DESIGN REPORT

FOR

AMOLE ARROYO

INCLUDING REVISIONS TO

THE AMOLE-HUBBELL

DRAINAGE MANAGEMENT PLAN

ALBUQUERQUE, NEW MEXICO

FEBRUARY 2003

Prepared by:
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Fred C. Arfman 02.20.03

Fred C. Arfman, PE **Date**

TABLE OF CONTENTS

I. INTRODUCTION

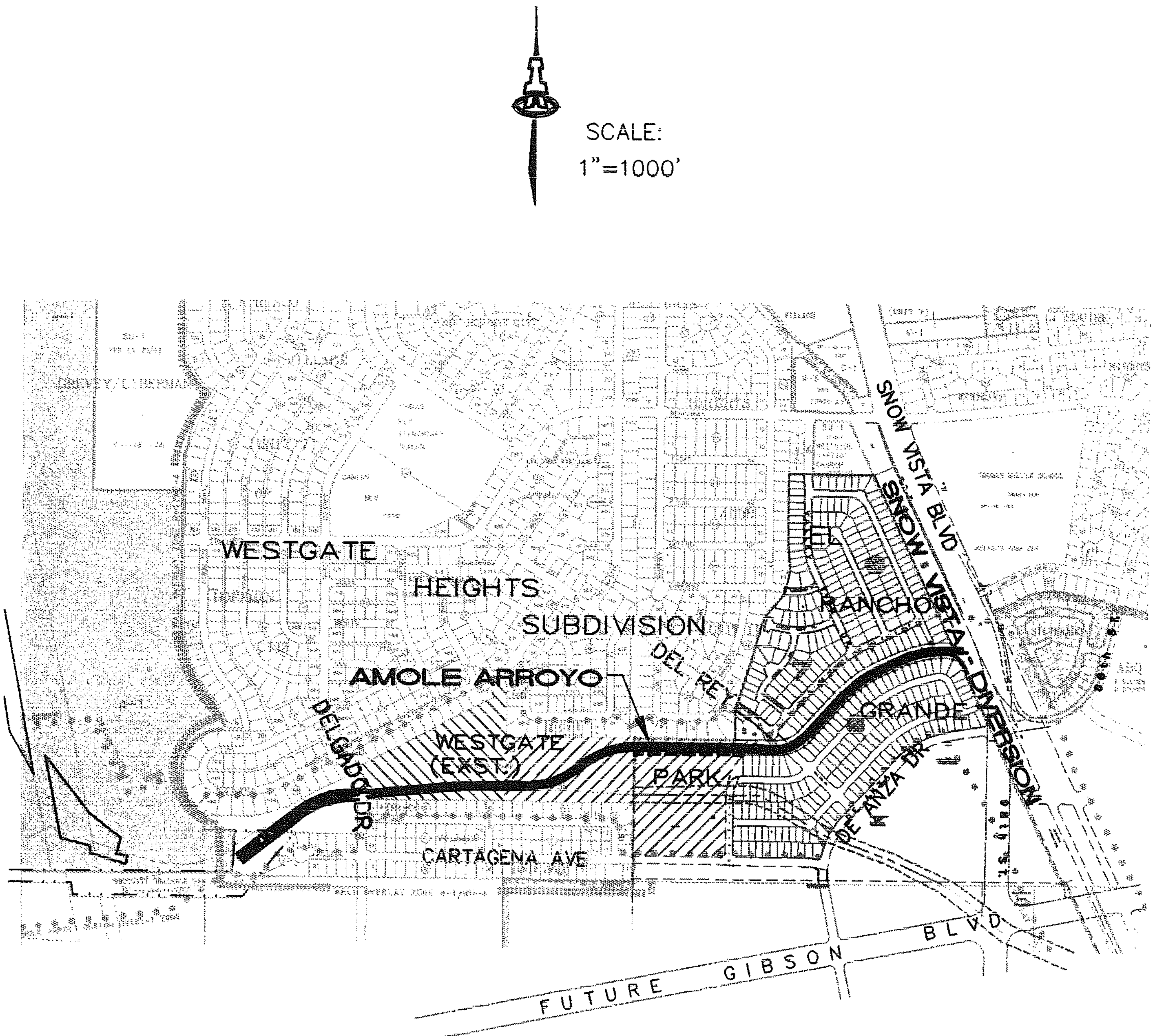
The Amole Arroyo will be improved between the southwest corner of Westgate Heights and the Snow Vista Channel (see Location Map on page 2). The easterly portion of the Amole Arroyo will be realigned through the existing 100-foot City of Albuquerque right-of-way through the proposed El Rancho Grande Subdivision.

These improvements are in accordance with the *Amole-Hubbell Drainage Management Plan, Volume I* (DMP), by Leedshill-Herkenhoff, Inc., Alternative 2, with the following exceptions:

- The proposed El Rancho Grande, Units 6 and 7 and an offsite portion of Westgate Heights is included in the Amole Basin instead of the Snow Vista Basin.
- A 70-acre portion of DMP Basin 60104 is proposed to be included in the Amole Arroyo Basin instead of the Sacate Blanco Basin. This change reflects a revision to the proposed Gibson Blvd alignment.

In addition to the channel improvements, a bridge crossing structure at the Del Ray Road extension will be constructed as part of this project.

LOCATION MAP



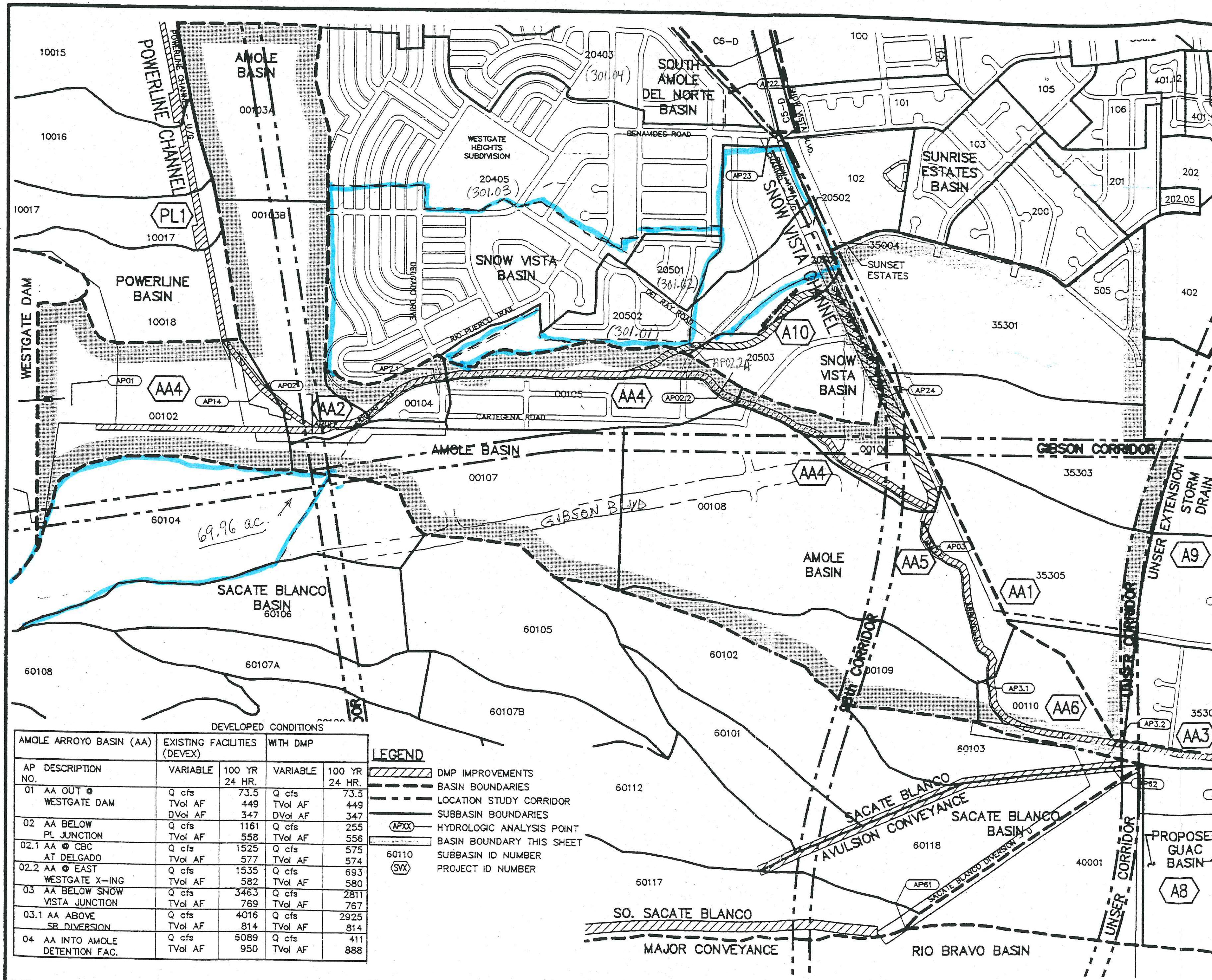
1241VIC.DWGanw 2/10/03

II. BASIN REVISIONS

The proposed El Rancho Grande subdivision development, Units 6 and 7 and a portion of Westgate Heights will drain to the realigned Amole Arroyo instead of the Snow Vista Channel. Therefore, the AHYMO runs from the DMP were modified to include these areas in the Amole Arroyo basin and exclude them from the Snow Vista basin. Also, a 70-acre portion of DMP Basin 60104 is proposed to drain to the Amole Arroyo because of revisions to the proposed location of Gibson Boulevard. See Appendix B for an enlarged basin map.

The DMP basin map on page 4 shows the revised limits of the basins. The El Rancho Grande subdivisions on-site and off-site basins are shown on pages 5-6. The table below lists the changes.

Area Changes to the Amole Arroyo Basins		
El Rancho Grande Units 6 & 7	Basins 210-280 & 600	+ 32.1 ac
El Rancho Grande Offsite	Basins A-L	+120.9 ac.
DMP	Portion of Basin 20405 added to Basin 00105	+ 5.8 ac.
	Total Excluding Portion of Basin 60104	+158.8 ac.
DMP	Portion of Basin 60104	+70.0 ac.
	Total Including Portion of Basin 60104	+228.8 ac.
Area Changes to the Snow Vista Basins		
DMP	Basin 20501 (=301.02)	- 25.0 ac.
DMP	Basin 20502 (=301.01)	- 44.2 ac.
DMP	Basin 20405 (=301.03)	- 91.1 ac.
El Rancho Grande Unit 6	Basin 500	+ 1.4 ac.
	Total	-158.8 ac.



DEVELOPED CONDITIONS

AMOLE ARROYO BASIN (AA)		EXISTING FACILITIES (DEVEX)		WITH DMP	
AP NO.	DESCRIPTION	VARIABLE	100 YR 24 HR.	VARIABLE	100 YR 24 HR.
01	AA OUT @ WESTGATE DAM	Q cfs TVol AF DVol AF	73.5 449 347	Q cfs TVol AF DVol AF	73.5 449 347
02	AA BELOW PL JUNCTION	Q cfs TVol AF	1161 558	Q cfs TVol AF	255 556
02.1	AA @ CBC AT DELGADO	Q cfs TVol AF	1525 577	Q cfs TVol AF	575 574
02.2	AA @ EAST WESTGATE X-ING	Q cfs TVol AF	1535 582	Q cfs TVol AF	693 580
03	AA BELOW SNOW VISTA JUNCTION	Q cfs TVol AF	3463 769	Q cfs TVol AF	2811 767
03.1	AA ABOVE SB DIVERSION	Q cfs TVol AF	4016 814	Q cfs TVol AF	2925 814
04	AA INTO AMOLE DETENTION FAC.	Q cfs TVol AF	5089 950	Q cfs TVol AF	411 888

LEGEND

- DMP IMPROVEMENTS
- BASIN BOUNDARIES
- LOCATION STUDY CORRIDOR
- SUBBASIN BOUNDARIES
- (APXX) HYDROLOGIC ANALYSIS POINT
- BASIN BOUNDARY THIS SHEET
- 60110 SUBBASIN ID NUMBER
- (SVX) PROJECT ID NUMBER

AMOLE ARROYO BASIN MANAGEMENT PLAN

- PL1 POWERLINE DETENTION 58 AF DISCHARGE RESTRICTED TO 20 cfs.
- AA1 BLAKE ROAD BANK REPAIR
- AA2 CHANNEL BANK UPGRADE
- AA3 CHANNEL BANK UPGRADE
- AA4 LOW FLOW CHANNEL WITH OPEN SPACE AMENITIES.
- AA5 COMPOSITE LOW FLOW W/ OVERBANK HIGH FLOW CHANNEL
- AA6 HIGH FLOW SOIL CEMENT CHANNEL
- AA7 ENTRY CHANNEL / CHUTE FREEBOARD UPGRADE
- A8 SEE FIGURE III-14 AMOLE/HUBBELL LAKE PLAN
- A9 UNSER EXTENSION STORM DRAIN
- A10 ALTERNATE ALIGNMENT

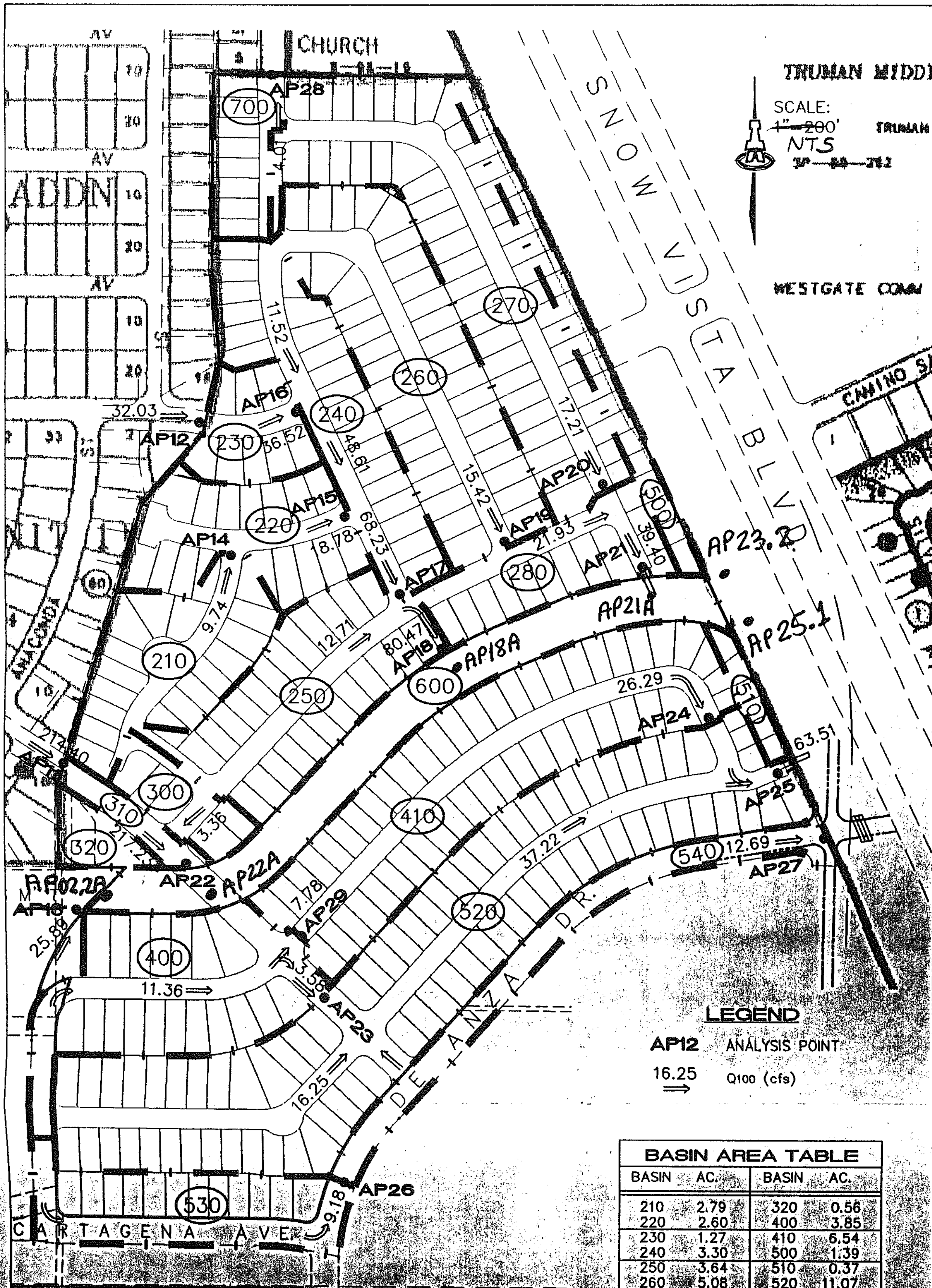
AMOLE-HUBBELL D.M.P.

AMOLE ARROYO MANAGEMENT PLAN

FIGURE NO. III-1

LEEDSHILL-HERKENHOFF, INC.

1 P:\95043\95043_32\DWG\C\AM-BASIN.dwg 6-9-99 KHK



BASIN AREA TABLE			
BASIN	AC.	BASIN	AC.
210	2.79	320	0.56
220	2.60	400	3.85
230	1.27	410	6.54
240	3.30	500	1.39
250	3.64	510	0.37
260	5.08	520	11.07
270	5.92	530	2.63
280	2.04	540	1.98
300	0.96	600	3.45
310	0.51	700	1.14

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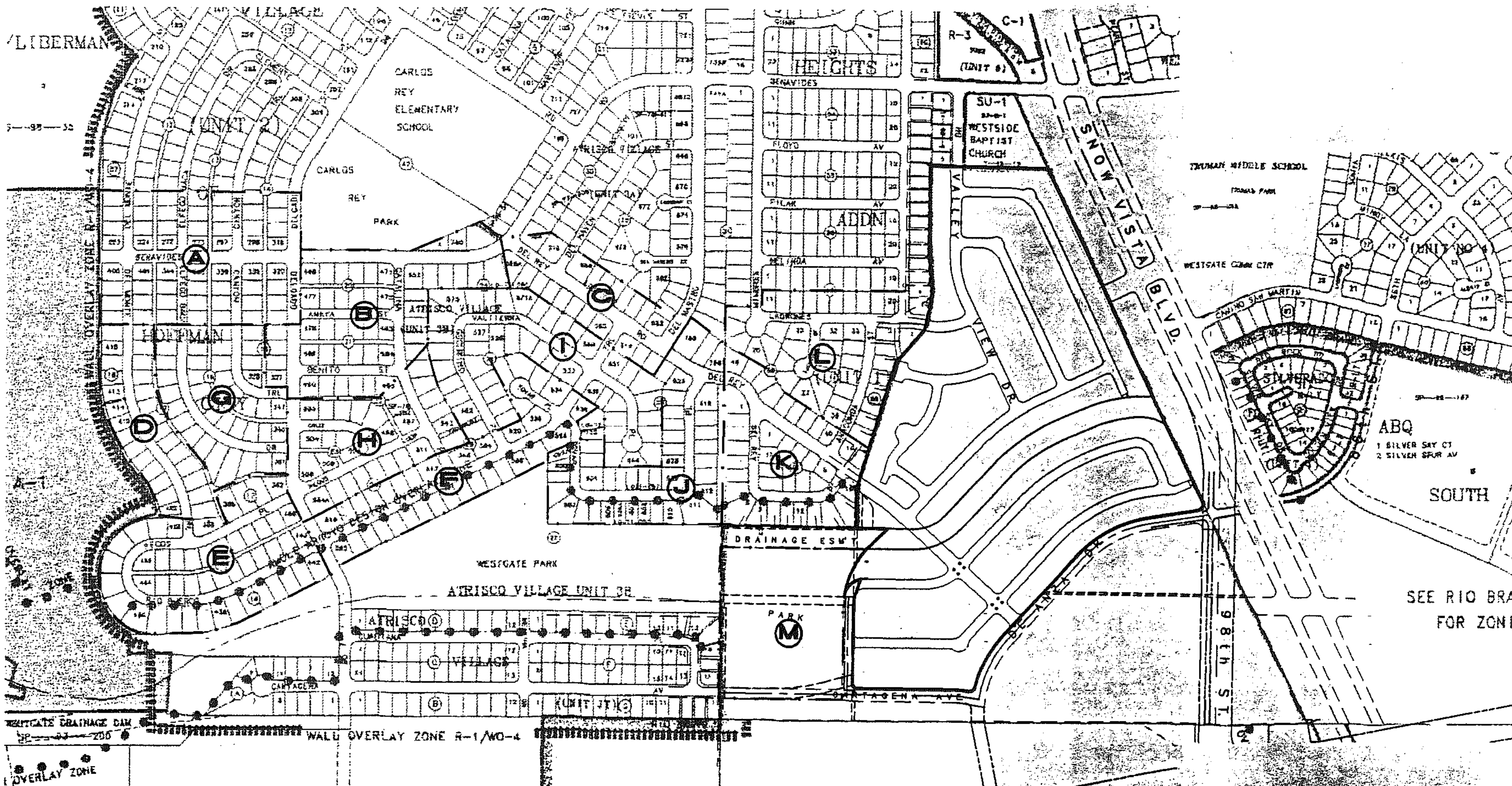
167EXH4.DWGnav 08/21/01

PROPOSED ONSITE BASIN MAP



BASIN	AC.	BASIN	AC.
A	14.14	H	8.44
B	12.32	I	11.89
C	5.95	J	10.63
D	6.33	K	9.80
E	12.65	L	10.30
F	9.66	M	11.00
G	8.80		

BASIN AREA TABLE

OFFSITE BASIN MAP

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167EXH3.DWG 08/23/01

III. FLOW RATE REVISIONS

The AHYMO runs from the DMP were modified to include these additional areas in the Amole Basins and exclude them from the Snow Vista Basins, and to include the proposed addition of the 70-acre portion of Basin 60104. See Appendix A for AHYMO Summary Tables. The table below summarizes the revised flows versus the DMP flow rates at the analysis points shown on pages 4-6. The DMP flow rate summary tables for the Amole Basin and the Snow Vista Basin are included in Appendix G.

Flow Rate Summary Table

Analysis Point	Flow Rate (cfs)		
	DMP	Revised Incl. Basin 60401	Revised Excl. Basin 60401)
AP02.1 (Delgado)	652	787	652
AP02.2A (West of Del Rey)	693	914	701
AP22A (Sta 25+00)	N/A	1129	916
AP18A (Sta 17+00)	N/A	1195	976
AP21A (Sta 12+50)	N/A	1237	1013
AP25 (Amole outfall to Snow Vista)	N/A	1245	1021
AP 23 (Snow Vista north of subdivision)	2050	1723	1723
AP23.2 (Snow Vista north of confluence)	2143	1692	1692
AP25.1 (Snow Vista south of confluence)	N/A	2879	2655

IV. CHANNEL DESIGN

Centerline Radii and Easement Curves

The horizontal alignment was laid out with a minimum centerline radius of 265 feet. The horizontal curves have easement curves upstream and downstream per the City of Albuquerque Development Process Manual (DPM). See Appendix E for calculations.

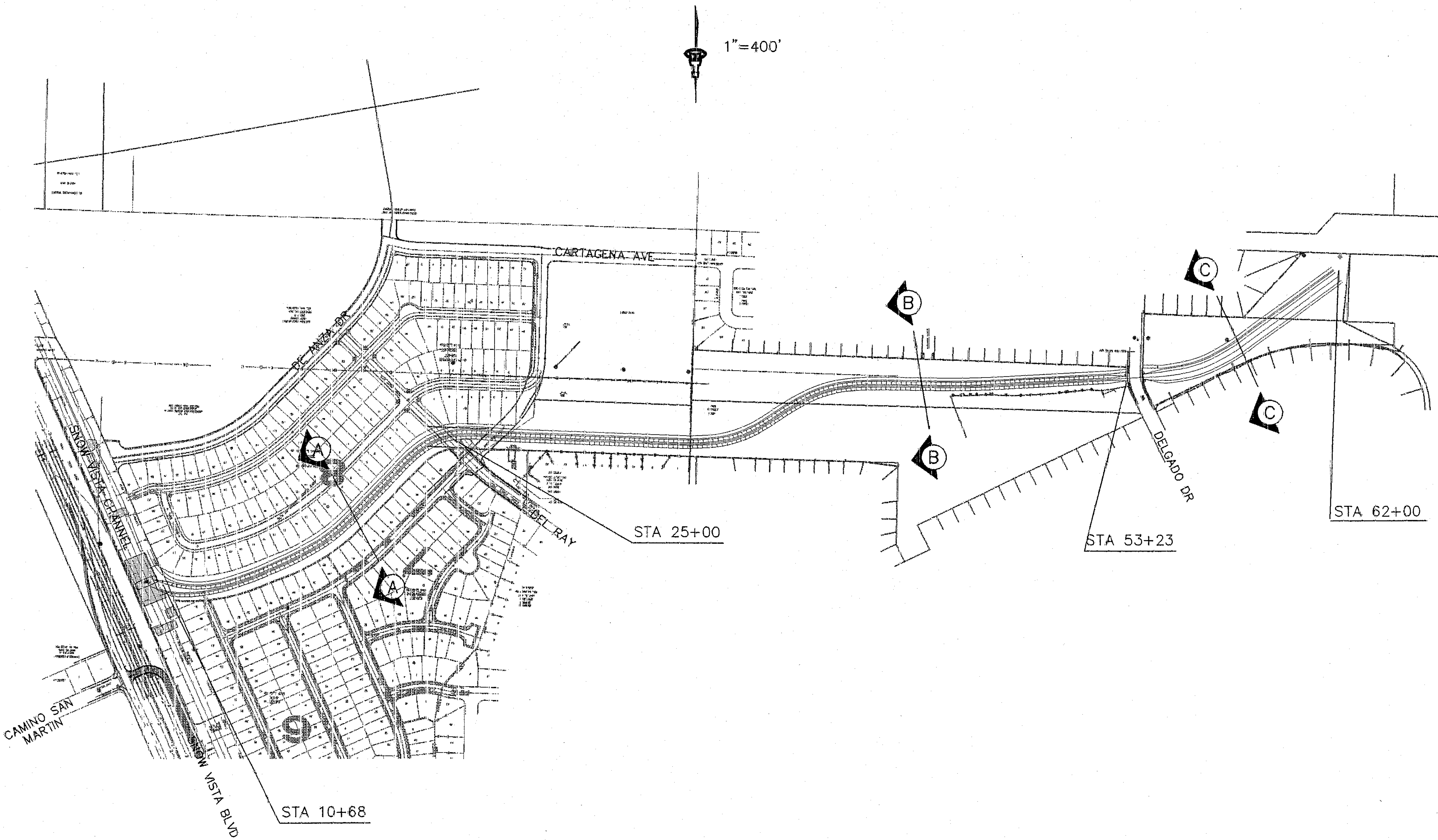
Hydraulic Analysis

HEC-RAS was used to model the Amole Arroyo and the Snow Vista Channel. The stations in HEC-RAS correspond to those shown on the plan & profile exhibits in the back pocket. Summary tables and water surface profiles are shown in Appendix C. The superelevation depths on the curves were calculated and added to the water depths, and a tabulation of the total water depths in the Amole Arroyo are included in Appendix D. Freeboard is 2 feet minimum throughout the project. The channel depth will vary between 4.5 feet and 6 feet as shown on the plan and sections on pages 9-10. From the west end of the project to the Delgado crossing, the channel will have shotcrete-lined sides, an earthen bottom and three shotcrete drop structures. The remaining portion of the channel will be completely lined with shotcrete. The flows are mixed west of the Delgado crossing and supercritical in the remaining reach.

Slug Flows

Waves generated by slug flows "are the result of transition from supercritical laminar to subcritical turbulent state of flow," (*Open Channel Hydraulics*, Chow). Theoretically, slug flow can occur when the Froude number is greater than 2 and the slope of the channel is greater than 12 divided by the Reynolds number. An experiment by Mayer showed that, in actuality, slug waves were formed only on slopes greater than two percent and for Reynolds number between 1000 and 4000 (Chow).

AMOLE ARROYO



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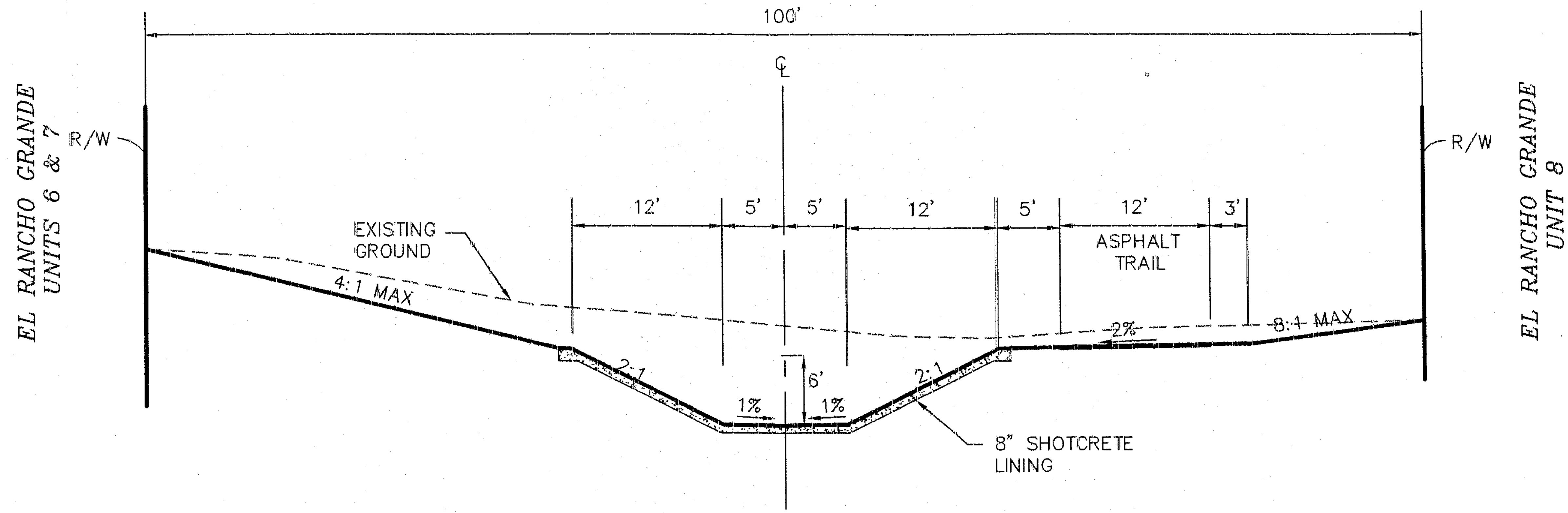
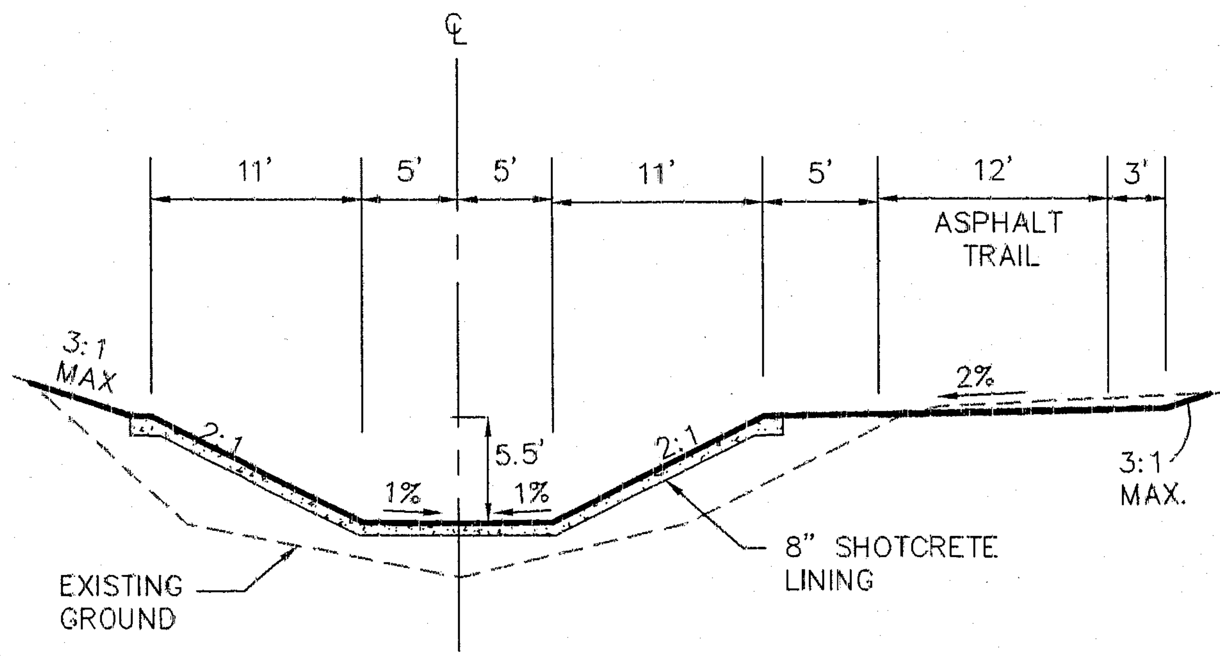
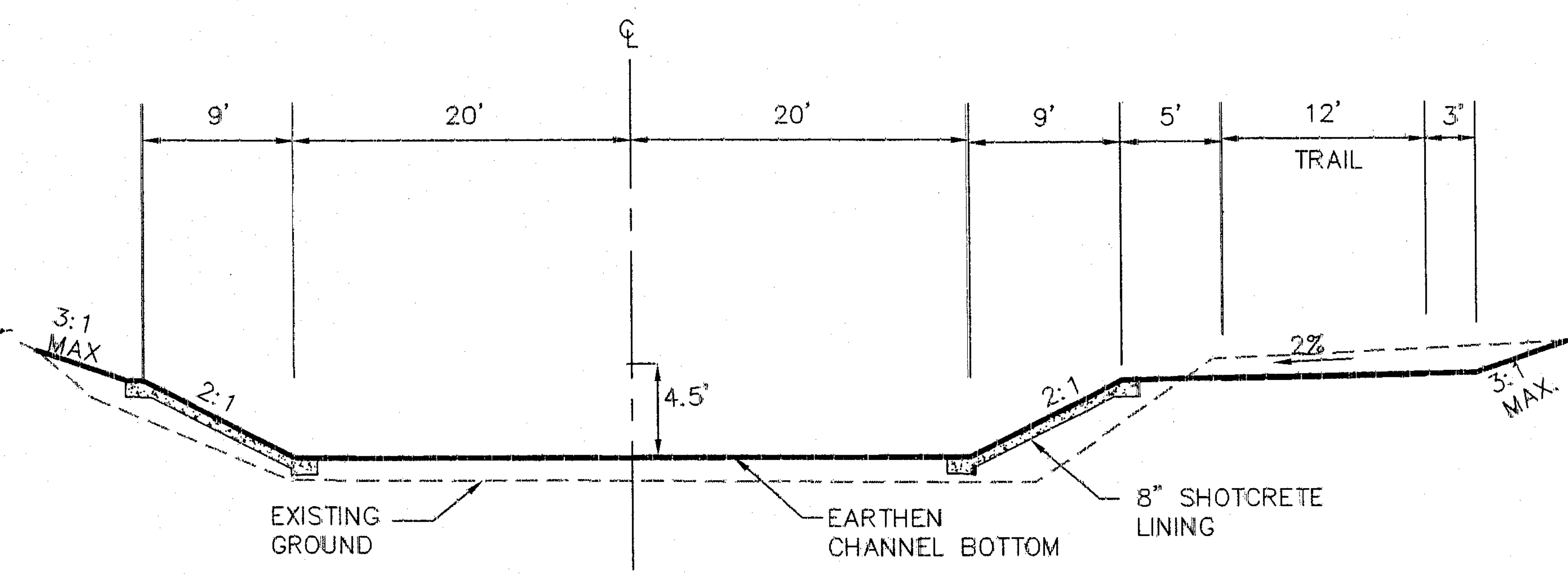


AMOLE ARROYO
SECTION A-A STA 10+68 – STA 25+00
1"=10'



AMOLE ARROYO
SECTION B-B STA 25+00– STA 53+23
1"=10'



AMOLE ARROYO
SECTION C-C STA 53+23– STA 62+00±
1"=10'

The areas where slug waves possibly could occur in the Amole Arroyo channel are at the drop structures (3:1 slope) west of the Delgado crossing. Calculations for a typical drop structure indicate that slug flow will not form (See Appendix F).

Confluence

The Amole Arroyo and Snow Vista Channel confluence was analyzed using the momentum method in HEC-RAS. No hydraulic jump will occur at the junction as shown on the profile of the Snow Vista and the Amole Arroyo and in the summary tables in Appendix C. There is an existing riprap check structure at the confluence, of which a portion is proposed to remain. The rundown from the Amole Arroyo is proposed to be shotcreted to the invert of the Snow Vista Channel with riprap gabion baskets tied to the 5-foot deep cutoff wall along the rundown. The bottom and sides of the Snow Vista Channel through the confluence will have tied riprap. See the confluence exhibit in the back Pocket.

Snow Vista Channel Freeboard

The hydraulic analysis shows that the Snow Vista Channel does not have adequate freeboard on the east side downstream of the confluence. An earthen berm will be constructed with the El Rancho Grande, Unit 8 construction by the developer. The added flows from Basin 60104 increase the water depth in the Snow Vista Channel by approximately 0.2 feet.

V. ESTIMATED COST OF ADDING BASIN 60104

In the Amole Arroyo, the added flows from the 70-acre portion of Basin 60104 results in a 0.5-foot deeper channel section between the west end of the

El Rancho Grande development and the Delgado crossing. See the tabulation of water depths in Appendix D for determination of needed channel depth.

The unit price for shotcrete was estimated as 1.15 times the unit price for 8" RPCC from the City Engineer's Estimated Unit Prices--$7.40/square foot. The cost of shotcrete due to the addition of Basin 60104 is as follows:

Width of added channel lining per foot of channel = 2.24 ft
Length of channel (Sta 25+00 - Sta 52+60) = 2760 ft

Added cost: 6182 SF shotcrete x $7.40/SF = $46,000

It should be noted that the cost estimate prepared by AMAFCA for the cost sharing allocating between AMAFCA, Curb, Inc., and the City of Albuquerque was based on a 6.5-foot channel depth. Since the channel depths have been reduced throughout the entire reach, the total project cost will be significantly lower than originally estimated.

VI. SUMMARY

The Amole Arroyo will be improved from the Snow Vista Channel to approximately one mile west per the plan and sections shown on pages 9-10. The addition of the 70-acre portion of the DMP Basin 60104 will result in an additional cost of $46,000.

The required improvements include:

- 4.5-foot deep channel with shotcrete check structures and side slope shotcrete lining west of the existing Delgado box culvert
- 5.5-foot deep shotcrete lining from Sta 53+23 to Sta 25+00
- 6-foot deep shotcrete lining from Sta 25+00 to Snow Vista Channel
- tied riprap confluence structure per the plan in back pocket
- crossing structure at the proposed Del Ray Road extension.

Appendix A

AMOLE BASIN--Portion of Basin 60104 Included

```
AHYMO SUMMARY TABLE (AHYMO194) - AMAFCA Hydrologic Model - January, 1994          RUN DATE (MON/DAY/YR) =02/11/2003
INPUT FILE = 1241DEVR.DAT                                                                   USER NO.= ISCARFNM.I01

                                 FROM  TO                   PEAK        RUNOFF               TIME TO    CFS     PAGE =    1
                  HYDROGRAPH      ID   ID        AREA     DISCHARGE     VOLUME     RUNOFF      PEAK     PER
COMMAND         IDENTIFICATION   NO.  NO.       (SQ MI)     (CFS)       (AC-FT)   (INCHES)   (HOURS)    ACRE     NOTATION

START                                                                                                          TIME=       .00
*S
*S      AMOLE ARROYO AND HUBBLE LAKE SYSTEM
*S
*S
*S THE DRAINAGE MANAGEMENT PLAN AHYMO FILE AA_DMP2.DAT WAS MODIFIED TO
*S INCLUDE UNITS 6 & 7 OF EL RANCHO GRANDE SUBDIVISION ALONG WITH
*S A 120.9-ACRE PORTION OF OFFSITE FLOWS FROM WESTGATE HEIGHTS. A 5.8-
*S ACRE OF BASIN 20502 (=301.01) WAS INCLUDED IN BASIN 00105.
*S IT ALSO INCLUDES A 69.4-ACRE PORTION OF THE DMP SACATE BLANCO BASIN
*S 60104.
*S
*S REVISED FILE DATA:
*S FILE NAME: 1241DEVR.DAT
*S BY: ASA NILSSON-WEBER
*S LAST REVISION: 2/7/03
*S
*S ORIGINAL FILE DATA:
*S 100-YR, 24-HR STORM WITH SEDIMENT
*S FILE NAME: AA_DMP2.DAT LOW FLOW ALT
*S BY: RICHARD STOCKTON / KAREN JACOBSEN
*S LAST REVISION: 3-10-99
*S
*S**************************************************************************
*S THE PURPOSE OF THIS MODEL IS TO CALCULATE THE RUNOFF FROM THE AMOLE ARROYO,
*S FROM WESTGATE DAM THROUGH TO THE HUBBLE LAKE DETENTION FACILITY.  THIS RUN
*S USES THE RECALL HYD COMMAND TO INPUT HYDOGRAPHS FROM POWERLINE CHANNEL (PL),
*S SNOW VISTA CHANNEL (SV), SACATE BLANCO CHANNEL (SB), AMOLE DEL NORTE CHANNEL
*S (AN), RIO BRAVO (RB), AND THE BORREGA CHANNEL (BR).  THIS RUN ALSO CALCULATES
*S RUNOFF FROM SUB-BASINS ADJACENT TO THE CHANNEL THAT ARE NOT INCLUDED IN THE
*S ABOVE MENTIONED HYDROGRAPHS.
*S
*S******************************************************************
*S
*S IMPORTANT NOTE1: ROUTE RESERVOIR DOES NOT INCLUDE ALL OF THE VOLUME FROM
*S                  WESTGATE DAM. THEREFORE, ADD ** 278 AC.FT ** OF VOLUME
*S                  TO ALL OF THE HYDROGRAPHS PUBLISHED IN THIS RUN.
*S                  THIS WILL ACCOUNT FOR THE VOLUME OF RUNOFF
```

```
*S                    TRUNCATED FROM WESTGATE DAM.
*S
*S**********************************************************************
*S
*S IMPORTANT NOTE2:  ROUTE RESERVOIR DOES NOT INCLUDE ALL OF THE VOLUME FROM
*S                    POWERLINE CHANNEL. THEREFORE, ADD ** 55.4 AC.FT ** OF VOLUME
*S                    TO THE AFFECTED HYDROGRAPHS PUBLISHED IN THIS RUN.
*S                    THIS WILL ACCOUNT FOR THE VOLUME OF RUNOFF
*S                    TRUNCATED FROM THE POWERLINE ALTERNATIVE.
*S
*S**********************************************************************
*S
*S IMPORTANT NOTE3: N/A
*S
*S**********************************************************************
*S
*S IMPORTANT NOTE4:  ROUTE RESERVOIR DOES NOT INCLUDE ALL OF THE VOLUME FROM
*S                    AMOLE DEL NORTE. THEREFORE, ADD ** 3.2 AC.FT ** OF VOLUME
*S                    TO THE AFFECTED HYDROGRAPHS PUBLISHED IN THIS RUN.
*S                    THIS WILL ACCOUNT FOR THE VOLUME OF RUNOFF
*S                    TRUNCATED FROM THE AMOLE DEL NORTE ALTERNATIVE.
*S**********************************************************************
*S ANALYSIS ASSUMPTIONS:
*S**********************************************************************
*S 1. ALL LAND IN THIS BASIN IS MODELED AS DEVELOPED CONDITION.
*S
*S 2. A BULKING FACTOR OF 15% HAS BEEN ADDED TO EACH UNDEVELOPED SUB-BASIN AND
*S    A BULKING FACTOR OF 6% HAS BEEN ADDED TO EACH DEVELOPED SUB-BASIN LIKELY
*S    TO PRODUCE SEDIMENT.  A BULKING FACTOR OF 3% HAS BEEN ADDED TO EACH
*S    DEVELOPED SUB-BASIN THAT COULD PROBIBLY PRODUCE SOME SEDIMENT, SUCH AS PAR
*S    AND SCHOOL PLAY GROUNDS.   AND, NO BULKING FACTOR FOR WELL
*S    DEFINED RESIDENTIAL DEVELOPMENTS.
*S
*S 3. BOTH THE AMOLE DETENTION FACILITY AND HUBBELL LAKE DETENTION FACILITY
*S    PRINCIPAL SPILLWAYS ARE MODELED CLOSED.  THESE TWO FACILITIES ARE
*S    REPRESENTATED AS AP40.1 AND AP 50.1, RESPECTIVELY ON THE SUPPLEMENTAL
*S    MAPPING AND REPORT.
*S
*S 4. THE AMOLE BASIN HAS FREE DISCHARGE TO THE AMOLE ARROYO.  POWERLINE
*S    HAS A RESTRICTED DISCHARGE OF 20 AND SNOW VISTA IS FREE DISCHARGE.
*S    THE RUNOFF IS CONVEYED IN A HIGH FLOW CHANNEL TO THE AMOLE DETENTION FACIL
*S
*S 5. THIS ALTERNATIVE INCLUDES THE GUAC DETENTION BASIN.
*S
*S 6. THIS ALTERNATIVE INCLUDES BASINS 35301, 35303, AND 35305 FROM THE
*S    AN_DMP.DAT FILE AS A RESULT OF THE UNSER EXTENSION.
*S************************************************************************
*S100 YEAR 24HR STORM DEVELOPED CONDITION
```

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                           FROM  TO                  PEAK        RUNOFF                TIME TO   CFS      PAGE =   3
              HYDROGRAPH    ID   ID       AREA     DISCHARGE     VOLUME     RUNOFF      PEAK     PER
COMMAND     IDENTIFICATION  NO.  NO.     (SQ MI)     (CFS)       (AC-FT)   (INCHES)   (HOURS)   ACRE      NOTATION

RAINFALL  TYPE= 2                                                                                       RAIN24=   2.660
*S RECALL OUTFLOW HYDROGRAPH FROM THE WESTGATE DAM
*S  HYD NO. WG100D1B.HYD IS ***** AP 01 *****
RECALL HYD       WG_DMP.HYD   -    5      5.15730       73.47     170.999      .62169     7.050     .022
*S ROUTE FLOW TO AP02
ROUTE              WG101.5    5   11      5.15730       73.47     170.672      .62050     6.950     .022
*S CALCULATE FLOW FROM SUB-BASIN 00102
*S GENERATION OF SEDIMENT LIKELY, BULK FLOWS 6%
SEDIMENT BULK                                                                                           PK BF =    1.06
COMPUTE NM HYD       102.00   -    2       .11190      218.60       9.283     1.55544     1.500    3.052 PER IMP=  47.00
*S ADD THE ROUTED FLOW FROM SUB-BASIN WG101.5 TO THE FLOW FROM SUB-BASIN 00102.
ADD HYD              102.10 11& 2  3      5.26920      254.43     179.955      .64035     1.500     .075
*S RECALL OUTFLOW HYDROGRAPH FROM POWERLINE CHANNEL
*S
*S IMPORTANT NOTE2: ROUTE RESERVOIR DOES NOT INCLUDE ALL OF THE VOLUME FROM
*S                  POWERLINE CHANNEL. THEREFORE, ADD ** 20.6 AC.FT ** OF VOLUME
*S                  TO THE AFFECTED HYDROGRAPHS PUBLISHED IN THIS RUN.
*S                  THIS WILL ACCOUNT FOR THE VOLUME OF RUNOFF
*S                  TRUNCATED FROM THE POWERLINE ALTERNATIVE. THE TOTAL
*S                  TRUNCATED VOLUME TO THIS POINT IS 289.6 AC FT
*S
RECALL HYD      PL_DMP1.HYD   -   11      1.20470       19.34      42.699      .66457    29.900     .025
ADD HYD              102.10 11& 3  3      6.47390      256.59     222.654      .64486     1.500     .062
*S HYD=102.1 IS *** AP02 *****
*S ROUTE FLOW IN THE AMOLE ARROYO TO 900 FEET EAST OF POWERLINE CHANNEL.
ROUTE                102.50   3   12      6.47390      257.32     222.483      .64437     1.550     .062
*S
*S GENERATION OF SEDIMENT LIKELY, BULK FLOWS 6%
SEDIMENT BULK                                                                                           PK BF =    1.06
COMPUTE NM HYD       00103A   -    2       .07170      162.04       6.475     1.69326     1.500    3.531 PER IMP=  49.00
*S ROUTE FLOW THROUGH SUB-BASIN 00103B TO THE AMOLE ARROYO.
ROUTE              00103A.5   2   11       .07170      100.85       6.475     1.69325     1.600    2.198
*S CALCULATE FLOW FROM SUB-BASIN 00103B
*S GENERATION OF SEDIMENT LIKELY, BULK FLOWS 6%
SEDIMENT BULK                                                                                           PK BF =    1.06
COMPUTE NM HYD       00103B   -    2       .12070      202.77      10.858     1.68669     1.600    2.625 PER IMP=  49.00
*S ADD THE ROUTE FLOW FROM SUB-BASIN 00103A.5 TO THE FLOW
*S FROM SUB-BASIN 00103B.
ADD HYD            00103B.1 11& 2  3       .19240      303.62      17.333     1.68913     1.600    2.466
*S ADD THE COMBINED FLOW FROM SUB-BASIN 00103B.1 TO THE ROUTED FLOW
*S IN THE AMOLE ARROYO.
ADD HYD            00103B.2 12& 3  4      6.66630      544.09     239.816      .67452     1.550     .128
*S CALCULATE THE FLOW FROM SUB-BASIN 60104.
```

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                                 FROM  TO                   PEAK        RUNOFF                TIME TO    CFS       PAGE =    4
                   HYDROGRAPH     ID   ID        AREA     DISCHARGE     VOLUME      RUNOFF      PEAK     PER
COMMAND          IDENTIFICATION   NO.  NO.     (SQ MI)      (CFS)       (AC-FT)    (INCHES)   (HOURS)    ACRE      NOTATION

*S BULK FLOWS 6%
SEDIMENT BULK                                                                                                    PK BF =     1.06
COMPUTE NM HYD          D60104    -     2       .10900      228.92       8.785      1.51117     1.500    3.282 PER IMP=   40.00
*S ADD THE FLOWS FROM SUB-BASIN 60104 TO SUB-BASIN 00103B.2.
ADD HYD               00103B.3   2& 4   5      6.77530      749.55     248.601       .68798     1.550     .173
*S ROUTE FLOW FROM SUB-BASIN 00103B.3 IN THE AMOLE ARROYO TO
*S DELGADO STREET.
ROUTE                 00103B.5    5    11      6.77530      750.90     248.534       .68779     1.550     .173
*S
*S CALCULATE FLOW FROM SUB-BASIN 00104
*S GENERATION OF SEDIMENT LIKELY, BULK FLOWS 6%
SEDIMENT BULK                                                                                                    PK BF =     1.06
COMPUTE NM HYD          104.00    -     2       .01830       40.11       1.617      1.65724     1.500    3.424 PER IMP=   49.00
*S ADD THE FLOW FROM SUB-BASIN 00104 TO THE ROUTED FLOW IN THE AMOLE ARROYO.
*S HYD NO. 00104.1 IS ***** AP 02.1 *****
ADD HYD                 104.10 11& 2    3      6.79360      786.70     250.151       .69041     1.550     .181
*S ROUTE FLOW FROM SUB-BASIN 00104 IN THE AMOLE ARROYO TO 2990 FEET EAST
*S FOR SNOW VISTA CHANNEL
 ROUTE                   104.50    3    11      6.79360      766.69     249.549       .68874     1.600     .176
*S
*S CALCULATE FLOW FROM SUB-BASIN 00105
*S GENERATION OF SEDIMENT LIKELY, BULK FLOWS 6%
SEDIMENT BULK                                                                                                    PK BF =     1.06
COMPUTE NM HYD          105.00    -     2       .08581      181.91       7.484      1.63539     1.500    3.312 PER IMP=   49.00
*S ADD THE FLOW FROM SUB-BASIN 00105 TO THE ROUTED FLOW IN THE AMOLE ARROYO.
*S HYD NO. 00105.1 IS ***** AP 02.2A *****
ADD HYD                 105.10 11& 2   41      6.87941      913.53     257.034       .70055     1.550     .207
*S**************************************************************
*S***            EL RANCHO GRANDE SUBDIVISION               ****
*S***             UNITS SIX, SEVEN, & EIGHT                 ****
*S***                DEVELOPED CONDITIONS                   ****
*S**************************************************************
*S*************** OFFSITE BASINS ******************
*S
*S  BASIN A (102)
COMPUTE NM HYD          102.00    -     2       .02210       45.19       1.774      1.50473     1.500    3.195 PER IMP=   42.00
*S  ~~~~~~~~~  AP1  ~~~~~~~~~
ROUTE                   102.20    3     2       .02210       43.14       1.774      1.50475     1.550    3.050
*S  BASIN B (103)
COMPUTE NM HYD          103.00    -     3       .01926       39.39       1.546      1.50472     1.500    3.195 PER IMP=   42.00
ADD HYD                 103.10   2& 3   1       .04136       78.57       3.319      1.50472     1.550    2.968
*S  ~~~~~~~~~  AP2  ~~~~~~~~~
ROUTE                   103.20    1     3       .04136       79.71       3.319      1.50473     1.550    3.011
```

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
*S BASIN C (104)										
COMPUTE NM HYD	104.00	-	4	.00929	19.01	.746	1.50473	1.500	3.197	PER IMP= 42.00
ADD HYD	104.10	3& 4	1	.05065	96.81	4.065	1.50471	1.550	2.986	
*S ~~~~~~~~~~ AP3 ~~~~~~~~~~										
ROUTE	104.20	1	4	.05065	94.44	4.065	1.50473	1.600	2.913	
*S BASIN D (110)										
*S ~~~~~~~~~~ AP4 ~~~~~~~~~~										
COMPUTE NM HYD	110.00	-	5	.00989	20.23	.794	1.50473	1.500	3.196	PER IMP= 42.00
*S BASIN E (111)										
COMPUTE NM HYD	111.00	-	6	.01977	40.43	1.587	1.50473	1.500	3.195	PER IMP= 42.00
ADD HYD	111.10	5& 6	1	.02966	60.66	2.380	1.50470	1.500	3.196	
*S ~~~~~~~~~~ AP5 ~~~~~~~~~~										
ROUTE	111.20	1	6	.02966	54.53	2.380	1.50473	1.550	2.873	
*S BASIN F (112)										
COMPUTE NM HYD	112.00	-	7	.01510	30.88	1.212	1.50472	1.500	3.196	PER IMP= 42.00
ADD HYD	112.10	6& 7	1	.04476	82.31	3.592	1.50471	1.550	2.873	
*S ~~~~~~~~~~ AP6 ~~~~~~~~~~										
ROUTE	112.20	1	7	.04476	78.22	3.592	1.50472	1.600	2.731	
*S BASIN G (120)										
*S ~~~~~~~~~~ AP8 ~~~~~~~~~~										
COMPUTE NM HYD	120.00	-	8	.01375	28.12	1.103	1.50473	1.500	3.196	PER IMP= 42.00
*S BASIN H (121)										
COMPUTE NM HYD	121.00	-	9	.01319	26.98	1.059	1.50472	1.500	3.196	PER IMP= 42.00
ADD HYD	121.10	8& 9	1	.02694	55.10	2.162	1.50470	1.500	3.196	
*S ~~~~~~~~~~ AP9 ~~~~~~~~~~										
ROUTE	121.20	1	9	.02694	53.66	2.162	1.50476	1.550	3.112	
*S BASIN I (122)										
COMPUTE NM HYD	122.00	-	10	.01858	38.00	1.491	1.50472	1.500	3.195	PER IMP= 42.00
ADD HYD	122.10	9&10	1	.04552	89.31	3.653	1.50472	1.500	3.066	
*S ~~~~~~~~~~ AP7 ~~~~~~~~~~										
ROUTE	122.20	1	10	.04552	85.57	3.653	1.50474	1.550	2.937	
ADD HYD	104.30	4&10	10	.09617	179.19	7.718	1.50472	1.550	2.911	
*S BASIN J (130)										
COMPUTE NM HYD	130.00	-	11	.01661	33.97	1.333	1.50473	1.500	3.196	PER IMP= 42.00
ADD HYD	130.10	10&11	1	.11278	209.75	9.051	1.50472	1.550	2.906	
*S ~~~~~~~~~~ AP10 ~~~~~~~~~~										
ROUTE	130.20	1	11	.11278	206.48	9.051	1.50472	1.600	2.861	
*S BASIN K (131)										
COMPUTE NM HYD	131.00	-	12	.01532	31.33	1.229	1.50472	1.500	3.196	PER IMP= 42.00
ADD HYD	131.10	11&12	1	.12810	229.34	10.280	1.50472	1.550	2.797	
*S ~~~~~~~~~~ AP11 ~~~~~~~~~~										
ROUTE	131.20	1	12	.12810	219.98	10.280	1.50472	1.600	2.683	
*S BASIN L (140)										

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
*S ~~~~~~~~~ AP12 ~~~~~~~~~										
COMPUTE NM HYD	140.00	-	13	.01609	32.91	1.291	1.50472	1.500	3.196	PER IMP= 42.00
*S										
*S*************** ONSITE BASINS ******************										
*S										
COMPUTE NM HYD	300.00	-	38	.00150	3.45	.144	1.80120	1.500	3.594	PER IMP= 57.88
COMPUTE NM HYD	310.00	-	39	.00080	1.85	.077	1.80120	1.500	3.610	PER IMP= 57.88
COMPUTE NM HYD	320.00	-	40	.00087	2.01	.084	1.80120	1.500	3.606	PER IMP= 57.88
ADD HYD	310.10	12&39	15	.12890	221.26	10.357	1.50655	1.600	2.682	
ADD HYD	310.20	38&15	16	.13040	223.67	10.501	1.50994	1.600	2.680	
ADD HYD	310.30	41&16	1	7.00981	1122.53	267.535	.71561	1.600	.250	
*S ~~~~~~~~~ AP22 ~~~~~~~~~										
ROUTE	310.40	1	39	7.00981	1127.58	267.426	.71532	1.600	.251	
*S ~~~~~~~~~ AP22A ~~~~~~~~~										
ADD HYD	310.A	39&40	1	7.01068	1128.98	267.510	.71545	1.600	.252	
*S ROUTE FLOW IN THE AMOLE ARROYO TO AP18										
ROUTE	310.B	1	11	7.01068	1132.06	267.350	.71502	1.600	.252	
*S ~~~~~~~~~ AP14 ~~~~~~~~~										
COMPUTE NM HYD	210.00	-	30	.00436	10.00	.419	1.80120	1.500	3.584	PER IMP= 57.88
COMPUTE NM HYD	220.00	-	31	.00408	9.36	.392	1.80120	1.500	3.584	PER IMP= 57.88
ADD HYD	220.10	30&31	1	.00844	19.36	.811	1.80112	1.500	3.584	
*S ~~~~~~~~~ AP15 ~~~~~~~~~										
ROUTE	220.20	1	31	.00844	19.00	.811	1.80131	1.500	3.518	
COMPUTE NM HYD	230.00	-	32	.00208	4.78	.200	1.80120	1.500	3.590	PER IMP= 57.88
ADD HYD	230.10	13&32	1	.01817	37.68	1.491	1.53863	1.500	3.241	
*S ~~~~~~~~~ AP16 ~~~~~~~~~										
ROUTE	230.20	1	32	.01817	37.87	1.491	1.53867	1.500	3.257	
COMPUTE NM HYD	240.00	-	33	.00516	11.83	.496	1.80120	1.500	3.583	PER IMP= 57.88
ADD HYD	240.10	32&33	1	.02333	49.70	1.987	1.59669	1.500	3.329	
ROUTE	240.20	1	33	.02333	49.54	1.987	1.59672	1.500	3.318	
ADD HYD	240.30	31&33	1	.03177	68.54	2.798	1.65103	1.500	3.371	
*S ~~~~~~~~~ AP17 ~~~~~~~~~										
ROUTE	240.40	1	33	.03177	67.88	2.798	1.65105	1.550	3.338	
COMPUTE NM HYD	250.00	-	34	.00569	13.05	.547	1.80120	1.500	3.583	PER IMP= 57.88
*S ~~~~~~~~~ AP 18 ~~~~~~~~~										
ADD HYD	250.10	33&34	34	.03746	80.87	3.344	1.67383	1.500	3.373	
*S ~~~~~~~~~ AP18A ~~~~~~~~~										
ADD HYD	250.A	34&11	1	7.04814	1195.54	270.694	.72012	1.600	.265	
*S ROUTE FLOW IN THE AMOLE ARROYO TO AP21										
ROUTE	250.B	1	34	7.04814	1196.70	270.580	.71982	1.600	.265	
COMPUTE NM HYD	260.00	-	35	.00793	18.18	.762	1.80120	1.500	3.582	PER IMP= 57.88
*S ~~~~~~~~~ AP19 ~~~~~~~~~										
ROUTE	260.10	36	35	.00793	16.19	.762	1.80126	1.550	3.190	
COMPUTE NM HYD	270.00	-	36	.00926	21.22	.890	1.80120	1.500	3.581	PER IMP= 57.88

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION PAGE = 7
*S ~~~~~~~~~ AP20 ~~~~~~~~~										
ROUTE	270.10	37	36	.00926	17.89	.890	1.80124	1.550	3.019	
COMPUTE NM HYD	280.00	-	37	.00319	7.32	.306	1.80120	1.500	3.587	PER IMP= 57.88
ADD HYD	280.10	35&37	1	.01112	22.70	1.068	1.80116	1.550	3.190	
COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION PAGE = 5
ROUTE	280.20	1	37	.01112	23.15	1.068	1.80123	1.550	3.253	
ADD HYD	280.30	36&37	1	.02038	41.04	1.958	1.80117	1.550	3.147	
*S ~~~~~~~~~ AP21 ~~~~~~~~~										
ROUTE	280.40	1	37	.02038	40.79	1.958	1.80121	1.550	3.127	
*S ~~~~~~~~~ AP21A ~~~~~~~~~										
ADD HYD	280.A	37&34	1	7.06852	1236.84	272.538	.72294	1.600	.273	
*S ROUTE FLOW IN THE AMOLE ARROYO TO SNOW VISTA CHANNEL										
ROUTE	250.B	1	34	7.06852	1236.69	272.533	.72292	1.600	.273	
COMPUTE NM HYD	600.00	-	49	.00539	11.55	.471	1.63961	1.500	3.349	PER IMP= 50.00
*S ~~~~~~~~~ AP25 ~~~~~~~~~										
ADD HYD	AP25	34&49	1	7.07391	1244.82	273.005	.72362	1.600	.275	
FINISH										

SNOW VISTA BASIN--Portion of Basin 60104 Included

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AHYMO SUMMARY TABLE (AHYMO194) - AMAFCA Hydrologic Model - January, 1994          RUN DATE (MON/DAY/YR) =02/11/2003
INPUT FILE = 1241SV.DAT                                                                      USER NO.= ISCARFNM.I01

                               FROM  TO                      PEAK      RUNOFF                TIME TO   CFS       PAGE =   1
                  HYDROGRAPH   ID    ID        AREA       DISCHARGE    VOLUME     RUNOFF     PEAK      PER
COMMAND         IDENTIFICATION NO.   NO.      (SQ MI)       (CFS)      (AC-FT)   (INCHES)   (HOURS)    ACRE      NOTATION

START                                                                                                         TIME=       .00
*S THE DRAINAGE MANAGEMENT PLAN AHYMO FILE SV_DMP1.DAT WAS MODIFIED TO
*S EXCLUDE UNITS 6 & 7 OF EL RANCHO GRANDE SUBDIVISION ALONG WITH
*S A 120.9-ACRE PORTION OF OFFSITE FLOWS FROM WESTGATE HEIGHTS.
*S BASINS 20501(=301.02) AND 20502 (=301.01) WERE ELIMINATED AND
*S BASIN 20502 (=301.03) WAS REDUCED FROM 220 ACRES TO 128.9 ACRES.
*S EL RANCHO GRANDE BASIN 500 WAS ADDED.
*S
*S NEW FILE DATA:
*S FILE NAME : 1241SV.DAT
*S BY: ASA NILSSON-WEBER
*S LAST REVISION: 2/7/03
*S
*S            SNOW VISTA
*S           WITH MANAGEMENT PLAN IN PLACE
*S
*S ORIGINAL FILE DATA:
*S 100-YR, 24-HR STORM WITH NO SEDIMENT**
*S FILE NAME : SV_DMP1.DAT
*S BY: TOM BLAINE AND RICHARD STOCKTON/K. JACOBSEN
*S LAST REVISION: 06-08-99 (PIPE FOR POND.71 CHANGED AND HYD=400)
*S100 YEAR 24HR STORM DEVELOPED CONDITION
RAINFALL  TYPE= 2                                                                                             RAIN24=   2.660
COMPUTE NM HYD        100.00   -     2      .13520      340.82      15.597    2.16311    1.500     3.939 PER IMP=  85.00
ROUTE RESERVOIR       100.10   2     5      .13520      111.60      15.611    2.16501    1.850     1.290 AC-FT=    4.075
ROUTE                 100.20   5     3      .13520      112.75      15.611    2.16502    1.400     1.303
ROUTE                 100.30   3    10      .13520      114.14      15.611    2.16502    1.450     1.319
COMPUTE NM HYD        110.00   -     2      .07170      181.36       8.272    2.16311    1.500     3.952 PER IMP=  85.00
ROUTE RESERVOIR       110.10   2     5      .07170       59.19       8.377    2.19060    2.600     1.290 AC-FT=     .001
ROUTE                 110.20   5    11      .07170       61.29       8.377    2.19061    1.400     1.336
COMPUTE NM HYD        120.00   -     2      .04030      101.99       4.649    2.16311    1.500     3.954 PER IMP=  85.00
ROUTE RESERVOIR       120.10   2     5      .04030       33.30       4.654    2.16525    1.850     1.291 AC-FT=    1.219
ADD HYD               120.20 11& 5  12      .11200       94.58      13.031    2.18148    1.400     1.319
ROUTE                 120.30  12    11      .11200       95.88      13.031    2.18148    1.400     1.338
COMPUTE NM HYD        130.00   -     2      .03770       95.41       4.349    2.16311    1.500     3.954 PER IMP=  85.00
ROUTE RESERVOIR       130.10   2     5      .03770       31.10       4.349    2.16310    1.850     1.289 AC-FT=    1.142
ADD HYD               130.20 11& 5  12      .14970      126.97      17.380    2.17685    1.400     1.325
ADD HYD               130.30 10&12  12      .28490      238.38      32.991    2.17123    1.450     1.307
ROUTE                 130.40  12    90      .28490      241.75      32.991    2.17124    1.450     1.326
COMPUTE NM HYD        140.00   -     2      .04300      105.07       4.718    2.05746    1.500     3.818 PER IMP=  79.00
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COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
ROUTE RESERVOIR	140.10	2	5	.04300	35.50	4.739	2.06628	1.800	1.290	AC-FT= 1.198
ROUTE	140.20	5	11	.04300	36.97	4.739	2.06630	1.400	1.343	
COMPUTE NM HYD	150.00	-	2	.02420	55.95	2.451	1.89898	1.500	3.612	PER IMP= 70.00
ROUTE RESERVOIR	150.10	2	5	.02420	19.99	2.456	1.90318	1.800	1.291	AC-FT= .589
ADD HYD	150.20	11& 5	12	.06720	56.96	7.195	2.00755	1.400	1.324	
COMPUTE NM HYD	170.00	-	70	.02853	65.96	2.889	1.89898	1.500	3.612	PER IMP= 70.00
ROUTE RESERVOIR	150.10	70	5	.02853	23.61	2.893	1.90140	1.800	1.293	AC-FT= .693
ADD HYD	170.20	12& 5	12	.09573	80.56	10.088	1.97591	1.400	1.315	
ROUTE	150.30	12	11	.09573	83.24	10.088	1.97592	1.400	1.359	
COMPUTE NM HYD	160.00	-	2	.02170	50.17	2.198	1.89898	1.500	3.612	PER IMP= 70.00
ROUTE RESERVOIR	160.10	2	5	.02170	15.89	2.198	1.89896	1.850	1.144	AC-FT= .888
ADD HYD	160.20	11& 5	12	.11743	94.99	12.286	1.96168	1.850	1.264	
ROUTE	170.40	12	11	.11743	94.99	12.286	1.96169	1.850	1.264	
COMPUTE NM HYD	180.00	-	2	.02810	64.96	2.846	1.89898	1.500	3.612	PER IMP= 70.00
ROUTE RESERVOIR	180.10	2	5	.02810	23.20	2.854	1.90432	1.800	1.290	AC-FT= .684
ADD HYD	180.20	11& 5	10	.14553	118.19	15.140	1.95061	1.850	1.269	
ROUTE	180.30	10	11	.14553	118.20	15.140	1.95061	1.850	1.269	
COMPUTE NM HYD	190.00	-	2	.03130	79.22	3.611	2.16311	1.500	3.955	PER IMP= 85.00
ROUTE RESERVOIR	190.10	2	5	.03130	25.80	3.611	2.16310	1.850	1.288	AC-FT= .950
ADD HYD	190.00	90& 5	1	.31620	267.54	36.602	2.17043	1.450	1.322	
ROUTE	190.20	1	10	.31620	271.17	36.602	2.17043	1.450	1.340	
ADD HYD	190.30	11&10	12	.46173	380.80	51.742	2.10114	1.450	1.289	
COMPUTE NM HYD	200.00	-	2	.02520	49.60	2.074	1.54349	1.500	3.075	PER IMP= 52.00
*S THE VOLUME FROM 200.1 IS THE SNOW VISTA POND VOLUME UNDER DEV. COND.										
*S HYD=200.1 IS *****AP 21.1*****										
ADD HYD	200.10	2&12	10	.48693	423.42	53.816	2.07228	1.450	1.359	
ROUTE RESERVOIR	200.20	10	3	.48693	387.71	53.814	2.07218	2.000	1.244	AC-FT= 6.455
*S HYD=200.2 IS *****AP 21*****										
MODIFY TIME	200.20	3	3	.48693	388.53	53.814	2.07218	1.950	1.247	
*s BEGIN ONSITE WATERSHED										
COMPUTE NM HYD	210.00	-	2	.00920	20.66	.871	1.77514	1.500	3.509	PER IMP= 61.00
ADD HYD	210.10	3& 2	10	.49613	393.57	54.685	2.06667	1.900	1.239	
ROUTE	210.20	10	11	.49613	393.76	54.684	2.06663	1.950	1.240	
COMPUTE NM HYD	220.00	-	2	.00800	17.97	.757	1.77514	1.500	3.510	PER IMP= 61.00
ADD HYD	220.10	11& 2	10	.50413	397.90	55.441	2.06200	1.950	1.233	
ROUTE	220.20	10	11	.50413	397.80	55.440	2.06198	1.900	1.233	
COMPUTE NM HYD	230.00	-	2	.00940	21.11	.890	1.77514	1.500	3.509	PER IMP= 61.00
ADD HYD	230.10	11& 2	10	.51353	403.48	56.330	2.05673	1.850	1.228	
ROUTE	230.20	10	11	.51353	404.02	56.330	2.05670	1.900	1.229	
COMPUTE NM HYD	240.00	-	2	.01450	32.56	1.373	1.77514	1.500	3.509	PER IMP= 61.00
*s END ONSITE WATERSHED										
ADD HYD	240.10	11& 2	10	.52803	412.58	57.702	2.04897	1.800	1.221	
COMPUTE NM HYD	250.00	-	2	.00220	5.04	.201	1.71016	1.500	3.582	PER IMP= 50.00
ADD HYD	250.10	10& 2	11	.53023	414.22	57.903	2.04756	1.800	1.221	
COMPUTE NM HYD	260.00	-	2	.01570	34.01	1.443	1.72289	1.500	3.385	PER IMP= 60.00

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
ROUTE	260.10	2	15	.01570	32.36	1.443	1.72292	1.550	3.221	
COMPUTE NM HYD	270.00	-	2	.01020	20.61	.841	1.54680	1.500	3.157	PER IMP= 50.00
ADD HYD	270.10	15& 2	16	.02590	52.62	2.284	1.65352	1.500	3.175	
DIVIDE HYD	270.20	16	15	.02035	25.79	1.795	1.65352	1.500	1.980	
	270.30	AND	3	.00555	26.84	.489	1.65352	1.500	7.556	
ROUTE	270.40	3	16	.00555	24.11	.489	1.65360	1.550	6.788	
COMPUTE NM HYD	280.00	-	2	.00220	5.42	.243	2.07506	1.500	3.850	PER IMP= 80.00
ADD HYD	280.10	16& 2	17	.00775	28.88	.733	1.77310	1.550	5.821	
ADD HYD	280.20	17&11	10	.53798	419.19	58.636	2.04361	1.750	1.217	
ROUTE	280.30	10	11	.53798	419.02	58.632	2.04348	1.750	1.217	
COMPUTE NM HYD	290.00	-	2	.00670	12.00	.421	1.17900	1.500	2.799	PER IMP= 25.00
ADD HYD	290.10	11& 2	10	.54468	424.08	59.053	2.03284	1.700	1.217	
COMPUTE NM HYD	300.00	-	2	.07090	179.34	8.179	2.16311	1.500	3.952	PER IMP= 85.00
ROUTE RESERVOIR	300.10	2	5	.07090	58.60	8.192	2.16634	1.850	1.291	AC-FT= 2.142
ROUTE	300.20	5	11	.07090	58.59	8.192	2.16636	2.350	1.291	
COMPUTE NM HYD	310.00	-	2	.08640	214.61	9.724	2.11028	1.500	3.881	PER IMP= 82.00
ROUTE RESERVOIR	310.10	2	5	.08640	71.30	9.826	2.13237	1.800	1.289	AC-FT= 2.505
ADD HYD	310.20	11& 5	12	.15730	129.89	18.018	2.14769	2.300	1.290	
ROUTE	310.30	12	11	.15730	129.89	18.018	2.14769	2.300	1.290	
ROUTE	310.40	11	13	.15730	129.89	18.018	2.14769	2.350	1.290	
COMPUTE NM HYD	320.00	-	2	.05470	122.45	5.283	1.81093	1.500	3.498	PER IMP= 65.00
ROUTE RESERVOIR	320.10	2	5	.05470	16.32	5.206	1.78457	2.100	.466	AC-FT= 3.035
ROUTE	320.20	5	11	.05470	16.32	5.205	1.78432	2.150	.466	
COMPUTE NM HYD	330.00	-	2	.02380	53.29	2.299	1.81093	1.500	3.498	PER IMP= 65.00
ADD HYD	330.10	11& 2	12	.07850	63.27	7.504	1.79239	1.500	1.259	
ADD HYD	330.20	12&13	14	.23580	190.99	25.522	2.02940	1.500	1.266	
ROUTE	330.30	14	12	.23580	189.79	25.521	2.02938	1.550	1.258	
ROUTE	330.40	12	11	.23580	190.04	25.521	2.02933	1.550	1.259	
ROUTE	330.50	15	17	.02035	25.49	1.795	1.65356	1.550	1.957	
ROUTE	330.60	17	16	.02035	25.11	1.795	1.65356	1.550	1.928	
COMPUTE NM HYD	340.00	-	2	.01550	31.31	1.279	1.54680	1.500	3.156	PER IMP= 50.00
ADD HYD	340.10	16& 2	15	.03585	55.01	3.073	1.60737	1.500	2.398	
ROUTE	340.20	15	16	.03585	54.76	3.073	1.60739	1.500	2.387	
ROUTE	340.30	16	15	.03585	54.42	3.073	1.60739	1.500	2.372	
COMPUTE NM HYD	350.00	-	2	.04830	97.54	3.985	1.54680	1.500	3.155	PER IMP= 50.00
ADD HYD	350.10	15& 2	16	.08415	151.96	7.058	1.57260	1.500	2.822	
ROUTE	350.20	16	15	.08415	151.86	7.058	1.57261	1.500	2.820	
ROUTE	350.30	15	16	.08415	150.38	7.058	1.57261	1.500	2.792	
COMPUTE NM HYD	360.00	-	2	.02080	42.01	1.716	1.54680	1.500	3.156	PER IMP= 50.00
ADD HYD	360.10	16& 2	15	.10495	192.40	8.774	1.56748	1.500	2.864	
ADD HYD	360.20	15&11	17	.34075	379.27	34.295	1.88709	1.500	1.739	
ROUTE	360.30	17	16	.34075	377.82	34.295	1.88708	1.500	1.732	
ADD HYD	360.40	16&10	15	.88543	741.01	93.348	1.97675	1.600	1.308	
COMPUTE NM HYD	370.00	-	2	.01830	36.97	1.510	1.54680	1.500	3.156	PER IMP= 50.00
ROUTE RESERVOIR	370.10	2	5	.01830	6.64	1.510	1.54678	2.050	.567	AC-FT= .768

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
*S HYD=AP22 IS *****AP 22*****										
ADD HYD	AP22	5&15	22	.90373	747.11	94.857	1.96804	1.600	1.292	
ROUTE	100.00	22	88	.90373	752.81	94.856	1.96801	1.600	1.302	
*S COMPUTE HYD FOR BASIN 301.61										
COMPUTE NM HYD	301.61	-	61	.03590	84.71	3.399	1.77514	1.500	3.687	PER IMP= 61.00
*S ROUTE ID=61 THROUGH POND.61										
ROUTE RESERVOIR	.61	61	1	.03590	26.35	3.411	1.78163	1.750	1.147	AC-FT= 1.154
*S ROUTE THIS FLOW DOWN THE 24" STORM DRAIN PIPE TO POND.62										
ROUTE	.61	1	11	.03590	26.36	3.411	1.78166	1.800	1.147	
*S HYDROGRAPH ID = 11 IS THE ROUTED FLOW OUT OF POND.61										
*S COMPUTE HYD FOR BASIN 301.62										
COMPUTE NM HYD	301.62	-	62	.03440	81.18	3.257	1.77514	1.500	3.687	PER IMP= 61.00
*S ROUTE ID=62 THROUGH POND.62										
ROUTE RESERVOIR	.62	62	1	.03440	25.02	3.267	1.78046	1.800	1.136	AC-FT= 1.098
*S ROUTED FLOW OUT OF POND.62										
*S ADD HYD ID=11 TO ID=1 AND ROUTE THIS FLOW THROUGH THE 30" STORM DRAIN										
*S TO POND.63										
ADD HYD	POND.62	1&11	1	.07030	51.38	6.678	1.78106	1.800	1.142	
ROUTE	.62	1	12	.07030	51.40	6.678	1.78107	1.800	1.142	
*S HYDROGRAPH ID = 12 IS THE ROUTED FLOW DOWN THE 30" STORM DRAIN PIPE										
*S COMPUTE HYD FOR BASIN 301.63										
COMPUTE NM HYD	301.63	-	63	.03440	81.18	3.257	1.77514	1.500	3.687	PER IMP= 61.00
*S ROUTE ID=63 THROUGH POND.63										
ROUTE RESERVOIR	.63	63	1	.03440	25.02	3.267	1.78046	1.800	1.136	AC-FT= 1.098
*S ROUTED FLOW OUT OF POND.63										
*S ADD HYD ID=12 TO ID=1 AND ROUTE THIS FLOW THROUGH THE 36" STORM DRAIN										
*S TO POND.64										
ADD HYD	POND.63	1&12	1	.10470	76.42	9.944	1.78086	1.800	1.140	
ROUTE	.63	1	13	.10470	76.44	9.944	1.78087	1.800	1.141	
*S HYDROGRAPH ID = 13 IS THE ROUTED FLOW DOWN THE 36" STORM DRAIN PIPE										
*S TO THE INLET OF POND.64 TO THIS STORM DRAIN PIPE										
*S COMPUTE HYD FOR BASIN 301.64										
COMPUTE NM HYD	301.64	-	64	.03440	81.18	3.257	1.77514	1.500	3.687	PER IMP= 61.00
*S ROUTE ID=64 THROUGH POND.64										
ROUTE RESERVOIR	.64	64	1	.03440	25.02	3.267	1.78046	1.800	1.136	AC-FT= 1.098
*S ROUTED FLOW OUT OF POND.64										
*S ADD HYD ID=13 TO ID=1 AND ROUTE THIS FLOW THROUGH THE 36" STORM DRAIN										
*S TO POND.65										
ADD HYD	POND.64	1&13	1	.13910	101.46	13.211	1.78076	1.800	1.140	
ROUTE	.64	1	14	.13910	101.46	13.211	1.78077	1.800	1.140	
*S HYDROGRAPH ID = 14 IS THE ROUTED FLOW DOWN THE 36" STORM DRAIN PIPE										
*S TO THE INLET OF POND.64 TO THIS STORM DRAIN PIPE										
*S COMPUTE HYD FOR BASIN 301.65										
COMPUTE NM HYD	301.65	-	65	.03440	81.18	3.257	1.77514	1.500	3.687	PER IMP= 61.00
*S ROUTE ID=65 THROUGH POND.65										

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
ROUTE RESERVOIR	.65	65	1	.03440	25.02	3.267	1.78046	1.800	1.136	AC-FT= 1.098
*S ROUTED FLOW OUT OF POND.65										
*S ADD HYD ID=14 TO ID=1 AND ROUTE THIS FLOW THROUGH THE 36" STORM DRAIN										
*S TO SNOW VISTA CHANNEL										
ADD HYD	POND.65	1&14	1	.17350	126.48	16.477	1.78070	1.800	1.139	
*S COMPUTE HYD FOR BASIN 301.05										
COMPUTE NM HYD	301.05	-	5	.03280	77.40	3.105	1.77514	1.500	3.687	PER IMP= 61.00
*S TOTAL FLOW AT AP-22.1 IN SNOW VISTA CHANNEL										
ADD HYD	301.00	88& 1	3	1.07723	870.85	111.334	1.93785	1.600	1.263	
*S HYD=AP22.1 IS *****AP 22.1*****										
ADD HYD	AP22.1	3& 5	2	1.11003	916.28	114.439	1.93304	1.600	1.290	
ROUTE	301.60	2	1	1.11003	925.36	114.436	1.93299	1.600	1.303	
*S COMPUTE HYD FOR BASIN 301.04										
COMPUTE NM HYD	301.04	-	4	.07660	180.72	7.252	1.77515	1.500	3.686	PER IMP= 61.00
*S HYD=AP22.2 IS *****AP 22.2*****										
ADD HYD	AP22.2	1& 4	1	1.18663	1031.47	121.688	1.92280	1.600	1.358	
ROUTE	300.00	1	9	1.18663	1037.20	121.687	1.92278	1.600	1.366	
*S COMPUTE HYD FOR BASIN 301.71										
COMPUTE NM HYD	301.71	-	71	.06940	163.75	6.570	1.77514	1.500	3.687	PER IMP= 61.00
*S ROUTE THIS FLOW DOWN THE 60" STORM DRAIN PIPE LINE TO 301.72										
ROUTE	.71	71	11	.06940	167.38	6.570	1.77515	1.500	3.769	
*S COMPUTE HYD FOR BASIN 301.72										
COMPUTE NM HYD	301.72	-	72	.04220	99.58	3.995	1.77514	1.500	3.687	PER IMP= 61.00
*S ADD BASIN 301.71 AND ROUTE THIS FLOW DOWN THE 60" STORM DRAIN PIPE LINE TO 3										
ADD HYD	301.72	72&11	2	.11160	266.96	10.566	1.77514	1.500	3.738	
ROUTE	.71	2	11	.11160	269.93	10.566	1.77515	1.500	3.779	
*S COMPUTE HYD FOR BASIN 301.74										
COMPUTE NM HYD	301.74	-	74	.00910	21.88	.830	1.71015	1.500	3.757	PER IMP= 50.00
*S ADD BASIN 301.72 AND BASIN 301.74										
ADD HYD	301.74	74&11	11	.12070	291.81	11.396	1.77024	1.500	3.778	
COMPUTE NM HYD	301.73	-	73	.01940	45.78	1.837	1.77514	1.500	3.688	PER IMP= 61.00
*S ADD HYDGRAPHS FROM										
ADD HYD	301.73	73&11	4	.14010	337.60	13.232	1.77092	1.500	3.765	
*S COMPUTE HYD FOR BASIN 301.03										
COMPUTE NM HYD	301.03	-	3	.20140	474.78	19.067	1.77514	1.500	3.683	PER IMP= 61.00
*S HYDROGRAPH ID 73 IS THE INFLOW TO THE SNOW VISTA CHANNEL AT AP-23										
ADD HYD	301.03	3& 4	73	.34150	812.38	32.300	1.77341	1.500	3.717	
*S HYD=AP23 IS *****AP 23*****										
ADD HYD	AP23	9&73	1	1.52813	1722.67	153.987	1.88940	1.500	1.761	
ROUTE	400.00	1	2	1.52813	1726.23	153.986	1.88939	1.500	1.765	
ROUTE	500.00	2	3	1.52813	1709.18	153.982	1.88934	1.550	1.748	
ROUTE	600.00	3	4	1.52813	1717.19	153.981	1.88933	1.550	1.756	
ROUTE	700.00	4	2	1.52813	1688.08	153.972	1.88922	1.550	1.726	
*S BASIN 500 EL RANCHO GRANDE										
COMPUTE NM HYD	500.00	-	44	.00217	4.70	.197	1.69924	1.500	3.386	PER IMP= 57.88

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
*S	*****AP23.2*****									
ADD HYD	AP23.2	2&44	3	1.53030	1692.26	154.169	1.88895	1.550	1.728	
*S RECALL AMOLE ARROYO OUTFLOW HYDROGRAPH										
RECALL HYD	AP25	-	1	7.07391	1244.82	273.005	.72362	1.600	.275	
*S ADD FLOWS AT AP23.2 AND AP25										
*S	*****AP25.1*****									
ADD HYD	AP25.1	1& 3	5	8.60421	2878.70	427.173	.93088	1.600	.523	
ROUTE	800.00	5	4	8.60421	2800.54	426.153	.92866	1.600	.509	
*S COMPUTE HYD FOR BASIN 301.00										
COMPUTE NM HYD	300.00	-	1	.05156	121.66	4.881	1.77514	1.500	3.687	PER IMP= 61.00
ROUTE RESERVOIR	.01	1	5	.05156	42.85	4.881	1.77514	1.750	1.298	AC-FT= 1.790
*S HYD=AP24 IS *****AP 24*****										
ADD HYD	AP24	5& 4	2	8.65577	2843.27	431.034	.93370	1.600	.513	
ROUTE	SV_DMP2.HYD	2	66	8.65577	2840.01	430.287	.93208	1.650	.513	
FINISH										

AMOLE BASIN--Portion of Basin 60104 Excluded

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AHYMO SUMMARY TABLE (AHYMO194) - AMAFCA Hydrologic Model - January, 1994        RUN DATE (MON/DAY/YR) =02/11/2003
INPUT FILE = 1241dev2.dat                                                                  USER NO.= ISCARFNM.I01

                            FROM  TO               PEAK     RUNOFF            TIME TO   CFS    PAGE =   1
              HYDROGRAPH    ID    ID     AREA    DISCHARGE  VOLUME   RUNOFF     PEAK    PER
COMMAND     IDENTIFICATION  NO.   NO.   (SQ MI)    (CFS)    (AC-FT)  (INCHES)  (HOURS)  ACRE    NOTATION

START                                                                                          TIME=       .00
*S
*S      AMOLE ARROYO AND HUBBLE LAKE SYSTEM
*S
*S
*S
*S THE DRAINAGE MANAGEMENT PLAN AHYMO FILE AA_DMP2.DAT WAS MODIFIED TO
*S INCLUDE UNITS 6 & 7 OF EL RANCHO GRANDE SUBDIVISION ALONG WITH
*S A 120.9-ACRE PORTION OF OFFSITE FLOWS FROM WESTGATE HEIGHTS. A 5.8-
*S ACRE PORTION OF BASIN 20502 (=301.01) WAS INCLUDED IN BASIN 00105.
*S
*S REVISED FILE DATA:
*S FILE NAME: 1241DEV2.DAT
*S BY: ASA NILSSON-WEBER
*S LAST REVISION: 2/7/03
*S
*S ORIGINAL FILE DATA:
*S 100-YR, 24-HR STORM WITH SEDIMENT
*S FILE NAME: AA_DMP2.DAT LOW FLOW ALT
*S BY: RICHARD STOCKTON / KAREN JACOBSEN
*S LAST REVISION: 3-10-99
*S
*S************************************************************************
*S THE PURPOSE OF THIS MODEL IS TO CALCULATE THE RUNOFF FROM THE AMOLE ARROYO,
*S FROM WESTGATE DAM THROUGH TO THE HUBBLE LAKE DETENTION FACILITY.  THIS RUN
*S USES THE RECALL HYD COMMAND TO INPUT HYDOGRAPHS FROM POWERLINE CHANNEL (PL),
*S SNOW VISTA CHANNEL (SV), SACATE BLANCO CHANNEL (SB), AMOLE DEL NORTE CHANNEL
*S (AN), RIO BRAVO (RB), AND THE BORREGA CHANNEL (BR).  THIS RUN ALSO CALCULATES
*S RUNOFF FROM SUB-BASINS ADJACENT TO THE CHANNEL THAT ARE NOT INCLUDED IN THE
*S ABOVE MENTIONED HYDROGRAPHS.
*S
*S*******************************************************************
*S
*S IMPORTANT NOTE1: ROUTE RESERVOIR DOES NOT INCLUDE ALL OF THE VOLUME FROM
*S                  WESTGATE DAM. THEREFORE, ADD ** 278 AC.FT ** OF VOLUME
*S                  TO ALL OF THE HYDROGRAPHS PUBLISHED IN THIS RUN.
*S                  THIS WILL ACCOUNT FOR THE VOLUME OF RUNOFF
*S                  TRUNCATED FROM WESTGATE DAM.
```

```
*S
*S***********************************************************************
*S
*S IMPORTANT NOTE2: ROUTE RESERVOIR DOES NOT INCLUDE ALL OF THE VOLUME FROM
*S                  POWERLINE CHANNEL. THEREFORE, ADD ** 55.4 AC.FT ** OF VOLUME
*S                  TO THE AFFECTED HYDROGRAPHS PUBLISHED IN THIS RUN.
*S                  THIS WILL ACCOUNT FOR THE VOLUME OF RUNOFF
*S                  TRUNCATED FROM THE POWERLINE ALTERNATIVE.
*S
*S***********************************************************************
*S
*S IMPORTANT NOTE3: N/A
*S
*S***********************************************************************
*S
*S IMPORTANT NOTE4: ROUTE RESERVOIR DOES NOT INCLUDE ALL OF THE VOLUME FROM
*S                  AMOLE DEL NORTE. THEREFORE, ADD ** 3.2 AC.FT ** OF VOLUME
*S                  TO THE AFFECTED HYDROGRAPHS PUBLISHED IN THIS RUN.
*S                  THIS WILL ACCOUNT FOR THE VOLUME OF RUNOFF
*S                  TRUNCATED FROM THE AMOLE DEL NORTE ALTERNATIVE.
*S***********************************************************************
*S ANALYSIS ASSUMPTIONS:
*S***********************************************************************
*S 1. ALL LAND IN THIS BASIN IS MODELED AS DEVELOPED CONDITION.
*S
*S 2. A BULKING FACTOR OF 15% HAS BEEN ADDED TO EACH UNDEVELOPED SUB-BASIN AND
*S    A BULKING FACTOR OF 6% HAS BEEN ADDED TO EACH DEVELOPED SUB-BASIN LIKELY
*S    TO PRODUCE SEDIMENT.  A BULKING FACTOR OF 3% HAS BEEN ADDED TO EACH
*S    DEVELOPED SUB-BASIN THAT COULD PROBIBLY PRODUCE SOME SEDIMENT, SUCH AS PAR
*S    AND SCHOOL PLAY GROUNDS.   AND, NO BULKING FACTOR FOR WELL
*S    DEFINED RESIDENTIAL DEVELOPMENTS.
*S
*S 3. BOTH THE AMOLE DETENTION FACILITY AND HUBBELL LAKE DETENTION FACILITY
*S    PRINCIPAL SPILLWAYS ARE MODELED CLOSED.  THESE TWO FACILITIES ARE
*S    REPRESENTATED AS AP40.1 AND AP 50.1, RESPECTIVELY ON THE SUPPLEMENTAL
*S    MAPPING AND REPORT.
*S
*S 4. THE AMOLE BASIN HAS FREE DISCHARGE TO THE AMOLE ARROYO.  POWERLINE
*S    HAS A RESTRICTED DISCHARGE OF 20 AND SNOW VISTA IS FREE DISCHARGE.
*S    THE RUNOFF IS CONVEYED IN A HIGH FLOW CHANNEL TO THE AMOLE DETENTION FACIL
*S
*S 5. THIS ALTERNATIVE INCLUDES THE GUAC DETENTION BASIN.
*S
*S 6. THIS ALTERNATIVE INCLUDES BASINS 35301, 35303, AND 35305 FROM THE
*S    AN_DMP.DAT FILE AS A RESULT OF THE UNSER EXTENSION.
*S***************************************************************************
*S100 YEAR 24HR STORM DEVELOPED CONDITION
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                                FROM  TO                  PEAK        RUNOFF              TIME TO    CFS       PAGE =    3
                  HYDROGRAPH     ID   ID        AREA    DISCHARGE     VOLUME     RUNOFF     PEAK     PER
COMMAND         IDENTIFICATION   NO.  NO.     (SQ MI)     (CFS)       (AC-FT)   (INCHES)  (HOURS)    ACRE      NOTATION

RAINFALL  TYPE= 2                                                                                         RAIN24=    2.660
*S RECALL OUTFLOW HYDROGRAPH FROM THE WESTGATE DAM
*S  HYD NO. WG100D1B.HYD IS ***** AP 01 *****
RECALL HYD        WG_DMP.HYD   -     5      5.15730       73.47     170.999      .62169    7.050      .022
*S ROUTE FLOW TO AP02
ROUTE               WG101.5    5    11      5.15730       73.47     170.672      .62050    6.950      .022
*S CALCULATE FLOW FROM SUB-BASIN 00102
*S GENERATION OF SEDIMENT LIKELY, BULK FLOWS 6%
SEDIMENT BULK                                                                                             PK BF =     1.06
COMPUTE NM HYD       102.00    -     2       .11190      218.60       9.283     1.55544    1.500     3.052 PER IMP=  47.00
*S ADD THE ROUTED FLOW FROM SUB-BASIN WG101.5 TO THE FLOW FROM SUB-BASIN 00102.
ADD HYD              102.10 11& 2    3      5.26920      254.43     179.955      .64035    1.500      .075
*S RECALL OUTFLOW HYDROGRAPH FROM POWERLINE CHANNEL
*S
*S IMPORTANT NOTE2: ROUTE RESERVOIR DOES NOT INCLUDE ALL OF THE VOLUME FROM
*S                  POWERLINE CHANNEL. THEREFORE, ADD ** 20.6 AC.FT ** OF VOLUME
*S                  TO THE AFFECTED HYDROGRAPHS PUBLISHED IN THIS RUN.
*S                  THIS WILL ACCOUNT FOR THE VOLUME OF RUNOFF
*S                  TRUNCATED FROM THE POWERLINE ALTERNATIVE. THE TOTAL
*S                  TRUNCATED VOLUME TO THIS POINT IS 289.6 AC FT
*S
RECALL HYD       PL_DMP1.HYD   -    11      1.20470       19.34      42.699      .66457   29.900      .025
ADD HYD              102.10 11& 3    3      6.47390      256.59     222.654      .64486    1.500      .062
*S HYD=102.1 IS *** AP02 *****
*S ROUTE FLOW IN THE AMOLE ARROYO TO 900 FEET EAST OF POWERLINE CHANNEL.
ROUTE                102.50    3    12      6.47390      257.32     222.483      .64437    1.550      .062
*S
*S GENERATION OF SEDIMENT LIKELY, BULK FLOWS 6%
SEDIMENT BULK                                                                                             PK BF =     1.06
COMPUTE NM HYD       00103A    -     2       .07170      162.04       6.475     1.69326    1.500     3.531 PER IMP=  49.00
*S ROUTE FLOW THROUGH SUB-BASIN 00103B TO THE AMOLE ARROYO.
ROUTE              00103A.5    2    11       .07170      100.85       6.475     1.69325    1.600     2.198
*S CALCULATE FLOW FROM SUB-BASIN 00103B
*S GENERATION OF SEDIMENT LIKELY, BULK FLOWS 6%
SEDIMENT BULK                                                                                             PK BF =     1.06
COMPUTE NM HYD       00103B    -     2       .12070      202.77      10.858     1.68669    1.600     2.625 PER IMP=  49.00
*S ADD THE ROUTE FLOW FROM SUB-BASIN 00103A.5 TO THE FLOW
*S FROM SUB-BASIN 00103B.
ADD HYD            00103B.1 11& 2    3       .19240      303.62      17.333     1.68913    1.600     2.466
*S ADD THE COMBINED FLOW FROM SUB-BASIN 00103B.1 TO THE ROUTED FLOW
*S IN THE AMOLE ARROYO.
ADD HYD            00103B.2 12& 3    4      6.66630      544.09     239.816      .67452    1.550      .128
*S ROUTE FLOW FROM SUB-BASIN 00103B.1 IN THE AMOLE ARROYO TO
*S DELGADO STREET.
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                           FROM  TO                    PEAK       RUNOFF              TIME TO   CFS
               HYDROGRAPH   ID   ID        AREA      DISCHARGE    VOLUME     RUNOFF     PEAK    PER
COMMAND      IDENTIFICATION NO.  NO.      (SQ MI)      (CFS)      (AC-FT)   (INCHES)  (HOURS)   ACRE      NOTATION

ROUTE            00103B.5    4   11      6.66630      537.98     239.749     .67433    1.550     .126
*S
*S CALCULATE FLOW FROM SUB-BASIN 00104
*S GENERATION OF SEDIMENT LIKELY, BULK FLOWS 6%
SEDIMENT BULK                                                                                      PK BF =     1.06
COMPUTE NM HYD      104.00   -    2       .01830       40.11       1.617    1.65724    1.500    3.424 PER IMP=  49.00
*S ADD THE FLOW FROM SUB-BASIN 00104 TO THE ROUTED FLOW IN THE AMOLE ARROYO.
*S HYD NO. 00104.1 IS ***** AP 02.1 *****
ADD HYD             104.10 11& 2  3      6.68460      573.79     241.367     .67702    1.550     .134
*S ROUTE FLOW FROM SUB-BASIN 00104 IN THE AMOLE ARROYO TO 2990 FEET EAST
*S FOR SNOW VISTA CHANNEL
ROUTE               104.50   3   11      6.68460      568.71     240.764     .67533    1.600     .133
*S
*S CALCULATE FLOW FROM SUB-BASIN 00105
*S GENERATION OF SEDIMENT LIKELY, BULK FLOWS 6%
SEDIMENT BULK                                                                                      PK BF =     1.06
COMPUTE NM HYD      105.00   -    2       .08581      181.91       7.484    1.63539    1.500    3.312 PER IMP=  49.00
*S ADD THE FLOW FROM SUB-BASIN 00105 TO THE ROUTED FLOW IN THE AMOLE ARROYO.
*S HYD NO. 00105.1 IS ***** AP 02.2A *****
ADD HYD             105.10 11& 2 41      6.77041      700.88     248.249     .68750    1.600     .162
*S**************************************************************
*S***          EL RANCHO GRANDE SUBDIVISION                ****
*S***           UNITS SIX, SEVEN, & EIGHT                  ****
*S***              DEVELOPED CONDITIONS                    ****
*S**************************************************************
*S*************** OFFSITE BASINS *******************
*S
*S  BASIN A (102)
COMPUTE NM HYD      102.00   -    2       .02210       45.19       1.774    1.50473    1.500    3.195 PER IMP=  42.00
*S  ~~~~~~~~~  AP1  ~~~~~~~~~
ROUTE               102.20   3    2       .02210       43.14       1.774    1.50475    1.550    3.050
*S  BASIN B (103)
COMPUTE NM HYD      103.00   -    3       .01926       39.39       1.546    1.50472    1.500    3.195 PER IMP=  42.00
ADD HYD             103.10  2& 3  1       .04136       78.57       3.319    1.50472    1.550    2.968
*S  ~~~~~~~~~  AP2  ~~~~~~~~~
ROUTE               103.20   1    3       .04136       79.71       3.319    1.50473    1.550    3.011
*S  BASIN C (104)
COMPUTE NM HYD      104.00   -    4       .00929       19.01        .746    1.50473    1.500    3.197 PER IMP=  42.00
ADD HYD             104.10  3& 4  1       .05065       96.81       4.065    1.50471    1.550    2.986
*S  ~~~~~~~~~  AP3  ~~~~~~~~~
ROUTE               104.20   1    4       .05065       94.44       4.065    1.50473    1.600    2.913
*S  BASIN D (110)
*S  ~~~~~~~~~  AP4  ~~~~~~~~~
COMPUTE NM HYD      110.00   -    5       .00989       20.23        .794    1.50473    1.500    3.196 PER IMP=  42.00
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COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
*S BASIN E (111)										
COMPUTE NM HYD	111.00	-	6	.01977	40.43	1.587	1.50473	1.500	3.195	PER IMP= 42.00
ADD HYD	111.10	5& 6	1	.02966	60.66	2.380	1.50470	1.500	3.196	
*S ~~~~~~~~~ AP5 ~~~~~~~~~										
ROUTE	111.20	1	6	.02966	54.53	2.380	1.50473	1.550	2.873	
*S BASIN F (112)										
COMPUTE NM HYD	112.00	-	7	.01510	30.88	1.212	1.50472	1.500	3.196	PER IMP= 42.00
ADD HYD	112.10	6& 7	1	.04476	82.31	3.592	1.50471	1.550	2.873	
*S ~~~~~~~~~ AP6 ~~~~~~~~~										
ROUTE	112.20	1	7	.04476	78.22	3.592	1.50472	1.600	2.731	
*S BASIN G (120)										
*S ~~~~~~~~~ AP8 ~~~~~~~~~										
COMPUTE NM HYD	120.00	-	8	.01375	28.12	1.103	1.50473	1.500	3.196	PER IMP= 42.00
*S BASIN H (121)										
COMPUTE NM HYD	121.00	-	9	.01319	26.98	1.059	1.50472	1.500	3.196	PER IMP= 42.00
ADD HYD	121.10	8& 9	1	.02694	55.10	2.162	1.50470	1.500	3.196	
*S ~~~~~~~~~ AP9 ~~~~~~~~~										
ROUTE	121.20	1	9	.02694	53.66	2.162	1.50476	1.550	3.112	
*S BASIN I (122)										
COMPUTE NM HYD	122.00	-	10	.01858	38.00	1.491	1.50472	1.500	3.195	PER IMP= 42.00
ADD HYD	122.10	9&10	1	.04552	89.31	3.653	1.50472	1.500	3.066	
*S ~~~~~~~~~ AP7 ~~~~~~~~~										
ROUTE	122.20	1	10	.04552	85.57	3.653	1.50474	1.550	2.937	
ADD HYD	104.30	4&10	10	.09617	179.19	7.718	1.50472	1.550	2.911	
*S BASIN J (130)										
COMPUTE NM HYD	130.00	-	11	.01661	33.97	1.333	1.50473	1.500	3.196	PER IMP= 42.00
ADD HYD	130.10	10&11	1	.11278	209.75	9.051	1.50472	1.550	2.906	
*S ~~~~~~~~~ AP10 ~~~~~~~~~										
ROUTE	130.20	1	11	.11278	206.48	9.051	1.50472	1.600	2.861	
*S BASIN K (131)										
COMPUTE NM HYD	131.00	-	12	.01532	31.33	1.229	1.50472	1.500	3.196	PER IMP= 42.00
ADD HYD	131.10	11&12	1	.12810	229.34	10.280	1.50472	1.550	2.797	
*S ~~~~~~~~~ AP11 ~~~~~~~~~										
ROUTE	131.20	1	12	.12810	219.98	10.280	1.50472	1.600	2.683	
*S BASIN L (140)										
*S ~~~~~~~~~ AP12 ~~~~~~~~~										
COMPUTE NM HYD	140.00	-	13	.01609	32.91	1.291	1.50472	1.500	3.196	PER IMP= 42.00
*S										
*S*************** ONSITE BASINS ******************										
*S										
COMPUTE NM HYD	300.00	-	38	.00150	3.45	.144	1.80120	1.500	3.594	PER IMP= 57.88
COMPUTE NM HYD	310.00	-	39	.00080	1.85	.077	1.80120	1.500	3.610	PER IMP= 57.88
COMPUTE NM HYD	320.00	-	40	.00087	2.01	.084	1.80120	1.500	3.606	PER IMP= 57.88
ADD HYD	310.10	12&39	15	.12890	221.26	10.357	1.50655	1.600	2.682	

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
ADD HYD	310.20	38&15	16	.13040	223.67	10.501	1.50994	1.600	2.680	
ADD HYD	310.30	41&16	1	6.90081	924.55	258.750	.70304	1.600	.209	
*S ~~~~~~~~~ AP22 ~~~~~~~~~										
ROUTE	310.40	1	39	6.90081	915.06	258.641	.70275	1.600	.207	
*S ~~~~~~~~~ AP22A ~~~~~~~~~										
ADD HYD	310.A	39&40	1	6.90168	916.46	258.725	.70289	1.600	.207	
*S ROUTE FLOW IN THE AMOLE ARROYO TO AP18										
ROUTE	310.B	1	11	6.90168	912.77	258.565	.70245	1.600	.207	
*S ~~~~~~~~~ AP14 ~~~~~~~~~										
COMPUTE NM HYD	210.00	-	30	.00436	10.00	.419	1.80120	1.500	3.584	PER IMP= 57.88
COMPUTE NM HYD	220.00	-	31	.00408	9.36	.392	1.80120	1.500	3.584	PER IMP= 57.88
ADD HYD	220.10	30&31	1	.00844	19.36	.811	1.80112	1.500	3.584	
*S ~~~~~~~~~ AP15 ~~~~~~~~~										
ROUTE	220.20	1	31	.00844	19.00	.811	1.80131	1.500	3.518	
COMPUTE NM HYD	230.00	-	32	.00208	4.78	.200	1.80120	1.500	3.590	PER IMP= 57.88
ADD HYD	230.10	13&32	1	.01817	37.68	1.491	1.53863	1.500	3.241	
*S ~~~~~~~~~ AP16 ~~~~~~~~~										
ROUTE	230.20	1	32	.01817	37.87	1.491	1.53867	1.500	3.257	
COMPUTE NM HYD	240.00	-	33	.00516	11.83	.496	1.80120	1.500	3.583	PER IMP= 57.88
ADD HYD	240.10	32&33	1	.02333	49.70	1.987	1.59669	1.500	3.329	
ROUTE	240.20	1	33	.02333	49.54	1.987	1.59672	1.500	3.318	
ADD HYD	240.30	31&33	1	.03177	68.54	2.798	1.65103	1.500	3.371	
*S ~~~~~~~~~ AP17 ~~~~~~~~~										
ROUTE	240.40	1	33	.03177	67.88	2.798	1.65105	1.550	3.338	
COMPUTE NM HYD	250.00	-	34	.00569	13.05	.547	1.80120	1.500	3.583	PER IMP= 57.88
*S ~~~~~~~~~ AP 18 ~~~~~~~~~										
ADD HYD	250.10	33&34	34	.03746	80.87	3.344	1.67383	1.500	3.373	
*S ~~~~~~~~~ AP18A ~~~~~~~~~										
ADD HYD	250.A	34&11	1	6.93914	976.24	261.909	.70769	1.600	.220	
*S ROUTE FLOW IN THE AMOLE ARROYO TO AP21										
ROUTE	250.B	1	34	6.93914	973.23	261.795	.70739	1.600	.219	
COMPUTE NM HYD	260.00	-	35	.00793	18.18	.762	1.80120	1.500	3.582	PER IMP= 57.88
*S ~~~~~~~~~ AP19 ~~~~~~~~~										
ROUTE	260.10	36	35	.00793	16.19	.762	1.80126	1.550	3.190	
COMPUTE NM HYD	270.00	-	36	.00926	21.22	.890	1.80120	1.500	3.581	PER IMP= 57.88
*S ~~~~~~~~~ AP20 ~~~~~~~~~										
ROUTE	270.10	37	36	.00926	17.89	.890	1.80124	1.550	3.019	
COMPUTE NM HYD	280.00	-	37	.00319	7.32	.306	1.80120	1.500	3.587	PER IMP= 57.88
ADD HYD	280.10	35&37	1	.01112	22.70	1.068	1.80116	1.550	3.190	
ROUTE	280.20	1	37	.01112	23.15	1.068	1.80123	1.550	3.253	
ADD HYD	280.30	36&37	1	.02038	41.04	1.958	1.80117	1.550	3.147	
*S ~~~~~~~~~ AP21 ~~~~~~~~~										
ROUTE	280.40	1	37	.02038	40.79	1.958	1.80121	1.550	3.127	
*S ~~~~~~~~~ AP21A ~~~~~~~~~										

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
ADD HYD	280.A	37&34	1	6.95952	1013.37	263.753	.71059	1.600	.228	
*S ROUTE FLOW IN THE AMOLE ARROYO TO SNOW VISTA CHANNEL										
ROUTE	250.B	1	34	6.95952	1012.86	263.748	.71058	1.600	.227	
COMPUTE NM HYD	600.00	-	49	.00539	11.55	.471	1.63961	1.500	3.349	PER IMP= 50.00
*S ~~~~~~~~~ AP25 ~~~~~~~~~										
ADD HYD	AP25X	34&49	1	6.96491	1020.99	264.220	.71130	1.600	.229	
FINISH										

SNOW VISTA BASIN--Portion of Basin 60104 Excluded

AHYMO SUMMARY TABLE (AHYMO194) - AMAFCA Hydrologic Model - January, 1994 RUN DATE (MON/DAY/YR) =02/11/2003
INPUT FILE = 1241sv2.dat USER NO.= ISCARFNM.I01

PAGE = 1

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION	
START										TIME=	.00
*S											
*S THE DRAINAGE MANAGEMENT PLAN AHYMO FILE SV_DMP1.DAT WAS MODIFIED TO											
*S EXCLUDE UNITS 6 & 7 OF EL RANCHO GRANDE SUBDIVISION ALONG WITH											
*S A 120.9-ACRE PORTION OF OFFSITE FLOWS FROM WESTGATE HEIGHTS.											
*S BASINS 20501(=301.02) AND 20502 (=301.01) WERE ELIMINATED AND											
*S BASIN 20502 (=301.03) WAS REDUCED FROM 220 ACRES TO 128.9 ACRES.											
*S EL RANCHO GRANDE BASIN 500 WAS ADDED.											
*S											
*S NEW FILE DATA:											
*S FILE NAME : 1241SV.DAT											
*S BY: ASA NILSSON-WEBER											
*S LAST REVISION: 2/7/03											
*S											
*S SNOW VISTA											
*S WITH MANAGEMENT PLAN IN PLACE											
*S											
*S ORIGINAL FILE DATA:											
*S 100-YR, 24-HR STORM WITH NO SEDIMENT**											
*S FILE NAME : SV_DMP1.DAT											
*S BY: TOM BLAINE AND RICHARD STOCKTON/K. JACOBSEN											
*S LAST REVISION: 06-08-99 (PIPE FOR POND.71 CHANGED AND HYD=400)											
*S100 YEAR 24HR STORM DEVELOPED CONDITION											
RAINFALL TYPE= 2										RAIN24=	2.660
COMPUTE NM HYD	100.00	-	2	.13520	340.82	15.597	2.16311	1.500	3.939	PER IMP=	85.00
ROUTE RESERVOIR	100.10	2	5	.13520	111.60	15.611	2.16501	1.850	1.290	AC-FT=	4.075
ROUTE	100.20	5	3	.13520	112.75	15.611	2.16502	1.400	1.303		
ROUTE	100.30	3	10	.13520	114.14	15.611	2.16502	1.450	1.319		
COMPUTE NM HYD	110.00	-	2	.07170	181.36	8.272	2.16311	1.500	3.952	PER IMP=	85.00
ROUTE RESERVOIR	110.10	2	5	.07170	59.19	8.377	2.19060	2.600	1.290	AC-FT=	.001
ROUTE	110.20	5	11	.07170	61.29	8.377	2.19061	1.400	1.336		
COMPUTE NM HYD	120.00	-	2	.04030	101.99	4.649	2.16311	1.500	3.954	PER IMP=	85.00
ROUTE RESERVOIR	120.10	2	5	.04030	33.30	4.654	2.16525	1.850	1.291	AC-FT=	1.219
ADD HYD	120.20	11& 5	12	.11200	94.58	13.031	2.18148	1.400	1.319		
ROUTE	120.30	12	11	.11200	95.88	13.031	2.18148	1.400	1.338		
COMPUTE NM HYD	130.00	-	2	.03770	95.41	4.349	2.16311	1.500	3.954	PER IMP=	85.00
ROUTE RESERVOIR	130.10	2	5	.03770	31.10	4.349	2.16310	1.850	1.289	AC-FT=	1.142
ADD HYD	130.20	11& 5	12	.14970	126.97	17.380	2.17685	1.400	1.325		
ADD HYD	130.30	10&12	12	.28490	238.38	32.991	2.17123	1.450	1.307		
ROUTE	130.40	12	90	.28490	241.75	32.991	2.17124	1.450	1.326		

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
COMPUTE NM HYD	140.00	-	2	.04300	105.07	4.718	2.05746	1.500	3.818	PER IMP= 79.00
ROUTE RESERVOIR	140.10	2	5	.04300	35.50	4.739	2.06628	1.800	1.290	AC-FT= 1.198
ROUTE	140.20	5	11	.04300	36.97	4.739	2.06630	1.400	1.343	
COMPUTE NM HYD	150.00	-	2	.02420	55.95	2.451	1.89898	1.500	3.612	PER IMP= 70.00
ROUTE RESERVOIR	150.10	2	5	.02420	19.99	2.456	1.90318	1.800	1.291	AC-FT= .589
ADD HYD	150.20	11& 5	12	.06720	56.96	7.195	2.00755	1.400	1.324	
COMPUTE NM HYD	170.00	-	70	.02853	65.96	2.889	1.89898	1.500	3.612	PER IMP= 70.00
ROUTE RESERVOIR	150.10	70	5	.02853	23.61	2.893	1.90140	1.800	1.293	AC-FT= .693
ADD HYD	170.20	12& 5	12	.09573	80.56	10.088	1.97591	1.400	1.315	
ROUTE	150.30	12	11	.09573	83.24	10.088	1.97592	1.400	1.359	
COMPUTE NM HYD	160.00	-	2	.02170	50.17	2.198	1.89898	1.500	3.612	PER IMP= 70.00
ROUTE RESERVOIR	160.10	2	5	.02170	15.89	2.198	1.89896	1.850	1.144	AC-FT= .888
ADD HYD	160.20	11& 5	12	.11743	94.99	12.286	1.96168	1.850	1.264	
ROUTE	170.40	12	11	.11743	94.99	12.286	1.96169	1.850	1.264	
COMPUTE NM HYD	180.00	-	2	.02810	64.96	2.846	1.89898	1.500	3.612	PER IMP= 70.00
ROUTE RESERVOIR	180.10	2	5	.02810	23.20	2.854	1.90432	1.800	1.290	AC-FT= .684
ADD HYD	180.20	11& 5	10	.14553	118.19	15.140	1.95061	1.850	1.269	
ROUTE	180.30	10	11	.14553	118.20	15.140	1.95061	1.850	1.269	
COMPUTE NM HYD	190.00	-	2	.03130	79.22	3.611	2.16311	1.500	3.955	PER IMP= 85.00
ROUTE RESERVOIR	190.10	2	5	.03130	25.80	3.611	2.16310	1.850	1.288	AC-FT= .950
ADD HYD	190.00	90& 5	1	.31620	267.54	36.602	2.17043	1.450	1.322	
ROUTE	190.20	1	10	.31620	271.17	36.602	2.17043	1.450	1.340	
ADD HYD	190.30	11&10	12	.46173	380.80	51.742	2.10114	1.450	1.289	
COMPUTE NM HYD	200.00	-	2	.02520	49.60	2.074	1.54349	1.500	3.075	PER IMP= 52.00
*S THE VOLUME FROM 200.1 IS THE SNOW VISTA POND VOLUME UNDER DEV. COND.										
*S HYD=200.1 IS *****AP 21.1*****										
ADD HYD	200.10	2&12	10	.48693	423.42	53.816	2.07228	1.450	1.359	
ROUTE RESERVOIR	200.20	10	3	.48693	387.71	53.814	2.07218	2.000	1.244	AC-FT= 6.455
*S HYD=200.2 IS *****AP 21*****										
MODIFY TIME	200.20	3	3	.48693	388.53	53.814	2.07218	1.950	1.247	
*s BEGIN ONSITE WATERSHED										
COMPUTE NM HYD	210.00	-	2	.00920	20.66	.871	1.77514	1.500	3.509	PER IMP= 61.00
ADD HYD	210.10	3& 2	10	.49613	393.57	54.685	2.06667	1.900	1.239	
ROUTE	210.20	10	11	.49613	393.76	54.684	2.06663	1.950	1.240	
COMPUTE NM HYD	220.00	-	2	.00800	17.97	.757	1.77514	1.500	3.510	PER IMP= 61.00
ADD HYD	220.10	11& 2	10	.50413	397.90	55.441	2.06200	1.950	1.233	
ROUTE	220.20	10	11	.50413	397.80	55.440	2.06198	1.900	1.233	
COMPUTE NM HYD	230.00	-	2	.00940	21.11	.890	1.77514	1.500	3.509	PER IMP= 61.00
ADD HYD	230.10	11& 2	10	.51353	403.48	56.330	2.05673	1.850	1.228	
ROUTE	230.20	10	11	.51353	404.02	56.330	2.05670	1.900	1.229	
COMPUTE NM HYD	240.00	-	2	.01450	32.56	1.373	1.77514	1.500	3.509	PER IMP= 61.00
*s END ONSITE WATERSHED										
ADD HYD	240.10	11& 2	10	.52803	412.58	57.702	2.04897	1.800	1.221	
COMPUTE NM HYD	250.00	-	2	.00220	5.04	.201	1.71016	1.500	3.582	PER IMP= 50.00
ADD HYD	250.10	10& 2	11	.53023	414.22	57.903	2.04756	1.800	1.221	

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
COMPUTE NM HYD	260.00	-	2	.01570	34.01	1.443	1.72289	1.500	3.385	PER IMP= 60.00
ROUTE	260.10	2	15	.01570	32.36	1.443	1.72292	1.550	3.221	
COMPUTE NM HYD	270.00	-	2	.01020	20.61	.841	1.54680	1.500	3.157	PER IMP= 50.00
ADD HYD	270.10	15& 2	16	.02590	52.62	2.284	1.65352	1.500	3.175	
DIVIDE HYD	270.20	16	15	.02035	25.79	1.795	1.65352	1.500	1.980	
	270.30	AND	3	.00555	26.84	.489	1.65352	1.500	7.556	
ROUTE	270.40	3	16	.00555	24.11	.489	1.65360	1.550	6.788	
COMPUTE NM HYD	280.00	-	2	.00220	5.42	.243	2.07506	1.500	3.850	PER IMP= 80.00
ADD HYD	280.10	16& 2	17	.00775	28.88	.733	1.77310	1.550	5.821	
ADD HYD	280.20	17&11	10	.53798	419.19	58.636	2.04361	1.750	1.217	
ROUTE	280.30	10	11	.53798	419.02	58.632	2.04348	1.750	1.217	
COMPUTE NM HYD	290.00	-	2	.00670	12.00	.421	1.17900	1.500	2.799	PER IMP= 25.00
ADD HYD	290.10	11& 2	10	.54468	424.08	59.053	2.03284	1.700	1.217	
COMPUTE NM HYD	300.00	-	2	.07090	179.34	8.179	2.16311	1.500	3.952	PER IMP= 85.00
ROUTE RESERVOIR	300.10	2	5	.07090	58.60	8.192	2.16634	1.850	1.291	AC-FT= 2.142
ROUTE	300.20	5	11	.07090	58.59	8.192	2.16636	2.350	1.291	
COMPUTE NM HYD	310.00	-	2	.08640	214.61	9.724	2.11028	1.500	3.881	PER IMP= 82.00
ROUTE RESERVOIR	310.10	2	5	.08640	71.30	9.826	2.13237	1.800	1.289	AC-FT= 2.505
ADD HYD	310.20	11& 5	12	.15730	129.89	18.018	2.14769	2.300	1.290	
ROUTE	310.30	12	11	.15730	129.89	18.018	2.14769	2.300	1.290	
ROUTE	310.40	11	13	.15730	129.89	18.018	2.14769	2.350	1.290	
COMPUTE NM HYD	320.00	-	2	.05470	122.45	5.283	1.81093	1.500	3.498	PER IMP= 65.00
ROUTE RESERVOIR	320.10	2	5	.05470	16.32	5.206	1.78457	2.100	.466	AC-FT= 3.035
ROUTE	320.20	5	11	.05470	16.32	5.205	1.78432	2.150	.466	
COMPUTE NM HYD	330.00	-	2	.02380	53.29	2.299	1.81093	1.500	3.498	PER IMP= 65.00
ADD HYD	330.10	11& 2	12	.07850	63.27	7.504	1.79239	1.500	1.259	
ADD HYD	330.20	12&13	14	.23580	190.99	25.522	2.02940	1.500	1.266	
ROUTE	330.30	14	12	.23580	189.79	25.521	2.02938	1.550	1.258	
ROUTE	330.40	12	11	.23580	190.04	25.521	2.02933	1.550	1.259	
ROUTE	330.50	15	17	.02035	25.49	1.795	1.65356	1.550	1.957	
ROUTE	330.60	17	16	.02035	25.11	1.795	1.65356	1.550	1.928	
COMPUTE NM HYD	340.00	-	2	.01550	31.31	1.279	1.54680	1.500	3.156	PER IMP= 50.00
ADD HYD	340.10	16& 2	15	.03585	55.01	3.073	1.60737	1.500	2.398	
ROUTE	340.20	15	16	.03585	54.76	3.073	1.60739	1.500	2.387	
ROUTE	340.30	16	15	.03585	54.42	3.073	1.60739	1.500	2.372	
COMPUTE NM HYD	350.00	-	2	.04830	97.54	3.985	1.54680	1.500	3.155	PER IMP= 50.00
ADD HYD	350.10	15& 2	16	.08415	151.96	7.058	1.57260	1.500	2.822	
ROUTE	350.20	16	15	.08415	151.86	7.058	1.57261	1.500	2.820	
ROUTE	350.30	15	16	.08415	150.38	7.058	1.57261	1.500	2.792	
COMPUTE NM HYD	360.00	-	2	.02080	42.01	1.716	1.54680	1.500	3.156	PER IMP= 50.00
ADD HYD	360.10	16& 2	15	.10495	192.40	8.774	1.56748	1.500	2.864	
ADD HYD	360.20	15&11	17	.34075	379.27	34.295	1.88709	1.500	1.739	
ROUTE	360.30	17	16	.34075	377.82	34.295	1.88708	1.500	1.732	
ADD HYD	360.40	16&10	15	.88543	741.01	93.348	1.97675	1.600	1.308	
COMPUTE NM HYD	370.00	-	2	.01830	36.97	1.510	1.54680	1.500	3.156	PER IMP= 50.00

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
ROUTE RESERVOIR	370.10	2	5	.01830	6.64	1.510	1.54678	2.050	.567	AC-FT= .768
*S HYD=AP22 IS *****AP 22*****										
ADD HYD	AP22	5&15	22	.90373	747.11	94.857	1.96804	1.600	1.292	
ROUTE	100.00	22	88	.90373	752.81	94.856	1.96801	1.600	1.302	
*S COMPUTE HYD FOR BASIN 301.61										
COMPUTE NM HYD	301.61	-	61	.03590	84.71	3.399	1.77514	1.500	3.687	PER IMP= 61.00
*S ROUTE ID=61 THROUGH POND.61										
ROUTE RESERVOIR	.61	61	1	.03590	26.35	3.411	1.78163	1.750	1.147	AC-FT= 1.154
*S ROUTE THIS FLOW DOWN THE 24" STORM DRAIN PIPE TO POND.62										
ROUTE	.61	1	11	.03590	26.36	3.411	1.78166	1.800	1.147	
*S HYDROGRAPH ID = 11 IS THE ROUTED FLOW OUT OF POND.61										
*S COMPUTE HYD FOR BASIN 301.62										
COMPUTE NM HYD	301.62	-	62	.03440	81.18	3.257	1.77514	1.500	3.687	PER IMP= 61.00
*S ROUTE ID=62 THROUGH POND.62										
ROUTE RESERVOIR	.62	62	1	.03440	25.02	3.267	1.78046	1.800	1.136	AC-FT= 1.098
*S ROUTED FLOW OUT OF POND.62										
*S ADD HYD ID=11 TO ID=1 AND ROUTE THIS FLOW THROUGH THE 30" STORM DRAIN										
*S TO POND.63										
ADD HYD	POND.62	1&11	1	.07030	51.38	6.678	1.78106	1.800	1.142	
ROUTE	.62	1	12	.07030	51.40	6.678	1.78107	1.800	1.142	
*S HYDROGRAPH ID = 12 IS THE ROUTED FLOW DOWN THE 30" STORM DRAIN PIPE										
*S COMPUTE HYD FOR BASIN 301.63										
COMPUTE NM HYD	301.63	-	63	.03440	81.18	3.257	1.77514	1.500	3.687	PER IMP= 61.00
*S ROUTE ID=63 THROUGH POND.63										
ROUTE RESERVOIR	.63	63	1	.03440	25.02	3.267	1.78046	1.800	1.136	AC-FT= 1.098
*S ROUTED FLOW OUT OF POND.63										
*S ADD HYD ID=12 TO ID=1 AND ROUTE THIS FLOW THROUGH THE 36" STORM DRAIN										
*S TO POND.64										
ADD HYD	POND.63	1&12	1	.10470	76.42	9.944	1.78086	1.800	1.140	
ROUTE	.63	1	13	.10470	76.44	9.944	1.78087	1.800	1.141	
*S HYDROGRAPH ID = 13 IS THE ROUTED FLOW DOWN THE 36" STORM DRAIN PIPE										
*S TO THE INLET OF POND.64 TO THIS STORM DRAIN PIPE										
*S COMPUTE HYD FOR BASIN 301.64										
COMPUTE NM HYD	301.64	-	64	.03440	81.18	3.257	1.77514	1.500	3.687	PER IMP= 61.00
*S ROUTE ID=64 THROUGH POND.64										
ROUTE RESERVOIR	.64	64	1	.03440	25.02	3.267	1.78046	1.800	1.136	AC-FT= 1.098
*S ROUTED FLOW OUT OF POND.64										
*S ADD HYD ID=13 TO ID=1 AND ROUTE THIS FLOW THROUGH THE 36" STORM DRAIN										
*S TO POND.65										
ADD HYD	POND.64	1&13	1	.13910	101.46	13.211	1.78076	1.800	1.140	
ROUTE	.64	1	14	.13910	101.46	13.211	1.78077	1.800	1.140	
*S HYDROGRAPH ID = 14 IS THE ROUTED FLOW DOWN THE 36" STORM DRAIN PIPE										
*S TO THE INLET OF POND.64 TO THIS STORM DRAIN PIPE										
*S COMPUTE HYD FOR BASIN 301.65										
COMPUTE NM HYD	301.65	-	65	.03440	81.18	3.257	1.77514	1.500	3.687	PER IMP= 61.00

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                            FROM   TO                     PEAK        RUNOFF                 TIME TO    CFS
             HYDROGRAPH     ID     ID       AREA       DISCHARGE     VOLUME       RUNOFF      PEAK      PER
COMMAND    IDENTIFICATION   NO.    NO.     (SQ MI)       (CFS)       (AC-FT)     (INCHES)   (HOURS)    ACRE       NOTATION

*S ROUTE ID=65 THROUGH POND.65
ROUTE RESERVOIR       .65   65     1       .03440       25.02         3.267      1.78046     1.800     1.136 AC-FT=     1.098
*S  ROUTED FLOW OUT OF POND.65
*S  ADD HYD ID=14 TO ID=1 AND ROUTE THIS FLOW THROUGH THE 36" STORM DRAIN
*S  TO SNOW VISTA CHANNEL
ADD HYD           POND.65  1&14    1       .17350      126.48        16.477      1.78070     1.800     1.139
*S COMPUTE HYD FOR BASIN 301.05
COMPUTE NM HYD     301.05   -      5       .03280       77.40         3.105      1.77514     1.500     3.687 PER IMP=   61.00
*S TOTAL FLOW AT AP-22.1 IN SNOW VISTA CHANNEL
ADD HYD            301.00  88& 1   3      1.07723      870.85       111.334      1.93785     1.600     1.263
*S HYD=AP22.1 IS *****AP 22.1*****
ADD HYD            AP22.1   3& 5   2      1.11003      916.28       114.439      1.93304     1.600     1.290
ROUTE              301.60    2     1      1.11003      925.36       114.436      1.93299     1.600     1.303
*S COMPUTE HYD FOR BASIN 301.04
COMPUTE NM HYD     301.04   -      4       .07660      180.72         7.252      1.77515     1.500     3.686 PER IMP=   61.00
*S HYD=AP22.2 IS *****AP 22.2*****
ADD HYD            AP22.2   1& 4   1      1.18663     1031.47       121.688      1.92280     1.600     1.358
ROUTE              300.00    1     9      1.18663     1037.20       121.687      1.92278     1.600     1.366
*S COMPUTE HYD FOR BASIN 301.71
COMPUTE NM HYD     301.71   -     71       .06940      163.75         6.570      1.77514     1.500     3.687 PER IMP=   61.00
*S  ROUTE THIS FLOW DOWN THE 60" STORM DRAIN PIPE LINE TO 301.72
ROUTE                 .71   71    11       .06940      167.38         6.570      1.77515     1.500     3.769
*S COMPUTE HYD FOR BASIN 301.72
COMPUTE NM HYD     301.72   -     72       .04220       99.58         3.995      1.77514     1.500     3.687 PER IMP=   61.00
*S  ADD BASIN 301.71 AND ROUTE THIS FLOW DOWN THE 60" STORM DRAIN PIPE LINE TO 3
ADD HYD            301.72  72&11   2       .11160      266.96        10.566      1.77514     1.500     3.738
ROUTE                 .71    2    11       .11160      269.93        10.566      1.77515     1.500     3.779
*S COMPUTE HYD FOR BASIN 301.74
COMPUTE NM HYD     301.74   -     74       .00910       21.88          .830      1.71015     1.500     3.757 PER IMP=   50.00
*S  ADD BASIN 301.72 AND BASIN 301.74
ADD HYD            301.74  74&11  11       .12070      291.81        11.396      1.77024     1.500     3.778
COMPUTE NM HYD     301.73   -     73       .01940       45.78         1.837      1.77514     1.500     3.688 PER IMP=   61.00
*S  ADD HYDGRAPHS FROM
ADD HYD            301.73  73&11   4       .14010      337.60        13.232      1.77092     1.500     3.765
*S COMPUTE HYD FOR BASIN 301.03
COMPUTE NM HYD     301.03   -      3       .20140      474.78        19.067      1.77514     1.500     3.683 PER IMP=   61.00
*S  HYDROGRAPH ID 73 IS THE INFLOW TO THE SNOW VISTA CHANNEL AT AP-23
ADD HYD            301.03   3& 4  73       .34150      812.38        32.300      1.77341     1.500     3.717
*S HYD=AP23 IS *****AP 23*****
ADD HYD              AP23   9&73   1      1.52813     1722.67       153.987      1.88940     1.500     1.761
ROUTE              400.00    1     2      1.52813     1726.23       153.986      1.88939     1.500     1.765
ROUTE              500.00    2     3      1.52813     1709.18       153.982      1.88934     1.550     1.748
ROUTE              600.00    3     4      1.52813     1717.19       153.981      1.88933     1.550     1.756
ROUTE              700.00    4     2      1.52813     1688.08       153.972      1.88922     1.550     1.726
*S  BASIN 500 EL RANCHO GRANDE
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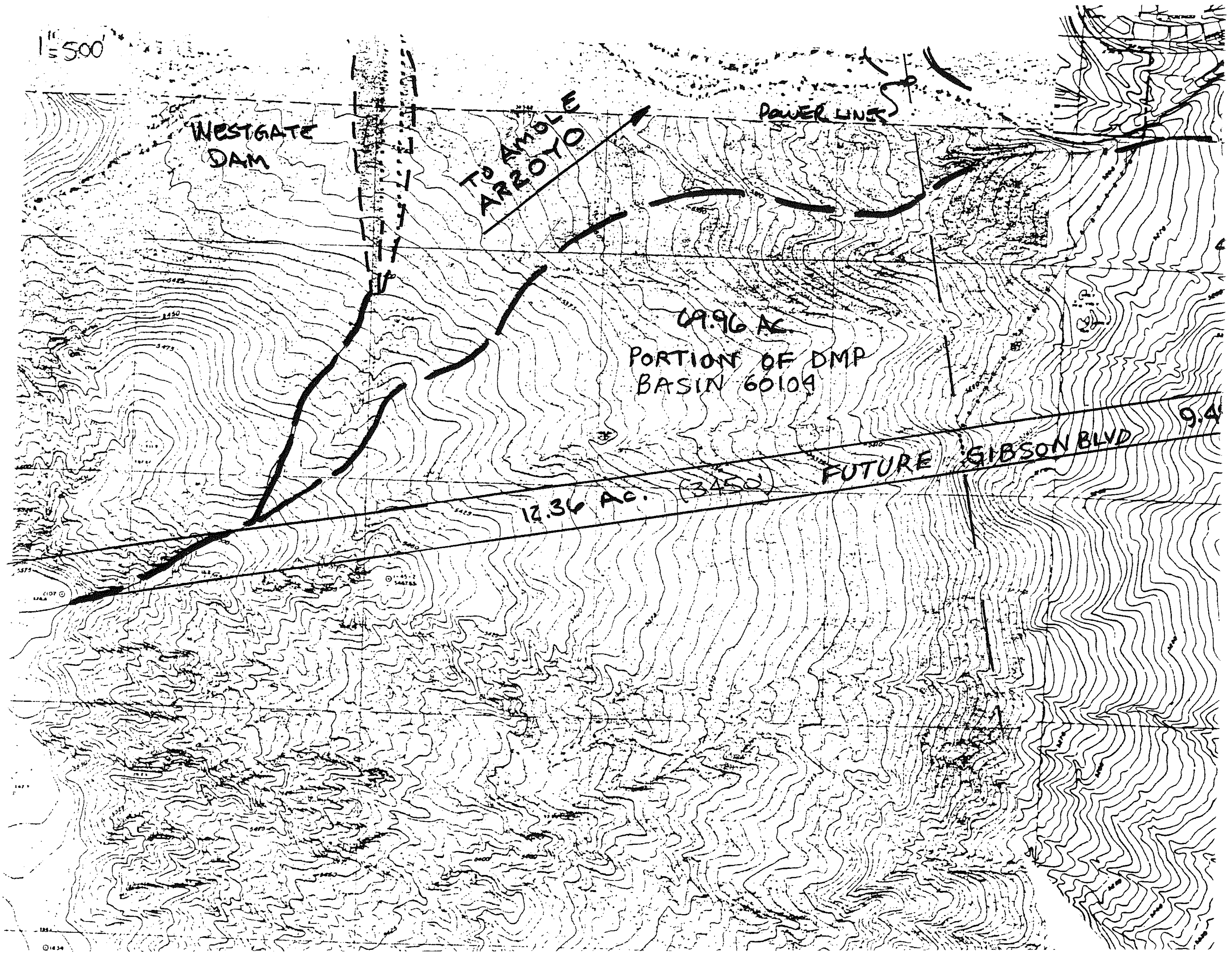
COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
COMPUTE NM HYD	500.00	-	44	.00217	4.70	.197	1.69924	1.500	3.386	PER IMP= 57.88
*S *****AP23.2*****										
ADD HYD	AP23.2	2&44	3	1.53030	1692.26	154.169	1.88895	1.550	1.728	
*S RECALL AMOLE ARROYO OUTFLOW HYDROGRAPH										
RECALL HYD	AP25X	-	1	6.96491	1020.99	264.220	.71130	1.600	.229	
*S ADD FLOWS AT AP23.2 AND AP25										
*S *****AP25.1*****										
ADD HYD	AP25.1	1& 3	5	8.49521	2654.87	418.389	.92344	1.600	.488	
ROUTE	800.00	5	4	8.49521	2574.23	417.368	.92118	1.600	.473	
*S COMPUTE HYD FOR BASIN 301.00										
COMPUTE NM HYD	300.00	-	1	.05156	121.66	4.881	1.77514	1.500	3.687	PER IMP= 61.00
ROUTE RESERVOIR	.01	1	5	.05156	42.85	4.881	1.77514	1.750	1.298	AC-FT= 1.790
*S HYD=AP24 IS *****AP 24*****										
ADD HYD	AP24	5& 4	2	8.54677	2616.95	422.249	.92633	1.600	.478	
ROUTE	SV_DMP2.HYD	2	66	8.54677	2624.45	421.502	.92470	1.650	.480	
FINISH										

Appendix B



1" = 500'
WESTGATE DAM
TO AMOLE ARROYO
POWER LINE
69.96 AC.
PORTION OF DMP BASIN 60109
12.36 AC.
(3450)
FUTURE GIBSON BLVD
9.4

Appendix C

Amole Arroyo - Including Portion of Basin 60104

HEC-RAS Plan: 1/27/03 River: Amole Arroyo Reach: Rancho Gr-lined Profile: 100-yr

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Rancho Gr-lined	6200	787.00	5262.93	5265.38	5265.13	5266.17	0.006105	7.17	109.72	49.78	0.85
Rancho Gr-lined	6100	787.00	5262.23	5264.48	5264.43	5265.44	0.008143	7.88	99.93	48.98	0.97
Rancho Gr-lined	6068	787.00	5262.01	5264.21	5264.21	5265.22	0.003888	8.06	97.64	48.80	1.00
Rancho Gr-lined	6050	787.00	5256.01	5256.90	5258.21	5263.87	0.082482	21.19	37.15	43.56	4.04
Rancho Gr-lined	6000	787.00	5255.66	5257.14	5257.86	5259.53	0.033823	12.42	63.36	45.90	1.86
Rancho Gr-lined	5900	787.00	5254.96	5257.35		5258.19	0.006608	7.36	106.93	49.55	0.88
Rancho Gr-lined	5818	787.00	5254.38	5256.39	5256.57	5257.62	0.005254	8.88	88.61	48.05	1.15
Rancho Gr-lined	5800	787.00	5248.38	5249.27	5250.58	5256.28	0.083247	21.25	37.04	43.55	4.06
Rancho Gr-lined	5700	787.00	5247.68	5250.13		5250.92	0.006076	7.16	109.89	49.79	0.85
Rancho Gr-lined	5600	787.00	5246.98	5249.23	5249.17	5250.19	0.008143	7.88	99.93	48.98	0.97
Rancho Gr-lined	5568	787.00	5246.76	5248.83	5248.96	5249.98	0.004770	8.61	91.41	48.28	1.10
Rancho Gr-lined	5550	787.00	5240.76	5241.65	5242.95	5248.65	0.083093	21.23	37.06	43.55	4.06
Rancho Gr-lined	5500	787.00	5239.31	5240.57	5241.51	5243.92	0.057488	14.69	53.59	45.04	2.37
Rancho Gr-lined	5400	787.00	5236.42	5237.84	5238.81	5241.23	0.011806	14.78	53.26	40.38	2.27
Rancho Gr-lined	5323	787.00	5234.20	5236.89	5237.95	5240.55	0.006690	15.35	51.28	19.10	1.65
Rancho Gr-lined	5261	914.00	5232.40	5235.24	5236.54	5239.68	0.007688	16.91	54.06	19.10	1.77
Rancho Gr-lined	5200	914.00	5230.63	5233.75	5235.29	5238.81	0.017635	18.06	50.62	22.47	2.12
Rancho Gr-lined	5100	914.00	5227.74	5230.66	5232.40	5236.71	0.022553	19.73	46.33	21.69	2.38
Rancho Gr-lined	5000	914.00	5226.38	5229.53	5231.05	5234.44	0.016892	17.78	51.41	22.61	2.08
Rancho Gr-lined	4900	914.00	5225.02	5228.28	5229.69	5232.75	0.014830	16.96	53.88	23.04	1.95
Rancho Gr-lined	4800	914.00	5223.67	5226.99	5228.34	5231.25	0.013876	16.56	55.20	23.27	1.89
Rancho Gr-lined	4700	914.00	5220.67	5223.66	5225.33	5229.35	0.020767	19.15	47.72	21.95	2.29
Rancho Gr-lined	4600	914.00	5217.67	5220.52	5222.34	5226.99	0.024757	20.40	44.80	21.41	2.49
Rancho Gr-lined	4500	914.00	5214.67	5217.45	5219.34	5224.36	0.027141	21.09	43.35	21.14	2.59
Rancho Gr-lined	4400	914.00	5211.67	5214.42	5216.34	5221.56	0.028440	21.44	42.63	21.00	2.65
Rancho Gr-lined	4300	914.00	5208.67	5211.40	5213.33	5218.68	0.029197	21.65	42.23	20.92	2.69
Rancho Gr-lined	4200	914.00	5205.67	5208.39	5210.34	5215.74	0.029595	21.75	42.02	20.88	2.70
Rancho Gr-lined	4100	914.00	5202.67	5205.38	5207.34	5212.79	0.029918	21.84	41.86	20.85	2.72
Rancho Gr-lined	4000	914.00	5199.67	5202.38	5204.34	5209.79	0.029918	21.84	41.86	20.85	2.72
Rancho Gr-lined	3900	914.00	5196.67	5199.39	5201.33	5206.77	0.029836	21.81	41.90	20.86	2.71
Rancho Gr-lined	3800	914.00	5194.92	5197.86	5199.59	5203.82	0.022114	19.59	46.65	21.75	2.36
Rancho Gr-lined	3700	914.00	5193.17	5196.22	5197.84	5201.60	0.019151	18.60	49.13	22.21	2.20
Rancho Gr-lined	3600	914.00	5191.42	5194.52	5196.09	5199.65	0.017945	18.17	50.30	22.41	2.14
Rancho Gr-lined	3500	914.00	5189.67	5192.79	5194.33	5197.83	0.017529	18.02	50.73	22.49	2.11
Rancho Gr-lined	3400	914.00	5186.96	5189.92	5191.62	5195.78	0.021630	19.44	47.03	21.82	2.33
Rancho Gr-lined	3300	914.00	5184.25	5187.13	5188.91	5193.44	0.023968	20.17	45.32	21.51	2.45
Rancho Gr-lined	3200	914.00	5181.54	5184.37	5186.20	5190.96	0.025427	20.60	44.37	21.33	2.52
Rancho Gr-lined	3100	914.00	5178.83	5181.64	5183.49	5188.38	0.026224	20.83	43.88	21.24	2.55

HEC-RAS Plan: 1/27/03 River: Amole Arroyo Reach: Rancho Gr-lined Profile: 100-yr (Continued)

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Rancho Gr-lined	3000	914.00	5176.12	5178.92	5180.79	5185.74	0.026696	20.96	43.60	21.19	2.57
Rancho Gr-lined	2900	914.00	5172.32	5174.99	5176.99	5182.71	0.031730	22.30	40.99	20.69	2.79
Rancho Gr-lined	2800	914.00	5168.52	5171.13	5173.18	5179.35	0.034614	23.00	39.73	20.44	2.91
Rancho Gr-lined	2700	914.00	5164.72	5167.30	5169.39	5175.79	0.036267	23.39	39.07	20.31	2.97
Rancho Gr-lined	2600	914.00	5160.92	5163.48	5165.59	5172.13	0.037157	23.59	38.74	20.25	3.01
Rancho Gr-lined	2500	1129.00	5157.12	5160.19	5162.33	5168.27	0.028655	22.82	49.48	22.27	2.70
Rancho Gr-lined	2470	1129.00	5155.98	5159.01	5161.20	5167.39	0.030114	23.23	48.60	22.11	2.76
Rancho Gr-lined	2400	1129.00	5154.93	5158.15	5160.15	5165.24	0.023912	21.37	52.82	22.86	2.48
Rancho Gr-lined	2300	1129.00	5153.44	5156.87	5158.66	5162.81	0.018703	19.56	57.73	23.70	2.21
Rancho Gr-lined	2200	1129.00	5151.95	5155.49	5157.17	5160.90	0.016435	18.66	60.50	24.17	2.08
Rancho Gr-lined	2100	1129.00	5150.45	5154.05	5155.67	5159.23	0.015498	18.27	61.80	24.38	2.02
Rancho Gr-lined	2000	1129.00	5147.69	5151.05	5152.91	5157.33	0.020189	20.11	56.15	23.44	2.29
Rancho Gr-lined	1900	1129.00	5144.93	5148.17	5150.15	5155.09	0.023091	21.11	53.49	22.98	2.44
Rancho Gr-lined	1800	1129.00	5142.16	5145.34	5147.38	5152.66	0.024961	21.71	52.01	22.72	2.53
Rancho Gr-lined	1700	1195.00	5139.40	5142.70	5144.77	5150.07	0.024101	21.78	54.88	23.22	2.50
Rancho Gr-lined	1600	1195.00	5137.80	5141.29	5143.17	5147.61	0.019500	20.17	59.25	23.96	2.26
Rancho Gr-lined	1500	1195.00	5136.20	5139.80	5141.57	5145.60	0.017372	19.34	61.79	24.38	2.14
Rancho Gr-lined	1400	1195.00	5134.60	5138.24	5139.97	5143.84	0.016532	18.99	62.91	24.56	2.09
Rancho Gr-lined	1300	1195.00	5133.00	5136.46	5138.21	5142.16	0.017262	19.16	62.38	24.95	2.13
Rancho Gr-lined	1250	1237.00	5132.20	5136.10	5137.49	5140.47	0.011631	16.76	73.79	26.71	1.78
Rancho Gr-lined	1200	1237.00	5131.40	5134.01	5135.65	5139.60	0.019979	18.97	65.21	30.23	2.28
Rancho Gr-lined	1100	1237.00	5129.80	5131.71	5133.24	5137.36	0.025271	19.26	66.51	38.72	2.53
Rancho Gr-lined	1068	1237.00	5129.48	5130.38	5131.60	5136.44	0.068065	19.81	63.32	73.64	3.72

Snow Vista - Including Portion of Basin 60104

HEC-RAS Plan: 1/27/03 Profile: 100-yr

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Units 6&7-unline	4300	1692.00	5133.00	5137.21	5136.50	5138.02	0.008607	7.22	234.19	76.31	0.73
Units 6&7-unline	4200	1692.00	5133.00	5136.15		5137.07	0.012209	7.71	219.49	84.58	0.84
Units 6&7-unline	4100	1692.00	5131.00	5135.69		5136.21	0.004363	5.77	293.11	79.98	0.53
Units 6&7-unline	4000	1692.00	5131.00	5135.17		5135.71	0.005157	5.88	287.60	86.84	0.57
Units 6&7-unline	3900	1692.00	5129.00	5134.90		5135.30	0.002811	5.08	333.32	79.05	0.44
Units 6&7-unline	3800	1692.00	5129.00	5134.57		5134.98	0.003092	5.15	328.23	81.91	0.45
Units 6&7-unline	3700	1692.00	5129.00	5134.24		5134.66	0.003014	5.20	325.12	78.50	0.45
Units 6&7-unline	3600	1692.00	5128.10	5134.01		5134.36	0.002426	4.70	360.13	86.30	0.40
Units 6&7-unline	3500	1692.00	5128.00	5133.73		5134.11	0.002697	4.95	341.97	82.12	0.43
Units 6&7-unline	3400	1692.00	5128.00	5133.14		5133.71	0.004764	6.04	280.12	78.10	0.56
Units 6&7-unline	3300	1692.00	5127.00	5132.86		5133.30	0.003411	5.32	318.14	81.61	0.47
Units 6&7-unline	3200	1692.00	5126.00	5132.70		5133.03	0.002174	4.62	366.36	82.60	0.39
Units 6&7-unline	3100	1692.00	5124.00	5132.50		5132.67	0.000738	3.25	521.33	87.91	0.23
Units 6&7-unline	3000	1692.00	5124.10	5132.31		5132.50	0.001022	3.54	478.50	91.15	0.27
Unit 8-unlined	2950	2879.00	5123.80	5130.88		5131.49	0.003227	6.27	459.08	87.54	0.48
Unit 8-unlined	2900	2879.00	5123.00	5129.41		5130.94	0.011766	9.92	290.21	73.71	0.88
Unit 8-unlined	2800	2879.00	5122.10	5129.00		5130.02	0.006651	8.12	354.57	79.24	0.68
Unit 8-unlined	2700	2879.00	5122.00	5128.17		5129.30	0.007699	8.52	337.94	78.46	0.72
Unit 8-unlined	2600	2879.00	5120.00	5127.94		5128.62	0.003534	6.63	434.25	81.20	0.51
Unit 8-unlined	2500	2879.00	5120.00	5127.29	5125.59	5128.18	0.005189	7.56	380.59	78.19	0.60
Unit 8-unlined	2400	2879.00	5119.80	5125.76		5127.36	0.011776	10.16	283.46	69.36	0.89
Unit 8-unlined	2300	2879.00	5117.00	5126.12		5126.59	0.002224	5.48	525.56	92.75	0.41
Unit 8-unlined	2200	2879.00	5116.90	5125.71		5126.31	0.003089	6.23	462.14	85.89	0.47
Unit 8-unlined	2100	2879.00	5116.60	5125.26		5125.96	0.003831	6.69	430.19	84.58	0.52
Unit 8-unlined	2000	2879.00	5116.30	5124.99	5122.25	5125.59	0.003004	6.21	463.44	84.42	0.47

Amole Arroyo - Excluding Portion of Basin 60104

HEC-RAS Plan: 1/27/03 River: Amole Arroyo Reach: Rancho Gr-lined Profile: 100-yr (Continued)

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Rancho Gr-lined	3000	701.00	5176.12	5178.54	5180.19	5184.44	0.026873	19.48	35.99	19.70	2.54
Rancho Gr-lined	2900	701.00	5172.32	5174.62	5176.39	5181.36	0.032437	20.83	33.66	19.22	2.77
Rancho Gr-lined	2800	701.00	5168.52	5170.77	5172.59	5177.92	0.035285	21.46	32.67	19.01	2.88
Rancho Gr-lined	2700	701.00	5164.72	5166.95	5168.79	5174.30	0.036736	21.76	32.21	18.91	2.94
Rancho Gr-lined	2600	701.00	5160.92	5163.14	5164.99	5170.58	0.037367	21.90	32.01	18.87	2.96
Rancho Gr-lined	2500	916.00	5157.12	5159.92	5161.79	5166.78	0.026884	21.03	43.56	21.18	2.58
Rancho Gr-lined	2470	916.00	5155.98	5158.73	5160.65	5165.92	0.028661	21.52	42.57	20.99	2.66
Rancho Gr-lined	2400	916.00	5154.93	5157.88	5159.60	5163.78	0.021766	19.49	46.99	21.82	2.34
Rancho Gr-lined	2300	916.00	5153.44	5156.58	5158.11	5161.58	0.017313	17.95	51.03	22.54	2.10
Rancho Gr-lined	2200	916.00	5151.95	5155.17	5156.62	5159.84	0.015741	17.34	52.82	22.86	2.01
Rancho Gr-lined	2100	916.00	5150.45	5153.70	5155.12	5158.25	0.015182	17.12	53.51	22.98	1.98
Rancho Gr-lined	2000	916.00	5147.69	5150.69	5152.36	5156.34	0.020497	19.07	48.02	22.00	2.28
Rancho Gr-lined	1900	916.00	5144.93	5147.82	5149.60	5154.07	0.023567	20.06	45.67	21.57	2.43
Rancho Gr-lined	1800	916.00	5142.16	5145.00	5146.83	5151.59	0.025389	20.60	44.47	21.35	2.52
Rancho Gr-lined	1700	976.00	5139.40	5142.37	5144.24	5148.96	0.024174	20.60	47.37	21.88	2.47
Rancho Gr-lined	1600	976.00	5137.80	5140.96	5142.63	5146.53	0.019158	18.95	51.51	22.63	2.21
Rancho Gr-lined	1500	976.00	5136.20	5139.45	5141.03	5144.58	0.017068	18.17	53.70	23.01	2.10
Rancho Gr-lined	1400	976.00	5134.60	5137.89	5139.43	5142.85	0.016290	17.87	54.62	23.17	2.05
Rancho Gr-lined	1300	976.00	5133.00	5136.12	5137.67	5141.18	0.017128	18.05	54.08	23.58	2.10
Rancho Gr-lined	1250	1013.00	5132.20	5135.77	5136.97	5139.53	0.011024	15.56	65.10	25.38	1.71
Rancho Gr-lined	1200	1013.00	5131.40	5133.72	5135.18	5138.70	0.020340	17.91	56.57	29.06	2.26
Rancho Gr-lined	1100	1013.00	5129.80	5131.49	5132.83	5136.42	0.025559	17.96	58.21	37.85	2.50
Rancho Gr-lined	1068	1013.00	5129.48	5130.28	5131.34	5135.47	0.068478	18.33	55.94	73.21	3.65

Amole Arroyo - Exclusing Portion of Basin 60104

HEC-RAS Plan: 1/27/03 River: Amole Arroyo Reach: Rancho Gr-lined Profile: 100-yr

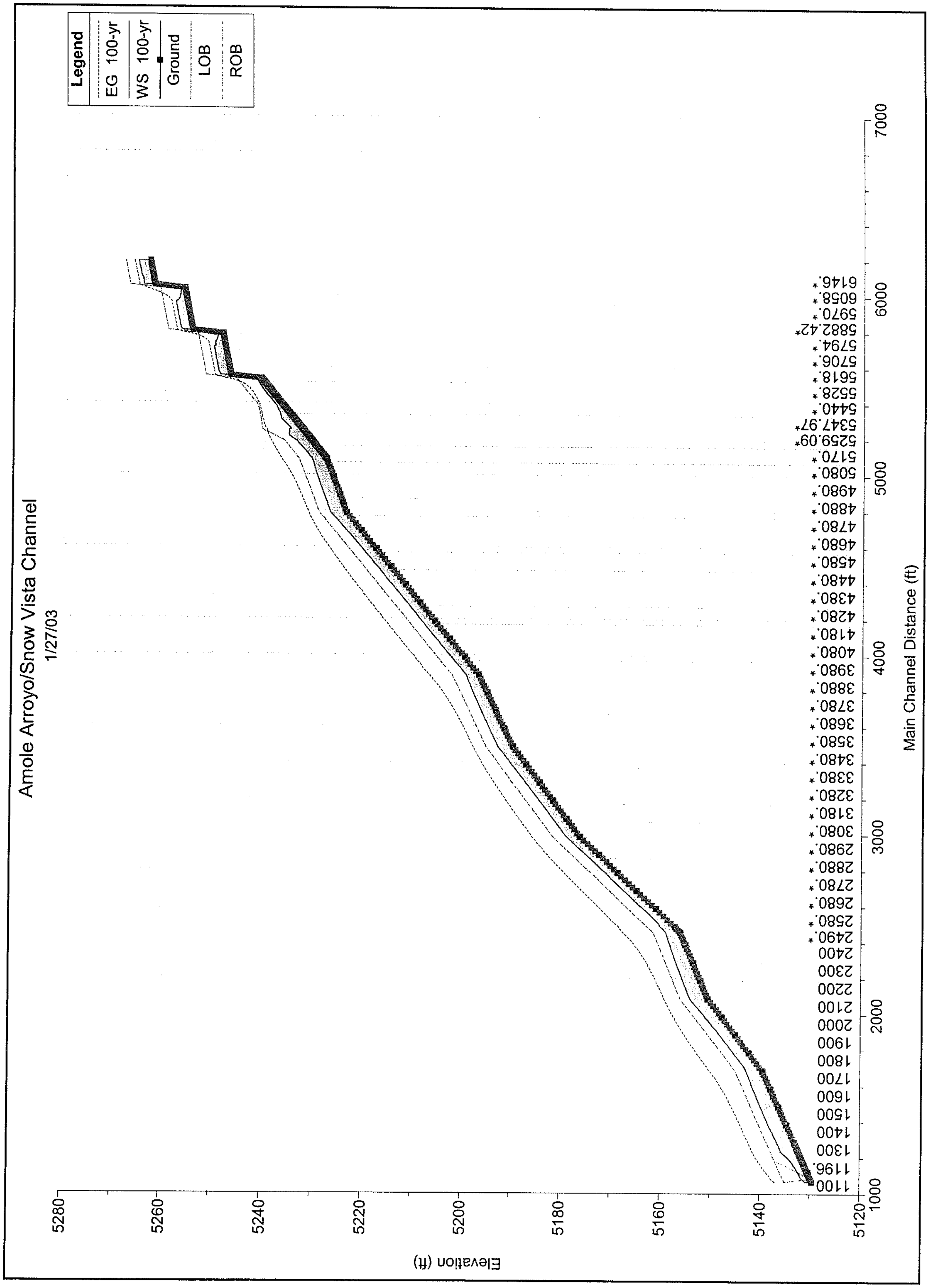
Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Rancho Gr-lined	6200	652.00	5262.93	5265.13	5264.88	5265.82	0.006018	6.68	97.57	48.79	0.83
Rancho Gr-lined	6100	652.00	5262.23	5264.23	5264.18	5265.08	0.008249	7.40	88.14	48.01	0.96
Rancho Gr-lined	6068	652.00	5262.01	5263.96	5263.96	5264.86	0.004051	7.64	85.36	47.78	1.01
Rancho Gr-lined	6050	652.00	5256.01	5256.77	5257.96	5263.43	0.096540	20.71	31.48	43.03	4.27
Rancho Gr-lined	6000	652.00	5255.66	5257.03	5257.61	5258.95	0.029562	11.11	58.69	45.49	1.72
Rancho Gr-lined	5900	652.00	5254.96	5256.99	5256.91	5257.82	0.007872	7.29	89.48	48.12	0.94
Rancho Gr-lined	5818	652.00	5254.38	5256.23	5256.33	5257.24	0.004811	8.07	80.78	47.39	1.09
Rancho Gr-lined	5800	652.00	5248.38	5249.14	5250.33	5255.82	0.096958	20.74	31.44	43.03	4.28
Rancho Gr-lined	5700	652.00	5247.68	5249.88		5250.57	0.006018	6.68	97.57	48.79	0.83
Rancho Gr-lined	5600	652.00	5246.98	5248.98	5248.93	5249.83	0.008249	7.40	88.14	48.01	0.96
Rancho Gr-lined	5568	652.00	5246.76	5248.71	5248.71	5249.61	0.004051	7.64	85.36	47.78	1.01
Rancho Gr-lined	5550	652.00	5240.76	5241.52	5242.71	5248.18	0.096540	20.71	31.48	43.03	4.27
Rancho Gr-lined	5500	652.00	5239.31	5240.46	5241.26	5243.26	0.054090	13.43	48.53	44.59	2.27
Rancho Gr-lined	5400	652.00	5236.42	5237.68	5238.54	5240.69	0.012188	13.93	46.79	39.73	2.26
Rancho Gr-lined	5323	652.00	5234.20	5236.50	5237.51	5239.95	0.007486	14.92	43.71	19.08	1.74
Rancho Gr-lined	5261	701.00	5232.40	5234.53	5235.88	5239.17	0.010880	17.28	40.58	19.08	2.09
Rancho Gr-lined	5200	701.00	5230.63	5233.21	5234.70	5238.20	0.021303	17.93	39.09	20.32	2.28
Rancho Gr-lined	5100	701.00	5227.74	5230.21	5231.81	5235.83	0.025130	19.02	36.86	19.87	2.46
Rancho Gr-lined	5000	701.00	5226.38	5229.11	5230.45	5233.38	0.017128	16.59	42.27	20.93	2.06
Rancho Gr-lined	4900	701.00	5225.02	5227.86	5229.09	5231.70	0.014734	15.71	44.61	21.38	1.92
Rancho Gr-lined	4800	701.00	5223.67	5226.57	5227.74	5230.21	0.013705	15.31	45.79	21.59	1.85
Rancho Gr-lined	4700	701.00	5220.67	5223.24	5224.74	5228.28	0.021608	18.02	38.90	20.28	2.29
Rancho Gr-lined	4600	701.00	5217.67	5220.12	5221.74	5225.83	0.025714	19.18	36.56	19.81	2.49
Rancho Gr-lined	4500	701.00	5214.67	5217.07	5218.74	5223.12	0.027906	19.74	35.51	19.60	2.58
Rancho Gr-lined	4400	701.00	5211.67	5214.04	5215.74	5220.27	0.029011	20.02	35.02	19.50	2.63
Rancho Gr-lined	4300	701.00	5208.67	5211.03	5212.74	5217.34	0.029550	20.15	34.79	19.45	2.65
Rancho Gr-lined	4200	701.00	5205.67	5208.03	5209.74	5214.36	0.029755	20.20	34.71	19.43	2.66
Rancho Gr-lined	4100	701.00	5202.67	5205.03	5206.74	5211.38	0.029893	20.23	34.65	19.42	2.67
Rancho Gr-lined	4000	701.00	5199.67	5202.02	5203.74	5208.40	0.030031	20.26	34.59	19.41	2.67
Rancho Gr-lined	3900	701.00	5196.67	5199.02	5200.74	5205.42	0.030170	20.30	34.54	19.40	2.68
Rancho Gr-lined	3800	701.00	5194.92	5197.50	5198.99	5202.51	0.021424	17.97	39.02	20.30	2.28
Rancho Gr-lined	3700	701.00	5193.17	5195.84	5197.24	5200.38	0.018626	17.09	41.02	20.69	2.14
Rancho Gr-lined	3600	701.00	5191.42	5194.13	5195.49	5198.50	0.017694	16.78	41.78	20.84	2.09
Rancho Gr-lined	3500	701.00	5189.67	5192.39	5193.74	5196.73	0.017503	16.71	41.94	20.87	2.08
Rancho Gr-lined	3400	701.00	5186.96	5189.51	5191.03	5194.65	0.022140	18.18	38.56	20.21	2.32
Rancho Gr-lined	3300	701.00	5184.25	5186.73	5188.32	5192.26	0.024562	18.86	37.16	19.93	2.43
Rancho Gr-lined	3200	701.00	5181.54	5183.99	5185.61	5189.72	0.025868	19.22	36.48	19.79	2.49
Rancho Gr-lined	3100	701.00	5178.83	5181.26	5182.90	5187.10	0.026513	19.39	36.16	19.73	2.52

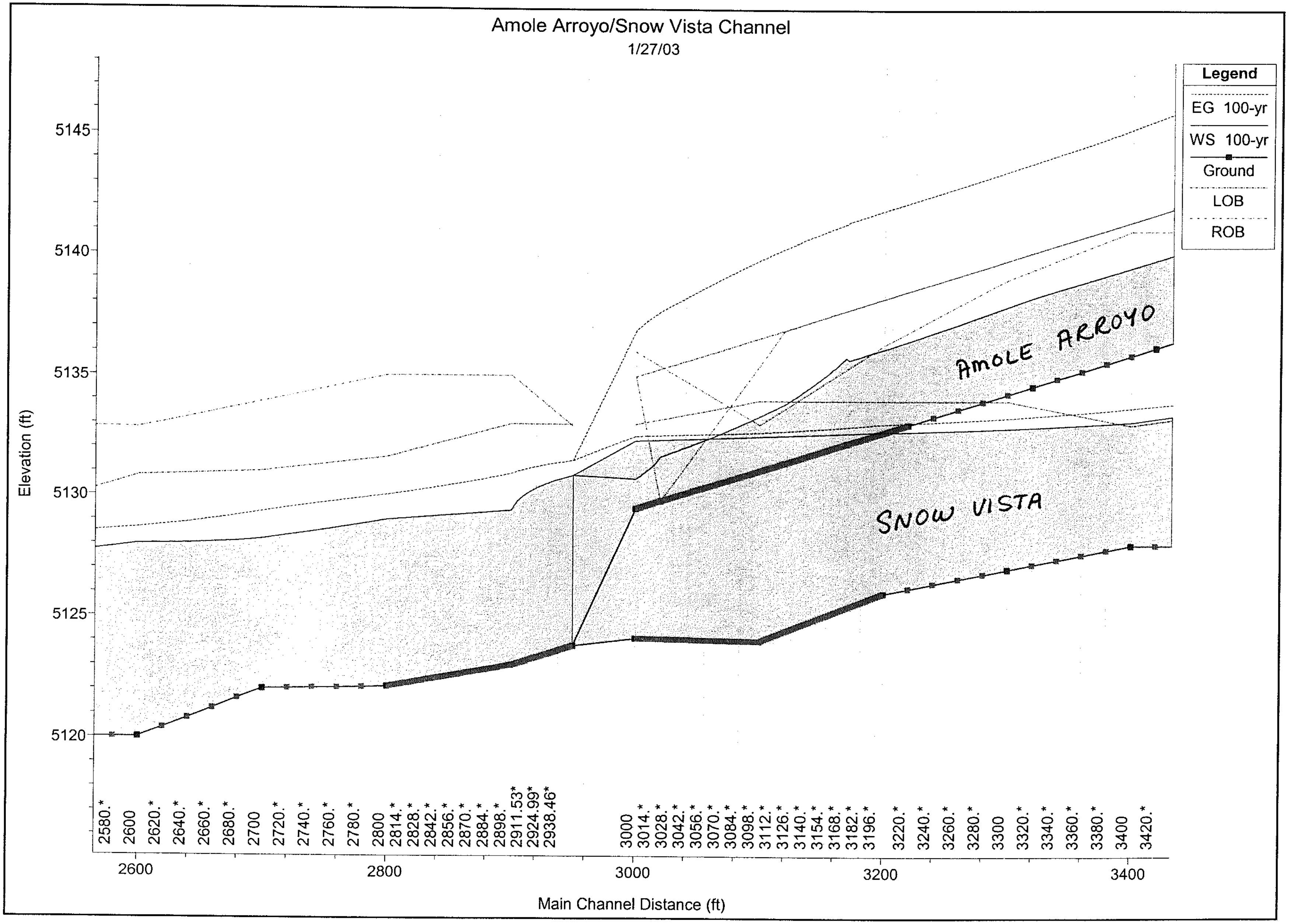
Snow Vista - Excluding Portion of Basin 60104

HEC-RAS Plan: 1/27/03 Profile: 100-yr

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Units 6&7-unline	4300	1692.00	5133.00	5137.23	5136.51	5138.03	0.008467	7.18	235.57	76.48	0.72
Units 6&7-unline	4200	1692.00	5133.00	5136.14		5137.07	0.012229	7.71	219.36	84.56	0.84
Units 6&7-unline	4100	1692.00	5131.00	5135.69		5136.20	0.004381	5.78	292.68	79.94	0.53
Units 6&7-unline	4000	1692.00	5131.00	5135.17		5135.71	0.005170	5.89	287.34	86.82	0.57
Units 6&7-unline	3900	1692.00	5129.00	5134.89		5135.29	0.002826	5.09	332.71	78.99	0.44
Units 6&7-unline	3800	1692.00	5129.00	5134.55		5134.96	0.003135	5.18	326.59	81.75	0.46
Units 6&7-unline	3700	1692.00	5129.00	5134.21		5134.63	0.003087	5.24	322.60	77.99	0.45
Units 6&7-unline	3600	1692.00	5128.10	5133.97		5134.32	0.002494	4.74	356.73	85.90	0.41
Units 6&7-unline	3500	1692.00	5128.00	5133.68		5134.07	0.002792	5.01	337.98	81.56	0.43
Units 6&7-unline	3400	1692.00	5128.00	5133.06		5133.65	0.005129	6.19	273.43	76.63	0.57
Units 6&7-unline	3300	1692.00	5127.00	5132.73		5133.20	0.003726	5.49	308.05	80.45	0.49
Units 6&7-unline	3200	1692.00	5126.00	5132.53		5132.89	0.002410	4.80	352.83	81.26	0.41
Units 6&7-unline	3100	1692.00	5124.00	5132.29		5132.46	0.000817	3.37	502.67	86.62	0.25
Units 6&7-unline	3000	1692.00	5124.10	5132.04		5132.26	0.001178	3.72	454.80	89.30	0.29
Unit 8-unlined	2950	2655.00	5123.80	5130.61		5131.19	0.003201	6.10	435.49	86.18	0.48
Unit 8-unlined	2900	2655.00	5123.00	5129.08		5130.62	0.012683	9.96	266.64	71.29	0.91
Unit 8-unlined	2800	2655.00	5122.10	5128.74		5129.72	0.006647	7.93	334.82	77.54	0.67
Unit 8-unlined	2700	2655.00	5122.00	5127.90		5128.99	0.007855	8.38	316.82	76.58	0.73
Unit 8-unlined	2600	2655.00	5120.00	5127.66		5128.31	0.003494	6.45	411.90	79.71	0.50
Unit 8-unlined	2500	2655.00	5120.00	5127.03	5125.35	5127.87	0.005125	7.36	360.51	76.42	0.60
Unit 8-unlined	2400	2655.00	5119.80	5125.44		5127.04	0.012560	10.16	261.34	67.13	0.91
Unit 8-unlined	2300	2655.00	5117.00	5125.80		5126.25	0.002234	5.35	496.24	91.13	0.40
Unit 8-unlined	2200	2655.00	5116.90	5125.40		5125.97	0.003083	6.10	435.50	83.51	0.47
Unit 8-unlined	2100	2655.00	5116.60	5124.95		5125.62	0.003869	6.58	403.74	82.12	0.52
Unit 8-unlined	2000	2655.00	5116.30	5124.67	5122.01	5125.25	0.003003	6.08	436.90	82.29	0.46

AMOLE ARROYO




Amole Arroyo/Snow Vista Channel
1/27/03
Legend
EG 100-yr
WS 100-yr
Ground
LOB
ROB
Elevation (ft)
5145
5140
5135
5130
5125
5120
AMOLE ARROYO
SNOW VISTA
2580.*
2600
2620.*
2640.*
2660.*
2680.*
2700
2720.*
2740.*
2760.*
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2800
2814.*
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2911.53*
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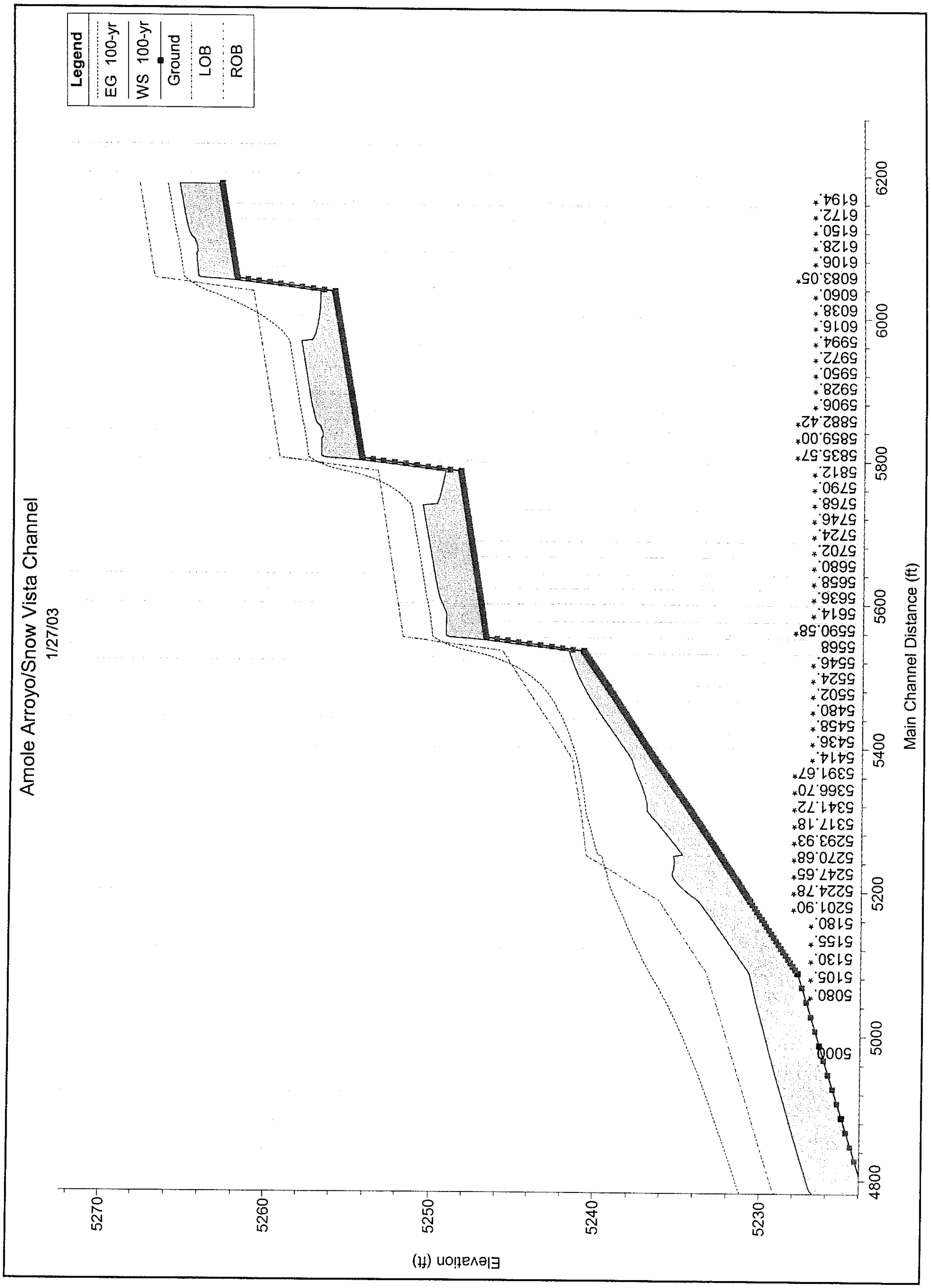
3380.*
3400
3420.*
2600
2800
3000
3200
3400
Main Channel Distance (ft)

AMOLE ARROYO

Drop Structures West of Delgado



Appendix D

Amole Arroyo--Depth of Channel Including Superelevation
Portion of Basin 60104 Included

Superelevation: $S = 1.3V^2(b+2zD)/2gr$ (*COA DPM*)

S = superelevation
V = velocity
b = channel bottom width
D = depth of flow for equiv. straight reach
R = channel radius
z = cotangent of channel side slope = 2
g = gravity = 32.2 ft/s^2

Station	R (ft)	V (ft/s)	b (ft)	D (ft)	S (ft)	Total Depth (ft)
11+00	400	19.1	31.1	1.8	0.7	2.5
12+00	400	20.1	19.8	2.5	0.6	3.1
12+50	700	18.7	14.6	3.6	0.3	3.9
13+00	700	19.0	11.1	3.5	0.3	3.8
14+00	700	19.0	10.0	3.6	0.3	3.9
15+00	1400	19.4	10.0	3.6	0.1	3.7
16+00				3.5		3.5
17+00	700	23.9	10.0	3.3	0.4	3.7
18+00	700	22.0	10.0	3.2	0.3	3.5
19+00	1400	21.6	10.0	3.2	0.2	3.4
20+00				3.3		3.3
21+00				3.4		3.4
22+00				3.7		3.7
23+00	500	19.3	10.0	3.4	0.4	3.8
24+00	265	21.0	10.0	3.2	0.8	4.0
24+50	265	23.1	10.0	3.0	0.9	3.9
25+00	500	22.7	10.0	3.1	0.5	3.6
26+00				2.6		2.6
27+00				2.6		2.6
28+00				2.6		2.6
29+00				2.7		2.7
30+00				2.8		2.8
31+00				2.8		2.8
32+00				2.8		2.8
33+00				2.9		2.9
34+00				3.0		3.0
35+00				3.1		3.1
36+00	500	18.2	10.0	3.1	0.3	3.4
37+00	500	18.6	10.0	3.0	0.3	3.3
38+00	1000	19.6	10.0	2.9	0.2	3.1
39+00	1000	21.8	10.0	2.7	0.2	2.9
40+00	500	21.8	10.0	2.7	0.4	3.1
41+00	500	21.8	10.0	2.7	0.4	3.1
42+00	1000	21.8	10.0	2.7	0.2	2.9
43+00				2.7		2.7
44+00				2.8		2.8

6' channel depth (stations 22+00 to 25+00)

5.5' channel depth (stations 26+00 to 30+00)

Station	R (ft)	V (ft/s)	b (ft)	D (ft)	S (ft)	Total Depth (ft)
44+00				2.8		2.8
45+00				2.8		2.8
46+00	3000	20.4	10.0	2.9	0.1	3.0
47+00				3.0		3.0
48+00				3.3		3.3
49+00				3.3		3.3
50+00				3.1		3.1
51+00				2.9		2.9
52+00				3.1		3.1
52+61				2.8		2.8
53+23				2.7		2.7
54+00	1000	14.8	40.0	1.4	0.2	1.6
55+00	1000	14.7	40.0	1.3	0.2	1.5
55+50	500	21.1	40.0	0.9	0.8	1.7
55+68	500	8.6	40.0	2.1	0.1	2.2
56+00	500	7.9	40.0	2.2	0.1	2.3
57+00	1000	7.2	40.0	2.4	0.1	2.5
58+00				0.9		0.9
58+18				2.0		2.0
59+00				2.4		2.4
60+00				1.5		1.5
60+50				0.9		0.9
60+68				2.2		2.2
61+00				2.3		2.3
62+00				2.4		2.4

4.5' channel depth

Amole Arroyo--Depth of Channel Including Superelevation
Portion of Basin 60104 Excluded

Superelevation: $S = 1.3V^2(b+2zD)/2gr$ (*COA DPM*)

S = superelevation
V = velocity
b = channel bottom width
D = depth of flow for equiv. straight reach
R = channel radius
z = cotangent of channel side slope = 2
g = gravity = 32.2 ft/s^2

Station	R (ft)	V (ft/s)	b (ft)	D (ft)	S (ft)	Total Depth (ft)
11+00	400	17.4	31.1	1.7	0.6	2.3
12+00	400	17.9	19.8	2.3	0.5	2.8
12+50	700	15.6	14.6	3.6	0.2	3.8
13+00	700	18.1	11.1	3.1	0.2	3.3
14+00	700	17.9	10.0	3.3	0.2	3.5
15+00	1400	18.2	10.0	3.2	0.1	3.3
16+00				3.2		3.2
17+00	700	20.6	10.0	3.0	0.3	3.3
18+00	700	20.6	10.0	2.8	0.3	3.1
19+00	1400	20.0	10.0	2.9	0.1	3.0
20+00				3.0		3.0
21+00				3.2		3.2
22+00				3.2		3.2
23+00	500	18.0	10.0	3.1	0.3	3.4
24+00	265	19.5	10.0	3.0	0.6	3.6
24+50	265	21.0	10.0	2.8	0.7	3.5
25+00	500	21.0	10.0	2.8	0.4	3.2
26+00				2.2		2.2
27+00				2.2		2.2
28+00				2.2		2.2
29+00				2.3		2.3
30+00				2.4		2.4
31+00				2.4		2.4
32+00				2.5		2.5
33+00				2.5		2.5
34+00				2.6		2.6
35+00				2.7		2.7
36+00	500	16.8	10.0	2.7	0.2	2.9
37+00	500	17.1	10.0	2.7	0.2	2.9
38+00	1000	18.0	10.0	2.6	0.1	2.7
39+00	1000	20.3	10.0	2.4	0.2	2.6
40+00	500	20.3	10.0	2.4	0.3	2.7
41+00	500	20.2	10.0	2.4	0.3	2.7
42+00	1000	20.2	10.0	2.4	0.2	2.6
43+00				2.4		2.4
44+00				2.4		2.4

6' channel depth (22+00 to 25+00)

5' channel depth (26+00 to 30+00)

45+00				2.4		2.4
46+00	3000	19.8	10.0	2.5	0.1	2.6
47+00				2.6		2.6
48+00				2.9		2.9
49+00				2.8		2.8
50+00				2.7		2.7
51+00				2.5		2.5
52+00				2.6		2.6
52+61				2.1		2.1
53+23				2.3		2.3
54+00	1000	13.9	40.0	1.2	0.2	1.4
55+00	1000	13.4	40.0	1.1	0.2	1.3
55+50	500	20.7	40.0	0.8	0.7	1.5
55+68	500	7.6	40.0	1.9	0.1	2.0
56+00	500	7.4	40.0	2.0	0.1	2.1
57+00	1000	6.7	40.0	2.2	0.0	2.2
58+00				0.8		0.8
58+18				1.9		1.9
59+00				2.0		2.0
60+00				1.4		1.4
60+50				0.8		0.8
60+68				1.9		1.9
61+00				2.0		2.0
62+00				2.2		2.2

4.5' channel depth

Appendix E

Amole Arroyo--Easement Curve Length & Min. Centerline Radius

V =	velocity	24 fps
b =	bottom width	10 ft
z =	cotangent of channel side slope	2
D =	depth of flow for equiv. straight reach	4 ft

L_E = length of easement curve = 0.32*(b+2*z*D)*(V/D$^{0.5}$)

L_E = 100 ft

$R_{min.}$ = minimum centerline radius = Q*V/100

Station	Q (cfs)	V (fps)	$R_{min.}$ (ft)
10+68-17+00	1237	20	247
17+00-25+00	1129	23.2	262
25+00-53+23	914	21	192
53+23-62+00	797	21.2	169

→ Use 265 ft

Appendix F

Amole Arroyo--Slug Flow Analysis

Reference: *Design of Small Canal Structures*, U.S. Department of the Interior

Q =	flow	787 cfs		
d =	avg. water depth =	Area of water prism / Top width of water prism	9.28 / 13.2	0.7 ft
V =	velocity	15 fps		
b =	bottom width	40 ft		
L =	length of section	18 ft		
s =	avg. slope of energy gradient	0.044 ft/ft		
ϕ =	angle of inclination of the energy gradient	2.52 °		
wp =	wetted perimeter	26.8 ft		
g =	acceleration of gravity	32.2 ft/s^2		
d/wp =		0.03		

V = Vedernikov number $= 2/3(b/wp)(v/(g*d*\cos\phi)^{1/2}) =$ = 3.15

M^2 = Montuori number $= V^2/(g*s*L*\cos\phi)$ = 8.83

From Figure 2-45 ⟶ Zone of no slug flow
From Figure 2-46 ⟶ Zone of slug flow

"Waves are not likely to be generated in the structure, unless the plotted data falls within the slugging zone on both figures." (page 112) ⟶ <u>No Slug Flows</u>

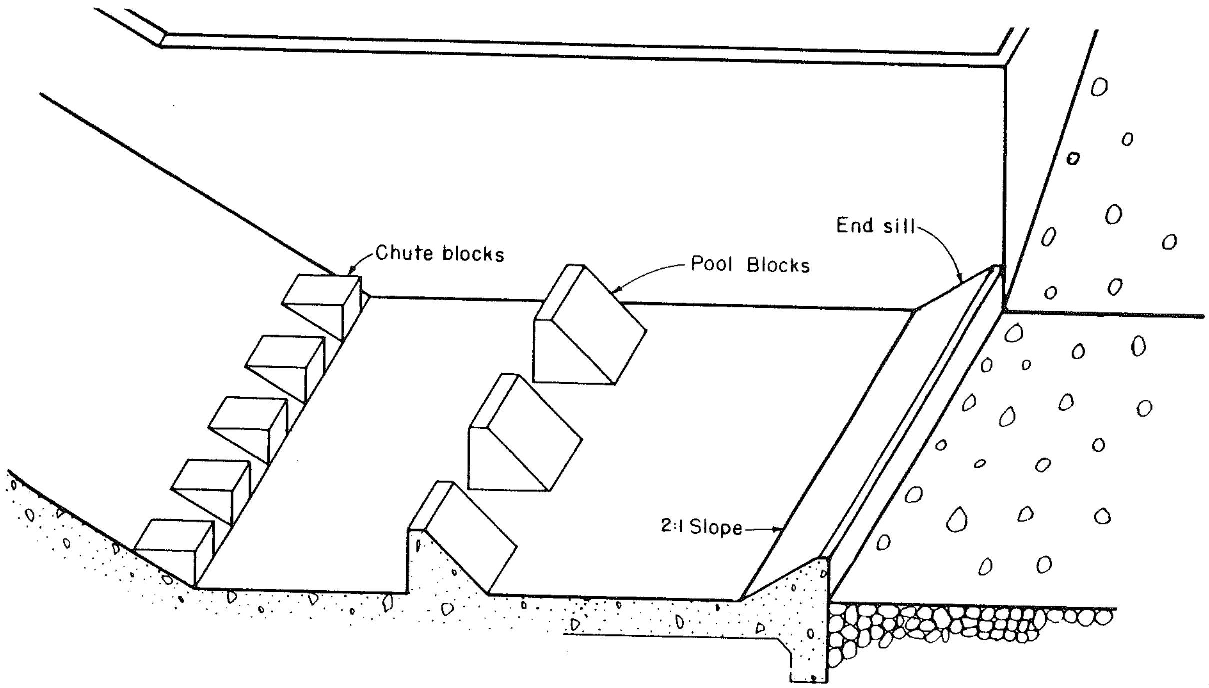


Figure 2-40. **Stilling pool with end sill. 103-D-1277**

Figures 2-45 and 2-46 have been developed to predict the possibility of slug flow occurring in a chute. The use of the figures requires the following operations:

(1) Divide the chute into a number of reaches as shown on figure 2-47. Point 1 should be at the beginning of the chute section.

(2) Using equation (6) or (7), with Q equal to 0.2, 0.5, and 1.0 times design Q, compute the water depth and energy levels at the points along the chute section that are to be checked for slugging. Use Manning's n = 0.010.

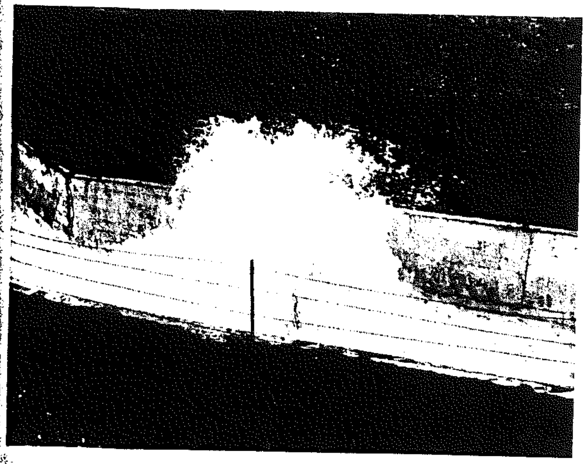


Figure 2-41. **Surging in a stilling pool caused by unstable flow in a chute structure. P222-117-36223**

(3) Determine sL for the point to be checked (fig. 2-47).

(4) At the points to be considered:

a. Compute the Vedernikov number ($\underline{V}$) [10].

$$\underline{V} = \frac{2}{3} \times \frac{b}{wp} \times \frac{V}{\sqrt{gd \cos \theta}} \qquad (10)$$

b. Compute the square of the Montuori number ($\underline{M}$) [11].

$$\underline{M}^2 = \frac{V^2}{g\,sL \cos \theta} \qquad (11)$$

In equations (10) and (11)

b = bottom width of the chute section

d = average water depth in the chute section:

$$d = \frac{\text{Area of the water prism}}{\text{Top width of the water prism,}}$$

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U.S. Dept. of the Interior - Bureau of Reclamation

Figure 2-42. **Pulsating flow in steep chute. Flow is 57 cfs. P222-117-36208D**

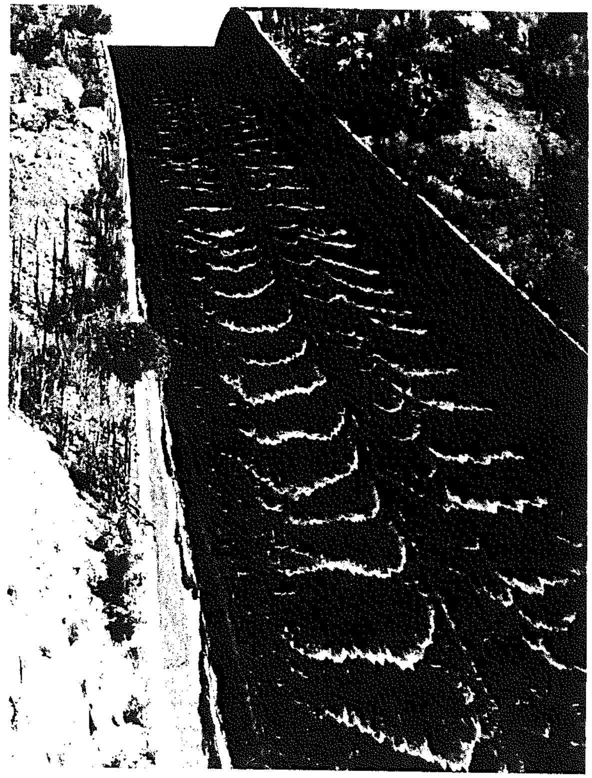

Figure 2-43. **Unstable flow at shallow depth. H-686-55D**

g = acceleration of gravity,
L = length of reach under consideration,
s = average slope of the energy gradient.

$$s = \tan \theta,$$

V = velocity,
wp = wetted perimeter of the section, and
θ = angle of inclination of the energy gradient.

(5) Plot the computed values on figure 2-45. If the plotted points fall within the slug flow zone, intermediate points may be checked to determine the point at which the waves begin to form.

(6) Compute the shape factor for the chute section.

$$\frac{d}{wp}$$

(7) Plot the computed value of $\frac{d}{wp}$ against the slope of the energy gradient, s, on figure 2-46.

Waves are not likely to be generated in the structure, unless the plotted data falls within the slugging zone on both figures 2-45 and 2-46.

If the charts indicate that slug flow will occur, the design may be modified to reduce the probability of waves being generated or the structure may be adapted to accommodate the

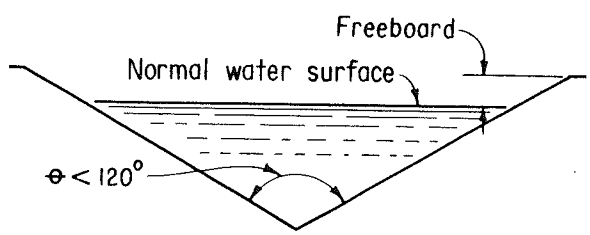

Figure 2-44. **Theoretical waveless chute section. Triangular shape prevents both cross waves and slug flow. 103-D-1278**

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surging flow that does occur. Possible design changes include:

(1) Divide the flow in the chute section with a wall down the center of the chute.

(2) Change the shape of the section. The theoretical waveless shapes could be considered.

(3) Reduce the length of the chute. A series of shorter chutes or drops could be considered.

(4) Steepen the chute.

(5) Replace the open channel chute section with pipe.

If these design changes are impractical, the chute section might be adapted to accommodate surging flow by:

(1) Increasing the freeboard of the chute walls.

(2) Providing a cover for the chute section to contain the waves, or

(3) Protecting the backfill around the chute section with riprap or paving.

Adaptations to the stilling pool could include:

(1) Designing the pool to provide for the momentary surge discharge. This would

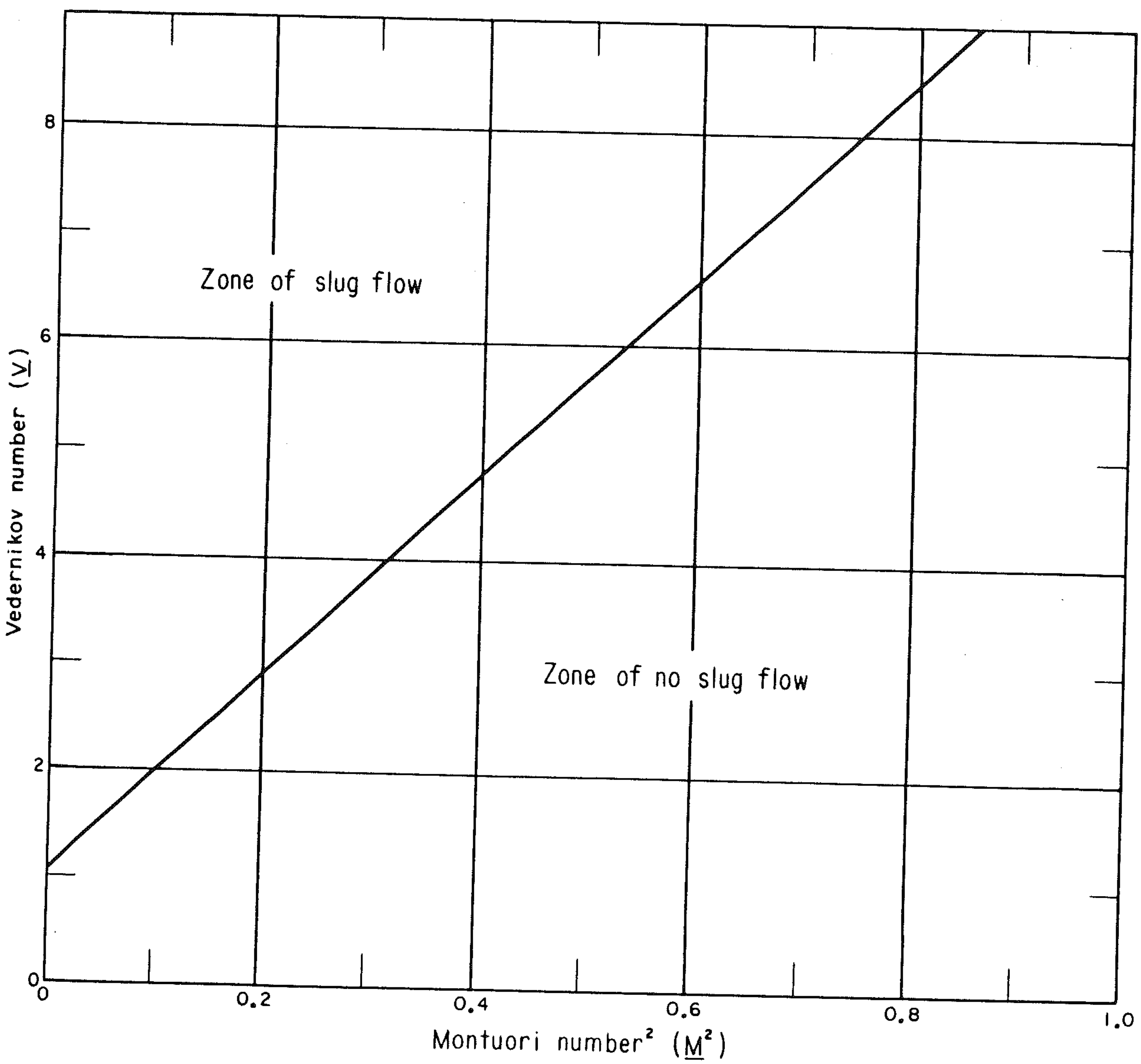

Figure 2-45. **Criteria for slug flow. 103-D-1279**

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provide a longer pool and higher pool walls to contain the surge.

(2) Provide additional riprap to protect the channel downstream and the backfill around the pool.

(3) Provide a surge suppressing device in the stilling pool. A baffle or weir wall in the pool could prevent flow from sweeping through the pool and outlet transition (fig. 2-48). Weir walls could also provide tailwater to submerge the surges. Rafts or other floating wave dampeners could be used.

(4) An energy dissipator less sensitive to surging could be used.

The study of wave action in chute structures is based largely on empirical data. If a serious wave problem in a structure is indicated, further studies should be undertaken to verify the extent of the problem and the effectiveness of the proposed solutions.

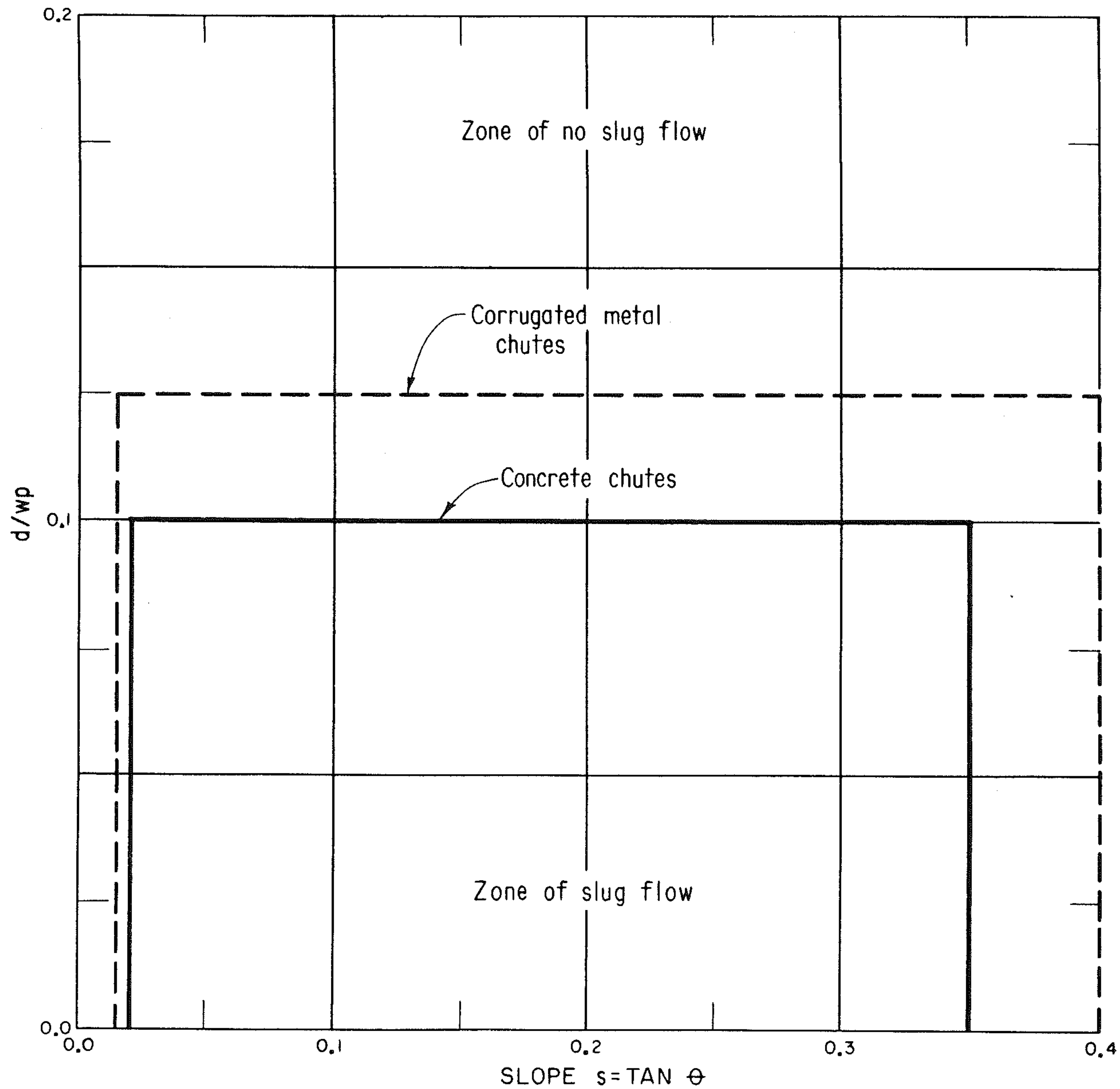

Figure 2-46. **Shape and slope criteria for slug flow. 103-D-1280**

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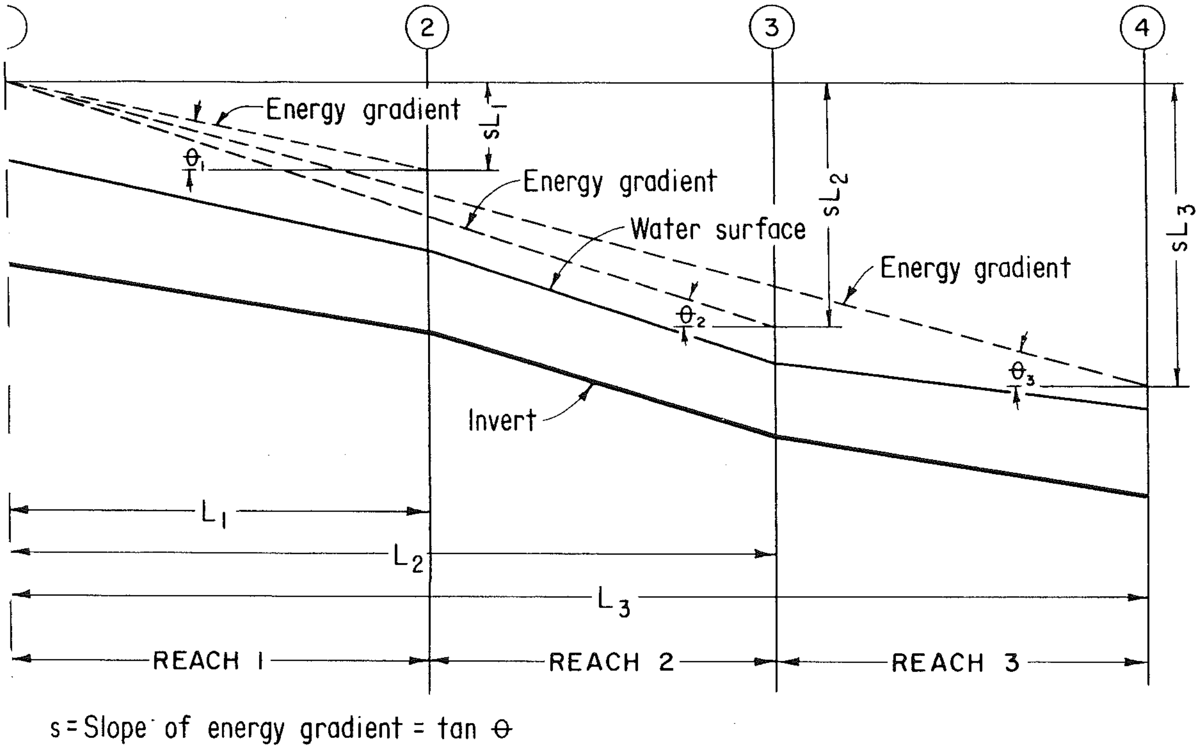

Figure 2-47. **Invert, water surface, and energy profiles of a chute structure. 103-D-1281**

2-35. *Design Procedure.*–

(1) Select and design the type of inlet to be used.

(2) Determine the energy gradient at the beginning of the chute section.

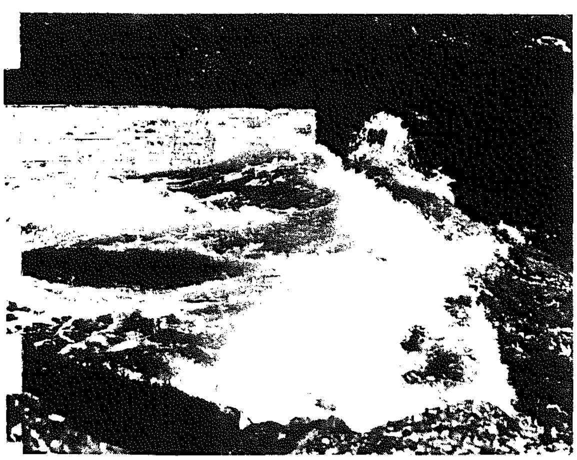

Figure 2-48. **Wave sweeping through the outlet transition of a stilling pool. Flow is 140 cfs. P222-117-36227**

(3) Compute the variables of flow down the chute section.

(4) Design the trajectory and the steep portion of the chute section.

(5) Assume an elevation for the floor of the stilling pool and compute the characteristics of flow upstream of the hydraulic jump.

Determine d_2 and the energy gradient after the hydraulic jump.

(6) Determine the energy gradient in the channel downstream and compare to the energy gradient after the jump.

(7) It may be necessary to assume a new pool invert elevation and to recompute the above values several times before a check in energy gradients is obtained.

(8) Review for proper operation at partial capacity.

(9) Determine the length of the pool and the height of the pool walls.

(10) Design the chute and floor blocks and the end sill or outlet transition as required.

(11) Check the possibility of waves developing on the structure.

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If an incoming surge of height h_2 approaches the junction from channel II, then it can be shown that

$$h = \frac{2h_2A_2}{Ic_2} \tag{19-84}$$

Similarly, if an incoming surge of height h_3 approaches the junction from channel III, then

$$h = \frac{2h_3A_3}{Ic_3} \tag{19-85}$$

By the above principle, it is possible to analyze surges in a complicated channel network. Such a method has been developed by Swain [32,33] for an approximate determination of surge flows in an interconnected system of estuarine channels in response to tidal variations. In this method, the friction barrier is assumed to be located at the middle of a channel reach. The surges are assumed to have small heights compared with the depth of flow, so that simplified equations can be applied. To further expedite the computation, it is desirable to have coincidental arrival of surges at a barrier or junction at some given instant. This is made possible by the use of a procedure that involves a modification of the true length of the channel reaches. The analytic method developed by Swain was actually applied to a problem for the determination of flows in interconnected estuarine channels in the Delta area of California east of Suisun Bay. The same problem was studied by the U.S. Bureau of Reclamation using an elaborate hydraulic model [34–36] and an electronic analog model [37]. The results of the Swain method were checked satisfactorily.

19-9. Pulsating Flow. When the slope of a channel becomes very steep, supercritical flow of uniform depth in the channel will break into a train of traveling waves or pulses, known as *pulsating flow*. Such an unsteady flow occurs in various situations and in each situation it has specific significance. When it occurs in inclined flumes and spillways, the increased height of the flow requires additional freeboard to prevent spillage, and the concentrated mass of the wavefronts calls for additional structural safety factors against transient pressures and stresses. In hydraulic models, presence of the flow often interferes with similarity conditions. On farm lands and unstabilized roads, the high scouring capacity of the flow causes surface erosions. In chemical processes, the effect of the flow will increase the mass-transfer rate between gas and liquid diffusion reactions.

There have been numerous studies on the phenomenon of pulsating flow. Most of them, however, were made primarily in connection with the investigation of the mechanism of instability of flow (Art. 8-8). An analytical and experimental study of pulsating flow which has long interested hydraulic engineers was made by Thomas [38]. In this study pulsating flow was described as a flow consisting of two parts, a roughly tumbling head and a smooth tail section. The results of the study indicate that, for pulsating flow to occur in a wide rectangular channel, the channel slope must be more than 4 times the critical slope or the velocity more than twice the critical velocity. Another investigation was made by Mayer [39], who found that pulsating flow can be classified into two distinct types, namely, roll waves and slug flow.

According to Mayer, *roll waves* are characterized by transverse ridges of high vorticity. The regions between the crests are quiescent. The waves are initiated by finite as well as infinitesimal disturbances in the laminar boundary layer. The process can be enhanced by external causes, such as addition of water by rain, release of air bubbles in the upstream pool, roughening the channel entrance, or contact of the flow surface with disturbing air currents. For roll waves to form, however, the surface velocity of the undisturbed flow must be less than the wave velocity, and the channel slope must be supercritical. This requirement will ensure the breaking of waves at their downstream ends and thus allow a frontward steepening of wave configuration and subsequent increase of capillary effects. This process is primarily responsible for the formation of roll waves. In Mayer's experiment, no roll waves were observed on slopes of less than 3% and in no case was the Reynolds number in excess of 420.

Slug flows are characterized by surges of turbulent ridges with wave crests separated by highly agitated regions. In model channels, they are originated randomly at the side walls and in the channel as spotty bursts of turbulence, exhibiting characteristics similar to moving oblique hydraulic jumps. They are the result of transition from supercritical laminar to subcritical turbulent state of flow. For slug flows to form, the surface velocity must be greater than the wave velocity. This will ensure the steepening and breaking of waves at their upstream ends and thereby result in the development of moving hydraulic jumps. In Mayer's experiment, no slug waves were formed on slopes less than about 2%. The range of Reynolds number for slug flows was approximately 1,000 to 4,000. For Reynolds number greater than 4,000, the flow was thoroughly turbulent.

Considering a parabolic distribution of the velocity of a uniform flow in an inclined channel, the surface velocity given by Eq. (6-42) for $y = y_m$ is $gSy_m^2/2\nu$. The average velocity of the flow is given by Eq. (6-43) or $V = gSy_m^2/3\nu$. The surface velocity is, therefore, equal to 1.5 times the average velocity, or $1.5V$.

According to the previous description, a roll wave can be formed when the surface velocity is equal to or less than the absolute wave

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velocity, that is, when

$$1.5V \leqq V + c \tag{19-86}$$

or

$$V/c \leqq 2 \tag{19-87}$$

Since V/c is equal to the Froude number and since roll waves can be formed only on supercritical slopes, the range of Froude number for the formation of roll waves is $1 \leqq \mathbf{F} \leqq 2$. Solving Eq. (6-43) for S, it can be shown that $S = 3\mathbf{F}^2/\mathsf{R}$. Thus, the range of slope for the formation of roll waves is $3/\mathsf{R} \leqq S \leqq 12/\mathsf{R}$.

Slug flow can be formed when the surface velocity is greater than the wave velocity. Theoretically, therefore, the formation of slug flow will occur when $\mathbf{F} > 2$ and $S > 12/\mathsf{R}$.

PROBLEMS

19-1. Prove Eq. (19-11).

19-2. Prove Eq. (19-15).

19-3. Assuming the energy loss in the moving hydraulic jump to be negligible, Koch and Carstanjen [27] have derived the following equation for the wave velocity of a surge:

$$V_w = \sqrt{\left(\frac{V_1 - V_2}{4}\right)^2 + gy_1} \pm \frac{V_1 + 3V_2}{4} \tag{19-88}$$

where the positive sign is for type A and C surges and the negative sign is for type B and D surges (Fig. 19-2). Verify this equation.

19-4. Assuming an initial depth of 20 ft, an initial velocity of 15 fps, and a rectangular channel cross section, compute the velocity and overrun of the bore shown in Fig. 19-3 and estimate the distance traveled by the bore in 7 min.

19-5. Compute the heights, depths, and wave velocities of the two component surges produced in Example 19-3.

19-6. A positive surge 0.63 ft high and 51.72 ft deep is moving in still water 51.09 ft deep with a wave velocity of 41.70 fps toward the dead end of a channel. Determine the height and wave velocity of the reflected surge after the original surge hits the dead end.

19-7. Solve Example 19-1 if the original steady flow has a velocity of 10 fps and a depth of 50 ft.

19-8. Solve Example 19-3, if the step has a height of $F = 3$ ft.

19-9. Two positive surges 3 and 2 ft in height, respectively, move in opposite directions toward each other in a frictionless horizontal channel where the water is initially stationary at a depth of 30 ft. The high surge has a wave velocity of 30 fps and the low surge a wave velocity of 20 fps. Determine the flow condition after the surges meet.

19-10. Solve Example 19-1 if the channel has a slope of 0.01. The initial steady flow is assumed uniform.

19-11. Show that the celerity formula in the form of Eq. (18-45) applies only to positive surges and that the corresponding celerity formula for negative surges is

$$c = \sqrt{gy\left(1 - \frac{3h}{2y}\right)} \tag{19-89}$$

19-12. Referring to Example 19-5, show that the crest velocity $V_{w2} = \sqrt{gy_2}$, that the trough velocity $V_{w1} = 2\sqrt{gy_2}$, that the velocity of flow through the dam site is $\frac{2}{3}\sqrt{gy_2}$, and that the discharge through the dam site is $\frac{8}{27}\sqrt{g}\,y_2^{3/2}$.

19-13. Continue the computation of the example illustrated in Fig. 19-12, and determine the flow conditions at 420, 504, 552, 743, and 767 sec, respectively, after the load was suddenly thrown off.

19-14. Solve Example 19-6 if the equalization time is (*a*) 8 min and (*b*) 12 min. The discharge from the lock increases linearly from 0 to 10,000 cfs for the first 20% of the time and then decreases linearly to 0 for the remaining part of the time. Study the effect due to change in equalization time.

19-15. Solve Example 19-7 if the discharge is 1,000 cfs.

19-16. Three horizontal frictionless channels 4, 6, and 8 ft wide meet at a junction. The water in the channels has an initial stationary depth of 10 ft. When an incoming surge 0.4 ft high approaches the junction from the narrowest channel, determine the flow condition after the surge enters the junction. Compute the reflection coefficient of the junction.

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"Open Channel Hydraulics" - Chow

Appendix G

TABLE III -1
HYDROLOGIC SUMMARY
AMOLE ARROYO BASIN

AP NO.	MAP NO.	DESCRIPTION	VARIABLE	EXISTING FACILITIES			PROPOSED DMP FACILITIES	
				EXISTING	DEVEX	EXISTING CAPACITY	DMP	FUTURE CAPACITY
1	6	AMOLE ARROYO OUT @ WESTGATE	Q (cfs)	73.2	73.5	74	73.5	74
			Tvol (AF)	418	449		449	
			Runoff (in)	0.17	0.62		0.62	
			cfs/ac	0.01	0.02		0.02	
2	6	AMOLE ARROYO BELOW POWERLINE JUNCTION	Q (cfs)	562	1161	N/A	255	N/A
			Tvol (AF)	489	558		556	
			Runoff (in)	0.22	0.81		0.64	
			cfs/ac	0.04	0.28		0.06	
2.1	6	AMOLE ARROYO AT CBC AT DELGADO	Q (cfs)	652	1525	1026	575	1026
			Tvol (AF)	494	577	(bank full)	574	(bank full)
			Runoff (in)	0.22	0.84		0.67	
			cfs/ac	0.05	0.36		0.13	
2.2	6	AMOLE ARROYO AT EAST WESTGATE CROSSING	Q (cfs)	620	1535	N/A	693	N/A
			Tvol (AF)	497	582		580	
			Runoff (in)	0.22	0.84		0.68	
			cfs/ac	0.05	0.36		0.16	
3	7	AMOLE ARROYO AND SNOW VISTA CONFLUENCE	Q (cfs)	1990	3463	N/A	2825	N/A
			Tvol (AF)	603	769		767	
			Runoff (in)	0.29	1.06		0.94	
			cfs/ac	0.14	0.63		0.51	
3.1	7	AMOLE ARROYO ABOVE SACATE BLANCO CONFLUENCE	Q (cfs)	2237	4016	N/A	3526	N/A
			Tvol (AF)	639	814		814	
			Runoff (in)	0.29	1.11		0.98	
			cfs/ac	0.15	0.68		0.61	
4	7	AMOLE ARROYO INTO AMOLE DETENTION FACILITY	Q (cfs)	3022	6089	1500 cfs channel	5293	4650
			Tvol (AF)	657	950	4235 cfs chute	925	
			Runoff (in)	0.31	1.18	(bank full)	1.08	
			cfs/ac	0.19	0.89	3000 cfs channel	0.81	
						7480 cfs chute		

Notes/Legend

AP - Analysis Point - See Figures this report, maps in Volume II and detail hydrology in Volume III.
Q - Peak discharge rate
Tvol - Total runoff volume (includes truncated volumes)
Dvol - Maximum detained volume
Runoff - inches of runoff

cfs/ac - peak discharge rate per acre of contributing area.
Existing - Existing land use and existing drainage facilities.
DEVEX - Fully developed land use and existing drainage facilities.
Capacity - Design capacity.
DMP - Proposed improvements in place, fully developed land use.

TABLE III-3
HYDROLOGIC SUMMARY
SNOW VISTA BASIN

AP NO.	MAP NO.	DESCRIPTION	VARIABLE	EXISTING FACILITIES: EXISTING	EXISTING FACILITIES: DEVEX	EXISTING FACILITIES: EXISTING CAPACITY	PROPOSED DMP FACILITIES: DMP	PROPOSED DMP FACILITIES: FUTURE CAPACITY
21.1	4	SNOW VISTA SEDIMENTATION BASIN	Q (cfs)	233	423	484	423	484
			Tvol (AF)	17.1	53.8		53.8	
			Dvol (AF)	4.0	6.4		6.4	
			Runoff (in)	0.76	2.07		2.07	
			cfs/ac	0.62	1.36		1.36	
21	4	SNOW VISTA CHANNEL AT HEAD	Q (cfs)	167	388	290	388	375
			Tvol (AF)	17.1	53.8	2530	53.18 *	
			Runoff (in)	0.76	2.07	(bank full)	2.07	
			cfs/ac	0.62	1.25		1.25	
22	4	SNOW VISTA BELOW SECTION LINE JUNCTION	Q (cfs)	407	747	810	747	810
			Tvol (AF)	41.5	95	4595	95 *	
			Runoff (in)	0.86	1.97	(bank full)	1.97	
			cfs/ac	0.70	1.29		1.29	
22.1	4	SNOW VISTA BELOW SAGE CROSSING	Q (cfs)	642	916	850	916	930
			Tvol (AF)	49.3	114.4	3850	114.4 *	
			Runoff (in)	0.83	1.93	(bank full)	1.93	
			cfs/ac	0.90	1.29		1.29	
22.2	4	SNOW VISTA BELOW INLET FROM WESTGATE	Q (cfs)	812	1031	990	1031	1050
			Tvol (AF)	57	121.7	3700	121.7 *	
			Runoff (in)	0.90	1.92	(bank full)	1.92	
			cfs/ac	1.07	1.36		1.36	
23	4	SNOW VISTA BELOW BENAVIDES INLET	Q (cfs)	1864	2050	1200	2050	2100
			Tvol (AF)	99	167.5	5230	167.5	
			Runoff (in)		1.88	(bank full)	1.88	
			cfs/ac		1.92		1.92	
24	7	SNOW VISTA AT ENTRANCE TO AMOLE ARROYO	Q (cfs)	1814	2083	1200	2083	2100
			Tvol (AF)	105.7	183.4	2600	183.4	
			Runoff (in)	1.10	1.87	(bank full)	1.87	
			cfs/ac	1.57	1.77		1.77	

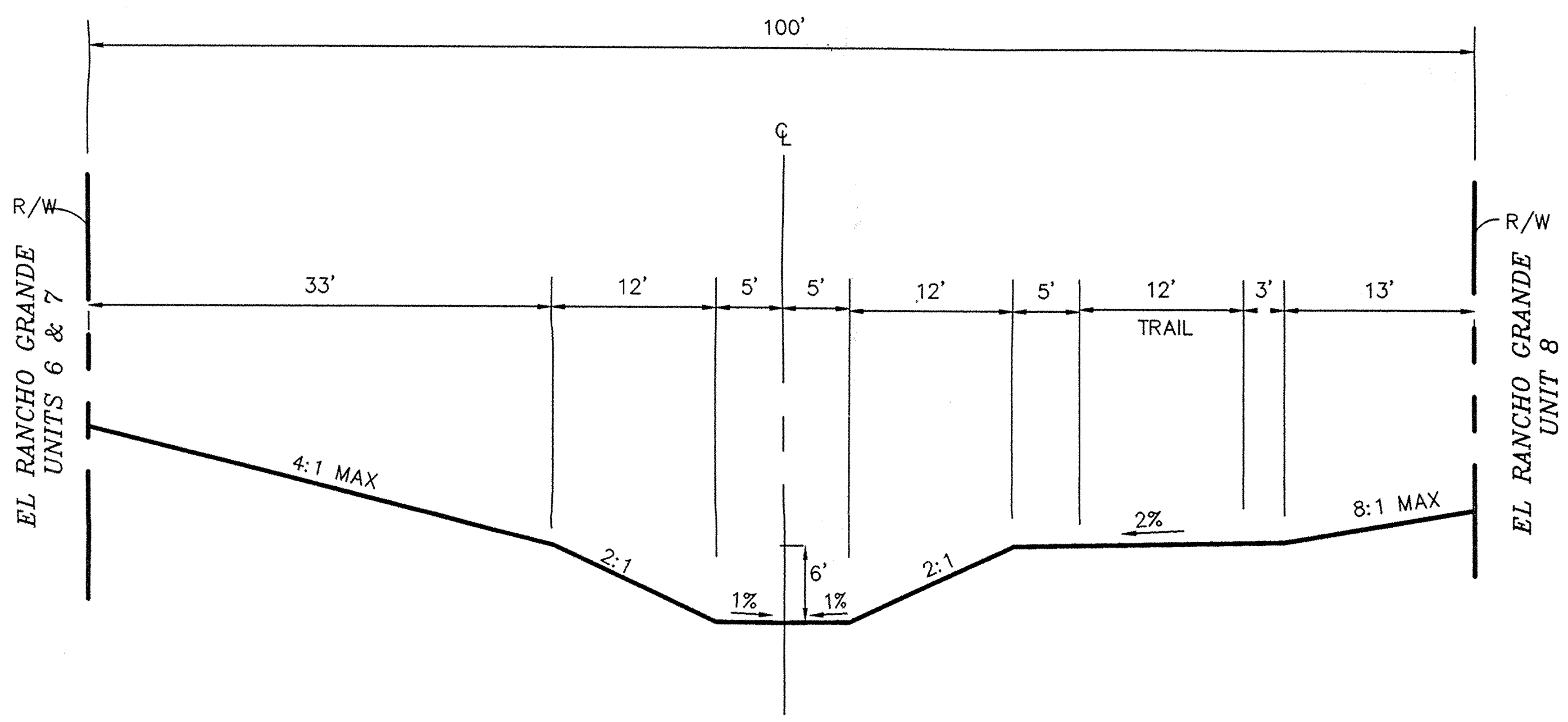
<u>Notes/Legend</u>

AP - Analysis Point - See Figures this report, maps in Volume II and detail hydrology in Volume III.
Q - Peak discharge rate
Tvol - Total runoff volume
Dvol - Maximum detained volume
Runoff - inches of runoff
cfs/ac - peak discharge rate per acre of contributing area.
Existing - Existing land use and existing drainage facilities.
DEVEX - Fully developed land use and existing drainage facilities.
Capacity - Design capacity.
DMP - Proposed improvements in place, fully developed land use.

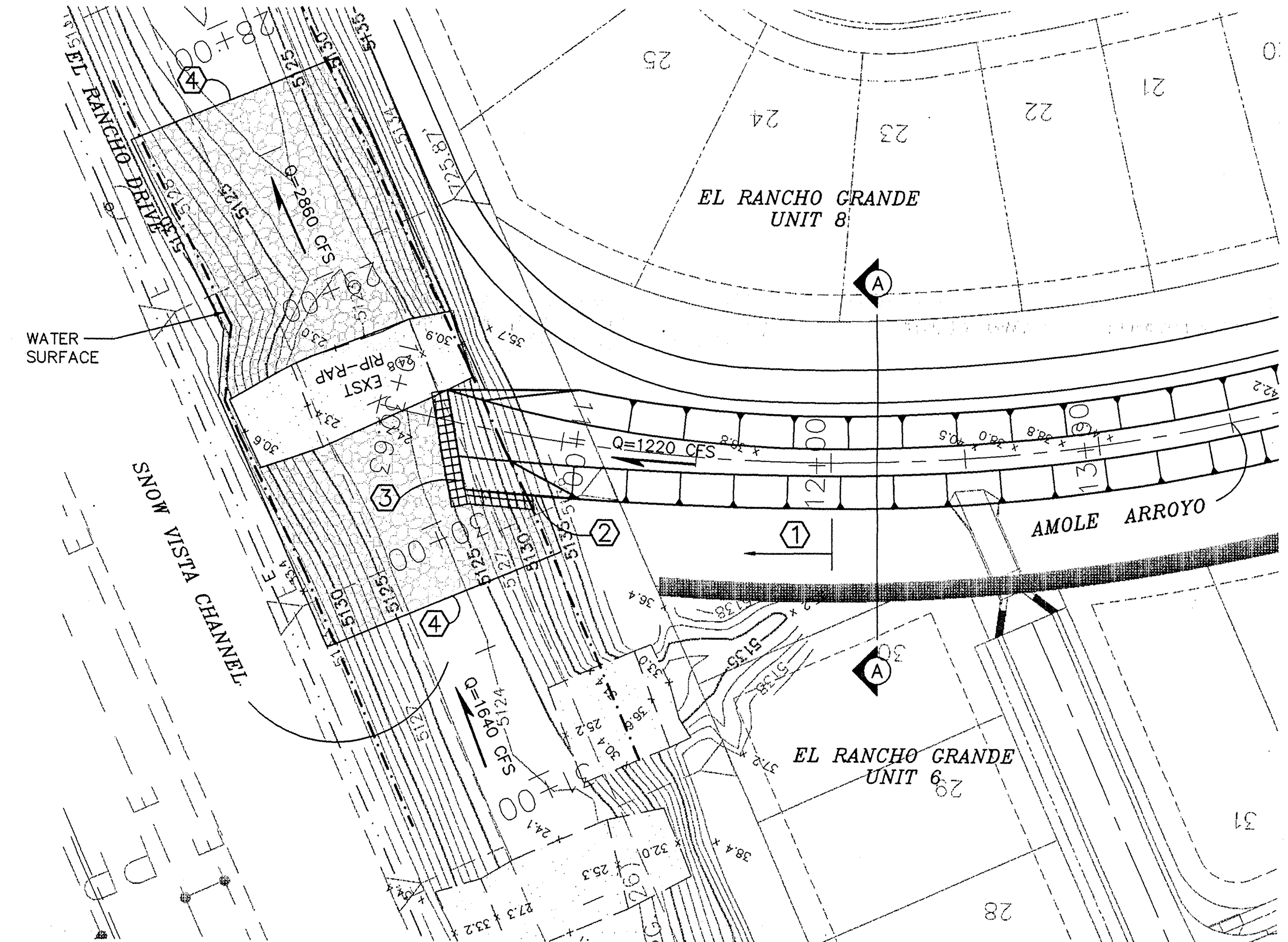
* Existing channel has excess capacity without additional freeboard. No improvements are necessary.

AMOLE ARROYO/SNOW VISTA CONFLUENCE

PRELIMINARY DESIGN



AMOLE ARROYO
SECTION A-A
1"=10'

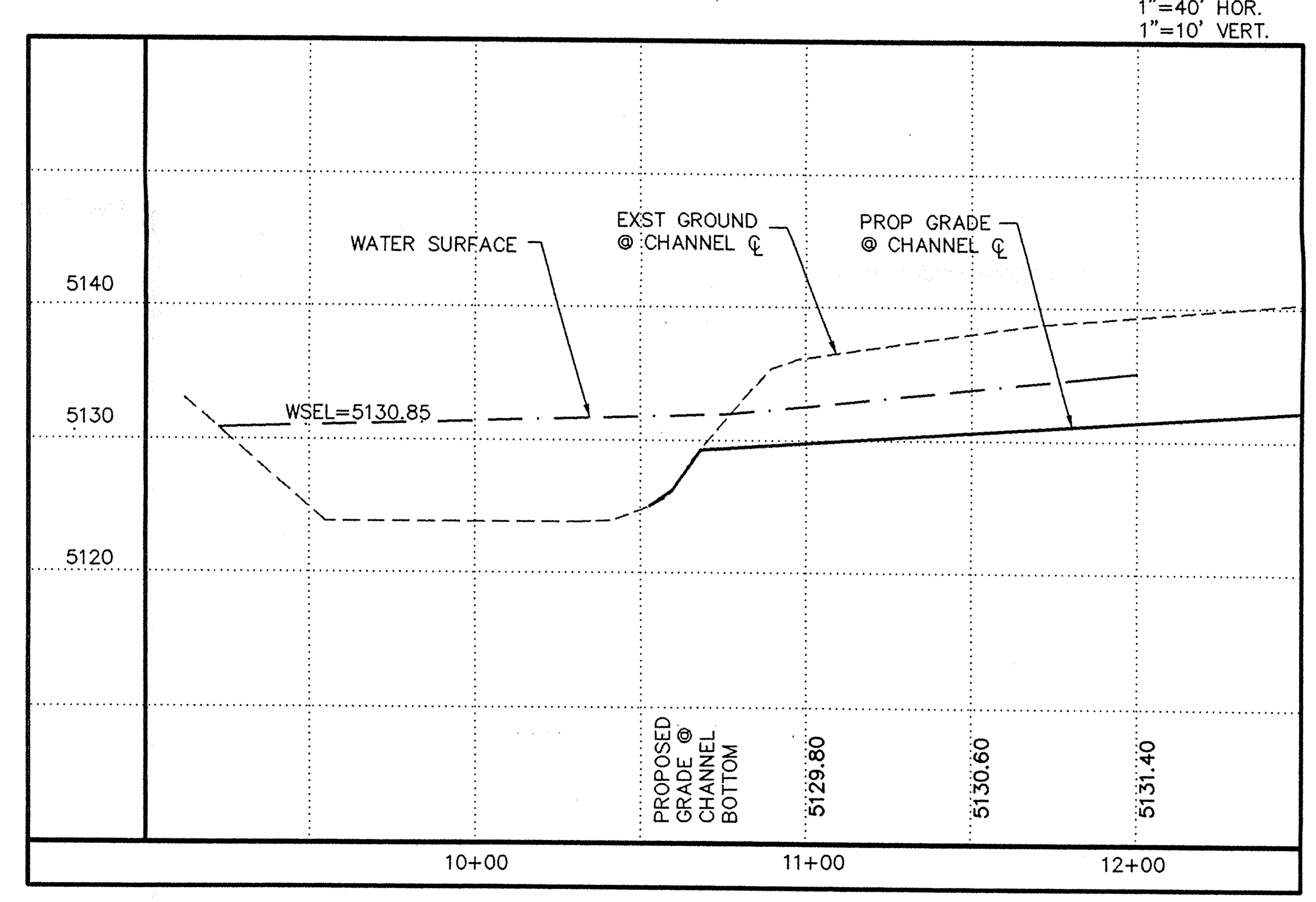


PLAN
1"=30'

NOTES

1. STA 12+00–10+60± TRANSITION CHANNEL BOTTOM WIDTH FROM 10' TO 25'.
2. 5' DEEP CUT-OFF WALL
3. 2–3'x3' GABION BASKETS
4. APPROXIMATE LIMITS OF 1' THICK WIRE-TIED RIPRAP.

1"=40' HOR.
1"=10' VERT.



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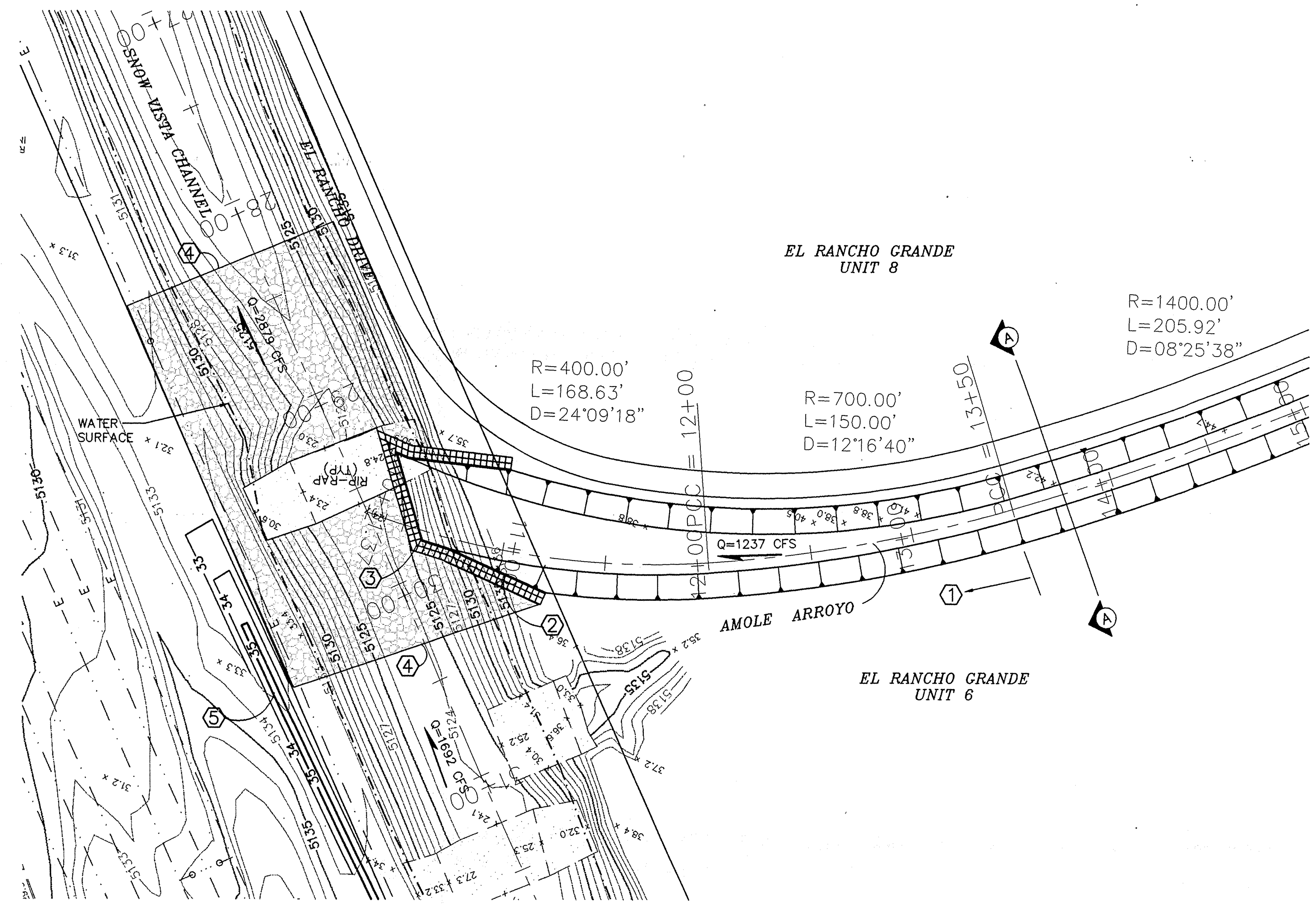
AMOLE ARROYO/SNOW VISTA

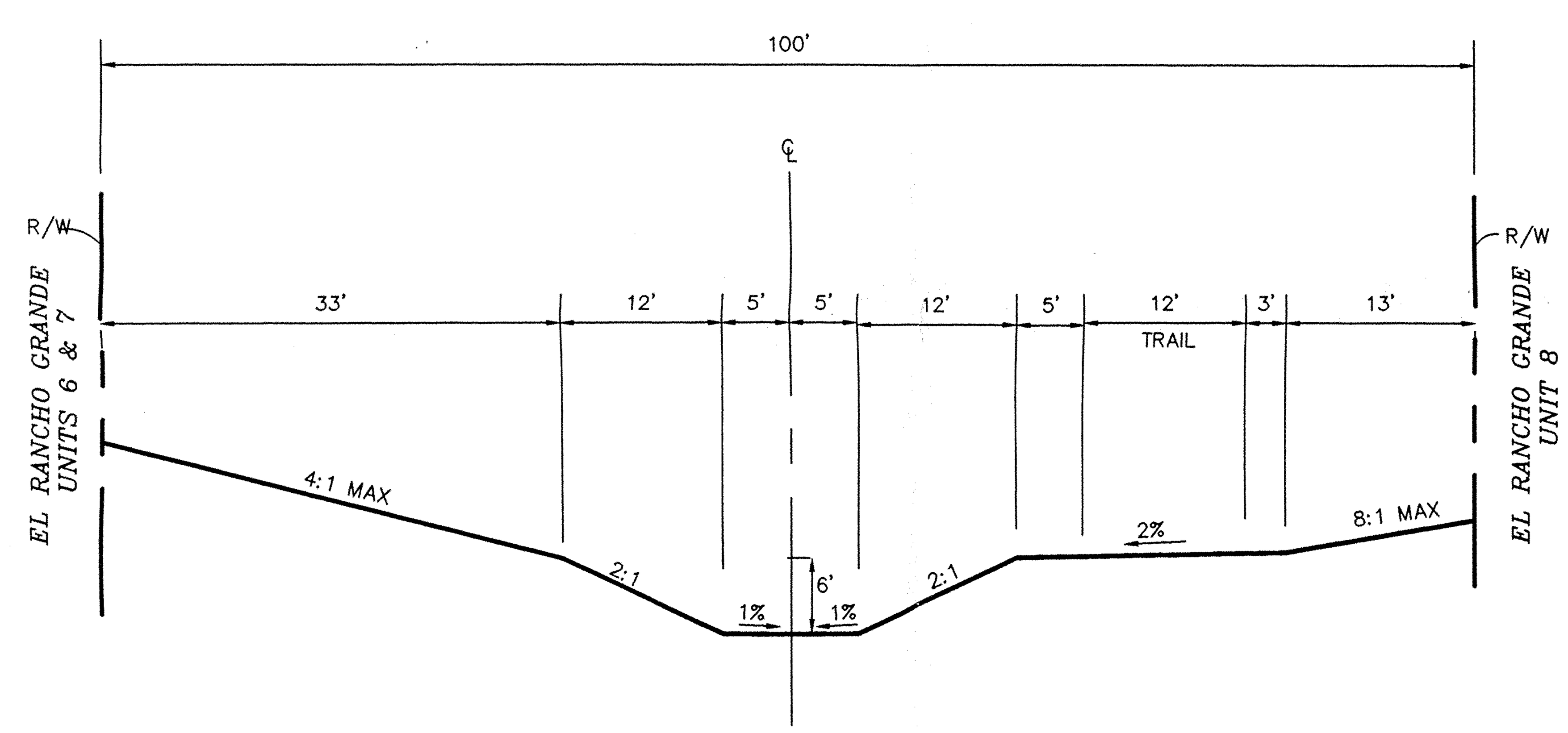
CONFLUENCE EXHIBIT



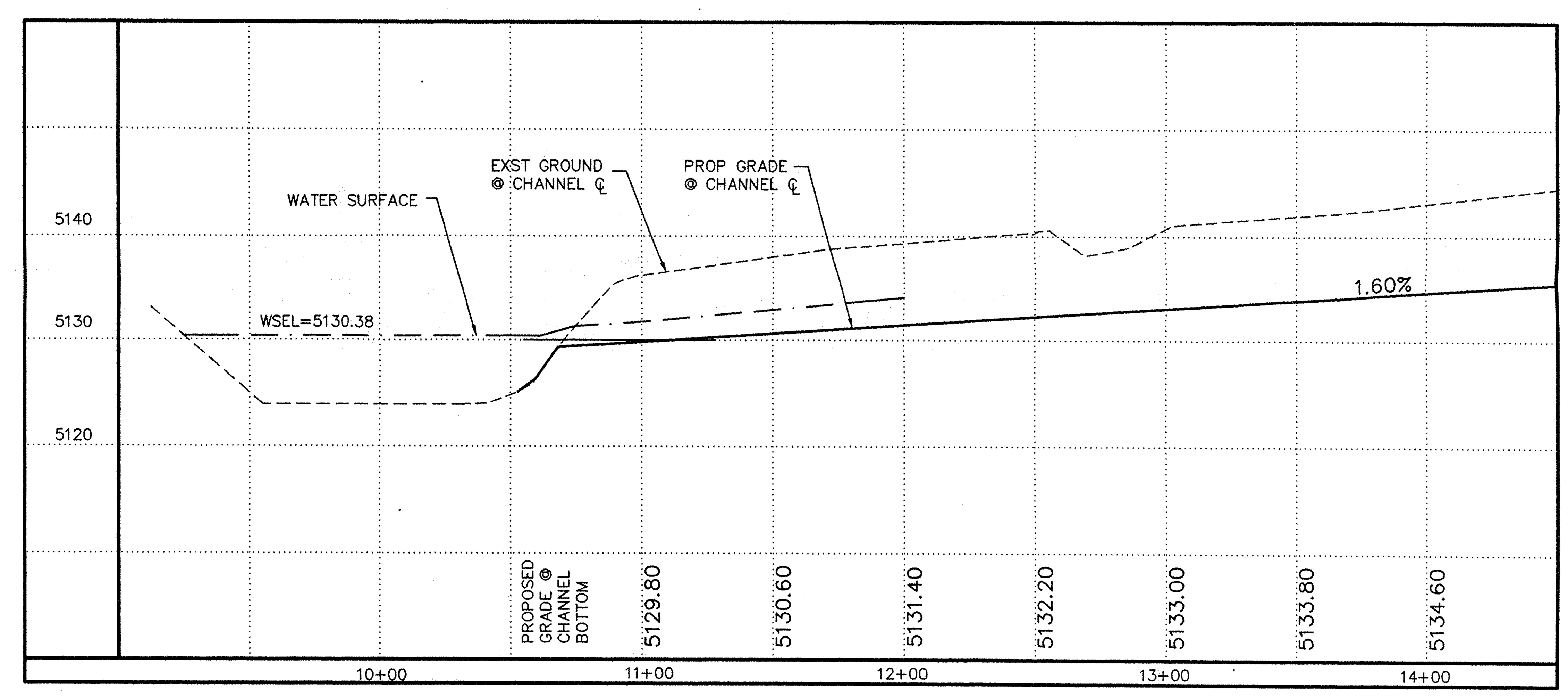
PLAN
1"=40'

NOTES

1. STA 13+50–10+60± TRANSITION CHANNEL BOTTOM WIDTH FROM 10' TO 45'.
2. 5' DEEP CUT-OFF WALL
3. 2–3'x3' GABION BASKETS
4. APPROXIMATE LIMITS OF 1' THICK WIRE-TIED *RIPRAP*.
5. EARTHEN BERM.



AMOLE ARROYO
SECTION A-A
1"=10'



PROFILE
1"=40' HOR.
1"=10' VERT.

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AMOLE ARROYO

ALIGNMENT

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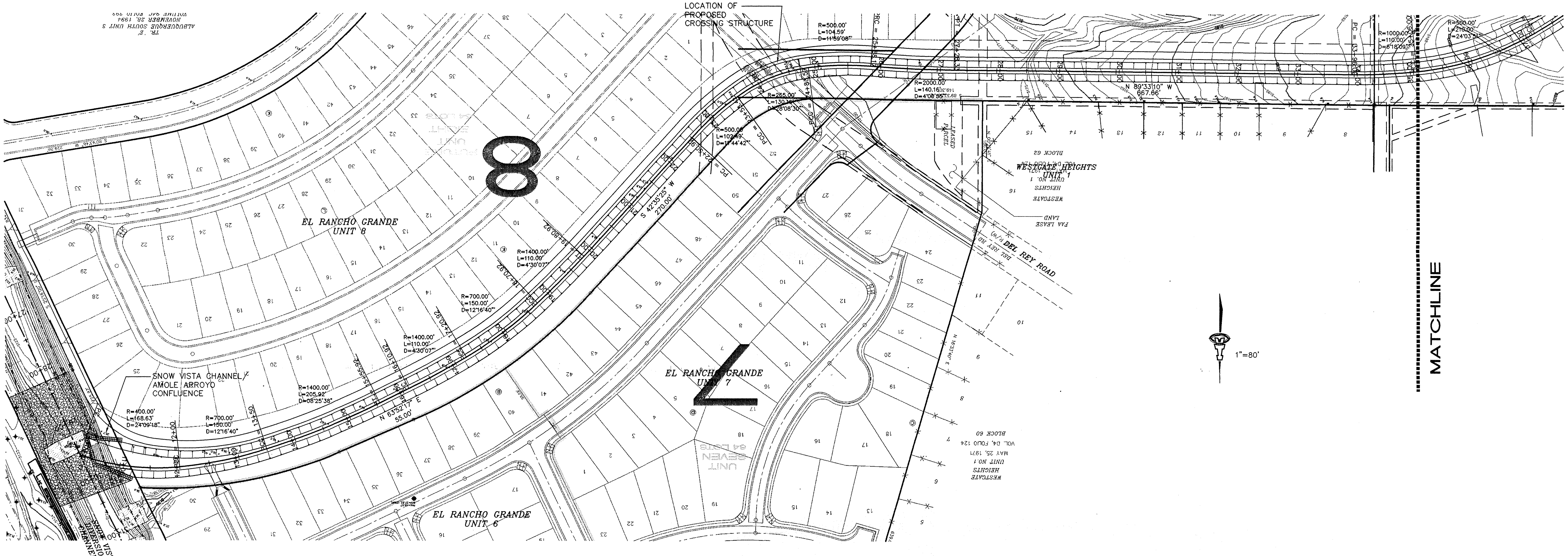
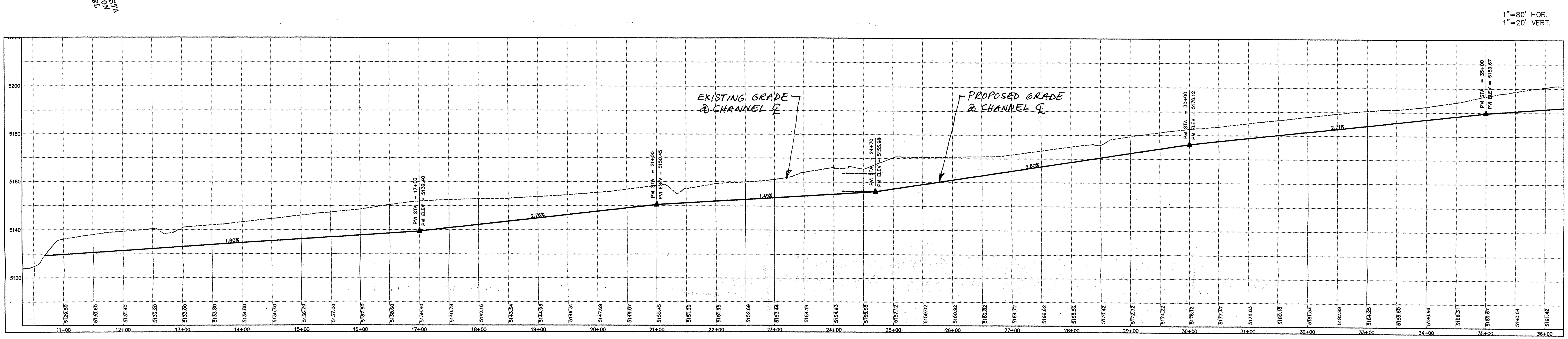
SHEET 1 OF 1





AMOLE ARROYO

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