Memorandum

MIAMI-DADE COUNTY

Date: July 17, 2013

To: Honorable Xavier L. Suarez
Commissioner – District 7

From: Carlos A. Gimenez
Mayor

Subject: Bear Cut Bridge Structural Integrity

In response to your May 13, 2013 correspondence regarding the structural integrity of the Bear Cut Bridge (Bridge) as it relates to statements made within TranSystems' report (attached for reference), please note that said report was prepared at the request of Commissioner Juan C. Zapata to address specific concerns regarding the Bridge. Transystems' report did not provide a life expectancy for the Bridge on account of two (2) unknown factors:

First, in response to a request for the feasibility of temporary repairs to the Bridge and the resulting life expectancy, Transystems stated that they "*cannot offer an opinion as to the life expectancy of the entire bridge if repairs are made to the superstructure, because of the many variables... and because these types of repairs are highly dependent on the quality of the field work.*"

While Public Works and Waste Management staff agreed with this assessment, this concern is no longer relevant as the County will replace the entire portion of the superstructure built in 1944 with a completely new superstructure consisting of concrete beams and deck. This will ensure the safety of the public accessing the Bridge.

Second, in response to a request for information regarding repairs to the existing bridge foundations and the resulting life expectancy, Transystems provided that *"The original portions of the bridges have unknown foundations, which means that documentation of the existing pile depths through design plans, as-built plans or pile driving records is unavailable."* Therefore, *"the life expectancy of the foundations cannot be predicted at this time."*

As noted in the report, there are only a few problems with the foundations that are accessible to underwater inspections, and these will be addressed as part of ongoing construction by Kiewit Infrastructure South Co. (the County's Contractor). Field testing will be conducted for the portions of the piles that are underground, and thus not accessible for inspection, and a report will be prepared addressing the condition and load carrying capacity of said piles. This study is being performed by the Contractor and their engineers and will be reviewed by the County and all other interested parties. It is expected that the study will be complete in mid-August 2013.

I hope that the information included above sufficiently addresses your concerns. If you have any further questions, please contact Kathleen Woods-Richardson at 305-514-6628 or me directly.

Attachment

c: Honorable Chairwoman Rebeca Sosa and Members, Board of County Commissioners
Robert A. Cuevas, Jr., County Attorney
Alina T. Hudak, Deputy Mayor
Kathleen Woods-Richardson, Director, Department of Public Works and Waste Management

TranSystems

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February 22, 2013

Mr. Marcos R. Redondo, P.E.
Section Head, Bridge Engineering
Highway Division
Miami-Dade Public Works and Waste Management Department
111 NW 1st Street, Suite 1510
Miami, FL 33128

RE: Response to Memorandum from Commissioner Zapata

Dear Mr. Redondo,

In response to your request to TranSystems via email on February 7, 2013, we offer the following discussion regarding the eight points that Commissioner Zapata requested be addressed. All time and money estimates are approximate given the many unknowns and the compressed time available for this analysis.

Feasibility and cost of temporarily repairing the bridges along with the resulting life expectancy of the bridge:

Although it is possible to perform repairs to the Bear Cut and West bridges, the effort to make the numerous repairs to the areas of section loss on the beams is very significant. The selected contractor must first strip off the grease coating and remove all the rust scale that is present to completely define the scope of the repairs. It is likely that the orange coating beneath the grease contains lead, as most coatings from the era the bridge was constructed, or even 30 years ago, contained lead. If lead paint is present, special containment will be required for the steel to be cleaned, which will put the cost for coatings removal at a premium. Once the scope of repairs is fully defined and materials received on site, the work can begin in earnest.

At the bearing areas, it may be required to jack the bridge in order to restore load path continuity, as there are many locations where the webs at the beam ends are in poor condition. Jacking the beams is likely to be complicated by the fact that the beam webs exhibit the worst conditions near the bearings. To perform jacking, the beam webs or diaphragms may require stiffening, replacement, and/or repair at the locations where the jacks are to be installed. An entire line of beams at a pier will need to be jacked simultaneously, while traffic is on the bridge. This work is possible, but very difficult to do, and may cause some additional deterioration to the deck.

In addition to the possible need to jack some spans to make repairs, it is very likely that voids will exist between the flat surfaces of the new steel and the uneven surfaces of the existing steel, creating locations where moisture can accumulate and corrosion will advance, even with the most careful cleaning, sealing and painting processes followed. In order for the new repair steel to carry both dead (self-weight and concrete deck, etc.) and live load (vehicles), the weight needs to be removed from the beams during the installation of new steel. Span jacking is very costly. Repair work also includes concrete repairs to the substructure elements, of which there is a high probability that the extent of repairs will exceed what has been anticipated due to the contractor performing a much more detailed examination of the concrete elements to determine locations to repair.

The existing deck slab is in fair to poor condition with large areas of spalls and delaminations on the deck underside. Jacking the bridge could cause additional spalling on the deck underside. Good quality repair results to large scale deficiencies on the deck underside are hard to obtain, because it is so difficult to place repair concrete in an overhead position that bonds well. This type of repair to the deck underside cannot be counted on to last as long as the steel repairs. If the deck underside is not repaired, it may be that the deck could become the limiting factor for the remaining life of the bridge.

Well-designed and constructed steel repairs commonly last for 15-20 years before further repairs will be needed at those locations. However, such repair activities usually only address the locations noted to be in the worst condition; all locations with deterioration are typically not addressed. Those locations that are not critical enough to warrant repairs at this time will worsen and eventually become critical locations. Once corrosion has started on steel elements, that location will worsen in an increasingly fast manner. Those locations could become critical enough to cause severe load restrictions to the bridges, of the type that the County is currently dealing with, in as little as five years. In addition to the conditions discussed above, we recommend cleaning and painting the entire steel structure in order to halt the continued deterioration for the period it would take to plan and design the structure replacement.

The table below summarizes our opinion of the probable cost to perform steel repairs and concrete substructure repairs, based on Florida Department of Transportation (FDOT) pay items for similar work and using typical unit prices for FDOT projects in District 6, without consideration for accelerated scheduling or the need for immediate completion.

OPINION OF PROBABLE COST - BRIDGE REPAIRS AT BEAR CUT AND WEST BRIDGES					
ITEM NO.	PAY ITEM	UNIT	QUANTITY	UNIT PRICE	COST
Bridge No. 874644 (Bear Cut Bridge)					
401-70-2	Restore Spalled Areas	CF	7,888	$ 400.00	$ 3,155,229.28
415-1-5	Reinforcing Steel - Substructure	LB	45	$ 1.00	$ 45.31
460-1-1	Structural Steel - Rehab, Carbon	LB	134,278	$ 7.72	$ 1,036,086.40
460-1-13	Structural Steel Rehab - Bolts, Nuts, Washers & Plates	LB	13,428	$ 6.54	$ 87,817.59
561-1	Coating Existing Structural Steel	TN	896	$ 1,500.00	$ 1,344,205.97
Bridge No. 874641 (West Bridge)					
401-70-2	Restore Spalled Areas	CF	1,705	$ 400.00	$ 681,807.60
415-1-5	Reinforcing Steel - Substructure	LB	1,445	$ 1.00	$ 1,445.00
460-1-1	Structural Steel - Rehab, Carbon	LB	36,620	$ 7.72	$ 282,557.04
460-1-13	Structural Steel Rehab - Bolts, Nuts, Washers & Plates	LB	3,662	$ 6.54	$ 23,949.24
561-1	Coating Existing Structural Steel	TN	312	$ 1,500.00	$ 467,803.85
	SUBTOTAL (BOTH BRIDGES)				$ 7,080,947.27
101-1	Mobilization				$ 100,000.00
	Superstructure Jacking				$ 650,000.00
	TOTAL				$ 7,830,947.27

In an emergency situation, where the work needs to get done under a very compressed schedule and labor, materials and equipment will incur premium costs related to overtime, rush delivery, or other factors, the cost to complete the work is likely to be higher. The amount of these premium costs is difficult to quantify, as each contractor has a unique situation and the extent of premium costs will vary widely because of such

factors as other workload, availability of required equipment to do the work, etc. Additionally, the requirements of the emergency work vary greatly, for example, will the contractor be allowed or required to work 24 hours/day? What levels of existing traffic will be allowed or required to be maintained? Premium costs could add up to 50% to the project, resulting in a total repair cost greater than $10,000,000. Spending upwards of $10,000,000 to make needed repairs, even though less costly than replacing the superstructures or replacing the bridges completely, does not appear to be prudent.

We cannot offer an opinion as to the life expectancy of the entire bridge if repairs are made to the superstructure, because of the many variables discussed above and because these types of repairs are highly dependent on the quality of the field work. In addition, the substructure for the original portions of both bridges have unknown foundations, which means that documentation of the existing pile depths through design plans, as-built plans or pile driving records is unavailable. The existing underwater inspection reports provided by FDOT indicate that there are few problems with the foundations. Because we do not know the details of the foundations and the depth of the piles, the life expectancy of the foundations, and by extension the bridge as a whole, cannot be predicted at this time.

Caveats with respect to temporarily repairing the bridges:
Repair and rehabilitation work on existing bridges commonly uncover hidden deterioration that results in additional cost. The extent of that additional deterioration is not known until partial demolition occurs at existing deteriorated locations. Generally, contingency quantities are used to account for the unknown conditions.

Anticipated cost difference of performing the work under emergency conditions with severe time constraints versus under non-emergency conditions:
Doing repair work under emergency conditions is always more expensive to perform, as premium overtime costs for labor and rush delivery surcharges for materials and equipment to perform the work would not be included if the work is done under non-emergency conditions. There are no standard guidelines for the incremental cost associated with emergency work because the cost difference cannot be determined with significant accuracy, as it is very much a function of the individual contractors, their labor force, and the extent to which they are able to fine tune their bids during the acquisition process. Additionally, the requirements of the emergency work vary greatly, as well as the owner's contractual requirements. Requirements for maintenance of existing traffic on structures also vary from project to project. In general terms, it can be reasonably estimated that work under emergency conditions may cost 30-50% more than when done under non-emergency conditions. However, the County has declared a public emergency in order to expedite the necessary bridge work, and is using a fast-paced, streamlined design-build procurement process that allows for competitive bidding by proposers, which should keep the premium costs down. At this time, there are five responsive contractors that have submitted packages to the County.

Cost to repair the existing bridge foundations and the resulting life expectancy:
The original portions of the bridges have unknown foundations, which means that documentation of the existing pile depths through design plans, as-built plans or pile driving records is unavailable. The existing underwater inspection reports provided by FDOT indicate that there are few problems with the foundations. Newly designed bridges have foundations much deeper than ones built decades ago. The modern design of such elements incorporates estimated effects of scouring of the channel bottom during storm events that are usually deeper than older design methods estimated. The bridges have been in place and withstood past storm events in the County, but that is no guarantee that a future storm event could not have greater scour impact. Because we do not know the details of the foundations and the depth of the piles, or what a reasonable calculated scour depth is at these specific bridge locations, the life expectancy of the foundations cannot be predicted at this time.

It should be noted that superstructure replacement will include widening of the bridge. As part of the widening, new piles will be installed that will be driven to the depth required to meet current design requirements.

Cost to build new bridges with new foundations and expected construction duration:

The proposed cross section for a new Bear Cut bridge is 116'-0", as described to us in meetings with County staff. The cross section of the West bridge would remain as-is. Our opinion of the probable cost to replace both bridges in their entirety is as follows:

OPINION OF PROBABLE COST - NEW CONSTRUCTION TO REPLACE ORIGINAL PORTIONS AT BEAR CUT AND WEST BRIDGES					
	PAY ITEM	UNIT	QUANTITY	UNIT PRICE	COST
Bridge No. 874544 (Bear Cut Bridge)					
	Demolition	SF	173,088	$ 60.00	$ 10,385,290.50
	New Construction	SF	242,637	$ 145.00	$ 35,182,394.00
Bridge No. 874541 (West Bridge)					
	Demolition	SF	65,685	$ 60.00	$ 3,941,122.50
	New Construction	SF	65,685	$ 145.00	$ 9,524,379.38
	TOTAL (BOTH BRIDGES)				$ 59,033,186.38

The square foot unit costs are from the FDOT Structures Design Guidelines, Topic No. 625-020-018, January 2013. We have assumed the high end of the cost range for both demolition and construction, as these bridges are in an urban location and they cross over waters that are likely to require special consideration, and unit costs do not account for such factors as mobilization, removal of existing structures, lighting, walls, approach slabs, maintenance of traffic or any contract-specific compressed construction schedules or requirements that go beyond what is expected of routine bridge construction. Note that the cost tabulated above does not include the work that will be necessary to tie into the approach roadways off of the bridge and assume that the vertical and horizontal geometry is very similar to the existing bridges. Additionally, the costs for design, construction inspection and the County's 10% construction contingency are not included. If the vertical profile is raised significantly, the cost of the work away from the channel will increase substantially.

The construction duration is difficult to estimate, since the parameters the County would put on such an effort are unknown. In addition, the effort to design and construct the new sections of bridges will be affected by the time it would take to address any potential environmental impacts with affected agencies and obtain permits. Typical bridge replacement projects of this size take five to ten years from concept to construction, depending on the level of project development and environment (PD&E) studies, alternatives, and cultural resource impacts evaluated. As you have noted in our discussions, some PD&E studies for replacement of County bridges have taken more than five years to complete. Given the location of these two bridges and the concerns of the affected citizens, the PD&E effort could take four to five years to complete.

Advantages of building a new bridge in accordance with today's standards:

Modern design codes and specifications are intended to provide a 75-year design life, assuming routine maintenance is performed on the bridge over that period. Building a new bridge will significantly reduce the maintenance effort required at the bridges, as the need for concrete repairs and the need for steel repairs should not be needed for decades. The foundation elements would be designed to withstand significant scour events, as well as some vessel impact. The level to which the existing bridges' might withstand these events is unknown. In addition to the structural and maintenance perspectives, constructing a new bridge

provides the opportunity to improve the roadway geometry and improve safety for vehicles, bicyclists and pedestrians.

Environmental permitting impacts and mitigation requirements of the different actions:

The impacts for the various construction options - repair, superstructure replacement with widening (re-use of existing substructure), full superstructure and substructure replacement with widening - are varied. Below is a very preliminary matrix of agencies that FDOT requires be consulted during the Efficient Transportation Decision Making screening process, along with our assessment of possible impact for the various types of work. Note that the final cross section desired for a new bridge and the environmental conditions at the bridge sites (seagrasses, mangroves, hazardous materials, etc.), are unknown. A more detailed discussion is not possible at this time.

ASSESSMENT OF LIKELY AGENCY CONCERN TO SELECTED CONSTRUCTION OPTION				
Issue	Agency	Repair	Superstructure Replacement	Superstructure and Substructure Replacement
Air Quality	US Environmental Protection Agency	Low	Low	Low
Coastal and Marine	National Marine Fisheries Service	Low	High	High
Contaminated Sites and hazardous materials	US Environmental Protection Agency	Moderate	Low	Low
	Federal Highway Administration	Low	Low	Low
	FL Department of Environmental Protection	Moderate	Low	Low
Floodplains	US Environmental Protection Agency	Low	Moderate	Moderate
	Federal Highway Administration	Low	Moderate	Moderate
Navigation	US Coast Guard	Low	Low	Low
Special Designations	Federal Highway Administration	Low	Moderate	Moderate
	US Environmental Protection Agency	Low	Moderate	Moderate
	US Fish and Wildlife Service	Low	Moderate	Moderate
Water Quality and Quantity	US Environmental Protection Agency	Low	Moderate	High
	FL Department of Environmental Protection	Low	Moderate	High
Wetlands	US Environmental Protection Agency	Low	Moderate	High
	FL Department of Environmental Protection	Low	Moderate	High
	National Marine Fisheries Service	Low	Moderate	High
	US Army Corps of Engineers	Low	Moderate	High
	South Florida Water Management District	Low	Moderate	High
	US Fish and Wildlife Service	Low	Moderate	High

ASSESSMENT OF LIKELY AGENCY CONCERN TO SELECTED CONSTRUCTION OPTION (continued)				
Issue	Agency	Repair	Superstructure Replacement	Superstructure and Substructure Replacement
Wildlife and Habitat	US Fish and Wildlife Service	Low	Moderate	High
	South Florida Water Management District	Low	Moderate	High
	FL Fish and Wildlife Conservation Commission	Low	Moderate	High
	Federal Highway Administration	Low	Moderate	High

Mitigation of effects vary widely depending on project location and the agencies involved. Mitigation can be generally categorized as avoidance, minimization or compensation. In general, it could involve techniques such as relocation of wildlife and habitat, wetland mitigation banking, or drainage improvements for handling increased runoff. FDOT construction activities are regulated by numerous environmental rules and regulations administered by Federal, State, local, and special district governing agencies. These agencies have established environmental programs to conserve, protect, manage, and control the air, land, water, and natural resources which will need to be adhered to as part of the project. Actual mitigation efforts needed for this project would need to be discussed with the individual agencies once more specifics of the actual work to be performed are known and the impacts of construction on the environment are identified.

Life-cycle cost analysis over a 50 year period, comparing temporary bridge repairs with complete bridge replacement within five years; to superstructure replacement and foundation repairs now with complete replacement when the expected remaining life of the existing foundation is reached:

The life expectancy of the bridges cannot be determined at this time, as the actual construction of the foundations is unknown. The FDOT has an on-going project to evaluate bridges with unknown foundations; the Bear Cut and West bridges are part of that study population. Depending on the results from that study, they may be able to evaluate the ability of the bridges to withstand significant storm surge.

If you have any questions, please feel free to contact me.

Steven Shaup, P.E.
Vice President

cc: Alan Klevens, P.E., TranSystems

MEMORANDUM
COMMISSIONER XAVIER L. SUAREZ

111 NW First Street, Suite 220 Miami, Florida 33128 Tel. (305) 375-5680 Fax (305) 372-6103

TO:	Mayor Carlos Gimenez Miami-Dade County	DATE:	May 13, 2013
CC:	Deputy Mayor Alina Hudak Miami-Dade County	RE:	Bear Cut Bridge Structural Integrity
FROM:	Xavier L. Suarez Commissioner, District 7		

Mayor,

In the most recent CBS news montage on the condition of Bear Cut Bridge, I believe a certain TranSystems engineering report conclusion was highlighted stating that the condition/longevity of the bridge's structural integrity is unknown and/or could not be determined.

In light of report's uncertainty, I would greatly appreciate if you could provide me a copy of the County Administration's response to said allegations.

Thank you in advance for cooperating with my office,

Commissioner Xavier L. Suarez