Agenda Item 7

DATE: January 8, 2024

TO: Honorable Mayor and Members of the City Council through City Manager

FROM: Gina Benedetti-Petnic, PE – Assistant Director, Public Works & Utilities
Brian Oh – Director, Community Development
Christina Paul – Principal Policy Planner, Community Development
Christopher J. Bolt, MPA, PE, CPM, ICMA-CM – Director of PW&U

SUBJECT: Flood and Sea Level Rise Mapping Update Workshop

RECOMMENDATION

It is recommended that the City Council receive an informational presentation on new floodplain and sea level rise modeling and draft maps and their application to the General Plan Update, receive public comments, and provide feedback.

BACKGROUND

This memorandum describes the background and results of an effort undertaken by the Department of Public Works and Utilities, supported by the Community Development Department, to comprehensively update the computer models used by the City to evaluate and plan for potential flood risks. This work has far-reaching applications and will inform the General Plan update process, infrastructure planning, and an anticipated FEMA map update process.

The City of Petaluma is located in the Petaluma Valley, an alluvial plain with elevation ranging from sea level along the Petaluma River to over 400 feet in the nearby hills. The mean annual precipitation over the valley is approximately 26 inches. The main waterways in the City include the Petaluma River, Adobe Creek, Lynch Creek, Lichau Creek, Willow Creek, Ellis Creek, and smaller branches or tributaries such as Thompson Creek, Washington Creek, Kelly Creek, Capri Creek, and Corona Creek. The City of Petaluma is primarily located within the San Pablo Bay sub-watershed.

During storm events, water levels increase above their historic waterway and tidal elevations, threatening the areas along the Petaluma River and other main waterways and tributaries with flooding. Floods can and have caused substantial damage to structures, landscapes, and infrastructure, as well as life safety issues. These flood hazards, from both rainfall flowing down the river and tides and storm surges pushing bay water up the river, will be exacerbated by future sea level rise (SLR), a consequence of climate change caused by global increases in greenhouse

gas (GHG) emissions. According to scientific research, GHG emissions have increased and will continue to increase Earth's temperatures, even with significant reductions in GHG emissions. Increased temperatures cause thermal expansion of the oceans and melting of ice sheets, consequently resulting in SLR. Sea Level Rise of about 8 inches has already occurred in the last century, and several feet or more of SLR is projected by the end of this century. In San Pablo Bay, increased water levels due to SLR are expected to exacerbate the frequency and severity of flooding along the banks of Petaluma River and adjoining creeks. (See Attachment 2, SLR/ECR White Paper).

Flood Model and Maps History:
Petaluma's initial flood maps, the Flood Insurance Rate Map (FEMA FIRM) and the National Flood Insurance Program Map (NFIP), date back to 1989 and 1974, respectively. During the 2025 General Plan update effort in 2006, the City and our consultants developed the current FEMA FIRM maps using XP Solutions' Stormwater, Sanitary, and River Systems Management software package (XPSWMM). At that time, XPSWMM was the state-of-the-art technology for simulating hydrology, hydraulics, and surface flooding. These flood maps were modeled from rain gauge data and other historical flood data available at the time to represent flooding from Petaluma's watershed surface runoff. FEMA has periodically updated the current FEMA FIRM maps, and these maps can be found online at FEMA's website https://msc.fema.gov/portal/home, and online at the City of Petaluma's website: https://cityofpetaluma.org/flooding/.

It is important to note that the current FEMA maps model only rain, surface runoff, and storm surge. They do not consider the probability of future impacts from climate change and rising sea levels. The new mapping update presented here was undertaken in 2022/23. As the Petaluma River is tidal, sea level rise, when combined with rainwater coming down waterways during storms, will have significant impacts on Petaluma as climate change occurs. The new mapping was developed to bring Petaluma up to current best practices and include newly available data and technology. This mapping update uses a newer and more powerful modeling software, Hydrologic Engineering Center's River Analysis System (HEC-RAS) which allows the user to perform one-dimensional (1D) and two-dimensional (2D) flow river hydraulics calculations. HEC-RAS 2D was used along with more robust landscape data, new waterway vegetation surveys, and historical rain data for the surface runoff component of the maps. Our new models and maps also utilize the latest State of California guidance on modeling climate change impacts from sea level rise. The models will help Petaluma adapt and work to protect the community from combined future flood hazards presented concurrently by storms and sea level rise.

Floodplain Management and CRS:
Utilizing these FEMA maps, the NFIP Community Rating System (CRS) was implemented in 1990 as a voluntary program for recognizing and encouraging community floodplain management activities that exceed minimum NFIP standards.

The City became a participant community in the NFIP in October 1996 and has maintained a Class 6 rating in the NFIP CRS system for many years, enforcing best practices and providing a 20% flood insurance discount to our residents in the regulatory floodplain. Petaluma's regulatory floodplains are defined by the FEMA FIRM maps referenced above and managed through adopted

General Plan goals, policies, and programs, and ultimately implemented through the Zoning Ordinance.

One of the foundational flood protection policies adopted by the City for the CRS program was the requirement for new structures to be constructed with a 1-ft. freeboard (or 2-ft. freeboard for properties upstream of the Payran area weir) above the base flood elevations identified on our FIRM maps. Freeboard is a term used to describe the difference between the expected flood level and the ground floor level of a building. Another critical component of the City's flood protection is open space preservation for parcels that provide flood storage capacity. The City maintains open space preservation of 325 parcels identified as providing flood capacity and/or natural resource benefits to the City.

The Public Works & Utilities department is responsible for the Floodplain Administration and CRS coordination duties, ensuring compliance with CRS program requirements to maintain our Class 6 status. Currently, staff is working towards requesting certification as a Class 5 community, which would result in a 25% flood insurance policy discount for residents.

General Plan:
The City of Petaluma is currently operating under the City of Petaluma: General Plan 2025, which was written in 2006-2007, adopted in 2008, and minorly updated in 2012. The City is in the process of developing an update to its General Plan. The General Plan is a guiding vision document and provides policies and implementation programs to achieve the City's goals. The General Plan also regulates the City's land use. Eight mandatory topical areas, referred to as Elements, must be included in a General Plan, including Land Use, Open Space, Conservation, Housing, Circulation, Noise, Safety, and Environmental Justice. Unlike the other elements, the Housing Element is required by State regulations to be updated every eight years. The General Plan Update process began with extensive public outreach in 2020, and a draft is expected to be completed in 2025.

The General Plan Advisory Committee (GPAC) was formed to provide insight throughout the General Plan Update process. The committee comprises a diverse group of residents, business owners, educators, and other members of the Petaluma community who serve as advisors and project ambassadors. They work collaboratively with the General Plan consultant team, led by Raimi + Associates and City staff, to provide input on General Plan issues and offer feedback on draft materials.

The Floodplain and SLR Mapping Update is integral to the General Plan Update process. The General Plan Update will include revisions to some existing land use designations and policies, which regulate how land can be zoned and the allowable uses. The risk of flooding can be prohibitive for critical facilities (e.g., hospitals and fire stations, critical infrastructure) that are essential for public health and safety. Similarly, flood risks from rain, tides, and sea level rise need to be considered in all types of development in and around the floodplain. The SLR Flood Maps created through this project have been integrated with other technical data that will be used to develop alternative scenarios for land use designations or Land Use Alternatives. The Land Use Alternatives will undergo a supplemental, focused public review process before the City Council selects a preferred alternative. The new maps will also be used to inform General Plan policies

relevant to development, potentially including topics such as setbacks and elevation above modeled flood elevations.

DISCUSSION

Updated Flood Model:
The more dynamic HEC-RAS 2D model uses updated and augmented rain data from significantly more watershed rain gauges than were available for the 2006 XPSWMM model. With much more historical data than before, we have great confidence in the surface water flow and flooding model. Also new to this model is the incorporation of both Kelly Creek and Thompson Creek on the city's west side, neither of which had been modeled before. Another refinement is the updated roughness coefficient for the creeks and the river, which have been re-surveyed for vegetation density. The roughness coefficient considers the impedance to water flow due to vegetation. It can significantly impact the location and degree of flood waters in the model. And lastly, the model was tested and calibrated using stream gauge data from recent past (significant) storms. Petaluma now has 19 stream gauges that monitor and record water levels in our tributary creeks and the Petaluma River. The data recorded during major storms from these stream gauges was used to compare and adjust the model, assuring that the model results were consistent with experienced flooding impacts.

SLR Model:
The City of Petaluma has previously utilized the SLR scenarios presented in *The State of California Sea-Level Rise Guidance: 2018 Update* (2018 State Guidance) for developing its Local Hazard Mitigation Plan (LHMP) in 2020. The 2018 State Guidance is recognized as the best available science by the California Coastal Commission. It is recommended by the Bay Conservation and Development Commission (BCDC) in its current draft of the San Francisco Bay Plan Climate Change Policy Guidance. The SLR maps represented in this mapping update are based on the SLR scenarios as presented in the 2018 State Guidance. SLR scenarios have been modeled for mid-century and late-century probability and are mapped in conjunction with 100-yr storm flood levels with storm surge and alternately with King Tides.

Next Steps – GPU Flood SLR Policy Framework:
In addition to the maps, the City's consultant team, in collaboration with City staff, is developing a draft Flooding and Sea Level Rise Policy Framework. A key focus of this Framework is adapting to the resultant effects of climate change, including providing City policies and associated actions that can guide future development in the City to create resiliency for flooding and rising sea levels. Policies in the framework include policy direction on adaptation strategies that should be taken to develop resiliency, and requirements and limitations for development in areas that may be subject to future flooding due to rising sea levels.

The draft Floodplain and SLR Maps and the initial outline for a policy framework were presented to and discussed by the General Plan Advisory Committee in two meetings on September 21, 2023, and October 19, 2023. The consultant team used the feedback to create an administrative draft Flood SLR Policy Framework, which is currently being reviewed internally by staff.

These new maps are also being used to inform General Plan Land Use work. Building on the discussions of flood risk and adaptation in September, the General Plan Advisory Committee

began the land use alternatives discussion at the November 16, 2023, meeting and will continue to discuss and provide guidance to staff at the January 18, 2024, meeting. This process sets the stage for public discussions of Land Use Alternatives in 2024.

Simultaneously, staff are working with the consultant team to prepare public draft Policy Frameworks for public review in the Spring of 2024. The Flood and Sea Level Rise Resiliency Framework will be released during the public review process.

Upon identifying the preferred Land Use Alternative, the City will begin the CEQA process for the General Plan. It is anticipated that finalizing the General Plan and completing the CEQA process may take approximately one year, at which time the updated General Plan could be adopted. To ensure the City's Zoning Ordinance is consistent with the General Plan, upon completion of the draft General Plan, the City will initiate a process to update the Implementing Zoning Ordinance, which regulates land use and provides standards for development.

Next Steps – FEMA Mapping Update:
The City will update our FEMA Flood Insurance Rate Maps (FIRMs) to reflect these latest HEC-RAS 2D flood models. Staff are currently seeking additional FEMA grant funding for that phase of the mapping process. The effort will take approximately 18-24 months and will include the completion of the draft 0.2% and the 1% Annual Chance Flood Hazard boundaries (commonly referred to respectively as the 500-year and 100-year floodplains). After submitting these maps, supporting data, and analysis to FEMA for preliminary review, we anticipate receiving FEMA comments and engaging in discussions before submitting the final maps for acceptance by FEMA.

PUBLIC OUTREACH

The General Plan Update community outreach has generally been facilitated via the City of Petaluma General Plan website: https://www.planpetaluma.org/, which the City maintains. It contains all information available on the General Plan Update process, including any documents that have been completed. GPAC meetings are publicized, and the public is invited to attend and provide feedback via public comment. All major documents also undergo a formal public review with the Planning Commission and the City Council.

The Floodplain and SLR Mapping presentation was given by City staff and consultants at the September 21, 2023, General Plan Update Advisory Committee meeting. It was also presented during a Community Meeting on September 27, 2023, by City staff and consultants. On December 14, 2023, City staff and consultants presented at the Sonoma Water Flood Protection Zone 2A Advisory Committee. The draft flood/SLR maps are available online at the Plan Petaluma website: https://www.planpetaluma.org/slr-flood-map.

More community meetings will be held over the next 12-18 months to present the mapping and gain further input from the community at large and from those impacted directly by any adjusted floodplain boundaries. The FEMA re-mapping process for the 100-yr and 500-yr maps will include public outreach to inform the community and to receive focused feedback on that part of the mapping update.

This agenda item appeared on the City's tentative agenda document on December 18, 2023, a publicly-noticed meeting.

COUNCIL GOAL ALIGNMENT

The City Council has identified "An environmental legacy that we can be proud of" as one of its five main goals. Under this goal, Workplan Item 71 identifies the following initiative, "Revisit flood plain management practices to address climate change and sea level rise."

CLIMATE ACTION/SUSTAINABILITY EFFORTS

The City of Petaluma is leading with sustainability policies and actions that will support the climate, having created a Climate Action Commission charged with helping further this effort. In July 2020, the Commission published the Draft Climate Emergency Action Framework, which includes a chapter on "Adaptation and Social Resilience," advising that the City of Petaluma should prepare for climate change-related impacts, including sea level rise (flooding and permanent inundation). The developed maps will ultimately inform the climate adaptation policies and infrastructure investments to address the effects of seasonal rain, tidal flooding, and rising sea levels.

FINANCIAL IMPACTS

There are no financial impacts in conjunction with this workshop discussion. The financial impacts of any guidance will be brought to the Council for consideration and authorization.

ATTACHMENTS

1. Floodplain and Sea Level Rise Modeling and Mapping Presentation
2. "Sea Level Rise + Climate Change" General Plan Update Existing Conditions Report/White Paper, 2021; Updated 2022 Sea Level Rise ECR/White Paper