8.5 FLOODING

This section evaluates flooding impacts associated with the proposed General Plan, including whether implementing the plan will: (1) permit the construction of housing within a 100-year Flood Hazard Area; (2) allow structures within a 100-year Flood Hazard Area that impede or redirect flood flows; and (3) expose people or structures to a significant risk involving flooding as a result of levee failure or mudflows. Water quality and drainage impacts are evaluated in Sections 5.1 and 7.3, respectively.

Environmental Setting

Watersheds

The Eel River has the largest watershed in Humboldt County. The river flows in a northwesterly direction, turning north as it passes Fortuna, then west at Fernbridge before reaching the Pacific Ocean north of Ferndale.

The Fortuna Planning Area's watersheds represent a small portion of the Eel River Watershed and either replenish local groundwater supplies or drain to the Eel and Van Duzen rivers and their tributary streams.

The Rohner Creek and Strongs Creek watersheds are the largest in the Fortuna Planning Area. Smaller watersheds in the Planning Area include the Jameson Creek and Mill Creek watersheds; both tributary to Strongs Creek. The Hillside Creek watershed is a tributary of Rohner Creek and the North Fortuna drainage area discharges directly to the Eel River. North of the Fortuna city limits are the Palmer and Little Palmer Creek watersheds. Wolverton Gulch watershed lies to the south. Planning Area watersheds, rivers, and streams serve as natural resources, storm water drainages, and flood conveyance channels.

Surface Water Flows

Surface water flows have shaped the Planning Area topography. Surface water flows follow natural waterways but have also been altered by constructed features (e.g., levees, detention basins). A portion of the City and Planning Area (along HWY 101) is located within the floodplain area of the Eel River, and failure of the existing levee along the east bank of the river could result in the inundation of properties within the western portion of the Planning Area. Currently the City experiences localized flooding along Strongs Creek near its confluence with the Eel River at Dinsmore Drive and Loop Road. Other areas that experience localized flooding include Rohner Creek along North Fortuna Boulevard, Beech Street, South 15th Street, and Mill Creek along Kenmar Road.

Floodplain Mapping

To implement the National Flood Insurance Program (NFIP) the Federal Emergency Management Agency (FEMA) offers education, technical and flood plain management assistance to local governments. In addition, FEMA produces Flood Insurance Rate Maps (FIRM) that contain historic, meteorological, hydrologic, and hydraulic data, to determine open-space conditions, flood plain control and management, and potential development constraints. In addition, FIRM maps illustrate both 100- and 500-year floodplains and the Base Flood Elevation (BFE), which is the elevation associated with the flood having a one-percent annual chance of being equaled or exceeded in any given year. FIRM maps generally include:

- Common physical features, such as major highways, secondary roads, lakes, railroads, streams, and other waterways;
- Special Flood Hazard Areas;
- Base (1 percent annual chance) flood elevations or depths;
- Flood insurance risk zones;
- Areas subject to inundation by the 0.2 percent annual chance flood; and
- Areas designated as regulatory floodways.

The term "100-year flood" means that the specified flood elevation has a 1% chance of being equaled or exceeded each year. It does not mean that the flood will occur once every 100 years, and in fact the 100-year flood could occur more than once in a relatively short time period.

The 100-year flood, which is the standard used by most Federal and state agencies, is used by the NFIP as the standard for floodplain management and to determine the need for flood insurance. A structure located within a special flood hazard area shown on an NFIP map has a 26 percent chance of suffering flood damage during the term of a 30-year mortgage.

Figure 8-8 shows the limits of the 100-year flood plains within the Planning Area. As indicated, portions of the Planning Area within 100-year floodplain:

(1) The area west of HWY 101, including the Riverwalk Annexation Area and Riverwalk District Focus Area is located within the Eel River 100-year floodplain;

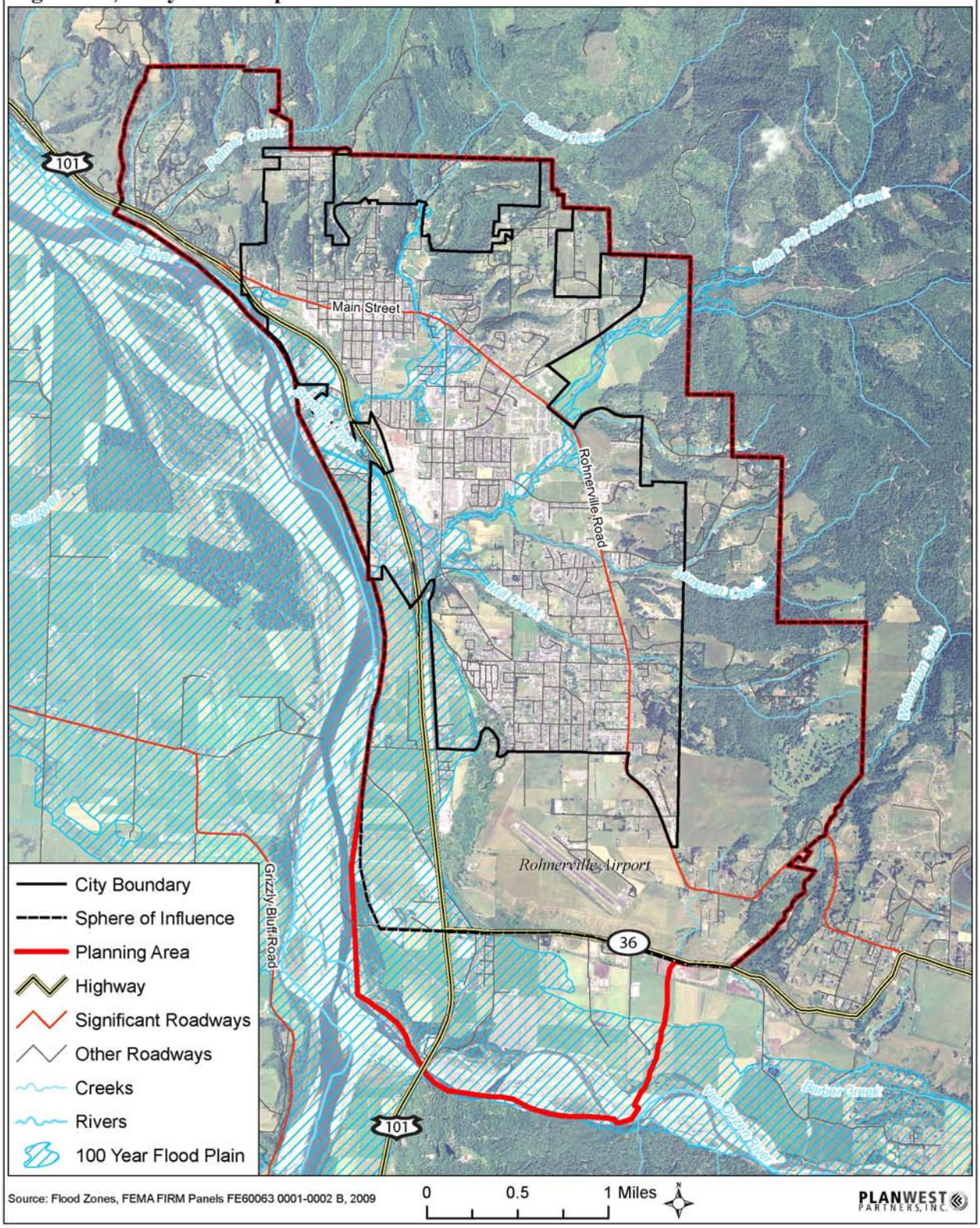
(2) Most of the area south of SR 36 is located within the Eel and Van Duzen River 100-year floodplains;

(3) The southern portion of the Mill District is located within the Eel, Strongs, Jameson and Mill Creek 100-year floodplains;

(4) The Fortuna Boulevard and Smith Lane area, including the northern portion of the Fortuna Boulevard Focus Area is located within the Rohner Creek 100-year floodplain; and

(5) The area on both sides of Strongs Creek between Rohnerville Road and Redwood Way is located within the Strongs Creek 100-year floodplain.

Fortuna General Plan 2030
Figure 8-8, 100-year Floodplain



Flooding History and Flood Insurance Studies (FIS)

The FEMA Flood Insurance Studies focused on the Eel River, Strongs Creek and the Rohner Creek drainages, the three largest drainages located within the Planning Area (Figure 9-10). FEMA studied Strongs Creek from the corporate limits at the Southern Pacific Railroad Bridge to the corporate limits near Rohnerville Road. FEMA studied Rohner Creek from the mouth of the creek to the corporate limits at Carson Woods Road. FEMA also conducted a preliminary study for Jameson Creek indicating the 100-year floodplain had a width less than 200 feet throughout the entire length of the stream; being under the 200 foot minimum, a detailed study was not required for this creek. According to the FIS study in 1981, the most significant floodplain development in Fortuna was the area of Fortuna Boulevard adjacent to Rohner Creek.

FEMA studied the Eel River, from just downstream of Ferndale to the upstream corporate limits of Fortuna, in conjunction with the FIS, for the unincorporated areas of Humboldt County. FEMA also conducted a detailed study of the Van Duzen River, from the confluence with the Eel River, to a location approximately 500 feet upstream of the Cummings Creek Camp.
The average annual rainfall in Fortuna is approximately 48.5 inches, with highest average monthly totals coming in December (9.29 inches), January (8.96 inches), and February (7.54 inches). On average, 75 percent of the annual rainfall occurs from November through March. According to the FIS study for the City of Fortuna, the principal flood problems stem from a succession of intense winter rainstorms (FEMA, 1981).

The Eel River borders the Planning Area on the west and is susceptible to frequent flooding. Two river gauges on the Eel River have recorded historical flood levels within the Planning Area. The United States Geological Survey (USGS) gauging station at Scotia has recorded discharges since 1911. The "flood of record" at the Scotia gauge occurred on December 23, 1964, with a measured peak discharge of 752,000 cubic feet per second (cfs) and an estimated recurrence interval of 290 years (FEMA, 1981). Another significant, large flood occurred in this area on December 22, 1955; the measured peak discharge was 541,000 cfs, with an estimated recurrence interval of 59 years. Downstream from Fortuna, at Fernbridge, the National Weather Service (NWS) has operated a gauging station since 1938; however, this gauge only measures river stage, with no correlation to discharge.

According to the FIS, the 1964 flood caused catastrophic damage in the Eel River basin (FEMA, 1981). The FIS study for the City of Fortuna includes a list of high water marks from the 1964 flood, tabulated within the city limits on the Eel River, Strongs Creek, Rohner Creek, and Jameson Creek drainages. On the Eel River, the high water marks ranged in elevation from 41.13 feet near the intersection of U.S. Highway 101 and the Southern Pacific Railroad, to 53.69 feet downstream of western end of Drake Hill Road. On Strongs Creek, the high water marks ranged in elevation from 50.32 feet at the upstream side of Highway 101, to 81.01 near the cemetery on Newburg Road. On Rohner Creek, the high water marks ranged in elevation from 43.88 feet near Sunnybrook Road, to 74.00 feet near the Carson Woods Road crossing. On Jameson Creek, the high water mark was noted at elevation 100.25 on the downstream side of the Rohnerville Road crossing (FEMA, 1981).

Flood Protection Improvements

The only major flood protection improvement constructed within the Planning Area is the Sandy Prairie Levee, built by the U.S. Army Corps of Engineers in 1959; three miles of levee on the east bank of the Eel River and one mile of levee on the south bank of Strongs Creek. According to the FIS, the levee provides a moderate amount of protection against major floods (FEMA, 1981). When constructed in 1959, the levee was built to an elevation above the 1955 high water mark. The FIS notes the levee did prevent damage to roads and railroads during the 1964 flood; however, the levee was damaged during this flood and inundation occurred on both sides of the levee. Following the 1964 flood, the levee was restored to a height of between 52 and 54 feet. Areas below the 46-foot elevation are considered to be located within the 100-year Flood Hazard Area; therefore, structures must be constructed one-foot above this set elevation (FEMA 2008).

Storm Drain Master Plans

The FIS, as discussed above, references the initial storm drainage studies completed in 1976 for the Strongs Creek, Rohner Creek, Jameson Creek and Hillside Creek drainages. At that time, areas of significant flood potential included Strongs Creek, where dense willow tree growth near the channel was cited as a contributory cause of flooding problems. Flooding in the Rohner Creek basin was also reported, and noted to be most severe in the Alder Drive area. Minor flooding was reported on Jameson Creek, upstream from the confluence with Strongs Creek; and an undersized culvert on Hillside Creek at Fortuna Boulevard was noted to cause flooding in the Smith and Fortuna Boulevard area. According to the FIS, increased development in the City has aggravated flooding problems in the surrounding watersheds, due to increasing amounts of runoff from newly created impervious areas (FEMA, 1981).

The City updated the initial storm drainage studies in 1982. At that time a Storm Drain Master Plan was adopted for the entire City, consisting of a number of improvement projects as outlined in the 1982 report. In anticipation of the Fortuna General Plan Update, the City completed a Storm Drain Master Plan update in 2005. The updated Plan provides a detailed overview of the existing major storm drain facilities within each drainage basin, and provides recommendations for improving identified deficiencies in the City's storm drain system. It also reports that approximately one-third of the improvements recommended in the 1982 Storm Drain Master Plan have been partially, or fully, completed. Many improvements that were not included in the 1982 Master Plan have also been completed to meet drainage requirements for new developments, improve existing facilities and facility capacity, and to reduce erosion caused by drainage outfalls.

The 2005 Storm Drain Master Plan is organized according to the six major natural drainages located within the City limits. These drainages include the North Fortuna Drainage; Rohner Creek Drainage; Hillside Creek Drainage; Strongs Creek Drainage; Jameson Creek Drainage; and Mill Creek Drainage. For each drainage basin, the Plan provides a detailed overview of the existing major storm drain facilities, along with recommendations for improving identified deficiencies in the City storm drain system. It also reports that many of the storm drains and culverts in the City are undersized, and that development is increasing runoff to the City's drainage system, which is causing some areas of localized flooding. Conditions in each of these drainage basins are described briefly below.

North Fortuna Drainage. Drainage facilities in North Fortuna are in generally acceptable or good condition. However, there are several areas that are subject to frequent flooding during even relatively minor storm events. Discussions by FEMA with City staff addressed the potential for significant flood problems in this drainage basin. Results of the hydraulic modeling effort that was undertaken for the 2005 Storm Drain Master Plan show that a number of the drainage facilities in the drainage basin are undersized for the 25-year design flow. The Plan also provides a summary of the existing facilities that are undersized in the drainage basin, along with recommended improvement projects.

Rohner Creek Drainage. Rohner Creek has more potential to cause serious flooding damage than any other creek in the City. The lower reaches of Rohner Creek traverse through urban and residential areas, and these reaches are subject to bank erosion and heavy vegetation. These factors contribute to a serious reduction in channel capacity, and Rohner Creek has topped its bank several times. Although a number of the improvements recommended in the 1982 storm drainage study have been completed, the 2005 Storm Drain Master Plan noted that the major projects addressing the Rohner Creek flooding problems had not been completed. The Plan also provides a summary of undersized existing facilities in the Rohner Creek drainage basin, along with recommended improvement projects.

Hillside Creek Drainage. The majority of the drainage facilities in the Hillside Creek Drainage are considered undersized for the 25-year storm event. The Plan notes that a number of improvement alternatives were recommended in the 1982 Storm Drainage Master Plan, and that none of those improvements were successfully implemented. The 2005 Storm Drain Master Plan provides a summary of the undersized, existing facilities in the Hillside Creek drainage basin, along with recommended improvement projects.

Strongs Creek Drainage. Development along Strongs Creek should correspond with building setbacks calculated for the 100-year floodplain – and inspection of the latest aerial photo of the City of Fortuna indicates that development has progressed in accordance with this recommendation. The Plan also states that, during extreme floods, the Eel River will cause flooding in the lower reaches of Strongs Creek.

Jameson Creek Drainage. The only flooding that has occurred in the Jameson Creek watershed has been at its confluence with Strongs Creek. Little, if any, damage to residences or property has resulted from this flooding because this area has not been developed. The Plan recommended only one improvement project on Jameson Creek, which was to replace one culvert on Rohnerville Road, if the existing culvert fails, or as development warrants.

Mill Creek Drainage. Many of the improvements recommended in the 1982 Storm Drain Master Plan study have been implemented in the Mill Creek Drainage. However, most of the installed storm drains have been downsized from those recommendations. As of 2005, significant development was occurring in the Mill Creek Drainage, and City staff members have observed a significant increase in the amount of runoff entering the Mill Creek drainage system as a result.

Applicable Plans, Policies, Codes and Regulations

Federal

National Flood Insurance Program. The National Flood Insurance Program (NFIP) was established by the US Congress with the passage of the National Flood Insurance Act of 1968. It was modified through the passage of the Flood Disaster Protection Act of 1973 and the National Flood Insurance Reform Act of 1994. FEMA, a component of the Department of Homeland Security (DHS), administers the NFIP. The NFIP consists of two major parts: (1) Flood Insurance Rate Map (FIRM) mapping; and (2) local regulation of the 100-year floodplain. Communities participating in the NFIP establish an agreement with the federal government to adopt and enforce a floodplain management ordinance that reduces future flood risks in the community. In return, the federal government makes flood insurance available for the community, allowing property owners in participating communities to purchase insurance protection against losses from flooding. Both the City of Fortuna and the County of Humboldt participate in the NFIP.

According to FEMA (FEMA 2008), NFIP floodplain management building requirements include, but are not limited to, the following:

- All buildings constructed within the 100-year floodplain (i.e., Flood Zones A, AO, AH, AE, and A1 through A30 as delineated by the FIRM) must be elevated so that the lowest floor is at or above the Base Flood Elevation level;
- If the area of construction is located within the 100-year floodplain as delineated on the FIRM, any development must not increase Base Flood Elevation levels. A hydrologic and hydraulic analysis must be performed prior to the start of development and must demonstrate that the development would not cause any rise in base flood levels. No rise is permitted within the 100-year floodplain; and
- Per 44 CFR §65.3, upon completion of any development that changes existing Special Flood Hazard Areas, the participating community shall submit the appropriate hydrologic and hydraulic data to FEMA for a FIRM revision.

Local

Fortuna Municipal Code. The Fortuna Municipal Code (FMC; 2005) addresses flooding in Chapters 15.50 through 15.60 of Title 15, Building and Construction and Chapter 16.36 of Title 16 Subdivisions. The FMC references Ordinances 79-426, 87-509, and 99-618 for floodplain management regulations.

The regulations are designed to: protect human life and health; promote the public health, safety, and general welfare; minimize public and private losses due to flood conditions in specific areas; minimize expenditure of public money for costly flood control projects; minimize the need for rescue and relief efforts associated with flooding; minimize prolonged business interruptions; minimize damage to public facilities, streets and utilities; help maintain a stable tax base by providing for the sound use and development of areas of special flood hazard so as to minimize

future blighted areas caused by flood damage; ensure that potential buyers are notified that property is in an area of special flood hazard; and ensure that those who occupy areas of special flood hazard assume responsibility for their actions (FMC 15.50.030). Restrictions include:

- Restricting or prohibiting uses that are dangerous to health, safety, and property due to water or erosion hazards, or that result in damaging increases in erosion or flood heights or velocities;
- Requiring that uses vulnerable to floods, including facilities that serve such uses, be protected against flood damage at the time of initial construction;
- Controlling the alteration of natural floodplains, stream channels, and natural protective barriers that help accommodate or channel flood control waters;
- Controlling flood filling, grading, dredging, and other development that may increase flood damage; and
- Preventing or regulating the construction of flood barriers that will unnaturally divert floodwaters or that may increase flood hazards in other areas (FMC 15.50.040).

Chapter 15.52 provides definitions for the floodplain management division. Chapter 15.54 provides the general provisions for the floodplain management division, including descriptions of the lands to which the floodplain management division applies and the basis for establishing the areas of special flood hazards. Chapter 15.54 also includes sections that describe the terms of compliance, abrogation, interpretation, liability, and severability for the floodplain management division of the FMC. Chapter 15.56 of the FMC provides for the administration of the floodplain management division and includes sections that provide for the establishment of development permits in special Flood Hazard Areas, as well as the designation of the building official as the appointed floodplain administrator. Chapter 15.58 of the FMC outlines the provisions for flood hazard reduction, including sections that describe the standards for construction; standards for utilities; standards for subdivisions; standards for manufactured homes; standards for recreational vehicles; and standards for construction in floodways. Chapter 15.60 of the FMC summarizes the variance procedure for the floodplain management division.

Chapter 16.36 of the FMC addresses other improvements associated with the subdivision of land and specifically addresses drainage and sewer facilities in Section 16.36.011. The purpose of Section 16.36.011, as it relates to drainage facilities, is to establish a program to reduce flooding within the City, by completing drainage improvements included in the 2005 Storm Drain Master Plan. This section describes procedures and policies for: addressing significant impacts associated with development projects; addressing conflicts with the 2005 Storm Drain Master Plan; and establishing payment and use of drainage fees (FMC 16.36.011).

Methodology

Policy Background

The following policy background is used to assess the flooding impacts of the proposed plan:

- The areas identified as being located within the 100-year floodplain in Figure 9-10 may be subject to future flooding during 100-year or greater storm events;
- As of the 2005 Storm Drain Master Plan update, approximately one-third of the improvements recommended in the 1982 Storm Drain Master Plan had been partially, or fully, completed.
- Increased development in the City has aggravated flooding problems in the surrounding watersheds due to increasing amounts of runoff from newly created impervious areas.

Thresholds of Significance

General Plan implementation would have a significant flood-hazard impact if it would:

- Place housing or other structures within a 100-year Flood Hazard Area as mapped on FEMA FIRM map;
- Place within a 100-year Flood Hazard Area structures which would impede or redirect flood flows;
- Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee.

Implications of the Draft Land Use Plan

The primary risk resulting from development consistent with proposed General Plan implementation is the potential to expose people and habitable structures to flooding. Increased exposure could occur by developing land within flood zones. Development facilitated under the proposed plan could place structures within a 100-year Flood Hazard Area could impede or redirect flows and could expose increased development and population to flooding as a result of the failure of a levee or by mudflows.

General Plan Policy Response

The proposed General Plan includes the following policies and programs relevant to flooding.

Policy HS-7.1 Flood Area Designation. The City shall work closely with the U.S. Army Corps of Engineers, local reclamation districts, FEMA, and the State Department of Water Resources in identifying existing and potential flood problem areas and possible solutions.

Policy HS-7.2 Levee Enhancements. Should the Riverwalk Annexation Area be annexed to the City, the City shall seek Federal and State assistance for Eel River levee enhancement to reduce

potential failures that could impact this annexation area in the future.

Policy HS-7.3 Floodplain Maps. The City shall encourage FEMA and the California Department of Water Resource to update and maintain the 100-year floodplain map in order to allow the City to correctly identify areas unsuitable for urban development.

Policy HS-7.4 New Development. The City shall require new development to submit final grading plans demonstrating both topographic and stormwater flow information.

Policy HS-7.5 Filing of Inundation Maps: The City shall encourage FEMA for the timely completion and filing of inundation maps for all levees where failure could cause loss of life or personal injury within the City. Where inundation maps indicate levee failure could cause loss of life or property or personal injury, coordinate with the corresponding responsible party to investigate levee stability and management and identify rehabilitation and maintenance needs as appropriate.

Policy HS-7.6 Regulating Land Uses in the 100-Year Floodplain. The City shall prohibit new residential uses, facilities essential for emergencies (hospitals, police stations, fire stations, etc.), and large public assembly facilities in the 100-year floodplain (Figure HS-3), unless the structure and road access is elevated above the 100-year Base Flood Elevation (46 feet MSL). Other types of development shall be permitted in the 100-year floodplain without elevating above the 100-year Base Flood Elevation, so long as no structure openings occur below the 100-year Base Flood Elevation. Levees shall not be permitted as a flood proofing option.

Policy HS-7.7 Stormwater Detention Facilities. The City shall require on-site stormwater detention facilities in future large developments projects to reduce stream flooding during precipitation events.

Policy HS-7.8 Flood Hazards Study. The City shall require a flood hazard study for proposed development in the 100-year floodplain. The study shall be submitted to the Fortuna Building Department for review and approval, and may be combined with any required drainage study.

Policy HS-7.9 Changes to FEMA Flood Zones. The City shall require new subdivisions, PUDs, and other large development projects proposed within the 100-year floodplain (Figure HS-3) to evaluate whether the development would change FEMA flood zone designations on and within the project site vicinity. The evaluation shall be submitted to the Fortuna Engineering Department for review and approval, and may be combined with any required drainage study.

Policy HS-7.10 Flooding. The City shall not approve any new development that results in flooding on- or -off the development site.

Policy HS-7.11 Flooding Escape Routes. The City shall ensure that multiple escape routes are available for areas protected from flooding by levees, in the event of a levee failure.

Policy HS-7.12 Flood Control Design Criteria. The City shall require flood control design criteria to include a section on stream geomorphic analysis, to update information on bank protection and erosion control, and to incorporate biotechnical bank stabilization methods for the

purpose of preventing erosion and siltation in drainage swales and streams. New development shall be flood proofed and otherwise demonstrate that it can be protected from flood impacts, and will not cause flood impacts in other areas.

Policy HS-7-13 Wastewater Treatment and Floodplain Precautions. The City shall take appropriate steps to protect and contain its wastewater treatment facilities located in the floodplain.

Program HS-20. The City shall prepare and adopt a Flood Protection Master Plan.

Program HS-21. The City shall work with FEMA in an effort to update the Flood Insurance Rate Maps (FIRMS).

Program HS-22. The City shall investigate measures for the abatement of flooding hazards, and report its findings to the City Council for consideration. The measures may include, but are not limited to, the following: (1) removal or relocation of development from Flood Hazard Areas; (2) construction of impoundments or channel diversions, provided that adequate mitigation of environmental impacts can be demonstrated; and (3) debris and silt removal programs conducted in a manner so as not to disrupt existing sensitive habitat communities.

Program HS-23. The City shall provide information to the public regarding flood zone locations. The City shall develop maps and other flood-related information available on the City's website and public counter at City Hall.

Program HS-24. If the FEMA flood zone evaluation determines there would be a change in the FEMA flood zone designation, the City shall submit the evaluation to FEMA for a flood map revision no later than six months after the evaluation is completed.

Impacts and Mitigation

Impact 8.5-1: Place Housing or Other Structures Within a 100-Year Flood Hazard Area

Proposed General Plan implementation will allow the development of new housing or other structures within a 100-year Flood Hazard Area as mapped on a FEMA FIRM map.

Discussion

The Planning Area contains lands located within 100-year Flood Hazard Areas (100-year floodplains) as mapped on FEMA FIRM maps (Figure 9-10). Many of these areas have flooded in the past and are likely to flood again in the future. Under the proposed plan, lands within these areas designated for urban uses include:

1) The area west of HWY 101, including the Riverwalk Annexation Area and Riverwalk District Focus Area located within the Eel River 100-year floodplain is designated as Riverwalk District (mixed-use) and Industrial;
2) Most of the area south of SR 36 located within the Eel River and Van Duzen River 100-year floodplains is designated as Commercial, Industrial and Agriculture;

3) The southern portion of the Mill District, located within the Eel River, Strongs Creek, Jameson Creek and Mill Creek 100-year floodplains, is designated as Mill District (mixed-use);

4) The Fortuna Boulevard and Smith Lane area, including the northern portion of the Fortuna Boulevard Focus Area located within the Rohner Creek 100-year flood area is designated as Corridor Mixed Use; and

5) The area on both sides of Strongs Creek between Rohnerville Road and Redwood Way located within the Strongs Creek 100-year floodplain is designated as Residential High.

The proposed designation of lands within Flood Hazard Areas for urban development could expose such development, and the associated resident and non-resident populations, to flooding during 100-year storm events. However, the following policies are proposed in the proposed plan to minimize the flood exposure hazard:

- Policy HS-7.6 prohibits new residential development, essential facilities and large public assembly facilities in the 100-year floodplain unless the structures are elevated above the 100-year Base Flood Elevation, and prohibits other types of development in the floodplain unless it is either elevated above the Base Flood Elevation or flood proofed;
- Policy HS-7.8 requires a flood hazard study for development proposed in the 100-year floodplain; and
- Policy HS-7.12 requires that new development be flood proofed.

While implementation of these policies would help reduce the potential flood hazard associated with new development in 100-year Flood Hazard Areas, they will not completely eliminate the hazard because they do not require that ALL new structures within these areas to be elevated above the Base Flood Elevation as required by FEMA. Without implementation of this additional measure, the impact will be significant.

Determination of Level of Impact

Significant, but can be reduced to a less than significant levels with implementation of the recommended mitigation.

Mitigation

Mitigation Measure 8.5-1a: Add a new Fortuna City Code requirement as follows:

> **Regulating Land Uses in the 100-Year Floodplain.** ALL buildings constructed within the 100-year floodplain (i.e., Flood Zones A, AO, AH, AE, and A1 through A30 as delineated by the FEMA FIRM maps) shall be elevated so that the lowest floor is at or above the Base Flood Elevation level.

Impact 8.5-2: Place Structures Within a 100-Year Flood Hazard Area That Could Impede or Redirect Flood Flows

Proposed General Plan implementation will allow new development within 100-year Flood Hazard Areas that could impede or redirect flood flows.

Discussion

Urban development in 100-year floodplains can impede or redirect flood waters during large storm events when flows exceed the capacity of river and creek channels and spread out into the floodplain. If development and associated features (roads, berms, development pads, etc.) developed in the floodplain are large enough, relative to the size of the floodplain, the associated impedance and/or redirection of flows can increase the Base Flood Elevation within the floodplain and potentially flood areas outside the floodplain.

The majority of the 100-year floodplain areas in the Planning Area (e.g., those generally west of HWY 101, but also extending east of the highway in the lower reaches of Rohner and Strongs Creeks) are associated with the Eel River (Figure 8-8). The Sandy Prairie Levee is intended to protect these areas from flooding by the River, but a combination of inadequate height, age and condition of the levee has resulted in FEMA re-designating these areas as 100-year floodplain. Development of these areas under the proposed plan could impede or redirect some flood flows, especially in the proposed Riverwalk Annexation Area and Riverwalk Focus Area that are designated for industrial and mixed uses.

The balance of the 100-year floodplain areas in the Planning Area are those east of HWY 101 associated with Rohner, Strongs, Jameson, Mill and Van Duzen Creeks (Figure 8-8). A spur of the Sandy Prairie Levee extends one mile eastward on the south bank of Strongs Creek, but as discussed above, the levee is an older improvement and has resulted in FEMA re-designating areas around the lower reaches of Strongs Creek as 100-year floodplain. However, several factors minimize the potential for the impeding or redirecting flood waters under the proposed plan. First, the development of Sandy Prairie Levee has effectively removed the portion of the Planning Area west of HWY 101 from the Eel River floodplain, and that portion of the river's floodplain within the Planning Area represents an extremely small portion of the river's total floodplain, such that the river's floodplain downstream of the Planning Area would likely experience little if any increase in Base Flood Elevations under the proposed plan. Second, approximately two-thirds of the floodplain area west of HWY 101 are designated as Agriculture and thus will remain largely undeveloped, while the majority of the floodplain area in the proposed Fortuna Boulevard Focus Area is already developed. Third, the following policies are proposed in the proposed plan to minimize the potential for the impedance or redirection of flood flows:

- Policy HS-7.9 requires new subdivisions, PUDs and other large development projects proposed within the 100-year floodplain to evaluate whether the development would change FEMA flood zone designations;
- Policy HS-7.10 prohibits the City from approving new development that results in flooding on- or off-site;

- Policy HS-21 requires the City to work with FEMA to update the FIRM maps; and
- Program HS-24 requires that if the FEMA flood zone evaluation determines there would be a change in FEMA flood zone designation, the City shall submit the evaluation to FEMA for a flood map revision no later than six months after the evaluation is completed.

Even with these policies in place, FEMA has identified an additional measure required to ensure that the proposed plan does not significantly impede or redirect flood flows within a flood hazard area. Without implementation of this additional measure, the impact will be significant.

Determination of Level of Significance

Significant, but can be reduced to a less than significant levels with implementation of the recommended mitigation.

Mitigation

Mitigation Measure 8.5-2a: Add a new Fortuna City Code requirement as follows:

> **Maintenance of Base Flood Elevation Levels Within the 100-year Floodplain.** If proposed development is located within a 100-year floodplain as delineated in the FEMA FIRM maps, a hydrologic and hydraulic analysis shall be performed prior to development that demonstrates that the development will not increase Base Flood Elevation levels within the floodplain – no rise is permitted within the 100-year floodplain. The analysis may be combined with the Drainage Study required by Policy PFS-5.14, and with the Flood Hazards Study required by Policy HS-7.8, of the City of Fortuna General Plan 2030.

Impact 8.5-3: Flooding -- Expose People or Structures to a Significant Risk Involving Flooding, Including as a Result of Levee Failure

General Plan Implementation could expose more people and structures to a significant risk involving flooding, including flooding resulting from failure of a levee.

Discussion

Portions of the Planning Area are located within the 100-year floodplain and subject to flooding during 100-year and greater storm events (Figure 8-8). As discussed previously, the proposed plan includes a range of policies to minimize potential flooding hazards, including but not limited to: (1) Policy HS-7.6 that requires new residential uses and critical facilities proposed in the 100-year floodplain to be elevated above the 100-year Base Flood Elevation, and requires other uses to either be elevated above the Base Flood Elevation or flood proofed; and (2) the preparation of flood hazards studies for development proposed in the 100-year floodplain. An additional mitigation measure has also been recommended that requires all buildings constructed within the 100-year floodplain [and not just residential and critical uses] be elevated above the

Base Flood Elevation. By implementing these policies and the recommended mitigation measure, the proposed plan will not expose more people or property to a significant risk involving flooding.

Portions of the Planning Area are partially protected from flooding by the Sandy Prairie Levee. The levee runs along the east bank of the Eel River, with a stub running eastward along the south bank of Strongs Creek. According to the FIS, the levee provides a moderate amount of protection against major floods, but has experienced damage and breeches in the past (FEMA, 1981). Sudden failure of this levee could potentially cause flooding within the portions of the Planning Area located within the 100-year floodplains of the Eel River and Strongs Creek (Figure 9-10). FEMA periodically inspects and re-certifies levees. The California Government Code requires periodic safety inspections of levees, completion of a routine maintenance plan, and development of emergency response plans in the event of a levee failure. In addition, the proposed plan includes the following policies designed to ensure that flood issues associated with the levee are quickly identified and solved:

- Policy HS-7.1 requires the City to work closely with the U.S. Army Corps, local reclamation districts, FEMA and the California Department of Water Resources in identifying existing and potential flood problems and solutions;
- Policy HS-7.2 requires the City to seek Federal and State assistance for Eel River levee enhancement to reduce potential failures;
- Policy HS-7.5 requires the City to encourage FEMA to complete and file inundation maps for levees in the City where failure could cause loss of life, and to rehabilitate the levees where required;
- HS-7.11 requires the City to ensure that multiple escape routes are available for areas protected from flooding by levees in the event of a levee failure; and
- Program HS-22 requires the City to investigate measures for abatement of flooding hazards, and possible removal or relocation of development in flood hazard areas. With ongoing federal and state levee and inspection and maintenance efforts, and with implementation of the proposed policies and programs, the potential for levee-related flooding would be less than significant.

Determination of Level of Significance

Less-Than-Significant

Mitigation

No mitigation necessary

References Cited

City of Fortuna. 2005. City of Fortuna Municipal Code. Fortuna: COF.
---. 1993. *Fortuna General Plan*. Public Services and Facilities Resolution 88-30 Fortuna: COF.

Federal Emergency Management Agency (FEMA). November 3, 1981. *Flood Insurance Study, City of Fortuna, California Humboldt County*. NR: FEMA.

Federal Emergency Management Agency (FEMA), 2008. FEMA comments on the 2007 Draft PEIR for the City of Fortuna General Plan 2030). May 22.

---. August 5, 1986. *Flood Insurance Study, Humboldt County, California Unincorporated Areas*. NR: FEMA.

---.Effective Date May 3, 1982. Flood Insurance Rate Map, City of Fortuna, California, Humboldt County, Community Panel Numbers 0600630002 A and B. NR: FEMA.

County of Humboldt. NR. Humboldt County Zoning Regulations. Eureka: County of Humboldt.

California Environmental Protection Agency. 1984. Title 14, California Code of Regulations, California Environmental Quality Act. Sacramento: CalEPA.

Winzler & Kelly. December 1982. Fortuna Drainage Study Storm Drain Master Plan Prepared for The City of Fortuna. Eureka: W&K.

---July 2005. 2005 Storm Drainage Master Plan City of Fortuna, California. Eureka: W&K.