

EXECUTIVE SUMMARY

This memorandum summarizes the findings of Bridging Solutions inspection and evaluation of the Harbour Drive Bridge over Mooring Bay (FDOT #035250), Naples, Florida. It also provides recommendations for maintenance repairs. The bridge is 54 years old and the most recent FDOT Bridge Inspection Report (01/16/19) overall condition ratings are summarized below. A site map is attached.

FDOT Bridge Inspection Report Overall NBI Ratings:

Deck:	7 Good
Superstructure:	7 Good
Substructure:	7 Good
Perf. Rating:	Good
Channel:	7 Minor Damage
Suff. Rating:	97.2
Health Index:	92.53

The recommended maintenance repairs should extend the service life of this bridge and address all of the repair recommendations included in the 2019 FDOT Bridge Inspection Report. Closure of the bridge to vehicular and boat traffic during construction is not required. However, if the City prefers to close the bridge to vehicular traffic as a means to facilitate construction, we can provide traffic control plan notes in the final plans in accordance with FDOT Index 102-600. The contractor will be required to notify the Coast Guard if the navigational waterway under the bridge will be partially closed.

The major work items to be included in the final repair plans are as follows as we discussed at our review meeting on June 10, 2019:

1. Removal and replacement of the asphalt wearing surface on the bridge deck and approach slabs.
2. Installation of a waterproofing membrane on top of the bridge deck and approach slabs.
3. The new asphalt will be saw cut over the expansion joints to control cracking and the saw cut will be filled with liquid asphalt.
4. The asphalt overlay would extend off the ends of the approach slabs at least 22 feet and would terminate at a saw cut in the asphalt.
5. The bridge will be closed during the street level repairs with the traffic detoured to Park Shore Drive.
6. Perform concrete patching repairs on the 4th pile from the joint with the private wall on the southeast sea wall. Clean the other piles and apply a breathable coating on all of the seven (7) piles.
7. Fill the voids behind the sea wall under Span 1 with low slump concrete up to level of the mean low water elevation and fill the remaining portion of the voids with #57 stone. The details for the means and methods for plugging of the holes on the canal side of the repair procedure will be delegated to the contractor.

8. End Bent 1, temporarily remove some of the rip rap stones where settlement has occurred under the bent and tightly install sand bags in the voids under the end bent between the exposed piles. Reinstall the rip rap stones.
9. At End Bent 2, pulverize and disperse the existing failed rip rap materials as necessary between the end bent and the sea wall. Install sand bags in the voids under the end bent between the exposed piles to the front face of the bent. Install at least 5 layers of sand cement bags at the front face of the end bent with #4 rebar driven in the bags. Install a 6" minimum layer of #3 stone over the dispersed materials between the sea wall and newly installed sand cement bags at the front face of the end bent.
10. Re-install the section of missing cast stone on the right barrier that was salvaged by the City. Fabricate a new section of cast stone to replace the missing cast stone element. Require the contractor to provide 4 additional cast stone pieces that will be provided to the City for future use.
11. The undermined area under the sidewalk on the left side at End Bent 4 will be filled using sand bags.
12. The fencing will be replaced on the sea wall below Span 3 per the City's requirements.

The estimated duration of a project that includes all of the proposed repairs is 4 to 6 weeks. The environmental classification of the bridge is assumed to be extremely aggressive due to the marine environment at the bridge site. The mode of flow for Mooring Bay is considered tidal. Based on the latest Bridge Inspection Report, scour vulnerability for this bridge is a low risk.

The recommended repairs are considered maintenance. Therefore, this project is exempt from environmental permitting.

BRIDGE DESCRIPTION

The Harbour Drive Bridge, built in 1965, consists of three spans (35'-40'-35') for a total length of 110 feet. The bridge carries two (2), 12'-0" travel lanes, 4'-0" bike lanes, and 6'-0" sidewalks for a total out-to-out width of 46'-8". The bridge was widened to its existing configuration in 2001.

The superstructure consists of twelve (12) precast, prestressed concrete channel slab beams that are 18 inches deep, with a 2-inch asphalt wearing surface. The structural components for the bridge railings consist of a full length cast-in-place concrete base (18" high by 16" wide) with W6X12 steel rolled beam posts at 11 foot spacing and a continuous 4x4 steel tube rail at mid-height of the posts. The structural components are covered with decorative cast stone panels and a decorative aluminum hand railing is placed between the structural posts. Utilities are supported outboard of the barriers on both sides of the bridge.

The 12-inch thick approach slabs are 20 feet long. The substructure of the bridge consists of concrete caps supported by 14-inch squared prestressed concrete piles. Concrete structural pile jackets have been installed on all of the original piles. The photographs below provides an overall view of the bridge.



End (Eastern) Approach



Right (Southern) Elevation

LOAD CAPACITY

The Harbour Drive Bridge is currently not posted and therefore all legal loads may cross the bridge. A load rating dated 10/16/2009 is referenced in the FDOT Bridge Inspection Report which confirms that load posting is not required.

INSPECTION FINDINGS

PRESTRESSED SLAB BEAMS

The 2019 FDOT Bridge Inspection Report lists the prestressed channel beams as a Condition State of 2 (fair). The following list summarizes the location and size of the deficiencies on the underside of the prestressed channel beams.

1. Slab Unit 1-12 has a spall 6in. x 6in. x 1in. at Bent 2.
2. There is evidence of water leakage between some of the joints between the slab beams.
3. There is evidence of bats living in between some of the slab beam joints.



Minor spall at Slab Unit 1-12 and leakage through joints

ASPHALT WEARING SURFACE

The 2 inch thick asphalt wearing surface has longitudinal and transverse cracks between 1/2" and 3/4" wide. The longitudinal cracks appear to be reflective cracks at joints between slab beam units. The cracks allow water to flow down between the joints in the slab beams. See photos below. The 2019 FDOT Bridge Inspection Report lists the wearing surface as a Condition State of 3 (poor).



Typical condition of wearing surface



Typical cracks along curb lines (at widening joint)

EXPANSION JOINTS

The FDOT Bridge Inspection Report lists the expansion joints as a Condition State of 1 (good). The pourable sealant in the expansion joints over the bents is covered with an asphalt overlay. There is partial adhesion failure and deterioration of the poured expansion joints in the sidewalks at Bent 3.



Covered expansion joint at Bent 4



Adhesion failure (12" long) in sidewalk joint at Bent 3

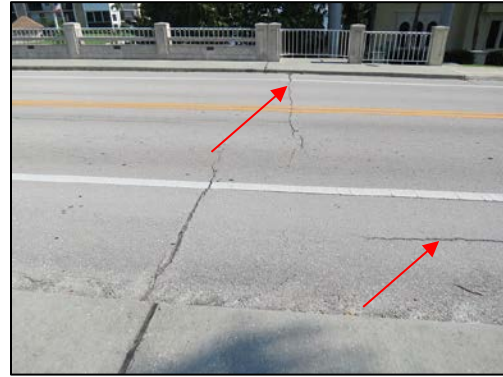
APPROACH SLABS

The FDOT Bridge Inspection Report lists the approach slabs as a Condition State of 2 (fair). The approach slabs are covered with an asphalt overlay. The begin (west) approach slab at End Bent 1, right shoulder, has a longitudinal crack up to 20 feet x 1/4 inch and a full width 1/2 inch transverse crack 2 feet west of the asphalt covered expansion joint. The end (east) approach slab has a longitudinal crack up to 18 feet x 1/4 in in the asphalt overlay in the right shoulder and a transverse crack 10 feet x 1/2 inch in the left shoulder and Lane 2 at the east approach roadway. There is a transverse crack up to 27ft. x 1/2in. in the asphalt overlay in the end approach slab that is 3 feet east of End Bent 4. The transverse cracks appear to line up

with construction joints shown in the record plans. We believe that water flowing down into these cracks has caused the undermining of the approach slabs and end bents.



Pavement cracks at approach slab for End Bent 1



Pavement cracks at approach slab End Bent 4

END BENT CAPS

The FDOT Bridge Inspection Report lists the end bent caps as a Condition State of 1 (good). End Bent Cap 1 is intermittently undermined throughout up to 8 inches high x 40 inches under the cap with the piles exposed. End Bent Cap 4 is undermined at the center of the cap 36 feet long x 21 inches high x 42 inches under the cap with the piles exposed. See photos below. End Bent Cap 1 has a minor crack and minor spall at the location of the construction joint where the cap was widened in 2001 (no repairs required).



Undermining at End Bent 1



Undermining at End Bent 4

PIER CAPS

The FDOT Bridge Inspection Report lists the pier caps as a Condition State of 2 (fair). The caps have several minor pop out spalls up to 1-1/2 in. diameter x 1/2 inch deep with exposed form ties throughout the structure (no repairs required).

PRESTRESSED CONCRETE END BENT PILES

There are four (4) exposed piles at End Bent 1 and seven (7) exposed piles at End Bent 4 due to undermining/settlement of the slope. There are some very minor spalls on some of the piles (no repairs required).

PRESTRESSED CONCRETE INTERMEDIATE BENT PILES

Piles 2 through 7 of each bent (original piles) have been jacketed with 30 inch square grout type jackets which are in good condition (no repairs required).

SEA WALL BULKHEADS

This section documents the concrete cap and sheet pile channel sea wall bulkheads under spans 1 and 3. It also documents the concrete cap and vinyl sheet pile bulkhead between End Bent 1 and the span 1 channel bulkhead sea wall.

The west sea wall bulkhead has two up to 6 ft. x 4 ft. x 3ft. void/depression areas behind the bulkhead cap in the northwest and southwest corners. See photos below.



Sink hole on left side behind sea wall



Sink hole on right side behind sea wall

There are 7 exposed piles on the right (south) side of the east sea wall bulkhead that exhibit corrosion bleed out. The 4th pile from the joint with the private wall has a spall that is approximately 8 inches x 13 inches x 3 inches deep. There are 3 steel channels on the face of the wall (that are presumably connected to tie back anchors) are heavily rusted. See photos below.



Seven piles at East sea wall (arrow on pile with spall)



Close-up of pile spall and rusted channel

The following deficiencies were documented in the diving inspection report:

1. The concrete panels have horizontal, diagonal and vertical cracks up to 4 feet (full panel width) x 1/32in. with some efflorescence.
2. East bulkhead, 6 feet north of Pile 7 from the south private wall, 5 inches below cap has a diagonal crack 3 feet x 1/32 inch with corrosion bleed out.
3. East bulkhead, panel behind Piles 4 and 5 from the north private wall at cap down, has a vertical crack 23 inches x up to 1/16 inch with corrosion bleed out.
4. The east and west bulkhead joints have spalls up to 24in. x 5in. x 1in., largest being the west bulkhead 1st joint north of the private sea wall.

END BENT SLOPE PROTECTION

The slope protection at End Bent 1 consists of rock rubble. The slope protection at End Bent 4 consists of rip-rap with intermittent grout or asphalt topping. A portion of the slope protection at End Bent 1 exhibits minor settlement/displacement. The settlement and displacement throughout the slope protection at End Bent 4 has produced undermining up to 21 inches deep of the cap, exposing seven piles. See the photos below.



Slope protection at End Bent 1



Slope protection at End Bent 4

BRIDGE RAILINGS

The aluminum bridge rails exhibit isolated areas of peeling paint. The concrete panels exhibit wide spread delamination from the substrate. The right railing in Span 2 has a 7'-9" length of concrete panel missing. Some of the flush mounted light fixtures are loose.



SIDEWALK OVERLOOK

The left sidewalk overlook at End Bent 4 is undermined.



FENCE AT END SPAN 3

The fence installed under Span 3 is in poor condition and should be replaced.

Bridge Site Location Map

