CHRISTOPHER B. BURKE ENGINEERING, LLC

TIPPECANOE COUNTY
SURVEYOR OFFICE

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Tippecanoe County Flood Inundation Library

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Where It All Began

- For years, Tippecanoe County has been a choke point for the Wabash River with its's warning level of only 11 feet.
- All warning levels up and down stream are well above 11 feet.
- This has impacted the flood control & management of the 3 reservoirs upstream, operated by the US Army Corps of Engineers; this restricts the amount of water which can be released in anticipation of large snow melts and heavy rainfall.
- Only release just enough water to only bring the Wabash River at Lafayette to the 11-foot level.
- The Corps requested that the NWS change the Flood Stage from 11 feet to 15 feet

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Current Flooding in the County

- So, what happens when the Wabash River at the Lafayette gage reaches 11 feet?
  - For the last 40 years, nothing was flooded at this stage
  - NWS warnings are largely ignored at the local level
  - At the 11-foot mark, the Wabash is only bank full throughout most of the county.
- What about 12 feet?
  - Up until 10 years ago, the only thing flooded at 12 feet was the former Lafayette Municipal Golf Course.
- And 13 feet?
  - Some Farm acreage begins to flood
- Currently, the Wabash can flood to the 15-foot level before it enters any structures.
- TEMA-DHS has been working with the Corps for the last 15 years to change the warning level of the Lafayette gage.

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Concerns?

When announced of the need to change the warning level, there were partners that expressed concerns

- **Wabash River Corridor & Enhancement** – Trail & bank erosion, increased siltation
- **Surveyor's Office** – Bank erosion & silting, impacts to tributaries of the Wabash within the county.
- **Area Plan Commission** – Building construction in floodplain, extended flood periods, higher instances of flooding.

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Identifying & Mitigating the Problems

Landowners & General Public Concerns

- River flood statements and warnings issued throughout Tippecanoe County are ignored
- Providing adequate notification for the agricultural sector in flood events.
- Residents along the river express interest and concern on the level remaining at 11 feet.
- Many residents along the River would like the level increased to a more relevant flood level.

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Identifying & Mitigating the Problems

Government Partners Concerns

- Increased bank erosion & scouring
- Erosion of established recreational trails
- The Corps has concerns about proper flood management if the level is not increased
- TEMA-DHS even reports that the general public disregards flood warning statements since nothing is impacted when a flood warning is issued at 11 feet

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Additional Study

Analysis of Stage 11 vs Stage 15

- Floodplain Connectivity
- Revised the inundation mapping using 2018 LiDAR

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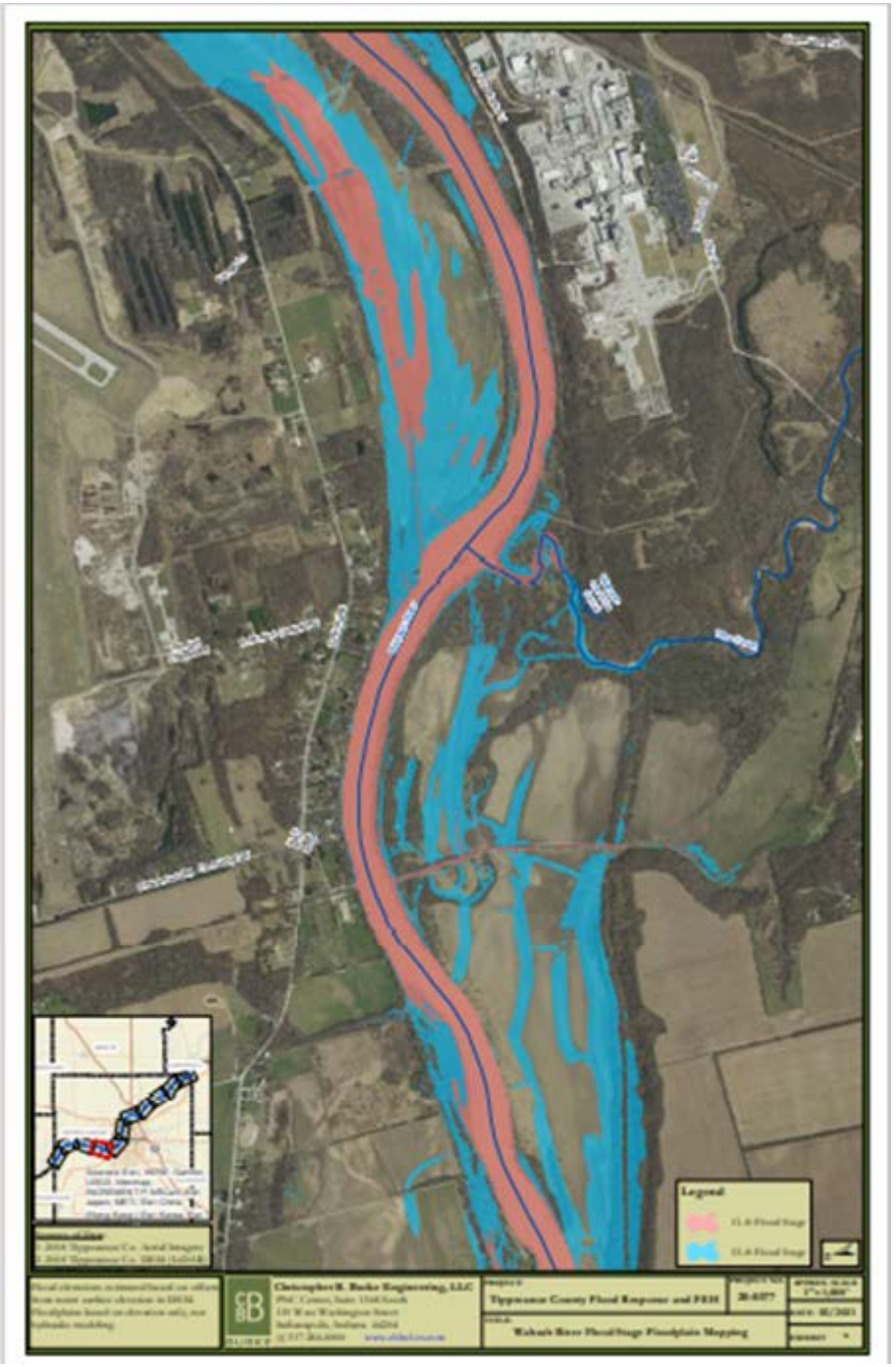
Floodplain Connectivity

Analysis of Stage 11 vs Stage 15

- Allows conservative estimate of where a river is connected to its floodplain and at what stage or discharge
- At 11 feet (red) – flow is confined to channel
- At 15 feet (blue) – moving out of channel
- Overall analysis of the Wabash showed impacts to one structure and one road



Additional Study

Analysis of Stage 11 vs Stage 15

- Revised inundation mapping using 2018 LiDAR
- Little potential for increased erosion and scouring
- Even the most upstream portion of the Wabash River in Lafayette barely leaves the channel
- Downstream of Lafayette, there is even more room in the channel
- Appears that increasing the number of reservoir releases may start to produce a more ‘normal’ flow regime in the Wabash River – this is good for overall river health

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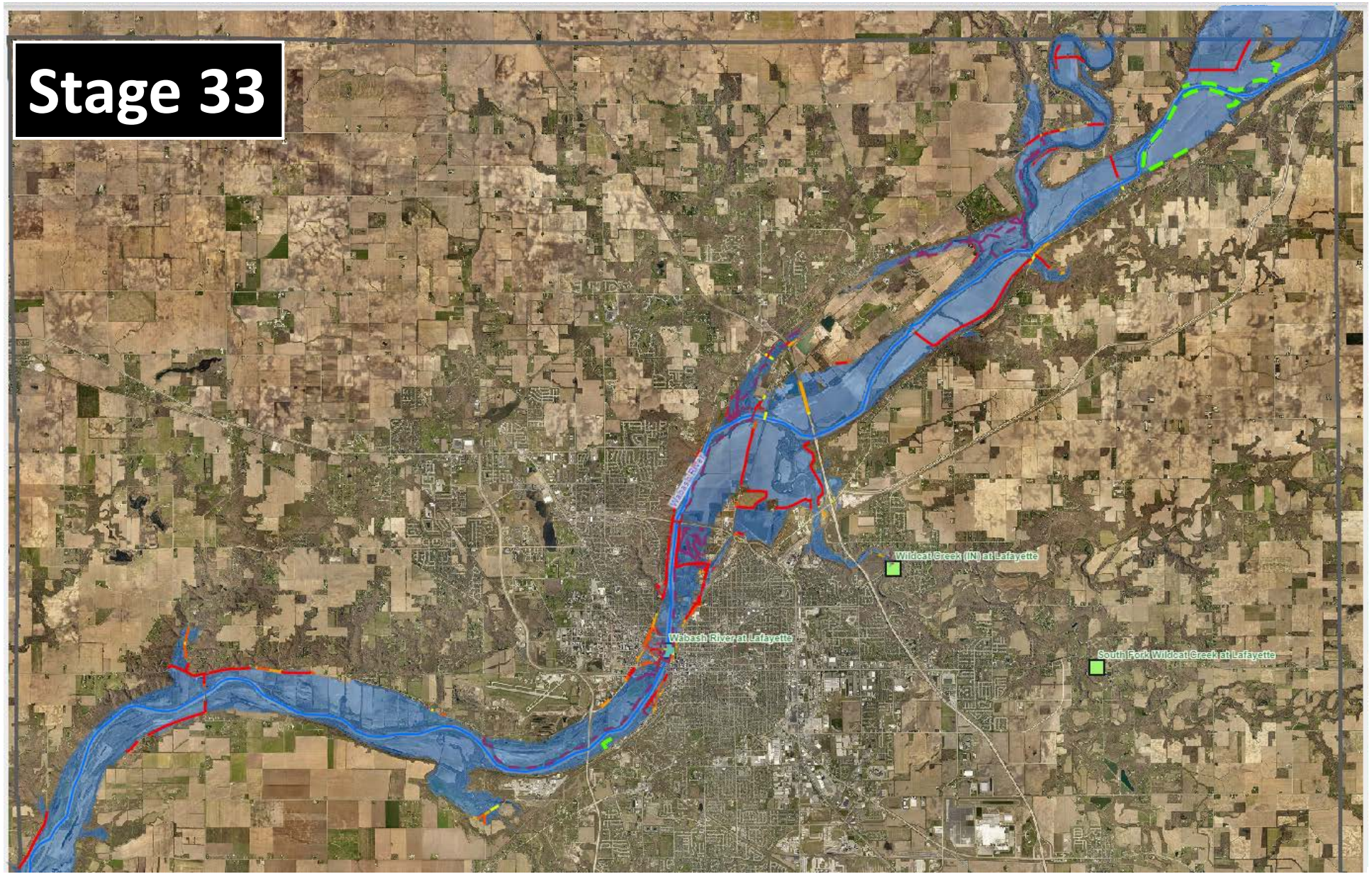
Wabash River - Stage 11 vs Stage 15



Resulting Actions

Impact-Based Flood Mapping Tool

- Apply to more than just the Wabash River.
- All major waterways within the county.
- Easy to use program which can be shared with response partners from Public Safety.
- Mapping to include roadways, public and private structures.
- Critical Infrastructure sites.
- Ability to secure portions of the information contained within the program

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Resulting Actions

Impact-Based Flood Mapping Tool

- Something that can be accessed on mobile platforms.
- An application which response personnel can enter pictures, observations and other data while in the field.
- Platform which will not require large amounts of manhours to maintain daily, monthly or yearly.
- Needs to be a tool that anyone can easily access and use.

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Requested Functionality

- Live screen captures
- Selecting a stream library to explore (gaged locations versus ungaged locations)
- Live link to USGS/AHPS stream monitoring gages
- Selecting a stage, zooming in and exploring impacts on roads, buildings, and trails
- Selecting an area to get the number and detailed list of buildings affected along with the ability to export the list.

ArcGIS Online

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Demonstration

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A Few Considerations

Difference with USGS library :

- The impact information is readily available
- The extent is much longer (entire stream within the County)
- Accuracy level/ relationship to gage height (both peak elevation and timing) not as accurate when there is a significant distance away from the gage or major tributaries are present
- For now, only 4 stage libraries (published FIS profiles) for the ungaged streams

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Future Improvements

- Upgrade Ungaged Streams' Flood Inundation and Impacts Libraries
  - Add water surface sensors at appropriate locations along each ungaged stream
  - Develop stage-discharge rating relationship for each sensor location
  - Perform detailed hydraulic analysis for various stages (each foot) along each stream
  - Create ArcGIS Online multi-stage flood inundation libraries along with impacts for each stream
- Work with NOAA-NWS to add forecast capability for more USGS gages
- Document flood detection, notifications, warning & evacuation actions, and flood fight termination through a formal county-wide Flood Response Plan

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Conclusions

Looking to the future

- Continue work to get the warning level increased
- Improvements to county and facility-level Flood Response Plans

Is it even being used?

- “We have a Web-Based Mapping Program that is easily accessible and user friendly”
- “We have used this Mapping Program for the current flood we are involved in since very early February”
- “We have extracted Flood Maps at each 1-foot level for two sites within the county”
- River Bend Mental Hospital – Improvements to the site Flood Response Plan
- Feast of the Hunters Moon (Tippecanoe County Historical Society) – A large outdoor event held each fall at Historic Fort Ouiatenon on the banks of the Wabash.

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Questions?

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