



WINTER STORM RECOVERY

Important Lessons and How to Move Forward



COMFORT, TX

Today's Panel



Tim James | PE

Vice President
Public Works Practice Leader



Cesar Molina | PE, PTOE

Public Works Business Development Manager



Kimberly Miller | AICP

Principal Planner for Resilience



Phillip Applebaum | PE

Vice President
MEP Engineering



Gini Connolly | GISP

GIS Director



Bill Pembroke | PE

Water/Wastewater Regional Practice Leader

Agenda



The winter storm's impact on **operations** was unprecedented.

Learn about steps you can take to improve **resilience**.

Use **condition assessments** to your advantage.

Achieve and maintain reliable **backup power generation**.

WINTER STORM BY THE NUMBERS



SAN ANTONIO

139: Consecutive hours the DFW area was at or below 32 degrees (nearly 6 days)

4.5 MILLION: Reported power outages in Texas at its peak

16 MILLION: People under boil-water advisories

2,000: Public water systems in Texas that reported disrupted operations

\$130 billion: Estimated cost of total damage and economic loss in Texas (would be greater than Hurricane Harvey)

\$18 billion: Estimated cost of the insured damage from the storm

IMPACT ON OPERATIONS



CARROLLTON

Impact on Operations

TWO PRIMARY CULPRITS

- Extremely cold temperatures for a long period of time
- Power outages



Impact on Operations



DALLAS

FOUR PRIMARY PUBLIC/MUNICIPAL INFRASTRUCTURE SYSTEMS AFFECTED

- Stormwater pumping (interchange/intersection sumps)
- Traffic control systems (intersections and tolling)
- Municipal electrical utilities
- Water and wastewater utilities (by far the most affected)

Impact on Operations

DIFFERENT WAYS CITIES OR AGENCIES OPERATED DURING THE STORM EVENT

- Most affected systems were water/wastewater systems
- Winter season minimized the impacts to wastewater systems
- Treatment and distribution of potable water was impacted most.



Impact on Operations

Because of the **widespread** nature of the event and the **variability** from city to city and utility to utility, responses were different. However, there was one constant: It was an **all-hands-on-deck attack!**

RICHARDSON

Associated Press

 HALFF

Impact on Operations



WHAT HAVE WE HEARD?

- Backup generators were needed at key pump stations
- Loss of power impacted various systems
- Most reported large increases in calls of service
- There was a shortage of diesel fuel
- Human resources was impacted heavily

Impact on Operations

MOVING FORWARD

- Conduct an after-action review
- It's critical to be prepared
- Have a plan to get support from other departments
- Address temporary housing for employees
- Ensure adequate backup power at your service centers
- Keep adequate materials on hand
- Think about emergency water wells
- Consider having snowplow attachments



RESILIENCE



Resilience

FEATURES TO CONSIDER IN RECOVERY PLANNING AND FUTURE MITIGATION

Power Supply

- Grid
- Generators
- Fuel source

Electronic Equipment

- Tank level monitoring
- Pressure and treatment inputs

Water Supply

- Alternate sources
- Distribution and service lines

People

- Field staff
- Plant and SCADA operators
- Emergency personnel

Resilience

RISK AND RESILIENCE ASSESSMENTS (RRA)

- Floods and hurricanes
- Tornados
- Cyberattacks
- Winter storms
- Droughts
- Terrorism

Protect your every day.

RECOGNIZE THE SIGNS OF TERRORISM-RELATED SUSPICIOUS ACTIVITY

<p>EXPRESSED OR IMPLIED THREAT Threatening to commit a crime that could harm or kill people or damage a facility, infrastructure, or secured site</p>	<p>SURVEILLANCE A prolonged interest in or taking pictures/videos of personnel, facilities, security features, or infrastructure in an unusual or covert manner</p>	<p>THEFT/LOSS/DIVERSION Stealing or diverting items—such as equipment, uniforms, or badges—that belong to a facility or secured site</p>	<p>TESTING OR PROBING OF SECURITY Investigating or testing a facility's security or IT systems to assess the strength or weakness of the target</p>	<p>AVIATION ACTIVITY Operating or interfering with the operation of an aircraft that poses a threat of harm to people and property</p>
<p>BREACH/ATTEMPTED INTRUSION Unauthorized people trying to enter a restricted area or impersonating authorized personnel</p>	<p>ACQUISITION OF EXPERTISE Gaining skills or knowledge on a specific topic, such as facility security, military tactics, or flying an aircraft</p>	<p>ELICITING INFORMATION Questioning personnel beyond mere curiosity about an event, facility, or operations</p>	<p>MISREPRESENTATION Presenting false information or misusing documents to conceal possible illegal activity</p>	<p>CYBERATTACK Disrupting or compromising an organization's information technology systems</p>
<p>RECRUITING/FINANCING Funding suspicious or criminal activity or recruiting people to participate in criminal or terrorist activity</p>	<p>SABOTAGE/TAMPERING/VANDALISM Damaging or destroying part of a facility, infrastructure, or secured site</p>	<p>MATERIALS ACQUISITION/STORAGE Acquisition and/or storage of unusual materials such as cell phones, radio controllers, or toxic materials</p>	<p>WEAPONS COLLECTION/STORAGE Collection or discovery of unusual amounts of weapons including explosives, chemicals, or other destructive materials</p>	<p>SECTOR-SPECIFIC INCIDENT Actions which raise concern to specific sectors, (e.g., power to their personnel, facilities, systems, or functions)</p>

If you **see** something, **say** something®
REPORT SUSPICIOUS ACTIVITY TO LOCAL AUTHORITIES OR CALL 9-1-1 IN CASE OF EMERGENCY

dhs.gov/see-something-say-something

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Resilience

RESILIENCY PLANNING IN PRACTICE: CHECK YOUR GENERATOR

- High-capacity generator
- Tested occasionally
- Unsure about whether it would meet need
- Activated generator
- Ran off generator power for five days

Resilience

RESILIENCY PLANNING IN PRACTICE: PREPARE YOUR PEOPLE

- Electronic systems may not work
- Have 24-hour monitoring
- Stay in contact with your water supplier
- Conduct manual checks
- Be prepared for repairs





Resilience

RESILIENCY PLANNING IN PRACTICE: BUILD IN REDUNDANCY

- City supplies its own water through wells
- Formerly obtained large share of water from neighboring City and maintained interconnection
- Continued to draw water when demand exceeded supply and maintained ties with neighboring City's water department
- During the storm, fire control system in private facility burst, affecting capacity of City to supply water (made up the difference by increasing the supply of water from former provider)

What's Up with SB3?

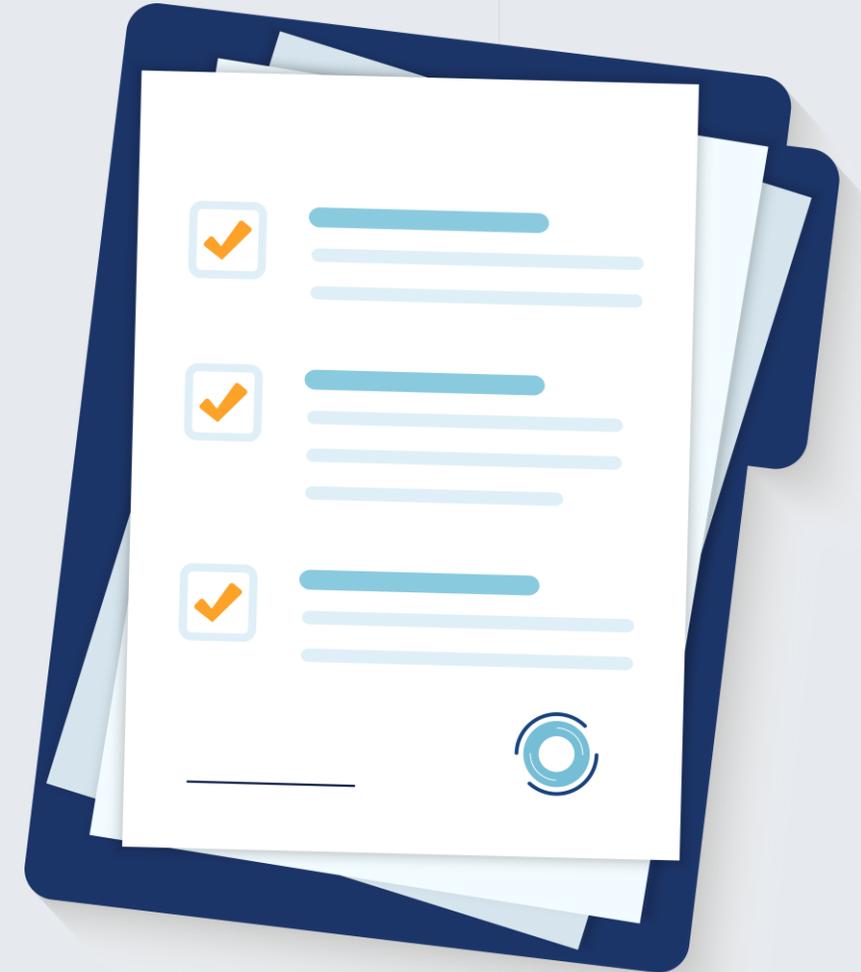
Emergency Preparedness Plan (EPP)

TCEQ has developed a form that the water system will submit for review. The plan contains information about the affected system and how it operates under emergency conditions.

Purpose: Develop a EPP to maintain 20 psi during an extended power outage (> 24 hours)

Submit EPP no later than March 1, 2022

Implement EPP no later than July 1, 2022



CONDITION ASSESSMENT

pipe deformed

Condition Assessment

DEFINITION

“Collection of data and information ... followed by analysis of the data and information, to make a determination of the current and/or future status.” (U.S. EPA)



BUSINESS CASE FOR CONDITION ASSESSMENT

- Serious impacts to infrastructure
- Effective asset management
- Reactive vs. proactive management

Condition Assessment



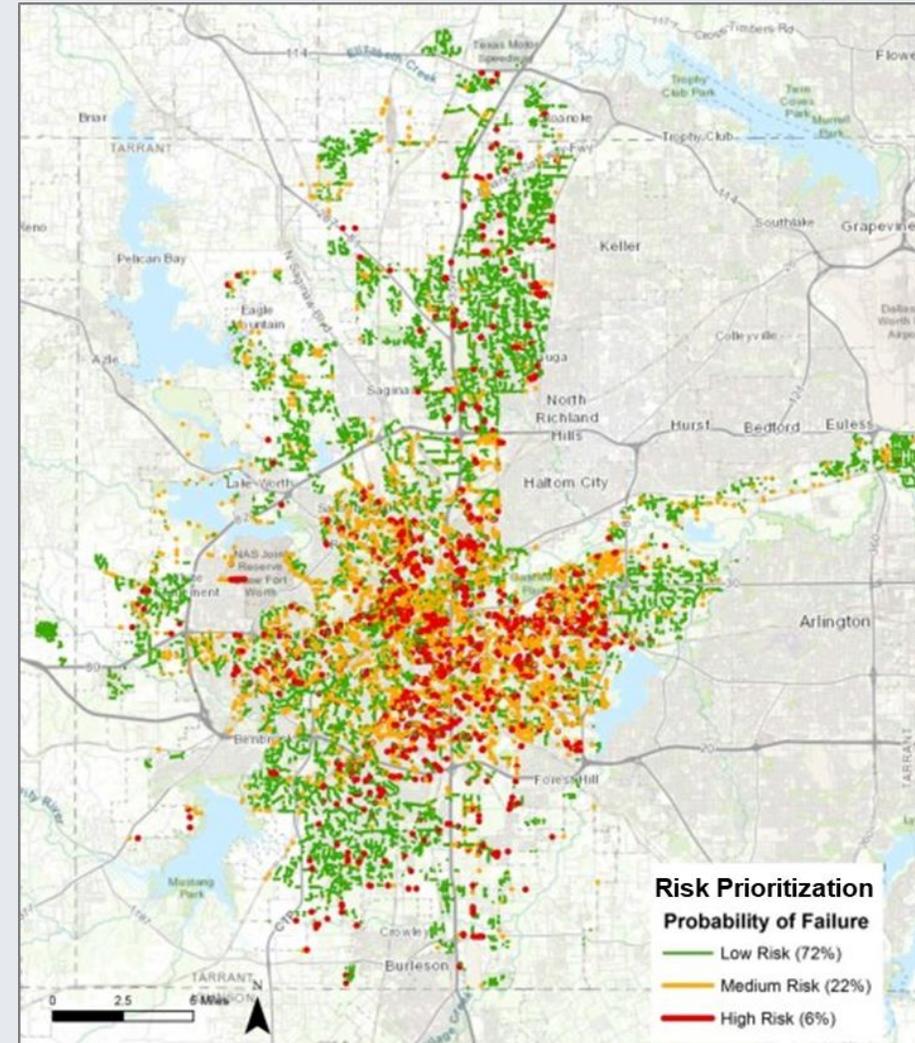
GIS AND WORK ORDER SYSTEM INTEGRATION

- Effective use of spatial and historical information
- Sync information collected in the field with GIS data
- Asset-based maintenance history

Condition Assessment

PRIORITIZATION AND ROLE OF CONDITION ASSESSMENT

- Condition assessment is a key element of an effective prioritization program
- GIS and work order data enable risk-based prioritization
- Business risk exposure (BRE) applies risk criteria to score and rank assets
- Advanced prioritization leverages artificial intelligence (AI)



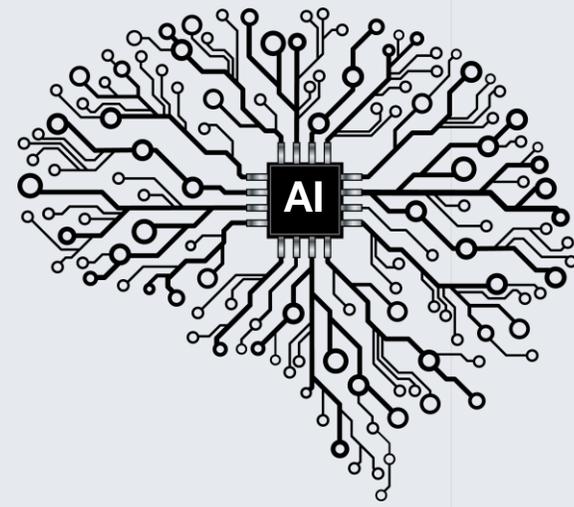
Condition Assessment

NEAR-TERM INSPECTION AND MAINTENANCE TARGETS

- Annual schedule of inspection and maintenance (key action item)
- Annual costs, budget, KPIs and LOS
- Opportunity to reassess & revise targets



Condition Assessment

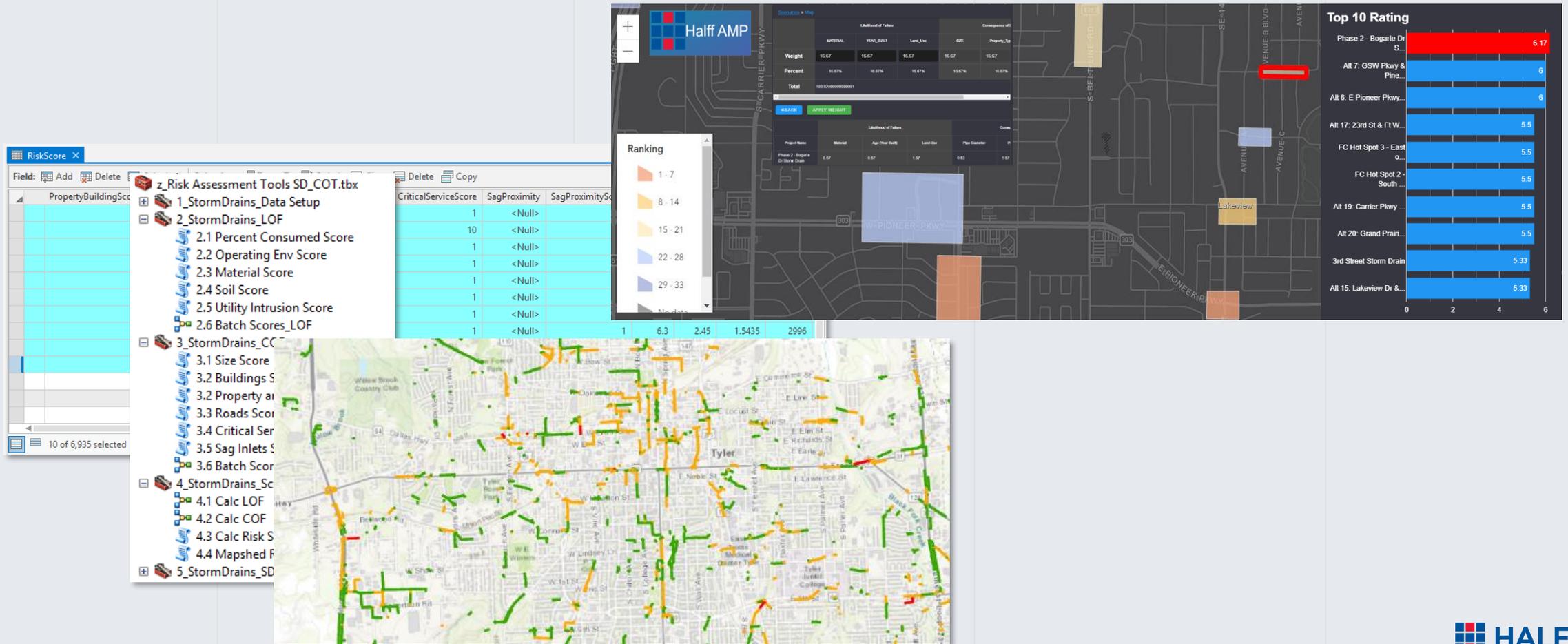


TOOLS TO VISUALIZE PRIORITY AND ALIGN WITH BUDGET

- GIS-based prioritization tools
- Program-tracking applications
- Prioritization applications

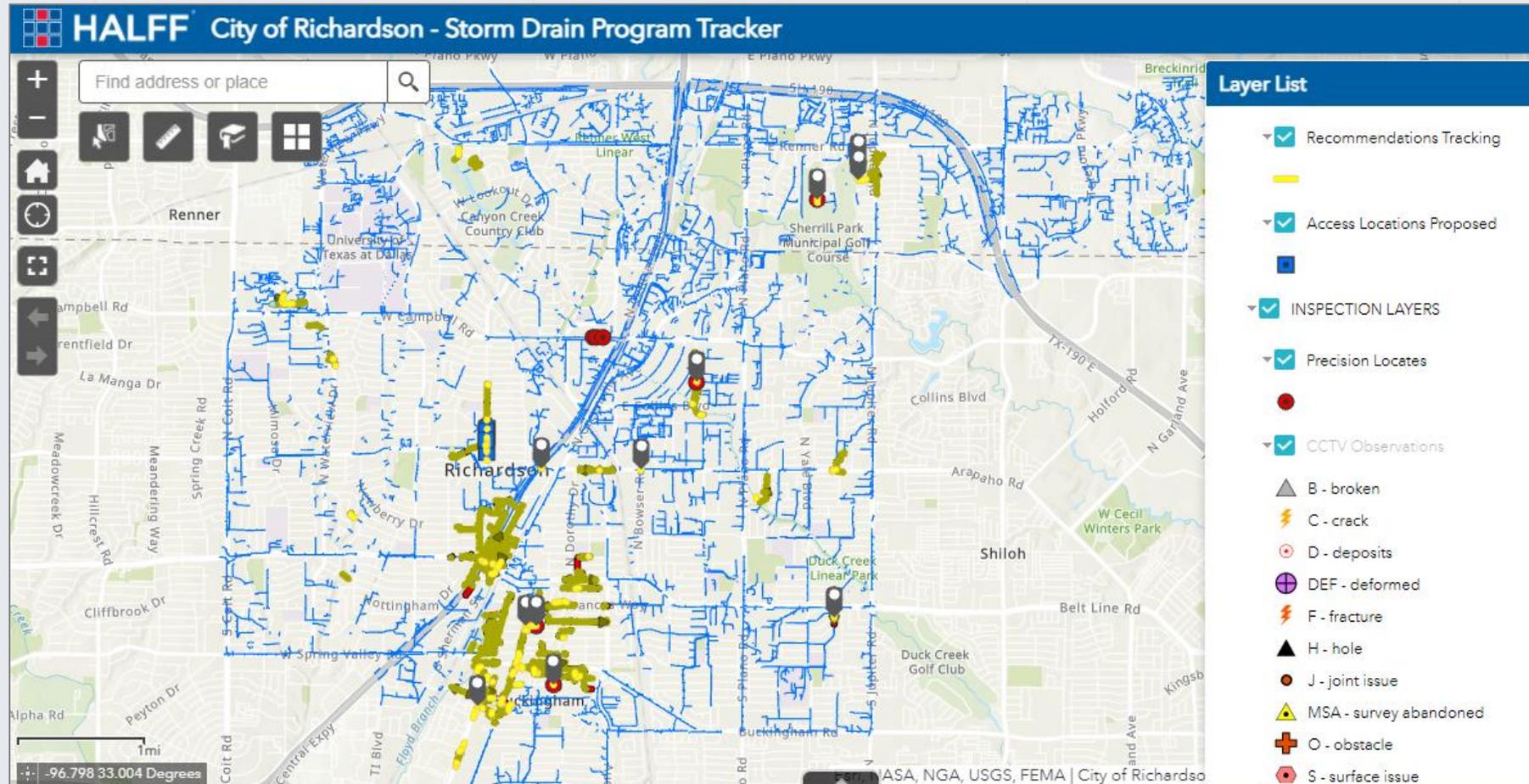
Condition Assessment

TOOLS: GIS-BASED & WEB-BASED PRIORITIZATION APPLICATIONS



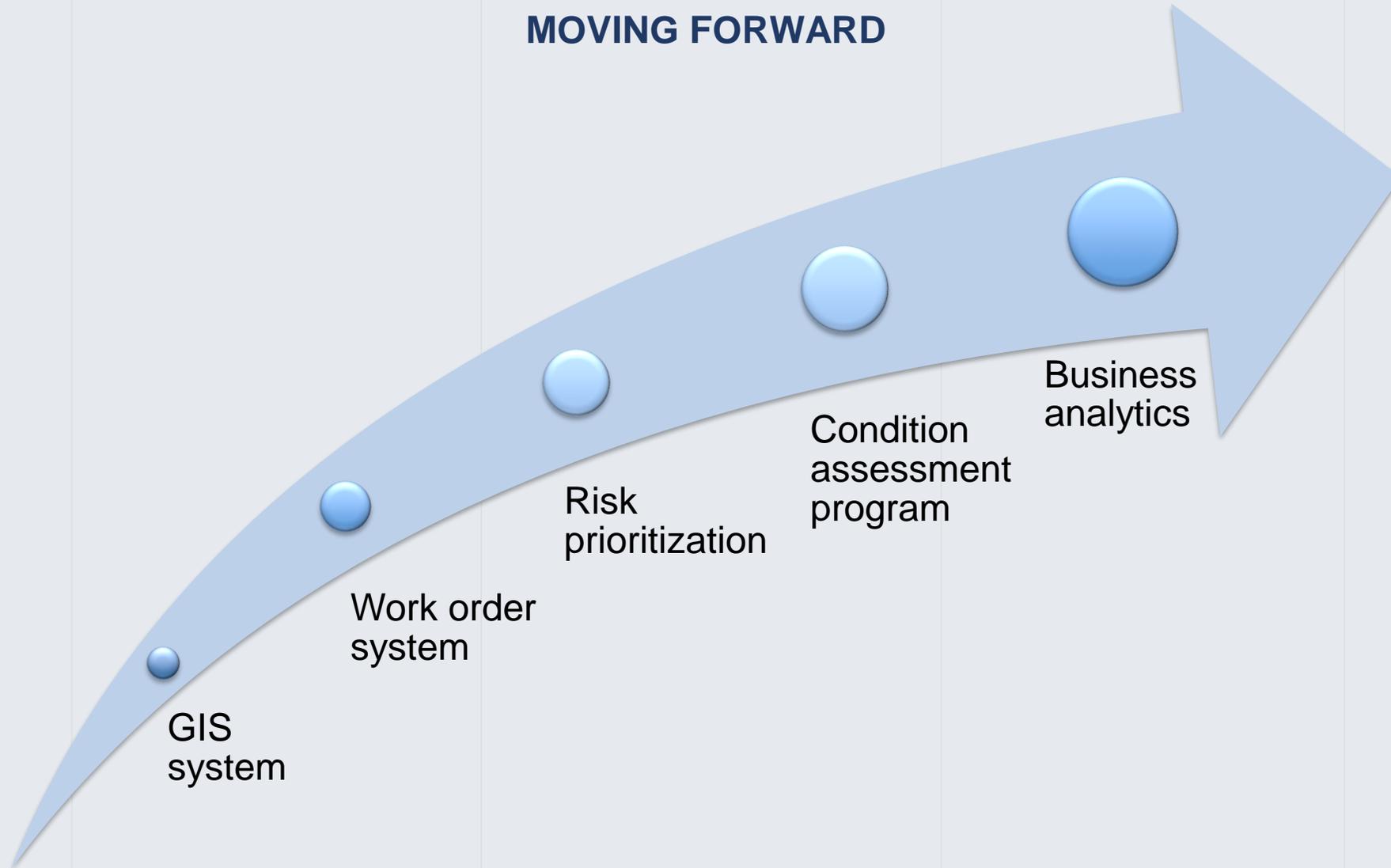
Condition Assessment

TOOLS: PROGRAM-TRACKING APPLICATIONS



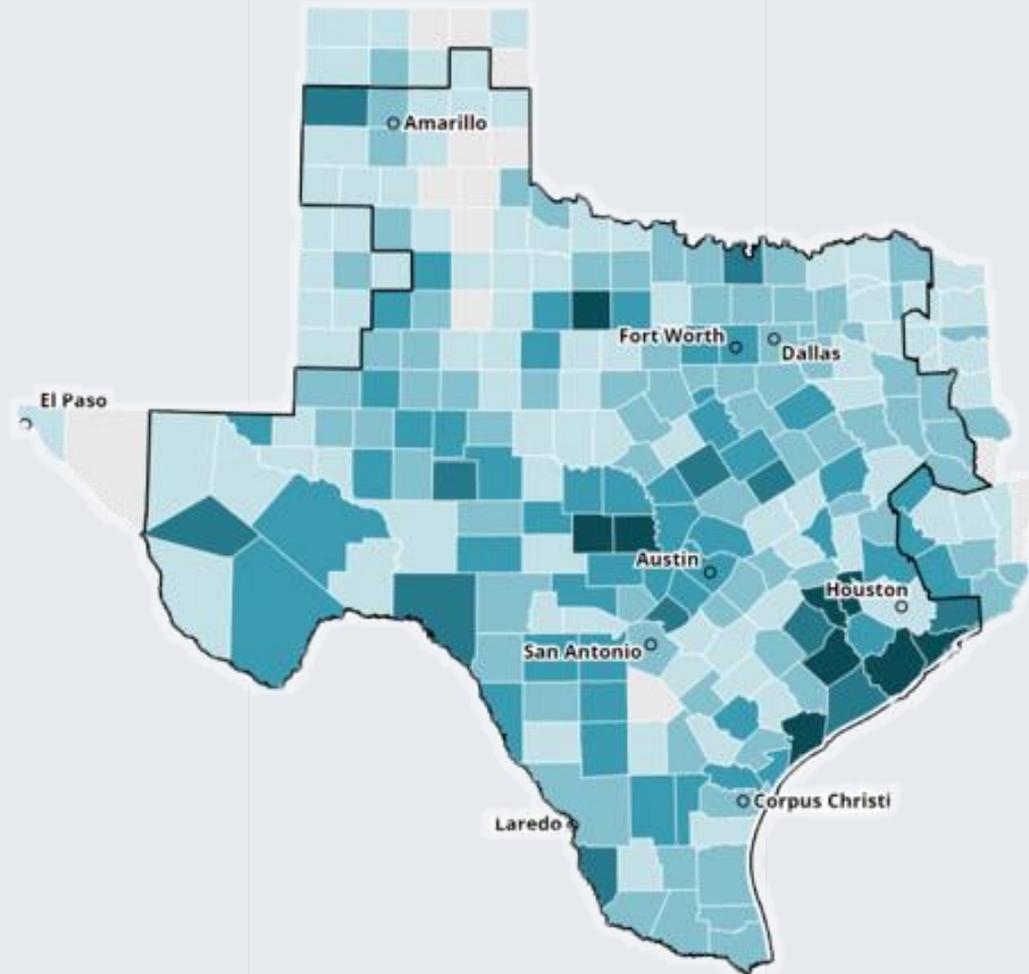
Condition Assessment

MOVING FORWARD



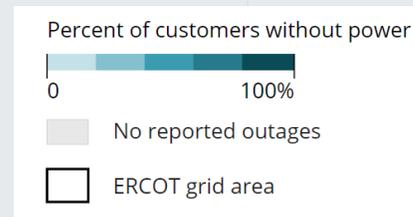
BACKUP POWER GENERATION

Backup Power Generation



On Feb. 16, at least 4.5 million customers in Texas were without power

Here is where Texans were most impacted during the worst of the outages between 10 and 11 a.m. on Feb. 16. (Texastribune.com)



Backup Power Generation

MISSION-CRITICAL FACILITIES

- Police stations
- Fire stations
- Emergency command centers
- Hospitals
- Vaccination facilities
- Water and wastewater treatment facilities
- Data centers
- Research facilities
- Financial facilities



Backup Power Generation

HOW THE STORM AFFECTED BACKUP POWER

- Undersized generators for assumed connected load
- Lack of diesel additive in the fuel system
- Diesel fueling stations on empty for lack of supply
- Battery failures
- Natural gas regulators freezing up
- Natural gas utility providers stopped supply of fuel
- Failure (or lack) of block heaters on generators
- Automatic transfer switches not switching over
- Wind turbines without deicing tools, such as built-in heating
- PV systems covered by ice/snow and overcast days



Backup Power Generation

IMPORTANT CONSIDERATIONS



- Know what you have
- Conduct a risk assessment
- Have a contingency plan
- Identify hazards
- Conduct witness testing
- Test periodically
- Have an active preventive maintenance program
- Keep written records

Backup Power Generation

IMPORTANT CONSIDERATIONS

- Conduct testing under load
- Have a plan and execute it!

Typical diesel-fueled generator maintenance schedule



Maintenance items	Service time				
	Daily	Weekly	Monthly	6 months	Yearly
Inspection	X				
Check coolant heater	X				
Check coolant level	X				
Check oil level	X				
Check fuel level	X				
Check charge-air piping	X				
Check/clean air cleaner		X			
Check battery charger		X			
Drain fuel filter		X			
Drain water from fuel tank		X			
Check coolant concentration			X		
Check drive belt tension			X		
Drain exhaust condensate			X		
Check starting batteries			X		
Change oil and filter				X	
Change coolant filter				X	
Clean crankcase breather				X	
Change air cleaner element				X	
Check radiator hoses				X	
Change fuel filters				X	
Clean cooling systems					X

Backup Power Generation

TYPES OF BACKUP POWER AND EMERGING TECHNOLOGY

- Engine-driven generator (diesel)
- Engine-driven generator (natural gas)
- Engine-driven generator bi-fuel (natural gas and diesel)
- Photovoltaic systems
- Wind turbine systems
- Microgrids



Backup Power Generation

TYPES OF BACKUP POWER AND EMERGING TECHNOLOGY

Backup Power System	Initial Cost	Area Required	Fuel Availability	Maintenance Required	Life Expectancy	Reliability
Engine Driven Generator (Diesel)						
Engine Driven Generator (Natl. Gas)						
Bi-fuel (Natural Gas and Diesel)						
Photovoltaic Systems						
Wind Turbines						
Microgrids						

Good	
Better	
Best	

Backup Power Generation

MOVING FORWARD

- Know what you have
- Determine if you can afford to do some load shedding
- Understand how your facility's electrical distribution system is connected
- Know your real estate limitations for additional backup systems
- Find out the remaining life expectancy of your existing backup systems
- Identify who will be (or is) providing preventive maintenance
- Search for available incentives
- Think regionally
- A power resiliency study is recommended



QUESTIONS?



GALVESTON

Associated Press

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THANK YOU!