Flood Study of Welch Creek and Big Rock Creek Kane County Illinois

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ILLINOIS

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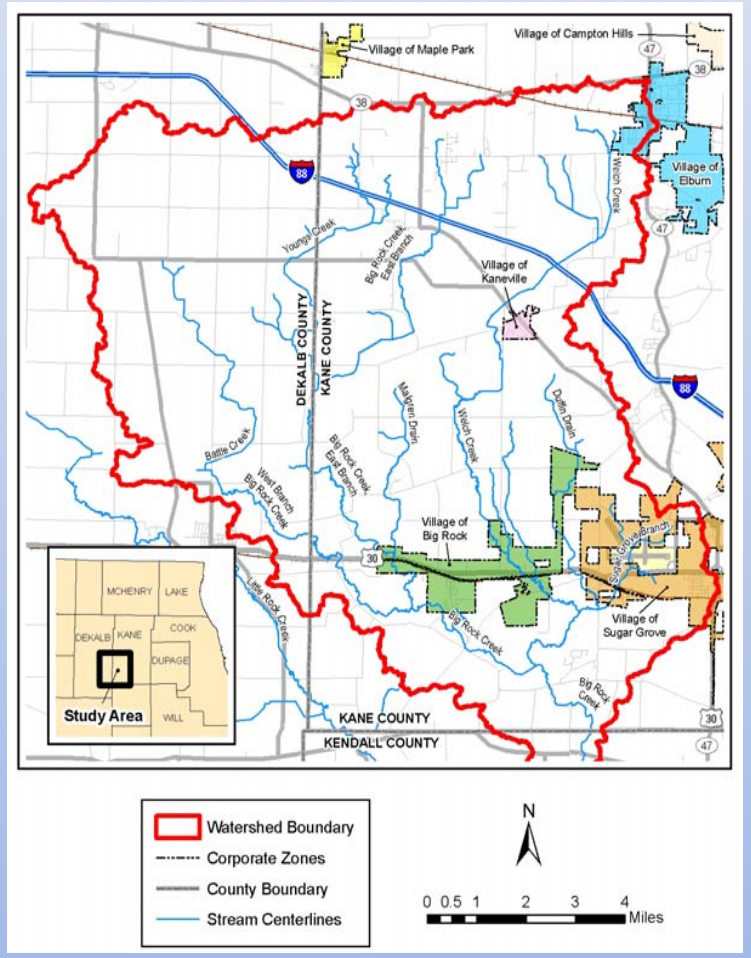
Illinois State Water Survey

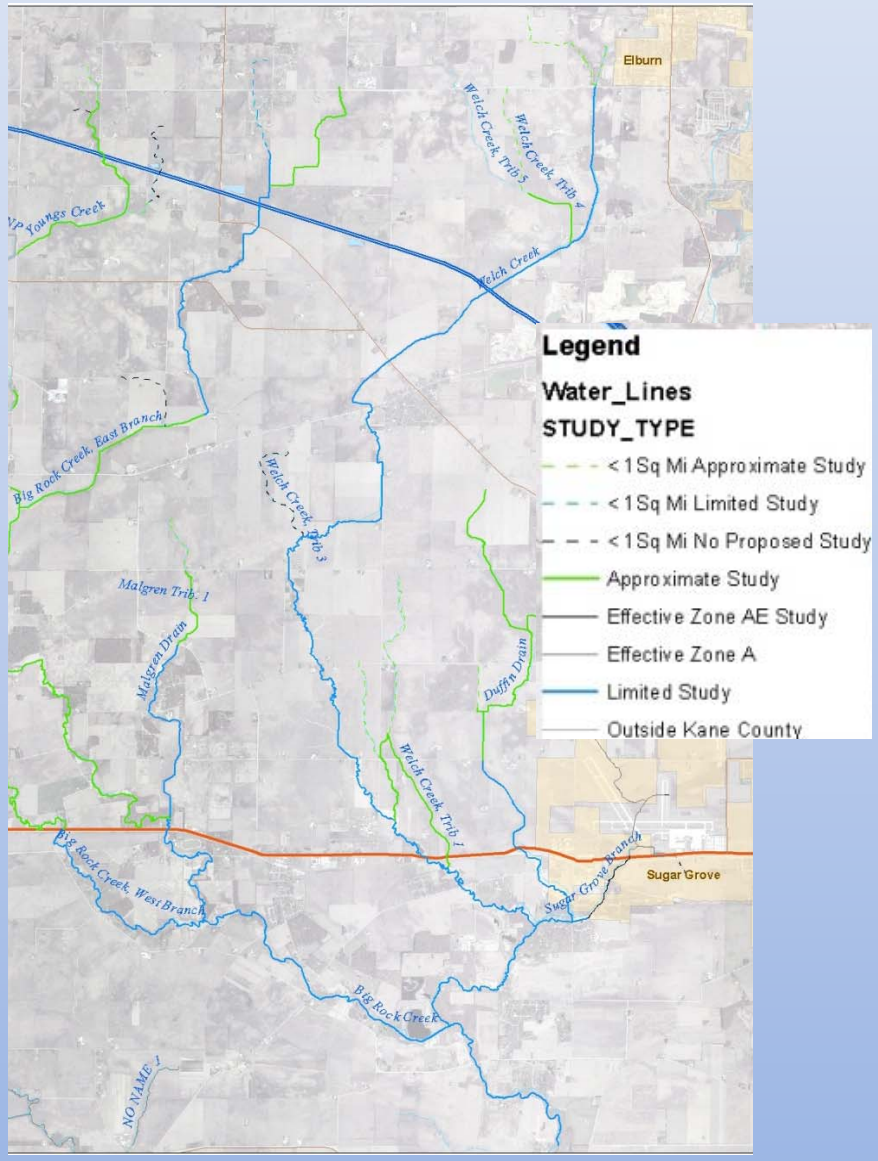
Project Overview

- Project Goal
  - Define flood hazards for use for floodplain management and to update the effective floodplain maps
- Proposed Study
  - Use limited detail and approximate study levels to increase stream miles analyzed

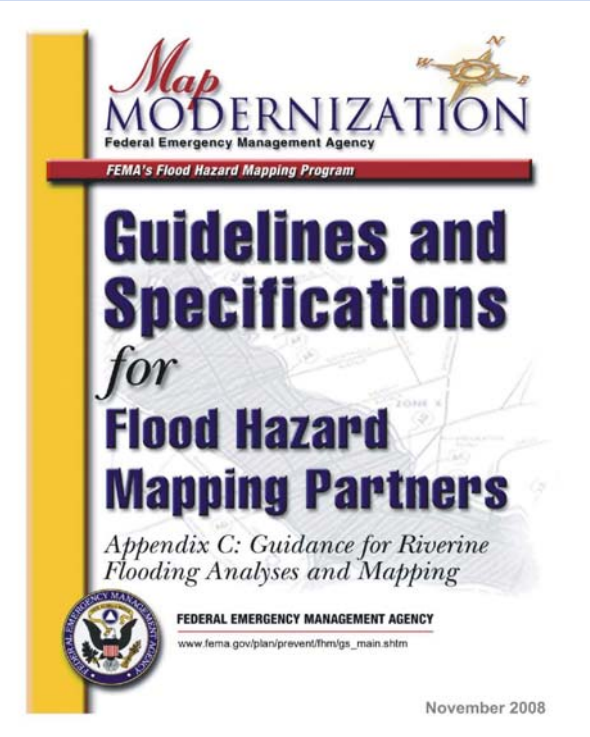


Project Overview

- Field Data Collection
- Hydrology Analysis
  - HEC-HMS model of 108 sq. mile watershed
- Hydraulic Analysis
  - HEC-RAS steady model
  - 38 stream miles of Limited Detail study
  - 30 stream miles of Approximate study
- FEMA Submittal Package
  - Pending OWR review

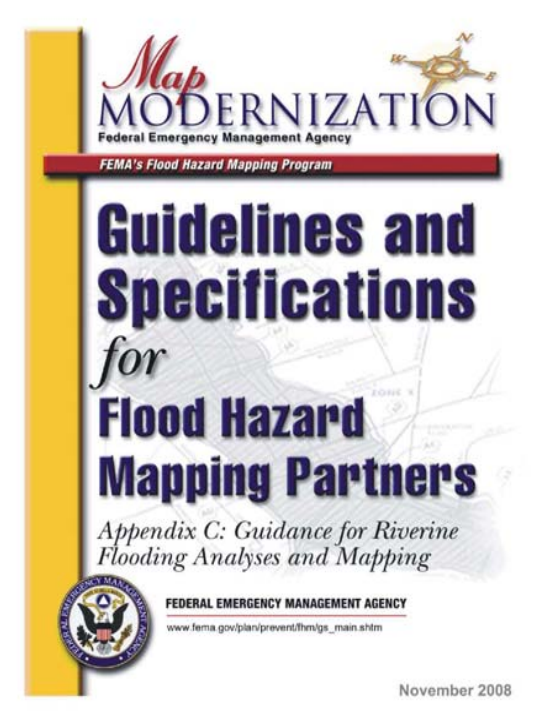


Hydraulic Level of Study
DRAFT FEMA Input Data Requirements



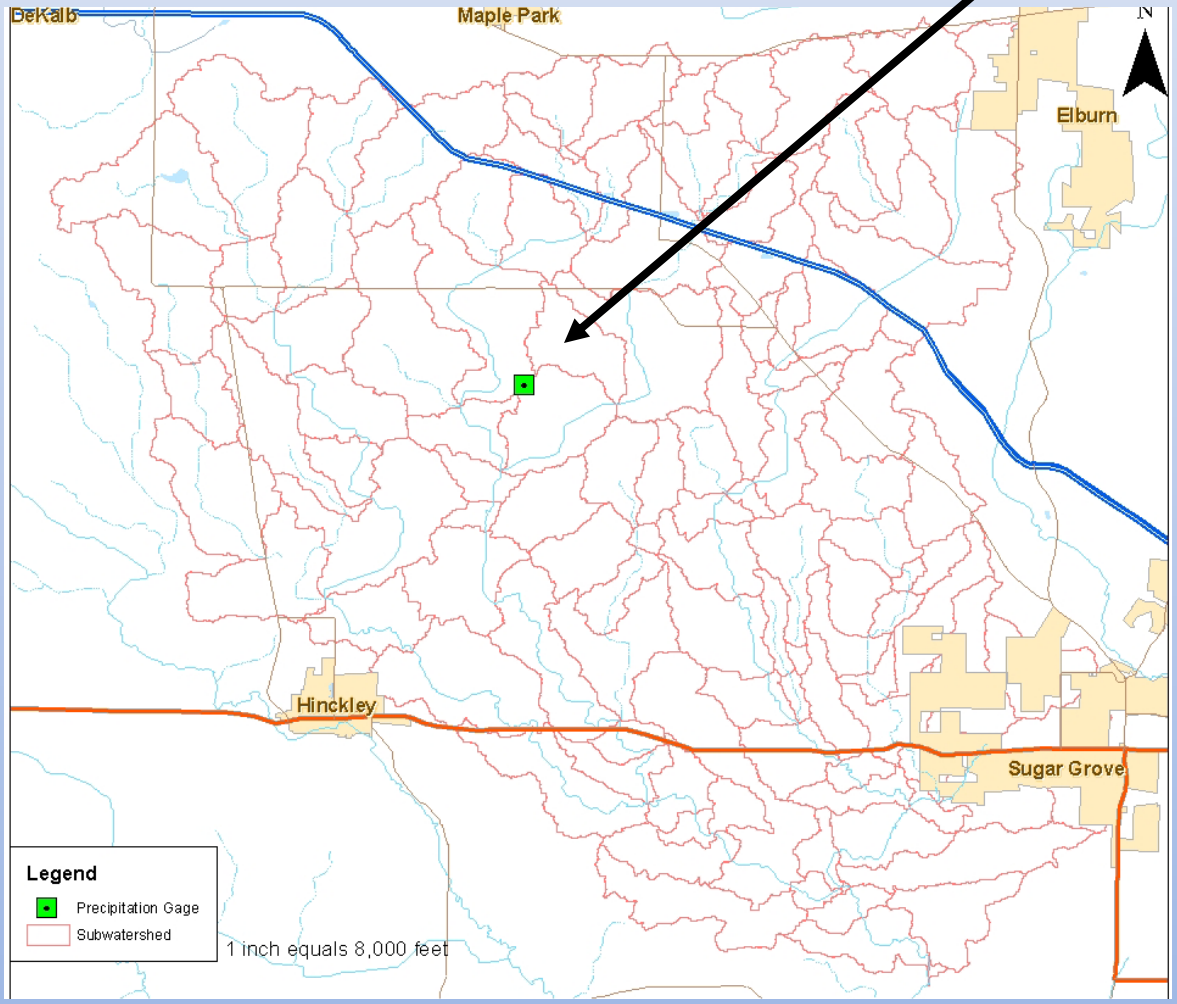
- Limited Detail Study
  - Base flood elevations are estimated using a hydraulic model but cross section data can come from topography (lidar or photgrametrically derived)
  - Structure data can come from field measurements or as-built plans
- Approximate Study
  - Base flood elevations are estimated normal depth calculations or similar calculation with no structure modeling

Hydraulic Level of Study
DRAFT FEMA Products

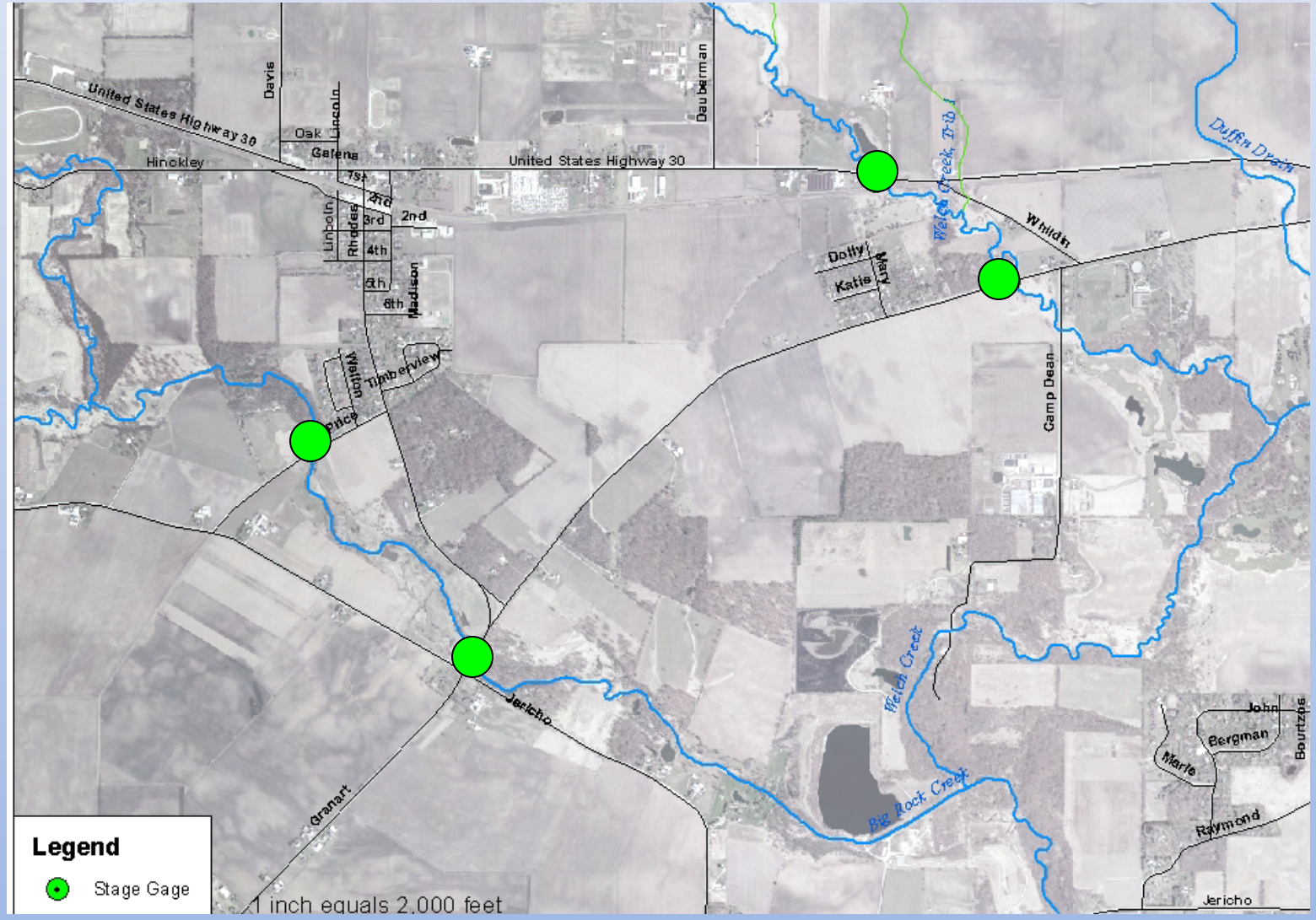


- Limited Detail Study
  - Placement of BFEs on maps and in FIS (profiles, and discharges) is based on joint agreement from FEMA, state, community. Floodway data table and cross sections are not addressed in draft.
- Approximate Study
  - Zone A floodplains.
  - Neither BFEs or discharges are published

Precipitation Gage Location



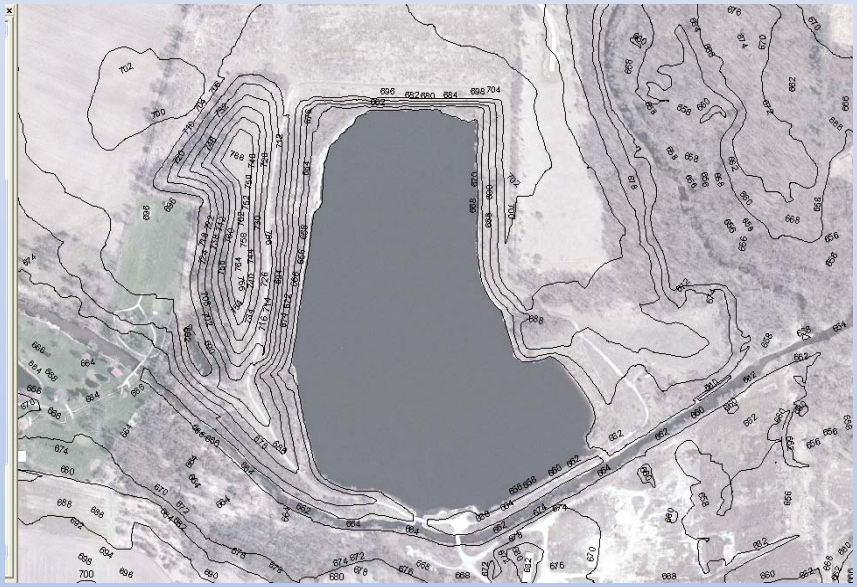
Stream Gage Locations

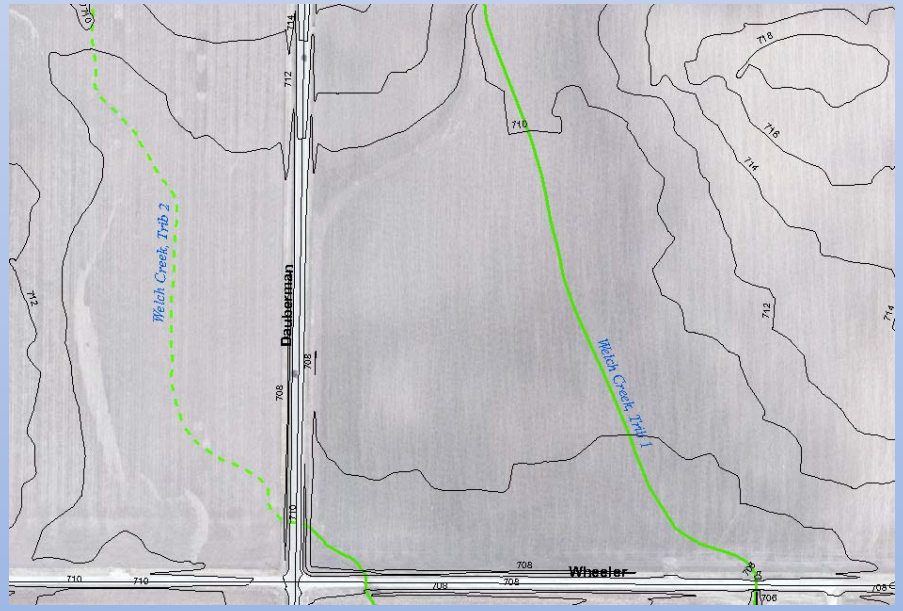


Precipitation Events Recorded

Precipitation Events			
Time Period	Duration	Total Precipitation	Corresponding Bullentin 70 % annual chance event
September 12, 1:00pm to September 14, 1:45pm	48.75hrs	8.24"	approximately 100 year event (1% annual chance event)
September 4, 5:15am to September 4, 9:45pm	16.5 hrs	2.88"	approximately 2 year event (50% annual chance event)
July 12, 5:15am to July 12, 8:15am	3 hrs	2.54"	approximately 7 year event (14.3 % annual chance event)
May 11, 1:00am to May 11, 11:00am	10 hrs	2.19"	approximately 2 year event (50% annual chance event)

Identified Issues for Future Detailed Study





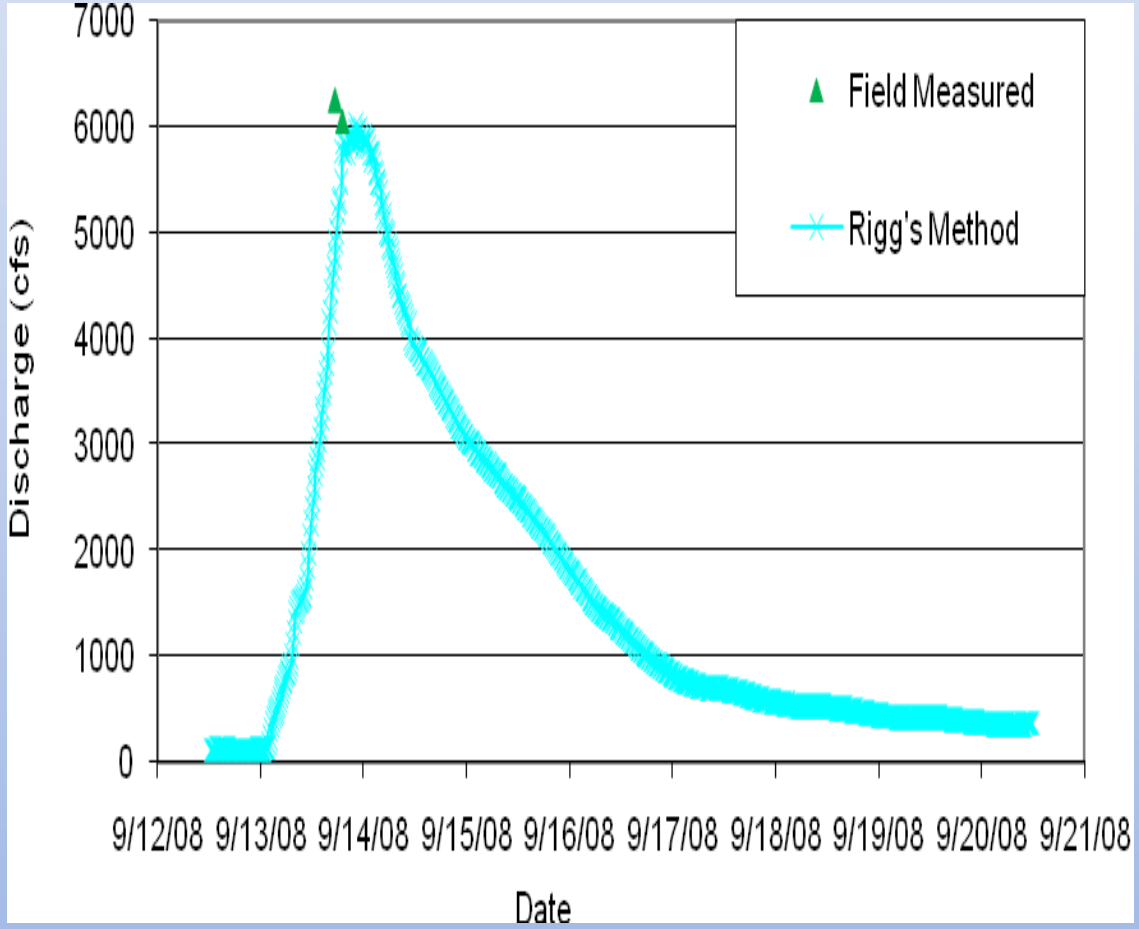
Hydrologic Model
HEC-HMS Model Input

Hydrologic Model Method	Source Data
Subbains	Automated using GeoHMS with Digital Elevation Model (DEM)
SCS CN Loss Method	Used ArcCN with Land Cover of Illinois 2000 and STATSGO Soil data to determine AMC II values
Clark Transformation Coefficients	Calculated initial input values using USGS 2000 Clark Unit Hydrogrpah parameter equations
Muskingham Cunge and Modified Puls Routing	Modified Puls rating curves calculated using HEC-RAS model. Geometric values from DEM.

- Further details available upon request

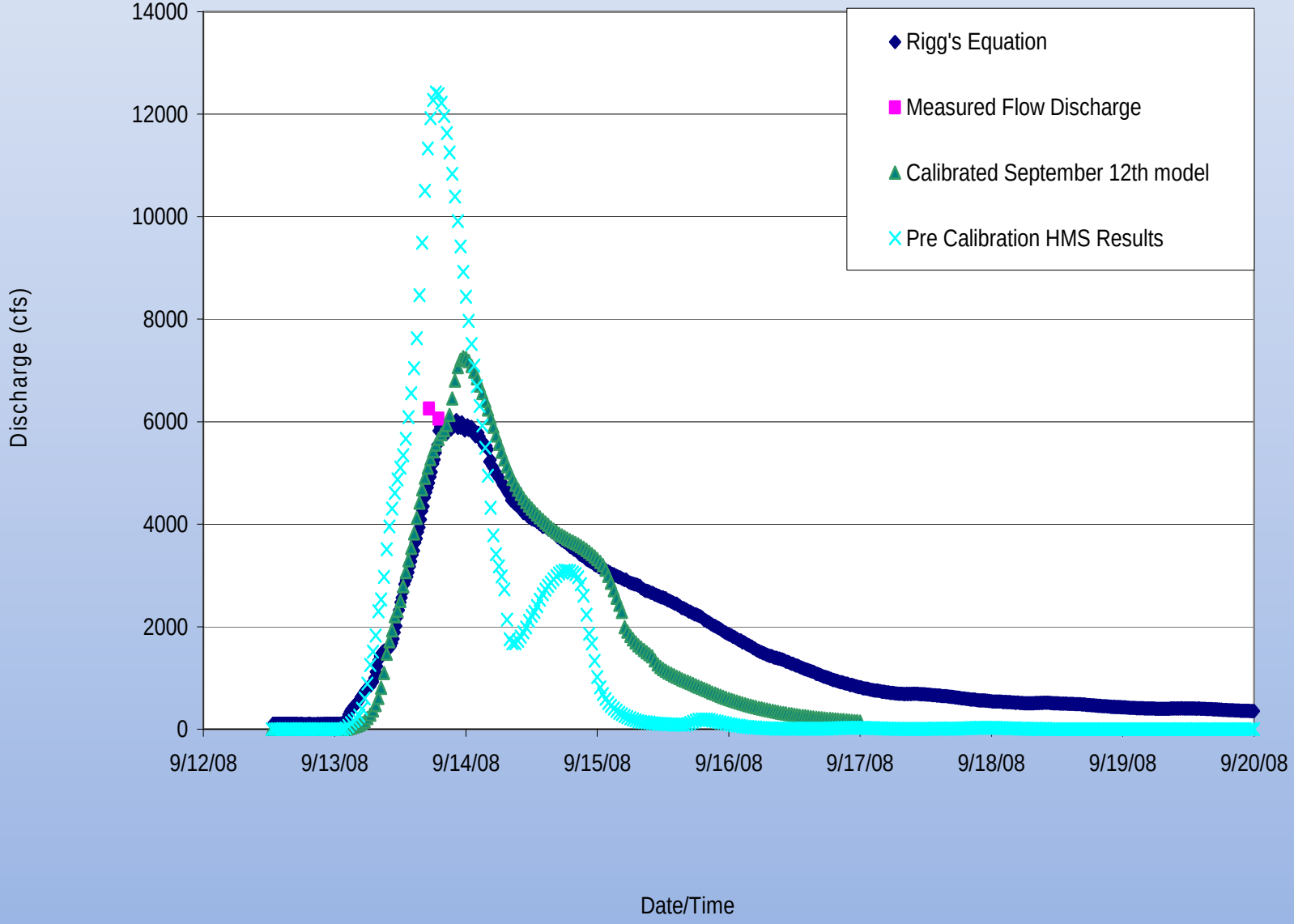
Hydrologic Model
Calibration

- Rigg's Method used to calculate discharges based on field stage measurements.
- Two field discharge measurement taken on Big Rock Creek near stage peak of calibration event



Hydrologic Model

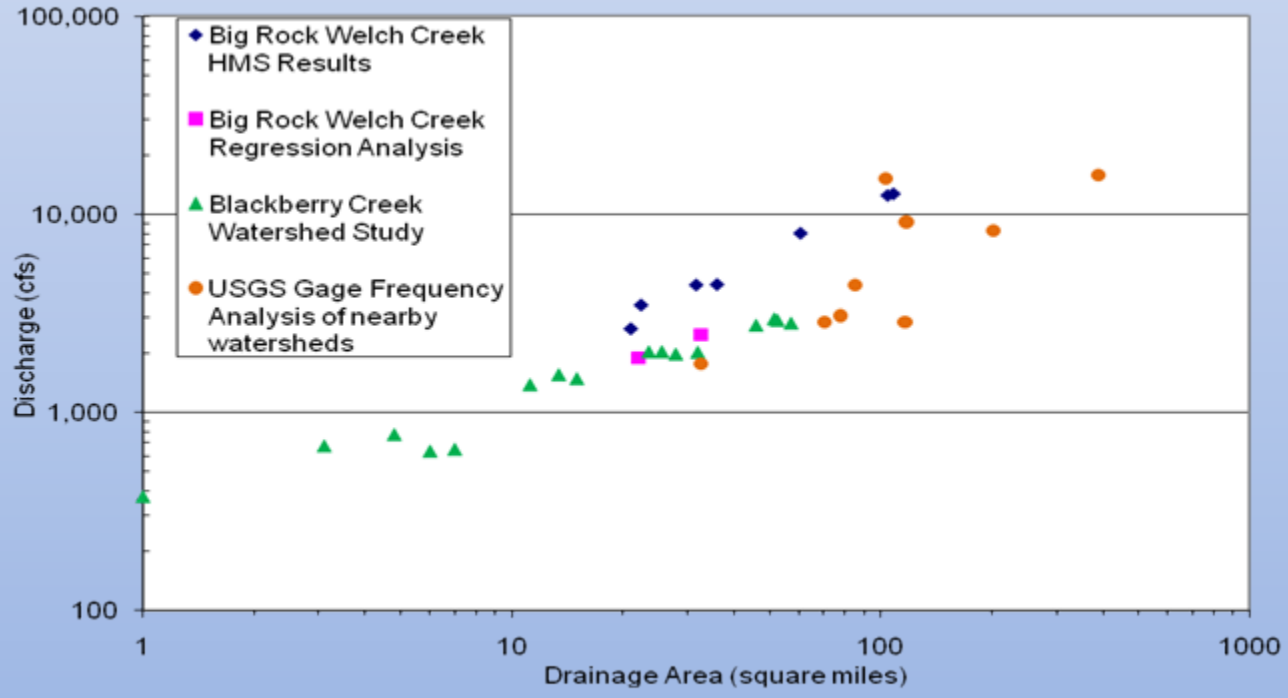
Calibration



Hydrologic Model

One Percent Annual Chance Discharge

- Critical Duration Analysis
  - Huff Distribution
  - Bulletin 70 Rainfall



Hydraulic Model

HEC-RAS Model Input

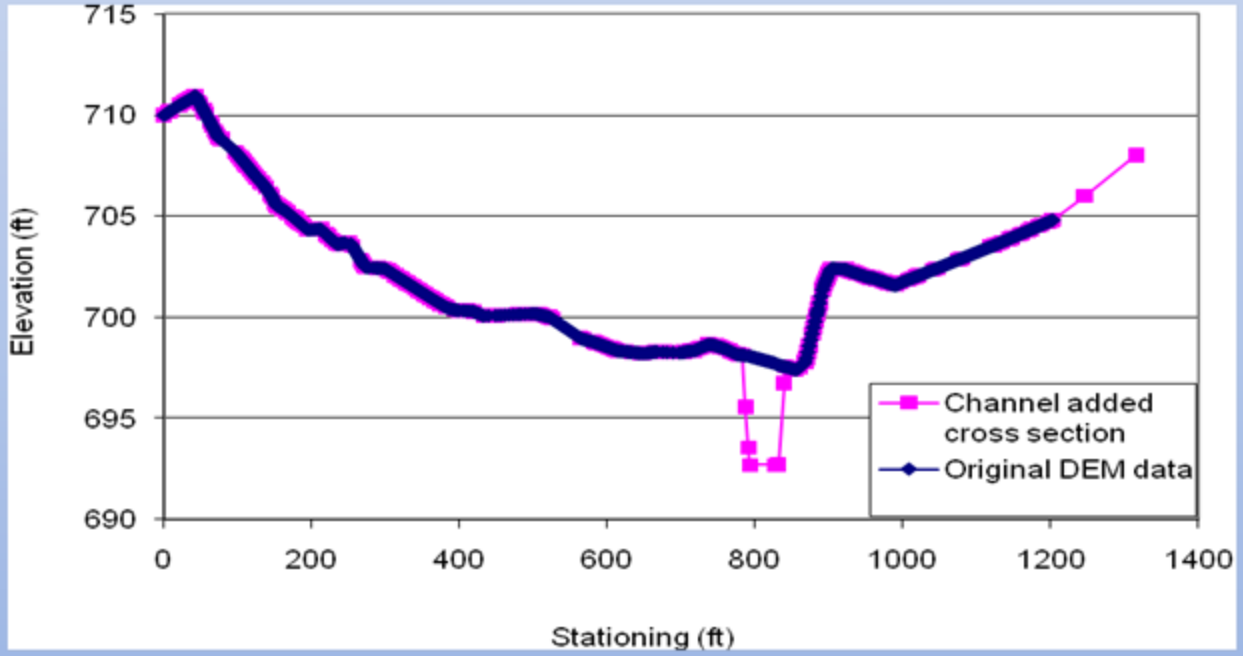
	Limited Detail - RAS	**Approximate- RAS**
Cross sections	LiDAR/surveying/Kane contours with engineering review	automated using DEM from contours
Manning’s	Engineering review	Automated calculation using Manning's n associated with the land cover
Bridges	Surveyed/Plans/Field Measurements	None
Ineffective flow areas	Engineer calculation at bridges, engineering review for each stream.	No bridge ineffective flow areas, engineering review for each stream.

- Further details available upon request

Hydraulic Model

HEC-RAS Model Input

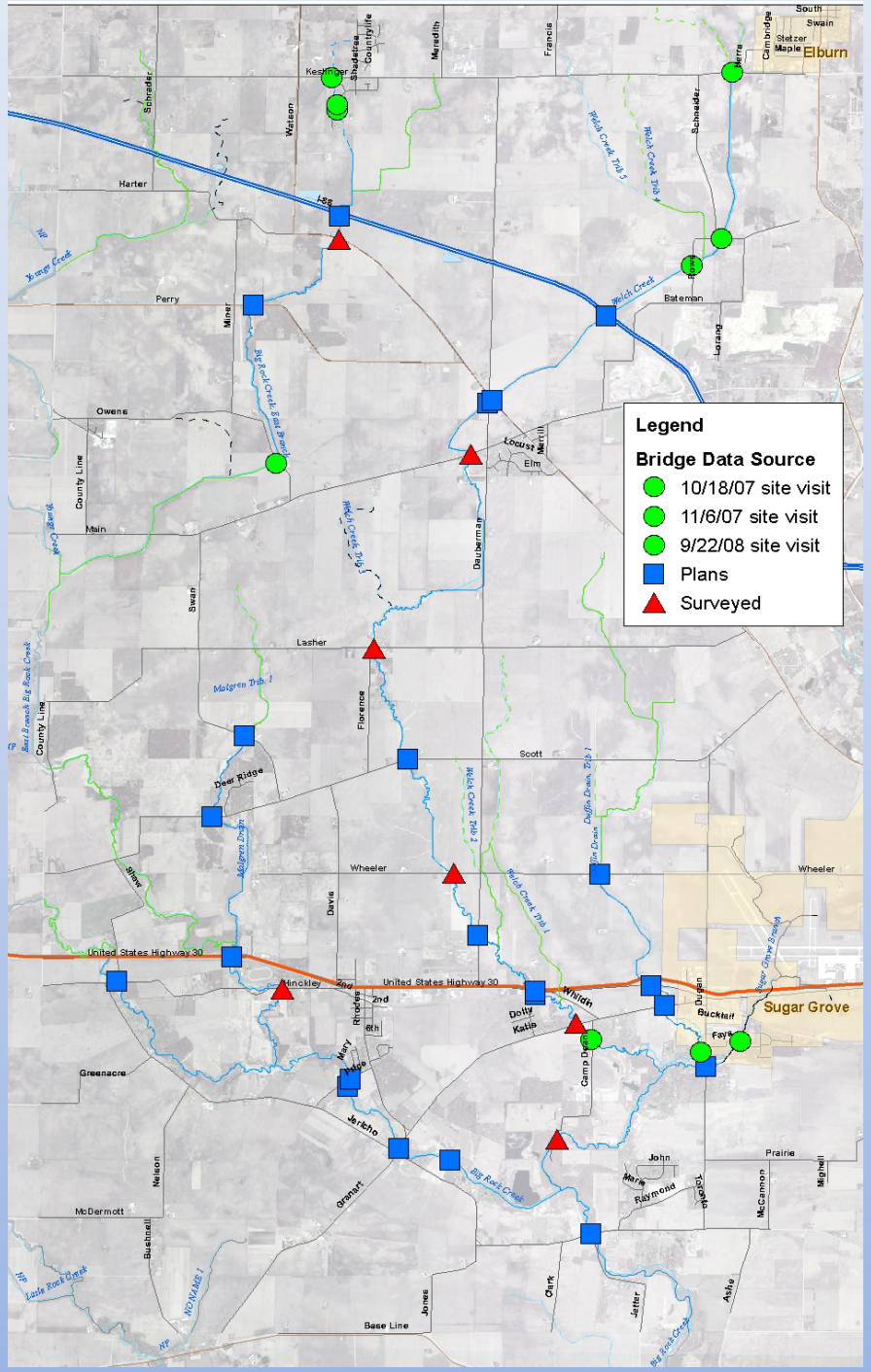
- Limited Detail Cross Section Data
  - Insert channel into topography.
- Approximate Cross Section Data
  - No channel insert. Use data “as is”.



Hydraulic Model

Limited Detail Structure Data

- Bridge and culvert measurements in the field
- IDNR/OWR performed site surveys.



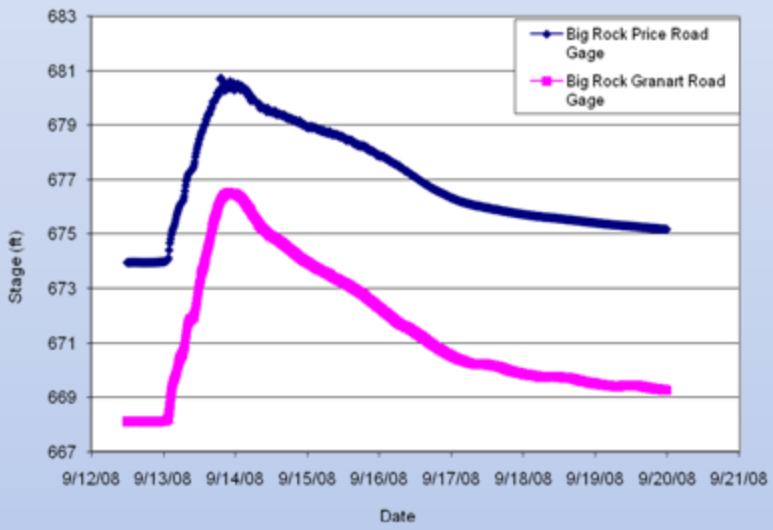
Hydraulic Model

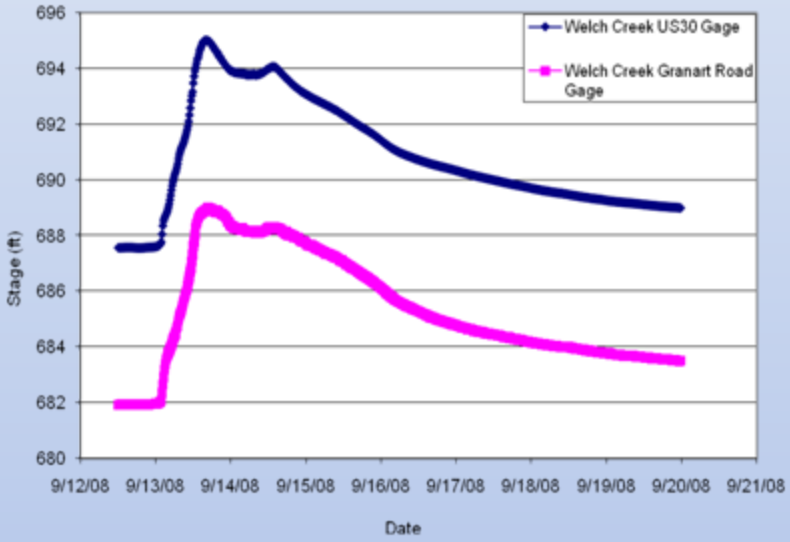
Limited Detail Structure Data

21 Field measurements
28 Bridge data from plans
7 Surveyed bridges

Hydraulic Model

Calibration





- Model calibrated to September event
- Also held public meeting to compare calibrated model to observed event

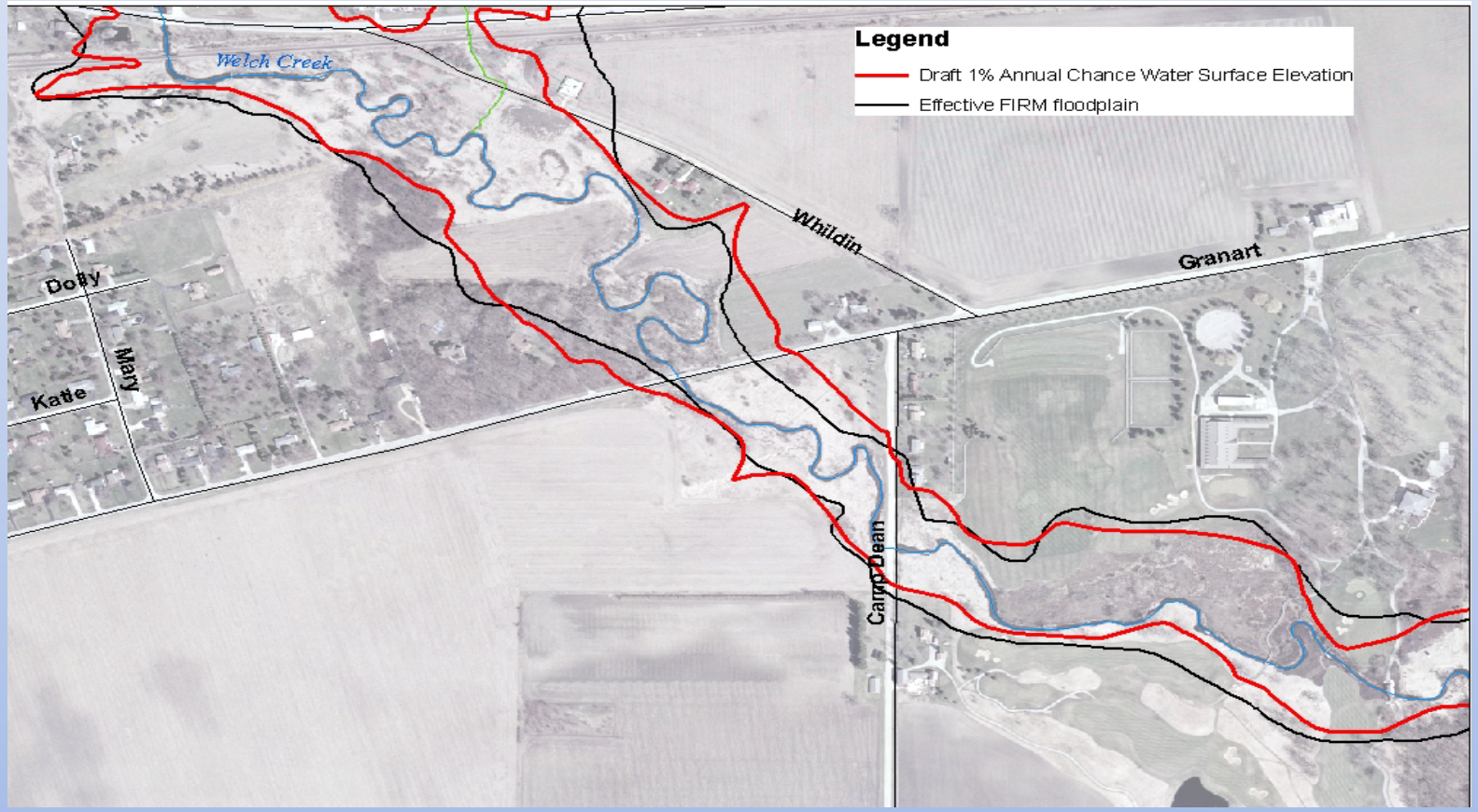
Hydraulic Model

Calibration Results

Stream	*Location*	*Gage data (feet)*	*Model results (feet)*
Big Rock Creek	Price Road	680.72	682.68
Big Rock Creek	Granart Road	676.53	676.34
Welch Creek	U.S. 30	695.0	695.1
Welch Creek	Granart Road	689.0	689.45

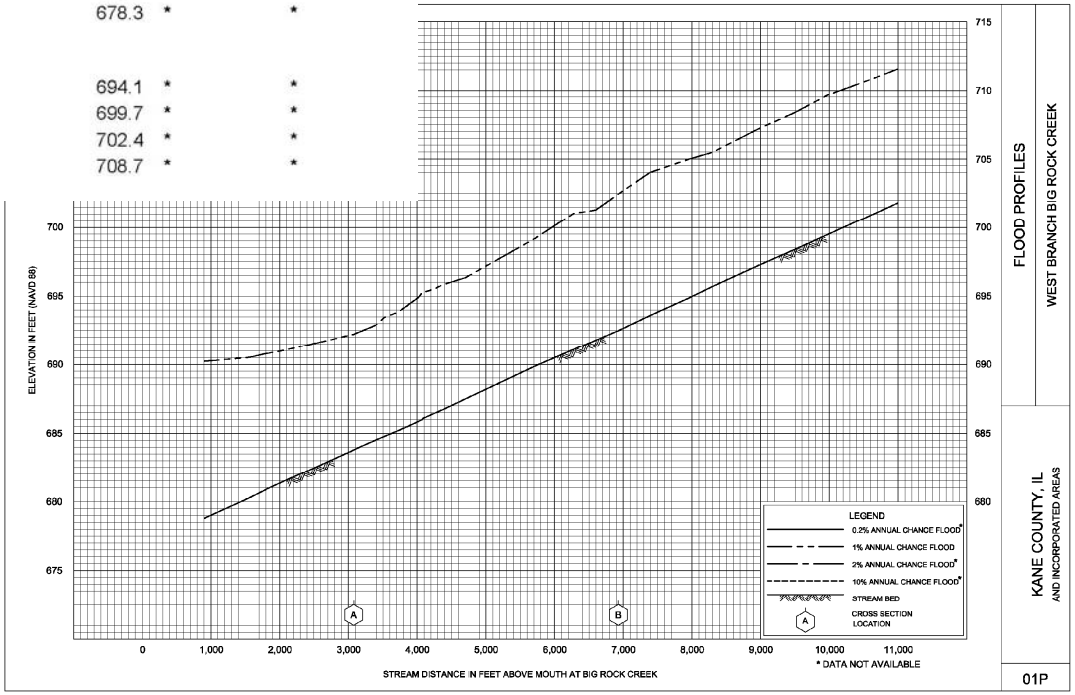
Hydraulic Model

1% Annual Chance Floodplain

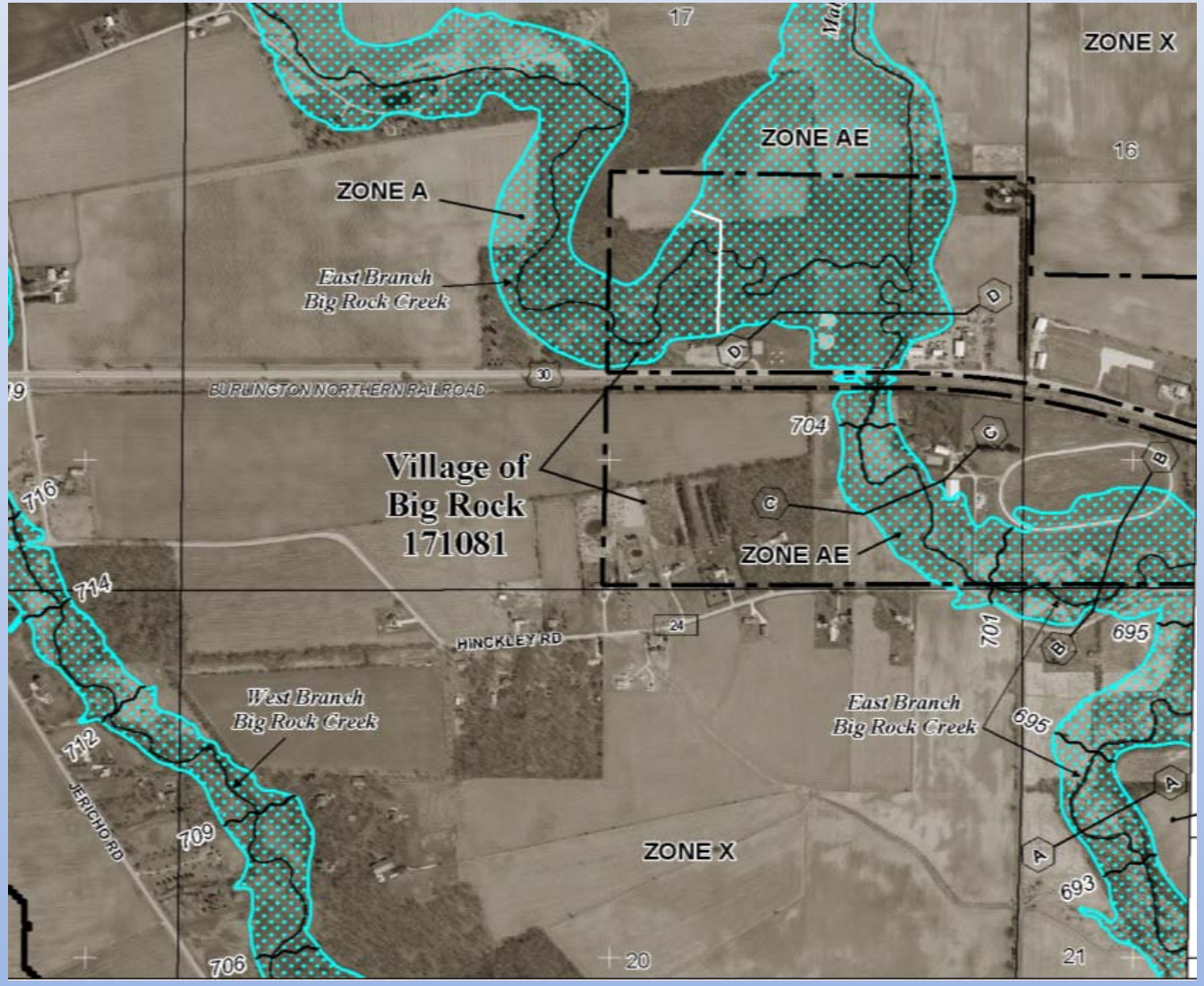


Limited Detail Proposed FIS Data

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Big Rock Creek								
A[1]		*	*	*	*	658.2	*	*
B[1]		*	*	*	*	665.3	*	*
C[1]		*	*	*	*	672.8	*	*
D[1]		*	*	*	*	678.3	*	*
Big Rock Creek, East Branch								
A[2]		*	*	*	*	694.1	*	*
B[2]		*	*	*	*	699.7	*	*
C[2]		*	*	*	*	702.4	*	*
D[2]		*	*	*	*	708.7	*	*



Proposed Mapping



Questions????