PRELIMINARY DRAINAGE STUDY

TRAN MINOR SUBDIVISION
TPM 20835

A PROPOSED 4-LOT SUBDIVISION WITH A REMAINDER PARCEL
IN THE COUNTY OF SAN DIEGO
APN # 172-014-38-00

PREPARED FOR: Mr. Thuan Tran
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Signature

REGISTERED PROFESSIONAL ENGINEER
JOHN EDWARD MAASHOFF
C 61909
EXP. 9-30-05
CIVIL
STATE OF CALIFORNIA

RECEIVED
JUL 25 2007
DEPARTMENT OF PLANNING
AND LAND USE

PREPARATION DATE:	November 4, 2004
1st Revision Date:	January 15, 2005
2nd Revision Date:	April 21, 2005
3rd Revision Date:	April 1, 2007
4th Revision Date:	June 20, 2007

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INTRODUCTION:

This report has been prepared to satisfy the County of San Diego's requirement for a preliminary drainage study to be submitted with all proposed Tentative Parcel Maps.

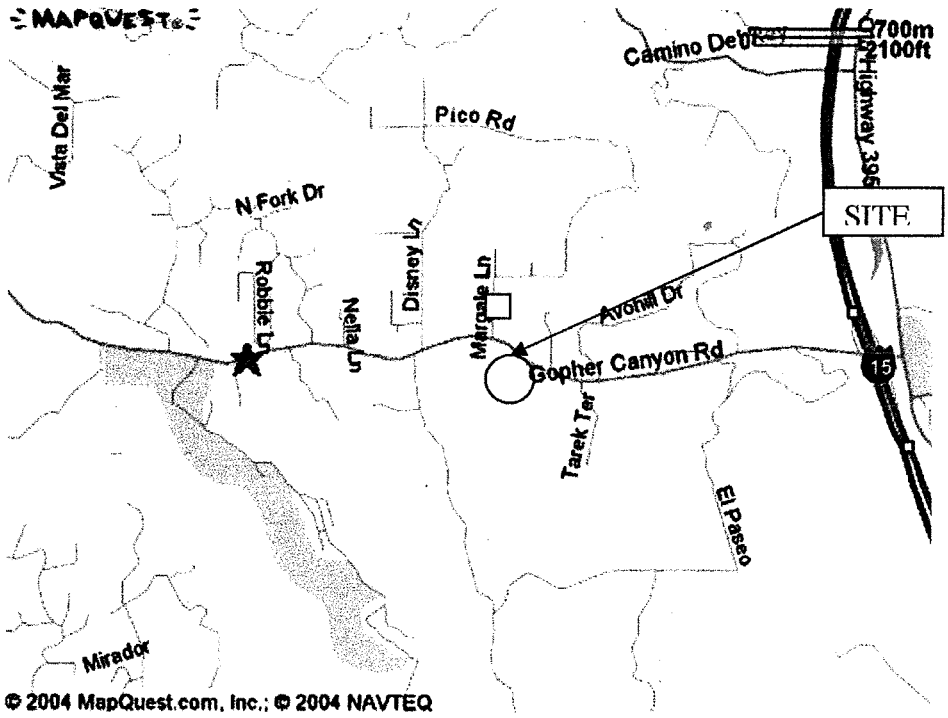
The Tentative Map this report is based on is a proposed 4-lot subdivision with a remainder parcel in the office of the County of San Diego. Parcel 4 is currently being developed with a single family residence and grading plan submitted independent of this report and the TPM. The subject Assessors Parcel Number is 172-014-38. The County TPM number is TPM 20835. Ralph Gonzales Consulting, 310 State Place, Escondido, CA has prepared the subject Tentative Map.

The purpose of this report is to identify potential impacts related to development of the subject property. This report does not contain the necessary detailed hydrology and hydraulic calculations necessary to construct facilities shown on the Tentative Map, it does however, include estimated calculations to demonstrate the feasibility of the proposed development.

The proposed development has been designed around existing water courses currently traversing the property. Improvements to these water courses are not currently proposed as part of this development. Improvement plans for Valley of the Kings Road and the drainage culverts at the intersection of Gopher Canyon Road and Valley of the Kings Road were prepared by Crew Engineering and Surveying in conjunction with TPM 17567. These improvements were completed between the time of the initial submittal of this TPM and the 4th revision date.

PROJECT DESCRIPTION:

The subject property is located on the northerly side of Gopher Canyon Road just east of Valley of the King Road. The County Assessors Parcel Number is 172-014-38-00. A Vicinity Map showing the approximate location of the site is shown below.

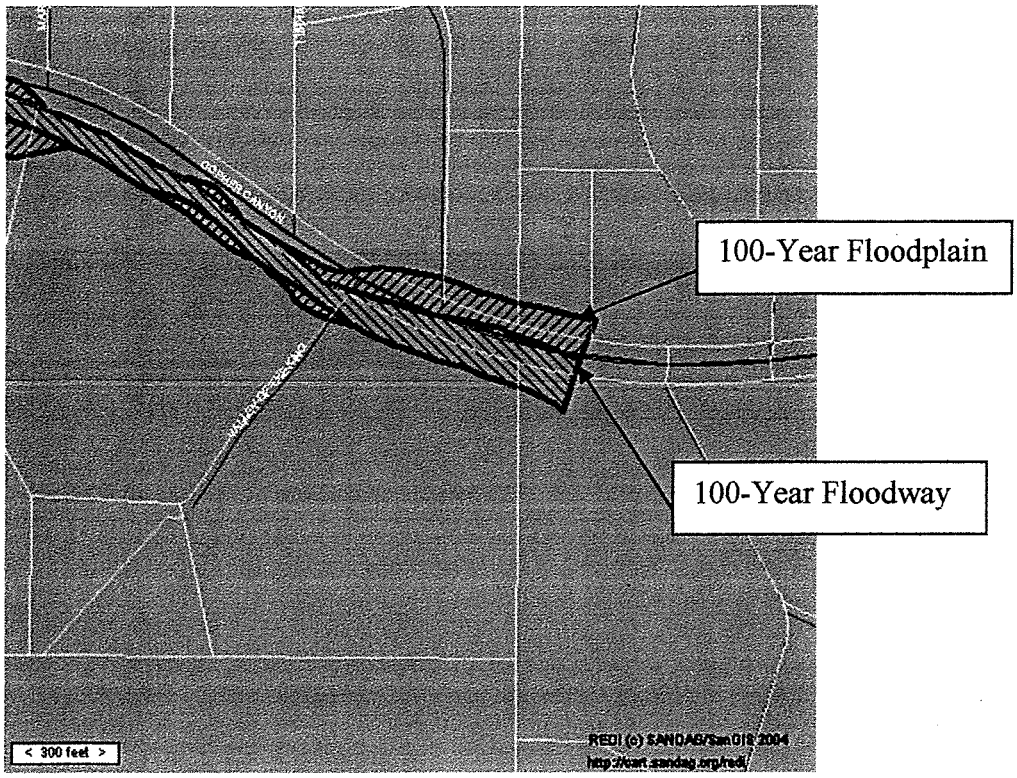


VICINITY MAP – NO SCALE

The subject property is approximately 14.62 acres in size and is proposed to be subdivided into 4 residential lots with a remainder parcel.

Elevations on the site range from approximately 704 feet at the highest point on the southerly property line to approximately 500 feet near the northeasterly corner of the property. On-site topography used for the preparation of this report was taken from the Ralph Gonzales Consulting Tentative Map. Offsite topography used for tributary runoff calculations was taken from San Diego County's 200-scale Floodplain Maps. Portions of the 200-scale maps are attached as Exhibit "A".

The project will take access off Valley of the Kings Road which was improved as part of the improvement plans prepared for PM 12858. These improvement plans and corresponding drainage studies were prepared by Crew Engineering and Surveying.



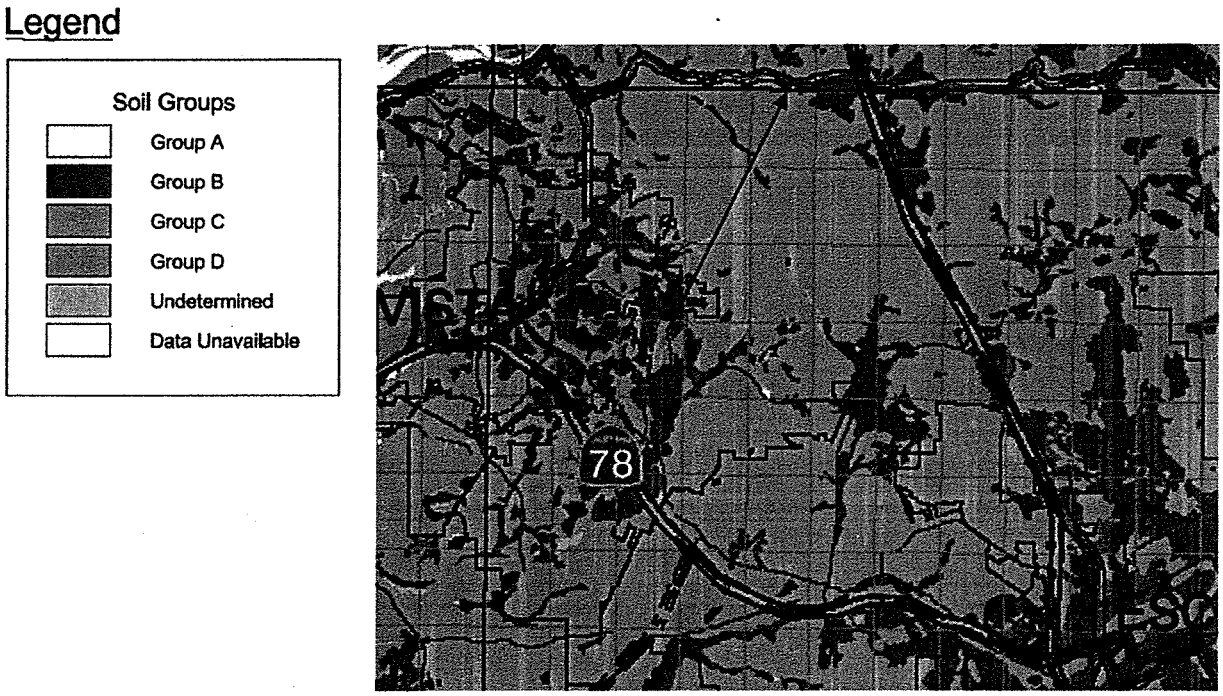
The exhibit above shows the 100-year floodway and floodplain for the conveyance system on the southerly side of Gopher Canyon Road adjacent to the site. The map was taken from the SANDAG site.

Tributary areas flowing into this basin exceed 400 acres in size, Due to the minimal runoff increases from development, the proposed development will not significantly increase the water surface elevation of the existing drainage system during a 100-year storm event.

The channel shown above along the northerly property line was determined to convey 408 cfs during a 100-year storm event as described in the drainage study prepared by Crew Engineering and Surveying in conjunction with the preparation of the Valley of the Kings Road improvement plans. The existing crossings just east of the proposed Valley of the Kings Road was removed and replaced with two new 60" pipes under the Valley of the Kings Road.

PROJECT SOILS:

Soil types for the subject site are not known, therefore Soil Type D was assumed for all calculations. The soils map from the County Manual shows soils on the site vary between soil group's C and D. A portion of the map is shown below. The entire map is included in the index.



METHODOLOGY:

Drainage basin maps were prepared using 200-scale San Diego County Floodplain Maps topographic maps and the tentative map prepared by Ralph Gonzales Consulting.

Rational Method and Modified Rational Method calculations outlined in the San Diego County Hydrology Manual dated June 2003 are used to estimate 100-year runoff quantities for existing watershed basins tributary to the site as well as pre and post development onsite basins.

Hydraulic calculations using Mannings Equation (Q=1.486/n*A*R^2/3*S^1/2) are used to estimate inundated cross sections of natural swales traversing the site and to estimate sizing requirements for storm drain facilities being installed as part of the proposed development.

HYDROLOGY:

The Rational Method (Q = CIA) and Modified Rational Method is used to calculate runoff quantities for the drainage basins. Q is the amount of runoff expressed as cubic-feet per second. C is the runoff coefficient, I is the rainfall intensity, and A is the acreage of the drainage basin.

Runoff coefficients were estimated from Table 3-1 in the San Diego County Hydrology Manual.

Intensity calculations are based precipitation isopluvials and times of concentration/Duration (D). Using Rational Method calculations, Intensity (I) = $7.44\ P_6D^{-.645}$. P_6 is estimated using precipitation isopluvials from the San Diego County Hydrology Manual and are included in the appendix. Times of concentration/Duration are estimated using Table 3-2, Figure 3-3, and Figure 3.6 of the San Diego County Hydrology Manual, or they are calculated using other identified techniques.

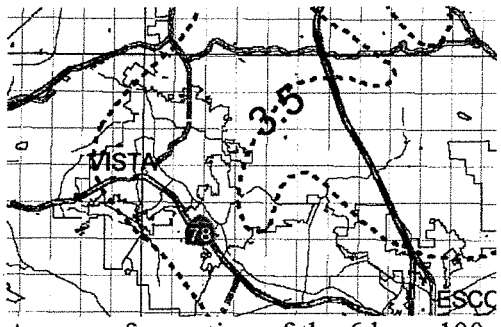
Areas used in runoff calculations were estimated by using the 200-scale County Floodplain Maps and the attached Tentative Map.

Using P6 = 3.5 in/hour Therefore P6/P24=.58 ; within range (.45-.65)
P24=6.0

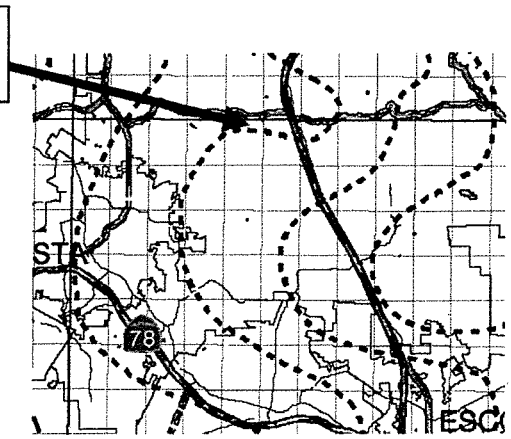
Duration for offsite basins are calculated for each basin by using Figure 3-4 and adding an initial Tc of 6.4 minutes from Table 3-2 (assuming 10% slope, 100' for the length of travel, and an LDR land use) to the calculated Tc from Figure 3-4.

Intensity, $I= 7.44\ P_6D^{-.645}$

SITE
6.0 Isopluvial



A copy of a portion of the 6 hour 100-year storm isopluvial is shown above.



A copy of a portion of the 24 hour 100-year isopluvial is shown above.

PRE DEVELOPMENT

As previously mentioned, the report prepared by Crew Engineering and Surveying shows a Q of 408 cfs is conveyed in the channel along the northerly property line from mainly offsite tributary areas.

Upstream pre and post development runoff quantities are unchanged due to development of the subject property. Increases in downstream runoff quantities are negligible due to the large tributary areas draining to, and through, the site.

Offsite areas to the south as well as onsite basin calculations are shown below. A map with corresponding basin identification letters is included in the appendix. Pre-development Runoff calculations for the corresponding basins are:

Sub-Basin	Area (acre)	P6	Delta H (ft)	L (ft)	Tc	Rainfall Intensity (in/hr)	Runoff Coef.	Q's (cfs)
A1	3.40	3.50	160	780	8.82	6.39	0.46	10.00
B1a	2.10	3.50	168	370	7.40	7.16	0.46	6.91
B2a	0.78	3.50	148	340	7.36	7.19	0.46	2.58
A2	7.70	3.50	155	993	10.51	5.71	0.46	29.16
B1b	3.00	3.50	85	432	8.32	6.63	0.46	15.56
B2b	3.20	3.50	110	556	8.74	6.43	0.46	11.78
Confluence of independent flows (@B1b and B2b) gives Q=26.87cfs and Tc=8.32min								
B3	2.51	3.50	65	540	9.37	5.99	0.46	32.74
Confluence of independent flows (@A2 & B3) gives Q=58.58cfs								

POST DEVELOPMENT

As can be seen from the TPM and attached basin maps, several offsite areas drain through the site and proposed development area. Runoff from these areas will be collected and directed around development area and released to continue on their natural drainage path towards the channel along the south side of Gopher Canyon Road.

The chart below shows the increase in runoff due to development for basins 3-11 as shown on **Post Development Exhibit 1**. Conservatively summing these basins together gives an increase in runoff due to development of 4.31 CFS.

Basin	A (acre)	Pre Dev C	Post Dev C	Tc	I	Pre Q	Post Q	Delta Q
3	0.25	0.46	0.8	9.2	6.22	0.72	1.24	0.53
4	0.39	0.46	0.8	9.2	6.22	1.13	1.96	0.84
5	0.25	0.46	0.8	9.2	6.22	0.72	1.24	0.53
6	0.18	0.46	0.8	9.2	6.22	0.52	0.91	0.39
7	0.20	0.46	0.8	9.2	6.22	0.58	1.00	0.43
8	0.09	0.46	0.8	9.2	6.22	0.26	0.46	0.19
9	0.17	0.46	0.8	9.2	6.22	0.49	0.86	0.37
10	0.18	0.46	0.8	9.2	6.22	0.52	0.90	0.38
11	0.32	0.46	0.8	9.2	6.22	0.90	1.57	0.67
							Sum Delta Q =	4.31 cfs

Because runoff travel times are not anticipated to vary drastically between pre and post-development, a simple calculation showing increases in runoff for the developed areas is performed to determine post-development increases. The following table shows on-site basins corresponding to development areas of Parcel 1,2 and the remainder parcel that drain to the newly created common driveway. Runoff at the driveway confluence of parcel 2 and Remainder will join the offsite flows being conveyed via the brow ditch between the common driveways where it will be discharged through the proposed pipe and into the natural vegetated swale located on Parcel 1 leading to the proposed vegetated swale. Runoff from the development area of parcel 1 will be conveyed via the proposed common driveway to Valley of the Kings Road where it will travel northerly and be discharged into the proposed vegetated swale. A graphic showing these basins is included as **Post Development Exhibit 2**

Use HDR land use for post dev as assumption that 80% imperv area
Ti=4.7 @1% slope on pad, ignore travel time in dwy-use 5 min.

	Basin (nodes)	A (acre)	Pre Dev C	Post Dev C	Tc	I	Pre Q	Post Q	Delta Q
Parcel 2 & rem									
Q100	R-S-T	0.39	0.46	0.8	9.2	9.22	1.67	2.91	1.24
Qwq	R-S-T	0.39		0.8		0.2		0.06	
Parcel 1									
Q100	U-V-W	0.38	0.46	0.8	9.2	6.22	1.08	1.89	0.80
Qwq	U-V-W	0.38		0.8		0.2		0.06	

Runoff from the pad portions of Parcel 1,2,3 and the Remainder shown as basin 1,2,3 and 4 will be directed away from proposed structures and discharged from the pad area via a rip-rap energy dissipater where they will join offsite flows being conveyed through the property. Runoff from these 4 development areas (using a C value of .57 (40% impervious – Soil type D) and an initial Tc of 8.4 (Table 3-2, MDR land use, 1% slope) are calculated in the table below. A graphic showing these basins is included as **Post Development Exhibit 3**

					85th percentile calc's	
Basin	Area (acre)	Runoff Coef.	I (Q100)	Q100	Rainfall Intensity (in/hr)	Flow-based Q's (cfs)
9	0.17	0.57	6.23	0.61	0.2	0.020
7	0.20	0.57	6.23	0.72	0.2	0.023
5	0.23	0.57	6.23	0.82	0.2	0.026
3	0.22	0.57	6.23	0.80	0.2	0.026

A calculation to determine the increase in runoff due to development at the confluence of flows generated on-site and traveling through the site and the flows being conveyed in the channel adjacent to gopher canyon is shown below.

Flow in the channel as calculated by the Crew Engineering & Surveying report = 408 cfs
Pre-Dev flow (on-site & basins conveyed through site from the south) =59.62 cfs
Post-Dev flow (on-site & basins conveyed through the site from the south)=63.93 cfs

Confluence of pre-development flows:

Q1 = 59.62 cfs	Q2 = 408 cfs
I = 5.62 in/hr	I = 2.84 in/hr
Tc = 10.77 min	Tc = 29 min

Q12 = 59.62 + (10.77/29) * 408 = 211.14 cfs
Q21 = 408 + (2.84/5.62) * 59.62 = 438.13 cfs

Confluence of post-development flows:

Q1 = 63.93 cfs	Q2 = 408 cfs
I = 5.62 in/hr	I = 2.84 in/hr
Tc = 10.77 min	Tc = 29 min

Q12 = 63.93 + (10.77/29) * 408 = 215.45 cfs
Q21 = 408 + (2.84/5.62) * 63.93 = 440.31 cfs

Therefore the increase in runoff due to development after confluence of the 2 basins is 2.17 cfs.

Pipe flow calculations:

Offsite tributary areas A1, B1a, and B2a are unchanged due to development of the property. Onsite areas A2, B1b, B2b, and B3 are minimally impacted due to development of the site. Increases in runoff are minimal due to the size of the basins and limited development areas within the basins. The TPM has been designed such that natural flow paths are generally retained within the site.

As can be seen from the TPM and exhibits included and attached basin maps, several offsite areas drain through the site and proposed development area. Runoff from these areas will be collected and directed around development area and released to continue on their natural drainage path towards the channel along the south side of Gopher Canyon Road.

Post Development flows directed to the proposed pipe on parcel 3 were calculated to be Q100=28.63 cfs. Using the headwater depth for pipe culverts chart included, it was calculated that a 24" diameter pipe with a headwater depth of 4.4 feet allows the proposed flows to be conveyed through the pipe. The specific design of the pipe (slope, etc) to convey the flow should be calculated with the preparation of the grading and improvement plans for the proposed development.

Post Development flows directed to the proposed pipe under the common driveway between parcel 2 and the remainder parcel were calculated to be Q100=13.29 cfs. Using the headwater depth for pipe culverts chart included, it was calculated that a 18" diameter pipe with a headwater depth of 3.45' allows the proposed flows to be conveyed in the pipe.

Vegetated swale calculations:

The proposed vegetated swale at the intersection of Valley of the Kings Road and Gopher Canyon Road is intended to be a treatment control BMP for the proposed driveways and pad area of Parcel 2 and the remainder parcel. The calculated runoff flow volume required to be treated was calculated above to be .06 cfs. The proposed swale will be trapezoidal channel approximately 300 feet in length with a longitudinal slope of 2%. The specific width and design of the swale should be determined with the preparation of the grading and improvement plans for the proposed private driveway.

The vegetated trapezoidal swale with a width of 4 feet, 3:1 side slopes and a flow depth of 3.4 feet can convey approximately 62 cfs using the CASQA design parameters of n=.25. Travel time in the swale with these characteristics will be approximately 3.2 minutes. 100-Year Storm Calculations are shown below:

1.486ar^2/3s^1/2			
		trap channel 3:1 side slopes	
a	48.28		
p	25.5	b	4
r	1.893074	d	3.4
s	0.02	a	48.28
r^2/3	1.530307	p	25.5
s^1/2	0.141421		
n	0.25		
Q	62.11		
Velocity	1.29		

The same channel can convey the calculated water quality flows with a depth of flow equal to .37' and a velocity of .38 fps. Travel time in the swale with these characteristics will be approximately 11 minutes.
Water Quality Calculations are shown below:

1.486ar^2/3s^1/2			
		trap channel 3:1 side slopes	
a	1.8907		
p	6.3	b	4
r	0.298214	d	0.37
s	0.02	a	1.8907
r^2/3	0.44636	p	6.3
s^1/2	0.141421		
n	0.25		
Q	0.71		
Velocity	0.38		

Summary & Conclusions:

The proposed development will have little impact on the existing drainage systems surrounding and traversing the property. On-site development has been limited such that the majority of the property remains undeveloped. The entire site drains to the north and runoff from the site, and tributary areas, is conveyed to a ditch along the south side of Gopher Canyon Road. The increase in runoff from the proposed development area is minimal compared to the large tributary areas currently draining through the site. The proposed project will not substantially alter the existing drainage patterns of the site or drainage facilities adjacent to the site.

Runoff conveyed through the site tributaries south of the property (and generated on-site from development areas) will be directed around development areas and discharged via rip-rap energy dissipators where they will return to their natural pre-development flow patterns. As pre-development flow patterns are generally maintained, substantial erosion or sedimentation is not anticipated due to development of the site.

The 60" CMP pipes being installed with the improvement plans for Valley of the Kings Road are designed to convey 408 cfs as identified in the referenced reports. The conservative estimate of an increase in runoff due to the proposed development of the site of 4.31 cfs represents an increase in runoff of approximately 1.1%. Due to the differing times of concentration for the on-site flows and the 408 cfs conveyed in the channel adjacent to Gopher Canyon, confluence calculations were performed to show total increase in flows due to development. Confluence calculations for flows discharging from the site joining the existing 408 cfs show an increase in pre and post-development flows of 2.17 cfs. This increase of 2.17 cfs represents an increase of .053%. Using the Headwater Depth chart included in the appendix, the increase in headwater due to development for the Valley of the Kings Road under-crossing is approximately .15'. A review of the improvement plans for the crossing shows a minimum of 1' exists between the proposed head water and the berm for the road. Therefore, the system currently proposed for the crossing is adequate to convey increases in runoff due to proposed development. Increases in runoff due to the development of the site will not substantially increase the rate or amount of surface runoff generated on-site. The downstream existing facilities are adequate to convey increases in runoff due to development of the site and flooding is not anticipated as a result of the sites development.

The PCC spillway at station 1+61 as shown on the Valley of the Kings Road improvement plans will be modified slightly to address water quality as referenced in the Storm Water Management Plan. The spillway should be relocated to approximately station 2+00 and runoff should be directed through a vegetated swale prior to being discharged to the existing channel along Gopher Canyon Road. The swale should be constructed with a maximum longitudinal slope of 2%. Due to the flat nature of the swale and installation of rip-rap at the termination of the swale, velocities exiting the channel will be low. The swale will increase travel time, allow for infiltration and the rip-rap will discharge into the existing channel therefore erosion potential through natural areas will be eliminated and peak increases in runoff will be reduced. Details of the construction of the vegetated swale will be included with the grading plans for the proposed private road.

The development portions of the site are located outside the mapped flood hazard areas and the proposed development will not place housing within the flood hazard area as shown on the TPM.

Calculations / Exhibits

H.D.P.M. VPM305,LMAP 209

TENTATIVE PARCEL MAP NO. 20835 RPL-5

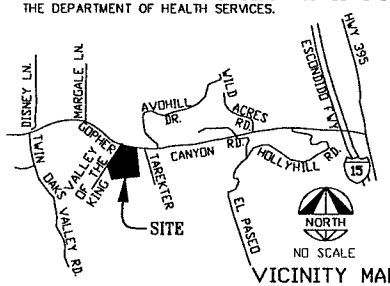
HEALTH DEPARTMENT CERTIFICATE

ALL PARCELS SHALL HAVE A LAYOUT OF THE SEWAGE DISPOSAL SYSTEM APPROVED BY THE SAN DIEGO DEPARTMENT OF ENVIRONMENTAL HEALTH PRIOR TO APPROVAL OF A BUILDING PERMIT AND/OR ISSUANCE OF A SEPTIC TANK PERMIT. CUTS AND FILLS FOR DRIVEWAYS AND BUILDING SITES SHALL BE MADE PRIOR TO APPROVAL OF THE LAYOUTS, AN ADDITIONAL EXPANSION AREA OF 100% OF THE INITIAL TILE AREA SHALL BE PROVIDED FOR POTENTIAL EXPANSION IN THE EVENT OF FAILURE OF GRAVITY FLOW. EACH PARCEL IS APPROVED FOR A STANDARD SEPTIC TANK 1,500 GAL CONNECTED TO x FEET (see chart below for individual sizes) OF TILE DRAIN FIELD TO SERVE A 5 BEDROOM DWELLING, PROVIDED THE ORIGINAL SOIL IS NOT DISTURBED IN ANY WAY SUCH AS CUTTING, FILLING OR RIPPING. THIS DOES NOT CONSTITUTE APPROVAL FOR COMMERCIAL ESTABLISHMENTS.

*SEE DATA AND RECOMMENDATIONS IN THE NAME OF R. MALCOLM VINJE, DATED 3-29-04, BY VINJE MIDDLETON ENGINEERING, INC.

COLLEEN HINES, EHS-II 5-4-07
GARY ERBECK - DEPUTY DIRECTOR
ENVIRONMENTAL HEALTH SERVICES

THIS CERTIFICATE DOES NOT IMPLY ALL CONDITIONS PURSUANT TO THE R.P.O. ORDINANCE HAVE BEEN MET, THE DEPARTMENT OF PLANNING AND LAND USE SHOULD BE CONSULTED REGARDING THE RESULTANT CHANGES TO THE SEPTIC SYSTEM DESIGN MUST BE RE-EVALUATED BY THE DEPARTMENT OF HEALTH SERVICES.

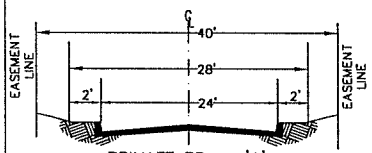


VICINITY MAP
THOMAS BROS. 1068 F-6

RPO DENSITY		
PARCEL	AREA X DESIGNATOR	NO. DU'S
PCL 1	=1.80 X .5 =.90 =.76 X.25 =.20	= 1.1 DU's MAX
PCL 2	=1.78 X .5 =.90 =.30 X.25 =.08	= .98 DU's MAX
PCL 3	=1.51 X .5 =.76 =.95 X.25 =.24	= 1.00 DU's MAX
PCL 4	=1.64 X .5 =.84 =.79 X.25 .20	= 1.0 DU's MAX
REMAINDER	=4.28 X .5 =2.1 =3.05 X.25 =.76	= 2.86 DU's MAX

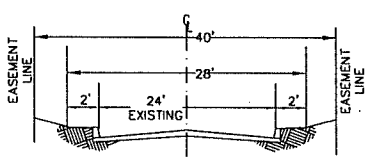
RPO DENSITY			
	AREA		NO. DU'S
0% - 15%	=11.01	x .5	=5.5 DU's
15% - 25%	=5.85	x .25	=1.4 DU's
			= 7.0 DU's MAX

● EMERGENCY FIRE TURN AROUND

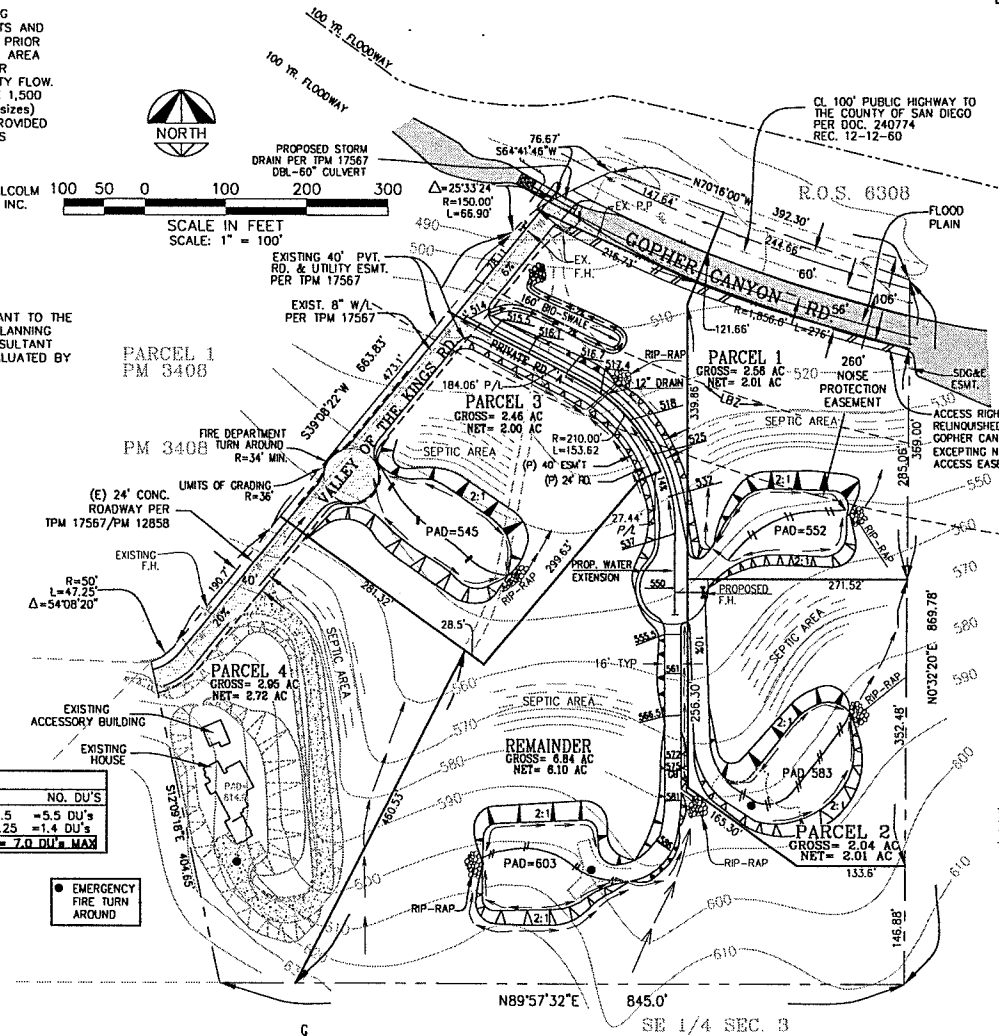


PRIVATE RD. - 'A'
N.T.S.

PARCEL	LEACH LINE FOOTAGE	TRENCH DEPTH FOOTAGE	ROCK UNDER PIPE FOOTAGE	REMARKS
1	605'	5'	36"	100% RESERVE
2	555'	3'	1"	100% RESERVE
3	460'	3'	12"	100% RESERVE
4 (exist.)	535'	5'	36"	100% RESERVE (exist.)
REMAINDER	480'	4'	24"	100% RESERVE



VALLEY OF THE KINGS
N.T.S.



LAND DIVISION STATEMENT OWNER'S CERTIFICATE

I HEREBY CERTIFY THAT I AM THE RECORD OWNER, AS SHOWN ON THE LATEST EQUALIZED COUNTY ASSESSMENT, OF THE PROPERTY SHOWN ON THE TENTATIVE PARCEL MAP. ALL OF MY CONTIGUOUS OWNERSHIP WITHIN AND BEYOND THE BOUNDARIES OF THE TENTATIVE PARCEL MAP IS SHOWN. THE BASIS OF CREATION OF THE LOTS IN MY OWNERSHIP (E.G. PARCEL MAP, FINAL MAP, CERTIFICATE OF COMPLIANCE, RECORDED DEED BEFORE 2-1-72) IS CONSIDERED CONTIGUOUS EVEN IF IT IS SEPARATED BY ROADS, STREETS, UTILITY EASEMENTS OR RAILROAD RIGHTS-OF-WAY. "FREEWAY" AS DEFINED IN SECTION 23.5 OF THE STREETS AND HIGHWAYS CODE, SHALL NOT BE CONSIDERED AS ROADS OR STREETS.

I FURTHER CERTIFY THAT I WILL NOT, BY THIS APPLICATION, CREATE, OR CAUSE TO BE CREATED, OR WILL NOT HAVE PARTICIPATED IN THE CREATION OF MORE THAN FOUR PARCELS

ON CONTIGUOUS PROPERTY UNLESS SUCH CONTIGUOUS PARCELS WERE CREATED BY MAJOR SUBDIVISION. FOR PURPOSES OF THIS CERTIFICATION, THE TERM PARTICIPANT MEANS HAVING COOPERATED WITH OR ACTED IN A PLANNING, COORDINATING, OR DECISION-MAKING CAPACITY IN ANY FORMAL OR INFORMAL ASSOCIATION OR PARTNERSHIP FOR THE PURPOSE OF DIVIDING REAL PROPERTY.

I CERTIFY UNDER PENALTY OF PERJURY THAT THE FOREGOING IS TRUE AND CORRECT.

DATE

NAME(S): THUAN TRAN AND KAREN R. TRAN
ADDRESS: 1029 VILETTA DR. ESCONDIDO CA 92027
PHONE: 725-0294

1. ASSESSOR'S PARCEL NO. 172-014-38
2. LEGAL DESCRIPTION OF LAND SHOWN A PORTION OF P.M. 12858 FILE #83-291316 ALSO DESCRIBED AS PARCEL A OF CERTIFICATE OF COMPLIANCE, RECORDED 9-13-02 #2002-078557
3. GENERAL PLAN REGIONAL CATAGORY: 17 - EDA
4. COMMUNITY/SUBREGIONAL PLAN AREA: BONSALL
5. LAND USE DESIGNATION: 17 - EDA
6. EXISTING ZONING: A - 70

ZONE	
USE REGULATIONS	A70
ANIMAL REGULATIONS	L
DENSITY	.5
LOT SIZE	2 AC
BUILDING TYPE	C
MAXIMUM FLOOR AREA	-
FLOOR AREA RATIO	-
HEIGHT	G
LOT COVERAGE	-
SETBACK	W
OPEN SPACE	-
SPECIAL AREA REGULATIONS	-

TAX RATE AREA: 57107
GRADING PLANNED: YES
CUT: 11,254 FILL: 10,666
CALIFORNIA COORDINATES: 402-1731
SOURCE OF TOPOGRAPHY: FIELD SURVEY BY TEAS SURVEYING & S.D. COUNTY 200 SCALE

7. ASSOCIATED PERMITS: N/A
8. LOCATION AND STATUS OF EXISTING LEGAL ACCESS TO SUBJECT PROPERTY FROM A PUBLICLY MAINTAINED ROAD. (I.E. RECORDED EASEMENT, UNRECORDED EASEMENT; IDENTIFY AND SPECIFY WIDTH;) GOPHER CANYON RD. & VALLEY OF THE KINGS RD.
9. WATER DISTRICT: RAINBOW MUNICIPAL WATER DISTRICT
10. SEWER DISTRICT: SEPTIC
11. FIRE DISTRICT: DEER SPRINGS
12. SCHOOL DISTRICTS: BONSALL ELM. - FALLBROOK HIGH SCHOOL DISTRICT

ALL LOTS WITHIN THIS SUBDIVISION HAVE A MINIMUM OF 100 SQUARE FEET OF SOLAR ACCESS FOR EACH FUTURE DWELLING/COMMERCIAL/INDUSTRIAL UNIT ALLOWED BY THIS SUBDIVISION.

IT IS THE RESPONSIBILITY OF THE SUBDIVIDER TO PROVIDE INSURABLE ACCESS TO EACH PARCEL CREATED BY THIS MAP.

SIGNATURE OF PERSON WHO PREPARED THE TENTATIVE PARCEL MAP

P.
P.

ALFONSO D. NEIS
ADDRESS(ES) P.O. BOX 300876
PHONE(S) (760) 739-8931
RCE 28846 EXP 12-31-06

REGISTERED PROFESSIONAL ENGINEER
ALFONSO DAPLIN NEIS
No. C 28846
Exp. 12/31/08
CIVIL
STATE OF CALIFORNIA

RGC
Ralph Gonzales Consulting
P.O. BOX 300876, ESCONDIDO CA 92033
(760) 739-8931

DATE REVISED: 1/30/08

JOB NO. --

PRE – DEVELOPMENT CALCULATIONS & EXHIBITS

L=576'
L=993'
L=1152'
L=1320'
L=1320'
L=1320

EXIST CONDS.

BASIN A1 Q100 CALC'S A = 3.4 ACRE

$C = .46$, $\Delta E = 815 - 655 = 160'$, $L = 780'$

$$T_c = \left(\frac{11.9\,L^3}{\Delta E}\right)^{.385} \quad \text{(Fig 3-4)}$$

$T_c = 2.42$ MIN

USE $T_i = 6.4$ MIN FROM ~~Fig~~ TABLE 3-2 (10%, LDR)

THEREFORE $T_c = T_T = 6.4 + 2.42 = 8.82$ MIN

$P_6 = 3.5$ (fig 3-1)

$$I = 7.44\,(3.5)(8.82)^{-.645} = 6.39 \text{ in/HR.}$$

$$Q = CIA$$
$$= .46\,(6.39)(3.4) = 10.0 \text{ CFS}$$

BASIN A2 A = 7.7 AC

BASIN A1 CA = .46(3.4) = 1.56

BASIN A2 CA = .46(7.7) = 3.54 > $\Sigma CA = 5.10$

$\Delta E = \cancel{688 - 500} = 655 - 500 = 155'$, $L = 993'$, $S = 15.6\%$

ASSUME ADDITION OF 2.5 CFS/ACRE

LET $Q_{AVG} = 10 + \left(\frac{2.5\text{cfs}}{\text{AC}}\right)\left(\frac{7.7}{2}\right) = 19.63$ cfs.

ASSUME TRAP channel w/ b = 2' and z = 4 to calc T_T.
n = .035, (see p.5)

$V = 8.47$ FPS. $\therefore \frac{993}{8.47}\left(\frac{1}{60}\right) = 1.95$ MIN. $T_T = 1.95 + 8.82 = 10.77$ MIN

$I = 5.62$

$Q = 5.10\,(5.62) = 28.66$ CFS

CK Q_{AVG} $10 + \left(\frac{28.66 - 10}{2}\right) = 19.33$ $19.33 \simeq 19.63$ ✓ OK.

$\therefore Q = 28.66$ CFS

BASIN B1a

$A = 2.1$ Ac, ~~ΔH~~ $\Delta E = 813 - 645 = 168$

$L = 370'$ $C = .46$ $CA = .966$

$T_i = 6.4$ MIN (TABLE 3-2)

$$T_c = \left[\frac{11.9\left(\frac{370}{5280}\right)^3}{168}\right]^{.385} = 1 \text{ MIN.}$$

$T_T = 6.4 + 1 = 7.4$ MIN.

$I = 7.16$ in/HR (Formula - Fig 3-1)

$Q = 7.16(.966) = 6.91$ CFS.

BASIN B1b

$A = 3$ ACRE

Assume $\frac{2.5 \text{ CFS}}{\text{AC}}$. let $Q_{Avg} = 6.91 + (2.5)\left(\frac{3}{2}\right) = 10.66$ cfs.

(see pg. 5)

assume trap channel w/ 4:1 side slopes, $b = 2$, $S = \frac{85}{432} = 19.6\%$

then $V = 7.78$ FPS (pg. 5) $T_T = \frac{432}{7.78}\left(\frac{1}{60}\right) = .925$ MIN.

total $T_T = 7.4 + .925 = 8.32$ MIN

$I = 6.63$ in/hr

$Q = .46(3) + .966 = 2.\cancel{898}\,346(6.63) = \cancel{15.24}\ 15.55$ CFS

ck Q_{Avg}

~~$6.91 + \left(\frac{2.5 \text{ CFS}}{\text{AC}}\right)\left(\frac{3}{2}\right)$~~

$6.91 + \frac{15.55 - 6.91}{2} = 11.23 \simeq 10.66$ ✓

$Q = 15.56$ CFS

BASIN B2a

$A = .78\,Ac$ $\quad \Delta E = \frac{813 - 665}{148}$ $\quad C = .46$

$L = 340'$

$T_T = T_i + T_t$ $\quad T_i = 6.4\,min$ (table 3-2) $+ \left(\frac{11.9L^3}{\Delta E}\right)^{.385}$

$T_T = 6.4 + .96 = 7.36\,min$

$I = 7.19$

$CA = .78(.46) = .359$

$Q = .359(7.19) = 2.58\,CFS$

BASIN B2b

$\Delta E = 665 - 560 = 105$ $\quad C = .46$

$L = 556'$ $\quad S = 18.8\%$

$A = 3.2$ $\quad CA = 1.472$

Assume trap channel w/ 2' wide base & ~~SECT.~~ $n = .035$, $z = 4$

~~then $V = 5.28\,FPS$~~

~~travel time $= \left(\frac{556}{5.28}\right)\left(\frac{1}{60}\right) = 1.76\,min$.~~

~~$T_T = 7.36 + 1.76 = 9.11\,min$.~~

let $Q_{Avg} = 2.5\,cfs/Ac$.

$\therefore Q_{Avg} = 2.58 + \left(\frac{2.5\,cfs}{Ac}\right)\left(\frac{3.2}{2}\right) = 6.58\,CFS$

$\Rightarrow$ Velocity in Channel $= 6.72\,FPS$ (see pg. 5)

$T_T = \frac{556}{6.72}\left(\frac{1}{60}\right) = 1.38\,min$.

$T_T = 7.36 + 1.38 = 8.74\,min$.

$I = 6.43$

$Q = 6.43(1.472 + .359) = 11.78\,CFS$

Ck Q_{avg} $\quad 2.58 + \frac{11.78 - 2.58}{2} = 7.18\,CFS$

$7.18 \simeq 6.58$ ✓

$Q = 11.78\,CFS$

$\boxed{\text{BASIN B-3}}$

$C = .46$, $A = 2.51$, $CA = 1.155$,

$L = 540'$, $\Delta E = 560 - 495 = 65'$, $S =$

$\Sigma CA\ (B1a, B1b, B2a, B2b) = 4.177$

$\Sigma CA = 5.33$

Let $Q_{ANY} = 2.5\,cfs/Acre$

$$26.87\ CFS + \left(\frac{2.5\,cfs}{Ac}\right)\left(\frac{2.51}{2}\right) = 30\ CFS$$

Ass. trap channel trans Velocity = 8.54 FPS

travel time = $\frac{540'}{8.54}\left(\frac{1}{60}\right) = 1.05$ MIN.

$T_T = 8.32 + 1.05 = 9.37$ MIN

$I = 6.15$ in/hr

$Q = 6.15\ (5.33) = 32.74$ CFS

ck. $26.87 + \frac{32.74 - 26.87}{2} = 29.80$

$29.80 \simeq 30$ CFS ✓

USE 32.74 CFS @ 9.37 min

Confluence of B1b and B2b

$$Q_{T1} = 15.\cancel{16}^{56} + \left(\frac{8.\cancel{68}^{32}}{\cancel{8.74}}\right) 11.\cancel{86}^{78} = \cancel{26.31}\ 26.77$$

$$Q_{T2} = 11.\cancel{86}^{78} + \left(\frac{6.\cancel{31}^{43}}{6.\cancel{46}_{63}}\right) 15.\cancel{16}^{56} = \cancel{26.37}\ 26.87$$

~~USE 26.37 CFS~~ ~~USE T_c = 8.68 min~~

USE 26.87 CFS @ $8.\cancel{68}^{32}$ min (because $Q_{T1} \simeq Q_{T2}$)

Confluence of A2 and B3

$$Q_{T1} = \cancel{31.96}^{32.74} + \left(\frac{\cancel{9.75}^{9.37}}{\cancel{10.59}\ 10.77}\right) \cancel{29.16}^{28.66} = \cancel{59.01}^{57.67}\ \text{CFS}$$

$$Q_{T2} = \cancel{29.16}^{28.66} + \left(\frac{\cancel{5.71}^{5.62}}{\cancel{5.99}\ 6.15}\right) \cancel{31.96}^{32.74} = \cancel{59.62}^{58.58}\ \text{CFS}$$

ESTIMATES OF VELOCITY IN A TRAP CHANNEL

BASIN # (TYPICAL)

WITH:

n = .035
b = base width
d = depth of flow
s = Slope

1.486ar^2/3s^1/2	A2
a	2.3744
p	6.6
r	0.358786
s	0.156
r^2/3	0.504921
s^1/2	0.394968
n	0.035
Q	20.10
Velocity	8.47

trap channel 4:1 side slopes	
b	2
d	0.56
a	2.3744
p	6.6

1.486ar^2/3s^1/2	B1b
a	1.3884
p	5.2
r	0.26618
s	0.196
r^2/3	0.413793
s^1/2	0.442719
n	0.035
Q	10.80
Velocity	7.78

trap channel 4:1 side slopes	
b	2
d	0.39
a	1.3884
p	5.2

1.486ar^2/3s^1/2	B2b
a	1.0044
p	4.6
r	0.220441
s	0.188
r^2/3	0.364917
s^1/2	0.43359
n	0.035
Q	6.75
Velocity	6.72

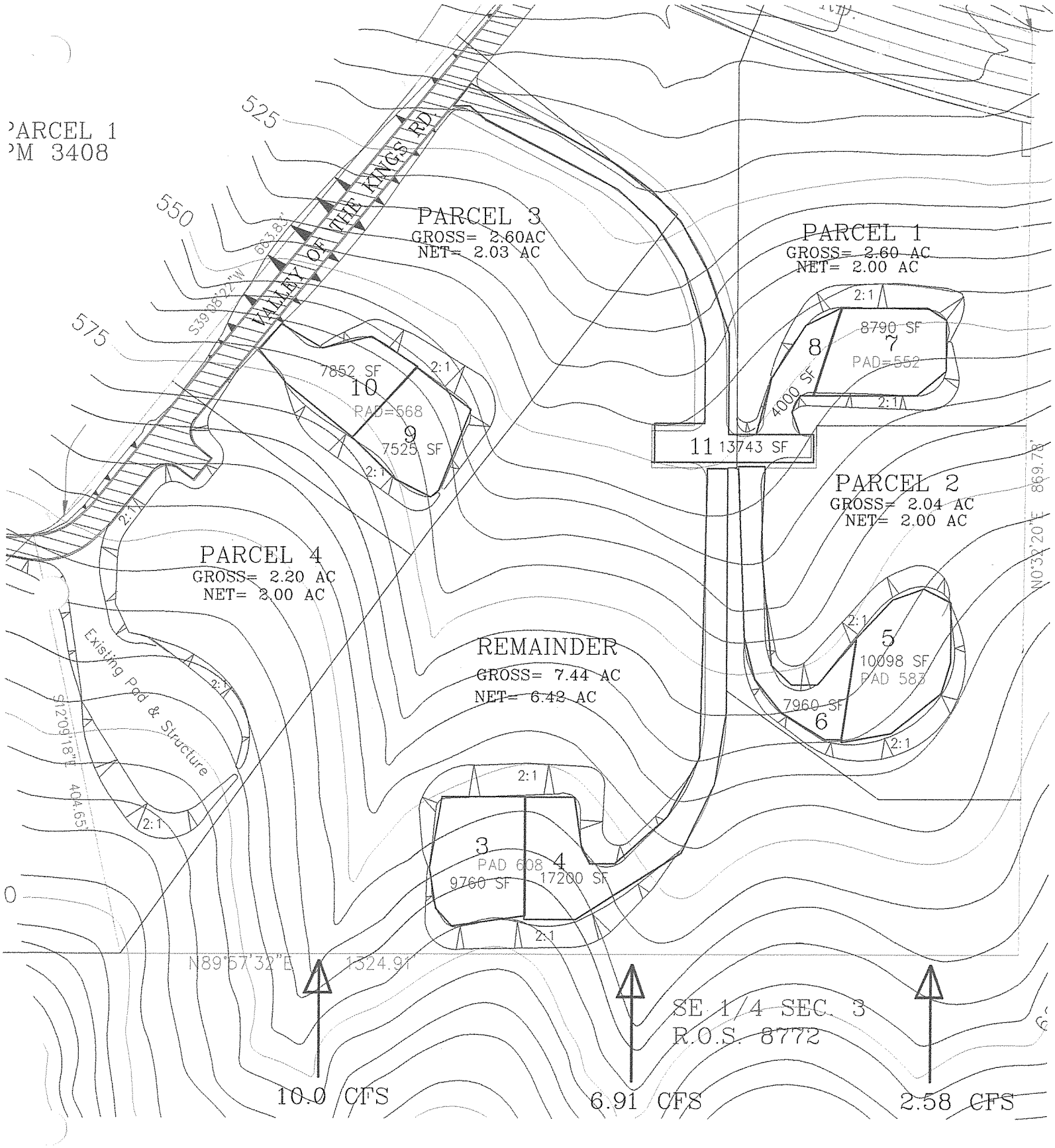
trap channel 4:1 side slopes	
b	2
d	0.31
a	1.0044
p	4.6

1.486ar^2/3s^1/2	B3
a	3.5136
p	7.9
r	0.442671
s	0.12
r^2/3	0.580837
s^1/2	0.34641
n	0.035
Q	30.02
Velocity	8.54

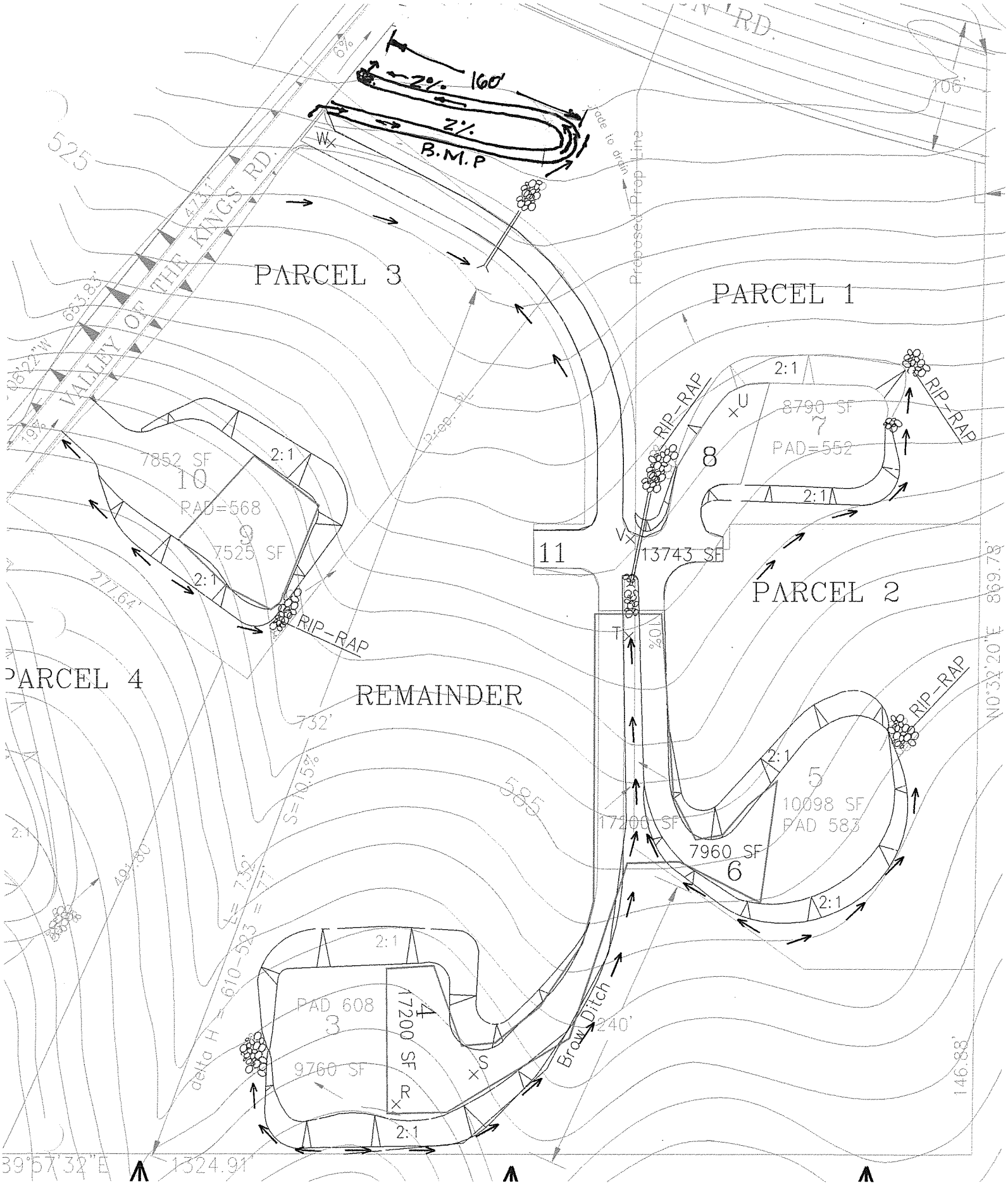
trap channel 4:1 side slopes	
b	2
d	0.72
a	3.5136
p	7.9

POST – DEVELOPMENT CALCULATIONS & EXHIBITS

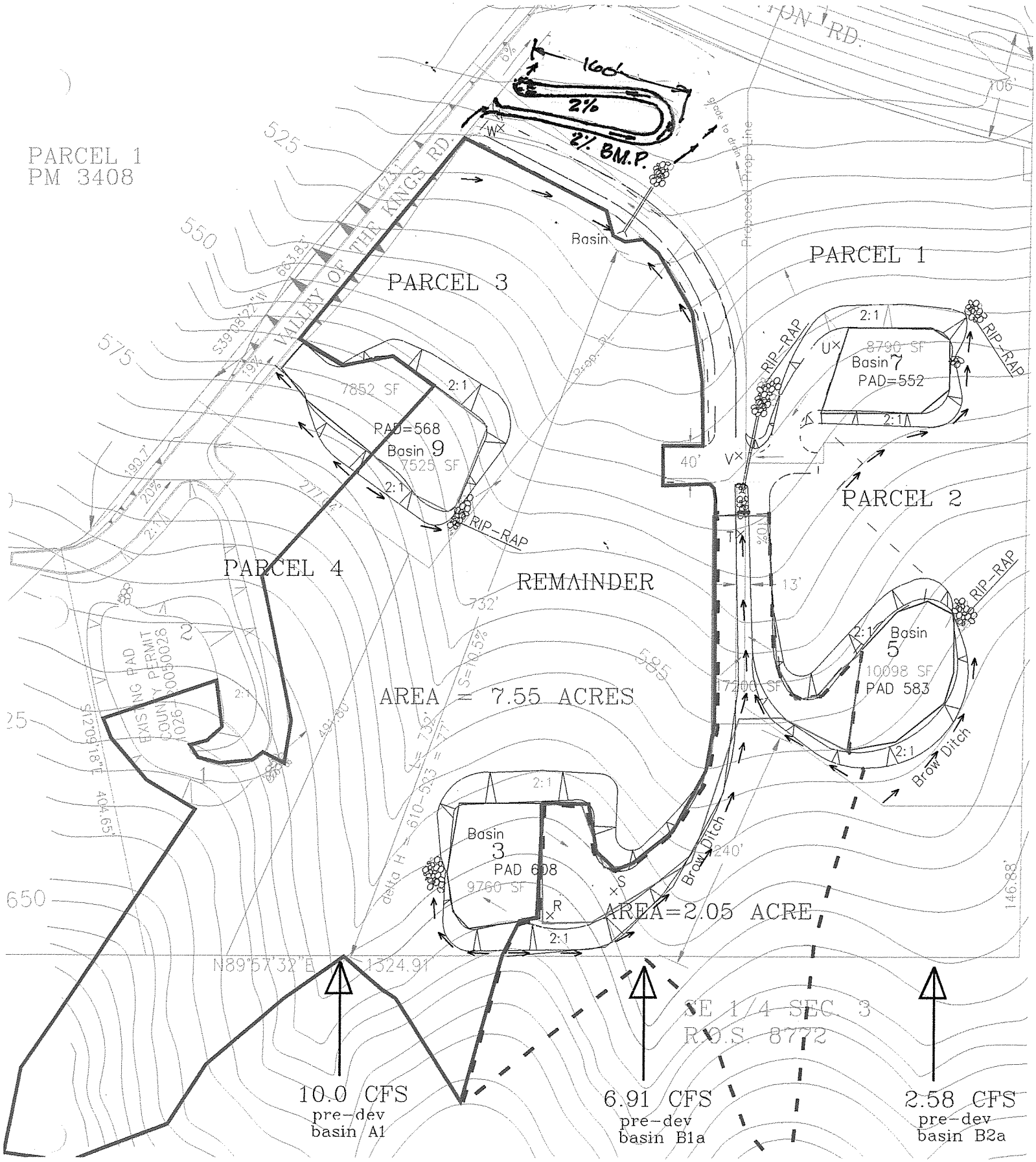
POST DEV EX 1


PARCEL 1
PM 3408
525
550
575
VALLEY OF THE KINGS RD.
S39°08'22"W 683.81'
PARCEL 3
GROSS= 2.60AC
NET= 2.03 AC
PARCEL 1
GROSS= 2.60 AC
NET= 2.00 AC
2:1
8790 SF
7
PAD=552
8
4000 SF
7852 SF
10
PAD=568
9
7525 SF
11 13743 SF
PARCEL 2
GROSS= 2.04 AC
NET= 2.00 AC
N0°32'20"E 869.78'
PARCEL 4
GROSS= 2.20 AC
NET= 2.00 AC
Existing Pad & Structure
S12°09'18"E 404.65'
REMAINDER
GROSS= 7.44 AC
NET= 6.42 AC
5
10098 SF
PAD 583
7960 SF
6
3
PAD 608
9760 SF
4
17200 SF
N89°57'32"E 1324.91'
SE 1/4 SEC. 3
R.O.S. 8772
10.0 CFS
6.91 CFS
2.58 CFS

POST-DEV EX 2


~2% 160'
2%
B.M.P
PARCEL 3
PARCEL 1
PARCEL 2
PARCEL 4
REMAINDER
VALLEY OF THE KINGS RD.
Proposed Prop. Line
RIP-RAP
2:1
8790 SF
7
PAD=552
8
11
13743 SF
7852 SF
10
PAD=568
9
7525 SF
10098 SF
PAD 583
5
7960 SF
6
17200 SF
PAD 608
3
9760 SF
4
17200 SF
Brow Ditch
240'
732'
585
S=10.5%
delta H = 610-583 = 27'
L = 732'
39°57'32"E
1324.91'
N0°32'20"E 869.78'
146.88'
525
683.83'
106'

POST-DEV EX 3


PARCEL 1
PM 3408
VALLEY OF THE KINGS RD
PARCEL 3
PARCEL 1
PARCEL 2
PARCEL 4
REMAINDER
AREA = 7.55 ACRES
AREA=2.05 ACRE
Basin
Basin 7
PAD=552
8790 SF
Basin 9
PAD=568
7525 SF
7852 SF
Basin 5
10098 SF
PAD 583
Basin 3
PAD 608
9760 SF
RIP-RAP
Brow Ditch
2:1
2%
2% BM.P.
100'
N89°57'32"E 1324.91'
SE 1/4 SEC. 3
R.O.S. 8772
10.0 CFS
pre-dev
basin A1
6.91 CFS
pre-dev
basin B1a
2.58 CFS
pre-dev
basin B2a

CONFLUENCE PRE-DEV

(@ N-W'ly corner of site where on-site flows join channel improvements adjacent to Gopher Canyon)

$Q_1 = 59.62$ CFS
$I = 5.62$ in/hr
$T_c = 10.77$ min

$Q_2 = 408$ CFS
$I = 2.84$ in/hr
$T_c = 29$ min

$$Q_{12} = 59.62 + \frac{10.77}{29} 408 = 211.14$$

$$Q_{21} = 408 + \frac{2.84}{5.62} 59.62 = 438.13$$

CONFLUENCE POST-DEV

$Q_1 = 63.93$
$I = 5.62$
$T_c = 10.77$

$Q_2 = 408$
$I_2 = 2.84$
$T_c = 29$

$$Q_{12} = 63.93 + \frac{10.77}{29}(408) = 215.45$$

$$Q_{21} = 408 + \frac{2.84}{5.62}(63.93) = 440.31$$

PRE/POST DEV ΔQ

$$\Delta Q = 440.31 - 438.13 = 2.17 \text{ CFS.}$$

POST-DEV CALC'S (Q_{100})
FOR PIPE UNDER RD.

$C = .41$ $A = 7.55\,AC$ $L = 732'$ $S = 10.5\%$

$\Sigma CA = \cancel{.35}\ .46(3.4) + .46(7.55) = \cancel{4.29}\ 5.03$

Assume SubArea (7.55AC) generates 2 cfs/AC

$Q_{AVG} = 7.6\,CFS + \left(\frac{2\,cfs}{Ac}\right)\left(\frac{7.55}{2}\right) = 15.15\,CFS$

Assume trap channel w/ $Z=4$, $S=10.5\%$, $n=.035$, $b=2'$
then $V = 6.96$ FPS

travel time $= \frac{732}{6.96} = 1.75$ MIN

$I = 7.44(3.5)(1.75 + 8.82)^{-.645}$

$I = 5.69$

$\therefore Q = 5.69\,(\cancel{4.29}\ 5.03) = \cancel{28.11}\ 28.63$ CFS

CK Q_{AVG} $7.6 + \left(\frac{28.63 - 7.6}{2}\right) = 18$ CFS

$15.15 \simeq 18$ ✓

~~$\therefore Q = 24.11$ CFS~~

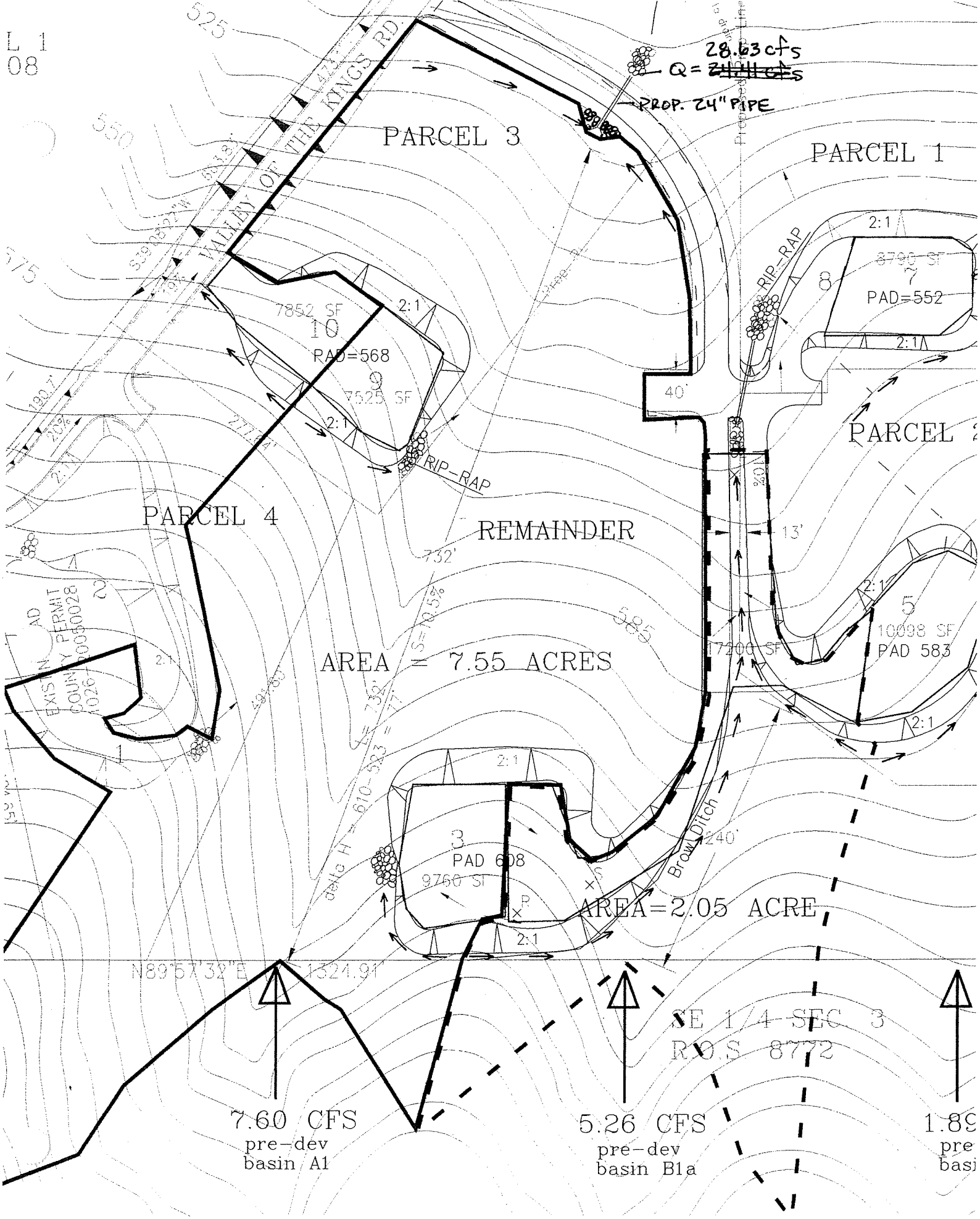
$\therefore Q = 28.63$ CFS

Assume Pipe has groove end & projects

24" pipe

~~$\frac{H_W}{D} = 1.8$~~ $\Rightarrow$ ~~$H_W = 2'(1.8) = 3.6'$~~

$\frac{H_W}{D} = 2.2$ $H_W = 2(2.2) = 4.4'$


L 1
08
28.63 cfs
Q = ~~24.11 cfs~~
PROP. 24" PIPE
PARCEL 3
PARCEL 1
VALLEY OF THE KINGS RD.
7852 SF
10
PAD=568
9
7525 SF
2:1
RIP-RAP
8
7
PAD=552
40'
PARCEL 4
REMAINDER
13'
732'
585
AREA = 7.55 ACRES
17200 SF
5
10098 SF
PAD 583
3
PAD 608
9760 SF
Brow Ditch
1240'
AREA=2.05 ACRE
N89°57'32"E 1321.91'
SE 1/4 SEC 3
R.O.S 8772
7.60 CFS
pre-dev
basin A1
5.26 CFS
pre-dev
basin B1a
1.89
pre
basi

POST-DEV CALC'S (Q100)
FOR PIPE UNDER DRIVEWAY

$C = .46$ $A = 2.05\ AC$ $L = 240'$ $S = 9.2\%$

$$\Sigma CA = (2.1AC)(.46) + 2.05(.46) = \cancel{1.68}\ 1.91$$

Assume sub-Area (2.05 ACRE) generates $\overset{2.5}{\cancel{2}}$ cfs/ACRE

$$Q_{AVG} = 6.91 + \left(\frac{2.05}{2}\right)\left(\frac{2.5\,cfs}{ACRE}\right) = 9.47\ cfs$$

flow travels through PCC ditch w/ $b = .25'$, $d = .43'$, $S = 9.2\%$
capacity $= 9.02$ cfs $V = 12.7$ FPS. or 20 sec.
$T_T = .33$ min. in brow ditch

total travel time
$7.4\,min + .33\,min = 7.73\ min.$
$I = 6.96\ in/hr$
$\therefore Q = 6.96(1.91) = 13.29\ CFS$

CK Q_{AVG}.

$$6.91 + \frac{13.29 - 6.91}{2} = 10.1\ cfs$$

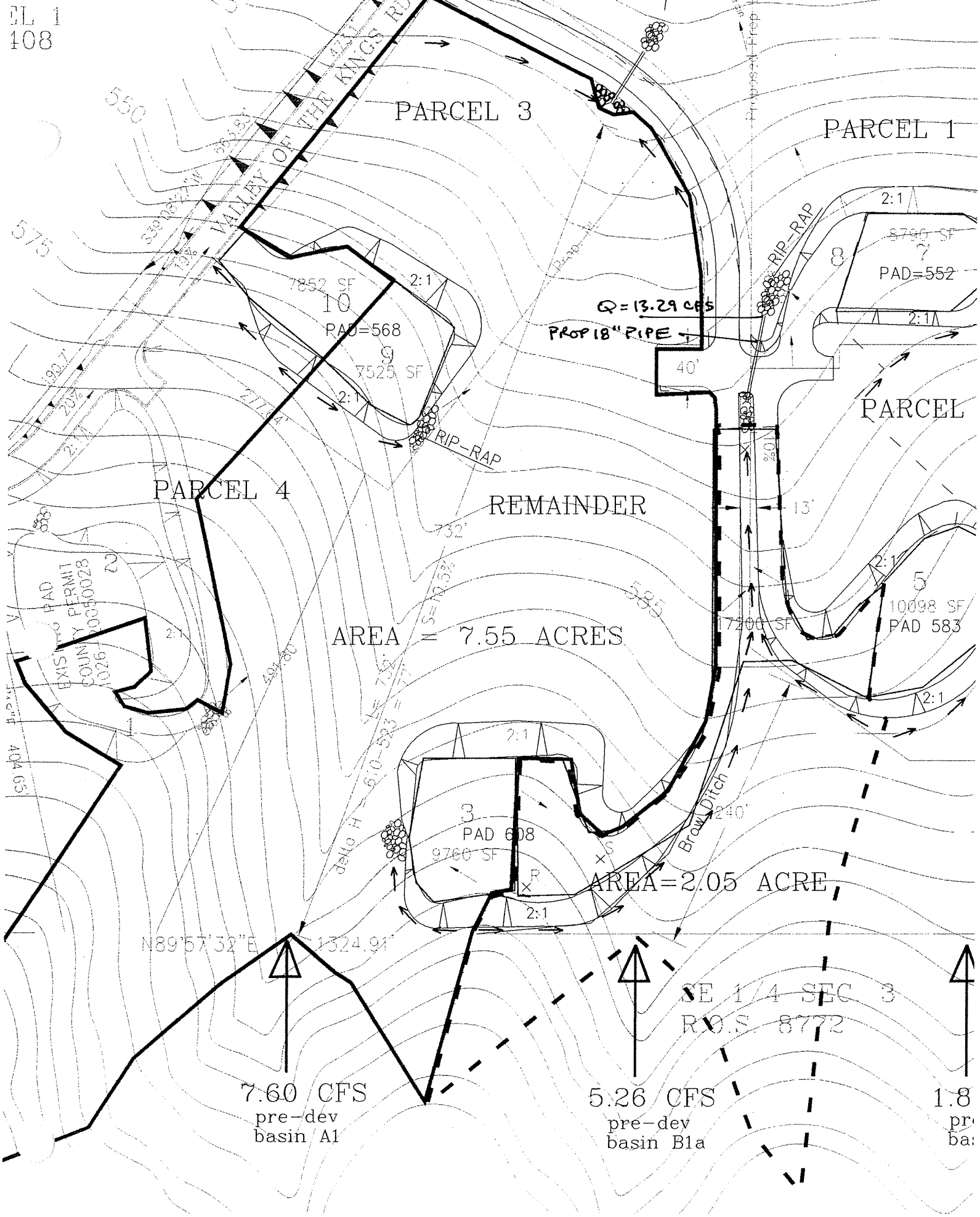
$9.47 \simeq 10.1$ ✓

Ignore travel time in ditch

$Q = \underline{13.29\ cfs}$ @ $T_T = 7.73\,min$

USING 18" PIPE w/grooved END + projecting

$\frac{H_W}{D} = 2.3$ $H_W = 2.3(1.5) = 3.45'$


PARCEL 3
PARCEL 1
PARCEL 4
REMAINDER
PARCEL
AREA = 7.55 ACRES
AREA=2.05 ACRE
VALLEY OF THE KINGS RD
Q = 13.29 CFS
PROP 18" PIPE
RIP-RAP
PAD=568
PAD=552
PAD 608
PAD 583
10098 SF
7200 SF
9760 SF
7852 SF
7525 SF
2:1
40'
13'
240'
Brown Ditch
N89°57'32"E 1324.91'
SE 1/4 SEC 3
R.O.S. 8772
7.60 CFS
pre-dev
basin A1
5.26 CFS
pre-dev
basin B1a

COUNTY HYDROLOGY & DRAINAGE DESIGN MANUAL FIGURES

COUNTY TOPO MAPS

EXHIBITS

COUNTY OF SAN DIEGO

TOPOGRAPHIC SURVEY

-LEGEND-

Horizontal Control Monument *Third Order*
Vertical Control Monument *Second Order or Better*

Horizontal Control Monument *Second Order or Better*
Vertical Control Monument *Third Order*

Horizontal Control Monument *Second Order or Better*

Horizontal Control Monument & Bench Mark *Second Order or Better*

Horizontal Control Monument *Third Order*

Horizontal Control Monument & Bench Mark *Third Order*

Bench Mark *Second Order or Better*

Vertical Control Monument *Third Order*

Found Section, Grant or Subdivision Corner.

Photograph, Nadir Point

Geographic Tick

BOUNDARIES IN ORDER OF PRECEDENCE

National

Name County

Name City (*Use at Border with County*)

Name within Bdry Reservation

Name within Bdry National, State or County Park

Name within Bdry Land Grant

T 2 S / R 3 E Township, Range, Section or Subdivision (*Name of Subdivision within Bdry.*)

PREPARED UNDER THE DIRECTION OF THE COUNTY ENGINEER OF THE COUNTY OF SAN DIEGO, CALIFORNIA.

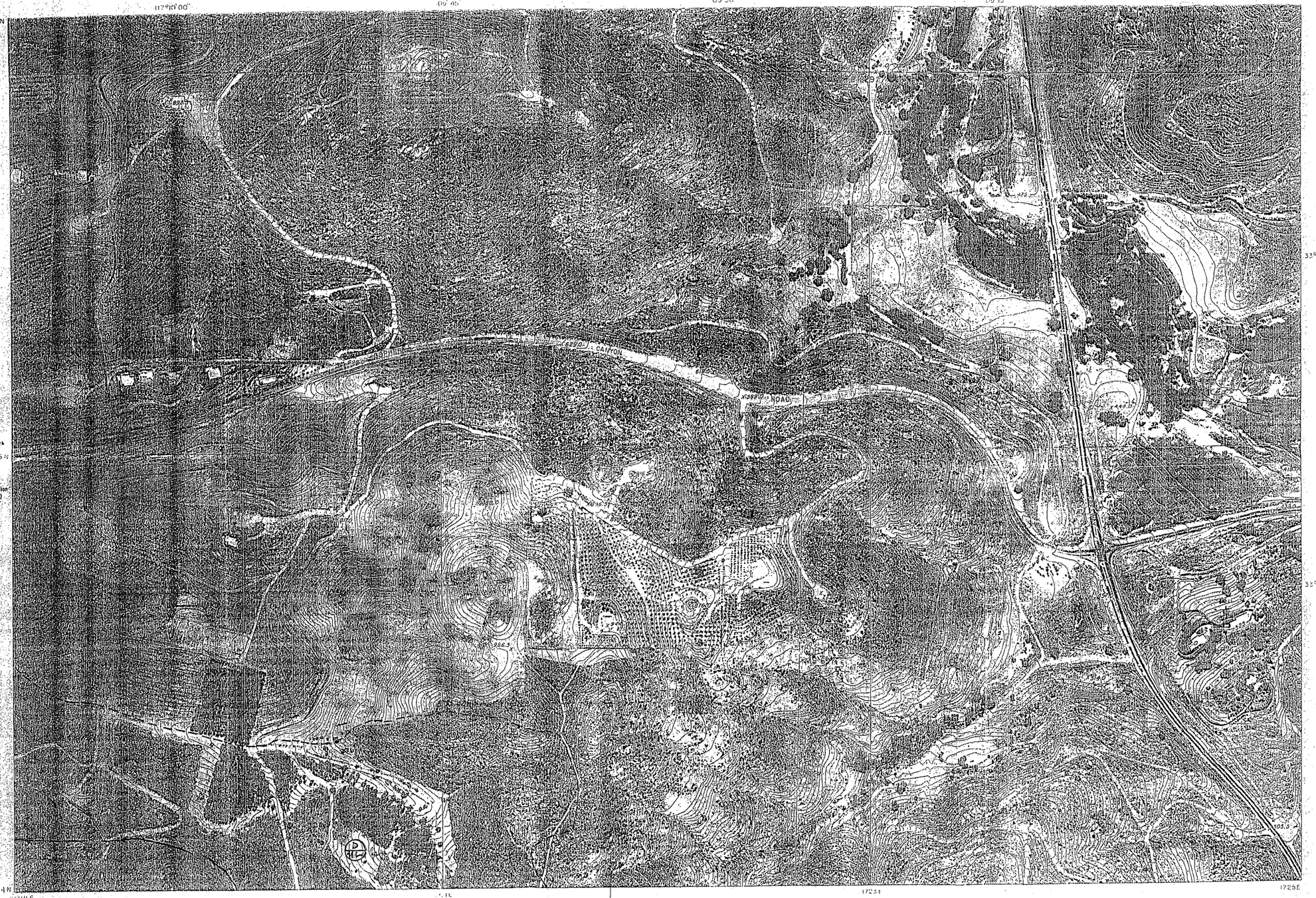
MAP CONTROL DATA FURNISHED BY THE COUNTY OF SAN DIEGO.

HORIZONTAL CONTROL IS BASED ON NORTH AMERICAN 1927 DATUM.

LAND LINES SHOWN ARE APPROXIMATE.

TOPOGRAPHY COMPILED BY PHOTOGRAMMETRIC METHODS FROM PHOTOGRAPHY DATED 7-22-73

ORTHOPHOTO IMAGE PREPARED FROM PHOTOGRAPHY DATED 7-22-73



SCALE 1:2400

200 0 200 400 600 800

CONTOUR INTERVAL 5 FEET

[illegible] & 6[illegible] [illegible] LEVEL DATUM OF [illegible]

TAN THOUSAND FEET CALIFORNIA RECTANGULAR GRID (ZONE VI)

THE LAST THREE DIGITS OF THE GRID NUMBERS ARE OMITTED

THE RECTANGULAR COORDINATE VALUES ARE SHOWN ON THE SOUTH AND WEST MARGINS

INDEX TO ADJOINING SHEETS

[illegible]-1713	[illegible]-1719	[illegible]
[illegible]-1713	394-1719	[illegible]-1725
[illegible]-1713	[illegible]-1719	[illegible]

SAN DIEGO COUNTY
CALIFORNIA

EDITION OF 1973

SHEET 394-1719

COUNTY OF SAN DIEGO — TOPOGRAPHIC SURVEY

-LEGEND-

- Horizontal Control Monument, *Third Order*; Vertical Control Monument, *Second Order or Better*
- Horizontal Control Monument, *Second Order or Better*; Vertical Control Monument, *Third Order*
- Horizontal Control Monument, *Second Order or Better*
- Horizontal Control Monument & Bench Mark, *Second Order or Better*
- Horizontal Control Monument, *Third Order*
- Horizontal Control Monument & Bench Mark, *Third Order*
- Bench Mark, *Second Order or Better*
- Vertical Control Monument, *Third Order*
- Property Corner Found & Coordinated (California Coordinate System, Zone 6)
- 16 21 / 9 16 T 10 S R 1 W — Found Section, Grant or Subdivision Corner
- Photograph, Nadir Point
- Geographic Tick

BOUNDARIES IN ORDER OF PRECEDENCE
(Land Lines Shown are Approximate)

- .025" — National
- Name .025" Name — County
- .015" — City
- Name within Bdry. .015" — Reservation
- Name within Bdry. .015" — National, State or County Park
- Name within Bdry. .015" — Land Grant
- T 2 S / T 2 S .015" — Township, Range or Section

PREPARED UNDER THE DIRECTION
of
DEPARTMENT OF PUBLIC WORKS
County of San Diego

CONTROL DATA FURNISHED
by
SURVEY SECTION
Department of Public Works

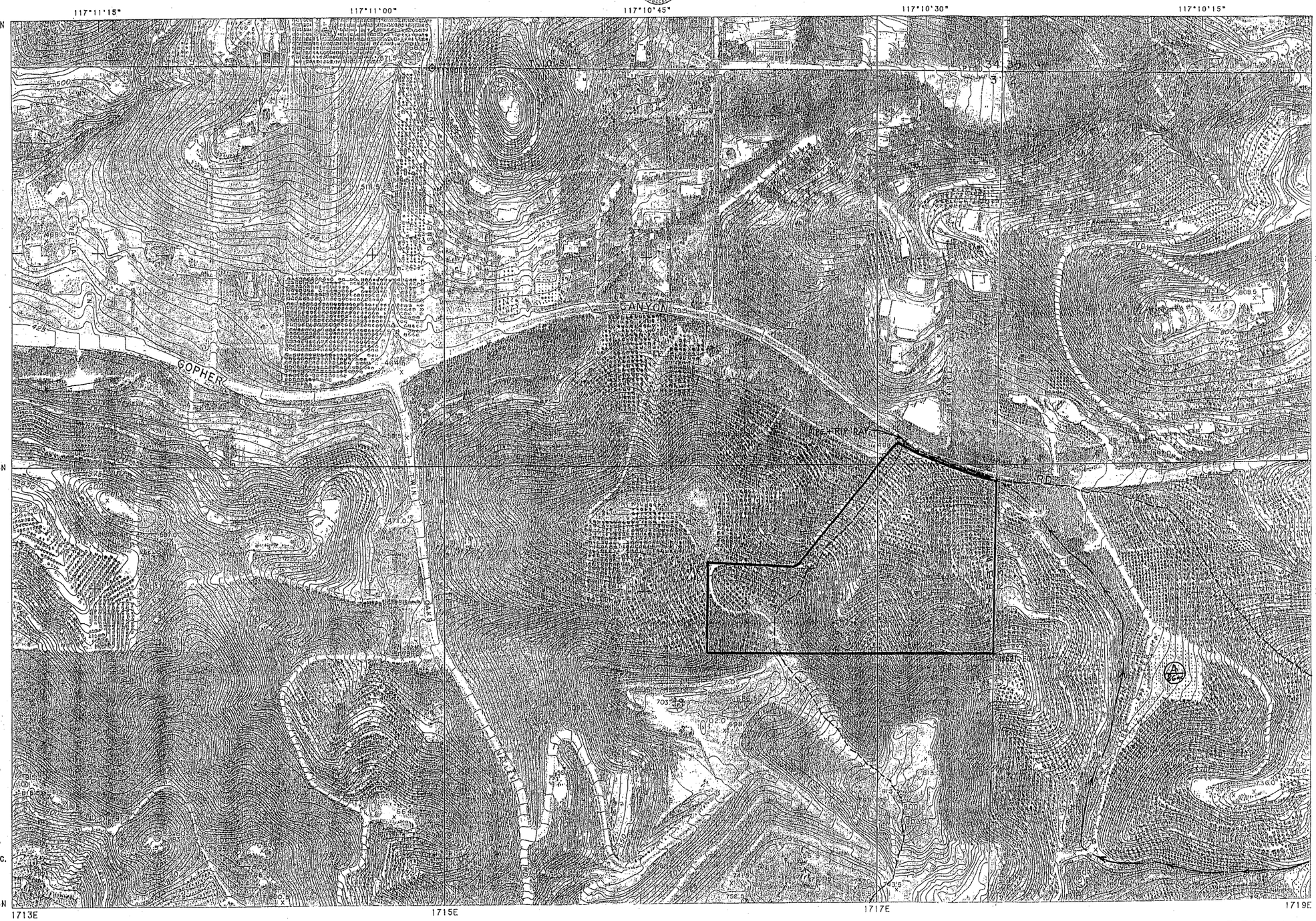
HORIZONTAL CONTROL BASED
on
NORTH AMERICAN 1927 DATUM

VERTICAL CONTROL BASED
on
U.S.C. & G.S. 1929 SEA LEVEL DATUM

ORTHOPHOTO IMAGE PREPARED
from
PHOTOGRAPHY DATED: APRIL 30, 1985
by
AMERICAN AERIAL SURVEYS, INC.

TOPOGRAPHY COMPILED
by
PHOTOGRAMMETRIC METHODS
from
PHOTOGRAPHY DATED: APRIL 30, 1985
by
BARTON WALTERS & ASSOCIATES, INC.

FINAL MAP PREPARED
by
MAPPING SECTION
Department of Public Works



This Map Complies with
NATIONAL MAP ACCURACY STANDARDS

200 0 200 400 600 800 1000 (Feet)
100 0 100 200 300 (Meters)

SCALE 1: 2400 (1" = 200')
INDEX CONTOUR INTERVAL: 25 FEET
CONTOUR INTERVAL: 5 FEET
TWO THOUSAND FOOT CALIFORNIA RECTANGULAR GRID (ZONE VI)
THE LAST THREE DIGITS OF THE GRID NUMBERS ARE OMITTED
THE RECTANGULAR COORDINATE VALUES ARE SHOWN ON THE SOUTH AND WEST MARGINS
THE GEOGRAPHIC VALUES ARE SHOWN ON THE NORTH AND EAST MARGINS

INDEX TO ADJOINING SHEETS

398-1707	398-1713	398-1719
394-1707	394-1713	394-1719
390-1707	390-1713	390-1719

SAN DIEGO COUNTY
CALIFORNIA

SHEET NO. 394-1713

COUNTY OF SAN DIEGO — TOPOGRAPHIC SURVEY

-LEGEND-

- Horizontal Control Monument, *Third Order*; Vertical Control Monument, *Second Order or Better*
- Horizontal Control Monument, *Second Order or Better*; Vertical Control Monument, *Third Order*
- Horizontal Control Monument, *Second Order or Better*
- Horizontal Control Monument & Bench Mark, *Second Order or Better*
- Horizontal Control Monument, *Third Order*
- Horizontal Control Monument & Bench Mark, *Third Order*
- Bench Mark, *Second Order or Better*
- Vertical Control Monument, *Third Order*
- Property Corner Found & Coordinated (California Coordinate System, Zone 6)
- 30 31 / 19 20 / 29 28 / 32 33 / 5 4 / 8 9 — T 10 S, T 11 S, R 2 W, R 1 W — Found Section, Grant or Subdivision Corner
- Photograph, Nadir Point
- Geographic Tick

BOUNDARIES IN ORDER OF PRECEDENCE
(Land Lines Shown are Approximate)

- .025" National
- Name .025" County
- .015" City
- Name within Bdry. .015" Reservation
- Name within Bdry. .015" National, State or County Park
- Name within Bdry. .015" Land Grant
- T 2 S .015" Township, Range or Section

PREPARED UNDER THE DIRECTION
of
DEPARTMENT OF PUBLIC WORKS
County of San Diego

CONTROL DATA FURNISHED
by
SURVEY SECTION
Department of Public Works

HORIZONTAL CONTROL BASED
on
NORTH AMERICAN 1927 DATUM

VERTICAL CONTROL BASED
on
U.S.C. & G.S. 1929 SEA LEVEL DATUM

ORTHOPHOTO IMAGE PREPARED
from
PHOTOGRAPHY DATED: APRIL 30,1985
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AMERICAN AERIAL SURVEYS, INC.

TOPOGRAPHY COMPILED
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PHOTOGRAMMETRIC METHODS
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PHOTOGRAPHY DATED: APRIL 30,1985
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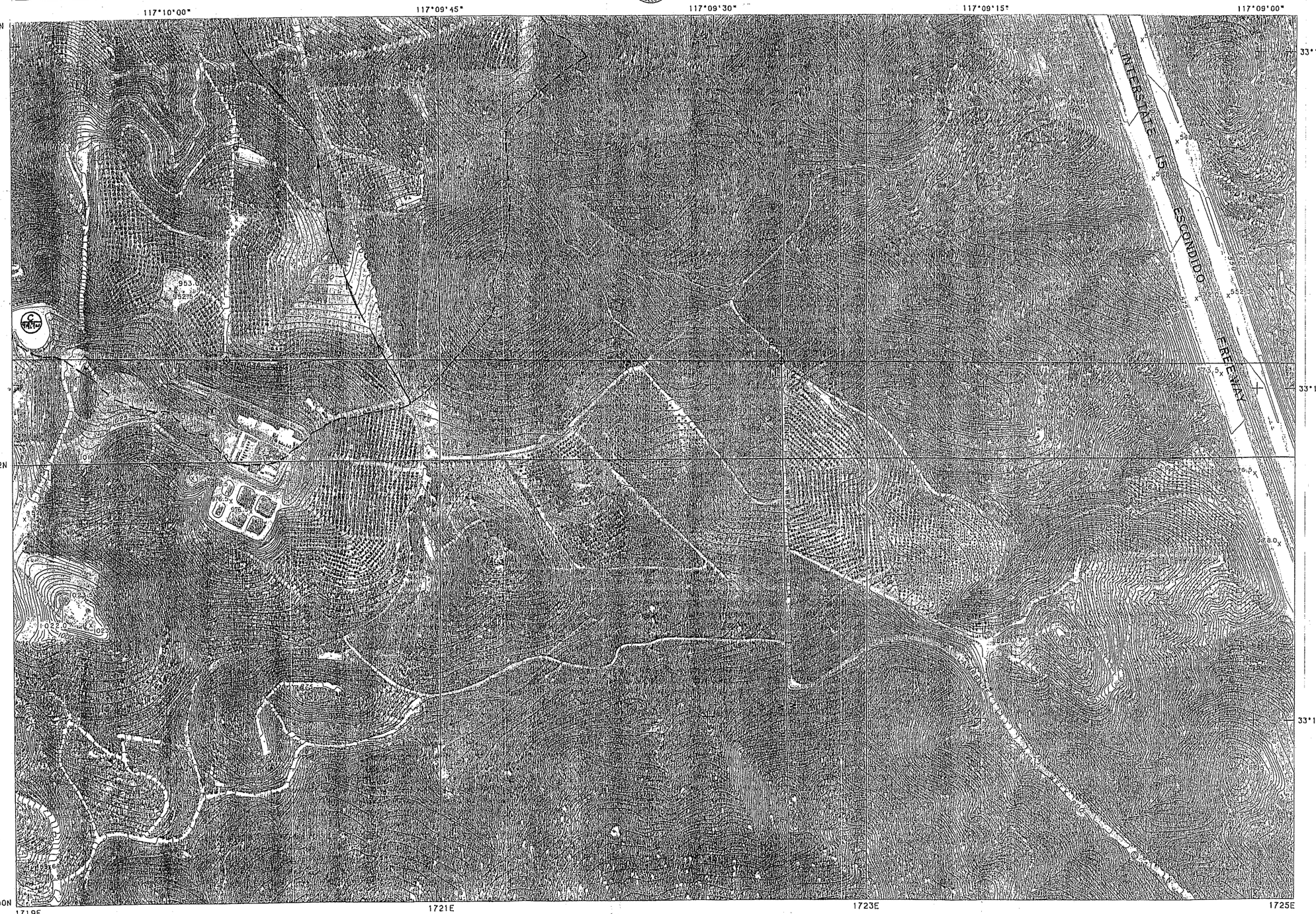
Department of Public Works



This Map Complies with
NATIONAL MAP ACCURACY STANDARDS

200 0 200 400 600 800 1000 (Feet)
100 0 100 200 300 (Meters)

SCALE 1: 2400 (1" = 200')
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INDEX TO ADJOINING SHEETS

394-1713	394-1719	394-1725
390-1713	390-1719	390-1725
386-1713	386-1719	386-1725

SAN DIEGO COUNTY
CALIFORNIA

SHEET NO. 390-1719

COUNTY OF SAN DIEGO — TOPOGRAPHIC SURVEY

-LEGEND-

- Horizontal Control Monument *Third Order* / Vertical Control Monument *Second Order or Better*
- Horizontal Control Monument *Second Order or Better* / Vertical Control Monument *Third Order*
- Horizontal Control Monument *Second Order or Better*
- Horizontal Control Monument & Bench Mark *Second Order or Better*
- Horizontal Control Monument *Third Order*
- Horizontal Control Monument & Bench Mark *Third Order*
- Bench Mark *Second Order or Better*
- Vertical Control Monument *Third Order*
- Property Corner Found & Coordinated (California Coordinate System, Zone II)
- 36 31 T19S / 1 6 T19S R1W / R2W — Found Section, Grant or Subdivision Corner
- Photograph, Nadir Point
- Geographic Tick

BOUNDARIES IN ORDER OF PRECEDENCE
(Land Lines Shown are Approximate)

- .025" — National
- Name .025" / Name .025" — County
- .015" — City
- Name within Bdry. .015" — Reservation
- Name within Bdry. .015" — National, State or County Park
- Name within Bdry. .015" — Land Grant
- T19S / T19S .015" — Township, Range or Section

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County of San Diego

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390-1707	390-1713	390-1719
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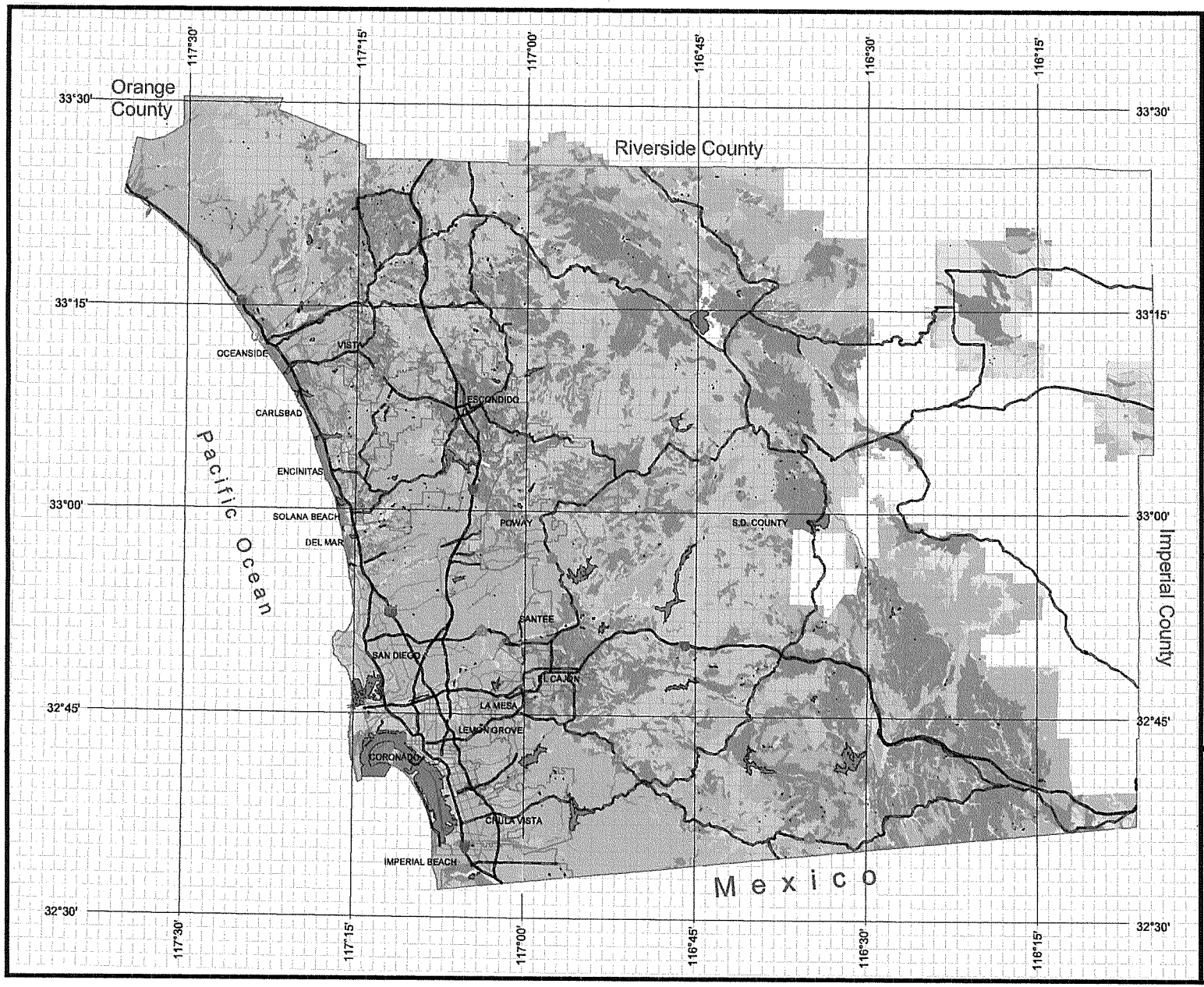
SAN DIEGO COUNTY
CALIFORNIA

SHEET NO. 390-1713



County of San Diego Hydrology Manual

Soil Hydrologic Groups

Legend

Soil Groups

- Group A
- Group B
- Group C
- Group D
- Undetermined
- Data Unavailable

DPW GIS
Department of Public Works
Geographic Information Services

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N
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3 0 3 Miles

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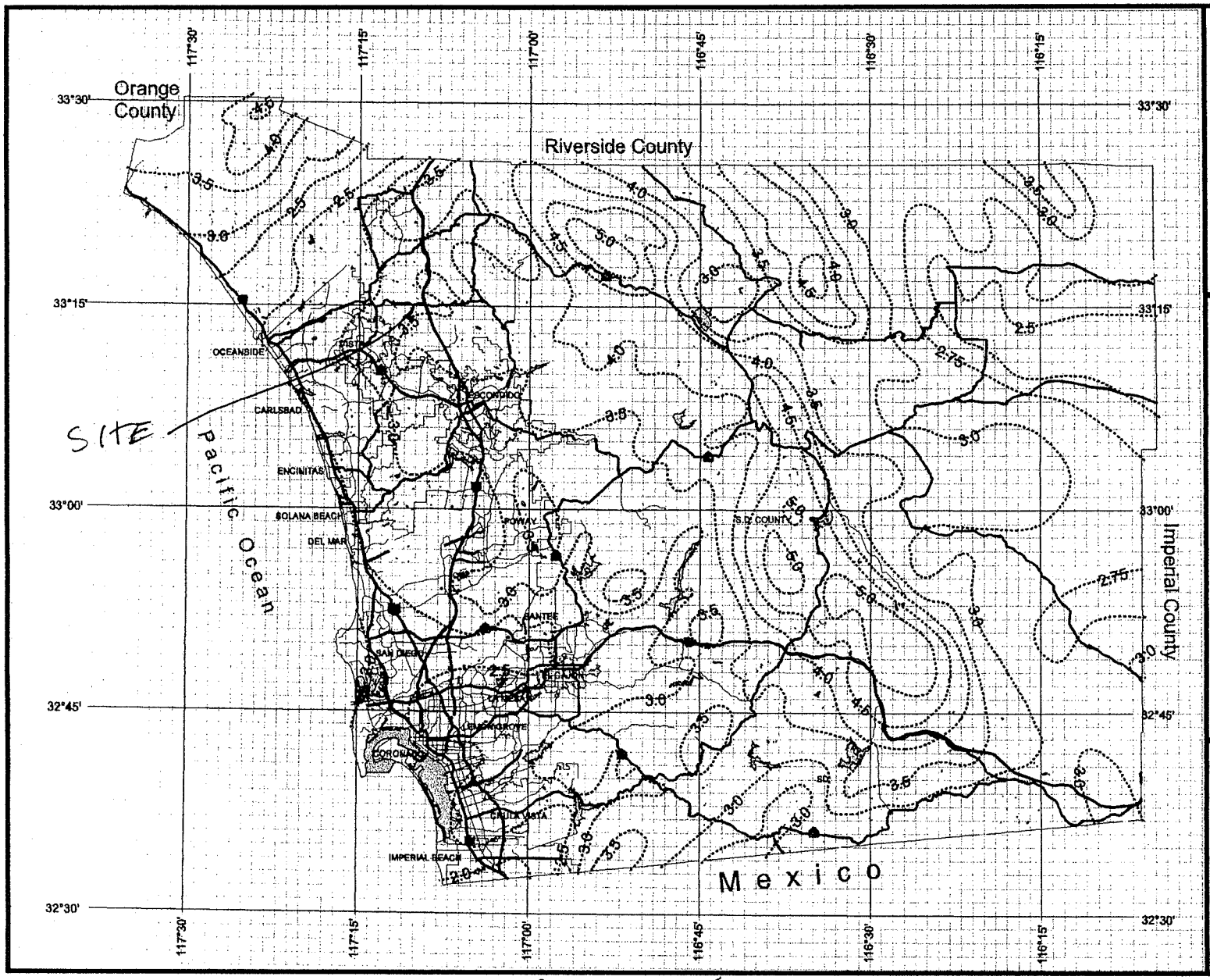

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

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3 0 3 Miles

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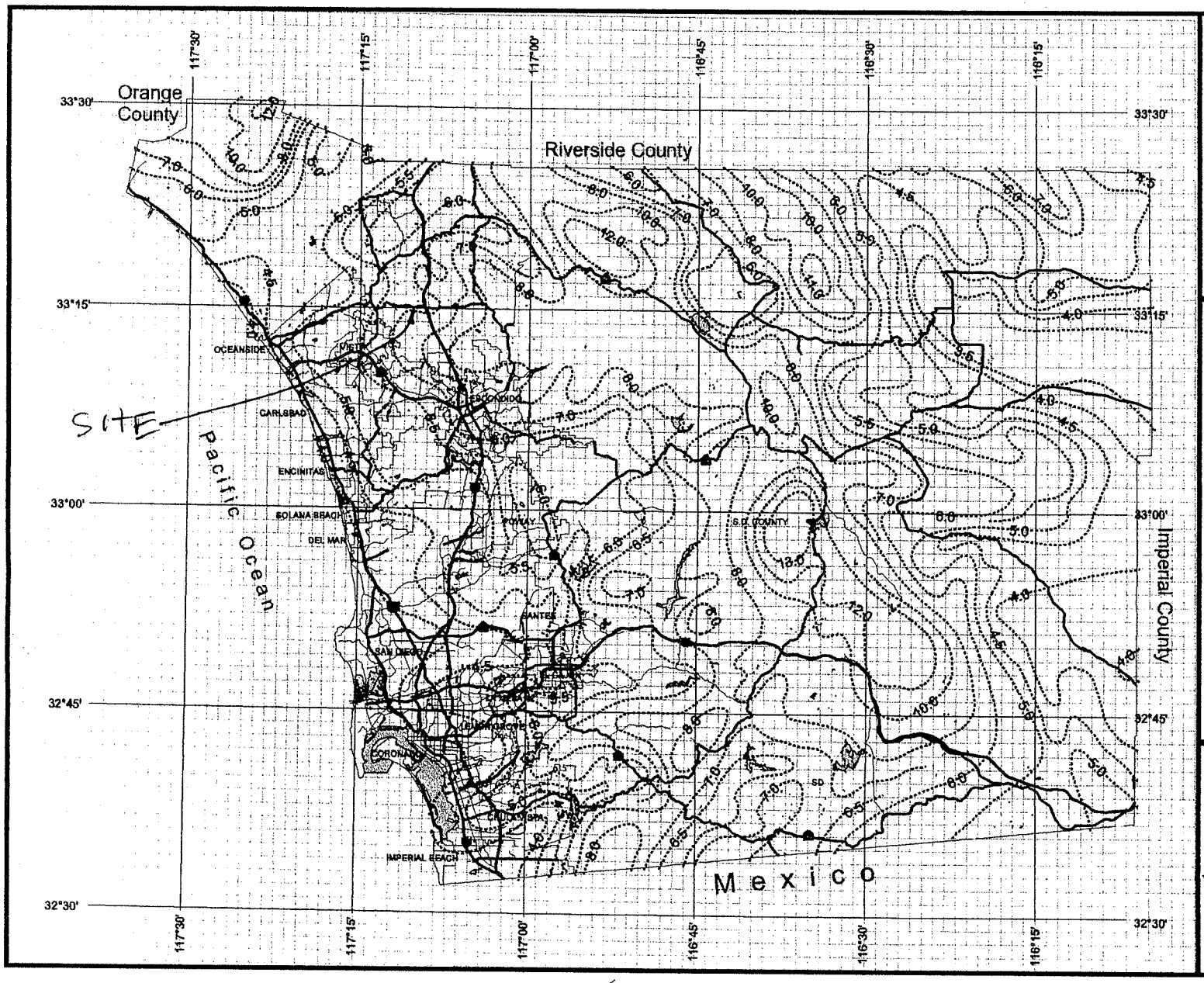

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)

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N W E S

3 0 3 Miles

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Note that the Initial Time of Concentration should be reflective of the general land-use at the upstream end of a drainage basin. A single lot with an area of two or less acres does not have a significant effect where the drainage basin area is 20 to 600 acres.

Table 3-2 provides limits of the length (Maximum Length (L_M)) of sheet flow to be used in hydrology studies. Initial T_i values based on average C values for the Land Use Element are also included. These values can be used in planning and design applications as described below. Exceptions may be approved by the "Regulating Agency" when submitted with a detailed study.

POST DEV. Ti

Table 3-2

MAXIMUM OVERLAND FLOW LENGTH (L_M) & INITIAL TIME OF CONCENTRATION (T_i)

Element*	DU/	.5%		1%		2%		3%		5%		10%	
	Acre	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i
Natural		50	13.2	70	12.5	85	10.9	100	10.3	100	8.7	100	6.9
LDR	1	50	12.2	70	11.5	85	10.0	100	9.5	100	8.0	100	6.4
LDR	2	50	11.3	70	10.5	85	9.2	100	8.8	100	7.4	100	5.8
LDR	2.9	50	10.7	70	10.0	85	8.8	95	8.1	100	7.0	100	5.6
MDR	4.3	50	10.2	70	9.6	80	8.1	95	7.8	100	6.7	100	5.3
MDR	7.3	50	9.2	65	8.4	80	7.4	95	7.0	100	6.0	100	4.8
MDR	10.9	50	8.7	65	7.9	80	6.9	90	6.4	100	5.7	100	4.5
MDR	14.5	50	8.2	65	7.4	80	6.5	90	6.0	100	5.4	100	4.3
HDR	24	50	6.7	65	6.1	75	5.1	90	4.9	95	4.3	100	3.5
HDR	43	50	5.3	65	4.7	75	4.0	85	3.8	95	3.4	100	2.7
N. Com		50	5.3	60	4.5	75	4.0	85	3.8	95	3.4	100	2.7
G. Com		50	4.7	60	4.1	75	3.6	85	3.4	90	2.9	100	2.4
O.P./Com		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
Limited I.		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
General I.		50	3.7	60	3.2	70	2.7	80	2.6	90	2.3	100	1.9

*See Table 3-1 for more detailed description

TRAN TPM 20835

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

Land Use		Runoff Coefficient "C"				
			Soil Type			
NRCS Elements	County Elements	% IMPER.	A	B	C	D
Undisturbed Natural Terrain (Natural)	Permanent Open Space	0*	0.20	0.25	0.30	0.35
Low Density Residential (LDR)	Residential, 1.0 DU/A or less	10	0.27	0.32	0.36	0.41
Low Density Residential (LDR)	Residential, 2.0 DU/A or less	20	0.34	0.38	0.42	0.46 PRE-DEV.
Low Density Residential (LDR)	Residential, 2.9 DU/A or less	25	0.38	0.41	0.45	0.49
Medium Density Residential (MDR)	Residential, 4.3 DU/A or less	30	0.41	0.45	0.48	0.52
Medium Density Residential (MDR)	Residential, 7.3 DU/A or less	40	0.48	0.51	0.54	0.57
Medium Density Residential (MDR)	Residential, 10.9 DU/A or less	45	0.52	0.54	0.57	0.60
Medium Density Residential (MDR)	Residential, 14.5 DU/A or less	50	0.55	0.58	0.60	0.63
High Density Residential (HDR)	Residential, 24.0 DU/A or less	65	0.66	0.67	0.69	0.71
High Density Residential (HDR)	Residential, 43.0 DU/A or less	80	0.76	0.77	0.78	0.79
Commercial/Industrial (N. Com)	Neighborhood Commercial	80	0.76	0.77	0.78	0.79 POST-DEV USE .8 (80% IMPER ASSUMED FOR DEVELOPED PORTIONS OF SITE
Commercial/Industrial (G. Com)	General Commercial	85	0.80	0.80	0.81	0.82
Commercial/Industrial (O.P. Com)	Office Professional/Commercial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (Limited I.)	Limited Industrial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (General I.)	General Industrial	95	0.87	0.87	0.87	0.87

*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, Cp, for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).
DU/A = dwelling units per acre
NRCS = National Resources Conservation Service

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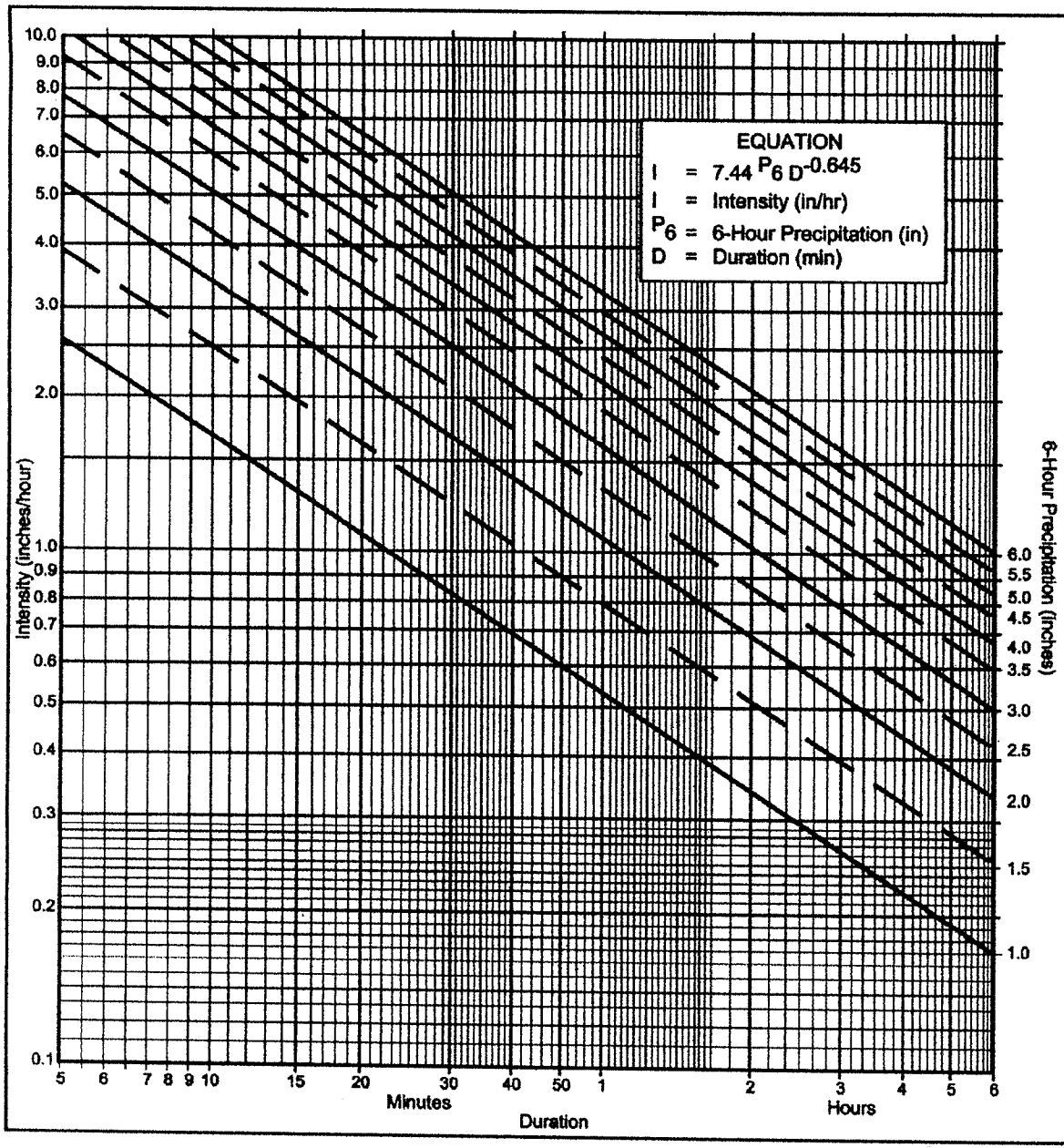

Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included 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 applicaple 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:

(a) Selected frequency 100 year

(b) P_6 = 3.5 in., P_{24} = 6.5, $\frac{P_6}{P_{24}}$ = 54 %(2)

(c) Adjusted P_6(2) = N/A in.

(d) t_x = * min. — SEE CALC CHARTS IN REPORT

(e) I = * in./hr. — SEE CALC CHARTS IN REPORT

* VARIES

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template

FIGURE

3-1

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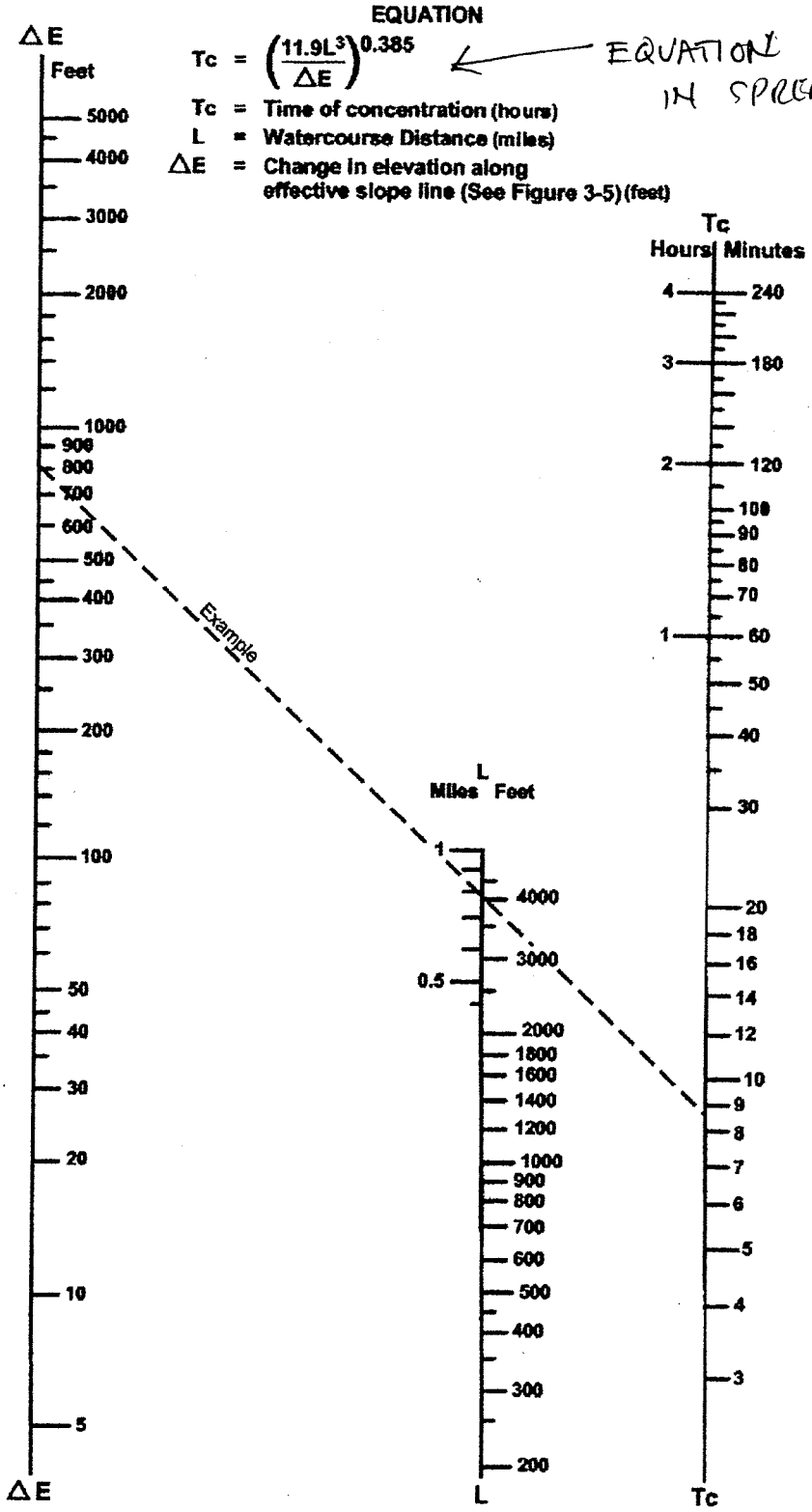


SOURCE: California Division of Highways (1941) and Kirpich (1940)

FIGURE

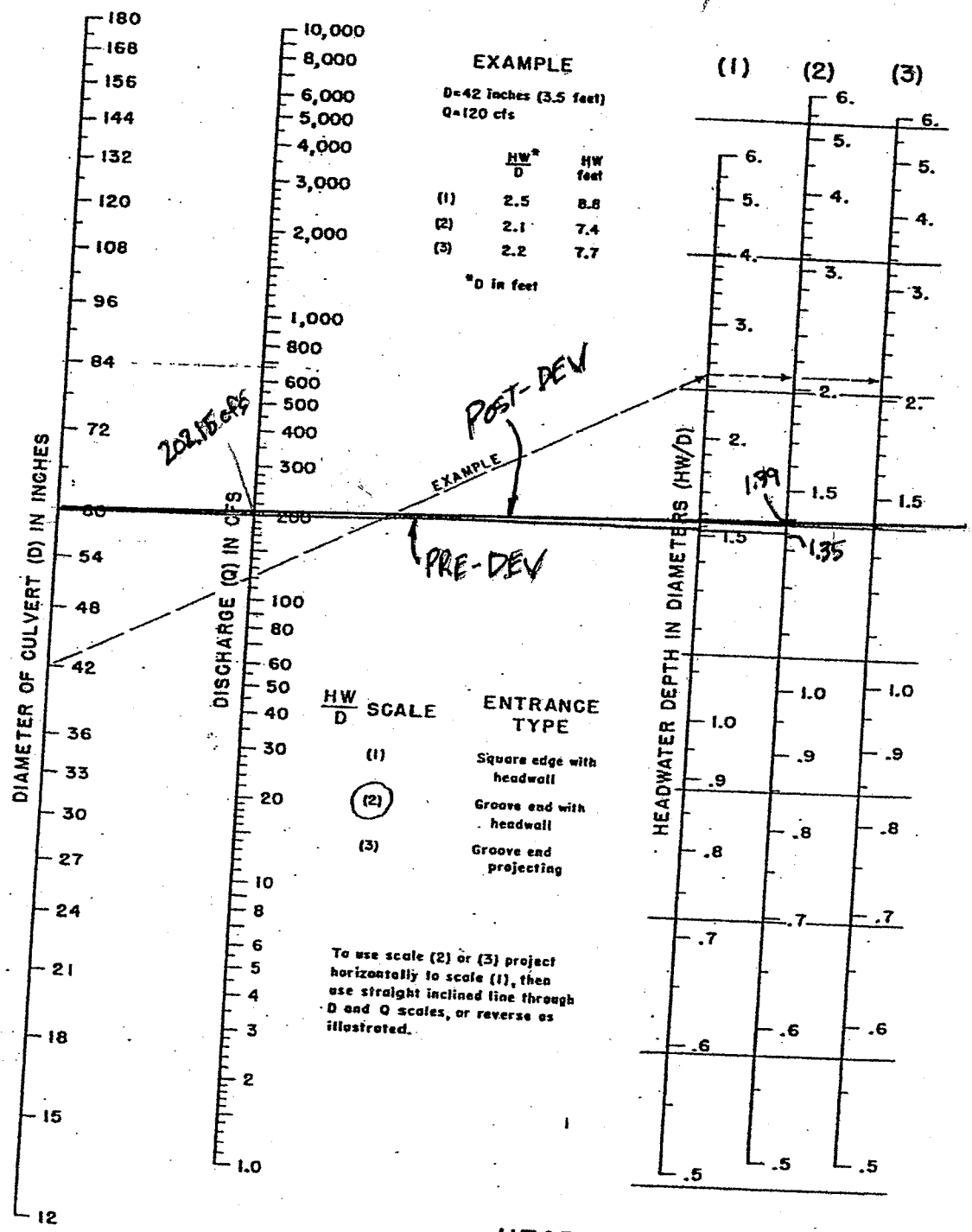
3-4

Nomograph for Determination of
Time of Concentration (Tc) or Travel Time (Tt) for Natural Watersheds

TRAN TPM 20835

USED IN ESTIMATING PIPE SIZES & HW DEPTH TO CONVEY POST-DEV Q's.

60" CMP - Valley of the Kings Road



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

$\frac{H_w}{D} = 1.35 \longrightarrow H_w = 1.35(5') = 6.75'$

POST $\frac{H_w}{D} = 1.39$

$1.4(5) = 6.9'$

$1.39(5) = 6.9'$

TRAN 1PM