

Delta Annex Chapter 7 RD 551

7.1 Introduction

This Annex details the hazard mitigation planning elements specific to Reclamation District No. 551 (RD 551 or District), a previously participating jurisdiction to the 2021 Sacramento County Local Hazard Mitigation Plan (LHMP) Update. This Annex is not intended to be a standalone document but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the District. This Annex provides additional information specific to the District, with a focus on providing additional details on the planning process, risk assessment, and mitigation strategy for this jurisdiction.

7.2 Planning Process

As described above, RD 551 followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Sacramento County Hazard Mitigation Planning Committee (HMPC), the District formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table 7-1. Additional details on Plan participation and District representatives are included in Appendix A.

Table 7-1 RD 551 – Internal Planning Team

Name	Position/Title	How Participated
Ryan Elliot	Reclamation District No. 551/District Trustee	Internal planning coordination with MBK Engineers
Topper Van Loben Sels	Reclamation District NO. 551/District President	Internal planning coordination with MBK Engineers
Tina Anderson	MBK Engineers: District Engineer/ Senior Project Manager	Participate in large county-wide planning meetings. Internal planning coordination with Moncrief and District. review and develop draft details, provide historical context and define mitigation actions.
Michael Moncrief	MBK Engineers: District Engineer/ Principal Engineer	Internal planning coordination with Anderson. Review and develop draft details, provide historical context and define mitigation actions.

Coordination with other community planning efforts is paramount to the successful implementation of this LHMP Update. This section provides information on how the District integrated the previously FEMA-approved 2021 LHMP into existing planning mechanisms and programs. Specifically, the District incorporated into or implemented the 2021 LHMP through other plans and programs shown in Table 7-2.

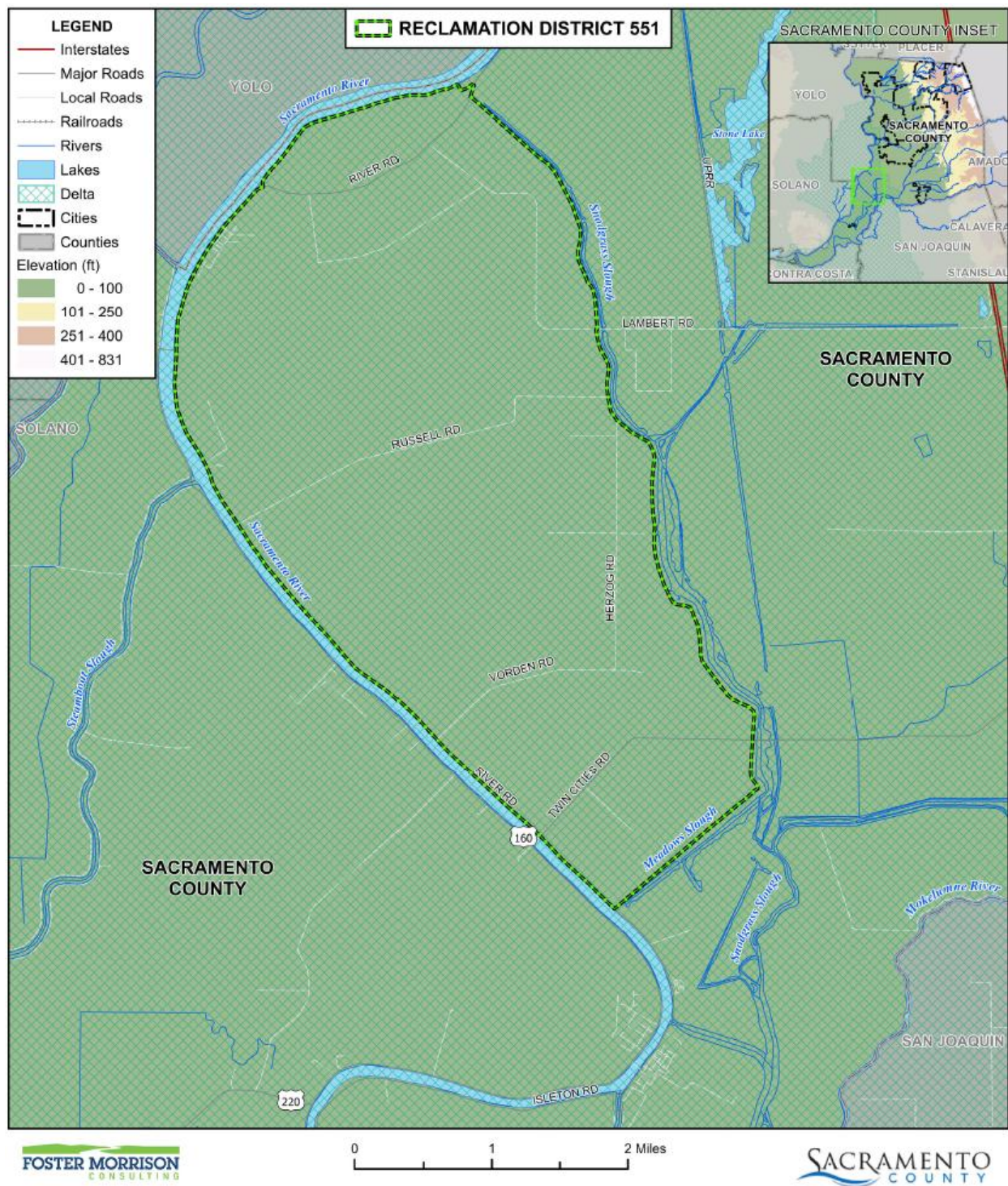
Table 7-2 2021 LHMP Incorporation

Planning Mechanism 2021 LHMP Was Incorporated or Implemented Through	Details
2025 EOP and Flood Contingency Map	Updated 2023 EOP; Purchasing Flood Fight Supplies through DWR/County Grant Opportunity. LHMP was not used for this work, but the updated EOP will support future emergency operations and recovery efforts.
Systemwide Improvement Framework	Develop plan for addressing deferred maintenance items throughout District levee system. LHMP was not used for this work.

7.3 Community Profile

The community profile for RD 551 is detailed in the following sections. Figure 7-1 displays a District map and the location of RD 551 within Sacramento County.

Figure 7-1 RD 551



Data Source: Sacramento County, Cal-Atlas; Map Date: 6/16/2026.

7.3.1. Overview and Background

Reclamation District No. 551, Pearson District, is the local public entity that provides flood protection in the form of levee maintenance and drainage to the landowners of Pearson District. The District operates and maintains all the levees that protect the landowners. As described in Division of Water Resources, (currently known as Department of Water Resources) Bulletin No. 37, published in 1930, the District is described as protecting 8,800 gross acres, with a net protected area of 8,537 acres, within Sacramento County.

On December 9, 2021, the District annexed the adjacent Reclamation District 755. The Sacramento River Levee segment was modified as a part of the annexation, to add that exterior levee as Unit 1. The pre-existing Sacramento River levee segment of RD 551 is now Unit 2. The Snodgrass Slough and Back Levee have not changed.

The landowners originally built the project levee along the Sacramento River (6.85 miles); USACE, under authority of the SRFCP, rebuilt portions of the levee. This is the levee recognized by both the state and federal governments as the primary flood protection levee, as part of the SRFCP. The District built the non-project levee along Snodgrass Slough (5.91 miles) to its present design in the 1920s. There are also 1.37 miles of non-project cross levee, adjacent to the Delta Meadows State Park.

The District does not supply water, which is the responsibility of the individual landowners; however, the District maintains 37.97 miles of canals and ditches that provide drainage to the property owners. These ditches and canals are fed by farmer ditches, which are designed by the landowner to drain their property adequately. Once the drain water enters the District's ditches and canals, water is removed at pumping plants located on the east side of RD 551.

Land use is predominantly agricultural, aside from the small town of Courtland. Orchards (including pears, apples, and cherries), vineyards, alfalfa, grain, and miscellaneous row crops are the primary crops. The historic town of Courtland is the largest residential area within the District. There are an estimated 600 permanent residents living in approximately 196 residential units – primarily in the communities of Courtland, Paintersville and Vorden. Courtland has a sewage treatment plant operated by Sacramento County. Two large fruit packing operations are located within the protected area of the District. There are public roads running along the entire length of the Sacramento River levee.

The District has no major land use changes, although there are statewide planning efforts that if carried out could require major land use changes, affecting all aspects of the District operation and maintenance of the levee and drainage system. This can be seen in Figure 7-2.

Figure 7-2 RD 551 – Aerial Map with Stationing



Source: RD 551/MBK Engineers

Interior ground elevations slope toward the center of the District. Interior ground elevations range from 12 feet (toe of Sacramento River levee) to -12 NGVD within the District interior. Top of levee elevations range from 19.0 to 27.5 feet national geodetic vertical datum (NGVD) along the non-project back levee, and 24.9 to 26.2 feet NGVD along the project levee (left bank of Sacramento River). The low elevation of 19.0 on the non-project levee is located at Lambert Road, still over 2.0 feet above the 100-year flood elevation. Except for this and two other road crossings, the non-project levee generally has over 6 feet of freeboard above the 100-year flood elevation. Elevations were included on Figure 7-1.

Reclamation is one of the first forms of public improvement in California, with the early focus on reclaiming "swamp and overflowed" lands granted to the state under the Federal 1850 Arkansas Act. The term reclamation primarily encompasses flood control and drainage but has also long included irrigation.¹ To help local landowners reclaim the swamp and overflowed lands, the state adopted a series of statutes authorizing them to form local reclamation and levee districts. The area of a proposed district was outlined in a formation petition presented to a state or county board, which would order a district to be formed after a majority vote of the affected landowners. Beginning in 1861, the Board of Swamp Land Commissioners issued the orders organizing reclamation and levee districts. Beginning in 1867, districts were organized under the Green Act by county boards of supervisors. (Stats. 1867-8, c. 415.) A few reclamation districts were also created by special act of the legislature. (See, e.g., Stats. 1911, c. 100 (RD 900).) Regardless of how they were formed, reclamation districts now operate under Water Code Division 15, § 50000 et seq., and levee districts under Division 19, § 70000 et seq. (See also Stats. 1911, c. 100, § 2.)

As reclamation districts were formed under the above noted laws, they were given numbers sequentially. Pearson District formed in 1893 and was given the number "551." The area protected by the District has remained the same for essentially the entire time of its existence.

Starting in the 1940s, USACE improved the Sacramento River levee is a flood control structure to meet the federal design standard. To satisfy the conditions of federal involvement in such projects, the Central Valley Flood Protection Board (CVFPB) agreed to operate and maintain the Sacramento River levee. USACE transferred the District levee, as part of Unit No. 111, completely over to CVFPB, formerly the State Reclamation Board, in September 1955. Under Section 8618 of the Water Code, reclamation districts are authorized to establish agreements with the CVFPB to perform these actions for the state. The District is required to maintain and operate the levees to meet the standards as listed in the Supplemental Operation and Maintenance Manual.

7.4 Risk Assessment

As defined by FEMA, risk is a combination of hazard, vulnerability, and exposure. "It is the impact that a hazard would have on people, services, facilities, and structures in a community and refers to the likelihood of a hazard event resulting in an adverse condition that causes injury or damage."

¹ Hershey v. Reclamation Dist. No. 108, 200 Cal. 550, 567-68 (1927).

The RD 551 risk assessment identifies and profiles relevant hazards and assesses the exposure of lives, property, infrastructure, and the environment to these hazards. The process allows for a better understanding of the District's potential risk and vulnerability to hazards and provides a framework for developing and prioritizing mitigation actions to reduce risk from future hazard events.

Building on the District Profile above, a risk assessment was performed for the District utilizing the existing District boundaries. This includes the following sections:

- 7.4.1 Assets Inventory and Growth and Development Trends
- 7.4.2 Hazard Identification
- 7.4.3 Hazard Profiles and Vulnerability to Specific Hazards

7.4.1. Assets Inventory and Growth and Development Trends

This section provides an inventory of the RD 551's total assets potentially at risk to hazards and an overview of growth and development trends. This section is broken into two parts:

- **Asset Inventory** – The assets inventory identifies the RD 551's total assets, including the people and populations; structures; critical facilities and infrastructure; community lifelines; natural, historic, and cultural resources; and economic assets and community activities of value. This data is not hazard specific, but is representative of total assets within the District, potentially at risk to identified hazards as discussed in Section 7.4.3 Hazard Profiles and Vulnerability to Specific Hazards.
- **Growth and Development Trends** – A discussion of growth and development trends in the District, both current and future, is presented.

Assets Inventory

The District's asset inventory is detailed in the following sections:

- People and Populations
- District Assets and Critical Facilities and Infrastructure
- Community Lifelines
- Natural, Historic, and Cultural Resources
- Economic Assets and Community Activities of Value

A discussion of each of these assets follows and serves as the template for the asset discussion for each hazard in Section 7.4.3.

People and Populations

The most important asset within any community are the people and populations that reside in the community. People and populations in the District include both District staff and workers as well as those populations located within District boundaries and are served by the District. This section includes an inventory of past and current populations of the District and also discusses vulnerable populations and underserved communities as a subsection of people and populations located within the District and

potentially at risk to hazards. Information from the District and other sources as detailed below form the basis of this discussion.

Historic Population Trends and Current Population

The most important asset within any community are the people and populations that both work and reside in the District. For special districts, this generally includes District staff and contractors as well as those populations located within its boundaries. The District has 1 part-time staff person that works for the District. Temporary emergency workers are hired, as necessary, along with vendors and contractors to support annual operations, maintenance and repair activities by the District. The District provides flood protection to approximately 600 residents; the number of residents may vary overtime. The Small Community and Legacy community of Courtland is within the District along the Sacramento River.

The District noted vulnerable or underserved populations exist inside the District. There are aging and elderly populations, medically underserved and health resource deficits; migrant and agricultural workforce; and environmental justice & infrastructure disadvantaged folks in the District.

District Assets and Critical Facilities and Infrastructure

This section considers the RD 551's assets at risk, with a focus on key District assets such as structures, critical facilities and infrastructure, and other District assets and their values. With respect to District assets, the majority of these assets are considered critical facilities as defined for this Plan. Critical facilities are defined for this Plan as:

Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.

A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-risk Populations Facilities, (3) Hazardous Materials Facilities.

Most of the District assets are considered Category 1 critical facilities, specifically essential services facilities. Table 7-3 lists critical facilities and other District assets identified by the District Planning Team as important to protect in the event of a disaster. RD 551's physical assets, valued at over \$422 million, consist of structures, critical facilities and infrastructure, and other District assets to support the District's operations.

Table 7-3 RD 551 Assets: Structures, Critical Facilities and Infrastructure, and Other Facilities.

Name of Asset	Facility Type	Replacement Value	Which Hazards Pose Risk
Pumps/Discharge Pipes – Snodgrass Slough	Drain Pumps	\$10,000,000	Floods, Levee Failure, Severe Weather: Heavy Rain and Storms

Name of Asset	Facility Type	Replacement Value	Which Hazards Pose Risk
Pumps/Pipes – Sacramento River	Drain Pumps	\$8,000,000	Floods, Levee Failure, Severe Weather: Heavy Rain and Storms
Pumps – Lake	Drain Pumps	\$2,000,000	Floods, Levee Failure, Severe Weather: Heavy Rain and Storms
District Owned Facilities	Home, Buildings & Equipment	\$3,000,000	Floods, Levee Failure, Severe Weather: Heavy Rain and Storms
Levees	Flood Control System (15.96 Miles of Project and Non-Project Levees)	399,000,000	Floods, Levee Failure, Severe Weather: Heavy Rain and Storms
Total		\$422,000,000	

Source: RD 551

Community Lifelines

Assessing the vulnerability of RD 551 to natural hazards and disasters also involves reviewing and inventorying the community lifelines in place that could be affected. It is important to include these items in hazard discussions as the continuous operation of critical government and business functions is essential to human health and safety, property protection, and economic security. The importance of community lifelines is discussed below:

- Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function.
- FEMA has developed a method for objectives-based response that prioritizes the rapid stabilization of Community Lifelines after a disaster.
- The integrated network of assets, services, and capabilities that provide lifeline services are used day-to-day to support the recurring needs of the community and enable all other aspects of society to function.
- When disrupted, decisive intervention (e.g., rapid re-establishment or employment of contingency response solutions) is required to stabilize the incident.

Community lifelines, as defined by FEMA, include the following:

- **Safety and Security** – Law Enforcement/Security, Fire Service, Search and Rescue, Government Service, Community Safety
- **Food, Hydration, Shelter** – Food, Water, Shelter, Agriculture
- **Health and Medical** – Medical Care, Public Health, Patient Movement, Medical Supply Chain, Fatality Management
- **Energy** – Power Grid, Fuel
- **Communications** – Infrastructure, Responder Communications, Alerts Warnings and Messages, Finance, 911 and Dispatch
- **Transportation** – Highway/Roadway/Motor Vehicle, Mass Transit, Railway, Aviation, Maritime
- **Hazardous Material** – Facilities, HAZMAT, Pollutants, Contaminants

➤ **Water Systems** – Potable Water Infrastructure, Wastewater Management

It should be noted that these community lifelines are all in place and functional as part of regular government operations in the Sacramento County Planning Area serving as a partnership between the cities, local special districts and agencies, and Sacramento County. Most all of the District's community lifelines overlap with the Planning Area's and include many of the critical facilities and infrastructure assets inventoried for this LHMP. As such, specific information on these community lifelines in the District and how they may be affected by a hazard event or disaster are discussed collectively for all jurisdictions in the Base Plan and in the Delta annex.

Natural, Historic, and Cultural Resources

Natural Resources

RD 551 has a variety of natural resources of value to the District. These natural resources are parallel to that of Sacramento County as a whole. Information can be found in Section 4.2.1 of the Base Plan. In the past, RD 551 has protected a number of natural gas wells. Currently, there are no wells in operation in Pearson District. RD 551's levees support vegetation that provide fish and wildlife habitat. Agricultural ground and ditches also support wildlife.

Historic and Cultural Resources

RD 551 has a variety of historic and cultural resources of value to the District. These historic and cultural resources are parallel to that of Sacramento County as a whole. Information can be found in Section 4.2.1 of the Base Plan. Since the land has been settled for over 150 years, there are many historic structures on Pearson District.

Economic Assets and Community Activities of Value

Assessing the vulnerability of RD 551 to natural hazards and disasters also involves inventorying the economic assets and community activities of value in the District. The town of Courtland is a Legacy community within the North Delta region and hosts the annual Delta Pear Fair every summer which has been a long standing Delta-Wide festival celebrating the pear harvest, and stands as a focal point of civic pride and tradition for the region. Along with their community is a school, and other community services to support the region.

Economic Assets

After a disaster, economic resiliency is one of the major drivers of a speedy recovery. Each community has specific economic drivers. Economic assets for the County were discussed in Section 4.2.1 of the Base Plan.

The District protects the town of Courtland. The total population within the District is approximately 600 with approximately 198 residential structures with a depreciated value of \$54 million.

The District has approximately 8,900 acres dedicated to agriculture. The District supports a mixture of permanent crops such as orchards and vineyards, row crops, grain, and pasture. The total value of this is estimated to be \$50 million.

Additionally, the District supports critical infrastructure that includes State Highway 160 as well as County roads, a ferry, local bridges, schools, fire station, water wells, gas wells, and communication tower

Community Activities of Value

Inventorying economic assets in the District and their vulnerability to natural hazards and disasters also involves inventorying activities that have value to the community. This includes activities that are important to a community, like long-standing traditions such as a festival or fair or other activities that bring money into the communities such as sports tournaments and other recreational activities. Community Activities of Value for the County were discussed in Section 4.2.1 of the Base Plan and are assumed to be the same or similar for the District.

Growth and Development Trends

As part of the planning process, the District looked at changes in growth and development, both current and future, and examined these changes in the context of hazard-prone areas, and how the changes in growth and development affect loss estimates and vulnerability over time. This inventory section details future development/redevelopment projects that are likely to occur over the next five years covered by this 2026 LHMP. For Districts, this generally includes the following:

- Construction/development projects related to adding new District facilities, infrastructure, land acquisition, etc.
- Plans for expansion or build out of the District's service area, including new service hookups, and other District functions related to where the District will be expanding services.

Population Trends and Projections

Population has stayed the same in the District, or has declined slightly. The District noted that there are no plans for development or changes in land use in the District, so future populations are expected to be the same as the current 2026 population.

Development since 2021 Plan

Little to no development has occurred within the District since 2021. Similarly, the area protected by the District's levees has experienced minimal to no development during the same period.

Future Development Areas

It is important to review future development plans for the District. Future development should be sited in areas that are away from known hazard risks. If this is not possible, mitigation should be done to ensure that future development is protected against future hazards. The District noted that no future facilities or additional development is expected in the District.

7.4.2. Hazard Identification

RD 551 identified the hazards that affect the District and summarized their location, extent, likelihood of future occurrence, potential magnitude, and significance (or priority of a hazard) specific to the District (see Table 7-4). Those hazards identified as a high or medium significance in Table 7-4 are considered District priority hazards for mitigation planning. Those hazards that occur infrequently or have little or no impact in the District were determined to be of low significance and not considered a priority hazard. Significance was determined based on the hazard profile, focusing on key criteria such as frequency, extent, and resulting damage, including deaths/injuries and property, natural and cultural resources, and economic damage. The ability of a jurisdiction to reduce losses through implementation of existing and new mitigation measures was also considered as to the significance of a hazard. This assessment was used to prioritize those hazards of greatest significance, enabling the District to focus resources where they are most needed.

Table 7-4 RD 551—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/Severity	Significance	Climate Change Influence
Aquatic Nuisance Species (plant/animal)	Limited	Occasional	Negligible	Low	Low
Climate Change	Extensive	Occasional	Limited	Low	–
Dam Failure	Limited	Unlikely	Negligible	Low	Medium
Drought & Water Shortage (w/tree mortality)	Significant	Occasional	Limited	Low	High
Earthquake (w/subhazards)	Extensive	Occasional	Limited	Low	Low
Flood: 1%/0.5%/0.2% annual chance	Extensive	Occasional	Catastrophic	High	Medium
Flood: Localized Stormwater	Significant	Likely	Critical	High	Medium
Landslides, Mudslides, and Debris Flow	Limited	Unlikely	Negligible	Low	Medium
Levee Failure	Extensive	Occasional	Catastrophic	High	Medium
Sea Level Rise	Limited	Likely	Limited	Low	High
Severe Weather: Extreme Cold and Freeze	Extensive	Likely	Negligible	Low	Medium
Severe Weather: Extreme Heat	Extensive	Likely	Negligible	Low	High
Severe Weather: Heavy Rains and Storms (Hail, Lightning, Wind)	Extensive	Likely	Critical	Medium	Medium
Severe Weather: High Winds and Tornadoes	Extensive	Likely	Limited	Low	Low
Subsidence	Significant	Likely	Limited	Low	Medium
Wildfire (with smoke and air quality)	Limited	Unlikely	Negligible	Low	High
Geographic Extent Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area Likelihood of Future Occurrences Highly Likely: Near 100% chance of occurrence in next year, or happens every year. Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less. Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years. Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years. Magnitude/Severity Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid Significance Low: minimal potential impact Medium: moderate potential impact High: widespread potential impact Climate Change Influence Low: minimal potential impact Medium: moderate potential impact High: widespread potential impact					

7.4.3. Hazard Profiles and Vulnerability to Specific Hazards

This section includes the hazard profiles and vulnerability assessment for the RD 551's priority hazards (i.e., those ranked of medium or high significance specific to the District as identified in the Significance column of Table 7-4). This section focuses on where and how the District is affected by their priority hazards. Chapter 4 of the Base Plan provides more detailed information about these hazards and their impacts on the Sacramento County Planning Area. Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.2 of the Base Plan.

Hazard Profiles and Vulnerability Assessment

Each hazard is profiled in the following format:

- **Hazard Profile** – A hazard profile is included for each hazard. This includes information on:
 - ✓ **Hazard Overview** – A general discussion of the hazard and related issues is detailed here.
 - ✓ **Location and Extent** – Location is the geographic area within the District that is affected by the hazard. Extent is the expected range of intensity for each hazard. These are discussed in specific detail for mapped hazards, and in more general detail for those hazards that do not have discrete mapped hazard areas.
 - ✓ **Past Occurrences** – Past occurrences are discussed for each hazard. A discussion of disaster declarations is included in each hazard section. NCEM events are also discussed. Other past occurrences data specific to the District follow the disaster declarations and NCEM events for each hazard.
 - ✓ **Climate Change** – This section contains the effects of climate change (as applicable). The possible influence of climate change on the hazard is discussed.

After the hazard profile, a vulnerability assessment is presented. As part of the vulnerability assessment, an estimate of the vulnerability of the District to each identified hazard, in addition to the estimate of risk of future occurrence, is provided in each of the hazard-specific sections. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

After this classification, a general discussion of hazard vulnerabilities occurs. This is done in the following format:

- **Vulnerability Overview** – A general discussion of the hazard vulnerability and related issues is detailed here.
- **Local Concerns** – This includes District provided information on how the District is uniquely affected by or vulnerable to each hazard.
- **Assets at Risk** – A discussion of the assets at risk follows, presented in the same order as in Section 7.4.1 above, with a few exceptions. This includes sections on: People and Populations; District Assets and Critical Facilities and Infrastructure; and Natural, Historic, and Cultural Resources. These are discussed in specific terms for mapped hazards, and in more general terms for those hazards that are unmapped. Sections on Community Lifelines and Economic Assets and Community Activities of Value are not included in the Sections below, as they are common to all jurisdictions and are fully covered in Section 7.4.1 above and in Chapter 4 of the Base Plan.
- **Impacts** – A discussion on hazard impacts follows. Impacts describe how each hazard can affect the District and its assets. The type and severity of impacts reflect both the potential magnitude of the hazard and the vulnerability of the asset.
- **Future Conditions/Future Development** – A discussion of how future conditions and future development may affect the hazard is also included. This considers both new District assets and improvements as well as any changes with the District’s boundaries.

Power Interruption/Power Failure: A Common Vulnerability of all Hazards

An impact or vulnerability of almost all hazards evaluated as part of this LHMP Update relates to power shortage and/or power failures. There are two major power providers in the Sacramento County Planning Area - Sacramento Municipal Utility District (SMUD) and Pacific Gas and Electric (PG&E). The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the U.S. Department of Energy, major blackouts are on the upswing. Incredibly, over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that plans may be made to handle them effectively. In addition to blackouts, brownouts can occur. A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency. Electric power disruptions can be generally grouped into two categories: intentional and unintentional. Much of the Sacramento County Planning Area is served by Pacific Gas & Electric (PG&E) and Sacramento Municipal Utility District (SMUD). More information on types of power disruptions can be found in Section 4.3 of the Base Plan.

Public Safety Power Shutoff (PSPS)

An intentional disruption type of power shortage/failure event has been implemented in California because of wildfires starting as a result of downed power lines or electrical equipment. This was the case for the Camp Fire in 2018. As a result, California’s three largest energy companies (including PG&E), at the direction of the California Public Utilities Commission (CPUC), are preparing all Californians for the threat of wildfires and power outages during times of extreme (fire) weather. To help protect customers and communities during extreme fire weather events, electric power may be shut off for public safety to proactively prevent wildfire. This is called a PSPS. More information on PSPS criteria can be found in

Section 4.3 of the Base Plan. PG&E noted no PSPS events in the Sacramento County Planning Area since the 2021 LHMP. SMUD noted that it has had no PSPS events for its service territories since 2021.

Local Concerns

There have been no intentional PSPS events associated with hazard events affecting the District since 2021. However, with an increase in climate change related issues (e.g., extreme heat conditions, atmospheric river storms) occurring in the District, the potential for future hazard related power outages remain a concern.

The 2023 FEMA DR 4683 event required the District to operate under an emergency to support temporary power generation at their pump station for critical drainage capabilities and avoid interior flooding. This was a temporary issue since power was active shortly after temporary power was procured, and there are on-site diesel powered pumps. The District has not been affected by a Public Safety Power Shutoff.

Hazard Profiles and Vulnerability Assessment by Hazards

The following sections provide the hazard profile and vulnerability assessments for each of the hazards identified in Section 0 Hazard Identification.

Flood: 1%/0.5%/0.2% Annual Chance

Likelihood of Future Occurrence—Occasional (1%)/Unlikely (0.5/0.2%)

Vulnerability—High

Hazard Profile

This hazard discusses the FEMA DFIRM 1%, 0.5%, and 0.2% annual chance floods. These tend to be the larger floods that can occur in the District and have caused damage in the past. Flooding can be a significant problem in the District. Historically, the District has been at risk of flooding primarily during the winter and spring months when river systems in the District swell with heavy rainfall and snowmelt runoff. The District has also been at risk during atmospheric river flood events. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures located throughout the Sacramento County Planning Area and the RD 551. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage. Flooding has occurred within the 1% annual chance floodplains and in other localized areas in the District. The District has also been at risk during atmospheric river flood events. Rain on snow events occurring in upper elevations during the spring months can also be significant and contribute to greater downstream runoff and flooding during large storm events.

Location and Extent

RD 551 has areas located in the 1% annual chance flood zones. This is seen in Figure 7-3. As shown, the District is entirely in the DFIRM AE Flood Zone.

Figure 7-3 RD 551 – FEMA DFIRM Flood Zones

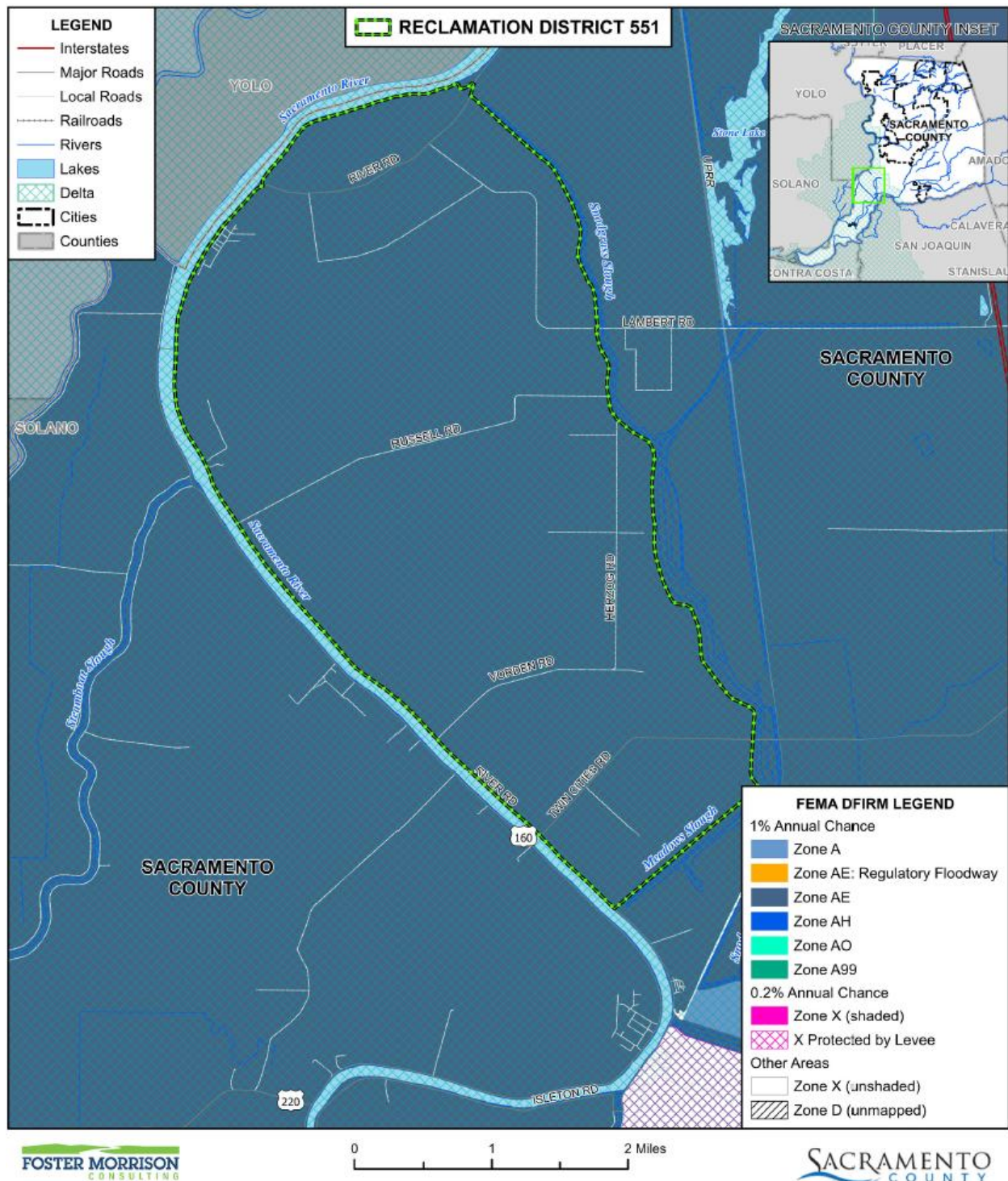


Table 7-5 details the DFIRM mapped flood zones located within the District.

Table 7-5 RD 551– DFIRM Flood Hazard Zones

Flood Zone	Description	Present in District
A	1% annual chance flooding; No base flood elevations provided	
AE Regulatory Floodway	1% annual chance flood: Regulatory floodway; Base flood elevations provided	
AE	1% annual chance flooding; Base flood elevations provided	X
AH	1% annual chance flood areas of shallow flooding between one to three feet deep. Regulatory floodway; Base flood elevations provided	
AO	Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet. Average flood depths derived from detailed hydraulic analyses are shown in this zone.	
A99	Areas subject to inundation by the 1-percent-annual-chance flood event, but which will ultimately be protected upon completion of an under-construction Federal flood protection system.. No Base Flood Elevations (BFEs) or depths are shown.	
X (shaded)	0.2% annual chance flooding: The areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood	
X Protected by Levee	Areas protected by levees from 1% annual chance flood event. Levee protection places these areas in the 0.2% annual chance flood zone. Flood insurance is not mandatory but is available.	
X (unshaded)	Areas of minimal flood hazard	
D	Unmapped areas	

Source: FEMA DFIRM 02/22/2024

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the District vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Flooding in the District tends to have a shorter speed of onset, due to the amount of water that flows through the District.

Geographical flood extents for the District from the FEMA DFIRMs are shown in Table 7-6.

Table 7-6 RD 551 – Geographical DFIRM Flood Zone Extents

Flood Zone	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
1% Annual Chance Flood Hazard	9,164	100%	6,395	100%	2,768	100%
0.2% Annual Chance Flood Hazard	0	0%	0	0%	0	0%
Other Areas	0	0%	0	0%	0	0%
RD 551 Total	9,164	100%	6,395	100%	2,768	100%

Source: FEMA DFIRM 02/22/2024

Past Occurrences

Disaster Declaration History

A list of state and federal disaster declarations for Sacramento County from flooding is shown on Table 7-7. These events also likely affected the District to some degree.

Table 7-7 Sacramento County – State and Federal Disaster Declarations from Flood 1950-2025

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	26	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times), 2022*, 2023 (three), 2024 (twice)	18	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times), 2023 (three times)*, 2024*

Source: Cal OES, FEMA

*included a landslide component.

NCDC Events

The NCDC tracks flood events for the County. Events have been tracked for flooding since 1993. Sacramento County has seen 174 events. These events most likely had some impact on the District.

RD 551 Events

Events since 2021 LHMP

The District operated emergency response activities during the federally declared disaster (DR 4683), which occurred between December 2022 and March 2023. Emergency operations primarily focused on responding to widespread power outages, interior drainage issues, and significant damage caused by extreme storms and flood conditions. The District's emergency response efforts and repair activities were largely centered on debris removal and power outages due to severe weather events. The District saw approximately \$150,000 in damage.

Events prior to 2021

Past river floods, most recently in 1986, 1997/1998, 2006 and 2017, have damaged the RD 551 levees in the form of erosion. Some of this erosion was repaired by RD 551 under flood fight conditions. Restoration erosion repair has typically been performed by the Corps of Engineers as authorized under PL 84-99. Repair work under PL 84-99 was performed by the Corps of Engineers on Pearson District levees following the recent floods of 1986, 1997, 1998, and 2006. Erosion experienced in other years was repaired by RD 551. The District temporarily lost eligibility in the PL84-99 program but is in the process to regain eligibility through the preparation and execution of a Systemwide Improvement Framework (SWIF). The District is now eligible to receive repair and recovery assistance from the Corps of Engineers in the event of a levee failure.

Past floods, as previously listed, have also required flood fighting by RD 551. This flooding fighting has consisted of seepage control and emergency erosion repair. Seepage control is critical in levee breach prevention. The levees and levee foundations of Pearson District are very porous and subject to flood water seeping through, and under, the levee. If left uncontrolled, this seepage could accelerate to the point that it has the force to move levee material. This phenomenon is called piping, or internal erosion of the levee. Once enough material is moved out of the levee section, a levee breach occurs.

Most recently, high water events in 2017 and 2019 have resulted in considerable waterside erosion and exacerbated sites that have experienced erosion over time throughout the District levees.

The flood event of 2017 also resulted in increased vegetation removal, levee patrols, and pumping costs.

Climate Change and Flood

It is likely that climate change will increase the chance of future occurrence as well as future impacts associated with floods. More information on future impacts to the District can be found in the Future Conditions/Future Development section of the Vulnerability Assessment below.

According to the 2024 CAS, climate change may affect flooding in California, the Sacramento County Planning Area, and the District. While average annual rainfall may increase or decrease slightly, the intensity of individual rainfall events is likely to increase during the 21st century. It is possible that average soil moisture and runoff could decline, however, due to increasing temperature, evapotranspiration rates, and spacing between rainfall events. Reduced snowpack and increased number of intense rainfall events are likely to put additional pressure on water infrastructure which could increase the chance of flooding associated with breaches or failures of flood control structures such as levees and dams.

Cal Adapt future precipitation projections were shown in Section 4.3.4.

The 2024 Sacramento County CAP noted that climate change is likely to lead to changes in the frequency, intensity, and duration of extreme weather events, such as sustained periods of heavy precipitation, increased rainfall intensity during precipitation events, and increased risk of rain-on-snow events. Further, more winter-time precipitation that falls as rain instead of snow, and higher temperatures that will cause earlier snowmelt, which could produce substantial surface water flows over a short period of time and may potentially affect dams and spillways and overwhelm levee systems designed for historical precipitation patterns. Historically, the County experienced an average of four extreme precipitation events per year (as shown in Section 4.3.4 of the Base Plan). Under the medium and high emissions scenarios, the County is expected to experience five to six extreme precipitation events per year by mid-century and six to seven extreme precipitation events per year by the late century.

The 2026 American, Bear, and Cosumnes Watersheds Resilience Plan noted that a key driver of climate vulnerability, adaptive capacity, and implementation readiness in the watershed group is flooding. An equity analysis was performed as part of this Plan. An Equity Analysis Technical Appendix demonstrates how social vulnerability aligns with the physical hazard environment across the watershed. It noted that flooding impacts are most severe downstream, where rising flows increasingly stress Sacramento's levee system; a modeled levee-breach scenario affects 12.5% of the watershed population, and 59% of those affected fall into the highest flood-sensitivity category.

Future flooding exacerbated by climate change will result in a range of potential impacts across the County and the District. For populations, there is an array of social vulnerability factors that exacerbate flood-related risks, and those residing in floodplains are especially vulnerable to the direct impacts of flooding. Floodwaters can interact with sources of pollution and distribute hazardous pollutants locally and regionally, which may result in water contamination and a range of human health impacts. Additionally, flooding can disrupt transportation networks, cause economic losses through business and government facility closures, disrupt communications, disrupt the provision of utilities, and cause significant damage to buildings and critical infrastructure. Further, flooding may also threaten ecosystems and agricultural resources; unlike natural flooding regimes that deposit useful sediment resulting in increased soil fertility as well as groundwater recharge, catastrophic flooding from levee overtopping could lead to soil erosion and loss of viable cropland. It could also release sewage and hazardous materials into the environment if wastewater treatment plants are inundated, storage tanks are damaged, and pipelines are severed.

The June 2025 Delta Adapts Adaptation Plan noted that climate change will affect flooding in the Delta. Located at the confluence of the Sacramento and San Joaquin Rivers and San Francisco Bay, the Delta is a complex system whose water levels are influenced by riverine inflows, tides, storm surge, and in some locations, flood hazard management and water supply infrastructure. Climate change will affect many of these factors, increasing the risk of flooding. Riverine flows are the primary driver of high-water levels in the north and south Delta, where more frequent and stronger watershed precipitation events and a shift in winter precipitation from snow to rain will drive flood vulnerabilities. In contrast, higher sea levels will increase the likelihood of flooding in Suisun Marsh and the western and central Delta. Climate change is expected to increase the frequency of large runoff events across the Delta watershed. Most of the Delta's flood management infrastructure, including 1,100 miles of levees and upstream reservoirs, were designed to operate under historical conditions that did not consider climate change. Climate change will place greater stress on the flood management system, and Delta levees will become increasingly vulnerable to breaches, overtopping, or other types of failure if no action is taken.

Vulnerability to Flood: 1%, 0.5%, and 0.2% Annual Chance

Floods have been a part of the District's historical past and will continue to be so in the future. During winter months, long periods of precipitation and the timing of that precipitation are critical in determining the threat of flood, and these characteristics further dictate the potential for widespread structural and property damage and potential loss of life and injury. Predominantly, the effects of 1% annual chance flooding are generally confined to areas near the waterways of the District. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat.

The whole of the District is at some measure of vulnerability to floods. An assessment of a community's vulnerability to flood begins with an understanding of local exposure to flood. This is included in the Local Concerns section below followed by a discussion of the District's Assets at Risk to this hazard.

Local Concerns

The District has specific concerns and unique vulnerabilities regarding this hazard. These concerns form a portion of the basis for the mitigation strategy and mitigation actions that seek to reduce risk and vulnerability to this hazard.

The District noted that the primary flood concerns are related to extreme weather conditions, rainfall/runoff interior flooding concerns, watershed riverine flood related impacts (high water, seepage, pumping and erosion related impacts).

Should a flood breach the levees, the entirety of the assets of RD 551 would be at risk. These assets include the small community of Courtland. All of the RD 551 drain pumps would be flooded and therefore, RD 551 could not drain the flooded areas with their existing pumps; auxiliary pumps would have to be brought in. A flood event could also deteriorate the District levees on waterside slopes causing significant erosion as seen in the aftermath of the 2017 event. If a breach were to occur, the levees could experience erosion on the landside slopes from wave wash.

Assets at Risk

Assets at risk from flood include people and populations; District assets and critical facilities and infrastructure); and natural, historic, and cultural resources. These are discussed in the following sections.

People and Populations

All people and populations located in the 1% annual chance floodplains within the District (including both District staff and the population within District boundaries) are at some risk of flooding. Certain vulnerable populations located within areas prone to flooding may be at increased risk to this hazard, especially during a large event with minimal advance notice. These vulnerable populations include: the unsheltered, those with limited mobility, and those that lack the resources to leave the area.

Populations within District boundaries can be the most vulnerable. Not only are the residents at risk, but their homes and contents are all at risk, compounding the impacts associated with significant hazard events.

District Assets and Critical Facilities and Infrastructure

Certain District structures are at risk of DFIRM flooding and primarily include those structures located within the 1% and 0.2% annual chance floodplains. Flooding presents a threat to both critical facilities and infrastructure, as well as community lifelines. Critical infrastructure plays an immensely important role in the District and surrounding communities. District assets listed in Table 7-8 would be at risk to flooding.

Table 7-8 RD 551 – Assets at Risk to Flooding

Name of Asset	Facility Type	Replacement Value
Pumps/Discharge Pipes – Snodgrass Slough	Drain Pumps	\$10,000,000
Pumps/Pipes – Sacramento River	Drain Pumps	\$8,000,000
Pumps – Lake	Drain Pumps	\$2,000,000
District Owned Facilities	Home, Buildings & Equipment	\$3,000,000
Levees	Flood Control System (15.96 Miles of Project and Non-Project Levees)	399,000,000
Total		\$422,000,000

Source: RD 551

Natural, Historic, and Cultural Resources

Large flood events can affect natural, historic, and cultural resources. There are a number of ways floodwaters can impact natural resources and the environment. Wildlife habitats can be destroyed by floodwaters. Contaminated floodwater can pollute rivers and habitats. Silt and sediment can destroy natural areas. Riverbanks and natural levees can be eliminated as rivers reach bankfull capacity. Rivers can be widened, and deposition can increase downstream. Trees can be uprooted by high-velocity water flow. Plants that survived the initial flood may die due to being inundated with water. Historic and cultural resources may also be affected. Generally, the impacts are associated with damage to structures within the flooded areas, but other cultural resources such as those associated with Native Americans and old tribal areas can also be disturbed, damaged and lost during extreme flood events. Any of these that fall in the flood zones shown on Figure 7-3 would be vulnerable.

Impacts from Flood: 1%, 0.5%, and 0.2% Annual Chance

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Large flood events, including those associated with 1% annual chance floods, can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. People may be swept away in floodwaters, causing injuries or deaths. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Structures can be damaged directly from floodwaters and can also be damaged from trees falling as a result of water-saturated soils. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services causing power outages. The interruption of power causes major problems and can result in the closure of governmental offices and community businesses. Public schools may also be required to close or be placed on a delayed start schedule. Roads can be damaged and closed, causing safety and evacuation issues.

Standing water can cause damage to crops, roads, foundations, and electrical circuits. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

Impacts to identified assets at risk to this hazard and the overall vulnerability of the District may be affected in the future by climate change (which was discussed in the hazard profile discussion above), changes in population patterns (migration, density, or the makeup of socially vulnerable populations), and changes in land use and development. These are discussed below.

Future Conditions/Future Development

This section provides a discussion of how future conditions will influence or affect the hazard over time and also discusses future development relative to each hazard.

Future Conditions

Future conditions may be affected by climate change, changes in population patterns (migration, density, or the makeup of socially vulnerable populations), and changes in land use and development. Findings on this for RD 551 include the following:

- Climate change is likely to exacerbate future flood conditions and associated impacts and vulnerability of the District to 1% and 0.2% annual chance flooding. This was discussed in greater detail in the Climate Change and Flood section of the Hazard Profile above.
- Population projections within the jurisdictional boundaries of the District show the population to be flat or slightly declining. It is unknown how population patterns and demographics will change in the near future. The District may add staff, but this number would be small. The District noted that it has no control over population changes within its jurisdictional boundaries. With no notable changes in populations numbers and makeup, the vulnerability of the District to this hazard is unlikely to change.
- Changes in land use and development in the District are expected to be limited in the near future and thus are not likely to affect flooding and associated impacts to the District. Additional development traditionally leads to additional flooding. In addition, adherence to protective building codes for new development will assist in limiting future impacts and associated vulnerabilities of the District to this hazard.

Future Development

Future development (though not currently expected to occur in the next five years) in the District may be built in the floodplain, as long as it conforms to the standards of the floodplain ordinance. The County enforces their floodplain management ordinance on areas inside the District. More detail on the specifics of the floodplain ordinance can be found in Section 4.4.1 of the Base Plan. New District facilities and assets will be sited in such a way as to reduce the risk from flooding to District structures and assets.

Flood: Localized Stormwater Flooding

Likelihood of Future Occurrence–Likely

Vulnerability–Medium

Hazard Profile

Flooding occurs in areas other than the FEMA mapped 1%, 0.5%, and 0.2% annual chance floodplains. Flooding may be from drainages not studied by FEMA, lack of or inadequate drainage infrastructure, or inadequate maintenance. Localized, stormwater flooding occurs throughout the District, during the rainy season from November through April. Prolonged heavy rainfall (including that from atmospheric river events) contributes to a large volume of runoff resulting in high peak flows of moderate duration.

Location and Extent

RD 551 is subject to localized flooding throughout the District. Areas prone to localized flooding are included in Table 7-9 below. Flood extents are usually measured in areas affected, velocity of flooding, and depths of flooding. Expected flood depths in the District vary by location. Flood durations in the

District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Localized flooding in the District tends to have a shorter speed of onset, especially when antecedent rainfall has soaked the ground and reduced its capacity to absorb additional moisture.

Past Occurrences

Disaster Declaration History

There have been no state or federal disaster declarations from localized floods. There would most likely have been localized flood events during the disaster declarations from flood as shown in the previous 1%/0.2% annual chance flood section. Some of these events may have affected the District.

NCDC Events

The NCDC occurrences of localized flooding are included in the 1% and 0.2% annual chance flood hazard profile above where past flood events were noted.

RD 551 Events

The District noted that localized flooding generally occurs during periods of heavy rain and storms and often occurs in conjunction with the larger, more significant flood events. In most years, it is not significant enough to be a problem. However, past floods have damaged county roads. In addition, many acres of vineyards and orchards have been planted in the past few years, so it is anticipated that these recently planted permanent crops may be damaged by future canal bank flooding. For the most part, past flooding has damaged alfalfa and winter wheat. Many of these were discussed in the Past Occurrences Section of the Flood:1% and 0.2% annual chance flood section above. In addition to those events, the following events occurred resulting in localized flooding within the District:

Events since 2021

There was an overall blackout period of power outage in the Delta region in the beginning of the January 2023 emergency that affected most of the counties in the Delta, including Sacramento County. The power outage on the District delayed critically important emergency drainage of the impounded rainfall during a short period of time, less than 7 days. The District worked to procure temporary power utilizing generators while power was being restored to the area.

Events prior to 2021

The storm event of **2017** resulted in localized flooding in the center of the District in low areas adjacent to State Highway 220 and Poverty Road. These areas are mostly row crops, but recently permanent orchards have been established in historically wet areas on the District and may be lost in a localized flooding event depending on the floodwater residency time.

Climate Change and Localized Flood

It is likely that climate change will increase the chance of future occurrence as well as future impacts from localized flood. More information on future impacts to the District can be found in the Future Conditions/Future Development section of the Vulnerability Assessment below.

Even if average annual rainfall may decrease slightly, the intensity of individual rainfall events is likely to increase during the 21st century, increasing the likelihood of overwhelming stormwater systems built to historical rainfall averages. This makes localized flooding more likely.

Vulnerability to Localized Flood

Flood vulnerability and their impacts vary by location and severity of any given flood event and will likely only affect certain areas of the District during specific times. Based on the risk assessment, it is evident that floods will continue to have potentially significant impacts to certain areas of the District. However, while flooding can cause significant impacts, depending on the duration and volume of precipitation and the drainage in any given area, many of the floods in the District are minor, localized flood events that are more of a nuisance than a disaster.

Many areas of the District are at some measure of vulnerability to localized flooding. An assessment of a community's vulnerability to localized flooding begins with an understanding of local exposure to localized flooding. This is included in the Local Concerns section below followed by a discussion of the District's Assets at Risk to this hazard.

Local Concerns

The District has specific concerns and unique vulnerabilities regarding this hazard. These concerns form a portion of the basis for the mitigation strategy and mitigation actions that seek to reduce risk and vulnerability to this hazard.

Historically, the District has been affected by flooding of rivers, streams and creeks occurring during heavy rain and storm (including atmospheric river) events. Additional development in the District and in the watersheds of these streams affect both the frequency and duration of damaging floods through an increase in stormwater runoff and contributes to localized flooding occurring in areas throughout the District. The lack of or inadequate drainage infrastructure in the District contributes to localized flooding issues.

During high rainfall events, the drainage system is not capable of evacuating water from the interior of Pearson District without flooding some low-lying properties. On properties that farm annual row crops, this is not a problem since crops are not normally planted until after the rainy season. However, winter wheat, perennial, or multi-year crops are susceptible to damage when water overflows the banks of the drain canals. Stormwater flooding can result in losses of less flood resistant crops planted at low elevations. Depending on timing and severity of flooding, some permanent crops will be lost and require reestablishment. Reestablishing a vineyard or orchard can take 5 years or more before there is a harvestable crop.

The District tracks localized flooding areas. Affected localized flood areas identified by the RD 551 are summarized in Table 7-9.

Table 7-9 RD 551 – List of Localized Flooding Problem Areas

Road/Location Name	Issues	Road Impacts?	Home/ Business Impacts?	Evacuation Route?
District Pump Stations – Sac River critical for managing localized flooding.	Loss of power due to storm damage during high wind events requires District to procure temporary power to support drainage to control interior flooding	Potential interior flooding when pumps are unable to dewater from interior flooding.	Flooding of agriculture and permanent crops over long durations could significantly damage crops; several homes and business structures are within lower areas of Island.	Potential impact to interior access/egress roads during emergency.
District Pump Stations – Snodgrass Slough critical for managing localized flooding.	Loss of power due to storm damage during high wind events requires District to procure temporary power to support drainage to control interior flooding; District would rely on Diesel powered pumping only	Potential interior flooding when pumps are unable to dewater from interior flooding.	Flooding of agriculture and permanent crops over long durations could significantly damage crops; several homes and business structures are within lower areas of Island.	Potential impact to interior access/egress roads during emergency.
Lake Pumpstation - critical for managing localized flooding.	Loss of power due to storm damage during high wind events requires District to procure temporary power to support drainage to control interior flooding;	Potential interior flooding when pumps are unable to dewater from interior flooding.	Flooding of agriculture and permanent crops over long durations could significantly damage crops; several homes and business structures are within lower areas of Island.	Potential impact to interior access/egress roads during emergency.

Source: RD 551

The District follows their dewatering plan and manages pumpstation operations during emergencies to minimize and limit localized flooding during extreme weather events. Power outages impacted pumping; however, the District was able to utilize their diesel generators to operate during the 2023 event to prevent any interior flooding related impacts, all while administering their Flood Safety Plan.

While not a problem area, the critical power generation for District pumpstations to operate and need reliable power is at the District pump station locations on the Sacramento River and internal Lake Pumpstations. The Snodgrass Slough pump station discharges the most volume and has 2 diesel powered pumps that are utilized during high runoff events.

Assets at Risk

Assets at risk from localized flood include people and populations; District assets and critical facilities and infrastructure); and natural, historic, and cultural resources. These are discussed in the following sections.

People and Populations

People and populations (including both District staff and the population within District boundaries) are traditionally not highly vulnerable to localized flooding, but their structures and contents can be at risk. Likewise, most vulnerable populations are not uniquely vulnerable to localized flooding. Localized flooding may cause transportation issues as roads and bridges are impacted or closed and affect the ability for people to travel throughout the District.

District Assets and Critical Facilities and Infrastructure

District assets and critical facilities and infrastructure in areas with localized flooding can be affected if floodwaters intrude into the structure. Structures and critical facilities in low lying areas can be at greater risk. Buildings with older foundations that are prone to water intrusion are also at greater risk. Once water finds its way into a structure, it tends to continue to do so until the path that brings water into a structure is mitigated. Structures can also be damaged by trees that have become uprooted and fall during rain and storm events. Large trees falling onto structures can cause significant damage.

Natural, Historic, and Cultural Resources

Natural resource assets may have some vulnerabilities to localized flood during major storm events, but can benefit from floodwaters, often by design. Many parks and green spaces are designed to take overflow water and release it into the underlying soils and natural areas. Wetland areas in the District help reduce the risk of flooding, as they can absorb excess rainfall that would have to be drained away from impervious surfaces. Flooding can provide many benefits to the natural environment, including recharging wetlands and groundwater, increasing fish production, creating wildlife habitat, and rejuvenating soil fertility. These smaller localized flooding events often provide more benefits to the environment in comparison to negative impacts associated with large flood events. Historic and cultural resources may be at some measure of vulnerability if they are located in areas subject to repeated localized flooding.

Impacts from Localized Flood

Primary concerns associated with localized stormwater flooding include impacts to infrastructure that provide a means of ingress and egress throughout the community. Ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Objects can also be buried or destroyed through sediment deposition. Floodwaters can break utility lines and interrupt services. Standing water can cause damage to crops, roads, and foundations. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

Life safety issues from localized flooding would be more limited. The amount and type of damage or flooding that occurs varies from year to year and from storm to storm, depending on the quantity of precipitation and runoff.

Impacts to identified assets at risk to this hazard and the overall vulnerability of the District may be affected in the future by climate change (which was discussed in the Likelihood of Future Occurrence discussion

above), changes in population patterns (migration, density, or the makeup of socially vulnerable populations), and changes in land use and development. These are discussed below.

Future Conditions/Future Development

This section provides a discussion of how future conditions will influence or affect the hazard over time and also discusses future development relative to each hazard.

Future Conditions

Future conditions may be affected by climate change, changes in population patterns (migration, density, or the makeup of socially vulnerable populations), and changes in land use and development. Findings on this for the RD 551 include the following:

- Climate change is likely to exacerbate future heavy rain conditions and associated impacts and vulnerability of the District to localized flood. This was discussed in greater detail in the Climate Change and Localized Flood section of the Hazard Profile above.
- Population projections within the jurisdictional boundaries of the District show the population to be relatively flat. It is unknown how population patterns and demographics will change in the near future. The District may add staff, but this number would be small. The District noted that it has no control over population changes within its jurisdictional boundaries. With no notable changes in populations numbers and makeup, the vulnerability of the District to this hazard is unlikely to change.
- Changes in land use and development in the District are expected to be limited in the near future and thus are not likely to affect flooding and associated impacts to the District. Additional development traditionally leads to additional localized flooding. However, adherence to protective building codes for new development will assist in limiting future impacts and associated vulnerabilities of the District to this hazard.

Future Development

The District will need to be proactive to ensure that increased development has proper siting and drainage for stormwater. The risk of localized flooding to future development can also be minimized by accurate recordkeeping of repetitive localized storm activity. Mitigating the root causes of the localized stormwater flooding can reduce future flood losses.

Levee Failure

Likelihood of Future Occurrence—Occasional

Vulnerability—Extremely High

Hazard Profile

A levee is a raised area that runs along the banks of a stream or canal. Levees reinforce the banks and help prevent flooding by containing higher flow events to the main stream channel. By confining the flow to a narrower stream channel, levees can also increase the speed of the water. Levees can be natural or man-made. A natural levee is formed when sediment settles on the streambank, raising the level of the land around the stream.

Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events or a release from or failure of a dam. Levees reduce, not eliminate, the risk to individuals and structures located behind them. A levee system failure or overtopping can create severe flooding and high-water velocities. It is important to remember that no levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

Over 518 miles of levees are located throughout the Sacramento County Planning Area. These include both accredited and unaccredited levees, as discussed in Section 4.3.14 of the Base Plan, all which pose a risk to adjacent communities should a levee fail or overtop. While the levee analysis included in this section focuses on the accredited levees and those with improvements in process based on the DFIRM A99 and X-Protected by Levee Flood Zones, there are many older, unaccredited levees located throughout the County Planning Area, including the District, that may have a greater potential for overtopping or breaching and pose a significant risk to communities should they fail.

Location and Extent

The entire District is at risk to levee failure flooding. There is not a scientific scale or measurement system in place for levee failure. It is usually measured in area covered and depth of flooding. A map of levees located in the Sacramento County Planning Area is shown in Section 4.3.14 of the Base Plan. Note, not all levees and levee inundation depths are depicted on these maps. The speed of onset is slow as the river rises, but if a levee fails the warning times are short for those in the inundation area. The duration of levee failure risk times can be hours to weeks, depending on the river flows that the levee holds back. Those levees accredited as providing protection against the 1% or greater annual chance flood and those in levees in the certification process are identified in the FEMA DFIRMs which also include those areas protected by the levees.

There are no DFIRM levee protected areas in the District, as the District sits outside of accredited levee areas. As such no mapping is shown and no tabular analysis is performed. While this gives the initial appearance of limited levee failure risk, it should be noted that these unaccredited levees may have a greater potential for failure or breach and can pose an even greater risk to those communities in which they are located.

Past Occurrences

Disaster Declaration History

There have been two state and two federal disasters declarations directly related to levee failure in Sacramento County, as shown on Table 7-10. Also, it is important to note that many of the flood disaster declarations included in Section 4.3.11 of the Base Plan (like the December 31, 2022 event near Wilton) also may include flooding associated with levee breach or failure events.

Table 7-10 Sacramento County – State and Federal Disaster Declarations Summary 1950-2025

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Levee Break	2	1972, 1980	2	1972, 1980

Source: Cal OES, FEMA

NCDC Events

There have been no NCDC levee failure events in Sacramento County, as the NCDC does not track levee failure flooding as a stand-alone hazard.

RD 551 Events

The District Planning Team noted no past occurrences of levee failures. The RD 551 levees have not failed in over 100 years. Two floods over the past few decades (1986 & 1997) required extensive flood fighting by RD 551 forces to prevent a levee breach.

Climate Change and Levee Failure

The 2024 Sacramento County CAP noted that climate change is likely to lead to changes in the frequency, intensity, and duration of extreme weather events. The County is projected to experience a steady increase in average annual precipitation through the end of the century, with much of that precipitation likely to occur during extreme precipitation events, which can lead to flood impacts. According to Cal-Adapt, the historic average annual precipitation in Sacramento County is 18.3 inches, and the historic average annual number of extreme precipitation events is four. The average annual precipitation across the County may rise upwards of 22 inches, with the number of extreme precipitation events potentially exceeding 7 per year by the end of the century, depending on the level of current and future GHG emissions.

In general, California exhibits “booms and busts,” which refers to the existence of both very wet years and very dry years. The amount of precipitation that falls in any particular year is largely influenced by occurrences of large, discrete winter storms, also known as atmospheric rivers, which often provide a substantial fraction of the region’s annual precipitation, inclusive of the county. In California, atmospheric rivers vary in intensity; some are beneficial for water supply and replenish snowpack that naturally melts during the summer, serving as the water supply for people and agriculture, while others are responsible for widespread and adverse impacts (NOAA 2023). Extreme precipitation from these atmospheric rivers in the future may prove to be more variable, volatile, and potentially more severe. These extremes are most likely to occur during storm events, leading to more severe damage from waves and floods, thus possibly leading to more levee failure events.

The June 2025 Delta Adapts Adaptation Plan noted that climate change will affect levee failure flooding in the Delta. The Delta’s 1,300 miles of levees protect more than 800,000 acres of land and play a critical role in conveying water supply through the Delta. By mid-century, overtopping of Delta levees by an event with a 1-percent annual chance of occurrence may result in the exposure of over \$1.8 billion in annual agricultural and commercial economic activity and \$10.5 billion in agricultural, residential, commercial, and infrastructure assets. Most of the Delta’s flood management infrastructure, including levees and

upstream reservoirs, are designed to operate under historical sea level and hydrologic conditions that do not consider potential future climate change. Changing climatic conditions will place greater stress on the flood management system in the future.

Vulnerability to Levee Failure

According to historical hazard data and levee mapping, levee failures can occur in or near the District. The whole of the District are at some measure of vulnerability to levee failure floods, including failure or breach of accredited levees, those in the certification process, and unaccredited levees. An assessment of a community's vulnerability to levee failure flooding begins with an understanding of local exposure to levees. This is included in the Local Concerns section below followed by a discussion of the District's Assets at Risk to this hazard.

Local Concerns

The District has specific concerns and unique vulnerabilities regarding this hazard. These concerns form a portion of the basis for the mitigation strategy and mitigation actions that seek to reduce risk and vulnerability to this hazard.

General Concerns

Waterside levee erosion related damage, and landside seepage/boils during high water events are the greatest local concerns. While these **damages** do not lead to immediate levee **failures**, erosion related storm damage can require significant repairs and recovery can be difficult. There are no current critical site locations that require immediate assistance, but there are known locations of seepage concern on the Unit 1 levee segment along the Sacramento River. The District is engaging with DWR and the FSRP Program to seek funding to improve these sites.

A levee failure would impact almost all the assets and critical facilities on Pearson District; including the small community of Courtland. State Highways 160, as well as several county roads are at risk. Approximately 8,000 acres of agricultural land would be damaged and possibly rendered unfarmable for at least a year. There are many permanent crops in Pearson District, such as wine grapes, pears, apples and cherries that would be destroyed. If a breach were to occur within the levees fronting the towns or areas north, there could be a potential loss of life due to limited evacuation time and disruptions in evacuation routes.

A levee failure and subsequent flooding on RD 551 could result in large wave fetch that could damage the interior slopes of the District's levee system as well as those of adjacent Districts. Scour at the breach area is another concern. Once the breach is repaired this location may prove to be too low to support any agriculture due to drainage difficulties.

StormReady Flood Scenarios and Evacuation Routes

The County of Sacramento and the City of Sacramento have prepared various detailed maps showing hypothetical levee breaks, inundation levels and the time it would take for waters to rise in affected neighborhoods, and rescue and evacuation zones. It is important to note that these maps deal with potential

scenarios. These are to help Sacramento County citizens think of how to escape before an emergency occurs. It should be noted that it would be incorrect to assume that the evacuation routes shown on the maps will necessarily be citizens only way out in a flood. Escape routes could be affected by localized flooding, traffic accidents, and different flooding situations occurring at the time. Emergency officials will monitor roads and let the public know through radio stations and other media if alternate routes should be taken.

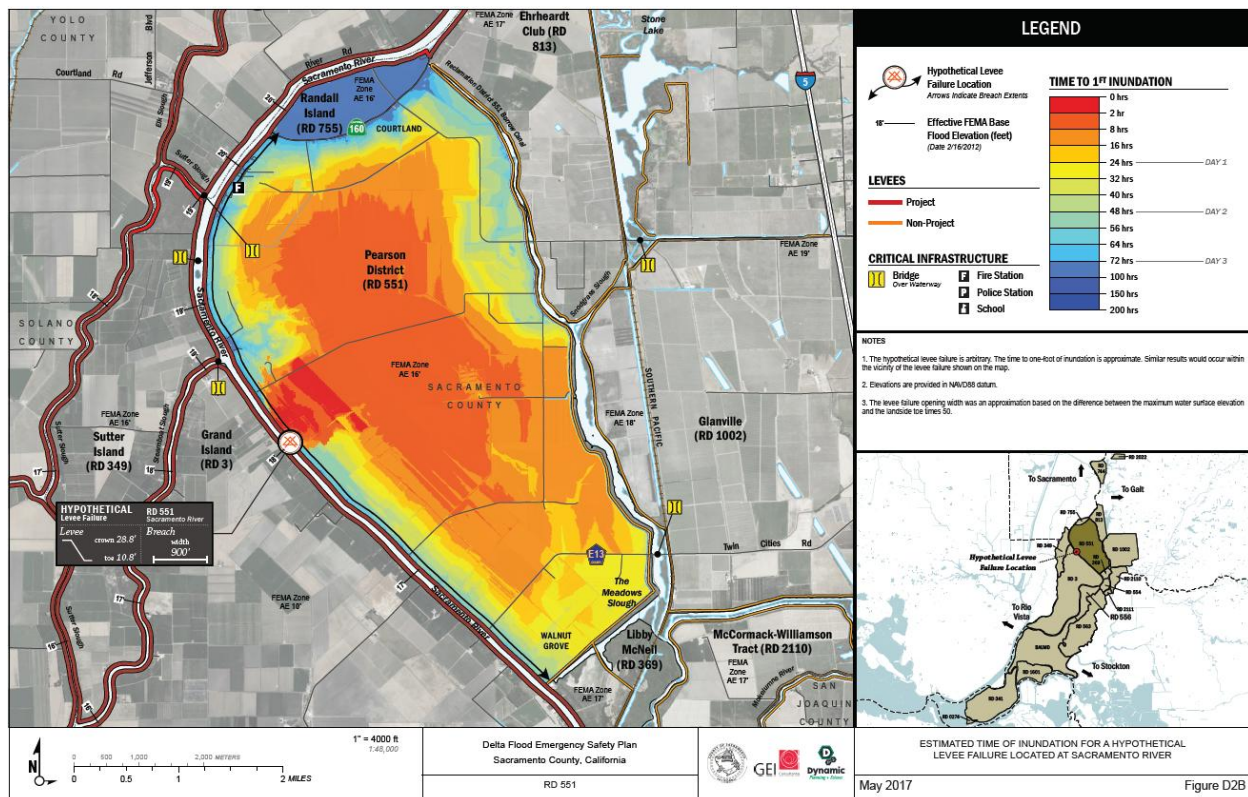
For RD 551, Figure 7-4 details the locations in the Delta within RD 551 where flooding could occur. The red triangles denote potential levee breach locations. RD 551 has two potential levee break scenarios. Maps for Scenario 1 regarding time to one foot inundation (Figure 7-5), estimated flood depths (Figure 7-6), and suggested evacuation routes (Figure 7-7) are displayed below. Maps for Scenario 2 can be found on the Sacramento County stormready.org website.

Figure 7-4 RD 551 – Potential Levee Breach Location



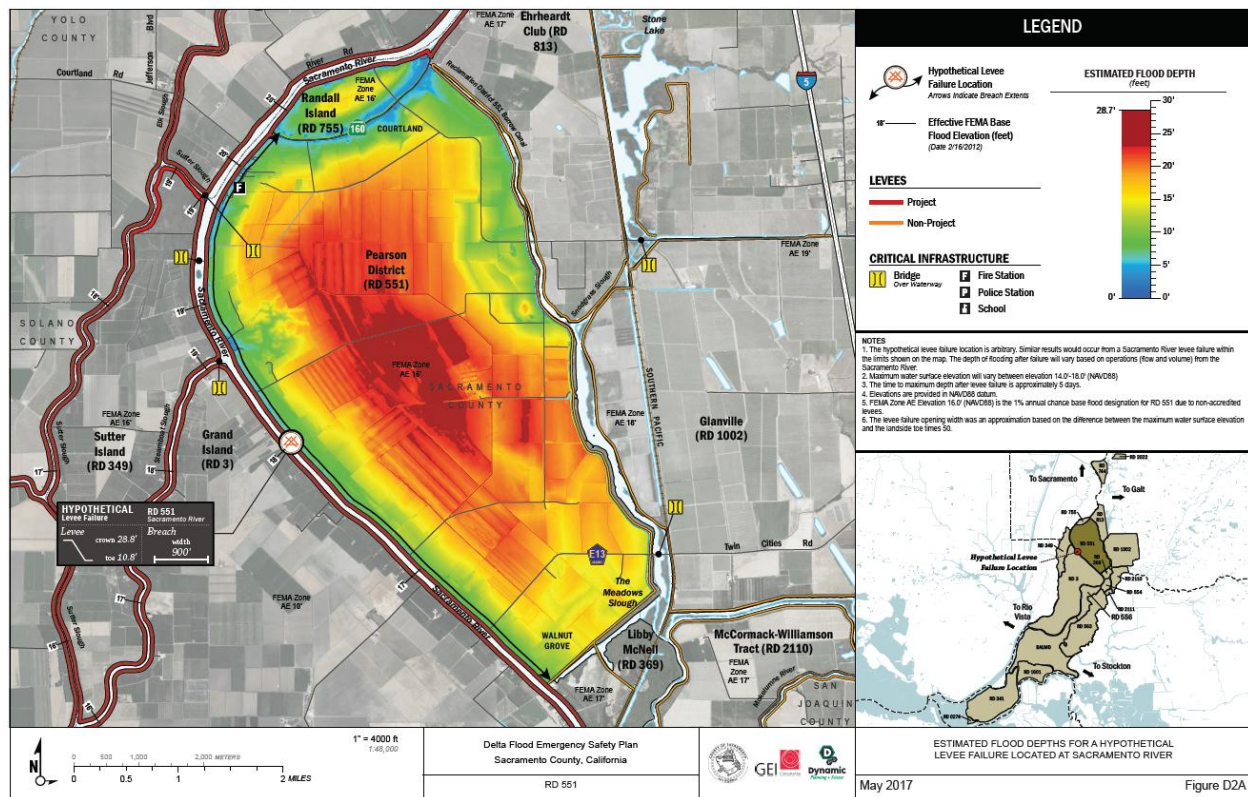
Source: Sacramento County Storm Ready – retrieved March 30, 2021

Figure 7-5 RD 551 – Time to One Foot Inundation after Levee Breach



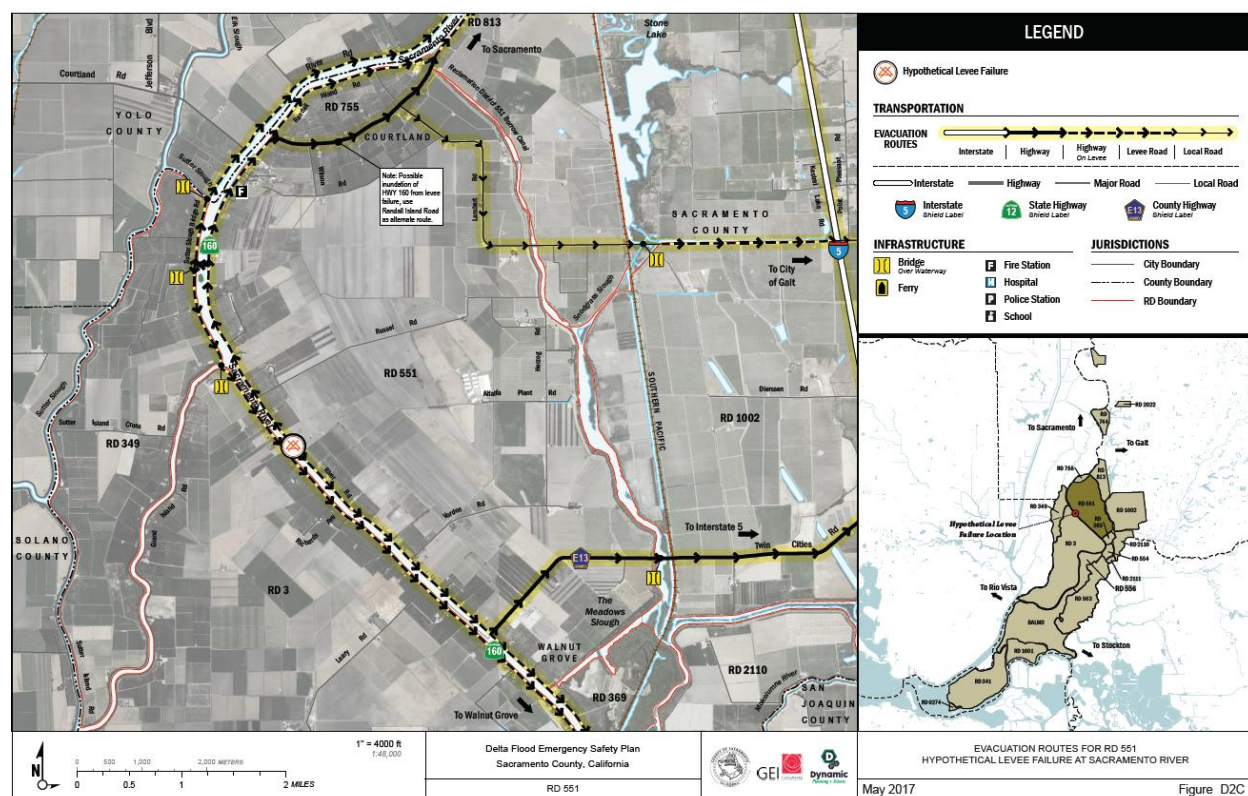
Source: Sacramento County Storm Ready – retrieved July 24, 2026

Figure 7-6 RD 551 – Estimated Flood Depth from Levee Breach Scenario



Source: Sacramento County Storm Ready – retrieved July 24, 2026

Figure 7-7 RD 551 – Levee Breach Scenario Evacuation Routes



Source: Sacramento County Storm Ready – retrieved July 24, 2026

Assets at Risk

Assets at risk from levee failure include people and populations; District assets and critical facilities and infrastructure); and natural, historic, and cultural resources. These are discussed in the following sections.

People and Populations

All people and populations (including both District staff and the population within District boundaries) located in leveed areas are at some risk to levee failure flooding. Certain vulnerable populations located within areas prone to levee failure flooding may be at increased risk to this hazard, especially during a large event with minimal advance notice. These vulnerable populations include: the unsheltered, those with limited mobility, and those that lack the resources to leave the area.

District Assets and Critical Facilities and Infrastructure

Certain District assets and critical facilities are at risk of levee failure flooding and primarily include those structures located adjacent to levee protected areas. A levee failure would impact almost all the assets and critical facilities on Pearson District; including the small community of Courtland. State Highway 160, as well as several county roads are at risk. Approximately 8,000 acres of agricultural land would be damaged and possibly rendered unfarmable for at least a year. There are many permanent crops on Pearson District, such as alfalfa, grain, orchards, tomatoes, potato processing, vineyards, and a variety of other field crops

that would be destroyed. Production of permanent crops can take approximately 5 years to produce a viable harvest.

A levee failure could cause flooding that could damage the District's pumps and drainage system. A levee failure can also result in subsequent levee failures around the District and on adjacent islands due to increased fetch of the flooded area and subsequent erosion on exposed levee slopes.

District assets listed in Table 7-11 would be at risk to levee failure flooding.

Table 7-11 RD 551 – Assets at Risk to Levee Failure Flooding

Name of Asset	Facility Type	Replacement Value
Pumps/Discharge Pipes – Snodgrass Slough	Drain Pumps	\$10,000,000
Pumps/Pipes – Sacramento River	Drain Pumps	\$8,000,000
Pumps – Lake	Drain Pumps	\$2,000,000
District Owned Facilities	Home, Buildings & Equipment	\$3,000,000
Levees	Flood Control System (15.96 Miles of Project and Non-Project Levees)	399,000,000
Total		\$422,000,000

Source: RD 551

Natural, Historic, and Cultural Resources

Large flood events, such as those occurring as a result of a levee failure, can affect natural, historic, and cultural resources. Levees protect the entire District, so all of these resources would be at risk. There are a number of ways floodwaters can impact natural resources and the environment. Wildlife habitats can be destroyed by floodwaters. Contaminated floodwater can pollute rivers and habitats. Silt and sediment can destroy natural areas. Riverbanks and natural levees can be eliminated as rivers reach bankfull capacity. Rivers can be widened, and deposition can increase downstream. Trees can be uprooted by high-velocity water flow. Plants that survived the initial flood may die due to being inundated with water. Historic and cultural resources may also be affected. Generally, the impacts are associated with damage to structures within the flooded areas, but other cultural resources such as those associated with Native Americans and old tribal areas can also be disturbed, damaged and lost during extreme flood events.

Impacts from Levee Failure

Floods and their impacts vary by location, including impacts associated with a levee failure flood event, and will only affect certain areas of the District that are in areas protected by levees. Based on the areas of the District surrounded by levees, it is evident that levee failure floods could potentially have significant impacts to the District, depending on the location, timing, and severity of the event. Impacts that are not quantified, but could be anticipated in large levee failure event, include:

- Injury and loss of life
- Structural and property damage
- Crop damage

- Disruption of and damage to public critical infrastructure and services
- Health hazards associated with mold and mildew, contamination of drinking water, etc.
- Impacts to natural resource areas, including stream bank erosion
- Damage to roads/bridges resulting in loss of mobility

In addition to flood related levee failures, the levees in the District are potentially at risk to failure during an earthquake event. Levee failure flooding could accompany an earthquake and could be compounded further if a dam or storage reservoir fails. Channels and water courses with earthen banks and levees are particularly vulnerable and could collapse in a major earthquake resulting in partial or complete blockage of channels causing flooding upstream of the impoundment. Levees are especially susceptible to rapid settlement due to liquefaction or horizontal spreading of underlying soils.

Impacts to identified assets at risk to this hazard and the overall vulnerability of the District may be affected in the future by climate change (which was discussed in the hazard profile section above), changes in population patterns, and changes in land use and development. The influencing effects of these factors on this hazard are discussed further in the Future Conditions/Future Development discussion below.

Future Conditions/Future Development

This section provides a discussion of how future conditions will influence or affect the hazard over time and also discusses future development relative to each hazard.

Future Conditions

Future conditions may be affected by climate change, changes in population patterns (migration, density, or the makeup of socially vulnerable populations), and changes in land use and development. Findings on this for RD 551 include the following:

- Climate change is likely to exacerbate future flood and levee failure conditions and associated impacts and vulnerability of the District to levee failure flooding. This was discussed in greater detail in the Climate Change and Levee Failure section of the Hazard Profile above.
- Population projections within the jurisdictional boundaries of the District show the population to be flat or slightly declining. It is unknown how population patterns and demographics will change in the near future. The District may add staff, but this number would be small. The District noted that it has no control over population changes within its jurisdictional boundaries. With no notable changes in populations numbers and makeup, the vulnerability of the Corp to this hazard is unlikely to change.
- Changes in land use and development in the Corp are expected to be limited in the near future and thus are not likely to affect levee failure flooding and associated impacts to the Corp. Additional development traditionally leads to additional flooding, especially in levee protected areas.

Future Development

Future development considerations should be ongoing and proactive. Ensuring that comprehensive land use planning is conducted, regulatory requirements, such as building codes and the floodplain ordinance, are followed, and levee improvements, inspections, and maintenance is ongoing will help reduce impacts to future development.

Severe Weather: Heavy Rains and Storms

Likelihood of Future Occurrence–Likely

Vulnerability–Medium

Hazard Profile

Storms in the District occur annually and are generally characterized by heavy rain, often accompanied by strong winds and sometimes lightning and hail. Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in excess of 50 knots (57.5 mph), or a tornado. Heavy precipitation in the District falls mainly in the fall, winter, and spring months. Wind often accompanies these storms; hail and lightning are rare in the District. In recent years, storms with heavy rains have been compounded by more frequent and higher intensity atmospheric river events. Rain on snow events occurring in the upper elevations can also be significant and contribute to greater downstream runoff and flooding during large storm events.

Location and Extent

Heavy rain events occur on a regional basis. Storms that generate significant rainfall and strong sustained wind events can occur in any location of the District. All portions of the District are at risk of heavy rains and storms. Most of the severe rains occur during the fall, winter, and spring months in the District as discussed below (with problem flooding areas associated with heavy rains and storms shown in Table 7-9 in the Flood: Localized Stormwater section). There is no scale by which heavy rains and severe storms are measured. Magnitude of storms is measured often in rainfall and damages. The speed of onset of heavy rains can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Hail and lightning are rarer in the District and Sacramento County. Duration of severe storms in the District can range from minutes to hours to days. According to the WRCC, average annual precipitation in the County is 18.15 inches per year. Information on precipitation extremes can be found in Section 4.3.4 of the Base Plan.

Past Occurrences

Disaster Declaration History

According to historical hazard data, severe weather, including heavy rains and storms, is an annual occurrence in the District. This contributes to many of the federal disaster declarations related to flooding. Disaster declarations from flooding are shown on Table 7-12, many of which likely affected the District.

Table 7-12 Sacramento County – State and Federal Disaster Declarations from Flood (Heavy Rain and Storms) 1950-2025

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	26	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times), 2022*, 2023 (three), 2024 (twice)	18	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times), 2023 (three times)*, 2024*

Source: Cal OES, FEMA

NCDC Events

The NCDC data recorded 9 hail, 29 heavy rain, 1 lightning, and 2 winter storm weather incidents for Sacramento County since 1950. Winter weather events tend to be rain in the County.

RD 551 Events

There have been past disaster declarations from heavy rains and storms, which were discussed in Past Occurrences of the Flood: 1%/0.2% Annual Chance and Flood: Localized Stormwater Flooding discussions above. According to historical hazard data, severe weather, including heavy rains and storms, is an annual occurrence in the District. This is the cause of many of the federal disaster declarations related to flooding.

Events since 2021 LHMP

2023 FEMA DR 4683– generated impacts to the District related power outages, interior flooding, wind driven damages (downed trees), waterside erosion damage, and debris removal.

Events prior to 2021

In **1996**, the District experienced a heavy rainfall event that overwhelmed the District’s drainage system and left a substantial amount of acreage in the lower elevations inundated for at least a month. Recent above average years for rainfall, such as 2017 and 2019 have resulted in similar localized flooding and increased costs to power and run the District’s pumping facilities.

Climate Change and Heavy Rains and Storms

It is likely that climate change will increase the chance of future occurrence as well as future impacts from heavy rains and storms. More information on future impacts to the District can be found in the Future Conditions/Future Development section of the Vulnerability Assessment below.

According to the 2024 CAS, while average annual rainfall may increase or decrease slightly, the intensity of individual rainfall events is likely to increase during the 21st century. It is unlikely that hail will become more common in Sacramento County and the RD 551. The amount of lightning is not projected to change.

Cal-Adapt noted that, on average, the projections show little change in total annual precipitation in California. Furthermore, among several models, precipitation projections do not show a consistent trend during the next century. Cal-Adapt modeled scenarios are shown in Section 4.3.4 of the Base Plan.

According to the 2024 CAP, the County is projected to experience a steady increase in average annual precipitation through the end of the century, with much of that precipitation likely to occur during extreme precipitation events, which can lead to flood impacts. According to Cal-Adapt, the historic average annual precipitation in Sacramento County is 18.3 inches, and the historic average annual number of extreme precipitation events is four. As shown in Section 4.3.4 of the Base Plan, the average annual precipitation across the County may rise upwards of 22 inches, with the number of extreme precipitation events potentially exceeding 7 per year by the end of the century, depending on the level of current and future GHG emissions.

June 2025 Delta Adapts Adaptation Plan noted that climate change will affect heavy rains and storms in the Delta. By mid-century, climate models show a reduction in the total number of rainy days and decreases in both fall and spring precipitation. These changes will likely be accompanied by an increase in the intensity and frequency of large storm and atmospheric river events during the winter. Decreases in spring and fall precipitation may impact freshwater availability, increase competition for limited water supply, and shift the phenology of species who are dependent on seasonal rainfall for reproduction, growth, and survival (Mauger et al. 2015). Although the ecosystem response to changes in intra- and inter-annual precipitation variability remains uncertain, data suggests that increased variability in precipitation will likely favor less diverse species assemblages and invasion of non-native species (Liu et al. 2020, Parton et al. 2012).

The Delta's growing season is determined by its Mediterranean climate – rains in late fall, winter, and spring followed by dry summers. As the climate changes and the rainfall season becomes shorter, freshwater and groundwater availability may be diminished. As a result, species adapted to a longer growing season and available freshwater sources may be negatively impacted. If species cannot tolerate or adapt to new precipitation patterns, they may experience increased mortality rates.

Vulnerability to Heavy Rain and Storms

Heavy rain and severe storms are among the most frequent type of severe weather occurrences in the District. These events can cause both significant and localized flooding. Flooding can be worse during times where the ground is already saturated. Wind often accompanies these storms and has caused damage in the past. Hail and lightning are rare in the District, but also can cause damage, with lightning occasionally igniting wildfires.

The whole of the District is at some measure of vulnerability to heavy rain and storms. An assessment of a community's vulnerability to heavy rains and storms begins with an understanding of local exposure to heavy rain and storms. This is included in the Local Concerns section below followed by a discussion of the District's Assets at Risk to this hazard.

Local Concerns

The District has specific concerns and unique vulnerabilities regarding this hazard. These concerns form a portion of the basis for the mitigation strategy and mitigation actions that seek to reduce risk and vulnerability to this hazard.

The District noted that heavy rains and storms cause localized flooding in the District. The problem areas are shown on Table 7-9 above. Direct impacts related to tree fall, impact to utility lines and utility poles due to soil saturation, high winds, aging utility infrastructure and large woody vegetation. It is the secondary effects of heavy rain and storms that are of concern to RD 551. Heavy rains can cause flooding, levee failure, and erosion. Flooding, levee failure, and erosion can cost RD 551 millions in damages.

Severe storm events can lead to erosion, significant flooding and impacts to the levee system. Although water surface elevation is a major factor to levee seepage and overtopping, severe weather can cause significant damage, such as erosion, that puts the integrity of the Pearson District levee system at risk.

A levee failure would impact almost all the assets and critical facilities on Pearson District; including the small community of Courtland. State Highways 160, as well as a number of county roads, are at risk. Approximately 8,000 acres of agricultural land would be damaged and possibly rendered unfarmable for at least a year. There are many permanent crops in Pearson District, such as wine grapes, pears, apples and cherries that would be destroyed.

Assets at Risk

Assets at risk from heavy rain and storms include people and populations; District assets and critical facilities and infrastructure); and natural, historic, and cultural resources. These are discussed in the following sections.

People and Populations

All populations (including vulnerable populations) in the District (including District staff and those within District boundaries) have some measure of risk to heavy rains and storms. Those populations that work or recreate outside and unhoused individuals are more vulnerable to impacts from heavy storm events. Heavy rains and storms occur every year and do not generally cause significant adverse impacts to individuals; it is the secondary hazard, flooding, which poses the biggest impact to people. Populations at risk to flooding resulting from heavy rains and storm events include those who live in floodplains (discussed in further detail in the Flood: 1%/0.2% Annual Chance and Levee Failure section above) and those who live in and near localized flooding areas (discussed in further detail in the Flood: Localized Stormwater Flooding section above).

District Assets and Critical Facilities and Infrastructure

District assets have some risk to heavy rains and storms. Heavy rain and storms can affect critical facilities and infrastructure during large events. District structures built to modern building codes are built to withstand heavy rains and storms (including thunderstorm winds and lightning); older structures may be more vulnerable. During a heavy storm, localized flooding may cause water intrusion into buildings from

the outside. Trees can be downed causing impacts to structures. Older homes and buildings may be at increased risk to heavy rains and storms. Power outages during severe storm events can occur, impacting the use of structures until the power is back online. Local roads, streets, and bridges can be impacted resulting in closures restricting traffic flow in the District. In certain areas, large storms can cause erosion and localized landslides which can impact affected facilities.

District assets listed in Table 7-13 would be at risk to flooding.

Table 7-13 RD 551 – Assets at Risk to Heavy Rains and Storms

Name of Asset	Facility Type	Replacement Value
Pumps/Discharge Pipes – Snodgrass Slough	Drain Pumps	\$10,000,000
Pumps/Pipes – Sacramento River	Drain Pumps	\$8,000,000
Pumps – Lake	Drain Pumps	\$2,000,000
District Owned Facilities	Home, Buildings & Equipment	\$3,000,000
Levees	Flood Control System (15.96 Miles of Project and Non-Project Levees)	399,000,000
Total		\$422,000,000

Source: RD 551

Natural, Historic, and Cultural Resources

Large rain and storm events and associated flooding can affect natural, historic, and cultural resources. Silt and sediment can damage natural areas. Trees can be uprooted and downed by high winds. Extended periods of rainfall can erode natural banks along waterways and degrade soil stability for terrestrial species. While some natural systems can be adversely impacted during these large storms, heavy rain events can also provide benefits. Groundwater and wetland areas can be recharged and water supplies replenished. Historic and cultural resources may also be affected. Generally, the impacts are associated with damage to structures affected by large storm events, but other cultural resources such as those associated with Native Americans and old tribal areas can also be disturbed, damaged, and lost during extreme rain and storm and events.

Impacts from Heavy Rain and Storms

Impacts from heavy rains and storms include damage to property, critical facilities and infrastructure, and the natural landscape. This includes: erosion; downed trees; damaged utility structures and infrastructure; power outages; road damage and blockages; and even lightning strikes to critical infrastructure and people. Lightning can also cause wildfires and urban fires to occur. Landsliding and erosion occur when the soil on slopes becomes oversaturated and fails. Climate change may cause these impacts to worsen.

Actual damage associated with the primary effects of severe storms and heavy rains has been somewhat limited. It is the secondary hazards caused by these severe weather events, such as floods, landslides, and erosion that would likely have the greatest impact.

Impacts to identified assets at risk to this hazard and the overall vulnerability of the District may be affected in the future by climate change (which was discussed in the hazard profile section above), changes in population patterns, and changes in land use and development. The influencing effects of these factors on this hazard are discussed further in the Future Conditions/Future Development discussion below.

Future Conditions/Future Development

This section provides a discussion of how future conditions will influence or affect the hazard over time and also discusses future development relative to each hazard.

Future Conditions

Future conditions may be affected by climate change, changes in population patterns (migration, density, or the makeup of socially vulnerable populations), and changes in land use and development. Findings on this for the District include the following:

- Climate change is likely to exacerbate future heavy rain and storm conditions and associated impacts and vulnerability of the District to flooding. This was discussed in greater detail in the Climate Change and Heavy Rains and Storms section of the Hazard Profile above.
- Population projections within the jurisdictional boundaries of the District show the population to be flat or slightly declining. It is unknown how population patterns and demographics will change in the near future. The District may add staff, but this number would be small. The District noted that it has no control over population changes within its jurisdictional boundaries. With no notable changes in populations numbers and makeup, the vulnerability of the District to this hazard is unlikely to change.
- Changes in land use and development in the District are expected to be limited in the near future and thus are not likely to affect heavy rains and storm and associated impacts to the District. In addition, adherence to protective building codes for new development will assist in limiting future impacts and associated vulnerabilities of the District to this hazard.

Future Development

Building codes in the District ensure that new development is built to current building standards, which should reduce the risk to future development in the District from heavy rains and storms. New critical facilities such should be built to withstand hail damage, lightning, and thunderstorm winds. New and existing critical facilities and infrastructure should also consider adding backup power systems to limit impacts associated with power outages. With adherence to development standards, future losses to new development should be minimal. Changes in land use may also amplify the impacts of heavy rains and storms, as additional impervious surfaces can cause additional runoff and localized flooding throughout the District.

7.5 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts.

7.5.1. Regulatory Mitigation Capabilities

Table 7-14 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the RD 551.

Note: The District does not have the authority to regulate land use and development within its jurisdiction. Authority for promulgating and enforcing zoning, land use, and development requirements falls to counties and incorporated communities. As such development within the District’s jurisdictional boundaries will conform to the zoning and land use development ordinances and building codes of the county or incorporated community in which the District is located.

Table 7-14 RD 551’s Regulatory Mitigation Capabilities

Plans	In Place Y/N	Does the plan address hazards? Can the plan be used to carry out mitigation actions? When was it last updated??
Capital Improvements Plan	Y	Five-year plan consisting of levee stability, seepage control and maintenance projects can outlay a long term improvement plan.
Climate Change Adaptation Plan	N	No plan in place.
Community Wildfire Protection Plan	N	No plan in place.
General Plan/Comprehensive Plan/Master Plan	Y	Five-year plan consisting of levee stability, seepage control and maintenance projects.
Continuity of Operations Plan	N	No plan in place.
Economic Development Plan	N	Not within the responsibilities of the Reclamation District
Land Use Plan	N	No plan in place.
Local Emergency Operations Plan	Y/2025-2026	Through state grants, Sacramento and Yolo Counties have funded revisions to the District’s existing Flood Emergency Safety Plan for RD 349. The plan update will be completed in 2026. The previous plan was updated in 2022. The 2022 plan has preliminary engineering drawing and an action plan for a relief cut in the event of a levee failure.
Stormwater Management Plan	Y/Ongoing	RD 551 consistently evaluates flooding of low areas and the need for improvements in its drainage system
Transportation Plan	N	No plan in place.
Other	Y	Annual routine maintenance plans and participation in the state Delta Levees Subventions Program which assists in funding levee maintenance. RD 3 is also active in the Corps of Engineers PL84-99 program and is beginning to implement its System-Wide Improvement Framework (SWIF) to respond to maintenance and rehabilitation issues brought up by the Corps of Engineers Periodic Inspection Report

Land Use Planning and Ordinances		Y/N	Is the ordinance an effective way to reduce hazard impacts? Is the ordinance adequately administered and enforced?
Acquisition of land for open space and public recreation use		N	Not within this jurisdiction's authority
Building code		N	Not within this jurisdiction's authority
Flood insurance rate maps		N	Not within this jurisdiction's authority
Floodplain ordinance		N	Not within this jurisdiction's authority
Natural hazard-specific ordinance (stormwater, steep slope, wildfire)		Y	Erosion control measures on levee and canal slopes as necessary. Sediment removal from drainage system canals as necessary.
Subdivision ordinance		N	Not within this jurisdiction's authority
Zoning ordinance		N	Not within this jurisdiction's authority
Other			
How can these capabilities be expanded and improved to reduce risk?			
Pursuant to Sacramento County General Plan Safety Element Policies, SA-18a&b, written approval must be obtained from the applicable Reclamation District to build any structure or grade any soil within 300 feet of the land side toe of levee. This applies to anyone who wants to fill, excavate, or construct a structure within 50 feet of the toe of a Sacramento County river levee and anyone who wants to develop land within 300 feet of the toe. To ensure this requirement is met, every parcel located near a levee is tagged in the building department database. In implementation of the District's SWIF, the District will require increased coordination from permitting agencies as well as landowners. Many issues identified are going to require significant permitting and come at a high cost to landowners. Programmatic permitting capabilities as well as a grant program to address such issues identified in the SWIF would help both the District and landowners remediate issues in a timely manner so that the District can remain eligible for PL84-99 funding in the event of a levee failure. The Delta Levees Special Projects and Subventions Programs are state-local cost share programs that the District relies on to perform required operations and maintenance activities. This program is currently only funded through bonds. With uncertainty on long term program funding, the District is unable to confidently outlay long term repair and improvement projects. The Districts capabilities could be expanded and improved if funding would be more consistent and secure such as coming from the General Fund. DWR Programs such as the Systemwide Program, FSRP, DMP, all have the ability to generate grant opportunities to support critical and serious issues related to their programs. Working regionally through the LSDN RFMP to support State investment from these programs in the north Delta region will continue to support levee improvement projects and increase resilience and performance during future emergency events.			

Source: RD 551

7.5.2. Administrative/Technical Mitigation Capabilities

Table 7-15 identifies the District department(s) responsible for activities related to mitigation and loss prevention in the RD 551.

Table 7-15 RD 551's Administrative and Technical Mitigation Capabilities

Administration	In Place Y/N	Describe capability Is coordination effective?
----------------	-----------------	---

Staff		Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?
Chief Building Official	N	Not within this jurisdiction's authority
Civil Engineer, including dam and levee safety	Y	Michael Moncrief, Michael Kynett and the staff at MBK Engineers have served as District Engineer for 20 years and has participated in many flood fight actions.
Community Planner	N	Not within this jurisdiction's authority
Emergency Manager	Y	District Trustee
Floodplain Administrator	N	Not within this jurisdiction's authority
GIS Coordinator	N	Not within this jurisdiction's authority
Planning Commission	N	Not within this jurisdiction's authority
Other		RD 551 annually performs maintenance. In addition, it periodically constructs projects to repair deficiencies in the levee such as planned erosion repairs.
Technical	Y/N	Has capability been used to assess/mitigate risk in the past?
Grant writing	N	Not a position within this jurisdiction
Hazard data and information	Y	Civil Engineer has hazard data and information to aide district
GIS analysis	N	Not a position within this jurisdiction
Mutual aid agreements	Y	As part of the FSP, there is ability to request mutual aid, as necessary during an emergency event
Other		
How can these capabilities be expanded and improved to reduce risk?		
Consistent and available funding opportunities can aid in planning and outlaying substantial improvement projects. The policy and regulatory requirements for the Sacramento River Flood Control Project, which RD 551 is a part of, requires RD 551 to be eligible and active in the PL 84-99 Program. This is being achieved through RD 551 participation in a SWIF. Funding, beyond general Subventions Program reimbursement, needs to be identified to steadily support small rural LMA's that have limited capacity to generate local assessments.		

Source: RD 551

7.5.3. Fiscal Mitigation Capabilities

Table 7-16 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table 7-16 RD 551's Fiscal Mitigation Capabilities

Funding Resource	In Place Y/N	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Y	RD 551's annual assessment includes funding for future anticipated capital projects

Funding Resource	In Place Y/N	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Community Development Block Grant	N	Not within this jurisdiction's authority
Federal funding programs (non-FEMA)	Y	The District has submitted a SWIF and is operating under the annual performance standards to address deficiencies. The District is active and eligible under PL 84-99
Fees for water, sewer, gas, or electric services	N	Not within this jurisdiction's authority
Impact fees for new development	N	Not within this jurisdiction's authority
State funding programs	Y	The District participates in the Delta Levees Subventions program that provides a 75/25 state to local cost share.
Stormwater utility fee	N	Not within this jurisdiction's authority
Other	Y	RD 551's annual assessment includes funding for future anticipated capital projects
How can these capabilities be expanded and improved to reduce risk?		
Substantial funding will be required both publicly and privately in implementation of the District's SWIF. A grant program to address such issues identified in the SWIF would help both the District and landowners remediate issues in a timely manner so that the District can remain eligible for PL84-99 funding in the event of a levee failure. The Delta Levees Special Projects and Subventions Programs are state-local cost share programs that the District relies on to perform required operations and maintenance activities. This program is currently only funded through bonds. With uncertainty on long term program funding, the District is unable to confidently outlay long term repair and improvement projects. The District's capabilities could be expanded and improved if funding would be more consistent and secure such as coming from the General Fund. Furthermore, the District has utilized other funding opportunities such as the Flood System Repair Program to address critical issues. Continued funding of such programs would greatly benefit the District's ability to perform necessary repairs and improvements.		

Source: RD 551

7.5.4. Mitigation Education, Outreach, and Partnerships

Table 7-17 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table 7-17 RD 551's Mitigation Education, Outreach, and Partnerships

Program/Organization	In Place Y/N	How widespread are each of these in your community?
Community newsletters		
Hazard awareness campaigns (such as Firewise, Storm Ready, Severe Weather Awareness Week, school programs, public events)	Y	With SWIF implementation, the District is performing outreach to landowners for education and assistance in addressing encroachment issues. The RD 349 manager, trustees, and District Engineer have been, or soon will be, trained in SEMS and NIMS

Program/Organization	In Place Y/N	How widespread are each of these in your community?
Local news		
Organizations that interact with underserved and vulnerable communities		
Social media		
How can these capabilities be expanded and improved to reduce risk?		
Many risks to the integrity of the levee system can come from noncompliant and aging encroachments such as pipes through the levee. Repair and replacement of encroachments, particularly pipes, can place a large financial burden on landowners leading to deferred maintenance and ultimately a dangerous situation within the flood control system. It would be beneficial if a program were established that would create a local agency/private landowner partnership that provides funding and permitting assistance to address these issues before they result in levee failure.		

Source: RD 551

7.5.5. Other Mitigation Efforts

District has an Emergency Operation Plan and Flood Contingency Map that complies with State and Federal Requirements for Flood Safety Plans.

RD 551 has been a very active participant in the state's Delta Levee Subventions Program for about 25 years. This program has proven useful and has enabled RD 551 to react financially if a non-routine cost arises.

7.6 Mitigation Strategy

7.6.1. Mitigation Goals and Objectives

RD 551 adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

7.6.2. NFIP Mitigation Strategy

The District does not participate in the NFIP, as it is not an eligible participant. Many of the District's projects work to reduce impacts from flooding thus furthering the objectives of the NFIP.

7.6.3. Mitigation Actions

The Planning Team for the RD 551 identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Flood: 1%/0.5%/0.2% annual chance
- Flood: Localized Stormwater
- Levee Failure

- Sea Level Rise
- Severe Weather: Heavy Rains and Storms (Hail, Lightning, Wind)

Low priority hazards for mitigation planning include:

- Aquatic Nuisance Species (plant/animal)
- Climate Change
- Dam Failure
- Drought & Water Shortage (w/tree mortality)
- Earthquake (w/subhazards)
- Landslide, Mudslide, Debris Flow
- Severe Weather: Extreme Cold and Freeze
- Severe Weather: Extreme Heat
- Severe Weather: High Winds and Tornadoes
- Subsidence
- Wildfire (with smoke and air quality)

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts are collaborative efforts among multiple local, state, and federal agencies. In addition, the countywide public outreach action, as well as many of the emergency services actions, apply to all hazards and jurisdictions regardless of hazard priority. Collectively, this LHMP's multi-jurisdictional mitigation strategy includes only those actions and projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this plan. It should further be noted, that each jurisdiction has focused on identifying those mitigation actions and projects to address their priority hazards, which are both realistic and reasonable for them to implement for this 5-year planning process, and would like to preserve their right to modify hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement. The participating jurisdictions are not obligated by this document to implement any or all of these projects. Rather this mitigation strategy represents the desires of the jurisdictions to mitigate the risks and vulnerabilities from identified hazards. The actual selection, prioritization, and implementation of these actions will also be further evaluated in accordance with the mitigation categories and criteria contained in Appendix C.

Mitigation Actions

The District has put forward the actions as shown in Table 7-18. Details of the actions can be found below the table.

Table 7-18 RD 551 Mitigation Actions

Action Title	New Action/ Previous Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 1. Pumpstation Retrofit Project along RD 551 Back Levee	Previous Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
Action 2. Pumpstation Retrofit Project: RD 551 Lake Lift Pumpstation	Previous Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
Action 3. Pumpstation Retrofit Project along Unit 1 Sacramento River Levee Pumpstations	Previous Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
Action 4. Seepage Rehabilitation Project along Unit 1 Sacramento River Levee: LM 0.1 – 0.9	Previous Action	X	X	X	Prevention Property Protection Natural Resource Protection

Action 1. Pumpstation Retrofit Project along RD 551 Back Levee (38.298666°, -121.512928°)

Hazards Addressed: Flood: 1%/0.5%/0.2% annual chance, Localized/Stormwater Flooding, Severe Weather

Goals Addressed: 1, 2, 3, 5, 6

Issue/Background (Problem Statement): Power generation and pump station operational capacity during extreme stream high water events, interior localized flooding, and extreme storm (wind/rain) events, is a critical necessity to control water levels within the District jurisdiction. If pump stations are incapable of operating due to a loss of power from either regional blackouts or faulty facility aging infrastructure then the District loses the ability to maintain interior water surface elevations which will lead to interior flooding, property loss and stranding and flooding of homes; along with loss of access along vital interior County and State roads to support egress and evacuation during emergencies. There are two existing diesel-powered pumps at this location and an electric pumpstation roundhouse

The ability and timing to rent and logistic challenges to mobilize temporary pumps and generators can be extremely costly and difficult to procure during regional or state emergencies. Timing and resource limitations also exacerbate potential flooding and loss of control.

District needs to have the ability to quickly transfer from electrical to temporary generator power with the flip of a switch to continue to operate critical drainage facilities at a moments notice to stay ahead of the interior flooding that occurs during heavy rainfall and high water events.

Project Description: Evaluation of existing pump station locations, motor and panel configurations and design, and lay out proposed alternatives to modernize and meet current design standards, and include switches to convert to temporary backup power generation for each pump that does not currently have redundancy. Develop access or space to house on-site power generation for diesel emergency operations during blackouts. Potential to purchase and stockpile temporary emergency 100 HP floating or submersible pumps with HDPE pipe connections to support need for additional pumping capacity if a pump/motor were to be unavailable due to mechanical failure during emergency operations.

Other Alternatives: Funding for replacement of existing pump/motor/ panel with new in-kind replacement

Existing Planning Mechanism(s) through which Action Will Be Implemented: The District has been regularly operating and monitoring the condition of pumps, motors, and electrical panels for both diesel and electric pumpstations, as part of their routine O&M. Internal to the District planning processes, the Board is evaluating options for future development of aspects of these project alternatives; there are currently no other available funding grants to support projects of this type.

Responsible Office/Partners: RD 551 General Manager

Project Benefits (Losses Avoided): Interior flood control benefits all landowners in the region, CA DOT benefits from Highway 160 staying open during high water events; Avoidance of damage to town of Courtland. There are numerous benefits during high water events to any agencies, or public utilizing Highway 160 for access/egress during emergency. Multiple county roads transect the interior of the District making seepage control a critical feature during high water events. District is an access corridor to Interstate 5 to the east along Twin Cities Road. Every landowner and citizen and acre of land benefits from having redundancy with interior flood control; Significant habitat benefits are also realized with active flood control.

Potential Funding (Local Budgets, Grant Funds, etc. by specific type): Specific funding could come from FEMA BRIC or HMGP funding. Other funding could come from future PG&E or other power incentive programs if they are replenished; DWR Small Community Program, both of which are not currently funded or seeking proposals until later in 2026 or 2027. Potentially an emergency funded project if critical damages were incurred during an emergency event.

Timeline: Unknown timing due to lack of resources to investigate or implement project.

Project Priority (High, Medium, Low): High Priority for the District, but due to lack of funding the project is likely to linger for the foreseeable future.

Action 2. *Pumpstation Retrofit Project: RD 551 Lake Lift Pumpstation (38.298653°, - 121.534795°)*

Hazards Addressed: Flood: 1%/0.5%/0.2% annual chance, Localized/Stormwater Flooding, Severe Weather

Goals Addressed: 1, 2, 3, 5, 6

Issue/Background (Problem Statement): Power generation and pump station operational capacity during extreme stream high water events, interior localized flooding, and extreme storm (wind/rain) events, is a critical necessity to control water levels within the District jurisdiction. If pump stations are incapable of operating due to a loss of power from either regional blackouts or faulty facility aging infrastructure then the District loses the ability to maintain interior water surface elevations which will lead to interior flooding, property loss and stranding and flooding of homes; along with loss of access along vital interior County and State roads to support egress and evacuation during emergencies. The interior lift pumpstation is critical for raising interior flood waters to drain towards the District main pumpstation on the back levee.

The ability and timing to rent and logistic challenges to mobilize temporary pumps and generators can be extremely costly and difficult to procure during regional or state emergencies. Timing and resource limitations also exacerbate potential flooding and loss of control.

District needs to have the ability to quickly transfer from electrical to temporary generator power with the flip of a switch to continue to operate critical drainage facilities at a moments notice to stay ahead of the interior flooding that occurs during heavy rainfall and high water events.

Project Description: Evaluation of existing pump station locations, motor and panel configurations and design, and lay out proposed alternatives to modernize and meet current design standards, and include switches to convert to temporary backup power generation for each pump that does not currently have redundancy. Develop access or space to house on-site power generation for diesel emergency operations during blackouts. Potential to purchase and stockpile temporary emergency 100 HP floating or submersible pumps with HDPE pipe connections to support need for additional pumping capacity if a pump/motor were to be unavailable due to mechanical failure during emergency operations.

Other Alternatives: Funding for replacement of existing pump/motor/ panel with new in-kind replacement

Existing Planning Mechanism(s) through which Action Will Be Implemented: The District has been regularly operating and monitoring the condition of pumps, motors, and electrical panels for this pumpstation, as part of their routine O&M. Internal to the District planning processes, the Board is evaluating options for future development of aspects of these project alternatives; there are currently no other available funding grants to support projects of this type.

Responsible Office/Partners: RD 551 General Manager

Project Benefits (Losses Avoided): Interior flood control benefits all landowners in the region, CA DOT benefits from Highway 160 staying open during high water events; Avoidance of damage to town of Courtland, benefit during high water events to any agencies, or public utilizing Highway 160 for access/egress during emergency. Multiple county roads transect the interior of the District making seepage control a critical feature during high water events. Every landowner and citizen and acre of land benefits from having redundancy with interior flood control; Significant habitat benefits are also realized with active flood control.

Potential Funding (Local Budgets, Grant Funds, etc. by specific type): Specific funding could come from FEMA BRIC or HMGP funding. Other funding could come from future PG&E or other power incentive programs if they are replenished; DWR Small Community Program, both of which are not

currently funded or seeking proposals until later in 2026 or 2027. Potentially an emergency funded project if critical damages were incurred during an emergency event.

Timeline: Unknown timing due to lack of resources to investigate or implement project.

Project Priority (High, Medium, Low): High Priority for the District, but due to lack of funding the project is likely to linger for the foreseeable future.

Action 3. *Pumpstation Retrofit Project along Unit 1 Sacramento River Levee Pumpstations (38.342287°, -121.547138° & 38.340497°, -121.552816° & 38.335677°, -121.561903°)*

Hazards Addressed: Flood: 1%/0.5%/0.2% annual chance, Localized/Stormwater Flooding, Severe Weather

Goals Addressed: 1, 2, 3, 5, 6, 7

Issue/Background (Problem Statement): Power generation and pump station operational capacity during extreme stream high water events, interior localized flooding, and extreme storm (wind/rain) events, is a critical necessity to control water levels within the District jurisdiction. If pump stations are incapable of operating due to a loss of power from either regional blackouts or faulty facility aging infrastructure then the District loses the ability to maintain interior water surface elevations which will lead to interior flooding, property loss and stranding and flooding of homes; along with loss of access along vital interior County and State roads (Highway 160) to support egress and evacuation during emergencies.

The ability and timing to rent and logistic challenges to mobilize temporary pumps and generators can be extremely costly and difficult to procure during regional or state emergencies. Timing and resource limitations also exacerbate potential flooding and loss of control.

District needs to have the ability to quickly transfer from electrical to temporary generator power with the flip of a switch to continue to operate critical drainage facilities at a moments notice to stay ahead of the interior flooding that occurs during heavy rainfall and high water events.

Project Description: Evaluation of existing pump station locations, motor and panel configurations and design, and lay out proposed alternatives to modernize and meet current design standards, and include switches to convert to temporary backup power generation for each pump that does not currently have redundancy. Develop access or space to house on-site power generation for diesel emergency operations during blackouts. Potential to purchase and stockpile temporary emergency floating or submersible pumps with HDPE pipe connections to support need for additional pumping capacity if a pump/motor were to be unavailable due to mechanical failure during emergency operations.

Other Alternatives: Funding for replacement of existing pump/motor/ panel with new in-kind replacement

Existing Planning Mechanism(s) through which Action Will Be Implemented: The District has been regularly operating and monitoring the condition of pumps, motors, and electrical panels for these pumpstations, as part of their routine O&M. Internal to the District planning processes, the Board is

evaluating options for future development of aspects of these project alternatives; there are currently no other available funding grants to support projects of this type.

Responsible Office/Partners: RD 551 General Manager

Project Benefits (Losses Avoided): Interior flood control benefits all landowners in the region, CA DOT benefits from Highway 160 staying open during high water events; Avoidance of damage to town of Courtland, benefit during high water events to any agencies, or public utilizing Highway 160 for access/egress during emergency. Multiple county roads transect the interior of the District making seepage control a critical feature during high water events. Every landowner and citizen and acre of land benefits from having redundancy with interior flood control; Significant habitat benefits are also realized with active flood control.

Potential Funding (Local Budgets, Grant Funds, etc. by specific type): Specific funding could come from FEMA BRIC or HMGP funding. Other funding could come from future PG&E or other power incentive programs if they are replenished; DWR Small Community Program, both of which are not currently funded or seeking proposals until later in 2026 or 2027. Potentially an emergency funded project if critical damages were incurred during an emergency event.

Timeline: Unknown timing due to lack of resources to investigate or implement project.

Project Priority (High, Medium, Low): High Priority for the District, but due to lack of funding the project is likely to linger for the foreseeable future.

Action 4. *Seepage Rehabilitation Project along Unit 1 Sacramento River Levee: LM 0.1 – 0.9*

Hazards Addressed: Flood: 1%/0.5%/0.2% annual chance

Goals Addressed: 1, 2, 3, 5, 6, 7

Issue/Background (Problem Statement): Historic seepage area along Unit 1 Sacramento River Levee has created concern related to long-term performance risk during high water events that could lead to flooding north of Courtland, CA, leading to flooding of Courtland, Highway 160, and lands with RD 551 if a levee failure occurred on the north end of the RD 551 levee system.

This Project area has been identified by CA DWR in past studies and has been in preliminary planning phases for several years. Funding does not currently exist to investigate or complete this work. Preliminary project costs are difficult to estimate due to lack of data and extreme shift in the construction market since the site was last evaluated.

Project Description: Geotechnical investigation compliant with USACE DIPP submittals, and development of cutoff wall or seepage berm elements to control and minimize future seepage modes of levee failure. Investigation will determine the site characteristics and options for rehabilitation of the levee embankment. Two primary methods for seepage control are cutoff wall methods or seepage berm methods.

Other Alternatives: Setback levee alternatives are not viable due to proximity to Highway 160, existing structures and legacy orchards.

Existing Planning Mechanism(s) through which Action Will Be Implemented: The District has been identifying this site since 1997, CA DWR and the Central Valley Flood Protection Board have been monitoring and tracking this site through various programs and planning documents (FSRP, CVFPP, LSND RFMP, DWR Inspections) and the District has included this project in its 2022 version of its Five Year Plan, identified as a high priority. The City of Courtland, through its Small Community feasibility study, has identified this site as a high priority.

Responsible Office/Partners: Besides the Reclamation District, the following agencies will be involved in this project on a Project levee, part of the Sacramento River Flood Control Project: 1) Sacramento County, 2) CVFPB, 3) USACE, 4) CA DWR, would also likely be a funding partner

Project Benefits (Losses Avoided): Seepage control benefits all landowners in the region, CA DOT benefits from Highway 160 staying open during high water events; Avoidance of damage to town of Courtland, benefit during high water events to any agencies, or public utilizing Highway 160 for access/egress during emergency.

Potential Funding (Local Budgets, Grant Funds, etc. by specific type): Specific funding would likely come from the Flood System Repair Program (FSRP). There is dedicated funding for seepage repair when there are program funds. This site is eligible for the program. Other funding could come from DWR Small Community Program, Special Projects; both of which are not currently funded or seeking proposals. Potentially an emergency funded project if critical damages were incurred during an emergency event.

Timeline: Unknown timing due to lack of resources to investigate or implement project.

Project Priority (High, Medium, Low): High Priority for the District, but due to lack of funding the project is likely to linger for the foreseeable future.