Media Response and Project Information – Bayway Height

Requesters: Tyler Fingert and Brendan Kirby - Fox 10 and Andrea Ramey - NBC15

Questions:
Fox 10: A federal official says ALDOT is not legally required to raise the Bayway to a 100 year flood event height. Federal regulations only require ALDOT to consider risk and other factors when building highway structures that affect flood plains. This seems to contradict what Director Cooper has told us before and said in Wednesday's meeting. It also directly contradicts a written release from the Governor's office. That release said: "The Federal Highway Administration regulations state that the Bayway needs to be raised above the 100-year storm surge level."

Does ALDOT have any comment that a federal official is saying that "the minimum requirement for projects over waterways is less than the 100-year event?"

Andrea: Please explain why the Bayway needs to be elevated.

ALDOT Response:
The Alabama Department of Transportation is committed to providing safe and efficient transportation facilities to the driving public. To that end, we are working to develop the Mobile River Bridge and Bayway Project which features three key elements: the Mobile River Bridge, a new eight-lane Bayway above the 100-year storm surge level, and modifications to seven interchanges.

Many factors went into the decision to replace the Bayway with a higher structure as opposed to widening it. Those factors include storm surge analysis, federal regulations, ALDOT design standards, and cost.

Federal Regulations:
Per 23 CFR 650.115, the design for an encroachment on a base (100-year) floodplain shall be supported by analyses of design alternatives with consideration given to capital costs and risks, and to other economic, engineering, social, and environmental concerns.

23 CFR 650.115(a)(2) states that the design flood for through lanes of interstate highways shall not be less than the flood with a 2-percent chance of being exceeded in any given year (also known as the 50-year storm).

23 CFR 650.115(a)(3) states that freeboard (clearance between the lowest member of the bridge and the top of the flood water) shall be provided, where practicable, to protect bridge structures from debris- and scour-related failure.

23 CFR 650.111 states that where FEMA Flood Insurance Rate Maps are available, their use is mandatory for highway agencies in determining whether a highway location alternative will include an encroachment on the 100-year (base) floodplain.

In December 2014, the FHWA issued Order 5520 Transportation System Preparedness and Resilience to Climate Change and Extreme Weather Events. This directive requires FHWA "to ensure that their programs, policies, and activities for which they are responsible integrate consideration of climate change and extreme weather event impacts and adaptation into its planning, operations, policies, and programs, in order to promote climate change and extreme weather event preparedness and resilience. Proactive management involves developing engineering solutions, operations and maintenance strategies, asset management plans, and transportation programs that address risk and promote resilience at both the project and systems levels."

In a January 2017 memo put out by the Federal Highway Administration, which falls under the U.S. Department of Transportation, states the following:

> *The Fixing America's Surface Transportation (FAST) Act, signed into law December 2015, requires agencies to take resiliency into consideration during transportation planning processes.*
>
> *Following passage of the FAST Act, the Federal Highway Administration and the Federal Transit Administration updated the metropolitan and statewide transportation planning regulations to reflect these new requirements.*
>
> *The transportation planning rule includes:*
>
> - *A new planning factor for states and metropolitan planning organizations (MPOs) to consider and implement: improving the resiliency and reliability of the transportation system (23 CFR 450.206(a)(9) and 23 CFR 450.306(b)(9)).*
> - *A recommendation for MPOs to consult with agencies and officials responsible for natural disaster risk reduction when developing a metropolitan transportation plan and the transportation improvement program (23 CFR 450.316(b)).*
> - *A requirement that the metropolitan transportation plan assess capital investment and other strategies that reduce the vulnerability of the existing transportation infrastructure to natural disasters (23 CFR 450.324(g)(7)).*

FHWA provides designers with manuals to be used to design projects that comply with the Code of Federal Regulations. These manuals present methodologies that must be followed by designers to satisfy federal requirements and meet design standards. The manuals applicable to this project include:

- U.S. Department of Transportation, Federal Highway Administration's Hydraulic Engineering Circular No. 25, 2nd Edition, Highways in the Coastal Environment, dated June 2008
  (Applicability: For bridges in coastal areas, engineers must evaluate the risk of the bridge being impacted by storm surge and wave impacts and design appropriate alternatives to mitigate for those risks.)
- U.S. Department of Transportation, Federal Highway Administration's Hydraulic Engineering Circular No. 17, 2nd Edition, Highways in the River Environment – Floodplains, Extreme Events, Risk, and Resilience, dated June 2016
  (Applicability: Engineers must consider climate change and sea level rise in designing bridges to be resilient to climate change and extreme weather events.)

In addition to the above-listed circulars, FHWA requires the use of the *2008 AASHTO Guide Specifications for Bridges Vulnerable to Coastal Storms*, which provides technical guidance and oversight for bridges vulnerable to coastal storms. These AASHTO specifications were developed by an FHWA-pooled fund following the wave induced damage experienced on a number of Gulf Coast bridges following Hurricanes Ivan, Rita, and Katrina. This document includes the following requirement.

4.2—CLEARANCE REQUIRED TO AVOID WAVE FORCES ON SUPERSTRUCTURE

Wherever practical, the vertical clearance of highway bridges should be sufficient to provide at least 1 ft of clearance over the 100-year design wave crest elevation, which includes the design storm water elevation.

For bridge spans where this vertical clearance is not possible, other design strategies may be considered, including those identified in Article 4.3.

In summary, bridges must be designed to avoid significant encroachments on the 100-year floodplain and to provide clearance above the 100-year floodplain unless it can be proven that it is not practicable. They must also be designed to withstand storm surge and wave action impacts, and they must be resilient to climate change and extreme weather events. Engineers meet these requirements by following the methodologies set forth in the U.S. Department of

Transportation's Hydraulic Engineering Circulars, Executive Orders, and Orders, as well as the 2008 AASHTO Guide Specifications.

Storm Surge Analysis:

ALDOT conducted Level I and Level III Storm Analyses to determine the flood height and wave impact forces for various storm events. These analyses used existing data for environmental conditions primarily related to wind and storm surge heights, water bottom terrain, water depths, flood prone areas identified by the Federal Emergency Management Agency (FEMA), and the heights and widths of the existing Bayway bridges and ramps.

The analysis confirmed that a 100-year storm event would catastrophically damage a major portion of the **existing** I-10 Bayway structure beyond repair (similar to the I-10 bridges in Pensacola after Ivan and the I-10 and US-90 bridges in Louisiana and Mississippi following Hurricane Katrina).

Most of the **existing** Bayway is well below the 100-year wave crest elevation, placing it well within the wave impact.

The Level I and III Storm Analyses also showed that due to the height of the existing Bayway, a 50-year storm could still damage over 50% of the Bayway. There is a 64% probability of a 50-year storm impacting the existing or new Bayway built at the same height during the 55-year Concession period.

AASHTO allows state DOT's to consider options other than full replacement. To determine the feasibility of strengthening the existing Bayway structure for wave impact forces, ALDOT performed a structural analysis of the existing Bayway, as well as design of several retrofit options.

The analysis revealed that even with the retrofit design, the uplift buoyant force from the waves for a 100-year storm damaged 75% of the bridge beyond repair.

ALDOT evaluated multiple design alternatives, the four most viable are outline in the document "Bayway Alternative Analysis Matrix 08 26 2019" on the project website: https://mobileriverbridge.com/documents/.

Cost:

ALDOT studied the economics of retrofitting and widening the existing Bayway. Retrofitting means the concessionaire would strengthen the structure at its current elevation against storm surge and wave impacts. It should be noted that the end of the design life for the existing Bayway would be reached in 2037, which means that it would need to be replaced during the 55-year concession period.

The estimated cost of retrofitting and widening the existing Bayway at 100-year storm surge level would be $1.032 billion. In 20 years, the structure would need to be replaced; that cost is

estimated at $890 million. The total estimate for widening the current Bayway and replacing it in 20 years would be $1.922 billion. These costs do not include inflation or impacts to the interstate traffic during future Bayway construction.

The estimated cost of retrofitting and widening the existing Bayway at the 50-year storm surge level would be $528 million. In 20 years, the structure would need to be replaced; that cost is estimated at $651 million. The total estimate for widening the current Bayway and replacing it in 20 years would be $1.179 billion. These costs do not include inflation or impacts to the interstate traffic during future Bayway construction.

The cost to replace the existing Bayway with a new eight-lane facility that is above the 100-year storm surge level is estimated to be $886 million. For comparison purposes, the cost to replace the existing Bayway with a new eight-lane facility that is above the 50-year storm surge level is estimated to be $883 million.

The Mobile River Bridge (the cable-stay structure across the Mobile River) will have a design life of 100 years and connect to the new Bayway, which will also have a 100-year design life.

Separately, a federal report done in 2016 found that the existing Bayway would be impacted if a storm similar in strength Hurricane Katrina directly hits Mobile. State and local governments would also experience loss in potential tax revenue, an estimate of $7,150 and $23,310 per day of bridge disruption. ALDOT would estimate a five-year construction cycle to replace the Bayway if it were to be destroyed by severe weather.

Conclusion:

ALDOT has heard the public's concerns about *replacing* the Bayway rather than *widening* it.

As stated in Section 6.1 Design Events of FHWA's HEC No. 17, "*In the transportation community, there are two major considerations driving the development of policy governing the specification of design events. First and foremost, the transportation community should ensure public safety. Threats to public safety may come in a direct form, such as the potential for vehicles being washed away by floods and encountering life-threatening situations, or in an indirect way, such as the impediment of emergency services access as a result of out-of-service transportation facilities.*

The second major consideration involves the preservation of the transportation asset, that is, the road, culvert, or bridge itself. Even if a transportation asset does not constitute a vital link in the chain of emergency services, damage to, or loss of, an asset may result in a financial loss as well as a loss of utility (economic loss) of the entire facility and inconvenience to the public."

To comply with Federal regulations, ALDOT determined replacing the Bayway above the 100-year storm surge elevation is in the best interest for the safety of traveling public and is the most cost-effective solution.

Please see these links for further information:

NBC 15: Current Mobile Bayway would be 'destroyed' by another Katrina:
https://mynbc15.com/news/local/latest-climate-change-report-current-mobile-bayway-would-be-destroyed-by-another-katrina

ALDOT Bridge Design Manual (which specifies in Section 3.2 that ALDOT uses the AASHTO Guide Specifications for Bridges Vulnerable to Coastal Storms)
https://www.dot.state.al.us/brweb/pdf/ALDOTStructuresDesignDetailManual.pdf

AASHTO Guide Specifications for Bridges Vulnerable to Coastal Storms. See provision 4.2 & 4.3.
https://books.google.com/books?id=cFY55eXFCbwC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

FHWA-HEP-17-028 (HEC-17):
https://www.fhwa.dot.gov/engineering/hydraulics/pubs/hif16018.pdf

FHWA-NHI-07-096 (HEC-25):
https://www.fhwa.dot.gov/engineering/hydraulics/pubs/07096/07096.pdf

Project website: www.mobileriverbridge.com