EXPERT WITNESS TESTIMONY

DRAINAGE AND THE NATURE OF WHAT REALLY HAPPENS ☺

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PEOPLE HAVE VALUE

- William Bauer, PhD – Visionary on a large scale
- William Lindley – Instruction in the way of drainage
- V3 Companies – Thank you for a place to practice the science and art of Engineering
- IAFSM – Thank you for the opportunity to present a few thoughts…

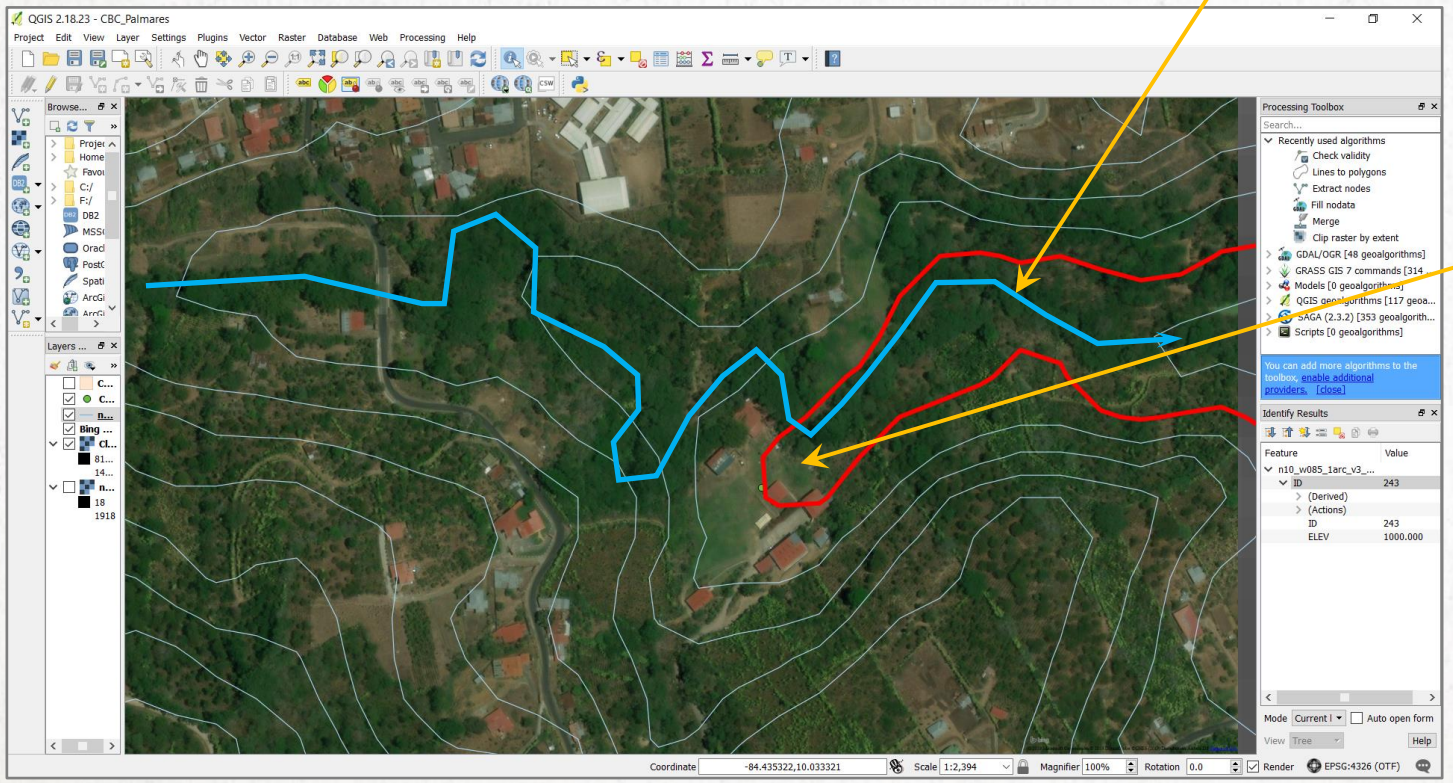
IAFSM
Illinois Association for Floodplain and Stormwater Management

DRAINAGE

SITE SPECIFIC, LOCAL AND REGIONAL

ANSWERING THE QUESTION – TO BUILD OR NOT TO BUILD

- Property in Costa Rica, SRTM Topography



- Regional Drainage = 2 sq.mi., Local Drainage = 136 ac., Soils = Sandy Loam

NATURE OF THE INVESTIGATION

- Site specific drainage for property transfer dispute?
- Floodplain or drainage for condemnation property valuation?
- Local or regional drainage for property damage dispute?
- Site specific, local or regional drainage remediation project?
- What is the cost – Philosophy of Truth in Investigation (Engineer as Neutral)?

ESTABLISH SCOPE – IDENTIFY RESOURCES

- **Site Specific**
  - Site Visits (more preferred, one minimum is required):
    Prepare for site visit, easy to forget, eyes on to give testimony
  - Approvals and co-ordination – Attorney to arrange site access and should be present if contentious ($$$ will likely dictate meeting or site attendance)
  - Photographs – more is better than less (bring a story pole – old survey rod preferred for me, I often use the rod for walking / balancing stick ☺)
  - Measurements – Site survey, Level Survey, Hand or 4-foot Level, Soil Character
  - Tools – Tape Measure, Chaining Pin, Manhole Hook (don't break the plane), Appropriate Attire (safety – gloves, snow cleats)

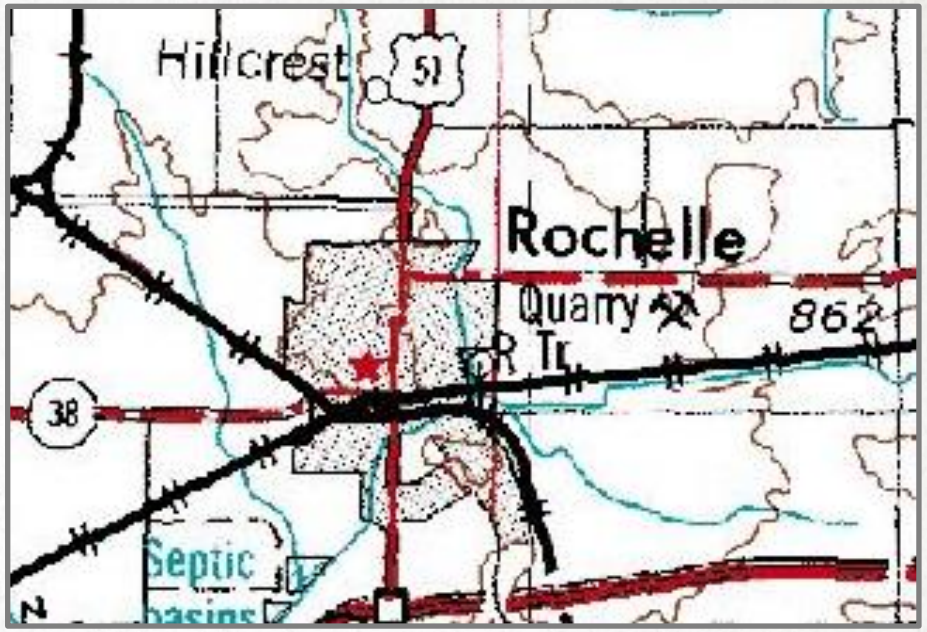
  - Recording Device – That is, note-taking or sometimes video recording of water movement (not tape-recording of individuals, although the owner may wish to video record activity)
  - Site Specific Reports – Property Inspections, Plats, Plans (Architect, Engineer, etc.)
  - Detailing Information – Construction Techniques, Time-Relevant data (Standard of Care)

ESTABLISH SCOPE – IDENTIFY RESOURCES

- **Local**
  - Site Visits (more than one is preferred, one minimum is required): Prepare for site visit, easy to forget, eyes on to give testimony
  - Photographs – more is better than less (again, bring a story pole)
  - Aerial and Street views – Planimetric or corridor characteristics
  - Measurements – Local survey, Local GIS Platform (aerial views, infrared, topography, soils, land use)
  - Hydrologic and Hydraulic background data – USGS, CCPN, Wunderground (confirm) Precipitation, USGS Stream Gages, Well Data (ISGS)
  - Local Media sources – Papers, Magazines and on-line Patch, etc.
  - Local Drainage Reports, investigations – ISWS reports on significant storms affecting local context, subdivision drainage plats and plans, stormwater management reports

ESTABLISH SCOPE – IDENTIFY RESOURCES

- **Regional**
  - Site Visits (Sometimes may be important, depending on scope of investigation)
  - Photographs – more is better than less (again, bring a story pole)
  - Aerial and Street views – Planimetric or corridor characteristics
  - Measurements – Regional GIS Platform (aerial views, infrared, topography, soils, land use)

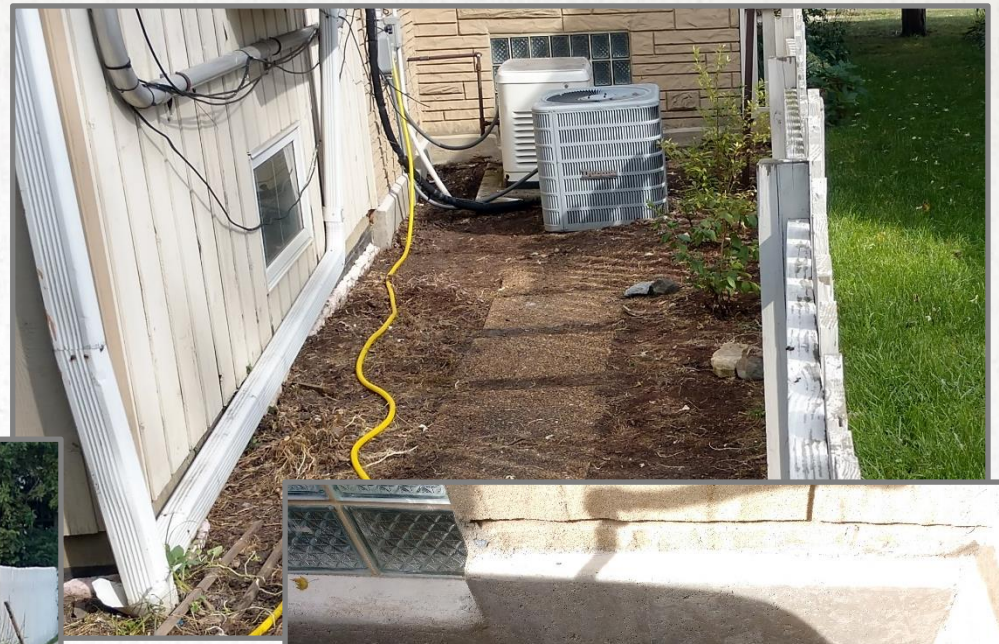


  - Hydrologic and Hydraulic background data – USGS, CCPN, and/or Wunderground (confirm) Precipitation, USGS Stream Gages, Well Data (ISGS), FEMA FIRM and FIS information, NEH
  - Geologic, Soils and Groundwater data – USGS, NRCS and ISGS
  - Agency Reports – USGS Stream Characteristics, ISWS Circulars on significant storms affecting local context

SITE SPECIFIC EXAMPLE

- Potential for Water Presence - External

Look for low elevations adjacent structure



The “Garden Hose” test

SITE SPECIFIC EXAMPLE

- Potential for Water Presence - Internal

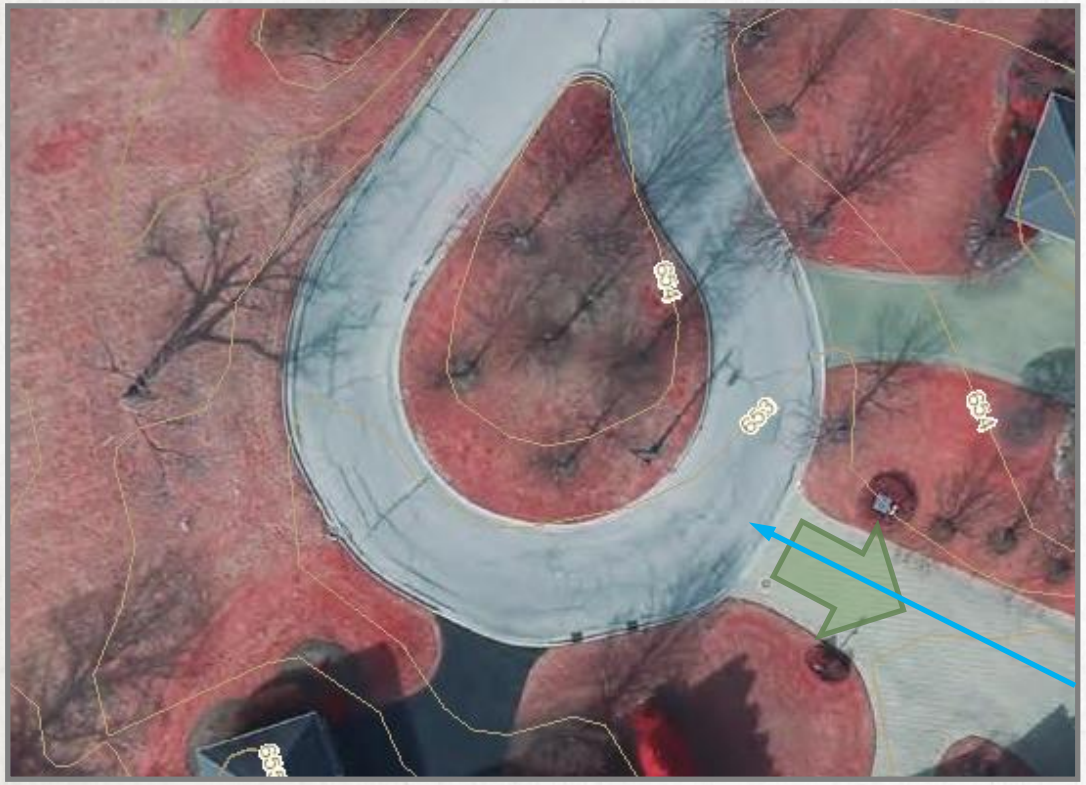
Interior wall modifications

The “Garden Hose” test result – water penetration

Note storm event water penetration through failed joint or tie

LOCAL EXAMPLES

- Likely Water Routes to Site, System Deficiencies



The joys of depressed driveways

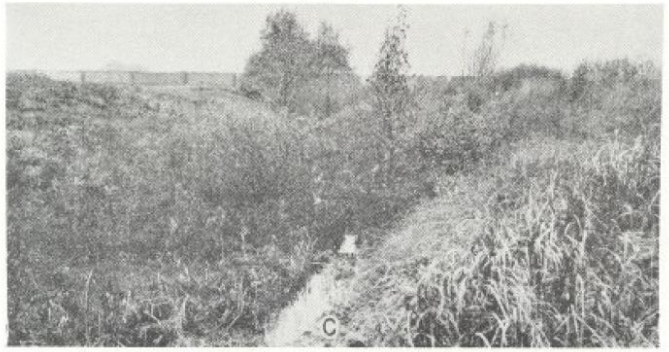
Chasing water depths

LOCAL EXAMPLES

- Character of Stream Corridor Resistance to Flow – Use lots of references

Character of stream corridor near damage location

Stewart Branch Dredged Channel near Champaign, Illinois. Approximate bottom width 15 feet. Picture taken October 1926.



Date of observation	Average maximum depth	Average surface width	Discharge	Average cross section	Mean velocity	Mean hydraulic radius	Slope of water surface	Coefficient of roughness n	Description of channel
Sept. 30, 1926	2.3	17.0	12.4	19.2	0.65	1.06	0.003169	0.106	*Course*, crooked; 360 feet long. *Cross section*, considerable variation in shape; for variation in size, see fig. 20, M. *Side slopes*, irregular. *Bottom*, very irregular. *Soil*, lower part, dark gray clay with some sand and pebbles; upper part, dark gray silty clay loam. *Condition*, slopes covered with dense growth of tall weeds, bushes, and wiry grass; occasional bushy willows, and trees 6 to 9 inches in diameter; bottom very grassy, except narrow winding strip. *Constructed*, about 1890. (Pl. 28, C and fig. 19, M.)
Oct. 3, 1925	2.5	17.8	16.7	23.6	.71	1.23	.003406	.114	
Sept. 13, 1925	2.8	18.6	21.1	28.4	.74	1.41	.003422	.122	
Sept. 4, 1926	3.6	20.5	34.4	44.2	.78	1.96	.003131	.149	
Sept. 9, 1926	3.7	20.8	43.2	46.5	.93	2.02	.002956	.125	
	[1] 7.5								

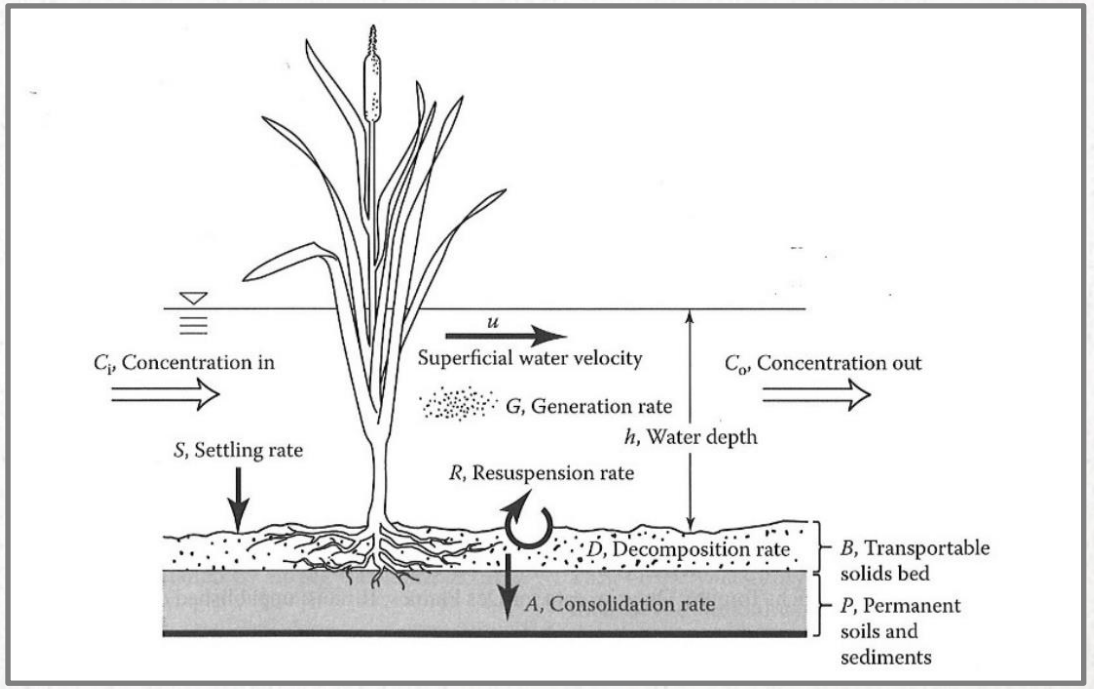
[1] Average maximum depth at bankful stage.

Character of stream corridor reference reach – Guy B. Fasken

LOCAL EXAMPLES

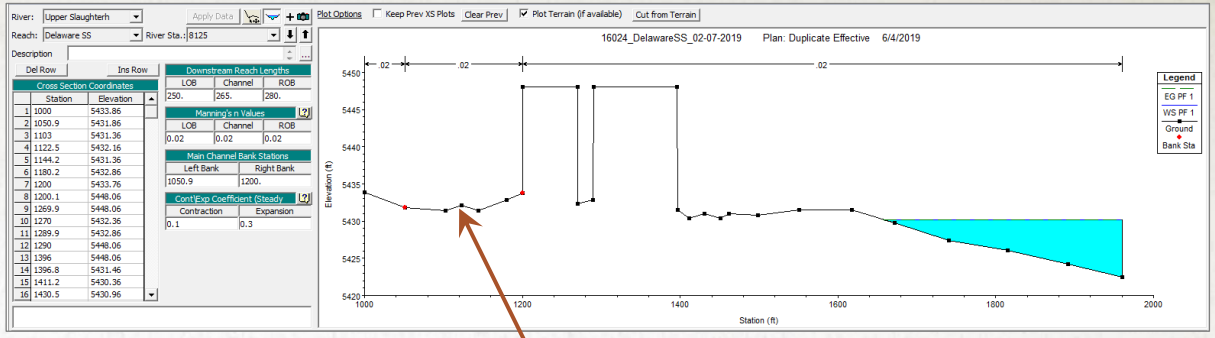
- Character of Stream Corridor Potential Sediment/Vegetation Accumulation – Did I mention use lots of references (protect your opinion)?

Downstream vegetation – shallow flow depth



Suspendable Material in Wetlands (from Kadlec, et al, Figure 7.14, pg. 217)

HEC-2 Conversion

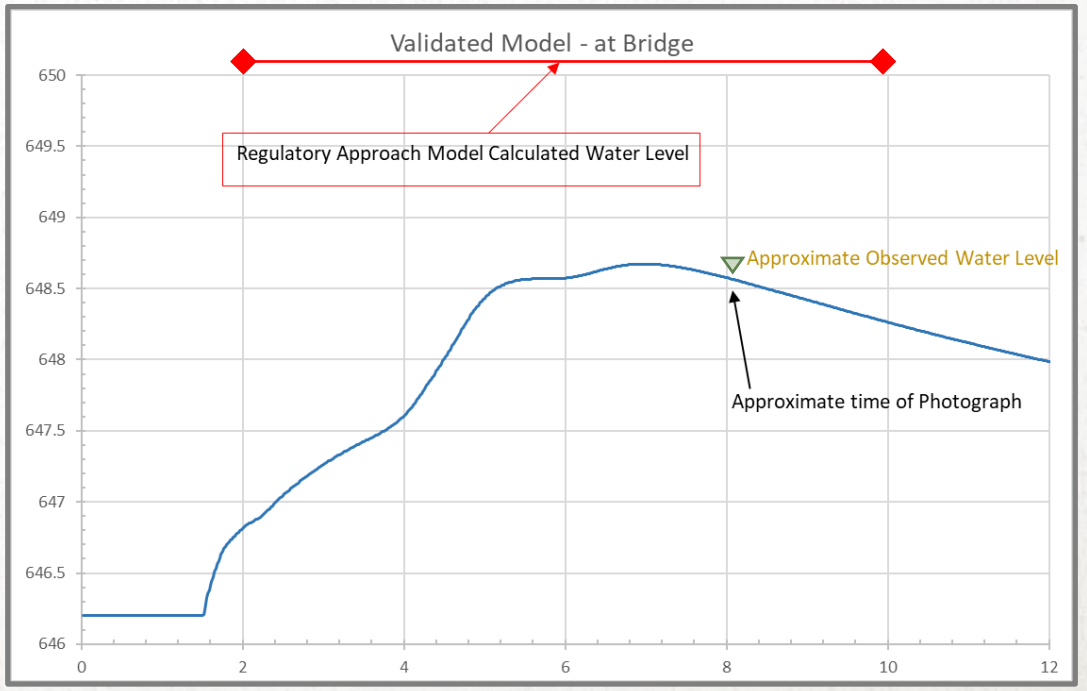


LOCAL EXAMPLES

- Nature of Stream Model Calibration and Validation
  - Regulatory Approach to Legal Challenge – How high will water get using Agency based drivers?
  - Scientific Approach to Legal Challenge – How does system historically behave?

Urban Stream (Street Flow)

Large Magnitude Storm at Bridge Location



COMPREHENSIVE EXAMPLE – RESIDENTIAL

- Character of Complaint
  - Residential Flooding – Insurance should cover first floor damage as well as basement, owner no longer protected by flood insurance due to repetitive loss claims

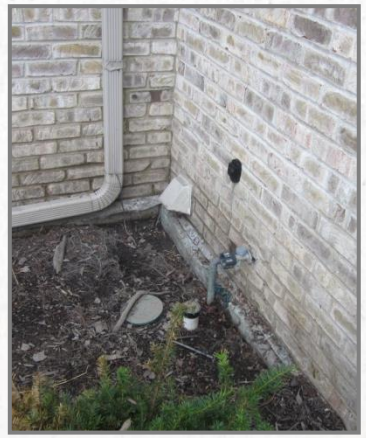
Sill Joint Failure at TF

- Site Specific Considerations
  - Sump Pumps, Footer Drain Tile, Basement Volume, Soil Characteristics (probable seepage rate), Window Wells, TF Elevation, Sill Plate, Wall Penetrations (venting), Door Protection

Pump and Tile

Wall Cracks

Sill Plate Gap, Fiberglass



Vent Penetration

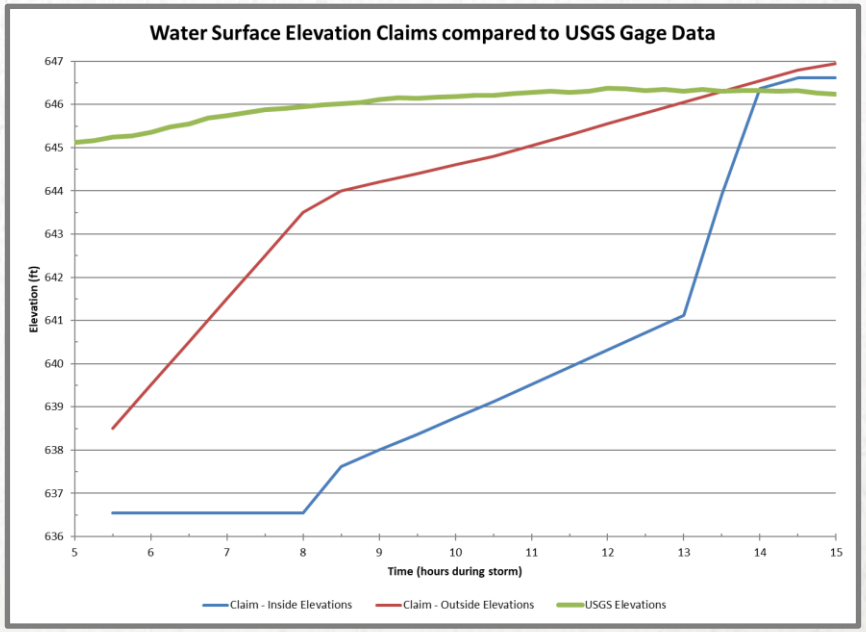
Exterior Doors

Window Well Wall Junction

COMPREHENSIVE EXAMPLE – RESIDENTIAL

- Local and Regional Considerations
  - Local topography allowed ponding and connection to nearby stream (yard inlets and storm sewer)
  - Regional stream evaluated using upstream and downstream USGS gages
    - Tie stream elevations to local elevations and site specific topography to establish damage elevation

Local flood impact along nearby roadway



Regional stream elevation comparison

QUESTIONS

HAVE A SAFE TRIP HOME…

IAFSM

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