# Delta Annex Chapter 13 RD 2111

## 13.1 Introduction

This Annex details the hazard mitigation planning elements specific to Reclamation District 2111 (RD 2111 or District), a previously participating jurisdiction to the 2016 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 RD 2111, with a focus on providing additional details on the risk assessment and mitigation strategy for this community.

## 13.2 Planning Process

As described above, the District 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 13-1. Additional details on plan participation and District representatives are included in Appendix A.

*Table 13-1 RD 2111 – Planning Team*

| Name | Position/Title | How Participated |
|---|---|---|
| Daniel Wilson | President | Attended meetings, collected data, drafted text and reviewed draft documents |
| Chiles Wilson | Trustee | Attended meetings, collected data, drafted text and reviewed draft documents |
| Dixie Wilson | Trustee | Attended meetings, collected data, drafted text and reviewed draft documents |
| Bill Darcie | Project Manager | KSN, Inc. Attended meetings, collected data, drafted text and reviewed draft documents |
| Elizabeth Ramos | Project Engineer | KSN, Inc. Attended meetings, collected data, drafted text, reviewed draft docs |
| Megan LeRoy | Project Engineer | KSN, Inc. Attended meetings, collected data, drafted text, reviewed draft docs |

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 approved 2016 Plan into existing planning mechanisms and programs. Specifically, the District incorporated into or implemented the 2016 LHMP through other plans and programs shown in Table 13-2.

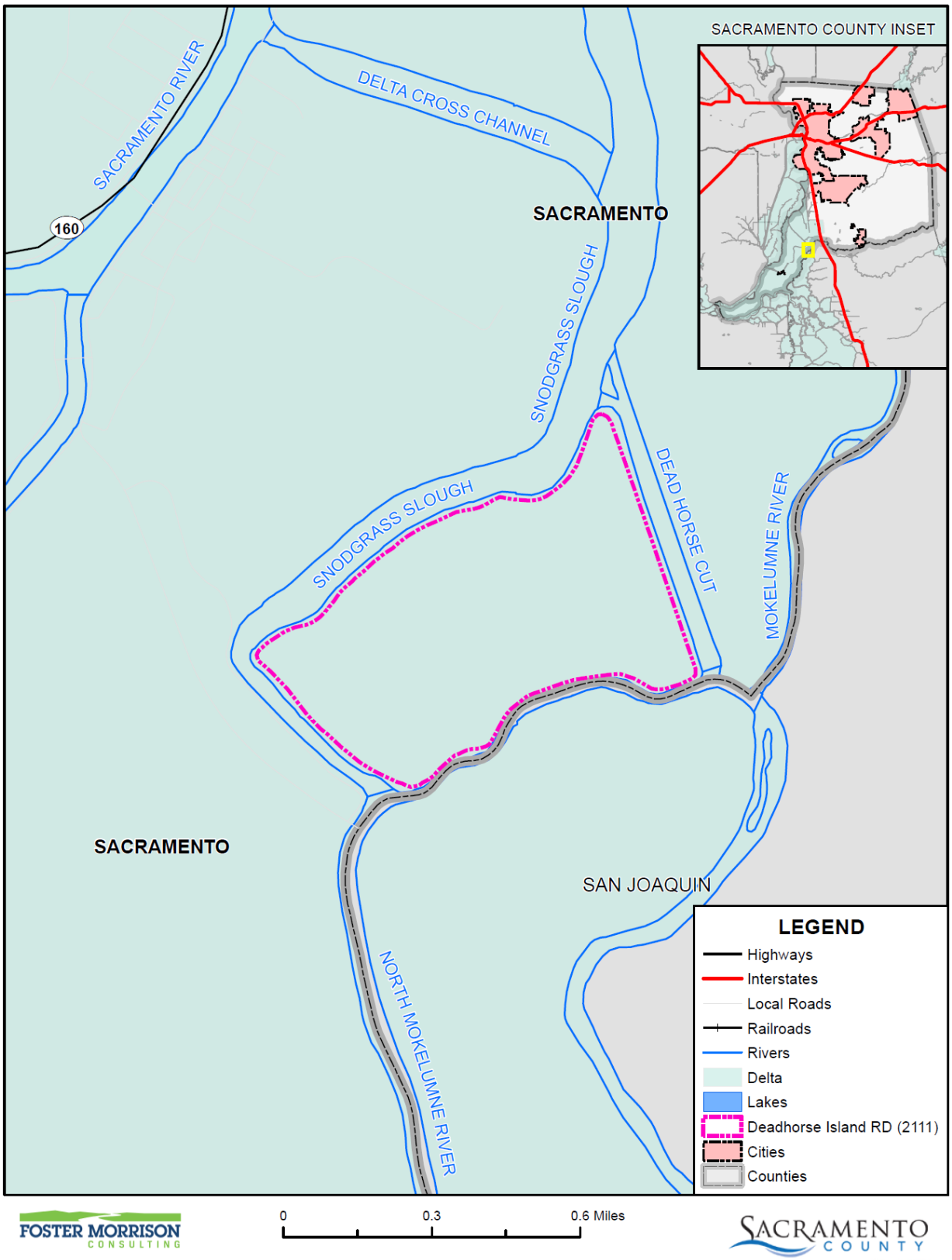
*Table 13-2 2016 LHMP Incorporation*

| Planning Mechanism 2016 LHMP Was Incorporated/Implemented In. | Details: How was it incorporated? |
|---|---|
| Development of RD 2111 Flood Emergency Operations Plan | Elements in the Hazard Assessment used in the development of the Flood RD2111 Emergency Operations Plan |

## 13.3 District Profile

The District profile for RD 2111 is detailed in the following sections. Figure 13-1 and Figure 13-2 display a map and the location of the District within Sacramento County.

*Figure 13-1 RD 2111*




Data Source: Deadhorse Island Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

## *Figure 13-2 Reclamation District 2111 Map*


Source: RD 2111

### 13.3.1. Overview and Background

Reclamation District No. 2111, Dead Horse Island is near the town of Walnut Grove, several miles to the west of Interstate 5 between Sacramento and Stockton. The District is protected by approximately 13,650 feet of non-project levee. The District has one landowner, who holds all of the lands within. Dead Horse Island is surrounded by Dead Horse Cut to the east, the North Mokelumne River to the south, and Snodgrass Slough to the north and west. The island is accessible by bridge from Staten Island, which connects to the southwest most portion of Dead Horse Island. The levee crown road is an all-weather gravel surface, and in one portion of the Island veers off the crown to avoid an existing structure; the levee crown is still accessible to truck traffic if necessary in a flood event, and the required levee crown width for access is provided adjacent to the structure.

Reclamation District No. 2111 is responsible for maintaining the levee and drainage system that provides flood protection for Dead Horse Island, shown in Figure 13-1. The District was formed in 1980, and encompasses an area of 211 acres, surrounded by 2.58 miles of non-project levee, all located within Sacramento County. The District's Board of Trustees is made up of three Trustees who meet annually, or as necessary.

Dead Horse Island is located in the North Delta and is bordered by Dead Horse Cut to the east, the North Mokelumne River to the south, and Snodgrass Slough to the north and west. The District is located within the boundaries of the North Delta Water Agency. Emergency ingress and egress routes are via a private road on Staten Island off North Walnut Grove Road immediately east of the bridge over the North Fork of the Mokelumne River.

Dead Horse Island is located just downstream of the Delta Cross Channel. Water from the Sacramento River flows into both the South Fork and North Fork of the Mokelumne Rivers around the perimeter of Dead Horse Island as it flows toward the State and Federal Water Project Pumps near the City of Tracy. The Reclamation District No. 2111 levees provide the conduit for this water to enter both the North Fork and South Fork of the Mokelumne River, and are important to the proper function of the State and Federal Water Projects.

None of the waterways immediately surrounding Dead Horse Island is a significant commercial marine transportation route, but every waterway around Dead Horse Island is navigable during certain times of the year. A private dock and lagoon serve the Island at approximately Station 6+00. There are also two marinas across the waterways from the Island: a marina called "Wimpy's" near the southeast corner of the Island, and Walnut Grove marina across from the westernmost point of the Island. These marinas are major hubs for recreational boating in the area, and there is substantial boat traffic in the channels surrounding Reclamation District No. 2111, which increases the erosion to which the District levees are subject. The waterways surrounding Reclamation District No. 2111 are used extensively by recreational boaters and by marine contractors that perform levee maintenance, flood fight response and other construction activities.

## 13.4 Hazard Identification

RD 2111 identified the hazards that affect the District and summarized their location, extent, frequency of occurrence, potential magnitude, and significance specific to District (see Table 13-3).

### *Table 13-3 RD 2111—Hazard Identification Assessment*

| Hazard | Geographic Extent | Likelihood of Future Occurrences | Magnitude/ Severity | Significance | Climate Change Influence |
|---|---|---|---|---|---|
| Climate Change | Extensive | Unlikely | Limited | Low | – |
| Dam Failure | Extensive | Unlikely | Limited | Low | Medium |
| Drought & Water Shortage | Extensive | Occasional | Critical | Low | High |
| Earthquake | Extensive | Unlikely | Negligible | Medium | Low |
| Earthquake Liquefaction | Significant | Unlikely | Negligible | Medium | Low |
| Floods: 1%/0.2% annual chance | Extensive | Occasional | Catastrophic | High | Medium |
| Floods: Localized Stormwater | Limited | Likely | Limited | Medium | Medium |
| Landslides, Mudslides, and Debris Flow | Limited | Unlikely | Negligible | Low | Medium |
| Levee Failure | Extensive | Occasional | Catastrophic | High | Medium |
| Pandemic | Extensive | Likeliy | Limited | Low | Medium |
| Severe Weather: Extreme Cold and Freeze | Limited | Unlikely | Negligible | Low | Medium |
| Severe Weather: Extreme Heat | Limited | Unlikely | Negligible | Low | High |
| Severe Weather: Heavy Rains and Storms | Limited | Likely | Negligible | High | Medium |
| Severe Weather: Wind and Tornado | Limited | Likely | Negligible | High | Low |
| Subsidence | Limited | Unlikely | Critical | Medium | Medium |
| Volcano | Extensive | Unlikely | Catastrophic | Low | Low |
| Wildfire | 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

## 13.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile the District's hazards and assess the District's vulnerability separate from that of the Sacramento County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Sacramento County Planning Area and describes the hazard problem description, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the District is included in this Annex. This vulnerability assessment analyzes the property and other assets at risk to hazards ranked of medium or high significance specific to the District. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

### 13.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section 13.5.3, includes a hazard profile/problem description as to how each medium or high significant hazard (as shown in Table 13-3) affects the District and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Sacramento County Planning Area.

### 13.5.2. Vulnerability Assessment and Assets at Risk

This section identifies the District's total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the District. This data is not hazard specific, but is representative of total assets at risk within the District.

#### *Assets at Risk and Critical Facilities*

This section considers RD 2111's assets at risk, with a focus on key District assets such as critical facilities, 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 LHMP. Critical facilities are defined for this Plan as:

> ***Any facility (a structure, infrastructure, equipment or service), that is adversely affected during a hazardous event may result in interruption of services and operations for the District 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.***

Table 13-4 lists critical facilities and other District assets identified by the District Planning Team as important to protect in the event of a disaster. RD 2111's physical assets, valued at over $150,000, consist of the buildings and infrastructure to support the District's operations.

*Table 13-4 RD 2111 Critical Facilities, Infrastructure, and Other District Assets*

| Name of Asset | Facility Type | Replacement Value | Which Hazards Pose Risk | |
|---|---|---|---|---|
| Drain Pump 10 | Essential Services | $50,000 | Out of floodplain | |
| Drain Pumps | Essential Services | $100,000 | Out of floodplain | |
| **Total** | | **$150,000** | | |

Source: RD 2111

There are several levee geometry standards and criteria that are recognized within the Delta. Dead Horse Island uses the Hazard Mitigation Plan (HMP) Criteria and the Bulletin 192-82 Standard. HMP level is the 100-year Base Flood Elevation plus an additional foot of freeboard for agricultural Districts. The goal is to reach the 192-82 level of flood protection, which is the 300-year surface elevation plus 1.5-ft freeboard for agricultural Districts.

The Level of Protection assessment below is based on the DWR 2017 Light Detection and Ranging (LiDAR) Survey. It should be noted that LiDAR survey data is generally suitable for high-level assessments and planning efforts such as this Plan, but it has limitations for more refined analyses due to accuracy thresholds, data gaps underneath vegetation and/or structure cover, and lack of identification of planimetric surface features.

The DWR 2017 LiDAR survey data indicates that the District's levee meets the following standards and criteria as shown in Table 13-5.

*Table 13-5 Current Levee Assessment*

| Delta Agricultural Levee Standard/Criteria | Length of Levee that Meets Standard/Criteria | Percentage of Levee that Meets Standard/Criteria |
|---|---|---|
| Total Levee Length | 13,642 feet | --- |
| HMP Criteria | 11,518 feet | 84.4% |
| Bulletin 192-82 | 0 feet | 0% |

Source: RD 2111

## Costs Due to a Levee Failure or Breach

A failure or breach of the District's levee system could result in flooding of the District to depths of approximately 14 feet on average. Projected costs associated with such an event have been calculated using actual costs from the 2004 Jones Tract flood event. All information used was gathered from the final FEMA Project Worksheets used to close out the claims for all of the public agencies involved in the disaster event (FEMA 1529-DR). Additional costs for work not claimed to FEMA included work performed by the United States Army Corps of Engineers; these costs were established from the invoiced amount provided by the Contractor.

In order to establish the unit costs for an anticipated flood cost model for Delta reclamation districts, the costs from the 2004 Jones Tract flood event were broken into component costs that can be applied to other districts using characteristic data for each district. The data used for the District includes the following:

- 211 acres of land
- 2.58 levee miles
- 14 feet average depth of District relative to BFE
- 7,800 linear feet of District maintained canals
- 3,000 acre-feet of floodwater to be evacuated from District

For the District, the estimated cost of a flood event resulting from a single levee failure would be approximately $19.9 million based on the costs from the 2004 Jones Tract flood event, with costs for distinct emergency and repair activities within the general cost magnitude shown. The cost analysis above does not include damage to privately owned property and improvements. The values of those properties exist elsewhere in this document. The actual financial impact to those properties and facilities would depend greatly on the replacement costs, the amount of insurance those properties might have, and where they are located relative to the location of the levee breach and depth of water at those locations. It should also be noted that a flood could potentially eliminate a cropping season.

### Reclamation District Structures, Pumps, and Pipelines

Water for irrigation is supplied from Snodgrass Slough and the North Mokelumne River via siphons, and is routed through irrigation ditches located on the high end of the fields. Drainage of irrigation tail-water and subsurface seepage occurs through approximately 7,800 feet of earth-lined drainage canals through the farmed portion of the island, draining toward the terminal drainage pump station in the southwest portion of the District. The drainage canals are maintained regularly to remove accumulated debris and vegetation from the channels by both mechanical means and by use of approved herbicides. In some instances, the drainage canals are utilized to provide water to portable irrigation pumps used for temporary sprinkler type irrigation.

Excess water is removed from the irrigation and drainage systems by the main District pump station, which discharges into Snodgrass Slough at approximately Station 136+50. The pump station has one 25-hp pump and one 10-hp pump. Pump capacities for any pump with a given motor vary, depending on the total dynamic head, impeller size, and efficiency. Pump curves specific to the pumps and motors installed on the District are not available, but typical optimal flow rates for pumps with the same motor sizes as those installed on the District are approximately 3,000 gallons per minute (gpm) for a 25-hp pump, and 1,500 gpm for a 10-hp pump.

The flow rates listed above are based on pump performance during conditions at the time of the pump test. These conditions are assumed to be indicative of normal operations of the pump stations. Pump capacities for any pump with a given motor vary, depending on the total dynamic head, impeller size, and efficiency.

Both pumps are powered by electricity provided by the Sacramento Municipal Utilities District. If the power supply to the island is disrupted, there is no backup power supply immediately available to the pumps, and it would be necessary to bring in backup generators to operate the pumps.

### General Infrastructure

According to the Delta Protection Commission's Economic Sustainability Plan for the Sacramento-San Joaquin Delta, there is a natural gas transmission pipeline that crosses Dead Horse Island, and the island is

situated in the middle of the West Thornton-Walnut Grove Gas Field. This gas field is part of a significant series of oil/gas fields that ranges from Sherman Island at its southwest-most point to Glanville Tract at its northeast-most point and includes the Rio Vista Gas Field, the largest natural gas field in California.

According to the State of California Department of Conservation Division of Oil, Gas & Geothermal Resources, three plugged and abandoned gas wells are located on Dead Horse Island. While the wells have been abandoned, the island retains value as a component of the State's gas production and transmission network through this portion of the Delta.

Electrical service to the island residents and District pump stations is provided by the Sacramento Municipal Utilities District. The transmission lines are fed from McCormack-Williamson Tract to a line that is located on and protected by the District's levee. Loss of this power supply would render the District drainage pumps useless, as well as cut power to the residences on the island.

The District is located just upstream of the bridge crossings of Walnut Grove Road, also called Sacramento County Road J11, across the North and South forks of the Mokelumne River. While there has not historically been a problem with access being impeded at these bridges directly due to flooding at Reclamation District No. 2111, this road is one of the major egress routes for the town of Walnut Grove, and provides access to Staten Island and Tyler Island specifically, and through much of the Delta in general. As can be seen in the photos included in the flood history in this report, boats have broken loose from local marinas and threatened to destroy bridges in this area in the past. Destruction of these egress routes could severely impede flood control operations for multiple reclamation districts in the area, as well as limit evacuation capabilities in the region.

### Local Assets

The agricultural production located on Dead Horse Island provides an economic base from which the public benefits in the form of jobs, tax revenues, and other economic benefits. The District's levee protects 211 acres of farmland, two residences, several non-residential structures, and the high-value vegetable seed crops produced on the island. The DRMS Phase 1 report estimates the total assets within the District to be $910,000, and does not include the value of the land. The Public Policy Institute (PPIC) estimates the land value to be $862,581, and the asset value to be $998,000, for a total value of the land and assets of $1,860,581. Based on recent land sales of similar properties and soil types in the region indicate a land value of approximately $2,000,000. The estimated value of other assets including homes, buildings, a bridge, and appurtenant structures is approximately $3,000,000. The total value of land and assets is approximately $5,000,000. Given that this is a unique property in a very desirable location with many opportunities for other uses, the value could be in excess of the stated amount.

For the purposes of this report, no economic value has been placed on the environmental benefits provided by the interior lands within the island and protected by the levees. The costs of replacing these environmental benefits are likely substantial, and the costs to mitigate for environmental or habitat losses currently range from $65,000 to $145,000 per acre.

## Natural Resources

The Reclamation District No. 2111 levee provides protection for valuable habitat essential for many threatened and endangered species. In general, Delta lands, including those protected by the District's levees, provide forage and cover for local and migratory populations of birds and terrestrial wildlife including many special status species. The levees also provide important waterside habitat and shoreline for various fisheries that includes several special status species. Flooding of Delta islands destroys habitat and kills most terrestrial species present.

## Historic and Cultural Resources

Per the 2015 Five-Year Plan, there are not historic or cultural resources in the District.

## Growth and Development Trends

According to the District in 2011, Dead Horse Island currently supports three permanent residences and several small structures which are generally not occupied. Three fulltime residents live on the Island. The permanent residences are above the required HMP levee crown elevation. The Planning Team for the District noted that future development is limited in the secondary zone of the Delta from the Delta Protection Plan.

### Future Development

The District has the following future development plans.

#### Rock Slope Protection Project

The District's first priority is to ensure the protection of the existing levee by adding quarry stone riprap above the existing riprap to any portions of the waterside slope of the levee requiring additional rock slope protection. This will prevent erosion and reduce future erosion repairs. Prior to submitting a project proposal, a thorough riprap inventory of the District must be completed to determine where additional riprap may be necessary and determine more definitive quantities and costs required to complete the project. The quantities and costs provided in this Plan are planning level estimates based on input from the District and from the District's most recent survey.

The anticipated planning-level costs of the Rock Slope Protection Project consisting or additional riprap as needed is approximately $3.5 million. Quantities and costs are provided in this Plan as planning level estimates based on input from the District and from the District's most recent survey and inspection. A thorough riprap inventory of the District must be completed prior to submitting a project proposal to determine where additional riprap may be necessary and determine more definitive quantities and costs required to complete the project.

#### Overflow Weir Project

Due to historical inundations caused by flood surge caused by high flows generated from uncontrolled upstream levee breaches, the District plans to install a weir at the upstream levee on Dead Horse Cut. This

will allow the District to fill the island with water to stabilize the levees against uncontrolled flooding. This should eliminate levee failures as the weight of the water on the island's interior will stabilize the levee against total levee failure. The District will likely sustain some damage and pumping costs, but the costs will be substantially than losing the entire levee section. Also, protecting against a failure of the entire levee section protects adjacent islands from failure due to rapid drawdown which can cause failure of adjacent levees. This project may be eligible for other funding sources because the adjacent levees protect a Delta Legacy Community as well as Federal Project Levees.

#### Bulletin 192-82 Levee Project

The District will then bring those portions of levee below the Bulletin 192-82 Standard to six inches above the Bulletin 192-82 Standard with a District minimum crown width of 24 feet to allow for future levee raises to address climate change and sea level rise. This work will likely be divided into several phases or projects, depending on the funding available. The Bulletin 192-82 Levee Project sites are proposed to be limited to the following locations as shown in Table 13-6.

*Table 13-6 Bulletin 192-82 Levee Project Sites*

| Start Station | End Station | Length in Feet |
|---|---|---|
| 0+00 | 136+42 | 13,642 |

These project sites may be addressed individually, or as a single project. The cost estimate provided in this report treats all Bulletin 192-82 Levee Project sites as a single project, and costs are reported accordingly.

The costs involved with constructing a minimum 16-foot wide crown in accordance with the Bulletin 192-82 Standard are approximately $11.5 million. Furthermore incremental costs involved with widening the crown to 24 feet to allow for future raises in freeboard to address climate change and sea level rise is approximately $5.5 million. Quantities and costs are provided in this Plan as planning level estimates based on input from the District and from the District's most recent survey and inspection. A design-level survey and inspection of the District must be completed prior to submitting a project proposal to determine more definitive quantities and costs required to complete the project.

#### Syphon Project

The District in the planning phase and plans to install 3 36-inch pipes to pre-flood the island. These pipes will be approximately 250 feet long. Fish screens will be used on the pipes to prevent fish from being sucked into the island. These pipes could also to relieve flooding within the District.

### 13.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table 13-3 as high or medium significance hazards. Impacts of past events and vulnerability of the District to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for 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 4.3 of the Base Plan.

An estimate of the vulnerability of the District to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow. 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.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, critical facilities and infrastructure, populations at risk, and future development.

### Power Outage/Power Failure

An impact of almost all hazards below relates to power outage and/or power failures. 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 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. More information on types of power disruptions can be found in Section 4.3.2 of the Base Plan.

The District Planning Team noted that the pump stations and drainage conveyances are potentially at risk to power outages and/ or power failure. In the absence of power, localized flooding can occur because existing pump stations do not have backup power. In addition, if power outages occur near the end of the flood, it will be a challenge to dewater the districts.

#### *Public Safety Power Shutoff (PSPS)*

A new intentional disruption type of power outage/failure event has recently occurred in California. In recent years, several wildfires have started 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 coordinating to prepare

all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3.2 of the Base Plan.

## *Earthquake*

**Likelihood of Future Occurrence**–Occasional
**Vulnerability**–Medium

### Hazard Profile and Problem Description

An earthquake is caused by a sudden slip on a fault. Stresses in the earth's outer layer push the sides of the fault together. Stress builds up, and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and cause the shaking that is felt during an earthquake. Earthquakes can cause structural damage, injury, and loss of life, as well as damage to infrastructure networks, such as water, power, gas, communication, and transportation. Earthquakes may also cause collateral emergencies including dam and levee failures, seiches, hazmat incidents, fires, avalanches, and landslides. The degree of damage depends on many interrelated factors. Among these are: the magnitude, focal depth, distance from the causative fault, source mechanism, duration of shaking, high rock accelerations, type of surface deposits or bedrock, degree of consolidation of surface deposits, presence of high groundwater, topography, and the design, type, and quality of building construction.

#### Location and Extent

The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. An earthquake's magnitude is expressed in whole numbers and decimals (e.g., 6.8). Seismologists have developed several magnitude scales, as discussed in Section 4.3.9 of the Base Plan. Geological literature indicates that no major active faults transect the County; however, there are several subsurface faults in the Delta. The Midland fault, buried under alluvium, extends north of Bethel Island in the Delta to the east of Lake Berryessa and is considered inactive but possibly capable of generating a near 7.0 (Richter Scale) earthquake. This magnitude figure is speculative based on an 1895 earthquake measuring 6.9 on the Richter Scale with an epicenter possibly in the Midland Fault vicinity. However, oil and gas companies exploring the area's energy potential have identified several subsurface faults, none of which show any recent surface rupture. A second, presumably inactive, fault is in the vicinity of Citrus Heights near Antelope Road. This fault's only exposure is along a railroad cut where offsetting geologic beds can be seen. Neither the lateral extent of the trace, the magnitude of the offset, nor the age of faulting has been determined. To the east, the Bear Mountain fault zone trends northwest-southeast through Amador and El Dorado Counties. Geologists believe this series of faults has not been active in historic time. Potential earthquakes on the Hayward, Calaveras, and San Andreas fault could also affect the Delta area.

Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface. Seismic shaking is typically the greatest cause of losses to

structures during earthquakes. Seismic shaking maps for the area show Sacramento County and the District fall within a low to moderate shake risk, with most of the moderate risk in the Delta area of the County.

### Past Occurrences

There have be no past federal or state disaster declarations from this hazard. After the 2014 Napa Earthquake the District performed levee inspections and verified the continued operation of the pump stations around the island to check the levee integrity and ensure there was no damage to District assets as a result of the earthquake.

## Vulnerability to and Impacts from Earthquake

The combination of plate tectonics and associated California coastal mountain range building geology generates earthquake as a result of the periodic release of tectonic stresses. Sacramento County lies in the center of the North American and Pacific tectonic plate activity. There have been earthquakes as a result of this activity in the historic past, and there will continue to be earthquakes in the future of the California north coastal mountain region.

Fault ruptures itself contributes very little to damage unless the structure or system element crosses the active fault; however, liquefaction can occur further from the source of the earthquake. In general, newer construction is more earthquake resistant than older construction due to enforcement of improved building codes. Manufactured buildings can be very susceptible to damage because their foundation systems are rarely braced for earthquake motions. Locally generated earthquake motions and associated liquefaction, even from very moderate events, tend to be more damaging to smaller buildings, especially those constructed of unreinforced masonry (URM) and soft story buildings.

The Uniform Building Code (UBC) identifies four seismic zones in the United States. The zones are numbered one through four, with Zone 4 representing the highest level of seismic hazard. The UBC establishes more stringent construction standards for areas within Zones 3 and 4. All of California lies within either Zone 3 or Zone 4. RD 2111 is within the less hazardous Zone 3.

Impacts from earthquake in the District will vary depending on the fault that the earthquake occurs on, the depth of the earthquake strike, and the intensity of shaking. Large events could cause damages to levees, infrastructure, critical facilities, residential and commercial properties, and possible injuries or loss of life. Potential earthquakes on the Hayward, Calaveras or San Andreas faults pose the highest risk to Delta Region levees. All assets in the District are at risk to the effects of a damaging earthquake.

The District Planning Team noted that all natural resources could be affected by an earthquake causing damage to the levee structure should the island flood due to an earthquake.

### Assets at Risk

The District Planning Team noted that the levees structures, pump stations and drainage conveyances are potentially at risk to an earthquake, though no evidence of damage has been observed to date.

## *Earthquake: Liquefaction*

**Likelihood of Future Occurrence**–Low
**Vulnerability**–Medium

### Hazard Profile and Problem Description

Liquefaction can be defined as the loss of soil strength or stiffness due to a buildup of pore-water pressure during a seismic event and is associated primarily with relatively loose, saturated fine- to medium-grained unconsolidated soils. Seismic ground shaking of relatively loose, granular soils that are saturated or submerged can cause the soils to liquefy and temporarily behave as a dense fluid. If this layer is at the surface, its effect is much like that of quicksand for any structure located on it. If the liquefied layer is in the subsurface, the material above it may slide laterally depending on the confinement of the unstable mass. Liquefaction is caused by a sudden temporary increase in pore-water pressure due to seismic densification or other displacement of submerged granular soils. Liquefiable soil conditions are not uncommon in alluvial deposits in moderate to large canyons and could also be present in other areas of alluvial soils where the groundwater level is shallow (i.e., 50 feet below the surface). Bedrock units, due to their dense nature, are unlikely to present a liquefaction hazard.

#### Location and Extent

There is no scientific scale for earthquake related liquefaction. The speed of onset is short, as is the duration. The effects from liquefaction can last for days, weeks, months or even years as areas of the County are rebuilt or leveed areas are dewatered, and the levees rebuilt. In Sacramento County, the Delta and areas of downtown Sacramento are at risk to liquefaction. The Delta sits atop a blind fault system on the western edge of the Central Valley. Moderate earthquakes in 1892 near Vacaville and in 1983 near Coalinga demonstrate the seismic potential of this structural belt. The increasing height of the levee system has prompted growing concern about the seismic stability of the levees. The concern is based on the proximity of faulting, the nature of the levee foundations, and the materials used to build the levees. Many levees consist of uncompacted weak local soils that may be unstable under seismic loading. The presence of sand and silt in the levees and their foundations indicates that liquefaction is also a possibility.

#### Past Occurrences

There have be no past federal or state disaster declarations from this hazard. The District noted no past occurrences of earthquake liquefaction or that affected the District in any meaningful way. The seismic events of 1989 and 2014 did not induce liquefaction on the Delta Levees. Delta levees are composed of material that contain pockets, rather than long continuous lenses, of sand. Though it has a low likelihood of future occurrence, liquefaction is a recognized potential risk.

### Vulnerability to and Impacts from Liquefaction

Earthquake is discussed above, but is primarily focused on the vulnerability of buildings and people from earthquake shaking. This section deals with a secondary hazard associated with earthquake – the possible collapse of structural integrity of the ground underneath liquefaction prone areas. In Sacramento County, two of these areas have been identified: downtown Sacramento and the Delta area, which could lead to a

possible collapse of delta levees and any above ground structures. While this levee failure differs from the levee failure discussion below which generally focuses on levee failure due to high water conditions or other types of structural failure, the resulting impacts would be similar and include those related to a large flood event. Potential earthquakes on the Hayward, Calaveras or San Andreas faults pose the highest risk to Delta Region levees. All assets in the District are at risk to the effects of liquefaction.

#### Assets at Risk

The District Planning Team noted that the levees structures, pump stations and drainage conveyances are potentially at risk to liquefaction resulting from seismic activity. Additionally, all-natural resources in the District would be at risk to liquefaction of the levee foundations and associated levee failures.

## *Flood: 1%/0.2% Annual Chance*

**Likelihood of Future Occurrence**–Occasional
**Vulnerability**–High

### Hazard Profile and Problem Description

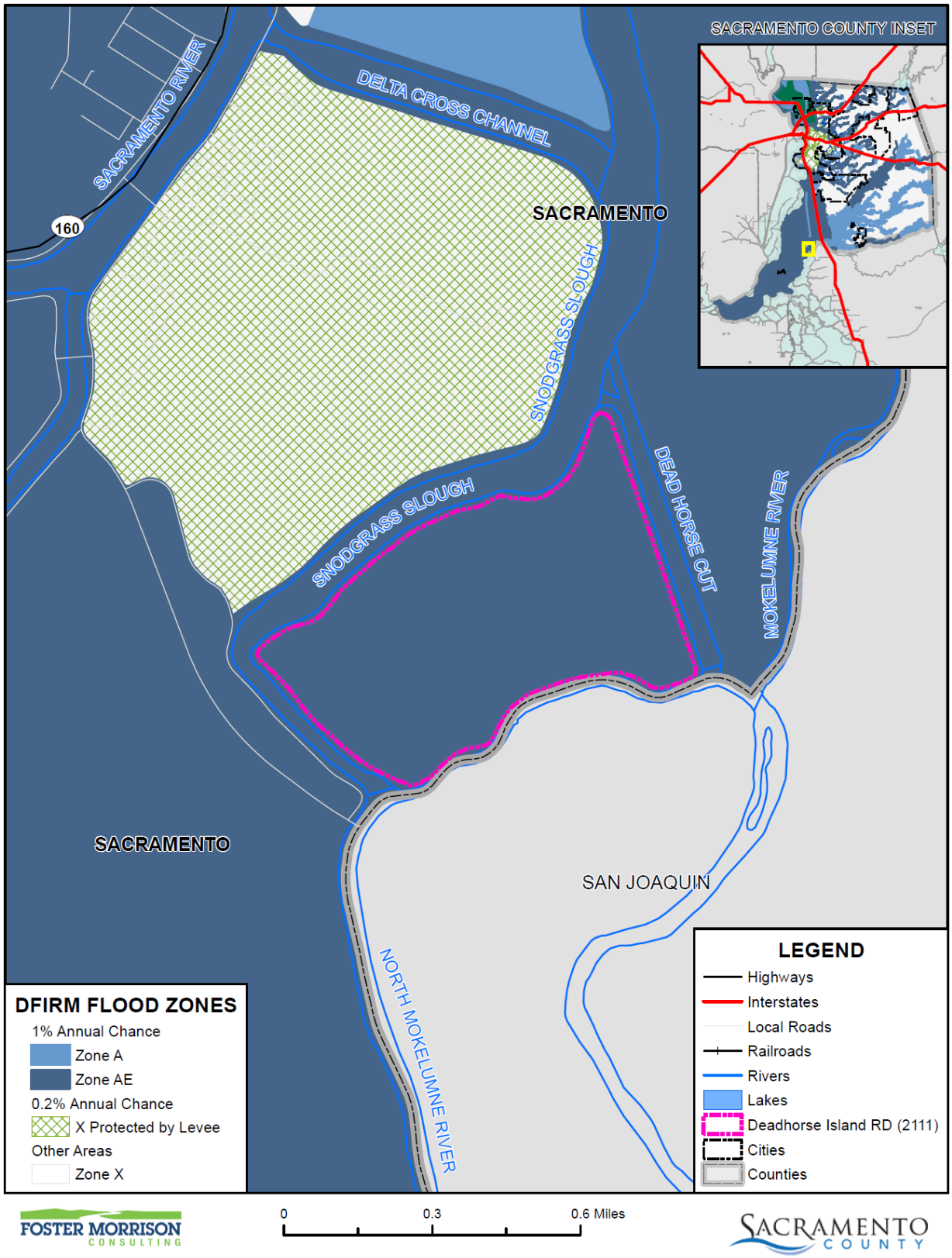
This hazard analyzes the FEMA DFIRM 1% and 0.2% annual chance floods. These tend to be the larger floods that can occur in the County or in the District, and have caused damages in the past. Flooding is a significant problem in Sacramento County and the District. Historically, the District has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage.

As previously described in Section 4.3.11 of the Base Plan, the Sacramento County Planning Area and RD 2111 have been subject to historical flooding. The Reclamation District No. 2111 levee is generally overtopped or the levee is breached during large flood events due to a confluence of several waterways in the vicinity of Dead Horse Island, which is located just downstream of where the Cosumnes and Mokelumne Rivers and Dry Creek merge with Snodgrass Slough. The island is separated from the Sacramento River by one reclamation district and the flood gates for the Delta Cross Channel. Flooding of the island occurs primarily because the island is located in a hydraulic choke point in the river system that is impacted by the timing of storms, the unrestricted flows from the Cosumnes River and Dry Creek as well as the management of reservoir releases on the Mokelumne River.

#### Location and Extent

RD 2111 has areas located in the 1% annual chance floodplain. This is seen in Figure 13-3.

*Figure 13-3 RD 2111 – FEMA DFIRM Flood Zones*




Data Source: FEMA NFHL 07/19/2018, Deadhorse Island Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Table 13-7 details the DFIRM mapped flood zones within the 1% annual chance flood zone as well as other flood zones located within the District.

### *Table 13-7 RD 2111– DFIRM Flood Hazard Zones*

| Flood Zone | Description | Flood Zone Present in the District |
|---|---|---|
| A | 100-year Flood: No base flood elevations provided | |
| AE | 100-year Flood: Base flood elevations provided | |
| AH | An area inundated by 1% annual chance flooding (usually an area of ponding), for which BFEs have been determined; flood depths range from 1 to 3 feet | |
| AO | Areas subject to inundation by 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet | |
| A99 | Areas with a 1% annual chance of flooding that will be protected by a Federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones | X |
| Shaded X | 500-year flood 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 | An area determined to be outside the 500-year flood and protected by levee from 100-year flood | |

Source: FEMA

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. Flooding can occur with compound effects of a storm, high releases from upstream dams, snowmelt, and is influenced by tidal movement.

#### Past Occurrences

A list of state and federal disaster declarations for Sacramento County from flooding is shown on Table 13-8. These events also likely affected the District to some degree.

### *Table 13-8 Sacramento County – State and Federal Disaster Declarations from Flood 1950-2020*

| Disaster Type | Federal Declarations | | State Declarations | |
|---|---|---|---|---|
| | Count | Years | Count | Years |
| Flood (including heavy rains and storms) | 19 | 1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times) | 14 | 1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times) |

Source: Cal OES, FEMA

Past occurrences of flooding affecting RD 2111 are detailed in the levee failure section below.

## Vulnerability to and Impacts from Flood

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 damages. Predominantly, the effects of flooding are generally confined to areas near the waterways of the County. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems. Loss of power is usually a precursor to closure of governmental offices and community businesses. Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. 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. Floodwaters can transport large objects downstream which can damage or remove stationary structures. 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. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

Dead Horse Island is located just downstream from the confluence of the Mokelumne and Cosumnes Rivers. The Cosumnes River is one of the few remaining rivers that does not have any dams, and flows are unrestricted upstream of Dead Horse Island. The Mokelumne River is controlled by several dams, with Camanche Dam being the principal flood control reservoir. McCormack Williamson Tract, located upstream to the northeast and adjacent to Dead Horse Island, has a restricted elevation levee on the upstream end of the tract that overtops and fills McCormack Williamson Tract when the Mokelumne and Cosumnes Rivers reach an elevation of 20.0 feet (NAVD 88 datum). The flood water that is contained within McCormack Williamson Tract builds up within the Tract until it overtops and breaches the levee on the downstream end of the Tract, adjacent to Dead Horse Island. When the McCormack Williamson Tract downstream levee fails, all of the water accumulated from upstream is released in a very short time, and given the narrow channels surrounding Dead Horse Island, causes an immediate short term rise in the water surface elevations in the channels surrounding Dead Horse Island. The majority of the recent flood events on Dead Horse Island can be attributed to this type of hydraulic event that commonly occurs during flood flows on the Mokelumne and Cosumnes Rivers.

Based on past history, the District Planning Team noted that the island's levees are sufficient to protect against a 100-year flood. A 200- or 500-year flood would likely overwhelm or overtop the levees. The

District Planning Team also noted that both marinas are unstable – they will break and block bridges during high water.

### Assets at Risk

Should a flood breach the levees, the entirety of the assets of RD 2111 would be at risk. Levee failure is discussed later in this section. Flooding also causes erosion, which is discussed later in this Annex.

Flooding of Delta islands destroys habitat, kills most species present, and can entrain and strand large populations of native and non-native fish species.

There is only one building site in the District. It is above the floodplain.

## *Flood: Localized Stormwater Flooding*

**Likelihood of Future Occurrence**–Occasional
**Vulnerability**–High

### Hazard Profile and Problem Description

Flooding occurs in areas other than the FEMA mapped 1% 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 County during the rainy season from November through April. Prolonged heavy rainfall contributes to a large volume of runoff resulting in high

### Location and Extent

RD 2221 is subject to localized flooding throughout the District. 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.

Historically, RD 2221 has been at risk to flooding primarily during the spring months when river systems in the County swell with heavy rainfall. The District has a drainage system set up deal with localized flooding. A map of this system can be seen on Figure 13-4

## *Figure 13-4 RD 2221 Drainage System*


Source: RD 2111

### Past Occurrences

There have been no federal or state disaster declarations in the County due to localized flooding. The District has not identified past events.

## Vulnerability to and Impacts from Localized Flooding

Primary concerns associated with stormwater flooding include impacts to agriculture and structures. 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.

### Assets at Risk

The District Planning Team noted that all District assets are at risk to localized flooding; however, this flooding is likely to be a nuisance-type of flood and would not have lasting impacts on the District. Flooding of Delta islands destroys habitat, kills most species present, and can entrain and strand large populations of native and non-native fish species.

# *Levee Failure*

**Likelihood of Future Occurrence**–Occasional
**Vulnerability**–Extremely High

## Hazard Profile and Problem Description

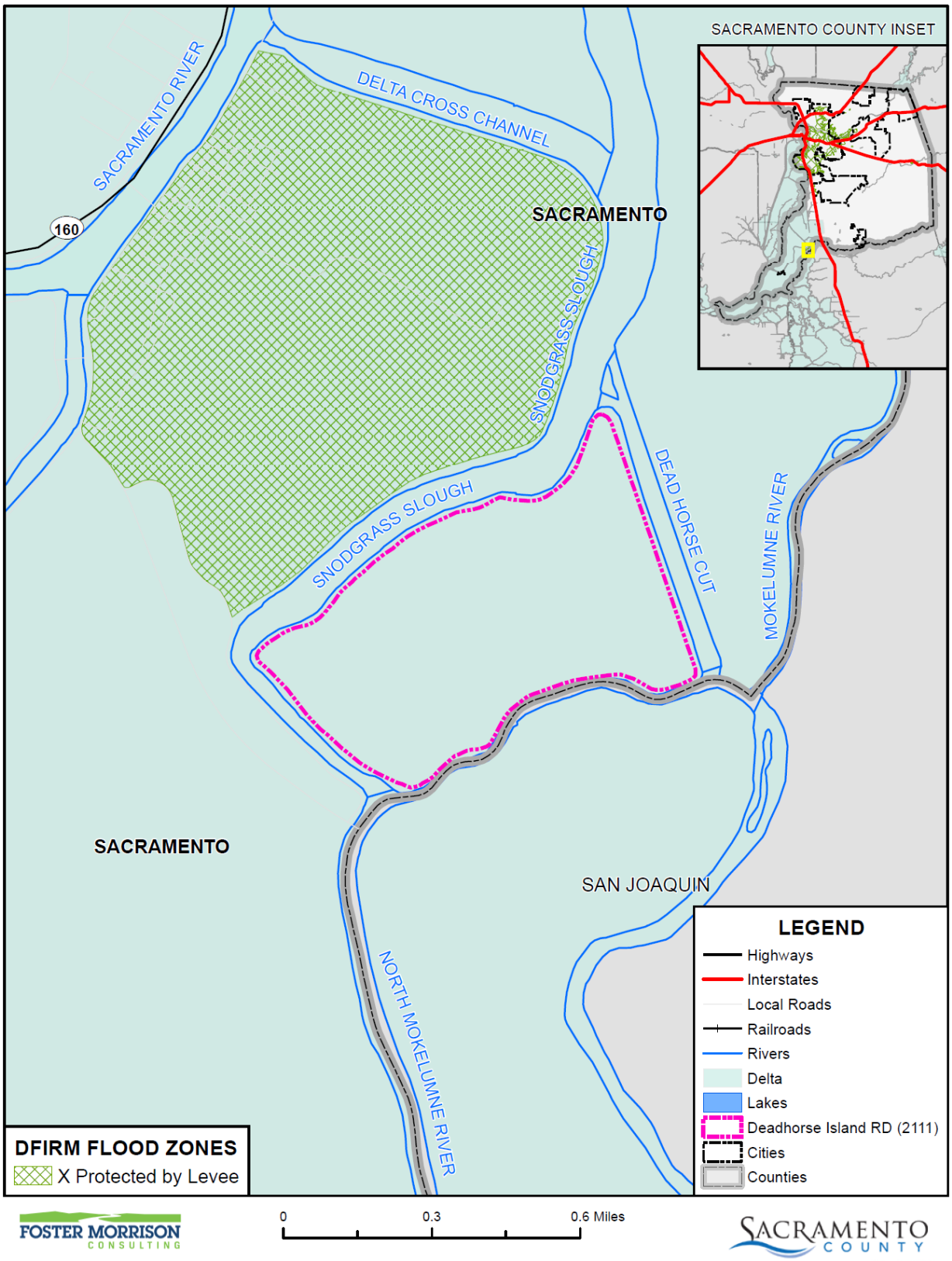
A levee is a raised area that runs along the banks of a stream or canal. Levees reinforce the banks and help prevent flooding by containing higher flow events to the main stream channel. By confining the flow to a narrower steam channel, levees can also increase the speed of the water. Levees can be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

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 dam failure. For example, levees can be certified to provide protection against the 1% annual chance flood. 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. Levee failure can occur through overtopping or from seepage issues resulting from burrowing rodents, general erosion, excessive vegetation and root systems and other factors that compromise the integrity of the levee. 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.

### Location and Extent

There is not a scientific scale or measurement system in place for levee failure. Expected flood depths from a levee failure in the District vary by event and location. The speed of onset is slow as the river rises, but if a levee fails the warning times are generally 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. When northern California dams and reservoirs are nearing maximum capacity, they release water through the river systems, causing additional burdens on County levees. Levees in the District are shown on Figure 13-5.

*Figure 13-5 RD 2111 – Levee Protected Areas*




Data Source: FEMA NFHL 07/19/2018, Deadhorse Island Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

### Past Occurrences

The 2015 Five-Year Plan contained detail of past occurrences of levee failure and how it affected the District. Those details are here below:

- 1900 – Dead Horse Island was initially reclaimed. The levee on the east side of the Island was constructed by dredgers, which separated the Island from McCormack Williamson Tract.
- 1907 – A flood event breached the levee on nearby Tyler Island, and likely flooded Reclamation District No. 2111 as well.
- December 1955 – Rainfall on a deep Sierra snowpack caused flooding at Reclamation District No. 2111. Levee failed and the District was inundated.
- 1957 – A flood event caused inundation at Dead Horse Island. The levee failed and the District was inundated.
- 1980 – Levee failure at approximately Station 96+00 to 97+00. Due to hydraulic conditions in this portion of the Delta, the levee was overtopped by rising floodwaters causing the failure along Snodgrass Slough opposite the Walnut Grove Marina. Reclamation District No. 2111 was inundated. The levee was temporarily repaired so that the Island could be dewatered. Complete repair of the failed levee section occurred during the following summer months and the full levee section was restored. A FEMA claim was filed, and helped to defer the costs of the repair.
- February 1986 – The east end of the Island was overtopped. In the words of one of the District trustees, this flood event caused overtopping simultaneously "all over" the District. The location of the District at the confluence of the of the Mokelumne and Cosumnes Rivers caused a huge volume of water to overwhelm the District in a very short time, and the elevation of the levee was insufficient to protect the District against this rapid floodwater rise. The levee prism also failed as a result in the rapid pressure increase from the high water. In addition to the increased flow throughout the Delta, floodwaters around the District rose even further due to an unexpected flow restriction in the North Fork of the Mokelumne River at the New Hope Bridge, where several house boats had broken loose of their moorings and lodged against the bridge (see photo). The house boats had been docked at the New Hope Marina, located upstream of the split between the North Fork and South Fork of the Mokelumne River, near the western portion of the District levee. Note the marina blocking water that caused the RD 2111 levees to fail.

*Figure 13-6 1986 Flooding*

Source: 2015 Five-Year Plan for RD 2111

- January 1997 – The District levee failed at approximately Station 107+00 to 110+00 just as the levee was about to be overtopped. Consequences: A levee break occurred opposite the Walnut Grove Marina during a flood event. The District was fully inundated. Several boats and sections of the dock from the Walnut Grove Marina were pulled through the levee breach into the interior of the island. Other recreational boats, house boats, and sections of dock were also pulled into the Millers Ferry Bridge, including a two story floating home which particularly threatened to reduce flows down the North Fork of the Mokelumne River, increase the flood threat to adjacent islands, and possibly destroy the bridge, cutting off one of the few available emergency evacuation routes (see photo). The large house boat was eventually destroyed and the debris was sucked under the bridge.

*Figure 13-7 1997 Flooding*

Source: 2015 Five-Year Plan for RD 2111

In earlier flood events, there are reports that the McCormack Williamson Tract levee was purposely breached on Dead Horse Cut prior to its overtopping, successfully attenuating the flood impacts previously anticipated to affect neighboring islands. These planned levee breaches also limited damage to the interior of the McCormack Williamson levees as the size and location of the planned breaches can be controlled, and the water surface elevation within the tract does not increase beyond the downstream high water surface elevations.

It should be noted that since 1986, significant portions of the levee system within the Legal Delta have been rehabilitated and improved, which has significantly reduced the number and frequency of levee breaches and failures during post-1986 Delta flood events.

In 2017, the District's levee performed well against high flows and high tides in February. Relief cuts made on McCormack-Williamson Tract upstream of the District in advance of peak flows helped alleviate extreme water surface elevations associated with past events due to water not building up behind those levees prior to them failing. Due to the relief cuts made upstream, no "surge" effect occurred and the District did not flood as in many prior events.

## Vulnerability to and Impacts from Levee Failure

A levee failure can range from a small, uncontrolled release to a catastrophic failure. Levee failure flooding can occur as the result of prolonged rainfall and flooding. The primary danger associated with levee failure is the high velocity flooding of those properties outside and downstream of the breach.

Should a levee fail, some or all of the area protected by the levees would be at risk to flooding. Impacts from a levee failure include property damage, critical facility damage, and life safety issues. Business and economic losses could be large as facilities could be flooded and services interrupted. School and road closures could occur. Road closures would impede both evacuation routes and ability of first responders to quickly respond to calls for aid. Other problems connected with levee failure flooding include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

There are several standards that the levees in the Delta must meet in order to remain eligible for certain State and Federal disaster assistance programs. These include the Hazard Mitigation Plan (HMP) criteria and the Public Law 84-99 Flood Control and Coastal Emergency Act (PL 84-99) Standard for agricultural levees. The Level of Protection assessment below is based on the DWR 2017 Light Detection and Ranging (LiDAR) Survey. It should be noted that LiDAR survey data is generally suitable for high-level assessments and planning efforts such as this Plan, but it has limitations for more refined analyses due to accuracy thresholds, data gaps underneath vegetation and/or structure cover, and lack of identification of planimetric surface features.

The DWR 2017 LiDAR survey data indicates that the District's levee meets the following standards and criteria as shown in Table 13-9.

### *Table 13-9 RD 2111 Levee Standards of Protection*

| Delta Agricultural Levee Standard | Feet of Levee | Percentage of Levee |
|---|---|---|
| Total Levee Length | 13,642 feet | – |
| Meets HMP Standard | 11,581 feet | 84.4% |
| Bulleting 192-82 | 0 feet | 0.0% |

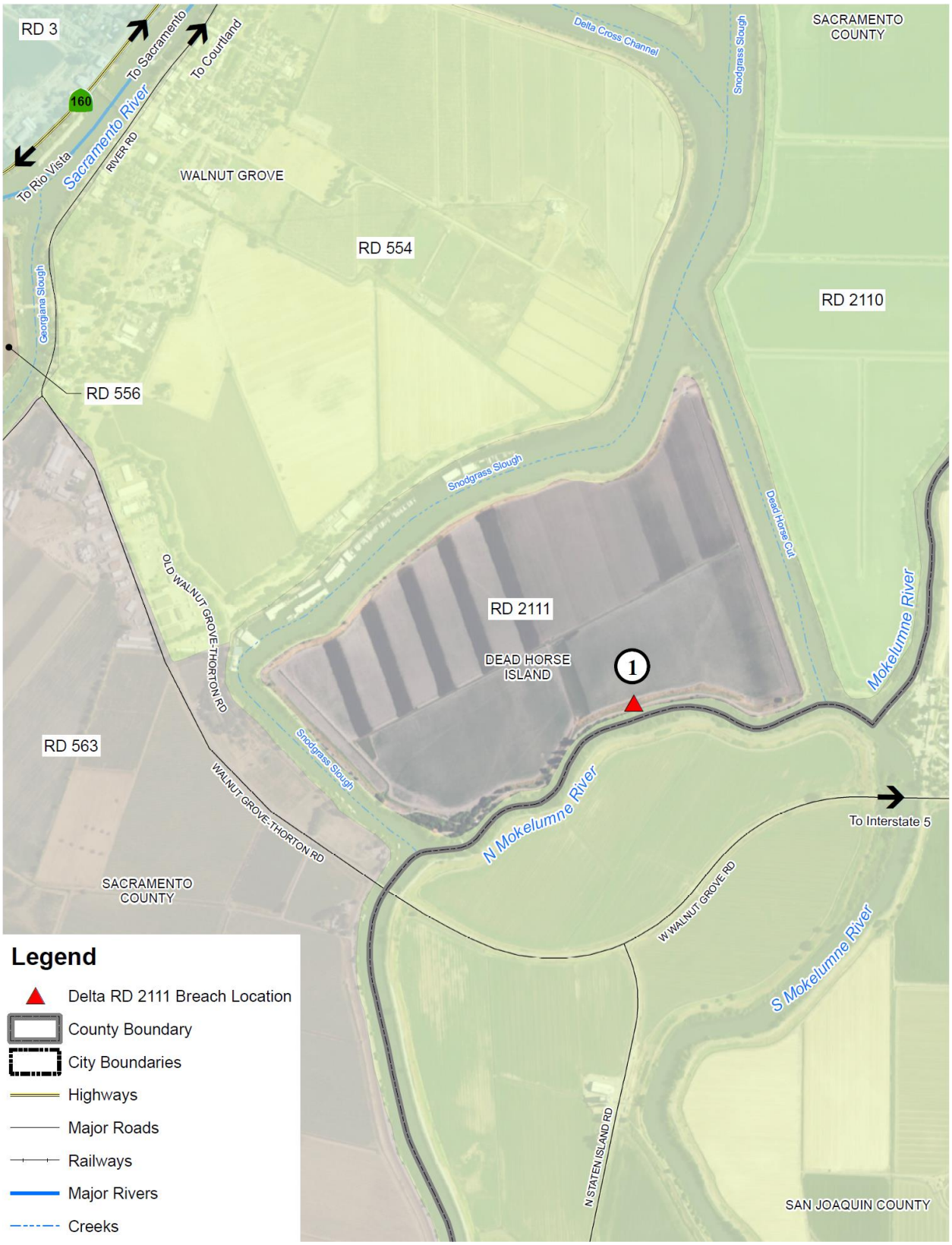
Source: 2020 Five Year Plan for RD 2111

### 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.

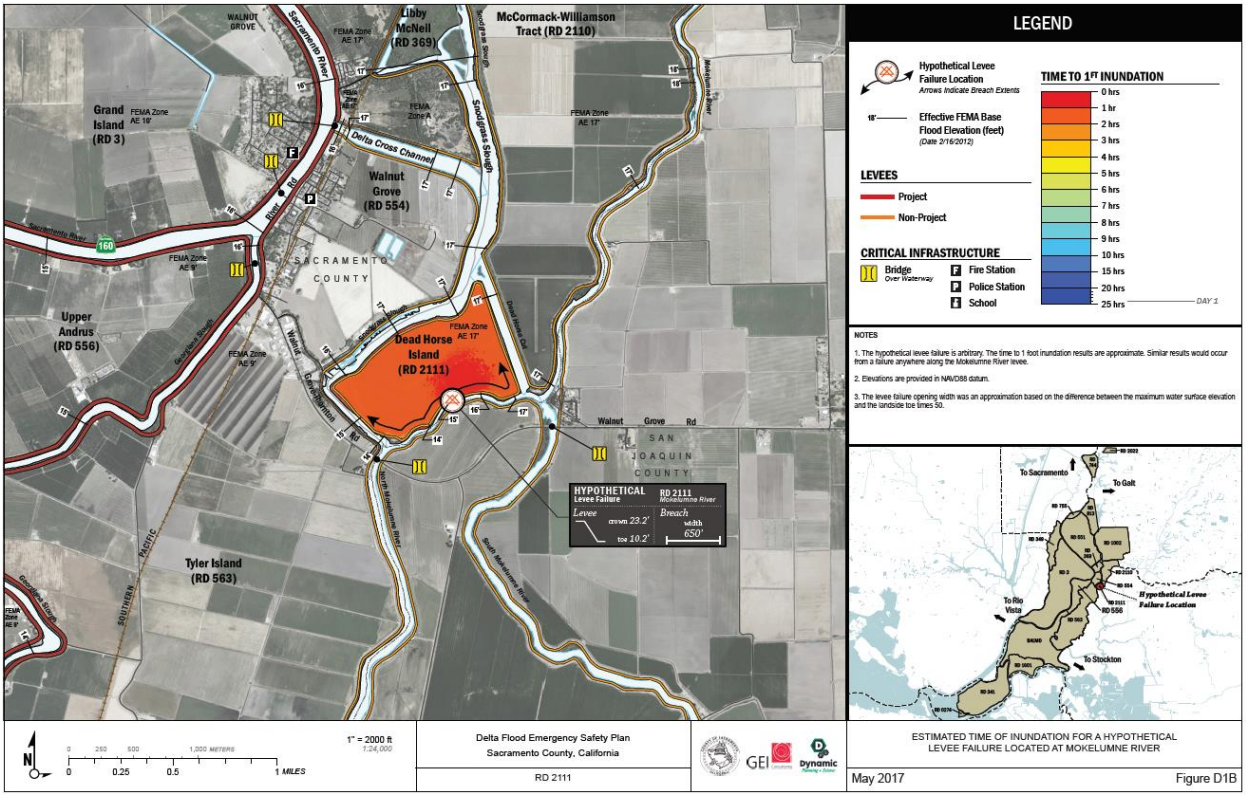
For RD 2111, Figure 13-8 details the locations in the Delta within Reclamation District 2111 where flooding could occur. The red triangle denotes a hypothetical potential levee breach location. Maps for this levee breach scenario regarding time to one foot inundation (Figure 13-9), estimated flood depths (Figure 13-10), and suggested evacuation routes (Figure 13-11) are displayed below.

*Figure 13-8 RD 2111 – Potential Levee Breach Location*



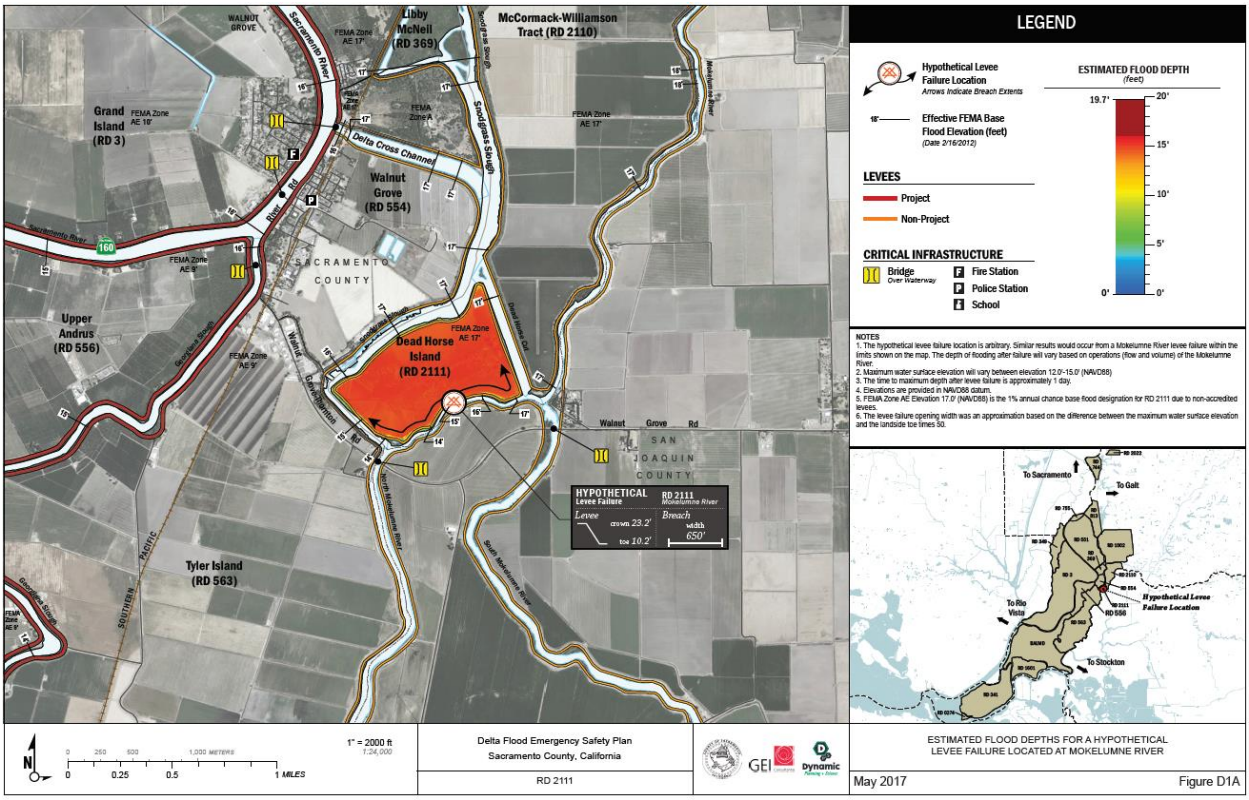

Source: Sacramento County Storm Ready – retrieved March 16, 2021

## *Figure 13-9 RD 2111 – Time to One Foot Inundation after Levee Breach*



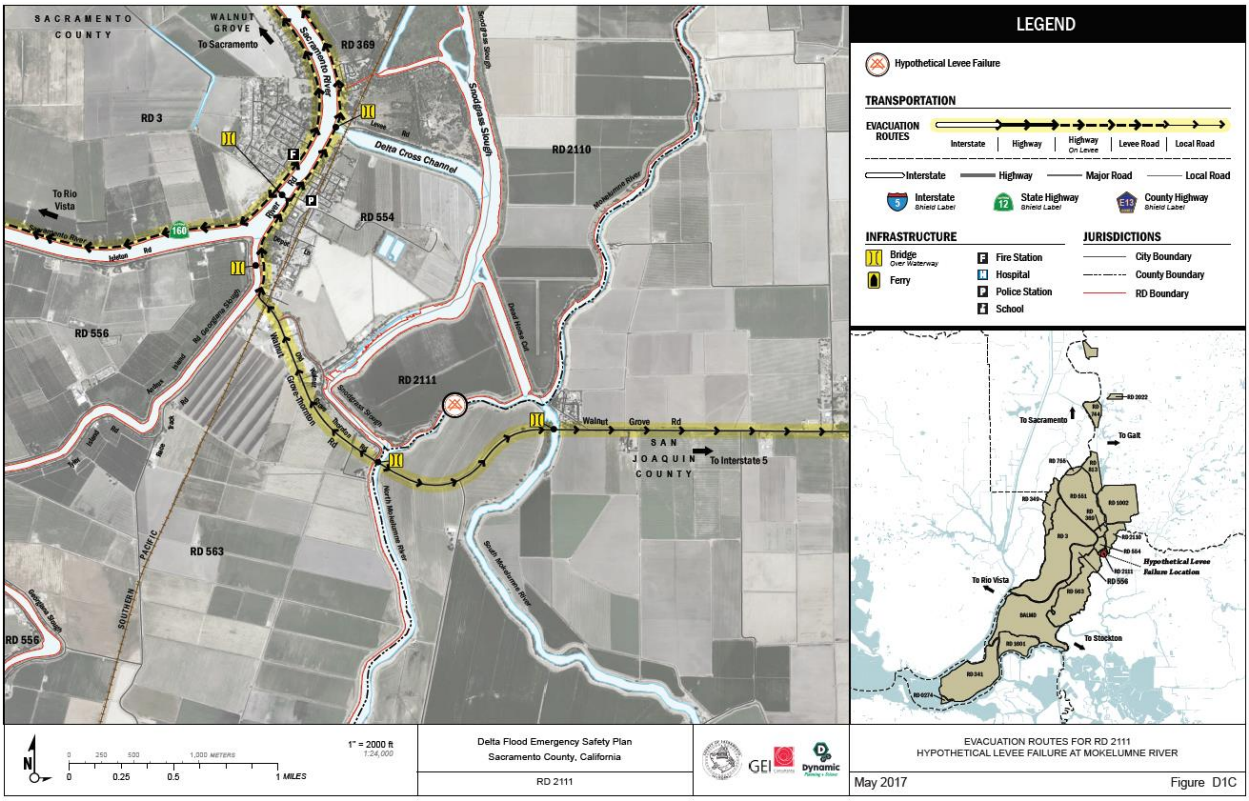

Source: Sacramento County Storm Ready – retrieved March 16, 2021

## *Figure 13-10 RD 2111 – Estimated Flood Depth from Levee Breach Scenario*




Source: Sacramento County Storm Ready – retrieved March 16, 2021

*Figure 13-11 RD 2111 – Levee Breach Scenario Evacuation Routes*




Source: Sacramento County Storm Ready – retrieved March 16, 2021

### Assets at Risk

Should the levees fail, all District assets would be at risk. Flooding of Delta islands destroys habitat, kills most species present, and can entrain and strand large populations of native and non-native fish species.

## *Severe Weather: Heavy Rains and Storms (Hail, Lightning)*

**Likelihood of Future Occurrence**–Likely
**Vulnerability**–Medium

### Hazard Profile and Problem Description

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.

### Location and Extent

Heavy rain events occur on a regional basis. Rains and storms can occur in any location of the District. All portions of the District are at risk to heavy rains. Most of the severe rains occur during the fall, winter, and spring months. 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. Duration of severe storms in California, Sacramento County, and the District can range from minutes to hours to days. Information on precipitation extremes can be found in Section 4.3.4 of the Base Plan.

### Past Occurrences

There have been past disaster declarations from heavy rains and storms, which were discussed in Past Occurrences of the flood section 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.

The 5-year plan for RD 2111 included the following events of severe weather in the District.

- 1986 – Due to the extreme storm event, multiple days of heavy rain, strong winds from extreme low pressure gradients, high tides and runoff affecting the entire Sacramento-San Joaquin Delta, the District's levee failed. More information can be found in the Past Occurrences Section of Levee Failure above.
- 1997 – A series of large storms that produced heavy rain and high winds caused heavy runoff and high tide conditions that impacted the Districts levee, as well as the entire Sacramento – San Joaquin Delta region. More information can be found in the Past Occurrences Section of Levee Failure above.
- 2017 High Water Event. A large series of storm events generating high winds and heavy rain caused rivers to rise above flood stage. Emergency erosion repairs, rodent hole repairs, deployment of muscle wall and emergency response patrols and labor occurred during the event. Between Levee Station 403+00 and 450+00 the District levee experienced a significant landside slope failure due to under and through seepage. Emergency and temporary repair included placing a rock berm extending landward around the failure and then adding fill material to the damaged levee prism to fill the void. An engineered long-term repair strategy has been developed and submitted for assistance and remains in appeal for FEMA funding at the time of this report. The District had well organized floodfight response, and was able to immediately address the slope failure site which kept the island from flooding. Other than the slope failure site, the District's levees and sustained only minor damage and performed well.

## Vulnerability to and Impacts from Heavy Rain and Storms

Heavy rain and severe storms are the most frequent type of severe weather occurrences in the District. These events can cause localized flooding. Elongated events, or events that occur during times where the ground is already saturated can cause 1% and 0.2% annual chance flooding. Wind often accompanies these storms and has caused damage in the past. Hail and lightning are rare in the District.

Actual damage associated with the effects of severe weather include impacts to property, critical facilities (such as utilities), and life safety. Heavy rains and storms often result in localized flooding creating

significant issues. Roads can become impassable and ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Floodwaters and downed trees can break utilities and interrupt services.

During periods of heavy rains and storms, power outages can occur. These power outages can affect pumping stations and lift stations that help alleviate flooding. More information on power shortage and failure can be found in the Severe Weather: Extreme Heat Section above, as well as in Section 4.3.3 of the Base Plan.

However, it is the secondary effects of heavy rain and storms that are of concern to RD 2111. Heavy rains can cause flooding, levee failure, and stream bank erosion.

#### Assets at Risk

Flooding, levee failure, and stream bank erosion can cost RD 2111 million in damages. The District Planning Team noted that flooding of Delta islands destroys habitat, kills most species present, and can entrain and strand large populations of native and non-native fish species.

## *Severe Weather: High Winds and Tornadoes*

**Likelihood of Future Occurrence**–Likely
**Vulnerability**–Medium

### Hazard Profile and Problem Description

High winds, as defined by the NWS glossary, are sustained wind speeds of 40 mph or greater lasting for 1 hour or longer, or winds of 58 mph or greater for any duration. High winds can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. High winds can also cause PSPS events.

Tornadoes are rotating columns of air marked by a funnel-shaped downward extension of a cumulonimbus cloud whirling at destructive speeds of up to 300 mph, usually accompanying a thunderstorm. Tornadoes form when cool, dry air sits on top of warm, moist air. Tornadoes are the most powerful storms that exist. Tornadoes, though rare, are another severe weather hazard that can affect areas of the Sacramento County Planning Area, primarily during the rainy season in the late fall, winter, and early spring.

#### Location and Extent

The entire District is subject to significant, non-tornadic (straight-line), winds. Each area of the County is at risk to high winds. Magnitude of winds is measured often in speed and damages. These events are often part of a heavy rain and storm event, but can occur outside of storms. The speed of onset of winds can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of winds in California is often short, ranging from minutes to hours. The Beaufort scale is an empirical 12 category scale that relates wind speed to observed conditions at sea or on land. Its full name is the Beaufort Wind Force Scale. The Beaufort Scale was shown in Section 4.3.5 of the Base Plan.

Tornadoes, while rare, can occur at any location in the County and District. Prior to February 1, 2007, tornado intensity was measured by the Fujita (F) scale. This scale was revised and is now the Enhanced Fujita scale. Both scales are sets of wind estimates (not measurements) based on damage. The new scale (EF) provides more damage indicators (28) and associated degrees of damage, allowing for more detailed analysis and better correlation between damage and wind speed. It is also more precise because it considers the materials affected and the construction of structures damaged by a tornado. The F Scale and EF Scale are shown in Section 4.3.5 of the Base Plan.

### Past Occurrences

There has been no federal or state disaster declarations in the County for winds and tornadoes. The District noted that since high winds is a regional phenomenon, events that affected the lower elevations of the County also affected the District. Those past occurrences were shown in the Base Plan in Section 4.3.5.

The 5-year plan for RD 2111 included the following events of winds and tornadoes in the District.

- 1986 – Due to the extreme storm event, multiple days of heavy rain, strong winds from extreme low-pressure gradients, high tides and runoff affecting the entire Sacramento-San Joaquin Delta, the District's levee failed. More information can be found in the Past Occurrences Section of Levee Failure above.
- 1997 Storms. A series of large storms that produced heavy rain on a heavy snow pack in the Sierras and high winds caused extraordinary heavy runoff and high tide conditions that impacted the District's levee, as well as the entire Sacramento – San Joaquin Delta region. The District claimed costs for flood event related erosion repairs, emergency response – floodfight, and engineering technical assistance. Due to the improvements to the District's levee since the 1986 flood event, and well organized floodfight response, the District's levees sustained only minor damage and performed well during this otherwise historical Flood Event.
- 2006 Flood Event. Rip rap was placed on waterside slopes to mitigate damage caused from high winds.
- 2017 High Water Event. A large series of storm events generating high winds and heavy rain caused rivers to rise above flood stage. Emergency erosion repairs, rodent hole repairs, deployment of muscle wall and emergency response patrols and labor occurred during the event. Between Levee Station 403+00 and 450+00 the District levee experienced a significant landside slope failure due to under and through seepage. Emergency and temporary repair included placing a rock berm extending landward around the failure and then adding fill material to the damaged levee prism to fill the void. An engineered long-term repair strategy has been developed and submitted for assistance and remains in appeal for FEMA funding at the time of this report. The District had well organized floodfight response, and was able to immediately address the slope failure site which kept the island from flooding. Other than the slope failure site, the District's levees and sustained only minor damage and performed well.

## Vulnerability to and Impacts from Severe Weather: Wind and Tornado

High winds are common occurrences in the District throughout the entire year. Straight line winds are primarily a public safety and economic concern. Windstorm can cause damage to structures and power lines which in turn can create hazardous conditions for people. Debris flying from high wind events can shatter windows in structures and vehicles and can harm people that are not adequately sheltered. High winds can impact critical facilities and infrastructure and can lead to power outages. Wind can also drive

wildfire flames, spreading wildfires quickly During periods of high winds and dry vegetation, wildfire risk increases. High winds that occur during periods of extreme heat can cause PSPS events to be declared in the County. More information on power shortage and failure can be found in the beginning of Section 13.5.3.

Impacts from high winds in the District will vary. Future losses from straight line winds include:

- Downed trees
- Power line impacts and economic losses from power outages
- Occasional structure damage
- Erosion of levees and other areas

When paired with highwater, heavy runoff, high tide, and high wind, impacts to District levees, as well as the entire Sacramento – San Joaquin Delta region, include serious levee erosion that could result in overtopping that possibly lead to failure.

#### Assets at Risk

The District Planning Team noted that the entire levee structures are at risk from wind. The District Planning Team noted that all-natural resources are at risk if wind caused levee failure in the District.

## *Subsidence*

**Likelihood of Future Occurrence**–Occasional
**Vulnerability**–Medium

### Hazard Profile and Problem Description

Subsidence is the gradual settling or sinking of the earth's surface over manmade or natural underground voids with little or no horizontal motion. Subsidence occurs naturally and also through man-driven or technologically exacerbated circumstances. Subsidence is worsened when groundwater drawdown exceeds the ability of the ground to naturally recharge. This is more common during periods of drought.

#### Location and Extent

There is no scientific scale to measure subsidence. Subsidence is measured in inches or feet of elevation change over time. Subsidence has a long speed of onset, as it occurs over many years. The duration of subsidence is long, as it is rare for subsidence to be reversed. In Sacramento County, the Delta in the southeast portion of the County is highly at risk to subsidence. In the Delta, subsidence affects the islands as well as the levees.

#### Past Occurrences

There have been no state or federal disasters in the County related to subsidence.

- In addition, there has been no other identified incidents of subsidence related specifically to RD 2111 to note.

### Vulnerability to and Impacts from Subsidence

Historically, the County has been at risk from subsidence. Vulnerability in the County from subsidence comes from several different causes:

- Compaction of Unconsolidated Soils by Earthquake Shaking (Liquefaction)
- Compaction by Heavy Structures
- The Erosion of Peat Soils
- Fluid Withdrawal

These were discussed in detail in Section 4.3.16 of the Base Plan.

Since reclamation of the island began, elevations have fallen to as much as 20 feet below sea level, requiring protection by over 1,125 miles of man-made levees throughout the Delta. Drainage is provided by a network of ditches that collect and transport shallow groundwater, irrigation runoff, and levee seepage to pump stations that discharge back into the Delta waterways. These ditches create an unsaturated root zone for crops, and provide a more stable levee foundation.

#### Assets at Risk

All levee structures in RD 2111 are at risk to subsidence. The District Planning Team noted that all natural resources are at risk from subsidence.

## 13.6 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.

### 13.6.1. Regulatory Mitigation Capabilities

Table 13-10 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 RD 2111.

*Table 13-10 RD 2111 Regulatory Mitigation Capabilities*

| Plans | Y/N<br>Year | Does the plan/program address hazards?<br>Does the plan identify projects to include in the mitigation strategy?<br>Can the plan be used to implement mitigation actions? |
|---|---|---|
| Comprehensive/Master Plan/General Plan | Y<br>2020 | 5 Year Plan identifies hazards that may affect RD 1601. Some mitigation strategies are proposed. Yes, the plan can be used to implement mitigation actions. |
| Capital Improvements Plan | N | |
| Economic Development Plan | N | |

| | | |
|---|---|---|
| Local Emergency Operations Plan | Y | The District completed a Flood Safety Plan consisting of an Emeregency Operations Plan and Annex A – Flood (the Flood Contignency map) in 2019 for RD2221. |
| Continuity of Operations Plan | N | |
| Transportation Plan | N | |
| Stormwater Management Plan/Program | N | |
| Engineering Studies for Streams | N | |
| Community Wildfire Protection Plan | N | |
| Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation) | Y | RD 2111 Five Year Plan completed in 2020. |
| **Building Code, Permitting, and Inspections** | **Y/N** | **Are codes adequately enforced?** |
| Building Code | N | Version/Year: |
| Building Code Effectiveness Grading Schedule (BCEGS) Score | N | Score: |
| Fire department ISO rating: | N | Rating: |
| Site plan review requirements | N | |
| **Land Use Planning and Ordinances** | **Y/N** | **Is the ordinance an effective measure for reducing hazard impacts?<br>Is the ordinance adequately administered and enforced?** |
| Zoning ordinance | N | |
| Subdivision ordinance | N | |
| Floodplain ordinance | N | |
| Natural hazard specific ordinance (stormwater, steep slope, wildfire) | N | |
| Flood insurance rate maps | N | |
| Elevation Certificates | N | |
| Acquisition of land for open space and public recreation uses | N | |
| Erosion or sediment control program | N | |
| Other | | |
| **How can these capabilities be expanded and improved to reduce risk?** | | |
| The Emergency Operations Plan development process alone helps to increase the capabilities of the District to respond to emergencies and disasters. Continued funding available to maintain these plans would be helpful. | | |

Source: RD 2111

## 13.6.2. Administrative/Technical Mitigation Capabilities

Table 13-11 identifies the District department(s) responsible for activities related to mitigation and loss prevention in RD 2111.

*Table 13-11 RD 2111's Administrative and Technical Mitigation Capabilities*

| Administration | Y/N | Describe capability<br>Is coordination effective? |
|---|---|---|
| Planning Commission | N | |
| Mitigation Planning Committee | Y | RD 2111 together with KSN (engineering firm) staff support this committee. |
| Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems) | Y | |
| Mutual aid agreements | Y | |
| Other | | |
| **Staff** | **Y/N<br>FT/PT** | **Is staffing adequate to enforce regulations?<br>Is staff trained on hazards and mitigation?<br>Is coordination between agencies and staff effective?** |
| Chief Building Official | N | |
| Floodplain Administrator | N | |
| Emergency Manager | Y | KSN, Inc. |
| Community Planner | N | |
| Civil Engineer | Y | KSN, Inc. |
| GIS Coordinator | Y | KSN, Inc. |
| Other | | |
| **Technical** | | |
| Warning systems/services (Reverse 911, outdoor warning signals) | Y | Sacramento County has an alert and warning system that covers the District. |
| Hazard data and information | Y | |
| Grant writing | Y | |
| Hazus analysis | N | |
| Other | | |
| **How can these capabilities be expanded and improved to reduce risk?** | | |
| These capabilities can be expanded by utilization of additional funding opportunities to pay for the services provided by KSN, Inc. so the District can use the General Fund dollars to fund additional District priorities. | | |

Source: RD 2111

## 13.6.3. Fiscal Mitigation Capabilities

Table 13-12 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

*Table 13-12 RD 2111's Fiscal Mitigation Capabilities*

| Funding Resource | Access/ Eligibility (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 | N | |
| Authority to levy taxes for specific purposes | N | |
| Fees for water, sewer, gas, or electric services | N | |
| Impact fees for new development | N | |
| Storm water utility fee | N | |
| Incur debt through general obligation bonds and/or special tax bonds | Y | RD taxes |
| Incur debt through private activities | N | |
| Community Development Block Grant | N | |
| Other federal funding programs | Y | HMGP, FEMA Post-Disaster Assistance |
| State funding programs | Y | DWR Delta Levee Maintenance Subventions and Special Projects Program |
| Other | | |
| **How can these capabilities be expanded and improved to reduce risk?** | | |
| Continued funding from the Delta Levees Program is crucial. Federal funding programs are difficult to pursue because of the local cost share; if state or other partners could help the local cost share then small, rural communities it would gain more access to federal grants. | | |

Source: RD 2111

## 13.6.4. Mitigation Education, Outreach, and Partnerships

Table 13-13 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 13-13 RD 2111's Mitigation Education, Outreach, and Partnerships*

| Program/Organization | Yes/No | Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities? |
|---|---|---|
| Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc. | N | |
| Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education) | N | |
| Natural disaster or safety related school programs | N | |
| StormReady certification | N | |
| Firewise Communities certification | N | |

| Program/Organization | Yes/No | Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities? |
|---|---|---|
| Public-private partnership initiatives addressing disaster-related issues | N | |
| Other | Y | DWR Flood Methods Course and Just In Time Training Program. Training Policy is outlined in Attachment 1 of RD1601's Emergency Operations Plan (EOP), which includes SEMS/NIMS courses (SEMS 100, 200, 700; or can be covered through G0402). |
| **How can these capabilities be expanded and improved to reduce risk?** | | |
| Additional Funding to provide these types of programs. The District will seek to find funding from Cal OES, CA DWR, and FEMA to increase mitigation capability. | | |

Source: RD 2111

### 13.6.5. Other Mitigation Efforts

The District Planning Team noted no other mitigation efforts.

## 13.7 Mitigation Strategy

### 13.7.1. Mitigation Goals and Objectives

RD 2111 adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

### 13.7.2. Mitigation Actions

The planning team for RD 2111 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, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Floods: 1%/0.2% annual chance
- Levee Failure

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 regardless of hazard priority. Collectively, this 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 although a jurisdiction may not have specific projects identified for each priority hazard for the five year coverage of this planning process, each jurisdiction has focused on identifying those projects which are realistic and reasonable for them to

implement and would like to preserve their hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement.

## *Multi-Hazard Actions*

### *Action 1. Rock Slope Protection Project*

**Hazards Addressed**: Earthquake; Earthquake: Liquefaction; Flood: 100/200/500-year, Localized Stormwater Flooding, Levee Failure; Severe Weather: Heavy Rains and Storms, Wind and Tornadoes; and Subsidence

**Goals Addressed**: 1, 2, 3, 4, 5

**Issue/Background**: The goal of this Mitigation Action is to provide additional protection to the levee by installing additional riprap.

**Project Description**: : The District plans to ensure the protection of the existing levee by adding quarry stone riprap above the existing riprap to any portions of the waterside slope of the levee requiring additional rock slope protection. This will prevent erosion and reduce future erosion repairs. Prior to submitting a project proposal, a thorough riprap inventory of the District must be completed to determine where additional riprap may be necessary and determine more definitive quantities and costs required to complete the project.

**Other Alternatives**: none

**Existing Planning Mechanism(s) through which Action Will Be Implemented**: District 5-Year Plan and Delta Levees Program

**Responsible Office/Partners**: RD 2111

**Project Priority**: High

**Cost Estimate**: $3.5 million

**Benefits (Losses Avoided)**: Preservation of 2111 levee structures, Ecosystem Restoration and Habitat Enhancement Component, Reversing Land Subsidence, Ensuring Adequate and Effective Emergency Response Plans, Benefitting Water Quality, Improving Water Supply Reliability

**Potential Funding**: Delta Levee Subventions, Delta Levee Special Projects, HMGP Grant Programs, State Funding Opportunities, seeking cost sharing partners

**Timeline**: 1-10 years depending on regulatory process and funding

### *Action 2. Levee Improvement Projects*

**Hazards Addressed**: Earthquake; Earthquake: Liquefaction; Flood: 100/200/500-year, Localized Stormwater Flooding, Levee Failure; Severe Weather: Heavy Rains and Storms, Wind and Tornadoes; and Subsidence

**Goals Addressed**: 1, 2, 3, 4, 5

**Issue/Background**: The goal of this Mitigation Action is to improve the Dead Horse Island levees over the next five years to a level of protection that meets, or exceeds, the Bulletin 192-82 standard.

**Project Description**: The District will then bring those portions of levee below the Bulletin 192-82 Standard to six inches above the Bulletin 192-82 Standard with a District minimum crown width of 24 feet using 2:1 landside side slopes to allow for future levee raises to address climate change and sea level rise. If sufficient funding is available, the segments of levee improved during this phase will include portions of the levee that meet the HMP Criteria, but do not meet the design template for this project, due to the many relatively short stretches of levee that do not meet the Bulletin 192-82 Standard in close proximity to longer stretches of levee that do not meet the HMP Standard. After the entire levee meets or exceeds the HMP Criteria, the District will bring any remaining portions of levee below the Bulletin 192-82 Standard to six inches above the Bulletin 192-82 Standard.

**Other Alternatives**: none

**Existing Planning Mechanism(s) through which Action Will Be Implemented**: District Five-year Plan

**Responsible Office/Partners**: RD 2111

**Project Priority**: High

**Cost Estimate**: $16,000,000

**Benefits (Losses Avoided)**: Preservation of 2111 levee structures, Ecosystem Restoration and Habitat Enhancement Component, Reversing Land Subsidence, Ensuring Adequate and Effective Emergency Response Plans, Benefitting Water Quality, Improving Water Supply Reliability

**Potential Funding**: Delta Levee Subventions, Delta Levee Special Projects, HMGP Grant Programs, State Funding Opportunities, seeking cost sharing partners.

**Timeline**: 1-10 years depending on regulatory process and funding

### *Action 3. Overflow Weir Project*

**Hazards Addressed**: Earthquake; Earthquake: Liquefaction; Flood: 100/200/500-year, Localized Stormwater Flooding, Levee Failure; Severe Weather: Heavy Rains and Storms, Wind and Tornadoes; and Subsidence

**Goals Addressed**: 1, 2, 3, 4, 5

**Issue/Background**: The goal of this Mitigation Action is to provide infrastructure that will allow the District to fill the island with water to stabilize the levees against uncontrolled flooding.

**Project Description**: Due to historical inundations caused by flood surge caused by high flows generated from uncontrolled upstream levee breaches, the District plans to install a weir at the upstream levee on Dead Horse Cut. This will allow the District to fill the island with water to stabilize the levees against uncontrolled flooding. This should eliminate levee failures as the weight of the water on the island's interior will stabilize the levee against total levee failure. The District will likely sustain some damage and pumping costs, but the costs will be substantially than losing the entire levee section. Also, protecting against a failure of the entire levee section protects adjacent islands from failure due to rapid drawdown which can cause failure of adjacent levees. This project may be eligible for other funding sources because the adjacent levees protect a Delta Legacy Community as well as Federal Project Levees.

**Other Alternatives**: none

**Existing Planning Mechanism(s) through which Action Will Be Implemented**: District Five-year Plan

**Responsible Office/Partners**: RD 2111

**Project Priority**: High

**Cost Estimate**: $5,000,000

**Benefits (Losses Avoided)**: Preservation of 2111 levee structures, Ecosystem Restoration and Habitat Enhancement Component, Reversing Land Subsidence, Ensuring Adequate and Effective Emergency Response Plans, Benefitting Water Quality, Improving Water Supply Reliability

**Potential Funding**: Delta Levee Subventions, Delta Levee Special Projects, HMGP Grant Programs, State Funding Opportunities, seeking cost sharing partners. **Timeline**: 1-10 years depending on regulatory process and funding

### *Action 4. Syphon Project*

**Hazards Addressed**: Earthquake; Earthquake: Liquefaction; Flood: 100/200/500-year, Localized Stormwater Flooding, Levee Failure; Severe Weather: Heavy Rains and Storms, Wind and Tornadoes; and Subsidence

**Goals Addressed**: 1, 2, 3, 4, 5

**Issue/Background**: The goal of this Mitigation Action is to provide infrastructure that will allow the District to fill the island with water to stabilize the levees against uncontrolled flooding.

**Project Description**: Due to historical inundations caused by flood surge caused by high flows generated from uncontrolled upstream levee breaches, the District plans to install The District will be installing 3 36-inch pipes to pre-flood the island. Fish screens will be used on the pipes to prevent fish from being sucked into the island. This will allow the District to fill the island with water to stabilize the levees against

uncontrolled flooding. This should eliminate levee failures as the weight of the water on the island's interior will stabilize the levee against total levee failure. The District will likely sustain some damage and pumping costs, but the costs will be substantially than losing the entire levee section. Also, protecting against a failure of the entire levee section protects adjacent islands from failure due to rapid drawdown which can cause failure of adjacent levees. This project may be eligible for other funding sources because the adjacent levees protect a Delta Legacy Community as well as Federal Project Levees.

**Other Alternatives**: none

**Existing Planning Mechanism(s) through which Action Will Be Implemented**: District Five-year Plan

**Responsible Office/Partners**: RD 2111

**Project Priority**: High

**Cost Estimate**: $1,000,000

**Benefits (Losses Avoided)**: Preservation of 2111 levee structures, Ecosystem Restoration and Habitat Enhancement Component, Reversing Land Subsidence, Ensuring Adequate and Effective Emergency Response Plans, Benefitting Water Quality, Improving Water Supply Reliability

**Potential Funding**: Delta Levee Subventions, Delta Levee Special Projects, HMGP Grant Programs, State Funding Opportunities, seeking cost sharing partners. **Timeline**: 1-10 years depending on regulatory process and funding

### *Action 5. Backup Power Project*

**Hazards Addressed**: Climate Change, Earthquake; Earthquake: Liquefaction; Flood: 100/200/500-year, Localized Stormwater Flooding, Levee Failure; Severe Weather: Heavy Rains and Storms, Wind and Tornadoes; and Subsidence

**Goals Addressed**: 1, 2, 3, 4, 5

**Issue/Background**: The goal of this Mitigation Action is to provide backup power to Reclamation District 2111 facilities when power goes out.

**Project Description**: The District would like to ensure continued operation of District infrastructure during a Public Safety Power Shutoff through obtaining backup power generators, quick connects, and associated electrical improvements. The project would design and install main disconnect systems to allow for safe use of generators as needed during a power shutoff or power failure. The project would include one generator per district and improvements for a disconnect systems for each pump station.

**Other Alternatives**: none

**Existing Planning Mechanism(s) through which Action Will Be Implemented**: District Five-year Plan

**Responsible Office/Partners**: RD 2111

**Project Priority**: High

**Cost Estimate**: $200,000

**Benefits (Losses Avoided)**: Preservation of 2111 levee structures, Ecosystem Restoration and Habitat Enhancement Component, Reversing Land Subsidence, Ensuring Adequate and Effective Emergency Response Plans, Benefitting Water Quality, Improving Water Supply Reliability

**Potential Funding**: State – Delta Flood Emergency Response Grant Program, HMGP Grant Programs

**Timeline:** 1-10 years depending on regulatory process

### *Action 6. Flood Safety Plan Updates, Training, and Exercises*

**Hazards Addressed**: Flood: 100/200/500-year, Localized Stormwater Flooding, Levee Failure; Severe Weather: Heavy Rains and Storms, Wind and Tornadoes; and Subsidence

**Goals Addressed**: 1, 2, 3, 4, 5

**Issue/Background**: The goal of this Mitigation Action is update RD 563's Flood Safety Plan, participate in training, and to exercise the flood safety plan to ensure it can successfully be implemented. This is especially important to mitigate against the effects of staff turnover.

**Project Description**: The District would like to ensure continued training of staff, board members, and agents with response functions with regards to flood fighting and associated activities. Updating RD2111 Flood Safety Plan is essential to continue to protect infrastructure protected by the district's levees. The Emergency Operations Plan provides guidance on how the District will organize, coordinate with outside partners, flood fight, dewater, recover, and serves as a planning document for future flood fight operations.

**Other Alternatives**: none

**Existing Planning Mechanism(s) through which Action Will Be Implemented**: California Water Code Section 9650-51 (AB156), Central Valley Flood Protection Plan's emergency preparedness priority, the District's Five-year Plan, and Districts Flood Safety Plan

**Responsible Office/Partners**: RD 2111

**Project Priority**: High

**Cost Estimate**: $100,000

**Benefits (Losses Avoided)**: Preservation of 2111 levee structures, Ecosystem Restoration and Habitat Enhancement Component, Reversing Land Subsidence, Ensuring Adequate and Effective Emergency Response Plans, Benefitting Water Quality, Improving Water Supply Reliability

**Potential Funding**: State – Delta Flood Emergency Response Grant Program, HMGP Grant Programs

**Timeline:** 1-10 years depending on regulatory process