

**PRELIMINARY
HYDROLOGY REPORT**

FOR

**SANTA BARBARA MTD PROPERTY
149 N. SAN ANTONIO ROAD
4678 CALLE REAL**

CLIENT: Mr. Steve Fort
Suzanne Elledge Planning and Permitting
1625 State Street, Suite 1
Santa Barbara, CA 93101

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Santa Barbara, CA 93110

DATE: February 16, 2018

W.O. 0482

MAC DESIGN ASSOCIATES

PURPOSE OF REPORT

The purpose of this report is to summarize the existing hydrology of the site, including an estimate of the tributary watershed, and anticipated inundation areas during peak storm events, for the MTD property.

LOCATION OF SITE

The property is located in the unincorporated area of Santa Barbara County, northwesterly of the corner of Calle Real and North San Antonio Road.

METHODOLOGY

The property is approximately 18.7 acres in size, and is currently undeveloped.

The property is bisected by a small drainage course with a tributary watershed that is conservatively assumed to be approximately 158 acres. The tributary watershed is a mixture of residential development, commercial development, orchard & other undeveloped land. The drainage course enters the property at the north-west corner, runs diagonally in a south-easterly direction, and leaves the property near the middle of the south property line via a 48" reinforced concrete pipe culvert under Calle Real. For the hydrology calculations, attached, the watershed was conservatively assumed to be comprised of 1/4 acre lot residential development, with a 27 minute time of concentration, and Hydrologic Soil Groups D. Historically, during peak storm events, the drainage course has been known to pond up onto the property as runoff tries to make its way through the 48" RCP culvert under Calle Real. Photos from March, 2011 (March Miracle Rains) have been attached, and the calculations below confirm this.

The property is not in a mapped Floodplain per the FEMA Flood Insurance Rate Maps, see attached Firmette.

The runoff during a 100-year storm event has been computed using both the Santa Barbara County Rational Method Program and the Santa Barbara Urban Hydrograph model, and these models result in 306cfs and 398cfs respectively. The drainage course has a relative flat longitudinal slope, averaging 2%, and site inspection indicates that no significant erosion is occurring in the drainage course through the project site. The 48" RCP culvert under Calle Real is estimated to have a capacity of approximately 175 cfs. Thus, runoff from larger storm events is expected to temporarily pond up in the area upstream of the culvert before being drained off-site. The runoff results from both models (308 cfs & 398 cfs) were routed through the 48" RCP culvert and result in a ponding elevation of 77.9 and 78.5, which indicates that the size & efficiency of the RCP culvert dictates depth of ponding more so than the hydrologic model used. The attached 100-Year Inundation Map has conservatively highlighted the 79.0 contour as the area of inundation.

The anticipated storm water runoff was calculated using the County of Santa Barbara Rational Method Excel Program, as well as HydroCad software with the Santa Barbara Urban Hydrograph (SBUH) method. All input parameters are in accordance the Santa Barbara County Flood Control District (SBCFD) standards.

MAC DESIGN ASSOCIATES

The time of concentration was established using Santa Barbara County nomograph. The pre-project time of concentration was estimated to be 27 minutes. The Hydrologic Soil Group for the project site was conservatively chosen to be Group D (highest runoff potential) per the Natural Resources Conservation Service (NRCS) Web Soil Survey, as attached.

CONCLUSIONS

The area highlighted on the attached 100-Year Inundation Map should be avoided for development, or the volume represented by this area should be preserved as a part of developing the property. In addition, developing the property will require the retention & treatment of storm water produced by the development, and sufficient area should be preserved to accommodate those retention & treatment needs. The calculations contained within this report do not include any assumed development upon the MTD property, and only describe the existing conditions.

CALCULATIONS

SANTA BARBARA COUNTY RATIONAL METHOD – 100 YEAR STORM EVENT

Santa Barbara County Flood Control and Water Conservation District									
Program Rational - XL									
User Data:									
Project Name:				Project Number:					
Date of Run:	2/16/2018			Run By:					
Notes:									
Input Data:									
Location:	South Coast			Land Use Type:	Single Family (<10,000 sq. ft.)				
Area (Acres):	158			Time of Concentration (Min.):	27				
	Q10:	Q25:	Q50:	Q100:					
Calculated Runoff Coefficient:	0.59	0.64	0.67	0.69					
User Selected Runoff Coefficient (Optional):					Calculate				
For Large Lot Subdivisions (>10,000 sq. ft.):									
	Low Value:	High Value:	User Selected:						
Q10:									
Q25:									
Q50:				Enter Selection					
Q100:									
Results:									
	Rainfall Intensity:	Runoff Coef:	Q (cfs):						
Q10:	1.84	0.59	172	View RI Curves		Print			
Q25:	2.23	0.64	225						
Q50:	2.54	0.67	269	View RC Curves		Exit			
Q100:	2.81	0.69	306						

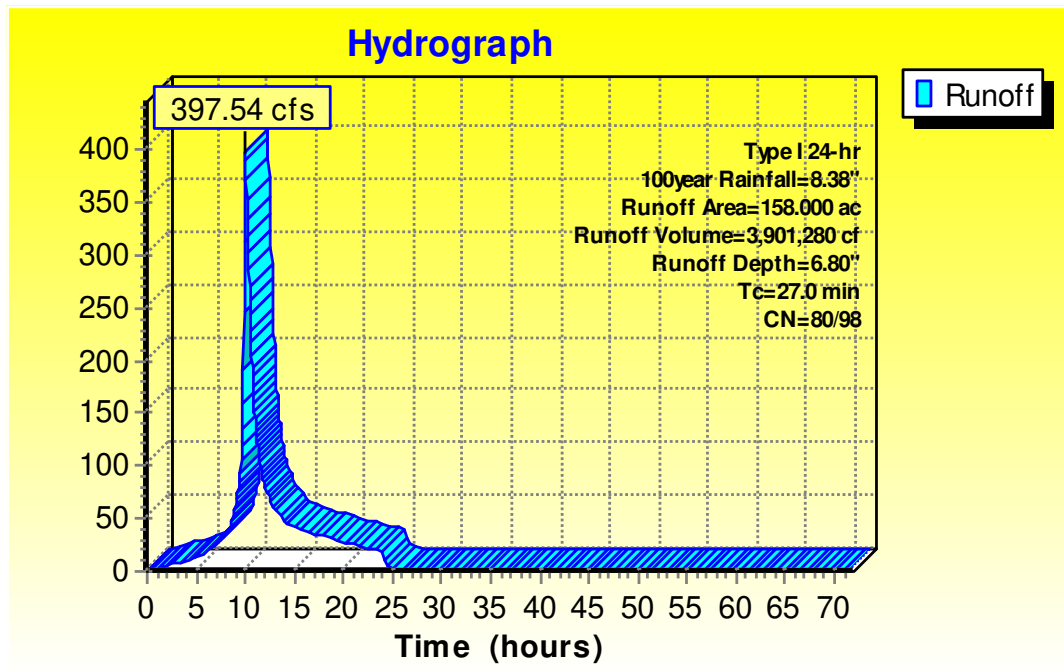
Summary for Subcatchment 78S: Watershed

Runoff = 397.54 cfs @ 10.01 hrs, Volume= 3,901,280 cf, Depth= 6.80"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type I 24-hr 100year Rainfall=8.38"

Area (ac)	CN	Description
158.000	87	1/4 acre lots, 38% imp, HSG D
97.960	80	62.00% Pervious Area
60.040	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.0					Direct Entry,



HYDROCAD ROUTING 100-YEAR STORM EVENT THROUGH 48" RCP CULVERT

Summary for Pond 77P: Inundation Area

Inflow Area = 6,882,480 sf, 38.00% Impervious, Inflow Depth = 6.80" for 100year event
 Inflow = 397.54 cfs @ 10.01 hrs, Volume= 3,901,280 cf
 Outflow = 179.82 cfs @ 10.78 hrs, Volume= 3,901,280 cf, Atten= 55%, Lag= 45.6 min
 Discarded = 1.72 cfs @ 10.78 hrs, Volume= 14,427 cf
 Primary = 178.10 cfs @ 10.78 hrs, Volume= 3,886,853 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Peak Elev= 78.54' @ 10.78 hrs Surf.Area= 148,892 sf Storage= 455,854 cf

Plug-Flow detention time= 12.9 min calculated for 3,898,572 cf (100% of inflow)
 Center-of-Mass det. time= 12.8 min (763.6 - 750.7)

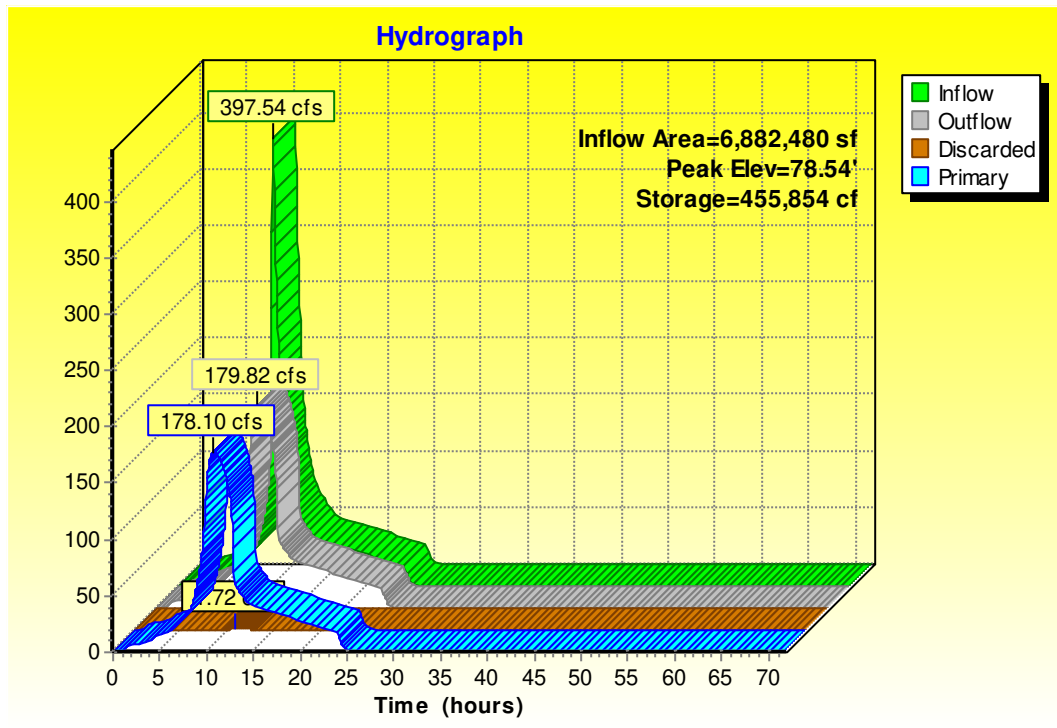
Volume	Invert	Avail.Storage	Storage Description
#1	67.88'	699,650 cf	Custom Stage Data (Conic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
67.88	0	0	0	0
68.00	9	0	0	9
69.00	286	115	116	288
70.00	863	549	664	871
71.00	1,778	1,293	1,957	1,795
72.00	4,122	2,869	4,827	4,146
73.00	14,227	8,669	13,495	14,257
74.00	28,616	21,007	34,502	28,655
75.00	63,923	45,103	79,605	63,970
76.00	88,188	75,731	155,336	88,254
77.00	111,949	99,833	255,168	112,042
79.00	160,810	271,288	526,457	160,972
80.00	185,879	173,193	699,650	186,084

Device	Routing	Invert	Outlet Devices
#1	Primary	79.60'	40.0' long x 30.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Primary	67.88'	48.0" Round Culvert L= 77.4' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 67.88' / 66.90' S= 0.0127 ' /' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 12.57 sf
#3	Discarded	67.88'	0.500 in/hr Exfiltration over Wetted area

Discarded OutFlow Max=1.72 cfs @ 10.78 hrs HW=78.54' (Free Discharge)
 ↳ **3=Exfiltration** (Exfiltration Controls 1.72 cfs)

Primary OutFlow Max=178.09 cfs @ 10.78 hrs HW=78.54' (Free Discharge)
 ↳ **1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
 ↳ **2=Culvert** (Inlet Controls 178.09 cfs @ 14.17 fps)



HISTORIC PHOTOS

MTD Property during recent rain events - March 2011

Submitted by GVPAC Member Tom
Elliott



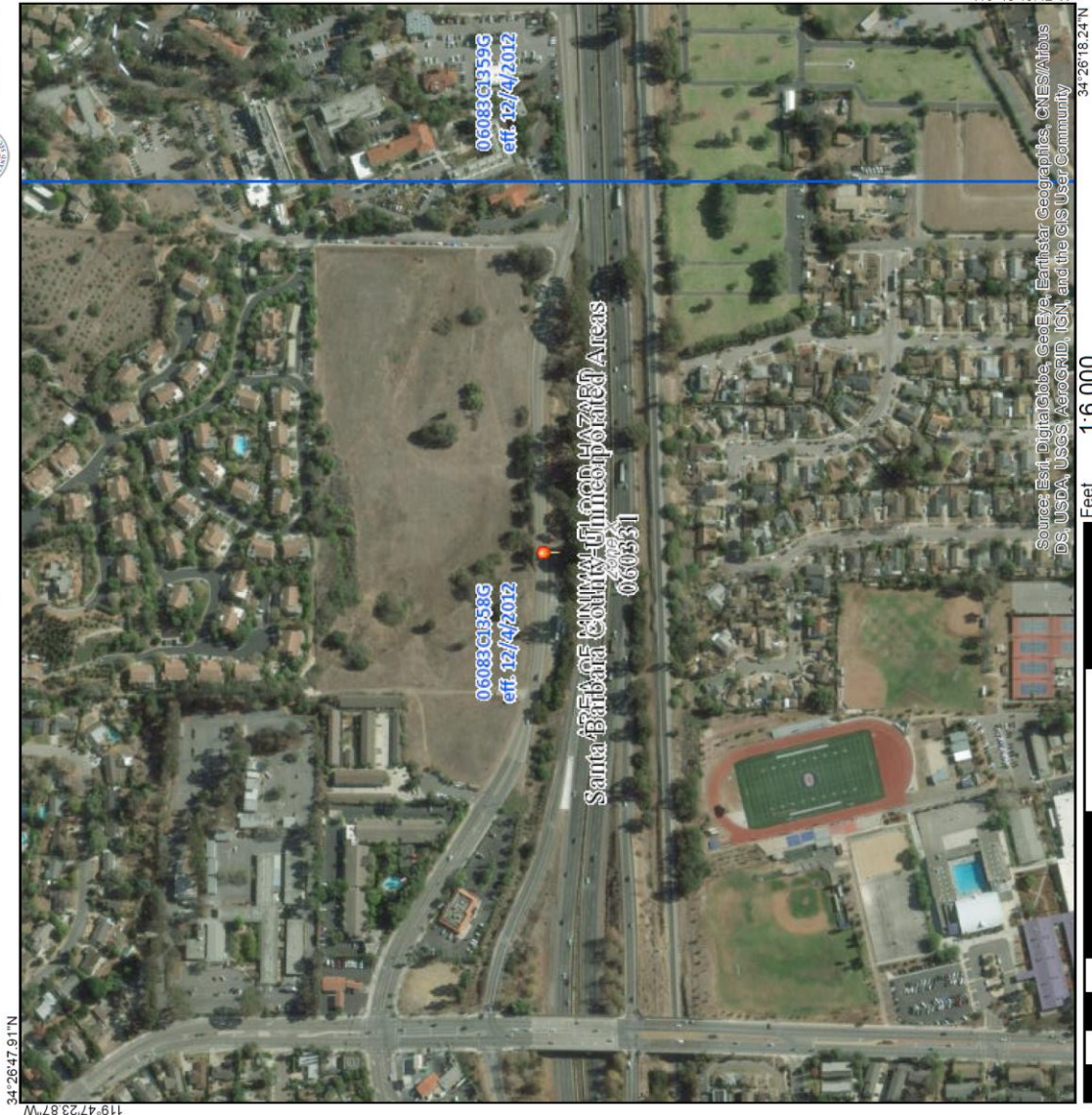








National Flood Hazard Layer FIRMette



Legend

SEE HIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS

- Without Base Flood Elevation (BFE) Zone A, V, A99
- With BFE or Depth
- Regulatory Floodway Zone AE, AO, AH, VE, AP

OTHER AREAS OF FLOOD HAZARD

- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
- Future Conditions 1% Annual Chance Flood Hazard Zone X
- Area with Reduced Flood Risk due to Levee, See Notes, Zone X
- Area with Flood Risk due to Levee Zone D

OTHER AREAS

- Area of Minimal Flood Hazard Zone X
- Effective LOMRs
- Area of Undetermined Flood Hazard Zone D

GENERAL STRUCTURES

- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES

- Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS

- Digital Data Available
- No Digital Data Available
- Unmapped

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The base map shown complies with FEMA's base map accuracy standards.

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **2/7/2015 at 6:13:28 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: base map imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Hydrologic Soil Group—Santa Barbara County, California, South Coastal Part (MTD)

Soil Map may not be valid at this scale.

Map Scale: 1:9,250 if printed on A landscape (11" x 8.5") sheet.

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

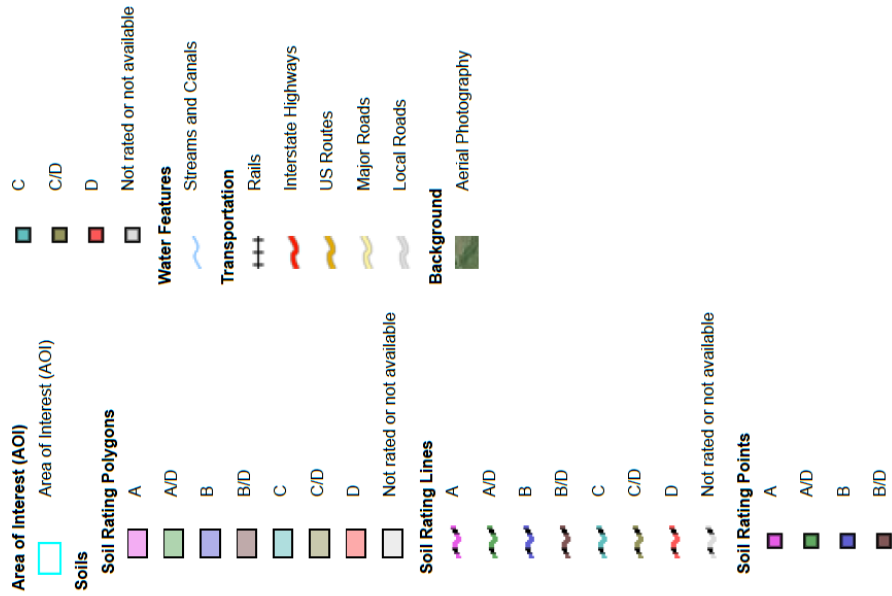
0 400 800 1600 2400 Feet

0 100 200 400 600 Meters

119° 47' 49" W 34° 27' 8" N

119° 46' 29" W 34° 25' 26" N

MAP LEGEND



MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Santa Barbara County, California, South Coastal Part

Survey Area Data: Version 10, Sep 11, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 16, 2016—Dec 22, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AgE2	Arnold loamy sand, 15 to 30 percent slopes, eroded, MLRA 20	A	10.9	3.1%
AhE2	Ayar clay, 15 to 30 percent slopes, eroded	C	0.0	0.0%
AhF2	Ayar clay, 30 to 50 percent slopes, eroded	C	8.5	2.4%
AhG	Ayar clay, 50 to 75 percent slopes	C	27.4	7.8%
BbC	Ballard variant, stony fine sandy loam, 2 to 9 percent slopes	B	15.9	4.5%
EaA	Elder sandy loam, 0 to 2 percent slopes, MLRA 14	A	6.6	1.9%
EaB	Elder sandy loam, 2 to 9 percent slopes, MLRA 14	A	13.3	3.8%
MdD	Milpitas stony fine sandy loam, 9 to 15 percent slopes	D	0.8	0.2%
MdF	Milpitas stony fine sandy loam, 30 to 50 percent slopes	D	19.9	5.7%
MeD2	Milpitas-Positas fine sandy loam, 9 to 15 percent slopes, eroded	D	190.4	54.2%
MeE2	Milpitas-Positas fine sandy loams, 15 to 30 percent slopes, eroded	D	42.0	12.0%
MeF2	Milpitas-Positas fine sandy loams, 30 to 50 percent slopes, eroded	D	10.2	2.9%
OAG	Orthents, 50 to 75 percent slopes		5.2	1.5%
Totals for Area of Interest			351.0	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

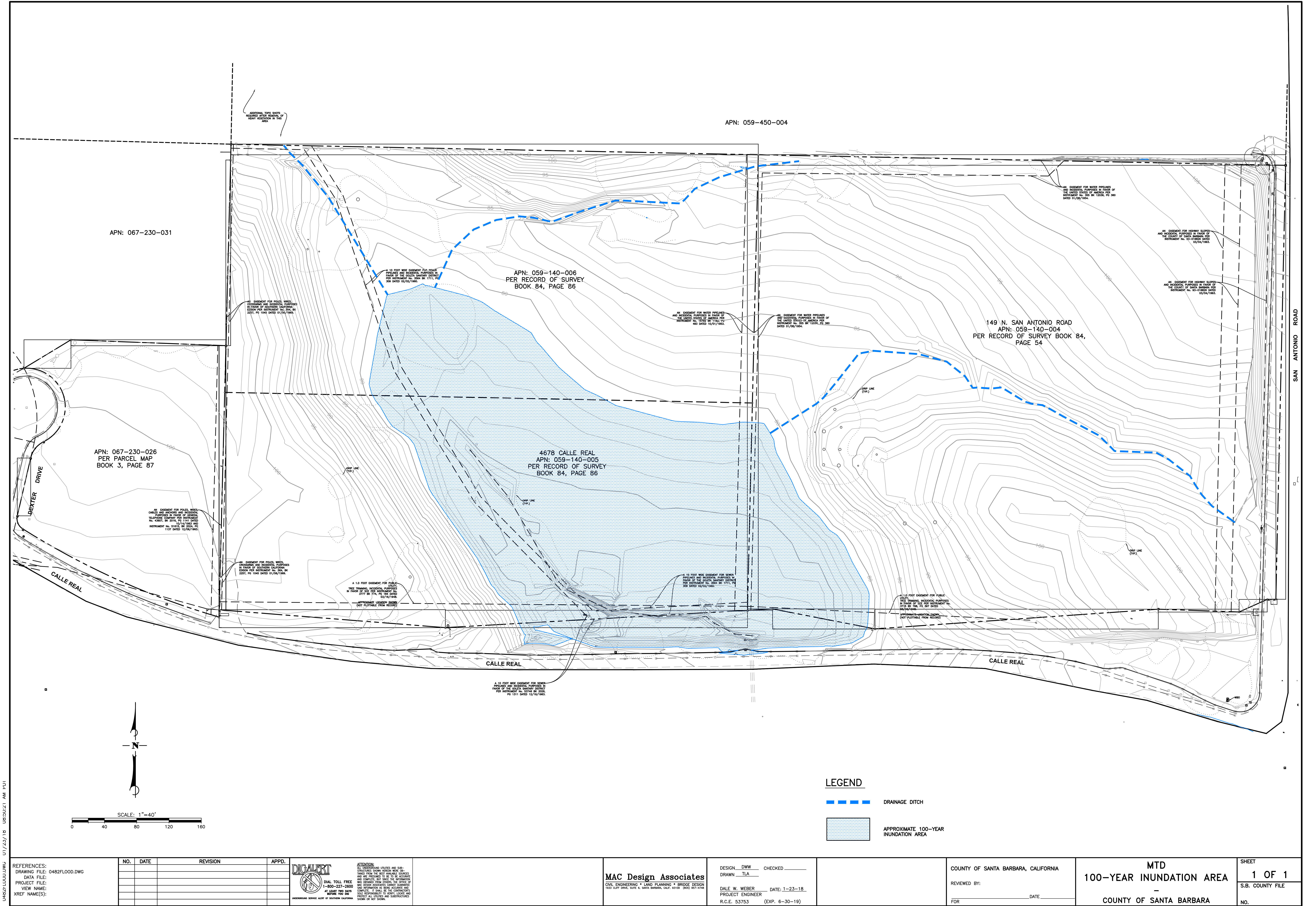
Aggregation Method: Dominant Condition

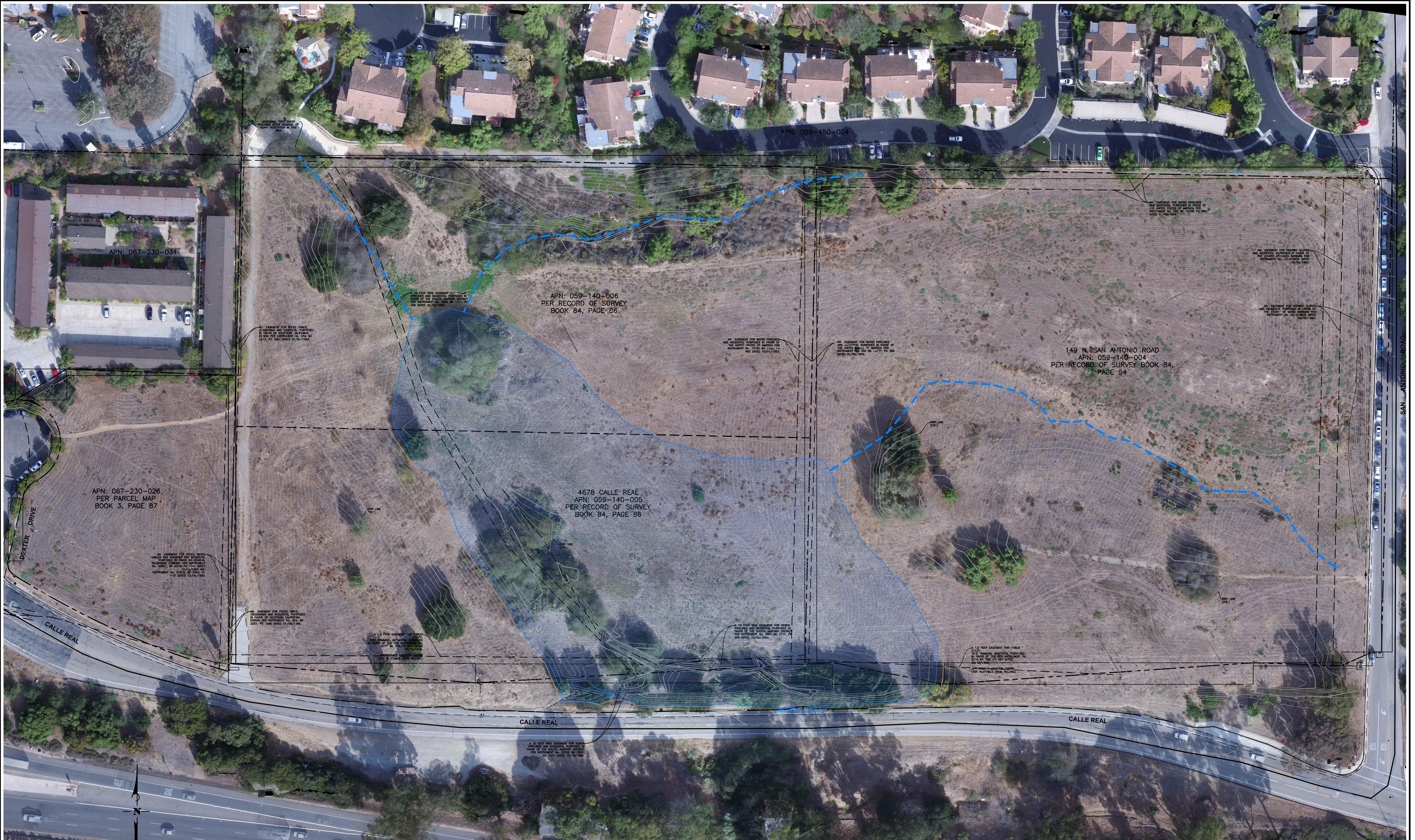
Component Percent Cutoff: None Specified

Tie-break Rule: Higher


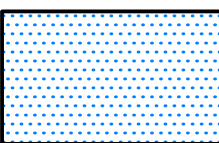
100 YEAR INUNDATION MAPS

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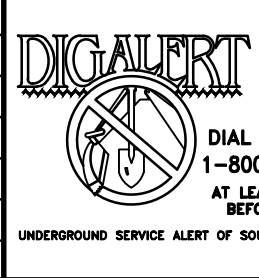


LEGEND

-  DRAINAGE DITCH
-  APPROXIMATE 100-YEAR INUNDATION AREA

REFERENCES:
DRAWING FILE: 0482FLOOD.DWG
DATA FILE:
PROJECT FILE:
VIEW NAME:
XREF NAME(S):

NO.	DATE	REVISION	APPD.



ATTENTION:
ALL UNDERGROUND UTILITIES AND SUB-
STRUCTURES SHOWN HEREON WERE OBTAINED
FROM THE BEST AVAILABLE SOURCES
AND ARE PRESENTED TO BE TO BE ACCURATE
AND COMPLETE, BUT THE INFORMATION
WAS OBTAINED FROM OTHERS. THE OFFICE OF
MAC DESIGN ASSOCIATES, ENGINEER, DOES
NOT GUARANTEE THE ACCURACY AND
COMPLETENESS OF THE INFORMATION.
IT SHALL BE THE CONTRACTOR'S
SOLE RESPONSIBILITY TO VERIFY LOCATION AND
PROTECT ALL UTILITIES AND SUBSTRUCTURES
SHOWN ON THE PLAN.

MAC Design Associates
CIVIL ENGINEERING • LAND PLANNING • BRIDGE DESIGN
1833 CLIFF DRIVE, SUITE 8, SANTA BARBARA, CALIF. 93109 (805) 967-4748

DESIGN DWW CHECKED _____
DRAWN TLA
DALE W. WEBER DATE: 1-23-18
PROJECT ENGINEER
R.C.E. 53753 (EXP. 6-30-19)

COUNTY OF SANTA BARBARA, CALIFORNIA
REVIEWED BY: _____
FOR _____ DATE: _____

MTD
100-YEAR INUNDATION AREA
—
COUNTY OF SANTA BARBARA

SHEET
1 OF 1
S.B. COUNTY FILE
NO.

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