Report P6A1 Beaumont Flood Emergency Response Exercise
TxDOT Project 0-7095 Evaluate Improved Streamflow Measurement at TxDOT Bridges

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EXERCISE OVERVIEW

Exercise Name	TxDOT HSEEP Exercise 1 / Beaumont District *(Streamflow II 0-7095)*
Exercise Dates	22 February 2022
Scope	This was a Table Top Exercise, planned for a 4 hour duration, at the Beaumont Regional TxDOT Headquarters at 8350 Eastex Fwy, Beaumont, TX 77708. Exercise play was limited to evaluation of the products produced by the Streamflow II project to identify if they are useful, accessible, in a usable format and accurate for TxDOT needs.
Focus Area(s)	Protection Response Recovery
Core Capabilities – TxDOT PRIORITIES	**Intelligence and Information Sharing** – SAFETY *Provide timely, accurate, and actionable information and allow for the sharing of that information, data, or knowledge with government or private sector entities as appropriate.* **Situational Assessment** – SAFETY *Provide all decision makers with decision-relevant information regarding the nature and extent of the hazard, any cascading effects, and the status of the response.* **Infrastructure Systems** – CONNECTIVITY and ASSET MANAGEMENT *Stabilize critical infrastructure functions, minimize health and safety threats, and efficiently restore and revitalize systems and services to support a viable, resilient community.* **Economic Recovery** – EFFICIENCY and EFFICACY *Return economic and business activities to a healthy state.*

Objectives	1. Evaluate the current draft versions of the maps, data and information available and capture feedback 2. Evaluate the ease of access to the maps, data and information available and capture feedback 3. Determine Improvement Plan/Action Items for the next version of the maps, data and information available in preparation for TxDOT HSEEP Exercise 2
Threat or Hazard	Flood event
Scenario	Severe flooding impacting roadways and travel in TxDOT Beaumont District
Sponsor	TxDOT and University of Texas at Austin (RTI Streamflow II 0-7095)
Participating Organizations	Texas Department of Transportation National Weather Service University of Texas at Austin United States Geological Survey

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ANALYSIS OF PRODUCTS PRESENTED DURING THE EXERCISE

GROUP RESPONSE

The exercise engaged the Maintenance staff of the TxDOT Beaumont District in a series of flood map products describing the impact of Tropical Storm Imelda, which occurred in September 2019. Maps were prepared for three time points, at 10AM on 18, 19, 20 September, representing before, during and after the flood peak, respectively. The group found value in all the map products, but did have some changes to either symbology, format, or data thresholds. The following are the product rankings based on feedback from the group:

Top New Products

1. **Flooded Road Depth Estimates**
   Number one product in the eyes of TxDOT. This product spoke directly to their service delivery and their need to manage access.

2. **Precipitation Forecast by Maintenance Section**
   This is a product based on existing National Weather Service data but calculated on TxDOT Maintenance Section areas. They would prefer the data also to be calculated on watersheds and overlaid with the TxDOT Section boundaries.

3. **Bridge Warnings**
   This product was very useful to the Bridge Group, but the Maintenance Group would prefer the warnings be based on the road elevation. The warning should reference when the roadway is about to be flooded, which the Bridge Group said would also help them with bridge inspections. This change benefits both groups.

Top Reference Products

1. **Flood Inundation**
   This product is necessary to produce the Flooded Road Estimates, but also provided value to the group. While they wouldn't rely on it to identify a flooded road, it did help tell the regional flood picture.

2. **Bankfull Rivers**
   This is a National Weather Service product and was found to be very helpful – especially when used with the Highway Conditions Reporting System (HCRS) layer.

3. **Water Rise**
   While this layer didn't provide details on if the roadway was flooding or about to flood, it was a key reference layer they would use to help with the regional flood picture.

RESULTS OF EVALUATION COMPONENTS

Requested Enhancements

1. **Historical Data – Past Storms**
   Both the EOC and the Maintenance groups mentioned their desire to explore or access historical data. There were multiple situations where this functionality would be useful.

2. **Slider Tool – Event Cycle**
   This function goes hand-in-hand with the historical data. Both groups found this function useful and needed.

3. **Symbology Changes**
   The group was very vocal and informative on how to present data in a way that best suits their needs. Some were as simple as adding more levels (ex: 7 colors vs 3) while others were more focused on the data settings (ex: only highlight depths which were greater than X). The Streamflow II Project Team should refer to the detailed Participant Feedback Forms and the Evaluation Forms for more information.

4. **Ability to Filter Data**
   This is a function to select particular depths of flooding which was identified and requested by the Maintenance Group.

TOP BREAKOUT COMMENTS

Emergency Management Breakout Group

1. "The cumulative precipitation maps (contours) will assist with getting to the area before it happens"
2. "Don't want the crew with cell phones or map in hand during an actionable flood". This would be a safety issue
3. "Don't rely of the tool solely" "Data might not be giving us the whole picture".
4. "Don't have time to be constantly watching a tool in the field during an event"
5. "Get ahead of the issues before they actual before cause a much more dramatic situation".
6. Leary of having to enter data mobile in the field.
7. From the flooded roads, these can prioritize resource allocations and access to damage
8. Would like about a 6-hour forecast look … TDEM typically likes a 72 hour outlook.
9. HCRS road graphics versus calculated statistics… style should consider how they are compared.
10. Can cameras be added as a potential tool?
11. Are detailed surveys of the bridges needed to get better bridge deck information?
12. Prioritizing resources to access data including vehicular access.

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Maintenance Breakout Session

1. "Roadways flood before the bridge does"
2. Flood inundation maps – zooming in helps determine the flood magnitude.
3. Flood inundation data would help with determining access to system.
4. "TxERA is not reasonable on mobile device." "It wasn't built for a mobile platform…. Tablet and laptops only".
5. Currently replying on weather apps on phone instead.
6. It takes staff about 2 hours to mobilize and get to a problem area.
7. Would like 2.5-foot increments of depth gradation.
8. Inundation map should include tidal surge information.
9. Would like the ability to turn off the 6" and less level.
10. Data helps with coordination with adjoining districts… who can get in the area to assist.
11. How far do we look back? Need to store peak data for event.
12. Flooded road historical estimate data could be used as quality control after event to validate / invalidate estimate. It did or did not flood where the estimate showed.

CONCLUSIONS

The key outcomes of the Beaumont Flood Emergency Response Exercise were:

(1) The idea was validated that flood information presented as maps provides useful and usable information for TxDOT flood emergency response.

(2) Three key maps of greatest interest to the TxDOT Maintenance staff were identified (flooded road depth estimates, rainfall forecasts by TxDOT jurisdictions, bridge warnings)

(3) Three reference maps that provide supportive information were identified (flood inundation, bankfull streams and HCRS flooded roads, gauge conditions)

The focus of "Improvement Plan" following the exercise is that the Streamflow II Project 0-7095 team will build a prototype flood map service within which enhancements to the maps will be developed with further guidance from TxDOT Maintenance staff. A key feature of this plan will be a focus on flooded conditions at bridges, considering both On-System and Off-System bridges. This will involve detailed flood modeling and mapping at bridges where gauges are located and approximate bridge modeling elsewhere.

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