

KC Urban Stormwater  
Conference  
February 5, 2019

Visualizing the  
Flood Risk from  
a Levee Breach



A large, leafy tree stands on a grassy hill under a clear blue sky. The tree's shadow is cast onto the grass. In the foreground, there is a field of dry, brownish grass.

# Agenda

1. Introduction
2. Current Conditions
3. Modeling Advancements
4. Visualization  
Advancements
5. Next Steps



# Safety Moment

What seem like an easy trail can quickly turn for the worse.

Prepare yourself with the proper safety equipment and travel with friends who can help get you out of a jam.



# 360° Virtual Reality

- Place headset over your head or hold up with hands
- Advance scenes using either the headset touch pad on RIGHT hand side or Remote
- Remote shows laser pointer and then use your thumb to click
- View and then pass on
- Do Not leave these 4 scenes



## Why Important to You

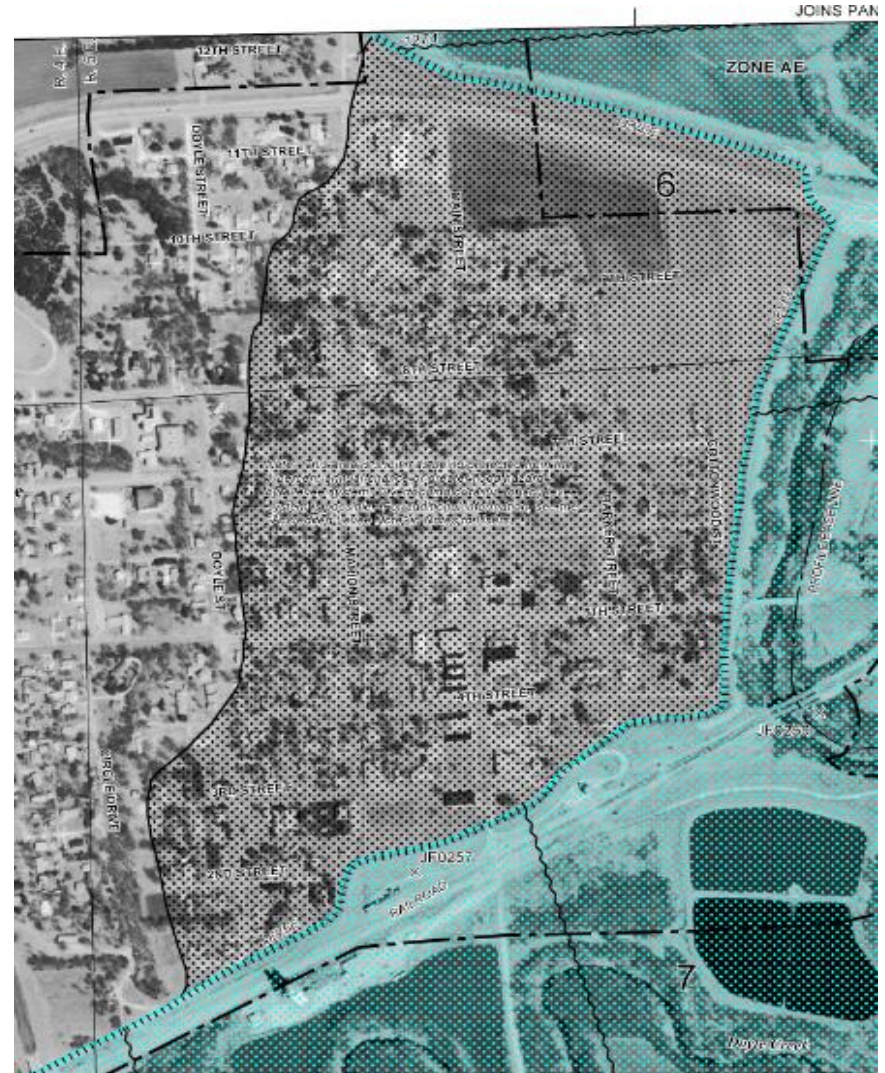
- Brings science to the people
- Personalizes the risk to your property
- Reminder of your risk when you forget
- Shareable with neighbors



# Visualize Flood Risk Behind Levee

## Regulatory FIRM

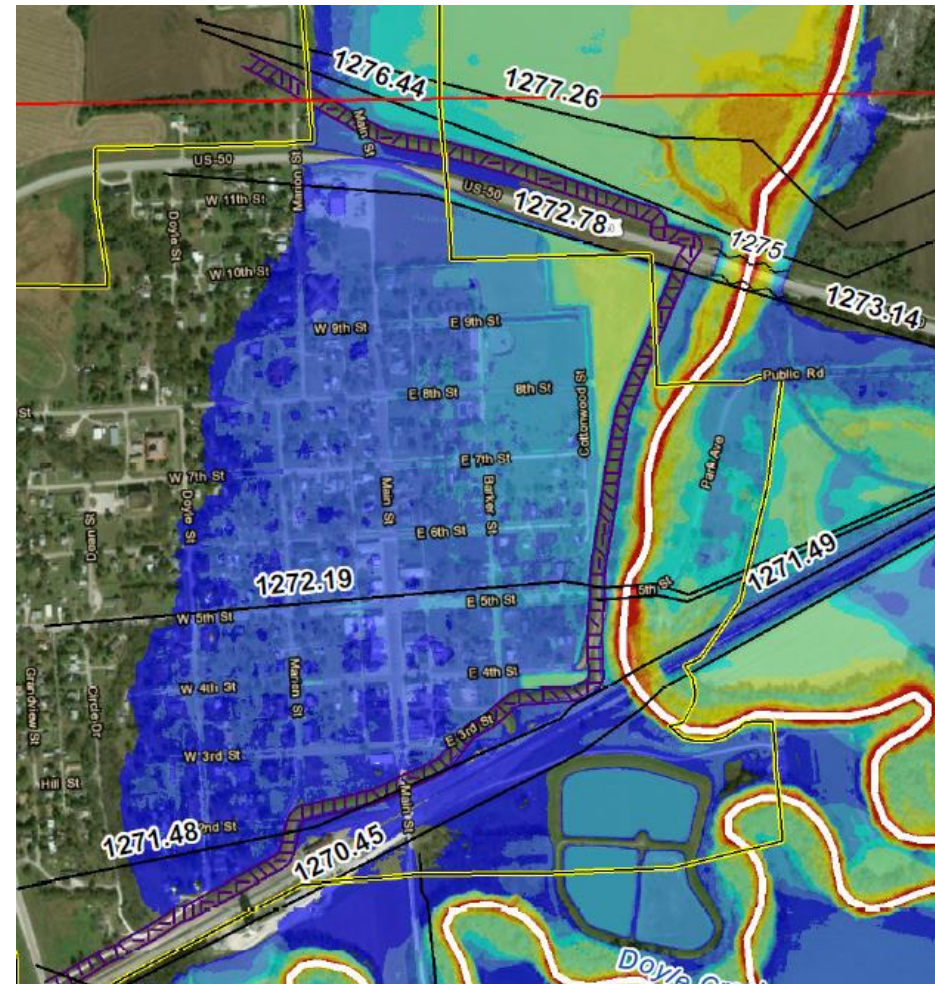
- Area Protected by Levee
- Zone X (Shaded)
- Might have interior drainage flood hazards



# Visualize Flood Risk Behind Levee

## Traditional Flood Risk Products

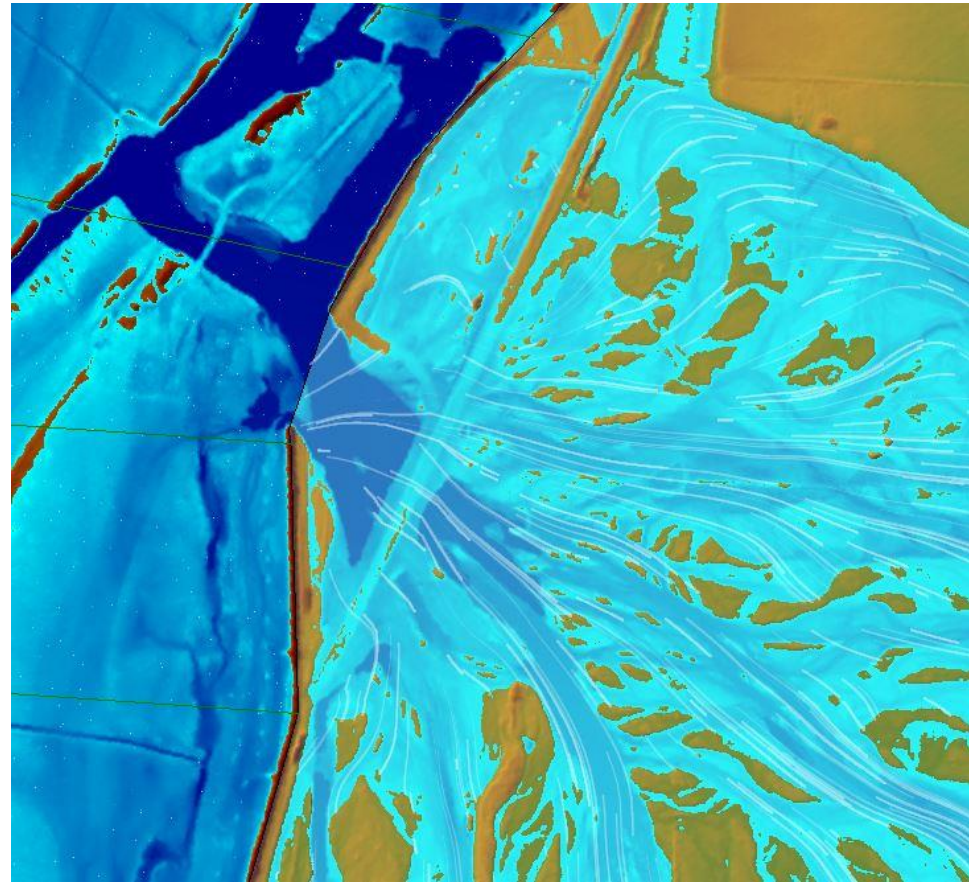
- Extent of Natural Valley flood hazard
- Depth grid of floods
- Percent Annual Chance grid





## 2D Modeling

- 1D & 2D interaction
- Widely accepted
- Increased Precision
  - Inundation Time
  - Accounts for Volume
  - Velocities/ Flow paths
- Multiple Scenarios
- Mapping of various results



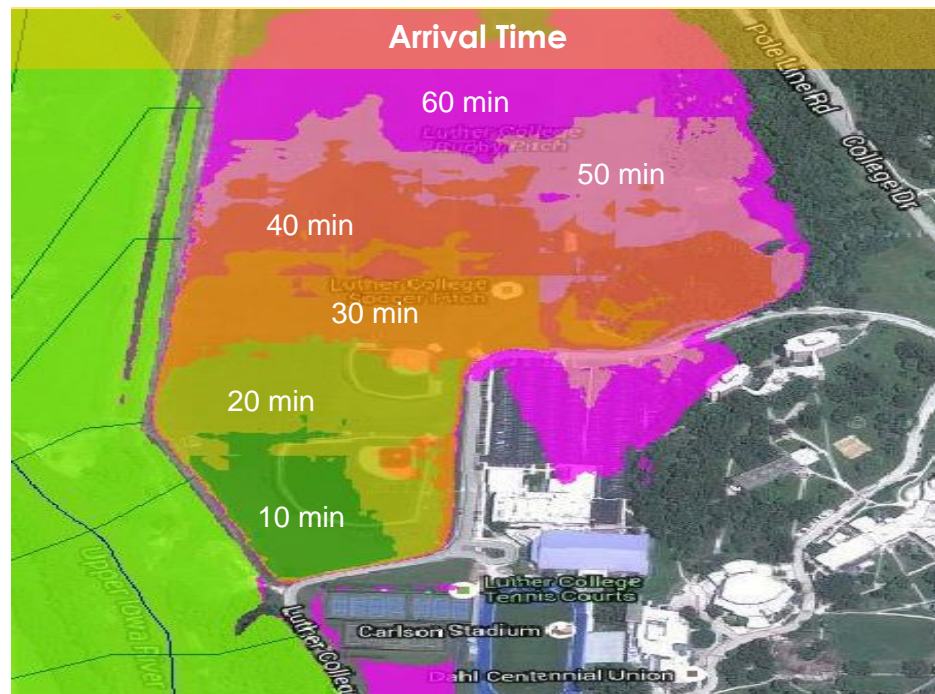
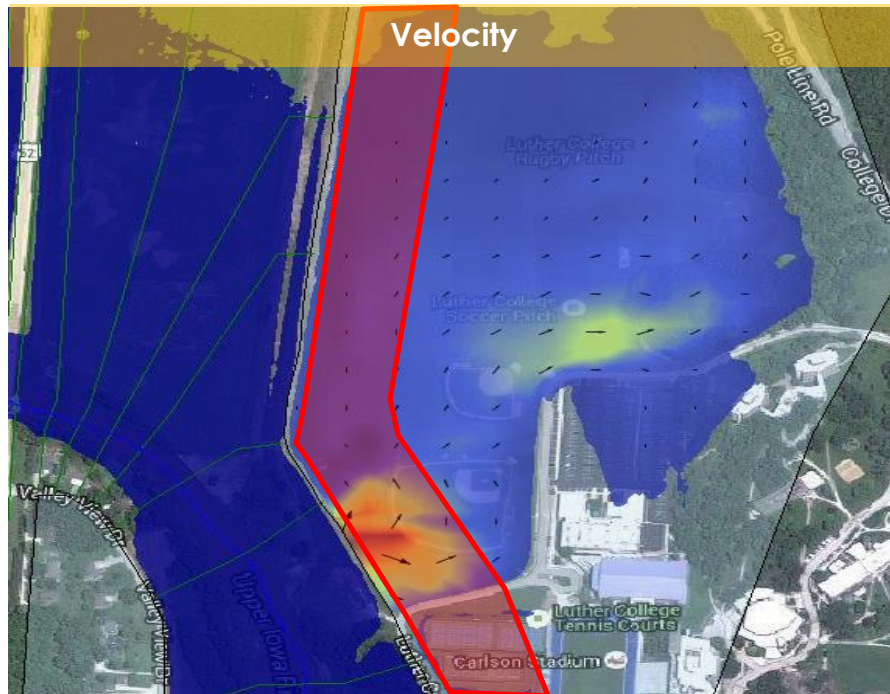


## 2D Model Simulations



## 2D Visualization

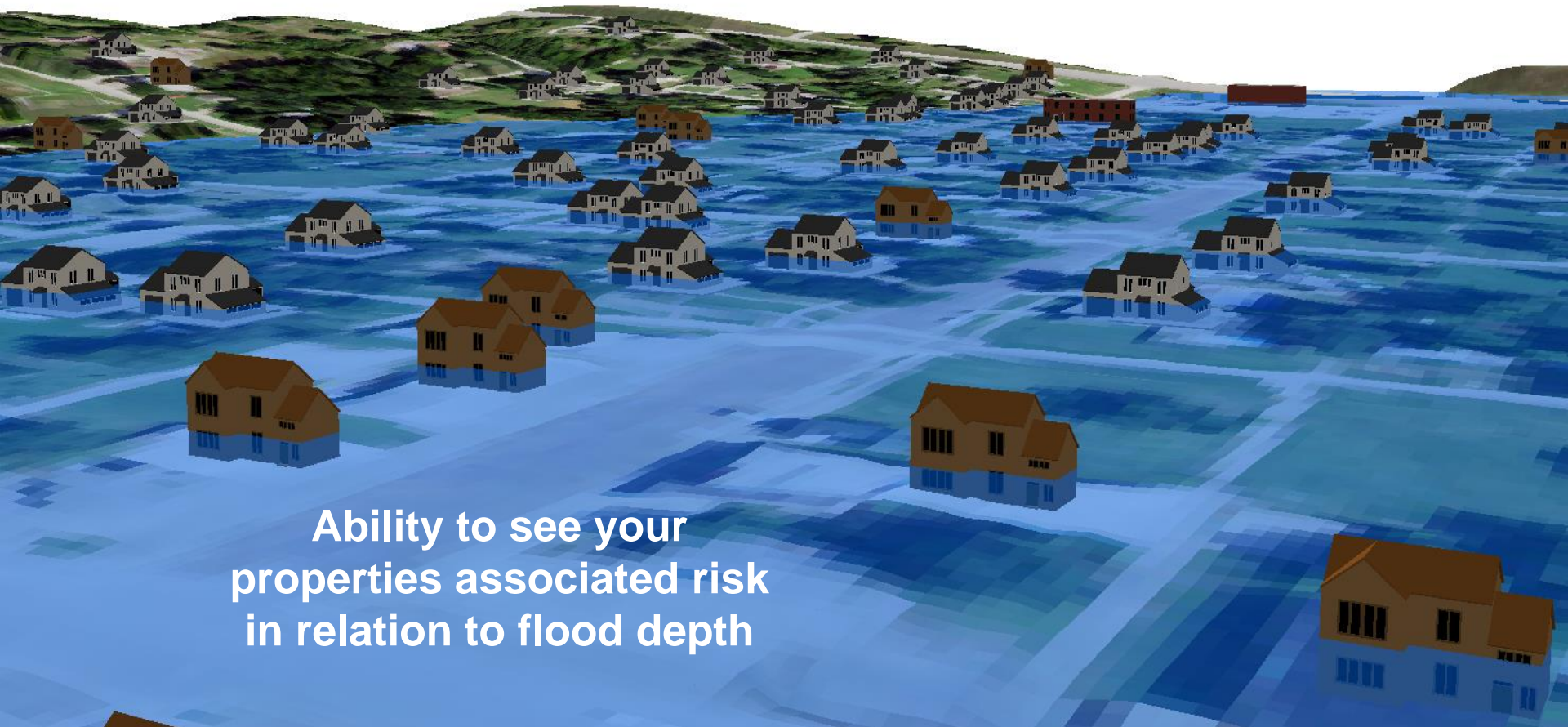
- Plan view of your associated risk
- Recognize spatial relationships with potential problems
- Aids in communicating potential risks





## 3D Visualization

- Better recognize the vertical relationships to hazards
- Easier to communicate potential risks
- Better understand your associated risk



**Ability to see your  
properties associated risk  
in relation to flood depth**

# 3D ArcScene Flythrough





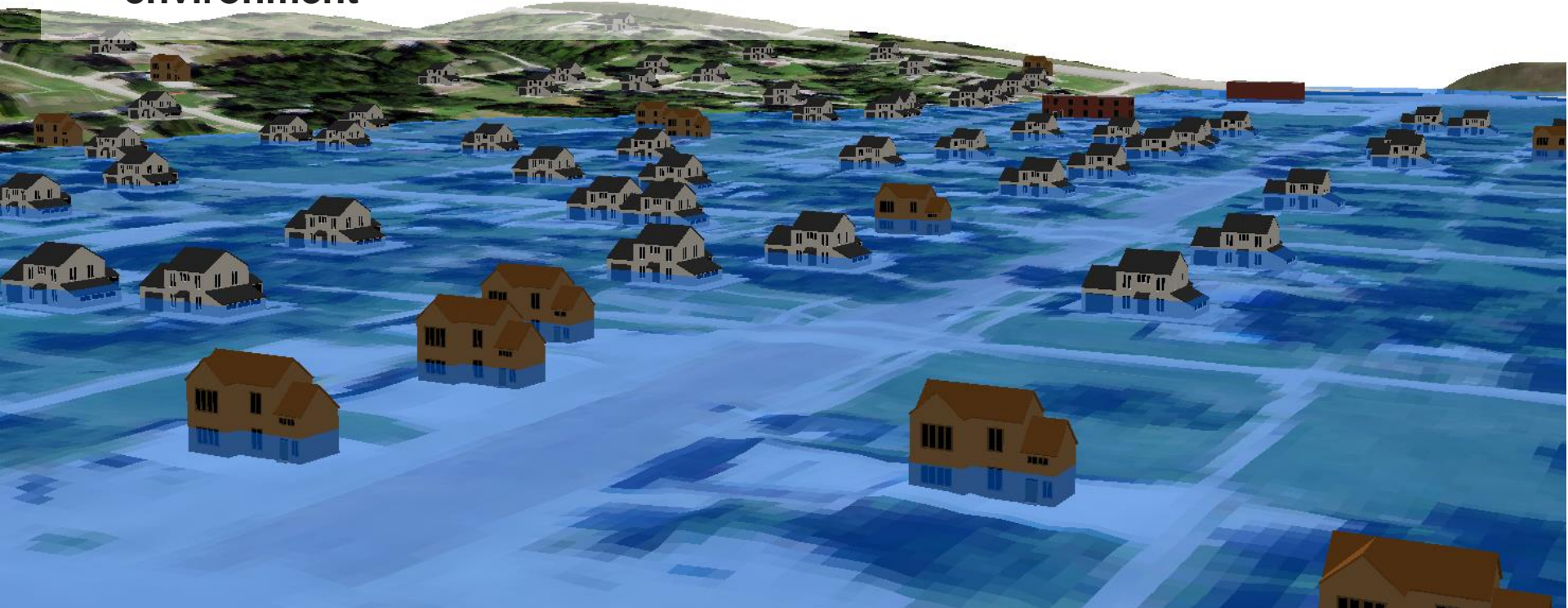
# 3D ArcScene

- **Pros**

- More user friendly for GIS users
- 3D flythrough video capability
- Simple navigation and interaction with 3D feature and raster data in desktop environment

- **Cons**

- Cannot export to 360 VR
- Some Raster troubleshooting needed
- Old coding language (VRML)



# CityEngine

- Esri CityEngine is a stand-alone software product
- Works similar to ArcScene but heavily code-oriented
- Shapes of geometry in a “locally oriented bounding-box.”
- Uses
  - Textures ~ Imagery
  - Shapes ~ Feature classes / shapefiles
  - Terrain ~ DEMs





# CityEngine



# CityEngine

- Beneficial in quickly creating large cities based on procedural modeling
  - Con - Algorithms used to produce scenes do not represent current reality
- Coding ability allows for individual feature modification for a more realistic city
  - Con - very time consuming and steep learning curve





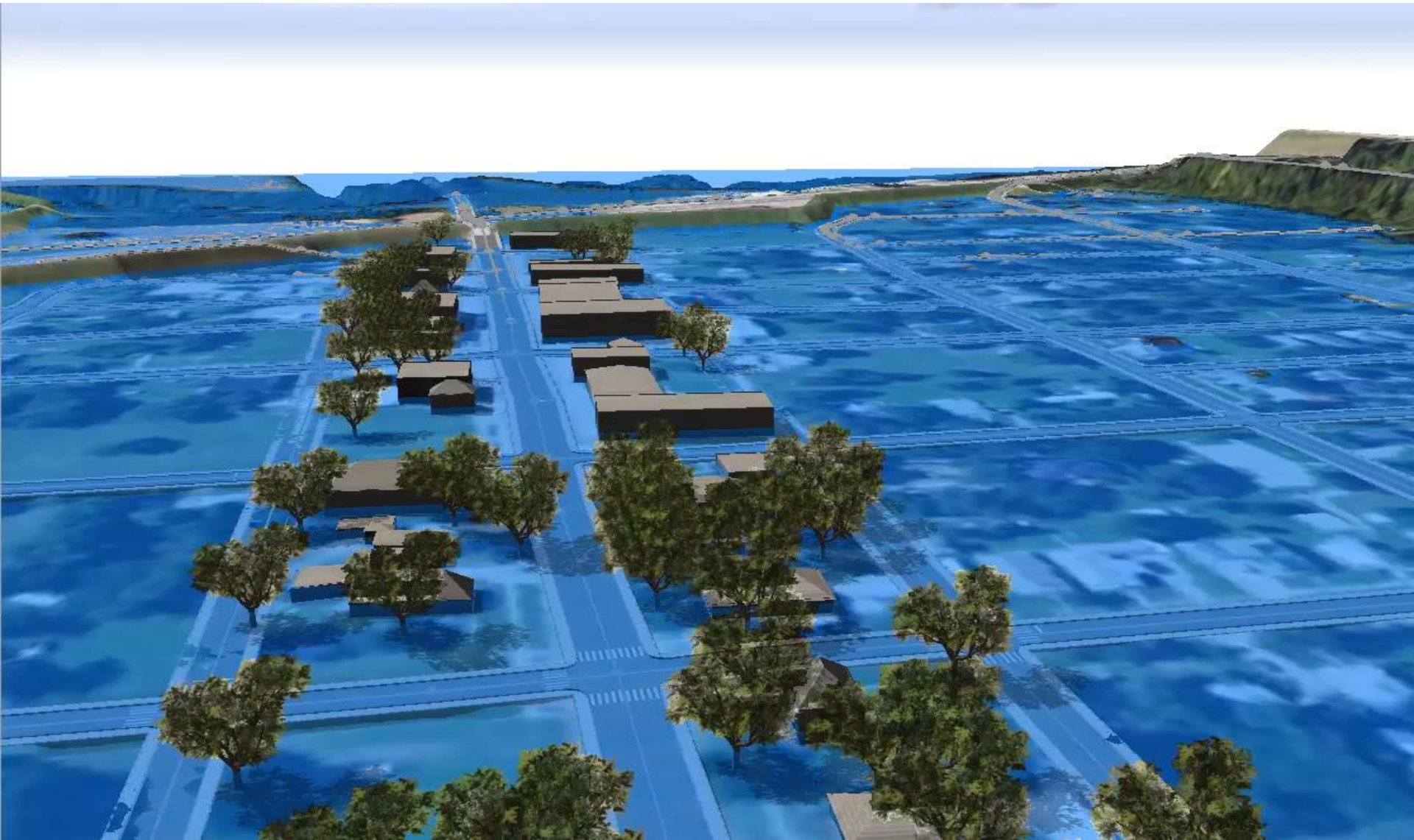
# 360° Virtual Reality

- Provides an immersive experience at predefined scene locations
  - See the risk of flooding at your property!



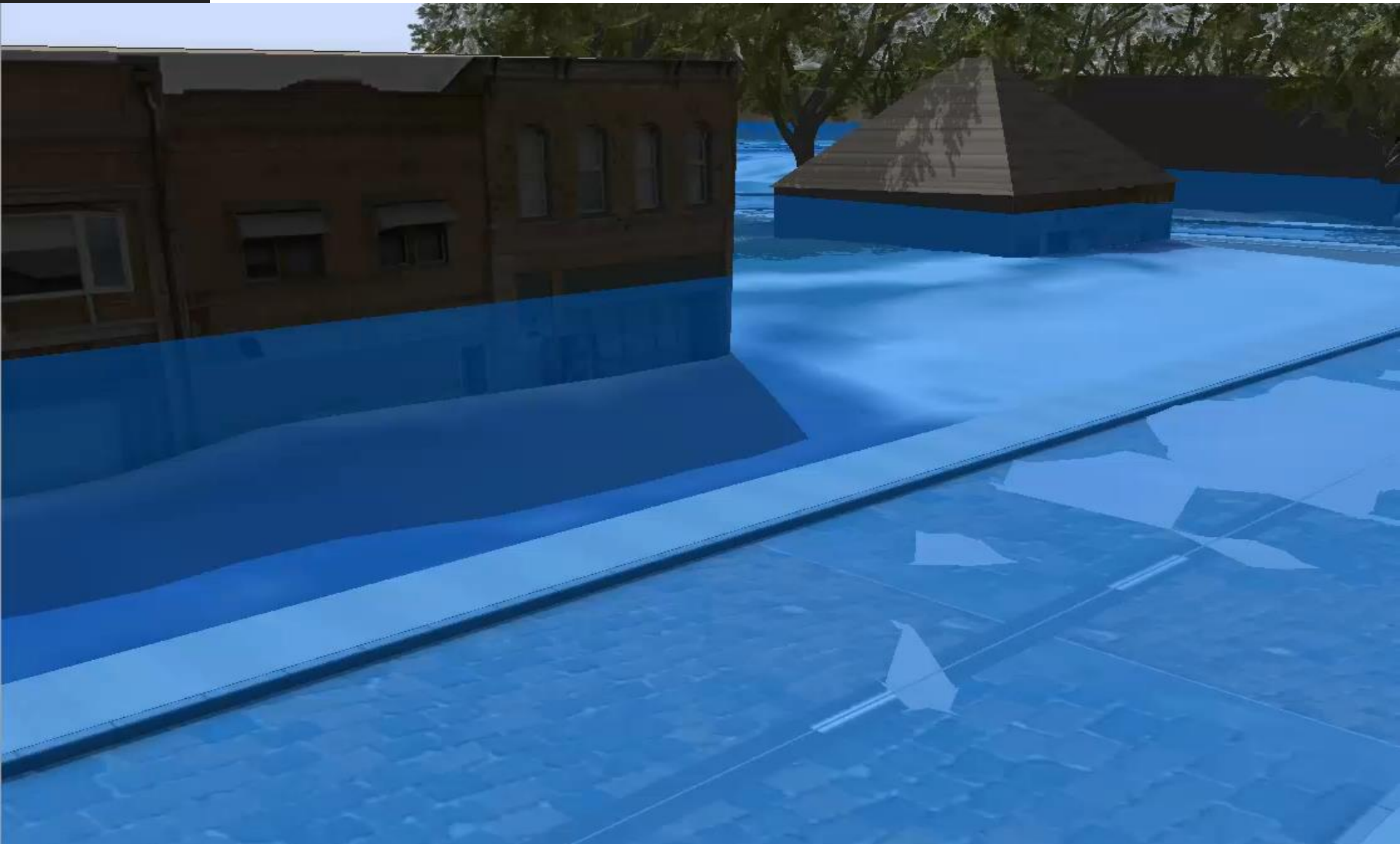


# 360° VR - Perspective Preview

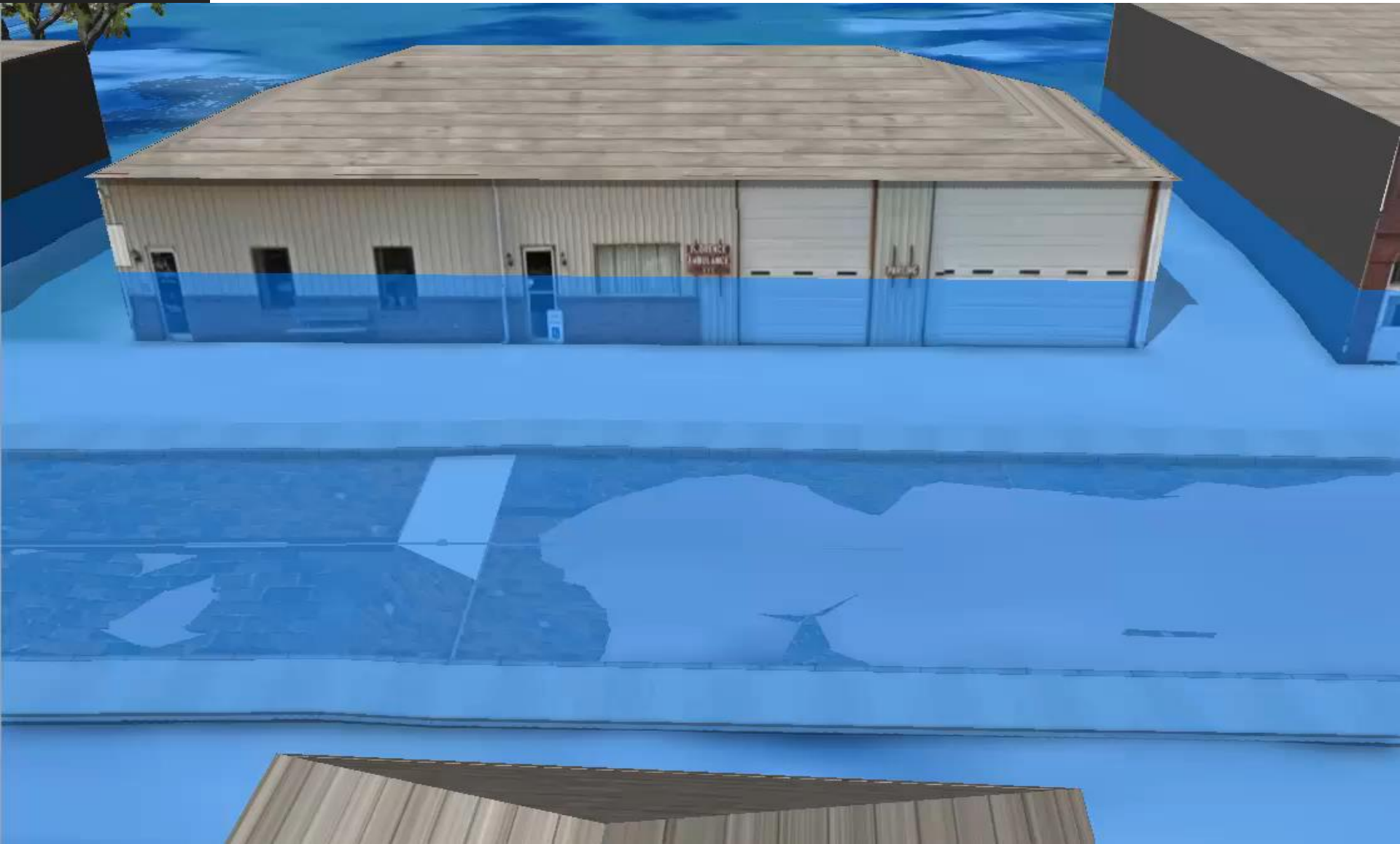




## 360° VR - Downtown Preview



## 360° VR – City Hall Preview





## 360° VR – House Preview



# 360° Virtual Reality

- Pros
  - Awesome
  - Simple export from CityEngine to ArcGIS Online
  - Graphics are great!
- Cons
  - Only Samsung Gear VR and Samsung phone compatible (no Google Cardboard or iPhone)
  - No line of movement (roller coaster)
  - Only ESRI option out of the box
  - Requires Advanced Version of CityEngine (\$)





## Great Power Comes Great Responsibility

- Include 360° VR into your community engagement meetings
- City planners use 360° VR as a tool to help with comprehensive plan development
  - Visualize mitigation effects as part of planning process
    - Add Landscape Architecture details
    - Show what an elevated house looks like
    - Show what a buyout property looks like
    - Show the change in depth from upstream mitigation
- Re-create past flood events to remind people

## Credits

Bryanna Aldridge, GISP, CFM

Stantec

GIS Manager

Will Zung, PMP, CFM, ENV SP

Stantec

Water Resources Manager

Dane Bailey, CFM

FEMA Region VII

Project Manager

Rick Nusz, RG, PH, CFM

FEMA Region VII

Regional Engineer