Staff Report

INDEPENDENT HYDRAULIC ANALYSIS OF RIVERSIDE MANOR AT 1204 S. 4^{TH} STREET

January 13, 2015

BACKGROUND:

At the December 9, 2014 meeting, the City Council deferred action on a minor final plat for a proposed two-lot subdivision at 1204 S. 4th Street (Prairie Village Subdivision located at Riverside Manor). The Council passed a motion referring this item back to staff asking for a third party evaluation of the hydraulic effects of the proposed project on the Oak-Riverside neighborhood north of the site and to explore what level of oversight is needed to ensure that the project would be built as approved.

It was anticipated that the staff would return to the City Council with a report on who might do the requested analysis, how much it would cost, and who would pay the cost for the analysis (the City or the owner of Riverside Manor).

After discussing this assignment amongst City staff members, it was determined that relevant flooding information is available from an analysis performed for the City's South Grand Extension project. With the information highlighted below, City Council may determine that it is not necessary to perform an additional site specific study to understand changes in potential flood impacts on the Oak Riverside Neighborhood.

FEMA 1D Model v. IDOT 2D Model

It should be noted that the FEMA flood levels were calculated in 1999 by Snyder and Associates using a 1D HEC-2 model. IDOT has a newer, more robust model using Lidar data that has a more accurate resolution of topography. The FEMA model is available for the entire city. The 2D model has been developed by IDOT for their I-35 bridge project, but it covers only portions of Squaw Creek (downstream from Lincoln Way) and the Skunk River (E 13th Street to I-35).

Both models calculate water surface levels based on inputted topography and a defined storm event. The IDOT's 2D Model calculates more detailed and realistic flow paths of flood waters (see figure in attachment) than the basic HEC-2 Model from FEMA. It can also capture the inundation of the water surface levels as flood waters flow over irregular channel beds, and meander along sinuous channels and around barriers whereas the FEMA HEC-2 Model provides a simplified water surface level. In general, there is a higher cost to use the 2D Model than the HEC-2 model. From the informal bid proposals for the Riverside Manor project, staff generally estimates a cost of \$1,000 dollars for a HEC-2 model of project impacts and approximately \$3,500 for the 2D Model of project

impacts. Larger projects or consideration of alternative designs would have additional costs.

South Grand Extension Baseline Hydraulic Analysis

The City has contracted with HR Green for the environmental and location study of the proposed Grand Avenue extension that is downstream of the subject Riverside Manor site. HR Green has subcontracted with HDR for a hydraulic analysis of existing conditions, including the addition of the fill at Riverside Manor, to set a baseline for analysis of the bridge design. As part of their analysis, HDR used a 2-D model owned by the lowa Department of Transportation (IDOT). This 2-D model provides more accurate hydraulic analysis than the traditional 1-D model used for the FEMA Flood Insurance Study (FIS) that led to the adoption of our regulatory flood maps.

Using the IDOT model and existing topography based on Lidar aerial photography, HDR inserted the Riverside Manor fill based on the proposed grading plan provided by FOX Engineering. The HDR model results showed increases in the water surface level of a 100-year flood upstream from S 4th Street of between 0.02 and 0.07 of a foot (0.24 to 0.84 inches). See the attachment for the location of data points showing this increase.

It should be noted that these numbers are preliminary data used for a project (Grand Avenue extension) unrelated to Prairie Village. However, in order to properly evaluate the impacts of the Grand Avenue extension, this analysis was made to determine the 100-year water surface level based on post-fill at Riverside Manor topography.

OPTIONS FOR HYDRAULIC ANALYSIS

<u>Option 1:</u> The City Council could find the preliminary hydraulic modeling based on the 2D IDOT model described above satisfies their request for additional information and does not require a site specific study.

While this preliminary information is intended as part of a larger study for Grand Avenue, staff believes it provides the information requested by the City Council for the Riverside Manor plat. This analysis indicates an increase of the water surface level of a 100-year flood at four points along Squaw Creek (two on each side of the bank) of between a 1/4 inch and 7/8 inch. It indicates a de minimus effect on base flood elevations compared to the FEMA determined base flood elevations. If the City Council that this information is adequate, the minor subdivision final plat could be placed on the January 27th Council Meeting for final action.

However, if the City Council wishes a more formal report, staff has obtained proposals from two firms that could provide that independent analysis and prepare a written report for the City Council to accompany the minor subdivision final plat application. <u>Option 2:</u> HDR of Des Moines, who did the preliminary analysis of Option 1, can reconstruct the work already done and add an explanatory technical report describing how the results were obtained.

They provided a proposal to:

- 1. Visit the site and take photographs.
- 2. Use the Iowa DOT 2D hydraulic model (TUFLOW) of the Squaw Creek and South Skunk Rivers.
- 3. Verify that the model executes correctly and compares reasonably to the FEMA effective model.
- 4. Coordinate with the City and develop to understand and obtain grading plans.
- 5. Code the grading plans into the 2D model to create a proposed conditions model.
- 6. Execute the 2D model for both the existing and proposed conditions for the 100year base flood.
- 7. Create figures and tables that describe the potential hydraulic impact of the proposed development.
- 8. Write a short letter report that describes the potential hydraulic impact of the proposed development.
- 9. Certify the letter report with a PE seal.

These preliminary results discussed above include items 2 through 7. Completion of steps 1, 8, and 9 would require about two weeks and cost about \$900 to prepare a final report.

<u>Option 3:</u> Another option is using Snyder and Associates of Ankeny. This firm prepared the 1999 1-D hydraulic model used by FEMA for the adoption of the City's regulatory maps.

They provided a proposal to use the current 1999 1-D hydraulic model to:

- 1. Verify base flood profile (1% Annual Chance Flood) from the effective HEC-2 model prepared by Snyder & Associates, Inc., 1999.
- 2. Revise the ground elevations for cross section 10750 to reflect the proposed Prairie Village Apartments grading plan.
- 3. Tabulate elevation differences between the proposed model and effective model between cross sections 9,850 and 12,900 using the effective base flood discharge.
- 4. Prepare a summary memo and cross section exhibit.
- 5. City will request a digital file of the site plan with proposed grading from the Owner and provide it to the Engineer.

The fee would be \$750 for the described work and would take about a week following receipt of the digital file of the grading plan.

VERIFICATION OF CONSTRUCTION

The City Council also asked what additional level of oversight and inspection can be implemented in order to ensure compliance with the approved grading on which the modeling is based. To ensure that the calculated impact is not exceeded, a certified contour map of Prairie Village subdivision should be provided by the applicant prior to issuance of a building permit for the apartment building foundation. This will ensure that that the fill placement and grading is consistent with the approved grading plan. This could be done by the applicant's engineer or request the applicant pay for a third-party verification of the contour map prior to building construction.

NEXT STEPS

In order to proceed with the deliberation of the final plat for the Prairie Village Subdivision, the City Council must decide which of the above options satisfies the request for a hydraulic analysis and verification of the elevation of the grading.

ATTACHMENT



Pre- and Post-Fill Comparison Locations

Water Surface of 100-yr Flood Level Pre- and Post-Fill Comparisons

Location	Current FEMA Base Flood Elevation (BFE) ¹	IDOT Model of Existing Base Flood Elevation (BFE) ²	IDOT Model of Post- Construction Base Flood Elevation (BFE) ³
Point 1	896.1	896.04	896.11
Point 2	896.1	895.67	895.72
Point 3	897.0	897.01	897.03
Point 4	897.0	897.04	897.07

¹ Water Surface Level of 100-year flood as predicted by FEMA (1D Model) ² Water Surface Level of 100-year flood as predicted by HDR <u>without</u> Riverside Manor fill. (2D Model)

³ Water Surface Level of 100-year flood as predicted by HDR <u>with</u> Riverside Manor fill. (2D Model)