

RESILIENCE AT RISK



2021 Texas Infrastructure Report Card

- ✓ Report Card overview
- ✓ Focus on Flood Risk Mitigation
- ✓ In 25 minutes or less.

North Central Texas CRS Users & Elected Officials Flood Plain Seminar

Wed. June 30, 2021 9:20AM | Virtual. "One night only" 😊

Presented by: Mark K. Boyd PhD, PE, D.WRE, CAPM
Principal Engineer, LCA Environmental, Inc.





Mark K. Boyd PhD, PE, D.WRE, CAPM
Principal Engineer, LCA Environmental, Inc.



ASCE Texas Section 2021 IRC Committee Chair
VP Technical Elect, ASCE Texas Section

Adjunct Associate Professor
Southern Methodist University



20+ years teaching
graduate
hydrology and
environmental
courses



"We were environmental before environmental was cool"





ASCE Texas Section | www.texasce.org

- Represents more than 10,000 civil engineers
- Supports year-round technical work of state agencies & policymakers
- Hosts a Legislative Drive-In (normally, this year “zoom-in”)
- Has an obligation to educate the public & policy makers about the condition of our state’s infrastructure

10,000 Civil Engineers!
SCARY THOUGHT.

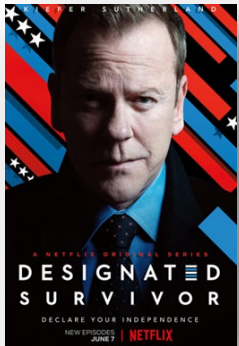




GAINING TRACTION!

since 1998 (national), Texas 2004

- ASCE Texas recommendations on flood risk mitigation were adopted & funded through actions of the 86th Texas Legislature, in the aftermath of Hurricane Harvey
- ASCE urges Congress to consider key priorities including: Sustainability, Resilience, and Prioritizing Asset Management and Operation & Maintenance needs
- On popular media! Script in Netflix Series “Designated Survivor”. Fictional President Tom Kirkman (played by Kiefer Sutherland...that’s Donald’s son to us old guys).



The report card in the Oval office?



2021 Texas Report Card – A Labor of Volunteer Dedication

Flood Risk Mitigation Subcommittee

Melvin Spinks, PE, CFM (Chair) | CivilTech

Chris Van Heerde, PE (co-Chair) | MHT Engineering

Jessica Sprague, PE, CFM | CivilTech

Stephanie Zertuche, PE, CFM | GeoSolutions, LLC

Levees Subcommittee

Curtis Beitel, PE CFM, ENV SP (Chair) | HDR

Andrew Wilson, PE, CFM | Peloton Land Solutions

Umesh K. Bachu, PE | ECS

The late Russell “Rusty” Gibson, PE* | E TTL Engineers & Consultants

*report card dedicated to Rusty

55 Committee Members
12 Categories
92 pages
Developed during pandemic
lockdown

<https://www.texasce.org/our-programs/infrastructure-report-card/>



10 things not to say to the public

1. Hit by a flood? Great! Now you're safe for another 100 years!

2. Explain 100 year event. 1/100, 1% chance any given year., could happen twice in a year... Huh??

3. Lecture them on the hydrologic cycle.

4. Don't worry, we have a stochastic model and a unit hydrograph for that.

5. Anything Evapo-transportation rates.

6. Anything about antecedent moisture conditions

7. Anything about conditional probability distribution, sequential heavy rainfall events

8. The record fits the Type I Gumbel extreme probability distribution.

9. Wanna know more? It's all in NOAA Atlas 14. Read it!

10. Play LED ZEPHELLIN – When the Levee Breaks, tell them it couldn't get worse than the Great Mississippi flood of 1927.



“when the levee breaks, we'll have no place to stay”.

**How to best summarize infrastructure issues?
Why not school letter grade?**

TEXAS INFRASTRUCTURE REPORT CARD GRADE BASIS

Methodology

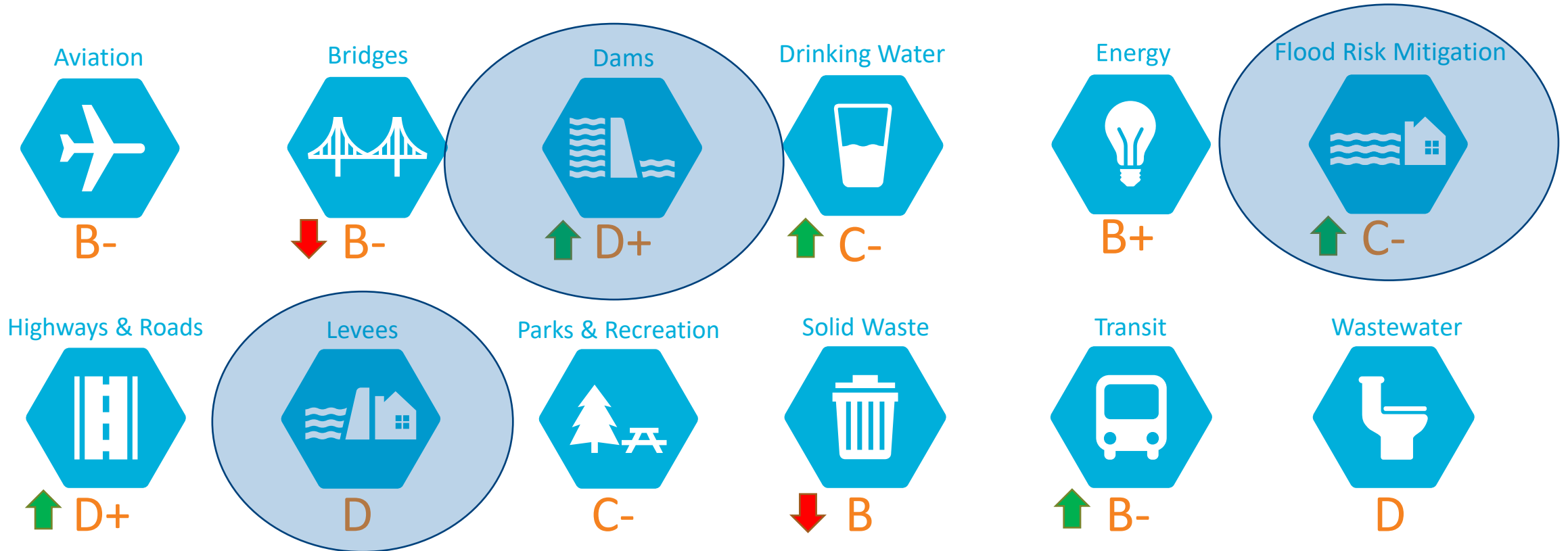
- CAPACITY
- CONDITION
- FUNDING
- FUTURE NEED (Texas Population Growth!)
- OPERATION & MAINTENANCE
- PUBLIC SAFETY
- RESILIENCE
- INNOVATION

NOT JUST NUTS & BOLTS





Texas Category Grades and Texas GPA on the rise:



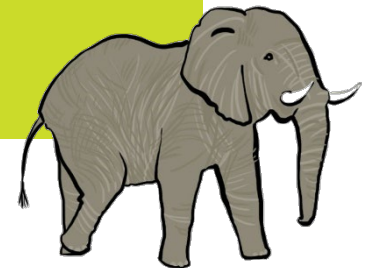
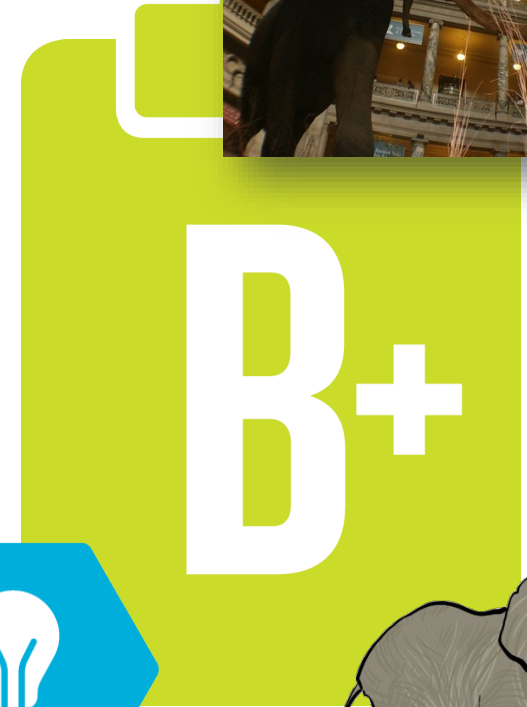
<https://www.texasce.org/wp-content/uploads/2021/02/2021-Texas-Infrastructure-Report-Card.pdf>



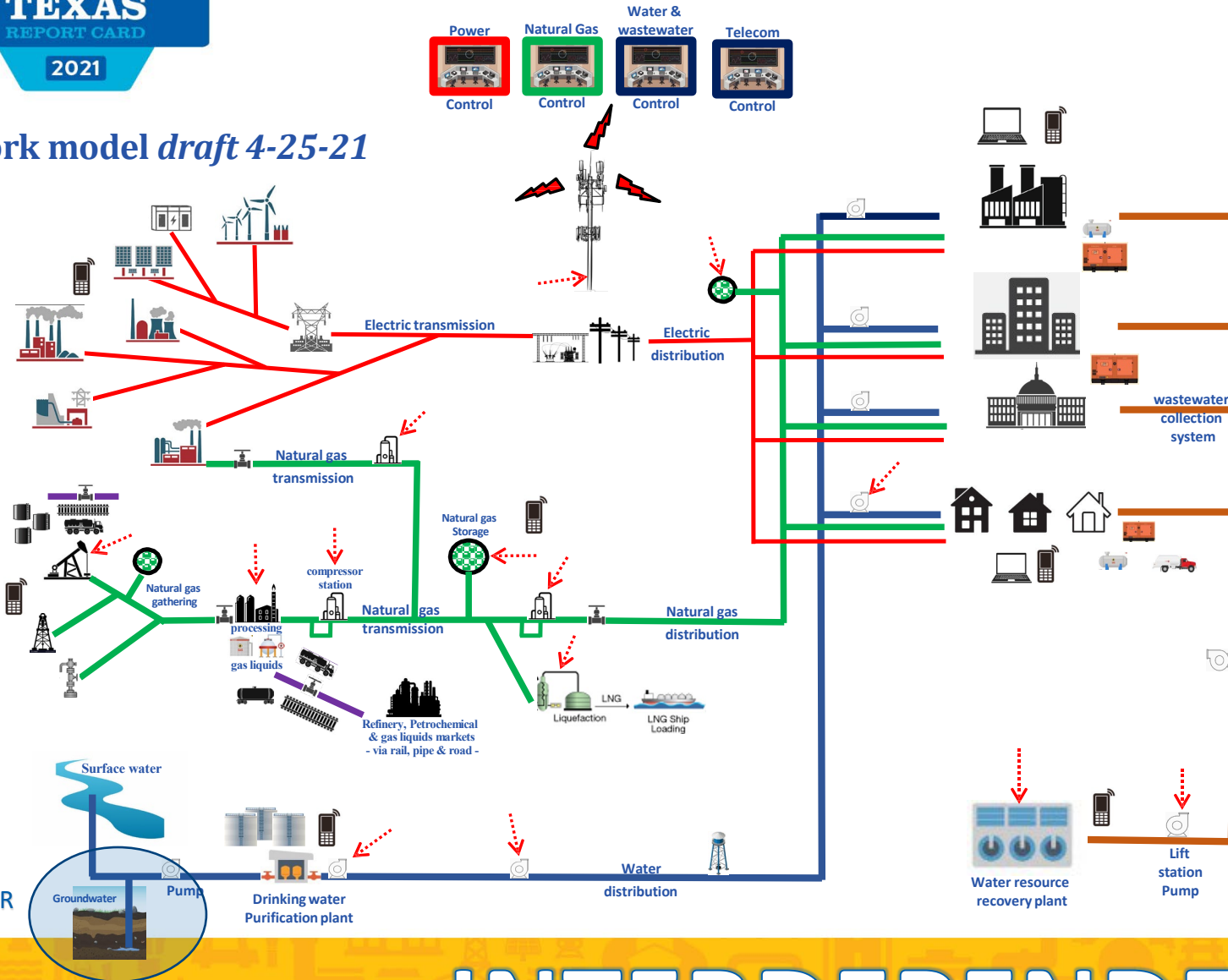
The Big Elephant, Feb 2021 winter storm.

Energy

- Two Energy categories: oil & gas and electricity
- Texas leads the U.S. in oil & gas production
- Texas is the energy innovation capitol of the world
- Oil production increased from 1 million barrels per day in 2011 to over 5.4 million barrels per day in 2019
- Texas needs to continue its leadership by example
- Big elephant in the room. What about the winter storms of 2021?
- Texas ASCE “Beyond the Storms” Committee producing a report similar to Hurricane Harvey report of aftermath that helped prompt the first Texas Flood Plan



Network model draft 4-25-21



Power - wires

- Transmission
- Distribution
- Substation
- Electricity delivery

Generation

- Natural gas
- Coal
- Wind
- Solar
- Nuclear
- Hydro
- Back-up generator /battery

Natural Gas

- Gathering
- Midstream & transmission
- Distribution
- Compression
- Storage
- Natural gas liquids
- Oil production
- Liquids & Propane

Telecommunications

- Towers & hubs
- Cellular access

WATER/WASTEWATER

Water & wastewater

- Water source
- Water treatment plant
- Water distribution pipe
- Water storage (tower)
- Wastewater collection pipe
- Water Resource Recovery
- Pump

GROUNDWATER

Flood Risk Mitigation

- Roughly 1 in 10 Texans is exposed to moderate or high annual riverine flood risks.
- Initiatives are underway to reduce risks through better planning, improved asset management, & new funding sources to support flood risk mitigation infrastructure.
- 2019 Texas State Flood Assessment report: More than \$31.5 billion needed over the next decade.
- TWDB Estimate: local communities need 18 to \$27 Billion in financial assistance.



- Major metropolitan areas passed flood control bond referendums
 - **Harris County \$2.5 Billion**
 - **Fort Bend County - \$83 million**
 - **Dallas \$1.05 Billion (\$139 million to drainage and flood control projects)**
 - **San Antonio \$550 million**
- Senate Bill 500 (86th legislature, 2019)
 - TWDB new responsibilities creating Texas Flood Infrastructure fund (FIF) and Texas Infrastructure resilience Fund (TIRF).
- 2019 State Flood Assessment report 31 of 40 Texas Cities (pop. 100,000+) have stormwater utilities.

D to C
↑

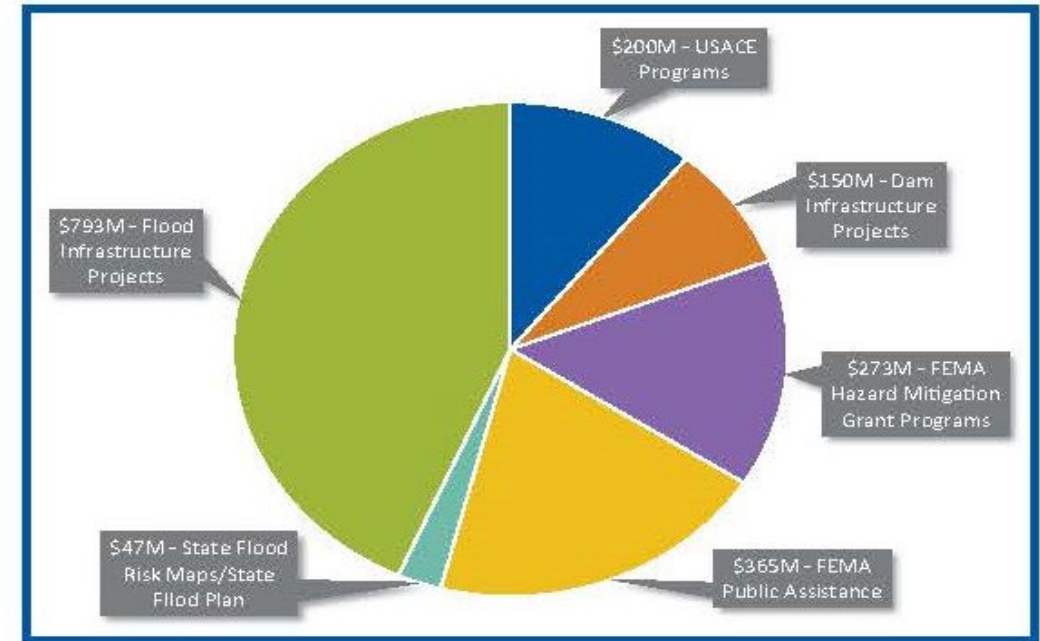


FIGURE 15. Senate Bill 500 Funding Allocation.

- 180 flood related deaths, 2015-2019, highest in US.
- Hurricane Harvey – 68 deaths (highest from hurricane since 1919)
- What’s ahead? Uncertain.
- NOAA Atlas 14, Volume 11, planning/design has not yet adjusted.
- Not enough there, there to address growing, accelerating Texas population.
- More building standards improvements
- More protective policies
- More/better smart growth
- New/better urban planning.

WHY C-?

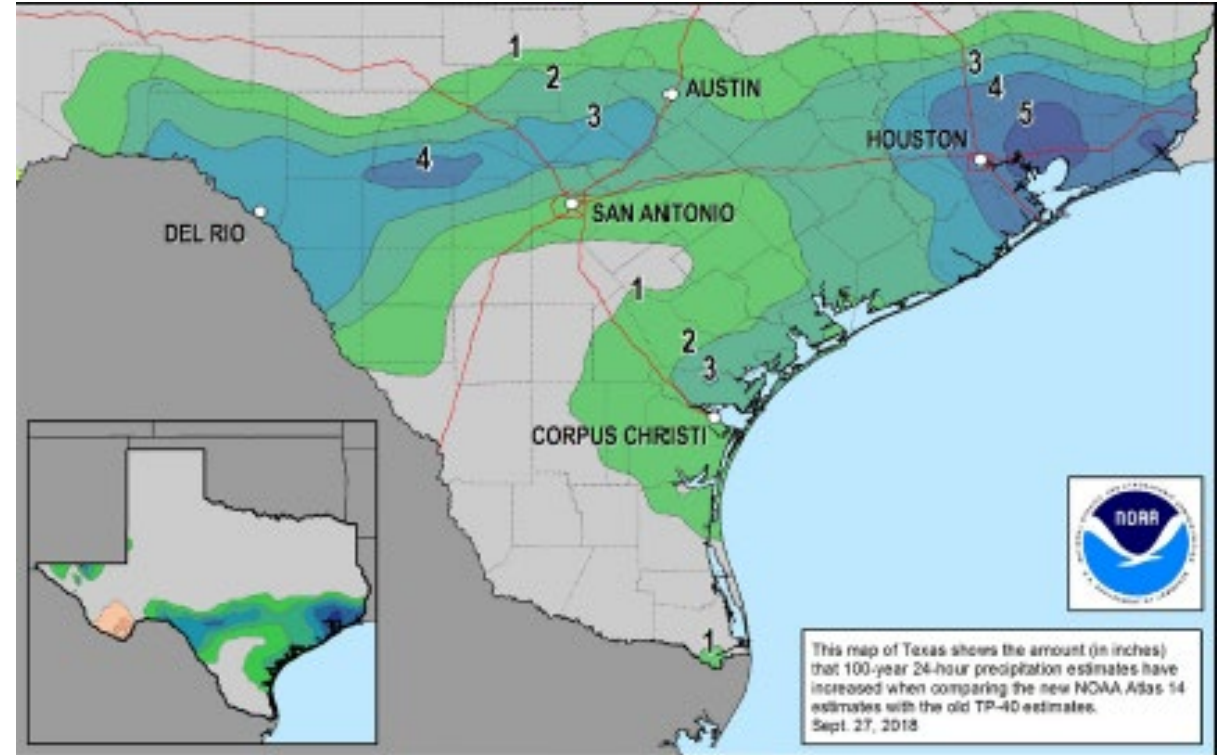


FIGURE 16. The 100-year rainfall estimates increased anywhere from 1 to 5 inches for a 24-hour storm. Source: NOAA.



SELECTED FLOOD RISK RECOMMENDATIONS

- Planning leads to “analysis by paralysis”. Committee recommended, a mix of shovel ready and planning projects to make sure public sees public dollars at work.
- Work with local communities to minimize development in identified flood hazard and at-risk areas.
- Encourage development standards and alternatives to design practices based on the latest data from NOAA Atlas 14. This relates to a separate recommendation to incorporate design and planning to consider environmental and data impacts.
- Continue to do what’s working, as this has resulted in improving the grade and path toward greater resilience and preparedness.

Note: Similar recommendations pages are available in the report card for all categories.



RECOMMENDATIONS TO RAISE THE GRADE

Texas has a singular opportunity to make a noteworthy impact on the flood risk reduction and stormwater drainage infrastructure improvements within the state, and significantly reduce future problems with development. Specific recommendations are listed below:

- The State’s current plan needs to emphasize the implementation of infrastructure projects as a result of the ongoing planning effort by TWDB and GLO.
- Increase coordination across local, municipal, and state authorities to facilitate watershed-based flood risk reduction planning and to provide technical assistance to communities.
- Flood mitigation planning leads to a perception of “analysis paralysis” by the public. Therefore, a blend of shovel ready and planning projects is recommended to show public dollars at work.
- Revenue sources need to be identified and have dedicated Operations and Maintenance Funds. Facilities need to be maintained or failures can occur; therefore, robust vetting of the O&M Funds should be undertaken to prevent maintenance shortfalls in the future.
- Flood mitigation designs need to consider environmental and climate impacts, sea level rise, subsidence, future population growth, and other factors.
- Continue to update FEMA FIRM maps using the most recent scientific data, updated models, and updated rainfall rates for all watersheds in the state.
- Continue to educate localities and the public on the benefits of the FEMA National Flood Insurance Program (NFIP).
- Work with communities to minimize development in identified flood hazard zones and at-risk areas.
- Encourage localities to explore the broader use of stormwater retention and detention strategies, including green infrastructure, regional systems, and public/private partnerships.
- Encourage localities to revisit, create and/or enforce development standards which consider alternative design practices and current rainfall values as presented in NOAA Atlas 14.
- Continue to ensure financial assistance is available for implementation of flood mitigation and stormwater drainage projects.

Dams

- About 1/3 of the state's dams are for flood risk mitigation and 1 in 7 dams are for irrigation or water supply.
- Dams have great value and great consequence. The consequences of a dam failure far exceed the loss of a water supply or your favorite fishing hole
- \$5 Billion 2019 Association of State Dam Safety Officials estimated cost to rehabilitate all non-federal dams in Texas.
- \$2.1 billion repair/rehab estimate, Texas State Soil and Water Conservation Board dams in the Small Watershed Programs.



What about levees? We don't really know.

Levees

- More than 1 million Texans and \$127 billion dollars' worth of property are protected by levees.
- There is no state levee program.
- Texas has 327 levee systems total, extending a combined 567 miles.
- More than 75% of Texas levee systems are without screened risk classification.
- 5 levee systems (about 100 miles of levees) are classified as high to very high risk.





TEXAS INFRASTRUCTURE REPORT CARD

BIG PICTURE | BOTTOM LINE

Three of the major Texas infrastructure identified funding shortfalls are related to flood risk:

- Flood Risk Mitigation - \$31.5 Billion (next 10 years)
- Levees - \$Billions (truly unknown)
- Dams - \$5 Billion (rehab/repair)
- Wastewater - \$250 million / year
- Drinking Water capital costs – \$ 26.8 Billion (50 year, to be funded by utility bills)
- Highways & Roads - \$15 Billion thru 2040



The American Jobs Plan

- **\$50 Billion toward infrastructure resilience (none toward flood risk).**
- **\$17 Billion for inland waterways, related to freight capability (nothing toward flood mitigation).**
- **\$621 Billion toward transportation (which if planned improperly, could make flooding worse).**



BRIEFING TO 87TH STATE LEGISLATURE

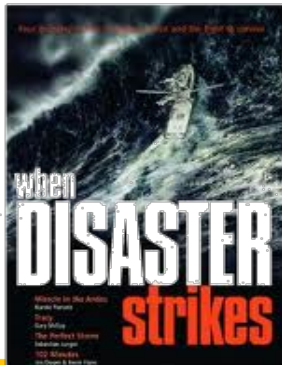
- ✓ Policy makers should collaborate with civil engineers to craft infrastructure legislation with resilience at the forefront, to maximize the return on investment and build a stronger Texas.
- ✓ Resilience refers to the capability to mitigate against significant all-hazards risks and incidents and to expeditiously recover with minimal impacts to public, the economy, & national security.
- ✓ Texas needs to understand the impact of the loss of infrastructure, as well as the timeline and cost to restore its function.
- ✓ **An all-hazard, comprehensive risk assessment that considers both event likelihood and consequences is necessary to prepare systems for the impacts of extreme events.**
- ✓ Texas needs to develop performance criteria and uniform statewide standards that address interdependencies and establish minimum performance goals for resilient infrastructure



Failure to Act! <https://www.asce.org/failuretoact/>
Consequence of status quo investments

Infrastructure is Critical to Texas' Economy

- Every additional \$1.00 invested in infrastructure delivers a return of roughly \$3.70 in additional economic growth over 20 years, according to the Business Roundtable.
- Neglecting infrastructure will leave us mired in static 20th Century status quo, or worse.
- The report card is an important advocacy tool
- ASCE commends governmental agencies for their work & dedication to serving the citizens of Texas
- Texas is the largest continental state, the 2nd most populous state, & an economic powerhouse, leading the Nation in wind power energy production
- Too often, we take infrastructure for granted & simply expect it to work
- Until....





Legislator Support

“The *ASCE Texas Infrastructure Report Card* is a critical tool as we assess our needs and measure progress in actively building Texas into a better place to live, work, and raise a family. We must continue to work together with all levels of government, community leaders, industry partners, and universities, using this invaluable resource to help keep us better informed about the issues facing Texas.”

- Representative Dennis Paul PE, Texas House of Representatives, District 129



State of the State

“... if Texas was its own country,
we would have the **9th largest economy** in the entire world.”

- Texas Governor Greg Abbott, February 1, 2021



“To sustain a higher quality of life for all, and to support its massive economy, growing population, and increasingly complex interconnected systems, Texas deserves and can afford **the best, most resilient and sustainable infrastructure in the world.**”

Mark K. Boyd, PhD, PE | Chair Texas ASCE 2021 Infrastructure Report Card Committee



WANT TO KNOW MORE? READ ENTIRE 92 PAGE REPORT CARD
<https://www.texasce.org/our-programs/infrastructure-report-card/>

THANK YOU!

OPEN Q&A