

EMERGENCY ACTION PLAN (EAP)

FOR

SAND CANYON DAM ORANGE COUNTY, CALIFORNIA

82 STRAWBERRY FARM ROAD
IRVINE, CA 92612
LATITUDE: 33.6479, LONGITUDE: -117.7960



DAM OWNER: IRVINE RANCH WATER DISTRICT

DSOD SOUTH REGION

DSOD DAM No. 1029.002

NATIONAL INVENTORY OF DAMS (NID) No. CA00854

FEDERAL ENERGY REGULATORY COMMISSION (FERC) No. N/A

Public Copy

Date Prepared: March 30, 2026
Prepared By: Stetson Engineers Inc. (760) 730-0701



CLASSIFICATION

Phone numbers and email addresses have been removed from this publicly posted copy of this Emergency Action Plan. That information is available from Irvine Ranch Water District's district secretary: Phone 949-453-5300, Email Comments@IRWD.com

Dam Contact Information

Sand Canyon Dam

82 Strawberry Farm Road
Irvine, CA 92612
(33.6479, -117.7960)

24-Hour Emergency Contact:

Jose Zepeda, IRWD Director of Water and Recycling Operations

Dam Owner:

Irvine Ranch Water District

Contact: Paul Cook, P.E., General Manager

Dam Operator:

Bryan Clinton, IRWD Operations Manager

Dam Safety Engineer:

Jacob Moeder, IRWD Engineering Manager

EAP Coordinator:

Steve Choi, IRWD Director of Safety and Security

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Key Dam Information

Dam Description

| | | | |
|-----------------|-----------|------------------------|----------------|
| Height: | 49.5 feet | DSOD #: | 1029.002 |
| Year Built: | 1942 | NID #: | CA00854 |
| Dam Operator: | IRWD | Hazard Classification: | Extremely High |
| Property Owner: | IRWD | | |



Potential Impacted Area

Sand Canyon Dam is located at the north end of Sand Canyon Reservoir in the City of Irvine, CA. The potential inundation area for the dam is hilly, with elevations ranging from 200 feet at the reservoir to sea level at Newport Beach Harbor. If Sand Canyon Dam were to fail, parts of the City of Irvine and the City of Newport Beach would be impacted (see Part II: Inundation Maps).

Directions to Sand Canyon Dam

In order to access Sand Canyon Reservoir from I-405, take the exit for University Drive and drive southwest for about a half of a mile. Turn left on Strawberry Farm Road and continue past the Strawberry Farms Golf Club to the entrance of the dam access road. The address for the dam access road is 82 Strawberry Farm Road, Irvine, CA, 92612.

Table of Contents

| | |
|---|-----------|
| Dam Contact Information | i |
| Key Dam Information..... | ii |
| PART I: EAP INFORMATION | 1 |
| Section 1: Introduction | 2 |
| 1.1 Background..... | 2 |
| 1.2 Purpose..... | 5 |
| 1.3 Planning Team | 5 |
| Section 2: Summary of EAP Responsibilities | 7 |
| 2.1 Irvine Ranch Water District Responsibilities | 7 |
| 2.2 Impacted Jurisdictions’/Public Safety Agencies’ Responsibilities | 7 |
| Section 3: Notification Flowcharts | 16 |
| 3.1 Notification Flowcharts | 16 |
| 3.2 Contact Information Table..... | 24 |
| Section 4: Project Description | 28 |
| Section 5: EAP Response Process | 32 |
| 5.1 Step 1: Incident Detection, Evaluation, and Emergency Level Determination | 32 |
| 5.2 Step 2: Notification and Communication | 36 |
| 5.3 Step 3: Emergency Actions..... | 37 |
| 5.4 Step 4: Termination and Follow-up | 43 |
| Section 6: General Responsibilities | 44 |
| 6.1 Irvine Ranch Water District Responsibilities (Dam Owner) | 44 |
| 6.2 Notification and Communication Responsibilities | 46 |
| 6.3 Evacuation Responsibilities..... | 47 |
| 6.4 Monitoring, Security, Termination, and Follow-up Responsibilities | 48 |
| 6.5 EAP Coordinator Responsibilities | 49 |
| Section 7: Preparedness | 50 |
| 7.1 Surveillance and Monitoring..... | 50 |
| 7.2 Evaluation of Detection and Response Timing..... | 54 |
| 7.3 Access to the Site..... | 55 |
| 7.4 Response During Periods of Darkness..... | 55 |
| 7.5 Response During Weekends and Holidays | 56 |

| | |
|--|-----------|
| 7.6 Response During Adverse Weather | 56 |
| 7.7 Alternative Sources of Power | 56 |
| 7.8 Emergency Supplies and Information..... | 57 |
| 7.9 Stockpiling Materials and Equipment..... | 57 |
| 7.10 Coordination of Information | 57 |
| 7.11 Training and Exercise | 58 |
| 7.12 Alternative Systems of Communication | 58 |
| 7.13 Public Awareness and Communication | 59 |
| Section 8: Plan Maintenance | 60 |
| 8.1 Plan Review | 60 |
| 8.2 Distribution | 60 |
| PART II: Inundation Maps..... | 61 |
| Main Dam Failure - Arrival Time | 64 |
| Main Dam Failure - Deflood Time | 72 |
| Spillway Failure - Arrival Time | 80 |
| Spillway Failure - Deflood Time | 85 |
| PART III: Appendices | 90 |
| Appendix A: EAP Status Report (for Non-FERC dams) | A-1 |
| Appendix B: Record of EAP Revisions | B-1 |
| Appendix C: Record of Plan Holders | C-1 |
| Appendix D: Contact Log | D-1 |
| Appendix E: Pre-Scripted Messages | E-1 |
| Appendix F: Emergency Incident Log | F-1 |
| Appendix G: Emergency Termination Log | G-1 |
| Appendix H: After Action Report | H-1 |
| Appendix I: Cal OES Warning Center Dam Incident Report | I-1 |
| Appendix J: Acronym List | J-1 |
| Appendix K: Potential ICP Locations Map | K-1 |
| Appendix L: Anatomy of a Dam Figure | L-1 |

PART I: EAP INFORMATION

Section 1: Introduction

1.1 Background

Irvine Ranch Water District (IRWD) is an independent special district that serves 447,000 residential customers in central Orange County, CA. IRWD owns and operates five jurisdictional dams, including Sand Canyon Dam that impounds Sand Canyon Reservoir. Sand Canyon Dam is located in Orange County, CA in the City of Irvine. The spillway is located on the northeast end of the dam and is classified as a Critical Appurtenant Structure (CAS) by the California Department of Water Resources (DWR) Division of Safety of Dams (DSOD). The reservoir collects natural runoff of a drainage area of 6.3 square miles and is used to store recycled water from IRWD's Michelson Water Recycling Plant (MWRP).

Sand Canyon Dam is an earthen dam originally constructed in 1942. The California State Dam Number is 1029.002 and the National Dam Number is CA00854. The dam spillway is an irregularly-shaped ogee outlet that discharges into a concrete-lined spillway.

The dam and reservoir are located within the coastal hills of the San Diego Creek watershed, situated approximately six miles inland from the Pacific Ocean (Figure 1-1). Topography downstream of the dam is hilly, with elevations ranging from about 200 feet at the reservoir down to sea level at Newport Beach Harbor. Flooding from a dam failure at Sand Canyon Reservoir has the potential to inundate portions of the following communities:

- City of Irvine
- City of Newport Beach

Figure 1-1 shows the location of Sand Canyon Reservoir and the above listed communities. Sand Canyon Dam impounds a reservoir along Sand Canyon Creek, which is tributary to San Diego Creek. The drainage area upstream of the Sand Canyon Dam is 6.3 square miles. Sand Canyon Creek flows through the City of Irvine and joins San Diego Creek within Irvine City limits. Nearby communities and development along Sand Canyon Creek, immediately downstream of the dam, are shown in Figure 1-2.

San Diego Creek is highly channelized both upstream and downstream of its confluence with Sand Canyon Creek. Downstream of its confluence with Sand Canyon Creek, San Diego Creek flows southwest through the City of Newport Beach, where it discharges into upper Newport Bay. San Diego Creek, at its point of discharge to Newport Bay, drains approximately 140 square miles. Newport Bay is a large estuary and harbor which is influenced by ocean tides.

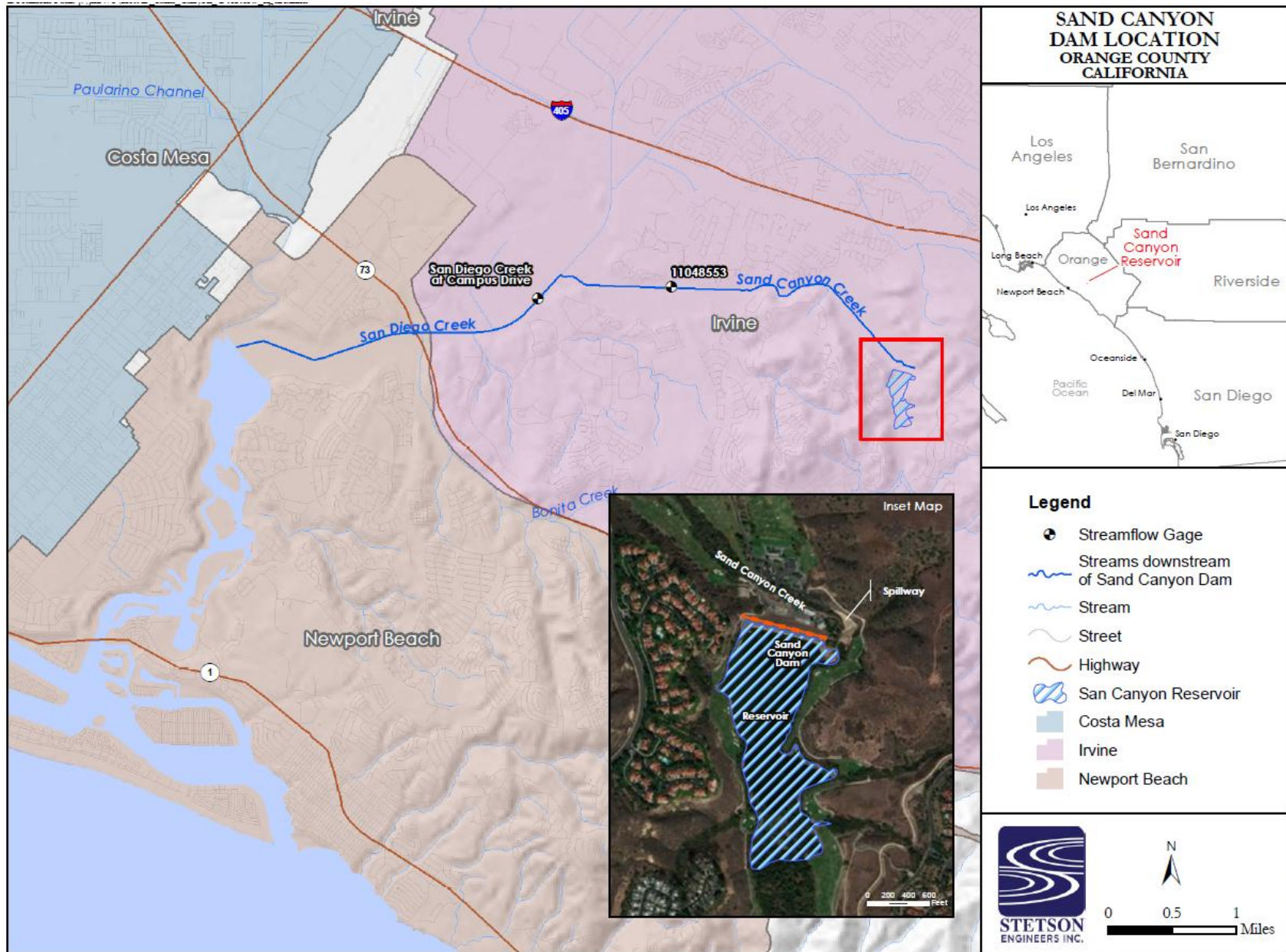


Figure 1-1 Sand Canyon Dam Area Overview

Document Path: I:\jn2478\IRWD_Sand_Canyon_Vicinity.mxd

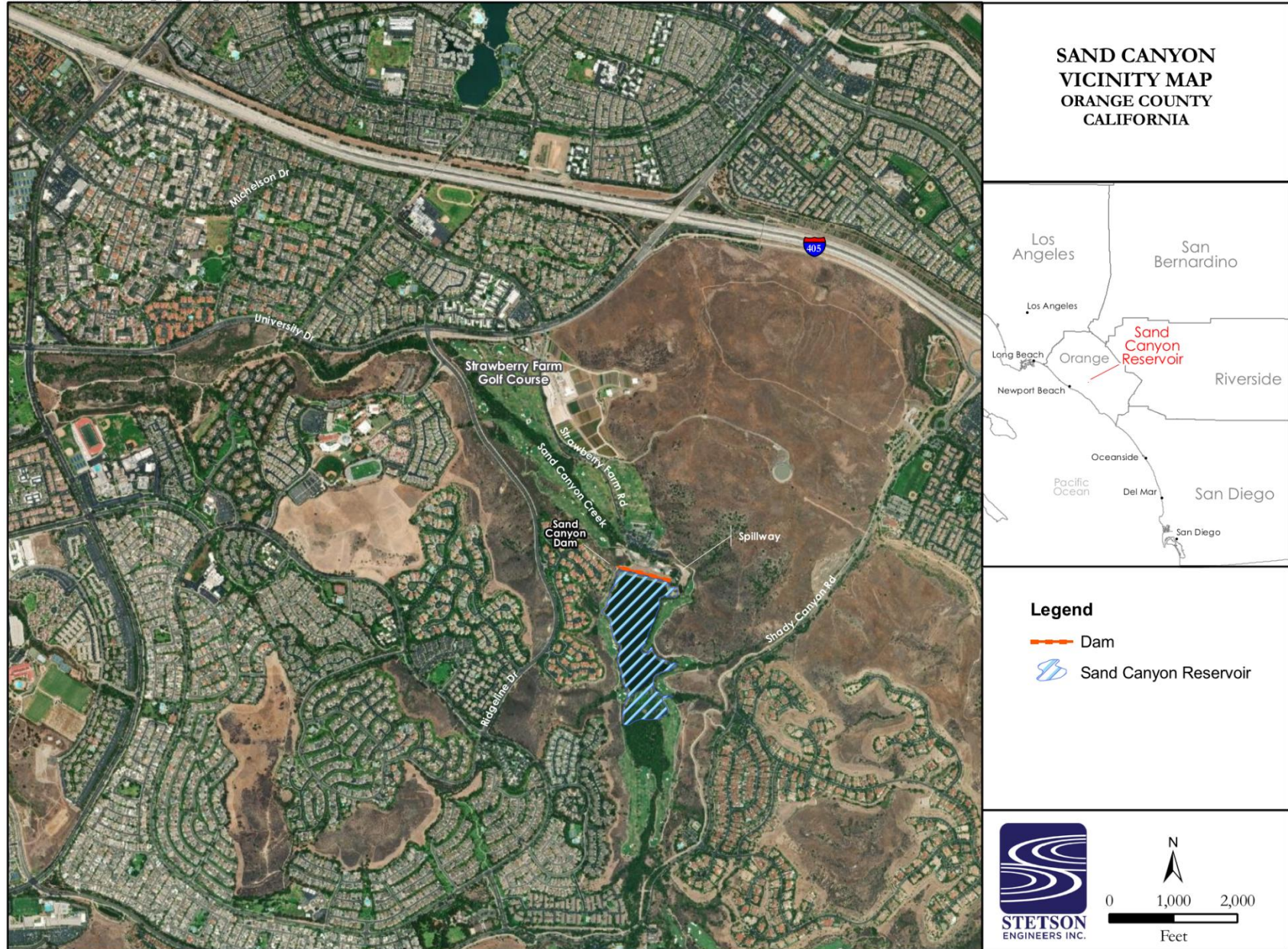


Figure 1-2 Sand Canyon Reservoir Vicinity Map

1.2 Purpose

A dam safety incident is an impending or actual sudden uncontrolled release or excessive controlled release of water from an impounding structure. The release may be caused by damage to, or failure of, the dam structure, flood conditions unrelated to failure, or any condition that may affect the safe operation of the dam. The release of water may or may not endanger human life, downstream property, or the operation of the structure. When people live in an area that could be affected by the operation or failure of a dam, there is the potential for an emergency related to a dam safety incident. The National Incident Management System (NIMS) defines an emergency as “any incident, whether natural or manmade, that requires responsive action to protect life or property.”¹

The purpose of this Emergency Action Plan (EAP) is to identify potential emergency conditions at Sand Canyon Dam, facilitate notification of affected parties, assign roles and responsibilities to involved agencies, reduce the risk of loss of human life or injury, and to minimize property damage in the event of a potential or actual emergency situation associated with the dam. These situations include, but are not limited to, dam instability, sizable earthquakes, extreme storm events, major spillway releases, overtopping of the dam, outlet system failure, abnormal instrument readings, vandalism or sabotage, spillway or gate failures, and failure of the dam.

Emergency management authorities will use the information in this EAP to facilitate the implementation of their responsibilities. Local, county, and state authorities have coordinating plans in place to address local emergency operations and/or warnings and evacuations. Those plans are not reprinted in the EAP but are maintained by the responsible agencies.

DSOD has rated Sand Canyon Dam as “Extremely High” based on the downstream hazard classification. Because of its hazard classification, IRWD developed this EAP in accordance with the requirements listed in California Water Code Sections 6160 and 6161 and Government Code Section 8589.5, following the Federal Emergency Management Agency (FEMA) Federal Guidelines for Dam Safety: Emergency Action Planning for Dams (FEMA-64/July 2013).

1.3 Planning Team

During the initial EAP preparation in 2019, the EAP was sent to the following affected agencies below for comment during an extended local agency review period. The same agencies were contacted during the annual EAP update process to verify and update their respective information, most recently in March 2025.

- Irvine Ranch Water District
- Orange County Sheriff’s Department, Emergency Management Division
- Orange County Public Works
- Orange County Fire Authority²
- Orange County Parks

¹ From FEMA Federal Guidelines for Dam Safety, Emergency Action Planning for Dams, July 2013. (FEMA 64)

² Orange County Fire Authority provides fire service to the City of Irvine.

- Irvine Police Department
- Newport Beach Fire Department
- Newport Beach Police Department
- California Highway Patrol, Santa Ana Office
- Water Emergency Response Organization of Orange County

Outreach was completed for all jurisdictions potentially affected by a dam failure at Sand Canyon Dam. The City of Irvine Police Department is the primary Public Safety Answering Point (PSAP) for this EAP.

Emergency planning for the City of Irvine is coordinated through the Irvine Police Department. The Emergency Management Administrator from the Irvine Police Department reviewed the EAP and provided feedback on jurisdictional responsibilities. Orange County Fire Authority (OCFA) serves the City of Irvine as part of the OCFA Division 2 service area. The OCFA Division 2 chief reviewed the EAP and provided updated contact information for OCFA staff.

IRWD consulted with the Orange County Sheriff's Department (OCSD), Emergency Management Division (EMD) regarding contact numbers and jurisdictions.

Outreach was completed to the California Governor's Office of Emergency Services (Cal OES) and DSOD to clarify responsibilities listed in this EAP. Additional coordination was conducted with the National Weather Service (NWS), the DWR Flood Operations Center, Orange County Public Works (OCPW), the Orange County Parks Department, and California Highway Patrol (CHP).

For more information about the outreach process, please contact the EAP Coordinator:

Steve Choi, Director of Safety and Security

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Section 2: Summary of EAP Responsibilities

2.1 Irvine Ranch Water District Responsibilities

IRWD, as the dam owner, is responsible for detecting and evaluating dam safety incidents, classifying the incident, notifying emergency management authorities, taking appropriate response actions, terminating the EAP, and follow-up tasks related to the dam incident.

General EAP responsibilities for IRWD are to:

- Detect, verify and assess emergency conditions.
- Respond to emergencies at the dam site.
- Activate and implement the Sand Canyon Dam EAP, including determining the appropriate emergency level.
- Notify other participating emergency management agencies of emergency conditions, emergency level, EAP activation, and other critical information.
- Utilize IRWD Emergency Operations Plan (EOP) for internal emergency response coordination.
- Take corrective action at the dam/reservoir.
- Terminate the EAP.
- Facilitate an after-action evaluation and report.
- Update EAP on at least an annual basis.
- Communicate with the public and the media.

Detailed responsibilities, including duties by staff member, are outlined in Section 6.1.

2.2 Impacted Jurisdictions'/Public Safety Agencies' Responsibilities

A dam safety incident at Sand Canyon Dam has the potential to impact both the City of Irvine and the City of Newport Beach. The involvement of potential impacted jurisdictions is crucial to the successful implementation of the EAP. Copies of the EAP were sent to impacted jurisdictions and public safety agencies as part of a local agency coordination effort to gather feedback and input to the emergency response process laid out in this EAP (see discussion in Section 1.3). Where applicable, comments from these agencies informed the responsibilities detailed below.

Field Level Incident Management

A dam safety incident is reported through a 911 or direct phone call to the City of Irvine Police Department (see Section 3). The emergency response through the public safety agencies can be assisted by the OCSD "Control One", which is the central point of contact for interoperable communications between all law enforcement, fire, and public works agencies responding to a dam safety emergency at the Sand Canyon Dam.

Once the incident is reported, an Incident Command Post (ICP) may be established by the City of Irvine. The Incident Commander (IC) is a field level position that falls to the Irvine Police

Department and/or the OCFA supervisor. For Potential Failure or Imminent Failure dam safety incidents, the City of Irvine Police Department and OCFA may establish a Unified Command to jointly perform the IC duties for a dam safety incident at the Sand Canyon Dam. If necessary, the Unified Command could also be extended to include the City of Newport Beach to share incident management responsibilities in both Irvine and Newport Beach. The Unified Command will include a representative from IRWD.

Unified Command/IC responsibilities consist of establishing the ICP, protecting life and property, controlling personnel and equipment resources, maintaining accountability for responder and public safety, and establishing and maintaining an effective liaison with outside agencies and organizations. The Unified Command/IC is responsible for all incident activities, including the development of strategies and tactics and the ordering and the release of resources.

The Unified Command/IC has overall authority and responsibility for conducting incident operations, while IRWD is responsible for monitoring and remedial actions at the dam site (see Section 5). IRWD remedial actions will be controlled at the IRWD operations center. IRWD actions will be coordinated with external emergency response agencies through the ICP, the City of Irvine EOC, and the Orange County EOC, if activated. IRWD prepared a map depicting potential locations where an ICP may be established in the event of an emergency at Rattlesnake Canyon Dam, Syphon Canyon Dam, or Sand Canyon Dam. The map is included in Appendix K to this EAP. The locations shown are for planning purposes only; in the event of a dam emergency, determination of the final ICP location is the responsibility of the Unified Command/IC.

Unified Command/IC duties may include the following:

- Establishing command.
- Ensuring responder safety.
- Assessing incident priorities.
- Determining operational objectives.
- Developing an appropriate organizational structure.
- Maintaining a manageable span of control.
- Coordinating overall emergency activities.
- Coordinating the activities of outside agencies.
- Authorizing the release of information to the media.
- Terminating the emergency response.³
- Participating in an annual review and update of the EAP.

³ The Unified Command/IC has the authority to terminate the emergency response. IRWD, as the dam owner, will terminate the EAP.

2.2.2 City of Irvine

The City of Irvine Emergency Operations Plan addresses the City of Irvine’s planned response to emergencies associated with natural and man-made disasters.⁴ It provides an overview of operational concepts, identifies components of the City’s emergency management organization within the Standardized Emergency Management System (SEMS), and describes the overall responsibilities of the federal, state and county entities and the City for protecting life and property, and assuring the overall well-being of the population.

In the event of a dam emergency at the Sand Canyon Dam, the City of Irvine will be the lead agency for executing and coordinating emergency response activities. Depending on the severity of the emergency, a Local Emergency may be proclaimed, the City of Irvine EOC may be activated, and Orange County Operational Area (OA) will be advised.

The City’s Emergency Operations Plan calls for an IC for a dam failure incident. As discussed in Section 2.2.1, a Unified Command is anticipated for potential or imminent failure situations. Depending on the situation, the Unified Command could include representatives from the City of Newport Beach.

The City of Irvine maintains responsibility for the evacuation of the inundation areas within the city limits, based on the threat and situation. Evacuation responsibilities would be directed by the Unified Command and carried out by the Irvine Police Department and OCFA.

Irvine Police Department and OCFA responsibilities include:

- Advising threatened populations of the emergency and apprising them of safety measures to be implemented.
- Advising the Orange County OA of the emergency.
- Identifying the need for mutual aid and requesting such through the Orange County OA.
- Establishing an ICP with a Unified Command/IC as appropriate
- Proclamation of a Local Emergency by local authorities.
- Dissemination of accurate and timely emergency public information and warning to the public.
- Evacuation and rescue operations.
- Establishing evacuation routes and road closures
- Facilitating return of evacuated individuals
- Medical care operations.
- Care and shelter operations, including establishing shelters.
- Access and perimeter control.
- Public health operations.
- Restoration of vital services and utilities.
- Participating in an after-action evaluation

⁴ Available at: <https://legacy.cityofirvine.org/civica/filebank/blobdload.asp?BlobID=34359>

2.2.3 City of Newport Beach

The City of Newport Beach Emergency Operations Plan addresses the City of Newport Beach's planned response to emergencies associated with natural and man-made disasters.⁵ It provides an overview of operational concepts, identifies components of the City's emergency management organization within the SEMS, and describes the overall responsibilities of the federal, state and county entities and the City for protecting life and property and assuring the overall well-being of the population.

The inundation area for a sudden and total failure of Sand Canyon Dam is expected to be confined to San Diego Creek within Newport Beach city limits. Because of this, evacuation of residents will not likely be necessary. However, high flows in the creek could pose a danger to public safety. City of Newport Beach responsibilities will be executed by the Newport Beach Police Department and Fire Department. Any emergency preparedness and response will be coordinated with the OA.

Responsibilities for the Newport Beach Police Department and Newport Beach Fire Department in the City of Newport Beach include:

- Advising threatened populations of the emergency and apprising them of safety measures to be implemented.
- Dissemination of accurate and timely emergency public information and warning to the public.
- Evacuation and rescue operations.
- Establishing evacuation routes and road closures.
- Facilitating return of evacuated individuals.
- Medical care operations.
- Care and shelter operations, including establishing shelters.
- Access and perimeter control.
- Public health operations.
- Restoration of vital services and utilities.
- Participating in an after-action evaluation.

2.2.4 Orange County Sheriff's Department, Emergency Management Division

Thirty-four incorporated cities in the county are responsible for emergency planning within their jurisdictions. The County of Orange (County) is responsible for the emergency planning of 205 square miles of unincorporated area and all county-owned facilities and properties. The County's OA Alert and Warning Plan establishes guidelines for the use of the County and OA's alert and warning program in partnership with the cities and water districts within Orange County. The alert and warning program provides public notification of protective actions to take before, during, and after threats or emergencies and to disseminate other kinds of messages to community member opt-ins. The plan may be used during an activation of this EAP to notify the public of developments. All County departments are in agreement with the warning plan and will execute the responsibilities included therein.

⁵ Available at: <https://www.newportbeachca.gov/home/showpublisheddocument/72743/638059324946730000>

The County provides support to OA jurisdictions or local governments by identifying and coordinating resources and communicating with regional and state authorities. During disasters, OA jurisdictions are required to coordinate emergency operations with the OA and, in some instances, other local governments.

The County of Orange and Orange County Operational Area Emergency Operations Plan (County and OA EOP) provides guidance and procedures for the County to prepare for and respond to significant or catastrophic natural, technological or conflict-related incidents that produce situations requiring a coordinated response. It further provides guidance regarding management concepts, identifies organizational structures and relationships and describes responsibilities and functions of the emergency organization to protect life and property. The OCSD EMD is responsible for developing, maintaining and distributing the County and OA EOP.

There are two roles within the OA discussed in this EAP: The County and OA EOC Manager and the Operational Area Coordinator (OAC).

County and OA EOC Manager. The OCSD EMD Director serves as the County and OA EOC Manager. The County and OA EOC Manager is the 24-hour point of contact for the County, Operational Area, State, Federal entities and agencies, and Mutual Aid Coordinators.

Responsibilities of the County and OA EOC Manager may include:

- Establish and maintain contact with the affected dam and reservoir owner or operators.
- Request current situational status of the affected dam and reservoir.
- Ensure the OAC, Board of Supervisors and Policy Group are notified and kept apprised of emergency conditions occurring due to a dam and reservoir failure event.
- Coordinate with the OAC to establish activation level of the County and OA EOC.
- Direct EMD staff to notify appropriate key personnel to report to the County and OA EOC, based on the activation level established.
- Establish and maintain communication with all impacted jurisdictions to ensure coordination of response activities and situational information.
- Ensure situational information is provided to OA jurisdictions, County departments and Cal OES, and updated on a regular basis.
- Activate the County and OA's alert and warning program to provide public notification of protective actions to take before, during, and after threats or emergencies and to disseminate other kinds of messages to community member opt-ins.
- Assist with the coordination of the County's reentry and recovery efforts.

Operational Area Coordinator. When an emergency impacts an OA jurisdiction, the Orange County Operational Area Agreement designates the OAC as being responsible for direction, coordination and communication of policy decisions, and coordinating resource needs and priorities between OA jurisdictions and the State throughout the emergency. In cases of dam and reservoir failure, the County and OA Emergency Operational Plan, Dam and Reservoir Failure Annex designates OCPW as the OAC.

Responsibilities of the OAC may include:

- Serve as a key decision maker in the County and OA EOC, providing direction and coordination necessary to accomplish the purposes of the Operational Area Agreement and responsibilities of the Operational Area Lead as specified in Title 19 California Code of Regulations Section 2409 (e).
- Coordinate with OA jurisdictions during emergency response.
- Maintain contact with the dam and reservoir owner/operator to receive regular updates on water releases and situation status.
- Represent the OA in all dealings with the public or private agencies on matters pertaining to emergencies.
- Appoint a Public Information Manager (PIM) to coordinate dissemination of all emergency information.
- In coordination with the PIM, prepare and approve dam and reservoir failure information statement and instructions for the public to be released via: media, Emergency Alert Systems, National Weather Service, and AlertOC.
- Activate the County and OA EOC to the appropriate level of organization and staffing to support operations.
- Participate in conference calls.
- Initiate discussion with the Policy Group on the necessity to proclaim a Local Emergency and/or Operational Area Proclamation of Emergency.

A dam and reservoir failure may require multi-jurisdiction, multi-agency and multi-discipline coordination at all levels, including first responders. The Dam and Reservoir Failure Annex delineates the specific organization and assignment of responsibilities within the County and OA EOC. The appropriate SEMS and NIMS functions will be activated, based on the failure threat or situation. Activation of the County and OA EOC is required by SEMS, Title 19 California Code of Regulations Section 2409 (f), under the following conditions:

- On Request - A local government within the OA has activated its EOC and requested activation of the County and OA EOC to support its emergency operations. Jurisdiction(s) determine that additional response resources beyond that which would normally be covered by mutual aid are required and assistance from the OA may be necessary.
- Two City Local Emergency - Two or more cities within the OA have proclaimed a Local Emergency.
- County and City Local Emergency - The County and one or more cities have proclaimed a Local Emergency.
- Request for Governor's Proclamation - A city, city and County, or County has requested a Governor's proclamation of a State of Emergency, as defined in Government Code 8558(b).
- State of Emergency - A State of Emergency is proclaimed by the Governor of the State for the County or two or more cities within the OA.
- Request for Outside Resources - The OA is requesting resources from outside its boundaries, except those resources used in normal day-to-day operations which are obtained through existing agreements providing for the exchange or furnishing of certain

types of facilities and services on a reimbursable, exchange, or other basis as provided for under the Master Mutual Aid Agreement.

- Request for OA Resources - The OA has received resource requests from outside its boundaries, except those resources used in normal day-to-day operations which are obtained through existing agreements providing for the exchange or furnishing of certain types of facilities and services on a reimbursable, exchange, or other basis as provided for under the Master Mutual Aid Agreement.

2.2.5 California Governor’s Office of Emergency Services and Cal OES Warning Center

Cal OES plays dual roles in managing an emergency; one at the regional level and the other at the state level. The regions include Inland Region, Coastal Region, and Southern Region, while the state level constitutes the executives and brokers resources between the regions. The state level also interfaces with the National Response Framework, and informs the governor, legislature, and state emergency management stakeholders. Cal OES also implements state-level media policy and provides the primary coordination with SEMS and NIMS at the federal level. Cal OES Southern Region will participate in the reviews of and updates to the EAP.

The Dam Safety Planning Division is responsible for reviewing and approving dam owners’ EAP. This process includes division outreach and technical assistance to dam owners and local emergency management personnel. The Cal OES Dam Safety Planning Division may also provide guidance to local public safety agencies with regard to incorporating EAPs into their existing all-hazards key response and mitigation plans. The division will also participate in the annual review and update of the EAP.

The Cal OES Warning Center is the link for notifications between state and federal agencies for this EAP. The mission of the Cal OES Warning Center is to be a central intelligence hub for statewide emergency communications and notifications, serving as a highly reliable and accurate “onestop” resource for emergency management, law enforcement, fire, and key decision-making personnel throughout the state. The Cal OES Warning Center is staffed 24 hours a day, seven days a week watching over California to identify potential and emerging threats, provide alert notification to all levels of government as well as critical situational awareness during an emergency or disaster.

The Cal OES Warning Center has the responsibility to receive, coordinate, verify and disseminate information pertaining to events which occur within California or that could affect California. Information received by the Cal OES Warning Center is coordinated between Cal OES and other sources to ensure that the information which is disseminated is both timely and accurate.

2.2.6 California Department of Water Resources – Division of Safety of Dams

The mission of DSOD is to protect people against the loss of life and property due to dam failure. The California Water Code entrusts this regulatory power to DWR, which delegates the responsibility to DSOD. Section 6110 of the Water Code directs the Department to immediately employ any remedial means necessary to protect life and property if either: (a) the condition of

the dam is so dangerous to the safety of life or property as to not permit time for the issuance and enforcement of an order relative to maintenance or operation, or (b) passing or imminent floods threaten the safety of any dam or reservoir. Section 6111 of the Water Code states that in applying the remedial means “the department may, in emergency, do any of the following: (a) lower the reservoir; (b) completely empty the reservoir; (c) take such other steps as may be essential to safeguard life and property.” In the event of an emergency at the dam, DSOD actions could include, but are not limited to:

- Advising the dam owner’s/operator’s representative of remedial actions to take.
- Ordering the dam owner’s/operator’s representative of remedial actions to take.
- Assuming control of the dam if necessary to safeguard life and property.
- Advising the dam owner’s/operator’s representative of the emergency level determination
- Inspecting the dam during and after the emergency.
- Design review and approval of emergency repairs.
- Acting as a dam technical specialist in the State Operations Center, or other emergency operations center.

Additionally, per Water Code Sections 6160 and 6161, DSOD is responsible for the review and approval of inundation maps. The California Code of Regulations, Title 23, Division 2, Chapter 1, Article 6 defines the specific requirements of the inundation maps.

IRWD communicated with DSOD staff to confirm DSOD responsibilities as described in this EAP. These DSOD responsibilities were provided to IRWD by the regional engineer via email on December 12, 2019.

2.2.7 National Weather Service Weather Forecast Office

The NWS has a congressional mandate to issue official public warnings for all weather-related events, including dam breaches and flooding. The NWS communicates all flash flood watches and warnings based on the inundation maps provided in this EAP. The San Diego WFO has a copy of the enclosed inundation map and will issue official public warnings upon notification, as appropriate, and in coordination with the OCSO EMD.

The NWS WFO will issue a ‘Flash Flood Watch’ for a potential dam failure and a ‘Flash Flood Warning’ following the confirmation of a dam failure for downstream areas.

2.2.8 DWR Flood Operations Center

The mission of the DWR Division of Flood Management is to prevent loss of life and reduce property damage caused by floods and to assist in recovery efforts following any natural disaster. The State-Federal Flood Operations Center, located in Sacramento, California, is operated by the Division of Flood Management. The Flood Operations Center provides a facility from which DWR can centrally coordinate emergency response state-wide. Upon activation of this EAP, the DWR Flood Operations Center will be notified by the dam owner. During a potential or imminent failure scenario, the DWR Flood Operations Center would be responsible for assisting

with coordination among state and local agencies. The DWR Flood Operations Center can also provide technical assistance during an incident.

2.2.9 Orange County Public Works

A copy of the EAP was sent to OCPW, as channel facilities and infrastructure managed by OCPW may be affected by an incident at Sand Canyon Dam. OCPW as a plan holder of this EAP and may assist with response related to county-managed facilities.

2.2.10 Orange County Parks Department

A copy of the EAP was sent to the Orange County Parks Department, as facilities and infrastructure managed by the Parks Department may be affected by an incident at Sand Canyon Dam. Orange County Parks Department is included as a plan holder and on the notification flowcharts of this EAP and may assist with response related to county-managed facilities. The Mason Irvine Regional Park Office is also included in the contact table in Section 3.2 since that is the primary location that would be impacted.

2.2.11 California Highway Patrol, Santa Ana Office

A copy of the EAP was sent to CHP. An incident at Sand Canyon Dam is not likely to directly inundate any state highways. CHP dispatch is included in the notification charts in this EAP. In the event of an emergency at Sand Canyon Dam, CHP would be responsible for evacuating impacted state highways and controlling traffic on these roads. CHP response would be coordinated by the Unified Command/IC.

2.2.12 Water Emergency Response Organization of Orange County

A copy of the EAP was sent to the Water Emergency Response Organization of Orange County (WEROC), which supports and manages countywide emergency preparedness, planning, response, and recovery efforts among Orange County water and wastewater utilities. WEROC does not have any prescribed responsibilities in this EAP, but may assist with an emergency response to a dam safety incident at the Sand Canyon Dam.

Section 3: Notification Flowcharts

3.1 Notification Flowcharts

This section contains notification flowcharts and accompanying messages for each emergency level that could be activated at the Sand Canyon Dam: high flow, non-failure, potential failure, and imminent failure. The high flow and non-failure scenarios share a notification flow chart, as the same parties would be notified during each event but have different notification messages. Similarly, the potential failure and imminent failure share a notification flow chart but have different notification messages. The notification messages for all emergency levels can also be found in Appendix E of this EAP. See Section 5.1 for an explanation of emergency level determination.

IRWD and public safety agencies should reference these flowcharts to know who to contact and in what order in the event of a dam emergency. Individuals or organizations at the beginning of flowchart branches are responsible for making all calls within that branch, in the order indicated. If a party is not answering the number indicated on the flowchart, the notifying party should reference the contact table given in Section 3.2 for alternate methods of contact. In order to facilitate clear and efficient communication of emergency conditions, suggested scripts for notification are included after each flowchart. To ensure timely and efficient notifications during a rapidly developing emergency situation, the suggested scripts for verbal notifications via phone calls are short and direct, and will be followed by text and/or email confirmations containing the language in the pre-scripted messages suggested in Appendix E.

The notification flowcharts require that the PSAP, City of Irvine Police Department, make additional calls as part of the notification process. IRWD has coordinated with the City of Irvine Police Department to ensure that they have a copy of the EAP on hand and will utilize the notification flowcharts in Section 3.1. To ensure that notifications are made in a timely manner, multiple staff members will be available to make notification calls for the City of Irvine Police Department. The City of Irvine Police Department may also use a mass notification system rather than individual phone numbers to communicate with all downstream public agencies at once. The City of Irvine Police Department has agreed to perform the responsibilities in the notification flowcharts and in this EAP. These instructions will be updated annually when the plan is reviewed and contacts are updated (see Section 8.1).

The notification charts in this section rely upon cellular phones and landlines as the means of communication. Alternative communication methods may be necessary during a severe emergency in which the region experiences power and cellular network outages. The PSAP, Irvine Police Department, utilizes the 800-megahertz (MHz) radio system and can communicate dispatch-to-dispatch to other local emergency management agencies (e.g., OCFA, Newport Beach Police Department, etc.). Orange County Control One also has the ability to communicate on a designated radio channel.

IRWD and other agencies have access to Government Emergency Telecommunications Service (GETS), which is operated by the federal government to prioritize emergency calls made over

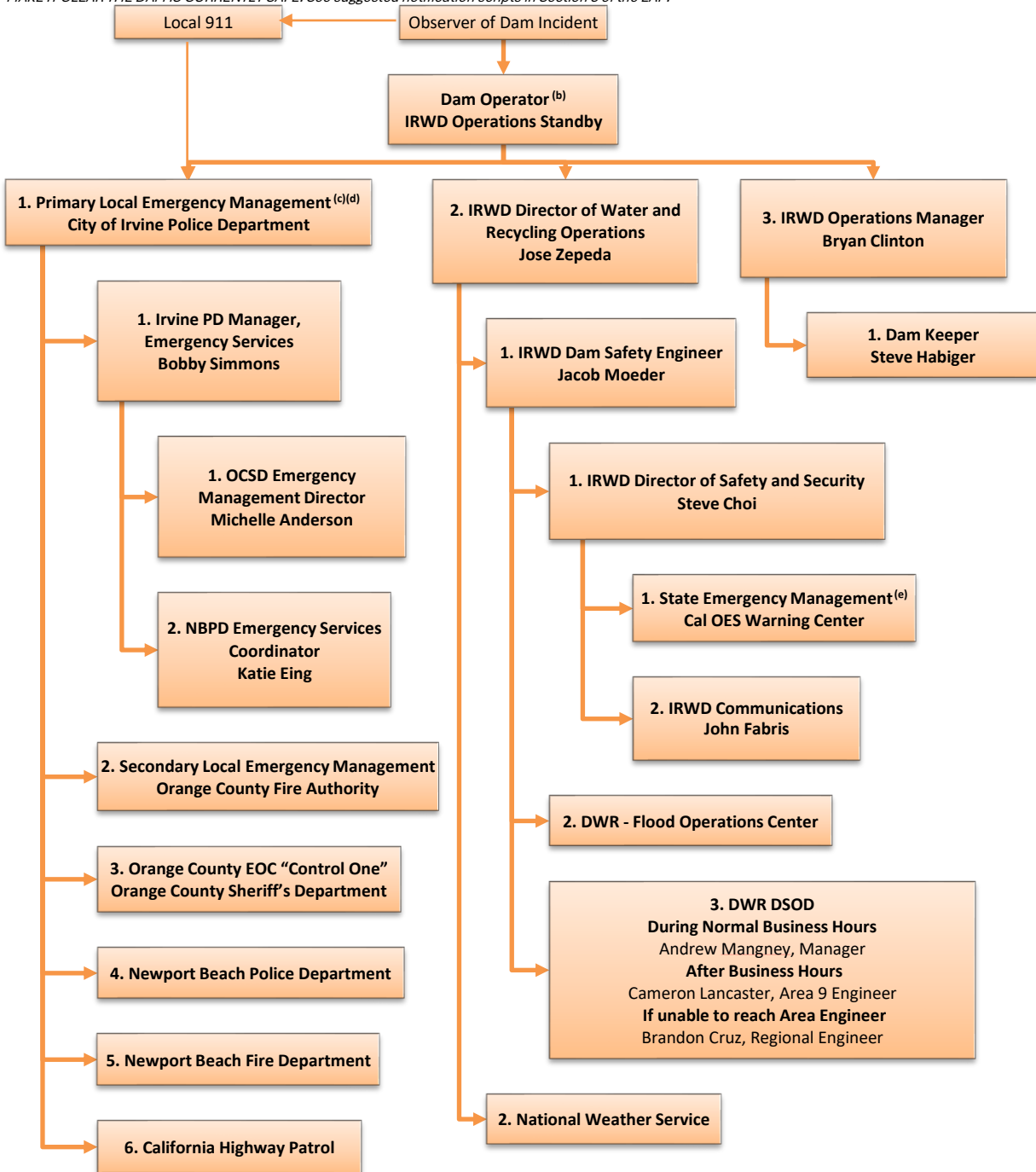
landlines and cellular lines. Users with a GETS card have priority access to telephone networks when there is congestion or other service problems. IRWD also has satellite phones that can be used for communications during a dam emergency, as well as two-way radio communications capability with WEROC.

The NWS has satellite phones which are operated to make outgoing calls if landlines or cellular service are unavailable. The NWS also uses amateur radio transmissions as a backup method for communication.

High Flow or Non-Failure Notification Flowchart ^(a)

Notifications to be made in order of appearance on flowchart. First number listed is primary contact number, second number listed (if applicable) is secondary contact number.

MAKE IT CLEAR THE DAM IS CURRENTLY SAFE. See suggested notification scripts in Section 3 of the EAP.



Notes:

- a. Use this chart in and the Contact Log in Appendix D to document notifications.
- b. After dam incident is reported to IRWD, IRWD will activate the EAP if necessary and make emergency level determination, triggering the continuation of notifications. Refer to Section 5 of the EAP for the EAP Response Process.
- c. Contact the Dam Operator if 911 is notified by a non-utility observer.
- d. Irvine Police Department notification calls will be made by mass notification systems.
- e. Use the Cal OES Warning Center Dam Incident Report in Appendix I. Send a copy to Irvine Police Department.

Phone numbers and email addresses have been removed from this publicly posted copy of this Emergency Action Plan. That information is available from Irvine Ranch Water District's district secretary: Phone 949-453-5300, Email Comments@IRWD.com

High Flow Emergency Level Notification Script

This is _____. [your name and position]

IRWD has activated the Emergency Action Plan for Sand Canyon Reservoir, Dam No. 1029.002, located in Irvine. The dam is under a **High Flow** condition but is not in danger of failing.

High flows at the dam began at _____ on _____.
(time) (date)

The current flow at the dam is ____ cfs.

You have/will receive a text or email with additional details. We'll provide updates when there are any changes in flow or dam condition. What is the best way to contact you with additional updates? [record contact information].

I can be contacted at _____. [preferred contact method]

If you can't reach me, please use _____. [alternate contact method]

Non-Failure Emergency Level Notification Script

This is _____. [your name and position].

IRWD has activated the Emergency Action Plan for Sand Canyon Reservoir, Dam No. 1029.002, located in Irvine. The dam is under a **Non-Failure** condition and is not in danger of failing.

IRWD activated the EAP because _____.
(description of condition)

You have/will receive a written notification with additional details. We'll provide updates detailing any changes in flow or dam condition. What is the best way to contact you with additional updates? [record contact information].

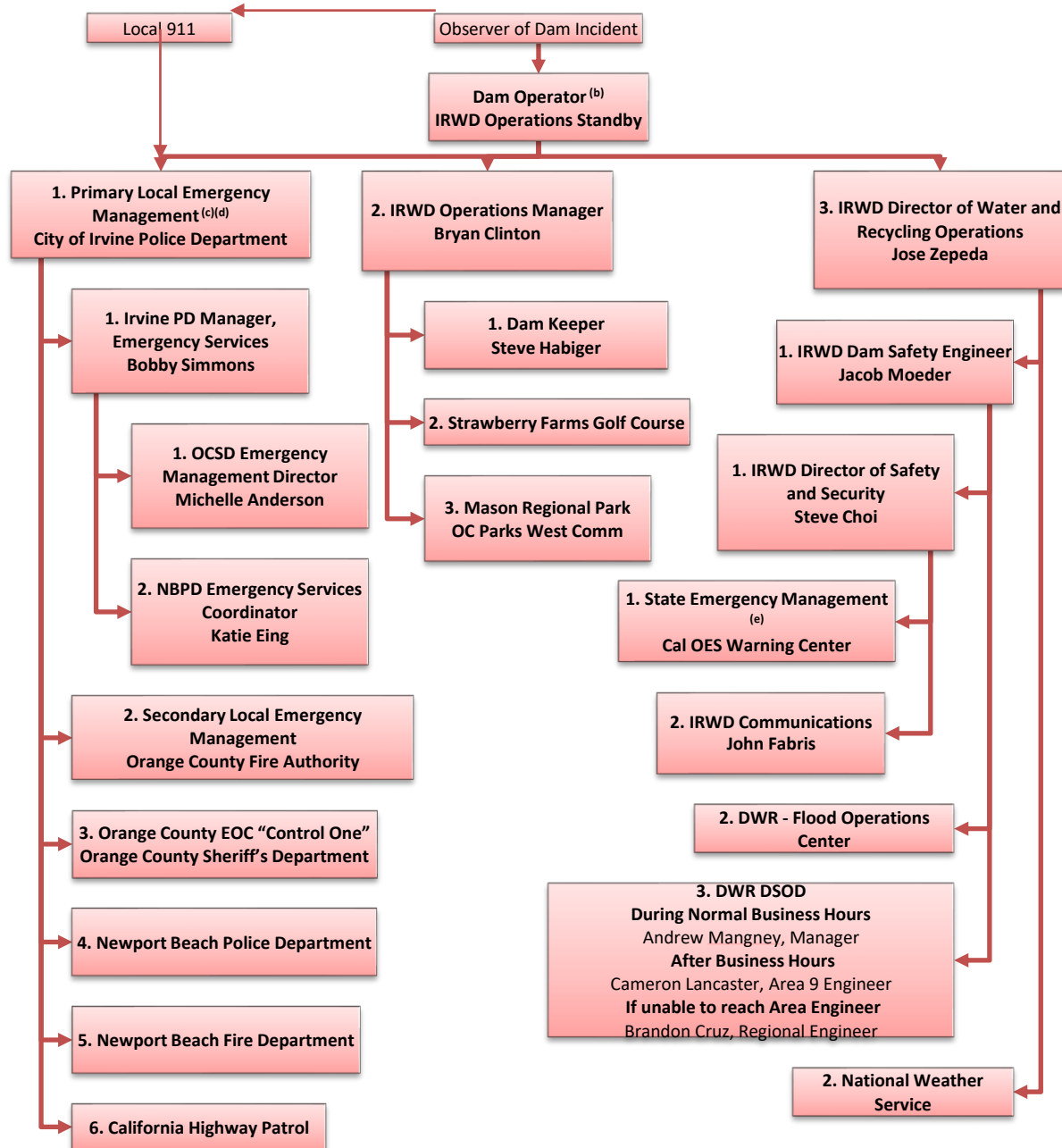
I can be contacted at _____. [preferred contact method]

If you can't reach me, please use _____. [alternate contact method]

Potential or Imminent Notification Flowchart^(a)

Notifications to be made in order of appearance on flowchart. First number listed is primary contact number, second number listed (if applicable) is secondary contact number.

See suggested notification scripts in Section 3 of the EAP.



Notes:

- a. Use this chart in and the Contact Log in Appendix D to document notifications.
- b. After dam incident is reported to IRWD, IRWD will activate the EAP if necessary and make emergency level determination, triggering the continuation of notifications. Refer to Section 5 of the EAP for the EAP Response Process.
- c. Contact the Dam Operator if 911 is notified by a non-utility observer.
- d. Irvine Police Department notification calls will be made by mass notification systems.

Phone numbers and email addresses have been removed from this publicly posted copy of this Emergency Action Plan. That information is available from Irvine Ranch Water District's district secretary: Phone 949-453-5300, Email Comments@IRWD.com

Potential Failure Emergency Level Notification Script

This is _____ [your name and position].

IRWD has activated the Emergency Action Plan for Sand Canyon Reservoir, Dam No. 1029.002, located in Irvine. The dam is under a **Potential Failure** condition and may be in danger of failing.

IRWD is responding to _____ [describe event] that could result in dam failure as early as _____.

Please reference the inundation map in your copy of the Emergency Action Plan and prepare to evacuate the low-lying portions of Irvine and Newport Beach, including University Drive from I-405 to Campus Drive.

The City of Irvine Police Department is the PSAP for this emergency.

You have/will receive a written notification with additional details. We'll provide updates detailing any changes in flow or dam condition. We'll provide updates detailing any changes in flow or dam condition. What is the best way to contact you with additional updates? [record contact information].

I can be contacted at _____. [preferred contact method]

If you can't reach me, please use _____. [alternate contact method]

Imminent Failure Emergency Level Notification Script

This is an emergency. This is _____ [your name and position].

Sand Canyon Reservoir, Dam No. 1029.002, located in Irvine, is failing. The downstream area must be evacuated immediately.

Repeat, Sand Canyon Reservoir is failing; evacuate the low-lying portions of Irvine and Newport Beach. University Drive from I-405 to Campus Drive should be closed due to potential inundation. High flows can be expected in San Diego Creek to Newport Bay. Trails, levees, and low-lying areas adjacent to Sand Canyon Wash and San Diego Creek should be avoided. Do not approach channels where high flow is expected.

Reference the inundation map in your copy of the Emergency Action Plan for specific evacuation areas.

The City of Irvine Police Department is the PSAP for this emergency.

You have/will receive a written notification with additional details for this **Imminent Failure** condition.

I can be contacted at _____. [preferred contact method]

If you can't reach me, please use _____. [alternate contact method]

The next status report will be provided in approximately 30 minutes. What is the best way to contact you with additional updates? [record contact information].

Imminent Failure Emergency Level Public Message

The following pre-scripted message may be **used for emergency management authorities to communicate the Imminent Failure of the dam with the public:**

Attention: This is an emergency message from _____ [emergency management agency]. Listen carefully. Your life may depend on immediate action.

Sand Canyon Reservoir, located in Irvine is failing. Repeat. Sand Canyon Reservoir, located in Irvine is failing.

If you are in or near this area, proceed immediately to high ground away from Sand Canyon Wash and San Diego Creek. The low-lying portions of Sand Canyon Creek and San Diego Creek along Strawberry Farm Road, University Drive and Michelson Drive intersection, and adjacent areas including: the Strawberry Farms Golf Club, Mason Regional Park, University Trail, Bethel Church, Irvine First Baptist Church, and portions of the Rancho San Joaquin Golf Course may be flooded. University Drive from I-405 to Campus Drive may flooded and access may be limited. High flows are expected in San Diego Creek to Newport Bay. Trails, levees, and low-lying areas adjacent to Sand Canyon Wash and San Diego Creek should be avoided. Do not approach channels where high flow is expected.

If you are in or near this area, proceed immediately to high ground away from low lying areas.

Repeat message.

3.2 Contact Information Table

The contact table below lists all parties included in the notification flowcharts, along with other key stakeholders. If unable to contact a party using the method shown on the flowcharts, refer to this table to attempt to contact through a different pathway. All contacts included in the flow charts and contact tables are confirmed to be up to date as part of the annual EAP review process.

| Organization | Name (Title) | Primary Phone # | Secondary Phone # | Email Address | Written Emergency Notification Method |
|--------------------------|--|-----------------|-------------------|---------------|---------------------------------------|
| Cal OES | California State Warning Center | | | | Email |
| CHP | 24-Hour Dispatch in Santa Ana | | | | None |
| CHP | Valerie Cardenas (Public Safety Dispatch Supervisor) | | | | Email |
| CHP | 24-Hour Dispatch in Santa Ana | | | | None |
| CHP | Sgt. Anselmo Templado | | | | Email |
| CHP | Capt. Gustavo Torres | | | | Email |
| CHP | Lt. Kris Ulibarri | | | | Email |
| CHP | Lt. Stephanie Hamilton | | | | Email |
| DWR DSOD | Andrew Mangney (Field Engineering Branch Manager) | | | | Email |
| DWR DSOD | Brandon Cruz (Southern Regional Engineer) | | | | Text + email |
| DWR DSOD | Cameron Lancaster (Area 9 Engineer) | | | | Text + email |
| DWR FOC | Flood Warning Center | | | | None |
| Irvine Police Department | 24-Hour Dispatch | | | | None |
| Irvine Police Department | Non-Emergency Dispatch | | | | None |

Phone numbers and email addresses have been removed from this publicly posted copy of this Emergency Action Plan. That information is available from Irvine Ranch Water District's district secretary: Phone 949-453-5300, Email Comments@IRWD.com

| Organization | Name (Title) | Primary Phone # | Secondary Phone # | Email Address | Written Emergency Notification Method |
|--------------------------|---|-----------------|-------------------|---------------|---------------------------------------|
| Irvine Police Department | Brendan Manning (Emergency Services Administrator) | | | | Text + email |
| Irvine Police Department | Christine Tully (Emergency Services Supervisor) | | | | Text + email |
| Irvine Police Department | Robert Simmons (Manager, Emergency Services) | | | | Text + email |
| IRWD | Steve Habiger (Dam Keeper) | | | | Text + email |
| IRWD | Bryan Clinton (Operations Manager) | | | | Text + email |
| IRWD | David Paulson (Operations Supervisor) | | | | Text + email |
| IRWD | Jacob Moeder (Engineering Manager/Dam Safety Engineer) | | | | Text + email |
| IRWD | John Fabris (Communications) | | | | Text + email |
| IRWD | Jose Zepeda (Director of Water and Recycling Operations) | | | | Text + email |
| IRWD | Operations Standby/Customer Service | | | | None |
| IRWD | IRWD Communications Department | | | | None |
| IRWD | Paul Cook, P.E. (General Manager) | | | | Email |
| IRWD | Steve Choi (Director of Safety and Security) | | | | Text + email |

Phone numbers and email addresses have been removed from this publicly posted copy of this Emergency Action Plan. That information is available from Irvine Ranch Water District's district secretary: Phone 949-453-5300, Email Comments@IRWD.com

| Organization | Name (Title) | Primary Phone # | Secondary Phone # | Email Address | Written Emergency Notification Method |
|------------------------------------|--|-----------------|-------------------|---------------|---------------------------------------|
| Newport Beach Fire Department | 24-Hour Dispatch (Metro Net) | | | | None |
| Newport Beach Fire Department | Jeff Boyles (Fire Chief) | | | | Text + email |
| Newport Beach Police Department | 24-Hour Dispatch | | | | None |
| Newport Beach Police Department | Katie Eing (Emergency Services Coordinator) | | | | Text + email |
| Newport Beach Utilities Department | Casey Parks (Utilities Superintendent) | | | | Text + email |
| Newport Beach Utilities Department | Steffen Catron (Water Operations Superintendent) | | | | Text + email |
| NWS | Sam Zuber (Hydrology Program Manager) | | | | email |
| NWS | National Weather Service | | | | None |
| OCFA | Non-Emergency Dispatch | | | | None |
| OCFA | Nick Freeman (Division 2 Chief) | | | | Email |
| Orange County Parks | 24-Hour Dispatch (WestComm) | | | | None |
| Orange County Parks | Eric Rubery (Operations Support Manager) | | | | Text + email |
| Orange County Parks | Mason Regional Park Office | | | | None |
| OCPW | Trevor Richardson (Emergency Manager) | | | | Email |
| OCSD | 24-Hour Dispatch | | | | None |

Phone numbers and email addresses have been removed from this publicly posted copy of this Emergency Action Plan. That information is available from Irvine Ranch Water District's district secretary: Phone 949-453-5300, Email Comments@IRWD.com

| Organization | Name (Title) | Primary Phone # | Secondary Phone # | Email Address | Written Emergency Notification Method |
|---|---|-----------------|-------------------|---------------|---------------------------------------|
| OCSD | Emergency Operations Center "Control One" | | | | None |
| OCSD | Kevin McArthur (Assistant Emergency Manager) | | | | Text + email |
| OCSD | Mayra Wheeler (Senior Emergency Management Program Coordinator) | | | | Text + email |
| OCSD | Michelle Anderson (Emergency Management Director) | | | | Text + email |
| Strawberry Farms Golf Club ^(a) | Clubhouse | | | | None |
| WEROC | Miriam Aldana (WEROC Specialist) | | | | Email |
| WEROC | Vicki Osborn (Director of Emergency Management) | | | | Text + email |

Notes: (a) Strawberry Farms Golf Club is located immediately downstream of the dam and has been added to the notification flowcharts and contact tables to facilitate communication about the EAP.

Phone numbers and email addresses have been removed from this publicly posted copy of this Emergency Action Plan. That information is available from Irvine Ranch Water District's district secretary: Phone 949-453-5300, Email Comments@IRWD.com

Section 4: Project Description

Sand Canyon Dam was constructed in 1942. It has a hazard classification of extremely high. It is an earthen dam with a random fill core with a crest length of 861 feet. The barrier height is 50 feet, as measured from the maximum water surface at the spillway crest elevation of 194 feet to the estimated downstream toe at an elevation of 144 feet. The upstream face of the dam is sloped at a 2.5:1 ratio; the downstream face is sloped at a 2:1 ratio.

The dam has a concrete spillway which discharges into a concrete-lined channel. DSOD has identified the spillway weir as a CAS for Sand Canyon Dam. The spillway is an irregularly-shaped ogee, with a crest elevation of 194 feet. The spillway crest is about 120 feet long. The concrete channel length is approximately 225 feet. It narrows from about 120 feet wide at the top of the channel down to 20 feet wide at the bottom. The concrete channel empties into a vegetated stilling basin where it then flows into Sand Canyon Creek. A schematic of the dam, appurtenant structures, and access road is shown in Figure 4-1.



Figure 4-1 Schematic of Sand Canyon Dam

Historically, the capacity of the reservoir behind the dam was up to 960 acre-feet (ac-ft), but recent surveys show that this capacity has been diminished over time due to sedimentation. At the spillway crest elevation of 194 feet, the reservoir capacity was estimated in a September 2017 survey to be 740 ac-ft. The dam has upstream toe elevations that range from 164 feet to 167 feet. The dam bottom elevation varies but is generally between 163 feet and 165 feet. The modeling and inundation areas associated with failure at the Sand Canyon Dam were completed using the full 960 acre-feet, in order to account for restoration of the full storage capacity at some time in the future. DWR regulations require that any accumulated sediment be modeled as water. The storage-capacity curve for the dam is depicted in Figure 4-2.

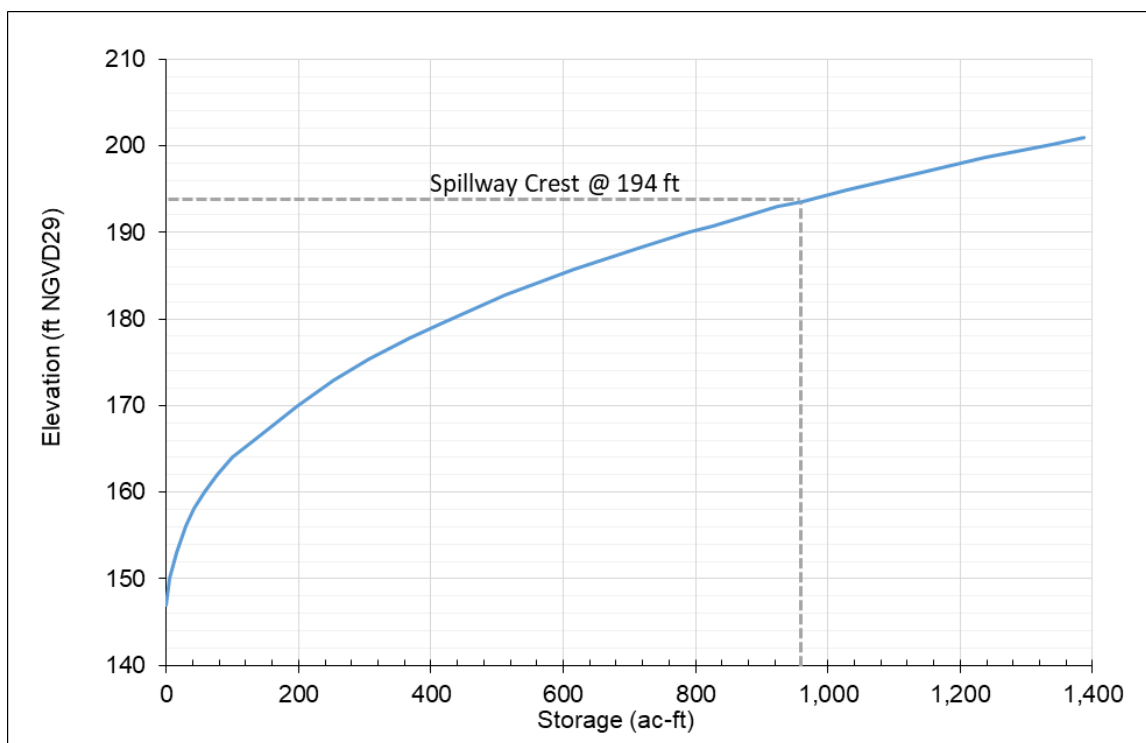


Figure 4-2 Reservoir Storage Capacity Curve
(add 2.38 ft to convert to NAVD88)

The drainage area upstream of Sand Canyon Dam is 6.3 square miles. The reservoir collects natural runoff during the rainy season from this area. It also stores recycled water from IRWD’s MWRP. A 10-inch pipe conveys water into the reservoir from the MWRP; a 12-inch outlet pipe conveys water from the reservoir back down to the MWRP. The outlet pipe can also be used to deliver water to the Strawberry Farms Golf Course, where it is used for irrigation and a water feature. The water feature drains back into the reservoir. The dam has a drainage system that conveys water from the center toward the ends of the dam.

The exact capacity of the channel downstream is not known, but the 2-year peak flood event on Sand Canyon Creek is on the order of 100 cfs.⁶ The historical peak recorded at a gage downstream of the dam was 1,310 cfs (recorded on December 22, 2010)⁷. Inundation maps for

⁶ Order of magnitude estimate based on historical peak flows at USGS gage 11048553; the 1- to 2-year event may be considered an approximation of bankfull flow.

⁷ Data from USGS Station 11048553 for peak flows observed from 2002 through 2013.

the CAS are provided in Part II that depict the inundation area associated with an instantaneous failure of the spillway when the reservoir is filled to capacity. When the water surface elevation is below 189.5 feet, the concrete spillway weir is not impounding water.

No extremely high flow, emergency flow, or dam emergency incidents are known to have occurred at Sand Canyon Dam. There are no dams upstream or downstream of Sand Canyon Dam which would contribute to or be affected by an emergency event at Sand Canyon Dam.

The water level in the reservoir is controlled through input valves, and the water level is reduced in advance of the wet season. If a potential or developing dam safety incident requires the lowering of the reservoir level, this must be done in accordance with the standard operating procedures maintained by the MWRP. All actions associated with controlling flow into or out of the reservoir must be coordinated with the dam operator or a representative designated by IRWD.

The spillway discharge curve for the dam is shown in Figure 4-3. Discharge curves for the outlet pipe have not been prepared; however, the typical discharge flowrate through the 12-inch outlet pipe is 5 to 10 cubic feet per second (cfs). The time required to drain the full reservoir under normal operating conditions would be 40 to 50 days, and water would be sent to the MWRP.

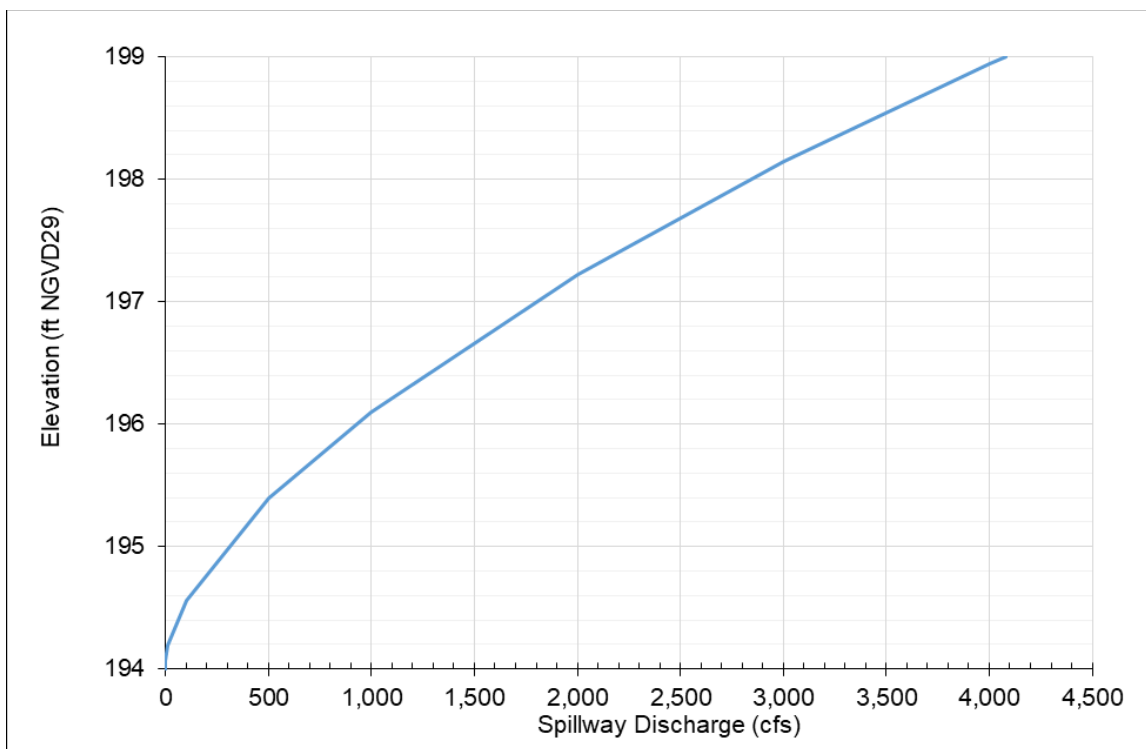


Figure 4-3 Spillway Discharge Curve
(add 2.38 ft to convert to NAVD88)

If the dam were to fail, the Strawberry Farms Golf Course would likely be inundated, along with the low-lying portions of Sand Canyon Creek and San Diego Creek along Strawberry Farm Road, the University Drive and Michelson Drive intersection, and adjacent areas. University Trail, Mason Park, Bethel Church, Irvine First Baptist Church, and portions of the Rancho San

Joaquin Golf Course may all be affected. University Drive from I-405 to Campus Drive could be closed in the event of inundation. High flows would be expected in San Diego Creek to Newport Bay. Trails, levees, and low-lying areas adjacent to Sand Canyon Wash and San Diego Creek would be inundated. The flood wave caused by a failure of Sand Canyon Dam could take eight hours to subside in some areas.

A failure of the spillway CAS would result in partial inundation of the Strawberry Farms Gold Club, mostly confined to the Sand Canyon Wash. The flood wave would continue to Sand Canyon Creek, potentially affecting the University and Turtle Rock Trails as well as University Drive. Mason Park, Harvard Avenue and adjacent parking areas, and the San Joaquin Golf Course may also be affected. The flood wave would be arrested at the San Joaquin Golf Course, at which point it would take approximately ten hours to subside.

Section 5: EAP Response Process

There are four steps that should be followed when an unusual or emergency incident is detected at the dam. These steps constitute the EAP Response Process. The steps are:

- Step 1: Incident detection, evaluation and emergency level determination
- Step 2: Notification and communication
- Step 3: Emergency actions
- Step 4: Termination and follow up

Early detection and evaluation of the condition(s) or triggering event(s) that initiate or require an emergency response action are crucial. Timely determination of an emergency level ensures that the appropriate response actions are taken based on the urgency of the situation. Procedures for early notification are provided in Section 3 that allow all entities involved with plan implementation to respond appropriately. Preventive or mitigating actions must be taken to attempt to address conditions at the dam. Eventually, a determination will need to be made concerning termination of the incident. After the incident is over, follow-up activities may be required. All of these steps make up the general EAP response process and are discussed in the following sections.

5.1 Step 1: Incident Detection, Evaluation, and Emergency Level Determination

Step 1 involves emergency detection, evaluation, and incident classification. Regular surveillance at the site is the normal method of detecting potential emergency situations. For conditions beyond the normal range of operations, contact DSOD for assistance with evaluation.

5.1.1 Monitoring, Detection, and Early Warning

This EAP establishes the procedures to be employed by IRWD personnel to ensure the safety of life and property at and downstream of Sand Canyon Dam. The reservoir is filled with recycled water prior to the high demand season, operated through the season, then drawn down to increase storage capacity for the wet season. There is a dam keeper who resides onsite, monitors the status of the reservoir, and maintains a presence at the dam. IRWD has a dam safety program which regularly monitors and inspects features of the dam to detect problems. This program includes:

- Routine visual inspections of the dam.
- Measurement of subdrain flows on a monthly basis. Subdrain flow data are compared to historical data to assess trends and detect anomalies.
- Measurement of water levels on a monthly basis. Measurements are compared to historical data to assess trends and detect anomalies.
- Annual surveys at survey monuments. Survey measurements are compared to historical data to assess trends and detect anomalies.
- Annual inspections by IRWD staff.
- Annual inspections by DSOD.
- Periodic dam safety reviews that consider potential failure modes and risk analysis.

Though there is no public access to the dam, the Strawberry Farms Golf Course is immediately downstream of the dam and it is possible for the general public to observe the dam and report potential anomalies from this area as well as surrounding residential areas.

Section 7 of this EAP contains more details about how monitoring and detection instrumentation are used by IRWD for incident preparedness.

5.1.2 Emergency Level Determination

After identification of a dam threatening condition, the dam operator or a qualified engineer will determine if there is sufficient time for additional investigation before declaring an emergency situation. Prior to activating the EAP, the IRWD Director of Water and Recycling Operations, in conjunction with the Dam Safety Engineer and EAP Coordinator, will determine the emergency level.

An emergency level determination may be re-evaluated at times during a dam emergency as it may not be readily apparent whether a complete breach will occur or how long it may take. The IRWD, in conjunction with DSOD engineers, will be appropriately conservative in evaluating the emergency level determination and will provide emergency management authorities with the most complete information possible so that decisions regarding public safety and evacuations may be made quickly and effectively.

There are four dam safety emergency level categories for the Sand Canyon Dam. The sections below describe how each emergency level applies to the dam. Table 5-1 describes different incidents that pose dam safety hazards.

High Flow – High Flows in System, No Threat to Dam

The High Flow emergency level indicates that flooding is occurring on the river system, but there is no apparent threat to the integrity of the dam. The High Flow emergency level is used by the dam owner to convey to outside agencies that downstream areas may be affected by the dam's release. Although the amount of flooding may be beyond the control of the dam owner, information on the timing and amount of release from the dam may be helpful to authorities in making decisions regarding warnings and evacuations.

Non-Failure – Unusual, Slowly Developing Event

The Non-Failure emergency level is appropriate for an event at a dam that will not, by itself, lead to a failure, but requires investigation and notification of internal and/or external personnel. This classification indicates a situation is developing; however, the dam is not in danger of failing. In many cases, these unusual events are remedied with no further action required. In some cases, flow over spillways could cause unexpected flooding downstream, but the dam is not endangered. In cases of spillway releases, downstream residents may need to be notified if flooding threatens life or property, but it should be made clear that the dam is safe. Examples of Non-Failure events are (1) new seepage or leakage on the downstream side of the dam, (2) presence of unauthorized personnel at the dam, and (3) malfunction of an inlet valve in the open position creating the

potential for high flow downstream of the dam or excessive erosion in the vicinity of the outlet works.

Potential Failure – Potential Dam Failure, Rapidly Developing

This classification indicates that a situation is rapidly developing that could cause the dam to fail. A reasonable amount of time is available for analysis before deciding whether to evacuate residents. Emergency responders in affected areas will be alerted that an unsafe situation is developing. The Potential Failure emergency level indicates that conditions are developing at the dam that could lead to a dam failure. Examples of Potential Failure events are (1) rising reservoir levels that are approaching the top of the non-overflow section of the dam, (2) transverse cracking of an embankment, and (3) a verified bomb threat. Declaration of a Potential Failure should convey that time is available for analyses, decisions, and actions before the dam could fail. A failure may occur, but predetermined response actions may moderate or alleviate failure.

Imminent Failure – Dam Failure Appears Imminent or In-Progress

The Imminent Failure classification indicates that time has run out, and the dam has failed, is failing, or is about to fail. Imminent Failure typically involves a continuing and progressive loss of material from the dam. It is not usually possible to determine how long a complete breach of a dam will take. Therefore, once a decision is made that there is no time to prevent failure, the Imminent Failure warning must be issued. For purposes of evacuation, emergency management authorities may assume the worst-case condition that failure has already occurred.

Decision criteria to assist the dam owner/operator in determining the appropriate emergency level is provided in Table 5-1. The guidance provided in Table 5-1 is intended to function as a framework for IRWD to use to determine when the EAP should be activated but is not prescriptive and each situation will be evaluated on a case-by-case basis.

Table 5-1 Emergency Level Determination

| Event | Example Situation | Emergency Level |
|--|--|------------------------|
| Erosion of Spillway | Spillway flowing with active erosion gullies | Potential Failure |
| | Spillway flowing with significant erosion and head cutting advancing rapidly toward reservoir | Imminent Failure |
| Embankment Overtopping | Reservoir level reaches higher than 194 feet (spillway crest elevation) and is increasing | Potential failure |
| | Water from the reservoir is flowing over the top of the dam | Imminent Failure |
| Seepage | New seepage areas of elevated concern in or near dam | Non-Failure |
| | New seepage areas with cloudy discharge or increasing flow rate | Potential Failure |
| | Seepage with increasing and significant flow rate | Imminent Failure |
| Sinkholes | Observation of new sinkhole in reservoir area or on embankment | Potential failure |
| | Rapidly enlarging sinkhole | Imminent failure |
| Embankment Cracking or Settlement | New cracks in embankment greater than 1/4-inch-wide without seepage | Non-Failure |
| | Cracks in the embankment with seepage | Potential Failure |
| Embankment Movement | Visual shallow slippage | Non-Failure |
| | Visual deep-seated movement/slippage of embankment | Potential Failure |
| | Sudden or rapidly proceeding slides of embankment slope | Imminent Failure |
| Earthquakes | Measurable earthquake reported within 50 miles of the dam | Non-Failure |
| | Earthquake resulting in visible damage to dam or appurtenances | Potential Failure |
| | Earthquake resulting in uncontrolled release of water over dam or rapidly developing flow through cracks or rapidly developing erosion through increased seepage | Imminent Failure |
| Fire | Significant fire in the area that affects access to the dam | Non-Failure |
| Instruments | Instrumentation readings beyond predetermined values | Non-Failure |
| Outlet System Failure | Releases causing erosion around outlet works | Non-Failure |
| | Uncontrolled releases through the outlet but the dam's structural integrity is still maintained | Potential Failure |
| | Uncontrolled releases through the outlet with dam failure imminent | Imminent Failure |
| Security Threat | Verified bomb threat that, if carried out, could result in damage to the dam | Potential failure |
| | Detonated bomb that has resulted in damage to the dam or appurtenances | Imminent failure |
| Sabotage/ Vandalism | Damage that could adversely impact the functioning of the dam | Non-failure |
| | Damage that has resulted in seepage flow | Potential failure |
| | Damage that has resulted in uncontrolled water release | Imminent failure |

5.2 Step 2: Notification and Communication

After the emergency level at the dam has been determined, immediate notifications are made in accordance with the appropriate notification flowcharts in Section 3. The notification flowcharts were prepared to assist EAP response personnel during an emergency. Each chart identifies who is responsible for notifying representatives and/or emergency management officials; the prioritized order in which individuals are to be notified; and who is to be notified. A contact list for the flowchart contacts, as well as other affected parties is found in Section 3.2.

During a dam safety incident, the observer of the dam incident will call 911 and/or the dam operator. If local 911 (primary local emergency management) is called first, they will then notify the dam operator. If the dam operator is notified first, they will ensure that primary local emergency management is also aware of the situation. Once the appropriate emergency level has been determined, the flowchart corresponding to that level will be used to inform affected parties of the situation as it progresses. Parties at the start of each branch are responsible for making all calls within that branch, in the order indicated. Positive contact is required. If it is not possible to contact a particular party based on the information given in the flowchart, the notifying party should refer to the contact table provided in Section 3.2.

The notification flowcharts (Section 3.1) require that the primary local emergency contact, City of Irvine Police Department, make additional calls as part of the notification process. City of Irvine Police Department has agreed to perform the responsibilities in the notification flowcharts and in this EAP. In order to make efficient and timely notifications, the City of Irvine Police Department may use mass notification systems designed to share information between multiple emergency response agencies at once. These instructions will be updated annually when the plan is reviewed and contacts are updated (see Section 8.1).

When performing notification and communication activities, it is important that people speak in clear, non-technical terms to ensure that those being notified understand what is happening at the dam, what the current emergency level is, and which actions to take. To assist in this step, suggested pre-scripted messages are available in Section 3.1 and Appendix E. To ensure timely and efficient notifications during a rapidly developing emergency situation, verbal notifications via phone calls will be short and direct, followed by email and/or text confirmations containing the language in the pre-scripted messages (Appendix E). Additionally, those making notifications will fill out the Cal OES Warning Center Dam Incident Report (Appendix I) and use it for initial notifications.

Use the Contact Log (Appendix D) to track required notifications that are attempted or made. The contact information on each notification flowcharts must be updated annually by the dam owner's/operator's representative.

In the event of an emergency, IRWD will coordinate closely with emergency management authorities. Communication between IRWD and emergency management authorities may be facilitated by the County and OA Joint Information System (JIS) as described in the County and OA EOP. All parties must understand that the formal declaration of public emergency by emergency management authorities can be a very difficult decision. During this step, IRWD will

provide any information that will assist in that decision. An early decision and declaration are critical to maximizing available response time.

5.3 Step 3: Emergency Actions

After the initial notifications have been made, IRWD will act to save the dam and minimize impacts to life, property, and the environment. Depending on the nature of the incident, a unified command may be established by the Irvine Police Department and the Orange County Fire Authority, and an ICP may be established to coordinate emergency response and/or evacuations.

During this step, there is a continuous process of taking actions, assessing the status of the situation, and keeping others informed through communication channels established during the initial notifications. Additional resources may be requested through the ICP, City of Irvine EOC, or Orange County EOC if requirements exceed the IRWD internal maintenance, construction, and contracting capabilities.

A set of remedial actions that may be taken during different potential dam safety incidents is provided in Table 5-2. The actions listed are not all inclusive of those that may need to be taken during an emergency. Use the Emergency Incident Log (Appendix F) to document the emergency event.

Table 5-2 Possible Remedial Actions

| Condition | Description of Condition | Action to be Taken |
|---|--|---|
| <p>Spillway Release/High Water Level</p> | <p>Reservoir level reaches elevation 194 ft (spillway begins to discharge).</p> | <p>1. Cease filling operations unless overfilling and spillway discharge is planned. Close inlet valves.</p> |
| | | <p>2. If inlet valves have malfunctioned and cannot be closed, contact maintenance crews for immediate repair. Determine if inlet flowrate exceeds the spillway discharge capacity. If not, monitor spillway for signs of excessive erosion, and determine whether a high flow condition may exist downstream. Make notifications as appropriate.</p> |
| <p>Seepage</p> | <p>Localized new seepage or boils observed along downstream face / toe of earthen embankment with muddy discharge and increasing but controllable discharge of water</p> | <p>1. Measure and record feature dimensions, approximate flow rate, and relative location to existing surface features. Take photos if camera is available. Document location on a site plan and in inspection report.</p> |
| | | <p>2. Place a ring of sand bags with a weir at the top towards the natural drainage path to monitor flow rate. If boil becomes too large to sand bag, place a blanket filter over the area using non-woven filter fabric and pea gravel. Attempt to contain flow in such a manner (without performing any excavations) that flow rates can be measured. Stockpile gravel and sand fill for later use, if necessary.</p> |
| | | <p>3. Inspect the dam and collect piezometer, water level and seepage flow data daily unless otherwise instructed by engineer. Record any changes of conditions. Carefully observe dam for signs of depressions, seepage, sinkholes, cracking or movement.</p> |
| | | <p>4. Contact geotechnical engineer and provide all data collected.</p> |
| | | <p>5. Maintain continuous monitoring of feature. Record measured flow rate and any changes of condition, including presence or absence of muddy discharge.</p> |

| Condition | Description of Condition | Action to be Taken |
|---|---|--|
| Seepage (cont.) | Localized new seepage or boils (cont.) | 6. Review information collected by field inspection and provide additional instructions / actions as required. Recommend remedial seepage and stability measures. |
| | | 7. Make notifications if condition worsens such that failure is imminent. |
| Sabotage and Miscellaneous Other Issues | Criminal action with significant damage to embankment or structures where significant repairs are required and the integrity of the facility is compromised – condition appears stable with time. | 1. Contact law enforcement authorities and restrict all access (except emergency responders) to dam. Restrict traffic on dam crest to essential emergency operations only. |
| | | 2. Assess extent of damage and visually inspect entire dam for additional less obvious damage. Based on inspection results, confirm if extent of damage to various components of the dam warrants revised emergency level and additional notifications. |
| | | 3. If necessary to lower reservoir level, coordinate with the Michelson Recycled Water Plant. |
| | | 4. Perform additional tasks as directed by the Engineering Supervisor or designee. |
| | | 5. Make notifications if conditions worsen. |
| Earthquakes | Report of an earthquake epicenter within 50 miles | Inspect dam and evaluate the damage sustained and the potential danger of failure. Check for seepage, cracks, displacements, and settlement. Inspect outlet works and spillways. Evaluate instrumentation. |
| Erosion of Spillway | | Provide temporary protection at the point of erosion by placing sandbags, riprap materials, or plastic sheets weighted with sandbags. Consider pumps and siphons to help reduce the water level in the reservoir. When inflow subsides, lower the water level in the reservoir to a safe level; continue operating at a lower water level to minimize spillway flow. |
| Fire | | Implement fire procedures (if applicable). |

| Condition | Description of Condition | Action to be Taken |
|---|---|--|
| Abnormal Instrumentation Reading | Piezometers, monuments, and seepage measurements are outside of established dam safety parameters. | Conduct daily inspections of the dam. Check and record reservoir elevation, rate at which reservoir is rising, weather conditions (past, current, forecasted), discharge conditions of creeks/rivers downstream, and new or changed conditions associated with this event. Evaluate accuracy of instrumentation. |
| Outlet System Failure | Failure of the outlet system piping at a point inside the dam foundation. | Implement temporary measures to protect the damaged structure, such as closing the inlet. Lower the water level in the reservoir to a safe elevation, possibly by using pumps or siphons. Consider the severity of flow through outlet, risk to the dam foundation/liner and increased flows in determining emergency level. |
| Embankment Deformation | <p>Cracks: New longitudinal (along the embankment) or transverse (across the embankment) cracks more than 6 inches deep or more than 3 inches wide or increasing with time. New concave cracks on or near the embankment crest associated with slope movement.</p> | 1. Measure and record feature dimensions, approximate flow rate, and relative location to existing surface features. Take photos if camera is available. Document location on a site plan and in inspection report. |
| | | 2. Restrict traffic on dam crest to essential emergency operations only. |
| | | 3. Contact geotechnical engineer and provide all data collected. |
| | | 4. Place buttress fill (min 3 ft. high, 15 ft. wide) against base of slope immediately below surface feature and extending 20 ft. beyond visible feature limits (parallel to the embankment). Stock pile additional fill. |
| | | 5. Place sand bags as necessary around crack area to divert any storm water runoff from flowing into crack(s). |
| | | 6. Inspect the dam; collect piezometer and water level data twice daily unless otherwise instructed by engineer; and record any changes of condition. Carefully observe dam for signs of depressions, seepage, sinkholes, cracking or movement. |
| | | 7. Review information collected by field inspectors and provide additional instructions / actions as required. Consider survey monitoring. |
| | | 8. Make notifications if conditions worsen such that failure is imminent. |

| Condition | Description of Condition | Action to be Taken |
|---------------------------------------|--|---|
| Embankment Deformation (cont.) | Slides / Erosion: Deep slide / erosion (greater than 2 feet deep) on the embankment that may also extend beyond the embankment toe but does not encroach onto the embankment crest and appears stable with time. | 1. Measure and record feature dimensions, approximate flow rate, and relative location to existing surface features. Take photos if camera is available. Document location on a site plan and in inspection report. |
| | | 2. Restrict traffic on dam crest to essential emergency operations only. |
| | | 3. Contact geotechnical engineer and provide all data collected. |
| | | 4. Re-establish embankment fill slope. Place 5 ft. high buttress fill against base of slope at the slide location that extends at least 15 ft. beyond the furthest downstream limits (perpendicular to the embankment) and extending 20 ft. beyond visible feature limits at either end (parallel to the embankment). |
| | | 5. Place sand bags as necessary around slide area to divert any storm water runoff from flowing into slide(s). |
| | | 6. Inspect the dam; collect piezometer and water level data daily unless otherwise instructed by engineer; and record any changes of condition. Carefully observe dam for signs of depressions, seepage, sinkholes, cracking or movement. |
| | | 7. Review information collected by field inspectors and provide additional instructions / actions as required. Consider survey monitoring. |
| | | 8. Make notifications if conditions worsen such that failure is imminent. |
| | Sinkholes: Small depression observed on the embankment or within 50 feet of the embankment toe that is less than 5 feet deep and 30 feet wide or which is increasing with time. | 1. Lower reservoir elevation. |
| | | 2. Measure and record feature dimensions, approximate flow rate, and relative location to existing surface features. Take photos if camera is available. Document location on a site plan and in inspection report. |
| | | 3. Restrict traffic on dam crest to essential emergency operations only. |
| | | 4. Contact geotechnical engineer and provide all data collected. |

| Condition | Description of Condition | Action to be Taken |
|--|----------------------------------|--|
| <p>Embankment Deformation (cont.)</p> | <p>Sinkholes (cont.):</p> | <p>5. Backfill the depression with relatively clean earth fill (free of organic materials) generally even with surrounding grade and slightly mounded (6 to 12 inches higher) in the center in order to shed storm water away from the depression. Stock pile additional fill.</p> |
| | | <p>6. Inspect the dam; collect piezometer and water level data daily unless otherwise instructed by engineer; and record any changes of condition. Carefully observe dam for signs of depressions, seepage, sinkholes, cracking or movement.</p> |
| | | <p>7. Review information collected by field inspectors and provide additional instructions / actions as required. Consider remedial construction such as grouting.</p> |
| | | <p>8. Make notifications if conditions worsen such that failure is imminent.</p> |

5.4 Step 4: Termination and Follow-up

Once conditions indicate that there is no longer an emergency at the dam site, EAP operations are terminated and follow-up actions are completed. Generally, IRWD or a designated safety expert will be responsible for notifying the incident commander that the condition of the dam has been stabilized.

The IRWD General Manager, in consultation with the IRWD operations and engineering staff members, dam safety experts, and response personnel, is responsible for determining when the dam safety situation has stabilized. The General Manager will terminate the EAP, which signifies that the dam incident has been resolved at the dam site.

The IRWD Director of Water and Recycling Operations, or designee, will follow the notification flowchart to alert all contacts of the EAP's termination. All contacts will be notified of the EAP termination in the same order as they were notified of its activation, using the notification flowchart. The Director of Water and Recycling Operations will complete the Termination Log (Appendix G).

The Unified Command/IC is responsible for terminating the field level emergency response and relaying this decision to appropriate individuals and agencies. Prior to the termination of an Imminent Failure event that has not caused actual dam failure, DSOD will inspect the dam to determine whether any damage has occurred that could potentially result in loss of life, injury, or property damage.

Post incident, the EAP Coordinator will set up and facilitate a meeting to review the incident and EAP implementation activities. The dam personnel involved with the plan implementation, as well as the responding agencies should be present at the meeting. The following topics will be discussed and evaluated in an after-action review:

- Events or conditions leading up to, during, and following the incident
- Significant actions taken by each participant and improvements for future emergencies
- All strengths and deficiencies found in the incident management process, materials, equipment, staffing levels, and leadership
- Corrective actions identified and a planned course of action to implement recommendations

IRWD will prepare an after-action report (Appendix H), which analyzes what happened, why it happened, and how it can be prevented in the future from a dam safety and/or EAP perspective. The City of Irvine, OCFA, the City of Newport Beach, and the County and OA EOC Manager may prepare separate after-action reports focused on localized emergency response and evacuation. Outside agencies will be invited to contribute to the after-action report, and findings of the report will be used to improve the EAP.

Section 6: General Responsibilities

6.1 Irvine Ranch Water District Responsibilities (Dam Owner)

Overall IRWD dam owner responsibilities include:

- Detect, verify and assess emergency conditions.
- Respond to emergencies at the dam site.
- Activate and implement the Sand Canyon Dam EAP, including determining the appropriate emergency level.
- Notify other participating emergency management agencies of emergency conditions, emergency level, EAP activation, and other critical information.
- Utilize IRWD EOP for internal emergency response coordination.
- Take corrective action at the dam/reservoir.
- Terminate the EAP.
- Facilitate an after-action evaluation and report.
- Update EAP on at least an annual basis.
- Communicate with the public and the media.

The above responsibilities are to be executed in coordination with emergency management authorities. A Summary of Dam Owner's Responsibilities by role are outlined in Table 6-1. Responsibilities are listed for key personnel including the Director of Water and Recycling Operations, Dam Operator, Executive Director of Operations, General Manager, IRWD Communications office, Dam Safety Engineer, and EAP Coordinator.

IRWD, as the dam owner and operator, is responsible for developing and maintaining the EAP. This includes updating the EAP on at least an annual basis, including updating contact information and notification charts in Section 3. The dam owner is responsible for regular monitoring and inspections of the dam and for responding to emergencies at the dam.

As the dam owner, IRWD will carry out notifications as outlined in Section 6.2, including to the primary local emergency management, state emergency management, and the NWS. Notification charts and procedures are given in Section 3. IRWD's Communications office will communicate with the public and the media using IRWD's Crisis Communications Plan. If needed, IRWD will procure outside equipment and materials to aid with a dam incident or emergency.

Table 6-1 Dam Owner Responsibilities by Role

| Role | Responsibilities |
|--|--|
| Director of Water and Recycling Operations, or designee | <ol style="list-style-type: none"> 1. Detect incident from alarms / SCADA / visual inspections, or other monitoring data. 2. As soon as an emergency event is observed or reported, determine the emergency level as detailed in Section 5. 3. Utilize the emergency notification flowcharts in Section 3 to notify the appropriate response personnel and record notifications in the contact log in Appendix D. 4. If no one is onsite, determine emergency level and dispatch operator to the site 5. Coordinate directly with the Unified Command/IC or first responders at the dam site. 6. Coordinate directly with the ICP, City of Irvine EOC, or County and OA EOC, if established. 7. Coordinate with Dam Operator on gate, valve operations and emergency procedures 8. Dispatch construction and maintenance crews as necessary 9. Procure outside equipment and materials as necessary 10. Participate in periodic status report conference calls initiated by the Executive Director of Operations. 11. Upon termination of EAP by General Manager, notify all entities on notification charts 12. Upon termination of EAP by General Manager, fill out a Dam Emergency Termination Log (Appendix G) 13. Participate in the creation of an After-Action Report (Appendix H) to be used in the EAP review process. |
| Dam Operator/ On-site Monitor | <ol style="list-style-type: none"> 1. Detect/confirm incident at dam 2. Make calls on notification charts 3. Implement gate and valve operations and other emergency procedures 4. Assess need for construction and maintenance crews and/or outside equipment and materials 5. Coordinate dam site security during incident |
| Executive Director of Operations | <ol style="list-style-type: none"> 1. Initiate periodic status report conference calls with the Director of Water and Recycling Operations, General Manager, Communications, Dam Safety Engineer, and Director of Safety and Security. 2. Provide regular status reports to ICP, City of Irvine EOC, or County and OA EOC, if established through the IRWD Agency Representative or Communications. 3. Coordinate with Communications office |
| General Manager | <ol style="list-style-type: none"> 1. Participate in periodic status report conference calls initiated by the Executive Director of Operations. 2. Terminate the EAP. 3. Coordinate with Communications office |

| Role | Responsibilities |
|---|--|
| Communications | <ol style="list-style-type: none"> 1. Mobilize to Irvine EOC, or County and OA EOC, if established. 2. Participate in periodic status report conference calls initiated by the Executive Director of Operations 3. Provide input to staff on emergency communications 4. Represent IRWD to media 5. Develop non-technical description of dam emergency situation and IRWD remedial actions to inform emergency management authorities and the public 6. Utilize Crisis Communications Plan to communicate with impacted areas. |
| Dam Safety Engineer | <ol style="list-style-type: none"> 1. Make calls on notification charts 2. Initiate periodic status report conference calls with DSOD. 3. Participate in periodic status report conference calls initiated by the Executive Director of Operations 4. Coordinate with Dam Operator/On-site Monitor. 5. Monitor and review data relevant to dam emergency situation. 6. Notify government authorities when the dam condition has been stabilized. 7. Coordinate with dam safety experts. 8. Maintain and update inundation maps. 9. Manage and implement dam safety program. |
| EAP Coordinator/ Director of Safety and Security | <ol style="list-style-type: none"> 1. Make calls on notification charts 2. Initiate periodic status report conference calls with State Emergency Management. 3. Participate in periodic status report conference calls initiated by the Executive Director of Operations 4. Notify government authorities when the dam condition has been stabilized. 5. Update EAP at least annually 6. Distribute EAP copies/updates to other plan holders 7. Facilitate the creation of an After-Action Report (Appendix H) 8. Coordinate with WEROC <p><i>(see Section 6.5 for additional information)</i></p> |

6.2 Notification and Communication Responsibilities

IRWD, as the dam owner/operator will determine the appropriate emergency level in accordance with Section 5, then notify the appropriate emergency management authorities in accordance with Section 3. The dam operator or IRWD operations center will maintain the contact log (Appendix D) to document notifications for the appropriate emergency level.

IRWD’s Director of Water and Recycling Operations will notify the NWS of an emergency at Sand Canyon Dam. Flood warnings and watches will be issued by the San Diego Weather Forecast Office of the NWS (see notification charts in Section 3.1). IRWD’s Dam Safety Engineer will notify DSOD and the DWR Flood Operations Center. IRWD’s Director of Safety and Security will notify the CalOES Warning Center (see notification charts in Section 3.1).

IRWD’s Communications office will be responsible for communication with the media. IRWD has prepared a Crisis Communications Plan to facilitate providing timely and accurate information and instructions to minimize injuries, impacts on people and property, and potential damage to the environment. The plan outlines how IRWD will provide timely, accurate, wide-

reaching, and easy-to-understand information to the media and the public, as well as to IRWD employees, contractors, board members and other stakeholders.

If time allows, onsite personnel may be able to seek internal advice and assistance. However, under an Imminent Failure condition, the responsibility and authority for notification is delegated to the dam operator or local official. Notification protocols are determined by the classification level of the incident and are pre-determined in the notification flowcharts found in Section 3.

IRWD is designated as the lead agency for notification and coordination with the City of Irvine to initiate required response actions including the appropriate notifications to impacted community members. The Irvine Police Department may establish a Unified Command in order to coordinate between multiple jurisdictions and/or agencies, as required. Once notified of an incident at the dam, the City of Irvine EOC may be activated to serve as the center for response, warning, and evacuation activities. In most cases, the County and OA EOC is not expected to be activated for an emergency at Sand Canyon Dam. However, since no emergency response situation is completely predictable, there may be situations where the County and OA EOC may be activated and staffed based on the situation.

Emergency management authorities with statutory obligations are responsible for warning and evacuation within the affected areas (see Part II Inundation Maps).

Emergency incident logs should be used to document incident related events and should be maintained at command centers and at the dam site or dam operations center. Appendix F contains an example emergency incident log.

6.3 Evacuation Responsibilities

Inundation maps developed by IRWD and approved by DSOD are included in Part II of this EAP and have been distributed to the emergency management authorities listed in the notification flowcharts in Section 3. The EAP distribution list can be found in Appendix C. These maps inform the development and refinement of warning and evacuation plans and are based on the worst-case scenario of a complete and sudden failure of the dam when it is filled to the spillway crest elevation during a “sunny day” failure, without additional storm flows in Sand Canyon or San Diego Creek. Water levels in the Sand Canyon Reservoir fluctuate considerably throughout the year.

Inundation maps are based on conservative breach parameters and a situation where the reservoir is storing the maximum capacity of water. Therefore, the inundation maps included in Part II of this EAP should be considered a worst-case scenario. Emergency planners and response personnel should consider the specifics of each situation when making response decisions during a dam emergency.

The Unified Command/IC will facilitate coordination among agencies and disciplines for evacuations within the affected area.

The Irvine Police Department, with possible assistance from OCFA, would have responsibility for evacuations within the City of Irvine.

Because the flood wave for a failure of Sand Canyon Dam would be entirely confined to the San Diego Creek Channel by the time it reached the city limits of Newport Beach, it is not anticipated that Newport Beach would assume any evacuation responsibilities. However, if it were determined that evacuation within city limits were required, the Newport Beach Police Department and Fire Department would be responsible for providing an effective emergency response in compliance with existing city evacuation plans and direction from the Unified Command/IC.

OCSD, which is not part of the Unified Command, may be called upon by the Unified Command to assist with evacuations, if necessary.

6.4 Monitoring, Security, Termination, and Follow-up Responsibilities

The dam operator or an appointed representative will be designated as the onsite monitor from the beginning of a dam safety incident until the emergency has been terminated. This person will provide status updates to the IRWD Director of Water and Recycling Operations, who will provide regular status reports to senior management and local authorities.

During a dam safety incident, the IRWD onsite monitor will oversee security at the dam site. Only those required to respond to the emergency or execute remedial actions will be granted access to the site.

Termination of a dam safety emergency is twofold. The IRWD General Manager, in consultation with IRWD operations and engineering staff members, dam safety experts, and response personnel, is responsible for determining when the dam safety situation has stabilized. The IRWD General Manager will officially terminate the EAP. The Unified Command/IC is responsible for termination of the emergency response activities, including termination of an evacuation.

The dam owner and emergency response authorities should coordinate closely while making decisions to terminate both the dam safety event and the response efforts. Upon termination, IRWD will notify all flowchart entities which were activated at the start of the emergency incident and complete an Emergency Termination Log (Appendix G) for submission to DSOD and the Cal OES Warning Center (if notified).

Recovery activities will continue on different levels for all involved in the dam safety incident after the emergency has been terminated. IRWD will coordinate a follow-up evaluation after any emergency and prepare an after-action report. All participants in the dam safety incident should be involved in the evaluation and should keep logs during the incident. An example emergency incident log is provided in Appendix F, although emergency response agencies may maintain alternate documentation methods according to their established internal procedures.

IRWD will prepare an after-action report (Appendix H), which analyzes what happened, why it happened, and how it can be prevented in the future from a dam safety and/or EAP perspective. The City of Irvine, OCFA, the City of Newport Beach, and the County and OA EOC Manager may prepare separate after-action reports focused on localized emergency response and evacuation. Outside agencies will be invited to contribute to the after-action report, and findings of the report will be used to improve the EAP.

6.5 EAP Coordinator Responsibilities

IRWD has designated the IRWD Director of Safety and Security as the EAP Coordinator. The EAP Coordinator is responsible for overall EAP related activities, including the following:

- Provide leadership to ensure the EAP is reviewed and updated annually.
- Coordinate annual EAP exercises (see Section 7.2.2 for exercise schedule).
- Summarize the annual EAP exercise for posting to the IRWD website.
- Prepare revisions to the EAP after annual exercise and review.
- Verify and update agency contact information.
- Distribute copies of the revised EAP to all parties who received copies of the original EAP.
- Establish training seminars for IRWD personnel and primary emergency management authorities.
- Coordinate emergency outreach programs with residents and businesses in close proximity to the reservoir.
- After a dam safety incident, hold a meeting to review the incident and EAP implementation activities.
- Facilitate the creation of an After Action Report (Appendix H) after a dam incident by gathering incident information from authorities.
- Utilize any After Action Reports during EAP review process.

The EAP Coordinator is the main point of contact for any questions or comments regarding this EAP. The current EAP Coordinator for IRWD is Steve Choi, who can be reached at:

Steve Choi, Director of Safety and Security
Irvine Ranch Water District
3512 Michelson Drive
Irvine, CA 92612-1799

Phone numbers and email addresses have been removed from this publicly posted copy of this Emergency Action Plan. That information is available from Irvine Ranch Water District's district secretary: Phone 949-453-5300, Email Comments@IRWD.com

Section 7: Preparedness

7.1 Surveillance and Monitoring

This EAP establishes the procedures to be employed by IRWD personnel to ensure the safety of life and property at and downstream of Sand Canyon Dam. The Water Operations Manager is responsible for the day-to-day operation of the reservoir and the dam surveillance and monitoring program. Operations are supported by IRWD maintenance activities. There is a dam keeper who resides at the reservoir and is responsible for maintaining a presence at the dam, monitoring water levels, ensuring the facility is properly secured, and conducting visual inspections. The reservoir is filled at the beginning of the high demand season, operated through the season, then drawn down for the low demand months. IRWD maintains a surveillance and inspection program for the Sand Canyon Dam that is described in the sections that follow. Monitoring and surveillance data is reviewed by an independent consultant and annual reports are prepared and maintained on file with IRWD. Schematic drawings of the dam which show the surveillance and monitoring instrumentation are included as Figure 7-1 and 7-2.

7.1.1 Survey Monuments

There are several survey monuments located along the crest of the dam. Annual surveys are conducted and compared to historical data. A cumulative settlement plot is maintained that indicates any movement of the monuments over time. Lateral or vertical shifting of the monuments is indicative of a potential dam safety issue and requires further investigation.

7.1.2 Piezometers

A piezometer is a small-diameter well used mainly to measure water levels. The water levels in the piezometers at Sand Canyon Dam are measured by IRWD personnel on a monthly basis. Water levels in the piezometers are compared to reservoir surface water elevations and evaluated against data collected over a 10-year historical period. Anomalies in the piezometer data may be an indication of adverse conditions in the dam embankment or abutments.

7.1.3 Subdrains

The flow from the two subdrains, which discharge into a drain junction vault and then flow out through an underground pipe at the left downstream toe of the dam, are measured by District personnel on a monthly basis. The flows are observed for clarity to check for the presence of any suspended solids that might indicate a potential piping condition. Blockages in the subdrain piping may cause seepage areas to appear upstream of the vault. Increased flows or anomalies based on historical data are investigated.

7.1.4 Visual Surveillance and Monitoring

Visual inspections are conducted daily by the dam operator that consist of monitoring the water surface elevation, inspecting visible appurtenances, inspecting the access roadway and spillway for cracking, inspecting the downstream toe for seepage, and inspecting the slopes and crest parapet wall for any visible displacement. Any visible cracking, seepage, or signs of settlement or instability are reported and trigger further investigation of the piezometers and monuments or engineering analysis. All of the outlet gates and blow off valves are exercised at least annually to confirm operability. DSOD requires the outlet valves and blow-off valves be exercised once every three years in the presence of a DSOD representative.

Maintenance is conducted as required to remove excessive vegetation at or near the spillway or on the dam face and to control rodent activity on the dam face.

7.1.5 IRWD and DSOD Inspections

IRWD conducts routine internal inspections. DSOD inspections are conducted annually. Visual inspections of the dam, spillway, outlet, and seepage are conducted, along with a review of monitoring and surveillance data. Annual inspections are documented and maintained on file at both IRWD and with DSOD.

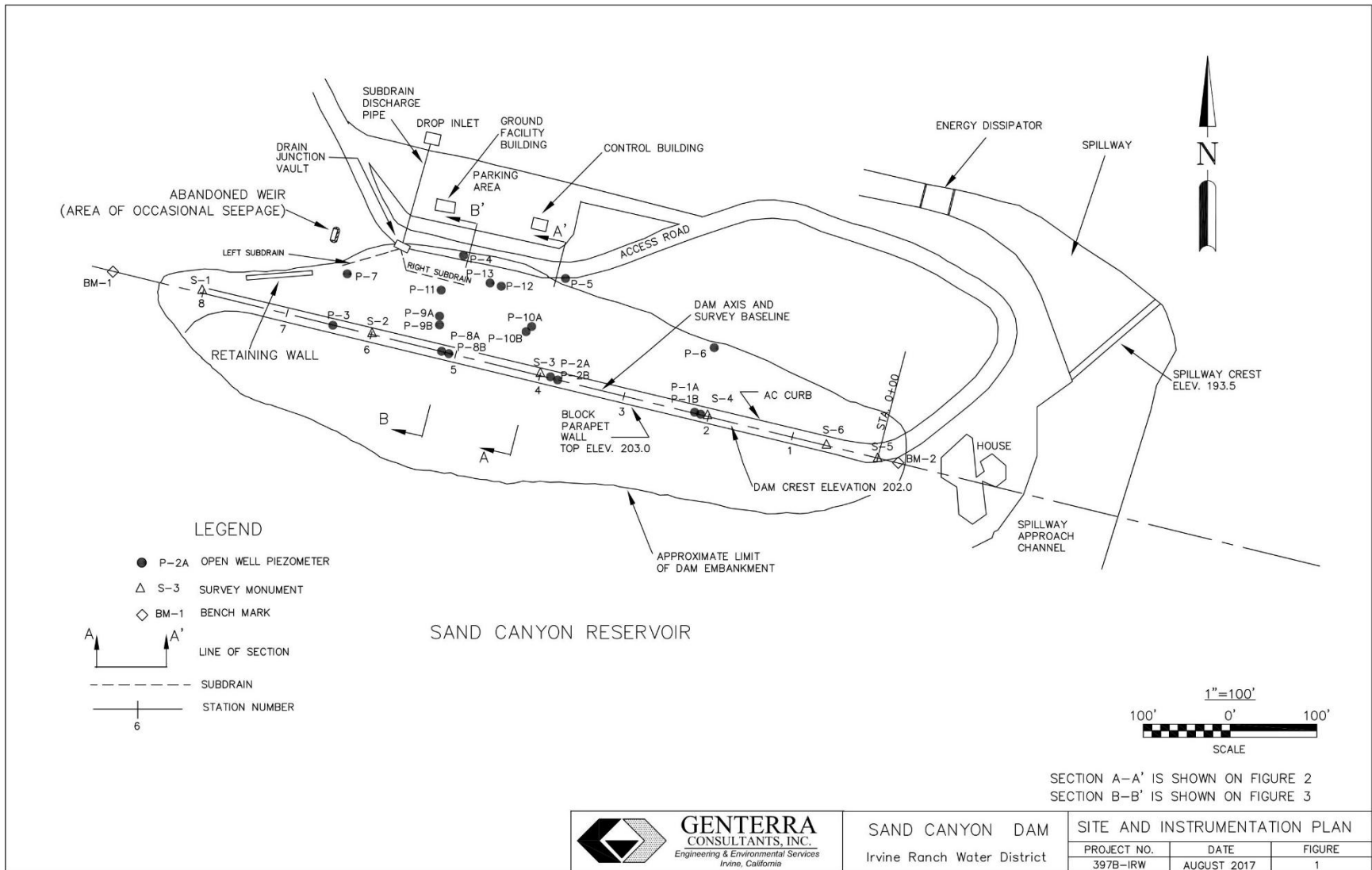


Figure 7-1 Monitoring and Surveillance Locations

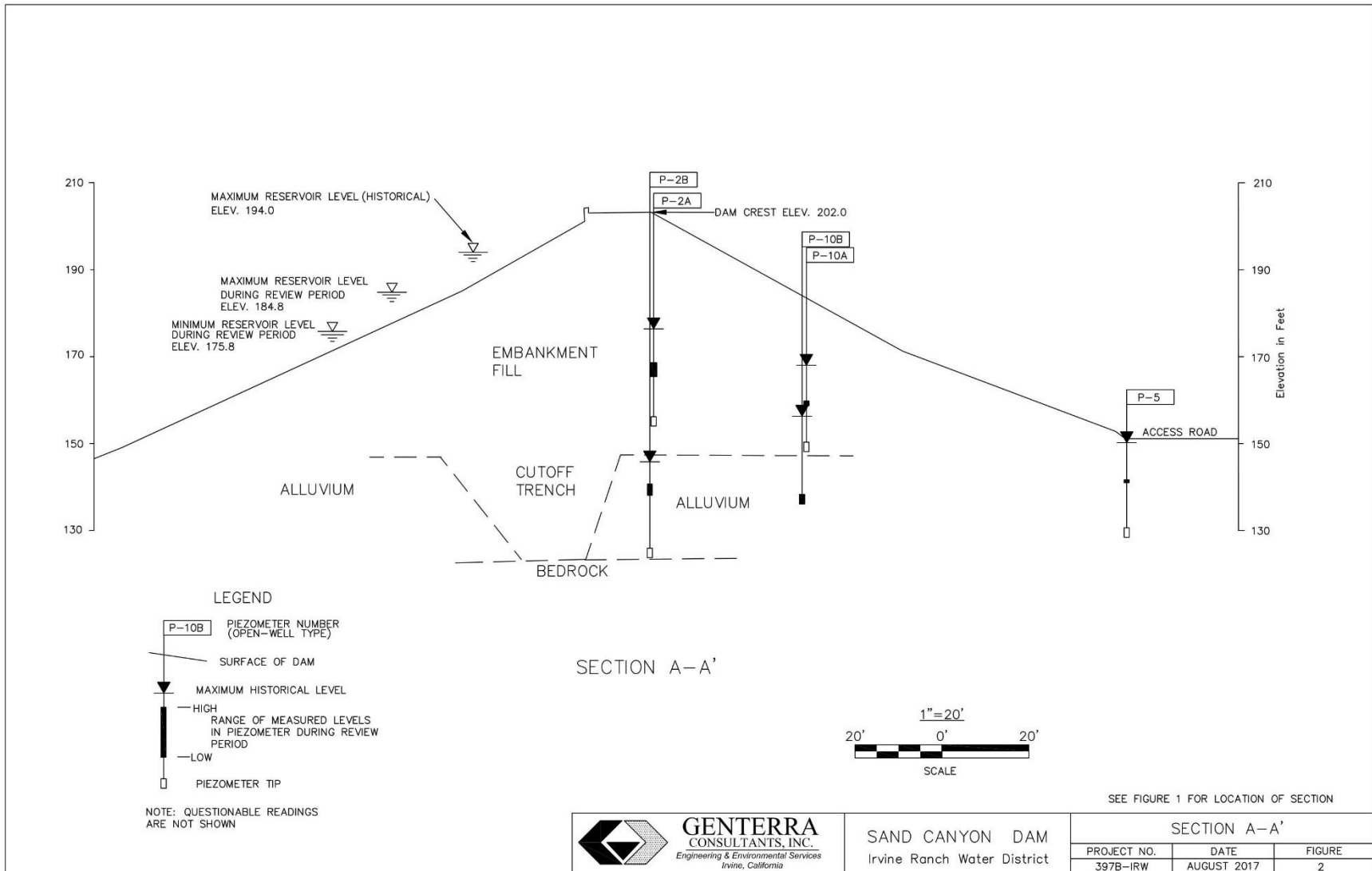


Figure 7-2 Monitoring and Surveillance Profile

7.2 Evaluation of Detection and Response Timing

Timely implementation of the EAP and coordination and communication with emergency management authorities are crucial elements in the effectiveness of the emergency response effort. Total EAP implementation time from the initiation of an actual incident to determination of an emergency situation and notification of appropriate entities involved with implementation is evaluated through annual exercises and training. The time from the initial detection of an incident through the determination of the emergency level and execution of the notifications to the appropriate entities should take no more than twenty minutes. The initial detection and notification time will be evaluated during IRWD's annual review and exercises (see Section 7.2.2), and may be updated in subsequent EAP revisions

7.2.1 Training

All personnel involved in the EAP should be familiar with the elements of the plan, their responsibilities and duties outlined in the plan and, if applicable, the types and availability of equipment during an emergency. Personnel should be familiar with problem detection and evaluation, and appropriate remediation actions, as detailed in this EAP.

7.2.2 Annual Review and Exercises

IRWD will review and, if needed, update the EAP at least once annually leading up to the emergency action plan notification exercise described below. This review includes calling all contact information listed to verify that contact names, phone numbers, addresses and other information is current. One of the most important tasks is to verify and update the contacts listed in the Emergency Notification Flowcharts in Section 3. Making updates to locally available resources along with the other information in the EAP is also important so that accurate information is readily available during an emergency.

In accordance with California Government Code Section 8589.5(c), at least once annually, IRWD will conduct an emergency action plan notification exercise with local public safety agencies, to the extent that a local public safety agency wishes to participate. This annual exercise is to ensure that emergency communications plans and processes are current and implemented effectively.

Exercises will follow the types of exercises defined in the Homeland Security Exercise and Evaluation Program (HSEEP), beginning with simple exercises and advancing to more complex exercises. Sufficient time should be provided between each exercise to learn and improve from the experiences of the previous exercise. IRWD, as the dam owner/operator, will coordinate with the City of Irvine, OCFA and the OCSD EMD in order to exercise the EAP. Exercises promote prevention, preparedness, and response to incidents and emergencies. Exercises may also be extended to include recovery operations. Periodic exercises result in an improved EAP as lessons learned are incorporated into the updated EAP document. The frequency and level of exercise will be determined in coordination with the City of Irvine, OCFA, the OCSD EMD and other local emergency response organizations.

The following are recommended frequencies for the exercise types described in the HSEEP:

- Seminars with primary emergency management authorities as part of the annual emergency action plan notification exercise – annually.
- Drills to test the notification flowcharts in Section 3 and emergency equipment/procedures (emergency action plan notification exercise) – annually.
- Tabletop exercise – every 3 to 4 years or before functional exercises.
- Functional exercise – every 5 years.
- Full scale exercise – as required to evaluate actual field movement and deployment. At least one functional exercise should be conducted before conducting a full-scale exercise.

Functional and full-scale exercises should be coordinated with other scheduled exercises, whenever possible, to share emergency management resources and reduce costs.

7.3 Access to the Site

Access to the Sand Canyon Dam can be coordinated with the dam operator at the phone numbers provided in the notification flowcharts in Section 3. Depending on the dam safety incident, IRWD may establish an operations center to coordinate dam safety response activities and provide information to other emergency response personnel. The dam is located in Irvine at the end of Strawberry Farm Road, south of the intersection of Michelson Drive and University Drive. The address of the dam is 82 Strawberry Farm Road, Irvine, CA 92612. Unescorted access to the dam site is not permitted. The site location, access routes, and facility layout is provided in Figures 1-1 and 1-2.

The primary access to the site is within the inundation area of a dam failure. If the primary access point is not available, access points upstream of the dam off of Shady Canyon Drive and Ridgeline Drive may be accessible and are not within the inundation area:

- From Shady Canyon Drive Access Road (33.640625, -117.792303), there is initial access with a vehicle, but some portions of this access route may be on foot only. This access route is outside the inundation area.
- From the Turtle Rock Pointe North neighborhood along Ridgeline Drive, a gated community accessible at (33.648288, -117.801361). From the neighborhood the dam may be accessed only on foot. This access route is outside the inundation area when approached from the south.

7.4 Response During Periods of Darkness

IRWD maintains a 24-hour emergency response staff to respond to various utility outages and emergency maintenance requirements. Because of the availability of 24-hour emergency response staff and the presence of a dam keeper on site, the response to an emergency incident during periods of darkness should not be significantly longer than the 20-minute daytime response time. Phone numbers in the notification charts are 24-hour contact numbers, so notification procedures during periods of darkness are the same as on weekdays.

Any dam safety incident that requires response actions during periods of darkness may require additional lighting such as portable floodlights. IRWD maintenance and construction personnel

can have rental lighting moved to the site in order to respond during times of darkness. Rental lighting equipment is located within 25 miles of the dam and could be moved to the dam site within 60 minutes. Additional lighting may also be required by the dam operator in order to perform visual surveillance of a potential or developing situation. Additional lighting options are also available through the IRWD purchasing and contracting department from locally available sources.

7.5 Response During Weekends and Holidays

IRWD staff are available for recall during emergencies. There is an on-site dam keeper who resides at the dam during weekends and holidays. The dam is not attended by the dam keeper during normal work-day hours, from 6 am to 4:30 pm on Monday through Thursday. However, it is still monitored remotely by IRWD staff during this time. For slowly developing situations, staff may be recalled and a 24-hour operations center may be established in order to have resources readily available should the situation deteriorate. A rapidly developing situation occurring after hours or during weekends and holidays may require the recall of engineering, maintenance, or other response personnel, and response may be delayed during the recall and mobilization of the IRWD staff. During weekends and holidays, IRWD staff could be onsite to assess a rapidly developing emergency within 60 minutes. This means that the daytime response time of 20 minutes could be extended by 60 minutes, for a weekend/holiday response time of about 90 minutes.

7.6 Response During Adverse Weather

Periods of adverse weather that could impact dam safety may require additional staff to be on-call or prepared to execute response actions. The IRWD Director of Water and Recycling Operations, in collaboration with the dam operator will make staffing recommendations to IRWD leadership during times of predicted adverse weather. Response time to an emergency situation may be lengthened by 30 minutes during periods of adverse weather. If the primary access to the site is affected by a dam failure, there is only foot access to the site. See Section 7.3 for access points and directions.

7.7 Alternative Sources of Power

IRWD maintains emergency backup generators for use in the district. Sand Canyon dam does not have backup power or generators on site. However, reservoir control valves and structures can be operated manually, and backup generators are not required to maintain normal operations at the dam.

IRWD maintains emergency backup generators for use in the district. Generators are located at the MWRP at 3512 Michelson Drive, Irvine, California, 92612, located about three miles northwest from Sand Canyon Dam. Generators may be brought to the site to power additional lighting if needed to evaluate the dam in periods of darkness. Generators may be brought to the dam site within 45 minutes.

7.8 Emergency Supplies and Information

IRWD maintains emergency supplies and response equipment for many potential response actions. IRWD’s supplies are centrally located at the MWRP at 3512 Michelson Drive, Irvine, California, 92612, located about three miles northwest of Sand Canyon Dam. IRWD emergency supplies are listed in Section 7.9. In the event that the IRWD internal response capabilities are exceeded *Table 7-1 Locally Available Resources* is provided to aid in securing additional response materials and equipment. The suppliers listed in Table 7-1 are typically open from 7am-5pm Monday through Friday; outside these hours, a dispatcher is typically available to handle after-hours requests. Secondary phone numbers have been listed where available.

Table 7-1 Locally Available Resources

| | Heavy Equipment Service and Rental | Sand and Gravel Supply | Ready-Mix Concrete Supply |
|----------------|---|------------------------------------|---|
| Company | Herc Rentals | PTI Sand and Gravel | National Ready Mix Concrete |
| Address | 3040 E Miraloma Ave Anaheim, CA 92806 | 14925 River Rd Corona, CA 92676 | 16282 Construction Dr Ctr Irvine, CA 92606 |
| Phone Numbers | | | |
| Contact Person | | | |

*Daytime and after-hours number: calling the main number after hours will route to an on-call employee.

7.9 Stockpiling Materials and Equipment

No equipment is stockpiled at Sand Canyon Dam. Because IRWD owns several dams, as well as other water facilities, IRWD centralizes its emergency supplies stockpile at the MWRP at 3512 Michelson Drive, Irvine, California, 92612, located about three miles northwest of Sand Canyon Dam. Supplies and equipment stockpiled centrally at MWRP are ready for deployment for use anywhere within the District’s boundary. Equipment and supplies stored at MWRP include generators; diesel fuel; construction equipment such as backhoes and excavators; vacuum trucks; compressors; tools; traffic control equipment; and excavation and backfill materials including sand, crushed rock and road base material. Equipment at MWRP can generally be moved to the dam site within 45 minutes. Equipment, materials, and supplies required that exceed the IRWD capabilities are locally accessible at the locations in *Table 7-1 Locally Available Resources*. Equipment obtained from third parties listed in Table 7-1 could be obtained within about 2 hours during regular business hours.

7.10 Coordination of Information

In the event of an emergency at Sand Canyon Dam, IRWD will notify the NWS so that they can issue appropriate flood watches and warnings. Contact numbers and notification procedures for NWS are outlined in Sections 3.1 and 3.2. No extremely high flow, overflow, or emergency flow incidents are known to have occurred at Sand Canyon Dam.

Phone numbers and email addresses have been removed from this publicly posted copy of this Emergency Action Plan. That information is available from Irvine Ranch Water District’s district secretary: Phone 949-453-5300, Email Comments@IRWD.com

The Sand Canyon Reservoir stores recycled water and does not collect significant runoff from upstream. The water level in the reservoir is controlled through input valves, and if a potential or developing dam safety incident requires the lowering of the reservoir level, this must be done in accordance with the standard operating procedures maintained by the MWRP. All actions associated with controlling flow into or out of the reservoir must be coordinated with the dam operator or a representative designated by IRWD.

There are no dams upstream or downstream of Sand Canyon Dam which would contribute to or be affected by an emergency event at the dam, so no coordination is required with other dams.

IRWD will work with emergency personnel to keep them up to date on any situation involving the Sand Canyon Dam. Communication between IRWD and emergency management authorities may be facilitated by the County and OA JIS as described in the County and OA EOP. The Water Operations Manager may designate staff members to act as liaisons at the ICP, a Unified Command, or at various EOCs, as required.

7.11 Training and Exercise

IRWD operations and maintenance staff receive training to ensure that they are thoroughly familiar with the elements of the EAP and potential response actions. The operations, engineering staff, and appropriate MWRP personnel are trained in the incident management process, including detection, evaluation, notification, and appropriate response actions during all emergency level determinations. IRWD duty staff are trained in notification requirements for dam safety incidents to ensure that the appropriate recall actions are initiated after working hours.

In accordance with California Government Code Section 8589.5(c), at least once annually, IRWD will conduct an emergency action plan notification exercise with local public safety agencies, to the extent that a local public safety agency wishes to participate. This annual exercise is to ensure that emergency communications plans and processes are current and implemented effectively. All contact information in the notification charts will be updated and verified; next, a notification exercise will be conducted to simulate the phone calls required in the notification charts. The timing and procedures in the notification exercise will be noted, and the EAP will be updated based on feedback from the participants.

Because the Sand Canyon Dam is categorized as an extremely high-risk dam, local emergency management authorities may develop evacuation and shelter-in-place training materials for people who would be affected by a dam failure in their jurisdiction. These requirements and materials will be determined and developed through the review and exercise process described in Section 7.2.

7.12 Alternative Systems of Communication

In the event of a dam safety emergency, the IC and emergency response personnel have access to various forms of alternative communication including social media, radio broadcasts, amber alerts, and opt-in email and cellphone lists.

IRWD maintains an operations communication architecture for internal communication. Communication at the dam is facilitated by the on-site dam keeper. The dam keeper is able to use a cellular phone, land line telephone, or computer connected to the internet to communicate with other IRWD personnel and emergency response personnel.

7.13 Public Awareness and Communication

IRWD will utilize already established communication protocols and channels to publish and promote established inter-agency emergency procedures within the affected area. In addition, information on the location of reservoir as well as related emergency procedures will be available on the IRWD website (<https://www.irwd.com/>).

In order to further prepare the public for a dam safety incident IRWD will implement the following measures:

- Educate customers about established IRWD emergency notification systems, which include the ability to text, call or email customers in the event of an emergency such as a dam safety incident.
- Promote the emergency preparedness section on the IRWD website and through various communications channels including the monthly customers billing insert and social media channels.
- Coordinate emergency outreach programs with residents and businesses in close proximity to the reservoir through cities, fire and police departments and the County of Orange.
- Post a map of the inundation area on the IRWD website so that members of the public may see if they live within possible impacted areas.
- Post a summary of the annual EAP exercise on the IRWD website each year.
- Update existing information on dam safety and emergency-preparedness on the IRWD website within one month of the approval of the EAP. After each annual review, updates will be made to the website as necessary.
- Complete outreach to customers through existing outreach channels within 4 months of completion of the EAP.

The timing and frequency of additional outreach measures will be evaluated and updated as part of the annual EAP review.

Section 8: Plan Maintenance

8.1 Plan Review

The EAP Coordinator will review and update the EAP at least once annually leading up to the emergency action plan notification exercise described below. This review includes calling all contact information listed to verify that contact names, phone numbers, addresses and other information is current. One of the most important tasks is to update the contacts listed in the Emergency Notification Flowcharts in Section 3. Making updates to locally available resources along with the other information in the EAP is also important so that accurate information is readily available during an emergency.

In accordance with California Government Code Section 8589.5(c), at least once annually, IRWD will conduct an emergency action plan notification exercise with local public safety agencies, to the extent that a local public safety agency wishes to participate. This annual exercise is to ensure that emergency communications plans and processes are current and implemented effectively.

In accordance with California Water Code section 6161(e), IRWD will update the EAP, including the inundation maps, no less frequently than every 10 years, and sooner under conditions that include: (1) a significant modification to the dam or a critical appurtenant structure and (2) a significant change to downstream development that involves people and property. The inundation maps for this EAP are dated June 12, 2018 and are set to require updating by June 12, 2028.

8.2 Distribution

A status report will be prepared annually that documents the plan review and any exercises that occurred. The EAP will be revised, as required, to incorporate updated information or lessons learned during exercises/event after action reports. Changes will be documented in the revision log in Appendix B, Record of EAP Revisions.

Electronic copies of the EAP Status Report (Appendix A) and revised EAP will be distributed to the EAP Plan Holders annually via email (Appendix C). The EAP Plan Holders include all parties on the notification flowcharts.

To request a copy of the Emergency Action Plan for Sand Canyon Dam, please contact the EAP Coordinator:

Steve Choi, Director of Safety and Security
Irvine Ranch Water District
3512 Michelson Drive
Irvine, CA 92612-1799

Phone numbers and email addresses have been removed from this publicly posted copy of this Emergency Action Plan. That information is available from Irvine Ranch Water District's district secretary: Phone 949-453-5300, Email Comments@IRWD.com

PART II: Inundation Maps

DEPARTMENT OF WATER RESOURCES

1416 NINTH STREET, P.O. BOX 942836
SACRAMENTO, CA 94236-0001
(916) 653-5791



JUL 12 2018

Mr. Paul Cook, General Manager
Irvine Ranch Water District
Post Office Box 57000
Irvine, California 92619-7000

Sand Canyon Dam, No. 1029-2
Orange County

Dear Mr. Cook:

We have reviewed the revised inundation maps dated June 12, 2018, submitted by Stetson Engineers, Inc. with a cover letter dated June 15, 2018, for Sand Canyon Dam and its spillway, which was identified as a critical appurtenant structure. We have determined that the maps meet the requirements of Title 23, Division 2, Chapter 1, Article 6 of the California Code of Regulations. Therefore, the inundation maps associated with the failure of the dam and the spillway are approved.

The approved maps will be made publicly available as required by section 6161(c) of the California Water Code. An emergency action plan (EAP) based on the approved inundation maps must now be submitted to the California Governor's Office of Emergency Services (Cal OES) for their review and approval. Upon Cal OES approval, please provide us with an electronic and hard copy of the approved EAP per section 6161(b)(3) of the CA Water Code.

Pursuant to section 6161(e) of the CA Water Code, the EAP and inundation maps must be updated no less frequently than every 10 years, and sooner under conditions that include, but are not limited to, the following: (1) a significant modification to the dam or a critical appurtenant structure, as determined by the department, and/or (2) a significant change to downstream development that involves people and property.

We recommend that you submit your next update at least six months prior to the expiration of your map on June 12, 2028, for our review and approval to meet the 10-year statutory requirement.

Mr. Cook

Page 2

If you have any questions or need additional information, you may contact Design Engineer Y-Nhi Enzler at (916) 736-2307 or Program Manager Ariya Balakrishnan at (916) 227-6742.

Sincerely,

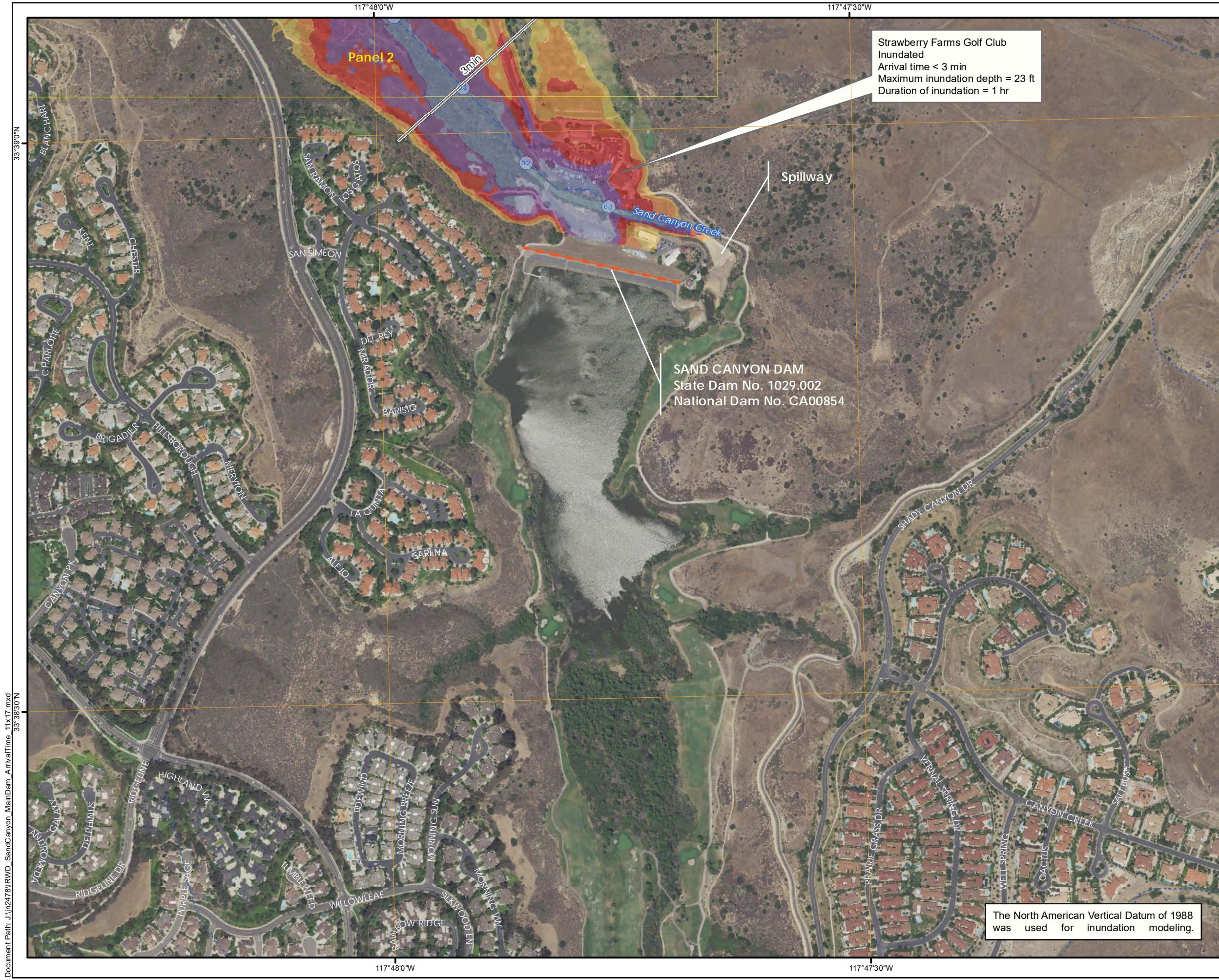
A handwritten signature in cursive script that reads "Sharon K. Tapia".

Sharon K. Tapia, Chief
Division of Safety of Dams

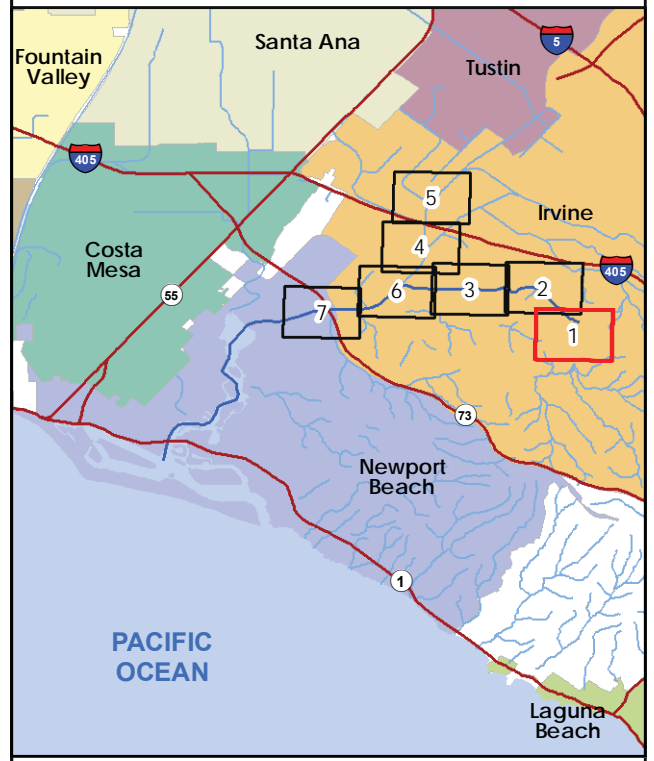
cc: Mr. José Lara, Chief
Dam Emergency Action Planning Division
California Governor's Office of Emergency Service
3650 Schriever Avenue
Mather, California 95655

Mr. Jeff Symons, Project Manager
Stetsons Engineers, Inc.
785 Grand Avenue, Suite 202
Carlsbad, California 92008

Main Dam Failure - Arrival Time



**SAND CANYON DAM
SUNNY DAY FAILURE INUNDATION MAP
FLOOD ARRIVAL TIME**
STATE DAM NO. 1029.002
NATIONAL DAM NO. CA00854
ORANGE COUNTY, CALIFORNIA



Legend

| | | |
|---------------|------------|------------|
| River Mile | 0 - 5 ft | 20 - 25 ft |
| Arrival Time | 5 - 10 ft | 25 - 30 ft |
| Dam Crest | 10 - 15 ft | 30 - 35 ft |
| Creek | 15 - 20 ft | 35 - 40 ft |
| Map Panel # | | |
| City Boundary | | |

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

This map meets all applicable state and federal standards and has been prepared in consideration of all potential downstream hazards by a licensed civil engineer.

Molly Palmer,
Civil Engineer 71788
Expiration Date December 31, 2019

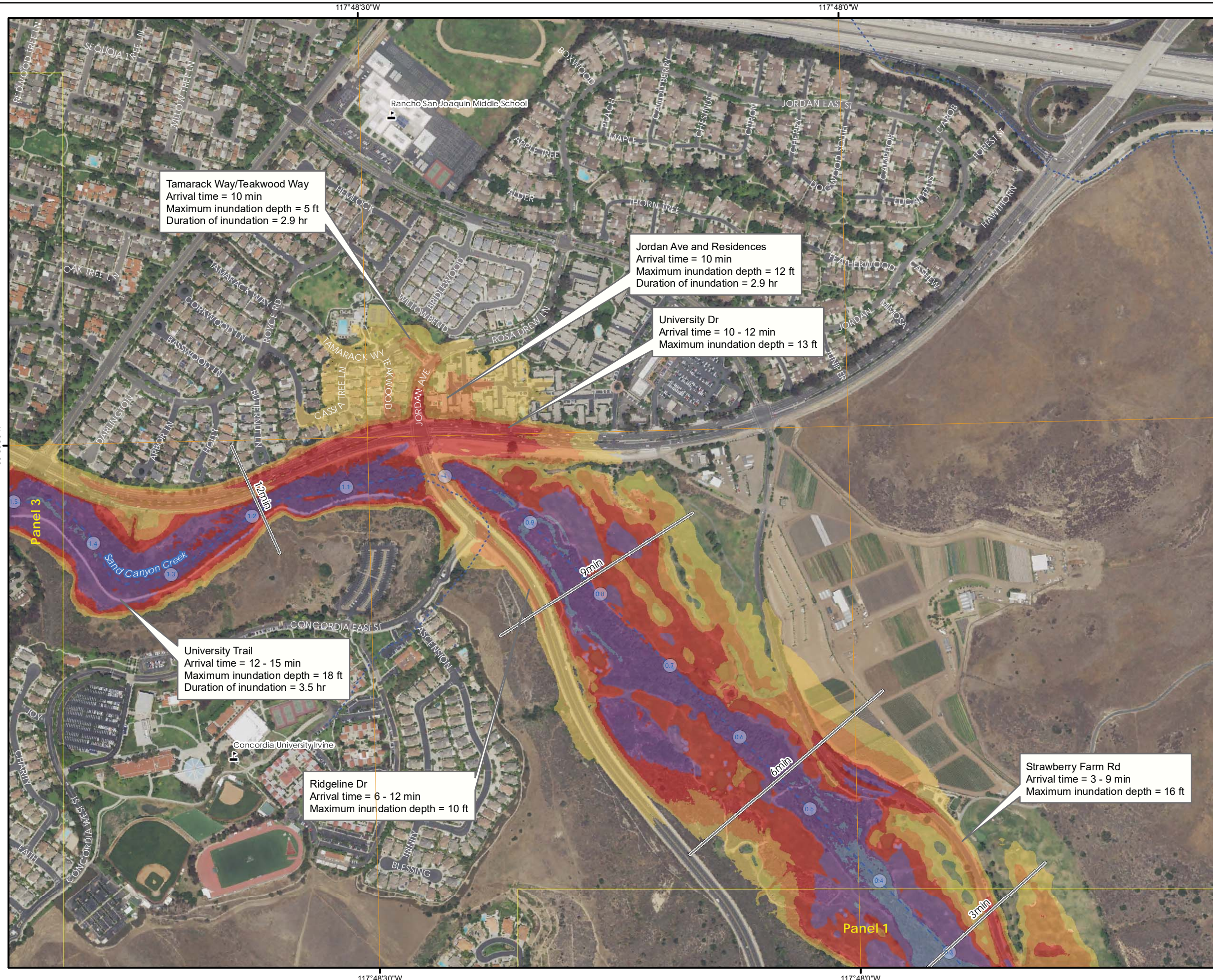
PANEL 1 of 7

12/29/2017
REVISED 6/12/2018

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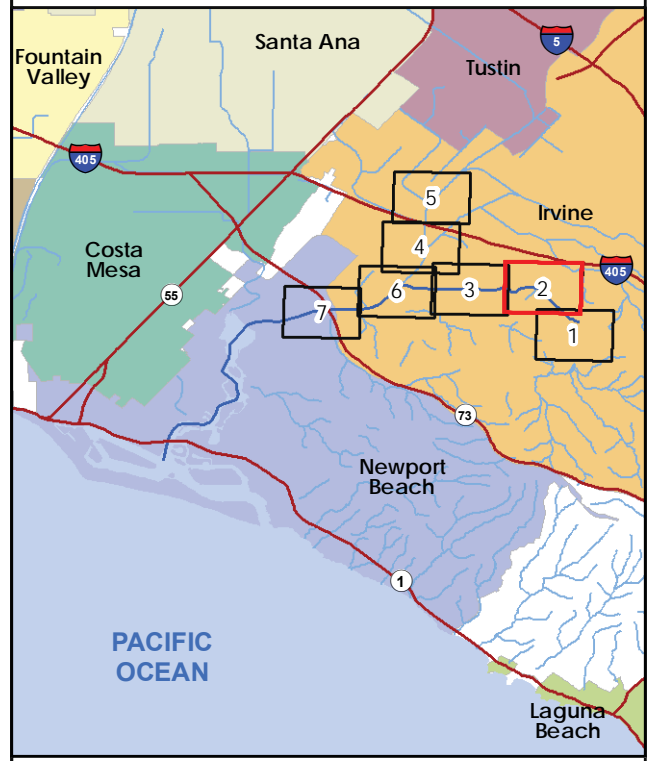
0 100 200 Meters

The North American Vertical Datum of 1988 was used for inundation modeling.



SAND CANYON DAM SUNNY DAY FAILURE INUNDATION MAP FLOOD ARRIVAL TIME

STATE DAM NO. 1029.002
NATIONAL DAM NO. CA00854
ORANGE COUNTY, CALIFORNIA



Legend

| | | |
|--|--------------------------|--|
| | Maximum Inundation Depth | |
| | | |
| | | |
| | | |
| | | |
| | | |

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

This map meets all applicable state and federal standards and has been prepared in consideration of all potential downstream hazards by a licensed civil engineer.

Molly Palmer

REGISTERED PROFESSIONAL ENGINEER
MOLLY R. PALMER
C 71788
EXP 12/31/19
CIVIL
STATE OF CALIFORNIA

Molly Palmer,
Civil Engineer 71788
Expiration Date December 31, 2019

PANEL 2 of 7

12/29/2017
REVISED 6/12/2018

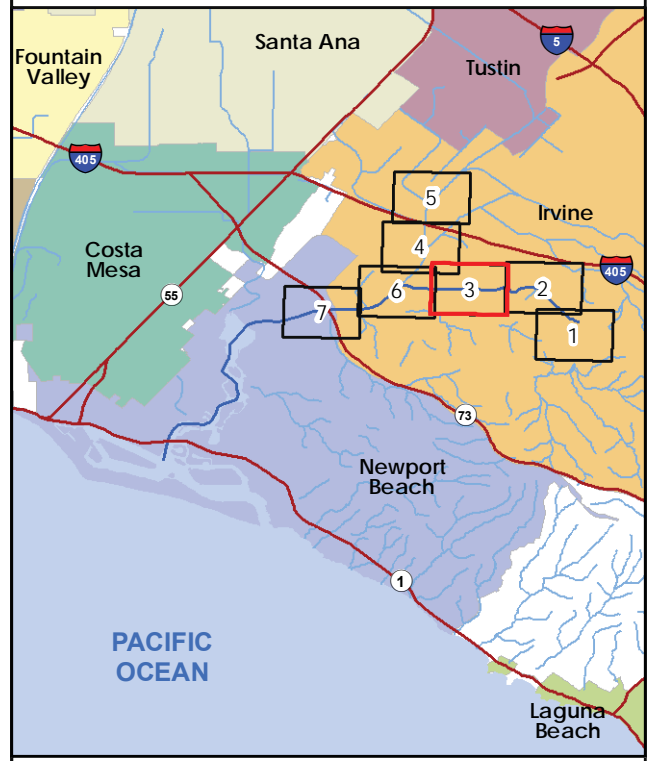
STETSON ENGINEERS INC.

0 250 500 750 Feet
0 100 200 Meters



SAND CANYON DAM SUNNY DAY FAILURE INUNDATION MAP FLOOD ARRIVAL TIME

STATE DAM NO. 1029.002
NATIONAL DAM NO. CA00854
ORANGE COUNTY, CALIFORNIA



Legend

| | | |
|---------------|------------|------------|
| River Mile | 0 - 5 ft | 20 - 25 ft |
| Arrival Time | 5 - 10 ft | 25 - 30 ft |
| Creek | 10 - 15 ft | 30 - 35 ft |
| School | 15 - 20 ft | 35 - 40 ft |
| Map Panel # | | |
| City Boundary | | |

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

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Molly Palmer,
Civil Engineer 71788
Expiration Date December 31, 2019

PANEL 3 of 7

STETSON ENGINEERS INC.

12/29/2017
REVISED 6/12/2018

0 250 500 750 Feet

0 100 200 Meters

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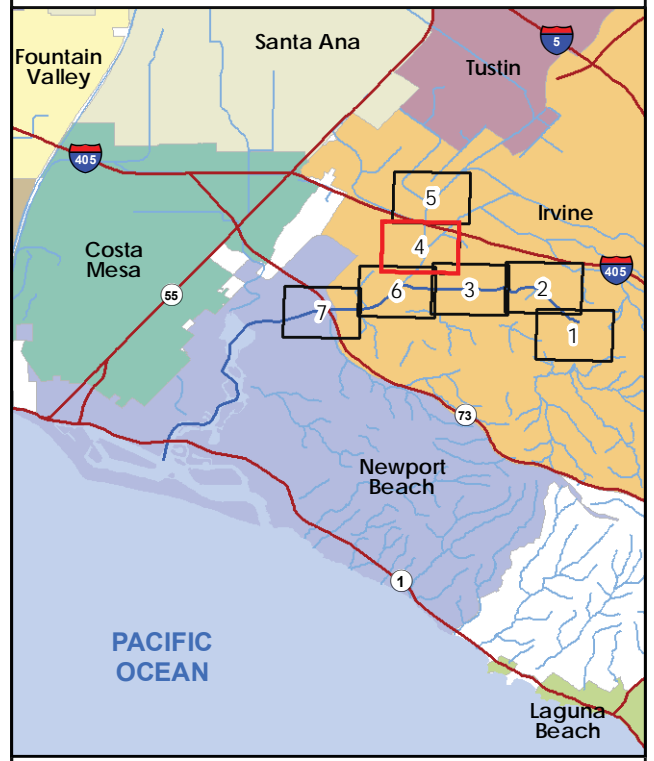


Interstate 405
Not overtopped
Arrival time = 1.3 hr
Maximum depth in channel = 7 ft

Michelson Dr
Not overtopped
Arrival time = 1.2 hr
Maximum depth in channel = 7 ft

SAND CANYON DAM SUNNY DAY FAILURE INUNDATION MAP FLOOD ARRIVAL TIME

STATE DAM NO. 1029.002
NATIONAL DAM NO. CA00854
ORANGE COUNTY, CALIFORNIA



Legend

| | | |
|---------------|------------|------------|
| Arrival Time | 0 - 5 ft | 20 - 25 ft |
| Creek | 5 - 10 ft | 25 - 30 ft |
| School | 10 - 15 ft | 30 - 35 ft |
| Map Panel # | 15 - 20 ft | 35 - 40 ft |
| City Boundary | | |

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

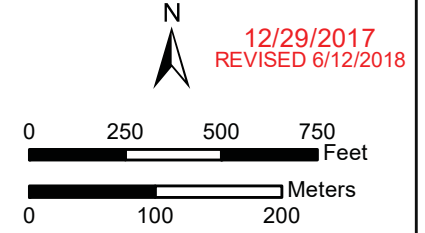
This map meets all applicable state and federal standards and has been prepared in consideration of all potential downstream hazards by a licensed civil engineer.

Molly Palmer



Molly Palmer,
Civil Engineer 71788
Expiration Date December 31, 2019

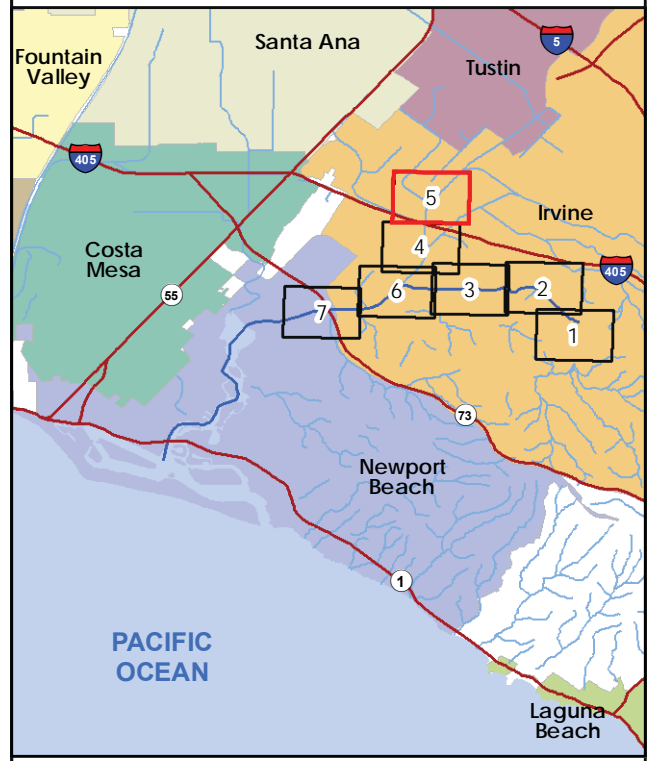
PANEL 4 of 7





SAND CANYON DAM SUNNY DAY FAILURE INUNDATION MAP FLOOD ARRIVAL TIME

STATE DAM NO. 1029.002
NATIONAL DAM NO. CA00854
ORANGE COUNTY, CALIFORNIA



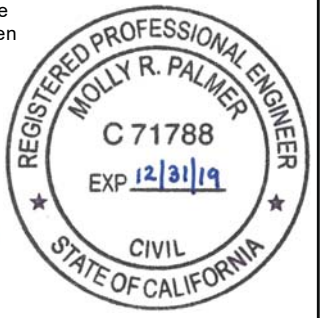
Legend

| | | | | | |
|--|----------------|--|------------|--|------------|
| | Arrival Time | | 0 - 5 ft | | 20 - 25 ft |
| | Creek | | 5 - 10 ft | | 25 - 30 ft |
| | Police Station | | 10 - 15 ft | | 30 - 35 ft |
| | School | | 15 - 20 ft | | 35 - 40 ft |
| | Map Panel # | | | | |
| | City Boundary | | | | |

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

This map meets all applicable state and federal standards and has been prepared in consideration of all potential downstream hazards by a licensed civil engineer.

Molly Palmer,
 Civil Engineer 71788
 Expiration Date December 31, 2019



PANEL 5 of 7

STETSON ENGINEERS INC.

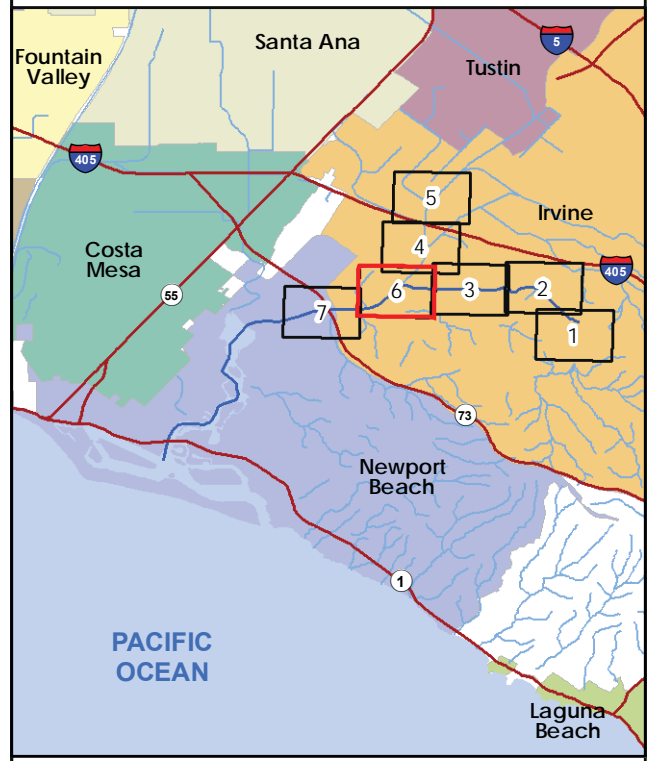
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REVISED 6/12/2018

0 250 500 750 Feet

0 100 200 Meters



**SAND CANYON DAM
 SUNNY DAY FAILURE INUNDATION MAP
 FLOOD ARRIVAL TIME**
 STATE DAM NO. 1029.002
 NATIONAL DAM NO. CA00854
 ORANGE COUNTY, CALIFORNIA



Legend

| | | |
|---------------|------------|------------|
| River Mile | 0 - 5 ft | 20 - 25 ft |
| Arrival Time | 5 - 10 ft | 25 - 30 ft |
| Creek | 10 - 15 ft | 30 - 35 ft |
| School | 15 - 20 ft | 35 - 40 ft |
| Map Panel # | | |
| City Boundary | | |

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

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REGISTERED PROFESSIONAL ENGINEER
 MOLLY R. PALMER
 C 71788
 EXP 12/31/19
 CIVIL
 STATE OF CALIFORNIA

Molly Palmer,
 Civil Engineer 71788
 Expiration Date December 31, 2019

PANEL 6 of 7

12/29/2017
 REVISED 6/12/2018

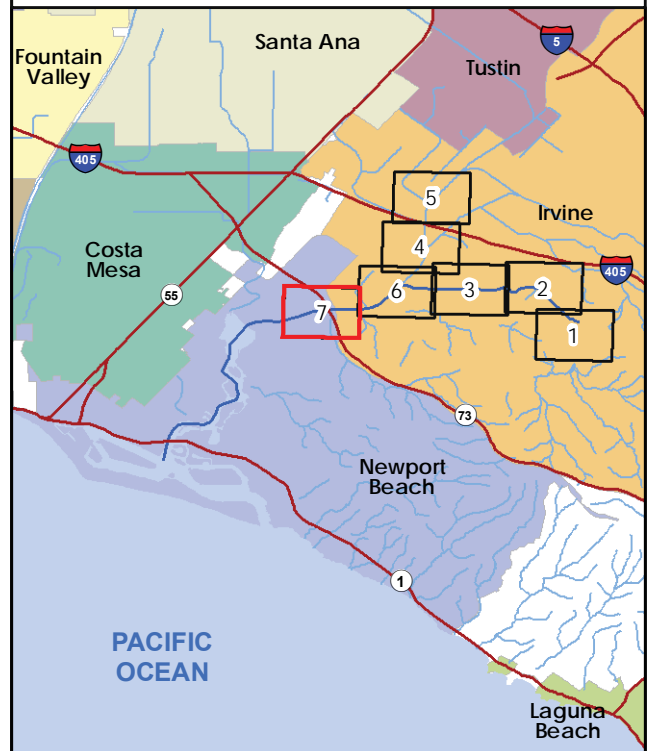
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117°52'0"W

117°51'30"W



**SAND CANYON DAM
SUNNY DAY FAILURE INUNDATION MAP
FLOOD ARRIVAL TIME**
STATE DAM NO. 1029.002
NATIONAL DAM NO. CA00854
ORANGE COUNTY, CALIFORNIA



Legend

| | | |
|---------------|------------|------------|
| River Mile | 0 - 5 ft | 20 - 25 ft |
| Arrival Time | 5 - 10 ft | 25 - 30 ft |
| Creek | 10 - 15 ft | 30 - 35 ft |
| Map Panel # | 15 - 20 ft | 35 - 40 ft |
| City Boundary | | |

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

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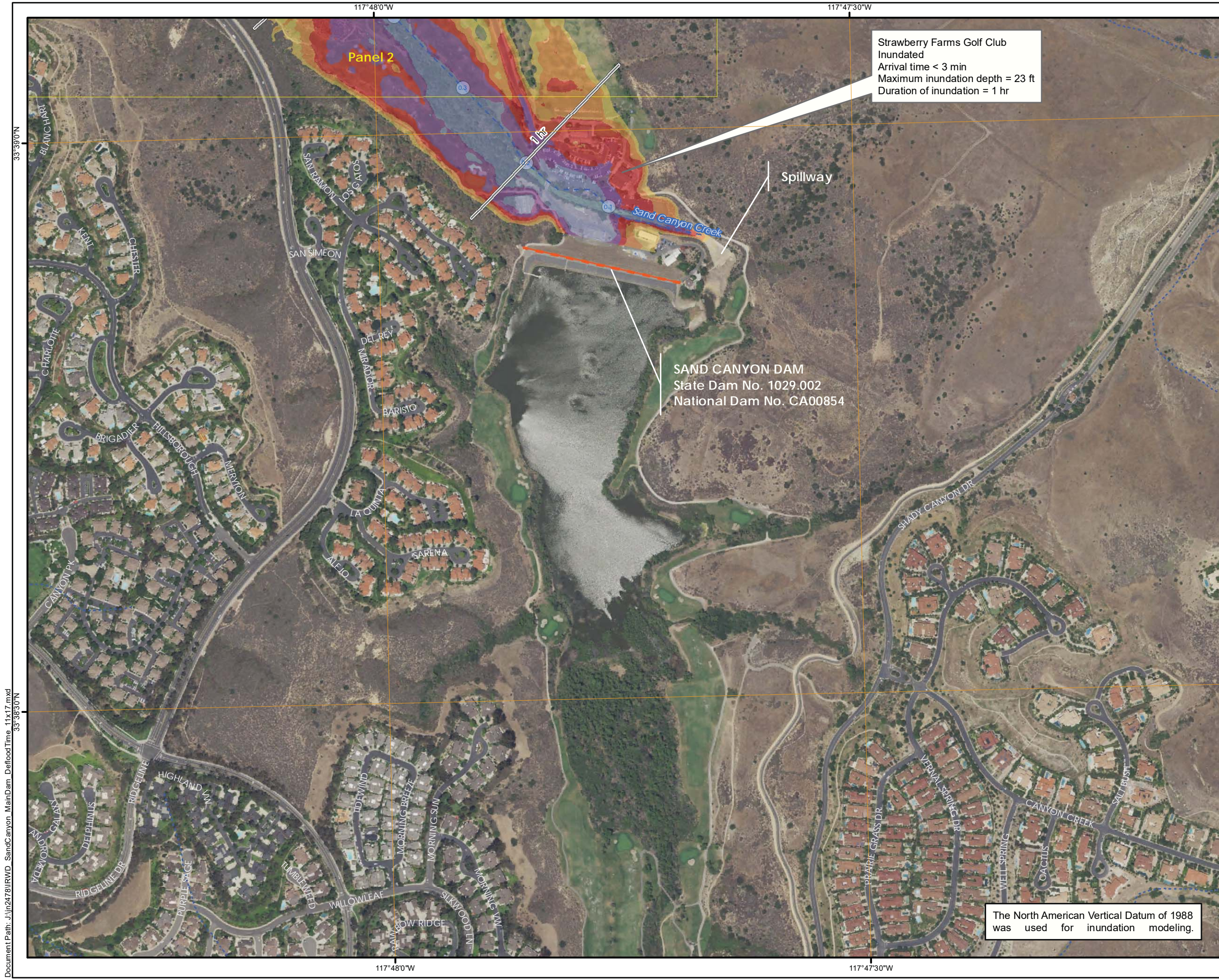
Molly Palmer,
Civil Engineer 71788
Expiration Date December 31, 2019

PANEL 7 of 7

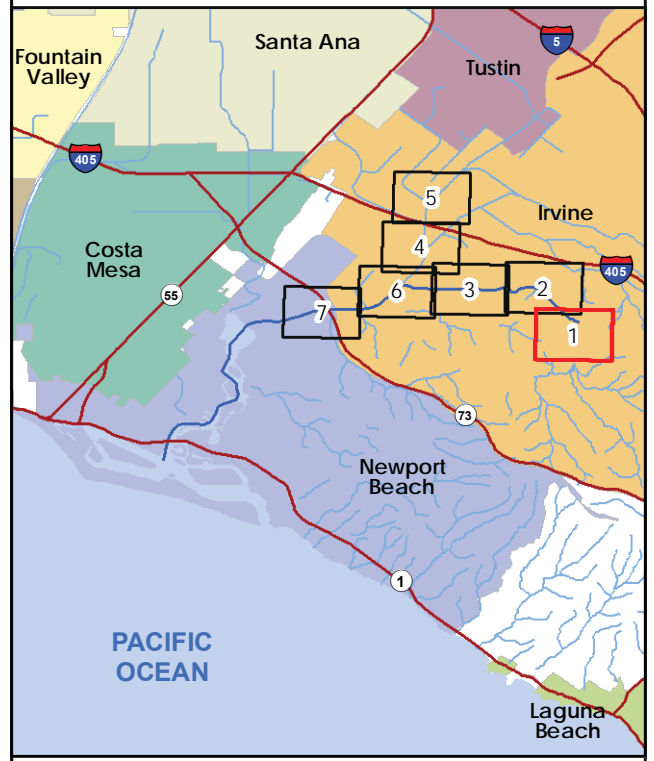
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REVISED 6/12/2018

0 250 500 750 Feet
0 100 200 Meters

Main Dam Failure - Deflood Time



**SAND CANYON DAM
SUNNY DAY FAILURE INUNDATION MAP
DEFLOOD TIME**
STATE DAM NO. 1029.002
NATIONAL DAM NO. CA00854
ORANGE COUNTY, CALIFORNIA



Legend

| | | |
|---------------|------------|------------|
| River Mile | 0 - 5 ft | 20 - 25 ft |
| Deflood Time | 5 - 10 ft | 25 - 30 ft |
| Dam Crest | 10 - 15 ft | 30 - 35 ft |
| Creek | 15 - 20 ft | 35 - 40 ft |
| Map Panel # | | |
| City Boundary | | |

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

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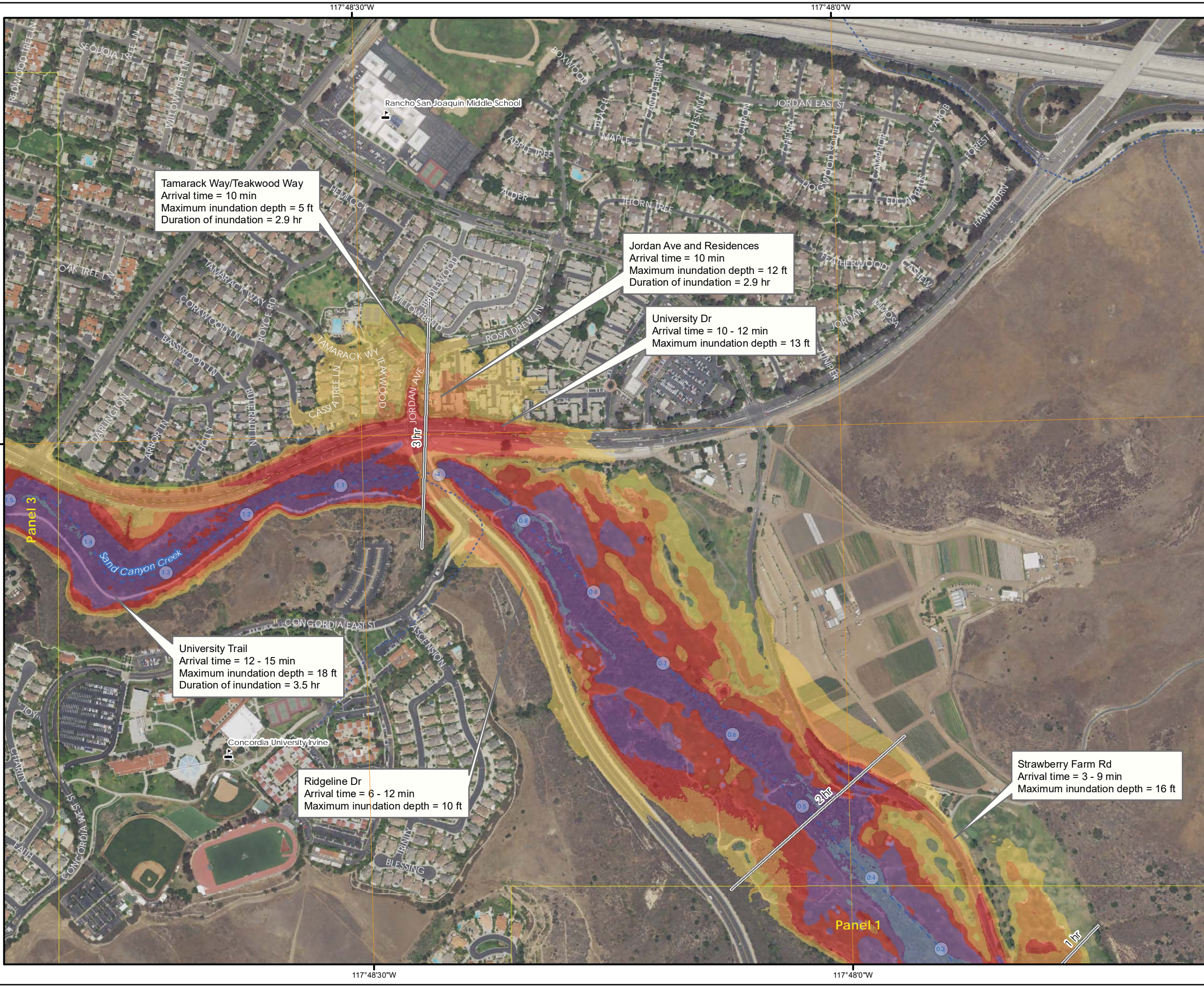
Molly Palmer,
Civil Engineer 71788
Expiration Date December 31, 2019

PANEL 1 of 7

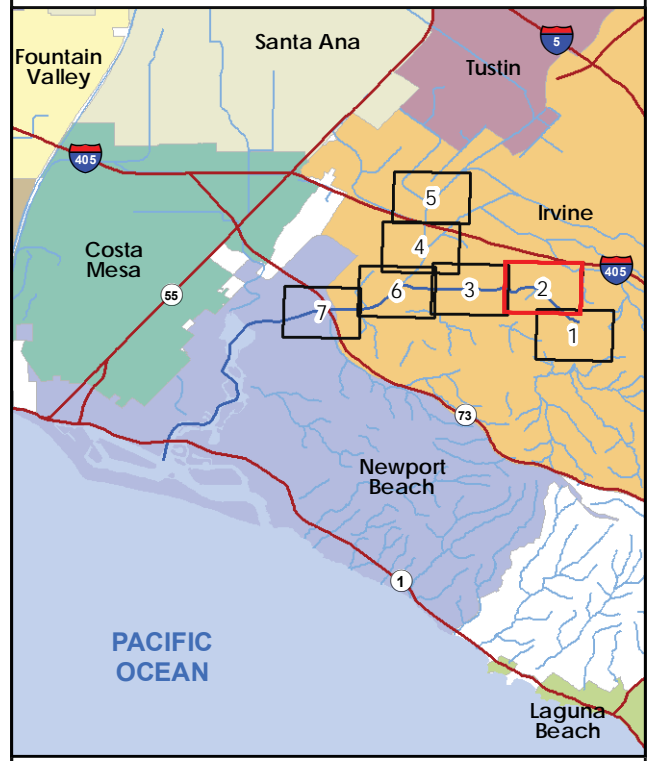
12/29/2017
REVISED 6/12/18

0 250 500 750 Feet
0 100 200 Meters

Document Path: J:\m2478\IRWD_SandCanyon_MainDam_DefloodTime_11x17.mxd



**SAND CANYON DAM
SUNNY DAY FAILURE INUNDATION MAP
DEFLOOD TIME**
STATE DAM NO. 1029.002
NATIONAL DAM NO. CA00854
ORANGE COUNTY, CALIFORNIA



Legend

| | | |
|---------------|------------|------------|
| River Mile | 0 - 5 ft | 20 - 25 ft |
| Deflood Time | 5 - 10 ft | 25 - 30 ft |
| Creek | 10 - 15 ft | 30 - 35 ft |
| School | 15 - 20 ft | 35 - 40 ft |
| Map Panel # | | |
| City Boundary | | |

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

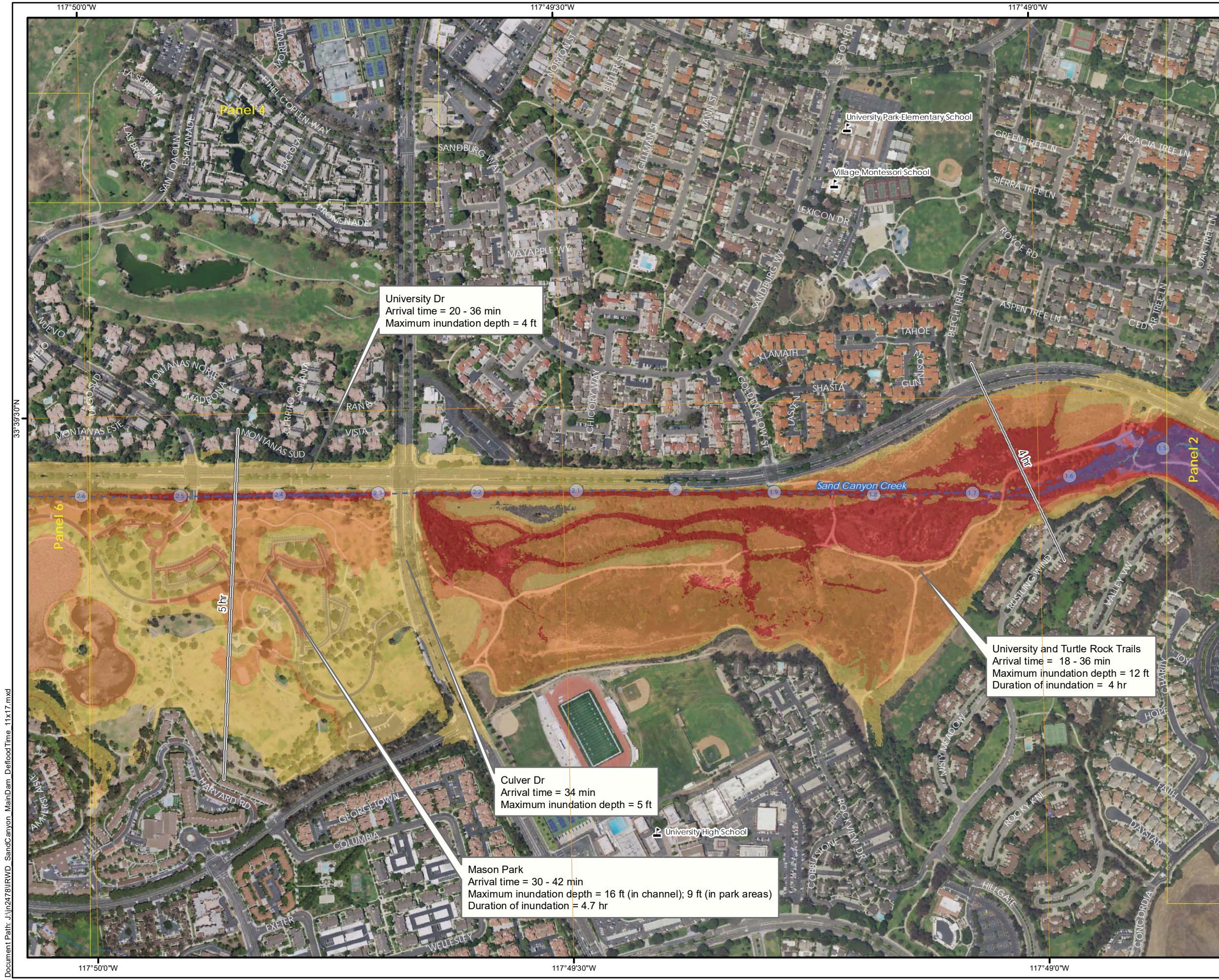
This map meets all applicable state and federal standards and has been prepared in consideration of all potential downstream hazards by a licensed civil engineer.

Molly Palmer,
Civil Engineer 71788
Expiration Date December 31, 2019

PANEL 2 of 7

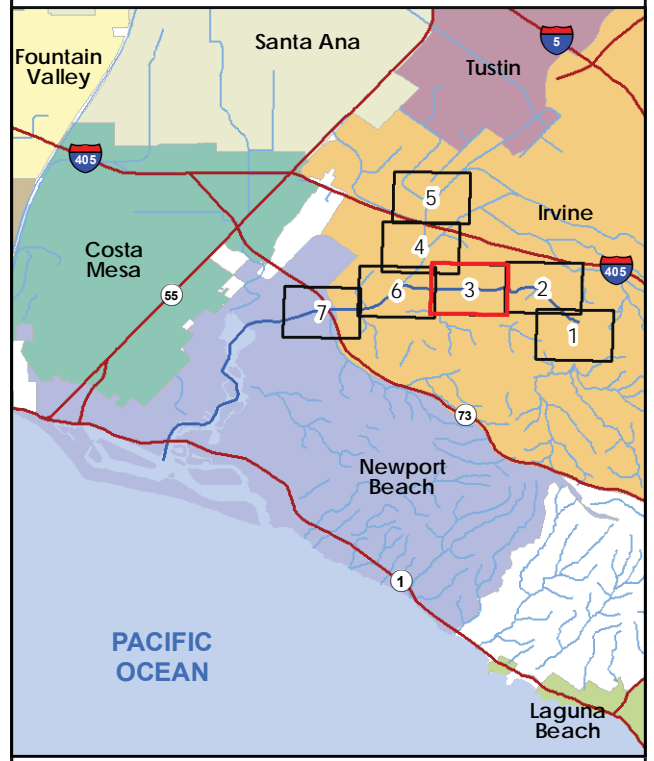
12/29/2017
REVISED 6/12/18

0 250 500 750 Feet
0 100 200 Meters



SAND CANYON DAM SUNNY DAY FAILURE INUNDATION MAP DEFLOOD TIME

STATE DAM NO. 1029.002
NATIONAL DAM NO. CA00854
ORANGE COUNTY, CALIFORNIA



Legend

| | | | | | |
|--|---------------|--|------------|--|------------|
| | River Mile | | 0 - 5 ft | | 20 - 25 ft |
| | Deflood Time | | 5 - 10 ft | | 25 - 30 ft |
| | Creek | | 10 - 15 ft | | 30 - 35 ft |
| | School | | 15 - 20 ft | | 35 - 40 ft |
| | Map Panel # | | | | |
| | City Boundary | | | | |

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

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Civil Engineer 71788
Expiration Date December 31, 2019

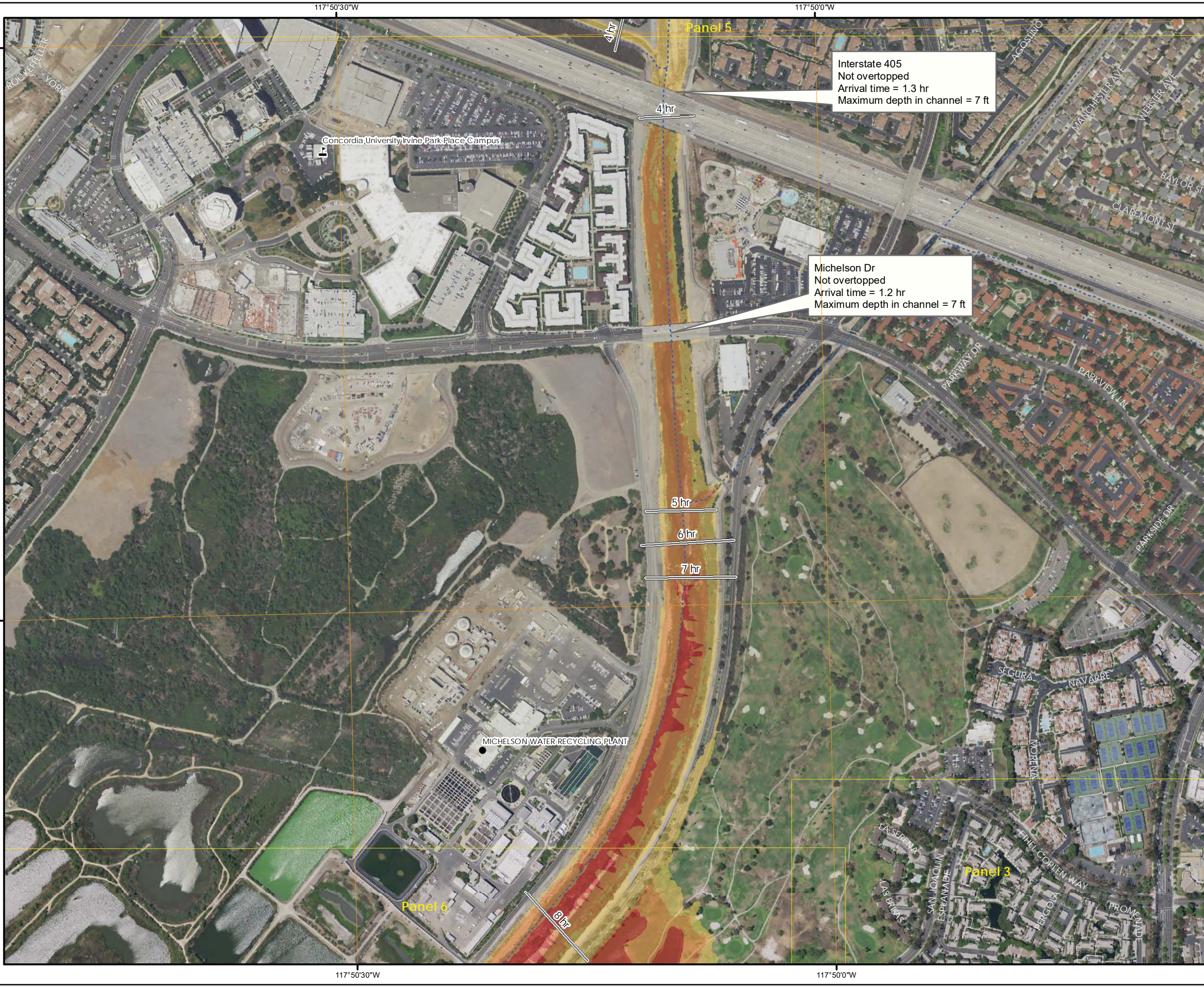
PANEL 3 of 7

12/29/2017
REVISED 6/12/18

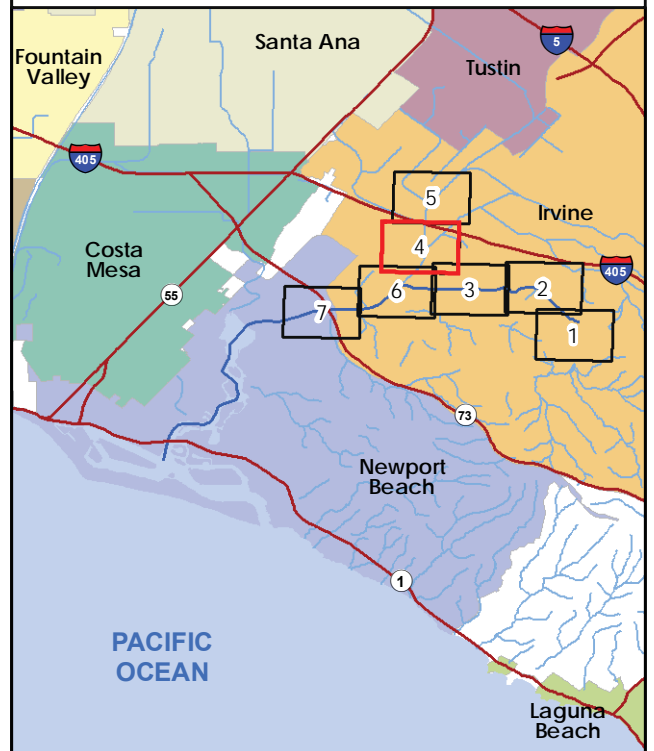
0 250 500 750 Feet

0 100 200 Meters

Document Path: J:\m2478\RW\SD_Canyon_MainDam_DefloodTime_11x17.mxd



**SAND CANYON DAM
SUNNY DAY FAILURE INUNDATION MAP
DEFLOOD TIME**
STATE DAM NO. 1029.002
NATIONAL DAM NO. CA00854
ORANGE COUNTY, CALIFORNIA



Legend

| | | |
|---------------|------------|------------|
| Deflood Time | 0 - 5 ft | 20 - 25 ft |
| Creek | 5 - 10 ft | 25 - 30 ft |
| School | 10 - 15 ft | 30 - 35 ft |
| Map Panel # | 15 - 20 ft | 35 - 40 ft |
| City Boundary | | |

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

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Molly Palmer,
Civil Engineer 71788
Expiration Date December 31, 2019

PANEL 4 of 7

12/29/2017
REVISED 6/12/18

0 250 500 750 Feet
0 100 200 Meters

117°50'30"W

117°50'0"W

117°49'30"W

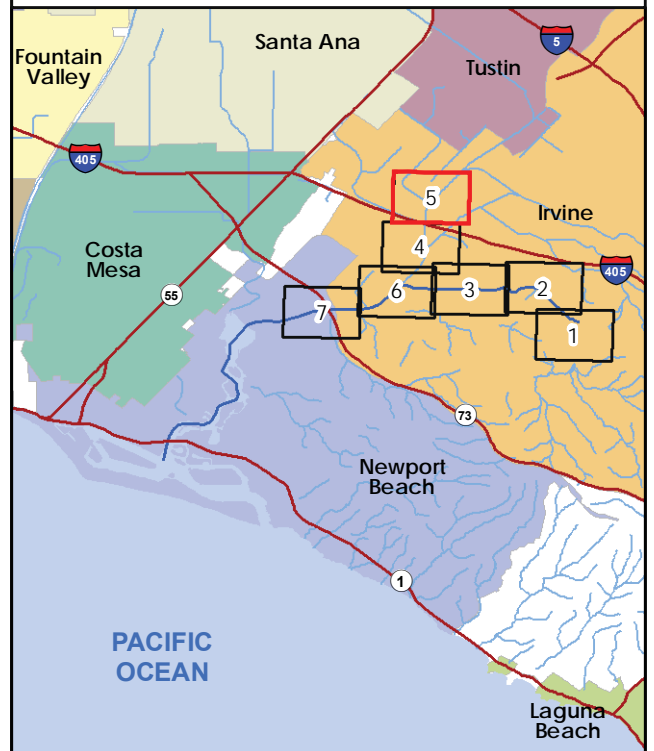


Alton Pkwy
 Not overtopped
 Arrival time = 2.1 hr
 Maximum depth in channel = 2 ft

Main St
 Not overtopped
 Arrival time = 1.8 hr
 Maximum depth in channel = 3 ft

SAND CANYON DAM SUNNY DAY FAILURE INUNDATION MAP DEFLOOD TIME

STATE DAM NO. 1029.002
 NATIONAL DAM NO. CA00854
 ORANGE COUNTY, CALIFORNIA



Legend

| | | | | | |
|--|----------------|--|------------|--|------------|
| | Deflood Time | | 0 - 5 ft | | 20 - 25 ft |
| | Creek | | 5 - 10 ft | | 25 - 30 ft |
| | Police Station | | 10 - 15 ft | | 30 - 35 ft |
| | School | | 15 - 20 ft | | 35 - 40 ft |
| | Map Panel # | | | | |
| | City Boundary | | | | |

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

This map meets all applicable state and federal standards and has been prepared in consideration of all potential downstream hazards by a licensed civil engineer.

Molly Palmer,
 Civil Engineer 71788
 Expiration Date December 31, 2019

PANEL 5 of 7

12/29/2017
 REVISED 6/12/18

STETSON
 ENGINEERS INC.

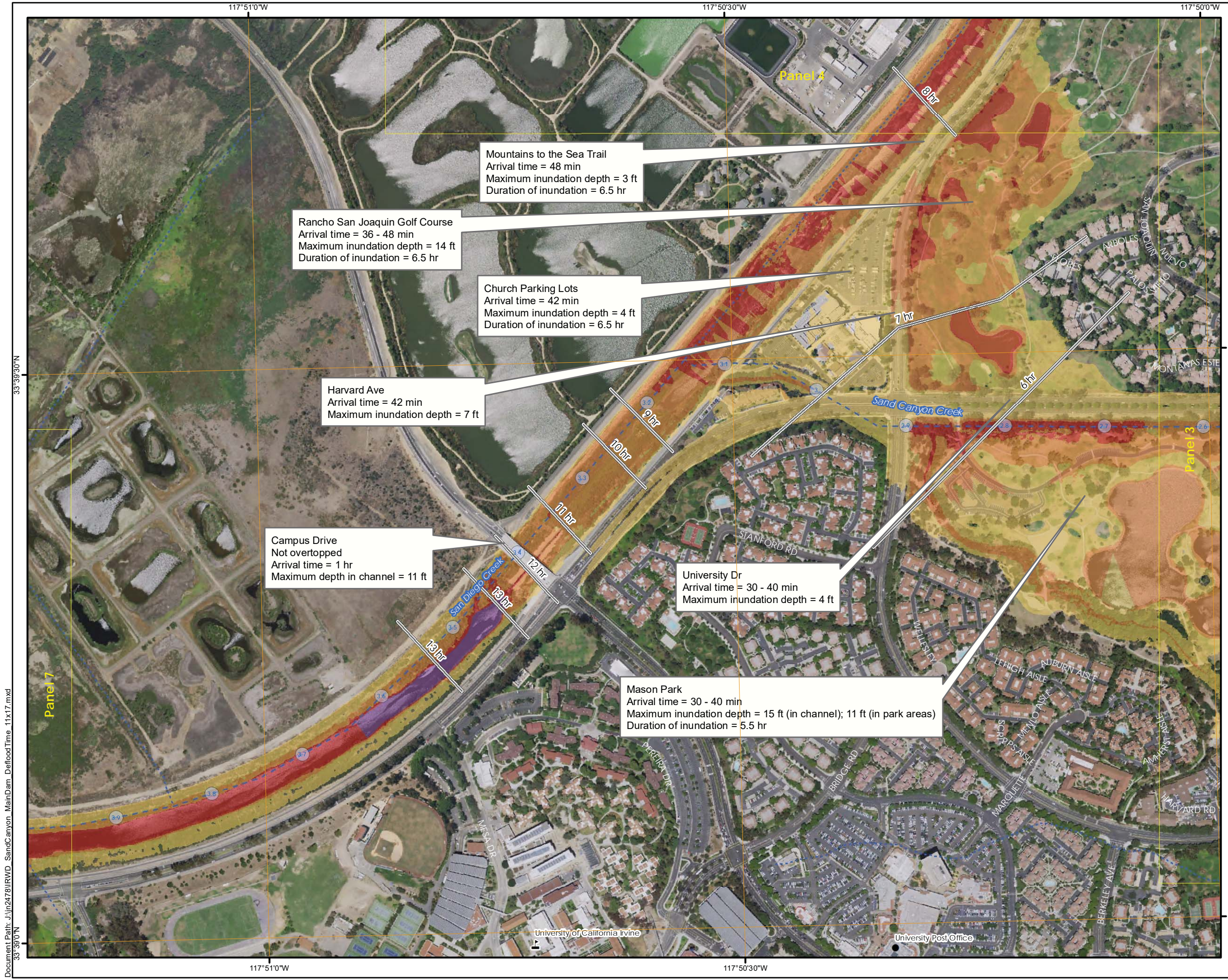
117°50'30"W

117°50'0"W

117°49'30"W

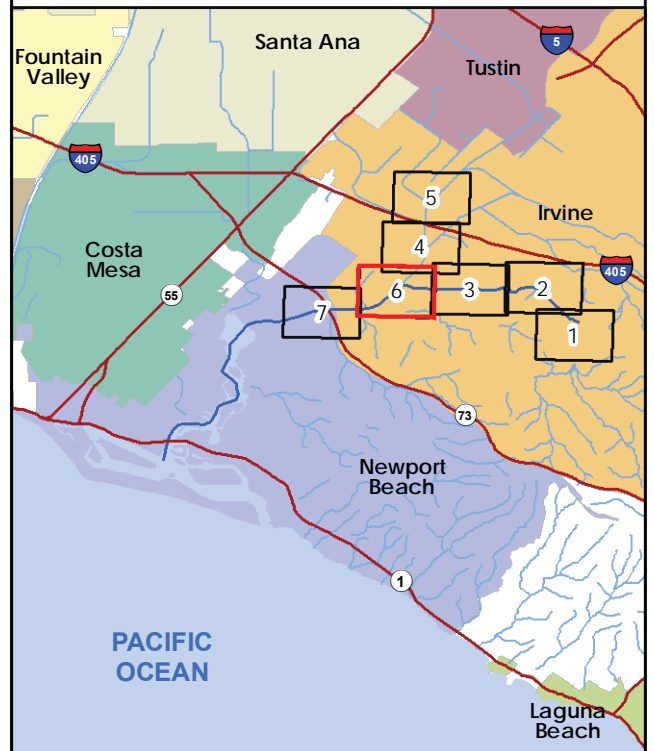
33°40'30"N

33°41'0"N



SAND CANYON DAM SUNNY DAY FAILURE INUNDATION MAP DEFLOOD TIME

STATE DAM NO. 1029.002
NATIONAL DAM NO. CA00854
ORANGE COUNTY, CALIFORNIA



Legend

| | | |
|--|--------------------------|--|
| | Maximum Inundation Depth | |
| | | |
| | | |
| | | |
| | | |
| | | |

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

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Molly Palmer

Molly Palmer,
Civil Engineer 71788
Expiration Date December 31, 2019

PANEL 6 of 7

STETSON ENGINEERS INC.

12/29/2017
REVISED 6/12/18

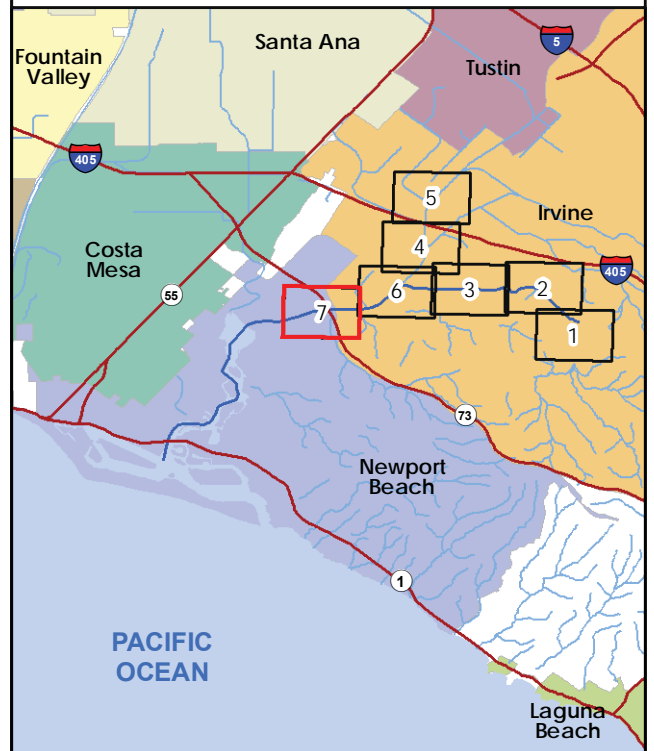
0 250 500 750 Feet
0 100 200 Meters

117°52'0"W

117°51'30"W



**SAND CANYON DAM
SUNNY DAY FAILURE INUNDATION MAP
DEFLOOD TIME**
STATE DAM NO. 1029.002
NATIONAL DAM NO. CA00854
ORANGE COUNTY, CALIFORNIA



Legend

| | | |
|---------------|------------|------------|
| River Mile | 0 - 5 ft | 20 - 25 ft |
| Deflood Time | 5 - 10 ft | 25 - 30 ft |
| Creek | 10 - 15 ft | 30 - 35 ft |
| Map Panel # | 15 - 20 ft | 35 - 40 ft |
| City Boundary | | |

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

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Civil Engineer 71788
Expiration Date December 31, 2019

PANEL 7 of 7

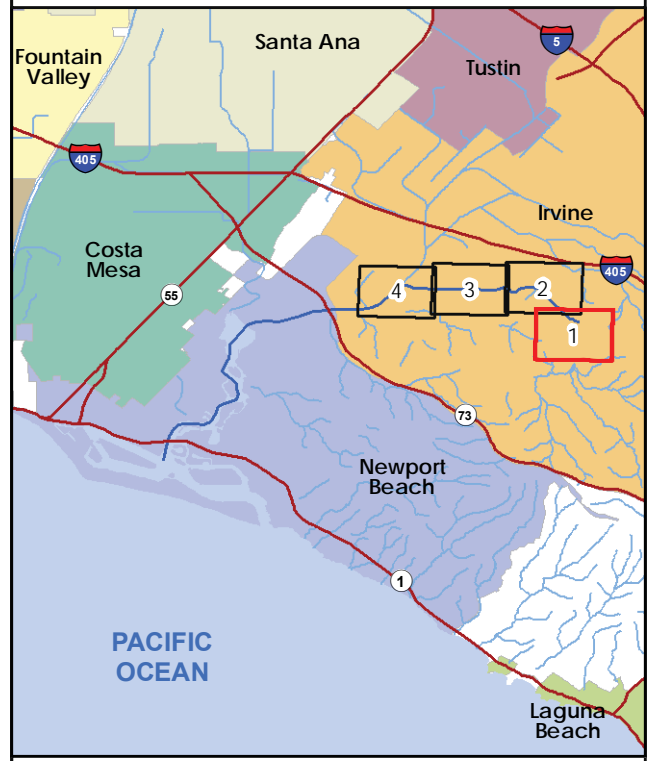
12/29/2017
REVISED 6/12/18

0 250 500 750 Feet
0 100 200 Meters

Spillway Failure - Arrival Time



**SAND CANYON DAM SPILLWAY
SUNNY DAY FAILURE INUNDATION MAP
FLOOD ARRIVAL TIME**
STATE DAM NO. 1029.002
NATIONAL DAM NO. CA00854
ORANGE COUNTY, CALIFORNIA



Legend

| | |
|---------------|-----------------------------------|
| River Mile | Maximum Inundation Depth 0 - 5 ft |
| Arrival Time | 5 - 10 ft |
| Dam Crest | 10 - 15 ft |
| Map Panel # | |
| City Boundary | |

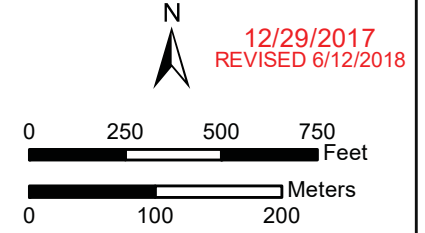
Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

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Molly Palmer,
Civil Engineer 71788
Expiration Date December 31, 2019

PANEL 1 of 4

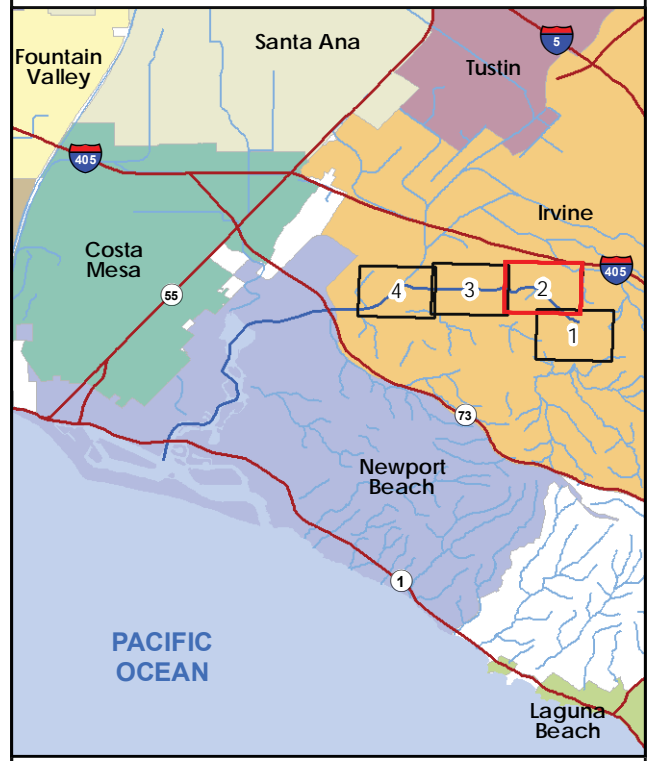


The North American Vertical Datum of 1988 was used for inundation modeling

Document Path: J:\m2478\IRWD_SandCanyon_Spillway_Failure_11x17.mxd



**SAND CANYON DAM SPILLWAY
SUNNY DAY FAILURE INUNDATION MAP
FLOOD ARRIVAL TIME**
STATE DAM NO. 1029.002
NATIONAL DAM NO. CA00854
ORANGE COUNTY, CALIFORNIA

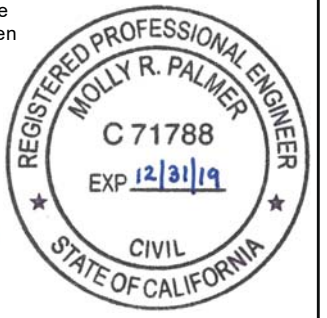


Legend

| | |
|---------------|-----------------------------------|
| River Mile | Maximum Inundation Depth 0 - 5 ft |
| Arrival Time | 5 - 10 ft |
| School | 10 - 15 ft |
| Map Panel # | |
| City Boundary | |

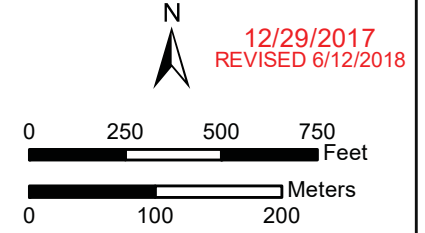
Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

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Molly Palmer,
Civil Engineer 71788
Expiration Date December 31, 2019

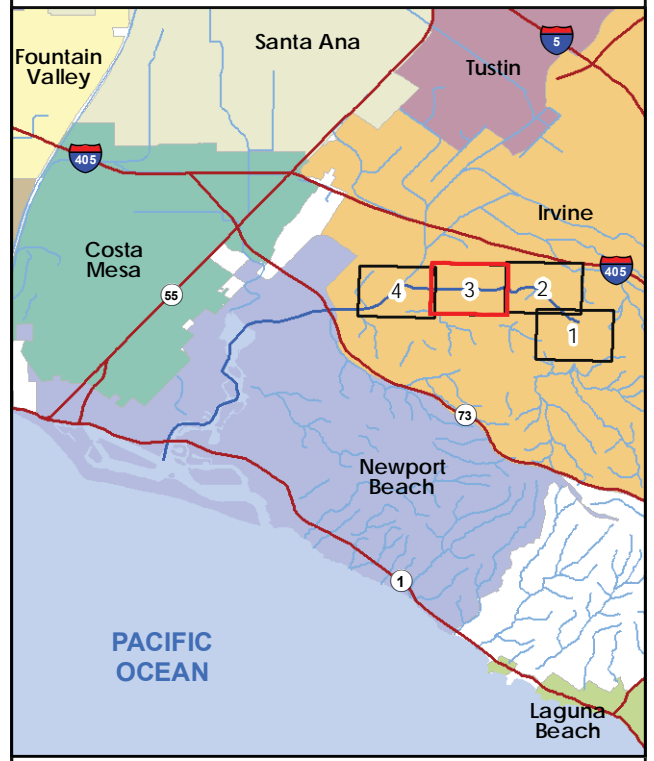
PANEL 2 of 4



117°50'0"W 117°49'30"W 117°49'0"W



**SAND CANYON DAM SPILLWAY
SUNNY DAY FAILURE INUNDATION MAP
FLOOD ARRIVAL TIME**
STATE DAM NO. 1029.002
NATIONAL DAM NO. CA00854
ORANGE COUNTY, CALIFORNIA



Legend

- River Mile
- Arrival Time
- ⚡ School
- Map Panel #
- ▭ City Boundary

Maximum Inundation Depth

- 0 - 5 ft
- 5 - 10 ft
- 10 - 15 ft

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

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Molly Palmer,
Civil Engineer 71788
Expiration Date December 31, 2019

PANEL 3 of 4

12/29/2017
REVISED 6/12/2018

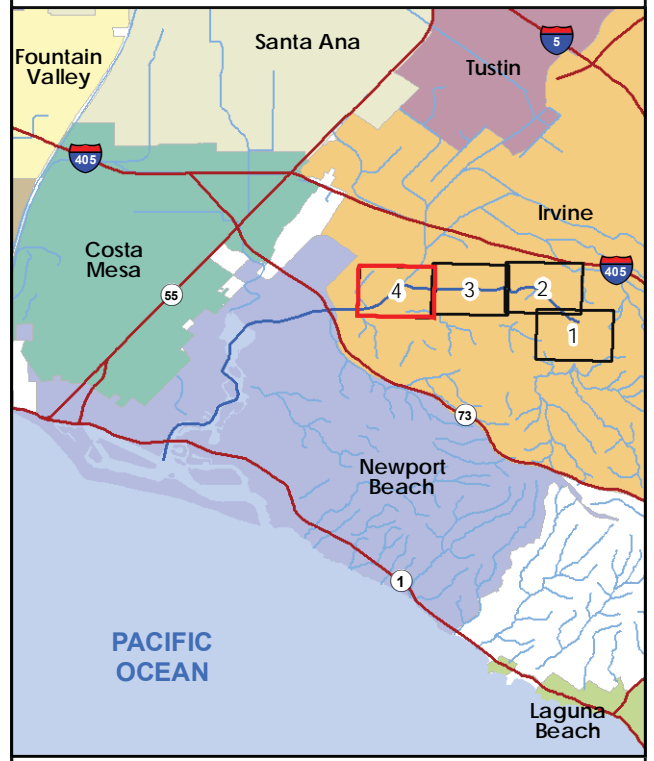
STETSON ENGINEERS INC.

Document Path: J:\m2478\RW\ SandCanyon_Spillway_Failure_11x17.mxd

117°50'0"W 117°49'30"W 117°49'0"W



**SAND CANYON DAM SPILLWAY
SUNNY DAY FAILURE INUNDATION MAP
FLOOD ARRIVAL TIME**
STATE DAM NO. 1029.002
NATIONAL DAM NO. CA00854
ORANGE COUNTY, CALIFORNIA

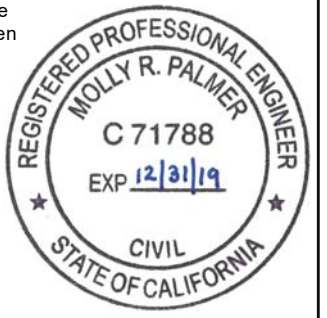


Legend

| | | |
|---------------|--------------|-------------------------------------|
| River Mile | Arrival Time | Maximum Inundation Depth 0 - 5 ft |
| School | Map Panel # | Maximum Inundation Depth 5 - 10 ft |
| City Boundary | | Maximum Inundation Depth 10 - 15 ft |

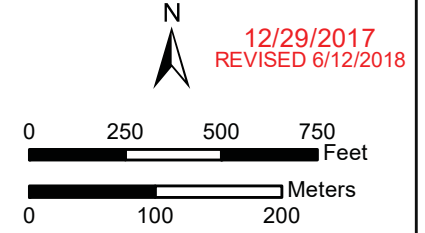
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Expiration Date December 31, 2019

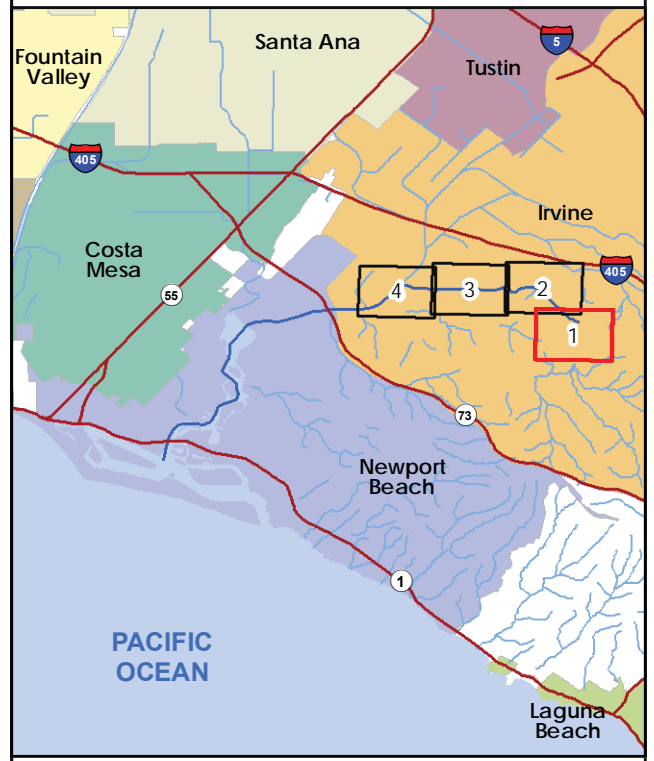
PANEL 4 of 4



Spillway Failure - Deflood Time



**SAND CANYON DAM SPILLWAY
SUNNY DAY FAILURE INUNDATION MAP
DEFLOOD TIME**
STATE DAM NO. 1029.002
NATIONAL DAM NO. CA00854
ORANGE COUNTY, CALIFORNIA



Legend

| | |
|---------------|-----------------------------------|
| River Mile | Maximum Inundation Depth 0 - 5 ft |
| Deflood Time | 5 - 10 ft |
| Dam Crest | 10 - 15 ft |
| Map Panel # | |
| City Boundary | |

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

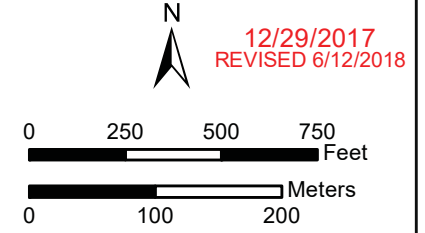
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Molly Palmer
Molly Palmer,
Civil Engineer 71788
Expiration Date December 31, 2019

The North American Vertical Datum of 1988 was used for inundation modeling

PANEL 1 of 4

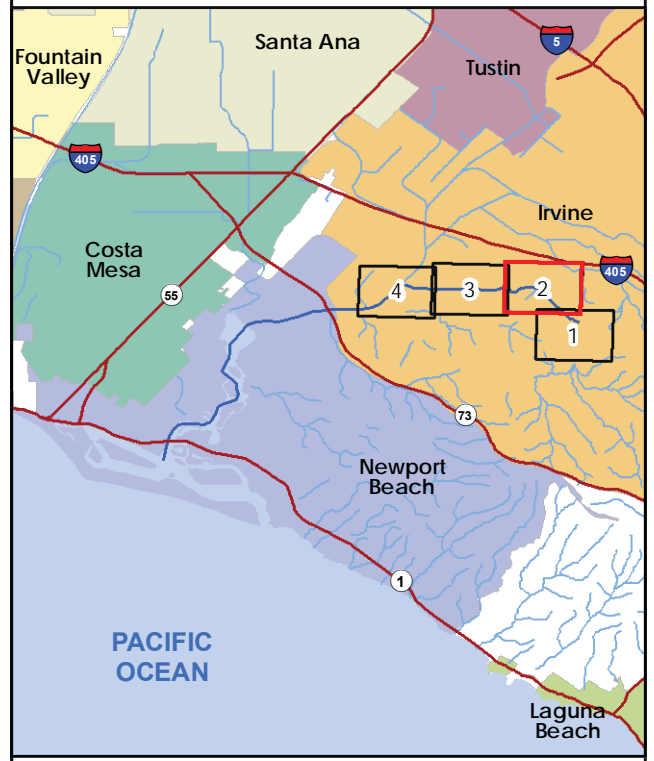


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SAND CANYON DAM SPILLWAY SUNNY DAY FAILURE INUNDATION MAP DEFLOOD TIME

STATE DAM NO. 1029.002
NATIONAL DAM NO. CA00854
ORANGE COUNTY, CALIFORNIA

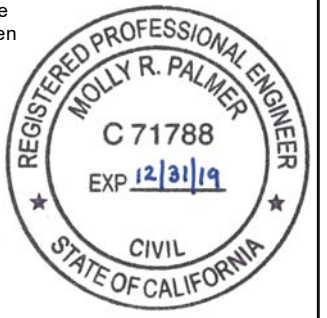


| Legend | |
|--------------------------|---------------|
| | River Mile |
| | Deflood Time |
| | School |
| | Map Panel # |
| | City Boundary |
| Maximum Inundation Depth | |
| | 0 - 5 ft |
| | 5 - 10 ft |
| | 10 - 15 ft |

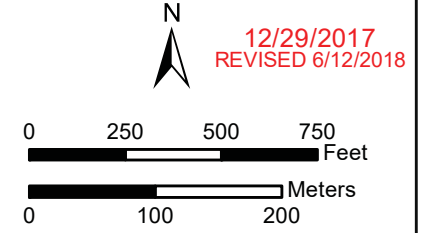
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Molly Palmer,
Civil Engineer 71788
Expiration Date December 31, 2019

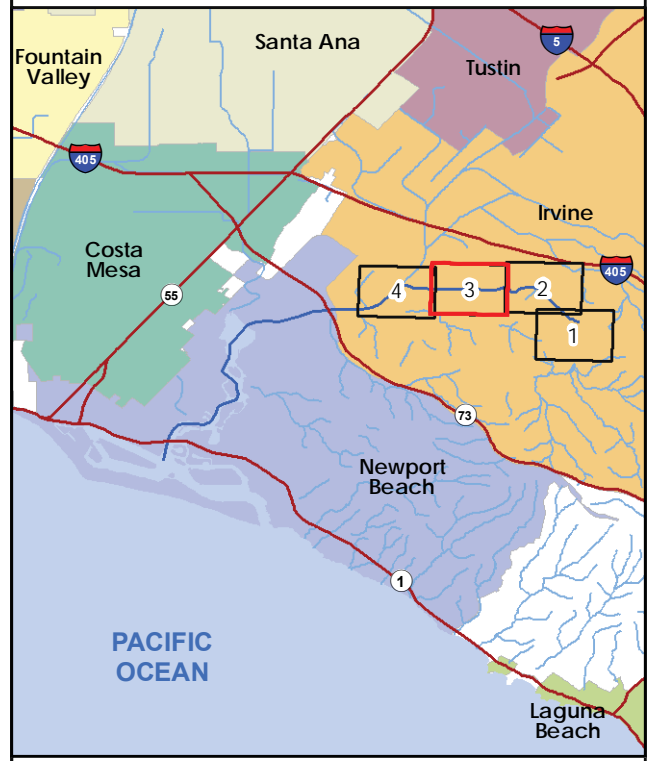


PANEL 2 of 4





**SAND CANYON DAM SPILLWAY
SUNNY DAY FAILURE INUNDATION MAP
DEFLOOD TIME**
STATE DAM NO. 1029.002
NATIONAL DAM NO. CA00854
ORANGE COUNTY, CALIFORNIA



Legend

| | |
|---------------|-----------------------------------|
| River Mile | Maximum Inundation Depth 0 - 5 ft |
| Deflood Time | 5 - 10 ft |
| School | 10 - 15 ft |
| Map Panel # | |
| City Boundary | |

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

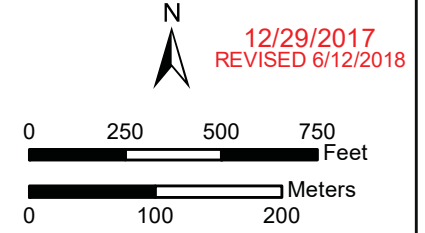
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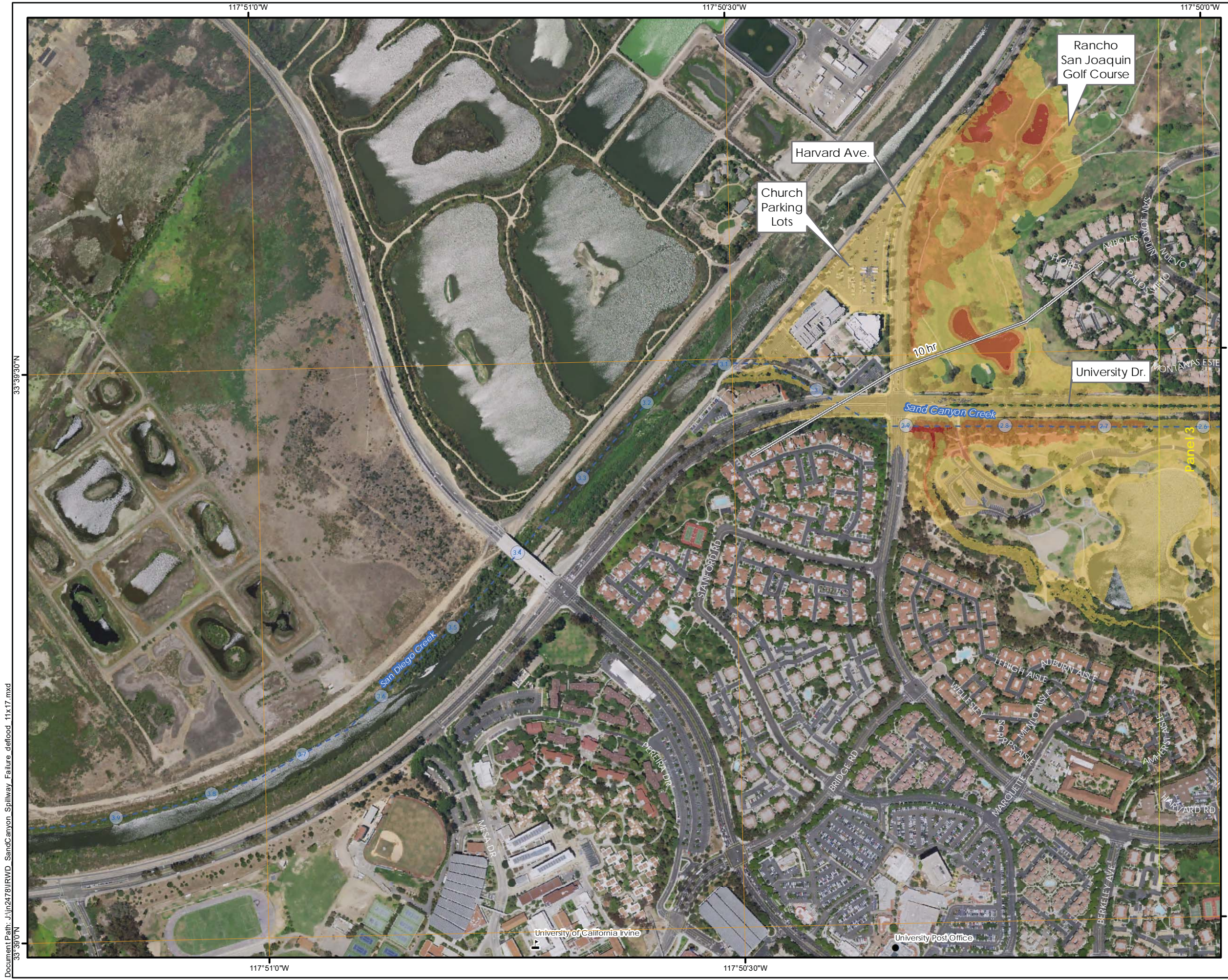
Molly Palmer



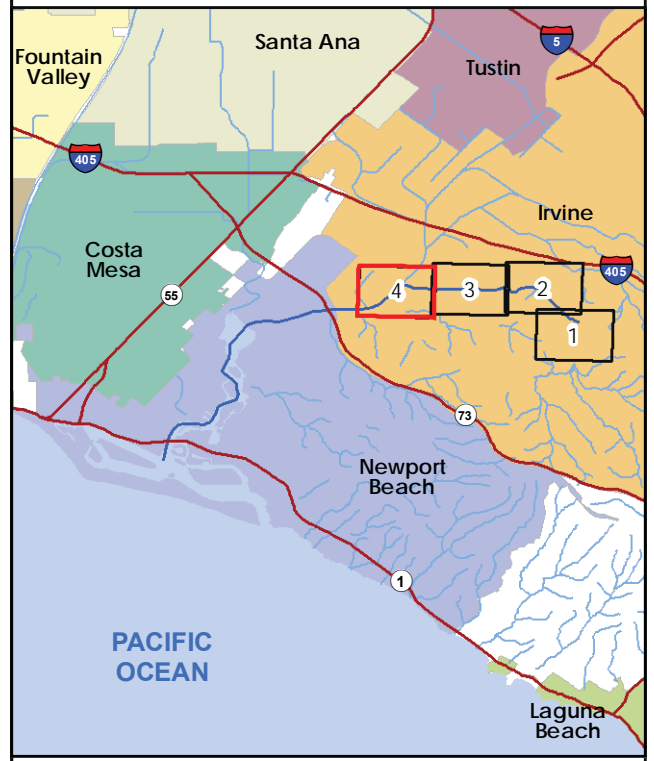
Molly Palmer,
Civil Engineer 71788
Expiration Date December 31, 2019

PANEL 3 of 4





**SAND CANYON DAM SPILLWAY
SUNNY DAY FAILURE INUNDATION MAP
DEFLOOD TIME**
STATE DAM NO. 1029.002
NATIONAL DAM NO. CA00854
ORANGE COUNTY, CALIFORNIA



Legend

| | | |
|---------------|--------------|------------|
| River Mile | Deflood Time | 0 - 5 ft |
| School | Map Panel # | 5 - 10 ft |
| City Boundary | | 10 - 15 ft |

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

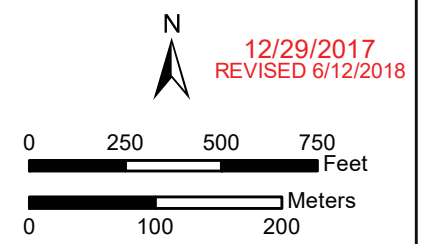
This map meets all applicable state and federal standards and has been prepared in consideration of all potential downstream hazards by a licensed civil engineer.

Molly Palmer



Molly Palmer,
Civil Engineer 71788
Expiration Date December 31, 2019

PANEL 4 of 4



PART III: Appendices

Appendix A: EAP Status Report (for Non-FERC dams)

EAP Status Report for Sand Canyon Dam, DSOD No. 1029.002

Annual EAP Review Performed:

Annual Update Sent to Plan Holders:

Annual Notification Exercise:

Prepared by:

Mail this document, or something similar, to the Cal OES Emergency Action Planning Division:

Dam Safety Planning Chief
Dam Emergency Action Planning Division
3650 Schriever Avenue
Mather, CA 95655

OR send it electronically to the Division at eap@caloes.ca.gov.

Appendix B: Record of EAP Revisions

| Revision # | Date | Sections Reviewed or Revisions Made | By Whom |
|------------|--------------------|--|----------------|
| 1 | May 31, 2019 | Dam Owner Contact, Sections 2.2, 3, 4, 5.1, 5.2, 5.4, 7.2, 7.13, 8.2 | IRWD (Stetson) |
| 2 | July 11, 2019 | Sections 1.1, 1.2, 2.1, 2.2, 3, 4, 5.1, 5.2, 6.3, 6.4, 7.4, 7.5, 7.6, 7.7, 7.9, 7.12, 7.13, 8.1, 8.2 | IRWD (Stetson) |
| 3 | August 27, 2019 | Sections 2.2, 3, 4, 5.2, 6.5, 7.10 | IRWD (Stetson) |
| 4 | September 30, 2019 | Update DSOD Emergency contacts | IRWD (Stetson) |
| 5 | December 16, 2021 | Annual EAP Update with updated contact information; Sections revised include: Cover page; Dam contact information; document header; Sections 3.1 (notification charts), 3.2, 6.5, 7.8, 7.9, 8.2. Appendices A, B, C. | IRWD (Stetson) |
| 6 | September 7, 2022 | Annual EAP Update with updated contact information and document date; Sections revised include: Cover page; Dam contact information, Key dam information; Sections 1.1, 1.3, 2.1, 2.2, 3, 4, 5.1, 5.4, 7, 8; Appendices B, C, E; Removed former Appendix J (signature page) | IRWD (Stetson) |
| 7 | April 24, 2024 | Annual EAP Update with updated contact information; Revisions include: added description of County Alert Warning Plan; referenced IRWD's public communications plan; updated language for CA State Warning Center responsibilities; added Appendix K Showing suggested ICP Locations; added Appendix L "Anatomy of a Dam" figure to explain dam terminology; updated plan holders | IRWD (Stetson) |

| | | | |
|----|----------------|--|----------------|
| 9 | May 16, 2025 | Annual EAP Update with updated contact information; Revisions include: updated links to public agency emergency operations plans, updated phone notification scripts to shorten and improve clarity; reformatted notification flowcharts to improve clarity; revised IRWD responsibilities according to current staffing; added written notification scripts to Appendix E; updated plan holders | IRWD (Stetson) |
| 10 | March 30, 2026 | <u>Annual EAP Update with updated contact information; Revisions include: added information to Section 2.2.11 at request of OC Parks, updated plan holders</u> | IRWD (Stetson) |

Appendix C: Record of Plan Holders

| Copy Number | Organization | Person Receiving Copy |
|-------------|---|---|
| 1 | Irvine Ranch Water District | Jose Zepeda, Director of Water and Recycling Operations |
| 2 | Irvine Ranch Water District | David Paulson, Operations Supervisor |
| 3 | Irvine Ranch Water District | Jacob Moeder, P.E., Engineering Department |
| 4 | Irvine Ranch Water District | Bryan Clinton, Operations Manager |
| 5 | Irvine Ranch Water District | Steve Choi, Director of Safety and Security; EAP Coordinator |
| 6 | Irvine Ranch Water District | John Fabris, Communications: |
| 7 | Orange County Sheriff's Department, Emergency Management Division | Michelle Anderson, Emergency Management Director Mayra Wheeler, Senior Emergency Management Program Coordinator Kevin McArthur, Assistant Emergency Manager |
| 8 | Orange County Public Works | Alison Camara, Senior Civil Engineer Trevor Richardson, Emergency Manager |
| 9 | Orange County Parks | Eric Rubery, Operations Support Manager |
| 10 | Orange County Fire Authority | Nick Freeman, Division 2 Chief |
| 11 | Newport Beach Fire Department | Jeff Boyles, Fire Chief |
| 12 | Newport Beach Police Department | Katie Eing, Emergency Services Coordinator |
| 13 | Newport Beach Utilities Department | Casey Parks, Utilities Superintendent |
| 14 | Irvine Police Department | Robert Simmons, Manager, Emergency Services |
| 15 | Cal OES | Dam Safety Planning Division |
| 16 | DSOD | Cameron Lancaster, Area 9 Engineer |
| 17 | DWR Flood Operations Center | State-Federal Flood Operations Center |
| 18 | National Weather Service | Sam Zuber, Hydrology Program Manager Weather Forecasting Office |

Phone numbers and email addresses have been removed from this publicly posted copy of this Emergency Action Plan. That information is available from Irvine Ranch Water District's district secretary: Phone 949-453-5300, Email Comments@IRWD.com

| | | |
|----|--|--|
| 19 | California Highway Patrol, Santa Ana Office | Sgt. Anselmo Templado Capt. Mike Salinas Lt. Kris Ulibarri Lt. Stephanie Hamilton |
| 20 | WEROC | Vicki Osborn, Director of Emergency Management |

Phone numbers and email addresses have been removed from this publicly posted copy of this Emergency Action Plan. That information is available from Irvine Ranch Water District's district secretary: Phone 949-453-5300, Email Comments@IRWD.com

Appendix D: Contact Log

After determining the emergency level, use the contact log to document notifications made in accordance with Section 3 of the EAP.

CONTACT LOG

| Dam Name: SAND CANYON DAM | | Date: | |
|---|-----------------------------|---------------------------|---------------------|
| NID #: CA00854 | DSOD Dam #: 1029.002 | FERC #: N/A | |
| DSOD Region: SOUTH | | County: ORANGE | |
| Emergency Level: | | Incident/Exercise: | |
| After determining the emergency level, immediately contact the following agencies/entities. The person making the contact should initial and record the time of the call and who was contacted at each agency/entity. | | | |
| Agency/Entity | Person Contacted | Contact Time | Contacted By |
| | | | |
| | | | |
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Appendix E: Pre-Scripted Messages

The following pre-scripted messages are for use during notifications at any Emergency Level for Sand Canyon Dam.

High Flow Emergency Level Phone Notification Script

This is _____. [your name and position]

IRWD has activated the Emergency Action Plan for Sand Canyon Reservoir, Dam No. 1029.002, located in Irvine. The dam is under a **High Flow** condition but is not in danger of failing.

High flows at the dam began at _____ on _____.
(time) (date)

The current flow at the dam is ____ cfs.

You have/will receive a text or email with additional details. We'll provide updates when there are any changes in flow or dam condition. What is the best way to contact you with additional updates? [record contact information].

I can be contacted at _____. [preferred contact method]

If you can't reach me, please use _____. [alternate contact method]

High Flow Emergency Level Written Notification Script

IRWD has identified an emergency condition at Sand Canyon Reservoir, Dam No. 1029.002, located in Irvine.

IRWD has activated the Emergency Action Plan for this dam and are determining this to be a **High Flow** condition. The Sand Canyon Dam is *not* in danger of failing.

At _____ on _____, IRWD observed unusually high flows at the dam.
(time) (date)

The high flows are the result of _____.

The current flow in Sand Canyon Creek is ____ cfs.

Current flow from the Michelson Water Recycling Plant into the reservoir is ____ cfs.

Current flow from the reservoir to Michelson Water Recycling Plant is ____ cfs.

The current water surface elevation in the reservoir is ____ ft.

The dam is not predicted to fail because of this condition. IRWD will provide updates detailing any changes in flow or dam condition and will notify you when the high flow situation is resolved.

Please take the following actions: _____

_____.

An IRWD representative can be contacted at: _____.

Non-Failure Emergency Level Phone Notification Script

This is _____. [your name and position].

IRWD has activated the Emergency Action Plan for Sand Canyon Reservoir, Dam No. 1029.002, located in Irvine. The dam is under a **Non-Failure** condition and is not in danger of failing.

IRWD activated the EAP because _____.
(description of condition)

You have/will receive a written notification with additional details. We'll provide updates detailing any changes in flow or dam condition. What is the best way to contact you with additional updates? [record contact information].

I can be contacted at _____. [preferred contact method]

If you can't reach me, please use _____. [alternate contact method]

Non-Failure Emergency Level Written Notification Script

IRWD has identified an emergency condition at Sand Canyon Reservoir, Dam No. 1029.002, located in Irvine.

IRWD has activated the Emergency Action Plan for this dam and are determining this to be a **Non-Failure** condition. The Sand Canyon Dam is *not* in danger of failing.

At _____ on _____, IRWD observed _____.
(time) (date)

The current flow into the reservoir is ___ cfs.
The current flow out of the reservoir is ___ cfs.

The dam is not predicted to fail because of this condition. IRWD will provide updates detailing any changes in flow or dam condition and will notify you when the situation is resolved.

Please take the following actions: _____

_____.

An IRWD representative can be contacted at: _____.

Potential Failure Emergency Level Phone Notification Script

This is _____ [your name and position].

IRWD has activated the Emergency Action Plan for Sand Canyon Reservoir, Dam No. 1029.002, located in Irvine. The dam is under a **Potential Failure** condition and may be in danger of failing.

IRWD is responding to _____ [describe event] that could result in dam failure as early as _____.

Please reference the inundation map in your copy of the Emergency Action Plan and prepare to evacuate the low-lying portions of Irvine and Newport Beach, including University Drive from I-405 to Campus Drive.

The City of Irvine Police Department is the PSAP for this emergency.

You have/will receive a written notification with additional details. We'll provide updates detailing any changes in flow or dam condition. What is the best way to contact you with additional updates? [record contact information].

I can be contacted at _____. [preferred contact method]

If you can't reach me, please use _____. [alternate contact method]

Potential Failure Emergency Level Written Notification Script

IRWD has activated the Emergency Action Plan for Sand Canyon Reservoir, Dam No. 1029.002, located in Irvine. The dam is under a **Potential Failure** condition. The Sand Canyon Dam may be in danger of failing.

At _____ on _____, IRWD observed _____.
(time) (date)

The current flow into the reservoir is ___ cfs.

The current flow out of the reservoir is ___ cfs.

IRWD is implementing predetermined actions to respond to this rapidly developing situation that could result in dam failure.

The dam could potentially fail as early as _____.

Please prepare to evacuate the low-lying portions of Sand Canyon Creek and San Diego Creek along Strawberry Farm Road, the University Drive and Michelson Drive intersection, and adjacent areas including: the Strawberry Farms Golf Club, Mason Regional Park, University Trail, Bethel Church, Irvine First Baptist Church, and portions of

the Rancho San Joaquin Golf Course. In the event of a dam failure, University Drive from I-405 to Campus Drive may be inundated. High flows would be experienced in San Diego Creek to Newport Bay. Trails, levees, and low-lying areas adjacent to Sand Canyon Wash and San Diego Creek should be avoided.

Reference the inundation map in your copy of the Emergency Action Plan for detailed inundation areas.

The City of Irvine Police Department is the Primary Safety Answering Point for this emergency and will be coordinating the emergency response.

IRWD will advise you when the situation is resolved or if the situation gets worse.

An IRWD representative can be contacted at the following number: _____.

Imminent Failure Emergency Level Phone Notification Script

This is an emergency. This is _____ [your name and position].

Sand Canyon Reservoir, Dam No. 1029.002, located in Irvine, is failing. The downstream area must be evacuated immediately.

Repeat, Sand Canyon Reservoir is failing; evacuate the low-lying portions of Irvine and Newport Beach. University Drive from I-405 to Campus Drive should be closed due to potential inundation. High flows can be expected in San Diego Creek to Newport Bay. Trails, levees, and low-lying areas adjacent to Sand Canyon Wash and San Diego Creek should be avoided.

Reference the inundation map in your copy of the Emergency Action Plan for specific evacuation areas.

The City of Irvine Police Department is the PSAP for this emergency.

You have/will receive a written notification with additional details for this **Imminent Failure** condition.

I can be contacted at _____. [preferred contact method]

If you can't reach me, please use _____. [alternate contact method]

The next status report will be provided in approximately 30 minutes. What is the best way to contact you with additional updates? [record contact information].

Imminent Failure Emergency Level Written Notification Script

THIS IS AN EMERGENCY.

Sand Canyon Reservoir, Dam No. 1029.002, located in Irvine, is failing.

The downstream area must be evacuated immediately:

Evacuate the low-lying portions of Sand Canyon Creek and San Diego Creek along Strawberry Farm Road, the University Drive and Michelson Drive intersection, and adjacent areas including: the Strawberry Farms Golf Club, Mason Regional Park, University Trail, Bethel Church, Irvine First Baptist Church, and portions of the Rancho San Joaquin Golf Course. University Drive from I-405 to Campus Drive should be closed due to potential inundation. High flows can be expected in San Diego Creek to Newport Bay. Trails, levees, and low-lying areas adjacent to Sand Canyon Wash and San Diego Creek should be avoided.

IRWD has activated the Emergency Action Plan for Sand Canyon Reservoir. The dam is under an **Imminent Failure** condition. The Sand Canyon Dam is failing.

At _____ on _____, IRWD observed _____.
(time) (date)

The current flow into the reservoir is ____ cfs.
The current flow out of the reservoir is ____ cfs.

Reference the inundation map in your copy of the Emergency Action Plan.

The City of Irvine Police Department is the Primary Safety Answering Point for this emergency and will be coordinating the emergency response.

IRWD will advise you when the situation is resolved or if the situation gets worse.

An IRWD representative can be contacted at the following number: _____.

The next status report will be provided in approximately 30 minutes.

Imminent Failure Emergency Level Public Message

The following pre-scripted message may be **used for emergency management authorities to communicate the Imminent Failure of the dam with the public:**

Attention: This is an emergency message from _____ [emergency management agency]. Listen carefully. Your life may depend on immediate action.

Sand Canyon Reservoir, located in Irvine is failing. Repeat. Sand Canyon Reservoir, located in Irvine is failing.

If you are in or near this area, proceed immediately to high ground away from Sand Canyon Wash and San Diego Creek. The low-lying portions of Sand Canyon Creek and San Diego Creek along Strawberry Farm Road, University Drive and Michelson Drive intersection, and adjacent areas including: the Strawberry Farms Golf Club, Mason Regional Park, University Trail, Bethel Church, Irvine First Baptist Church, and portions of the Rancho San Joaquin Golf Course may be flooded. University Drive from I-405 to Campus Drive may flooded and access may be limited. High flows are expected in San Diego Creek to Newport Bay. Trails, levees, and low-lying areas adjacent to Sand Canyon Wash and San Diego Creek should be avoided. Do not approach channels where high flow is expected.

If you are in or near this area, proceed immediately to high ground away from low lying areas.

Repeat message.

Appendix G: Emergency Termination Log

| | |
|---|---------------------------------|
| Dam Name: SAND CANYON | County: ORANGE |
| Dam Location: IRVINE, CA | Stream/River: SAND CANYON CREEK |
| Date/Time: | |
| Weather Conditions: | |
| General Description of Emergency Situation: | |
| Area(s) of Dam Affected: | |
| Extent of Damage to Dam and Possible Causes: | |
| Effect on Dam Operation: | |
| Initial Reservoir Elevation/Time: Maximum Reservoir Elevation/Time: Final Reservoir Elevation/Time: | |
| Description of Area Flooded Downstream/Damage/Loss of Life: | |
| Justification for Termination of Dam Safety Emergency: | |
| Other Data and Comments: | |
| Report Prepared By (Printed Name and Signature): Date: | |

Appendix H: After Action Report

Background

Event Details

Type of Event:

Location:

Incident Period:

Brief Description of Event:

Response Activities

Summary of Successes

Summary of Recommended Improvements

Organizations Contributing to this Report

Appendix I: Cal OES Warning Center Dam Incident Report

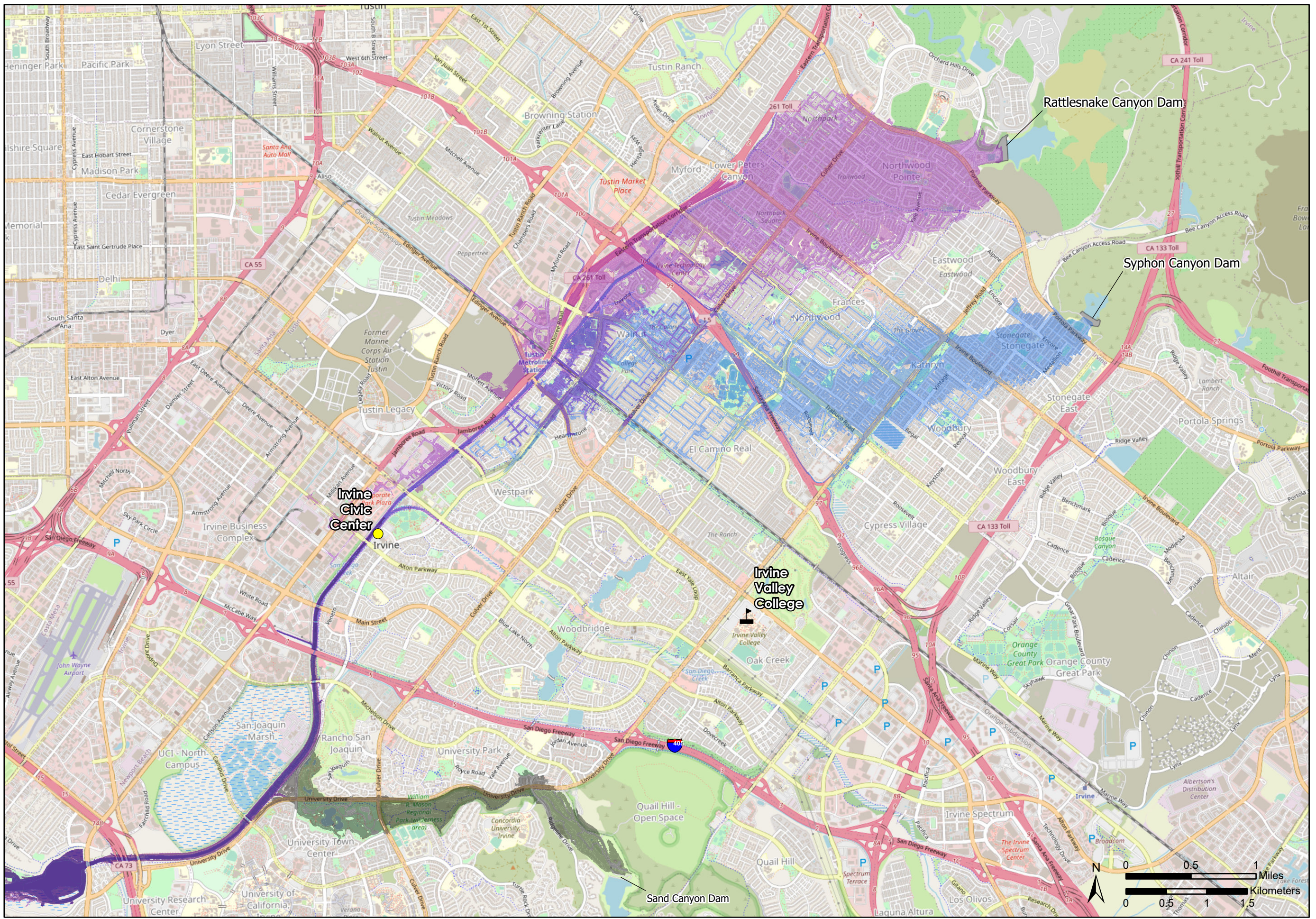
DAM INCIDENT – CALIFORNIA STATE WARNING CENTER

| | | |
|---|--|--|
| EVENT TYPE: | <input type="checkbox"/> DRILL <input type="checkbox"/> ACTUAL EVENT | |
| DATE: | | TIME: |
| CALLER INFORMATION | | |
| NAME/AGENCY: | PHONE #: | |
| ALTERNATE CONTACT: | PHONE #: | |
| DAM INFORMATION | | |
| DAM NAME: Sand Canyon | DSOD DAM #: 1029.002 | FERC: N/A |
| DSOD HAZARD CLASSIFICATION: Extremely High | | |
| LOCATION OF DAM | | |
| DSOD REGION: | <input type="checkbox"/> NORTHERN <input type="checkbox"/> CENTRAL <input checked="" type="checkbox"/> SOUTHERN | |
| PHYSICAL ADDRESS: 82 Strawberry Farm Road, Irvine, CA 92612 | | |
| LATITUDE: 33.6479 | LONGITUDE: -117.7960 | |
| COUNTY: Orange County | DOWNSTREAM JURISDICTIONS: Irvine; Newport Beach | |
| NEAREST CITY OR POPULATED AREA: City of Irvine | | |
| NEAREST OR AFFECTED HIGHWAY OR CROSS ROADS: I-405 and University Drive | | |
| RIVER OR CREEK THAT FLOWS INTO RESERVOIR: Sand Canyon Creek | | |
| SITUATION | | |
| ACTIVATION OF EAP: | <input type="checkbox"/> Yes <input type="checkbox"/> No | |
| EMERGENCY LEVEL: | <input type="checkbox"/> High Flow <input type="checkbox"/> Non-Failure <input type="checkbox"/> Potential Failure <input type="checkbox"/> Imminent Failure | |
| EMERGENCY TYPE: | | |
| <input type="checkbox"/> Earthquake | <input type="checkbox"/> Outlet System Failure | <input type="checkbox"/> Sinkholes |
| <input type="checkbox"/> Embankment Cracking or Settlement | <input type="checkbox"/> Sabotage/Vandalism | <input type="checkbox"/> Storm Event |
| <input type="checkbox"/> Embankment Movement | <input type="checkbox"/> Sand Boils | <input type="checkbox"/> Other: List Below |
| <input type="checkbox"/> Erosion of Spillway | <input type="checkbox"/> Security Threats | |
| <input type="checkbox"/> Instrumentation Reading (Abnormal) | <input type="checkbox"/> Seepage, Springs, Piping | |
| OTHER: | | |
| RESERVOIR LEVEL: | <input type="checkbox"/> Full <input type="checkbox"/> Partially Full <input type="checkbox"/> Empty | |
| | Approximate % Full (Acre-Feet): | |
| WHEN/HOW EVENT WAS DETECTED: | | |
| OBSERVER IN POSITION: | <input type="checkbox"/> Yes <input type="checkbox"/> No | |
| ADDITIONAL DETAILS: | | |
| REPORTING PERSON NOTIFICATION | | |
| Was the County Sheriff Notified by Reporting Person? | YES | NO |
| Were Downstream Jurisdictions Notified by Reporting Person? | | |

Appendix J: Acronym List

| | |
|---------------|--|
| CAS..... | Critical Appurtenant Structure |
| Cal OES | California Governor’s Office of Emergency Services |
| cfs..... | Cubic feet per second |
| CHP..... | California Highway Patrol |
| DSOD..... | Division of Safety of Dams |
| DWR..... | Department of Water Resources |
| EAP..... | Emergency Action Plan |
| EMD..... | Emergency Management Division |
| EOC..... | Emergency Operations Center |
| EOP..... | Emergency Operations Plan |
| FEMA..... | Federal Emergency Management Agency |
| HSEEP | Homeland Security Exercise and Evaluation Program |
| IC..... | Incident Commander |
| ICP | Incident Command Post |
| IRWD..... | Irvine Ranch Water District |
| MACS | Multi-Agency Coordination System |
| MWRP | Michelson Water Recycling Plant |
| NAVD88..... | North American Vertical Datum of 1988 |
| NID | National Inventory of Dams |
| NIMS..... | National Incident Management System |
| NWS..... | National Weather Service |
| OA..... | Operational Area |
| OAC | Operational Area Coordinator |
| OCFA..... | Orange County Fire Authority |
| OCPW..... | Orange County Public Works |
| OCSD..... | Orange County Sheriff’s Department |
| PIM | Public Information Manager |
| PSAP..... | Public Safety Answering Point |
| SEMS | Standardized Emergency Management System |
| WEROC..... | Water Emergency Response Organization of Orange County |
| WFO..... | Weather Forecasting Office |

Appendix K: Potential ICP Locations Map



**POTENTIAL ICP LOCATIONS
FOR DISCUSSION PURPOSES ONLY**
ORANGE COUNTY, CALIFORNIA

Legend

-  Other
-  School
-  Rattlesnake Canyon Dam Failure Inundation Extent
-  Sand Canyon Dam Failure Inundation Extent
-  Syphon Canyon Dam Failure Inundation Extent



Appendix L: Anatomy of a Dam Figure

