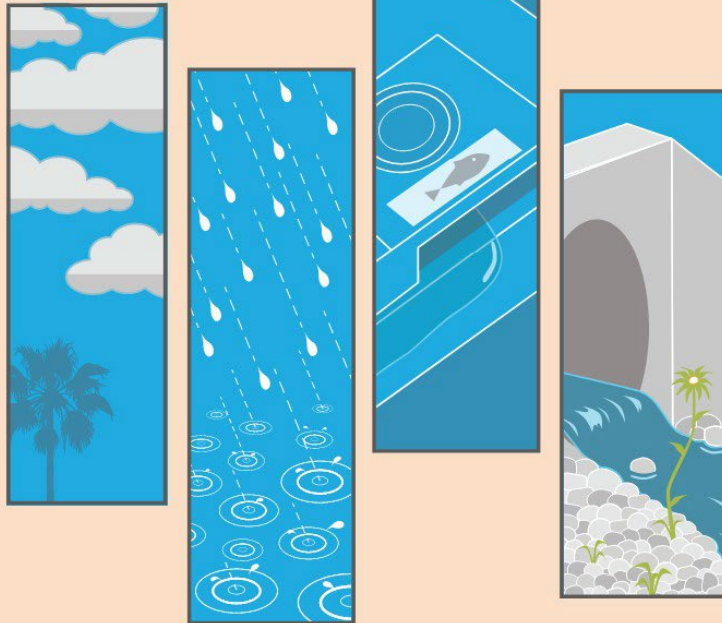




# San Diego County Hydrology Manual

April 2026

Prepared by the County of San Diego  
Department of Public Works  
Flood Control Section



# San Diego County Hydrology Manual Update



April 2026

Presentation June 17, 2026



**RICK**



**RIVER FOCUS**  
WATER RESOURCE CONSULTANTS

# Housekeeping



## Parking

- Environmental Services Department Lot: Park in “City Employees Only” and visitor spots
- Additional street parking along Ridgehaven Ct.
- Do not park in neighboring lots

## Questions

Please save all questions for the Q & A sessions.

## Refreshments

Refreshments will be provided during the break.

## Virtual Guests

- Please keep cameras and mics off during presentations
- Allowed to turn on during Q & A



# Speakers



**Sara Agahi** *Flood Control District Manager*

County of San Diego



**RICK**

**Ashkan Azarnia** *Civil Engineer/Project Manager*

County of San Diego



**RICK**

**Ash Paranthaman** *Associate Project Manager*

RICK



**RIVER FOCUS**  
WATER RESOURCE CONSULTANTS

**Laura Henry** *Associate Project Engineer*

RICK



**Jon Viducich** *Senior Hydraulic Engineer*

River Focus



# AGENDA

Welcome and Introduction

Session 1

- Chapter by chapter overview
- Intensity change - NOAA Atlas 14
- Questions roundtable 1

Break

Session 2

- Purpose and use of SDHydroTools
- Sediment bulking factor
- Grandfathering criteria
- How/where to get the manual
- Questions roundtable 2





# Welcome/Introduction

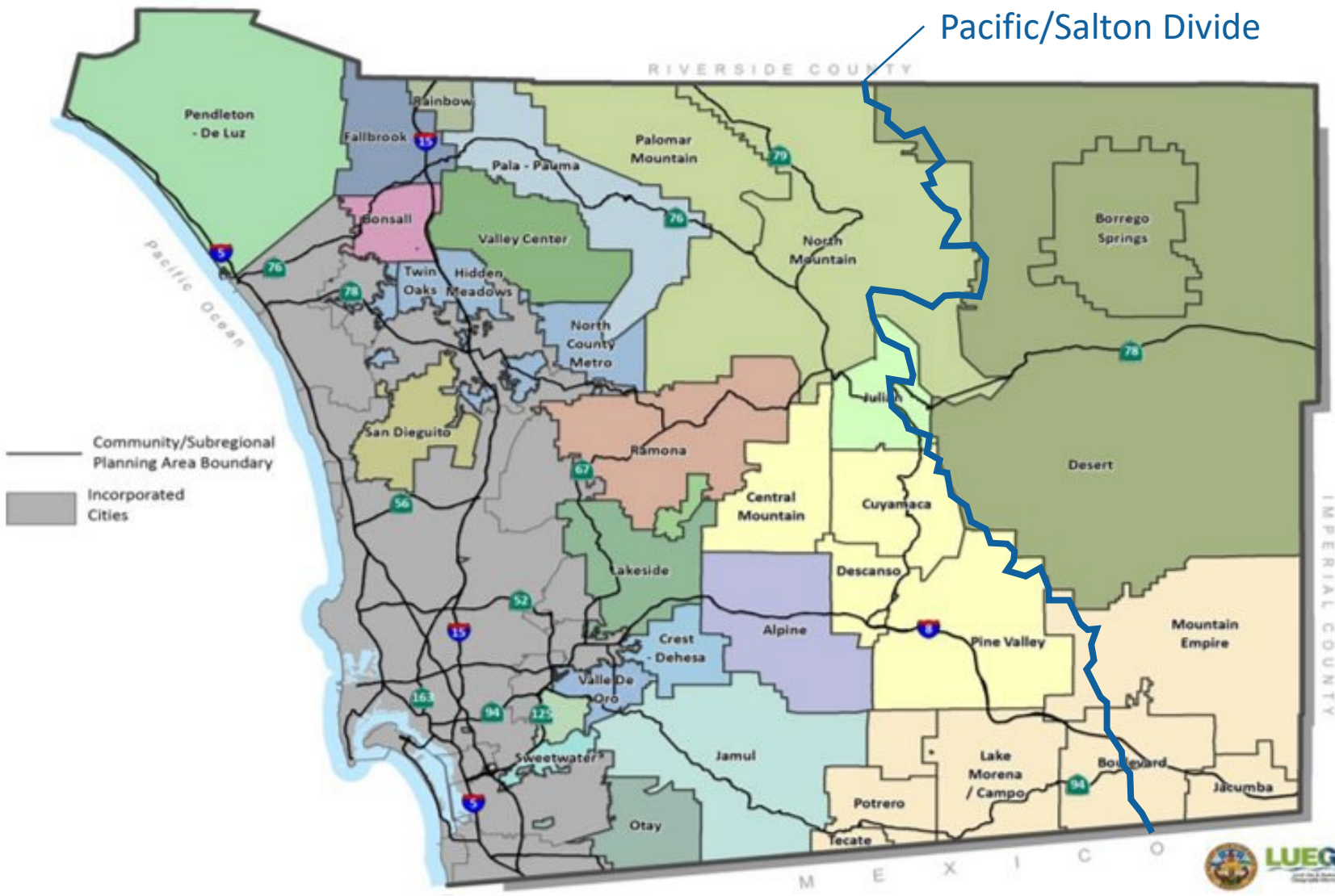
June 17, 2026

**Sara Agahi, PE CFM**

**San Diego County Flood Control District Manager**



# County of San Diego Jurisdiction



# County Supervisorial Districts

Board of Supervisors

MENU

## County of San Diego Board of Supervisors

✉️ 🖨️

**Paloma Aguirre**  
District 1 / Chair Pro Tem

**Joel Anderson**  
District 2

**Terra Lawson-Remer**  
District 3 / Chair

**Monica Montgomery Steppe**  
District 4 / Vice Chair

**Jim Desmond**  
District 5

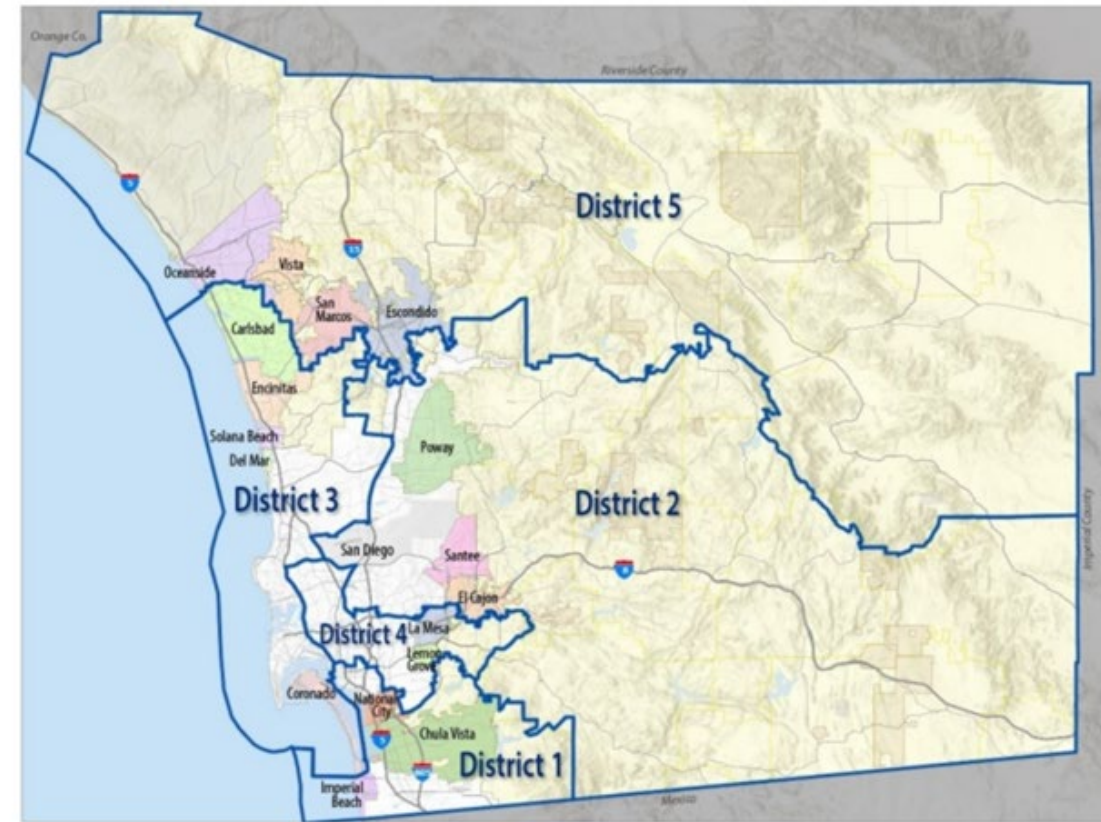
[Board Meetings](#) [Board of Supervisors History](#)

[Find My District](#) [Redistricting Commission](#)

## Supervisorial District Boundaries

Supervisorial District boundaries were adjusted by the [County of San Diego Independent Redistricting Commission](#). The new district boundaries became **effective January 15, 2022**.

## Find My District



<https://www.sandiegocounty.gov/content/sdc/general/bos.html>



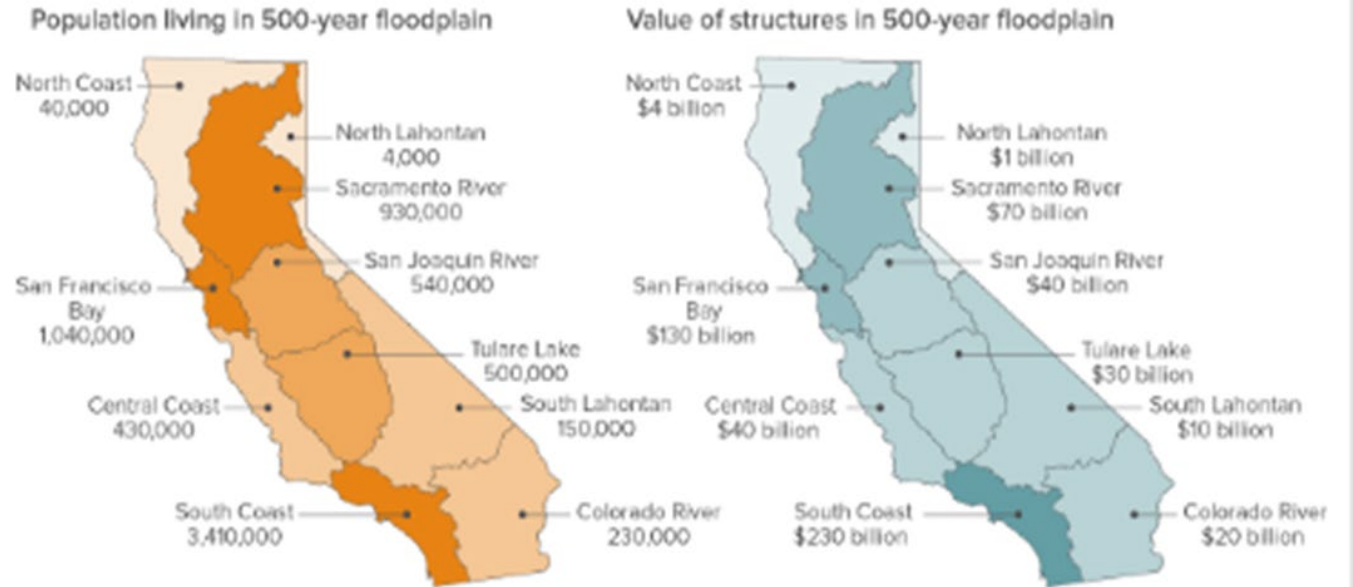
# Does it actually flood in San Diego?



# FLOOD RISK

1 in 5 Californians, \$580+ Billion of infrastructure vulnerable to flooding

## Flood risk is high throughout California

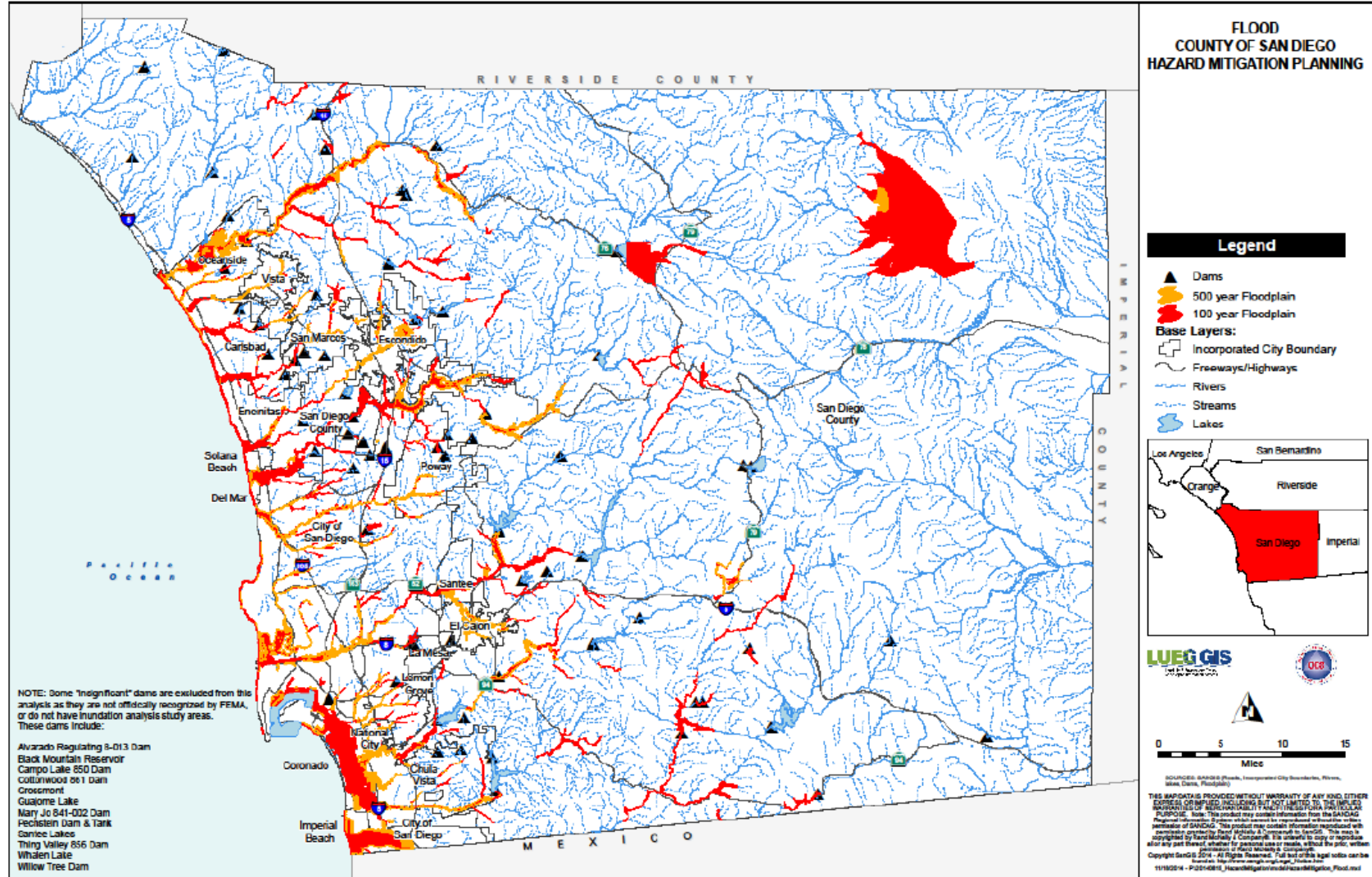


SOURCES: California Department of Water Resources and US Army Corps of Engineers, "California's Flood Future" (2013).

NOTES: The figure shows population and structures in the 500-year floodplain—the area susceptible to floods so large that they have just a 0.2 percent chance of occurring in a given year. Levees protect much of this area from 100-year floods, which have a 1 percent chance of occurring in a given year. Population is adjusted to 2010 levels. Value of structures is based on the depreciated replacement value of structures and their contents in 2010 dollars.



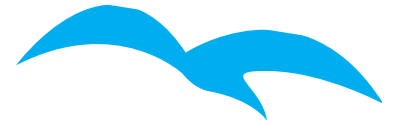
# 200,000+ acres of flood-prone property in San Diego County



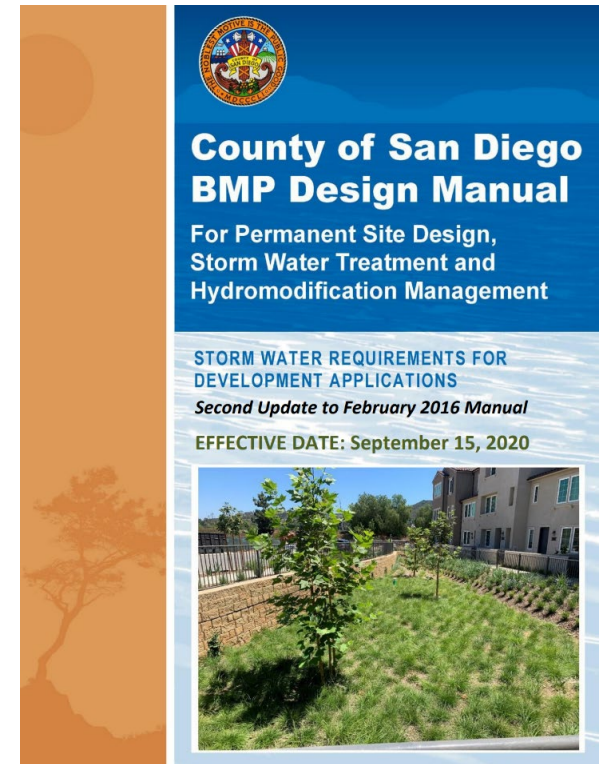
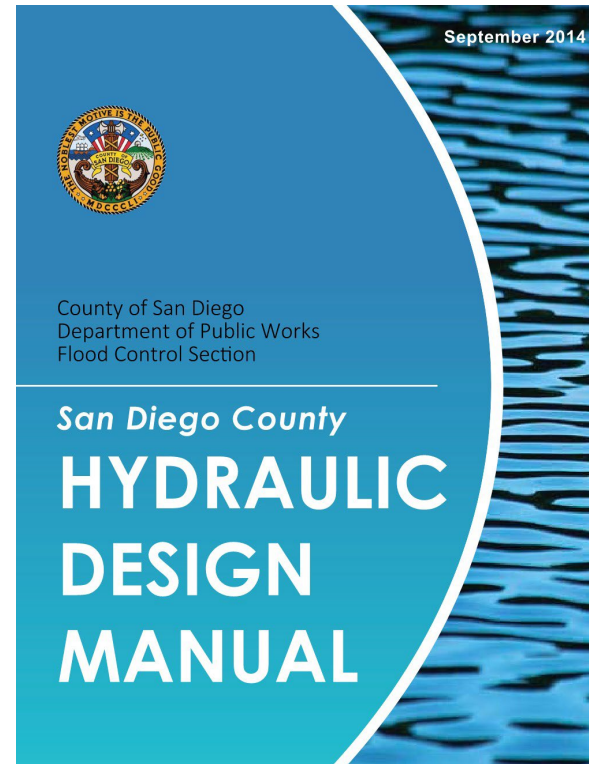
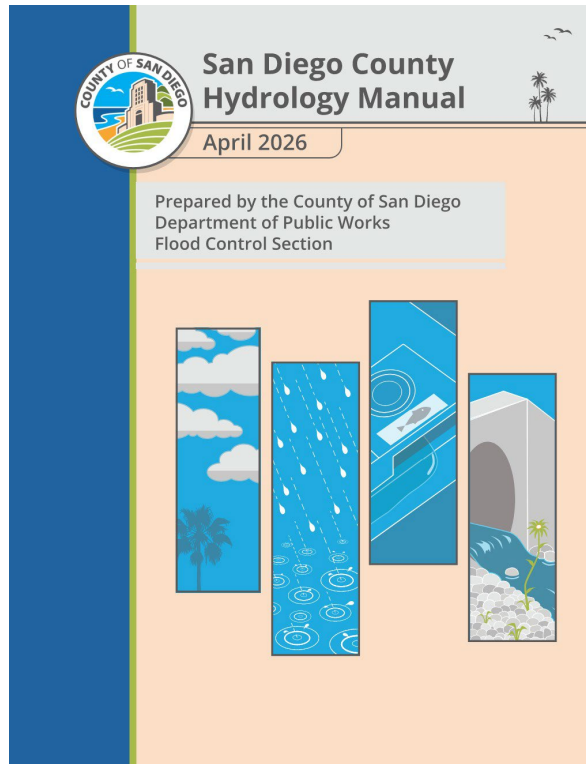
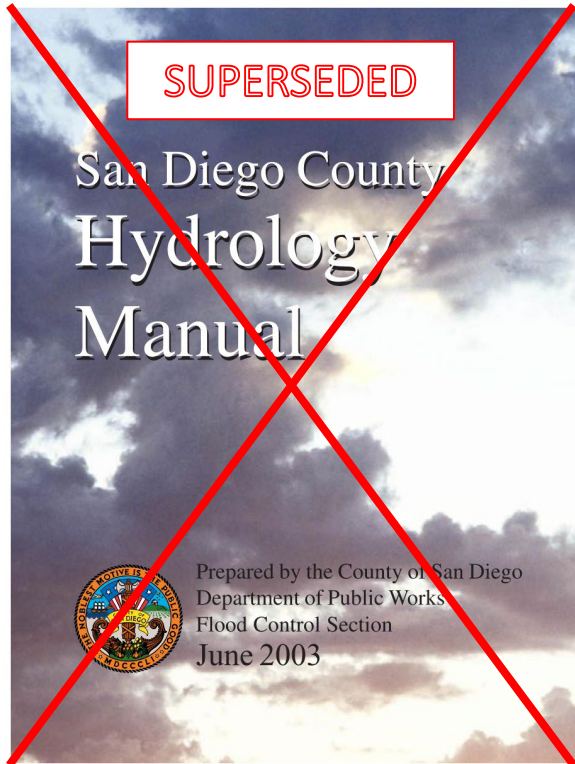
# Chapter by Chapter Overview

June 17, 2026

**Ash Paranthaman, PE QSD QSP**  
Associate Project Manager



# San Diego County Manuals



# Section 1: Introduction

## NEW SECTIONS

### Seasonal Precipitation Patterns

- Cool-season frontal systems
- Warm-season North American monsoon
- Orographic effects: windward vs. leeward
- High-elevation snow accumulation

### Weather Systems & Flooding

- Atmospheric rivers (ARs) mechanics
- Narrow cold-frontal rainbands (NCFRs)
- Jan 22, 2024 flash flood case study
- Updated tropical cyclone history (Kay '22, Hilary '23)
- Highlights high-intensity, short-duration rainfall risks

## MAJOR REVISIONS

### Policies

- New subsections: Application of Design Standards, Exceptions
- Watershed-wide planning study provisions

### Maintenance Requirements

- Resource agency permits (USACE, CDFW, RWQCB)
- Funding mechanism & owner responsibility

### Computer Programs

- New SDHydroTools program (5 modules)
- HEC-1 & TR-20 replaced with HEC-HMS

## UPDATES & REFINEMENTS

### Data Sources & References

- NOAA Atlas 14 as primary rainfall data
- Added SANGIS & NRCS resources

### Figures & Maps

- New 30-year rainfall climatology maps
- ALERT station map updated (August 2025)

### Purpose

- Clarifies manual use across agencies, consultants, and jurisdictions
- Reinforces that local jurisdictions may supersede County guidance



# Section 2: Regional Flood Flow Information And Selection Of Hydrologic Method And Design Criteria

## DESIGN CRITERIA OVERHAUL

### Design Frequency

- Old: Dual 50-year (upstream) / 100-year (at major roadway) standard
- **New: Unified 100-year design frequency for all hydrologic analysis**
- Infrastructure-specific criteria (storm drains, inlets, culverts) deferred to Hydraulic Design Manual

### Sediment Bulking

- New cross-reference to Section 5.5 for sediment/debris flow hazard methods

## FLOW RATE REQUIREMENTS

### FEMA FIS Flow Rates

- FIS rates limited to regulatory purposes (remapping, no-rise certification)
- All facility design must follow Hydrology Manual methodology

### Engineer Certification

- If design is based on previously calculated flow rate, those analyses must be certified by current engineer of record
- Flow rate comparisons required; significant differences must be discussed

### Master Plan Analyses

- Flagged as planning purposes *only*; design projects require independent site-specific analysis

## UPDATES & REFINEMENTS

### FEMA Map Resources

- Added NFHL Viewer as resource alongside SanGIS

### Land Use Basis

- Clarified that FEMA studies reflect land use "at the time originally completed"



# Section 3: Rational Method & Modified Rational Method

## NOAA ATLAS 14 ADOPTION

### Data Source

- Old  $P_6$  and  $P_{24}$  isopluvial maps replaced by NOAA Atlas 14 precipitation data
- Appendix B updated with NOAA Atlas 14 access procedures

### Removed Items

- Intensity-Duration Design Chart removed (old Figures 3-1, 3-2)
- $P_6/P_{24}$  45%-65% adjustment procedure eliminated

## INTENSITY FORMULA

### Old Method & Equation Removed

- $I = 7.44 \cdot P_6 \cdot D^{-0.645}$  formula deleted

### New Method: Log-Log Interpolation from NOAA Atlas 14

- New formula:  $I_{T_c} = K \cdot T_c^n$  using NOAA Atlas 14 bounding data pairs
- Interpolates between NOAA Atlas 14 duration/intensity pairs ( $T_1, T_2$ )

### SDHydroTools

- New interpolation module added for depth/intensity calculations

## CLARIFICATIONS

### Data & References

- Table 3-1 impervious % for planning level study. Use actual impervious % for project-level studies and design.
- SANGIS identified as soil type data source



# Section 4: NRCS Hydrologic Method

## NOAA ATLAS 14 ADOPTION

### Rainfall Data Source

- Isopluvial maps ( $P_6$  and  $P_{24}$ ) replaced by NOAA Atlas 14 precipitation depths
- Depths for durations up to 24 hours now sourced from NOAA Atlas 14
- $P_6/P_{24}$  45%–65% adjustment eliminated

### Hyetograph Computation

- Old  $I = 7.44 \cdot P_6 \cdot D^{-0.645}$  formula removed
- New log-log interpolation between NOAA Atlas 14 data pairs for sub-durations

## SOFTWARE & TOOLS UPDATE

### SDHydroTools Program

- SDUH Peak Discharge Program replaced by SDHydroTools
- SDUH module within SDHydroTools: single-basin hydrograph & peak flow
- HEC-HMS required for multi-basin routing & hydrograph combination

### Retired References

- HEC TD-15 replaced by HEC-HMS Technical Reference Manual
- HEC-1 input/output references removed
- NOAA Atlas 2 citation updated

## CLARIFICATIONS

### Data Sources & Methods

- SanGIS identified as source for GIS soil & land cover data layers



# Section 5: Erosion & Sedimentation

## NEW: SEDIMENT BULKING

### Bulking Factor Study

- TAC subcommittee formed 2020; study by River Focus (October 2022)
- Addresses sediment/debris yields, bulking factors, & post-fire runoff
- Draws on Southern California county practices & current research

### Design Guidance

- Normal conditions: hazard area ID (Fig 5-8), mitigation flowchart (Fig 5-9)
- Post-fire conditions: emergency & 2 to 10-year recovery guidance
- Example problem added (Workbook WB.4.3)

## RUSLE 2

### Soil Loss Updates

- USLE upgraded to RUSLE 2
- R factor: isopluvial maps replaced by NOAA Atlas 14 data for rainfall depths



# Section 6: Rational Method Hydrograph Procedure

## PROCEDURE REWRITE

### Hydrograph Methodology

- Section substantially expanded with new 4-step procedure
- Detailed incremental rainfall block methodology added
- Triangular hydrograph construction explicitly described
- Peak time formally defined as  $T_p = 240 \text{ min} + 1/2 T_c$

## RAINFALL & FORMULAS

### NOAA Atlas 14 Integration

- Old intensity formula removed
- Rainfall depths now from NOAA Atlas 14 (5 min to 6 hr)
- Log-log interpolation for in-between durations
- Legacy equations (Eq. 6-2, 6-6, 6-7) all deleted

## SOFTWARE UPDATE

### SDHydroTools

- RATHYDRO program replaced by SDHydroTools
- Automates all 4 steps; outputs HEC-HMS-compatible hydrograph



# Section 7: Water Quality Considerations

## ADDED

### Current Standards Reference

- Direct reference to County BMP Design Manual for water quality requirements
- Reference to DPW Watershed Protection Program stormwater regulations webpage
- Guidance to consult latest BMP Design Manual for current regulations

## NET EFFECT

### Minimal Changes

- Section 7 remains brief; water quality procedures still governed externally



# Workbook & Other Sections

## WORKBOOK

### Updates to

- Reflect NOAA Atlas 14 change
- Switching to HEC-HMS from HEC-1
- Sediment bulking factor sample problem

## OTHER SECTIONS

### Updates to

- Table of Contents
- Acknowledgements
- Acronyms
- Glossary





# NOAA Atlas 14 Implementation

June 17, 2026

**Laura Henry, PE**  
Associate Project Engineer



# NOAA Atlas 14



NOAA Atlas 14



Precipitation-Frequency Atlas  
of the United States

Volume 6 Version 2.3:  
California

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

- More current rainfall data
- Spatial variability of intensity slope across the County

U.S. Department  
of Commerce

National Oceanic  
and Atmospheric  
Administration

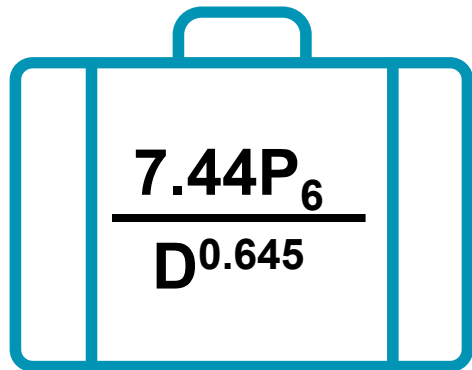
National Weather  
Service

Silver Spring,  
Maryland, 2011  
revised 2014



# NOAA Atlas 14 Implementation

- The intensity equation  $7.44P_6/D^{0.645}$  and isopluvial maps provided in the June 2003 Hydrology Manual will be retired


$$\frac{7.44P_6}{D^{0.645}}$$



# NOAA Atlas 14 Implementation

- Rainfall depths and rainfall intensity will be obtained from NOAA Atlas 14
- Precipitation Frequency Estimates are published through a Precipitation Frequency Data Server (PFDS)

<http://hdsc.nws.noaa.gov/hdsc/pfds>



www.nws.noaa.gov

NOAA's National Weather Service  
**Hydrometeorological Design Studies Center**  
 Precipitation Frequency Data Server (PFDS)

Home Site Map Organization Search   NWS  All NOAA Go

**Precipitation Frequency Data Server (PFDS)**


General Information  
 Homepage  
 Progress Reports  
 FAQ  
 Glossary

Precipitation Frequency  
 Data Server  
 GIS Grids  
 Maps  
 Time Series  
 Temporals  
 Documents

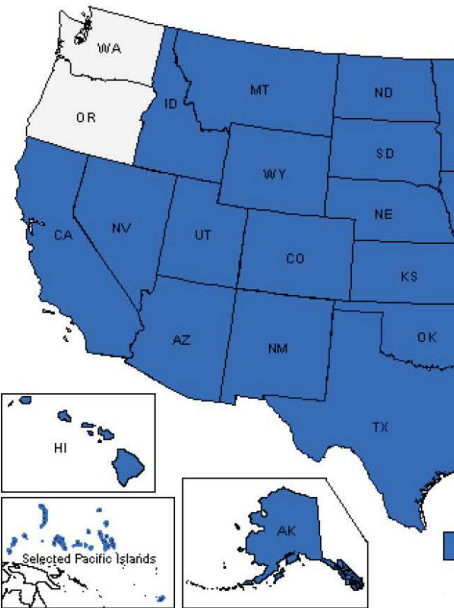
Probable Maximum Precipitation  
 Documents

Miscellaneous  
 Publications  
 Storm Analysis  
 Record Precipitation

Contact Us  
 Inquiries



State:



4/1/26, 10:12 AM

Precipitation Frequency Data Server



NOAA Atlas 14, Volume 6, Version 2  
 Location name: **San Diego, California, USA\***  
 Latitude: 32.8335°, Longitude: -117.1296°  
 Elevation: 431 ft\*\*



\* source: ESRI Maps  
 \*\* source: USGS

**POINT PRECIPITATION FREQUENCY ESTIMATES**

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

[PF\\_tabular](#) | [PF\\_graphical](#) | [Maps\\_&\\_aerials](#)

**PF tabular**

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches) <sup>1</sup>										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.120 (0.101-0.145)	0.151 (0.127-0.182)	0.191 (0.160-0.231)	0.224 (0.185-0.273)	0.267 (0.213-0.337)	0.300 (0.234-0.387)	0.332 (0.253-0.441)	0.366 (0.271-0.499)	0.410 (0.291-0.585)	0.444 (0.304-0.657)
10-min	0.172 (0.145-0.207)	0.217 (0.182-0.261)	0.274 (0.229-0.332)	0.320 (0.265-0.391)	0.382 (0.306-0.483)	0.429 (0.336-0.555)	0.476 (0.363-0.631)	0.524 (0.388-0.716)	0.588 (0.417-0.839)	0.637 (0.435-0.941)
15-min	0.208 (0.175-0.251)	0.262 (0.220-0.316)	0.332 (0.277-0.401)	0.388 (0.321-0.473)	0.463 (0.370-0.584)	0.519 (0.406-0.671)	0.576 (0.439-0.764)	0.634 (0.469-0.865)	0.711 (0.504-1.01)	0.770 (0.526-1.14)
30-min	0.286 (0.240-0.344)	0.360 (0.301-0.434)	0.455 (0.380-0.550)	0.532 (0.440-0.648)	0.634 (0.507-0.801)	0.712 (0.557-0.920)	0.790 (0.602-1.05)	0.870 (0.644-1.19)	0.976 (0.691-1.39)	1.06 (0.722-1.56)
60-min	0.405 (0.339-0.487)	0.509 (0.426-0.614)	0.644 (0.538-0.778)	0.752 (0.623-0.918)	0.898 (0.718-1.13)	1.01 (0.788-1.30)	1.12 (0.853-1.48)	1.23 (0.911-1.68)	1.38 (0.979-1.97)	1.50 (1.02-2.21)
2-hr	0.551 (0.462-0.664)	0.693 (0.581-0.836)	0.876 (0.732-1.06)	1.02 (0.848-1.25)	1.22 (0.976-1.54)	1.37 (1.07-1.77)	1.52 (1.16-2.01)	1.67 (1.24-2.28)	1.87 (1.33-2.67)	2.02 (1.38-2.99)
3-hr	0.659 (0.553-0.794)	0.830 (0.695-1.00)	1.05 (0.876-1.27)	1.22 (1.01-1.49)	1.46 (1.17-1.84)	1.64 (1.28-2.11)	1.82 (1.38-2.40)	2.00 (1.48-2.72)	2.24 (1.58-3.19)	2.42 (1.65-3.57)
6-hr	0.908 (0.761-1.09)	1.14 (0.958-1.38)	1.45 (1.21-1.75)	1.69 (1.40-2.06)	2.01 (1.61-2.54)	2.25 (1.76-2.91)	2.50 (1.90-3.31)	2.74 (2.03-3.74)	3.07 (2.17-4.37)	3.31 (2.26-4.90)



# Gathering NOAA Atlas 14 Data

- Online PFDS interface
- GIS data available from PFDS website
- 100-year data embedded in SDHydroTools program
- Instructions for using the online PFDS interface and/or SDHydroTools are provided in Appendix B of the Hydrology Manual



# Gathering NOAA Atlas 14 Data

- Open the PFDS website and select California

NOAA's National Weather Service  
Hydrometeorological Design Studies Center  
Precipitation Frequency Data Server (PFDS)

Home Site Map Organization

General Information  
Homepage  
Progress Reports  
FAQ  
Glossary

Precipitation Frequency Data Server  
GIS Grids  
Maps

State: California Load

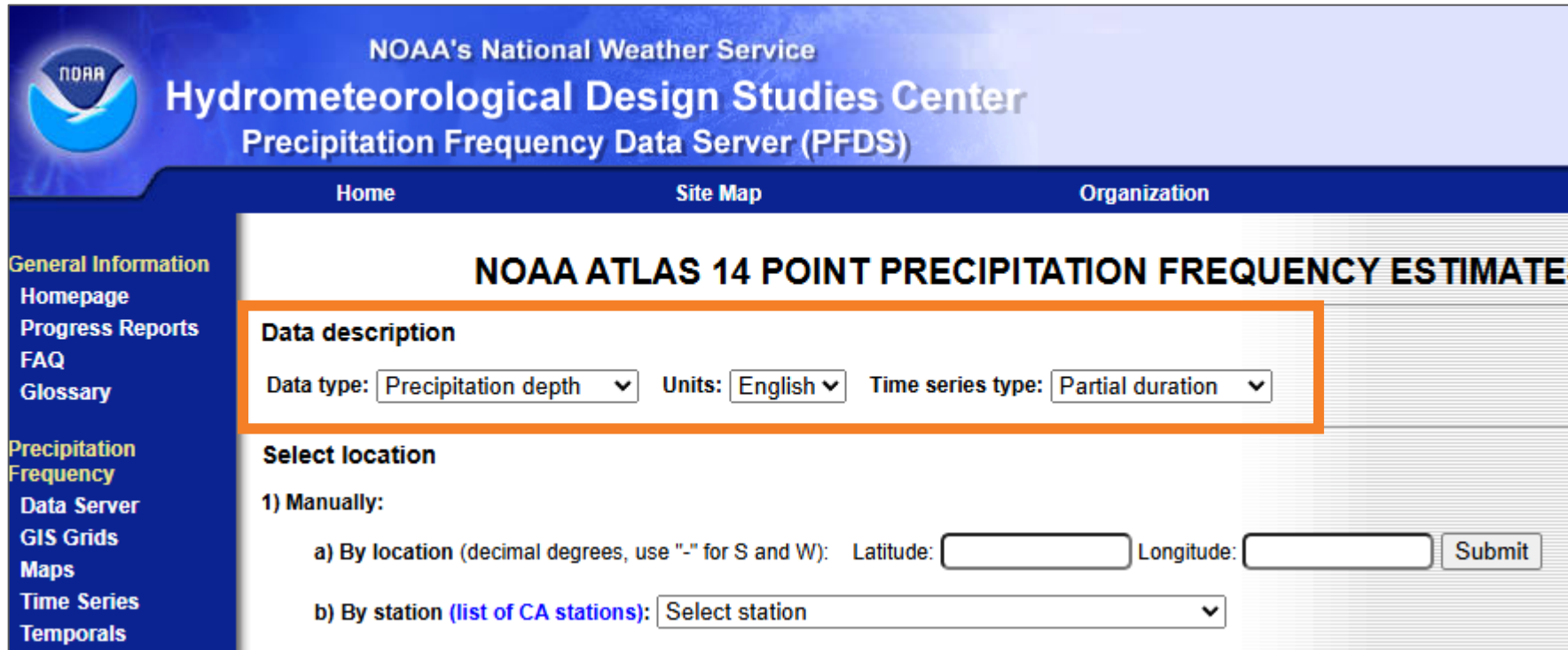
WA OR ID MT ND MN ME

<http://hdsc.nws.noaa.gov/hdsc/pfds>



# Gathering NOAA Atlas 14 Data

- Select the data type, units, and time series type



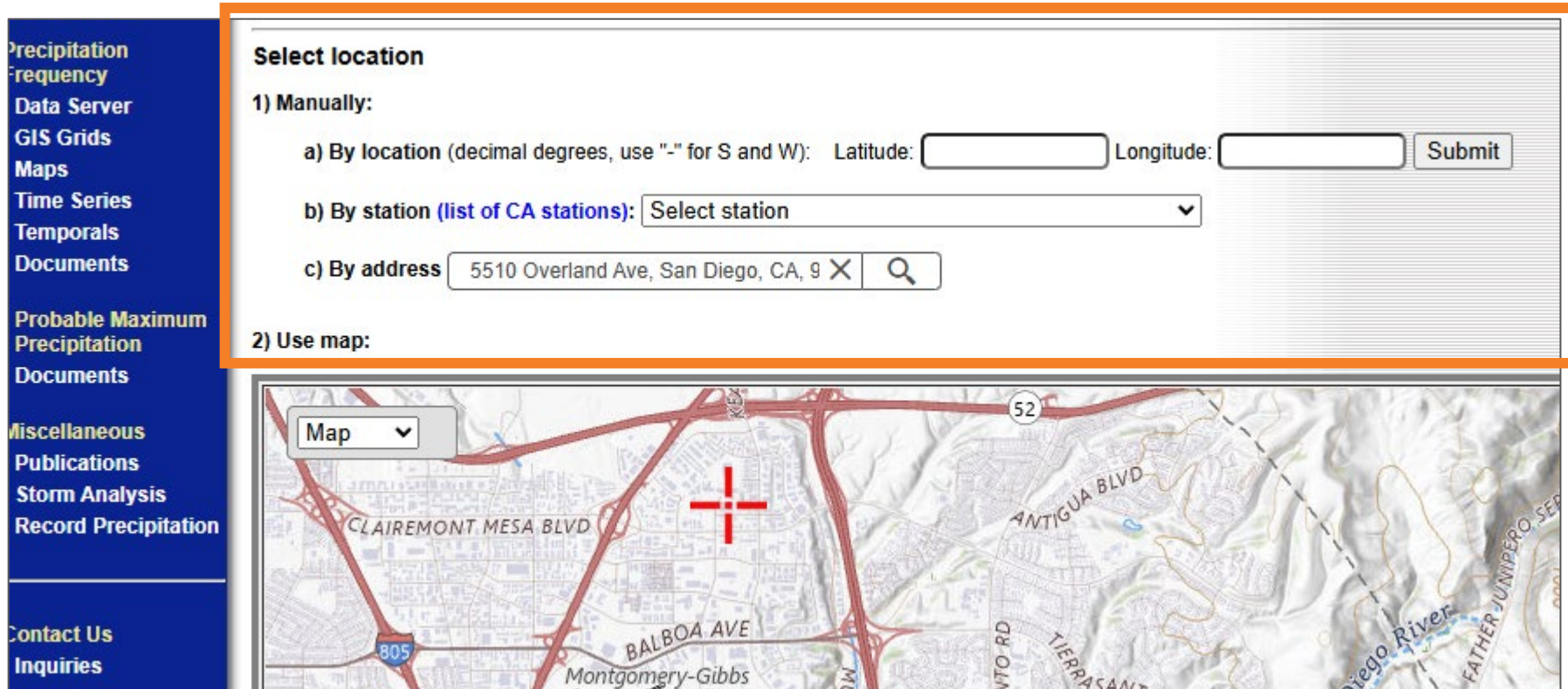
The screenshot shows the NOAA Atlas 14 Point Precipitation Frequency Estimate web form. The page header includes the NOAA logo and the text "NOAA's National Weather Service Hydrometeorological Design Studies Center Precipitation Frequency Data Server (PFDS)". The main title is "NOAA ATLAS 14 POINT PRECIPITATION FREQUENCY ESTIMATE". The form is divided into sections: "Data description" (highlighted with an orange border), "Select location", and "1) Manually:". The "Data description" section contains three dropdown menus: "Data type" set to "Precipitation depth", "Units" set to "English", and "Time series type" set to "Partial duration". The "Select location" section has two options: "a) By location (decimal degrees, use '-' for S and W):" with input fields for "Latitude:" and "Longitude:" and a "Submit" button; and "b) By station (list of CA stations):" with a "Select station" dropdown menu.

<http://hdsc.nws.noaa.gov/hdsc/pfds>



# Gathering NOAA Atlas 14 Data

- Select the location for the data



The screenshot shows the NOAA Atlas 14 data selection interface. On the left is a dark blue sidebar with navigation links: Precipitation Frequency, Data Server, GIS Grids, Maps, Time Series, Temporals, Documents, Probable Maximum Precipitation Documents, Miscellaneous Publications, Storm Analysis, Record Precipitation, Contact Us, and Inquiries. The main content area is titled "Select location" and is highlighted with an orange border. It contains three manual selection options: a) "By location (decimal degrees, use '-' for S and W):" with input fields for Latitude and Longitude and a Submit button; b) "By station (list of CA stations):" with a dropdown menu labeled "Select station"; and c) "By address" with a text input field containing "5510 Overland Ave, San Diego, CA, 9" and a search icon. Below these options is a "2) Use map:" section with a map of San Diego. The map shows major roads like I-805, I-52, and I-15, and landmarks like the Diego River. A red crosshair is positioned on the map, indicating the selected location.



# Gathering NOAA Atlas 14 Data

- Print the data to store in your project file and to include in your drainage study report

**POINT PRECIPITATION FREQUENCY (PF) ESTIMATES**  
WITH 90% CONFIDENCE INTERVALS AND SUPPLEMENTARY INFORMATION  
NOAA Atlas 14, Volume 6, Version 2

[PF tabular](#)   
 [PF graphical](#)   
 [Supplementary information](#)   
 [Print page](#)

**PDS-based precipitation frequency estimates with 90% confidence intervals (in inches)<sup>1</sup>**

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	<b>0.120</b> (0.101-0.145)	<b>0.151</b> (0.127-0.182)	<b>0.191</b> (0.160-0.231)	<b>0.224</b> (0.185-0.273)	<b>0.267</b> (0.213-0.337)	<b>0.300</b> (0.234-0.387)	<b>0.332</b> (0.253-0.441)	<b>0.366</b> (0.271-0.499)	<b>0.410</b> (0.291-0.585)	<b>0.444</b> (0.304-0.657)
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30-min	<b>0.286</b> (0.240-0.344)	<b>0.360</b> (0.301-0.434)	<b>0.455</b> (0.380-0.550)	<b>0.532</b> (0.440-0.648)	<b>0.634</b> (0.507-0.801)	<b>0.712</b> (0.557-0.920)	<b>0.790</b> (0.602-1.05)	<b>0.870</b> (0.644-1.19)	<b>0.976</b> (0.691-1.39)	<b>1.06</b> (0.722-1.56)
60-min	<b>0.405</b> (0.339-0.487)	<b>0.509</b> (0.426-0.614)	<b>0.644</b> (0.538-0.778)	<b>0.752</b> (0.623-0.918)	<b>0.898</b> (0.718-1.13)	<b>1.01</b> (0.788-1.30)	<b>1.12</b> (0.853-1.48)	<b>1.23</b> (0.911-1.68)	<b>1.38</b> (0.979-1.97)	<b>1.50</b> (1.02-2.21)



# Gathering NOAA Atlas 14 Data

- Gather NOAA Atlas 14 data specific to each project/study
  - Rational method / small watersheds –
    - Select the project location
  - NRCS hydrology / large watersheds –
    - Select the watershed centroid
- *Always record the latitude / longitude for the selected location to ensure data can be reproduced*



# Using NOAA Atlas 14 Data

- NOAA Atlas 14 provides paired data
  - Time-Depth, Time-Intensity

## POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aerials](#)

### PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour) <sup>1</sup>										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	1.44 (1.21-1.74)	1.81 (1.52-2.18)	2.29 (1.92-2.77)	2.69 (2.22-3.28)	3.20 (2.56-4.04)	3.60 (2.81-4.64)	3.98 (3.04-5.29)	4.39 (3.25-5.99)	4.92 (3.49-7.02)	5.33 (3.65-7.88)
10-min	1.03 (0.870-1.24)	1.30 (1.09-1.57)	1.64 (1.37-1.99)	1.92 (1.59-2.35)	2.29 (1.84-2.90)	2.57 (2.02-3.33)	2.86 (2.18-3.79)	3.14 (2.33-4.30)	3.53 (2.50-5.03)	3.82 (2.61-5.65)
15-min	0.832 (0.700-1.00)	1.05 (0.880-1.26)	1.33 (1.11-1.60)	1.55 (1.28-1.89)	1.85 (1.48-2.34)	2.08 (1.62-2.68)	2.30 (1.76-3.06)	2.54 (1.88-3.46)	2.84 (2.02-4.06)	3.08 (2.10-4.55)
30-min	0.572 (0.480-0.688)	0.720 (0.602-0.868)	0.910 (0.760-1.10)	1.06 (0.880-1.30)	1.27 (1.01-1.60)	1.42 (1.11-1.84)	1.58 (1.20-2.09)	1.74 (1.29-2.37)	1.95 (1.38-2.78)	2.11 (1.44-3.12)
60-min	0.405 (0.339-0.487)	0.509 (0.426-0.614)	0.644 (0.538-0.778)	0.752 (0.623-0.918)	0.898 (0.718-1.13)	1.01 (0.788-1.30)	1.12 (0.853-1.48)	1.23 (0.911-1.68)	1.38 (0.979-1.97)	1.50 (1.02-2.21)



# Using NOAA Atlas 14 Data

- Use log-log interpolation between paired data points
- New procedures are described in Sections 3, 4, 6, and Workbook

- The intensity equation  $I = 7.44P_6 D^{-0.645}$  provided in Figure 3-1 of the June 2003 version of the manual has been retired



# Log-Log Interpolation

$$I_{T_c} = K \cdot T_c^n$$

$$\text{with } K = I_1/T_1^n = I_2/T_2^n$$

$$n = \text{Log}(I_2/I_1)/\text{Log}(T_2/T_1)$$

Or

$$I_{T_c} = \text{Log}_1(\text{Log}I_1 + (\text{Log}(T_c / T_1)) (\text{Log}(I_2 / I_1)/(\text{Log}(T_2 / T_1))))$$

Or

$$I_{T_c} = I_1 \cdot (T_c / T_1)^n$$

$$\text{with } n = \text{Log}(I_2 / I_1)/(\text{Log}(T_2 / T_1))$$

Equations for log-log interpolation are provided in Section 3

Where:

$I_{T_c}$  = Intensity at  $T_c$  (inches per hour)

$T_c$  = time of concentration (minutes)

$T_1$  and  $T_2$  are the bounding times (minutes) of given data points from NOAA Atlas 14 and  $T_1 < T_c < T_2$

$I_1$  = Intensity at  $T_1$  (inches per hour) from NOAA Atlas 14

$I_2$  = Intensity at  $T_2$  (inches per hour) from NOAA Atlas 14



# Log-Log Interpolation

- SDHydroTools provides an interpolation tool

**NOTE**  
This module uses log-log interpolation between the known precipitation ordinates to determine precipitation and intensity for a user-requested time. See Sections 3 and 4 of the San Diego County Hydrology Manual for equations for log-log interpolation.

**INTERPOLATION INPUT**

Time: 18.2      Units (min or hr): Minutes      Interpolate: RUN      Clear Table: CLEAR

**RESULTS**

TIME (MIN)	PRECIPITATION (IN)	AVG. INTENSITY (IN/HR)	RAN
7.5	0.410	3.279	3/23/2021 1:53:20 PM
9	0.451	3.004	3/23/2021 1:53:23 PM
12	0.519	2.593	3/23/2021 1:53:27 PM
15	0.576	2.304	3/23/2021 1:53:32 PM
18.2	0.629	2.074	3/23/2021 1:53:39 PM



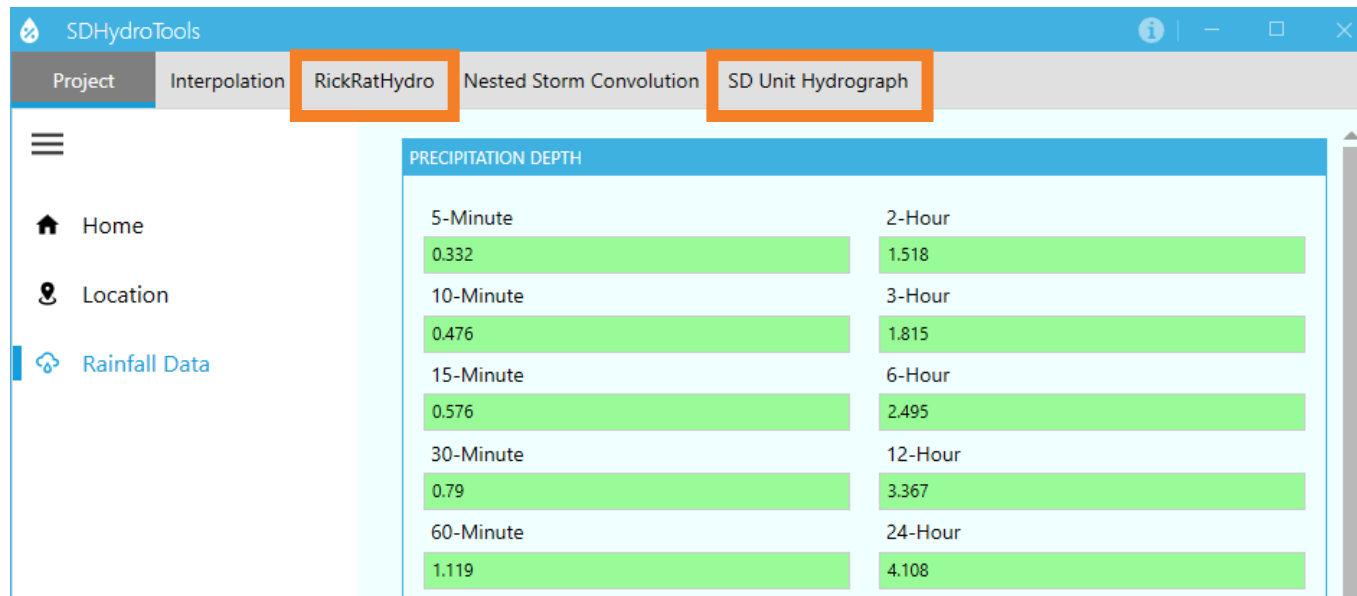
# Updated Hydrologic Procedures

- Rational method (Section 3)
  - Intensity in the rational method equation  $Q = CIA$
- NRCS method (Section 4)
  - Rainfall depths in the hyetograph
- Rational method hydrograph (Section 6)
  - Rainfall depths in each rainfall block



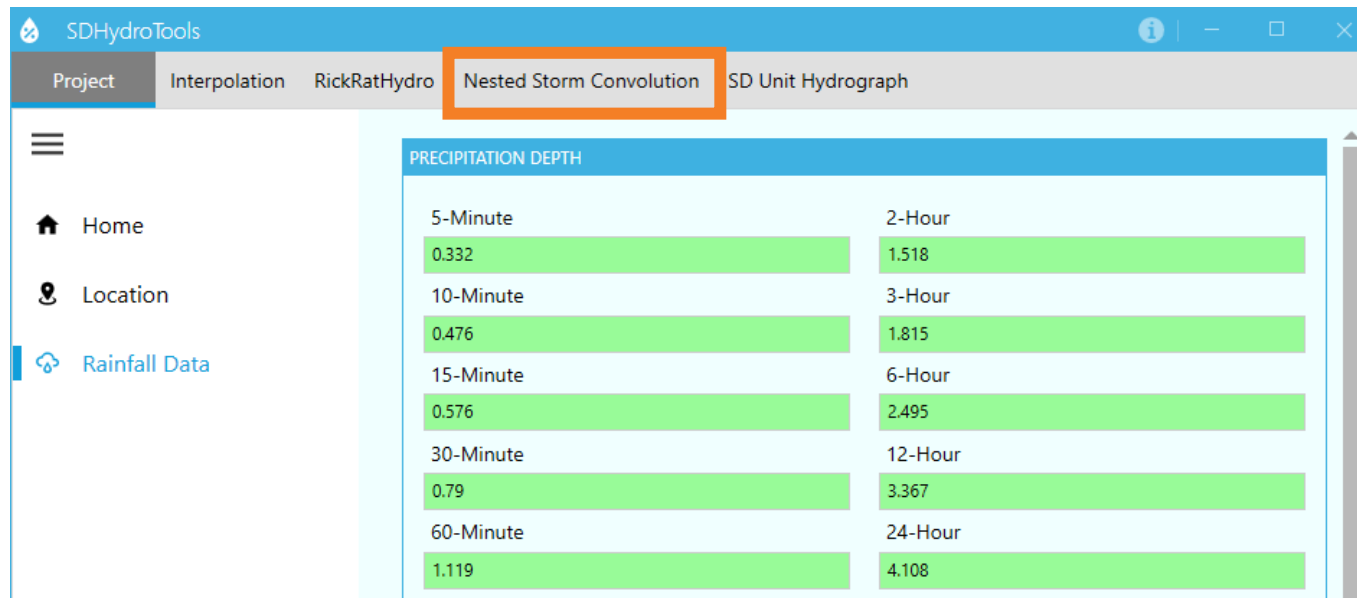
# Updated Tools

- SDHydroTools computer program replaces
  - Rational Hydrograph (RATHYDRO) with “RickRatHydro” module
  - San Diego Unit Hydrograph (SDUH) with “SD Unit Hydrograph”



# Updated Tools

- SDHydroTools computer program adds
  - “Nested Storm Convolution” to create a hyetograph for NRCS studies



## Example Problems

- Example problems in the Hydrology Manual Workbook have been updated to reflect NOAA Atlas 14 intensity input

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$$I_{10.6\text{-min}} = \text{Log}^{-1}(\text{Log}(3.49) + (\text{Log}(10.6 / 10)) (\text{Log}(2.82 / 3.49)/(\text{Log}(15 / 10))))$$

$$I_{10.6\text{-min}} = 3.4 \text{ in/hr}$$

Now calculate Q for node 0102 using the rational method equation.

$$Q_{0102} = \Sigma(CA)I = 0.21 (3.4) = 0.7 \text{ cfs}$$



# Questions Roundtable 1





# SDHydroTools

June 17, 2026

**Laura Henry, PE**  
Associate Project Engineer



# SDHydroTools

- Free tool provided by the County
- Replaces June 2003 Hydrology Manual Rational Hydrograph (RATHYDRO) and San Diego Unit Hydrograph (SDUH) programs
- Adds log-log interpolation utility and nested storm utility
- NOAA Atlas 14 100-year data embedded within program



# SDHydroTools

SDHydroTools

Project Interpolation RickRatHydro Nested Storm Convolution SD Unit Hydrograph

Home  
Location  
Rainfall Data  
Settings

**GENERAL INFORMATION**

Study/Project Title Information  
June 17, 2026 Presentation

Study Recurrence Interval  
100

Description

**ADDRESS INFORMATION**

Address

City State Zipcode

**NOTE**

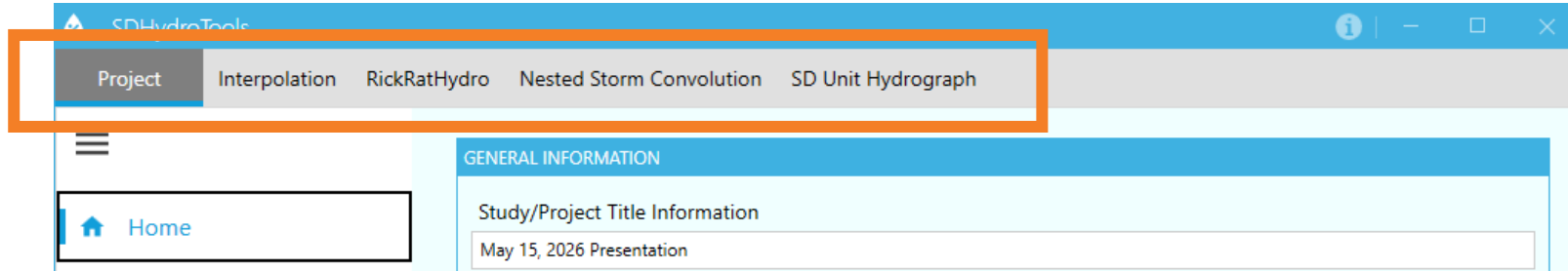
SDHydroTools does not store project files. The user is responsible to save screen captures of relevant windows and to export the results calculated by the program.

NEXT

SDHydroTools | Current Path: > Project > Home



# SDHydroTools Modules



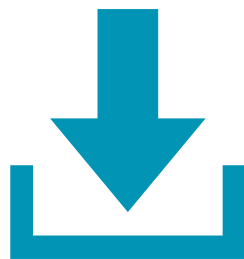
- Obtain NOAA Atlas 14 100-year rainfall depth data for locations within San Diego County
- Interpolate rainfall depths and intensities using log-log interpolation
- Prepare a rational method hydrograph (Section 6)
- Prepare a nested storm hyetograph (Section 4)
- Calculate a peak flow rate and generate a hydrograph using NRCS hydrologic method (Section 4)



# SDHydroTools Location and Instructions

- Program and user instructions provided on County of San Diego Hydrology Manual website

<https://www.sandiegocounty.gov/content/sdc/dpw/flood/hydrologymanual.html>



- Download program and install on local machine
- Download user instructions



# SDHydroTools User Instructions

- How to install the program
- Overview of the program layout
  - Program modules/tabs & windows within each module
- How to get started
  - Required input and actions to initiate program modules
- Description and purpose of each module
- How to use each module and export results



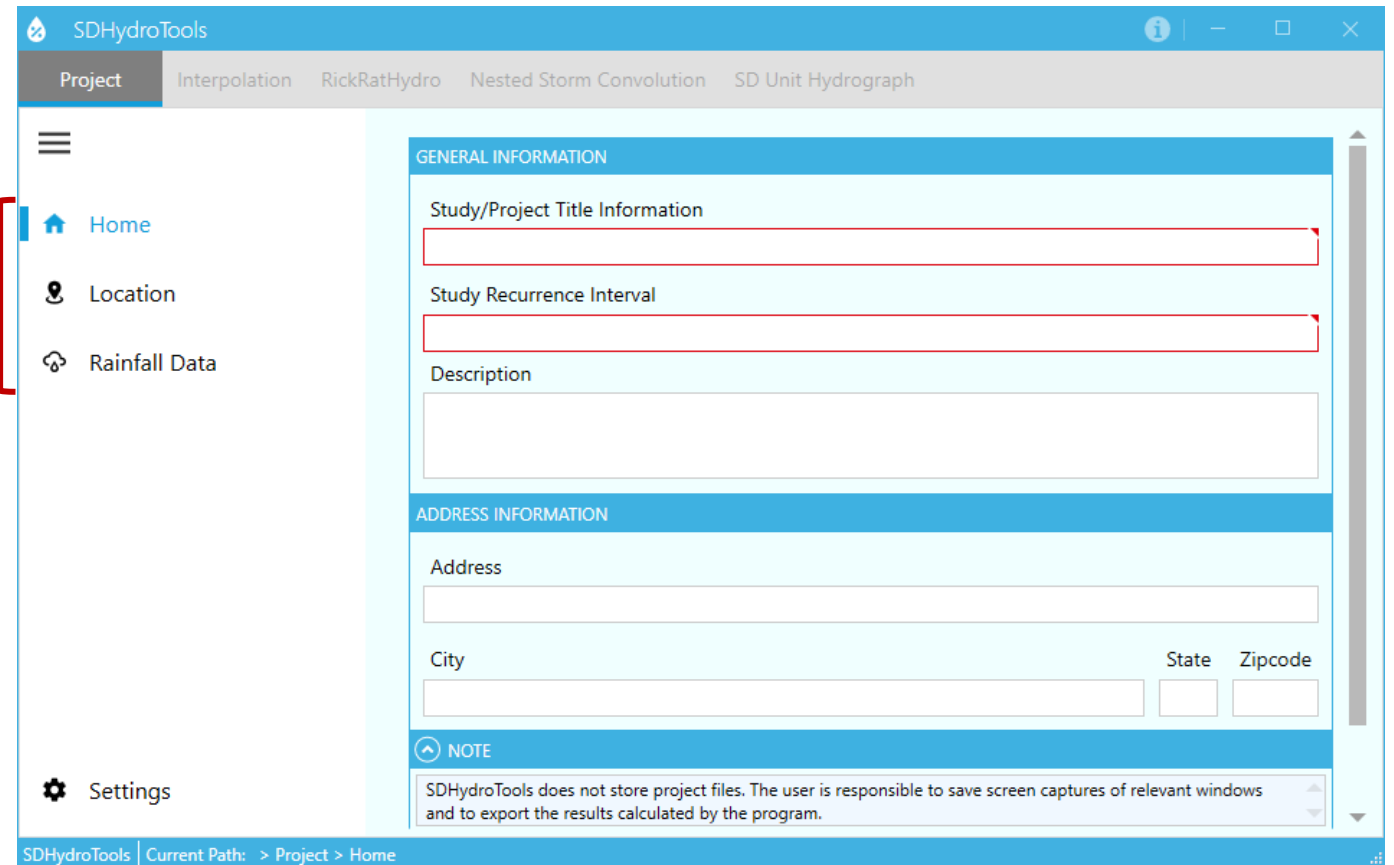
# SDHydroTools Layout

- SDHydroTools includes 5 Modules shown in Tabs across the top.
- Each Module includes one or more Windows accessible along the left side.

Use Tabs on top to move between Modules. →

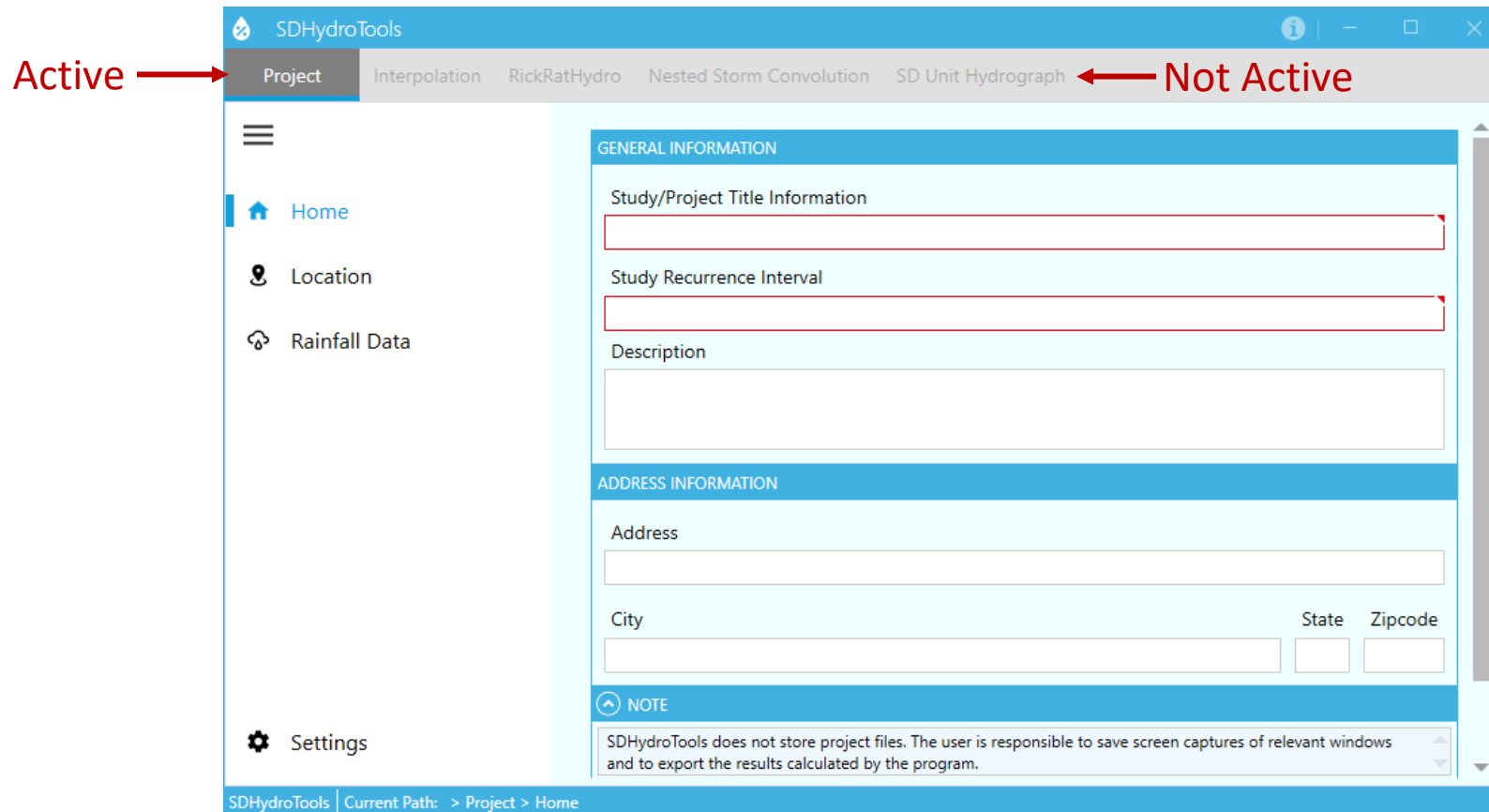
Available Windows within each Module/Tab –  
Windows vary depending on the Module. →  
Select these to move between Windows  
within a Module.

Settings (available in the Project Module) provides an  
option to access an offline map in the Location Window  
of the Project Module if no internet connection is  
available or if the online map does not load in the  
Location Window. →



# Starting SDHydroTools – Project Module

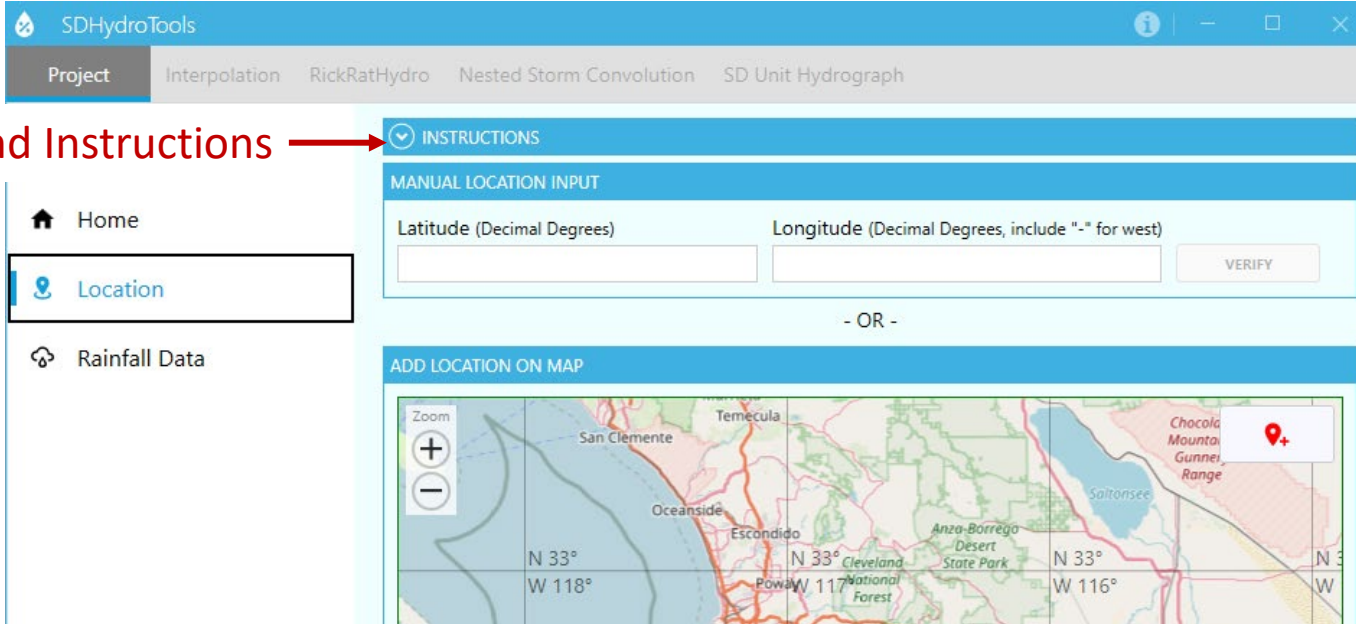
- When SDHydroTools is initially opened, only the Project Module is active.
- To activate the other modules, rainfall data must be populated in the Rainfall Data Window based on a location provided in the Location Window of the Project Module.



# Starting SDHydroTools – Project Module (Continued)

- A location must be provided for the program to get the embedded 100-year rainfall data. This step is mandatory to activate the computation modules, even when the user intends to substitute data from another source.
- If needed, expand the “Instructions” box to see instructions to select a location by entering a point or by entering latitude and longitude.

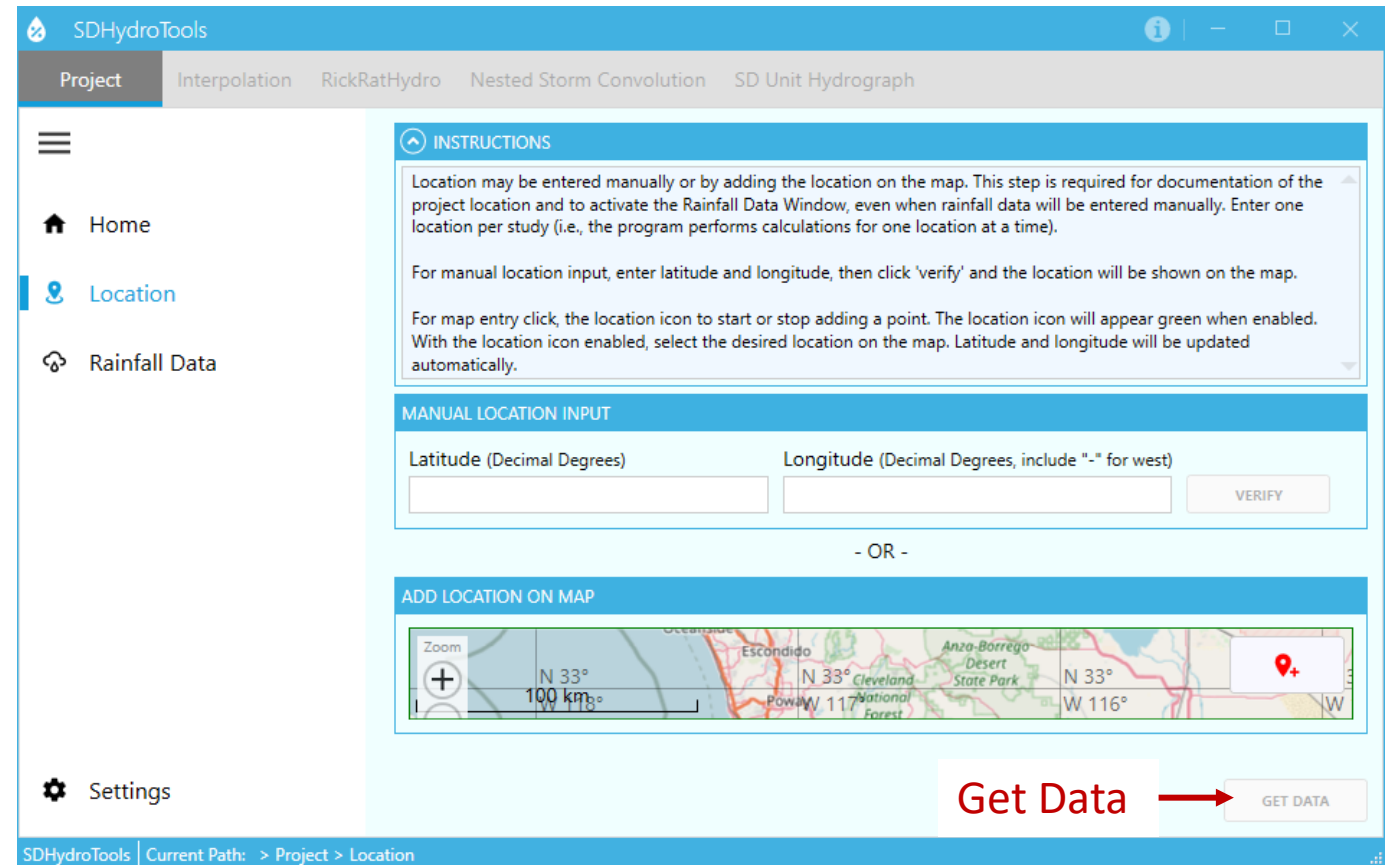
Click to Expand Instructions →



The screenshot displays the SDHydroTools software interface. The top navigation bar includes 'Project', 'Interpolation', 'RickRatHydro', 'Nested Storm Convolution', and 'SD Unit Hydrograph'. The 'Project' tab is active. On the left, a sidebar contains 'Home', 'Location', and 'Rainfall Data'. The 'Location' option is highlighted with a black box. The main content area shows the 'INSTRUCTIONS' section expanded, revealing two methods for location input: 'MANUAL LOCATION INPUT' with text boxes for 'Latitude (Decimal Degrees)' and 'Longitude (Decimal Degrees, include "-" for west)', and 'ADD LOCATION ON MAP' with a map of Southern California. A red arrow points to the 'INSTRUCTIONS' dropdown menu.

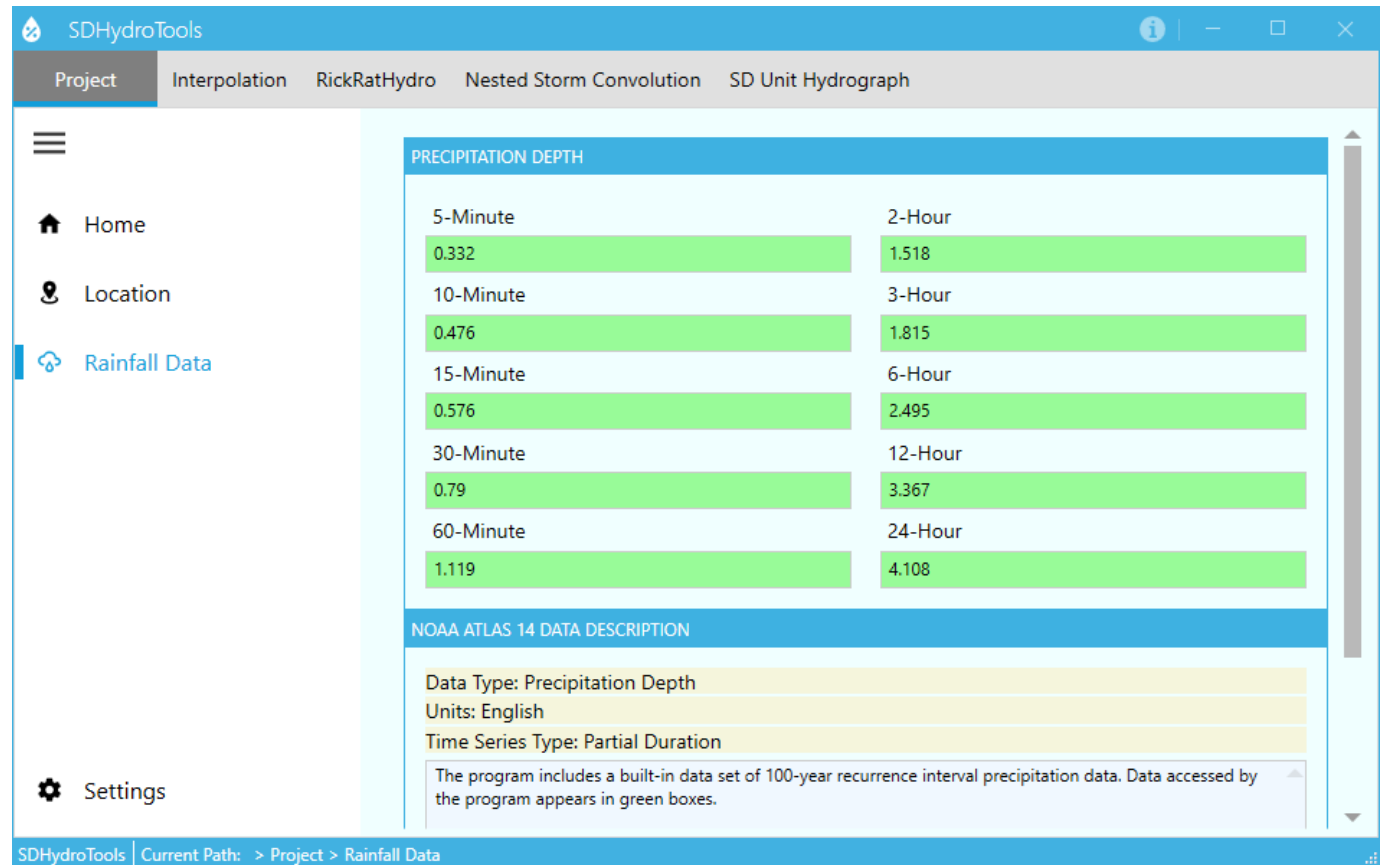
# Starting SDHydroTools – Project Module (Continued)

- Enter the project location in the Location Window of the Project Tab to get the embedded 100-year rainfall data.
1. Provide the project location per the instructions.
  2. The “Get Data” button will be active after a valid (*i.e., within San Diego County*) project location has been entered.
  3. (As Needed) Save a screen capture of the window for documentation. Note the latitude and longitude. Data can be reproduced by entering the same latitude and longitude.
  4. Click on “Get Data” to move to the next Window.



# Starting SDHydroTools – Project Module (Continued)

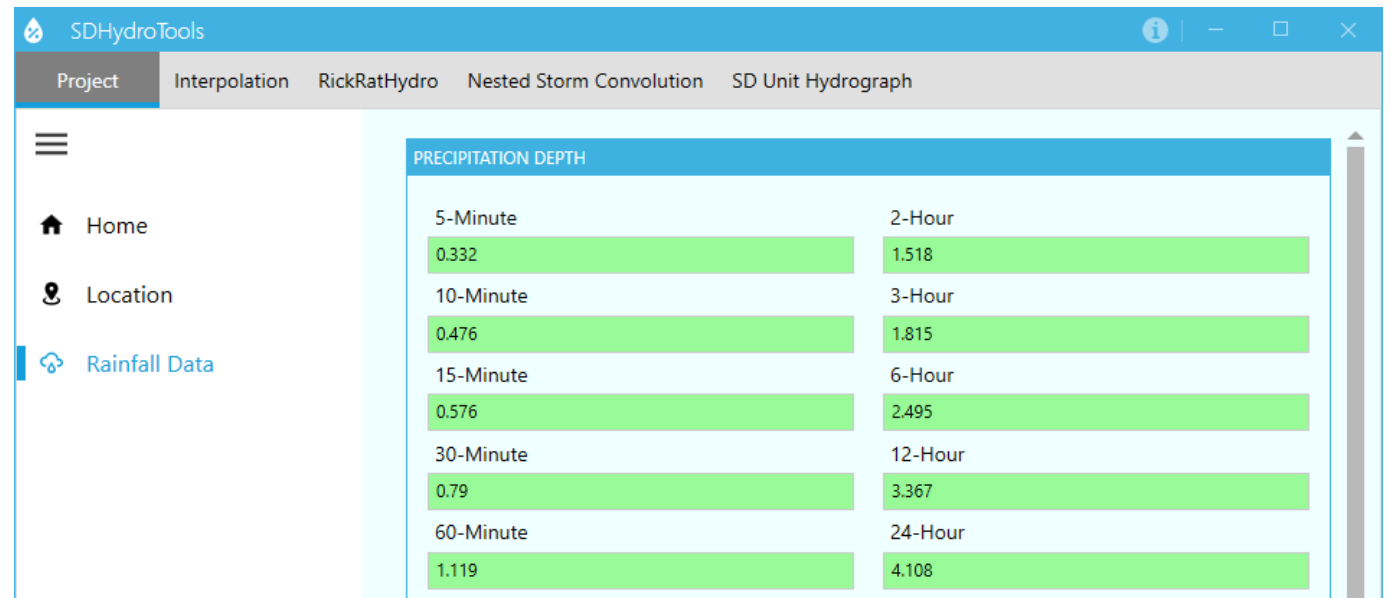
- After clicking on “Get Data” in the Location Window, the data are presented in the Rainfall Data Window of the Project Module.
- 100-year rainfall data is provided in units of inches.
- (As Needed) Save a screen capture of the rainfall data.
- (As Needed) Data can be reproduced by re-entering the latitude and longitude of the project location in the Location Window (e.g., after closing the program, upon opening a new session).



# Starting SDHydroTools – Project Module (Continued)

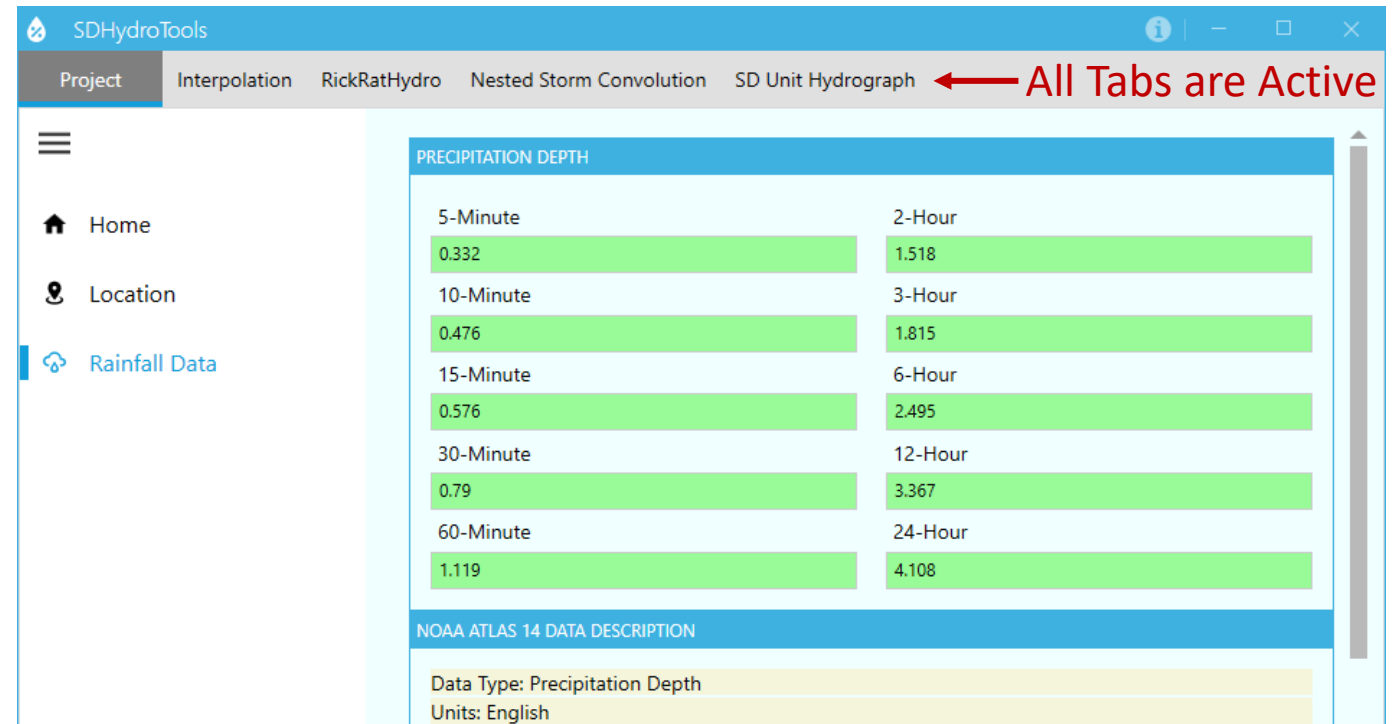
- Once the embedded 100-year rainfall data has been populated by the program, the data will appear in green boxes.
- In this Window, the user may overwrite the embedded 100-year rainfall data with data obtained for a different storm event (e.g., 10-year) from an outside source (e.g., from the NOAA Atlas 14 website) if desired (optional).

- If the user overwrites the embedded data, the boxes will change color.
- The user-entered data will appear in red boxes.



# Starting SDHydroTools – Project Module (Continued)

- After rainfall data has been populated in the Project Tab, the Tabs for the computation Modules become active.
- Select the Tab for the desired Module.
- It is not necessary to move through all Tabs within the program. Go directly to the Tab for the desired Module.
- More than one Module may be used in the same session with the same rainfall data.



# SDHydroTools Interpolation Module

- Performs log-log interpolation between rainfall data points
- Log-log interpolation equation presented in Section 3 of the 2026 Hydrology Manual
- Depths and intensities calculated
- Results may be exported



# SDHydroTools Interpolation Module

- The **Interpolation Module** performs log-log interpolation between rainfall data points. For example, to obtain rainfall intensity for a given time of concentration for the purpose of rational method calculations.

1. Enter the desired time (e.g., your rational method time of concentration) in minutes or hours.
2. Select the applicable units for the time that was entered (either minutes or hours).
3. Click “Run”
4. (As Needed) Repeat steps 1-3 for additional times.

The screenshot shows the SDHydroTools application window with the Interpolation module selected. The interface includes a navigation menu on the left with a 'Home' button. The main content area is divided into several sections:

- NOTE:** A text box explaining that the module uses log-log interpolation between known precipitation ordinates to determine precipitation and intensity for a user-requested time. It references Sections 3 and 4 of the San Diego County Hydrology Manual.
- INTERPOLATION INPUT:** A section with a text input field for 'Time', a dropdown menu for 'Units (min or hr)' set to 'Minutes', and two buttons: 'Interpolate' (labeled 'RUN') and 'Clear Table' (labeled 'CLEAR').
- RESULTS:** A section with an 'Export' button and a table with the following columns: 'TIME (MIN)', 'PRECIPITATION (IN)', 'AVG. INTENSITY (IN/HR)', and 'RAN'. The table is currently empty.

A 'NEXT' button is located at the bottom right of the interface. The status bar at the bottom shows the current path: 'SDHydroTools | Current Path: > Interpolation > Home'.

# SDHydroTools Interpolation Module (Continued)

- Results from the Interpolation Module may be exported to a .csv file using the Export button and may be opened with an external program.
- (As Needed) Save a screen capture of SDHydroTools.

NOTE  
This module uses log-log interpolation between the known precipitation ordinates to determine precipitation and intensity for a user-requested time. See Sections 3 and 4 of the San Diego County Hydrology Manual for equations for log-log interpolation.

INTERPOLATION INPUT

Time: 18.2  
Units (min or hr): Minutes  
Interpolate: RUN  
Clear Table: CLEAR

RESULTS

TIME (MIN)	PRECIPITATION (IN)	AVG. INTENSITY (IN/HR)	RAN
7.5	0.410	3.279	3/23/2021 1:53:20 PM
9	0.451	3.004	3/23/2021 1:53:23 PM
12	0.519	2.593	3/23/2021 1:53:27 PM
15	0.576	2.304	3/23/2021 1:53:32 PM
18.2	0.629	2.074	3/23/2021 1:53:39 PM

Export

InterpolationResults\_2021\_0323 - Notepad

```
File Edit Format View Help
time (min),Precipitation (in),Avg. Intensity (in/hr),Ran
7.5,0.41,3.279,3/23/2021 1:53:20 PM
9,0.451,3.004,3/23/2021 1:53:23 PM
12,0.519,2.593,3/23/2021 1:53:27 PM
15,0.576,2.304,3/23/2021 1:53:32 PM
18.2,0.629,2.074,3/23/2021 1:53:39 PM
```

InterpolationResults\_2021\_0323 - Excel

	A	B	C	D	E	F	G
1	Time (min)	Precipitation (in)	Avg. Intensity (in/hr)	Ran			
2	7.5	0.41	3.279	3/23/2021 13:53			
3	9	0.451	3.004	3/23/2021 13:53			
4	12	0.519	2.593	3/23/2021 13:53			
5	15	0.576	2.304	3/23/2021 13:53			
6	18.2	0.629	2.074	3/23/2021 13:53			
7							
8							

# SDHydroTools RickRatHydro Module

- Prepares a rational method hydrograph using the procedure presented in Section 6 of the 2026 Hydrology Manual
- Replaces the 2003 Rational Hydrograph (RATHYDRO) program
  - Results from RickRatHydro are not expected to match 2003 RATHYDRO program due to NOAA Atlas 14 intensity process
- Results may be exported for use in other programs such as HEC-HMS



# SDHydroTools RickRatHydro Module (Continued)

- To prepare a rational method hydrograph using the RickRatHydro Module, first complete your rational method calculations (calculations external to SDHydroTools) in accordance with Section 3 of the 2026 Hydrology Manual.

1. Provide the required input data in the red boxes.
2. The “Calculate” button will be active after the required data has been entered.
3. (As Needed) Save a screen capture of the window for documentation.
4. Click on “Calculate” to obtain the rational method hydrograph.

SDHydroTools

Project Interpolation **RickRatHydro** Nested Storm Convolution SD Unit Hydrograph

NOTE

This module prepares a rational method hydrograph for user-provided rational method study results according to the procedure described in Section 6 of the San Diego County Hydrology Manual.

RATIONAL METHOD HYDROGRAPH INPUT

Time of Concentration (min)

Watershed Area (ac)

Weighted Runoff Coefficient for Watershed Area

Peak Flow Rate (Qp)

RESULTS SUMMARY

Export

ATTRIBUTE	VALUE	UNIT	RAN

CALCULATE

SDHydroTools | Current Path: > RickRatHydro > Home

# SDHydroTools RickRatHydro Module (Continued)

Example Data for the RickRatHydro Module:

The screenshot displays the SDHydroTools application window with the RickRatHydro module selected. The interface includes a navigation menu on the left with 'Home' and 'Table' options. The main content area is divided into sections: a 'NOTE' section, a 'RATIONAL METHOD HYDROGRAPH INPUT' section with four input fields, a 'RESULTS SUMMARY' section with an 'Export' button and a table header, and a 'CALCULATE' button at the bottom right. A red arrow points to the 'CALCULATE' button with the word 'Calculate' written in red text.

**NOTE**  
This module prepares a rational method hydrograph for user-provided rational method study results according to the procedure described in Section 6 of the San Diego County Hydrology Manual.

**RATIONAL METHOD HYDROGRAPH INPUT**

Time of Concentration (min)	Watershed Area (ac)
<input type="text" value="10"/>	<input type="text" value="20"/>
Weighted Runoff Coefficient for Watershed Area	Peak Flow Rate (Qp)
<input type="text" value="0.6"/>	<input type="text" value="34.3"/>

**RESULTS SUMMARY**

Export

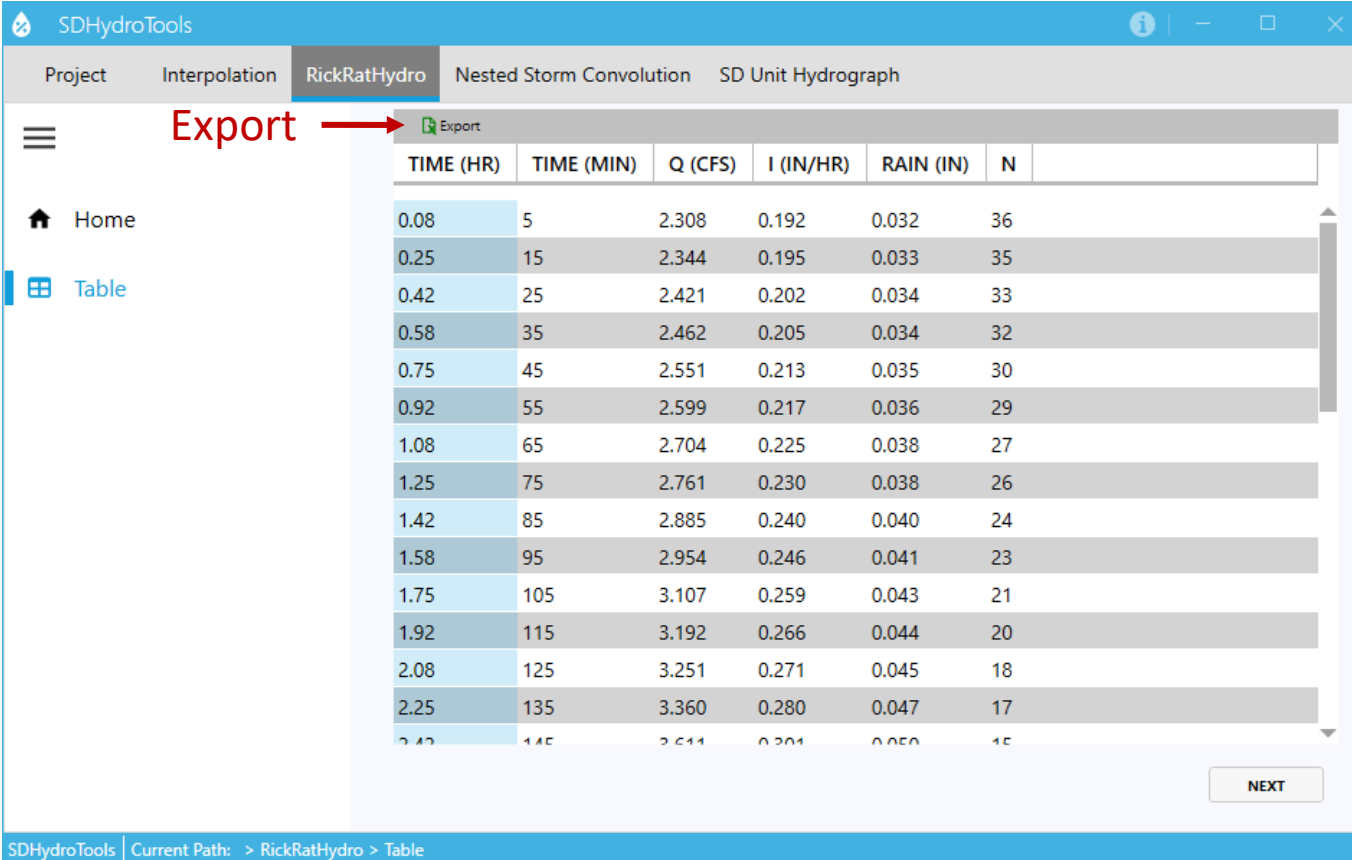
ATTRIBUTE	VALUE	UNIT	RAN

Calculate → **CALCULATE**

SDHydroTools | Current Path: > RickRatHydro > Home

# SDHydroTools RickRatHydro Module (Continued)

- After clicking on “Calculate” to obtain the rational method hydrograph, the results are presented in the Table Window of the RickRatHydro Module.
- Results from the RickRatHydro Module may be exported to a .csv file using the Export button and may be opened with an external program.



The screenshot displays the SDHydroTools interface with the RickRatHydro module selected. The 'Table' window is active, showing a table of hydrograph results. A red arrow labeled 'Export' points to the 'Export' button at the top of the table. Another red arrow labeled 'Table' points to the 'Table' tab in the left sidebar. The table contains the following data:

TIME (HR)	TIME (MIN)	Q (CFS)	I (IN/HR)	RAIN (IN)	N
0.08	5	2.308	0.192	0.032	36
0.25	15	2.344	0.195	0.033	35
0.42	25	2.421	0.202	0.034	33
0.58	35	2.462	0.205	0.034	32
0.75	45	2.551	0.213	0.035	30
0.92	55	2.599	0.217	0.036	29
1.08	65	2.704	0.225	0.038	27
1.25	75	2.761	0.230	0.038	26
1.42	85	2.885	0.240	0.040	24
1.58	95	2.954	0.246	0.041	23
1.75	105	3.107	0.259	0.043	21
1.92	115	3.192	0.266	0.044	20
2.08	125	3.251	0.271	0.045	18
2.25	135	3.360	0.280	0.047	17
2.42	145	3.511	0.291	0.050	15

The interface also includes a 'NEXT' button at the bottom right and a status bar at the bottom showing the current path: > RickRatHydro > Table.

# SDHydroTools RickRatHydro Module (Continued)

- Exported Results from the RickRatHydro Module may be opened with an external program.

Time (hr)	Time (min)	Q (cfs)	I (in/hr)	Rain (in)	N
0.08	5	2.308220893	0.192	0.032058624	36
0.25	15	2.344178122	0.195	0.032558029	35
0.42	25	2.421149607	0.202	0.033627078	33
0.58	35	2.462433338	0.205	0.034200463	32
0.75	45	2.551390363	0.213	0.035435977	30
0.92	55	2.599439642	0.217	0.036103328	29
1.08	65	2.703805694	0.225	0.037552857	27
1.25	75	2.760665594	0.23	0.038342578	26
1.42	85	2.885399498	0.24	0.040074993	24
1.58	95	2.954092423	0.246	0.041029061	23
1.75	105	3.106699453	0.259	0.043148604	21
1.92	115	3.191917121	0.266	0.044332182	20
2.08	125	3.250737546	0.271	0.045149133	18
2.25	135	3.359545666	0.28	0.046660356	17
2.42	145	3.611460285	0.301	0.050159171	15

```
File Edit Format View Help
Time (hr),Time (min),Q (cfs),I (in/hr),Rain (in),N
0.08,5,2.308220893,0.192,0.032058624,36
0.25,15,2.344178122,0.195,0.032558029,35
0.42,25,2.421149607,0.202,0.033627078,33
0.58,35,2.462433338,0.205,0.034200463,32
0.75,45,2.551390363,0.213,0.035435977,30
0.92,55,2.599439642,0.217,0.036103328,29
1.08,65,2.703805694,0.225,0.037552857,27
1.25,75,2.760665594,0.23,0.038342578,26
1.42,85,2.885399498,0.24,0.040074993,24
1.58,95,2.954092423,0.246,0.041029061,23
1.75,105,3.106699453,0.259,0.043148604,21
1.92,115,3.191917121,0.266,0.044332182,20
2.08,125,3.250737546,0.271,0.045149133,18
2.25,135,3.359545666,0.28,0.046660356,17
2.42,145,3.611460285,0.301,0.050159171,15
2.58,155,3.758820437,0.313,0.052205839,14
2.75,165,4.104960595,0.342,0.057013341,12
2.92,175,4.319755631,0.36,0.059996605,11
3.08,185,4.863284606,0.405,0.067545619,9
3.25,195,5.217163971,0.435,0.072460617,8
3.42,205,7.050455526,0.588,0.097922993,6
3.58,215,7.794980057,0.65,0.108263611,5
3.75,225,9.597542899,0.8,0.133299206,3
3.92,235,12.982457100,1.082,0.180311904,2
4.08,245,34.3,2.858,0.476388888,1
4.25,255,8.842564416,0.737,0.122813394,4
4.42,265,5.653705670,0.471,0.078523689,7
4.58,275,4.569129530,0.381,0.063460132,10
4.75,285,3.924276844,0.327,0.054503845,13
4.92,295,3.479159221,0.29,0.048321655,16
5.08,305,3.284151823,0.274,0.045613219,19
5.25,315,3.027659726,0.252,0.042050829,22
5.42,325,2.821070247,0.235,0.039181531,25
5.58,335,2.650160063,0.221,0.036807786,28
5.75,345,2.505787899,0.209,0.034802609,31
5.92,355,2.381778488,0.198,0.033080256,34
6.08,365,0,0.198,0,
```

# SDHydroTools RickRatHydro Module (Continued)

- Return to the Home Window of the RickRatHydro Module to view the calculated volume of runoff.
- Total rain and total runoff volume results shown in the Home Window may also be exported.

Home →

Export →

SDHydroTools RickRatHydro

NOTE

This module prepares a rational method hydrograph for user-provided rational method study results according to the procedure described in Section 6 of the San Diego County Hydrology Manual.

RATIONAL METHOD HYDROGRAPH INPUT

Time of Concentration (min): 10  
Watershed Area (ac): 20  
Weighted Runoff Coefficient for Watershed Area: 0.6  
Peak Flow Rate (Qp): 34.3

RESULTS SUMMARY

ATTRIBUTE	VALUE	UNIT	RAN
Total Rain	2.495	in	3/23/2021 2:34:57 PM
Total Runoff Volume	108682.2	cubic feet	3/23/2021 2:34:57 PM

CALCULATE

SDHydroTools | Current Path: > RickRatHydro > Home

Note: Total Runoff Volume =  $C P_6 A$   
 $(0.6)(2.495 \text{ in})(1 \text{ ft}/12 \text{ in})(20 \text{ ac})(43,560 \text{ ft}^2/\text{ac}) = 108,682 \text{ ft}^3$

# SDHydroTools Nested Storm Convolution Module

- Prepares a nested storm hyetograph according to the procedure presented in Section 4 of the 2026 Hydrology Manual
- Rainfall depth-area adjustment will be applied automatically
  - If no depth-area adjustment is desired, user may enter zero for the watershed area
- Results may be exported for use in other programs such as HEC-HMS



# SDHydroTools Nested Storm Convolution Module (Continued)

1. Provide the required input data in the red boxes.
2. The “Calculate” button will be active after the required data has been entered.
3. (As Needed) Save a screen capture of the window for documentation.
4. Click on “Calculate” to obtain the nested storm hyetograph.

The screenshot shows the SDHydroTools application window with the 'Nested Storm Convolution' module selected. The interface includes a navigation menu on the left with 'Home' and 'Table' options. The main content area features a 'NOTE' section, a 'NESTED STORM CONVOLUTION INPUT' section with two red-bordered input fields for 'Computation Interval (D) (min)' and 'Watershed Area (mi<sup>2</sup>) for Rainfall Depth-Area Adjustment', a 'RESULTS SUMMARY' section with an 'Export' button and a table with columns 'ATTRIBUTE', 'VALUE', 'UNIT', and 'RAN', and a 'CALCULATE' button at the bottom right. The status bar at the bottom indicates the current path: 'SDHydroTools | Current Path: > Project > Rainfall Data'.

SDHydroTools

Project Interpolation RickRatHydro **Nested Storm Convolution** SD Unit Hydrograph

NOTE

This module prepares a nested storm hyetograph according to the procedure described in Section 4 of the San Diego County Hydrology Manual. See Section 4 of the Hydrology Manual for guidelines to select a computation interval. The program will apply a rainfall depth-area adjustment based on the user-provided watershed area. If no rainfall depth-area adjustment is desired, enter zero (0) for the watershed area.

NESTED STORM CONVOLUTION INPUT

Computation Interval (D) (min) Watershed Area (mi<sup>2</sup>) for Rainfall Depth-Area Adjustment

RESULTS SUMMARY

Export

ATTRIBUTE	VALUE	UNIT	RAN
-----------	-------	------	-----

CALCULATE

SDHydroTools | Current Path: > Project > Rainfall Data

# SDHydroTools Nested Storm Convolution Module (Continued)

Example Data for the Nested Storm Convolution Module:

The screenshot shows the SDHydroTools application window with the 'Nested Storm Convolution' module selected. The interface includes a navigation menu on the left with 'Home' and 'Table' options. The main content area is divided into several sections:

- NOTE:** A text box explaining the module's function: "This module prepares a nested storm hyetograph according to the procedure described in Section 4 of the San Diego County Hydrology Manual. See Section 4 of the Hydrology Manual for guidelines to select a computation interval. The program will apply a rainfall depth-area adjustment based on the user-provided watershed area. If no rainfall depth-area adjustment is desired, enter zero (0) for the watershed area."
- NESTED STORM CONVOLUTION INPUT:** Two input fields: 'Computation Interval (D) (min)' with a value of 5, and 'Watershed Area (mi<sup>2</sup>) for Rainfall Depth-Area Adjustment' with a value of 20.
- RESULTS SUMMARY:** A table with columns for 'ATTRIBUTE', 'VALUE', 'UNIT', and 'RAN'. An 'Export' button is located above the table.

At the bottom right, a red arrow points to a 'CALCULATE' button. The status bar at the bottom indicates the current path: 'SDHydroTools | Current Path: > Project > Rainfall Data'.

# SDHydroTools Nested Storm Convolution Module (Continued)

- After clicking on “Calculate” to obtain the nested storm hyetograph, the results are presented in the Table Window of the Nested Storm Convolution Module.
- Results from the Nested Storm Convolution Module may be exported to a .csv file using the Export button and may be opened with an external program.

The screenshot displays the SDHydroTools interface with the 'Nested Storm Convolution' module active. The 'Table' window is open, showing a table of results. A red arrow labeled 'Export' points to the 'Export' button in the top right of the table area. Another red arrow labeled 'Table' points to the 'Table' icon in the left sidebar. The table contains the following data:

N	TIME (MIN)	DURATION (MIN)	PRECIPITATION FOR D	DEPTH-AREA ADJUSTMENT	D
288	5	1440	4.1080	0.9750	4.0
287	10	1435	4.1039	0.9749	4.0
285	15	1425	4.0957	0.9748	3.9
284	20	1420	4.0915	0.9748	3.9
282	25	1410	4.0833	0.9747	3.9
281	30	1405	4.0791	0.9746	3.9
279	35	1395	4.0707	0.9745	3.9
278	40	1390	4.0665	0.9744	3.9
276	45	1380	4.0581	0.9743	3.9
275	50	1375	4.0539	0.9743	3.9
273	55	1365	4.0454	0.9742	3.9
272	60	1360	4.0412	0.9741	3.9
270	65	1350	4.0326	0.9740	3.9
269	70	1345	4.0283	0.9739	3.9

The interface also includes a 'NEXT' button at the bottom right and a status bar at the bottom showing the current path: 'SDHydroTools | Current Path: > Nested Storm Convolution > Table'.

# SDHydroTools Nested Storm Convolution Module (Continued)

- Exported Results from the Nested Storm Convolution Module may be opened with an external program.

The screenshot shows an Excel spreadsheet with the following data:

	A	B	C	D	E	F	G	H	I	J
1	N	Time (min)	Duration (min)	Precipitation for D	Depth-Area Adjustment	Depth-Area Adjusted P (in)	Hyetograph Ordinate (in)	Cumulative Rainfall (in)		
2	288	5	1440	4.108	0.975	4.0053	0.004223955	0.004223955		
3	287	10	1435	4.10390158	0.974944444	4.001076045	0.004233438	0.008457393		
4	285	15	1425	4.095674093	0.974833333	3.992599628	0.004252579	0.012709972		
5	284	20	1420	4.091544904	0.974777778	3.988347049	0.004262238	0.01697221		
6	282	25	1410	4.083255322	0.974666667	3.979812854	0.004281735	0.021253945		
7	281	30	1405	4.079094804	0.974611111	3.975531119	0.004291575	0.025545519		
8	279	35	1395	4.07074199	0.9745	3.966938069	0.004311438	0.029856957		
9	278	40	1390	4.066549565	0.974444444	3.962626632	0.004321463	0.03417842		

The Notepad window above the spreadsheet shows the following text:

```
HyetographTable_2021_0324 - Notepad
File Edit Format View Help
N,Time (min),Duration (min),Precipitation for D,Depth-Area Adjustment,Depth-Area Adjusted P (in),Hyetograph
288,5,1440,4.108,0.975,4.0053,0.0042239551005197,0.0042239551005197
287,10,1435,4.10390157950989,0.974944444444444,4.00107604548995,0.00423343799591036,0.00845739250596234
```

# SDHydroTools Nested Storm Convolution Module (Continued)

- Return to the Home Window of the Nested Storm Convolution Module to view the total rainfall and calculated area-adjusted rainfall.
- Total rain and area-adjusted depth results shown in the Home Window may also be exported.

Home →

Export →

SDHydroTools

Project Interpolation RickRatHydro **Nested Storm Convolution** SD Unit Hydrograph

NOTE

This module prepares a nested storm hyetograph according to the procedure described in Section 4 of the San Diego County Hydrology Manual. See Section 4 of the Hydrology Manual for guidelines to select a computation interval. The program will apply a rainfall depth-area adjustment based on the user-provided watershed area. If no rainfall depth-area adjustment is desired, enter zero (0) for the watershed area.

NESTED STORM CONVOLUTION INPUT

Computation Interval (D) (min) Watershed Area (mi<sup>2</sup>) for Rainfall Depth-Area Adjustment

5 20

RESULTS SUMMARY

Export

ATTRIBUTE	VALUE	UNIT	RAN
Total Rain	4.11	in	3/24/2021 3:47:08 PM
Area-Adjust Depth	4.01	in	3/24/2021 3:47:08 PM

CALCULATE

SDHydroTools | Current Path: > Nested Storm Convolution > Home

# SDHydroTools SD Unit Hydrograph Module

- Calculates a peak flow rate for a single basin and generates a hydrograph using the NRCS hydrologic method
- Replaces the San Diego Unit Hydrograph (SDUH) software that was provided with the June 2003 Hydrology Manual
  - Results from the SD Unit Hydrograph Module are not expected to match results from the San Diego Unit Hydrograph software
- Rainfall depth-area adjustment will be applied automatically
- Results may be exported for use in other programs such as HEC-HMS



# SDHydroTools SD Unit Hydrograph Module (Continued)

1. Provide the required input data in the red boxes.
2. The “Calculate” button will be active after the required data has been entered.
3. (As Needed) Save a screen capture of the window for documentation.
4. Click on “Calculate” to obtain the hydrograph.

The screenshot shows the SDHydroTools application window with the 'SD Unit Hydrograph' module selected. The interface includes a navigation menu on the left with 'Home' and 'Table' options. A 'NOTE' section at the top right explains the module's purpose. The 'SDUH INPUT' section contains four red-bordered input fields: 'Computation Interval (D) (min)', 'Watershed Area (mi²)', 'Adjusted Curve Number for Watershed Area', and 'Watershed Corps Lag Time (hrs)'. Below this is a 'RESULTS SUMMARY' section with an 'Export' button and a table with columns for 'ATTRIBUTE', 'VALUE', and 'UNIT'. A 'CALCULATE' button is located at the bottom right of the main content area. The status bar at the bottom shows the current path: 'SDHydroTools | Current Path: > SD Unit Hydrograph > Home'.

SDHydroTools

Project Interpolation RickRatHydro Nested Storm Convolution **SD Unit Hydrograph**

NOTE

This module prepares a hydrograph according to the NRCS hydrologic method procedure described in Section 4 of the San Diego County Hydrology Manual. Preparation of a nested storm hyetograph occurs within this module and includes rainfall depth-areaadjustment based on the user-provided watershed area.

SDUH INPUT

Computation Interval (D) (min)  
D should be  $\leq 0.2T_p$

Watershed Area (mi<sup>2</sup>)

Adjusted Curve Number for  
Watershed Area

Watershed Corps Lag Time (hrs)

RESULTS SUMMARY

Export

ATTRIBUTE	VALUE	UNIT
-----------	-------	------

CALCULATE

SDHydroTools | Current Path: > SD Unit Hydrograph > Home

# SDHydroTools SD Unit Hydrograph Module (Continued)

Example Data for the SD Unit Hydrograph Module:

The screenshot displays the SDHydroTools application window with the 'SD Unit Hydrograph' module selected. The interface includes a navigation menu on the left with 'Home' and 'Table' options. A 'NOTE' section provides context on the NRCS hydrologic method. The 'SDUH INPUT' section contains four input fields: 'Computation Interval (D) (min)' with value 5, 'Watershed Area (mi<sup>2</sup>)' with value 20, 'Adjusted Curve Number for Watershed Area' with value 81, and 'Watershed Corps Lag Time (hrs)' with value .551. Below this is a 'RESULTS SUMMARY' section with an 'Export' button and a table with columns 'ATTRIBUTE', 'VALUE', and 'UNIT'. A red arrow points to a 'CALCULATE' button at the bottom right.

SDHydroTools

Project Interpolation RickRatHydro Nested Storm Convolution **SD Unit Hydrograph**

NOTE

This module prepares a hydrograph according to the NRCS hydrologic method procedure described in Section 4 of the San Diego County Hydrology Manual. Preparation of a nested storm hyetograph occurs within this module and includes rainfall depth-area adjustment based on the user-provided watershed area.

SDUH INPUT

Computation Interval (D) (min)  
D should be  $\leq 0.2T_p$   
5

Watershed Area (mi<sup>2</sup>)  
20

Adjusted Curve Number for Watershed Area  
81

Watershed Corps Lag Time (hrs)  
.551

RESULTS SUMMARY

Export

ATTRIBUTE	VALUE	UNIT
-----------	-------	------

Calculate → CALCULATE

SDHydroTools | Current Path: > SD Unit Hydrograph > Home

# SDHydroTools SD Unit Hydrograph Module (Continued)

- After clicking on “Calculate” to obtain the hydrograph, the results are presented in the Table Window of the SD Unit Hydrograph Module.
- Results from the SD Unit Hydrograph Module may be exported to a .csv file using the Export button and may be opened with an external program.

Table

Export

N	TIME (MIN)	DURATION (MIN)	PRECIPITATION FOR D	DEPTH-AREA ADJUSTMENT	I
288	5	1440	4.1080	0.9750	4.
287	10	1435	4.1039	0.9749	4.
285	15	1425	4.0957	0.9748	3.
284	20	1420	4.0915	0.9748	3.
282	25	1410	4.0833	0.9747	3.
281	30	1405	4.0791	0.9746	3.
279	35	1395	4.0707	0.9745	3.
278	40	1390	4.0665	0.9744	3.
276	45	1380	4.0581	0.9743	3.
275	50	1375	4.0539	0.9743	3.
273	55	1365	4.0454	0.9742	3.
272	60	1360	4.0412	0.9741	3.
270	65	1350	4.0326	0.9740	3.

SDHydroTools | Current Path: > SD Unit Hydrograph > Table

Note:

“SDUH Table” provides the hydrograph of direct runoff from the project area (the results).

“Unit Hydrograph” and “UH Time” provide the project unit hydrograph  $q$  ordinates based on the time to peak ( $T_p$ ) and unit hydrograph  $q_p$  for the study area. These are provided for reference.

See Section 4 of the Hydrology Manual for discussion of the computation process, and see the Hydrology Manual Workbook for an example calculation.

# SDHydroTools SD Unit Hydrograph Module (Continued)

- Exported Results from the SD Unit Hydrograph Module may be opened with an external program.

SDUHRResultsTable\_2021\_0326 - Notepad

File Edit Format View Help

N,Time (min),Duration (min),Precipitation for D,Depth-Area Adjustment,Depth-Area Adjusted P (in),Hyetograph Ordinate (in),Cumulative Rainfall (in),Cumulative Excess Rain (in),Incremental Excess Rain (in),Hydrograph Ordinate (cfs)

```

288,5,1440,4.108,0.975,4.0053,0.00422395451005197,0.00422395451005197,0,0,0
287,10,1435,4.10390157950989,0.974944444444444,4.00107604548995,0.00423343799591036,0.00845739250596234,0,0,0
285,15,1425,4.09567409277866,0.974833333333333,3.9925996281104,0.00425257922769484,0.0127099717336572,0,0,0
284,20,1420,4.0915449036754,0.974777777777778,3.9883470488827,0.00426223808981563,0.0169722098234728,0,0,0
282,25,1410,4.08325532242178,0.974666666666667,3.97981285425376,0.00428173515227481,0.0212539449757476,0,0,0
281,30,1405,4.07909480384351,0.974611111111111,3.97553111910149,0.00429157451355699,0.0255455194893046,0,0,0

```

Ln 1, Col 1 100% Windows (CRLF) UTF-8

---

SDUHRResultsTable\_2021\_0326 - Excel

File Home Insert Page Layout Formulas Data Review View Help Tell me what you want to do

Clipboard Font Alignment Number Styles Cells Editing

K7 0

	A	B	C	D	E	F	G	H	I	J	K
1	N	Time (min)	Duration (min)	Precipitation for D	Depth-Area Adjustment	Depth-Area Adjusted P (in)	Hyetograph Ordinate (in)	Cumulative Rainfall (in)	Cumulative Excess Rain (in)	Incremental Excess Rain (in)	Hydrograph Ordinate (cfs)
2	288	5	1440	4.108	0.975	4.0053	0.004223955	0.004223955	0	0	0
3	287	10	1435	4.10390158	0.974944444	4.001076045	0.004233438	0.008457393	0	0	0
4	285	15	1425	4.095674093	0.974833333	3.992599628	0.004252579	0.012709972	0	0	0
5	284	20	1420	4.091544904	0.974777778	3.988347049	0.004262238	0.01697221	0	0	0
6	282	25	1410	4.083255322	0.974666667	3.979812854	0.004281735	0.021253945	0	0	0
7	281	30	1405	4.079094804	0.974611111	3.975531119	0.004291575	0.025545519	0	0	0

SDUHRResultsTable\_2021\_0326

Ready 100%

# SDHydroTools SD Unit Hydrograph Module (Continued)

- Return to the Home Window of the SD Unit Hydrograph Module to view summary output including the peak flow rate.
- The summary output shown in the Home Window may also be exported. The summary output will be a .txt file.

The screenshot displays the SDHydroTools interface with the 'SD Unit Hydrograph' module selected. The 'RESULTS SUMMARY' table is visible, and the 'Export' button is highlighted. A Notepad window titled 'SDUHQuickResults\_2021\_0326 - Notepad' shows the text output of the summary.

**Home** → [Home button]

**Export** → [Export button]

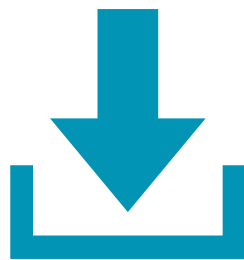
ATTRIBUTE	VALUE	UNIT
Study/Project Title Information	Sample Project for User Instructions	
Latitude	32.8335	
Longitude	-117.1296	
Study Recurrence Interval	100	
Total Rainfall Depth (24-Hour Rainfall)	4.11	inch
Area Adjusted Rainfall Depth	4.01	inch
Watershed Area	20	mi2
Adjusted Curve Number for Watershed Area	81	
Watershed Corps Lag Time	.551	hours
Computation Interval (D)	5	min
Peak Flow Rate	10694.68	cfs
Time Ran	3/26/2021 11:14:28 AM	

```
San Diego Unit Hydrograph Output for:  
Study/Project Title Information: Sample Project for User Instructions  
Latitude: 32.8335  
Longitude: -117.1296  
Study Recurrence Interval: 100  
Total Rainfall Depth (24-Hour Rainfall) (inch): 4.11  
Area Adjusted Rainfall Depth (inch): 4.01  
Watershed Area (mi2): 20  
Adjusted Curve Number for Watershed Area: 81  
Watershed Corps Lag Time (hours): .551  
Computation Interval (D) (min): 5  
Peak Flow Rate (cfs): 10694.68  
Time Ran: 3/26/2021 11:14:28 AM
```

# SDHydroTools Location and Instructions

- Program and user instructions provided on County of San Diego Hydrology Manual website

<https://www.sandiegocounty.gov/content/sdc/dpw/flood/hydrologymanual.html>



- Download program and install on local machine
- Download user instructions





# Sediment Bulking

June 17, 2026

**Jon Viducich, PE**  
Senior Hydraulic Engineer



# AGENDA

- **Sediment bulking in SoCal**
- **Sediment/debris hazards in San Diego County**
- **New guidance for Normal Design Conditions**
- **New guidance for Post-Fire Conditions**
- **Manual resources**

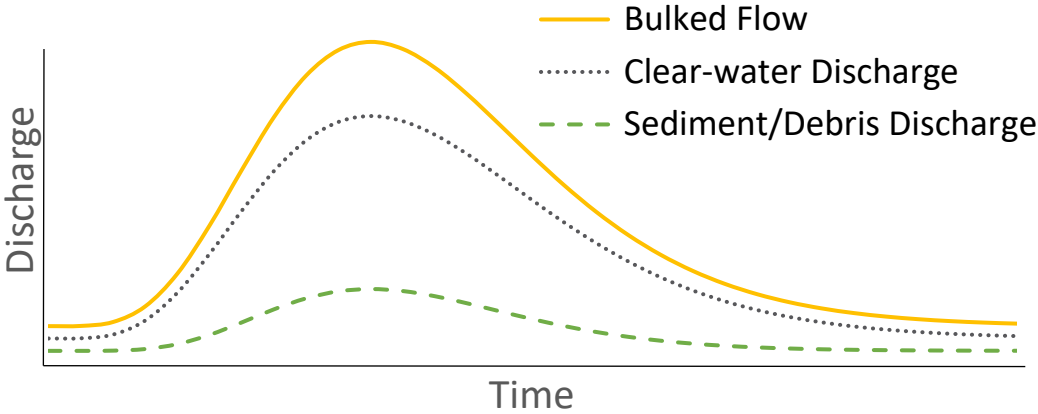


# REGIONAL CONTEXT AND 2022 BULKING FACTOR STUDY

- Key concepts:
  - Sediment/debris yield
  - Sediment bulking



(County of Los Angeles, 2023)



	Bulking Factor						
1	1.11	1.25	1.43	1.67	2.00	2.50	> 3.33
	Sediment Concentration, % by Weight (100% by WT = $1 \times 10^6$ ppm)						
0	23	40	52	63	72	80	87 to 100
	Sediment Concentration, % by Volume (specific gravity = 2.65)						
0	10	20	30	40	50	60	70 to 100
	Normal Streamflow	Hyperconcentrated Flow	Debris Flow/Mud Flow	Landslide			

(Gusman et. al, 2011)



# REGIONAL CONTEXT AND 2022 BULKING FACTOR STUDY

- **Wildfire Impacts:**

- Effects on clear-water hydrology
- Effects on sediment/debris
- Elevated debris flow risk 0-3 yr post-fire, high sediment rates for ~10 yr



# REGIONAL CONTEXT AND 2022 BULKING FACTOR STUDY

- **Sediment/debris in SoCal:**
  - Event-based
  - Transverse Ranges and design basis in empirical regressions
- **Previous approach in San Diego County**

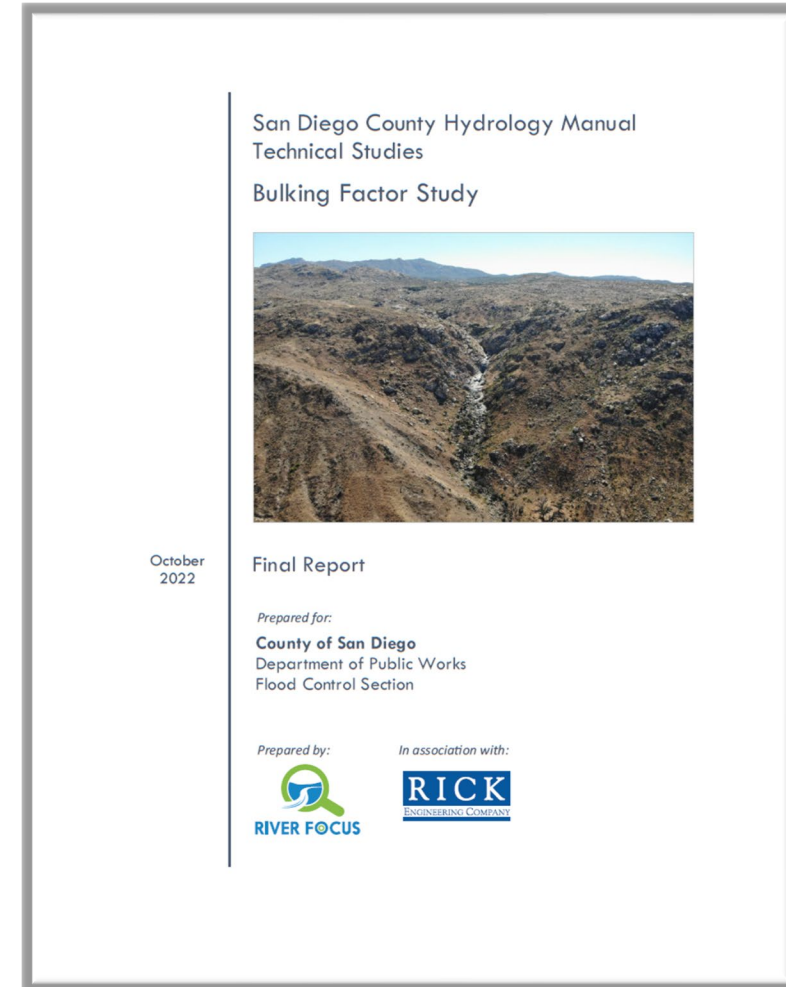


(California Geological Survey, 2018, used with permission)



# REGIONAL CONTEXT AND 2022 BULKING FACTOR STUDY

- **2022 Bulking Factor Study**
  - **How and where can existing methods be applied in less-erosive San Diego County?**
  - **Report available for download at County of San Diego Department of Public Works Flood Control Section website**
  - **Recommendations for three scenarios:**
    - **Normal Design Conditions**
    - **Post-Fire Conditions 0-2 Years Post-Fire**
    - **Post-Fire Conditions 2-10 Years Post-Fire**



# SEDIMENT BULKING IN THE UPDATED HYDROLOGY MANUAL

- Section 5.6: Sediment Bulking
- Workbook 4.3: Example Sediment Bulking Problem

San Diego County Hydrology Manual  
Date: April 2026

Section: WB  
Page: 64 of 93

## WB.4.3 EXAMPLE SEDIMENT BULKING PROBLEM (Reference Hydrology Manual Section 5.5)

A concrete drainage channel is planned for a hypothetical new development in the project location shown in Figure WB. 4-4, east of Ramona, CA. The project drains an undeveloped, 1-sq-mi watershed and it is not feasible to construct an upstream debris basin. A rainfall-runoff hydrologic model has been developed to compute the design clear-water flows at the project location, including the 100-year clear-water hydrograph, shown in Figure WB. 4-5. Evaluate whether sediment/debris bulking is required for this project, and if so, compute the bulked hydrograph and peak discharge.

### Step 1: Review Sediment/Debris Hazard Map to Identify Known Risk

To start, refer to the sediment/debris hazard map in Figure 5-8 to assess whether the project watershed is located within an identified hazard area.

As shown in Figure WB. 4-6, the entire project watershed is located within the hazard area, so sediment/debris loading must be evaluated under normal conditions.

### Step 2: Identify Whether Planned Infrastructure is at Risk

Next, evaluate whether the planned infrastructure associated with the project is truly at risk. For this case, the project is a flood control channel in the new development and the adequacy of its design will be directly affected by any flow bulking due to sediment/debris loading. While upstream channel slopes decrease from over 10 percent to approximately 5 percent at the upstream end of the project location, because these are larger than 2 percent, the channel may be affected by debris flows in the upper reaches and must be designed to mitigate these hazards.

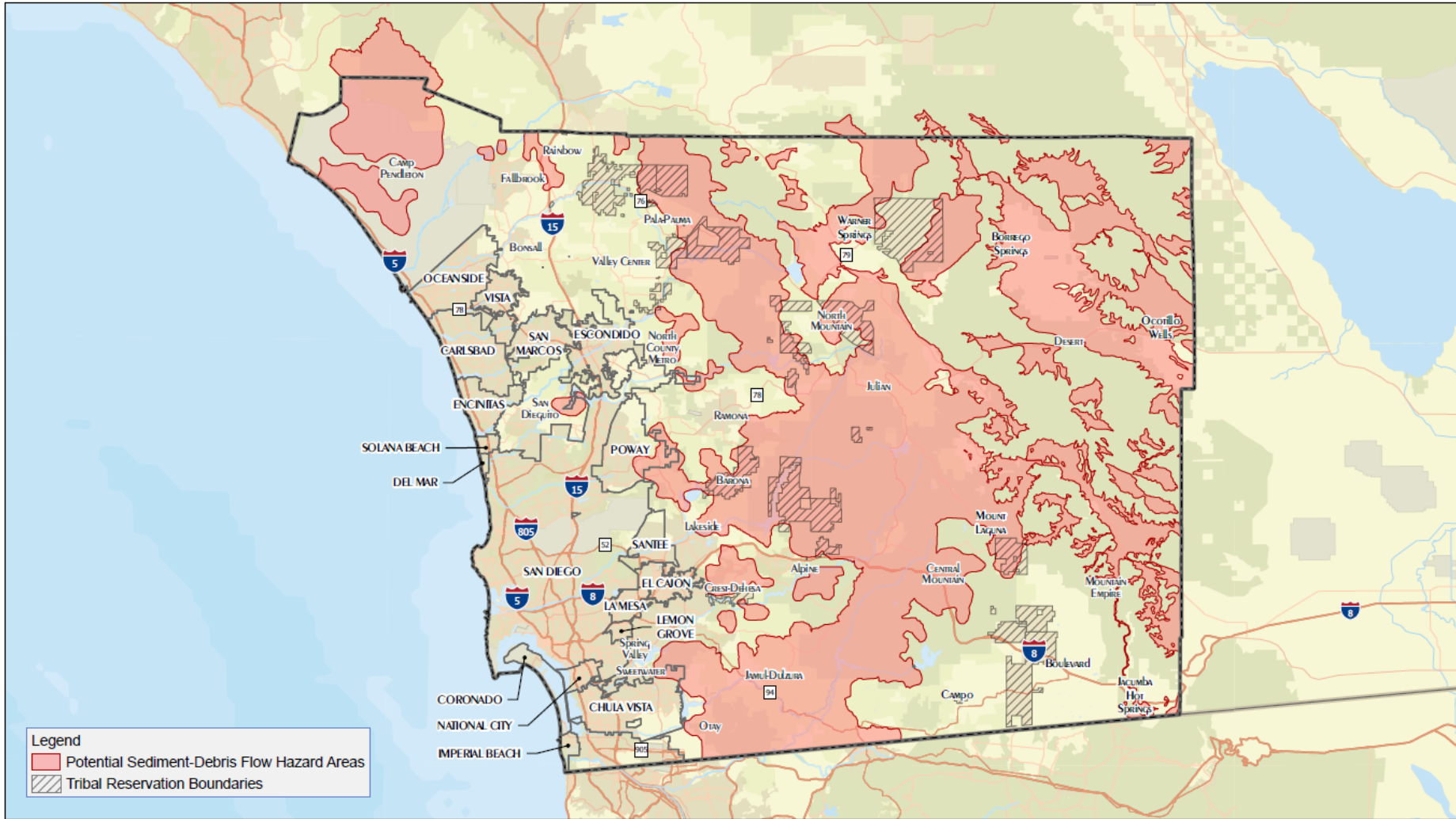


# SEDIMENT BULKING FOR NORMAL DESIGN CONDITIONS

Step 1: Is project in sediment/debris hazard area?

No

No bulking requirement  
design hydrology



Legend  
 Potential Sediment-Debris Flow Hazard Areas  
 Tribal Reservation Boundaries

POTENTIAL SEDIMENT / DEBRIS FLOW HAZARD AREA

FIGURE  
5-8

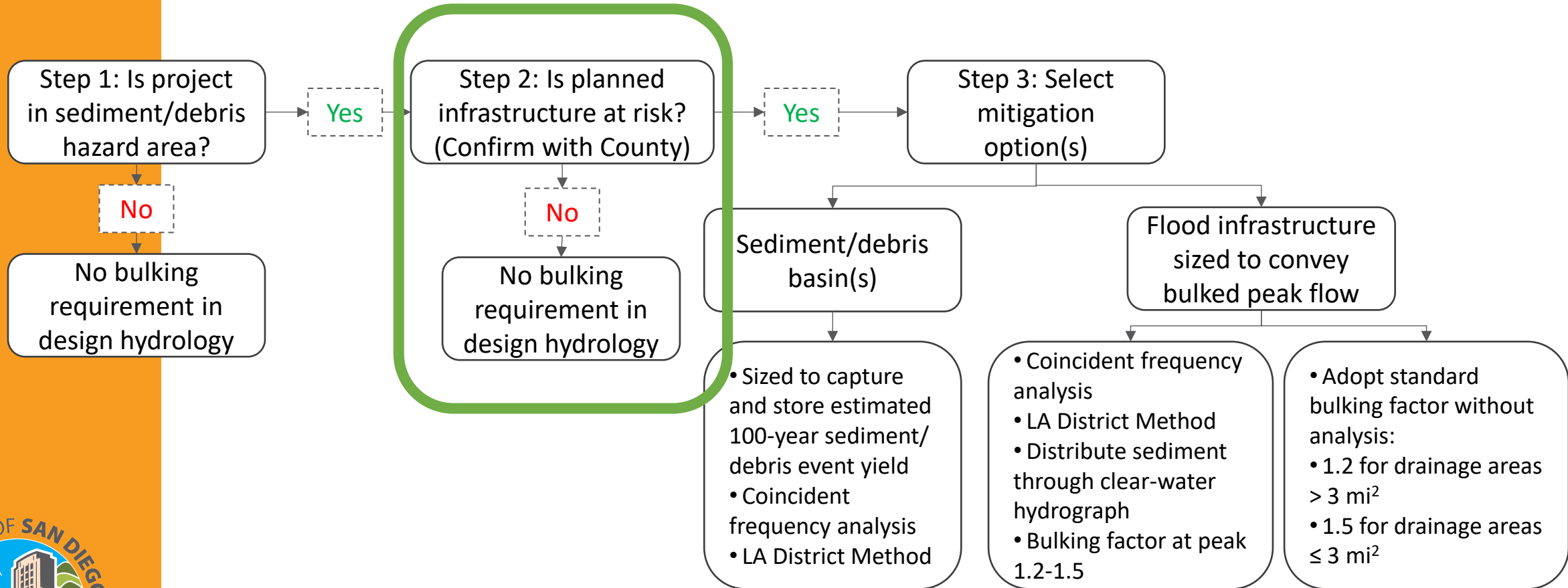
Refer to Section 5 of the 2022 Bulking Factor Study Report at <https://www.sandiegocounty.gov/content/sdc/dpw/flood/hydrologymanual.html> for more information on how the sediment/debris hazard areas were developed.



Standard  
 without  
 hazard areas  
 hazard areas

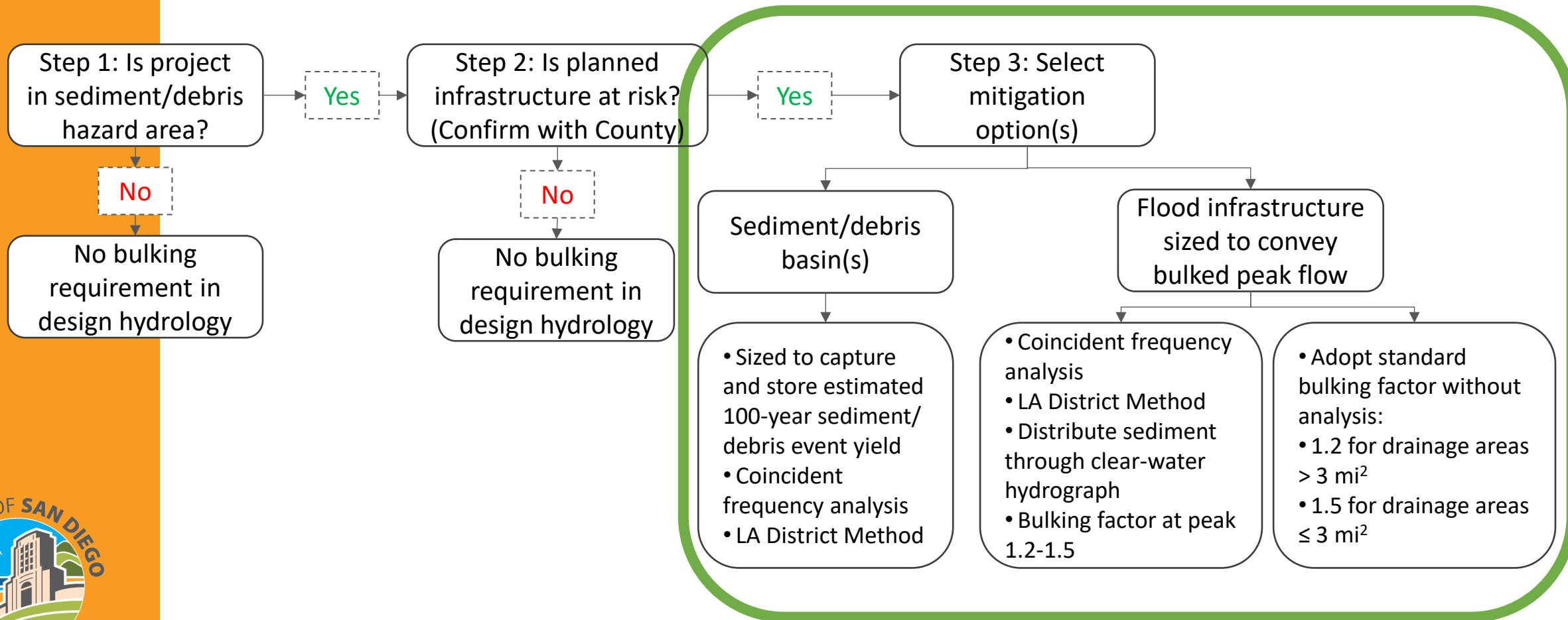
# SEDIMENT BULKING FOR NORMAL DESIGN CONDITIONS

- Case-by-case approach to bulking in high-risk areas



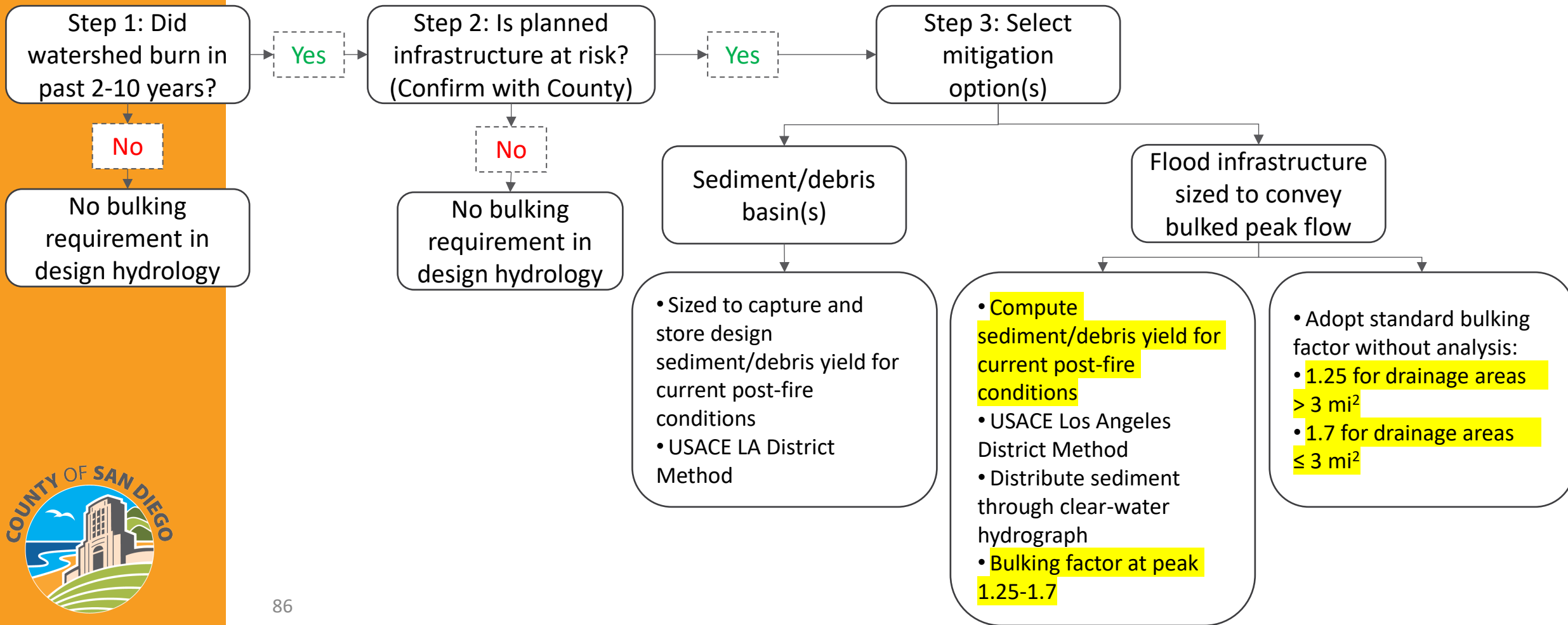
# SEDIMENT BULKING FOR NORMAL DESIGN CONDITIONS

- Case-by-case approach to bulking in high-risk areas



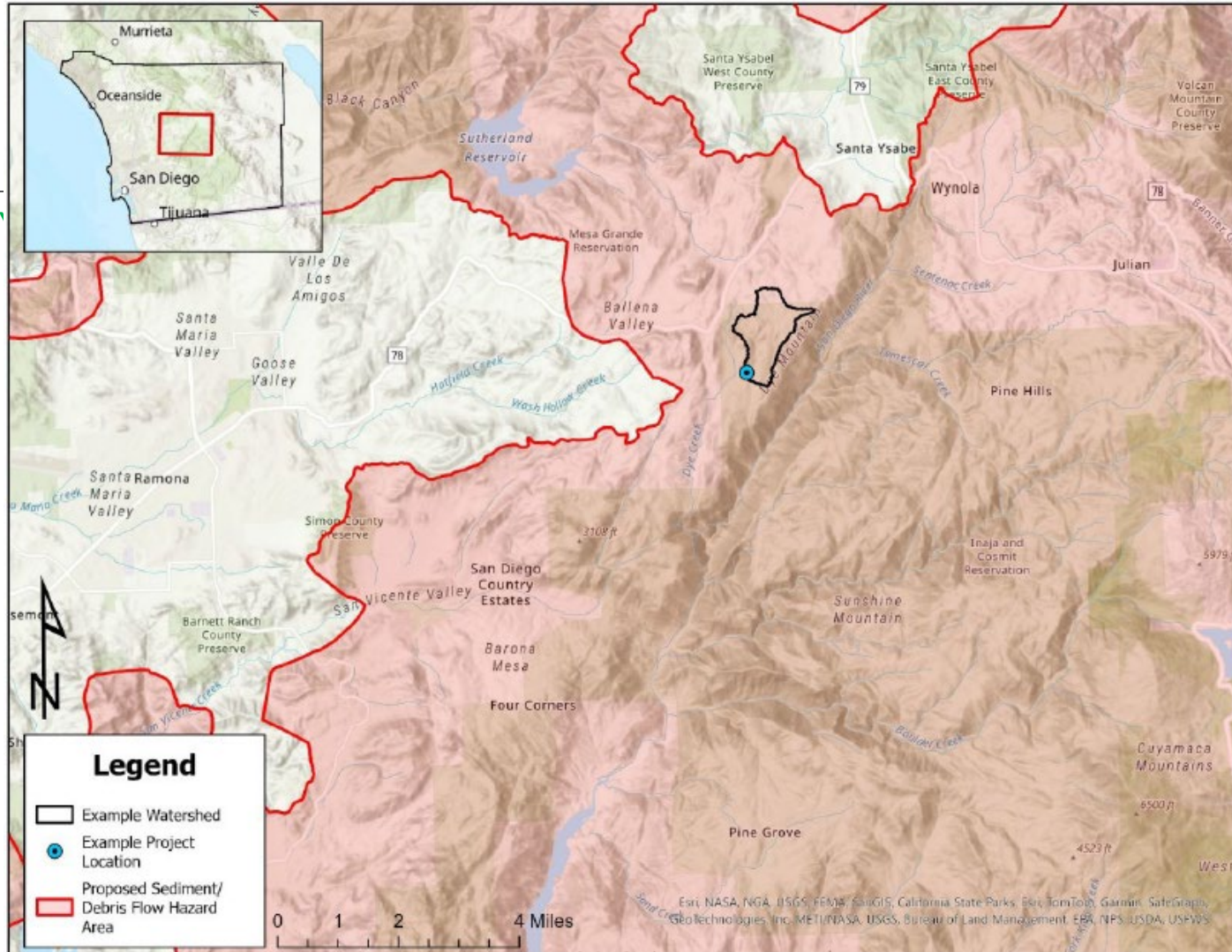
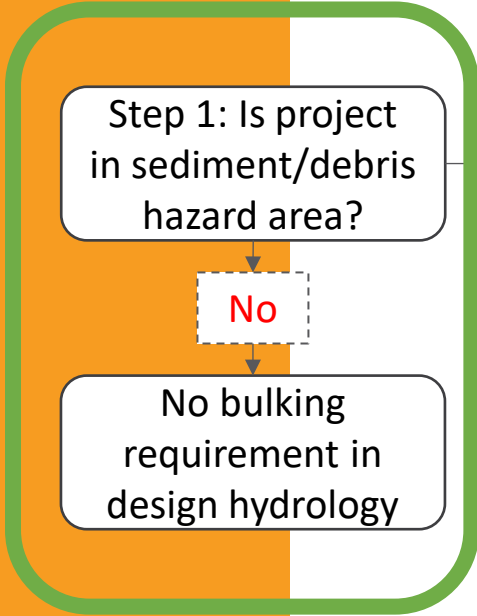
# SEDIMENT BULKING FOR POST-FIRE CONDITIONS

- Emergency period (0-2 years post-fire)
- 2-10 years post-fire



# EXAMPLE PROBLEM – WORKBOOK SECTION WB.4.3

## • Step 1: Review sediment/debris hazard map



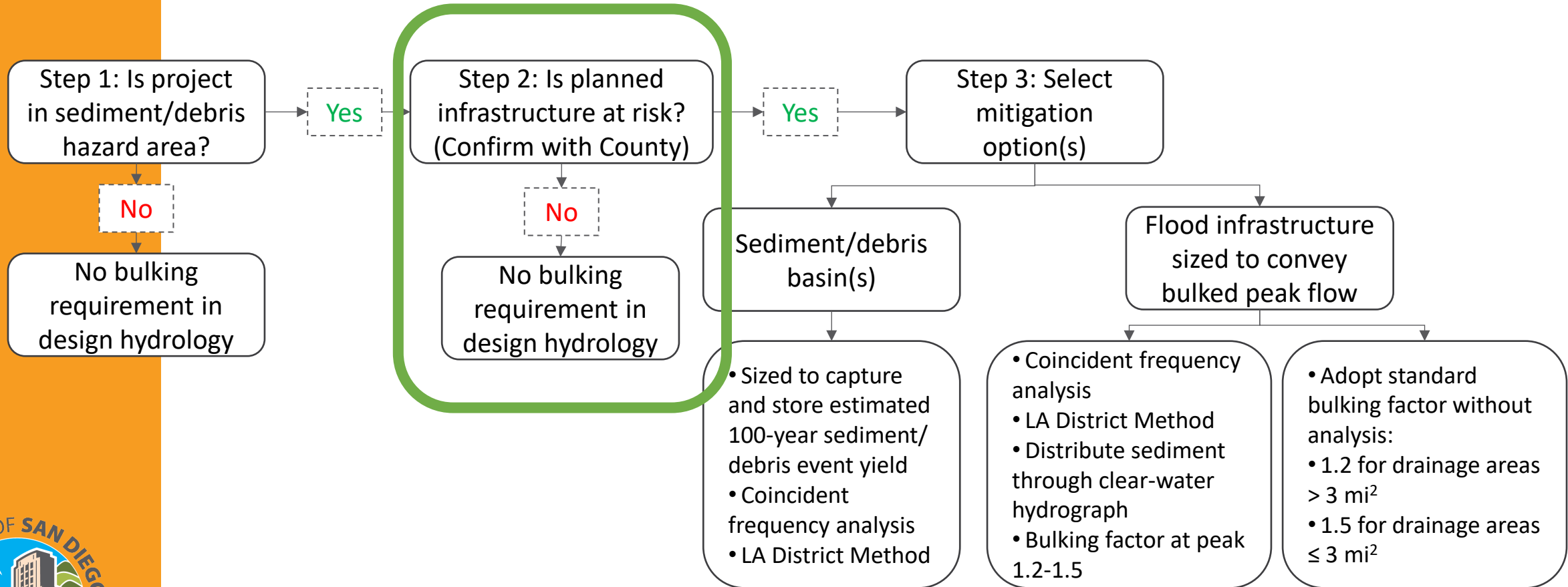
structure convey peak flow

- Adopt standard bulking factor without analysis:
- 1.2 for drainage areas > 3 mi<sup>2</sup>
- 1.5 for drainage areas ≤ 3 mi<sup>2</sup>



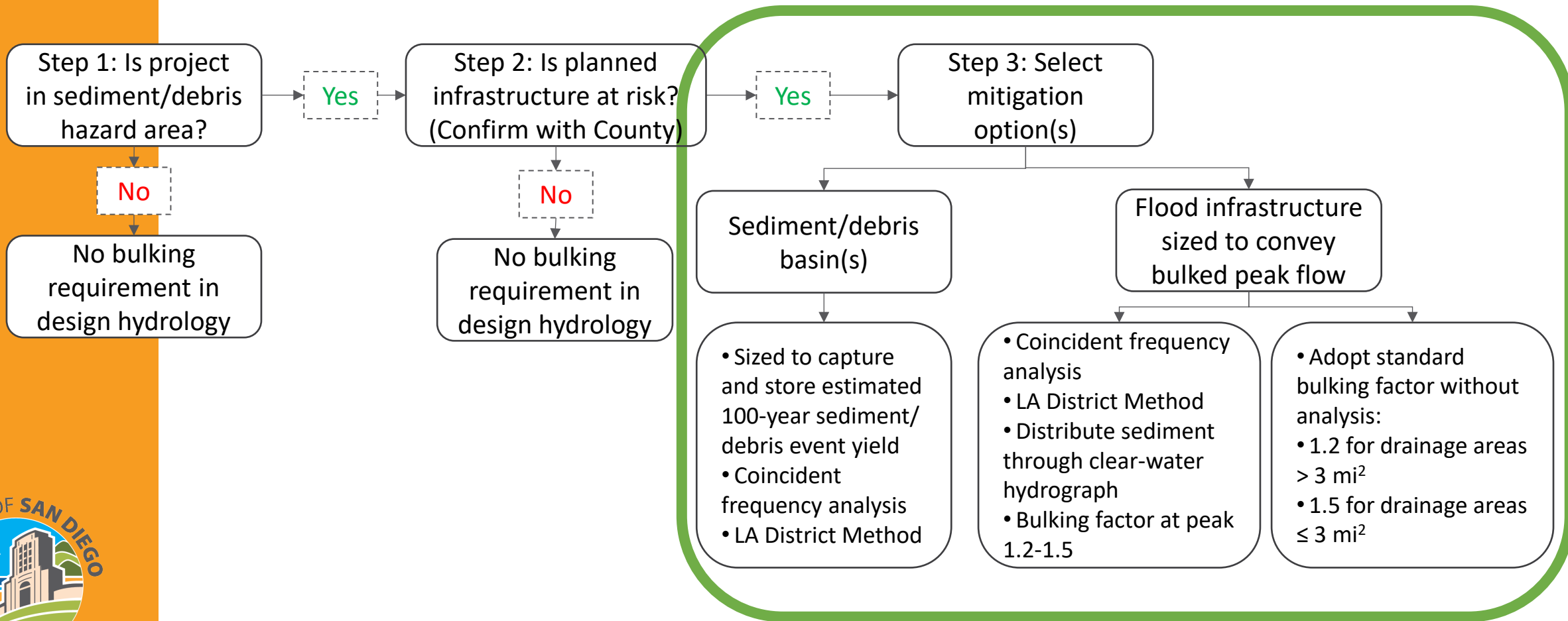
# EXAMPLE PROBLEM – WORKBOOK SECTION WB.4.3

## • Step 2: Identify whether planned infrastructure is at risk



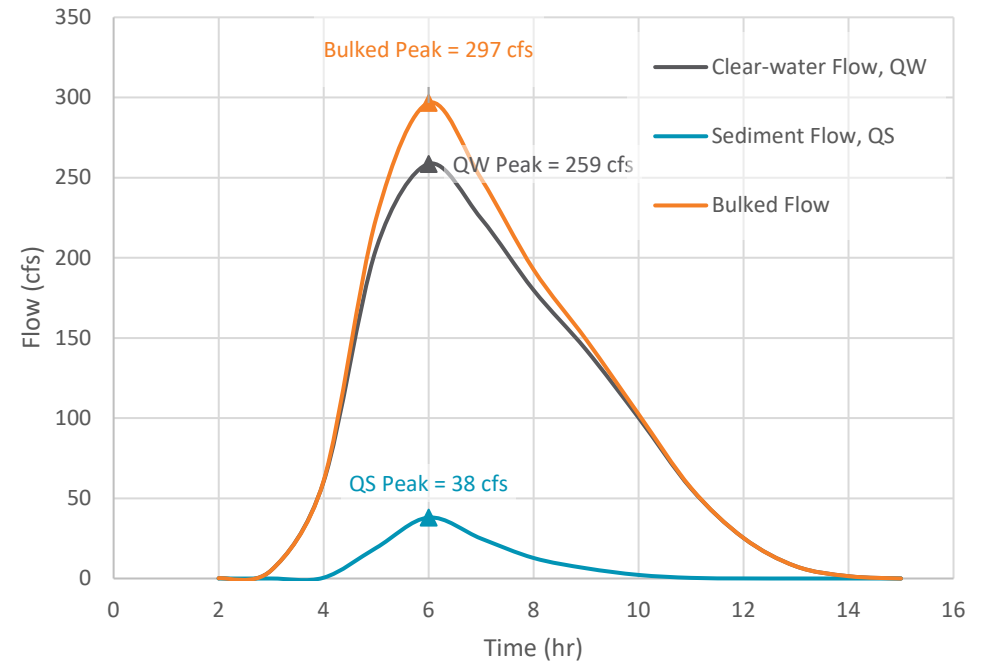
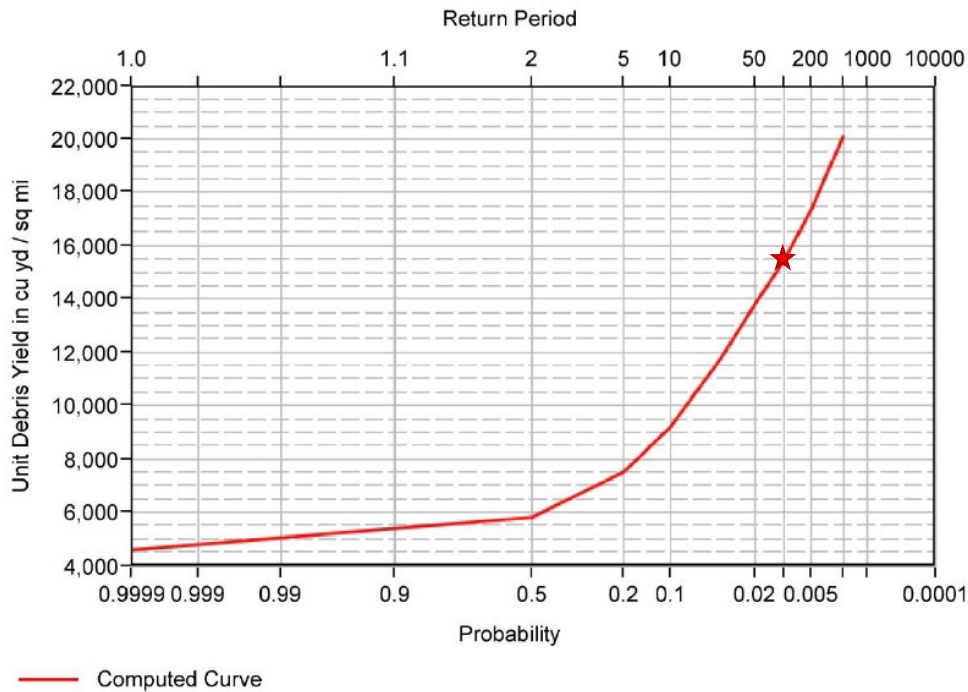
# EXAMPLE PROBLEM – WORKBOOK SECTION WB.4.3

## • Step 3: Select appropriate mitigation option(s)



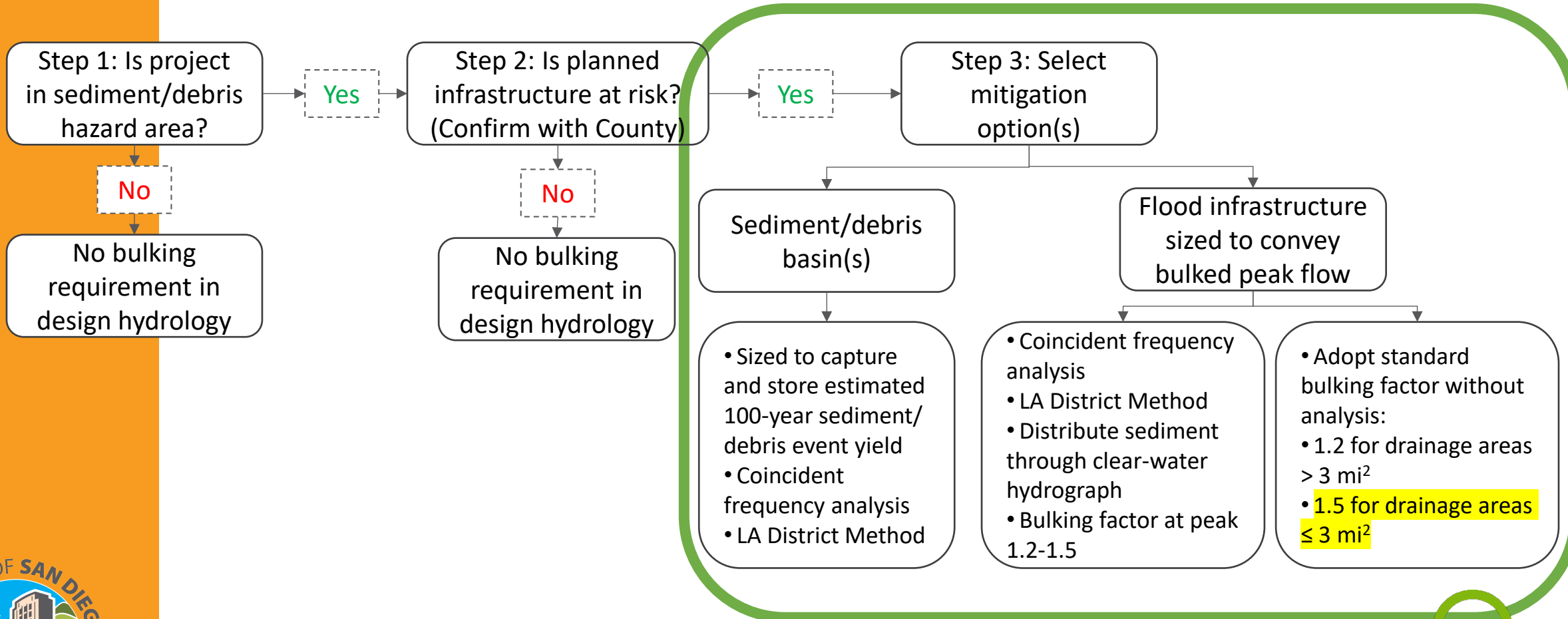
# EXAMPLE PROBLEM – WORKBOOK SECTION WB.4.3

- Option 1: Coincident frequency analysis → Distribute sediment/debris
- Result: Bulking factor = 1.2



# EXAMPLE PROBLEM – WORKBOOK SECTION WB.4.3

## • Option 2: Standard bulking factor = 1.5



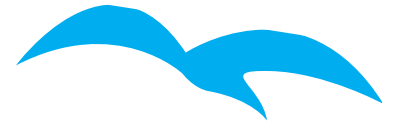
## CONCLUSION

- Regional transition from event-driven response to more proactive policy
- Starting point for San Diego County amidst a growing body of research



# THANK YOU

**Jon Viducich, PE**  
Senior Hydraulic Engineer



# References

California Geological Survey. (2018). Geology of California. Scale 1 : 2,000,000. Map Sheet 57. Retrieved from [https://www.conservation.ca.gov/cgs/Documents/Publications/Map-Sheets/MS\\_057-2018-Geology-of-California.pdf](https://www.conservation.ca.gov/cgs/Documents/Publications/Map-Sheets/MS_057-2018-Geology-of-California.pdf)

County of Los Angeles. (2023). *Debris Basins*. Department of Public Works. Retrieved on April 14, 2023 from <https://dpw.lacounty.gov/lacfd/sediment/debrisbasins.aspx>

Gusman, A. J., Teal, M. J., Todesco, D., & Bandurraga, M. (2011). *Sediment/debris bulking factors and post-fire hydrology for Ventura County*. WEST Consultants Inc., San Diego, California.



# Grandfathering Eligibility to Proceed Under Earlier Hydrology Manual Provisions



June 17, 2026

**Ashkan Azarnia, PE CFM**  
Civil Engineer/Project  
Manager



# Grandfathering Eligibility

## Purpose

- Provide a clear and predictable transition to the 2026 Hydrology Manual
- Allow projects already in the review process to proceed without unnecessary rework
- Prevent repeated hydrology revisions driven solely by timing
- Allow projects to benefit from updated methodology where appropriate



# Grandfathering Eligibility

**The guidance document will be coming out shortly.**

**Effective Date: July 1st, 2026**

## **Substantive Change**

- Any modification to the project that results in a material impact on the approved hydrology or hydraulic analysis.
  - Examples
    - Underlying assumptions
    - Input parameters
    - Flow characteristics
    - Drainage patterns
    - System capacity
    - Results previously established in the approved study,



# Grandfathering Eligibility

## Project Status:

- **New projects**
  - First complete hydrology submittal accepted for review **after the effective date**
  - Shall comply with 2026 Manual
- **Projects with hydrology studies in review**
  - Complete hydrology submittal accepted for review prior to the effective date
    - Option A – Continue Under the 2003 Hydrology Manual
    - Option B – Elect to Use the 2026 Hydrology Manual
- **Projects with hydrology approval prior to effective date**
  - Flexibility will be provided within grace period



# Grandfathering Eligibility – Grace Period

- A **one-year** grace period **begins** on the **effective date** of the 2026 Manual
  - Already in hydrology review with an Accela record number (requesting substantive changes)
  - Previously approved hydrology studies (requesting substantive changes)



# Grandfathering Eligibility – Decision Authority

- The County shall determine hydrology manual applicability and grandfathering eligibility based on guideline document
- The determination shall be documented in the project record.
- Applicants are responsible for identifying their project status and requesting manual selection where applicable.



# Questions Roundtable 2



# Closing Remarks

## Additional Questions?

Reach out to **Ashkan Azarnia**  
[ashkan.azarnia@sdcounty.ca.gov](mailto:ashkan.azarnia@sdcounty.ca.gov)

## Access the new Manual & Tools

A screenshot of the Department of Public Works website. The header includes the Department of Public Works logo and navigation links: MENU, I WANT TO ..., ROADS, ENGINEERING, ENVIRONMENT, DEVELOPMENT, SEWER, AIRPORTS. The main content area features a "Flood Control" section with a graphic titled "FLOOD AFTER FIRE" and a link to "Erosion Control Homeowners Assistance Center and More". Below this is a section for "Flood Control Functions" with a paragraph of text and a group photo of staff. The right sidebar contains a "Select Language" dropdown, the County of San Diego Public Works logo, social media icons, and a "Land Use & Environment Group Open Performance" section.

Department of Public Works

ENHANCED BY Google

MENU I WANT TO ... ROADS ENGINEERING ENVIRONMENT DEVELOPMENT SEWER AIRPORTS

### Flood Control

FLOOD AFTER FIRE

Erosion Control Homeowners Assistance Center and More

Click Here For Info and Resources

### Flood Control Functions

The Flood Control Section is responsible for the maintenance of existing stormwater drainage facilities, construction of new district facilities, flood warning, hydrologic data collection and assuring private development projects meet flood control objectives and compliance with Federal Emergency Management Association (FEMA) guidelines. It provides staff support for the Flood Control Commission, drafts and reviews state and local regulations and provides FEMA and County Flood Plain Map information, technical reports, public and private land development studies and standards for support of private development. It also receives drainage complaints and provides information and appropriate action(s).

DPW Flood Control is supported by the:

- Flood Control District
- Flood Control District Advisory Commission Public Meetings and Info

Land Use & Environment Group Open Performance

The LUEG Open Performance website provides a look into how the Land Use & Environment Group makes your life BETTER through the use of performance measures and data.