

**EMERGENCY ACTION PLAN (EAP)  
FOR  
SAND CANYON DAM  
ORANGE COUNTY, CALIFORNIA**



**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**



**DATE PREPARED:  
PREPARED BY: STETSON ENGINEERS, INC. (760)730-0701**

*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.*

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# Dam Contact Information

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## **Sand Canyon Dam**

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

**24-Hour Emergency Contact: Tom Roberts, Director of Water Operations**

**Dam Owner: Irvine Ranch Water District**

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

**Dam Operator: Ken Pfister, Water Operations Manager, Irvine Ranch Water District**

**EAP Coordinator: Emilyn Zuniga, IRWD Safety Manager**

*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.*

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# Key Dam Information

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## Dam Description

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



## Potential Impacted Area

Sand Canyon Dam is located at the north end of Sand Canyon Reservoir on land in the City of Irvine, CA. The area around 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 flood (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 head 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.

# PART I: EAP INFORMATION

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# Section 1: Introduction

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## 1.1 Background

Irvine Ranch Water District (IRWD) is an independent special district that serves 380,000 people in central Orange County, CA and owns and operates five jurisdictional dams, one of which is at the Sand Canyon Reservoir. Sand Canyon Dam is located in Orange County, CA in the City of Irvine. The spillway is located on the northeast corner of the reservoir. The reservoir collects natural runoff of a drainage area of 6.3 square miles and stores recycled water from IRWD's Michelson Water Recycling Plant (MWRP).

The dam at Sand Canyon Reservoir 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 is located in the San Diego Creek watershed in coastal hills about six miles inland from the Pacific Ocean. Topography in this area 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 1.2-1- Sand Canyon Dam Area Overview* 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. The figure also shows the location of the reservoir and the spillway. Sand Canyon Creek flows through the City of Irvine and joins San Diego Creek within Irvine City limits. San Diego Creek in that area is highly channelized. It flows southwest through the City of Newport Beach, where it flows into upper Newport Bay. The total drainage area of Newport Bay is about 150 square miles. San Diego Creek, at its point of discharge to Newport Bay, drains about 140 square miles. Newport Bay is a large estuary and harbor which is influenced by ocean tides.

## 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 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.”

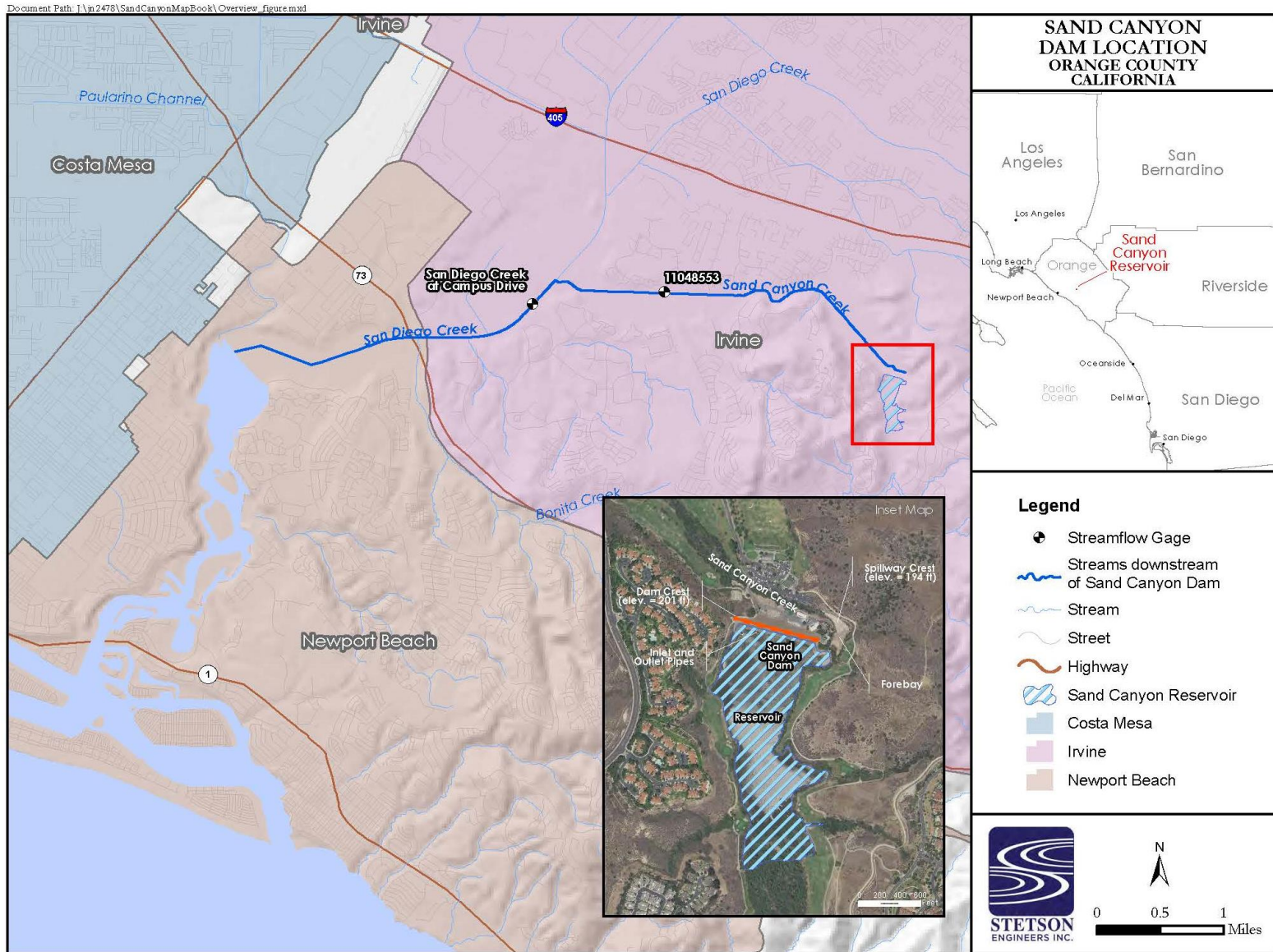


Figure 1.2-1- Sand Canyon Dam Area Overview



The purpose of this Emergency Action Plan (EAP) is to detect actual or potential emergency situations associated with 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.

The Department of Water Resources (DWR), Division of Safety of Dams (DSOD) has rated the Sand Canyon Reservoir 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**

The EAP was sent to the following affected agencies below for comment during an extended local agency review period.

- Irvine Ranch Water District
- Orange County Sheriff’s Department, Emergency Management Division
- Orange County Public Works
- Orange County Fire Authority
- Orange County Parks
- Newport Beach Fire Department
- Irvine Police Department
- City of Newport Beach Police Department
- California Highway Patrol, Santa Ana Office

The following agencies provided comments on the draft EAP and participated in consultations:

- Irvine Ranch Water District
- Orange County Sherriff’s Department, Emergency Management Division
- Irvine Police Department
- Orange County Fire Authority
- Orange County Public Works

The City of Irvine Police Department is the lead emergency management agency for this EAP. They reviewed and approved the notification flowcharts presented in Section 3. Additional coordination was conducted with the National Weather Service (NWS), the DWR, Flood Operations Center, and DSOD to determine the level of participation desired in the EAP development process. These agencies requested a copy of the California Governor's Office of Emergency Services (Cal OES)-approved EAP.

For more information, please contact the EAP Coordinator:

Emilyn Zuniga  
IRWD Safety Manager

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# Section 2: Summary of EAP Responsibilities

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## 2.1 Irvine Ranch Water District Responsibilities

IRWD is responsible for detecting and evaluating dam safety incidents, classifying the incident, notifying emergency management authorities, taking appropriate response actions, and performing termination and follow-up tasks related to the dam incident. Duties of specified staff members follow.

### 2.1.1 Onsite Dam Operator and/or IRWD Operations Center

- Monitor, verify, and assess emergency conditions.
- As soon as an emergency event is observed or reported, immediately determine the emergency level as detailed in Section 5.
- Utilize the emergency notification flowcharts in Section 3 to notify the appropriate response personnel and record notifications in the contact log in Appendix D.
- Establish an emergency incident log (Appendix F) to document actions and activities associated with the situation.
- Implement gate operations and other emergency procedures.
- Coordinate directly with the designated Incident Commander (IC) or first responders at the dam site.
- Coordinate directly with the Incident Command Post (ICP), the City of Irvine Emergency Operations Center (EOC), or the Orange County EOC, if established.
- Notify government authorities when the dam condition has been stabilized.
- Terminate the emergency event at the direction of government officials and fill out a Dam Emergency Termination Log (Appendix G)
- Communicate termination to emergency management authorities using the Notification Flowcharts shown in Section 3.
- Participate in the creation of an After Action Report (Appendix H) to be used in the EAP review process.

### 2.1.2 EAP Coordinator

- Provide leadership to ensure the EAP is reviewed and updated annually and copies of the revised EAP are distributed to all who received copies of the original EAP, and any other agency/department in need of the document. See Section 8 for more information.

### 2.1.3 Operations Manager

- Support the onsite operator and/or IRWD Operations Center on emergency level determination.

- Provide updates of the situation to the ICP or the City of Irvine EOC to assist them in making timely and accurate decisions regarding warnings and evacuations.
- Make calls on the emergency notification flowchart for the appropriate level (see Section 3).
- Dispatch engineers and construction crews as necessary.
- Dispatch a technical liaison to the ICP, the City of Irvine EOC, or the Orange County EOC, as necessary.
- Provide regular status reports to senior management.

#### **2.1.4 Director of Water Operations**

- Provide regular status reports to the IC, the City of Irvine EOC, or the Orange County EOC, as required.
- Initiate regular status report conference calls with dam site, IRWD command center (if established), engineering, and public relations.
- Coordinate with public relations staff at the City of Irvine and/or the Joint Information Center if established.

#### **2.1.5 IRWD Public Relations**

- As required, mobilize to the City of Irvine EOC or the Joint Information Center, if established.
- Participate in periodic status report conference calls.
- Provide input to staff on emergency communications.
- Represent IRWD to the media.

## **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. Where applicable, comments from these agencies informed the responsibilities detailed below.

### **2.2.1 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 is coordinated through the City of Irvine, 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 ICP may be established by the City of Irvine. The IC is a field level position that falls to the Irvine Police Department and/or the Orange County Fire Authority (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. The IC provides for unified command between applicable agencies. Responsibilities consist of establishing the incident command post, 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 IC is responsible for all incident activities, including the development of strategies and tactics and the ordering and the release of resources. Any emergency preparedness and response associated with a dam safety incident at the Sand Canyon Dam will be coordinated by the City of Irvine. The 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.

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.
- Participating in an annual review and update of the EAP.

### **2.2.2 City of Irvine**

The City of Irvine Emergency Management Plan addresses the City of Irvine's planned response to emergencies associated with natural and man-made disasters. 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.

Local governments manage and coordinate the overall emergency response and recovery activities within their jurisdiction. Local governments are required to use SEMS when their EOC is activated, or a local emergency is proclaimed, in order to be eligible for state funding of response-related personnel costs. In SEMS, the local government emergency management organization and its relationship to the field response level may vary, depending upon factors related to geographical size, population, function and complexity. The City of Irvine Emergency Management Plan details the organization and responsibilities of the SEMS elements within the City of Irvine. The City of Irvine maintains responsibility for the evacuation of the inundation

areas within the City limits, based on the threat and situation. Requests for response resources that exceed the capabilities of the City are forwarded to the Operational Area (OA). 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. As described in Section 2.2.1, depending on the nature of the incident and the designated emergency level, an ICP may be established. Additionally, depending on the severity of the emergency, a Local Emergency may be proclaimed, the City of Irvine EOC may be activated, and Orange County OA will be advised. When a potential dam failure emergency exists, typical responses by the City of Irvine might be:

- 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.
- 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.
- Medical care operations.
- Coroner operations.
- Care and shelter operations.
- Access and perimeter control.
- Public health operations.
- Restoration of vital services and utilities.

### **2.2.3 City of Newport Beach**

The City of Newport Beach maintains responsibility for emergency preparedness and response within the city limits. Since the inundation area of a dam failure at Sand Canyon Dam includes areas of the City of Newport Beach (Map Panel 7 of the Main Dam Failure Maps in Part II of this EAP), any emergency preparedness and response will be coordinated with the OA. The inundation area for a sudden and total failure of the dam within the City limits is confined to the San Diego Creek channel, and no overtopping of major cross roads is predicted within the City of Newport Beach.

The modeling that was conducted for the creation of the inundation map showed the impacts and risk of inundation are minimal once the flood wave reaches Newport Bay, west of Jamboree Road. Model results showed significant attenuation of the flood wave peak upon arrival in Newport Bay. The maximum increase in water depth due to a complete and total failure of the Sand Canyon Dam was 0.6 feet above the pre-flood water levels, which did not meet the definition for flood wave arrival and was therefore not mapped.

## 2.2.4 Orange County Department of Emergency Services, Emergency Management Division (EMD)

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 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 Orange County Sheriff's Department, Emergency Management Division (EMD) is responsible for developing, maintaining and distributing the County and OA EOP.

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

County and OA EOC Manager. The Orange County Sheriff's Department, 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 (BOS) 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.
- 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 Orange County Public Works (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 Operational Area 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.

Based on the inundation mapping conducted in support of this EAP, activation of the County and OA EOC is not anticipated. The City of Irvine is almost exclusively affected by a dam emergency at the 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. 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 (Cal OES) 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. At the request of the OA manager or a state agency, the Warning Center can obtain rapid responses from the personnel who coordinate resources for emergency response. The Warning Center is operated 24 hours a day, 7 days a week and, in extreme conditions, a dam owner's/operator's representative may request that the Warning Center notify the Orange County Sheriff on their behalf as a backup notification plan.

If the Warning Center is notified, immediate notifications would then be provided to:

- DWR - Division of Safety of Dams (DSOD)
- National Weather Service
- Cal OES Duty Officers
- Flood Operations Center
- State Parks and Recreation and/or
- Other agencies/departments as dictated by the event or required by law

### **2.2.6 California Department of Water Resources (DWR) – Division of Safety of Dams (DSOD)**

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. In the event of an emergency at the dam, the DSOD South Region Engineer will be notified in accordance with Section 3. DSOD actions could include, but are not limited to:

- Advising the dam owner's/operator's representative during the emergency level determination.
- Advising the dam owner's/operator's representative regarding remedial actions.

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. In order to confirm DSOD responsibilities, IRWD undertook the following communication and coordination with DSOD:

- Letter to DSOD on August 27, 2019 documenting DSOD responsibilities in this EAP
- Conversation with Richard Draeger, the regional engineer, on September 26, 2019
- Receipt of updated emergency contact info sheet from DSOD on September 26, 2019
- Email to Richard Draeger on October 2, 2019 as follow-up to August 27, 2019 letter
- Email from Richard Draeger on October 25, 2019 in response to August 27, 2019 letter, providing clarification on responsibilities and contact phone numbers

IRWD updated this EAP to reflect the contact phone numbers and comments received from DSOD.

### **2.2.7 National Weather Service (NWS) Weather Forecast Office (WFO)**

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 Orange County EMD.

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## Section 3: Notification Flowcharts

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### 3.1 Notification Flowcharts

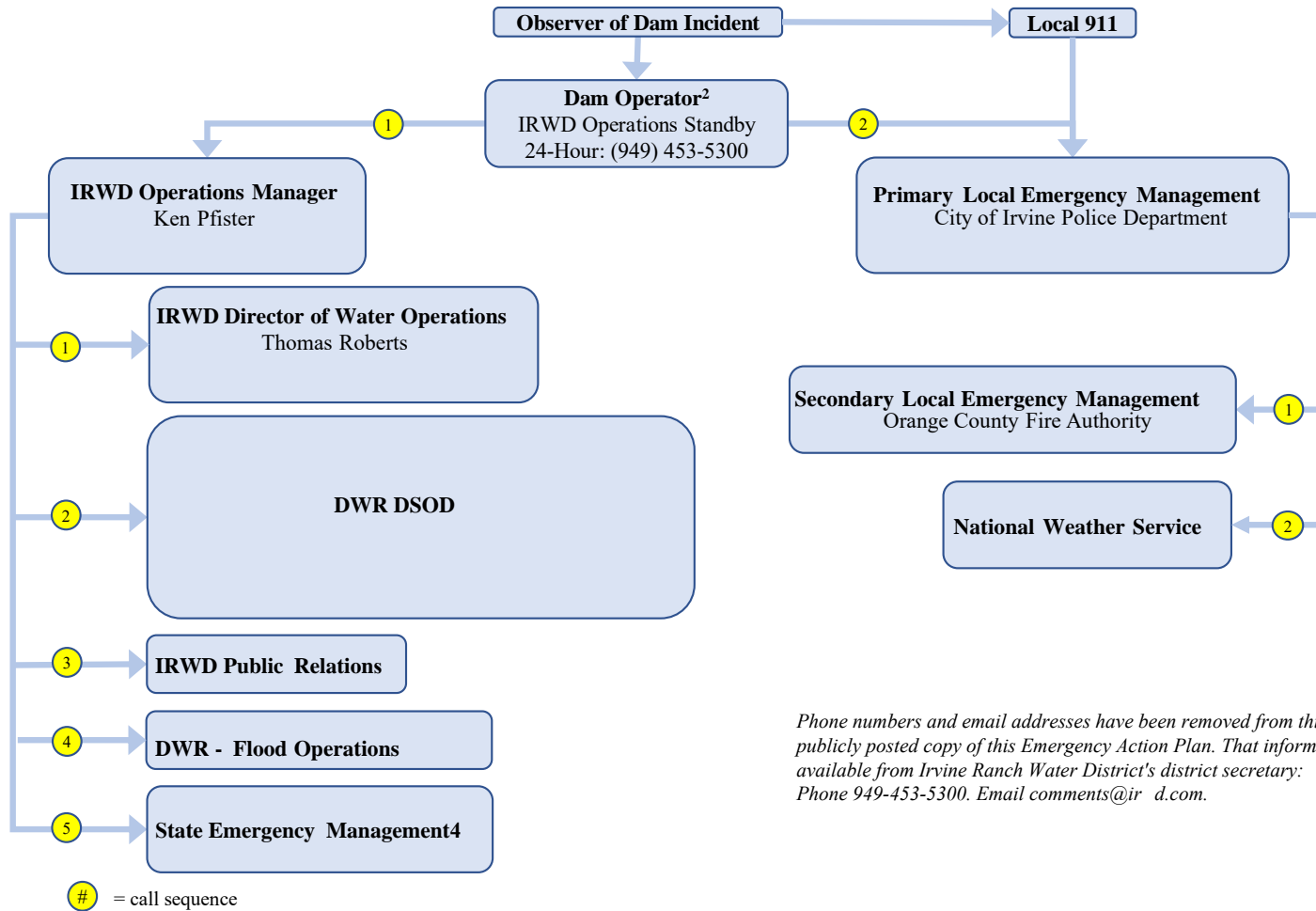
This section contains notification flowcharts and accompanying messages for each emergency level that could be activated at the Sand Canyon Dam: high flow, non-failure, potential failure, and imminent failure. The high flow and non-failure scenarios share a notification flow chart, as the same parties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

In the event of an emergency situation, IRWD and public safety agencies should reference these flowcharts to know who to contact and in what order. 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.

The Sand Canyon Reservoir has a very small drainage area and is filled and drained independently of a downstream system. It is therefore highly unlikely that it would be affected by a high flow situation as described in the FEMA guidelines. However, a notification flowchart and emergency message has been prepared for the high flow scenario to ensure complete preparedness.

The potential failure and imminent failure notification flowcharts require that the primary local emergency contact, 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. 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).

### High Flow and Non-Failure Notification Flowchart<sup>1</sup>



*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@ir d.com.*

**Notes:**

1. Use this chart in concert with the Contact Log in Appendix D to document notifications. Non-failure notifications are situation-dependent.
2. Inform the City of Irvine and IRWD Operations of the situation. Make it clear that the dam is currently safe.
3. Contact the Dam Operator if 911 is notified by a non-utility observer.
4. Use the Cal OES Warning Center Dam Incident Report in Appendix I. Copy to City of Irvine.

## High Flow Emergency Level Notification Script

This is \_\_\_\_\_ [your name and position].

We have an emergency condition at Sand Canyon Reservoir, Dam No. 1029.002, located in Irvine.

We have activated the Emergency Action Plan for this dam and are determining this to be a **High Flow** condition. The Sand Canyon Reservoir is not in danger of failing. Again, this is a **High Flow** condition and the Sand Canyon Reservoir is not in danger of failing.

At \_\_\_\_\_ on \_\_\_\_\_, IRWD observed or verified that flows into the reservoir  
(time) (date)  
are unusually high.

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 as a result of this condition. We will provide updates detailing any changes in flow or dam condition, and will notify you when the high flow situation is resolved.

I can be contacted at the following number: \_\_\_\_\_.

If you cannot reach me, please call the following alternative number: \_\_\_\_\_.

## Non-Failure Emergency Level Notification Script

This is \_\_\_\_\_ [your name and position].

We have an emergency condition at Sand Canyon Reservoir, Dam No. 1029.002, located in Irvine.

We have activated the Emergency Action Plan for this dam and are determining this to be a **Non-Failure** condition. Again, this is a **Non-Failure** condition.

At \_\_\_\_\_ on \_\_\_\_\_, IRWD observed or verified that:  
(time) (date)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_.

We are implementing predetermined actions to investigate and respond to this condition.

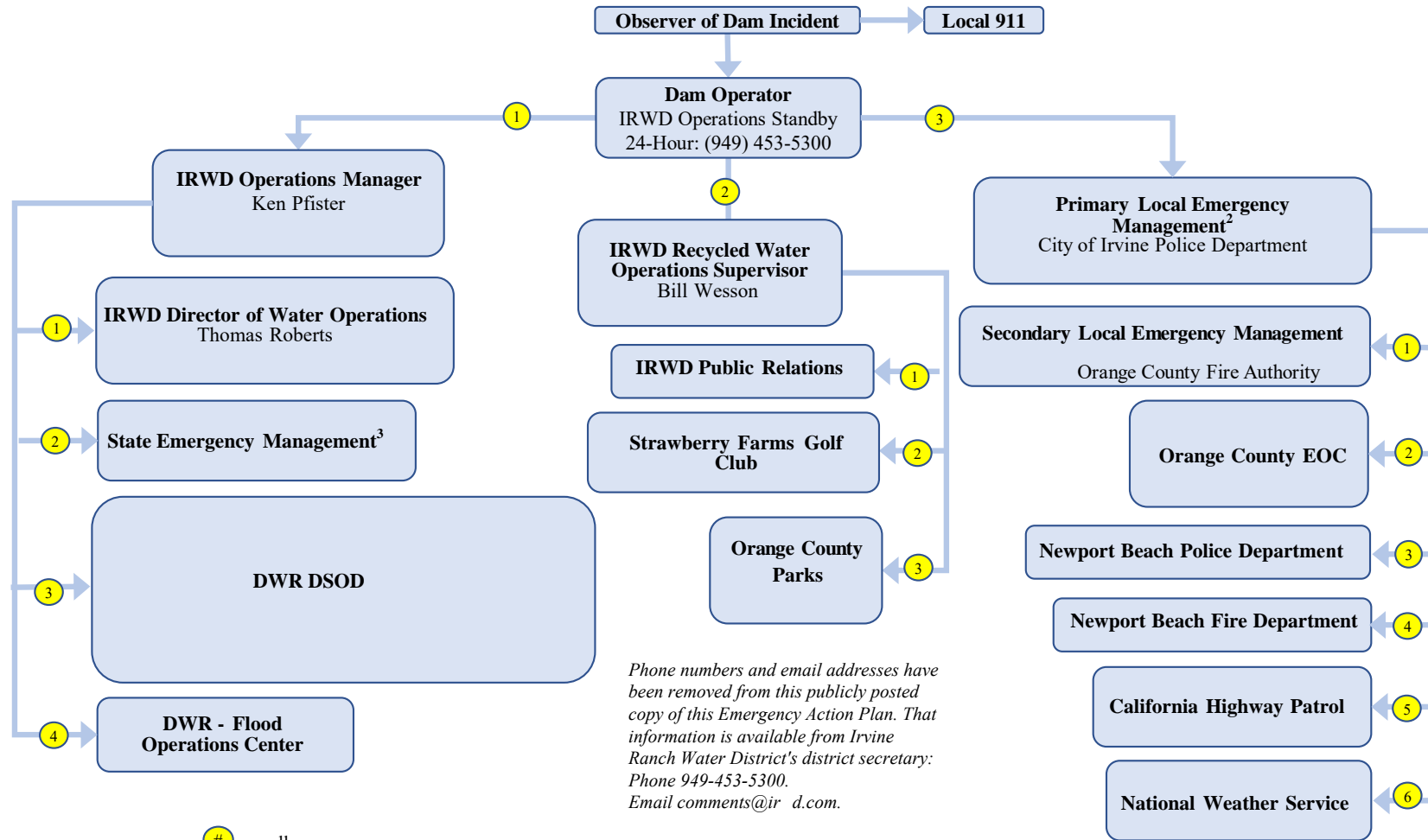
The dam is not predicted to fail as a result of this condition.

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

I can be contacted at the following number: \_\_\_\_\_.

If you cannot reach me, please call the following alternative number: \_\_\_\_\_.

### Potential Failure Notification Flowchart<sup>1</sup>



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## Potential Failure Emergency Level Notification Script

This is \_\_\_\_\_ [your name and position].

We have an emergency condition at the Sand Canyon Reservoir, Dam No. 1029.002, located in Irvine.

We have activated the Emergency Action Plan for this dam and are determining this to be a **Potential Failure** condition.

At \_\_\_\_\_ on \_\_\_\_\_, IRWD observed or verified that:  
(time) (date)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_.

We are implementing predetermined actions to respond to a rapidly developing situation that could result in dam failure.

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, University Trail, Mason Park, 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.

The dam could potentially fail as early as \_\_\_\_\_.

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

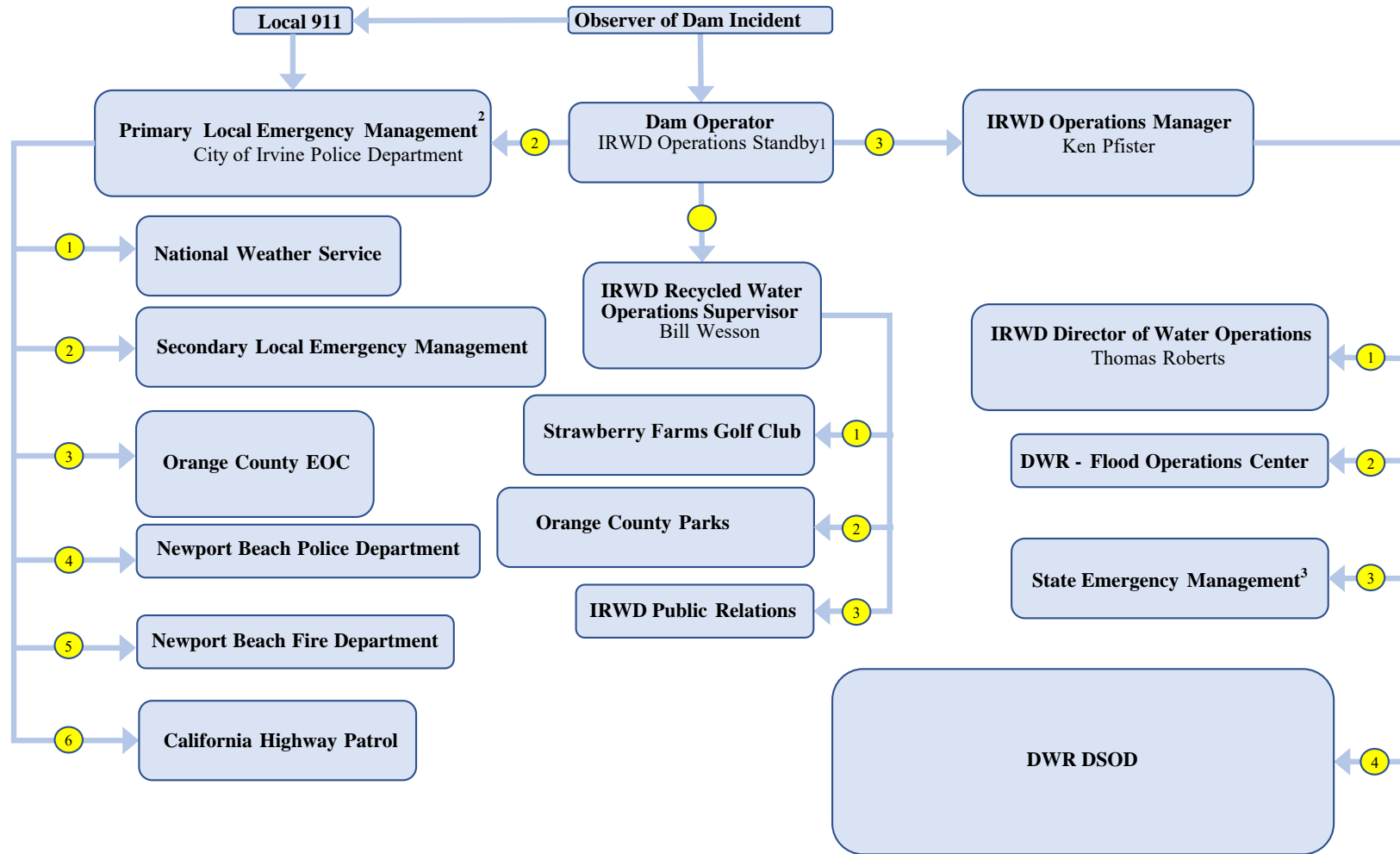
We will advise you when the situation is resolved or if the situation gets worse.

I can be contacted at the following number: \_\_\_\_\_.

If you cannot reach me, please call the following alternative number: \_\_\_\_\_.



### Imminent Failure Notification Flowchart<sup>1</sup>



# = call sequence

Notes:

1. Use this chart in concert with the Contact Log in Appendix D to document notifications.
2. Contact the Dam Operator if 911 is notified by a non-utility observer.
3. Use the Cal OES Warning Center Dam Incident Report in Appendix I. Copy to City of 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@ir d.com.*

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## Imminent Failure Emergency Level Notification Scripts

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, Dam No. 1029.002, is failing; 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, University Trail, Mason Park, 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.

We have activated the Emergency Action Plan for this dam and are determining this to be an **Imminent Failure** condition.

At \_\_\_\_\_ on \_\_\_\_\_, IRWD observed or verified that:  
(time) (date)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_.

We are implementing predetermined actions to investigate and respond to this condition.

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

I can be contacted at the following number \_\_\_\_\_.

If you cannot reach me, please call the following alternative number: \_\_\_\_\_.

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

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, Dam No. 1029.002, located in Irvine is failing. Repeat. Sand Canyon Reservoir, Dam No. 1029.002, 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, the University Drive and Michelson Drive intersection, and adjacent areas including: the Strawberry Farms Golf Club, University Trail, Mason Park, Bethel Church, Irvine First Baptist Church, and portions of the Rancho San Joaquin Golf Course may be flooded. In the event of a dam failure, University Drive from I-405 to Campus Drive may flooded. 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.

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
Cal OES	California State Warning Center			
CHP	24-Hour Dispatch/Immediate			
DWR DSOD	Andrew Mangney (Chief, Field Engineering Branch)			
DWR DSOD	Richard Draeger (Southern Regional Engineer)			
DWR DSOD	Ashley Moran (Area 9 Engineer)			
Irvine Police Department	Robert Simmons (Emergency Management Administrator)			
IRWD	Paul Cook, P.E. (General Manager)			
IRWD	Ken Pfister (Water Operations Manager)			
IRWD	Thomas Roberts (Director of Water Operations)			
IRWD	Bill Wesson (Recycled Water Operations Supervisor)			
IRWD	Beth Beeman (Public Relations)			
IRWD	Operations Standby			
NWS	National Weather Service			
Newport Beach Fire Department	Chip Duncan (Fire Chief)			

Organization	Name (Title)	Primary Phone #	Secondary Phone #	Email Address
Newport Beach Police Department	Jon T. Lewis (Chief of Police)			
Orange County Fire Authority	Dave Anderson (Deputy Chief, Emergency Operations)			
Orange County Sheriff's Department	Emergency Operations Center "Control One"			
Orange County Sheriff's Department	Non-Emergency Dispatch			
Strawberry Farms Golf Club <sup>(a)</sup>				

*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.*

Notes: (a) Strawberry Farms Golf Club is located immediately downstream of the dam, and has been added to the notification flowcharts and contact tables in order to facilitate warnings and evacuations.

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## Section 4: Project Description

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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. It has 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.

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 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 Michelson Water Recycling Plant (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 dam has a concrete spillway which discharges into a concrete-lined channel. 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. 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<sup>1</sup>. The historical peak recorded at a gage downstream of the dam was 1,310 cfs (recorded on December 22, 2010)<sup>2</sup>. Because of the inundation area associated with a failure of the spillway weir when the reservoir is full, the spillway weir has been designated as a Critical Appurtenant Structure (CAS) by DSOD. Inundation maps 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.

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

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<sup>1</sup> 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.

<sup>2</sup> Data from USGS Station 11048553 for peak flows observed from 2002 through 2013.

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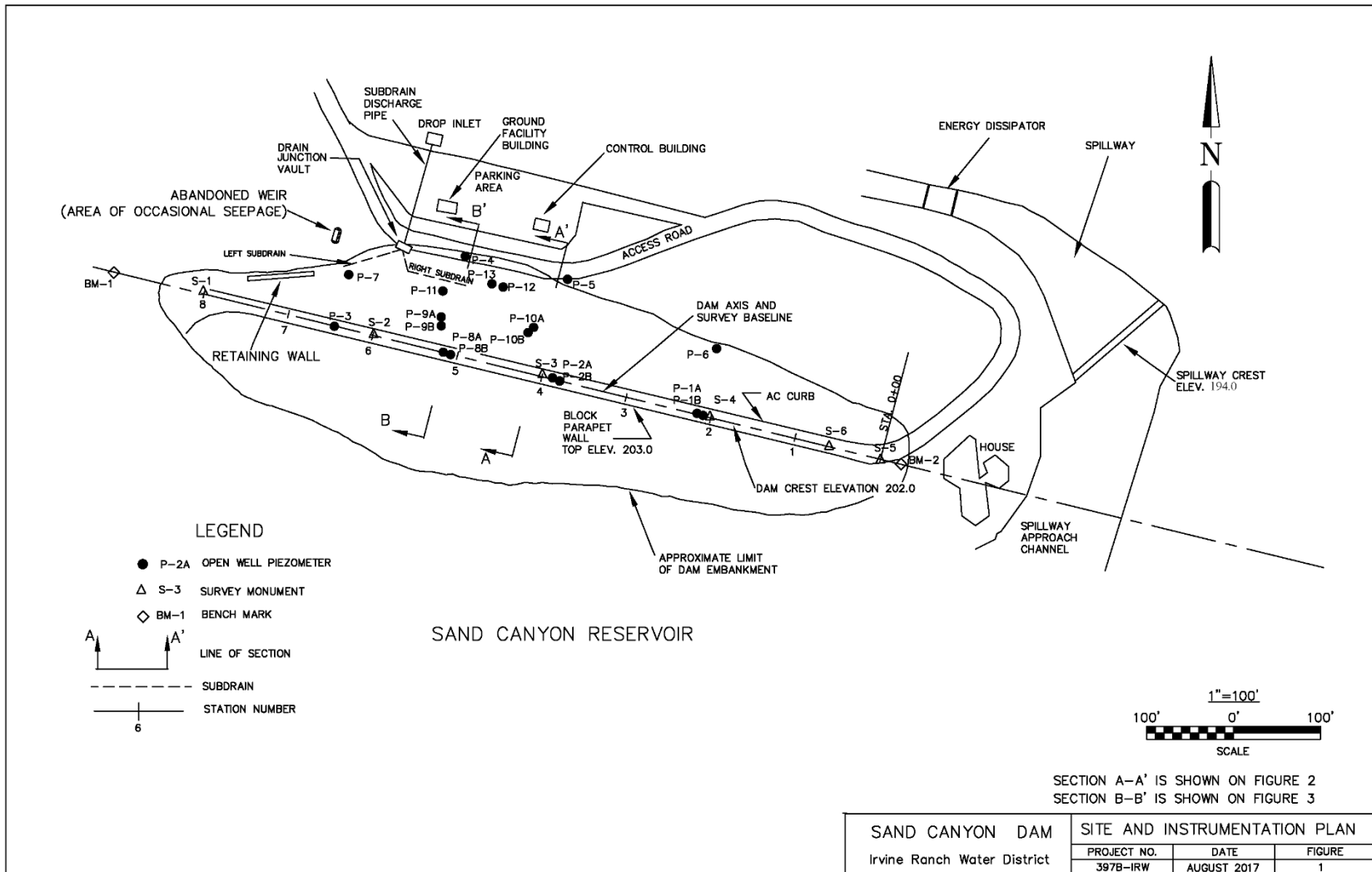
lowering of the reservoir level, this must be done in accordance with the standard operating procedures maintained by the MWRP. All actions associated with controlling flow into or out of the reservoir must be coordinated with the dam operator or a representative designated by IRWD.

*Figure 4-1- Schematic, Appurtenant Structures and Access Road* shows a schematic of the dam, appurtenant structures and access road. *Figure 4-2- Spillway Discharge Curve* and *Figure 4-3- Reservoir Storage Capacity Curve* are provided for emergency planning and response purposes.

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.

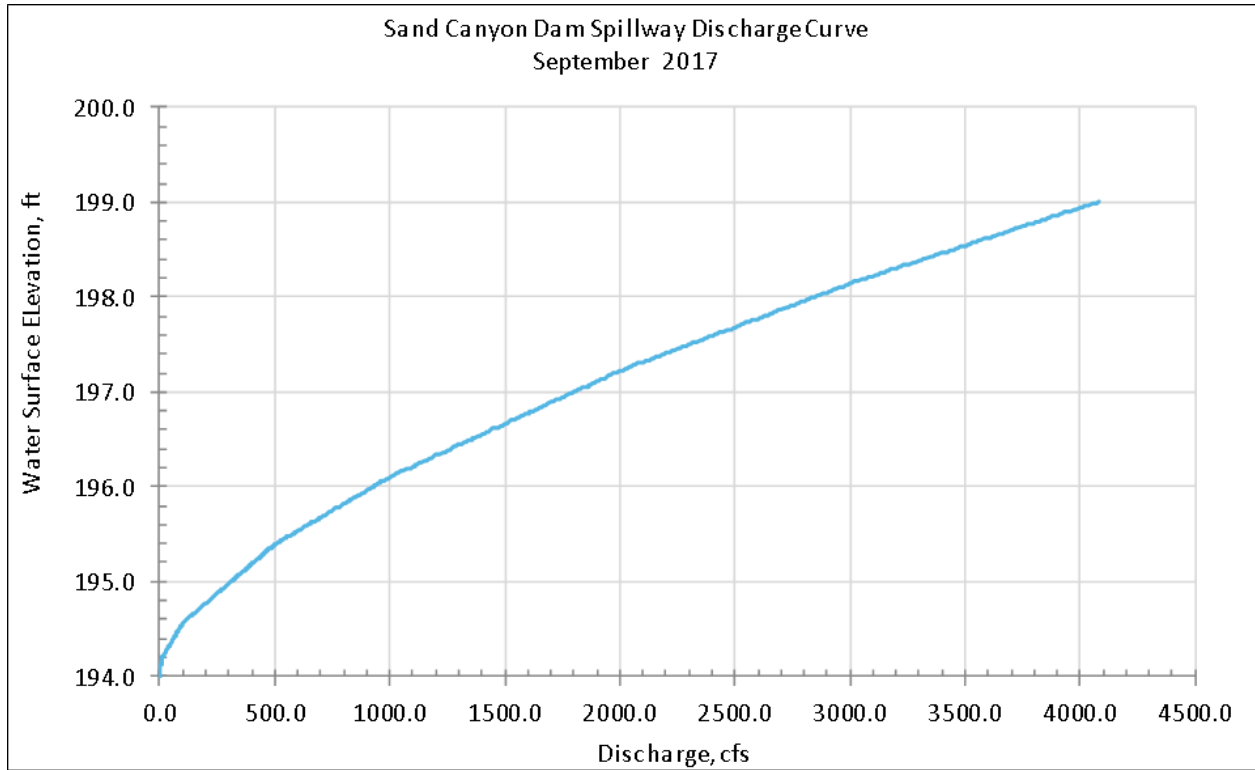
No extreme high flow or emergency events have ever occurred at the Sand Canyon Dam which affected the surrounding community or downstream areas. If the dam were to fail, the Strawberry Farms Golf Course would likely be inundated, along with the low-lying portions of Sand Canyon Creek and San Diego Creek 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. 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 flood wave caused by a failure of Sand Canyon Dam could take 8 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 10 hours to subside.

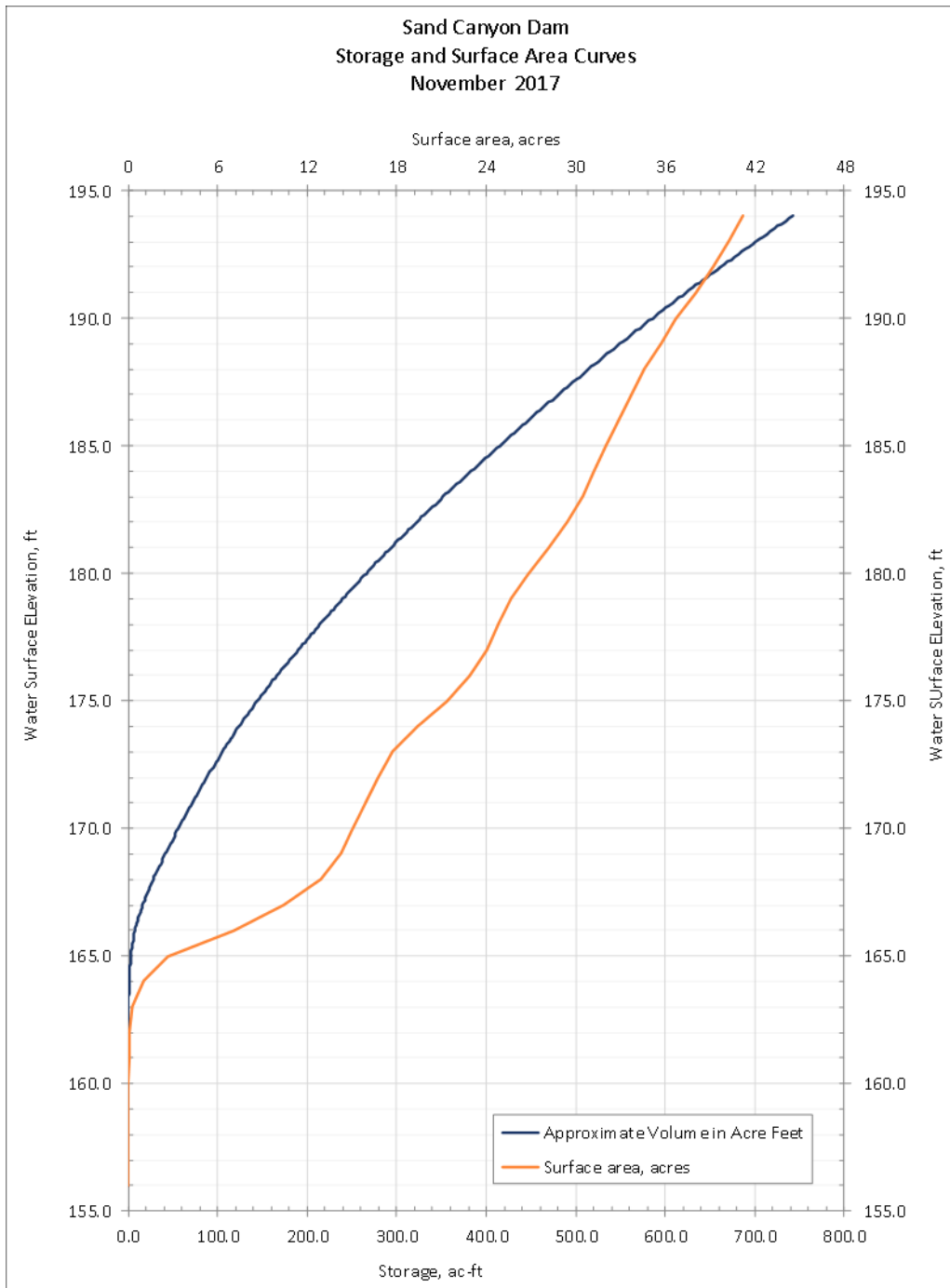


**Figure 4-1- Schematic, Appurtenant Structures and Access Road**





**Figure 4-2- Spillway Discharge Curve**



**Figure 4-3- Reservoir Storage Capacity Curve**

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# Section 5: EAP Response Process

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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. The dam is visually inspected on a daily basis. Subdrain flows and piezometer water levels are monitored monthly at the dam. The dam also has six survey monuments, which are surveyed annually as part of the dam's annual surveillance program. See additional information in Section 7.1. 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. Additionally, the Strawberry Farms Golf Course is immediately downstream of the dam. Any anomalies that are not detected by IRWD operations and maintenance staff, may be observed and reported by the general public. See Section 7 of this EAP for specific monitoring and detection instrumentation.

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## 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 Operations Manager will determine the emergency level.

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, and *Table 5.1-1- Emergency Level Determination* is provided for 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.

The Sand Canyon Reservoir has a very small drainage area and is filled and drained independently of a downstream system. It is therefore highly unlikely that it would be affected by a high flow situation as described in the FEMA guidelines. However, the high flow scenario has been included in this EAP to ensure complete preparedness.

### ***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***

This classification indicates dam failure is imminent or in progress and could threaten life and property. When it is determined that there is no longer time available to implement corrective measures to prevent dam failure, an order for evacuation of residents in potential inundation areas will be issued by the IC. 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.

**Table 5.1-1- Emergency Level Determination**

<b>Event</b>	<b>Example Situation</b>	<b>Emergency Level</b>
<b>Earthquakes</b>	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
<b>Embankment Cracking or Settlement</b>	New cracks in embankment greater than 1/4-inch-wide without seepage	Non-Failure
	Cracks in the embankment with seepage	Potential Failure
<b>Embankment Movement</b>	Visual shallow slippage	Non-Failure
	Visual deep-seated movement/slippage of embankment	Potential Failure
	Sudden or rapidly proceeding slides of embankment slope	Imminent Failure
<b>Erosion of Spillway</b>	Spillway flowing with active erosion gullies	Potential Failure
	Spillway flowing with significant erosion and head cutting advancing rapidly toward reservoir	Imminent Failure
<b>Fire</b>	Significant fire in the area that affects access to the dam	Non-Failure
<b>Abnormal Instrumentation Reading</b>	Instrumentation readings beyond predetermined values	Non-Failure
<b>Outlet System Failure</b>	Releases causing erosion around outlet works	Non-Failure

Event	Example Situation	Emergency Level
	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

## 5.2 Step 2: Notification and Communication

After the emergency level at the dam has been determined, notifications are made in accordance with the appropriate notification flowcharts in Section 3. The three 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. 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 potential failure and imminent failure 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. 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, prescribed messages are available in Appendix E. Additionally, 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. 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.

*Table 5.4-1 - Possible Remedial Actions* provides the dam owner/operator with a set of actions to take for different events. 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.

### 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 incident commander is responsible for terminating the emergency event and relaying this decision to appropriate individuals and agencies. Part of this notification process includes calling all contacts on the notification flowcharts to inform them that the EAP has been terminated. 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 a 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.



**Table 5.4-1 - Possible Remedial Actions**

Condition	Description of Condition	Action to be Taken
<b>Large Spillway Release/High Water Level</b>	Reservoir level reaches elevation 194.00 ft (spillway begins to discharge).	1. Cease filling operations unless overfilling and spillway discharge is planned. Close inlet valves.
		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.
<b>Seepage</b>	Localized new seepage or boils observed along downstream face / toe of earthen embankment with muddy discharge and increasing but controllable discharge of water	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. 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.
		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.
		4. Contact geotechnical engineer and provide all data collected.
		5. Maintain continuous monitoring of feature. Record measured flow rate and any changes of condition, including presence or absence of muddy discharge.

Condition	Description of Condition	Action to be Taken
<b>Seepage (cont.)</b>	Localized new seepage or boils (cont.)	<p>6. Review information collected by field inspection and provide additional instructions / actions as required. Recommend remedial seepage and stability measures.</p> <p>7. Make notifications if condition worsens such that failure is imminent.</p>
<b>Sabotage and Miscellaneous Other Issues</b>	Criminal action with significant damage to embankment or structures where significant repairs are required and the <b>integrity of the facility is compromised – condition appears stable with time.</b>	<p>1. Contact law enforcement authorities and restrict all access (except emergency responders) to dam. Restrict traffic on dam crest to essential emergency operations only.</p> <p>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.</p> <p>3. If necessary to lower reservoir level, coordinate with the Michelson Recycled Water Plant.</p> <p>4. Perform additional tasks as directed by the Engineering Supervisor or designee.</p> <p>5. Make notifications if conditions worsen.</p>
<b>Earthquakes</b>	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.
<b>Erosion of Spillway</b>		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.
<b>Fire</b>		Implement fire procedures (if applicable).

Condition	Description of Condition	Action to be Taken
<b>Abnormal Instrumentation Reading</b>	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.
<b>Outlet System Failure</b>	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.
<b>Embankment Deformation</b>	<p><b>Cracks:</b> 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>	<ol style="list-style-type: none"> <li>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.</li> <li>2. Restrict traffic on dam crest to essential emergency operations only.</li> <li>3. Contact geotechnical engineer and provide all data collected.</li> <li>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.</li> <li>5. Place sand bags as necessary around crack area to divert any storm water runoff from flowing into crack(s).</li> <li>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.</li> <li>7. Review information collected by field inspectors and provide additional instructions / actions as required. Consider survey monitoring.</li> <li>8. Make notifications if conditions worsen such that failure is imminent.</li> </ol>

Condition	Description of Condition	Action to be Taken
<b>Embankment Deformation (cont.)</b>	<p><b>Slides / Erosion:</b> 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.</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. 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.
	<p><b>Sinkholes:</b> 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.</p>	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
<b>Embankment Deformation (cont.)</b>	<b>Sinkholes (cont.):</b>	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.
		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 remedial construction such as grouting.
		8. Make notifications if conditions worsen such that failure is imminent.

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# Section 6: General Responsibilities

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## 6.1 Irvine Ranch Water District Responsibilities

IRWD is responsible for developing and maintaining the EAP. In coordination with the emergency management authorities described in Section 2, IRWD is also responsible for implementing the EAP, detecting and evaluating dam safety incidents, classifying incidents, notifying emergency management authorities, and taking appropriate response actions.

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

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.

The City of Irvine has the overall responsibility to provide an effective emergency response. A unified command may be established in order to coordinate between multiple jurisdictions and/or agencies, as required. Once notified of an incident at the dam, the City of Irvine may activate an EOC to serve as a central coordination center for emergency response, warning, and evacuation activities.

Flood warnings and watches will be issued by the San Diego Weather Forecast Office of the National Weather Service.

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 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 City of Irvine maintains the evacuation plan within the city limits for a dam safety emergency at the Sand Canyon Dam, and has the overall responsibility to provide an effective emergency response. The City of Irvine will implement evacuation plans as required, and in consultation with IRWD operations and engineering staff.

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. If it were determined that evacuation within city limits were required, the City of Newport Beach would retain the overall responsibility to provide an effective emergency response in compliance with existing city evacuation plans and direction from IRWD operations and engineering staff.

#### **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 Operations Manager, who will provide regular status reports to senior management and local authorities. During a dam safety incident, access to the dam site will be strictly controlled by IRWD. 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 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 F) 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.

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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. OCFA, the City of Irvine EOC Manager and the County and OA EOC Manager may prepare a separate after-action report focused on the emergency response and evacuation.

## **6.5 EAP Coordinator Responsibilities**

IRWD has designated the IRWD Safety Manager 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 Emilyn Zuniga, who can be reached at:

Emilyn Zuniga, IRWD Safety Manager  
Irvine Ranch Water District



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# Section 7: Preparedness

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## 7.1 Surveillance and Monitoring

The Sand Canyon Dam 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. *Figure 7.1-1- Monitoring and Surveillance Locations* is a site and instrumentation plan showing the layout of the dam and appurtenances, as well as the locations of the piezometers, subdrains, and survey monuments. *Figure 7.1-2- Monitoring and Surveillance Profile* shows Section A-A', which is the location of the deepest portion of the alluvium in the foundation.

### 7.1.1 Survey Monuments

There are six 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. There are currently a total of 18 open-well piezometers that are being monitored at Sand Canyon Dam. The water levels in the piezometers 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.

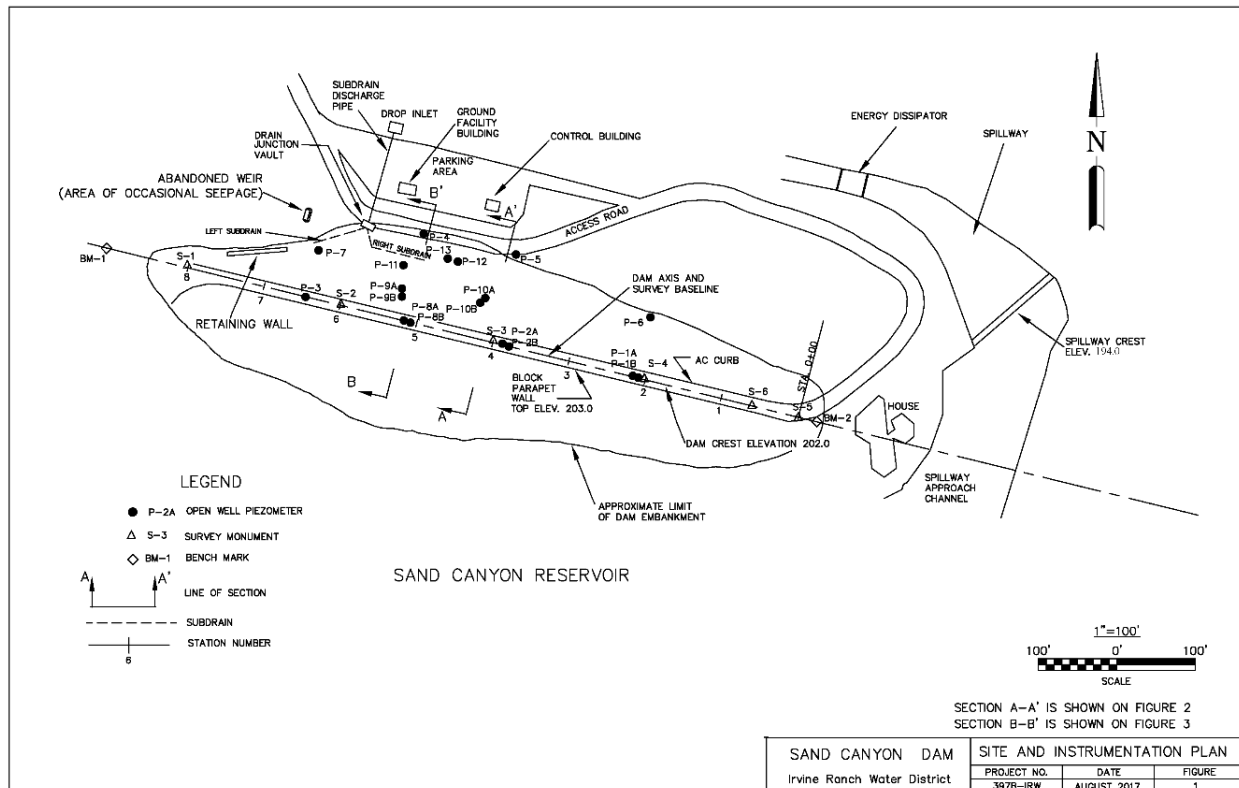
### 7.1.4 Visual Surveillance and Monitoring

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 semi-annual 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 7.1-1- Monitoring and Surveillance Locations**

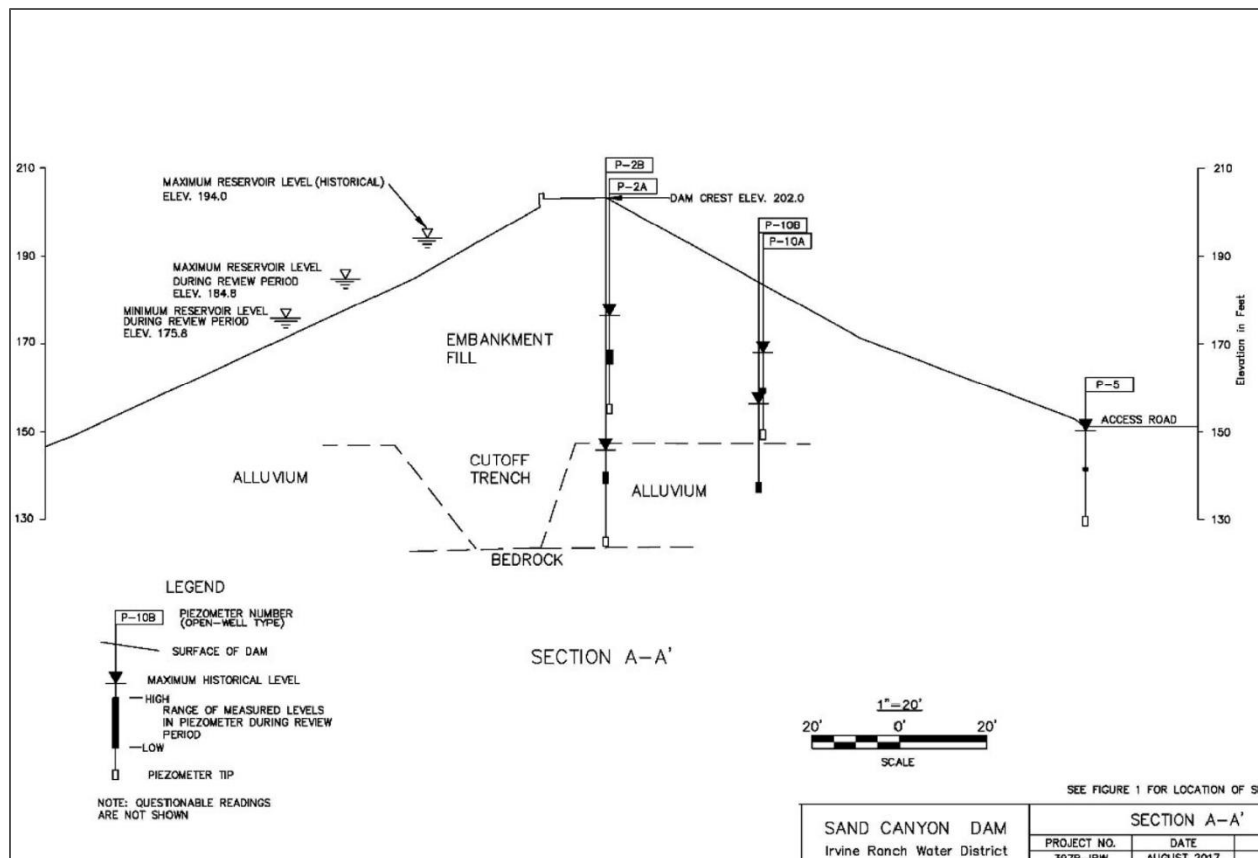


Figure 7.1-2- Monitoring and Surveillance Profile

## 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.

### 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 County Emergency Management Division. 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 County Emergency Management Division 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 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 at 82 Strawberry Farm Road, Irvine, CA 92612. Unescorted access to the dam site is not permitted. *Figure 1.2-1-*

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*Sand Canyon Dam Area Overview and Figure 4-1- Schematic, Appurtenant Structures and Access Road* provide additional site information.

The primary access to the site is in the inundation area of a dam failure. In the event of a dam failure, the site may be accessible from the adjacent neighborhood off Ridgeline Road or an access road that runs along the eastern side of the reservoir that is accessible from Shady Canyon Drive.

#### **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. 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. Because of the availability of 24-hour emergency response staff, the response to an emergency incident during periods of darkness should not be significantly longer than during periods of daylight. Notification times would be the same as during daylight hours. Phone numbers in the notification charts are 24-hour contact numbers, so notification procedures during periods of darkness are the same as on weekdays.

#### **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.

#### **7.6 Response During Adverse Weather**

Periods of adverse weather that have the ability to impact dam safety may require additional staff to be on-call or prepared to execute response actions. The Director of Water 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.

## 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. In the event of an electrical outage, cellular phones may be used for communications in lieu of a telephone land line or computer. Reservoir control valves and structures can be operated manually. Backup generators are not required to maintain normal operations at the dam. However, generators may be brought to the site to power additional lighting if needed to evaluate the dam in periods of darkness.

## 7.8 Emergency Supplies and Information

IRWD maintains emergency supplies and response equipment for many potential response actions. However, in the event that the IRWD internal response capabilities are exceeded, *Table 7.8-1- Locally Available Resources* is provided to aid in securing additional response materials and equipment.

**Table 7.8-1- Locally Available Resources**

Heavy Equipment Service and Rental	Sand and Gravel Supply	Ready-Mix Concrete Supply
<i>Primary</i>		
Herc Rentals-Jennifer Mendez	PTI Sand and Gravel- Mike Ellena	National Ready Mix Concrete- Joe Palladino
3040 E Miraloma Ave Anaheim, CA 92806	14925 River Rd Corona, CA 92676	16282 Construction Dr Ctr Irvine, CA 92606
<i>Secondary</i>		
Herc Rentals—Josh Anfang	Saddleback Materials	
3040 E Miraloma Ave Anaheim, CA 92806	6090 Etiwanda Ave Mira Loma, CA 91752	

## 7.9 Stockpiling Materials and Equipment

IRWD has construction and maintenance staff with equipment and supplies on hand that can respond with earthmoving equipment, minor flooding response, pipe and appurtenance repair. Equipment, materials, and supplies required that exceed the IRWD capabilities are locally accessible at the locations in *Table 7.8-1- Locally Available Resources*. Equipment owned by IWRD is generally located within 10 miles of the dam and could be moved to the dam site within 45 minutes. Equipment obtained from third parties listed in Table 7.8-1 could be obtained within about 2 hours during regular business hours.

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## 7.10 Coordination of Information

Coordination with the NWS or other appropriate agency is recommended to monitor storms, river stages, and flood waves resulting from a dam break. The Sand Canyon Reservoir stores recycled water and natural flows collected from the surrounding watershed. 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. 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, so no coordination is required with other dams.

## 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.

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.

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 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.



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## Section 8: Plan Maintenance

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### 8.1 Plan Review

The EAP Coordinator, Emilyn Zuniga, 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.

### 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. 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. A list of the revisions to the EAP is maintained in Appendix B.

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

Emilyn Zuniga, IRWD Safety Manager  
Irvine Ranch Water District

## 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 ----- or Program Manager Ariya Balakrishnan at -----.

Sincerely,



Sharon K. Tapia, Chief  
Division of Safety of Dams

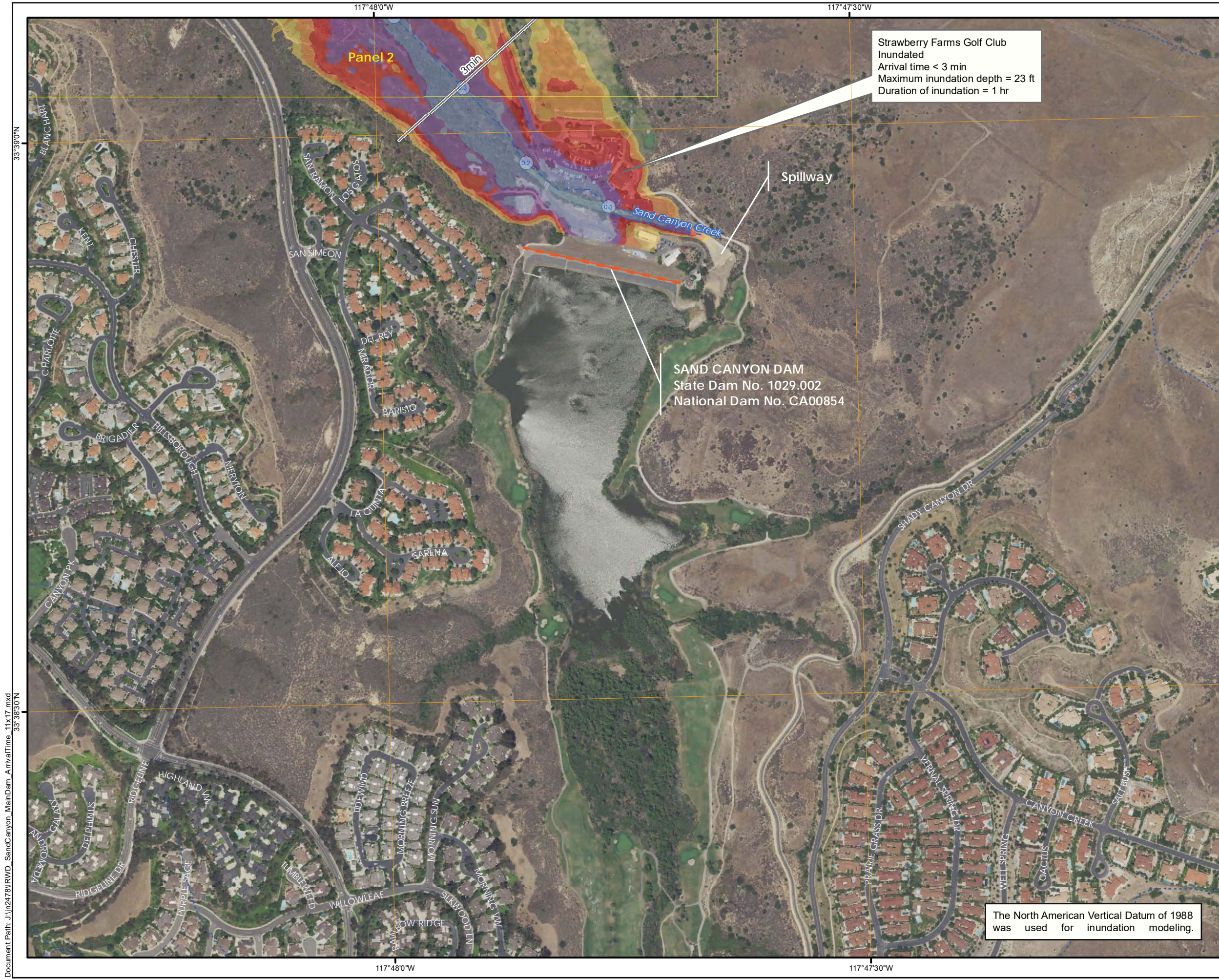
cc: Mr. José Lara, Chief  
Dam Emergency Action Planning Division  
California Governor's Office of Emergency Service  
3650 Schriever Avenue  
Mather, California 95655

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

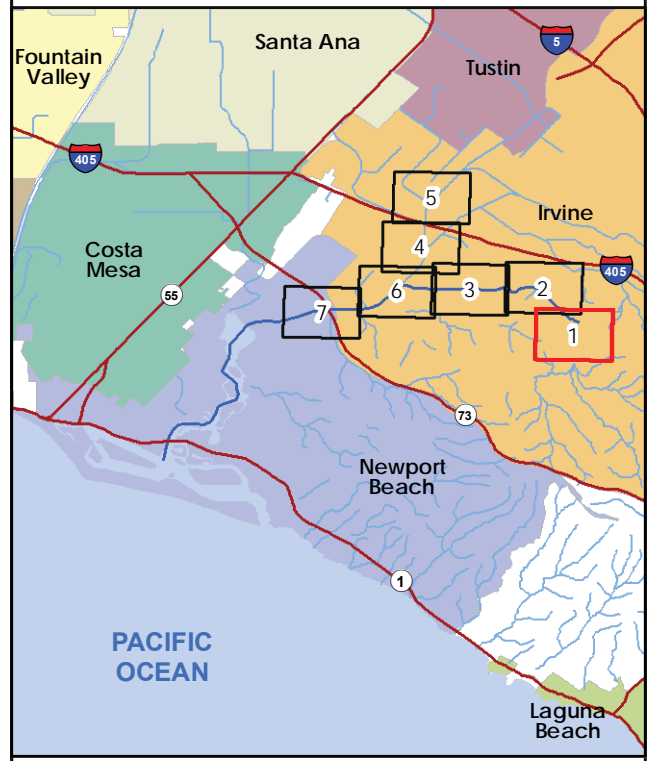
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# Main Dam Failure - Arrival Time

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**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

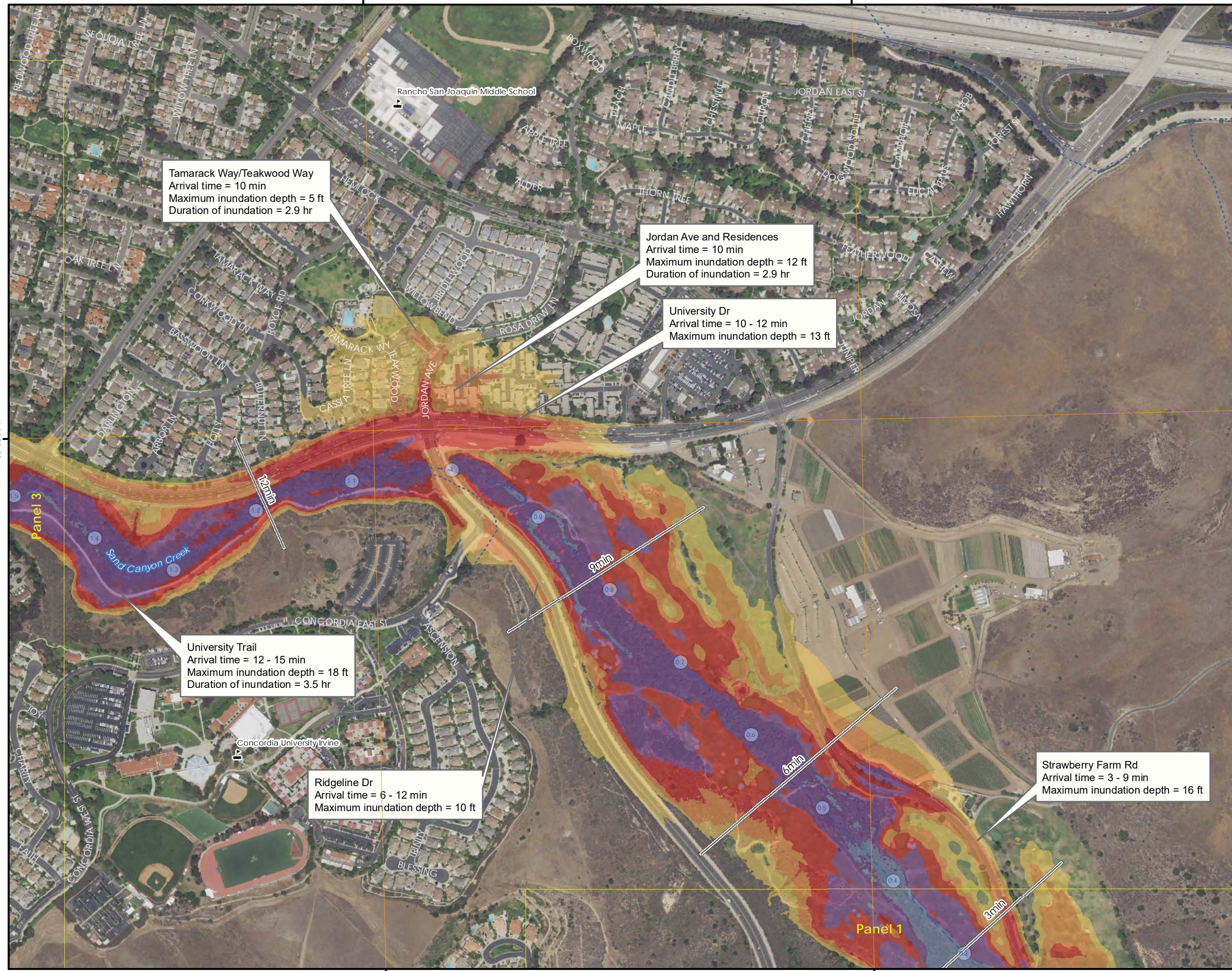
0 250 500 750 Feet

0 100 200 Meters

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

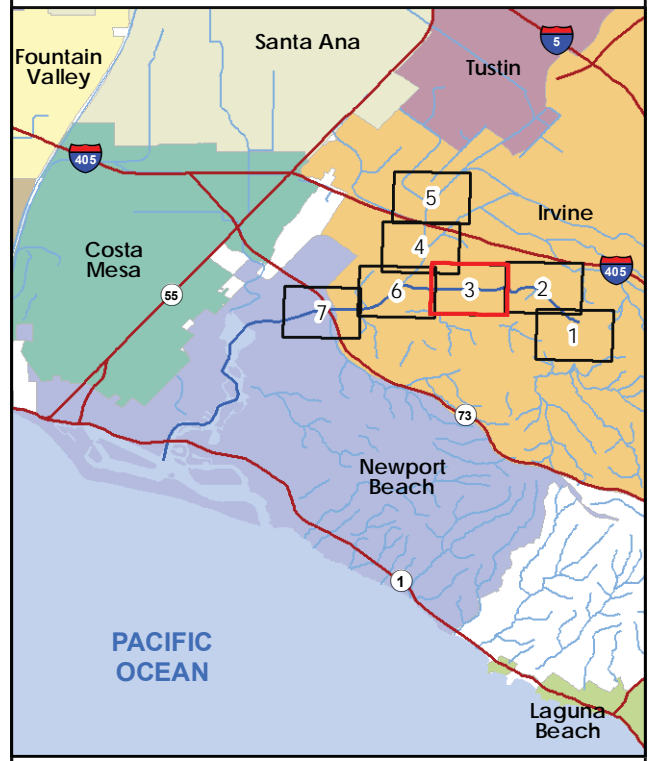
117°48'30"W

117°48'0"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
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**



Document Path: J:\m2478\IRWD\_SandCanyon\_MainDam\_ArrivalTime\_11x17.mxd

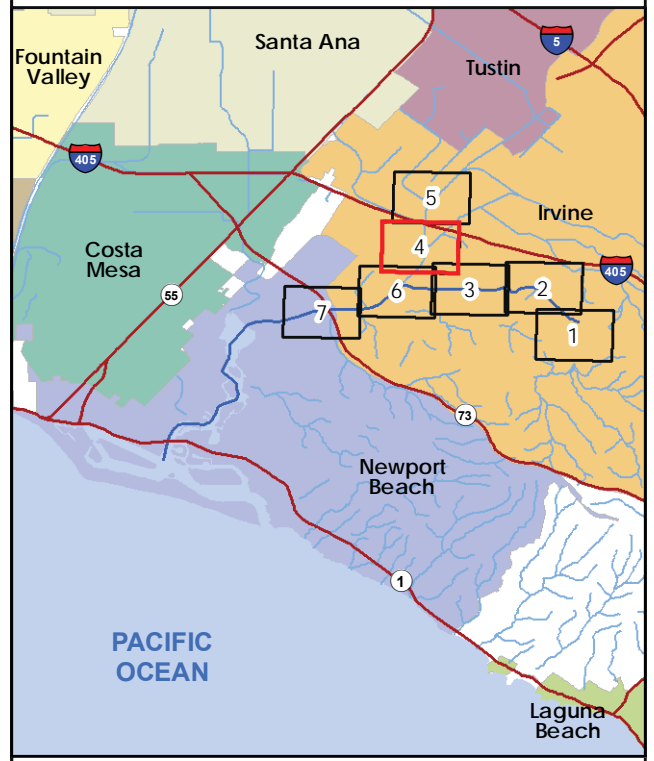


Interstate 405  
Not overtopped  
Arrival time = 1.3 hr  
Maximum depth in channel = 7 ft

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

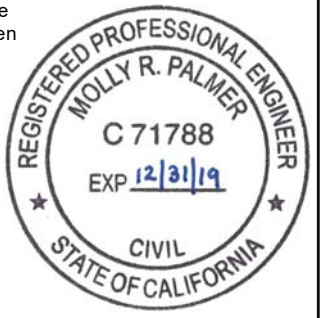


**Legend**

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		

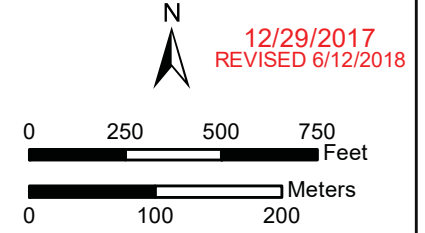
Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

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

PANEL 4 of 7



117°50'30"W

117°50'0"W

117°49'30"W

117°50'30"W

117°50'0"W

117°49'30"W

33°41'0"N

33°41'0"N

33°40'30"N

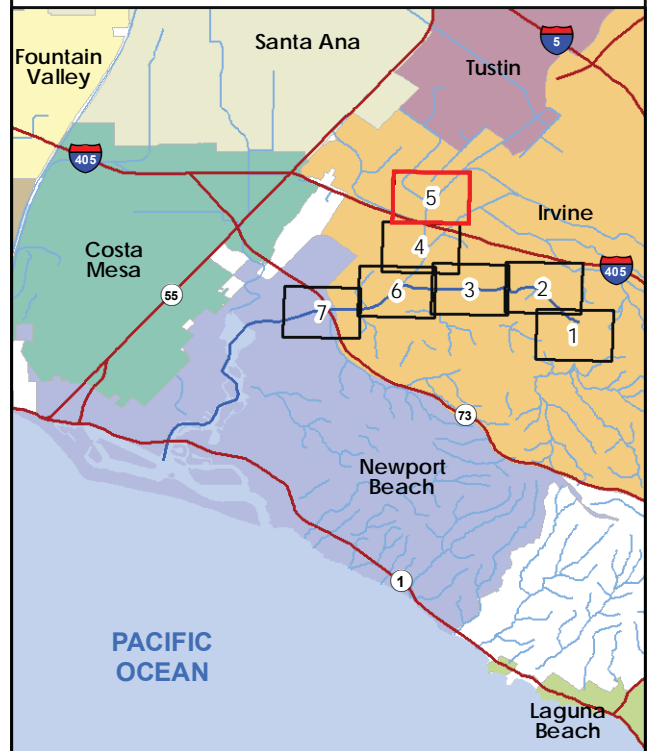


Alton Pkwy  
 Not overtopped  
 Arrival time = 2.1 hr  
 Maximum depth in channel = 2 ft

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

# SAND CANYON DAM SUNNY DAY FAILURE INUNDATION MAP 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.

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

**PANEL 5 of 7**

12/29/2017  
 REVISED 6/12/2018

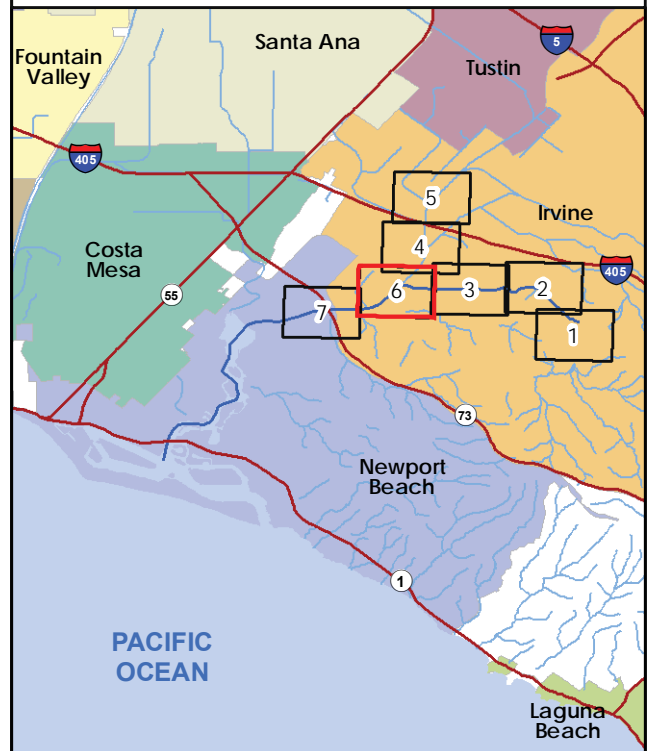
0 250 500 750 Feet

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

**PANEL 6 of 7**

12/29/2017  
REVISED 6/12/2018

0 250 500 750 Feet  
0 100 200 Meters

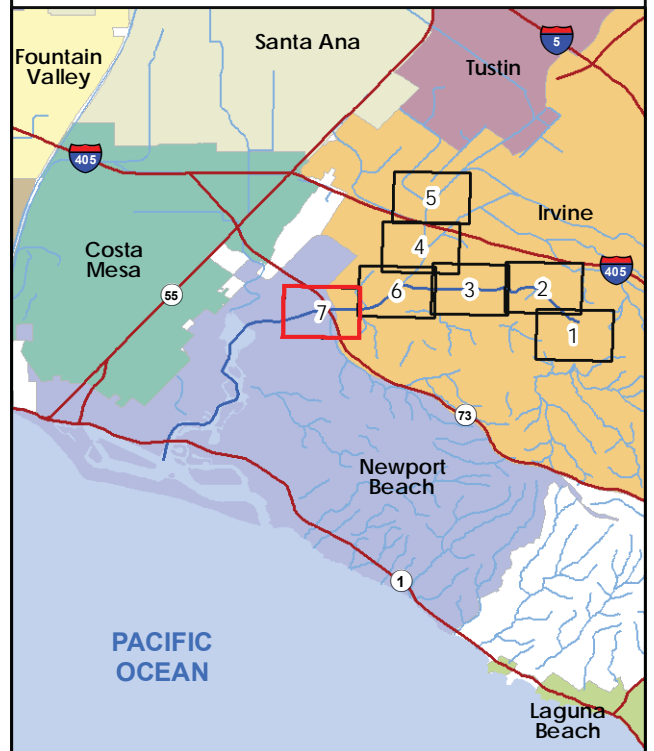
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117°52'0"W

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**

**STETSON ENGINEERS INC.**

12/29/2017  
REVISED 6/12/2018

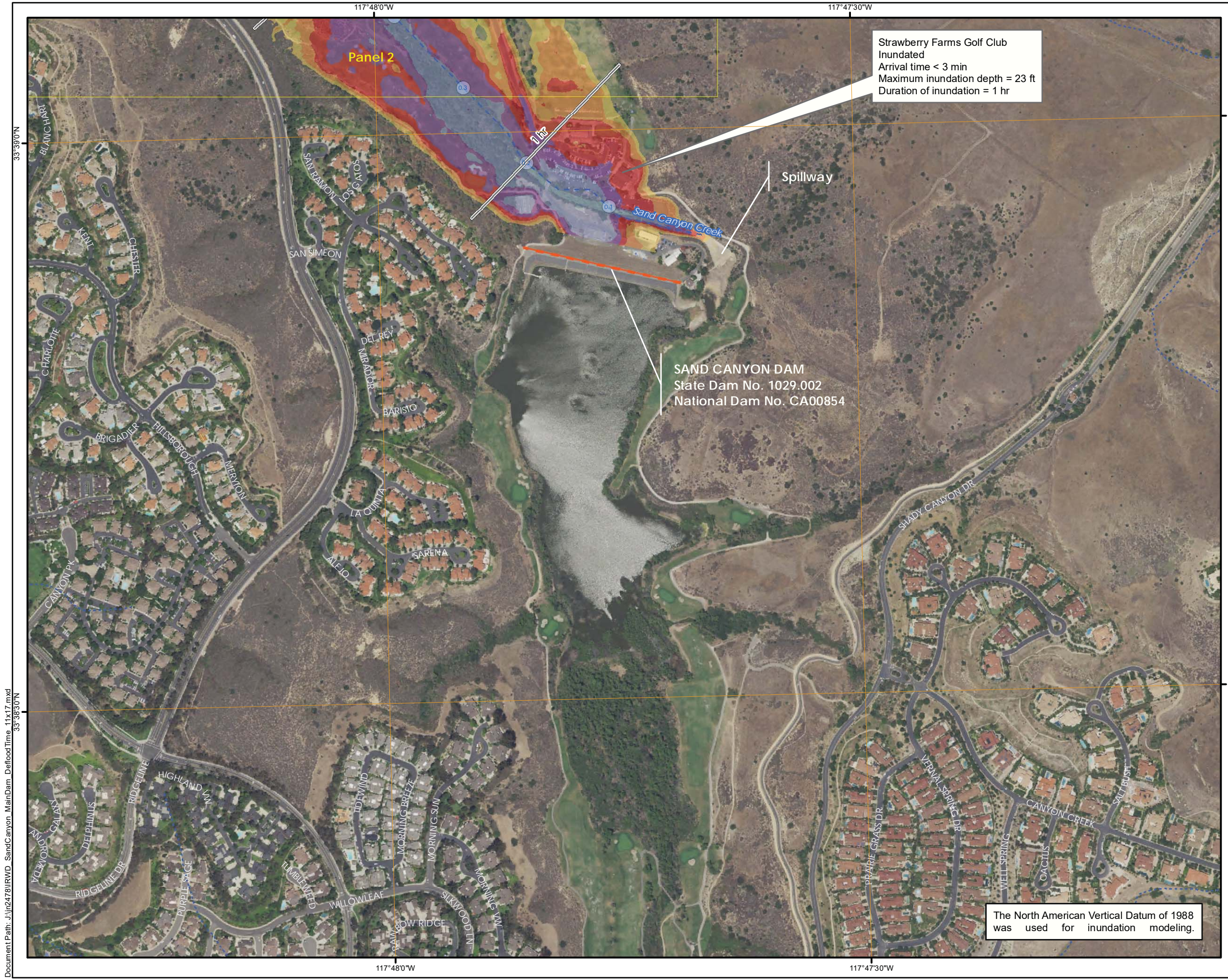
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0 100 200 Meters

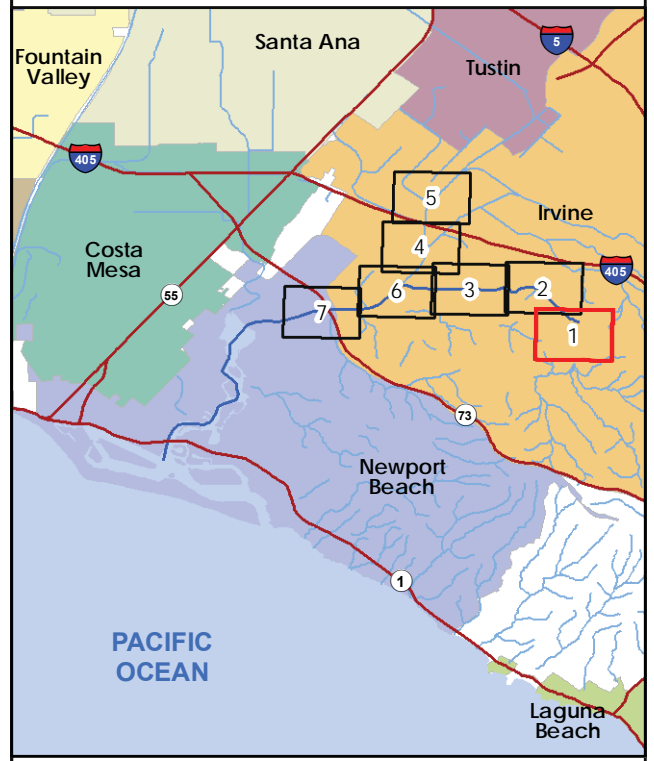
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# Main Dam Failure - Deflood Time

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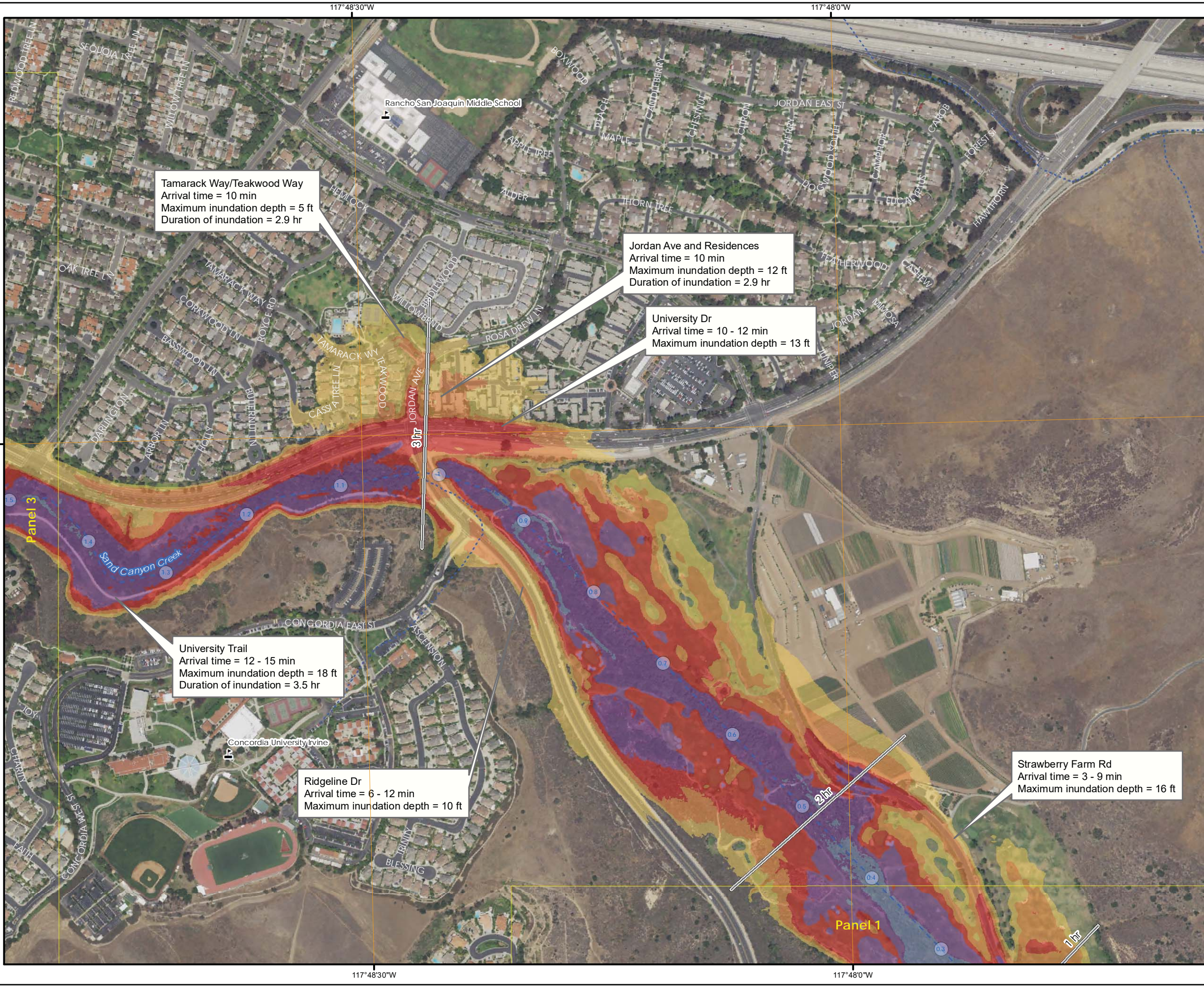
**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

**PANEL 1 of 7**

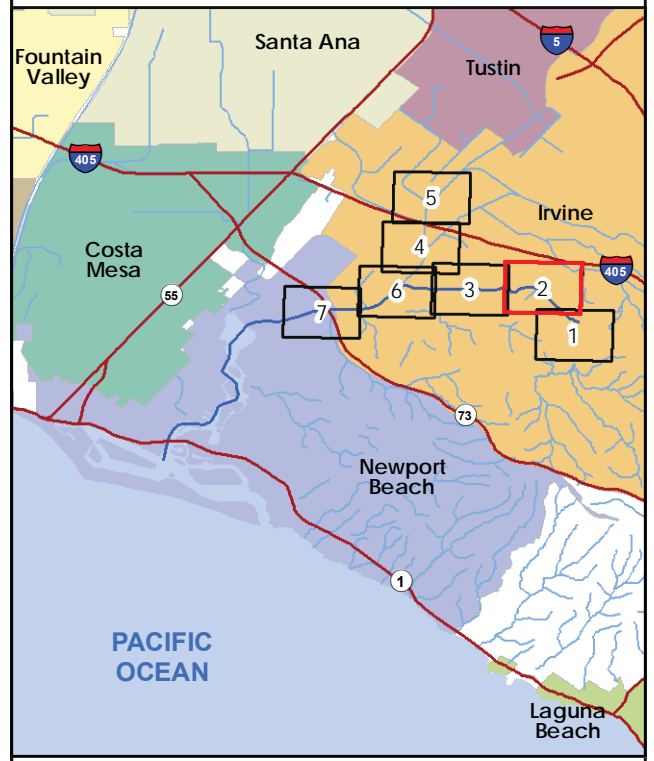
12/29/2017  
REVISED 6/12/18

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.

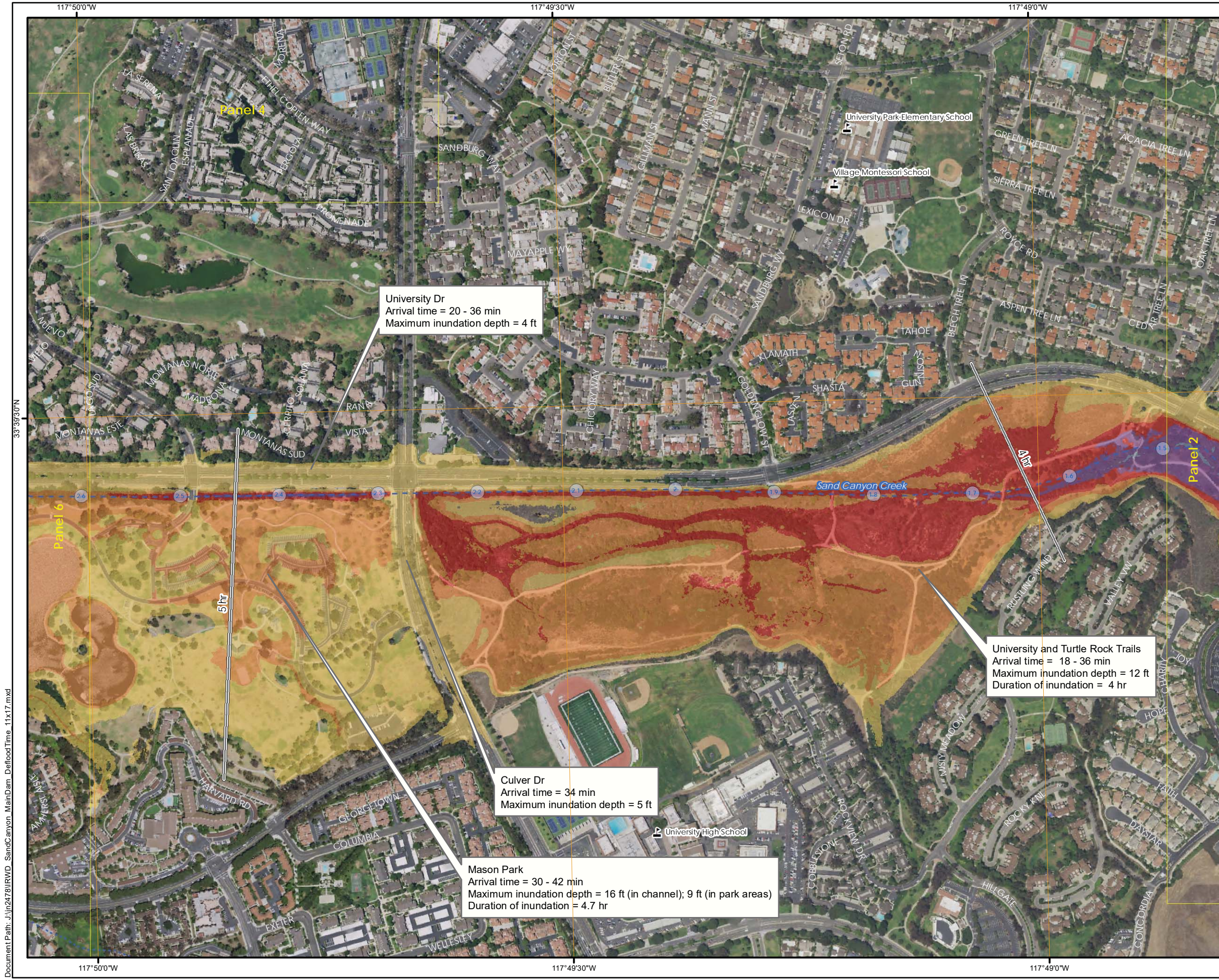
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**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

**PANEL 2 of 7**

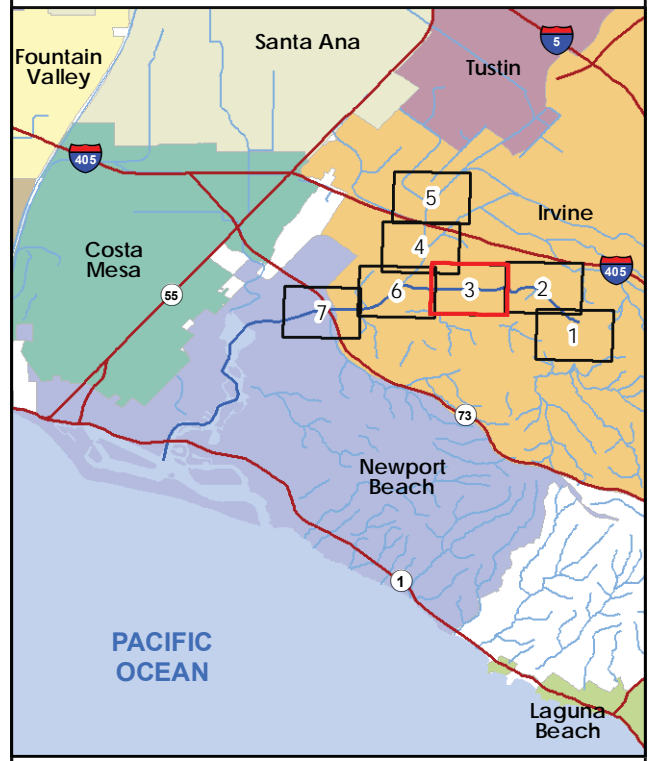
12/29/2017  
REVISED 6/12/18

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

**PANEL 3 of 7**

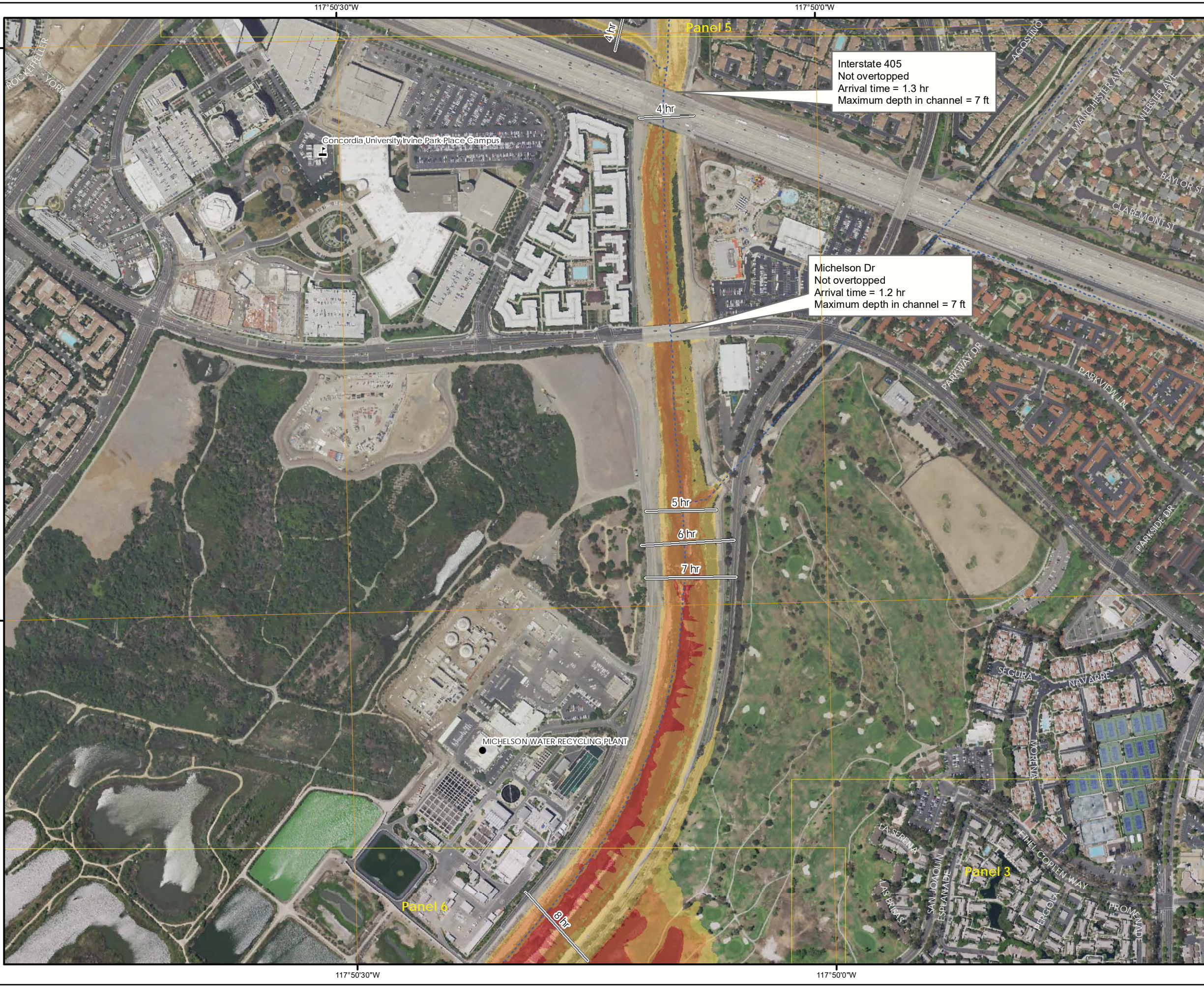
12/29/2017  
REVISED 6/12/18

0 250 500 750 Feet

0 100 200 Meters



Document Path: J:\j2478\RW\SD\_Canyon\_MainDam\_DefloodTime\_11x17.mxd

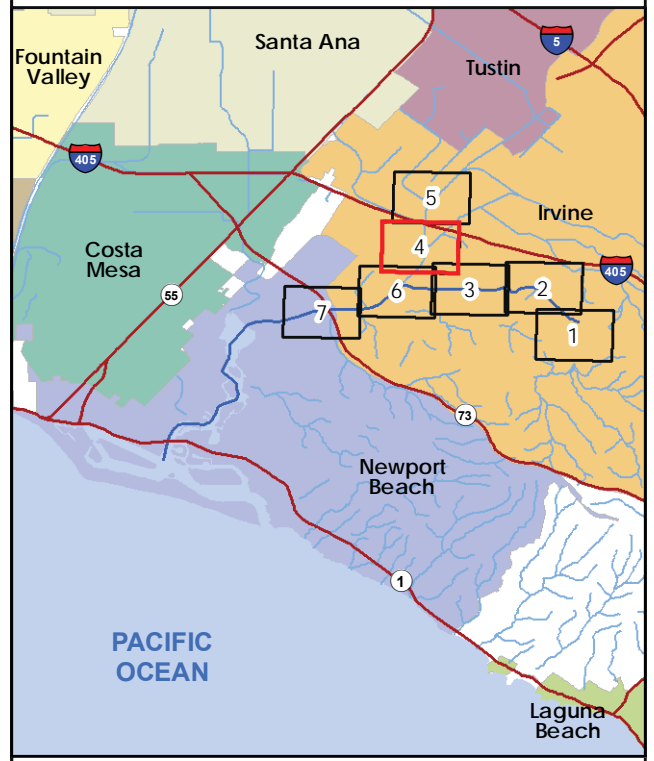


Interstate 405  
Not overtopped  
Arrival time = 1.3 hr  
Maximum depth in channel = 7 ft

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

# SAND CANYON DAM SUNNY DAY FAILURE INUNDATION MAP DEFLOOD TIME

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



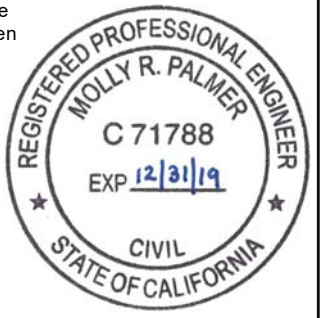
**Legend**

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.

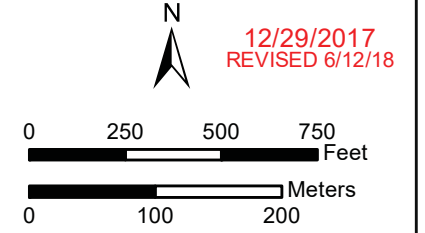
This map meets all applicable state and federal standards and has been prepared in consideration of all potential downstream hazards by a licensed civil engineer.

*Molly Palmer*



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

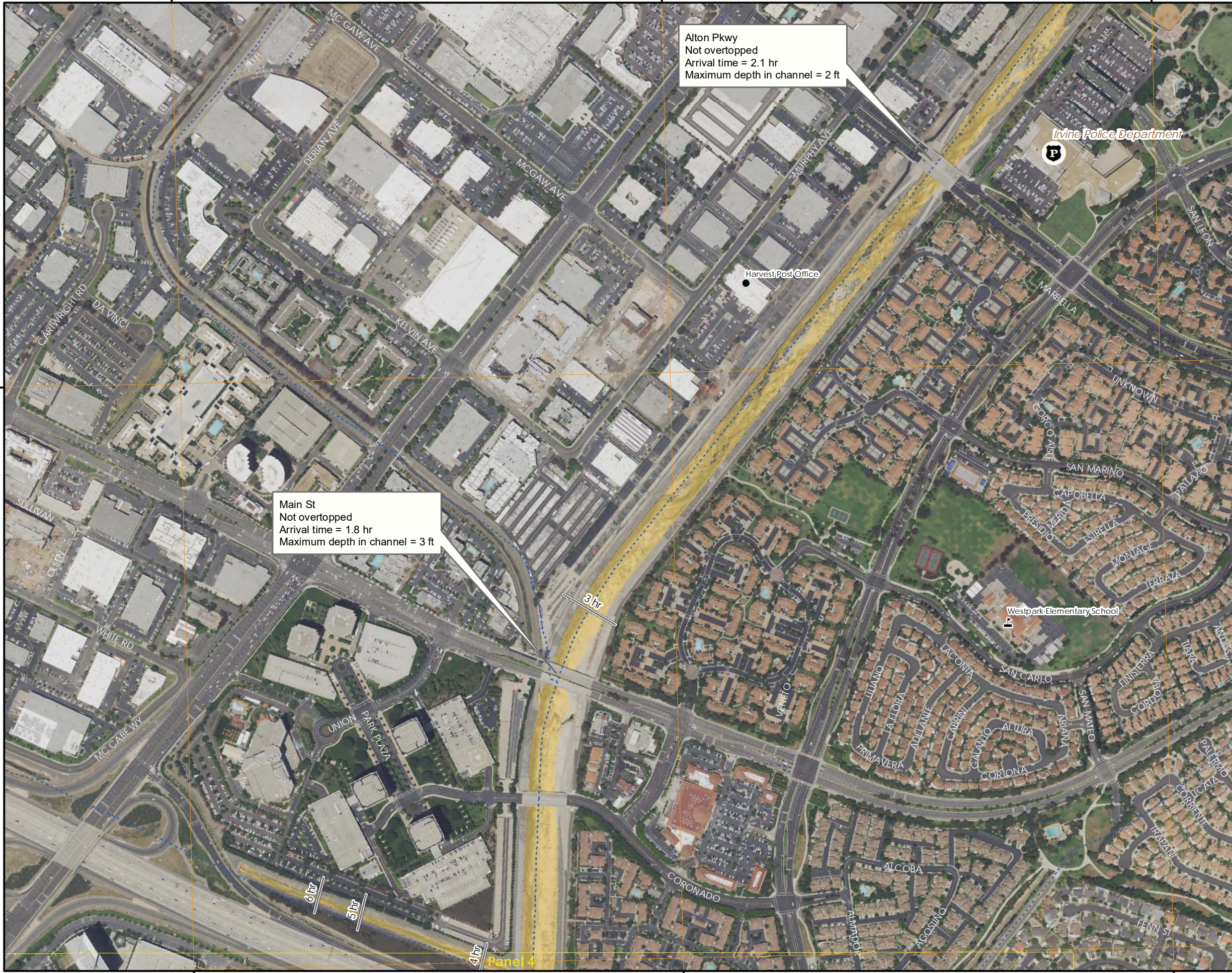
PANEL 4 of 7



117°50'30"W

117°50'0"W

117°49'30"W

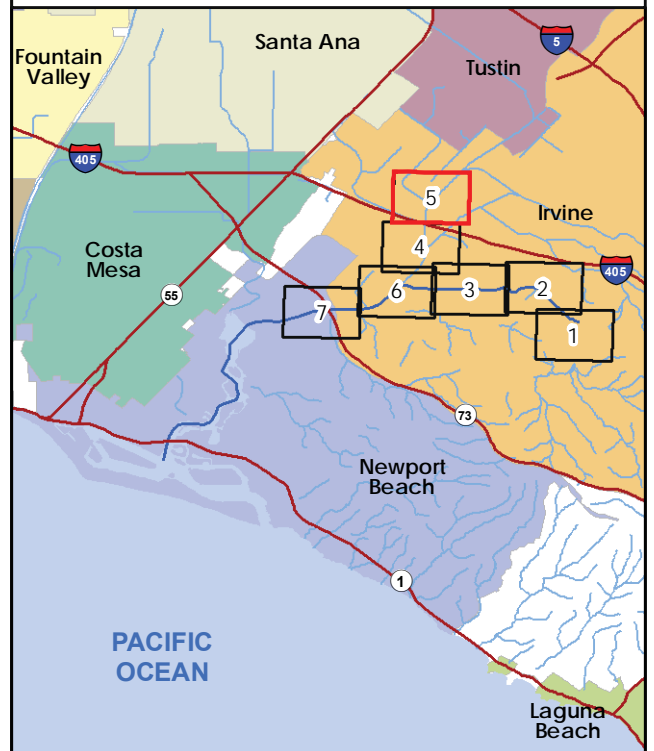


Alton Pkwy  
 Not overtopped  
 Arrival time = 2.1 hr  
 Maximum depth in channel = 2 ft

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.

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 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

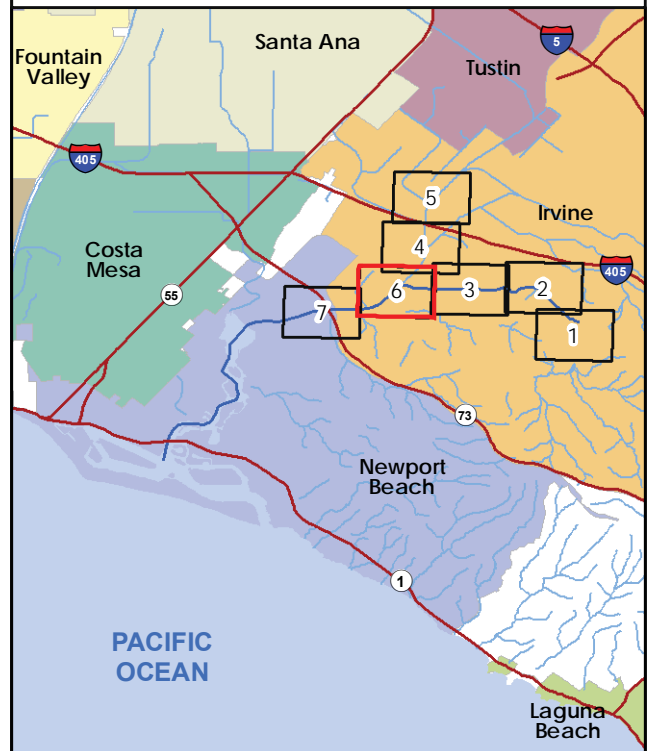
117°49'30"W

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**

	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*

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Civil Engineer 71788  
Expiration Date December 31, 2019

**PANEL 6 of 7**

**STETSON ENGINEERS INC.**

12/29/2017  
REVISED 6/12/18

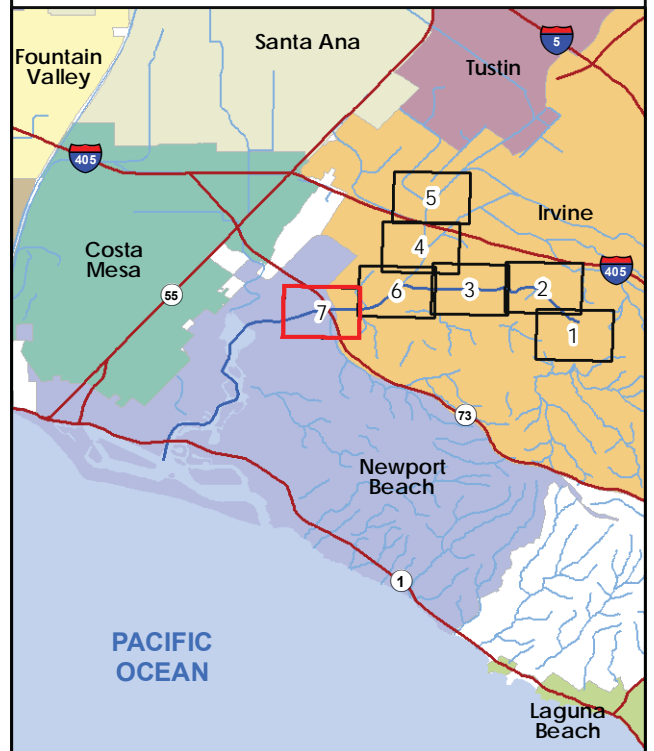
0 250 500 750 Feet  
0 100 200 Meters

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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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

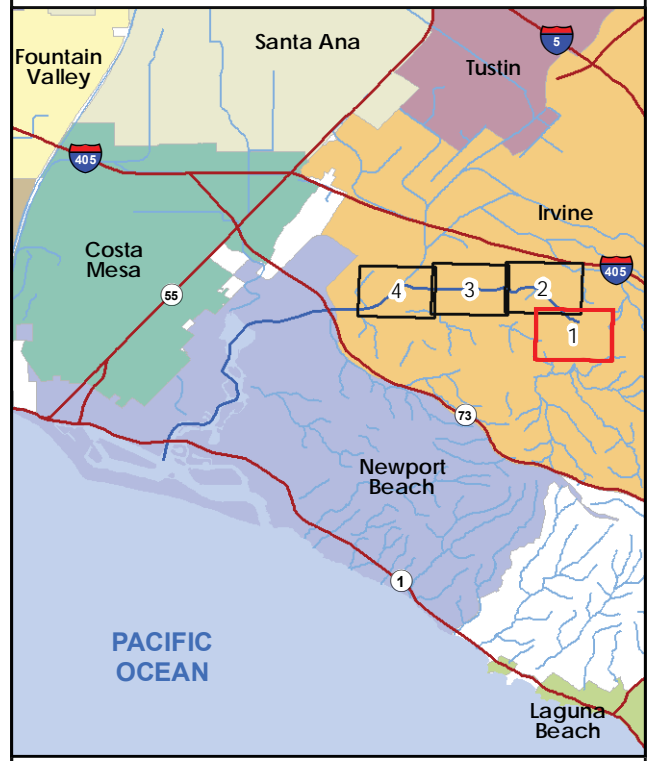
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# Spillway Failure - Arrival Time

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**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	

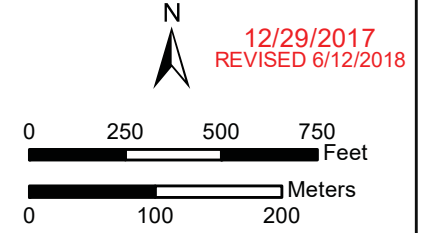
Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

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

PANEL 1 of 4

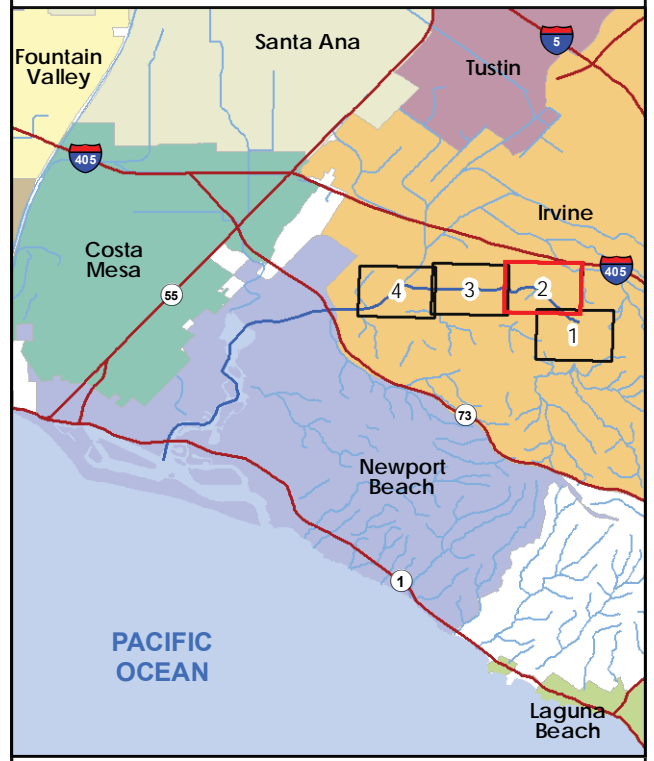


The North American Vertical Datum of 1988 was used for inundation modeling

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	

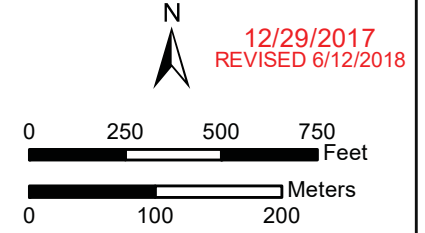
Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

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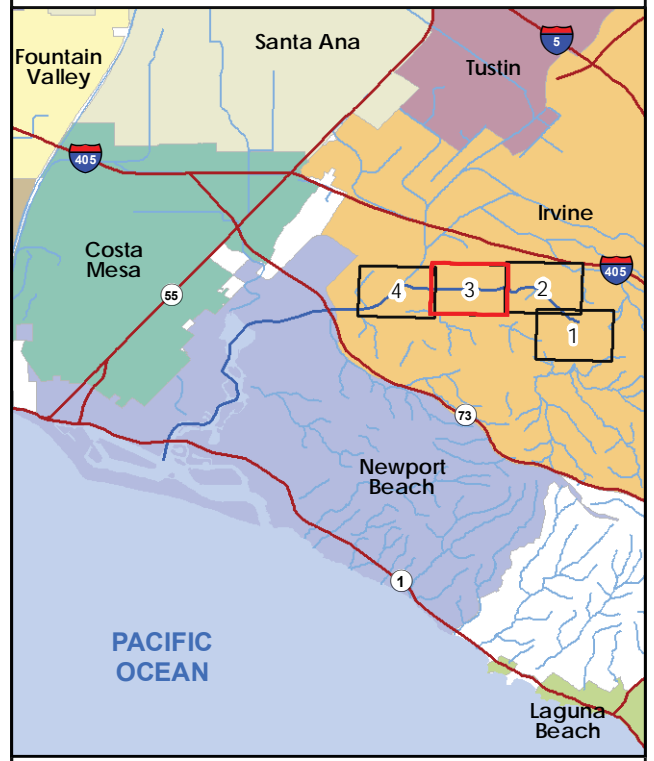
Molly Palmer,  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 2 of 4





**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

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,**  
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Expiration Date December 31, 2019

**PANEL 3 of 4**

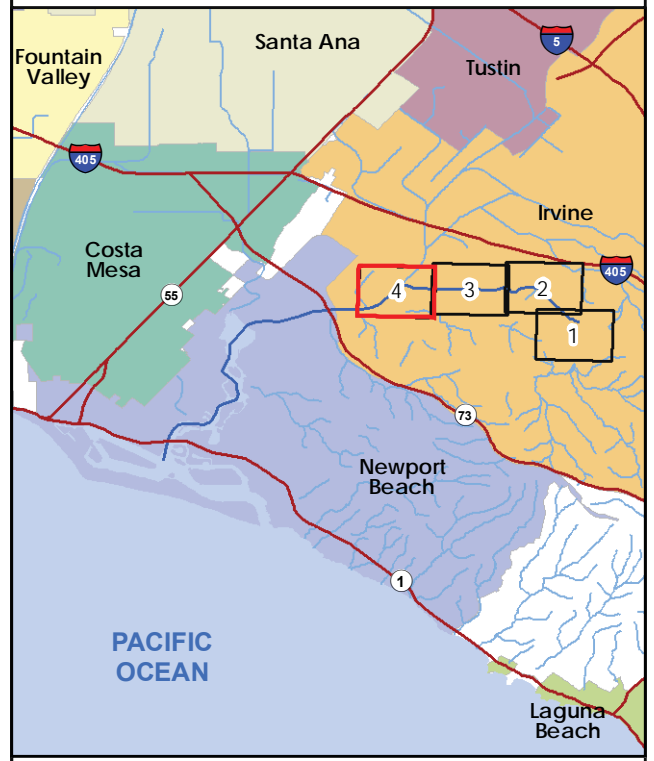
12/29/2017  
REVISED 6/12/2018

0 250 500 750 Feet  
0 100 200 Meters





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

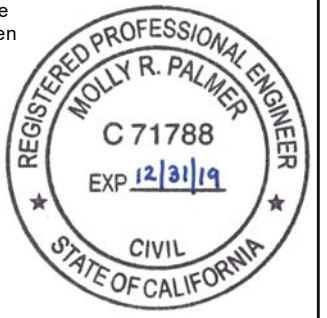


**Legend**

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

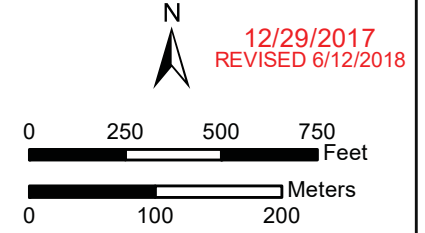
Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

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Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 4 of 4



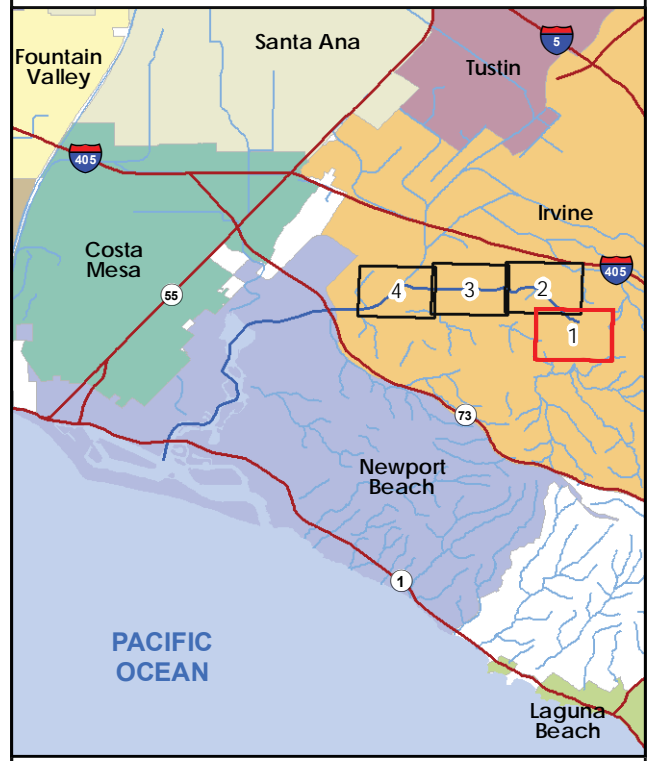
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# Spillway Failure - Deflood Time

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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	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

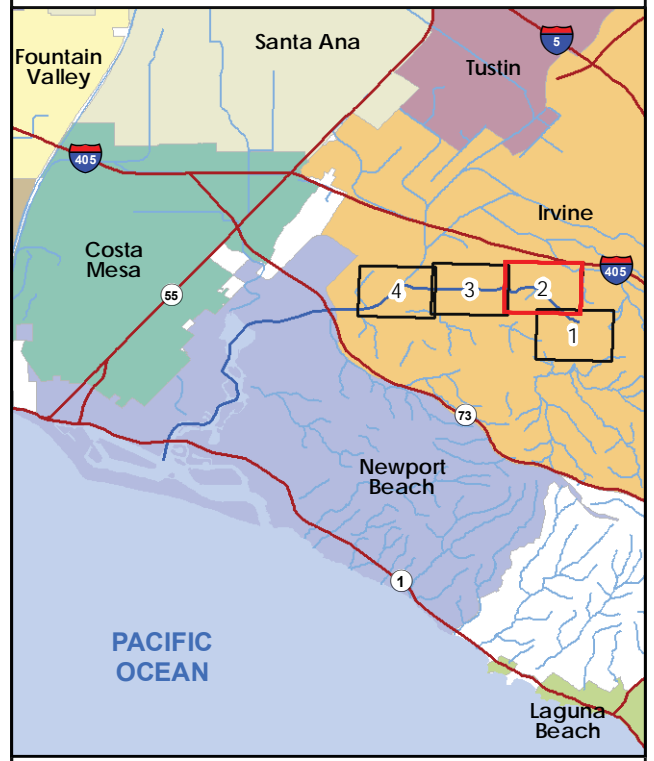
**PANEL 1 of 4**

12/29/2017  
REVISED 6/12/2018

Document Path: J:\m2478\IRWD\_SandCanyon\_Spillway\_Failure\_deflood\_11x17.mxd



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



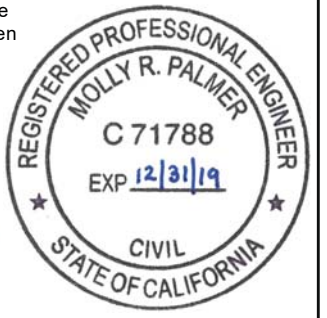
**Legend**

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.

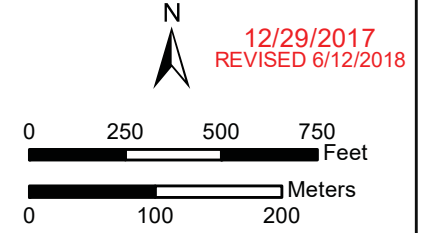
This map meets all applicable state and federal standards and has been prepared in consideration of all potential downstream hazards by a licensed civil engineer.

*Molly Palmer*



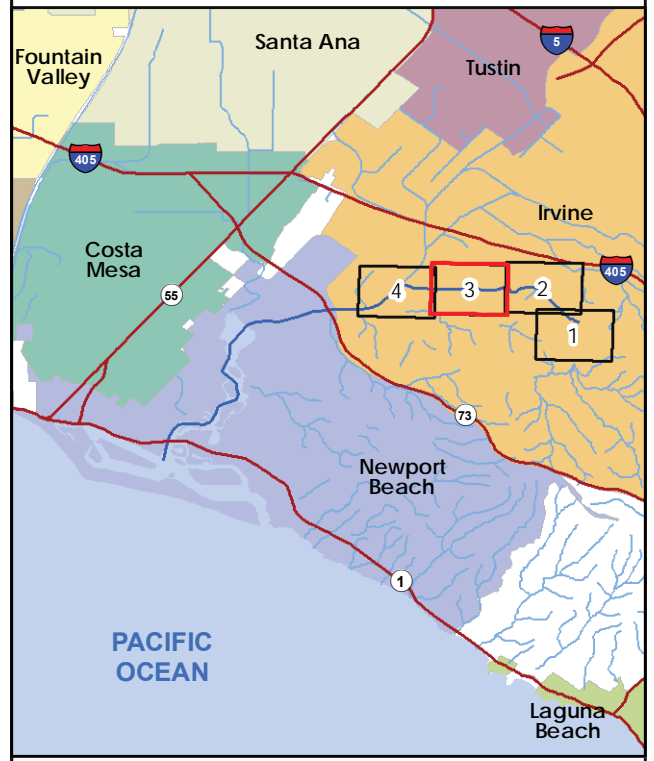
Molly Palmer,  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 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.

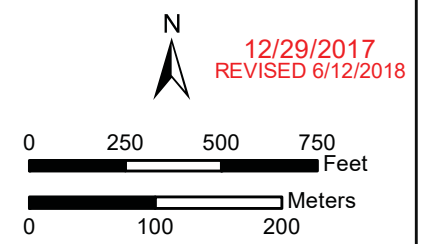
This map meets all applicable state and federal standards and has been prepared in consideration of all potential downstream hazards by a licensed civil engineer.

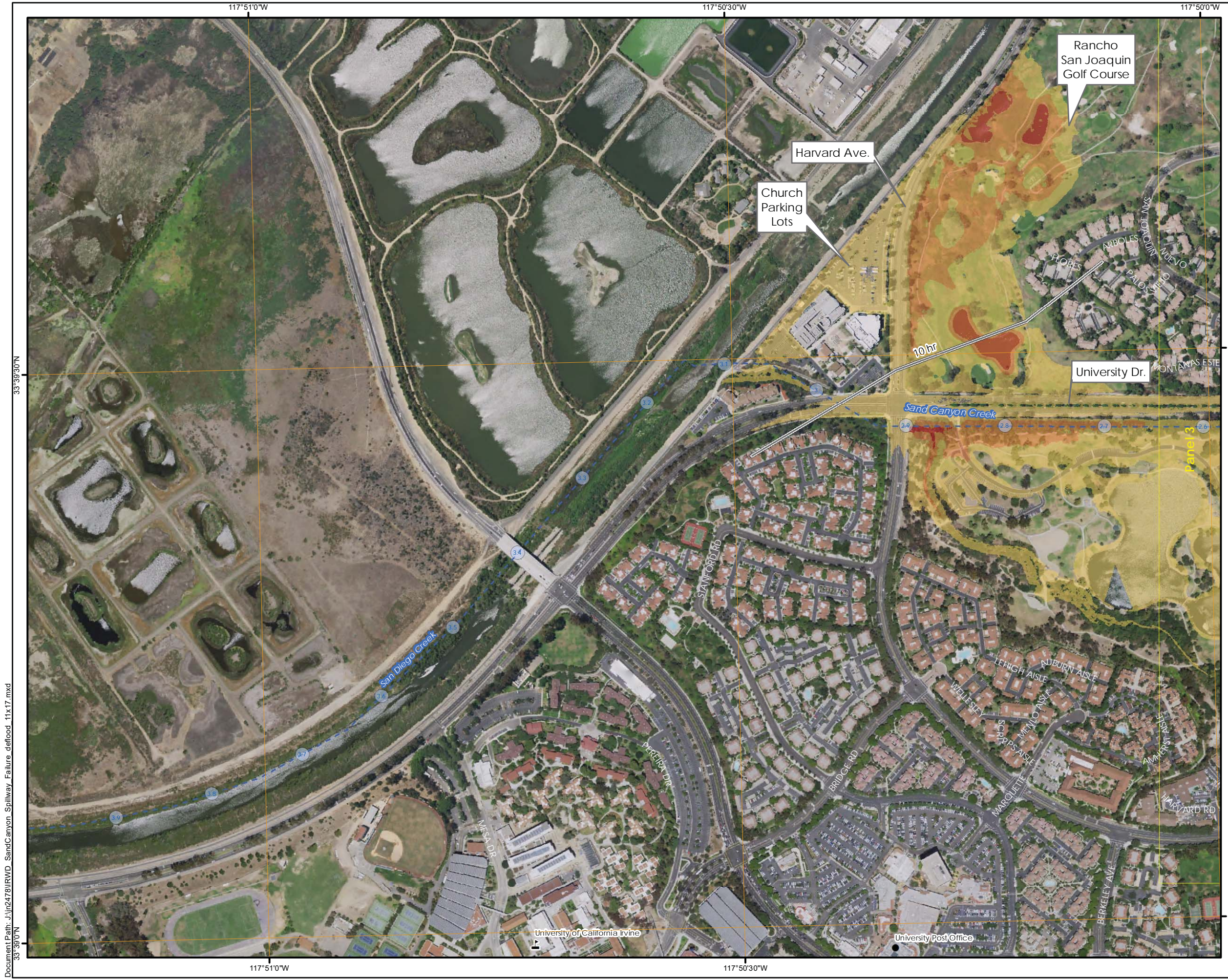
*Molly Palmer*



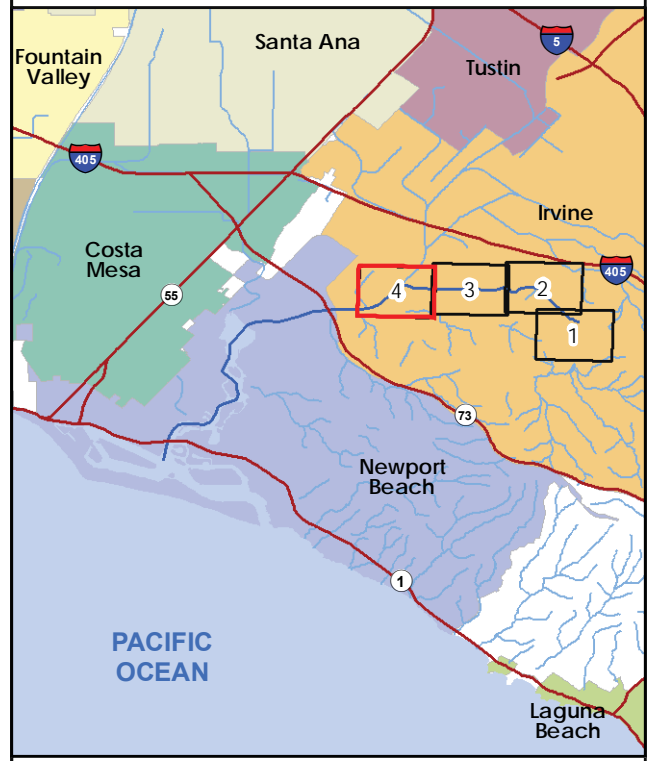
**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

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

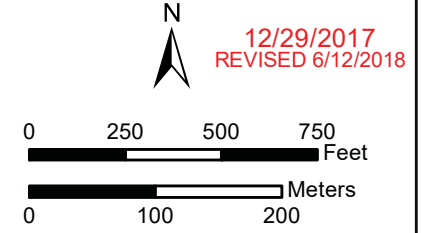
Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

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 4 of 4



Document Path: J:\m2478\IRWD\_SandCanyon\_Spillway Failure deflood\_11x17.mxd

## PART III: Appendices

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

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## **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:

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

OR to send it electronically to the Division at [eap@caloes.ca.gov](mailto:eap@caloes.ca.gov).





## Appendix C: Record of Plan Holders

<b>Copy Number</b>	<b>Organization</b>	<b>Person Receiving Copy</b>
1	Irvine Ranch Water District	Thomas Roberts Director of Water Operations
2	Irvine Ranch Water District	Ken Pfister IRWD Operations Manager
3	Irvine Ranch Water District	Malcolm Cortez, P.E. Engineering Department
4	Irvine Ranch Water District	Bill Wesson Recycled Water Operations Supervisor
5	Irvine Ranch Water District	Emilyn Zuniga IRWD EAP Coordinator
6	Irvine Ranch Water District	Beth Beeman, IRWD Public Relations
7	Orange County Sheriff's Department, Emergency Management Division	Kevin McArthur, Senior Emergency Management Program Coordinator
8	Orange County Public Works, Operational Area Coordinator	Penny Lew, P.E. Sr. Civil Engineer OCPW Flood Programs/Floodplain Management and Hydrology Section
9	Orange County Fire Authority	Jeff Hoey, Battalion Chief
10	Newport Beach Fire Department	Chip Duncan, Fire Chief
11	Irvine Police Department	Robert Simmons, Emergency Management Administrator
12	Cal OES	Jose Lara, Chief
13	DSOD	Sharon Tapia, Chief of DSOD
14	DWR Flood Operations Center	State-Federal Flood Operations Center
15	National Weather Service	Alex Tardy, Warning Coordination Meteorologist, Skywarn Program Manager

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16	Newport Beach Police Department	Jon T. Lewis, Chief
17	California Highway Patrol, Santa Ana Office	Lt Torres and Lt Knarr
18	Orange County Parks	Christopher Lorenzi, Supervising Park Ranger



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# Appendix E: Pre-Scripted Messages

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

## High Flow Emergency Level Notification Script

This is \_\_\_\_\_ [your name and position].

We have an emergency condition at Sand Canyon Reservoir, Dam No. 1029.002, located in Irvine.

We have activated the Emergency Action Plan for this dam and are determining this to be a **High Flow** condition. The Sand Canyon Reservoir is not in danger of failing. Again, this is a **High Flow** condition and the Sand Canyon Reservoir is not in danger of failing.

At \_\_\_\_\_ on \_\_\_\_\_, IRWD observed or verified that flows into the reservoir  
(time) (date)  
are unusually high.

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 as a result of this condition. We will provide updates detailing any changes in flow or dam condition, and will notify you when the high flow situation is resolved.

I can be contacted at the following number: \_\_\_\_\_.

If you cannot reach me, please call the following alternative number: \_\_\_\_\_.

---

## Non-Failure Emergency Level

This is \_\_\_\_\_ [your name and position].

We have an emergency condition at Sand Canyon Reservoir, Dam No. 1029.002, located in Irvine.

We have activated the Emergency Action Plan for this dam and are determining this to be a **Non-Failure** condition. Again, this is a **Non-Failure** condition.

At \_\_\_\_\_ on \_\_\_\_\_, IRWD observed or verified that:  
(time) (date)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_.

We are implementing predetermined actions to investigate and respond to this condition.

The dam is not predicted to fail as a result of this condition.

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

I can be contacted at the following number: \_\_\_\_\_.

If you cannot reach me, please call the following alternative number: \_\_\_\_\_.

---

## Potential Failure

This is \_\_\_\_\_ [your name and position].

We have an emergency condition at the Sand Canyon Reservoir, Dam No. 1029.002, located in Irvine.

We have activated the Emergency Action Plan for this dam and are determining this to be a **Potential Failure** condition.

At \_\_\_\_\_ on \_\_\_\_\_, IRWD observed or verified that:  
(time) (date)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_.

We are implementing predetermined actions to respond to a rapidly developing situation that could result in dam failure.

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, University Trail, Mason Park, 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.

The dam could potentially fail as early as \_\_\_\_\_.

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

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

I can be contacted at the following number: \_\_\_\_\_.

If you cannot reach me, please call the following alternative number: \_\_\_\_\_.

---

## Imminent Failure

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, Dam No. 1029.002, is failing; 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, University Trail, Mason Park, 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.

We have activated the Emergency Action Plan for this dam and are determining this to be an **Imminent Failure** condition.

At \_\_\_\_\_ on \_\_\_\_\_, IRWD observed or verified that:  
(time) (date)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_.

We are implementing predetermined actions to investigate and respond to this condition.

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

I can be contacted at the following number \_\_\_\_\_.

If you cannot reach me, please call the following alternative number:

\_\_\_\_\_.

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



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, Dam No. 1029.002, located in Irvine is failing. Repeat. Sand Canyon Reservoir, Dam No. 1029.002, 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, the University Drive and Michelson Drive intersection, and adjacent areas including: the Strawberry Farms Golf Club, University Trail, Mason Park, Bethel Church, Irvine First Baptist Church, and portions of the Rancho San Joaquin Golf Course may be flooded. In the event of a dam failure, University Drive from I-405 to Campus Drive may flooded. 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.

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

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## **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**

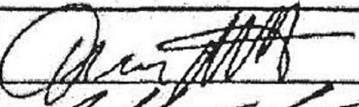
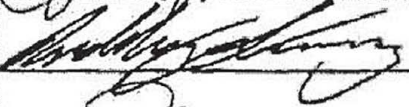
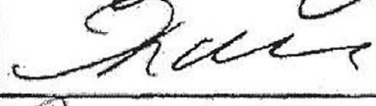
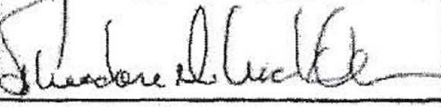

# Appendix I: Cal OES Warning Center Dam Incident Report

## DAM INCIDENT – CALIFORNIA STATE WARNING CENTER

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

## Appendix J: Signature Page

The following people participated in the planning process for the Emergency Action Plan:

Name	Title/Organization	Signature	Date
Tom Roberts	Director of Water Operations, Irvine Ranch Water District		2-4-2020
Robert Simmons	City of Irvine Police Department		2/6/20
KEVIN McARTHUR	Orange County Sheriff's Department, Emergency Management Division		2-27-20
THEODORE (TED) LUCKHAM	ORANGE COUNTY PUBLIC WORKS GENERAL MAINTENANCE MANAGER		3-6-20
Kenny Dossey	Orange County Fire Authority (OCFA)		4/20/20

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# Appendix K: Acronym List

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BOS.....	Board of Supervisors
CAS.....	Critical Appurtenant Structure
Cal OES .....	California Governor’s Office of Emergency Services
CERT .....	Community Emergency Response Team
County and OA EOP.....	Operational Area Emergency Operations Plan
DSOD.....	Division of Safety of Dams
DWR .....	Department of Water Resources
EAP .....	Emergency Action Plan
EMD.....	Orange County Sheriff’s Department, Emergency Management Division
EOC.....	Emergency Operations Center
FEMA .....	Federal Emergency Management Agency
HSEEP .....	Homeland Security Exercise and Evaluation Program
IC.....	Incident Commander
ICP .....	Incident Command Post
ICS .....	Incident Command System
IRWD.....	Irvine Ranch Water District
MACS .....	Multi-Agency Coordination System
MWRP .....	Michelson Water Recycling Plant
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
PIM .....	Public Information Manager
SEMS .....	Standardized Emergency Management System
WFO.....	Weather Forecasting Office