MHFD Flood Risk

Niver Creek Pilot Overview

Maximizing impact by optimizing risk reduction

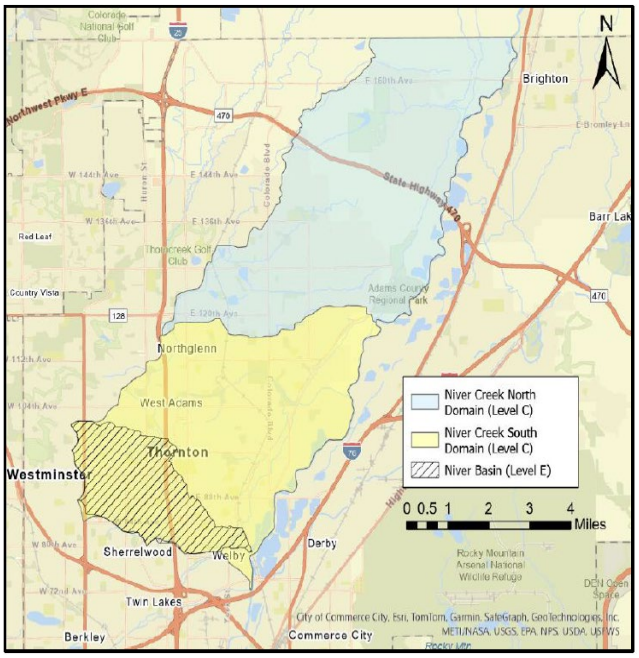
MILE HIGH FLOOD DISTRICT

Purpose & Background

- Explored 2D Rain-on-Mesh (RoM) modeling in HECRAS to develop enhanced products and optimize risk reduction
- Conducted from September 2023 to November 2024, testing scalable methods and evaluating data products to inform future MHFD-wide implementation

Work Performed

- *Base Model Setup:* 2-foot terrain, high-res land cover, detailed hydraulic structures; and approximated storm sewer
- *Calibration:* flow and stage hydrographs assessed volume and peak flow and stage at two gauges for three historic events
- *Performance & Sensitivity:* evaluated best practices across 90+ simulations of varied mesh resolution, bathymetry, land cover, solution equations, precipitation uncertainty, hydraulic structure representation, and underground sewer approximations
- *Dataset Creation:* assessed hazard and/or risk through floodplain mapping, parameter grids, percent annual chance, flood force (D×V), building damages, and social vulnerability
- Supplemental Analysis: compared RoM results to the effective FHAD (SWMM + 1D RAS), estimated storage and detention capacity, quantified development impacts, analyzed dam breach, and evaluated pseudo-steady state
- *Risk & Equity Mapping:* attributed social vulnerability data to receptors intersected with depth and flood force



Niver Pilot Study Domain

Key Findings

- *Model Construction:* will be detailed in MHFD H&H Guidance
  - *cell size:* 100-foot nominal with 25-foot refinements
  - *bathymetry:* incorporate only if readily available
  - *land cover:* DRCOG supplemented by machine-learning
  - *equations:* diffusion wave for Zone A, shallow water for Zone AE
  - *structures:* survey-informed connections where elevations and velocities are of interest, otherwise use terrain modifications
  - sewer: limit to 3-foot diameter for riverine and 2-foot for pluvial
- *Accuracy:* RoM modeling better matched observed conditions than SWMM, which consistently overestimated volume and peak flows
- *Development Effects:* peak flows increased up to 4x with doubled runoff volumes; constructed storage mitigated only 10–15% of that increase
- *Products:* D×V is a useful means to translate hazard to risk by receptor

Category	Effect	
Precip & Volume	None	RoM FHAD FLOW
Inherent Storage	Moderate Difference in Volume	RoM FHAD FLOW
Routing	Significant Difference in Flow (same volume)	RoM FHAD FLOW
Hydraulics	Significant Difference in Volume (+ inundation)	RoM FHAD FLOW

Compounding Differences between RoM and SWMM

Recommendations

- Include stormwater pipes ≥2 ft and represent key structures with 2D connections; use terrain mods and survey-based bathymetry to streamline modeling without sacrificing accuracy
- Create District-specific H&H guidance, receptor datasets, and a Program Implementation Plan
- Conduct additional testing on other infiltration methods (e.g., Green-Ampt), further assess differences with SWMM, and explore new pipe functionality in HEC-RAS

For more information, contact David Anderson

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