

December 7, 2020

Mrs. Suzanne Jiwani  
Minnesota Department of Natural Resources  
500 Lafayette Road  
PO Box 32  
St. Paul, MN 55155

**Re: FEMA Floodplain Modeling and Mapping**

Dear Mrs. Jiwani:

The purpose of this letter is to provide additional detail on the request for modifications to the budget and schedule for the Elm Creek floodplain modeling and mapping project sent on September 24, 2020. The items described below were provided as part of the September 24<sup>th</sup> memo. Table 1 has been added to show how the approximate cost associated with each high-level task for developing the hydrologic model compares to the original budget.

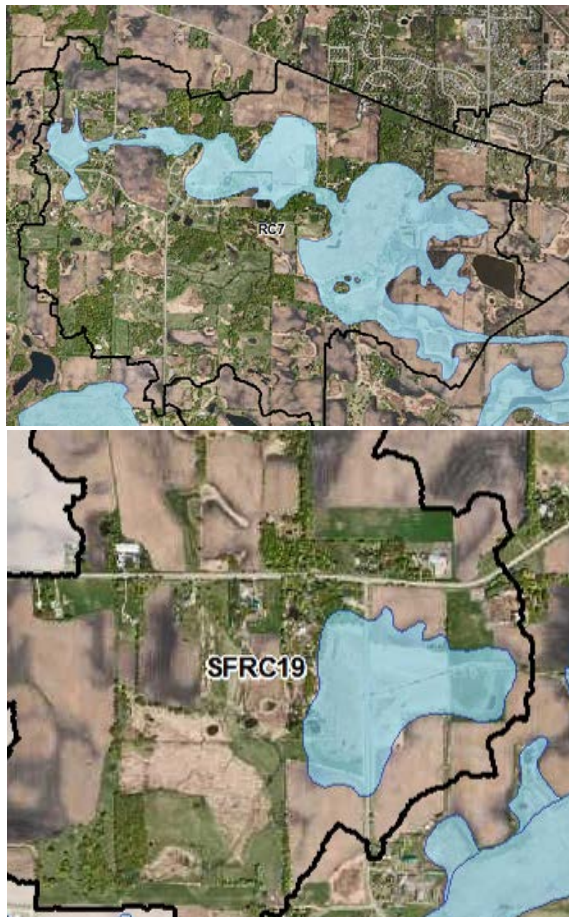
**Hydrologic Modeling**

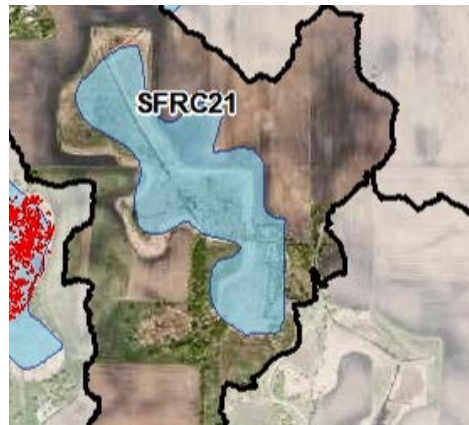
MnDNR approved the Elm Creek hydrology submittal prepared by Barr, on behalf of the ECWMC, on August 17, 2020. However, the Hydrologic Modeling task took a much greater effort than estimated in Barr's initial budget for that task. Barr performed the following additional work that resulted in a budget overrun on this task.

1. An April 24, 2000 MnDNR memo summarized review comments on the hydrologic modeling. Comments that led to additional effort are highlighted in the attachment. On April 30, 2020 Barr and the MnDNR had a conference call to discuss the comments in the April 24, 2020 memorandum. While some rework was expected from the MnDNR review process, the level of effort exceeded what was assumed in the original scope of work. Tasks that required a larger than expected level of effort include:
  - a. Request for a spot check of impervious areas with aerial imagery. This added to the quality control effort. **(\$1,000, approx. 10 hours) accept as change in scope**
  - b. Request for quality control documentation for areas where storage areas will be used to define water levels. The review of storage areas resulted in additional work to add new storage areas and additional scrutiny of the modeling approach to verify that the changes in elevations and flow rates from publish FEMA values are reasonable and substantiated.
    - i. Several storage areas suggested to be mapped using the hydrologic model were significantly lower in elevation than currently mapped special flood hazard areas. In some of these instances, this occurred because the waterbody's inundation extent was not a level pool as assumed from the effective mapping. Where

- mapping a single water level for a subcatchment did not generate a reasonable flood extent, the decision was made to map the subcatchment using cross-sections in the hydraulic model. **(\$3,500, approx. 35 hours) accept**
- ii. The initial hydrologic model had 29 storage areas for mapping ponds and lakes. MnDNR requested an additional 21 storage areas for shallow depressions that may accumulate water during wet periods. Barr's scope assumed the shallow areas would be modeled with cross sections in the hydraulic model. This effort required defining hydrologic inputs for the subdivided watersheds, development of storage area parameters, and recalibration of the model. **(\$4,500, approx. 45 hours) reject**
  - iii. Substantial changes in the regulatory flow rates and flood elevations (particularly a significant REDUCTION in several locations) was unexpected given that generally flood flow rates have increased in the past decades and prompted extra scrutiny by Barr staff. This additional scrutiny was critical because adopting lower flows and flood elevations would allow development closer to water bodies and with lower floor elevations, potentially increasing the flood risk for the community. After detailed review of the methodology of FEMA's original hydrologic analysis, Barr staff concluded that the lower flows were justified, and the MnDNR agreed through the hydrology review process. A flow frequency analysis was performed on the Elm Creek stream gage to verify that the results from the HEC-HMS model results were reasonably similar to recurrence interval flows based on the historic record. **(\$2,500, approx. 25 hours) accept**
  - iv. The additional work under the hydrology scope listed under 1.b. i. ii. & iii. will result in slightly less effort in the hydraulics scope due to mapping in some areas based on the hydrologic model instead of a hydraulic model. The reduced hydraulics effort partially offsets the additional effort required in the hydrology tasks; we estimate a 12 hour savings, or **\$1,200** for the hydraulic modeling task.
- c. Request for a comparison of how calibrated flows compare to gaged flows. While this a normal part of the calibration process, the task had to be completed three times instead of once because of changes to the hydrologic modeling approach based on DNR comments. The second iteration added new storage areas. The third iteration reverted some storage areas back to cross sections because a level pool assumption was not valid for some areas. This added to the quality control effort. **(\$1,500, approx. 15 hours) accept**
  - d. Request to update watershed divides such that all individual special flood hazard areas have their own unique drainage area. This added to the modeling effort and required recalibration of the model.
    - i. After receiving comments from the MnDNR on the draft submittal, we reviewed all 76 subcatchments from the draft submittal, 29 of which we had originally planned to map in HMS. **(\$1,500, approx. 15 hours) reject**

- ii. The effort to update watershed divides to all individual special flood hazard areas led to the subdivision of 6 subcatchments and the revision of divides for an additional 15. **(\$3,000, approx. 30 hours) reject**
- iii. From the discussion with the DNR, it appeared we could increase the number of subcatchments to map in HMS in order to reduce hydraulics work. Therefore, we increased the number of subcatchments to map in HMS to 50. **(accounted for in item 1.b.ii)**
- iv. Updated hydrologic inputs were generated for the new and revised subcatchments, and the model was recalibrated. **(\$4,000, approx. 40 hours) accept**
- v. After QAQC of the 1% mapped flood extents for the subcatchments we planned to map in HMS, we found that level pool mapping from the HMS model would not provide a reasonable flood extent for 11 of these subcatchments. A few examples are shown below **(accounted for in item 1.b.i):**





- vi. Review and QAQC of these 11 areas that would still need to be mapped in the hydraulics model required additional time **(accounted for in item 1.b.i)**.
  - vii. To support the decision to map the final 37 subcatchments in HMS, we created Addendum Figure 3 depicting the updated 1% inundation compared to the effective. This figure was provided in the final hydrology submittal. **(\$1,000, approx. 10 hours) accept**
2. A May 20, 2020 MnDNR email provided a link to download survey and as-builts data for updating the draft hydrology model (Attachment 3). The information received required sifting through more than 30 pages of handwritten notes on crossings and locating the crossing in the HEC-HMS model. This information came after the draft model was submitted to the MnDNR for review. The timing and format of the data led to more time than expected for incorporating the information into the HEC-HMS model. **(\$2,500, approx. 25 hours) accept**

The work requested by the MnDNR was valuable and will provide greater benefit to the residents of the Elm Creek Watershed, giving the residents a better understanding of their flood risk, helping them make better risk-informed decisions. However, the cost of the additional and out of scope hydrologic modeling work was **\$25,000** more than was budgeted for the task. Table 1 shows the original hydrology task budget compared to the actual cost for each task to develop the approved hydrologic model.

**Table 1 Elm Creek Hydrology Submittal Task Budgets**

Task	Description	Original Budget	Approximate Cost
1	HEC-HMS model	\$15,000	\$15,000
2	HMS QA/QC	\$1,500	\$1,500
3	DNR Submittal	\$1,000	\$2,000
4	Response to DNR Comments	\$1,000	\$8,000
5	Final HEC-HMS model	\$4,500	\$16,000
6	Final QA/QC	\$900	\$6,400
	<i>Hydraulic Modeling Savings</i>	--	-\$1,200
	<b>Total</b>	<b>\$23,900 (236 hours)</b>	<b>\$47,700 (477 hours)</b>

As noted above and accounted for in Table 1, some of the extra hydrology work reduced the level of effort required for the hydraulics model by approximately **\$1,200**.

Thank you for your consideration of this matter. Please contact me or Joe Waln regarding any questions.

Sincerely,

A handwritten signature in black ink, appearing to read "Nathan Campeau". The signature is fluid and cursive, with the first name "Nathan" and last name "Campeau" clearly distinguishable.

Nathan Campeau  
Vice President