TPM 20747
ER 03-14-036

CREW ENGINEERING
AND SURVEYING
5725 KEARNY VILLA ROAD, SUITE D
SAN DIEGO, CALIFORNIA 92123
(858) 571-0555

Preliminary Drainage Study

Hydrology and Hydraulic Calculations for Kvaas Ramona Associates, LLC T.P.M. Application

Introduction

The Project is located South of Mesa Estates Road at Rainbird Road and Mykrantz Truck Trail in the Barona Mesa area. The owner, Kvaas Ramona Associates, LLC, seeks to subdivide The Northwest Quarter of the Southwest Quarter and the West Half of the Northeast Quarter if the Southwest Quarter of Section 4, Township 14 South, Range 2 East, San Bernardino Meridian, in the County of San Diego, State of California into four parcels and a Designated Remainder, all of which will be 12.0 ± acres. The natural watershed in the Barona Mesa area is predominantly soils type C and vegetated with Broad Leaf Chaparral. The area has mild slopes, gently rolling terrain and well defined natural drainage courses. The entire area drains Northwesterly to the San Vicente Creek, offsite to the north of the subject property. This particular site has gentle to mild slopes from the Southeast to the Northwest. Hills South and East of the property and two well defined drainage swales that run East to West define the drainage onsite.

This study is to analyze the developed runoff from and across the site through the existing natural watercourse. There are two points of concentration of water entering the subject property from the Northeast and Southeast that flow into one point of concentration that exits the property at the Northwest corner of the property. Another point of concentrated flow develops onsite that exits the property at the West. Because the project is in a rural area and is over 1/2 acre the Runoff Coefficient, C will remain unchanged by the proposed development. Therefore there will be no substantial change between pre-project and post project runoff characteristics.

The proposed subdivision design respects the natural drainage patterns and no diversion results from the proposed project. The project design proposes open space for the natural swales with no disturbance to occur. Given that the drainage pattern and basin area will be unchanged by the project and the low density and large lot sizes proposed, no significant impacts will occur to the local drainage as a result of this project.

Engineer of Work
Crew Engineering
And Surveying

5725 Kearny Villa Road, Suite D
San Diego, CA 92123
(858) 571-0555

Ronald C. Ashman, R.C.E. 34300
Expires September 30, 2005

REGISTERED PROFESSIONAL ENGINEER
RONALD CREW ASHMAN
No. 34300
CIVIL
STATE OF CALIFORNIA

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Methodology

A Drainage Map at 1"= 200' scale was prepared using County topographic maps. A site inspection and survey was conducted to verify the drainage basins and flow patterns.

Rational Method (Q=CIA) used for runoff calculations.

Manning's Equation used for dip section capacity check.

Intensity based on 10 year frequency storm.

Equation from Nomograph for Determination of Time of Concentration (T_C) for Natural Watersheds used for $Tc = (11.9L^3 / H)^{.385}$; See Page 7

Rational Method Intensity Calculation:

10 Year Frequency: $P_6 = 2.3"$, $P_{24} = 4.2"$, $P_6/P_{24} = 54.8\%$: no adjustment required

Intensity formula based on T_C: $I = 7.44 \times P_6 \times D^{-0.645}$ where $D = T_C$; See Page 10

Runoff Coefficient Soil Group C, Runoff Coefficient C = 0.40

Basin A
Overland Flow - Pt. A_1 to Pt. A_2

Length (L)	Elevation Difference (H)	Slope(%)	C	T_C (min.)
4810'	151.5'	3.15	0.40	30.2

Intensity

$P_{6(10)}$	T_C (min.)	$I_{(10)}$ (in./hr.)
2.3"	30.2	1.90

$A = A_1 + A_2 + A_3 + A_4 =$ 166 ac + 49.9 ac.+7.35 ac.+ 24.8 ac.= 248 ac.

C	x	I	x	A	=	Q_A (CFS)
0.4		1.90		248		188

Basin B
Overland Flow - Pt. B to Pt. D

Length (L)	Elevation Difference (H)	Slope (%)	C	T_C(min.)
1000'	91'	9.10%	0.40	14.0

Intensity

$P_{6(10)}$	T_C (min.)	$I_{(10)}$ (in./hr.)
2.3"	14.0	3.12

C	x	I	x	A	=	Q_B (CFS)
0.4		3.12		11.7		14.6

TABLE 2

RUNOFF COEFFICIENTS (RATIONAL METHOD)

DEVELOPED AREAS (URBAN)

Land Use	Coefficient, C Soil Group (1) A	B	C	D
Residential:				
Single Family	.40	.45	.50	.55
Multi-Units	.45	.50	.60	.70
Mobile homes	.45	.50	.55	.65
Rural (lots greater than 1/2 acre)	.30	.35	.40	.45
Commercial (2) 80% Impervious	.70	.75	.80	.85
Industrial (2) 90% Impervious	.80	.85	.90	.95

NOTES:

(1) Soil Group maps are available at the offices of the Department of Public Works.

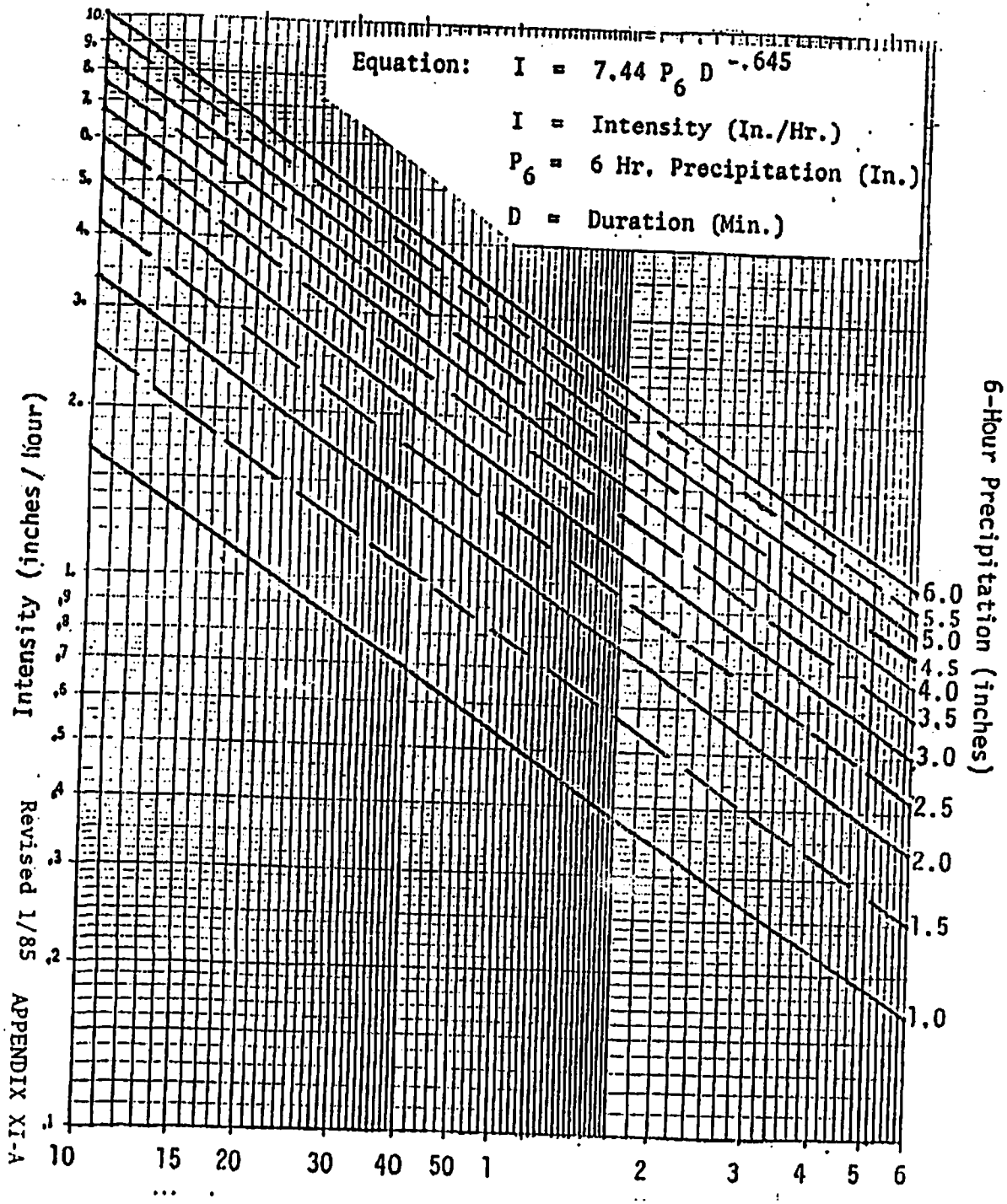
(2) Where actual conditions deviate significantly from the tabulated imperviousness values of 80% or 90%, the values given for coefficient C, may be revised by multiplying 80% or 90% by the ratio of actual imperviousness to the tabulated imperviousness. However, in no case shall the final coefficient be less than 0.50. For example: Consider commercial property on D soil group.

Actual imperviousness = 50%

Tabulated imperviousness = 80%

$$\text{Revised } C = \frac{50}{80} \times 0.85 = 0.53$$

INTENSITY-DURATION DESIGN CHART



Directions for Application:

1) From precipitation maps determine 6 hr. and 24 hr. amounts for the selected frequency. These maps are printed in the County Hydrology Manual (10, 50 and 100 yr. maps included in the Design and Procedure Manual).

2) Adjust 6 hr. precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr. precipitation. (Not applicable to Desert)

3) Plot 6 hr. precipitation on the right side of the chart.

4) Draw a line through the point parallel to the plotted lines.

5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

0) Selected Frequency 10 yr.

1) P_6 = 2.3 in., P_{24} = 4.2, $\frac{{}^*P_6}{P_{24}}$ = 54.8%*

2) Adjusted $^*P_6$ = 2.3 in.

3) t_c = _____ min.

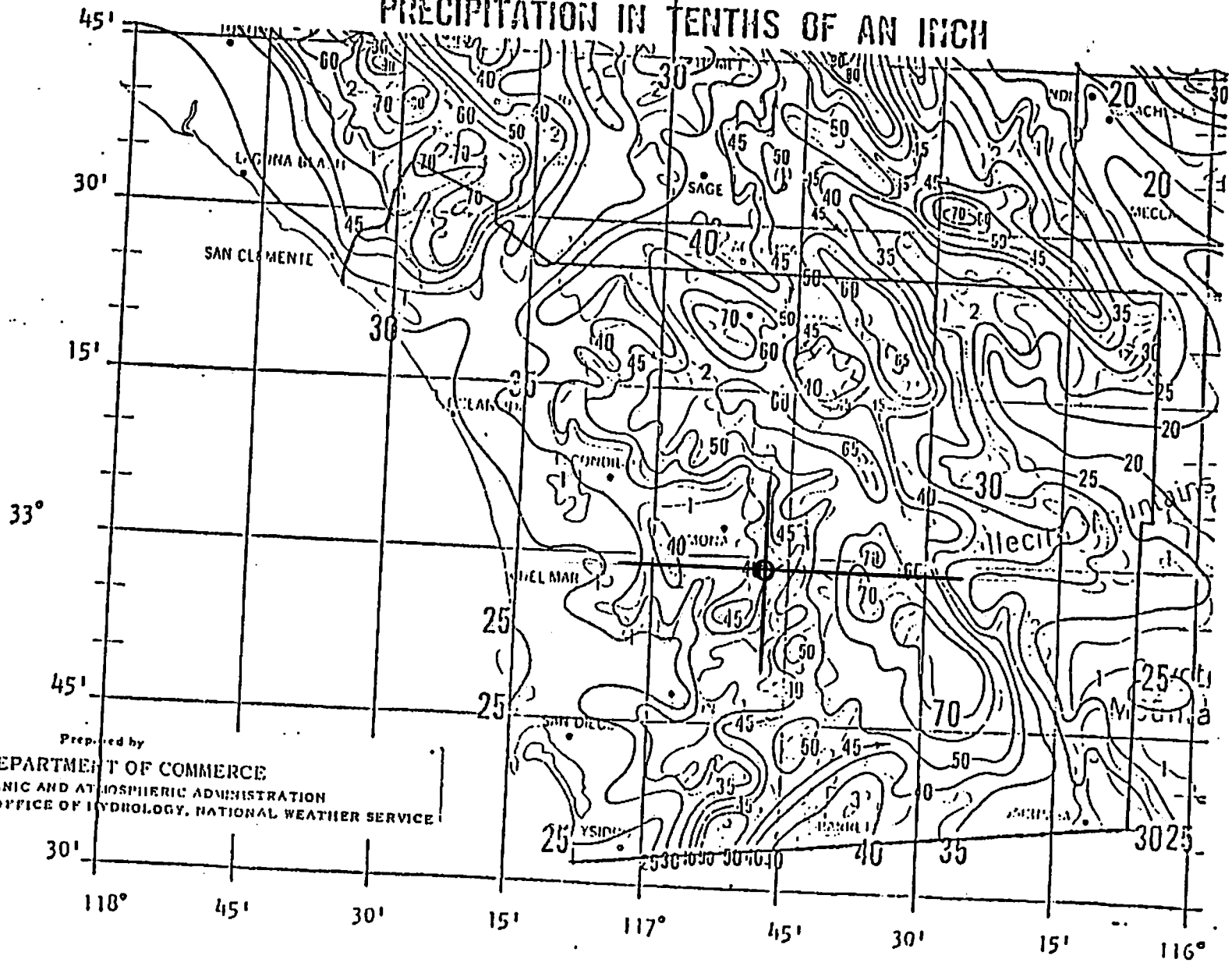
4) I = _____ in/hr.

*Not Applicable to Desert Region

COUNTY OF SAN DIEGO
DEPARTMENT OF SANITATION &
FLOOD CONTROL

10-YEAR 24-HOUR PRECIPITATION

20 ISOPLUVIALS OF 10-YEAR 24-HOUR PRECIPITATION IN TENTHS OF AN INCH



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U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
SPECIAL STUDIES BRANCH, OFFICE OF HYDROLOGY, NATIONAL WEATHER SERVICE

COUNTY OF SAN DIEGO
DEPARTMENT OF SANITATION &
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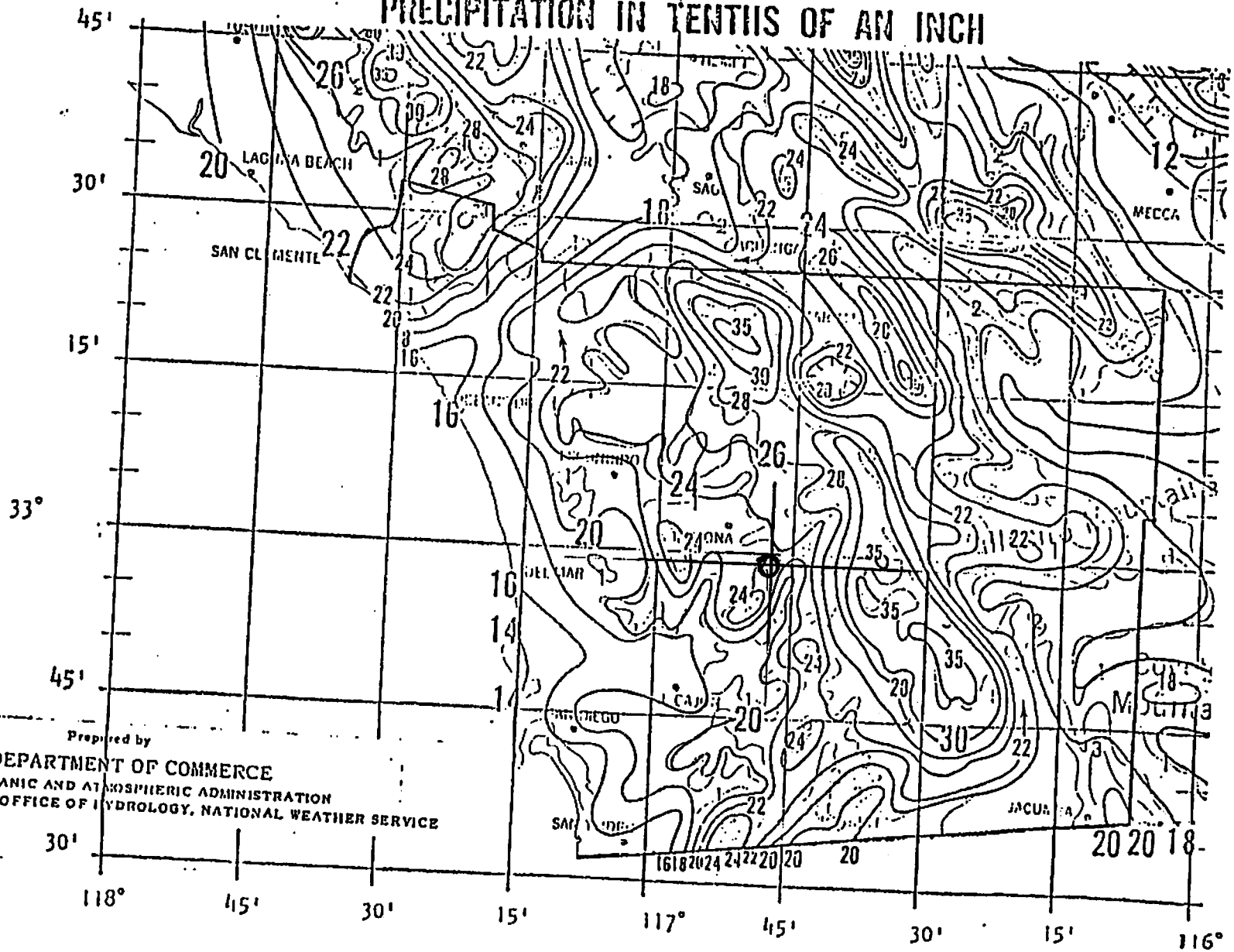
10-YEAR 6-HOUR PRECIPITATION

—10— ISOPLUVIALS OF 10-YEAR 6-HOUR PRECIPITATION IN TENTHS OF AN INCH



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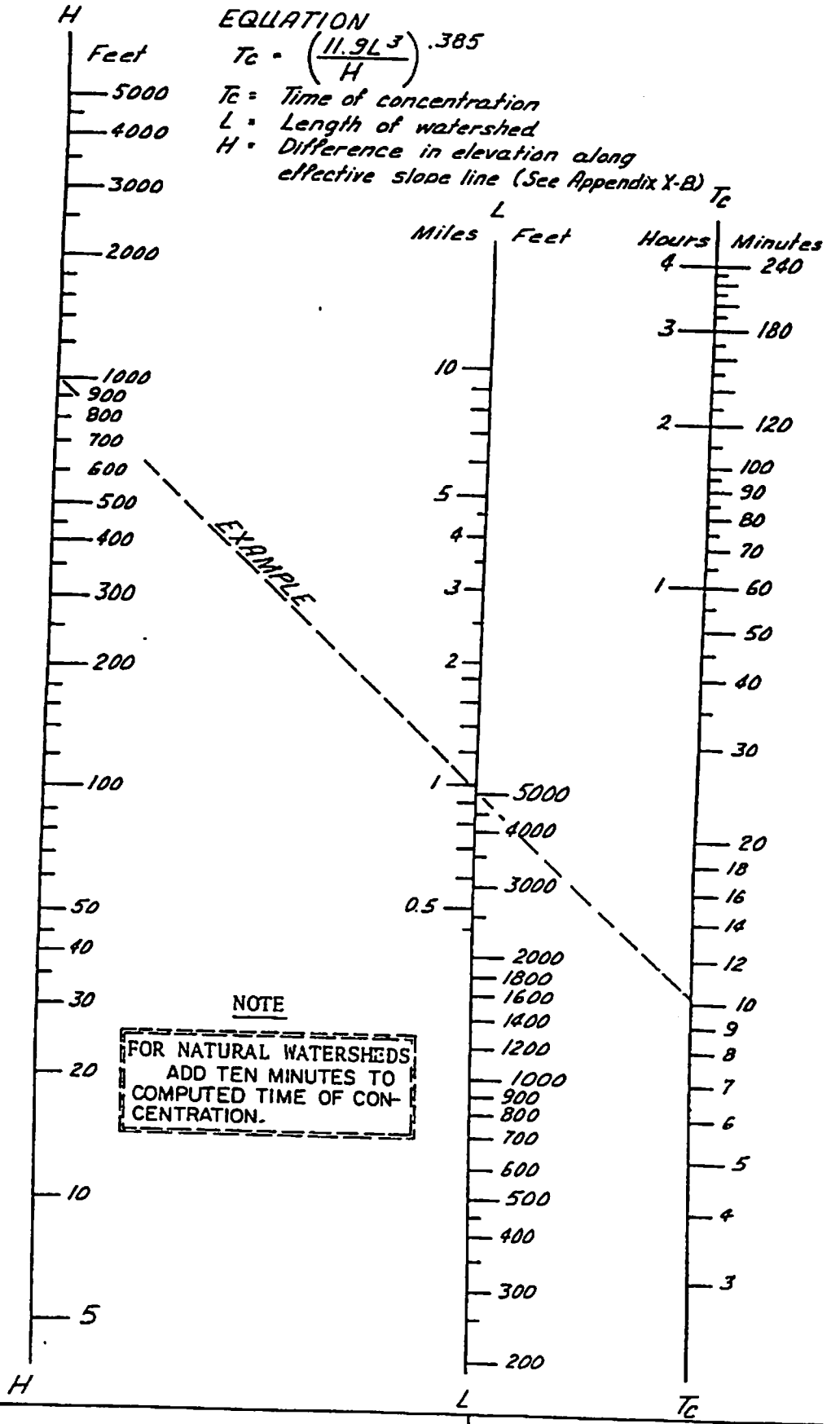
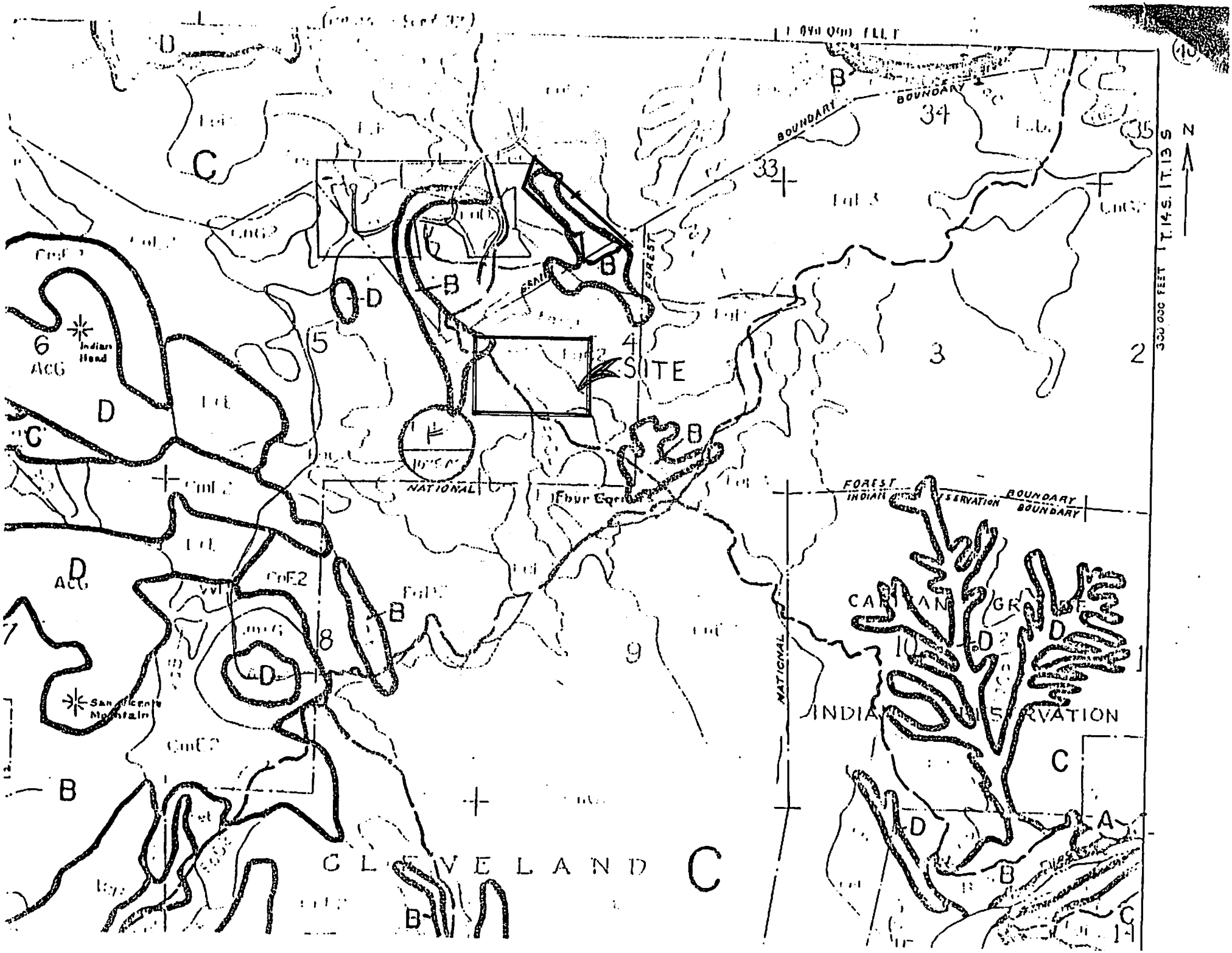
EQUATION

$$T_c = \left(\frac{11.9L^3}{H}\right)^{.385}$$

T_c = Time of concentration
L = Length of watershed
H = Difference in elevation along effective slope line (See Appendix X-B)



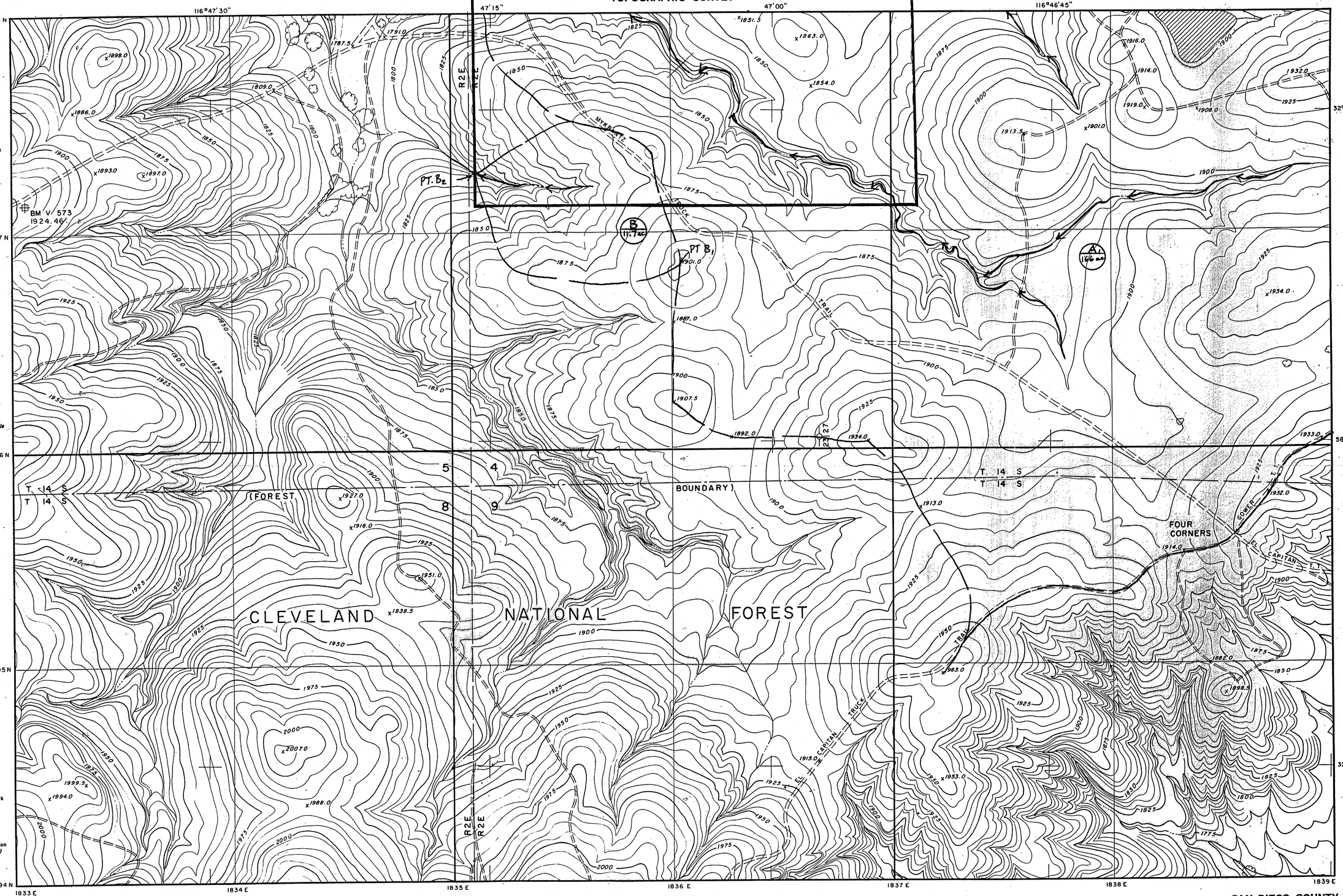
SAN DIEGO COUNTY DEPARTMENT OF SPECIAL DISTRICT SERVICES DESIGN MANUAL APPROVED B. H. Hoffmaster	NOMOGRAPH FOR DETERMINATION OF TIME OF CONCENTRATION (Tc) FOR NATURAL WATERSHEDS DATE 12/1/69



SITE
Indian Head
San Vicente Mountain
CLEVELAND
NATIONAL
FOREST
BOUNDARY
INDIAN RESERVATION
T.14 S. | T.13 S.
N

COUNTY OF SAN DIEGO

TOPOGRAPHIC SURVEY



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- Settling Pond or Storage Reservoir
- Timber or Brush Areas
- Free Standing Tree
- Orchard, Grove, Etc. * Labeled ** Numbered

BOUNDARIES IN ORDER OF PRECEDENCE

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200 0 200 400 600 800 1000

CONTOUR INTERVAL 5 FEET
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ONE THOUSAND FOOT CALIFORNIA RECTANGULAR GRID (ZONE VI)
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SAN DIEGO COUNTY
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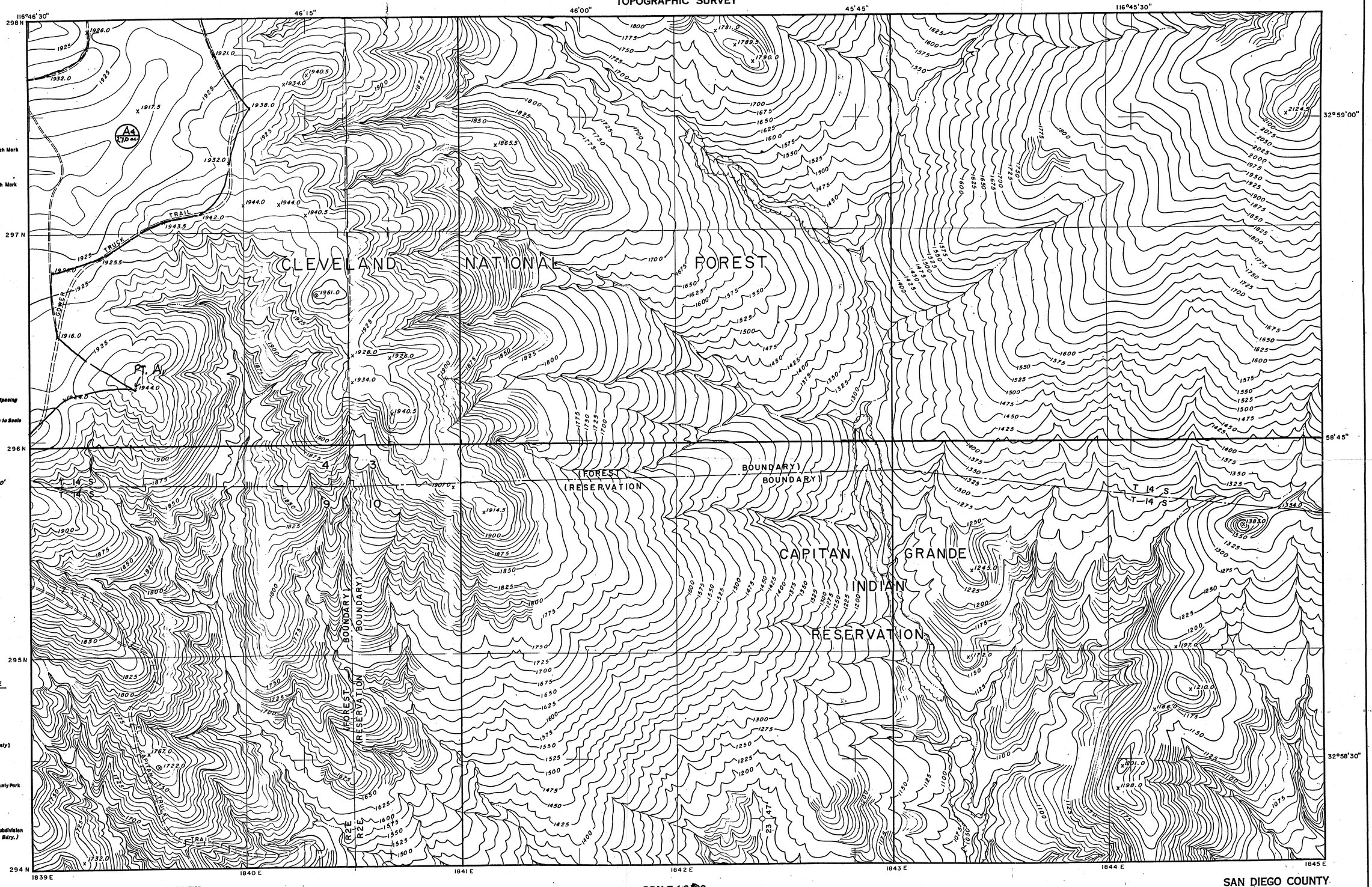

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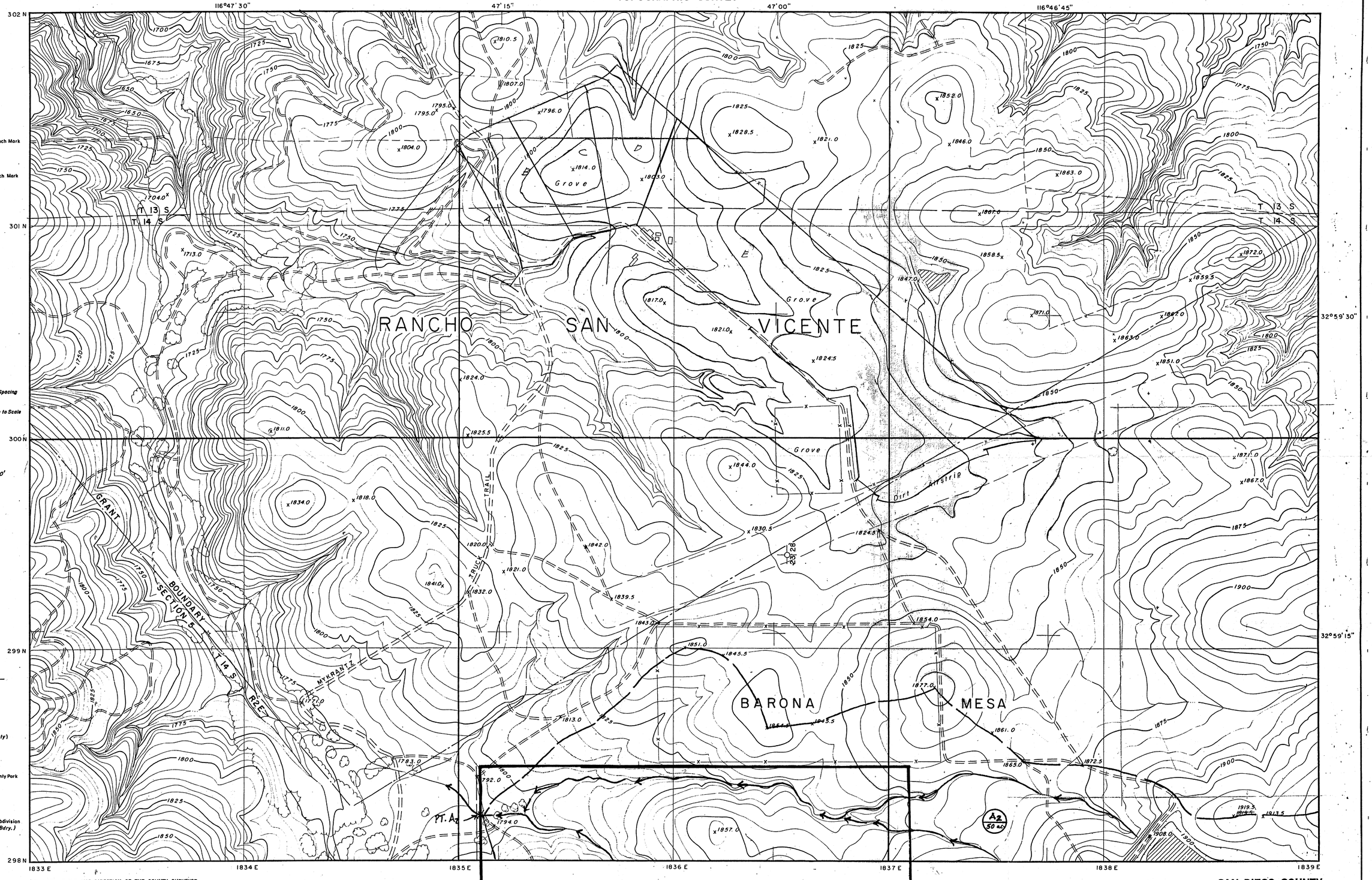

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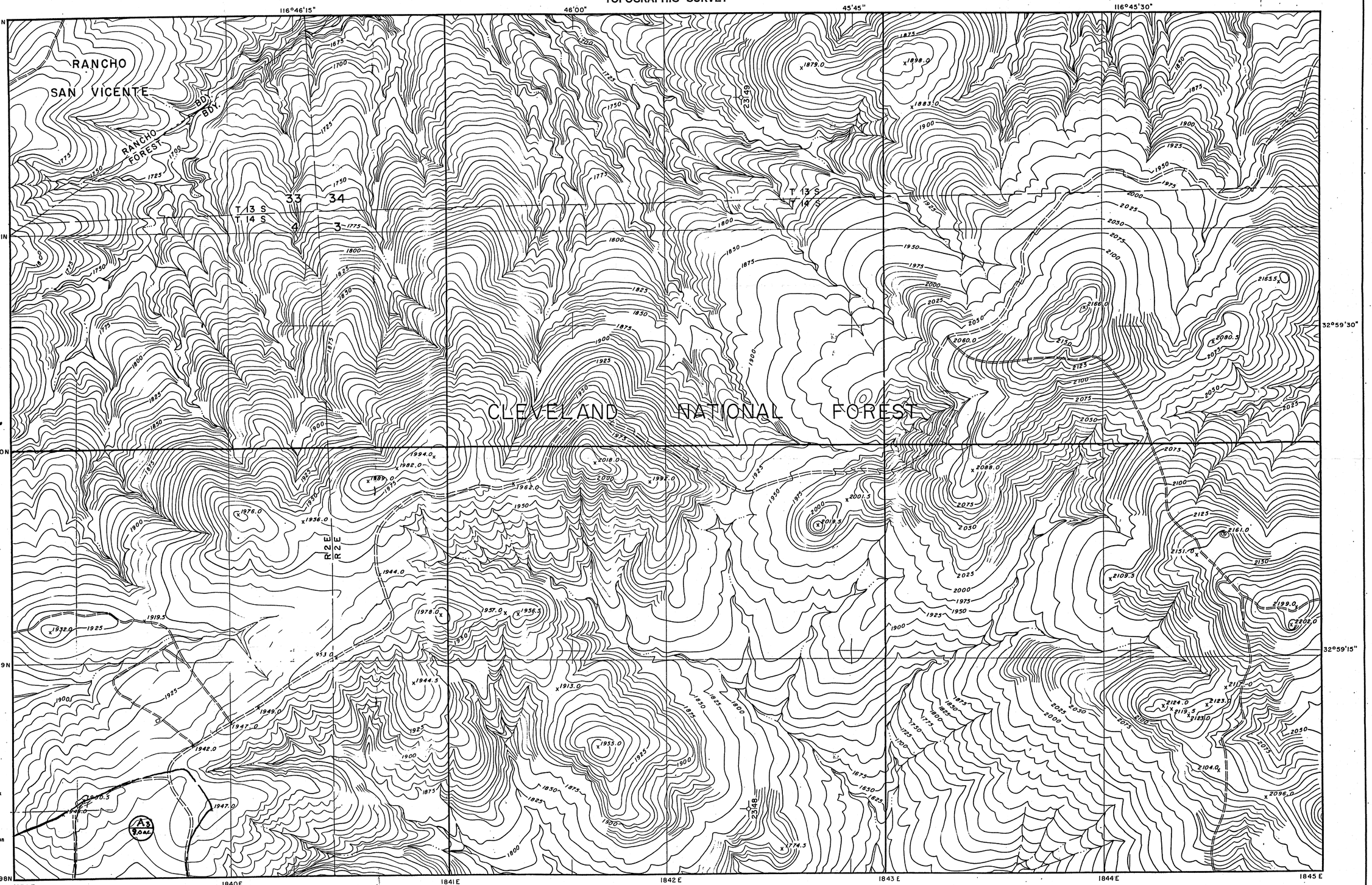

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