Avalon Fire/Rescue District
Commissioner Meeting Minutes

Date: 16 July 2018

Call to Order: The regular meeting of the Avalon Fire Protection District was called to order by Chairman Rod Johnson at 7:00 p.m. at the North Firehouse, 5408 Mulat Road, Milton, FL 32583.

Quorum: Commissioners present: Rodney Johnson, Paul Hazucha, and Wes Woodham. Chief Sid Wiggins, ex-officio was also present. Don Galbraith and Mark Talbott were not present.

Attendance Names: Sandy Luntsford, Eddie Roukema, James Stephenson, Tom Peterson, Michael Farrow, Pam Farrow, Philip Anderson, Felicia Anderson, and Josh Huber.

Minutes: Minutes were not available for approval.

Treasurer's Report: A Treasurer's Report was not available for approval.

Chief's Report: N/A.

Old Business: N/A.

New Business: Mr. Farrow and other citizens from Bernath Place voiced concerns regarding their deficient timber bridge and a viable emergency entrance. The bridge was certified in 2015 assuming the engineer's recommended repairs were made. All repairs were not made; however, $94,000 was spent to shore up the bridge. A rear entrance to the neighborhood, one not requiring a bridge, may be the most cost effective and expeditious route to restore full services. Any new ingress (bridge or road) will need to meet national standards.

Josh Huber's structural analysis of the Bernath Bridge was reviewed. A copy is attached.

Doug and Tyler attended Honor Guard training.

Regarding the expected growth in the district the Haas Center at UWF may be able to provide some answers. If the cost is less than $5000 their services will be used.

Correspondence and Communication: The UWF Small Business Development Center (SBDC) is helping regarding the expected growth within our district.

Financial: No bills for approval.

Adjournment: Chairman Johnson adjourned the meeting. The next regular meeting is scheduled for 7:00 p.m. 6 August 2018.

Rodney M. Johnson, Chairman

Wes Woodham, Secretary

HUBER
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Date: 01 May 2018

Subject: Structural Analysis of Timber Bridge

Address: Bernath Subdivision – Milton, FL

To Whom It May Concern:

The following analysis has been requested by the Bernath Homeowners Association and has been conducted to assess the structural capacity of the existing timber bridge that connects the subdivision to Seneca Trail. Due to concerns voiced by the local fire and school districts, an acceptable load rating is necessary to establish whether the bridge can safely support emergency response vehicles and school buses. This report follows an analysis and repair recommendations that were provided in June 2015 by Joshua Huber, PE, while he was employed with Irby Engineering.

Description of Fire Truck Chassis:
Based on past requests by Avalon Fire rescue, the bridge must be able to support a 50,000-lb emergency response vehicle which has a maximum individual rear wheel load of 21,250 lbs.

Description of Standard School Bus Chassis:
The prior Florida Administrative Code Rule 6A-3.0291 that was in effect at the time of the last report has been eliminated and included in FAC 6A-3.003. The rule currently states that school buses shall meet the *National Transportation Specifications and Procedures May 2010,* and the *Florida School Bus Specifications 2013.* These standards will be referred to as NSTSP and FSBS, respectively, throughout this report and are incorporated by reference.

The Gross Vehicle Weight Rating (GVWR) is the sum of the allowable weights on a vehicle's axles. The Gross Axle Weight Rating (GAWR) is the sum of the forces on the tires of individual axles. Where axle spacing (wheelbase) and GAWR were not specified, this information was taken from school bus manufacturers such as Ford, Chevrolet, Blue Bird Corp., Thomas Built Buses Inc., etc. In cases where data varies across manufacturers, load configurations with the greatest impact on the bridge will be used in the analysis.

Description of Bridge:
The timber bridge is located at the entrance of the Bernath Subdivision between Seneca Trail and Bernath Drive in Milton, FL. The following nomenclature is used to describe the bridge

components. All cross sectional dimensions are given in inches, unless otherwise noted. Rectangular cross sections are [horizontal dimension] x [vertical dimension].

1) Piling: Driven timber pilings that support the bridge structure by transmitting gravity loads to the surrounding soils. The pilings vary in diameter and spacing.
2) Bent Cap: Treated timbers that span each line of pilings. These are typically made by stacking 2-16x8 timbers on top of each other. They are aligned by a steel shear pin projecting from the tops of the pilings.
3) Stringer: Treated timbers that span between the bent caps as simply supported beams. Their nominal cross-sectional dimensions are 8x16. Solid stringers are those that are made of one solid 8x16 timber. Stacked stringers are those that are made by stacking two 8x8 timbers so that the sum of their cross section is equal to an 8x16 stringer.
4) Decking: 8x3 treated timbers fastened to the upper surface of the stringers and serve to partially distribute concentrated loads to multiple stringers.
5) Runner: 2x8 treated lumber oriented flat and fastened to decking that serves as a driving surface protecting the decking.
6) Railing: Treated posts, curb, and railing lumber fastened along each side of the bridge.

Since no changes to the construction of the bridge, the survey conducted for the 2015 report was used in this analysis to determine piling locations and stringer span lengths.

Method of Analysis:
Since the number of pilings per bent, the span of the stringers, and the relative locations of adjacent bents vary over the length of the bridge, wheel loads will have different effects depending on where they are applied. Therefore, allowable wheel loads on the stringers will be determined based on the maximum and minimum spans of the stringers. Based on the bridge survey, these spans are 19'-8" and 13'-0", respectively.

A maximum allowable concentrated load will be determined per the current National Design Specification for Wood Construction (2015 ed.) that went into effect in Florida at the beginning of 2018. Stringers are assumed to be treated southern pine #2 timbers whose reference values are given in the NDS 2015 Supplement, Table 4D:

- Bending .... $F_b = 850\ psi$
- Tension .... $F_t = 550\ psi$
- Shear parallel to grain .... $F_v = 165\ psi$
- Compression perpendicular to grain .... $F_{c\perp} = 375\ psi$
- Compression parallel to grain .... $F_c = 525\ psi$
- Modulus of elasticity .... $E = 1{,}200{,}000\ psi$
- Modulus of elasticity for beam stability .... $E_{min} = 440{,}000\ psi$

Reference values for bending and compression perpendicular to grain have been modified for load duration, wet service, and timber size as follows per NDS 2015 Section 4.3.

- $F'_b = 1319$ *psi*
- $F_{c\perp} = 251$ *psi*
- $E = 1{,}200{,}000$ *psi*

Maximum Wheel Loads for Bending Stress:

- Maximum span = 19'-8"
  - Solid stringer ⇨ Wheel Load = 7,620 lbs (19,100 lbs distributed)
  - Stacked stringer ⇨ Wheel Load = 3,820 lbs (9,560 lbs distributed)
- Minimum span = 13'-0"
  - Solid stringer ⇨ Wheel Load = 11,500 lbs (28,800 distributed)
  - Stacked stringer ⇨ Wheel Load = 5,780 lbs (14,500 distributed)
- Note: For distributed loads where wheel load is spread across adjacent stringers spaced at 1.5ft on center, the allowable wheel load may be multiplied by 2.5 (ref: AASHTO Bridge Design Manual, Table 3.23.1).

Maximum Wheel Loads for Stringer Deflection:

- Maximum span = 19'-8"
  - Solid stringer ⇨ Wheel Load = 6,643 lbs
  - Stacked stringer ⇨ Wheel Load = 1,660 lbs
- Minimum span = 13'-0"
  - Solid stringer ⇨ Wheel Load = 15,200 lbs
  - Stacked stringer ⇨ Wheel Load = 3,800 lbs
- Note: Deflection criteria = Span / 425 (ref: AASHTO LRFD Article 2.5.2.6.2)
- Note: No allowance was found for distributed wheel loads when calculating deflection.

Maximum Crushing Force Over Bent:

- Maximum crushing force = 64,300 lbs
- Note: This is the maximum allowable force that can be applied to the end of a stringer supported on a 16-inch wide bent before the stringer crushes perpendicular to grain.

Assumptions and Related Uncertainties:

The following assumptions provide a basis for the structural analysis. Uncertainties related to these assumptions are also briefly discussed. **Superseding these assumptions is the intent to hold paramount the safety, health, and welfare of the public when using this bridge.** As a result, any suspect or missing information regarding structural aspects of the bridge are conservatively estimated in favor of safety.

Assumption 1: Maintenance is ongoing.

Uncertainty: Based on recent inspections, components of the 2015 recommendations not yet been fully implemented. Additionally, several of the connections between pilings and bents have loosened with repeated movement relating to dynamic loading on the bridge.

Assumption 2: Stringers may be stacked or unstacked.

Uncertainty: Based on recent inspections, stacked stringers were found in multiple places throughout the bridge. These do not have the same load capacity as solid stringers and are addressed in the analysis.

Assumption 3: The possibility exists that the driver of a heavy vehicle will lack sufficient knowledge of where it is most appropriate to position his vehicle as he crosses the bridge. This implies that a given wheel load can be applied on any part of the bridge deck.

Uncertainty: Since special knowledge of each bridge that a heavy vehicle may encounter is not a realistic solution to safe passage, the maximum safe load for any part of the bridge is considered in this analysis.

Assumption 4: Timbers are treated southern pine #2 rough cut lumber.

Uncertainty: It was unclear from maintenance documents what species and grade of lumber was used to accomplish the repairs that were recommended in the 2015 report. Therefore, a conservative assumption was made that seemed to agree with the need to meet cost constraints related to the upkeep of the bridge.

Assumption 5: Bent capacity is assumed to be that which was determined in the pile test performed by Larry Jacobs & Associates (LMJA File #12-154).

Uncertainty: Pile and bent capacities were determined conservatively based on assumed and/or design information available at the time of testing. Since much of the repair work on the bridge that was performed throughout its existence has not been documented, the condition and depth of the pilings are uncertain. Comparisons made between original and recent inspection photos imply that there has been some movement in parts of the bridge.

Assumption 6: Allowable Stress Design was used in the original bridge design and is continued in the analysis shown in this report.

Uncertainty: Allowable Stress Design (ASD) is the oldest of the three design codes commonly used for bridges in the United States in recent decades. The ASD method of design utilizes unfactored loads which are combined to produce a maximum effect in a member. The maximum load or combination of loads cannot exceed the allowable stress of the material. The allowable stress is found by taking the strength of the material and applying an appropriate factor of safety that is greater than unity. One primary limitation of ASD is that no consideration is given to the fact that various types of loads have different levels of uncertainty. For example, dead loads, live loads, and environmental loads are all treated equally. Because the factor of safety is applied to the resistance side of the analysis and is based primarily on experience and judgement, consistent measures of risk cannot be determined. The current standard for bridge design and analysis is Load and Resistance Factor Design (LRFD).

Design Standards Used:

1) *National Design Specification for Wood Construction* (2015)
2) *Florida School Bus Specifications* (Revised 2013)
3) *Load and Resistance Factor Design for High Bridge Superstructures* (2015), Federal Highway Administration, Publication No. FHWA-NHI-15-047
4) *AASHTO Standard Specifications for Highway Bridges*
5) *Timber Bridges: Design, Construction, Inspection, and Maintenance* (1990), United States Department of Agriculture / Forest Service.

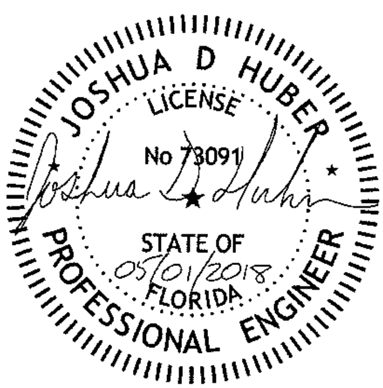
Summary and Recommendations:

The load calculations shown above do not account for a safety factor. Based on the load calculations, it is my professional opinion that the bridge should not be relied upon for safe passage by heavy emergency response vehicles. While it may support light vehicular traffic in the short term, it is recommended that long term use of this bridge be evaluated in light of current condition and maintenance.

If it is the desire of the Bernath Homeowners Association to continue the use of this bridge for the foreseeable future, it is recommended that an elevation survey of the bents be performed to determine any vertical movement of the piles under continued loading when compared to subsequent elevation surveys. Since conservative estimates of the bent capacities had to be made due to inconsistent or missing information regarding the configuration of the bridge below grade, it will be important to correlate these measurements for future assessments.

If you have any further questions or comments. Please feel free to contact me.

Sincerely,



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