

EXHIBIT C-2

CONSULTING CIVIL ENGINEERS

- ◆ WINERY ENTITLEMENT PERMIT SUPPORT ◆
 - ◆ WASTEWATER TREATMENT SYSTEM DESIGN ◆
 - ◆ SITE EVALUATIONS & SEPTIC SYSTEM DESIGN ◆
 - ◆ WATER SYSTEM PERMITTING & DESIGN ◆
 - ◆ WATER & WASTEWATER FEASIBILITY STUDIES ◆
 - ◆ GRADING & DRAINAGE DESIGN ◆
 - ◆ VINEYARD PLANNING AND EROSION CONTROL PLANS ◆
 - ◆ HYDROLOGY & HYDRAULIC STUDIES ◆
 - ◆ CONSTRUCTION OBSERVATION ◆
- ESTABLISHED 2007



INCORPORATED

Culvert Hydro Analysis

PROJECT NAME

WARRLAND G LLC ECP

JOB NUMBER

08-152

DATE

5/3/2019

BY

MRM

Culvert Analysis - A

$$Q_{100} = C I A$$

$$C = 0.6 \text{ (See attached)}$$

$$I = 3.3 \text{ in/hr (see attached)}$$

$$A = 0.5 \text{ acres (See attached)}$$

$$Q_{100} = 0.6 \times 3.3 \times 0.5$$

$$Q_{100} = 1 \text{ cfs}$$

$$Q_{\text{Full @ 1/2 min}} = 3+ \text{ cfs} \therefore \text{OK} \checkmark$$

$$Q_{\text{For HW}} = 1 = 2.2 \text{ cfs} \therefore \text{OK} \checkmark$$

Culvert Analysis - B

$$Q_{100} = C I A$$

$$C = 0.62$$

$$I = 3.3 \text{ in/hr (see attached)}$$

$$A = 0.9 \text{ acres}$$

$$Q_{100} = 0.62 \times 3.3 \times 0.9$$

$$Q_{100} = 1.8 \text{ cfs}$$

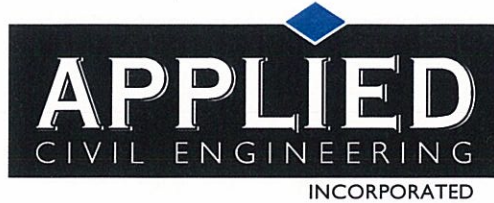
$$Q_{\text{Full @ 1/2}} = 3+ \text{ cfs} \therefore \text{OK} \checkmark$$

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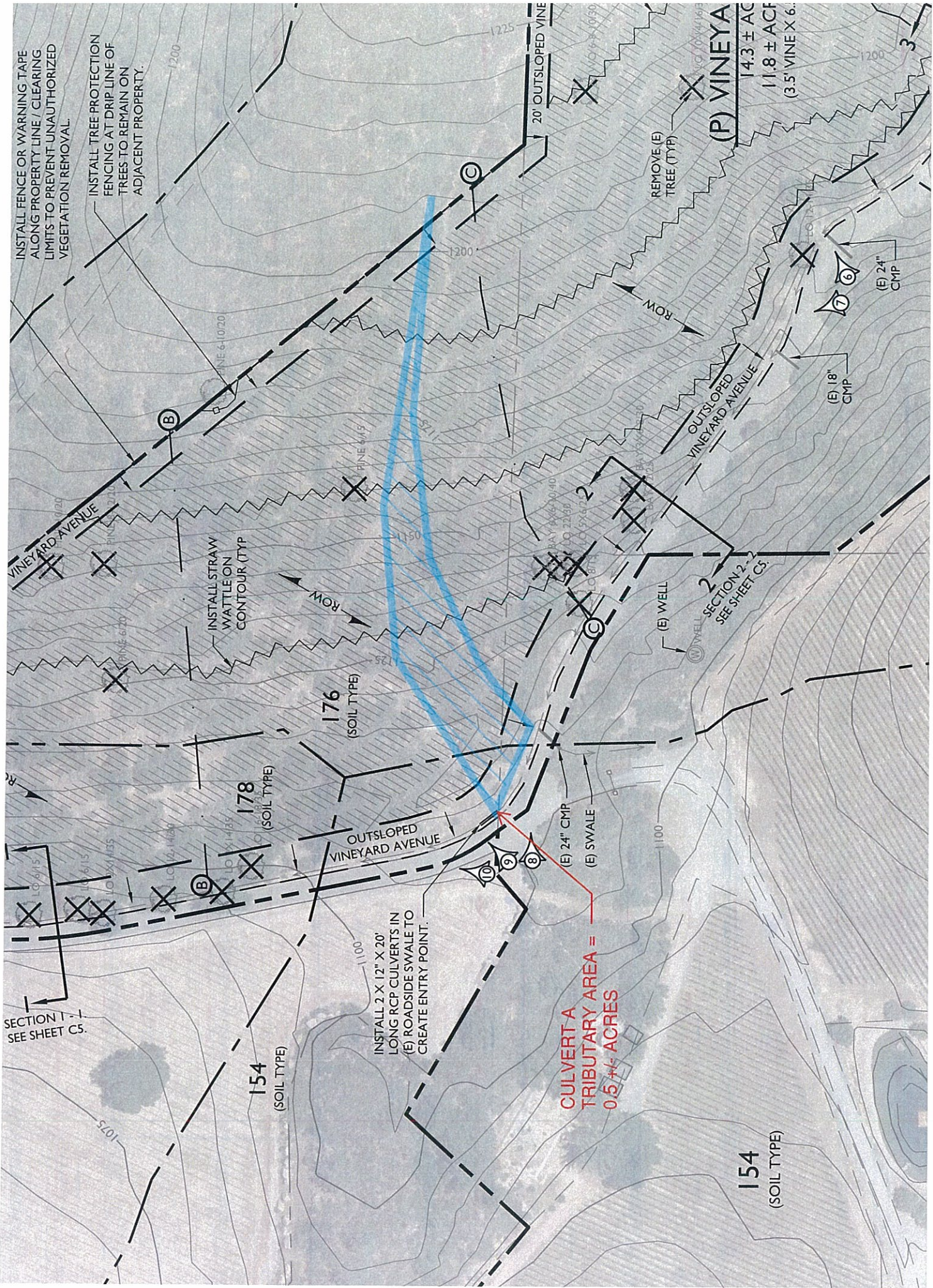
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Notes: TR-55 modeling for larger watersheds yielded 0.8 $\frac{1}{4}$ cfs per acre. This analysis on a much smaller scale yields 2 cfs per acre and is therefore much more which yields more safety margin in culvert sizing.



INSTALL FENCE OR WARNING TAPE
ALONG PROPERTY LINE / CLEARING
LIMITS TO PREVENT UNAUTHORIZED
VEGETATION REMOVAL.

INSTALL TREE PROTECTION
FENCING AT DRIP LINE OF
TREES TO REMAIN ON
ADJACENT PROPERTY.

INSTALL STRAW
WATTLE ON
CONTOUR (TYP)

ROW

176
(SOIL TYPE)

178
(SOIL TYPE)

OUTSLOPED
VINEYARD AVENUE

INSTALL 2 X 12" X 20"
LONG RCP CULVERTS IN
(E) ROADSIDE SWALE TO
CREATE ENTRY POINT.

CULVERT A
TRIBUTARY AREA =
0.5 +/- ACRES

(E) 24" CMP

(E) SWALE

(E) WELL

SECTION 2
SEE SHEET C3

REMOVE (E)
TREE (TYP)

(P) VINEYA

14.3 ± AC
11.8 ± AC
(3.5' VINE X 6')

(E) 24"
CMP

(E) 18"
CMP

154
(SOIL TYPE)

SECTION 1 - 1
SEE SHEET C5.

CULVERT B
TRIBUTARY A
0.9 +/- ACRES

APN 030-220-041

ANDS OF WAPPO LAND COMPANY LLC

LONG RANCH

CAUTION!
EXISTING UNDERGROUND
UTILITIES KNOWN IN THIS
AREA. FIELD LOCATE PRIOR
TO CONSTRUCTION.

INSTALL TREE PROTECTION
FENCING AT DRIP LINE OF
TREES TO REMAIN ON
ADJACENT PROPERTY.

SURVEYOR
AND VINEY
INSTALL FEM
ALONG PRO
LIMITS TO P
VEGETATIO

SECTION 1 - 1.
SEE SHEET C5.

INSTALL STRAW
WATTLE ON
CONTOUR (TYP

154
(SOIL TYPE)

178
(SOIL TYPE)

CONTOUR (TYPE)

ROW

(E) 36" CMP

WATERSHED A - CULVERT A
 CONDITION = VINEYARD WITH 80% GRASS COVER
 $0.28+0.12+0.05+1 = 0.55$, use 0.6

WATERSHED TYPES AND FACTORS

RUN-OFF PRODUCING CHARACTERISTICS OF WATERSHEDS SHOWING FACTORS FOR EACH CHARACTERISTIC FOR VARIOUS WATERSHED TYPES				
WATERSHED TYPES AND FACTORS				
Run-off Producing Features	Extreme	High	Normal	Low
Relief	0.28 – 0.38 Steep, rugged terrain, with average slopes above 30%	0.20 – 0.28 Rolling, with average slopes of 10 to 30%	0.14 – 0.20 Rolling, with average slopes of 5 to 10%	0.08 – 0.14 Relatively flat land, with average slopes of 0 to 5%
Soil Infiltration	0.12 – 0.16 No effective soil cover either rock or thin soil mantle of negligible infiltration capacity.	0.08 – 0.12 Slow to take up water; clay or shallow loam soils of low infiltration capacity imperfectly or poorly drained.	0.06 – 0.08 Normal; well drained light and medium textured soils sandy loams, silt, and silt loams.	0.04 – 0.06 Slow to take up water; clay or shallow loam soils of low infiltration capacity imperfectly or poorly drained.
Vegetation Cover	0.12 – 0.16 No effective plant cover; bare or very sparse cover.	0.08 – 0.12 Poor to fair; clean cultivation crops or poor natural cover; less than 20% of drainage area under good cover.	0.06 – 0.08 Fair to good; about 50% of area in good grassland or woodland; not more than 50% of area in cultivated crops.	0.04 – 0.06 Good to excellent; about 90% of drainage area in good grassland, woodland, or equivalent crop.
Surface	0.10 – 0.12 Negligible; surface depressions, few and shallow; drainage ways steep and small; no marshes.	0.08 – 0.10 Low well-defined system of small drainage ways; no ponds or marsh.	0.06 – 0.08 Normal; considerable surface depression storage; lakes, ponds, and marshes.	0.04 – 0.06 High; surface storage high; drainage system not sharply defined; large floodplain storage or large number of ponds or marshes.

THE RUNOFF FACTOR IS DETERMINED BY THE SUM OF THE FACTORS FOR RELIEF INFILTRATION, COVER, AND SURFACE. NOT APPLICABLE TO BUILT UP AREAS.

FIGURE 3

WATERSHED B - CULVERT B
 CONDITION = SHRUB
 $0.28+0.12+0.12+0.1 = 0.62$
WATERSHED TYPES AND FACTORS

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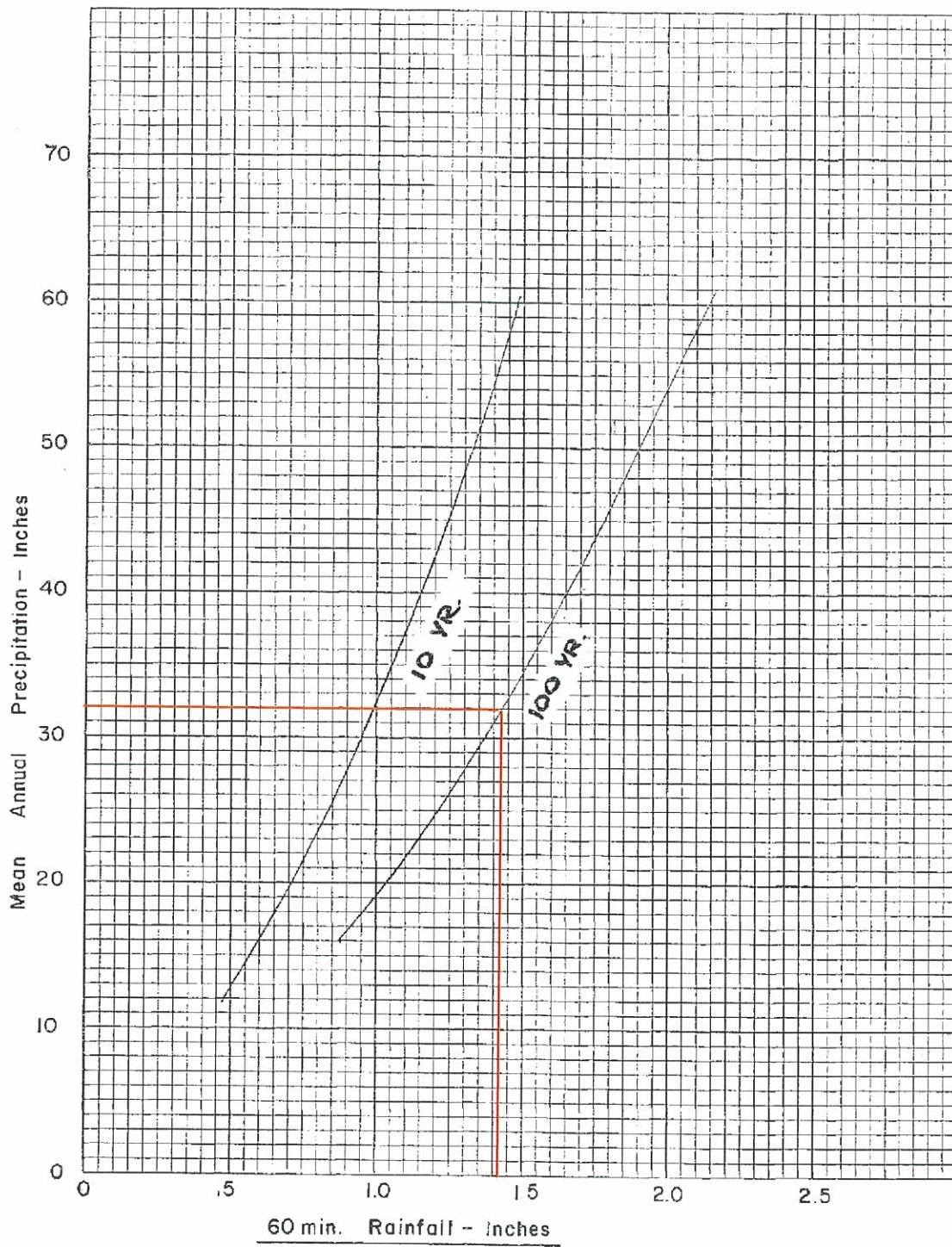
FIGURE 3



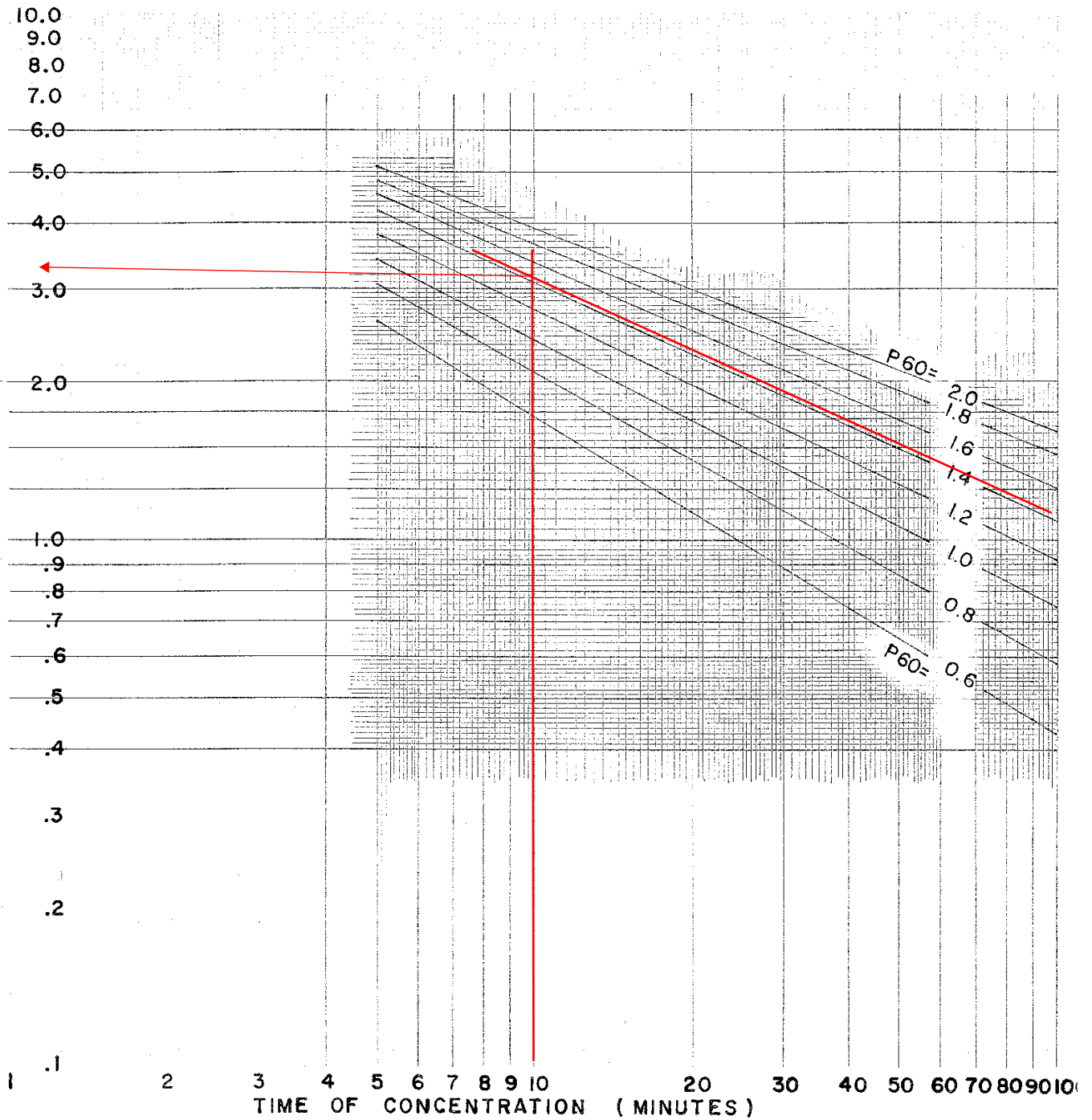
FLOOD CONTROL
GENERAL DESIGN MEMORANDUM
NAPA RIVER CHANNEL IMPROVEMENTS
NAPA COUNTY, CALIFORNIA
HYDROLOGY AND HYDRAULIC ANALYSIS
NORMAL ANNUAL PRECIPITATION AND
HYDROLOGIC INDEX MAP
U.S. ARMY ENGINEER DISTRICT, SAN FRANCISCO, CORPS OF
ENGINEERS

TO ACCOMPANY REPORT
DATED 12 March 75

MEAN ANNUAL PRECIPITATION VS. 60 MINUTE RAINFALL

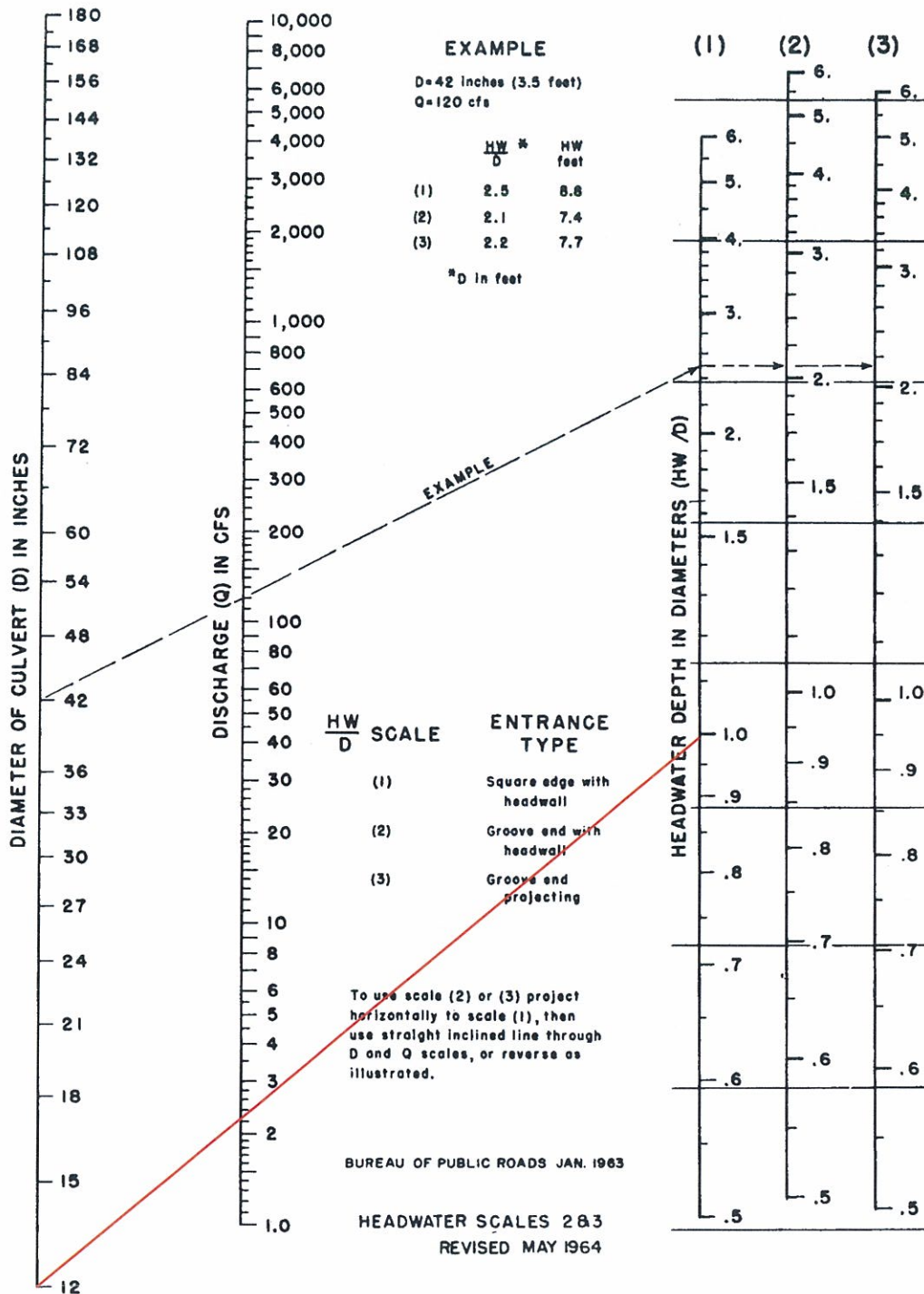


INTENSITY – DURATION CHART



Based on figure 7-811.6 (-8-64)
State of California
Division of Highways
Planning Manual

CHART 28B



Headwater Water Depth for Concrete Pipe Culverts
 with Inlet Control - English Units