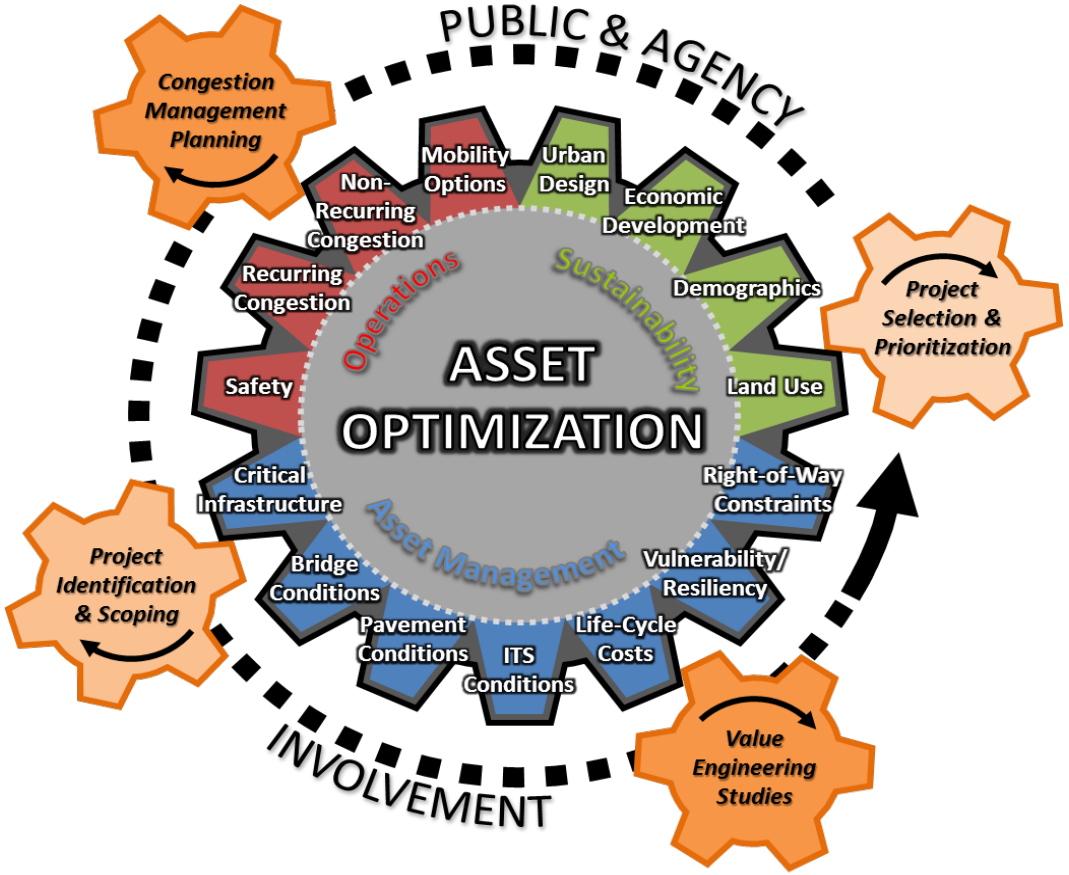
Incorporating Asset Management and Resiliency With Transportation Planning in North Central Texas



Presented by: Jeffrey C. Neal – North Central Texas Council of Governments (NCTCOG)

June 26, 2019

Panel Discussion – Addressing Resiliency in Regional Transportation Plans

TxDOT/Texas A&M TTI Workshop – Arlington, TX

Context for Asset Management/Resiliency Coordination

Mobility 2045 Plan – Establishing Investment Priorities

Asset Management

Resiliency

Maximize Existing System

Infrastructure Maintenance Maintain & Operate Existing Facilities Bridge Replacements	$ 37.5
Management, Operations and Technology Improve Efficiency & Remove Trips from System Traffic Signals & Bicycle/Pedestrian Improvements	$ 9.5
Growth, Development, and Land Use Strategies More Efficient Land Use & Transportation Balance	$ 3.2

Strategic Infrastructure Investment

Rail and Bus Induce Switch to Transit	$ 33.3
HOV/Managed Lanes Increase Auto Occupancy	$ 52.0
Freeways/Tollways and Arterials Additional Roadway Capacity	

Total Expenditures [1]	**$135.4[2]**

Notes:

[1] Actual dollars, in billions. Values may not sum due to independent rounding.

[2] Balances to reasonably expected revenue, demonstrating financial constraint.

Context for Asset Management/Resiliency Coordination *(cont.)*

FAST Act – Performance Measures and Target Setting

Complete	Rulemaking	Number of Measures	MPO Target Setting Deadline	Reporting Period	Reporting Schedule
✓	Transit Asset Management	**4**	12/27/2017	Annually	Annually
✓	Safety (PM1)	**5**	2/27/2018	Annually	Annually
✓	Pavement/Bridge (PM2)	**6**	11/15/2018	Four-Year Performance Periods (starting 2018-2022)	Biennially (beginning, middle, and end of performance periods)
✓	System Performance (PM3)	**6**	11/15/2018	Four-Year Performance Periods (starting 2018-2022)	Biennially (beginning, middle, and end of performance periods)

FAST Act Performance Measures/Targets

Breakdown of NHS Pavement Good/Poor Condition Targets

NHS ROADWAY CATEGORIES	TOTAL NETWORK	2018 BASELINE	2022 TARGET
State of Texas			
Good Pavement Condition			
Interstate National Highway System (NHS)	19.19%	66.80%	66.40%
Non-Interstate National Highway System (NHS)	80.81%	54.40%	52.30%
Poor Pavement Condition			
Interstate National Highway System (NHS)	19.19%	0.30%	0.30%
Non-Interstate National Highway System (NHS)	80.81%	13.80%	14.30%
North Central Texas Region			
Interstates (On-system) *	25.90% **	5.81% ***	7.99% ***
Non-Interstate Freeway (On-system) *	13.40% **	6.76% ***	8.93% ***
Toll Roads (Off-system)	6.70% **	8.43% ***	9.32% ***
Arterials (On-system) *	30.30% **	18.52% ***	18.39% ***
Arterials (Off-system)	23.80% **	73.66% ***	69.82% ***

** "On-system" refers to the TxDOT System; ** Mobility 2045 Plan – 2018 Baseline Network Lane Miles; *** Based on 5-year moving average*

FAST Act Performance Measures/Targets *(cont.)*

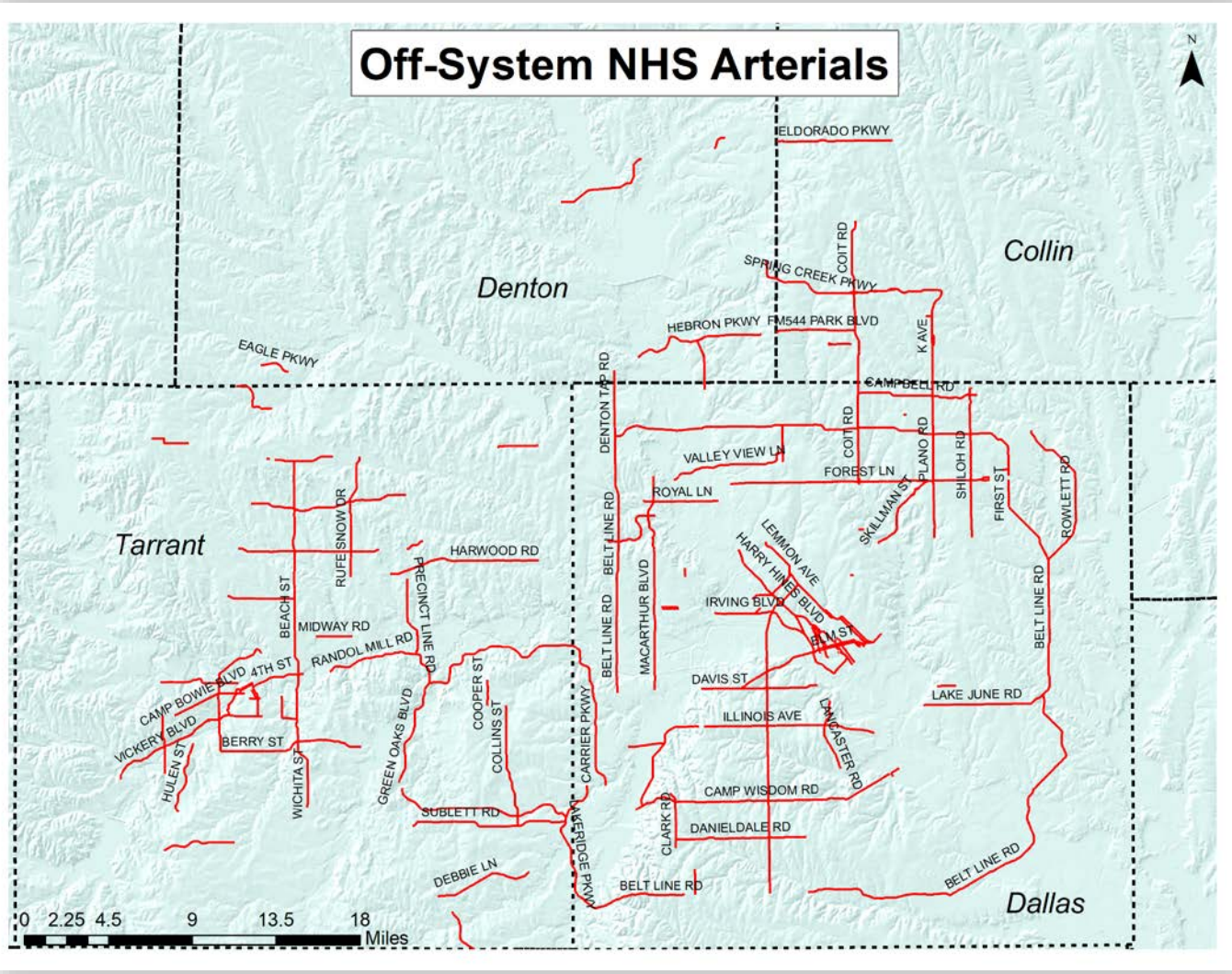
Regional Transportation Council (RTC) Action – Pavements

Good

- NCTCOG **Supports** TxDOT Statewide 2022 "Good Condition" NHS Pavement Targets
- Analysis of TxDOT Data for NCTCOG Region Indicates General Compatibility Across All NHS Roadway Categories

Poor

- NCTCOG **Supports** TxDOT Statewide 2022 "Poor Condition" NHS Pavement Targets
- Collaboration to Plan/Program Projects Contributing Toward Accomplishment of Pavement Goals Will Also Include the Following Action:
  - **NCTCOG Will Work With Local Governments to Expedite Improvements for NHS Off-System Arterials in "Poor Condition"**



FAST Act Performance Measures/Targets *(cont.)*

Breakdown of NHS Bridge Good/Poor Condition Targets

NHS ROADWAY CATEGORIES	2018 BASELINE	2022 TARGET
State of Texas		
Good Bridge Condition		
All NHS Facilities*	50.63%	50.42%
Poor Bridge Condition		
All NHS Facilities*	0.88%	0.80%
North Central Texas Region		
Good Bridge Condition		
All NHS Facilities*	55.60%	61.30%**
Poor Bridge Condition		
All NHS Facilities*	2.00%	3.40%**

** Based on total deck area; ** Based on trend analysis*

FAST Act Performance Measures/Targets *(cont.)*

Regional Transportation Council (RTC) Action – Bridges

Good

- NCTCOG **Supports** TxDOT Statewide 2022 "Good Condition" NHS Bridge Targets
- Analysis of TxDOT Data for NCTCOG Region Indicates General Compatibility Across All NHS Roadway Categories

Poor

- NCTCOG **Supports** TxDOT Statewide 2022 "Poor Condition" NHS Bridge Targets
- Collaboration to Plan/Program Projects Contributing Toward Accomplishment of Bridge Goals Will Also Include the Following Action:
  - **NCTCOG Will Work With TxDOT & Local Governments to Expedite Improvements for NHS Bridges in "Poor Condition"**

NCTCOG Region – Location/Status of "Poor Condition" NHS Bridges (2018)

Facility Carried	Feature(s) Crossed	County	NHS Category	Under Construction?	TIP?	UTP?	MTP?
IH 345 SB	IH 30, US 75, & DART Rail	Dallas	Interstate	Yes	Yes	Yes	Yes
IH 345 NB	IH 30, US 75, & DART Rail	Dallas	Interstate	Yes	Yes	Yes	Yes
SH 310	S. Lamar Street, Budd Street, & UP R/R	Dallas	On-System Arterial	No	Yes	Yes (CAT 6)	Yes
Belt Line Rd	Goff Branch	Dallas	Off-System Arterial	No	No	Yes (CAT 6)	Yes
Loop 12 NB to IH 35E NB	IH 35E SB	Dallas	Non-IH Freeway	No	No	No	Yes
IH 30 EB	FM 2642	Hunt	Interstate	Yes	Yes	Yes	Yes
IH 30 WB	FM 1903	Hunt	Interstate	No	No	Yes	Yes
IH 30 EB	FM 1903	Hunt	Interstate	No	No	Yes	Yes
IH 30	FM 1565 O-P	Hunt	Interstate	No	No	Yes	Yes
IH 35W SB	IH 35W SB Alvarado Exit	Johnson	Interstate	No	No	Yes (CAT 6)	Yes
US 80 EB	E FK TRIN REL 1 & SRV RD	Kaufman	Non-IH Freeway	No	Yes	Yes	Yes
US 80 EB	East Fork Trinity River	Kaufman	Non-IH Freeway	No	Yes	Yes	Yes
US 80 WB	Buffalo Creek Relief	Kaufman	Non-IH Freeway	No	No	Yes (CAT 6)	Yes
US 287 NB	Carey Street	Tarrant	Non-IH Freeway	No	Yes	Yes	Yes

Ongoing Asset Management Efforts – Local

Monitoring of Capital Improvement Program (CIP) Initiatives

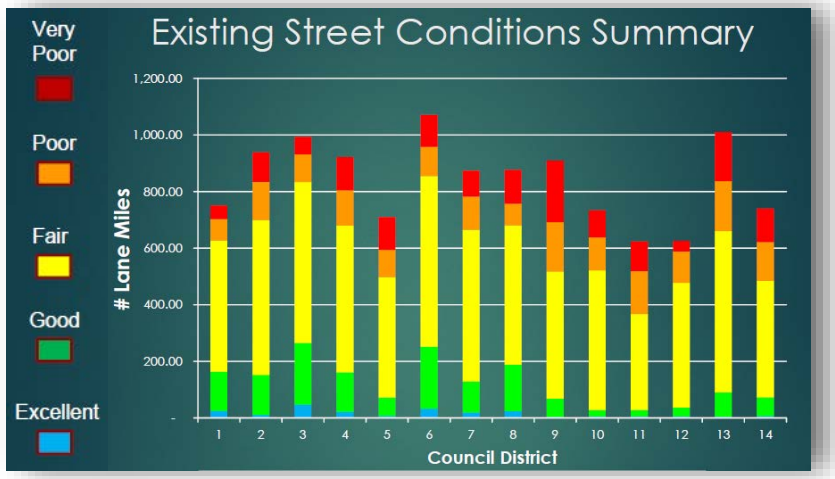
- NCTCOG conducts routine local government requests for information on capacity, maintenance, and enhancement projects for roadways within the regional network:
- Current street improvement spending (via CIP or Bond Program) for largest DFW cities:
  - **Dallas – $534 Million (2017)**
  - **Fort Worth – $262 Million (2018)**
  - **Arlington – $160 Million (2014)**
  - **Plano – $90 Million (2017)**
  - **Garland – $65 Million (2017)**
  - **Irving – $100 Million (2017)**
  - **Grand Prairie – $56 Million (2017)**
  - **McKinney – $64 Million (2015)**
  - **Frisco – $125 Million (2015)**
  - **Mesquite – $125 Million (2015)**
- While significant expenditures are allocated for lane-mile expansion to accommodate growth, increasing funds over time are directed toward preservation and rehabilitation
- Expenditures not typically tracked in MPO documentation (MTP, TIP, CMP, etc…)
- Tracking is further complicated through "complete street" conversion processes

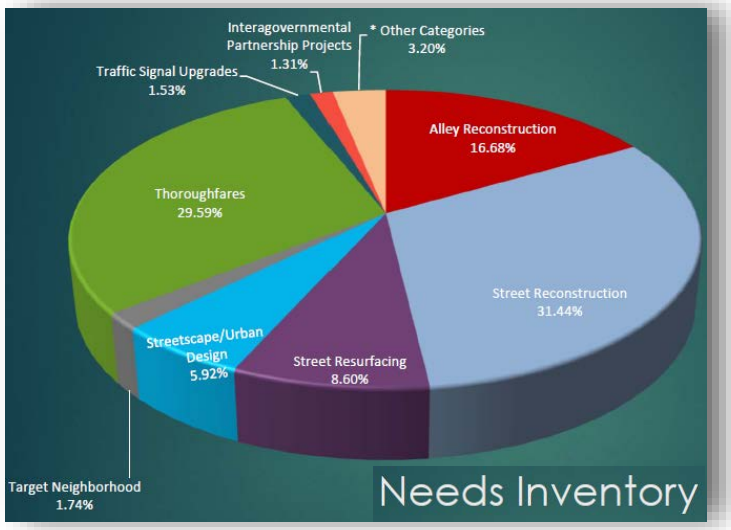
Ongoing Asset Management Efforts – Local *(cont.)*

Analyzing Asset Management Needs & Performance

- Some local governments are reporting asset management status, needs, & goals for various purposes
- Needs vastly outweigh resources and consistent goal attainability is difficult:
  - City of Dallas (2019) – Pavements (11,775 lane-miles)
    - 2006 City Council goal – 87% overall satisfaction rate; > 80% all districts
    - November 2018 condition rating – **77%**
    - FY 2019-23 Infrastructure Maintenance Program (IMP) – **63%**
    - **"Zero Degradation" – $1.66 Billion shortage over 10 years**
  - City of Irving (2017) – Pavements (1,440 lane-miles)
    - Average Pavement Condition Index (PCI) score – **72**
    - **> $800 Million/year** to maintain PCI score
- Multiple cities report that pavement deterioration rates are increasing over time

Dallas 2017 Bond Program – http://www.dallasbond.com/





Ongoing Asset Management Efforts – Local *(cont.)*

Climate/Weather Challenges to Mobility, Functionality, & Longevity


Frisco


Palo Pinto County

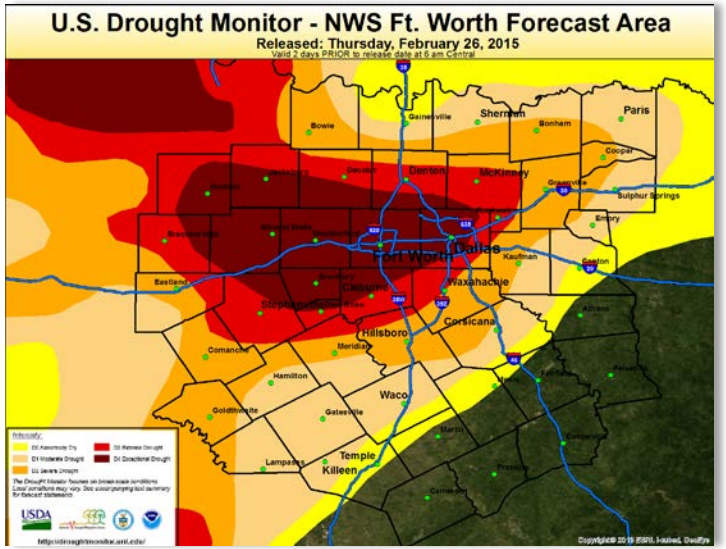

Fort Worth


Euless

2015 NCTCOG Vulnerability Assessment Study

Extreme Weather Impacts are a Current & Worsening Problem

- Eight of the top-10 warmest years in DFW have occurred after 1998:
  - #1 – 2017; #2 – 2012; #3 – 2006; #4 – 2016
  - Heat concerns at all hours of the day (high minimum temperatures also critical due to strong urban heat island effect)
- Large DFW weather variations:
  - 2011 Summer Heat = 72 days > 100° (average – 18 days)
  - 2014 Annual Precipitation Total = 21.32 inches (fifth year of worst long-term drought since the 1950's)
  - 2015 Annual Precipitation Total = 62.61 inches (all-time record)
  - 2017 Last Freeze – January 8th (average – March 12th)
  - 2018 September/October Precipitation = 28.35 inches (all-time record for consecutive months; 21.58 inches above normal)

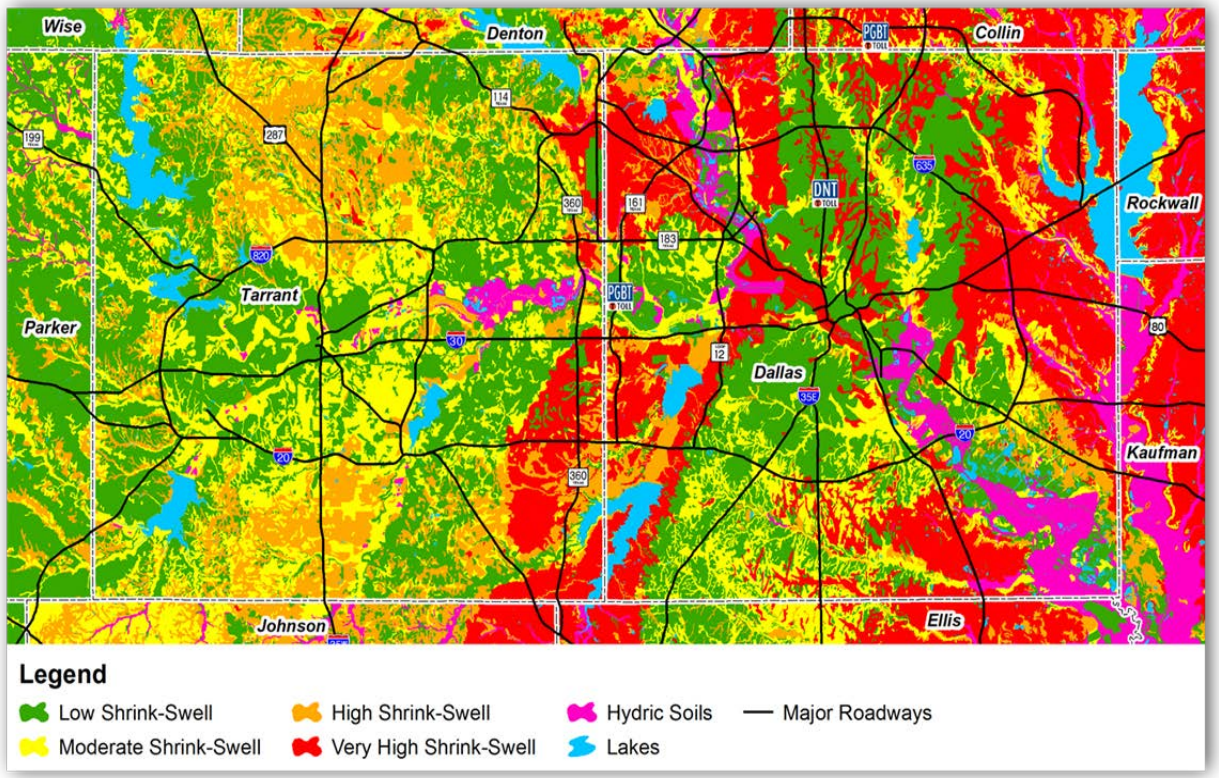


2015 NCTCOG Vulnerability Assessment Study *(cont.)*

Notable Findings – Significant Future Climate Change Anticipated

- "Business-as-Usual" emissions scenario translates to substantial temperature increases and soil moisture reduction by year 2100:

Dallas/Tarrant County – Spatial Distribution of High-Plasticity Soils

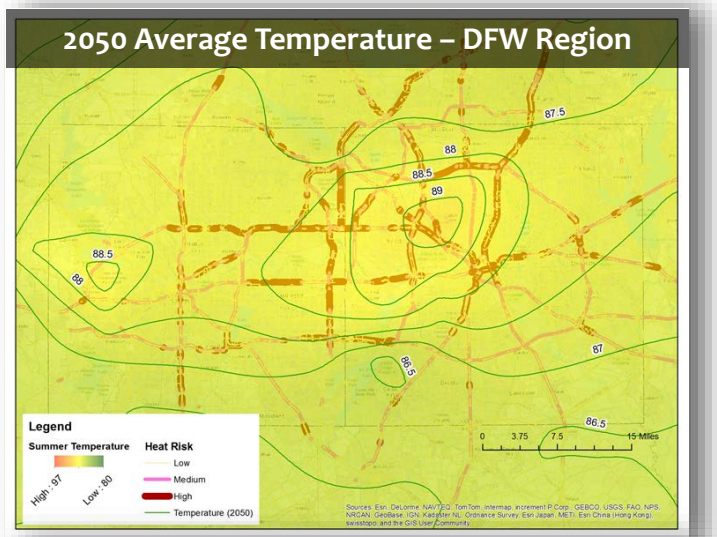


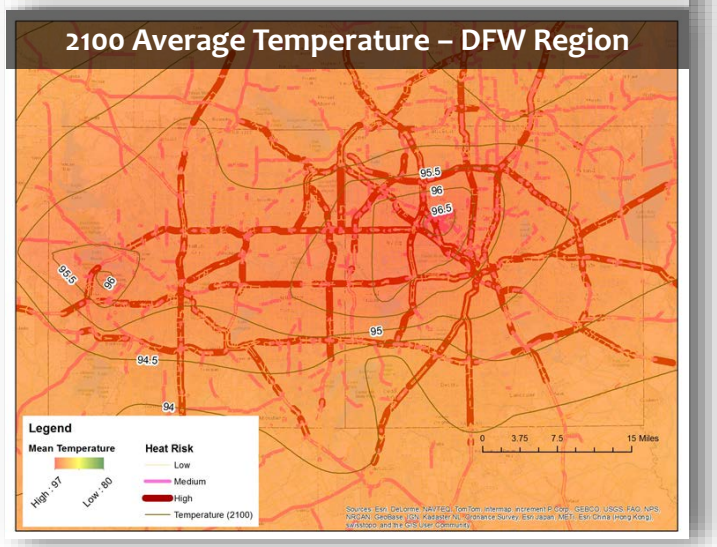
2015 NCTCOG Vulnerability Assessment Study (FHWA Grant) - https://www.fhwa.dot.gov/environment/sustainability/resilience/pilots/2013-2015_pilots/

- Mean temperature > 8° F compared to current average (extreme > 13° F)
- Lower annual rainfall, but punctuated by storms of greater intensity
- Infrastructure effects magnified due to large regional distribution of soils with high shrink-swell rates

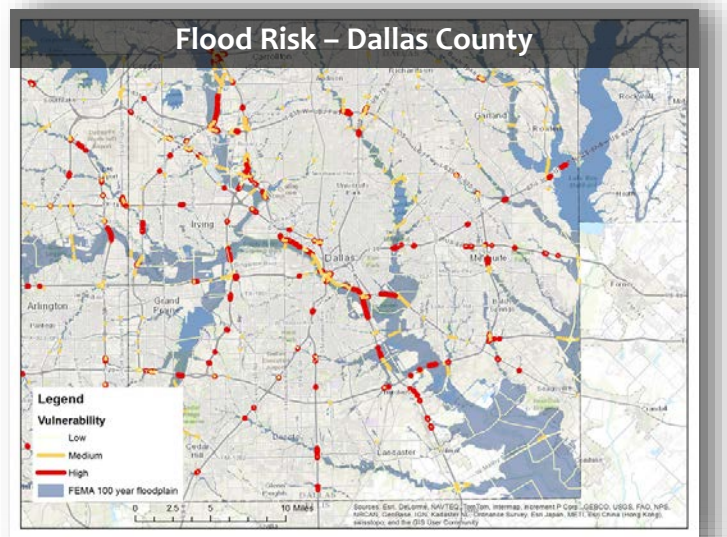
2015 NCTCOG Vulnerability Assessment Study *(cont.)*

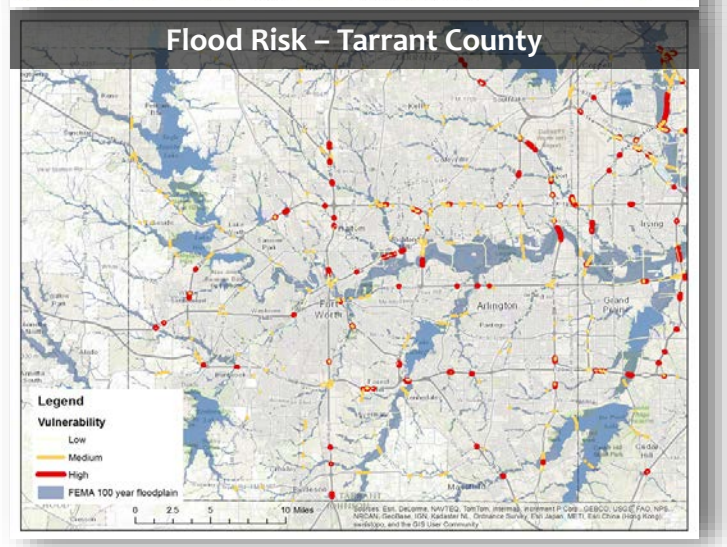
Notable Findings – Heat and Flood Risks for Critical Roadways





- Significant future temperature increases will accelerate pavement degradation and result in greater cracking/rutting, joint failures, and utility breaches
- Urbanization enhances regional heat island effect which amplifies moisture losses and structure destabilization rates
- Many critical roadway segments cross the 100-year floodplain, exist in flood-prone and/or poorly drained locations, or among predominantly impervious surface areas
- Substantial additional data required (elevation, materials, design, event detection/response plans, mitigation effects, etc.) to define overall vulnerability





Expanding Asset Optimization Efforts

Identifying Local Asset Needs & Delivering Critical Services

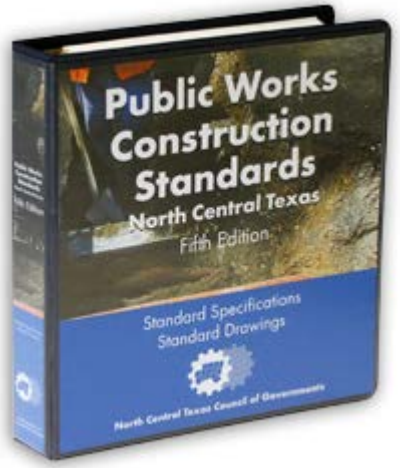
- North Texas SHARE Program:
  - Determine needs/solutions through collaboration and cooperative purchasing programs through procured private vendors
  - Pavement Analysis Services (started in 2016):
    - Choice of four highly-qualified vendors
    - Continually mobile to reduce equipment fees and allows bulk-level purchasing efficiency
    - Digital imaging, budget estimates, ADA ramp placement, condition scoring/analysis, and training
    - Initial start-up for shared regional database (PM2 data for "off-system" NHS)
- Public Works Construction Standards:
  - NCTCOG Public Works Council (PWC) product
  - Promotion of "green infrastructure" plus increased asset/stormwater management emphasis and consistency in 5th Edition (2017)

North Texas Share – http://www.northtexasshare.org

North Texas SHARE

Your Public Sector Solutions Center

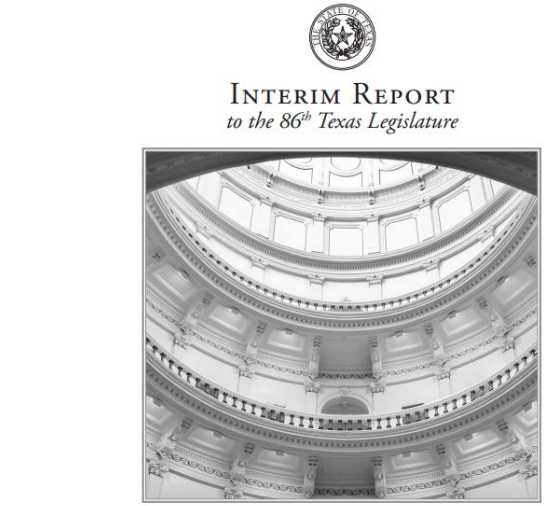
Public Works Council – http://www.nctcog.org/envir/committees/pwc/index.asp



Expanding Asset Optimization Efforts *(cont.)*

Incorporation with Hazard Mitigation Planning Efforts

- Emergency Preparedness Coordination:
  - Greater inclusion of transportation considerations within official city/county hazard mitigation plans
  - Pursuing Federal grant for Regional Data & Communications Hub building from 511DFW, Waze, & other architecture/distribution platforms
- Texas State Flood Assessment (2018):
  - Comprehensive review of existing programs, risks, and needs for floodplain management/mitigation
  - Resulted in January 2019 Interim Report to the 86th Texas Legislature from the House Committee on County Affairs:
    - Evaluate whether counties have necessary ordinance-making and enforcement authority to deal with flood risk in rural/suburban areas
    - Explore **regional** floodplain regulation approaches, allowing counties that share watersheds to adopt similar regulations, as allowed by the Texas State Water Code

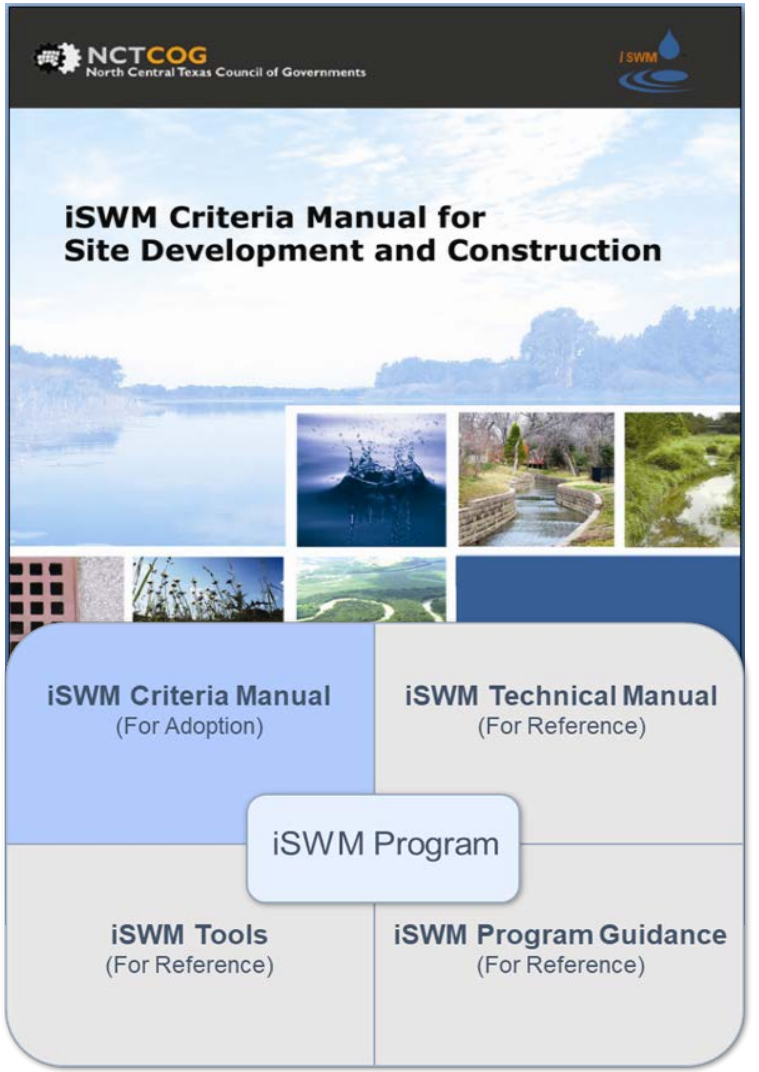


Texas State Flood Assessment – http://www.texasfloodassessment.com/

Expanding Asset Optimization Efforts *(cont.)*

Infrastructure, Land Use, and Sustainability Management

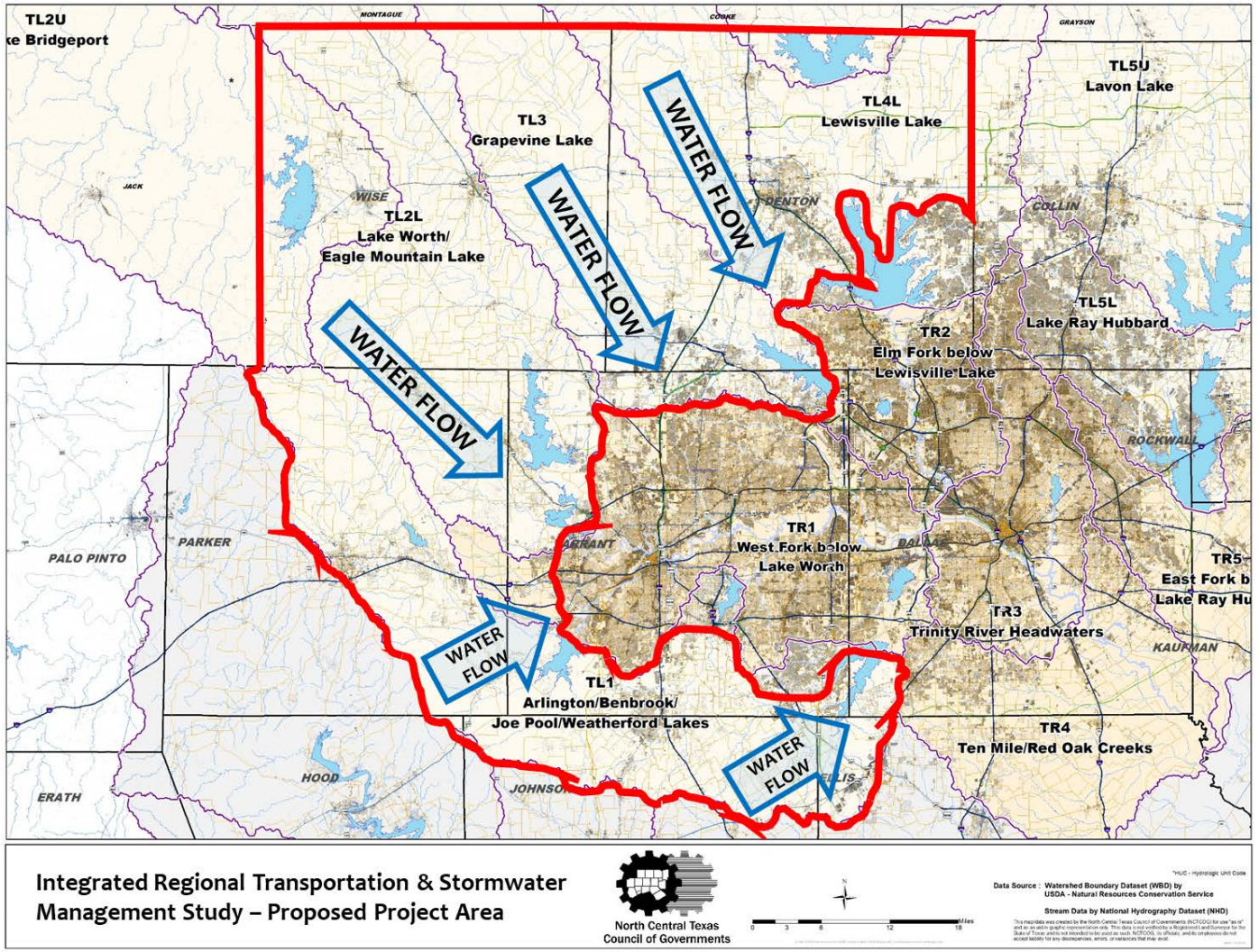
- *integrated* Stormwater Management (iSWM):
  - Incorporate effective, low-impact, uniform, and sustainable stormwater management strategies within site development practices and construction projects
  - Guidance and tools aiding public/private sectors to:
    - Design/maintain infrastructure and development sites mindful of potential drainage impacts
    - Address runoff effects to achieve short-term water quality protection and flood mitigation goals while also improving overall system resiliency



Expanding Asset Optimization Efforts *(cont.)*

Integrated Regional Transportation & Stormwater Management Study

WHY: Comprehensive, collaborative planning will dissolve silos and improve delivery of consolidated, adaptive infrastructure ***before*** expected population growth, urban development distribution /intensity, and expected levels of service make addressing these issues more difficult and costly.

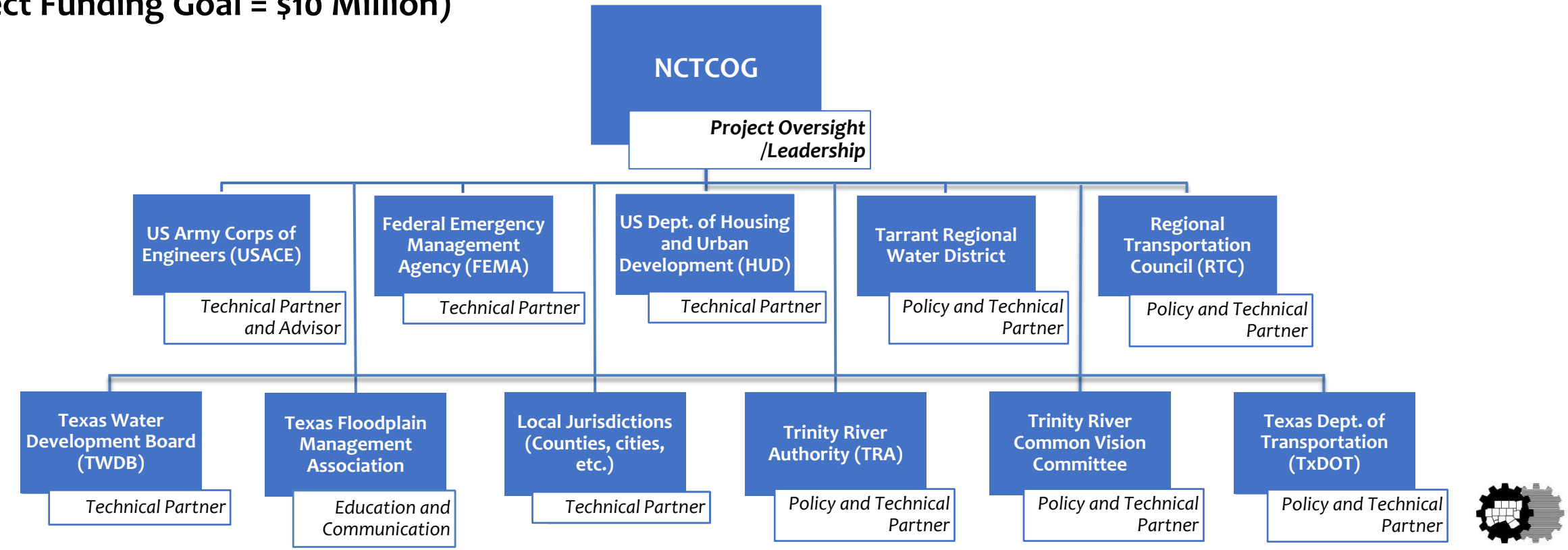


Expanding Asset Optimization Efforts *(cont.)*

Integrated Regional Transportation & Stormwater Management Study

WHO: A working group of partners and stakeholders to carry out a comprehensive planning effort across all/portions of Dallas, Denton, Ellis, Johnson, Parker, Tarrant, and Wise counties

HOW: Partner contributions are critical to making this possible; process to secure funds is underway **(Project Funding Goal = $10 Million)**



Expanding Asset Optimization Efforts *(cont.)*

Integrated Regional Transportation & Stormwater Management Study

WHAT: 2017 "Natural Hazard Mitigation Saves" Report by: National Institute of Building Sciences, Multi-Hazard Mitigation Council (MMC), directed by the U.S. Congress: ***$5 – $7 return for every $1 invested to alleviate riverine flooding risks***

Prevention vs. Response Measures:

Transportation Infrastructure
- Structure Elevation / Culverts / Model Growth
- Transportation "LEED" Certification (Lake Ray Roberts / Lake Lewisville)
- "Green Parkway" Widths / Detention

Safety
- Technology / Routing
- Prioritization / Low-Lying Facilities

Stormwater
- Minimize / Delay Downstream
- Tools, Data, Experts

Environmental Features
- Tree Farms / Intentional Saturation
- Filtration / Recharge
- Wetland / Stream Mitigation Banks

Stewardship as a Revenue Element
- Horse Farms
- Eco-Tourism

National Benefit-Cost Ratio Per Peril *BCR numbers in this study have been rounded	Federally Funded	Beyond Code Requirements
Overall Hazard Benefit-Cost Ratio	6:1	4:1
Riverine Flood	7:1	5:1
Hurricane Surge	Too few grants	7:1
Wind	5:1	5:1
Earthquake	3:1	4:1
Wildland-Urban Interface Fire	3:1	4:1

Table 1. Benefit-Cost Ratio by Hazard and Mitigation Measure.

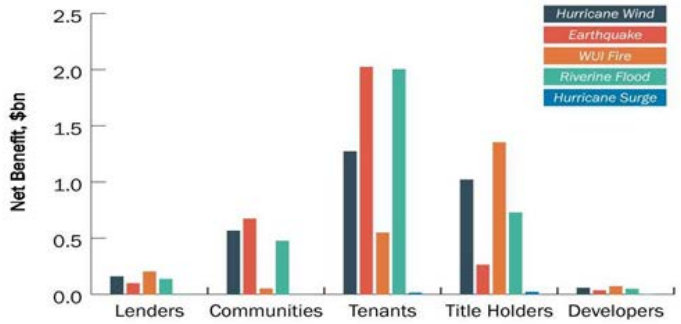


Figure 8. Stakeholder net benefits resulting from one year of constructing all new buildings to exceed select 2015 IBC and IRC requirements or to comply with 2015 IWUIC.

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