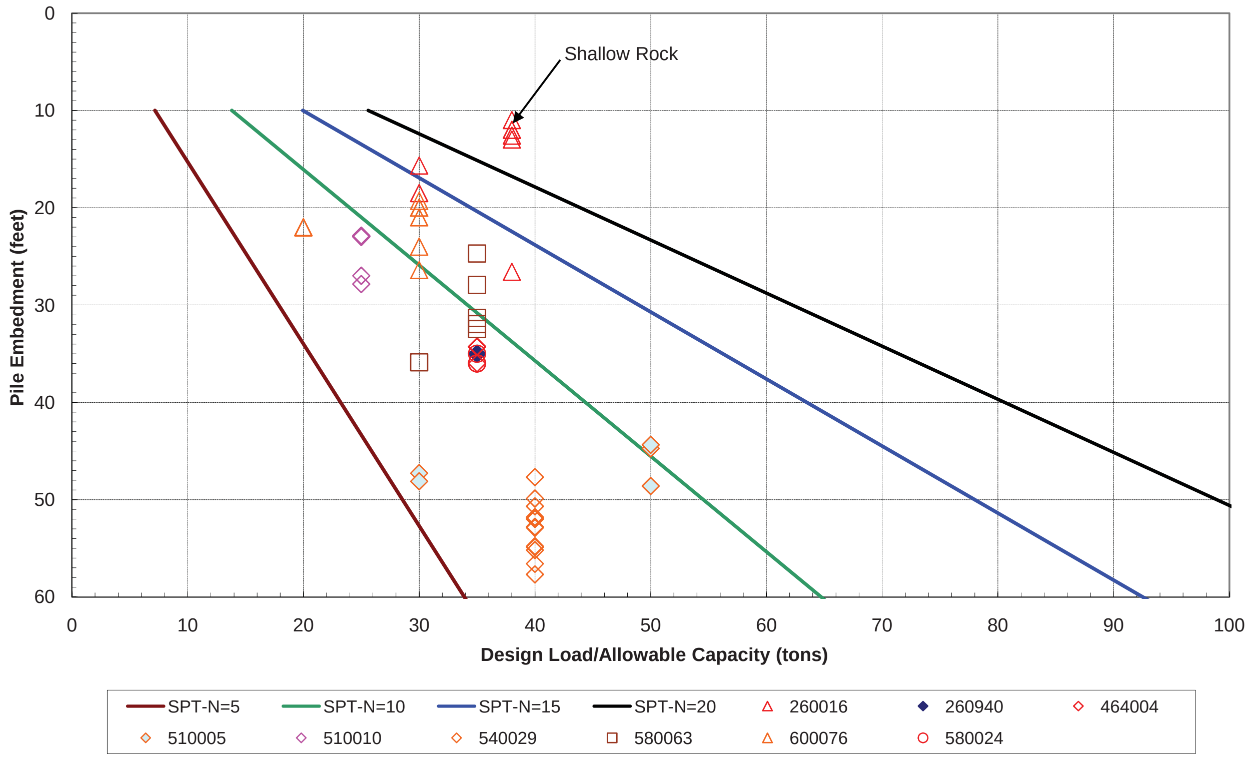


Figure 4.16: Pile Embedment vs. Design Load from Pile Driving Record for 14-inch Concrete Piles

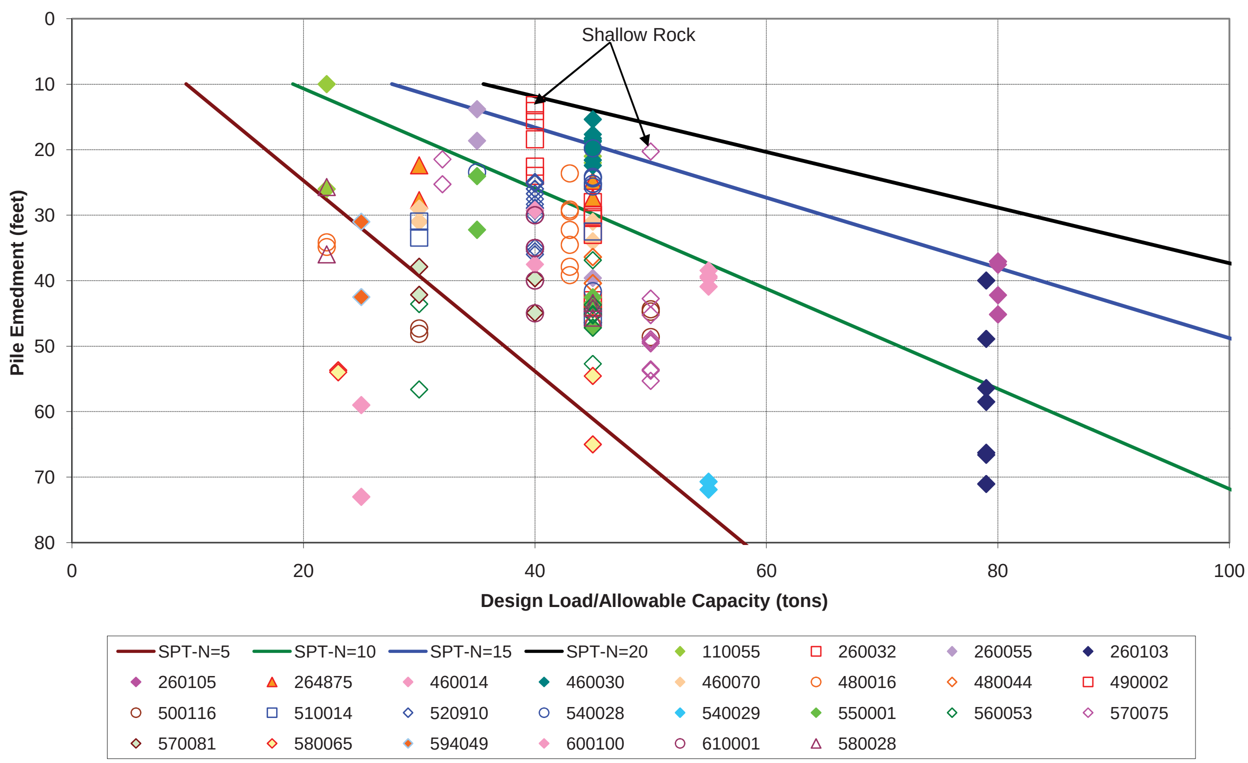


Figure 4.17: Pile Embedment vs. Design Load from Pile Driving Record for 18-inch Concrete Piles

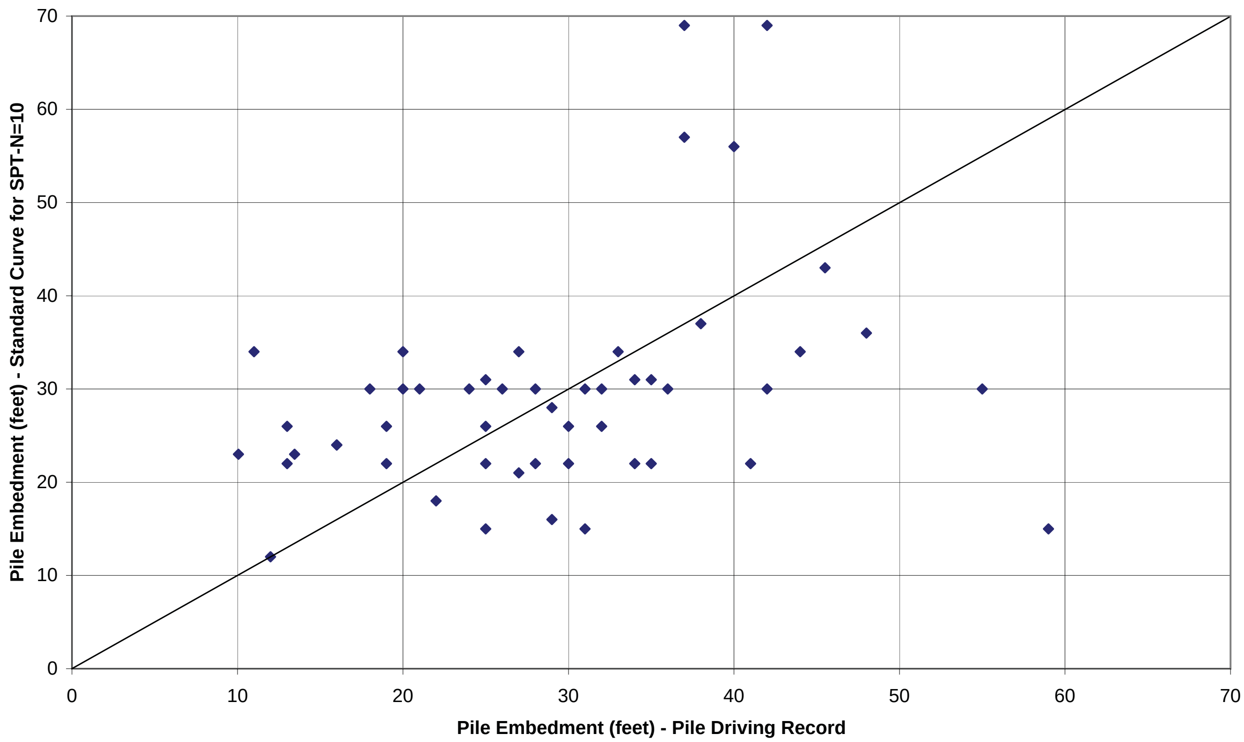


Figure 4.18: Comparison of Pile Embedment from Pile Driving Record & FB-Deep Analysis using SPT-N=10 for Concrete Piles

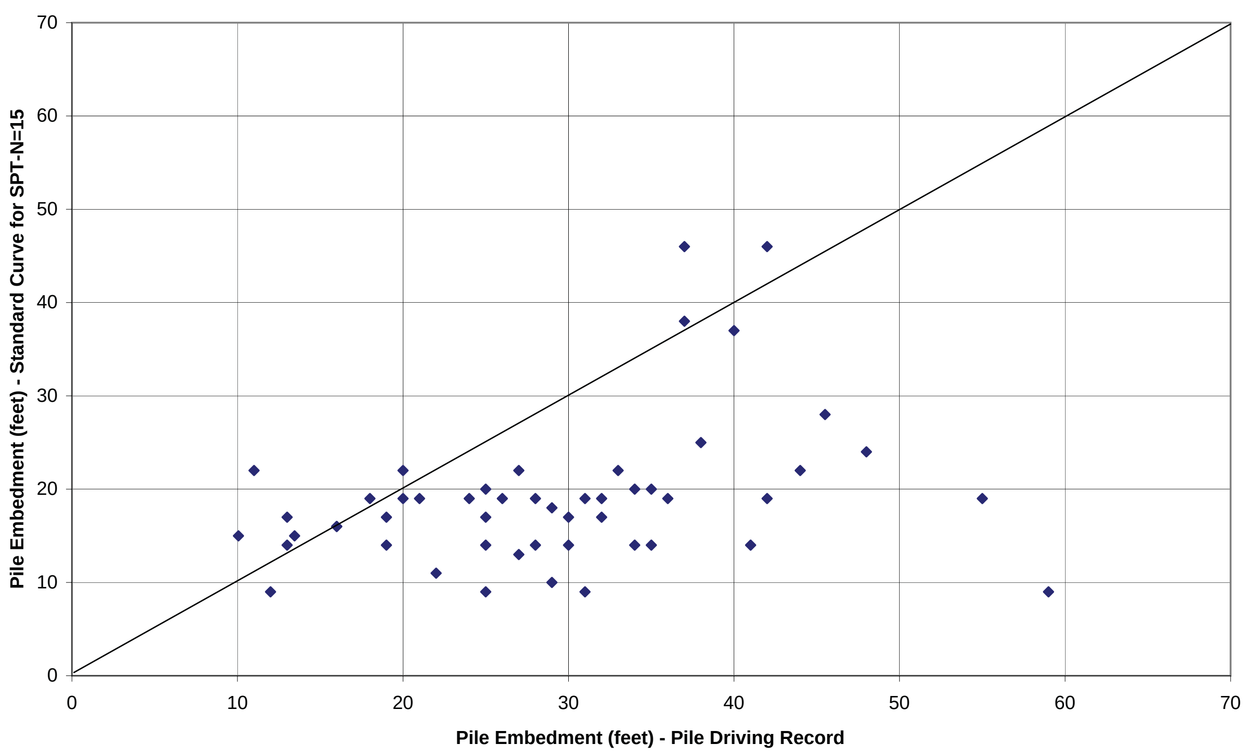


Figure 4.19: Comparison of Pile Embedment from Pile Driving Record & FB-Deep Analysis using SPT-N=15 for Concrete Piles

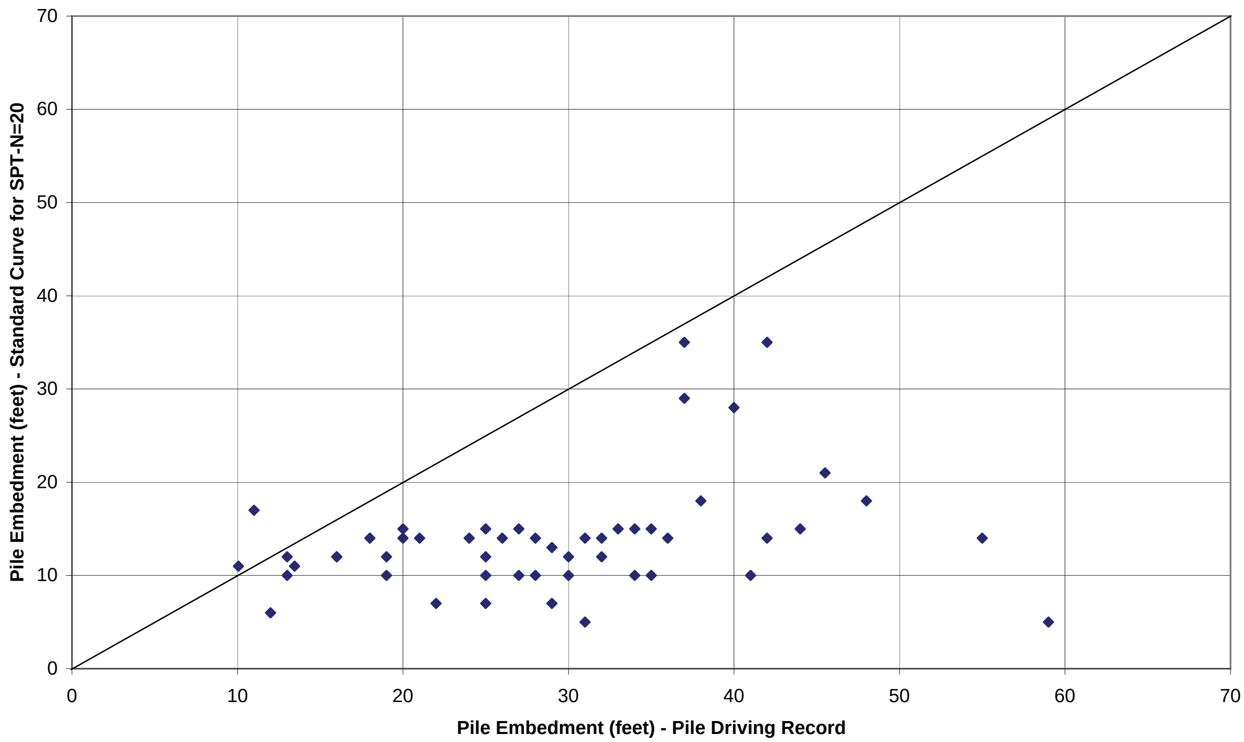


Figure 4.20: Comparison of Pile Embedment from Pile Driving Record & FB-Deep Analysis using SPT-N=20 for Concrete Piles

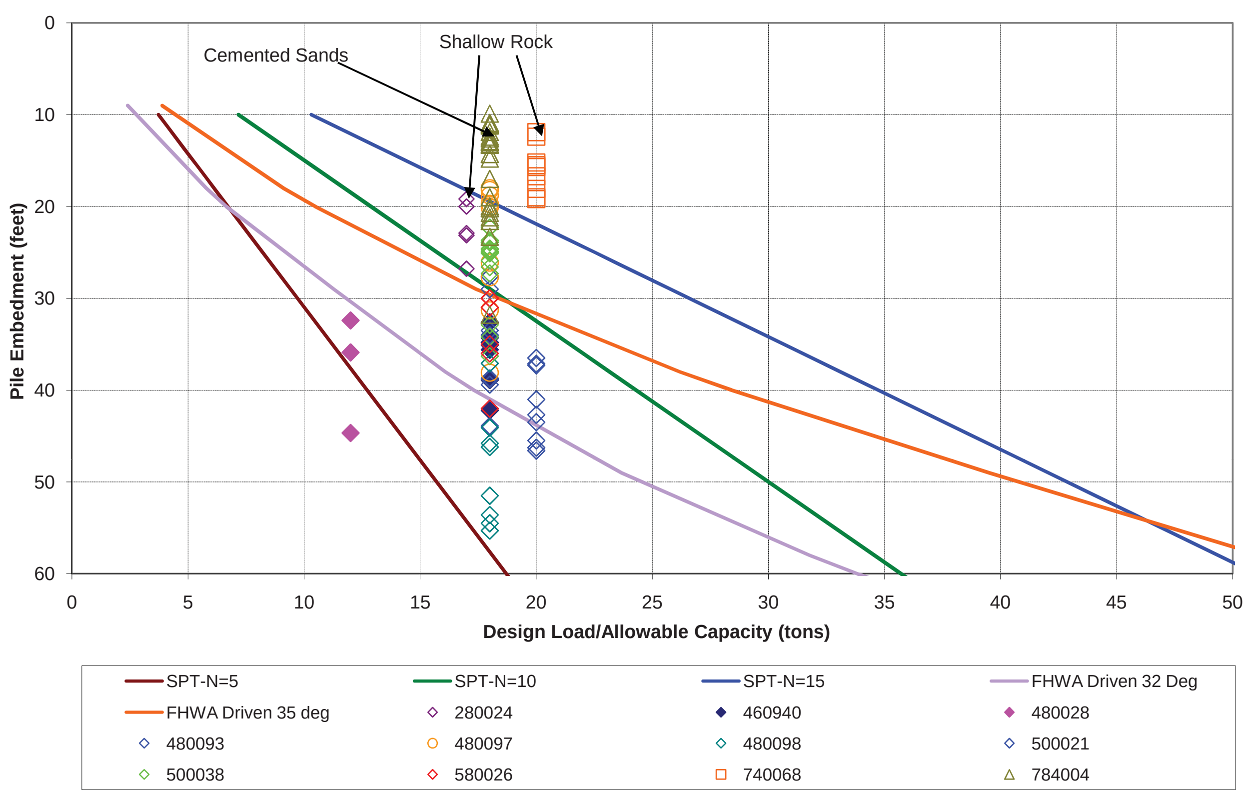


Figure 4.21: Pile Embedment vs. Design Load from Pile Driving Record for Timber Piles

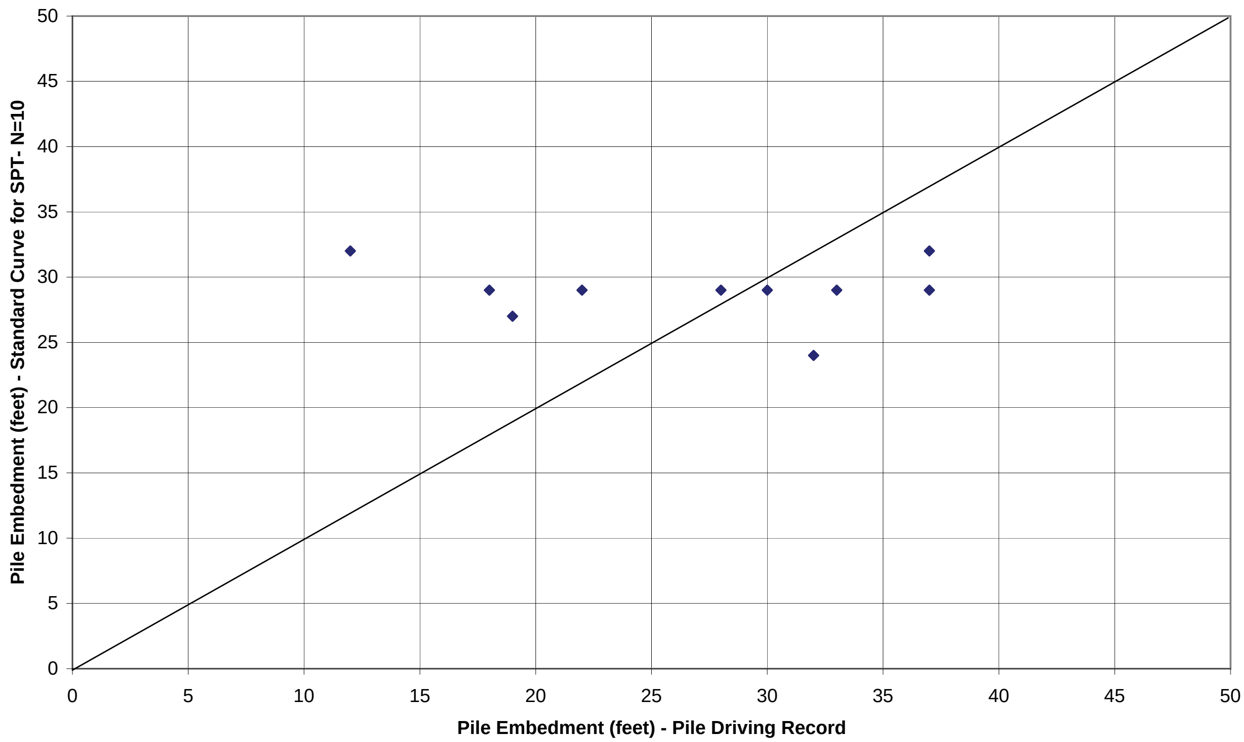


Figure 4.22: Comparison of Pile Embedment from Pile Driving Record and FB-Deep Analysis using SPT-N=10 for Timber Piles

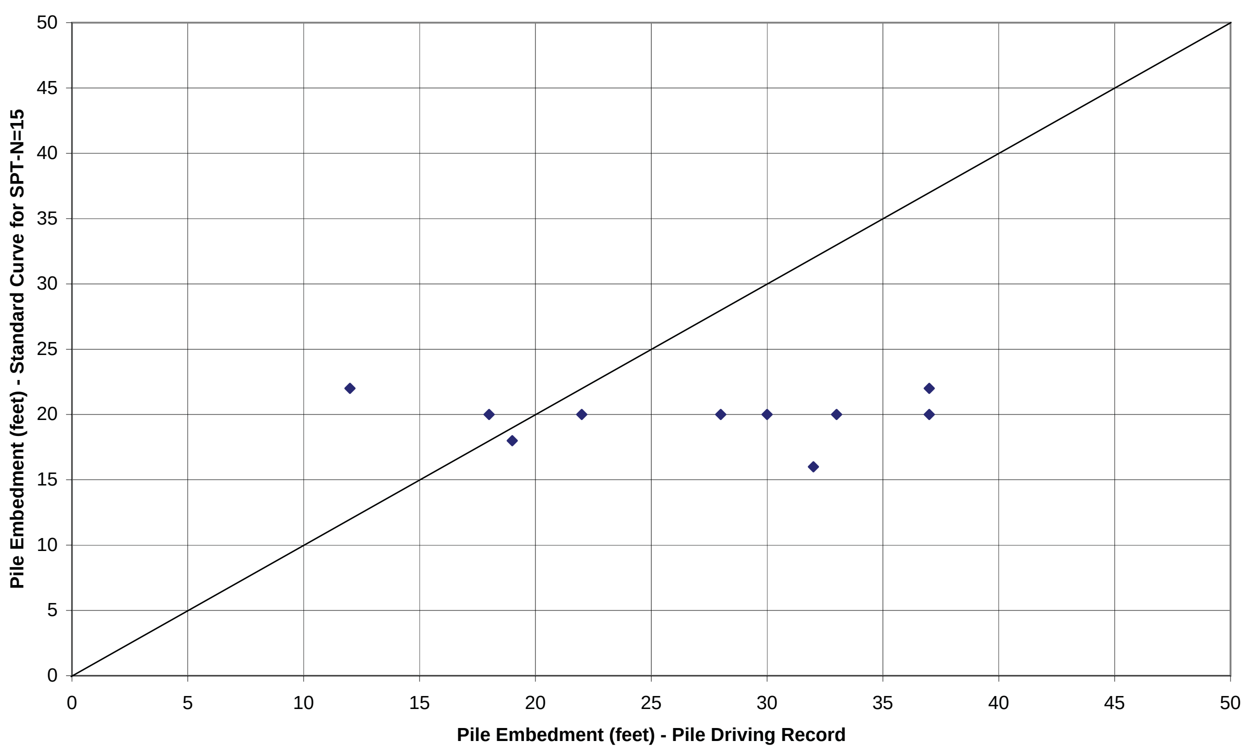


Figure 4.23: Comparison of Pile Embedment from Pile Driving Record and FB-Deep Analysis using SPT-N=15 for Timber Piles

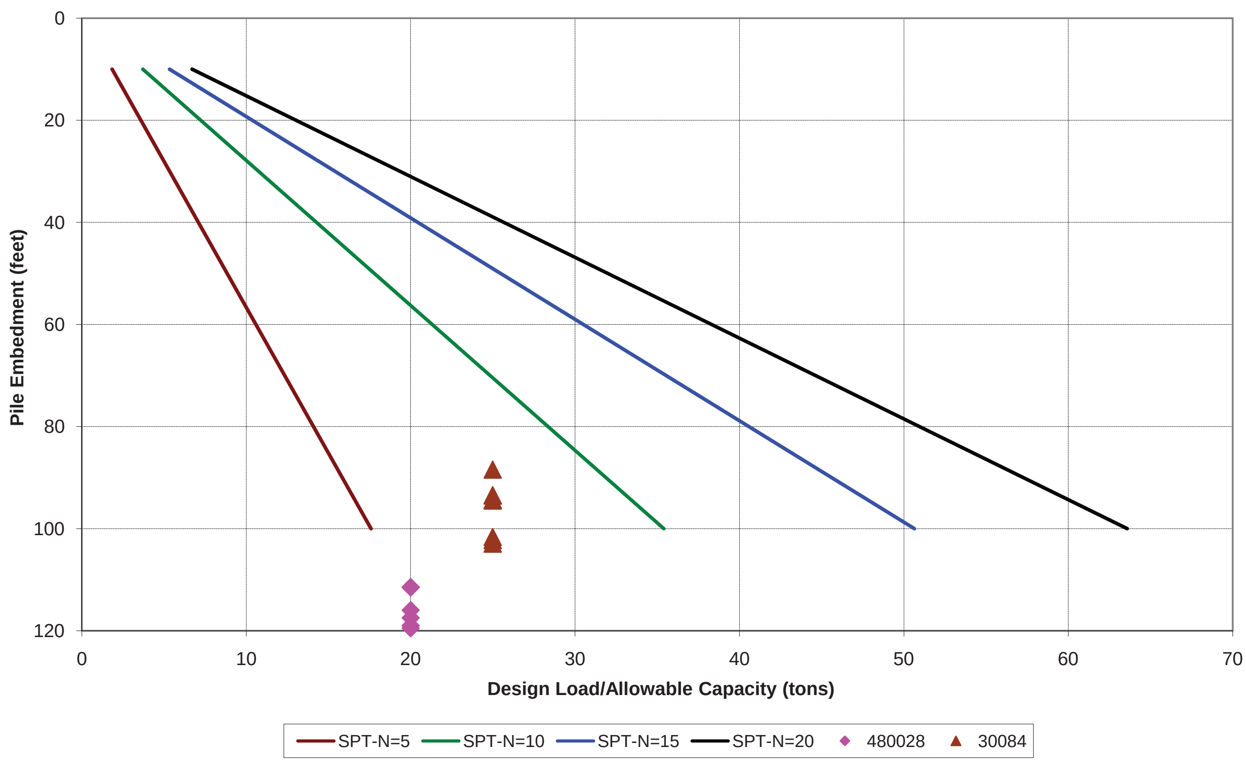


Figure 4.24: Pile Embedment vs. Design load from Pile Driving Record for HP8X36 Piles

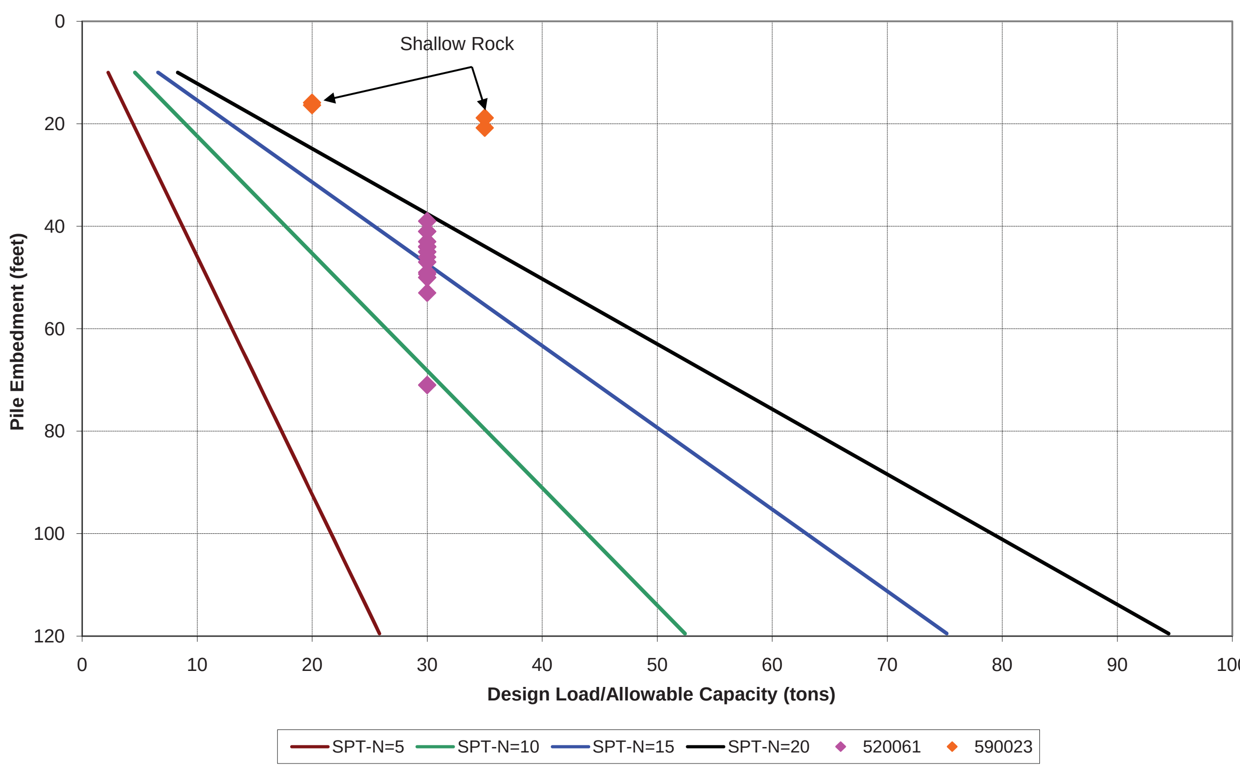


Figure 4.25: Pile Embedment vs. Design Load from Pile Driving Record for HP10X42 Piles

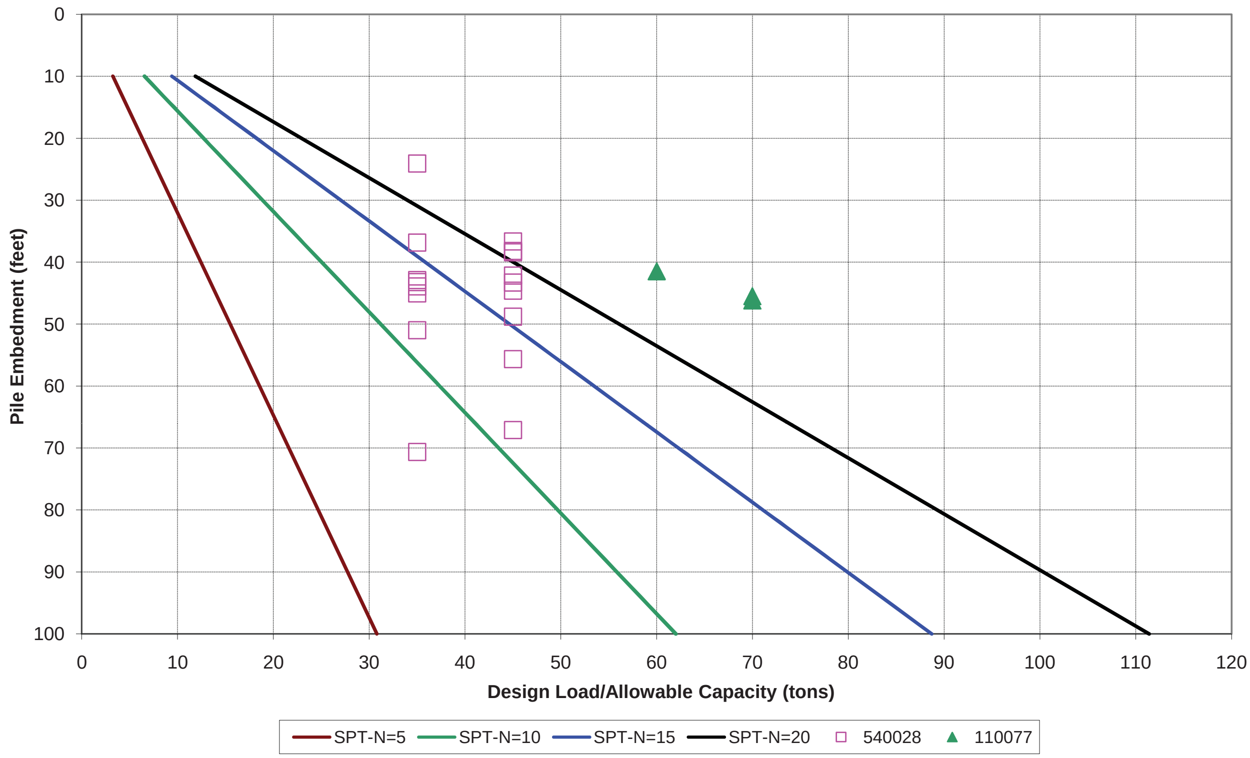


Figure 4.26: Pile Embedment vs. Design Load from Pile Driving Record for HP14X73 Piles

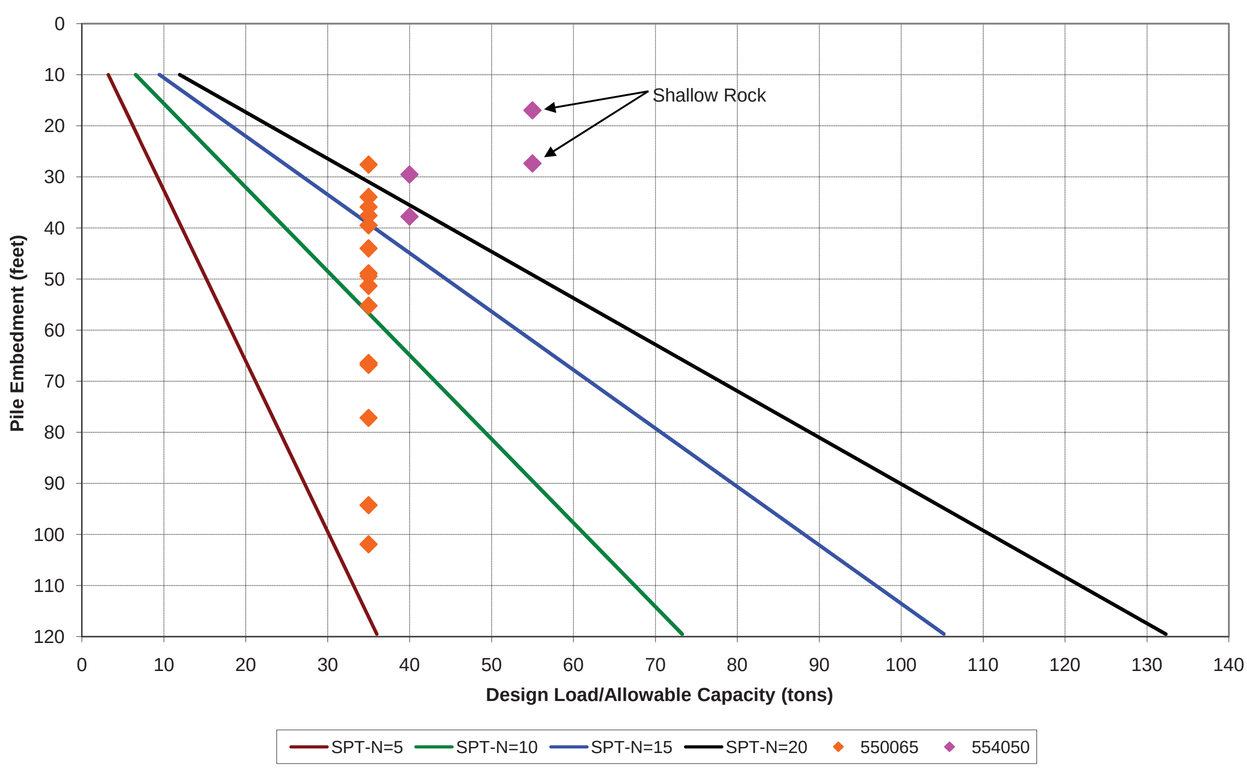


Figure 4.27: Pile Embedment vs. Design Load from Pile Driving Record for HP14X89 Piles

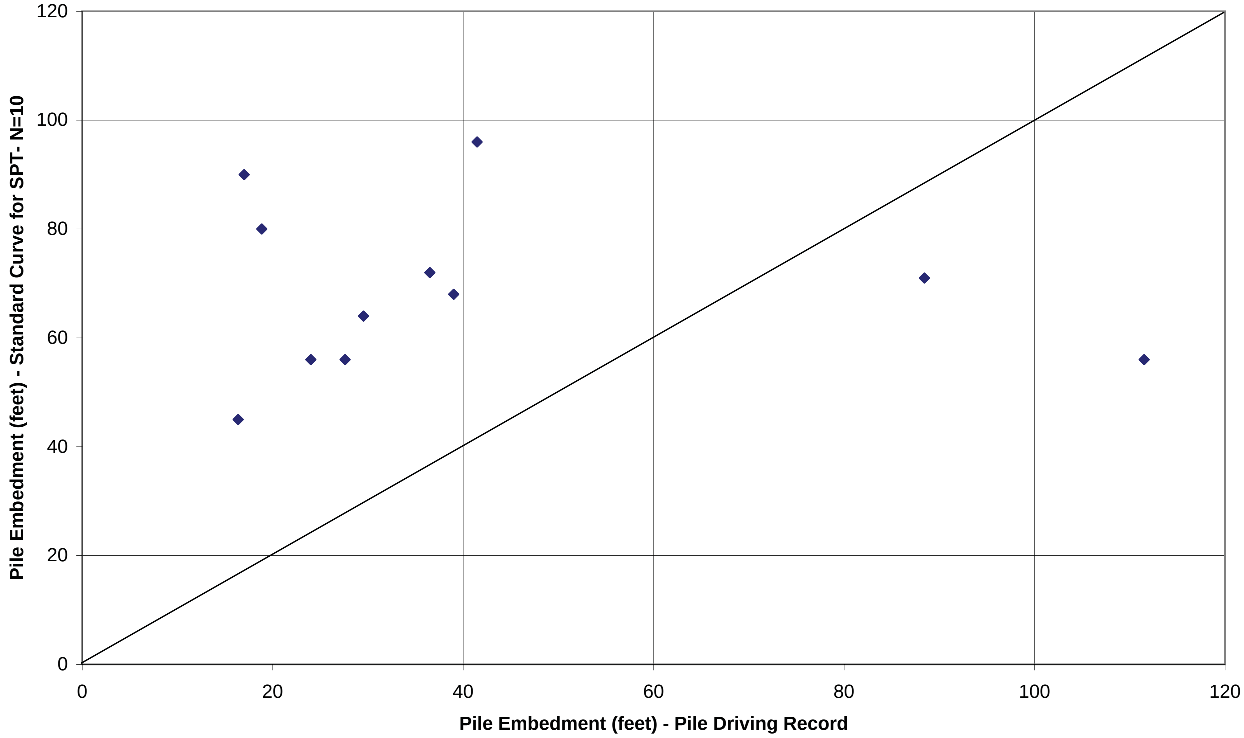


Figure 4.28: Comparison of Pile Embedment from Pile Driving Record and FB-Deep Analysis using SPT-N=10 for Steel Piles

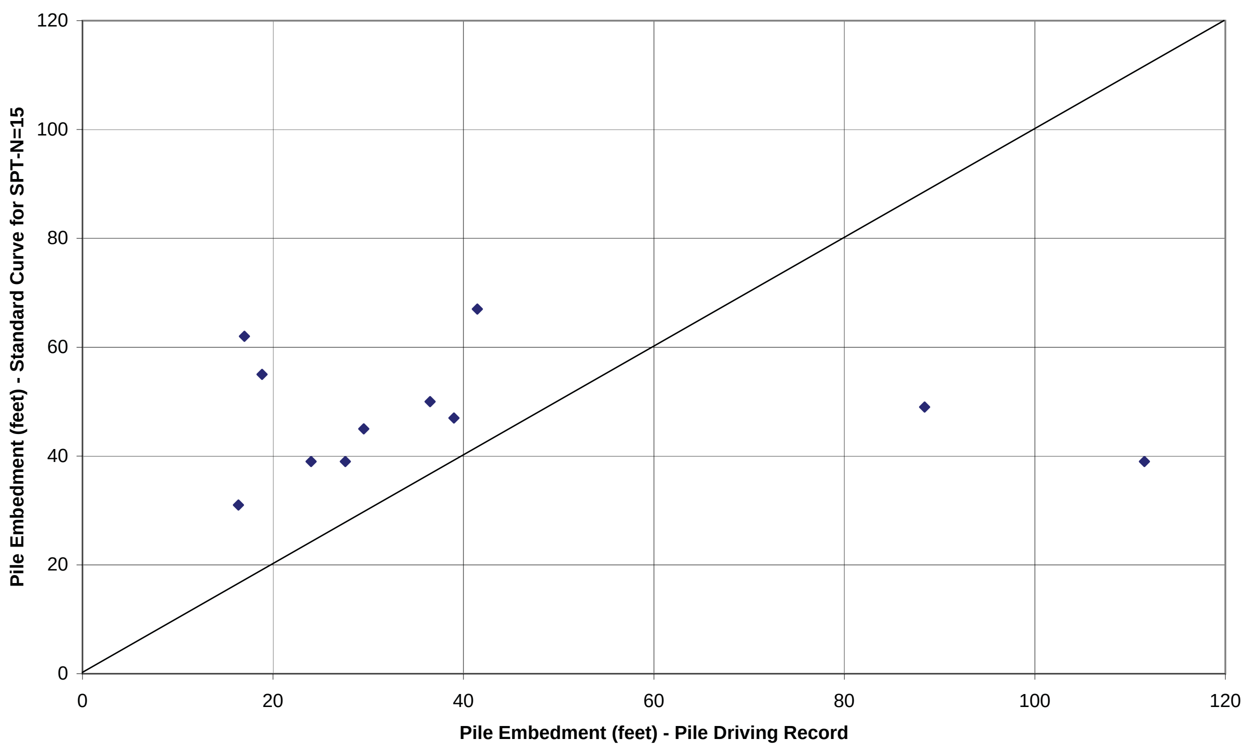


Figure 4.29: Comparison of Pile Embedment from Pile Driving Record and FB-Deep Analysis using SPT-N=15 for Steel Piles

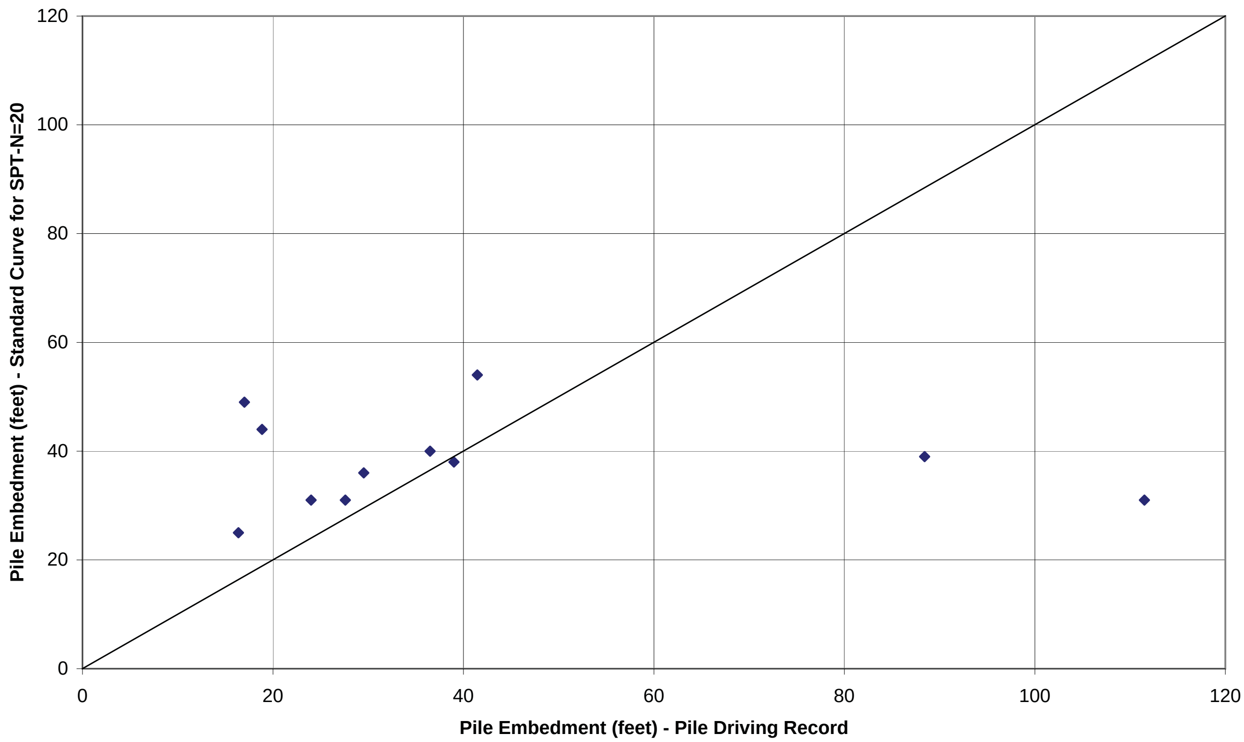


Figure 4.30: Comparison of Pile Embedment from Pile Driving Record and FB-Deep Analysis using SPT-N=20 for Steel Piles

Estimating Pile Embedment of Unknown Foundation Procedures

Based on the calibration of known foundations as discussed above, this section outlines the methodology for estimating pile embedment of unknown foundations. It should be noted that the estimated pile embedment depths are based on ground elevations and soil profiles at the time of pile driving. Any soil losses since pile driving, including predicted scour, must be accounted for when evaluating the bridge's stability.

This procedure is intended to estimate pile embedment under soil conditions existing at the time the bridge was originally constructed. Scour that has occurred since construction or might occur in the future must be considered when evaluating the current capacity of the pile foundations. For the study of bridges in which ASD was used in the original design, the estimated "Allowable" pile capacity rather than the "Davisson" pile capacity is recommended for estimating pile embedment. If LRFD methodology was used in bridge design to determine the pile embedment, appropriate adjustments need to be made to the procedures such as, using the "Davisson" pile capacity curve with SPT data, or by dividing the Design Bearing capacity by 2 and then using the "Standardized" curve when SPT data is not available.

See Figure 4.31 for estimating pile embedment by the geotechnical method flow chart. The "Standard" Bearing Capacity curves for uniform soil profiles should be developed using a SPT N-value of 15 for concrete piles, 15 for timber piles and 20 for steel piles. See standardized curve diagrams (Figures 4.32 thru 4.40) following flow chart.

A detailed procedure to estimate pile embedments is given in the *Procedural Manual: Reclassify Unknown Foundation Bridges*.

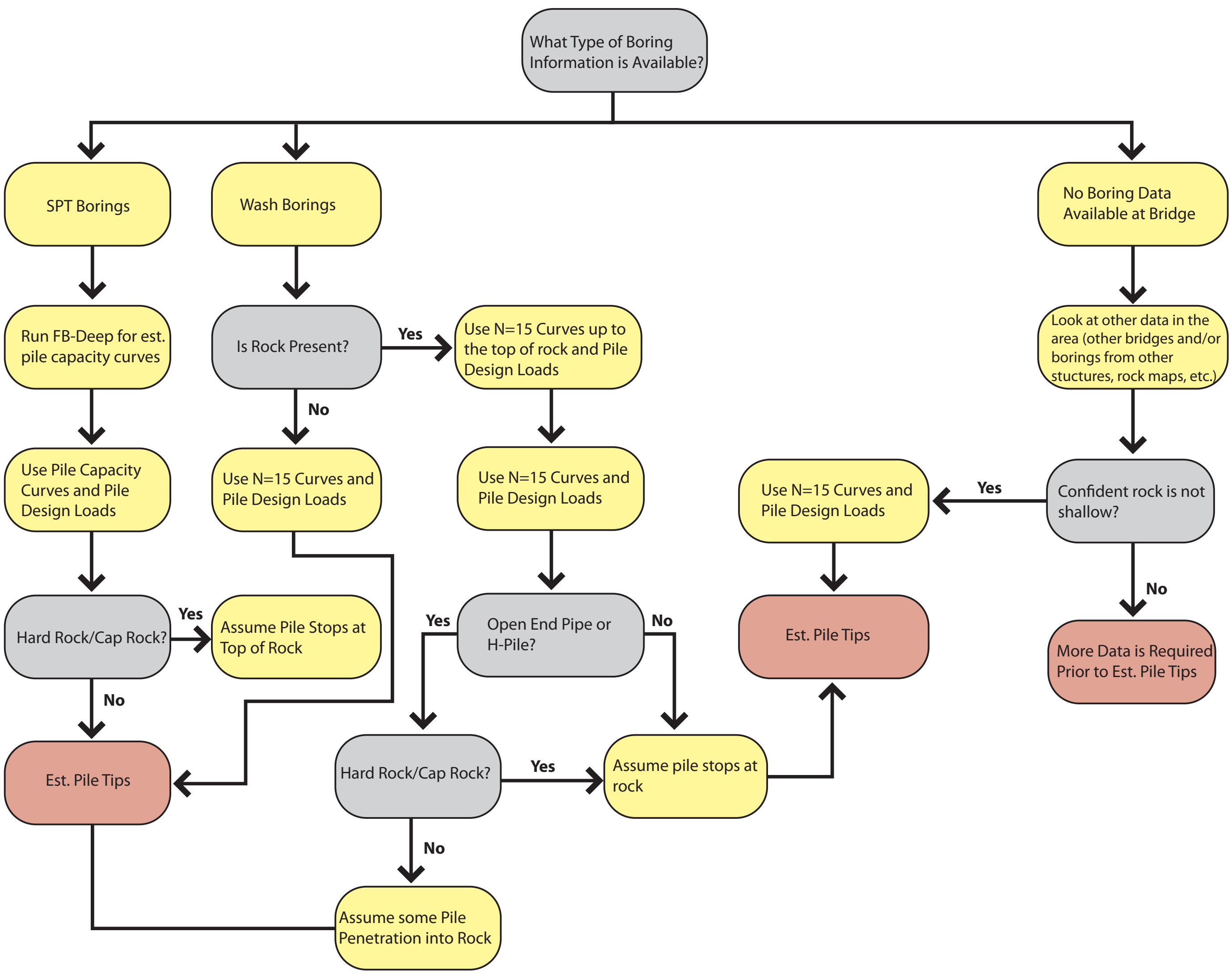


Figure 4.31: Estimating Pile Embedment by the Geotechnical Method Flow Chart

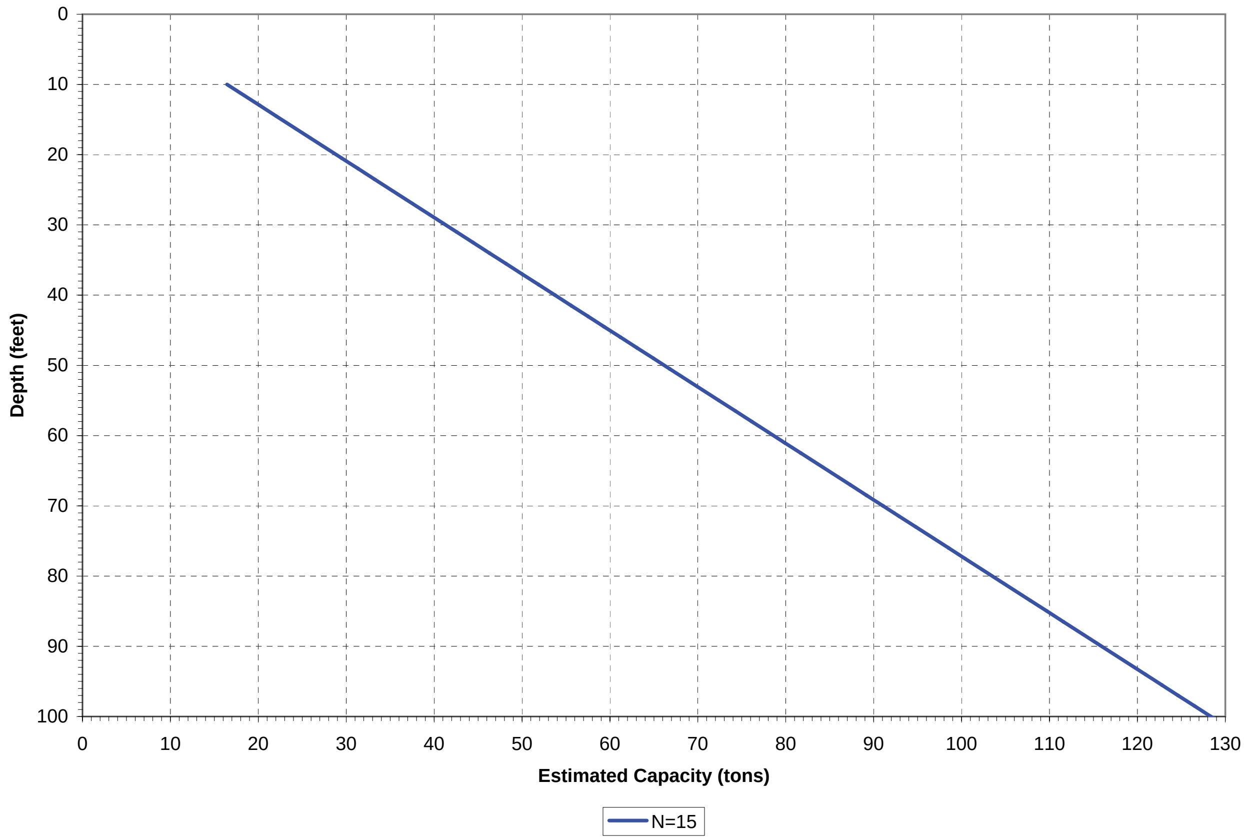


Figure 4.32: 12 inch Piles - "Standardized Curve"

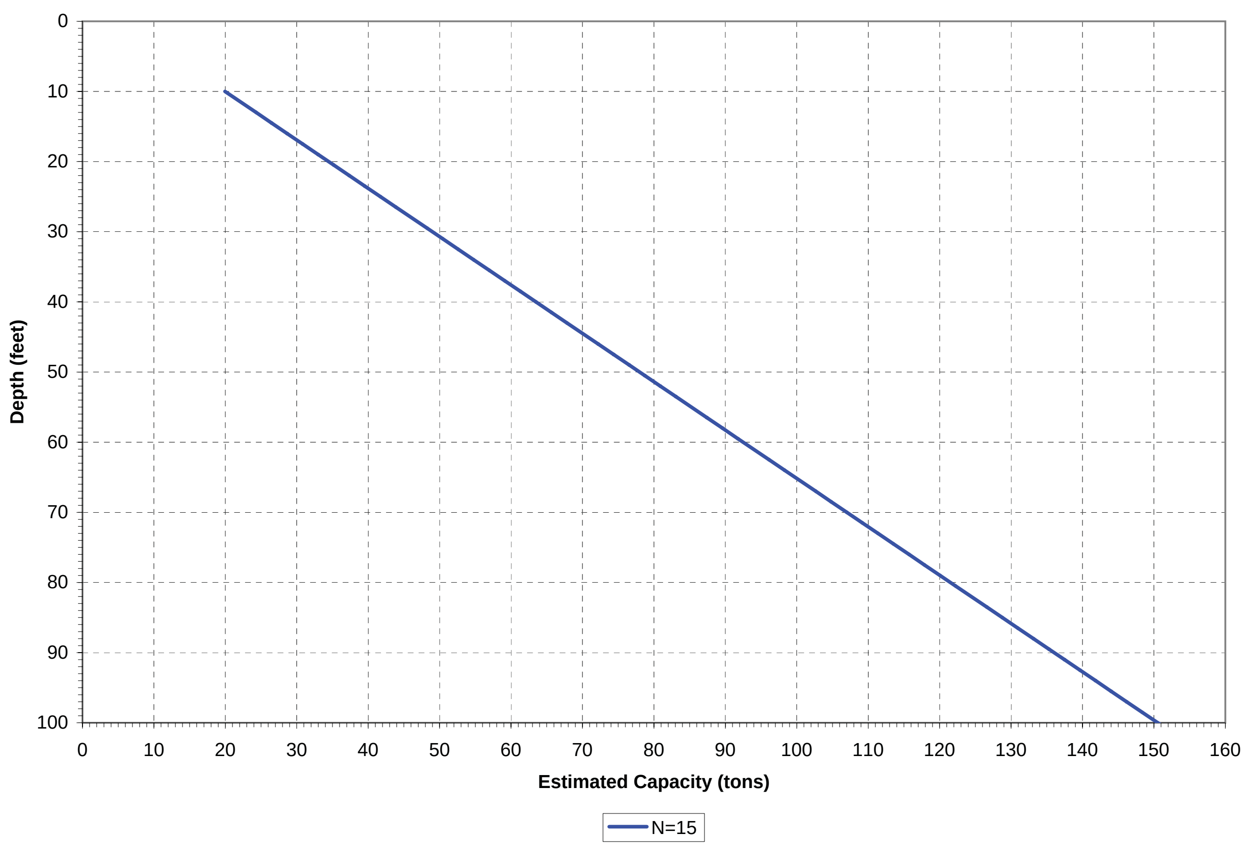


Figure 4.33: 14 inch Piles - "Standardized Curve"

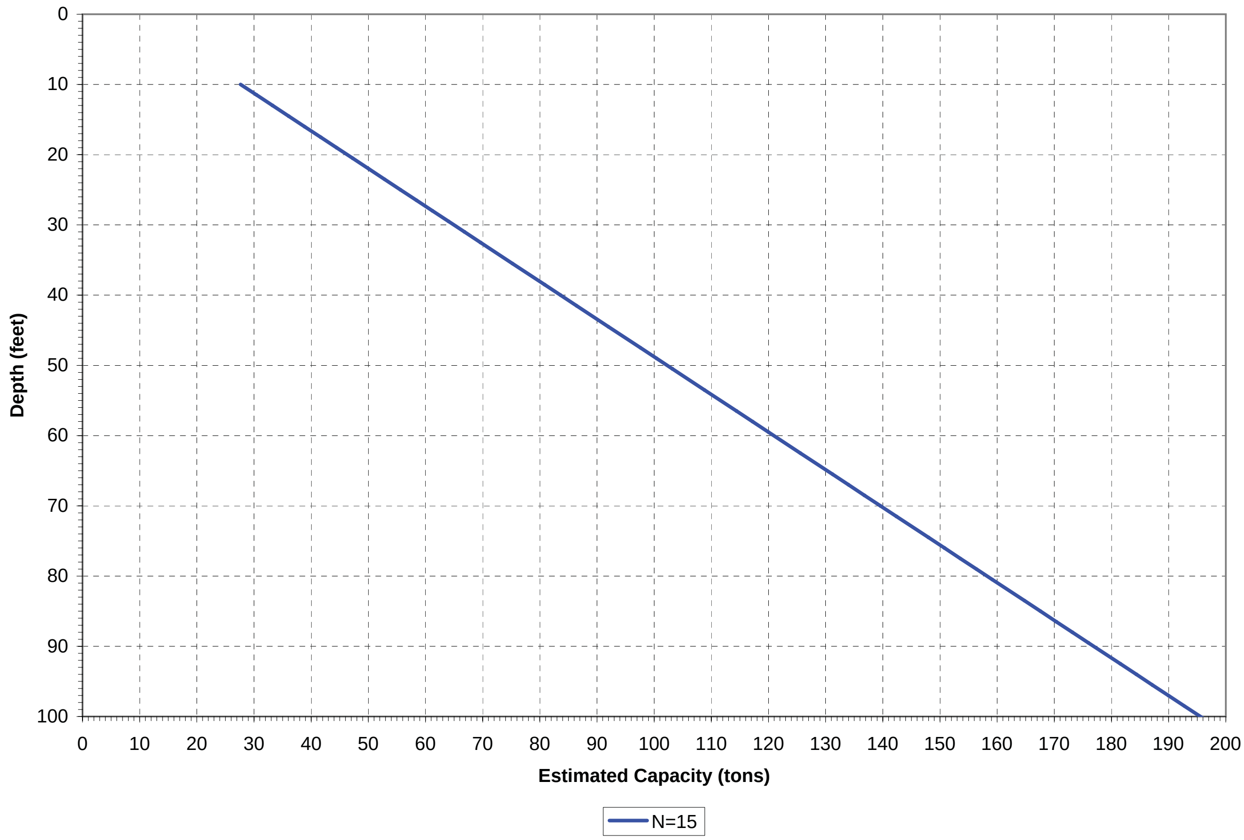


Figure 4.34: 18 inch Piles - "Standardized Curve"

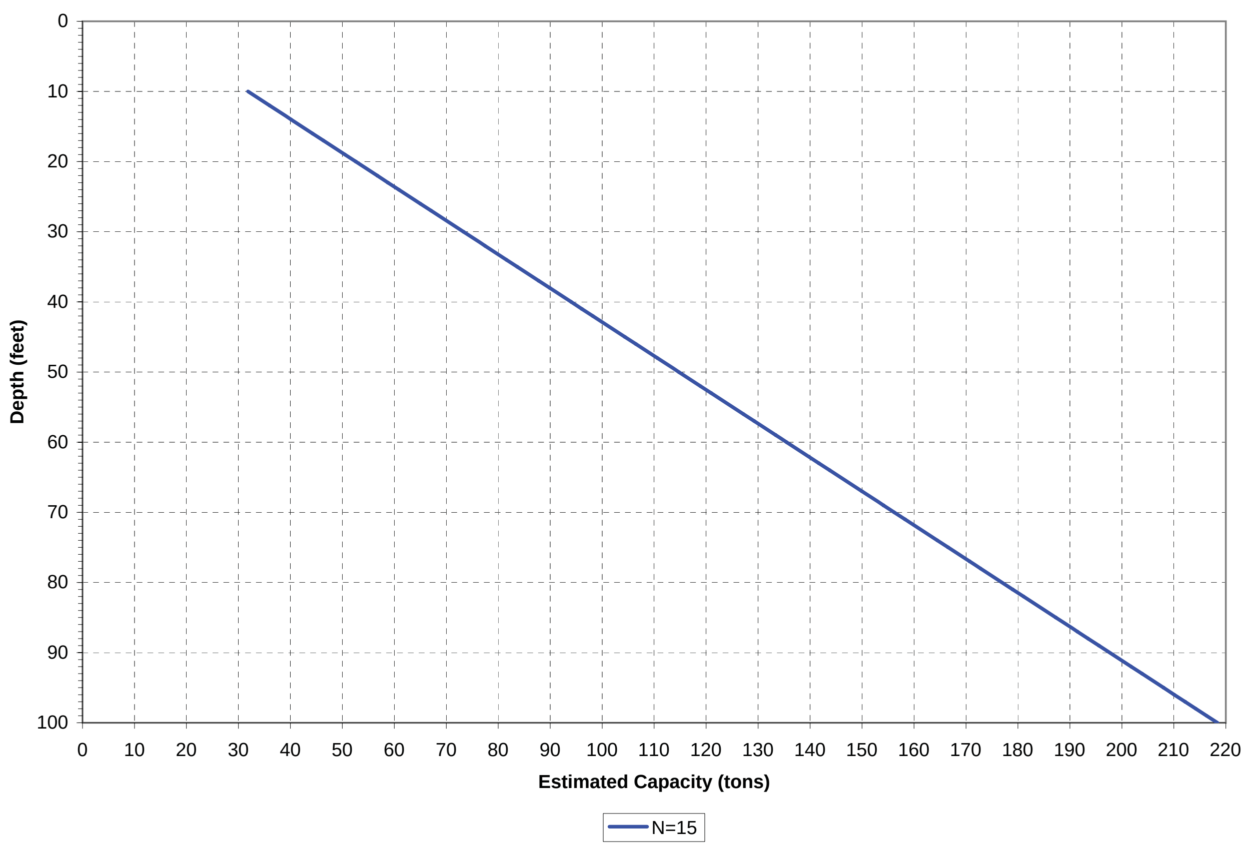


Figure 4.35: 20 inch Piles - "Standardized Curve"

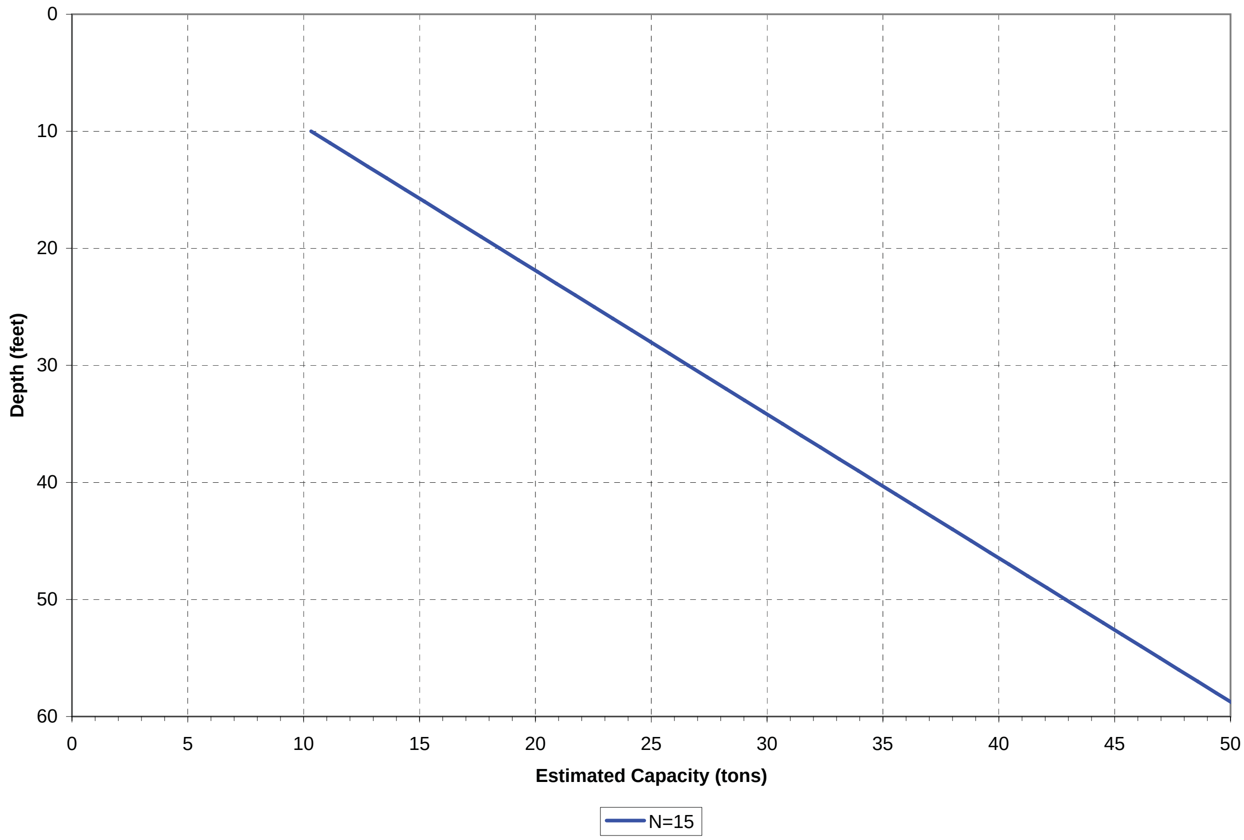


Figure 4.36: Timber Piles - "Standardized Curve"

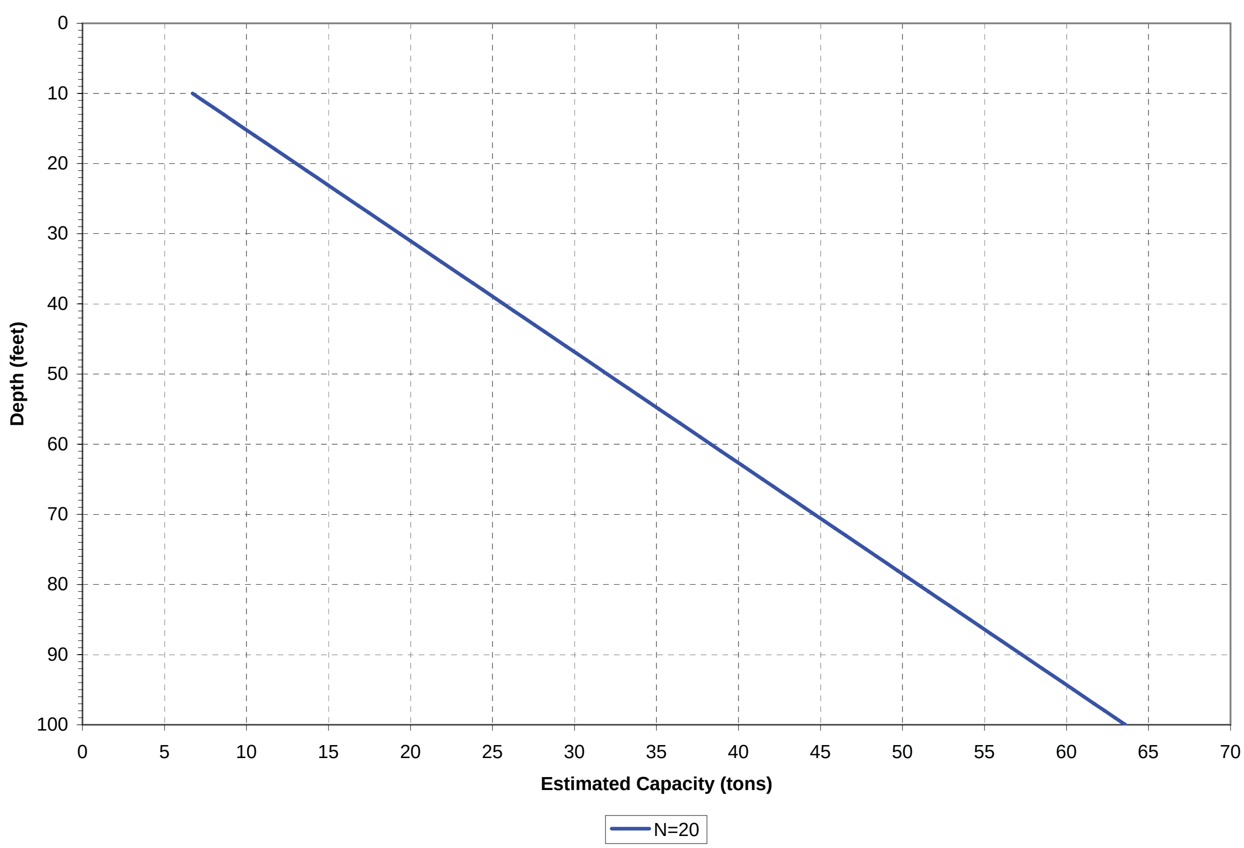


Figure 4.37: HP8X36 Pile - "Standardized Curve"

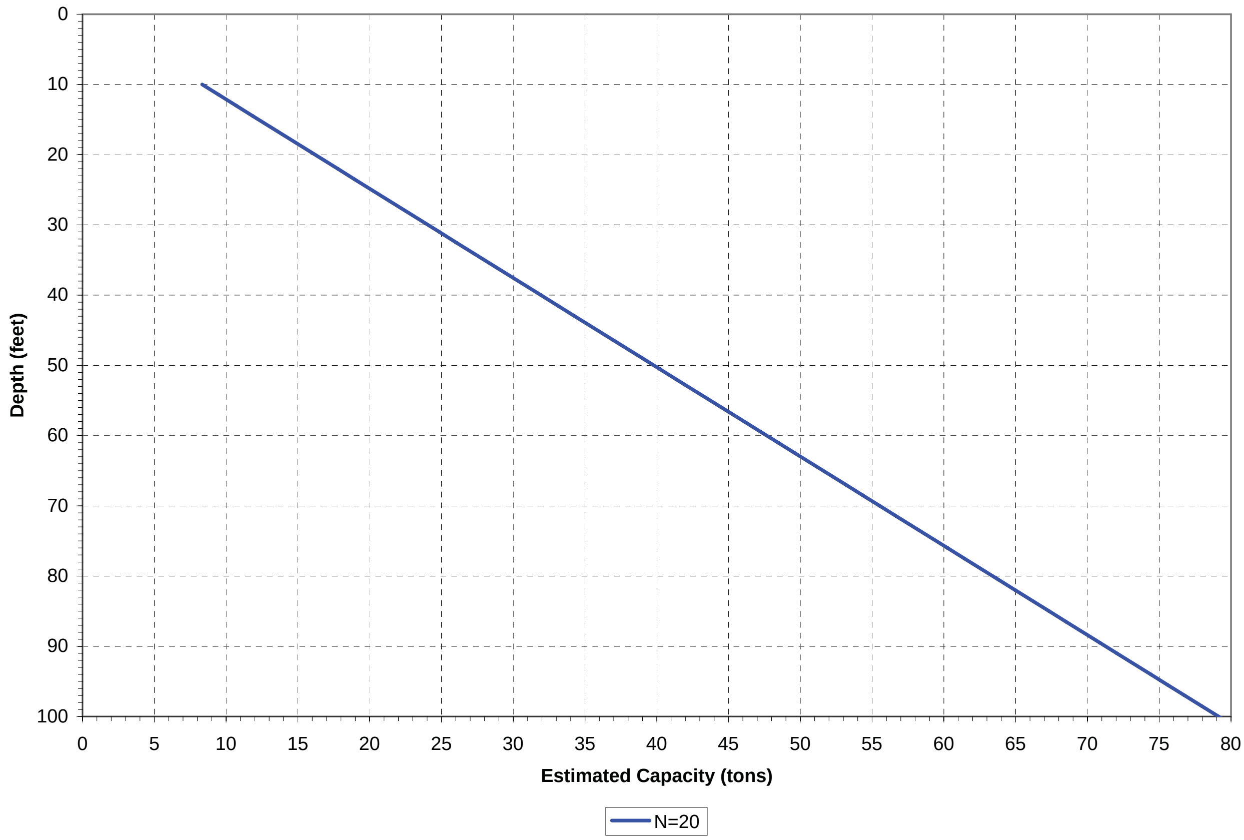


Figure 4.38: HP10X42 Piles - "Standardized Curve"

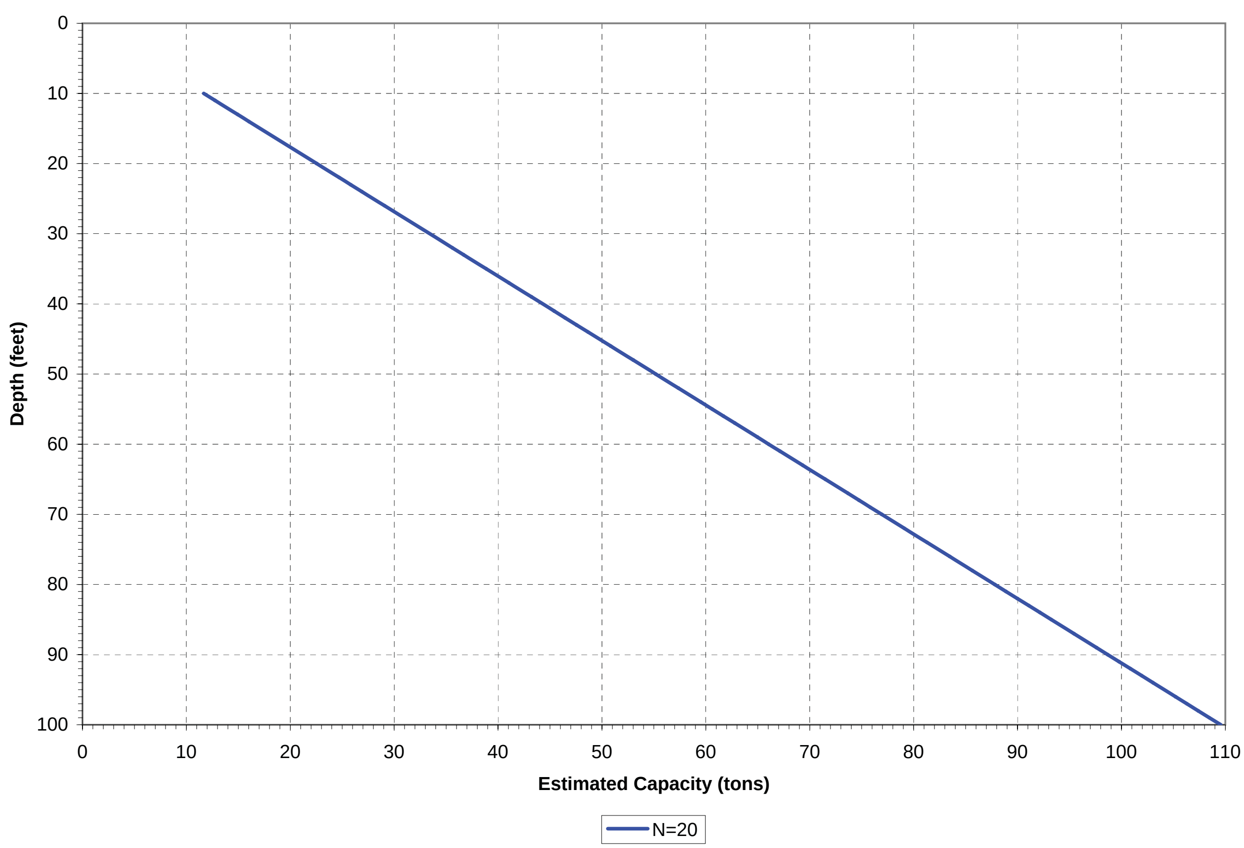


Figure 4.39: HP14X73 Piles - "Standardized Curve"

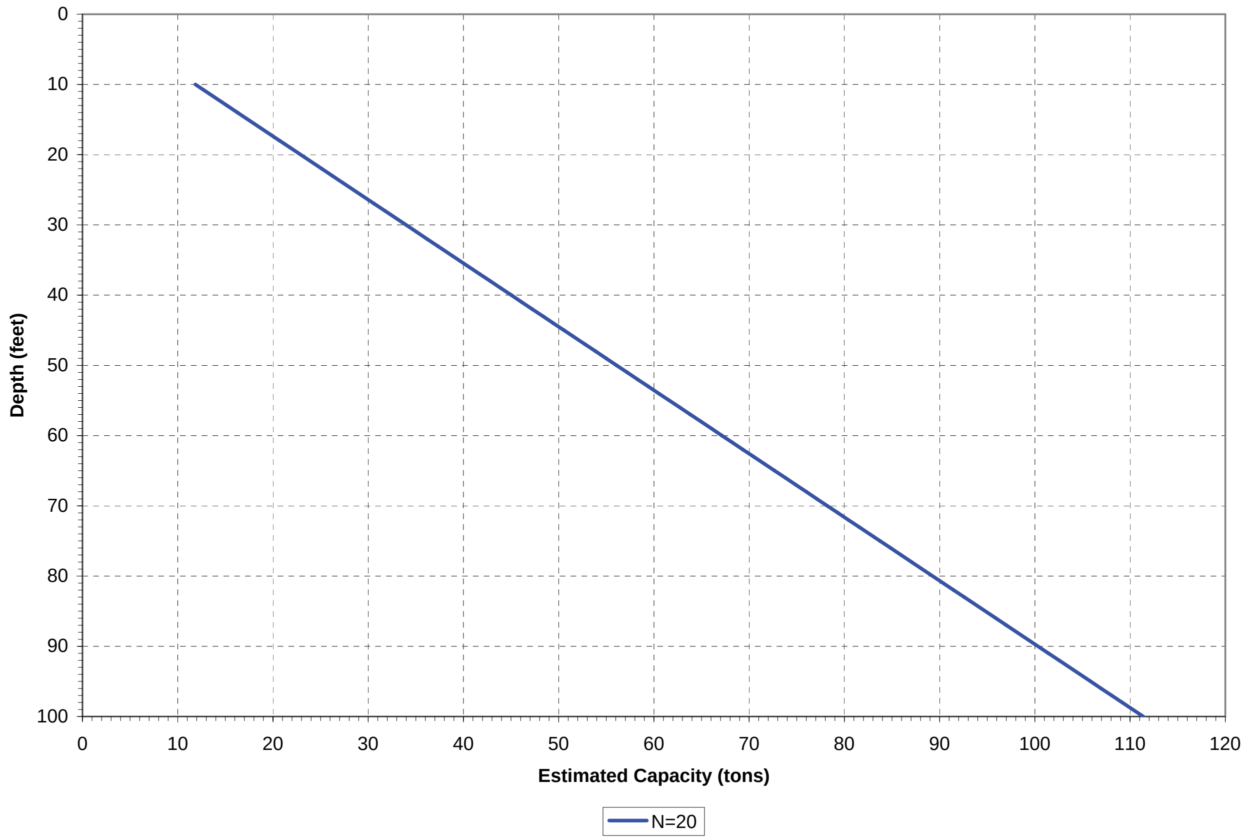


Figure 4.40: HP14X89 Pile - "Standardized Curve"

Hybrid Method of Estimating Pile Embedment

Figure 4.41 is a comparison of the accuracy of the various methods. The comparison is based on predictions of minimum pile embedment per bridge. For the geotechnical method, the prediction is made by using the worst case boring on the bridge to develop the depth vs. capacity curve. The hybrid method uses the smaller embedment prediction from the ANN and geotechnical methods.

The total percent error was determined by summing the square of the difference between the actual minimum embedment per bridge and the predicted embedment, then dividing the sum by the variance of the minimum measured embedment per bridge. Dividing by the variance normalizes the error. Next, the over-prediction percent error was determined using the same approach except only the sum of differences for the predictions that were greater than the actual embedments were used in the calculation.

For the purpose of comparing the different predictive methods there are two criteria that must be considered, the overall accuracy and over-prediction. The objective is to maximize the total accuracy while minimizing over-prediction. Figure 4.41 is a plot of over-prediction error versus total error for three methods, geotechnical, ANN and the hybrid method. The lines on the plot show how the errors can be changed by a constant multiplier (safety factor). The curve is generated by changing the magnitude of the safety factor. The numbers along the geotechnical curve are the values of the safety factor at that point on the curve. The circles for each method show the recommended safety factor for each method. These values are 0.8 for the geotechnical, 0.7 for the ANN and 1.0 for the hybrid method. By using a factor of safety of 0.8 for the geotechnical method the over-prediction is decreased significantly without decreasing the total accuracy. The hybrid method is sufficiently conservative with a safety factor of 1.0 and smaller values would increase the total error.

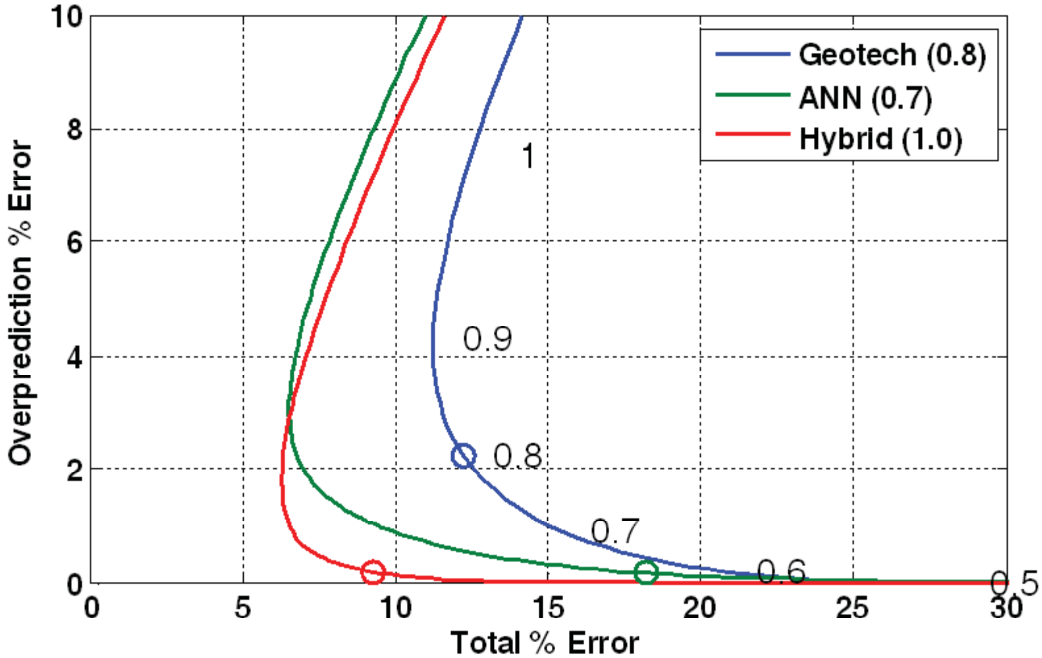


Figure 4.41: Over-Prediction Error versus Total Error for Minimum Pile Embedment Per Bridge for 3 Methods and 25 Bridges

Figure 4.41 is based on 25 bridges that were predicted using both the ANN and the geotechnical method. These were chosen randomly so the plot is thought to be representative of the comparative performance of the methods. A total of 113 bridges were used for training and testing the ANN. Six bridges that the ANN over-predicted were added to the list to be analyzed by the geotechnical method making a total of 31 bridges analyzed by both methods. Figure 4.42 is similar to Figure 4.41 with the exception that it uses 31 bridges. As with the 25 bridge case the hybrid method performs the best and is recommended for use in predicting minimum pile embedment per bridge.

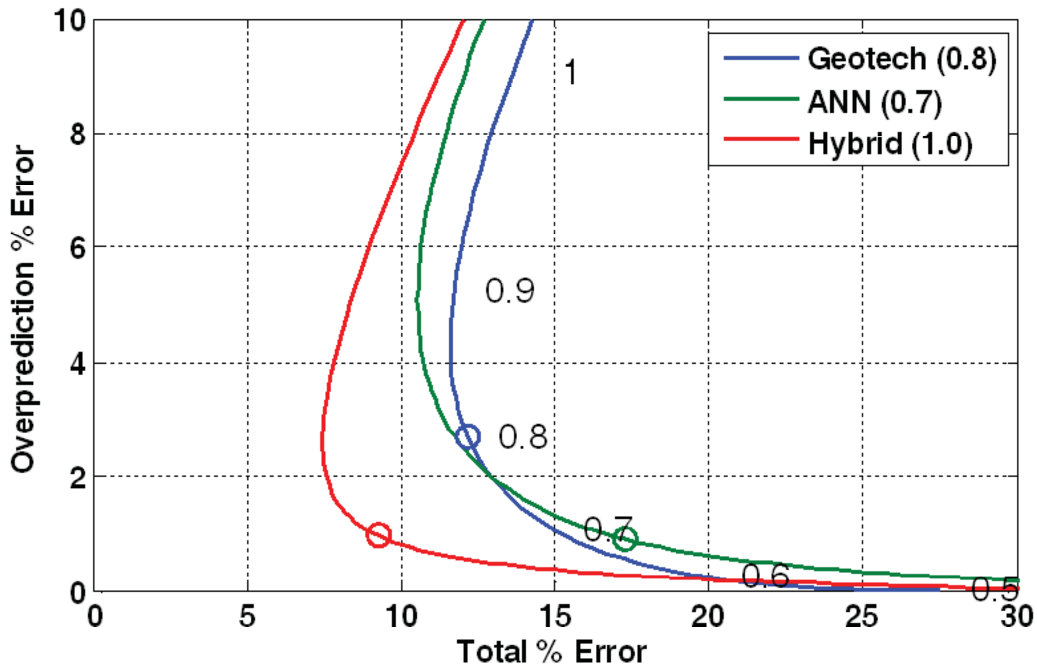
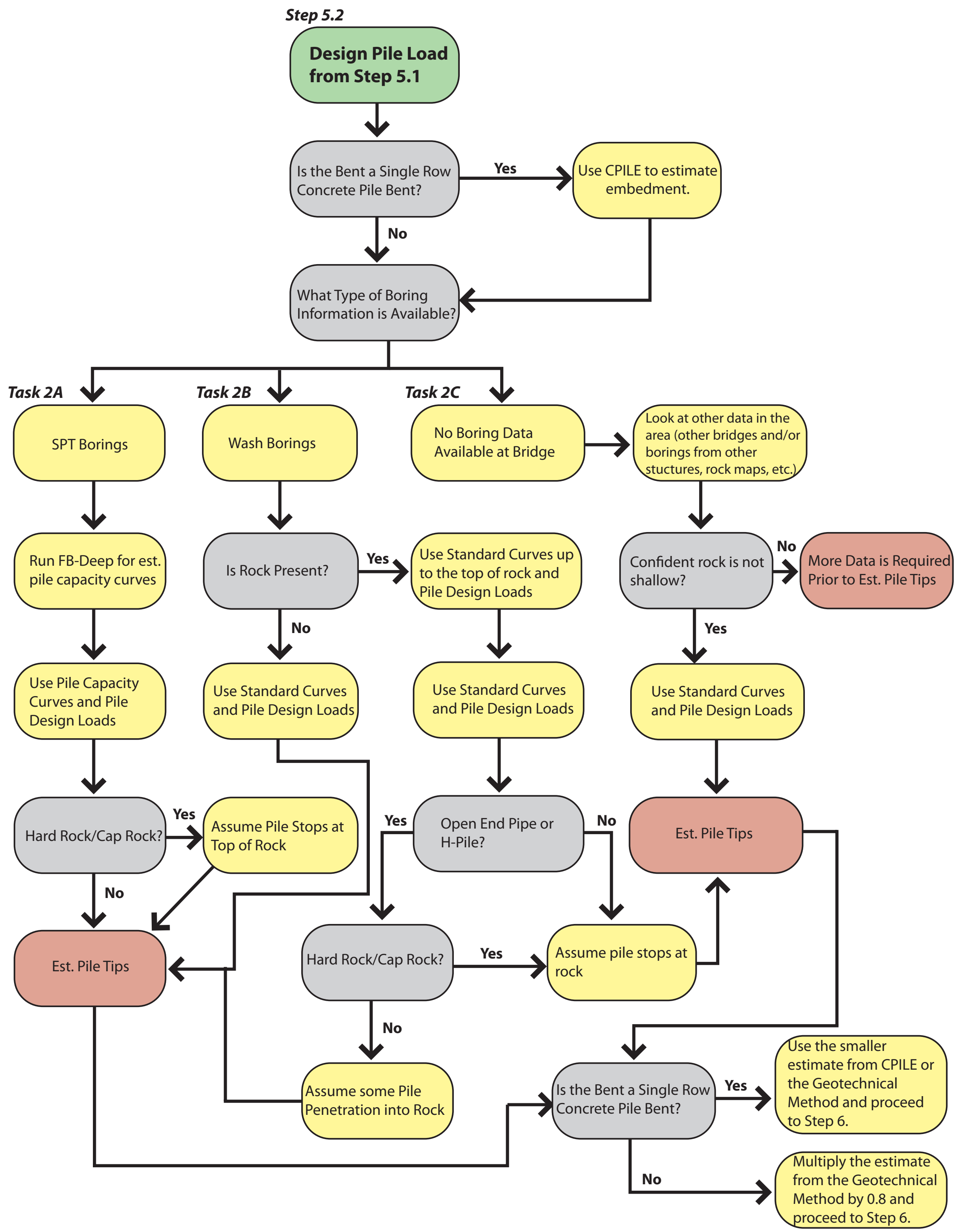


Figure 4.42: Over-Prediction Error versus Total Error for Minimum Pile Embedment Per Bridge for 3 Methods and 31 Bridges



All final results should be concurred with by the District Geotechnical Engineer (DGE)

Figure 4.43: Estimating Pile Embedment of Unknown Foundations Flow Chart

Figure 4.43 combines the geotechnical method and CPILE into a single flow chart to estimate pile embedment of unknown foundations. If CPILE cannot be used and the geotechnical method is used alone, the estimate should include a safety factor of 0.8. According to the procedure, CPILE should not be used alone. However, if an unexpected situation occurs where CPILE is used alone, the estimate should include a safety factor of 0.7.

Section 5: Scour Evaluation Process

Completing the Scour Evaluation Process with the Predicted Pile Embedment Depths

After the pile embedment depths have been predicted, the embedment predictions can be used to complete Florida's Scour Evaluation Process for existing bridges. The process was described in Section 1. Considerations for completing the process with the information obtained from the unknown foundations evaluation process will be discussed in this section.

The embedment depth predictions from the methods described in Section 4 were estimates of the embedment depths at the time the pile was driven, either during the original bridge construction or during any widening or resurfacing. If the ground elevation at the pile has changed since the pile was driven, then the embedment depth must be adjusted by the difference between the ground elevation today and the ground elevation when the pile was driven. If the ground elevations at the time of driving can be found in the plans or some other documentation, then this adjustment is straight forward.

If the ground elevations from the time the piles were driven are not available, then an estimate of the ground elevation change must be made. The soundings taken during the regular bridge inspections can be plotted over top of each other to see how the ground elevations have been changing during the period covered by the inspections. This information can be used to judge the changes since the time of construction. (Sheppard, D. M., and Renna, R. (2005)) and (Lagasse, P.F. et al. (2001)) can be used to estimate future channel bed elevation changes. These same techniques can be applied to estimate historical changes in bed elevations. Adjust the pile embedment predictions with the estimated bed elevation changes.

Phase 1 Scour Evaluation

Most of the unknown foundation bridges in Florida have already had a Phase 1 Evaluation. If not, then the evaluation should have been done during the initial steps of the unknown foundations evaluation process. The Phase 1 evaluation and the recommendations should be updated with the information determined from the unknown foundations evaluation process. The team of hydraulic, structural and geotechnical engineers must use the predicted embedment depths, the knowledge of the types of soil in the area, the potential scour at the site, and the approximate embedment that will be needed for the bridge to remain stable to determine risk and decide if further quantitative evaluation is needed. If the risk is low, then item 113 can be recoded into one of the categories indicating that the bridge is stable. Otherwise, a Phase 2 Scour Evaluation should be recommended.

Phase 2 Scour Evaluation

Computations of the scour depths will be made in the Phase 2 Scour Evaluation. A hydrologic and hydraulic analysis may be necessary if this information not available from other sources. The scour predictions are made using (Sheppard, D. M., and Renna, R. (2005)). An option for small streams is to use the method described in the Rapid Calculation of Scour at In-line Pile Bent Bridges over Small Streams (see page 5-3) to estimate the scour depths.

Phase 3 Scour Evaluation

If this Phase is needed, then SPT borings are required for the stability computations. If SPT borings are not available from the existing data, then at least one boring must be obtained, the geotechnical engineer should determine the number and location of borings needed. The stability analysis is discussed below. If the bridge is stable, then item 113 can be recoded as such. If the bridge is not stable then a Phase 4 Evaluation will be needed.

Stability Analysis

If it is determined that a stability analysis must be conducted as part of a Phase 3 Scour Evaluation, the pile embedment prediction obtained from either the geotechnical method or the hybrid method as detailed in Section 4 should be used. The accuracy of this prediction should, however, be reexamined with any new SPT boring data. This is especially true if rock is encountered in the boring, as the standardized capacity curves and CPILE do not accurately account for the presence of a rock layer, and this can significantly reduce the pile embedment.

If the bridge is found stable with this embedment, then it can be labeled as “Low Risk” and Item 113 should be recoded as such. If the bridge is found to be unstable, then it should be classified as “Scour Critical” and a Phase 4 Scour Evaluation should be conducted.

It has been noted that a large number of bridges with unknown foundations are founded on timber piles. The FB-Pier program, which is a good tool for conducting lateral stability analyses, does not have timber as a standard material. As a result, it is necessary to input the material properties into the program. A good approximation is to model the material as concrete, with a stress-strain curve that has a slope equal to the modulus of elasticity of timber. Creating a non-linear stress strain curve allows the model of the bent to function more realistically by allowing for the redistribution of loads. When concrete is the chosen material in FB-Pier, reinforcing bars must be specified within the pile. It is acceptable to model these bars as mild steel with a negligible area and the predefined material properties for steel. Using this approximation will yield good results for the overall stability of the bent but will not yield accurate results for the failure of the pile itself. This is because timber is not a homogeneous material. The strength of timber in bending is not the same as that in compression parallel to the grain -- the primary loading conditions experienced by a pile. It is necessary, therefore, to check the pile capacity using the interaction between the moments and axial forces acting on the pile. These forces can be obtained from FB-Pier.

If a timber pile cap is utilized, additional material properties must be input. Good resources for these material properties include (U.S. Department of Agriculture, Forest Service (1999)), (American Forest and Paper Association and the American Wood Council (2005)), and (Collin, J.G. (2002)).

Phase 4 Scour Evaluation

The result of the traditional Phase 4 Evaluation is a countermeasure recommendation. Evaluating countermeasures is discussed further in Section 6. For unknown foundation bridges, non-destructive testing (NDT) should also be considered to improve the estimate of the pile embedment depths. Selecting NDT is discussed in Section 7. If NDT is the recommended alternative, then the results of the NDT will be used to reevaluate each phase of the scour evaluation.

Rapid Calculation of Scour at In-line Pile Bent Bridges over Small Streams

Part of the Hydraulic Categorization task included development of surface plots for initial estimates of scour at short, pile bent bridges over small waterways. The intent is to provide a tool to quickly estimate scour with easily obtained information. The scour plots are only meant to provide a rapid assessment of scour for comparison purposes only. They are not meant to replace a Phase 2 Scour Evaluation. For the purposes of this investigation, a small stream is defined as an inland river (i.e., non-tidal) where the design stream depth is 6 ft or less. Plots are provided in Appendix G for estimating contraction and local scour depths. This process does not include estimations of long term scour (channel migration and aggradation/degradation).

Calculation Procedure

The first step in the process involves collection of the data necessary to perform the scour estimation. These include as a minimum:

- Pile bent geometry (pile size, number of piles) — from existing plans or site visit;
- Current and if possible historic aerial photographs;
- FEMA Flood Maps;
- Bridge Inspection Reports, if available; and
- USGS Quadrangle Maps.

The next step involves estimating the quantities needed to use the plots. These include the following:

- Upstream width during design flow conditions;
- Width of the contracted section during design flow conditions;
- Upstream depth during design flow conditions;
- Depth at the bridge during design flow conditions;
- Flow skew angle to pier; and
- Pier approach velocity during design flow conditions.

If this information is available from other sources (e.g., a Flood Insurance Study or a previous hydraulic study), then this would supercede the estimation techniques described below.

For the contraction scour plot, the required inputs are the ratio between the upstream water surface width ($W_{upstream}$) and the water surface width at the contracted section (W_{bridge}), the upstream depth (y_1), and existing depth (y_0). The width ratio can be estimated from aerial photography, the USGS topographic maps, and the FEMA Flood Map. The bridge water surface width is the water surface width within the opening minus the widths of the piers. The upstream depth (y_1) and existing depth (y_0) can be estimated from the USGS Quadrangle Maps, FEMA Flood Map (if the design flood elevation is unknown), and Bridge Inspection Reports.

For the local scour calculation, the required inputs are the median sediment diameter, the flow skew angle to the pier, the flow approach velocity, and the bridge geometry. Bridge geometry is determined from the plans or a site visit. The median sediment diameter can be estimated from geotechnical records, a site visit, or general knowledge of the area. The flow skew angle can be estimated from the angle between the floodway approach direction and the bridge alignment (taking into account skew of the piers if applicable). This is done through examination of the flood maps, aerials, and topographic maps. Flow velocity (if not found from other sources; e.g. existing hydraulic studies) can be estimated through an application of Manning's Equation:

$$V = \frac{1.49}{n} R_h^{2/3} S^{1/2}$$

where V is the average velocity across the cross section in ft/s, n is Manning's n (estimated from site conditions), R_h is the hydraulic radius (estimated from USGS Maps, Bridge Inspection Reports, and design water surface elevations), and S is the slope of the free surface (estimated from the channel bottom slope via the USGS Maps). Several references provide suggestions and techniques for estimating Manning's n. One such reference is available from the FHWA is found via the following link: http://www.fhwa.dot.gov/bridge/wsp2339.pdf.

Manning's Equation provides estimates of the average velocity across the cross section. For rivers, local velocities can range from 0.9 to approximately 1.7 times the average velocity for the channel depending on the location within the cross section. As such, a 1.7 multiplier is recommended for conservative estimating purposes.

The final step involves estimating the scour from the provided plots. The first graph in Appendix G contains estimates of contraction scour as a function of the upstream depth (y_1) and the water surface width ratio ($W_{upstream}/ W_{bridge}$). This plot was constructed from the Modified Laursen Live Bed Contraction Scour Equation (Richardson, E.V., and Davis, S.R. ((2001)). The equation estimates scour at a contracted section (y_s) under live bed conditions:

$$\frac{y_2}{y_1} = \left(\frac{Q_2}{Q_1}\right)^{6/7} \left(\frac{W_1}{W_2}\right)^{k_1}$$

where:

y_1 = Average depth in the upstream main channel (ft)
y_2 = Average depth in the contracted section (ft)
y_0 = Existing depth in the contracted section before scour (ft)
Q_1 = Flow in the upstream channel transporting sediment (ft^3/s)
Q_2 = Flow in the contracted channel (ft^3/s)
W_1 = Bottom width of the upstream main channel that is transporting bed material (ft)
W_2 = Bottom width of the main channel in the contracted section less pier width(s) (ft)

The exponent k_1 is a function of the mode of transport of the bed material. The plot in Appendix G reflects the assumption that under design conditions, the transport is mostly suspended material discharge ($k_1 = 0.69$). (Richardson, E.V., and Davis, S.R. ((2001)) states that "in some cases, it is acceptable to use the top width of the main channel to define these widths. Whether top width or bottom width is used, it is important to be consistent so that W_1 and W_2 refer to either bottom widths or top widths." Finally, the plot was constructed from the assumption all flow routed through the bridge opening; i.e., $Q_1 = Q_2$. This provides a more conservative answer than if the bridge approaches are overtopped during the design event. It is left to the engineer performing the estimate to decide whether the assumption of live bed conditions is valid. From the contraction scour plot in Appendix G, one can calculate the contraction scour (y_s) as the difference between y_2 and y_0.

As stated earlier, local scour is a function of several variables: pier geometry, flow parameters, and sediment size. The plots in the present calculations of local scour for in-line pile bent bridge through an application of the local scour equations (Sheppard, D. M., and Renna, R. (2005)). The equations for local scour require multiple steps so the reader is referred to the reference for details. To reduce the number of plots presented, several assumptions had to be made. First, the piles within each bent are assumed to be square and spaced three diameters apart. Next, the depth of flow is assumed to be 6 ft. Smaller depths at the bridge can be examined via these plots; however, using 6 ft will yield conservative scour depths. These assumptions reduce local scour to a function of the pile diameter, the number of piles in a bent, the median grain, size, the flow skew angle, and the approach velocity.

The plots in Appendix G provide estimates of local scour as a function of flow skew angle and approach velocity. The plots were generated for several combinations of pile diameter (12, 14, 16, 18, 20, and 24 inch), number of piles per bent (4, 6, 8, and 10), and median sediment diameter (0.15, 0.2, and 0.3 mm). These median sediment diameters encompass a range of fine sands (USC) encountered in Florida. These plots should not be employed if the sediment diameters are believed to be outside this range of sediments. Table 5.1 on the following page provides quick reference to the figure numbers found in Appendix G.

Table 5.1: Figure Numbers in Appendix G by Median Sediment Diameter, Pile Diameter, and Number of Piles per Bent

			# of Piles per Bent			
		Pile Diameter	4	6	8	10
Median Sediment Diameter	D50 = 0.15 mm	12″	Fig. 2	Fig. 3	Fig. 4	
		14″	Fig. 5	Fig. 6	Fig. 7	
		16″	Fig. 8	Fig. 9	Fig. 10	Fig. 11
		18″	Fig. 12	Fig. 13	Fig. 14	Fig. 15
		20″	Fig. 16	Fig. 17	Fig. 18	Fig. 19
		24″	Fig. 20	Fig. 21	Fig. 22	Fig. 23
	D50 = 0.2 mm	12″	Fig. 24	Fig. 25	Fig. 26	
		14″	Fig. 27	Fig. 28	Fig. 29	
		16″	Fig. 30	Fig. 31	Fig. 32	Fig. 33
		18″	Fig. 34	Fig. 35	Fig. 36	Fig. 37
		20″	Fig. 38	Fig. 39	Fig. 40	Fig. 41
		24″	Fig. 42	Fig. 43	Fig. 44	Fig. 45
	D50 = 0.3 mm	12″	Fig. 46	Fig. 47	Fig. 48	
		14″	Fig. 49	Fig. 50	Fig. 51	
		16″	Fig. 52	Fig. 53	Fig. 54	Fig. 55
		18″	Fig. 56	Fig. 57	Fig. 58	Fig. 59
		20″	Fig. 60	Fig. 61	Fig. 62	Fig. 63
		24″	Fig. 64	Fig. 65	Fig. 66	Fig. 67

Example

A theoretical bridge is located over a small inland creek. The bridge has two pile bents consisting of six 18-inch square piles spaced 4.5 ft apart. The FEMA Flood Map for the area shows that the upstream width is approximately 300 ft and the width at the bridge is only 100 ft. This leads to a width ratio of 3. Additionally, the map shows that the slope of the water surface approaching the bridge displays a 1 ft drop over 3000 ft (S = 1/3000 = 3.3E-4). A comparison of the flood elevation with the bed elevation from the Bridge Inspection Reports reveals that the depth of flow during design flow conditions is 4 ft. The flow skew angle, estimated from the aerials, is 0°. Finally, the upstream velocity is found through an application of the Manning's Equation. With an estimate of Manning's n equal to 0.03 and a hydraulic radius equal to the depth of flow (a conservative assumption), the average velocity is calculated as 2.3 ft/s. Multiplying this times 1.7 equals 3.9 ft/s. Finally, local knowledge of the area indicates that the sediments are generally fine, on the order of 0.15 mm.

From Figure 1 in Appendix G, the depth in the contracted section corresponding to a contraction ratio of 3 and an upstream depth of 4 feet is 8 feet. Therefore, the contraction scour is 4 feet (8 feet depth in contracted section, 4 ft depth before scour). Next, the local scour is estimated. From the Table 5.1, the plot corresponding to a median grain size of 0.15 mm and six 18-inch piles per bent is Figure 13 in Appendix G. From the figure, a velocity of 3.9 ft/s and a flow skew angle of 0° yield a local scour depth estimate of 2.9 ft. Adding this to the contraction scour depth yields a total scour estimate of 7 feet (rounded up).

As illustrated in the example, this procedure is only intended to provide a quick estimate based on limited information. These plots should not be used for a Phase 2 Scour Evaluation. Rather, this procedure is only intended to provide a quick estimate of contraction and local scour depths for use in a Phase 1 Scour Evaluation.

Section 6: Countermeasures

At some point during the evaluation process, if the risk of scour failure is considered too great then something must be done to reduce the risk. This is accomplished by implementing a countermeasure to:

- Reduce the scour depth expected at the structure
- Strengthen the structure to resist the effects of the expected scour
- Monitor the site more closely to either:
    - Prevent loss of life by closing the bridge before failure
    - Delay installing a more expensive countermeasure until conditions worsen and failure is more imminent

Another option that can be considered is to replace the bridge. Bridge replacement can address other issues besides scour vulnerability, including structural obsolescence, roadway capacity problems, or safety concerns.

(Lagasse, P.F. et al. (2001)) defines a countermeasure as a measure incorporated into a highway stream crossing to monitor, control, inhibit, change, delay, or minimize stream and bridge stability problems. (Lagasse, P.F. et al. (2001)) provides guidance on selecting countermeasures. The document discusses countermeasures both incorporated during design and installed as a retrofit after construction. Only retrofit countermeasures need to be considered during the unknown foundations evaluation. Other considerations when selecting a countermeasure are:

- Type of scour
    - Local scour
    - Contraction scour
    - Channel instability
    - Aggregation or degradation
- Constructability constraints
- Inspection and maintenance requirements
- Permitting requirements
- Cost

The most appropriate countermeasure may not always be obvious. Prepare conceptual designs for several alternatives considering the site conditions and type of scour expected. Use the conceptual designs to make preliminary cost estimates that can be used to select the appropriate countermeasure.

In Florida's Scour Evaluation Program, countermeasures are considered during Phase 4. The standard Phase 4 report format includes the following countermeasures:

- Guide Banks
- Spur Field
- Sill or Drop Structure
- Lengthen Bridge
- Relief Bridge(s)
- Other Channel Improvements
- Riprap with Monitoring (Monitoring Program required)
- Fixed Monitoring Device (Monitoring Program required)
- Portable Monitoring Device (Monitoring Program required)
- Strengthen Foundation (e.g., Crutch Bents)
- Pier Geometry Modification
- Protect Foundations with Sheet Piling
- Protect Foundations with grouted riprap (Monitoring Program required)
- Protect Foundations with gabions (Monitoring Program required)
- Protect Foundations with Tremic Concrete
- Other riprap
- Visual Monitoring
- Other

- Repair Existing Countermeasures
- Close Bridge
- Bridge Replacement

Appropriate pay items from the FDOT Cost Estimating System (CES) can be used to estimate the installed cost of each countermeasure alternative considered. The cost estimate should also include costs for:

- Mobilization
- Maintenance of traffic
- Erosion and sediment controls and other stormwater pollution prevention needs
- Clearing and grubbing and/or debris removal, if needed

The CES does not have a pay item for rubble riprap larger than bank and shore rubble. If a larger stone is needed, there are cost guidelines for rubble in (Stein, S. and Sedmera, K. (2006)).

The countermeasure cost can be compared to the lifetime risk of failure to determine if the countermeasure should be installed. If the cost is less than the lifetime risk, then the countermeasure is warranted and should be installed. The countermeasure cost can also be compared to the cost of Non-Destructive Testing (NDTs), described in Section 7, to decide which should be done.

It is difficult to decide the least expensive approach at this point. If the countermeasures are installed, then only the cost of countermeasures will be incurred. If the NDTs are performed and the results show that the bridge is stable for the expected scour, then only the cost of NDTs (and the stability analysis) will be incurred. However, if the results show that the bridge is not stable, then the countermeasure will be needed and the cost of both the NDTs and the countermeasures will be incurred. Assuming that the chance that the bridge is stable verses unstable is about even, then the NDTs should be performed (i.e., NDTs are warranted) if their cost is less than half the cost of countermeasures. However, if the cost of NDTs is greater than half the cost of countermeasures, then the countermeasures should be installed without performing the NDTs.

If in the judgment of the evaluating team the bridge is more likely to be shown stable, then the recommendation to perform NDTs could be made even if their cost is greater than half the cost of countermeasures. However, there is still a chance that the bridge will be shown to be unstable, and the cost of both NDTs and countermeasures would be incurred. Therefore, as the cost of the NDTs approaches the cost of countermeasures it is much safer to install the countermeasures and avoid doubling the cost for the bridge. And if the cost of NDTs exceeds the cost of countermeasures, then the countermeasures should be installed without performing the NDTs.

If in the judgment of the evaluating team the bridge is more likely to be shown unstable, then the recommendation could be made to rule out NDTs even if their cost is less than half the cost of countermeasures. However, as the cost becomes a small percentage of the cost of countermeasures, then even a small risk of showing the bridge to be stable is worth taking.

Automated Scour Monitoring

The minimum monitoring program in Florida is once every 2 years, including an underwater inspection. The federal requirement for underwater inspections is once every 5 years.

Automated Scour Monitoring (AM) would use a fixed instrument to continually monitor scour at the bridge. Multiple sensors would be needed to monitor multiple piers. These instruments would be connected to a data logger configured to communicate remotely through telemetry. The system can be used to initiate a closure plan when a predetermined scour depth is detected. AM does not include visual monitoring.

(Stein, S. and Sedmera, K. (2006)) recommends that cost of AM be compared to the lifetime risk of death for the bridge to determine if AM is warranted. The lifetime risk of death can be calculated from:

$R_{death} = K_1 K_2 P_L Cost_{death}$

$K_1 K_2$	Risk adjustment factors, defined in Section 2
P_L	Lifetime Probability of Failure, defined in Section 2
$Cost_{death}$	The cost of Loss of Life, defined in Section 2

If the cost of AM is less than the lifetime risk of death, then AM is warranted. If AM is warranted, then the lifetime risk of death should be subtracted from the lifetime risk of failure. The assumption is that if AM is installed and a closure plan is implemented, then the chance of loss of life will be eliminated. Therefore, when checking the warrant for other countermeasures during later steps of the process, the risk of death should not be included in the comparison.

There are several types of devices that can be used. These devices are described in (Lagasse, P.F. et al. (2001)) and (Stein, S. and Sedmera, K. (2006)), along with guidance to select the appropriate device. The minimum cost of a device is about $4,000. The cost of telemetry equipment is about $3,000. The cost of installing the device and the cost of continuing operation and maintenance will increase the cost, but less data is available. If only one device is installed at a site, a reasonable minimum estimate of the lifetime cost is $15,000.

A practical concern that may override a warrant for AM based on cost is the inability to determine a critical scour elevation that would initiate a closure plan. If the foundation dimensions are unknown, then a critical scour depth cannot be back calculated. The estimated pile embedments from the methods given in this report can be used to estimate a critical scour elevation to initiate the closure plan.

Minimum Countermeasure Cost

The cost of countermeasures is site specific. The minimum cost of $15,000 for AM is a reasonable estimate for the minimum cost of any countermeasure. Therefore, if the risk of failure for a bridge is less than $15,000 then it is reasonable to assume that countermeasures would not be warranted. It is also reasonable to assume that NDTs would not be warranted, since the cost of NDTs plus the stability analysis would exceed half of the minimum $15,000 countermeasure cost. Therefore, no further evaluation of the bridge is warranted if the lifetime risk of failure is less than $15,000. A Plan of Action that includes a closure plan is the remaining effort needed for the bridge.

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Section 7: Non-Destructive Testing

Introduction

The primary objective is to identify the most current and widely used non-destructive testing (NDT) methods for determining the embedment depth of bridge foundations in the state of Florida. Outlined in the Study are considerations that must be made when selecting the most appropriate NDT. General guidelines have been included in this Study to provide guidance to FDOT personnel or consultant in selecting the proper NDT method. This study was based on extensive research of existing literature, contact with experts in the field of NDT testing, and various Department of Transportation agencies throughout the country.

The NDT methods have been divided into surface NDT Methods and Subsurface NDT. These methods are:

Surface NDT Methods

- Sonic Echo
- Bending Waves with Short Kernel
- Ultra-Seismic
- Surface Wave Spectral Analysis
- Ground Penetrating Radar
- Dynamic Foundation Response

Subsurface NDT Methods

- Parallel Seismic
- Borehole Radar
- Borehole Sonic
- Cross Hole Sonic
- Induction Field
- Borehole Magnetic

Project Background

Over the past decade, growing concerns for the scour susceptibility of bridges across the United States have led to the FHWA, in cooperation with the DOTs across the county, to develop standardized systems to categorize bridges which may be Scour Critical.

There have been studies performed in other states and countries regarding non-destructive testing for unknown foundation embedment whose findings have greatly contributed to this Study. (Olson L.D. et al. (1997)) was a study consisting of experimental NDT testing at seven different bridge locations in Colorado, Alabama, and Texas. At each of the bridge sites, several different non-destructive test methods were used. These methods consisted of Ultra-Seismic, Sonic Echo/Impulse Response, Borehole Radar, Dynamic Foundation Response, Borehole Sonic, Parallel Seismic, Cross Hole Seismic, Spectral Analysis of Surface Waves, Bending Wave, and Surface Radar. Several other studies have been conducted by researchers to further test the NDT methods for foundation embedment.

University research has influenced the recommendations within this Study. An example of University research conducted on NDT was funded by the Texas DOT at the University of Houston using the Parallel Seismic method coupled with automated scour monitoring devices. The test was based on installing a pile under a controlled environment to establish and calibrate the effectiveness of the Parallel Seismic test. Although the test results have indicated good correlation between predicted and actual scour and embedment depth, full scale testing under field conditions was limited.

The state DOT with the most NDT experience has been North Carolina. The North Carolina DOT has funded considerable research at North Carolina State University on Bending Waves with Short Kernel NDT. This method is currently being used on a regular basis by the North Carolina DOT on unknown foundation bridges.

Some practices and methods used currently to assess pile integrity and evaluation have been transferred over to estimating the depth of unknown foundation embedment. An example of this is the Cross Hole Sonic Logging (CSL), which is currently used nationwide to identify and measure flaws or voids in drilled shaft foundations. CSL has been adapted with some modification for establishing unknown foundation embedment. Other examples of the crossover in technology are electrical resistance and magnetic flux fields to measure the depth of embedment of steel piles.

Current NDT Methods

NDT methods can be categorized into one of two general categories; surface non-destructive testing and subsurface non-destructive testing. A surface NDT does not require the installation of a soil boring or probe and can be performed with only minimal intrusion. The advantage to surface NDT is that it is typically quicker to perform, requires less equipment and requires access only to the top of the substructure element thereby reducing traffic disruption. Drawbacks to surface NDT are its inability to provide foundation data below a subsurface pile cap (if one exists) and its reliance on uniform wave propagation thereby, the more stratified the subsurface conditions, the less accurate the results. For this reason surface NDT works best with piles driven in fairly homogeneous soils. Due to these problems, we believe that for critical structures, surface NDT methods are best used in conjunction with subsurface tests.

Subsurface NDT methods are the methods which require the installation of at least one soil boring or probe to analyze the unknown foundation. The soil boring or probe is typically installed through the bridge deck; however, installation of the soil borings or probes below the bridge deck can be used in those locations where coring through the paved deck is not a valid option. One major benefit to using a subsurface method is the ability to detect foundations below a subsurface pile cap (i.e. "complex foundations"). If the bridge foundation is truly unknown, then it may be unclear whether a subsurface pile cap exists or not. Although subsurface NDT methods are slightly more expensive and take longer to implement, they offer greater reliability and versatility.

A survey of state DOTs throughout the country was conducted to establish which NDT methods are currently being used or actively researched. The survey revealed that NDT is not widely used; although, there is considerable interest throughout the country in identifying viable NDT methods to estimate the depths of unknown bridge foundations. Current states with the most NDT experience are North Carolina, South Carolina, Louisiana, Alabama, Connecticut, and Texas. A summary of the findings obtained from this national survey is provided in Table 7.1.

Table 7.1: State DOT Summary

State	NDT Methods[1]	Frequency of Use	Results of NDT	Considered Methods	General Comments
Alabama	Surface and Subsurface Methods	Rarely	Poor/Good	NA	10 interstate bridges tested 2 years back. Parallel seismic worked well and surface methods performed poorly due to encased steel piles.
Alaska	None	NA	NA	NA	NDT has been considered but not yet implemented.
Arizona	Surface and Subsurface Methods	Occasionally	Good	NA	Testing results correlated with data collected from a soil boring.
Arkansas	None	NA	NA	Surface and Subsurface Methods	NDT has been considered but not yet implemented.
California	Ground Penetrating Radar	Occasionally	Good	Surface and Subsurface Methods	Ground penetrating radar has been used on tabular foundations.
Colorado	Surface and Subsurface Methods	Past Research Only	Average/ Good	Surface and Subsurface Methods	Golden, Coors, Franktown, and Weld Bridges tested for research.
Connecticut	Surface and Subsurface Methods	10 - 15 times per year	Average/ Good	NA	Often used for testing bridge abutments. (PS, US, SE)
Delaware	None	NA	NA	NA	NDT has been considered but not yet implemented.
Florida	Surface	Past Research Only	Poor	Surface and Subsurface Methods	Surface methods have been used in the past with poor result.
Georgia	None	NA	NA	Surface and Subsurface Methods	NDT has been considered but not yet implemented.
Hawaii	None	NA	NA	NA	NDT has been considered but not yet implemented.
Idaho	None	NA	NA	NA	NDT has been considered but not yet implemented.
Illinois	None	NA	NA	Surface and Subsurface Methods	NDT has been considered but not yet implemented.
Indiana	None	NA	NA	NA	NDT has been considered but not yet implemented.
Iowa	None	NA	NA	NA	NDT has been considered but not yet implemented.
Kansas	None	NA	NA	Ground Penetrating Radar	NDT has been considered but not yet implemented.
Kentucky	None	NA	NA	NA	NDT has been considered but not yet implemented.
Louisiana	Surface and Subsurface Methods	Occasionally	SEE COMMENTS	NA	Steel pile tests were unreliable using surface methods. Tests on concrete and timber provided accurate estimations.
Maine	—				
Maryland	—				
Massachusetts	—				
Michigan	—				
Minnesota	Subsurface Methods Only	1 Bridge Tested	Good	Surface and Subsurface Methods	Parallel Seismic Method tested at one bridge.
Mississippi	Surface Methods Only	Past Research Only	NA	Surface and Subsurface Methods	NDT has been considered but not yet implemented.
Missouri	Direct Probing Only	1 Bridge Tested	Good	Surface and Subsurface Methods	Drilled through the footing to reveal foundation base.
Montana	None	NA	NA	NA	NDT has been considered but not yet implemented.
Nebraska	Parallel Seismic Method	1 Bridge Tested	Average	Surface Methods	Currently investigating use of surface methods as currently being used in North Carolina.

Table 7.1: State DOT Summary (continued)

State	NDT Methods[1]	Frequency of Use	Results of NDT	Considered Methods	General Comments
Nevada	None	NA	NA	Surface and Subsurface Methods	NDT has been considered but not yet implemented.
New Hampshire	Surface and Subsurface Methods	Past Research Only	NA	Parallel Seismic	New contract for future NDT testing.
New Jersey	Surface and Subsurface Methods	Past Research Only	Good	Surface and Subsurface Methods	No bridges have been directly tested by DOT.
New Mexico	None	NA	NA	NA	As built plans typically exist; very few bridges may require testing.
New York	Parallel Seismic and Sonic Echo	Occasionally	Very Good	Surface and Subsurface Methods	20 pile bents with one to three piles per bent tested with parallel seismic.
North Carolina	Bending Waves, Sonic Echo, and Parallel Seismic	800 bridges in 2 years	Good	NA	All methods are validated using data from driving rods and other geological data.
North Dakota	—				
Ohio	—				
Oklahoma	Direct Probing Only	1 Bridge Tested	Good	Surface and Subsurface Methods	Other NDT methods have been considered but not yet implemented.
Oregon	None	NA	NA	Surface and Subsurface Methods	NDT has been considered but not yet implemented.
Pennsylvania	Surface and Subsurface Methods	Occasionally	Good/ Excellent	Surface and Subsurface Methods	Induction Field method worked well at Birmingham Bridge (steel piles).
Rhode Island	None	NA	NA	Surface and Subsurface Methods	NDT has been considered but not yet implemented.
South Carolina	Surface Methods Only	New Contrat (70 bridges)	NA	Surface and Subsurface Methods	70 bridges with various foundation types will be tested over the next year.
South Dakota	—				
Tennessee	Surface Methods Only	Past Research Only	Average	Subsurface	Bridges are maintained through consistent monitoring for scour and installation of countermeasures if needed.
Texas	Surface and Subsurface Methods	Past Research Only	Good	NA	Research with TexasTransportation Technology Institute beginning in September, 2009
Utah	None	NA	NA	Surface	NDT has been considered but not yet implemented.
Vermont	None	NA	NA	Surface and Subsurface Methods	NDT has been considered but not yet implemented.
Virginia	None	NA	NA	NA	NDT has been considered but not yet implemented.
Washington	None	NA	NA	Surface and Subsurface Methods	NDT has been considered but not yet implemented.
West Virginia	—				
Wisconsin	—				
Wyoming	Direct Probing only	1-5 times per year	Good	NA	The location of bedrock results primarily in spread footings.

NOTES:
1. NDT METHODS USED IN THE PAST AND/OR CURRENTLY USED IN THE STATE

Description of NDT Methods

Illustrations of the NDT methods and testing equipment described in this Study are provided in Figures 7.1 through 7.19.

Surface NDT

Sonic Echo

To perform a Sonic Echo test a wave must be induced near the signal receiver which is mounted at or near the top of the foundation element. The induced wave is typically created through a strike with a test hammer. The resulting compression wave travels vertically through the foundation and reflects off the bottom and back up to the receiver. The received signal is then used to estimate the foundation depth. The superstructure of the bridge often induces wave echoes that register on the receiver and make the data interpretation more difficult. The Sonic Echo test is fairly inexpensive; however, the data has been inconsistent. Splices in piles, imperfections in piles, stiff or stratified soils, and rock make data interpretation difficult and often lead to "false bottom" interpretations. If a subsurface pile-cap exists, this test will not provide any foundation data below the pile-cap (Olson L.D. et al. (1997)). A sketch of the Sonic Echo method is shown in Figure 7.1 with a photograph of the test equipment provided in Figure 7.2.

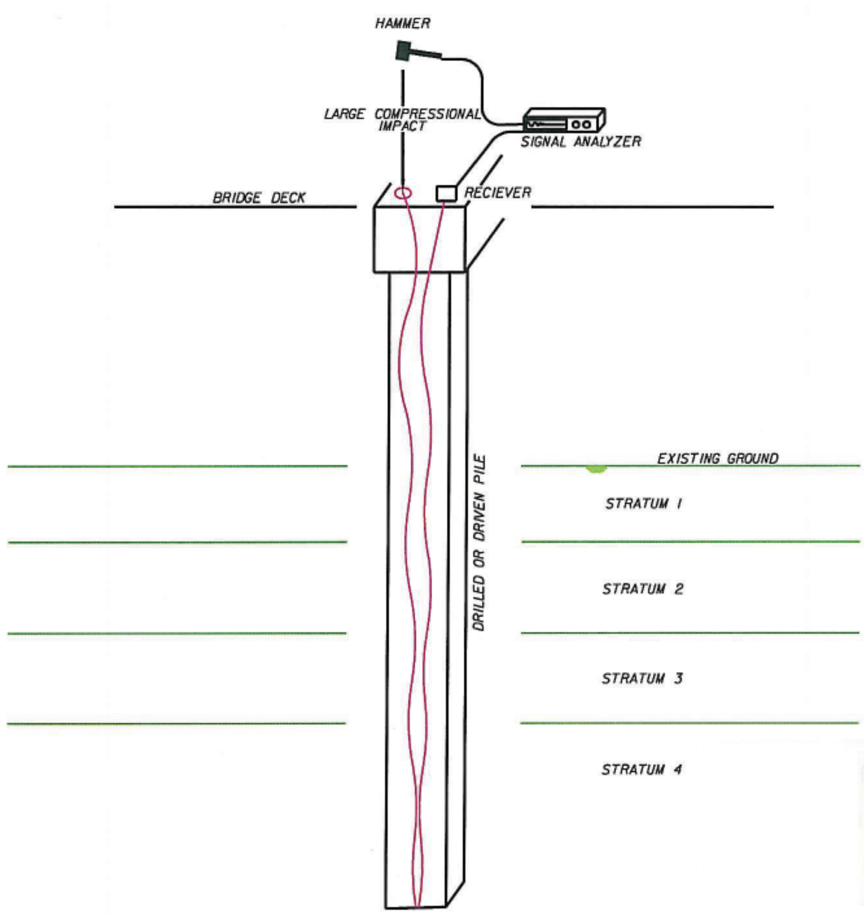

Figure 7.1: Sonic Echo Method

Figure 7.2: Sonic Echo or Bending Waves Testing Equipment

Bending Waves

The Bending Wave method consists of two mounted accelerometers near the top of the foundation element. An induced flexural wave is created above the receiver locations and the resulting wave dispersion is recorded through a monitoring device connected to the accelerometers. The recorded data received from the accelerometers is then used to estimate foundation depth. The bending wave with short kernel test is fairly low in cost; however, the data to date has been inconsistent. Splices in piles, imperfections in piles, stratified or stiff soils, and rock all may contribute to problems with data interpretation or "false bottom" evaluations. If a subsurface pile-cap exists, this test will not provide accurate foundation data below the pile-cap (Douglas, R.A. and Holt, J.D. (1993)). A sketch of the Bending Wave method is shown in Figure 7.3.

This method has been used in Florida in the past and did not yield satisfactory results (Florida Department of Transportation (1999) Project No. 99906-1-52-20). North Carolina has had better success than Florida with this method. The reason North Carolina may be having better success is that the piles may be shorter than those typically used in Florida. Another area where inconsistent results are produced is when testing steel piles and jacketed steel piles. Tests conducted in other states using this method experienced significant challenges in developing consistent data.

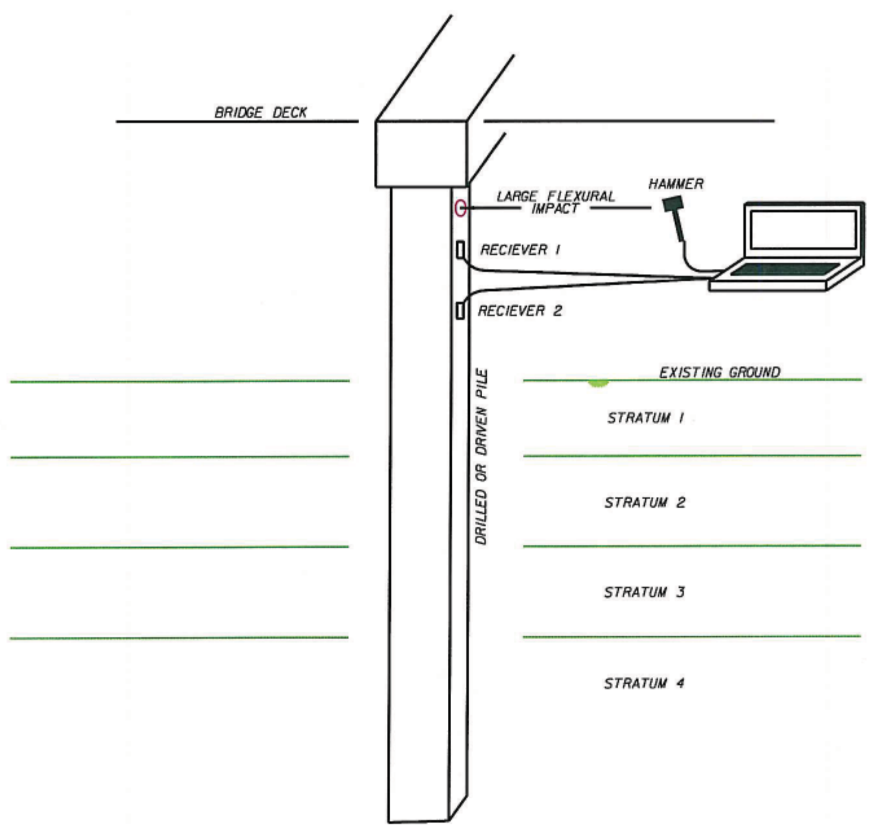

Figure 7.3: Bending Wave Method

Ultra-Seismic

Ultra-Seismic testing uses multiple receivers mounted near the top of the foundation element to receive the reflected wave transmitted. The induced wave is generated at or near the top of the foundation element causing the wave to travel to the base of the foundation element and then is reflected back to the receivers. The received waves are recorded and then analyzed in conjunction to predict depth of the foundation. The Ultra-Seismic test is fairly inexpensive; however, it has not provided consistent foundation depths. Like the other surface NDT methods, splices in the piles, imperfections in the piles, stratified or stiff soils, and rock all contribute to problems with data interpretation or "false bottom" evaluations.

If a subsurface pile-cap exists, this test will not provide accurate foundation data below the pile-cap (Olson L.D. et al. (1997)). A sketch of the Ultra-Seismic method is shown in Figure 7.4 with a photograph of the test equipment provided in Figure 7.5.

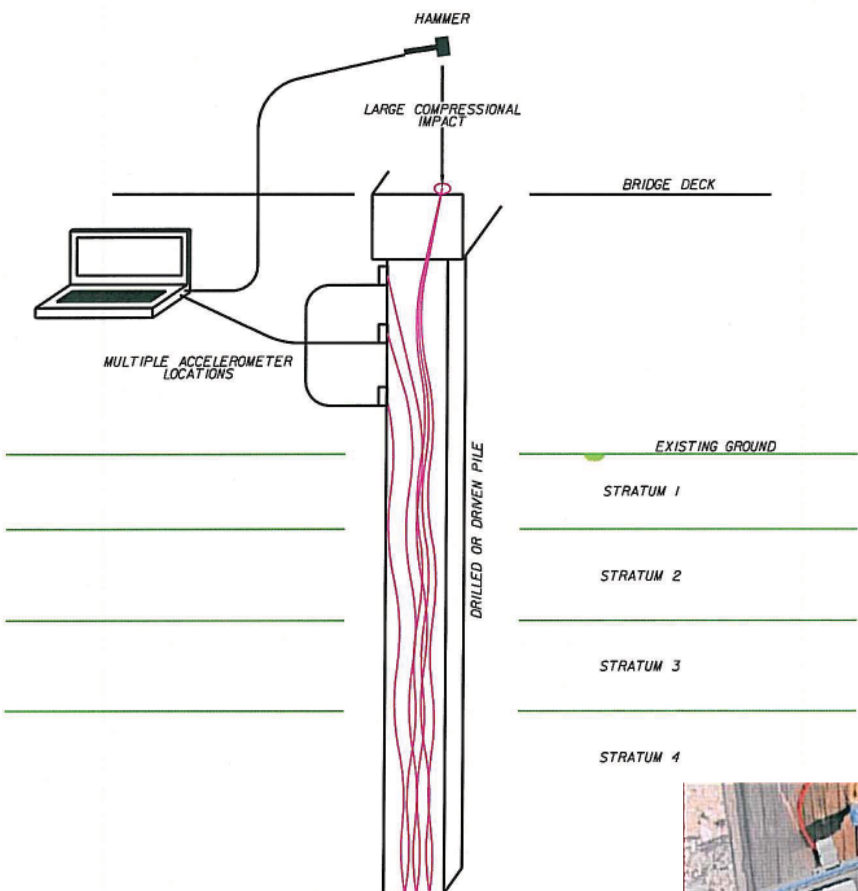

Figure 7.4: Ultra-Seismic Method

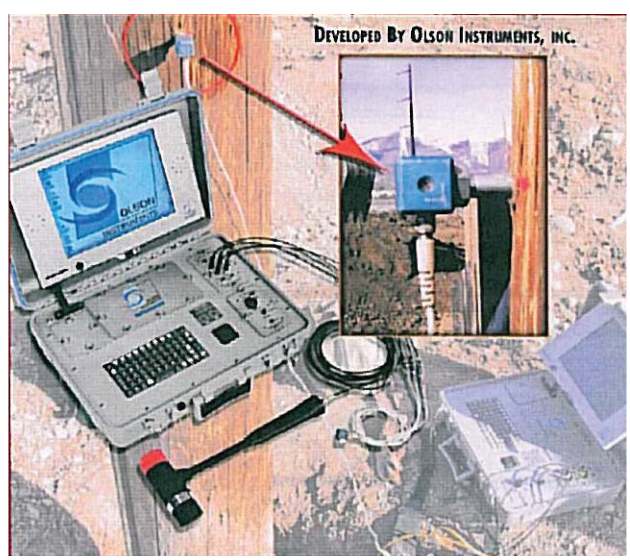

Figure 7.5: Ultra-Seismic Testing Equipment

Surface Wave Spectral Analysis

The surface wave spectral analysis method is normally used to determine underlying strata layers or foundation thicknesses. The test consists of inducing a wave at the ground surface and recording the resulting wave receivers also placed at the ground surface some distance away. Generally, the receivers are placed variable distances away from the source depending on the type and anticipated depth of foundation to be tested. The transmission source for the test may consist of a manual device, such as a hammer, much like the other surface NDT methods. Using wave dispersion theory, the underlying soil and foundation properties can be used to estimate the foundation depth. The surface wave spectral analysis test has had good results in circumstances such as bridge abutments and tabular foundations. One drawback to this test is that it requires a large flat surface to assemble the testing equipment (Olson L.D. et al. (1997)). A sketch of the Surface Wave Spectral Analysis method is shown in Figure 7.6 with a photograph of the test equipment provided in Figure 7.7.

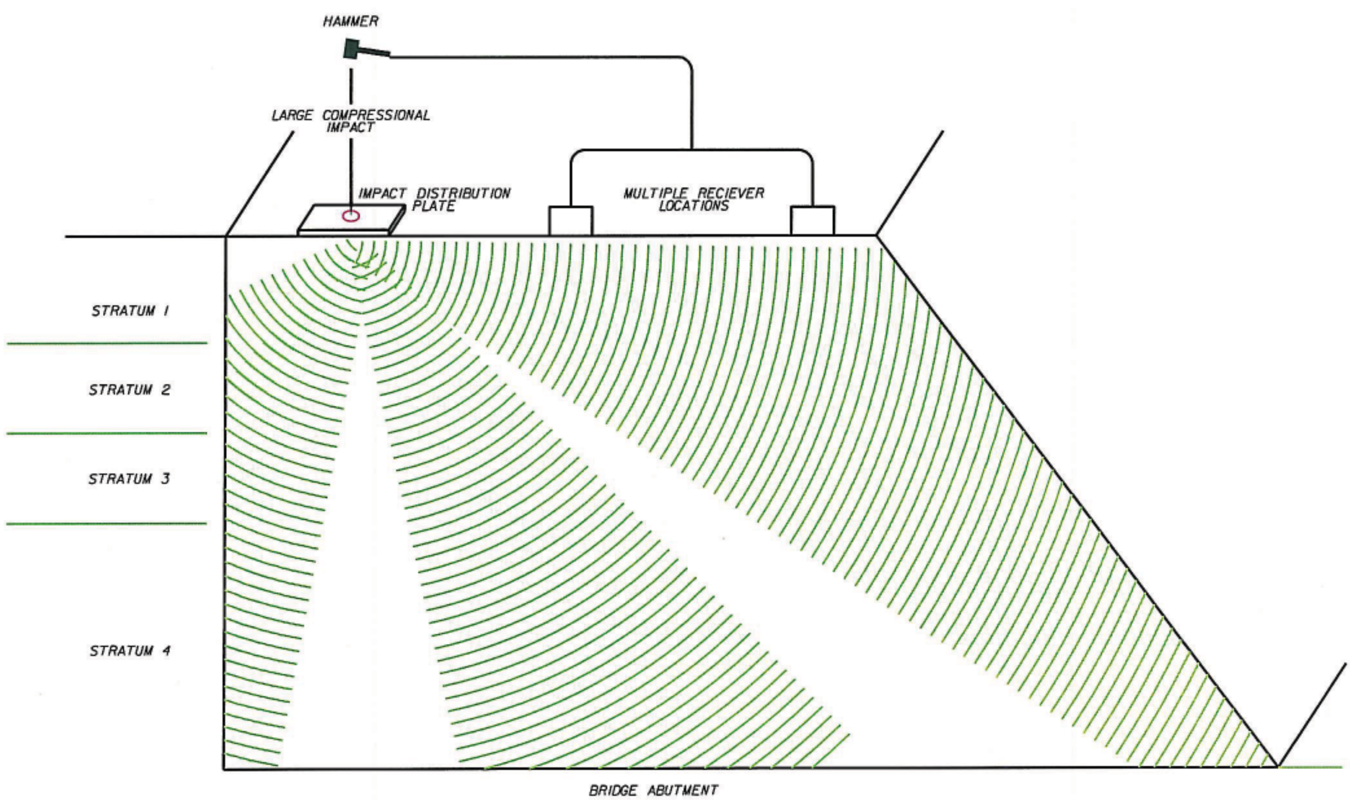

Figure 7.6: Surface Wave Spectral Analysis Method

Figure 7.7: Surface Wave Spectral Analysis Testing Equipment

Ground Penetrating Radar

Ground Penetrating Radar (GPR) is generally used to establish subsurface strata layers by moving a radar source and receiver over the foundation/ground in a grid pattern. In the past this technique has been widely used in Florida as a method of karst feature investigation and mapping. This technology registers the reflected radar signals and allows for the creation of a three-dimensional image of the subsurface. This method is applicable to large foundations, such as spread footings, where reflected signals can be received with limited interference. This method is most applicable with shallow foundations (Olson L.D. et al. (1997)). A sketch of the Ground Penetrating Radar method is shown in Figure 7.8 with a photograph of the test equipment provided in Figure 7.9.

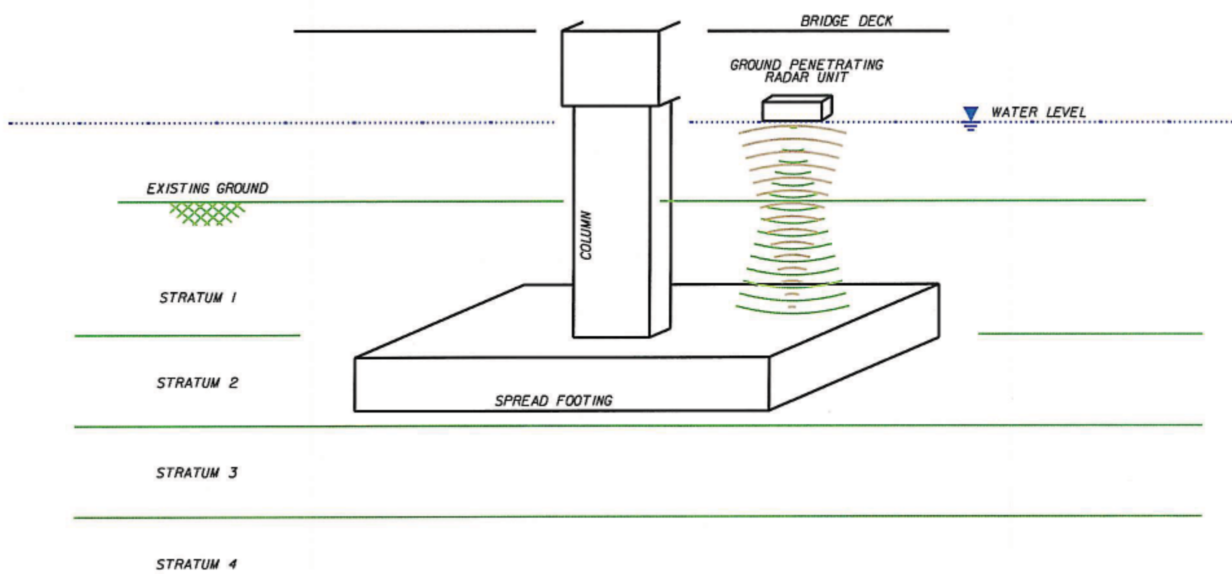

Figure 7.8: Ground Penetrating Radar Method

Figure 7.9: Ground Penetrating Radar Testing Equipment

Dynamic Foundation Response

The Dynamic Foundation Response method is based on recording the resonant frequencies of a foundation element after inducing vibration into the foundation. The technique is based on comparing the resonant frequencies received at the site with frequencies from known foundations and subsurface conditions. The primary use of this method is to establish the foundation type, but not necessarily the foundation depth.

The results of this method vary significantly due to the high variability of soils and foundation types (Olson L.D. et al. (1997)) and (Novak, M. and Aboul-Ella, F. (1978)). A sketch of the Dynamic Foundation Response method is shown in Figure 7.10. This method is being further tested at the University of Texas.

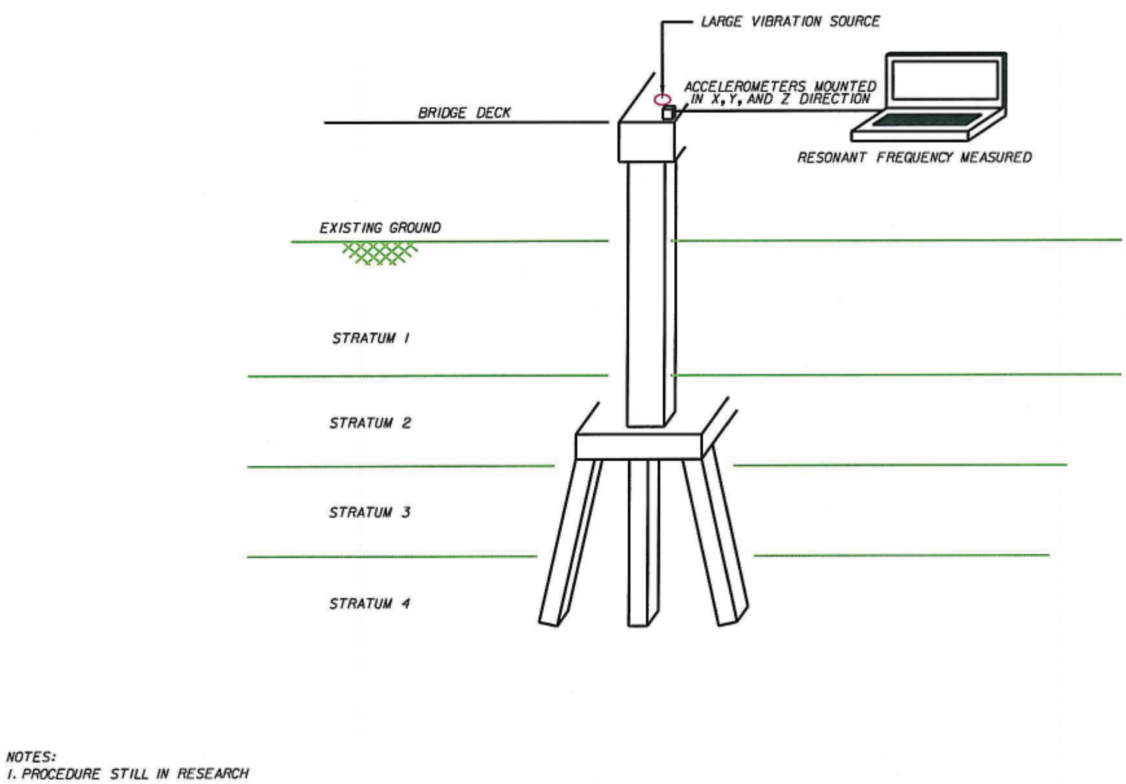

Figure 7.10: Dynamic Foundation Response Method

Subsurface NDT

Parallel Seismic

The Parallel Seismic method is based on installing a cased borehole adjacent to the unknown foundation. A hydrophone (or geophone) is lowered into the borehole in descending increments. At each depth increment an induced wave is generated at the top of the pile. For each induced wave created, the receiver records the time of first arrival for the signal to pass down through the pile and horizontally through the soil. As the bottom of the foundation is passed, the time of arrival for the signal will change significantly due to the difference in wave velocity between the pile and the soil. The time of the first signal arrival, when plotted as a function of each depth increment, is approximated as a linear relationship. The point where the linear slope changes significantly indicates the bottom of the foundation element (Olson L.D. et al. (1997)) and (Mercado, E.J. and McDonald, J.A. (2002)).

A significant advantage of the Parallel Seismic method is that it allows for collection of soils data at the same time the test casing is installed. This allows for a more accurate method of incorporating the subsurface strata layers into the analyses. The correlations between the predicted and known foundation depth is fairly good. The disadvantage, as with all subsurface NDT methods, is a soil boring must be installed adjacent to the foundation element. A sketch of the Parallel Seismic method is shown in Figure 7.11 with a photograph of the test equipment provided in Figure 7.12.

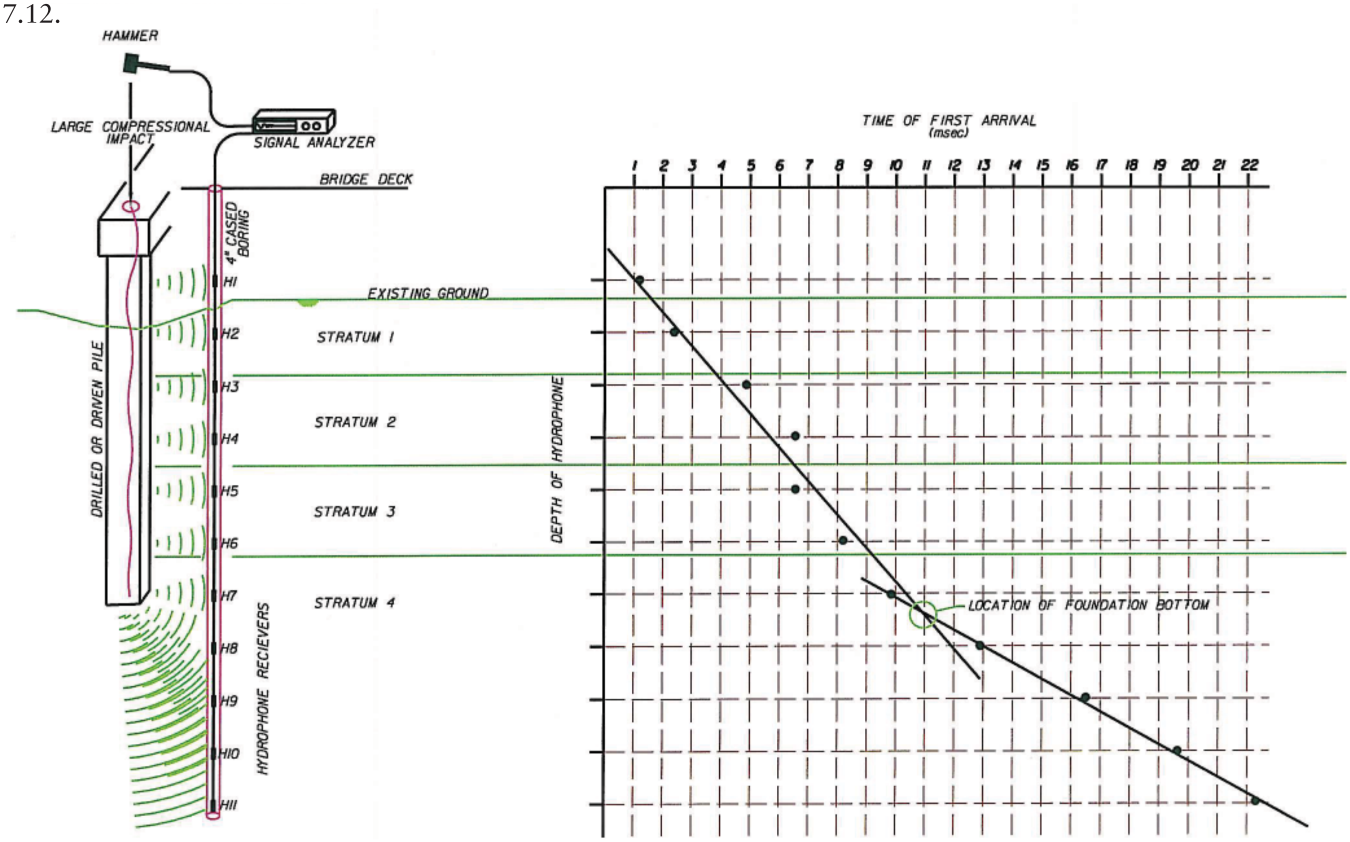

Figure 7.11: Parallel Seismic Method

Figure 7.12: Parallel Seismic Testing Equipment

Borehole Radar

Borehole Radar method is based on emitting and collecting a radar signal adjacent to the foundation element. With this method a PVC casing is installed adjacent to the unknown foundation. After the casing is installed, the radar transmitter/receiver is lowered into the cased borehole and a radar signal is emitted at descending depth increments through the transmitter, then the reflections are received and recorded through the receiver. The intensity of the reflected signal fades after the receiver passes below the bottom of the foundation element. The Borehole Radar method has provided satisfactory results in a number of field tests: however, it has not performed well in brackish environments (Olson L.D. et al. (1997)). This constraint could factor for many of the bridge sites in Florida due to the numerous salty and brackish waterways that exist. A sketch of the Borehole Radar method is shown in Figure 7.13 with a photograph of the test equipment provided in Figure 7.14.

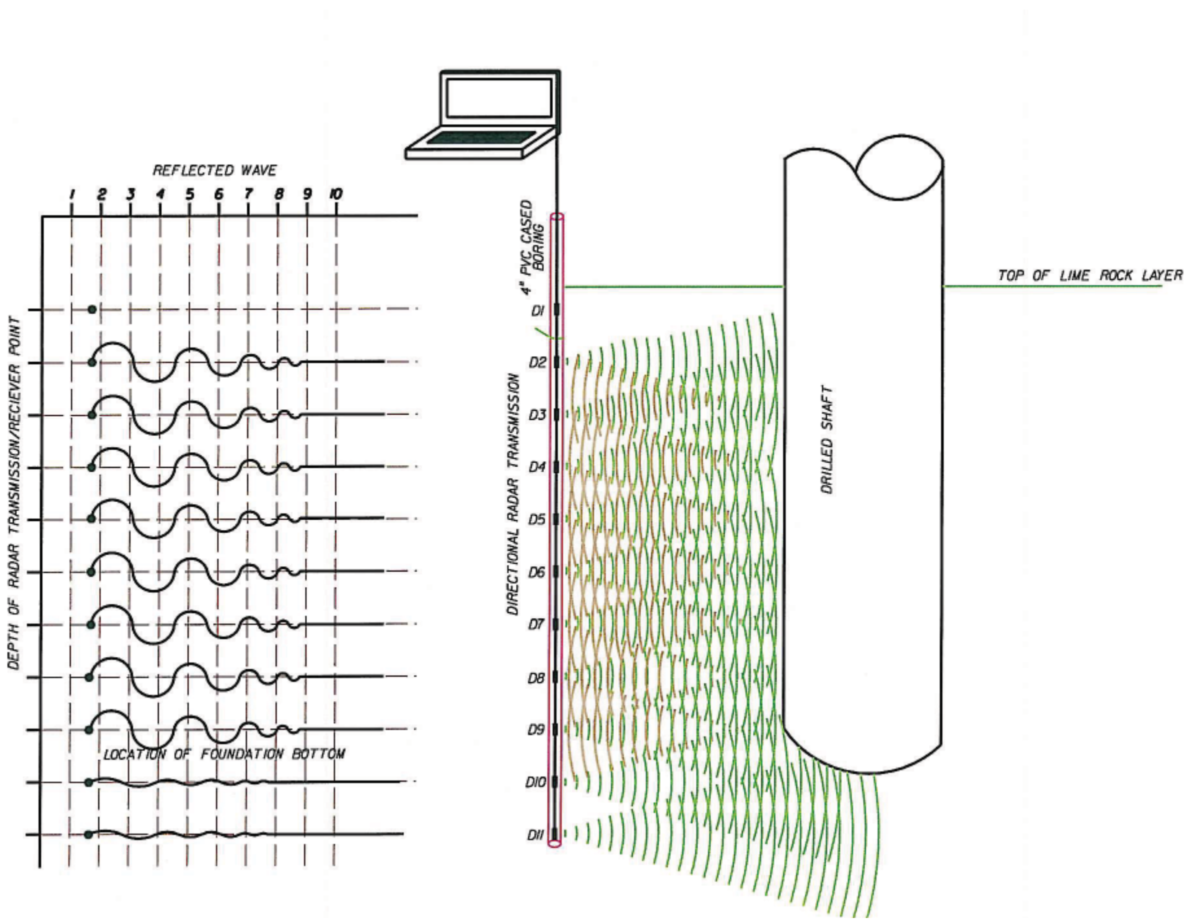

Figure 7.13: Borehole Radar Method

Figure 7.14: Borehole Radar Testing Equipment

Borehole Sonic

The Borehole Sonic method utilizes reflected sonic wave signals to determine the bottom of an unknown foundation element. A soil boring is installed adjacent to the unknown foundation and a source transmitter is lowered incrementally into a boring in conjunction with a receiver. The source transmitter induces a sonic wave which reflects off the unknown foundation, similar to the Borehole Radar method. The receiver measures the reflection at each depth increment until the signal fades (Olson L.D. et al. (1997)). A sketch of the Borehole Sonic method is shown in Figure 7.15 with a photograph of the test equipment provided in Figure 7.16.

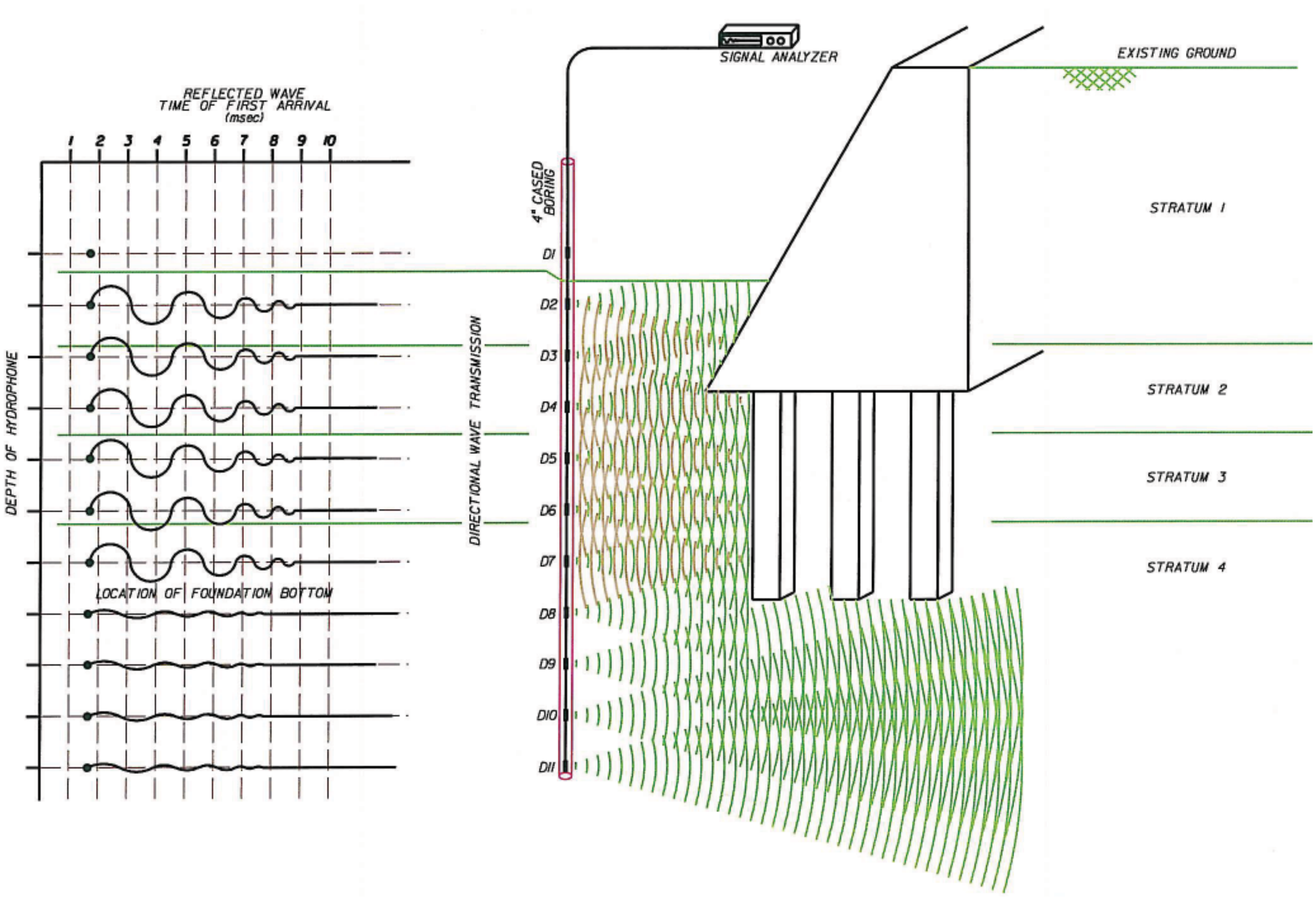

Figure 7.15: Borehole Sonic Method

Figure 7.16: Borehole Sonic or Cross Hole Testing Equipment

Cross Hole Sonic

The Cross Hole Sonic method is similar to the Borehole Sonic method used to evaluate the uniformity and integrity of a drilled shaft foundation. The method consists on installing two cased boreholes. A cased borehole is installed on opposite sides of the unknown foundation with the boreholes spaced equidistant from the foundation. Once the boreholes have been installed either a Parallel Seismic test or a Borehole Sonic test may be performed. Cross Hole Sonic Logging is still in its infancy; however, its principles are widely used. Cross Hole Sonic Logging has been a very powerful tool in the past for indentifying the in situ features of drilled shafts using pre-installed boreholes within the foundation (White, B. et al. (2008)). A sketch of the Cross Hole Sonic method is shown in Figure 7.17.

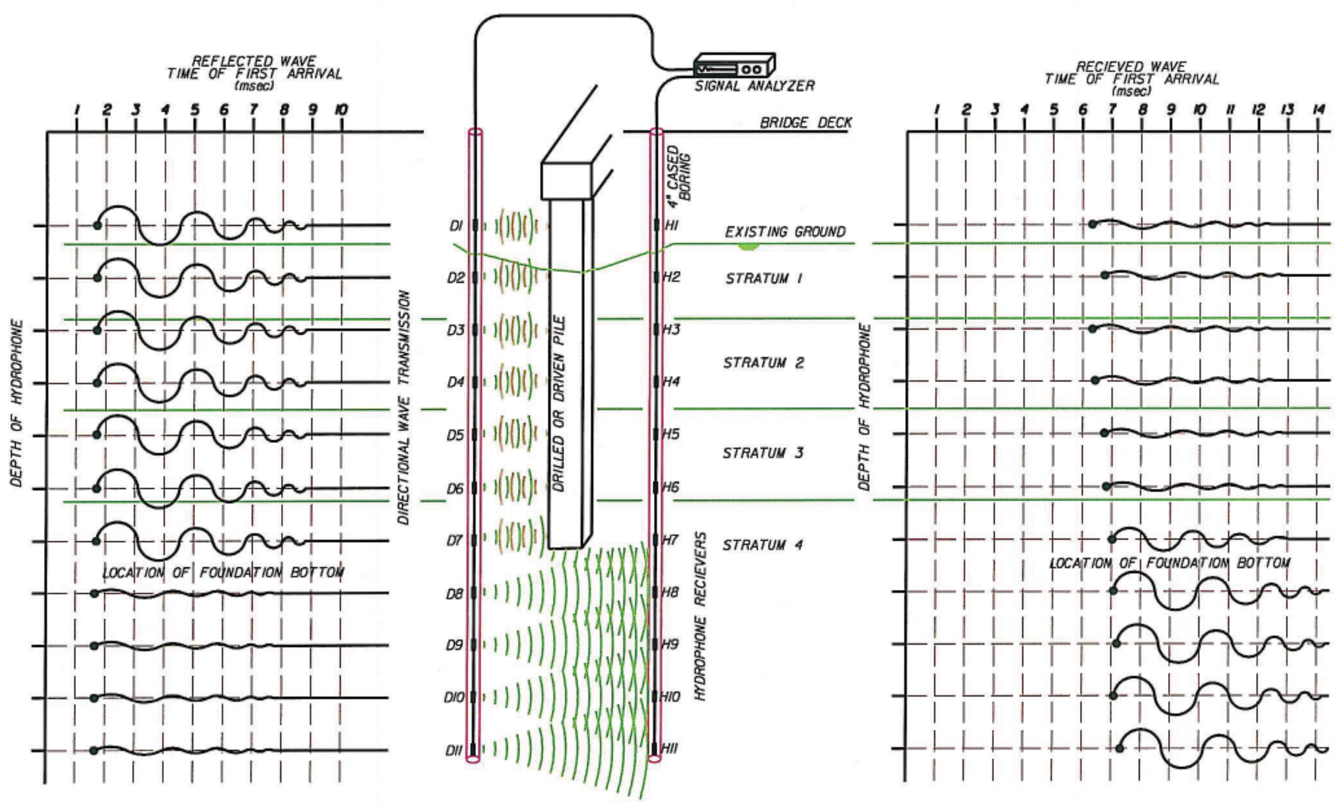

Figure 7.17: Cross Hole Sonic Method

Induction Field

The Induction Field method, like the Cross Hole Sonic method, requires the installation of a cased soil boring installed adjacent to the unknown foundation. An electrical current is passed through the steel pile or steel reinforcement of a concrete pile. This electrical field created by the imposed electrical current is recorded when lowering a sensor into the borehole. The Induction Field method is limited to foundation materials that are good conductors (Olson L.D. et al. (1997)) and (Robinson, B., Webster, S. (2004)). A sketch of the Induction Field method is shown in Figure 7.18 with a photograph of the test equipment provided in Figure 7.19.

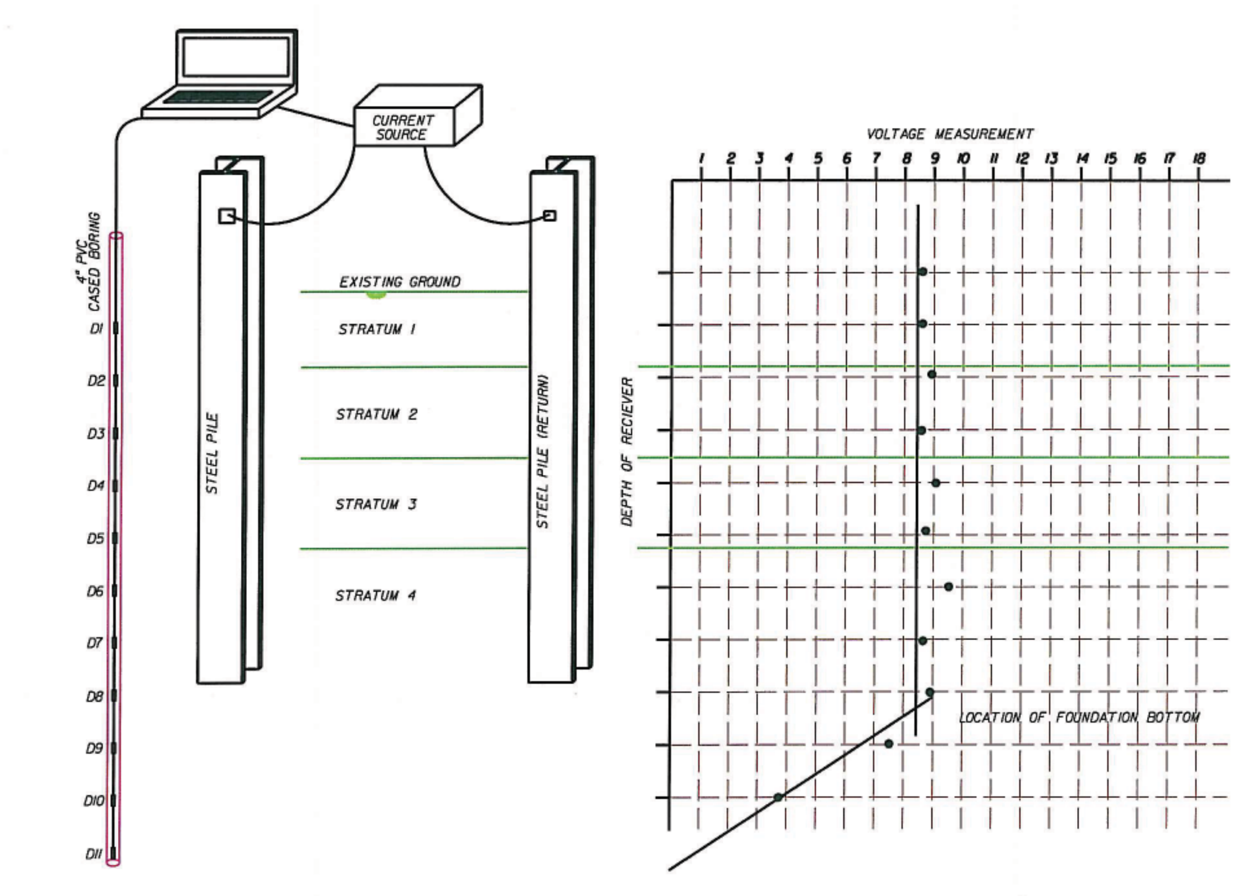

Figure 7.18: Induction Field Method

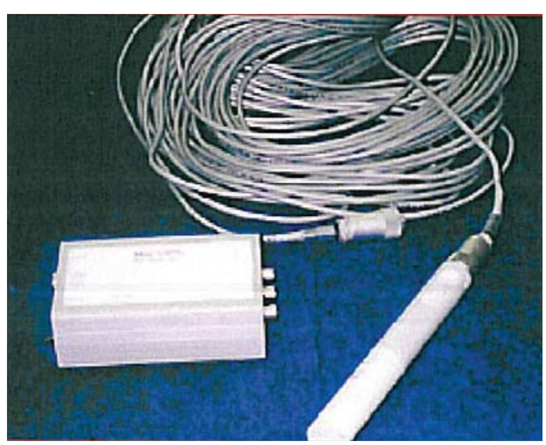

Figure 7.19: Induction Field Testing Equipment

Borehole Magnetic

The Borehole Magnetic method requires the installation of a cased soil boring installed adjacent to and parallel to the unknown foundation. A flux gate magnetometer is lowered into the cased borehole and the magnetic field created by the ferrous material in the foundation is measured at various depths until the bottom of the foundation is reached (Jo, C.H. et al. (2003)). A sketch of the Borehole Magnetic method is shown in Figure 7.20 with a photograph of the test equipment provided in Figures 7.21 and 7.22.

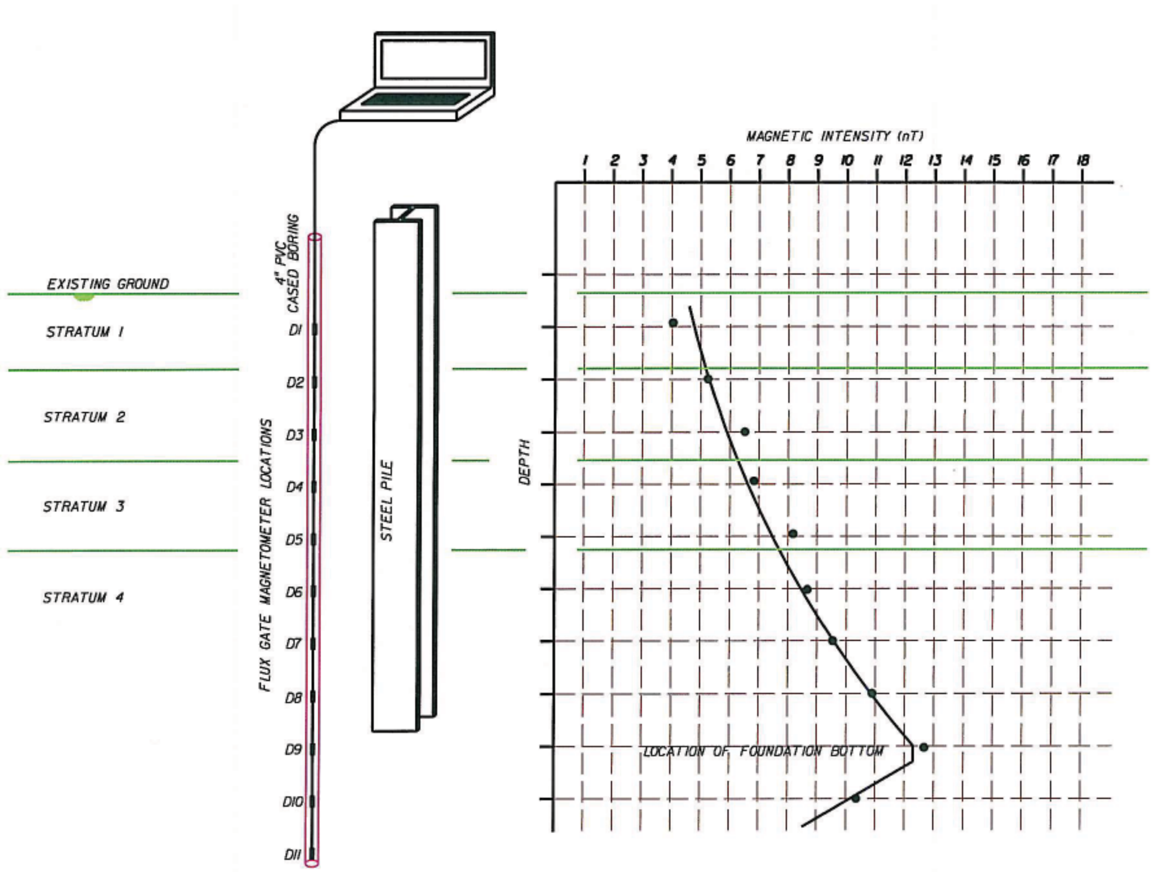

Figure 7.20: Borehole Magnetic Method

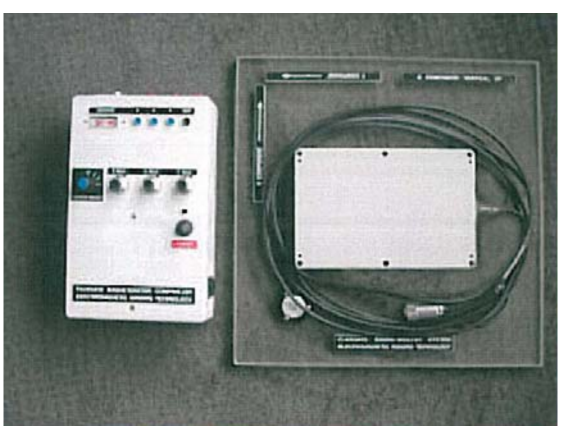

Figure 7.21: Borehole Magnetic Testing Equipment

Figure 7.22: Borehole Magnetic Testing Equipment

Selection of the Appropriate NDT Method

Before selection of an NDT method, the following factors need to be considered:

Site Characteristics

Site Access Limitations

NDT testing methods have varying degrees of site access requirements. Surface NDT will generally require access to the substructure of a bridge. This can normally be achieved using wading boots or a small boat. On larger bridges access may require some form of barge or amphibious vehicle. Subsurface NDT methods will require a soil boring or probe and therefore will be more limited at each site. Typically, a soil boring or probe can be installed through the existing bridge superstructure (i.e. bridge deck). In some situations a barge may be required to install the soil boring at the water level. The access requirements should be reviewed prior to selection of the NDT method.

Bridge Deck

A bridge deck may have several variables that may impact the quality of the test data. Bridge decks may range in thickness and contain significant amounts of structural steel reinforcement. Should a pavement core be required for the selected NDT method, the total time of installation could be greatly dependent on the condition of the bridge deck. The clearance below the bridge deck can vary greatly from location to location to accommodate different levels of maritime navigation.

Automotive Traffic

Traffic on bridges may pose a substantial problem for some NDT methods. One factor to consider is the number of traffic lanes on the bridge relative to the volume of traffic and time of day. This relationship between traffic flow and existing lanes will greatly influence maintenance of traffic (MOT) plans and schedule. For most of the NDT methods, testing during non-peak hours (i.e. at night) may be preferable (i.e. less noise and vibrations at night). If daytime lane closure is required on a highly traveled bridge, then some lane capacity analysis may be necessary to ensure minimal impact to traffic flow.

Maritime Traffic

Bridges qualifying for NDT may be located in areas with navigable waterways. In situations such as this, it may be necessary to perform some form of survey or evaluation of existing boat traffic. Blocking of primary navigation channels should be avoided. For most NDT methods, little impact will be made to the navigable waterway; however, impact must be determined and assessed.

Season

Seasonal weather fluctuations may also impact NDT testing. These impacts could be associated with variations in the water levels and flow velocities under a bridge. Also, temperature and humidity can impact the equipment. Throughout most of Florida, testing schedules between the months of June and November could be impacted by weather conditions.

Subsurface Conditions

Soil Strata

Highly variable soil strata may be reflected in the data resulting from NDT testing and should be considered while making predictions about foundation depth. Many of the NDT methods utilize wave transmission principles based on shear wave velocities through soil strata. Shear wave velocities vary differently from one material to the next; therefore, some basic understanding of the subsurface conditions is helpful.

Presence of Rock

The presence of rock (limestone) is typical throughout much of Florida and may impact the NDT tests and resulting data. The data interpretation from the NDT methods should be analyzed in conjunction with known or estimated rock depths as they apply to the area. Map Series No. 110 (Sinclaire, W.C. and Stewart, J.W. (1985)) can be used as a reference for rock depths when site specific information is not available.

Presence of Debris

Subsurface debris may be encountered around some Florida bridges which could damage or disrupt the NDT equipment. The possible existence of buried debris, rubble and abandoned foundation elements needs to be considered when selecting the method and location of NDT testing.

Salinity Levels

Brackish or salty environments can have an effect on the selection of the NDT. The presence of saturated soils, containing high salinity contents, has a significant impact on NDT methods which utilize radar signals, since the salinity can disrupt the signal.

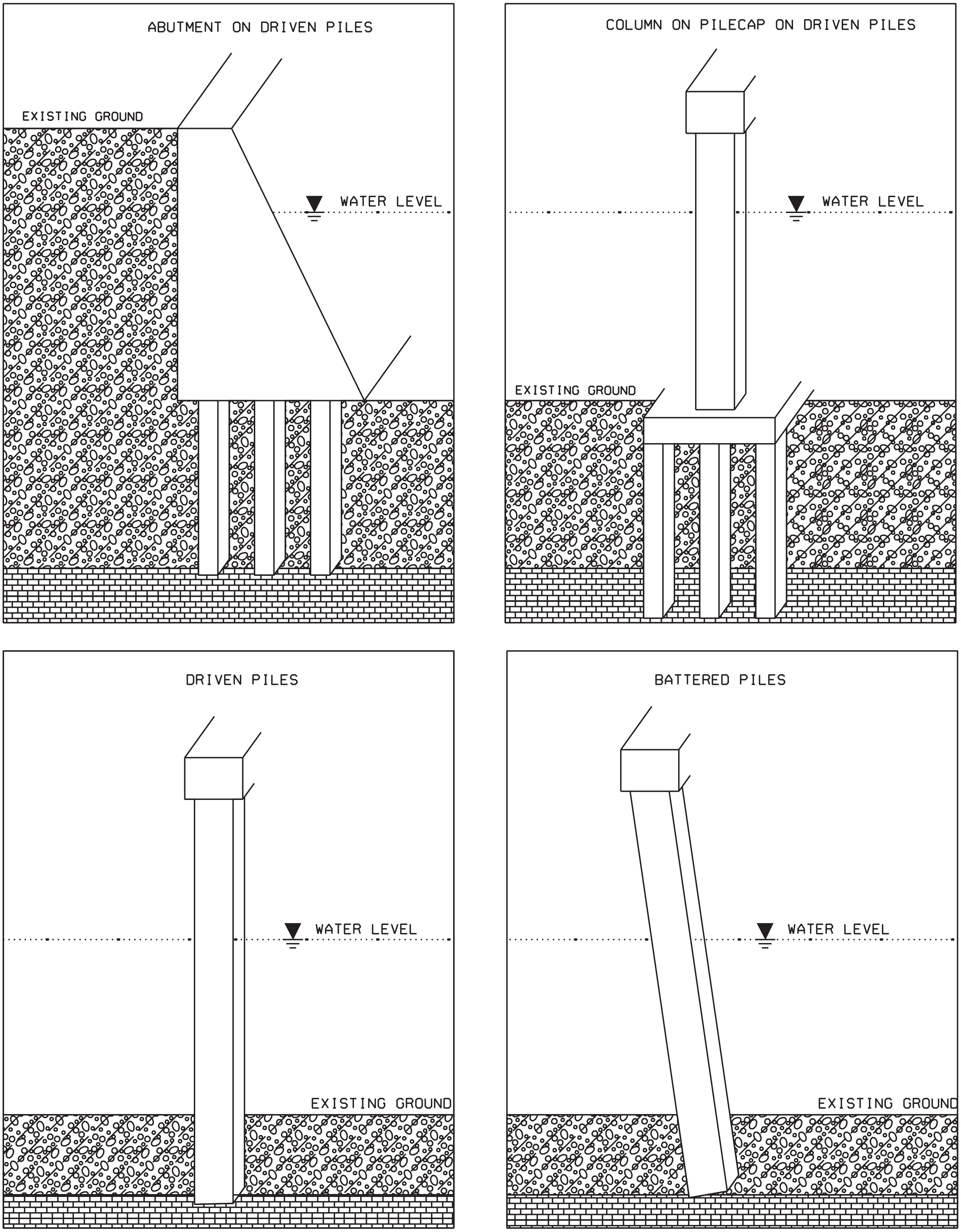

Figure 7.23: Bridge Foundation Types

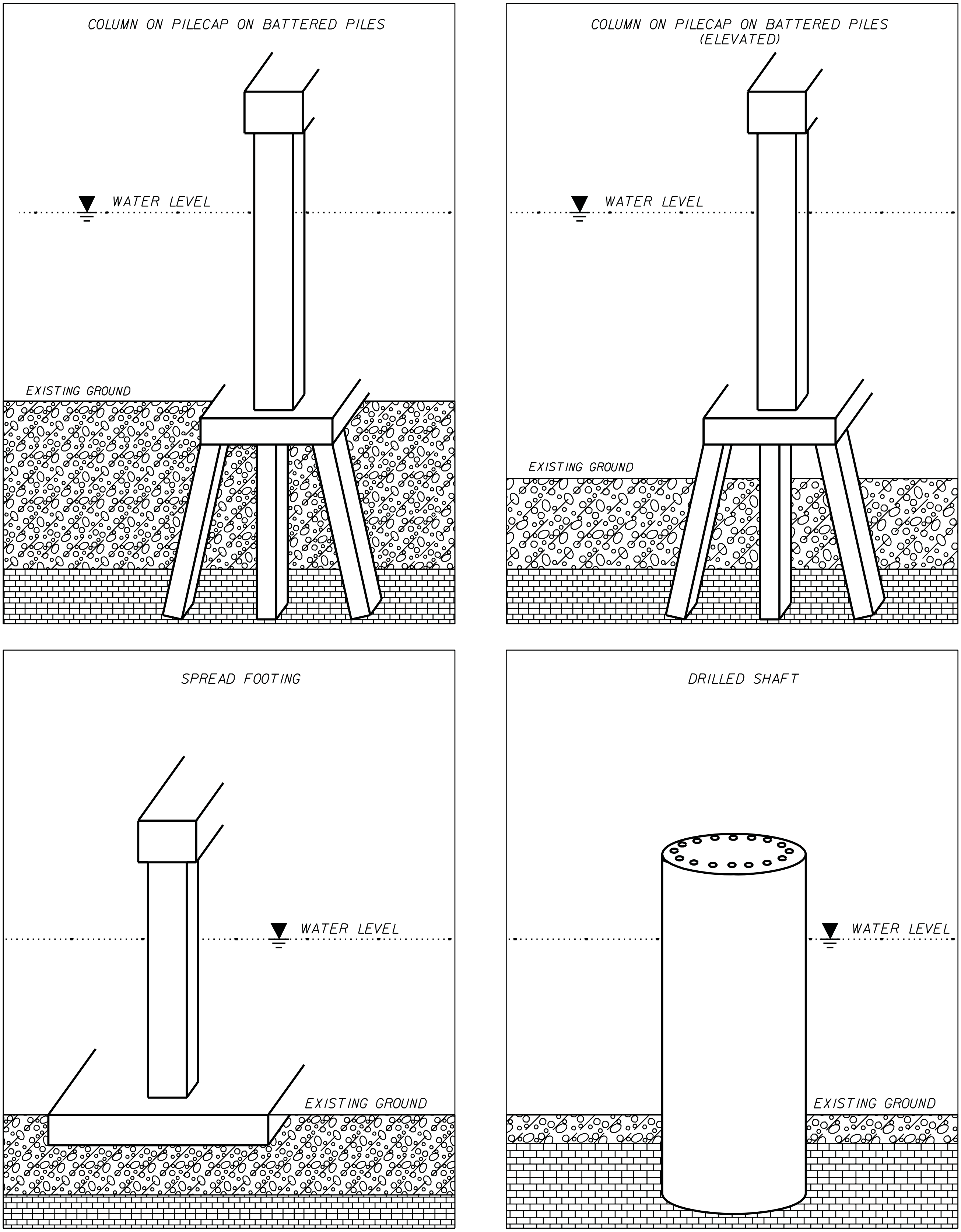

Figure 7.24: Bridge Foundation Types

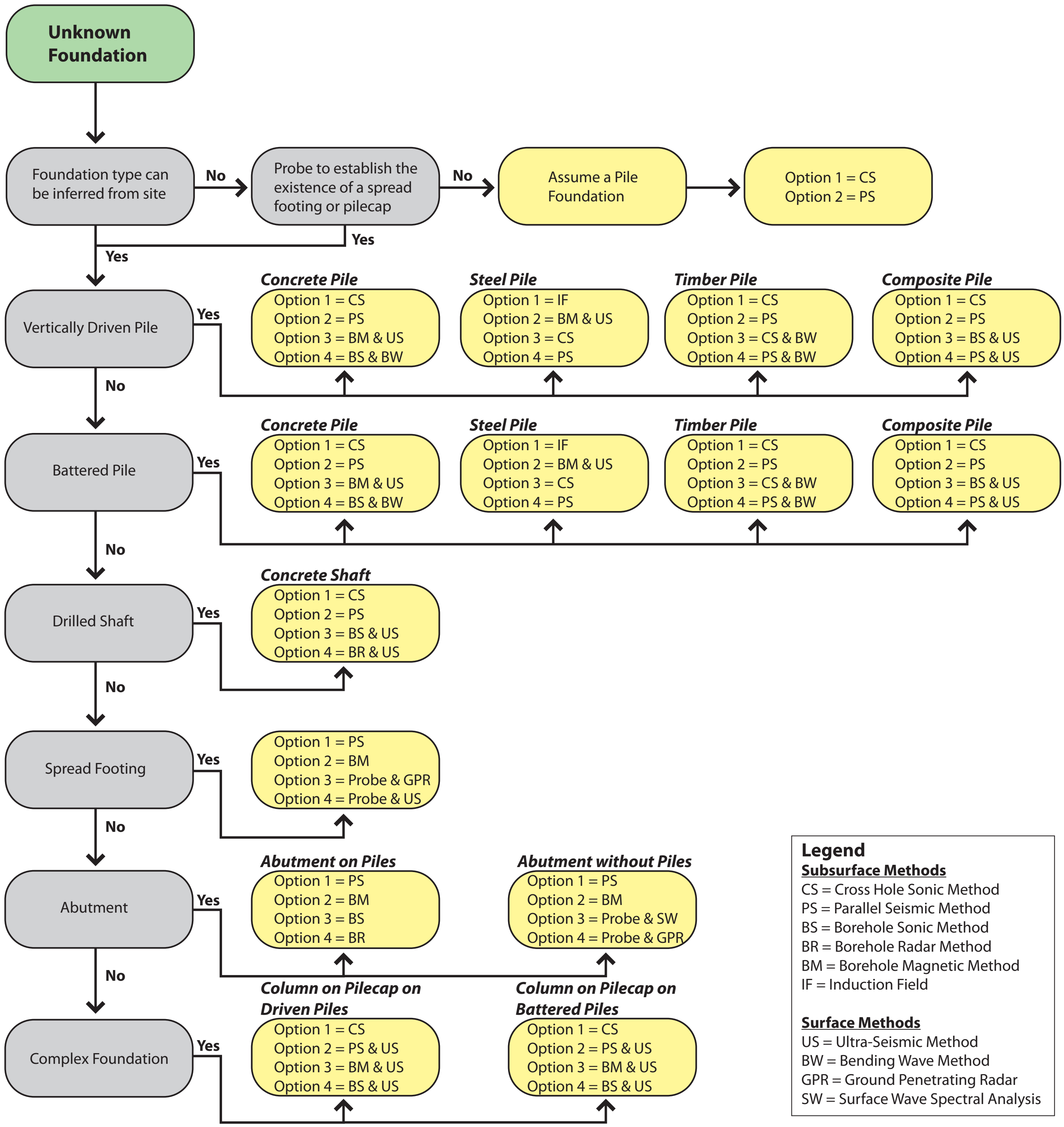

Figure 7.25: NDT Flow Chart

Foundation Types

Bridge foundations in Florida are influenced by the type, size, and location of the bridge structure. The majority of the bridges throughout Florida are founded upon non-complex foundations (i.e. driven and/or battered piles). These non-complex foundations can be tested with a fair degree of accuracy using several NDT methods. Foundation types, described below, are illustrated in Figures 7.23 and 7.24 for further clarification. Various foundation types can be tested using many of the same forms of NDTs; however, the optimal NDT testing method for each foundation type is shown in the flow chart provided in Figure 7.25.

Drilled Shafts

A drilled shaft consists of a predrilled hole, in which steel reinforcement and concrete are placed. Drilled shafts will generally provide a large subsurface area which is highly conducive to multiple forms of NDT. Typically in Florida, drilled shafts are at least 30 inches in diameter and may extend up to 9 feet in diameter. Drilled shafts historically are generally used in areas where rock is within about 70 feet of the surface. It is unlikely that drilled shafts will be encountered in smaller bridges constructed in Florida prior to 1980.

Driven Vertical Piles

Driven vertical piles are typically either steel, concrete, timber or a combination of steel and concrete (composite). Driven piles comprise a majority of the foundation types to be expected in Florida. Steel piles are normally found in areas where the driving resistance is fairly substantial or where driving concrete or timber piles was not practical. Most older bridges in Florida with steel pile foundations were constructed with H-piles; however, some older rural bridges (as well as newer FDOT bridges) have been constructed using closed ended pipe piles. Concrete piles are typically pre-cast and pre-stressed. Piles may be spliced together during the pile driving process to achieve adequate embedment depth; however, the splicing of concrete piles is typically avoided. Where concrete piles were too short to reach capacity, they have likely been “built up”, rather than spliced. It should be noted that pile splices can cause inaccurate foundation depth estimations using surface NDT methods. Steel piles covered with concrete, or “jacketed”, can also pose a problem for surface NDT methods. If the foundation contained spliced or “jacketed” piles, it is likely that surface NDT testing should be coupled with subsurface NDT tests.

Battered Piles

Battered piles are driven piles that are designed to maximize their ability to carry lateral loads through installation at an angled orientation. Like a vertical pile, material types comprising battered piles are concrete, steel, and timber. The depth of battered piles can be determined in a manner similar to that used for vertical piles.

Complex Foundation With Driven Piles

To distribute load more efficiently, some bridge foundations were designed with one large reinforced concrete cap structurally attached to the top of driven piles. This concrete cap serves as a pile cap to the driven pile cluster below it. Foundations such as this can be expected on major bridges throughout Florida. Bridges that are constructed using a complex foundation typically have longer span lengths that may exceed 100 feet.

Abutment on Driven Piles

The point at which a bridge ties into a shoreline will typically consist of some form of large abutment. An abutment will generally function as a large bearing surface; however, it may be supported with driven or battered piles for additional stability. The depth of the base of the abutment can fairly accurately be estimated with most forms of NDT; however, the depth of the underlying piles (if present) will require a subsurface NDT method to determine their lengths.

Spread Footing

Spread footings are likely found on only a few bridges throughout the state of Florida. These bridges are likely rural bridges that experience only infrequent traffic. The federal and state forest services construct rural bridges on spread footings. Most of the surface NDT methods are adequate for these foundations.

Foundation Materials

Foundations in Florida will generally consist of concrete, steel, or timber. Composites of concrete and steel are fairly typical and should be expected on many complex foundations. Steel piles may be jacketed in concrete and are a common occurrence throughout Florida. Various material types can be tested using NDTs; however, the optimal NDT testing method for each material is shown in the flow chart provided in Figure 7.25.

Scour Considerations

NDT performed on bridges with unknown bridge foundation depths will usually have some degree of pre-existing scour susceptibility. There are several considerations that must be taken when selecting an NDT method that is appropriate under these conditions. It should be noted that scour susceptible areas may have different shear wave velocities relative to an existing undisturbed soil. If data is available on the depth and extent of scour, it should be reviewed prior to selecting the NDT method.

Applicability Guidelines

Guidelines for applicability have been summarized in Table 7.2 on the following page and in the flow chart provided in Figure 7.25.

Guidelines for Surface NDT

To ensure accuracy, it is recommended that surface NDT methods only be used when other forms of foundation depth estimation methods (i.e. subsurface NDT) cannot be used because of site access limitations. If a surface NDT method is used it should be closely monitored by an experienced engineer.

Sonic Echo

The Sonic Echo method is best used on standard vertically driven or battered piles. Jacketed steel piles should be avoided for this test method due to problems with the variable composite properties of the pile. Sonic Echo testing is not an appropriate application for complex foundations as they will not register data accurately. Complex foundations may be considered as any foundation with supplementary piles (i.e. pile clusters) below the primary or visible supporting structure. If a foundation type is not known prior to testing, other methods may be used to establish the presence of a complex foundation. Typically any foundation material type is acceptable for sonic echo testing; however, knots in timber piles or splices may cause inaccurate results. The presence of stiff soils or other pile imperfections may also skew data and result in incorrect foundation depth approximations. This test is not recommended for use in Florida due to the advantages of other NDT methods; however, this test has been used by other states throughout the country with successful results.

Bending Wave

The optimal foundation type for the Bending Wave method test is a vertically driven pile. Jacketed steel piles should be avoided for this test method due to problems analyzing the variable composite properties of the pile. The bending wave method test is not an appropriate application for complex foundations as the data will not be receivable by this test. Complex foundations may be considered as any foundation with supplementary piles below the primary or visible supporting structure. The bending wave test will be the most suitable surface NDT method for timber piles. Steel piles have been shown to result in inconsistent embedment approximations in several past tests, therefore, will not be a recommended application for the bending waves test. This method should be used only in combination with some form of subsurface NDT to ensure estimation validity.

Ultra-Seismic

The Ultra-Seismic method may be used on vertically driven or battered piles. Jacketed steel piles should be avoided for this test method due to problems with the variable composite properties of the pile. Ultra-Seismic testing is not an appropriate application for complex foundations as they will not register data accurately. Complex foundations may be considered as any foundation with supplementary piles below the primary or visible supporting structure. All foundation material types will be acceptable for this test. Stiff soils may cause false bottom reflections which could potentially result in inaccurate conclusions. This method should be used only in combination with some form of subsurface NDT to ensure estimation validity.

Surface Wave Spectral Analysis

Table 7.2: Applicability of NDT Methods

TESTING METHOD	CONFIDENCE IN ESTIMATION[1]	ADVANTAGES	DISADVANTAGES
SURFACE NDT METHODS			
SONIC ECHO	75%	LOW COST, VERY QUICK, NO SOIL BORING REQUIRED, MINIMAL MOT REQUIRED, CAN BE EASILY USED IN CONJUNCTION WITH SUBSURFACE NDT AS A MEANS OF DATA VALIDATION TO ENSURE ACCURACY.	IMPERFECTIONS, SPLICES, OR STIFF SOILS CAN CAUSE INACCURATE FOUNDATION DEPTH ESTIMATIONS. COMPLEX FOUNDATION ELEMENTS, SUCH AS SUBSURFACE PILECAPS, WILL NOT BE DISTINGUISHABLE NOR WILL ANY PILES BELOW SUCH PILECAPS.
BENDING WAVES	75%	EASILY ADAPTED TO TIMBER PILES, LOW COST, VERY QUICK, NO SOIL BORING REQUIRED, MINIMAL MOT REQUIRED, CAN BE EASILY USED IN CONJUNCTION WITH SUBSURFACE NDT TO ENSURE ACCURACY.	IMPERFECTIONS, SPLICES, OR STIFF SOILS CAN CAUSE INACCURATE FOUNDATION DEPTH ESTIMATIONS. COMPLEX FOUNDATION ELEMENTS, SUCH AS SUBSURFACE PILECAPS, WILL NOT BE DISTINGUISHABLE NOR WILL ANY PILES BELOW SUCH PILECAPS.
ULTRA-SEISMIC	85%	ADAPTABLE TO MOST DRIVEN PILES, LOW COST, VERY QUICK, NO SOIL BORING REQUIRED, MINIMAL MOT REQUIRED, CAN BE EASILY USED IN CONJUNCTION WITH SUBSURFACE NDT TO ENSURE ACCURACY.	IMPERFECTIONS, SPLICES, OR STIFF SOILS CAN CAUSE INACCURATE FOUNDATION DEPTH ESTIMATIONS. COMPLEX FOUNDATION ELEMENTS, SUCH AS SUBSURFACE PILECAPS, WILL NOT BE DISTINGUISHABLE NOR WILL ANY PILES BELOW SUCH PILECAPS.
SURFACE WAVE SPECTRAL ANALYSIS	75%	ACCURATE ESTIMATION OF FOUNDATION DEPTH AT BRIDGE ABUTMENTS, LOW COST, VERY QUICK, NO SOIL BORING REQUIRED, MINIMAL MOT REQUIRED, CAN BE EASILY USED IN CONJUNCTION WITH SUBSURFACE NDT TO ENSURE ACCURACY.	REQUIRES A LARGE FLAT SURFACE WHICH MAY ELIMINATE MOST PILE FOUNDATIONS FROM ACCEPTABLE APPLICATION.
GROUND PENETRATING RADAR	NA	ACCURATE ESTIMATION OF FOUNDATION DEPTH AT BRIDGE ABUTMENTS, LOW COST, VERY QUICK, NO SOIL BORING REQUIRED, MINIMAL MOT REQUIRED, CAN BE EASILY USED IN CONJUNCTION WITH SUBSURFACE NDT TO ENSURE ACCURACY.	PRIMARILY ONLY USEFUL FOR TABULAR FOUNDATIONS BURIED BENEATH ACCESSIBLE TERRAIN.
DYNAMIC FOUNDATION RESPONSE	NA	TEST MAY BE ABLE TO DETERMINE EXISTENCE OF A COMPLEX FOUNDATION AND CAN BE EASILY USED IN CONJUNCTION WITH SUBSURFACE NDT TO ENSURE ACCURACY.	NOT A MEANS OF ACCURATELY ESTIMATING FOUNDATION DEPTH. METHOD WILL REQUIRE A DATABASE COMPILING TEST RESULTS FROM EXISTING BRIDGE SITES TO DETERMINE EXISTENCE OF COMPLEX FOUNDATION.
SUBSURFACE NDT METHODS			
PARALLEL SEISMIC TEST	90%	TEST MAY PROVIDE ACCURATE FOUNDATION DEPTH ESTIMATES FOR MOST FOUNDATION TYPES.	ACCESS FOR TEST MAY REQUIRE SIGNIFICANT MOT. PAVEMENT CORE WILL TYPICALLY BE INSTALLED THROUGH THE BRIDGE DECK.
BOREHOLE RADAR	80%	TEST WILL PROVIDE ACCURATE DEPTH APPROXIMATIONS IN SANDY SOIL CONDITIONS WHERE THERE IS NO PRESENCE OF SALT WATER.	NOT RELIABLE IN A BRACKISH ENVIRONMENT. CLAYEY SOILS MAY INTERFERE WITH RADAR TRANSMISSION. ACCESS FOR TEST MAY REQUIRE SIGNIFICANT MOT. PAVEMENT CORE WILL TYPICALLY BE INSTALLED THROUGH THE BRIDGE DECK.
BOREHOLE SONIC TEST	85%	TEST WILL ACCURATELY DETERMINE THE DEPTH OF LARGE BRIDGE ABUTMENTS.	TEST MAY REQUIRE A LARGE REFLECTIVE SURFACE FOR THE SONIC WAVE (I.E. LARGE PILES, DRILLED SHAFTS, ETC.). REQUIRES SOIL BORING.
CROSS HOLE SONIC TEST	95%	WILL PROVIDE DATA FROM TWO RECEIVER LOCATIONS FOR INCREASED ACCURACY.	TWO SOIL BORINGS ARE REQUIRED FOR TEST. ACCESS FOR TEST MAY REQUIRE SIGNIFICANT MOT. PAVEMENT CORE WILL TYPICALLY BE INSTALLED THROUGH THE BRIDGE DECK.
INDUCTION FIELD	80%	VERY ACCURATE TEST FOR THE ESTIMATION OF STEEL PILE DEPTH. REINFORCED CONCRETE MAY ALSO YIELD GOOD RESULT IF THERE IS SIGNIFICANT ACCESS TO STEEL REINFORCING.	REQUIRES ACCESS TO CONDUCTIVE MATERIAL. ACCESS FOR TEST MAY REQUIRE SIGNIFICANT MOT. PAVEMENT CORE WILL TYPICALLY BE INSTALLED THROUGH THE BRIDGE DECK.
BOREHOLE MAGNETIC	90%	TEST CAN BE EXTREMELY ACCURATE WITH THE PRESENCE OF A LARGE AMOUNT OF FERROUS MATERIAL.	PRESTRESSED PILES MAY NOT HAVE ENOUGH FERROUS MATERIAL TO YIELD ACCURATE RESULTS. FURTHER TESTING WILL BE REQUIRED.

NOTES:
1. Confidence in estimation refers to the accuracy of the test relative to the known problematic variables associated with the test procedure.

Surface Wave Spectral analysis may be used on larger tabular foundations, such as bridge abutments. This test method requires a large flat surface to place receivers. The Surface Wave Spectral analysis method is not an appropriate application for complex foundations as the data will not be received accurately by this test. Complex foundations may be considered as any foundation with supplementary piles below the primary or visible supporting structure. This method should be used only in combination with some form of subsurface NDT to ensure estimation validity.

Ground Penetrating Radar

Ground Penetrating Radar may be used on tabular foundations such as bridge abutments or spread footings. A complex foundation will not be recorded accurately by this test and; therefore, will not be an appropriate application for the ground penetrating radar method. Complex foundations may be considered as any foundation with supplementary piles below the primary or visible supporting structure. Radar signals will be obscured by the presence of salty or brackish water; therefore, use of this method should be avoided in coastal areas. This method should be used only in combination with some form of subsurface NDT to ensure estimation validity.

Dynamic Foundation Response

Dynamic Foundation Response may be used on any foundation type for the determination of the existence of complex foundations. This method will not accurately determine foundation depth; however, it is currently being researched for the use of determining the existence of a complex foundation. Complex foundations may be considered as any foundation with supplementary piles below the primary or visible supporting structure. This method may require compilation of a network or database of resonant frequencies from known foundations in a similar location for comparison to test results. This method is not recommended for use in Florida due to ongoing research still to be completed with this test.

Guidelines for Subsurface NDT

Parallel Seismic with Hydrophone or Geophone

Parallel Seismic testing may be used on any foundation type (i.e. steel, concrete, and timber). Appropriate foundation types include: vertically driven piles, battered piles, abutments, and complex foundations. Thick bridge decks and pilecaps may limit the transmitted signal, in which case, access to the substructure of the bridge may be required. A hydrophone or geophone may be used as the receiver inside of the cased borehole. Standard 4 inch steel casing will work for parallel seismic. It should be common practice to perform several tests to check results from the Parallel Seismic test.

Borehole Radar

Borehole Radar should be used with foundations such as drilled shafts, large piles, and abutments. Large subsurface structures will provide a better surface for transmitted signals to reflect off and return to the receiver. This method should work best when foundations consist of concrete or steel. Brackish or coastal areas that may have high salinity should avoid the use of Borehole Radar. The borehole must be cased with a PVC casing to avoid signal interference. It should be common practice to perform several tests to check results from the Borehole Radar method.

Borehole Sonic

The Borehole Sonic method should be used for testing on drilled shafts, vertically driven piles, battered piles, and complex foundations. Complex foundations may be considered as any foundation with supplementary piles below the primary or visible supporting structure. Ideal foundation material types for the Borehole Sonic method are steel and concrete. It should be common practice to perform several tests to check results from the Borehole Sonic method.

Cross Hole Sonic

The Cross Hole Sonic method should be applicable for any foundation type and material. Cross Hole Sonic testing may be performed with standard Cross Hole Sonic Logging equipment or a combination of Parallel Seismic and Sonic Echo equipment. It should be common practice to perform several tests to check results from the Cross Hole Sonic method.

Induction Field

The Induction Field method should be used for vertically driven and battered piles only. Ideal foundation material type for Borehole Sonic is steel and heavily reinforced concrete. If induction field is to be used on reinforced concrete, access to steel reinforcing will be required. It should be common practice to perform several tests to check results from the Induction Field method.

Borehole Magnetic

Any foundation type may be acceptable for the Borehole Magnetic method. The foundation in question must have a significant amount of ferrous material (i.e. steel reinforcement) that will yield a significant reading on the magnetometer. Foundations which may qualify for this method of testing include steel piles and most reinforced concrete piles. For this method, it is very important that steel casing not be used due to interference problems. Instead, the borehole may be cased with a non-ferrous material such as PVC. Research on this method is ongoing; therefore, current information regarding this test should be reviewed prior to implementation. It should be common practice to perform several tests to check results from the Borehole Magnetic method.

Cost Estimation for NDT Methods

The cost of NDT testing varies from low to fairly high depending on the existing site requirements. The costs have been divided into several major categories: Maintenance of Traffic (MOT), Required Testing Personnel, Soil Boring Installation, Testing Equipment, Mobilization on Site, and General Lab and Engineering Labor. Costs incurred through purchase of the testing equipment have been amortized over time. Table 7.3 includes a summary for estimating the costs.

Table 7.3: Estimated Costs of NDT Methods

TESTING METHOD	TOTAL COST PER TEST		MOBILIZATION[1]		MOT[2]		TESTING EQUIPMENT[3]		TESTING PERSONEL[4]		SOIL BORINGS AND/OR PROBES[5]		LABORATORY AND ENGINEERING[6]	
	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH
SURFACE NDT METHODS														
SONIC ECHO	$4,500	$11,400	$500	$1,500	$0	$1,000	$500	$900	$1,000	$3,000	$0	$0	$2,500	$5,000
BENDING WAVES	$4,500	$11,400	$500	$1,500	$0	$1,000	$500	$900	$1,000	$3,000	$0	$0	$2,500	$5,000
ULTRA-SEISMIC	$4,600	$11,600	$500	$1,500	$0	$1,000	$600	$1,100	$1,000	$3,000	$0	$0	$2,500	$5,000
SURFACE WAVE SPECTRAL ANALYSIS	$4,500	$11,400	$500	$1,500	$0	$1,000	$500	$900	$1,000	$3,000	$0	$0	$2,500	$5,000
GROUND PENETRATING RADAR	$6,000	$14,000	$500	$1,500	$0	$1,000	$2,000	$3,500	$1,000	$3,000	$0	$0	$2,500	$5,000
DYNAMIC FOUNDATION RESPONSE	$4,500	$11,500	$500	$1,500	$0	$1,000	$500	$1,000	$1,000	$3,000	$0	$0	$2,500	$5,000
SUBSURFACE NDT METHODS														
PARALLEL SEISMIC TEST	$10,000	$22,800	$500	$2,000	$1,000	$2,500	$500	$1,300	$1,000	$3,000	$2,000	$4,000	$5,000	$10,000
BOREHOLE RADAR	$11,500	$25,000	$500	$2,000	$1,000	$2,500	$2,000	$3,500	$1,000	$3,000	$2,000	$4,000	$5,000	$10,000
BOREHOLE SONIC TEST	$10,500	$23,000	$500	$2,000	$1,000	$2,500	$1,000	$1,500	$1,000	$3,000	$2,000	$4,000	$5,000	$10,000
CROSS HOLE SONIC TEST	$12,700	$28,000	$500	$2,000	$1,000	$2,500	$1,200	$2,500	$1,000	$3,000	$4,000	$8,000	$5,000	$10,000
INDUCTION FIELD	$10,000	$22,500	$500	$2,000	$1,000	$2,500	$500	$1,000	$1,000	$3,000	$2,000	$4,000	$5,000	$10,000
BOREHOLE MAGNETIC	$9,800	$22,500	$500	$2,000	$1,000	$2,500	$300	$1,000	$1,000	$3,000	$2,000	$4,000	$5,000	$10,000

NOTES:
1. MOBILIZATION COSTS INCLUDE EQUIPMENT AND PERSONNEL.
2. MOT COSTS ARE FROM 0 TO 9 HOURS.
3. TESTING EQUIPMENT COSTS ARE BASED ON 5% OF THE AVERAGE COST TO PURCHASE TESTING EQUIPMENT.
4. TESTING PERSONNEL COSTS ARE BASED ON 4 TO 9 HOURS OF A FIELD ENGINEER AND TRAINED TECHNICIANS TIME.
5. SOIL BORING AND/OR PROBES COSTS INCLUDE DRILLING, CASING, GROUTING, ETC.
6. LABORATORY AND ENGINEERING ESTIMATES INCLUDE DATA ANALYSIS, COMPUTATIONS AND REPORT PREPARATION WITH RECOMMENDATIONS.

Pay Items

- Maintenance of Traffic
- Mobilization – Includes the following depending on need
  - Truck Drill/Probe Rig Mobilization
  - NDT Equipment
  - Small Amphibious Drill/Probe
  - Support Boat
  - Pavement Coring Equipment
  - Large Barge for Coastal Application (Not Included)
- Drilling/Probing
  - Footage for Borings/Probes Using Truck Mounted Equipment
  - Footage Temporary Casing (if Needed)
  - Grout to Close Boring/Probe Casing When Complete

Predicted Cost of NDT Methods

Cost of Surface NDT

Sonic Echo

The Sonic Echo method will have multiple requirements for operation which should be assessed for cost estimation purposes. These requirements are mobilization, MOT requirements, testing equipment, testing personnel, and engineering analysis. The expected cost of mobilization should include personnel and equipment mobilization. Based on averages throughout the state the typical range of mobilization cost should be $500 - $1,500 per test. MOT for surface NDT methods such as this will generally be fairly low due to the low impact of testing; however, typical costs for MOT should range from $0 - $1,000 per test. The cost of MOT is based on time requirement in the range of 0 – 9 hours per test. Testing equipment can vary depending upon the vendor; however, assuming an amortized cost per test of 5% for the total equipment cost, the cost range per test should be $500 - $900. The total equipment costs were attained through price quotes received from multiple vendors. A field technician and engineer will typically be required at each site. Assuming a duration range of 4 – 9 hours per test, the total cost range for testing personnel per test should be $1,000 - $3,000. After a test is complete, data analysis, computations, and report preparation with recommendations will also have a cost. Time from both mid to upper level engineers typically required at this stage will typically cost $2,500 - $5,000. Adding all of the components involved, the total cost range of testing will be $4,500 - $11,400.

Bending Waves

The Bending Waves method will have the following requirements for operation which should be assessed for cost estimation purposes: mobilization, MOT requirements, testing equipment, testing personnel, and engineering analysis. The expected cost of mobilization should include personnel and equipment mobilization. Based on averages throughout the state the typical range of mobilization cost should be $500 - $1,500 per test. MOT for surface NDT methods such as this will generally be fairly low due to the low impact of testing; however, typically costs for mobilization should range from $0 - $1,000 per test. The cost of MOT is based on time requirement range of 0 – 9 hours per test. Testing equipment can vary considerably depending upon the vendor; however, assuming an amortized cost per test of 5% of the total equipment cost, the cost range per test should be $500 - $900. The total equipment costs were attained through price quotes received from multiple vendors. A field technician and engineer will typically be required at each site. Assuming a duration range of 4 – 9 hours per test, the total cost range for testing personnel per test should be $1,000 - $3,000. After a test is complete, data analysis, computations, and report preparation with recommendations will have an incurred cost. Time from both mid to upper level engineers at this stage will be required which will typically cost $2,500 - $5,000. Adding all of the components involved, the total cost range of testing will be $4,500 - $11,400.

Ultra-Seismic

The Ultra-Seismic method will have multiple requirements for operation which should be assessed for cost estimation purposes. These requirements are mobilization, MOT requirements, testing equipment, testing personnel, and engineering analysis. The expected cost of mobilization should include personnel and equipment mobilization. Based on averages throughout the state the typical range of mobilization cost should be $500 - $1,500 per test. MOT for surface NDT methods such as this will generally be fairly low due to the low impact of testing; however, typically costs should range from $0 - $1,000 per test. The cost of MOT is based on time requirement range of 0 – 9 hours per test. Testing equipment can be considerably expensive depending upon the vendor; however, assuming an amortized cost per test of 5% of the total equipment cost, the cost range per test should be $600 - $1,100. The total equipment costs were attained through price quotes received from multiple vendors. A field technician and engineer will typically be required at each site. Assuming a duration range of 4 – 9 hours per test, the total cost range for testing personnel per test should be $1,000 - $3,000. After a test is complete, data analysis, computations, and report preparation with recommendations will have an incurred cost. Time from both mid to upper level engineers required at this stage will typically cost $2,500 - $5,000. Adding all of the components involved; the total cost range of testing will be $4,600 - $11,600.

Surface Wave Spectral Analysis

The Surface Wave Spectral Analysis method will have the following requirements for operation which should be assessed for proper cost estimation purposes: mobilization, MOT requirements, testing equipment, testing personnel, and engineering analysis. The expected cost of mobilization should include personnel and equipment mobilization. Based on averages throughout the state the typical range of mobilization cost should be $500 - $1,500 per test. MOT for surface NDT methods such as this will generally be fairly low due to the low impact of testing; however, typically costs should range from $0 - $1,000 per test. The cost of MOT is based on time requirement range of 0 – 9 hours per test. Testing equipment can be considerably expensive depending upon the vendor; however, assuming an amortized cost per test of 5% of the total equipment cost, the cost range per test should be $500 - $900. The total equipment costs were attained through price quotes received from multiple vendors. A field technician and engineer will typically be required at each site. Assuming a duration range of 4 – 9 hours per test, the total cost range for testing personnel per test should be $1,000 - $3,000. After a test is complete, data analysis, computations, and report preparation with recommendations will have an incurred cost. Time from both mid to upper level engineers at this stage will be typically $2,500 - $5,000. Adding all of the components involved; the total cost range of testing will be $4,500 - $11,400.

Ground Penetrating Radar

The Ground Penetrating Radar method will have the following requirements for operation which should be assessed for the cost estimation. These requirements are mobilization, MOT requirements, testing equipment, testing personnel, and engineering analysis. The expected cost of mobilization should include personnel and equipment mobilization. Based on averages throughout the state the typical range of mobilization cost should be $500 - $1,500 per test. MOT for surface NDT methods such as this will generally be fairly low due to the low impact of testing; however, typically costs should range from $0 - $1,000 per test. The cost of MOT is based on time requirement range of 0 – 9 hours per test. Testing equipment can be considerably expensive depending upon the vendor; however, assuming an amortized cost per test of 5% of the total equipment cost, the cost range per test should be $2,000 - $3,500. The total equipment costs were attained through price quotes received from multiple vendors. A field technician and engineer will typically be required at each site. Assuming a duration range of 4 – 9 hours per test, the total cost range for testing personnel per test should be $1,000 - $3,000. After a test is complete, data analysis, computations, and report preparation with recommendations will have an incurred cost. Time from both mid to upper level engineers at this stage will typically cost $2,500 - $5,000. Adding all of the components involved; the total cost range of testing will be $6,000 - $14,000.

Dynamic Foundation Response

The Dynamic Foundation Response method will have the following requirements for operation which should be assessed for accurate cost estimation purposes: mobilization, MOT requirements, testing equipment, testing personnel, and engineering analysis. The expected cost of mobilization should include personnel and equipment mobilization. Based on averages throughout the state the typical range of mobilization cost should be $500 - $1,500 per test. MOT for surface NDT methods such as this will generally be fairly low due to the low impact of testing; however, typically costs should range from $0 - $1,000 per test. The cost of MOT is based on time requirement range of 0 – 9 hours per test. Testing equipment costs can vary depending upon the vendor; however, assuming an amortized cost per test of 5% of the total equipment cost, the cost range per test should be $500 - $1,000. The total equipment costs were attained through price quotes received from multiple vendors. A field technician and engineer will typically be required at each site. Assuming a duration range of 4 – 9 hours per test, the total cost range for testing personnel per test should be $1,000 - $3,000. After a test is complete, data analysis, computations, and report preparation with recommendations will have an incurred cost. Time from both mid to upper level engineers required at this stage will be typically cost $2,500 - $5,000. Adding all of the components involved, the total cost range of testing will be $4,500 - $11,500.

Cost of Subsurface NDT

Parallel Seismic with Hydrophone or Geophone

The Parallel Seismic method will have the following requirements for operation which should be assessed for accurate cost estimation purposes. These requirements are mobilization, MOT requirements, testing equipment, testing personnel, installation of a soil boring or probe, and engineering analysis. The expected cost of mobilization should include personnel and equipment mobilization. Based on averages throughout the state the typical range of mobilization cost should be $500 - $2,000 per test. Cost of MOT for subsurface NDT methods such as this will typically range from $1,000 - $2,500 per test. The cost of MOT is based on time requirement range of 0 – 9 hours per test. Testing equipment can be considerably expensive depending upon the vendor; however, assuming an amortized cost per test of 5% of the total equipment cost, the cost range per test should be $500 - $1,300. The total equipment costs were attained through price quotes received from multiple vendors. A field technician and engineer will typically be required at each site. Assuming a duration range of 4 – 9 hours per test, the total cost range for testing personnel per test should be $1,000 - $3,000. Installation of a soil boring and/or probe will typically cost $2,000 - $4,000 per test location. The installation of soil boring and/or probe includes drilling, casing, grouting, etc. After a test is complete, data analysis, computations, and report preparation with recommendations will have an incurred cost. Soil samples may be collected during the installation of the boring to determine data regarding soil strata layers. The cost range of both laboratory testing and engineering services will typically cost $5,000 - $10,000. Adding all of the components involved, the total cost range of testing will be $10,000 - $22,800.

Borehole Radar

The Borehole Radar method will have the following requirements for operation which should be assessed for accurate cost estimation: mobilization, MOT requirements, testing equipment, testing personnel, soil boring and/or probe installation, and engineering analysis. The expected cost of mobilization should include personnel and equipment mobilization. Based on averages throughout the state the typical range of mobilization cost should be $500 - $2,000 per test. Cost of MOT for subsurface NDT methods such as this will typically range from $1,000 - $2,500 per test. The cost of MOT is based on time requirement range of 0 – 9 hours per test. Testing equipment can be considerably expensive depending upon the vendor; however, assuming an amortized cost per test of 5% of the total equipment cost, the cost range per test should be $2,000 - $3,500. The total equipment costs were attained through price quotes received from multiple vendors. A field technician and engineer will typically be required at each site. Assuming a duration range of 4 – 9 hours per test, the total cost range for testing personnel per test should be $1,000 - $3,000. Installation of a soil boring and/or probe will typically cost $2,000 - $4,000 per test location. The installation of soil boring and/or probe includes drilling, casing, grouting, etc. After a test is complete, data analysis, computations, and report preparation with recommendations will have an incurred cost. Soil samples may be collected during the installation of the boring to determine data regarding soil strata layers. The cost range of both laboratory and final engineering services will typically cost $5,000 - $10,000. Adding all of the components involved, the total cost range of testing will be $11,500 - $25,000.

Borehole Sonic

The Borehole Sonic method will have the following requirements for operation which should be assessed for accurate cost estimation: mobilization, MOT requirements, testing equipment, testing personnel, soil boring and/or probe installation, and engineering analysis. The expected cost of mobilization should include personnel and equipment mobilization. Based on averages throughout the state the typical range of mobilization cost should be $500 - $2,000 per test. Cost of MOT for subsurface NDT methods such as this will typically range from $1,000 - $2,500 per test. The cost of MOT is based on time requirement range of 0 – 9 hours per test. Testing equipment can be considerably expensive depending upon the vendor; however, assuming an amortized cost per test of 5% of the total equipment cost, the cost range per test should be $1,000 - $1,500. The total equipment costs were attained through price quotes received from multiple vendors. A field technician and engineer will typically be required at each site. Assuming a duration range of 4 – 9 hours per test, the total cost range for testing personnel per test should be $1,000 - $3,000. Installation of a soil boring and/or probe will typically cost $2,000 - $4,000 per test location. The installation of soil boring and/or probe includes drilling, casing, grouting, etc. After a test is complete, data analysis, computations, and report preparation with recommendations will have an incurred cost. Soil samples may be collected during the installation of the boring to determine data regarding soil strata layers. The cost range of both laboratory and final engineering services will typically cost $5,000 - $10,000. Adding all of the components involved; the total cost range of testing will be $10,500 - $23,000.

Cross Hole Sonic

The Cross Hole Sonic method will have the following requirements for operation which should be assessed for accurate cost estimation: mobilization, MOT requirements, testing equipment, testing personnel, soil boring and/or probe installation, and engineering analysis. The expected cost of mobilization should include personnel and equipment mobilization. Based on averages throughout the state the typical range of mobilization cost should be $500 - $2,000 per test. Cost of MOT for subsurface NDT methods such as this will typically range from $1,000 - $2,500 per test. The cost of MOT is based on time requirement range of 0 – 9 hours per test. Testing equipment can be considerably expensive depending upon the vendor; however, assuming an amortized cost per test of 5% of the total equipment cost, the cost range per test should be $1,200 - $2,500. The total equipment costs were attained through price quotes received from multiple vendors. A field technician and engineer will typically be required at each site. Assuming a duration range of 4 – 9 hours per test; the total cost range for testing personnel per test should be $1,000 - $3,000. Installation of two soil borings and/or probe will typically cost $4,000 - $8,000 per test location. The installation of soil boring and/or probe includes drilling, casing, grouting, etc. After a test is complete, data analysis, computations, and report preparation with recommendations will have an incurred cost. Soil samples may be collected during the installation of the boring to determine data regarding soil strata layers. The cost range of both laboratory and final engineering services will typically cost $5,000 - $10,000. Adding all of the components involved; the total cost range of testing will be $12,700 - $28,000.

Induction Field

The Induction Field method will have the following requirements for operation which should be assessed for accurate cost estimation: mobilization, MOT requirements, testing equipment, testing personnel, soil boring and/or probe installation, and engineering analysis. The expected cost of mobilization should include personnel and equipment mobilization. Based on averages throughout the state the typical range of mobilization cost should be $500 - $2,000 per test. Cost of MOT for subsurface NDT methods such as this will typically range from $1,000 - $2,500 per test. The cost of MOT is based on time requirement range of 0 – 9 hours per test. Testing equipment can be considerably expensive depending upon the vendor; however, assuming an amortized cost per test of 5% of the total equipment cost, the cost range per test should be $500 - $1,000. The total equipment costs were attained through price quotes received from multiple vendors. A field technician and engineer will typically be required at each site. Assuming a duration range of 4 – 9 hours per test; the total cost range for testing personnel per test should be $1,000 - $3,000. Installation of a soil boring and/or probe will typically cost $2,000 - $4,000 per test location. The installation of soil boring and/or probe includes drilling, casing, grouting, etc. After a test is complete, data analysis, computations, and report preparation with recommendations will have an incurred cost. Soil samples may be collected during the installation of the boring to determine data regarding soil strata layers. The cost range of both laboratory and final engineering services will typically cost $5,000 - $10,000. Adding all of the components involved; the total cost range of testing will be $10,000 - $22,500.

Borehole Magnetic

The Borehole Magnetic method will have the following requirements for operation which should be assessed for accurate cost estimation: mobilization, MOT requirements, testing equipment, testing personnel, soil boring and/or probe installation, and engineering analysis. The expected cost of mobilization should include personnel and equipment mobilization. Based on averages throughout the state the typical range of mobilization cost should be $500 - $2,000 per test. Cost of MOT for subsurface NDT methods such as this will typically range from $1,000 - $2,500 per test. The cost of MOT is based on time requirement range of 0 – 9 hours per test. Testing equipment can be considerably expensive depending upon the vendor; however, assuming an amortized cost per test of 5% of the total equipment cost, the cost range per test should be $300 - $1,000. The total equipment costs were attained through price quotes received from multiple vendors. A field technician and engineer will typically be required at each site. Assuming a duration range of 4 – 9 hours per test; the total cost range for testing personnel per test should be $1,000 - $3,000. Installation of a soil boring and/or probe will typically cost $2,000 - $4,000 per test location. The installation of soil boring and/or probe includes drilling, casing, grouting, etc. After a test is complete, data analysis, computations, and report preparation with recommendations will have an incurred cost. Soil samples may be collected during the installation of the boring to determine data regarding soil strata layers. The cost range of both laboratory and final engineering services will typically cost $5,000 - $10,000. Adding all of the components involved, the total cost range of testing will be $9,800 - $22,500.

NDT Recommendations

Recommendations for the selection of the appropriate NDT method are shown in the flow chart provided in Figure 7.25.

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Section 8: Unknown Foundation Process Example

Example 1

The first example is based on Bridge No. 544061, C.R. 257A over the Aucilla River in Jefferson County.

Step One

Gather data regarding the bridge. This bridge has some available information, including Pile Driving Records and Scour Evaluation Reports through Phase 4. According to the Scour Evaluation Reports, the plans for this bridge were not found. The plans are not likely to be found with additional effort. In order to test the unknown foundations procedures, the bridge will be treated as if the information provided in the Scour Reports and Pile Driving Records were not available.

Step Two

Verify if scour was considered during the design of the structure. As the bridge was built in 1984, scour would not have been considered for design, as this requirement was not added to the design criteria until 1991. Therefore, even if plans were available, a Pile Data Table would not be present.

Step Three

Determine the foundation dimensions from as-built information. Assuming that the pile driving records are missing, as-built information would not be available to determine the dimensions of the bridge foundations, as a result, step four of the unknown foundations procedure should be completed.

The first step in risk screening would be to determine the annual and lifetime risks of failure. The *Procedural Manual: Reclassify Unknown Foundation Bridges* provides the unadjusted annual and lifetime risks, many of the calculations have been completed. Since this bridge is not an unknown foundation bridge, we need to perform all of the calculations for the risk. The data required for the calculations are summarized in Table 8.1.

Table 8.1: Data Required to Calculate the Risk of Failure for Bridge No. 544061

Bridge Number	Bypass Length (miles)	Functional Class	ADT	Structure Type	Length (ft)	Width (ft)	Substructure Rating	Channel Rating
544061	42.25	7	463	501	175.9	34.78	7	4

Waterway Adequacy	Truck Percentage	Maximum Span Length
8	5	29.2

Using the PONTIS data and the methods discussed in Section 2.0 of the *Procedural Manual: Reclassify Unknown Foundation Bridges*, the bridge replacement cost, detour cost, loss of life cost, and the total cost of failure can be estimated as shown in Table 8.2 below. These costs are given for unknown foundation bridges in Appendix A of the *Procedural Manual: Reclassify Unknown Foundation Bridges* in Florida, therefore they do not need to be recalculated during the evaluation process. However, they should be checked for reasonableness during the process. Also, some of the bridges have NA shown for the detour cost because either the detour exceeds 199 kilometers or the bridge provides the only vehicle access to an area. A detour cost must be determined for bridges with NA.

Table 8.2: Values Associated with Failure Costs for Bridge No. 544061

Bridge Unit Cost per ft^2	Replacement Multiplier	Duration	Lives	Bridge Replacement Cost	Detour Cost	Loss of Life Cost	Total Cost of Failure
145	1.1	292	1	$975,442	$3,692,326	$580,000	$5,247,768

Next, the annual and lifetime risks of failure need to be determined. The unadjusted risk values for all unknown foundation bridges in Florida are given in Appendix A of the *Procedural Manual: Reclassify Unknown Foundation Bridges*. The risk of failure may need to be adjusted for three reasons:

1. NA is shown for the detour cost
2. The bridge is tidally influenced, and the probability of failure needs to be adjusted based on the tidal influence
3. The risk adjustment factors, K_1 and K_2, as defined in Section 2.0

K_1 is given in Appendix A of the *Procedural Manual: Reclassify Unknown Foundation Bridges*. K_2 must be determined from the definition given in Section 2.0 of the *Procedural Manual: Reclassify Unknown Foundation Bridges*. Table 8.3 shows unadjusted annual and lifetime risk for this bridge.

Table 8.3: Unadjusted Annual and Lifetime Risks for Bridge No. 544061

Scour Vulnerability	Overtopping Frequency	Annual Probability of Failure	Annual Unadjusted Risk	Remaining Life	Lifetime Probability of Failure	Unadjusted Lifetime Risk
5	S	0.000	$17.84	50	0.000	$892.05

Adjustments are not needed for the detour cost or tidal conditions. K_1 is 1.0 because the superstructure does not have spans greater than 100 feet and is not continuous. K_2 is 0.8 because the bridge is supported by piles with unknown length. Therefore, the annual risk and the lifetime risk are $14.27 and $713.64, respectively.

This bridge is not a High Priority bridge because the route is not a principal arterial nor is it a critical route. The minimum performance level (MPL) is 0.0005 from Table 1.4 in the *Procedural Manual: Reclassify Unknown Foundation Bridges*. The annual probability of failure for this bridge is much less than MPL, therefore the bridge meets the minimum performance level. Also, the lifetime risk of failure is less than $15,000. The bridge can be considered a relatively low risk bridge based on the following three factors:

1. The bridge is not a High Priority bridge
2. The annual risk of failure is less than the MPL
3. The lifetime risk of failure is less than $15,000

In the proposed unknown foundations process, a Plan of Action would be prepared, including a bridge closure plan. However, for this example an assumption was made that the bridge did not pass one of the three criteria cited above, and the pile embedment was determined using the PLOAD program, reverse engineering, and an SPT boring. It will also be assumed that Phase 2 and 3 Scour Evaluations will also be necessary.

This bridge is a concrete slab bridge founded on pile bents with four precast prestressed piles per bent. The outer two piles are battered at a rate of 0.125 inches per foot. From the existing Phase 2 Scour Evaluation, completed in October 1996, the anticipated 100-year scour at this site is 10.7 ft with a stream velocity of 11.7 feet per second.

All pile load calculations were conducted using field measurements gathered for the Phase 3 Scour Evaluation, completed in April 1998. The pile load was calculated to be 48.3 Tons. The pile driving records for this bridge are available and noted a required bearing of 45 Tons. The PLOAD program calculated a pile load of 41 Tons.

The various predicted embedment depths for this bridge are shown in Table 8.4.

Table 8.4: Predicted Embedment Depths (feet) for Bridge No. 544061

SPT Boring (calculated load)	Standard Curve (calculated load)	SPT Boring (design load)	Standard Curve (design load)	ANN Average Bent	ANN Minimum Bent	ANN Average Boring	ANN Minimum Boring
24	21	24	19	27.8	23	19.3	19.2

The actual minimum pile embedment on the bridge is 23.2 ft.

A lateral stability analysis was conducted utilizing the FB-Pier parameters provided in the Phase 3 Scour Evaluation. The analysis was conducted utilizing a pile embedment of 19 ft, and the model converged, indicating that the bent is stable. At this point the bridge could be reclassified as low risk. The existing Phase 3 Scour Report indicates that the bridge is Scour Critical, however. This is due to a cracking check of the concrete piles during the scour event. Discussions with the FDOT led to the conclusion that this check was unnecessary as the 100-year scour is an extreme event condition, and pile cracking is a serviceability issue.

Calculations for the determination of the pile load and the lateral stability analysis are available in Appendix H.

Example 2

The second example is based on Bridge No. 534171, Dock Road over Little Dry Creek in Jackson County. The first step is to gather data regarding the bridge. This bridge has some available information, including Pile Driving Records and Scour Evaluation Reports through Phase 4. The plans are not likely to be found with additional effort. In order to test the unknown foundations procedures, the bridge will be treated as if the foundation information was not available.

Following the same process as described for the first example, the following information can be determined, see Table 8.5:

Table 8.5: Failure Risks and Costs for Bridge No. 534171

Bridge Number	Bypass Length (miles)	Functional Class	ADT	Structure Type	Length (ft)	Width (ft)	Sub-structure Rating	Channel Rating
534171	3.11	9	50	501	45.6	20.34	8	7

Waterway Adequacy	Truck Percentage	Maximum Span Length
7	0	12.5

Bridge Unit Cost per ft²	Replace-ment Multiplier	Duration	Lives	Bridge Replacement Cost	Detour Cost	Loss of Life Cost	Total Cost of Failure
145	1	365	0	$134,507	$32,319	$0	$166,826

Scour Vulner-ability	Over-topping Frequency	Annual Probability of Failure	Annual Unadjusted Risk	Remaining Life	Lifetime Probability of Failure	Unadjusted Lifetime Risk
7	S	0.000	$18.35	64	0.007	$1,170.39

Adjustments are not needed for the detour cost or tidal conditions. K_1 is 1.0 because the superstructure does not have spans greater than 100 feet and is not continuous. K_2 is 0.8 because the bridge is supported by piles with unknown length. Therefore, the annual risk and the lifetime risk are $14.68 and $936.31, respectively.

This bridge is not a high priority bridge because the route is not a principal arterial nor is it a critical route. The minimum performance level (MPL) is 0.002 from Table 1.4 in the *Procedural Manual: Reclassify Unknown Foundation Bridges*. The annual probability of failure for this bridge is less than MPL, therefore the bridge meets the minimum performance level. Also, the lifetime risk of failure is less than $15,000. Therefore, the bridge can be considered a relatively low risk bridge. In the proposed unknown foundations process, a Plan of Action would be prepared, including a bridge closure plan. However, for this example the assumption will be made that the bridge did not pass one of the three criteria cited above.

Bridge No. 534171 is entirely constructed of timber, including timber pile caps founded on five round timber piles per bent. None of the piles are battered. From the Phase 2 Scour Evaluation, completed in November 2000 the anticipated 100-year scour at this site is 7.8 ft with a stream velocity of 6.0 feet per second.

There are no plans available for this bridge. Pile load calculations were completed using a combination of field measurements taken for the Phase 3 Scour Report dated January 2001 and for a recent inspection report, dated December 2007. The pile load was calculated to be approximately nine tons. There is no information included in the data received with this bridge to indicate the actual design pile load.

As this is a timber pile bridge, the CPILE program is not useful in determining a pile embedment. Also as the spans are less than 15 feet in length, the PLOAD program is not particularly useful in determining a pile load. Therefore, reverse engineering in conjunction with the standard (N=15) and SPT boring capacity curves were used to determine pile embedment. These two depths are shown in Table 8.6.

Table 8.6: Predicted Embedment Depths (feet) for Bridge No. 534171

SPT Boring (Calculated load)	Standard Curve (Calculated load)
14	11

From the Phase 3 Scour Evaluation completed in 2001, the actual minimum pile embedment on the bridge is 11.4 ft.

A lateral stability analysis was conducted utilizing the FB-Pier parameters provided in the Phase 3 Scour Evaluation. The analysis was initially conducted using an initial pile embedment of 11 ft. The FB-Pier model converged, indicating that the bent is stable. A pile capacity check shows that the piles do not exceed their capacity under the applied loadings. This bridge would be classified as low risk. The existing Phase 3 Scour Evaluation indicates that this structure is Scour Critical. This is due to the scour at the end bent, which has not been considered for this Pilot Study. In the case of this structure, however, evaluating the scour at the end bent may have merit as the abutment piles are driven into the stream bottom, rather than through berm, which is generally the case.

Calculations for the determination of pile load and the lateral stability analysis are available in Appendix I.

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Appendix A

The following items are included in Appendix A:

- FHWA memo
- Meeting minutes

FHWA Memo

U.S. Department of Transportation
Federal Highway Administration

Memorandum

Subject: **ACTION**: Technical Guidance for Bridges over Waterways with Unknown Foundations

Date: January 9, 2008

/s/ Original Signed by

From: King W. Gee
Associate Administrator for Infrastructure

In Reply Refer To: HIBT-20

To: Associate Administrator for RD&T
Associate Administrator for
Federal Lands Highway Program
Directors of Field Services
Resource Center Director
Division Administrators

The purpose of this memorandum is to provide technical guidance on a process that should be considered by Federal, State and local agencies (referenced herein as bridge owners) to identify foundation characteristics such as width, depth and length for bridge foundations identified as unknown. The goal of this process is to reduce or eliminate the population of bridges over waterways identified as having unknown foundations, which in turn would allow bridge owners to evaluate these bridges for their scour vulnerability.

Background:

The term "unknown foundations" has been traditionally associated with examining the population of existing bridges over waterways (riverine and tidal) where foundation details are unknown and therefore, foundations could not be evaluated against the hydraulic hazards related to scour. Most of the bridges having unknown foundations were identified by owners while screening their bridges over waterways (riverine and tidal) for their scour vulnerability. These bridges received a Code U for Item 113 of the FHWA's Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges (Coding Guide).

The FHWA exempted this population of bridges from being evaluated for their scour vulnerability due to the lack of a process and guidance that would have allowed bridge owners to determine their foundation characteristics and therefore, evaluate these bridges. This exemption did not apply to bridges on Interstate designated routes for which FHWA recommended bridge owners to consider technology available to determine their foundation characteristics and evaluate their scour vulnerability. The use of geophysics technology such as non-destructive testing (NDT) has been available for quite some time; however, cost and reliability of results may be the leading reason for their limited use for determining foundation characteristics.

MOVING THE AMERICAN ECONOMY

The National Bridge Inspection Standards (NBIS) regulation, 23 CFR 650.313.e.3, requires that bridge owners develop a plan of action (POA) for bridges identified as scour critical bridges. We are concerned that some bridges within the unknown foundation population may be scour critical and as such need to have a POA as required by the NBIS regulation.

An additional growing concern, primarily related to our aging bridge population and increasing load and performance demand on all bridges, is our limited "body of knowledge" to assess the structural and geotechnical load capacity and deterioration mechanisms of foundation elements in both the short and long-term. When examining the "body of knowledge" from a broader view point, a more global definition of unknown foundations appears to be appropriate as we have to consider the potential of having another population of unknown foundations on land bridges currently reported in the Coding Guide. In general, the topic of unknown foundations presents a broad based challenge to bridge owners, which warrants FHWA's attention.

Status of Bridges with Unknown Foundations:

As of September 2007, the National Bridge Inventory (NBI) data showed that bridge owners reported 67,240 bridges over waterways as having unknown foundations. Table 1 presents the number of bridges over waterways on the National Highway System (NHS) and the non-NHS with unknown foundations by Federal, State and local agencies. It is important to highlight that the NHS population of unknown foundation bridges presented in Table 1 includes 144 bridges with Interstate designation. The number of bridges over waterways having unknown foundations is presented by bridge owner in Attachment A.

Table 1 – Number of Bridges over Waterways Coded U (Unknown Foundations) for Item 113 of the NBI

Agency	NHS	Non-NHS	Total
Federal	0	238	238
State	1,155*	12,864	14,019
Local	324	52,577	52,901
Other Bridge Owners	2	80	82
Total	1,481	65,759	67,240

* Includes 144 bridges with Interstate designation

Guidance on Process for Reducing the Number of Bridges with Unknown Foundations:

The following steps outline a process developed by the FHWA Office of Bridge Technology's Hydraulics and Geotechnical Team that bridge owners may consider to reduce or eliminate the population of bridges over waterways identify as having unknown foundations:

1. Screen all bridges coded U to ensure that they are correctly coded as having unknown foundations. In addition, bridges with unknown foundations that may have been coded 6 for

Item 113 should be recoded as U and undergo a screening as well. Bridge owners that assigned a Code 6 to Interstate bridges with unknown foundations based on the current definition of Code U should keep these bridges with a Code 6 and follow the guidance presented in this process. Direct and specific communication between bridge inspection and bridge design and construction units should expedite and improve the results of this activity.

- Most bridge owners may have some form of historical technical inventory of project plans, standard sheets, construction specifications, and design guidance. A concerted effort to "mine" this historical data by cross referencing coded U bridges construction dates should yield valuable preliminary information regarding foundation practices in that period. This information could also be coupled with knowledge on bridges with known foundations constructed in the same time period. Similar to current foundation practices, historical practices were very repetitive and rather simple in concept.

2. For bridges over waterways that are determined to be correctly identified as having unknown foundations:

- Prioritize these bridges based on their functional classification. We recommend that this prioritization be as follows: Principal Arterial – Interstate; Principal Arterial – Other Freeways or Expressways; Other Principal Arterial; Minor Arterial, Major Collector; Minor Collector.

- Consider using the following criteria for determining, with a reasonable accuracy, foundation characteristics:
  a) Collect and document historical knowledge of foundation design and construction practices for the period of original construction.
  b) Consider geologic, subsurface conditions, bridge standards, and information that may be available from nearby bridges.
  c) Consider applying "proven" surface and subsurface NDT tools to confirm foundation type and determine foundation length.
     1. NCHRP 21-05(2) "Determination of Unknown Subsurface Bridge Foundations" specifically examined NDT tools for the application. The unedited final report and accompanying guideline document can be obtained for loan by contacting NCHRP at NCHRP@nas.edu. More information on this project is available at http://www.trb.org/TRBNet/ProjectDisplay.asp?ProjectID=667.
        a) Pertinent results of this study are summarized in FHWA's Geotechnical Notebook Issuance No. 16 (GT-16) of the same title, which is available at http://www.fhwa.dot.gov/engineering/geotech/policymemo/gt-16.pdf.
        b) Since the completion of project NCHRP 21-05(2) further advancements in computer software and hardware have greatly advanced to provide improved result reliability. The current state of knowledge is such that the combined suite of surface and subsurface NDT tools has limitations based on foundation access (surface or down-hole) foundation material type and dimension and the best results require the user to consider each situation for undertaking a testing program.

- Conduct a scour evaluation based on this determination and consider recoding the bridge for Item 113 according to the outcome of the evaluation.

a) A risk-based prioritized schedule for conducting the scour evaluations of these bridges may be considered.
   1. Factors other than functional classification, such as the amount and reliability of the determined information should be considered in a risk-based prioritization schedule in order to target the scour evaluation of the bridges most in need of attention.
   2. It is likely that only partial foundation information may be determined on some bridges and that some information may be qualitative rather than quantitative resulting in some uncertainty in the scour evaluations for that population.
   3. Several projects funded by the NCHRP have addressed the topic of unknown foundations and produced valuable though limited information and guidance. The concept of a risk based approach was addressed in the NCHRP project 24-25, Risk-based Management Guidelines for Scour at Bridges with Unknown Foundations (Web-only document 107). This project advanced a template for a risk-based approach and computer software. While this project might not meet the needs of all bridge owners, it provides a protocol of how a risk-based approach could be structured to manage bridges with unknown foundations. We encourage bridge owners to consider this product as a beginning draft to develop their own risk based approach. The Web-only document 107 could be downloaded at: http://www.trb.org/news/blurb_detail.asp?id=8000.

3. For bridges that were previously coded as U for Item 113 of the NBI and whose foundations are completely and accurately identified after completing the screening:

- Conduct scour evaluations following the guidance presented in the FHWA publication Hydraulic Engineering Circular No. 18, Evaluating Scour at Highway Bridges, Fourth Edition dated May 2001.
  a) Prioritize the scour evaluation of these bridges based on the functional classification previously recommended.

- Code Item 113 according to the outcome of the evaluation.

We request that your appropriate staff disseminate and discuss this technical guidance with their appropriate Federal and State department of transportation management official. We plan to monitor the progress made by bridge owners towards reducing their number of bridges with unknown foundations by reviewing the NBI data every year in April. November 2010 is the target date for eliminating the number of bridges with unknown foundations from the NBI. We are contemplating amending the NBIS regulations so that any remaining bridge reported as having unknown foundations after November 2010 would be kept with a Code U for Item 113, considered scour critical and subject to the plan of action requirement of the NBIS regulation, 23 CFR 650.313(e)(3), until properly designed countermeasures are installed to protect the bridge foundations or until the bridge is replaced.

If you have any questions please do not hesitate to contact Mr. Jorge E. Pagán-Ortiz, Principal Bridge Engineer – Hydraulics at (202) 366-4604 (jorge.pagan@dot.gov), or Jerry DiMaggio, Principal Bridge Engineer – Geotechnical at (202) 366-1569 (jerome.dimaggio@dot.gov).

Attachment

Attachment A

Number of State, Local and Other Bridge Owner Bridges Coded U (Unknown Foundations) for Item 113

	State		Local		Other Bridge Owners			
	NHS	NNHS	NHS	NNHS	NHS	NNHS	Interstate*	Total
AL	67	159	4	3,419	0	0	0	3,649
AK	33	65	0	45	0	0	8	143
AZ	0	0	0	87	0	0	0	87
AR	7	909	0	3,478	0	0	0	4,394
CA	30	122	0	1,694	0	0	4	1,846
CO	10	24	0	1	0	0	2	35
CT	0	0	0	0	0	0	0	0
DE	0	0	0	0	0	0	0	0
DC	3	3	0	1	0	0	1	7
FL	122	280	12	2,018	0	7	13	2,439
GA	429	1,087	4	3,804	0	0	3	5,324
HI	0	0	2	5	0	3	0	10
ID	2	9	0	480	0	1	0	492
IL	0	1	0	0	0	0	0	1
IN	0	9	0	1,350	0	1	0	1,360
IA	0	0	0	3,073	0	17	0	3,090
KS	1	26	0	13	0	0	0	40
KY	0	1	0	3	0	0	0	4
LA	18	1,465	5	3,444	0	11	7	4,943
ME	12	41	0	50	0	1	10	104
MD	8	35	2	311	0	0	9	356
MA	27	51	6	271	0	0	2	355
MI	53	60	2	549	0	0	7	664
MN	0	6	0	183	0	4	0	193
MS	15	102	0	6,291	0	5	0	6,413
MO	0	2	0	0	0	0	0	2
MT	3	7	0	1,667	0	0	2	1,677
NE	1	26	0	3,183	0	0	0	3,210
NV	1	3	0	35	0	4	0	43
NH	0	7	1	28	0	0	0	36
NJ	8	4	0	73	0	1	0	86
NM	13	101	4	296	0	0	1	414
NY	1	0	2	34	0	1	0	38
NC	38	4,943	0	246	0	0	0	5,227
ND	0	5	0	1,936	0	0	0	1,941
OH	6	6	4	321	0	0	4	337
OK	10	6	0	11	0	0	1	27
OR	75	121	2	1,635	0	5	20	1,838
PA	11	30	0	5	0	4	5	50
RI	0	6	0	1	0	0	0	7
SC	82	2,615	0	709	0	0	27	3,406
SD	0	0	0	0	0	0	0	0
TN	14	114	0	973	0	0	4	1,101
TX	30	253	258	8,468	2	14	5	9,025
UT	2	6	0	8	0	0	0	16
VT	1	22	2	216	0	0	0	241
VA	0	0	0	0	0	0	0	0
WA	1	1	12	201	0	0	1	215
WV	0	0	0	0	0	0	0	0
WI	18	34	2	1,546	0	1	5	1,601
WY	0	8	0	393	0	0	0	401
PR	3	89	0	22	0	0	3	114
TOTALS	1,155	12,864	324	52,577	2	80	144	67,002

* Included under State NHS

Attachment A

Federal Bridges Coded U (Unknown Foundations) for Item 113

	NHS Fed	Non NHS Fed	All Fed
ALABAMA	0	0	0
ALASKA	0	2	2
ARIZONA	0	0	0
ARKANSAS	0	2	2
CALIFORNIA	0	4	4
COLORADO	0	13	13
CONNECTICUT	0	0	0
DELAWARE	0	0	0
DIST. OF COL.	0	5	5
FLORIDA	0	30	30
GEORGIA	0	6	6
HAWAII	0	0	0
IDAHO	0	0	0
ILLINOIS	0	1	1
INDIANA	0	0	0
IOWA	0	5	5
KANSAS	0	7	7
KENTUCKY	0	0	0
LOUISIANA	0	0	0
MAINE	0	0	0
MARYLAND	0	7	7
MASSACHUSETTS	0	0	0
MICHIGAN	0	1	1
MINNESOTA	0	0	0
MISSISSIPPI	0	69	69
MISSOURI	0	1	1
MONTANA	0	1	1
NEBRASKA	0	1	1
NEVADA	0	0	0
NEW HAMPSHIRE	0	0	0
NEW JERSEY	0	4	4
NEW MEXICO	0	1	1
NEW YORK	0	4	4
NORTH CAROLINA	0	12	12
NORTH DAKOTA	0	1	1
OHIO	0	0	0
OKLAHOMA	0	1	1
OREGON	0	1	1
PENNSYLVANIA	0	6	6
RHODE ISLAND	0	0	0
SOUTH CAROLINA	0	0	0
SOUTH DAKOTA	0	0	0
TENNESSEE	0	4	4
TEXAS	0	23	23
UTAH	0	1	1
VERMONT	0	0	0
VIRGINIA	0	13	13
WASHINGTON	0	6	6
WEST VIRGINIA	0	0	0
WISCONSIN	0	3	3
WYOMING	0	3	3
PUERTO RICO	0	0	0
TOTALS	0	238	238

Meeting Minutes

We began the 2nd day of the workshop discussing the importance of having a solid problem definition. It has been said that: A problem well defined is a problem half solved! With this in mind, we came up with the following problem definition:

Problem Definition
Develop the methods or approaches to resolve unknown foundations into either a low risk or a scour critical category for bridges over water by 11/2010.

The desired **outcome** of our two day workshop was to develop a Scope of Work for the Pilot Study keeping in mind that the Pilot Study is to be completed by June 2009! The draft scope will then be shared with all participants and then finalized. This final scope will then become the basis for a fee proposal from Jacobs for the pilot study. With this in mind we began the workshop portion by brainstorming the potential methods we may use to further determine whether an unknown bridge foundation is "**Low Risk**", "**Scour Susceptible**" or "**Scour Critical**". The potential methods were:

Potential Methods

1. Scour design verified - some bridges already have a scour design and therefore we should use it as a factor in our analysis.
2. Statistical distribution in categories
   - Watershed groupings
   - Structural Categories
   - Soils Categories
3. Neural Network
4. Inference from historical practices and local conditions
   - Evaluation of pile capacity based upon past specs and standards and practices- including State codes and requirements
   - Estimating pile lengths based upon existing data as well as geologic formations
5. Historical events as 'proof'
6. Reverse Engineering
7. Non-Destructive Testing (NDT's)
8. Search for additional records
   - Bridge soundings
   - Investigate geological formations
   - Review of replacement projects and recent armoring review of excavations of removed foundations)
9. Bridges replaced in 5 years or less (scheduled)
10. Countermeasures
11. Load testing
12. Cost of replacing vs. cost of evaluating
13. Prioritization mechanism (NCHRP 24-25)
14. Subsurface exploration – rods, borings, etc. (look at existing as well as doing more testing/field work)

15. Water velocities – weighted hydraulic screenings
16. Additional scour and unknown foundation data – new data items
17. Develop new storm event data collection and review this data

There is a broader issue of unknown foundations that goes beyond just scour concerns. While these approaches may address the issue of risk related to scour, they may not address other risks associated with unknown foundations. So, it may be appropriate to consider changing the Pontis or NBIS to identify the fact that the bridge still has unknown foundations but is "low risk" for scour concerns.

FHWA expressed that generally the state will determine which methods are acceptable to determine that a bridge with unknown foundations was low risk. If the state adopted a method, it would be acceptable to FHWA.

The next part of our discussion was focused on determining which of these methods would be used at various points in the pilot study. The Pilot Study will include three evaluation or analysis steps: Preliminary screening, Core screening and Residual screening. They are further defined below.

Evaluation Steps

I. Preliminary Screening

The first phase of the review will be to look at all 2500 bridges and try to find the low hanging fruit based upon existing data collected and a preliminary evaluation requiring minimal level of effort. This minimal effort will be done in order to identify certain bridges as "low risk" based upon the facts and possibly even some assumptions made using the available data. Those bridge foundations that cannot be determined to be low risk will be moved on to the second stage of analysis and evaluation. We are hoping that 20-30% of the foundations can be moved into the low risk category from this review. This Step is the least costly and therefore the more that can be accomplished in this phase the better. The various methodologies to be used in this phase of the study are further discussed below in the section titled 'Protocol/Methodology'.

II. Core Screening

At this stage, further evaluation/analysis will be done requiring a medium level of effort. This will include a risk assessment, more rigorous evaluation and further data collection and analysis. A variety of evaluation methods will be applied based upon the known characteristics of the particular bridge or group of bridges. Those bridge foundations that cannot be determined to be low risk at this stage will be moved on to the final stage of analysis and evaluation. We are hoping that 40-50% of the foundations can be moved into the low risk category based upon this review. The various methodologies to be used in this phase of the study are further discussed below in the section titled 'Protocol/Methodology'.

III. Residual Screening (covering the rest of the outliers)

The final evaluation stage will require a much more extensive and rigorous set of evaluation methods to determine if a bridge foundation is low risk or scour critical. All bridges not determined to be low risk foundations in the Step II analysis noted above will require additional analysis in this phase of the study. This phase is costly and therefore the least desirable approach. The various methodologies to be used in this phase of the study are further discussed below in the section titled 'Protocol/Methodology'.

Outputs – in addition to working thru the three steps or phases of the study as noted above, the Team is tasked with developing a list of recommendations for additional data that the Department might consider gathering in the future. This might include:

- Additional scour and unknown foundation data…i.e. new data to be collected in the field when 'events' occur
- New storm event data to be collected
- Instrumentation to gather long term data for evaluation

Next, we discussed whether each methodology could be defined in 'Categories' as noted below:

A. Geotechnical / Structure
B. Hydraulic / Coastal Engineering

The main purpose of this exercise was to determine the types of technical experts involved in each method of analysis.

The final step in our scope definition/development exercise was to develop the methodologies and protocols we would use for the Pilot Study. The purpose of this exercise is so that all stakeholders would know exactly how the Pilot Study would be managed. This is the most critical part of the workshop in order to get everyone on the same page. The results are as follows:

Protocol / Methodology

I. Preliminary Screening Approach Protocol

- use NCHRP 24-25 to determine low or high 'priority' (not 'risk')
- modify NCHRP flow chart to include more inputs?
- verify if scour design has been done
- gather all existing/ known data
- get data from local bridge owners
- use NCHRP 24-25 on known foundations to validate results for unknown foundation analysis

- for all “low priority” bridges obtain feedback from districts as to their findings from bi-annual reviews, etc. to further validate the decision as to whether they can be moved to the “low risk” designation
- conduct Phase I Scour Evaluations on all bridges if not available (Note: Most of the 2500 Unknown Foundation Bridges in Florida have had a Phase I Scour Evaluation, but about 400 have not.)

Deliverables:

- reports for each bridge or group of bridges categorized as a Low Risk foundation bridges
- prioritized list of remaining Unknown Foundation bridges

II. <u>Core Approach & Protocol</u>

- categorize “high priority” bridges (structural, hydraulic, geotechnical)
- known pile records, etc. to match bridges in previous categories
- determine additional info needed for each approach
- use A Neural Network (ANN) if appropriate
- use reverse engineering
- look at historic events
- stop and think….what do we do next…..move forward slowly because everything gets real costly from here on out!
- water velocities = weighted hydraulic screenings (coastal zone only?) (exists in some districts) (not for Pilot Study?) Can be used for riverine crossings.

Deliverables:

- reports for each bridge or group of bridges categorized as a Low Risk foundation bridges
- POA’s for those bridge foundations classified as scour critical
- Updated priority list

III. <u>Residual Approach and Protocol</u>

- cost of replacing, repairing/remediation vs. investigation/evaluation
- NDTs
- Load testing (limited circumstances)
- Countermeasures
- Further use of ANN?

Deliverables:

- reports for each bridge or group of bridges categorized as a Low Risk foundation bridges
- POA’s for those bridge foundations classified as scour critical

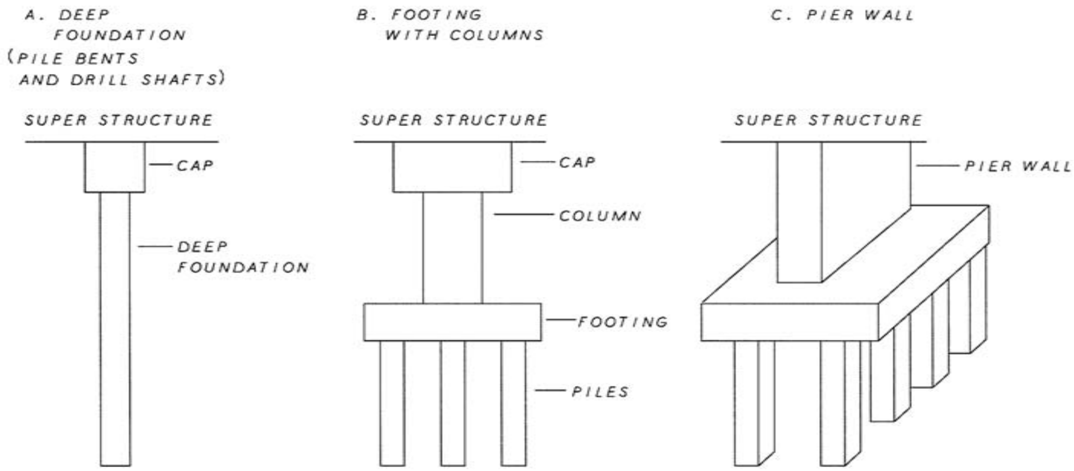
Statistical Distribution Discussion:
Towards the end of the day we expanded our discussion of the statistical distribution presentation made by Shaw McLemore the day before. We talked about using statistics to assist us in grouping foundations by various categories of characteristics.

1. Statistical distribution in Categories:
    - Group bridges together that have similar characteristics that affect the embedment depth of piles.
    - Determine the embedment depth of piles at known foundation bridges
    - Use the embedment depth from known foundation sites to estimate unknown pile depths
    - Method of construction

2. Possible Procedure for Method:

    - Determine categories that affect pile embedment
    - Determine the average pile embedment for all known piles within the category.
    - Determine the standard deviation of the embedment.
    - Decide on the acceptable confidence limit
    - Determine the minimum pile embedment for the selected confidence limit
    - Use the determined pile embedment to complete the Scour Evaluation Process

3. Possible Structural Categories
    - The following possible categories were presented:
        - Substructure/Foundation Types (shown in figure below)
        - Pile Material and Size
        - Superstructure Type
        - Date of Construction



POSSIBLE SUBSTRUCTURE/FOUNDATION TYPES

- The following suggestions were made concerning the substructure/foundation types
  - Possibly combine Footings with Columns and Pier Walls
  - Location of Footing (ie, buried, groundline, waterline, etc.)
  - Consider a separate type for Bascule Piers
  - Method of Construction

4. Possible Soils Categories
- The following possible categories were presented:
  - Sand
  - Clay
  - Rock
- The following suggestions were made:
  - Add a category for Silt
  - Reduce the categories to 1. Soil and 2. Rock, only. (This suggestion was considered by the group to be the best grouping
  - Categorize by general geologic formations
  - Include separate categories for bridges with good soils information vs. those with less soils information

5. Possible Hydraulic Categories
- The following possible categories were presented:
  - Bridge designed / not designed for scour
  - Characteristics that affect bed level changes and therefore embedment depths
    - Smaller vs. Larger Streams
    - Active geomorphic sites
    - Coastal
- The following suggestions were made:
  - In coastal areas consider the following:
    - Inland coastal

        - Inlets (undeveloped)
        - Barrier Island overtopping
        - Waves
        - Bulkhead Geometry
    - At inland sites consider the following:
        - Skew
        - Slope of Channel
        - Artificial Channels
        - Out of Bank flows
        - Location of Pier
        - Flashy conditions (few, if any, sites in Fla. have potential for flash floods)

6. Complicating Factors
    - Some categories will have too few known foundation bridges for statistical significance
    - Bridge widenings
    - Single Span Bridges
    - Spread Footings

As a result of our meeting, a set of actions were agreed to.
Action Plan:

1. Meeting minutes will be developed and distributed early next week by Shawn McLemore.

2. Jacobs (Shawn) to draft the Pilot Study approach and protocols with a letter report by November 14th.

    a. Review, comment, concurrence by all stakeholder by November 21st.

3. Jacobs (Shawn) to develop a budget from Scope of Services (#1) by December 5th.

    b. Review, comment, approval by all stakeholders within one week – target by December 12th.

We agreed to have monthly conference calls during the Pilot Study in order to keep everyone up to speed since we know adjustments in the approach will have to be made.

We will include deliverables for each phase of the Pilot Study. These will be included in the Scope of Work and include:

- Documentation/reports to justify bridge classification
- recommendations for approaches (state wide)

- recommendation for FHWA

The meeting came to a close. Everyone agreed that this workshop was extremely beneficial in getting all stakeholders on the same page and using the same terminology!

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Appendix B

The following items are included in Appendix B:

- Scour evaluation forms
- FDOT memos

Scour Evaluation Forms

SCOUR EVALUATION - FIELD / OFFICE REVIEW REPORT			
Bridge #:	County:	Route:	Over:

1. SCOUR VULNERABILITY RATING (PER FHWA)

a.	Scour Susceptible	☐ (1) High	☐ (2) Medium	☐ (3) Low
	Low Risk	☐ (4) High	☐ (5) Medium	☐ (6) Low
	Scour Critical	☐ Yes	☐ No	
	Foundations	☐ Unknown	☐ Known	
b.	Reasons for Rating:			

2. FLORIDA DOT SCOUR INDEX NUMBER — Initial _____ Secondary _____

3. INTERIM RECOMMENDATION

a. Countermeasures

☐ Riprap

☐ Scour Monitor

☐ Inspection

☐ Other

b.	Phase Two Analysis	☐ Recommended	☐ Not Recommended	
c.	Priority	☐ High	☐ Medium	☐ Low

SCOUR EVALUATION - FIELD / OFFICE REVIEW REPORT

4. SITE FIELD REVIEW

a.	Evidence of Scour at Structure			COMMENTS
	1) Abutment Tilting / Moving In	☐ Yes	☐ No	
	2) Slopes Washing In / Sloughing	☐ Yes	☐ No	
	3) Scour Holes Near Abutment / Bents	☐ Yes	☐ No	
	4) Bed Deposits Downstream	☐ Yes	☐ No	
	5) Bridge Railing Sagging	☐ Yes	☐ No	
	6) Debris	☐ Yes	☐ No	
	7) Highwater Mark	☐ Yes	☐ No	
b.	Feasibility of Monitoring During High Flow			
	1) Rod / Pole / Weight from Deck	☐ Yes	☐ No	
	2) Fixed Monitoring Device	☐ Yes	☐ No	
c.	Feasibility of Adding Riprap or Other Scour Countermeasures			
		☐ Yes	☐ No	

5. ABUTMENTS

a.	Type of Abutment	☐ Spill Through	☐ Vertical Wall	☐ Wing Walls	☐ Seawall
	1) Source of Data	☐ Field Review	☐ Design Plans	☐ As-Built Drawings	
		☐ Pile Driving Records	☐ Inspection Reports	☐ Other _____	
b.	Foundation				
	1) Type of Footings	☐ Spread Footings	☐ Pile Footings	☐ Pile Bents	☐ Drilled Shaft
	2) Dimensions (L,W,D)	_____	_____	_____	_____
	3) Embedment	_____	_____	_____	_____
	4) Scour Exposure	_____	_____	_____	_____
c.	Location of Abutment from Bank		Set Back	At Bank	In Channel
	1) Left		_____	_____	_____
	2) Right		_____	_____	_____
d.	Abutment Protection	☐ Yes	☐ No		
	1) Riprap	☐ Sand Cement	☐ Rubble	☐ Commercial Block	☐ Concrete
	2) Other	_____			
	3) Condition				
	Left	☐ Good	☐ Fair	☐ Poor	
	Right	☐ Good	☐ Fair	☐ Poor	

SCOUR EVALUATION - FIELD / OFFICE REVIEW REPORT

6.	PIER / BENT					
	a.	Type of Pier / Bent	☐ Concrete Wall	☐ Pile Bent	☐ Column Type	
	b.	Nose Shape	☐ Square	☐ Rounded	☐ Sharp Nose	
	c.	Dimensions (W, L)	_____			
	d.	Foundation (worst pier / bent)				
		Source of Data	☐ Field Review	☐ Design Plans	☐ As-Built Drawings	
			☐ Pile Driving Records	☐ Inspection Reports	☐ Other _____	
		1) Type of Footings	☐ Spread Footings	☐ Pile Footings	☐ Pile Bents	☐ Drilled Shafts
		2) Dimensions (L, W, D)	_____			
		3) Embedment	_____			
		4) Scour Exposure	_____			
		5) Comments	_____			
	e.	Pier Protection	☐ Yes	☐ No		
		1) Counter Measure	☐ Riprap	☐ Sand Cement	☐ Rubble	☐ Commercial Block ☐ Grouted
		2) Other	_____			
		3) Condition	☐ Good	☐ Fair	☐ Poor	☐ Unknown

7.	CHANNEL LATERAL STABILITY					
	a.	Bends	☐ Yes	☐ No		
		1) Bridge Location	☐ Upstream of Bend	☐ Downstream of Bend	☐ In Bend	
		2) Migration	☐ Yes	☐ No		
		3) Countermeasures	☐ Yes	☐ No	Type _____	
	b.	Bank Condition	☐ Eroding	☐ Stable	☐ Vegetated	☐ Countermeasures
		1) Upstream Left	☐	☐	☐	☐
		Right	☐	☐	☐	☐
		2) Downstream Left	☐	☐	☐	☐
		Right	☐	☐	☐	☐
		3) Angle of Attack	☐ Flood Flow 0°	☐ Normal Flow 0°		
	d.	Point Bar Under Bridge	☐ Yes	☐ No		
	e.	Island or Bars				
		1) Upstream	☐ Yes	☐ No		
		2) Downstream	☐ Yes	☐ No		

SCOUR EVALUATION - FIELD / OFFICE REVIEW REPORT

8. CHANNEL VERTICAL STABILITY

a.	Exposed Footing	☐ Yes	☐ No			
b.	Exposed Piles	☐ Yes	☐ No			
c.	Contraction Scour (Encroachment)					
	1) Overbank Flow	☐ Left	☐ Right			
	2) Relief Bridge	☐ Yes	☐ No			
	3) Abutments					
	Left	☐ Set Back	☐ At Bank		☐ In Channel	
	Right	☐ Set Back	☐ At Bank		☐ In Channel	
	4) Over Topping	☐ Yes	☐ No		☐ Unknown	
d.	Long Term				COMMENTS	
	1) Aggredation					
	Channel	☐ Yes	☐ No			
	Slope	☐ Yes	☐ No			
	2) Degradation					
	Channel	☐ Yes	☐ No			
	Slope	☐ Yes	☐ No			
e.	Bed Material	☐ Silt-Clay	☐ Silt	☐ Sand	☐ Gravel	☐ Cobbles
		☐ Other _____				

9. GEOMORPHOLOGY — COMMENTS

a.	Alluvial Fan	☐ Yes	☐ No		
b.	Dam or Reservoir	☐ Yes	☐ No		
c.	Instream Mining	☐ Yes	☐ No		
d.	Headcuts or Nickpoints	☐ Yes	☐ No		
e.	Diversions	☐ Yes	☐ No		
f.	Channel Straightening	☐ Yes	☐ No		
g.	River Form	☐ Straight	☐ Sinuous	☐ Meandering	☐ Highly Meandering
h.	Stream Size	☐ Small (<100 ft)	☐ Medium (100-500 ft)	☐ Large (>500 ft)	
i.	Flow Characteristics	☐ Ephemeral	☐ Intermittent	☐ Perennial but Flashy	☐ Perennial

SCOUR EVALUATION - FIELD / OFFICE REVIEW REPORT

10. OTHER CONSIDERATIONS

a. Sediment Transport (observed)

1) ☐ Live Bed Condition ☐ Clear Water Condition

2) Armored Bed ☐ Yes ☐ No

b. Watershed ☐ Agricultural ☐ Forested ☐ Swamp ☐ Urban

c. Tidal Influence ☐ Yes ☐ No ☐ Possibly

d. Tidal Features ☐ Bay ☐ Estuary ☐ Inlet ☐ Barrier Island

1) Normal Range (amplitude) ____

2) Observed Surface Velocity ____

3) Seiching (wind set up) ____

4) Distance to Coast ____

e. Traffic ☐ Ship ☐ Recreation ☐ Commercial ☐ Barge ☐ I.C.W.

f. Tributaries Stream Factor? (Y or N)

Upstream

Downstream

g. Observed Stream Velocity Left Bank Channel Right Bank

Upstream

Downstream

h. Mannings n ____ Channel ____ Overbank

11. ADDITIONAL COMMENTS

a. Photographs ☐ Bridge Number ☐ Upstream Channel ☐ Upstream Face

☐ Downstream Channel ☐ Downstream face

b. Remarks ____

Field Inspectors:

Date of Field Evaluation: Time of Field Evaluation:

INSTRUCTIONS AND INFORMATION SHEET
Phase 1 Qualitative Scour Evaluation
Field/Office Review Report

This form provides a standardized format for the Phase I evaluation of bridge scour as required by the Florida Department of Transportation's Scour Evaluation Program. It represents a simple qualitative evaluation of physical characteristics and structural features which are considered important in the evaluation of bridge scour, in accordance with the guidelines contained in FHWA HEC 18 & 20. It is intended to provide direction in the initial field inspection and data collection, and also serve as a format for office review.

Since the Phase 1 scour evaluation provides only a one time evaluation of site conditions, it is important that the inspector or reviewer pay special attention to the potential scour associated with high flow conditions. If there is concern for potential scour during storm events or particular tidal conditions, then Phase II analysis, and/or countermeasures should be recommended.

The form consists of eleven (11) categories which systematically address structures, abutments and piers, lateral and vertical stream stability, geomorphology, and other considerations which can be evaluated on a qualitative basis during field inspection. The appropriate data collected in the field for categories 4 through 11 should then be assimilated during the Phase I office evaluation/review. Specific conclusions reached following the office review should be summarized in categories 1 through 3, which outline the Scour Vulnerability Rating and appropriate recommendations for further action. For the field inspection to be meaningful, it would be prudent to review the available site specific data as a precursor to the actual field investigation.

The forms are arranged to guide the inspector/reviewer through a standard evaluation process. In this regard, several areas of the form allow alternative choices in each of the categories. These areas should be appropriately marked or circled in the field for further evaluation in the office. The scope of Phase I qualitative analysis is designed to formulate an informed opinion of scour susceptibility based on available site specific data and good engineering judgment.

Certain areas of the form should adhere to specific guidelines for conformance with the basic intent of the evaluation. Countermeasures identified on the form are representative of recommendations of the inspector or reviewer. If scour monitoring is specified as a countermeasure, this requires installation of a device designed to continuously or periodically measure scour. If inspections are recommended as a countermeasure, the frequency should be specified (i.e. during routine bridge inspections, frequent seasonal inspections, or inspections made following storm events or tidal surges). Similarly, if special conditions or other considerations were noted during the site investigation, then these issues should be addressed under Category 11 as additional comments.

The Scour Vulnerability Rating for the bridge was developed to establish a qualitative rating system to enable the inspector/reviewer to formulate an informed site specific opinion. The rating is divided into six general classifications and two informational items as outlined below:

CATEGORY	RATING		
• Scour Susceptible	High	Medium	Low
• Low Risk	High	Medium	Low
• Scour Critical	High	Medium	Low
• Scour Critical	Yes or No		
• Foundations	Known or Unknown		

Guidelines for these ratings are provided as follows:

SCOUR SUSCEPTIBLE (HIGH PRIORITY)

- Aggressive stream or tidal waterway (high velocity, deep)
- Foundations are spread footings on erodible soil, shallow piles or embedment unknown
- Tidal flows have high velocity (surface velocity >3fps) and large tidal amplitude (>2 ft)
- Bed material is easily eroded
- Evidence of scour and/or degradation
- Scour is below top of footing
- Large angle of attack (>10 degrees)
- Countermeasures in poor condition or lacking

SCOUR SUSCEPTIBLE (MEDIUM PRIORITY)

- Characteristics fall between High and Low

SCOUR SUSCEPTIBLE (LOW PRIORITY)

- Stream is not aggressive (low velocities) or other factors mitigate the high velocities
- Foundations on piles but of unknown embedment
- Tidal flows have low velocity and tidal amplitude
- Bed material is erodible
- Some evidence of scour or degradation
- Scour is not below top of spread footings
- Stream is stable and foundations are unknown or spread footing in erodible soil
- Countermeasures are in fair to good condition

LOW RISK (HIGH PRIORITY)

- Stream is not aggressive (low velocity) or other factors mitigate the high velocity
- Foundations on piles of known embedment
- If stream is aggressive or tidal range large, then foundations are known and cross section is stable
- Stream is aggrading or stable
- Countermeasures in fail condition

LOW RISK (MEDIUM PRIORITY)

- Characteristics fall between High and Low

LOW RISK (LOW PRIORITY)

- Stream is not aggressive or other factors mitigate high velocity
- Foundation is in bedrock
- Stream aggrading or stable
- Pile foundations are deep
- Cross section stable
- No evidence of scour
- Tidal flows have low velocity and range
- Countermeasures are in good condition
- No possibility of overtopping bridge
- Foundations designed using current technology
- Channel heavily vegetated

SCOUR CRITICAL:

- Aggressive stream or tidal waterway
- Exposed footing in erodible material
- Exposed piles with unknown or insufficient embedment
- Needs countermeasures immediately
- Actively degrading channel
- Evidence of structural damage due to scour

UNKNOWN FOUNDATIONS

- No record of foundation type (i.e. spread footing vs. piles) or condition of foundation or pile embedment is unknown

FDOT Memos

FLORIDA DEPARTMENT OF TRANSPORTATION

LAWTON CHILES
GOVERNOR

605 Suwannee Street, Tallahassee, Florida 32399-0450

BEN G. WATTS
SECRETARY

December 4, 1996

M E M O R A N D U M

TO: District Structures and Facilities Engineers

FROM: Richard I. Kerr, Bridge Inspection and Evaluation Engineer RIK

COPIES: Jerry Potter, Paul Passe, Shawn Mclemore, Douglas Edwards, FHWA

SUBJECT: Scour Evaluation Phase III, Debris Accumulation

A question was raised about considering the horizontal forces from stream flow on debris accumulation for the Phase III Scour Evaluations. There are probably some streams predominantly in Northern Florida (Districts 2 and 3) where debris accumulation is possible during flood events. Accumulation of debris would reduce the effective stream opening, probably increase the scour depth and create a significant horizontal force on the structure. However identifying which bridges would collect debris during a storm event would be largely guesswork.

Therefore debris accumulation should not be considered during Phase III. However Maintenance needs to be aware of the danger posed to structures when debris accumulates at bridges to the extent that the stream opening is reduced. Maintenance forces in the field during storm events should alert the District Structures and Facilities Office to any significant debris accumulation. The District Structures and Facilities Office should assess the structure to determine the most appropriate action. Some of the items that should be considered by the Structures and Facilities Office during the assessment are:

- Scour potential of the foundation.
- Ability to monitor the stream bed during the current flood event.
- Data from the scour evaluation process.
- Availability of detour route.
- Importance of route (e.g. evacuation route).

The following are some of the possible courses of action that might be chosen by the District Structures and Facilities Office depending on the assessment of the condition during the flood event:

- Immediate removal of the debris.
- Closing of the structure to traffic, until the condition of the structure can be established.
- Monitoring of the scour by fathometer or other means if possible.
- Inspection of the structure after the flood waters have receded.

RIK
SCN: 372 (265)

FLORIDA DEPARTMENT OF TRANSPORTATION

LAWTON CHILES
GOVERNOR

605 Suwannee Street, Tallahassee, Florida 32399-0450

BEN G. WATTS
SECRETARY

December 3, 1996

M E M O R A N D U M

TO: District Structures and Facilities Engineers

FROM: Richard I. Kerr, Bridge Inspection and Evaluation Engineer

COPIES: Jerry Potter, Paul Passe, Shawn Mclemore

SUBJECT: Scour Evaluation Phase III, Geotechnical Issues

There were some questions raised concerning what methods to use for the lateral stability analysis and the axial capacity analysis for the Phase III Scour Evaluation. I discussed this with Paul Passe the State Geotechnical Engineer.

Lateral Stability Analysis will be performed using the Florida Pier Program. For the Axial Capacity Analysis the ultimate capacity of SPT94 will be used.

If you wish to discuss this further contact Paul or myself. If you want to discuss the geotechnical issues Paul would be the better contact.

RIK
SCN: 372 (265)

July 10, 1996

MEMORANDUM

TO: District Structures and Facilities Engineers

FROM: Richard I. Kerr, Bridge Inspection and Evaluation Engineer

COPIES: Jerry Potter, Paul Passe, Shawn Mclemore, Douglas Edwards

SUBJECT: Phase III Scour Evaluation Criteria

One of the tasks involved in the Phase III Scour Evaluation Process is to determine if the structure is stable with the soil removed to the calculated scour depth (the 100 year event). The structural analysis should be performed using the load factor method with Beta and Gamma factors of 1.0. The analysis should include only Group 1 loads. The loads shall be compared with the ultimate strength (FS = 1) of the soil. The structure should be considered stable if the group load effect does not exceed the resistance provided by the ultimate soil strength. This is a departure from current design procedures. It is emphasized that this process is intended only to protect the existing structure and not to bring it up to current design criteria. (Remember that the AASHTO "Standard Specifications for Highway Bridges" Section 3.8.1 requires impact for the portion of concrete and steel piles that are above the groundline, and excludes it for the portion below the groundline.)

Among the justifications for this are: (1) the difference between a new design where all current design criteria must be met and an existing bridge where departure from current criteria may be allowed; (2) the Department's aggressive maintenance and inspection program which should identify and carry out remedial action before the calculated scour depth is reached; (3) and the general conservativeness of the calculation of the scour depth.

RIK/lp
Attachment
SCN: 372 (265)

Appendix C

The following items are included in Appendix C:

- Total cost of failure for all unknown foundation bridges in Florida

Total Cost of Failure For All Unknown Foundation Bridges In Florida

Bridge Number	Bridge Replacement Cost	Detour Cost	Loss of Life Cost	Total Cost of Failure	Scour Vulnerability	Overtopping Frequency	Annual Probability of Failure	Annual Unadjusted Risk	High Priority	MPL	Meets MPL	K1	Remaining Life	Lifetime Probability of Failure	Unadjusted Lifetime Risk	Scour Mode
010004	$1,039,658	$7,529,184	$2,900,000	$11,468,842	6	S	0.00011	$1,262	N	0.002	Y	1	23	0.002526941	$28,981.09	T
010005	$778,315	$1,046,125	$1,160,000	$2,984,440	7	S	0.00011	$328	N	0.002	Y	1	25	0.002746373	$8,196.39	R
010011	$263,520	$614,056	$1,160,000	$2,037,576	4	S	0.0005	$1,019	N	0.0001	N	1	31	0.01538431	$31,346.70	T
010021	$1,359,038	$11,223,338	$1,160,000	$13,742,376	7	S	0.00011	$1,512	N	0.0001	N	1	40	0.004390575	$60,336.93	T
010032	$2,031,338	$687,805	$2,900,000	$5,619,144	7	S	0.00011	$618	Y	0.0001	N	1	37	0.004061952	$22,824.69	T
010033	$789,623	$1,047,353	$2,900,000	$4,736,977	6	S	0.00011	$521	Y	0.0001	N	1	15	0.00164873	$7,810.00	T
014017	$408,297	$2,204,954	$2,900,000	$5,513,251	6	S	0.00011	$606	N	0.0005	Y	1	31	0.003404379	$18,769.20	T
014022	$334,191	$734,985	$2,900,000	$3,969,176	6	S	0.00011	$437	N	0.0002	Y	1	28	0.003075431	$12,206.93	T
014023	$744,486	$477,864	$1,160,000	$2,382,350	6	S	0.00011	$262	N	0.0005	Y	1	29	0.003185092	$7,588.00	T
014026	$792,870	$1,190,675	$2,900,000	$4,883,545	6	S	0.00011	$537	N	0.002	Y	1	30	0.003294742	$16,090.02	M
014027	$605,328	$353,588	$1,160,000	$2,118,916	7	S	0.00011	$233	N	0.0005	Y	1	30	0.003294742	$6,981.28	R
014029	$1,522,559	$1,918,310	$2,900,000	$6,340,870	7	R	0.000077	$488	N	0.0005	Y	1	30	0.002307423	$14,631.07	T
014031	$662,569	$531,195	$1,160,000	$2,353,764	7	S	0.00011	$259	N	0.0002	Y	1	34	0.00373322	$8,787.12	R
014032	$551,388	$524,657	$1,160,000	$2,236,045	7	S	0.00011	$246	N	0.0005	Y	1	34	0.00373322	$8,347.65	T
014033	$980,505	$1,472,910	$2,900,000	$5,353,415	6	S	0.00011	$589	N	0.002	Y	1	34	0.00373322	$19,985.48	T
014034	$1,298,152	$4,887,649	$2,900,000	$9,085,801	6	S	0.00011	$999	N	0.002	Y	1	34	0.00373322	$33,919.29	T
014035	$1,514,038	$4,887,649	$2,900,000	$9,301,687	6	S	0.00011	$1,023	N	0.002	Y	1	35	0.003842809	$35,744.61	T
014036	$1,264,065	$3,529,269	$2,900,000	$7,693,334	6	R	0.000077	$592	N	0.0005	Y	1	34	0.002614677	$20,115.58	T
014037	$1,445,863	$2,303,828	$2,900,000	$6,649,692	6	R	0.000077	$512	N	0.0002	Y	1	34	0.002614677	$17,386.79	T
014038	$909,701	$1,382,710	$1,160,000	$3,452,411	6	S	0.00011	$380	N	0.0002	Y	1	34	0.00373322	$12,888.61	T
014039	$713,700	$595,756	$1,160,000	$2,469,456	7	S	0.00011	$272	N	0.0002	Y	1	34	0.00373322	$9,219.02	T
014040	$574,362	$232,750	$1,160,000	$1,967,112	7	S	0.00011	$216	N	0.0002	Y	1	36	0.003952386	$7,774.79	T
014041	$459,490	NA	$0	$459,490	7	S	0.00011	$51	N	0.0002	Y	1	36	0.003952386	$1,816.08	T
014044	$649,173	$68,647	$580,000	$1,297,820	7	S	0.00011	$143	N	0.0005	Y	1	36	0.003952386	$5,129.49	T
014045	$698,137	$68,647	$580,000	$1,346,784	7	S	0.00011	$148	N	0.0005	Y	1	36	0.003952386	$5,323.01	T
014046	$509,336	$33,016	$580,000	$1,122,352	7	S	0.00011	$123	N	0.002	Y	1	36	0.003952386	$4,435.97	T
014047	$437,520	$33,016	$580,000	$1,050,536	6	S	0.00011	$116	N	0.002	Y	1	36	0.003952386	$4,152.12	T
014048	$674,445	$146,226	$580,000	$1,400,671	7	S	0.00011	$154	N	0.002	Y	1	36	0.003952386	$5,535.99	T
014049	$754,656	$33,016	$580,000	$1,367,672	6	S	0.00011	$150	N	0.0005	Y	1	38	0.004171505	$5,705.25	T
014050	$754,656	$49,033	$580,000	$1,383,689	6	S	0.00011	$152	N	0.002	Y	1	38	0.004171505	$5,772.07	T
014051	$609,823	$79,634	$580,000	$1,269,457	7	S	0.00011	$140	N	0.002	Y	1	38	0.004171505	$5,295.55	T
014052	$1,372,101	$1,773,993	$2,900,000	$6,046,094	6	S	0.00011	$665	N	0.002	Y	1	38	0.004171505	$25,221.31	T
014053	$699,391	$168,348	$580,000	$1,447,739	7	S	0.00011	$159	N	0.0001	N	1	41	0.004500092	$6,514.96	M
014054	$699,391	$91,529	$580,000	$1,370,920	7	S	0.00011	$151	N	0.002	Y	1	40	0.004390575	$6,019.13	T
014059	$864,961	$795,133	$1,160,000	$2,820,095	6	S	0.00011	$310	N	0.002	Y	1	40	0.004390575	$12,381.84	R
014060	$438,872	$506,678	$1,160,000	$2,105,551	6	S	0.00011	$232	N	0.002	Y	1	40	0.004390575	$9,244.58	R
014061	$438,872	$392,267	$1,160,000	$1,991,139	7	S	0.00011	$219	N	0.002	Y	1	40	0.004390575	$8,742.25	R
014063	$445,263	$784,534	$1,160,000	$2,389,798	5	S	0.00024	$8	N	0.002	Y	1	48	0.011455266	$27,375.77	R
014064	$703,202	$59,930	$580,000	$1,343,132	7	S	0.00011	$148	N	0.0005	Y	1	41	0.004500092	$6,044.22	M
014065	$1,694,010	$71,044	$580,000	$2,345,054	7	S	0.00011	$258	N	0.002	Y	1	47	0.005156941	$12,093.31	M
014066	$942,547	$318,576	$1,160,000	$2,421,123	7	S	0.00011	$266	N	0.002	Y	1	47	0.005156941	$12,485.59	T
014067	$785,456	$171,953	$1,160,000	$2,117,409	7	S	0.00011	$233	N	0.002	Y	1	47	0.005156941	$10,919.35	T
014068	$961,511	$264,780	$1,160,000	$2,386,291	7	S	0.00011	$262	N	0.0002	Y	1	47	0.005156941	$12,305.96	T
014069	$787,602	$103,172	$1,160,000	$2,050,774	7	S	0.00011	$226	N	0.0002	Y	1	47	0.005156941	$10,575.72	T
014070	$694,978	$108,963	$580,000	$1,383,941	6	S	0.00011	$152	N	0.0005	Y	1	47	0.005156941	$7,136.90	M
014071	$694,978	$65,378	$580,000	$1,340,356	7	S	0.00011	$147	N	0.002	Y	1	47	0.005156941	$6,912.14	M
014073	$2,077,506	$4,498,107	$2,900,000	$9,475,613	5	S	0.00024	$32	N	0.002	Y	1	51	0.012166847	$115,288.33	T
014074	$2,645,875	$2,868,118	$2,900,000	$8,413,993	7	S	0.00011	$926	N	0.002	Y	1	57	0.006250727	$52,593.58	T
014082	$806,058	$796,106	$1,160,000	$2,762,164	7	S	0.00011	$304	N	0.002	Y	1	50	0.005485204	$15,151.03	R
014083	$751,978	$858,085	$1,160,000	$2,770,062	7	S	0.00011	$305	N	0.002	Y	1	50	0.005485204	$15,194.35	R
014084	$630,940	$256,025	$1,160,000	$2,046,965	7	S	0.00011	$225	N	0.002	Y	1	50	0.005485204	$11,228.02	R
014091	$751,978	$402,243	$1,160,000	$2,314,221	7	S	0.00011	$255	N	0.0002	Y	1	50	0.005485204	$12,693.97	M
014097	$761,412	$367,751	$1,160,000	$2,289,163	7	S	0.00011	$252	N	0.0002	Y	1	50	0.005485204	$12,556.53	R
014098	$365,727	$114,635	$1,160,000	$1,640,362	7	S	0.00011	$180	N	0.0005	Y	1	49	0.005375795	$8,818.25	M
014099	$365,727	$229,270	$1,160,000	$1,754,997	6	S	0.00011	$193	N	0.0002	Y	1	49	0.005375795	$9,434.50	M
014100	$365,727	$114,635	$1,160,000	$1,640,362	6	S	0.00011	$180	N	0.0005	Y	1	50	0.005485204	$8,997.72	M
014101	$369,277	$114,635	$1,160,000	$1,643,913	6	S	0.00011	$181	N	0.002	Y	1	50	0.005485204	$9,017.20	R
014102	$324,964	$43,585	$580,000	$948,549	6	S	0.00011	$104	N	0.002	Y	1	51	0.0055946	$5,306.75	R
014103	$324,964	$43,585	$580,000	$948,549	7	S	0.00011	$104	N	0.002	Y	1	51	0.0055946	$5,306.75	R
014104	$369,277	$114,635	$1,160,000	$1,643,913	6	S	0.00011	$181	N	0.002	Y	1	51	0.0055946	$9,197.04	R
014105	$369,277	$114,635	$1,160,000	$1,643,913	6	S	0.00011	$181	N	0.0002	Y	1	51	0.0055946	$9,197.04	R
014106	$369,277	$114,635	$1,160,000	$1,643,913	6	S	0.00011	$181	N	0.0005	Y	1	51	0.0055946	$9,197.04	M
014107	$369,277	$95,529	$1,160,000	$1,624,807	6	R	0.000077	$125	N	0.0005	Y	1	51	0.00391945	$6,368.35	R
014108	$324,964	$32,689	$580,000	$937,653	7	S	0.00011	$103	N	0.002	Y	1	51	0.0055946	$5,245.79	R
014109	$324,964	$0	$580,000	$904,964	7	S	0.00011	$100	N	0.002	Y	1	51	0.0055946	$5,062.91	R
014110	$369,277	$95,529	$1,160,000	$1,624,807	6	S	0.00011	$179	N	0.002	Y	1	51	0.0055946	$9,090.15	R
014111	$369,277	$95,529	$1,160,000	$1,624,807	6	S	0.00011	$179	N	0.002	Y	1	51	0.0055946	$9,090.15	R
014112	$324,964	$22,011	$580,000	$926,975	6	S	0.00011	$102	N	0.002	Y	1	51	0.0055946	$5,186.05	R
014113	$324,964	$88,042	$580,000	$993,006	5	S	0.00024	$3	N	0.002	Y	1	51	0.012166847	$12,081.75	R
014123	$367,502	$95,529	$1,160,000	$1,623,031	7	S	0.00011	$179	N	0.002	Y	1	51	0.0055946	$9,080.21	R
015004	$798,005	$74,886,758	$1,160,000	$76,844,762	6	S	0.00011	$8,453	Y	0.0001	N	1	52	0.005703985	$438,321.35	T
015005	$2,706,276	$3,022,644	$2,900,000	$8,628,920	7	S	0.00011	$949	N	0.0001	N	1	57	0.006250727	$53,937.03	T
015006	$1,678,449	$1,117,177	$2,900,000	$5,695,626	5	S	0.00024	$19	Y	0.0001	N	1	57	0.013588474	$77,394.86	T
024003	$1,533,547	NA	$2,900,000	$4,433,547	6	S	0.00011	$488	Y	0.0001	N	1	20	0.002197703	$9,743.62	R
024004	$358,196	$1,081,874	$1,160,000	$2,600,070	7	S	0.00011	$286	N	0.0002	Y	1	39	0.004281046	$11,131.02	R
024009	$556,960	NA	$1,160,000	$1,716,960	6	S	0.00011	$189	Y	0.0002	Y	1	16	0.001758549	$3,019.36	T
024019	$840,395	NA	$580,000	$1,420,395	5	O	0.00032	$24	Y	0.0002	N	1	30	0.009555589	$13,572.71	T
024020	$846,607	NA	$1,160,000	$2,006,607	6	S	0.00011	$221	Y	0.0002	Y	1	33	0.003623618	$7,271.18	R
024022	$469,728	$351,829	$1,160,000	$1,981,557	6	S	0.00011	$218	N	0.0002	Y	1	33	0.003623618	$7,180.41	R

Bridge Number	Bridge Replacement Cost	Detour Cost	Loss of Life Cost	Total Cost of Failure	Scour Vulnerability	Overtopping Frequency	Annual Probability of Failure	Annual Unadjusted Risk	High Priority	MPL	Meets MPL	K1	Remaining Life	Lifetime Probability of Failure	Unadjusted Lifetime Risk	Scour Mode
024025	$616,940	$6,409,067	$2,900,000	$9,926,007	6	S	0.00011	$1,092	Y	0.0002	Y	1	27	0.002965757	$29,438.12	R
024028	$629,254	$3,574,580	$1,160,000	$5,363,835	7	S	0.00011	$590	N	0.0002	Y	1	32	0.003514005	$18,848.54	R
024031	$287,048	NA	$1,160,000	$1,447,048	6	S	0.00011	$159	Y	0.0002	Y	1	31	0.003404379	$4,926.30	R
024032	$287,048	NA	$1,160,000	$1,447,048	6	S	0.00011	$159	Y	0.002	Y	1	30	0.003294742	$4,767.65	T
024040	$53,497	NA	$580,000	$633,497	7	S	0.00011	$70	Y	0.002	Y	1	41	0.004500092	$2,850.79	R
024046	$521,421	$1,029,701	$1,160,000	$2,711,123	7	R	0.000077	$209	N	0.0005	Y	1	53	0.004072841	$11,041.97	R
024047	$490,331	$303,452	$1,160,000	$1,953,783	6	R	0.000077	$150	N	0.002	Y	1	53	0.004072841	$7,957.45	R
024048	$599,873	$303,452	$1,160,000	$2,063,325	6	R	0.000077	$159	N	0.0005	Y	1	53	0.004072841	$8,403.59	R
024049	$173,745	NA	$580,000	$753,745	7	R	0.000077	$58	Y	0.002	Y	1	57	0.004379551	$3,301.06	T
024050	$293,323	$638,569	$1,160,000	$2,091,892	6	R	0.000077	$161	N	0.002	Y	1	31	0.002384245	$4,987.58	R
030061	$323,945	$10,926,448	$1,160,000	$12,410,393	7	S	0.00011	$1,365	Y	0.002	Y	1	18	0.00197815	$24,549.62	T
030065	$432,715	$10,926,448	$1,160,000	$12,519,163	7	S	0.00011	$1,377	Y	0.002	Y	1	18	0.00197815	$24,764.78	T
030066	$326,310	$10,926,448	$1,160,000	$12,412,758	7	S	0.00011	$1,365	Y	0.0005	Y	1	18	0.00197815	$24,554.29	T
030067	$323,945	$10,926,448	$1,160,000	$12,410,393	6	S	0.00011	$1,365	Y	0.0005	Y	1	18	0.00197815	$24,549.62	M
030068	$432,715	$10,926,448	$1,160,000	$12,519,163	7	S	0.00011	$1,377	Y	0.002	Y	1	18	0.00197815	$24,764.78	M
030069	$326,310	$10,926,448	$1,160,000	$12,412,758	7	S	0.00011	$1,365	Y	0.0001	N	1	18	0.00197815	$24,554.29	M
030070	$430,350	$10,926,448	$1,160,000	$12,516,799	7	S	0.00011	$1,377	Y	0.0005	Y	1	18	0.00197815	$24,760.10	M
030071	$430,350	$10,926,448	$1,160,000	$12,516,799	6	S	0.00011	$1,377	Y	0.0005	Y	1	19	0.002087932	$26,134.23	T
030072	$430,350	$10,926,448	$1,160,000	$12,516,799	7	S	0.00011	$1,377	Y	0.0001	N	1	18	0.00197815	$24,760.10	T
030073	$430,350	$10,926,448	$1,160,000	$12,516,799	6	S	0.00011	$1,377	Y	0.0005	Y	1	18	0.00197815	$24,760.10	T
030074	$323,945	$10,926,448	$1,160,000	$12,410,393	7	S	0.00011	$1,365	Y	0.0002	Y	1	18	0.00197815	$24,549.62	T
030075	$326,310	$10,926,448	$1,160,000	$12,412,758	7	S	0.00011	$1,365	Y	0.0002	Y	1	18	0.00197815	$24,554.29	M
030078	$401,976	$18,857,802	$1,160,000	$20,419,777	7	S	0.00011	$2,246	Y	0.0005	Y	1	16	0.001758549	$35,909.17	R
030083	$1,430,677	$18,857,802	$1,160,000	$21,448,479	6	S	0.00011	$2,359	Y	0.002	Y	1	15	0.00164873	$35,362.75	R
030086	$678,863	$22,399,414	$1,160,000	$24,238,277	7	S	0.00011	$2,666	Y	0.001	Y	1	21	0.002307461	$55,928.87	R
030087	$425,621	$22,399,414	$1,160,000	$23,985,035	6	S	0.00011	$2,638	Y	0.0005	Y	1	15	0.00164873	$39,544.85	R
030088	$215,175	$22,399,414	$1,160,000	$23,774,589	6	S	0.00011	$2,615	Y	0.0002	Y	1	15	0.00164873	$39,197.88	R
030092	$279,089	$22,399,414	$1,160,000	$23,838,502	7	S	0.00011	$2,622	Y	0.0005	Y	1	15	0.00164873	$39,303.26	R
030100	$465,233	$10,635,180	$1,160,000	$12,260,413	6	S	0.00011	$1,349	Y	0.0005	Y	1	15	0.00164873	$20,214.11	R
030101	$228,309	$10,635,180	$1,160,000	$12,023,489	7	S	0.00011	$1,323	Y	0.0005	Y	1	15	0.00164873	$19,823.49	R
030123	$1,719,341	$5,879,878	$2,900,000	$10,499,219	6	S	0.00011	$1,155	N	0.0001	N	1	37	0.004061952	$42,647.32	R
030125	$884,955	$1,786,013	$2,900,000	$5,570,968	6	R	0.000077	$429	N	0.0001	Y	1	41	0.003152143	$17,560.49	T
030135	$1,141,732	$539,367	$1,160,000	$2,841,100	6	S	0.00011	$313	N	0.0005	Y	1	37	0.004061952	$11,540.41	R
030136	$195,533	$12,763,685	$1,160,000	$14,119,218	6	S	0.00011	$1,553	N	0.0005	Y	1	15	0.00164873	$23,278.78	R
030137	$278,597	$8,812,037	$1,160,000	$10,250,634	5	S	0.00024	$35	N	0.0005	Y	1	15	0.003593958	$36,840.35	R
030138	$642,763	$8,812,037	$1,160,000	$10,614,800	6	S	0.00011	$1,168	N	0.0005	Y	1	15	0.00164873	$17,500.94	R
030139	$572,739	$7,880,965	$1,160,000	$9,613,704	6	S	0.00011	$1,058	N	0.0005	Y	1	15	0.00164873	$15,850.40	R
030140	$762,279	$7,880,965	$1,160,000	$9,803,243	6	S	0.00011	$1,078	N	0.0005	Y	1	15	0.00164873	$16,162.90	R
030141	$370,464	$7,880,965	$1,160,000	$9,411,429	6	S	0.00011	$1,035	N	0.002	Y	1	15	0.00164873	$15,516.91	R
030145	$2,001,777	$170,659	$1,160,000	$3,332,436	7	S	0.00011	$367	Y	0.002	Y	1	35	0.003842809	$12,805.92	T
030146	$2,001,777	$170,659	$1,160,000	$3,332,436	7	S	0.00011	$367	Y	0.0005	Y	1	35	0.003842809	$12,805.92	T
030147	$555,227	$562,926	$580,000	$1,698,153	6	S	0.00011	$187	N	0.0005	Y	1	37	0.004061952	$6,897.82	R
030149	$2,834,852	$1,102,477	$2,900,000	$6,837,330	7	S	0.00011	$752	Y	0.0005	Y	1	35	0.003842809	$26,274.55	T
030157	$168,001	$4,278,165	$1,160,000	$5,606,166	7	S	0.00011	$617	N	0.0005	Y	1	21	0.002307461	$12,936.01	R
030158	$249,080	$129,004	$580,000	$958,084	7	S	0.00011	$105	N	0.0005	Y	1	19	0.002087932	$2,000.41	R
030160	$1,418,425	$4,045,355	$2,900,000	$8,363,780	7	S	0.00011	$920	Y	0.0005	Y	1	21	0.002307461	$19,299.09	R
030161	$1,470,945	NA	$1,160,000	$2,630,945	5	S	0.00024	$9	Y	0.001	Y	1	21	0.005027922	$13,228.19	T
030174	$3,906,038	$6,574,538	$2,900,000	$13,380,576	7	S	0.00011	$1,472	Y	0.001	Y	1	39	0.004281046	$57,282.86	R
030207	$1,997,282	$3,401,511	$2,900,000	$8,298,793	7	S	0.00011	$913	Y	0.001	Y	1	45	0.00493804	$40,979.77	T
030208	$631,642	$1,885,809	$2,900,000	$5,417,451	7	S	0.00011	$596	Y	0.001	Y	1	29	0.003185092	$17,255.08	T
030209	$631,642	$754,323	$2,900,000	$4,285,966	7	S	0.00011	$471	Y	0.001	Y	1	37	0.004061952	$17,409.39	T
030210	$659,170	NA	$1,160,000	$1,819,170	7	S	0.00011	$200	Y	0.002	Y	1	51	0.0055946	$10,177.53	T
030940	$436,999	$10,922,166	$1,160,000	$12,519,165	7	S	0.00011	$1,377	Y	0.002	Y	1	21	0.002307461	$28,887.48	T
030951	$428,431	$10,922,166	$1,160,000	$12,510,596	7	S	0.00011	$1,376	Y	0.001	Y	1	20	0.002197703	$27,494.57	T
034006	$368,263	$25,062	$580,000	$973,324	6	S	0.00011	$107	N	0.002	Y	1	33	0.003623618	$3,526.95	R
034008	$556,000	$22,011	$580,000	$1,158,010	6	S	0.00011	$127	N	0.002	Y	1	33	0.003623618	$4,196.19	R
034009	$120,711	$23,362	$580,000	$724,074	6	R	0.000077	$56	N	0.001	Y	1	33	0.002537872	$1,837.61	R
034011	$587,531	$55,407	$1,160,000	$1,802,938	6	S	0.00011	$198	N	0.001	Y	1	44	0.004828571	$8,705.61	R
034012	$264,784	$0	$1,160,000	$1,424,784	6	S	0.00011	$157	N	0.001	Y	1	31	0.003404379	$4,850.51	R
034014	$382,802	$1,847,101	$1,160,000	$3,389,903	7	S	0.00011	$373	N	0.001	Y	1	26	0.002856071	$9,681.80	R
034017	$587,531	$55,407	$1,160,000	$1,802,938	6	S	0.00011	$198	N	0.0005	Y	1	44	0.004828571	$8,705.61	R
034019	$682,211	$108,903	$1,160,000	$1,951,115	7	S	0.00011	$215	N	0.001	Y	1	31	0.003404379	$6,642.34	R
034020	$262,747	NA	$1,160,000	$1,422,747	6	S	0.00011	$157	Y	0.001	Y	1	31	0.003404379	$4,843.57	R
034021	$704,663	NA	$1,160,000	$1,864,663	6	S	0.00011	$205	Y	0.001	Y	1	31	0.003404379	$6,348.02	R
034026	$614,084	$679,469	$1,160,000	$2,453,553	6	S	0.00011	$270	Y	0.001	Y	1	26	0.002856071	$7,007.52	R
034028	$302,477	$679,469	$1,160,000	$2,141,946	6	S	0.00011	$236	N	0.001	Y	1	26	0.002856071	$6,117.55	R
034030	$570,655	$300,917	$1,160,000	$2,031,573	7	R	0.000077	$156	N	0.002	Y	1	31	0.002384245	$4,843.77	R
034032	$352,226	$1,715,165	$1,160,000	$3,227,391	7	S	0.00011	$355	N	0.0005	Y	1	26	0.002856071	$9,217.66	R
034036	$694,057	$266,415	$1,160,000	$2,120,472	7	S	0.00011	$233	N	0.002	Y	1	32	0.003514005	$7,451.35	R
034042	$511,551	$98,067	$580,000	$1,189,618	7	S	0.00011	$131	N	0.0005	Y	1	31	0.003404379	$4,049.91	R
034044	$575,221	$516,330	$1,160,000	$2,251,551	7	S	0.00011	$248	N	0.001	Y	1	31	0.003404379	$7,665.13	R
034046	$362,878	NA	$1,160,000	$1,522,878	6	S	0.00011	$168	Y	0.001	Y	1	26	0.002856071	$4,349.45	R
034048	$1,022,615	$2,295,519	$2,900,000	$6,218,133	6	S	0.00011	$684	N	0.0005	Y	1	31	0.003404379	$21,168.88	R
034050	$347,730	$40,861	$580,000	$968,591	6	S	0.00011	$107	N	0.0005	Y	1	31	0.003404379	$3,297.45	R
034052	$319,973	$21,902	$0	$341,875	7	S	0.00011	$38	N	0.002	Y	1	31	0.003404379	$1,163.87	R
034054	$279,190	$48,209	$0	$327,399	7	S	0.00011	$36	N	0.0005	Y	1	31	0.003404379	$1,114.59	R
034073	$1,362,620	NA	$1,160,000	$2,522,620	8	S	0.0000022	$6	N	0.002	Y	1	69	0.000151789	$382.91	R
034101	$2,178,331	$4,850,900	$2,900,000	$9,929,231	6	R	0.000077	$765	N	0.002	Y	1	23	0.001769501	$17,569.78	T
034102	$589,783	$141,622	$1,160,000	$1,891,405	7	S	0.00011	$208	N	0.0005	Y	1	38	0.004171505	$7,890.01	R

Bridge Number	Bridge Replacement Cost	Detour Cost	Loss of Life Cost	Total Cost of Failure	Scour Vulnerability	Overtopping Frequency	Annual Probability of Failure	Annual Unadjusted Risk	High Priority	MPL	Meets MPL	K1	Remaining Life	Lifetime Probability of Failure	Unadjusted Lifetime Risk	Scour Mode
034103	$589,783	$131,787	$1,160,000	$1,881,570	6	S	0.00011	$207	N	0.001	Y	1	33	0.003623618	$6,818.09	R
034105	$490,986	$269,000	$1,160,000	$1,919,986	7	S	0.00011	$211	N	0.001	Y	1	33	0.003623618	$6,957.30	R
034106	$573,582	$245,167	$1,160,000	$1,978,749	7	S	0.00011	$218	N	0.001	Y	1	33	0.003623618	$7,170.23	R
034107	$380,476	$189,148	$1,160,000	$1,729,624	7	S	0.00011	$190	N	0.001	Y	1	46	0.005047497	$8,730.27	R
034108	$502,567	$209,475	$1,160,000	$1,872,042	7	S	0.00011	$206	N	0.002	Y	1	34	0.00373322	$6,988.74	R
034112	$1,877,678	NA	$580,000	$2,457,678	6	S	0.00011	$270	Y	0.002	Y	1	39	0.004281046	$10,521.43	T
034113	$711,710	$735,501	$1,160,000	$2,607,211	7	S	0.00011	$287	N	0.001	Y	1	33	0.003623618	$9,447.54	T
034116	$525,257	NA	$1,160,000	$1,685,257	5	S	0.00024	$6	Y	0.001	Y	1	38	0.009079624	$15,301.50	T
034117	$951,116	$314,252	$1,160,000	$2,425,368	6	S	0.00011	$267	N	0.001	Y	1	38	0.004171505	$10,117.43	T
034118	$834,456	$314,252	$1,160,000	$2,308,709	7	S	0.00011	$254	N	0.001	Y	1	38	0.004171505	$9,630.79	T
034119	$685,021	NA	$1,160,000	$1,845,021	7	S	0.00011	$203	Y	0.0005	Y	1	38	0.004171505	$7,696.51	T
034120	$939,691	$251,402	$1,160,000	$2,351,093	7	S	0.00011	$259	N	0.0005	Y	1	38	0.004171505	$9,807.60	T
034122	$209,642	NA	$0	$209,642	6	S	0.00011	$23	Y	0.001	Y	1	33	0.003623618	$759.66	T
034124	$3,174,038	$3,307,432	$2,900,000	$9,381,470	6	S	0.00011	$1,032	N	0.001	Y	1	51	0.0055946	$52,485.57	T
034127	$473,147	NA	$1,160,000	$1,633,147	5	S	0.00024	$6	Y	0.001	Y	1	52	0.012403927	$20,257.44	T
035250	$1,499,835	$1,278,874	$2,900,000	$5,678,708	6	R	0.000077	$437	N	0.001	Y	1	31	0.002384245	$13,539.43	T
035252	$253,383	$169,546	$1,160,000	$1,582,928	8	O	0.0000085	$13	Y	0.002	Y	1	71	0.00060332	$955.01	M
040004	$5,576,995	$3,835,597	$1,160,000	$10,572,592	6	R	0.000077	$814	N	0.0005	Y	1	25	0.001923222	$20,333.45	R
040025	$2,021,068	$3,068,477	$1,160,000	$6,249,546	7	S	0.00011	$687	N	0.0005	Y	1	25	0.002746373	$17,163.58	R
044006	$110,204	$133,427	$580,000	$823,631	6	S	0.00011	$91	N	0.0005	Y	1	36	0.003952386	$3,255.31	R
044010	$670,178	$1,062,165	$1,160,000	$2,892,343	6	S	0.00011	$318	N	0.0005	Y	1	36	0.003952386	$11,431.66	R
044012	$818,092	$1,215,589	$1,160,000	$3,193,681	7	S	0.00011	$351	N	0.002	Y	1	36	0.003952386	$12,622.66	R
044014	$755,274	$220,880	$580,000	$1,556,153	6	O	0.00017	$265	N	0.001	Y	1	49	0.008296104	$12,910.01	R
044021	$58,046	$22,011	$580,000	$660,057	6	S	0.00011	$73	N	0.002	Y	1	26	0.002856071	$1,885.17	R
044031	$513,851	$457,377	$580,000	$1,551,229	6	S	0.00011	$171	N	0.002	Y	1	50	0.005485204	$8,508.81	R
044032	$145,838	$24,045	$0	$169,883	6	S	0.00011	$19	N	0.001	Y	1	51	0.0055946	$950.43	R
044033	$212,168	$65,378	$580,000	$857,545	6	S	0.00011	$94	N	0.0005	Y	1	51	0.0055946	$4,797.62	R
044034	$262,986	$42,219	$580,000	$885,206	4	R	0.0004	$354	N	0.001	Y	1	52	0.020589247	$18,225.73	R
044035	$160,422	$49,687	$580,000	$790,109	6	S	0.00011	$87	N	0.001	Y	1	52	0.005703985	$4,506.77	R
044036	$63,804	$30,646	$0	$94,450	4	S	0.0005	$47	N	0.001	Y	1	15	0.007473807	$705.90	R
044039	$151,185	$33,451	$580,000	$764,636	7	R	0.000077	$59	N	0.002	Y	1	59	0.00453287	$3,466.00	R
044040	$137,863	$20,431	$0	$158,293	6	S	0.00011	$17	N	0.002	Y	1	59	0.00646934	$1,024.05	R
050011	$2,150,932	$17,407,881	$1,160,000	$20,718,813	7	S	0.00011	$2,279	Y	0.002	Y	1	26	0.002856071	$59,174.40	R
050018	$1,654,210	$17,407,881	$1,160,000	$20,222,091	7	S	0.00011	$2,224	Y	0.002	Y	1	26	0.002856071	$57,755.73	R
050022	$421,725	$70,087	$580,000	$1,071,812	7	R	0.000077	$83	N	0.002	Y	1	31	0.002384245	$2,555.46	R
050031	$406,096	$10,672,380	$1,160,000	$12,238,476	7	S	0.00011	$1,346	Y	0.002	Y	1	15	0.00164873	$20,177.94	R
050032	$537,528	$10,672,380	$1,160,000	$12,369,908	7	S	0.00011	$1,361	Y	0.0001	N	1	15	0.00164873	$20,394.64	R
050033	$1,540,009	$10,672,380	$1,160,000	$13,372,389	7	S	0.00011	$1,471	Y	0.0001	N	1	15	0.00164873	$22,047.46	R
050035	$544,669	$10,672,380	$1,160,000	$12,377,049	7	S	0.00011	$1,361	Y	0.0001	N	1	15	0.00164873	$20,406.41	R
050052	$1,053,850	$672,705	$580,000	$2,306,555	6	R	0.000077	$178	N	0.0001	Y	1	43	0.003305652	$7,624.67	R
050053	$642,220	$672,705	$580,000	$1,894,924	7	S	0.00011	$208	N	0.0001	N	1	43	0.00471909	$8,942.32	R
050062	$1,245,398	$25,333,166	$1,160,000	$27,738,565	7	S	0.00011	$3,051	Y	0.0001	N	1	56	0.006141403	$170,353.70	R
050070	$639,284	$1,099,169	$580,000	$2,318,453	6	S	0.00011	$255	N	0.0001	N	1	44	0.004828571	$11,194.81	R
054002	$521,234	$40,861	$580,000	$1,142,095	6	S	0.00011	$126	N	0.0001	N	1	18	0.00197815	$2,259.23	R
054011	$146,540	NA	$0	$146,540	6	R	0.000077	$11	N	0.0001	Y	1	28	0.00215376	$315.61	R
054012	$147,180	NA	$0	$147,180	7	S	0.00011	$16	Y	0.0001	N	1	28	0.003075431	$452.64	R
054014	$147,180	NA	$0	$147,180	5	S	0.00024	$1	Y	0.0001	N	1	28	0.006698272	$985.85	R
054015	$649,207	$37,528	$580,000	$1,266,736	6	S	0.00011	$139	N	0.0001	N	1	24	0.002636663	$3,339.96	R
054016	$279,908	NA	$0	$279,908	7	S	0.00011	$31	N	0.0001	N	1	21	0.002307461	$645.88	R
054017	$198,398	$140,562	$580,000	$918,961	7	R	0.000077	$71	N	0.0001	Y	1	52	0.003996148	$3,672.30	R
060002	$1,585,833	$14,428,008	$2,900,000	$18,913,841	7	S	0.00011	$2,081	Y	0.0001	N	1	21	0.002307461	$43,642.95	R
060022	$1,411,464	$10,570,009	$2,900,000	$14,881,473	7	S	0.00011	$1,637	Y	0.0001	N	1	22	0.002417207	$35,971.60	R
060029	$894,788	$1,822,918	$1,160,000	$3,877,706	6	S	0.00011	$427	N	0.0001	N	1	26	0.002856071	$11,075.00	R
060030	$1,454,768	$579,410	$1,160,000	$3,194,178	5	R	0.00018	$10	N	0.0001	N	1	36	0.00645963	$20,633.21	R
060032	$453,130	$445,943	$1,160,000	$2,059,073	7	S	0.00011	$226	N	0.0001	N	1	36	0.003952386	$8,138.25	R
060036	$624,347	$1,107,440	$580,000	$2,311,787	6	S	0.00011	$254	N	0.0001	N	1	19	0.002087932	$4,826.85	R
060040	$1,128,200	$402,999	$1,160,000	$2,691,199	7	S	0.00011	$296	N	0.002	Y	1	27	0.002965757	$7,981.44	R
064004	$142,248	$177,337	$0	$319,586	6	R	0.000077	$25	N	0.002	Y	1	50	0.003842746	$1,228.09	R
064017	$227,980	$951,305	$580,000	$1,759,284	6	S	0.00011	$194	Y	0.0005	Y	1	45	0.00493804	$8,687.41	R
064033	$107,303	NA	$580,000	$687,303	4	S	0.0005	$344	N	0.0005	N	1	36	0.017843389	$12,263.81	R
064034	$217,043	$1,241,252	$580,000	$2,038,295	6	S	0.00011	$224	N	0.0005	Y	1	41	0.004500092	$9,172.52	R
064035	$174,139	$142,139	$580,000	$896,278	6	S	0.00011	$99	N	0.0005	Y	1	36	0.003952386	$3,542.44	R
064040	$83,284	$86,626	$580,000	$749,910	7	S	0.00011	$82	N	0.0005	Y	1	58	0.00636004	$4,769.46	R
064047	$514,679	$705,593	$1,160,000	$2,380,271	6	S	0.00011	$262	N	0.0005	Y	1	41	0.004500092	$10,711.44	R
064054	$509,317	$1,251,981	$1,160,000	$2,921,299	6	S	0.00011	$321	N	0.0005	Y	1	43	0.00471909	$13,785.87	R
064083	$119,458	$70,718	$580,000	$770,176	6	S	0.00011	$85	N	0.0001	N	1	51	0.0055946	$4,308.83	R
064084	$190,965	$40,861	$580,000	$811,826	7	S	0.00011	$89	N	0.0001	N	1	51	0.0055946	$4,541.84	R
064085	$99,421	$36,389	$0	$135,810	4	S	0.0005	$68	N	0.002	Y	1	51	0.025183838	$3,420.22	R
064086	$272,120	$156,362	$580,000	$1,008,482	7	S	0.00011	$111	N	0.0002	Y	1	52	0.005703985	$5,752.37	R
064088	$79,537	$31,463	$0	$111,000	6	S	0.00011	$12	N	0.002	Y	1	52	0.005703985	$633.14	R
064089	$221,250	$216,492	$580,000	$1,017,742	7	S	0.00011	$112	N	0.0005	Y	1	53	0.005813357	$5,916.50	R
064094	$413,603	$32,682	$0	$446,286	7	S	0.00011	$49	N	0.0005	Y	1	56	0.006141403	$2,740.82	R
064097	$398,651	$444,255	$580,000	$1,422,906	7	S	0.00011	$157	N	0.0005	Y	1	56	0.006141403	$8,738.64	R
064098	$136,283	$115,537	$580,000	$831,820	7	R	0.000077	$64	N	0.0002	Y	1	54	0.004149527	$3,451.66	R
064100	$50,475	NA	$0	$50,475	6	S	0.00011	$6	N	0.0005	Y	1	54	0.005922718	$298.95	R
064101	$111,887	$22,959	$580,000	$714,846	7	S	0.00011	$79	N	0.0005	Y	1	55	0.006032066	$4,312.00	R
064102	$84,967	$56,996	$580,000	$721,963	7	S	0.00011	$79	N	0.0005	Y	1	55	0.006032066	$4,354.93	R
064103	$75,713	NA	$0	$75,713	7	S	0.00011	$8	N	0.002	Y	1	56	0.006141403	$464.98	R
064105	$190,123	$175,431	$580,000	$945,554	7	S	0.00011	$104	N	0.0001	N	1	56	0.006141403	$5,807.03	R

Bridge Number	Bridge Replacement Cost	Detour Cost	Loss of Life Cost	Total Cost of Failure	Scour Vulnerability	Overtopping Frequency	Annual Probability of Failure	Annual Unadjusted Risk	High Priority	MPL	Meets MPL	K1	Remaining Life	Lifetime Probability of Failure	Unadjusted Lifetime Risk	Scour Mode
064110	$81,602	$138,849	$580,000	$800,450	6	S	0.00011	$88	N	0.0001	N	1	57	0.006250727	$5,003.39	R
064111	$505,164	$319,426	$580,000	$1,404,590	6	S	0.00011	$155	N	0.002	Y	1	57	0.006250727	$8,779.71	R
064112	$440,817	$161,837	$580,000	$1,182,654	7	S	0.00011	$130	N	0.002	Y	1	58	0.00636004	$7,521.73	R
070011	$872,313	$5,074,789	$1,160,000	$7,107,102	7	S	0.00011	$782	N	0.002	Y	1	27	0.002965757	$21,077.94	R
070034	$661,551	$3,104,044	$1,160,000	$4,925,595	7	S	0.00011	$542	Y	0.002	Y	1	20	0.002197703	$10,824.99	R
074018	$284,684	$2,793,640	$1,160,000	$4,238,324	7	S	0.00011	$466	Y	0.002	Y	1	52	0.005703985	$24,175.34	R
074019	$242,023	NA	$580,000	$822,023	7	S	0.00011	$90	Y	0.002	Y	1	52	0.005703985	$4,688.81	R
074023	$133,090	$123,071	$580,000	$836,161	6	R	0.000077	$64	N	0.002	Y	1	55	0.004226207	$3,533.79	R
074024	$523,774	$269,990	$1,160,000	$1,953,764	7	S	0.00011	$215	N	0.002	Y	1	53	0.005813357	$11,357.93	R
074030	$84,562	NA	$0	$84,562	6	S	0.00011	$9	Y	0.002	Y	1	46	0.005047497	$426.83	R
080028	$1,266,609	$1,812,275	$1,160,000	$4,238,884	6	S	0.00011	$466	Y	0.002	Y	1	50	0.005485204	$23,251.14	T
080031	$859,670	$5,638,841	$1,160,000	$7,658,512	7	S	0.00011	$842	Y	0.002	Y	1	51	0.0055946	$42,846.31	T
084007	$195,686	NA	$580,000	$775,686	7	O	0.00017	$132	Y	0.002	Y	1	48	0.008127486	$6,304.38	T
084008	$146,977	NA	$1,160,000	$1,306,977	6	S	0.00011	$144	N	0.002	Y	1	45	0.00493804	$6,453.90	T
090004	$2,391,907	$1,008,787	$2,900,000	$6,300,693	6	S	0.00011	$693	Y	0.002	Y	1	34	0.00373322	$23,521.87	R
090010	$742,613	$3,667,810	$1,160,000	$5,570,423	7	S	0.00011	$613	N	0.002	Y	1	25	0.002746373	$15,298.46	R
090015	$284,309	$1,451,821	$1,160,000	$2,896,131	7	S	0.00011	$319	N	0.002	Y	1	20	0.002197703	$6,364.83	R
090028	$2,200,213	$1,253,271	$2,900,000	$6,353,485	7	S	0.00011	$699	Y	0.002	Y	1	35	0.003842809	$24,415.23	R
090047	$1,941,750	$1,688,778	$1,160,000	$4,790,528	7	R	0.000077	$369	N	0.002	Y	1	48	0.00368932	$17,673.79	R
094001	$270,197	$70,366	$580,000	$920,563	7	S	0.00011	$101	N	0.002	Y	1	42	0.004609597	$4,243.42	R
094006	$219,444	$154,226	$1,160,000	$1,533,670	6	S	0.00011	$169	N	0.002	Y	1	41	0.004500092	$6,901.66	R
094007	$310,062	$527,215	$1,160,000	$1,997,277	7	S	0.00011	$220	N	0.002	Y	1	40	0.004390575	$8,769.19	R
094011	$75,713	$32,282	$580,000	$687,995	7	S	0.00011	$76	N	0.002	Y	1	41	0.004500092	$3,096.04	R
094012	$127,871	$32,282	$580,000	$740,153	7	S	0.00011	$81	N	0.002	Y	1	42	0.004609597	$3,411.81	R
094013	$255,029	$246,762	$1,160,000	$1,661,791	7	S	0.00011	$183	N	0.0005	Y	1	41	0.004500092	$7,478.21	R
094014	$153,949	$42,477	$580,000	$776,426	7	S	0.00011	$85	N	0.0005	Y	1	41	0.004500092	$3,493.99	R
094015	$104,727	$42,477	$580,000	$727,204	7	S	0.00011	$80	N	0.0005	Y	1	41	0.004500092	$3,272.49	R
094019	$219,444	$102,818	$1,160,000	$1,482,261	7	S	0.00011	$163	N	0.0005	Y	1	40	0.004390575	$6,507.98	R
094026	$493,234	$4,304,071	$2,900,000	$7,697,305	7	R	0.000077	$593	N	0.002	Y	1	26	0.002000074	$15,395.18	R
094031	$370,272	NA	$580,000	$950,272	6	S	0.00011	$105	Y	0.002	Y	1	31	0.003404379	$3,235.09	R
094034	$97,517	$1,327	$0	$98,844	7	S	0.00011	$11	N	0.002	Y	1	26	0.002856071	$282.31	R
094036	$76,554	$32,282	$580,000	$688,836	7	S	0.00011	$76	N	0.002	Y	1	42	0.004609597	$3,175.26	R
094037	$932,340	$5,541,303	$1,160,000	$7,633,643	6	S	0.00011	$840	N	0.0005	Y	1	47	0.005156941	$39,366.25	R
094044	$270,130	$1,027,730	$1,160,000	$2,457,860	7	S	0.00011	$270	N	0.002	Y	1	56	0.006141403	$15,094.71	R
100001	$3,823,879	$5,356,926	$2,900,000	$12,080,805	7	S	0.00011	$1,329	Y	0.002	Y	1	15	0.00164873	$19,917.99	T
100026	$1,855,315	$2,636,605	$1,160,000	$5,651,920	6	S	0.00011	$622	N	0.002	Y	1	29	0.003185092	$18,001.89	R
100030	$2,360,660	$888,450	$2,900,000	$6,149,110	7	R	0.000077	$473	N	0.002	Y	1	33	0.002537872	$15,605.65	T
100039	$9,674,945	$563,116	$2,900,000	$13,138,061	7	S	0.00011	$1,445	Y	0.002	Y	1	37	0.004061952	$53,366.17	T
100100	$42,523,495	$4,814,341	$2,900,000	$50,237,837	7	S	0.00011	$5,526	Y	0.002	Y	1	15	0.00164873	$82,828.63	M
100106	$1,946,932	$965,061	$2,900,000	$5,811,993	6	S	0.00011	$639	Y	0.002	Y	1	15	0.00164873	$9,582.41	T
100248	$2,052,783	$7,783,489	$2,900,000	$12,736,272	7	S	0.00011	$1,401	N	0.002	Y	1	39	0.004281046	$54,524.57	T
100260	$588,448	$1,023,185	$1,160,000	$2,771,633	3	S	0.0013	$3,603	N	0.002	Y	1	20	0.025681391	$71,179.39	R
100262	$1,501,146	$894,580	$2,900,000	$5,295,725	6	S	0.00011	$583	Y	0.002	Y	1	26	0.002856071	$15,124.97	R
100263	$1,188,181	$962,830	$2,900,000	$5,051,011	6	S	0.00011	$556	N	0.0005	Y	1	26	0.002856071	$14,426.05	R
100265	$346,186	$3,096,093	$1,160,000	$4,602,279	6	S	0.00011	$506	N	0.0005	Y	1	31	0.003404379	$15,667.90	R
100271	$1,446,269	$1,146,576	$2,900,000	$5,492,845	6	S	0.00011	$604	N	0.002	Y	1	20	0.002197703	$12,071.64	R
100276	$7,230,971	$7,001,883	$2,900,000	$17,132,855	6	S	0.00011	$1,885	N	0.0005	Y	1	27	0.002965757	$50,811.88	R
100301	$59,144,329	$47,924,778	$2,900,000	$109,969,107	6	S	0.00011	$12,097	Y	0.0005	Y	1	40	0.004390575	$482,827.63	T
100433	$5,030,758	$589,218	$1,160,000	$6,779,976	7	R	0.000077	$522	N	0.001	Y	1	46	0.00353587	$23,973.12	R
100500	$13,695,262	$7,887,325	$2,900,000	$24,482,587	7	S	0.00011	$2,693	Y	0.002	Y	0.67	26	0.002856071	$69,924.01	T
100507	$846,498	$2,048,656	$2,900,000	$5,795,153	7	S	0.00011	$637	N	0.002	Y	1	55	0.006032066	$34,956.75	R
104101	$151,707	$13,214,689	$1,160,000	$14,526,396	7	S	0.00011	$1,598	N	0.002	Y	1	27	0.002965757	$43,081.76	R
104102	$505,689	NA	$0	$505,689	6	S	0.00011	$56	Y	0.002	Y	1	27	0.002965757	$1,499.75	R
104103	$177,810	NA	$1,160,000	$1,337,810	6	S	0.00011	$147	N	0.002	Y	1	36	0.003952386	$5,287.54	R
104104	$529,077	$245,167	$1,160,000	$1,934,244	7	S	0.00011	$213	N	0.002	Y	1	29	0.003185092	$6,160.75	R
104105	$147,258	$416,784	$1,160,000	$1,724,042	6	S	0.00011	$190	N	0.002	Y	1	15	0.00164873	$2,842.48	R
104107	$336,611	$163,445	$1,160,000	$1,660,055	7	O	0.00017	$282	N	0.002	Y	1	31	0.005256584	$8,726.22	M
104126	$394,016	$268,213	$1,160,000	$1,822,228	7	S	0.00011	$200	N	0.002	Y	1	44	0.004828571	$8,798.76	R
104131	$2,010,767	$2,860,561	$2,900,000	$7,771,328	7	R	0.000077	$598	Y	0.0005	Y	1	51	0.00391945	$30,459.33	R
104132	$2,138,501	$2,860,561	$2,900,000	$7,899,061	7	R	0.000077	$608	Y	0.0005	Y	1	51	0.00391945	$30,959.97	R
104135	$415,133	$35,183	$580,000	$1,030,316	7	R	0.000077	$79	N	0.001	Y	1	53	0.004072841	$4,196.31	R
104136	$217,540	NA	$1,160,000	$1,377,540	5	O	0.00032	$23	Y	0.0001	N	1	18	0.00574436	$7,913.08	T
104137	$261,905	NA	$1,160,000	$1,421,905	5	O	0.00032	$24	Y	0.0001	N	1	31	0.009872531	$14,037.80	T
104141	$1,370,041	$1,661,066	$2,900,000	$5,931,107	7	R	0.000077	$457	N	0.0001	Y	1	59	0.00453287	$26,884.94	R
104142	$1,841,237	$3,659,853	$2,900,000	$8,401,090	6	S	0.00011	$924	N	0.0001	N	1	63	0.006906421	$58,021.47	R
104143	$4,920,287	$1,668,289	$2,900,000	$9,488,576	7	S	0.00011	$1,044	N	0.001	Y	1	67	0.007343311	$69,677.56	R
104144	$4,916,479	$1,668,289	$2,900,000	$9,484,768	7	S	0.00011	$1,043	N	0.001	Y	1	67	0.007343311	$69,649.60	R
104146	$217,103	NA	$1,160,000	$1,377,103	7	S	0.00011	$151	Y	0.0005	Y	1	51	0.0055946	$7,704.34	R
104201	$144,215	$659,679	$1,160,000	$1,963,894	6	S	0.00011	$216	N	0.001	Y	1	32	0.003514005	$6,901.13	R
104204	$1,029,357	$14,006,675	$2,900,000	$17,936,032	7	S	0.00011	$1,973	N	0.0005	Y	1	50	0.005485204	$98,382.79	R
104205	$215,667	$2,038,888	$1,160,000	$3,414,555	7	S	0.00011	$376	N	0.002	Y	1	37	0.004061952	$13,869.76	R
104208	$281,594	$1,155,396	$2,900,000	$4,336,990	7	S	0.00011	$477	N	0.002	Y	1	39	0.004281046	$18,566.85	R
104213	$1,115,948	$11,509,862	$2,900,000	$15,525,810	7	S	0.00011	$1,708	N	0.002	Y	1	51	0.0055946	$86,860.70	T
104214	$465,233	$1,794,046	$2,900,000	$5,159,279	7	O	0.00017	$877	N	0.001	Y	1	31	0.005256584	$27,120.18	M
104221	$429,039	$1,627,208	$1,160,000	$3,216,247	7	S	0.00011	$354	N	0.002	Y	1	43	0.00471909	$15,177.76	T
104222	$665,613	$571,722	$1,160,000	$2,397,334	6	S	0.00011	$264	N	0.001	Y	1	28	0.003075431	$7,372.83	T
104223	$470,290	$1,686,790	$2,900,000	$5,057,080	7	S	0.00011	$556	N	0.0001	N	1	31	0.003404379	$17,216.22	T
104224	$278,378	$2,246,145	$2,900,000	$5,424,524	7	S	0.00011	$597	N	0.0001	N	1	36	0.003952386	$21,439.82	R
104228	$1,585,333	$2,065,045	$2,900,000	$6,550,379	7	S	0.00011	$721	N	0.0005	Y	1	47	0.005156941	$33,779.92	M

Bridge Number	Bridge Replacement Cost	Detour Cost	Loss of Life Cost	Total Cost of Failure	Scour Vulnerability	Overtopping Frequency	Annual Probability of Failure	Annual Unadjusted Risk	High Priority	MPL	Meets MPL	K1	Remaining Life	Lifetime Probability of Failure	Unadjusted Lifetime Risk	Scour Mode
104234	$444,819	$851,864	$2,900,000	$4,196,683	6	S	0.00011	$462	N	0.0005	Y	1	31	0.003404379	$14,287.10	R
104235	$878,400	$837,883	$2,900,000	$4,616,282	6	S	0.00011	$508	N	0.0005	Y	1	31	0.003404379	$15,715.58	R
104245	$1,565,200	$732,071	$2,900,000	$5,197,270	7	S	0.00011	$572	N	0.001	Y	1	46	0.005047497	$26,233.20	R
104248	$468,230	NA	$1,160,000	$1,628,230	6	S	0.00011	$179	Y	0.0005	Y	1	44	0.004828571	$7,862.02	R
104249	$336,638	NA	$1,160,000	$1,496,638	7	S	0.00011	$165	Y	0.002	Y	1	47	0.005156941	$7,718.07	T
104250	$679,964	$183,523	$1,160,000	$2,023,487	7	S	0.00011	$223	Y	0.002	Y	1	43	0.00471909	$9,549.02	R
104252	$679,964	$183,523	$1,160,000	$2,023,487	6	S	0.00011	$223	Y	0.002	Y	1	43	0.00471909	$9,549.02	R
104256	$2,800,016	$2,043,993	$2,900,000	$7,744,009	7	S	0.00011	$852	N	0.0005	Y	1	51	0.0055946	$43,324.63	R
104257	$188,441	NA	$580,000	$768,441	7	S	0.00011	$85	Y	0.001	Y	1	51	0.0055946	$4,299.12	R
104260	$4,310,714	$8,804,383	$2,900,000	$16,015,097	7	S	0.00011	$1,762	N	0.002	Y	1	55	0.006032066	$96,604.13	R
104262	$1,718,217	$1,067,198	$2,900,000	$5,685,415	7	S	0.00011	$625	N	0.001	Y	1	58	0.00636004	$36,159.47	M
104267	$2,330,100	$6,644,263	$2,900,000	$11,874,363	7	S	0.00011	$1,306	N	0.002	Y	1	57	0.006250727	$74,223.40	R
104269	$2,300,227	$1,792,645	$2,900,000	$6,992,872	7	S	0.00011	$769	N	0.002	Y	1	63	0.006906421	$48,295.72	M
104281	$2,360,660	$888,450	$2,900,000	$6,149,110	7	R	0.000077	$473	N	0.002	Y	1	60	0.004609521	$28,344.45	T
104288	$4,211,948	$10,892,475	$2,900,000	$18,004,423	7	R	0.000077	$1,386	N	0.002	Y	1	58	0.004456213	$80,231.55	R
104292	$1,393,734	$1,641,950	$2,900,000	$5,935,684	7	R	0.000077	$457	N	0.002	Y	1	67	0.005145913	$30,544.51	R
104293	$1,382,215	$1,641,950	$2,900,000	$5,924,166	7	R	0.000077	$456	N	0.002	Y	1	67	0.005145913	$30,485.24	R
104301	$473,193	$1,968,482	$1,160,000	$3,601,675	6	S	0.00011	$396	N	0.002	Y	1	31	0.003404379	$12,261.47	T
104304	$259,037	$167,803	$580,000	$1,006,841	7	O	0.00017	$171	N	0.002	Y	1	32	0.00542569	$5,462.81	R
104308	$344,617	$439,786	$1,160,000	$1,944,403	7	S	0.00011	$214	N	0.001	Y	1	30	0.003294742	$6,406.31	R
104309	$149,834	$13,017,665	$1,160,000	$14,327,499	6	R	0.000077	$1,103	Y	0.002	Y	1	31	0.002384245	$34,160.27	T
104312	$531,285	$952,540	$2,900,000	$4,383,825	6	S	0.00011	$482	N	0.002	Y	1	26	0.002856071	$12,520.52	T
104313	$143,591	$498,665	$1,160,000	$1,802,256	7	S	0.00011	$198	N	0.002	Y	1	30	0.003294742	$5,937.97	R
104314	$127,493	$205,233	$580,000	$912,726	6	S	0.00011	$100	N	0.002	Y	1	32	0.003514005	$3,207.32	R
104315	$252,719	$65,566	$580,000	$898,285	6	R	0.000077	$69	N	0.002	Y	1	31	0.002384245	$2,141.73	R
104317	$172,777	$160,087	$1,160,000	$1,492,864	6	S	0.00011	$164	N	0.001	Y	1	31	0.003404379	$5,082.28	T
104320	$156,473	$50,123	$580,000	$786,596	6	F	0.00022	$173	N	0.001	Y	1	40	0.008762353	$6,892.43	T
104321	$1,411,644	$290,259	$1,160,000	$2,861,902	7	R	0.000077	$220	N	0.002	Y	1	30	0.002307423	$6,603.62	T
104322	$491,080	$717,948	$1,160,000	$2,369,027	6	S	0.00011	$261	N	0.002	Y	1	35	0.003842809	$9,103.72	T
104323	$498,080	$994,796	$1,160,000	$2,652,876	6	S	0.00011	$292	N	0.0005	Y	1	36	0.003952386	$10,485.19	T
104324	$209,065	$1,947,303	$1,160,000	$3,316,368	7	S	0.00011	$365	N	0.0005	Y	1	31	0.003404379	$11,290.18	T
104329	$211,078	NA	$1,160,000	$1,371,078	7	S	0.00011	$151	Y	0.0005	Y	1	42	0.004609597	$6,320.12	T
104330	$5,661,714	$12,524,141	$2,900,000	$21,085,855	7	O	0.00017	$3,585	N	0.002	Y	1	37	0.006270791	$132,224.98	R
104331	$158,070	$105,549	$580,000	$843,618	7	O	0.00017	$143	N	0.001	Y	1	43	0.007283964	$6,144.88	T
104335	$351,797	$1,894,927	$1,160,000	$3,406,724	7	S	0.00011	$375	N	0.002	Y	1	32	0.003514005	$11,971.25	R
104350	$2,288,592	$2,245,547	$1,160,000	$5,694,139	7	S	0.00011	$626	N	0.002	Y	1	47	0.005156941	$29,364.34	R
104357	$841,761	$185,072	$1,160,000	$2,186,832	7	S	0.00011	$241	N	0.002	Y	1	53	0.005813357	$12,712.84	R
104362	$5,022,423	$15,650,628	$2,900,000	$23,573,051	7	S	0.00011	$2,593	N	0.0005	Y	1	63	0.006906421	$162,805.43	R
104363	$2,437,294	$16,426,910	$2,900,000	$21,764,204	7	R	0.000077	$1,676	N	0.002	Y	1	63	0.004839439	$105,326.53	R
104401	$175,898	$117,550	$1,160,000	$1,453,449	7	S	0.00011	$160	N	0.002	Y	1	40	0.004390575	$6,381.48	R
104402	$156,473	$70,087	$580,000	$806,560	6	S	0.00011	$89	N	0.0001	N	1	40	0.004390575	$3,541.26	R
104403	$208,784	$1,473,820	$1,160,000	$2,842,604	6	S	0.00011	$313	N	0.0005	Y	1	40	0.004390575	$12,480.67	R
104404	$177,810	$420,329	$1,160,000	$1,758,139	7	S	0.00011	$193	N	0.0005	Y	1	40	0.004390575	$7,719.24	R
104405	$383,059	$2,696,768	$1,160,000	$4,239,827	6	S	0.00011	$466	N	0.0001	N	1	27	0.002965757	$12,574.30	R
104406	$588,003	$387,012	$1,160,000	$2,135,015	7	S	0.00011	$235	N	0.0005	Y	1	33	0.003623618	$7,736.48	R
104407	$255,878	$159,288	$580,000	$995,166	7	S	0.00011	$109	N	0.002	Y	1	31	0.003404379	$3,387.92	R
104408	$129,519	$47,944	$580,000	$757,462	6	O	0.00017	$129	N	0.002	Y	1	32	0.00542569	$4,109.75	R
104409	$348,363	$1,763,165	$1,160,000	$3,271,528	7	S	0.00011	$360	N	0.0005	Y	1	31	0.003404379	$11,137.52	R
104410	$348,925	$228,689	$1,160,000	$1,737,614	7	S	0.00011	$191	N	0.002	Y	1	31	0.003404379	$5,915.50	R
104411	$145,385	$146,001	$1,160,000	$1,451,386	6	S	0.00011	$160	N	0.002	Y	1	32	0.003514005	$5,100.18	R
104412	$129,519	$58,840	$580,000	$768,359	6	S	0.00011	$85	N	0.002	Y	1	26	0.002856071	$2,194.49	R
104413	$130,927	$99,821	$580,000	$810,747	6	S	0.00011	$89	N	0.002	Y	1	33	0.003623618	$2,937.84	R
104414	$174,697	$490,361	$1,160,000	$1,825,058	7	S	0.00011	$201	N	0.002	Y	1	31	0.003404379	$6,213.19	R
104415	$415,578	$812,725	$1,160,000	$2,388,302	6	S	0.00011	$263	N	0.002	Y	1	37	0.004061952	$9,701.17	R
104416	$213,466	$791,615	$1,160,000	$2,165,081	6	O	0.00017	$368	N	0.001	Y	1	37	0.006270791	$13,576.77	R
104417	$303,413	$284,981	$1,160,000	$1,748,394	6	S	0.00011	$192	N	0.002	Y	1	36	0.003952386	$6,910.33	R
104418	$355,387	$106,930	$1,160,000	$1,622,317	7	S	0.00011	$178	N	0.002	Y	1	37	0.004061952	$6,589.77	R
104419	$516,926	$3,192,846	$1,160,000	$4,869,772	7	S	0.00011	$536	N	0.002	Y	1	31	0.003404379	$16,578.55	R
104420	$176,616	$3,166,459	$1,160,000	$4,503,075	6	S	0.00011	$495	N	0.0005	Y	1	32	0.003514005	$15,823.83	R
104421	$529,849	$1,018,544	$1,160,000	$2,708,394	7	S	0.00011	$298	N	0.0005	Y	1	32	0.003514005	$9,517.31	R
104422	$671,348	$818,002	$1,160,000	$2,649,350	6	S	0.00011	$291	N	0.0001	N	1	32	0.003514005	$9,309.83	R
104423	$213,372	$964,011	$1,160,000	$2,337,383	6	S	0.00011	$257	N	0.0005	Y	1	37	0.004061952	$9,494.34	R
104424	$158,156	$147,489	$580,000	$885,645	5	S	0.00024	$3	N	0.0002	N	1	39	0.009317444	$8,251.95	R
104425	$218,008	$964,011	$1,160,000	$2,342,019	6	S	0.00011	$258	N	0.0001	N	1	37	0.004061952	$9,513.17	R
104426	$396,123	$658,032	$1,160,000	$2,214,155	6	S	0.00011	$244	N	0.0001	N	1	15	0.00164873	$3,650.54	R
104427	$284,309	$254,861	$580,000	$1,119,170	6	S	0.00011	$123	N	0.0001	N	1	36	0.003952386	$4,423.39	R
104428	$282,284	$308,453	$1,160,000	$1,750,737	6	S	0.00011	$193	N	0.0002	Y	1	32	0.003514005	$6,152.10	R
104429	$153,211	$175,914	$580,000	$909,126	6	S	0.00011	$100	N	0.001	Y	1	37	0.004061952	$3,692.83	R
104430	$254,488	$58,406	$580,000	$892,893	7	S	0.00011	$98	N	0.0002	Y	1	33	0.003623618	$3,235.50	R
104431	$351,313	$257,425	$1,160,000	$1,768,738	7	S	0.00011	$195	N	0.0002	Y	1	33	0.003623618	$6,409.23	R
104432	$771,052	$424,956	$580,000	$1,776,008	6	R	0.000077	$137	N	0.0005	Y	1	39	0.002998611	$5,325.56	R
104433	$173,987	NA	$1,160,000	$1,333,987	7	S	0.00011	$147	Y	0.002	Y	1	35	0.003842809	$5,126.26	R
104434	$191,693	$492,560	$1,160,000	$1,844,254	6	S	0.00011	$203	N	0.0002	Y	1	35	0.003842809	$7,087.12	R
104435	$184,701	NA	$0	$184,701	7	S	0.00011	$20	Y	0.0001	N	1	31	0.003404379	$628.79	R
104436	$208,784	$1,797,891	$1,160,000	$3,166,675	7	S	0.00011	$348	N	0.0005	Y	1	38	0.004171505	$13,209.80	R
104440	$426,745	$2,418,823	$1,160,000	$4,005,568	7	S	0.00011	$441	N	0.0001	N	1	38	0.004171505	$16,709.25	R
104442	$357,533	$158,339	$1,160,000	$1,675,872	7	S	0.00011	$184	N	0.002	Y	1	42	0.004609597	$7,725.09	R
104443	$177,888	$504,395	$1,160,000	$1,842,283	6	S	0.00011	$203	N	0.002	Y	1	41	0.004500092	$8,290.44	R
104444	$213,372	$297,869	$1,160,000	$1,671,241	6	S	0.00011	$184	N	0.002	Y	1	43	0.00471909	$7,886.74	R

Bridge Number	Bridge Replacement Cost	Detour Cost	Loss of Life Cost	Total Cost of Failure	Scour Vulnerability	Overtopping Frequency	Annual Probability of Failure	Annual Unadjusted Risk	High Priority	MPL	Meets MPL	K1	Remaining Life	Lifetime Probability of Failure	Unadjusted Lifetime Risk	Scour Mode
104445	$213,372	$251,402	$1,160,000	$1,624,774	7	S	0.00011	$179	N	0.002	Y	1	42	0.004609597	$7,489.55	R
104446	$213,372	$1,099,465	$1,160,000	$2,472,837	6	S	0.00011	$272	N	0.002	Y	1	43	0.00471909	$11,669.54	R
104452	$742,613	$1,521,419	$2,900,000	$5,164,031	7	S	0.00011	$568	N	0.002	Y	1	49	0.005375795	$27,760.77	R
104470	$414,240	NA	$580,000	$994,240	7	S	0.00011	$109	Y	0.002	Y	1	46	0.005047497	$5,018.42	R
104501	$1,825,973	$962,830	$2,900,000	$5,688,803	7	S	0.00011	$626	Y	0.002	Y	1	53	0.005813357	$33,071.04	R
104502	$1,806,994	$2,629,815	$2,900,000	$7,336,809	7	S	0.00011	$807	Y	0.0005	Y	1	55	0.006032066	$44,256.12	R
104601	$1,599,474	$1,273,803	$2,900,000	$5,773,277	8	S	0.0000022	$13	N	0.0005	Y	1	72	0.000158388	$914.42	M
104602	$1,578,060	$3,108,986	$2,900,000	$7,587,046	8	S	0.0000022	$17	N	0.002	Y	1	70	0.000153988	$1,168.32	T
104702	$2,057,403	$1,611,675	$2,900,000	$6,569,078	7	R	0.000077	$506	N	0.002	Y	1	71	0.005452292	$35,816.53	R
105100	$91,491	$42,477	$580,000	$713,967	7	S	0.00011	$79	N	0.002	Y	1	31	0.003404379	$2,430.61	R
105300	$91,491	$53,096	$580,000	$724,587	7	S	0.00011	$80	N	0.0005	Y	1	31	0.003404379	$2,466.77	R
105600	$12,732,113	$2,149,052	$2,900,000	$17,781,165	7	R	0.000077	$1,369	N	0.0005	Y	1	25	0.001923222	$34,197.13	T
105602	$4,228,555	$5,975,426	$2,900,000	$13,103,981	7	S	0.00011	$1,441	N	0.0002	Y	1	26	0.002856071	$37,425.90	T
105605	$11,636,579	$3,451,633	$2,900,000	$17,988,212	6	R	0.000077	$1,385	Y	0.0002	Y	1	32	0.002461061	$44,270.10	T
105606	$5,626,066	$4,109,087	$2,900,000	$12,635,152	6	R	0.000077	$973	Y	0.002	Y	1	15	0.001154378	$14,585.74	T
105608	$1,039,330	$457,377	$1,160,000	$2,656,708	5	S	0.00024	$9	N	0.002	Y	1	15	0.003593958	$9,548.10	T
105612	$1,358,367	$2,572,124	$2,900,000	$6,830,491	7	S	0.00011	$751	N	0.0005	Y	1	43	0.00471909	$32,233.70	T
105613	$325,514	NA	$580,000	$905,514	7	S	0.00011	$100	Y	0.002	Y	1	43	0.00471909	$4,273.20	T
105618	$149,131	NA	$1,160,000	$1,309,131	7	S	0.00011	$144	Y	0.002	Y	1	39	0.004281046	$5,604.45	T
105622	$391,284	$1,643,635	$2,900,000	$4,934,919	7	O	0.00017	$839	N	0.0005	Y	1	48	0.008127486	$40,108.48	T
105623	$51,240	NA	$0	$51,240	7	O	0.00017	$9	Y	0.002	Y	1	36	0.006101828	$312.66	T
105627	$226,670	$238,932	$1,160,000	$1,625,602	7	S	0.00011	$179	N	0.002	Y	1	58	0.00636004	$10,338.89	T
105914	$724,867	NA	$1,160,000	$1,884,867	7	S	0.00011	$207	Y	0.002	Y	1	57	0.006250727	$11,781.79	T
105915	$1,048,835	$1,442,498	$1,160,000	$3,651,333	7	R	0.000077	$281	N	0.002	Y	1	62	0.004762806	$17,390.59	R
110026	$32,757,378	$38,770,292	$2,900,000	$74,427,670	6	S	0.00011	$8,187	Y	0.0002	Y	1	16	0.001758549	$130,884.69	R
110800	$264,175	$23,699	$0	$287,875	7	S	0.00011	$32	N	0.002	Y	1	52	0.005703985	$1,642.03	R
114023	$1,393,016	$6,441,995	$2,900,000	$10,735,011	7	S	0.00011	$1,181	N	0.002	Y	1	34	0.00373322	$40,076.16	R
114044	$550,420	$7,219,903	$2,900,000	$10,670,323	6	S	0.00011	$1,174	N	0.0002	Y	1	20	0.002197703	$23,450.20	R
114045	$891,136	$838,672	$1,160,000	$2,889,807	6	O	0.00017	$491	N	0.002	Y	1	24	0.004072034	$11,767.39	R
114047	$1,746,771	$1,357,192	$1,160,000	$4,263,963	7	S	0.00011	$469	N	0.002	Y	1	25	0.002746373	$11,710.43	R
114051	$973,411	$1,316,579	$1,160,000	$3,449,990	7	S	0.00011	$379	N	0.002	Y	1	33	0.003623618	$12,501.45	R
114052	$528,538	NA	$2,900,000	$3,428,538	7	O	0.00017	$583	Y	0.002	Y	1	18	0.003055582	$10,476.18	R
114053	$995,481	$6,012,937	$1,160,000	$8,168,417	7	S	0.00011	$899	N	0.002	Y	1	34	0.00373322	$30,494.50	R
114054	$306,663	$562,457	$580,000	$1,449,120	7	R	0.000077	$112	N	0.002	Y	1	22	0.001692631	$2,452.83	R
114077	$1,654,912	$10,072,673	$2,900,000	$14,627,585	7	S	0.00011	$1,609	N	0.002	Y	1	28	0.003075431	$44,986.12	R
114079	$6,407,760	$10,211,573	$2,900,000	$19,519,333	7	S	0.00011	$2,147	N	0.0002	Y	1	46	0.005047497	$98,523.77	R
114082	$942,547	$1,265,000	$1,160,000	$3,367,548	6	R	0.000077	$259	N	0.002	Y	1	29	0.002230594	$7,511.63	R
114084	$161,383	$123,140	$580,000	$864,523	7	S	0.00011	$95	N	0.0002	Y	1	51	0.0055946	$4,836.66	R
114086	$1,321,837	$1,377,762	$1,160,000	$3,859,599	7	S	0.00011	$425	N	0.0005	Y	1	42	0.004609597	$17,791.20	R
114087	$910,895	$3,230,492	$1,160,000	$5,301,387	7	S	0.00011	$583	N	0.0002	Y	1	45	0.00493804	$26,178.46	R
114091	$1,619,467	$1,397,464	$1,160,000	$4,176,931	8	S	0.0000022	$9	N	0.0002	Y	1	65	0.00014299	$597.26	R
114092	$2,227,839	$1,837,426	$1,160,000	$5,225,265	7	S	0.00011	$575	N	0.0002	Y	1	65	0.00712489	$37,229.44	R
115100	$98,444	NA	$580,000	$678,444	7	S	0.00011	$75	N	0.0002	Y	1	36	0.003952386	$2,681.47	R
115600	$809,102	$1,177,659	$1,160,000	$3,146,761	7	S	0.00011	$346	N	0.0005	Y	1	25	0.002746373	$8,642.18	R
120001	$1,381,279	$4,520,995	$2,900,000	$8,802,274	7	S	0.00011	$968	Y	0.002	Y	1	15	0.00164873	$14,512.57	T
120011	$416,163	$1,923,052	$2,900,000	$5,239,215	7	S	0.00011	$576	Y	0.002	Y	1	15	0.00164873	$8,638.05	R
120025	$1,927,547	$23,262,763	$2,900,000	$28,090,310	7	S	0.00011	$3,090	Y	0.002	Y	1	38	0.004171505	$117,178.87	T
120033	$381,451	$23,262,763	$2,900,000	$26,544,214	7	S	0.00011	$2,920	Y	0.0005	Y	1	38	0.004171505	$110,729.32	M
120034	$1,276,489	$23,262,763	$2,900,000	$27,439,252	7	S	0.00011	$3,018	Y	0.0005	Y	1	38	0.004171505	$114,462.97	M
120035	$1,079,177	$12,606,677	$2,900,000	$16,585,854	7	S	0.00011	$1,824	Y	0.002	Y	1	38	0.004171505	$69,187.97	M
120043	$621,435	NA	$1,160,000	$1,781,435	7	S	0.00011	$196	Y	0.002	Y	1	37	0.004061952	$7,236.10	T
120050	$22,121,214	NA	$2,900,000	$25,021,214	6	S	0.00011	$2,752	Y	0.0005	Y	1	34	0.00373322	$93,409.69	T
120065	$1,325,278	$3,080,653	$2,900,000	$7,305,931	7	S	0.00011	$804	N	0.002	Y	1	26	0.002856071	$20,866.26	R
120160	$28,538,625	$26,853,882	$2,900,000	$58,292,507	7	S	0.00011	$6,412	Y	0.0005	Y	1	56	0.006141403	$357,997.77	T
120164	$1,732,764	$6,435,606	$2,900,000	$11,068,370	8	R	0.0000017	$19	Y	0.0005	Y	1	54	9.17959E-05	$1,016.03	T
124002	$217,249	$67,963	$580,000	$865,212	7	S	0.00011	$95	N	0.002	Y	1	16	0.001758549	$1,521.52	T
124004	$292,275	$63,715	$580,000	$935,991	7	S	0.00011	$103	N	0.0005	Y	1	44	0.004828571	$4,519.50	T
124006	$256,637	$398,805	$1,160,000	$1,815,442	7	S	0.00011	$200	N	0.002	Y	1	41	0.004500092	$8,169.66	R
124008	$518,448	$168,348	$1,160,000	$1,846,796	7	S	0.00011	$203	N	0.0005	Y	1	15	0.00164873	$3,044.87	R
124010	$1,005,548	NA	$1,160,000	$2,165,548	7	S	0.00011	$238	N	0.002	Y	1	16	0.001758549	$3,808.22	T
124012	$858,422	$1,147,247	$2,900,000	$4,905,669	7	S	0.00011	$540	N	0.0005	Y	1	41	0.004500092	$22,075.96	R
124015	$656,693	$32,909,418	$1,160,000	$34,726,111	7	S	0.00011	$3,820	N	0.0005	Y	1	45	0.00493804	$171,478.92	R
124019	$1,726,895	$4,632,011	$2,900,000	$9,258,906	6	S	0.00011	$1,018	N	0.002	Y	1	39	0.004281046	$39,637.80	M
124022	$420,002	NA	$1,160,000	$1,580,002	7	S	0.00011	$174	Y	0.0005	Y	1	51	0.0055946	$8,839.48	M
124023	$391,440	$526,292	$1,160,000	$2,077,732	6	S	0.00011	$229	N	0.0005	Y	1	33	0.003623618	$7,528.91	M
124025	$1,025,143	$1,763,964	$2,900,000	$5,689,107	7	S	0.00011	$626	N	0.002	Y	1	21	0.002307461	$13,127.39	M
124026	$740,272	$1,146,258	$1,160,000	$3,046,530	7	S	0.00011	$335	N	0.0005	Y	1	15	0.00164873	$5,022.91	R
124027	$321,908	$1,125,370	$1,160,000	$2,607,279	5	S	0.00024	$9	N	0.002	Y	1	36	0.008603811	$22,432.53	T
124031	$768,647	$6,257,440	$2,900,000	$9,926,087	6	S	0.00011	$1,092	N	0.002	Y	1	46	0.005047497	$50,101.89	R
124032	$320,466	NA	$580,000	$900,466	7	S	0.00011	$99	Y	0.0005	Y	1	52	0.005703985	$5,136.24	R
124038	$106,307	NA	$580,000	$686,307	6	O	0.00017	$117	Y	0.002	Y	1	16	0.002716535	$1,864.38	R
124044	$33,811,208	$3,119,372	$2,900,000	$39,830,580	7	R	0.000077	$3,067	Y	0.002	Y	0.67	29	0.002230594	$88,845.87	T
124046	$1,328,525	$1,397,075	$2,900,000	$5,625,600	7	S	0.00011	$619	Y	0.002	Y	1	44	0.004828571	$27,163.61	R
124050	$1,676,389	$4,799,451	$2,900,000	$9,375,839	7	S	0.00011	$1,031	Y	0.0005	Y	1	47	0.005156941	$48,350.65	R
124051	$2,239,264	$3,549,977	$2,900,000	$8,689,240	7	S	0.00011	$956	Y	0.002	Y	1	47	0.005156941	$44,809.90	R
124053	$1,203,976	$3,463,321	$2,900,000	$7,567,297	7	S	0.00011	$832	N	0.002	Y	1	52	0.005703985	$43,163.75	R
124056	$788,312	$1,053,968	$2,900,000	$4,742,280	7	S	0.00011	$522	Y	0.0005	Y	1	48	0.005266374	$24,974.62	M
124057	$788,312	$1,053,968	$2,900,000	$4,742,280	7	S	0.00011	$522	Y	0.0005	Y	1	48	0.005266374	$24,974.62	M
124059	$1,974,121	$4,870,089	$2,900,000	$9,744,210	6	R	0.000077	$750	Y	0.0005	Y	1	29	0.002230594	$21,735.38	M

Bridge Number	Bridge Replacement Cost	Detour Cost	Loss of Life Cost	Total Cost of Failure	Scour Vulnerability	Overtopping Frequency	Annual Probability of Failure	Annual Unadjusted Risk	High Priority	MPL	Meets MPL	K1	Remaining Life	Lifetime Probability of Failure	Unadjusted Lifetime Risk	Scour Mode
124060	$1,894,022	$21,915,402	$2,900,000	$26,709,424	7	R	0.000077	$2,057	Y	0.0005	Y	1	29	0.002230594	$59,577.89	T
124061	$1,289,974	$3,517,378	$2,900,000	$7,707,352	6	S	0.00011	$848	Y	0.0005	Y	1	31	0.003404379	$26,238.75	T
124062	$1,289,974	$3,517,378	$2,900,000	$7,707,352	6	S	0.00011	$848	Y	0.0005	Y	1	31	0.003404379	$26,238.75	T
124063	$1,289,974	$4,355,632	$2,900,000	$8,545,606	7	S	0.00011	$940	Y	0.0005	Y	1	33	0.003623618	$30,966.02	T
124064	$1,289,974	$4,355,632	$2,900,000	$8,545,606	7	S	0.00011	$940	Y	0.0005	Y	1	33	0.003623618	$30,966.02	T
124065	$42,852,419	$3,119,618	$2,900,000	$48,872,038	7	R	0.000077	$3,763	Y	0.0005	Y	1	55	0.004226207	$206,543.37	T
124070	$6,231,955	$3,930,562	$2,900,000	$13,062,518	6	R	0.000077	$1,006	N	0.0005	Y	1	56	0.004302882	$56,206.47	R
124071	$6,215,599	$3,930,562	$2,900,000	$13,046,161	6	R	0.000077	$1,005	N	0.0005	Y	1	56	0.004302882	$56,136.09	R
124073	$1,428,352	$2,399,725	$2,900,000	$6,728,077	7	S	0.00011	$740	Y	0.001	Y	1	56	0.006141403	$41,319.83	R
124074	$1,907,944	$2,399,725	$2,900,000	$7,207,669	7	S	0.00011	$793	Y	0.0005	Y	1	57	0.006250727	$45,053.17	R
124075	$1,668,148	$1,397,075	$2,900,000	$5,965,222	7	R	0.000077	$459	Y	0.001	Y	1	57	0.004379551	$26,124.99	R
124076	$395,654	$379,975	$1,160,000	$1,935,630	7	S	0.00011	$213	N	0.002	Y	1	57	0.006250727	$12,099.10	T
124078	$157,540	$95,529	$1,160,000	$1,413,069	7	S	0.00011	$155	N	0.0005	Y	1	57	0.006250727	$8,832.71	M
124079	$273,339	NA	$580,000	$853,339	7	S	0.00011	$94	Y	0.001	Y	1	57	0.006250727	$5,333.99	M
124083	$99,010	NA	$580,000	$679,010	6	O	0.00017	$115	Y	0.0005	Y	1	58	0.00981238	$6,662.70	T
124084	$1,755,676	$1,660,071	$2,900,000	$6,315,747	8	R	0.0000017	$11	N	0.0005	Y	1	59	0.000100295	$633.44	R
124092	$1,200,355	$10,419,747	$2,900,000	$14,520,101	7	S	0.00011	$1,597	Y	0.002	Y	1	65	0.00712489	$103,454.12	R
124097	$1,135,552	$8,006,802	$2,900,000	$12,042,353	7	S	0.00011	$1,325	Y	0.002	Y	1	65	0.00712489	$85,800.44	R
124126	$570,554	$58,328,394	$2,900,000	$61,798,948	7	S	0.00011	$6,798	Y	0.0005	Y	1	63	0.006906421	$426,809.58	T
124904	$317,324	$205,233	$580,000	$1,102,558	7	S	0.00011	$121	N	0.002	Y	1	30	0.003294742	$3,632.64	R
124905	$317,039	$1,715,493	$1,160,000	$3,192,532	7	S	0.00011	$351	N	0.002	Y	1	38	0.004171505	$13,317.66	R
124906	$410,669	$132,740	$580,000	$1,123,409	7	S	0.00011	$124	N	0.0005	Y	1	38	0.004171505	$4,686.31	R
124907	$560,003	$1,475,229	$1,160,000	$3,195,233	7	S	0.00011	$351	N	0.0005	Y	1	38	0.004171505	$13,328.93	R
124908	$213,644	$137,294	$580,000	$930,938	7	S	0.00011	$102	N	0.002	Y	1	26	0.002856071	$2,658.82	R
124909	$245,157	$220,407	$1,160,000	$1,625,565	7	S	0.00011	$179	N	0.002	Y	1	26	0.002856071	$4,642.73	R
124910	$576,953	$817,223	$1,160,000	$2,554,177	7	S	0.00011	$281	N	0.001	Y	1	30	0.003294742	$8,415.35	R
124911	$432,715	$849,732	$1,160,000	$2,442,447	7	S	0.00011	$269	N	0.0005	Y	1	30	0.003294742	$8,047.23	R
124912	$1,342,182	$2,744,790	$1,160,000	$5,246,971	7	S	0.00011	$577	N	0.002	Y	1	46	0.005047497	$26,484.07	R
124926	$429,039	$52,774	$580,000	$1,061,814	7	S	0.00011	$117	N	0.0005	Y	1	52	0.005703985	$6,056.57	R
124928	$972,592	$47,786	$0	$1,020,378	7	S	0.00011	$112	N	0.002	Y	1	58	0.00636004	$6,489.64	R
124929	$821,063	$238,932	$580,000	$1,639,995	7	S	0.00011	$180	N	0.0005	Y	1	58	0.00636004	$10,430.43	R
124930	$1,896,707	$2,048,656	$2,900,000	$6,845,362	7	S	0.00011	$753	N	0.0002	Y	1	58	0.00636004	$43,536.77	R
124931	$809,706	$343,906	$1,160,000	$2,313,612	7	S	0.00011	$254	N	0.0002	Y	1	58	0.00636004	$14,714.66	R
124932	$511,036	$42,477	$580,000	$1,133,513	7	S	0.00011	$125	N	0.002	Y	1	58	0.00636004	$7,209.19	R
124933	$511,036	$42,477	$580,000	$1,133,513	7	S	0.00011	$125	N	0.0005	Y	1	58	0.00636004	$7,209.19	R
124934	$469,488	$53,096	$580,000	$1,102,584	7	S	0.00011	$121	N	0.002	Y	1	60	0.006578628	$7,253.49	R
124935	$690,171	$653,779	$1,160,000	$2,503,950	6	S	0.00011	$275	N	0.002	Y	1	60	0.006578628	$16,472.56	R
124936	$501,474	$165,549	$1,160,000	$1,827,023	8	S	0.0000022	$4	N	0.0002	Y	1	53	0.000116593	$213.02	R
125002	$317,039	$760,018	$1,160,000	$2,237,056	7	S	0.00011	$246	N	0.0002	Y	1	36	0.003952386	$8,841.71	R
125003	$554,104	$1,393,086	$2,900,000	$4,847,190	7	S	0.00011	$533	N	0.002	Y	1	36	0.003952386	$19,157.97	M
125004	$464,601	$923,551	$1,160,000	$2,548,152	6	S	0.00011	$280	N	0.002	Y	1	36	0.003952386	$10,071.28	R
125005	$384,323	$771,751	$1,160,000	$2,316,074	6	S	0.00011	$255	N	0.002	Y	1	36	0.003952386	$9,154.02	R
125019	$194,784	$271,260	$1,160,000	$1,626,044	7	S	0.00011	$179	N	0.0005	Y	1	41	0.004500092	$7,317.35	R
125203	$3,893,802	$1,816,216	$2,900,000	$8,610,018	8	R	0.0000017	$15	N	0.0005	Y	1	74	0.000125792	$1,083.07	R
125204	$4,333,875	$4,273,868	$2,900,000	$11,507,743	8	S	0.0000022	$25	N	0.002	Y	1	74	0.000162787	$1,873.31	R
125500	$474,621	$26,548	$580,000	$1,081,169	7	S	0.00011	$119	Y	0.0005	Y	1	49	0.005375795	$5,812.14	T
125501	$474,621	$21,238	$580,000	$1,075,860	7	S	0.00011	$118	Y	0.002	Y	1	49	0.005375795	$5,783.60	T
125502	$907,992	$477,864	$1,160,000	$2,545,856	7	S	0.00011	$280	N	0.002	Y	1	36	0.003952386	$10,062.21	T
125512	$437,514	$2,498,948	$2,900,000	$5,836,463	7	S	0.00011	$642	N	0.002	Y	1	41	0.004500092	$26,264.62	R
125514	$917,731	$1,763,964	$2,900,000	$5,581,695	7	S	0.00011	$614	N	0.002	Y	1	36	0.003952386	$22,061.02	R
125518	$277,614	$65,378	$580,000	$922,991	7	S	0.00011	$102	N	0.0005	Y	1	36	0.003952386	$3,648.02	R
125522	$255,279	$779,346	$1,160,000	$2,194,625	7	S	0.00011	$241	N	0.002	Y	1	31	0.003404379	$7,471.34	T
125542	$336,681	$1,029,296	$1,160,000	$2,525,977	7	S	0.00011	$278	N	0.0005	Y	1	41	0.004500092	$11,367.13	R
125546	$942,454	$2,006,508	$2,900,000	$5,848,962	7	S	0.00011	$643	N	0.0005	Y	1	36	0.003952386	$23,117.36	R
125556	$442,072	$1,290,653	$2,900,000	$4,632,725	7	S	0.00011	$510	N	0.0005	Y	1	41	0.004500092	$20,847.69	R
125557	$184,576	$343,033	$1,160,000	$1,687,609	7	S	0.00011	$186	N	0.0005	Y	1	40	0.004390575	$7,409.57	R
125558	$187,994	$343,033	$1,160,000	$1,691,027	7	S	0.00011	$186	N	0.0005	Y	1	40	0.004390575	$7,424.58	R
125560	$997,954	$2,175,555	$2,900,000	$6,073,509	7	S	0.00011	$668	N	0.002	Y	1	35	0.003842809	$23,339.34	R
125562	$984,938	$3,527,927	$2,900,000	$7,412,865	7	S	0.00011	$815	N	0.0005	Y	1	35	0.003842809	$28,486.23	R
125566	$711,616	$282,343	$1,160,000	$2,153,959	7	S	0.00011	$237	N	0.001	Y	1	39	0.004281046	$9,221.20	R
125568	$708,128	$263,872	$1,160,000	$2,131,999	7	S	0.00011	$235	N	0.0005	Y	1	36	0.003952386	$8,426.48	R
125570	$152,902	$39,227	$580,000	$772,129	7	S	0.00011	$85	N	0.0005	Y	1	40	0.004390575	$3,390.09	R
125572	$279,502	$39,227	$580,000	$898,729	7	S	0.00011	$99	N	0.002	Y	1	36	0.003952386	$3,552.12	R
125574	$205,085	$126,658	$1,160,000	$1,491,743	7	S	0.00011	$164	N	0.002	Y	1	40	0.004390575	$6,549.61	R
125577	$248,380	$437,047	$2,900,000	$3,585,427	7	S	0.00011	$394	N	0.0005	Y	1	40	0.004390575	$15,742.09	R
125578	$243,823	$437,047	$2,900,000	$3,580,870	7	S	0.00011	$394	N	0.0005	Y	1	40	0.004390575	$15,722.08	R
125582	$934,868	$1,102,477	$2,900,000	$4,937,345	7	S	0.00011	$543	N	0.0005	Y	1	39	0.004281046	$21,137.00	R
125584	$703,375	$1,240,196	$1,160,000	$3,103,572	7	S	0.00011	$341	N	0.0005	Y	1	38	0.004171505	$12,946.57	R
125586	$923,974	$2,601,846	$2,900,000	$6,425,820	7	S	0.00011	$707	Y	0.002	Y	1	39	0.004281046	$27,509.23	R
125588	$696,445	$3,236,825	$1,160,000	$5,093,270	7	S	0.00011	$560	Y	0.002	Y	1	36	0.003952386	$20,130.57	R
125590	$146,636	$78,679	$580,000	$805,315	7	S	0.00011	$89	N	0.0001	N	1	40	0.004390575	$3,535.80	R
125592	$166,631	$143,294	$1,160,000	$1,469,925	7	S	0.00011	$162	N	0.0001	N	1	40	0.004390575	$6,453.82	R
125594	$281,391	NA	$580,000	$861,391	7	S	0.00011	$95	Y	0.0005	Y	1	36	0.003952386	$3,404.55	R
125608	$262,466	$738,840	$1,160,000	$2,161,307	7	S	0.00011	$238	N	0.0005	Y	1	26	0.002856071	$6,172.85	T
125630	$231,493	$392,267	$1,160,000	$1,783,760	6	S	0.00011	$196	N	0.0005	Y	1	29	0.003185092	$5,681.44	T
125632	$277,614	$77,566	$580,000	$935,179	7	O	0.00017	$159	N	0.0005	Y	1	36	0.006101828	$5,706.30	R
125638	$1,625,039	$10,524,982	$2,900,000	$15,050,022	7	S	0.00011	$1,656	N	0.0005	Y	1	33	0.003623618	$54,535.54	M
125640	$934,868	$2,249,053	$2,900,000	$6,083,922	7	S	0.00011	$669	N	0.0005	Y	1	36	0.003952386	$24,046.01	R
125642	$375,989	$564,685	$1,160,000	$2,100,674	7	S	0.00011	$231	N	0.0002	Y	1	35	0.003842809	$8,072.49	R

Bridge Number	Bridge Replacement Cost	Detour Cost	Loss of Life Cost	Total Cost of Failure	Scour Vulnerability	Overtopping Frequency	Annual Probability of Failure	Annual Unadjusted Risk	High Priority	MPL	Meets MPL	K1	Remaining Life	Lifetime Probability of Failure	Unadjusted Lifetime Risk	Scour Mode
125644	$928,594	$2,513,648	$2,900,000	$6,342,242	7	S	0.00011	$698	N	0.0001	N	1	35	0.003842809	$24,372.03	R
125646	$928,594	$1,389,121	$2,900,000	$5,217,715	7	S	0.00011	$574	N	0.0001	N	1	36	0.003952386	$20,622.43	R
125648	$713,770	$845,798	$1,160,000	$2,719,568	7	S	0.00011	$299	N	0.002	Y	1	36	0.003952386	$10,748.78	R
125650	$265,836	$71,069	$580,000	$916,905	6	R	0.000077	$71	N	0.002	Y	1	46	0.00353587	$3,242.06	R
125652	$286,507	$118,018	$580,000	$984,525	7	S	0.00011	$108	N	0.002	Y	1	36	0.003952386	$3,891.22	R
125654	$151,649	$46,911	$580,000	$778,559	7	S	0.00011	$86	N	0.002	Y	1	40	0.004390575	$3,418.32	R
125656	$276,274	$65,378	$580,000	$921,652	7	S	0.00011	$101	N	0.002	Y	1	36	0.003952386	$3,642.72	R
125660	$1,229,760	$3,572,026	$2,900,000	$7,701,786	7	S	0.00011	$847	N	0.002	Y	1	36	0.003952386	$30,440.43	T
125662	$1,441,400	$3,902,769	$2,900,000	$8,244,169	7	S	0.00011	$907	N	0.002	Y	1	36	0.003952386	$32,584.14	R
125664	$934,868	$2,465,452	$2,900,000	$6,300,320	7	S	0.00011	$693	N	0.0005	Y	1	36	0.003952386	$24,901.30	R
125668	$1,647,546	$392,141	$2,900,000	$4,939,687	7	S	0.00011	$543	N	0.002	Y	1	34	0.00373322	$18,440.94	M
125670	$942,454	$1,106,274	$2,900,000	$4,948,728	7	S	0.00011	$544	N	0.002	Y	1	36	0.003952386	$19,559.29	R
125672	$1,301,992	$808,483	$2,900,000	$5,010,475	7	S	0.00011	$551	N	0.0005	Y	1	36	0.003952386	$19,803.33	T
125674	$944,170	$2,293,153	$2,900,000	$6,137,323	7	S	0.00011	$675	N	0.0005	Y	1	36	0.003952386	$24,257.07	R
125675	$365,735	$179,789	$1,160,000	$1,705,524	7	S	0.00011	$188	N	0.001	Y	1	40	0.004390575	$7,488.23	R
125676	$377,674	$179,789	$1,160,000	$1,717,464	7	S	0.00011	$189	N	0.0005	Y	1	40	0.004390575	$7,540.65	R
125677	$423,514	$92,536	$1,160,000	$1,676,050	7	S	0.00011	$184	N	0.0005	Y	1	40	0.004390575	$7,358.82	R
125678	$427,728	$83,790	$1,160,000	$1,671,518	7	S	0.00011	$184	N	0.002	Y	1	40	0.004390575	$7,338.93	R
125680	$169,031	$143,294	$1,160,000	$1,472,325	7	S	0.00011	$162	N	0.0002	Y	1	41	0.004500092	$6,625.60	R
125687	$444,210	$262,089	$1,160,000	$1,866,299	7	S	0.00011	$205	N	0.0001	N	1	40	0.004390575	$8,194.13	R
125708	$554,104	$310,612	$1,160,000	$2,024,715	7	S	0.00011	$223	N	0.0001	N	1	41	0.004500092	$9,111.40	R
125710	$331,554	$637,434	$1,160,000	$2,128,988	7	S	0.00011	$234	N	0.0001	N	1	41	0.004500092	$9,580.64	R
125712	$693,098	$1,127,768	$1,160,000	$2,980,866	7	S	0.00011	$328	N	0.0005	Y	1	41	0.004500092	$13,414.17	R
125714	$835,440	$955,729	$1,160,000	$2,951,168	6	S	0.00011	$325	N	0.0002	Y	1	41	0.004500092	$13,280.53	R
125716	$539,167	$764,583	$1,160,000	$2,463,750	6	S	0.00011	$271	N	0.0002	Y	1	49	0.005375795	$13,244.61	R
125719	$275,811	$118,018	$1,160,000	$1,553,829	7	S	0.00011	$171	N	0.002	Y	1	31	0.003404379	$5,289.82	T
125726	$270,598	NA	$1,160,000	$1,430,598	7	S	0.00011	$157	N	0.002	Y	1	41	0.004500092	$6,437.82	R
125729	$220,855	$44,239	$580,000	$845,094	7	S	0.00011	$93	N	0.002	Y	1	49	0.005375795	$4,543.05	T
125730	$250,971	$49,198	$1,160,000	$1,460,169	7	S	0.00011	$161	N	0.002	Y	1	49	0.005375795	$7,849.57	T
125731	$161,992	$646	$0	$162,638	7	S	0.00011	$18	N	0.002	Y	1	49	0.005375795	$874.31	T
125732	$242,988	$326,541	$1,160,000	$1,729,529	6	S	0.00011	$190	N	0.002	Y	1	49	0.005375795	$9,297.59	T
125733	$316,449	$23,455	$580,000	$919,904	7	S	0.00011	$101	N	0.0002	Y	1	49	0.005375795	$4,945.22	T
125734	$316,449	$23,455	$580,000	$919,904	7	S	0.00011	$101	N	0.0005	Y	1	49	0.005375795	$4,945.22	T
125735	$552,892	$23,455	$580,000	$1,156,348	7	S	0.00011	$127	N	0.0005	Y	1	49	0.005375795	$6,216.29	R
125736	$552,892	$23,455	$580,000	$1,156,348	7	S	0.00011	$127	N	0.0001	N	1	49	0.005375795	$6,216.29	R
125737	$527,912	$23,455	$580,000	$1,131,368	7	S	0.00011	$124	N	0.0001	N	1	49	0.005375795	$6,082.00	M
125738	$527,912	$23,455	$580,000	$1,131,368	7	S	0.00011	$124	N	0.0001	N	1	49	0.005375795	$6,082.00	M
125740	$424,352	$70,366	$580,000	$1,074,718	7	S	0.00011	$118	N	0.002	Y	1	49	0.005375795	$5,777.46	R
125743	$631,596	$89,895	$1,160,000	$1,881,490	7	S	0.00011	$207	N	0.002	Y	1	50	0.005485204	$10,320.36	T
125744	$631,596	$89,895	$1,160,000	$1,881,490	7	S	0.00011	$207	N	0.002	Y	1	50	0.005485204	$10,320.36	T
126500	$621,560	$883,654	$2,900,000	$4,405,213	7	S	0.00011	$485	Y	0.002	Y	1	35	0.003842809	$16,928.39	T
130012	$833,543	$2,887,195	$1,160,000	$4,880,738	7	S	0.00011	$537	N	0.0005	Y	1	16	0.001758549	$8,583.02	R
130014	$227,958	$2,198,050	$1,160,000	$3,586,008	7	S	0.00011	$394	N	0.0005	Y	1	21	0.002307461	$8,274.57	R
130037	$1,516,082	$8,901,197	$1,160,000	$11,577,279	6	S	0.00011	$1,274	N	0.0005	Y	1	16	0.001758549	$20,359.21	R
130132	$100,214,665	$7,319,707	$2,900,000	$110,434,371	7	S	0.00011	$12,148	Y	0.0005	Y	1	52	0.005703985	$629,915.97	T
130136	$10,245,874	$18,507,842	$2,900,000	$31,653,716	7	S	0.00011	$3,482	Y	0.002	Y	1	54	0.005922718	$187,476.03	T
134002	$322,629	$133,802	$580,000	$1,036,431	7	S	0.00011	$114	N	0.002	Y	1	16	0.001758549	$1,822.61	T
134005	$169,195	$375,923	$1,160,000	$1,705,118	7	S	0.00011	$188	N	0.002	Y	1	26	0.002856071	$4,869.94	T
134007	$156,473	$164,598	$580,000	$901,071	7	S	0.00011	$99	N	0.0005	Y	1	36	0.003952386	$3,561.38	T
134010	$261,272	$161,337	$0	$422,609	5	S	0.00024	$1	N	0.002	Y	1	32	0.007651499	$3,233.59	R
134011	$185,814	$69,025	$580,000	$834,839	7	S	0.00011	$92	N	0.002	Y	1	26	0.002856071	$2,384.36	R
134015	$461,581	$661,046	$1,160,000	$2,282,627	6	S	0.00011	$251	Y	0.0005	Y	1	28	0.003075431	$7,020.06	T
134017	$151,980	$238,823	$1,160,000	$1,550,803	6	S	0.00011	$171	N	0.002	Y	1	34	0.00373322	$5,789.49	M
134019	$170,319	$441,301	$1,160,000	$1,771,619	7	S	0.00011	$195	N	0.002	Y	1	26	0.002856071	$5,059.87	T
134023	$909,537	$1,604,339	$1,160,000	$3,673,876	4	R	0.0004	$1,470	N	0.002	Y	1	29	0.011535273	$42,379.16	T
134024	$350,704	$1,604,339	$1,160,000	$3,115,044	6	S	0.00011	$343	N	0.002	Y	1	29	0.003185092	$9,921.70	R
134025	$243,226	$771,132	$1,160,000	$2,174,358	7	S	0.00011	$239	N	0.002	Y	1	36	0.003952386	$8,593.90	R
134026	$193,871	$2,814,630	$1,160,000	$4,168,501	6	S	0.00011	$459	N	0.002	Y	1	36	0.003952386	$16,475.53	R
134030	$150,653	$1,700,327	$1,160,000	$3,010,980	6	S	0.00011	$331	N	0.002	Y	1	26	0.002856071	$8,599.57	R
134031	$197,094	$1,190,354	$580,000	$1,967,448	7	S	0.00011	$216	N	0.002	Y	1	26	0.002856071	$5,619.17	R
134033	$547,579	$4,183,073	$2,900,000	$7,630,653	7	S	0.00011	$839	N	0.002	Y	1	29	0.003185092	$24,304.33	R
134034	$165,051	$255,750	$1,160,000	$1,580,801	7	S	0.00011	$174	Y	0.002	Y	1	16	0.001758549	$2,779.92	T
134035	$230,778	$84,954	$580,000	$895,732	6	R	0.000077	$69	N	0.002	Y	1	30	0.002307423	$2,066.83	R
134037	$166,175	$196,134	$1,160,000	$1,522,308	6	S	0.00011	$167	N	0.002	Y	1	24	0.002636663	$4,013.81	R
134042	$166,175	$593,632	$1,160,000	$1,919,807	4	S	0.0005	$960	N	0.0005	N	1	24	0.011931252	$22,905.70	M
134045	$258,463	$3,279,044	$1,160,000	$4,697,507	7	S	0.00011	$517	N	0.0005	Y	1	31	0.003404379	$15,992.10	R
134046	$990,775	$1,394,291	$1,160,000	$3,545,066	7	R	0.000077	$273	N	0.0005	Y	1	41	0.003152143	$11,174.56	R
134049	$198,155	$7,767,480	$1,160,000	$9,125,635	6	S	0.00011	$1,004	N	0.0005	Y	1	17	0.001868355	$17,049.93	R
134054	$295,079	$2,225,317	$1,160,000	$3,680,396	6	S	0.00011	$405	N	0.002	Y	1	21	0.002307461	$8,492.37	R
134055	$126,549	$45,663	$580,000	$752,211	6	S	0.00011	$83	N	0.0005	Y	1	36	0.003952386	$2,973.03	R
134059	$124,986	$119,466	$580,000	$824,452	6	S	0.00011	$91	N	0.0005	Y	1	36	0.003952386	$3,258.55	R
134062	$150,533	$152,917	$580,000	$883,449	6	S	0.00011	$97	N	0.002	Y	1	26	0.002856071	$2,523.19	R
134063	$102,667	$71,998	$580,000	$754,665	6	S	0.00011	$83	N	0.002	Y	1	26	0.002856071	$2,155.38	R
134064	$142,172	$209,209	$580,000	$931,381	6	S	0.00011	$102	N	0.0005	Y	1	17	0.001868355	$1,740.15	R
134069	$259,797	$1,144,113	$1,160,000	$2,563,910	6	S	0.00011	$282	N	0.0005	Y	1	36	0.003952386	$10,133.56	R
134070	$146,378	$50,777	$580,000	$777,155	5	S	0.00024	$3	N	0.002	Y	1	36	0.008603811	$6,686.49	T
134074	$183,084	$390,256	$580,000	$1,153,340	7	S	0.00011	$127	N	0.002	Y	1	44	0.004828571	$5,568.98	R
134090	$114,170	NA	$580,000	$694,170	7	S	0.00011	$76	Y	0.002	Y	1	51	0.0055946	$3,883.60	T
134091	$880,202	$1,147,841	$1,160,000	$3,188,044	7	S	0.00011	$351	N	0.0005	Y	1	56	0.006141403	$19,579.06	T

Bridge Number	Bridge Replacement Cost	Detour Cost	Loss of Life Cost	Total Cost of Failure	Scour Vulnerability	Overtopping Frequency	Annual Probability of Failure	Annual Unadjusted Risk	High Priority	MPL	Meets MPL	K1	Remaining Life	Lifetime Probability of Failure	Unadjusted Lifetime Risk	Scour Mode
134092	$227,248	$95,893	$1,160,000	$1,483,141	7	S	0.00011	$163	N	0.002	Y	1	53	0.005813357	$8,622.03	R
134093	$716,884	$180,312	$1,160,000	$2,057,196	7	S	0.00011	$226	N	0.0005	Y	1	54	0.005922718	$12,184.19	R
134094	$782,881	$1,469,970	$2,900,000	$5,152,850	7	R	0.000077	$397	N	0.002	Y	1	55	0.004226207	$21,777.01	M
134095	$672,004	$896,681	$2,900,000	$4,468,685	7	S	0.00011	$492	N	0.002	Y	1	55	0.006032066	$26,955.40	R
134096	$893,411	$68,812	$580,000	$1,542,224	7	S	0.00011	$170	N	0.0005	Y	1	55	0.006032066	$9,302.80	R
134098	$1,726,716	$46,854	$580,000	$2,353,570	6	S	0.00011	$259	N	0.0005	Y	1	55	0.006032066	$14,196.89	R
134100	$76,022	NA	$580,000	$656,022	6	S	0.00011	$72	Y	0.0005	Y	1	55	0.006032066	$3,957.17	R
134101	$192,699	NA	$580,000	$772,699	5	O	0.00032	$13	Y	0.0005	Y	1	56	0.017763208	$13,725.61	R
134103	$174,494	$167,593	$1,160,000	$1,502,086	7	S	0.00011	$165	N	0.002	Y	1	58	0.00636004	$9,553.33	R
134106	$186,037	$400,113	$580,000	$1,166,150	7	S	0.00011	$128	N	0.002	Y	1	60	0.006578628	$7,671.67	R
135000	$144,262	$552,547	$1,160,000	$1,856,809	7	S	0.00011	$204	N	0.002	Y	1	18	0.00197815	$3,673.05	T
135001	$120,218	$177,874	$1,160,000	$1,458,092	7	S	0.00011	$160	N	0.002	Y	1	18	0.00197815	$2,884.32	T
140050	$3,052,798	$1,295,043	$2,900,000	$7,247,841	6	S	0.00011	$797	N	0.002	Y	1	23	0.002526941	$18,314.87	T
140064	$2,999,997	$580,518	$1,160,000	$4,740,515	7	R	0.000077	$365	N	0.0005	Y	1	51	0.00391945	$18,580.21	T
144001	$64,124	NA	$580,000	$644,124	7	S	0.00011	$71	Y	0.0005	Y	1	15	0.00164873	$1,061.99	R
144017	$477,107	$274,284	$1,160,000	$1,911,391	6	S	0.00011	$210	N	0.0005	Y	1	38	0.004171505	$7,973.38	R
144024	$3,452,167	$1,098,067	$2,900,000	$7,450,234	7	S	0.00011	$820	N	0.0005	Y	1	38	0.004171505	$31,078.69	T
144025	$1,532,611	$404,977	$2,900,000	$4,837,587	7	S	0.00011	$532	N	0.002	Y	1	44	0.004828571	$23,358.63	R
144026	$1,521,748	$480,680	$2,900,000	$4,902,428	7	S	0.00011	$539	N	0.002	Y	1	46	0.005047497	$24,744.99	R
144033	$247,460	$269,684	$1,160,000	$1,677,143	6	S	0.00011	$184	N	0.002	Y	1	49	0.005375795	$9,015.98	T
144034	$1,492,561	$1,338,494	$2,900,000	$5,731,055	7	S	0.00011	$630	N	0.0005	Y	1	54	0.005922718	$33,943.42	T
144035	$374,163	$402,844	$1,160,000	$1,937,007	7	S	0.00011	$213	N	0.0005	Y	1	55	0.006032066	$11,684.15	T
144036	$1,328,837	$2,636,368	$1,160,000	$5,125,205	7	S	0.00011	$564	N	0.002	Y	1	54	0.005922718	$30,355.14	R
144038	$638,305	NA	$580,000	$1,218,305	7	R	0.000077	$94	N	0.0005	Y	1	35	0.002691475	$3,279.04	R
144051	$6,360,438	$4,961,147	$2,900,000	$14,221,585	7	S	0.00011	$1,564	N	0.0005	Y	1	69	0.007561683	$107,539.12	R
144055	$161,695	$66,740	$0	$228,435	7	S	0.00011	$25	N	0.0005	Y	1	67	0.007343311	$1,677.47	R
150009	$955,939	$4,997,574	$2,900,000	$8,853,513	7	S	0.00011	$974	N	0.0005	Y	1	15	0.00164873	$14,597.05	T
150013	$495,387	$32,339,331	$2,900,000	$35,734,719	6	S	0.00011	$3,931	Y	0.0005	Y	1	15	0.00164873	$58,916.91	T
150023	$997,767	$3,515,446	$2,900,000	$7,413,213	6	S	0.00011	$815	Y	0.0005	Y	1	15	0.00164873	$12,222.39	T
150062	$233,491	$2,456,338	$2,900,000	$5,589,829	7	S	0.00011	$615	N	0.002	Y	1	15	0.00164873	$9,216.12	R
150067	$4,445,595	NA	$2,900,000	$7,345,595	7	S	0.00011	$808	Y	0.002	Y	1	29	0.003185092	$23,396.40	T
150068	$33,696,551	NA	$2,900,000	$36,596,551	6	S	0.00011	$4,026	Y	0.002	Y	1	29	0.003185092	$116,563.39	T
150113	$398,589	$1,680,604	$2,900,000	$4,979,193	7	S	0.00011	$548	N	0.002	Y	1	15	0.00164873	$8,209.35	R
154001	$993,959	NA	$1,160,000	$2,153,959	6	S	0.00011	$237	N	0.002	Y	1	34	0.00373322	$8,041.20	T
154002	$1,002,527	NA	$1,160,000	$2,162,527	6	O	0.00017	$368	Y	0.0002	Y	1	34	0.005763816	$12,464.41	T
154003	$317,753	$223,440	$1,160,000	$1,701,192	7	S	0.00011	$187	N	0.0005	Y	1	22	0.002417207	$4,112.13	R
154004	$211,835	NA	$1,160,000	$1,371,835	7	S	0.00011	$151	Y	0.0005	Y	1	24	0.002636663	$3,617.07	R
154005	$2,475,376	NA	$2,900,000	$5,375,376	7	R	0.000077	$414	Y	0.0005	Y	1	60	0.004609521	$24,777.91	T
154050	$703,047	$472,770	$1,160,000	$2,335,817	6	S	0.00011	$257	N	0.0005	Y	1	43	0.00471909	$11,022.93	R
154100	$256,216	$269,684	$1,160,000	$1,685,899	6	S	0.00011	$185	N	0.0005	Y	1	15	0.00164873	$2,779.59	T
154101	$197,804	$809,051	$1,160,000	$2,166,855	6	S	0.00011	$238	N	0.0005	Y	1	15	0.00164873	$3,572.56	T
154111	$3,263,002	$2,711,997	$2,900,000	$8,874,999	6	S	0.00011	$976	N	0.0005	Y	1	51	0.0055946	$49,652.07	R
154140	$182,432	NA	$580,000	$762,432	7	S	0.00011	$84	Y	0.0005	Y	1	43	0.00471909	$3,597.99	R
154153	$1,873,670	$1,168,626	$2,900,000	$5,942,295	7	S	0.00011	$654	N	0.0005	Y	1	51	0.0055946	$33,244.76	R
154201	$1,086,793	$2,238,029	$2,900,000	$6,224,822	6	S	0.00011	$685	N	0.002	Y	1	51	0.0055946	$34,825.39	R
154208	$3,022,394	$8,995,633	$2,900,000	$14,918,027	6	S	0.00011	$1,641	Y	0.0005	Y	1	16	0.001758549	$26,234.08	T
154209	$30,172,253	$20,779,026	$2,900,000	$53,851,278	6	S	0.00011	$5,924	Y	0.002	Y	1	16	0.001758549	$94,700.10	T
154252	$159,510	$1,653,716	$2,900,000	$4,713,226	6	S	0.00011	$518	N	0.002	Y	1	15	0.00164873	$7,770.84	R
154353	$1,241,091	$387,012	$1,160,000	$2,788,102	7	S	0.00011	$307	N	0.0005	Y	1	40	0.004390575	$12,241.37	T
154362	$24,696,329	$2,432,726	$2,900,000	$30,029,055	7	R	0.000077	$2,312	Y	0.0005	Y	1	59	0.00453287	$136,117.81	R
154363	$24,696,329	$2,432,726	$2,900,000	$30,029,055	7	R	0.000077	$2,312	Y	0.002	Y	1	59	0.00453287	$136,117.81	R
154364	$11,179,337	$19,461,808	$2,900,000	$33,541,145	6	S	0.00011	$3,690	N	0.002	Y	1	59	0.00646934	$216,989.07	R
154370	$564,686	$1,212,725	$2,900,000	$4,677,410	6	O	0.00017	$795	N	0.0005	Y	1	42	0.007115173	$33,280.58	T
154371	$827,433	$699,260	$1,160,000	$2,686,693	6	S	0.00011	$296	Y	0.002	Y	1	28	0.003075431	$8,262.74	T
154406	$256,216	$926,816	$2,900,000	$4,083,031	7	R	0.000077	$314	N	0.002	Y	1	31	0.002384245	$9,734.95	R
154408	$20,377,031	$2,469,549	$2,900,000	$25,746,580	7	R	0.000077	$1,982	N	0.002	Y	1	50	0.003842746	$98,937.57	T
154549	$993,959	$734,985	$2,900,000	$4,628,944	7	S	0.00011	$509	N	0.002	Y	1	50	0.005485204	$25,390.70	R
154554	$1,928,328	$3,233,933	$2,900,000	$8,062,261	7	S	0.00011	$887	N	0.002	Y	1	47	0.005156941	$41,576.61	R
154556	$1,699,394	$3,638,175	$2,900,000	$8,237,569	7	S	0.00011	$906	N	0.002	Y	1	47	0.005156941	$42,480.66	R
154559	$4,313,804	$2,263,753	$2,900,000	$9,477,557	8	S	0.0000022	$21	N	0.002	Y	1	59	0.000129792	$1,230.11	R
154700	$1,280,211	NA	$1,160,000	$2,440,211	6	S	0.00011	$268	Y	0.002	Y	1	23	0.002526941	$6,166.27	T
154701	$1,053,939	NA	$1,160,000	$2,213,939	7	O	0.00017	$376	Y	0.002	Y	1	23	0.003902697	$8,640.33	T
155000	$115,011	NA	$580,000	$695,011	7	S	0.00011	$76	Y	0.002	Y	1	16	0.001758549	$1,222.21	T
155001	$115,011	NA	$580,000	$695,011	7	S	0.00011	$76	Y	0.002	Y	1	16	0.001758549	$1,222.21	T
155003	$436,999	$238,932	$1,160,000	$1,835,931	7	R	0.000077	$141	N	0.0005	Y	1	58	0.004456213	$8,181.30	R
155200	$215,971	NA	$1,160,000	$1,375,971	6	S	0.00011	$151	Y	0.0005	Y	1	31	0.003404379	$4,684.33	T
155501	$190,429	$263,872	$1,160,000	$1,614,301	6	S	0.00011	$178	N	0.0005	Y	1	31	0.003404379	$5,495.69	T
155502	$190,429	$263,872	$1,160,000	$1,614,301	6	S	0.00011	$178	Y	0.0005	Y	1	31	0.003404379	$5,495.69	T
155507	$438,919	$1,041,744	$1,160,000	$2,640,663	6	S	0.00011	$290	N	0.0005	Y	1	41	0.004500092	$11,883.23	R
155701	$340,347	$116,811	$580,000	$1,037,158	7	S	0.00011	$114	N	0.0005	Y	1	52	0.005703985	$5,915.93	R
155703	$366,666	$46,725	$580,000	$993,391	5	S	0.00024	$3	N	0.0001	N	1	52	0.012403927	$12,321.95	R
156311	$230,744	$0	$580,000	$810,744	7	S	0.00011	$89	N	0.0001	N	1	55	0.006032066	$4,890.46	R
156700	$468,254	$246,148	$1,160,000	$1,874,401	7	S	0.00011	$206	N	0.0005	Y	1	31	0.003404379	$6,381.17	R
156701	$451,678	$810,614	$1,160,000	$2,422,292	7	S	0.00011	$266	N	0.0005	Y	1	31	0.003404379	$8,246.40	R
156702	$232,804	$432,398	$1,160,000	$1,825,202	7	S	0.00011	$201	N	0.002	Y	1	31	0.003404379	$6,213.68	R
157001	$173,245	$100,548	$1,160,000	$1,433,793	6	S	0.00011	$158	N	0.001	Y	1	15	0.00164873	$2,363.94	T
157003	$1,413,649	$1,024,328	$2,900,000	$5,337,977	7	S	0.00011	$587	N	0.002	Y	1	54	0.005922718	$31,615.33	T
157101	$1,152,970	$849,789	$2,900,000	$4,902,759	6	S	0.00011	$539	N	0.0005	Y	1	15	0.00164873	$8,083.33	T
157103	$556,757	$747,774	$2,900,000	$4,204,530	6	S	0.00011	$462	N	0.002	Y	1	24	0.002636663	$11,085.93	T

Bridge Number	Bridge Replacement Cost	Detour Cost	Loss of Life Cost	Total Cost of Failure	Scour Vulnerability	Overtopping Frequency	Annual Probability of Failure	Annual Unadjusted Risk	High Priority	MPL	Meets MPL	K1	Remaining Life	Lifetime Probability of Failure	Unadjusted Lifetime Risk	Scour Mode
157105	$312,754	$297,960	$1,160,000	$1,770,714	7	S	0.00011	$195	N	0.002	Y	1	15	0.00164873	$2,919.43	T
157111	$199,978	$40,098	$580,000	$820,076	7	O	0.00017	$139	N	0.001	Y	1	35	0.005932837	$4,865.38	T
157117	$2,178,331	$1,554,346	$2,900,000	$6,632,677	6	R	0.000077	$511	N	0.001	Y	1	15	0.001154378	$7,656.61	R
157124	$1,018,713	$2,947,941	$2,900,000	$6,866,653	7	O	0.00017	$1,167	N	0.0005	Y	1	15	0.002546968	$17,489.14	R
157125	$815,251	$3,154,628	$2,900,000	$6,869,879	7	S	0.00011	$756	N	0.0005	Y	1	15	0.00164873	$11,326.58	R
157127	$379,579	$111,085	$1,160,000	$1,650,664	6	R	0.000077	$127	N	0.001	Y	1	15	0.001154378	$1,905.49	R
157128	$1,128,317	NA	$1,160,000	$2,288,317	6	S	0.00011	$252	Y	0.001	Y	1	31	0.003404379	$7,790.30	T
157130	$2,759,093	$1,774,547	$2,900,000	$7,433,640	7	R	0.000077	$572	N	0.0002	Y	1	46	0.00353587	$26,284.39	R
157152	$158,636	NA	$580,000	$738,636	6	S	0.00011	$81	Y	0.0005	Y	1	26	0.002856071	$2,109.60	T
157154	$5,625,753	$9,619,334	$2,900,000	$18,145,088	6	S	0.00011	$1,996	N	0.002	Y	1	27	0.002965757	$53,813.92	T
157159	$1,113,919	NA	$1,160,000	$2,273,919	6	S	0.00011	$250	Y	0.0005	Y	1	42	0.004609597	$10,481.85	T
157160	$454,495	$923,671	$2,900,000	$4,278,166	6	S	0.00011	$471	N	0.0005	Y	1	23	0.002526941	$10,810.67	R
157174	$1,721,339	$0	$2,900,000	$4,621,339	6	S	0.00011	$508	N	0.001	Y	1	29	0.003185092	$14,719.39	T
157179	$414,442	$151,194	$1,160,000	$1,725,636	6	S	0.00011	$190	N	0.001	Y	1	33	0.003623618	$6,253.05	T
157181	$389,380	$87,715	$580,000	$1,057,095	6	S	0.00011	$116	N	0.001	Y	1	41	0.004500092	$4,757.02	R
157182	$526,970	$202,345	$1,160,000	$1,889,314	6	S	0.00011	$208	N	0.002	Y	1	42	0.004609597	$8,708.98	R
157185	$255,466	$564,676	$1,160,000	$1,980,143	7	S	0.00011	$218	N	0.001	Y	1	23	0.002526941	$5,003.70	T
157186	$254,951	$263,463	$1,160,000	$1,678,414	6	S	0.00011	$185	N	0.002	Y	1	23	0.002526941	$4,241.25	T
157187	$155,523	$647,241	$1,160,000	$1,962,764	6	S	0.00011	$216	N	0.001	Y	1	23	0.002526941	$4,959.79	T
157189	$1,431,590	$3,397,962	$1,160,000	$5,989,553	6	S	0.00011	$659	N	0.001	Y	1	31	0.003404379	$20,390.71	T
157191	$3,394,044	$3,586,350	$2,900,000	$9,880,394	7	S	0.00011	$1,087	N	0.001	Y	1	15	0.00164873	$16,290.10	T
157196	$1,180,689	$793,198	$1,160,000	$3,133,887	6	S	0.00011	$345	N	0.0005	Y	1	21	0.002307461	$7,231.32	T
157197	$740,389	$611,654	$1,160,000	$2,512,043	7	S	0.00011	$276	Y	0.002	Y	1	27	0.002965757	$7,450.11	T
157198	$869,222	$0	$2,900,000	$3,769,222	7	S	0.00011	$415	N	0.001	Y	1	61	0.006687905	$25,208.20	T
157201	$502,458	$203,797	$1,160,000	$1,866,255	7	O	0.00017	$317	Y	0.002	Y	1	33	0.005594768	$10,441.26	T
157202	$507,046	NA	$1,160,000	$1,667,046	6	O	0.00017	$283	Y	0.002	Y	1	33	0.005594768	$9,326.73	T
157205	$515,451	$142,491	$1,160,000	$1,817,942	7	S	0.00011	$200	N	0.002	Y	1	41	0.004500092	$8,180.91	R
157210	$878,774	NA	$1,160,000	$2,038,774	7	S	0.00011	$224	Y	0.0005	Y	1	69	0.007561683	$15,416.56	T
157236	$508,217	$247,951	$1,160,000	$1,916,168	6	O	0.00017	$326	N	0.0005	Y	1	44	0.007452726	$14,280.67	T
157237	$884,143	$0	$2,900,000	$3,784,143	6	S	0.00011	$416	N	0.0005	Y	1	44	0.004828571	$18,272.00	T
157238	$560,963	$284,893	$1,160,000	$2,005,856	6	S	0.00011	$221	N	0.002	Y	1	44	0.004828571	$9,685.42	T
157239	$123,894	$0	$1,160,000	$1,283,894	7	S	0.00011	$141	N	0.002	Y	1	44	0.004828571	$6,199.37	T
157402	$706,466	$487,589	$2,900,000	$4,094,054	7	S	0.00011	$450	N	0.002	Y	1	49	0.005375795	$22,008.79	R
157403	$540,525	$1,124,086	$2,900,000	$4,564,611	7	S	0.00011	$502	N	0.002	Y	1	49	0.005375795	$24,538.41	R
157406	$448,721	$53,979	$1,160,000	$1,662,700	7	S	0.00011	$183	N	0.002	Y	1	49	0.005375795	$8,938.33	R
157408	$1,092,565	NA	$580,000	$1,672,565	7	O	0.00017	$284	Y	0.001	Y	1	50	0.008464694	$14,157.75	T
157503	$379,266	NA	$1,160,000	$1,539,266	7	S	0.00011	$169	Y	0.002	Y	1	56	0.006141403	$9,453.25	T
157701	$554,104	$712,981	$1,160,000	$2,427,085	7	S	0.00011	$267	N	0.002	Y	1	43	0.00471909	$11,453.63	T
157702	$757,721	$1,203,905	$2,900,000	$4,861,626	5	S	0.00024	$17	N	0.0002	N	1	52	0.012403927	$60,303.25	T
157703	$122,823	NA	$580,000	$702,823	8	R	0.0000017	$1	Y	0.0005	Y	1	61	0.000103695	$72.88	T
157860	$419,284	NA	$2,900,000	$3,319,284	6	O	0.00017	$564	Y	0.002	Y	1	24	0.004072034	$13,516.24	T
157880	$160,603	NA	$1,160,000	$1,320,603	6	O	0.00017	$225	Y	0.002	Y	1	22	0.003733332	$4,930.25	T
160037	$397,996	$136,563,484	$2,900,000	$139,861,480	7	S	0.00011	$15,385	Y	0.0002	Y	1	15	0.00164873	$230,593.83	R
160039	$479,218	$136,563,484	$2,900,000	$139,942,702	7	S	0.00011	$15,394	Y	0.0005	Y	1	15	0.00164873	$230,727.75	R
160045	$1,608,214	$1,194,579	$2,900,000	$5,702,793	4	S	0.0005	$2,851	Y	0.0002	N	1	17	0.008466085	$48,280.33	R
160086	$1,291,847	$2,368,916	$1,160,000	$4,820,763	6	S	0.00011	$530	N	0.002	Y	1	38	0.004171505	$20,109.84	R
160087	$2,597,670	$1,060,764	$1,160,000	$4,818,434	6	S	0.00011	$530	N	0.0005	Y	1	37	0.004061952	$19,572.25	R
160093	$826,036	$619,099	$1,160,000	$2,605,135	7	S	0.00011	$287	N	0.0002	Y	1	38	0.004171505	$10,867.33	R
160094	$1,311,544	$12,204,414	$2,900,000	$16,415,958	6	S	0.00011	$1,806	N	0.0005	Y	1	20	0.002197703	$36,077.39	R
160107	$1,159,572	$681,063	$1,160,000	$3,000,635	7	R	0.000077	$231	N	0.0005	Y	1	27	0.00207692	$6,232.08	R
160111	$925,410	$3,577,619	$1,160,000	$5,663,029	7	S	0.00011	$623	N	0.0005	Y	1	32	0.003514005	$19,899.91	R
160212	$1,542,859	$118,655	$580,000	$2,241,514	7	S	0.00011	$247	N	0.002	Y	1	49	0.005375795	$12,049.92	R
160400	$458,678	NA	$0	$458,678	6	S	0.00011	$50	Y	0.0002	Y	1	30	0.003294742	$1,511.23	R
164104	$175,555	$1,007,219	$2,900,000	$4,082,774	7	S	0.00011	$449	N	0.0001	N	1	26	0.002856071	$11,660.69	R
164111	$124,042	$40,778	$580,000	$744,820	6	S	0.00011	$82	N	0.0002	Y	1	26	0.002856071	$2,127.26	R
164117	$358,898	$1,117,056	$1,160,000	$2,635,955	6	S	0.00011	$290	N	0.0005	Y	1	15	0.00164873	$4,345.98	R
164121	$191,857	$55,420	$580,000	$827,277	7	S	0.00011	$91	N	0.0002	Y	1	26	0.002856071	$2,362.76	R
164131	$108,239	$96,265	$1,160,000	$1,364,504	7	O	0.00017	$232	N	0.0002	Y	1	26	0.00441062	$6,018.31	R
164136	$196,540	$810,428	$1,160,000	$2,166,968	7	S	0.00011	$238	N	0.0002	Y	1	26	0.002856071	$6,189.01	R
164137	$272,697	$6,676,479	$1,160,000	$8,109,176	7	S	0.00011	$892	N	0.002	Y	1	26	0.002856071	$23,160.38	R
164139	$272,697	$6,763,557	$1,160,000	$8,196,254	7	S	0.00011	$902	N	0.002	Y	1	26	0.002856071	$23,409.08	R
164140	$217,306	$3,297,387	$1,160,000	$4,674,693	6	O	0.00017	$795	N	0.002	Y	1	26	0.00441062	$20,618.30	R
164142	$200,218	$621,465	$580,000	$1,401,684	6	S	0.00011	$154	N	0.002	Y	1	26	0.002856071	$4,003.31	R
164144	$137,210	$423,540	$580,000	$1,140,750	6	O	0.00017	$194	N	0.0002	Y	1	26	0.00441062	$5,031.42	R
164146	$183,874	$1,333,083	$580,000	$2,096,957	6	S	0.00011	$231	N	0.002	Y	1	15	0.00164873	$3,457.32	R
164148	$407,009	$4,130,527	$1,160,000	$5,697,536	6	S	0.00011	$627	N	0.002	Y	1	26	0.002856071	$16,272.57	R
164149	$402,725	$4,007,345	$1,160,000	$5,570,070	6	S	0.00011	$613	N	0.002	Y	1	26	0.002856071	$15,908.52	R
164170	$547,954	$1,932,863	$2,900,000	$5,380,817	7	S	0.00011	$592	N	0.0005	Y	1	53	0.005813357	$31,280.61	R
164171	$1,157,715	$1,319,274	$2,900,000	$5,376,989	7	S	0.00011	$591	N	0.002	Y	1	57	0.006250727	$33,610.09	R
164201	$128,178	$898,678	$1,160,000	$2,186,856	7	S	0.00011	$241	N	0.002	Y	1	26	0.002856071	$6,245.82	R
164202	$364,166	$376,851	$1,160,000	$1,901,017	7	S	0.00011	$209	N	0.0002	Y	1	30	0.003294742	$6,263.36	R
164204	$468,417	$438,027	$1,160,000	$2,066,444	7	S	0.00011	$227	N	0.0002	Y	1	26	0.002856071	$5,901.91	R
164205	$547,970	$1,095,067	$1,160,000	$2,803,037	7	S	0.00011	$308	N	0.0002	Y	1	26	0.002856071	$8,005.67	R
164206	$413,541	$4,850,664	$1,160,000	$6,424,204	7	S	0.00011	$707	N	0.0005	Y	1	26	0.002856071	$18,347.98	R
164207	$409,233	$5,068,973	$1,160,000	$6,638,206	6	S	0.00011	$730	N	0.002	Y	1	26	0.002856071	$18,959.19	R
164216	$90,649	$2,934,159	$580,000	$3,604,808	7	S	0.00011	$397	Y	0.002	Y	1	22	0.002417207	$8,713.57	R
164219	$608,699	$1,152,327	$1,160,000	$2,921,026	7	S	0.00011	$321	N	0.002	Y	1	59	0.00646934	$18,897.11	R
164220	$1,132,711	$1,866,101	$2,900,000	$5,898,812	7	S	0.00011	$649	N	0.002	Y	1	50	0.005485204	$32,356.18	R
164221	$1,128,622	$1,996,127	$2,900,000	$6,024,749	6	S	0.00011	$663	N	0.002	Y	1	50	0.005485204	$33,046.97	R

Bridge Number	Bridge Replacement Cost	Detour Cost	Loss of Life Cost	Total Cost of Failure	Scour Vulnerability	Overtopping Frequency	Annual Probability of Failure	Annual Unadjusted Risk	High Priority	MPL	Meets MPL	K1	Remaining Life	Lifetime Probability of Failure	Unadjusted Lifetime Risk	Scour Mode
164222	$1,132,711	$1,866,101	$2,900,000	$5,898,812	7	S	0.00011	$649	N	0.0002	Y	1	50	0.005485204	$32,356.18	R
164301	$230,369	$1,686,991	$1,160,000	$3,077,360	7	S	0.00011	$339	N	0.0005	Y	1	26	0.002856071	$8,789.16	R
164304	$215,113	$1,050,590	$1,160,000	$2,425,702	7	S	0.00011	$267	N	0.002	Y	1	26	0.002856071	$6,927.98	R
164308	$190,501	$3,993,960	$580,000	$4,764,461	7	R	0.000077	$367	Y	0.0005	Y	1	26	0.002000074	$9,529.28	R
164309	$200,733	$336,700	$580,000	$1,117,434	7	S	0.00011	$123	N	0.0005	Y	1	26	0.002856071	$3,191.47	R
164310	$196,888	$324,966	$580,000	$1,101,853	7	S	0.00011	$121	N	0.0005	Y	1	26	0.002856071	$3,146.97	R
164311	$287,142	$315,984	$580,000	$1,183,126	6	S	0.00011	$130	N	0.0002	Y	1	26	0.002856071	$3,379.09	R
164315	$131,854	$80,686	$580,000	$792,540	7	S	0.00011	$87	N	0.002	Y	1	15	0.00164873	$1,306.68	R
164320	$154,797	$3,634,375	$1,160,000	$4,949,172	6	S	0.00011	$544	N	0.002	Y	1	15	0.00164873	$8,159.85	R
164321	$99,010	$201,246	$580,000	$880,256	6	S	0.00011	$97	N	0.002	Y	1	26	0.002856071	$2,514.07	R
164322	$188,990	$662,496	$580,000	$1,431,486	6	S	0.00011	$157	N	0.002	Y	1	21	0.002307461	$3,303.10	R
164324	$217,571	$1,035,888	$2,900,000	$4,153,458	6	S	0.00011	$457	N	0.002	Y	1	27	0.002965757	$12,318.15	R
164325	$87,778	NA	$0	$87,778	7	S	0.00011	$10	Y	0.002	Y	1	26	0.002856071	$250.70	R
164326	$230,369	$3,983,618	$2,900,000	$7,113,987	7	S	0.00011	$783	N	0.002	Y	1	15	0.00164873	$11,729.04	R
164327	$111,045	$73,745	$580,000	$764,790	6	S	0.00011	$84	N	0.002	Y	1	26	0.002856071	$2,184.29	R
164338	$708,339	$8,573,645	$2,900,000	$12,181,983	6	S	0.00011	$1,340	N	0.002	Y	1	42	0.004609597	$56,154.03	R
164344	$92,744	$127,372	$580,000	$800,116	7	S	0.00011	$88	N	0.002	Y	1	26	0.002856071	$2,285.19	R
164345	$243,168	$12,646,079	$1,160,000	$14,049,247	7	S	0.00011	$1,545	Y	0.002	Y	1	34	0.00373322	$52,448.93	R
164346	$542,035	$918,992	$1,160,000	$2,621,027	7	S	0.00011	$288	N	0.002	Y	1	55	0.006032066	$15,810.21	R
164402	$318,771	$277,179	$0	$595,950	6	S	0.00011	$66	N	0.002	Y	1	26	0.002856071	$1,702.08	R
164405	$175,976	$148,190	$580,000	$904,166	6	O	0.00017	$154	N	0.0005	Y	1	26	0.00441062	$3,987.93	R
164406	$194,896	$153,046	$580,000	$927,942	7	S	0.00011	$102	N	0.0005	Y	1	26	0.002856071	$2,650.27	R
164407	$99,148	$523,196	$580,000	$1,202,344	6	O	0.00017	$204	N	0.002	Y	1	26	0.00441062	$5,303.08	R
164408	$96,555	$523,196	$580,000	$1,199,752	6	S	0.00011	$132	N	0.002	Y	1	26	0.002856071	$3,426.58	R
164414	$103,967	$932,761	$1,160,000	$2,196,727	6	S	0.00011	$242	N	0.0002	Y	1	26	0.002856071	$6,274.01	R
164420	$346,490	$4,987,597	$2,900,000	$8,234,088	6	S	0.00011	$906	N	0.0005	Y	1	26	0.002856071	$23,517.14	R
164422	$127,515	$1,110,496	$1,160,000	$2,398,010	7	S	0.00011	$264	N	0.002	Y	1	26	0.002856071	$6,848.89	R
164441	$173,298	$175,649	$580,000	$928,947	6	S	0.00011	$102	N	0.002	Y	1	29	0.003185092	$2,958.78	R
164450	$935,407	$1,618,102	$1,160,000	$3,713,509	7	S	0.00011	$408	N	0.0002	Y	1	55	0.006032066	$22,400.13	R
164504	$443,882	$122,584	$1,160,000	$1,726,466	6	R	0.000077	$133	N	0.0005	Y	1	51	0.00391945	$6,766.80	R
164505	$442,009	$122,584	$1,160,000	$1,724,593	6	R	0.000077	$133	N	0.0005	Y	1	51	0.00391945	$6,759.46	R
165101	$175,352	$122,584	$1,160,000	$1,457,936	6	S	0.00011	$160	N	0.002	Y	1	31	0.003404379	$4,963.37	R
167001	$163,178	$844,389	$1,160,000	$2,167,567	6	S	0.00011	$238	N	0.002	Y	1	27	0.002965757	$6,428.48	R
170014	$525,354	$1,451,595	$2,900,000	$4,876,949	6	S	0.00011	$536	Y	0.0005	Y	1	15	0.00164873	$8,040.77	T
170031	$1,087,979	$1,689,347	$2,900,000	$5,677,326	6	S	0.00011	$625	Y	0.002	Y	1	15	0.00164873	$9,360.38	
170032	$4,336,060	$5,711,954	$2,900,000	$12,948,014	7	S	0.00011	$1,424	N	0.002	Y	1	40	0.004390575	$56,849.23	T
170033	$436,578	$1,689,347	$2,900,000	$5,025,924	6	R	0.000077	$387	Y	0.002	Y	1	15	0.001154378	$5,801.81	
170056	$1,075,056	$4,014,716	$2,900,000	$7,989,772	7	R	0.000077	$615	N	0.002	Y	1	37	0.002845055	$22,731.34	
170058	$19,191,622	$5,800,344	$1,160,000	$26,151,966	7	S	0.00011	$2,877	Y	0.0002	Y	1	30	0.003294742	$86,163.98	T
170064	$6,851,337	$3,319,071	$1,160,000	$11,330,408	6	S	0.00011	$1,246	Y	0.002	Y	1	15	0.00164873	$18,680.78	T
170066	$1,424,637	$6,210,962	$1,160,000	$8,795,599	5	S	0.00024	$30	N	0.002	Y	1	20	0.004789072	$42,122.75	R
170120	$1,256,730	$665,239	$2,900,000	$4,821,969	7	S	0.00011	$530	Y	0.002	Y	1	42	0.004609597	$22,227.33	T
170141	$1,256,730	$665,239	$2,900,000	$4,821,969	6	S	0.00011	$530	Y	0.002	Y	1	42	0.004609597	$22,227.33	T
170400	$139,954	NA	$0	$139,954	6	S	0.00011	$15	Y	0.002	Y	1	53	0.005813357	$813.60	M
170401	$928,266	$1,864,732	$1,160,000	$3,952,998	7	S	0.00011	$435	N	0.002	Y	1	15	0.00164873	$6,517.43	R
170920	$1,974,308	$13,129,721	$2,900,000	$18,004,029	7	S	0.00011	$1,980	Y	0.002	Y	1	15	0.00164873	$29,683.78	T
174008	$274,617	$402,362	$1,160,000	$1,836,979	7	S	0.00011	$202	N	0.0005	Y	1	34	0.00373322	$6,857.85	R
174009	$217,727	$402,362	$1,160,000	$1,780,089	7	S	0.00011	$196	N	0.0005	Y	1	34	0.00373322	$6,645.46	R
174014	$138,206	$180,550	$1,160,000	$1,478,756	6	S	0.00011	$163	N	0.0005	Y	1	25	0.002746373	$4,061.22	M
174019	$157,911	$607,890	$1,160,000	$1,925,800	6	S	0.00011	$212	N	0.0002	Y	1	28	0.003075431	$5,922.66	T
174022	$204,195	$1,834,999	$1,160,000	$3,199,194	7	S	0.00011	$352	N	0.002	Y	1	23	0.002526941	$8,084.17	R
174025	$144,696	NA	$580,000	$724,696	6	S	0.00011	$80	N	0.002	Y	1	21	0.002307461	$1,672.21	M
174028	$187,175	$168,210	$1,160,000	$1,515,384	6	S	0.00011	$167	N	0.002	Y	1	25	0.002746373	$4,161.81	R
174029	$216,400	$110,975	$1,160,000	$1,487,375	7	S	0.00011	$164	N	0.0005	Y	1	34	0.00373322	$5,552.70	T
174030	$154,516	$665,220	$1,160,000	$1,979,736	6	S	0.00011	$218	N	0.002	Y	1	22	0.002417207	$4,785.43	M
174031	$241,732	$54,158	$580,000	$875,890	6	S	0.00011	$96	N	0.0002	Y	1	24	0.002636663	$2,309.43	R
174035	$191,600	$810,614	$1,160,000	$2,162,213	6	S	0.00011	$238	N	0.0002	Y	1	25	0.002746373	$5,938.24	R
174037	$147,492	$104,509	$1,160,000	$1,412,002	6	S	0.00011	$155	N	0.0002	Y	1	41	0.004500092	$6,354.14	R
174039	$198,155	$1,149,912	$1,160,000	$2,508,067	7	S	0.00011	$276	N	0.0005	Y	1	27	0.002965757	$7,438.32	R
174042	$100,950	$88,883	$580,000	$769,833	6	S	0.00011	$85	N	0.0002	Y	1	23	0.002526941	$1,945.32	M
174043	$124,276	$139,650	$1,160,000	$1,423,926	7	S	0.00011	$157	N	0.0005	Y	1	24	0.002636663	$3,754.41	R
174046	$287,649	$176,825	$1,160,000	$1,624,474	6	S	0.00011	$179	N	0.002	Y	1	36	0.003952386	$6,420.55	T
174049	$2,383,853	$2,522,468	$2,900,000	$7,806,321	6	S	0.00011	$859	N	0.002	Y	1	35	0.003842809	$29,998.20	T
174059	$533,642	$5,692,766	$1,160,000	$7,386,408	7	S	0.00011	$813	Y	0.002	Y	1	48	0.005266374	$38,899.59	T
174065	$5,502,952	$14,530,225	$2,900,000	$22,933,177	7	S	0.00011	$2,523	Y	0.002	Y	1	52	0.005703985	$130,810.49	T
174068	$2,471,818	$10,147,494	$2,900,000	$15,519,312	7	R	0.000077	$1,195	N	0.002	Y	1	53	0.004072841	$63,207.68	R
174069	$2,936,177	$5,078,451	$2,900,000	$10,914,628	7	S	0.00011	$1,201	N	0.0005	Y	1	56	0.006141403	$67,031.13	M
174072	$933,838	$9,613,160	$2,900,000	$13,446,998	7	S	0.00011	$1,479	N	0.002	Y	1	54	0.005922718	$79,642.78	R
174073	$837,008	$8,010,967	$2,900,000	$11,747,975	7	R	0.000077	$905	N	0.0001	Y	1	54	0.004149527	$48,748.54	R
174075	$905,182	$2,622,621	$2,900,000	$6,427,803	7	S	0.00011	$707	N	0.0001	N	1	56	0.006141403	$39,475.73	R
174078	$412,792	$714,407	$1,160,000	$2,287,199	7	S	0.00011	$252	N	0.0001	N	1	57	0.006250727	$14,296.66	R
174079	$4,038,016	$6,515,143	$2,900,000	$13,453,159	7	S	0.00011	$1,480	N	0.002	Y	1	58	0.00636004	$85,562.63	T
175001	$602,963	$1,324,883	$1,160,000	$3,087,846	7	S	0.00011	$340	N	0.0005	Y	1	30	0.003294742	$10,173.66	R
175003	$1,085,545	$694,640	$1,160,000	$2,940,185	7	S	0.00011	$323	N	0.0005	Y	1	34	0.00373322	$10,976.36	R
175004	$1,450,265	$6,533,574	$2,900,000	$10,883,839	7	S	0.00011	$1,197	N	0.0005	Y	1	35	0.003842809	$41,824.52	R
175005	$1,306,674	$5,199,625	$2,900,000	$9,406,299	7	S	0.00011	$1,035	Y	0.002	Y	1	35	0.003842809	$36,146.61	R
175006	$1,349,751	$1,824,853	$2,900,000	$6,074,604	7	S	0.00011	$668	Y	0.0005	Y	1	35	0.003842809	$23,343.54	R
175008	$1,095,167	$2,888,067	$1,160,000	$5,143,234	7	S	0.00011	$566	N	0.001	Y	1	36	0.003952386	$20,328.05	R
175009	$1,024,511	$2,110,567	$1,160,000	$4,295,078	7	S	0.00011	$472	N	0.002	Y	1	36	0.003952386	$16,975.81	R

Bridge Number	Bridge Replacement Cost	Detour Cost	Loss of Life Cost	Total Cost of Failure	Scour Vulnerability	Overtopping Frequency	Annual Probability of Failure	Annual Unadjusted Risk	High Priority	MPL	Meets MPL	K1	Remaining Life	Lifetime Probability of Failure	Unadjusted Lifetime Risk	Scour Mode
175010	$698,904	$2,064,531	$1,160,000	$3,923,435	7	S	0.00011	$432	N	0.0005	Y	1	36	0.003952386	$15,506.93	R
175012	$706,419	$3,701,856	$1,160,000	$5,568,274	7	S	0.00011	$613	N	0.002	Y	1	37	0.004061952	$22,618.06	R
175013	$1,472,584	$11,251,370	$2,900,000	$15,623,954	6	S	0.00011	$1,719	N	0.002	Y	1	38	0.004171505	$65,175.40	R
175014	$4,078,191	$7,931,644	$2,900,000	$14,909,835	6	S	0.00011	$1,640	N	0.002	Y	1	39	0.004281046	$63,829.69	R
175018	$1,313,105	$3,571,876	$1,160,000	$6,044,981	6	S	0.00011	$665	N	0.002	Y	1	49	0.005375795	$32,496.58	R
175019	$1,313,105	$3,571,876	$1,160,000	$6,044,981	7	S	0.00011	$665	N	0.001	Y	1	49	0.005375795	$32,496.58	R
175024	$780,867	$11,548	$0	$792,416	7	S	0.00011	$87	N	0.001	Y	1	51	0.0055946	$4,433.25	R
175025	$858,954	$44,282	$580,000	$1,483,236	7	S	0.00011	$163	N	0.001	Y	1	51	0.0055946	$8,298.11	R
175026	$1,179,472	$5,093,396	$1,160,000	$7,432,868	6	S	0.00011	$818	N	0.001	Y	1	52	0.005703985	$42,396.97	R
175027	$757,128	$582,039	$1,160,000	$2,499,167	6	S	0.00011	$275	Y	0.001	Y	1	51	0.0055946	$13,981.84	R
175028	$1,514,256	$2,742,483	$1,160,000	$5,416,739	6	S	0.00011	$596	Y	0.002	Y	1	51	0.0055946	$30,304.49	R
175029	$976,084	$1,118,339	$1,160,000	$3,254,423	6	S	0.00011	$358	Y	0.002	Y	1	51	0.0055946	$18,207.20	R
175030	$561,408	NA	$0	$561,408	7	S	0.00011	$62	Y	0.002	Y	1	54	0.005922718	$3,325.06	R
175033	$1,117,728	$72,395	$0	$1,190,122	6	S	0.00011	$131	N	0.002	Y	1	54	0.005922718	$7,048.76	R
175034	$710,052	$142,307	$580,000	$1,432,360	6	S	0.00011	$158	N	0.002	Y	1	54	0.005922718	$8,483.46	R
175036	$2,132,632	$3,579,836	$2,900,000	$8,612,468	7	R	0.000077	$663	Y	0.002	Y	1	59	0.00453287	$39,039.20	R
175037	$1,071,217	$615,124	$1,160,000	$2,846,341	7	S	0.00011	$313	N	0.0005	Y	1	59	0.00646934	$18,413.95	R
175505	$129,982	NA	$580,000	$709,982	7	S	0.00011	$78	Y	0.0005	Y	1	29	0.003185092	$2,261.36	T
175550	$525,413	NA	$1,160,000	$1,685,413	7	S	0.00011	$185	Y	0.002	Y	1	26	0.002856071	$4,813.66	T
175575	$630,495	NA	$1,160,000	$1,790,495	7	S	0.00011	$197	Y	0.002	Y	1	26	0.002856071	$5,113.78	T
175600	$1,692,933	$612,182	$1,160,000	$3,465,115	6	S	0.00011	$381	N	0.002	Y	1	41	0.004500092	$15,593.34	T
175615	$622,746	NA	$1,160,000	$1,782,746	7	S	0.00011	$196	Y	0.002	Y	1	26	0.002856071	$5,091.65	T
175620	$622,746	NA	$1,160,000	$1,782,746	6	S	0.00011	$196	Y	0.002	Y	1	26	0.002856071	$5,091.65	T
175624	$2,376,424	$3,086,936	$2,900,000	$8,363,360	7	S	0.00011	$920	N	0.0002	Y	1	48	0.005266374	$44,044.58	T
175630	$266,844	$818,002	$1,160,000	$2,244,846	7	S	0.00011	$247	N	0.0005	Y	1	31	0.003404379	$7,642.31	T
175650	$491,361	$2,271,103	$2,900,000	$5,662,464	6	S	0.00011	$623	N	0.0005	Y	1	15	0.00164873	$9,335.87	M
175660	$156,267	$54,158	$580,000	$790,425	7	S	0.00011	$87	N	0.0005	Y	1	15	0.00164873	$1,303.20	T
175670	$125,261	$92,387	$580,000	$797,648	6	S	0.00011	$88	N	0.002	Y	1	21	0.002307461	$1,840.54	T
175680	$333,442	$0	$2,900,000	$3,233,442	7	S	0.00011	$356	N	0.001	Y	1	25	0.002746373	$8,880.24	R
175690	$59,128	$21,451	$580,000	$660,579	7	S	0.00011	$73	N	0.002	Y	1	24	0.002636663	$1,741.72	M
175700	$117,175	$63,715	$580,000	$760,890	7	S	0.00011	$84	N	0.002	Y	1	26	0.002856071	$2,173.16	R
175710	$137,777	$63,715	$580,000	$781,492	7	S	0.00011	$86	N	0.002	Y	1	21	0.002307461	$1,803.26	R
175760	$545,722	NA	$1,160,000	$1,705,722	7	S	0.00011	$188	Y	0.001	Y	1	42	0.004609597	$7,862.69	R
175950	$457,024	$4,189,413	$2,900,000	$7,546,437	7	S	0.00011	$830	N	0.002	Y	1	15	0.00164873	$12,442.04	T
175970	$262,677	$1,935,058	$1,160,000	$3,357,735	7	S	0.00011	$369	N	0.001	Y	1	21	0.002307461	$7,747.84	R
175995	$190,499	$515,374	$1,160,000	$1,865,873	6	S	0.00011	$205	N	0.002	Y	1	22	0.002417207	$4,510.20	R
176000	$244,728	NA	$0	$244,728	7	O	0.00017	$42	N	0.002	Y	1	36	0.006101828	$1,493.29	R
176003	$892,330	$858,085	$1,160,000	$2,910,414	7	S	0.00011	$320	N	0.002	Y	1	50	0.005485204	$15,964.21	M
180805	$214,684	$32,319	$0	$247,003	6	S	0.00011	$27	N	0.002	Y	1	34	0.00373322	$922.12	R
184000	$116,093	$117,511	$580,000	$813,604	5	S	0.00024	$3	N	0.0005	Y	1	15	0.003593958	$2,924.06	R
184002	$175,805	$104,141	$580,000	$859,946	6	S	0.00011	$95	N	0.002	Y	1	29	0.003185092	$2,739.01	R
184006	$2,305,448	$10,735,036	$1,160,000	$14,200,484	6	S	0.00011	$1,562	N	0.002	Y	1	15	0.00164873	$23,412.77	R
184008	$822,056	$6,541,713	$2,900,000	$10,263,769	7	S	0.00011	$1,129	N	0.002	Y	1	21	0.002307461	$23,683.24	R
184019	$1,603,220	$5,601,818	$1,160,000	$8,365,038	7	S	0.00011	$920	N	0.002	Y	1	17	0.001868355	$15,628.86	R
184052	$278,480	$1,818,020	$1,160,000	$3,256,500	6	O	0.00017	$554	N	0.001	Y	1	21	0.003563938	$11,605.96	R
184053	$556,960	$1,008,781	$1,160,000	$2,725,741	6	S	0.00011	$300	N	0.002	Y	1	23	0.002526941	$6,887.79	R
184054	$769,747	$9,067,156	$1,160,000	$10,996,903	6	S	0.00011	$1,210	N	0.002	Y	1	23	0.002526941	$27,788.53	R
184055	$461,453	$322,275	$580,000	$1,363,728	7	S	0.00011	$150	N	0.002	Y	1	34	0.00373322	$5,091.10	R
184059	$371,322	NA	$0	$371,322	4	S	0.0005	$186	Y	0.002	Y	1	31	0.01538431	$5,712.53	R
184065	$1,275,529	$5,601,818	$1,160,000	$8,037,347	7	S	0.00011	$884	N	0.002	Y	1	44	0.004828571	$38,808.90	R
260006	$2,208,173	$32,490,840	$2,900,000	$37,599,013	6	S	0.00011	$4,136	Y	0.0005	Y	1	15	0.00164873	$61,990.62	R
260017	$585,522	$4,513,787	$1,160,000	$6,259,309	5	S	0.00024	$21	N	0.0005	Y	1	21	0.005027922	$31,471.32	R
260024	$779,744	$3,220,446	$1,160,000	$5,160,189	5	S	0.00024	$18	N	0.0005	Y	1	24	0.00574413	$29,640.80	R
260027	$581,542	$1,320,589	$1,160,000	$3,062,130	6	S	0.00011	$337	N	0.0005	Y	1	15	0.00164873	$5,048.63	R
260033	$1,980,301	$9,878,373	$2,900,000	$14,758,674	6	S	0.00011	$1,623	N	0.0005	Y	1	25	0.002746373	$40,532.82	R
260038	$2,799,080	$5,121,640	$2,900,000	$10,820,719	6	S	0.00011	$1,190	Y	0.002	Y	1	23	0.002526941	$27,343.32	R
260086	$1,831,872	$1,023,446	$1,160,000	$4,015,318	6	S	0.00011	$442	N	0.002	Y	1	16	0.001758549	$7,061.13	R
262501	$686,051	$1,460,529	$1,160,000	$3,306,580	7	S	0.00011	$364	N	0.002	Y	1	51	0.0055946	$18,498.99	R
264126	$121,140	$141,083	$580,000	$842,224	6	O	0.00017	$143	N	0.0005	Y	1	15	0.002546968	$2,145.12	R
270020	$1,441,076	$1,595,934	$1,160,000	$4,197,010	5	S	0.00024	$14	N	0.0001	N	1	15	0.003593958	$15,083.88	R
270024	$590,251	$295,341	$1,160,000	$2,045,592	4	S	0.0005	$1,023	N	0.0001	N	1	16	0.00797007	$16,303.51	R
270027	$428,524	$692,985	$580,000	$1,701,510	4	S	0.0005	$851	N	0.0005	N	1	16	0.00797007	$13,561.15	R
270071	$43,311	$1,422	$0	$44,733	5	S	0.00024	$0	N	0.0001	N	1	18	0.004311198	$192.85	R
270072	$79,115	$1,422	$0	$80,537	5	S	0.00024	$0	N	0.0005	Y	1	18	0.004311198	$347.21	R
270073	$70,453	$1,191	$0	$71,644	4	S	0.0005	$36	N	0.0005	N	1	18	0.008961852	$642.06	R
270074	$78,538	$1,422	$0	$79,960	5	S	0.00024	$0	N	0.0005	Y	1	18	0.004311198	$344.72	R
273001	$72,435	$55,072	$0	$127,507	5	O	0.00032	$2	N	0.002	Y	1	39	0.01240442	$1,581.65	R
273002	$106,913	$282,024	$0	$388,936	6	S	0.00011	$43	N	0.0005	Y	1	39	0.004281046	$1,665.05	R
274091	$127,682	$105,954	$580,000	$813,636	6	O	0.00017	$138	N	0.0005	Y	1	15	0.002546968	$2,072.30	R
274092	$81,310	$105,954	$580,000	$767,264	6	S	0.00011	$84	N	0.002	Y	1	26	0.002856071	$2,191.36	R
274094	$45,075	$20,161	$0	$65,236	7	S	0.00011	$7	N	0.002	Y	1	15	0.00164873	$107.56	R
274098	$43,889	$8,144	$0	$52,033	6	S	0.00011	$6	N	0.0001	N	1	15	0.00164873	$85.79	R
274100	$193,746	$81,722	$580,000	$855,468	6	S	0.00011	$94	N	0.002	Y	1	15	0.00164873	$1,410.44	R
274101	$87,778	$30,052	$0	$117,830	6	S	0.00011	$13	N	0.002	Y	1	15	0.00164873	$194.27	R
274106	$145,468	$39,733	$580,000	$765,201	6	S	0.00011	$84	N	0.002	Y	1	42	0.004609597	$3,527.27	R
274114	$169,607	$67,376	$580,000	$816,983	3	S	0.0013	$1,062	N	0.0005	N	1	26	0.03325642	$27,169.93	R
274120	$176,133	$78,135	$0	$254,268	6	S	0.00011	$28	N	0.002	Y	1	36	0.003952386	$1,004.97	R
274128	$67,612	$29,011	$0	$96,624	5	S	0.00024	$0	N	0.002	Y	1	36	0.008603811	$831.33	R
274135	$448,388	$230,213	$580,000	$1,258,601	2	S	0.006	$7,552	N	0.001	N	1	36	0.194788742	$245,161.31	R

Bridge Number	Bridge Replacement Cost	Detour Cost	Loss of Life Cost	Total Cost of Failure	Scour Vulnerability	Overtopping Frequency	Annual Probability of Failure	Annual Unadjusted Risk	High Priority	MPL	Meets MPL	K1	Remaining Life	Lifetime Probability of Failure	Unadjusted Lifetime Risk	Scour Mode
274137	$87,778	$23,658	$0	$111,435	5	S	0.00024	$0	N	0.002	Y	1	39	0.009317444	$1,038.29	R
274140	$45,075	$309,455	$0	$354,530	6	S	0.00011	$39	Y	0.002	Y	1	49	0.005375795	$1,905.88	R
274145	$145,526	$27,267	$0	$172,793	6	S	0.00011	$19	N	0.002	Y	1	46	0.005047497	$872.17	R
280003	$1,936,849	$28,854,417	$2,900,000	$33,691,266	7	S	0.00011	$3,706	Y	0.002	Y	1	15	0.00164873	$55,547.80	R
280042	$275,788	$0	$0	$275,788	6	S	0.00011	$30	N	0.002	Y	1	15	0.00164873	$454.70	R
280043	$413,681	$758,538	$1,160,000	$2,332,220	6	S	0.00011	$257	N	0.0005	Y	1	15	0.00164873	$3,845.20	R
280044	$410,716	$0	$0	$410,716	7	S	0.00011	$45	N	0.002	Y	1	15	0.00164873	$677.16	R
280045	$616,074	$758,538	$1,160,000	$2,534,612	7	S	0.00011	$279	N	0.002	Y	1	15	0.00164873	$4,178.89	R
280051	$377,019	$1,413,488	$1,160,000	$2,950,507	6	S	0.00011	$325	Y	0.002	Y	1	15	0.00164873	$4,864.59	R
280052	$377,019	$1,413,488	$1,160,000	$2,950,507	6	S	0.00011	$325	Y	0.0005	Y	1	15	0.00164873	$4,864.59	R
280941	$2,425,120	$1,587,567	$2,900,000	$6,912,687	6	S	0.00011	$760	N	0.002	Y	1	15	0.00164873	$11,397.16	R
284021	$122,817	$13,633	$0	$136,450	5	S	0.00024	$0	N	0.0002	N	1	31	0.007413278	$1,011.54	R
284023	$118,737	$211,801	$580,000	$910,538	6	S	0.00011	$100	N	0.0002	Y	1	46	0.005047497	$4,595.94	R
284024	$298,799	$211,801	$580,000	$1,090,600	5	S	0.00024	$4	N	0.0005	Y	1	46	0.010980593	$11,975.44	R
284025	$118,737	$70,600	$580,000	$769,337	7	S	0.00011	$85	N	0.001	Y	1	46	0.005047497	$3,883.23	R
284026	$98,360	$13,633	$0	$111,993	5	S	0.00024	$0	N	0.001	Y	1	44	0.010505693	$1,176.56	R
284028	$385,587	$529,859	$1,160,000	$2,075,446	5	S	0.00024	$7	N	0.002	Y	1	53	0.01264095	$26,235.61	R
290027	$2,293,016	$13,989,856	$1,160,000	$17,442,873	6	S	0.00011	$1,919	N	0.002	Y	0.67	17	0.001868355	$32,589.48	R
290041	$433,984	$317,350	$580,000	$1,331,333	5	S	0.00024	$5	N	0.0002	N	1	17	0.004072176	$5,421.42	R
290042	$883,316	$767,627	$1,160,000	$2,810,943	4	S	0.0005	$1,405	N	0.0005	N	1	17	0.008466085	$23,797.68	R
290044	$785,250	$134,751	$580,000	$1,500,001	3	S	0.0013	$1,950	N	0.002	Y	1	21	0.026948005	$40,422.03	R
290085	$1,061,322	$484,308	$1,160,000	$2,705,629	5	S	0.00024	$9	N	0.0005	Y	1	15	0.003593958	$9,723.92	R
294070	$127,768	$26,489	$580,000	$734,256	4	S	0.0005	$367	N	0.0005	N	1	37	0.018334467	$13,462.19	R
294090	$159,186	$33,744	$580,000	$772,929	4	F	0.0007	$541	N	0.0005	N	1	37	0.025576309	$19,768.67	R
294130	$116,152	$12,023	$0	$128,175	6	S	0.00011	$14	N	0.0005	Y	1	37	0.004061952	$520.64	R
294370	$105,680	$0	$0	$105,680	6	S	0.00011	$12	N	0.0005	Y	1	37	0.004061952	$429.27	R
294445	$139,954	$252,347	$0	$392,301	3	O	0.0016	$628	N	0.002	Y	1	53	0.081366384	$31,920.11	R
294446	$171,702	$42,571	$580,000	$794,273	5	S	0.00024	$3	N	0.002	Y	1	53	0.01264095	$10,040.37	R
294447	$279,908	$24,045	$0	$303,953	5	S	0.00024	$1	N	0.0005	Y	1	52	0.012403927	$3,770.21	R
294448	$115,612	$23,690	$580,000	$719,302	6	S	0.00011	$79	N	0.0005	Y	1	53	0.005813357	$4,181.56	R
295500	$72,357	$0	$0	$72,357	1	S	0.01	$724	N	0.0005	N	1	36	0.303586782	$21,966.63	R
300002	$289,191	$3,501,364	$1,160,000	$4,950,554	6	S	0.00011	$545	N	0.0005	Y	1	15	0.00164873	$8,162.13	R
300003	$481,984	$3,501,364	$1,160,000	$5,143,348	6	S	0.00011	$566	N	0.002	Y	1	15	0.00164873	$8,479.99	R
300004	$481,984	$3,501,364	$1,160,000	$5,143,348	6	S	0.00011	$566	N	0.001	Y	1	15	0.00164873	$8,479.99	R
300005	$481,984	$3,104,983	$1,160,000	$4,746,967	6	S	0.00011	$522	N	0.0005	Y	1	15	0.00164873	$7,826.47	R
300013	$294,868	$935,958	$1,160,000	$2,390,826	6	S	0.00011	$263	N	0.0005	Y	1	21	0.002307461	$5,516.74	M
300015	$397,683	NA	$0	$397,683	4	S	0.0005	$199	Y	0.0005	N	1	38	0.0188253	$7,486.50	T
300022	$309,341	$104,655	$580,000	$993,995	6	S	0.00011	$109	N	0.001	Y	1	20	0.002197703	$2,184.51	R
300038	$536,123	$652,440	$1,160,000	$2,348,564	7	S	0.00011	$258	Y	0.002	Y	1	19	0.002087932	$4,903.64	R
300053	$411,115	$104,655	$580,000	$1,095,770	6	S	0.00011	$121	N	0.002	Y	1	21	0.002307461	$2,528.45	R
300056	$714,051	$652,440	$1,160,000	$2,526,491	7	S	0.00011	$278	Y	0.002	Y	1	19	0.002087932	$5,275.14	R
300057	$714,051	$652,440	$1,160,000	$2,526,491	7	S	0.00011	$278	Y	0.002	Y	1	19	0.002087932	$5,275.14	R
300058	$714,051	$652,440	$1,160,000	$2,526,491	7	S	0.00011	$278	Y	0.002	Y	1	19	0.002087932	$5,275.14	R
310005	$2,808,585	$3,958,138	$1,160,000	$7,926,723	6	S	0.00011	$872	N	0.002	Y	1	15	0.00164873	$13,069.03	R
314000	$55,626	NA	$0	$55,626	5	S	0.00024	$0	Y	0.002	Y	1	26	0.006221316	$346.07	R
315250	$129,793	NA	$580,000	$709,793	6	S	0.00011	$78	Y	0.0005	Y	1	40	0.004390575	$3,116.40	R
320001	$741,068	$1,357,211	$1,160,000	$3,258,279	7	S	0.00011	$358	Y	0.002	Y	1	15	0.00164873	$5,372.02	R
320004	$589,385	$4,543,707	$1,160,000	$6,293,091	7	S	0.00011	$692	Y	0.002	Y	1	15	0.00164873	$10,375.61	R
320010	$608,488	$3,357,622	$1,160,000	$5,126,111	7	S	0.00011	$564	N	0.002	Y	1	34	0.00373322	$19,136.90	R
320012	$203,446	$3,357,622	$1,160,000	$4,721,068	6	S	0.00011	$519	N	0.002	Y	1	29	0.003185092	$15,037.04	R
320015	$529,131	$692,985	$580,000	$1,802,117	6	S	0.00011	$198	N	0.002	Y	1	34	0.00373322	$6,727.70	R
320021	$309,422	$124,899	$0	$434,321	7	S	0.00011	$48	N	0.002	Y	1	29	0.003185092	$1,383.35	R
320052	$7,211,685	$1,792,007	$1,160,000	$10,163,692	6	S	0.00011	$1,118	N	0.002	Y	0.67	50	0.005485204	$55,749.92	R
324222	$81,207	$33,779	$0	$114,985	7	O	0.00017	$20	N	0.002	Y	1	29	0.004918285	$565.53	R
324232	$102,261	$35,623	$0	$137,884	6	O	0.00017	$23	N	0.0005	Y	1	54	0.009138766	$1,260.09	R
324233	$322,389	$71,069	$580,000	$973,458	5	S	0.00024	$3	N	0.002	Y	1	55	0.013114826	$12,766.73	R
324235	$137,582	$27,786	$0	$165,367	6	O	0.00017	$28	N	0.002	Y	1	55	0.009307212	$1,539.11	R
324304	$89,931	$13,539	$0	$103,471	7	S	0.00011	$11	N	0.002	Y	1	61	0.006687905	$692.00	R
324305	$151,675	$29,011	$0	$180,687	6	S	0.00011	$20	N	0.002	Y	1	62	0.006797169	$1,228.16	R
324306	$133,555	$60,104	$0	$193,659	7	S	0.00011	$21	N	0.002	Y	1	62	0.006797169	$1,316.33	R
330012	$5,044,399	$41,792,595	$2,900,000	$49,736,994	7	S	0.00011	$5,471	Y	0.0005	Y	1	20	0.002197703	$109,307.12	R
330013	$289,191	$3,501,364	$1,160,000	$4,950,554	6	S	0.00011	$545	N	0.002	Y	1	15	0.00164873	$8,162.13	R
330014	$578,381	$3,501,364	$1,160,000	$5,239,745	6	S	0.00011	$576	N	0.002	Y	1	15	0.00164873	$8,638.93	R
330021	$684,884	$356,965	$1,160,000	$2,201,849	6	S	0.00011	$242	N	0.002	Y	1	15	0.00164873	$3,630.25	R
334001	$392,689	$19,779	$0	$412,468	5	O	0.00032	$7	N	0.002	Y	1	15	0.004789263	$1,975.42	R
334005	$46,776	NA	$0	$46,776	6	S	0.00011	$5	Y	0.002	Y	1	38	0.004171505	$195.13	R
340008	$611,986	$814,246	$580,000	$2,006,232	6	S	0.00011	$221	Y	0.001	Y	1	23	0.002526941	$5,069.63	M
340012	$1,142,285	NA	$580,000	$1,722,285	6	S	0.00011	$189	Y	0.0005	Y	1	25	0.002746373	$4,730.04	T
340025	$1,932,854	$251,138	$1,160,000	$3,343,992	7	S	0.00011	$368	Y	0.0005	Y	1	37	0.004061952	$13,583.13	R
340034	$1,978,155	$251,138	$1,160,000	$3,389,293	7	S	0.00011	$373	Y	0.0005	Y	1	37	0.004061952	$13,767.14	R
340039	$848,058	$369,019	$1,160,000	$2,377,077	6	S	0.00011	$261	Y	0.001	Y	1	36	0.003952386	$9,395.13	R
340045	$438,341	$684,154	$1,160,000	$2,282,496	7	S	0.00011	$251	Y	0.0005	Y	1	15	0.00164873	$3,763.22	R
340049	$416,959	$778,655	$1,160,000	$2,355,614	6	S	0.00011	$259	N	0.0005	Y	1	26	0.002856071	$6,727.80	R
340050	$625,438	$778,655	$1,160,000	$2,564,094	4	S	0.0005	$1,282	N	0.0005	N	1	26	0.012919074	$33,125.72	R
340066	$848,058	$369,019	$1,160,000	$2,377,077	6	S	0.00011	$261	Y	0.002	Y	1	36	0.003952386	$9,395.13	R
340068	$848,058	$369,019	$1,160,000	$2,377,077	7	S	0.00011	$261	Y	0.0005	Y	1	36	0.003952386	$9,395.13	R
340069	$1,812,261	$4,592,233	$1,160,000	$7,564,494	6	S	0.00011	$832	N	0.0001	N	1	37	0.004061952	$30,726.61	R
340941	$848,058	$369,019	$1,160,000	$2,377,077	7	S	0.00011	$261	Y	0.0005	Y	1	36	0.003952386	$9,395.13	R
344003	$64,631	$39,559	$0	$104,190	7	S	0.00011	$11	N	0.001	Y	1	31	0.003404379	$354.70	R

Bridge Number	Bridge Replacement Cost	Detour Cost	Loss of Life Cost	Total Cost of Failure	Scour Vulnerability	Overtopping Frequency	Annual Probability of Failure	Annual Unadjusted Risk	High Priority	MPL	Meets MPL	K1	Remaining Life	Lifetime Probability of Failure	Unadjusted Lifetime Risk	Scour Mode
344005	$139,064	NA	$580,000	$719,064	6	S	0.00011	$79	Y	0.0005	Y	1	31	0.003404379	$2,447.97	R
344007	$81,940	$8,144	$0	$90,085	5	S	0.00024	$0	N	0.0005	Y	1	61	0.014535088	$1,309.39	R
350001	$2,182,303	$782,967	$1,160,000	$4,125,270	6	S	0.00011	$454	Y	0.0001	N	1	15	0.00164873	$6,801.46	R
350007	$696,200	$1,404,063	$1,160,000	$3,260,262	4	S	0.0005	$1,630	N	0.0005	N	1	16	0.00797007	$25,984.52	R
350022	$408,437	$749,941	$580,000	$1,738,378	6	S	0.00011	$191	N	0.001	Y	1	29	0.003185092	$5,536.89	R
350028	$2,181,902	$1,023,704	$580,000	$3,785,607	6	S	0.00011	$416	N	0.002	Y	1	37	0.004061952	$15,376.95	R
350064	$5,860,892	$377,160	$580,000	$6,818,053	6	S	0.00011	$750	N	0.0005	Y	1	50	0.005485204	$37,398.41	R
360028	$714,051	$10,433,974	$1,160,000	$12,308,025	6	S	0.00011	$1,354	Y	0.0005	Y	1	21	0.002307461	$28,400.28	R
360055	$33,566,840	$45,041,434	$2,900,000	$81,508,274	6	R	0.000077	$6,276	Y	0.0005	Y	0.67	38	0.002921836	$238,153.79	R
360800	$342,744	$1,062	$0	$343,806	6	S	0.00011	$38	N	0.002	Y	1	35	0.003842809	$1,321.18	R
364009	$2,011,423	$13,342,326	$2,900,000	$18,253,749	7	S	0.00011	$2,008	N	0.002	Y	1	15	0.00164873	$30,095.51	R
364010	$1,349,556	$1,300,359	$1,160,000	$3,809,915	6	S	0.00011	$419	N	0.002	Y	1	27	0.002965757	$11,299.28	R
364040	$34,109,643	$12,567,676	$1,160,000	$47,837,319	7	S	0.00011	$5,262	N	0.002	Y	0.67	35	0.003842809	$183,829.69	R
364056	$760,874	$15,334,106	$1,160,000	$17,254,980	7	S	0.00011	$1,898	Y	0.002	Y	1	45	0.00493804	$85,205.78	R
364057	$1,159,572	$1,263,417	$1,160,000	$3,582,989	7	S	0.00011	$394	Y	0.002	Y	1	46	0.005047497	$18,085.13	R
364110	$7,711,039	$893,997	$1,160,000	$9,765,036	6	S	0.00011	$1,074	N	0.002	Y	1	15	0.00164873	$16,099.91	R
364130	$2,184,574	$11,195,192	$1,160,000	$14,539,766	7	R	0.000077	$1,120	N	0.002	Y	1	56	0.004302882	$62,562.90	R
364140	$15,306,348	$5,916,334	$2,900,000	$24,122,682	7	R	0.000077	$1,857	N	0.002	Y	1	53	0.004072841	$98,247.84	R
365100	$285,236	NA	$580,000	$865,236	6	S	0.00011	$95	Y	0.002	Y	1	31	0.003404379	$2,945.59	R
365102	$285,683	NA	$580,000	$865,683	7	R	0.000077	$67	Y	0.002	Y	1	57	0.004379551	$3,791.30	R
380004	$1,428,102	$11,946,119	$1,160,000	$14,534,220	4	S	0.0005	$7,267	Y	0.002	Y	1	16	0.00797007	$115,838.75	R
380009	$592,662	$12,178,887	$1,160,000	$13,931,549	6	S	0.00011	$1,532	N	0.002	Y	1	15	0.00164873	$22,969.36	R
380011	$439,621	$3,349,194	$1,160,000	$4,948,815	6	S	0.00011	$544	N	0.002	Y	1	15	0.00164873	$8,159.26	R
380012	$291,801	$3,349,194	$1,160,000	$4,800,995	6	S	0.00011	$528	N	0.002	Y	1	15	0.00164873	$7,915.54	R
380013	$585,522	$2,870,738	$1,160,000	$4,616,259	6	S	0.00011	$508	N	0.002	Y	1	15	0.00164873	$7,610.97	R
380014	$592,662	$2,870,738	$1,160,000	$4,623,400	7	S	0.00011	$509	N	0.002	Y	1	15	0.00164873	$7,622.74	R
380015	$2,194,267	$2,870,738	$1,160,000	$6,225,004	6	S	0.00011	$685	N	0.002	Y	1	15	0.00164873	$10,263.35	R
380018	$320,738	$609,761	$1,160,000	$2,090,499	6	S	0.00011	$230	Y	0.002	Y	1	15	0.00164873	$3,446.67	R
380025	$1,543,286	$451,921	$1,160,000	$3,155,208	6	S	0.00011	$347	Y	0.002	Y	1	25	0.002746373	$8,665.38	R
380035	$209,455	$3,285,843	$1,160,000	$4,655,298	5	O	0.00032	$79	N	0.0001	N	1	15	0.004789263	$22,295.45	R
380036	$487,935	$3,285,843	$1,160,000	$4,933,778	6	O	0.00017	$839	N	0.0005	Y	1	15	0.002546968	$12,566.17	R
380037	$292,761	$3,285,843	$1,160,000	$4,738,604	6	S	0.00011	$521	N	0.0005	Y	1	15	0.00164873	$7,812.68	R
380038	$355,597	$13,626,153	$1,160,000	$15,141,750	6	S	0.00011	$1,666	N	0.0005	Y	1	15	0.00164873	$24,964.66	R
380040	$390,348	$1,982,836	$1,160,000	$3,533,184	6	O	0.00017	$601	N	0.0005	Y	1	15	0.002546968	$8,998.91	R
380049	$1,588,237	$10,501,683	$1,160,000	$13,249,920	6	S	0.00011	$1,457	Y	0.0005	Y	1	18	0.00197815	$26,210.33	M
380058	$213,045	$304,881	$1,160,000	$1,677,925	7	S	0.00011	$185	Y	0.0005	Y	1	15	0.00164873	$2,766.45	R
380059	$1,558,270	$451,921	$1,160,000	$3,170,191	6	S	0.00011	$349	Y	0.0005	Y	1	15	0.00164873	$5,226.79	R
380060	$1,946,409	$546,314	$1,160,000	$3,652,723	7	S	0.00011	$402	Y	0.002	Y	1	19	0.002087932	$7,626.64	R
380087	$5,334,903	$1,103,335	$580,000	$7,018,238	6	S	0.00011	$772	N	0.001	Y	1	48	0.005266374	$36,960.67	T
380910	$1,035,702	$6,393,916	$1,160,000	$8,589,617	6	S	0.00011	$945	N	0.001	Y	1	15	0.00164873	$14,161.96	R
384006	$209,549	$32,965	$0	$242,514	5	S	0.00024	$1	N	0.001	Y	1	50	0.01192971	$2,893.12	R
384008	$69,798	$12,023	$0	$81,820	5	S	0.00024	$0	N	0.002	Y	1	21	0.005027922	$411.38	R
384029	$77,851	NA	$0	$77,851	4	O	0.0006	$47	Y	0.002	Y	1	41	0.024307089	$1,892.33	R
384094	$175,134	NA	$0	$175,134	6	S	0.00011	$19	Y	0.0005	Y	1	53	0.005813357	$1,018.12	R
384096	$67,300	$15,901	$0	$83,201	4	S	0.0005	$42	N	0.001	Y	1	55	0.027132008	$2,257.41	T
384097	$64,382	$32,965	$0	$97,347	6	S	0.00011	$11	N	0.0005	Y	1	60	0.006578628	$640.41	R
384101	$100,669	$15,901	$0	$116,570	7	O	0.00017	$20	N	0.001	Y	1	60	0.010149015	$1,183.07	T
385080	$104,727	$105,900	$580,000	$790,628	4	S	0.0005	$395	N	0.0005	N	1	16	0.00797007	$6,301.36	R
390007	$2,289,598	$2,877,976	$1,160,000	$6,327,574	4	S	0.0005	$3,164	N	0.002	Y	1	21	0.010447666	$66,108.38	R
390023	$490,125	$378,708	$580,000	$1,448,832	6	S	0.00011	$159	N	0.002	Y	1	26	0.002856071	$4,137.97	R
394003	$190,518	$84,791	$580,000	$855,309	6	S	0.00011	$94	N	0.002	Y	1	53	0.005813357	$4,972.22	R
394004	$143,805	$179,690	$1,160,000	$1,483,495	6	S	0.00011	$163	N	0.002	Y	1	53	0.005813357	$8,624.09	R
460003	$1,039,190	$1,296,593	$1,160,000	$3,495,783	4	S	0.0005	$1,748	N	0.002	Y	1	22	0.010942442	$38,252.40	T
460007	$558,481	$1,172,120	$1,160,000	$2,890,601	7	S	0.00011	$318	N	0.002	Y	1	24	0.002636663	$7,621.54	R
460015	$527,508	$1,154,577	$2,900,000	$4,582,085	7	S	0.00011	$504	N	0.002	Y	1	38	0.004171505	$19,114.19	R
460020	$952,216	$690,853	$1,160,000	$2,803,069	6	S	0.00011	$308	N	0.002	Y	1	21	0.002307461	$6,467.97	M
460027	$1,304,138	$630,493	$1,160,000	$3,094,631	6	S	0.00011	$340	N	0.002	Y	1	24	0.002636663	$8,159.50	R
460032	$839,519	$762,296	$580,000	$2,181,815	7	S	0.00011	$240	N	0.0005	Y	1	32	0.003514005	$7,666.91	R
460053	$11,944,453	$1,653,716	$2,900,000	$16,498,169	6	S	0.00011	$1,815	N	0.0005	Y	1	17	0.001868355	$30,824.44	T
460055	$1,647,608	$17,780,481	$2,900,000	$22,328,089	6	S	0.00011	$2,456	N	0.0005	Y	1	18	0.00197815	$44,168.30	T
460801	$65,427	$0	$0	$65,427	7	N	NA	NA	N	0.0005	N	1	62	NA	NA	T
464006	$10,789,075	$1,055,486	$1,160,000	$13,004,561	7	S	0.00011	$1,431	N	0.0005	Y	1	23	0.002526941	$32,861.76	M
464007	$432,364	$31,026	$0	$463,390	7	S	0.00011	$51	N	0.001	Y	1	53	0.005813357	$2,693.85	T
464104	$201,651	$136,006	$1,160,000	$1,497,657	7	S	0.00011	$165	N	0.001	Y	1	41	0.004500092	$6,739.59	T
464109	$328,276	$2,382,206	$1,160,000	$3,870,482	7	S	0.00011	$426	N	0.0001	N	1	22	0.002417207	$9,355.76	T
464129	$123,379	NA	$0	$123,379	7	S	0.00011	$14	N	0.001	Y	1	70	0.007670851	$946.42	T
464130	$49,710	$27,148	$0	$76,858	8	S	0.0000022	$0	N	0.0001	Y	1	70	0.000153988	$11.84	R
464201	$691,264	$272,530	$1,160,000	$2,123,794	6	S	0.00011	$234	N	0.0001	N	1	32	0.003514005	$7,463.02	T
464405	$54,299	$46,539	$0	$100,839	7	S	0.00011	$11	N	0.0001	N	1	18	0.00197815	$199.47	R
464408	$277,836	$139,650	$1,160,000	$1,577,486	6	S	0.00011	$174	N	0.0005	Y	1	46	0.005047497	$7,962.36	R
464414	$95,800	$334,505	$580,000	$1,010,305	6	S	0.00011	$111	N	0.002	Y	1	38	0.004171505	$4,214.49	R
464417	$458,706	$54,158	$580,000	$1,092,864	6	S	0.00011	$120	N	0.002	Y	1	40	0.004390575	$4,798.30	R
464418	$103,682	$51,711	$0	$155,392	6	S	0.00011	$17	N	0.0001	N	1	43	0.00471909	$733.31	R
464419	$466,513	$64,638	$0	$531,151	7	S	0.00011	$58	N	0.0001	N	1	15	0.00164873	$875.72	R
464423	$208,784	$42,661	$0	$251,445	4	S	0.0005	$126	N	0.0005	N	1	23	0.011436971	$2,875.77	R
464426	$134,051	$326,889	$580,000	$1,040,941	7	S	0.00011	$115	N	0.0005	Y	1	34	0.00373322	$3,886.06	R
464427	$133,071	$72,395	$0	$205,466	7	S	0.00011	$23	N	0.001	Y	1	38	0.004171505	$857.10	R
464430	$86,638	$21,331	$0	$107,969	6	S	0.00011	$12	N	0.001	Y	1	50	0.005485204	$592.23	R
464502	$451,959	$490,334	$1,160,000	$2,102,293	7	S	0.00011	$231	N	0.0005	Y	1	44	0.004828571	$10,151.07	M

Bridge Number	Bridge Replacement Cost	Detour Cost	Loss of Life Cost	Total Cost of Failure	Scour Vulnerability	Overtopping Frequency	Annual Probability of Failure	Annual Unadjusted Risk	High Priority	MPL	Meets MPL	K1	Remaining Life	Lifetime Probability of Failure	Unadjusted Lifetime Risk	Scour Mode
464503	$609,323	$167,580	$1,160,000	$1,936,903	6	S	0.00011	$213	N	0.002	Y	1	15	0.00164873	$3,193.43	R
464504	$329,119	$349,363	$1,160,000	$1,838,482	6	S	0.00011	$202	N	0.002	Y	1	25	0.002746373	$5,049.16	M
464505	$129,602	$154,226	$1,160,000	$1,443,829	7	S	0.00011	$159	N	0.002	Y	1	46	0.005047497	$7,287.72	T
464506	$435,220	$84,030	$0	$519,249	7	S	0.00011	$57	N	0.002	Y	1	20	0.002197703	$1,141.15	R
464507	$78,382	$32,965	$0	$111,347	7	S	0.00011	$12	N	0.002	Y	1	39	0.004281046	$476.68	M
465001	$3,716,811	$581,743	$1,160,000	$5,458,554	6	S	0.00011	$600	N	0.002	Y	1	15	0.00164873	$8,999.68	T
465401	$103,682	$36,844	$0	$140,525	4	S	0.0005	$70	N	0.002	Y	1	40	0.019806229	$2,783.27	R
466001	$283,485	$31,858	$580,000	$895,343	6	S	0.00011	$98	N	0.0001	N	1	48	0.005266374	$4,715.21	T
470014	$1,883,268	$20,479,060	$1,160,000	$23,522,329	4	S	0.0005	$11,761	Y	0.0005	N	1	15	0.007473807	$175,801.34	R
470022	$2,090,882	$5,129,003	$1,160,000	$8,379,885	4	S	0.0005	$4,190	Y	0.0005	N	1	15	0.007473807	$62,629.64	R
470023	$1,870,813	$4,968,722	$1,160,000	$7,999,535	4	S	0.0005	$4,000	Y	0.0005	N	1	15	0.007473807	$59,786.98	R
470029	$58,576,385	$813,254	$1,160,000	$60,549,639	7	S	0.00011	$6,660	Y	0.002	Y	0.67	15	0.00164873	$99,830.01	R
470035	$918,649	$648,255	$580,000	$2,146,904	7	S	0.00011	$236	N	0.002	Y	1	20	0.002197703	$4,718.26	R
470045	$1,622,324	$4,213,915	$1,160,000	$6,996,239	7	R	0.000077	$539	N	0.0005	Y	1	44	0.003382397	$23,664.06	R
474057	$901,686	$759,792	$580,000	$2,241,479	8	S	0.0000022	$5	N	0.001	Y	0.67	63	0.000138591	$310.65	R
475047	$129,553	$93,079	$580,000	$802,632	7	S	0.00011	$88	N	0.0001	N	1	31	0.003404379	$2,732.46	R
480003	$852,179	$2,517,551	$2,900,000	$6,269,730	7	S	0.00011	$690	Y	0.0001	N	1	15	0.00164873	$10,337.09	R
480009	$2,373,927	$851,750	$1,160,000	$4,385,676	7	S	0.00011	$482	Y	0.0001	N	1	26	0.002856071	$12,525.80	R
480017	$477,969	$8,395,690	$1,160,000	$10,033,659	4	S	0.0005	$5,017	Y	0.0005	N	1	15	0.007473807	$74,989.63	R
480018	$282,249	$8,395,690	$1,160,000	$9,837,939	6	S	0.00011	$1,082	Y	0.0005	Y	1	15	0.00164873	$16,220.11	R
480025	$214,159	$424,768	$580,000	$1,218,927	7	S	0.00011	$134	N	0.0005	Y	1	31	0.003404379	$4,149.69	R
480026	$186,398	$750,568	$580,000	$1,516,966	6	S	0.00011	$167	N	0.0001	N	1	34	0.00373322	$5,663.17	R
480027	$302,731	$364,026	$580,000	$1,246,757	6	S	0.00011	$137	N	0.0001	N	1	31	0.003404379	$4,244.43	R
480030	$124,265	$191,146	$580,000	$895,411	7	S	0.00011	$98	N	0.0005	Y	1	34	0.00373322	$3,342.77	R
480032	$1,660,406	$1,770,351	$2,900,000	$6,330,757	4	S	0.0005	$3,165	Y	0.0001	N	1	15	0.007473807	$47,314.85	T
480033	$1,660,406	$1,770,351	$2,900,000	$6,330,757	4	S	0.0005	$3,165	Y	0.002	Y	1	15	0.007473807	$47,314.85	T
480039	$1,333,004	$1,407,315	$1,160,000	$3,900,319	6	S	0.00011	$429	N	0.002	Y	1	15	0.00164873	$6,430.57	R
480040	$594,605	$1,407,315	$1,160,000	$3,161,921	7	S	0.00011	$348	N	0.002	Y	1	15	0.00164873	$5,213.15	R
480041	$183,874	$343,234	$1,160,000	$1,687,108	7	S	0.00011	$186	N	0.0001	N	1	29	0.003185092	$5,373.59	R
480088	$468,441	$322,824	$580,000	$1,371,265	7	S	0.00011	$151	N	0.0005	Y	1	15	0.00164873	$2,260.85	R
480096	$6,068,387	$1,130,251	$2,900,000	$10,098,638	6	S	0.00011	$1,111	N	0.001	Y	1	20	0.002197703	$22,193.80	M
480099	$124,265	$159,288	$580,000	$863,553	7	S	0.00011	$95	N	0.0005	Y	1	34	0.00373322	$3,223.83	R
480103	$614,664	$631,986	$580,000	$1,826,650	6	S	0.00011	$201	N	0.001	Y	1	34	0.00373322	$6,819.29	R
480105	$489,129	$146,014	$580,000	$1,215,143	5	S	0.00024	$4	N	0.0005	Y	1	35	0.008365818	$10,165.67	R
480106	$423,030	$143,132	$580,000	$1,146,162	6	S	0.00011	$126	N	0.0001	N	1	35	0.003842809	$4,404.48	R
480107	$802,144	$175,914	$580,000	$1,558,058	6	S	0.00011	$171	N	0.002	Y	1	24	0.002636663	$4,108.07	R
480108	$741,091	$1,289,646	$1,160,000	$3,190,737	7	S	0.00011	$351	N	0.0005	Y	1	26	0.002856071	$9,112.97	R
480110	$6,592,914	$4,061,847	$1,160,000	$11,814,761	7	S	0.00011	$1,300	N	0.001	Y	1	26	0.002856071	$33,743.80	R
480114	$245,886	$254,861	$580,000	$1,080,747	6	S	0.00011	$119	N	0.0005	Y	1	25	0.002746373	$2,968.13	R
480115	$127,218	$258,896	$580,000	$966,114	6	S	0.00011	$106	N	0.0005	Y	1	24	0.002636663	$2,547.32	R
480117	$305,375	$127,430	$580,000	$1,012,805	6	S	0.00011	$111	N	0.001	Y	1	36	0.003952386	$4,003.00	R
480120	$560,773	$495,782	$580,000	$1,636,555	7	S	0.00011	$180	N	0.0005	Y	1	15	0.00164873	$2,698.24	R
480131	$608,602	$605,149	$1,160,000	$2,373,751	7	S	0.00011	$261	N	0.001	Y	1	15	0.00164873	$3,913.67	R
484000	$124,265	$89,387	$580,000	$793,652	7	S	0.00011	$87	N	0.001	Y	1	31	0.003404379	$2,701.89	R
484002	$112,968	$153,063	$0	$266,031	6	S	0.00011	$29	N	0.002	Y	1	34	0.00373322	$993.15	R
484003	$117,775	$82,737	$0	$200,512	6	S	0.00011	$22	N	0.002	Y	1	30	0.003294742	$660.64	R
484004	$432,542	$170,544	$580,000	$1,183,086	6	S	0.00011	$130	N	0.0001	N	1	33	0.003623618	$4,287.05	R
484006	$113,218	$25,855	$0	$139,073	7	S	0.00011	$15	N	0.0005	Y	1	34	0.00373322	$519.19	R
484007	$225,219	$103,421	$0	$328,640	3	S	0.0013	$427	N	0.0005	N	1	33	0.042019551	$13,809.31	R
484008	$109,363	$103,421	$0	$212,784	6	S	0.00011	$23	N	0.0005	Y	1	32	0.003514005	$747.72	R
484009	$167,049	$32,319	$0	$199,368	7	S	0.00011	$22	N	0.0005	Y	1	31	0.003404379	$678.72	R
484011	$224,735	$51,711	$0	$276,445	6	S	0.00011	$30	N	0.0005	Y	1	31	0.003404379	$941.12	R
484014	$169,452	$134,447	$0	$303,900	7	S	0.00011	$33	N	0.0005	Y	1	31	0.003404379	$1,034.59	R
484015	$278,784	$31,026	$0	$309,811	6	S	0.00011	$34	N	0.0001	N	1	31	0.003404379	$1,054.71	R
484016	$309,341	$82,737	$580,000	$972,078	7	S	0.00011	$107	N	0.0001	N	1	32	0.003514005	$3,415.89	R
484017	$224,735	$51,711	$0	$276,445	6	S	0.00011	$30	N	0.0005	Y	1	31	0.003404379	$941.12	R
484018	$116,870	$148,926	$0	$265,797	7	S	0.00011	$29	N	0.0005	Y	1	34	0.00373322	$992.28	R
484020	$164,879	$165,474	$0	$330,353	6	S	0.00011	$36	N	0.0005	Y	1	34	0.00373322	$1,233.28	R
484023	$144,215	$745,129	$1,160,000	$2,049,343	7	S	0.00011	$225	N	0.0005	Y	1	34	0.00373322	$7,650.65	R
484024	$167,650	$490,334	$1,160,000	$1,817,984	6	S	0.00011	$200	N	0.0005	Y	1	33	0.003623618	$6,587.68	R
484028	$221,129	$106,653	$0	$327,782	2	S	0.006	$1,967	N	0.0001	N	1	35	0.189928312	$62,255.08	R
484029	$276,412	$58,821	$0	$335,233	4	S	0.0005	$168	N	0.0001	N	1	34	0.016860495	$5,652.19	R
484030	$204,905	$381,371	$580,000	$1,166,276	5	S	0.00024	$4	N	0.0001	N	1	35	0.008365818	$9,756.85	R
484032	$174,088	$89,976	$0	$264,064	6	S	0.00011	$29	N	0.0001	N	1	33	0.003623618	$956.87	R
484034	$228,871	$45,247	$0	$274,118	6	O	0.00017	$47	N	0.0005	Y	1	31	0.005256584	$1,440.92	R
484036	$125,587	$65,378	$580,000	$770,965	3	S	0.0013	$1,002	N	0.0005	N	1	34	0.043264925	$33,355.74	R
484037	$114,170	$29,087	$0	$143,257	4	S	0.0005	$72	N	0.002	Y	1	33	0.016368679	$2,344.93	R
484038	$117,775	$72,395	$0	$190,170	7	S	0.00011	$21	N	0.002	Y	1	31	0.003404379	$647.41	R
484039	$309,341	$99,284	$580,000	$988,625	6	S	0.00011	$109	N	0.002	Y	1	31	0.003404379	$3,365.65	R
484040	$118,088	$64,638	$0	$182,726	6	S	0.00011	$20	N	0.002	Y	1	32	0.003514005	$642.10	R
484041	$165,847	$19,391	$0	$185,239	6	S	0.00011	$20	N	0.002	Y	1	32	0.003514005	$650.93	R
484042	$111,767	$127,208	$0	$238,974	6	S	0.00011	$26	N	0.002	Y	1	32	0.003514005	$839.76	R
484043	$353,045	$678,596	$1,160,000	$2,191,641	6	S	0.00011	$241	N	0.002	Y	1	33	0.003623618	$7,941.67	R
484045	$490,451	$944,147	$580,000	$2,014,598	4	S	0.0005	$1,007	N	0.002	Y	1	26	0.012919074	$26,026.74	R
484046	$224,001	$26,502	$0	$250,503	6	S	0.00011	$28	N	0.0005	Y	1	31	0.003404379	$852.81	R
484047	$828,034	$56,882	$0	$884,915	4	S	0.0005	$442	N	0.001	Y	1	33	0.016368679	$14,484.89	R
484048	$170,436	$11,635	$0	$182,071	6	S	0.00011	$20	N	0.002	Y	1	27	0.002965757	$539.98	R
484049	$118,088	$8,144	$0	$126,232	7	O	0.00017	$21	N	0.001	Y	1	26	0.00441062	$556.76	R
484050	$435,048	$62,053	$0	$497,101	6	S	0.00011	$55	N	0.0005	Y	1	22	0.002417207	$1,201.60	R

Bridge Number	Bridge Replacement Cost	Detour Cost	Loss of Life Cost	Total Cost of Failure	Scour Vulnerability	Overtopping Frequency	Annual Probability of Failure	Annual Unadjusted Risk	High Priority	MPL	Meets MPL	K1	Remaining Life	Lifetime Probability of Failure	Unadjusted Lifetime Risk	Scour Mode
484051	$168,001	$78,859	$0	$246,859	6	S	0.00011	$27	N	0.0005	Y	1	25	0.002746373	$677.97	R
484052	$66,770	$64,638	$0	$131,408	6	S	0.00011	$14	N	0.0005	Y	1	22	0.002417207	$317.64	R
484053	$113,218	$95,147	$0	$208,365	4	S	0.0005	$104	N	0.0005	N	1	26	0.012919074	$2,691.88	R
484054	$286,026	$41,239	$0	$327,265	7	O	0.00017	$56	N	0.0005	Y	1	25	0.004241341	$1,388.04	R
484060	$138,479	$232,750	$1,160,000	$1,531,229	6	S	0.00011	$168	N	0.0005	Y	1	24	0.002636663	$4,037.33	R
484064	$128,557	$31,647	$580,000	$740,204	7	S	0.00011	$81	N	0.002	Y	1	27	0.002965757	$2,195.27	R
484067	$149,693	$19,391	$0	$169,085	6	S	0.00011	$19	N	0.0005	Y	1	28	0.003075431	$520.01	R
484068	$99,749	$95,573	$580,000	$775,321	4	S	0.0005	$388	N	0.002	Y	1	15	0.007473807	$5,794.60	T
484069	$903,310	$6,614,863	$2,900,000	$10,418,173	7	S	0.00011	$1,146	N	0.002	Y	1	28	0.003075431	$32,040.37	R
484071	$318,584	$395,807	$1,160,000	$1,874,391	7	S	0.00011	$206	N	0.002	Y	1	36	0.003952386	$7,408.32	R
484072	$175,305	$1,445,725	$1,160,000	$2,781,030	7	S	0.00011	$306	N	0.002	Y	1	26	0.002856071	$7,942.82	R
484073	$169,452	$837,319	$1,160,000	$2,166,772	3	S	0.0013	$2,817	N	0.0005	N	1	24	0.030737977	$66,602.19	R
484075	$335,300	$41,368	$0	$376,668	3	S	0.0013	$490	N	0.002	Y	1	24	0.030737977	$11,578.01	R
484078	$282,421	$512,049	$1,160,000	$1,954,470	7	S	0.00011	$215	N	0.002	Y	1	26	0.002856071	$5,582.11	M
484083	$195,171	$88,115	$580,000	$863,286	7	S	0.00011	$95	N	0.002	Y	1	42	0.004609597	$3,979.40	R
484084	$145,382	$84,392	$580,000	$809,774	6	O	0.00017	$138	N	0.002	Y	1	42	0.007115173	$5,761.68	R
485005	$2,266,046	$6,614,863	$2,900,000	$11,780,910	7	S	0.00011	$1,296	N	0.0005	Y	1	22	0.002417207	$28,476.90	M
490018	$757,850	$4,100,301	$1,160,000	$6,018,151	7	S	0.00011	$662	Y	0.002	Y	1	15	0.00164873	$9,922.31	R
490025	$2,205,208	$3,807,422	$1,160,000	$7,172,630	7	S	0.00011	$789	Y	0.0005	Y	1	43	0.00471909	$33,848.29	R
490030	$608,371	$517,387	$1,160,000	$2,285,759	7	S	0.00011	$251	Y	0.002	Y	1	52	0.005703985	$13,037.93	T
490806	$196,001	$40,314	$0	$236,315	8	O	0.0000085	$2	N	0.002	Y	1	63	0.000535359	$126.51	R
490807	$87,590	$36,649	$0	$124,239	7	O	0.00017	$21	N	0.002	Y	1	63	0.010653753	$1,323.61	R
490808	$85,436	$10,995	$0	$96,431	7	O	0.00017	$16	N	0.002	Y	1	63	0.010653753	$1,027.35	R
490811	$66,052	$36,649	$0	$102,700	8	O	0.0000085	$1	N	0.002	Y	1	63	0.000535359	$54.98	R
490825	$97,111	$58,638	$0	$155,749	7	O	0.00017	$26	N	0.002	Y	1	67	0.011326337	$1,764.07	M
490826	$400,181	$69,633	$0	$469,813	7	O	0.00017	$80	N	0.002	Y	1	67	0.011326337	$5,321.26	M
490827	$266,579	$69,633	$0	$336,212	7	O	0.00017	$57	N	0.002	Y	1	67	0.011326337	$3,808.05	R
490828	$87,590	$40,314	$0	$127,904	7	O	0.00017	$22	N	0.002	Y	1	67	0.011326337	$1,448.68	R
490829	$43,795	$10,995	$0	$54,790	7	O	0.00017	$9	N	0.002	Y	1	67	0.011326337	$620.57	M
490830	$43,795	$10,995	$0	$54,790	7	O	0.00017	$9	N	0.002	Y	1	67	0.011326337	$620.57	M
490831	$43,795	$18,324	$0	$62,120	8	O	0.0000085	$1	N	0.002	Y	1	67	0.00056934	$35.37	M
490832	$76,165	$10,995	$0	$87,160	7	O	0.00017	$15	N	0.002	Y	1	67	0.011326337	$987.20	M
490833	$43,795	$21,989	$0	$65,784	7	O	0.00017	$11	N	0.002	Y	1	67	0.011326337	$745.09	M
490834	$56,812	$47,643	$0	$104,455	7	O	0.00017	$18	N	0.002	Y	1	67	0.011326337	$1,183.09	M
490835	$43,795	$47,643	$0	$91,439	7	O	0.00017	$16	N	0.0001	N	1	67	0.011326337	$1,035.67	M
490836	$109,847	$10,995	$0	$120,841	7	O	0.00017	$21	N	0.0005	Y	1	67	0.011326337	$1,368.69	M
490837	$87,590	$10,995	$0	$98,585	7	O	0.00017	$17	N	0.0005	Y	1	67	0.011326337	$1,116.61	R
490838	$43,795	$36,649	$0	$80,444	7	O	0.00017	$14	N	0.0001	N	1	67	0.011326337	$911.14	R
490839	$65,334	$10,995	$0	$76,328	7	O	0.00017	$13	N	0.001	Y	1	67	0.011326337	$864.52	R
490840	$56,812	$36,649	$0	$93,461	7	O	0.00017	$16	N	0.0005	Y	1	67	0.011326337	$1,058.57	R
490841	$56,812	$18,324	$0	$75,136	7	O	0.00017	$13	N	0.001	Y	1	67	0.011326337	$851.02	R
490842	$56,812	$51,308	$0	$108,120	7	O	0.00017	$18	N	0.002	Y	1	67	0.011326337	$1,224.60	R
490843	$65,334	$40,314	$0	$105,647	7	O	0.00017	$18	N	0.0001	N	1	67	0.011326337	$1,196.59	R
494000	$593,805	$2,615,115	$580,000	$3,788,920	7	S	0.00011	$417	N	0.0001	N	1	55	0.006032066	$22,855.02	M
494096	$158,808	$19,391	$0	$178,199	5	S	0.00024	$1	N	0.0005	Y	1	25	0.005982752	$1,066.12	M
494099	$58,232	$89,201	$0	$147,433	6	S	0.00011	$16	N	0.0005	Y	1	65	0.00712489	$1,050.44	M
500004	$2,025,688	$17,456,582	$2,900,000	$22,382,271	8	S	0.0000022	$49	N	0.0005	Y	1	37	8.13968E-05	$1,821.84	R
500041	$1,442,383	$527,757	$1,160,000	$3,130,140	6	S	0.00011	$344	N	0.0005	Y	1	22	0.002417207	$7,566.20	R
500045	$2,782,972	$5,152,735	$1,160,000	$9,095,707	5	S	0.00024	$31	N	0.0005	Y	1	25	0.005982752	$54,417.36	R
500048	$888,022	$2,781,921	$1,160,000	$4,829,943	4	S	0.0005	$2,415	Y	0.0005	N	1	15	0.007473807	$36,098.06	R
500049	$464,133	$974,112	$1,160,000	$2,598,245	4	S	0.0005	$1,299	N	0.0001	N	1	33	0.016368679	$42,529.84	R
500063	$3,561,514	$997,519	$2,900,000	$7,459,033	4	O	0.0006	$4,475	N	0.0001	N	1	15	0.008962298	$66,850.08	R
500106	$1,162,869	$658,032	$1,160,000	$2,980,901	7	S	0.00011	$328	N	0.0005	Y	1	45	0.00493804	$14,719.81	R
500803	$72,357	NA	$0	$72,357	8	O	0.0000085	$1	N	0.0005	Y	1	69	0.000586331	$42.43	R
500804	$72,357	NA	$0	$72,357	8	O	0.0000085	$1	N	0.0005	Y	1	69	0.000586331	$42.43	R
500910	$412,558	$715,993	$1,160,000	$2,288,550	6	S	0.00011	$252	N	0.001	Y	1	15	0.00164873	$3,773.20	R
500920	$6,185,132	$1,684,725	$2,900,000	$10,769,858	8	S	0.0000022	$24	N	0.0005	Y	1	37	8.13968E-05	$876.63	R
504024	$93,693	$45,764	$0	$139,457	7	S	0.00011	$15	N	0.0005	Y	1	26	0.002856071	$398.30	R
504130	$387,268	$148,669	$580,000	$1,115,937	7	S	0.00011	$123	N	0.0005	Y	1	61	0.006687905	$7,463.28	R
504131	$463,719	$178,403	$580,000	$1,222,122	7	S	0.00011	$134	N	0.001	Y	1	61	0.006687905	$8,173.44	R
504135	$583,143	$108,963	$580,000	$1,272,106	6	S	0.00011	$140	N	0.001	Y	1	62	0.006797169	$8,646.72	R
504136	$513,165	$431,685	$580,000	$1,524,849	7	S	0.00011	$168	N	0.001	Y	1	62	0.006797169	$10,364.66	R
504137	$571,288	$338,575	$1,160,000	$2,069,862	7	S	0.00011	$228	N	0.001	Y	1	63	0.006906421	$14,295.34	R
510019	$460,028	$55,751	$580,000	$1,095,779	6	S	0.00011	$121	N	0.0005	Y	1	32	0.003514005	$3,850.57	M
510020	$271,399	$4,136,841	$580,000	$4,988,240	7	S	0.00011	$549	N	0.001	Y	1	46	0.005047497	$25,178.12	T
510022	$1,318,864	$17,774,402	$1,160,000	$20,253,266	7	S	0.00011	$2,228	Y	0.001	Y	1	15	0.00164873	$33,392.17	R
510024	$377,019	$7,039,252	$1,160,000	$8,576,271	7	S	0.00011	$943	N	0.001	Y	1	15	0.00164873	$14,139.96	R
510026	$471,789	$7,039,252	$1,160,000	$8,671,041	7	S	0.00011	$954	N	0.001	Y	1	15	0.00164873	$14,296.21	M
510046	$510,558	$318,576	$0	$829,134	7	S	0.00011	$91	N	0.001	Y	1	41	0.004500092	$3,731.18	T
514008	$163,662	$16,160	$0	$179,822	6	S	0.00011	$20	N	0.002	Y	1	26	0.002856071	$513.58	R
514013	$480,064	$637,152	$580,000	$1,697,216	7	S	0.00011	$187	N	0.002	Y	1	16	0.001758549	$2,984.64	M
514017	$193,457	$144,789	$0	$338,247	5	S	0.00024	$1	N	0.002	Y	1	55	0.013114826	$4,436.05	T
514019	$331,156	$575,778	$1,160,000	$2,066,934	7	S	0.00011	$227	N	0.002	Y	1	59	0.00646934	$13,371.70	R
514055	$206,770	$19,391	$0	$226,162	7	S	0.00011	$25	N	0.002	Y	1	59	0.00646934	$1,463.12	R
514056	$228,403	$31,026	$0	$259,429	7	S	0.00011	$29	N	0.002	Y	1	59	0.00646934	$1,678.33	R
514057	$121,490	$116,349	$0	$237,839	7	S	0.00011	$26	N	0.002	Y	1	60	0.006578628	$1,564.65	R
514058	$261,750	$98,067	$580,000	$939,817	7	S	0.00011	$103	N	0.002	Y	1	60	0.006578628	$6,182.71	R
514060	$191,537	$19,391	$0	$210,929	6	S	0.00011	$23	N	0.002	Y	1	61	0.006687905	$1,410.67	T
514061	$271,386	$82,737	$0	$354,123	7	S	0.00011	$39	N	0.002	Y	1	61	0.006687905	$2,368.34	R

Bridge Number	Bridge Replacement Cost	Detour Cost	Loss of Life Cost	Total Cost of Failure	Scour Vulnerability	Overtopping Frequency	Annual Probability of Failure	Annual Unadjusted Risk	High Priority	MPL	Meets MPL	K1	Remaining Life	Lifetime Probability of Failure	Unadjusted Lifetime Risk	Scour Mode
514064	$121,490	NA	$0	$121,490	4	S	0.0005	$61	N	0.002	Y	1	65	0.031985418	$3,885.91	R
520006	$653,499	$548,853	$580,000	$1,782,352	6	S	0.00011	$196	N	0.002	Y	1	22	0.002417207	$4,308.31	R
520062	$753,733	$3,503,508	$1,160,000	$5,417,241	6	S	0.00011	$596	N	0.002	Y	1	35	0.003842809	$20,817.42	R
524000	$95,597	$31,026	$0	$126,623	6	S	0.00011	$14	N	0.002	Y	1	50	0.005485204	$694.55	R
524006	$64,772	$27,148	$0	$91,920	7	S	0.00011	$10	N	0.002	Y	1	50	0.005485204	$504.20	R
524007	$68,065	$46,539	$0	$114,605	6	S	0.00011	$13	N	0.002	Y	1	50	0.005485204	$628.63	R
524011	$62,712	$15,513	$0	$78,225	7	S	0.00011	$9	N	0.002	Y	1	55	0.006032066	$471.86	R
524013	$51,006	$19,391	$0	$70,397	6	S	0.00011	$8	N	0.002	Y	1	45	0.00493804	$347.62	R
524014	$61,947	$11,635	$0	$73,582	7	S	0.00011	$8	N	0.002	Y	1	45	0.00493804	$363.35	R
524015	$63,211	$46,539	$0	$109,751	7	S	0.00011	$12	N	0.001	Y	1	51	0.0055946	$614.01	R
524016	$94,832	$20,684	$0	$115,516	6	S	0.00011	$13	N	0.002	Y	1	53	0.005813357	$671.54	R
524020	$75,213	$19,391	$0	$94,605	6	S	0.00011	$10	N	0.002	Y	1	47	0.005156941	$487.87	R
524021	$61,182	$31,026	$0	$92,208	3	S	0.0013	$120	N	0.002	Y	1	52	0.06540685	$6,031.03	R
524022	$335,300	$136,204	$580,000	$1,051,503	7	S	0.00011	$116	N	0.002	Y	1	57	0.006250727	$6,572.66	R
524023	$180,784	$62,637	$580,000	$823,421	7	S	0.00011	$91	N	0.002	Y	1	58	0.00636004	$5,236.99	R
524100	$57,046	$19,391	$0	$76,437	7	S	0.00011	$8	N	0.002	Y	1	60	0.006578628	$502.85	R
524102	$94,067	$100,835	$0	$194,903	7	S	0.00011	$21	N	0.002	Y	1	31	0.003404379	$663.52	R
524103	$94,067	$42,661	$0	$136,729	6	O	0.00017	$23	N	0.002	Y	1	36	0.006101828	$834.30	R
524105	$157,544	$7,757	$0	$165,300	3	S	0.0013	$215	N	0.002	Y	1	44	0.055629973	$9,195.63	R
524107	$93,303	$92,433	$0	$185,735	6	S	0.00011	$20	N	0.002	Y	1	31	0.003404379	$632.31	R
524112	$105,352	$19,391	$0	$124,743	6	S	0.00011	$14	N	0.002	Y	1	47	0.005156941	$643.29	R
524113	$64,241	$32,319	$0	$96,560	6	O	0.00017	$16	N	0.002	Y	1	37	0.006270791	$605.51	R
524115	$308,205	$54,296	$0	$362,501	6	S	0.00011	$40	N	0.002	Y	1	37	0.004061952	$1,472.46	R
524117	$77,851	$38,783	$0	$116,634	3	S	0.0013	$152	N	0.002	Y	1	41	0.051937334	$6,057.66	R
524118	$162,897	$109,238	$0	$272,136	6	S	0.00011	$30	N	0.002	Y	1	42	0.004609597	$1,254.44	R
524119	$94,067	$51,711	$0	$145,778	2	S	0.006	$875	N	0.002	N	1	41	0.218656938	$31,875.37	R
524122	$47,447	$31,026	$0	$78,474	6	S	0.00011	$9	N	0.002	Y	1	38	0.004171505	$327.35	R
524123	$54,627	$15,513	$0	$70,140	7	S	0.00011	$8	N	0.002	Y	1	39	0.004281046	$300.27	R
524124	$48,321	$23,270	$0	$71,591	7	S	0.00011	$8	N	0.002	Y	1	41	0.004500092	$322.17	R
524125	$64,241	$41,368	$0	$105,610	6	S	0.00011	$12	N	0.002	Y	1	43	0.00471909	$498.38	R
524126	$98,656	$7,757	$0	$106,413	6	S	0.00011	$12	N	0.002	Y	1	36	0.003952386	$420.59	R
524127	$63,476	$41,368	$0	$104,845	3	S	0.0013	$136	N	0.002	Y	1	36	0.04575082	$4,796.74	R
524128	$64,553	$77,566	$0	$142,119	4	O	0.0006	$85	N	0.002	Y	1	43	0.02547757	$3,620.85	R
524129	$57,686	$11,635	$0	$69,321	7	S	0.00011	$8	N	0.002	Y	1	44	0.004828571	$334.72	R
524130	$55,704	$46,539	$0	$102,243	3	S	0.0013	$133	N	0.002	Y	1	44	0.055629973	$5,687.78	R
524132	$54,299	$64,638	$0	$118,937	6	S	0.00011	$13	N	0.002	Y	1	45	0.00493804	$587.32	R
524134	$53,534	$19,391	$0	$72,926	4	S	0.0005	$36	N	0.002	Y	1	60	0.029561747	$2,155.82	R
524136	$69,126	$7,757	$0	$76,883	6	S	0.00011	$8	N	0.002	Y	1	36	0.003952386	$303.87	R
524137	$63,476	$5,817	$0	$69,294	7	S	0.00011	$8	N	0.002	Y	1	60	0.006578628	$455.86	R
524138	$126,953	$54,296	$0	$181,249	6	S	0.00011	$20	N	0.002	Y	1	60	0.006578628	$1,192.37	R
524139	$61,947	$32,319	$0	$94,266	7	S	0.00011	$10	N	0.002	Y	1	60	0.006578628	$620.14	R
524140	$57,358	$32,319	$0	$89,677	6	S	0.00011	$10	N	0.002	Y	1	60	0.006578628	$589.95	R
524150	$127,203	$19,391	$0	$146,594	6	S	0.00011	$16	N	0.0005	Y	1	66	0.007234106	$1,060.48	R
524153	$60,417	$38,783	$0	$99,200	7	S	0.00011	$11	N	0.0005	Y	1	68	0.007452503	$739.29	R
524155	$400,454	$187,642	$580,000	$1,168,096	7	S	0.00011	$128	N	0.0005	Y	1	68	0.007452503	$8,705.24	R
524156	$63,211	$63,992	$0	$127,203	7	S	0.00011	$14	N	0.0001	N	1	68	0.007452503	$947.98	R
524157	$91,773	$100,835	$0	$192,609	7	S	0.00011	$21	N	0.002	Y	1	68	0.007452503	$1,435.42	R
524158	$92,148	$22,623	$0	$114,771	7	S	0.00011	$13	N	0.002	Y	1	68	0.007452503	$855.33	R
524159	$57,717	$71,102	$0	$128,819	3	O	0.0016	$206	N	0.002	Y	1	56	0.085768774	$11,048.65	R
524160	$61,182	$32,319	$0	$93,501	7	S	0.00011	$10	N	0.002	Y	1	69	0.007561683	$707.02	R
524161	$163,756	$38,783	$0	$202,539	7	S	0.00011	$22	N	0.002	Y	1	53	0.005813357	$1,177.43	R
524162	$54,923	NA	$0	$54,923	7	S	0.00011	$6	N	0.002	Y	1	69	0.007561683	$415.31	R
524163	$54,362	$19,391	$0	$73,753	7	S	0.00011	$8	N	0.002	Y	1	61	0.006687905	$493.25	R
524164	$93,303	$84,030	$0	$177,332	7	S	0.00011	$20	N	0.002	Y	1	70	0.007670851	$1,360.29	R
524166	$261,428	$36,649	$0	$298,077	8	S	0.0000022	$1	N	0.002	Y	1	72	0.000158388	$47.21	R
524201	$51,006	$64,638	$0	$115,644	6	S	0.00011	$13	N	0.002	Y	1	36	0.003952386	$457.07	R
524202	$92,538	$31,026	$0	$123,564	6	S	0.00011	$14	N	0.002	Y	1	36	0.003952386	$488.37	R
524203	$120,070	$41,368	$0	$161,438	6	S	0.00011	$18	N	0.002	Y	1	36	0.003952386	$638.07	R
524204	$185,076	$41,368	$0	$226,444	6	S	0.00011	$25	N	0.002	Y	1	36	0.003952386	$894.99	R
524206	$78,522	$25,855	$0	$104,377	7	S	0.00011	$11	N	0.002	Y	1	47	0.005156941	$538.27	R
524207	$58,529	$31,026	$0	$89,555	6	S	0.00011	$10	N	0.002	Y	1	41	0.004500092	$403.01	R
524208	$77,851	$17,452	$0	$95,303	6	S	0.00011	$10	N	0.002	Y	1	37	0.004061952	$387.12	R
524209	$249,317	$38,783	$0	$288,100	3	S	0.0013	$375	N	0.002	Y	1	47	0.059308231	$17,086.70	R
524210	$127,983	$25,855	$0	$153,838	3	O	0.0016	$246	N	0.002	Y	1	36	0.056016063	$8,617.40	R
524212	$64,241	$51,711	$0	$115,952	6	S	0.00011	$13	N	0.002	Y	1	36	0.003952386	$458.29	R
524213	$63,476	$51,711	$0	$115,187	3	S	0.0013	$150	N	0.002	Y	1	41	0.051937334	$5,982.51	R
524214	$63,991	$51,711	$0	$115,702	6	S	0.00011	$13	N	0.002	Y	1	35	0.003842809	$444.62	R
524216	$120,835	$41,368	$0	$162,203	3	S	0.0013	$211	N	0.002	Y	1	36	0.04575082	$7,420.92	R
524217	$73,824	$25,855	$0	$99,680	3	S	0.0013	$130	N	0.002	Y	1	39	0.049467556	$4,930.93	R
524302	$62,712	$67,224	$0	$129,935	7	S	0.00011	$14	N	0.001	Y	1	41	0.004500092	$584.72	R
524303	$56,593	$42,015	$0	$98,608	6	S	0.00011	$11	N	0.002	Y	1	45	0.00493804	$486.93	R
524309	$1,084,702	$209,209	$580,000	$1,873,911	6	S	0.00011	$206	N	0.002	Y	1	46	0.005047497	$9,458.56	R
524310	$149,896	$62,053	$0	$211,949	6	S	0.00011	$23	N	0.0005	Y	1	41	0.004500092	$953.79	R
524402	$181,252	$134,447	$0	$315,699	6	S	0.00011	$35	N	0.0005	Y	1	44	0.004828571	$1,524.38	R
524501	$52,005	$48,479	$0	$100,483	7	S	0.00011	$11	N	0.001	Y	1	38	0.004171505	$419.17	R
524505	$79,193	$38,783	$0	$117,976	6	S	0.00011	$13	N	0.0005	Y	1	36	0.003952386	$466.29	R
524506	$63,991	$54,942	$0	$118,934	6	S	0.00011	$13	N	0.001	Y	1	47	0.005156941	$613.34	R
524507	$141,484	$38,783	$0	$180,266	6	S	0.00011	$20	N	0.0005	Y	1	37	0.004061952	$732.23	R
525403	$112,625	$65,931	$0	$178,556	7	S	0.00011	$20	N	0.0005	Y	1	41	0.004500092	$803.52	R

Bridge Number	Bridge Replacement Cost	Detour Cost	Loss of Life Cost	Total Cost of Failure	Scour Vulnerability	Overtopping Frequency	Annual Probability of Failure	Annual Unadjusted Risk	High Priority	MPL	Meets MPL	K1	Remaining Life	Lifetime Probability of Failure	Unadjusted Lifetime Risk	Scour Mode
530005	$8,606,818	$18,658,076	$2,900,000	$30,164,894	7	S	0.00011	$3,318	Y	0.002	Y	1	15	0.00164873	$49,733.77	R
530014	$1,803,819	$787,520	$580,000	$3,171,339	7	S	0.00011	$349	N	0.002	Y	1	40	0.004390575	$13,924.00	R
530016	$714,004	$6,913,216	$1,160,000	$8,787,220	6	S	0.00011	$967	N	0.001	Y	1	23	0.002526941	$22,204.79	R
530026	$1,627,310	$802,170	$580,000	$3,009,480	5	S	0.00024	$10	N	0.0005	Y	1	32	0.007651499	$23,027.03	R
530041	$1,584,887	$239,670	$580,000	$2,404,557	7	S	0.00011	$265	N	0.002	Y	1	34	0.00373322	$8,976.74	R
530081	$2,227,839	$1,299,650	$1,160,000	$4,687,488	7	S	0.00011	$516	Y	0.0005	Y	1	45	0.00493804	$23,147.00	R
530910	$795,429	$1,294,200	$2,900,000	$4,989,630	7	S	0.00011	$549	Y	0.0005	Y	1	28	0.003075431	$15,345.26	R
534002	$74,261	$32,319	$0	$106,580	7	S	0.00011	$12	N	0.0005	Y	1	57	0.006250727	$666.20	R
534003	$163,756	$51,711	$0	$215,466	7	S	0.00011	$24	N	0.001	Y	1	57	0.006250727	$1,346.82	R
534005	$140,906	$27,148	$0	$168,054	7	S	0.00011	$18	N	0.0005	Y	1	57	0.006250727	$1,050.46	R
534009	$69,501	$19,391	$0	$88,892	7	S	0.00011	$10	N	0.002	Y	1	57	0.006250727	$555.64	R
534010	$117,104	$46,539	$0	$163,644	7	S	0.00011	$18	N	0.002	Y	1	57	0.006250727	$1,022.89	R
534011	$71,405	$25,855	$0	$97,260	7	S	0.00011	$11	N	0.0005	Y	1	57	0.006250727	$607.95	R
534012	$139,954	$31,026	$0	$170,980	7	S	0.00011	$19	N	0.001	Y	1	57	0.006250727	$1,068.75	R
534013	$277,848	$25,855	$0	$303,703	6	S	0.00011	$33	N	0.001	Y	1	57	0.006250727	$1,898.36	R
534014	$277,848	$31,026	$0	$308,874	6	S	0.00011	$34	N	0.0005	Y	1	57	0.006250727	$1,930.69	R
534015	$237,580	$82,737	$0	$320,317	7	S	0.00011	$35	N	0.002	Y	1	57	0.006250727	$2,002.21	R
534016	$134,242	$31,026	$0	$165,268	7	S	0.00011	$18	N	0.002	Y	1	57	0.006250727	$1,033.05	R
534017	$70,453	$25,855	$0	$96,308	7	S	0.00011	$11	N	0.0005	Y	1	57	0.006250727	$602.00	R
534018	$293,955	$45,247	$0	$339,202	6	S	0.00011	$37	N	0.001	Y	1	57	0.006250727	$2,120.26	R
534020	$303,694	$23,270	$0	$326,964	7	S	0.00011	$36	N	0.002	Y	1	58	0.00636004	$2,079.50	R
534021	$209,455	$25,855	$0	$235,310	7	S	0.00011	$26	N	0.002	Y	1	58	0.00636004	$1,496.58	R
534022	$655,023	$32,319	$0	$687,342	6	S	0.00011	$76	N	0.002	Y	1	58	0.00636004	$4,371.52	R
534024	$112,250	$22,623	$0	$134,874	7	S	0.00011	$15	N	0.002	Y	1	58	0.00636004	$857.80	R
534025	$103,775	$25,855	$0	$129,631	7	S	0.00011	$14	N	0.002	Y	1	58	0.00636004	$824.46	R
534026	$105,680	$38,783	$0	$144,462	7	S	0.00011	$16	N	0.002	Y	1	58	0.00636004	$918.78	R
534027	$277,848	$32,319	$0	$310,167	7	S	0.00011	$34	N	0.002	Y	1	58	0.00636004	$1,972.67	R
534028	$277,848	$32,319	$0	$310,167	7	S	0.00011	$34	N	0.001	Y	1	58	0.00636004	$1,972.67	R
534113	$204,180	$23,270	$0	$227,449	7	S	0.00011	$25	N	0.0005	Y	1	59	0.00646934	$1,471.44	R
534134	$88,589	$25,855	$0	$114,444	6	S	0.00011	$13	N	0.002	Y	1	38	0.004171505	$477.40	R
534152	$74,261	$19,391	$0	$93,653	7	S	0.00011	$10	N	0.002	Y	1	59	0.00646934	$605.87	R
534153	$133,290	$155,132	$0	$288,421	7	S	0.00011	$32	N	0.002	Y	1	60	0.006578628	$1,897.41	R
534155	$70,453	$38,783	$0	$109,236	7	S	0.00011	$12	N	0.002	Y	1	60	0.006578628	$718.62	R
534156	$79,593	$353,596	$580,000	$1,013,189	7	S	0.00011	$111	N	0.002	Y	1	60	0.006578628	$6,665.39	R
534157	$68,705	$19,391	$0	$88,096	7	S	0.00011	$10	N	0.002	Y	1	60	0.006578628	$579.55	R
534158	$259,724	$91,838	$580,000	$931,562	7	S	0.00011	$102	N	0.002	Y	1	60	0.006578628	$6,128.40	R
534159	$241,919	$100,835	$0	$342,754	7	S	0.00011	$38	N	0.002	Y	1	60	0.006578628	$2,254.85	R
534160	$677,373	$100,835	$0	$778,208	7	S	0.00011	$86	N	0.002	Y	1	60	0.006578628	$5,119.54	R
534161	$72,576	$23,270	$0	$95,845	7	S	0.00011	$11	N	0.002	Y	1	61	0.006687905	$641.00	R
534162	$48,992	$12,928	$0	$61,920	7	S	0.00011	$7	N	0.0005	Y	1	61	0.006687905	$414.12	R
534163	$671,941	$291,647	$0	$963,589	7	S	0.00011	$106	N	0.002	Y	1	61	0.006687905	$6,444.39	R
534164	$204,695	$126,691	$0	$331,385	7	O	0.00017	$56	N	0.002	Y	1	61	0.010317289	$3,418.99	R
534165	$72,357	$72,395	$0	$144,752	7	S	0.00011	$16	N	0.002	Y	1	61	0.006687905	$968.09	R
534168	$195,970	$46,539	$0	$242,509	6	S	0.00011	$27	N	0.002	Y	1	61	0.006687905	$1,621.88	R
534169	$190,632	$38,783	$0	$229,415	7	S	0.00011	$25	N	0.001	Y	1	63	0.006906421	$1,584.44	R
534174	$105,477	$31,026	$0	$136,503	7	S	0.00011	$15	N	0.002	Y	1	64	0.007015662	$957.66	R
534176	$178,989	$32,319	$0	$211,308	7	S	0.00011	$23	N	0.002	Y	1	65	0.00712489	$1,505.55	R
534177	$195,970	$32,319	$0	$228,289	7	S	0.00011	$25	N	0.002	Y	1	65	0.00712489	$1,626.53	R
534182	$557,912	$100,835	$0	$658,747	7	S	0.00011	$72	N	0.002	Y	1	67	0.007343311	$4,837.38	R
534183	$72,357	$15,513	$0	$87,870	6	S	0.00011	$10	N	0.002	Y	1	61	0.006687905	$587.67	R
540005	$756,660	$3,394,430	$1,160,000	$5,311,090	6	S	0.00011	$584	Y	0.002	Y	1	15	0.00164873	$8,756.55	R
540023	$2,803,153	$0	$1,160,000	$3,963,153	6	S	0.00011	$436	Y	0.002	Y	1	20	0.002197703	$8,709.83	R
540025	$465,655	$1,410,606	$1,160,000	$3,036,260	6	S	0.00011	$334	N	0.002	Y	1	17	0.001868355	$5,672.81	R
540043	$550,386	$2,101,591	$580,000	$3,231,976	4	S	0.0005	$1,616	N	0.002	Y	1	21	0.010447666	$33,766.61	R
540048	$2,066,440	$1,168,480	$1,160,000	$4,394,920	7	R	0.000077	$338	Y	0.002	Y	1	17	0.001308194	$5,749.41	R
540064	$700,277	$383,572	$1,160,000	$2,243,849	6	S	0.00011	$247	N	0.002	Y	1	45	0.00493804	$11,080.22	R
544077	$72,576	$20,684	$0	$93,260	6	S	0.00011	$10	N	0.002	Y	1	62	0.006797169	$633.90	R
550001	$2,850,335	$3,509,913	$2,900,000	$9,260,248	7	S	0.00011	$1,019	N	0.002	Y	1	29	0.003185092	$29,494.74	R
550005	$1,324,810	$1,872,984	$2,900,000	$6,097,794	7	R	0.000077	$470	N	0.002	Y	1	39	0.002998611	$18,284.91	R
550006	$586,411	$2,131,795	$2,900,000	$5,618,206	7	S	0.00011	$618	N	0.002	Y	1	15	0.00164873	$9,262.91	R
550008	$548,578	$1,357,412	$1,160,000	$3,065,990	8	S	0.0000022	$7	N	0.002	Y	1	15	3.29995E-05	$101.18	R
550028	$928,969	$2,266,803	$2,900,000	$6,095,771	4	S	0.0005	$3,048	Y	0.002	Y	1	15	0.007473807	$45,558.61	R
550033	$1,777,577	$287,679	$1,160,000	$3,225,256	7	S	0.00011	$355	N	0.002	Y	1	54	0.005922718	$19,102.28	R
550034	$486,959	NA	$1,160,000	$1,646,959	6	S	0.00011	$181	N	0.002	Y	1	18	0.00197815	$3,257.93	R
550051	$308,002	$87,957	$580,000	$975,959	7	S	0.00011	$107	N	0.002	Y	1	16	0.001758549	$1,716.27	R
550054	$281,219	$1,838,753	$1,160,000	$3,279,972	6	S	0.00011	$361	N	0.002	Y	1	15	0.00164873	$5,407.79	R
550058	$668,352	$2,050,834	$1,160,000	$3,879,186	6	S	0.00011	$427	N	0.002	Y	1	24	0.002636663	$10,228.11	R
550062	$2,872,898	$361,974	$580,000	$3,814,871	7	S	0.00011	$420	N	0.002	Y	1	37	0.004061952	$15,495.82	R
550065	$3,664,954	$650,637	$1,160,000	$5,475,591	7	S	0.00011	$602	Y	0.002	Y	1	20	0.002197703	$12,033.72	R
550073	$731,438	$1,872,984	$2,900,000	$5,504,422	7	S	0.00011	$605	N	0.002	Y	1	15	0.00164873	$9,075.31	R
550803	$74,261	$0	$0	$74,261	7	S	0.00011	$8	N	0.001	Y	1	71	0.007780007	$577.75	R
550804	$917,310	$232,697	$1,160,000	$2,310,007	8	S	0.0000022	$5	N	0.002	Y	1	61	0.000134191	$309.98	R
554001	$304,087	$1,654,736	$580,000	$2,538,824	7	S	0.00011	$279	N	0.002	Y	1	15	0.00164873	$4,185.84	R
554033	$568,447	$424,768	$580,000	$1,573,215	7	S	0.00011	$173	N	0.002	Y	1	58	0.00636004	$10,005.71	R
554034	$281,305	$424,768	$580,000	$1,286,073	7	S	0.00011	$141	N	0.002	Y	1	58	0.00636004	$8,179.48	R
554035	$287,125	$424,768	$580,000	$1,291,893	7	S	0.00011	$142	N	0.002	Y	1	58	0.00636004	$8,216.49	R
555010	$229,862	$167,580	$1,160,000	$1,557,442	6	S	0.00011	$171	N	0.002	Y	1	26	0.002856071	$4,448.16	R
555011	$1,203,539	$1,874,211	$2,900,000	$5,977,750	7	S	0.00011	$658	N	0.002	Y	1	41	0.004500092	$26,900.43	R
555020	$283,888	$256,430	$1,160,000	$1,700,318	7	S	0.00011	$187	N	0.002	Y	1	45	0.00493804	$8,396.24	R

Bridge Number	Bridge Replacement Cost	Detour Cost	Loss of Life Cost	Total Cost of Failure	Scour Vulnerability	Overtopping Frequency	Annual Probability of Failure	Annual Unadjusted Risk	High Priority	MPL	Meets MPL	K1	Remaining Life	Lifetime Probability of Failure	Unadjusted Lifetime Risk	Scour Mode
555024	$537,060	$553,838	$1,160,000	$2,250,898	7	S	0.00011	$248	N	0.002	Y	1	53	0.005813357	$13,085.27	R
560008	$742,613	$103,421	$0	$846,034	6	S	0.00011	$93	N	0.002	Y	1	30	0.003294742	$2,787.46	R
560013	$3,612,473	$822,989	$0	$4,435,462	7	S	0.00011	$488	N	0.002	Y	1	50	0.005485204	$24,329.41	R
560023	$603,951	$87,502	$580,000	$1,271,454	6	S	0.00011	$140	N	0.002	Y	1	16	0.001758549	$2,235.91	R
560026	$1,480,036	$4,086,154	$1,160,000	$6,726,191	6	S	0.00011	$740	N	0.002	Y	1	15	0.00164873	$11,089.67	R
560027	$863,085	$4,086,154	$1,160,000	$6,109,239	7	S	0.00011	$672	N	0.002	Y	1	15	0.00164873	$10,072.49	R
560033	$510,212	$1,360,814	$580,000	$2,451,025	7	S	0.00011	$270	N	0.002	Y	1	18	0.00197815	$4,848.49	R
560037	$428,524	$1,397,275	$580,000	$2,405,799	7	S	0.00011	$265	N	0.002	Y	1	24	0.002636663	$6,343.28	R
560049	$604,140	$1,494,227	$580,000	$2,678,367	6	S	0.00011	$295	N	0.002	Y	1	24	0.002636663	$7,061.95	R
560058	$2,603,952	$399,149	$0	$3,003,102	7	S	0.00011	$330	N	0.002	Y	1	50	0.005485204	$16,472.63	R
560059	$3,170,433	$399,149	$0	$3,569,582	7	S	0.00011	$393	N	0.002	Y	1	50	0.005485204	$19,579.88	R
560060	$1,704,053	$15,739,815	$1,160,000	$18,603,868	8	R	0.0000017	$32	Y	0.002	Y	1	56	9.51955E-05	$1,771.01	R
560061	$5,256,117	$15,739,815	$1,160,000	$22,155,932	8	R	0.0000017	$38	Y	0.002	Y	1	56	9.51955E-05	$2,109.15	R
560062	$773,352	$22,627,064	$1,160,000	$24,560,416	7	S	0.00011	$2,702	Y	0.002	Y	1	55	0.006032066	$148,150.06	R
560809	$111,392	$51,308	$0	$162,700	7	O	0.00017	$28	N	0.002	Y	1	67	0.011326337	$1,842.80	R
564067	$1,040,201	$886,609	$580,000	$2,506,810	7	S	0.00011	$276	N	0.002	Y	1	66	0.007234106	$18,134.53	R
570006	$14,547,098	$1,966,313	$2,900,000	$19,413,411	7	S	0.00011	$2,135	Y	0.002	Y	1	15	0.00164873	$32,007.48	R
570016	$1,112,398	$4,614,066	$1,160,000	$6,886,463	7	S	0.00011	$758	N	0.002	Y	1	26	0.002856071	$19,668.23	R
570017	$30,948,511	$20,660,963	$2,900,000	$54,509,474	6	S	0.00011	$5,996	Y	0.002	Y	1	24	0.002636663	$143,723.12	T
570018	$42,553,001	$19,283,565	$2,900,000	$64,736,567	7	R	0.000077	$4,985	Y	0.002	Y	1	24	0.001846365	$119,527.30	M
570021	$1,669,357	$3,761,615	$1,160,000	$6,590,972	7	S	0.00011	$725	N	0.002	Y	1	26	0.002856071	$18,824.28	R
570026	$1,060,597	$1,569,069	$580,000	$3,209,666	7	S	0.00011	$353	N	0.002	Y	1	26	0.002856071	$9,167.03	R
570028	$735,187	$1,743,410	$580,000	$3,058,597	7	S	0.00011	$336	N	0.002	Y	1	15	0.00164873	$5,042.80	R
570032	$555,438	$157,623	$1,160,000	$1,873,061	6	S	0.00011	$206	N	0.002	Y	1	31	0.003404379	$6,376.61	R
570033	$4,866,222	$10,356,197	$1,160,000	$16,382,419	7	S	0.00011	$1,802	Y	0.002	Y	1	15	0.00164873	$27,010.19	R
570036	$1,124,876	$1,970,241	$580,000	$3,675,117	7	S	0.00011	$404	N	0.002	Y	1	41	0.004500092	$16,538.37	R
570040	$5,662,734	$1,834,201	$580,000	$8,076,935	7	S	0.00011	$888	N	0.002	Y	1	15	0.00164873	$13,316.69	R
570055	$7,419,574	$2,274,516	$2,900,000	$12,594,090	7	R	0.000077	$970	Y	0.0005	Y	1	20	0.001538874	$19,380.72	M
570085	$1,062,383	$458,550	$580,000	$2,100,933	7	S	0.00011	$231	N	0.002	Y	1	48	0.005266374	$11,064.30	R
570802	$226,592	$117,641	$0	$344,234	7	S	0.00011	$38	N	0.002	Y	1	55	0.006032066	$2,076.44	R
570803	$157,091	$16,160	$0	$173,251	7	S	0.00011	$19	N	0.0005	Y	1	55	0.006032066	$1,045.06	R
570804	$100,638	$95,343	$0	$195,981	8	S	0.0000022	$0	N	0.001	Y	1	56	0.000123193	$24.14	R
570805	$100,638	$90,493	$0	$191,132	8	S	0.0000022	$0	N	0.002	Y	1	56	0.000123193	$23.55	R
570806	$162,804	$84,030	$0	$246,833	7	S	0.00011	$27	N	0.001	Y	1	56	0.006141403	$1,515.90	R
570810	$669,260	$103,421	$580,000	$1,352,681	7	O	0.00017	$230	N	0.0005	Y	1	62	0.010485535	$14,183.58	R
570811	$146,618	$32,319	$0	$178,938	7	O	0.00017	$30	N	0.0005	Y	1	62	0.010485535	$1,876.26	R
570813	$175,555	$19,391	$0	$194,947	8	S	0.0000022	$0	N	0.002	Y	1	66	0.00014519	$28.30	R
574008	$205,885	$193,128	$1,160,000	$1,559,013	6	S	0.00011	$171	N	0.001	Y	1	53	0.005813357	$9,063.10	R
574009	$78,013	$53,096	$580,000	$711,109	6	S	0.00011	$78	N	0.001	Y	1	15	0.00164873	$1,172.43	R
574011	$253,781	$48,479	$0	$302,259	7	S	0.00011	$33	N	0.002	Y	1	15	0.00164873	$498.34	R
574012	$311,045	$19,391	$0	$330,437	6	S	0.00011	$36	N	0.0005	Y	1	15	0.00164873	$544.80	R
574013	$533,526	$103,421	$580,000	$1,216,947	6	O	0.00017	$207	N	0.002	Y	1	42	0.007115173	$8,658.79	R
574016	$187,994	$51,711	$0	$239,705	7	S	0.00011	$26	N	0.002	Y	1	53	0.005813357	$1,393.49	R
574038	$257,495	$32,319	$0	$289,814	6	S	0.00011	$32	N	0.002	Y	1	15	0.00164873	$477.83	R
574041	$421,004	$393,000	$580,000	$1,394,004	6	S	0.00011	$153	N	0.002	Y	1	41	0.004500092	$6,273.15	R
574054	$99,015	$90,493	$0	$189,508	7	S	0.00011	$21	N	0.002	Y	1	36	0.003952386	$749.01	R
574071	$97,735	$13,574	$0	$111,309	4	O	0.0006	$67	N	0.0005	N	1	50	0.029563204	$3,290.65	R
574072	$232,242	$13,574	$0	$245,816	4	O	0.0006	$147	N	0.001	Y	1	50	0.029563204	$7,267.11	R
574073	$132,572	$13,574	$0	$146,146	4	O	0.0006	$88	N	0.002	Y	1	50	0.029563204	$4,320.54	R
574081	$202,119	$127,984	$0	$330,103	5	S	0.00024	$1	N	0.002	Y	1	41	0.009792915	$3,232.67	R
574082	$66,645	$32,319	$0	$98,964	7	S	0.00011	$11	N	0.002	Y	1	47	0.005156941	$510.35	R
574085	$536,639	$64,638	$0	$601,277	6	S	0.00011	$66	N	0.002	Y	1	26	0.002856071	$1,717.29	R
574088	$145,838	$73,007	$0	$218,845	7	S	0.00011	$24	N	0.002	Y	1	15	0.00164873	$360.82	R
574090	$166,105	$233,623	$580,000	$979,727	7	S	0.00011	$108	N	0.002	Y	1	26	0.002856071	$2,798.17	R
574096	$796,787	$108,963	$580,000	$1,485,750	7	S	0.00011	$163	N	0.0001	N	1	15	0.00164873	$2,449.60	R
574097	$243,998	$54,482	$580,000	$878,479	7	S	0.00011	$97	N	0.0005	Y	1	15	0.00164873	$1,448.37	R
574100	$292,207	$53,096	$580,000	$925,303	3	S	0.0013	$1,203	N	0.0005	N	1	50	0.062972161	$58,268.33	R
574102	$452,326	$103,421	$0	$555,747	6	S	0.00011	$61	N	0.0005	Y	1	50	0.005485204	$3,048.39	R
574105	$127,577	$11,635	$0	$139,212	7	S	0.00011	$15	N	0.0005	Y	1	61	0.006687905	$931.04	R
574106	$45,574	NA	$0	$45,574	4	O	0.0006	$27	N	0.0001	N	1	50	0.029563204	$1,347.31	R
574108	$76,977	$32,319	$0	$109,296	7	S	0.00011	$12	N	0.0001	N	1	49	0.005375795	$587.55	R
574110	$507,015	$38,783	$0	$545,798	7	S	0.00011	$60	N	0.0001	N	1	52	0.005703985	$3,113.22	R
574111	$107,100	$29,087	$0	$136,187	7	S	0.00011	$15	N	0.0001	N	1	53	0.005813357	$791.70	R
574112	$229,353	$65,378	$580,000	$874,731	7	S	0.00011	$96	N	0.0005	Y	1	51	0.0055946	$4,893.77	R
574115	$336,072	$94,192	$580,000	$1,010,264	7	S	0.00011	$111	N	0.0005	Y	1	55	0.006032066	$6,093.98	R
574116	$201,695	$108,963	$580,000	$890,658	7	S	0.00011	$98	N	0.0005	Y	1	56	0.006141403	$5,469.89	R
574118	$154,953	$85,322	$0	$240,275	7	S	0.00011	$26	N	0.0005	Y	1	59	0.00646934	$1,554.42	R
574119	$153,611	$77,566	$0	$231,176	6	S	0.00011	$25	N	0.0005	Y	1	56	0.006141403	$1,419.74	R
574120	$106,257	$25,855	$0	$132,112	6	S	0.00011	$15	N	0.0005	Y	1	58	0.00636004	$840.24	R
574121	$455,120	$36,844	$0	$491,963	7	S	0.00011	$54	N	0.0001	N	1	59	0.00646934	$3,182.68	R
574122	$151,535	$25,855	$0	$177,390	7	S	0.00011	$20	N	0.0005	Y	1	59	0.00646934	$1,147.60	R
574123	$220,580	$217,926	$580,000	$1,018,506	7	S	0.00011	$112	N	0.002	Y	1	60	0.006578628	$6,700.37	R
574124	$105,102	$32,319	$0	$137,421	7	S	0.00011	$15	N	0.002	Y	1	60	0.006578628	$904.04	R
574127	$256,980	$153,615	$1,160,000	$1,570,595	7	S	0.00011	$173	N	0.0005	Y	1	62	0.006797169	$10,675.60	R
574129	$105,960	$9,696	$0	$115,656	7	S	0.00011	$13	N	0.002	Y	1	63	0.006906421	$798.77	R
574130	$105,960	$9,696	$0	$115,656	7	S	0.00011	$13	N	0.002	Y	1	63	0.006906421	$798.77	R
574132	$11,920,436	$502,804	$1,160,000	$13,583,240	7	R	0.000077	$1,046	N	0.0005	Y	1	63	0.004839439	$65,735.26	R
574133	$153,814	$9,696	$0	$163,509	7	S	0.00011	$18	N	0.002	Y	1	63	0.006906421	$1,129.26	R
574134	$245,540	$38,783	$0	$284,323	7	S	0.00011	$31	N	0.002	Y	1	64	0.007015662	$1,994.71	R

Bridge Number	Bridge Replacement Cost	Detour Cost	Loss of Life Cost	Total Cost of Failure	Scour Vulnerability	Overtopping Frequency	Annual Probability of Failure	Annual Unadjusted Risk	High Priority	MPL	Meets MPL	K1	Remaining Life	Lifetime Probability of Failure	Unadjusted Lifetime Risk	Scour Mode
574135	$189,134	$25,855	$0	$214,989	7	S	0.00011	$24	N	0.002	Y	1	65	0.00712489	$1,531.77	R
574136	$534,368	$588,401	$580,000	$1,702,768	7	S	0.00011	$187	N	0.002	Y	1	65	0.00712489	$12,132.03	R
574137	$339,233	$382,117	$1,160,000	$1,881,350	7	S	0.00011	$207	N	0.002	Y	1	65	0.00712489	$13,404.41	R
574138	$607,236	$620,941	$1,160,000	$2,388,176	7	S	0.00011	$263	N	0.002	Y	1	65	0.00712489	$17,015.49	R
574139	$402,881	$39,822	$0	$442,703	7	S	0.00011	$49	N	0.002	Y	1	65	0.00712489	$3,154.21	R
574142	$402,881	$51,711	$0	$454,591	7	S	0.00011	$50	N	0.0005	Y	1	67	0.007343311	$3,338.20	R
574146	$264,925	$64,638	$0	$329,563	7	S	0.00011	$36	N	0.0005	Y	1	70	0.007670851	$2,528.03	R
574150	$190,501	$53,096	$580,000	$823,597	8	S	0.0000022	$2	N	0.0005	Y	1	72	0.000158388	$130.45	R
574151	$400,454	$127,430	$580,000	$1,107,884	8	S	0.0000022	$2	N	0.0005	Y	1	73	0.000160587	$177.91	R
574152	$242,309	$49,778	$0	$292,087	8	S	0.0000022	$1	N	0.0005	Y	1	73	0.000160587	$46.91	R
580002	$4,860,322	$3,177,581	$2,900,000	$10,937,903	7	S	0.00011	$1,203	Y	0.0002	Y	1	36	0.003952386	$43,230.82	R
580004	$4,050,940	$3,177,581	$2,900,000	$10,128,520	7	S	0.00011	$1,114	Y	0.0005	Y	1	36	0.003952386	$40,031.83	M
580005	$17,013,141	$3,177,581	$2,900,000	$23,090,721	7	S	0.00011	$2,540	Y	0.0005	Y	1	36	0.003952386	$91,263.45	M
580007	$3,163,987	$3,177,581	$2,900,000	$9,241,568	7	S	0.00011	$1,017	Y	0.0005	Y	1	32	0.003514005	$32,474.92	M
580013	$2,537,963	$17,605,020	$2,900,000	$23,042,984	4	S	0.0005	$11,521	Y	0.0005	N	1	15	0.007473807	$172,218.81	M
580030	$508,404	$3,551,004	$2,900,000	$6,959,408	7	S	0.00011	$766	N	0.0005	Y	1	16	0.001758549	$12,238.46	M
580088	$4,454,624	$2,462,802	$1,160,000	$8,077,426	7	S	0.00011	$889	N	0.0005	Y	1	50	0.005485204	$44,306.33	R
580096	$1,781,054	$15,287,684	$2,900,000	$19,968,737	7	S	0.00011	$2,197	N	0.0005	Y	1	53	0.005813357	$116,085.40	R
580102	$2,722,914	$43,440,343	$2,900,000	$49,063,258	7	S	0.00011	$5,397	Y	0.0005	Y	1	60	0.006578628	$322,768.95	R
580801	$164,708	$18,616	$0	$183,324	7	S	0.00011	$20	N	0.0005	Y	1	54	0.005922718	$1,085.78	R
580802	$167,158	$46,539	$0	$213,698	7	S	0.00011	$24	N	0.0001	N	1	54	0.005922718	$1,265.67	R
580803	$70,453	$119,466	$0	$189,919	7	S	0.00011	$21	N	0.0001	N	1	52	0.005703985	$1,083.30	R
580804	$133,539	$72,395	$0	$205,934	7	S	0.00011	$23	N	0.0005	Y	1	56	0.006141403	$1,264.72	R
580805	$40,424	$624,404	$0	$664,828	7	O	0.00017	$113	N	0.0001	N	1	57	0.009644019	$6,411.61	M
580806	$162,804	$49,771	$0	$212,575	8	O	0.0000085	$2	N	0.0001	Y	1	58	0.000492881	$104.77	R
580807	$218,024	$77,566	$0	$295,589	8	S	0.0000022	$1	N	0.0002	Y	1	61	0.000134191	$39.67	R
580809	$140,890	$38,783	$0	$179,673	8	S	0.0000022	$0	N	0.0001	Y	1	63	0.000138591	$24.90	R
580810	$209,954	$77,566	$0	$287,520	8	S	0.0000022	$1	N	0.002	Y	1	64	0.00014079	$40.48	R
580811	$156,092	$77,566	$0	$233,658	7	O	0.00017	$40	N	0.002	Y	1	64	0.010821942	$2,528.63	R
580812	$261,023	$122,812	$0	$383,835	7	S	0.00011	$42	N	0.0005	Y	1	65	0.00712489	$2,734.78	R
580813	$260,913	$27,148	$0	$288,061	7	S	0.00011	$32	N	0.0001	N	1	65	0.00712489	$2,052.40	R
580814	$174,322	$23,270	$0	$197,592	7	O	0.00017	$34	N	0.002	Y	1	67	0.011326337	$2,237.99	R
580818	$58,903	$23,893	$0	$82,797	7	O	0.00017	$14	N	0.0002	Y	1	70	0.011830475	$979.53	R
580819	$396,747	$23,658	$0	$420,405	7	S	0.00011	$46	N	0.0005	Y	1	72	0.007889152	$3,316.64	R
584042	$100,919	$32,319	$0	$133,238	7	S	0.00011	$15	N	0.0005	Y	1	49	0.005375795	$716.26	R
584046	$61,791	$11,635	$0	$73,426	7	O	0.00017	$12	N	0.0005	Y	1	26	0.00441062	$323.85	R
584047	$60,636	$23,270	$0	$83,906	7	O	0.00017	$14	N	0.0005	Y	1	26	0.00441062	$370.08	R
584050	$99,967	$15,513	$0	$115,480	6	O	0.00017	$20	N	0.0005	Y	1	26	0.00441062	$509.34	R
584059	$80,317	$116,349	$0	$196,666	5	O	0.00032	$3	N	0.0005	Y	1	26	0.008286805	$1,629.73	R
584065	$335,783	$32,319	$0	$368,102	7	S	0.00011	$40	N	0.0005	Y	1	26	0.002856071	$1,051.33	R
584067	$68,923	$106,653	$0	$175,576	6	S	0.00011	$19	N	0.0001	N	1	26	0.002856071	$501.46	R
584069	$292,925	$90,493	$0	$383,418	6	O	0.00017	$65	N	0.0005	Y	1	26	0.00441062	$1,691.11	R
584084	$623,214	$434,368	$580,000	$1,637,583	6	O	0.00017	$278	N	0.0005	Y	1	41	0.006946354	$11,375.23	R
584106	$142,482	$90,493	$0	$232,976	4	S	0.0005	$116	N	0.0002	N	1	26	0.012919074	$3,009.83	R
584111	$227,259	$73,884	$580,000	$881,143	7	S	0.00011	$97	N	0.0005	Y	1	52	0.005703985	$5,026.03	R
584113	$343,697	$217,184	$0	$560,881	5	O	0.00032	$10	N	0.0005	Y	1	51	0.01619012	$9,080.73	R
584116	$101,871	$32,689	$0	$134,560	7	O	0.00017	$23	N	0.0002	Y	1	51	0.008633255	$1,161.69	R
584117	$104,727	$31,026	$0	$135,754	4	S	0.0005	$68	N	0.0002	N	1	51	0.025183838	$3,418.81	R
584119	$161,852	$117,641	$0	$279,493	6	S	0.00011	$31	N	0.0001	N	1	51	0.0055946	$1,563.65	R
584122	$67,597	$31,858	$0	$99,454	7	S	0.00011	$11	N	0.0002	Y	1	53	0.005813357	$578.16	R
584123	$42,156	$26,548	$0	$68,704	7	S	0.00011	$8	N	0.0005	Y	1	53	0.005813357	$399.40	R
584125	$171,372	$42,015	$0	$213,387	7	O	0.00017	$36	N	0.0001	N	1	56	0.00947563	$2,021.98	R
584126	$78,546	$65,378	$580,000	$723,923	6	S	0.00011	$80	N	0.0002	Y	1	52	0.005703985	$4,129.25	R
584128	$249,080	$38,701	$580,000	$867,781	6	O	0.00017	$148	N	0.002	Y	1	54	0.009138766	$7,930.45	R
584129	$96,159	$20,684	$0	$116,843	6	O	0.00017	$20	N	0.0002	Y	1	54	0.009138766	$1,067.80	R
584132	$125,798	$90,493	$0	$216,291	6	O	0.00017	$37	N	0.0002	Y	1	54	0.009138766	$1,976.63	R
584134	$181,179	$79,644	$580,000	$840,823	7	S	0.00011	$92	N	0.0002	Y	1	56	0.006141403	$5,163.83	R
584135	$224,117	$79,644	$580,000	$883,761	6	S	0.00011	$97	N	0.0002	Y	1	56	0.006141403	$5,427.53	R
584136	$95,207	$23,270	$0	$118,477	7	S	0.00011	$13	N	0.0005	Y	1	54	0.005922718	$701.71	R
584137	$429,523	$719,723	$1,160,000	$2,309,246	7	S	0.00011	$254	N	0.0002	Y	1	55	0.006032066	$13,929.53	R
584139	$194,222	$48,479	$0	$242,700	7	S	0.00011	$27	N	0.0001	N	1	56	0.006141403	$1,490.52	R
584140	$365,594	$87,908	$0	$453,502	7	S	0.00011	$50	N	0.0005	Y	1	57	0.006250727	$2,834.72	R
584143	$194,222	$48,479	$0	$242,700	6	S	0.00011	$27	N	0.002	Y	1	56	0.006141403	$1,490.52	R
584145	$135,098	$451,514	$580,000	$1,166,612	7	S	0.00011	$128	N	0.0001	N	1	57	0.006250727	$7,292.17	R
584147	$136,146	$286,719	$580,000	$1,002,864	7	S	0.00011	$110	N	0.001	Y	1	57	0.006250727	$6,268.63	R
584148	$122,817	$32,319	$0	$155,136	7	S	0.00011	$17	N	0.001	Y	1	58	0.00636004	$986.67	R
584150	$86,638	$13,574	$0	$100,212	6	S	0.00011	$11	N	0.001	Y	1	59	0.00646934	$648.31	R
584151	$100,638	$62,053	$0	$162,691	7	S	0.00011	$18	N	0.0005	Y	1	58	0.00636004	$1,034.72	R
584152	$273,219	$126,277	$580,000	$979,496	7	S	0.00011	$108	N	0.0005	Y	1	59	0.00646934	$6,336.69	R
584153	$86,638	$139,618	$0	$226,257	7	O	0.00017	$38	N	0.0001	N	1	60	0.010149015	$2,296.29	R
584154	$81,878	$77,566	$0	$159,444	7	S	0.00011	$18	N	0.002	Y	1	60	0.006578628	$1,048.92	R
584155	$82,830	$77,566	$0	$160,396	7	S	0.00011	$18	N	0.002	Y	1	60	0.006578628	$1,055.19	R
584156	$168,625	$96,957	$0	$265,582	7	S	0.00011	$29	N	0.002	Y	1	59	0.00646934	$1,718.14	R
584158	$180,873	$917,081	$1,160,000	$2,257,955	6	S	0.00011	$248	N	0.002	Y	1	59	0.00646934	$14,607.48	R
584159	$534,110	$309,953	$580,000	$1,424,063	7	S	0.00011	$157	N	0.002	Y	1	60	0.006578628	$9,368.38	R
584161	$89,026	NA	$0	$89,026	6	S	0.00011	$10	N	0.002	Y	1	61	0.006687905	$595.40	R
584163	$108,567	$103,421	$0	$211,988	7	S	0.00011	$23	N	0.002	Y	1	61	0.006687905	$1,417.76	R
584164	$81,878	$22,623	$0	$104,501	7	S	0.00011	$11	N	0.002	Y	1	61	0.006687905	$698.89	R
584166	$173,183	$25,209	$0	$198,392	8	S	0.0000022	$0	N	0.002	Y	1	61	0.000134191	$26.62	R

Bridge Number	Bridge Replacement Cost	Detour Cost	Loss of Life Cost	Total Cost of Failure	Scour Vulnerability	Overtopping Frequency	Annual Probability of Failure	Annual Unadjusted Risk	High Priority	MPL	Meets MPL	K1	Remaining Life	Lifetime Probability of Failure	Unadjusted Lifetime Risk	Scour Mode
584169	$105,960	$122,812	$0	$228,773	7	S	0.00011	$25	N	0.002	Y	1	62	0.006797169	$1,555.01	R
584170	$521,827	$281,176	$0	$803,003	6	S	0.00011	$88	N	0.002	Y	1	62	0.006797169	$5,458.15	R
584172	$173,183	$51,711	$0	$224,893	7	O	0.00017	$38	N	0.002	Y	1	63	0.010653753	$2,395.95	R
584176	$800,970	$45,247	$0	$846,217	7	S	0.00011	$93	N	0.002	Y	1	63	0.006906421	$5,844.33	R
584178	$1,206,117	$507,200	$580,000	$2,293,317	7	S	0.00011	$252	N	0.002	Y	1	65	0.00712489	$16,339.63	R
584180	$141,281	$23,270	$0	$164,550	7	S	0.00011	$18	N	0.002	Y	1	66	0.007234106	$1,190.37	M
584182	$143,559	$20,684	$0	$164,244	8	S	0.0000022	$0	N	0.002	Y	1	67	0.000147389	$24.21	R
584188	$119,008	$42,661	$0	$161,670	7	S	0.00011	$18	N	0.002	Y	1	69	0.007561683	$1,222.50	R
584189	$211,921	$46,539	$0	$258,460	7	S	0.00011	$28	N	0.002	Y	1	69	0.007561683	$1,954.39	R
584190	$174,322	$135,094	$0	$309,416	7	S	0.00011	$34	N	0.002	Y	1	70	0.007670851	$2,373.48	R
584191	$139,408	$32,319	$0	$171,727	8	O	0.0000085	$1	N	0.002	Y	1	70	0.000594826	$102.15	R
584192	$262,053	$45,247	$0	$307,299	7	S	0.00011	$34	N	0.002	Y	1	70	0.007670851	$2,357.24	R
584193	$498,197	$51,711	$0	$549,907	7	O	0.00017	$93	N	0.002	Y	1	62	0.010485535	$5,766.07	T
584194	$269,459	$146,014	$580,000	$995,473	8	S	0.0000022	$2	N	0.002	Y	1	71	0.000156188	$155.48	R
584196	$209,642	$71,102	$0	$280,744	8	S	0.0000022	$1	N	0.002	Y	1	72	0.000158388	$44.47	R
584197	$210,782	$45,247	$0	$256,028	8	S	0.0000022	$1	N	0.002	Y	1	72	0.000158388	$40.55	R
584198	$205,584	$98,250	$0	$303,834	8	S	0.0000022	$1	N	0.002	Y	1	73	0.000160587	$48.79	R
584199	$91,611	$335,606	$580,000	$1,007,217	3	O	0.0016	$1,612	N	0.002	Y	1	46	0.071011522	$71,524.01	R
584200	$141,281	$19,391	$0	$160,672	8	S	0.0000022	$0	N	0.002	Y	1	72	0.000158388	$25.45	R
584201	$116,557	$1,982,555	$580,000	$2,679,112	8	S	0.0000022	$6	N	0.002	Y	1	69	0.000151789	$406.66	R
584202	$127,768	NA	$580,000	$707,768	8	S	0.0000022	$2	N	0.002	Y	1	72	0.000158388	$112.10	R
584203	$96,349	NA	$580,000	$676,349	8	S	0.0000022	$1	N	0.002	Y	1	72	0.000158388	$107.13	R
585001	$205,335	$95,573	$580,000	$880,907	7	S	0.00011	$97	N	0.002	Y	1	58	0.00636004	$5,602.60	R
590004	$1,060,597	$176,084	$580,000	$1,816,682	6	S	0.00011	$200	N	0.002	Y	1	30	0.003294742	$5,985.50	R
590017	$1,043,919	$263,872	$1,160,000	$2,467,791	7	S	0.00011	$271	N	0.002	Y	1	15	0.00164873	$4,068.72	M
590018	$565,528	$7,725,473	$1,160,000	$9,451,001	3	S	0.0013	$12,286	N	0.002	Y	1	16	0.020598425	$194,675.74	R
590020	$423,374	$1,552,724	$1,160,000	$3,136,098	7	S	0.00011	$345	N	0.002	Y	1	16	0.001758549	$5,514.98	R
590021	$423,374	$1,307,557	$1,160,000	$2,890,931	6	S	0.00011	$318	N	0.002	Y	1	16	0.001758549	$5,083.84	R
590023	$772,018	$7,289,833	$1,160,000	$9,221,851	7	S	0.00011	$1,014	Y	0.002	Y	1	30	0.003294742	$30,383.62	R
590801	$148,523	$2,628,254	$0	$2,776,776	7	S	0.00011	$305	N	0.002	Y	1	46	0.005047497	$14,015.77	R
594008	$420,424	$64,638	$0	$485,062	7	S	0.00011	$53	N	0.002	Y	1	55	0.006032066	$2,925.93	R
594053	$49,820	$22,623	$0	$72,443	7	S	0.00011	$8	N	0.002	Y	1	60	0.006578628	$476.58	R
594055	$84,562	$42,661	$0	$127,224	7	S	0.00011	$14	N	0.002	Y	1	60	0.006578628	$836.96	R
600019	$1,189,402	$1,856,478	$1,160,000	$4,205,880	7	S	0.00011	$463	N	0.002	Y	1	22	0.002417207	$10,166.48	R
600022	$978,910	$980,668	$580,000	$2,539,578	7	S	0.00011	$279	N	0.0001	N	1	24	0.002636663	$6,696.01	R
600088	$162,382	$4,300,779	$1,160,000	$5,623,161	7	S	0.00011	$619	N	0.0001	N	1	36	0.003952386	$22,224.91	M
600111	$1,734,184	$21,526,092	$1,160,000	$24,420,276	7	S	0.00011	$2,686	Y	0.0005	Y	1	55	0.006032066	$147,304.73	R
600802	$221,816	NA	$580,000	$801,816	7	S	0.00011	$88	N	0.001	Y	1	54	0.005922718	$4,748.93	M
600920	$3,353,839	$98,397,678	$2,900,000	$104,651,516	7	S	0.00011	$11,512	Y	0.0001	N	1	34	0.00373322	$390,687.12	R
602506	$407,797	$103,421	$0	$511,218	6	S	0.00011	$56	N	0.002	Y	1	15	0.00164873	$842.86	
604002	$107,459	$32,319	$0	$139,778	7	S	0.00011	$15	N	0.002	Y	1	51	0.0055946	$782.00	R
604003	$46,651	$19,391	$0	$66,043	7	S	0.00011	$7	N	0.0005	Y	1	51	0.0055946	$369.48	R
604004	$105,539	$25,855	$0	$131,394	7	O	0.00017	$22	N	0.0002	Y	1	51	0.008633255	$1,134.36	R
604008	$133,071	$19,391	$0	$152,462	7	S	0.00011	$17	N	0.0005	Y	1	51	0.0055946	$852.96	R
604009	$78,007	$51,711	$0	$129,718	7	S	0.00011	$14	N	0.0005	Y	1	26	0.002856071	$370.48	R
604016	$99,873	$19,391	$0	$119,265	7	S	0.00011	$13	N	0.0002	Y	1	51	0.0055946	$667.24	R
604024	$94,832	$19,391	$0	$114,224	6	S	0.00011	$13	N	0.0005	Y	1	46	0.005047497	$576.55	R
604026	$120,959	$19,391	$0	$140,351	7	S	0.00011	$15	N	0.0005	Y	1	41	0.004500092	$631.59	M
604095	$118,618	$15,513	$0	$134,131	7	S	0.00011	$15	N	0.0005	Y	1	54	0.005922718	$794.42	R
604109	$138,253	$25,855	$0	$164,108	6	S	0.00011	$18	N	0.0005	Y	1	56	0.006141403	$1,007.85	R
604111	$83,501	$15,513	$0	$99,014	7	S	0.00011	$11	N	0.002	Y	1	56	0.006141403	$608.08	R
604112	$178,958	$13,574	$0	$192,532	6	S	0.00011	$21	N	0.0005	Y	1	46	0.005047497	$971.80	R
604114	$236,768	$23,270	$0	$260,038	7	S	0.00011	$29	N	0.0001	N	1	57	0.006250727	$1,625.43	R
604121	$257,558	$25,209	$0	$282,767	6	S	0.00011	$31	N	0.0002	Y	1	60	0.006578628	$1,860.22	R
604124	$158,371	$21,331	$0	$179,702	6	S	0.00011	$20	N	0.002	Y	1	60	0.006578628	$1,182.19	R
604129	$103,791	$19,391	$0	$123,182	6	S	0.00011	$14	N	0.001	Y	1	62	0.006797169	$837.29	R
604130	$355,293	$71,102	$0	$426,395	7	S	0.00011	$47	N	0.002	Y	1	66	0.007234106	$3,084.59	R
604133	$391,222	$51,711	$0	$442,932	7	S	0.00011	$49	N	0.0005	Y	1	63	0.006906421	$3,059.08	R
604135	$252,126	$32,319	$0	$284,445	7	S	0.00011	$31	N	0.0005	Y	1	63	0.006906421	$1,964.50	R
604136	$241,560	$51,711	$0	$293,270	8	S	0.0000022	$1	N	0.0005	Y	1	63	0.000138591	$40.64	R
604138	$236,753	$19,391	$0	$256,144	7	S	0.00011	$28	N	0.002	Y	1	63	0.006906421	$1,769.04	R
604142	$634,077	$2,696,837	$1,160,000	$4,490,914	7	S	0.00011	$494	N	0.0005	Y	1	64	0.007015662	$31,506.73	M
604149	$77,242	$25,855	$0	$103,098	7	O	0.00017	$18	N	0.002	Y	1	65	0.010990102	$1,133.06	R
604152	$255,201	$23,270	$0	$278,471	7	S	0.00011	$31	N	0.002	Y	1	65	0.00712489	$1,984.08	R
604155	$280,721	$84,954	$580,000	$945,675	7	S	0.00011	$104	N	0.002	Y	1	65	0.00712489	$6,737.83	R
604157	$255,201	$38,783	$0	$293,984	7	S	0.00011	$32	N	0.002	Y	1	66	0.007234106	$2,126.71	R
604158	$380,858	$27,148	$0	$408,006	7	S	0.00011	$45	N	0.001	Y	1	66	0.007234106	$2,951.56	R
604159	$402,881	$25,855	$0	$428,736	7	S	0.00011	$47	N	0.001	Y	1	66	0.007234106	$3,101.52	R
604160	$675,750	$63,715	$580,000	$1,319,465	8	S	0.0000022	$3	N	0.001	Y	1	66	0.00014519	$191.57	R
604161	$666,994	$138,050	$580,000	$1,385,043	7	S	0.00011	$152	N	0.0005	Y	1	66	0.007234106	$10,019.55	R
604162	$382,154	$90,493	$0	$472,647	7	S	0.00011	$52	N	0.0005	Y	1	66	0.007234106	$3,419.18	R
604167	$316,087	$23,270	$0	$339,356	7	S	0.00011	$37	N	0.0005	Y	1	67	0.007343311	$2,492.00	R
604168	$253,906	$32,319	$0	$286,225	8	S	0.0000022	$1	N	0.002	Y	1	67	0.000147389	$42.19	R
604169	$122,817	$7,757	$0	$130,573	7	O	0.00017	$22	N	0.002	Y	1	67	0.011326337	$1,478.91	R
604173	$81,160	$5,817	$0	$86,977	7	S	0.00011	$10	N	0.0001	N	1	68	0.007452503	$648.20	R
604174	$59,309	$3,878	$0	$63,187	7	O	0.00017	$11	N	0.0001	N	1	68	0.011494411	$726.30	R
604175	$338,796	$19,391	$0	$358,187	8	S	0.0000022	$1	N	0.0001	Y	1	68	0.000149589	$53.58	R
604176	$224,844	$19,391	$0	$244,236	7	S	0.00011	$27	N	0.002	Y	1	68	0.007452503	$1,820.17	R
604177	$79,022	NA	$0	$79,022	7	S	0.00011	$9	N	0.0005	Y	1	68	0.007452503	$588.91	M

Bridge Number	Bridge Replacement Cost	Detour Cost	Loss of Life Cost	Total Cost of Failure	Scour Vulnerability	Overtopping Frequency	Annual Probability of Failure	Annual Unadjusted Risk	High Priority	MPL	Meets MPL	K1	Remaining Life	Lifetime Probability of Failure	Unadjusted Lifetime Risk	Scour Mode
604178	$154,485	$31,026	$0	$185,511	7	O	0.00017	$32	N	0.0005	Y	1	68	0.011494411	$2,132.34	R
604179	$294,205	$1,264,890	$1,160,000	$2,719,095	8	S	0.0000022	$6	N	0.0005	Y	1	69	0.000151789	$412.73	T
604180	$838,506	$108,592	$0	$947,099	7	S	0.00011	$104	N	0.0001	N	1	69	0.007561683	$7,161.66	R
604181	$1,336,563	$437,511	$580,000	$2,354,074	7	S	0.00011	$259	N	0.0001	N	1	69	0.007561683	$17,800.76	R
604183	$304,662	$27,148	$0	$331,810	7	S	0.00011	$36	N	0.0005	Y	1	69	0.007561683	$2,509.04	R
604184	$59,653	NA	$0	$59,653	7	O	0.00017	$10	N	0.0005	Y	1	70	0.011830475	$705.72	R
604185	$54,299	$19,391	$0	$73,691	7	S	0.00011	$8	N	0.0005	Y	1	70	0.007670851	$565.27	R
604187	$51,240	NA	$0	$51,240	7	O	0.00017	$9	N	0.0005	Y	1	69	0.011662457	$597.58	R
604191	$379,188	$825,373	$1,160,000	$2,364,562	8	S	0.0000022	$5	N	0.0005	Y	1	70	0.000153988	$364.11	R
604192	$59,653	$46,539	$0	$106,192	7	O	0.00017	$18	N	0.001	Y	1	70	0.011830475	$1,256.30	R
604193	$76,478	$32,319	$0	$108,797	7	S	0.00011	$12	N	0.002	Y	1	71	0.007780007	$846.44	R
604195	$242,309	$32,319	$0	$274,628	8	S	0.0000022	$1	N	0.0001	Y	1	72	0.000158388	$43.50	R
604196	$417,443	$32,319	$0	$449,762	7	S	0.00011	$49	N	0.002	Y	1	72	0.007889152	$3,548.24	R
604197	$281,079	$90,493	$0	$371,572	8	S	0.0000022	$1	N	0.002	Y	1	73	0.000160587	$59.67	R
604316	$118,540	$9,696	$0	$128,236	7	S	0.00011	$14	N	0.002	Y	1	44	0.004828571	$619.20	R
604343	$79,537	$35,551	$0	$115,088	7	S	0.00011	$13	N	0.002	Y	1	26	0.002856071	$328.70	R
604348	$47,416	$23,270	$0	$70,686	7	S	0.00011	$8	N	0.002	Y	1	26	0.002856071	$201.88	R
604372	$185,841	$25,209	$0	$211,049	6	S	0.00011	$23	N	0.002	Y	1	52	0.005703985	$1,203.82	R
604373	$168,251	$29,087	$0	$197,338	6	S	0.00011	$22	N	0.002	Y	1	52	0.005703985	$1,125.61	R
604377	$1,080,993	$1,034,210	$580,000	$2,695,204	7	S	0.00011	$296	N	0.002	Y	1	52	0.005703985	$15,373.40	R
604382	$128,482	$22,623	$0	$151,106	6	S	0.00011	$17	N	0.002	Y	1	51	0.0055946	$845.38	R
610007	$388,007	$450,341	$1,160,000	$1,998,348	6	S	0.00011	$220	N	0.002	Y	1	34	0.00373322	$7,460.27	R
610008	$8,372,703	$10,049,667	$2,900,000	$21,322,370	4	S	0.0005	$10,661	Y	0.002	Y	1	15	0.007473807	$159,359.27	R
610034	$551,622	$1,459,875	$1,160,000	$3,171,497	7	S	0.00011	$349	N	0.002	Y	1	17	0.001868355	$5,925.48	R
610052	$4,539,491	$528,564	$1,160,000	$6,228,055	7	S	0.00011	$685	N	0.002	Y	1	37	0.004061952	$25,298.06	R
610083	$4,303,767	$437,511	$580,000	$5,321,278	7	S	0.00011	$585	N	0.002	Y	1	61	0.006687905	$35,588.20	R
610084	$1,610,314	$2,485,862	$1,160,000	$5,256,175	7	S	0.00011	$578	N	0.002	Y	1	61	0.006687905	$35,152.80	R
610803	$177,693	$103,421	$0	$281,114	8	S	0.0000022	$1	N	0.002	Y	1	69	0.000151789	$42.67	R
610910	$733,342	$8,128,558	$1,160,000	$10,021,899	6	S	0.00011	$1,102	Y	0.002	Y	1	15	0.00164873	$16,523.41	R
614118	$134,601	$19,391	$0	$153,992	6	S	0.00011	$17	N	0.002	Y	1	47	0.005156941	$794.13	R
614128	$71,015	$38,783	$0	$109,798	6	S	0.00011	$12	N	0.002	Y	1	45	0.00493804	$542.19	R
614129	$104,010	$17,452	$0	$121,462	3	S	0.0013	$158	N	0.002	Y	1	45	0.056857654	$6,906.04	R
614130	$98,328	$23,893	$0	$122,222	6	S	0.00011	$13	N	0.002	Y	1	45	0.00493804	$603.54	R
614131	$103,011	$84,030	$0	$187,040	3	S	0.0013	$243	N	0.002	Y	1	45	0.056857654	$10,634.66	R
614132	$70,359	$19,911	$0	$90,270	6	S	0.00011	$10	N	0.002	Y	1	46	0.005047497	$455.64	R
614134	$235,551	$51,711	$0	$287,261	7	S	0.00011	$32	N	0.002	Y	1	46	0.005047497	$1,449.95	R
614135	$69,595	$26,548	$0	$96,143	6	S	0.00011	$11	N	0.002	Y	1	46	0.005047497	$485.28	R
614137	$208,362	$45,247	$0	$253,609	7	S	0.00011	$28	N	0.002	Y	1	45	0.00493804	$1,252.33	R
614138	$104,774	$25,209	$0	$129,983	3	S	0.0013	$169	N	0.002	Y	1	46	0.058083739	$7,549.90	R
614139	$71,795	$71,102	$0	$142,897	6	O	0.00017	$24	N	0.002	Y	1	50	0.008464694	$1,209.58	R
614140	$119,867	$19,911	$0	$139,778	3	S	0.0013	$182	N	0.002	Y	1	50	0.062972161	$8,802.12	R
614142	$198,077	$71,102	$0	$269,179	7	S	0.00011	$30	N	0.002	Y	1	56	0.006141403	$1,653.14	R
614144	$73,356	$46,539	$0	$119,896	7	O	0.00017	$20	N	0.002	Y	1	68	0.011494411	$1,378.13	R
700018	$654,094	$703,017	$1,160,000	$2,517,111	7	S	0.00011	$277	Y	0.002	Y	1	33	0.003623618	$9,121.05	R
700037	$5,360,860	$38,679,626	$2,900,000	$46,940,486	4	S	0.0005	$23,470	Y	0.002	Y	1	15	0.007473807	$350,824.12	T
700072	$22,529,930	$1,260,188	$2,900,000	$26,690,119	7	S	0.00011	$2,936	N	0.002	Y	1	27	0.002965757	$79,156.40	T
700110	$23,423,710	$2,058,995	$2,900,000	$28,382,705	5	S	0.00024	$97	Y	0.002	Y	0.67	36	0.008603811	$244,199.42	T
700185	$3,369,758	$2,360,878	$2,900,000	$8,630,637	7	S	0.00011	$949	Y	0.002	Y	1	28	0.003075431	$26,542.92	R
700186	$2,138,251	$28,664,407	$2,900,000	$33,702,658	7	S	0.00011	$3,707	Y	0.002	Y	1	48	0.005266374	$177,490.81	R
700190	$3,218,551	$2,360,878	$2,900,000	$8,479,430	7	S	0.00011	$933	Y	0.002	Y	1	57	0.006250727	$53,002.60	R
700194	$1,408,436	$31,943,594	$2,900,000	$36,252,030	8	R	0.0000017	$62	Y	0.002	Y	1	65	0.000110494	$4,005.63	R
700196	$8,158,566	$91,363,322	$2,900,000	$102,421,888	6	S	0.00011	$11,266	Y	0.002	Y	1	59	0.00646934	$662,602.03	T
704004	$1,119,632	$4,036,559	$1,160,000	$6,316,191	6	S	0.00011	$695	N	0.002	Y	1	38	0.004171505	$26,348.02	R
704011	$4,036,050	$3,033,492	$2,900,000	$9,969,542	7	S	0.00011	$1,097	N	0.002	Y	1	36	0.003952386	$39,403.48	T
704013	$224,844	$1,187,158	$1,160,000	$2,572,002	7	S	0.00011	$283	N	0.002	Y	1	41	0.004500092	$11,574.25	T
704016	$202,900	$209,351	$1,160,000	$1,572,250	6	S	0.00011	$173	N	0.002	Y	1	28	0.003075431	$4,835.35	T
704017	$125,501	NA	$580,000	$705,501	7	S	0.00011	$78	Y	0.002	Y	1	43	0.00471909	$3,329.32	T
704019	$215,292	NA	$580,000	$795,292	6	S	0.00011	$87	Y	0.0005	Y	1	41	0.004500092	$3,578.89	R
704042	$846,747	$3,922,166	$1,160,000	$5,928,913	7	S	0.00011	$652	N	0.002	Y	1	46	0.005047497	$29,926.17	R
704048	$874,285	$37,337	$580,000	$1,491,622	6	O	0.00017	$254	Y	0.002	Y	1	29	0.004918285	$7,336.22	T
704049	$43,926,216	$31,426,381	$2,900,000	$78,252,597	4	S	0.0005	$39,126	Y	0.002	Y	1	15	0.007473807	$584,844.79	T
704063	$16,991,586	$3,887,506	$1,160,000	$22,039,092	7	S	0.00011	$2,424	N	0.002	Y	1	15	0.00164873	$36,336.51	T
704075	$4,626,113	$16,757,603	$2,900,000	$24,283,717	7	S	0.00011	$2,671	Y	0.002	Y	1	51	0.0055946	$135,857.69	R
704085	$137,098	NA	$0	$137,098	7	S	0.00011	$15	Y	0.002	Y	1	53	0.005813357	$797.00	R
704086	$185,419	NA	$0	$185,419	7	S	0.00011	$20	Y	0.002	Y	1	53	0.005813357	$1,077.91	R
704125	$1,356,650	$1,077,833	$2,900,000	$5,334,483	4	S	0.0005	$2,667	Y	0.002	Y	1	15	0.007473807	$39,868.90	T
704144	$1,998,078	$317,174	$1,160,000	$3,475,252	6	R	0.000077	$268	N	0.001	Y	1	57	0.004379551	$15,220.04	T
704154	$1,872,733	$5,998,198	$1,160,000	$9,030,931	7	R	0.000077	$695	N	0.002	Y	1	33	0.002537872	$22,919.35	R
704191	$482,158	NA	$580,000	$1,062,158	7	S	0.00011	$117	Y	0.002	Y	1	53	0.005813357	$6,174.70	R
704256	$1,019,805	$323,507	$1,160,000	$2,503,312	7	R	0.000077	$193	N	0.002	Y	1	58	0.004456213	$11,155.29	R
705500	$1,004,061	$329,016	$1,160,000	$2,493,077	7	R	0.000077	$192	N	0.002	Y	1	53	0.004072841	$10,153.91	R
705601	$202,486	$265,983	$1,160,000	$1,628,469	7	S	0.00011	$179	N	0.002	Y	1	26	0.002856071	$4,651.02	R
705603	$285,152	$794,781	$1,160,000	$2,239,933	7	S	0.00011	$246	N	0.002	Y	1	16	0.001758549	$3,939.03	R
705906	$2,057,715	$1,782,170	$2,900,000	$6,739,885	7	S	0.00011	$741	N	0.0005	Y	1	43	0.00471909	$31,806.12	R
705907	$471,695	$455,037	$1,160,000	$2,086,732	7	S	0.00011	$230	N	0.0005	Y	1	36	0.003952386	$8,247.57	R
705908	$397,352	$210,415	$1,160,000	$1,767,767	7	S	0.00011	$194	N	0.0005	Y	1	36	0.003952386	$6,986.90	R
705909	$1,237,844	$2,224,407	$2,900,000	$6,362,252	7	S	0.00011	$700	N	0.0005	Y	1	41	0.004500092	$28,630.72	R
705910	$1,441,150	$836,801	$2,900,000	$5,177,951	7	S	0.00011	$570	N	0.0002	Y	1	44	0.004828571	$25,002.10	R
705911	$1,366,608	$786,803	$2,900,000	$5,053,411	7	S	0.00011	$556	N	0.0005	Y	1	31	0.003404379	$17,203.73	R

Bridge Number	Bridge Replacement Cost	Detour Cost	Loss of Life Cost	Total Cost of Failure	Scour Vulnerability	Overtopping Frequency	Annual Probability of Failure	Annual Unadjusted Risk	High Priority	MPL	Meets MPL	K1	Remaining Life	Lifetime Probability of Failure	Unadjusted Lifetime Risk	Scour Mode
705912	$1,395,700	$2,154,882	$2,900,000	$6,450,583	6	S	0.00011	$710	N	0.0005	Y	1	41	0.004500092	$29,028.22	R
705913	$471,695	$350,454	$1,160,000	$1,982,149	7	S	0.00011	$218	N	0.001	Y	1	41	0.004500092	$8,919.85	R
705914	$628,927	$1,388,680	$2,900,000	$4,917,607	7	S	0.00011	$541	N	0.0005	Y	1	41	0.004500092	$22,129.68	R
705915	$345,910	$143,504	$580,000	$1,069,414	7	S	0.00011	$118	N	0.002	Y	1	41	0.004500092	$4,812.46	R
705916	$628,927	$1,336,643	$2,900,000	$4,865,570	7	S	0.00011	$535	N	0.002	Y	1	41	0.004500092	$21,895.51	R
705917	$975,651	$1,237,294	$1,160,000	$3,372,945	7	R	0.000077	$260	N	0.002	Y	1	54	0.004149527	$13,996.13	R
705918	$1,664,558	$994,004	$1,160,000	$3,818,562	6	R	0.000077	$294	N	0.002	Y	1	54	0.004149527	$15,845.23	R
705919	$708,919	NA	$580,000	$1,288,919	6	S	0.00011	$142	Y	0.002	Y	1	39	0.004281046	$5,517.92	R
705953	$4,738,176	$2,850,120	$2,900,000	$10,488,296	7	S	0.00011	$1,154	N	0.002	Y	1	38	0.004171505	$43,751.98	R
710006	$7,630,840	$54,034,190	$2,900,000	$64,565,029	6	S	0.00011	$7,102	Y	0.002	Y	1	39	0.004281046	$276,405.86	M
710014	$445,568	$1,770,865	$1,160,000	$3,376,433	6	S	0.00011	$371	N	0.002	Y	1	15	0.00164873	$5,566.83	M
710017	$1,221,027	$317,692	$1,160,000	$2,698,719	6	S	0.00011	$297	Y	0.002	Y	1	15	0.00164873	$4,449.46	R
710027	$779,744	$885,433	$1,160,000	$2,825,176	6	S	0.00011	$311	Y	0.002	Y	1	15	0.00164873	$4,657.95	R
710033	$1,221,027	$317,692	$1,160,000	$2,698,719	6	S	0.00011	$297	Y	0.002	Y	1	15	0.00164873	$4,449.46	R
710045	$2,109,658	$4,813,220	$2,900,000	$9,822,877	6	S	0.00011	$1,081	N	0.002	Y	1	25	0.002746373	$26,977.28	R
710052	$1,208,174	$501,873	$1,160,000	$2,870,047	6	S	0.00011	$316	N	0.002	Y	1	15	0.00164873	$4,731.93	R
710053	$1,005,711	$983,978	$1,160,000	$3,149,689	6	S	0.00011	$346	N	0.002	Y	1	15	0.00164873	$5,192.99	R
710054	$1,307,205	$983,978	$1,160,000	$3,451,183	6	S	0.00011	$380	Y	0.002	Y	1	15	0.00164873	$5,690.07	R
710086	$78,538	$1,422	$0	$79,960	4	S	0.0005	$40	N	0.002	Y	1	18	0.008961852	$716.59	R
710089	$142,061	$0	$0	$142,061	2	S	0.006	$852	N	0.002	N	1	18	0.102664356	$14,584.60	R
710940	$771,175	$10,852,041	$2,900,000	$14,523,216	6	S	0.00011	$1,598	N	0.002	Y	1	15	0.00164873	$23,944.86	R
714040	$1,665,553	$1,142,288	$1,160,000	$3,967,841	7	R	0.000077	$306	N	0.002	Y	1	59	0.00453287	$17,985.71	M
714046	$211,275	$66,221	$580,000	$857,496	4	S	0.0005	$429	N	0.002	Y	1	57	0.028104633	$24,099.61	R
714052	$169,109	NA	$0	$169,109	5	O	0.00032	$3	N	0.002	Y	1	61	0.019333782	$3,269.52	R
714053	$172,543	$41,798	$0	$214,341	6	O	0.00017	$36	N	0.002	Y	1	61	0.010317289	$2,211.42	R
714056	$284,567	$136,278	$1,160,000	$1,580,845	6	S	0.00011	$174	N	0.002	Y	1	27	0.002965757	$4,688.40	M
720005	$24,460,384	$2,224,617	$2,900,000	$29,585,000	6	S	0.00011	$3,254	Y	0.002	Y	1	15	0.00164873	$48,777.68	M
720007	$573,800	$2,691,069	$2,900,000	$6,164,869	7	S	0.00011	$678	N	0.002	Y	1	15	0.00164873	$10,164.21	R
720012	$942,703	$688,914	$2,900,000	$4,531,617	6	S	0.00011	$498	Y	0.002	Y	1	15	0.00164873	$7,471.41	M
720017	$1,631,314	$2,312,686	$2,900,000	$6,844,000	6	R	0.000077	$527	Y	0.002	Y	1	15	0.001154378	$7,900.56	M
720028	$1,943,155	$9,329,038	$2,900,000	$14,172,193	6	S	0.00011	$1,559	N	0.002	Y	1	31	0.003404379	$48,247.52	M
720031	$2,136,877	$3,544,175	$2,900,000	$8,581,052	7	S	0.00011	$944	N	0.002	Y	1	15	0.00164873	$14,147.84	T
720033	$12,144,765	$13,930,860	$2,900,000	$28,975,625	6	S	0.00011	$3,187	N	0.002	Y	1	23	0.002526941	$73,219.70	T
720042	$6,109,342	$8,809,220	$2,900,000	$17,818,562	6	S	0.00011	$1,960	Y	0.002	Y	1	15	0.00164873	$29,378.00	M
720058	$3,118,787	$3,068,562	$2,900,000	$9,087,349	6	S	0.00011	$1,000	Y	0.002	Y	1	38	0.004171505	$37,907.92	R
720060	$9,805,987	$0	$2,900,000	$12,705,987	6	S	0.00011	$1,398	N	0.002	Y	1	21	0.002307461	$29,318.57	T
720066	$7,371,815	$59,479,309	$2,900,000	$69,751,124	5	S	0.00024	$237	Y	0.001	Y	1	15	0.003593958	$250,682.63	M
720095	$1,680,041	$688,914	$2,900,000	$5,268,954	6	S	0.00011	$580	Y	0.002	Y	1	32	0.003514005	$18,515.13	M
720107	$87,843,094	$42,630,537	$2,900,000	$133,373,632	7	S	0.00011	$14,671	Y	0.002	Y	0.67	33	0.003623618	$483,295.15	T
720109	$1,833,683	$472,670	$2,900,000	$5,206,353	7	S	0.00011	$573	Y	0.002	Y	1	33	0.003623618	$18,865.84	T
720110	$1,708,103	$2,601,470	$2,900,000	$7,209,573	6	S	0.00011	$793	Y	0.002	Y	1	33	0.003623618	$26,124.74	M
720130	$3,508,635	$3,068,562	$2,900,000	$9,477,197	6	S	0.00011	$1,042	Y	0.002	Y	1	38	0.004171505	$39,534.17	R
720148	$2,913,913	$161,180	$1,160,000	$4,235,093	7	S	0.00011	$466	Y	0.002	Y	1	27	0.002965757	$12,560.26	R
720280	$5,741,531	$751,174	$2,900,000	$9,392,705	7	S	0.00011	$1,033	Y	0.0005	Y	1	33	0.003623618	$34,035.58	M
720281	$1,427,165	$2,601,470	$2,900,000	$6,928,635	6	S	0.00011	$762	Y	0.002	Y	1	33	0.003623618	$25,106.73	M
720288	$3,951,487	$29,270,770	$2,900,000	$36,122,257	7	S	0.00011	$3,973	Y	0.002	Y	1	38	0.004171505	$150,684.17	R
720292	$4,867,720	$15,434,681	$2,900,000	$23,202,401	7	S	0.00011	$2,552	Y	0.002	Y	1	40	0.004390575	$101,871.88	R
720359	$1,566,511	$5,080,435	$2,900,000	$9,546,946	6	S	0.00011	$1,050	N	0.002	Y	1	35	0.003842809	$36,687.09	R
720360	$3,143,197	$2,028,779	$2,900,000	$8,071,976	6	S	0.00011	$888	N	0.001	Y	1	35	0.003842809	$31,019.06	R
720401	$3,903,416	$6,965,430	$2,900,000	$13,768,846	7	S	0.00011	$1,515	N	0.002	Y	1	41	0.004500092	$61,961.08	R
720402	$2,426,056	$7,682,460	$2,900,000	$13,008,516	7	S	0.00011	$1,431	N	0.002	Y	1	41	0.004500092	$58,539.52	R
720425	$3,563,418	$14,352,366	$2,900,000	$20,815,784	7	S	0.00011	$2,290	N	0.002	Y	1	44	0.004828571	$100,510.49	M
720442	$56,824,093	$2,260,078	$2,900,000	$61,984,171	6	S	0.00011	$6,818	Y	0.002	Y	1	45	0.00493804	$306,080.31	T
720443	$7,422,071	$4,520,157	$2,900,000	$14,842,228	6	S	0.00011	$1,633	Y	0.002	Y	1	44	0.004828571	$71,666.75	T
720444	$2,428,990	$4,520,157	$2,900,000	$9,849,147	7	S	0.00011	$1,083	Y	0.002	Y	1	44	0.004828571	$47,557.31	T
720445	$2,428,990	$4,520,157	$2,900,000	$9,849,147	7	S	0.00011	$1,083	Y	0.002	Y	1	44	0.004828571	$47,557.31	T
720448	$8,220,716	$3,546,302	$2,900,000	$14,667,018	6	S	0.00011	$1,613	Y	0.002	Y	1	44	0.004828571	$70,820.74	R
720474	$20,971,434	$5,179,304	$2,900,000	$29,050,738	7	S	0.00011	$3,196	Y	0.002	Y	0.67	50	0.005485204	$159,349.21	T
720476	$4,958,869	$2,635,084	$2,900,000	$10,493,953	8	S	0.0000022	$23	Y	0.001	Y	1	50	0.000109994	$1,154.27	M
720509	$56,824,093	$4,520,157	$2,900,000	$64,244,250	6	R	0.000077	$4,947	Y	0.002	Y	1	54	0.004149527	$266,583.24	R
720514	$7,422,071	$4,520,157	$2,900,000	$14,842,228	7	S	0.00011	$1,633	Y	0.002	Y	1	54	0.005922718	$87,906.33	T
720910	$1,162,771	$13,380,433	$2,900,000	$17,443,205	6	S	0.00011	$1,919	Y	0.002	Y	1	15	0.00164873	$28,759.14	M
724001	$869,035	$757,776	$1,160,000	$2,786,811	6	O	0.00017	$474	N	0.002	Y	1	31	0.005256584	$14,649.10	R
724007	$193,457	NA	$0	$193,457	6	S	0.00011	$21	Y	0.002	Y	1	33	0.003623618	$701.01	R
724011	$1,623,447	$1,512,308	$2,900,000	$6,035,756	6	S	0.00011	$664	N	0.002	Y	1	37	0.004061952	$24,516.95	R
724027	$440,292	$3,175,355	$2,900,000	$6,515,647	6	O	0.00017	$1,108	N	0.002	Y	1	26	0.00441062	$28,738.04	R
724029	$414,150	$154,535	$1,160,000	$1,728,684	7	S	0.00011	$190	N	0.002	Y	1	32	0.003514005	$6,074.60	R
724031	$482,511	$1,357,506	$1,160,000	$3,000,017	3	S	0.0013	$3,900	N	0.002	Y	1	31	0.039523936	$118,572.48	R
724039	$715,955	$2,175,777	$2,900,000	$5,791,733	6	S	0.00011	$637	N	0.002	Y	1	40	0.004390575	$25,429.04	R
724041	$334,176	$885,433	$1,160,000	$2,379,609	3	O	0.0016	$3,807	N	0.002	Y	1	25	0.039241338	$93,379.04	R
724049	$295,047	NA	$0	$295,047	3	S	0.0013	$384	Y	0.002	Y	1	24	0.030737977	$9,069.15	R
724050	$418,176	$316,910	$1,160,000	$1,895,086	6	O	0.00017	$322	N	0.002	Y	1	30	0.005087448	$9,641.15	R
724055	$364,452	$121,233	$580,000	$1,065,685	6	S	0.00011	$117	N	0.002	Y	1	39	0.004281046	$4,562.25	R
724065	$331,320	$380,239	$1,160,000	$1,871,559	6	S	0.00011	$206	N	0.002	Y	1	17	0.001868355	$3,496.74	R
724066	$331,320	$633,732	$1,160,000	$2,125,051	6	S	0.00011	$234	N	0.002	Y	1	17	0.001868355	$3,970.35	R
724071	$564,873	$2,478,026	$2,900,000	$5,942,899	5	S	0.00024	$20	N	0.002	Y	1	31	0.007413278	$44,056.36	R
724073	$1,821,353	$9,827,228	$2,900,000	$14,548,581	6	S	0.00011	$1,600	N	0.002	Y	1	31	0.003404379	$49,528.89	R
724075	$154,859	$127,010	$580,000	$861,869	6	O	0.00017	$147	N	0.002	Y	1	15	0.002546968	$2,195.15	R
724078	$292,222	$736,466	$1,160,000	$2,188,688	6	O	0.00017	$372	N	0.002	Y	1	15	0.002546968	$5,574.52	R

Bridge Number	Bridge Replacement Cost	Detour Cost	Loss of Life Cost	Total Cost of Failure	Scour Vulnerability	Overtopping Frequency	Annual Probability of Failure	Annual Unadjusted Risk	High Priority	MPL	Meets MPL	K1	Remaining Life	Lifetime Probability of Failure	Unadjusted Lifetime Risk	Scour Mode
724080	$497,760	$1,346,383	$2,900,000	$4,744,143	6	S	0.00011	$522	N	0.002	Y	1	15	0.00164873	$7,821.81	R
724081	$170,436	$985,748	$1,160,000	$2,316,184	5	S	0.00024	$8	N	0.002	Y	1	31	0.007413278	$17,170.52	R
724085	$104,024	$53,126	$580,000	$737,150	6	O	0.00017	$125	N	0.002	Y	1	15	0.002546968	$1,877.50	R
724088	$1,589,610	$1,975,109	$2,900,000	$6,464,719	7	S	0.00011	$711	N	0.002	Y	1	36	0.003952386	$25,551.07	M
724095	$213,953	NA	$580,000	$793,953	5	O	0.00032	$13	Y	0.002	Y	1	48	0.015245058	$12,103.86	R
724115	$1,149,622	$326,317	$1,160,000	$2,635,939	6	S	0.00011	$290	N	0.002	Y	1	33	0.003623618	$9,551.64	R
724116	$552,199	$293,338	$1,160,000	$2,005,538	6	S	0.00011	$221	N	0.0005	Y	1	39	0.004281046	$8,585.80	M
724117	$662,639	$277,329	$1,160,000	$2,099,968	4	S	0.0005	$1,050	N	0.002	Y	1	38	0.0188253	$39,532.53	M
724118	$721,191	$1,869,607	$1,160,000	$3,750,799	6	S	0.00011	$413	N	0.0005	Y	1	36	0.003952386	$14,824.61	R
724126	$891,136	$2,170,009	$2,900,000	$5,961,144	6	O	0.00017	$1,013	N	0.0005	Y	1	28	0.004749092	$28,310.02	M
724129	$264,667	$1,186,675	$1,160,000	$2,611,342	6	O	0.00017	$444	N	0.0005	Y	1	17	0.002886073	$7,536.52	R
724130	$264,667	$1,186,675	$1,160,000	$2,611,342	6	O	0.00017	$444	N	0.0005	Y	1	17	0.002886073	$7,536.52	R
724131	$220,556	NA	$1,160,000	$1,380,556	6	O	0.00017	$235	Y	0.0005	Y	1	17	0.002886073	$3,984.39	M
724132	$220,556	NA	$1,160,000	$1,380,556	7	S	0.00011	$152	Y	0.002	Y	1	17	0.001868355	$2,579.37	R
724147	$5,114,821	$1,770,244	$2,900,000	$9,785,064	4	S	0.0005	$4,893	N	0.002	Y	1	30	0.014891756	$145,716.78	M
724150	$2,070,350	$1,230,341	$1,160,000	$4,460,691	6	S	0.00011	$491	N	0.002	Y	1	40	0.004390575	$19,585.00	R
724174	$690,639	$2,722,105	$2,900,000	$6,312,745	6	S	0.00011	$694	N	0.002	Y	1	42	0.004609597	$29,099.21	M
724179	$84,188	NA	$0	$84,188	3	S	0.0013	$109	Y	0.0005	N	1	21	0.026948005	$2,268.70	R
724183	$99,557	$283,158	$1,160,000	$1,542,715	5	O	0.00032	$26	N	0.0005	Y	1	15	0.004789263	$7,388.47	R
724185	$492,695	$831,734	$1,160,000	$2,484,429	6	S	0.00011	$273	N	0.0005	Y	1	41	0.004500092	$11,180.16	M
724190	$2,647,841	$628,743	$1,160,000	$4,436,584	6	O	0.00017	$754	N	0.0001	N	1	21	0.003563938	$15,811.71	T
724211	$584,351	$356,491	$1,160,000	$2,100,842	6	S	0.00011	$231	N	0.002	Y	1	24	0.002636663	$5,539.21	R
724214	$10,284,206	$6,110,149	$2,900,000	$19,294,355	6	S	0.00011	$2,122	N	0.0001	N	1	23	0.002526941	$48,755.70	T
724219	$662,639	$2,065,250	$2,900,000	$5,627,889	6	S	0.00011	$619	N	0.002	Y	1	31	0.003404379	$19,159.47	R
724222	$251,552	$39,339	$580,000	$870,891	7	S	0.00011	$96	N	0.002	Y	1	70	0.007670851	$6,680.48	T
724236	$209,352	$138,344	$580,000	$927,696	6	O	0.00017	$158	N	0.002	Y	1	50	0.008464694	$7,852.66	R
724237	$315,178	$138,344	$580,000	$1,033,522	6	O	0.00017	$176	N	0.002	Y	1	50	0.008464694	$8,748.45	R
724238	$212,803	$442,700	$580,000	$1,235,503	6	O	0.00017	$210	N	0.002	Y	1	50	0.008464694	$10,458.15	R
724252	$1,446,269	$1,775,209	$2,900,000	$6,121,478	6	S	0.00011	$673	N	0.002	Y	1	26	0.002856071	$17,483.38	R
724253	$942,547	$767,027	$1,160,000	$2,869,574	5	S	0.00024	$10	N	0.002	Y	1	34	0.008127769	$23,323.23	M
724258	$568,338	$1,923,570	$2,900,000	$5,391,908	6	S	0.00011	$593	N	0.002	Y	1	15	0.00164873	$8,889.80	R
724264	$137,004	NA	$1,160,000	$1,297,004	6	O	0.00017	$220	Y	0.002	Y	1	36	0.006101828	$7,914.10	R
724268	$474,844	$396,362	$1,160,000	$2,031,205	6	S	0.00011	$223	Y	0.002	Y	1	23	0.002526941	$5,132.74	R
724274	$223,773	$137,565	$580,000	$941,338	6	O	0.00017	$160	N	0.002	Y	1	45	0.007621459	$7,174.37	R
724275	$1,043,466	$836,774	$2,900,000	$4,780,241	6	R	0.000077	$368	N	0.002	Y	1	44	0.003382397	$16,168.67	R
724277	$227,958	$560,882	$1,160,000	$1,948,840	6	S	0.00011	$214	N	0.002	Y	1	45	0.00493804	$9,623.45	R
724278	$399,869	$1,086,307	$1,160,000	$2,646,176	6	R	0.000077	$204	N	0.002	Y	1	16	0.001231289	$3,258.21	M
724279	$291,590	$224,526	$1,160,000	$1,676,116	6	S	0.00011	$184	N	0.002	Y	1	45	0.00493804	$8,276.73	T
724288	$346,553	$2,588,971	$2,900,000	$5,835,524	6	S	0.00011	$642	N	0.002	Y	1	46	0.005047497	$29,454.79	R
724290	$512,571	$1,159,825	$1,160,000	$2,832,397	7	S	0.00011	$312	N	0.002	Y	1	46	0.005047497	$14,296.51	R
724291	$190,604	$148,472	$580,000	$919,076	5	O	0.00032	$16	N	0.002	Y	1	31	0.009872531	$9,073.61	R
724292	$1,070,811	$3,810,602	$2,900,000	$7,781,413	6	S	0.00011	$856	N	0.001	Y	1	48	0.005266374	$40,979.83	R
724293	$1,070,811	$3,810,602	$2,900,000	$7,781,413	7	S	0.00011	$856	N	0.002	Y	1	48	0.005266374	$40,979.83	R
724295	$326,956	NA	$580,000	$906,956	6	S	0.00011	$100	Y	0.002	Y	1	22	0.002417207	$2,192.30	M
724297	$1,349,182	$216,564	$1,160,000	$2,725,745	7	S	0.00011	$300	N	0.002	Y	1	61	0.006687905	$18,229.52	R
724301	$264,925	NA	$1,160,000	$1,424,925	6	R	0.000077	$110	Y	0.0005	Y	1	47	0.003612598	$5,147.68	T
724304	$17,812,597	$545,511	$1,160,000	$19,518,107	3	S	0.0013	$25,374	N	0.002	Y	1	27	0.034513186	$673,632.07	T
724305	$1,043,466	$3,307,652	$2,900,000	$7,251,118	6	R	0.000077	$558	N	0.002	Y	1	49	0.003766036	$27,307.97	T
724307	$696,914	$3,080,777	$2,900,000	$6,677,691	6	R	0.000077	$514	N	0.002	Y	1	25	0.001923222	$12,842.68	R
724308	$2,166,719	$2,381,571	$2,900,000	$7,448,290	7	S	0.00011	$819	N	0.002	Y	1	18	0.00197815	$14,733.83	T
724312	$6,594,740	$609,958	$1,160,000	$8,364,698	4	S	0.0005	$4,182	N	0.002	Y	1	27	0.013412615	$112,192.47	T
724316	$485,742	$3,335,417	$2,900,000	$6,721,159	6	S	0.00011	$739	N	0.002	Y	1	23	0.002526941	$16,983.97	R
724317	$526,970	$496,342	$1,160,000	$2,183,312	6	S	0.00011	$240	N	0.002	Y	1	21	0.002307461	$5,037.91	R
724318	$748,325	$3,540,282	$2,900,000	$7,188,608	6	R	0.000077	$554	N	0.002	Y	1	22	0.001692631	$12,167.66	R
724320	$522,685	$1,158,940	$1,160,000	$2,841,626	5	S	0.00024	$10	N	0.002	Y	1	21	0.005027922	$14,287.47	R
724321	$561,244	$1,847,629	$1,160,000	$3,568,873	7	S	0.00011	$393	N	0.002	Y	1	53	0.005813357	$20,747.13	T
724322	$724,293	$727,665	$1,160,000	$2,611,958	6	R	0.000077	$201	N	0.002	Y	1	52	0.003996148	$10,437.77	T
724323	$1,606,217	$2,360,256	$2,900,000	$6,866,473	6	S	0.00011	$755	N	0.002	Y	1	21	0.002307461	$15,844.12	R
724326	$1,043,466	$2,048,997	$2,900,000	$5,992,464	7	S	0.00011	$659	N	0.002	Y	1	24	0.002636663	$15,800.11	R
724328	$748,325	$9,632,196	$2,900,000	$13,280,522	6	R	0.000077	$1,023	N	0.002	Y	1	23	0.001769501	$23,499.89	R
724329	$696,914	$3,472,014	$2,900,000	$7,068,927	6	R	0.000077	$544	N	0.002	Y	1	32	0.002461061	$17,397.06	R
724330	$547,829	$1,874,432	$2,900,000	$5,322,261	6	S	0.00011	$585	N	0.002	Y	1	52	0.005703985	$30,358.10	M
724332	$410,966	$318,945	$1,160,000	$1,889,910	6	S	0.00011	$208	N	0.002	Y	1	26	0.002856071	$5,397.72	R
724337	$547,829	$1,874,432	$2,900,000	$5,322,261	6	S	0.00011	$585	N	0.002	Y	1	52	0.005703985	$30,358.10	M
724338	$1,468,370	$277,916	$1,160,000	$2,906,285	6	S	0.00011	$320	N	0.0005	Y	1	26	0.002856071	$8,300.56	M
724339	$384,823	NA	$2,900,000	$3,284,823	6	S	0.00011	$361	Y	0.002	Y	1	52	0.005703985	$18,736.58	M
724340	$417,006	$532,993	$1,160,000	$2,109,999	5	R	0.00018	$6	N	0.001	Y	1	57	0.01020846	$21,539.84	M
724341	$411,579	$141,083	$580,000	$1,132,662	6	S	0.00011	$125	N	0.002	Y	1	55	0.006032066	$6,832.29	R
724342	$1,668,023	$1,972,608	$2,900,000	$6,540,631	5	S	0.00024	$22	N	0.002	Y	1	21	0.005027922	$32,885.78	M
724348	$6,659,379	$1,336,853	$1,160,000	$9,156,232	6	S	0.00011	$1,007	N	0.002	Y	1	54	0.005922718	$54,229.78	R
724356	$195,943	$15,011	$580,000	$790,955	7	S	0.00011	$87	Y	0.002	Y	1	56	0.006141403	$4,857.57	T
724357	$421,004	NA	$580,000	$1,001,004	6	S	0.00011	$110	Y	0.001	Y	1	55	0.006032066	$6,038.12	R
724358	$539,822	$277,329	$1,160,000	$1,977,152	7	R	0.000077	$152	N	0.002	Y	1	53	0.004072841	$8,052.62	R
724360	$233,085	$2,172,615	$1,160,000	$3,565,700	7	O	0.00017	$606	N	0.002	Y	1	56	0.00947563	$33,787.25	M
724361	$1,496,651	$2,470,629	$2,900,000	$6,867,280	7	S	0.00011	$755	N	0.002	Y	1	56	0.006141403	$42,174.73	M
724363	$6,781,704	$367,996	$1,160,000	$8,309,700	7	R	0.000077	$640	N	0.002	Y	1	55	0.004226207	$35,118.52	R
724364	$427,260	$1,293,235	$1,160,000	$2,880,495	6	O	0.00017	$490	N	0.002	Y	1	55	0.009307212	$26,809.38	R
724366	$514,117	$3,686,316	$2,900,000	$7,100,433	6	S	0.00011	$781	N	0.002	Y	1	56	0.006141403	$43,606.62	R
724373	$1,695,742	$1,011,417	$1,160,000	$3,867,159	6	R	0.000077	$298	N	0.002	Y	1	58	0.004456213	$17,232.89	R

Bridge Number	Bridge Replacement Cost	Detour Cost	Loss of Life Cost	Total Cost of Failure	Scour Vulnerability	Overtopping Frequency	Annual Probability of Failure	Annual Unadjusted Risk	High Priority	MPL	Meets MPL	K1	Remaining Life	Lifetime Probability of Failure	Unadjusted Lifetime Risk	Scour Mode
726601	$123,699	NA	$580,000	$703,699	4	F	0.0007	$493	Y	0.002	Y	1	26	0.018041638	$12,695.88	M
730007	$875,590	$808,204	$2,900,000	$4,583,794	7	O	0.00017	$779	Y	0.002	Y	1	15	0.002546968	$11,674.78	R
730008	$2,091,428	$808,204	$2,900,000	$5,799,631	6	S	0.00011	$638	Y	0.002	Y	1	15	0.00164873	$9,562.03	R
730043	$784,504	$808,204	$2,900,000	$4,492,708	6	S	0.00011	$494	Y	0.001	Y	1	23	0.002526941	$11,352.81	R
730044	$784,504	$808,204	$2,900,000	$4,492,708	6	O	0.00017	$764	Y	0.002	Y	1	23	0.003902697	$17,533.68	R
730045	$2,157,386	$808,204	$2,900,000	$5,865,589	6	S	0.00011	$645	Y	0.001	Y	1	23	0.002526941	$14,822.00	R
734003	$235,871	$231,956	$1,160,000	$1,627,827	6	O	0.00017	$277	N	0.0005	Y	1	15	0.002546968	$4,146.02	R
734004	$350,002	$250,772	$1,160,000	$1,760,774	6	O	0.00017	$299	N	0.0005	Y	1	15	0.002546968	$4,484.63	R
734005	$235,871	$2,081,438	$1,160,000	$3,477,309	6	S	0.00011	$383	N	0.0005	Y	1	15	0.00164873	$5,733.14	R
734007	$138,479	$2,081,438	$1,160,000	$3,379,917	7	S	0.00011	$372	N	0.001	Y	1	15	0.00164873	$5,572.57	R
734008	$1,509,574	$4,086,310	$1,160,000	$6,755,884	5	O	0.00032	$115	N	0.001	Y	1	15	0.004789263	$32,355.70	R
734009	$835,440	$2,954,668	$1,160,000	$4,950,107	5	S	0.00024	$17	N	0.002	Y	1	19	0.004550164	$22,523.80	R
734011	$1,445,075	$885,259	$1,160,000	$3,490,334	6	R	0.000077	$269	N	0.0005	Y	1	32	0.002461061	$8,589.93	R
734012	$784,598	$265,578	$1,160,000	$2,210,175	6	R	0.000077	$170	N	0.002	Y	1	32	0.002461061	$5,439.38	R
734013	$585,444	$307,219	$1,160,000	$2,052,663	7	R	0.000077	$158	N	0.002	Y	1	32	0.002461061	$5,051.73	R
734046	$86,591	$16,712	$0	$103,303	6	O	0.00017	$18	N	0.002	Y	1	46	0.007790163	$804.75	R
734047	$86,591	$16,712	$0	$103,303	7	S	0.00011	$11	N	0.002	Y	1	46	0.005047497	$521.42	R
734048	$95,250	$574,654	$580,000	$1,249,904	7	S	0.00011	$137	N	0.002	Y	1	47	0.005156941	$6,445.68	R
734049	$95,250	$779,887	$580,000	$1,455,138	7	S	0.00011	$160	N	0.002	Y	1	47	0.005156941	$7,504.06	R
734052	$107,506	$16,712	$0	$124,217	6	O	0.00017	$21	N	0.002	Y	1	50	0.008464694	$1,051.46	R
734054	$758,221	$177,398	$1,160,000	$2,095,619	6	O	0.00017	$356	N	0.002	Y	1	46	0.007790163	$16,325.21	R
734055	$292,275	$308,366	$580,000	$1,180,641	7	O	0.00017	$201	N	0.002	Y	1	46	0.007790163	$9,197.39	R
734056	$172,730	$32,544	$0	$205,274	7	R	0.000077	$16	N	0.002	Y	1	54	0.004149527	$851.79	R
734057	$172,730	$11,033	$0	$183,763	7	R	0.000077	$14	N	0.002	Y	1	54	0.004149527	$762.53	R
734058	$172,730	$23,748	$0	$196,479	7	S	0.00011	$22	N	0.002	Y	1	54	0.005922718	$1,163.69	R
734059	$133,914	$48,552	$580,000	$762,466	7	S	0.00011	$84	N	0.002	Y	1	55	0.006032066	$4,599.25	R
734060	$674,205	$614,821	$1,160,000	$2,449,025	6	S	0.00011	$269	N	0.002	Y	1	36	0.003952386	$9,679.49	T
734061	$1,546,213	$3,140,424	$1,160,000	$5,846,637	6	S	0.00011	$643	N	0.0001	N	1	41	0.004500092	$26,310.41	T
734062	$1,535,069	$1,083,193	$1,160,000	$3,778,262	5	S	0.00024	$13	N	0.0001	N	1	40	0.009555208	$36,102.08	T
734063	$1,001,092	$111,578	$580,000	$1,692,670	6	O	0.00017	$288	N	0.0002	Y	1	40	0.006777506	$11,472.08	T
734064	$992,679	$144,158	$580,000	$1,716,837	7	S	0.00011	$189	N	0.0001	N	1	40	0.004390575	$7,537.90	T
734065	$314,182	$299,816	$1,160,000	$1,773,998	7	S	0.00011	$195	N	0.0002	Y	1	42	0.004609597	$8,177.42	R
734066	$283,240	$267,673	$1,160,000	$1,710,913	7	S	0.00011	$188	N	0.0002	Y	1	42	0.004609597	$7,886.62	R
734067	$1,071,076	$1,188,214	$1,160,000	$3,419,290	7	S	0.00011	$376	N	0.0005	Y	1	44	0.004828571	$16,510.28	T
734068	$859,670	$1,361,742	$2,900,000	$5,121,412	7	S	0.00011	$563	N	0.0005	Y	1	51	0.0055946	$28,652.25	T
734069	$190,003	$45,386	$580,000	$815,389	6	R	0.000077	$63	N	0.0001	Y	1	55	0.004226207	$3,446.00	R
734070	$190,003	$44,682	$580,000	$814,685	6	R	0.000077	$63	N	0.002	Y	1	55	0.004226207	$3,443.03	R
734071	$39,551,085	$13,335,564	$2,900,000	$55,786,649	7	R	0.000077	$4,296	N	0.0005	Y	1	54	0.004149527	$231,488.20	T
734072	$190,003	$45,034	$580,000	$815,037	6	R	0.000077	$63	N	0.002	Y	1	56	0.004302882	$3,507.01	R
734073	$998,891	$1,203,464	$2,900,000	$5,102,355	7	R	0.000077	$393	N	0.002	Y	1	48	0.00368932	$18,824.22	T
734079	$444,819	$1,188,478	$1,160,000	$2,793,296	7	S	0.00011	$307	N	0.002	Y	1	49	0.005375795	$15,016.19	R
734090	$54,861	$286,588	$1,160,000	$1,501,449	3	O	0.0016	$2,402	N	0.002	Y	1	26	0.040778552	$61,226.92	T
735502	$333,892	$0	$580,000	$913,892	7	N	NA	NA	Y	0.0005	N	1	46	NA	NA	R
735503	$254,678	$7,494,542	$1,160,000	$8,909,220	7	O	0.00017	$1,515	Y	0.002	Y	1	36	0.006101828	$54,362.53	R
740011	$691,232	$1,516,094	$2,900,000	$5,107,327	7	S	0.00011	$562	Y	0.0005	Y	1	15	0.00164873	$8,420.60	R
740014	$695,228	$1,373,872	$2,900,000	$4,969,100	6	S	0.00011	$547	Y	0.0005	Y	1	15	0.00164873	$8,192.70	R
740019	$503,956	$12,318,064	$1,160,000	$13,982,020	6	S	0.00011	$1,538	Y	0.0001	N	1	15	0.00164873	$23,052.58	R
740021	$671,941	$11,894,338	$2,900,000	$15,466,279	5	S	0.00024	$53	Y	0.002	Y	1	15	0.003593958	$55,585.16	R
740023	$267,016	$11,894,338	$2,900,000	$15,061,354	5	S	0.00024	$51	Y	0.002	Y	1	15	0.003593958	$54,129.88	R
740024	$401,991	$11,894,338	$2,900,000	$15,196,329	4	S	0.0005	$7,598	Y	0.0002	N	1	15	0.007473807	$113,574.43	R
740069	$779,744	$4,849,784	$1,160,000	$6,789,528	4	S	0.0005	$3,395	N	0.002	Y	1	24	0.011931252	$81,007.57	T
740095	$727,461	$153,046	$580,000	$1,460,507	6	S	0.00011	$161	N	0.0005	Y	1	15	0.00164873	$2,407.98	R
740920	$402,725	$12,318,064	$1,160,000	$13,880,789	6	S	0.00011	$1,527	Y	0.002	Y	1	15	0.00164873	$22,885.67	R
744001	$484,868	$152,029	$0	$636,897	5	S	0.00024	$2	N	0.002	Y	1	44	0.010505693	$6,691.04	R
744006	$139,002	NA	$0	$139,002	5	O	0.00032	$2	Y	0.002	Y	1	15	0.004789263	$665.72	R
744007	$413,673	$556,007	$580,000	$1,549,680	6	S	0.00011	$170	N	0.002	Y	1	15	0.00164873	$2,555.00	T
744010	$293,237	$39,733	$580,000	$912,970	6	S	0.00011	$100	N	0.002	Y	1	15	0.00164873	$1,505.24	R
744306	$649,310	$138,344	$580,000	$1,367,654	4	S	0.0005	$684	N	0.0002	N	1	15	0.007473807	$10,221.58	T
750004	$2,146,804	$9,150,883	$2,900,000	$14,197,687	7	S	0.00011	$1,562	Y	0.0005	Y	1	15	0.00164873	$23,408.15	R
750013	$3,428,194	$2,762,830	$2,900,000	$9,091,024	6	S	0.00011	$1,000	Y	0.002	Y	1	30	0.003294742	$29,952.58	R
750057	$2,207,767	$1,633,200	$2,900,000	$6,740,967	5	S	0.00024	$23	Y	0.0005	Y	1	33	0.007889662	$53,183.95	R
750085	$634,077	$17,639,635	$2,900,000	$21,173,712	7	S	0.00011	$2,329	Y	0.0002	Y	1	37	0.004061952	$86,006.60	R
750121	$31,998,221	$8,614,422	$2,900,000	$43,512,643	7	S	0.00011	$4,786	Y	0.0002	Y	1	39	0.004281046	$186,279.63	R
750133	$3,799,781	$3,579,806	$2,900,000	$10,279,587	6	S	0.00011	$1,131	Y	0.0005	Y	1	38	0.004171505	$42,881.35	R
750169	$3,221,236	$2,762,830	$2,900,000	$8,884,066	6	S	0.00011	$977	Y	0.002	Y	1	15	0.00164873	$14,647.43	R
750183	$56,703,696	$8,877,745	$2,900,000	$68,481,441	7	R	0.000077	$5,273	Y	0.0005	Y	1	39	0.002998611	$205,349.19	R
750212	$2,207,767	$0	$2,900,000	$5,107,767	6	S	0.00011	$562	Y	0.002	Y	1	33	0.003623618	$18,508.60	R
750227	$3,799,781	$3,579,806	$2,900,000	$10,279,587	6	S	0.00011	$1,131	Y	0.0005	Y	1	38	0.004171505	$42,881.35	R
750247	$32,102,230	$4,307,211	$2,900,000	$39,309,442	7	S	0.00011	$4,324	Y	0.0005	Y	1	39	0.004281046	$168,285.53	R
750357	$10,219,621	$2,370,326	$2,900,000	$15,489,947	7	R	0.000077	$1,193	Y	0.0005	Y	1	55	0.004226207	$65,463.73	R
750358	$10,219,621	$2,370,326	$2,900,000	$15,489,947	7	S	0.00011	$1,704	Y	0.002	Y	1	55	0.006032066	$93,436.39	R
750393	$18,525,711	$5,071,395	$2,900,000	$26,497,106	7	R	0.000077	$2,040	Y	0.0002	Y	1	56	0.004302882	$114,013.92	R
750394	$21,665,662	$2,535,698	$2,900,000	$27,101,360	7	R	0.000077	$2,087	Y	0.0001	Y	1	56	0.004302882	$116,613.95	R
750484	$21,873,525	$5,838,906	$2,900,000	$30,612,432	7	S	0.00011	$3,367	Y	0.0005	Y	1	61	0.006687905	$204,733.03	R
750553	$1,962,821	$206,109	$1,160,000	$3,328,930	8	R	0.0000017	$6	Y	0.0001	Y	1	71	0.000120693	$401.78	R
750554	$2,944,231	$412,219	$1,160,000	$4,516,450	8	R	0.0000017	$8	Y	0.0002	Y	1	71	0.000120693	$545.10	R
750820	$104,384	$4,398	$0	$108,782	7	N	NA	NA	N	0.0001	N	1	67	NA	NA	R
750821	$167,564	$1,759	$0	$169,323	7	S	0.00011	$19	N	0.0005	Y	1	67	0.007343311	$1,243.39	R
754003	$564,717	$2,450,807	$2,900,000	$5,915,524	7	S	0.00011	$651	N	0.0005	Y	1	28	0.003075431	$18,192.78	R

Bridge Number	Bridge Replacement Cost	Detour Cost	Loss of Life Cost	Total Cost of Failure	Scour Vulnerability	Overtopping Frequency	Annual Probability of Failure	Annual Unadjusted Risk	High Priority	MPL	Meets MPL	K1	Remaining Life	Lifetime Probability of Failure	Unadjusted Lifetime Risk	Scour Mode
754004	$1,336,703	$24,866,741	$2,900,000	$29,103,444	6	S	0.00011	$3,201	N	0.0005	Y	1	22	0.002417207	$70,349.05	R
754005	$1,225,311	$886,577	$1,160,000	$3,271,888	6	S	0.00011	$360	N	0.0005	Y	1	15	0.00164873	$5,394.46	R
754006	$248,410	$91,124	$580,000	$919,534	6	O	0.00017	$156	N	0.002	Y	1	27	0.00457987	$4,211.35	R
754009	$298,387	NA	$0	$298,387	7	O	0.00017	$51	Y	0.002	Y	1	27	0.00457987	$1,366.57	R
754016	$248,410	$90,420	$580,000	$918,830	6	O	0.00017	$156	N	0.0005	Y	1	27	0.00457987	$4,208.12	R
754017	$248,410	$90,420	$580,000	$918,830	7	O	0.00017	$156	N	0.0005	Y	1	27	0.00457987	$4,208.12	R
754019	$913,985	$625,376	$1,160,000	$2,699,361	7	R	0.000077	$208	N	0.002	Y	1	41	0.003152143	$8,508.77	R
754024	$839,724	$1,291,651	$1,160,000	$3,291,375	7	S	0.00011	$362	N	0.002	Y	1	34	0.00373322	$12,287.43	R
754027	$338,741	$611,127	$1,160,000	$2,109,868	7	O	0.00017	$359	N	0.002	Y	1	28	0.004749092	$10,019.96	R
754032	$165,660	$8,796	$0	$174,456	5	O	0.00032	$3	N	0.002	Y	1	32	0.010189372	$1,777.60	R
754033	$122,146	$8,796	$0	$130,941	6	O	0.00017	$22	N	0.0005	Y	1	32	0.00542569	$710.45	R
754051	$246,848	NA	$580,000	$826,848	7	O	0.00017	$141	Y	0.0002	Y	1	27	0.00457987	$3,786.86	R
754057	$517,834	$592,714	$580,000	$1,690,549	4	S	0.0005	$845	N	0.0001	N	1	31	0.01538431	$26,007.93	R
754059	$246,848	$94,290	$580,000	$921,138	7	S	0.00011	$101	N	0.0001	N	1	27	0.002965757	$2,731.87	R
754064	$474,692	$1,436,087	$2,900,000	$4,810,778	7	O	0.00017	$818	N	0.0002	Y	1	45	0.007621459	$36,665.15	R
754067	$1,464,624	$622,900	$2,900,000	$4,987,523	7	S	0.00011	$549	N	0.0002	Y	1	38	0.004171505	$20,805.48	R
754068	$422,344	$8,774,837	$2,900,000	$12,097,180	7	S	0.00011	$1,331	N	0.0002	Y	1	47	0.005156941	$62,384.45	R
754069	$3,336,046	$659,355	$2,900,000	$6,895,401	7	R	0.000077	$531	N	0.0001	Y	1	53	0.004072841	$28,083.87	R
754072	$1,553,775	$3,608,408	$2,900,000	$8,062,183	6	S	0.00011	$887	N	0.0001	N	1	50	0.005485204	$44,222.71	R
754073	$1,620,607	$6,383,343	$2,900,000	$10,903,950	7	S	0.00011	$1,199	N	0.0002	Y	1	49	0.005375795	$58,617.40	R
754074	$676,780	$5,424,496	$1,160,000	$7,261,276	7	S	0.00011	$799	N	0.0001	N	1	51	0.0055946	$40,623.94	R
754076	$319,216	$547,797	$1,160,000	$2,027,013	7	S	0.00011	$223	N	0.0001	N	1	53	0.005813357	$11,783.75	R
754077	$936,554	NA	$1,160,000	$2,096,554	7	S	0.00011	$231	Y	0.0001	N	1	54	0.005922718	$12,417.30	R
754078	$551,154	$945,980	$1,160,000	$2,657,133	7	R	0.000077	$205	N	0.0001	Y	1	54	0.004149527	$11,025.84	R
754079	$4,369,711	$4,321,270	$2,900,000	$11,590,980	7	S	0.00011	$1,275	Y	0.0001	N	1	53	0.005813357	$67,382.51	R
754080	$4,126,949	$2,104,482	$2,900,000	$9,131,431	7	S	0.00011	$1,004	N	0.0001	N	1	53	0.005813357	$53,084.27	R
754082	$2,993,301	$4,941,744	$2,900,000	$10,835,045	7	S	0.00011	$1,192	N	0.0001	N	1	55	0.006032066	$65,357.71	R
754083	$2,448,937	$2,014,005	$2,900,000	$7,362,942	7	R	0.000077	$567	Y	0.0001	Y	1	55	0.004226207	$31,117.32	R
754084	$831,077	$2,180,994	$2,900,000	$5,912,071	7	R	0.000077	$455	Y	0.0001	Y	1	55	0.004226207	$24,985.64	R
754085	$3,336,046	$1,423,813	$2,900,000	$7,659,858	7	R	0.000077	$590	N	0.0001	Y	1	55	0.004226207	$32,372.15	R
754092	$831,077	$1,138,712	$2,900,000	$4,869,789	7	R	0.000077	$375	Y	0.0001	Y	1	55	0.004226207	$20,580.74	R
754093	$2,448,937	$1,162,966	$2,900,000	$6,511,904	7	R	0.000077	$501	Y	0.0005	Y	1	55	0.004226207	$27,520.66	R
754099	$537,778	$20,952,653	$2,900,000	$24,390,431	7	S	0.00011	$2,683	N	0.0005	Y	1	51	0.0055946	$136,454.71	R
754108	$1,428,102	$5,248,383	$2,900,000	$9,576,485	7	R	0.000077	$737	N	0.0002	Y	1	63	0.004839439	$46,344.81	R
754110	$1,492,842	$639,522	$2,900,000	$5,032,365	7	S	0.00011	$554	N	0.0002	Y	1	64	0.007015662	$35,305.37	R
754113	$1,313,105	$560,727	$1,160,000	$3,033,832	7	R	0.000077	$234	N	0.0002	Y	1	65	0.004992688	$15,146.98	R
754123	$2,056,467	$4,387,130	$1,160,000	$7,603,597	7	S	0.00011	$836	N	0.0001	N	1	69	0.007561683	$57,495.99	R
754131	$4,073,602	$514,489	$2,900,000	$7,488,091	7	S	0.00011	$824	N	0.0001	N	1	69	0.007561683	$56,622.57	R
754138	$2,262,113	$176,002	$1,160,000	$3,598,116	7	S	0.00011	$396	N	0.0001	N	1	57	0.006250727	$22,490.84	R
754139	$2,262,113	$176,002	$1,160,000	$3,598,116	7	S	0.00011	$396	N	0.0001	N	1	57	0.006250727	$22,490.84	R
754141	$8,929,579	NA	$580,000	$9,509,579	7	S	0.00011	$1,046	Y	0.0001	N	1	70	0.007670851	$72,946.57	R
754311	$3,824,660	$486,339	$2,900,000	$7,210,999	7	S	0.00011	$793	N	0.0001	N	1	47	0.005156941	$37,186.70	R
754314	$2,499,998	$726,430	$1,160,000	$4,386,427	7	S	0.00011	$483	N	0.0001	N	1	49	0.005375795	$23,580.53	R
754321	$1,054,080	$1,889,502	$1,160,000	$4,103,582	7	S	0.00011	$451	N	0.0001	N	1	48	0.005266374	$21,611.00	R
755100	$797,162	$1,554,643	$1,160,000	$3,511,805	6	S	0.00011	$386	N	0.0001	N	1	15	0.00164873	$5,790.02	R
755400	$171,138	NA	$1,160,000	$1,331,138	7	S	0.00011	$146	Y	0.0001	N	1	31	0.003404379	$4,531.70	R
755800	$2,386,850	$8,408,226	$2,900,000	$13,695,076	6	O	0.00017	$2,328	N	0.002	Y	1	26	0.00441062	$60,403.78	R
755801	$2,532,501	$3,961,642	$2,900,000	$9,394,142	7	S	0.00011	$1,033	N	0.002	Y	1	39	0.004281046	$40,216.75	R
755803	$473,849	$584,739	$1,160,000	$2,218,588	7	S	0.00011	$244	N	0.0005	Y	1	24	0.002636663	$5,849.67	R
755804	$347,489	$71,361	$580,000	$998,850	7	S	0.00011	$110	N	0.002	Y	1	24	0.002636663	$2,633.63	R
755806	$471,274	$314,535	$1,160,000	$1,945,809	7	S	0.00011	$214	N	0.0005	Y	1	15	0.00164873	$3,208.11	R
755807	$285,480	$518,508	$1,160,000	$1,963,988	7	S	0.00011	$216	N	0.0005	Y	1	15	0.00164873	$3,238.09	R
755808	$744,111	$1,786,258	$1,160,000	$3,690,369	6	S	0.00011	$406	N	0.002	Y	1	40	0.004390575	$16,202.84	R
755809	$834,386	$1,801,668	$2,900,000	$5,536,054	7	S	0.00011	$609	N	0.002	Y	1	37	0.004061952	$22,487.18	R
755812	$3,955,483	$3,381,298	$2,900,000	$10,236,781	8	S	0.0000022	$23	N	0.002	Y	1	57	0.000125392	$1,283.61	R
755813	$601,769	$784,414	$1,160,000	$2,546,184	7	R	0.000077	$196	N	0.0005	Y	1	58	0.004456213	$11,346.34	R
755814	$3,358,895	$7,028,072	$2,900,000	$13,286,967	7	S	0.00011	$1,462	Y	0.002	Y	1	61	0.006687905	$88,861.97	R
755815	$1,281,312	NA	$0	$1,281,312	7	O	0.00017	$218	N	0.0005	Y	1	36	0.006101828	$7,818.35	R
755817	$1,744,742	$641,736	$1,160,000	$3,546,478	7	S	0.00011	$390	N	0.0005	Y	1	65	0.00712489	$25,268.27	R
755904	$3,694,773	$22,626,274	$2,900,000	$29,221,047	7	S	0.00011	$3,214	N	0.0005	Y	1	47	0.005156941	$150,691.23	R
755905	$3,156,558	$6,775,555	$2,900,000	$12,832,113	7	S	0.00011	$1,412	N	0.0005	Y	1	47	0.005156941	$66,174.46	R
755916	$1,103,244	$181,544	$1,160,000	$2,444,787	7	R	0.000077	$188	N	0.002	Y	1	54	0.004149527	$10,144.71	R
755917	$1,922,155	$609,192	$1,160,000	$3,691,346	7	R	0.000077	$284	N	0.002	Y	1	56	0.004302882	$15,883.43	R
755941	$4,657,953	$0	$2,900,000	$7,557,953	8	R	0.0000017	$13	N	0.002	Y	1	59	0.000100295	$758.03	R
755944	$1,536,478	$459,858	$1,160,000	$3,156,336	8	R	0.0000017	$5	N	0.002	Y	1	69	0.000117293	$370.22	R
755947	$2,525,071	$969,744	$2,900,000	$6,394,816	7	R	0.000077	$492	N	0.002	Y	1	69	0.005299114	$33,886.86	R
755948	$4,657,953	$2,136,725	$2,900,000	$9,694,678	7	R	0.000077	$746	N	0.002	Y	1	69	0.005299114	$51,373.21	R
756000	$520,040	$202,302	$1,160,000	$1,882,341	7	R	0.000077	$145	N	0.002	Y	1	38	0.002921836	$5,499.89	R
756001	$520,040	$222,620	$1,160,000	$1,902,659	7	R	0.000077	$147	N	0.0005	Y	1	38	0.002921836	$5,559.26	R
756002	$2,353,980	$1,636,885	$2,900,000	$6,890,865	7	R	0.000077	$531	N	0.002	Y	1	47	0.003612598	$24,893.93	R
756003	$2,395,278	$1,868,699	$2,900,000	$7,163,977	7	R	0.000077	$552	N	0.002	Y	1	47	0.003612598	$25,880.57	R
756004	$3,320,813	$21,033,501	$2,900,000	$27,254,314	7	R	0.000077	$2,099	N	0.0005	Y	1	47	0.003612598	$98,458.88	R
756005	$4,140,372	$1,786,675	$2,900,000	$8,827,046	6	R	0.000077	$680	N	0.0005	Y	1	47	0.003612598	$31,888.57	R
756006	$3,849,819	$2,408,031	$2,900,000	$9,157,850	6	R	0.000077	$705	N	0.002	Y	1	47	0.003612598	$33,083.63	R
756013	$2,667,975	$2,714,078	$2,900,000	$8,282,053	6	R	0.000077	$638	N	0.002	Y	1	57	0.004379551	$36,271.67	R
756014	$1,584,928	$2,677,917	$2,900,000	$7,162,845	7	R	0.000077	$552	N	0.002	Y	1	57	0.004379551	$31,370.04	R
756015	$2,018,384	$1,391,106	$2,900,000	$6,309,490	6	R	0.000077	$486	N	0.002	Y	1	57	0.004379551	$27,632.73	R
756016	$6,541,487	$0	$2,900,000	$9,441,487	7	R	0.000077	$727	N	0.002	Y	1	56	0.004302882	$40,625.60	R
756017	$2,204,802	$662,054	$1,160,000	$4,026,856	7	R	0.000077	$310	N	0.0005	Y	1	57	0.004379551	$17,635.82	R

Bridge Number	Bridge Replacement Cost	Detour Cost	Loss of Life Cost	Total Cost of Failure	Scour Vulnerability	Overtopping Frequency	Annual Probability of Failure	Annual Unadjusted Risk	High Priority	MPL	Meets MPL	K1	Remaining Life	Lifetime Probability of Failure	Unadjusted Lifetime Risk	Scour Mode
756020	$2,212,606	$874,558	$2,900,000	$5,987,164	7	R	0.000077	$461	N	0.0005	Y	1	55	0.004226207	$25,303.00	R
756021	$2,212,606	$801,060	$2,900,000	$5,913,666	8	R	0.0000017	$10	N	0.002	Y	1	55	9.34957E-05	$552.90	R
756022	$1,186,963	$2,736,495	$2,900,000	$6,823,459	7	S	0.00011	$751	N	0.002	Y	1	54	0.005922718	$40,413.42	R
756026	$988,090	$423,131	$2,900,000	$4,311,221	7	R	0.000077	$332	N	0.002	Y	1	59	0.00453287	$19,542.21	R
756027	$988,090	$388,219	$2,900,000	$4,276,309	8	R	0.0000017	$7	N	0.002	Y	1	59	0.000100295	$428.89	R
756028	$2,116,900	$423,131	$2,900,000	$5,440,030	N	N	NA	NA	N	0.0005	N	1	59	NA	NA	R
756029	$3,477,763	$388,219	$2,900,000	$6,765,982	N	N	NA	NA	N	0.0005	N	1	59	NA	NA	R
756032	$6,279,528	$1,466	$0	$6,280,994	7	O	0.00017	$1,068	Y	0.002	Y	1	66	0.011158234	$70,084.80	R
756033	$6,279,528	$1,466	$0	$6,280,994	7	R	0.000077	$484	Y	0.002	Y	1	66	0.005069303	$31,840.26	R
756406	$355,074	$2,550,691	$2,900,000	$5,805,766	7	S	0.00011	$639	N	0.002	Y	1	36	0.003952386	$22,946.63	R
756411	$364,962	$1,319,358	$1,160,000	$2,844,320	7	R	0.000077	$219	N	0.002	Y	1	38	0.002921836	$8,310.64	R
756417	$398,394	$1,194,661	$1,160,000	$2,753,054	7	R	0.000077	$212	N	0.002	Y	1	38	0.002921836	$8,043.97	R
756420	$281,438	$33,679,943	$2,900,000	$36,861,381	7	R	0.000077	$2,838	N	0.002	Y	1	37	0.002845055	$104,872.65	R
756421	$837,820	$12,121,957	$2,900,000	$15,859,777	7	R	0.000077	$1,221	N	0.002	Y	1	35	0.002691475	$42,686.20	R
756422	$696,200	$483,654	$1,160,000	$2,339,853	7	R	0.000077	$180	N	0.0005	Y	1	55	0.004226207	$9,888.70	R
756426	$1,542,631	$1,444,245	$2,900,000	$5,886,876	8	S	0.0000022	$13	N	0.002	Y	1	55	0.000120993	$712.27	R
756427	$584,492	$976,325	$1,160,000	$2,720,817	7	S	0.00011	$299	N	0.002	Y	1	69	0.007561683	$20,573.96	R
756428	$829,641	$1,002,173	$2,900,000	$4,731,814	7	R	0.000077	$364	N	0.002	Y	1	56	0.004302882	$20,360.44	R
756429	$508,048	$87,957	$580,000	$1,176,006	7	S	0.00011	$129	N	0.002	Y	1	55	0.006032066	$7,093.75	R
756500	$898,721	$427,423	$0	$1,326,144	7	N	NA	NA	Y	0.002	N	1	69	NA	NA	R
756702	$520,040	$1,834,787	$1,160,000	$3,514,827	7	S	0.00011	$387	N	0.002	Y	1	42	0.004609597	$16,201.94	R
764002	$500,351	$2,164,752	$1,160,000	$3,825,102	5	S	0.00024	$13	N	0.002	Y	1	21	0.005027922	$19,232.32	T
764033	$348,480	$293,505	$1,160,000	$1,801,985	6	S	0.00011	$198	N	0.002	Y	1	21	0.002307461	$4,158.01	R
764042	$148,523	NA	$0	$148,523	6	S	0.00011	$16	N	0.0005	Y	1	57	0.006250727	$928.38	R
764045	$71,889	$24,045	$0	$95,934	5	R	0.00018	$0	N	0.002	Y	1	59	0.010564753	$1,013.52	R
770002	$772,861	$1,806,650	$2,900,000	$5,479,510	6	S	0.00011	$603	Y	0.0005	Y	1	15	0.00164873	$9,034.23	R
770030	$3,201,570	$24,034,003	$2,900,000	$30,135,573	7	S	0.00011	$3,315	Y	0.0005	Y	1	43	0.00471909	$142,212.48	R
770035	$4,556,191	$45,021,222	$2,900,000	$52,477,413	7	S	0.00011	$5,773	Y	0.002	Y	1	53	0.005813357	$305,069.95	R
770037	$10,014,318	$17,318,651	$2,900,000	$30,232,969	7	R	0.000077	$2,328	Y	0.002	Y	1	55	0.004226207	$127,770.80	R
774003	$371,236	$676,303	$1,160,000	$2,207,539	7	S	0.00011	$243	N	0.002	Y	1	28	0.003075431	$6,789.13	R
774004	$357,572	$1,216,473	$2,900,000	$4,474,045	6	S	0.00011	$492	N	0.002	Y	1	37	0.004061952	$18,173.35	R
774006	$463,610	$1,283,945	$2,900,000	$4,647,555	7	S	0.00011	$511	N	0.0005	Y	1	27	0.002965757	$13,783.52	R
774007	$227,248	$4,511,778	$2,900,000	$7,639,025	6	S	0.00011	$840	N	0.002	Y	1	15	0.00164873	$12,594.69	R
774008	$181,088	$406,890	$1,160,000	$1,747,978	6	S	0.00011	$192	N	0.0005	Y	1	31	0.003404379	$5,950.78	R
774009	$422,718	$1,824,820	$2,900,000	$5,147,538	6	S	0.00011	$566	N	0.002	Y	1	33	0.003623618	$18,652.71	R
774014	$332,131	$1,216,473	$2,900,000	$4,448,605	7	S	0.00011	$489	N	0.0005	Y	1	42	0.004609597	$20,506.28	R
774016	$2,356,368	NA	$1,160,000	$3,516,368	7	S	0.00011	$387	Y	0.0005	Y	1	47	0.005156941	$18,133.70	R
774033	$7,430,094	$1,915,855	$2,900,000	$12,245,949	6	R	0.000077	$943	N	0.0005	Y	1	59	0.00453287	$55,509.30	R
774034	$3,898,039	$1,370,989	$1,160,000	$6,429,028	6	R	0.000077	$495	N	0.0005	Y	1	61	0.004686166	$30,127.49	R
774035	$1,121,817	$962,683	$2,900,000	$4,984,500	6	S	0.00011	$548	N	0.002	Y	1	64	0.007015662	$34,969.57	R
774036	$931,122	$801,738	$2,900,000	$4,632,860	7	S	0.00011	$510	N	0.002	Y	1	63	0.006906421	$31,996.48	R
774040	$931,122	$1,596,395	$2,900,000	$5,427,517	7	S	0.00011	$597	N	0.0005	Y	1	63	0.006906421	$37,484.72	R
774042	$1,121,817	$962,683	$2,900,000	$4,984,500	7	S	0.00011	$548	N	0.0005	Y	1	64	0.007015662	$34,969.57	R
774048	$633,671	$2,719,778	$2,900,000	$6,253,449	5	S	0.00024	$21	N	0.002	Y	1	55	0.013114826	$82,012.89	R
774050	$2,069,702	$2,536,800	$2,900,000	$7,506,502	8	S	0.0000022	$17	N	0.0005	Y	1	70	0.000153988	$1,155.91	R
775100	$181,088	$686,066	$1,160,000	$2,027,154	7	S	0.00011	$223	N	0.0005	Y	1	40	0.004390575	$8,900.37	R
775101	$181,088	$1,213,370	$1,160,000	$2,554,458	6	S	0.00011	$281	N	0.002	Y	1	36	0.003952386	$10,096.21	R
775102	$206,653	$1,212,226	$1,160,000	$2,578,879	6	S	0.00011	$284	N	0.0005	Y	1	40	0.004390575	$11,322.76	R
775501	$2,937,957	$19,913,678	$2,900,000	$25,751,635	7	S	0.00011	$2,833	N	0.002	Y	1	54	0.005922718	$152,519.67	R
775502	$6,148,470	$1,828,627	$1,160,000	$9,137,097	6	R	0.000077	$704	N	0.0005	Y	1	63	0.004839439	$44,218.42	R
775702	$301,540	$906,927	$1,160,000	$2,368,467	7	S	0.00011	$261	N	0.0005	Y	1	39	0.004281046	$10,139.52	R
775703	$356,510	$760,742	$1,160,000	$2,277,252	6	O	0.00017	$387	N	0.002	Y	1	39	0.00660863	$15,049.52	R
775707	$432,645	$1,384,711	$2,900,000	$4,717,356	7	S	0.00011	$519	N	0.0005	Y	1	38	0.004171505	$19,678.47	R
775708	$326,942	$868,138	$1,160,000	$2,355,079	7	S	0.00011	$259	N	0.0005	Y	1	38	0.004171505	$9,824.22	R
775709	$712,038	$704,537	$1,160,000	$2,576,575	6	O	0.00017	$438	N	0.002	Y	1	47	0.007958839	$20,506.54	R
775710	$712,038	$704,801	$1,160,000	$2,576,839	6	S	0.00011	$283	N	0.002	Y	1	47	0.005156941	$13,288.61	R
775711	$1,877,665	$3,319,338	$2,900,000	$8,097,003	6	S	0.00011	$891	N	0.002	Y	1	48	0.005266374	$42,641.85	R
775712	$1,050,521	$5,673,348	$2,900,000	$9,623,869	6	O	0.00017	$1,636	N	0.002	Y	1	53	0.008970291	$86,328.90	R
775713	$257,630	NA	$580,000	$837,630	7	S	0.00011	$92	Y	0.0005	Y	1	61	0.006687905	$5,601.99	R
780071	$3,517,969	$21,903,876	$2,900,000	$28,321,845	6	S	0.00011	$3,115	N	0.002	Y	1	22	0.002417207	$68,459.76	T
784001	$133,914	$82,328	$580,000	$796,242	5	S	0.00024	$3	N	0.002	Y	1	15	0.003593958	$2,861.66	R
784002	$178,255	$380,239	$1,160,000	$1,718,494	4	S	0.0005	$859	N	0.0005	N	1	15	0.007473807	$12,843.69	R
784017	$490,125	$591,403	$580,000	$1,661,528	6	S	0.00011	$183	N	0.0002	Y	1	20	0.002197703	$3,651.54	R
784023	$445,568	$3,900,802	$1,160,000	$5,506,369	6	S	0.00011	$606	N	0.002	Y	1	23	0.002526941	$13,914.27	R
784038	$329,617	$105,900	$580,000	$1,015,517	4	S	0.0005	$508	N	0.0001	N	1	44	0.021765147	$22,102.88	T
784046	$451,873	$35,417	$580,000	$1,067,291	6	S	0.00011	$117	N	0.0001	N	1	54	0.005922718	$6,321.26	R
784051	$118,205	NA	$580,000	$698,205	7	R	0.000077	$54	Y	0.0001	Y	1	57	0.004379551	$3,057.82	R
790012	$2,498,008	$22,784,529	$2,900,000	$28,182,536	6	S	0.00011	$3,100	Y	0.0001	N	1	15	0.00164873	$46,465.40	T
790013	$1,032,042	$5,838,669	$2,900,000	$9,770,711	7	S	0.00011	$1,075	Y	0.0001	N	1	15	0.00164873	$16,109.27	T
790021	$1,508,076	$2,232,182	$2,900,000	$6,640,257	6	S	0.00011	$730	Y	0.001	Y	1	15	0.00164873	$10,947.99	R
790028	$1,698,926	$18,467,390	$2,900,000	$23,066,316	7	S	0.00011	$2,537	Y	0.001	Y	1	35	0.003842809	$88,639.45	R
790029	$1,834,619	$18,467,390	$2,900,000	$23,202,009	7	S	0.00011	$2,552	Y	0.001	Y	1	35	0.003842809	$89,160.89	R
790034	$1,075,056	$14,480,114	$2,900,000	$18,455,171	7	S	0.00011	$2,030	Y	0.001	Y	1	23	0.002526941	$46,635.13	R
790086	$1,323,850	$351,829	$1,160,000	$2,835,679	6	S	0.00011	$312	Y	0.001	Y	1	21	0.002307461	$6,543.22	R
790151	$8,712,982	$11,123,084	$2,900,000	$22,736,065	7	S	0.00011	$2,501	Y	0.001	Y	1	56	0.006141403	$139,631.33	T
790801	$77,211	$664	$0	$77,875	8	S	0.0000022	$0	N	0.001	Y	1	65	0.00014299	$11.14	R
794003	$34,095,332	$4,316,198	$2,900,000	$41,311,530	6	S	0.00011	$4,544	Y	0.001	Y	1	20	0.002197703	$90,790.45	T
794004	$38,090,035	$2,028,102	$2,900,000	$43,018,136	6	S	0.00011	$4,732	Y	0.001	Y	1	25	0.002746373	$118,143.85	T
794007	$524,886	$7,516,690	$2,900,000	$10,941,575	7	S	0.00011	$1,204	N	0.002	Y	1	27	0.002965757	$32,450.05	R

Bridge Number	Bridge Replacement Cost	Detour Cost	Loss of Life Cost	Total Cost of Failure	Scour Vulnerability	Overtopping Frequency	Annual Probability of Failure	Annual Unadjusted Risk	High Priority	MPL	Meets MPL	K1	Remaining Life	Lifetime Probability of Failure	Unadjusted Lifetime Risk	Scour Mode
794008	$266,891	$13,152,112	$2,900,000	$16,319,003	6	S	0.00011	$1,795	N	0.002	Y	1	27	0.002965757	$48,398.19	R
794009	$621,560	$9,861,879	$2,900,000	$13,383,439	7	S	0.00011	$1,472	N	0.002	Y	1	28	0.003075431	$41,159.84	R
794010	$211,141	$3,218,498	$2,900,000	$6,329,639	7	S	0.00011	$696	N	0.002	Y	1	28	0.003075431	$19,466.37	R
794011	$1,094,160	$5,872,014	$2,900,000	$9,866,174	7	S	0.00011	$1,085	Y	0.002	Y	1	28	0.003075431	$30,342.73	R
794014	$169,031	$833,306	$1,160,000	$2,162,338	6	S	0.00011	$238	N	0.001	Y	1	28	0.003075431	$6,650.12	R
794015	$2,910,144	$422,370	$1,160,000	$4,492,514	6	S	0.00011	$494	N	0.001	Y	1	28	0.003075431	$13,816.41	T
794016	$1,573,909	$2,341,333	$1,160,000	$5,075,241	6	S	0.00011	$558	N	0.002	Y	1	30	0.003294742	$16,721.61	T
794019	$252,064	$7,516,690	$2,900,000	$10,668,753	7	S	0.00011	$1,174	N	0.002	Y	1	31	0.003404379	$36,320.48	R
794020	$110,908	$65,440	$580,000	$756,348	7	S	0.00011	$83	N	0.002	Y	1	31	0.003404379	$2,574.90	R
794022	$1,399,540	$2,971,810	$1,160,000	$5,531,350	6	S	0.00011	$608	N	0.002	Y	1	33	0.003623618	$20,043.50	T
794025	$16,298,105	$1,556,491	$1,160,000	$19,014,596	5	S	0.00024	$65	Y	0.002	Y	1	21	0.005027922	$95,603.91	T
794032	$513,165	$2,262,494	$580,000	$3,355,658	6	S	0.00011	$369	Y	0.0005	Y	1	35	0.003842809	$12,895.15	R
794035	$659,611	$10,853,080	$2,900,000	$14,412,691	6	S	0.00011	$1,585	N	0.0005	Y	1	41	0.004500092	$64,858.44	R
794036	$367,280	$6,327,925	$2,900,000	$9,595,205	7	S	0.00011	$1,055	N	0.002	Y	1	41	0.004500092	$43,179.31	R
794038	$1,786,298	$4,797,977	$1,160,000	$7,744,275	7	S	0.00011	$852	N	0.002	Y	1	34	0.00373322	$28,911.08	R
794045	$252,345	$10,352,702	$2,900,000	$13,505,047	6	S	0.00011	$1,486	N	0.002	Y	1	27	0.002965757	$40,052.68	R
794061	$236,316	$924,430	$1,160,000	$2,320,746	7	S	0.00011	$255	N	0.002	Y	1	39	0.004281046	$9,935.22	T
794063	$238,610	$925,310	$1,160,000	$2,323,920	7	S	0.00011	$256	N	0.0005	Y	1	39	0.004281046	$9,948.81	R
794065	$125,158	NA	$0	$125,158	5	S	0.00024	$0	Y	0.0005	Y	1	15	0.003593958	$449.81	R
794067	$243,199	$2,053,097	$1,160,000	$3,456,296	7	S	0.00011	$380	N	0.002	Y	1	41	0.004500092	$15,553.65	R
794117	$968,253	$1,330,792	$1,160,000	$3,459,045	7	S	0.00011	$380	N	0.002	Y	1	50	0.005485204	$18,973.57	T
794118	$798,941	$2,927,743	$1,160,000	$4,886,684	6	S	0.00011	$538	N	0.0002	Y	1	50	0.005485204	$26,804.46	R
794120	$4,098,980	$4,316,198	$2,900,000	$11,315,178	7	R	0.000077	$871	N	0.001	Y	1	55	0.004226207	$47,820.29	T
794121	$4,762,868	$2,324,463	$2,900,000	$9,987,331	7	R	0.000077	$769	N	0.001	Y	1	57	0.004379551	$43,740.02	R
794122	$390,855	$186,614	$1,160,000	$1,737,469	6	S	0.00011	$191	N	0.002	Y	1	54	0.005922718	$10,290.54	T
794123	$280,563	$942,901	$1,160,000	$2,383,465	7	S	0.00011	$262	N	0.002	Y	1	46	0.005047497	$12,030.53	T
794124	$288,430	$942,901	$1,160,000	$2,391,331	7	S	0.00011	$263	N	0.0001	N	1	46	0.005047497	$12,070.24	T
794126	$679,121	$1,203,958	$1,160,000	$3,043,079	7	S	0.00011	$335	N	0.002	Y	1	54	0.005922718	$18,023.30	T
794130	$281,992	$855,031	$1,160,000	$2,297,022	6	S	0.00011	$253	N	0.0001	N	1	54	0.005922718	$13,604.61	T
794131	$273,446	$610,325	$1,160,000	$2,043,771	7	S	0.00011	$225	N	0.0001	N	1	53	0.005813357	$11,881.17	R
794133	$273,446	$610,325	$1,160,000	$2,043,771	7	O	0.00017	$347	N	0.0001	N	1	53	0.008970291	$18,333.22	R
794139	$440,336	$1,303,174	$580,000	$2,323,510	7	S	0.00011	$256	N	0.0001	N	1	51	0.0055946	$12,999.11	R
794141	$679,558	$2,178,909	$1,160,000	$4,018,467	7	S	0.00011	$442	N	0.0001	N	1	51	0.0055946	$22,481.72	R
794146	$444,044	$60,515	$580,000	$1,084,559	7	S	0.00011	$119	N	0.0001	N	1	49	0.005375795	$5,830.37	R
794162	$268,483	$802,170	$1,160,000	$2,230,653	7	R	0.000077	$172	N	0.0005	Y	1	53	0.004072841	$9,085.09	R
794184	$140,609	NA	$0	$140,609	6	S	0.00011	$15	Y	0.001	Y	1	54	0.005922718	$832.79	R
794185	$140,609	NA	$0	$140,609	6	S	0.00011	$15	Y	0.0001	N	1	54	0.005922718	$832.79	R
795000	$510,745	$2,068,688	$2,900,000	$5,479,434	6	S	0.00011	$603	N	0.002	Y	1	21	0.002307461	$12,643.58	T
795502	$155,827	$200,116	$1,160,000	$1,515,943	6	R	0.000077	$117	N	0.002	Y	1	15	0.001154378	$1,749.97	T
795503	$268,102	$115,719	$580,000	$963,821	7	S	0.00011	$106	N	0.0005	Y	1	65	0.00712489	$6,867.12	R
795521	$374,272	$1,805,196	$2,900,000	$5,079,468	7	S	0.00011	$559	N	0.002	Y	1	31	0.003404379	$17,292.44	R
795700	$263,333	$571,282	$1,160,000	$1,994,615	6	O	0.00017	$339	N	0.001	Y	1	31	0.005256584	$10,484.86	T
795701	$139,954	NA	$1,160,000	$1,299,954	7	S	0.00011	$143	Y	0.0001	N	1	31	0.003404379	$4,425.54	T
795713	$338,062	$1,007,989	$1,160,000	$2,506,052	7	S	0.00011	$276	N	0.0001	N	1	28	0.003075431	$7,707.19	T
796000	$3,195,452	$1,277,110	$2,900,000	$7,372,562	7	S	0.00011	$811	N	0.0001	N	1	45	0.00493804	$36,406.01	R
796412	$227,810	$1,431,677	$2,900,000	$4,559,486	7	O	0.00017	$775	N	0.0002	Y	1	28	0.004749092	$21,653.42	T
796500	$301,718	NA	$580,000	$881,718	6	S	0.00011	$97	Y	0.0001	N	1	49	0.005375795	$4,739.94	T
796518	$437,702	$726,438	$1,160,000	$2,324,140	7	O	0.00017	$395	N	0.0001	N	1	31	0.005256584	$12,217.04	T
796547	$295,079	NA	$1,160,000	$1,455,079	6	S	0.00011	$160	Y	0.0001	N	1	26	0.002856071	$4,155.81	T
796566	$301,540	NA	$1,160,000	$1,461,540	7	O	0.00017	$248	Y	0.0001	N	1	38	0.006439725	$9,411.92	T
860001	$2,135,754	$12,462,657	$2,900,000	$17,498,410	6	R	0.000077	$1,347	Y	0.0001	Y	1	15	0.001154378	$20,199.77	T
860060	$40,469,935	$4,814,341	$2,900,000	$48,184,276	7	R	0.000077	$3,710	N	0.0001	Y	1	33	0.002537872	$122,285.52	T
860063	$2,470,195	$15,544,928	$2,900,000	$20,915,123	6	R	0.000077	$1,610	Y	0.0001	Y	1	15	0.001154378	$24,143.95	T
860096	$2,799,080	$5,382,137	$2,900,000	$11,081,217	7	R	0.000077	$853	Y	0.0001	Y	1	22	0.001692631	$18,756.41	T
860139	$3,839,861	$12,486,558	$2,900,000	$19,226,420	7	R	0.000077	$1,480	Y	0.0001	Y	1	31	0.002384245	$45,840.50	T
860156	$1,797,879	$5,267,195	$2,900,000	$9,965,074	6	S	0.00011	$1,096	N	0.0001	N	1	30	0.003294742	$32,832.35	T
860159	$1,760,732	$5,790,210	$2,900,000	$10,450,943	6	S	0.00011	$1,150	N	0.0001	N	1	30	0.003294742	$34,433.16	T
860213	$20,686,031	$14,133,080	$2,900,000	$37,719,111	7	R	0.000077	$2,904	Y	0.0001	Y	1	35	0.002691475	$101,520.05	T
860274	$1,874,981	$9,800,770	$2,900,000	$14,575,750	7	S	0.00011	$1,603	N	0.0001	N	1	40	0.004390575	$63,995.93	T
860319	$33,607,942	$7,937,836	$2,900,000	$44,445,778	7	S	0.00011	$4,889	N	0.0001	N	1	47	0.005156941	$229,204.28	T
860431	$57,619,040	$21,388,058	$2,900,000	$81,907,098	7	R	0.000077	$6,307	Y	0.002	Y	0.67	54	0.004149527	$339,875.71	T
860466	$29,158,917	$1,843,790	$2,900,000	$33,902,707	7	R	0.000077	$2,611	N	0.002	Y	1	55	0.004226207	$143,279.87	T
860467	$28,981,118	$1,843,790	$2,900,000	$33,724,909	7	R	0.000077	$2,597	N	0.002	Y	1	53	0.004072841	$137,356.18	T
860574	$3,360,019	$20,212,082	$2,900,000	$26,472,101	7	R	0.000077	$2,038	Y	0.0002	Y	1	56	0.004302882	$113,906.33	T
860575	$3,360,019	$20,212,082	$2,900,000	$26,472,101	7	R	0.000077	$2,038	Y	0.002	Y	1	56	0.004302882	$113,906.33	T
860591	$3,363,640	$5,633,804	$2,900,000	$11,897,444	7	R	0.000077	$916	N	0.002	Y	1	48	0.00368932	$43,893.48	T
860592	$9,557,388	$3,207,754	$2,900,000	$15,665,142	7	R	0.000077	$1,206	N	0.002	Y	1	50	0.003842746	$60,197.16	T
864028	$1,512,134	$7,472,373	$2,900,000	$11,884,506	6	S	0.00011	$1,307	N	0.002	Y	1	15	0.00164873	$19,594.34	T
864031	$685,348	$733,540	$1,160,000	$2,578,888	6	S	0.00011	$284	N	0.002	Y	1	24	0.002636663	$6,799.66	T
864069	$987,653	$3,105,458	$2,900,000	$6,993,111	7	S	0.00011	$769	N	0.002	Y	1	31	0.003404379	$23,807.20	T
864070	$859,608	$3,348,003	$2,900,000	$7,107,611	7	S	0.00011	$782	N	0.002	Y	1	15	0.00164873	$11,718.53	M
864071	$27,071,859	$4,130,090	$2,900,000	$34,101,949	7	S	0.00011	$3,751	N	0.002	Y	1	26	0.002856071	$97,397.59	T
864072	$27,442,633	$3,880,720	$2,900,000	$34,223,352	7	S	0.00011	$3,765	N	0.002	Y	1	30	0.003294742	$112,757.11	T
864073	$788,312	$514,851	$1,160,000	$2,463,163	7	S	0.00011	$271	N	0.002	Y	1	49	0.005375795	$13,241.46	T
865501	$131,315	$619,782	$1,160,000	$1,911,097	6	S	0.00011	$210	N	0.002	Y	1	21	0.002307461	$4,409.78	T
865502	$107,148	$105,912	$580,000	$793,060	6	S	0.00011	$87	N	0.0005	Y	1	21	0.002307461	$1,829.95	T
865707	$152,565	$178,831	$1,160,000	$1,491,396	6	S	0.00011	$164	N	0.002	Y	1	23	0.002526941	$3,768.67	T
865708	$243,729	$3,751,499	$2,900,000	$6,895,228	4	S	0.0005	$3,448	N	0.002	Y	1	28	0.013905908	$95,884.41	T
865709	$511,260	$1,286,123	$1,160,000	$2,957,383	5	S	0.00024	$10	N	0.0002	N	1	28	0.006698272	$19,809.36	T

Bridge Number	Bridge Replacement Cost	Detour Cost	Loss of Life Cost	Total Cost of Failure	Scour Vulnerability	Overtopping Frequency	Annual Probability of Failure	Annual Unadjusted Risk	High Priority	MPL	Meets MPL	K1	Remaining Life	Lifetime Probability of Failure	Unadjusted Lifetime Risk	Scour Mode
865710	$672,316	$1,742,090	$2,900,000	$5,314,406	6	S	0.00011	$585	N	0.0002	Y	1	28	0.003075431	$16,344.09	T
865712	$187,175	NA	$1,160,000	$1,347,175	6	S	0.00011	$148	Y	0.0002	Y	1	22	0.002417207	$3,256.40	T
865713	$192,794	NA	$1,160,000	$1,352,794	5	S	0.00024	$5	Y	0.0005	Y	1	22	0.005266716	$7,124.78	T
865720	$857,423	$2,982,843	$2,900,000	$6,740,266	6	S	0.00011	$741	N	0.002	Y	1	15	0.00164873	$11,112.88	T
865725	$407,009	NA	$1,160,000	$1,567,009	6	S	0.00011	$172	Y	0.0005	Y	1	25	0.002746373	$4,303.59	T
865727	$237,900	NA	$1,160,000	$1,397,900	6	S	0.00011	$154	Y	0.0005	Y	1	15	0.00164873	$2,304.76	T
865728	$477,244	$1,286,123	$1,160,000	$2,923,366	6	S	0.00011	$322	N	0.001	Y	1	19	0.002087932	$6,103.79	T
865729	$1,725,147	$4,180,282	$2,900,000	$8,805,429	7	S	0.00011	$969	Y	0.002	Y	1	15	0.00164873	$14,517.78	T
865732	$166,946	NA	$580,000	$746,946	6	S	0.00011	$82	Y	0.0001	N	1	15	0.00164873	$1,231.51	T
865733	$892,759	NA	$2,900,000	$3,792,759	6	S	0.00011	$417	Y	0.0002	Y	1	28	0.003075431	$11,664.37	T
865737	$308,311	NA	$580,000	$888,311	7	S	0.00011	$98	Y	0.0002	Y	1	15	0.00164873	$1,464.59	T
865738	$777,730	NA	$1,160,000	$1,937,730	6	O	0.00017	$329	Y	0.0001	N	1	32	0.00542569	$10,513.52	T
865739	$777,730	NA	$1,160,000	$1,937,730	6	O	0.00017	$329	Y	0.0001	N	1	32	0.00542569	$10,513.52	T
865740	$770,004	NA	$1,160,000	$1,930,004	7	S	0.00011	$212	Y	0.0002	Y	1	34	0.00373322	$7,205.13	T
865742	$770,004	NA	$1,160,000	$1,930,004	6	S	0.00011	$212	Y	0.0001	N	1	34	0.00373322	$7,205.13	T
865743	$770,004	NA	$1,160,000	$1,930,004	6	S	0.00011	$212	Y	0.0001	N	1	35	0.003842809	$7,416.64	T
865748	$11,387,356	$1,424,759	$2,900,000	$15,712,115	6	S	0.00011	$1,728	Y	0.0002	Y	1	15	0.00164873	$25,905.04	T
865758	$466,981	$2,392,830	$2,900,000	$5,759,812	7	S	0.00011	$634	N	0.002	Y	1	37	0.004061952	$23,396.08	T
865762	$594,457	NA	$1,160,000	$1,754,457	6	S	0.00011	$193	Y	0.0002	Y	1	38	0.004171505	$7,318.73	T
865763	$635,232	NA	$1,160,000	$1,795,232	6	S	0.00011	$197	Y	0.002	Y	1	38	0.004171505	$7,488.82	T
865764	$615,918	NA	$1,160,000	$1,775,918	6	S	0.00011	$195	Y	0.0005	Y	1	38	0.004171505	$7,408.25	T
865765	$1,004,354	NA	$1,160,000	$2,164,354	6	S	0.00011	$238	Y	0.0002	Y	1	18	0.00197815	$4,281.42	T
865766	$738,305	NA	$1,160,000	$1,898,305	6	S	0.00011	$209	Y	0.002	Y	1	20	0.002197703	$4,171.91	T
865767	$749,753	NA	$1,160,000	$1,909,753	6	S	0.00011	$210	Y	0.002	Y	1	20	0.002197703	$4,197.07	T
865770	$644,753	NA	$1,160,000	$1,804,753	5	S	0.00024	$6	Y	0.002	Y	1	24	0.00574413	$10,366.74	T
865771	$537,294	NA	$1,160,000	$1,697,294	6	S	0.00011	$187	Y	0.0002	Y	1	22	0.002417207	$4,102.71	T
865772	$642,646	NA	$1,160,000	$1,802,646	5	S	0.00024	$6	Y	0.0005	Y	1	22	0.005266716	$9,494.02	T
865773	$1,041,812	NA	$1,160,000	$2,201,812	6	S	0.00011	$242	Y	0.0005	Y	1	22	0.002417207	$5,322.24	T
865774	$642,646	NA	$1,160,000	$1,802,646	6	S	0.00011	$198	Y	0.0005	Y	1	22	0.002417207	$4,357.37	T
865775	$936,835	$2,019,456	$2,900,000	$5,856,291	6	S	0.00011	$644	N	0.002	Y	1	18	0.00197815	$11,584.62	T
865776	$428,711	$344,062	$1,160,000	$1,932,774	7	S	0.00011	$213	N	0.0005	Y	1	41	0.004500092	$8,697.66	T
865777	$3,928,138	$4,712,318	$2,900,000	$11,540,457	6	S	0.00011	$1,269	N	0.0002	Y	1	25	0.002746373	$31,694.40	T
865778	$544,317	NA	$1,160,000	$1,704,317	4	S	0.0005	$852	Y	0.002	Y	1	33	0.016368679	$27,897.42	T
866100	$4,625,364	$1,721,486	$2,900,000	$9,246,850	7	S	0.00011	$1,017	N	0.002	Y	1	44	0.004828571	$44,649.07	T
866101	$3,317,317	NA	$2,900,000	$6,217,317	7	S	0.00011	$684	N	0.0002	Y	1	44	0.004828571	$30,020.76	T
866102	$5,650,039	$1,375,892	$2,900,000	$9,925,931	6	S	0.00011	$1,092	N	0.002	Y	1	36	0.003952386	$39,231.12	T
866200	$194,415	NA	$580,000	$774,415	4	S	0.0005	$387	Y	0.002	Y	1	31	0.01538431	$11,913.84	T
866303	$382,919	$276,542	$1,160,000	$1,819,461	7	S	0.00011	$200	N	0.0005	Y	1	29	0.003185092	$5,795.15	T
866304	$645,877	$2,233,035	$2,900,000	$5,778,912	7	S	0.00011	$636	N	0.0002	Y	1	28	0.003075431	$17,772.64	T
866305	$656,552	$2,233,035	$2,900,000	$5,789,587	6	S	0.00011	$637	N	0.002	Y	1	31	0.003404379	$19,709.95	T
867200	$226,211	NA	$580,000	$806,211	6	O	0.00017	$137	Y	0.0005	Y	1	16	0.002716535	$2,190.10	T
867202	$434,143	$1,140,623	$2,900,000	$4,474,766	6	S	0.00011	$492	N	0.002	Y	1	16	0.001758549	$7,869.09	T
867204	$434,143	$1,140,623	$2,900,000	$4,474,766	6	S	0.00011	$492	N	0.0005	Y	1	21	0.002307461	$10,325.35	T
867208	$113,874	NA	$1,160,000	$1,273,874	6	S	0.00011	$140	Y	0.002	Y	1	16	0.001758549	$2,240.17	T
867209	$218,851	$791,615	$1,160,000	$2,170,466	7	S	0.00011	$239	N	0.002	Y	1	16	0.001758549	$3,816.87	T
867602	$142,740	$754,206	$1,160,000	$2,056,946	6	S	0.00011	$226	N	0.002	Y	1	24	0.002636663	$5,423.47	T
867603	$445,755	$1,648,203	$2,900,000	$4,993,958	6	S	0.00011	$549	N	0.002	Y	1	19	0.002087932	$10,427.05	T
867604	$124,549	$171,953	$1,160,000	$1,456,502	4	O	0.0006	$874	N	0.002	Y	1	26	0.01548356	$22,551.84	T
867606	$1,207,222	$2,283,010	$2,900,000	$6,390,232	7	S	0.00011	$703	N	0.002	Y	1	31	0.003404379	$21,754.77	T
868101	$862,831	$257,425	$1,160,000	$2,280,256	7	S	0.00011	$251	N	0.002	Y	1	37	0.004061952	$9,262.29	R
868109	$610,455	$222,392	$1,160,000	$1,992,847	6	S	0.00011	$219	N	0.0005	Y	1	25	0.002746373	$5,473.10	R
870002	$1,756,799	$12,079,343	$2,900,000	$16,736,143	7	S	0.00011	$1,841	Y	0.002	Y	1	15	0.00164873	$27,593.38	@
870055	$6,584,564	$30,808,786	$2,900,000	$40,293,350	7	R	0.000077	$3,103	Y	0.002	Y	1	19	0.001461987	$58,908.34	T
870056	$2,248,441	$26,203,729	$2,900,000	$31,352,170	7	R	0.000077	$2,414	Y	0.002	Y	1	33	0.002537872	$79,567.79	M
870240	$833,543	$1,278,997	$2,900,000	$5,012,540	8	R	0.0000017	$9	Y	0.002	Y	1	33	5.60985E-05	$281.20	M
874003	$377,998	$508,947	$1,160,000	$2,046,945	6	S	0.00011	$225	N	0.002	Y	1	45	0.00493804	$10,107.90	@
874005	$178,123	$597,177	$1,160,000	$1,935,300	6	S	0.00011	$213	N	0.002	Y	1	21	0.002307461	$4,465.63	@
874017	$563,187	$346,911	$1,160,000	$2,070,098	7	S	0.00011	$228	N	0.002	Y	1	23	0.002526941	$5,231.02	@
874021	$563,187	$354,814	$1,160,000	$2,078,001	7	S	0.00011	$229	N	0.002	Y	1	23	0.002526941	$5,250.99	R
874023	$542,140	$541,295	$1,160,000	$2,243,435	6	S	0.00011	$247	N	0.002	Y	1	23	0.002526941	$5,669.03	R
874024	$493,234	$286,565	$1,160,000	$1,939,798	6	S	0.00011	$213	N	0.002	Y	1	21	0.002307461	$4,476.01	R
874030	$2,693,041	$3,641,691	$2,900,000	$9,234,732	6	S	0.00011	$1,016	N	0.002	Y	1	30	0.003294742	$30,426.06	R
874032	$875,902	$1,157,601	$2,900,000	$4,933,504	7	S	0.00011	$543	N	0.002	Y	1	22	0.002417207	$11,925.30	R
874093	$412,792	$1,197,396	$1,160,000	$2,770,187	7	S	0.00011	$305	N	0.002	Y	1	32	0.003514005	$9,734.45	R
874103	$917,793	$0	$0	$917,793	8	S	0.0000022	$2	N	0.002	Y	1	70	0.000153988	$141.33	R
874104	$415,507	$836,737	$1,160,000	$2,412,244	6	S	0.00011	$265	N	0.002	Y	1	33	0.003623618	$8,741.05	R
874105	$550,389	$1,393,531	$2,900,000	$4,843,920	5	S	0.00024	$16	N	0.002	Y	1	32	0.007651499	$37,063.25	@
874119	$2,077,787	$7,760,750	$2,900,000	$12,738,536	5	S	0.00024	$43	N	0.0005	Y	1	25	0.005982752	$76,211.50	R
874122	$1,701,314	$1,060,916	$1,160,000	$3,922,230	6	S	0.00011	$431	N	0.002	Y	1	34	0.00373322	$14,642.55	R
874129	$1,147,601	$2,078,170	$2,900,000	$6,125,770	6	S	0.00011	$674	N	0.002	Y	1	15	0.00164873	$10,099.74	R
874130	$794,743	$2,100,881	$2,900,000	$5,795,623	7	S	0.00011	$638	N	0.0001	N	1	15	0.00164873	$9,555.42	R
874149	$899,314	$6,568,400	$2,900,000	$10,367,714	7	S	0.00011	$1,140	N	0.0001	N	1	26	0.002856071	$29,610.93	M
874177	$1,619,140	$3,090,602	$2,900,000	$7,609,742	5	S	0.00024	$26	N	0.002	Y	1	17	0.004072176	$30,988.21	M
874178	$261,155	$606,888	$1,160,000	$2,028,043	6	S	0.00011	$223	N	0.002	Y	1	16	0.001758549	$3,566.41	T
874179	$1,097,063	NA	$1,160,000	$2,257,063	7	S	0.00011	$248	Y	0.002	Y	1	36	0.003952386	$8,920.79	R
874212	$415,507	$291,626	$1,160,000	$1,867,134	6	S	0.00011	$205	N	0.002	Y	1	33	0.003623618	$6,765.78	R
874215	$1,206,348	$3,384,605	$2,900,000	$7,490,953	7	S	0.00011	$824	N	0.002	Y	1	31	0.003404379	$25,502.05	R
874216	$1,629,815	$3,726,373	$2,900,000	$8,256,188	6	S	0.00011	$908	N	0.002	Y	1	47	0.005156941	$42,576.68	R
874218	$133,055	$33,819	$580,000	$746,874	6	S	0.00011	$82	N	0.002	Y	1	15	0.00164873	$1,231.39	T

Bridge Number	Bridge Replacement Cost	Detour Cost	Loss of Life Cost	Total Cost of Failure	Scour Vulnerability	Overtopping Frequency	Annual Probability of Failure	Annual Unadjusted Risk	High Priority	MPL	Meets MPL	K1	Remaining Life	Lifetime Probability of Failure	Unadjusted Lifetime Risk	Scour Mode
874225	$284,790	$96,105	$580,000	$960,896	7	S	0.00011	$106	N	0.002	Y	1	32	0.003514005	$3,376.59	R
874236	$175,942	NA	$580,000	$755,942	7	S	0.00011	$83	Y	0.002	Y	1	32	0.003514005	$2,656.38	R
874238	$498,197	$3,659,853	$2,900,000	$7,058,050	8	S	0.0000022	$16	Y	0.002	Y	1	26	5.71984E-05	$403.71	R
874242	$323,625	$234,513	$1,160,000	$1,718,138	7	S	0.00011	$189	N	0.002	Y	1	32	0.003514005	$6,037.55	R
874250	$456,243	$1,174,756	$1,160,000	$2,791,000	6	S	0.00011	$307	N	0.002	Y	1	32	0.003514005	$9,807.59	R
874265	$388,350	$329,504	$1,160,000	$1,877,855	7	S	0.00011	$207	N	0.001	Y	1	33	0.003623618	$6,804.63	R
874307	$174,088	$225,170	$580,000	$979,258	7	O	0.00017	$166	Y	0.001	Y	1	15	0.002546968	$2,494.14	R
874308	$456,062	$71,916	$580,000	$1,107,978	7	S	0.00011	$122	N	0.002	Y	1	32	0.003514005	$3,893.44	R
874310	$1,183,342	$4,380,075	$2,900,000	$8,463,417	6	S	0.00011	$931	N	0.002	Y	1	32	0.003514005	$29,740.49	R
874315	$158,043	NA	$0	$158,043	6	O	0.00017	$27	N	0.0001	N	1	26	0.00441062	$697.07	R
874317	$495,075	$227,975	$1,160,000	$1,883,050	6	S	0.00011	$207	N	0.0001	N	1	22	0.002417207	$4,551.72	R
874319	$523,637	NA	$1,160,000	$1,683,637	7	S	0.00011	$185	Y	0.0001	N	1	41	0.004500092	$7,576.52	R
874334	$3,131,835	$5,194,118	$2,900,000	$11,225,953	7	S	0.00011	$1,235	N	0.0001	N	1	32	0.003514005	$39,448.05	@
874336	$2,742,143	$5,592,646	$2,900,000	$11,234,789	7	S	0.00011	$1,236	N	0.0005	Y	1	30	0.003294742	$37,015.73	@
874337	$2,976,133	$3,546,669	$2,900,000	$9,422,802	7	S	0.00011	$1,037	N	0.002	Y	1	63	0.006906421	$65,077.84	@
874342	$388,350	$312,833	$1,160,000	$1,861,183	7	S	0.00011	$205	N	0.002	Y	1	33	0.003623618	$6,744.22	R
874350	$284,790	$140,562	$580,000	$1,005,352	7	S	0.00011	$111	N	0.0002	Y	1	32	0.003514005	$3,532.81	R
874352	$284,790	$92,837	$580,000	$957,627	7	S	0.00011	$105	N	0.002	Y	1	32	0.003514005	$3,365.11	R
874355	$391,066	$311,362	$1,160,000	$1,862,428	7	S	0.00011	$205	N	0.002	Y	1	32	0.003514005	$6,544.58	R
874356	$391,066	$440,075	$1,160,000	$1,991,141	7	S	0.00011	$219	N	0.002	Y	1	33	0.003623618	$7,215.14	R
874357	$323,079	$173,166	$1,160,000	$1,656,245	7	S	0.00011	$182	N	0.002	Y	1	32	0.003514005	$5,820.05	R
874386	$1,201,759	$2,026,353	$2,900,000	$6,128,112	7	S	0.00011	$674	N	0.0002	Y	1	30	0.003294742	$20,190.55	@
874414	$1,358,179	$2,612,871	$2,900,000	$6,871,050	6	S	0.00011	$756	N	0.001	Y	1	31	0.003404379	$23,391.66	R
874422	$716,954	$3,273,752	$2,900,000	$6,890,706	6	S	0.00011	$758	N	0.0005	Y	1	32	0.003514005	$24,213.98	R
874423	$883,519	$6,241,901	$2,900,000	$10,025,420	7	S	0.00011	$1,103	N	0.0002	Y	1	32	0.003514005	$35,229.38	R
874433	$997,049	$588,401	$1,160,000	$2,745,450	7	S	0.00011	$302	N	0.0002	Y	1	30	0.003294742	$9,045.55	R
874437	$461,675	$364,533	$1,160,000	$1,986,208	7	S	0.00011	$218	N	0.0005	Y	1	32	0.003514005	$6,979.54	R
874440	$372,056	$385,399	$1,160,000	$1,917,455	7	S	0.00011	$211	N	0.0002	Y	1	32	0.003514005	$6,737.95	R
874441	$365,641	$350,957	$1,160,000	$1,876,598	7	S	0.00011	$206	N	0.0005	Y	1	32	0.003514005	$6,594.37	@
874443	$496,074	$2,287,050	$2,900,000	$5,683,124	7	S	0.00011	$625	N	0.002	Y	1	32	0.003514005	$19,970.53	@
874444	$456,243	$984,490	$1,160,000	$2,600,733	6	S	0.00011	$286	N	0.002	Y	1	32	0.003514005	$9,138.99	R
874445	$453,528	$1,198,769	$1,160,000	$2,812,296	7	S	0.00011	$309	N	0.002	Y	1	32	0.003514005	$9,882.42	R
874446	$662,639	$1,073,291	$2,900,000	$4,635,930	7	S	0.00011	$510	N	0.0005	Y	1	32	0.003514005	$16,290.68	R
874447	$667,134	$871,107	$1,160,000	$2,698,242	7	S	0.00011	$297	N	0.0002	Y	1	32	0.003514005	$9,481.64	R
874448	$454,242	$189,435	$1,160,000	$1,803,676	7	S	0.00011	$198	N	0.002	Y	1	31	0.003404379	$6,140.40	R
874455	$372,555	NA	$580,000	$952,555	7	S	0.00011	$105	Y	0.002	Y	1	32	0.003514005	$3,347.28	R
874456	$835,440	$429,048	$1,160,000	$2,424,487	6	S	0.00011	$267	N	0.002	Y	1	32	0.003514005	$8,519.66	R
874476	$576,157	$668,532	$1,160,000	$2,404,689	7	S	0.00011	$265	Y	0.002	Y	1	33	0.003623618	$8,713.68	R
874479	$133,539	$776	$0	$134,315	4	S	0.0005	$67	N	0.002	Y	1	33	0.016368679	$2,198.56	@
874494	$302,714	$328,401	$580,000	$1,211,115	7	S	0.00011	$133	N	0.0005	Y	1	35	0.003842809	$4,654.08	@
874541	$19,785,531	$3,046,616	$2,900,000	$25,732,147	6	S	0.00011	$2,831	Y	0.002	Y	1	15	0.00164873	$42,425.37	T
874542	$8,718,382	$2,120,222	$2,900,000	$13,738,604	6	S	0.00011	$1,511	Y	0.002	Y	1	51	0.0055946	$76,862.00	T
874544	$49,137,035	NA	$2,900,000	$52,037,035	4	O	0.0006	$31,222	Y	0.002	Y	1	15	0.008962298	$466,371.42	T
874545	$96,988,434	NA	$2,900,000	$99,888,434	7	S	0.00011	$10,988	Y	0.0002	Y	1	51	0.0055946	$558,835.85	T
874712	$3,292,282	$2,179,377	$2,900,000	$8,371,659	6	S	0.00011	$921	N	0.002	Y	1	22	0.002417207	$20,236.03	T
875102	$2,753,193	$12,838,244	$2,900,000	$18,491,437	6	S	0.00011	$2,034	Y	0.001	Y	1	24	0.002636663	$48,755.69	T
875103	$6,570,517	$12,838,244	$2,900,000	$22,308,760	6	S	0.00011	$2,454	Y	0.001	Y	1	29	0.003185092	$71,055.46	T
875800	$822,587	$2,306,991	$2,900,000	$6,029,578	6	S	0.00011	$663	N	0.001	Y	1	36	0.003952386	$23,831.22	M
875801	$825,490	$5,196,196	$2,900,000	$8,921,685	7	S	0.00011	$981	N	0.002	Y	1	36	0.003952386	$35,261.95	R
875802	$1,390,456	$2,466,287	$2,900,000	$6,756,743	8	S	0.0000022	$15	N	0.002	Y	1	36	7.9197E-05	$535.11	R
875803	$1,864,118	$3,460,385	$2,900,000	$8,224,502	7	S	0.00011	$905	N	0.002	Y	1	36	0.003952386	$32,506.41	R
875805	$310,780	$19,391	$0	$330,171	8	S	0.0000022	$1	N	0.0001	Y	1	71	0.000156188	$51.57	R
876100	$3,219,082	NA	$1,160,000	$4,379,082	6	O	0.00017	$744	Y	0.0001	N	1	15	0.002546968	$11,153.38	T
876417	$187,081	$658,887	$1,160,000	$2,005,969	6	O	0.00017	$341	N	0.0001	N	1	15	0.002546968	$5,109.14	R
876705	$1,380,124	$2,003,995	$2,900,000	$6,284,119	6	S	0.00011	$691	N	0.0005	Y	1	15	0.00164873	$10,360.82	T
876726	$1,460,285	$1,877,179	$2,900,000	$6,237,463	7	S	0.00011	$686	N	0.0005	Y	1	40	0.004390575	$27,386.05	T
876727	$1,169,545	$0	$1,160,000	$2,329,545	6	S	0.00011	$256	Y	0.0005	Y	1	41	0.004500092	$10,483.17	T
876728	$1,628,270	$1,431,367	$1,160,000	$4,219,637	7	S	0.00011	$464	N	0.0001	N	1	49	0.005375795	$22,683.90	T
876735	$2,616,283	$2,620,231	$2,900,000	$8,136,513	7	S	0.00011	$895	N	0.0001	N	1	55	0.006032066	$49,079.99	T
877301	$654,960	NA	$1,160,000	$1,814,960	6	S	0.00011	$200	Y	0.002	Y	1	36	0.003952386	$7,173.42	T
877302	$338,062	NA	$1,160,000	$1,498,062	6	R	0.000077	$115	Y	0.0002	Y	1	21	0.001615756	$2,420.50	T
877500	$4,181,357	$4,986,143	$2,900,000	$12,067,500	7	S	0.00011	$1,327	N	0.0002	Y	1	22	0.002417207	$29,169.64	M
877501	$3,305,954	$1,416,850	$2,900,000	$7,622,805	7	S	0.00011	$839	N	0.0005	Y	1	28	0.003075431	$23,443.41	M
878500	$1,342,416	$1,015,462	$1,160,000	$3,517,877	6	S	0.00011	$387	N	0.0005	Y	1	47	0.005156941	$18,141.49	T
880002	$1,081,393	$1,249,474	$2,900,000	$5,230,867	6	R	0.000077	$403	Y	0.0002	Y	1	15	0.001154378	$6,038.40	R
880005	$13,864,067	$1,688,778	$1,160,000	$16,712,845	5	R	0.00018	$50	N	0.0005	Y	1	30	0.00538593	$90,014.21	T
880062	$544,973	$885,138	$1,160,000	$2,590,111	5	S	0.00024	$9	Y	0.0001	N	1	15	0.003593958	$9,308.75	R
880077	$116,124,250	$4,951,566	$2,900,000	$123,975,816	7	R	0.000077	$9,546	Y	0.0005	Y	1	45	0.003459137	$428,849.30	T
890093	$6,604,667	$4,049,213	$1,160,000	$11,813,880	7	S	0.00011	$1,300	N	0.0005	Y	1	46	0.005047497	$59,630.52	R
890107	$28,032,064	$18,646,320	$2,900,000	$49,578,384	7	S	0.00011	$5,454	Y	0.0005	Y	1	51	0.0055946	$277,371.24	T
890138	$2,370,649	$8,536,066	$2,900,000	$13,806,715	7	R	0.000077	$1,063	Y	0.0002	Y	1	53	0.004072841	$56,232.55	T
894059	$608,371	$1,171,898	$1,160,000	$2,940,270	8	S	0.0000022	$6	N	0.002	Y	1	73	0.000160587	$472.17	T
900020	$36,394,574	NA	$0	$36,394,574	4	O	0.0006	$21,837	N	0.0005	N	1	15	0.008962298	$326,179.02	T
900803	$98,890	NA	$0	$98,890	3	O	0.0016	$158	N	0.0005	N	1	33	0.051470402	$5,089.91	T
904025	$2,073,323	$2,208,776	$2,900,000	$7,182,099	6	S	0.00011	$790	Y	0.001	Y	1	31	0.003404379	$24,450.59	T
904110	$758,182	NA	$1,160,000	$1,918,182	4	S	0.0005	$959	Y	0.0005	N	1	21	0.010447666	$20,040.52	T
904120	$379,828	NA	$1,160,000	$1,539,828	6	S	0.00011	$169	Y	0.0005	Y	1	23	0.002526941	$3,891.05	T
904140	$82,252	$9,063,821	$1,160,000	$10,306,073	6	O	0.00017	$1,752	Y	0.0002	Y	1	41	0.006946354	$71,589.63	T
904152	$169,006	NA	$580,000	$749,006	7	S	0.00011	$82	Y	0.0002	Y	1	57	0.006250727	$4,681.83	T

Bridge Number	Bridge Replacement Cost	Detour Cost	Loss of Life Cost	Total Cost of Failure	Scour Vulnerability	Overtopping Frequency	Annual Probability of Failure	Annual Unadjusted Risk	High Priority	MPL	Meets MPL	K1	Remaining Life	Lifetime Probability of Failure	Unadjusted Lifetime Risk	Scour Mode
904153	$570,655	NA	$1,160,000	$1,730,655	7	S	0.00011	$190	Y	0.002	Y	1	27	0.002965757	$5,132.70	T
904155	$1,060,912	NA	$1,160,000	$2,220,912	7	S	0.00011	$244	Y	0.002	Y	1	34	0.00373322	$8,291.15	T
904160	$351,173	$776	$0	$351,948	6	S	0.00011	$39	N	0.002	Y	1	34	0.00373322	$1,313.90	T
904250	$121,272	NA	$1,160,000	$1,281,272	6	S	0.00011	$141	Y	0.001	Y	1	26	0.002856071	$3,659.40	T
904255	$808,290	NA	$580,000	$1,388,290	7	O	0.00017	$236	Y	0.0005	Y	1	49	0.008296104	$11,517.40	T
904260	$519,174	NA	$580,000	$1,099,174	7	S	0.00011	$121	Y	0.0005	Y	1	49	0.005375795	$5,908.93	T
904305	$159,058	$543,575	$1,160,000	$1,862,633	7	S	0.00011	$205	N	0.0002	Y	1	26	0.002856071	$5,319.81	T
904307	$132,548	$200,612	$1,160,000	$1,493,160	7	S	0.00011	$164	N	0.0002	Y	1	26	0.002856071	$4,264.57	T
904310	$192,724	NA	$1,160,000	$1,352,724	6	S	0.00011	$149	Y	0.0005	Y	1	31	0.003404379	$4,605.19	T
904320	$16,725,648	NA	$1,160,000	$17,885,648	6	S	0.00011	$1,967	Y	0.0005	Y	1	33	0.003623618	$64,810.76	T
904490	$11,527,493	NA	$580,000	$12,107,493	4	S	0.0005	$6,054	Y	0.0005	N	1	26	0.012919074	$156,417.60	T
904495	$409,233	NA	$1,160,000	$1,569,233	6	S	0.00011	$173	Y	0.0005	Y	1	33	0.003623618	$5,686.30	T
904510	$202,900	NA	$1,160,000	$1,362,900	7	O	0.00017	$232	Y	0.002	Y	1	31	0.005256584	$7,164.20	T
904512	$202,900	NA	$1,160,000	$1,362,900	6	O	0.00017	$232	Y	0.002	Y	1	33	0.005594768	$7,625.11	T
904515	$178,552	NA	$580,000	$758,552	7	O	0.00017	$129	Y	0.002	Y	1	33	0.005594768	$4,243.92	T
904517	$178,552	$5,125,625	$580,000	$5,884,177	7	O	0.00017	$1,000	Y	0.001	Y	1	33	0.005594768	$32,920.60	T
904540	$238,017	NA	$1,160,000	$1,398,017	7	O	0.00017	$238	Y	0.001	Y	1	43	0.007283964	$10,183.11	T
904600	$1,835,837	NA	$1,160,000	$2,995,837	6	S	0.00011	$330	Y	0.002	Y	1	33	0.003623618	$10,855.77	T
904602	$345,476	NA	$1,160,000	$1,505,476	7	O	0.00017	$256	Y	0.002	Y	1	21	0.003563938	$5,365.42	T
904603	$189,282	NA	$1,160,000	$1,349,282	6	O	0.00017	$229	Y	0.002	Y	1	21	0.003563938	$4,808.76	T
904604	$253,878	NA	$1,160,000	$1,413,878	6	O	0.00017	$240	Y	0.002	Y	1	21	0.003563938	$5,038.97	T
904606	$252,376	NA	$1,160,000	$1,412,376	6	S	0.00011	$155	Y	0.0005	Y	1	21	0.002307461	$3,259.00	T
904908	$254,986	NA	$580,000	$834,986	6	S	0.00011	$92	Y	0.0005	Y	1	61	0.006687905	$5,584.31	T
904910	$69,501	NA	$0	$69,501	7	S	0.00011	$8	Y	0.002	Y	1	28	0.003075431	$213.75	T
904980	$2,657,580	$5,066,418	$1,160,000	$8,883,999	6	O	0.00017	$1,510	Y	0.0005	Y	1	34	0.005763816	$51,205.74	T
904982	$846,396	$5,066,418	$1,160,000	$7,072,814	6	O	0.00017	$1,202	Y	0.002	Y	1	35	0.005932837	$41,961.85	T
904984	$850,868	$5,066,418	$1,160,000	$7,077,286	7	O	0.00017	$1,203	Y	0.002	Y	1	35	0.005932837	$41,988.38	T
904986	$840,918	$5,069,603	$1,160,000	$7,070,520	7	O	0.00017	$1,202	Y	0.0005	Y	1	35	0.005932837	$41,948.24	T
904990	$20,013,653	$5,831,298	$1,160,000	$27,004,951	6	O	0.00017	$4,591	Y	0.002	Y	1	35	0.005932837	$160,215.96	T
910006	$3,063,473	$2,603,737	$2,900,000	$8,567,210	7	S	0.00011	$942	Y	0.002	Y	1	38	0.004171505	$35,738.16	R
910057	$1,346,817	$7,005,050	$2,900,000	$11,251,867	7	S	0.00011	$1,238	Y	0.0005	Y	1	38	0.004171505	$46,937.22	R
910065	$3,146,506	$11,000,080	$2,900,000	$17,046,586	7	S	0.00011	$1,875	Y	0.002	Y	1	38	0.004171505	$71,109.92	R
910066	$3,080,954	$7,005,050	$2,900,000	$12,986,004	7	S	0.00011	$1,428	Y	0.002	Y	1	38	0.004171505	$54,171.18	R
910072	$439,387	$2,633,285	$1,160,000	$4,232,672	6	S	0.00011	$466	Y	0.002	Y	1	15	0.00164873	$6,978.53	R
910073	$293,931	$2,382,496	$1,160,000	$3,836,427	6	S	0.00011	$422	Y	0.0001	N	1	15	0.00164873	$6,325.23	R
910074	$283,045	$2,257,101	$1,160,000	$3,700,146	7	S	0.00011	$407	Y	0.0005	Y	1	15	0.00164873	$6,100.54	R
910075	$973,919	$2,006,312	$1,160,000	$4,140,231	6	S	0.00011	$455	Y	0.0001	N	1	15	0.00164873	$6,826.12	R
910076	$1,003,885	$7,899,854	$1,160,000	$10,063,739	6	S	0.00011	$1,107	Y	0.0001	N	1	15	0.00164873	$16,592.39	R
910077	$563,047	$7,649,065	$1,160,000	$9,372,111	7	S	0.00011	$1,031	Y	0.0001	N	1	15	0.00164873	$15,452.08	R
910081	$4,920,162	$56,574,258	$2,900,000	$64,394,420	7	S	0.00011	$7,083	Y	0.0002	Y	1	49	0.005375795	$346,171.19	R
914001	$490,125	$115,907	$580,000	$1,186,032	6	S	0.00011	$130	N	0.0002	Y	1	23	0.002526941	$2,997.03	R
914013	$185,045	$392,267	$1,160,000	$1,737,312	6	S	0.00011	$191	N	0.0001	N	1	37	0.004061952	$7,056.88	R
914015	$195,650	NA	$1,160,000	$1,355,650	6	S	0.00011	$149	Y	0.0005	Y	1	28	0.003075431	$4,169.21	R
914016	$797,396	$1,180,345	$1,160,000	$3,137,741	6	S	0.00011	$345	Y	0.0005	Y	1	37	0.004061952	$12,745.35	R
914017	$1,414,130	NA	$580,000	$1,994,130	5	S	0.00024	$7	Y	0.0001	N	1	38	0.009079624	$18,105.95	R
914022	$923,701	NA	$1,160,000	$2,083,701	6	S	0.00011	$229	Y	0.0002	Y	1	23	0.002526941	$5,265.39	R
914023	$527,758	$1,080,701	$580,000	$2,188,459	6	S	0.00011	$241	N	0.0002	Y	1	36	0.003952386	$8,649.64	R
914024	$453,144	$125,886	$580,000	$1,159,030	6	S	0.00011	$127	N	0.0001	N	1	35	0.003842809	$4,453.93	R
914025	$417,983	$31,858	$580,000	$1,029,840	6	S	0.00011	$113	N	0.0001	N	1	35	0.003842809	$3,957.48	R
924001	$541,012	NA	$580,000	$1,121,012	6	S	0.00011	$123	Y	0.0002	Y	1	38	0.004171505	$4,676.31	R
924002	$439,855	NA	$580,000	$1,019,855	7	S	0.00011	$112	Y	0.0002	Y	1	38	0.004171505	$4,254.33	R
924007	$403,802	NA	$0	$403,802	4	O	0.0006	$242	Y	0.0005	N	1	39	0.023135203	$9,342.04	R
924014	$164,973	NA	$0	$164,973	7	O	0.00017	$28	Y	0.002	Y	1	29	0.004918285	$811.38	R
924015	$58,123	NA	$0	$58,123	6	S	0.00011	$6	Y	0.0002	Y	1	44	0.004828571	$280.65	R
924030	$231,743	$1,139,520	$2,900,000	$4,271,263	6	S	0.00011	$470	N	0.0002	Y	1	23	0.002526941	$10,793.23	R
924037	$927,657	$4,739,182	$2,900,000	$8,566,839	6	S	0.00011	$942	N	0.0002	Y	1	26	0.002856071	$24,467.50	R
924038	$374,834	$3,159,847	$2,900,000	$6,434,680	5	S	0.00024	$22	N	0.0005	Y	1	39	0.009317444	$59,954.77	R
924045	$636,325	$1,891,432	$1,160,000	$3,687,756	6	S	0.00011	$406	N	0.0005	Y	1	32	0.003514005	$12,958.79	R
924046	$625,438	$2,392,050	$1,160,000	$4,177,489	3	S	0.0013	$5,431	N	0.002	Y	1	22	0.028212973	$117,859.38	R
924049	$742,613	$2,073,760	$2,900,000	$5,716,373	5	S	0.00024	$19	N	0.002	Y	1	23	0.005505452	$31,471.22	R
924051	$584,351	$1,891,432	$1,160,000	$3,635,783	6	S	0.00011	$400	N	0.002	Y	1	21	0.002307461	$8,389.43	R
924071	$835,440	$3,402,027	$1,160,000	$5,397,467	6	S	0.00011	$594	N	0.0005	Y	1	24	0.002636663	$14,231.30	R
924113	$706,091	$21,889,380	$1,160,000	$23,755,471	7	S	0.00011	$2,613	N	0.002	Y	1	31	0.003404379	$80,872.64	R
924114	$891,136	$21,889,380	$1,160,000	$23,940,515	7	S	0.00011	$2,633	N	0.0005	Y	1	31	0.003404379	$81,502.60	R
924115	$1,585,053	$21,889,380	$1,160,000	$24,634,432	6	S	0.00011	$2,710	N	0.002	Y	1	31	0.003404379	$83,864.95	R
924117	$825,958	$15,635,271	$1,160,000	$17,621,229	6	S	0.00011	$1,938	N	0.002	Y	1	31	0.003404379	$59,989.35	R
924141	$540,220	$2,652,693	$1,160,000	$4,352,913	7	S	0.00011	$479	Y	0.0005	Y	1	38	0.004171505	$18,158.20	R
924145	$2,244,976	$1,648,758	$1,160,000	$5,053,734	6	S	0.00011	$556	N	0.002	Y	1	49	0.005375795	$27,167.84	R
924148	$1,447,393	$42,352,764	$2,900,000	$46,700,157	7	R	0.000077	$3,596	N	0.002	Y	1	51	0.00391945	$183,038.93	R
924150	$1,028,233	$18,928,064	$2,900,000	$22,856,297	7	R	0.000077	$1,760	Y	0.002	Y	1	47	0.003612598	$82,570.62	R
924152	$2,626,833	$1,427,928	$2,900,000	$6,954,762	7	S	0.00011	$765	Y	0.0005	Y	1	57	0.006250727	$43,472.32	R
924153	$1,929,857	$1,891,189	$2,900,000	$6,721,047	7	R	0.000077	$518	N	0.002	Y	1	57	0.004379551	$29,435.17	R
924162	$20,497,241	$415,357	$2,900,000	$23,812,598	6	R	0.000077	$1,834	Y	0.002	Y	1	61	0.004686166	$111,589.80	R
924163	$20,497,241	$415,357	$2,900,000	$23,812,598	6	R	0.000077	$1,834	Y	0.002	Y	1	61	0.004686166	$111,589.80	R
924166	$1,848,011	$7,436,282	$2,900,000	$12,184,293	7	S	0.00011	$1,340	N	0.002	Y	1	59	0.00646934	$78,824.34	R
924167	$1,714,097	$15,501,334	$2,900,000	$20,115,431	6	R	0.000077	$1,549	Y	0.002	Y	1	60	0.004609521	$92,722.51	R
924168	$2,776,230	$5,819,610	$2,900,000	$11,495,840	7	R	0.000077	$885	N	0.002	Y	1	61	0.004686166	$53,871.42	R
924169	$4,532,748	$1,646,660	$2,900,000	$9,079,408	7	R	0.000077	$699	N	0.002	Y	1	60	0.004609521	$41,851.72	R
924172	$426,581	NA	$1,160,000	$1,586,581	7	S	0.00011	$175	N	0.002	Y	1	61	0.006687905	$10,610.90	R

Bridge Number	Bridge Replacement Cost	Detour Cost	Loss of Life Cost	Total Cost of Failure	Scour Vulnerability	Overtopping Frequency	Annual Probability of Failure	Annual Unadjusted Risk	High Priority	MPL	Meets MPL	K1	Remaining Life	Lifetime Probability of Failure	Unadjusted Lifetime Risk	Scour Mode
924176	$2,727,222	$1,421,020	$2,900,000	$7,048,241	7	S	0.00011	$775	Y	0.002	Y	1	65	0.00712489	$50,217.94	R
924186	$3,497,304	$0	$1,160,000	$4,657,304	7	O	0.00017	$792	N	0.002	Y	1	71	0.011998463	$55,880.49	R
930004	$36,612,817	$8,809,220	$2,900,000	$48,322,037	6	R	0.000077	$3,721	N	0.002	Y	1	22	0.001692631	$81,791.38	T
930026	$18,866,627	$1,801,509	$2,900,000	$23,568,136	7	S	0.00011	$2,592	Y	0.002	Y	1	15	0.00164873	$38,857.50	T
930056	$20,048,547	$7,694,496	$1,160,000	$28,903,043	7	S	0.00011	$3,179	Y	0.002	Y	1	35	0.003842809	$111,068.88	T
930059	$768,053	$2,604,937	$2,900,000	$6,272,990	6	R	0.000077	$483	N	0.002	Y	1	31	0.002384245	$14,956.35	T
930061	$1,546,158	$1,377,827	$2,900,000	$5,823,985	7	S	0.00011	$641	N	0.002	Y	1	41	0.004500092	$26,208.47	T
930064	$24,157,950	$4,325,888	$2,900,000	$31,383,838	7	R	0.000077	$2,417	N	0.002	Y	1	18	0.001385093	$43,469.54	T
930094	$27,155,602	$9,894,745	$2,900,000	$39,950,347	6	S	0.00011	$4,395	Y	0.002	Y	1	16	0.001758549	$70,254.63	T
930097	$25,045,284	$5,508,131	$2,900,000	$33,453,415	4	R	0.0004	$13,381	N	0.002	Y	1	16	0.006380836	$213,460.75	T
930106	$24,741,795	$2,458,387	$2,900,000	$30,100,182	7	R	0.000077	$2,318	Y	0.002	Y	1	32	0.002461061	$74,078.40	T
930154	$20,210,211	$1,011,842	$2,900,000	$24,122,052	7	R	0.000077	$1,857	N	0.002	Y	1	37	0.002845055	$68,628.56	T
930157	$55,853,501	$4,430,804	$2,900,000	$63,184,304	4	R	0.0004	$25,274	N	0.002	Y	1	15	0.005983229	$378,046.17	T
930214	$25,718,943	$2,423,143	$2,900,000	$31,042,086	7	S	0.00011	$3,415	Y	0.002	Y	1	33	0.003623618	$112,484.68	T
930226	$20,210,211	$1,011,842	$2,900,000	$24,122,052	7	R	0.000077	$1,857	N	0.002	Y	1	37	0.002845055	$68,628.56	T
930227	$2,205,551	$4,604,696	$2,900,000	$9,710,247	6	S	0.00011	$1,068	N	0.0005	Y	1	28	0.003075431	$29,863.19	T
930322	$86,447,031	$26,385,986	$2,900,000	$115,733,018	6	S	0.00011	$12,731	Y	0.002	Y	1	47	0.005156941	$596,828.40	T
930339	$32,057,062	$7,877,833	$2,900,000	$42,834,895	7	R	0.000077	$3,298	N	0.0005	Y	1	41	0.003152143	$135,021.72	T
930349	$32,008,942	$1,229,194	$2,900,000	$36,138,135	7	R	0.000077	$2,783	Y	0.002	Y	1	48	0.00368932	$133,325.14	T
934347	$630,425	$3,847,884	$2,900,000	$7,378,309	7	S	0.00011	$812	Y	0.002	Y	1	55	0.006032066	$44,506.45	T
934408	$16,418,117	$8,969,655	$2,900,000	$28,287,772	4	S	0.0005	$14,144	Y	0.002	Y	1	15	0.007473807	$211,417.34	T
934464	$1,062,570	$905,506	$2,900,000	$4,868,076	7	S	0.00011	$535	Y	0.0002	Y	1	32	0.003514005	$17,106.44	T
934908	$48,368,633	$3,307,432	$2,900,000	$54,576,064	7	R	0.000077	$4,202	Y	0.0005	Y	1	53	0.004072841	$222,279.61	T
936653	$195,858	NA	$580,000	$775,858	6	S	0.00011	$85	Y	0.0005	Y	1	21	0.002307461	$1,790.26	T
940007	$1,298,558	$3,872,455	$2,900,000	$8,071,013	7	S	0.00011	$888	N	0.002	Y	1	29	0.003185092	$25,706.92	R
940015	$769,747	$1,949,927	$1,160,000	$3,879,674	6	S	0.00011	$427	Y	0.0005	Y	1	25	0.002746373	$10,655.03	R
940029	$1,646,976	$393,395	$1,160,000	$3,200,370	5	S	0.00024	$11	N	0.0005	Y	1	28	0.006698272	$21,436.95	T
940045	$37,635,582	$23,168,506	$2,900,000	$63,704,088	6	R	0.000077	$4,905	N	0.0005	Y	1	29	0.002230594	$142,097.99	T
940067	$416,959	$154,226	$1,160,000	$1,731,185	6	S	0.00011	$190	N	0.002	Y	1	24	0.002636663	$4,564.55	R
940094	$50,501,176	$12,168,165	$2,900,000	$65,569,341	7	R	0.000077	$5,049	N	0.0005	Y	1	40	0.00307538	$201,650.63	T
940157	$2,007,802	$22,705,946	$2,900,000	$27,613,748	9	R	0.0000011	$30	Y	0.0005	Y	1	73	8.02968E-05	$2,217.30	R
940158	$1,016,434	$2,834,004	$1,160,000	$5,010,438	8	S	0.0000022	$11	Y	0.002	Y	1	74	0.000162787	$815.63	R
945007	$239,266	$228,823	$1,160,000	$1,628,088	6	S	0.00011	$179	N	0.0005	Y	1	27	0.002965757	$4,828.51	R

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Appendix D

The following items are included in Appendix D:

- List of historical bridge standard drawings

List of Historical Bridge Standard Drawings

Please contact Charles Boyd at charles.boyd@dot.state.fl.us to report problems with this index.

Index Number	Sheet Number or suffix	Date	Sheet Title	Sheet Subtitle
227		1919	Standard Wooden Truss-48 Foot Span	
497		1921	Standard Wood Truss-16'-0" Roadway	
535		1922	Standard Wood Bridge-20`'-0" Roadway	
563	1 of 1	1922	Standard Concrete Slab Bridges-Span 8 ft to 20 ft-20 ft Roadway	Details of Existing Structures
581		1922	Standard Wood Bridge-18'-0" Roadway	
566		1926	Standard Concrete Box Culvert Spans 6'-0" to 10'-0"	
693	3	1926	Standard Slab Bridges	Reference Drawing No. 563
693	2	1926	Standard Slab Bridges	Reference Drawing No. 563
693	1	1926	Standard Slab Bridges	Reference Drawing No. 563
701		1927	Standard Slab Bridges	
722	1 of 2	1927	Standard Slab Bridges ~ Superstructure	Details of Existing Structure
723	3	1927	Standard Concrete Handrail	
724		1927	Standard Concrete Four Pile Bents	
722	2 of 2	1928	Standard Slab Bridges ~ Substructure	
792		1928	45' I-Beam Span Concrete Floor 20'-0" Roadway	
754	4	1929	Superstructure Details	
825		1930	Concrete Slab Approach	
837		1931	Double 6' x 5' x 46' Concrete Culvert for 4 : 1 Slopes	
839		1931	Standard Endwalls for Box Culverts	For Paved Sections .8' Cov.
844	2 of 2	1931	Slab Bridges ~ Substructure 16'-0" Span 24'-0" Roadway	
844	1 of 2	1931	Slab Bridges ~ Substructure 24' Roadway	
755	2 of 2	1932	Standard Timber Bridge - 20' RDWY.	
755	1 of 2	1932	Standard Timber Bridge - 20' RDWY.	
826	1 of 2	1932	Standard Timber Bridge - 24' RDWY	15' Span
854		1932	Standard Timber Pile Bent	
859		1932	Superstructure for Standard I-Beam Span Span 25'-0" 24'-0" Roadway	
861	2 of 2	1932	Superstructure Details Standard I-Beam Span 28'-0" Span 20'-0" Roadway	
861	1 of 2	1932	Superstructure Details Standard I-Beam Span 28'-0" Span 20'-0" Roadway	
884	2 of 2	1932	Standard Timber Bridges 24' RDWY	18' Span
884	1 of 2	1932	Standard Timber Bridges 24' RDWY	18' Span
889	2 of 2	1932	Concrete D.G. Superstructure 24' Roadway 30'-0" Span	Design Loading 2-Typ. 15 Ton Trucks Plus 30% Impact
899	1 of 2	1932	Concrete Pile Bent Superstructure 30' Rdway. 2-5' Sidewalks 30'-0" Span	
899	2 of 2	1932	Concrete D.G. Superstructure 30' Rdway. 2-5' Sidewalks 30'-0" Span	
924	1 of 1	1932	Standard Timber Bridge	15' Span 20' RDWY.
940	1 of 3	1932	270'-0" Swing Span ~ 24'-0" Roadway	
940	2 of 3	1932	270'-0" Swing Span ~ 24'-0" Roadway	
940	3 of 3	1932	270'-0" Swing Span ~ 24'-0" Roadway	
918		1933	Standard I-Beam Superstructure Span 20'-0" 24'-0" Roadway	
971		1933	Standard Timber Pile Bent	
976		1933	Sextuple Concrete Box Culvert	Spans 6'-0" , 8'-0" AND 10'-0" 1½ : 1 Slope
993		1933	Standard Concrete D.G. Superstructure 23' -0" Span 24'-0" Roadway	
1005	2 of 2	1933	159'-11 3/4" Span-24' Roadway	
1005	1 of 2	1933	159'11¾" Span - 24' Roadway	
1008		1933	Concrete Culvert	1 1/2 : 1 Slopes-6',8',10' Spans
1010	1 of 1	1933	Standard I-Beam Superstructure-25'-0" Span-24'-0" Roadway	For Use on Construction over Salt Water
1022	2 of 2	1933	120'-0 1/4" Span-24' Roadway	
1022	1 of 2	1933	120'-0¼" Span - 24' Roadway	
1026	1 o f 2	1933	120'-0" Truss Span 24' Roadway	
1026	2 of 2	1933	120'-0" Truss Span 24' Roadway	
1038	3 of 3	1933	283'-11 1/2" Swing Span-24' Rdwy	
1038	2 of 3	1933	283'-11 1/2" Swing Span-24' Rdwy	
1038	1 of 3	1933	283'-11 1/2" Swing Span-24' Rdwy	
889	1 of 2	1934	Concrete (5 Pile) Substructure 24' Roadway 30'-0" Span	
1033	1 of 1	1934	Cantilever Suspended Type I-Beam Superstr-Spans: 66',83',66',-Rdwy:24'-0"-8" Concrete Slab	

1042	2 of 2	1934	I-Beam Span Superst. Details-25'-0" Span-24'-0" Roadway	For use on Salt Water Construction
1042	1 of 2	1934	I-Beam Span-Superstructure Details-25'-0" Span-24'-0" Roadway	
1044	2 of 2	1934	Standard I-Beam Superstructure-20'-0" Span-24'-0" Roadway	For use on Salt Water Construction
1044	1 of 2	1934	Timber Pile Bent	
1046	1 of 2	1934	Standard Timber Pile Bent	
1046	2 of 2	1934	Standard I-Beam Superstructure Span 25'-0" 24'-0" Roadway	
1047	2 of 2	1934	Standard I-Beam Superstructure Span 20'-0" 24'-0" Roadway	
1050	1050	1934	Standard Cypress Bridge	15' Span 24' RDWY
1059		1934	Concrete (5-Pile) Substructure 24'-0" Roadway 33'-0" Span	For Details Superstructure See Index No. 933
1064		1934	Standard I-Beam Superstructure Span 20'-0" 24'-0" Roadway	
1075	2 of 2	1934	Standard I-Beam Superstruct. Span 28'-0" 24'-0" Roadway	
1075	1 of 2	1934	Standard I-Beam Superstruct. Span 28'-0" 24'-0" Roadway	
1077		1934	Standard I-Beam Superstructure Span 25'-0" 24'-0" Roadway	
1098	2 of 2	1934	Standard I-Beam Superstruct. Span 20'-0" 24'-0" Roadway	
1098	1 of 2	1935	Standard I-Beam Superstruct. Span 20'-0" 24'-0" Roadway	
1124		1935	Standard I-Beam Superst.	Cantilever-Suspended Type Spans: 66'-83'-66' RDWY.: Slab 7½" for use over Fresh Water
1129		1935	U-Endwalls for Pipe Culverts	
1130		1935	Standard I-Beam Superstructure Span 40'-0" 24' Roadway	
1154		1935	Cantilever-Suspended Type I-Beam Supers. 20' RDWY. 56'-70'-56' Spans 7½" Slab	
1195	5	1935	Concrete D.G. Superstructure 36' Span 24' Roadway	
826	2 of 2	1936	Standard Timber Bridge - 24' RDWY	15' Span
947	1 of 2	1936	Details for I Beam Span Span = 45'-0" Roadway = 24'-0"	Details of Superstructure
1047	1 of 2	1936	Timber Pile Bent use with Superstructure - Index 1047 for Construction over Salt Water	
1050	2 of 2	1936	Standard Cypress Bridge	15'-0" Span 24'-0" RDWY
1058	1 of 2	1936	Standard Timber 4-Pile Bent for Construction over Fresh Water	
1149		1936	Concrete Deck Girder 24' Roadway 36' Span	
1159		1936	Standard Timber Pile Bent 4 Piles 20' Roadway	
1160		1936	I-Beam Superstr. For Salt Water Constr. 25'-0" Span 20'-0" Roadway	
1226		1936	Miscellaneous Bridges	Substructure and Superstructure
1231	3 of 3	1936	180'-0" Swing Span-24'-0" Rdwy	
1231	2 of 3	1936	180'-0" Swing Span-24'-0" Rdwy	
1231	1 of 3	1936	180'-0" Swing Span-24'-0" Rdwy	
1246		1936	Standard 26 ft Superstructure	Details of 26' Superstructure
1247		1936	Standard 32 ft Superstructure	Details 32' Superstructure
1265	1 of 1	1936	Standard Concrete D.G. Superstructure-38'-0" Span-24'-0" Roadway	
1275	2 of 2	1936	Standard I-Beam Superstructure-25'-0" Span-Skew 30° Rt Fwd-24'-0"Rdwy	
947	2 of 2	1937	Details for I Beam Span Span 45'-0" Roadway 24'-0"	Details of Superstructure
1058	2 of 2	1937	Standard I-Beam Superstructure 15'-0" Span 24'-0" Roadway	
1092		1937	Standard I-Beam Superstructure Span 39'-0" 24'-0" Roadway	
1121		1937	Standard I-Beam Superstructure Span 40'-0" 24' Roadway	
1297	2 of 3	1937	220'-0" Swing Span-24' Rdwy	
1297	1 of 3	1937	220'-0" Swing Span-24' Rdwy	
1297	3 of 3	1937	220'-0" Swing Span-24' Rdwy	
1312	1 of 1	1937	Stnd. 36' I-Beam Superstr.	
1318	1 of 1	1937	Steel H-Pile Bent-24 ft Roadway	
1319	1 of 1	1937	Standard 25' I-Beam Span-24' Roadway-Fresh Water Construction	
1322	1 of 1	1937	Treated Timber Pile Bent	24 ft Roadway
1323	1 of 1	1937	Standard I-Beam Superstructure-25'-0" Span-24'-0" Roadway	
1324	1 of 1	1937	Standard 6 Pile Bent (Treated Timber)	26 ft Roadway
1325	1 of 1	1937	Standard 25' I-Beam Span-26' Rdwy-Fresh Water	

1333	1 of 1	1937	Treated Timber Pile Bent	24 ft Roadway
1334	1 of 1	1937	Stand. 20' I-Beam Span-24'-0" Roadway-Fresh Water	
1339	1 of 1	1937	Standard 20 ft I-Beam Span-28 ft Roadway-Fresh Water	
1342	1 of 1	1937	Standard Slab Bridge-10 ft Span-28 ft Roadway	
1349	1 of 1	1937	Standard 25 ft I-Beam Span-24 ft Roadway-Fresh Water	
1350	1 of 1	1937	Standard 6 Pile Bent (Treated Timber)	24 ft Roadway
1354	1 of 1	1937	Standard Slab Bridge-10 ft Span-28 ft Rdwy. Skew=30° Rt. Fwd.	
1364		1937	Standard Steel H-Pile Bent-24 ft Roadway	
1365		1937	Standard 34' I-Beam Span-24' Roadway-Fresh Water	
1366		1937	Standard Endwall for Pipe Culverts	
1367		1937	70' Deck Plate Girder Span-24'-0" Roadway-Fresh Water	
1043		1938	Standard Guard Rail-"Empire" Type	
1244	1 of 1	1938	Concrete Handrail	Type "C"
1338	1 of 1	1938	Standard 5-Pile Steel Bent-24 ft Roadway	
1373	1 of 1	1938	Standard Conc. D.G. Superstructure-26'-0" Span-24'-0" Roadway	
1374	1 of 1	1938	Standard Conc. D.G. Superstructure-32'-0" Span-24'-0" Roadway	
1376	1 of 1	1938	Standard Conc. D. G. Superstructure 30'-0" Span 24'-0" Roadway	
1378	1 of 1	1938	Standard 25 Ft. I-Beam Span 24 Ft. Roadway - Fresh Water	
1381	3 of 3	1938	Trunnion Type Bascule 80'-0" Clear Channel Opening 24'-0" Roadway 1-5'-0" Sidewalk	Details of Main Girder
1381	2 of 3	1938	Trunnion Type Bascule 80'-0" Clear Channel Opening 24'-0" Roadway 1-5'-0" Sidewalk	Details of Main Girder
1381	1 of 3	1938	Trunnion Type Bascule 80'-0" Clear Channel Opening 24'-0" Roadway 1-5'-0" Sidewalk	
1392	2 of 2	1938	Stnd. Conc. D.G. Superstr. 30 Ft. Span 24 Ft. RDWY.	
1392	1 of 2	1938	Standard Pile Bent 30' Span - 24' Roadway	
1395	2 of 2	1938	Standard Concr. D.G. Superstructuct. 35 Ft. Span 26 Ft. Roadway	
1395	1 of 2	1938	Concrete Pile Bent 35 Ft. Span - 26 Ft. RDWY.	
1398	1 of 1	1938	Standard I-Beam Superstructure-20'-0" Span-24'-0" Roadway	
1401	1 of 1	1938	Standard I-Beam Superstructure-53 ft Span-24 ft Roadway	
1402	1 of 1	1938	Standard I-Beam Superstructure-45 ft Span-24 ft Roadway	
1407	1 of 1	1938	Standard I-Beam Superstructure-70 ft Span-24 ft Roadway	
1408	1 of 1	1938	Standard Approach Slab-No Skew-Spillway-24' Roadway	
1409	1 of 1	1938	Standard Steel H-Pile Bent-24' Rdwy	
1410	1 of 1	1938	Standard I-Beam Superstructure-45 ft Span-24 ft Roadway	
1420	1 of 1	1938	Standard 5 Pile Bent (Treated Timber)	24 ft Roadway
1421	1 of 1	1938	Standard 25 Ft. I-Beam Span 24 Ft. Roadway Fresh Water	
1425	1 of 1	1938	Standard 36 ft I-Beam Superstructure-Freshwater-24 ft Roadway	
1427	1 of 1	1938	Steel H-Pile Bent-36 ft Span-24 ft Roadway	Fresh Water Construction
1433	1 of 1	1938	Standard I-Beam Superstructure for Widening Existing Timber Bridges-15'-0" Span-28'-0" Roadway	
1440	1 of 1	1938	Pile Lagging for 10" Steel Piles	
1441	1 of 1	1938	Standard I-Beam Superstructure 15'-0" Span 24'-0" RDWY.	
1442	1 of 1	1938	Steel H-Pile Bent 36 Ft. Span 24 Ft. R'DW'Y Treated Timber Bulkhead	
1451	1 of 1	1938	Steel H-Pile Bent 36 Ft. Span 24 Ft. R'DW'Y. Salt Water Constr.	
1457	1 of 4	1938	Bob Tail Swing Span	Typical Sections Through Span
1457	2 of 4	1938	Bob Tail Swing Span	Long Arm of Main Girder
1457	3 of 4	1938	Bob Tail Swing Span	Short Arm of Main Girder
1457	4 of 4	1938	Bob Tail Swing Span	Flooring Details at Ends of Swing Span
1476	1 of 1	1939	Standard 25 Ft. I-Beam Span 28 Ft. Roadway Fresh Water	
1477	1 of 1	1939	Standard Concrete Pile Bent using 14"Sq. Piles, 28' Roadway, 25' Span	
1478	1 of 1	1939	Standard 5 Pile Bent (Treaded Timber)	28 Ft. Roadway
1480	1 of 2	1939	Standard Concrete Pile Bent 25' Span - 30' RDWY.	
1480	2 of 2	1939	Standard Concrete D.G.Superstr. 25' Span - 30' RDWY.	
1484	1 of 1	1939	Standard I-Beam Superstructure 36' Span 28' Roadway	
1485	1 of 1	1939	Steel H-Pile Bents for use with Index 1484 36 Ft. Span 28 Ft. Roadway Fresh Water Constr.	

1486	1 of 1	1939	Standard I-Beam Superstructure 70' Span 28' Roadway	
1490	1 of 1	1939	Standard Slab Superstructure ~ 15 Ft. Span	
1491	1 of 1	1939	Standard H-Pile Abutment fpr 15 Ft. Slab Span - 24' & 26' Roadway	
1492	1 of 1	1939	Standard H-Pile Intermediate Bent for 15 Ft. Slab Span - 24 Ft. Roadway	
1502	1 of 1	1939	Standard 36' I-Beam Superstructure ~ 24'-0" Roadway	Superstructure for Fresh or Salt Water Constructuion (See General Plan & Elevation)
1505	1 of 1	1939	Teated Timber substructure	
1511	1 of 4	1939	Standard 36' I-Beam Superstructure-24' Roadway	Superstructure for Salt Water Construction
1511	2 of 4	1939	Standard 36' I-Beam Superstructure ~ 24' Roadway	Superstructure for Salt Water Construction (Span Adjoining Swing Span)
1511	4 of 4	1939	End, Intermediate & Tower Bents 36 Ft. Span - 24 Ft. RDWY.-Salt Water	
1513	1 of 6	1939	Plate Girder Swing Span-210 ft C-C End Wedges-24' Rd'y	Machinery Layout
1513	2 of 6	1939	Plate Girder Swing Span-210 ft C-C End Wedges-24' Rd'y	Typical Sections Thru Span
1513	3 of 6	1939	Plate Girder Swing Span-210 ft C-C End Wedges-24' Rd'y	Main Girder
1513	4 of 6	1939	Plate Girder Swing Span-210 ft C-C End Wedges-24' Rd'y	Main Girder
1513	5 of 6	1939	Plate Girder Swing Span-210 ft C-C End Wedges-24' Rd'y	Machinery Details
1518	2 of 2	1939	Standard I-Beam Superstructure-25'-0" Span-Skew 30° Lt Fwd-24'-0"Rdwy	
1518	1 of 2	1939	Standard I-Beam Superstucture 25'-0" Span ~ 30˚ Skew Lt. FWT 24'-0" RDWY	
1524	1 of 3	1939	Trunnion Type Bascule	Stresses and Member Sizes
1524	2 of 3	1939	Trunnion Type Bascule	Longitudinal Girder
1524	3 of 3	1939	Trunnion Type Bascule	Longitudinal Girder
1527	1 of 1	1939	Standard Slab Superstructure 15 Ft. Span - 30 Ft. RDWY.	
1522	1 of 1	1940	Standard I-Beam Superstucture 48 Ft. Span 24 Ft. Roadway	
1529	1 of 1	1940	Standard 39' I-Beam Span Superst. 28 Ft. Roadway 4 Ft. Sidewalk	
1530	1 of 1	1940	Standard Steel Pile Bent 28 Ft. Roadway 4 Ft. Sidewalk	
1532	1 of 4	1940	Plate Girder Swing Span 150 Ft. C.-C. End Wedges - 28 Ft. R'DW'Y.	General Layout
1532	2 of 4	1940	Plate Girder Swing Span 150 Ft. C.-C. End Wedges - 28 Ft. R'DW'Y.	Typical Section Thru Span
1532	3 of 4	1940	Plate Girder Swing Span 150 Ft. C.-C. End Wedges - 28 Ft. R'DW'Y.	Longitudinal Girder
1532	4 of 4	1940	Plate Girder Swing Span 150 Ft. C.-C. End Wedges - 28 Ft. R'DW'Y.	Machinery Layout
1538	1 of 1	1940	Five Pile Steel Bent 24' RDWY	
1544	1 of 1	1940	Span Adjoining Bascule	
1548	1 of 1	1940	Standard 25 Ft. I-Beam Span 24 Ft. Roadway - Salt Water	
1550		1940	Standard 25 ft I-Beam Span-24' Rdwy for Salt & Fresh Water Construction	
1551	1 of 1	1940	Steel H-Pile Bent-25 ft Span-24 ft Roadway-Salt or Fresh Water Constr.	
1556	1 of 1	1940	Standard I-Beam Superstruct.-30 ft Span-Freshwater-28 ft Roadway	
1558	1 of 6	1940	Plate Girder Swing Span-220' C-C End Wedges-24 ft Roadway-5' Sidewalk	Table of Stresses, Est. Quant. And Gen'l Notes
1558	2 of 6	1940	Plate Girder Swing Span-220' C-C End Wedges-24 ft Roadway-5' Sidewalk	General Layout
1558	3 of 6	1940	Plate Girder Swing Span-220' C-C End Wedges-24 ft Roadway-5' Sidewalk	Typical Sections Thru Roadway
1558	4 of 6	1940	Plate Girder Swing Span-220' C-C End Wedges-24 ft Roadway-5' Sidewalk	Details of Long Girder
1558	5 of 6	1940	Plate Girder Swing Span-220' C-C End Wedges-24 ft Roadway-5' Sidewalk	Details of Long Girder
1558	6 of 6	1940	Plate Girder Swing Span-220' C-C End Wedges-24 ft Roadway-5' Sidewalk	Machinery Details
1559	3 of 3	1940	Details of Span Adjoining Swing Span	
1559	1 of 3	1940	Standard 39' I-Beam Span Superstr.-24' Roadway-5'-0"Sidewalk	Salt Water Construction
1560	1 of 2	1940	Concrete Pile Bents-24' Roadway-5' Sidewalk	Salt Water Construction
1564	1 of 4	1940	208' Swing Span-24' Roadway	Table of Stresses, Member Diagram, General Notes and Est. Quantities
1564	2 of 4	1940	208' Swing Span-24' Roadway	Typical Sections Thru Roadway

1568	1 of 1	1940	Standard Slab Superstructure-10 ft Span-24 ft Roadway	
1569	1 of 1	1940	Standard Conc. Handrail for Use on 15' Slab Spans	
1570	1 of 1	1940	Treated Timber Substructure	
1575	1 of 5	1940	Plate Girder Swing Span 170' C-C End Wedges 24 Ft. Roadway 5 Ft. Sidewalk	Table of Stresses, Est. Quant. And Genl. Notes
1575	2 of 5	1940	Plate Girder Swing Span 170' C-C End Wedges 24 Ft. Roadway 5 Ft. Sidewalk	General Layout
1575	3 of 5	1940	Plate Girder Swing Span 170' C-C End Wedges 24 Ft. Roadway 5 Ft. Sidewalk	Typical Section Thru Roadway
1575	4 of 5	1940	Plate Girder Swing Span 170' C-C End Wedges 24 Ft. Roadway 5 Ft. Sidewalk	Details of Longitudinal Girder
1575	5 of 5	1940	Plate Girder Swing Span 170' C-C End Wedges 24 Ft. Roadway 5 Ft. Sidewalk	Machinery Layout
1582	1 of 2	1940	Standard 43' Span I-Beam Superstr. 24' Roadway 5' Sidewalk	
1583	1 of 3	1940	Trunnion Type Bascule	General Layout and Estimated Quant.
1583	2 of 3	1940	Trunnion Type Bascule	Longitudinal Girder
1583	3 of 3	1940	Trunnion Type Bascule	Longitudinal Girder
1589	1 of 1	1940	Standard 15 Foot Span Slab Superstructure	
1591	1 of 1	1940	Standard Concrete Pile Bent-14" Sq. Piles, 26' Rdwy, 15 Span	(Freshwater Construction)
1631	1 of 1	1940	Standard Timber Bridge-One Lane	
1636	1 of 1	1940	Approach Slab	
1637	1 of 1	1940	Standard 40' I-Beam Superstructure-44 ft Roadway-5 ft Sidewalk	
1639	1 of 1	1940	28' Roadway Superelevated Section	Approach Slab
1645	1 of 1	1940	Standard Steel H-Pile Bent-8" @ 36# HP-26' Rdwy-15' Span	Freshwater Construction
1646	1 of 1	1940	Concrete Pile Bents-44' Roadway-5'-0" Sidewalk	
1740	2 of 2	1940	Plate Girder Swing Span-220' C.C. End Wedges-24 ft Roadway-2~4 ft Sidewalks	Typical Sections Thru Roadway
1740	1 of 2	1940	Plate Girder Swing Span-220' C.C. End Wedges-24 ft Roadway-2~4 ft Sidewalks	General Layout
1765	1 of 5	1940	Plate Girder Swing Span 220' C.C. End Wedges-24 ft Roadway-2~3'-3" Sidewalks	Table of Stresses, Estimated Quantities and General Notes
1765	2 of 5	1940	Plate Girder Swing Span 220' C.C. End Wedges-24 ft Roadway-2~3'-3" Sidewalks	General Layout
1765	3 of 5	1940	Plate Girder Swing Span 220' C.C. End Wedges-24 ft Roadway-2~3'-3" Sidewalks	Typical Sections Thru Roadway
1765	4 of 5	1940	Plate Girder Swing Span 220' C.C. End Wedges-24 ft Roadway-2~3'-3" Sidewalks	Details of Longitudinal Girder
1653	1 of 1	1941	Standard 36' I-Beam Span Superstr. 34' Roadway Two 5' Sidewalks	
1656	1 of 1	1941	Steel Pile Substructure 34' Roadway 36' Span	
1659	1 of 1	1941	Standard 15 Foot Span Slab Superstructure	Fresh Water Construction
1663	1 of 1	1941	Concrete Pile Substructure 34' Roadway ~ 36' Span	
1664	1 of 1	1941	Standard 36' I-Beam Span Superstr. 24' Roadway 4'-0" Sidewalk	
1665	1 of 1	1941	Concrete Pile Bents 24' Roadway - 4' Sidewalk	
1669	1 of 1	1941	Standard 30' I-Beam Span Superstr. 44' Roadway Two 5' Sidewalks	
1670	1 of 1	1941	Concrete Pile Bents - 44' R'W'D'Y Two 5' Sidewalks	
1671	1 of 1	1941	Concrete Pile Bent for 15 Ft. Slab Superstructure	
1672	1 of 1	1941	Standard 15 Ft. Span Slabs 2 - 5 Ft. Sidewalks	
1673	1 of 1	1941	Concrete Pile Bent for 15 Ft. Slab Superstructure	
1676	1 of 1	1941	Steel Pile Bent for 15 Ft. Slab Span Superstructure	
1680	1 of 1	1941	Standard 15 Ft. Slab Superstucture - 2 - 5 Ft. Sidewalks	
1681	1 of 1	1941	Standard Concrete Pile Bent 16" Sq. Piles, 44' RDWY., 2-5' Sidewalks	
1683	1 of 1	1941	Standard Steel Pile Bent 15' Slabs ~ 24 Ft. RDWY.	
1686	1 of 1	1941	Standard Timber Pile Bent with Concrete Cap-24' Rdwy-H:15 Loading	
1692	1 of 1	1941	28 ft Roadway-Superelevated Section with One 5 ft Sidewalk	Approach Slab
1695	1 of 1	1941	Standard 32 ft Span Concrete Deck Girder Superstructure	28 ft Roadway-H-20 Loading-Salt water Construction
1701	1 of 1	1941	Treated Timber Substructure	
1716	1 of 1	1941	Timber - Concrete - Composit Deck - 18 Ft. Span - 24 Ft. RDWY.	

1718		1941	Standard Substructure Details for Widening Exist. Timber Bridges	
1719	1 of 1	1941	Standard Timber Truss-60 ft Span-20 ft Roadway	
1727	1 of 1	1941	Standard Timber Truss-50 ft Span-24 ft Roadway	
1738	1 of 1	1941	Standard Concr. D.G. Superstr.-30 ft Span-24 ft Rdwy-4 ft Sidewalk	
1716	1 of 1	1942	Timber Concrete Composite Deck-24 ft Roadway-18 ft Span	
1745	1 of 1	1942	Details of Concrete Pile Bents	For use with Superstructure, Index No. 1738
1759	1 of 2	1942	Standard Conc. D. G. Superstr. 30 Ft. Span 24 Ft. Roadway	
1759	2 of 2	1942	Standard Conc. Pile Bents 30 Ft. Span 24 Ft. Roadway	
1764	1 of 1	1942	Concrete Pile Bents 24' Roadway; 2-3'-3" Sidewalk	
1765	5 of 5	1942	Plate Girder Swing Span 220' C-C End Wedges 24 Ft. Roadway 2-3'-3" Sidewalk	
1766	1 of 2	1942	Standard 36 ft I-Beam Span Superstructure-24 ft Roadway-2~3'-3" Sidewalks	Salt Water Construction
1771	1 of 1	1942	St'n'd Timber Pile Bent with Concrete Cap	
1772	1 of 1	1942	Standard Slab Superstructure-15 ft Span: 20',22',24' &26' Rdwy	20' to 26' Roadway-Salt Water Construction
1774	1 of 1	1942	Standard 15 ft Span Slab Superstructure-With or Without 5 ft Sidewalk	For Fresh Water Construction
1781	1 of 1	1942	Standard Slab Superstructure-15 ft Span-24 ft Roadway	H20 Salt Water Construction
1782	1 of 2	1942	Concrete Pile Bents-24' Roadway-2~3'-3" Sidewalks	End and Intermediate Bents
1782	2 of 2	1942	Concrete Pile Bents-24' Roadway-2~3'-3" Sidewalks	Details of Tower Bents
1783	1 of 3	1942	Standard Conc. D.G. Superstructure-36'-0" Span-24'-0" Roadway-2~3'-3" S. Walks	
1783	2 of 3	1942	Details of Span Adjacent Swing Span, Details of Safety Gate Brackets	
1784	1 of 1	1942	Standard Conc. D.G. Superstructure-42 ft Span-24 ft Roadway	
1797	1 of 2	1942	Standard Conc. Pile Bent Substr.-26 ft Roadway-36 ft Span	
1797	2 of 2	1942	Standard Conc. D.G. Superstructure-26 ft Roadway-36 ft Span	
1799	1 of 1	1942	Standard Treated Timber Bridge-2o ft Span-10'-8" Roadway	
1800	1 of 1	1942	Standard Treated Timber Bridge 20 Ft. Span - 18'-8" Roadway	
1801	2 of 2	1942	Standard Slab Superstructure 15 Ft. Span 30 Ft. Roadway	
1801	1 of 2	1942	Standard Timber Pile Bent 15 Ft. Span 30 Ft. Roadway	
1804	2 of 2	1942	Standard Treated Timber Bridge 24 Ft. Roadway - 15 Ft. Span	
1804	1 of 2	1942	Standard Treated Timber Bridge 24 Ft. Roadway - 15 Ft. Span	
1805	2 of 2	1942	Standard Cypress Bridge 24 Ft. Roadway - 15 Ft. Span	
1805	1 of 2	1942	Standard Cypress Bridge 24 Ft. Roadway - 15 Ft. Span	
1806	2 of 2	1942	Standard Treated Timber Bridge 20 Ft. Roadway - 15 Ft. Span	
1806	1 of 2	1942	Standard Treated Timber Bridge 20 Ft. Roadway - 15 Ft. Span	
1807	2 of 2	1942	Standard 15 Ft. Span Slab Superstructure	
1807	1 of 2	1942	Standard 15 Ft. Span Slab Superstructure	
1809	2 of 2	1942	Standar Treated Timber Bridge 26 Ft. Roadway - 15 Ft. Span	
1809	1 of 2	1942	Standard Treated Timber Bridge 26 Ft. Roadway - 15 Ft. Span	
1813	2 of 2	1942	Standard Treated Timber Bridge 30 Ft. Roadway - 15 Ft. Span	
1813	1 of 2	1942	Standard Treated Timber Bridge 30 Ft. Roadway - 15 Ft. Span	
1818	1 of 1	1942	Timber-Concrete Composite Deck-26' Roadway-14' Span	
1819	1 of 1	1942	Standard Treated Timber Bulkhead-26 ft Roadway	
1820	2 of 2	1942	Standard Treated Timber Bridge-24 ft Roadway-15 ft Span	
1820	1 of 2	1942	Standard Treated Timber Bridge-24 ft Roadway-15 ft Span	
1821	1 of 1	1942	Timber-Concrete Composite Deck-26'-0" Roadway-18'-0" Span	
1870	1 of 2	1942	Standard Treated Timber Bridge 26' Roadway 15' Span	
1870	2 of 2	1942	Standard Treated Timber Bridge 26 Ft. Roadway 15 Ft.Span	
1899	2 of 2	1942	Standard Timber Bridge 20 Ft. Roadway - 15 Ft. Span	

1613	E 2 of 2	1943	Standard Concrete Box Culverts	Triple 10 Ft. Span Culvert 7 Ft., 8 Ft., 9 Ft. & 10 Ft. Heights
1830	1 of 2	1943	Standard Slab Bridge-15 ft Span-30 ft Roadway	Details of Bents
1830	2 of 2	1943	Standard Slab Bridge-15 ft Span-30 ft Roadway	Details of Superstructure
1839	2 of 2	1943	Standard 25 ft I-Beam Span Superstructure -25' Rdwy-2~3 ft S.W.S.	
1850	1 of 1	1943	Standard Cypress Bridge	26' Roadway 15' Span
1853	1 of 1	1943	Std 25 ft I-Beam Span Superstr.-16" x 16" Conc. Piles-24 ft Rdwy-2~3 ft Sidewalks	
1858	1 of 1	1943	Standard I-Beam Superst.-35' and 40' Spans-26' Roadway	
1859	1 of 1	1943	Concrete Pile Bent-26 ft Roadway-15 ft Span	
1861	1 of 3	1943	Concrete Pile Bents-26 ft Roadway-30 ft Span	End and Intermediate Bents
1861	2 of 3	1943	Concrete Pile Bent-26 ft Roadway-30 ft Span	Tower Bent
1861	3 of 3	1943	Standard Conc. D.G. Superstructure-26 ft Roadway-30 ft Span	
1864	1 of 1	1943	Standard Pile Bent-15'-0" Span-30'-0" Roadway	
1868	1 of 3	1943	Standard Concr. Pile Bent Substr.-37'-6" Span-24' Rdwy-Two 3'-6" Sidewalks	Details of Intermed. And End Bents
1868	2 of 3	1943	Standard Concr. Pile Bent Substr.-37'-6" Span-26' Rdwy-Two 3'-6" S'dw'ks	Details of Tower Bent
1868	3 of 3	1943	Standard Concrete D.G. Superstr.-37'-6" Span-26' Rdwy-Two 3'-6" Sidewalks	
1871	1 of 3	1943	Standard Concr. Pile Bent Substr.-36'-0" Span-24' Rdwy-Two 3'-9" Sidewalks	End and Intermediate Bents
1871	3 of 3	1943	Standard Concrete D.G. Superstructure-36 Span-24'Rdwy-Two 3'-9" Sidewalks	
1883	1 of 2	1943	Concrete Pile Bents 26 Ft. Roadway - 35 Ft. & 40 Ft. Spans	
1883	2 of 2	1943	Concrete Pile Bents 26 Ft. R'DWAY - 35 Ft. & 40 Ft. Spans	
1860	1 of 1	1944	Standard Slab Superstructure-15 ft Span-26 ft Roadway	For Fresh Water or Salt Water Construction
1882	1 of 2	1944	Standard Conc. Pile Bent Substr.-26 ft Roadway-36 ft Span	
1882	2 of 2	1944	Standard Conc. D.G. Superstructure-26 ft Roadway-36 ft Span	
1884	1 of 1	1944	Standard Steel Pile Bent 23' & 40' Spans 26' Roadway	
1886	1 of 1	1944	Standard Steel Pile Bent 15' Slab Span 26' Roadway	
1889	1 of 2	1944	Precast Concrete Superstructure 15 Ft. Span 26 Ft. Roadway	
1889	2 of 2	1944	Concrete Pile Bent 15 Ft. Span 26 Ft. Roadway	
1899	1 of 2	1944	Standard Treated Timber Bridge 20' Roadway 15' Span	
1904	1 of 1	1944	Standard Detour Bridge	
1905	1 of 1	1944	Standard Slab Superstructure 15' Span ~ 24', 26', 28', 30' RDWY. ~ One 5' Sidewalk	
1906	2 of 3	1944	Standard Pile Bent Superstructure 31'-0" Span ~ 26' R'DW'Y ~ Two 3'-6" S'DW'KS.	Details of Tower Bent
1906	1 of 3	1944	Standard Concr. Pile Bent Substruct. 31'-0" Span - 26' RDWY - Two 3'-6" Sidewalks	Details of End and Intermediated Bents
1908	1 of 1	1944	Standard Timber Pile Bent 26 Ft. Roadway 15 Ft. Span	
1916	1 of 1	1944	Standard I-Beam Superstructure 40' Span : 26' Roadway	
1920	1 of 2	1944	Standard Concrete D.G. Superstr. 36' Span - 24' RDWY - RDWY - Two 3'-0" Sidewalks	
1693	1 of 2	1945	Standard 38' I-Beam Span Superstructure-26' Roadway	
1693	2 of 2	1945	Concrete Pile Bents-26 ft Roadway-38 ft Span	
1922	1 of 1	1945	66'-83'-66' Cantilever Suspended I-Beam Span Superstr ~ 26' RDWY	
1923	1 of 1	1945	Standard Steel Pile Bents 40' Span 26' Roadway	
1926	1 of 1	1945	70'-90'-80' Cantilever Suspended I-Beam Span Superstr ~ 26' RDWY ~ Two 3' Sidewalks	
1928	1 of 2	1945	Standard Concrete D.G. Superstr.-36'-0" Span-26' Rdwy-Two 3'-0" Sidewalks	
1928	2 of 2	1945	Standard Concr. Pile Bent Substruct.-36'-0" Span-26' Rdwy-Two 3'-0" Sidewalks	Details of Intermed. Tower and End Bents
1932		1945	Standard I-Beam Superstructure-50'-0" Span-26'-0" Roadway	
1933	1 of 1	1945	Standard Conc. D.G. Superstructure-26 ft Span-33 ft Span	
1937	1 of 2	1945	Standard Steel Pile Bent Substructure 30 Ft. Span 26 Ft. Roadway	For Salt Water Construction
1942	1 of 1	1945	Concrete Pile Bent-15 ft Span-26 ft Rdwy	
1947	1 of 1	1945	Standard Conc. D.G. Superstructure-28 ft Roadway-30 ft Span	For Salt Water and Fresh Water Construction

1948	1 of 1	1945	Standard Steel Pile Bent Substructure-30 ft Span-28 ft Roadway	Fresh or Salt Water Construction
1951	1 of 1	1945	Standard 15 ft Span Slab Superstructure	Fresh or Salt Water Construction
1956	1 of 2	1945	Concrete Pile Bent-25 ft Span-24 ft Rdwy	
1956	2 of 2	1945	Standard 25' I-Beam Span-24' Rdwy-Fresh Water Construction	
1964	1 of 3	1945	Standard Concrete Pile Bent Substr.-36'-0" Span-26' Rdwy-Two 3'-9" Sidewalks	End and Intermediate Bents
1964	2 of 3	1945	Standard Conc. Pile Bent Substr.-36'-0" Span-26' Rdwy-Two 3'-9" S.walks	Tower Bent
1964	3 of 3	1945	Standard Concrete D.G. Superstr.-36' Span-26' Rdwy-Two 3'-9" Sidewalks	For Fresh Water Construction
1969	1 of 1	1945	Standard Steel Pile Bent Substructure-33 ft Span-26 ft Roadway	For Fresh Water Construction
1973	1 of 1	1945	Standard I-Beam Superstructure-50'-0" Span-24'-0" Roadway	
1975	1 of 1	1945	Standard Conc. D.G. Superstructure-28 ft Roadway-33 ft Span	For Fresh or Salt Water Construction
1979	1 of 1	1945	Four Pile Concrete Bent Substruct. Intermed. And Tower Bents	28 ft Roadway-Fresh or Salt Water Construction-H15 or H20
1980	1 of 1	1945	Concrete Pile End Bent-28 ft Roadway-33 ft Span	
1985	1 of 1	1945	Standard Steel Pile Bents-15 ft Slab Span-24 ft Roadway	
1985	1 of 1	1945	Standard Steel Pile Bents-15 ft Slab Span-24 ft Roadway	
1990	3 of 3	1945	Standard Concrete D.G. Superstructure 35'-0" Span ~ 28' Roadway ~ One 3'-6" Sidewalk	
1988	1 of 1	1946	Standard Steel Pile Bent-36 ft Span-30 ft Roadway	End Bent
1989	1 of 1	1946	Standard Steel Pile Bent-33 ft Span-30 ft Roadway	End Bent
1990	2 of 3	1946	Standard Steel Pile Bent Substruct.-35'-0" Span-28'-0" Rdwy-One 3'-6" Sidewalk	Details of Intermediate Bents
1990	1 of 3	1946	Standard Steel Pile Bent Substruct.-35'-0" Span-28'-0" Rdwy-One 3'-6" Sidewalk	Details of End Bents
1996	1 of 1	1946	Standard Steel Pile Bent 33 Ft. Slab - 30 Ft. Roadway	
2004	1 of 1	1946	Standard Conc. D.G. Suprstr. 36'-0" Span 30'-0" Roadway	
2007	1 of 1	1946	Concret Pile Bent 15 Ft. Span 28 Ft. R'DW'Y.	
2009	2 of 2	1946	Standard Conr. Pile Bent 36 Ft. Span - 30 Ft. Roadway	Interm. And Tower Bents
2010	1 of 1	1946	Standard Conc. D.G. Suprstr. 36'-0 Span 30'-0" Roadway	
2011	1 of 1	1946	Standard Steel Pile Bents 15 Ft. Slab Span 28 Ft. Roadway	
2012	2 of 2	1946	Standard Steel Pile Bent 33' Span - 28' RDWY. - 2-3'-6" Walks	End Bent
2020	1 of 1	1946	Standard Concrete D.G. Superstr. 33'-0" Span, 28' RDWY., Two 3'-6" Sidewalks	
2028	1 of 1	1946	Standard 60' I-Beam Span Superstructure 30'-0" Roadway	Frech Water Construction
2036	1 of 1	1946	Standard Timber Pile Bent with Concrete Cap ~ 24'-0" RDW - 15' Span	
2041	1 of 1	1946	Standard H-Pile Abutment for 15 Ft. Slab Span ~ 28 Ft. Roadway	
2044	1 of 1	1946	Standard Steel Pile Bents 15 Ft. Slab Span ~ 26 Ft. Roadway	
2066	2 of 2	1946	Standard I-Beam Superstructure 32'-0" Span 28'-0" Roadway	
2066	1 of 2	1946	Concrete Pile Bents 24 Ft. RDWY - 32 Ft. Span	
2069	2 of 2	1946	Standard I-Beam Superstructure 32'-0" Span 28'-0" Roadway	
2069	1 of 2	1946	Concrete Pile Bents 28 Ft. RDWY - 32 Ft. Span	
2071	1A of 1	1946	Concrete Cap for Timber Piles 12' Roadway	
2071	1 of 1	1946	Standard 15 Ft. Span Slab Superstr. 12 Ft. Roadway	
2072	1 of 1	1946	Concrete Pile End Bent 28 Ft. Roadway 33 Ft. Span	
2080	1 of 1	1946	Standard Precast Concrete Pile Abutment ~ 15 Ft. Span 28 Ft. Roadway	
2083	1 of 1	1946	Widening 18 Ft. Clear Span Slab Bridge	Superstructure Details
2085	1 of 1	1946	Widening 16 Ft. Clear Span Slab Bridge	Superstructure Details
2087	2 of 2	1946	Steel Pile Bent 28 Ft. Roadway 33 Ft. Span	Intermediate and Tower Bent
2087	1 of 2	1946	Steel Pile Bent 28 Ft. Roadway 33 Ft. Span	End Bent
2093	1 of 1	1946	Standard Concrete Pile Bent 15 Ft. Span 28 Ft. Roadway	
2094	1 of 1	1946	Concrete Pile Bent 15 Ft. Span ~ 24 Ft. Roadway	
2098	1 of 1	1946	15 Ft. Span Superelevated Slab Superstructure	Special Details for 15 Ft. Slab with .03 Ft. Per Ft. Superelevation
2105	1 of 1	1946	Intermediate Bent Utilizing Existing Timber Piles	

2106	1 of 1	1946	Superelevated Slab Superstructure 26 Ft. Roadway 15 Ft. Span	
2108	1 of 1	1946	Concrete Abutment 26Ft. Roadway 15 Ft. Slab Span	
2120	1 of 1	1946	Standard I-Beam Span Superstructure 62'-0" Span ~ 44' Roadway ~ 2 ~ 6' Sidewalks	
2046	2 of 3	1947	Intermediate Pile Bent 40' Span - 44' R'DW'Y. - 2-6' S'D'W'K'.	
2046	1 of 3	1947	End Pile Bent 40' Span - 44' R'DW'Y. - 2-6' S'D'W'K'.	
2046	3 of 3	1947	Standard 40' I-Beam Span Superstr. 44' Roadway Two 6'-0" Sidewalks	
2136	1 of 1	1947	Concrete Pile Bents 28 Ft. RDWY - 62 Ft. Span	End and Interm. Bents
2138	1 of1	1947	Standard I-Beam Span Superstr. 62'-0" Span 28'-0" Roadway	
2144	1 of 1	1947	Standard Slab Superstructure-15' Span-24',26',28',30' Rdwy-Two 4' Sidewalks	
2150	1 of 1	1947	Standard Conc. D.G. Superstructure-28 ft Roadway-33 ft Span	For Fresh Water or Salt Water Construction
2150	A 1of 1	1947	Standard Concrete D.G. Superstructure 28 Ft. Roadway 33 Ft. Span	
2156	1 of 1	1947	Concrete Pile Bent-30° Skew-15 ft Span-28 ft Roadway	
2157	1 of 1	1947	Standard I-Beam Span Superstr.-44'-0" Span-28'-0" Roadway	
2158	1 of 1	1947	Standard 15 ft Span-Slab Superstructure on 30° Skew	Fresh or Salt Water Construction
2161	1 of 1	1947	Standard 15 ft Span-Slab Superstructure	Fresh or Salt Water Construction
2168	1 of 1	1947	Standard Steel Pile Bents 15 Ft. Slab Span 28 Ft. Roadway	
2179	2 of 2	1947	Standard Concrete D.G. Superst. 36 Ft. Span Dual 26 Ft. Roadway	
2181	1 of 1	1947	Widening 8 Ft. Clear Span Slab Bridge	Superstructure Details
2183	1 of 1	1947	Standard Concrete Pile Abutment - 15 Ft. Span, 35Ft. Slab Width	Details of Intermediate Bent
2187	1 of 1	1947	Standard Concrete Pile Abutment - 15 Ft. Span, 20 Ft. RDWY.	
2191	3 of 4	1947	Single Leaf Trunnion Type Bascule	Longitudinal Girder
2191	2 of 4	1947	Single Leaf Trunnion Type Bascule	Longitudinal Girder
2191	1 of 4	1947	Single Leaf Trunnion Type Bascule	Stresses and Member Sizes
2192	1 of 1	1947	Rest Bent for Single Leaf Bascule	
2201	1 of 1	1947	Standard I-Beam Superstructure 65'-0" Span 30'-0" Raodway	
2211	1 of 1	1947	Standard Steel Pile Bents 25 Ft. Span 24 Ft. Roadway	
2218	1 of 1	1947	Superelevated Slab Superstructure-24 ft Roadway-15 ft Span	Special Details for Spans on 1° Curve
2193-A	1 of 1	1947	Details of Approach Slab for 20'-0" Roadway	
1604	E 1 of 1	1948	Single Concrete Box Culverts	4 Ft. Span - 6 Ft. Heght
2184	CP40	1948	Standard Concrete Pile Bent-15 ft Span-40 ft Slab Width	Details of Intermediate Bent
2184	CP35	1948	Standard Concrete Pile Bent-15 ft Span-35 ft Slab Width	Details of Intermediate Bent
2184	SE	1948	15'-6" Span Slab Superstructure	Details of End Span
2184	SO	1948		Details of Superstructure
2223	1 of 1	1948	Details of Drainage Sump	
2224	S-S.3	1948	Standard 15 ft Span-Slab Superstructure	Special Details for Slabs-Superelevated 0.03 ft per ft
2224	CA28-2	1948	Concrete Pile Abutments-15 ft Slab Span-28' Roadway	
2224	TP24	1948	Timber Pile Bents-15 ft Span-24 ft Roadway	
2224	SE	1948	Standard 15 ft Span-Slab Superstructure	Details of Intermediate & End Spans
2224	SS428	1948	Std. 15 ft Span-28 ft Rdwy-Slab Superstructure	Special Details for Slabs to be Superelevated .04 ft per ft
2224	S	1948	Standard 15 Ft. Span Slab Superstructure	
2237	S	1948	15 ft Span Slab Superstructure	
2237	SE	1948	15 ft 6 in Span Slab Superstructure	Details of End Span
2239	S	1948	Standard 15 Ft. Span Slab Superstructure	
2239	S S E 2	1948	Standard 15 Ft. Span 28 Ft. Roadway	Special Details - Intermed. & End Spans Slab Superelevated 0.02' Per Ft.
2239	S. E.	1948	Standard 15 Ft. Span Slab Superstructure	Details of Intermediate & End Spans
2243	S. E.	1948	Standard 15 Ft. Span Slab Superstructure	Details of Intermediate & End Spans (To Be Constructed One Half at a Time)
2248	C P - 24	1948	Standard 40' I-Beam Span - 24 Ft. Roadway	Details of End Bents & Intermediate Bents
2248	S	1948	Standard 40 Ft. I-Beam Span - 24 Ft. Roadway	Superstructure Details
2251	1 of 1	1948	66'-83-66 Cantilever Suspended I-Beam Span Superstructure-24 Ft. RDWY.	
2260	1 of 1	1948	Details of Concrete Sheet Piling Bulkhead	
2270	CP24	1948	Concrete Pile Bent-25 ft Span-24 ft Roadway	

2270	S	1948	Standard 25 ft I-Beam Span-24 ft Rdwy-fresh water Construction	
2281	2 of 2	1948	Concrete D.G. Superstructure-36'-0" Span-24'-0" Roadway-2~3'-0" Sidewalks	Superelevated .03' per ft
2281	1 of 2	1948	Concrete Pile Bents-36'-0" Span-24'-0" Rdwy-2~3'-0" Sidewalks	Details of End Bents & Intermediate Bents-Superelevated .03 ft per ft
2287	CP28	1948	Standard 36 ft I-Beam Span-28 ft Roadway	Details of End Bents & Intermediate Bents
2287	S	1948	Standard 36 ft I-Beam Span-28 ft Roadway-Fresh Water	
2288	1 of 1	1948	Standard 44 ft I-Beam Span-28 ft Roadway	
2294	1 of 5	1948	Concrete D.G. Superstructure-36'-0" Span-24'-0" Roadway-2~3'-0" Sidewalks	
2297	1 of 1	1948	Standard Concrete Handrail	
2305	S	1948	Standard 50 ft I-Beam Span-28 ft Roadway-Fresh Water	
2307	TP24	1948	Timber Pile Bents-25 ft Span-24 ft Roadway	
2308	TP24	1948	Timber Pile Bents-15 ft Span-24 ft Roadway	
2308	TPA24	1948	Concrete Abutment-15 ft Span-24 ft Roadway	
2308	S	1948	Standard Slab Superstructure-15 ft Span-24 Roadway	
2321	2 of 2	1948	Standard I-Beam Superstructure-28 ft Span-28 ft Roadway-1~4 ft Sidewalk	
2321	1 of 2	1948	Concrete Pile Bents-28'-0" Span-28'-0" Rdwy-1~4'-0" S.W.	Details of End Bents and Intermediate Bents
2326	S	1948	Standard Slab Superstructure-15' Span-24 ft Roadway	
2326	TP 24	1948	Timber Pile Bents 15 Ft. Span 24 Ft. Roadway	
2797	S	1948	Standard Slab Superstructure-15' Span-24 ft Roadway	
3170	S	1948	Standard Slab Superstructure 15' Span 24 Ft. Roadway	
2184	1 of 1	1949	15 ft Span Slab Superstructure	
2224	CP24	1949	Concrete Pile Bents-15 ft Span 24 ft Roadway	
2224	CP24-5	1949	Concrete Pile Bents-15 ft Span-24 ft Roadway	Superelevated 0.05 ft per ft
2224	S-S.5	1949	Standard 15 ft Span-Slab Superstructure	Special Details for Slabs-Superelevated 0.05 ft per ft
2255	1 of 1	1949	Details of Approach Slab for 28 Ft. Roadway Superelevated	
2264	1 of 1	1949	Details of Approach Slab for 24'-0" Roadway; Superelevated	
2270	TP24	1949	Timber Pile Bents-25 ft Span-24 ft Roadway	
2304	3 of 3	1949	Concrete Deck Girder Span 36'-0" Span ~ 28'-0" RDWY. ~ 2-3'-6" Sidewalks	Half End Elevation of 36 Ft. C.D.G. Span at Bascule Piers & at Bents Adjacent to Bascule Piers & Special Details fo Span with Safety Gate & Light Seat
2304	2 of 3	1949	Concrete Deck Gired Span 36'-0" Span ~ 28'-0" RDWY. ~ 2'-3'-6" Sidewalks	
2304	1 of 3	1949	Concrete Pile Bents 36'-0" Span ~ 28'-0" RDWY. ~ 2-3'-6" S. W.	
2307	S	1949	Standard I-Beam Superstructure 25Ft. Span 24Ft. Roadway	
2332	CP24	1949	Concrete Pile Bent-25 ft Span-24 ft Roadway	
2334	S	1949	Standard 41 ft I-Beam Span-28 ft Roadway	
2335	CP28	1949	Standard 30 ft I-Beam Span-28 ft Roadway	Details of End and Intermediate Bents
2335	S	1949	Standard 30 ft I-Beam Span-28 ft Roadway	
2337	TP20	1949	Timber Pile Bents-15 ft Span-20 ft Roadway	
2337	S	1949	Standard Slab Superstructure-15 ft Span-20 ft Roadway	
2346	S	1949	Standard Slab Superstructure-15 ft Span-20 ft Roadway	
2346	TP20	1949	Timber Pile Bents-15 ft Span-20 ft Roadway	
2350	SP24E	1949	Steel Pile Bent-24 ft Roadway-35 ft Span	End Bent
2350	S	1949	Composite I-Beam Superstructure-35 ft Span-24 ft Roadway	
2350	CP24	1949	Concrete Pile Bents-24 ft Roadway-35 ft Span	Details of End Bents and Intermediate Bents
2350	ST24 I	1949	Steel Pile Bent-24 ft Roadway-35 ft Span	
2359	CP28	1949	Concrete Pile Bent-36 ft Span-28 ft Roadway-2~3'-6" Sidewalks	
2359	S	1949	Concrete Deck Girder Span-36'-0" Span-28'-0" Rdwy-2~3'-6" Sidewalks	
2365	1 of 1	1949	Composite I-Beam Superstucture 62 Ft. Span 24 Ft. Roadway	
2366	1 of 1	1949	Precast Units 15 Ft. Slab Spab ~ 24 Ft. Roadway	
2370	1 of 1	1949	Elementary Wiring Detail	Double Leaf Bascule
2381	2 of 2	1949	Standard I-Beam Superstructure-40'-0" Span-28'-0" Rdwy-2~ 3'-0" Sidewalks	
2381	1 of 2	1949	Concrete Pile Bents-28 ft Roadway-40 ft Span	Details of End Bents and Typical Intermediate Bents
2382	1 of 1	1949	Standard I-Beam Superstructure-50'-0" Span-28'-0" Rdwy-2~3'-0" Sidewalks	

2398	S	1949	Standard Slab Superstructure-15 ft Span-31 ft Roadway	
2398	CP31	1949	Standard Concrete Pile Bent-15 ft Span-31 ft Roadway	
2401	SP28 I	1949	Steel Pile Bent-28 ft Roadway-35 ft Span	Intermediate Bent
2401	SP28E	1949	Steel Pile Bent-28 ft Roadway-35 ft Span	End Bent
2401	S	1949	Composite I-Beam Superstructure-35 ft Span-28 ft Roadway	
2405	S	1949	Concrete Deck Girder Span-36'-0" Span-28'-0" Rdwy-2~3'-6" Sidewalks	
2408	CP28	1949	Concrete Pile Bents-36'-0" Span-28'-0" Rdwy-2~3'-6" S.W.	
2409	S	1949	Composite I-Beam Superstructure-63 ft Span-28 ft Roadway	
2413	S-S-6	1949	Standard I Beam Superstructure-25 ft Span-20 ft Roadway	Special Details for Spans-Superelevated 0.06 ft per ft
2413	TP20	1949	Standard Timber Pile Bents-25 ft Span-20 ft Roadway	
2413	SP20	1949	Standard Steel Pile Bents-25 ft Span-20 ft Rdwy-Superelev. .06' per ft	
2413	S	1949	Standard I-Beam Superstructure-25 ft Span-20' Roadway	
2423	C.P. 28	1949	Concrete Pile Bents 15 Ft. Span 28 Ft. Roadway	
2433	S	1949	Composite I-Beam Superstructure-50 ft Span-28 ft Roadway	
2433	C.P. 28	1949	Concrete Pile Bents 28 Ft. Roadway 50 Ft. Span	
2931	TP20	1949	Timber Pile Bents-15 ft Span-20 ft Roadway	
2931	S	1949	Standard Slab Superstructure-15 ft Span-20 ft Roadway	
3159	CP28	1949	Concrete Pile Bents-36'-0"-28'-0" Rdwy-2~3'-6" S.W.	
2307	S-1	1950	Standard I-Beam Superstructure 24' Roadway 25' Span	Special Details for Spans on a 1˚00' Curve
2337	S-4	1950	Standard Slab Superstructure-15 ft Span-20 ft Roadway	Special Details for Slabs to be Superelevated .04 ft per ft
2423	TP24	1950	Timber Pile Bents-15 ft Span-24 ft Roadway	
2423	C.P. 24	1950	Concrete Pile Bent 15 Ft. Span 24 Ft. Roadway	
2423	S-S-4	1950	15 Ft. Span Slab Superstructure 24 Ft. Roadway	
2431	S	1950	Standard I-Beam Superstructure 25 Ft. Span 20 Ft. Roadway	
2431	T.P. 20	1950	Standard Timber Pile Bents 25 Ft. Span 20 Ft. Roadway	
2433	SP 28 E	1950	Steel Pile Bent 28 Ft. Roadway - 50 Ft. Span	
2433	S.P. 28 I	1950	Steel Pile Bent 50 Ft. Span - 28 Ft. Roadway	
2446	CP28	1950	Concrete Pile Bents-36'-0" Span-28'-0" Rdwy-2~5'-0" S.W.	
2446	S	1950	Concrete Deck Girder Span-36 ft Span-28 ft Rdwy-2~5 ft Sidewalks	
2453	S	1950	Composite I-Beam Superstructure-56 ft Span-28 ft Roadway	
2454	2 of 2	1950	Steel Pile End Bent 28 Ft. Roadway 56 Ft. Span	
2454	1 of 2	1950	Steel Pile Bent 28 Ft. Roadway 56 Ft. Span	
2455	2 of 2	1950	Steel Pile End Bent 28 Ft. Roadway 35 Ft. Span	
2455	1 of 2	1950	Steel Pile Bent 28 Ft. Roadway 35 Ft. Span	
2456	1 of 1	1950	Steel Pile Bent 28 Ft. Roadway 35 Ft. & 56 Ft. Span	
2466	S	1950	Standard Slab Superstructure-15 ft Span-24 ft Roadway	
2466	CP - 24I	1950	Standard Concrete Pile Bent 15 Ft. Span ~ 24 Ft. Roadway	
2471	1 of 2	1950	Details of 65-65-65 Continuous I-Beam Spans for 20 ft Roadway	Details of 65-65-65 Continuous I-Beam Spans for 20 ft Roadway
2471	2 of 2	1950	Details of 65 - 65 - 65 Continuous I-Beam Spans for 20 Ft. Roadway	
2474	1 of 1	1950	Precast Slab Suprstructure 15 Ft. Span 28 Ft. Roadway	
2478	2 of 2	1950	Standard 50'-50'-50' Continuous I Beam Superstructure ~ 20' RDWY	
2478	1 of 2	1950	Standard 50'-50'-50' Continuous I Beam Superstructure ~ 20' RDWY	
2479	1 of 1	1950	20 Ft. Span I-Beam Bridge	
2484	1 of 1	1950	Conversion of Standard Four-Pile Timber Bent	For use with 24 ft Roadway
2504	2 of 2	1950	Standard I-Beam Superstructure 25 Ft. Span - 28' Roadway - 1 ~ 4 Ft. Sidewalk	
2522	1 of 1	1950	Precast Concrete Deck Slabs for 15 ft Span Timber Bridges	
2541	CP24 E	1950	Concrete Pile End Bent-50 ft Span-24 ft Roadway	
2541	CP24 I	1950	Concrete Pile Intermediate Bents and Tower Bent-50 ft Span-24 ft Roadway	
2541	S	1950	Composite I-Beam Superstructure 50 Ft. Span 24 Ft. Roadway	Details ~ 50' Span
2547	TP20	1950	Timber Pile Bents-15 ft Span-20 ft Roadway	
2547	S	1950	Standard Slab Superstructure 15 Ft. Span ~ 20 Ft. Roadway	
2556	CP28	1950	Concrete Pile Bents-15 ft Span-28 ft Rdwy-5'-0" SW	
2556	S	1950	Standard 15 Ft. Span Slab Superstucture with 5' Ft. Walk	
2561	CP28	1950	Standard Concrete Pile Bents-18"sq Piling-28' Roadway-35' Span	End and Intermediate Bents
2569	CP28	1950	Concrete Pile Bents-15 ft Span-28 ft Rdwy-2~1'-6" Sdwks	
2569	S	1950	Precast Slab Superstructure-15 ft Span-28 ft Roadway	

2570	S	1950	Standard 15' Span Slab Superstructure on 30° Skew	
2574	CP24	1950	Concrete Pile Bents-15 ft Span-24 ft Roadway-2~3 ft SW	
2574	S	1950	15 ft Span Superstructure-24 & 28 ft Roadway-2~3 ft SW	
2575	S	1950	Slab Superstructure 15' Span - 28' Roadway	
2588	2 of 2	1950	Composite I-Beam Superstructure-40 ft Span-28 ft Rdwy-2~4'-0" SW	Special Details of 40' Span on 1° Curve
2588	1 of 2	1950	Composite I-Beam Superstructure 40 Ft. Span 28 Ft. Roadway 2 ~ 4 Ft. S. Walks	
2588	C.P. 28	1950	Concrete Pile Bents 40'-0" Span ~ 28'-0" RDWY ~ 2-4'-0" S.W.	
2592	S	1950	Composite I-Beam Superstructure-40 ft Span-28 ft Rdwy-2~3'-6" Sidewalks	
2592	CP - 28-I	1950	Concrete Pile Bents 28 Ft. Roadway 40 Ft. Span	
2592	C.P. 28-E	1950	Concrete Pile Bent 40'-0" Span~28'-0" RDWY.~2~3'-6"Sidewalks	
2594	S	1950	Precast Slab Superstructure-15 ft Span-20 ft Roadway	
2595	S	1950	Composite I-Beam Superstructure 60 Ft. Span 28 Ft. RDWY 2 ~ 3'-6" Sidewalks	
2608	1 of 2	1950	Composite I-Beam Superstructure 60 Ft. Span 28 Ft. RDWY 2 ~ 4'-0" Sidewalks	
2608	2 of 2	1950	Composite I-Beam Superstructure 60 Ft. Span 28 Ft. RDWY 2 ~ 4'-0" S.W.	Special Details of 60' Span on 1˚ Curve
2610	CP28	1950	Standard Concrete Pile Bents-40 ft Span-28 ft Rdwy	
2610	S	1950	Composite I-Beam Superstructure 40 Ft. Span 28 Ft. Roadway	
2615	S	1950	Slab Superstructure-15' Span-28' Roadway-2~3' Sidewalks	
2615	CP28	1950	Concrete Pile Bents-15' Span-28' Roadway-2~3' Sidewalks	
2620	SS 5	1950	Details of 40 Ft. Span Composite I-Beam Superstructure	
2620	C.P. - 28 - S5	1950	Concrete Pile Bents 40' Span ~ 28' RDWY ~ .05' Superelevation	
2625	S	1950	Precast Slab Superstructure 15 Ft. Span 24 Ft. Roadway	
2627	TP24	1950	Timber Pile Bents-15 ft Span-24 ft Roadway	
2635	CP28	1950	Concrete Pile Bents-15 ft Span-28 ft Roadway-2~1'-6" Sidewalks	
2635	S	1950	Precast Slab Superstructure-15 ft Span-28 ft Roadway	
2639	SP28-I	1950	Steel Pile Bent-28 ft Roadway-35 ft Span	Intermediate Bent
2639	SP-28-E	1950	Standard Steel Pile Bents-10 HP 42 Piles-28' Roadway-35' Span	End Bent
2639	S	1950	Composite I-Beam Superstructure 35 Ft. Span 28 Ft. Roadway	
2642	S	1950	Precast Slab Superstructure-15 ft Span-24 ft Rdwy-2~2'-6"SW	
2644	CP28	1950	Concrete Pile Bents-15' Span-28' Rdwy-2~3 ft Sdwks	
2651	CP28	1950	Concrete Pile Bent-15 ft Span-28 ft Roadway-2~1'-6" Sdwks	
2651	S	1950	Precast Slab Superstructure 15 Ft. Span 28 Ft. Roadway	
2658	TP20	1950	Timber Pile Bents-15 ft Span-20 ft Roadway	
2658	S	1950	Standard Slab Supstructure 15 Ft. Span 30˚ Skew 20' Roadway	
2679	S 1 of2	1950	25' Span ~ 24' RDWY ~ Precast Girders ~ Cast In Place Slab	
2869	S	1950	Composite I-Beam Superstructure-40 ft Span-28 ft Rdwy-2~3'-3" SW	
2877	CP28	1950	Concrete Pile Bents-33 ft Span-28 ft Roadway	Bents Nos. 3,4,5,& 6
2326	A T.P. 24	1951	Timber Pile Bents 15 Ft. Span 24 Ft. Roadway	
2437	1 of 1	1951	Standard Concrete Box Culvert	Triple 8 Ft. Span Culverts 7 Ft. 8 Ft. Heights
2615	BH28	1951	Concrete Bulkheads-15' Span-28' Roadway-2~3'-1" Sidewalks	
2670	CP 42 E	1951	Composite Pile End Bent-60 ft Span-Four Lane Roadway	
2670	S	1951	Composite I-Beam Superstructure 60 Ft. Span ~ Four Lane Roadway	
2670	C.P. 42 E	1951	Composite Pile End Bent 60 Ft. Span ~ Four Lane Roadway	
2678	1 of 1	1951	Details of 14' & 20" Octagonal Piles	
2679	CP24	1951	Concrete Pile Bents-25' Span-24' Roadway	
2681	1 of 1	1951	Slab Superstructure-15 ft Span-28 ft Roadway	
2695	T.P. 20	1951	Timber Pile Bents 25 Ft. Span ~ 20 Ft. Roadway	Superseded by Index 2698
2695	S	1951	Precast Girders ~ Cast In Place Slab 25 Ft. Span 20 Ft. Roadway	
2703	S	1951	Slab Superstructure 15 Ft. Span 52 Ft. Roadway	
2703	C.P.	1951	Concrete Pile Bents 15 Ft. Span 52 Ft. Roadway	
2710	C.P. 28	1951	Concrete Pile Bent 25 Ft. Span ~ 28 Ft. Roadway	

2710	S	1951	Precast Girders ~ Cast In Place Slab 25 Ft. Span 28 Ft. Roadway	
2711	S	1951	Slab Superstructure-15 ft Span-24 ft Roadway	
2715	TP24	1951	Timber Pile Bents-25 ft Span-24 ft Roadway	
2715	S	1951	Precast Girders-Cast in Place Slab-25 ft Span-24 ft Roadway	
2715	CPA	1951	Concrete Pile Abutment-25 ft Span-24 ft Roadway	
2715	CP24	1951	Concrete Pile Bents-25 ft Span-24 ft Roadway	
2721	SP28	1951	Steel Pile Bents-25' Span-28' Roadway	
2721	S	1951	Precast Girders~Cast in Place Slab-25 ft Span-28 ft Roadway	
2723	CPA	1951	Conrete Pile Abutment-25 ft Span-28 ft Roadway	
2733	CP28	1951	Concrete Pile Bents-36 ft Span-28 ft Rdwy-2~3'-6" SW	
2733	S	1951	Concrete Deck Girder Span-36 ft Span-28 ft Roadway-2~3'-6" Sidewalks	
2750	S	1951	Precast Slab Superstructure-15 ft Span-24 ft Roadway	
2752	CP28	1951	Concrete Pile End Bent-60 ft Span-28 ft Roadway	
2752	S	1951	Composite I-Beam Superstructure-60 ft Span-28 ft Roadway	
2767	1 of 1	1951	Precast Concrete Deck Slabs for 15 ft Span Timber Bridges	
2770	S	1951	Concrete Deck Girder Superstructure 40'-0" Span ~ 28'-0" RDWY ~ 2 ~ 3'-0" Sidewalk	
2771	S	1951	Precast Slab Superstructure-15 ft Span-28 ft Roadway	
2771	CP28	1951	Concrete Pile Bents-15 ft Span-28 ft Roadway	
2777	CP28	1951	Concrete Pile Bent-42 ft Span-28 ft Roadway	
2777	S	1951	Composite I-Beam Superstructure-42 ft Span-28 ft Roadway	
2778	S	1951	Composite I-Beam Superstructure-55 ft Span-28 ft Roadway	
2786	S	1951	Precast Slab Superstructure 15 Ft. Span - 28 Ft. RDWY -2-3'-1" Ft. S.W.	
2797	T.P. 24	1951	Timber Pile Bents 15 Ft. Span 24 Ft. Roadway	
2803	1 of 1	1951	Details of Approach Slab for 24 Ft. Roadway ~ 30˚ Skew	
2808	T.P. 24	1951	Timber Pile Bents 18 Ft. Span 24 Ft. Roadway	
2825	S	1951	Precast Slab Superstructure 15 Ft. Span 20 Ft. Roadway	
2839	1 of 1	1951	Precast Concrete Deck Slabs for 15 ft Span Timber Bridges	
2840	S	1951	Precast Girders-Cast in Place Slab-25 ft Span-28 ft Roadway	
2840	C.P. 28	1951	Concrete Pile Bents 25 Ft. Span Ft. Roadway	
2844	S	1951	Composite I-Beam Superstructure-53 ft Span-28 ft Rdwy-2~3'-0" Sidewalks	
2866	3 of 3	1951	60'-60' Continuous Composite I-Beam Superstructure-2~26' Rdwy-2~5' S.W.	
2867	1 of 3	1951	60'-90'-60' Continuous Composite I-Beam Superstructure-2~26' Rdwy-2~5' S.W.	
2867	3 of 3	1951	60'-90'-60' Continuous Composite I-Beam Superstructure-2~26' Rdwy-2~5' S.W.	
2893	5 of 5	1951	Standard Continuous 84'-126'-84' Plate Girder Superstructure	
2893	4 of 5	1951	Standard Continuous 84'-126'-84' Plate Girder Superstructure	
2893	2 of 5	1951	Standard Continuous 84'-126'-84' Plate Girder Superstructure	
2897	1 of 1	1951	Precast Concrete Deck Slabs for 15 Ft. Span Timber Bridge	
2903	S	1951	Precast Girders-Cast in Place Slab-25 ft Span-24 ft Roadway	
2903	C.P. 24	1951	Concrete Pile Bents 25' Span 24' Roadway	
2936	S	1951	Composite I-Beam Superstructure-42 ft Span-28 ft Roadway	
2937	S	1951	Composite I-Beam Superstructure-55 ft Span-28 ft Roadway	
4241	1 of 1	1951	Standard Timber Bridge	
2294	5 of 5	1952	Concrete Pile Bents-36'-0" Span-24'-0" Rdwy-2~3'-0" Sidewalks	Details of End Bents & Intermediate Bents
2844	S.P. 28 E	1952	Steel Pile End Bent 28'-0" RDWY 3'-0" Sidewalk ~ 53'-0" Span	
2854	S	1952	Standard I-Beam Superstructure-25 ft Span-28 ft Roadway	
2854	C.P. 28	1952	Concrete Pile Bents 25 Ft. Span 28 Ft. Roadway	Details of End Bents and Intermediate Bents Nos. 2 and 5
2861	TP24	1952	Timber Pile Bent-15 ft Span-24 ft Roadway	
2861	C.P. 24	1952	Concrete Pile Bent 15 Ft. Span 24 Ft. Roadway	
2861	S	1952	Slab Superstructure 15 Ft. ~ 24, 26, 28 & 30 Ft. Roadway	
2861	S-S-3_28	1952	Std. 15 Ft. Span ~ 28 Ft. RDWY Slab Suprstructure	
2866	2 of 3	1952	60'-60' Continuous Composite I-Beam Superstructure-2~26' Rdwy-2~5' S.W.	

2866	1 of 3	1952	60'-60' Continuous Composite I-Beam Superstructure ~ 2-26' RDWY ~ 2-5' S.W.	
2867	2 of 3	1952	60'-90'-60' Continuous Composite I-Beam Superstructure ~ 2-26' RDWY ~ 2-5' S.W.	
2869	S.P. 28-E	1952	Steel Pile End Bent 40'-0" Span ~ 28'-0" RDWY ~ 2~3'-3" Sidewalks	
2874	CP28	1952	Concrete Pile Bents-25 ft Span-28 ft Roadway-2~3 ft Sdwks	
2874	S	1952	Precast Girders-Cast in Place Slab-25 ft Span-28 ft Rdwy-2~3'-0" Sdwks	
2877	S	1952	Concrete Deck Girder Span 33 Ft. 28 Ft. Roadway	
2878	S	1952	Concrete Deck Girder Span 25 Ft. 28 Ft. Roadway	
2879	1 of 1	1952	Approach Slab for 28 Ft. RDWY with Flared Curb and 6" Slab	
2893	3 of 5	1952	Standard Continuous 84'-126'-84' Plate Girder Superstructure	
2893	1 of 5	1952	Standard Continuous 84'-126'-84' Plate Girder Superstructure	
2922	2 of 2	1952	Concrete Slab Superstructure-20'-0" Rdwy-15'-0" Span-30° Skew	
2922	1 of 2	1952	Timber Pile Bents-20'-0" Rdwy-15'-0" Span-30° Skew	
2930	S	1952	Precast Girders-Cast in Place Slab-25' Span-28' Roadway-2° Curve-Superel. .05' per ft	
2930	S.P. 28 E	1952	Steel Pile Bents 28 Ft. Roadway ~ 25 Ft. Span ~ Superel. .05'Per Ft.	
2930	S.P. 28 I	1952	Steel Pile Bents 28 Ft. Roadway ~ 25 Ft. Span ~ Superel. .05'Per Ft.	Intermediate Bents
2939	2 of 5	1952	Movable Span-33'-0" Span-28'-0" Rdwy-1~3'-6" S.W.	Superstructure Details
2939	3 of 5	1952	Movable Span 33'-0" Span ~ 28'-0" RDWY ~ 2 - 3'-6" S.W.	
2939	1 of 5	1952	Concrete Pile Bents 33'-0" Span ~ 28'-0" RDWY ~ 1 - 3'-6" S.W.	
2940	1 of 2	1952	Concrete Pile Bents-28 ft Span-28 ft Roadway-1~4 ft Sidewalk	
2940	2 of 2	1952	Standard I-Beam Superstructure-28 ft Span-28 ft Roadway-1~4 ft Sidewalk	
2960	1 of 2	1952	Concrete Pile Bents 25' Span ~ 28' RDWY ~ 2-3'0" SDWKS ~ 2.78˚ Curve	
2960	2 of 2	1952	Precast Girders ~ Cast In Place Slab 25' Span ~ 28' RDWY ~ 2-3'0" SDWKS ~ 2.78˚ Curve	
2963	2 of 2	1952	Precast Slab Superstructure-15 ft Span-24 ft Roadway	
2976	CP28	1952	Concrete Pile Bents-32'-0" Span-28'-0" Roadway	
2991	S	1952	Precast Slab Superstructure 15 Ft. Span 28 Ft. Roadway	
2997	1 of 1	1952	Treated Timber Bulkhead Maximum Height 14'-0"	
3096	T.P. 24 ~ 0.0072	1952	Timber Pile Bents 15 Ft. Span 24 Ft. RDWY	
3297	S	1952	Concrete Pile Bents 25 Ft. Span 28 Ft. RDWY 2-3 Ft. SDWKS	
3297	S	1952	Precast Girders ~ Cast In Place Slab 25 Ft. Span 28 Ft. RDWY 2-3'-0" Ft. SDWKS	
3759	C.P. 28	1952	Concrete Pile Bents 25 Ft. Span, 28 Ft. RDWY., 2 ~ 3 Ft. S.W.	
3759	S	1952	Precast Girders ~ Cast In Place Slab 25 Ft. Span ~ 28 Ft. RDWY. ~ 2-3'-0" SDWKS.	
2546	SS-5-24	1953	Standard C.D.G. Superstructure-33 ft Span-28' Rdwy-Two 3' Sdwks	
2546	CP28	1953	Concrete Pile Bents-33 ft Span-28' Rdwy-Two 3' Sdwks	
2594	TP20	1953	Timber Pile Bents-15 ft Span-20 ft Roadway	
2642	CP28	1953	Concrete Pile Bents-15' Span-24' Rdwy-2~2'-6" Sdwks	
2644	S	1953	Precast Slab Superstructure-15 ft Span-28 ft Roadway-2~3 ft Sdwks	
2698	S	1953	Precast Girders~Cast in Place Slab-25 ft Span-20 ft Roadway	
2698	TP20	1953	Timber Pile Bents-25' Span-20' Roadway	
2788	S	1953	Standard I-Beam Superstructure 25' Span 28' RDWY 2 ~ 4' SDWKS	
2788	C.P. 28	1953	Concrete Pile Bents 25 Ft. Span, 28 Ft. RDWY., 2 ~ 4 Ft. S.W.	
2813	T.P. 24	1953	Timber Pile Bents 15 Ft. 24 Ft. RDW'Y.	
2813	S	1953	Precast Slab Superstructure 15' Span 24' Roadway	
2825	T.P. 20	1953	Timber Pile Bents 15 Ft. Span 20 Ft. Roadway	
2846	1 of 5	1953	Concrete Pile Bents 33' Span 28' Roadway 2 ~ 4'-0" S.W.	Bent at Hinged End and Rest Bent for Movable Span

2861	CP-046-28	1953	Concrete Pile Bents-15 ft Span-28 ft Roadway	Superelevated .046 ft per ft
2861	TP5-24	1953	Timber Pile Bent-15 ft Span-24 ft Roadway	
2861	SS.046-28	1953	Concrete Slab Superstructure-15' Span-28 ft Roadway	Special Details for Slabs to be Superelevated .046 per foot
2861	SS-5-24	1953	Concrete Slab Superstructure-15' Span-24 ft Roadway	Special Details for Slabs to be Superelevated .045 ft per ft
2861	S-S-3/16-28	1953	Concrete Slab Suprestructure 15 Ft. Span ~ 28 Ft. Roadway	Sprecial Details for Slabs to be Superelveated 3/16" Per Ft.
2861	C.P. 28	1953	Concrete Pile Bent 15 Ft. Span 28 Ft. RDWY	
2903	T.P. 24	1953	Timber Pile Bents 25' Span 24' Roadway	
2915	CP24	1953	Concrete Pile Bents-25 ft Span-24 ft Roadway	
2915	S	1953	Concrete D.G. Superstructure-25 ft Span-24 ft Rdwy	
2944	S	1953	Concrete D.G. Superstructure 25' Span ~ 28' RDWY. ~ 2-3'-0" SDWKS.	
2944	C.P. 28	1953	Concrete Pile Bents 25 Ft. Span - 28 Ft. RDWY - 2 ~ 3 Ft. SDWKS	
2976	S	1953	Concrete Deck Girder Span 32 Ft. Span 28 Ft. Roadway	
2991	C.P. 28	1953	Concrete Pile Bents 15 Ft. Span 28 Ft. Roadway	
3000	S	1953	Standard Concrete D. G. Superstr. 33 Ft. Span 28' RDWY Two 3' SDWKS	
3000	T.P. 28	1953	Concrete Pile Bent 33 Ft. Span 28' RDWY 2~3' SDWKS	
3003	T.P. 20	1953	Timber Pile Bents 15 Ft. Span ~ 20 Ft. RDWY. ~ 2-3 Ft. S.W.	
3003	S	1953	Precast Slab Superstructure 15 Ft. Span , 20 Ft. RDWY. , 2~3 Ft. S.W.	
3004	S	1953	Precast Slab Superstructure 15 Ft. Span ~ 20 Ft. RDWY. ~ 2-3 Ft. S.W.	
3007	1 of 1	1953	14" X 14" Precast Concrete Pile Fresh Water Construction	
3012	S	1953	Concrete Slab Superstructure 15' Span 28' Roadway 30˚ Skew	
3012	C.P. 28	1953	Concrete Pile Bents 15' Span 28' Roadway 30˚ Skew	
3031	CP28	1953	Concrete Pile Bents-36 ft Span-28 ft Rdwy-2~3 ft S.W.	
3031	S	1953	Precast Girders-Cast in Place Slab-36 ft Span-28 ft Rdwy-2~3'-0" S.W.	
3043	1 of 3	1953	Composite Pile Bent-30 ft Span-Two Traffic Lanes	End Bent
3043	3 of 3	1953	Concrete D.G. Superstructure-30'-0" Span-4 Traffic Lanes	
3043	2 of 3	1953	Composite Pile Bent 30 Ft. Span - Two Traffic Lanes	
3044	1 of 1	1953	Concrete Decking for 20' RDWY - 15" Span - Timber Bridge	
3047	1 of 1	1953	Concrete Decking for 20' Rdwy-15' Span-Timber Bridge	15 ft Timber Span (Concrete Decking Details)
3050	CP28	1953	Concrete Pile Bents-25 ft Span-42° Skew-28 ft Roadway	
3050	S	1953	Concrete Deck Girder Span-25 ft Span-48° Skew-28 ft Roadway	
3055	C.P. 24	1953	Concrete Pile Bents 15'-0" Span ~ 24' RDWY ~ 1-5'-0" Sidewalk	
3055	S	1953	Slab Superstructure 15 Ft. Span ~ 24 Ft. Roadway ~ 1-5'-0" Sidewalk	
3062	1 of 1	1953	Concrete Decking for 24' Rdwy-15' Span-Timber Bridge	Details of Concrete Decking
3068	CP28	1953	Concrete Pile Bents-33'-0" Span-28'-0" Roadway	
3068	S	1953	Concrete Deck Girder Superstr.-33 ft Span-28' Roadway	
3088	CP28	1953	Concrete Pile Bents-20' Span-28' Rdwy-1:5' S.W.-.0208 Superelev.	
3089	1 of 1	1953	Composite Concrete & Steel Piling (14" Sq.)	
3096	S.S. 24 ~ 0.0072	1953	Concrete Slab Superstructure 15 Ft. Span 24 Ft. RDWY Superelev. 0.072'	
3100	S	1953	Precast Slab Superstructure 15 Ft. Span 20 Ft. Roadway	
3100	T.P. 20	1953	Timber Pile Bents 15 Ft. Span ~ 20 Ft. Roadway	
3102	T.P. 20-0.06	1953	Timber Pile Bents 15 Ft. Span ~ 20 Ft. Roadway	
3137	S	1953	Precast Slab Superstructure-15 ft Span-28 ft Roadway	
3142	CP28-E	1953	Concrete Pile Bents-45' Span-28' Rdwy-2~4' Sdwks	
3142	S	1953	Composite I-Beam Superstructure-45 ft Span- 28 ft Rdwy-2~4 ft Sidewalks	
3142	CP - 28-I	1953	Concrete Pile Intermediate Bent 45 Ft. Span - 28 Ft. R'DW'Y - ~ 4 Ft. S.Walks	
3160	C.P. 28	1953	Concrete Pile Bents 25 Ft. Span - 28 Ft. Roadway	
3160	S	1953	Concrete Deck Girder Supstr. 25 Ft. Span - 28 Ft. Roadway	
3201	S	1953	Concrete Deck Girder Super. 36 Ft. Span ~ 24 Ft. Roadway	

3201	CP 24	1953	Concrete Pile Bents 36'-0" Span ~ 24'-0" Roadway ~ 2-3'-0" Sidewalks	
3493	C.P. 24	1953	Concrete Pile Bents 25 Ft. Span 24 Ft. Roadway	
3493	S	1953	Precast Girders ~ Cast In Place Slab 25 Ft. Span 24 Ft. Roadway	
3567	C.P. 24	1953	Concrete Pile Bents 25 Ft. Span 24 Ft. RDW'Y.	
3567	S	1953	Concrete D. G. Superstructure 25 Ft. Span 24 Ft. RDW'Y	
3580	C.P. 24	1953	Concrete Pile Bents 25 Ft. Span 24 Ft. RDW'Y	
3580	S	1953	Concrete D. G. Superstructure 25 Ft. Span 24 Ft. RDW'Y	
2123	1 of 1	1954	Precast Concrete Piles	Details of Piles for Salt Water Construction
2228	1 of 1	1954	12"x 12" Precast Concrete Pile-Fresh Water Construction	
2469	1 of 1	1954	14" X 14" Precast Concrete Pile - Salt Water Construction	
2721	CP - 28	1954	Concrete Pile Bents 25' Span 28'Roadway	
2723	CP28	1954	Concrete Pile Bents-25' Span-28' Roadway	
2723	S	1954	Precast Girders~Cast in Place Slab-25 ft Span-28 ft Roadway	
2915	C.P.A.	1954	Concrete Pile Abutment 25 ft Span-24 ft Roadway	
3082	CP24	1954	Composite Concrete & Steel Pile Bent-24 ft Roadway-25 ft Span	
3102	S	1954	Standard Slab Superstructure 15 Ft. Span ~ 20 Ft. Roadway	
3102	C.P. 20	1954	Timber Pile Bents 15 Ft. Span ~ 20 Ft. Roadway	
3102	T.P. 20	1954	Timber Pile Bents 15 Ft. Span ~ 20 Ft. Roadway	
3159	S	1954	Concrete Deck Girder Span 36'-0" Span ~ 28'-0" RDWY ~ 2-3'-6" S.W.	
3170	T.P. 24	1954	Timber Pile Bents 15 Ft. Span 24 Ft. Roadway	
3182	CP28	1954	Concrete Pile Bents-36'-0"-28'-0" Rdwy	
3182	S	1954	Concrete Deck Girder Span-36 ft Span-28 ft Roadway	
3194	S	1954	Concrete Slab Superstructure 20 Ft. Span 28 Ft. Roadway	
3196	S	1954	Concrete Deck Girder Superstructure-36 ft Span-24 ft Rdwy-2~3'-0" Sdwks	
3196	CP24	1954	Intermediate Concrete Pile Bent-36 ft Span-24 ft Roadway	
3197	1 of 1	1954	Composite Concret and Steel Piling 20' Sq.	
3223	S	1954	Concrete Deck Girder Superstr.-25 ft Span-28 ft Roadway-2~5'-0" Sidewalks	
3223	CP28	1954	Concrete Pile Bents-25 ft Span-28 ft Roadway-2~5 ft Sidewalks	
3264	S	1954	Standard I-Beam Superstructure-36 ft Span-28 ft Roadway-2~3'-6" SW	
3264	CP28	1954	Concrete Pile Bent-36 ft Span-28 ft Roadway-2~3'-6" Sidewalks	End Bent No. 1
3276	1 of 3	1954	Concrete Pile Bent-76' Span-28' Roadway	
3276	2 of 3	1954	Superstructure - 76 Ft. Span	
3281	CP28	1954	Concrete Pile Bents-20 ft Span-28 ft Roadway	
3281	S	1954	Concrete Slab Superstructure-20 ft Span-2~3'-6" SW-28 ft Rdwy	
3294	1 of 1	1954	18"x 18" & 20"x 20" Prestressed Concrete Piles	
3320	S	1954	Concrete Deck Girder Span-36 ft Span-28 ft Roadway-2~3'-6" Sidewalks	
3320	CP28	1954	Concrete Pile Bents-36'-0"-28'-0" Rdwy-2~3'-6" S.W.	
3347	S	1954	Composite I-Beam Supersructure 60 Ft. Span 28 Ft. Roadway	
3352	CP28	1954	Concrete Pile Bents-36 ft Span-28'-0" Roadway	
3352	S	1954	Concrete Deck Girder Span 36 Ft. Span 28 Ft. Roadway	
3355	S	1954	Concrete Deck Girder Span 36 Ft. Span 28 Ft. RDWY 2~5 Ft. Sidewalks	
3355	C.P. 28	1954	Concrete Pile Bents 36'-0" Span ~ 28'-0" RDWY ~ 2 ~ 5'-0" S.W.	
3379	S	1954	Concrete Slab Superstruct.-20 ft Span-28 ft Rdwy-30° S.K.	
3379	C.P. 24	1954	Concrete Pile Bents 20' Span ~ 24'RDWY ~ 30˚ SK.	
3389	S	1954	Concrete Slab Superstructure 20 Ft. Span ~ 24 Ft. R'DW'y ~ 30˚ Skew	
3389	C.P. 24	1954	Concrete Pile Bents 20' Span ~ 24' RDWY ~ 30˚ SK. Lt.	
3399	1 of 2	1954	Composite I-Beam Superstructure-63 ft Span-2~23 ft Rdwys-2~5 ft Swks	
3486	2 of 3	1954	Superstructure-76 ft Span	
3010	1 of 2	1955	Composite I-Beam Superstructure-50 ft Span-Four Lane Roadway	50 ft I-Beam Span

3010	2 of 2	1955	Composite I-Beam Superstructure-50 ft Span-Four Lane Roadway	
3011	2 of 2	1955	Composite I-Beam Superstructure-45 ft Span-Four Lane Roadway	
3011	1 of 2	1955	Composite I-Beam Superstructure-45 ft Span-Four Lane Roadway	
3108	C.P. 28	1955	Concrete Pile Bents 20 Ft. Span - 28 Ft. Roadway	
3108	S	1955	Concrete Slab Superstructure 20' Span 28' Roadway	
3185	S	1955	Precast Slab Superstructure 15 Ft. Slab 28 Ft. Roadway	
3194	C.P. 28	1955	Concrete Pile Bents 20 Ft. Span 28 Ft. Roadway	
3296	S	1955	Precast Slab Superstructure-15 ft Span-24 ft Roadway	
3320	EB-SP-28	1955	Steel Pile End Bent-36'-0" Span-28'-0" Rdwy-2~3'-6" SW	
3320	IB-SP28	1955	Steel Pile Intermediate Bent-36'-0" Span-28'-0" Roadway-2~3'-6"SW	
3323	1 of 1	1955	Prestressed Concrete Beams	
3399	2 of 2	1955	Composite I-Beam Supersructure 63 Ft. Span ~ 2 ~ 23 Ft. RDWYS ~ 2 ~ 5 Ft. SWKS.	
3438	1 of 1	1955	Prestressed C. D. G. Superstructure 36 Ft. Span 4 Lane Roadway	
3440	1 of 3	1955	Concrete Pile Bents 36 Ft. Span 4 Lane Roadway	
3440	3 of 3	1955	Concrete Deck Girder 36 Ft. Span 4 Lane Roadway	
3441	1 of 1	1955	Concrete Deck Girder 45 Ft. Span 4 Lane Roadway	
3444	1 of 1	1955	Prestressed Superstructure 24 Ft. Roadway	
3486	1 of 3	1955	Steel Pile Bent 76 Ft. Span - 28 Ft. R'DW'Y	
3486	3 of 3	1955	Superstructure 76 Ft. Span	Details of Expansion Jt. Assembly & Details of Shoes for 76 Ft. Span
3516	T.P. 24	1955	Timber Pile Bents 20 Ft. Span 24 Ft. Roadway	
3516	S	1955	Standard SlabSuperstructure 20 Ft. Span 24 Ft. Roadway	
3518	C.P. 24	1955	Concrete Pile Bents 20 Ft. Span 2 ~ 3'-0" S.W. 24 Ft. RDWY	
3518	S	1955	Concrete Slab Superstructure 20 Ft. Span 2 ~ 3'-0" S.W. 24 Ft. RDWY	
3526	1 of 1	1955	Prestessed Superstructure 48 Ft. Span 24 Ft. - 28 Ft. Roadway	
3532	2 of 3	1955	Composite I-Beam Superstructure-76 ft Span-2~26 ft Roadways	
3532	1 of 3	1955	Concrete Pile Abutment-76 ft Span-2`26'-0" Roadways-2~2'-0" Curbs	
3532	3 of 3	1955	Composite I-Beam Superstructure 76 Ft. Span 2 ~ 26 Ft. Roadways	
3539	S	1955	Composite I-Beam Superstructure 40 Ft. Span 28 Ft. Roadway	
3539	C.P. - 28	1955	Concrete Pile Bent 40 Ft. Span 28 Ft. RDWY	
3540	1 of 1	1955	Composite I-Beam Superstructure 55 Ft. Span 28 Ft. Roadway	
3547	TP-7-24	1955	Timber Pile Bents 20 Ft. Span 24 Ft. Roadway	
3547	SS-7-24	1955	Concrete Slab Superstructure 20 Ft. Span 24 Ft. Roadway	
3555	SP - 28	1955	Steel Pile Bents 20 Ft. Span 28 Ft. Roadway	
3603	2 of 2	1955	Composite I-Beam Superstructure 86 Ft. Span Four Lane Roadway	
3603	1 of 2	1955	Composite I-Beam Superstructure 86 Ft. Span Four Lane Roadway	
3606	3 of 4	1955	48 Ft. Prestressed Superstructure 24 Ft. and 28 Ft. Roadways	
3606	4 of 4	1955	48 Ft. Prestressed Superstructure 24 Ft. and 28 Ft. Roadways	
3606	2 of 4	1955	48 Ft. Prestressed Superstructure 24 Ft. and 28 Ft. Roadways	
3606	1 of 4	1955	48 Ft. Prestressed Superstructure 24 Ft. and 28 Ft. Roadways	
3612	1 of 4	1955	48 Ft. Prestressed Superstructure 2-21 Ft. Roadways 2 ~ 5 Ft. Walks	
3612	2 of 4	1955	48 Ft. Prestressed Superstructure 2-21 Ft. Roadways 5 Ft. SDWLKS.	
3612	3 of 4	1955	48 Ft. Prestressed Span 2-21 Ft. Roadways, 5 Ft. Sidewalks	
3612	4 of 4	1955	48 Ft. Prestressed Span 2-21 Ft. Roadways, 5 Ft. SDWLKS.	

3619	1 of 1	1955	Typical Details of 18" Square and 20" Square Prestressed Piles	
3643	1 of 3	1955	Concret Pile End Bent 50 Ft. Span ~ 28 Ft. RD WY	
3643	2 of 3	1955	Concret Pile Intermediate Bent 50 Ft. Span ~ 28 Ft. RD WY	
3643	3 of 3	1955	Prestressed Concrete Span 50 Ft. Span ~ 28 Ft. RD WY	
3667	1 of 1	1955	66 Ft. Prestressed Superstructure	
4768	S	1955	Standard Slab Superstructure 20 Ft. Span 24 Ft. Roadway	
3108	S-C.P. 28	1956	Concrete Pile Bents 20 Ft. 28 Ft. RDWY.	
3108	SS-.035-28	1956	Concrete Slab Superstructure 20' Span 28' Roadway	Special Details for Slabs to be Super
3457	1 of 1	1956	Prestressed Slab-15 ft Span-28 ft Roadway	
3458	1 of 1	1956	Prestressed Slab 20 Ft. Span 24 Ft. Roadway	
3461	1 of 1	1956	Prestressed Slab 20 Ft. Span 28 Ft. Roadway	
3464	1 of 1	1956	Prestressed Slab-15 ft Span-24 ft Roadway	
3596	C.P.-28	1956	Concrete Pile Bents 33 Ft. Span ~ 28 Ft. Roadway	
3596	S	1956	Concrete Deck Girder Span 33 Ft. Span 28 Ft. Roadway	
3632	1 of 1	1956	40 Ft. Prestressed Superstructure 2-26 Ft. Roadways 6'-6" Median	
3638	4 of 4	1956	63 Ft. Prestressed Concrete Span 2 ~ 23 Ft. Roadways 2 ~ 5 Ft. Sidewalks	
3638	3 of4	1956	63 Ft. Prestressed Concrete Span 2 ~ 23 Ft. Roadways 2 ~ 5 Ft. Sidewalks	
3644	SP 28	1956	Steel Pile Bents 28 Ft. Roadway ~ 36 Ft. Prestressed Span	
3644	CP 28	1956	Concrete Pile Bents 28 Ft. RDWY 36 Ft. Span	
3644	S	1956	36 Ft. Prestressed Concrete Span 28 Ft. Roadway	
3649	1 of 3	1956	End Bents 66 Ft. Span 4 Lane Roadway	
3649	2 of 3	1956	Intermediate Bents & Tower Bents 66Ft. Prestressed Span ~ 2 - 26'Roadways	
3659	1 of 1	1956	24'Sq. Prestressed Concrete Piles	
3660	1 of 2	1956	Prestressed Superstructure 48 Ft. Span 28 Ft. Roadway	
3660	2 of 2	1956	Concrete Pile Superstructure 48 Ft. Span 28 Ft. Roadway	
3666	1 of 1	1956	54" Prestressed Concrete Cylinder Pile	
3684	1 of 2	1956	Concrete Pile Bents 30 Ft. Span 4 Lane Roadway	
3684	2 of 2	1956	Prestressed Slab Superstructure 30 Ft. Span 4 Lane Roadway	
3690	C.P. 28	1956	Concrete Pile Bents 40 Ft. Span ~ 28 Ft. Roadway ~ 2 : 3'-6" Sidewalks	
3690	S	1956	40 Ft. Prestressed Beam Span 28'-0" Roadway 2 ~ 3'-6" Sidewalks	
3706	1 of 2	1956	Concrete Pile Substructure 37 Ft. Span ~ 26 Ft. Roadway ~ One 5 Ft. Sideway	
3706	2 of 2	1956	37 Ft. Prestressed Concrete Span 26 Ft. Roadway ~ One 5 Ft. Sideway	
3712	S	1956	Concrete Slab Superstructure 30'-0" Span 28'-0" Roadway	
3712	C.P. 28	1956	Concrete Pile Bent 28 Ft. Roadway ~ 30 Ft. Slab Span	
3746	S	1956	Concrete Slab Superstructure 33 Ft. Span 2 ~ 3'-0" S.W. 24 Ft. RDWY	
3746	C.P. 24	1956	Concrete Pile Bents 33 Ft. Span 2 ~ 3'-0" S.W. 24 Ft. RDWY	
3772	S	1956	Prestressed Concrete Superstructure 60 Ft. Span ~ 28 Ft. Roadway ~ 2-2Ft. Curbs	
3772	CP -28-I	1956	Concrete Pile Superstructure 60 Ft. Span 28 Ft. Roadway	
3792	S	1956	Concrete Slab Superstructure-20 ft Span-28 ft Rdwy-2-3 ft Sidewalks-30° Skew	
3792	CP28	1956	Concrete Pile Bents-20 ft Span-28 ft Roadway-30° Skew	
3798	1 of 3	1956	Concrete Pile Bents-33 ft Span-Dual 26 ft Roadways	End Bent
3798	2 of 3	1956	Concrete Pile Bents-33 ft Span-Dual 26 ft Roadways	Intermediate Bents
3798	3 of 3	1956	Concrete Slab Superstructure-33 ft Span-Dual 26 ft Roadways	
3800	1 of 3	1956	98 ft Prestressed Superstructure	
3800	2 of 3	1956	98 ft Prestressed Superstructure	
3800	3 of 3	1956	98 ft Prestressed Superstructure	
3802	CP28	1956	Concrete Pile Bents-28 ft Roadway-30 ft Span-30° Skew	
3802	S	1956	Concrete Slab Superstructure-30 ft Span-28 ft Roadway-30° Skew	
3804	S	1956	Concrete Slab Superstructure-30 ft Span-28 ft Roadway-15° Skew	

3804	CP28	1956	Concrete Pile Bents-30 ft Span-28 ft Roadway-15° Skew	
3809	1 of 3	1956	98 ft Prestressed Superstructure	
3811	CP76	1956	Concrete Pile End Bent-65 ft Span-2~38 ft Roadways	
3811	1 of 3	1956	Prestressed Concrete Superstructure-65' Span-Two 38 ft Roadways	
3827	CP28	1956	Concrete Pile Bents-20 ft Span-28 ft Roadway-15° Skew	
3827	S	1956	Concrete Slab Superstructure-20 ft Span-28 ft Rdwy-15° Skew	
3829	1 of 2	1956	68 ft Prestressed Superstructure	
3829	2 of 2	1956	68 ft Prestressed Superstructure	
3832	TP24	1956	Timber Pile Bents-30 ft Span-15° Skew-24 ft Roadway	
3832	S	1956	Concrete Slab Superstructure-30 ft Span- 15° Skew-24 ft Roadway	
3835	1 of 1	1956	47 ft Prestressed Superstructure	
3840	S	1956	Concrete Slab Superstructure-15 ft Span-28 ft Roadway	
3849	1 of 2	1956	Concrete Pile Bents-30 ft Span-52 ft Roadway	Substructure
3849	2 of 2	1956	Prestressed Slab Superstructure-32 ft Span-52 ft Roadway	
3857	1 of 3	1956	Concrete Pile Bents-38 ft Span-28 ft Roadway	End Bents
3857	2 of3	1956	Concrete Pile Bents-38 ft Span-28 ft Roadway	
3858	2 of 3	1956	Concrete Pile Bents-38 ft Span-28 ft Roadway	
3434	S	1957	Prestressed Beam Superstructure 36 Ft. Span 28 Ft. Roadway	
3516	C.P. 24	1957	Concrete Pile Bents 20 Ft. Span 24 Ft. Roadway	
3888	CP28	1957	Concrete Pile Bents-43' Span-28' Roadway-2 ft Curb-4 ft Sidewalk	
3888	S	1957	Prestressed Concrete Superstructure-43' Span-28' Roadway-2 ft Curb-4 ft Sidewalk	
3892	T.P. 24	1957	Timber Pile Bents 30 Ft. Span 24 Ft. RDWY.	
3892	S	1957	Concrete Slab Superstructure 30 Ft. Span 24 Ft. Roadway	
3895	T.P. - 24	1957	Timber Pile Bents 26 Ft. Span ~ 24 Ft. RDWY.	
3895	S	1957	Concrete Slab Superstructure	
3900	2 of 2	1957	Prestressed Concrete Superstructure 62 Ft. Span ~ 28 Ft. Roadway ~ 2-3'-6" Sidewalks	Details of Prestressed Beams (Type C-18-2)
3900	1 of 2	1957	Prestressed Concrete Superstructure 62 Ft. Span ~ 28 Ft. Roadway ~ 2-3'-6" Sidewalks	
3908	1 of 1	1957	Slab Superstructure	
3913	S	1957	Prestressed Beam Superstructure	
3913	CP - 24I	1957	Concrete Pile Bents 26 Ft. Span 24 Ft. Roadway	
3919	C.P. 24	1957	Concrete Pile Bents Ft. Span 24 Ft. Roadway	
3923	C.P. 28	1957	Concrete Pile Bents 40 Ft. Span 2~28 Ft. RDWYS 2 Ft. Curbs & 5 Ft. SWKS	
3923	S	1957	Prestressed Beam Superstructure 40 Ft. Span 2~28 Ft. RDWYS 2 Ft. Curbs & 5 Ft. SWKS	
3927	1 of 1	1957	Prestressed Concrete Beam Type IV	
3928	1 of 3	1957	Prestressed Concrete Superstructure 98 Ft. Two 38 Ft. Roadway	
3934	C.P. - 28	1957	Concrete Pile Bents 36 Ft. Span 28 Ft. Roadway	
3935	S	1957	Prestressed Beam Superstructure 44 F. Span 28 Ft. Roadway	
3940	CP28	1957	Concrete Pile Bents-Continuous 30'-30'-30'-Spans-28 ft Roadway	
3940	S	1957	Continuous Span Concr. Slab Superstructure 30'-30'-30' Spans ~ 28 Ft. Roadway	
3969	S	1957	Concrete Slab Superstructure-20 ft Span-2~4 ft SW-24 ft Roadway	
3969	WCP24	1957	Concrete Pile Bents-20 ft Spans-2~4 ft SW-24 ft Roadway	
3969	CP24	1957	Concrete Pile Bents-20 ft Span-2~4 ft SW-24 ft Roadway	
3973	1 of 3	1957	Prestressed Concrete Superstructure-66 ft Span-2~26 ft Roadways	
3984	1 of 3	1957	Prestressed Beam Superstructure-46 ft Span-2~21 ft Roadways-2~5 ft Sidewalks	
3984	3 of 3	1957	Concrete Pile Bents-46 ft Span-2~21 ft Roadways-2~ 5 ft Swks	
3985	1 of 2	1957	Prestressed Beam Superstructure	
3985	1 of 2	1957	Prestressed Beam Superstructure-43 ft Span-2~21 ft Roadways-2~5 ft Sidewalks	

3991	S	1957	Concrete Slab Superstructure-20 ft Span-2~4'-0" SW-28 ft Roadway	
3991	CP28	1957	Concrete Pile Bents-20 ft Span-2~4'-0" SW-28 ft Roadway	
3998	1 of 1	1957	Concrete Pile Bent-43 ft Span-2~ 21 ft Rdwys-2~5' Swks~2' Median	Bents 2 & 3
4006	1 of 1	1957	Details of Approach Slab-28 ft Roadway-30° Skew-Two 3' SW Flared	
4007	1 of 2	1957	Concrete Slab Superstructure-23 ft Span-28 ft Roadway	
4008	1 of 3	1957	Concrete Slab Superstructure-21 ft Span-28 ft Roadway	
4008	2 of 3	1957	Concrete Slab Superstructure-16 ft Span-28 ft Roadway	
4008	3 of 3	1957	Concrete Pile Bents-21 ft Span-28 ft Roadway-2 ft Curbs	
4031	1 of 4	1957	Prestressed Beam Superstructure-36 ft Span-28 ft Roadway	
4033	1 of 2	1957	Prestressed Beam Superstructure-40 ft Span-2~26 ft Rdwys-2~5 ft Swks-4 ft Med	
4033	2 of 2	1957	Concrete Pile Bents-40 ft Span-2~26 ft Rdwys-2~5 ft Swks-4 ft Med	
4039	1 of 2	1957	Prestressed Beam Superstructure-60 ft Span-28 ft Roadway	
4049	1 of 4	1957	Concrete Pile End Bent-40 ft Span-28 ft Roadway	
4049	2 of 4	1957	Concrete Pile End Bent-40 ft Span-28 ft Roadway	
4049	3 of 4	1957	Prestressed Beam Superstructure-40 ft Span-28 ft Roadway	
4055	1 of 1	1957	Prestressed Beam Superstructure 48 Ft. Span 2~26 Ft. Rdwys 2~5 Ft. Swks 4 Ft. Med.	
4197	1 of 5	1957	Concrete Pile End Bent 40 Ft. Span ~ 28 Ft. RDWY. ~ 3 Ft. SDWK.	
4197	4 of 5	1957	40 Ft. Span Superstructure 28 Ft. RDWY. ~ 3'-6" SDWK.	
4197	5 of 5	1957	Prestressed Beam Type II 26-0 ~ 40 Ft. Span	
		1957	Concrete Pile End Bent Ft. Span Ft. Roadway	Wingwall Details Type III Beams
4098	S	1958	Concrete Slab Superstructure 15 Ft. Span 24 Ft. Roadway	
4098	C.P.-24	1958	Concrete Pile Bent 15 Ft. Span 24 Ft. Roadway	
4141	1 of 2	1958	Concrete Pile Bents-26' Span-28' Roadway	
4141	2 of 2	1958	Concrete Slab Superstructure-26 ft Span-28 ft Roadway	
4174	C.P.-28	1958	Concrete Pile Bents 20' Span 28' Roadway 2' Curbs 3/16" Super. Elev.	
4174	S	1958	Concrete Slab Superstructure 20 Ft. Span 28 Ft. Roadway 3/16" / Ft. Super. Elev.	
4193	3 of 5	1958	Concrete Pile Bent 40 ' Span 24' Roadway	
4193	4 of 5	1958	40 Ft. Span Superstructure 24 Ft. Roadway 3'-6" Sidewalks	
4193	5 of 5	1958	Prestressed Concrete Beam (Type II, 22-0) 40 Ft. Span Superstructure	
4193	1 of 5	1958	Concrete Pile End Bent 40 Ft. Span 24 Ft. Roadway 3'-6" Sidewalks	
4197	3 of 5	1958	Concrete Pile Bent 40 Ft. Span 28 Ft. Roadway	
4212	1 of 1	1958	Prestressed Beam Superstructure 70 Ft. Span 28 Ft. Roadway	
4237	C.P. 24	1958	Concrete Pile Bents 20 Ft. Span 24 Ft. Roadway	
4249	S	1958	Prestressed Slab 30 Ft. Span 24 Ft. Roadway	Proposed 30 Ft. Superstructure
4249	CP - 24I	1958	Concrete Pile Bents 30 Ft. Span 24 Ft. Roadway	
4249	CP - 24E	1958	Concrete Pile Bents 30 Ft. Span 24 Ft. Roadway	
4460	CP28	1959	End Bent and Intermediate Bent 25 Ft. Span 28 Ft. Roadway	
4460	S	1959	Concrete Slab Superstructure 25 Ft. Span 28 Ft. Roadway	
4474	1 of 1	1959	Approach Slab Details 28' Roadway ~ Superelevate 3/16" Per Ft. ~ 2' Curb & 4' S.W.	
4494	CP28	1959	Concrete Pile Bents 20 Ft. Span 28 Ft. Roadway	
4494	S	1959	Concrete Slab Superstructure20 Ft. Span 28 Ft. Roadway	
4579	5 of 6	1959	41 Ft. Span Superstructure	
4699	C.P.28	1959	Concrete Pile Bents 20' Span ~ 28' RDWY ~ 35˚ Skew	
7347	1 of 2	1959	Prestressed Slab Superstructure 30 Ft. Span ~ 24 Ft. Roadway	
4749	1 of 1	1960	Concrete Pile Bent 40 Ft. Span 28 Ft. Roadway	
4827	SP-24	1960	Standard Substructure 24' Roadway; 26' Span; 30˚ Skew Left	
4827	S-24	1960	Standard Superstructure 26' Span; 24' Roadway; 30˚ Skew Left	
4859	2 of 2	1960	Substructures	
4859	1 of 2	1960	25 Ft. Span Superstructure	
4911	S	1960	28 ft Span Slab Superstructure-24 ft Roadway-9" Curbs	

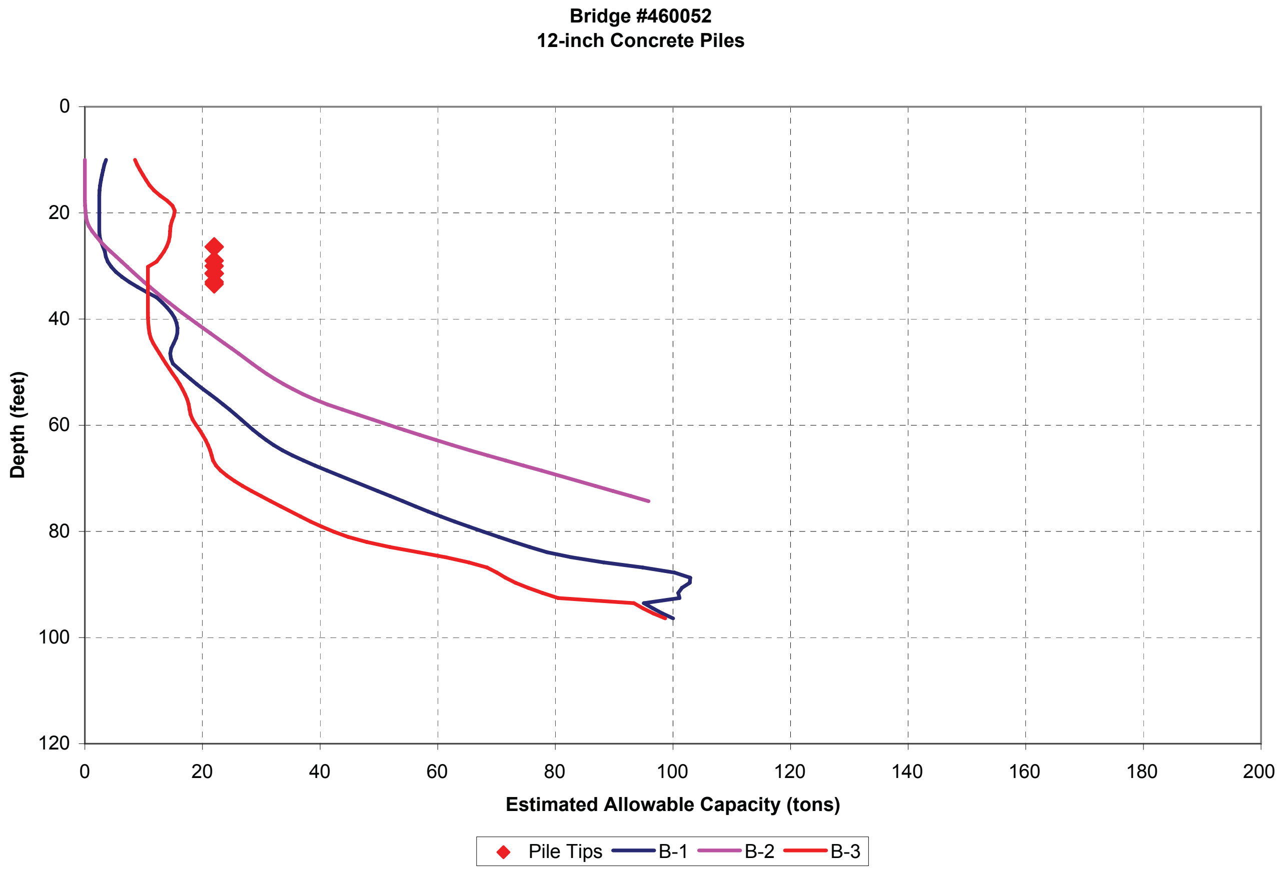
7020	1 of 1	1960	Steel Pile Bents-41 ft Span-24 ft Roadway	
		1960	Prestressed Beams (Type II -	
7347	2 of 2	1962	Prestressed Slab Superstructure 30 Ft. Span ~ 24 Ft. Roadway	Slab Unit Details
7432	CP24	1962	Concrete Pile Bents-20 ft Span-24 ft Roadway	
7432	S	1962	Standard Slab Superstructure-20 ft Span-24 ft Roadway	
7473	CP24	1962	Concrete Pile Bents-20 ft Span-24 ft Roadway	
7697	1 of 2	1963	Prestressed Slabs & Beams	
7697	2 of 2	1963	Prestressed Slabs & Beams	
7786	1 of 5	1963	Concrete Slab Superstructure-25 ft Span-28 ft Roadway	
7786	5 of 5	1963	Intermediate Bents-25 ft Span-28 ft Roadway	
7786	4 of 5	1963	Intermediate Bents-25 ft Span-28 ft Roadway	
7786	2 of 5	1963	End Bents-25 ft Span-28 ft Roadway	
8381	1 of 1	1964	Intermediate Bents	
8502	1 of 1	1964	Intermediate Bents	
8750	CP	1964	Concrete Pile Bents-30 ft Span-30 ft Roadway	
		1966	Prestressed Slab Unit (15" x 36")	
9663	1 of 1	1967	Bridge Typical Sections	
10289	S 1 of 1	1969	20", 24" and 30" Prestressed Concrete Piles	
12670	2 of 3	1978	Prestressed Slab Units	
12670	1 of 3	1978	Prestressed Slab Units	
1	4		28'-0" Clear Span Concrete Deck Girder	
1866	1 of 1		Standard Conc. D.G. Superstructure 26'-0" Roadway ~ 22'-6" Span	
4007			Concrete Pile Bents-23 ft Span-28 ft Rdwy-2 ft Curbs-Superelevated 3/16" per ft	

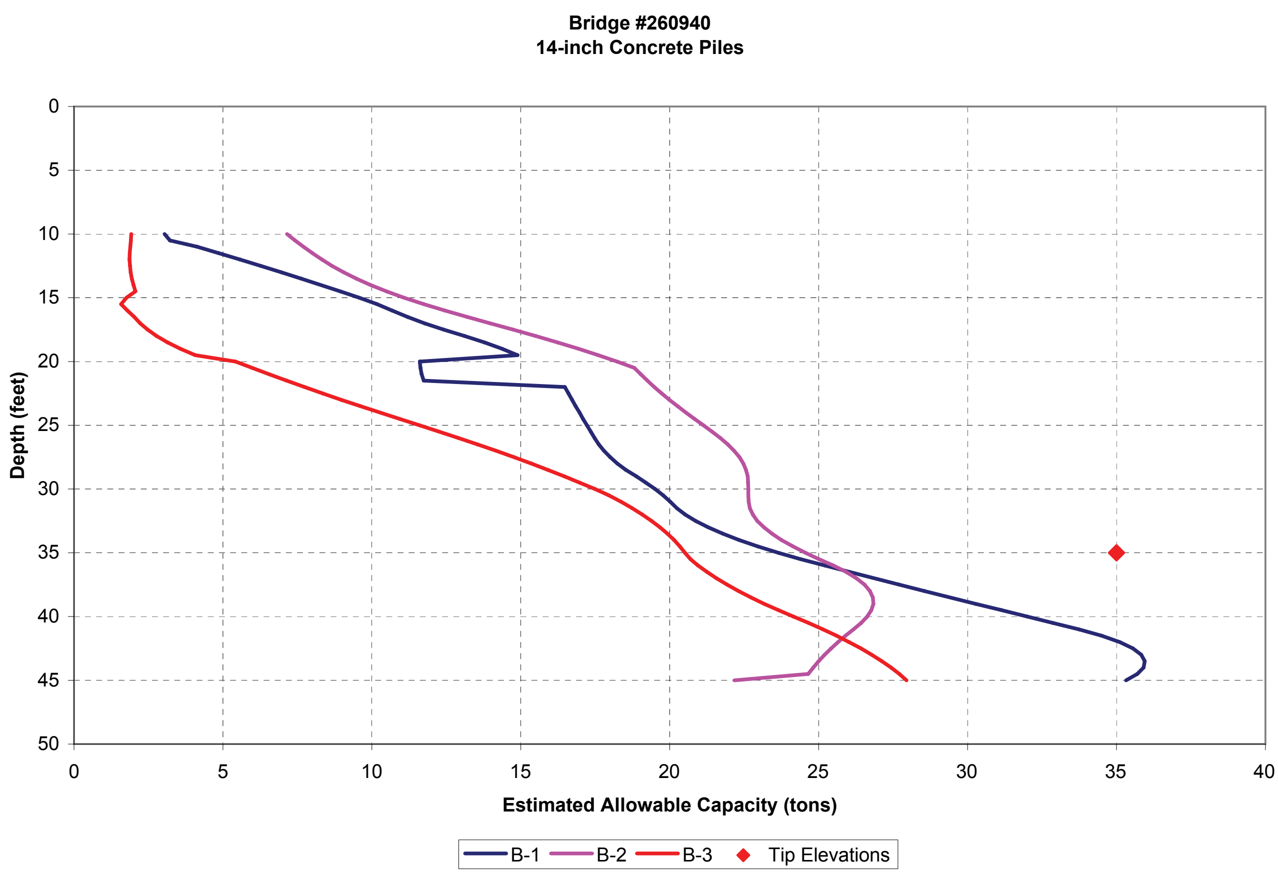
Appendix E

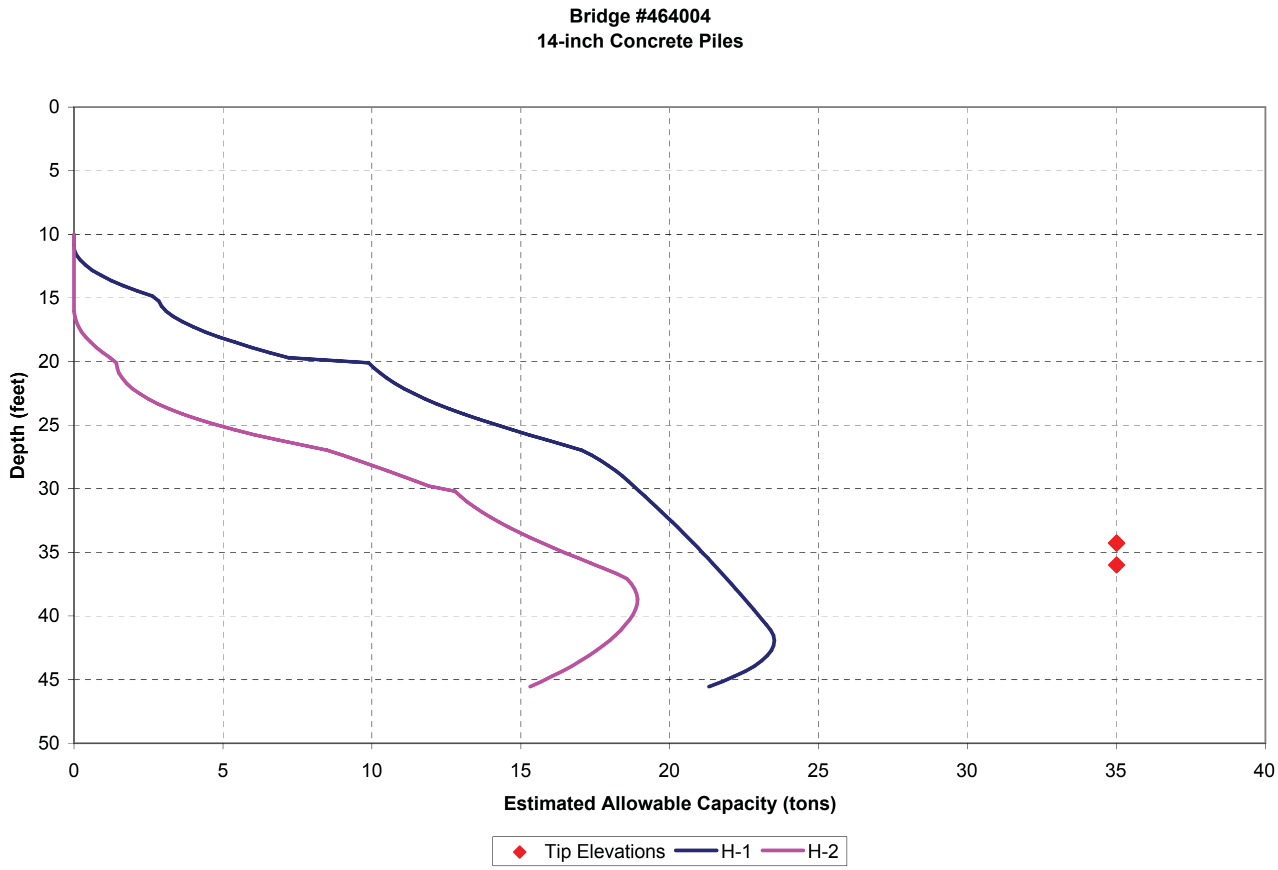
The following items are included in Appendix E:

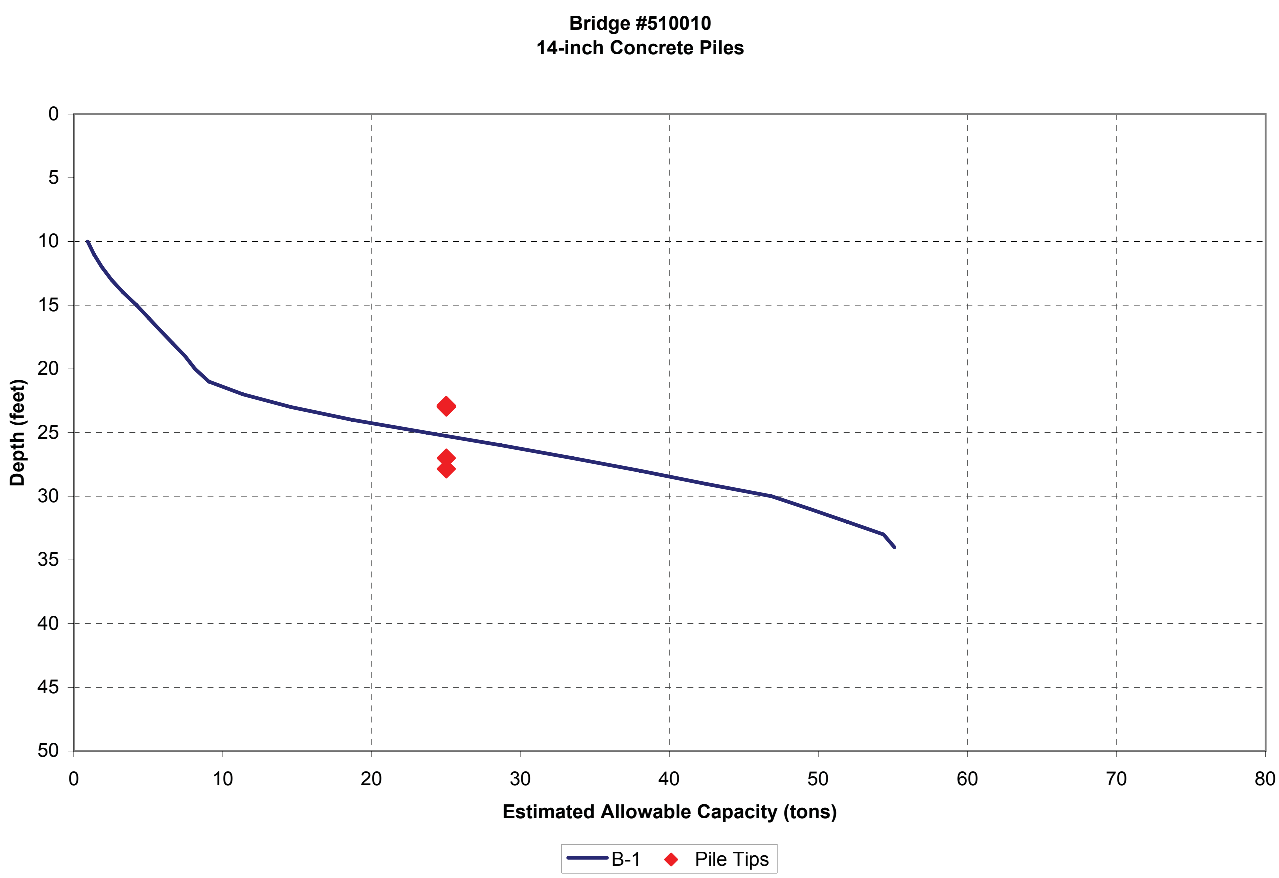
- FB-Deep analysis using SPT borings

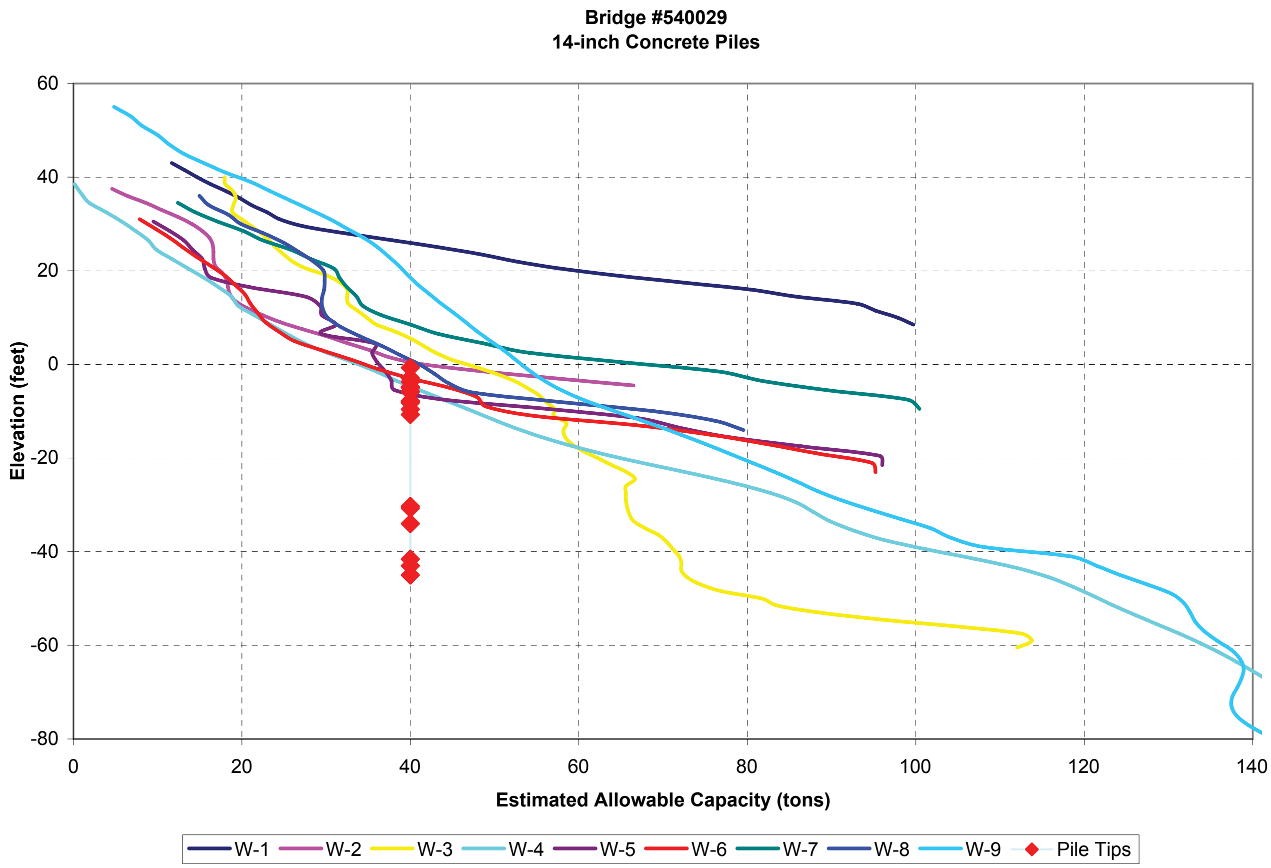
FB-Deep Analysis Using SPT Borings

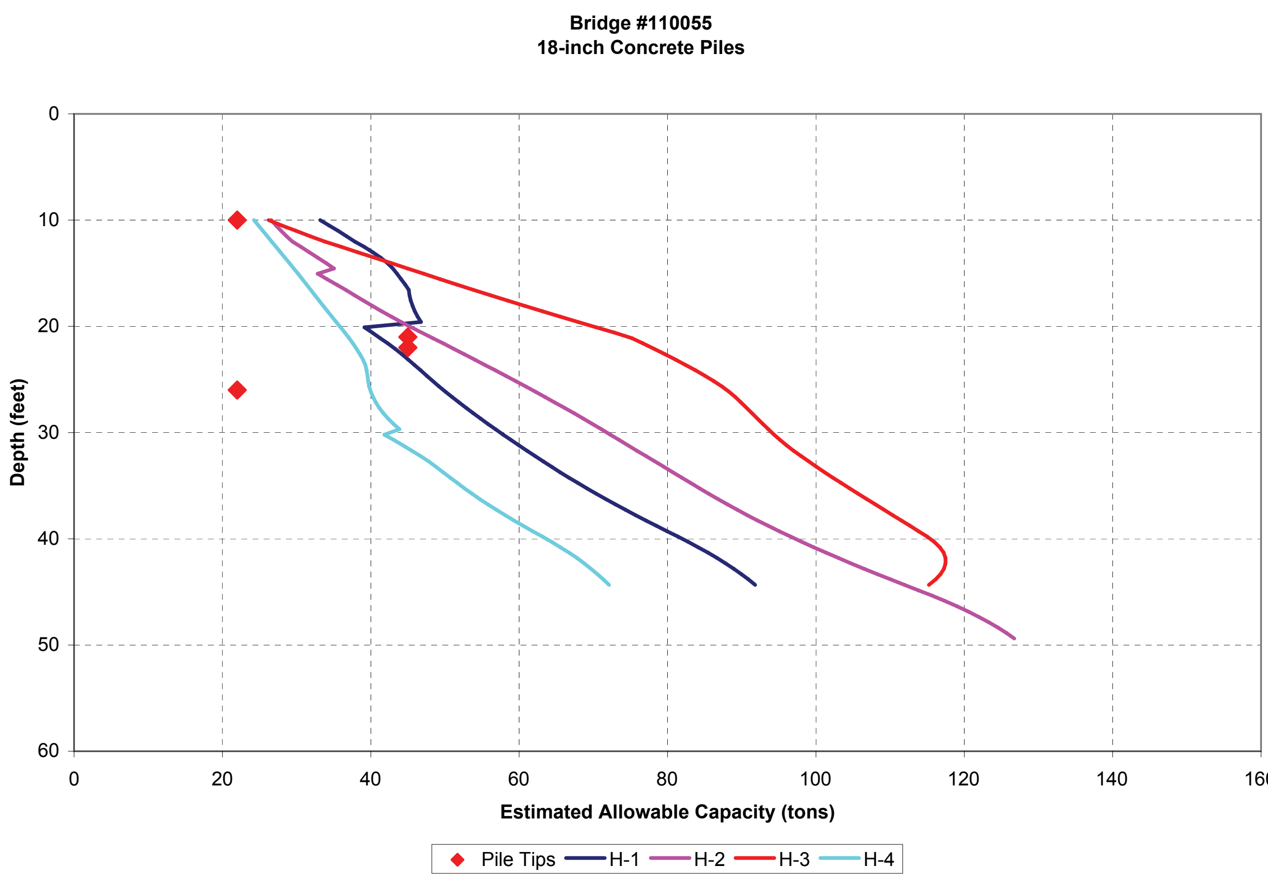


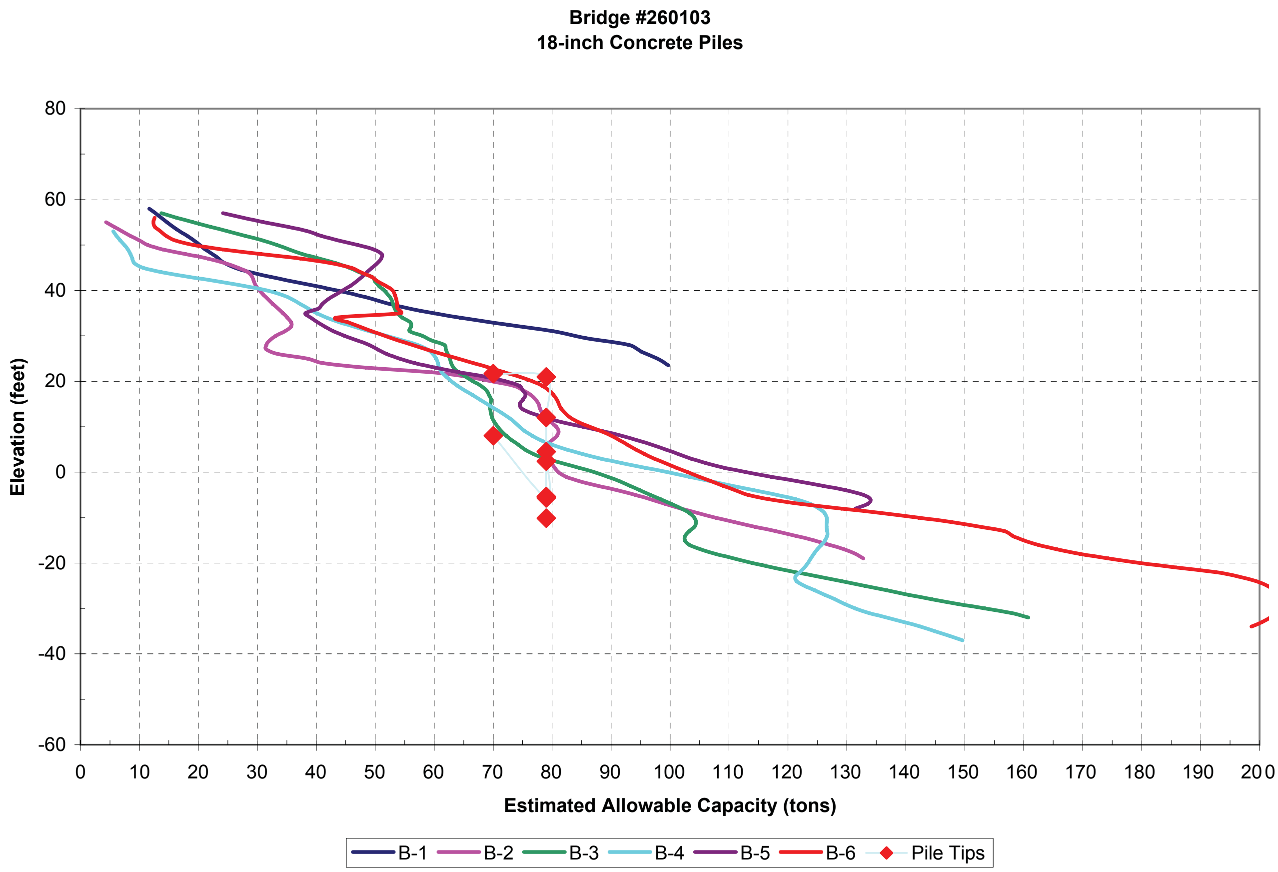


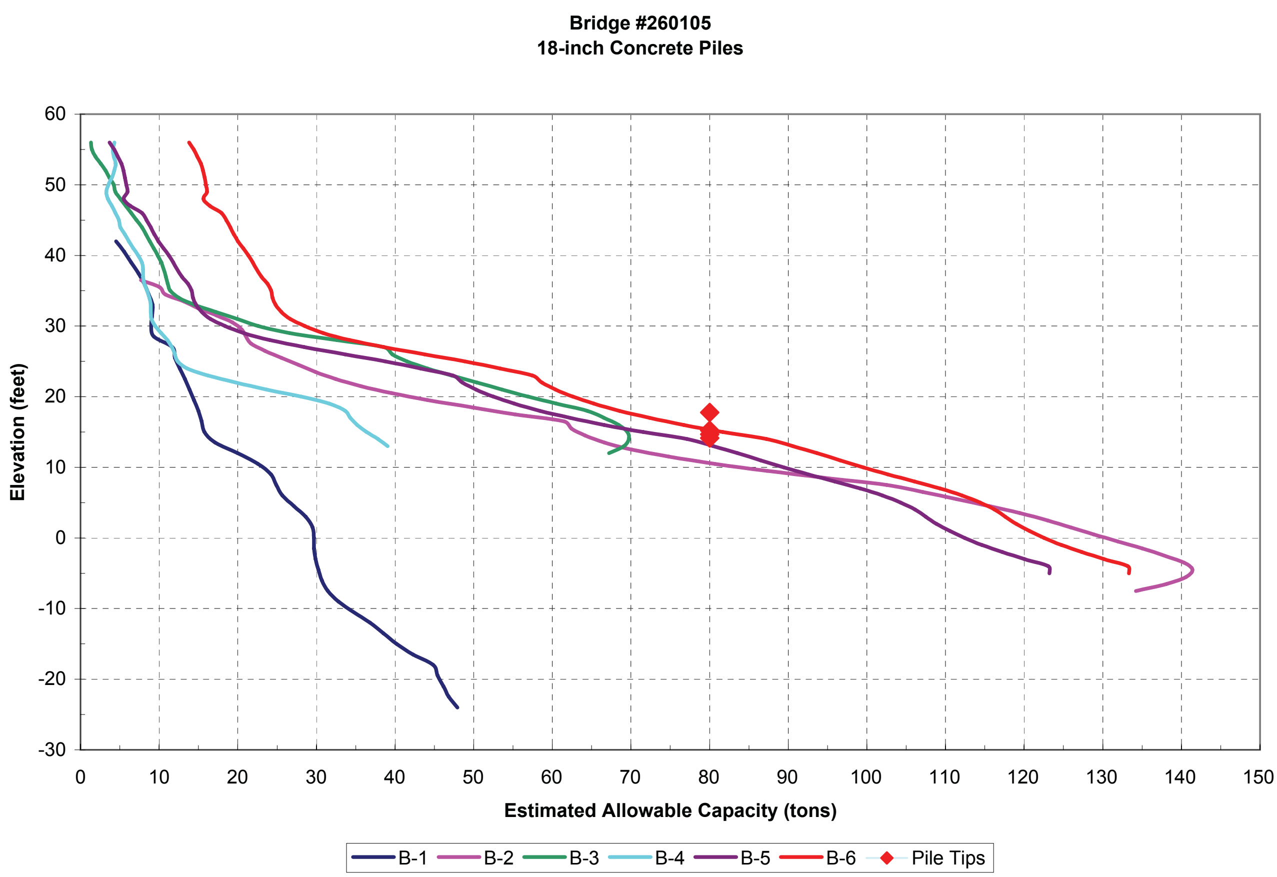

Bridge #464004
14-inch Concrete Piles
Depth (feet)
Estimated Allowable Capacity (tons)
0
5
10
15
20
25
30
35
40
45
50
0
5
10
15
20
25
30
35
40
Tip Elevations
H-1
H-2

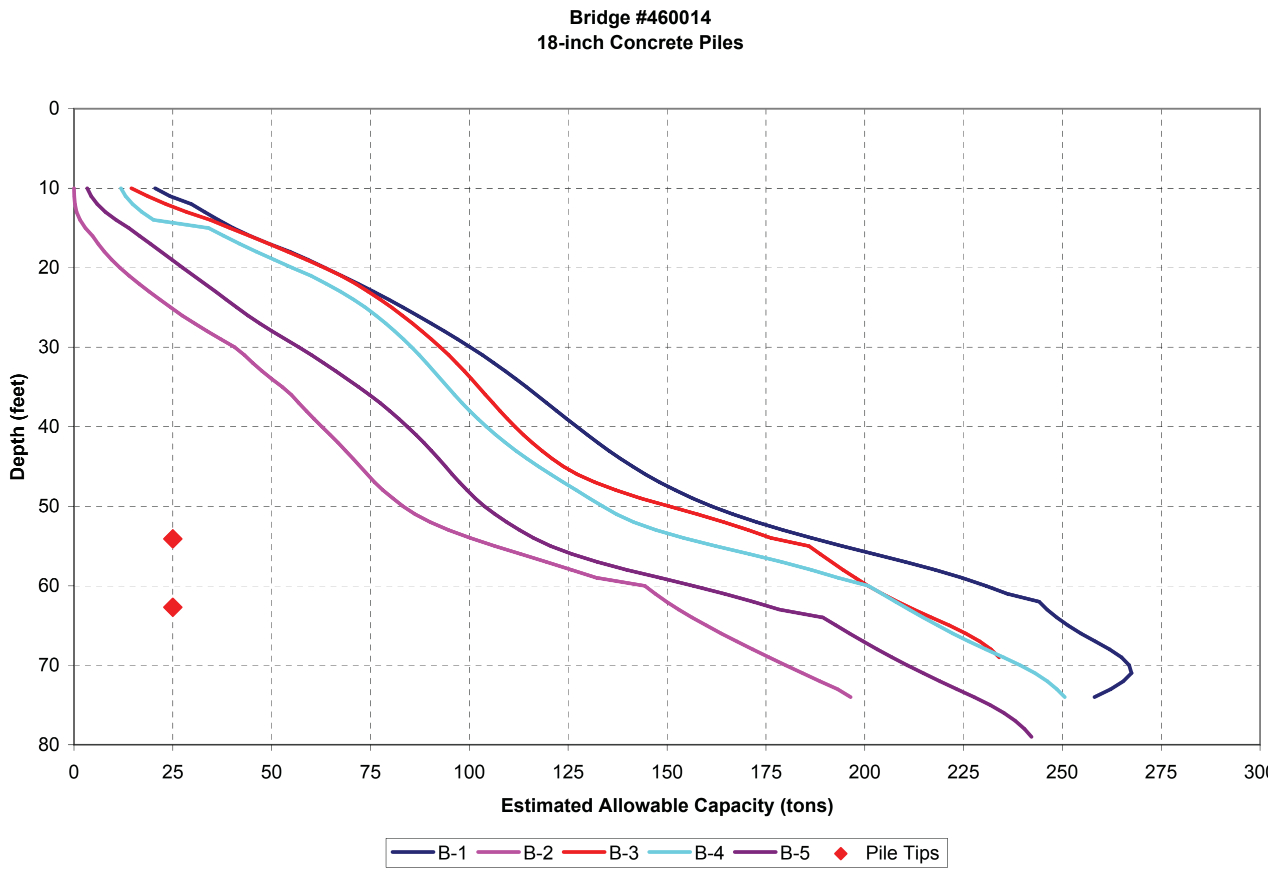

Bridge #510010
14-inch Concrete Piles
Depth (feet)
Estimated Allowable Capacity (tons)
0
5
10
15
20
25
30
35
40
45
50
0
10
20
30
40
50
60
70
80
B-1
Pile Tips

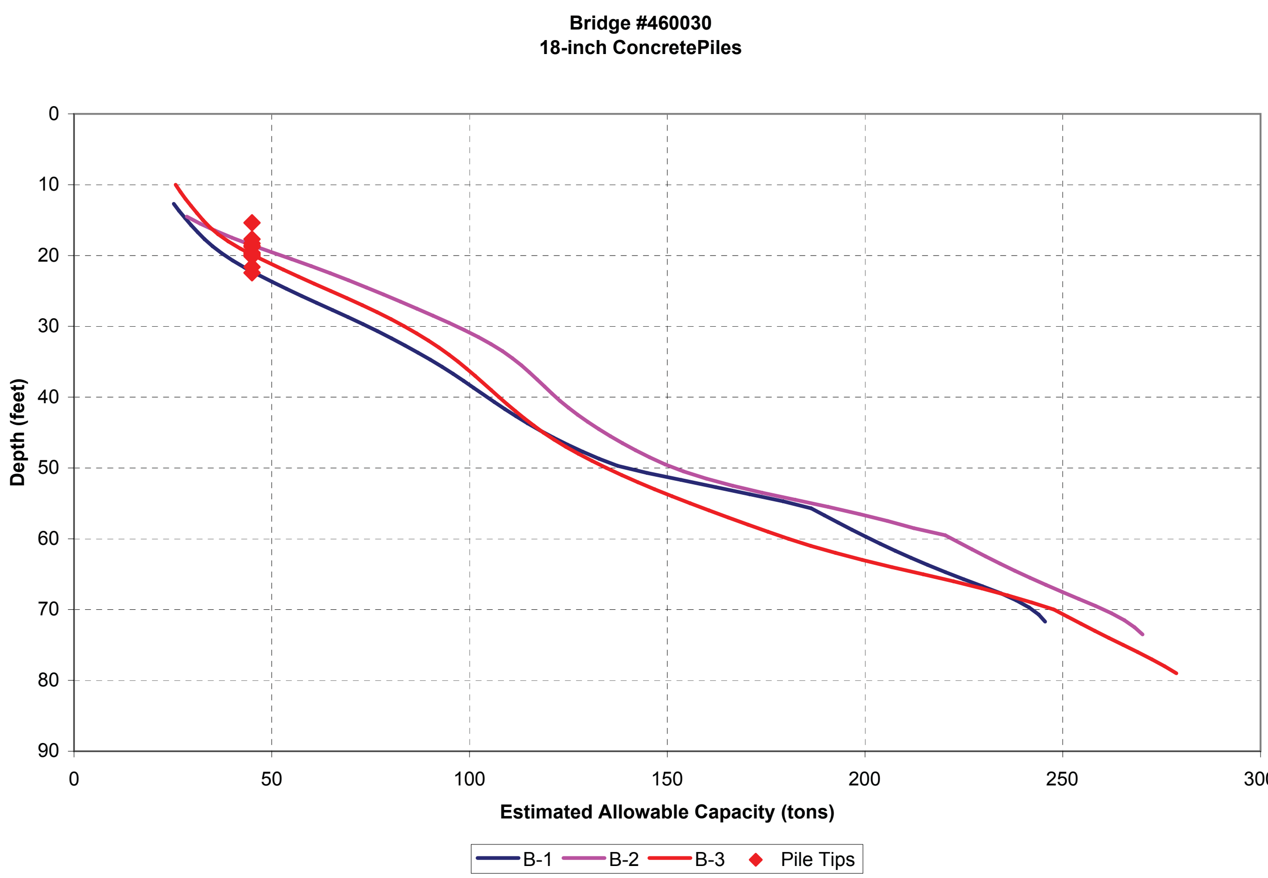

Bridge #540029
14-inch Concrete Piles
60
40
20
0
-20
-40
-60
-80
Elevation (feet)
0
20
40
60
80
100
120
140
Estimated Allowable Capacity (tons)
W-1
W-2
W-3
W-4
W-5
W-6
W-7
W-8
W-9
Pile Tips

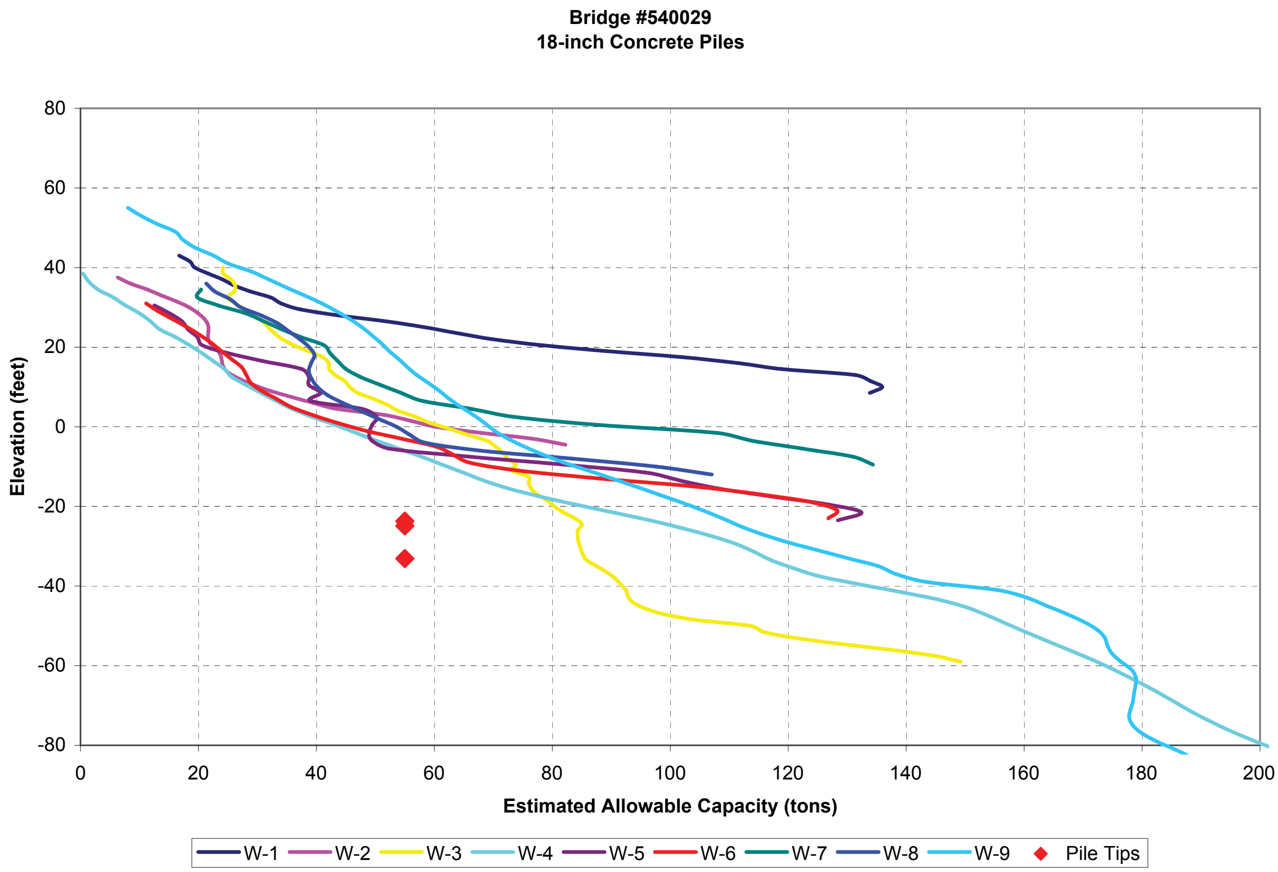

Bridge #110055
18-inch Concrete Piles
0
10
20
30
40
50
60
Depth (feet)
0
20
40
60
80
100
120
140
160
Estimated Allowable Capacity (tons)
Pile Tips
H-1
H-2
H-3
H-4

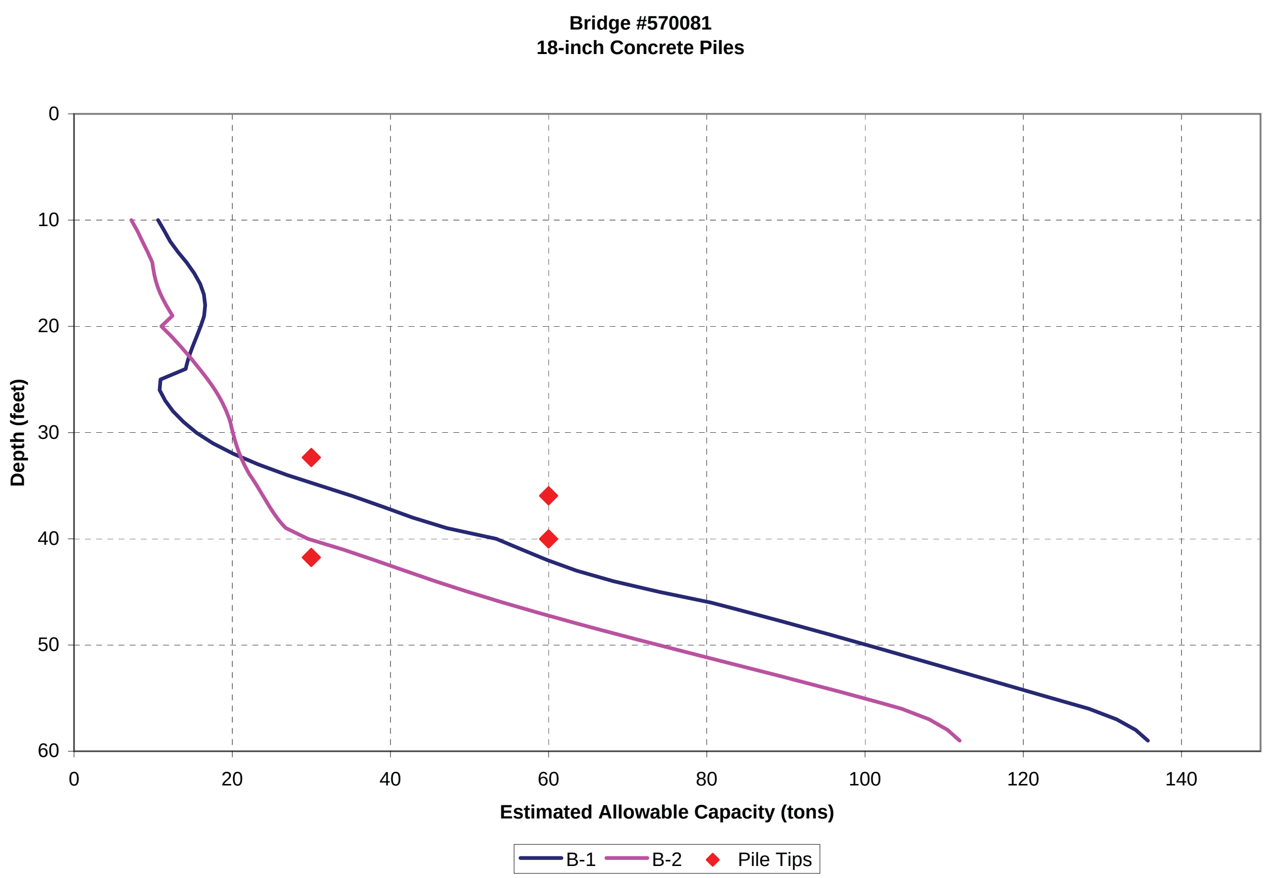

Bridge #260103
18-inch Concrete Piles
Elevation (feet)
80
60
40
20
0
-20
-40
-60
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
Estimated Allowable Capacity (tons)
B-1
B-2
B-3
B-4
B-5
B-6
Pile Tips


Bridge #260105
18-inch Concrete Piles
Elevation (feet)
60
50
40
30
20
10
0
-10
-20
-30
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
Estimated Allowable Capacity (tons)
B-1
B-2
B-3
B-4
B-5
B-6
Pile Tips

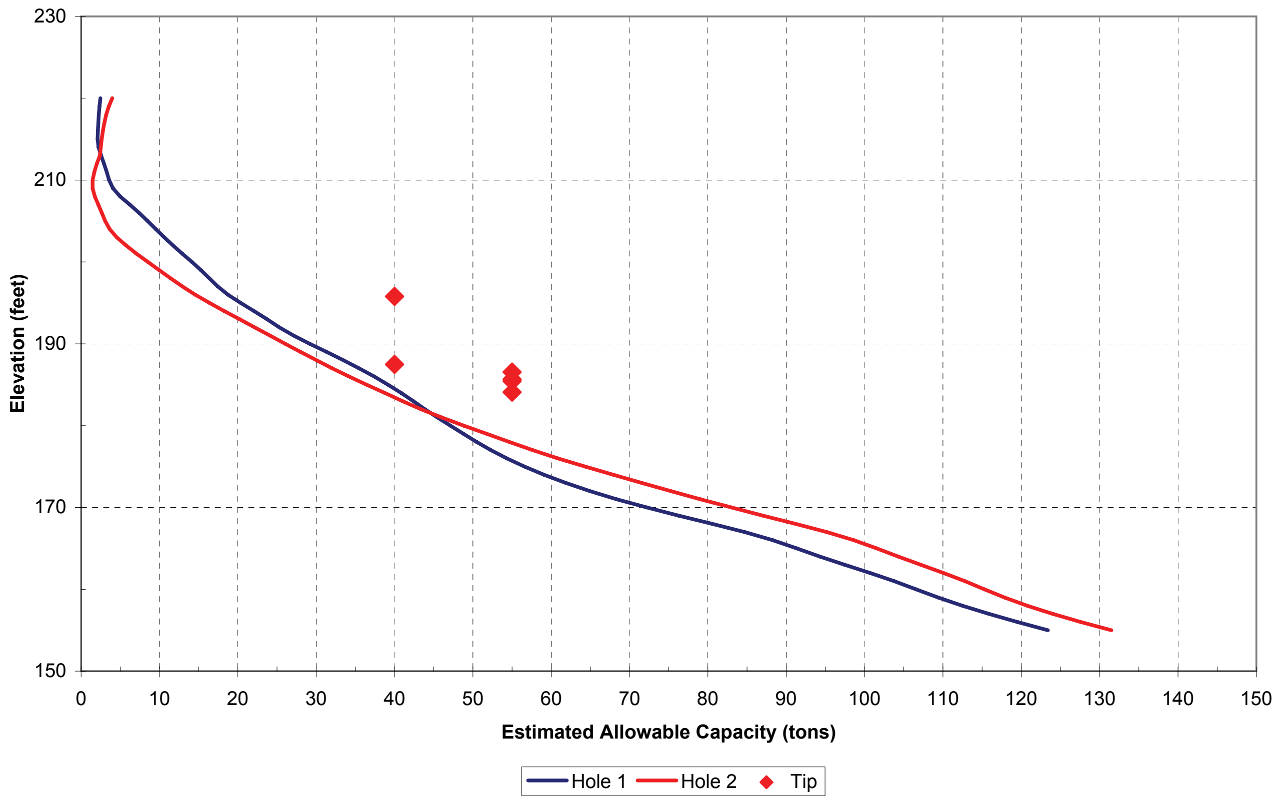

Bridge #460014
18-inch Concrete Piles
Depth (feet)
Estimated Allowable Capacity (tons)
B-1
B-2
B-3
B-4
B-5
Pile Tips


Bridge #460030
18-inch ConcretePiles
Depth (feet)
Estimated Allowable Capacity (tons)
B-1
B-2
B-3
Pile Tips

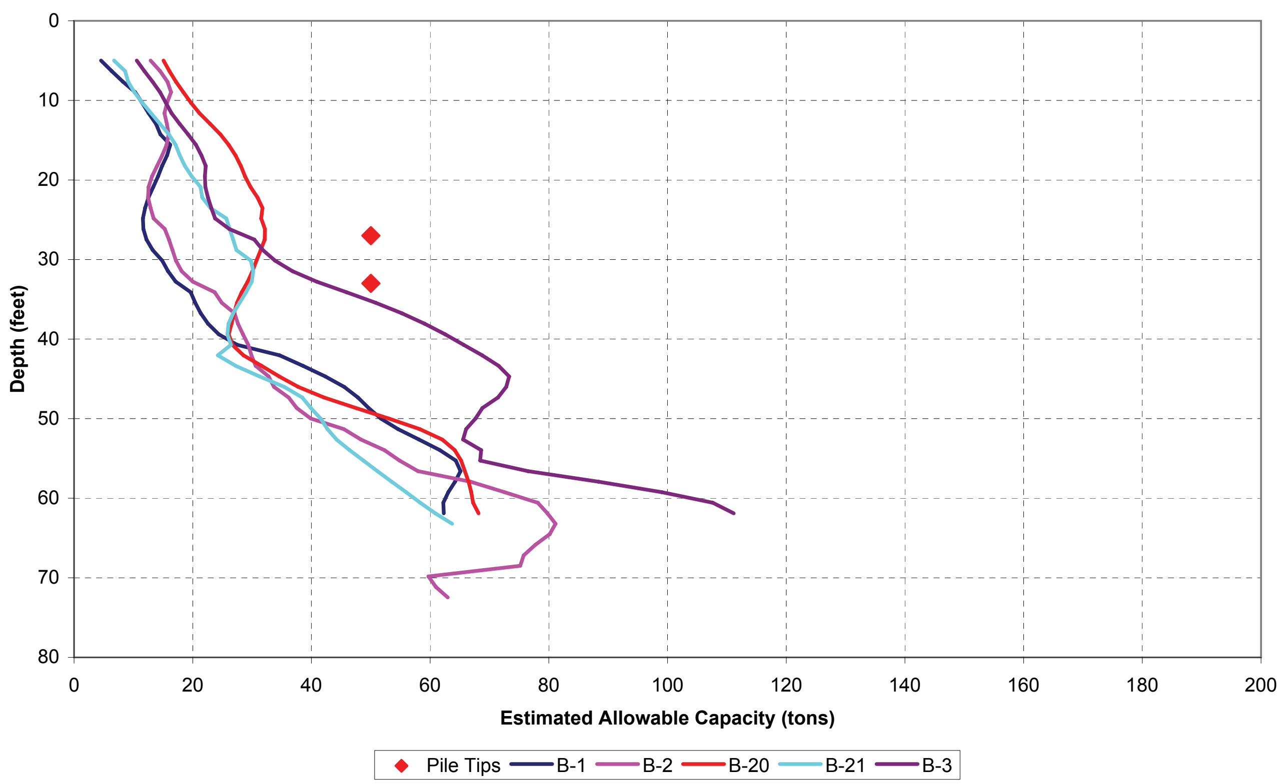

Bridge #540029
18-inch Concrete Piles
Elevation (feet)
80
60
40
20
0
-20
-40
-60
-80
0
20
40
60
80
100
120
140
160
180
200
Estimated Allowable Capacity (tons)
W-1
W-2
W-3
W-4
W-5
W-6
W-7
W-8
W-9
Pile Tips


Bridge #570081
18-inch Concrete Piles
Depth (feet)
0
10
20
30
40
50
60
0
20
40
60
80
100
120
140
Estimated Allowable Capacity (tons)
B-1
B-2
Pile Tips

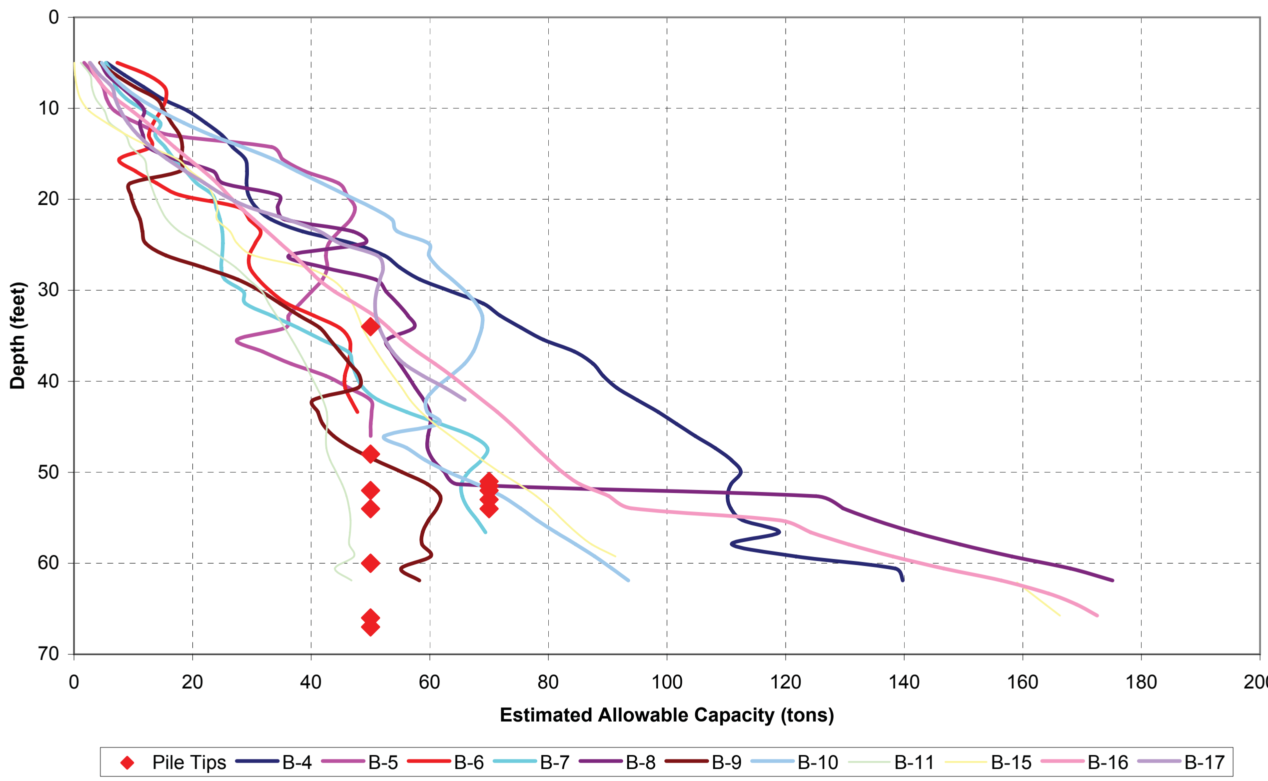
Bridge #600100
18-inch Concrete Piles



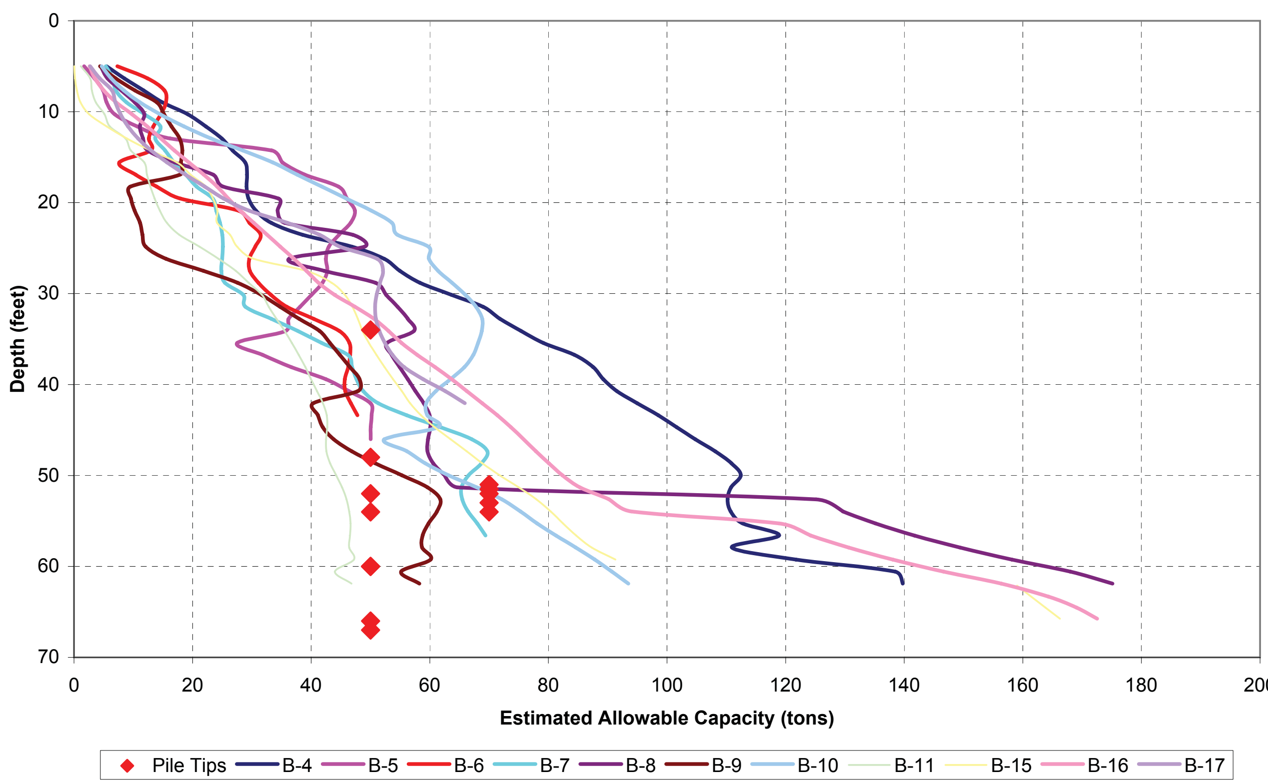
Bridge #780089 & #780100
18-inch Concrete Piles

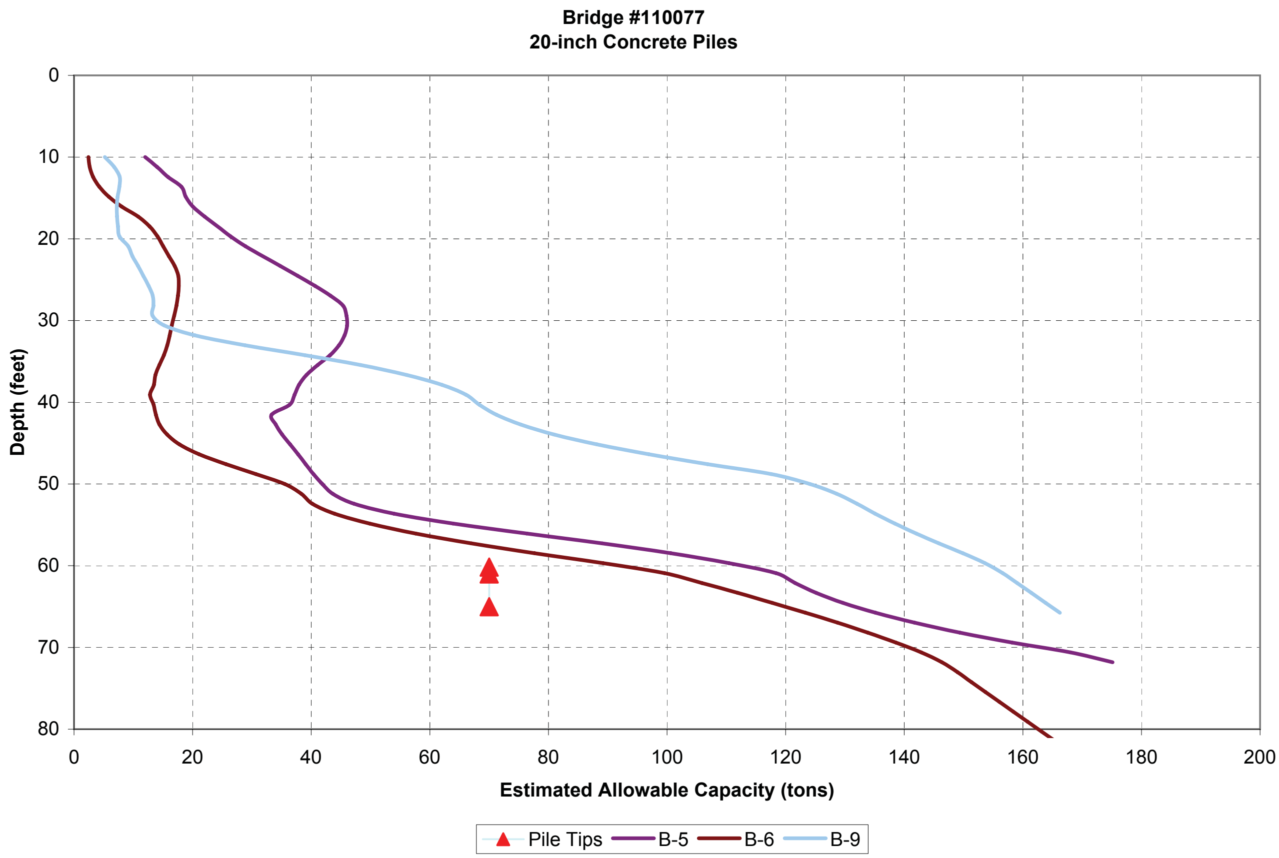


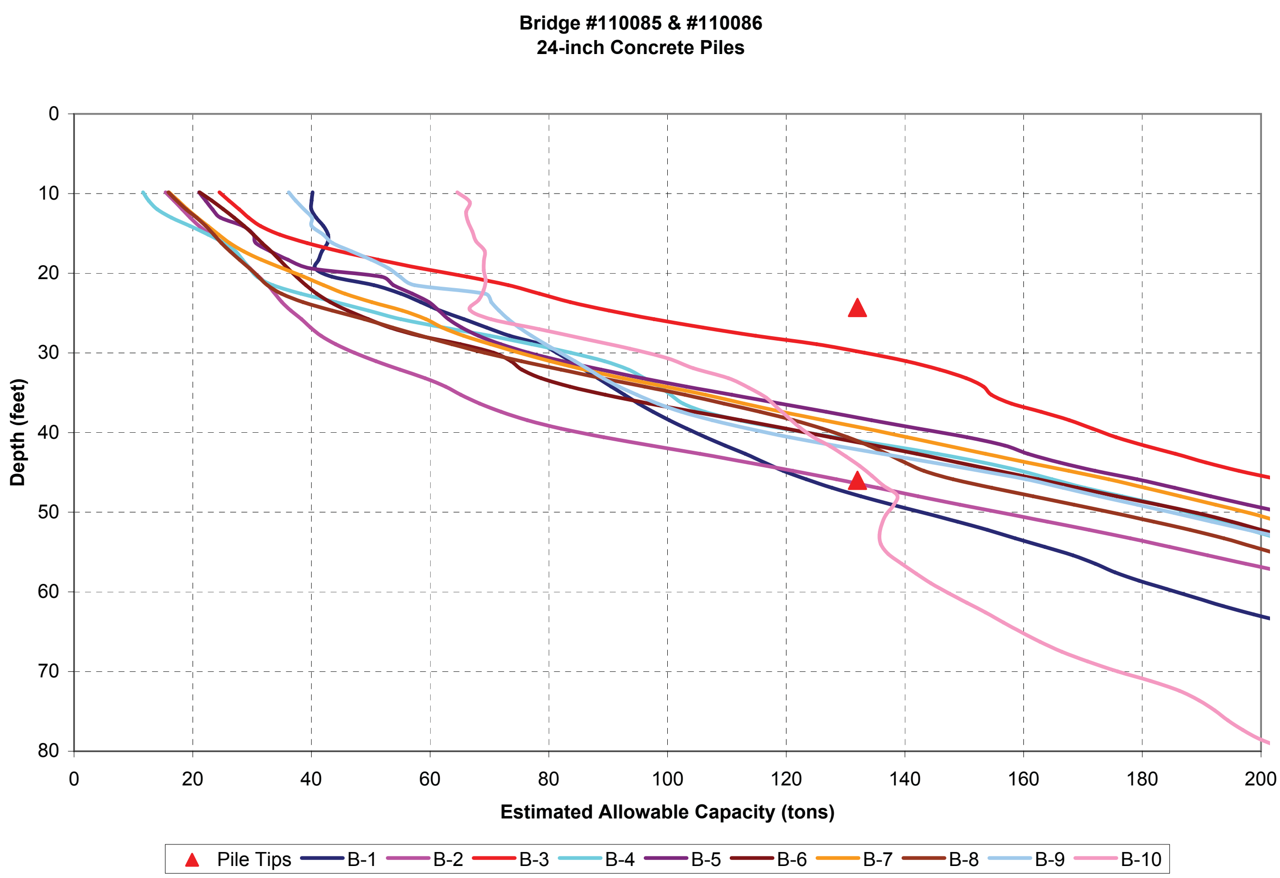
Bridge #780089 & #780100
20-inch Piles

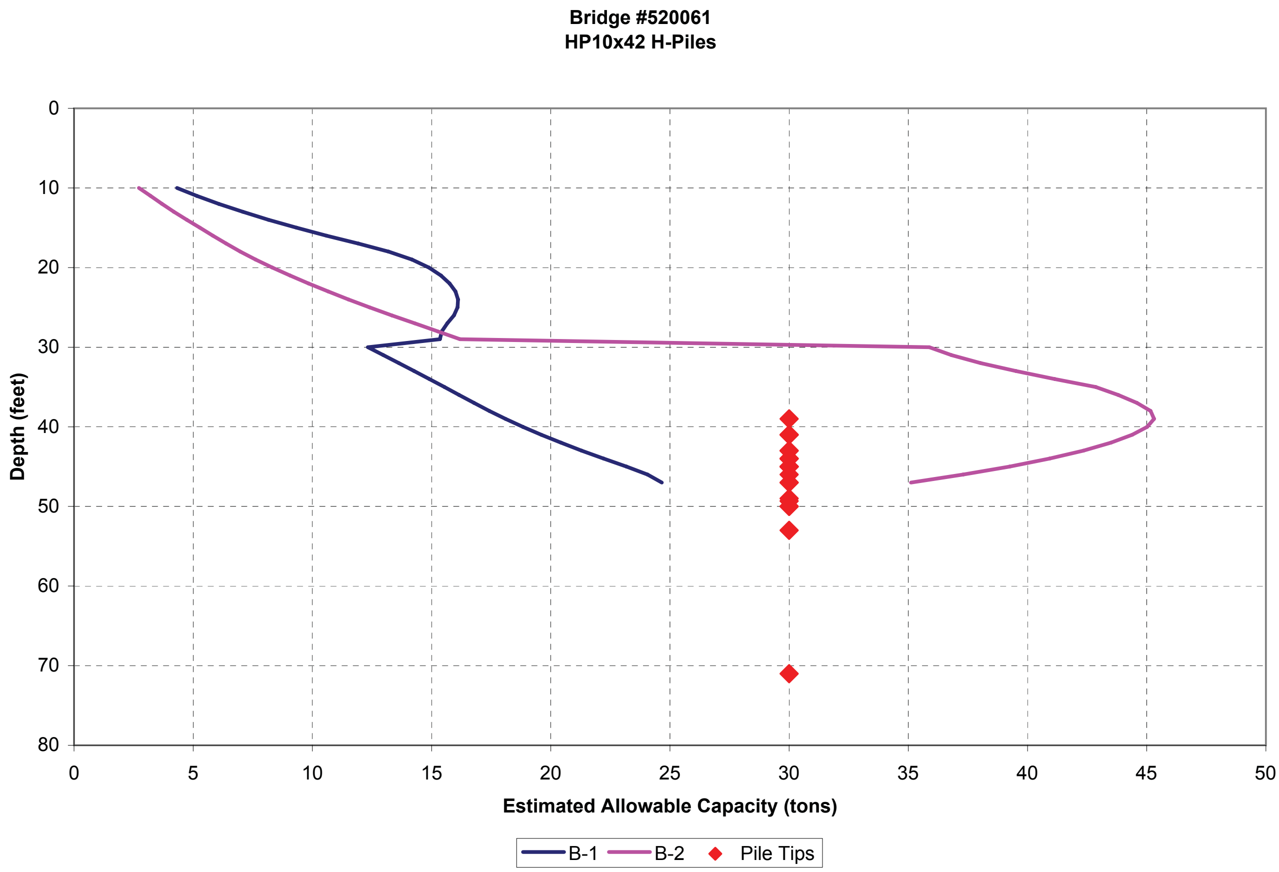


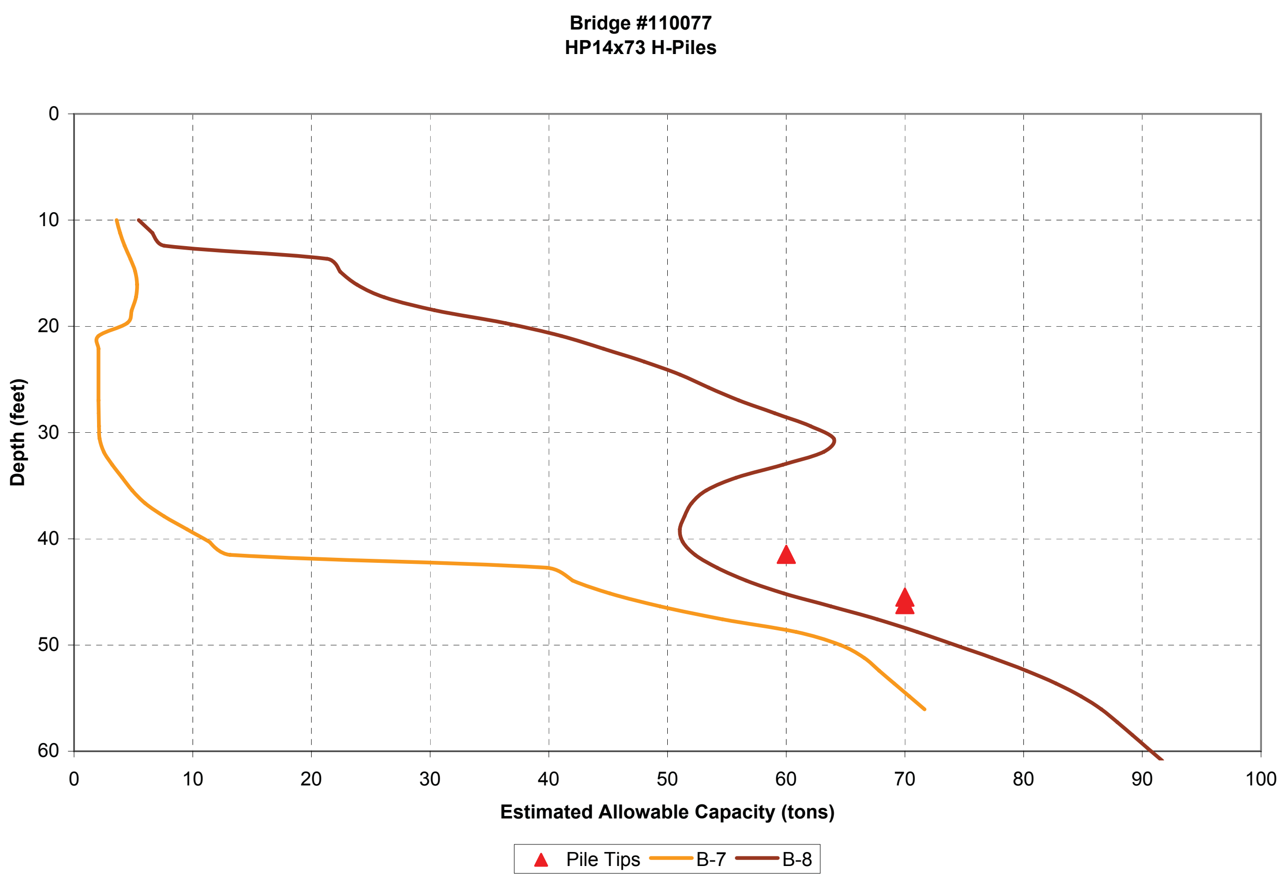
Bridge #780089 & #780100
20-inch Concrete Piles



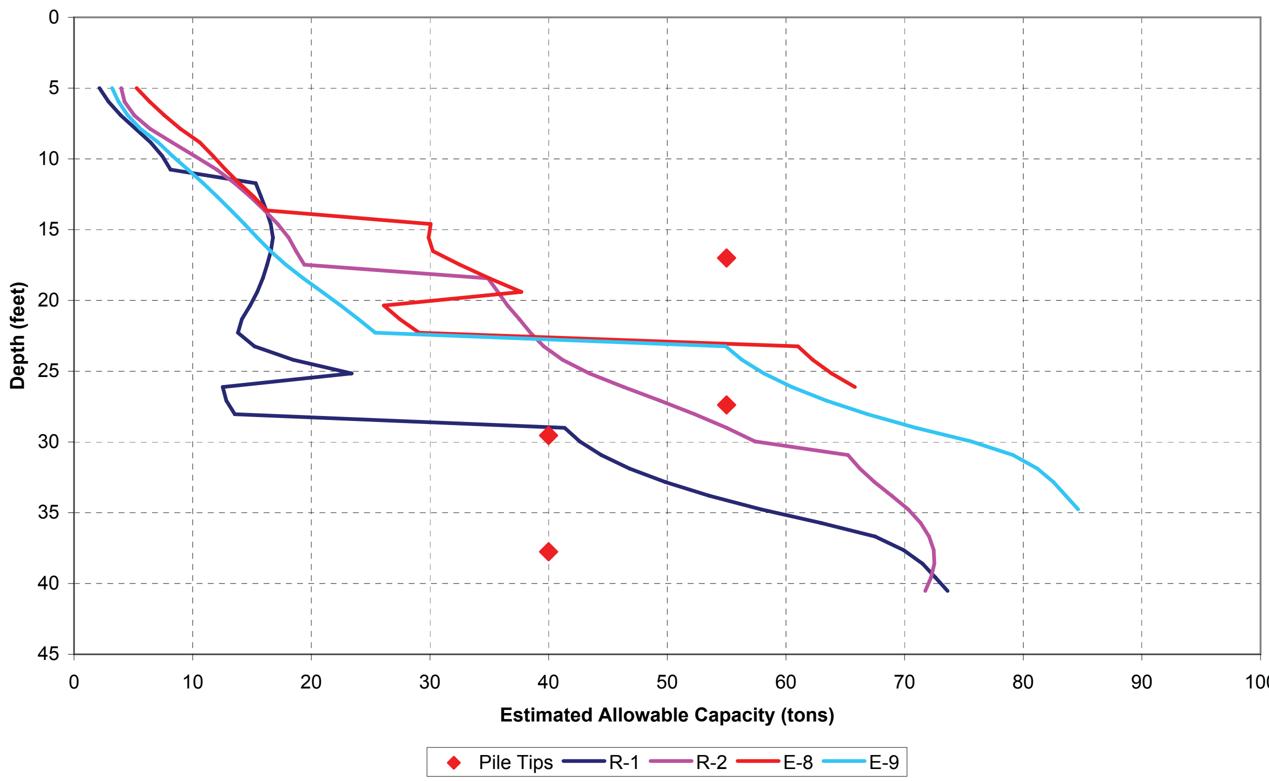

Bridge #110077
20-inch Concrete Piles
Depth (feet)
Estimated Allowable Capacity (tons)
Pile Tips
B-5
B-6
B-9


Bridge #110085 & #110086
24-inch Concrete Piles
Depth (feet)
Estimated Allowable Capacity (tons)
Pile Tips
B-1
B-2
B-3
B-4
B-5
B-6
B-7
B-8
B-9
B-10

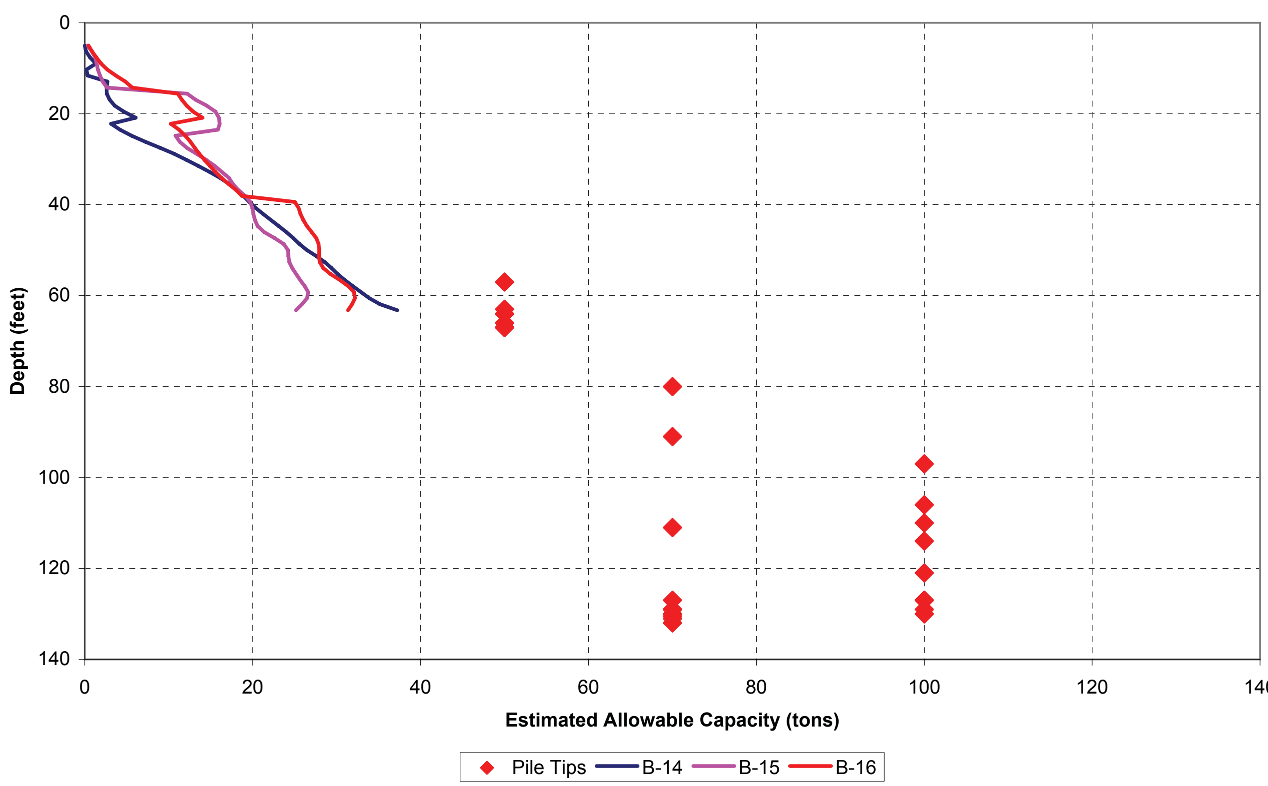

Bridge #520061
HP10x42 H-Piles
Depth (feet)
0
10
20
30
40
50
60
70
80
0
5
10
15
20
25
30
35
40
45
50
Estimated Allowable Capacity (tons)
B-1
B-2
Pile Tips


Bridge #110077
HP14x73 H-Piles
Depth (feet)
0
10
20
30
40
50
60
0
10
20
30
40
50
60
70
80
90
100
Estimated Allowable Capacity (tons)
Pile Tips
B-7
B-8

Bridge #554050
HP14x89 H-Piles



Bridge #780089 & #780100
HP14x89 H-Piles

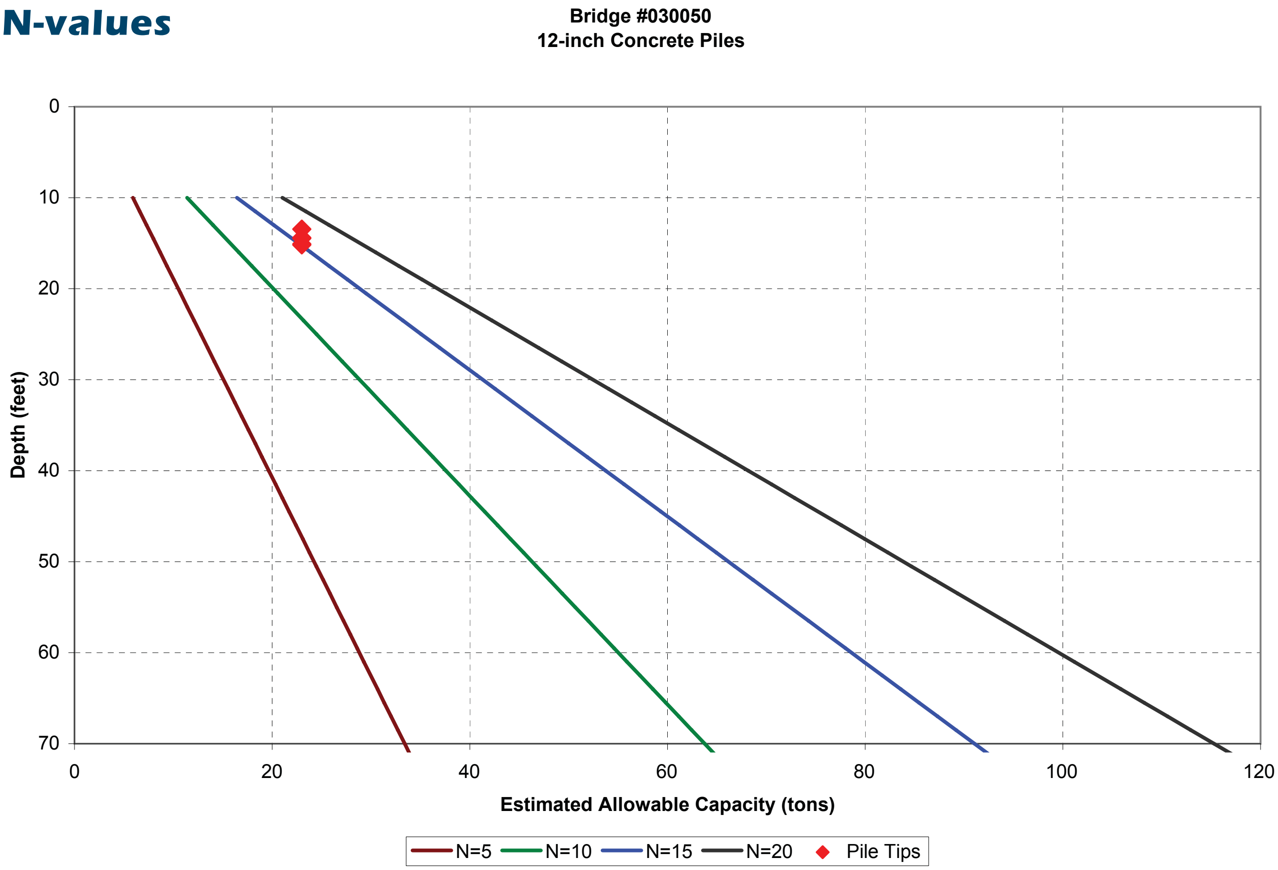


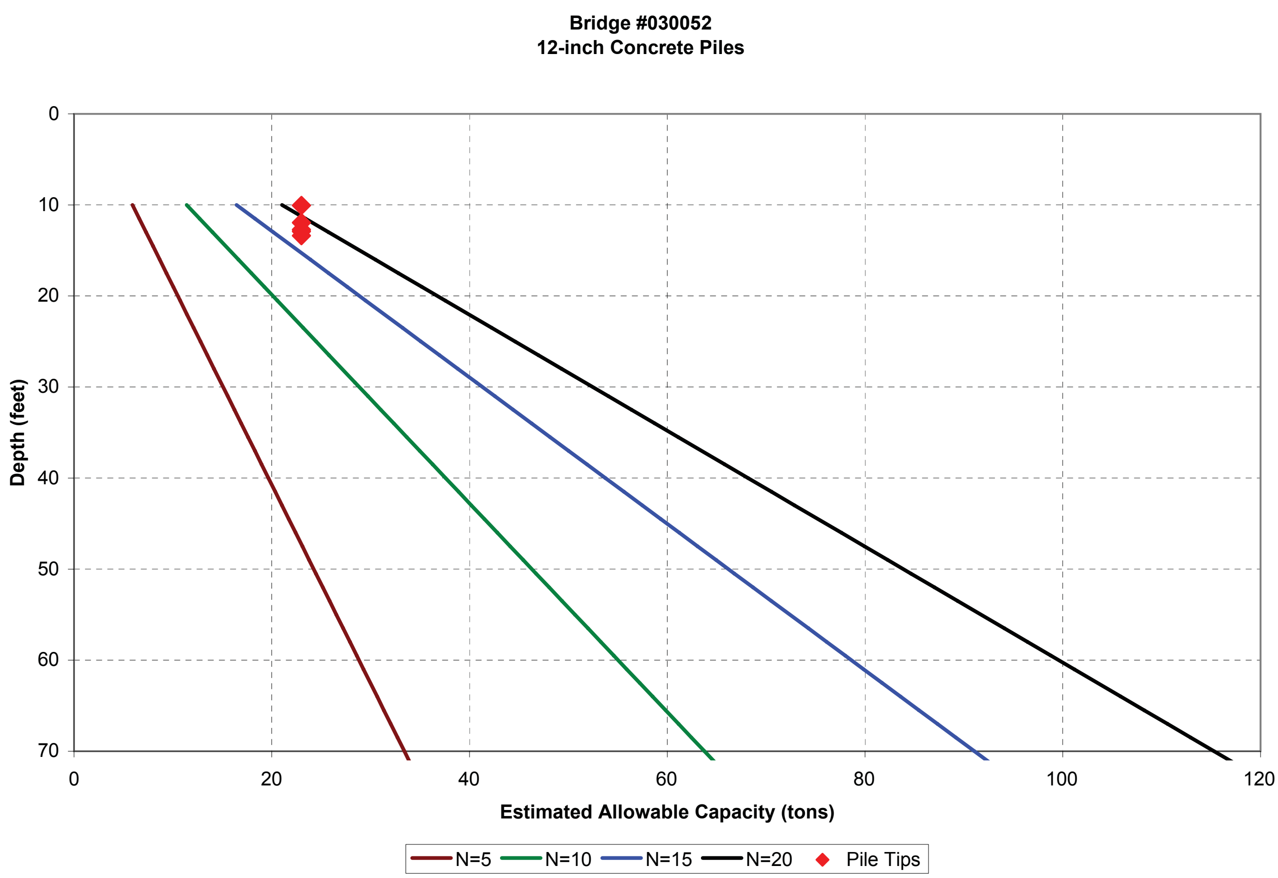
Appendix F

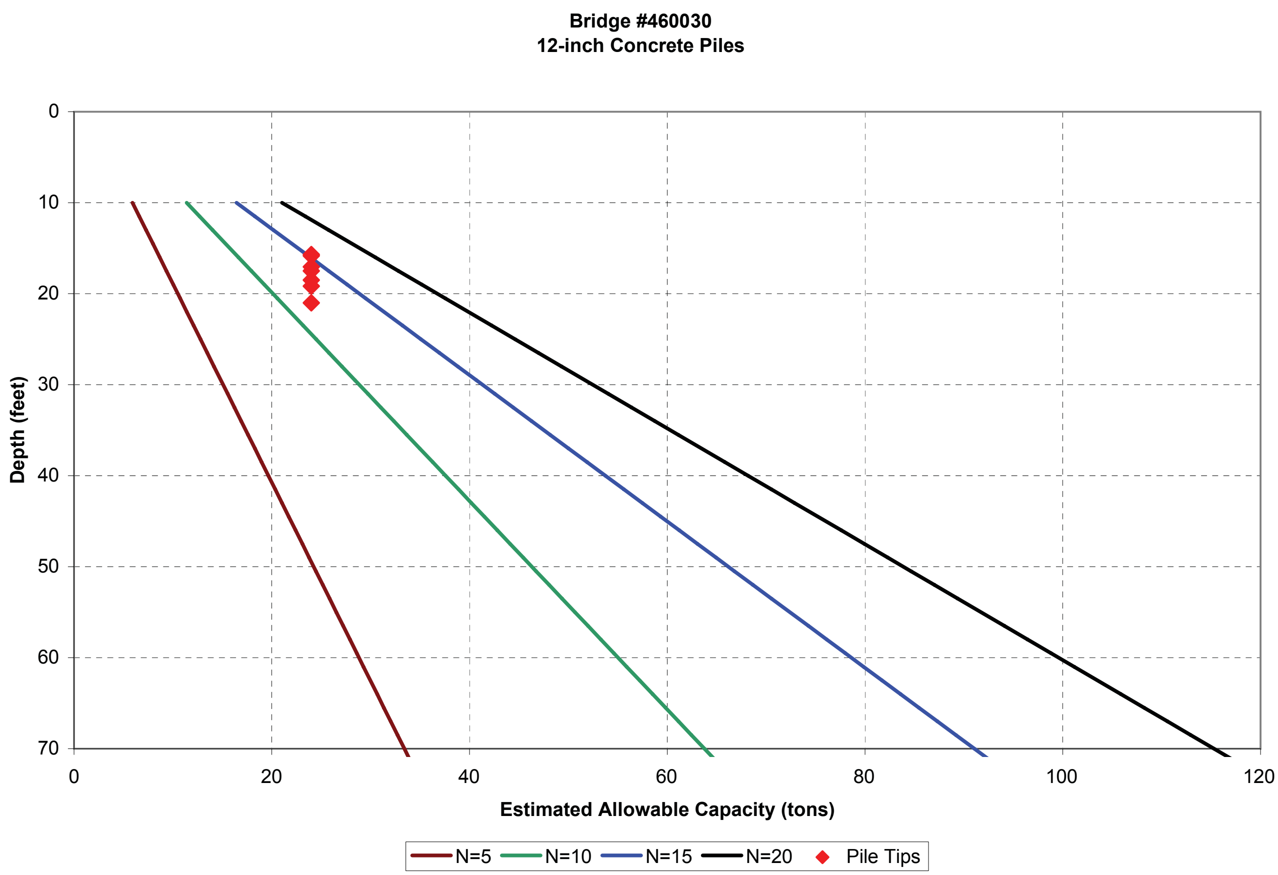
The following items are included in Appendix F:

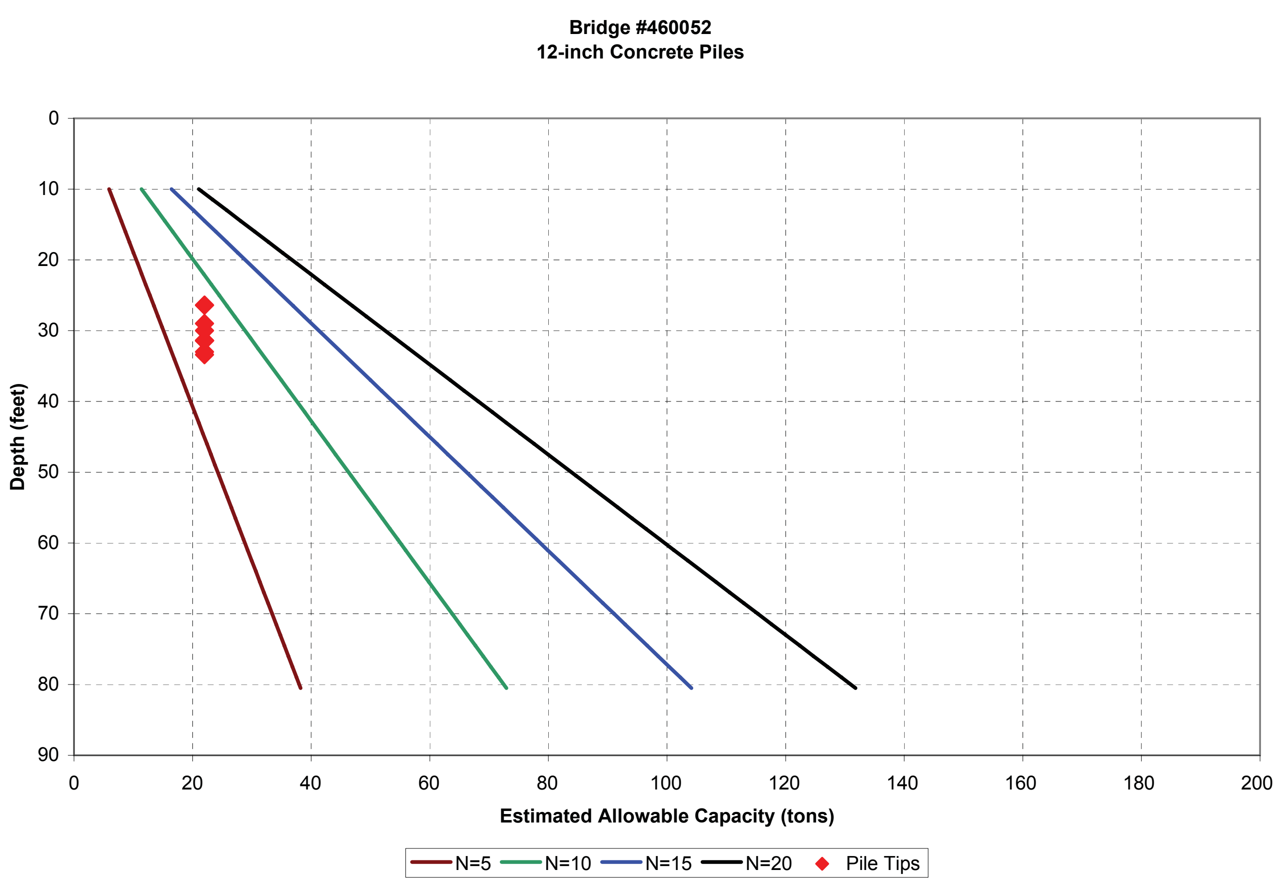
- FB-Deep analysis using uniform soil profile and constant SPT N-values

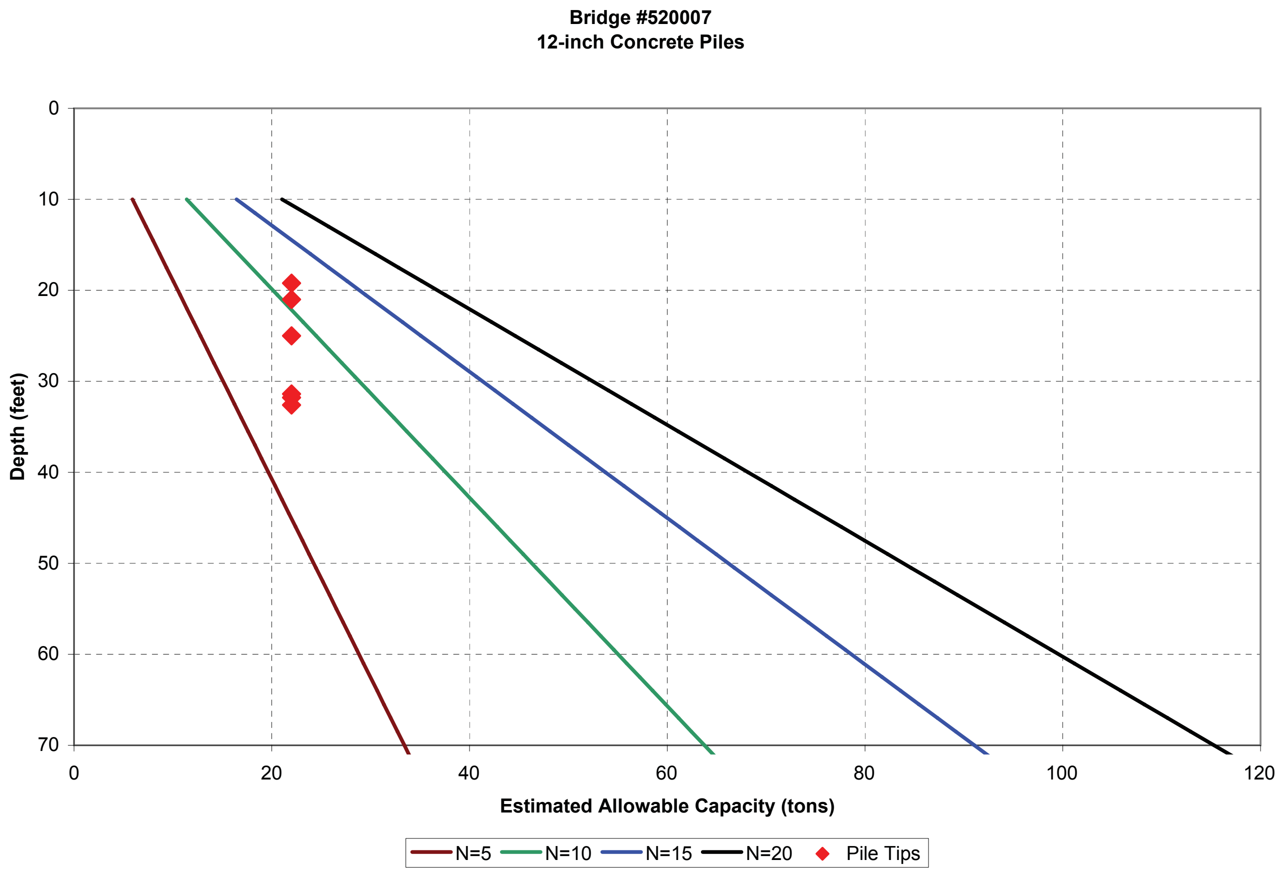
FB-Deep Analysis Using Uniform Soil Profile and Constant SPT N-values

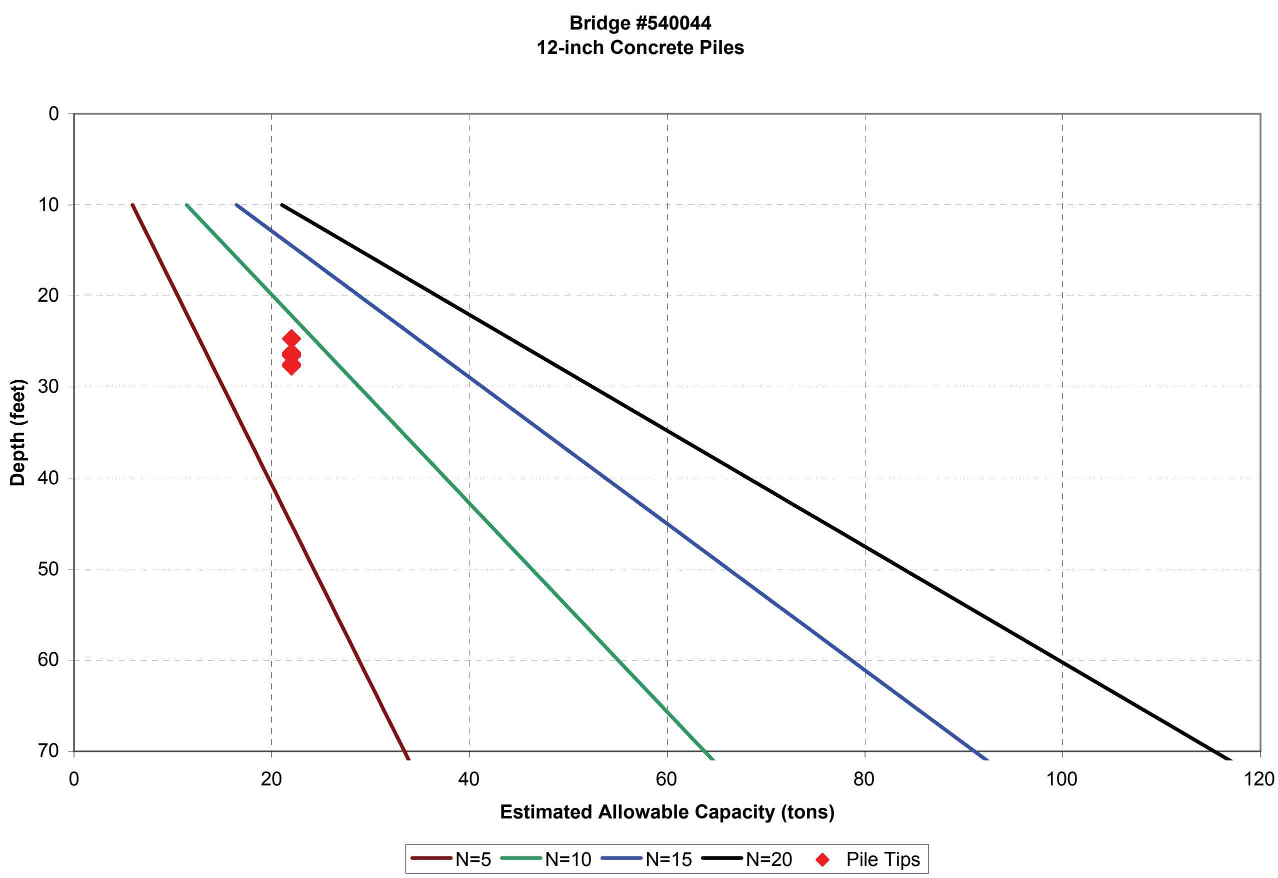




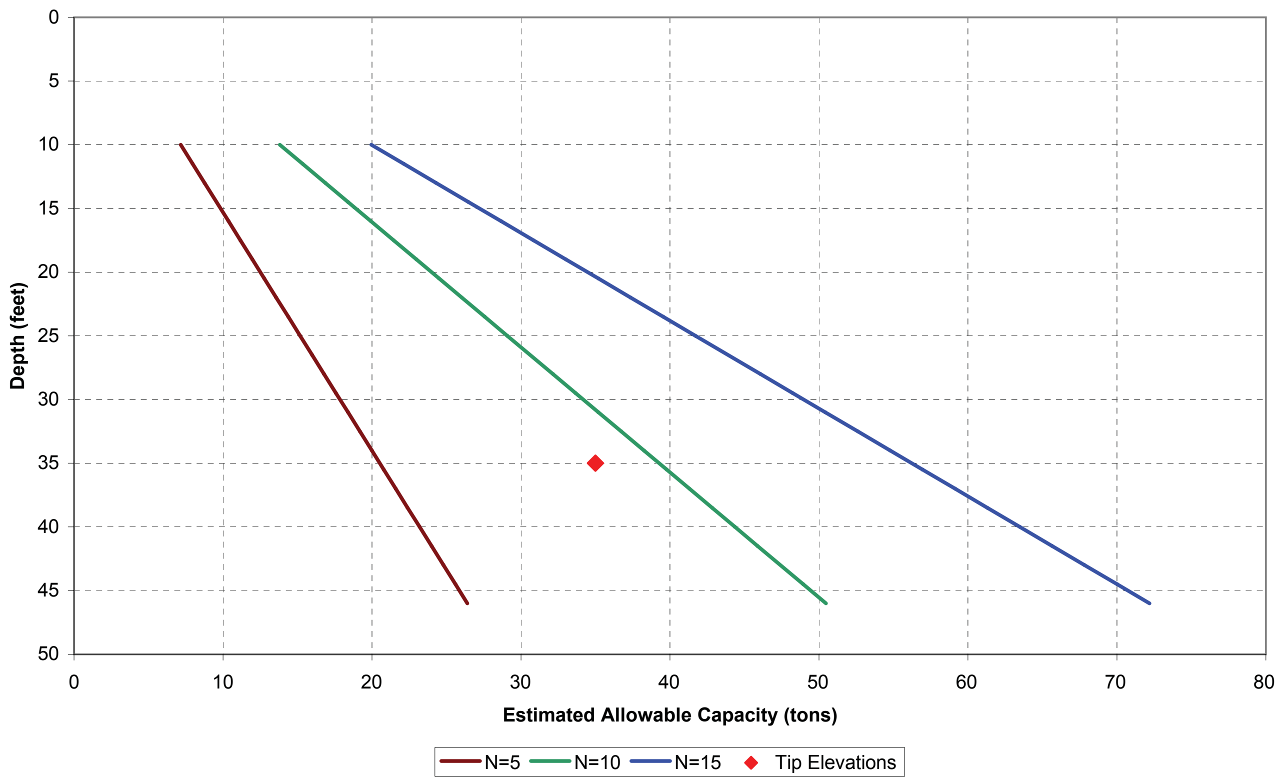

Bridge #460030
12-inch Concrete Piles
Depth (feet)
0
10
20
30
40
50
60
70
0
20
40
60
80
100
120
Estimated Allowable Capacity (tons)
N=5
N=10
N=15
N=20
Pile Tips


Bridge #460052
12-inch Concrete Piles
Depth (feet)
0
10
20
30
40
50
60
70
80
90
0
20
40
60
80
100
120
140
160
180
200
Estimated Allowable Capacity (tons)
N=5
N=10
N=15
N=20
Pile Tips

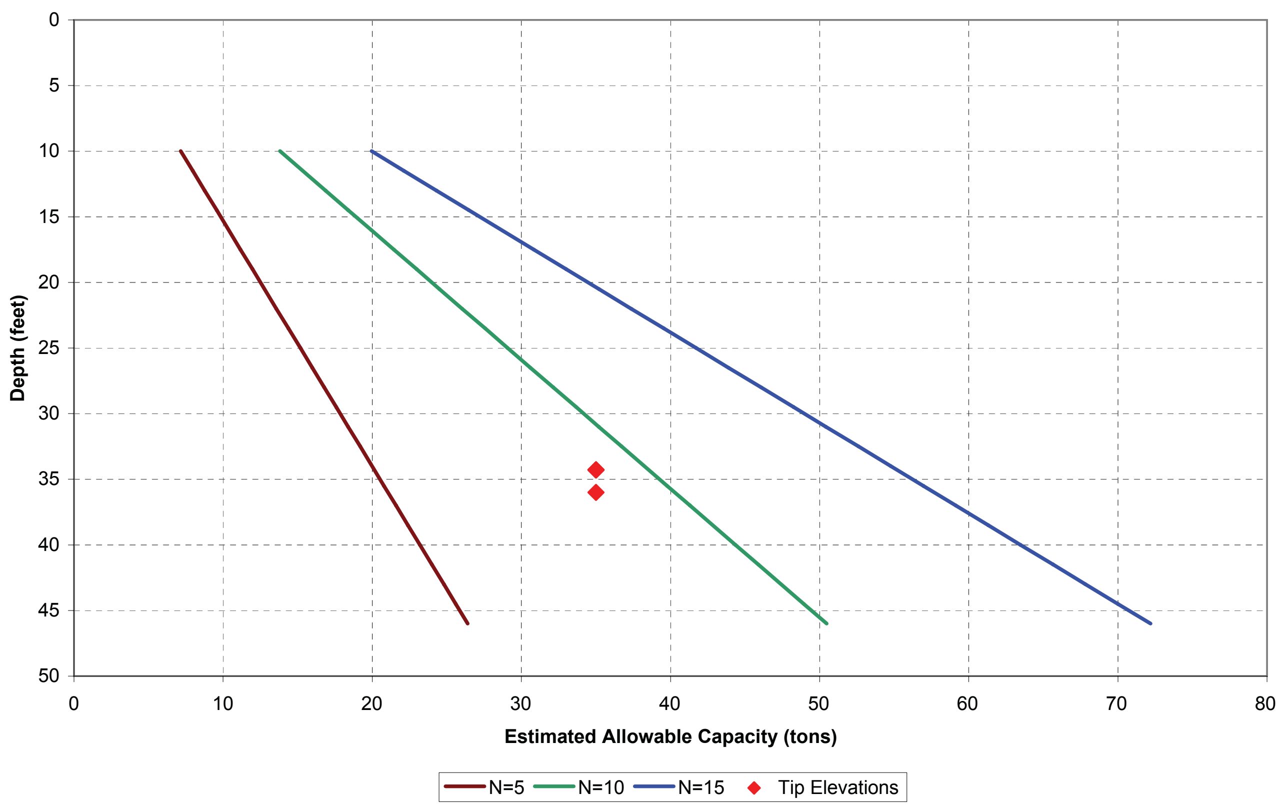

Bridge #520007
12-inch Concrete Piles
Depth (feet)
0
10
20
30
40
50
60
70
0
20
40
60
80
100
120
Estimated Allowable Capacity (tons)
N=5
N=10
N=15
N=20
Pile Tips

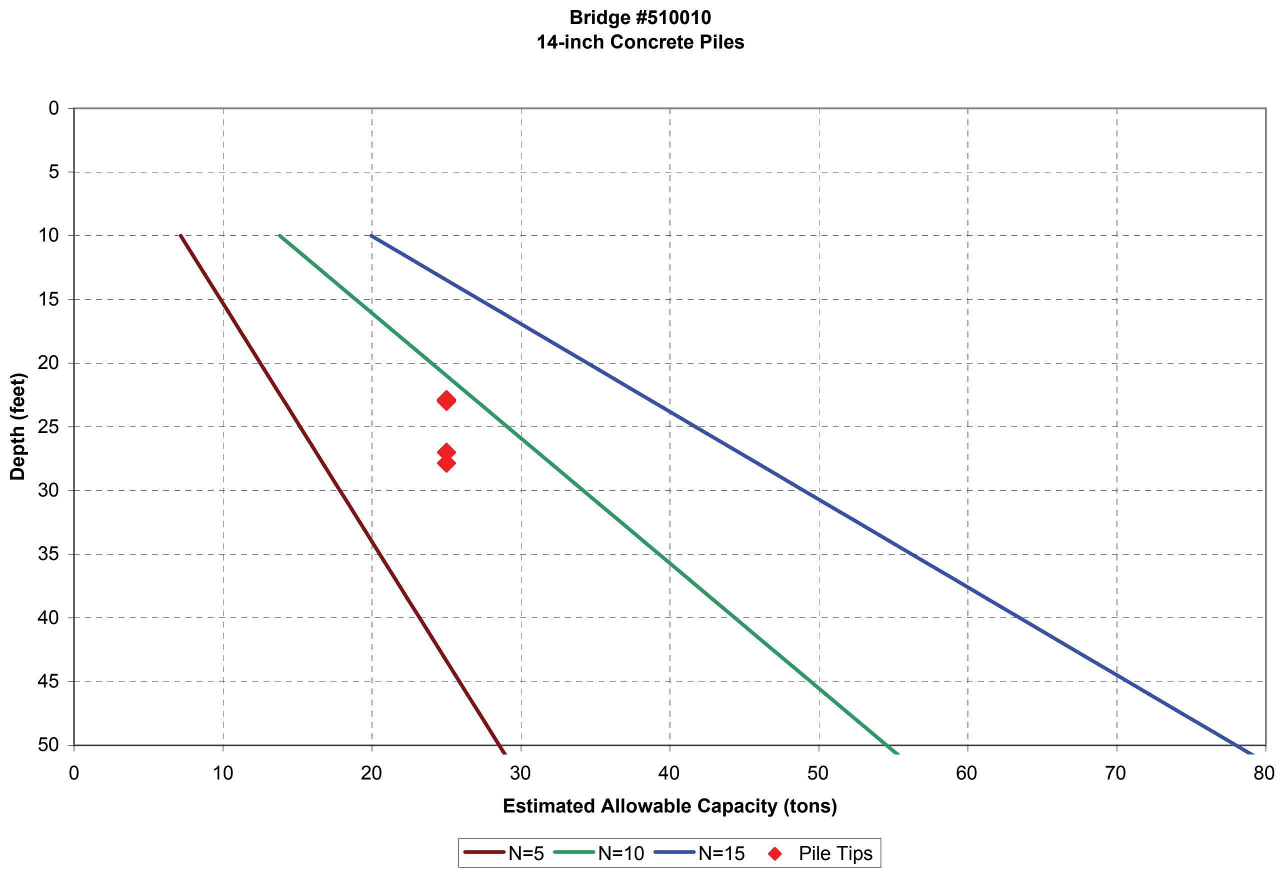

Bridge #540044
12-inch Concrete Piles
Depth (feet)
0
10
20
30
40
50
60
70
0
20
40
60
80
100
120
Estimated Allowable Capacity (tons)
N=5
N=10
N=15
N=20
Pile Tips

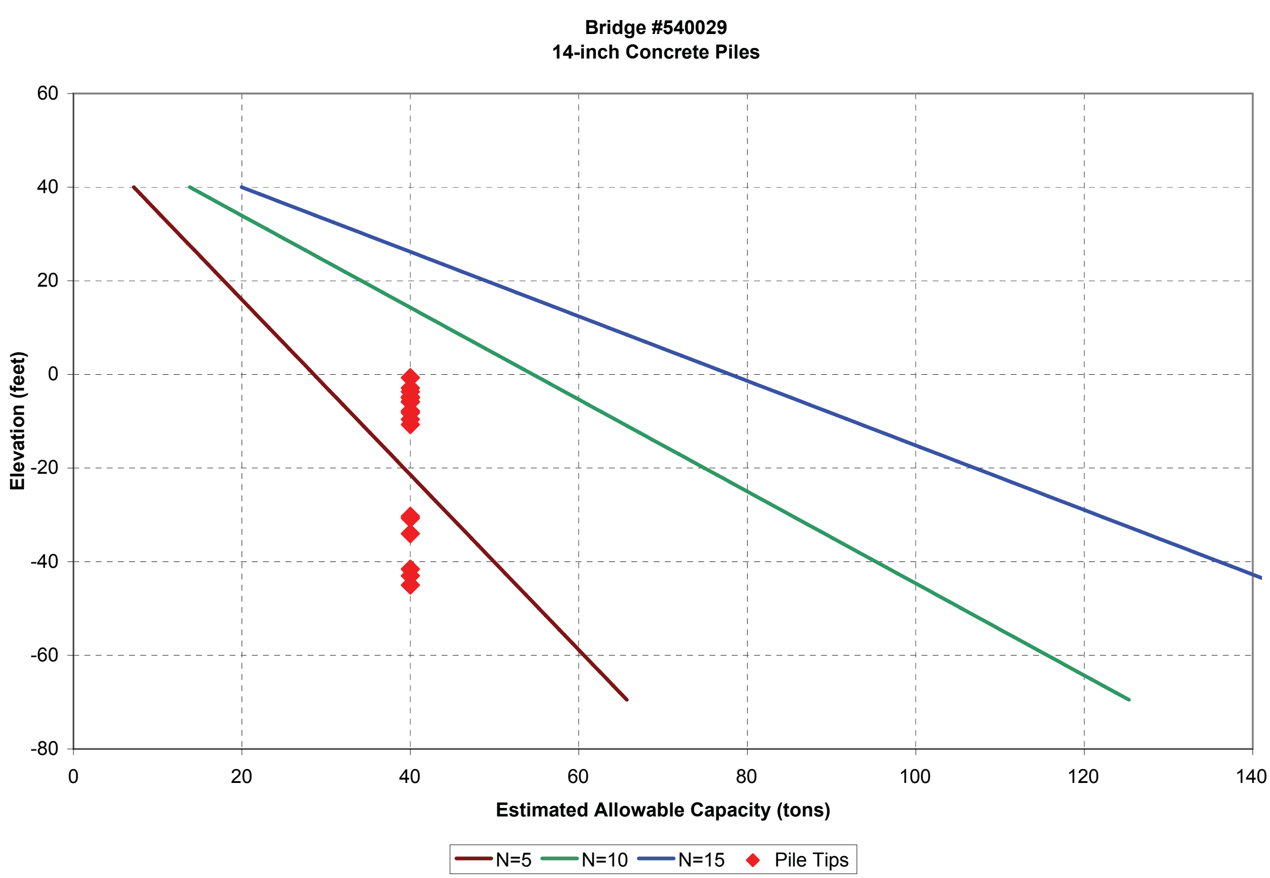
Bridge #260940
14-inch Concrete Piles



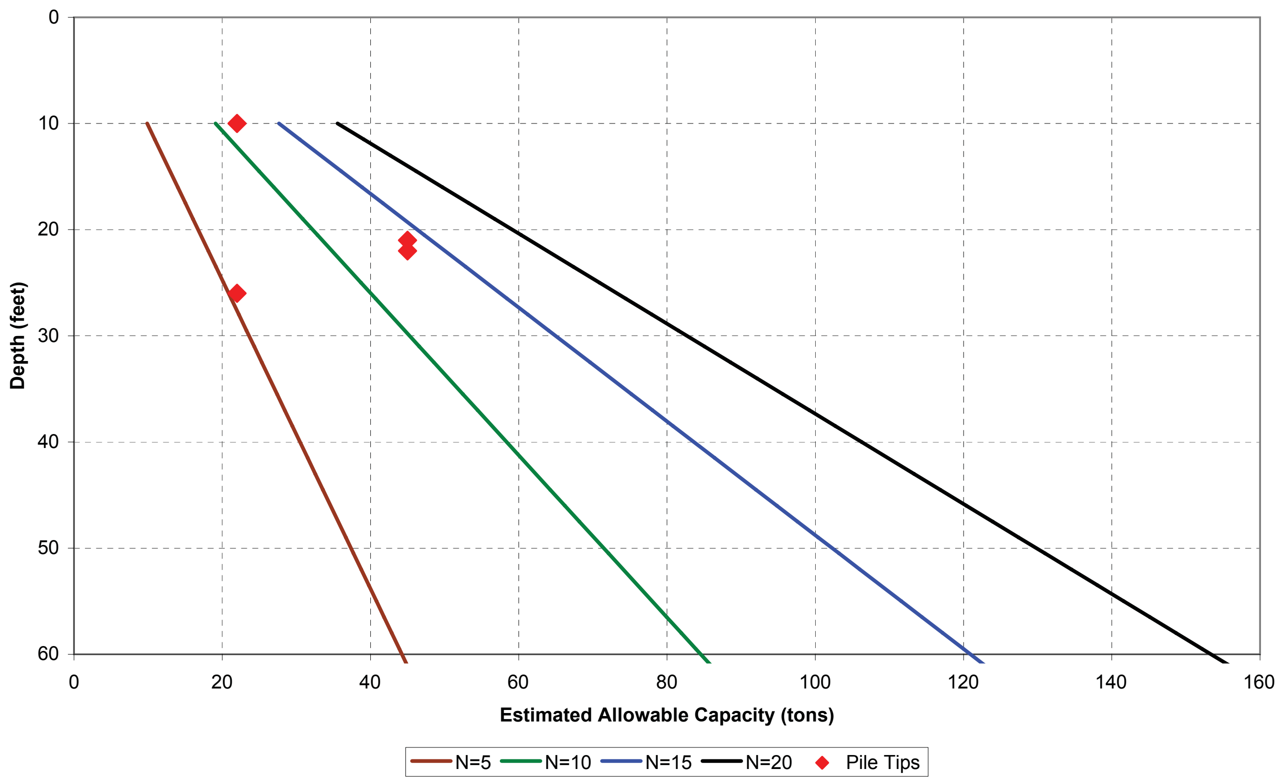
Bridge #464004
14-inch Concrete Piles



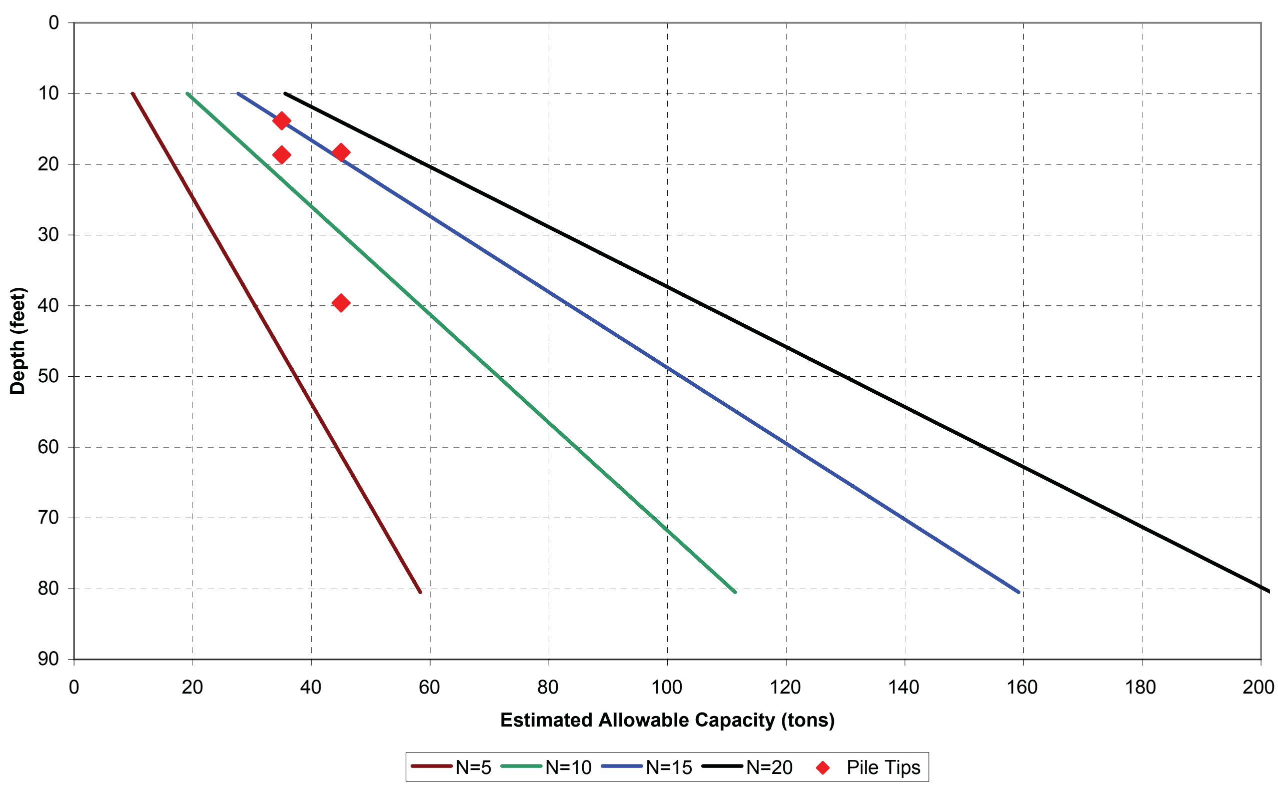

Bridge #510010
14-inch Concrete Piles
Depth (feet)
0
5
10
15
20
25
30
35
40
45
50
0
10
20
30
40
50
60
70
80
Estimated Allowable Capacity (tons)
N=5
N=10
N=15
Pile Tips


Bridge #540029
14-inch Concrete Piles
Elevation (feet)
60
40
20
0
-20
-40
-60
-80
0
20
40
60
80
100
120
140
Estimated Allowable Capacity (tons)
N=5
N=10
N=15
Pile Tips

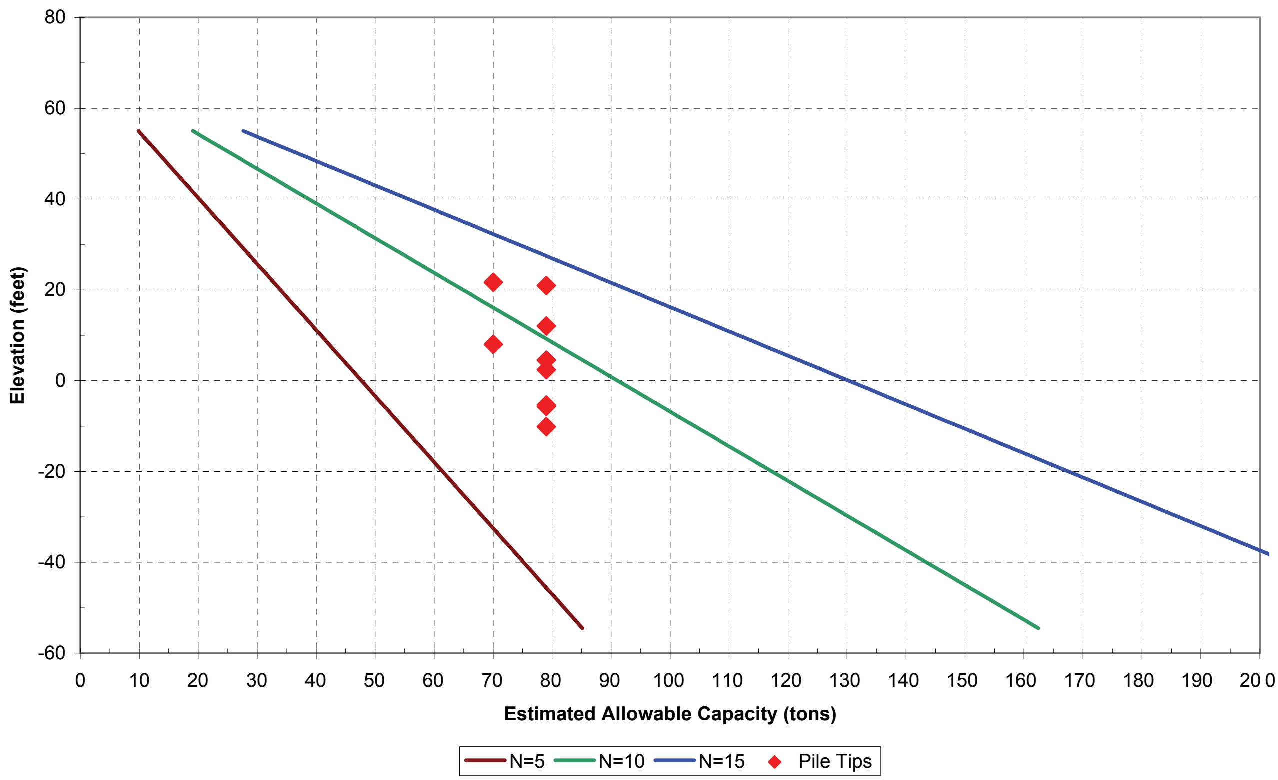
Bridge #110055
18-inch Concrete Piles



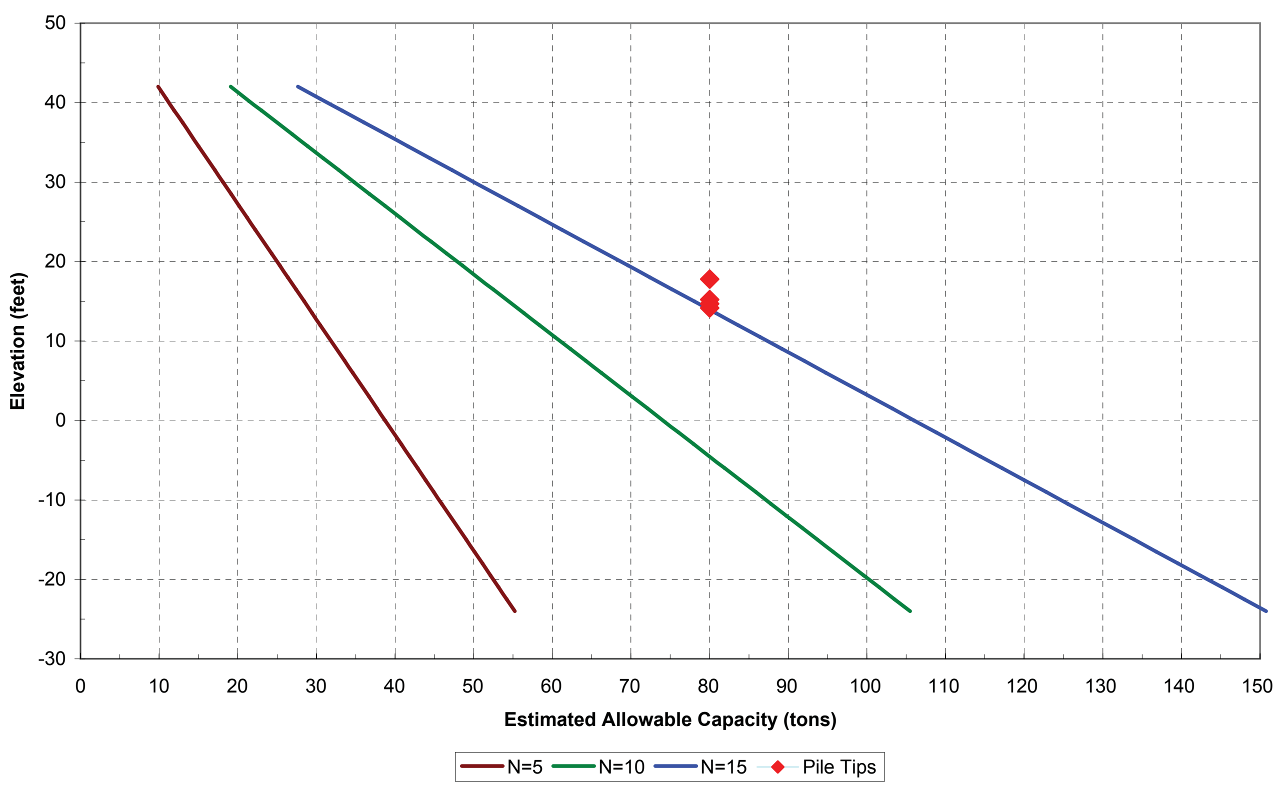
Bridge #260055
18-inch Concrete Piles



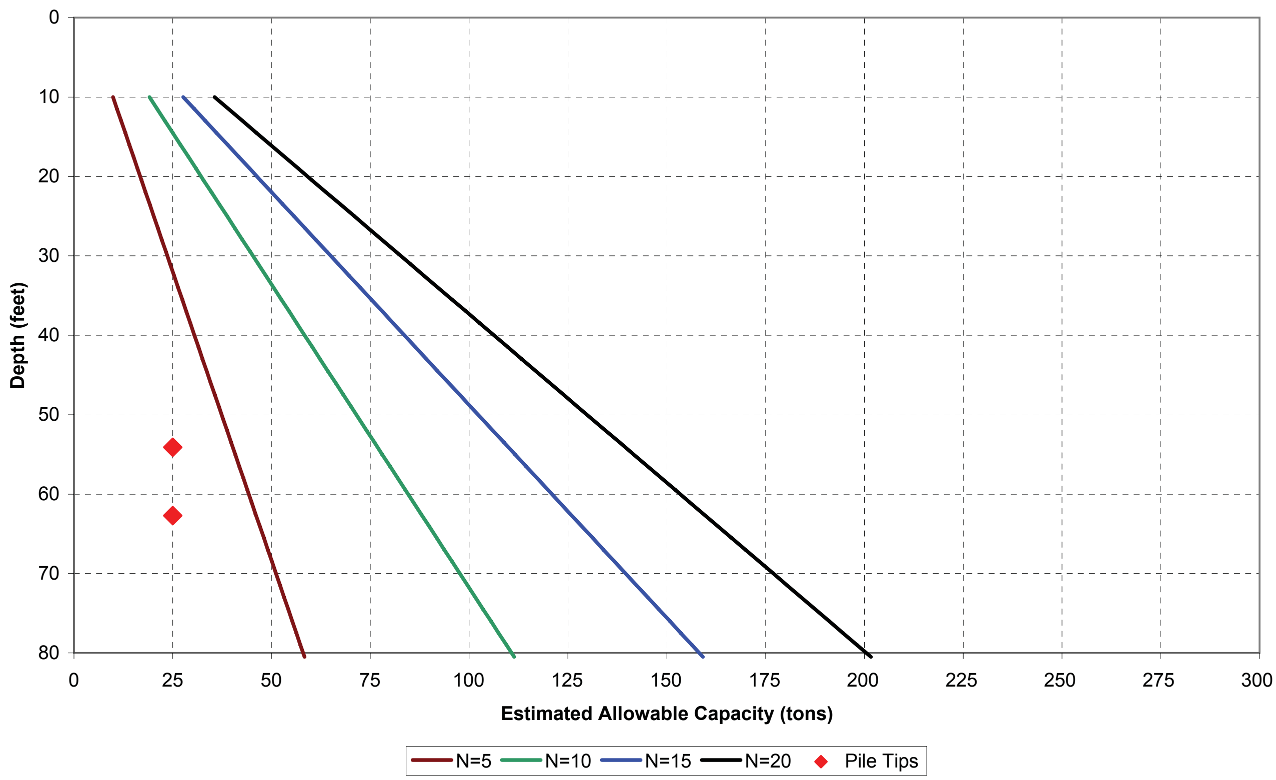
Bridge #260103
18-inch Concrete Piles



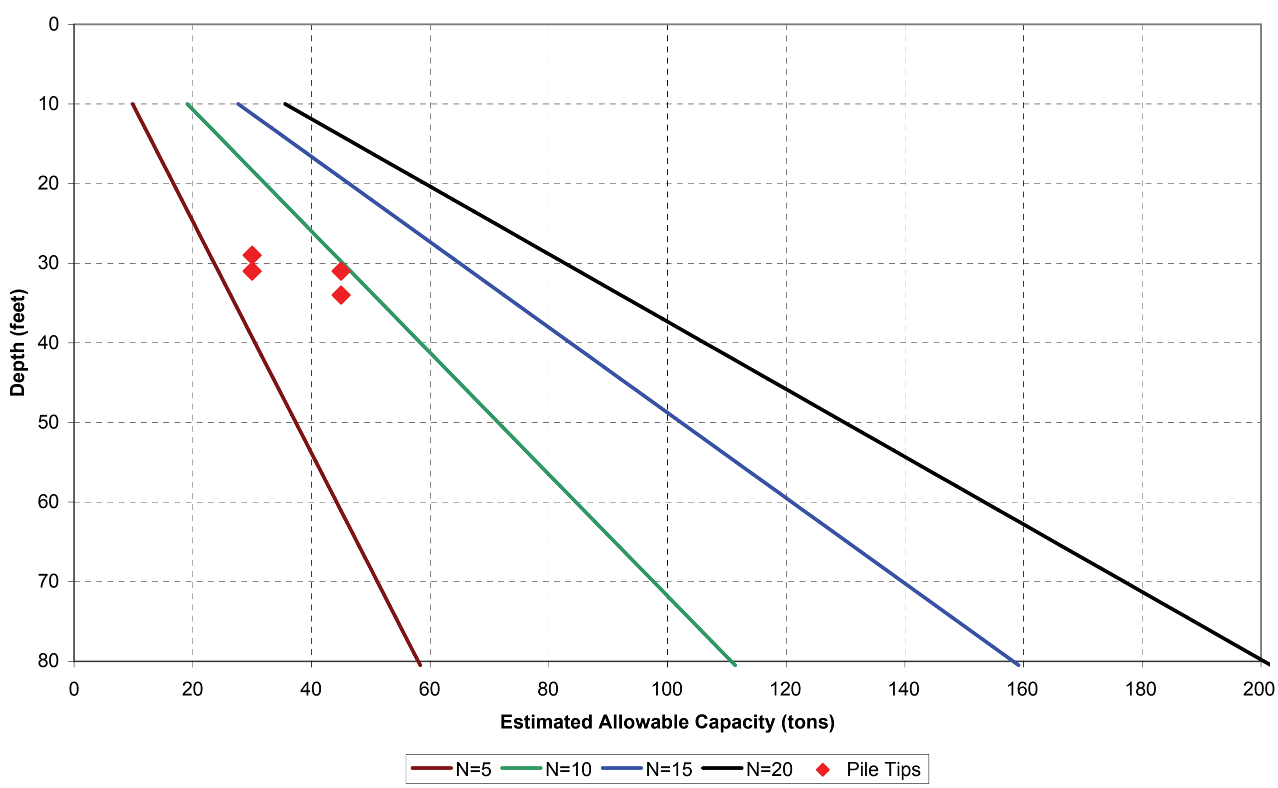
Bridge #260105
18-inch Concrete Piles

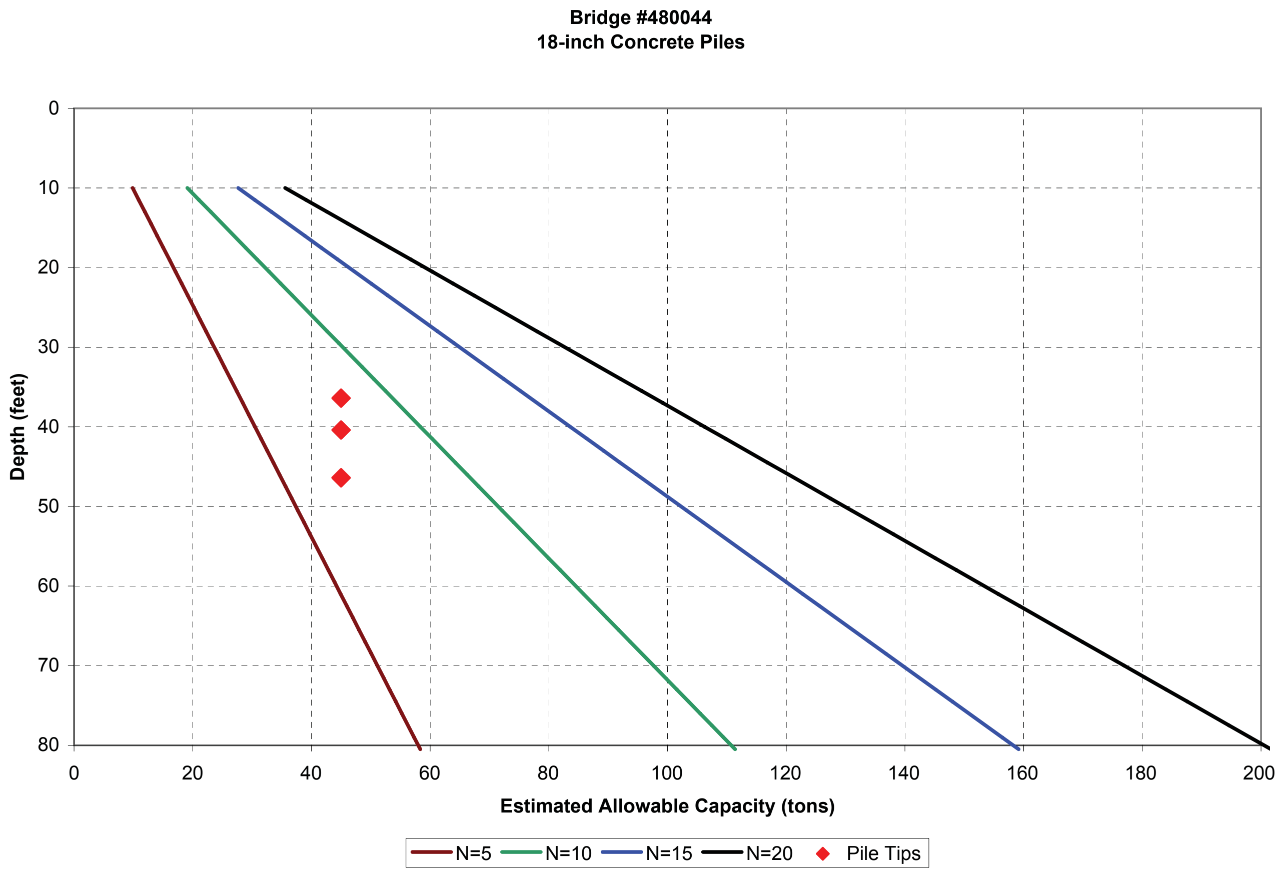


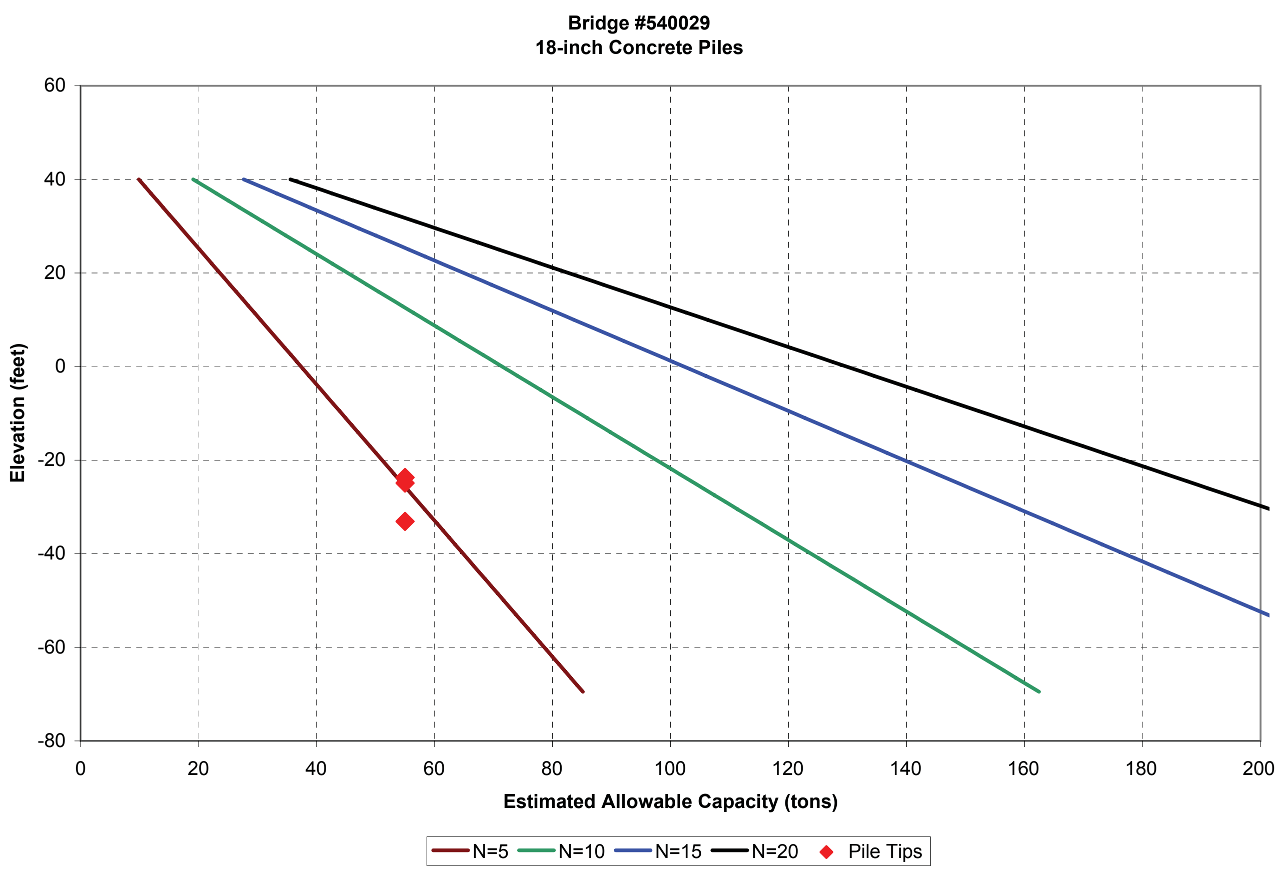
Bridge #460014
18-inch Concrete Piles

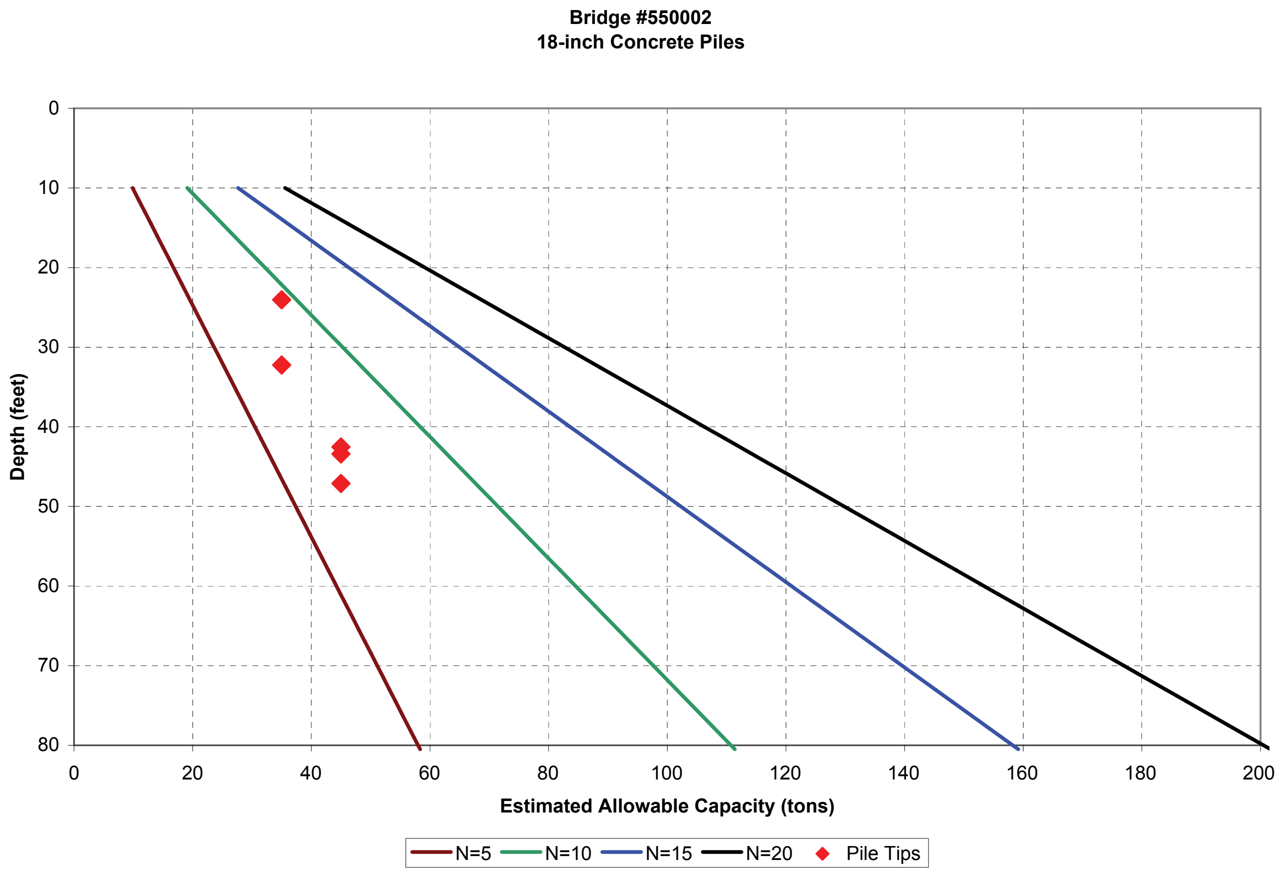


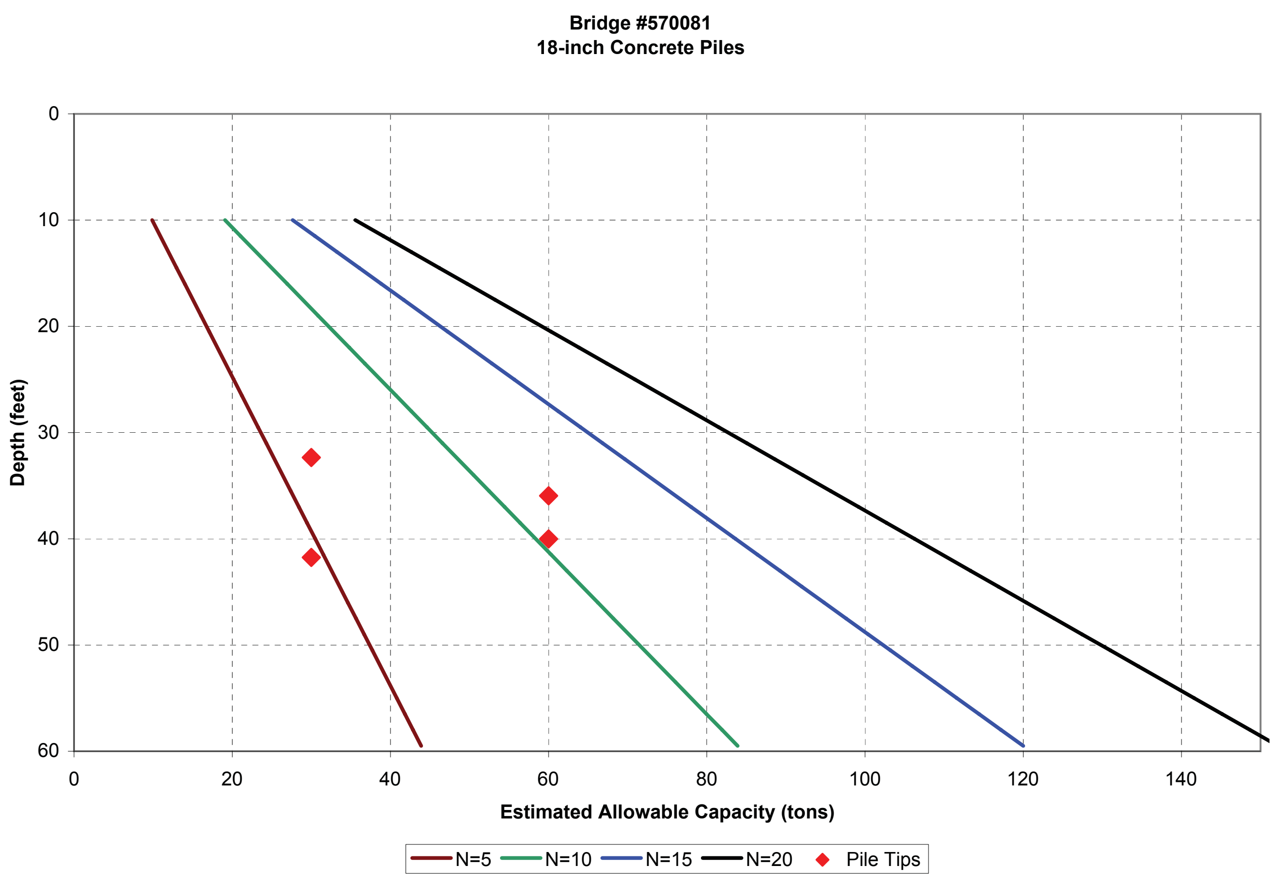
Bridge #460070
18-inch Concrete Piles



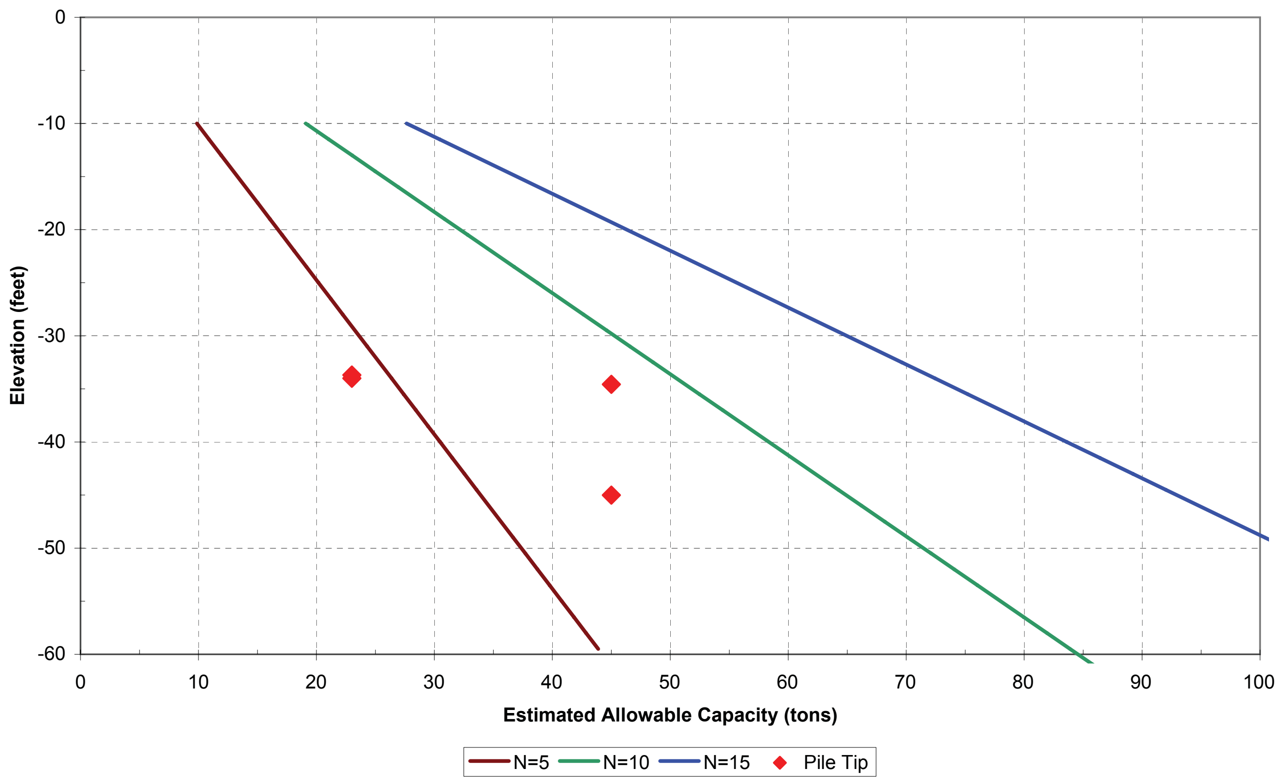

Bridge #480044
18-inch Concrete Piles
Depth (feet)
0
10
20
30
40
50
60
70
80
0
20
40
60
80
100
120
140
160
180
200
Estimated Allowable Capacity (tons)
N=5
N=10
N=15
N=20
Pile Tips


Bridge #540029
18-inch Concrete Piles
Elevation (feet)
60
40
20
0
-20
-40
-60
-80
0
20
40
60
80
100
120
140
160
180
200
Estimated Allowable Capacity (tons)
N=5
N=10
N=15
N=20
Pile Tips

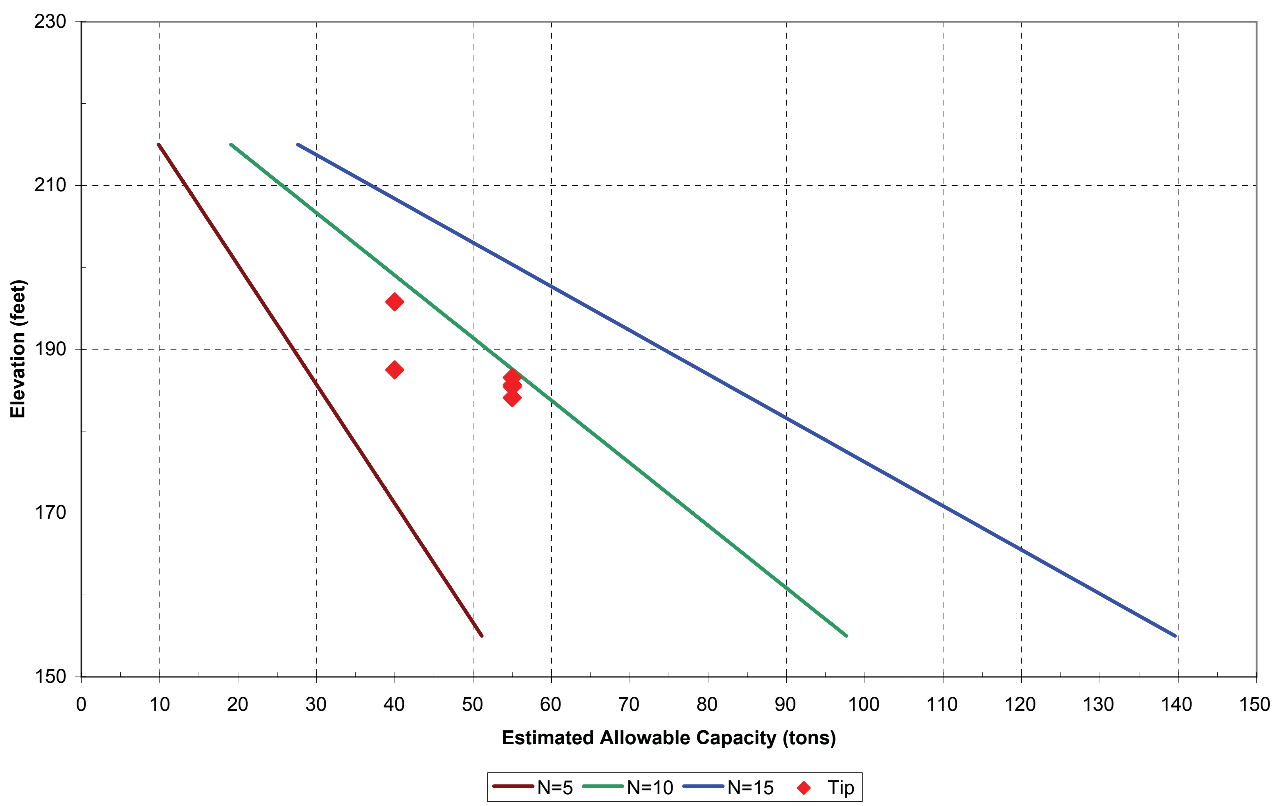

Bridge #550002
18-inch Concrete Piles
Depth (feet)
Estimated Allowable Capacity (tons)
N=5
N=10
N=15
N=20
Pile Tips

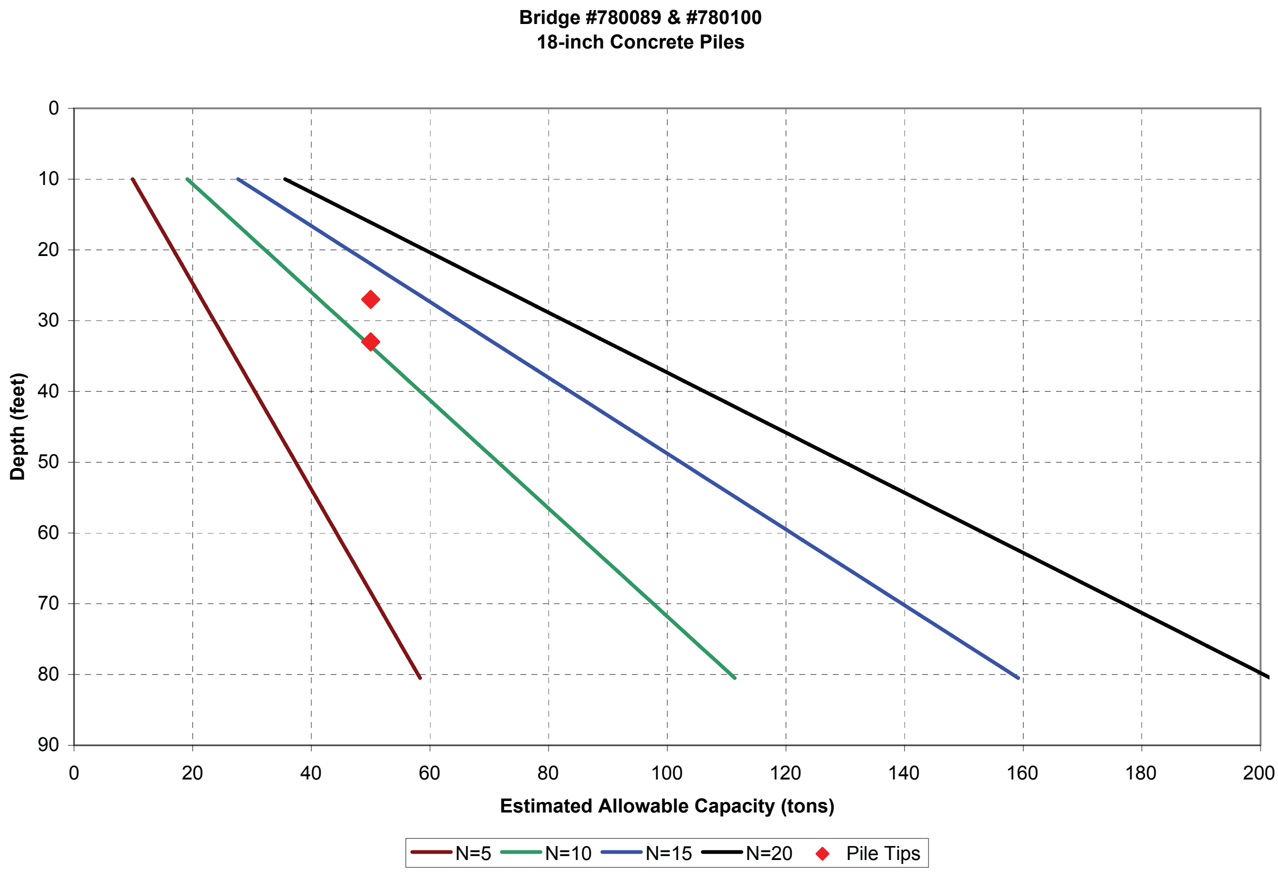

Bridge #570081
18-inch Concrete Piles
Depth (feet)
Estimated Allowable Capacity (tons)
N=5
N=10
N=15
N=20
Pile Tips

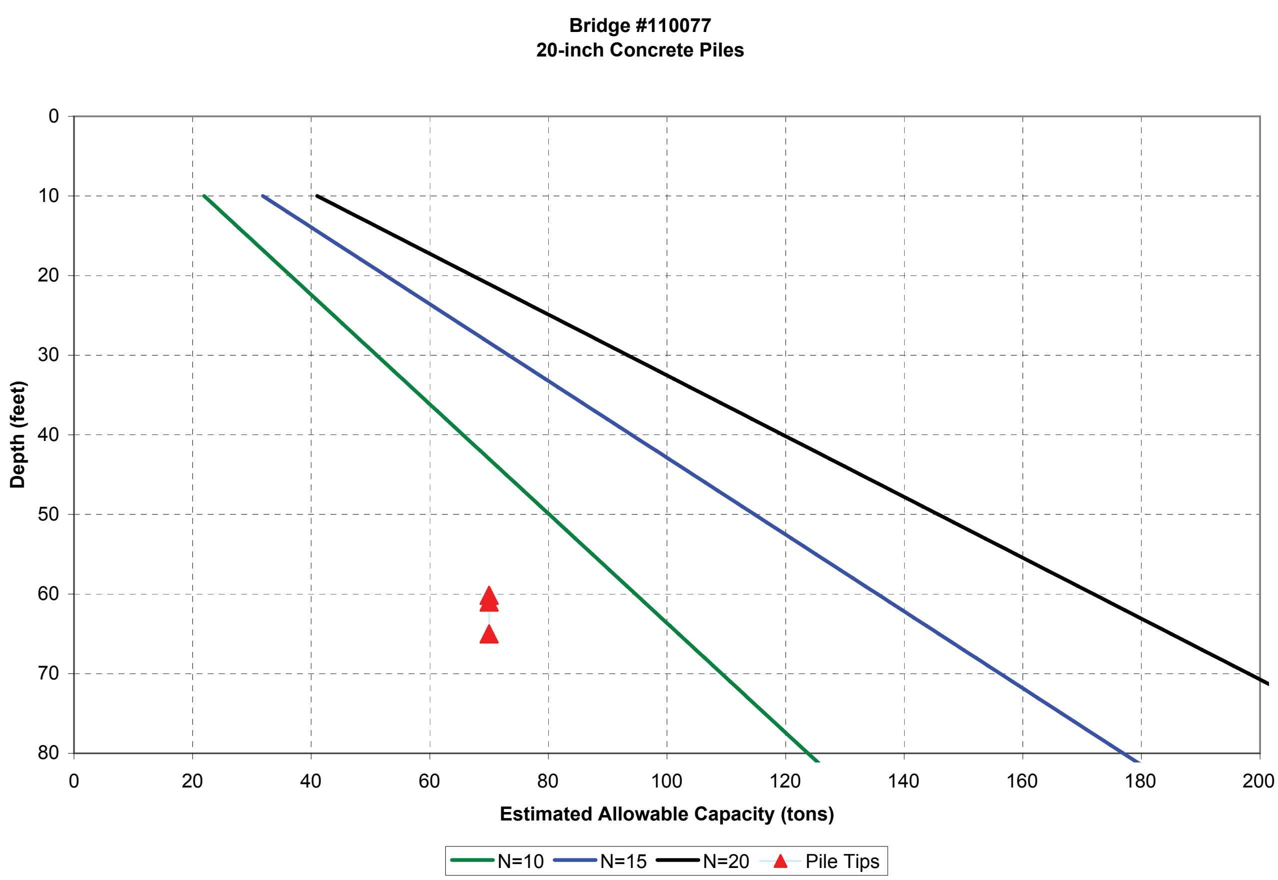
Bridge #580065
18-inch Concrete Piles

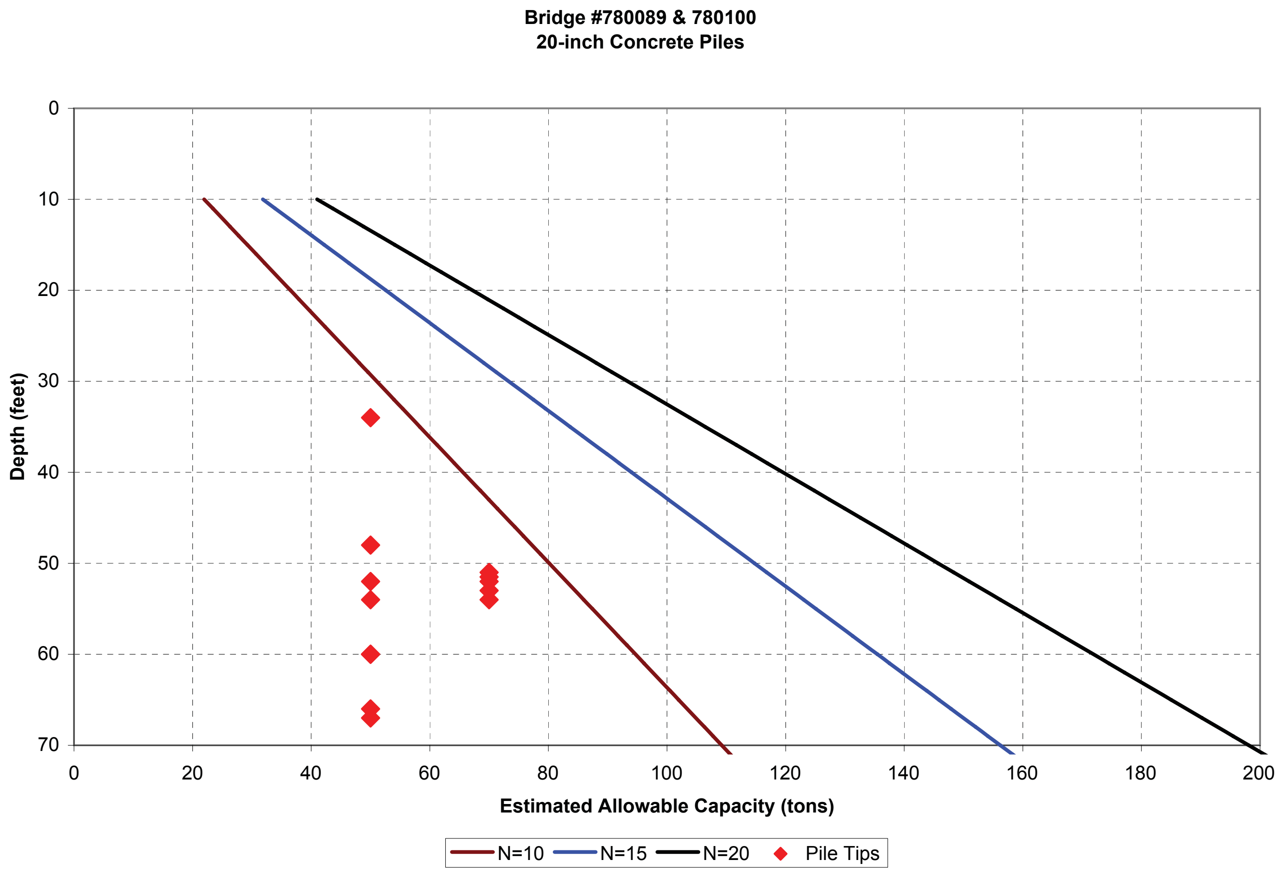


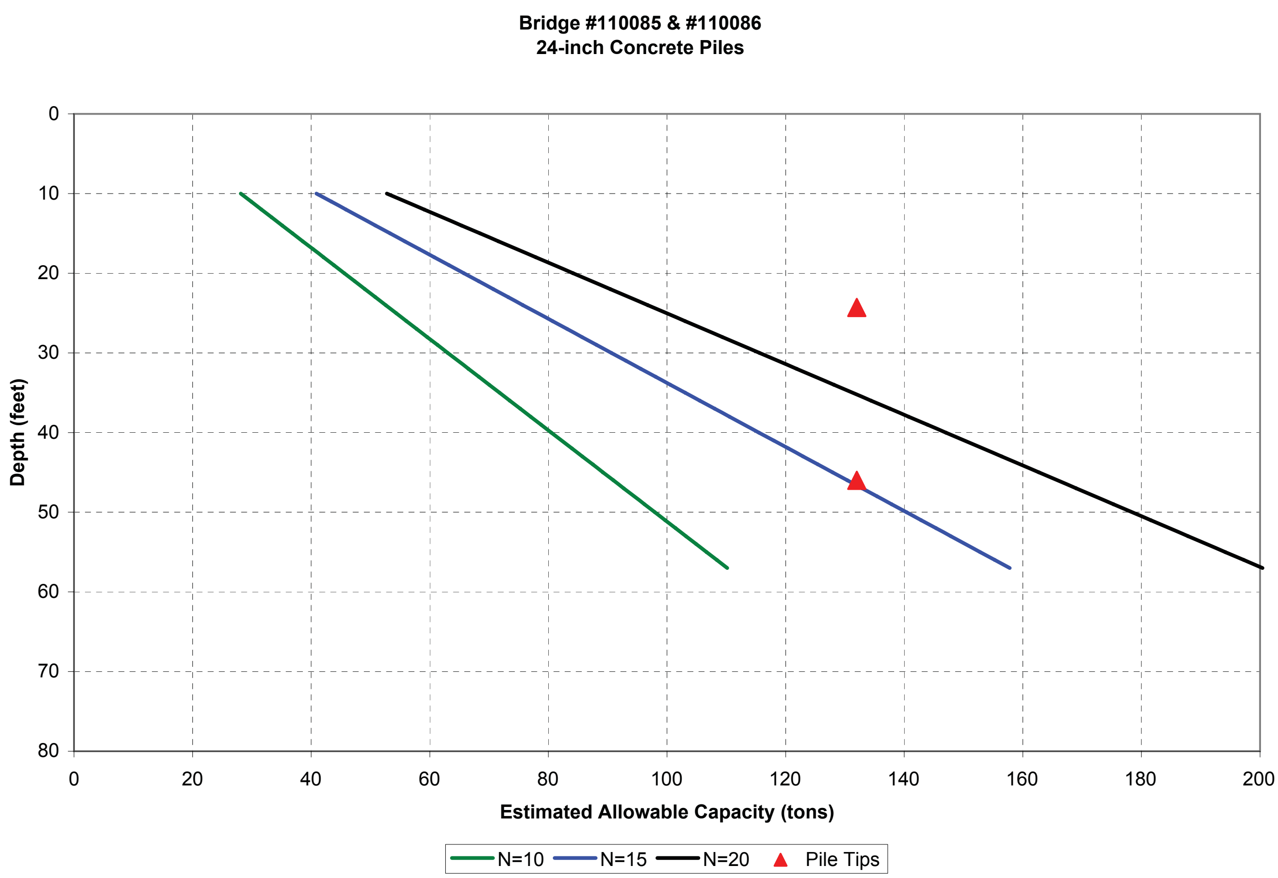
Bridge #600100
18-inch Concrete Piles

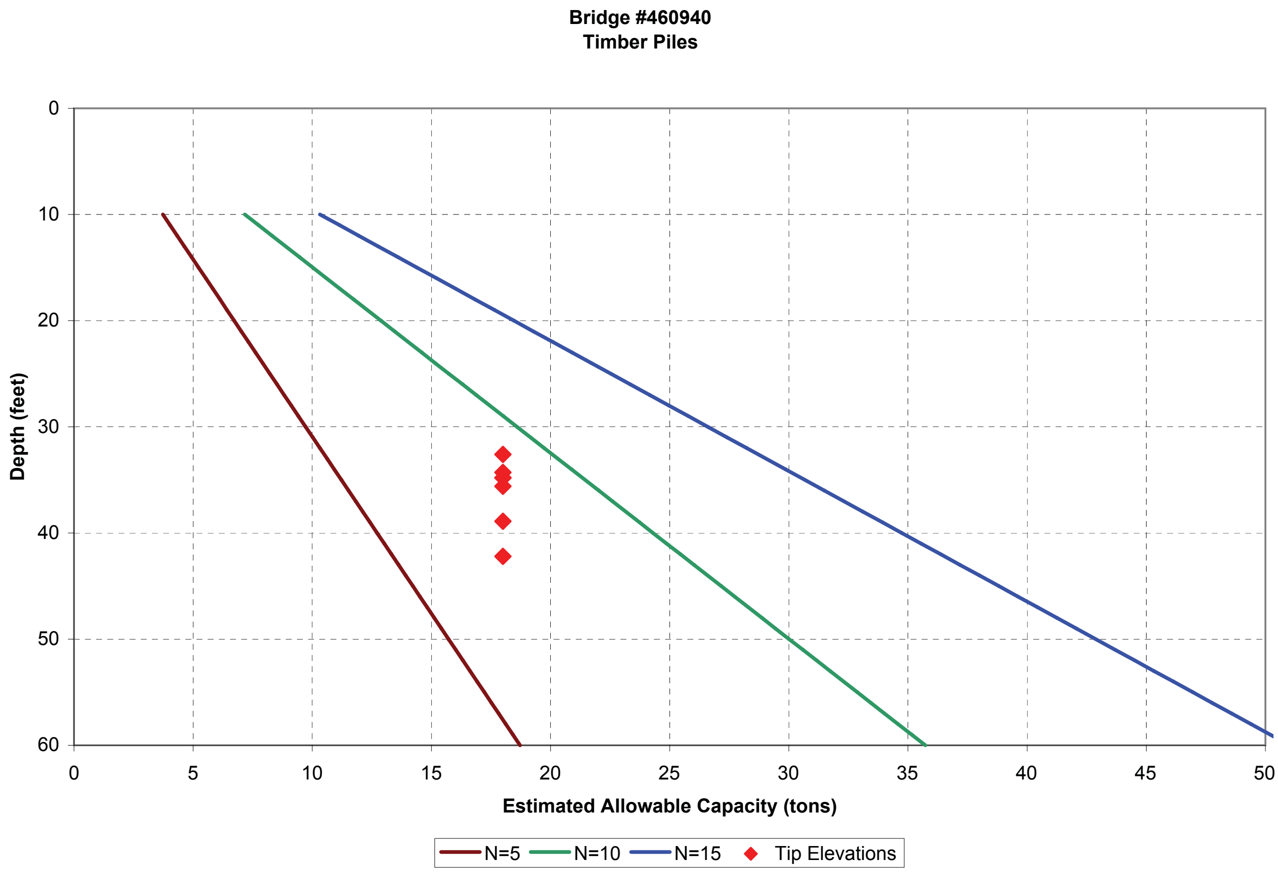


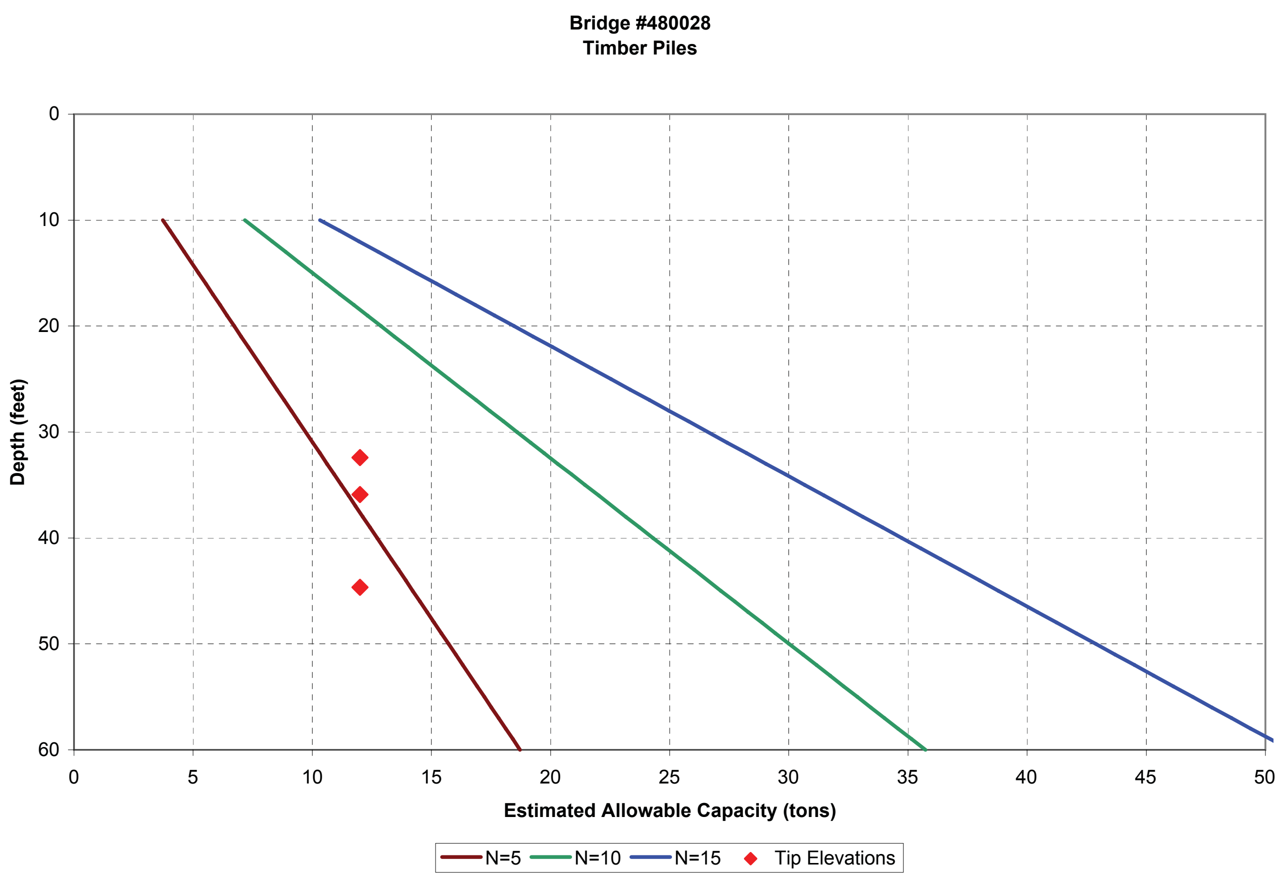

Bridge #780089 & #780100
18-inch Concrete Piles
Depth (feet)
0
10
20
30
40
50
60
70
80
90
0
20
40
60
80
100
120
140
160
180
200
Estimated Allowable Capacity (tons)
N=5
N=10
N=15
N=20
Pile Tips


Bridge #110077
20-inch Concrete Piles
Depth (feet)
0
10
20
30
40
50
60
70
80
0
20
40
60
80
100
120
140
160
180
200
Estimated Allowable Capacity (tons)
N=10
N=15
N=20
Pile Tips

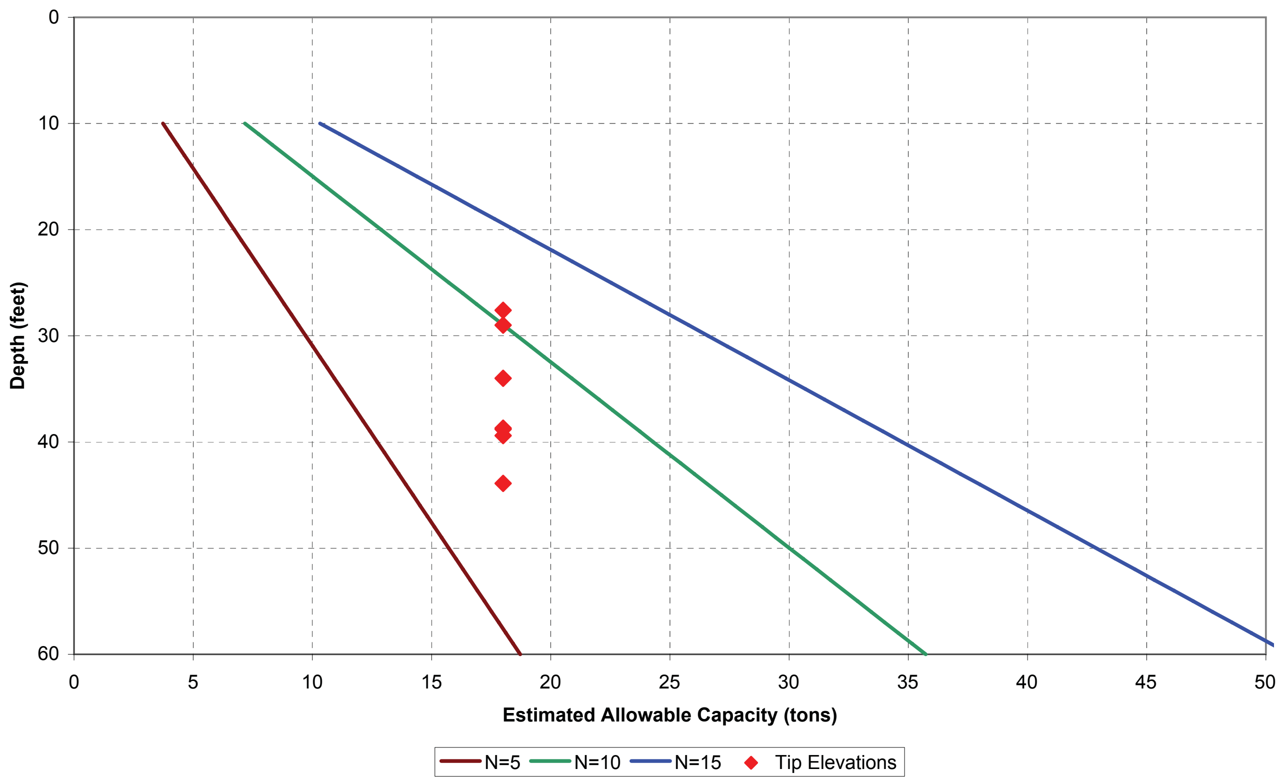

Bridge #780089 & 780100
20-inch Concrete Piles
Depth (feet)
Estimated Allowable Capacity (tons)
N=10
N=15
N=20
Pile Tips


Bridge #110085 & #110086
24-inch Concrete Piles
Depth (feet)
Estimated Allowable Capacity (tons)
N=10
N=15
N=20
Pile Tips

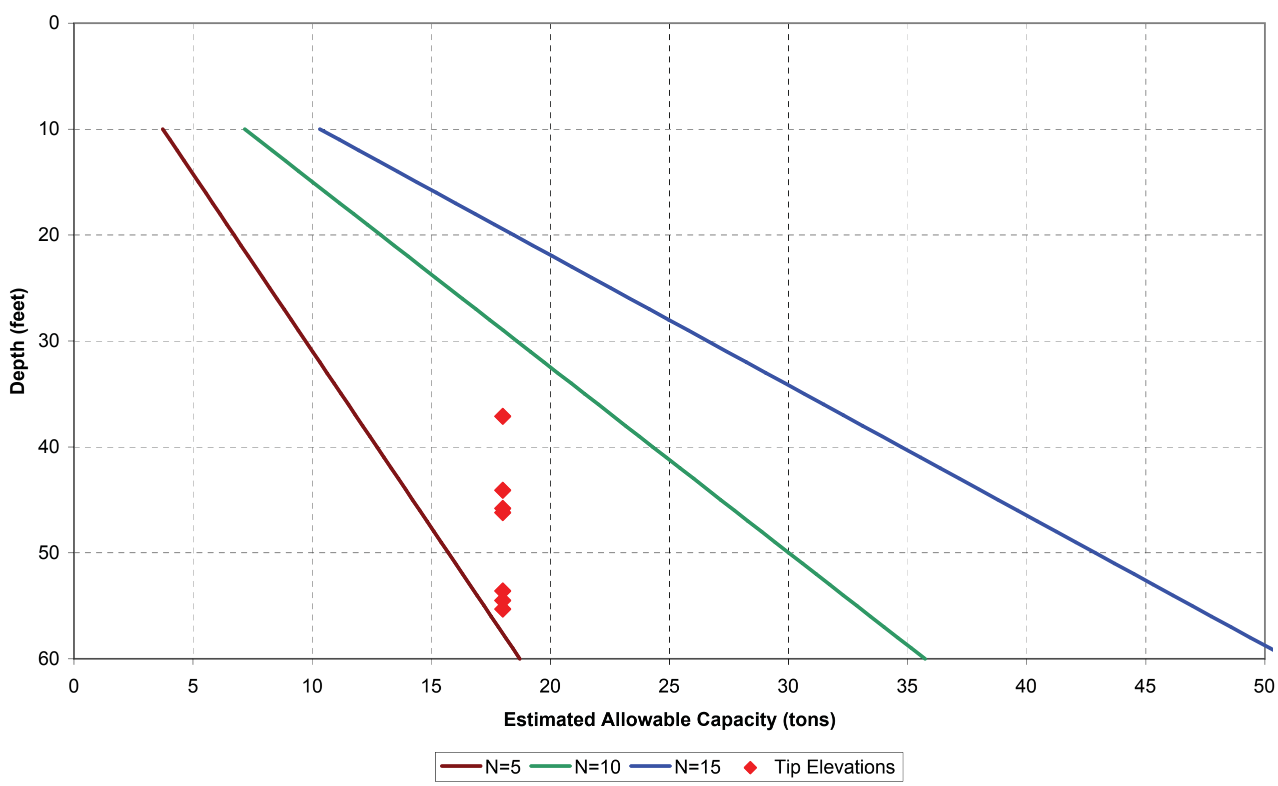

Bridge #460940
Timber Piles
Depth (feet)
0
10
20
30
40
50
60
0
5
10
15
20
25
30
35
40
45
50
Estimated Allowable Capacity (tons)
N=5
N=10
N=15
Tip Elevations

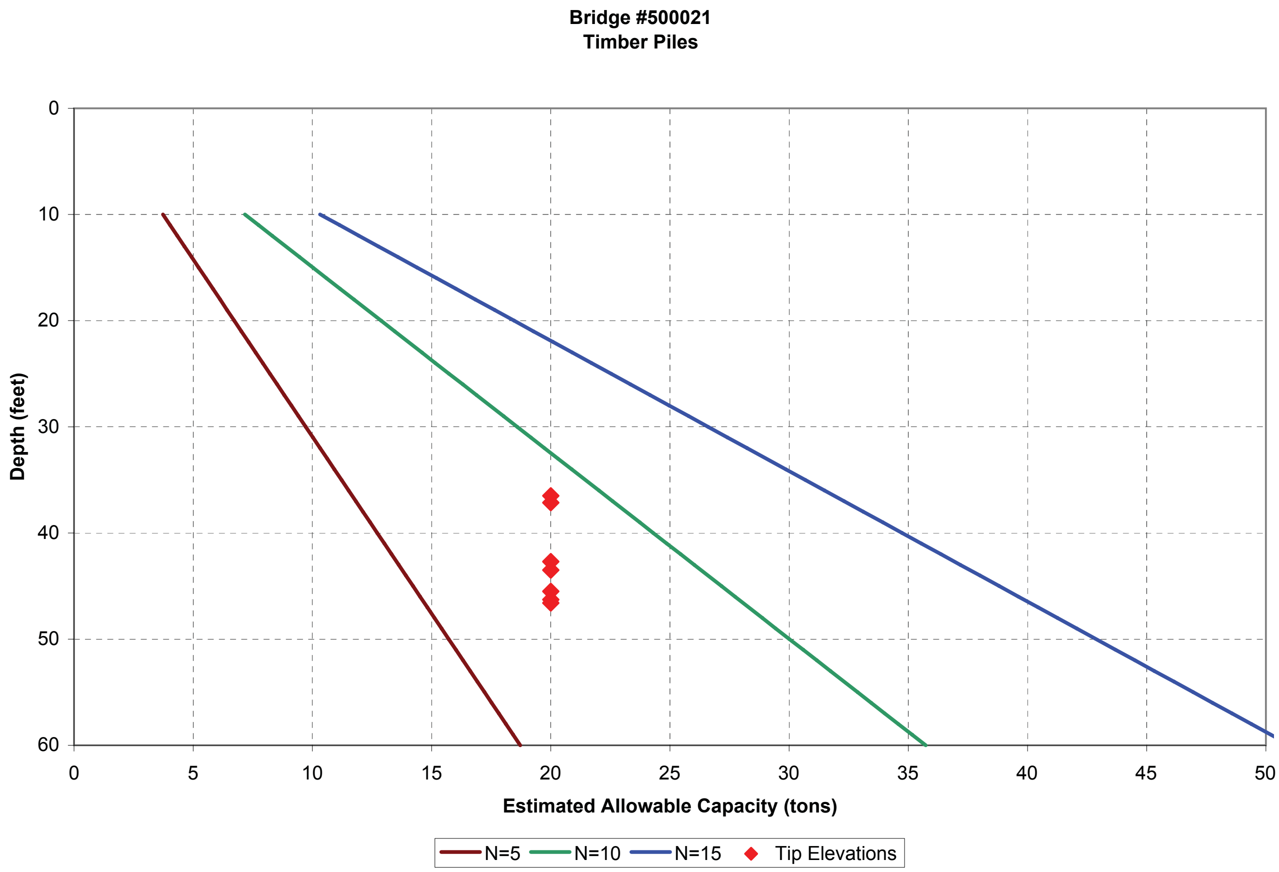

Bridge #480028
Timber Piles
Depth (feet)
0
10
20
30
40
50
60
0
5
10
15
20
25
30
35
40
45
50
Estimated Allowable Capacity (tons)
N=5
N=10
N=15
Tip Elevations

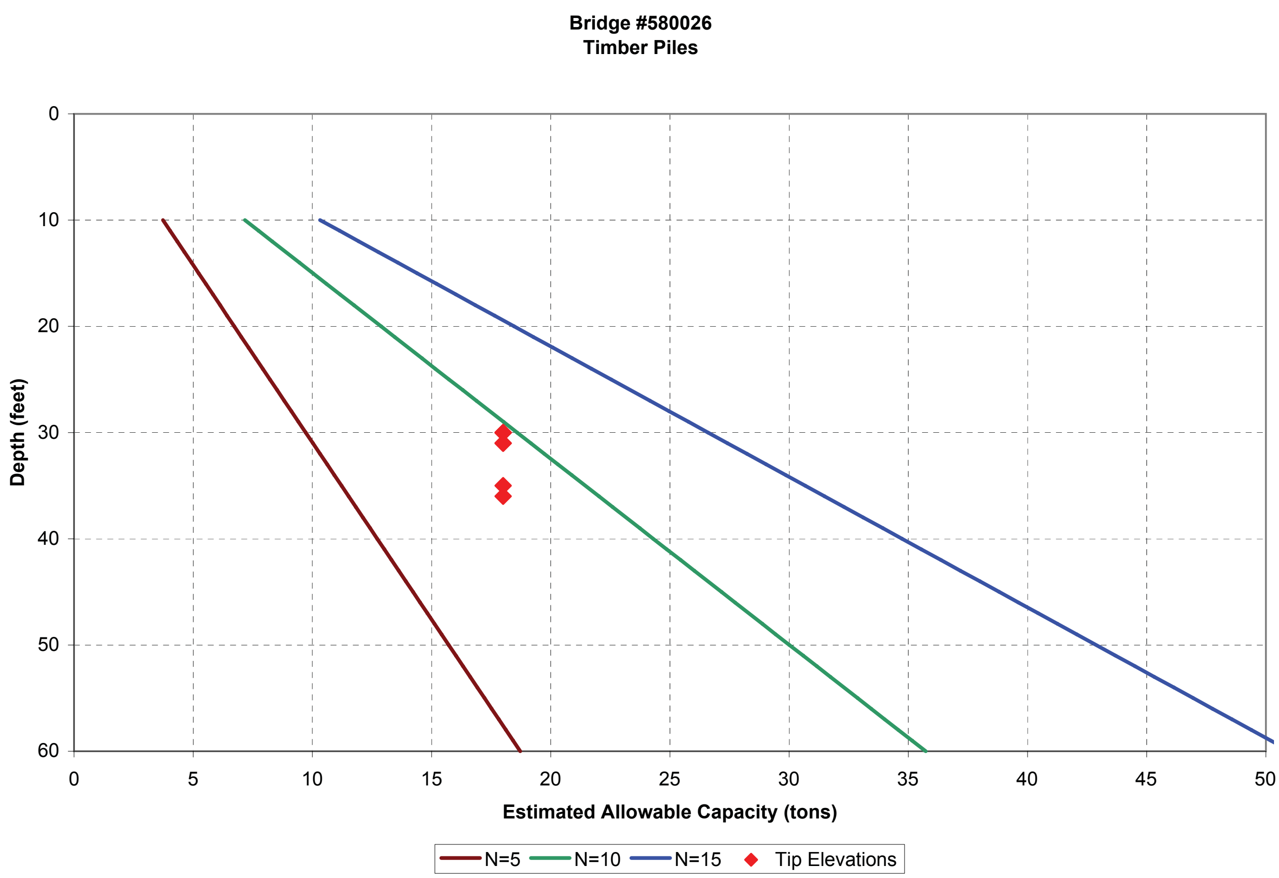
Bridge #480093
Timber Piles

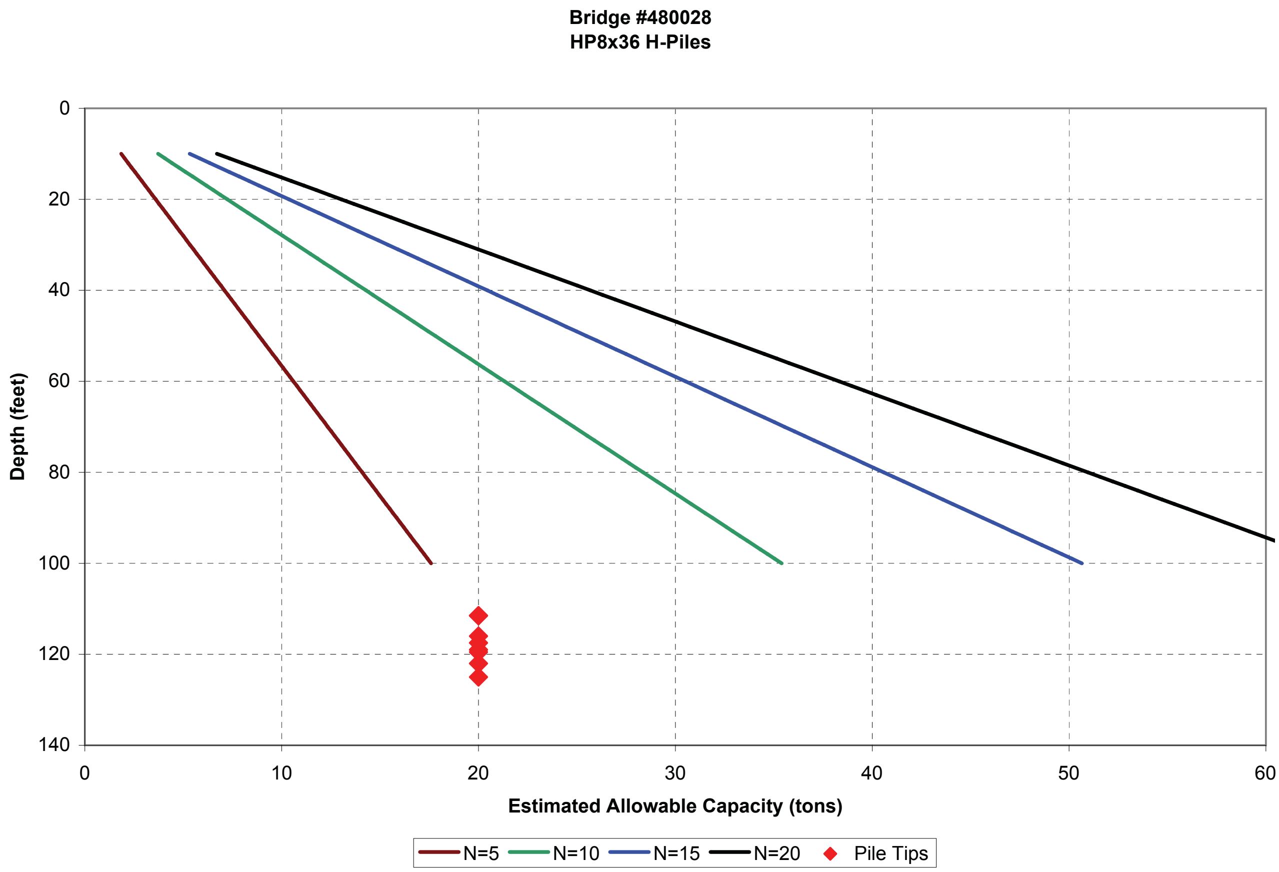


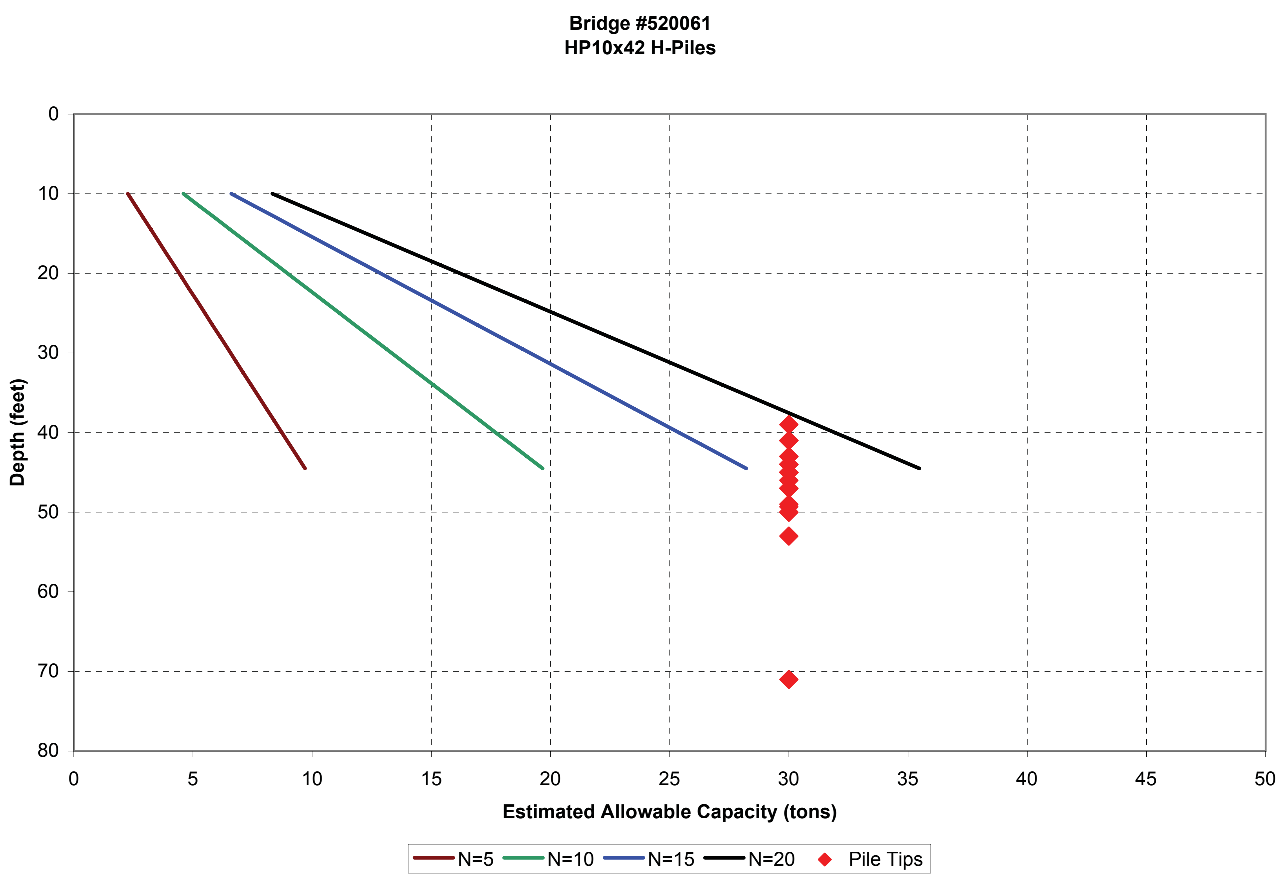
Bridge #480098
Timber Piles



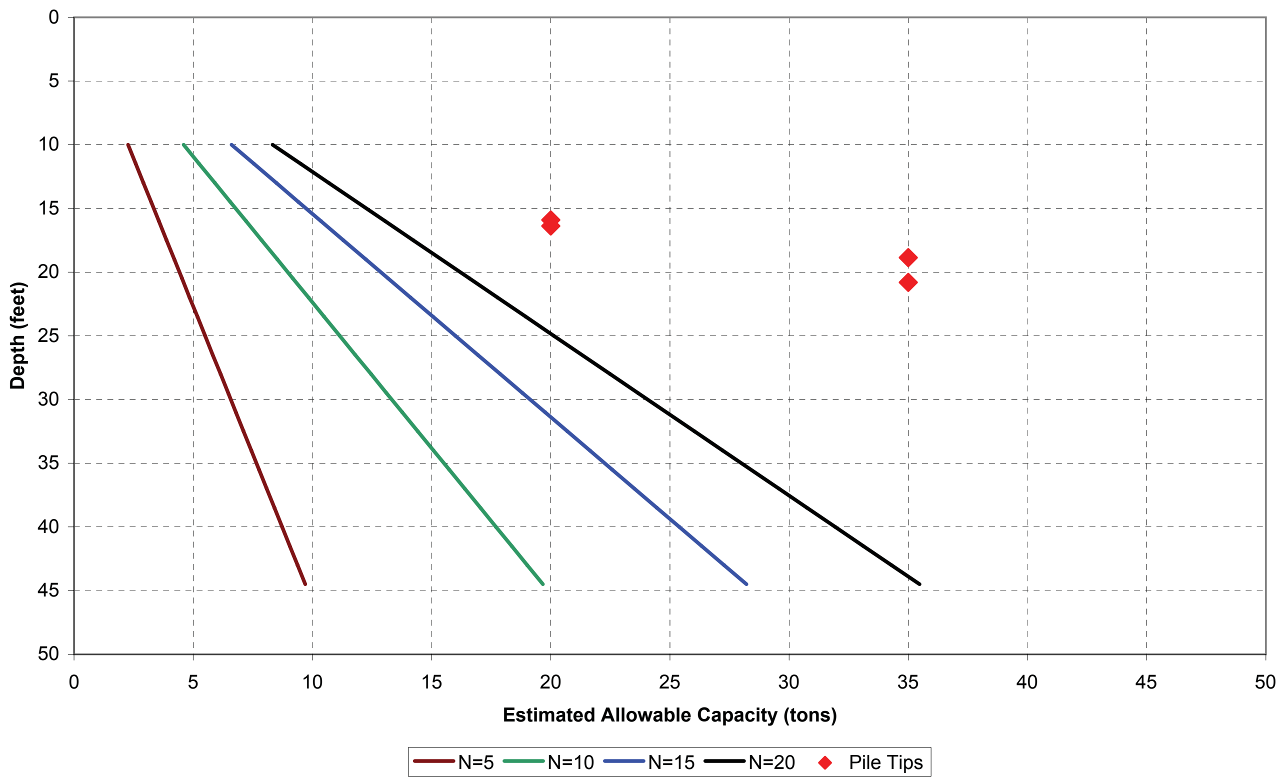

Bridge #500021
Timber Piles
Depth (feet)
0
10
20
30
40
50
60
0
5
10
15
20
25
30
35
40
45
50
Estimated Allowable Capacity (tons)
N=5
N=10
N=15
Tip Elevations


Bridge #580026
Timber Piles
Depth (feet)
0
10
20
30
40
50
60
0
5
10
15
20
25
30
35
40
45
50
Estimated Allowable Capacity (tons)
N=5
N=10
N=15
Tip Elevations

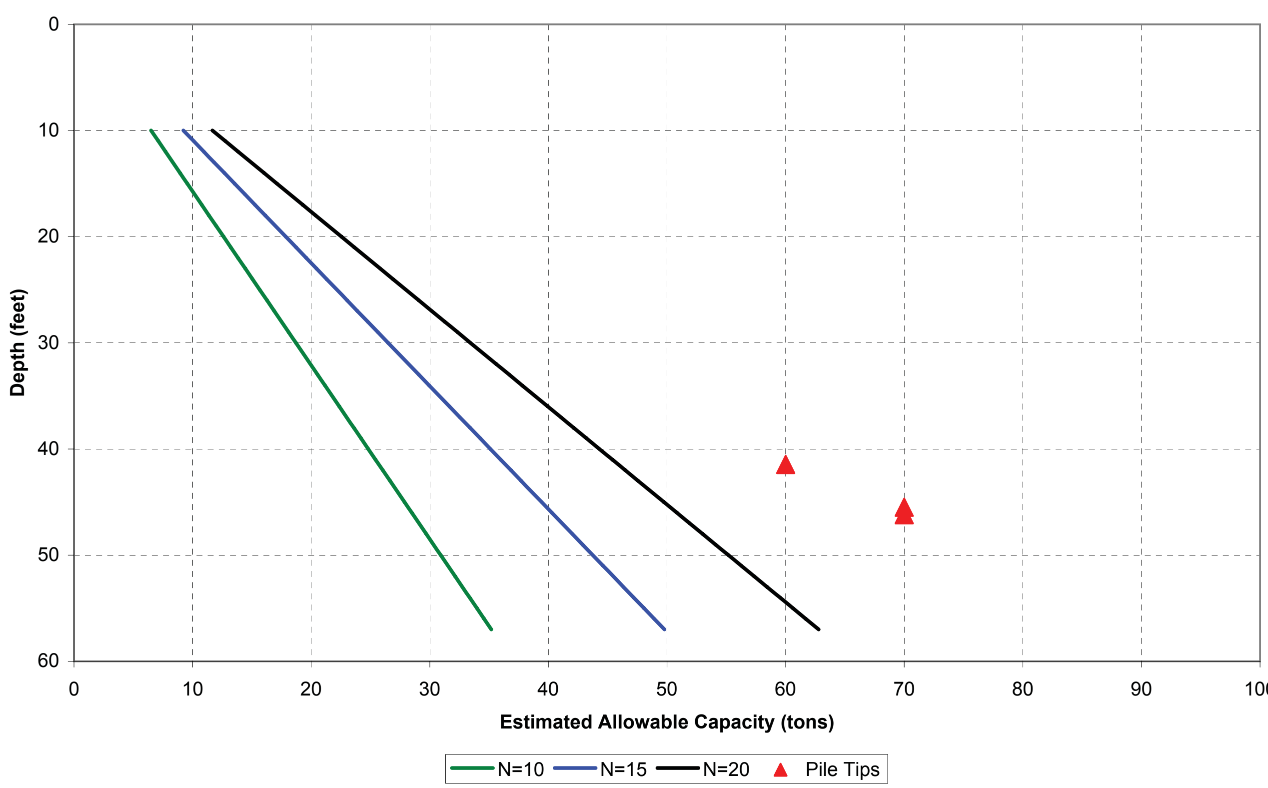

Bridge #480028
HP8x36 H-Piles
Depth (feet)
0
20
40
60
80
100
120
140
0
10
20
30
40
50
60
Estimated Allowable Capacity (tons)
N=5
N=10
N=15
N=20
Pile Tips

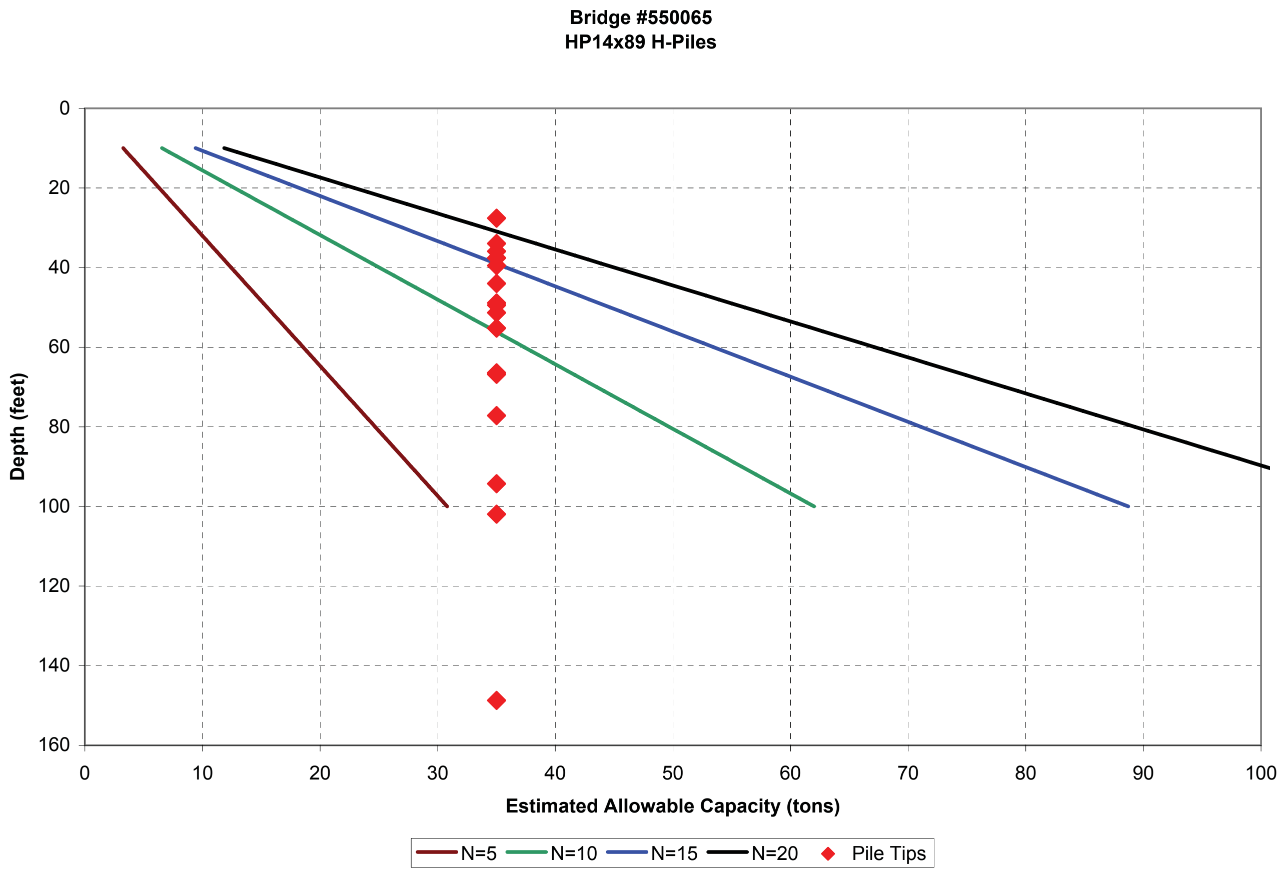

Bridge #520061
HP10x42 H-Piles
Depth (feet)
0
10
20
30
40
50
60
70
80
0
5
10
15
20
25
30
35
40
45
50
Estimated Allowable Capacity (tons)
N=5
N=10
N=15
N=20
Pile Tips

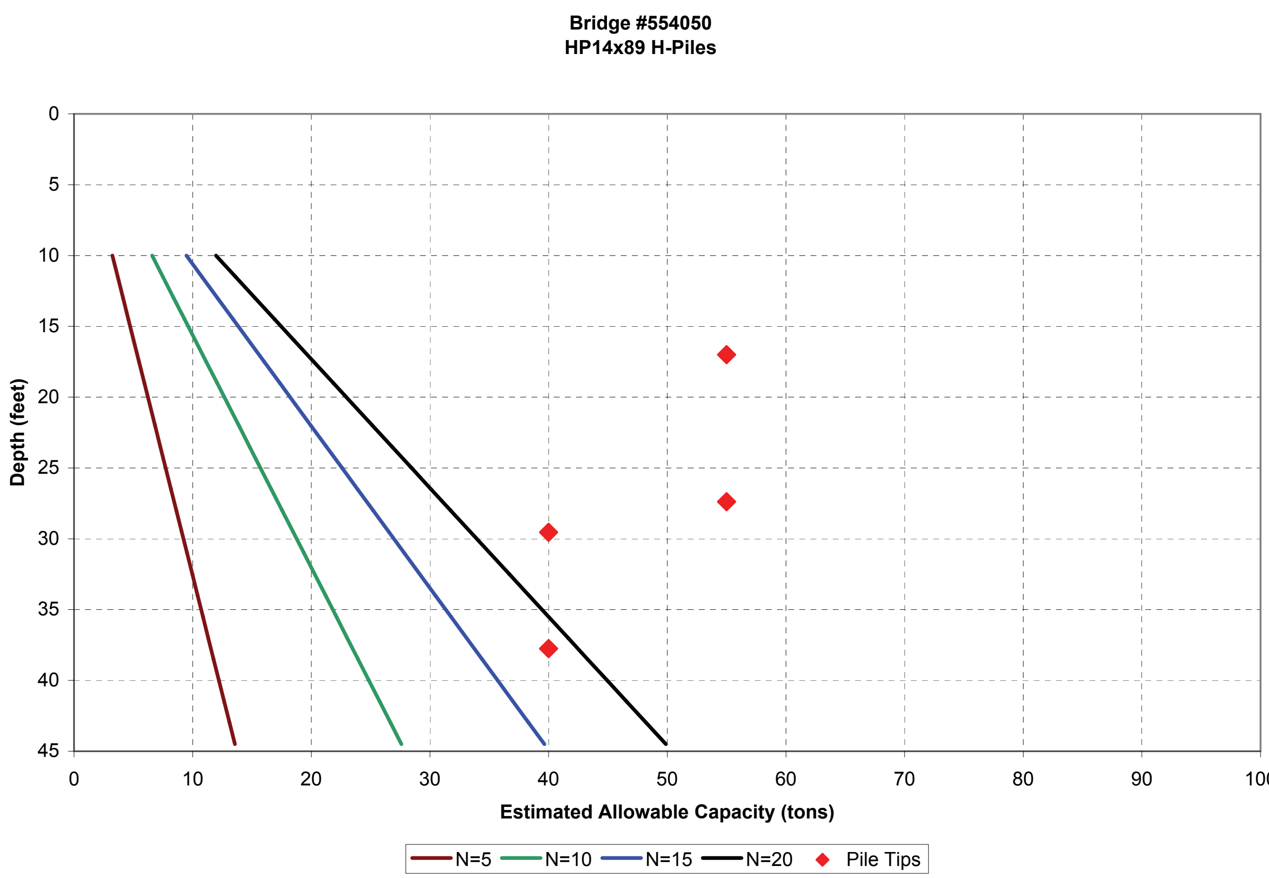
Bridge #590023
HP10x42 H-Piles

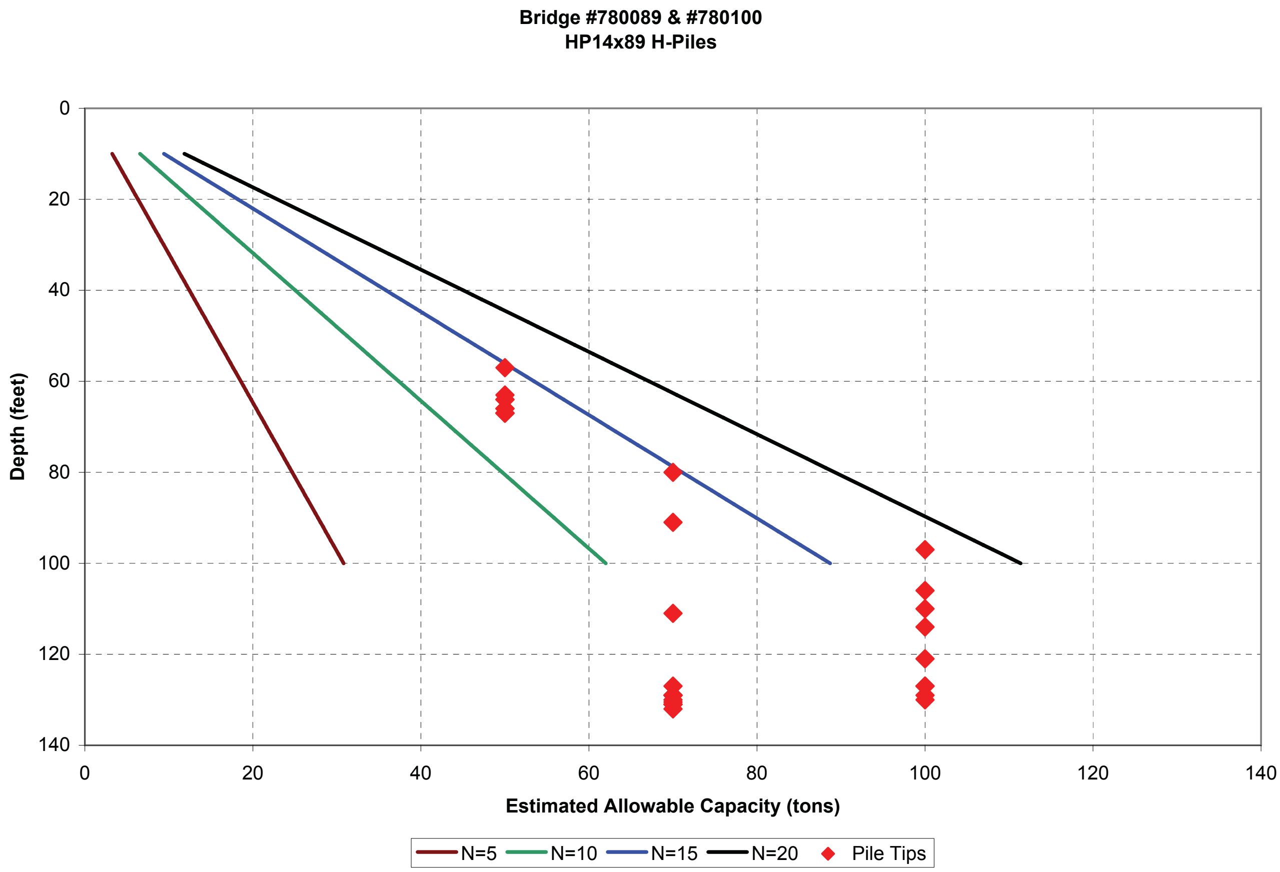


Bridge #110077
HP14x73 H-Piles




Bridge #550065
HP14x89 H-Piles
Depth (feet)
Estimated Allowable Capacity (tons)
N=5
N=10
N=15
N=20
Pile Tips


Bridge #554050
HP14x89 H-Piles
Depth (feet)
Estimated Allowable Capacity (tons)
N=5
N=10
N=15
N=20
Pile Tips


Bridge #780089 & #780100
HP14x89 H-Piles
Depth (feet)
0
20
40
60
80
100
120
140
0
20
40
60
80
100
120
140
Estimated Allowable Capacity (tons)
N=5
N=10
N=15
N=20
Pile Tips

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Appendix G

The following items are included in Appendix G:

- Rapid scour estimation graphs

Rapid Scour Estimation Graphs

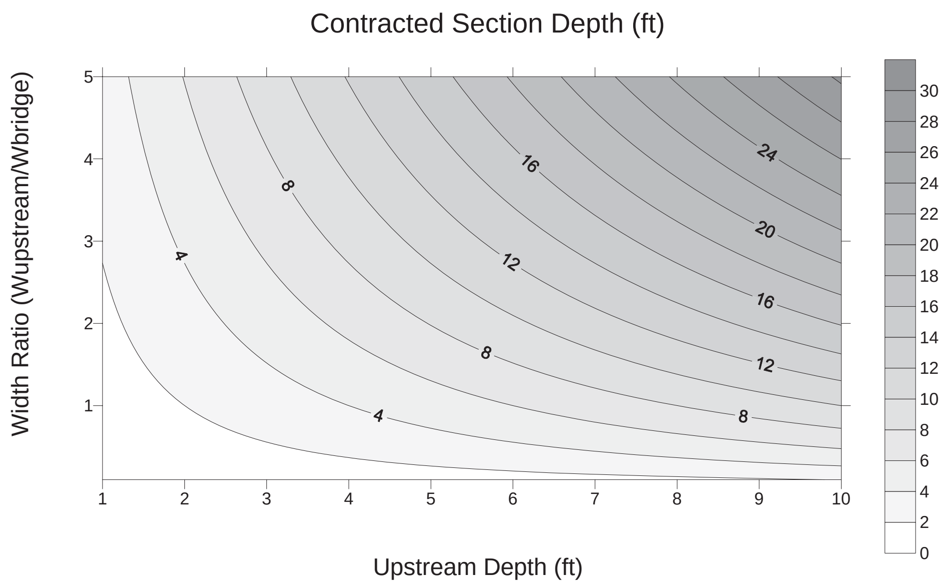

Figure 1 **Contracted Section Depth as a Function of Upstream Depth and Width Ratio**

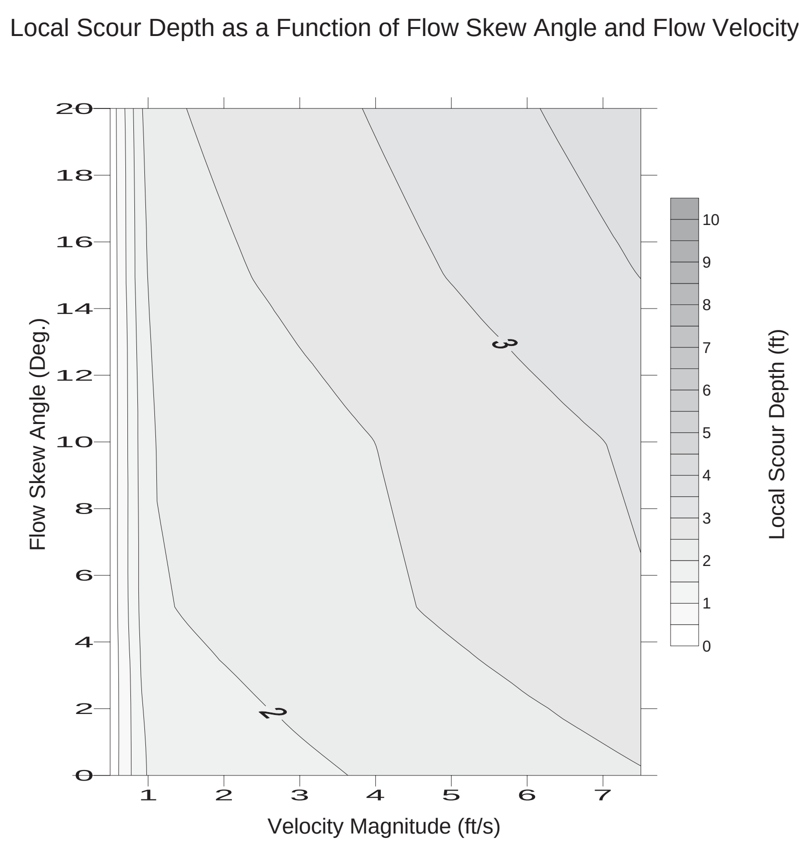

Figure 2 **Local Scour Plot for a Group of Four 12" Piles (D_{50} = 0.15 mm)**

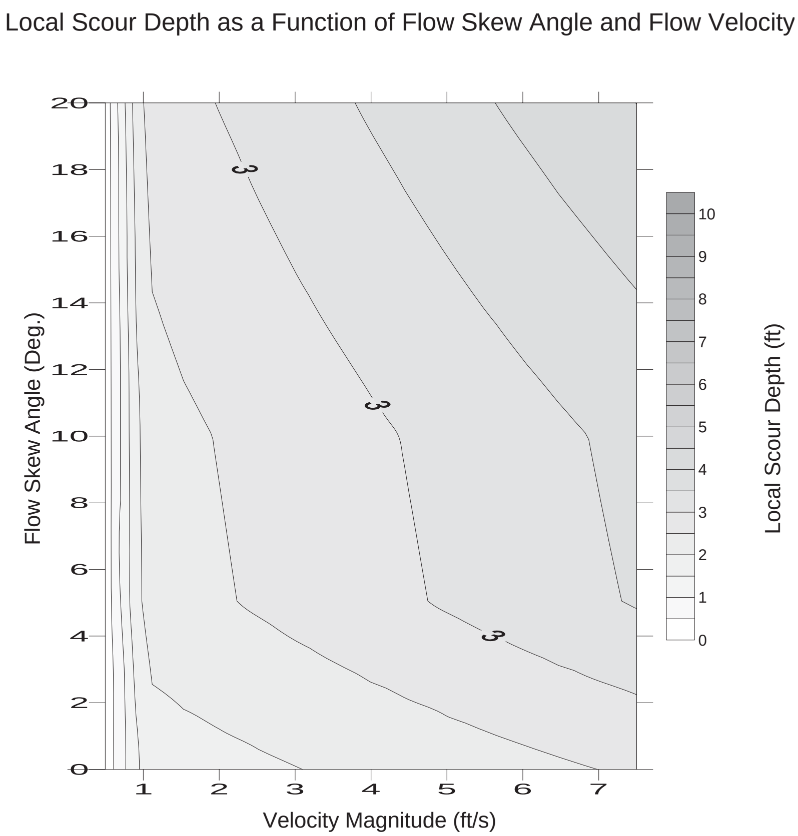

Figure 3 **Local Scour Plot for a Group of Six 12" Piles (D_{50} = 0.15 mm)**

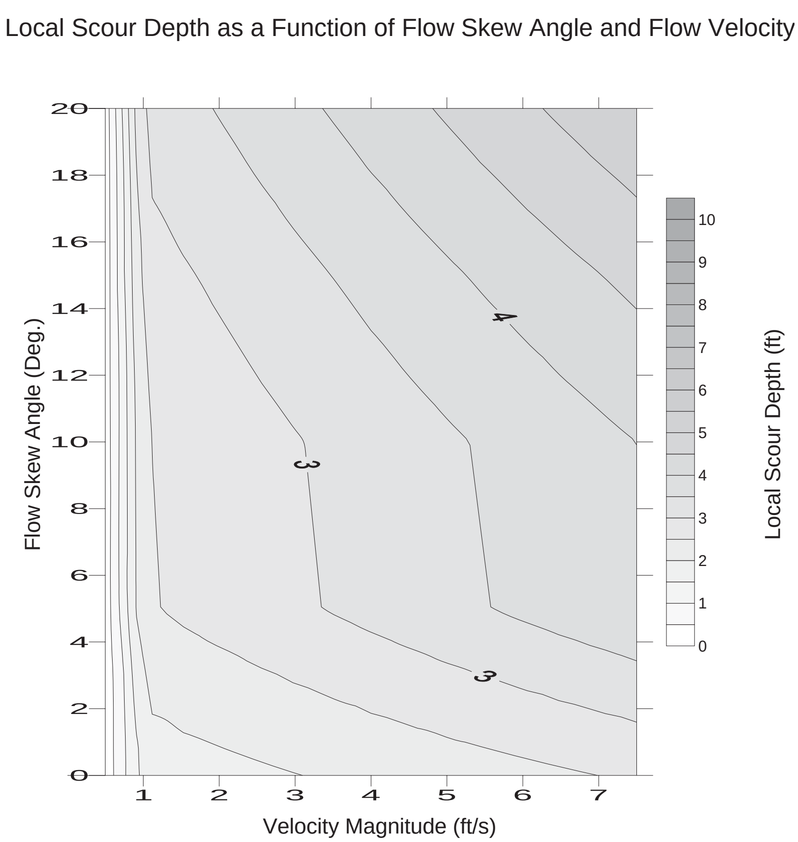

Figure 4 **Local Scour Plot for a Group of Eight 12" Piles (D_{50} = 0.15 mm)**

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

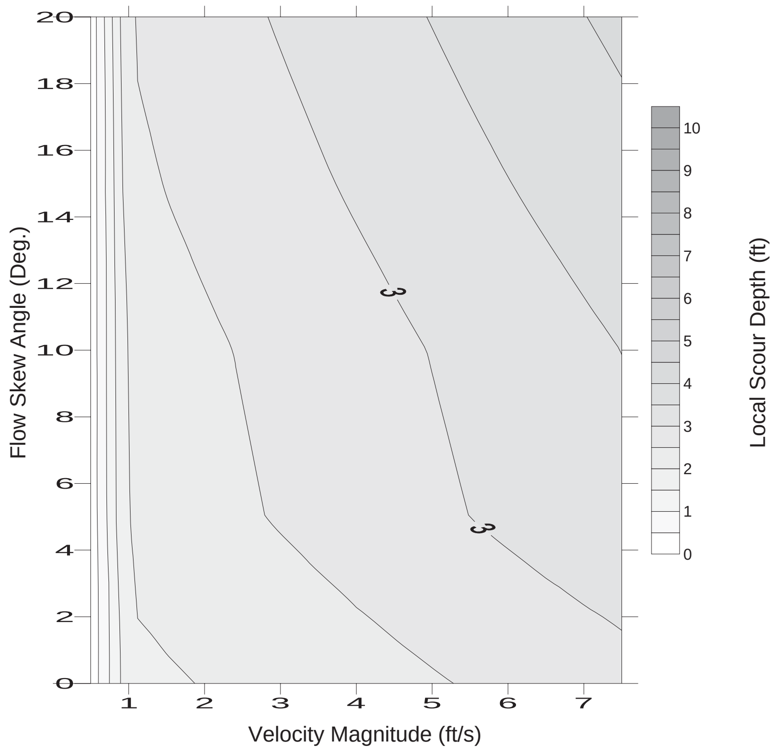

Figure 5 **Local Scour Plot for a Group of Four 14" Piles (D_{50} = 0.15 mm)**

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

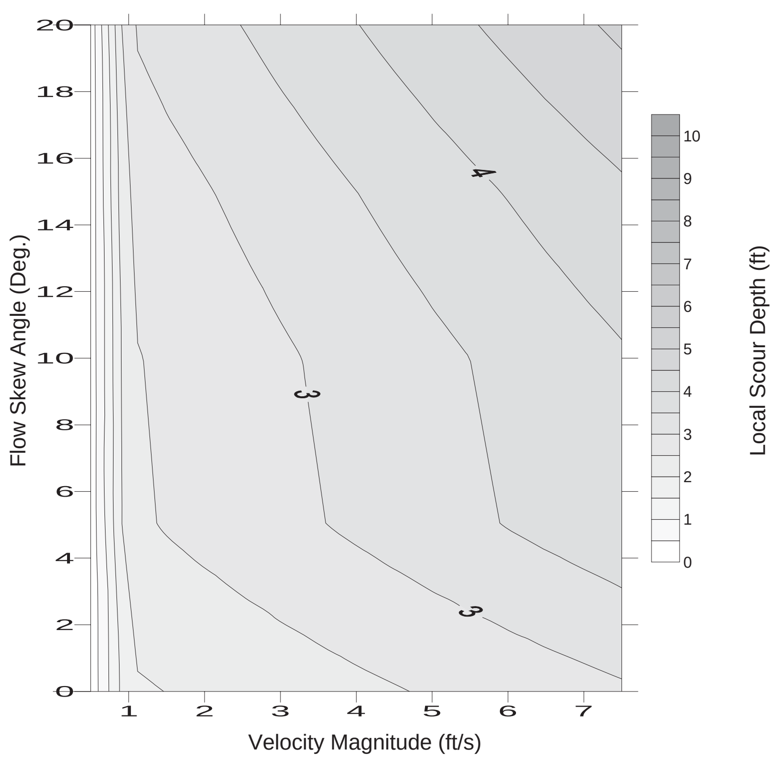

Figure 6 **Local Scour Plot for a Group of Six 14" Piles (D_{50} = 0.15 mm)**

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

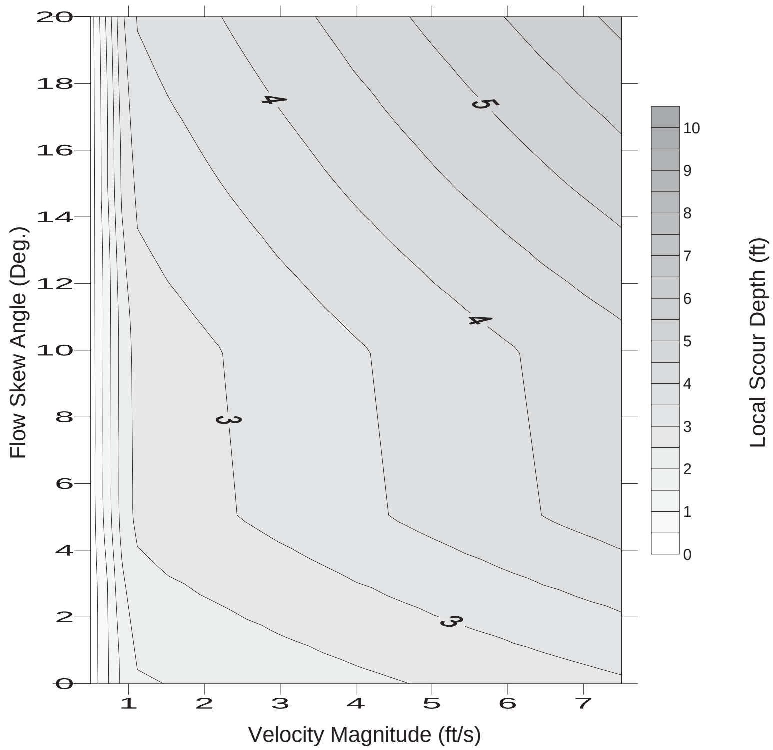

Figure 7 **Local Scour Plot for a Group of Eight 14" Piles (D_{50} = 0.15 mm)**

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

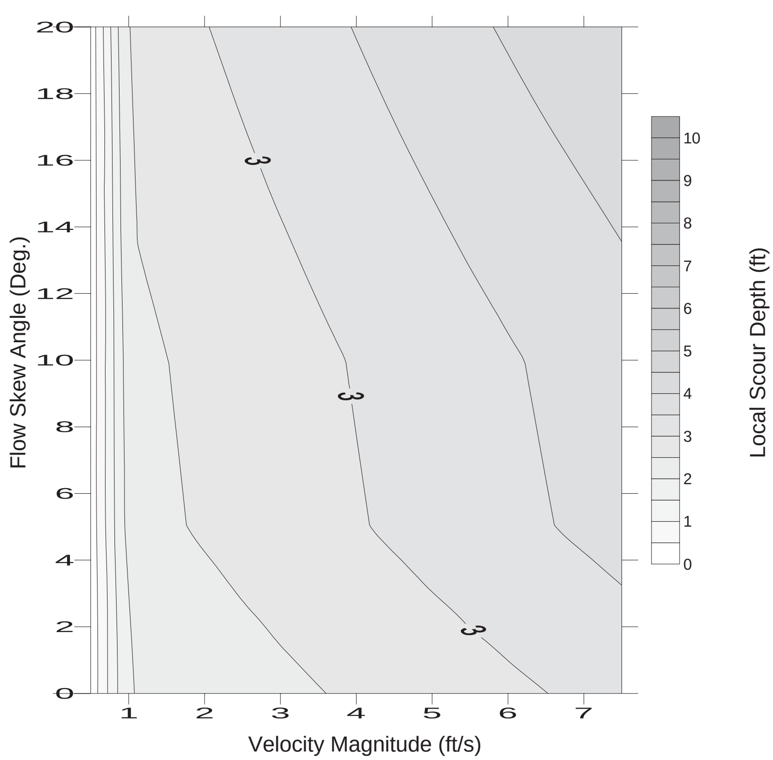

Figure 8 **Local Scour Plot for a Group of Four 16" Piles (D_{50} = 0.15 mm)**

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

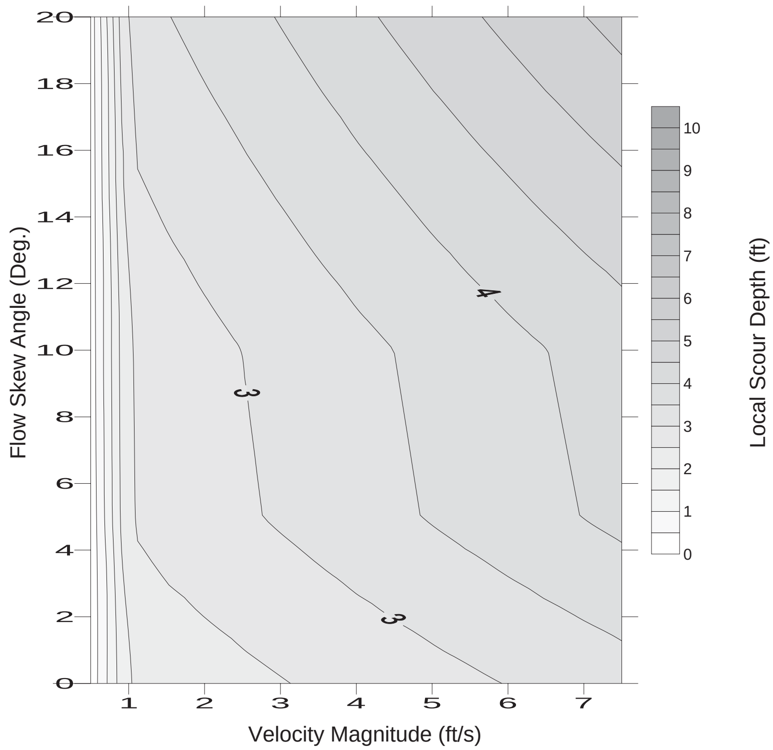

Figure 9 Local Scour Plot for a Group of Six 16” Piles (D_{50} = 0.15 mm)

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

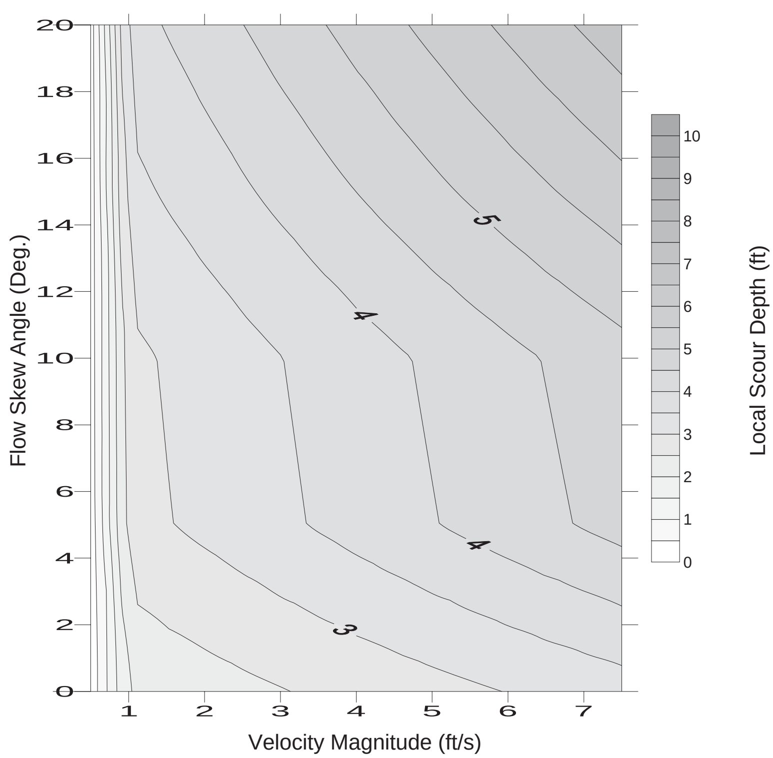

Figure 10 Local Scour Plot for a Group of Eight 16” Piles (D_{50} = 0.15 mm)

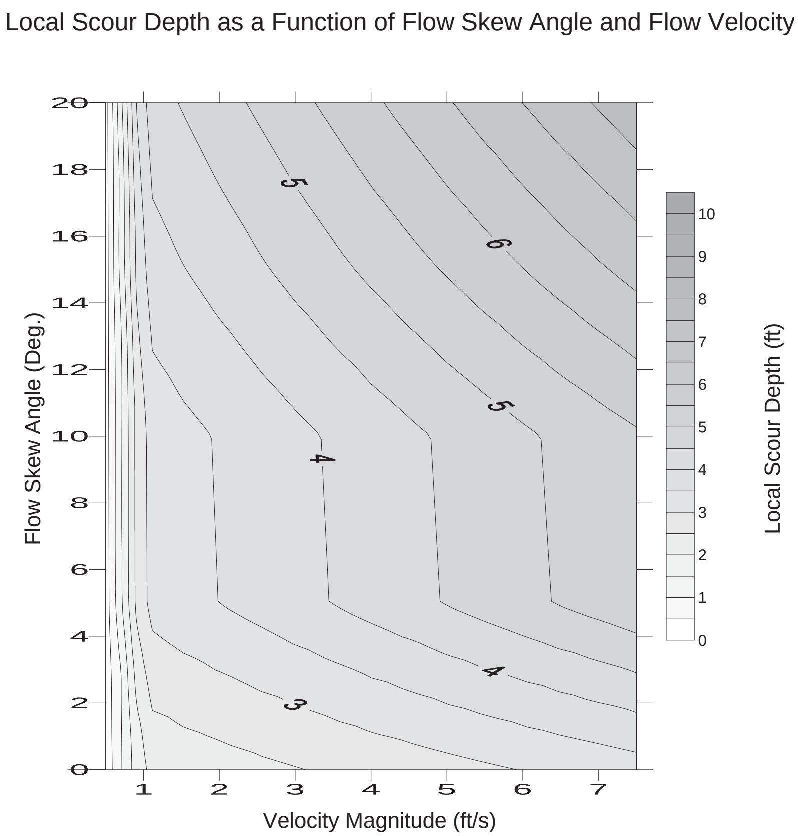

Figure 11 **Local Scour Plot for a Group of Ten 16” Piles (D_{50} = 0.15 mm)**

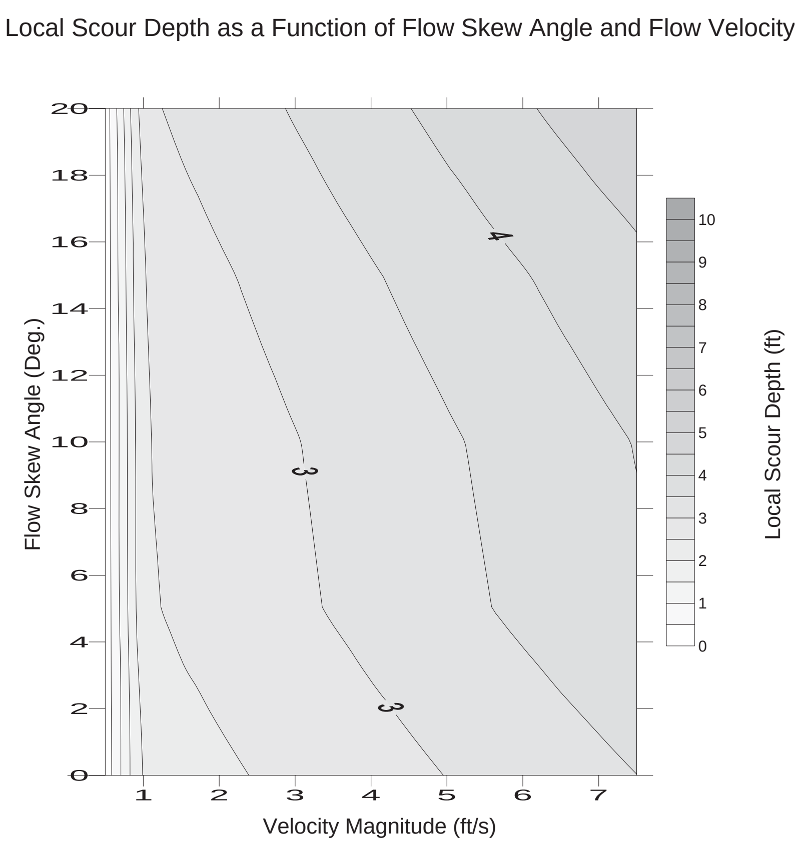

Figure 12 **Local Scour Plot for a Group of Four 18” Piles (D_{50} = 0.15 mm)**

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

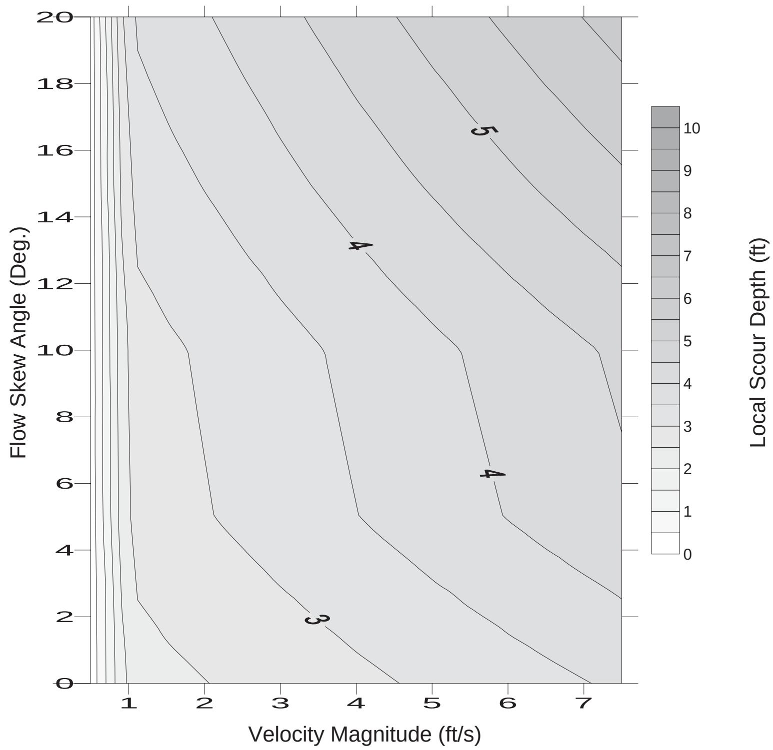

Figure 13 Local Scour Plot for a Group of Six 18" Piles (D_{50} = 0.15 mm)

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

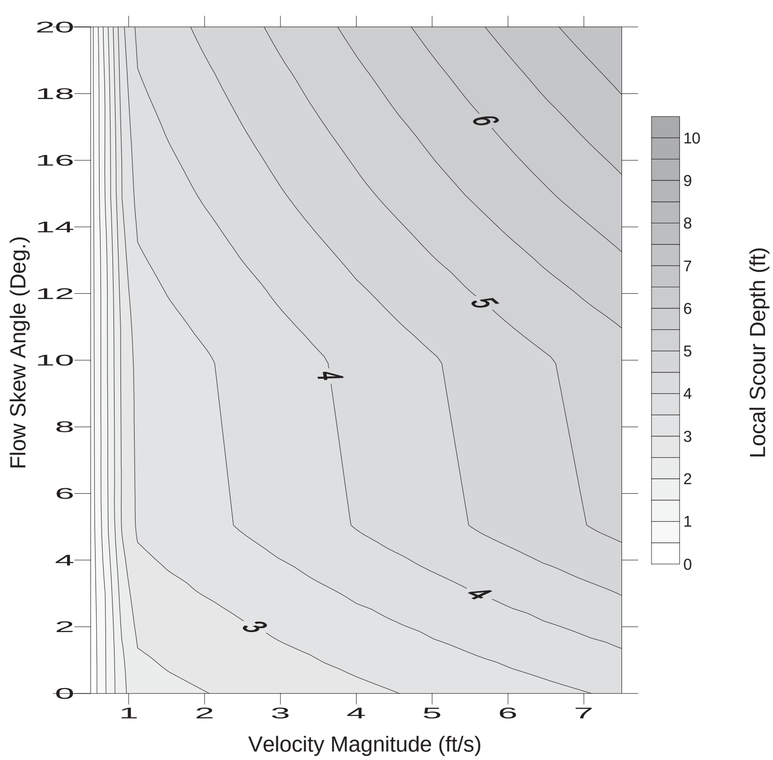

Figure 14 Local Scour Plot for a Group of Eight 18" Piles (D_{50} = 0.15 mm)

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

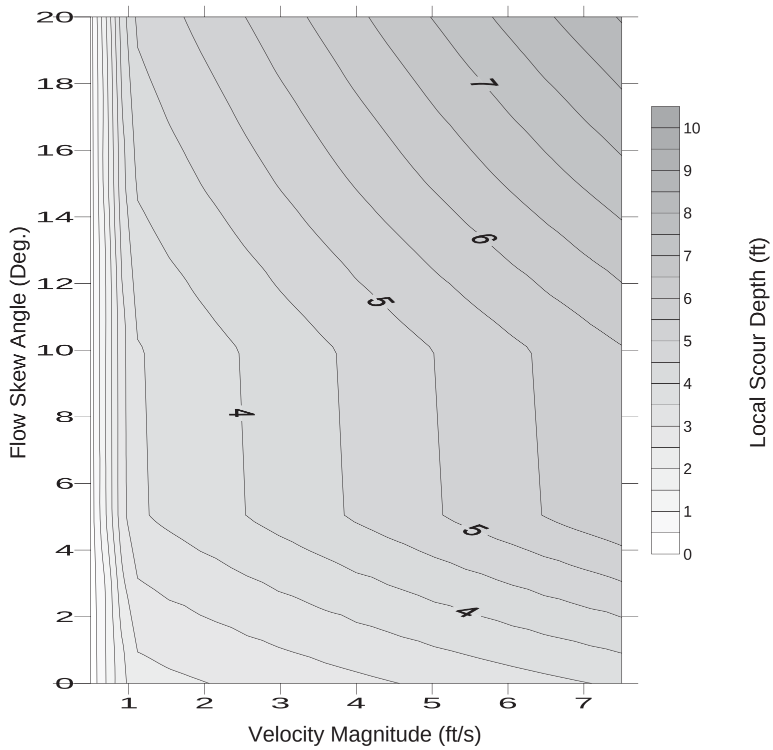

Figure 15 **Local Scour Plot for a Group of Ten 18" Piles (D_{50} = 0.15 mm)**

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

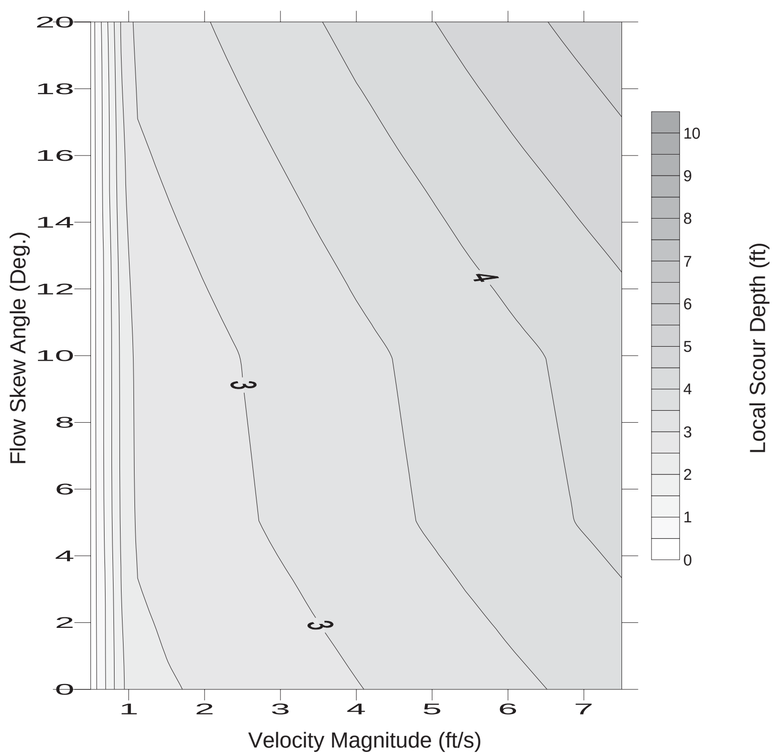

Figure 16 **Local Scour Plot for a Group of Four 20" Piles (D_{50} = 0.15 mm)**

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

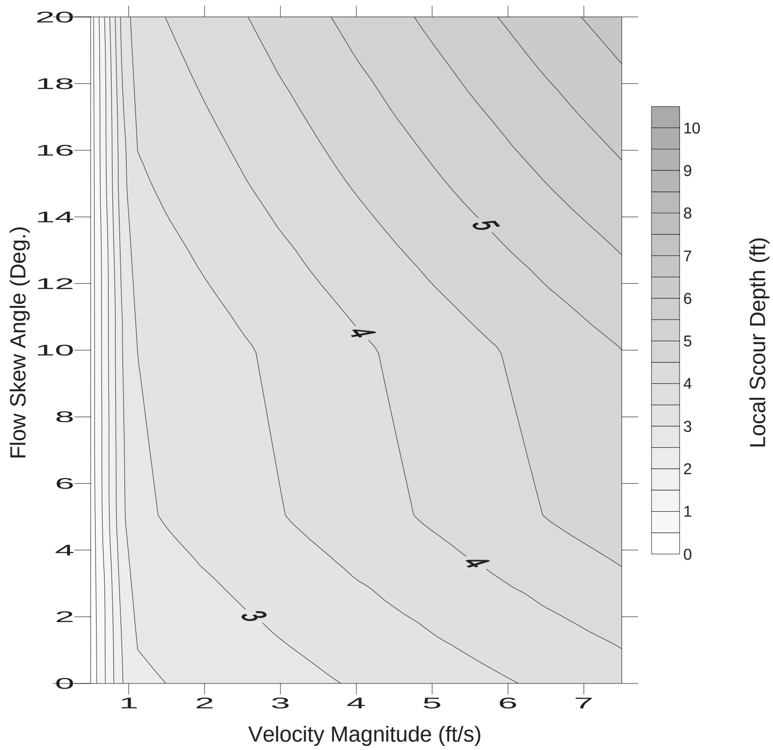

Figure 17 Local Scour Plot for a Group of Six 20" Piles (D_{50} = 0.15 mm)

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

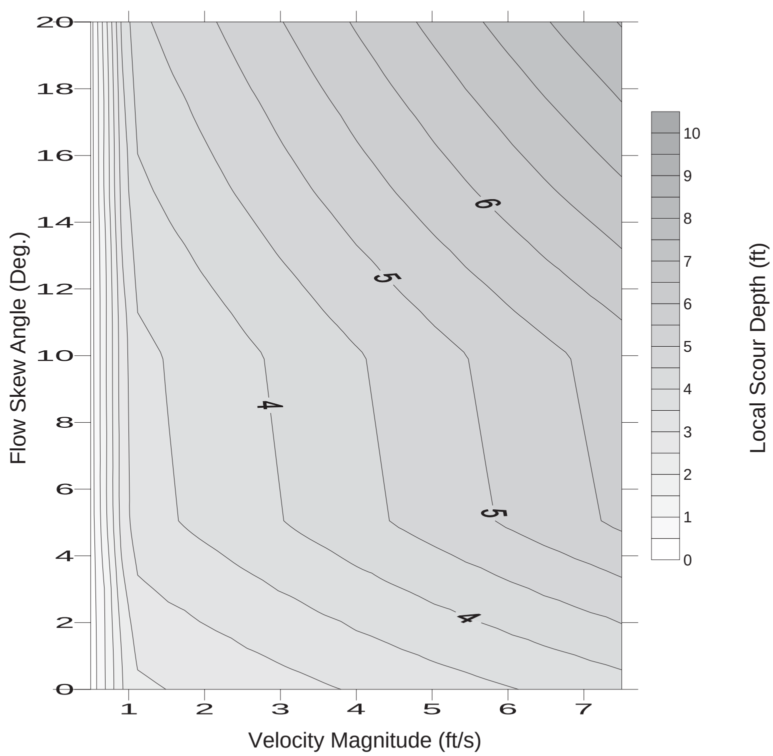

Figure 18 Local Scour Plot for a Group of Eight 20" Piles (D_{50} = 0.15 mm)

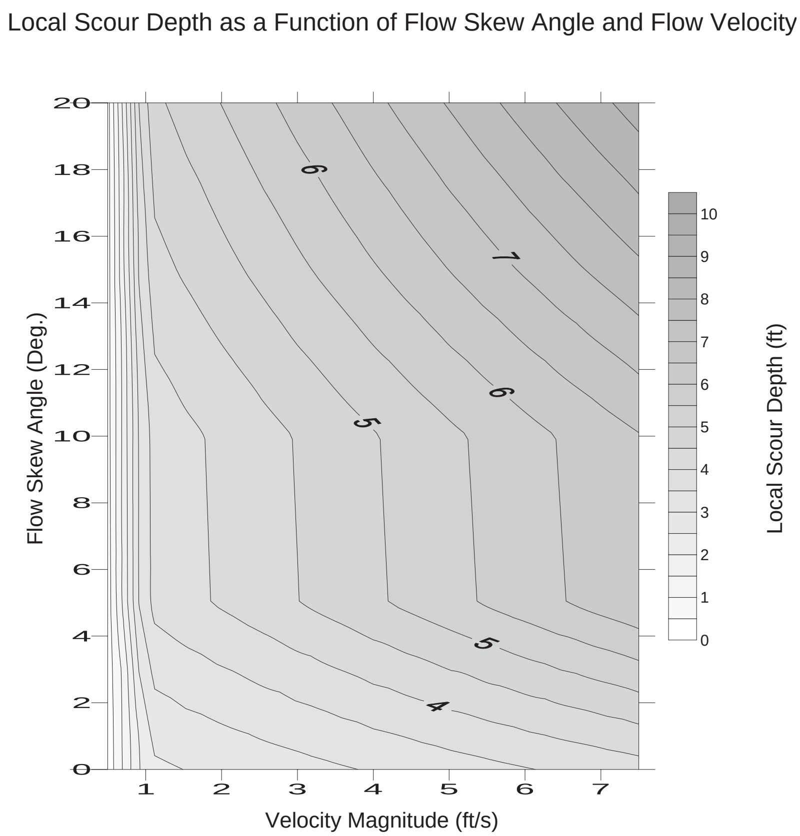

Figure 19 **Local Scour Plot for a Group of Ten 20” Piles (D_{50} = 0.15 mm)**

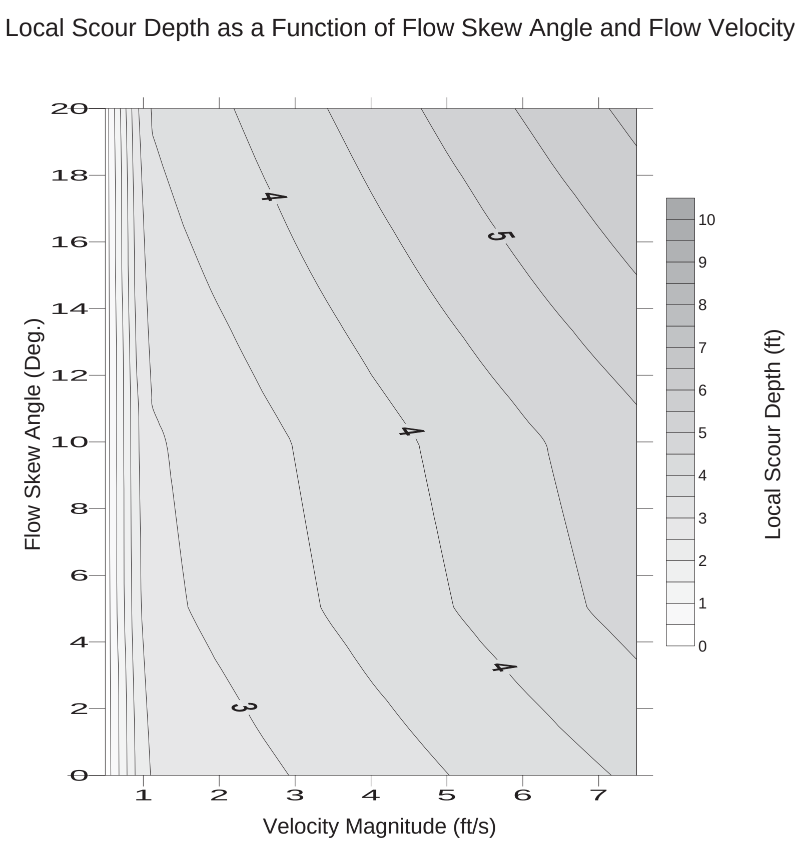

Figure 20 **Local Scour Plot for a Group of Four 24” Piles (D_{50} = 0.15 mm)**

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

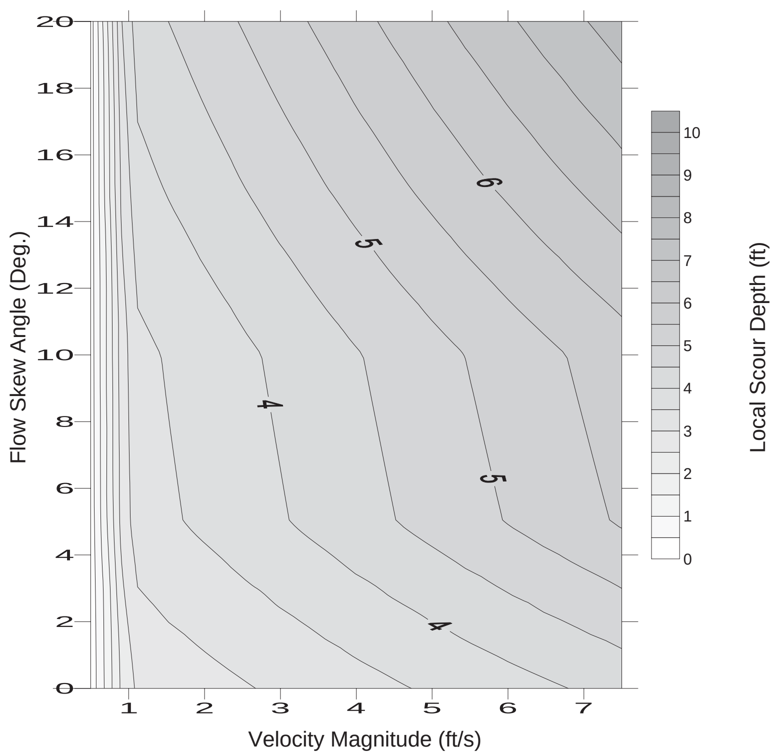

Figure 21 Local Scour Plot for a Group of Six 24" Piles (D_{50} = 0.15 mm)

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

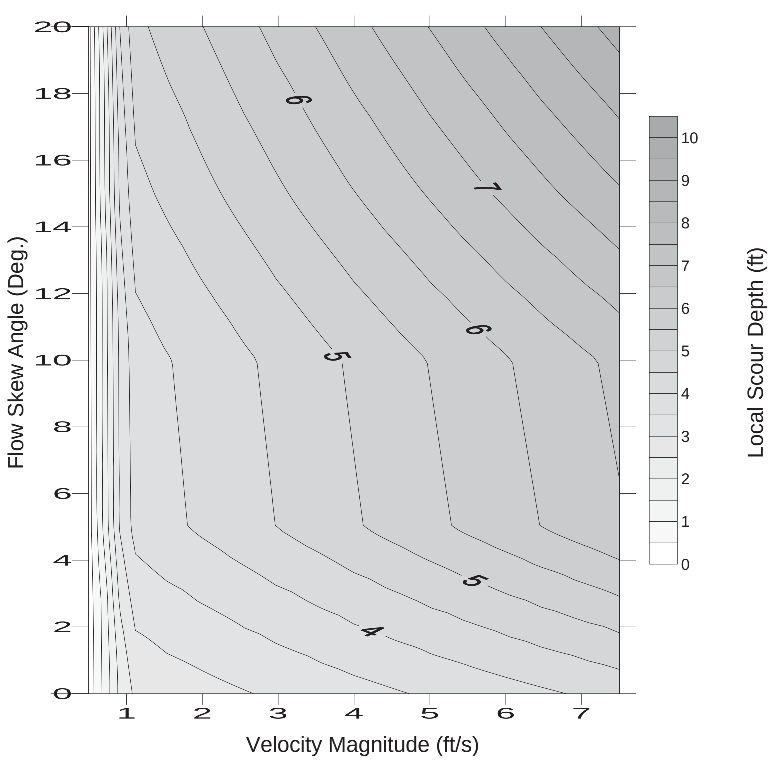

Figure 22 Local Scour Plot for a Group of Eight 24" Piles (D_{50} = 0.15 mm)

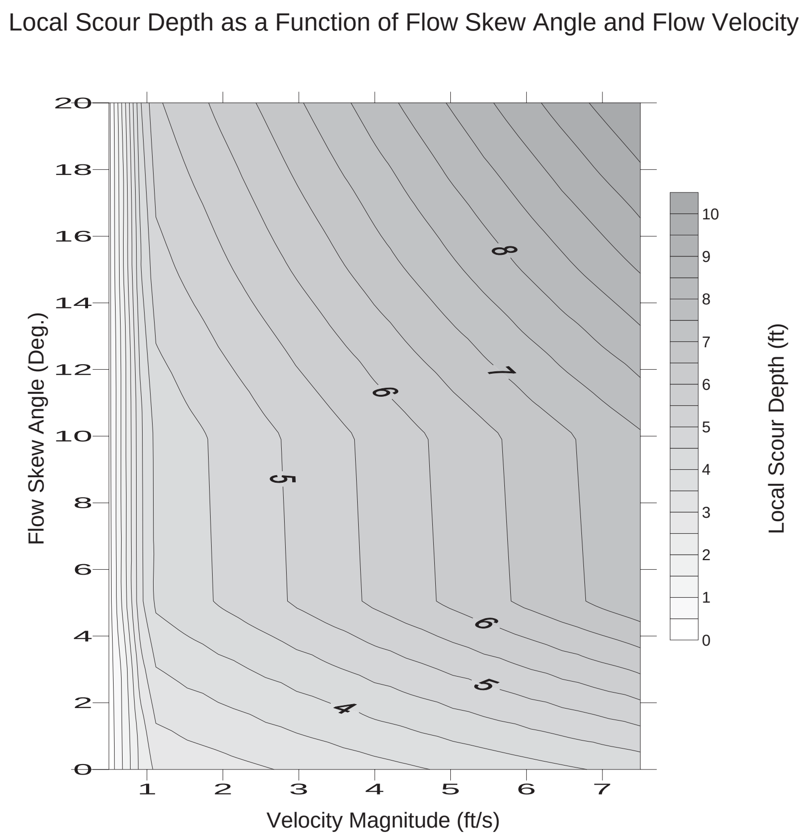

Figure 23 **Local Scour Plot for a Group of Ten 24" Piles (D_{50} = 0.15 mm)**

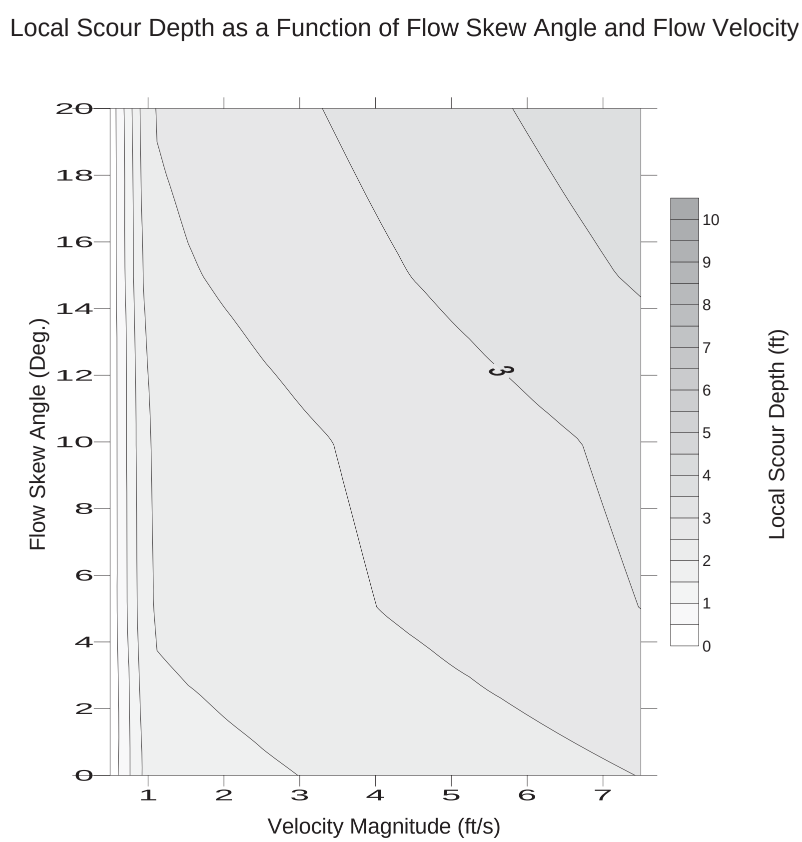

Figure 24 **Local Scour Plot for a Group of Four 12" Piles (D_{50} = 0.20 mm)**

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

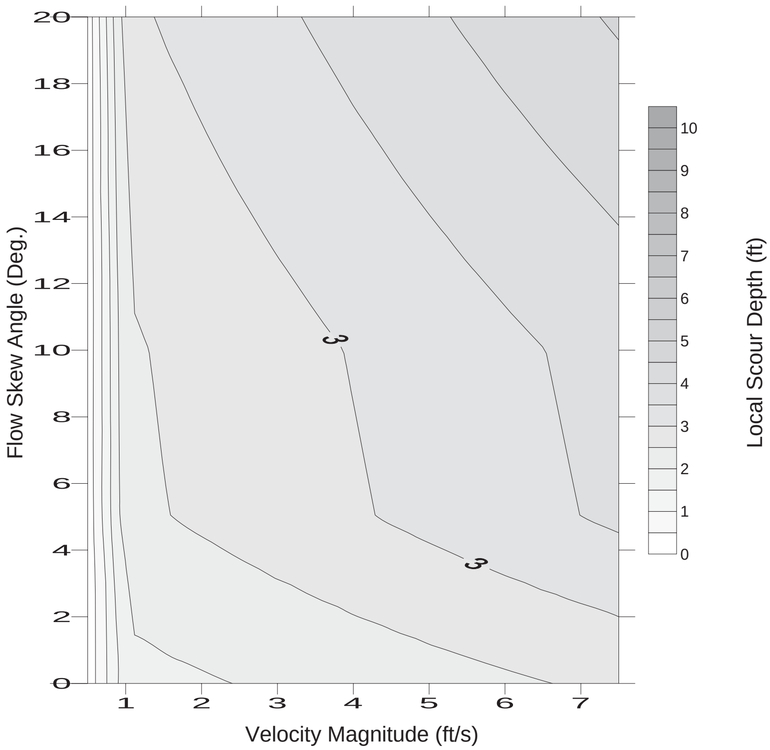

Figure 25 **Local Scour Plot for a Group of Six 12" Piles (D_{50} = 0.20 mm)**

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

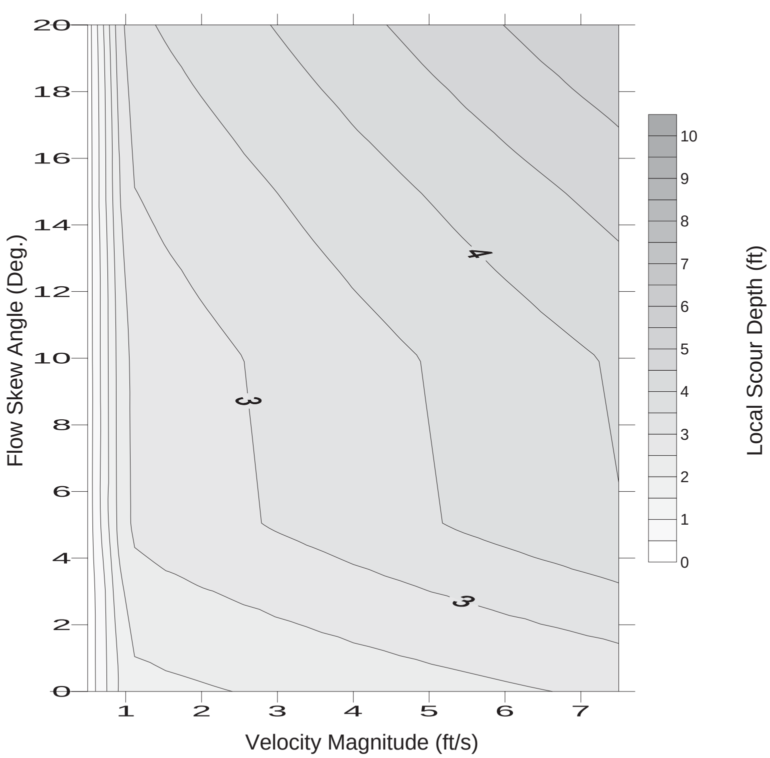

Figure 26 **Local Scour Plot for a Group of Eight 12" Piles (D_{50} = 0.20 mm)**

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

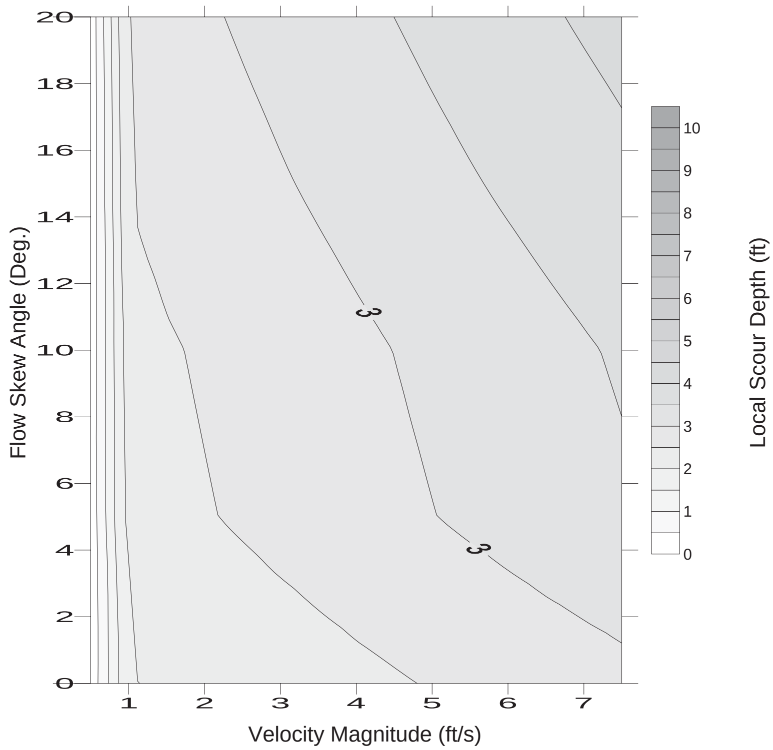

Figure 27 **Local Scour Plot for a Group of Four 14" Piles (D_{50} = 0.20 mm)**

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

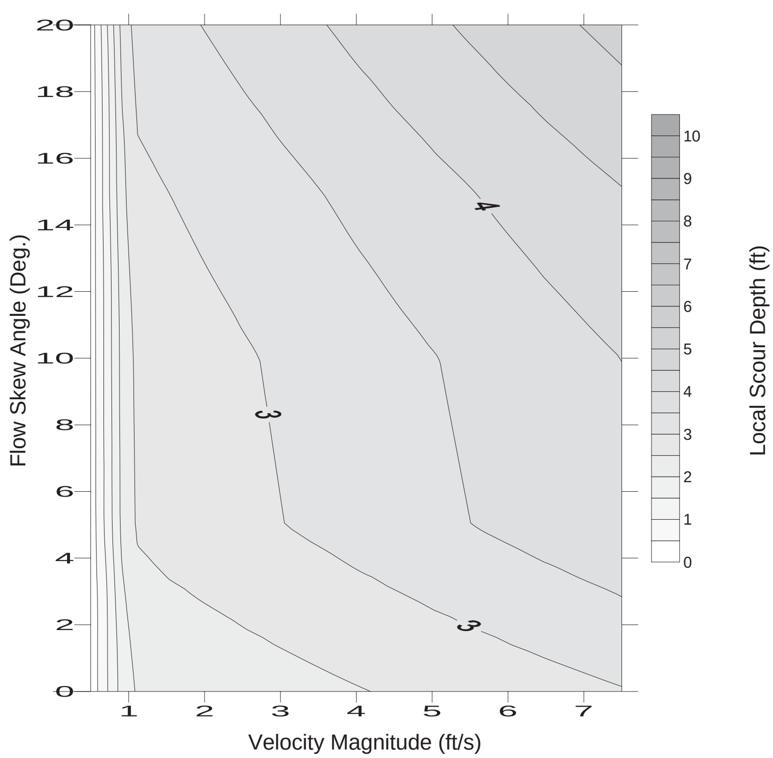

Figure 28 **Local Scour Plot for a Group of Six 14" Piles (D_{50} = 0.20 mm)**

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

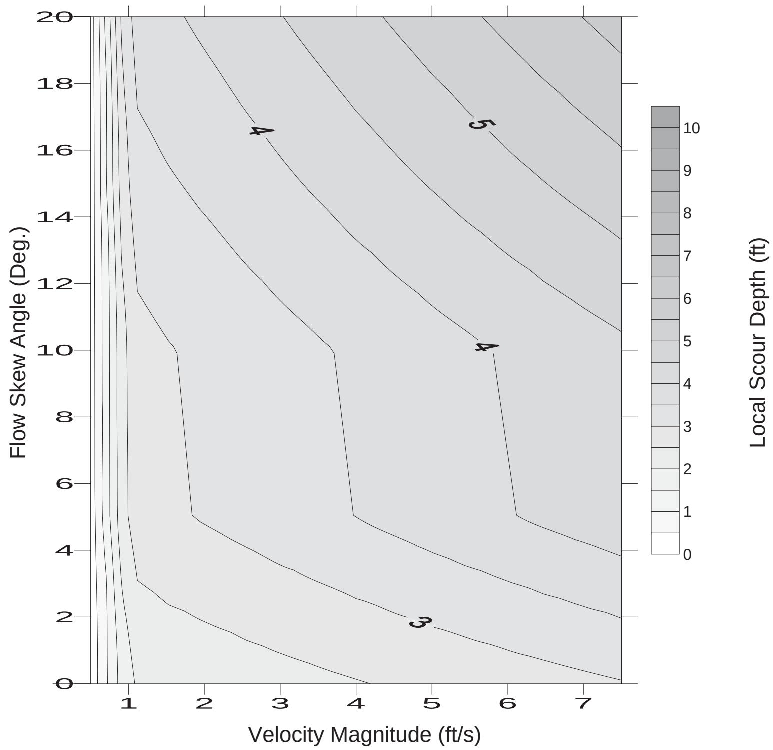

Figure 29 **Local Scour Plot for a Group of Eight 14" Piles (D_{50} = 0.20 mm)**

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

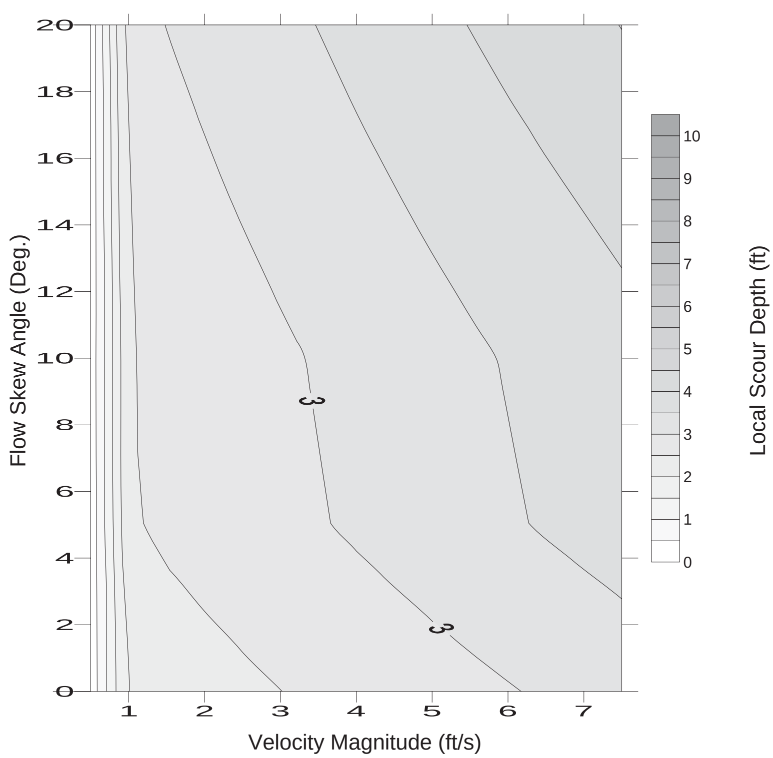

Figure 30 **Local Scour Plot for a Group of Four 16" Piles (D_{50} = 0.20 mm)**

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

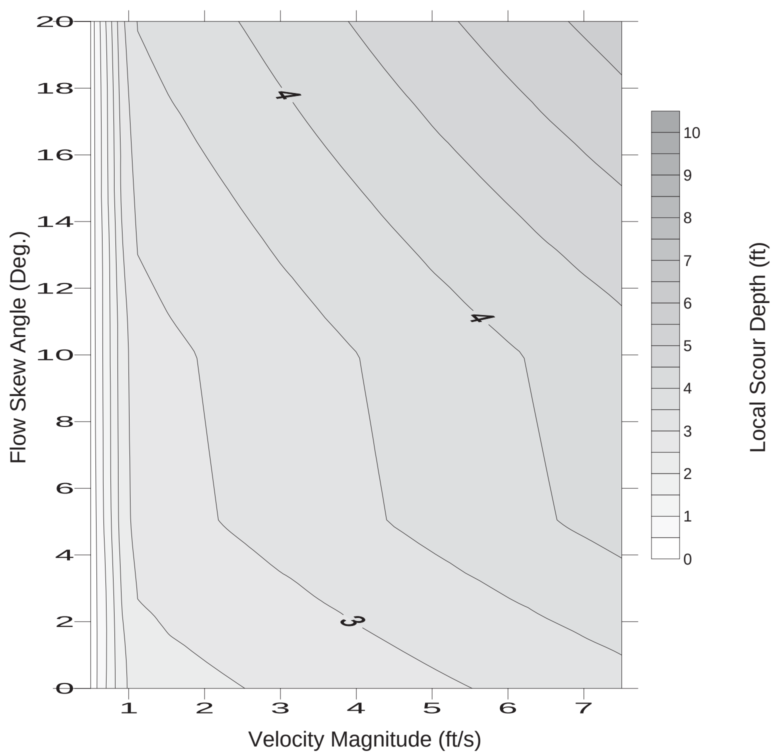

Figure 31 **Local Scour Plot for a Group of Six 16" Piles (D_{50} = 0.20 mm)**

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

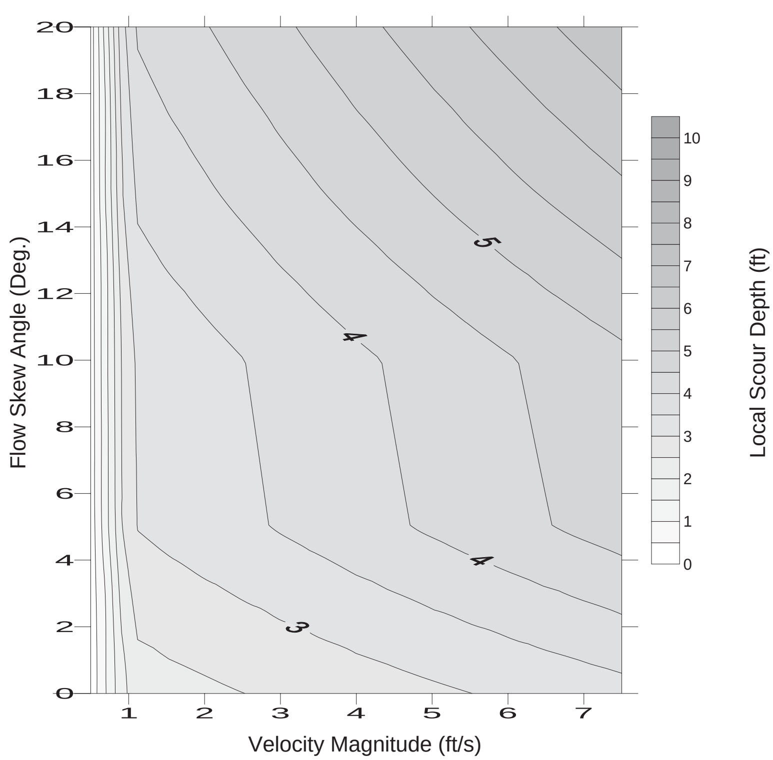

Figure 32 **Local Scour Plot for a Group of Eight 16" Piles (D_{50} = 0.20 mm)**

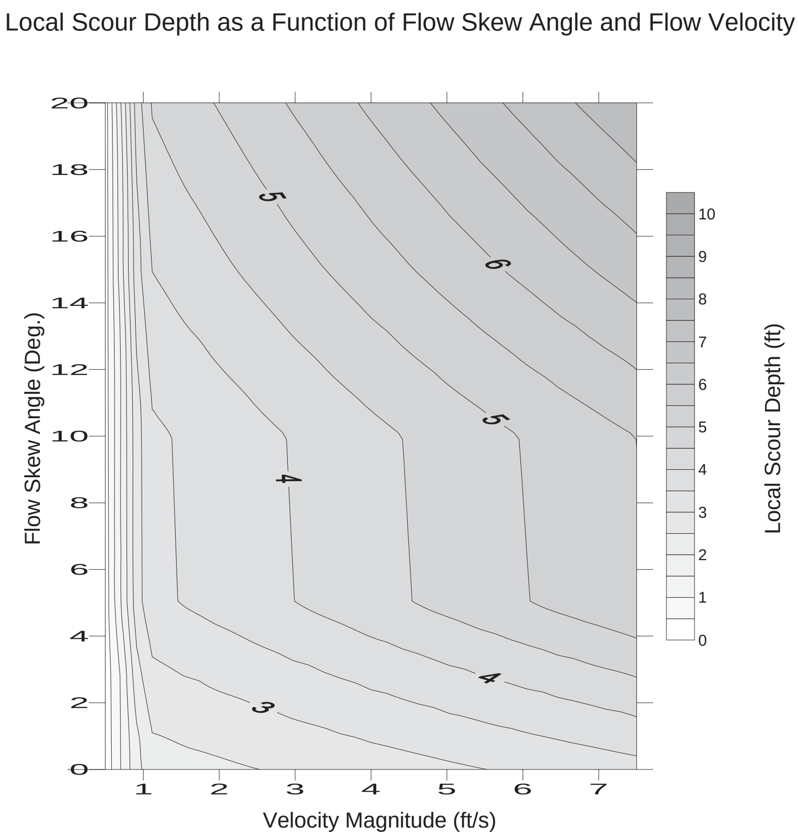

Figure 33 **Local Scour Plot for a Group of Ten 16” Piles (D_{50} = 0.20 mm)**

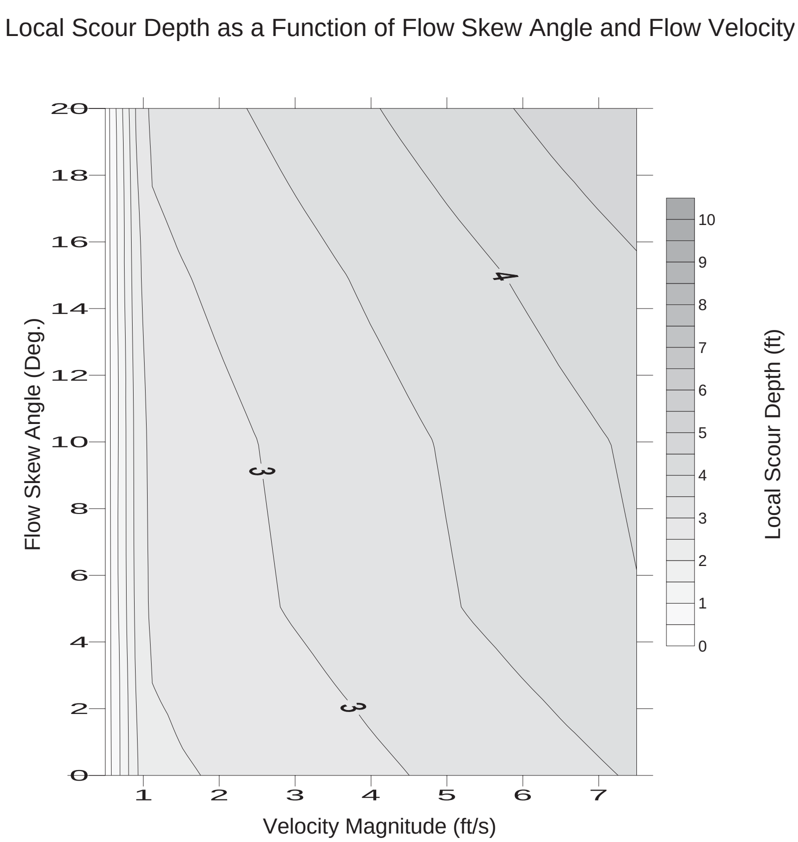

Figure 34 **Local Scour Plot for a Group of Four 18” Piles (D_{50} = 0.20 mm)**

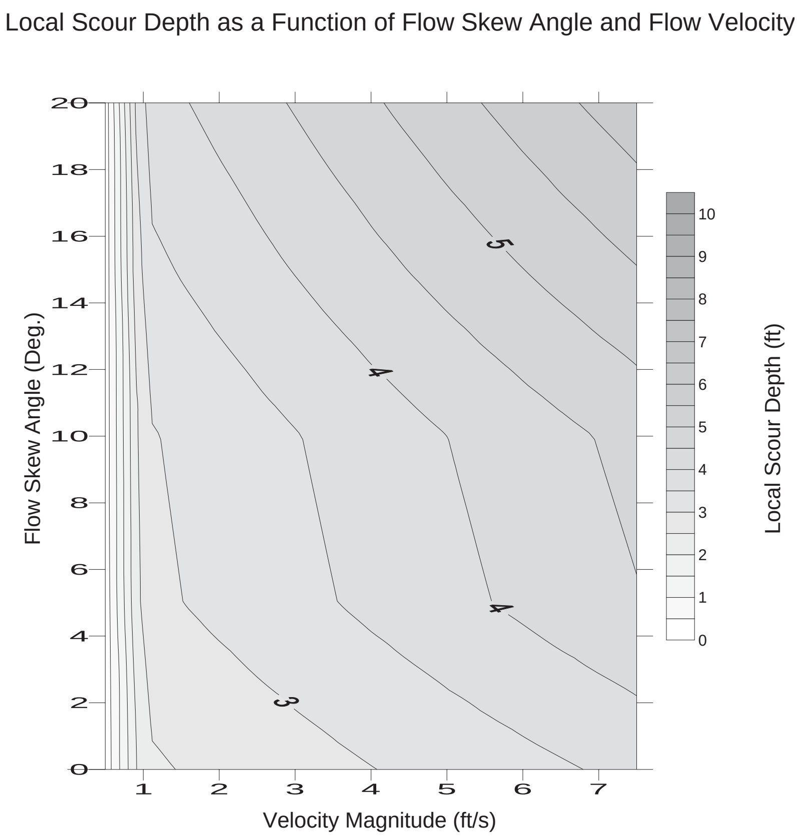

Figure 35 **Local Scour Plot for a Group of Six 18" Piles (D_{50} = 0.20 mm)**

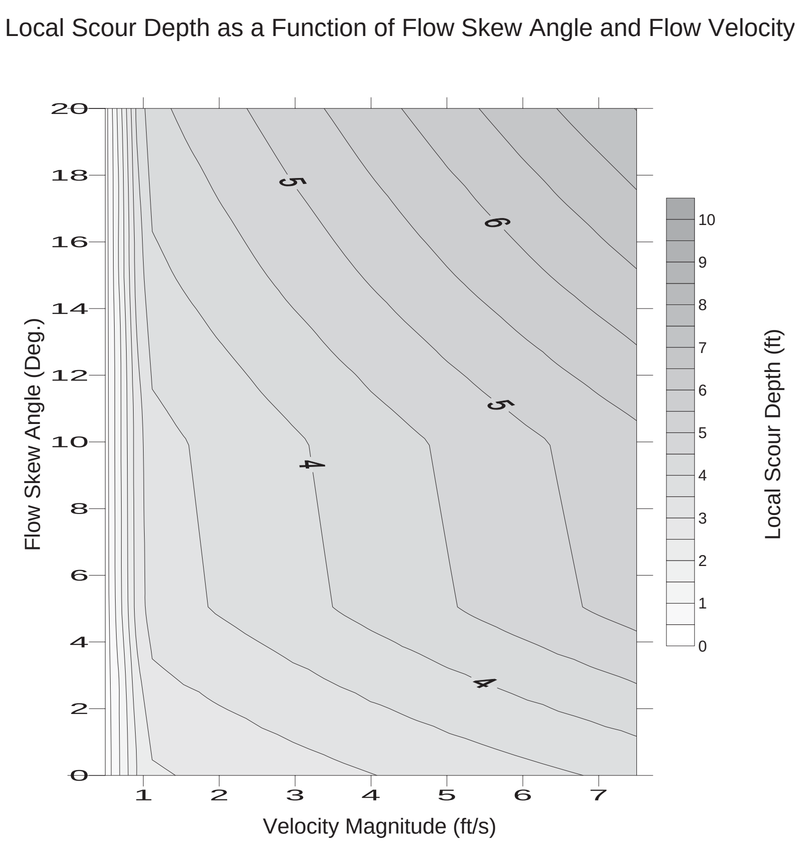

Figure 36 **Local Scour Plot for a Group of Eight 18" Piles (D_{50} = 0.20 mm)**

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

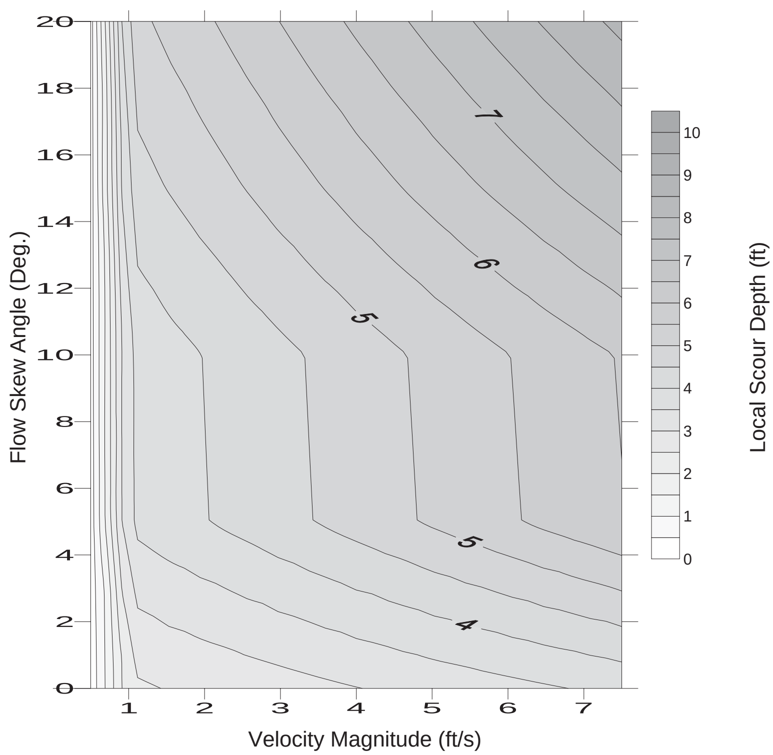

Figure 37 **Local Scour Plot for a Group of Ten 18" Piles (D_{50} = 0.20 mm)**

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

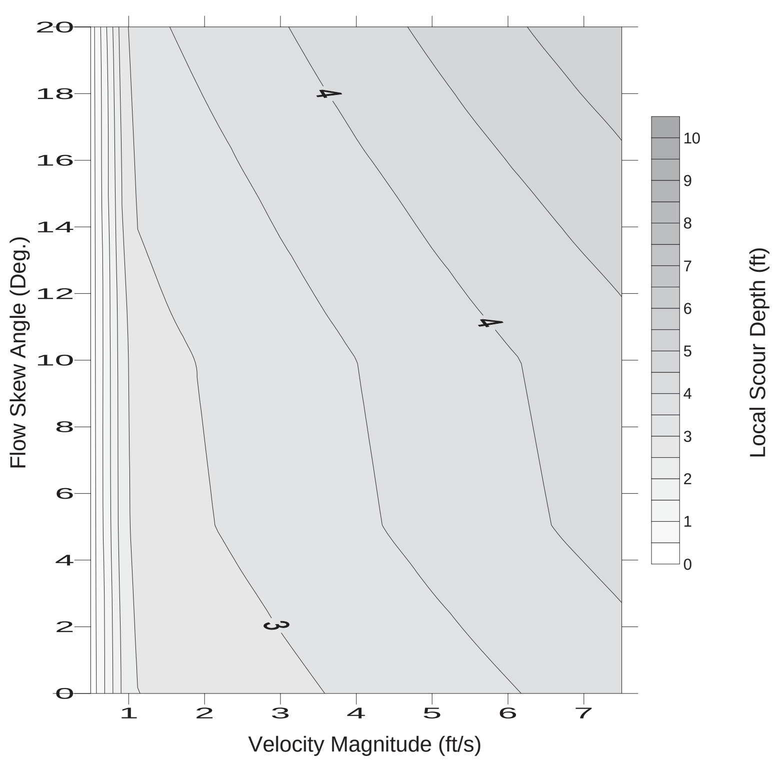

Figure 38 **Local Scour Plot for a Group of Four 20" Piles (D_{50} = 0.20 mm)**

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

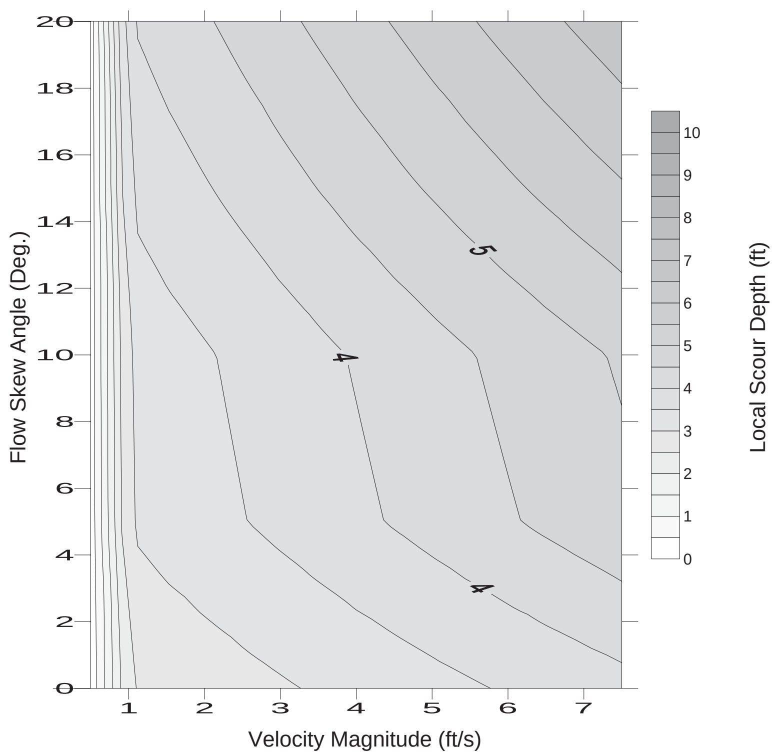

Figure 39 **Local Scour Plot for a Group of Six 20" Piles (D_{50} = 0.20 mm)**

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

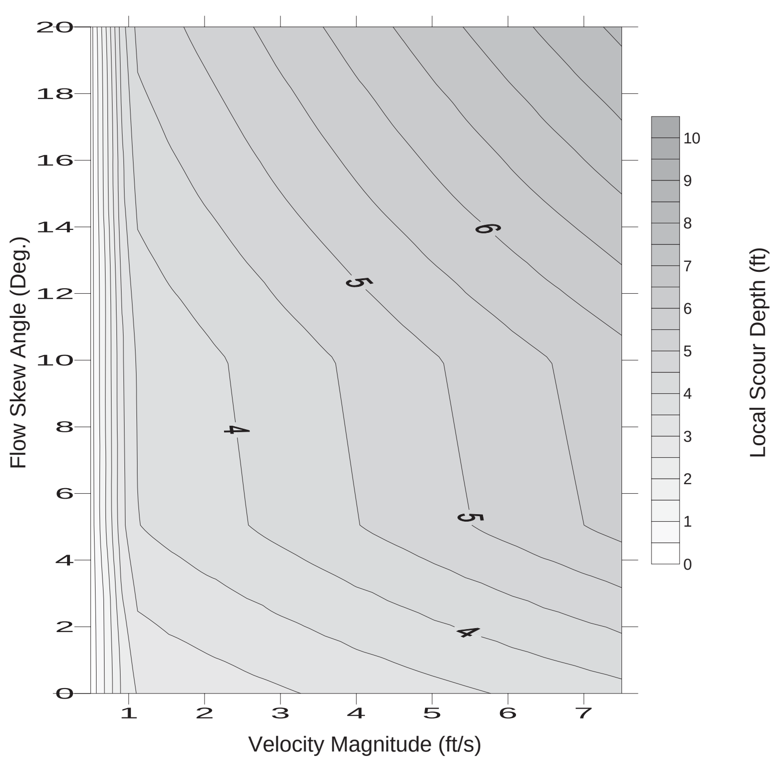

Figure 40 **Local Scour Plot for a Group of Eight 20" Piles (D_{50} = 0.20 mm)**

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

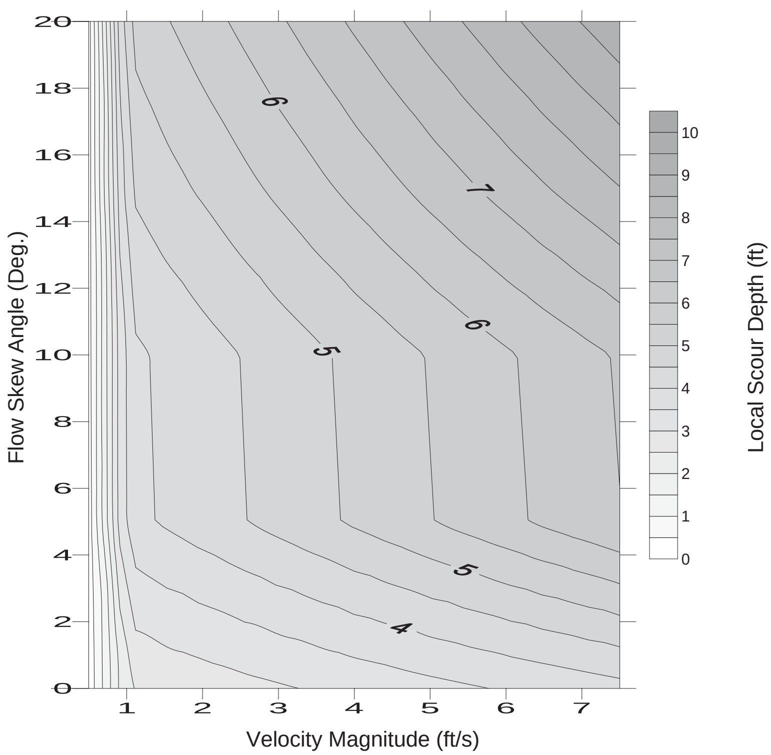

Figure 41 **Local Scour Plot for a Group of Ten 20” Piles (D_{50} = 0.20 mm)**

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

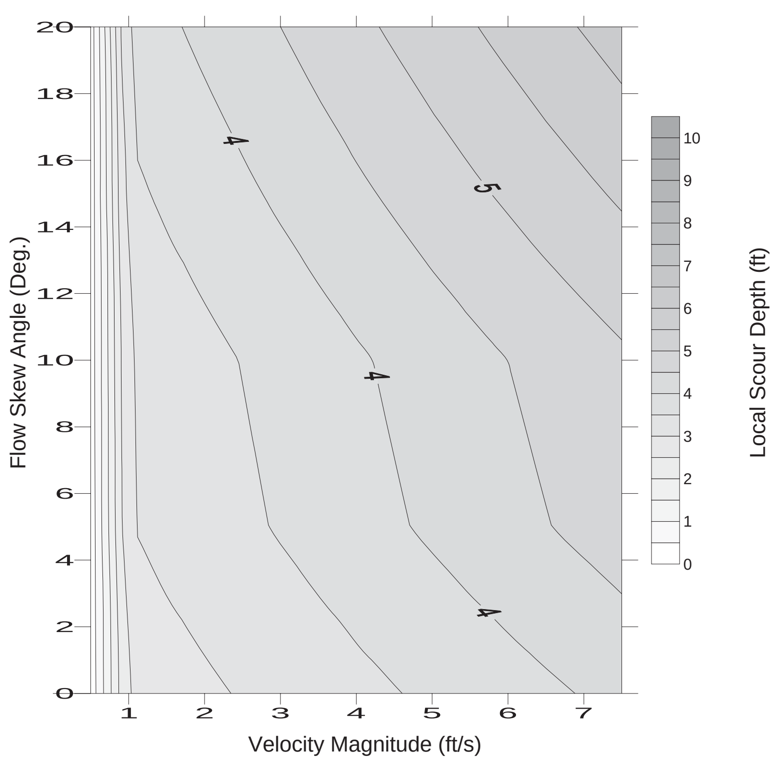

Figure 42 **Local Scour Plot for a Group of Four 24” Piles (D_{50} = 0.20 mm)**

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

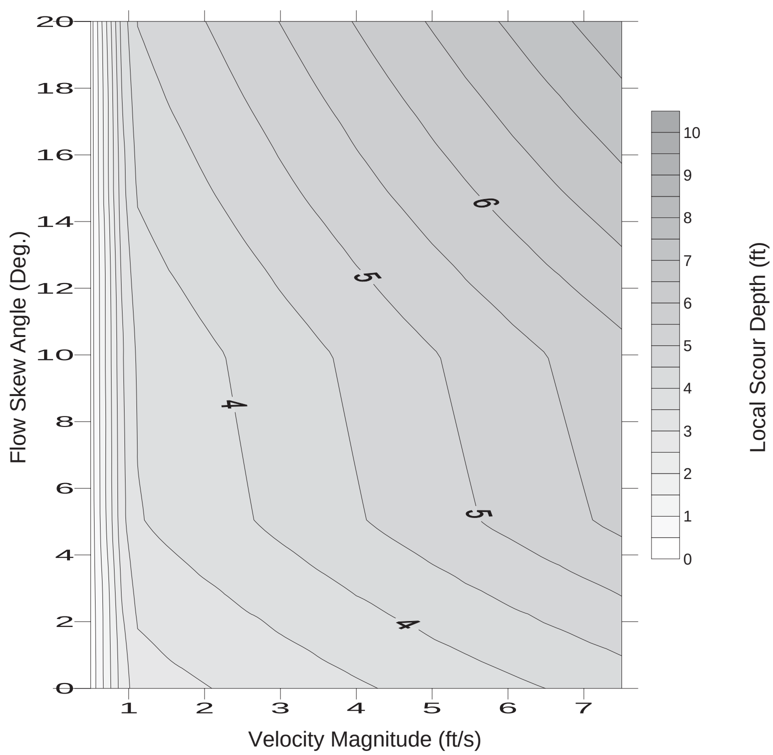

Figure 43 Local Scour Plot for a Group of Six 24" Piles (D_{50} = 0.20 mm)

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

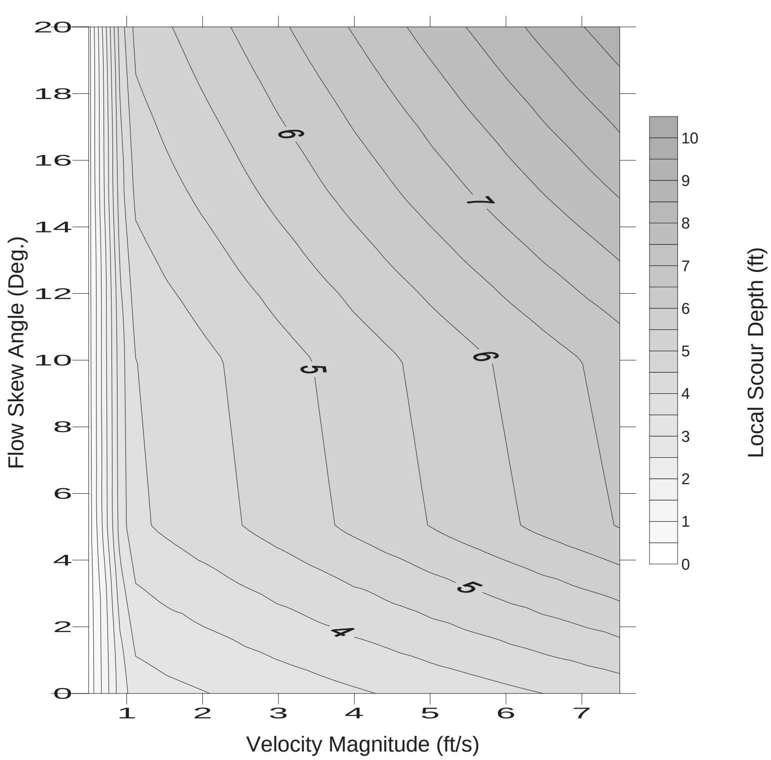

Figure 44 Local Scour Plot for a Group of Eight 24" Piles (D_{50} = 0.20 mm)

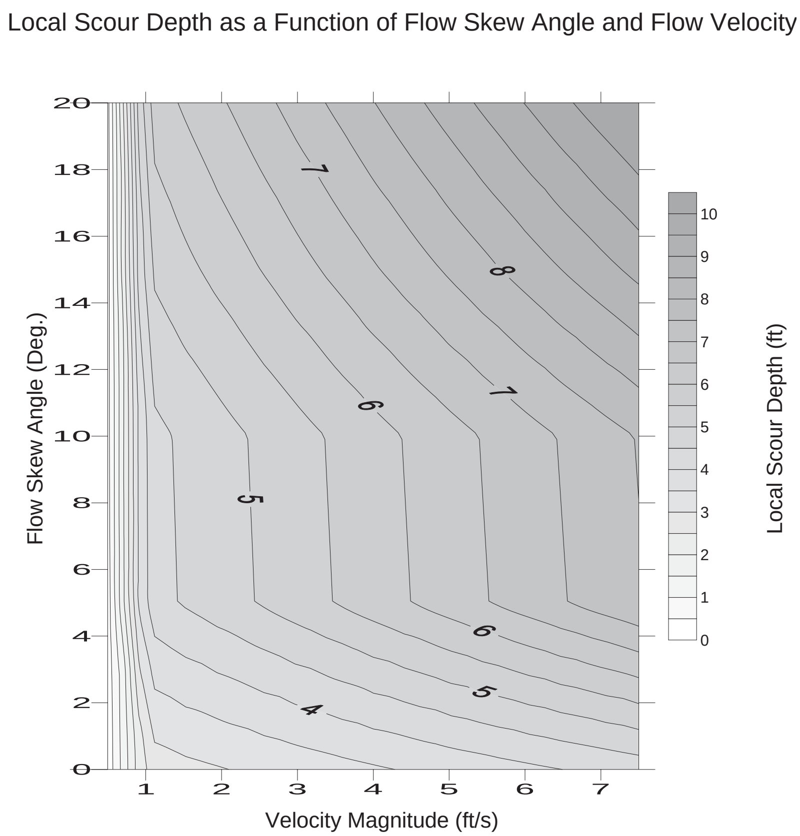

Figure 45 Local Scour Plot for a Group of Ten 24" Piles (D_{50} = 0.20 mm)

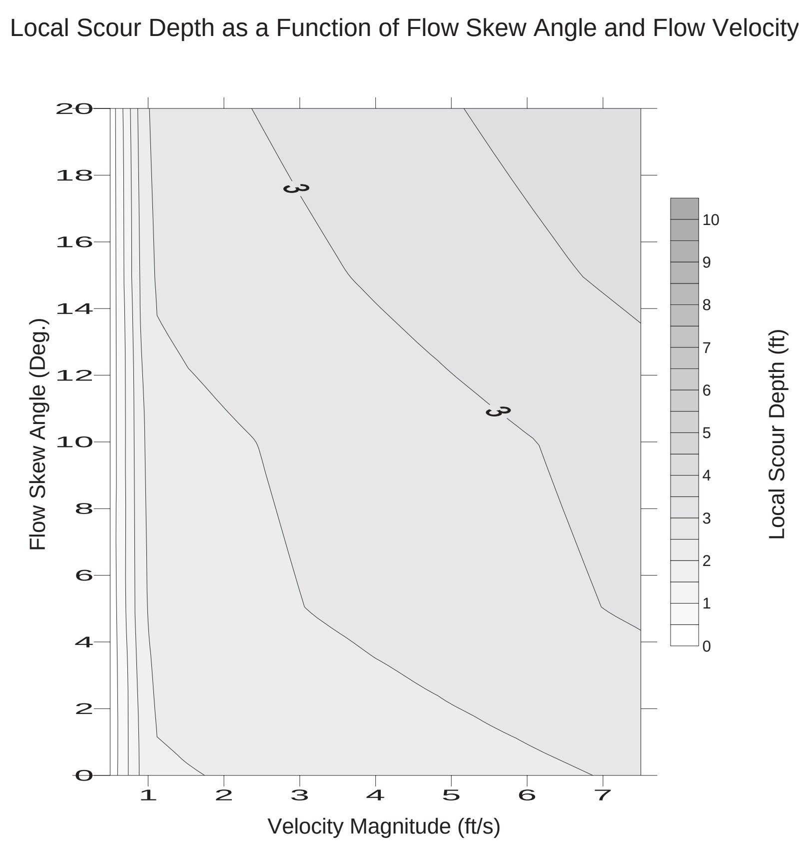

Figure 46 Local Scour Plot for a Group of Four 12" Piles (D_{50} = 0.30 mm)

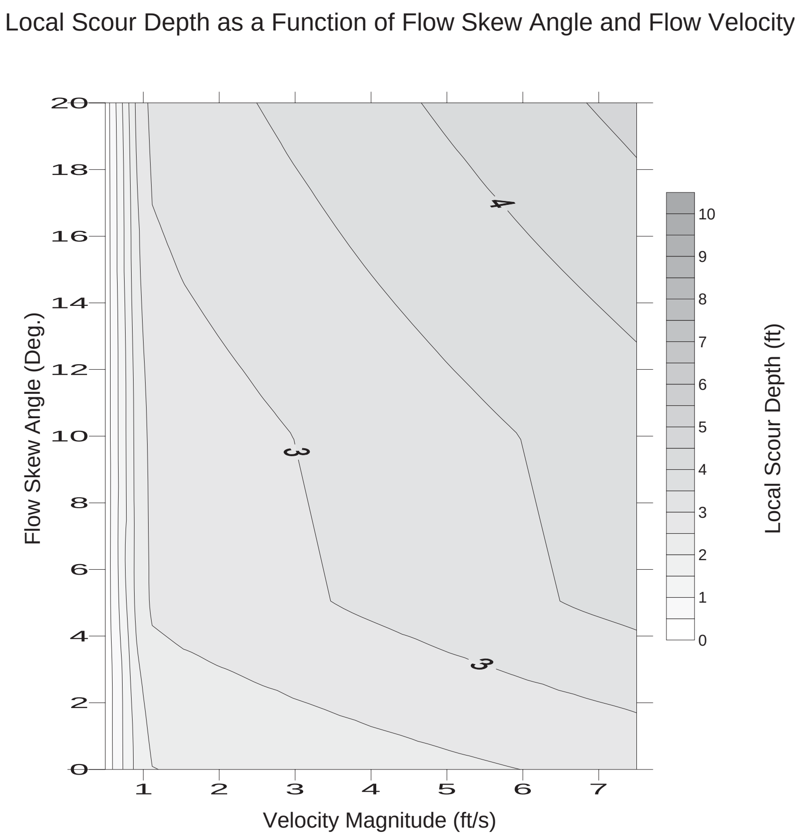

Figure 47 **Local Scour Plot for a Group of Six 12" Piles (D_{50} = 0.30 mm)**

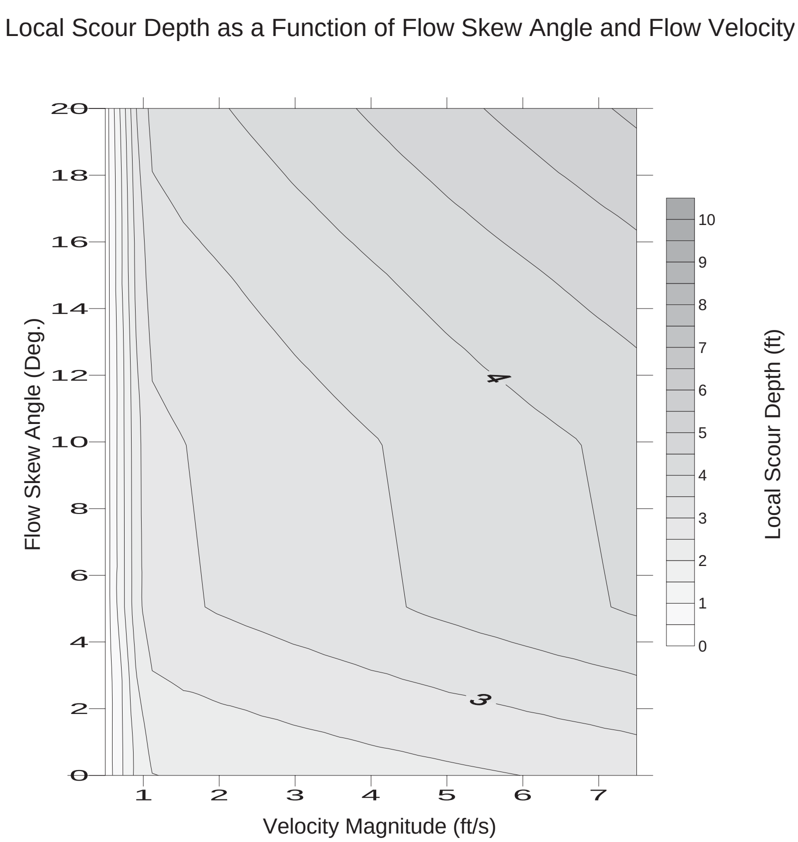

Figure 48 **Local Scour Plot for a Group of Eight 12" Piles (D_{50} = 0.30 mm)**

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

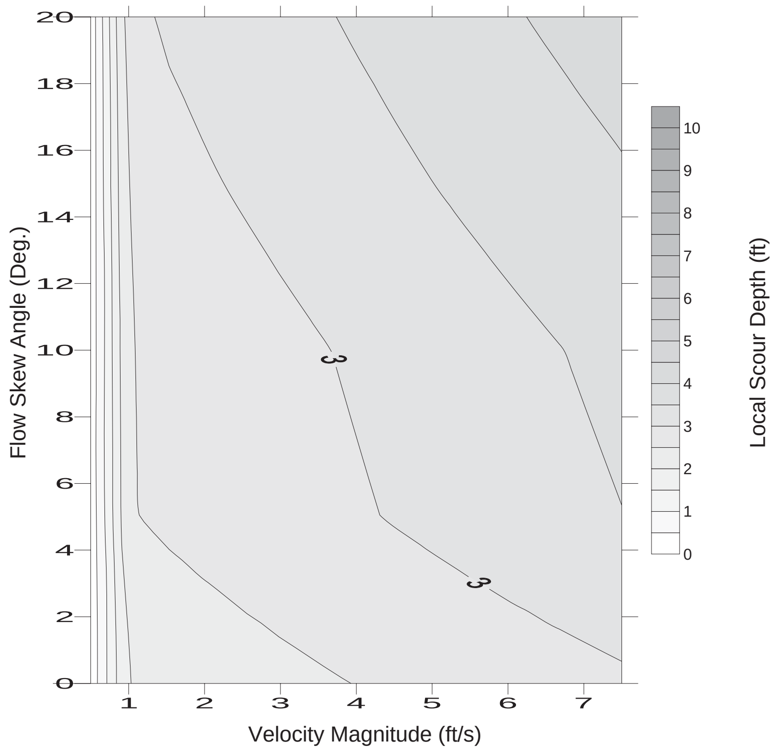

Figure 49 **Local Scour Plot for a Group of Four 14" Piles (D_{50} = 0.30 mm)**

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

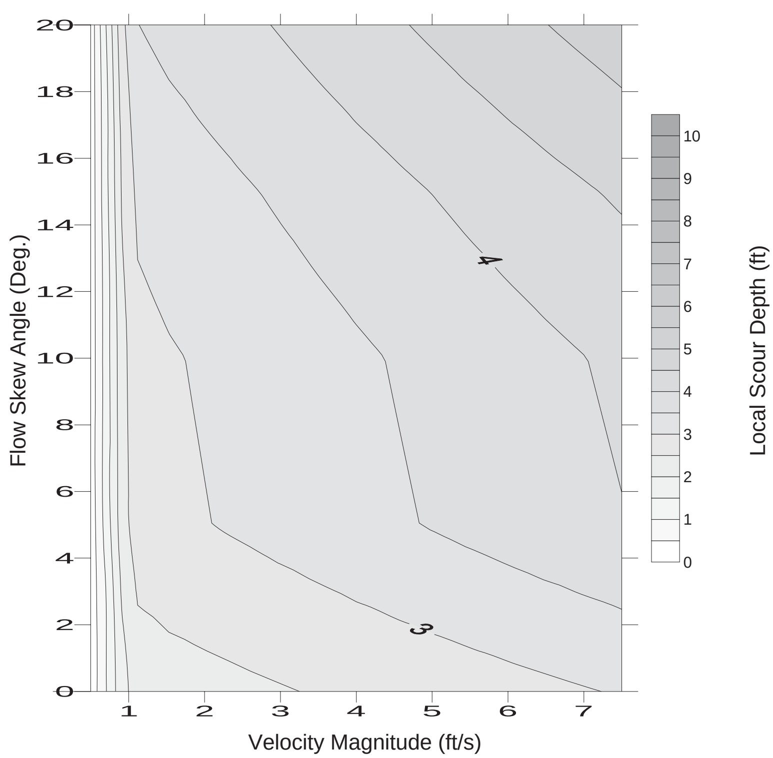

Figure 50 **Local Scour Plot for a Group of Six 14" Piles (D_{50} = 0.30 mm)**

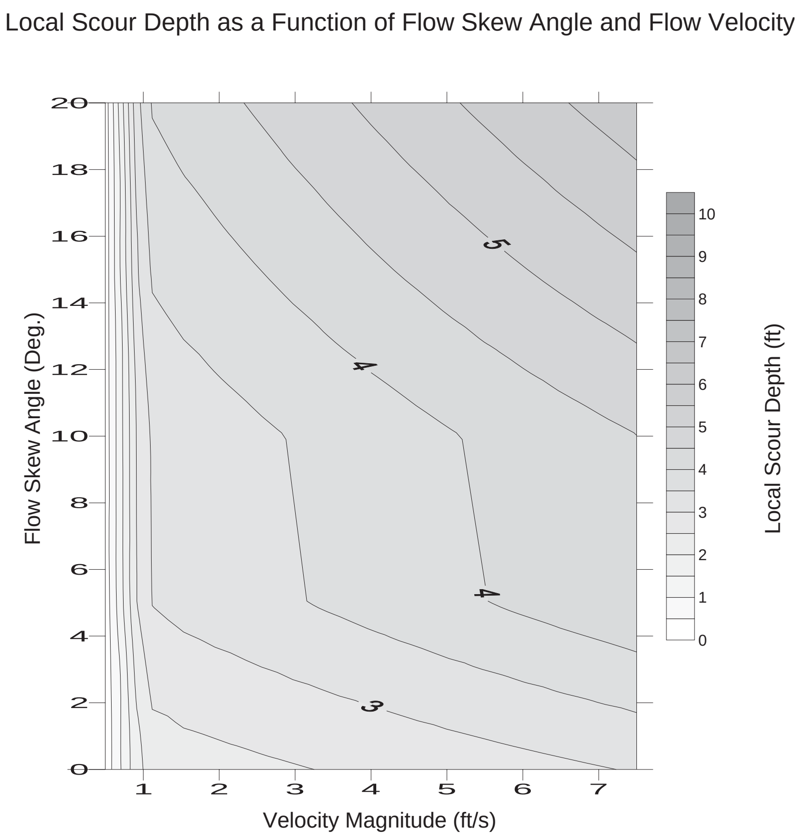

Figure 51 **Local Scour Plot for a Group of Eight 14" Piles (D_{50} = 0.30 mm)**

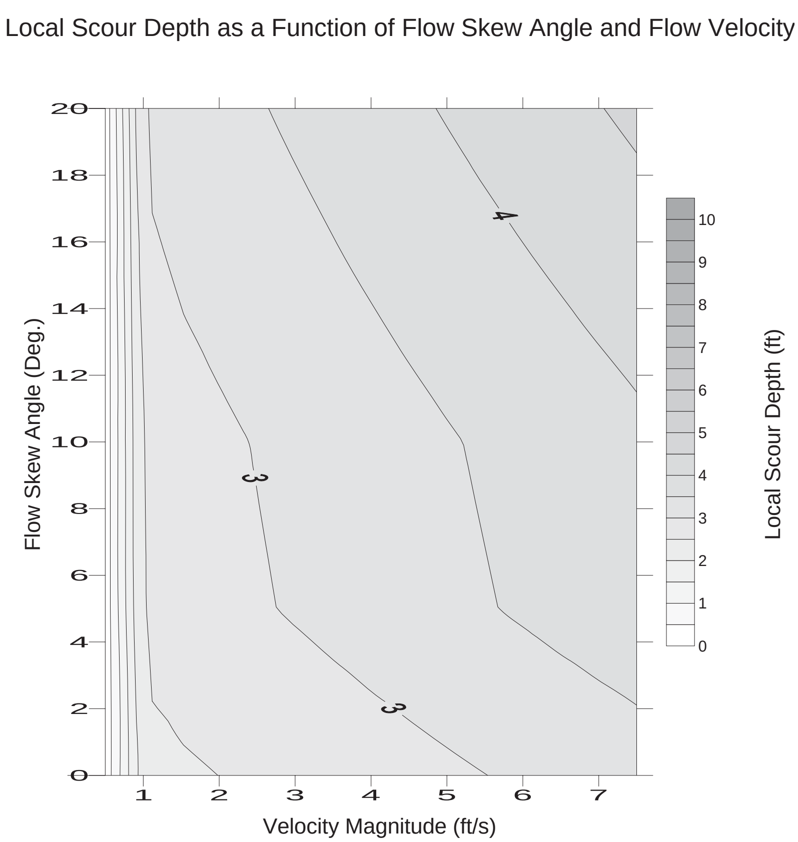

Figure 52 **Local Scour Plot for a Group of Four 16" Piles (D_{50} = 0.30 mm)**

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

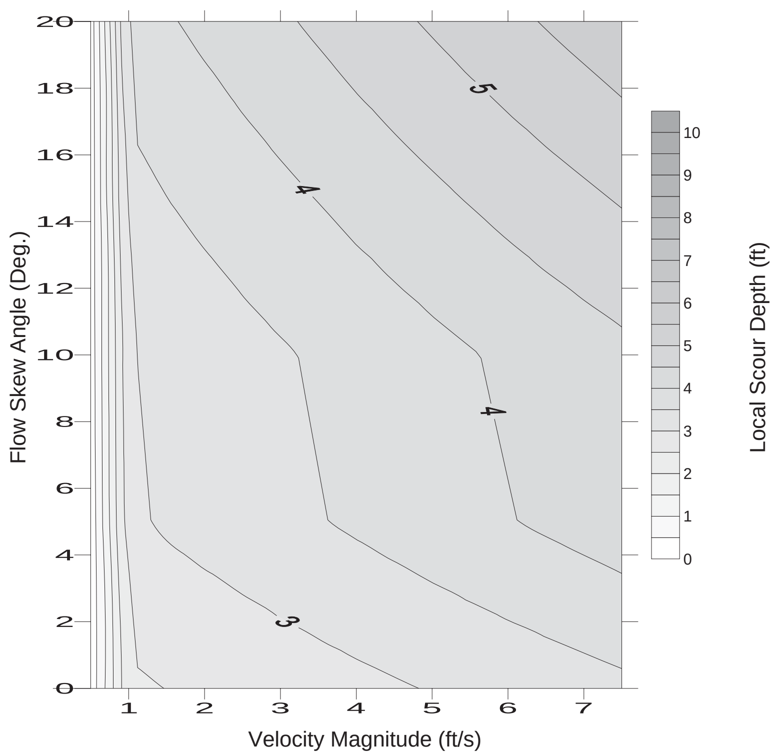

Figure 53 **Local Scour Plot for a Group of Six 16" Piles (D_{50} = 0.30 mm)**

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

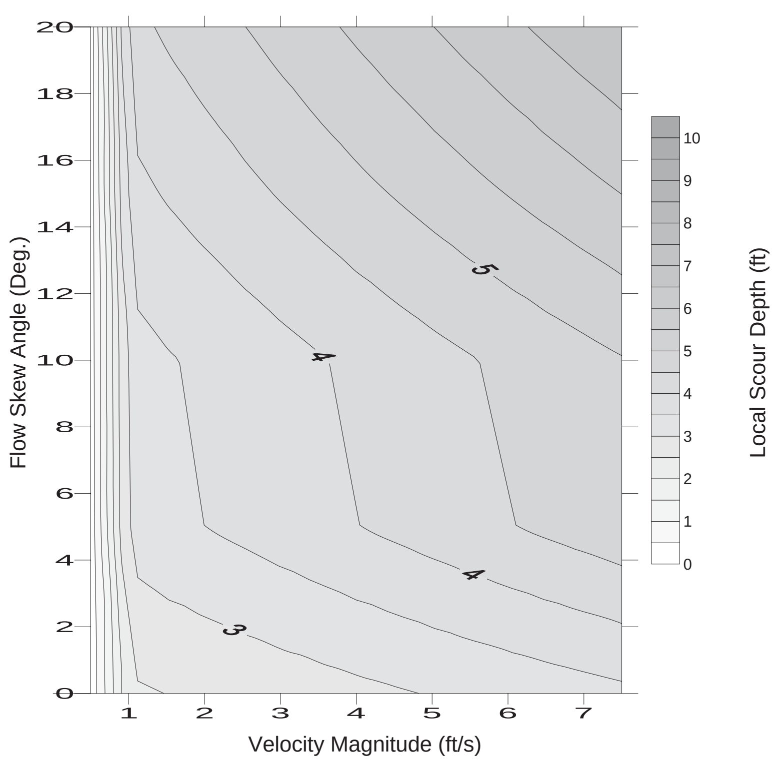

Figure 54 **Local Scour Plot for a Group of Eight 16" Piles (D_{50} = 0.30 mm)**

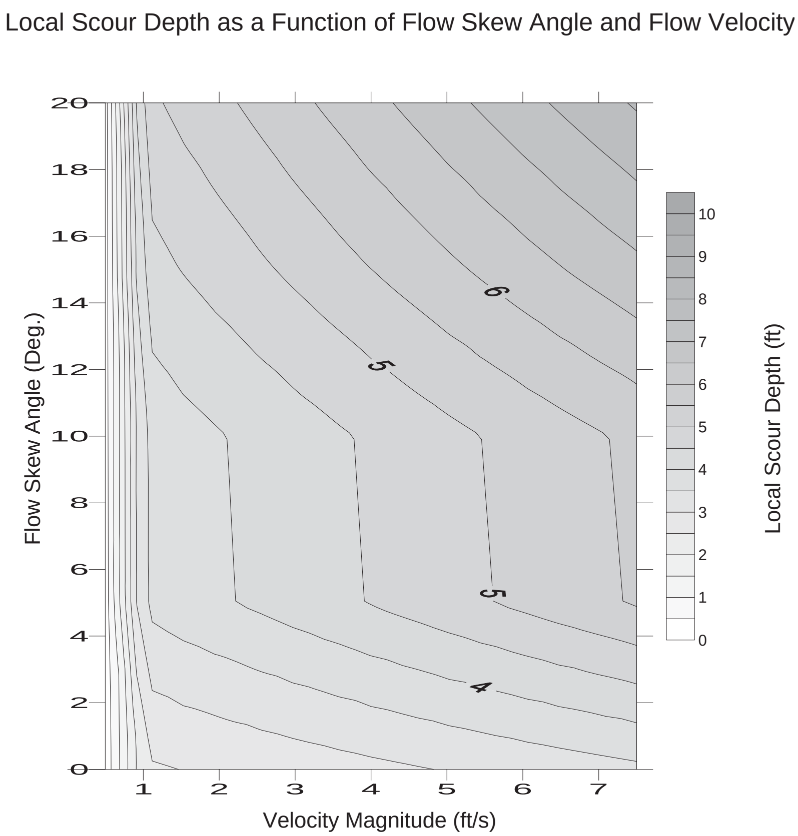

Figure 55 **Local Scour Plot for a Group of Ten 16" Piles (D_{50} = 0.30 mm)**

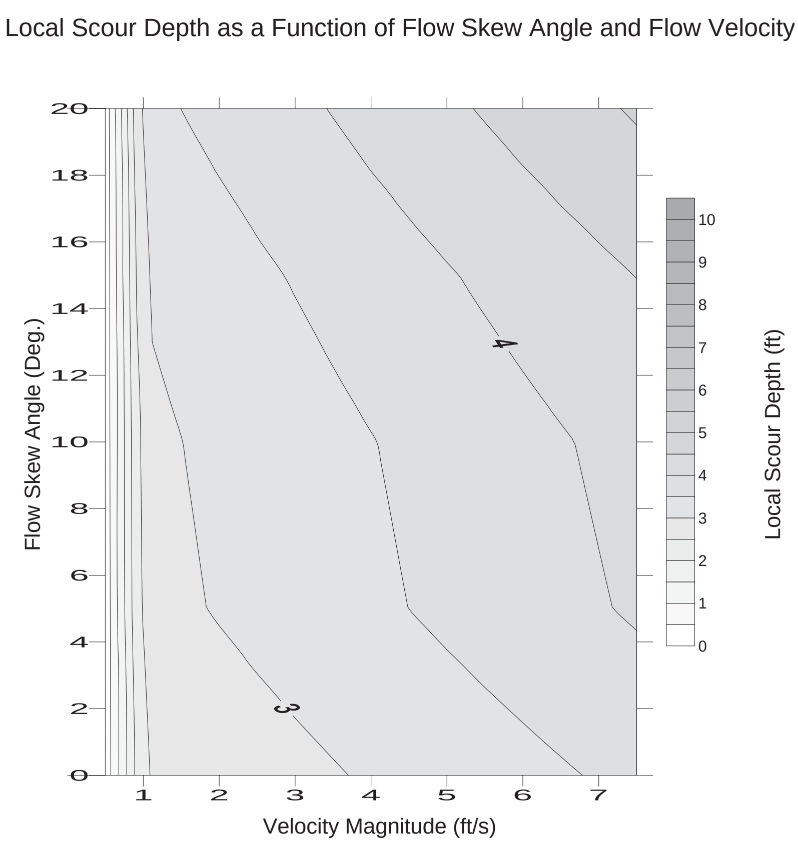

Figure 56 **Local Scour Plot for a Group of Four 18" Piles (D_{50} = 0.30 mm)**

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

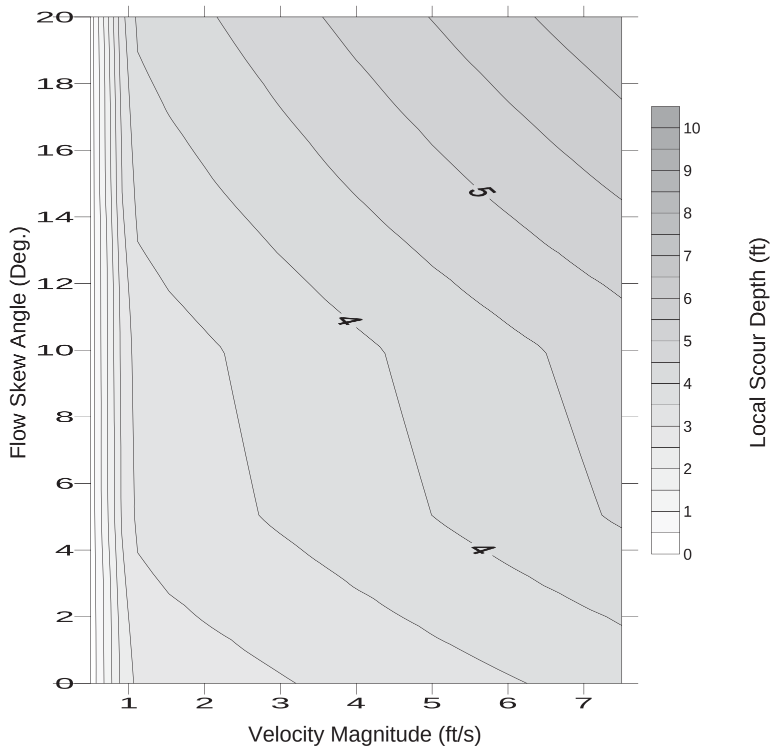

Figure 57 Local Scour Plot for a Group of Six 18" Piles (D_{50} = 0.30 mm)

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

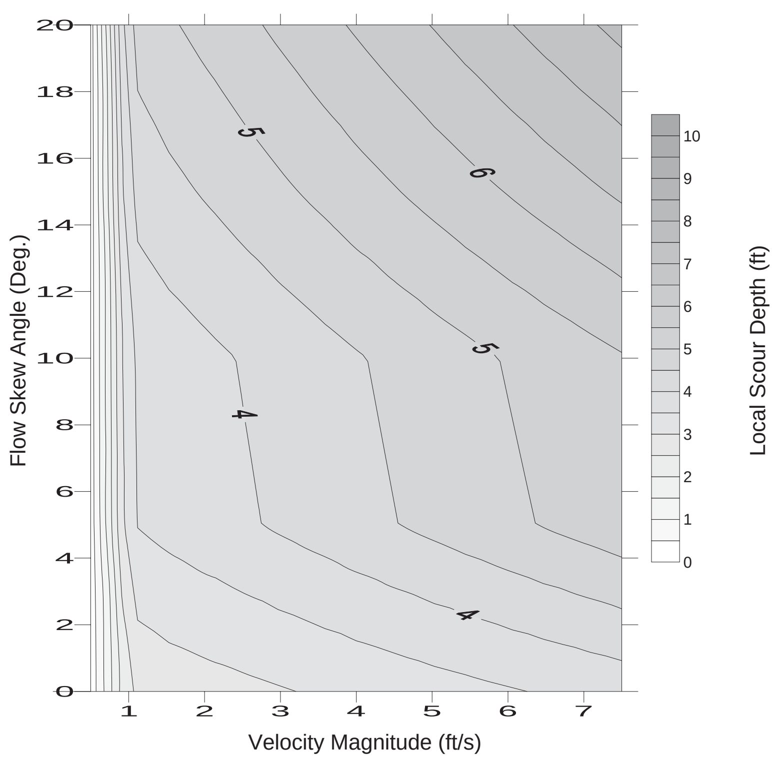

Figure 58 Local Scour Plot for a Group of Eight 18" Piles (D_{50} = 0.30 mm)

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

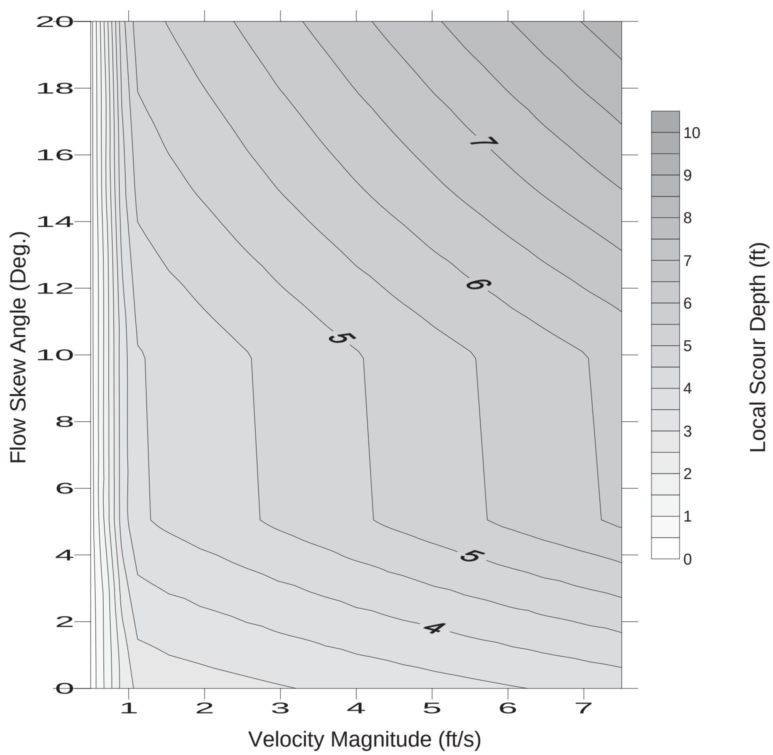

Figure 59 Local Scour Plot for a Group of Ten 18" Piles (D_{50} = 0.30 mm)

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

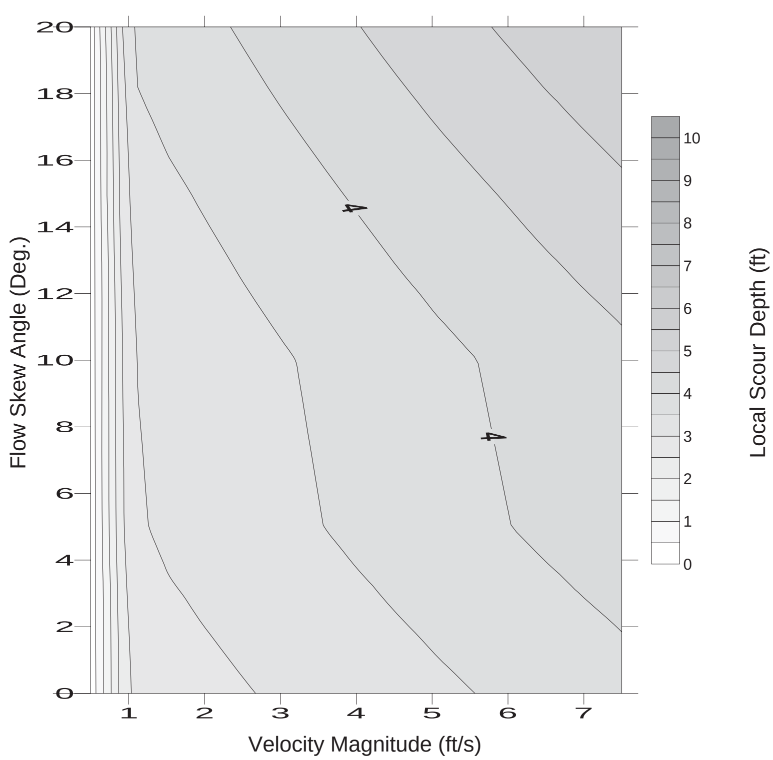

Figure 60 Local Scour Plot for a Group of Four 20" Piles (D_{50} = 0.30 mm)

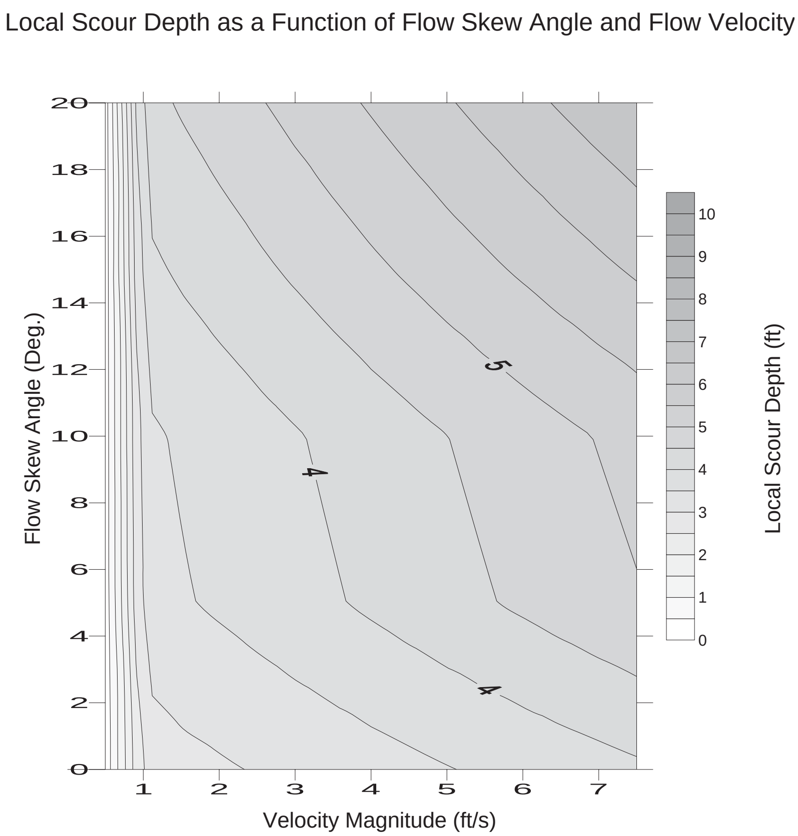

Figure 61 **Local Scour Plot for a Group of Six 20" Piles (D_{50} = 0.30 mm)**

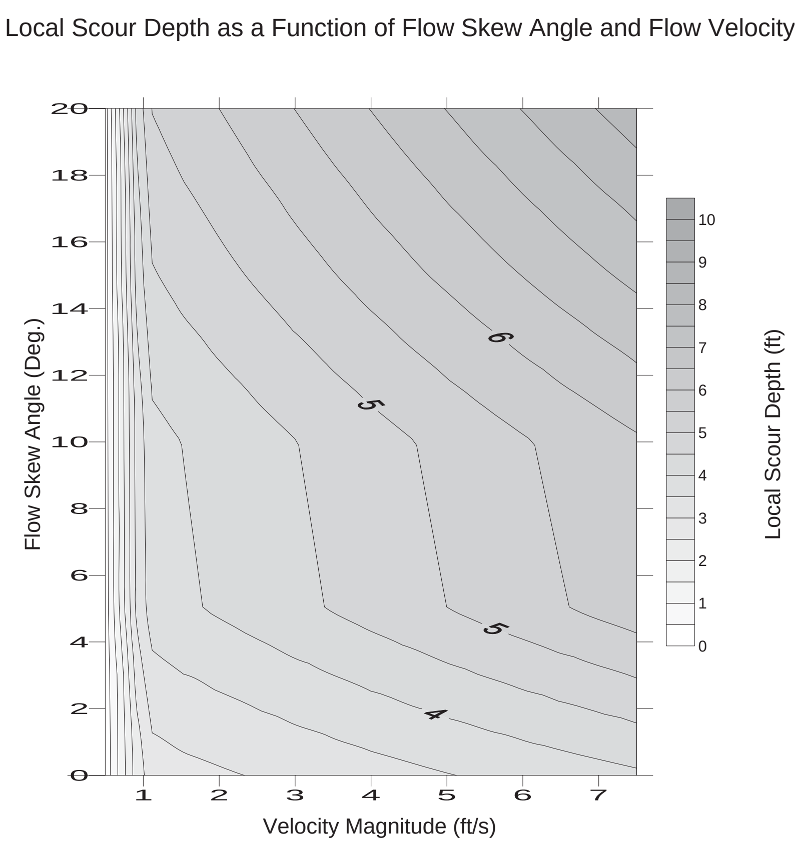

Figure 62 **Local Scour Plot for a Group of Eight 20" Piles (D_{50} = 0.30 mm)**

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

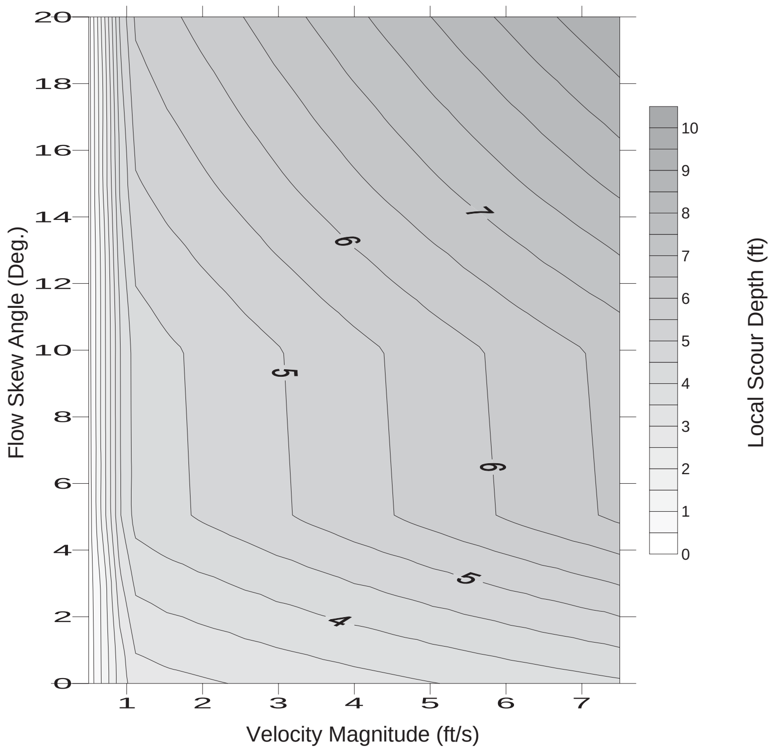

Figure 63 Local Scour Plot for a Group of Ten 20” Piles (D_{50} = 0.30 mm)

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

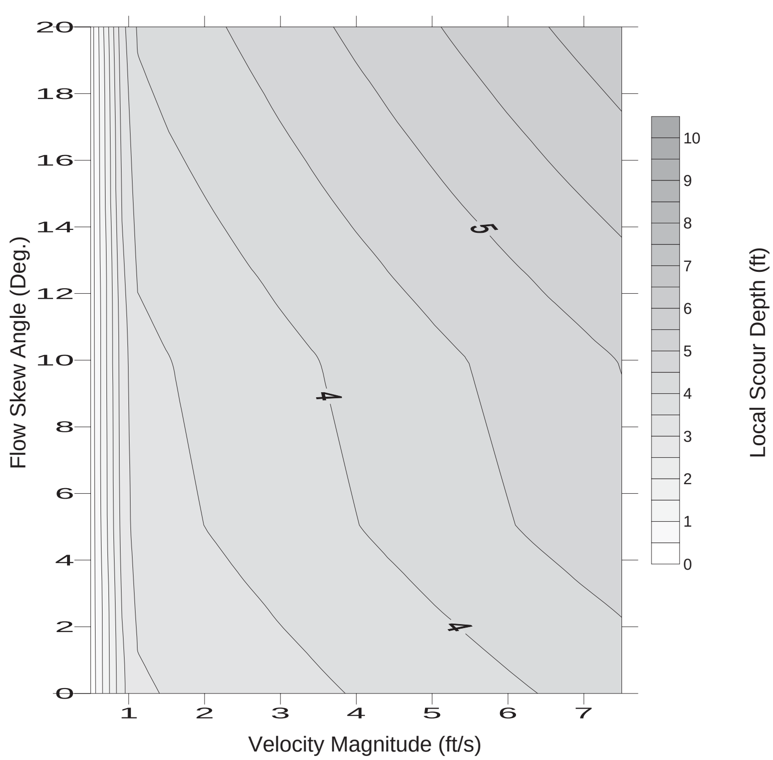

Figure 64 Local Scour Plot for a Group of Four 24” Piles (D_{50} = 0.30 mm)

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

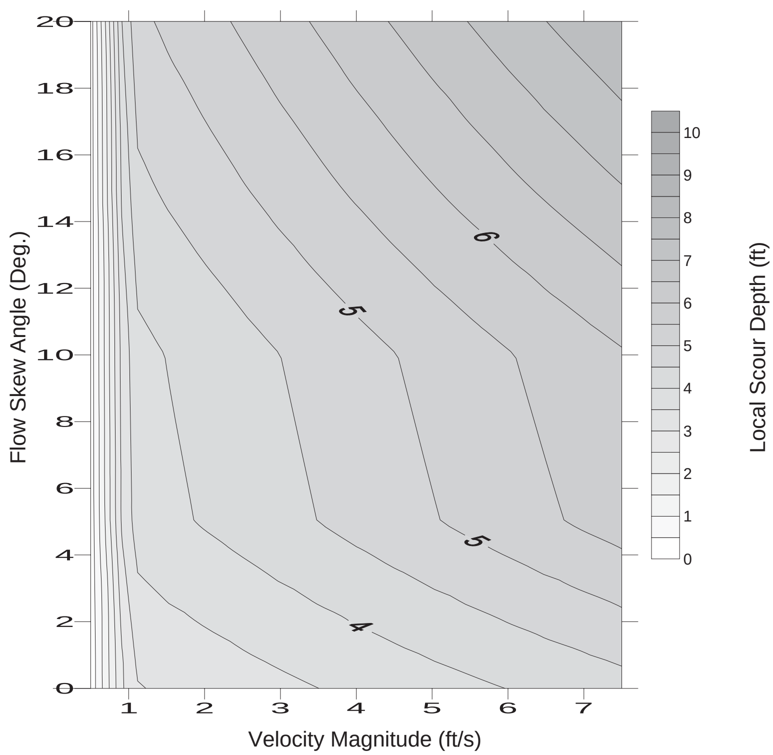

Figure 65 Local Scour Plot for a Group of Six 24" Piles (D_{50} = 0.30 mm)

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

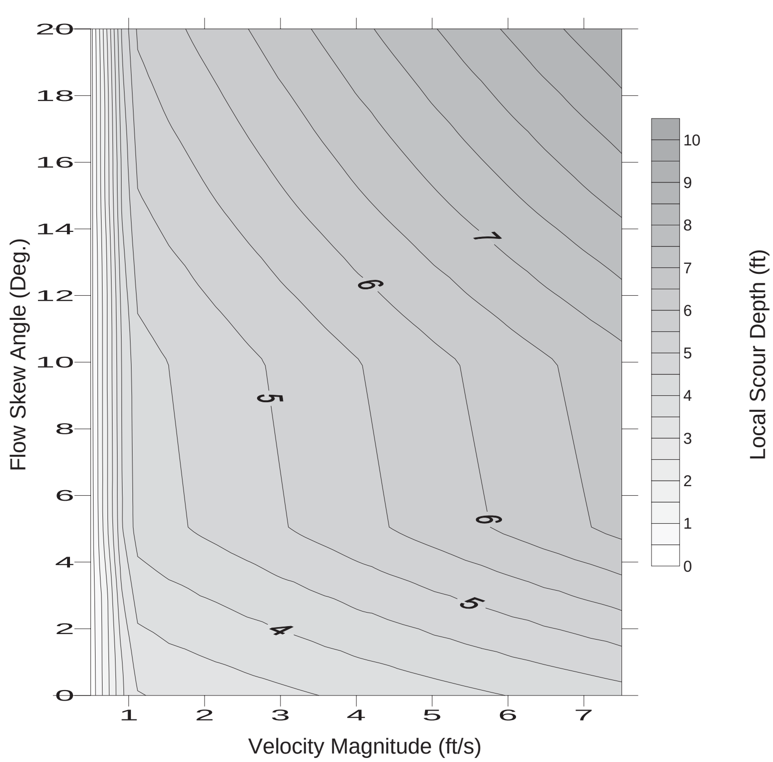

Figure 66 Local Scour Plot for a Group of Eight 24" Piles (D_{50} = 0.30 mm)

Local Scour Depth as a Function of Flow Skew Angle and Flow Velocity

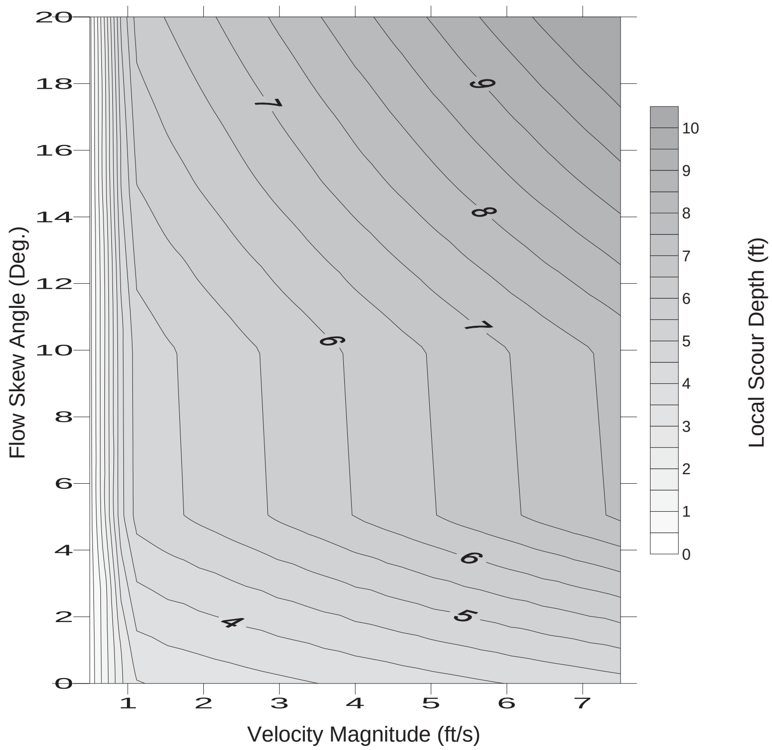

Figure 67 Local Scour Plot for a Group of Ten 24" Piles (D_{50} = 0.30 mm)

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Appendix H

The following items are included in Appendix H:

- Pile load and lateral stability analysis

Pile Load and Lateral Stability Analysis

JACOBS

Project := "Unknown Foundations" Subject := "Slab Bridge Dead Loads"
AuthoredBy := "JLW" Date := "07/14/09"
CheckedBy := "JSH" BridgeNo := "544061"

General Input

Out-to-Out Bridge Width	$width := 34.9ft$
Roadway Width	$width_{rdwy} := 32ft + 0in$
Concrete Unit Weight	$\gamma_c := 150pcf$
Future Wearing Surface Unit Weight (2" Asphalt Overlay)	$FWS := 24psf$
Barrier Type	Barrier := 32" F-shape
Number of Barriers	$N_{barr} := 2$
Is/Are there a Pedestrian/Bicycle Railing(s)?	PedRlg := No
Number of Railings	$N_{PedRlg} := 0$
Fencing or Bullet Railing on Bridge	Rlg := None
Is there a Median Barrier on the Bridge?	Median := No
Slab Thickness	$t_{slab} := 15in$
Design Width	$b := 1ft$
Post Width	$w_{post} := 0in$
Post Depth	$d_{post} := 0in$
Post Height	$h_{post} := 0ft$
Number of Posts per Span	$N_{post} := 0$
Curb Height	$h_{curb} := 0in$
Curb Width	$w_{curb} := 0in$
Curb Slope Width	$w_{slope.curb} := 0in$
Number of Curbs	$N_{curb} := 0$
Guardrail Weight (Based on a manufacturer weight, weight of thrie beam retrofit and aluminum pedestrian railing as given in SDG 2.5)	$w_{gr} := 0plf$
Number of Guardrails	$N_{gr} := 0$

JACOBS

Project = "Unknown Foundations"
AuthoredBy = "JLW"
CheckedBy = "JSH"
Subject = "Slab Bridge Dead Loads"
Date = "07/14/09"
BridgeNo = "544061"

All Span Input

Skew Angle $skew_{sp1} := 0deg$

Span Length $Span_{sp1} := 29ft + 4in$

Intermediate Bent Input

Cap Length $L_{ib2} := 36ft + 1in$

Minimum Cap Height $h_{ib2.min} := 2ft + 10.25in$

Maximum Cap Height $h_{ib2.max} := 3ft + 1in$

Cap Depth $d_{ib2} := 3ft + 0in$

Number of piles $N_{pile.ib2} := 4$

Load Factors Input

Constructed in 1984, Assume ASD

Dead Load Component Load Factor $\gamma_{DC} := 1.00$

Dead Load Wearing Load Factor $\gamma_{DW} := 1.00$

Live Load Factor $\gamma_{LL} := 1.00$

Live Load Input

Number of Lanes (see AASHTO, 1973 for older bridges) $N_{lanes} := 3$

Multiple Presence Factor $MPF := 0.9$

Determine Superstructure Dead Loads

Slab Weight $w_{slab} := t_{slab} \cdot b \cdot \gamma_c$ $w_{slab} = 0.187 \cdot klf$

Barrier Weight $w_{bar} := \dfrac{Br_{Barrier,0} \cdot plf \cdot N_{barr} \cdot b}{width}$ $w_{bar} = 0.024 \cdot klf$

Median Barrier Weight $w_{median} := \begin{cases} \left(\dfrac{0klf \cdot b}{width}\right) & \text{if Median} = 0 \\ \left(\dfrac{0.485klf \cdot b}{width}\right) & \text{otherwise} \end{cases}$ $w_{median} = 0 \cdot klf$

Pedestrian Railing Weight $w_{ped} := \dfrac{b \cdot N_{PedRlg}}{width} \cdot (Rlg \cdot klf + PedRlg \cdot klf)$ $w_{ped} = 0 \cdot klf$

Future Wearing Surface $w_{FWS} := \dfrac{FWS \cdot (width_{rdwy}) \cdot b}{width}$ $w_{FWS} = 0.022 \cdot klf$

Curb Weight $w_{curb} := \dfrac{(h_{curb} \cdot w_{curb} + 0.5 \cdot w_{slope.curb} \cdot h_{curb}) \cdot \gamma_c \cdot N_{curb}}{width} \cdot b$

$w_{curb} = 0 \cdot klf$

Weight of Overlay

2

P:\E9X99914\Reverse Engineering\BridgeNo544061\544061_PileLoad.xmcd 2 / 3

JACOBS

Project = "Unknown Foundations" Subject = "Slab Bridge Dead Loads"
AuthoredBy = "JLW" Date = "07/14/09"
CheckedBy = "JSH" BridgeNo = "544061"

Post Weight $w_{post} := \frac{h_{post} \cdot d_{post} \cdot w_{post} \cdot \gamma_c \cdot N_{post}}{width} \cdot b$ $w_{post} = 0 \cdot kip$

Guardrail Weight $w_{guardrail} := \frac{w_{gr} \cdot N_{gr}}{width} \cdot b$ $w_{guardrail} = 0 \cdot klf$

Superstructure Weight $w_{super} := (w_{slab} + w_{bar} + w_{median} + w_{ped} + w_{curb} + w_{guardrail}) \cdot \gamma_{DC} + w_{FWS} \cdot \gamma_{DW}$

$w_{super} = 0.234 \cdot klf$

Intermediate Bent Dead Loads

Cap Weight $w_{cap.ib} := 0.5 \cdot (h_{ib2.min} + h_{ib2.max}) \cdot d_{ib2} \cdot \gamma_c \cdot \gamma_{DC}$ $w_{cap.ib} = 1.336 \cdot klf$

Superstructure Reaction $R_{super.ib} := \frac{1}{b} \cdot \left(\frac{w_{super} \cdot Span_{sp1}}{2} + \frac{w_{post}}{2} \right) \cdot 2$ $R_{super.ib} = 6.852 \cdot klf$

Total Load $IB := (w_{cap.ib} + R_{super.ib}) \cdot L_{ib2}$ $IB = 295.431 \cdot kip$

Maximum Pile Reaction $R_{ib.DL} := \frac{IB}{N_{pile.ib2}}$ $R_{ib.DL} = 36.929 \cdot Ton$

Live Load Reactions

H15 Truck (per Reverse Engineering Flowchart, bridge constructed prior to 1986)

Max LL Reaction at End Bent $R_{LL.tr} := 24kip + \frac{6kip \cdot (Span_{sp1} - 14ft)}{Span_{sp1}}$

$R_{LL.tr} = 27.136 \cdot kip$

$R_{LL.ln} := 0.48 \frac{kip}{ft} \cdot \frac{Span_{sp1}}{2} \cdot 2 + 19.5kip$ $R_{LL.ln} = 33.58 \cdot kip$

$R_{LL} := \max(R_{LL.tr}, R_{LL.ln})$ $R_{LL} = 33.58 \cdot kip$

$R_{LL.ib} := R_{LL} \cdot N_{lanes} \cdot MPF$ $R_{LL.ib} = 90.666 \cdot kip$

Intermediate Bent Pile Reaction $R_{ib.LL} := \frac{R_{LL.ib}}{N_{pile.ib2}}$ $R_{ib.LL} = 11.333 \cdot Ton$

Pile Loads

Intermediate Bent Pile Load $R_{ib} := R_{ib.DL} + R_{ib.LL}$ $R_{ib} = 48.262 \cdot Ton$

3

P:\E9X99914\Reverse Engineering\BridgeNo544061\544061_PileLoad.xmcd 3 / 3

Bridge No.	SPT Boring (calc'd load)	Standard Curve (calc'd load)	SPT Boring (design load)	Standard Curve (design load)	ANN Average Bent	Ann Minimum Bent	ANN Average Boring	ANN Minimum Boring
534171	14	11	N/A	N/A	N/A	N/A	N/A	N/A

EL @ Top of Pile	124.6	
GSE	118.4	
Tip EL	104.4	107.4
Length of Pile	20.2	17.2

Scour EL	110.5
Unsupported Leng	14.1

Bridge No.	SPT Boring (calc'd load)	Standard Curve (calc'd load)	SPT Boring (design load)	Standard Curve (design load)	ANN Average Bent	Ann Minimum Bent	ANN Average Boring	ANN Minimum Boring
544061	24	19	24	21	27.8	23	19.3	19.2

EL @ Top of Pile	38.23							
GSE	16.1							
Tip EL	-7.9	-2.9	-7.9	-4.9	-11.7	-6.9	-3.2	-3.1
Length of Pile	46.13	41.13	46.13	43.13	49.93	45.13	41.43	41.33

BRIDGE NO. 534171

ELEVATIONS		LATERAL								AXIAL			TIP		
Top El	Bottom El	Phi	Soil modulus (kci)	Unit Weight (kci)	Undrained Shear Strength (ksi)	Strain @ 50	Strain @ 100	Soil Modulus (kci)	Unit Weight (kci)	Shear Modulus (ksi)	Poisson's Ratio	Failure Shear Stress (ksi)	Shear Modulus (ksi)	Poisson's Ratio	Bearing Failure Load (kips)
118.4	110.5				0.003	0.02	0.15	0.03	6.70E-05	2	0.4	0.003	6	0.35	47
110.5	101	32	0.06	6.50E-05						6	0.35	0.034	6	0.35	35
101	86				6.00E-03	7.00E-03	5.00E-02	5.00E-01	6.81E-05	5	0.4	0.007			

Top El	Bottom El	Phi	Soil modulus (pci)	Unit Weight (pcf)	Undrained Shear Strength (psf)	Strain @ 50	Strain @ 100	Soil Modulus (pci)	Unit Weight (pcf)	Shear Modulus (ksi)	Poisson's Ratio	Failure Shear Stress (psf)	Shear Modulus (ksi)	Poisson's Ratio	Bearing Failure Load (kips)
118.4	110.5				432	0.02	0.15	30	115.776	2	0.4	432	6	0.35	47
110.5	101	32	60	112.32						6	0.35	4896	6	0.35	35
101	86				864	0.007	0.05	500	117.6768	5	0.4	1008	0	0	0

BRIDGE NO. 544061

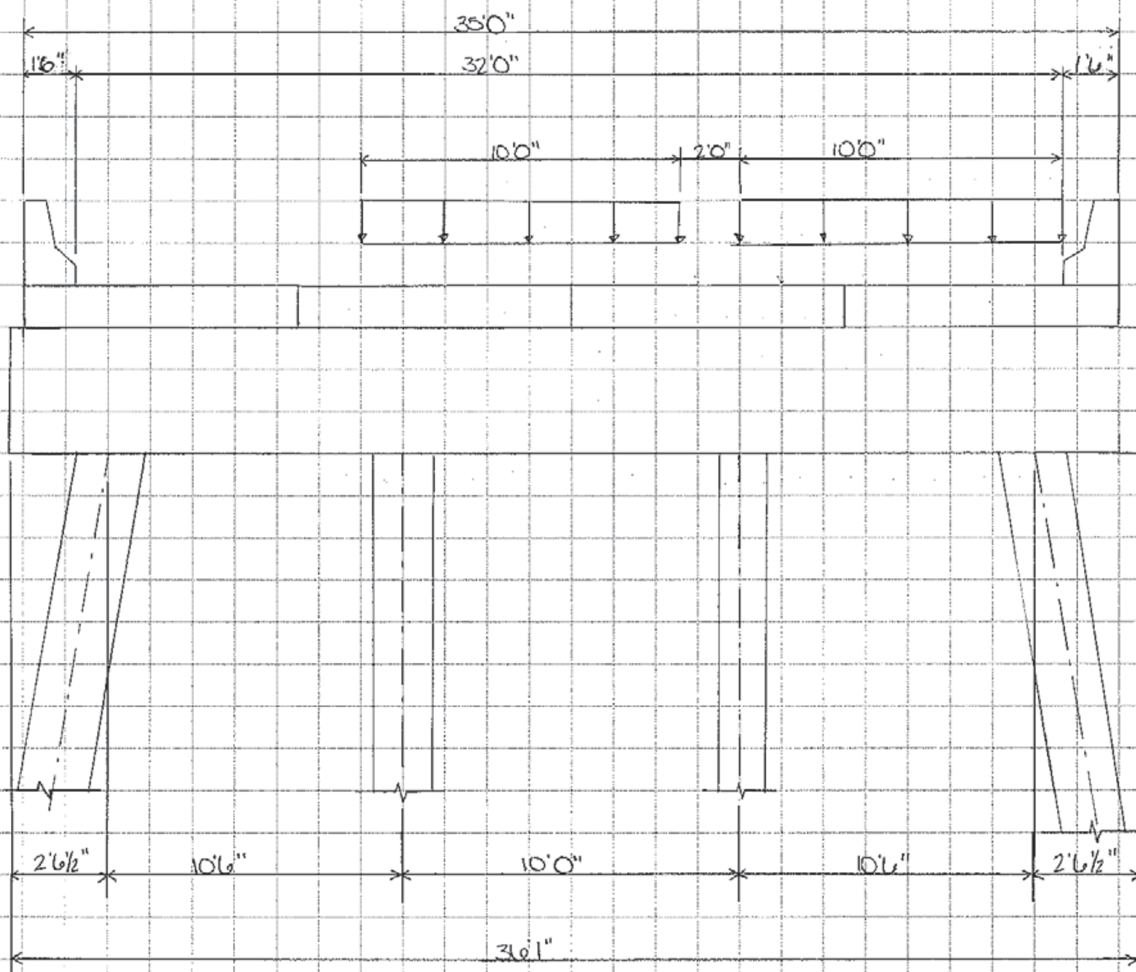
ELEVATIONS		LATERAL								AXIAL			TIP		
Top El	Bottom El	Phi	Soil modulus (kci)	Unit Weight (kci)	Undrained Shear Strength (ksi)	Strain @ 50	Strain @ 100	Soil Modulus (kci)	Unit Weight (kci)	Shear Modulus (ksi)	Poisson's Ratio	Failure Shear Stress (ksi)	Shear Modulus (ksi)	Poisson's Ratio	Bearing Failure Load (kips)
16.1	5.4				0.01	0.007	0.05	0.5	7.20E-05	6	0.4	0.002	9	0.4	141
Scour at 5.4					0.02	0.005	0.03	1	7.20E-05	7	0.4	0.004	9	0.4	136
5.4	-5				0.024	0.005	0.03	1	7.20E-05	7	0.4	0.004			
Average Values					0.018	0.0057	0.0367	0.8333	0.0001	6.6667	0.4000	0.0033			
-5	-27				5.20E-02	4.00E-03	1.00E-02	2.00E+00	7.50E-05	9	0.4	0.01			

Top El	Bottom El	Phi	Soil modulus (pci)	Unit Weight (pcf)	Undrained Shear Strength (psf)	Strain @ 50	Strain @ 100	Soil Modulus (pci)	Unit Weight (pcf)	Shear Modulus (ksi)	Poisson's Ratio	Failure Shear Stress (psf)	Shear Modulus (ksi)	Poisson's Ratio	Bearing Failure Load (kips)
16.1	5.4				2592	0.0057	0.0367	833.3333333	124.416	6.6667	0.4000	480	9	0.4	136
-5	-27				7488	4.00E-03	0.01	2000	129.6	9	0.4	1440	0	0	0

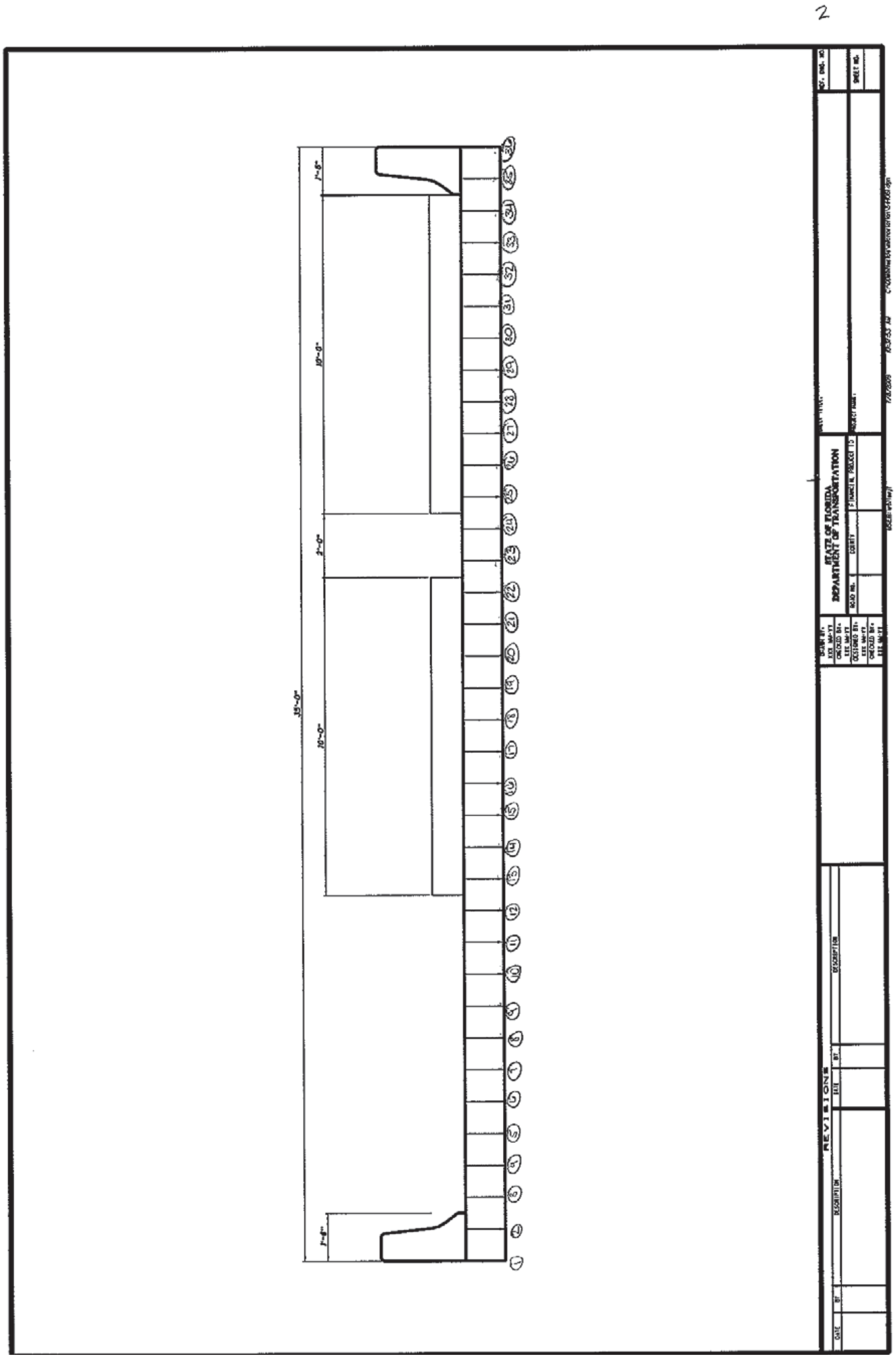
JACOBS™

Subject BRIDGE NO. 544001 Project E9X99914
LIVE LOADS Sheet No. 1 of
Authored by JLW Date 7/8/09 Checked by Date

32/12 = 2.67 → 2 lanes



Assume Bearings @ 1'0"
- See microstation for bearing locations


2
1'-8"
10'-0"
2'-0"
35'-0"
10'-0"
1'-8"
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION
REVISIONS

JACOBS™

Subject: BRIDGE NO. 544061 — Project: E9X99914
DISTRIBUTED LOADS — Sheet No. 3 of
Authored by: JLW — Date: 7/8/09 — Checked by: — Date:

From mathCAD:

Dead Load

weight of slab = 0.187 klf
weight of wearing surface = 0.022 klf
weight of railing = 0.024 klf

DC Reaction on bent = $\frac{1}{1ft}\left[\frac{(0.234)\,(29'4")}{2}\right](2)$ = 6.86 klf

Live Load

R_{truck} = 32k + $\frac{32k(29'4" - 14'0") + 8k(29'4" - 14 ft)}{29'4"}$ = 52.91k

R_{lane} = $\frac{0.64 k/ft\,(29'4")}{2}$ (2 spans) = 18.77k

R_{LL} = 52.91k + 18.77k = 71.68k

over a 10' lane width = 7.17 k/ft

Apply Live load at bearings 24-35 & 12-22

$\frac{7.17\,(10ft)}{9\,nodes}$ = 7.97 k/node

Braking Force

0.25(32k + 32k + 8k) = 18k

0.05[0.64(29'4") + (32+32+8)] = 4.5k

$\frac{18k}{7\,bents\,(36\,bearings)}$ = 0.07k/bearing

JACOBS™

Subject: BRIDGE No. 314061 — Project: 69X99914
BENT CAP PROPERTIES — Sheet No. 4 of
Authored by: JRW — Date: 7/8/09 — Checked by: — Date:

Bent Cap Properties

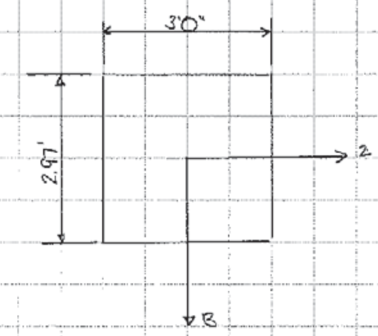
Min. Height = 2'10¼"

Max. Height = 3'1"

average height = ½(2'10¼" + 3'1") = 2.9688 ft

width = 3'0"

Area = 3(2.97) = 8.91 ft² x 144 in²/ft² = 1282.5 in²



$I_{22} = \frac{3(2.97)^3}{12} = 6.55\,ft^4 \times 20736\,in^4/ft^4 = 135821\,in^4$

$I_{33} = \frac{2.97(3)^3}{12} = 6.68\,ft^4 \times 20736\,in^4/ft^4 = 138568\,in^4$

Torsional Inertia (AASHTO C4.6.2.2.1-2)

$J = \frac{A^4}{40.0 I_p}$ $\qquad I_p = I_{22} + I_{33} = 135821\,in^4 + 138568\,in^4 = 274389$

$= \frac{(1282.5)^4}{40(274389)} = 246492\ in^4$

Modulus of elasticity

Bridge was constructed in 1982. Likely concrete compressive strength f'c = 3000 psi

$E = 33000(0.145)^{1.5}\sqrt{3.0}\ (0.9) = 2840\ ksi$

Shear modulus

$G = 24500\sqrt{f'c} = 24500\sqrt{3000} = 1342\ ksi$

(Hassan p. 26)

JACOBS™

Subject BRIDGE No. 514061 Project E9Y99914

STREAM FORCES Sheet No. 5 of

Authored by JLW Date 7/8/09 Checked by Date

AASHTO LRFD 3.7.3 - STREAM PRESSURE

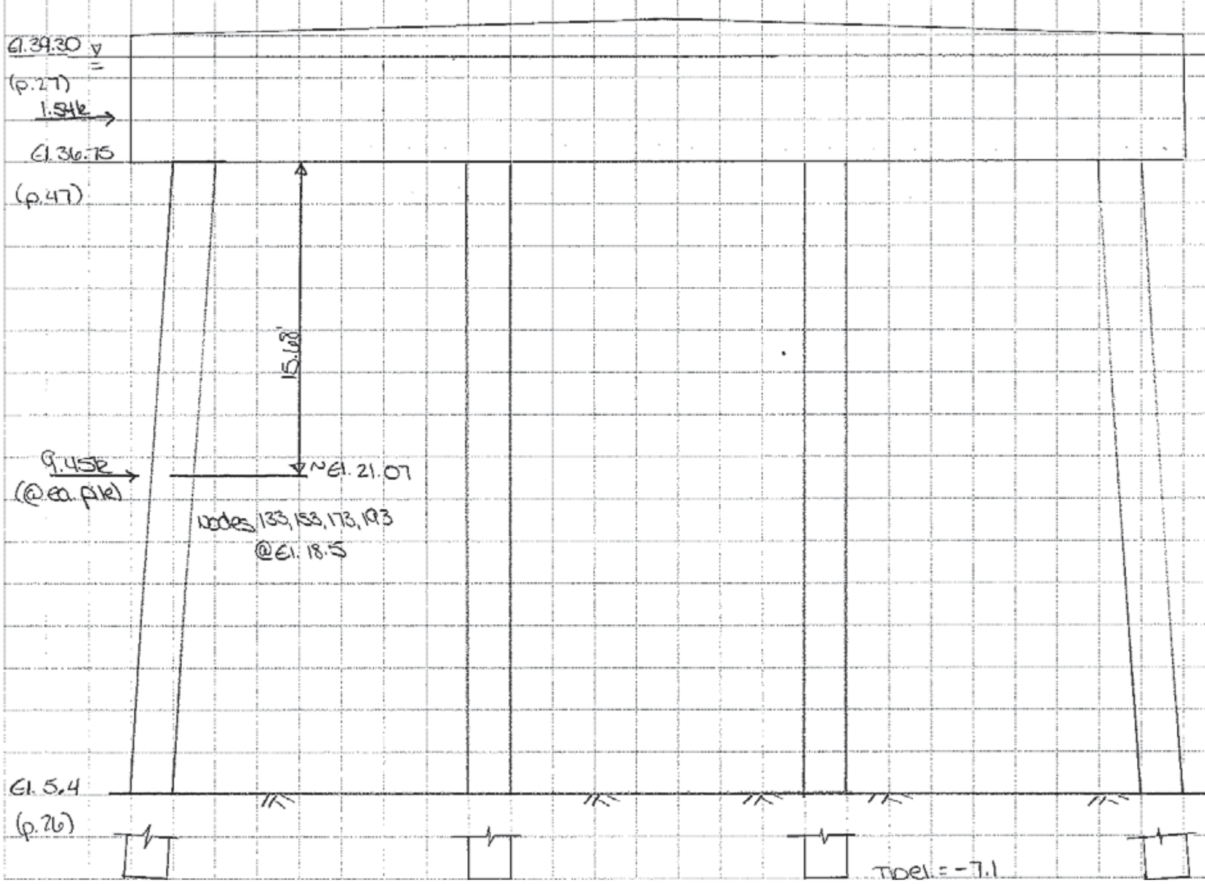
Longitudinal

$$p = \frac{C_D V^2}{1000}$$

$C_D = 1.4$

V = 11.97 ft/s (Phase 3 scour report, p. 27)

$$p = \frac{1.4(11.97\ ft/s)^2}{1000} = 0.201\ ksf$$



JACOBS™

Subject Bridge No. 544061 Project E9X99914
Stream Forces Sheet No. 6 of
Authored by JLW Date 7/8/09 Checked by Date

Area of pile exposed to stream flow

h = (36.75 - 5.4) = 31.35 ft
w = 1'6"
A = 1'6" (31.35 ft) = 47.03 sf

Force = 0.201(47.03) = 9.45 k Apply to top node of each pile

Area of cap exposed to stream flow

h = (39.30 - 36.75) = 2.55 ft
w = 30"
A = 2.55(3) = 7.65 sf

Force = 0.201(7.65) = 1.54 k Apply to ℄ cap

FB-MultiPier XML Report
Model Data Report

Return to Main Menu Options

Report Based on XML Data File:
P:\E9X99914\Reverse Engineering\BridgeNo544061\LateralStability.XML

Project Information

Client	FDOT
Project Name	Unknown Foundations
Description	Bridge No. 544061 Lateral Analysis
Computed By	JLW
Project Date	06/30/09

Control Information

Control Settings

Units	English	
Maximum Iterations	50	
Tolerance	1.00000	(*kip*)
Soil Behavior	1	
all user supplied P-Y Multipliers are set to 1 internally in FB-Pier		
Tip Spring Option	0	
no linear tip springs on piles		
Pile Tip Stiffness	0.00000	(*kip/in*)
Analysis	Static	
Design Code	AASHTO-LRFD	

Pile Group - Substructure 1

Bearing Capacity	0
fixed pile head connection	
Pile to Cap Fixity	0
not included for pile cap	
Axial Efficiency	1.00000

X Grid Spacings	(*in*)
Space 1	126.00000
Space 2	120.00000
Space 3	126.00000

Y Grid Spacings	()

Number of Piles	4

Pile Sets

Set #1 Piles: 1 2 3 4

Soil Input Data

Pile Element Segments

Pile #1

Element #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Segment #	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Pile #2

Element #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Segment #	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Pile #3

Element #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Segment #	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Pile #4

Element #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Segment #	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Pile Coordinates

Pile #1

Point #	X (*in*)	Y (*in*)	Z (*in*)
1	0.00000	0.00000	-458.80800
2	-10.24421	0.00000	-380.00640
3	-20.48842	0.00000	-301.20480
4	-30.73262	0.00000	-222.40320
5	-40.97683	0.00000	-143.60160
6	-51.22104	0.00000	-64.80000
7	-52.07907	0.00000	-58.19977
8	-52.93710	0.00000	-51.59953
9	-53.79513	0.00000	-44.99930
10	-54.65316	0.00000	-38.39906
11	-55.51119	0.00000	-31.79883
12	-56.36922	0.00000	-25.19860
13	-57.22725	0.00000	-18.59836
14	-58.08528	0.00000	-11.99813
15	-58.94331	0.00000	-5.39790
16	-59.80134	0.00000	1.20234
17	-60.65937	0.00000	7.80257
18	-61.51740	0.00000	14.40281
19	-62.37544	0.00000	21.00304
20	-63.23347	0.00000	27.60327
21	-64.09150	0.00000	34.20351

Pile #2

Point #	X (*in*)	Y (*in*)	Z (*in*)
1	126.00000	0.00000	-458.80800
2			

	126.00000	0.00000	-380.00640
3	126.00000	0.00000	-301.20480
4	126.00000	0.00000	-222.40320
5	126.00000	0.00000	-143.60160
6	126.00000	0.00000	-64.80000
7	126.00000	0.00000	-57.92320
8	126.00000	0.00000	-51.04640
9	126.00000	0.00000	-44.16960
10	126.00000	0.00000	-37.29280
11	126.00000	0.00000	-30.41600
12	126.00000	0.00000	-23.53920
13	126.00000	0.00000	-16.66240
14	126.00000	0.00000	-9.78560
15	126.00000	0.00000	-2.90880
16	126.00000	0.00000	3.96800
17	126.00000	0.00000	10.84480
18	126.00000	0.00000	17.72160
19	126.00000	0.00000	24.59840
20	126.00000	0.00000	31.47520
21	126.00000	0.00000	38.35200

Pile #3

Point #	X (*in*)	Y (*in*)	Z (*in*)
1	246.00000	0.00000	-458.80800
2	246.00000	0.00000	-380.00640
3	246.00000	0.00000	-301.20480
4	246.00000	0.00000	-222.40320
5	246.00000	0.00000	-143.60160
6	246.00000	0.00000	-64.80000
7	246.00000	0.00000	-57.92320
8	246.00000	0.00000	-51.04640
9	246.00000	0.00000	-44.16960
10	246.00000	0.00000	-37.29280
11	246.00000	0.00000	-30.41600
12	246.00000	0.00000	-23.53920
13	246.00000	0.00000	-16.66240
14	246.00000	0.00000	-9.78560
15	246.00000	0.00000	-2.90880
16	246.00000	0.00000	3.96800
17	246.00000	0.00000	10.84480
18	246.00000	0.00000	17.72160
19	246.00000	0.00000	24.59840
20	246.00000	0.00000	31.47520
21	246.00000	0.00000	38.35200

Pile #4

Point #	X (*in*)	Y (*in*)	Z (*in*)
1	372.00000	0.00000	-458.80800

2	382.24421	0.00000	-380.00640
3	392.48842	0.00000	-301.20480
4	402.73262	0.00000	-222.40320
5	412.97683	0.00000	-143.60160
6	423.22104	0.00000	-64.80000
7	424.07907	0.00000	-58.19977
8	424.93710	0.00000	-51.59953
9	425.79513	0.00000	-44.99930
10	426.65316	0.00000	-38.39906
11	427.51119	0.00000	-31.79883
12	428.36922	0.00000	-25.19860
13	429.22725	0.00000	-18.59836
14	430.08528	0.00000	-11.99813
15	430.94331	0.00000	-5.39790
16	431.80134	0.00000	1.20234
17	432.65937	0.00000	7.80257
18	433.51740	0.00000	14.40281
19	434.37544	0.00000	21.00304
20	435.23347	0.00000	27.60327
21	436.09150	0.00000	34.20351

Pier Geometry - Substructure 1

Modeling

STRUCTURE_TYPE	PILE BENT STRUCTURE	
NUM_COLUMNS	4	
NUM_ELEMENTS_PER_SPAN	37	
CANTILEVER_LENGTH	2.50000	(*ft*)
NUM_ELEMENTS_PER_CANTILEVER	9	

BEARING_PADS

Pad # 1	Located @ Node 5
Pad # 2	Located @ Node 9
Pad # 3	Located @ Node 12
Pad # 4	Located @ Node 15
Pad # 5	Located @ Node 18
Pad # 6	Located @ Node 22
Pad # 7	Located @ Node 25
Pad # 8	Located @ Node 29
Pad # 9	Located @ Node 32
Pad # 10	Located @ Node 36
Pad # 11	Located @ Node 39
Pad # 12	Located @ Node 43
Pad # 13	Located @ Node 46
Pad # 14	Located @ Node 2
Pad # 15	Located @ Node 53
Pad # 16	Located @ Node 56

Pad # 17	Located @ Node 60
Pad # 18	Located @ Node 64
Pad # 19	Located @ Node 67
Pad # 20	Located @ Node 71
Pad # 21	Located @ Node 75
Pad # 22	Located @ Node 79
Pad # 23	Located @ Node 82
Pad # 24	Located @ Node 3
Pad # 25	Located @ Node 89
Pad # 26	Located @ Node 92
Pad # 27	Located @ Node 96
Pad # 28	Located @ Node 99
Pad # 29	Located @ Node 103
Pad # 30	Located @ Node 106
Pad # 31	Located @ Node 110
Pad # 32	Located @ Node 113
Pad # 33	Located @ Node 117
Pad # 34	Located @ Node 120
Pad # 35	Located @ Node 123
Pad # 36	Located @ Node 126

COLUMN_TAPER	no
CANTILEVER_TAPER	no
BEAM_TAPER	no

Nodal Coordinates

		Boundary Conditions						Coordinates		
Node #	Location	X	Y	Z	XX	YY	ZZ	X (*in*)	Y (*in*)	Z (*in*)
5	Pier	R	R	R	R	R	R	-30.00000	0.00000	-458.80800
6	Pier	R	R	R	R	R	R	-26.66667	0.00000	-458.80800
7	Pier	R	R	R	R	R	R	-23.33333	0.00000	-458.80800
8	Pier	R	R	R	R	R	R	-20.00000	0.00000	-458.80800
9	Pier	R	R	R	R	R	R	-18.00000	0.00000	-458.80800
10	Pier	R	R	R	R	R	R	-13.33333	0.00000	-458.80800
11	Pier	R	R	R	R	R	R	-10.00000	0.00000	-458.80800
12	Pier	R	R	R	R	R	R	-6.00000	0.00000	-458.80800
13	Pier	R	R	R	R	R	R	-3.33333	0.00000	-458.80800
14	Pier	R	R	R	R	R	R	3.40541	0.00000	-458.80800
15	Pier	R	R	R	R	R	R	6.00000	0.00000	-458.80800
16	Pier	R	R	R	R	R	R	10.21622	0.00000	-458.80800
17	Pier	R	R	R	R	R	R	13.62162	0.00000	-458.80800
18	Pier	R	R	R	R	R	R	18.00000	0.00000	-458.80800
19	Pier	R	R	R	R	R	R	20.43243	0.00000	-458.80800
20	Pier	R	R	R	R	R	R	23.83784	0.00000	-458.80800
21	Pier	R	R	R	R	R	R	27.24324	0.00000	-458.80800
22	Pier	R	R	R	R	R	R	30.00000	0.00000	-458.80800
23	Pier	R	R	R	R	R	R	34.05405	0.00000	-458.80800
24	Pier	R	R	R	R	R	R	37.45946	0.00000	-458.80800

25	Pier	R	R	R	R	R	R	42.00000	0.00000	-458.80800
26	Pier	R	R	R	R	R	R	44.27027	0.00000	-458.80800
27	Pier	R	R	R	R	R	R	47.67568	0.00000	-458.80800
28	Pier	R	R	R	R	R	R	51.08108	0.00000	-458.80800
29	Pier	R	R	R	R	R	R	54.00000	0.00000	-458.80800
30	Pier	R	R	R	R	R	R	57.89189	0.00000	-458.80800
31	Pier	R	R	R	R	R	R	61.29730	0.00000	-458.80800
32	Pier	R	R	R	R	R	R	66.00000	0.00000	-458.80800
33	Pier	R	R	R	R	R	R	68.10811	0.00000	-458.80800
34	Pier	R	R	R	R	R	R	71.51351	0.00000	-458.80800
35	Pier	R	R	R	R	R	R	74.91892	0.00000	-458.80800
36	Pier	R	R	R	R	R	R	78.00000	0.00000	-458.80800
37	Pier	R	R	R	R	R	R	81.72973	0.00000	-458.80800
38	Pier	R	R	R	R	R	R	85.13514	0.00000	-458.80800
39	Pier	R	R	R	R	R	R	90.00000	0.00000	-458.80800
40	Pier	R	R	R	R	R	R	91.94595	0.00000	-458.80800
41	Pier	R	R	R	R	R	R	95.35135	0.00000	-458.80800
42	Pier	R	R	R	R	R	R	98.75676	0.00000	-458.80800
43	Pier	R	R	R	R	R	R	102.00000	0.00000	-458.80800
44	Pier	R	R	R	R	R	R	105.56757	0.00000	-458.80800
45	Pier	R	R	R	R	R	R	108.97297	0.00000	-458.80800
46	Pier	R	R	R	R	R	R	114.00000	0.00000	-458.80800
47	Pier	R	R	R	R	R	R	115.78378	0.00000	-458.80800
48	Pier	R	R	R	R	R	R	119.18919	0.00000	-458.80800
49	Pier	R	R	R	R	R	R	122.59459	0.00000	-458.80800
50	Pier	R	R	R	R	R	R	129.24324	0.00000	-458.80800
51	Pier	R	R	R	R	R	R	132.48649	0.00000	-458.80800
52	Pier	R	R	R	R	R	R	135.72973	0.00000	-458.80800
53	Pier	R	R	R	R	R	R	138.00000	0.00000	-458.80800
54	Pier	R	R	R	R	R	R	142.21622	0.00000	-458.80800
55	Pier	R	R	R	R	R	R	145.45946	0.00000	-458.80800
56	Pier	R	R	R	R	R	R	150.00000	0.00000	-458.80800
57	Pier	R	R	R	R	R	R	151.94595	0.00000	-458.80800
58	Pier	R	R	R	R	R	R	155.18919	0.00000	-458.80800
59	Pier	R	R	R	R	R	R	158.43243	0.00000	-458.80800
60	Pier	R	R	R	R	R	R	162.00000	0.00000	-458.80800
61	Pier	R	R	R	R	R	R	164.91892	0.00000	-458.80800
62	Pier	R	R	R	R	R	R	168.16216	0.00000	-458.80800
63	Pier	R	R	R	R	R	R	171.40541	0.00000	-458.80800
64	Pier	R	R	R	R	R	R	174.00000	0.00000	-458.80800
65	Pier	R	R	R	R	R	R	177.89189	0.00000	-458.80800
66	Pier	R	R	R	R	R	R	181.13514	0.00000	-458.80800
67	Pier	R	R	R	R	R	R	186.00000	0.00000	-458.80800
68	Pier	R	R	R	R	R	R	187.62162	0.00000	-458.80800
69	Pier	R	R	R	R	R	R	190.86486	0.00000	-458.80800
70	Pier	R	R	R	R	R	R	194.10811	0.00000	-458.80800

71	Pier	R	R	R	R	R	R	198.00000	0.00000	-458.80800
72	Pier	R	R	R	R	R	R	200.59459	0.00000	-458.80800
73	Pier	R	R	R	R	R	R	203.83784	0.00000	-458.80800
74	Pier	R	R	R	R	R	R	207.08108	0.00000	-458.80800
75	Pier	R	R	R	R	R	R	210.00000	0.00000	-458.80800
76	Pier	R	R	R	R	R	R	213.56757	0.00000	-458.80800
77	Pier	R	R	R	R	R	R	216.81081	0.00000	-458.80800
78	Pier	R	R	R	R	R	R	220.05405	0.00000	-458.80800
79	Pier	R	R	R	R	R	R	222.00000	0.00000	-458.80800
80	Pier	R	R	R	R	R	R	226.54054	0.00000	-458.80800
81	Pier	R	R	R	R	R	R	229.78378	0.00000	-458.80800
82	Pier	R	R	R	R	R	R	234.00000	0.00000	-458.80800
83	Pier	R	R	R	R	R	R	236.27027	0.00000	-458.80800
84	Pier	R	R	R	R	R	R	239.51351	0.00000	-458.80800
85	Pier	R	R	R	R	R	R	242.75676	0.00000	-458.80800
86	Pier	R	R	R	R	R	R	249.40541	0.00000	-458.80800
87	Pier	R	R	R	R	R	R	252.81081	0.00000	-458.80800
88	Pier	R	R	R	R	R	R	256.21622	0.00000	-458.80800
89	Pier	R	R	R	R	R	R	258.00000	0.00000	-458.80800
90	Pier	R	R	R	R	R	R	263.02703	0.00000	-458.80800
91	Pier	R	R	R	R	R	R	266.43243	0.00000	-458.80800
92	Pier	R	R	R	R	R	R	270.00000	0.00000	-458.80800
93	Pier	R	R	R	R	R	R	273.24324	0.00000	-458.80800
94	Pier	R	R	R	R	R	R	276.64865	0.00000	-458.80800
95	Pier	R	R	R	R	R	R	280.05405	0.00000	-458.80800
96	Pier	R	R	R	R	R	R	282.00000	0.00000	-458.80800
97	Pier	R	R	R	R	R	R	286.86486	0.00000	-458.80800
98	Pier	R	R	R	R	R	R	290.27027	0.00000	-458.80800
99	Pier	R	R	R	R	R	R	294.00000	0.00000	-458.80800
100	Pier	R	R	R	R	R	R	297.08108	0.00000	-458.80800
101	Pier	R	R	R	R	R	R	300.48649	0.00000	-458.80800
102	Pier	R	R	R	R	R	R	303.89189	0.00000	-458.80800
103	Pier	R	R	R	R	R	R	306.00000	0.00000	-458.80800
104	Pier	R	R	R	R	R	R	310.70270	0.00000	-458.80800
105	Pier	R	R	R	R	R	R	314.10811	0.00000	-458.80800
106	Pier	R	R	R	R	R	R	318.00000	0.00000	-458.80800
107	Pier	R	R	R	R	R	R	320.91892	0.00000	-458.80800
108	Pier	R	R	R	R	R	R	324.32432	0.00000	-458.80800
109	Pier	R	R	R	R	R	R	327.72973	0.00000	-458.80800
110	Pier	R	R	R	R	R	R	330.00000	0.00000	-458.80800
111	Pier	R	R	R	R	R	R	334.54054	0.00000	-458.80800
112	Pier	R	R	R	R	R	R	337.94595	0.00000	-458.80800
113	Pier	R	R	R	R	R	R	342.00000	0.00000	-458.80800
114	Pier	R	R	R	R	R	R	344.75676	0.00000	-458.80800
115	Pier	R	R	R	R	R	R	348.16216	0.00000	-458.80800
116	Pier	R	R	R	R	R	R	351.56757	0.00000	-458.80800

117	Pier	R	R	R	R	R	R	354.00000	0.00000	-458.80800
118	Pier	R	R	R	R	R	R	358.37838	0.00000	-458.80800
119	Pier	R	R	R	R	R	R	361.78378	0.00000	-458.80800
120	Pier	R	R	R	R	R	R	366.00000	0.00000	-458.80800
121	Pier	R	R	R	R	R	R	368.59459	0.00000	-458.80800
122	Pier	R	R	R	R	R	R	375.33333	0.00000	-458.80800
123	Pier	R	R	R	R	R	R	378.00000	0.00000	-458.80800
124	Pier	R	R	R	R	R	R	382.00000	0.00000	-458.80800
125	Pier	R	R	R	R	R	R	385.33333	0.00000	-458.80800
126	Pier	R	R	R	R	R	R	390.00000	0.00000	-458.80800
127	Pier	R	R	R	R	R	R	392.00000	0.00000	-458.80800
128	Pier	R	R	R	R	R	R	395.33333	0.00000	-458.80800
129	Pier	R	R	R	R	R	R	398.66667	0.00000	-458.80800
130	Pier	R	R	R	R	R	R	402.00000	0.00000	-458.80800

Cross Sections

Segment Number 2

Dimensions

WIDTH	18.00000	(*in*)
DEPTH	18.00000	(*in*)
VOID_WIDTH	0.00000	(*in*)
VOID_DEPTH	0.00000	(*in*)

Gross Section Properties

AREA	1282.50000	(*in^2*)
EMODULUS	2840.00000	(*ksi*)
INERTIA2	138568.00000	(*in^4*)
INERTIA3	135821.00000	(*in^4*)
SHEAR_MODULUS	1342.00000	(*ksi*)
TORSIONAL_INERTIA	246492.00000	(*in^4*)
UNIT_WEIGHT	0.00009	(*k/in^3*)

Segment Number 3

Dimensions

WIDTH	18.00000	(*in*)
DEPTH	18.00000	(*in*)
VOID_WIDTH	0.00000	(*in*)
VOID_DEPTH	0.00000	(*in*)

Gross Section Properties

AREA	1282.50000	(*in^2*)
EMODULUS	2840.00000	(*ksi*)
INERTIA2	138568.00000	(*in^4*)
INERTIA3	135821.00000	(*in^4*)
SHEAR_MODULUS	1342.00000	(*ksi*)
TORSIONAL_INERTIA	246492.00000	(*in^4*)

UNIT_WEIGHT 0.00009 (*k/in^3*)

Pier Member Connectivity

Beam Element #

Load Case Data - Substructure 1

Load Case #1

Self Weight Factor 1.00000

Buoyancy Factor 0.00000

Load Values

Node	FX (*kip*)	FY (*kip*)	FZ (*kip*)	MX (*kip-ft*)	MY (*kip-ft*)	MZ (*kip-ft*)
5	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000
9	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000
12	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000
15	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000
18	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000
22	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000
25	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000
29	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000
32	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000
36	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000
39	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000
43	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000
46	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000
2	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000
53	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000
56	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000
60	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000
64	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000
68	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000
71	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000
75	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000
79	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000
82	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000
3	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000
89	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000
92	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000
96	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000
99	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000
103	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000
106	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000
110	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000
113	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000

117	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000
120	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000
123	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000
126	0.00000	0.00000	6.86000	0.00000	0.00000	0.00000
1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Load Case #2

Self Weight Factor	0.00000
Buoyancy Factor	0.00000

Load Values

Node	FX (*kip*)	FY (*kip*)	FZ (*kip*)	MX (*kip-ft*)	MY (*kip-ft*)	MZ (*kip-ft*)
5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
22	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
25	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
29	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
36	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
39	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
43	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
46	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
53	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
56	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
60	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
64	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
68	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
71	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
75	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
79	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
82	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
89	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
92	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
96	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
99	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
103	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
106	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
110	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
113	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
117	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

120	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
123	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
126	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Load Case #3

Self Weight Factor	0.00000
Buoyancy Factor	0.00000

Load Values

Node	FX (*kip*)	FY (*kip*)	FZ (*kip*)	MX (*kip-ft*)	MY (*kip-ft*)	MZ (*kip-ft*)
5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
22	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
25	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
29	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
36	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
39	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
43	0.00000	0.00000	7.97000	0.00000	0.00000	0.00000
46	0.00000	0.00000	7.97000	0.00000	0.00000	0.00000
2	0.00000	0.00000	7.97000	0.00000	0.00000	0.00000
53	0.00000	0.00000	7.97000	0.00000	0.00000	0.00000
56	0.00000	0.00000	7.97000	0.00000	0.00000	0.00000
60	0.00000	0.00000	7.97000	0.00000	0.00000	0.00000
64	0.00000	0.00000	7.97000	0.00000	0.00000	0.00000
68	0.00000	0.00000	7.97000	0.00000	0.00000	0.00000
71	0.00000	0.00000	7.97000	0.00000	0.00000	0.00000
75	0.00000	0.00000	7.97000	0.00000	0.00000	0.00000
79	0.00000	0.00000	7.97000	0.00000	0.00000	0.00000
82	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	0.00000	0.00000	7.97000	0.00000	0.00000	0.00000
89	0.00000	0.00000	7.97000	0.00000	0.00000	0.00000
92	0.00000	0.00000	7.97000	0.00000	0.00000	0.00000
96	0.00000	0.00000	7.97000	0.00000	0.00000	0.00000
99	0.00000	0.00000	7.97000	0.00000	0.00000	0.00000
103	0.00000	0.00000	7.97000	0.00000	0.00000	0.00000
106	0.00000	0.00000	7.97000	0.00000	0.00000	0.00000
110	0.00000	0.00000	7.97000	0.00000	0.00000	0.00000
113	0.00000	0.00000	7.97000	0.00000	0.00000	0.00000
117	0.00000	0.00000	7.97000	0.00000	0.00000	0.00000
120	0.00000	0.00000	7.97000	0.00000	0.00000	0.00000
123	0.00000	0.00000	7.97000	0.00000	0.00000	0.00000

126	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Load Case #4

Self Weight Factor	0.00000
Buoyancy Factor	0.00000

Load Values

Node	FX (*kip*)	FY (*kip*)	FZ (*kip*)	MX (*kip-ft*)	MY (*kip-ft*)	MZ (*kip-ft*)
5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
22	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
25	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
29	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
36	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
39	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
43	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
46	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
53	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
56	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
60	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
64	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
68	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
71	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
75	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
79	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
82	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
89	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
92	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
96	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
99	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
103	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
106	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
110	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
113	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
117	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
120	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
123	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
126	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Load Case #5

Self Weight Factor 0.00000
Buoyancy Factor 0.00000

Load Values

Node	FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)
5	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000
9	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000
12	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000
15	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000
18	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000
22	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000
25	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000
29	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000
32	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000
36	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000
39	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000
43	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000
46	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000
2	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000
53	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000
56	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000
60	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000
64	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000
68	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000
71	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000
75	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000
79	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000
82	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000
3	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000
89	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000
92	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000
96	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000
99	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000
103	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000
106	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000
110	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000
113	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000
117	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000
120	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000
123	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000
126	0.00000	0.07000	0.00000	0.00000	0.00000	0.00000

Load Case #6

Self Weight Factor 0.00000

Buoyancy Factor 1.00000

Load Values

Node	FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)
5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
1	1.54000	0.00000	0.00000	0.00000	0.00000	0.00000
133	9.45000	0.00000	0.00000	0.00000	0.00000	0.00000
153	9.45000	0.00000	0.00000	0.00000	0.00000	0.00000
173	9.45000	0.00000	0.00000	0.00000	0.00000	0.00000
193	9.45000	0.00000	0.00000	0.00000	0.00000	0.00000

Load Case #7

Self Weight Factor 0.00000
Buoyancy Factor 0.00000

Load Values

Node	FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)

Load Combinations

Load Combination 1

Load Type	DC	DW	LL1	IM1	BR1	WA
Value	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

Load Case Results - Substructure 1
Load Case 7 - Time Step 1

PY Multipliers

Pile #	X-PYM	Y-PYM
1	1.00000	1.00000
2	1.00000	1.00000
3	1.00000	1.00000
4	1.00000	1.00000

Pile Displacement

Pile #1

Node #	Local #	DX (in)	DY (in)	DZ (in)	RX (rad)	RY (rad)	RZ (rad)
1	1	2.83463	0.84274	0.96931	-0.00132	0.00345	0.00005
131	2	2.29297	0.62727	0.89387	0.00264	-0.00690	0.00034
132	3	1.74565	0.42408	0.81759	0.00241	-0.00701	0.00030
133	4	1.18662	0.24637	0.73961	0.00201	-0.00720	0.00024
134	5	0.63462	0.10788	0.66228	0.00143	-0.00663	0.00016
135	6	0.19336	0.02286	0.59822	0.00068	-0.00439	0.00005
136	7	0.16531	0.01855	0.59395	0.00061	-0.00413	0.00004
137	8	0.13901	0.01472	0.58992	0.00054	-0.00386	0.00003

138	9	0.11453	0.01135	0.58612	0.00047	-0.00358	0.00002
139	10	0.09187	0.00845	0.58256	0.00040	-0.00331	0.00002
140	11	0.07100	0.00600	0.57925	0.00034	-0.00304	0.00001
141	12	0.05183	0.00395	0.57618	0.00028	-0.00279	0.00000
142	13	0.03423	0.00227	0.57333	0.00023	-0.00257	0.00000
143	14	0.01800	0.00092	0.57069	0.00018	-0.00238	-0.00001
144	15	0.00290	-0.00017	0.56823	0.00015	-0.00222	-0.00001
145	16	-0.01133	-0.00104	0.56592	0.00012	-0.00211	-0.00001
146	17	-0.02499	-0.00175	0.56373	0.00010	-0.00205	-0.00001
147	18	-0.03833	-0.00235	0.56161	0.00009	-0.00201	-0.00001
148	19	-0.05152	-0.00289	0.55952	0.00008	-0.00200	-0.00001
149	20	-0.06470	-0.00339	0.55745	0.00008	-0.00200	-0.00001
150	21	-0.07789	-0.00389	0.55539	0.00008	-0.00201	-0.00001

Pile #2

Node #	Local #	DX (*in*)	DY (*in*)	DZ (*in*)	RX (*rad*)	RY (*rad*)	RZ (*rad*)
2	1	2.83413	0.84932	3.16909	-0.00138	0.00359	0.00005
151	2	2.26834	0.62769	3.16250	0.00276	-0.00719	0.00004
152	3	1.70092	0.42048	3.15567	0.00248	-0.00722	0.00003
153	4	1.13040	0.24177	3.14864	0.00203	-0.00726	0.00002
154	5	0.58139	0.10501	3.14113	0.00142	-0.00645	0.00001
155	6	0.16415	0.02197	3.13239	0.00067	-0.00393	0.00001
156	7	0.13817	0.01763	3.13157	0.00059	-0.00363	0.00001
157	8	0.11430	0.01379	3.13075	0.00052	-0.00331	0.00000
158	9	0.09259	0.01045	3.12993	0.00045	-0.00300	0.00000
159	10	0.07306	0.00761	3.12912	0.00038	-0.00268	0.00000
160	11	0.05569	0.00523	3.12833	0.00031	-0.00237	0.00000
161	12	0.04037	0.00329	3.12755	0.00025	-0.00208	0.00000
162	13	0.02696	0.00174	3.12681	0.00020	-0.00182	0.00000
163	14	0.01526	0.00053	3.12610	0.00015	-0.00159	0.00000
164	15	0.00503	-0.00041	3.12543	0.00012	-0.00139	0.00000
165	16	-0.00402	-0.00112	3.12480	0.00009	-0.00124	0.00000
166	17	-0.01220	-0.00167	3.12421	0.00007	-0.00114	0.00000
167	18	-0.01979	-0.00210	3.12365	0.00006	-0.00107	0.00000
168	19	-0.02703	-0.00247	3.12312	0.00005	-0.00104	0.00000
169	20	-0.03411	-0.00280	3.12262	0.00005	-0.00102	0.00000
170	21	-0.04114	-0.00313	3.12213	0.00005	-0.00102	0.00000

Pile #3

Node #	Local #	DX (*in*)	DY (*in*)	DZ (*in*)	RX (*rad*)	RY (*rad*)	RZ (*rad*)
3	1	2.83361	0.85507	5.13921	-0.00139	0.00359	0.00005
171	2	2.26791	0.63072	5.13220	0.00279	-0.00719	0.00004
172	3	1.70044	0.42160	5.12497	0.00250	-0.00722	0.00003
173	4	1.12971	0.24189	5.11755	0.00204	-0.00727	0.00002

174	5	0.58054	0.10490	5.10964	0.00142	-0.00645	0.00001
175	6	0.16357	0.02191	5.10052	0.00067	-0.00392	0.00001
176	7	0.13764	0.01757	5.09966	0.00059	-0.00362	0.00000
177	8	0.11381	0.01374	5.09880	0.00052	-0.00331	0.00000
178	9	0.09216	0.01041	5.09795	0.00045	-0.00299	0.00000
179	10	0.07268	0.00757	5.09711	0.00038	-0.00267	0.00000
180	11	0.05536	0.00521	5.09628	0.00031	-0.00237	0.00000
181	12	0.04010	0.00327	5.09548	0.00025	-0.00208	0.00000
182	13	0.02675	0.00172	5.09470	0.00020	-0.00181	0.00000
183	14	0.01511	0.00051	5.09396	0.00015	-0.00158	0.00000
184	15	0.00494	-0.00042	5.09325	0.00012	-0.00139	0.00000
185	16	-0.00405	-0.00113	5.09259	0.00009	-0.00124	0.00000
186	17	-0.01217	-0.00167	5.09196	0.00007	-0.00113	0.00000
187	18	-0.01969	-0.00210	5.09137	0.00006	-0.00106	0.00000
188	19	-0.02685	-0.00246	5.09081	0.00005	-0.00103	0.00000
189	20	-0.03386	-0.00279	5.09028	0.00005	-0.00101	0.00000
190	21	-0.04081	-0.00310	5.08976	0.00005	-0.00101	0.00000

Pile #4

Node #	Local #	DX (*in*)	DY (*in*)	DZ (*in*)	RX (*rad*)	RY (*rad*)	RZ (*rad*)
4	1	2.83304	0.86048	7.05047	-0.00139	0.00365	0.00004
191	2	2.25607	0.63347	7.11780	0.00278	-0.00731	-0.00028
192	3	1.67938	0.42248	7.18490	0.00249	-0.00730	-0.00025
193	4	1.10341	0.24191	7.25172	0.00202	-0.00729	-0.00020
194	5	0.55541	0.10483	7.31429	0.00141	-0.00637	-0.00013
195	6	0.14924	0.02191	7.35716	0.00066	-0.00369	-0.00004
196	7	0.12574	0.01774	7.35932	0.00059	-0.00339	-0.00003
197	8	0.10427	0.01403	7.36122	0.00052	-0.00308	-0.00002
198	9	0.08489	0.01079	7.36286	0.00045	-0.00276	-0.00001
199	10	0.06761	0.00800	7.36423	0.00039	-0.00244	-0.00001
200	11	0.05244	0.00564	7.36534	0.00033	-0.00213	0.00000
201	12	0.03930	0.00368	7.36621	0.00027	-0.00182	0.00000
202	13	0.02809	0.00208	7.36686	0.00022	-0.00154	0.00001
203	14	0.01866	0.00079	7.36732	0.00017	-0.00129	0.00001
204	15	0.01083	-0.00023	7.36759	0.00014	-0.00106	0.00001
205	16	0.00436	-0.00105	7.36773	0.00011	-0.00087	0.00002
206	17	-0.00099	-0.00171	7.36777	0.00009	-0.00073	0.00002
207	18	-0.00549	-0.00225	7.36772	0.00008	-0.00062	0.00002
208	19	-0.00938	-0.00274	7.36764	0.00007	-0.00055	0.00002
209	20	-0.01292	-0.00318	7.36753	0.00007	-0.00051	0.00002
210	21	-0.01628	-0.00362	7.36743	0.00007	-0.00050	0.00002

Structure Displacement

Node #	DX	DY	DZ	RX	RY	RZ

	(in)	(in)	(in)	(rad)	(rad)	(rad)
5	2.83463	0.84115	0.43849	0.00038	-0.01769	0.00005
6	2.83463	0.84133	0.49746	0.00038	-0.01769	0.00005
7	2.83463	0.84150	0.55643	0.00038	-0.01769	0.00005
8	2.83463	0.84168	0.61540	0.00038	-0.01769	0.00005
9	2.83463	0.84179	0.65078	0.00038	-0.01769	0.00005
10	2.83463	0.84203	0.73335	0.00038	-0.01769	0.00005
11	2.83463	0.84221	0.79233	0.00038	-0.01769	0.00005
12	2.83463	0.84242	0.86311	0.00038	-0.01770	0.00005
13	2.83463	0.84257	0.91031	0.00038	-0.01770	0.00005
14	2.83462	0.84293	1.02960	0.00038	-0.01771	0.00005
15	2.83461	0.84306	1.07554	0.00038	-0.01771	0.00005
16	2.83459	0.84329	1.15019	0.00038	-0.01770	0.00005
17	2.83457	0.84347	1.21048	0.00038	-0.01770	0.00005
18	2.83456	0.84370	1.28797	0.00038	-0.01770	0.00005
19	2.83455	0.84383	1.33101	0.00038	-0.01769	0.00005
20	2.83453	0.84402	1.39124	0.00038	-0.01768	0.00005
21	2.83452	0.84420	1.45144	0.00038	-0.01767	0.00005
22	2.83451	0.84434	1.50015	0.00038	-0.01766	0.00005
23	2.83449	0.84456	1.57174	0.00038	-0.01765	0.00005
24	2.83448	0.84474	1.63182	0.00038	-0.01764	0.00005
25	2.83446	0.84498	1.71186	0.00038	-0.01762	0.00005
26	2.83445	0.84510	1.75184	0.00038	-0.01761	0.00005
27	2.83444	0.84528	1.81176	0.00038	-0.01759	0.00005
28	2.83442	0.84546	1.87163	0.00038	-0.01757	0.00005
29	2.83441	0.84562	1.92289	0.00038	-0.01755	0.00005
30	2.83440	0.84582	1.99117	0.00038	-0.01753	0.00005
31	2.83438	0.84600	2.05084	0.00038	-0.01751	0.00005
32	2.83437	0.84625	2.13311	0.00038	-0.01748	0.00005
33	2.83436	0.84636	2.16995	0.00038	-0.01747	0.00005
34	2.83434	0.84654	2.22939	0.00038	-0.01744	0.00005
35	2.83433	0.84671	2.28875	0.00038	-0.01742	0.00005
36	2.83432	0.84687	2.34239	0.00038	-0.01740	0.00005
37	2.83430	0.84707	2.40724	0.00038	-0.01737	0.00005
38	2.83429	0.84724	2.46635	0.00038	-0.01735	0.00005
39	2.83427	0.84749	2.55065	0.00038	-0.01731	0.00005
40	2.83426	0.84759	2.58433	0.00038	-0.01730	0.00005
41	2.83425	0.84777	2.64319	0.00038	-0.01727	0.00005
42	2.83423	0.84794	2.70196	0.00038	-0.01725	0.00005
43	2.83422	0.84811	2.75785	0.00038	-0.01722	0.00005
44	2.83421	0.84829	2.81924	0.00038	-0.01719	0.00005
45	2.83419	0.84846	2.87775	0.00038	-0.01717	0.00005
46	2.83417	0.84872	2.96398	0.00038	-0.01713	0.00005
47	2.83417	0.84881	2.99453	0.00038	-0.01712	0.00005
48	2.83415	0.84898	3.05279	0.00038	-0.01710	0.00005
49	2.83414	0.84915	3.11098	0.00038	-0.01708	0.00005

50	2.83411	0.84949	3.22437	0.00038	-0.01703	0.00005
51	2.83410	0.84965	3.27958	0.00038	-0.01701	0.00005
52	2.83408	0.84981	3.33471	0.00038	-0.01699	0.00005
53	2.83407	0.84992	3.37324	0.00038	-0.01697	0.00005
54	2.83406	0.85013	3.44470	0.00038	-0.01693	0.00005
55	2.83404	0.85030	3.49956	0.00038	-0.01690	0.00005
56	2.83402	0.85052	3.57619	0.00038	-0.01685	0.00005
57	2.83401	0.85062	3.60896	0.00038	-0.01683	0.00005
58	2.83400	0.85078	3.66350	0.00038	-0.01680	0.00005
59	2.83399	0.85094	3.71792	0.00038	-0.01676	0.00005
60	2.83397	0.85111	3.77765	0.00038	-0.01672	0.00005
61	2.83396	0.85126	3.82641	0.00038	-0.01669	0.00005
62	2.83395	0.85142	3.88047	0.00038	-0.01665	0.00005
63	2.83393	0.85157	3.93440	0.00038	-0.01661	0.00005
64	2.83392	0.85170	3.97745	0.00038	-0.01658	0.00005
65	2.83390	0.85189	4.04186	0.00038	-0.01653	0.00005
66	2.83389	0.85205	4.09540	0.00038	-0.01649	0.00005
67	2.83387	0.85228	4.17545	0.00038	-0.01642	0.00005
68	2.83386	0.85236	4.20207	0.00038	-0.01640	0.00005
69	2.83385	0.85251	4.25520	0.00038	-0.01636	0.00005
70	2.83383	0.85267	4.30820	0.00038	-0.01632	0.00005
71	2.83382	0.85285	4.37161	0.00038	-0.01627	0.00005
72	2.83381	0.85297	4.41378	0.00038	-0.01624	0.00005
73	2.83379	0.85313	4.46638	0.00038	-0.01620	0.00005
74	2.83378	0.85328	4.51884	0.00038	-0.01616	0.00005
75	2.83377	0.85342	4.56594	0.00038	-0.01612	0.00005
76	2.83375	0.85358	4.62337	0.00038	-0.01608	0.00005
77	2.83374	0.85373	4.67545	0.00038	-0.01604	0.00005
78	2.83372	0.85388	4.72741	0.00038	-0.01600	0.00005
79	2.83372	0.85397	4.75853	0.00038	-0.01598	0.00005
80	2.83370	0.85418	4.83098	0.00038	-0.01593	0.00005
81	2.83368	0.85433	4.88260	0.00038	-0.01590	0.00005
82	2.83366	0.85452	4.94954	0.00038	-0.01586	0.00005
83	2.83365	0.85463	4.98552	0.00038	-0.01584	0.00005
84	2.83364	0.85478	5.03684	0.00038	-0.01581	0.00005
85	2.83363	0.85492	5.08806	0.00038	-0.01578	0.00005
86	2.83360	0.85522	5.19282	0.00038	-0.01573	0.00005
87	2.83358	0.85538	5.24634	0.00038	-0.01570	0.00005
88	2.83357	0.85553	5.29976	0.00038	-0.01567	0.00004
89	2.83356	0.85561	5.32770	0.00038	-0.01566	0.00004
90	2.83353	0.85584	5.40628	0.00038	-0.01561	0.00004
91	2.83352	0.85599	5.45938	0.00038	-0.01558	0.00004
92	2.83350	0.85615	5.51489	0.00038	-0.01554	0.00004
93	2.83349	0.85629	5.56523	0.00038	-0.01551	0.00004
94	2.83347	0.85644	5.61798	0.00038	-0.01547	0.00004
95	2.83346	0.85659	5.67061	0.00038	-0.01544	0.00004

96	2.83345	0.85668	5.70062	0.00038	-0.01541	0.00004
97	2.83343	0.85689	5.77548	0.00038	-0.01536	0.00004
98	2.83341	0.85704	5.82773	0.00038	-0.01533	0.00004
99	2.83339	0.85720	5.88482	0.00038	-0.01528	0.00004
100	2.83338	0.85734	5.93186	0.00038	-0.01525	0.00004
101	2.83336	0.85749	5.98373	0.00038	-0.01521	0.00004
102	2.83335	0.85763	6.03549	0.00038	-0.01518	0.00004
103	2.83334	0.85772	6.06746	0.00038	-0.01516	0.00004
104	2.83332	0.85792	6.13863	0.00038	-0.01511	0.00004
105	2.83330	0.85807	6.19002	0.00038	-0.01507	0.00004
106	2.83328	0.85824	6.24861	0.00038	-0.01504	0.00004
107	2.83327	0.85836	6.29246	0.00038	-0.01501	0.00004
108	2.83326	0.85850	6.34353	0.00038	-0.01498	0.00004
109	2.83324	0.85865	6.39448	0.00038	-0.01495	0.00004
110	2.83323	0.85874	6.42840	0.00038	-0.01493	0.00004
111	2.83321	0.85893	6.49611	0.00038	-0.01490	0.00004
112	2.83319	0.85908	6.54680	0.00038	-0.01487	0.00004
113	2.83317	0.85924	6.60703	0.00038	-0.01484	0.00004
114	2.83316	0.85936	6.64793	0.00038	-0.01483	0.00004
115	2.83315	0.85950	6.69839	0.00038	-0.01481	0.00004
116	2.83313	0.85964	6.74879	0.00038	-0.01479	0.00004
117	2.83312	0.85974	6.78477	0.00038	-0.01478	0.00004
118	2.83310	0.85992	6.84946	0.00038	-0.01477	0.00004
119	2.83308	0.86006	6.89974	0.00038	-0.01476	0.00004
120	2.83307	0.86024	6.96196	0.00038	-0.01475	0.00004
121	2.83305	0.86034	7.00023	0.00038	-0.01475	0.00004
122	2.83304	0.86062	7.09965	0.00038	-0.01475	0.00004
123	2.83304	0.86073	7.13900	0.00038	-0.01476	0.00004
124	2.83304	0.86089	7.19802	0.00038	-0.01476	0.00004
125	2.83304	0.86103	7.24721	0.00038	-0.01476	0.00004
126	2.83304	0.86122	7.31608	0.00038	-0.01476	0.00004
127	2.83304	0.86130	7.34560	0.00038	-0.01476	0.00004
128	2.83304	0.86144	7.39479	0.00038	-0.01476	0.00004
129	2.83304	0.86158	7.44398	0.00038	-0.01476	0.00004
130	2.83304	0.86172	7.49317	0.00038	-0.01476	0.00004

Pile Out-Of-Balance Forces

Soil Reaction Forces

Pile #1

Node #	Local #	FX (*kip*)	FY (*kip*)	FZ (*kip*)	MX (*kip-in*)	MY (*kip-in*)	MZ (*kip-in*)
1	1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
131	2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
132	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
133	4	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

134	5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
135	6	0.30469E-13	0.36015E-14	0.79007	0.00000	0.00000	-1.21856
136	7	2.43579	0.67881	1.58012	0.00000	0.00000	-2.45455
137	8	3.89758	1.07705	1.58010	0.00000	0.00000	-2.43777
138	9	5.04516	1.24647	1.58008	0.00000	0.00000	-2.39409
139	10	5.79191	1.23745	1.58006	0.00000	0.00000	-2.33012
140	11	6.17070	1.09704	1.58004	0.00000	0.00000	-2.25199
141	12	6.02641	0.86694	1.58002	0.00000	0.00000	-2.16535
142	13	5.47932	0.58181	1.58000	0.00000	0.00000	-2.07538
143	14	4.39547	0.26833	1.57998	0.00000	0.00000	-1.98672
144	15	0.95670	-0.05538	1.57997	0.00000	0.00000	-1.90338
145	16	-4.14658	-0.37970	1.57995	0.00000	0.00000	-1.82868
146	17	-6.60521	-0.70307	1.57994	0.00000	0.00000	-1.76519
147	18	-8.17972	-1.03081	1.57993	0.00000	0.00000	-1.71469
148	19	-9.48401	-1.37276	1.57991	0.00000	0.00000	-1.67825
149	20	-10.62744	-1.73861	1.57990	0.00000	0.00000	-1.65630
150	21	-5.83034	-1.06805	76.51826	0.00000	0.00000	-0.82449

Pile #2

Node #	Local #	FX (*kip*)	FY (*kip*)	FZ (*kip*)	MX (*kip-in*)	MY (*kip-in*)	MZ (*kip-in*)
2	1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
151	2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
152	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
153	4	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
154	5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
155	6	0.26725E-13	0.35770E-14	0.82368	0.00000	0.00000	0.21530
156	7	2.70425	0.69443	1.64737	0.00000	0.00000	0.37835
157	8	4.06146	1.08639	1.64736	0.00000	0.00000	0.33279
158	9	5.08222	1.23531	1.64736	0.00000	0.00000	0.29318
159	10	5.69010	1.19893	1.64736	0.00000	0.00000	0.25887
160	11	5.84776	1.03087	1.64736	0.00000	0.00000	0.22926
161	12	5.65923	0.77833	1.64736	0.00000	0.00000	0.20385
162	13	5.18093	0.48020	1.64736	0.00000	0.00000	0.18220
163	14	4.31682	0.16586	1.64736	0.00000	0.00000	0.16392
164	15	1.78426	-0.14504	1.64736	0.00000	0.00000	0.14870
165	16	-1.58426	-0.44218	1.64736	0.00000	0.00000	0.13625
166	17	-4.76813	-0.72372	1.64736	0.00000	0.00000	0.12637
167	18	-6.07256	-0.99472	1.64736	0.00000	0.00000	0.11886
168	19	-7.09735	-1.26487	1.64736	0.00000	0.00000	0.11359
169	20	-7.97307	-1.54565	1.64736	0.00000	0.00000	0.11046
170	21	-4.37828	-0.92328	106.62991	0.00000	0.00000	0.05471

Pile #3

Node #	Local #	FX (*kip*)	FY (*kip*)	FZ (*kip*)	MX (*kip-in*)	MY (*kip-in*)	MZ (*kip-in*)

3	1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
171	2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
172	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
173	4	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
174	5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
175	6	0.26631E-13	0.35667E-14	0.82428	0.00000	0.00000	0.19413
176	7	2.70601	0.69224	1.64856	0.00000	0.00000	0.34102
177	8	4.05899	1.08259	1.64856	0.00000	0.00000	0.29986
178	9	5.07543	1.23046	1.64856	0.00000	0.00000	0.26409
179	10	5.67917	1.19352	1.64856	0.00000	0.00000	0.23312
180	11	5.83061	1.02534	1.64856	0.00000	0.00000	0.20641
181	12	5.64026	0.77304	1.64856	0.00000	0.00000	0.18349
182	13	5.16046	0.47546	1.64856	0.00000	0.00000	0.16397
183	14	4.29501	0.16196	1.64856	0.00000	0.00000	0.14750
184	15	1.75110	-0.14788	1.64856	0.00000	0.00000	0.13379
185	16	-1.59657	-0.44369	1.64856	0.00000	0.00000	0.12258
186	17	-4.76152	-0.72354	1.64856	0.00000	0.00000	0.11367
187	18	-6.05680	-0.99236	1.64856	0.00000	0.00000	0.10691
188	19	-7.07423	-1.25970	1.64856	0.00000	0.00000	0.10216
189	20	-7.94337	-1.53693	1.64856	0.00000	0.00000	0.09935
190	21	-4.36051	-0.91683	112.52636	0.00000	0.00000	0.04921

Pile #4

Node #	Local #	FX (*kip*)	FY (*kip*)	FZ (*kip*)	MX (*kip-in*)	MY (*kip-in*)	MZ (*kip-in*)
4	1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
191	2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
192	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
193	4	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
194	5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
195	6	0.23517E-13	0.34520E-14	0.79806	0.00000	0.00000	1.47923
196	7	2.59637	0.64916	1.59612	0.00000	0.00000	2.90787
197	8	3.77644	1.02715	1.59612	0.00000	0.00000	2.83397
198	9	4.66443	1.18459	1.59612	0.00000	0.00000	2.74199
199	10	5.20618	1.17067	1.59612	0.00000	0.00000	2.63698
200	11	5.34139	1.03124	1.59612	0.00000	0.00000	2.52384
201	12	5.24768	0.80695	1.59612	0.00000	0.00000	2.40728
202	13	4.96392	0.53156	1.59612	0.00000	0.00000	2.29178
203	14	4.47589	0.23096	1.59612	0.00000	0.00000	2.18139
204	15	3.56617	-0.07739	1.59612	0.00000	0.00000	2.07971
205	16	1.59526	-0.38410	1.59612	0.00000	0.00000	1.98973
206	17	-0.39927	-0.68700	1.59612	0.00000	0.00000	1.91379
207	18	-2.40966	-0.99001	1.59612	0.00000	0.00000	1.85358
208	19	-4.04742	-1.30125	1.59612	0.00000	0.00000	1.81014
209	20	-4.74841	-1.63062	1.59612	0.00000	0.00000	1.78400
210	21	-2.66576	-0.99336	116.18296	0.00000	0.00000	0.88764

Pile Internal Forces

Pile #1

Elem #	Node #	AXIAL (kip)	SHEAR-2 (kip)	SHEAR-3 (kip)	MOMENT-2 (kip-ft)	MOMENT-3 (kip-ft)	TORQUE (kip-ft)	FAILURE RATIO
130	1	-92.21024	-1.08694	-0.70568	0.55141E-12	0.14784E-11	-0.23871	0.10662
	131	93.96252	1.08694	0.70568	-6.34844	2.94564	0.23871	0.10662
131	131	-94.07943	-1.08693	-0.70586	6.34917	-2.94616	-0.23871	0.10822
	132	95.37375	1.08693	0.70586	-12.63013	5.77435	0.23871	0.12199
132	132	-95.37622	-1.08677	-0.70570	12.63041	-5.77408	-0.23871	0.12316
	133	96.67053	1.08677	0.70570	-18.72806	8.44671	0.23871	0.14030
133	133	-95.45625	8.28475	-0.70487	18.72978	-8.44601	-0.23871	0.14037
	134	96.75057	-8.28475	0.70487	-24.50840	-50.88732	0.23871	0.26894
134	134	-96.75045	8.28404	-0.70558	24.50887	50.88601	-0.23871	0.26934
	135	98.04477	-8.28404	0.70558	-29.87251	-109.36804	0.23871	0.51784
135	135	-97.50761	8.17566	-0.70556	29.85578	109.36826	-0.10799	0.51792
	136	97.61602	-8.17566	0.70556	-30.28213	-114.13355	0.10799	0.53941
136	136	-96.27449	5.54579	-0.02676	30.25456	114.13369	0.10391	0.53967
	137	96.38290	-5.54579	0.02676	-30.30018	-117.42316	-0.10391	0.55388
137	137	-95.23941	1.46764	1.05029	30.27871	117.42327	0.26957	0.55410
	138	95.34782	-1.46764	-1.05029	-29.72288	-118.43401	-0.26957	0.55704
138	138	-94.36111	-3.74731	2.29674	29.70691	118.43405	0.39207	0.55723
	139	94.46952	3.74731	-2.29674	-28.45585	-116.53605	-0.39207	0.54599
139	139	-93.58741	-9.70199	3.53406	28.44511	116.53618	0.47465	0.54616
	140	93.69582	9.70199	-3.53406	-26.50414	-111.31986	-0.47465	0.51901
140	140	-92.86977	-16.03151	4.63152	26.49810	111.31993	0.52094	0.51918
	141	92.97818	16.03151	-4.63152	-23.94509	-102.57837	-0.52094	0.47543
141	141	-92.14058	-22.21635	5.49844	23.94323	102.57844	0.53506	0.47561
	142	92.24899	22.21635	-5.49844	-20.90642	-90.39314	-0.53506	0.41652
142	142	-91.34684	-27.85785	6.07993	20.90816	90.39320	0.52153	0.41661
	143	91.45525	27.85785	-6.07993	-17.54626	-75.06710	-0.52153	0.34456
143	143	-90.42058	-32.42418	6.34824	17.55099	75.06722	0.48509	0.34469
	144	90.52899	32.42418	-6.34824	-14.03814	-57.19849	-0.48509	0.26482
144	144	-89.05568	-33.58058	6.29227	14.04511	57.19858	0.43064	0.26475
	145	89.16409	33.58058	-6.29227	-10.56158	-38.68025	-0.43064	0.19258
145	145	-87.03728	-29.67556	5.91230	10.57041	38.68021	0.36296	0.19163
	146	87.14569	29.67556	-5.91230	-7.29632	-22.32112	-0.36296	0.13890
146	146	-84.70399	-23.33688	5.20978	7.30613	22.32108	0.28666	0.13693
	147	84.81240	23.33688	-5.20978	-4.42078	-9.47267	-0.28666	0.10373
147	147	-82.17153	-15.42844	4.17983	4.43037	9.47124	0.20584	0.10138
	148	82.27994	15.42844	-4.17983	-2.11572	-1.00542	-0.20584	0.09336
148	148	-79.48081	-6.22945	2.80666	2.12649	1.00548	0.12349	0.09031
	149	79.58922	6.22945	-2.80666	-0.57315	2.36130	-0.12349	0.09031
149	149	-76.64765	4.10347	1.06804	0.58386	-2.36130	0.04109	0.08709
	150	76.75606	-4.10347	-1.06804	0.00534	0.00000	-0.04109	0.08709

Pile #2

Elem #	Node #	AXIAL (kip)	SHEAR-2 (kip)	SHEAR-3 (kip)	MOMENT-2 (kip-ft)	MOMENT-3 (kip-ft)	TORQUE (kip-ft)	FAILURE RATIO
150	2	-122.09236	-0.99857	-0.62942	-0.00072	0.00023	-0.25556	0.14052
	151	123.84073	0.99857	0.62942	-6.40767	0.74918	0.25556	0.14052
151	151	-123.95811	-0.99864	-0.63073	6.41108	-0.74959	-0.25556	0.14212
	152	125.25243	0.99864	0.63073	-12.70735	1.40784	0.25556	0.14641
152	152	-125.25428	-0.99867	-0.63074	12.70750	-1.40793	-0.25556	0.14762
	153	126.54860	0.99867	0.63074	-18.72682	1.97250	0.25556	0.16100
153	153	-126.55679	8.45044	-0.63140	18.72591	-1.97265	-0.25556	0.16226
	154	127.85110	-8.45044	0.63140	-24.32379	-59.34672	0.25556	0.30807
154	154	-127.85503	8.45133	-0.63096	24.32266	59.34811	-0.25556	0.30870
	155	129.14935	-8.45133	0.63096	-29.35634	-119.32002	0.25556	0.55298
155	155	-128.61790	8.45151	-0.63076	29.35627	119.32055	-0.23762	0.55303
	156	128.73086	-8.45151	0.63076	-29.76430	-124.44241	0.23762	0.57545
156	156	-127.07445	5.74781	0.06362	29.76448	124.44229	-0.20609	0.57564
	157	127.18740	-5.74781	-0.06362	-29.76870	-127.98909	0.20609	0.59054
157	157	-125.53078	1.68699	1.15001	29.76869	127.98903	-0.17835	0.59073
	158	125.64373	-1.68699	-1.15001	-29.14458	-129.18299	0.17835	0.59436
158	158	-123.98708	-3.39457	2.38533	29.14458	129.18293	-0.15392	0.59464
	159	124.10003	3.39457	-2.38533	-27.80703	-127.43947	0.15392	0.58419
159	159	-122.44324	-9.08414	3.58440	27.80704	127.43942	-0.13235	0.58441
	160	122.55619	9.08414	-3.58440	-25.77719	-122.41102	0.13235	0.55867
160	160	-120.89906	-14.93142	4.61520	25.77724	122.41091	-0.11324	0.55885
	161	121.01201	14.93142	-4.61520	-23.15198	-114.00864	0.11324	0.51766
161	161	-119.35461	-20.59017	5.39357	23.15199	114.00850	-0.09626	0.51784
	162	119.46756	20.59017	-5.39357	-20.07656	-102.34239	0.09626	0.46191
162	162	-117.80988	-25.77066	5.87385	20.07656	102.34224	-0.08107	0.46209
	163	117.92283	25.77066	-5.87385	-16.72239	-87.68883	0.08107	0.39443
163	163	-116.26539	-30.08693	6.03878	16.72204	87.68872	-0.06741	0.39436
	164	116.37834	30.08693	-6.03878	-13.27049	-70.54610	0.06741	0.32023
164	164	-114.72041	-31.87166	5.89449	13.27012	70.54596	-0.05502	0.31965
	165	114.83336	31.87166	-5.89449	-9.89901	-52.36799	0.05502	0.24988
165	165	-113.17402	-30.28798	5.45235	9.89896	52.36775	-0.04367	0.24916
	166	113.28698	30.28798	-5.45235	-6.77957	-35.08790	0.04367	0.19251
166	166	-111.62767	-25.52102	4.72874	6.77951	35.08759	-0.03314	0.19129
	167	111.74063	25.52102	-4.72874	-4.07367	-20.53298	0.03314	0.15282
167	167	-110.08087	-19.44968	3.73338	4.07377	20.53253	-0.02323	0.15134
	168	110.19382	19.44968	-3.73338	-1.93765	-9.45305	0.02323	0.12549
168	168	-108.54317	-12.34031	2.46869	1.93706	9.45226	-0.01376	0.12404
	169	108.65613	12.34031	-2.46869	-0.52535	-2.44454	0.01376	0.12329
169	169	-107.00769	-4.37789	0.92329	0.52623	2.44606	-0.00456	0.12155
	170	107.12064	4.37789	-0.92329	0.00000	0.00000	0.00456	0.12155

Pile #3

Elem #	Node #	AXIAL (kip)	SHEAR-2 (kip)	SHEAR-3 (kip)	MOMENT-2 (kip-ft)	MOMENT-3 (kip-ft)	TORQUE (kip-ft)	FAILURE RATIO

170	3	-128.24349	-1.04723	-0.61340	0.00016	0.00015	-0.23011	0.14750
	171	129.99186	1.04723	0.61340	-6.44633	0.77969	0.23011	0.14750
171	171	-130.10668	-1.04735	-0.61362	6.44678	-0.77987	-0.23011	0.14910
	172	131.40100	1.04735	0.61362	-12.75768	1.46672	0.23011	0.15231
172	172	-131.40213	-1.04763	-0.61355	12.75794	-1.46643	-0.23011	0.15353
	173	132.69644	1.04763	0.61355	-18.76696	2.05791	0.23011	0.16689
173	173	-132.70179	8.40175	-0.61387	18.76569	-2.05591	-0.23011	0.16809
	174	133.99611	-8.40175	0.61387	-24.32102	-59.22675	0.23011	0.31067
174	174	-133.99766	8.40254	-0.61376	24.32075	59.22736	-0.23011	0.31130
	175	135.29198	-8.40254	0.61376	-29.28350	-119.08936	0.23011	0.55111
175	175	-134.75854	8.40248	-0.61358	29.28360	119.08956	-0.21393	0.55116
	176	134.87149	-8.40248	0.61358	-29.68393	-124.19613	0.21393	0.57351
176	176	-133.21111	5.69697	0.07859	29.68392	124.19603	-0.18551	0.57369
	177	133.32407	-5.69697	-0.07859	-29.68145	-127.72538	0.18551	0.58851
177	177	-131.66401	1.63846	1.16077	29.68130	127.72543	-0.16052	0.58869
	178	131.77696	-1.63846	-1.16077	-29.05264	-128.90212	0.16052	0.59222
178	178	-130.11675	-3.43622	2.39162	29.05258	128.90206	-0.13851	0.59240
	179	130.22970	3.43622	-2.39162	-27.71280	-127.14414	0.13851	0.58200
179	179	-128.56923	-9.11476	3.58514	27.71286	127.14396	-0.11909	0.58219
	180	128.68218	9.11476	-3.58514	-25.68373	-122.10630	0.11909	0.55646
180	180	-127.02146	-14.94550	4.61050	25.68365	122.10622	-0.10189	0.55664
	181	127.13441	14.94550	-4.61050	-23.06202	-113.70311	0.10189	0.51546
181	181	-125.47341	-20.58484	5.38341	23.06199	113.70296	-0.08660	0.51564
	182	125.58636	20.58484	-5.38341	-19.99311	-102.04614	0.08660	0.45977
182	182	-123.92513	-25.74525	5.85928	19.99305	102.04592	-0.07293	0.45995
	183	124.03808	25.74525	-5.85928	-16.64779	-87.41242	0.07293	0.39343
183	183	-122.37693	-30.03931	6.02093	16.64776	87.41233	-0.06064	0.39336
	184	122.48988	30.03931	-6.02093	-13.20687	-70.30159	0.06064	0.32155
184	184	-120.82855	-31.79073	5.87305	13.20685	70.30146	-0.04949	0.32096
	185	120.94150	31.79073	-5.87305	-9.84834	-52.17385	0.04949	0.25206
185	185	-119.27980	-30.19451	5.42896	9.84814	52.17367	-0.03928	0.25126
	186	119.39275	30.19451	-5.42896	-6.74239	-34.95089	0.03928	0.19688
186	186	-117.73041	-25.43385	4.70587	6.74216	34.95063	-0.02980	0.19566
	187	117.84336	25.43385	-4.70587	-4.04960	-20.44915	0.02980	0.15826
187	187	-116.18062	-19.37813	3.71361	4.04954	20.44880	-0.02089	0.15687
	188	116.29357	19.37813	-3.71361	-1.92489	-9.41329	0.02089	0.13196
188	188	-114.63311	-12.30306	2.45494	1.92530	9.41287	-0.01238	0.13020
	189	114.74607	12.30306	-2.45494	-0.52158	-2.42935	0.01238	0.13020
189	189	-113.09371	-4.36012	0.91683	0.52242	2.43306	-0.00410	0.12846
	190	113.20666	4.36012	-0.91683	0.00000	0.00000	0.00410	0.12846

Pile #4

Elem #	Node #	AXIAL (*kip*)	SHEAR-2 (*kip*)	SHEAR-3 (*kip*)	MOMENT-2 (*kip-ft*)	MOMENT-3 (*kip-ft*)	TORQUE (*kip-ft*)	FAILURE RATIO
190	4	-135.97980	-0.98447	-0.56889	-0.00021	0.00006	-0.23871	0.15628
	191	137.73208	0.98447	0.56889	-6.36016	-0.11574	0.23871	0.14393

191	191	-137.84268	-0.98460	-0.56860	6.36061	0.11503	-0.23871	0.14526
	192	139.13699	0.98460	0.56860	-12.56379	-0.30249	0.23871	0.15879
192	192	-139.13648	-0.98476	-0.56858	12.56379	0.30260	-0.23871	0.16007
	193	140.43079	0.98476	0.56858	-18.43480	-0.54295	0.23871	0.17291
193	193	-141.65077	8.38564	-0.56875	18.43226	0.54485	-0.23871	0.17525
	194	142.94509	-8.38564	0.56875	-23.82586	-62.62212	0.23871	0.32496
194	194	-142.94325	8.38631	-0.56870	23.82592	62.62226	-0.23871	0.32559
	195	144.23756	-8.38631	0.56870	-28.58532	-123.04808	0.23871	0.56507
195	195	-143.71926	8.49245	-0.56881	28.57260	123.04797	-0.33349	0.56509
	196	143.82767	-8.49245	0.56881	-28.93801	-128.04089	0.33349	0.58692
196	196	-141.86128	6.12996	0.08059	28.91849	128.04074	-0.48327	0.58709
	197	141.96969	-6.12996	-0.08059	-28.91761	-131.69542	0.48327	0.60248
197	197	-139.85073	2.59780	1.10761	28.90294	131.69546	-0.59512	0.60268
	198	139.95914	-2.59780	-1.10761	-28.32643	-133.36289	0.59512	0.60844
198	198	-137.72507	-1.81475	2.29230	28.31655	133.36282	-0.67091	0.60867
	199	137.83348	1.81475	-2.29230	-27.07720	-132.55496	0.67091	0.60255
199	199	-135.52900	-6.76485	3.46260	27.07168	132.55493	-0.71286	0.60280
	200	135.63741	6.76485	-3.46260	-25.17784	-128.97449	0.71286	0.58359
200	200	-133.31472	-11.84842	4.49419	25.17629	128.97432	-0.72374	0.58385
	201	133.42312	11.84842	-4.49419	-22.70539	-122.54869	0.72374	0.55142
201	201	-131.11180	-16.84008	5.30126	22.70758	122.54847	-0.70686	0.55168
	202	131.22021	16.84008	-5.30126	-19.78474	-113.33058	0.70686	0.50654
202	202	-128.94518	-21.54954	5.83254	19.79003	113.33059	-0.66605	0.50680
	203	129.05359	21.54954	-5.83254	-16.56885	-101.47932	0.66605	0.45066
203	203	-126.84087	-25.77514	6.06430	16.57667	101.47914	-0.60550	0.45060
	204	126.94928	25.77514	-6.06430	-13.22395	-87.26558	0.60550	0.38611
204	204	-124.85368	-29.09847	5.98639	13.23390	87.26549	-0.52954	0.38607
	205	124.96209	29.09847	-5.98639	-9.92205	-71.19306	0.52954	0.32015
205	205	-123.12035	-30.46809	5.60220	9.93342	71.19293	-0.44236	0.31949
	206	123.22876	30.46809	-5.60220	-6.83292	-54.34839	0.44236	0.25592
206	206	-121.64365	-29.85978	4.91512	6.84519	54.34823	-0.34785	0.25506
	207	121.75206	29.85978	-4.91512	-4.12458	-37.83173	0.34785	0.20360
207	207	-120.42581	-27.25766	3.92507	4.13732	37.83154	-0.24936	0.20264
	208	120.53422	27.25766	-3.92507	-1.96512	-22.75182	0.24936	0.16435
208	208	-119.41875	-23.03225	2.62378	1.97799	22.75158	-0.14947	0.16348
	209	119.52716	23.03225	-2.62378	-0.52717	-10.01154	0.14947	0.13563
209	209	-118.50299	-18.11156	0.99337	0.54019	10.01130	-0.04972	0.13459
	210	118.61140	18.11156	-0.99337	0.00646	0.00137	0.04972	0.13459

Stucture Internal Forces

COLUMN #1

Elem # Node #

COLUMN #2

Elem # Node #

COLUMN #3

Elem #	Node #

COLUMN #4

Elem #	Node #

PIER_CAP

Elem #	Node #	AXIAL (*kip*)	SHEAR-2 (*kip*)	SHEAR-3 (*kip*)	MOMENT-2 (*kip-ft*)	MOMENT-3 (*kip-ft*)	TORQUE (*kip-ft*)	FAILURE RATIO
1	5	0.00000	6.86000	-0.06998	0.00000	-0.00001	-0.13097E-09	0.00000
	6	0.00000	-7.23109	0.06998	0.01944	1.95711	-0.13097E-09	0.00000
2	6	0.00000	7.23109	-0.06998	-0.01944	-1.95711	-0.13946E-09	0.00000
	7	0.00000	-7.60219	0.06998	0.03888	4.01729	-0.13946E-09	0.00000
3	7	0.00000	7.60219	-0.06998	-0.03888	-4.01729	-0.13521E-09	0.00000
	8	0.00000	-7.97328	0.06998	0.05831	6.18055	-0.13521E-09	0.00000
4	8	0.00000	7.97328	-0.06998	-0.05831	-6.18055	-0.92162E-10	0.00000
	9	0.00000	-8.19594	0.06998	0.06998	7.52798	-0.92162E-10	0.00000
5	9	0.00000	15.05594	-0.13990	-0.06998	-7.52803	0.29407E-10	0.00000
	10	0.00000	-15.57547	0.13990	0.12438	13.48413	0.29407E-10	0.00000
6	10	0.00000	15.57547	-0.13990	-0.12438	-13.48413	0.10914E-10	0.00000
	11	0.00000	-15.94656	0.13990	0.16324	17.86219	0.10914E-10	0.00000
7	11	0.00000	15.94656	-0.13990	-0.16324	-17.86219	0.12127E-10	0.00000
	12	0.00000	-16.39187	0.13990	0.20988	23.25193	0.12127E-10	0.00000
8	12	0.00000	23.25188	-0.20987	-0.20988	-23.25187	-0.23465E-09	0.00000
	13	0.00000	-23.54875	0.20987	0.25651	28.45194	-0.23465E-09	0.00000
9	13	0.00000	23.54875	-0.20987	-0.25651	-28.45194	-0.23404E-09	0.00000
	1	0.00000	-23.91984	0.20987	0.31481	35.04480	-0.23404E-09	0.00000
10	1	14.56205	-67.81520	0.49565	-0.55153	-35.04480	-0.03077	0.00000
	14	-14.56205	67.43608	-0.49565	0.41087	15.85374	-0.03077	0.00000
11	14	14.56205	-67.43608	0.49565	-0.41087	-15.85374	-0.03077	0.00000
	15	-14.56205	67.14723	-0.49565	0.30371	1.30419	-0.03077	0.00000
12	15	14.56205	-60.28723	0.42571	-0.30371	-1.30416	-0.03077	0.00000
	16	-14.56205	59.81785	-0.42571	0.15413	-19.79538	-0.03077	0.00000
13	16	14.56205	-59.81785	0.42571	-0.15413	19.79538	-0.03077	0.00000
	17	-14.56205	59.43873	-0.42571	0.03332	-36.71692	-0.03077	0.00000
14	17	14.56205	-59.43873	0.42571	-0.03332	36.71692	-0.03077	0.00000
	18	-14.56205	58.95129	-0.42571	-0.12201	-58.31510	-0.03077	0.00000
15	18	14.56205	-52.09129	0.35578	0.12201	58.31507	-0.03077	0.00000
	19	-14.56205	51.82049	-0.35578	-0.19412	-68.84667	-0.03077	0.00000
16	19	14.56205	-51.82049	0.35578	0.19412	68.84667	-0.03077	0.00000
	20	-14.56205	51.44138	-0.35578	-0.29509	-83.49869	-0.03077	0.00000
17	20	14.56205	-51.44138	0.35578	0.29509	83.49869	-0.03077	0.00000
	21	-14.56205	51.06226	-0.35578	-0.39606	-98.04313	-0.03077	0.00000
18	21	14.56205	-51.06226	0.35578	0.39606	98.04313	-0.03077	0.00000
	22	-14.56205	50.75536	-0.35578	-0.47779	-109.73840	-0.03077	0.00000
19	22	14.56205	-43.89535	0.28586	0.47779	109.73835	-0.03077	0.00000

	23	-14.56205	43.44402	-0.28586	-0.57436	-124.49162	-0.03077	0.00000
20	23	14.56205	-43.44402	0.28586	0.57436	124.49162	-0.03077	0.00000
	24	-14.56205	43.06491	-0.28586	-0.65549	-136.76653	-0.03077	0.00000
21	24	14.56205	-43.06491	0.28586	0.65549	136.76653	-0.03077	0.00000
	25	-14.56205	42.55942	-0.28586	-0.76365	-152.96573	-0.03077	0.00000
22	25	14.56205	-35.69942	0.21593	0.76365	152.96577	-0.03077	0.00000
	26	-14.56205	35.44667	-0.21593	-0.80450	-159.69580	-0.03077	0.00000
23	26	14.56205	-35.44667	0.21593	0.80450	159.69580	-0.03077	0.00000
	27	-14.56205	35.06756	-0.21593	-0.86578	-169.70120	-0.03077	0.00000
24	27	14.56205	-35.06756	0.21593	0.86578	169.70120	-0.03077	0.00000
	28	-14.56205	34.68844	-0.21593	-0.92705	-179.59901	-0.03077	0.00000
25	28	14.56205	-34.68844	0.21593	0.92705	179.59901	-0.03077	0.00000
	29	-14.56205	34.36348	-0.21593	-0.97957	-187.99722	-0.03077	0.00000
26	29	14.56205	-27.50348	0.14599	0.97957	187.99717	-0.03077	0.00000
	30	-14.56205	27.07020	-0.14599	-1.02692	-196.84695	-0.03077	0.00000
27	30	14.56205	-27.07020	0.14599	1.02692	196.84695	-0.03077	0.00000
	31	-14.56205	26.69109	-0.14599	-1.06835	-204.47524	-0.03077	0.00000
28	31	14.56205	-26.69109	0.14599	1.06835	204.47524	-0.03077	0.00000
	32	-14.56205	26.16754	-0.14599	-1.12556	-214.83268	-0.03077	0.00000
29	32	14.56205	-19.30754	0.07599	1.12556	214.83268	-0.03077	0.00000
	33	-14.56205	19.07285	-0.07599	-1.13891	-218.20393	-0.03077	0.00000
30	33	14.56205	-19.07285	0.07599	1.13891	218.20393	-0.03077	0.00000
	34	-14.56205	18.69373	-0.07599	-1.16048	-223.56270	-0.03077	0.00000
31	34	14.56205	-18.69373	0.07599	1.16048	223.56270	-0.03077	0.00000
	35	-14.56205	18.31462	-0.07599	-1.18204	-228.81389	-0.03077	0.00000
32	35	14.56205	-18.31462	0.07599	1.18204	228.81389	-0.03077	0.00000
	36	-14.56205	17.97161	-0.07599	-1.20155	-233.47225	-0.03077	0.00000
33	36	14.56205	-11.11161	0.00598	1.20155	233.47214	-0.03077	0.00000
	37	-14.56205	10.69638	-0.00598	-1.20341	-236.86122	-0.03077	0.00000
34	37	14.56205	-10.69638	0.00598	1.20341	236.86122	-0.03077	0.00000
	38	-14.56205	10.31726	-0.00598	-1.20511	-239.84288	-0.03077	0.00000
35	38	14.56205	-10.31726	0.00598	1.20511	239.84288	-0.03077	0.00000
	39	-14.56205	9.77567	-0.00598	-1.20753	-243.91577	-0.03077	0.00000
36	39	14.56205	-2.91567	-0.06404	1.20753	243.91569	-0.03077	0.00000
	40	-14.56205	2.69903	0.06404	-1.19715	-244.37093	-0.03077	0.00000
37	40	14.56205	-2.69903	-0.06404	1.19715	244.37093	-0.03077	0.00000
	41	-14.56205	2.31991	0.06404	-1.17898	-245.08308	-0.03077	0.00000
38	41	14.56205	-2.31991	-0.06404	1.17898	245.08308	-0.03077	0.00000
	42	-14.56205	1.94079	0.06404	-1.16080	-245.68764	-0.03077	0.00000
39	42	14.56205	-1.94079	-0.06404	1.16080	245.68764	-0.03077	0.00000
	43	-14.56205	1.57973	0.06404	-1.14350	-246.16339	-0.03077	0.00000
40	43	14.56205	13.25027	-0.13404	1.14350	246.16332	-0.03077	0.00000
	44	-14.56205	-13.64744	0.13404	-1.10365	-242.16502	-0.03077	0.00000
41	44	14.56205	13.64744	-0.13404	1.10365	242.16502	-0.03077	0.00000
	45	-14.56205	-14.02656	0.13404	-1.06561	-238.23830	-0.03077	0.00000
42	45	14.56205	14.02656	-0.13404	1.06561	238.23830	-0.03077	0.00000

	46	-14.56205	-14.58621	0.13404	-1.00946	-232.24509	-0.03077	0.00000
43	46	14.56205	29.41621	-0.20398	1.00946	232.24502	-0.03077	0.00000
	47	-14.56205	-29.61479	0.20398	-0.97913	-227.85758	-0.03077	0.00000
44	47	14.56205	29.61479	-0.20398	0.97913	227.85758	-0.03077	0.00000
	48	-14.56205	-29.99391	0.20398	-0.92125	-219.39959	-0.03077	0.00000
45	48	14.56205	29.99391	-0.20398	0.92125	219.39959	-0.03077	0.00000
	49	-14.56205	-30.37303	0.20398	-0.86336	-210.83401	-0.03077	0.00000
46	49	14.56205	30.37303	-0.20398	0.86336	210.83401	-0.03077	0.00000
	2	-14.56205	-30.75214	0.20398	-0.80547	-202.16084	-0.03077	0.00000
47	2	15.56029	-76.96635	0.35690	0.54992	202.16081	-0.03077	0.00000
	50	-15.56029	76.60529	-0.35690	-0.64638	-222.91373	-0.03077	0.00000
48	50	15.56029	-76.60529	0.35690	0.64638	222.91373	-0.03077	0.00000
	51	-15.56029	76.24423	-0.35690	-0.74284	-243.56907	-0.03077	0.00000
49	51	15.56029	-76.24423	0.35690	0.74284	243.56907	-0.03077	0.00000
	52	-15.56029	75.88316	-0.35690	-0.83930	-264.12683	-0.03077	0.00000
50	52	15.56029	-75.88316	0.35690	0.83930	264.12683	-0.03077	0.00000
	53	-15.56029	75.63042	-0.35690	-0.90682	-278.45919	-0.03077	0.00000
51	53	15.56029	-60.80042	0.28693	0.90682	278.45916	-0.03077	0.00000
	54	-15.56029	60.33103	-0.28693	-1.00763	-299.73901	-0.03077	0.00000
52	54	15.56029	-60.33103	0.28693	1.00763	299.73901	-0.03077	0.00000
	55	-15.56029	59.96997	-0.28693	-1.08518	-315.99590	-0.03077	0.00000
53	55	15.56029	-59.96997	0.28693	1.08518	315.99590	-0.03077	0.00000
	56	-15.56029	59.46448	-0.28693	-1.19375	-338.59161	-0.03077	0.00000
54	56	15.56029	-44.63448	0.21695	1.19375	338.59156	-0.03077	0.00000
	57	-15.56029	44.41784	-0.21695	-1.22893	-345.81201	-0.03077	0.00000
55	57	15.56029	-44.41784	0.21695	1.22893	345.81201	-0.03077	0.00000
	58	-15.56029	44.05678	-0.21695	-1.28756	-357.76804	-0.03077	0.00000
56	58	15.56029	-44.05678	0.21695	1.28756	357.76804	-0.03077	0.00000
	59	-15.56029	43.69571	-0.21695	-1.34620	-369.62649	-0.03077	0.00000
57	59	15.56029	-43.69571	0.21695	1.34620	369.62649	-0.03077	0.00000
	60	-15.56029	43.29854	-0.21695	-1.41070	-382.55807	-0.03077	0.00000
58	60	15.56029	-28.46854	0.14696	1.41070	382.55806	-0.03077	0.00000
	61	-15.56029	28.14358	-0.14696	-1.44644	-389.44332	-0.03077	0.00000
59	61	15.56029	-28.14358	0.14696	1.44644	389.44332	-0.03077	0.00000
	62	-15.56029	27.78252	-0.14696	-1.48616	-397.00090	-0.03077	0.00000
60	62	15.56029	-27.78252	0.14696	1.48616	397.00090	-0.03077	0.00000
	63	-15.56029	27.42146	-0.14696	-1.52588	-404.46090	-0.03077	0.00000
61	63	15.56029	-27.42146	0.14696	1.52588	404.46090	-0.03077	0.00000
	64	-15.56029	27.13261	-0.14696	-1.55766	-410.35863	-0.03077	0.00000
62	64	15.56029	-12.30261	0.07703	1.55766	410.35856	-0.03077	0.00000
	65	-15.56029	11.86933	-0.07703	-1.58264	-414.27833	-0.03077	0.00000
63	65	15.56029	-11.86933	0.07703	1.58264	414.27833	-0.03077	0.00000
	66	-15.56029	11.50826	-0.07703	-1.60346	-417.43746	-0.03077	0.00000
64	66	15.56029	-11.50826	0.07703	1.60346	417.43746	-0.03077	0.00000
	67	-15.56029	10.96667	-0.07703	-1.63469	-421.99319	-0.03077	0.00000
65	67	15.56029	-10.96667	0.07707	1.63469	421.99316	-0.03077	0.00000

	68	-15.56029	10.78614	-0.07707	-1.64511	-423.46294	-0.03077	0.00000
66	68	15.56029	4.04386	0.00707	1.64511	423.46294	-0.03077	0.00000
	69	-15.56029	-4.40493	-0.00707	-1.64702	-422.32121	-0.03077	0.00000
67	69	15.56029	4.40493	0.00707	1.64702	422.32121	-0.03077	0.00000
	70	-15.56029	-4.76599	-0.00707	-1.64893	-421.08190	-0.03077	0.00000
68	70	15.56029	4.76599	0.00707	1.64893	421.08190	-0.03077	0.00000
	71	-15.56029	-5.19927	-0.00707	-1.65122	-419.46591	-0.03077	0.00000
69	71	15.56029	20.02927	-0.06288	1.65122	419.46586	-0.03077	0.00000
	72	-15.56029	-20.31812	0.06288	-1.63763	-415.10398	-0.03077	0.00000
70	72	15.56029	20.31812	-0.06288	1.63763	415.10398	-0.03077	0.00000
	73	-15.56029	-20.67919	0.06288	-1.62063	-409.56380	-0.03077	0.00000
71	73	15.56029	20.67919	-0.06288	1.62063	409.56380	-0.03077	0.00000
	74	-15.56029	-21.04025	0.06288	-1.60364	-403.92604	-0.03077	0.00000
72	74	15.56029	21.04025	-0.06288	1.60364	403.92604	-0.03077	0.00000
	75	-15.56029	-21.36521	0.06288	-1.58834	-398.76862	-0.03077	0.00000
73	75	15.56029	36.19521	-0.13287	1.58834	398.76856	-0.03077	0.00000
	76	-15.56029	-36.59238	0.13287	-1.54884	-387.94878	-0.03077	0.00000
74	76	15.56029	36.59238	-0.13287	1.54884	387.94878	-0.03077	0.00000
	77	-15.56029	-36.95344	0.13287	-1.51293	-378.01015	-0.03077	0.00000
75	77	15.56029	36.95344	-0.13287	1.51293	378.01015	-0.03077	0.00000
	78	-15.56029	-37.31451	0.13287	-1.47702	-367.97395	-0.03077	0.00000
76	78	15.56029	37.31451	-0.13287	1.47702	367.97395	-0.03077	0.00000
	79	-15.56029	-37.53114	0.13287	-1.45547	-361.90538	-0.03077	0.00000
77	79	15.56029	52.36114	-0.20283	1.45547	361.90533	-0.03077	0.00000
	80	-15.56029	-52.86663	0.20283	-1.37872	-341.99737	-0.03077	0.00000
78	80	15.56029	52.86663	-0.20283	1.37872	341.99737	-0.03077	0.00000
	81	-15.56029	-53.22770	0.20283	-1.32390	-327.66030	-0.03077	0.00000
79	81	15.56029	53.22770	-0.20283	1.32390	327.66030	-0.03077	0.00000
	82	-15.56029	-53.69708	0.20283	-1.25264	-308.87621	-0.03077	0.00000
80	82	15.56029	60.55708	-0.27278	1.25264	308.87614	-0.03077	0.00000
	83	-15.56029	-60.80983	0.27278	-1.20103	-297.39549	-0.03077	0.00000
81	83	15.56029	60.80983	-0.27278	1.20103	297.39549	-0.03077	0.00000
	84	-15.56029	-61.17089	0.27278	-1.12731	-280.91161	-0.03077	0.00000
82	84	15.56029	61.17089	-0.27278	1.12731	280.91161	-0.03077	0.00000
	85	-15.56029	-61.53195	0.27278	-1.05358	-264.33014	-0.03077	0.00000
83	85	15.56029	61.53195	-0.27278	1.05358	264.33014	-0.03077	0.00000
	3	-15.56029	-61.89302	0.27278	-0.97986	-247.65109	-0.03077	0.00000
84	3	16.60774	-51.96314	0.27096	0.74975	247.65106	-0.03077	0.00000
	86	-16.60774	51.58402	-0.27096	-0.82665	-262.34356	-0.03077	0.00000
85	86	16.60774	-51.58402	0.27096	0.82665	262.34356	-0.03077	0.00000
	87	-16.60774	51.20491	-0.27096	-0.90354	-276.92848	-0.03077	0.00000
86	87	16.60774	-51.20491	0.27096	0.90354	276.92848	-0.03077	0.00000
	88	-16.60774	50.82579	-0.27096	-0.98044	-291.40581	-0.03077	0.00000
87	88	16.60774	-50.82579	0.27097	0.98044	291.40581	-0.03077	0.00000
	89	-16.60774	50.62720	-0.27097	-1.02072	-298.94623	-0.03077	0.00000
88	89	16.60774	-35.79720	0.20101	1.02072	298.94624	-0.03077	0.00000

	90	-16.60774	35.23755	-0.20101	-1.10492	-313.82515	-0.03077	0.00000
89	90	16.60774	-35.23755	0.20101	1.10492	313.82515	-0.03077	0.00000
	91	-16.60774	34.85844	-0.20101	-1.16197	-323.77120	-0.03077	0.00000
90	91	16.60774	-34.85844	0.20101	1.16197	323.77120	-0.03077	0.00000
	92	-16.60774	34.46127	-0.20101	-1.22173	-334.07548	-0.03077	0.00000
91	92	16.60774	-19.63127	0.13106	1.22173	334.07540	-0.03077	0.00000
	93	-16.60774	19.27020	-0.13106	-1.25715	-339.33236	-0.03077	0.00000
92	93	16.60774	-19.27020	0.13106	1.25715	339.33236	-0.03077	0.00000
	94	-16.60774	18.89108	-0.13106	-1.29434	-344.74713	-0.03077	0.00000
93	94	16.60774	-18.89108	0.13106	1.29434	344.74713	-0.03077	0.00000
	95	-16.60774	18.51197	-0.13106	-1.33153	-350.05432	-0.03077	0.00000
94	95	16.60774	-18.51197	0.13106	1.33153	350.05432	-0.03077	0.00000
	96	-16.60774	18.29533	-0.13106	-1.35278	-353.03870	-0.03077	0.00000
95	96	16.60774	-3.46533	0.06106	1.35278	353.03870	-0.03077	0.00000
	97	-16.60774	2.92373	-0.06106	-1.37753	-354.33378	-0.03077	0.00000
96	97	16.60774	-2.92373	0.06106	1.37753	354.33378	-0.03077	0.00000
	98	-16.60774	2.54461	-0.06106	-1.39486	-355.10969	-0.03077	0.00000
97	98	16.60774	-2.54461	0.06106	1.39486	355.10969	-0.03077	0.00000
	99	-16.60774	2.12939	-0.06106	-1.41384	-355.83606	-0.03077	0.00000
98	99	16.60774	12.70061	-0.00894	1.41384	355.83599	-0.03077	0.00000
	100	-16.60774	-13.04362	0.00894	-1.41154	-352.53099	-0.03077	0.00000
99	100	16.60774	13.04362	-0.00894	1.41154	352.53099	-0.03077	0.00000
	101	-16.60774	-13.42274	0.00894	-1.40900	-348.77563	-0.03077	0.00000
100	101	16.60774	13.42274	-0.00894	1.40900	348.77563	-0.03077	0.00000
	102	-16.60774	-13.80185	0.00894	-1.40647	-344.91268	-0.03077	0.00000
101	102	16.60774	13.80185	-0.00894	1.40647	344.91268	-0.03077	0.00000
	103	-16.60774	-14.03655	0.00894	-1.40490	-342.46741	-0.03077	0.00000
102	103	16.60774	28.86655	-0.07890	1.40490	342.46743	-0.03077	0.00000
	104	-16.60774	-29.39009	0.07890	-1.37398	-331.05228	-0.03077	0.00000
103	104	16.60774	29.39009	-0.07890	1.37398	331.05228	-0.03077	0.00000
	105	-16.60774	-29.76921	0.07890	-1.35159	-322.65805	-0.03077	0.00000
104	105	16.60774	29.76921	-0.07890	1.35159	322.65805	-0.03077	0.00000
	106	-16.60774	-30.20248	0.07890	-1.32600	-312.93291	-0.03077	0.00000
105	106	16.60774	45.03248	-0.14885	1.32600	312.93291	-0.03077	0.00000
	107	-16.60774	-45.35744	0.14885	-1.28979	-301.93954	-0.03077	0.00000
106	107	16.60774	45.35744	-0.14885	1.28979	301.93954	-0.03077	0.00000
	108	-16.60774	-45.73656	0.14885	-1.24755	-289.01404	-0.03077	0.00000
107	108	16.60774	45.73656	-0.14885	1.24755	289.01404	-0.03077	0.00000
	109	-16.60774	-46.11568	0.14885	-1.20531	-275.98095	-0.03077	0.00000
108	109	16.60774	46.11568	-0.14885	1.20531	275.98095	-0.03077	0.00000
	110	-16.60774	-46.36842	0.14885	-1.17715	-267.23246	-0.03077	0.00000
109	110	16.60774	61.19842	-0.21876	1.17715	267.23241	-0.03077	0.00000
	111	-16.60774	-61.70391	0.21876	-1.09438	-243.98062	-0.03077	0.00000
110	111	16.60774	61.70391	-0.21876	1.09438	243.98062	-0.03077	0.00000
	112	-16.60774	-62.08303	0.21876	-1.03230	-226.41626	-0.03077	0.00000
111	112	16.60774	62.08303	-0.21876	1.03230	226.41626	-0.03077	0.00000

	113	-16.60774	-62.53436	0.21876	-0.95839	-205.36602	-0.03077	0.00000
112	113	16.60774	77.36436	-0.28865	0.95839	205.36599	-0.03077	0.00000
	114	-16.60774	-77.67126	0.28865	-0.89208	-187.55785	-0.03077	0.00000
113	114	16.60774	77.67126	-0.28865	0.89208	187.55785	-0.03077	0.00000
	115	-16.60774	-78.05038	0.28865	-0.81017	-165.46221	-0.03077	0.00000
114	115	16.60774	78.05038	-0.28865	0.81017	165.46221	-0.03077	0.00000
	116	-16.60774	-78.42950	0.28865	-0.72826	-143.25898	-0.03077	0.00000
115	116	16.60774	78.42950	-0.28865	0.72826	143.25898	-0.03077	0.00000
	117	-16.60774	-78.70030	0.28865	-0.66975	-127.33367	-0.03077	0.00000
116	117	16.60774	93.53030	-0.35864	0.66975	127.33362	-0.03077	0.00000
	118	-16.60774	-94.01773	0.35864	-0.53889	-93.11878	-0.03077	0.00000
117	118	16.60774	94.01773	-0.35864	0.53889	93.11878	-0.03077	0.00000
	119	-16.60774	-94.39685	0.35864	-0.43712	-66.38428	-0.03077	0.00000
118	119	16.60774	94.39685	-0.35864	0.43712	66.38428	-0.03077	0.00000
	120	-16.60774	-94.86624	0.35864	-0.31111	-33.13536	-0.03077	0.00000
119	120	16.60774	109.69624	-0.42862	0.31111	33.13532	-0.03077	0.00000
	121	-16.60774	-109.98509	0.42862	-0.21843	-9.38598	-0.03077	0.00000
120	121	16.60774	109.98509	-0.42862	0.21843	9.38598	-0.03077	0.00000
	4	-16.60774	-110.36420	0.42862	-0.09680	21.87979	-0.03077	0.00000
121	4	0.00000	-25.02984	0.13992	-0.13992	-21.87979	0.00000	0.00000
	122	0.00000	24.65875	-0.13992	0.10105	14.97860	0.00000	0.00000
122	122	0.00000	-24.65875	0.13992	-0.10105	-14.97860	0.00000	0.00000
	123	0.00000	24.36187	-0.13992	0.06996	9.53186	0.00000	0.00000
123	123	0.00000	-9.53187	0.06996	-0.06996	-9.53185	0.00000	0.00000
	124	0.00000	9.08656	-0.06996	0.04664	6.42878	0.00000	0.00000
124	124	0.00000	-9.08656	0.06996	-0.04664	-6.42878	0.00000	0.00000
	125	0.00000	8.71547	-0.06996	0.02721	3.95627	0.00000	0.00000
125	125	0.00000	-8.71547	0.06996	-0.02721	-3.95627	0.00000	0.00000
	126	0.00000	8.19594	-0.06996	0.00000	0.66795	0.00000	0.00000
126	126	0.00000	-1.33594	0.00000	0.00000	-0.66797	0.12127E-11	0.00000
	127	0.00000	1.11328	0.00000	0.00000	0.46387	0.12127E-11	0.00000
127	127	0.00000	-1.11328	0.00000	0.00000	-0.46387	0.60633E-12	0.00000
	128	0.00000	0.74219	0.00000	0.00000	0.20616	0.60633E-12	0.00000
128	128	0.00000	-0.74219	0.00000	0.00000	-0.20616	0.12127E-11	0.00000
	129	0.00000	0.37109	0.00000	0.00000	0.05154	0.12127E-11	0.00000
129	129	0.00000	-0.37109	0.00000	-0.64726E-10	-0.05154	0.00000	0.00000
	130	0.00000	0.00000	0.00000	-0.13006E-09	0.00000	0.00000	0.00000

Interaction Diagram Data - Substructure 1

Diagram Number 1

Max Tension Force	594.86400 (*kip*)
Local 2 Axis Shift	-0.96218E-17 (*in*)

Local 3 Axis Shift -0.96218E-17 (*in*)

Phi Factor Concrete 0.70000

Interaction Points

Point #	AXIAL (*kip*)	MOMENT_3_POS (*kip-ft*)	MOMENT_2_NEG (*kip-ft*)	MOMENT_3_NEG (*kip-ft*)	MOMENT_2_POS (*kip-ft*)
1	594.86400	0.00000	0.00000	0.00000	0.00000
2	514.05775	90.81373	90.81373	90.81373	90.81373
3	481.03779	108.97243	108.97243	108.97243	108.97243
4	475.92602	111.71737	111.71737	111.71737	111.71737
5	422.09715	140.28757	140.28757	140.28757	140.28757
6	362.18750	168.14171	168.14171	168.14171	168.14171
7	300.25138	193.66986	193.66986	193.66986	193.66986
8	240.34909	219.02784	219.02784	219.02784	219.02784
9	180.20432	241.61828	241.61828	241.61828	241.61828
10	120.17455	261.13739	261.13739	261.13739	261.13739
11	60.08727	274.32579	274.32579	274.32579	274.32579
12	0.17764E-13	287.01096	287.01096	287.01096	287.01096
13	-26.42080	282.33891	282.33891	282.33891	282.33891
14	-50.63490	276.14773	276.14773	276.14773	276.14773
15	-73.09659	268.50544	268.50544	268.50544	268.50544
16	-93.64933	260.64843	260.64843	260.64843	260.64843
17	-112.30532	252.26677	252.26677	252.26677	252.26677
18	-129.27520	243.27011	243.27011	243.27011	243.27011
19	-144.82485	233.74694	233.74694	233.74694	233.74694
20	-210.49884	235.50779	235.50779	235.50779	235.50779
21	-275.84657	237.11432	237.11432	237.11432	237.11432
22	-344.44715	237.53931	237.53931	237.53931	237.53931
23	-413.25240	229.07792	229.07792	229.07792	229.07792
24	-478.76745	220.89011	220.89011	220.89011	220.89011
25	-544.09585	206.95195	206.95195	206.95195	206.95195
26	-610.01854	187.19253	188.45099	188.45099	188.45099
27	-680.77645	163.10876	163.10876	163.10876	163.10876
28	-752.78429	132.29593	132.29593	132.29593	132.29593
29	-814.77634	105.88985	105.88985	105.88985	105.88985
30	-881.29138	77.01679	77.01679	77.01679	77.01679
31	-881.29138	0.00000	0.00000	0.00000	0.00000

Output Summary - Substructure 1

Max/Min Pile Internal Forces	Value	Load Case	Combination	Pile
max shear in 2 direction	8.49245 (*kip*)	7	1	4
min shear in 2 direction	-33.58058 (*kip*)	7	1	1
max shear in 3 direction	6.34824 (*kip*)	7	1	1
min shear in 3 direction	-0.70586 (*kip*)	7	1	1

max moment about 2 axis	0.00646 (*kip-ft*)	7	1	4
min moment about 2 axis	-30.30018 (*kip-ft*)	7	1	1
max moment about 3 axis	8.44671 (*kip-ft*)	7	1	1
min moment about 3 axis	-133.36289 (*kip-ft*)	7	1	4
max axial force	-76.64765 (*kip*)	7	1	1
min axial force	-144.23756 (*kip*)	7	1	4
max torsional force	6.42075 (*kip-ft*)	7	1	1
max demand/capacity ratio	0.60867	7	1	4

Max/Min Soil Reaction Forces	Value	Load Case	Combination	Pile
max axial soil force	1.64856 (*kip*)	7	1	3
min axial soil force	0.78995 (*kip*)	7	1	1
max lateral in X direction	6.17070 (*kip*)	7	1	1
min lateral in X direction	-10.62744 (*kip*)	7	1	1
max lateral in Y direction	1.24647 (*kip*)	7	1	1
min lateral in Y direction	-1.73861 (*kip*)	7	1	1
max torsional soil force	2.90787 (*kip-ft*)	7	1	4

Max/Min Pile Head Displacements	Value	Load Case	Combination	Pile
max displacement in axial	7.36777 (*in*)	7	1	4
min displacement in axial	0.55539 (*in*)	7	1	1
max displacement in x	2.83463 (*in*)	7	1	1
min displacement in x	-0.07789 (*in*)	7	1	1
max displacement in y	0.86048 (*in*)	7	1	4
min displacement in y	-0.00389 (*in*)	7	1	1

Max/Min Pier Cap Internal Forces	Value	Load Case	Combination
max axial force	0.00000 (*kip*)	7	1
min axial force	-16.60774 (*kip*)	7	1
max shear in 2 direction	76.96635 (*kip*)	7	1
min shear in 2 direction	-110.36420 (*kip*)	7	1
max shear in 3 direction	0.42862 (*kip*)	7	1
min shear in 3 direction	-0.49565 (*kip*)	7	1
max torque	0.00000 (*kip-ft*)	7	1
min torque	-0.03077 (*kip-ft*)	7	1
max moment about 2 axis	1.65122 (*kip-ft*)	7	1
min moment about 2 axis	-0.55153 (*kip-ft*)	7	1
max moment about 3 axis	423.46294 (*kip-ft*)	7	1
min moment about 3 axis	-35.04480 (*kip-ft*)	7	1

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Appendix I

The following items are included in Appendix I:

- Pile load and lateral stability analysis

Pile Load and Lateral Stability Analysis

JACOBS

Project := "Unknown Foundations" Subject := "Bridge No. 534171"
AuthoredBy := "JLW" Date := "07/09"
CheckedBy := "DD" CkDate := "07/14/09"

Objective

To determine pile loads for a timber bridge

References

- *Design of Wood Structures, 4th Ed.*, Donald E. Breyer, Kenneth J. Fridley, and Kelly E. Cobeen, 1999 (Breyer)
- *AASHTO Standard Specifications for Highway Bridges, 17th Ed.,* AASHTO, 2002 (AASHTO)
- *Structures Design Guidelines,* Florida Department of Transportation (SDG)
- *National Design Specification for Wood Construction*, American Forest & Paper Association and American Wood Council, 1997 (NDS)

Material Input

Unit Weight of Timber *(NDS)* $\gamma_t := 50pcf$

Load Factors

Live Load Factor $\gamma_{LL} := 1.0$

Dead Load Factor $\gamma_{DL} := 1.0$

General Bridge Input

Span 1 Length $Span_1 := 12.6ft$

Span 2 Length $Span_2 := 11.5ft$

Span 3 Length $Span_3 := 10.6ft$

Span 4 Length $Span_4 := 10.6ft$

Bridge Width $width := 20ft + 3in$

Superstructure Input

Curb Width $w_{curb} := 6in$

Curb Height $h_{curb} := 12in$

Number of Curbs $N_{curb} := 2$

Stringer Width $w_{stringer} := 6in$

Stringer Height $h_{stringer} := 12in$

Stringer Spacing $s_{stringer} := 1ft + 1in$

Number of Stringers $N_{stringer} := 18$

Deck Plank Thickness $t_{deck} := 2.5in$

Additional Decking Width $w_{additional} := 33in$

Additional Decking Thickness $t_{additional} := 1.5in$

Number of Additional Decking Regions $N_{add} := 2$

1

P:\E9X99914\Reverse Engineering\BridgeNo534171\BridgeNo534171.xmcd 1 / 2

JACOBS

Project = "Unknown Foundations"
AuthoredBy = "JLW"
CheckedBy = "DD"

Subject = "Bridge No. 534171"
Date = "07/09"
CkDate = "07/14/09"

Substructure Input

Timber Cap Height	$h_{cap} := 12in$
Timber Cap Width	$w_{cap} := 12in$
Timber Cap Length	$l_{cap} := 19ft + 9in$
Timber Pile Diameter	$d_{pile} := 9in$
Number of Timber Piles	$N_{piles} := 5$
Timber Pile Spacing	$s_{pile} := 4ft$

Calculate Dead Loads

Deck Load (per foot)	$wt_{deck} := t_{deck} \cdot width \cdot \gamma_t$	$wt_{deck} = 210.938 \cdot plf$
Stringer Self Weight	$wt_{stringer} := h_{stringer} \cdot w_{stringer} \cdot \gamma_t$	$wt_{stringer} = 25 \cdot plf$
Curb Weight per Stringer	$wt_{curb} := \frac{h_{curb} \cdot w_{curb} \cdot \gamma_t \cdot N_{curb}}{N_{stringer}}$	$wt_{curb} = 2.778 \cdot plf$
Additional Deck Weight per Stringer	$wt_{additional} := \frac{t_{additional} \cdot w_{additional} \cdot \gamma_t \cdot N_{add}}{N_{stringer}}$	$wt_{additional} = 1.91 \cdot plf$
Total Load per Stringer	$wt_s := wt_{stringer} + wt_{curb} + wt_{additional}$	$wt_s = 29.687 \cdot plf$
Stringer Reaction on Bent	$R_{stringer.bent} := wt_s \cdot \left(0.5Span_1 + 0.5 \cdot Span_2\right)$	$R_{stringer.bent} = 0.358 \cdot kip$
Total Deck Reaction on Bent	$R_{deck} := wt_{deck} \cdot \left(0.5 \cdot Span_1 + 0.5 \cdot Span_2\right)$	$R_{deck} = 2.542 \cdot kip$
Total Weight of Superstructure on Bent	$wt_{super} := R_{stringer.bent} \cdot N_{stringer} + R_{deck}$	$wt_{super} = 8.981 \cdot kip$
Weight of Cap	$wt_{cap} := h_{cap} \cdot w_{cap} \cdot \gamma_t \cdot l_{cap}$	$wt_{cap} = 0.987 \cdot kip$
Dead Load Pile Reaction	$DL_{pile} := \frac{\gamma_{DL} \cdot \left(wt_{cap} + wt_{super}\right)}{N_{piles}}$	$DL_{pile} = 1.994 \cdot kip$
Live Load Pile Reaction	$LL_{pile} := \gamma_{LL} \cdot 16kip$	$LL_{pile} = 16 \cdot kip$
Total Pile Reaction	$Pile := DL_{pile} + LL_{pile}$	$Pile = 8.997 \cdot Ton$

Bridge No.	SPT Boring (calc'd load)	Standard Curve (calc'd load)	SPT Boring (design load)	Standard Curve (design load)	ANN Average Bent	Ann Minimum Bent	ANN Average Boring	ANN Minimum Boring
534171	14	11	N/A	N/A	N/A	N/A	N/A	N/A

EL @ Top of Pile	124.6	
GSE	118.4	
Tip EL	104.4	107.4
Length of Pile	20.2	17.2

Scour EL	110.5
Unsupported Leng	14.1

Bridge No.	SPT Boring (calc'd load)	Standard Curve (calc'd load)	SPT Boring (design load)	Standard Curve (design load)	ANN Average Bent	Ann Minimum Bent	ANN Average Boring	ANN Minimum Boring
544061	24	19	24	21	27.8	23	19.3	19.2

EL @ Top of Pile	38.23							
GSE	16.1							
Tip EL	-7.9	-2.9	-7.9	-4.9	-11.7	-6.9	-3.2	-3.1
Length of Pile	46.13	41.13	46.13	43.13	49.93	45.13	41.43	41.33

BRIDGE NO. 534171

ELEVATIONS		LATERAL								AXIAL			TIP		
Top El	Bottom El	Phi	Soil modulus (kci)	Unit Weight (kci)	Undrained Shear Strength (ksi)	Strain @ 50	Strain @ 100	Soil Modulus (kci)	Unit Weight (kci)	Shear Modulus (ksi)	Poisson's Ratio	Failure Shear Stress (ksi)	Shear Modulus (ksi)	Poisson's Ratio	Bearing Failure Load (kips)
118.4	110.5				0.003	0.02	0.15	0.03	6.70E-05	2	0.4	0.003	6	0.35	47
110.5	101	32	0.06	6.50E-05						6	0.35	0.034	6	0.35	35
101	86				6.00E-03	7.00E-03	5.00E-02	5.00E-01	6.81E-05	5	0.4	0.007			

Top El	Bottom El	Phi	Soil modulus (pci)	Unit Weight (pcf)	Undrained Shear Strength (psf)	Strain @ 50	Strain @ 100	Soil Modulus (pci)	Unit Weight (pcf)	Shear Modulus (ksi)	Poisson's Ratio	Failure Shear Stress (psf)	Shear Modulus (ksi)	Poisson's Ratio	Bearing Failure Load (kips)
118.4	110.5				432	0.02	0.15	30	115.776	2	0.4	432	6	0.35	47
110.5	101	32	60	112.32						6	0.35	4896	6	0.35	35
101	86				864	0.007	0.05	500	117.6768	5	0.4	1008	0	0	0

BRIDGE NO. 544061

ELEVATIONS		LATERAL								AXIAL			TIP		
Top El	Bottom El	Phi	Soil modulus (kci)	Unit Weight (kci)	Undrained Shear Strength (ksi)	Strain @ 50	Strain @ 100	Soil Modulus (kci)	Unit Weight (kci)	Shear Modulus (ksi)	Poisson's Ratio	Failure Shear Stress (ksi)	Shear Modulus (ksi)	Poisson's Ratio	Bearing Failure Load (kips)
16.1	5.4				0.01	0.007	0.05	0.5	7.20E-05	6	0.4	0.002	9	0.4	141
Scour at 5.4					0.02	0.005	0.03	1	7.20E-05	7	0.4	0.004	9	0.4	136
5.4	-5				0.024	0.005	0.03	1	7.20E-05	7	0.4	0.004			
Average Values					0.018	0.0057	0.0367	0.8333	0.0001	6.6667	0.4000	0.0033			
-5	-27				5.20E-02	4.00E-03	1.00E-02	2.00E+00	7.50E-05	9	0.4	0.01			

Top El	Bottom El	Phi	Soil modulus (pci)	Unit Weight (pcf)	Undrained Shear Strength (psf)	Strain @ 50	Strain @ 100	Soil Modulus (pci)	Unit Weight (pcf)	Shear Modulus (ksi)	Poisson's Ratio	Failure Shear Stress (psf)	Shear Modulus (ksi)	Poisson's Ratio	Bearing Failure Load (kips)
16.1	5.4				2592	0.0057	0.0367	833.3333333	124.416	6.6667	0.4000	480	9	0.4	136
-5	-27				7488	4.00E-03	0.01	2000	129.6	9	0.4	1440	0	0	0

4

FB-MultiPier XML Report
Model Data Report

Return to Main Menu Options

Report Based on XML Data File:
P:\E9X99914\Reverse Engineering\BridgeNo534171\534171_TimberPiles.XML

Project Information

Client	FDOT
Project Name	Unknown Foundations
Description	Bridge No. 534171
Computed By	JLW
Project Date	07/13/09

Control Information

Control Settings

Units	English	
Maximum Iterations	50	
Tolerance	1.00000	(*kip*)
Soil Behavior	1	
all user supplied P-Y Multipliers are set to 1 internally in FB-Pier		
Tip Spring Option	0	
no linear tip springs on piles		
Pile Tip Stiffness	0.00000	(*kip/in*)
Analysis	Static	
Design Code	AASHTO-LRFD	

Pile Geometry - Substructure 1

Segment Number 1

Dimensions

WIDTH	8.66000	(*in*)
DEPTH	8.66000	(*in*)
TW	0.00000	(*in*)
TF	0.00000	(*in*)
ORIENTATION	0	
VOID_TYPE	None	
VOID_DIA	0.00000	(*in*)
VOID_WIDTH	0.00000	(*in*)
VOID_DEPTH	0.00000	(*in*)
HWIDTH	0.00000	(*in*)
HDEPTH	0.00000	(*in*)
HTW	0.00000	(*in*)

HTF	0.00000	(*in*)
HORIENTATION	0	
SHELL_THICK	0.00000	(*in*)
SHEAR_STEEL	spiral	
LENGTH	206.40000	(*in*)

Material Properties

FPC	2.82353	(*ksi*)
E_CONCRETE	0.00000	(*ksi*)
FY_MILD	60.00000	(*ksi*)
E_STEEL	28999.93717	(*ksi*)
FY_PS	0.00000	(*ksi*)
E_PS	0.00000	(*ksi*)
FY_HPILE	0.00000	(*ksi*)
E_HPILE	0.00000	(*ksi*)
FY_SHELL	0.00000	(*ksi*)
E_SHELL	0.00000	(*ksi*)

Gross Section Properties

AREA	58.90141	(*in^2*)
EMODULUS	1500.00000	(*ksi*)
INERTIA2	276.08415	(*in^4*)
INERTIA3	276.08415	(*in^4*)
SHEAR_MODULUS	625.00000	(*ksi*)
TORSIONAL_INERTIA	552.16829	(*in^4*)
UNIT_WEIGHT	0.00003	(*k/in^3*)

Steel Groups

Bar Group #1

BARS	4	
LAYER_DIA	3.50000	(*in*)
COORD_2	0.00000	(*in*)
COORD_3	0.00000	(*in*)
BAR_AREA	0.00250	(*in^2*)
PRESTRESS	0.00000	(*ksi*)
ORIENTATION	0	

Stress-Strain Curves

CONCRETE

Point #	Stress (*ksi*)	Strain
1	-2.40000	-0.10000
2	-2.40000	-0.00160
3	0.00000	0.00000
4	2.40000	0.00160
5	2.40000	0.10000

MILD_STEEL

Point #	Stress (*ksi*)	Strain
1	-60.00000	-0.09999
2	-60.00000	-0.00207
3	60.00000	0.00207
4	60.00000	0.09999

Pile Group - Substructure 1

Bearing Capacity 0

fixed pile head connection

Pile to Cap Fixity 1

included for pile cap

Axial Efficiency 1.00000

X Grid Spacings	(*in*)
Space 1	49.00000
Space 2	49.00000
Space 3	49.00000
Space 4	49.00000

Y Grid Spacings ()

Number of Piles 5

Pile Sets

Set #1 Piles: 1 2 3 4 5

Soil Input Data

Pile Element Segments

Pile #1

Element #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Segment #	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Pile #2

Element #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Segment #	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Pile #3

Element #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Segment #	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Pile #4

Element #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Segment #	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Pile #5

Element #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Segment #	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Pile Coordinates

Pile #1

Point #	X (*in*)	Y (*in*)	Z (*in*)
1	0.00000	0.00000	-1501.20000
2	0.00000	0.00000	-1466.16000
3	0.00000	0.00000	-1431.12000
4	0.00000	0.00000	-1396.08000
5	0.00000	0.00000	-1361.04000
6	0.00000	0.00000	-1326.00000
7	0.00000	0.00000	-1323.92000
8	0.00000	0.00000	-1321.84000
9	0.00000	0.00000	-1319.76000
10	0.00000	0.00000	-1317.68000
11	0.00000	0.00000	-1315.60000
12	0.00000	0.00000	-1313.52000
13	0.00000	0.00000	-1311.44000
14	0.00000	0.00000	-1309.36000
15	0.00000	0.00000	-1307.28000
16	0.00000	0.00000	-1305.20000
17	0.00000	0.00000	-1303.12000
18	0.00000	0.00000	-1301.04000
19	0.00000	0.00000	-1298.96000
20	0.00000	0.00000	-1296.88000
21	0.00000	0.00000	-1294.80000

Pile #2

Point #	X (*in*)	Y (*in*)	Z (*in*)
1	49.00000	0.00000	-1501.20000
2	49.00000	0.00000	-1466.16000
3	49.00000	0.00000	-1431.12000
4	49.00000	0.00000	-1396.08000
5	49.00000	0.00000	-1361.04000
6	49.00000	0.00000	-1326.00000
7	49.00000	0.00000	-1323.92000
8	49.00000	0.00000	-1321.84000
9	49.00000	0.00000	-1319.76000
10	49.00000	0.00000	-1317.68000
11	49.00000	0.00000	-1315.60000
12	49.00000	0.00000	-1313.52000
13	49.00000	0.00000	-1311.44000
14	49.00000	0.00000	-1309.36000
15	49.00000	0.00000	-1307.28000
16	49.00000	0.00000	-1305.20000
17	49.00000	0.00000	-1303.12000
18	49.00000	0.00000	-1301.04000
19	49.00000	0.00000	-1298.96000
20	49.00000	0.00000	-1296.88000

21	49.00000	0.00000	-1294.80000

Pile #3

Point #	X (*in*)	Y (*in*)	Z (*in*)
1	98.00000	0.00000	-1501.20000
2	98.00000	0.00000	-1466.16000
3	98.00000	0.00000	-1431.12000
4	98.00000	0.00000	-1396.08000
5	98.00000	0.00000	-1361.04000
6	98.00000	0.00000	-1326.00000
7	98.00000	0.00000	-1323.92000
8	98.00000	0.00000	-1321.84000
9	98.00000	0.00000	-1319.76000
10	98.00000	0.00000	-1317.68000
11	98.00000	0.00000	-1315.60000
12	98.00000	0.00000	-1313.52000
13	98.00000	0.00000	-1311.44000
14	98.00000	0.00000	-1309.36000
15	98.00000	0.00000	-1307.28000
16	98.00000	0.00000	-1305.20000
17	98.00000	0.00000	-1303.12000
18	98.00000	0.00000	-1301.04000
19	98.00000	0.00000	-1298.96000
20	98.00000	0.00000	-1296.88000
21	98.00000	0.00000	-1294.80000

Pile #4

Point #	X (*in*)	Y (*in*)	Z (*in*)
1	147.00000	0.00000	-1501.20000
2	147.00000	0.00000	-1466.16000
3	147.00000	0.00000	-1431.12000
4	147.00000	0.00000	-1396.08000
5	147.00000	0.00000	-1361.04000
6	147.00000	0.00000	-1326.00000
7	147.00000	0.00000	-1323.92000
8	147.00000	0.00000	-1321.84000
9	147.00000	0.00000	-1319.76000
10	147.00000	0.00000	-1317.68000
11	147.00000	0.00000	-1315.60000
12	147.00000	0.00000	-1313.52000
13	147.00000	0.00000	-1311.44000
14	147.00000	0.00000	-1309.36000
15	147.00000	0.00000	-1307.28000
16	147.00000	0.00000	-1305.20000
17	147.00000	0.00000	-1303.12000
18	147.00000	0.00000	-1301.04000
19	147.00000	0.00000	-1298.96000
20	147.00000	0.00000	-1296.88000

21	147.00000	0.00000	-1294.80000

Pile #5

Point #	X (*in*)	Y (*in*)	Z (*in*)
1	196.00000	0.00000	-1501.20000
2	196.00000	0.00000	-1466.16000
3	196.00000	0.00000	-1431.12000
4	196.00000	0.00000	-1396.08000
5	196.00000	0.00000	-1361.04000
6	196.00000	0.00000	-1326.00000
7	196.00000	0.00000	-1323.92000
8	196.00000	0.00000	-1321.84000
9	196.00000	0.00000	-1319.76000
10	196.00000	0.00000	-1317.68000
11	196.00000	0.00000	-1315.60000
12	196.00000	0.00000	-1313.52000
13	196.00000	0.00000	-1311.44000
14	196.00000	0.00000	-1309.36000
15	196.00000	0.00000	-1307.28000
16	196.00000	0.00000	-1305.20000
17	196.00000	0.00000	-1303.12000
18	196.00000	0.00000	-1301.04000
19	196.00000	0.00000	-1298.96000
20	196.00000	0.00000	-1296.88000
21	196.00000	0.00000	-1294.80000

Pier Geometry - Substructure 1

Modeling

STRUCTURE_TYPE	PILE BENT STRUCTURE	
NUM_COLUMNS	5	
NUM_ELEMENTS_PER_SPAN	12	
CANTILEVER_LENGTH	2.00000	(*ft*)
NUM_ELEMENTS_PER_CANTILEVER	7	

BEARING_PADS

Pad # 1	Located @ Node 9
Pad # 2	Located @ Node 13
Pad # 3	Located @ Node 15
Pad # 4	Located @ Node 18
Pad # 5	Located @ Node 22
Pad # 6	Located @ Node 24
Pad # 7	Located @ Node 27
Pad # 8	Located @ Node 30
Pad # 9	Located @ Node 33
Pad # 10	Located @ Node 36
Pad # 11	Located @ Node 39
Pad # 12	Located @ Node 42

Pad # 13	Located @ Node 45
Pad # 14	Located @ Node 47
Pad # 15	Located @ Node 51
Pad # 16	Located @ Node 54
Pad # 17	Located @ Node 56
Pad # 18	Located @ Node 60

COLUMN_TAPER	no
CANTILEVER_TAPER	no
BEAM_TAPER	no

Nodal Coordinates

		Boundary Conditions						Coordinates		
Node #	Location	X	Y	Z	XX	YY	ZZ	X (*in*)	Y (*in*)	Z (*in*)
6	Pier	R	R	R	R	R	R	-24.00000	0.00000	-1501.20000
7	Pier	R	R	R	R	R	R	-20.57143	0.00000	-1501.20000
8	Pier	R	R	R	R	R	R	-17.14286	0.00000	-1501.20000
9	Pier	R	R	R	R	R	R	-12.50040	0.00000	-1501.20000
10	Pier	R	R	R	R	R	R	-10.28571	0.00000	-1501.20000
11	Pier	R	R	R	R	R	R	-6.85714	0.00000	-1501.20000
12	Pier	R	R	R	R	R	R	-3.42857	0.00000	-1501.20000
13	Pier	R	R	R	R	R	R	0.49920	0.00000	-1501.20000
14	Pier	R	R	R	R	R	R	8.16667	0.00000	-1501.20000
15	Pier	R	R	R	R	R	R	13.49880	0.00000	-1501.20000
16	Pier	R	R	R	R	R	R	16.33333	0.00000	-1501.20000
17	Pier	R	R	R	R	R	R	20.41667	0.00000	-1501.20000
18	Pier	R	R	R	R	R	R	26.49840	0.00000	-1501.20000
19	Pier	R	R	R	R	R	R	28.58333	0.00000	-1501.20000
20	Pier	R	R	R	R	R	R	32.66667	0.00000	-1501.20000
21	Pier	R	R	R	R	R	R	36.75000	0.00000	-1501.20000
22	Pier	R	R	R	R	R	R	39.49800	0.00000	-1501.20000
23	Pier	R	R	R	R	R	R	44.91667	0.00000	-1501.20000
24	Pier	R	R	R	R	R	R	52.49760	0.00000	-1501.20000
25	Pier	R	R	R	R	R	R	57.16667	0.00000	-1501.20000
26	Pier	R	R	R	R	R	R	61.25000	0.00000	-1501.20000
27	Pier	R	R	R	R	R	R	65.49720	0.00000	-1501.20000
28	Pier	R	R	R	R	R	R	69.41667	0.00000	-1501.20000
29	Pier	R	R	R	R	R	R	73.50000	0.00000	-1501.20000
30	Pier	R	R	R	R	R	R	78.49680	0.00000	-1501.20000
31	Pier	R	R	R	R	R	R	81.66667	0.00000	-1501.20000
32	Pier	R	R	R	R	R	R	85.75000	0.00000	-1501.20000
33	Pier	R	R	R	R	R	R	91.49640	0.00000	-1501.20000
34	Pier	R	R	R	R	R	R	93.91667	0.00000	-1501.20000
35	Pier	R	R	R	R	R	R	102.08333	0.00000	-1501.20000
36	Pier	R	R	R	R	R	R	104.49600	0.00000	-1501.20000
37	Pier	R	R	R	R	R	R	110.25000	0.00000	-1501.20000
38	Pier	R	R	R	R	R	R	114.33333	0.00000	-1501.20000
39	Pier	R	R	R	R	R	R	117.49560	0.00000	-1501.20000

40	Pier	R	R	R	R	R	R	122.50000	0.00000	-1501.20000
41	Pier	R	R	R	R	R	R	126.58333	0.00000	-1501.20000
42	Pier	R	R	R	R	R	R	130.49520	0.00000	-1501.20000
43	Pier	R	R	R	R	R	R	134.75000	0.00000	-1501.20000
44	Pier	R	R	R	R	R	R	138.83333	0.00000	-1501.20000
45	Pier	R	R	R	R	R	R	143.49480	0.00000	-1501.20000
46	Pier	R	R	R	R	R	R	151.08333	0.00000	-1501.20000
47	Pier	R	R	R	R	R	R	156.49440	0.00000	-1501.20000
48	Pier	R	R	R	R	R	R	159.25000	0.00000	-1501.20000
49	Pier	R	R	R	R	R	R	163.33333	0.00000	-1501.20000
50	Pier	R	R	R	R	R	R	167.41667	0.00000	-1501.20000
51	Pier	R	R	R	R	R	R	169.49400	0.00000	-1501.20000
52	Pier	R	R	R	R	R	R	175.58333	0.00000	-1501.20000
53	Pier	R	R	R	R	R	R	179.66667	0.00000	-1501.20000
54	Pier	R	R	R	R	R	R	182.49360	0.00000	-1501.20000
55	Pier	R	R	R	R	R	R	187.83333	0.00000	-1501.20000
56	Pier	R	R	R	R	R	R	195.49320	0.00000	-1501.20000
57	Pier	R	R	R	R	R	R	199.42857	0.00000	-1501.20000
58	Pier	R	R	R	R	R	R	202.85714	0.00000	-1501.20000
59	Pier	R	R	R	R	R	R	206.28571	0.00000	-1501.20000
60	Pier	R	R	R	R	R	R	208.49280	0.00000	-1501.20000
61	Pier	R	R	R	R	R	R	213.14286	0.00000	-1501.20000
62	Pier	R	R	R	R	R	R	216.57143	0.00000	-1501.20000
63	Pier	R	R	R	R	R	R	220.00000	0.00000	-1501.20000

Cross Sections

Segment Number 2

Dimensions

WIDTH	8.66000	(*in*)
DEPTH	8.66000	(*in*)
VOID_WIDTH	0.00000	(*in*)
VOID_DEPTH	0.00000	(*in*)

Gross Section Properties

AREA	169.00000	(*in^2*)
EMODULUS	1500.00000	(*ksi*)
INERTIA2	2380.00000	(*in^4*)
INERTIA3	2380.00000	(*in^4*)
SHEAR_MODULUS	580.00000	(*ksi*)
TORSIONAL_INERTIA	4284.00000	(*in^4*)
UNIT_WEIGHT	0.00003	(*k/in^3*)

Segment Number 3

Dimensions

WIDTH	8.66000	(*in*)
DEPTH	8.66000	(*in*)

VOID_WIDTH	0.00000	(*in*)
VOID_DEPTH	0.00000	(*in*)

Gross Section Properties

AREA	169.00000	(*in^2*)
EMODULUS	1500.00000	(*ksi*)
INERTIA2	2380.00000	(*in^4*)
INERTIA3	2380.00000	(*in^4*)
SHEAR_MODULUS	580.00000	(*ksi*)
TORSIONAL_INERTIA	4284.00000	(*in^4*)
UNIT_WEIGHT	0.00003	(*k/in^3*)

Pier Member Connectivity

Beam Element #

Load Case Data - Substructure 1

Load Case #1

Self Weight Factor	1.00000
Buoyancy Factor	0.00000

Load Values

Node	FX (*kip*)	FY (*kip*)	FZ (*kip*)	MX (*kip-ft*)	MY (*kip-ft*)	MZ (*kip-ft*)
9	0.00000	0.00000	0.54000	0.00000	0.00000	0.00000
13	0.00000	0.00000	0.49000	0.00000	0.00000	0.00000
15	0.00000	0.00000	0.49000	0.00000	0.00000	0.00000
18	0.00000	0.00000	0.49000	0.00000	0.00000	0.00000
22	0.00000	0.00000	0.49000	0.00000	0.00000	0.00000
24	0.00000	0.00000	0.49000	0.00000	0.00000	0.00000
27	0.00000	0.00000	0.49000	0.00000	0.00000	0.00000
30	0.00000	0.00000	0.49000	0.00000	0.00000	0.00000
33	0.00000	0.00000	0.49000	0.00000	0.00000	0.00000
36	0.00000	0.00000	0.49000	0.00000	0.00000	0.00000
39	0.00000	0.00000	0.49000	0.00000	0.00000	0.00000
42	0.00000	0.00000	0.49000	0.00000	0.00000	0.00000
45	0.00000	0.00000	0.49000	0.00000	0.00000	0.00000
47	0.00000	0.00000	0.49000	0.00000	0.00000	0.00000
51	0.00000	0.00000	0.49000	0.00000	0.00000	0.00000
54	0.00000	0.00000	0.49000	0.00000	0.00000	0.00000
56	0.00000	0.00000	0.49000	0.00000	0.00000	0.00000
60	0.00000	0.00000	0.54000	0.00000	0.00000	0.00000
1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Load Case #2

Self Weight Factor	0.00000

Buoyancy Factor 0.00000

Load Values

Node	FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)
9	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
22	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
24	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
27	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
30	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
33	0.00000	0.00000	0.27300	0.00000	0.00000	0.00000
36	0.00000	0.00000	0.82000	0.00000	0.00000	0.00000
39	0.00000	0.00000	16.83500	0.00000	0.00000	0.00000
42	0.00000	0.00000	0.83500	0.00000	0.00000	0.00000
45	0.00000	0.00000	0.83500	0.00000	0.00000	0.00000
47	0.00000	0.00000	0.83500	0.00000	0.00000	0.00000
51	0.00000	0.00000	0.83500	0.00000	0.00000	0.00000
54	0.00000	0.00000	0.83500	0.00000	0.00000	0.00000
56	0.00000	0.00000	16.83500	0.00000	0.00000	0.00000
60	0.00000	0.00000	0.77100	0.00000	0.00000	0.00000

Load Case #3

Self Weight Factor 0.00000

Buoyancy Factor 0.00000

Load Values

Node	FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)
9	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	0.00000	0.00000	0.00600	0.00000	0.00000	0.00000
22	0.00000	0.00000	0.50900	0.00000	0.00000	0.00000
24	0.00000	0.00000	0.83600	0.00000	0.00000	0.00000
27	0.00000	0.00000	16.83600	0.00000	0.00000	0.00000
30	0.00000	0.00000	0.83600	0.00000	0.00000	0.00000
33	0.00000	0.00000	0.83600	0.00000	0.00000	0.00000
36	0.00000	0.00000	0.83600	0.00000	0.00000	0.00000
39	0.00000	0.00000	0.83600	0.00000	0.00000	0.00000
42	0.00000	0.00000	16.83600	0.00000	0.00000	0.00000
45	0.00000	0.00000	0.83600	0.00000	0.00000	0.00000
47	0.00000	0.00000	0.50900	0.00000	0.00000	0.00000
51	0.00000	0.00000	0.00600	0.00000	0.00000	0.00000
54						

	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
56	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
60	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Load Case #4

Self Weight Factor	0.00000
Buoyancy Factor	0.00000

Load Values

Node	FX (*kip*)	FY (*kip*)	FZ (*kip*)	MX (*kip-ft*)	MY (*kip-ft*)	MZ (*kip-ft*)
9	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
22	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
24	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
27	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
30	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
33	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
36	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
39	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
42	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
45	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
47	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
51	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
54	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
56	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
60	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Load Case #5

Self Weight Factor	0.00000
Buoyancy Factor	0.00000

Load Values

Node	FX (*kip*)	FY (*kip*)	FZ (*kip*)	MX (*kip-ft*)	MY (*kip-ft*)	MZ (*kip-ft*)
9	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
22	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
24	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
27	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
30	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
33	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
36	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

39	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
42	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
45	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
47	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
51	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
54	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
56	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
60	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Load Case #6

Self Weight Factor	0.00000
Buoyancy Factor	0.00000

Load Values

Node	FX (*kip*)	FY (*kip*)	FZ (*kip*)	MX (*kip-ft*)	MY (*kip-ft*)	MZ (*kip-ft*)
9	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000
13	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000
15	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000
18	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000
22	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000
24	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000
27	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000
30	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000
33	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000
36	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000
39	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000
42	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000
45	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000
47	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000
51	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000
54	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000
56	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000
60	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000

Load Case #7

Self Weight Factor	0.00000
Buoyancy Factor	0.00000

Load Values

Node	FX (*kip*)	FY (*kip*)	FZ (*kip*)	MX (*kip-ft*)	MY (*kip-ft*)	MZ (*kip-ft*)
9	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000
13	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000
15	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000
18	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000
22	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000

24	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000
27	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000
30	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000
33	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000
36	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000
39	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000
42	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000
45	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000
47	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000
51	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000
54	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000
56	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000
60	0.00000	0.20000	0.00000	0.00000	0.00000	0.00000

Load Case #8

Self Weight Factor	0.00000
Buoyancy Factor	1.00000

Load Values

Node	FX (*kip*)	FY (*kip*)	FZ (*kip*)	MX (*kip-ft*)	MY (*kip-ft*)	MZ (*kip-ft*)
1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
66	0.21000	0.00000	0.00000	0.00000	0.00000	0.00000
86	0.21000	0.00000	0.00000	0.00000	0.00000	0.00000
106	0.21000	0.00000	0.00000	0.00000	0.00000	0.00000
126	0.21000	0.00000	0.00000	0.00000	0.00000	0.00000
146	0.21000	0.00000	0.00000	0.00000	0.00000	0.00000

Load Case #9

Self Weight Factor	0.00000
Buoyancy Factor	0.00000

Load Values

Node	FX (*kip*)	FY (*kip*)	FZ (*kip*)	MX (*kip-ft*)	MY (*kip-ft*)	MZ (*kip-ft*)

Load Case #10

Self Weight Factor	0.00000
Buoyancy Factor	0.00000

Load Values

Node	FX (*kip*)	FY (*kip*)	FZ (*kip*)	MX (*kip-ft*)	MY (*kip-ft*)	MZ (*kip-ft*)

Load Combinations

Load Combination 1

Load Type	DC	LL1	LL2	IM1	IM2	BR1	BR2	WA
Value	1.00000	1.00000	0.00000	1.00000	0.00000	1.00000	0.00000	1.00000

Load Combination 2

Load Type	DC	LL1	LL2	IM1	IM2	BR1	BR2	WA
Value	1.00000	0.00000	1.00000	0.00000	1.00000	0.00000	1.00000	1.00000

Load Case Results - Substructure 1

Load Case 9 - Time Step 1

PY Multipliers

Pile #	X-PYM	Y-PYM
1	1.00000	1.00000
2	1.00000	1.00000
3	1.00000	1.00000
4	1.00000	1.00000
5	1.00000	1.00000

Pile Displacement

Pile #1

Node #	Local #	DX (*in*)	DY (*in*)	DZ (*in*)	RX (*rad*)	RY (*rad*)	RZ (*rad*)
1	1	1.14144	-12.25696	0.00098	-0.06986	-0.00035	-0.01559
64	2	1.08786	-9.86839	0.00089	-0.06654	-0.00268	-0.01276
65	3	0.95625	-7.58696	0.00078	-0.06375	-0.00480	-0.00994
66	4	0.75418	-5.39383	0.00068	-0.06150	-0.00670	-0.00711
67	5	0.49351	-3.26999	0.00059	-0.05979	-0.00807	-0.00428
68	6	0.20002	-1.19623	0.00050	-0.05864	-0.00858	-0.00145
69	7	0.18218	-1.07431	0.00050	-0.05859	-0.00858	-0.00129
70	8	0.16433	-0.95250	0.00049	-0.05854	-0.00858	-0.00115
71	9	0.14649	-0.83079	0.00049	-0.05849	-0.00858	-0.00103
72	10	0.12865	-0.70917	0.00049	-0.05845	-0.00857	-0.00092
73	11	0.11083	-0.58764	0.00048	-0.05841	-0.00857	-0.00082
74	12	0.09302	-0.46620	0.00048	-0.05837	-0.00856	-0.00074
75	13	0.07523	-0.34483	0.00047	-0.05833	-0.00855	-0.00067
76	14	0.05746	-0.22353	0.00047	-0.05830	-0.00854	-0.00061
77	15	0.03972	-0.10229	0.00047	-0.05828	-0.00853	-0.00056
78	16	0.02199	0.01890	0.00047	-0.05826	-0.00852	-0.00052
79	17	0.00428	0.14006	0.00046	-0.05824	-0.00851	-0.00049
80	18	-0.01342	0.26120	0.00046	-0.05823	-0.00851	-0.00046
81	19	-0.03112	0.38232	0.00046	-0.05823	-0.00851	-0.00044
82	20	-0.04880	0.50344	0.00046	-0.05823	-0.00850	-0.00043
83	21	-0.06649	0.62455	0.00045	-0.05823	-0.00850	-0.00043

Pile #2

Node #	Local #	DX (*in*)	DY (*in*)	DZ (*in*)	RX (*rad*)	RY (*rad*)	RZ (*rad*)

2	1	1.14145	-13.02800	0.01797	-0.07069	-0.00054	-0.01583
84	2	1.08352	-10.58133	0.01640	-0.06899	-0.00275	-0.01295
85	3	0.95075	-8.19102	0.01483	-0.06747	-0.00481	-0.01008
86	4	0.74907	-5.85037	0.01325	-0.06615	-0.00668	-0.00721
87	5	0.48937	-3.55204	0.01169	-0.06506	-0.00804	-0.00434
88	6	0.19710	-1.28814	0.01013	-0.06419	-0.00854	-0.00147
89	7	0.17933	-1.15466	0.01004	-0.06415	-0.00854	-0.00131
90	8	0.16156	-1.02128	0.00995	-0.06411	-0.00854	-0.00117
91	9	0.14380	-0.88798	0.00987	-0.06406	-0.00854	-0.00104
92	10	0.12604	-0.75477	0.00979	-0.06402	-0.00853	-0.00093
93	11	0.10830	-0.62164	0.00972	-0.06399	-0.00853	-0.00084
94	12	0.09057	-0.48858	0.00965	-0.06395	-0.00852	-0.00075
95	13	0.07286	-0.35559	0.00958	-0.06392	-0.00851	-0.00068
96	14	0.05518	-0.22267	0.00952	-0.06389	-0.00850	-0.00062
97	15	0.03751	-0.08979	0.00946	-0.06387	-0.00849	-0.00057
98	16	0.01986	0.04304	0.00941	-0.06386	-0.00848	-0.00053
99	17	0.00223	0.17585	0.00936	-0.06384	-0.00847	-0.00049
100	18	-0.01539	0.30864	0.00931	-0.06384	-0.00847	-0.00047
101	19	-0.03301	0.44142	0.00927	-0.06383	-0.00847	-0.00045
102	20	-0.05062	0.57419	0.00923	-0.06383	-0.00847	-0.00044
103	21	-0.06823	0.70697	0.00920	-0.06383	-0.00847	-0.00044

Pile #3

Node #	Local #	DX (*in*)	DY (*in*)	DZ (*in*)	RX (*rad*)	RY (*rad*)	RZ (*rad*)
3	1	1.14147	-13.80992	0.05346	-0.07192	-0.00090	-0.01599
104	2	1.07540	-11.28849	0.04899	-0.07198	-0.00287	-0.01309
105	3	0.94065	-8.76759	0.04451	-0.07188	-0.00481	-0.01019
106	4	0.73973	-6.25298	0.04003	-0.07162	-0.00664	-0.00729
107	5	0.48163	-3.75013	0.03556	-0.07121	-0.00799	-0.00439
108	6	0.19113	-1.26401	0.03109	-0.07067	-0.00849	-0.00149
109	7	0.17348	-1.11705	0.03084	-0.07064	-0.00849	-0.00132
110	8	0.15582	-0.97017	0.03059	-0.07060	-0.00849	-0.00118
111	9	0.13817	-0.82335	0.03035	-0.07057	-0.00848	-0.00105
112	10	0.12053	-0.67661	0.03013	-0.07053	-0.00848	-0.00094
113	11	0.10290	-0.52994	0.02992	-0.07050	-0.00847	-0.00085
114	12	0.08529	-0.38333	0.02972	-0.07047	-0.00846	-0.00076
115	13	0.06770	-0.23678	0.02953	-0.07045	-0.00845	-0.00069
116	14	0.05013	-0.09027	0.02935	-0.07043	-0.00844	-0.00063
117	15	0.03258	0.05620	0.02919	-0.07041	-0.00843	-0.00058
118	16	0.01504	0.20264	0.02903	-0.07040	-0.00843	-0.00053
119	17	-0.00248	0.34907	0.02889	-0.07040	-0.00842	-0.00050
120	18	-0.01998	0.49549	0.02876	-0.07040	-0.00842	-0.00047
121	19	-0.03749	0.64192	0.02864	-0.07040	-0.00841	-0.00046
122	20	-0.05499	0.78835	0.02853	-0.07040	-0.00841	-0.00045
123	21	-0.07248	0.93478	0.02843	-0.07040	-0.00841	-0.00044

Pile #4

Node #	Local #	DX (*in*)	DY (*in*)	DZ (*in*)	RX (*rad*)	RY (*rad*)	RZ (*rad*)
4	1	1.14149	-14.59485	0.07161	-0.07311	-0.00017	-0.01595
124	2	1.09573	-12.00476	0.06572	-0.07468	-0.00244	-0.01306
125	3	0.97084	-9.36625	0.05982	-0.07587	-0.00467	-0.01016
126	4	0.77007	-6.69374	0.05393	-0.07662	-0.00676	-0.00727
127	5	0.50423	-4.00311	0.04804	-0.07690	-0.00830	-0.00438
128	6	0.20085	-1.31093	0.04216	-0.07671	-0.00890	-0.00148
129	7	0.18234	-1.15141	0.04182	-0.07668	-0.00890	-0.00132
130	8	0.16382	-0.99195	0.04149	-0.07665	-0.00891	-0.00118
131	9	0.14530	-0.83254	0.04118	-0.07662	-0.00890	-0.00105
132	10	0.12678	-0.67319	0.04089	-0.07660	-0.00890	-0.00094
133	11	0.10827	-0.51389	0.04061	-0.07657	-0.00889	-0.00084
134	12	0.08978	-0.35464	0.04035	-0.07655	-0.00889	-0.00076
135	13	0.07130	-0.19544	0.04010	-0.07653	-0.00888	-0.00069
136	14	0.05285	-0.03628	0.03987	-0.07651	-0.00887	-0.00063
137	15	0.03441	0.12286	0.03965	-0.07650	-0.00886	-0.00058
138	16	0.01598	0.28199	0.03945	-0.07650	-0.00885	-0.00053
139	17	-0.00243	0.44111	0.03926	-0.07650	-0.00885	-0.00050
140	18	-0.02083	0.60023	0.03909	-0.07650	-0.00885	-0.00047
141	19	-0.03923	0.75936	0.03893	-0.07651	-0.00884	-0.00045
142	20	-0.05762	0.91850	0.03879	-0.07651	-0.00884	-0.00044
143	21	-0.07601	1.07764	0.03866	-0.07651	-0.00884	-0.00044

Pile #5

Node #	Local #	DX (*in*)	DY (*in*)	DZ (*in*)	RX (*rad*)	RY (*rad*)	RZ (*rad*)
5	1	1.14150	-15.37419	0.09629	-0.07391	-0.00071	-0.01579
144	2	1.08216	-12.72562	0.08856	-0.07720	-0.00269	-0.01292
145	3	0.95226	-9.97115	0.08082	-0.07993	-0.00472	-0.01006
146	4	0.75213	-7.13335	0.07308	-0.08194	-0.00669	-0.00719
147	5	0.49035	-4.23963	0.06536	-0.08311	-0.00815	-0.00433
148	6	0.19296	-1.32055	0.05763	-0.08338	-0.00871	-0.00147
149	7	0.17484	-1.14712	0.05718	-0.08337	-0.00871	-0.00131
150	8	0.15671	-0.97372	0.05676	-0.08336	-0.00871	-0.00117
151	9	0.13859	-0.80036	0.05635	-0.08334	-0.00871	-0.00104
152	10	0.12047	-0.62703	0.05597	-0.08332	-0.00871	-0.00093
153	11	0.10236	-0.45373	0.05560	-0.08331	-0.00870	-0.00084
154	12	0.08427	-0.28046	0.05525	-0.08329	-0.00869	-0.00075
155	13	0.06620	-0.10722	0.05493	-0.08328	-0.00868	-0.00068
156	14	0.04814	0.06600	0.05462	-0.08328	-0.00868	-0.00062
157	15	0.03011	0.23922	0.05434	-0.08328	-0.00867	-0.00057
158	16	0.01209	0.41244	0.05407	-0.08328	-0.00866	-0.00053
159	17	-0.00592	0.58567	0.05383	-0.08329	-0.00865	-0.00049

160	18	-0.02392	0.75892	0.05360	-0.08330	-0.00865	-0.00047
161	19	-0.04191	0.93218	0.05340	-0.08330	-0.00865	-0.00045
162	20	-0.05990	1.10545	0.05321	-0.08331	-0.00865	-0.00044
163	21	-0.07790	1.27874	0.05305	-0.08331	-0.00865	-0.00044

Structure Displacement

Node #	DX (*in*)	DY (*in*)	DZ (*in*)	RX (*rad*)	RY (*rad*)	RZ (*rad*)
6	1.14144	-11.88263	-0.00709	-0.06986	-0.00033	-0.01560
7	1.14144	-11.93611	-0.00594	-0.06986	-0.00033	-0.01560
8	1.14144	-11.98959	-0.00480	-0.06986	-0.00033	-0.01560
9	1.14144	-12.06200	-0.00325	-0.06986	-0.00033	-0.01560
10	1.14144	-12.09654	-0.00251	-0.06986	-0.00033	-0.01560
11	1.14144	-12.15002	-0.00136	-0.06986	-0.00034	-0.01560
12	1.14144	-12.20349	-0.00020	-0.06986	-0.00034	-0.01560
13	1.14144	-12.26474	0.00116	-0.06987	-0.00035	-0.01560
14	1.14144	-12.38454	0.00366	-0.07000	-0.00031	-0.01565
15	1.14144	-12.46808	0.00527	-0.07009	-0.00030	-0.01568
16	1.14144	-12.51256	0.00610	-0.07014	-0.00029	-0.01570
17	1.14144	-12.57673	0.00729	-0.07021	-0.00029	-0.01573
18	1.14144	-12.67247	0.00910	-0.07031	-0.00030	-0.01576
19	1.14144	-12.70534	0.00974	-0.07034	-0.00031	-0.01577
20	1.14145	-12.76976	0.01107	-0.07041	-0.00034	-0.01579
21	1.14145	-12.83425	0.01251	-0.07048	-0.00037	-0.01580
22	1.14145	-12.87769	0.01357	-0.07053	-0.00040	-0.01581
23	1.14145	-12.96339	0.01592	-0.07062	-0.00047	-0.01582
24	1.14145	-13.08340	0.01991	-0.07077	-0.00057	-0.01585
25	1.14145	-13.15751	0.02269	-0.07089	-0.00061	-0.01589
26	1.14145	-13.22246	0.02526	-0.07099	-0.00065	-0.01592
27	1.14146	-13.29013	0.02807	-0.07110	-0.00068	-0.01594
28	1.14146	-13.35266	0.03078	-0.07120	-0.00070	-0.01597
29	1.14146	-13.41789	0.03370	-0.07130	-0.00073	-0.01598
30	1.14146	-13.49780	0.03741	-0.07143	-0.00076	-0.01600
31	1.14146	-13.54852	0.03985	-0.07151	-0.00078	-0.01600
32	1.14147	-13.61388	0.04308	-0.07161	-0.00080	-0.01601
33	1.14147	-13.70587	0.04781	-0.07175	-0.00084	-0.01601
34	1.14147	-13.74461	0.04987	-0.07181	-0.00086	-0.01600
35	1.14147	-13.87525	0.05712	-0.07202	-0.00089	-0.01601
36	1.14147	-13.91388	0.05923	-0.07207	-0.00086	-0.01601
37	1.14148	-14.00608	0.06383	-0.07221	-0.00073	-0.01603
38	1.14148	-14.07155	0.06653	-0.07231	-0.00059	-0.01604
39	1.14148	-14.12228	0.06818	-0.07239	-0.00045	-0.01604
40	1.14148	-14.20256	0.06989	-0.07251	-0.00024	-0.01604
41	1.14148	-14.26807	0.07063	-0.07261	-0.00012	-0.01604
42	1.14148	-14.33080	0.07093	-0.07271	-0.00004	-0.01603

43	1.14148	-14.39899	0.07101	-0.07281	0.00000	-0.01602
44	1.14149	-14.46437	0.07101	-0.07291	-0.00001	-0.01600
45	1.14149	-14.53889	0.07119	-0.07303	-0.00008	-0.01597
46	1.14149	-14.65998	0.07250	-0.07318	-0.00026	-0.01595
47	1.14149	-14.74628	0.07421	-0.07327	-0.00036	-0.01595
48	1.14149	-14.79022	0.07526	-0.07331	-0.00040	-0.01595
49	1.14149	-14.85533	0.07702	-0.07338	-0.00046	-0.01594
50	1.14149	-14.92041	0.07898	-0.07345	-0.00050	-0.01593
51	1.14149	-14.95350	0.08004	-0.07348	-0.00052	-0.01593
52	1.14150	-15.05044	0.08334	-0.07358	-0.00057	-0.01591
53	1.14150	-15.11537	0.08571	-0.07365	-0.00059	-0.01589
54	1.14150	-15.16028	0.08741	-0.07369	-0.00061	-0.01588
55	1.14150	-15.24499	0.09076	-0.07378	-0.00065	-0.01585
56	1.14150	-15.36618	0.09593	-0.07390	-0.00071	-0.01579
57	1.14150	-15.42831	0.09875	-0.07391	-0.00073	-0.01579
58	1.14150	-15.48243	0.10126	-0.07391	-0.00074	-0.01578
59	1.14150	-15.53654	0.10379	-0.07391	-0.00074	-0.01578
60	1.14150	-15.57137	0.10542	-0.07391	-0.00074	-0.01578
61	1.14150	-15.64476	0.10887	-0.07391	-0.00074	-0.01578
62	1.14150	-15.69888	0.11142	-0.07391	-0.00074	-0.01578
63	1.14150	-15.75299	0.11396	-0.07391	-0.00074	-0.01578

Pile Out-Of-Balance Forces

Soil Reaction Forces

Pile #1

Node #	Local #	FX (*kip*)	FY (*kip*)	FZ (*kip*)	MX (*kip-in*)	MY (*kip-in*)	MZ (*kip-in*)
1	1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
64	2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
65	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
66	4	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
67	5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
68	6	0.00000	0.00000	0.00453	0.00000	0.00000	-1.40849
69	7	0.00806	-0.01007	0.00897	0.00000	0.00000	-2.60562
70	8	0.01676	-0.02183	0.00889	0.00000	0.00000	-2.40453
71	9	0.02548	-0.03454	0.00881	0.00000	0.00000	-2.21514
72	10	0.03361	-0.04759	0.00873	0.00000	0.00000	-2.03866
73	11	0.04069	-0.06061	0.00866	0.00000	0.00000	-1.87605
74	12	0.04606	-0.07293	0.00860	0.00000	0.00000	-1.72804
75	13	0.04983	-0.08523	0.00853	0.00000	0.00000	-1.59517
76	14	0.05108	-0.08109	0.00847	0.00000	0.00000	-1.47778
77	15	0.04942	-0.06767	0.00842	0.00000	0.00000	-1.37605
78	16	0.04313	0.04097	0.00837	0.00000	0.00000	-1.29009
79	17	0.01221	0.08641	0.00832	0.00000	0.00000	-1.21987
80	18	-0.03732	0.12061	0.00827	0.00000	0.00000	-1.16537

81	19	-0.05198	0.14743	0.00823	0.00000	0.00000	-1.12651
82	20	-0.06415	0.16122	0.00820	0.00000	0.00000	-1.10322
83	21	-0.03754	0.08734	0.07635	0.00000	0.00000	-0.54773

Pile #2

Node #	Local #	FX (kip)	FY (kip)	FZ (kip)	MX (kip-in)	MY (kip-in)	MZ (kip-in)
2	1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
84	2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
85	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
86	4	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
87	5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
88	6	0.00000	0.00000	0.08742	0.00000	0.00000	-1.42339
89	7	0.00802	-0.01007	0.17335	0.00000	0.00000	-2.63451
90	8	0.01667	-0.02183	0.17193	0.00000	0.00000	-2.43237
91	9	0.02535	-0.03454	0.17057	0.00000	0.00000	-2.24183
92	10	0.03341	-0.04759	0.16928	0.00000	0.00000	-2.06412
93	11	0.04041	-0.06061	0.16805	0.00000	0.00000	-1.90026
94	12	0.04569	-0.07293	0.16689	0.00000	0.00000	-1.75101
95	13	0.04933	-0.08523	0.16580	0.00000	0.00000	-1.61693
96	14	0.05041	-0.08096	0.16477	0.00000	0.00000	-1.49841
97	15	0.04849	-0.06480	0.16381	0.00000	0.00000	-1.39566
98	16	0.04167	0.05422	0.16291	0.00000	0.00000	-1.30878
99	17	0.00637	0.09414	0.16208	0.00000	0.00000	-1.23780
100	18	-0.03932	0.13214	0.16131	0.00000	0.00000	-1.18269
101	19	-0.05325	0.14743	0.16061	0.00000	0.00000	-1.14338
102	20	-0.06520	0.16122	0.15996	0.00000	0.00000	-1.11982
103	21	-0.03801	0.08734	1.43808	0.00000	0.00000	-0.55599

Pile #3

Node #	Local #	FX (kip)	FY (kip)	FZ (kip)	MX (kip-in)	MY (kip-in)	MZ (kip-in)
3	1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
104	2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
105	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
106	4	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
107	5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
108	6	0.00000	0.00000	0.24488	0.00000	0.00000	-1.43371
109	7	0.00794	-0.01007	0.48624	0.00000	0.00000	-2.65451
110	8	0.01649	-0.02183	0.48287	0.00000	0.00000	-2.45163
111	9	0.02506	-0.03454	0.47966	0.00000	0.00000	-2.26027
112	10	0.03297	-0.04759	0.47660	0.00000	0.00000	-2.08172
113	11	0.03980	-0.06061	0.47370	0.00000	0.00000	-1.91698
114	12	0.04485	-0.07293	0.47095	0.00000	0.00000	-1.76686
115	13	0.04820	-0.07350	0.46836	0.00000	0.00000	-1.63195
116	14	0.04887	-0.05913	0.46592	0.00000	0.00000	-1.51264

117	15	0.04627	0.05546	0.46363	0.00000	0.00000	-1.40917
118	16	0.03791	0.09310	0.46150	0.00000	0.00000	-1.32166
119	17	-0.00707	0.12627	0.45952	0.00000	0.00000	-1.25015
120	18	-0.04342	0.13606	0.45770	0.00000	0.00000	-1.19461
121	19	-0.05610	0.14743	0.45603	0.00000	0.00000	-1.15500
122	20	-0.06763	0.16122	0.45452	0.00000	0.00000	-1.13125
123	21	-0.03913	0.08734	3.87442	0.00000	0.00000	-0.56167

Pile #4

Node #	Local #	FX (*kip*)	FY (*kip*)	FZ (*kip*)	MX (*kip-in*)	MY (*kip-in*)	MZ (*kip-in*)
4	1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
124	2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
125	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
126	4	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
127	5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
128	6	0.00000	0.00000	0.31611	0.00000	0.00000	-1.43132
129	7	0.00807	-0.01007	0.62805	0.00000	0.00000	-2.64992
130	8	0.01674	-0.02183	0.62407	0.00000	0.00000	-2.44723
131	9	0.02542	-0.03454	0.62027	0.00000	0.00000	-2.25608
132	10	0.03347	-0.04759	0.61665	0.00000	0.00000	-2.07773
133	11	0.04041	-0.06061	0.61321	0.00000	0.00000	-1.91321
134	12	0.04556	-0.07293	0.60995	0.00000	0.00000	-1.76331
135	13	0.04899	-0.06798	0.60687	0.00000	0.00000	-1.62859
136	14	0.04971	-0.04400	0.60398	0.00000	0.00000	-1.50947
137	15	0.04712	0.07192	0.60126	0.00000	0.00000	-1.40617
138	16	0.03870	0.10841	0.59874	0.00000	0.00000	-1.31882
139	17	-0.00694	0.12627	0.59639	0.00000	0.00000	-1.24743
140	18	-0.04412	0.13606	0.59423	0.00000	0.00000	-1.19199
141	19	-0.05716	0.14743	0.59225	0.00000	0.00000	-1.15245
142	20	-0.06905	0.16122	0.59046	0.00000	0.00000	-1.12874
143	21	-0.04004	0.08734	4.94262	0.00000	0.00000	-0.56042

Pile #5

Node #	Local #	FX (*kip*)	FY (*kip*)	FZ (*kip*)	MX (*kip-in*)	MY (*kip-in*)	MZ (*kip-in*)
5	1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
144	2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
145	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
146	4	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
147	5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
148	6	0.00000	0.00000	0.40323	0.00000	0.00000	-1.42097
149	7	0.00796	-0.01007	0.80180	0.00000	0.00000	-2.62983
150	8	0.01651	-0.02183	0.79734	0.00000	0.00000	-2.42787
151	9	0.02508	-0.03454	0.79307	0.00000	0.00000	-2.23752
152	10	0.03297	-0.04759	0.78900	0.00000	0.00000	-2.06002

153	11	0.03973	-0.06061	0.78514	0.00000	0.00000	-1.89636
154	12	0.04469	-0.06797	0.78147	0.00000	0.00000	-1.74732
155	13	0.04786	-0.05570	0.77800	0.00000	0.00000	-1.61344
156	14	0.04823	0.05342	0.77474	0.00000	0.00000	-1.49510
157	15	0.04507	0.09245	0.77169	0.00000	0.00000	-1.39252
158	16	0.03138	0.11666	0.76884	0.00000	0.00000	-1.30579
159	17	-0.01690	0.12627	0.76619	0.00000	0.00000	-1.23494
160	18	-0.04650	0.13606	0.76376	0.00000	0.00000	-1.17992
161	19	-0.05873	0.14743	0.76153	0.00000	0.00000	-1.14069
162	20	-0.07025	0.16122	0.75951	0.00000	0.00000	-1.11717
163	21	-0.04051	0.08734	6.25221	0.00000	0.00000	-0.55467

Pile Internal Forces

Pile #1

Elem #	Node #	AXIAL (*kip*)	SHEAR-2 (*kip*)	SHEAR-3 (*kip*)	MOMENT-2 (*kip-ft*)	MOMENT-3 (*kip-ft*)	TORQUE (*kip-ft*)	FAILURE RATIO
63	1	-0.21075	0.07031	-0.19424	-3.47325	-2.35860	2.32203	47.56878
	64	0.27047	-0.07031	0.19424	2.95396	2.15223	-2.32203	41.34600
64	64	-0.27047	0.07068	-0.19476	-2.95394	-2.15222	2.32203	41.36924
	65	0.25770	-0.07068	0.19476	2.43544	1.94293	-2.32203	35.19693
65	65	-0.25770	0.07102	-0.19519	-2.43543	-1.94292	2.32203	35.22417
	66	0.24289	-0.07102	0.19519	1.91122	1.73131	-2.32203	29.07764
66	66	-0.24289	0.28131	-0.19552	-1.91121	-1.73129	2.32203	29.10450
	67	0.22808	-0.28131	0.19552	1.38196	0.90474	-2.32203	18.48809
67	67	-0.22808	0.28147	-0.19577	-1.38194	-0.90471	2.32203	18.51546
	68	0.21327	-0.28147	0.19577	0.84844	0.07741	-2.32203	9.33816
68	68	-0.20874	0.28146	-0.19614	-0.84838	-0.07740	2.18490	9.34752
	69	0.20786	-0.28146	0.19614	0.81650	0.02830	-2.18490	8.94704
69	69	-0.19890	0.27110	-0.20454	-0.81650	-0.02830	1.93414	8.96530
	70	0.19802	-0.27110	0.20454	0.78306	-0.01899	-1.93414	8.58001
70	70	-0.18914	0.24962	-0.22206	-0.78306	0.01899	1.70529	8.59797
	71	0.18826	-0.24962	0.22206	0.74648	-0.06253	-1.70529	8.20882
71	71	-0.17946	0.21689	-0.24938	-0.74648	0.06253	1.49669	8.22689
	72	0.17858	-0.21689	0.24938	0.70507	-0.10039	-1.49669	7.80732
72	72	-0.16986	0.17364	-0.28669	-0.70507	0.10039	1.30662	7.82529
	73	0.16898	-0.17364	0.28669	0.65709	-0.13074	-1.30662	7.34558
73	73	-0.16033	0.12110	-0.33380	-0.65709	0.13074	1.13331	7.36318
	74	0.15945	-0.12110	0.33380	0.60085	-0.15197	-1.13331	6.79144
74	74	-0.15086	0.06133	-0.38985	-0.60085	0.15197	0.97500	6.80895
	75	0.14998	-0.06133	0.38985	0.53480	-0.16282	-0.97500	6.11610
75	75	-0.14146	-0.00383	-0.45422	-0.53480	0.16282	0.82997	6.13354
	76	0.14058	0.00383	0.45422	0.45749	-0.16237	-0.82997	5.29317
76	76	-0.13211	-0.07151	-0.52054	-0.45749	0.16237	0.69651	5.31039
	77	0.13123	0.07151	0.52054	0.36860	-0.15017	-0.69651	4.31115
77	77	-0.12282	-0.13894	-0.57250	-0.36860	0.15017	0.57295	4.32831

	78	0.12195	0.13894	0.57250	0.27060	-0.12627	-0.57295	3.19160
78	78	-0.11359	-0.19609	-0.53097	-0.27060	0.12627	0.45767	3.20861
	79	0.11271	0.19609	0.53097	0.17971	-0.09244	-0.45767	2.10438
79	79	-0.10440	-0.20838	-0.44629	-0.17971	0.09244	0.34909	2.12144
	80	0.10352	0.20838	0.44629	0.10340	-0.05648	-0.34909	1.15695
80	80	-0.09525	-0.17139	-0.33352	-0.10340	0.05648	0.24569	1.17386
	81	0.09437	0.17139	0.33352	0.04655	-0.02691	-0.24569	0.44070
81	81	-0.08615	-0.11442	-0.20706	-0.04655	0.02691	0.14595	0.45756
	82	0.08527	0.11442	0.20706	0.01152	-0.00720	-0.14595	0.00145
82	82	-0.07708	-0.04222	-0.07093	-0.01152	0.00720	0.04841	0.00141
	83	0.07620	0.04222	0.07093	0.15073E-09	-0.10011E-09	-0.04841	0.00084

Pile #2

Elem #	Node #	AXIAL (*kip*)	SHEAR-2 (*kip*)	SHEAR-3 (*kip*)	MOMENT-2 (*kip-ft*)	MOMENT-3 (*kip-ft*)	TORQUE (*kip-ft*)	FAILURE RATIO
83	2	-3.93569	0.04134	-0.33524	-1.72449	-2.20491	2.35632	24.64877
	84	3.99541	-0.04134	0.33524	1.55410	2.06504	-2.35632	22.19008
84	84	-3.99541	0.04099	-0.33498	-1.55411	-2.06505	2.35632	22.21384
	85	3.98264	-0.04099	0.33498	1.37056	1.90124	-2.35632	19.45659
85	85	-3.98264	0.04066	-0.33474	-1.37057	-1.90124	2.35632	19.48416
	86	3.96783	-0.04066	0.33474	1.16852	1.71571	-2.35632	16.41626
86	86	-3.96783	0.25038	-0.33454	-1.16852	-1.71573	2.35632	16.44388
	87	3.95302	-0.25038	0.33454	0.95020	0.89892	-2.35632	7.65615
87	87	-3.95302	0.25022	-0.33437	-0.95021	-0.89895	2.35632	7.68378
	88	3.93821	-0.25022	0.33437	0.71821	0.07221	-2.35632	0.95355
88	88	-3.84942	0.25014	-0.33468	-0.71826	-0.07222	2.21743	1.12006
	89	3.84854	-0.25014	0.33468	0.70305	0.02317	-2.21743	0.90746
89	89	-3.67248	0.23981	-0.34348	-0.70305	-0.02317	1.96333	1.23504
	90	3.67160	-0.23981	0.34348	0.68433	-0.02384	-1.96333	1.02030
90	90	-3.49700	0.21842	-0.36165	-0.68433	0.02384	1.73135	1.34655
	91	3.49612	-0.21842	0.36165	0.66049	-0.06687	-1.73135	1.11000
91	91	-3.32290	0.18586	-0.38984	-0.66049	0.06687	1.51982	1.43247
	92	3.32202	-0.18586	0.38984	0.62980	-0.10400	-1.51982	1.14304
92	92	-3.15011	0.14291	-0.42816	-0.62980	0.10400	1.32700	1.46299
	93	3.14923	-0.14291	0.42816	0.59053	-0.13343	-1.32700	1.08771
93	93	-2.97858	0.09082	-0.47628	-0.59053	0.13343	1.15114	1.40669
	94	2.97770	-0.09082	0.47628	0.54099	-0.15357	-1.15114	0.91666
94	94	-2.80823	0.03172	-0.53309	-0.54099	0.15357	0.99046	1.23209
	95	2.80735	-0.03172	0.53309	0.47971	-0.16322	-0.99046	0.59724
95	95	-2.63899	-0.03249	-0.59747	-0.47971	0.16322	0.84321	0.91063
	96	2.63811	0.03249	0.59747	0.40538	-0.16147	-0.84321	0.10700
96	96	-2.47080	-0.09881	-0.66263	-0.40538	0.16147	0.70768	0.41845
	97	2.46992	0.09881	0.66263	0.31787	-0.14798	-0.70768	0.04353
97	97	-2.30360	-0.16419	-0.70810	-0.31787	0.14798	0.58218	0.04308
	98	2.30272	0.16419	0.70810	0.22063	-0.12291	-0.58218	0.03363
98	98	-2.13732	-0.21582	-0.61290	-0.22063	0.12291	0.46507	0.03265

	99	2.13644	0.21582	0.61290	0.13805	-0.08864	-0.46507	0.02668
99	99	-1.97189	-0.22224	-0.51209	-0.13805	0.08864	0.35476	0.02535
	100	1.97101	0.22224	0.51209	0.07110	-0.05302	-0.35476	0.02178
100	100	-1.80725	-0.18072	-0.38271	-0.07110	0.05302	0.24968	0.02010
	101	1.80637	0.18072	0.38271	0.02475	-0.02434	-0.24968	0.01996
101	101	-1.64333	-0.12077	-0.24469	-0.02475	0.02434	0.14833	0.01815
	102	1.64245	0.12077	0.24469	0.00052	-0.00582	-0.14833	0.01815
102	102	-1.48007	-0.04611	-0.09744	-0.00052	0.00582	0.04920	0.01635
	103	1.47919	0.04611	0.09744	-0.48099E-10	0.56266E-09	-0.04920	0.01635

Pile #3

Elem #	Node #	AXIAL (kip)	SHEAR-2 (kip)	SHEAR-3 (kip)	MOMENT-2 (kip-ft)	MOMENT-3 (kip-ft)	TORQUE (kip-ft)	FAILURE RATIO
103	3	-11.28429	-0.01992	-0.76078	0.14181	-1.90231	2.38056	0.83165
	104	11.34401	0.01992	0.76078	0.01404	1.89818	-2.38056	0.72522
104	104	-11.34401	-0.01967	-0.76078	-0.01405	-1.89818	2.38056	0.74885
	105	11.33124	0.01967	0.76078	0.17431	1.82830	-2.38056	0.22659
105	105	-11.33124	-0.01943	-0.76080	-0.17431	-1.82830	2.38056	0.22667
	106	11.31643	0.01943	0.76080	0.32568	1.69544	-2.38056	0.21187
106	106	-11.31643	0.19078	-0.76085	-0.32568	-1.69543	2.38056	0.21185
	107	11.30162	-0.19078	0.76085	0.46274	0.89510	-2.38056	0.14954
107	107	-11.30162	0.19090	-0.76091	-0.46274	-0.89508	2.38056	0.14943
	108	11.28681	-0.19090	0.76091	0.58079	0.06424	-2.38056	0.12687
108	108	-11.03052	0.19067	-0.76305	-0.58076	-0.06423	2.24041	0.12457
	109	11.02964	-0.19067	0.76305	0.58358	0.01495	-2.24041	0.12451
109	109	-10.52076	0.18003	-0.77486	-0.58358	-0.01495	1.98392	0.12001
	110	10.51988	-0.18003	0.77486	0.57804	-0.03173	-1.98392	0.11979
110	110	-10.01452	0.15850	-0.79529	-0.57804	0.03173	1.74970	0.11542
	111	10.01365	-0.15850	0.79529	0.56271	-0.07394	-1.74970	0.11486
111	111	-9.51166	0.12602	-0.82461	-0.56271	0.07394	1.53608	0.11043
	112	9.51078	-0.12602	0.82461	0.53609	-0.10976	-1.53608	0.10948
112	112	-9.01201	0.08343	-0.86229	-0.53609	0.10976	1.34132	0.10506
	113	9.01113	-0.08343	0.86229	0.49677	-0.13746	-1.34132	0.10358
113	113	-8.51542	0.03207	-0.90704	-0.49677	0.13746	1.16365	0.09915
	114	8.51454	-0.03207	0.90704	0.44358	-0.15552	-1.16365	0.09715
114	114	-8.02172	-0.02583	-0.95607	-0.44358	0.15552	1.00129	0.09271
	115	8.02084	0.02583	0.95607	0.37582	-0.16280	-1.00129	0.09005
115	115	-7.53077	-0.08817	-1.00450	-0.37582	0.16280	0.85248	0.08565
	116	7.52989	0.08817	1.00450	0.29364	-0.15854	-0.85248	0.08322
116	116	-7.04239	-0.15167	-1.03585	-0.29364	0.15854	0.71550	0.07782
	117	7.04151	0.15167	1.03585	0.20005	-0.14255	-0.71550	0.07782
117	117	-6.55645	-0.21432	-1.00331	-0.20005	0.14255	0.58863	0.07245
	118	6.55557	0.21432	1.00331	0.10615	-0.11498	-0.58863	0.07245
118	118	-6.07276	-0.25374	-0.82162	-0.10615	0.11498	0.47024	0.06710
	119	6.07188	0.25374	0.82162	0.03783	-0.07986	-0.47024	0.06710
119	119	-5.59119	-0.24704	-0.65862	-0.03783	0.07986	0.35871	0.06178

	120	5.59031	0.24704	0.65862	-0.00811	-0.04520	-0.35871	0.05207
120	120	-5.11157	-0.19641	-0.48448	0.00811	0.04520	0.25247	0.04778
	121	5.11069	0.19641	0.48448	-0.02972	-0.01861	-0.25247	0.05648
121	121	-4.63373	-0.13048	-0.31263	0.02972	0.01861	0.14999	0.05120
	122	4.63285	0.13048	0.31263	-0.02737	-0.00275	-0.14999	0.04339
122	122	-4.15753	-0.05084	-0.13473	0.02737	0.00275	0.04975	0.03904
	123	4.15665	0.05084	0.13473	0.00000	0.52204E-09	-0.04975	0.04594

Pile #4

Elem #	Node #	AXIAL (*kip*)	SHEAR-2 (*kip*)	SHEAR-3 (*kip*)	MOMENT-2 (*kip-ft*)	MOMENT-3 (*kip-ft*)	TORQUE (*kip-ft*)	FAILURE RATIO
123	4	-14.86788	-0.02220	-0.98644	1.67479	-2.18005	2.37466	3.82944
	124	14.92760	0.02220	0.98644	-1.33966	2.18807	-2.37466	1.72547
124	124	-14.92760	-0.02237	-0.98654	1.33967	-2.18807	2.37466	1.74932
	125	14.91483	0.02237	0.98654	-0.93957	2.09809	-2.37466	0.28218
125	125	-14.91483	-0.02252	-0.98661	0.93957	-2.09809	2.37466	0.28216
	126	14.90002	0.02252	0.98661	-0.50047	1.91445	-2.37466	0.24932
126	126	-14.90002	0.18734	-0.98665	0.50048	-1.91446	2.37466	0.24926
	127	14.88521	-0.18734	0.98665	-0.04229	1.03750	-2.37466	0.18033
127	127	-14.88521	0.18726	-0.98666	0.04230	-1.03751	2.37466	0.18020
	128	14.87040	-0.18726	0.98666	0.41448	0.11459	-2.37466	0.16434
128	128	-14.53237	0.18696	-0.98913	-0.41449	-0.11460	2.23484	0.16059
	129	14.53149	-0.18696	0.98913	0.43622	0.05977	-2.23484	0.16059
129	129	-13.85991	0.17621	-1.00163	-0.43622	-0.05977	1.97896	0.15316
	130	13.85903	-0.17621	1.00163	0.44678	0.00784	-1.97896	0.14469
130	130	-13.19174	0.15450	-1.02259	-0.44678	-0.00784	1.74531	0.13859
	131	13.19086	-0.15450	1.02259	0.44476	-0.03930	-1.74531	0.14578
131	131	-12.52767	0.12178	-1.05208	-0.44476	0.03930	1.53221	0.13844
	132	12.52679	-0.12178	1.05208	0.42876	-0.07974	-1.53221	0.13844
132	132	-11.86751	0.07889	-1.08928	-0.42875	0.07974	1.33793	0.13114
	133	11.86663	-0.07889	1.08928	0.39748	-0.11172	-1.33793	0.13114
133	133	-11.21109	0.02718	-1.13239	-0.39748	0.11172	1.16070	0.12389
	134	11.21021	-0.02718	1.13239	0.34997	-0.13371	-1.16070	0.12389
134	134	-10.55820	-0.03111	-1.17773	-0.34997	0.13371	0.99875	0.11667
	135	10.55732	0.03111	1.17773	0.28590	-0.14457	-0.99875	0.11667
135	135	-9.90867	-0.09384	-1.21838	-0.28590	0.14457	0.85032	0.10949
	136	9.90779	0.09384	1.21838	0.20613	-0.14355	-0.85032	0.10949
136	136	-9.26230	-0.15771	-1.23340	-0.20613	0.14355	0.71368	0.10235
	137	9.26142	0.15771	1.23340	0.11517	-0.13044	-0.71368	0.10235
137	137	-8.61889	-0.21894	-1.15220	-0.11517	0.13044	0.58714	0.09524
	138	8.61801	0.21894	1.15220	0.02974	-0.10572	-0.58714	0.09524
138	138	-7.97827	-0.26082	-0.93337	-0.02974	0.10572	0.46904	0.08816
	139	7.97739	0.26082	0.93337	-0.02626	-0.07276	-0.46904	0.08816
139	139	-7.34023	-0.25427	-0.73816	0.02626	0.07276	0.35780	0.08111
	140	7.33935	0.25427	0.73816	-0.05688	-0.03994	-0.35780	0.08111
140	140	-6.70458	-0.20229	-0.54509	0.05688	0.03994	0.25183	0.07409

	141	6.70370	0.20229	0.54509	-0.06246	-0.01515	-0.25183	0.07409
141	141	-6.07114	-0.13517	-0.35683	0.06246	0.01515	0.14961	0.06708
	142	6.07026	0.13517	0.35683	-0.04380	-0.00103	-0.14961	0.05717
142	142	-5.43970	-0.05403	-0.16344	0.04380	0.00103	0.04962	0.05141
	143	5.43882	0.05403	0.16344	0.00000	0.27374E-09	-0.04962	0.06011

Pile #5

Elem #	Node #	AXIAL (kip)	SHEAR-2 (kip)	SHEAR-3 (kip)	MOMENT-2 (kip-ft)	MOMENT-3 (kip-ft)	TORQUE (kip-ft)	FAILURE RATIO
143	5	-19.52356	-0.06949	-1.32424	3.38092	-1.84625	2.35062	7.82733
	144	19.58328	0.06949	1.32424	-2.93200	1.95247	-2.35062	4.06298
144	144	-19.58328	-0.06961	-1.32441	2.93200	-1.95247	2.35062	4.08650
	145	19.57051	0.06961	1.32441	-2.30562	1.94382	-2.35062	0.37043
145	145	-19.57051	-0.06972	-1.32455	2.30563	-1.94382	2.35062	0.37041
	146	19.55570	0.06972	1.32455	-1.54697	1.82115	-2.35062	0.30594
146	146	-19.55570	0.14017	-1.32464	1.54697	-1.82115	2.35062	0.30590
	147	19.54089	-0.14017	1.32464	-0.70098	0.98541	-2.35062	0.22826
147	147	-19.54089	0.14011	-1.32468	0.70099	-0.98541	2.35062	0.22813
	148	19.52608	-0.14011	1.32468	0.18258	0.09220	-2.35062	0.21579
148	148	-19.08212	0.13973	-1.32822	-0.18258	-0.09220	2.21204	0.21087
	149	19.08124	-0.13973	1.32822	0.22813	0.03917	-2.21204	0.21087
149	149	-18.19849	0.12894	-1.34252	-0.22813	-0.03917	1.95850	0.20111
	150	18.19761	-0.12894	1.34252	0.25839	-0.01067	-1.95850	0.20111
150	150	-17.31983	0.10733	-1.36475	-0.25839	0.01067	1.72705	0.19140
	151	17.31895	-0.10733	1.36475	0.27205	-0.05543	-1.72705	0.19140
151	151	-16.44592	0.07491	-1.39467	-0.27205	0.05543	1.51601	0.18174
	152	16.44504	-0.07491	1.39467	0.26785	-0.09325	-1.51601	0.18174
152	152	-15.57657	0.03258	-1.43094	-0.26785	0.09325	1.32365	0.17213
	153	15.57569	-0.03258	1.43094	0.24476	-0.12240	-1.32365	0.17213
153	153	-14.71155	-0.01826	-1.47089	-0.24476	0.12240	1.14821	0.16257
	154	14.71068	0.01826	1.47089	0.20222	-0.14141	-1.14821	0.16257
154	154	-13.85067	-0.07528	-1.50922	-0.20222	0.14141	0.98793	0.15306
	155	13.84979	0.07528	1.50922	0.14057	-0.14922	-0.98793	0.15306
155	155	-12.99371	-0.13620	-1.53514	-0.14057	0.14922	0.84105	0.14359
	156	12.99283	0.13620	1.53514	0.06204	-0.14517	-0.84105	0.14359
156	156	-12.14044	-0.19748	-1.51871	-0.06204	0.14517	0.70586	0.13416
	157	12.13956	0.19748	1.51871	-0.02596	-0.12918	-0.70586	0.13416
157	157	-11.29066	-0.25478	-1.32669	0.02596	0.12918	0.58067	0.12477
	158	11.28978	0.25478	1.32669	-0.09295	-0.10198	-0.58067	0.12477
158	158	-10.44414	-0.28665	-1.06515	0.09295	0.10198	0.46386	0.11541
	159	10.44326	0.28665	1.06515	-0.12681	-0.06796	-0.46386	0.11541
159	159	-9.60066	-0.27022	-0.83118	0.12681	0.06796	0.35383	0.10609
	160	9.59978	0.27022	0.83118	-0.13228	-0.03552	-0.35383	0.10609
160	160	-8.76001	-0.21234	-0.61528	0.13228	0.03552	0.24903	0.09680
	161	8.75913	0.21234	0.61528	-0.11245	-0.01185	-0.24903	0.09680
161	161	-7.92195	-0.14125	-0.40685	0.11245	0.01185	0.14794	0.08754

	162	7.92107	0.14125	0.40685	-0.06859	0.00076	-0.14794	0.07507
162	162	-7.08627	-0.05693	-0.19460	0.06859	-0.00076	0.04907	0.06744
	163	7.08539	0.05693	0.19460	0.00000	-0.25449E-09	-0.04907	0.07830

Stucture Internal Forces

COLUMN #1

Elem # Node #

COLUMN #2

Elem # Node #

COLUMN #3

Elem # Node #

COLUMN #4

Elem # Node #

COLUMN #5

Elem # Node #

PIER_CAP

Elem #	Node #	AXIAL (*kip*)	SHEAR-2 (*kip*)	SHEAR-3 (*kip*)	MOMENT-2 (*kip-ft*)	MOMENT-3 (*kip-ft*)	TORQUE (*kip-ft*)	FAII RA
1	6	0.00000	0.11286E-11	0.00000	0.35016E-09	-0.12491E-12	0.00000	0.C
	7	0.00000	-0.01677	0.00000	0.81248E-10	0.00240	0.00000	0.C
2	7	0.00000	0.01677	0.00000	0.15522E-09	-0.00240	0.00000	0.C
	8	0.00000	-0.03353	0.00000	0.31226E-09	0.00958	0.00000	0.C
3	8	0.21828E-10	0.03353	-0.54570E-09	-0.44353E-09	-0.00958	-0.12127E-11	0.C
	9	-0.21828E-10	-0.05623	0.54570E-09	0.66393E-09	0.02694	-0.12127E-11	0.C
4	9	0.00000	0.59623	-0.19999	0.00000	-0.02694	0.00000	0.C
	10	0.00000	-0.60706	0.19999	0.03691	0.13798	0.00000	0.C
5	10	0.00000	0.60706	-0.19999	-0.03691	-0.13798	0.00000	0.C
	11	0.00000	-0.62383	0.19999	0.09405	0.31382	0.00000	0.C
6	11	0.00000	0.62383	-0.19999	-0.09405	-0.31382	0.00000	0.C
	12	0.00000	-0.64060	0.19999	0.15119	0.49446	0.00000	0.C
7	12	0.00000	0.64060	-0.19999	-0.15119	-0.49446	0.00000	0.C
	1	0.00000	-0.65736	0.19999	0.20833	0.67988	0.00000	0.C
8	1	-0.07005	0.44661	0.00579	2.11370	1.67857	-3.47304	0.C
	13	0.07005	-0.44905	-0.00579	-2.11394	-1.65994	-3.47304	0.C
9	13	-0.07005	0.93905	-0.19423	2.11394	1.65994	-3.47304	0.C
	14	0.07005	-0.97655	0.19423	-1.98983	-1.04795	-3.47304	0.C
10	14	-0.07005	0.97655	-0.19423	1.98983	1.04795	-3.47304	0.C
	15	0.07005	-1.00262	0.19423	-1.90353	-0.60823	-3.47304	0.C
11	15	-0.07005	1.49262	-0.39424	1.90353	0.60823	-3.47304	0.C
	16	0.07005	-1.50648	0.39424	-1.81041	-0.25402	-3.47304	0.C
12	16	-0.07005	1.50648	-0.39424	1.81041	0.25402	-3.47304	0.C

	17	0.07005	-1.52645	0.39424	-1.67626	0.26200	-3.47304	0.C
13	17	-0.07005	1.52645	-0.39424	1.67626	-0.26200	-3.47304	0.C
	18	0.07005	-1.55619	0.39424	-1.47645	1.04316	-3.47304	0.C
14	18	-0.07005	2.04619	-0.59424	1.47645	-1.04316	-3.47304	0.C
	19	0.07005	-2.05638	0.59424	-1.37321	1.39956	-3.47304	0.C
15	19	-0.07005	2.05638	-0.59424	1.37321	-1.39956	-3.47304	0.C
	20	0.07005	-2.07635	0.59424	-1.17100	2.10270	-3.47304	0.C
16	20	-0.07005	2.07635	-0.59424	1.17100	-2.10270	-3.47304	0.C
	21	0.07005	-2.09632	0.59424	-0.96880	2.81263	-3.47304	0.C
17	21	-0.07005	2.09632	-0.59424	0.96880	-2.81263	-3.47304	0.C
	22	0.07005	-2.10976	0.59424	-0.83272	3.29423	-3.47304	0.C
18	22	-0.07005	2.59976	-0.79427	0.83272	-3.29423	-3.47304	0.C
	23	0.07005	-2.62626	0.79427	-0.47406	4.47414	-3.47304	0.C
19	23	-0.07005	2.62626	-0.79427	0.47406	-4.47414	-3.47304	0.C
	2	0.07005	-2.64622	0.79427	-0.20379	5.37120	-3.47304	0.C
20	2	-0.11166	-1.28947	-0.47065	2.56011	-3.16616	-5.19763	0.C
	24	0.11166	1.27236	0.47065	-2.42293	2.79281	-5.19763	0.C
21	24	-0.11166	-0.78236	-0.67068	2.42293	-2.79281	-5.19763	0.C
	25	0.11166	0.75953	0.67068	-2.16198	2.49285	-5.19763	0.C
22	25	-0.11166	-0.75953	-0.67068	2.16198	-2.49285	-5.19763	0.C
	26	0.11166	0.73956	0.67068	-1.93376	2.23779	-5.19763	0.C
23	26	-0.11166	-0.73956	-0.67068	1.93376	-2.23779	-5.19763	0.C
	27	0.11166	0.71879	0.67068	-1.69639	1.97971	-5.19763	0.C
24	27	-0.11166	-0.22879	-0.87069	1.69639	-1.97971	-5.19763	0.C
	28	0.11166	0.20963	0.87069	-1.41200	1.90811	-5.19763	0.C
25	28	-0.11166	-0.20963	-0.87069	1.41200	-1.90811	-5.19763	0.C
	29	0.11166	0.18966	0.87069	-1.11573	1.84018	-5.19763	0.C
26	29	-0.11166	-0.18966	-0.87069	1.11573	-1.84018	-5.19763	0.C
	30	0.11166	0.16523	0.87069	-0.75317	1.76629	-5.19763	0.C
27	30	-0.11166	0.32477	-1.07071	0.75317	-1.76629	-5.19763	0.C
	31	0.11166	-0.34028	1.07071	-0.47034	1.85413	-5.19763	0.C
28	31	-0.11166	0.34028	-1.07071	0.47034	-1.85413	-5.19763	0.C
	32	0.11166	-0.36024	1.07071	-0.10600	1.97332	-5.19763	0.C
29	32	-0.11166	0.36024	-1.07071	0.10600	-1.97332	-5.19763	0.C
	33	0.11166	-0.38834	1.07071	0.40673	2.15255	-5.19763	0.C
30	33	-0.11166	1.15135	-1.27074	-0.40673	-2.15255	-5.19763	0.C
	34	0.11166	-1.16318	1.27074	0.66302	2.38596	-5.19763	0.C
31	34	-0.11166	1.16318	-1.27074	-0.66302	-2.38596	-5.19763	0.C
	3	0.11166	-1.18315	1.27074	1.09543	2.78516	-5.19763	0.C
32	3	-0.09150	-10.10114	-0.50084	1.28514	-0.88294	-5.05583	0.C
	35	0.09150	10.08117	0.50084	-1.11472	-2.55085	-5.05583	0.C
33	35	-0.09150	-10.08117	-0.50084	1.11472	2.55085	-5.05583	0.C
	36	0.09150	10.06937	0.50084	-1.01402	-4.57654	-5.05583	0.C
34	36	-0.09151	-8.75937	-0.70084	1.01402	4.57654	-5.05583	0.C
	37	0.09151	8.73123	0.70084	-0.67797	-8.76991	-5.05583	0.C
35	37	-0.09151	-8.73123	-0.70084	0.67797	8.76991	-5.05583	0.C

	38	0.09151	8.71126	0.70084	-0.43949	-11.73756	-5.05583	0.C
36	38	-0.09151	-8.71126	-0.70084	0.43949	11.73756	-5.05583	0.C
	39	0.09151	8.69580	0.70084	-0.25480	-14.03113	-5.05583	0.C
37	39	-0.09151	8.62919	-0.90085	0.25480	14.03113	-5.05583	0.C
	40	0.09151	-8.65366	0.90085	0.12088	-10.42737	-5.05583	0.C
38	40	-0.09151	8.65366	-0.90085	-0.12088	10.42737	-5.05583	0.C
	41	0.09151	-8.67363	0.90085	0.42742	-7.47932	-5.05583	0.C
39	41	-0.09151	8.67363	-0.90085	-0.42742	7.47932	-5.05583	0.C
	42	0.09151	-8.69276	0.90085	0.72109	-4.64870	-5.05583	0.C
40	42	-0.09151	10.01776	-1.10087	-0.72109	4.64870	-5.05583	0.C
	43	0.09151	-10.03856	1.10087	1.11142	-1.09305	-5.05583	0.C
41	43	-0.09151	10.03856	-1.10087	-1.11142	1.09305	-5.05583	0.C
	44	0.09151	-10.05853	1.10087	1.48603	2.32625	-5.05583	0.C
42	44	-0.09151	10.05853	-1.10087	-1.48603	-2.32625	-5.05583	0.C
	45	0.09151	-10.08133	1.10087	1.91367	6.23797	-5.05583	0.C
43	45	-0.09151	11.40633	-1.30091	-1.91367	-6.23797	-5.05583	0.C
	4	0.09151	-11.42347	1.30091	2.29366	9.57226	-5.05583	0.C
44	4	-0.06940	-3.44441	-0.31983	0.08100	-7.39215	-3.38099	0.C
	46	0.06940	3.42444	0.31983	0.02783	6.22349	-3.38099	0.C
45	46	-0.06940	-3.42444	-0.31983	-0.02783	-6.22349	-3.38099	0.C
	47	0.06940	3.39798	0.31983	0.17205	4.68530	-3.38099	0.C
46	47	-0.06940	-2.07298	-0.51986	-0.17205	-4.68530	-3.38099	0.C
	48	0.06940	2.05951	0.51986	0.29142	4.21082	-3.38099	0.C
47	48	-0.06940	-2.05951	-0.51986	-0.29142	-4.21082	-3.38099	0.C
	49	0.06940	2.03954	0.51986	0.46832	3.51342	-3.38099	0.C
48	49	-0.06940	-2.03954	-0.51986	-0.46832	-3.51342	-3.38099	0.C
	50	0.06940	2.01957	0.51986	0.64522	2.82280	-3.38099	0.C
49	50	-0.06940	-2.01957	-0.51986	-0.64522	-2.82280	-3.38099	0.C
	51	0.06940	2.00941	0.51986	0.73521	2.47407	-3.38099	0.C
50	51	-0.06940	-0.68441	-0.71987	-0.73521	-2.47407	-3.38099	0.C
	52	0.06940	0.65464	0.71987	1.10051	2.13432	-3.38099	0.C
51	52	-0.06940	-0.65464	-0.71987	-1.10051	-2.13432	-3.38099	0.C
	53	0.06940	0.63467	0.71987	1.34546	1.91496	-3.38099	0.C
52	53	-0.06940	-0.63467	-0.71987	-1.34546	-1.91496	-3.38099	0.C
	54	0.06940	0.62085	0.71987	1.51505	1.76708	-3.38099	0.C
53	54	-0.06940	0.70415	-0.91988	-1.51505	-1.76708	-3.38099	0.C
	55	0.06940	-0.73026	0.91988	1.92437	2.08622	-3.38099	0.C
54	55	-0.06940	0.73026	-0.91988	-1.92437	-2.08622	-3.38099	0.C
	56	0.06940	-0.76772	0.91988	2.51155	2.56432	-3.38099	0.C
55	56	-0.06940	18.09272	-1.11991	-2.51155	-2.56432	-3.38099	0.C
	5	0.06940	-18.09520	1.11991	2.55885	3.32849	-3.38099	0.C
56	5	0.00000	-1.42836	0.20001	-0.20823	-1.48220	0.00000	0.C
	57	0.00000	1.41159	-0.20001	0.15108	1.07649	0.00000	0.C
57	57	0.00000	-1.41159	0.20001	-0.15108	-1.07649	0.00000	0.C
	58	0.00000	1.39483	-0.20001	0.09393	0.67557	0.00000	0.C
58	58	0.00000	-1.39483	0.20001	-0.09393	-0.67557	0.00000	0.C

	59	0.00000	1.37806	-0.20001	0.03679	0.27945	0.00000	0.C
59	59	0.00000	-1.37806	0.20001	-0.03679	-0.27945	0.00000	0.C
	60	0.00000	1.36727	-0.20001	0.00000	0.02698	0.00000	0.C
60	60	-0.14552E-10	-0.05627	0.00000	0.00000	-0.02698	-0.12127E-11	0.C
	61	0.14552E-10	0.03353	0.00000	0.84401E-09	0.00958	-0.12127E-11	0.C
61	61	0.00000	-0.03353	0.00000	-0.68758E-09	-0.00958	-0.60633E-12	0.C
	62	0.00000	0.01677	0.00000	-0.13461E-09	0.00240	-0.60633E-12	0.C
62	62	0.00000	-0.01677	0.00000	0.60633E-12	-0.00240	0.00000	0.C
	63	0.00000	0.11247E-10	0.00000	0.12127E-11	0.12618E-11	0.00000	0.C

Load Case Results - Substructure 1

Load Case 10 - Time Step 1

PY Multipliers

Pile #	X-PYM	Y-PYM
1	1.00000	1.00000
2	1.00000	1.00000
3	1.00000	1.00000
4	1.00000	1.00000
5	1.00000	1.00000

Pile Displacement

Pile #1

Node #	Local #	DX (*in*)	DY (*in*)	DZ (*in*)	RX (*rad*)	RY (*rad*)	RZ (*rad*)
1	1	1.02740	-14.49200	0.00748	-0.07585	-0.00129	-0.00122
64	2	0.95418	-11.84678	0.00681	-0.07514	-0.00288	-0.00099
65	3	0.82640	-9.22620	0.00614	-0.07444	-0.00441	-0.00077
66	4	0.64611	-6.62997	0.00547	-0.07375	-0.00587	-0.00055
67	5	0.41978	-4.05761	0.00481	-0.07308	-0.00696	-0.00033
68	6	0.16801	-1.50845	0.00415	-0.07243	-0.00733	-0.00010
69	7	0.15277	-1.35784	0.00412	-0.07239	-0.00733	-0.00009
70	8	0.13754	-1.20731	0.00408	-0.07235	-0.00732	-0.00008
71	9	0.12231	-1.05685	0.00405	-0.07231	-0.00732	-0.00007
72	10	0.10709	-0.90648	0.00401	-0.07228	-0.00731	-0.00006
73	11	0.09189	-0.75617	0.00398	-0.07224	-0.00730	-0.00006
74	12	0.07671	-0.60594	0.00395	-0.07221	-0.00729	-0.00005
75	13	0.06155	-0.45578	0.00393	-0.07218	-0.00728	-0.00005
76	14	0.04641	-0.30568	0.00390	-0.07215	-0.00727	-0.00004
77	15	0.03130	-0.15563	0.00387	-0.07213	-0.00726	-0.00004
78	16	0.01620	-0.00562	0.00385	-0.07211	-0.00725	-0.00003
79	17	0.00111	0.14435	0.00383	-0.07210	-0.00725	-0.00003
80	18	-0.01396	0.29430	0.00381	-0.07209	-0.00724	-0.00003
81	19	-0.02902	0.44424	0.00379	-0.07208	-0.00724	-0.00003
82	20	-0.04408	0.59417	0.00378	-0.07208	-0.00724	-0.00003

83	21	-0.05914	0.74410	0.00376	-0.07208	-0.00724	-0.00003

Pile #2

Node #	Local #	DX (in)	DY (in)	DZ (in)	RX (rad)	RY (rad)	RZ (rad)
2	1	1.02740	-14.54955	0.06618	-0.07601	-0.00114	-0.00107
84	2	0.96022	-11.88353	0.06072	-0.07614	-0.00271	-0.00087
85	3	0.83710	-9.21609	0.05524	-0.07609	-0.00432	-0.00068
86	4	0.65746	-6.55365	0.04976	-0.07586	-0.00592	-0.00048
87	5	0.42725	-3.90235	0.04430	-0.07545	-0.00712	-0.00029
88	6	0.16837	-1.26778	0.03884	-0.07490	-0.00756	-0.00009
89	7	0.15265	-1.11202	0.03852	-0.07487	-0.00756	-0.00008
90	8	0.13694	-0.95633	0.03822	-0.07483	-0.00755	-0.00007
91	9	0.12123	-0.80072	0.03793	-0.07480	-0.00755	-0.00006
92	10	0.10553	-0.64518	0.03766	-0.07476	-0.00754	-0.00006
93	11	0.08984	-0.48971	0.03740	-0.07473	-0.00754	-0.00005
94	12	0.07418	-0.33430	0.03715	-0.07470	-0.00753	-0.00004
95	13	0.05853	-0.17894	0.03692	-0.07468	-0.00752	-0.00004
96	14	0.04290	-0.02363	0.03671	-0.07466	-0.00751	-0.00004
97	15	0.02730	0.13164	0.03651	-0.07465	-0.00750	-0.00003
98	16	0.01171	0.28690	0.03632	-0.07464	-0.00749	-0.00003
99	17	-0.00387	0.44215	0.03614	-0.07464	-0.00749	-0.00003
100	18	-0.01944	0.59740	0.03598	-0.07464	-0.00748	-0.00003
101	19	-0.03500	0.75265	0.03584	-0.07464	-0.00748	-0.00003
102	20	-0.05056	0.90791	0.03571	-0.07464	-0.00748	-0.00002
103	21	-0.06612	1.06317	0.03559	-0.07465	-0.00748	-0.00002

Pile #3

Node #	Local #	DX (in)	DY (in)	DZ (in)	RX (rad)	RY (rad)	RZ (rad)
3	1	1.02739	-14.59284	0.08701	-0.07612	-0.00001	-0.00066
104	2	0.99159	-11.91715	0.07998	-0.07658	-0.00205	-0.00054
105	3	0.88341	-9.22945	0.07293	-0.07680	-0.00412	-0.00042
106	4	0.70379	-6.53804	0.06589	-0.07679	-0.00611	-0.00030
107	5	0.46166	-3.85133	0.05885	-0.07653	-0.00760	-0.00018
108	6	0.18322	-1.17737	0.05183	-0.07606	-0.00818	-0.00006
109	7	0.16620	-1.01920	0.05142	-0.07603	-0.00818	-0.00005
110	8	0.14917	-0.86110	0.05103	-0.07599	-0.00819	-0.00004
111	9	0.13215	-0.70306	0.05066	-0.07596	-0.00819	-0.00004
112	10	0.11512	-0.54510	0.05031	-0.07593	-0.00818	-0.00003
113	11	0.09811	-0.38719	0.04998	-0.07590	-0.00818	-0.00003
114	12	0.08111	-0.22935	0.04966	-0.07588	-0.00817	-0.00003
115	13	0.06413	-0.07154	0.04936	-0.07586	-0.00816	-0.00002
116	14	0.04716	0.08622	0.04909	-0.07584	-0.00815	-0.00002
117	15	0.03021	0.24397	0.04883	-0.07584	-0.00814	-0.00002
118	16	0.01328	0.40170	0.04859	-0.07583	-0.00814	-0.00002

119	17	-0.00364	0.55944	0.04836	-0.07584	-0.00813	-0.00002
120	18	-0.02056	0.71718	0.04816	-0.07584	-0.00813	-0.00002
121	19	-0.03747	0.87493	0.04797	-0.07585	-0.00813	-0.00002
122	20	-0.05437	1.03270	0.04780	-0.07585	-0.00813	-0.00002
123	21	-0.07128	1.19047	0.04765	-0.07585	-0.00813	-0.00002

Pile #4

Node #	Local #	DX (*in*)	DY (*in*)	DZ (*in*)	RX (*rad*)	RY (*rad*)	RZ (*rad*)
4	1	1.02738	-14.61468	0.06538	-0.07610	0.00105	-0.00026
124	2	1.01913	-11.94351	0.05997	-0.07634	-0.00152	-0.00021
125	3	0.92217	-9.26770	0.05455	-0.07637	-0.00400	-0.00016
126	4	0.74165	-6.59423	0.04914	-0.07620	-0.00628	-0.00012
127	5	0.49033	-3.92992	0.04374	-0.07585	-0.00795	-0.00007
128	6	0.19775	-1.28111	0.03834	-0.07532	-0.00863	-0.00002
129	7	0.17980	-1.12448	0.03803	-0.07528	-0.00863	-0.00002
130	8	0.16184	-0.96792	0.03773	-0.07525	-0.00864	-0.00002
131	9	0.14387	-0.81144	0.03744	-0.07521	-0.00864	-0.00001
132	10	0.12590	-0.65503	0.03717	-0.07518	-0.00864	-0.00001
133	11	0.10794	-0.49869	0.03692	-0.07515	-0.00863	-0.00001
134	12	0.08999	-0.34241	0.03668	-0.07512	-0.00863	-0.00001
135	13	0.07205	-0.18618	0.03645	-0.07510	-0.00862	-0.00001
136	14	0.05413	-0.03000	0.03624	-0.07508	-0.00861	-0.00001
137	15	0.03622	0.12615	0.03604	-0.07507	-0.00861	-0.00001
138	16	0.01833	0.28228	0.03585	-0.07506	-0.00860	-0.00001
139	17	0.00045	0.43840	0.03568	-0.07506	-0.00859	-0.00001
140	18	-0.01743	0.59452	0.03552	-0.07506	-0.00859	-0.00001
141	19	-0.03529	0.75064	0.03537	-0.07506	-0.00859	-0.00001
142	20	-0.05315	0.90677	0.03524	-0.07506	-0.00859	-0.00001
143	21	-0.07102	1.06291	0.03513	-0.07506	-0.00859	-0.00001

Pile #5

Node #	Local #	DX (*in*)	DY (*in*)	DZ (*in*)	RX (*rad*)	RY (*rad*)	RZ (*rad*)
5	1	1.02736	-14.62204	0.01348	-0.07602	0.00095	-0.00010
144	2	1.01382	-11.96570	0.01229	-0.07560	-0.00170	-0.00008
145	3	0.91161	-9.32500	0.01110	-0.07512	-0.00410	-0.00006
146	4	0.72976	-6.70178	0.00991	-0.07460	-0.00624	-0.00004
147	5	0.48212	-4.09771	0.00873	-0.07403	-0.00778	-0.00003
148	6	0.19695	-1.51415	0.00755	-0.07343	-0.00838	-0.00001
149	7	0.17951	-1.36145	0.00749	-0.07339	-0.00839	-0.00001
150	8	0.16206	-1.20884	0.00742	-0.07336	-0.00839	-0.00001
151	9	0.14461	-1.05630	0.00736	-0.07332	-0.00839	-0.00001
152	10	0.12715	-0.90383	0.00730	-0.07328	-0.00839	-0.00001
153	11	0.10971	-0.75144	0.00724	-0.07325	-0.00838	0.00000
154	12	0.09228	-0.59911	0.00719	-0.07322	-0.00838	0.00000

155	13	0.07486	-0.44686	0.00714	-0.07319	-0.00837	0.00000
156	14	0.05746	-0.29466	0.00710	-0.07316	-0.00836	0.00000
157	15	0.04008	-0.14251	0.00705	-0.07314	-0.00835	0.00000
158	16	0.02272	0.00959	0.00701	-0.07312	-0.00834	0.00000
159	17	0.00537	0.16167	0.00697	-0.07311	-0.00834	0.00000
160	18	-0.01197	0.31372	0.00694	-0.07310	-0.00833	0.00000
161	19	-0.02930	0.46576	0.00691	-0.07310	-0.00833	0.00000
162	20	-0.04663	0.61780	0.00688	-0.07309	-0.00833	0.00000
163	21	-0.06396	0.76984	0.00685	-0.07309	-0.00833	0.00000

Structure Displacement

Node #	DX (*in*)	DY (*in*)	DZ (*in*)	RX (*rad*)	RY (*rad*)	RZ (*rad*)
6	1.02740	-14.46269	-0.02329	-0.07585	-0.00128	-0.00122
7	1.02740	-14.46688	-0.01891	-0.07585	-0.00128	-0.00122
8	1.02740	-14.47107	-0.01452	-0.07585	-0.00128	-0.00122
9	1.02740	-14.47674	-0.00858	-0.07585	-0.00128	-0.00122
10	1.02740	-14.47945	-0.00575	-0.07585	-0.00128	-0.00122
11	1.02740	-14.48364	-0.00135	-0.07585	-0.00128	-0.00122
12	1.02740	-14.48782	0.00305	-0.07585	-0.00129	-0.00122
13	1.02740	-14.49261	0.00812	-0.07585	-0.00129	-0.00122
14	1.02740	-14.50193	0.01794	-0.07587	-0.00127	-0.00121
15	1.02740	-14.50840	0.02462	-0.07589	-0.00124	-0.00121
16	1.02740	-14.51182	0.02812	-0.07590	-0.00123	-0.00121
17	1.02740	-14.51674	0.03310	-0.07591	-0.00121	-0.00120
18	1.02740	-14.52398	0.04036	-0.07593	-0.00118	-0.00118
19	1.02740	-14.52645	0.04281	-0.07594	-0.00117	-0.00118
20	1.02740	-14.53123	0.04757	-0.07595	-0.00116	-0.00116
21	1.02740	-14.53594	0.05227	-0.07597	-0.00114	-0.00115
22	1.02740	-14.53907	0.05540	-0.07598	-0.00114	-0.00113
23	1.02740	-14.54512	0.06155	-0.07599	-0.00113	-0.00110
24	1.02740	-14.55324	0.07013	-0.07602	-0.00111	-0.00105
25	1.02740	-14.55805	0.07510	-0.07603	-0.00101	-0.00101
26	1.02740	-14.56212	0.07895	-0.07604	-0.00087	-0.00098
27	1.02740	-14.56623	0.08224	-0.07605	-0.00067	-0.00095
28	1.02740	-14.56991	0.08447	-0.07605	-0.00047	-0.00092
29	1.02740	-14.57362	0.08604	-0.07606	-0.00030	-0.00089
30	1.02740	-14.57798	0.08711	-0.07608	-0.00013	-0.00085
31	1.02740	-14.58063	0.08740	-0.07608	-0.00005	-0.00082
32	1.02740	-14.58393	0.08746	-0.07609	0.00002	-0.00079
33	1.02740	-14.58830	0.08723	-0.07611	0.00005	-0.00073
34	1.02739	-14.59004	0.08711	-0.07611	0.00004	-0.00071
35	1.02739	-14.59546	0.08710	-0.07612	-0.00003	-0.00062
36	1.02739	-14.59693	0.08718	-0.07612	-0.00003	-0.00060
37	1.02739	-14.60020	0.08722	-0.07612	0.00003	-0.00054

38	1.02739	-14.60234	0.08697	-0.07612	0.00010	-0.00051
39	1.02739	-14.60390	0.08652	-0.07611	0.00019	-0.00048
40	1.02739	-14.60619	0.08519	-0.07611	0.00035	-0.00044
41	1.02738	-14.60792	0.08343	-0.07611	0.00051	-0.00041
42	1.02738	-14.60945	0.08107	-0.07611	0.00070	-0.00038
43	1.02738	-14.61099	0.07771	-0.07611	0.00087	-0.00035
44	1.02738	-14.61234	0.07388	-0.07611	0.00099	-0.00032
45	1.02738	-14.61373	0.06908	-0.07611	0.00106	-0.00028
46	1.02738	-14.61566	0.06106	-0.07610	0.00106	-0.00023
47	1.02737	-14.61681	0.05529	-0.07609	0.00107	-0.00020
48	1.02737	-14.61733	0.05233	-0.07608	0.00108	-0.00018
49	1.02737	-14.61803	0.04791	-0.07607	0.00108	-0.00016
50	1.02737	-14.61867	0.04347	-0.07607	0.00109	-0.00015
51	1.02737	-14.61898	0.04121	-0.07606	0.00109	-0.00014
52	1.02737	-14.61979	0.03460	-0.07605	0.00108	-0.00013
53	1.02737	-14.62029	0.03020	-0.07604	0.00107	-0.00012
54	1.02737	-14.62062	0.02718	-0.07604	0.00106	-0.00011
55	1.02736	-14.62121	0.02160	-0.07603	0.00103	-0.00011
56	1.02736	-14.62199	0.01396	-0.07602	0.00096	-0.00010
57	1.02736	-14.62237	0.01022	-0.07602	0.00095	-0.00010
58	1.02736	-14.62270	0.00697	-0.07602	0.00094	-0.00009
59	1.02736	-14.62302	0.00375	-0.07602	0.00094	-0.00009
60	1.02736	-14.62323	0.00167	-0.07602	0.00094	-0.00009
61	1.02736	-14.62367	-0.00270	-0.07602	0.00094	-0.00009
62	1.02736	-14.62399	-0.00592	-0.07602	0.00094	-0.00009
63	1.02736	-14.62431	-0.00914	-0.07602	0.00094	-0.00009

Pile Out-Of-Balance Forces

Soil Reaction Forces

Pile #1

Node #	Local #	FX (kip)	FY (kip)	FZ (kip)	MX (kip-in)	MY (kip-in)	MZ (kip-in)
1	1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
64	2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
65	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
66	4	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
67	5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
68	6	0.00000	0.00000	0.03679	0.00000	0.00000	-0.14702
69	7	0.00765	-0.01007	0.07292	0.00000	0.00000	-0.26017
70	8	0.01591	-0.02183	0.07229	0.00000	0.00000	-0.23044
71	9	0.02419	-0.03454	0.07169	0.00000	0.00000	-0.20443
72	10	0.03184	-0.04759	0.07112	0.00000	0.00000	-0.18175
73	11	0.03847	-0.06061	0.07058	0.00000	0.00000	-0.16208
74	12	0.04342	-0.07293	0.07007	0.00000	0.00000	-0.14511
75	13	0.04678	-0.08523	0.06958	0.00000	0.00000	-0.13058

76	14	0.04766	-0.09379	0.06913	0.00000	0.00000	-0.11826
77	15	0.04566	-0.07785	0.06871	0.00000	0.00000	-0.10796
78	16	0.03887	-0.01460	0.06831	0.00000	0.00000	-0.09951
79	17	0.00318	0.08734	0.06794	0.00000	0.00000	-0.09278
80	18	-0.03788	0.12865	0.06760	0.00000	0.00000	-0.08766
81	19	-0.05052	0.14743	0.06729	0.00000	0.00000	-0.08406
82	20	-0.06132	0.16122	0.06701	0.00000	0.00000	-0.08192
83	21	-0.03548	0.08734	0.61515	0.00000	0.00000	-0.04061

Pile #2

Node #	Local #	FX (kip)	FY (kip)	FZ (kip)	MX (kip-in)	MY (kip-in)	MZ (kip-in)
2	1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
84	2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
85	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
86	4	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
87	5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
88	6	0.00000	0.00000	0.29553	0.00000	0.00000	-0.12958
89	7	0.00765	-0.01007	0.58708	0.00000	0.00000	-0.22916
90	8	0.01589	-0.02183	0.58326	0.00000	0.00000	-0.20285
91	9	0.02413	-0.03454	0.57961	0.00000	0.00000	-0.17986
92	10	0.03170	-0.04759	0.57614	0.00000	0.00000	-0.15984
93	11	0.03821	-0.06061	0.57284	0.00000	0.00000	-0.14248
94	12	0.04297	-0.07293	0.56971	0.00000	0.00000	-0.12752
95	13	0.04604	-0.06578	0.56677	0.00000	0.00000	-0.11471
96	14	0.04646	-0.03830	0.56399	0.00000	0.00000	-0.10386
97	15	0.04363	0.07359	0.56139	0.00000	0.00000	-0.09480
98	16	0.03038	0.10936	0.55897	0.00000	0.00000	-0.08736
99	17	-0.01105	0.12627	0.55672	0.00000	0.00000	-0.08144
100	18	-0.04297	0.13606	0.55465	0.00000	0.00000	-0.07693
101	19	-0.05455	0.14743	0.55276	0.00000	0.00000	-0.07377
102	20	-0.06516	0.16122	0.55104	0.00000	0.00000	-0.07189
103	21	-0.03744	0.08734	4.63505	0.00000	0.00000	-0.03563

Pile #3

Node #	Local #	FX (kip)	FY (kip)	FZ (kip)	MX (kip-in)	MY (kip-in)	MZ (kip-in)
3	1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
104	2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
105	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
106	4	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
107	5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
108	6	0.00000	0.00000	0.37216	0.00000	0.00000	-0.08107
109	7	0.00784	-0.01007	0.73981	0.00000	0.00000	-0.14312
110	8	0.01628	-0.02183	0.73550	0.00000	0.00000	-0.12649
111	9	0.02474	-0.03454	0.73138	0.00000	0.00000	-0.11200

112	10	0.03253	-0.04759	0.72745	0.00000	0.00000	-0.09940
113	11	0.03923	-0.06061	0.72371	0.00000	0.00000	-0.08851
114	12	0.04417	-0.06224	0.72018	0.00000	0.00000	-0.07914
115	13	0.04738	-0.04905	0.71683	0.00000	0.00000	-0.07113
116	14	0.04791	0.05826	0.71369	0.00000	0.00000	-0.06436
117	15	0.04512	0.09328	0.71074	0.00000	0.00000	-0.05870
118	16	0.03447	0.11666	0.70799	0.00000	0.00000	-0.05407
119	17	-0.01041	0.12627	0.70544	0.00000	0.00000	-0.05038
120	18	-0.04390	0.13606	0.70309	0.00000	0.00000	-0.04758
121	19	-0.05609	0.14743	0.70094	0.00000	0.00000	-0.04561
122	20	-0.06730	0.16122	0.69900	0.00000	0.00000	-0.04444
123	21	-0.03882	0.08734	5.78423	0.00000	0.00000	-0.02202

Pile #4

Node #	Local #	FX (*kip*)	FY (*kip*)	FZ (*kip*)	MX (*kip-in*)	MY (*kip-in*)	MZ (*kip-in*)
4	1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
124	2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
125	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
126	4	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
127	5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
128	6	0.00000	0.00000	0.29239	0.00000	0.00000	-0.03155
129	7	0.00803	-0.01007	0.58082	0.00000	0.00000	-0.05560
130	8	0.01668	-0.02183	0.57702	0.00000	0.00000	-0.04906
131	9	0.02535	-0.03454	0.57340	0.00000	0.00000	-0.04338
132	10	0.03340	-0.04759	0.56995	0.00000	0.00000	-0.03846
133	11	0.04037	-0.06061	0.56668	0.00000	0.00000	-0.03421
134	12	0.04560	-0.07293	0.56357	0.00000	0.00000	-0.03056
135	13	0.04915	-0.06675	0.56064	0.00000	0.00000	-0.02745
136	14	0.05010	-0.04137	0.55789	0.00000	0.00000	-0.02482
137	15	0.04793	0.07255	0.55531	0.00000	0.00000	-0.02262
138	16	0.04054	0.10847	0.55290	0.00000	0.00000	-0.02083
139	17	0.00127	0.12627	0.55067	0.00000	0.00000	-0.01940
140	18	-0.04122	0.13606	0.54861	0.00000	0.00000	-0.01831
141	19	-0.05473	0.14743	0.54673	0.00000	0.00000	-0.01755
142	20	-0.06663	0.16122	0.54502	0.00000	0.00000	-0.01710
143	21	-0.03875	0.08734	4.58796	0.00000	0.00000	-0.00847

Pile #5

Node #	Local #	FX (*kip*)	FY (*kip*)	FZ (*kip*)	MX (*kip-in*)	MY (*kip-in*)	MZ (*kip-in*)
5	1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
144	2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
145	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
146	4	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
147	5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

148	6	0.00000	0.00000	0.06592	0.00000	0.00000	-0.01221
149	7	0.00803	-0.01007	0.13070	0.00000	0.00000	-0.02151
150	8	0.01668	-0.02183	0.12960	0.00000	0.00000	-0.01898
151	9	0.02539	-0.03454	0.12855	0.00000	0.00000	-0.01678
152	10	0.03350	-0.04759	0.12756	0.00000	0.00000	-0.01487
153	11	0.04057	-0.06061	0.12662	0.00000	0.00000	-0.01322
154	12	0.04595	-0.07293	0.12572	0.00000	0.00000	-0.01181
155	13	0.04975	-0.08523	0.12488	0.00000	0.00000	-0.01061
156	14	0.05108	-0.09209	0.12409	0.00000	0.00000	-0.00959
157	15	0.04957	-0.07555	0.12335	0.00000	0.00000	-0.00874
158	16	0.04362	0.02490	0.12266	0.00000	0.00000	-0.00805
159	17	0.01533	0.09108	0.12202	0.00000	0.00000	-0.00749
160	18	-0.03573	0.13338	0.12142	0.00000	0.00000	-0.00707
161	19	-0.05071	0.14743	0.12088	0.00000	0.00000	-0.00678
162	20	-0.06287	0.16122	0.12039	0.00000	0.00000	-0.00661
163	21	-0.03685	0.08734	1.09166	0.00000	0.00000	-0.00327

Pile Internal Forces

Pile #1

Elem #	Node #	AXIAL (*kip*)	SHEAR-2 (*kip*)	SHEAR-3 (*kip*)	MOMENT-2 (*kip-ft*)	MOMENT-3 (*kip-ft*)	TORQUE (*kip-ft*)	FAILURE RATIO
63	1	-1.65017	0.01336	-0.12969	-0.68692	-1.55425	0.18287	16.28386
	64	1.70989	-0.01336	0.12969	0.67857	1.50500	-0.18287	15.73061
64	64	-1.70989	0.01323	-0.12963	-0.67857	-1.50500	0.18287	15.75421
	65	1.69712	-0.01323	0.12963	0.67206	1.44823	-0.18287	15.13227
65	65	-1.69712	0.01311	-0.12957	-0.67206	-1.44823	0.18287	15.15981
	66	1.68231	-0.01311	0.12957	0.65928	1.38458	-0.18287	14.43832
66	66	-1.68231	0.22299	-0.12952	-0.65928	-1.38459	0.18287	14.46587
	67	1.66750	-0.22299	0.12952	0.64012	0.70185	-0.18287	7.78818
67	67	-1.66750	0.22293	-0.12946	-0.64012	-0.70186	0.18287	7.81569
	68	1.65269	-0.22293	0.12946	0.61474	0.01606	-0.18287	3.96304
68	68	-1.61568	0.22291	-0.12961	-0.61476	-0.01607	0.17041	4.03347
	69	1.61480	-0.22291	0.12961	0.61257	-0.02462	-0.17041	4.01188
69	69	-1.54144	0.21324	-0.13872	-0.61257	0.02462	0.14842	4.14942
	70	1.54056	-0.21324	0.13872	0.60785	-0.06354	-0.14842	4.12950
70	70	-1.46783	0.19321	-0.15809	-0.60785	0.06354	0.12897	4.26582
	71	1.46695	-0.19321	0.15809	0.59885	-0.09889	-0.12897	4.21986
71	71	-1.39483	0.16272	-0.18857	-0.59885	0.09889	0.11175	4.35510
	72	1.39395	-0.16272	0.18857	0.58364	-0.12886	-0.11175	4.25125
72	72	-1.32240	0.12255	-0.23041	-0.58364	0.12886	0.09645	4.38536
	73	1.32152	-0.12255	0.23041	0.56026	-0.15178	-0.09645	4.18998
73	73	-1.25051	0.07389	-0.28352	-0.56026	0.15178	0.08283	4.32312
	74	1.24963	-0.07389	0.28352	0.52676	-0.16617	-0.08283	4.00316
74	74	-1.17914	0.01877	-0.34714	-0.52676	0.16617	0.07064	4.13535
	75	1.17826	-0.01877	0.34714	0.48134	-0.17091	-0.07064	3.66099

75	75	-1.10826	-0.04095	-0.42095	-0.48134	0.17091	0.05969	3.79226
	76	1.10738	0.04095	0.42095	0.42224	-0.16521	-0.05969	3.13668
76	76	-1.03783	-0.10242	-0.50352	-0.42224	0.16521	0.04977	3.26707
	77	1.03696	0.10242	0.50352	0.34793	-0.14876	-0.04977	2.40949
77	77	-0.96784	-0.16179	-0.57236	-0.34793	0.14876	0.04073	2.53913
	78	0.96696	0.16179	0.57236	0.26082	-0.12194	-0.04073	1.50418
78	78	-0.89824	-0.20386	-0.58342	-0.26082	0.12194	0.03239	1.63303
	79	0.89736	0.20386	0.58342	0.17091	-0.08773	-0.03239	0.53701
79	79	-0.82901	-0.20706	-0.49653	-0.17091	0.08773	0.02462	0.66521
	80	0.82813	0.20706	0.49653	0.09520	-0.05288	-0.02462	0.01374
80	80	-0.76013	-0.16769	-0.37288	-0.09520	0.05288	0.01729	0.01350
	81	0.75925	0.16769	0.37288	0.04006	-0.02477	-0.01729	0.00888
81	81	-0.69156	-0.11106	-0.23675	-0.04006	0.02477	0.01025	0.00832
	82	0.69068	0.11106	0.23675	0.00766	-0.00638	-0.01025	0.00763
82	82	-0.62327	-0.04134	-0.08907	-0.00766	0.00638	0.00340	0.00688
	83	0.62239	0.04134	0.08907	-0.33862E-09	0.27424E-09	-0.00340	0.00688

Pile #2

Elem #	Node #	AXIAL (*kip*)	SHEAR-2 (*kip*)	SHEAR-3 (*kip*)	MOMENT-2 (*kip-ft*)	MOMENT-3 (*kip-ft*)	TORQUE (*kip-ft*)	FAILURE RATIO
83	2	-13.80272	-0.05426	-0.99349	0.21249	-1.46558	0.16068	0.20137
	84	13.86244	0.05426	0.99349	-0.04033	1.54657	-0.16068	0.20705
84	84	-13.86244	-0.05417	-0.99349	0.04033	-1.54657	0.16068	0.20697
	85	13.84967	0.05417	0.99349	0.13870	1.56259	-0.16068	0.20852
85	85	-13.84967	-0.05408	-0.99350	-0.13870	-1.56259	0.16068	0.20843
	86	13.83486	0.05408	0.99350	0.30888	1.51329	-0.16068	0.20591
86	86	-13.83486	0.15600	-0.99351	-0.30888	-1.51328	0.16068	0.20582
	87	13.82005	-0.15600	0.99351	0.46287	0.79249	-0.16068	0.16496
87	87	-13.82005	0.15605	-0.99354	-0.46287	-0.79248	0.16068	0.16483
	88	13.80524	-0.15605	0.99354	0.59427	0.03885	-0.16068	0.15257
88	88	-13.49149	0.15580	-0.99605	-0.59425	-0.03884	0.14972	0.14909
	89	13.49061	-0.15580	0.99605	0.59672	-0.00583	-0.14972	0.14745
89	89	-12.86736	0.14569	-1.00844	-0.59672	0.00583	0.13036	0.14175
	90	12.86649	-0.14569	1.00844	0.58886	-0.04794	-0.13036	0.14219
90	90	-12.24731	0.12529	-1.02911	-0.58886	0.04794	0.11326	0.13585
	91	12.24643	-0.12529	1.02911	0.56929	-0.08569	-0.11326	0.13534
91	91	-11.63115	0.09458	-1.05809	-0.56929	0.08569	0.09811	0.12963
	92	11.63027	-0.09458	1.05809	0.53664	-0.11730	-0.09811	0.12853
92	92	-11.01871	0.05440	-1.09453	-0.53664	0.11730	0.08467	0.12298
	93	11.01783	-0.05440	1.09453	0.48968	-0.14113	-0.08467	0.12176
93	93	-10.40980	0.00608	-1.13656	-0.48968	0.14113	0.07270	0.11578
	94	10.40892	-0.00608	1.13656	0.42748	-0.15577	-0.07270	0.11503
94	94	-9.80425	-0.04822	-1.18038	-0.42748	0.15577	0.06200	0.10834
	95	9.80337	0.04822	1.18038	0.34981	-0.16020	-0.06200	0.10834
95	95	-9.20188	-0.10637	-1.21879	-0.34981	0.16020	0.05238	0.10168
	96	9.20100	0.10637	1.21879	0.25764	-0.15374	-0.05238	0.10168

96	96	-8.60250	-0.16514	-1.23011	-0.25764	0.15374	0.04367	0.09506
	97	8.60162	0.16514	1.23011	0.15573	-0.13631	-0.04367	0.09506
97	97	-8.00593	-0.22098	-1.13764	-0.15573	0.13631	0.03573	0.08847
	98	8.00505	0.22098	1.13764	0.06211	-0.10840	-0.03573	0.08847
98	98	-7.41200	-0.25172	-0.92146	-0.06211	0.10840	0.02842	0.08190
	99	7.41112	0.25172	0.92146	-0.00172	-0.07439	-0.02842	0.06968
99	99	-6.82051	-0.24102	-0.72664	0.00172	0.07439	0.02160	0.06438
	100	6.81963	0.24102	0.72664	-0.03944	-0.04146	-0.02160	0.07537
100	100	-6.23129	-0.19057	-0.53445	0.03944	0.04146	0.01517	0.06885
	101	6.23041	0.19057	0.53445	-0.05146	-0.01651	-0.01517	0.06885
101	101	-5.64415	-0.12605	-0.34713	0.05146	0.01651	0.00899	0.06237
	102	5.64328	0.12605	0.34713	-0.03861	-0.00198	-0.00899	0.05306
102	102	-5.05892	-0.04926	-0.15482	0.03861	0.00198	0.00298	0.04772
	103	5.05804	0.04926	0.15482	0.00000	0.46650E-09	-0.00298	0.05590

Pile #3

Elem #	Node #	AXIAL (*kip*)	SHEAR-2 (*kip*)	SHEAR-3 (*kip*)	MOMENT-2 (*kip-ft*)	MOMENT-3 (*kip-ft*)	TORQUE (*kip-ft*)	FAILURE RATIO
103	3	-17.76856	-0.04679	-1.28811	0.54023	-1.91891	0.09968	0.26500
	104	17.82828	0.04679	1.28811	-0.33293	2.00244	-0.09968	0.26877
104	104	-17.82828	-0.04633	-1.28804	0.33292	-2.00244	0.09968	0.26869
	105	17.81551	0.04633	1.28804	-0.10234	1.97707	-0.09968	0.26534
105	105	-17.81551	-0.04587	-1.28801	0.10233	-1.97707	0.09968	0.26525
	106	17.80070	0.04587	1.28801	0.13075	1.84445	-0.09968	0.25489
106	106	-17.80070	0.16454	-1.28804	-0.13076	-1.84443	0.09968	0.25479
	107	17.78589	-0.16454	1.28804	0.35345	1.00497	-0.09968	0.20653
107	107	-17.78589	0.16477	-1.28813	-0.35346	-1.00494	0.09968	0.20640
	108	17.77108	-0.16477	1.28813	0.55371	0.11129	-0.09968	0.19640
108	108	-17.36699	0.16443	-1.29166	-0.55367	-0.11126	0.09284	0.19192
	109	17.36611	-0.16443	1.29166	0.55869	0.05812	-0.09284	0.19192
109	109	-16.56283	0.15388	-1.30543	-0.55869	-0.05812	0.08079	0.18303
	110	16.56195	-0.15388	1.30543	0.55063	0.00795	-0.08079	0.17359
110	110	-15.76337	0.13278	-1.32663	-0.55063	-0.00795	0.07015	0.16629
	111	15.76249	-0.13278	1.32663	0.52827	-0.03743	-0.07015	0.17420
111	111	-14.96841	0.10112	-1.35492	-0.52827	0.03743	0.06074	0.16541
	112	14.96753	-0.10112	1.35492	0.49045	-0.07619	-0.06074	0.16541
112	112	-14.17775	0.05973	-1.38889	-0.49045	0.07619	0.05239	0.15667
	113	14.17687	-0.05973	1.38889	0.43626	-0.10664	-0.05239	0.15667
113	113	-13.39120	0.00996	-1.42578	-0.43626	0.10664	0.04497	0.14798
	114	13.39032	-0.00996	1.42578	0.36527	-0.12734	-0.04497	0.14798
114	114	-12.60854	-0.04597	-1.46006	-0.36527	0.12734	0.03834	0.13933
	115	12.60766	0.04597	1.46006	0.27799	-0.13722	-0.03834	0.13933
115	115	-11.82957	-0.10595	-1.48004	-0.27799	0.13722	0.03238	0.13072
	116	11.82869	0.10595	1.48004	0.17697	-0.13558	-0.03238	0.13072
116	116	-11.05410	-0.16666	-1.45519	-0.17697	0.13558	0.02699	0.12215
	117	11.05322	0.16666	1.45519	0.07004	-0.12230	-0.02699	0.12215

117	117	-10.28191	-0.22422	-1.26732	-0.07004	0.12230	0.02208	0.11362
	118	10.28103	0.22422	1.26732	-0.01448	-0.09795	-0.02208	0.11362
118	118	-9.51279	-0.25922	-1.01911	0.01448	0.09795	0.01756	0.10512
	119	9.51191	0.25922	1.01911	-0.06609	-0.06643	-0.01756	0.10512
119	119	-8.74654	-0.24933	-0.79247	0.06609	0.06643	0.01335	0.09665
	120	8.74566	0.24933	0.79247	-0.08848	-0.03554	-0.01335	0.09665
120	120	-7.98294	-0.19750	-0.58204	0.08848	0.03554	0.00937	0.08821
	121	7.98206	0.19750	0.58204	-0.08443	-0.01255	-0.00937	0.08821
121	121	-7.22178	-0.13137	-0.37882	0.08443	0.01255	0.00556	0.07980
	122	7.22090	0.13137	0.37882	-0.05515	0.00004	-0.00556	0.06813
122	122	-6.46286	-0.05227	-0.17199	0.05515	-0.00004	0.00184	0.06121
	123	6.46198	0.05227	0.17199	0.00000	-0.13151E-10	-0.00184	0.07141

Pile #4

Elem #	Node #	AXIAL (*kip*)	SHEAR-2 (*kip*)	SHEAR-3 (*kip*)	MOMENT-2 (*kip-ft*)	MOMENT-3 (*kip-ft*)	TORQUE (*kip-ft*)	FAILURE RATIO
123	4	-13.64517	0.01078	-0.97945	0.31342	-2.49336	0.03842	3.38868
	124	13.70489	-0.01078	0.97945	-0.12940	2.45249	-0.03842	2.73734
124	124	-13.70489	0.01086	-0.97945	0.12940	-2.45249	0.03842	2.76127
	125	13.69212	-0.01086	0.97945	0.06515	2.31008	-0.03842	1.10220
125	125	-13.69212	0.01095	-0.97945	-0.06516	-2.31008	0.03842	1.13024
	126	13.67731	-0.01095	0.97945	0.25397	2.07225	-0.03842	0.25614
126	126	-13.67731	0.22102	-0.97946	-0.25397	-2.07225	0.03842	0.25612
	127	13.66250	-0.22102	0.97946	0.42901	1.14059	-0.03842	0.18081
127	127	-13.66250	0.22106	-0.97948	-0.42901	-1.14058	0.03842	0.18070
	128	13.64769	-0.22106	0.97948	0.58309	0.16217	-0.03842	0.15083
128	128	-13.33754	0.22078	-0.98193	-0.58309	-0.16216	0.03578	0.14739
	129	13.33666	-0.22078	0.98193	0.58697	0.10394	-0.03578	0.14739
129	129	-12.72057	0.21019	-0.99429	-0.58697	-0.10394	0.03112	0.14057
	130	12.71969	-0.21019	0.99429	0.58057	0.04847	-0.03112	0.14057
130	130	-12.10764	0.18875	-1.01500	-0.58057	-0.04847	0.02701	0.13424
	131	12.10676	-0.18875	1.01500	0.56252	-0.00238	-0.02701	0.13342
131	131	-11.49858	0.15639	-1.04414	-0.56252	0.00238	0.02338	0.12787
	132	11.49770	-0.15639	1.04414	0.53140	-0.04670	-0.02338	0.12707
132	132	-10.89321	0.11391	-1.08087	-0.53140	0.04670	0.02016	0.12117
	133	10.89233	-0.11391	1.08087	0.48597	-0.08275	-0.02016	0.12038
133	133	-10.29134	0.06258	-1.12338	-0.48597	0.08275	0.01730	0.11401
	134	10.29046	-0.06258	1.12338	0.42527	-0.10899	-0.01730	0.11372
134	134	-9.69281	0.00455	-1.16792	-0.42527	0.10899	0.01474	0.10711
	135	9.69193	-0.00455	1.16792	0.34902	-0.12427	-0.01474	0.10711
135	135	-9.09743	-0.05820	-1.20747	-0.34902	0.12427	0.01245	0.10053
	136	9.09655	0.05820	1.20747	0.25812	-0.12777	-0.01245	0.10053
136	136	-8.50502	-0.12257	-1.22070	-0.25812	0.12777	0.01038	0.09398
	137	8.50414	0.12257	1.22070	0.15720	-0.11922	-0.01038	0.09398
137	137	-7.91540	-0.18520	-1.13350	-0.15720	0.11922	0.00849	0.08747
	138	7.91452	0.18520	1.13350	0.06370	-0.09892	-0.00849	0.08747

138	138	-7.32839	-0.23317	-0.91903	-0.06370	0.09892	0.00675	0.08098
	139	7.32751	0.23317	0.91903	-0.00026	-0.06942	-0.00675	0.06871
139	139	-6.74381	-0.23483	-0.72551	0.00026	0.06942	0.00513	0.06347
	140	6.74293	0.23483	0.72551	-0.03828	-0.03876	-0.00513	0.07452
140	140	-6.16148	-0.18948	-0.53396	0.03828	0.03876	0.00360	0.06808
	141	6.16060	0.18948	0.53396	-0.05068	-0.01508	-0.00360	0.06808
141	141	-5.58122	-0.12720	-0.34705	0.05068	0.01508	0.00213	0.06167
	142	5.58034	0.12720	0.34705	-0.03822	-0.00134	-0.00213	0.05247
142	142	-5.00284	-0.05072	-0.15499	0.03822	0.00134	0.00071	0.04720
	143	5.00196	0.05072	0.15499	0.00000	0.31447E-09	-0.00071	0.05528

Pile #5

Elem #	Node #	AXIAL (*kip*)	SHEAR-2 (*kip*)	SHEAR-3 (*kip*)	MOMENT-2 (*kip-ft*)	MOMENT-3 (*kip-ft*)	TORQUE (*kip-ft*)	FAILURE RATIO
143	5	-2.96455	0.07700	-0.20949	-0.37911	-2.67409	0.01479	25.31843
	144	3.02427	-0.07700	0.20949	0.43026	2.44588	-0.01479	22.82849
144	144	-3.02427	0.07641	-0.20938	-0.43025	-2.44589	0.01479	22.85228
	145	3.01151	-0.07641	0.20938	0.48297	2.19706	-0.01479	20.17326
145	145	-3.01151	0.07589	-0.20927	-0.48297	-2.19708	0.01479	20.20080
	146	2.99670	-0.07589	0.20927	0.52861	1.92996	-0.01479	17.35538
146	146	-2.99670	0.28544	-0.20914	-0.52860	-1.92999	0.01479	17.38307
	147	2.98188	-0.28544	0.20914	0.56661	1.03480	-0.01479	7.98253
147	147	-2.98188	0.28520	-0.20901	-0.56660	-1.03484	0.01479	8.01039
	148	2.96707	-0.28520	0.20901	0.59670	0.13138	-0.01479	1.48992
148	148	-2.90032	0.28514	-0.20907	-0.59675	-0.13141	0.01377	1.61587
	149	2.89944	-0.28514	0.20907	0.59741	0.07777	-0.01377	1.51431
149	149	-2.76710	0.27499	-0.21812	-0.59741	-0.07777	0.01198	1.76102
	150	2.76622	-0.27499	0.21812	0.59479	0.02609	-0.01198	1.67748
150	150	-2.63500	0.25389	-0.23741	-0.59479	-0.02609	0.01040	1.92209
	151	2.63412	-0.25389	0.23741	0.58713	-0.02175	-0.01040	1.83255
151	151	-2.50396	0.22169	-0.26775	-0.58713	0.02175	0.00900	2.07518
	152	2.50308	-0.22169	0.26775	0.57253	-0.06382	-0.00900	1.94631
152	152	-2.37393	0.17913	-0.30936	-0.57253	0.06382	0.00776	2.18705
	153	2.37306	-0.17913	0.30936	0.54905	-0.09832	-0.00776	1.98030
153	153	-2.24487	0.12738	-0.36205	-0.54905	0.09832	0.00666	2.21926
	154	2.24399	-0.12738	0.36205	0.51478	-0.12366	-0.00666	1.89724
154	154	-2.11671	0.06848	-0.42494	-0.51478	0.12366	0.00568	2.13454
	155	2.11583	-0.06848	0.42494	0.46798	-0.13860	-0.00568	1.66338
155	155	-1.98941	0.00421	-0.49744	-0.46798	0.13860	0.00480	1.89907
	156	1.98853	-0.00421	0.49744	0.40698	-0.14221	-0.00480	1.24888
156	156	-1.86291	-0.06264	-0.57748	-0.40698	0.14221	0.00400	1.48312
	157	1.86203	0.06264	0.57748	0.33050	-0.13405	-0.00400	0.63240
157	157	-1.73717	-0.12934	-0.64111	-0.33050	0.13405	0.00327	0.86526
	158	1.73630	0.12934	0.64111	0.24139	-0.11415	-0.00327	0.03278
158	158	-1.61214	-0.18723	-0.62002	-0.24139	0.11415	0.00260	0.07193
	159	1.61126	0.18723	0.62002	0.15434	-0.08403	-0.00260	0.02346

159	159	-1.48776	-0.20257	-0.52456	-0.15434	0.08403	0.00198	0.02273
	160	1.48688	0.20257	0.52456	0.08226	-0.05106	-0.00198	0.01763
160	160	-1.36399	-0.16849	-0.39362	-0.08226	0.05106	0.00139	0.01664
	161	1.36311	0.16849	0.39362	0.03131	-0.02383	-0.00139	0.01506
161	161	-1.24077	-0.11359	-0.25254	-0.03131	0.02383	0.00082	0.01370
	162	1.23989	0.11359	0.25254	0.00325	-0.00593	-0.00082	0.01370
162	162	-1.11805	-0.04352	-0.10045	-0.00325	0.00593	0.00027	0.01235
	163	1.11717	0.04352	0.10045	-0.28101E-09	0.50297E-09	-0.00027	0.01235

Stucture Internal Forces

COLUMN #1

Elem # Node #

COLUMN #2

Elem # Node #

COLUMN #3

Elem # Node #

COLUMN #4

Elem # Node #

COLUMN #5

Elem # Node #

PIER_CAP

Elem #	Node #	AXIAL (kip)	SHEAR-2 (kip)	SHEAR-3 (kip)	MOMENT-2 (kip-ft)	MOMENT-3 (kip-ft)	TORQUE (kip-ft)	FAILURE RATIO
1	6	0.00000	0.00838	0.95724E-09	-0.91139E-10	0.00040	0.00000	0.00000
	7	0.00000	-0.00838	-0.95724E-09	0.12831E-09	0.00200	0.00000	0.00000
2	7	0.00000	0.02515	-0.66120E-09	0.62983E-10	-0.00200	0.00000	0.00000
	8	0.00000	-0.02515	0.66120E-09	0.43656E-09	0.00918	0.00000	0.00000
3	8	0.00000	0.04488	0.00000	-0.19312E-09	-0.00885	-0.12127E-11	0.00000
	9	0.00000	-0.04488	0.00000	0.00000	0.02621	-0.12127E-11	0.00000
4	9	0.00000	0.60165	-0.19999	0.00000	-0.02678	0.00000	0.00000
	10	0.00000	-0.60165	0.19999	0.03691	0.13782	0.00000	0.00000
5	10	0.00000	0.61545	-0.19999	-0.03691	-0.13758	0.00000	0.00000
	11	0.00000	-0.61545	0.19999	0.09405	0.31343	0.00000	0.00000
6	11	0.00000	0.63221	-0.19999	-0.09405	-0.31343	0.00000	0.00000
	12	0.00000	-0.63221	0.19999	0.15119	0.49406	0.00000	0.00000
7	12	0.00000	0.64898	-0.19999	-0.15119	-0.49406	0.00000	0.00000
	1	0.00000	-0.64898	0.19999	0.20833	0.67948	0.00000	0.00000
8	1	-0.01353	-0.99159	-0.07648	-0.02547	0.87442	-0.68694	0.00000
	13	0.01353	0.99159	0.07648	0.02865	-0.91567	-0.68694	0.00000
9	13	-0.01353	-0.48162	-0.27652	-0.02865	0.91766	-0.68694	0.00000
	14	0.01353	0.48162	0.27652	0.20533	-1.22539	-0.68694	0.00000

10	14	-0.01353	-0.44984	-0.27652	-0.20533	1.22436	-0.68694	0.00000
	15	0.01353	0.44984	0.27652	0.32820	-1.42425	-0.68694	0.00000
11	15	-0.01353	0.06013	-0.47653	-0.32820	1.42355	-0.68694	0.00000
	16	0.01353	-0.06013	0.47653	0.44076	-1.40935	-0.68694	0.00000
12	16	-0.01353	0.07705	-0.47653	-0.44076	1.40964	-0.68694	0.00000
	17	0.01353	-0.07705	0.47653	0.60291	-1.38343	-0.68694	0.00000
13	17	-0.01353	0.10190	-0.47653	-0.60291	1.38412	-0.68694	0.00000
	18	0.01353	-0.10190	0.47653	0.84443	-1.33247	-0.68694	0.00000
14	18	-0.01353	0.61787	-0.67655	-0.84443	1.33136	-0.68694	0.00000
	19	0.01353	-0.61787	0.67655	0.96197	-1.22401	-0.68694	0.00000
15	19	-0.01353	0.63295	-0.67655	-0.96197	1.22443	-0.68694	0.00000
	20	0.01353	-0.63295	0.67655	1.19219	-1.00905	-0.68694	0.00000
16	20	-0.01353	0.65292	-0.67655	-1.19219	1.00905	-0.68694	0.00000
	21	0.01353	-0.65292	0.67655	1.42240	-0.78688	-0.68694	0.00000
17	21	-0.01353	0.66962	-0.67655	-1.42240	0.78657	-0.68694	0.00000
	22	0.01353	-0.66962	0.67655	1.57733	-0.63323	-0.68694	0.00000
18	22	-0.01353	1.68859	-0.87659	-1.57733	0.63397	-0.68694	0.00000
	23	0.01353	-1.68859	0.87659	1.97316	0.12852	-0.68694	0.00000
19	23	-0.01353	1.71182	-0.87659	-1.97316	-0.12895	-0.68694	0.00000
	2	0.01353	-1.71182	0.87659	2.27144	0.71145	-0.68694	0.00000
20	2	0.04084	-12.07236	0.12108	-2.11076	0.75395	-0.47446	0.00000
	24	-0.04084	12.07236	-0.12108	2.07547	-4.27264	-0.47446	0.00000
21	24	0.04084	-10.72639	-0.07895	-2.07547	4.27296	-0.47446	0.00000
	25	-0.04084	10.72639	0.07895	2.10619	-8.44648	-0.47446	0.00000
22	25	0.04084	-10.70499	-0.07895	-2.10619	8.44630	-0.47446	0.00000
	26	-0.04084	10.70499	0.07895	2.13306	-12.08897	-0.47446	0.00000
23	26	0.04084	-10.68462	-0.07895	-2.13306	12.08902	-0.47446	0.00000
	27	-0.04084	10.68462	0.07895	2.16100	-15.87066	-0.47446	0.00000
24	27	0.04084	6.66134	-0.27897	-2.16100	15.87057	-0.47446	0.00000
	28	-0.04084	-6.66134	0.27897	2.25212	-13.69483	-0.47446	0.00000
25	28	0.04084	6.68090	-0.27897	-2.25212	13.69488	-0.47446	0.00000
	29	-0.04084	-6.68090	0.27897	2.34704	-11.42151	-0.47446	0.00000
26	29	0.04084	6.70311	-0.27897	-2.34704	11.42180	-0.47446	0.00000
	30	-0.04084	-6.70311	0.27897	2.46321	-8.63062	-0.47446	0.00000
27	30	0.04084	8.04907	-0.47898	-2.46321	8.63012	-0.47446	0.00000
	31	-0.04084	-8.04907	0.47898	2.58973	-6.50391	-0.47446	0.00000
28	31	0.04084	8.06681	-0.47898	-2.58973	6.50413	-0.47446	0.00000
	32	-0.04084	-8.06681	0.47898	2.75272	-3.75918	-0.47446	0.00000
29	32	0.04084	8.09084	-0.47898	-2.75272	3.75973	-0.47446	0.00000
	33	-0.04084	-8.09084	0.47898	2.98209	0.11470	-0.47446	0.00000
30	33	0.04084	9.43681	-0.67900	-2.98209	-0.11562	-0.47446	0.00000
	34	-0.04084	-9.43681	0.67900	3.11903	2.01892	-0.47446	0.00000
31	34	0.04084	9.45272	-0.67900	-3.11903	-2.01855	-0.47446	0.00000
	3	-0.04084	-9.45272	0.67900	3.35008	5.23510	-0.47446	0.00000
32	3	0.08786	-8.29588	0.62620	-3.25041	-3.31636	0.06573	0.00000
	35	-0.08786	8.29588	-0.62620	3.03732	0.49346	0.06573	0.00000

33	35	0.08786	-8.27999	0.62620	-3.03732	-0.49383	0.06573	0.00000
	36	-0.08786	8.27999	-0.62620	2.91142	-1.17091	0.06573	0.00000
34	36	0.08786	-6.93402	0.42616	-2.91142	1.17183	0.06573	0.00000
	37	-0.08786	6.93402	-0.42616	2.70708	-4.49670	0.06573	0.00000
35	37	0.08786	-6.90997	0.42616	-2.70708	4.49614	0.06573	0.00000
	38	-0.08786	6.90997	-0.42616	2.56206	-6.84745	0.06573	0.00000
36	38	0.08786	-6.89225	0.42616	-2.56206	6.84722	0.06573	0.00000
	39	-0.08786	6.89225	-0.42616	2.44976	-8.66349	0.06573	0.00000
37	39	0.08786	-5.54629	0.22612	-2.44976	8.66400	0.06573	0.00000
	40	-0.08786	5.54629	-0.22612	2.35546	-10.97698	0.06573	0.00000
38	40	0.08786	-5.52407	0.22612	-2.35546	10.97670	0.06573	0.00000
	41	-0.08786	5.52407	-0.22612	2.27852	-12.85642	0.06573	0.00000
39	41	0.08786	-5.50452	0.22612	-2.27852	12.85637	0.06573	0.00000
	42	-0.08786	5.50452	-0.22612	2.20480	-14.65078	0.06573	0.00000
40	42	0.08786	11.84144	0.02609	-2.20480	14.65088	0.06573	0.00000
	43	-0.08786	-11.84144	-0.02609	2.19555	-10.45230	0.06573	0.00000
41	43	0.08786	11.86183	0.02609	-2.19555	10.45225	0.06573	0.00000
	44	-0.08786	-11.86183	-0.02609	2.18667	-6.41593	0.06573	0.00000
42	44	0.08786	11.88321	0.02609	-2.18667	6.41610	0.06573	0.00000
	45	-0.08786	-11.88321	-0.02609	2.17654	-1.80001	0.06573	0.00000
43	45	0.08786	13.22918	-0.17395	-2.17654	1.79969	0.06573	0.00000
	4	-0.08786	-13.22918	0.17395	2.22735	2.06456	0.06573	0.00000
44	4	0.07709	-0.39743	0.80812	-2.18892	0.42892	0.37914	0.00000
	46	-0.07709	0.39743	-0.80812	1.91394	-0.56416	0.37914	0.00000
45	46	0.07709	-0.37422	0.80812	-1.91394	0.56459	0.37914	0.00000
	47	-0.07709	0.37422	-0.80812	1.54954	-0.73333	0.37914	0.00000
46	47	0.07709	0.64475	0.60808	-1.54954	0.73259	0.37914	0.00000
	48	-0.07709	-0.64475	-0.60808	1.40990	-0.58454	0.37914	0.00000
47	48	0.07709	0.66147	0.60808	-1.40990	0.58485	0.37914	0.00000
	49	-0.07709	-0.66147	-0.60808	1.20299	-0.35976	0.37914	0.00000
48	49	0.07709	0.68144	0.60808	-1.20299	0.35976	0.37914	0.00000
	50	-0.07709	-0.68144	-0.60808	0.99607	-0.12789	0.37914	0.00000
49	50	0.07709	0.69650	0.60808	-0.99607	0.12747	0.37914	0.00000
	51	-0.07709	-0.69650	-0.60808	0.89080	-0.00690	0.37914	0.00000
50	51	0.07709	1.21247	0.40807	-0.89080	0.00801	0.37914	0.00000
	52	-0.07709	-1.21247	-0.40807	0.68373	0.60725	0.37914	0.00000
51	52	0.07709	1.23734	0.40807	-0.68373	-0.60794	0.37914	0.00000
	53	-0.07709	-1.23734	-0.40807	0.54487	1.02898	0.37914	0.00000
52	53	0.07709	1.25423	0.40807	-0.54487	-1.02928	0.37914	0.00000
	54	-0.07709	-1.25423	-0.40807	0.44874	1.32475	0.37914	0.00000
53	54	0.07709	1.76420	0.20807	-0.44874	-1.32405	0.37914	0.00000
	55	-0.07709	-1.76420	-0.20807	0.35616	2.10908	0.37914	0.00000
54	55	0.07709	1.79599	0.20807	-0.35616	-2.10806	0.37914	0.00000
	56	-0.07709	-1.79599	-0.20807	0.22334	3.25447	0.37914	0.00000
55	56	0.07709	2.30596	0.00803	-0.22334	-3.25646	0.37914	0.00000
	5	-0.07709	-2.30596	-0.00803	0.22300	3.35385	0.37914	0.00000

56	5	0.00000	-0.64898	0.20001	-0.20822	-0.67914	0.00000	0.00000
	57	0.00000	0.64898	-0.20001	0.15107	0.49372	0.00000	0.00000
57	57	0.00000	-0.63221	0.20001	-0.15107	-0.49372	0.00000	0.00000
	58	0.00000	0.63221	-0.20001	0.09393	0.31308	0.00000	0.00000
58	58	0.00000	-0.61545	0.20001	-0.09393	-0.31308	0.00000	0.00000
	59	0.00000	0.61545	-0.20001	0.03679	0.13724	0.00000	0.00000
59	59	0.00000	-0.60167	0.20001	-0.03679	-0.13748	0.00000	0.00000
	60	0.00000	0.60167	-0.20001	0.00000	0.02681	0.00000	0.00000
60	60	-0.72760E-11	-0.04490	0.00000	0.00000	-0.02625	-0.12127E-11	0.00000
	61	0.72760E-11	0.04490	0.00000	0.56863E-09	0.00885	-0.12127E-11	0.00000
61	61	0.00000	-0.02515	0.00000	-0.71007E-09	-0.00918	-0.60633E-12	0.00000
	62	0.00000	0.02515	0.00000	-0.17837E-09	0.00200	-0.60633E-12	0.00000
62	62	0.00000	-0.00838	0.00000	-0.88785E-10	-0.00200	0.00000	0.00000
	63	0.00000	0.00838	0.00000	0.13288E-09	-0.00040	0.00000	0.00000

Interaction Diagram Data - Substructure 1

Diagram Number 1

Max Tension Force	0.54000 (*kip*)
Local 2 Axis Shift	0.78218E-18 (*in*)
Local 3 Axis Shift	-0.22545E-12 (*in*)
Phi Factor Concrete	0.75000

Interaction Points

Point #	AXIAL (*kip*)	MOMENT_3_POS (*kip-ft*)	MOMENT_2_NEG (*kip-ft*)	MOMENT_3_NEG (*kip-ft*)	MOMENT_2_POS (*kip-ft*)
1	0.54000	0.00000	0.00000	0.00000	0.00000
2	-49.33128	8.06644	8.08630	8.06644	8.08630
3	-49.87069	8.10235	8.10235	8.10235	8.10235
4	-52.16522	8.16519	8.16519	8.16519	8.16519
5	-54.77597	8.14002	8.14002	8.14002	8.14002
6	-56.53635	8.09107	8.09107	8.09107	8.09107
7	-62.26180	7.80436	7.80436	7.80436	7.80436
8	-63.94952	7.69403	7.69403	7.69403	7.69403
9	-66.18071	7.52837	7.54308	7.52837	7.54308
10	-69.08611	7.31137	7.31137	7.31137	7.31137
11	-72.03312	7.06367	7.06367	7.06367	7.06367
12	-74.20677	6.88097	6.88097	6.88097	6.88097
13	-76.76804	6.61378	6.61380	6.61378	6.61380
14	-79.87020	6.16292	6.21805	6.16292	6.21805
15	-82.06528	5.85569	5.85569	5.85569	5.85569
16	-85.36422	5.27354	5.27354	5.27354	5.27354
17	-88.54959	4.66336	4.70525	4.66336	4.70525

18	-90.48635	4.27247	4.27247	4.27247	4.27247
19	-90.48635	0.00000	0.00000	0.00000	0.00000

Output Summary - Substructure 1

Max/Min Pile Internal Forces	Value	Load Case	Combination	Pile
max shear in 2 direction	0.28544 (*kip*)	10	2	5
min shear in 2 direction	-0.28665 (*kip*)	9	1	5
max shear in 3 direction	-0.07093 (*kip*)	9	1	1
min shear in 3 direction	-1.53514 (*kip*)	9	1	5
max moment about 2 axis	3.47325 (*kip-ft*)	9	1	1
min moment about 2 axis	-3.38092 (*kip-ft*)	9	1	5
max moment about 3 axis	2.67409 (*kip-ft*)	10	2	5
min moment about 3 axis	-0.17091 (*kip-ft*)	10	2	1
max axial force	-0.07620 (*kip*)	9	1	1
min axial force	-19.58328 (*kip*)	9	1	5
max torsional force	28.56678 (*kip-ft*)	9	1	3
max demand/capacity ratio	47.56878	9	1	1

Max/Min Soil Reaction Forces	Value	Load Case	Combination	Pile
max axial soil force	0.80180 (*kip*)	9	1	5
min axial soil force	0.00408 (*kip*)	9	1	1
max lateral in X direction	0.05108 (*kip*)	10	2	5
min lateral in X direction	-0.07025 (*kip*)	9	1	5
max lateral in Y direction	0.16122 (*kip*)	9	1	1
min lateral in Y direction	-0.09379 (*kip*)	10	2	1
max torsional soil force	-0.00327 (*kip-ft*)	10	2	5

Max/Min Pile Head Displacements	Value	Load Case	Combination	Pile
max displacement in axial	0.09629 (*in*)	9	1	5
min displacement in axial	0.00045 (*in*)	9	1	1
max displacement in x	1.14150 (*in*)	9	1	5
min displacement in x	-0.07790 (*in*)	9	1	5
max displacement in y	1.27874 (*in*)	9	1	5
min displacement in y	-15.37419 (*in*)	9	1	5

Max/Min Pier Cap Internal Forces	Value	Load Case	Combination
max axial force	0.11166 (*kip*)	9	1
min axial force	-0.08786 (*kip*)	10	2
max shear in 2 direction	12.07236 (*kip*)	10	2
min shear in 2 direction	-18.09520 (*kip*)	9	1
max shear in 3 direction	1.30091 (*kip*)	9	1
min shear in 3 direction	-0.80812 (*kip*)	10	2
max torque	0.37914 (*kip-ft*)	10	2
min torque	-5.19763 (*kip-ft*)	9	1

max moment about 2 axis	2.56011 (*kip-ft*)	9	1
min moment about 2 axis	-3.35008 (*kip-ft*)	10	2
max moment about 3 axis	15.87066 (*kip-ft*)	10	2
min moment about 3 axis	-9.57226 (*kip-ft*)	9	1

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