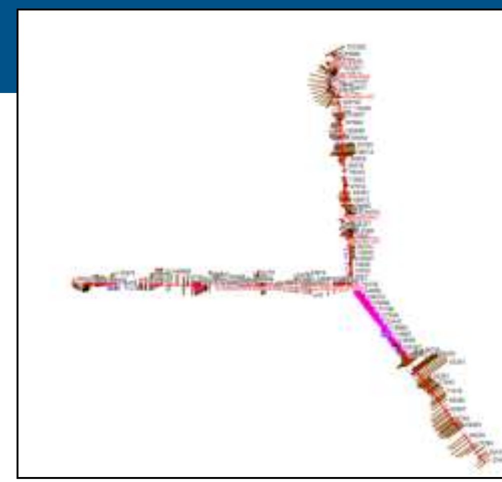
Upper Trinity River Corridor Development Certificate Model Updates

Flood Management Task Force Meeting
April 20, 2018



RiskMAP
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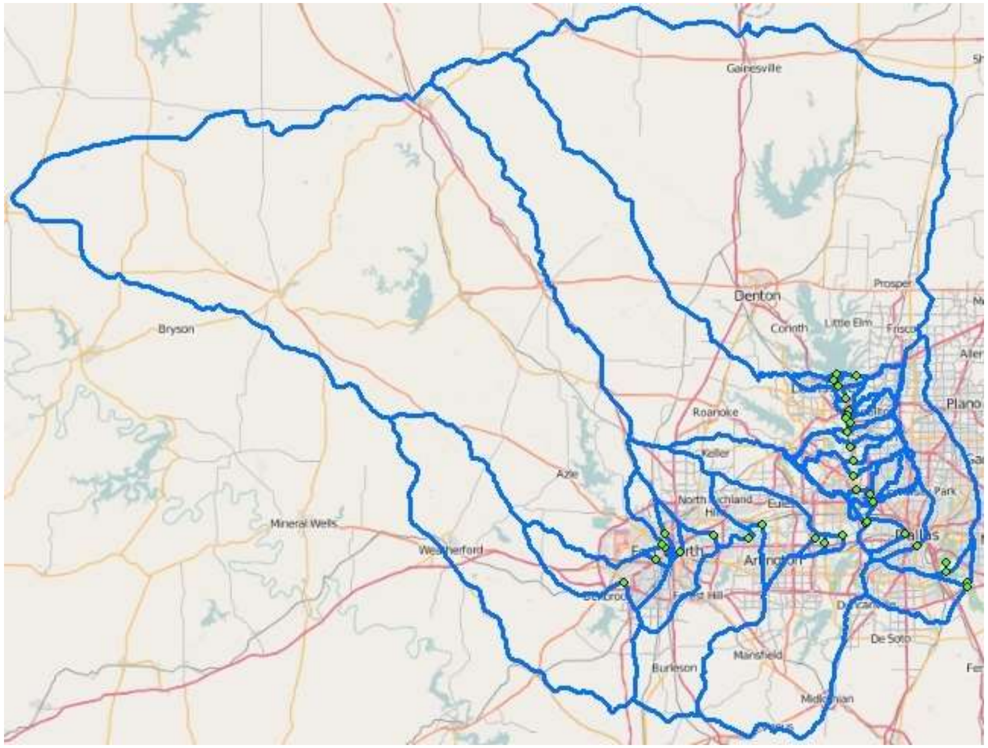
Agenda

- Review of the Phase II – Upper Trinity Watershed CDC Model Development
  - Hydrology
  - Georeferencing and Hydraulics
  - Floodplain Mapping
- Flood Risk Review Meeting Comments and Responses
- Next Steps : FIRM Update Timeline

What was done? Hydrology

- Received HEC-HMS models for the Upper Trinity dated 2012 & model for the Elm Fork Trinity dated 2012 both with 2005 landuse data. RAMPP reviewed USACE model and coordinated with USACE on methods
- RAMPP delivered the CDC Hydrology package using FEMA standards and specifications to the Mapping Information Platform (MIP)



Special Considerations Hydrology

- There were two HEC-HMS models used. One model for Lower West Fork Trinity, Clear Fork, and Upper Trinity River and one for the Elm Fork Trinity
- For both the Clear Fork and Elm Fork downstream of the large dams, there are controlled releases whose discharges supersede that of the local rainfall runoff.
- Local rainfall runoff discharges from the HEC-HMS model are used upstream to the point in which the Lake discharges become dominant.

Hydrologic Methods used in the CDC Model Update

River	Reach	HEC-HMS Model	Frequency Rainfall
Clear Fork	All	Upper Trinity	Uniform
West Fork	Above Clear Fork	Upper Trinity	Eagle Mountain Centering
West Fork	Below Clear Fork	Upper Trinity	Walker Branch Centering
Elm Fork	All	Elm Fork Detailed	Uniform
Trinity River	All	Upper Trinity	Walker Branch Centering

Table 1 – Lewisville Lake Dam Discharges

Average Return Period (years)	Annual Chance Exceedance	Peak Outflows from Lewisville Lake	Outflow Type
2	50%	5,500	Main Gates
5	20%	7,000	Main Gates
10	10%	7,000	Main Gates
25	4%	7,000	Main Gates
50	2%	10,200	Spillway
100	1%	21,000	Spillway
500	0.20%	57,000	Spillway

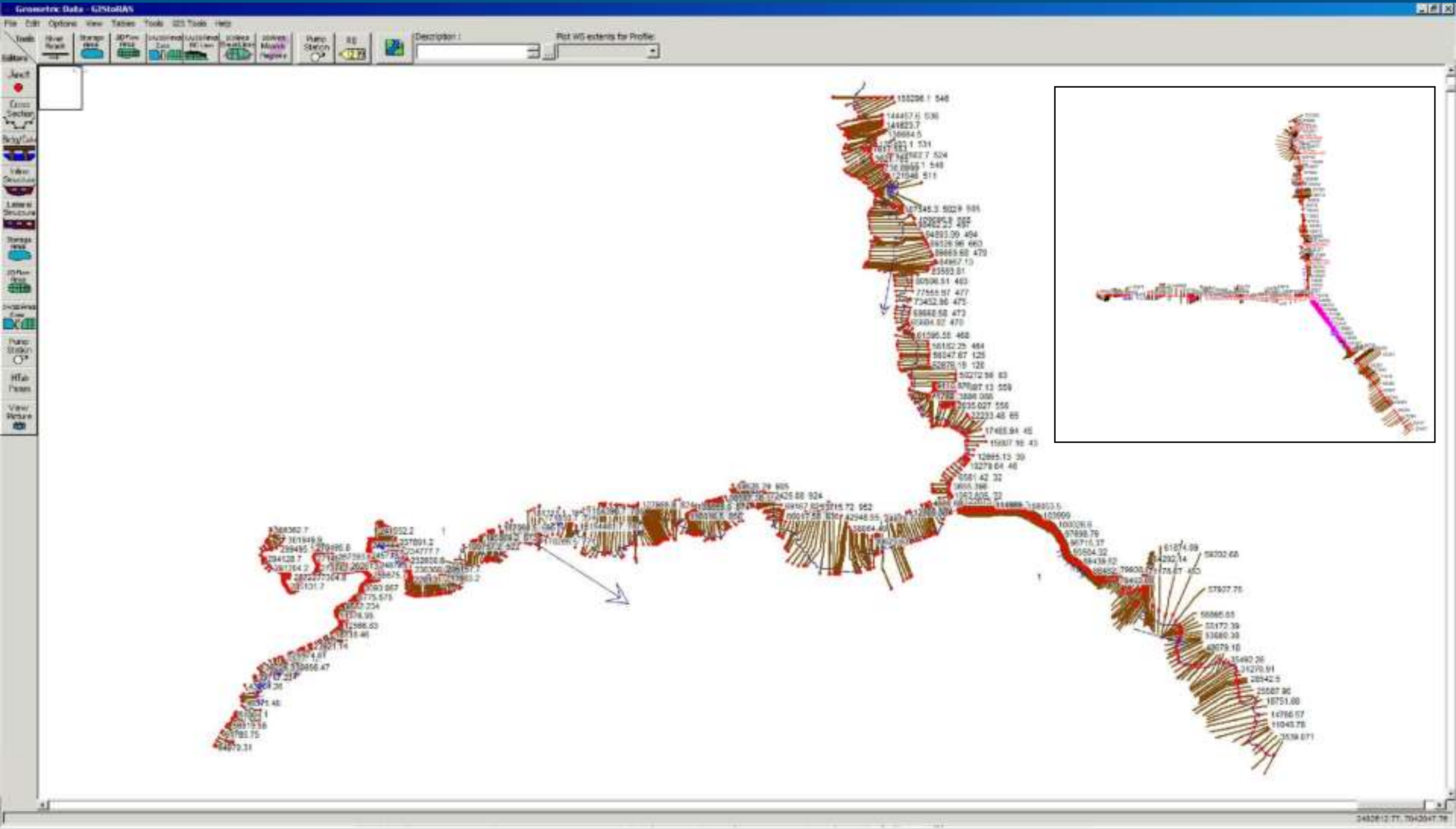
Benbrook Dam - Frequency Outflows
Based on a 1996 Period of Record Analysis
These match the numbers on the currently effective FIRM maps

Average Return Period (years)	Annual Chance Exceedance	Pool Elevation (ft NGVD)	Total Outflows from Benbrook Dam (cfs)	Peak Outflow from Main Gates (cfs)	Peak Outflow from Spillway (cfs)
2	50%	698.0	3,000	3,000	-
5	20%	704.3	6,000	6,000	-
10	10%	708.5	6,000	6,000	-
25	4%	714.0	6,000	6,000	2,700
50	2%	718.0	7,500	6,000	7,500
100	1%	721.5	13,000	6,000	13,000
500	0.20%	729.5	46,000	6,000	46,000

Special Considerations Hydrology

- Hydrology model included 2 different storm centering scenarios. For the purpose of this Task, RAMPP used the storm centering that produced the highest discharges at each stream location.
- Spillway discharges estimated from statistical analysis of reservoir stage.
- Although minor, removed proposed Dallas Floodway project from routing
- Resolved comments from TRWD on hydrology on July 25, 2015, in coordination with USACE.
- All correspondence for special considerations are documented in the correspondence folder of the hydrology deliverable

Georeferenced CDC Model



HEC-2 sample

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T1      Example 1:  Single profile subcritical run
T2      Output options include: User design summary, flow distribution, suppress
T2        printer plot of profile, and cross-section printer plot.
T3      Bear Creek
T4      Input options include: Effective area option, encroachment method 1,
T5        add points, repeat cross section, and change discharge.
*   Starting with energy slope and estimated water surface elevation
J1                                0.0092                    7800 1756.02
*   Supress profile printer plot (J2.3 = -1)
J2                      -1
*   User designed output with variables and defined table (150)
J3     38       1       3       57      68      150

NC     .1      .1     .04       .1      .3

*   Use effective area option to only consider overbank when channel banks are
*   exceeded (X3.1 = 10).
*   Use left encroachment to block low overbank area beyond station 183 (X3.4&5)
X1    1.0      60     767      815       0       0       0
X3     10                      183    1757
GR1767.0        0  1765.4       23  1763.5      49  1762.0      69  1759.1      87
GR1758.1      103  1756.9      113  1756.9     122  1753.2     127  1753.1     131
GR1757.7      140  1757.7      152  1755.0     160  1755.6     168  1755.6     171
GR1755.6      174  1754.7      177  1755.9     183  1756.0     190  1754.9     208
GR1754.7      220  1753.7      247  1753.3     282  1752.7     321  1750.9     352
GR1748.6      373  1747.2      391  1748.3     404  1752.1     434  1753.6     452
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FEMA

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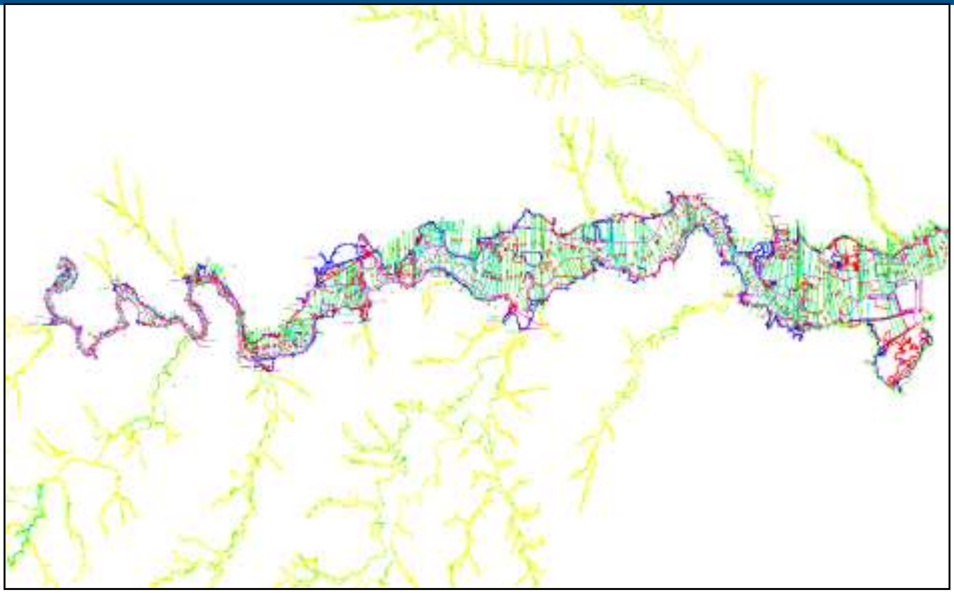
Data Gathering



DGN Files from October 1996 and March 2000 containing original cross sections

Provided a starting point for acquiring geospatial coordinates for cross sections

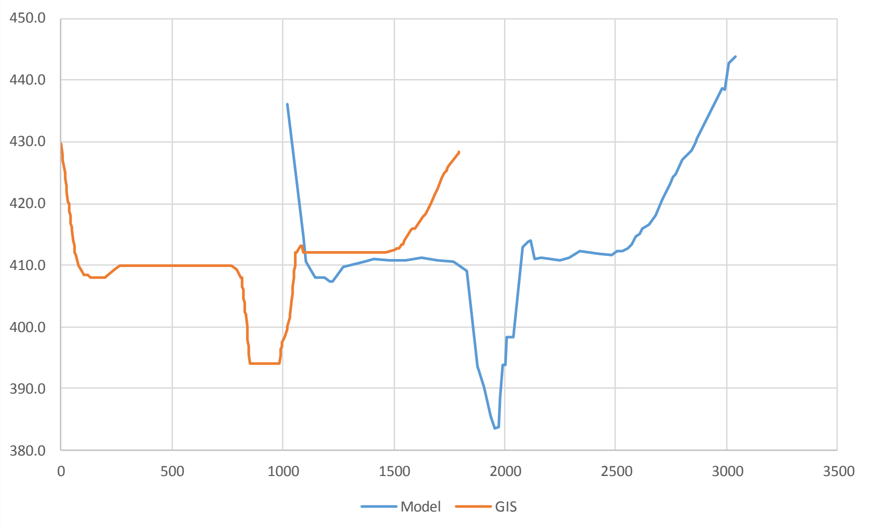
Gathered the CDC permit applications that corresponded with data gaps and coordinated with USACE

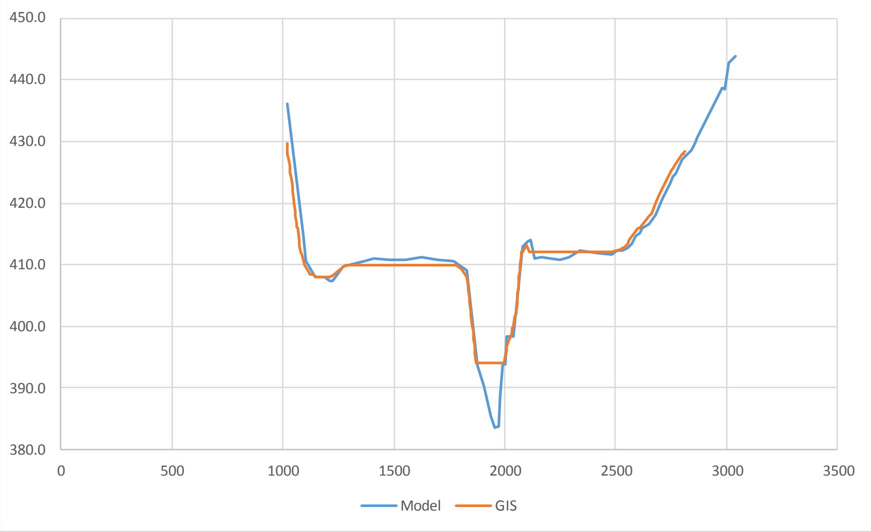
What was done? Georeferencing

- Previously USACE georeferenced streamlines and cross-sections were maintained in DGN file with original spatial coordinates
- Initial cross section locations were determined by importing the DGN file into GIS
- Identified which sections or reaches were missing, which sections had linear referencing, which sections were not based on model downstream reach lengths with mismatches in river stationing

What was done? Georeferencing

- Cross section profiles were generated in GIS from imported sections using 1991 topography.
- Each section profile was compared graphically in excel to model cross section data.
- GIS data is horizontally (X-coordinate) shifted. Plots provided a visual inspection of differences in beginning and end stations, comparison of section lengths, and comparison of section profiles,





Georeferencing Notes/ Recomendations

- Once georeferenced, some cross sections intersected. Typically near the end of cross sections in the left and right overbank area.
  - Manually adjusted to eliminate crossing
  - No impact to the model results, but revised topography in model sections needed
- Some cross sections could be re-aligned to follow model assumptions that section is perpendicular to flow
  - No adjustments made
- Cross sections were extended and tied into higher elevations. Extensions were generally added in areas of ineffective flow. Necessary to generate flood inundation limits.
  - Reassessment of the ineffective flow areas needed and refinement of cross section profile elevations
- Updates to cross sections as they relate to Letters of Map Revisions (LOMR)
  - Changes needed to be made as they relate to revisions made clear during community comment period

What was done?
Hydraulics

- Received HEC-RAS model (UT_CDC_RAS_2014) for the Upper Trinity dated 2014
- RAMPP reviewed modeling and coordinated methodologies with USACE
- Revised Hydraulic Model
  - Added revised flood flows
  - Georeferenced all stream centerlines and cross sections
  - Updated cross section down stream reach lengths based on georeferenced horizontal locations and river stations.
- RAMPP delivered the CDC Hydraulic package in FEMA standards and specifications to the Mapping Information Platform (MIP)

Special Considerations Hydraulics

- During the georeferencing process, GIS computed downstream reach length showed slight variations to what was input in the HEC-RAS model data
  - Found when comparing different plans
  - DNG workmap stream centerline used as basis for reach length computations
  - Adjusted based on distances computed in GIS
  - Overbank reach lengths revised based on the percent differences in calculated channel reach length

Special Considerations Hydraulics

- Cross section stationing was renamed based on the recalculated channel reach length of the georeferenced data
  - Necessary per FEMA specifications
  - New stationing names are consistent with the cumulative channel reach length
  - Original CDC non-georeferenced stationing names are tracked in the HEC-RAS XS notes

- Cross section extension
  - Many cross sections were originally truncated at the limits of effective flow or non-conveyance areas
  - Does not capture the full floodplain extent
  - Cross sections were extended in these cases
    - Extension does not change the effective flow and does not affect the model simulation results
    - Ineffective flow points were placed at the original termination point to ensure that the model computed the same effective flow with the extended cross section

Special Considerations Hydraulics

- Existing conditions consideration
  - CDC model is maintained to represent proposed developments
  - Some projects in the CDC model were not constructed
  - Cross section changes due to these projects were restored to the 1991 condition based on the 1991 Terrain data to represent the “existing conditions”.
  - Includes removal of the Dallas Floodway Extension (DFE) (Lamar levee and Cadillac Heights levee)
  - The project list was finalized for the “existing conditions” model based on the date May 30th 2017 (USACE, 2017).

Flood Risk Review Meeting Comments and Responses

- CDC comments received by City of Arlington and City of Grand Prairie
- LOMRs
  - Cases where LOMRs were not in the CDC model, which should not happen, based on permitting process.
  - Several slight mismatches with the CDC model, based on final as-built conditions.
  - Some LOMRs had more detailed local survey. Floodplain based on 1991 topography does not match
  - Checked all LOMRs for these conditions and documented each case in the comments and disposition form.
- LOMR-Fs
  - Revised a specific case request within City of Grand Prairie.
  - City of Arlington commented on all LOMR-Fs in the community – these will go through the revalidation process during Phase III.

Flood Risk Review Meeting Comments and Responses

- Bridge updates
  - City of Arlington needed minor georeferencing adjustments for bridge hydraulic widths.
  - Removed BLR Reclamation bridge as a future condition (does not affect WSELs)
- Additional minor floodplain mapping comments

Long-term Goals: Future CDC Considerations

- Tributary tie-ins to be refined and remapped with consideration for the backwater of the CDC model
- Document levee certification packages
- Incorporate bathymetry
  - Leverage sources such as TRA supplied bathy to refine the model geometry
  - Have a channel survey conducted and incorporate to augment existing sources
- Incorporate LiDAR
  - Current overbank information from 1991 topo
  - Replace 1991 overbank topo with more recent LiDAR
- Combine plans/geometries
  - Currently 2 plans exist for events < 100 year and 500 year
  - Geometries exist to handle split flow situations in the < 100 year events
  - Ideal to have one plan and one geometry for all events
- Add Standard Project Flood (SPF) and CDC flows (based on future development)

Long-term Goals: Future CDC Considerations

- Channel and Overbank Flow paths
  - Model should be inspected for changes in channel alignment and adjusted as needed
  - Channel and overbank flow paths should be drawn taking into consideration current topography and floodplain delineation
  - Updates to channel and flow path should be added to GIS, model, and stationing recalculated
  - Currently recalculated based on a ratio between overbank reach lengths and applied to new reach lengths
- Modeled bridges in HEC-RAS
  - Bridge contraction\expansion coefficients for bridge cross sections
  - FEMA and HEC-RAS guidance are 0.3 and 0.5
  - CDC modeled at 0.1 and 0.3
- XS layout
  - There are some residual methods from HEC 2 geometry data capture. Example, reduce XS around structures in some cases there are XS stationed within a foot of each other.

Long-term Goals: Future CDC Considerations

- Channel Inverts
  - Review channel inverts found XS 889 on EFS1 is several feet higher than surrounding sections
- Ground profile
  - Higher than the 2- and 5-yr WSEL in some cases
- Negative depths
  - Negative depths present in some cases
- Utilized updated Hydrology
  - USACE is conducting a study of the Trinity Basin to include updated discharges
  - Tentatively available September 2019

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