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Floodplain Impact Analysis
Duckhorn Vineyards Winery Major Modification
P19-00097-MOD

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MEMORANDUM

TO:	Patrick C. Ryan, PE Napa County	DATE:	January 20, 2021
FROM:	Robin J. Lee, PE Schaaf & Wheeler	JOB#:	DUCK.03.19
SUBJECT:	Duckhorn Vineyards Proposed Development Impact Analysis		

Introduction

The Duckhorn Vineyards property resides in the regulatory floodway of the Napa River. Initially, the Winery was proposing a conservatory, a bridge over the river, and additional production facility in the West overbank of the river. Since then, the proposed development footprint has significantly lessened to an addition to the estate house within the floodway in the East overbank. The proposed production facility in the West overbank is outside of the FEMA floodway and floodplain.

This memo is meant to describe the model development and analysis of the proposed development to show that there are no significant hydraulic impacts to the floodway water surface elevations based on the proposed development.

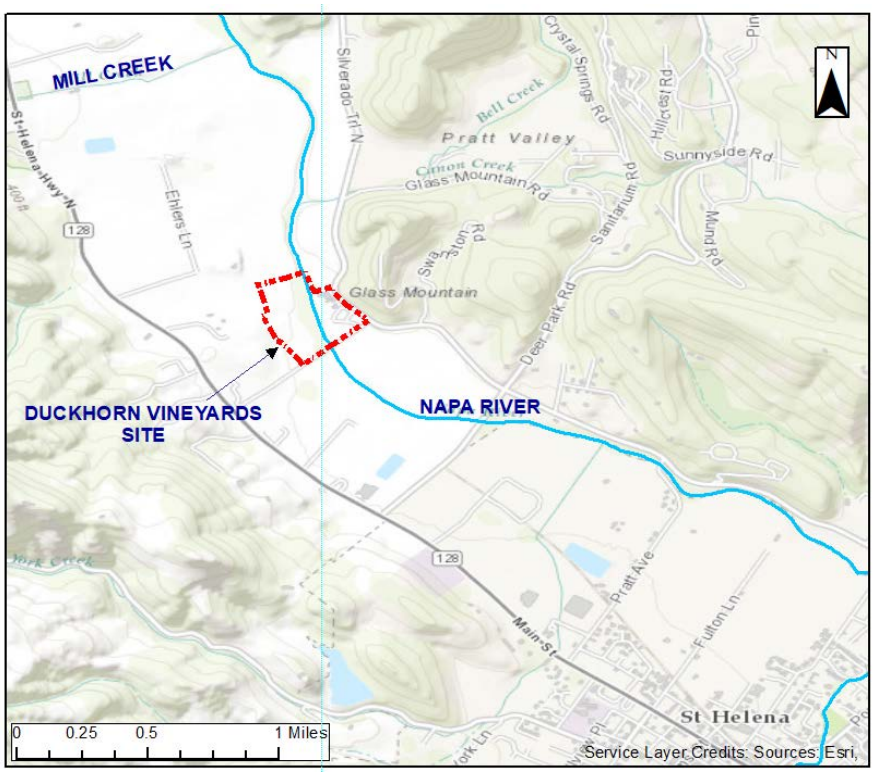

Figure 1. Study Area

Per Napa County's municipal Code Section 17.38, potential development projects in the floodway or floodplain need to follow strict design guidelines to ensure that any proposed development will not only withstand a flooding event but also not jeopardize the existing surrounding or upstream/downstream structures. Because the proposed development is minor in nature and requires a small section of the Napa River to be modeled, the proposed model is being sent to the County for review and comment rather than a lengthy LOMR process.

Model Development

Existing FEMA HEC2 Model

The Effective model for Napa River was originally developed by George S. Nolte and Associates for the FEMA's Flood Insurance Study for Napa County. It is noted that variations of the effective model exists dated 1974, 1976, and 1989. Schaaf & Wheeler placed a FEMA data request to obtain a LOMR that was developed by Albion in 2000. Electronic HEC-2 files were sent, but no associated report or information was provided. Based on the information available to Schaaf & Wheeler, the HEC-2 model entitled DCKHN02G.DAT was reviewed for use in this impact analysis. The HEC2 model is in the local datum, which translates to NAVD by the following equation:

$$NAVD\ (feet) = Local\ Datum(feet) - 50 + 2.78$$

Based on a review of the HEC2 model DCKHN02G.DAT, it was determined that the model was not sufficient for this impact analysis for several reasons. The first being that the topography of several cross sections appeared to miss ground levels and was not nearly as detailed as the more recent County LiDAR data collected in 2014. Figure 2 below shows a comparison of the HEC2 cross section on the left and a cross section from county LiDAR on the right. Secondly, the lettered cross section closest to the project site (BE) was not included in the HEC2 model. Finally, the model spacing between cross section was over 500-ft which meant that cross sections through the project site would have to be interpreted and not representative of the project site.

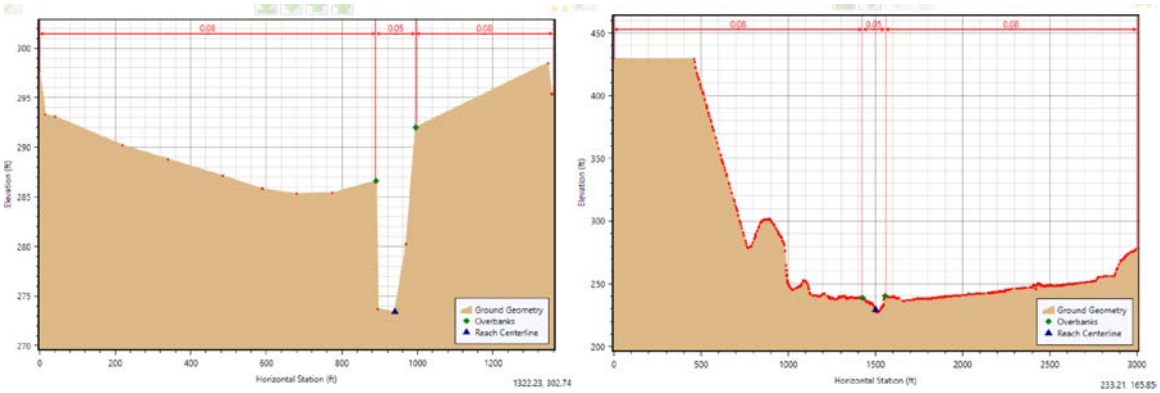

Figure 2. HEC2 (left) and County LiDAR (right) Cross Section Comparison

For these reason, Schaaf & Wheeler proposed developing an existing model based on the County's LiDAR using the downstream water surface elevation from the effective HEC2 model as the boundary condition. The model presented in this memo is not intended to replace or update the effective model, it is purely meant to serve as a tool to analyze the impact of the proposed project. The input and output files for the HEC2 model are included in the link at the end of this memo.

Existing Conditions Model

A HEC-RAS model was developed using the County's 2014 LiDAR data as the effective HEC-2 model data received from FEMA is missing detail through the Duckhorn property as described above. A new HEC-RAS model was developed from at lettered cross section BE down to Lodi lane where the BFE is shown on the effective FEMA map at elevation 241-feet (NAVD). Cross sections were generated approximately every 100-feet and Manning's 'n' values were used from the effective HEC-2 data provided from FEMA which are 0.05 in the channel and 0.08 in the overbanks. Floodway encroachments were set at the limits of the floodway shown on FEMA effective map (yellow circles in Figure 2). Blockages were developed drawing polygons over the existing buildings (white areas in Figure 2) and blocking the areas along the cross section shown in red in Figure 3.

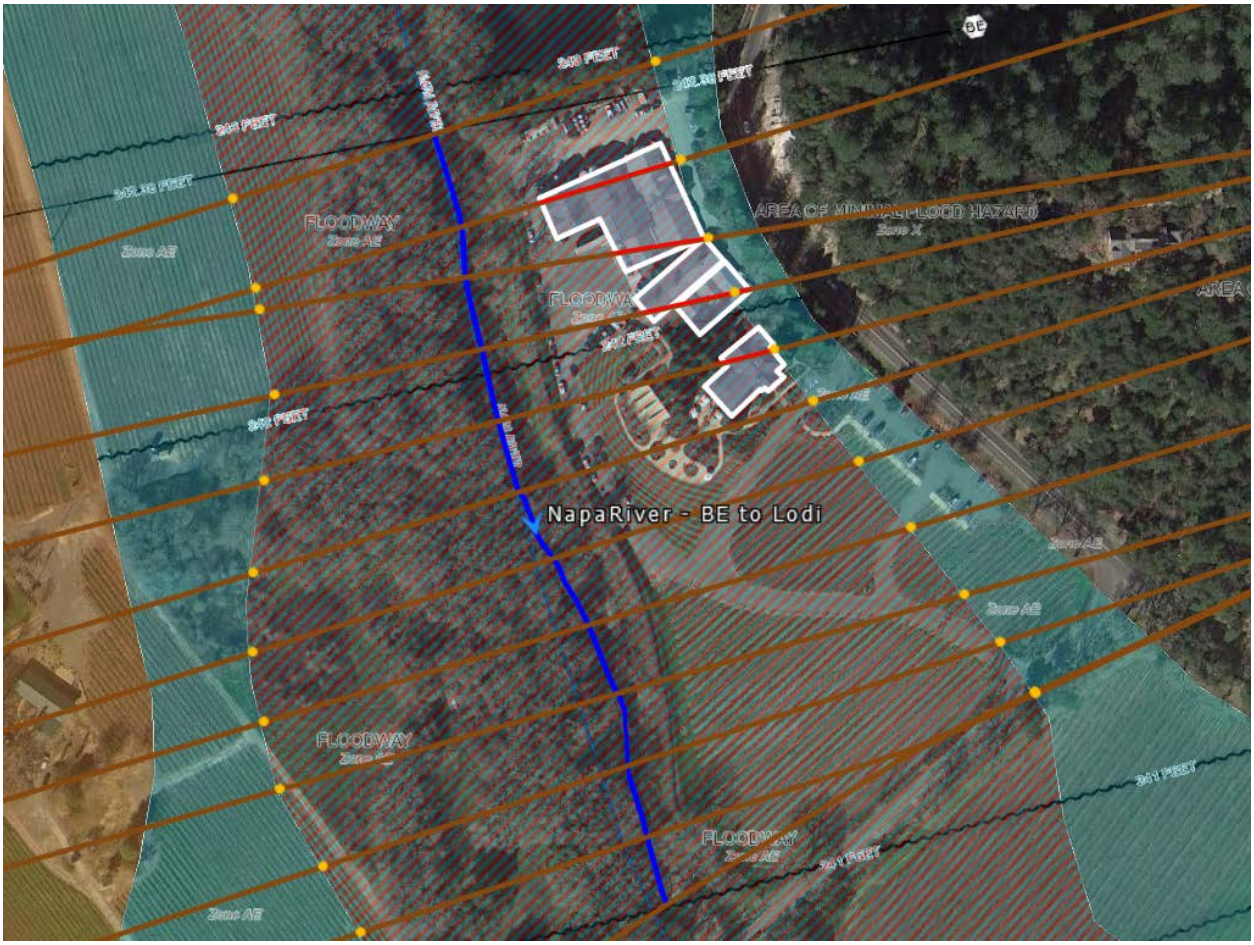

Figure 3. Existing Condition Model

Project Model

Project design files were brought into the HEC-RAS software to show where the project blockages would be increased and decreased. The proposed project includes the removal of several buildings and the expansion of the existing estate house. Figure 4 below shows the Project model over laid on the design drawings.

Figure 4. Project Model

Steady State Flow and Boundary Conditions

The effective 100-year flow (17,700cfs) applied upstream at cross section BE is from the HEC-2 model and the downstream boundary conditions were pulled from the HEC2 model at cross section 107 and upstream at cross section 109. Table 1 below summarizes the model flow and boundary conditions.

Table 1. Steady State Flow Data

Parameter	Floodplain (FP)	Floodway (FW)
100-year Peak Flow	17,700 cfs	17,700 cfs
Upstream Effective Water Surface (Cross Section BE)	242.38-ft	242.58-ft
Downstream Effective Water Surface (BFE upstream of Lodi Lane)	241.39-ft	241.44-ft

Model Results

The removal of Building 11 presented a WSEL rise in the Project model. In order to mitigate this rise, a privacy wall was included into the design that is higher than the 100-year water surface and provides additional blockage. The proposed 2-foot seat walls were not modeled as blockages because their height is lower than the water surface and there are openings that allow water through.

The resulting design does not increase the water surface elevation across the entire model in the floodway. Table 2 shows the resulting water surface elevations in the model for the Existing Condition and Project Condition model.

Table 2. Floodway Water Surface Elevations Results

Cross Section ID	Existing	Project	Difference
1011	244.58	244.58	0.00
1010	243.28	243.28	0.00
1009	243.31	243.31	0.00
1008	242.34	242.34	0.00
1007	242.26	242.26	0.00
1006	242.19	242.19	0.00
1005	242.08	242.08	0.00
1004	241.92	241.92	0.00
1003	241.83	241.83	0.00
1002	241.70	241.70	0.00
1001	241.54	241.54	0.00
1000	241.44	241.44	0.00

Summary

The proposed development at the Duckhorn Winery property does not increase the water surface elevations in the floodway and meets the County's requirement for development within the floodway.

Flood Proofing Requirements

Since the existing estate home lies within the regulatory floodway, it has been floodproofed to a BFE that was given by the County of 241.9-ft. Since the proposed improvements include additions to the existing building, the BFE should be revised to the most upstream point of the improvements. The improvement to the existing estate house is approximately 108-ft upstream. Figure 5 shows the updated BFE on the FIS profile and Figure 6 shows the improvement plans on the FEMA effective map. Both Figures 5 and 6

indicate that the new BFE for the larger estate house should be 242.1-ft. Which requires buildings to floodproof to 243.1-ft.

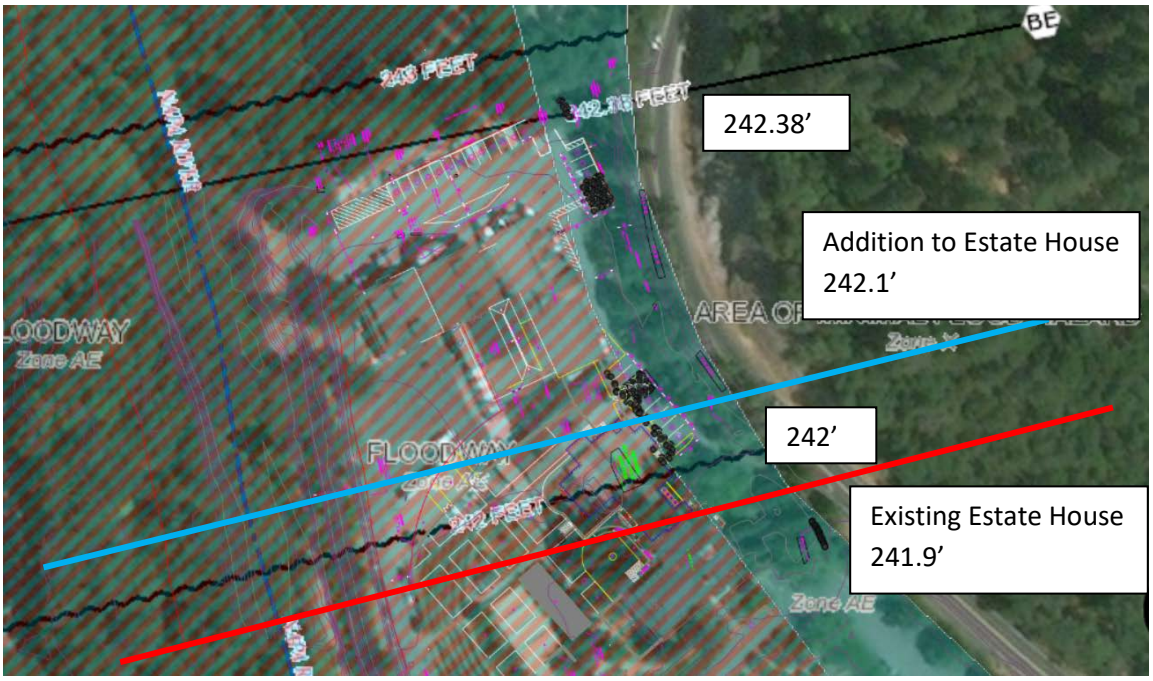

Figure 5. Existing and Improved Estate House on Effective FIRM

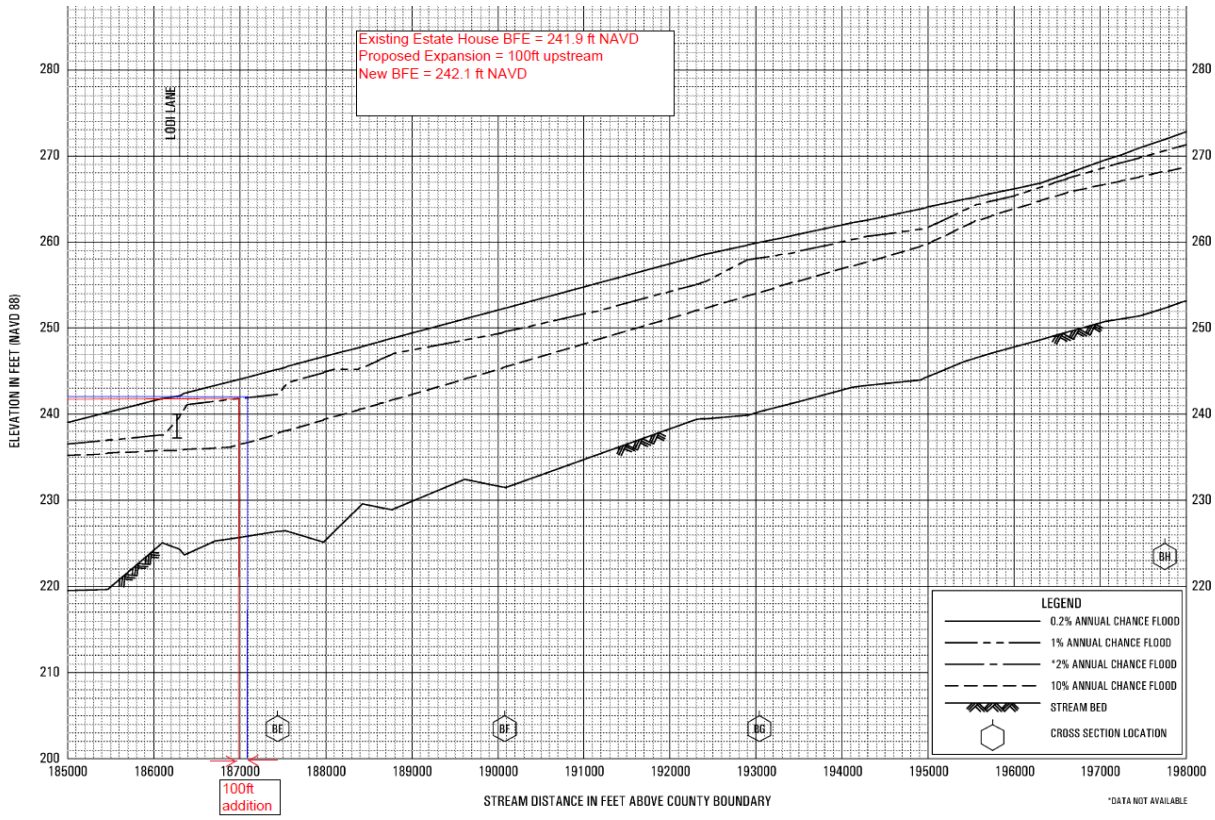

Figure 5. Estate House BFE Based on FIS Profile Approximately 100' upstream

Electronic model files can be downloaded at the following link:

https://schaafandwheeler-my.sharepoint.com/:f:/g/personal/rlee_swsv_com/EveD45vzuK1LhgER0B-BWk8BSr3lIYChW1dT4kt_i0zGJQ?e=VzJLd1