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TECHNICAL MEMORANDUM

DATE: June 23, 2021

Project No.: 263-60-21-09
SENT VIA: EMAIL

TO: Keith Jukes, Associate Civil Engineer
City of Rocklin

FROM: Melissa Duffy, PE, RCE #87217

REVIEWED BY: Doug Moore, PE, RCE # 58122

SUBJECT: Rocklin City Tributary LOMR Application

West Yost is pleased to provide the City of Rocklin (City) with this Technical Memorandum (TM) to summarize the Letter of Map Revision (LOMR) application to the Federal Emergency Management Agency (FEMA) for the Rocklin City Tributary. Key topics include:

- Background
- Hydraulic Analysis
- LOMR Application

BACKGROUND

In 1991, the Central Rocklin Drainage Project was built to divert a portion of the upstream flows from the Rocklin City Tributary to a small creek tributary to Antelope Creek (called the Antelope Creek Tributary) to reduce flooding in the Central Rocklin area, but the FEMA Flood Insurance Rate Map (FIRM) was not updated. The project reduced the tributary area of the Rocklin City Tributary by approximately 200 acres.

The Rocklin City Tributary is a tributary of Antelope Creek. The confluence with Antelope Creek is north of Highway 65, just upstream of Springview Drive. The Rocklin City Tributary Effective Model was provided by FEMA in February 2021. Based on documentation provided by FEMA, the model was last updated based on a LOMR in 2011. FIRM panel 06061C0963H was revised based on this model, updating the base flood elevations (BFEs) along the Rocklin City Tributary from approximately 50 feet downstream of the Union Pacific Railroad to approximately 270 feet upstream of Pacific Street. The revision of this model did not include the 1991 Central Rocklin Drainage Project.

The water surface elevations (WSEs) from the FEMA Effective HEC-RAS model were assumed to be the most recent results and were used for comparison in this study. The results from the HEC-RAS model do not match the BFEs shown on the current FIRM panel at the corresponding modeled cross sections. The HEC-RAS model results are between 1.49 feet lower and 0.42 feet higher than the BFEs shown on the FIRM panel.

HYDRAULIC ANALYSIS

The Effective Model received from FEMA was run and became the Duplicate Effective Model for this LOMR Application. The Duplicate Effective Model was updated based on the tributary areas after the completion of the Central Rocklin Drainage Project to create a Revised Model. The Revised Model was split into two separate watersheds, modeled as two reaches, and described below.

- Revised Model – North (northern reach): This model includes the upstream portion of the Duplicate Effective Model, with flow being re-routed to the Antelope Creek Tributary based on the Central Rocklin Drainage Project. The upstream limit of the reach is the upstream end of the drainage ditch approximately 350 feet southwest of the intersection of Pacific Street and Midas Avenue, which is consistent with the upstream limit of the Duplicate Effective Model. The downstream limit of the reach is the outfall of the double 3-foot by 5-foot culverts to the Antelope Creek Tributary.
- Revised Model – South (southern reach): This model includes the downstream portion of the Duplicate Effective Model that continues draining to the Rocklin City Tributary after the construction of the Central Rocklin Drainage Project. The upstream limit of the reach is the downstream end of the 2nd Street crossing. The downstream limit of the reach is the downstream end of the south railroad crossing downstream of Pacific Street, which is consistent with the downstream limit of the Duplicate Effective Model.

The entire northern reach was updated based on topographic data using CVFED LiDAR and As-Built data from the Central Rocklin Drainage Project. The entire southern reach was updated based on topographic data using CVFED LiDAR, plans from the 5535 Chester Lane Drainage Study, and City GIS data for the Sunset Boulevard Culvert. The CVFED LiDAR data is in NAVD88 datum, while the plans and the model are in NGVD29 datum. A conversion factor of 2.49 was used to convert the LiDAR cross-section data for the model based on the National Oceanic and Atmospheric Administration (NOAA) VERTCON North American Vertical Datum Conversion Tool at the latitude/longitude of the study area.

The flows from the Duplicate Effective Model were split into the northern reach and the southern reach based on the tributary area of the watersheds for the Revised Model. The tributary area for the flow at the upstream end of the Duplicate Effective Model is 291 acres. The tributary area that will drain to the Antelope Creek Tributary via the Central Rocklin Drainage Project is 199 acres (approximately 68 percent of the Duplicate Effective tributary area). Therefore, the northern reach of the Revised Model includes steady-state flow equal to 68 percent of the Duplicate Effective model steady-state flow at the upstream cross section. This flow was subtracted from the steady-state flow for the southern reach of the Revised Model so that the total flow and total tributary area of the Duplicate Effective Model match the Revised Model. Steady-state flow data for the Duplicate Effective Model and Revised Model are shown in Table 1.

Table 1. HEC-RAS Steady-State Flow Data

River Station	Location	Tributary Area, acres	Steady-State Flow, cfs			
			500-Year	100-Year	50-Year	10-Year
Duplicate Effective Model						
10900	Upstream Limit of Reach	291	157	82	60	45
7188		291	157	82	60	45
4583	Upstream of Sunset Blvd	383	210	115	84	58

Table 1. HEC-RAS Steady-State Flow Data

River Station	Location	Tributary Area, acres	Steady-State Flow, cfs			
			500-Year	100-Year	50-Year	10-Year
Revised Model – North						
10800	Upstream Limit of Reach	199	107	56	41	31
Revised Model – South						
7281	Upstream Limit of Reach	64	35	18	13	10
5127		92	50	26	19	14
4683	Upstream of Sunset Blvd	184	103	59	43	27

cfs = cubic feet per second

Boundary conditions for the Duplicate Effective Model were based on known water surface elevations at the upstream and downstream limits of the modeled river reach. The Revised Model includes the following boundary conditions:

- The upstream end of the northern reach assumes the same boundary conditions as the Duplicate Effective Model.
- The downstream end of the northern reach, at the outfall of the double 3-foot by 5-foot box culverts, a normal depth boundary condition was assumed. A sensitivity analysis was conducted to determine the impact of the boundary conditions on the resulting water surface elevations. It was determined that the resulting floodplain boundary did not change when the downstream boundary condition was changed from a known water surface elevation to a normal depth.
- At the upstream end of the southern reach, known water surface elevations were assumed as the boundary conditions based on the water surface elevations of the Duplicate Effective Model at the downstream end of the 2nd Street crossing.
- The water surface elevations at the downstream end of the Duplicate Effective Model were used as the downstream boundary condition for the southern reach.

The flow that is being rerouted to the Antelope Creek Tributary due to the Central Rocklin Drainage Project is insignificant compared to the large flows in Antelope Creek. Based on the FEMA Effective Model of Antelope Creek, the flow at the confluence with the Antelope Creek Tributary is 2,330 cfs during the 100-year storm event. This means that the additional 56 cfs that was added as part of the Central Rocklin Drainage Project results in a 2 percent increase in flow. Additionally, this LOMR Application does not cover the Antelope Creek Tributary or Antelope Creek.

LOMR APPLICATION

FEMA MT-2 application forms and required submittals are included as attachments to this TM, including the following:

- MT-2 Form 1 – Overview and Concurrence Form
  - Affected FIRM Panels
- MT-2 Form 2 – Riverine Hydrology and Hydraulic Form
  - Certified Topographic Work Map
  - Annotated FIRM
  - Templates for Public Notifications of Intent to Revise the Regulatory Floodway. Revision of the regulatory floodway requires submitting a copy of a public notice distributed by the community stating the intent to revise the regulatory floodway, or a statement by the community that it has notified all affected property owners and affected adjacent jurisdictions.
- MT-2 Form 3 – Riverine Structure Form
  - Central Rocklin Drainage Project Plans
  - 5535 Chester Lane Culvert Plans