

TxDOT HSEEP EXERCISE 2

AUSTIN DISTRICT

Streamflow II Project 0-7095
Report P6A2

After-Action Report/Improvement Plan

Exercise Date: 17 January 2023

Prepared by Harry Evans, Christine Thies and Larry Jantzen, Center for Water and the Environment, University of Texas at Austin

The After-Action Report/Improvement Plan (AAR/IP) aligns the exercise objectives with the Texas Department of Transportation's mission, goals and priorities under the scope of the Streamflow II Project. Feedback from the exercise participants, to include specific recommendations concerning product and process improvement, are included in this document.

EXERCISE OVERVIEW

Exercise Name	TxDOT HSEEP Exercise 2 / Austin District (<i>Streamflow II 0-7095</i>)
Exercise Dates	17 January 2023
Scope	This is a Table Top Exercise, planned for 5 hour duration, at the TxDOT Stassney Campus at 6230 E. Stassney Lane, Austin, TX 78744. Exercise play is 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	<p><u>Intelligence and Information Sharing</u> – SAFETY <i>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.</i></p> <p><u>Situational Assessment</u> – SAFETY <i>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.</i></p> <p><u>Infrastructure Systems</u> – CONNECTIVITY and ASSET MANAGEMENT <i>Stabilize critical infrastructure functions, minimize health and safety threats, and efficiently restore and revitalize systems and services to support a viable, resilient community.</i></p> <p><u>Economic Recovery</u> – EFFICIENCY and EFFICACY <i>Return economic and business activities to a healthy state.</i></p>
Objectives	<ol style="list-style-type: none"> 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 final version of the maps, data and information.
Threat or Hazard	Flood event
Scenario	Severe flooding impacting roadways and travel in TxDOT Austin District
Sponsor	TxDOT and University of Texas at Austin (RTI Streamflow II 0-7095)

<p>Participating Organizations</p>	<p>Texas Department Of Transportation National Weather Service University of Texas at Austin United States Geological Survey</p>
<p>Point of Contact</p>	<p><u>Exercise Director</u> Larry Jantzen, MEP Univ of Texas at Austin – Center for Water and the Environment 10100 Burnet Rd Austin, TX 78758 Larry.jantzen@austin.utexas.edu</p> <p><u>Principal Investigator</u> Dr. David Maidment Univ of Texas at Austin – Center for Water and the Environment 10100 Burnet Rd Austin, TX 78758 maidment@utexas.edu</p> <p><u>Project Manager</u> Shelley Pridgen Research Project Manager Research & Technology Implementation (RTI) Division Texas Dept. of Transportation (281) 300-8156 Shelley.Pridgen@txdot.gov</p> <p><u>TxDOT / Beaumont Contact</u> Omar X. De Leon, P.E. Director of Maintenance, Austin District Texas Dept. of Transportation (512) 832-7000 Omar.x.deleon@txdot.gov</p>

PURPOSE OF THE EXERCISE

The Streamflow II Project Team created several products that were exercised in February of 2022 in the TxDOT Beaumont Maintenance District. These products were refined, based on the results of that exercise, and creation of additional products were considered. The refined versions of these products were exercised in the Austin Maintenance District on 17 January 2023.

The Exercise evaluated the effectiveness, ease of use and ability to access the following products:

- ~ **Flooded Road Estimates** (based on flood depth map)
- ~ **Flood Inundation** (flood depth map)
- ~ **Bridge Warnings** using Streamflow I and Drainage District 6 gauges
- ~ **Precipitation Forecast by Section** (National Weather Service Product)

SUMMARY

The TxDOT Austin Exercise was deemed successful based on the attendance, the engagement, and the findings during the 5-hour exercise. A total of 43 TxDOT employees participated. The participants provided several hundred comments related to the review of the products presented and presented numerous improvement recommendations.

Primary Findings

1. **Bridge Warnings** – Found the symbology and the cross-section of the bridge (with water depth to low chord) helpful and informative. Would like to see this capability expanded to include low water crossings.
2. **Flooded Roads** – Found the spatial display of flooded roads (current and predicted) to be helpful and informative. Would like to see them expanded to both on-system and off-system roads.
3. **Situational Awareness** – Found the spatial display of bridge status and flooded roads helpful and informative. Would like to include some addition layers to help with the overall situational awareness for both the Maintenance Sections and District (low water crossings, off-system roads, etc.). Also, would like to have access to the map in the field for improved communication between the Maintenance Section staff and the EOC staff.
4. **Alerts and Reporting** – During the exercise, there was discussion about the need to have either spatial or tabular alters highlighting changes in flooding situations (increased flooding, receding water levels, etc.). Also, the idea of a tabular report of flooded roads / bridges to help with work orders and response by field personnel.

ANALYSIS OF PRODUCTS PRESENTED DURING THE EXERCISE

GROUP RESPONSE

The exercise presented each product using October 2018 Llano Flood and sought reactions from the Austin EOC and Maintenance representatives. The following are the product rankings based on feedback from the group:

Top Products Referenced

1. Bridge Warnings
2. Flooded Roads
3. Situational Awareness / Map Functionality
4. Inundation
5. Forecasts
6. Asset Inventory / Base Map Layers
7. Weather Layers

Top Improvements Suggested

1. Add Low Water Crossings
2. Alerts - Changes in levels (Increasing / Receding)
3. Forecasted Timeframes
4. Mobile / Field Access
5. After Action Impacts
6. Sharing of Info or Location
7. Sharing with other Applications
8. Reporting
9. Symbology of Map Layers

TOP BREAKOUT GROUP COMMENTS FROM EXERCISE EVALUATION GUIDES

Emergency Operations Center Breakout Group

- Worst case scenario color dots (and triangles when low water crossings are included) should be on top.
- Consider incorporating the “public safety/first responder” perspective of 1’, 3’, 6’, 9’ into the system somehow so TxDOT can advise local EMS, first response agencies and TDEM of impact to roads (response routes, evacuation routes, etc.)
- If worst case scenario is based on an 18 hour window, need to be able to select and see predictions in 2 hour increments (what is expected at 2, 4, 6, 8, etc. hours from now) within the 18 hour period.
- Need both “on and off system” roads layers.
- Include low water crossings.
- Need to see “no flow” (current situation and forecasted) depicted by a color (maybe gray).
- Need time predictions to know when to expect color changes (i.e. yellow to red).
- How can HCRS be more accurate in relation to forecasted situations.
- Need to incorporate velocity to make decisions about possible scour critical situations, even where water did not reach low chord of bridge.

Maintenance Section Breakout Group

- Include “off system” roads, low water crossings and bridges in a layer.
- Include a layer of low water crossings (separate from bridge layer) and depict them as a triangle using the same color system as used for bridges.
- Incorporate depth and rate of rise into bridge and low water crossing data.
- Use VIOCI to send alerts concerning flooded roads, bridge and low water crossing forecasted problems.
- Include a notification of when flooded roads, bridges, low water crossings are no longer under water (incorporate a rate of decline forecast).
- Add “real time traffic” layer.
- Have a color-coding system of impact (amount of flooded roads, etc., not weather) to each maintenance section layer.
- Incorporate dam information (releasing water, holding water, failure) into model.
- Place point of contact info on maps (Maintenance Section Supervisor).
- Need to see forecasted info in 1 hour increments up to 18 hours.
- Must be able to use on mobile devices, especially phones.

TOP COMMENTS FROM PARTICIPANT FEEDBACK FORMS

- Alert system and criteria established for awareness.
- Provide available list of impacted roads/bridges (table)
- Adding a share button at specific locations and structures
- Additional refinement of analysis of available data
- Map that shows when bridges are no longer flooded
- Make a mobile friendly app
- Make the data for low water crossings available and have an isolated layer on the map for it
- Would like to see a graph of rising levels hour by hour and when the levels will peak
- When opening each bridge point, give timeline of water height
- Low water crossing predictive mapping
- Change time steps in map
- Send alerts hour by hour of projected possible road openings
- Combined layers with interagency data needed before the next event
- Inventory of low water crossings
- ID resources in needed subjects
- Hourly prediction of water level
- Implement for debris
- Segment roads flooded to facilitate target areas to close
- Perhaps a static database by county to easily identify the tiers of roadways affected

- Better methods of display for flood extents based on the recovery phase
- Discussed having a share button to be able to send a priority location out to the workers in the field
- Tier mapping - great for prioritization
- Add an export option for tabular format
- Prioritize by traffic count and length of closure
- TxDOT data collection to update maps for better predictive models
- Meet with TxDOT Supervisors
- Develop symbology for low water crossings
- Graph of the level and time to structure
- Zooming out, most critical color of cluster should be shown
- Divide on- and off-system into layers
- Add real-time traffic layer
- Use Veoci
- Use larger database that contains more roads than current system

CONCLUSION

While both the Emergency Management Group and the Maintenance Group found value in all the products, they favored a few of them more than others. In addition, they discussed various data settings and symbology changes to several of the products to match their focus during a flood. If these products are implemented across TxDOT, the Streamflow II Team will need to incorporate several of the symbology requests.

Appendix A: IMPROVEMENT PLAN

This IP is developed specifically for the University of Texas and Texas Department Of Transportation as a result of the TxDOT HSEEP Exercise 1 / Beaumont District (*Streamflow II 0-7095*) Exercise conducted on 22 February 2022

Issue/Area for Improvement	Corrective Action	Primary Responsible Organization	Organization POC	Recommended Start Date	Recommended Completion Date
Include Low Water Crossings	Provide inventory of Low Water Crossings to UT Team	TxDOT	Shelley Pridgen	TBD by TxDOT	TBD by TxDOT
Include visual Depiction of Low Water Crossings	Provide Mock-Up of Low Water Crossings	UT	Dr. David Maidment	2/20/2023	8/31/2023
Bridge warnings	1. Color Code Predictions 2. Create Stage Hydrograph	UT/KISTERS	Dr. David Maidment/Andy Carter	2/20/2023	8/31 2023
Flooded Roads	Design prototype Flooded Roads Methodology	UT	Dr. David Maidment/Tim Whiteaker	2/20/2023	8/31/2023
Allow Use via Mobile Devices	Develop Mobile Access/Platform	TxDOT	Shelley Pridgen	TBD by TxDOT	TBD by TXDOT
Sharing Information and Location	Include Sharing Capability in Platforms	TxDOT	Shelley Pridgen	TBD by TxDOT	TBD by TxDOT