



DS#

2748

DS INDEX

APN

125-25-302-001

PROJECT

Elementary School at El Campo Grande & Bradley

SUBMITTAL

2<sup>nd</sup>



<b>CITY OF LAS VEGAS</b>		<b>DATE:</b>	
<b>INTER-OFFICE MEMORANDUM</b>		October 6, 2000	
<b>TO:</b> Land Development Services Department of Public Works		<b>FROM:</b> Randy Fultz, P.E. <i>RF</i> Flood Control Project Manager Department of Public Works	
<b>SUBJECT:</b>		<b>COPIES TO:</b>	
Drainage Study for:		Clark County School District	
Elementary School at El Campo Grande & Bradley		Nevada By Design, LLC	
<b>Cross Streets:</b>	NWC of El Campo Grande Avenue and Bradley Road	JMA Architecture Studios	
<b>FILE NO.</b>	F:\Depot\DSMEMOS\DS2748B.doc	Cheri Edleman, P.E. DEVCO	
<b>Parcel Number:</b>	125-25-302-001		
<b>Zoning Action:</b>			
<b>FEMA Flood Zone</b>	YES	No	X
<b>Proposed Storm Drain</b>	YES	X	No

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES
1 <sup>st</sup> Submittal	7/25/2000	8/8/2000	See Comments Below	NC
2 <sup>nd</sup> Submittal	9/25/2000	10/5/2000	See Comments Below	NC
			<b>TOTAL FEES</b>	NC

**REMARKS:**

The Drainage Study for the subject project has been reviewed and:

	is acceptable in concept subject to conformance to all City standards and the following conditions.
X	must be resubmitted or supplemented including the following:
	must have Clark County Regional Flood Control District concurrence

- (Repeated from previous memo) *Leon Avenue is designed to be raised approximately 3' at Station 13+30 (Sheet C5.01). Grading to the west must be shown how to tie the proposed fill back to the existing grade in adjacent property. A notarized letter of permission for offsite grading and the proposed fill in Leon Avenue must be obtained from the adjacent property owners prior to final acceptance of this study.*

(Clarification) Per site visit by City of Las Vegas Flood control staff on 10/5/00 this site is undergoing mass grading. The resolution of this comment may affect the grading in progress. It appears that an offsite drainage basin will impact the west side of Leon Avenue. The proposed retaining/screen wall on the west RW line of Leon will block these flows. Address how these flows will be routed. Provide additional information on the grading plans to show positive drainage. Drainage along the back of the lots adjoining Leon will not be allowed without consent from the property owners affected and public drainage easements to be privately maintained.

- The grading plans show the intersection of Leon and El Campo Grande to be raised approximately one foot blocking offsite flows and the entrance to the existing drainage facility at the same corner. In addition, street plan and profiles in sheet C5.03 show a low point in El Campo Grande at station 10+65. Address how these flows will be routed and show existing or proposed inlets for the existing drainage facility.

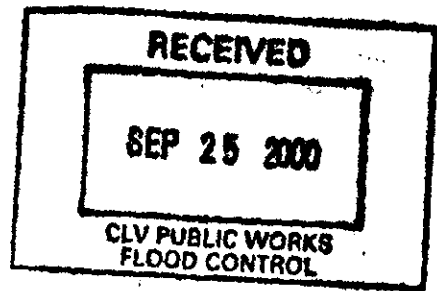
3. (Repeated from previous memo) *In sheet C4.03, the proposed drainage intends to sheet flow onto the future parcel to the east adjacent to Bradley Road. As stated in the study, the undeveloped portion will be parceled out; a public drainage easement to be privately maintained must be granted in the future parcel to perpetuate onsite drainage. The parcel map must provide for the drainage easement. The parcel map will not be recorded without the easement.*
4. Storm drain construction details "Storm drain outlet transition" and "Connection of PVC storm drain laterals to RCP main lines" show 18 to 24 inch storm drain lines while the utility plans show an onsite 8" storm drain line. Correct discrepancy.
5. Typical Street section shows 2% minimum street slope from the curb and gutter to the street centerline in Corbett. Street capacity sections in the drainage study show standard street cross sections with normal crown. Correct discrepancy.
6. Depth of flow calculation section A-A for Corbett shows Q100 water surface elevation above the back of sidewalk. Provide a stem wall six inches above Q100 water surface elevation at back of sidewalk for erosion control.

**END OF REMARKS**

Jwb

**T/R/S: T19S/R60E/25**

**AREA G-25**



**ADDENDUM #1**  
**TO THE**  
**TECHNICAL DRAINAGE STUDY** 2748  
**For The** 025  
**Elementary School At** AC  
**El Campo Grande Avenue**  
**And Bradley Road**  
**City of Las Vegas Comments**

**NBD Project CE00041**  
**CCSD Project 1461**

**September 25, 2000**

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**Prepared For**

**JMA ARCHITECTURE STUDIOS**  
**10150 Covington Cross Drive**  
**Las Vegas, NV 89144**



**Prepared By**

**Nevada By Design, LLC**  
**1830 E. Sahara Avenue**  
**Suite 209**  
**Las Vegas, NV 89104**

**DRAINAGE STUDY INFORMATION FORM**

Name of Development: El Campo Grande Avenue and Bradley Road Elem. School Date 9/21/00

Location of Development: a) Descriptive Northwest corner of El Campo Grande Avenue and Bradley Road

b) Sect. 25 Twn 19S Rng 60E

Name of Owner Clark County School District Assessors Parcel No.: 125-25-302-001

Telephone No.: (702) 799-7600 Facsimile No.: (702) 799-7716

Address: 4828 South Pearl Street

Las Vegas, Nevada 89121

Contact Person - Name: Mark G. Wittgraf, P.E. Telephone No.: (702) 938-1525

Firm: Nevada By Design

Address: 1830 East Sahara Avenue, Suite #209, Las Vegas, Nevada 89104

Type of Land Development/ Land Disturbance Process:

Rezoning	<input checked="" type="checkbox"/>	Subdivision Map	<input type="checkbox"/>	Clearing and Grading Only
Parcel Map	<input type="checkbox"/>	Planned Unit Development	<input type="checkbox"/>	Other (Please specify below)
Large Parcel Map	<input type="checkbox"/>	Building Permit	<input type="checkbox"/>	

1. Total Owned Land Area: At Site: 17 acres Being Developed/Disturbed: 17 acres

2. Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? YES  NO

3. Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? YES  NO

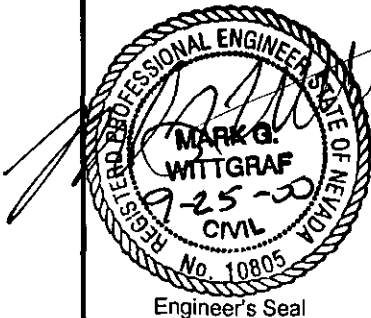
4. Proposed type of development (Residential, Commercial, etc.)? Commercial (school site)

5. Approximate upstream land area which drains to the subject site? +/-1000 acres

6. Has the site drainage been evaluated in the past?  YES NO  If yes, please identify documentation: "Technical Drainage Study for The Ridge II" by deRoulhac Consulting, July 1998, City of Las Vegas approval in September 1998.

7. If known, please briefly identify the proposed discharge point (s) of runoff from the site: Corbett St. east across Bradley Rd., Bradley Rd. south across El Campo Grande, thru exist. Drainage esmt's south on El Campo Grande thru the Sunset Hills subdivision.

8. Briefly describe your proposed schedule for the subject project: A.S.A.P.



Submit this form as part of the required drainage study to the local entity which has jurisdiction over the subject property. This form may provide sufficient information to serve as the Conceptual Drainage Study.

\*Review and concurrence of the Clark County Regional Flood Control District is Required.

Local Entity File No. \_\_\_\_\_

Revision	Date

REFERENCE:

STANDARD FORM 1

**ADDENDUM #1  
TO THE  
TECHNICAL DRAINAGE STUDY  
FOR THE  
ELEMENTARY SCHOOL AT  
EL CAMPO GRANDE AVENUE  
AND BRADLEY ROAD**

NBD Project CE00041-4.5  
CCSD Project 1461  
September 25, 2000

Prepared by:

***Nevada By Design***  
*1830 East Sahara Avenue, Suite #209*  
*Las Vegas, Nevada 89104*

# Nevada By Design

1830 E. Sahara Avenue

Suite 209

Las Vegas, NV 89104

Tel: 702-938-1525

Fax: 702-938-1530

September 25, 2000

City of Las Vegas  
Department of Public Works  
731 South Fourth Street  
Las Vegas, Nevada 89101  
Attn: Mr. Randy Fultz, P.E.

**RE: *Technical Drainage Study for the Elementary School at El Campo Grande Avenue and Bradley Road***

Dear Mr. Fultz:

This letter is in response to your comments dated August 8, 2000, regarding the above referenced project.

## **CITY OF LAS VEGAS COMMENTS**

✓ **Comment 1** In Sheet C4.03, the proposed drainage intends to sheet flow onto the future parcel to the east adjacent to Bradley Road. As stated in the study, the undeveloped portion will be parceled out; a public drainage easement to be privately maintained must be granted in the future parcel to perpetuate onsite drainage. The parcel map must provide for the drainage easement. The parcel map will not be recorded without the easement.

*Response 1* Noted.

✓ **Comment 2** The proposed school building is set at 102.24 and will be more than 2' of fill above existing grade. Acknowledgement and approval from City of Las Vegas Current Planning Department must be obtained prior to final acceptance of this study.

*Response 2* Noted. We have received acknowledgement and approval enclosed in Map Pocket No. 1 is a copy of the approved plan from the City of Las Vegas Current Planning Department.

**Comment 3** Neon Avenue is designed to be raised approximately 3' at Station 13+30 (Sheet C5.01). Grading to the west must be shown how to tie the proposed fill back to the existing grade in adjacent property. A notarized letter of permission for offsite grading and the proposed fill in Neon Avenue must be obtained from the adjacent property owner prior to final acceptance of this study.

*Response 3* There is no development with the exception of a single family home that fronts Calverts Street. The high point on Leon Avenue will have no impact on this property. A wall will be constructed along the back of sidewalk on the west side of Leon Avenue per an agreement between the property owners and the School District as a condition of the final zoning action. The proposed wall will be a combination 6' screen/retaining wall constructed per City of Las Vegas Std. Detail B-101 as shown in Appendix C.

✓ **Comment 4** Standard Form 1 must be revised to show correct location of development.

*Response 4* Noted. Standard Form 1 has been revised and is included with this Addendum No. 1.

✓ **Comment 5** Provide a legend and list of abbreviations on the plans.

*Response 5* Noted. A 24" x 36" blueline of the cover sheet that includes a legend and list of abbreviations is provided in Map Pocket 2 of this Addendum. A revised drainage basin map is included in Map Pocket 1.

✓ **Comment 6** The parking area inside the site at the corner of Corbett Street and Leon Avenue needs to be elevated to drain south to the internal valley gutter.

*Response 6* Noted. See revised Sheet C4.01 and revised grades in the parking area to provide positive drainage to the proposed concrete valley gutter.

✓ **Comment 7** Hump the driveways at El Campo Grande Avenue 6" above the  $Q_{100}$  flow depth.

*Response 7* The driveways on El Campo are for school bus ingress/egress from the designated drop off area, the driveway cannot be "humped" for this reason. The school district busses pick-up and drop off the students at the interior driveway curb. Consequently, there is no pedestrian traffic in this driveway.

Additionally, per the revised flow hydraulic calculations, the flows from the east on El Campo Grande Avenue are conveyed to the 10'x 4' RCBC. The revised hydraulic capacity calculations in appendix C indicate the Q100 are contained within the street section.

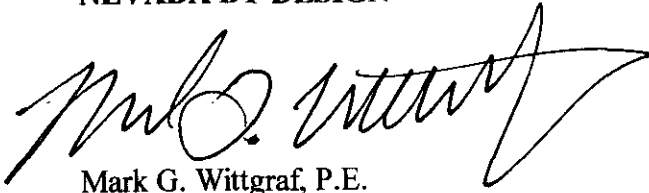
**Comment 8** On Standard Form 4 use a 5-minute minimum for the final Time of Concentration (ST5D and ST6D). Correct the flow calculations accordingly.

*Response 8* Noted. Standard Form 4 has been revised using a 5-minute minimum for the final time of concentration for the basins listed above, and all others less than 5 minutes. Refer to Appendix B for the revised flow rates and hydraulic capacity calculations, revised Tables 2 and 3 and Standard Form 4.

If you have any questions or comments, please don't hesitate to call this office at (702) 938-1525.

Sincerely,

**NEVADA BY DESIGN**



Mark G. Wittgraf, P.E.  
Senior Engineer

**APPENDIX A**

**Excerpts From Previously Approved Drainage Studies**

.....  
 \*  
 FLOOD HYDROGRAPH PACKAGE (HEC-1) \*  
 SEPTEMBER 1990 \*  
 VERSION 4.0 \*  
 \*  
 .....

RUN DATE 07/09/1998 TIME 09:23:28 \*  
 \*

\*\*\*\*\*  
 \*  
 \* U.S. ARMY CORPS OF ENGINEERS \*  
 \* HYDROLOGIC ENGINEERING CENTER \*  
 \* 609 SECOND STREET \*  
 \* DAVIS, CALIFORNIA 95616 \*  
 \* (916) 756-1104 \*  
 \*  
 \*\*\*\*\*

```

X   X  XXXXXXX  XXXXX      X
X   X  X      X   X      XX
X   X  X      X           X
XXXXXXX XXXX  X      XXXXX X
X   X  X      X           X
X   X  X      X   X      X
X   X  XXXXXXX  XXXXX      XXX
  
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.  
 THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION  
 NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,  
 DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION  
 KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

*EXISTING CONDITIONS*

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

1 ID THE RIDGE II -- EXISTING OFFSITE HYDROLOGY

2 ID EXOFF.DAT

3 ID SE CORNER OF TROPICAL AND BRADLEY IN LAS VEGAS, NV

4 ID JULY 1998

5 ID MCCRAREN AIRPORT PRECIPITATION DATA

\*DIAGRAM

6 IT 5 300

7 IN 5

8 IO 5

9 JR PREC 0.57 1.00

\* \*\*\*\*\*

10 KK OFF-A

11 KM AREA TRIBUTARY TO WEST EDGE OF EAGLE CREEK ESTATES SOUTH SITE

12 BA .16125

13 PB 2.77

14 PC 0.0000 0.0200 0.0570 0.0700 0.0870 0.1080 0.1240 0.1300 0.1300 0.1300

15 PC 0.1300 0.1300 0.1300 0.1330 0.1400 0.1420 0.1480 0.1580 0.1720 0.1810

16 PC 0.1900 0.1970 0.1990 0.2000 0.2010 0.2040 0.2140 0.2290 0.2410 0.2490

17 PC 0.2510 0.2560 0.2700 0.2780 0.2810 0.2830 0.2950 0.3220 0.3520 0.4090

18 PC 0.4990 0.5900 0.7100 0.7440 0.7810 0.8120 0.8190 0.8350 0.8510 0.8560

19 PC 0.8600 0.8680 0.8760 0.8880 0.9100 0.9260 0.9370 0.9500 0.9700 0.9760

20 PC 0.9820 0.9850 0.9870 0.9890 0.9900 0.9930 0.9930 0.9940 0.9950 0.9980

21 PC 0.9980 0.9990 1.0000

22 LS 0 82.8

23 UD 1.680

\* \*\*\*\*\*

24 KK SCHOOL

25 KM FUTURE SCHOOL SITE ON SW CORNER OF BRADLEY AND CORBETT

26 BA .01563

27 LS 0 85

28 UD 0.452

\* \*\*\*\*\*

29 KK EX-ECS

30 KM EXIST SITE FROM EAGLE CREEK SOUTH DRNG STUDY

31 BA .02703

32 LS 0 85

33 UD .420

\* \*\*\*\*\*

34 KK INPAWN

35 KM TOTAL EXIST FLOW EXCLUDING TROPICAL PKWY

36 HC 3

\* \*\*\*\*\*

37 KK OFF-B

38 KM TROPICAL PKWY WEST OF BRADLEY RD

39 BA .28844

40 LS 0 81.1

41 UD 2.498

\* \*\*\*\*\*

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
42	KK OFF-C
43	KM BRADLEY ROAD NORTH OF TROPICAL PARKWAY
44	BA .14063
45	LS 0 84.6
46	UD 1.385
	* .....
47	KK BRTROP
48	KM BRADLEY AND TROPICAL INTERSECTION
49	HC 2
	* .....
50	KK OFFNO
51	KM EXISTING OFFSITE AT BRADLEY RD / BIG FAWN AVE (CORBETT) FROM NORTH & WEST
52	HC 2
	* .....
53	KK OFF-D
54	KM EL CAMPO GRANDE WEST OF BRADLEY (BEFORE SUNSET HILLS INTERCEPTION)
55	BA 1.5781
56	LS 0 82.2
57	UD 3.400
	* .....
58	KK SUNHIL
59	KM FLOW ACCEPTANCE FROM EL CAMPO GRANDE INTO SUNSET HILLS UNIT 4 SUBDIVISION
60	KM (INTO TWO 20-FT EASEMENTS @ 96.6 CFS EACH, AND ONE 54-IN RCP @ 147.8 CFS,
61	KM PER SUMMIT ENGINEERING REPORT - 1994)
62	DT SUNHQ
63	DI 0 300 341 400
64	DQ 0 300 341 341
	* .....
65	KK FLOSPL
66	KM FLOW SPLIT AT EL CAMPO GRANDE / BRADLEY
67	KM DIVERSION BASED ON RATING CURVE FROM HEC-RAS FLOW SPLIT ANALYSIS
68	KM DIVERSION TO BRADLEY SOUTH AND EL CAMPO GRANDE EAST
69	KM UNDIVERTED RUNOFF WOULD GO NORTH ON BRADLEY.
70	DT SPLIT
71	DI 0 30 70 100 143
72	DQ 0 0 1 9 30
	* .....
73	KK TOTOFF
74	KM TOTAL OFFSITE Q AT BRADLEY / CORBETT
75	HC 2
	* .....
76	KK EXSITE
77	KM EXISTING SITE
78	BA .02964
79	LS 0 85
80	UD .313
81	ZZ

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT  
 LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW  
 NO. (.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW

10 OFF-A  
 .  
 .  
 24 . SCHOOL  
 .  
 .  
 29 . EX-ECS  
 .  
 .  
 34 INFAWN.....  
 .  
 .  
 37 . OFF-B  
 .  
 .  
 42 . OFF-C  
 .  
 .  
 47 . BRTROP.....  
 .  
 .  
 50 OFFNO.....  
 .  
 .  
 53 . OFF-D  
 .  
 .  
 52 . -----> SUNHQ  
 58 . SUNHIL  
 .  
 .  
 70 . -----> SPLIT  
 65 . FLOSPL  
 .  
 .  
 73 TOTOFF.....  
 .  
 .  
 76 . EXSITE

) RUNOFF ALSO COMPUTED AT THIS LOCATION

\*\*\*\*\*  
FLOOD HYDROGRAPH PACKAGE (HEC-1) \*  
SEPTEMBER 1990 \*  
VERSION 4.0 \*  
\*\*\*\*\*

RUN DATE 07/09/1998 TIME 09:23:28 \*  
\*\*\*\*\*

\*\*\*\*\*  
\* U.S. ARMY CORPS OF ENGINEERS \*  
\* HYDROLOGIC ENGINEERING CENTER \*  
\* 609 SECOND STREET \*  
\* DAVIS, CALIFORNIA 95616 \*  
\* (916) 756-1104 \*  
\*\*\*\*\*

THE RIDGE II -- EXISTING OFFSITE HYDROLOGY  
EKOFF.DAT  
SE CORNER OF TROPICAL AND BRADLEY IN LAS VEGAS, NV  
JULY 1998  
MCARREN AIRPORT PRECIPITATION DATA

B IO

OUTPUT CONTROL VARIABLES

IPRNT 5 PRINT CONTROL  
IPLOT 0 PLOT CONTROL  
QSCAL 0. HYDROGRAPH PLOT SCALE

IT

HYDROGRAPH TIME DATA

NMIN 5 MINUTES IN COMPUTATION INTERVAL  
IDATE 1 0 STARTING DATE  
ITIME 0000 STARTING TIME  
NQ 300 NUMBER OF HYDROGRAPH ORDINATES  
NDDATE 2 0 ENDING DATE  
NDTIME 0055 ENDING TIME  
ICENT 19 CENTURY MARK

COMPUTATION INTERVAL .08 HOURS  
TOTAL TIME BASE 24.92 HOURS

ENGLISH UNITS

DRAINAGE AREA SQUARE MILES  
PRECIPITATION DEPTH INCHES  
LENGTH, ELEVATION FEET  
FLOW CUBIC FEET PER SECOND  
STORAGE VOLUME ACRE-FEET  
SURFACE AREA ACRES  
TEMPERATURE DEGREES FAHRENHEIT

JP

MULTI-PLAN OPTION

NPLAN 1 NUMBER OF PLANS

JR

MULTI-RATIO OPTION

RATIOS OF PRECIPITATION  
.57 1.00

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS  
 FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES  
 TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO PRECIPITATION	
				RATIO 1	RATIO 2
				.57	1.00
HYDROGRAPH AT	OFF-A	.16	1 FLOW	15.	45.
			TIME	5.58	5.33
HYDROGRAPH AT	SCHOOL	.02	1 FLOW	4.	11.
			TIME	3.92	3.92
HYDROGRAPH AT	EX-ECS	.03	1 FLOW	7.	21.
			TIME	3.92	3.83
COMBINED AT	INPAWN	.20	1 FLOW	18.	54.
			TIME	5.17	5.17
HYDROGRAPH AT	OFF-B	.29	1 FLOW	18.	56.
			TIME	6.42	6.25
HYDROGRAPH AT	OFF-C	.14	1 FLOW	17.	48.
			TIME	5.08	5.00
COMBINED AT	BRTROP	.43	1 FLOW	30.	91.
			TIME	5.58	5.50
COMBINED AT	OFFNO	.63	1 FLOW	48.	142.
			TIME	5.42	5.33
HYDROGRAPH AT	OFF-D	1.58	1 FLOW	83.	252.
			TIME	7.25	7.17
CONVERSION TO	SUNHQ	1.58	1 FLOW	83.	252.
			TIME	7.25	7.17
HYDROGRAPH AT	SUNHIL	1.58	1 FLOW	0.	0.
			TIME	.08	.08
CONVERSION TO	SPLIT	1.58	1 FLOW	0.	0.
			TIME	.08	.08
HYDROGRAPH AT	FLOSPL	1.58	1 FLOW	0.	0.
			TIME	.08	.08
COMBINED AT	TOTOFF	2.21	1 FLOW	48.	142.
			TIME	5.42	5.33
HYDROGRAPH AT	EXSITE	.03	1 FLOW	9.	26.
			TIME	3.75	3.75

NORMAL END OF HEC-1 \*\*\*





LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

\*DIAGRAM

\*\* FREE \*\*

1 ID THE RIDGE II  
 2 ID FILE NAME: Ridge.dat  
 3 ID SE CORNER OF TROPICAL AND BRADLEY IN LAS VEGAS, NV  
 4 ID MAY 1998  
 5 ID  
 6 ID EXTRACT FROM THE CITY OF LAS VEGAS NORTHWEST NEIGHBORHOOD AREA PLAN  
 7 ID FOR THOSE AREAS DRAINING TO BRADLEY/EL CAMPO GRANDE & BRADLEY/CORBETT + SITE  
 8 ID FOR ULTIMATE DEVELOPED CONDITIONS ONLY.  
 9 ID  
 10 ID DEVELOPED CONDITION SITE AND EAGLE CREEK SOUTH SITE ADDED TO:  
 11 ID NORTHWEST NEIGHBORHOOD STUDY AND CITY-WIDE HYDROLOGY STUDY UPDATE  
 12 ID FOR: THE CITY OF LAS VEGAS  
 13 ID  
 14 ID AUGUST 1997  
 15 ID REFERENCE NUMBER: 51300  
 16 ID  
 17 ID EXTRACTED FROM AREA PLAN HEC1 FILE: ULTWEST3.DAT  
 18 ID WEST TRIBUTARY OF THE UPPER LAS VEGAS WASH  
 19 ID MODEL FOR AREA DOWNSTREAM OF THE KYLE CANYON DETENTION BASIN AND  
 20 ID WITHIN THE CITY OF LAS VEGAS CORPORATE BOUNDARY  
 21 ID  
 22 ID FUTURE CONDITION, EXISTING AND PROPOSED FACILITIES AND ULTIMATE LAND USE  
 23 ID  
 24 ID REGIONAL FACILITIES FOLLOW "ADDENDUM #2 TO KYLE CANYON DETENTION BASIN  
 25 ID OUTFALL FACILITIES", ALTERNATIVE 1D, BY: VTN NEVADA, DATED: MARCH 1997,  
 26 ID WITH THE EXCEPTION OF A FLOW SPLIT AT CENTENNIAL AND U.S. 95.  
 27 ID (CONNECTING RCHB 0066 AND RCHO 0097, AND THE REALIGNMENT OF RCHB 0000).  
 28 ID  
 29 ID SPECIAL NOTES:  
 30 ID  
 31 ID 1. INTERPOLATION BETWEEN FLOWS WAS COMPLETED TO OBTAIN THE MOST ACCURATE  
 32 ID FLOW FOR EACH TRIBUTARY AREA AT EACH CONCENTRATION POINT.  
 33 ID 2. IT SHOULD BE NOTED THAT AT CENTENNIAL AND US 95 THE FIRST 2500 CFS  
 34 ID IS DIVERTED TO THE EAST IN THE CENTENNIAL CHANNEL, THEREFORE NO FLOW  
 35 ID WILL DRAIN SOUTH ALONG US 95 UNTIL THE TOTAL FLOW AT CENTENNIAL AND  
 36 ID US 95 REACHES 2501 CFS.  
 37 ID 3. THE TRIBUTARY AREA TO THE RANCHO DETENTION BASIN (-11 SQ. MI.) IS NOT  
 38 ID CONSIDERED WHEN CALCULATING THE DARF FOR FLOWS IN ANN RD. DOWNSTREAM  
 39 ID OF THE DETENTION BASIN.  
 40 ID 4. THE PEAK FLOW ALONG US 95 UPSTREAM OF THE RANCHO DETENTION BASIN AND  
 41 ID THE PEAK STAGE IN THE DETENTION BASIN IS OBTAINED FROM HEC-1  
 42 ID MODEL RCHOPK3.DAT. THAT HEC-1 MODEL CONTAINS A REVISED STORM  
 43 ID CENTERING THAT IMPACTS THE PREVIOUSLY MENTION AREAS.  
 44 ID 5. TO OBTAIN THE PEAK 100-YEAR FLOWS IN THE CENTENNIAL CHANNEL EAST OF  
 45 ID US 95, HEC-1 MODELS CENTPK3.DAT AND CENTPK5.DAT SHOULD BE USED. THESE  
 46 ID MODELS ALSO CONTAIN REVISED STORM CENTERINGS THAT IMPACT THE  
 47 ID PREVIOUSLY MENTIONED AREAS. PEAK 10-YEAR FLOWS FOR THE CENTENNIAL  
 48 ID CHANNEL ARE OBTAINED FROM ULTWEST3.DAT AND ULTWEST5.DAT.  
 49 ID 6. ALL DIVERSIONS TO PROPOSED RCP'S ARE DIVERSIONS TO 10-YEAR FACILITIES  
 50 ID PROPOSED IN THIS STUDY. IF A DIVERSION TO A 10-YEAR FACILITY OCCURS  
 51 ID AT A STREET INTERSECTION WITH A SURFACE FLOW SPLIT THEN THE 10-YEAR  
 52 ID FLOW IS DIVERTED TO THE PROPOSED FACILITY FIRST AND THEN THE  
 53 ID REMAINING FLOW IS CONSIDERED FOR THE SURFACE FLOW SPLIT, BUT THIS IS

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

54 ID ALL DONE WITH ONE SET OF DI-DQ CARDS OR ONE DIVERSION.

55 ID 7. ONLY 10-YEAR FLOWS FROM SUBBASINS PT3AA2 AND PT2AA1 ARE BROUGHT INTO

56 ID THIS HEC-1 MODEL. THIS IS ACCOMPLISHED USING A MULTIPLAN RUN WITH

57 ID JP AND KP CARDS, FOR THE 100-YEAR FLOWS IN ANN RD. PLAN 1 SHOULD BE

58 ID USED, FOR THE 10-YEAR PLAN 2 FLOWS SHOULD BE USED.

59 ID 8. DUE TO THE NUMBER OF DIVERSIONS AND THE FACT THAT TRIBUTARY AREA IS

60 ID NOT CARRIED WITH A DIVERTED FLOW, IT MAY BE DIFFICULT TO DETERMINE THE

61 ID CORRECT DARF TO USE FOR CERTAIN CONCENTRATION POINTS, HOWEVER, AS A

62 ID GENERAL RULE TRIBUTARY AREA WAS NOT MANUALLY CARRIED WITH A DIVERTED

63 ID FLOW UNLESS THE AREA WAS GREATER THAN 1 SQUARE MILE. ADDITIONALLY,

64 ID IN SOME AREAS THE TRIBUTARY AREA FOR A DIVERTED FLOW WAS ESTIMATED

65 ID BASED ON THE AMOUNT OF THE TOTAL FLOW DIVERTED.

66 ID

67 ID JR CARD RATIOS REPRESENT DEPTH-AREA REDUCTION FACTORS (DARF'S)

68 ID

69 ID 100-YEAR, 6-HOUR STORM, SDN3

70 ID DARF RATIOS FOR AREAS OF 0, 1, 2, 6 AND 10 SQUARE MILES FOR 100-YEAR

71 ID DARF RATIOS FOR AREAS OF 0, 2, 6 AND 10 SQUARE MILES FOR 10-YEAR

72 ID

73 IT 5 0 0 300

74 IO 5 0 0

75 IN 5 0 0

76 JR PREC 1 0.97 0.93 0.9 0.86 0.57 0.53 0.513 0.49

\*

77 KK ANN2C1

78 BA 0.12

79 PB 2.774

80 PC 0.000 0.020 0.057 0.070 0.087 0.108 0.124 0.130 0.130 0.130

81 PC 0.130 0.130 0.130 0.133 0.140 0.142 0.148 0.158 0.172 0.181

82 PC 0.190 0.197 0.199 0.200 0.201 0.204 0.214 0.229 0.241 0.249

83 PC 0.251 0.256 0.270 0.278 0.281 0.283 0.295 0.322 0.352 0.409

84 PC 0.499 0.590 0.710 0.744 0.781 0.812 0.819 0.835 0.851 0.856

85 PC 0.860 0.868 0.876 0.888 0.910 0.926 0.937 0.950 0.970 0.976

86 PC 0.982 0.985 0.987 0.989 0.990 0.993 0.993 0.994 0.995 0.998

87 PC 0.998 0.999 1.000

88 LS 0 82.6

89 UD 0.257

\*

90 KK DANN2C1

91 KM FLOW SPLIT AT TORREY PINES AND AZURE

92 KM DIVERT FLOW TO TORREY PINES

93 KM REMAINING FLOW CONTINUES EAST IN AZURE

94 KM CROWN NOT HELD IN EITHER STREET

95 KM DIVERT FIRST 33 CFS TO PROPOSED 42" PIPE IN TORREY PINES

96 KM MINIMUM 1 CFS WILL REMAIN TO AVOID ZERO FLOW

97 DT DANN2C3

98 DI 0 11 34 133 533 1033

99 DQ 0 10 33 82 297 578

\*



LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

135 KK 2D2C3  
 136 KM DIVERT FIRST 57 CFS TO PROPOSED 48" RCP IN TORREY PINES  
 137 KM REMAINING FLOW CONTINUES EAST IN TROPICAL  
 138 KM MINIMUM 1 CFS WILL REMAIN TO AVOID ZERO FLOW  
 139 DT DANN2D1  
 140 DI 0 11 58 150 500 1000  
 141 DQ 0 10 57 57 57 57  
 \*

142 KK R2C3  
 143 KM ROUTE TO ANN2C4  
 144 RK 2440 0.0041 0.02 0 TRAP 70 2  
 \*

145 KK DANN2C4  
 146 KM RETRIEVE FLOW DIVERTED AT JONES AND AZURE (ANN2C2)  
 147 DR DANN2C4  
 \*

148 KK RDAN2C4  
 149 KM ROUTE TO ANN2C4  
 150 RK 1320 0.0038 0.02 0 TRAP 90 2  
 \*

151 KK ANN2C4  
 152 BA 0.12  
 153 PB 2.774  
 154 LS 0 83.2  
 155 UD 0.250  
 \*

156 KK C2C4  
 157 KM COMBINE R2C3, DANN2C4 AND ANN2C4  
 158 HC 3  
 \*

159 KK 2D2C4  
 160 KM DIVERT FIRST 64 CFS TO PROPOSED 54" RCP IN TORREY PINES  
 161 KM REMAINING FLOW CONTINUES EAST IN TROPICAL  
 162 KM MINIMUM 1 CFS WILL REMAIN TO AVOID ZERO FLOW  
 163 DT D2D2  
 164 DI 0 11 65 150 500 1000  
 165 DQ 0 10 64 64 64 64  
 \*  
 \*

166 KK DANN2D1  
 167 KM RETRIEVE FLOW DIVERTED TO PROPOSED RCP IN TORREY PINES  
 168 DR DANN2D1  
 \*



```

LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

204      KK DANN2D2
205      KM FLOW SPLIT AT JONES AND EL CAMPO GRANDE
206      KM DIVERT FLOW TO JONES
207      KM REMAINING FLOW CONTINUES EAST IN EL CAMPO GRANDE
208      KM CROWN NOT HELD IN EITHER STREET
209      KM DIVERT FIRST 91 CFS TO PROPOSED 60" RCP IN JONES
210      KM MINIMUM 1 CFS WILL REMAIN TO AVOID ZERO FLOW
211      DT DANN2D4
212      DI      0      11      92      191      591      1091
213      DQ      0      10      91      137      345      634
          *

214      KK RD2D2
215      KM ROUTE TO ANN3B1
216      RK      2650  0.0022  0.02      0      TRAP      50      2
          *

217      KK ANN3B1
218      KM ANN3B1 BASIN AREA MODIFIED TO EXCLUDE EAGLE CREEK SOUTH AND OFF-3
219      BA      .0767
220      PB      2.774
221      LS      0      82.7
222      UD      0.257
          *

223      KK C3B1
224      KM COMBINE RD2D2 AND ANN3B1
225      HC      2
          *

226      KK SUNHIL
227      KM FLOW ACCEPTANCE FROM EL CAMPO GRANDE INTO SUNSET HILLS UNIT 4 SUBDIVISION
228      KM (INTO TWO 20-FT EASEMENTS @ 96.6 CFS EACH, AND ONE 54-IN RCP @ 147.8 CFS,
229      KM PER SUMMIT ENGINEERING REPORT - 1994)
230      DT SUNHQ
231      DI      0      300      341      400
232      DQ      0      300      341      341
          * *****

233      KK FLOSPL
234      KM FLOW SPLIT AT EL CAMPO GRANDE / BRADLEY
235      KM DIVERSION BASED ON RATING CURVE FROM HEC-RAS SPLIT FLOW ANALYSIS
236      KM DIVERSION TO BRADLEY SOUTH AND EL CAMPO GRANDE EAST
237      DT SPLIT
238      DI      0      30      70      100      143
239      DQ      0      0      1      9      30
          * *****
          *
          * *****
          * ULTIMATE DEVELOPED DRAINAGE AREAS
          * *****
    
```

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
240	KK OFF-3
241	KM OFFSITE DRAINAGE IMPACTING WEST EDGE OF SITE
242	BA .01781
243	PB 2.77
244	LS 0 80
245	UD .172
	* .....
246	KK RTOFF3
247	KM ROUTE OFF-3 DOWN CORBETT
248	RK 1320 0.004 0.016 0 TRAP 50 0
	* .....
249	KK CORBET
250	KM CORBETT STREET RIGHT-OF-WAY
251	BA .00234
252	LS 0 98
253	UD .138
	* .....
254	KK CR@BRD
255	HC 2
	* .....
	* .....
256	KK REST
257	KM RESTON ST & W. PART OF BURLINGAME
258	BA .00520
259	LS 0 83
260	UD .149
	* .....
261	KK BAN
262	KM BANFIELD ST
263	BA .00255
264	LS 0 90
265	UD .104
	* .....
266	KK BANRES
267	KM RESTON + BANFIELD
268	HC 2
	* .....
269	KK RBANRE
270	RK 856 .0048 .016 0 TRAP 36 0
	* .....
271	KK HAM
272	KM HAMDEN ST
273	BA .00255
274	LS 0 90
275	UD .104
	* .....

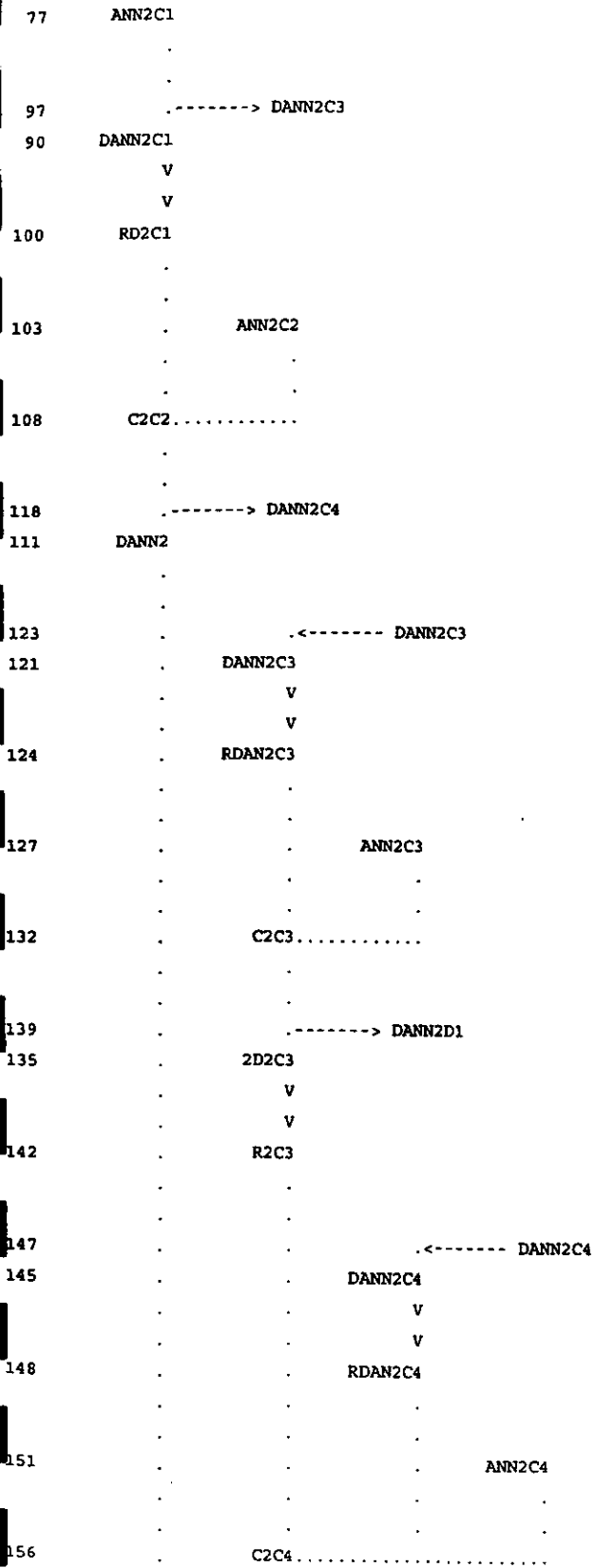
LINE	ID.....	1.....	2.....	3.....	4.....	5.....	6.....	7.....	8.....	9.....	10.....
276	KK	RHAM									
277	RK	630	.0048	.016	0	TRAP	36	0			
	* *****										
278	KK	KENT									
279	KM	KENTLANDS ST									
280	BA	.00255									
281	LS	0	90								
282	UD	.104									
	* *****										
283	KK	RKENT									
284	RK	370	.0048	.016	0	TRAP	36	0			
	* *****										
285	KK	BURLIN									
286	KM	EAST PART OF BURLINGAME ST.									
287	BA	.0042									
288	LS	0	90								
289	UD	.156									
	* *****										
290	KK	CBURL									
291	HC	4									
	* *****										
292	KK	BRIDGA									
293	KM	BRIDGEHAMPTON ST NEAR COMMON AREA A									
294	BA	.00188									
295	LS	0	90								
296	UD	.121									
	* *****										
297	KK	RBRDGA									
298	RK	260	.0048	.016	0	TRAP	36	0			
	* *****										
299	KK	BRIDGB									
300	KM	BRIDGEHAMPTON ST NEAR COMMON AREA B									
301	BA	.00150									
302	LS	0	90								
303	UD	.105									
	* *****										
304	KK	CBRDGB									
305	HC	2									
	* *****										
306	KK	RBRDGB									
307	RK	260	.0048	.016	0	TRAP	36	0			
	* *****										

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
308	KK BRIDGC
309	KM BRIDGEHAMPTON ST NEAR COMMON AREA C
310	BA .00189
311	LS 0 90
312	UD .105
	* *****
313	KK CBRDGC
314	HC 2
	* *****
315	KK RBRDGC
316	RK 375 .0048 .016 0 TRAP 36 0
	* *****
317	KK BRIDGD
318	KM BRIDGEHAMPTON ST NEAR COMMON AREA D
319	BA .00231
320	LS 0 90
321	UD .118
	* *****
322	KK CBRDGD
323	HC 2
	* *****
324	KK RBRDGD
325	RK 380 .0048 .016 0 TRAP 36 0
	* *****
326	KK OAK
327	KM OAKTON ST
328	BA .00256
329	LS 0 90
330	UD .120
	* *****
331	KK COAK
332	HC 2
	* *****
333	KK EAGLES
334	KM TOTAL DISCHARGE FROM DEVEL EAGLE CREEK SOUTH SITE
335	HC 2
	* *****
336	KK BRDSCH
337	KM 2.5 AC +/- OF FUTURE SCHOOL BLDG. ESTIMATED TO DRAIN TO BRADLEY
338	BA .00391
339	LS 0 94
340	UD .107
	* *****

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
341	KK BRDLEY
342	KM DRADLEY ROAD R-O-W
343	BA .00375
344	LS 0 98
345	UD .157
	* *****
346	KK IN2RDG
347	KM FLOW AT BRADLEY / CORBETT ENTERING THE RIDGE II
348	HC 5
	* *****
349	KK RTOFF
350	KM ROUTE OFFSITE Q THROUGH SITE
351	RK 675 0.004 0.016 0 TRAP 35 0
	* *****
	* ONSITE RUNOFF FROM THE RIDGE II
	* *****
	*
352	KK STRKPT
353	BA .00342
354	LS 0 88.25
355	UD .131
356	KK FAWN
357	BA .00508
358	LS 0 88.25
359	UD .132
360	KK DAWN
361	BA .00583
362	LS 0 88.25
363	UD .130
364	KK HEART
365	BA .00652
366	LS 0 88.25
367	UD .132
368	KK RIDGE2
369	KM ONSITE FLOWS FOR THE RIDGE II WHICH DRAIN TO EASEMENT
370	HC 4
371	KK EASMNT
372	KM TOTAL Q100 AT EASEMENT (ONSITE + OFFSITE)
373	HC 2
374	KK BSKY
375	KM PART OF SITE DRAINING TO EL CAMPO GRANDE
376	BA .00880
377	LS 0 88.25
378	UD .144
379	ZZ

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT  
LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW  
NO. (.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW



163	----->	D2D2
159	2D2C4	
168		<----- DANN2D1
166	DANN2D1	
	V	
	V	
169	RD2D1	
	.	
172		ANN2D1
	.	
177	C2D1.....	
	.	
184	----->	DANN2D3
180	2D2D1	
	V	
	V	
187	RANN2D1	
	.	
192		<----- D2D2
190	D2D2	
	V	
	V	
193	RD2D2	
	.	
196		ANN2D2
	.	
201	CANN2D2.....	
	.	
211	----->	DANN2D4
204	DANN2D2	
	V	
	V	
214	RD2D2	
	.	
217		ANN3B1
	.	
223	C3B1.....	
	.	
230	----->	SUNHQ
226	SUNHIL	
	.	
237	----->	SPLIT
233	FLOSPL	
	.	
240		OFF-3
	.	V

246  
249  
254  
256  
261  
266  
269  
271  
276  
278  
283  
285  
290  
292  
297  
299  
304  
306  
308  
313

V  
RTOFF3

CORBET

CRØBRD.....

REST

BAN

BANRES.....

V

V

RBANRE

HAM

V

V

RHAM

KENT

V

V

RKENT

BURLIN

CBURL.....

BRIDGA

V

V

RBRDGA

BRIDGB

CBRDGB.....

V

V

RBRDGB

BRIDGC

CBRDGC.....

V

315

V  
RBRDGC

317

BRIDGD

322

CBRDGD.....

324

V  
RBRDGD

326

OAK

331

COAK.....

333

EAGLES.....

336

BRDSCH

341

BRDLEY

346

IN2RDG.....

349

V  
V  
RTOFF

352

STRKPT

356

FAWN

360

DAWN

364

HEART

368

RIDGE2.....

371

EASMNT.....

374

BSKY

\*) RUNOFF ALSO COMPUTED AT THIS LOCATION

FLOOD HYDROGRAPH PACKAGE (HEC-1)  
SEPTEMBER 1990  
VERSION 4.0

RUN DATE 07/09/1998 TIME 08:48:29

U.S. ARMY CORPS OF ENGINEERS  
HYDROLOGIC ENGINEERING CENTER  
609 SECOND STREET  
DAVIS, CALIFORNIA 95616  
(916) 756-1104

THE RIDGE II  
FILE NAME: Ridge.dat  
SE CORNER OF TROPICAL AND BRADLEY IN LAS VEGAS, NV  
MAY 1998

EXTRACT FROM THE CITY OF LAS VEGAS NORTHWEST NEIGHBORHOOD AREA PLAN  
FOR THOSE AREAS DRAINING TO BRADLEY/EL CAMPO GRANDE & BRADLEY/CORBETT + SITE  
FOR ULTIMATE DEVELOPED CONDITIONS ONLY.

DEVELOPED CONDITION SITE AND EAGLE CREEK SOUTH SITE ADDED TO:  
NORTHWEST NEIGHBORHOOD STUDY AND CITY-WIDE HYDROLOGY STUDY UPDATE  
FOR: THE CITY OF LAS VEGAS

AUGUST 1997  
REFERENCE NUMBER: 51300

EXTRACTED FROM AREA PLAN HEC1 FILE: ULTWEST3.DAT  
WEST TRIBUTARY OF THE UPPER LAS VEGAS WASH  
MODEL FOR AREA DOWNSTREAM OF THE KYLE CANYON DETENTION BASIN AND  
WITHIN THE CITY OF LAS VEGAS CORPORATE BOUNDARY

FUTURE CONDITION, EXISTING AND PROPOSED FACILITIES AND ULTIMATE LAND USE

REGIONAL FACILITIES FOLLOW "ADDENDUM #2 TO KYLE CANYON DETENTION BASIN  
OUTFALL FACILITIES", ALTERNATIVE 1D, BY: VTN NEVADA, DATED: MARCH 1997,  
WITH THE EXCEPTION OF A FLOW SPLIT AT CENTENNIAL AND U.S. 95.  
(CONNECTING RCHB 0066 AND RCHO 0097, AND THE REALIGNMENT OF RCHB 0000).

SPECIAL NOTES:

1. INTERPOLATION BETWEEN FLOWS WAS COMPLETED TO OBTAIN THE MOST ACCURATE FLOW FOR EACH TRIBUTARY AREA AT EACH CONCENTRATION POINT.
2. IT SHOULD BE NOTED THAT AT CENTENNIAL AND US 95 THE FIRST 2500 CFS IS DIVERTED TO THE EAST IN THE CENTENNIAL CHANNEL, THEREFORE NO FLOW WILL DRAIN SOUTH ALONG US 95 UNTIL THE TOTAL FLOW AT CENTENNIAL AND US 95 REACHES 2501 CFS.
3. THE TRIBUTARY AREA TO THE RANCHO DETENTION BASIN (~11 SQ. MI.) IS NOT CONSIDERED WHEN CALCULATING THE DARF FOR FLOWS IN ANN RD. DOWNSTREAM OF THE DETENTION BASIN.
4. THE PEAK FLOW ALONG US 95 UPSTREAM OF THE RANCHO DETENTION BASIN AND THE PEAK STAGE IN THE DETENTION BASIN IS OBTAINED FROM HEC-1 MODEL RCHOPK3.DAT. THAT HEC-1 MODEL CONTAINS A REVISED STORM CENTERING THAT IMPACTS THE PREVIOUSLY MENTIONED AREAS.
5. TO OBTAIN THE PEAK 100-YEAR FLOWS IN THE CENTENNIAL CHANNEL EAST OF US 95, HEC-1 MODELS CENTPK3.DAT AND CENTPK5.DAT SHOULD BE USED. THESE MODELS ALSO CONTAIN REVISED STORM CENTERINGS THAT IMPACT THE

PREVIOUSLY MENTIONED AREAS. PEAK 10-YEAR FLOWS FOR THE CENTENNIAL CHANNEL ARE OBTAINED FROM ULTWEST3.DAT AND ULTWEST5.DAT.

6. ALL DIVERSIONS TO PROPOSED RCP'S ARE DIVERSIONS TO 10-YEAR FACILITIES PROPOSED IN THIS STUDY. IF A DIVERSION TO A 10-YEAR FACILITY OCCURS AT A STREET INTERSECTION WITH A SURFACE FLOW SPLIT THEN THE 10-YEAR FLOW IS DIVERTED TO THE PROPOSED FACILITY FIRST AND THEN THE REMAINING FLOW IS CONSIDERED FOR THE SURFACE FLOW SPLIT, BUT THIS IS ALL DONE WITH ONE SET OF DI-DQ CARDS OR ONE DIVERSION.
7. ONLY 10-YEAR FLOWS FROM SUBBASINS PT3AA2 AND PT2AA1 ARE BROUGHT INTO THIS HEC-1 MODEL. THIS IS ACCOMPLISHED USING A MULTIPLAN RUN WITH JP AND KP CARDS, FOR THE 100-YEAR FLOWS IN ANN RD. PLAN 1 SHOULD BE USED, FOR THE 10-YEAR PLAN 2 FLOWS SHOULD BE USED.
8. DUE TO THE NUMBER OF DIVERSIONS AND THE FACT THAT TRIBUTARY AREA IS NOT CARRIED WITH A DIVERTED FLOW, IT MAY BE DIFFICULT TO DETERMINE THE CORRECT DARF TO USE FOR CERTAIN CONCENTRATION POINTS, HOWEVER, AS A GENERAL RULE TRIBUTARY AREA WAS NOT MANUALLY CARRIED WITH A DIVERTED FLOW UNLESS THE AREA WAS GREATER THAN 1 SQUARE MILE. ADDITIONALLY, IN SOME AREAS THE TRIBUTARY AREA FOR A DIVERTED FLOW WAS ESTIMATED BASED ON THE AMOUNT OF THE TOTAL FLOW DIVERTED.

JR CARD RATIOS REPRESENT DEPTH-AREA REDUCTION FACTORS (DARF'S)

100-YEAR, 6-HOUR STORM, SDN3

DARF RATIOS FOR AREAS OF 0, 1, 2, 6 AND 10 SQUARE MILES FOR 100-YEAR

DARF RATIOS FOR AREAS OF 0, 2, 6 AND 10 SQUARE MILES FOR 10-YEAR

74 IO

OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

IT

HYDROGRAPH TIME DATA

NMIN	5	MINUTES IN COMPUTATION INTERVAL
IDATE	1 0	STARTING DATE
ITIME	0000	STARTING TIME
NQ	300	NUMBER OF HYDROGRAPH ORDINATES
NDDATE	2 0	ENDING DATE
NDTIME	0055	ENDING TIME
ICENT	19	CENTURY MARK

COMPUTATION INTERVAL .08 HOURS

TOTAL TIME BASE 24.92 HOURS

ENGLISH UNITS

DRAINAGE AREA	SQUARE MILES
PRECIPITATION DEPTH	INCHES
LENGTH, ELEVATION	FEET
FLOW	CUBIC FEET PER SECOND
STORAGE VOLUME	ACRE-FEET
SURFACE AREA	ACRES
TEMPERATURE	DEGREES FAHRENHEIT

JP

MULTI-PLAN OPTION

NPLAN	1	NUMBER OF PLANS
-------	---	-----------------

JR

MULTI-RATIO OPTION

RATIOS OF PRECIPITATION

1.00	.97	.93	.90	.86	.57	.53	.51	.49
------	-----	-----	-----	-----	-----	-----	-----	-----

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS  
 FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES  
 TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO PRECIPITATION								
				RATIO 1	RATIO 2	RATIO 3	RATIO 4	RATIO 5	RATIO 6	RATIO 7	RATIO 8	RATIO 9
				1.00	.97	.93	.90	.86	.57	.53	.51	.49
HYDROGRAPH AT	ANN2C1	.12	1 FLOW	103.	98.	91.	86.	79.	34.	28.	26.	23.
			TIME	3.67	3.67	3.67	3.67	3.67	3.75	3.75	3.75	3.75
DIVERSION TO	DANN2C3	.12	1 FLOW	67.	65.	61.	59.	55.	33.	27.	25.	22.
			TIME	3.67	3.67	3.67	3.67	3.67	3.75	3.75	3.75	3.75
HYDROGRAPH AT	DANN2C1	.12	1 FLOW	36.	33.	30.	27.	24.	1.	1.	1.	1.
			TIME	3.67	3.67	3.67	3.67	3.67	3.50	3.50	3.50	3.58
ROUTED TO	RD2C1	.12	1 FLOW	35.	33.	29.	26.	23.	1.	1.	1.	1.
			TIME	3.83	3.83	3.83	3.83	3.92	4.17	4.25	4.17	4.25
HYDROGRAPH AT	ANN2C2	.12	1 FLOW	100.	95.	88.	82.	76.	31.	26.	24.	21.
			TIME	3.67	3.67	3.67	3.67	3.67	3.75	3.75	3.75	3.75
COMBINED AT	C2C2	.24	1 FLOW	126.	122.	104.	97.	86.	31.	26.	24.	21.
			TIME	3.75	3.75	3.83	3.83	3.83	3.75	3.75	3.75	3.75
DIVERSION TO	DANN2C4	.24	1 FLOW	78.	75.	67.	63.	58.	30.	25.	23.	20.
			TIME	3.75	3.75	3.83	3.83	3.83	3.75	3.75	3.75	3.75
HYDROGRAPH AT	DANN2	.24	1 FLOW	49.	46.	37.	34.	28.	1.	1.	1.	1.
			TIME	3.75	3.75	3.83	3.83	3.83	3.50	3.50	3.58	3.58
HYDROGRAPH AT	DANN2C3	.00	1 FLOW	67.	65.	61.	59.	55.	33.	27.	25.	22.
			TIME	3.67	3.67	3.67	3.67	3.67	3.75	3.75	3.75	3.75
ROUTED TO	RDAN2C3	.00	1 FLOW	67.	64.	61.	58.	55.	33.	27.	25.	22.
			TIME	3.75	3.75	3.75	3.75	3.75	3.83	3.83	3.83	3.83
HYDROGRAPH AT	ANN2C3	.11	1 FLOW	85.	81.	74.	70.	64.	25.	21.	19.	17.
			TIME	3.67	3.67	3.67	3.67	3.67	3.75	3.75	3.75	3.75
COMBINED AT	C2C3	.11	1 FLOW	151.	143.	134.	127.	118.	57.	47.	43.	38.
			TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.83	3.83	3.83
DIVERSION TO	DANN2D1	.11	1 FLOW	57.	57.	57.	57.	57.	56.	46.	42.	37.
			TIME	3.50	3.50	3.50	3.50	3.50	3.75	3.83	3.83	3.83
HYDROGRAPH AT	2D2C3	.11	1 FLOW	94.	86.	77.	70.	61.	1.	1.	1.	1.
			TIME	3.75	3.75	3.75	3.75	3.75	3.50	3.50	3.58	3.58
ROUTED TO	R2C3	.11	1 FLOW	92.	85.	75.	69.	59.	1.	1.	1.	1.
			TIME	3.83	3.83	3.83	3.83	3.83	4.33	4.42	4.83	4.42
HYDROGRAPH AT	DANN2C4	.00	1 FLOW	78.	75.	67.	63.	58.	30.	25.	23.	20.
			TIME	3.75	3.75	3.83	3.83	3.83	3.75	3.75	3.75	3.75
ROUTED TO	RDAN2C4	.00	1 FLOW	77.	74.	66.	62.	57.	30.	25.	23.	20.

				TIME	3.83	3.83	3.83	3.92	3.92	3.83	3.83	3.83	3.83
HYDROGRAPH AT	ANN2C4	.12	1	FLOW	108.	103.	95.	90.	83.	36.	30.	28.	25.
				TIME	3.67	3.67	3.67	3.67	3.67	3.75	3.75	3.75	3.75
COMBINED AT	C2C4	.23	1	FLOW	259.	246.	222.	205.	185.	64.	53.	48.	43.
				TIME	3.83	3.83	3.83	3.83	3.83	3.75	3.75	3.83	3.83
VERSION TO	D2D2	.23	1	FLOW	64.	64.	64.	64.	64.	63.	52.	47.	42.
				TIME	3.50	3.50	3.50	3.50	3.50	3.75	3.75	3.83	3.83
HYDROGRAPH AT	2D2C4	.23	1	FLOW	195.	182.	158.	141.	121.	1.	1.	1.	1.
				TIME	3.83	3.83	3.83	3.83	3.83	3.50	3.50	3.50	3.50
HYDROGRAPH AT	DANN2D1	.00	1	FLOW	57.	57.	57.	57.	57.	56.	46.	42.	37.
				TIME	3.50	3.50	3.50	3.50	3.50	3.75	3.83	3.83	3.83
ROUTED TO	RD2D1	.00	1	FLOW	57.	57.	57.	57.	57.	55.	45.	41.	36.
				TIME	3.58	3.58	3.58	3.58	3.58	3.83	3.83	3.83	3.83
HYDROGRAPH AT	ANN2D1	.11	1	FLOW	99.	94.	88.	83.	77.	34.	29.	27.	24.
				TIME	3.67	3.67	3.67	3.67	3.67	3.75	3.75	3.75	3.75
COMBINED AT	C2D1	.11	1	FLOW	156.	151.	145.	140.	134.	87.	72.	66.	59.
				TIME	3.67	3.67	3.67	3.67	3.67	3.75	3.83	3.83	3.83
VERSION TO	DANN2D3	.11	1	FLOW	87.	87.	87.	87.	87.	86.	71.	65.	58.
				TIME	3.50	3.50	3.50	3.50	3.50	3.75	3.83	3.83	3.83
HYDROGRAPH AT	2D2D1	.11	1	FLOW	69.	64.	58.	53.	47.	1.	1.	1.	1.
				TIME	3.67	3.67	3.67	3.67	3.67	3.42	3.50	3.50	3.50
ROUTED TO	RANN2D1	.11	1	FLOW	68.	64.	57.	52.	45.	1.	1.	1.	1.
				TIME	3.83	3.83	3.83	3.83	3.92	6.17	6.17	4.42	4.67
HYDROGRAPH AT	D2D2	.00	1	FLOW	64.	64.	64.	64.	64.	63.	52.	47.	42.
				TIME	3.50	3.50	3.50	3.50	3.50	3.75	3.75	3.83	3.83
ROUTED TO	RD2D2	.00	1	FLOW	64.	64.	64.	64.	64.	62.	51.	47.	41.
				TIME	3.58	3.58	3.58	3.58	3.58	3.83	3.83	3.83	3.83
HYDROGRAPH AT	ANN2D2	.11	1	FLOW	96.	92.	85.	80.	74.	32.	27.	25.	22.
				TIME	3.67	3.67	3.67	3.67	3.67	3.75	3.75	3.75	3.75
COMBINED AT	CANN2D2	.22	1	FLOW	214.	209.	194.	185.	167.	91.	76.	69.	61.
				TIME	3.83	3.75	3.83	3.83	3.83	3.75	3.83	3.83	3.83
VERSION TO	DANN2D4	.22	1	FLOW	149.	146.	139.	134.	126.	90.	75.	68.	60.
				TIME	3.83	3.75	3.83	3.83	3.83	3.75	3.83	3.83	3.83
HYDROGRAPH AT	DANN2D2	.22	1	FLOW	65.	62.	55.	51.	41.	1.	1.	1.	1.
				TIME	3.83	3.75	3.83	3.83	3.83	3.42	3.42	3.50	3.50
ROUTED TO	RD2D2	.22	1	FLOW	64.	62.	53.	45.	36.	1.	1.	1.	1.
				TIME	3.92	3.92	4.00	4.00	4.08	4.42	4.83	4.42	4.50
HYDROGRAPH AT	ANN3B1	.08	1	FLOW	66.	63.	58.	55.	51.	22.	18.	17.	15.
				TIME	3.67	3.67	3.67	3.67	3.67	3.75	3.75	3.75	3.75
COMBINED AT	C3B1	.30	1	FLOW	111.	106.	86.	76.	65.	22.	18.	17.	15.











DS# 1104

DS INDEX 2293

APN N/A

PROJECT Sunset Hills

SUBMITTAL 3<sup>rd</sup> Submittal, Addendum 2



1104  
9/23/93  
625

**HYDROLOGY STUDY  
FOR  
SUNSET HILLS  
Addendum #2 - September 23, 1993**

**A.P.N. 500-060-004/006  
A.P.N. 500-060-002/005**

**Prepared for:**

**RPS CONSULTANTS  
6010 Cheyenne #15-606  
Las Vegas, Nevada 89108**

**Prepared by:**

**SUMMIT ENGINEERING CORPORATION  
3684 South Highland Drive  
Las Vegas, Nevada 89103  
(702) 252-3236**

**Contact: John A. Entsminger, P.E.**

September 23, 1993

Mr. Mark Sorenson  
CITY OF LAS VEGAS  
Flood Control - Engineering Planning Division  
400 East Stewart Avenue  
Las Vegas, Nevada 89101

Re: *Addendum No. 2 to the Hydrology Study for Sunset Hills*

Dear Mark,

Addendum number 2 addresses comments received from the City on September 22, 1993.

- ITEM 1. The entrance apron to the 10'x4' RCBC will be concrete lined. the concrete apron will be 10' wide at the RCBC entrance and will widen to 55 feet in width at the south right-of-way line for El Campo Grande. A wrought iron fence with gate will be constructed between lots 11 and 12 along the south right-of-way line of El Campo Grande. The fence will have openings 6 inches wide, minimum. The invert elevation at the entrance to the 10'x4' RCBC is 85.50 feet. This elevation has been added to the Master Grading and Drainage Plan.
- ITEM 2. The Master Grading and Drainage Plan has been revised to raise the "hump" in Aqua Ocean Way and Island Breeze Court East of Tropic Mist Drive so that the top of curb grades at the "hump" are 6 inches above the 100 year water surface elevation in Tropic Mist Drive. Thus, the minimum top of curb elevation in Island Breeze Court at the "high point" shall be 90.06 feet. Similarly, the minimum top of curb grade in Aqua Ocean Way at the "high point" shall be 92.25 feet. The "high point" top of curb elevation in Scenic Point Drive shall be 94.30 feet.
- ITEM 3. The detail for the 10 foot wide public drainage easement has been revised to provide a CMU wall on each side of the easement. The CMU wall will transition from two feet high at the head of the cul-de-sac to 6 feet high at the east end of the public drainage easement. A wrought iron gate or other acceptable traffic barrier will be constructed at the ends of the easement. The concrete valley pan shall be 6 inches thick with #4 reinforcing bars 12 inches on centers each way.

- ITEM 4. The cross-section for the 45 foot wide public drainage easement (Section A-A) shall be modified to show weep holes at the base of the retaining wall spaced at 50 feet on centers. In addition, a note will be added to the section indicating that traverse concrete walls will be constructed at 90 feet on centers along the length of the concrete channel. The cut-off wall will be 8 inches wide by 2 feet deep with #4 rebars extended down into the cut-off wall at 12 inches on centers.
- ITEM 5. Summit Engineering personnel met with Mr. Michael Cuddy at RFCD to discuss the proposed drainage improvements in Ann Road east of Jones Boulevard. Mr. Cuddy states that Southwest Engineering has established a precedent with the approval of their change to the Master Plan Update. As a result, the future improvements in Ann Road east of Jones Boulevard will be a double 10'x7' RCBC. In addition, because of the established precedent, the Master Plan Update will not have to be further updated or revised to show the double 10'x7' RCBC in Ann Road adjacent to the Sunset Hills property.
- ITEM 6. During Phase I construction, the 45 foot wide public drainage easement and channel will be rough graded and the east CMU retaining wall will be constructed. The 6" diameter grouted rip-rap will be installed from the base of the East retaining wall to the top of the slope to the future location of the concrete drainage channel. North of Toucan Trails adjacent to the Phase I development a CMU wall will be constructed. Rip-rap of 6 to 8 inches will be placed along the slope adjacent to this wall to protect the CMU wall and footing from erosion.

Similarly, a CMU wall will be constructed along the west boundary of Phase 2. The wall and building finished floor elevations are above the existing ground elevations west of Phase 2. Rip-rap of 6 to 8 inches will be placed along the slope on the west side of the CMU wall to protect the CMU wall and footing from erosion.

During Phase 3 development, considerable storm sewer and drainage improvements will be necessary. The 45 foot drainage channel (Cross-Section A-A) will be completed in its entirety. The Type C inlet at Aqua Ocean Way and Emerald View Drive will be constructed and the 48" diameter RCP will be installed from this inlet to its outlet in the 45 foot wide drainage channel. Also, the 20 foot wide drainage channel (Cross-Section B-B) will be constructed in its entirety, including the CMU retaining walls. The 10'x4' RCBC will be constructed from the north line of Lot 7 in Phase 4, southeast in Aqua Ocean Way, Island Mist Drive and Toucan Trails to its terminus in the 45 foot wide drainage channel. An earthen berm will be constructed along the north side of Phase 3 to protect the Phase 3 development from flooding. Grading in Phase 4 will be performed to route storm flows from the northwest to the entrance to the Type C inlet, 20 foot drainage channel and to the entrance to the 10'x4' RCBC. A low point in the earthen berm will be located in line with Tropic Mist Drive to allow any overflow to drain south in this street in correspondence to the overall drainage concept.

Mr. Mark Sorenson  
September 23, 1993  
Page 3

The remainder of the drainage and storm sewer improvements will be constructed during Phase 4 development.

ITEM 7. Rip-rap sizing in the 45 foot drainage channel (Cross-Section A-A) was determined using equation 718 of the HCDDM. That is:

$$V = \frac{3(d_{50}^{0.5})(S_s - 1)}{S^{0.17}}$$

$$\therefore d_{50} = 0.40'$$

Where V = Velocity = 7 f/s  
S<sub>s</sub> = Spec. Gravity of Rock = 2.5  
S = Channel Slope = 0.005 f/f

Use rip-rap with d<sub>50</sub> = 6" and grout.

ITEM 8. Registered Professional Engineer will stamp and sign all submittals as required.

ITEM 9. The Master Grading and Drainage Plan has been revised to reflect above referenced comments. In addition, detailed grading plans of Phases 1-4 accompany this addendum number 2.

Please call me if you have any questions or comments regarding this addendum.

Sincerely,

SUMMIT ENGINEERING CORPORATION

*John A. Entsminger*

John A. Entsminger, P.E. 255043  
Project Engineer  
CIVIL  
No. 8365

JAE:rsj

reports\hydro\rsj\addendum.2

15 July 1993

Hydraulic Calculations

Sunset Hills

Job # 70644.00

I Analyze Q<sub>100</sub> storm flow thru the Subject Site.

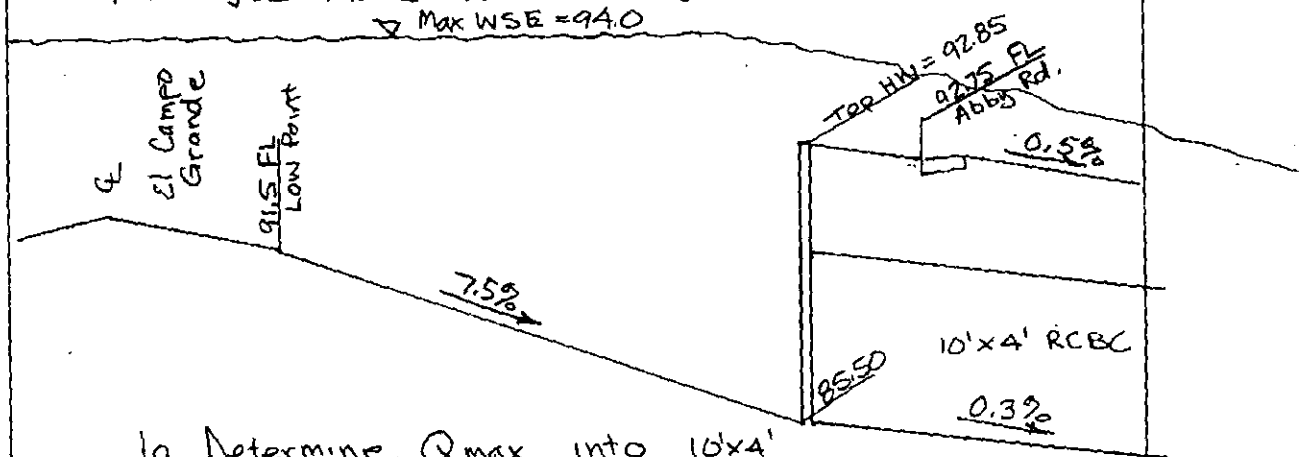
A. From the HEC-1 Analysis, Q<sub>100</sub> = 1057 cfs at the NW corner of the site.

B. 700 cfs is intercepted at the low point in El Campo Grande and by the headwall structure for the proposed 10' x 4' RCBC.

The remaining 357 cfs drains into the West 1/2 of the subdivision via John Anthony Way (JAW).

1. Analyze Flows at NW Corner

▽ Max WSE = 94.0



1a. Determine Q<sub>max</sub> into 10' x 4' RCBC.

$$94.0 - 85.5 = \frac{8.5}{4} = \frac{HW}{R} = 2.125$$

from Fig 37, CPDM, Find Q = 48 cfs/ft

$$Q = (48 \text{ cfs/ft}) (10 \text{ ft}) = 480 \text{ cfs}$$

1b. Weir Overflow topping Headwall structure and draining South in Abby Rd.

$$Q = CLH^{3/2}$$

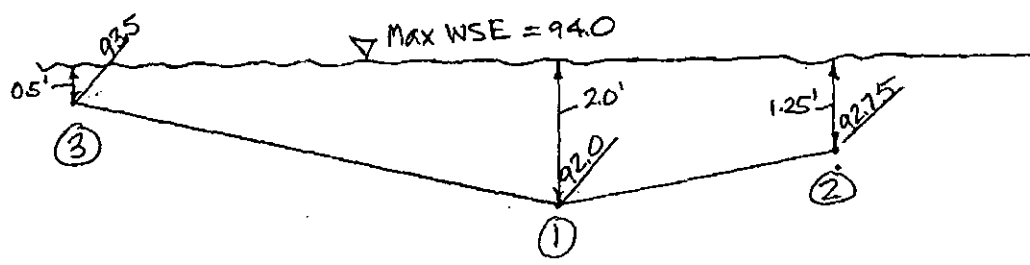
Where C = 3.58  
 L = 50'  
 H = 94.0 - 92.85 = 1.15'

$$Q = (3.58)(50)(1.15)^{1.5} = 220 \text{ cfs}$$

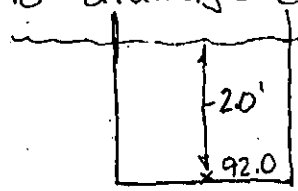
1c. Total Q = 480 cfs + 220 cfs = 700 cfs

C. Analyze Distribution of 357 cfs at the Junction of John Anthony Way and Jenny Ave.

1. Cross-Section thru South flowline Jenny Ave.



① Low Point in South flowline JA at entrance to 10' drainage easement



$$Q = CLH^{3/2}$$

H = 2.0'  
L = 10'  
C = 3.58

$$Q = 100 \text{ cfs}$$

② 92.75' Highpoint in JA flowline immediately East of John A. Way. Street Slope = 0.60% and d = 1.25' ∴ Find Q = 250 cfs

③ 93.50' Highpoint in JA immediately East of Abby Road. allows minor overflow from Jenny Ave to Abby Road = 7.0 cfs

$$\underline{\underline{\text{Total} = 250 + 100 + 7 = 357 \text{ cfs}}}$$

D. Analyze Distribution of Storm Flows in North-South Streets at Blaine Ave.

1. Abby Road

a. As previously discussed, 10'x4' RCBC conveys 480 cfs from HW inlet structure to the large Drainage Easement South of Jacquelyn Drive.

b. 227 cfs is Conveyed South to Ann Rd in Abby Rd. Depth of flow required is 1.30 feet.

•  $Q_{in} = Q_{out} = 720' = \text{Fin Fr Flow In and Out}$



2a. Weir overflow to 20' drainage easement.  
(Surface flow).

$$Q = CLH^{3/2} \quad \text{Where } C = 3.58$$

$$L = 20'$$

$$H = 90.5 - 89 = 1.5'$$

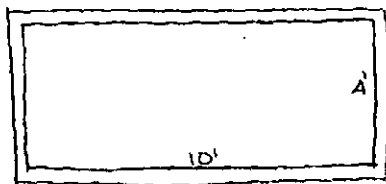
$$\therefore Q = 131.5 \text{ cfs}$$

3a. Total Capacity at 20' Drg Esmt Entrance  
= 146 cfs (Storm Inlets)  
+ 131 cfs (Weir Overflow on Surface)  
277 cfs

277 cfs > 250 cfs  
∴ Proposed Storm Sewer system and  
20' Drainage Channel is adequate  
to convey the projected flow in  
Tricia Lane to a suitable outlet.

5. Calculate Storm Sewer Pipe Requirements

a. 10' x 4' RCBC.



$$A = 40 \text{ SF}$$

$$WP = 2(3.9) + 10' = 17.80$$

$$R = A/WP = 2.247$$

$$S = 0.30\%$$

$$n = 0.013$$

$$\therefore \text{Vel} = 10.74 \text{ f/s}$$

$$\therefore Q = VA = 430 \text{ cfs} < 480 \text{ cfs}$$

Pressure Pipe Situation.

b. Nuisance Flow Storm Sewer

1. Inlet A to Inlet B 18" Ø RCP @ 1.0% OK  
 $Q_{\text{req}} = 9 \text{ cfs} \pm$   $Q_{\text{cap}} = 10.5 \text{ cfs}$  OK

2. Outlet Inlet B to Bank of Tyre B Inlets at  
Entrance to 20' Drg Esmt.  
 $Q_{\text{req}} = 18.5 \text{ cfs}$   $\text{Slope} = 0.8 \text{ cfs}$

Use 24" Ø RCP @ 0.8%  $Q_{\text{cap}} = 20 \text{ cfs}$  OK

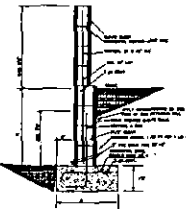
Continue Next Page







NO.	DATE	BY	DESCRIPTION
1	10/1/58	J.A.L.	PRELIMINARY PLAN
2	10/15/58	J.A.L.	REVISED PLAN
3	11/1/58	J.A.L.	REVISED PLAN
4	11/15/58	J.A.L.	REVISED PLAN
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123	11/1/63	J.A.L.	REVISED PLAN
124	11/15/63	J.A.L.	REVISED PLAN
125	12/1/63	J.A.L.	REVISED PLAN
126	12/15/63	J.A.L.	REVISED PLAN
127	1/1/64	J.A.L.	REVISED PLAN
128	1/15/64	J.A.L.	REVISED PLAN
129	2/1/64	J.A.L.	REVISED PLAN
130	2/15/64	J.A.L.	REVISED PLAN
131	3/1/64	J.A.L.	REVISED PLAN
132	3/15/64	J.A.L.	REVISED PLAN
133	4/1/64	J.A.L.	REVISED PLAN
134	4/15/64	J.A.L.	REVISED PLAN
135	5/1/64	J.A.L.	REVISED PLAN
136	5/15/64	J.A.L.	REVISED PLAN
137	6/1/64	J.A.L.	REVISED PLAN
138	6/15/64	J.A.L.	REVISED PLAN
139	7/1/64	J.A.L.	REVISED PLAN
140	7/15/64	J.A.L.	REVISED PLAN
141	8/1/64	J.A.L.	REVISED PLAN
142	8/15/64	J.A.L.	REVISED PLAN
143	9/1/64	J.A.L.	REVISED PLAN
144	9/15/64	J.A.L.	REVISED PLAN
145	10/1/64	J.A.L.	REVISED PLAN
146	10/15/64	J.A.L.	REVISED PLAN
147	11/1/64	J.A.L.	REVISED PLAN
148	11/15/64	J.A.L.	REVISED PLAN
149	12/1/64	J.A.L.	REVISED PLAN
150	12/15/64	J.A.L.	REVISED PLAN



1. ALL WALLS AND RETAINING WALLS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE SPECIFICATIONS OF THE DIVISION OF HIGHWAYS, STATE OF NEVADA, AND THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS, LATEST EDITION.

2. ALL WALLS AND RETAINING WALLS SHALL BE CONSTRUCTED WITH A MINIMUM OF 12" REINFORCING BARS PER FOOT OF WALL.

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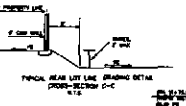
6. ALL WALLS AND RETAINING WALLS SHALL BE CONSTRUCTED WITH A MINIMUM OF 12" REINFORCING BARS PER FOOT OF WALL.

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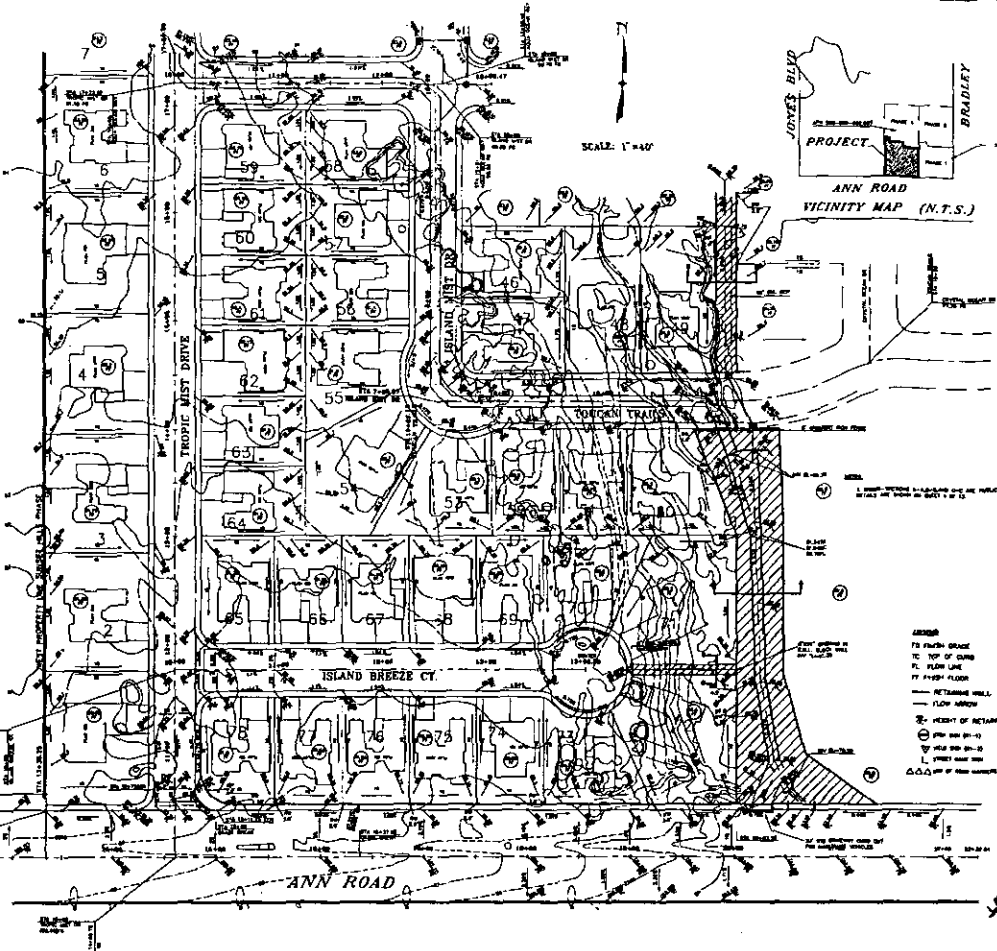
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DESIGNED BY: J.A.L.  
 CHECKED BY: J.A.L.  
 DATE: 12/15/64

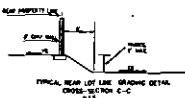
SUNSET HILLS PHASE 3  
 DETAILED GRADING PLAN  
 LAS VEGAS, NEVADA

REVISIONS

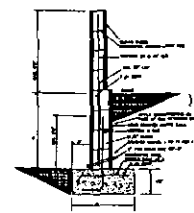
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SCALE: 1"=40'

23-0000

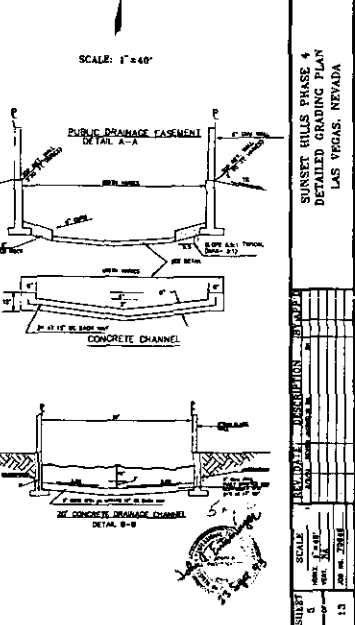
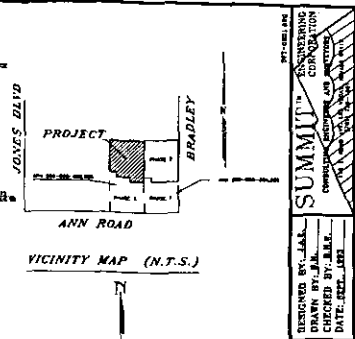
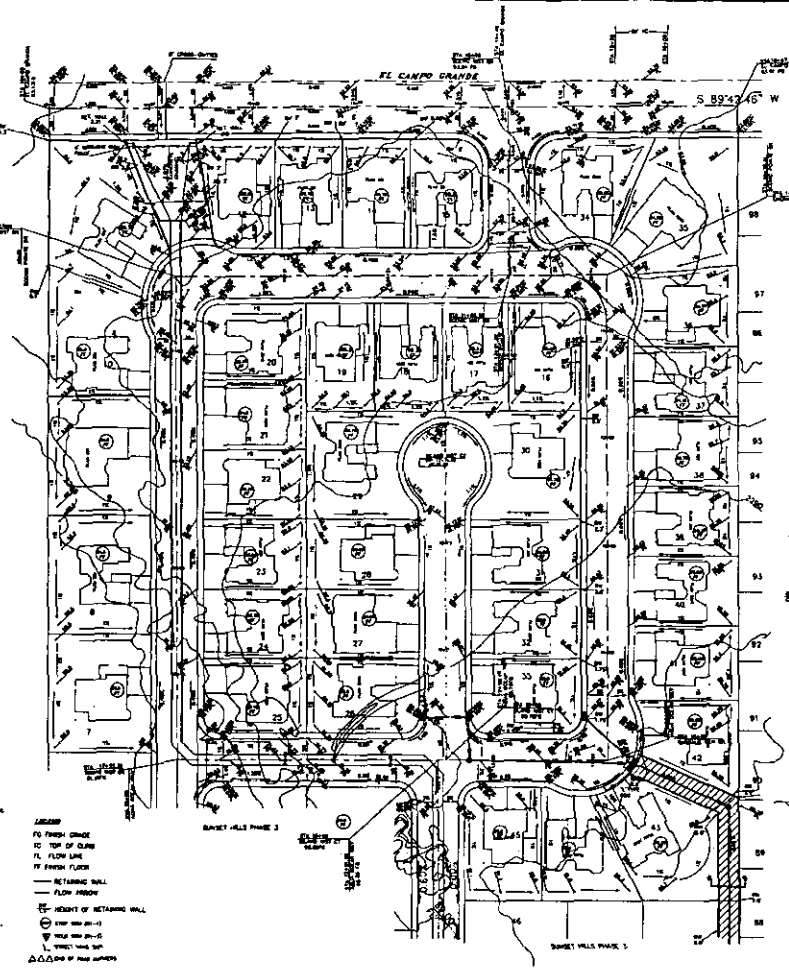


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100	AS SHOWN	11/15/55



NOTES:  
 1. ALL WALLS ARE TO BE CONCRETE AND ONLY SHOWN FOR THE PURPOSES OF THIS PLAN.  
 2. ALL WALLS ARE TO BE 12" THICK UNLESS OTHERWISE NOTED.  
 3. ALL WALLS ARE TO BE FINISHED WITH 1/2" PLASTER AND PAINTED.  
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LEGEND:  
 PG FRESH GRADE  
 TO TOP OF CLAMP  
 FL FLOW LINE  
 FF FRESH FLOOR  
 RW RETAINING WALL  
 FW FLOW FLOOR  
 HW HEIGHT OF RETAINING WALL  
 (S) 12" DIA. 10' HIGH  
 (C) 12" DIA. 10' HIGH  
 (V) 12" DIA. 10' HIGH  
 (A) 12" DIA. 10' HIGH  
 (B) 12" DIA. 10' HIGH  
 (D) 12" DIA. 10' HIGH  
 (E) 12" DIA. 10' HIGH  
 (F) 12" DIA. 10' HIGH  
 (G) 12" DIA. 10' HIGH  
 (H) 12" DIA. 10' HIGH  
 (I) 12" DIA. 10' HIGH  
 (J) 12" DIA. 10' HIGH  
 (K) 12" DIA. 10' HIGH  
 (L) 12" DIA. 10' HIGH  
 (M) 12" DIA. 10' HIGH  
 (N) 12" DIA. 10' HIGH  
 (O) 12" DIA. 10' HIGH  
 (P) 12" DIA. 10' HIGH  
 (Q) 12" DIA. 10' HIGH  
 (R) 12" DIA. 10' HIGH  
 (S) 12" DIA. 10' HIGH  
 (T) 12" DIA. 10' HIGH  
 (U) 12" DIA. 10' HIGH  
 (V) 12" DIA. 10' HIGH  
 (W) 12" DIA. 10' HIGH  
 (X) 12" DIA. 10' HIGH  
 (Y) 12" DIA. 10' HIGH  
 (Z) 12" DIA. 10' HIGH



DESIGNED BY: J.A.S.  
 DRAWN BY: J.M.  
 CHECKED BY: B.E.E.  
 DATE: 11/15/55

SUNSET HILLS PHASE 4  
 DETAILED GRADING PLAN  
 LAS VEGAS, NEVADA

REV.	DATE	DESCRIPTION
1	11/15/55	AS SHOWN
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**APPENDIX B**

**Revised Rational Method Runoff Determination  
Proposed and Existing Conditions**

## DEVELOPED BASIN CONDITIONS

DEVELOPMENT: EL CAMPO GRANDE AVENUE & BRADLEY ROAD  
 CALCULATED BY: RT DATE: 9/6/2000

DESIG:	SUB-BASIN DATA			INITIAL/OVERLAND TIME (t <sub>i</sub> )			TRAVEL TIME (t <sub>t</sub> )				t <sub>c</sub> CHECK (URBANIZED BASINS)		FINAL t <sub>c</sub>	REMARK	
	AREA	CN	K	LENGTH	SLOPE	t <sub>i</sub>	LENGTH	SLOPE	VEL.	t <sub>t</sub>	TOTAL LENGTH	t <sub>c</sub> =(L/180)+10			
	Ac (2)	(3)	(4)	Ft (5)	% (6)	Min (7)	Ft (8)	% (9)	F/S (10)	Min (11)	Ft (12)	Min (13)			
(1)															
OFF1D	2.75		0.25	215	0.47	28.85	190	0.57	1.50	2.11	405		30.97	(14)	(15)
OFF2D	2.27		0.25	180	0.56	24.90	240	0.36	1.40	2.86	420		27.75		
ON1D	1.02		0.88	45	1.00	2.66	110	1.05	2.10	0.87	155	10.86	5.00		
ON2D	1.80		0.88	60	4.45	1.86	202	1.28	2.20	1.53	262	11.46	5.00		
ON3D	1.95		0.88	25	3.20	1.34	515	1.05	2.10	4.09	540	13.00	5.43		
ON4D	0.44		0.88	50	0.96	2.84	82	3.16	3.50	0.39	132	10.73	5.00		
ON5D	1.81		0.88	80	2.13	2.75	115	3.29	3.60	0.53	195	11.08	5.00		
ON6D	1.30		0.88	25	3.20	1.34	515	1.05	2.10	4.09	540	13.00	5.43		
ON7D	0.92		0.88	115	1.57	3.65	135	2.91	3.30	0.68	250	11.39	5.00		
ON8D	1.44		0.88	50	1.60	2.39	590	0.97	1.90	5.18	640	13.56	7.57		
ON9D	1.35		0.88	50	1.00	2.80	230	2.17	2.90	1.32	280	11.56	5.00		
ST1D	2.33		0.90	23	2.00	1.37	1563	0.48	1.40	18.61	1586	18.81	18.81		
ST2D	0.80		0.90	33	2.00	1.64	400	0.47	1.40	4.76	433	12.41	6.40		
ST3D	0.52		0.90	33	2.00	1.64	270	0.37	1.40	3.21	303	11.68	5.00		
ST4D	0.65		0.90	23	2.00	1.37	500	0.37	1.40	5.95	523	12.91	7.32		
ST5D	0.69		0.90	23	1.00	1.73	120	0.67	1.70	1.18	143	10.79	5.00		
ST6D	0.80		0.90	23	2.00	1.37	365	1.15	2.15	2.83	388	12.16	5.00		

$$K = 0.0132 (CN) - 0.39 \quad t_i = 1.8 (1.1-K) L^{1/2} / S^{1/3}$$

$$t_t = L / (60V)$$

$$t_c = t_i + t_t$$

$$t_c = 0.6(t_c)$$

STANDARD FORM 4

**Rational Method Runoff Determination**  
**El Campo Grande Avenue/Bradley Road Elementary School**  
**Developed Onsite Basin ON1D**

- 1) Determine flow resistance coefficient,  $C_{10}$ :

$C_{10} = 0.88$  (Table 601)  $K = 0.50$  (Modified Rational Method Factor)

- 2) Determine  $t_t$

$t_t = (1.8(1.1 - C_{10})L^{1/2}) / S^{1/3}$   $L = 45$  feet  $S = 1.00$  %  
 $t_t = 2.66$  minutes

- 3) Determine  $t_t$  (Figure 602)

$t_t = L / 60 \cdot V$   $L = 110$  feet  $V = 2.10$  ft/sec  
 $t_t = 0.87$  minutes

- 4) Determine  $t_c$

$t_c = t_t + t_t$   
 $t_c = 5.00$  minutes

or  
 $t_c = L/180 + 10$

$t_c = 10.86$  minutes

CHOOSE THE LESSER OF THE TWO  $t_c$  (5 minutes minimum for urbanized areas)

- 5) From Table 601, Determine C

$C_{10} = 0.88$

$C_{100} = 0.89$

- 6) Determine  $i_{100}$  from Figure 517 (site must be in McCarran Rainfall Area)

From Graph:  $i_{10} = 4.20$  in/hr

$i_{100} = 7.60$  in/hr

- 7) Determine Q Area = 1.02 acres

$Q = KCiA$

$Q_{10} =$	<b>1.88 cfs</b>
$Q_{100} =$	<b>3.45 cfs</b>

**Rational Method Runoff Determination**  
**El Campo Grande Avenue/Bradley Road Elementary School**  
**Developed Onsite Basin ON2D**

- 1) Determine flow resistance coefficient,  $C_{10}$ :

$$C_{10} = 0.88$$

(Table 601)

$$K = 0.50 \quad (\text{Modified Rational Method Factor})$$

- 2) Determine  $t_t$

$$t_t = (1.8(1.1 - C_{10})L^{1/2}) / S^{1/3} \quad L = 60 \text{ feet} \quad S = 4.45 \%$$

$$t_t = 1.87 \text{ minutes}$$

- 3) Determine  $t_f$  (Figure 602)

$$t_f = L / 60 \cdot V \quad L = 202 \text{ feet} \quad V = 2.20 \text{ ft/sec}$$

$$t_f = 1.53 \text{ minutes}$$

- 4) Determine  $t_c$

$$t_c = t_t + t_f$$

$$t_c = 5.00 \text{ minutes}$$

or

$$t_c = L/180 + 10$$

$$t_c = 11.46 \text{ minutes}$$

CHOOSE THE LESSER OF THE TWO  $t_c$  (5 minutes minimum for urbanized areas)

- 5) From Table 601, Determine C

$$C_{10} = 0.88$$

$$C_{100} = 0.89$$

- 6) Determine  $i_{100}$  from Figure 517 (site must be in McCarran Rainfall Area)

From Graph:  $i_{10} = 4.20 \text{ in/hr}$

$$i_{100} = 7.60 \text{ in/hr}$$

- 7) Determine Q Area = 1.80 acres

$$Q = KCiA$$

$$Q_{10} = 3.33 \text{ cfs}$$

$$Q_{100} = 6.09 \text{ cfs}$$

**Rational Method Runoff Determination**  
**El Campo Grande Avenue/Bradley Road Elementary School**  
**Developed Onsite Basin ON4D**

- 1) Determine flow resistance coefficient,  $C_{10}$ :

$C_{10} = 0.88$  (Table 601)  $K = 0.50$  (Modified Rational Method Factor)

- 2) Determine  $t_1$

$t_1 = (1.8(1.1 - C_{10})L^{1/2}) / S^{1/3}$        $L = 50$  feet       $S = 0.96\%$   
 $t_1 = 2.84$  minutes

- 3) Determine  $t_2$  (Figure 602)

$t_2 = L / 60 \cdot V$        $L = 82$  feet       $V = 3.50$  ft/sec  
 $t_2 = 0.39$  minutes

- 4) Determine  $t_c$

$t_c = t_1 + t_2$   
 $t_c = 5.00$  minutes

or  
 $t_c = L/180 + 10$

$t_c = 10.73$  minutes

CHOOSE THE LESSER OF THE TWO  $t_c$  (5 minutes minimum for urbanized areas)

- 5) From Table 601, Determine C

$C_{10} = 0.88$

$C_{100} = 0.89$

- 6) Determine  $i_{100}$  from Figure 517 (site must be in McCarran Rainfall Area)

From Graph:  $i_{10} = 4.20$  in/hr

$i_{100} = 7.60$  in/hr

- 7) Determine Q      Area = 0.44 acres

$Q = KCiA$

**$Q_{10} = 0.81$  cfs**

**$Q_{100} = 1.49$  cfs**

**Rational Method Runoff Determination**  
**El Campo Grande Avenue/Bradley Road Elementary School**  
**Developed Onsite Basin ON5D**

1) Determine flow resistance coefficient,  $C_{10}$ :

$$C_{10} = 0.88 \quad (\text{Table 601}) \quad K = 0.50 \quad (\text{Modified Rational Method Factor})$$

2) Determine  $t_t$

$$t_t = (1.8(1.1 - C_{10})L^{1/2}) / S^{1/3} \quad L = 80 \text{ feet} \quad S = 2.13 \%$$

$$t_t = 2.76 \text{ minutes}$$

3) Determine  $t_t$  (Figure 602)

$$t_t = L / 60 \cdot V \quad L = 115 \text{ feet} \quad V = 3.60 \text{ ft/sec}$$

$$t_t = 0.53 \text{ minutes}$$

4) Determine  $t_c$

$$t_c = t_t + t_t$$

$$t_c = 5.00 \text{ minutes}$$

or

$$t_c = L/180 + 10$$

$$t_c = 11.08 \text{ minutes}$$

CHOOSE THE LESSER OF THE TWO  $t_c$  (5 minutes minimum for urbanized areas)

5) From Table 601, Determine C

$$C_{10} = 0.88$$

$$C_{100} = 0.89$$

6) Determine  $i_{100}$  from Figure 517 (site must be in McCarran Rainfall Area)

From Graph:

$$i_{10} = 4.20 \text{ in/hr}$$

$$i_{100} = 7.60 \text{ in/hr}$$

7) Determine Q Area = 1.81 acres

$$Q = KCiA$$

$Q_{10} =$	<b>3.34 cfs</b>
$Q_{100} =$	<b>6.12 cfs</b>

**Rational Method Runoff Determination**  
**El Campo Grande Avenue/Bradley Road Elementary School**  
**Developed Onsite Basin ON7D**

- 1) Determine flow resistance coefficient,  $C_{10}$ :

$$C_{10} = 0.88 \quad (\text{Table 601}) \quad K = 0.50 \quad (\text{Modified Rational Method Factor})$$

- 2) Determine  $t_t$

$$t_t = (1.8(1.1 - C_{10})L^{1/2}) / S^{1/3} \quad L = 115 \text{ feet} \quad S = 1.57 \%$$

$$t_t = 3.66 \text{ minutes}$$

- 3) Determine  $t_t$  (Figure 602)

$$t_t = L / 60 \cdot V \quad L = 135 \text{ feet} \quad V = 3.30 \text{ ft/sec}$$

$$t_t = 0.68 \text{ minutes}$$

- 4) Determine  $t_c$

$$t_c = t_t + t_t$$

$$t_c = 5.00 \text{ minutes}$$

or

$$t_c = L/180 + 10$$

$$t_c = 11.39 \text{ minutes}$$

CHOOSE THE LESSER OF THE TWO  $t_c$  (5 minutes minimum for urbanized areas)

- 5) From Table 601, Determine C

$$C_{10} = 0.88$$

$$C_{100} = 0.89$$

- 6) Determine  $i_{100}$  from Figure 517 (site must be in McCarran Rainfall Area)

From Graph:

$$i_{10} = 4.20 \text{ in/hr}$$

$$i_{100} = 7.60 \text{ in/hr}$$

- 7) Determine Q Area = 0.92 acres

$$Q = KCiA$$

$Q_{10} =$	<b>1.70 cfs</b>
$Q_{100} =$	<b>3.11 cfs</b>

**Rational Method Runoff Determination**  
**El Campo Grande Avenue/Bradley Road Elementary School**  
**Developed Onsite Basin ON9D**

- 1) Determine flow resistance coefficient,  $C_{10}$ :

$$C_{10} = 0.88 \quad (\text{Table 601}) \quad K = 0.50 \quad (\text{Modified Rational Method Factor})$$

- 2) Determine  $t_t$

$$t_t = (1.8(1.1 - C_{10})L^{1/2}) / S^{1/3} \quad L = 50 \text{ feet} \quad S = 1.00 \%$$

$$t_t = 2.80 \text{ minutes}$$

- 3) Determine  $t_f$  (Figure 602)

$$t_f = L / 60 \cdot V \quad L = 230 \text{ feet} \quad V = 2.90 \text{ ft/sec}$$

$$t_f = 1.32 \text{ minutes}$$

- 4) Determine  $t_c$

$$t_c = t_t + t_f$$

$$t_c = 5.00 \text{ minutes}$$

or

$$t_c = L/180 + 10$$

$$t_c = 11.56 \text{ minutes}$$

CHOOSE THE LESSER OF THE TWO  $t_c$  (5 minutes minimum for urbanized areas)

- 5) From Table 601, Determine C

$$C_{10} = 0.88$$

$$C_{100} = 0.89$$

- 6) Determine  $i_{100}$  from Figure 517 (site must be in McCarran Rainfall Area)

From Graph:  $i_{10} = 4.20 \text{ in/hr}$

$$i_{100} = 7.60 \text{ in/hr}$$

- 7) Determine Q Area = 1.35 acres

$$Q = KCiA$$

$$Q_{10} = 2.49 \text{ cfs}$$

$$Q_{100} = 4.57 \text{ cfs}$$

**Rational Method Runoff Determination**  
**El Campo Grande Avenue/Bradley Road Elementary School**  
**Developed Offsite Basin ST3D**

- 1) Determine flow resistance coefficient,  $C_{10}$ :

$C_{10} = 0.90$  (Table 601)  $K = 0.50$  (Modified Rational Method Factor)

- 2) Determine  $t_t$

$t_t = (1.8(1.1 - C_{10})L^{1/2}) / S^{1/3}$   $L = 33$  feet  $S = 2.00$  %  
 $t_t = 1.65$  minutes

- 3) Determine  $t_f$  (Figure 602)

$t_f = L / 60 \cdot V$   $L = 270$  feet  $V = 1.40$  ft/sec  
 $t_f = 3.21$  minutes

- 4) Determine  $t_c$

$t_c = t_t + t_f$   
 $t_c = 5.00$  minutes

or  
 $t_c = L/180 + 10$   
 $t_c = 11.68$  minutes

CHOOSE THE LESSER OF THE TWO  $t_c$  (5 minutes minimum for urbanized areas)

- 5) From Table 601, Determine C

$C_{10} = 0.90$   
 $C_{100} = 0.93$

- 6) Determine  $i_{100}$  from Figure 517 (site must be in McCarran Rainfall Area)

From Graph:  $i_{10} = 4.20$  in/hr  
 $i_{100} = 7.60$  in/hr

- 7) Determine Q Area = 0.52 acres

$Q = KCiA$

$Q_{10} =$	<b>0.98 cfs</b>
$Q_{100} =$	<b>1.84 cfs</b>

**Rational Method Runoff Determination**  
**El Campo Grande Avenue/Bradley Road Elementary School**  
**Developed Offsite Basin ST5D**

- 1) Determine flow resistance coefficient,  $C_{10}$ :

$$C_{10} = 0.90$$

(Table 601)

$$K = 0.50 \quad (\text{Modified Rational Method Factor})$$

- 2) Determine  $t_t$

$$t_t = (1.8(1.1 - C_{10})L^{1/2}) / S^{1/3}$$

$$L = 23 \text{ feet} \quad S = 1.00 \%$$

$$t_t = 1.73 \text{ minutes}$$

- 3) Determine  $t_f$  (Figure 602)

$$t_f = L / 60 \cdot V$$

$$L = 120 \text{ feet} \quad V = 1.70 \text{ ft/sec}$$

$$t_f = 1.18 \text{ minutes}$$

- 4) Determine  $t_c$

$$t_c = t_t + t_f$$

$$t_c = 5.00 \text{ minutes}$$

or

$$t_c = L/180 + 10$$

$$t_c = 10.79 \text{ minutes}$$

CHOOSE THE LESSER OF THE TWO  $t_c$  (5 minutes minimum for urbanized areas)

- 5) From Table 601, Determine C

$$C_{10} = 0.90$$

$$C_{100} = 0.93$$

- 6) Determine  $i_{100}$  from Figure 517 (site must be in McCarran Rainfall Area)

From Graph:  $i_{10} = 4.20 \text{ in/hr}$

$$i_{100} = 7.60 \text{ in/hr}$$

- 7) Determine Q Area = 0.69 acres

$$Q = KCiA$$

$$Q_{10} = 1.30 \text{ cfs}$$

$$Q_{100} = 2.44 \text{ cfs}$$

**Rational Method Runoff Determination**  
**El Campo Grande Avenue/Bradley Road Elementary School**  
**Developed Offsite Basin ST6D**

- 1) Determine flow resistance coefficient,  $C_{10}$ :

$C_{10} = 0.90$  (Table 601)  $K = 0.50$  (Modified Rational Method Factor)

- 2) Determine  $t_f$

$t_f = (1.8(1.1 - C_{10})L^{1/2}) / S^{1/3}$   $L = 23$  feet  $S = 2.00$  %  
 $t_f = 1.37$  minutes

- 3) Determine  $t_f$  (Figure 602)

$t_f = L / 60 \cdot V$   $L = 365$  feet  $V = 2.15$  ft/sec  
 $t_f = 2.83$  minutes

- 4) Determine  $t_c$

$t_c = t_f + t_t$   
 $t_c = 5.00$  minutes

or

$t_c = L/180 + 10$   
 $t_c = 12.16$  minutes

CHOOSE THE LESSER OF THE TWO  $t_c$  (5 minutes minimum for urbanized areas)

- 5) From Table 601, Determine C

$C_{10} = 0.90$   
 $C_{100} = 0.93$

- 6) Determine  $i_{100}$  from Figure 517 (site must be in McCarran Rainfall Area)

From Graph:  $i_{10} = 4.20$  in/hr  
 $i_{100} = 7.60$  in/hr

- 7) Determine Q Area = 0.80 acres  
 $Q = KCiA$

$Q_{10} =$	<b>1.51 cfs</b>
$Q_{100} =$	<b>2.83 cfs</b>

## EXISTING BASIN CONDITIONS

DEVELOPMENT: EL CAMPO GRANDE AVENUE & BRADLEY ROAD  
 CALCULATED BY: RT DATE: 9/21/2000

DESIG:	SUB-BASIN DATA			INITIAL/OVERLAND TIME(t)				TRAVEL TIME (t)				t CHECK (URBANIZED BASINS)		FINAL t <sub>c</sub>	REMARK
	AREA	CN	K	LENGTH	SLOPE	t	LENGTH	SLOPE	VEL.	t	TOTAL LENGTH	Min			
(1)	Ac (2)	(3)	(4)	Ft (5)	% (6)	Min (7)	Ft (8)	% (9)	F/S (10)	Min (11)	Ft (12)	Min (13)	Min (14)	(15)	
ON1E	0.96		0.25	100	0.90	15.85	165	0.97	1.00	2.75	265		18.60		
ON2E	2.91		0.25	150	0.80	20.19	580	0.66	0.81	11.93	730		32.12		
ON3E	5.09		0.25	270	0.74	27.79	1075	0.50	0.70	25.60	1345		53.39		
ON4E	5.08		0.25	60	1.83	9.69	890	0.55	0.75	19.78	950		29.47		
ON5E	3.01		0.25	90	1.22	13.58	495	0.51	0.69	11.96	585		25.54		
ST1E	1.90		0.90	23	2.00	1.37	1253	0.50	1.40	14.92	1276	17.09	16.29		
ST2E	0.80		0.90	33	2.00	1.64	400	0.47	1.40	4.76	433	12.41	6.40		
ST3E	0.52		0.90	33	2.00	1.64	270	0.37	1.40	3.21	303	11.68	5.00		
ST4E	0.65		0.90	23	2.00	1.37	500	0.37	1.40	5.95	523	12.91	7.32		
ST5E	0.69		0.90	23	1.00	1.73	120	0.67	1.70	1.18	143	10.79	5.00		
ST6E	0.34		0.90	23	1.20	1.62	210	0.44	1.40	2.50	233	11.29	5.00		

$K = 0.0132 (CN) - 0.39$

$t_1 = 1.8 (1.1-K) L^{1/2} / S^{1/3}$

$t_2 = L / (60V)$

$t_c = t_1 + t_2$   
 $t_c = 0.6(t_c)$

STANDARD FORM 4

**Rational Method Runoff Determination**  
**El Campo Grande Avenue/Bradley Road Elementary School**  
**Existing Onsite Basin ON1E**

1) Determine flow resistance coefficient,  $C_{10}$ :

$C_{10} = 0.25$  (Table 601)  $K = 0.50$  (Modified Rational Method Factor)

2) Determine  $t_t$

$t_t = (1.8(1.1 - C_{10})L^{1/2}) / S^{1/3}$   $L = 100$  feet  $S = 0.90$  %  
 $t_t = 15.84$  minutes

3) Determine  $t_t$  (Figure 602)

$t_t = L / 60 \cdot V$   $L = 165$  feet  $V = 1.00$  ft/sec  
 $t_t = 2.75$  minutes

4) Determine  $t_c$

$t_c = t_t + t_t$   
 $t_c = 18.59$  minutes

5) From Table 601, Determine C

$C_{10} = 0.25$   
 $C_{100} = 0.50$

6) Determine  $i_{100}$  from Figure 517 (site must be in McCarran Rainfall Area)

From Graph:  $i_{10} = 2.75$  in/hr  
 $i_{100} = 4.95$  in/hr

7) Determine Q Area = 0.96 acres  
 $Q = KCiA$

$Q_{10} =$	<b>0.33</b>	cfs
$Q_{100} =$	<b>1.19</b>	cfs

**Rational Method Runoff Determination**  
**El Campo Grande Avenue/Bradley Road Elementary School**  
**Existing Onsite Basin ON2E**

1) Determine flow resistance coefficient,  $C_{10}$ :

$C_{10} = 0.25$  (Table 601)  $K = 0.50$  (Modified Rational Method Factor)

2) Determine  $t_t$

$t_t = (1.8(1.1 - C_{10})L^{1/2}) / S^{1/3}$   $L = 150$  feet  $S = 0.80$  %  
 $t_t = 20.17$  minutes

3) Determine  $t_f$  (Figure 602)

$t_f = L / 60 \cdot V$   $L = 580$  feet  $V = 0.81$  ft/sec  
 $t_f = 11.93$  minutes

4) Determine  $t_c$

$t_c = t_t + t_f$   
 $t_c = 32.10$  minutes

5) From Table 601, Determine C

$C_{10} = 0.25$   
 $C_{100} = 0.50$

6) Determine  $i_{100}$  from Figure 517 (site must be in McCarran Rainfall Area)

From Graph:  $i_{10} = 2.10$  in/hr  
 $i_{100} = 3.70$  in/hr

7) Determine Q  $Area = 2.91$  acres  
 $Q = KCiA$

$Q_{10} = 0.76$ cfs
$Q_{100} = 2.69$ cfs

**Rational Method Runoff Determination**  
**El Campo Grande Avenue/Bradley Road Elementary School**  
**Existing Onsite Basin ON3E**

1) Determine flow resistance coefficient,  $C_{10}$ :

$$C_{10} = 0.25 \quad (\text{Table 601}) \quad K = 0.50 \quad (\text{Modified Rational Method Factor})$$

2) Determine  $t_1$

$$t_1 = (1.8(1.1 - C_{10})L^{1/2}) / S^{1/3} \quad L = 270 \text{ feet} \quad S = 0.74 \%$$

$$t_1 = 27.77 \text{ minutes}$$

3) Determine  $t_2$  (Figure 602)

$$t_2 = L / 60 \cdot V \quad L = 1075 \text{ feet} \quad V = 0.70 \text{ ft/sec}$$

$$t_2 = 25.60 \text{ minutes}$$

4) Determine  $t_c$

$$t_c = t_1 + t_2$$

$$t_c = 53.36 \text{ minutes}$$

5) From Table 601, Determine C

$$C_{10} = 0.25$$

$$C_{100} = 0.50$$

6) Determine  $i_{100}$  from Figure 517 (site must be in McCarran Rainfall Area)

From Graph:

$$i_{10} = 1.30 \text{ in/hr}$$

$$i_{100} = 2.30 \text{ in/hr}$$

7) Determine Q      Area = 5.09 acres

$$Q = KCiA$$

$Q_{10} =$	<b>0.83 cfs</b>
$Q_{100} =$	<b>2.93 cfs</b>

**Rational Method Runoff Determination**  
**El Campo Grande Avenue/Bradley Road Elementary School**  
**Existing Onsite Basin ON4E**

1) Determine flow resistance coefficient,  $C_{10}$ :

$C_{10} = 0.25$  (Table 601)  $K = 0.50$  (Modified Rational Method Factor)

2) Determine  $t_t$

$t_t = (1.8(1.1 - C_{10})L^{1/2}) / S^{1/3}$   $L = 60$  feet  $S = 1.83 \%$   
 $t_t = 9.71$  minutes

3) Determine  $t_f$  (Figure 602)

$t_f = L / 60 \cdot V$   $L = 890$  feet  $V = 0.75$  ft/sec  
 $t_f = 19.78$  minutes

4) Determine  $t_c$

$t_c = t_t + t_f$   
 $t_c = 29.49$  minutes

5) From Table 601, Determine C

$C_{10} = 0.25$   
 $C_{100} = 0.50$

6) Determine  $i_{100}$  from Figure 517 (site must be in McCarran Rainfall Area)

From Graph:  $i_{10} = 2.20$  in/hr  
 $i_{100} = 3.90$  in/hr

7) Determine Q Area = 5.08 acres  
 $Q = KCiA$

$Q_{10} =$	<b>1.40</b> cfs
$Q_{100} =$	<b>4.95</b> cfs

**Rational Method Runoff Determination**  
**El Campo Grande Avenue/Bradley Road Elementary School**  
**Existing Onsite Basin ON5E**

1) Determine flow resistance coefficient,  $C_{10}$ :

$C_{10} = 0.25$  (Table 601)  $K = 0.50$  (Modified Rational Method Factor)

2) Determine  $t_t$

$t_t = (1.8(1.1 - C_{10})L^{1/2}) / S^{1/3}$   $L = 90$  feet  $S = 1.22$  %  
 $t_t = 13.59$  minutes

3) Determine  $t_f$  (Figure 602)

$t_f = L / 60 * V$   $L = 495$  feet  $V = 0.69$  ft/sec  
 $t_f = 11.96$  minutes

4) Determine  $t_c$

$t_c = t_t + t_f$   
 $t_c = 25.55$  minutes

5) From Table 601, Determine C

$C_{10} = 0.25$   
 $C_{100} = 0.50$

6) Determine  $i_{100}$  from Figure 517 (site must be in McCarran Rainfall Area)

From Graph:  $i_{10} = 2.40$  in/hr  
 $i_{100} = 4.20$  in/hr

7) Determine Q  $Area = 3.01$  acres  
 $Q = KCiA$

$Q_{10} =$	<b>0.90</b>	cfs
$Q_{100} =$	<b>3.16</b>	cfs

**Rational Method Runoff Determination**  
**El Campo Grande Avenue/Bradley Road Elementary School**  
**Existing Offsite Basin ST1E**

- 1) Determine flow resistance coefficient,  $C_{10}$ :

$C_{10} = 0.90$  (Table 601)  $K = 0.50$  (Modified Rational Method Factor)

- 2) Determine  $t_t$

$t_t = (1.8(1.1 - C_{10})L^{1/2}) / S^{1/3}$   $L = 23$  feet  $S = 2.00$  %  
 $t_t = 1.37$  minutes

- 3) Determine  $t_f$  (Figure 602)

$t_f = L / 60 \cdot V$   $L = 1253$  feet  $V = 1.40$  ft/sec  
 $t_f = 14.92$  minutes

- 4) Determine  $t_c$

$t_c = t_t + t_f$   
 $t_c = 16.29$  minutes

or  
 $t_c = L/180 + 10$

$t_c = 17.09$  minutes

CHOOSE THE LESSER OF THE TWO  $t_c$

- 5) From Table 601, Determine C

$C_{10} = 0.90$

$C_{100} = 0.93$

- 6) Determine  $i_{100}$  from Figure 517 (site must be in McCarran Rainfall Area)

From Graph:  $i_{10} = 2.80$  in/hr

$i_{100} = 5.20$  in/hr

- 7) Determine Q Area = 1.90 acres

$Q = KCiA$

$Q_{10} =$	<b>2.39 cfs</b>
$Q_{100} =$	<b>4.59 cfs</b>

**Rational Method Runoff Determination**  
**El Campo Grande Avenue/Bradley Road Elementary School**  
**Existing Offsite Basin ST2E**

- 1) Determine flow resistance coefficient,  $C_{10}$ :

$C_{10} = 0.90$  (Table 601)       $K = 0.50$  (Modified Rational Method Factor)

- 2) Determine  $t_t$

$t_t = (1.8(1.1 - C_{10})L^{1/2}) / S^{1/3}$        $L = 33$  feet       $S = 2.00$  %  
 $t_t = 1.65$  minutes

- 3) Determine  $t_f$  (Figure 602)

$t_f = L / 60 * V$        $L = 400$  feet       $V = 1.40$  ft/sec  
 $t_f = 4.76$  minutes

- 4) Determine  $t_c$

$t_c = t_t + t_f$   
 $t_c = 6.41$  minutes

or

$t_c = L/180 + 10$   
 $t_c = 12.41$  minutes

CHOOSE THE LESSER OF THE TWO  $t_c$

- 5) From Table 601, Determine C

$C_{10} = 0.90$   
 $C_{100} = 0.93$

- 6) Determine  $i_{100}$  from Figure 517 (site must be in McCarran Rainfall Area)

From Graph:       $i_{10} = 4.00$  in/hr  
                           $i_{100} = 7.10$  in/hr

- 7) Determine Q      Area = 0.80 acres  
 $Q = KCiA$

$Q_{10} = 1.44$ cfs
$Q_{100} = 2.64$ cfs

**Rational Method Runoff Determination**  
**El Campo Grande Avenue/Bradley Road Elementary School**  
**Existing Offsite Basin ST3E**

- 1) Determine flow resistance coefficient,  $C_{10}$ :

$$C_{10} = 0.90 \quad (\text{Table 601}) \quad K = 0.50 \quad (\text{Modified Rational Method Factor})$$

- 2) Determine  $t_t$

$$t_t = (1.8(1.1 - C_{10})L^{1/2}) / S^{1/3} \quad L = 33 \text{ feet} \quad S = 2.00 \%$$

$$t_t = 1.65 \text{ minutes}$$

- 3) Determine  $t_t$  (Figure 602)

$$t_t = L / 60 \cdot V \quad L = 270 \text{ feet} \quad V = 1.40 \text{ ft/sec}$$

$$t_t = 3.21 \text{ minutes}$$

- 4) Determine  $t_c$

$$t_c = t_t + t_t$$

$$t_c = 5.00 \text{ minutes}$$

or

$$t_c = L/180 + 10$$

$$t_c = 11.68 \text{ minutes}$$

CHOOSE THE LESSER OF THE TWO  $t_c$

- 5) From Table 601, Determine C

$$C_{10} = 0.90$$

$$C_{100} = 0.93$$

- 6) Determine  $i_{100}$  from Figure 517 (site must be in McCarran Rainfall Area)

From Graph:  $i_{10} = 4.20 \text{ in/hr}$

$$i_{100} = 7.60 \text{ in/hr}$$

- 7) Determine Q Area = 0.52 acres

$$Q = KCiA$$

$$Q_{10} = 0.98 \text{ cfs}$$

$$Q_{100} = 1.84 \text{ cfs}$$

**Rational Method Runoff Determination**  
**El Campo Grande Avenue/Bradley Road Elementary School**  
**Existing Offsite Basin ST4E**

- 1) Determine flow resistance coefficient,  $C_{10}$ :

$$C_{10} = 0.90 \quad (\text{Table 601}) \quad K = 0.50 \quad (\text{Modified Rational Method Factor})$$

- 2) Determine  $t_t$

$$t_t = (1.8(1.1 - C_{10})L^{1/2}) / S^{1/3} \quad L = 23 \text{ feet} \quad S = 2.00 \%$$

$$t_t = 1.37 \text{ minutes}$$

- 3) Determine  $t_t$  (Figure 602)

$$t_t = L / 60 \cdot V \quad L = 500 \text{ feet} \quad V = 1.40 \text{ ft/sec}$$

$$t_t = 5.95 \text{ minutes}$$

- 4) Determine  $t_c$

$$t_c = t_t + t_t$$

$$t_c = 7.33 \text{ minutes}$$

or

$$t_c = L/180 + 10$$

$$t_c = 12.91 \text{ minutes}$$

CHOOSE THE LESSER OF THE TWO  $t_c$

- 5) From Table 601, Determine C

$$C_{10} = 0.90$$

$$C_{100} = 0.93$$

- 6) Determine  $i_{100}$  from Figure 517 (site must be in McCarran Rainfall Area)

From Graph:

$$i_{10} = 3.80 \text{ in/hr}$$

$$i_{100} = 6.90 \text{ in/hr}$$

- 7) Determine Q      Area = 0.65 acres
- $$Q = KCiA$$

$Q_{10} =$	<b>1.11 cfs</b>
$Q_{100} =$	<b>2.09 cfs</b>

**Rational Method Runoff Determination**  
**El Campo Grande Avenue/Bradley Road Elementary School**  
**Existing Offsite Basin ST5E**

- 1) Determine flow resistance coefficient,  $C_{10}$ :

$C_{10} = 0.90$  (Table 601)  $K = 0.50$  (Modified Rational Method Factor)

- 2) Determine  $t_t$

$t_t = (1.8(1.1 - C_{10})L^{1/2}) / S^{1/3}$   $L = 23$  feet  $S = 1.00$  %  
 $t_t = 1.73$  minutes

- 3) Determine  $t_t$  (Figure 602)

$t_t = L / 60 \cdot V$   $L = 120$  feet  $V = 1.70$  ft/sec  
 $t_t = 1.18$  minutes

- 4) Determine  $t_c$

$t_c = t_t + t_t$   
 $t_c = 5.00$  minutes

or  
 $t_c = L/180 + 10$

$t_c = 10.79$  minutes

CHOOSE THE LESSER OF THE TWO  $t_c$

- 5) From Table 601, Determine C

$C_{10} = 0.90$

$C_{100} = 0.93$

- 6) Determine  $i_{100}$  from Figure 517 (site must be in McCarran Rainfall Area)

From Graph:  $i_{10} = 4.20$  in/hr

$i_{100} = 7.60$  in/hr

- 7) Determine Q Area = 0.69 acres

$Q = KCiA$

$Q_{10} = 1.30$  cfs

$Q_{100} = 2.44$  cfs

**Rational Method Runoff Determination**  
**El Campo Grande Avenue/Bradley Road Elementary School**  
**Existing Offsite Basin ST6E**

- 1) Determine flow resistance coefficient,  $C_{10}$ :

$C_{10} = 0.90$  (Table 601)  $K = 0.50$  (Modified Rational Method Factor)

- 2) Determine  $t_i$

$t_i = (1.8(1.1 - C_{10})L^{1/2}) / S^{1/3}$      $L = 23$  feet     $S = 1.20$  %  
 $t_i = 1.63$  minutes

- 3) Determine  $t_t$  (Figure 602)

$t_t = L / 60 \cdot V$      $L = 210$  feet     $V = 1.40$  ft/sec  
 $t_t = 2.50$  minutes

- 4) Determine  $t_c$

$t_c = t_i + t_t$   
 $t_c = 5.00$  minutes

or  
 $t_c = L/180 + 10$

$t_c = 11.29$  minutes

CHOOSE THE LESSER OF THE TWO  $t_c$

- 5) From Table 601, Determine C

$C_{10} = 0.90$

$C_{100} = 0.93$

- 6) Determine  $i_{100}$  from Figure 517 (site must be in McCarran Rainfall Area)

From Graph:  $i_{10} = 4.20$  in/hr

$i_{100} = 7.60$  in/hr

- 7) Determine Q    Area = 0.34 acres

$Q = KCiA$

$Q_{10} =$	<b>0.64</b> cfs
$Q_{100} =$	<b>1.20</b> cfs

**APPENDIX C**

**Revised Table 2 & 3  
Revised Street Capacity Calculations  
Court Yard & Swale @ Wall Capacity Calculations  
Existing Drop Inlet Capacity Calculations  
Proposed 6' Screen/Retaining Wall Detail**

**REVISED TABLE 2  
10 100-YEAR FLOWS  
DEVELOPED CONDITIONS**

<b>BASIN</b>	<b>AREA (acres)</b>	<b>Q10 (cfs)</b>	<b>Q100 (cfs)</b>
<b>Total future flows to Corbett Street from Eagle Creek South Subdivision</b>	N/A	15	45
ON1D	1.02	2	4
ON2D	1.80	3	6
ON3D	1.95	4	6
OFF1D	2.75	1	3
ST1D	2.33	3	5
ST2D	0.80	1	3
<b>Total flow at the intersection of Corbett Street and Bradley road</b>	N/A	29	72
ON6D	1.30	2	4
ON8D	1.44	3	5
OFF2D	2.27	1	2
ST3D	0.52	1	2
ST4D	0.65	1	2
<b>Total flow at the intersection of El Campo Grande Avenue and Bradley Road</b>	N/A	8	15
<b>Total flow at intersection of El Campo Grande Avenue and Leon Avenue</b>	N/A	83	300
ON4D	0.44	1	2
ON7D	0.72	2	3
ST6D	0.34	2	3
<b>Total flow to El Campo Grande Avenue and Sunset Hills 10' x 4' RCB</b>	N/A	88	308

**REVISED TABLE 2  
10 100-YEAR FLOWS  
DEVELOPED CONDITIONS**

<b>BASIN</b>	<b>AREA (acres)</b>	<b>Q10 (cfs)</b>	<b>Q100 (cfs)</b>
ON6D	1.3	2	4
ON8D	1.44	3	5
OFF2D	2.27	1	2
ST4D	0.65	1	2
<b>Total flow on El Eampo Grande at Section C-C</b>	<b>N/A</b>	<b>7</b>	<b>13</b>
ON5D	1.81	3	6
ON9D	1.35	3	5
ST5D	0.69	1	3
<b>Total flow on El Campo Grande at Section D-D</b>	<b>N/A</b>	<b>7</b>	<b>14</b>
ON3D	1.95	4	6
OFF1D	2.75	1	3
OFF2D	2.27	1	2
<b>Total flow along the L-curb at Wall</b>	<b>N/A</b>	<b>6</b>	<b>11</b>

**REVISED TABLE 3  
10-YEAR 100-YEAR STORMS  
VD PRODUCT**

Street	Q100 (cfs)	Q10 (cfs)	Slope (%)	Depth 100-yr (ft)	Depth 10-yr (ft)	V100 (ft/s)	V10 (ft/s)	VD 100yr	VD 10-yr
Corbett Street (A-A)	72	29	1.35	0.68	0.54	4.41	3.49	3.00	1.88
Bradley Road (B-B)	15	8	0.4	0.53	0.43	1.9	1.82	1.01	0.78
El Campo Grande Avenue (C-C)	13	7	1.8	0.49	0.4	4.17	3.75	2.04	1.50
El Campo Grande Avenue (D-D)	14	7	0.64	0.6	0.47	2.51	2.44	1.51	1.15

SECTION A - A

Corbett Street Q100 = 72 cfs  
Worksheet for Irregular Channel

Project Description	
Project File	i:\fmw\00041.fm2
Worksheet	Corbett Street Q100 = 72 cfs
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data				
Channel Slope	1.35 %			
Elevation range: 0.00 ft to 0.64 ft.				
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	0.60	0.00	5.00	0.013
5.00	0.50	5.00	55.00	0.017
5.00	0.00	55.00	60.00	0.013
6.50	0.13			
6.50	0.17			
30.00	0.64			
53.50	0.17			
53.50	0.13			
55.00	0.00			
55.00	0.50			
60.00	0.60			
Discharge	72.00 cfs			

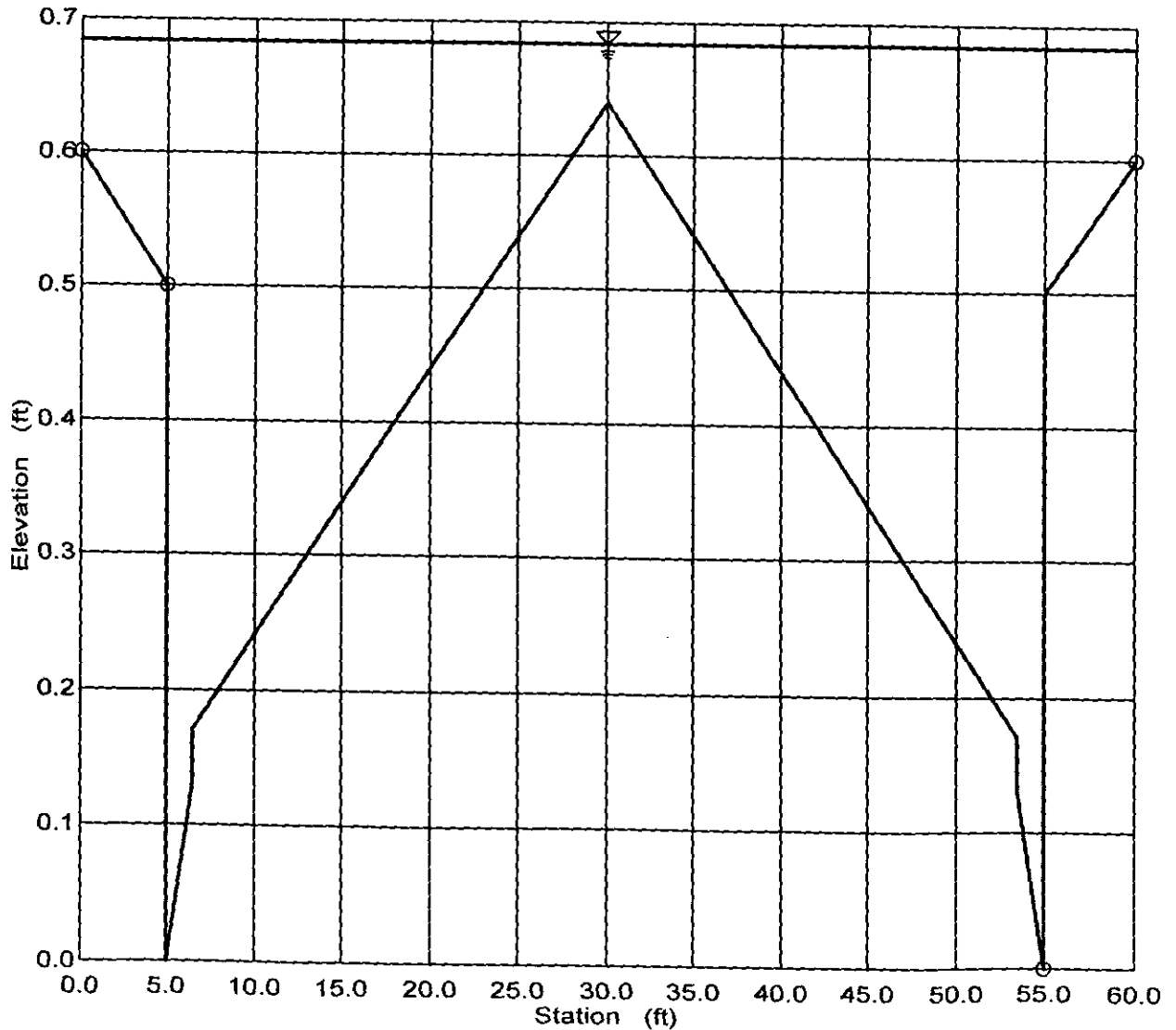
Results	
Wtd. Mannings Coefficient	0.016
Water Surface Elevation	0.68 ft
Flow Area	16.31 ft <sup>2</sup>
Wetted Perimeter	61.27 ft
Top Width	60.00 ft
Height	0.68 ft
Critical Depth	0.77 ft
Critical Slope	0.005632 ft/ft
Velocity	4.41 ft/s
Velocity Head	0.30 ft
Specific Energy	0.99 ft
Froude Number	1.49
Flow is supercritical.	
Water elevation exceeds lowest end station by 0.08 ft.	

SECTION A - A

Corbett Street Q100 = 72 cfs  
 Cross Section for Irregular Channel

Project Description	
Project File	i:\fmw\00041.fm2
Worksheet	Corbett Street Q100 = 72 cfs
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data	
Wtd. Mannings Coefficient	0.016
Channel Slope	1.35 %
Water Surface Elevation	0.68 ft
Discharge	72.00 cfs



**SECTION A - A**

Corbett Street Q10 = 29 cfs  
Worksheet for Irregular Channel

Project Description	
Project File	i:\fmw\00041.fm2
Worksheet	Corbett Street Q10 = 29 cfs
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data	
Channel Slope	1.35 %
Elevation range: 0.00 ft to 0.64 ft.	
Station (ft)	Elevation (ft)
0.00	0.60
5.00	0.50
5.00	0.00
6.50	0.13
6.50	0.17
30.00	0.64
53.50	0.17
53.50	0.13
55.00	0.00
55.00	0.50
60.00	0.60
Discharge	29.00 cfs

Start Station	End Station	Roughness
0.00	5.00	0.013
5.00	55.00	0.017
55.00	60.00	0.013

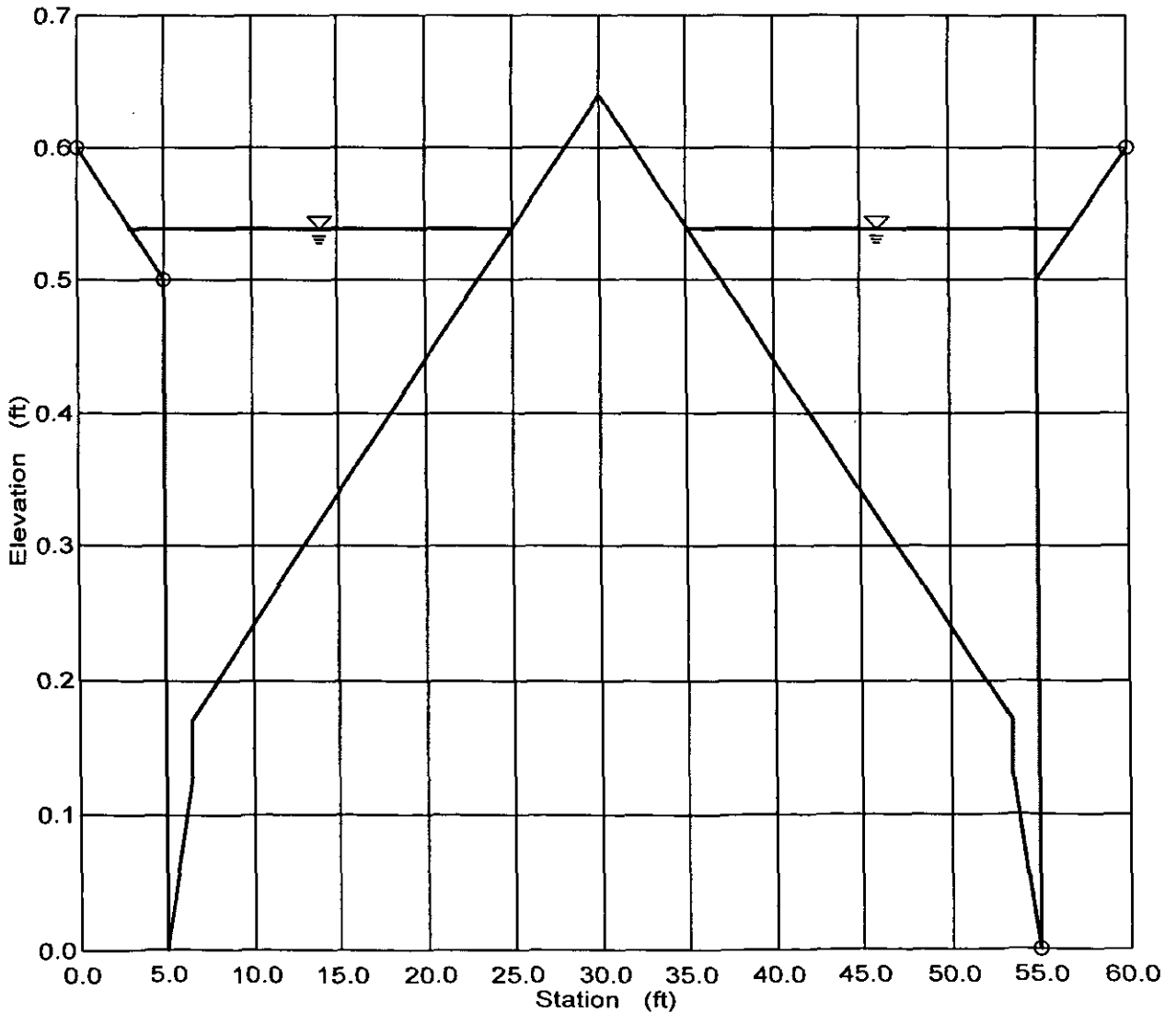
Results	
Wtd. Mannings Coefficient	0.016
Water Surface Elevation	0.54 ft
Flow Area	8.32 ft <sup>2</sup>
Wetted Perimeter	44.94 ft
Top Width	43.84 ft
Height	0.54 ft
Critical Depth	0.60 ft
Critical Slope	0.006256 ft/ft
Velocity	3.49 ft/s
Velocity Head	0.19 ft
Specific Energy	0.73 ft
Froude Number	1.41
Flow is supercritical.	
Flow is divided.	

SECTION A - A

Corbett Street Q10 = 29 cfs  
 Cross Section for Irregular Channel

Project Description	
Project File	i:\fmw\00041.fm2
Worksheet	Corbett Street Q10 = 29 cfs
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data	
Wtd. Mannings Coefficient	0.016
Channel Slope	1.35 %
Water Surface Elevation	0.54 ft
Discharge	29.00 cfs



EXISTING 12'x20' DRAIN INLET  
CORBETT

FHWA Urban Drainage Design Program, HY-22  
Drainage of Highway Pavements

Inlets on Grade  
Date: 09/22/2000

Project No. : CE 0004.1-4.5  
Project Name.: ELCAMPO GRANDE  
Computed by : MGW

Inlets on Grade: Curb Opening Inlet

Roadway and Discharge Data

	Cross Slope	Composite
S	Longitudinal Slope (ft/ft)	0.0135
Sx	Pavement Cross Slope (ft/ft)	0.0200
Sw	Gutter Cross Slope (ft/ft)	0.0330
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	6.00
Q	Discharge (cfs)	72.000 ← Q <sub>100</sub>
T	Width of Spread (ft)	33.89

Gutter Flow

Eo	Gutter Flow Ratio	0.116
d	Depth at Curb (ft)	0.70
V	Average Velocity (ft/sec)	6.26

Inlet Interception

	Inlet Type	Curb-Opening
LT	Length for 100% Inteception (ft)	64.11
L	Curb-Opening Length (ft)	20.00
e	Inlet Efficiency	0.490
Qi	Intercepted Flow (cfs)	35.271
Qb	By-pass Flow (cfs)	36.729 ← Q <sub>100</sub> by-pass

**SECTION B - B**

Bradley Road Q100 = 15 cfs  
Worksheet for Irregular Channel

Project Description	
Project File	i:\fmw\00041.fm2
Worksheet	Bradley Road Q100 = 15 cfs (REV)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data					
Channel Slope	0.40 %				
Elevation range: 0.00 ft to 0.84 ft.					
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness	
0.00	0.60	0.00	6.50	0.013	
5.00	0.50	6.50	73.50	0.017	
5.00	0.00	73.50	80.00	0.013	
6.50	0.13				
6.50	0.17				
40.00	0.84				
73.50	0.17				
73.50	0.13				
75.00	0.00				
75.00	0.50				
80.00	0.60				
Discharge	15.00 cfs				

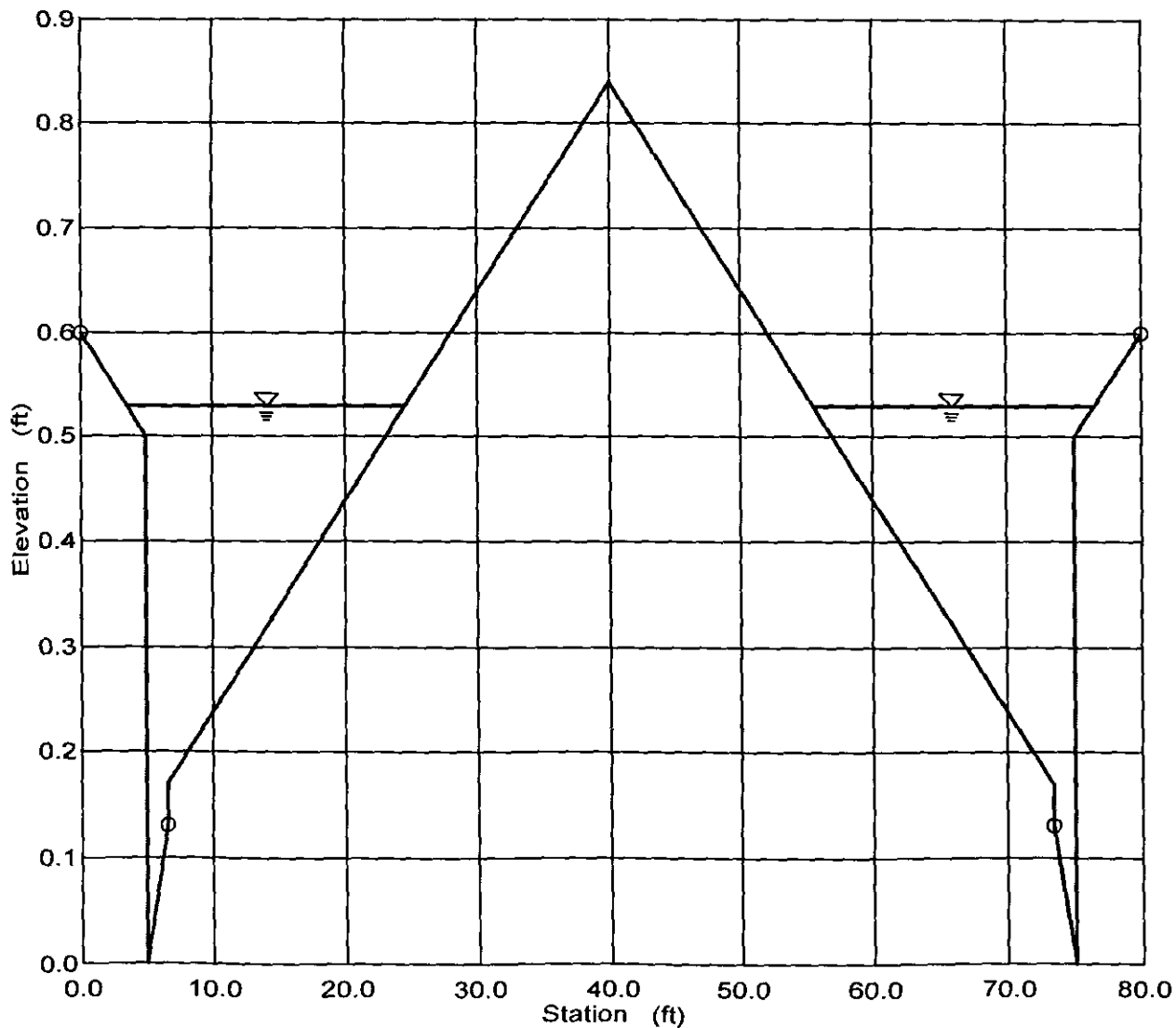
Results		
Wtd. Mannings Coefficient	0.016	
Water Surface Elevation	0.53	ft
Flow Area	7.91	ft <sup>2</sup>
Wetted Perimeter	43.03	ft
Top Width	41.93	ft
Height	0.53	ft
Critical Depth	0.49	ft
Critical Slope	0.006020	ft/ft
Velocity	1.90	ft/s
Velocity Head	0.06	ft
Specific Energy	0.59	ft
Froude Number	0.77	
Flow is subcritical.		
Flow is divided.		

SECTION B - B

Bradley Road Q100 = 15 cfs  
 Cross Section for Irregular Channel

Project Description	
Project File	i:\fmw\00041.fm2
Worksheet	Bradley Road Q100 = 15 cfs (REV)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data	
Wtd. Mannings Coefficient	0.016
Channel Slope	0.40 %
Water Surface Elevation	0.53 ft
Discharge	15.00 cfs



SECTION B - B

Bradley Road Q10 = 8 cfs  
Worksheet for Irregular Channel

Project Description	
Project File	i:\fmw\00041.fm2
Worksheet	Bradley Road Q10 = 8 cfs (REV)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data					
Channel Slope	0.40 %				
Elevation range: 0.00 ft to 0.84 ft.					
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness	
0.00	0.60	0.00	6.50	0.013	
5.00	0.50	6.50	73.50	0.017	
5.00	0.00	73.50	80.00	0.013	
6.50	0.13				
6.50	0.17				
40.00	0.84				
73.50	0.17				
73.50	0.13				
75.00	0.00				
75.00	0.50				
80.00	0.60				
Discharge	8.00 cfs				

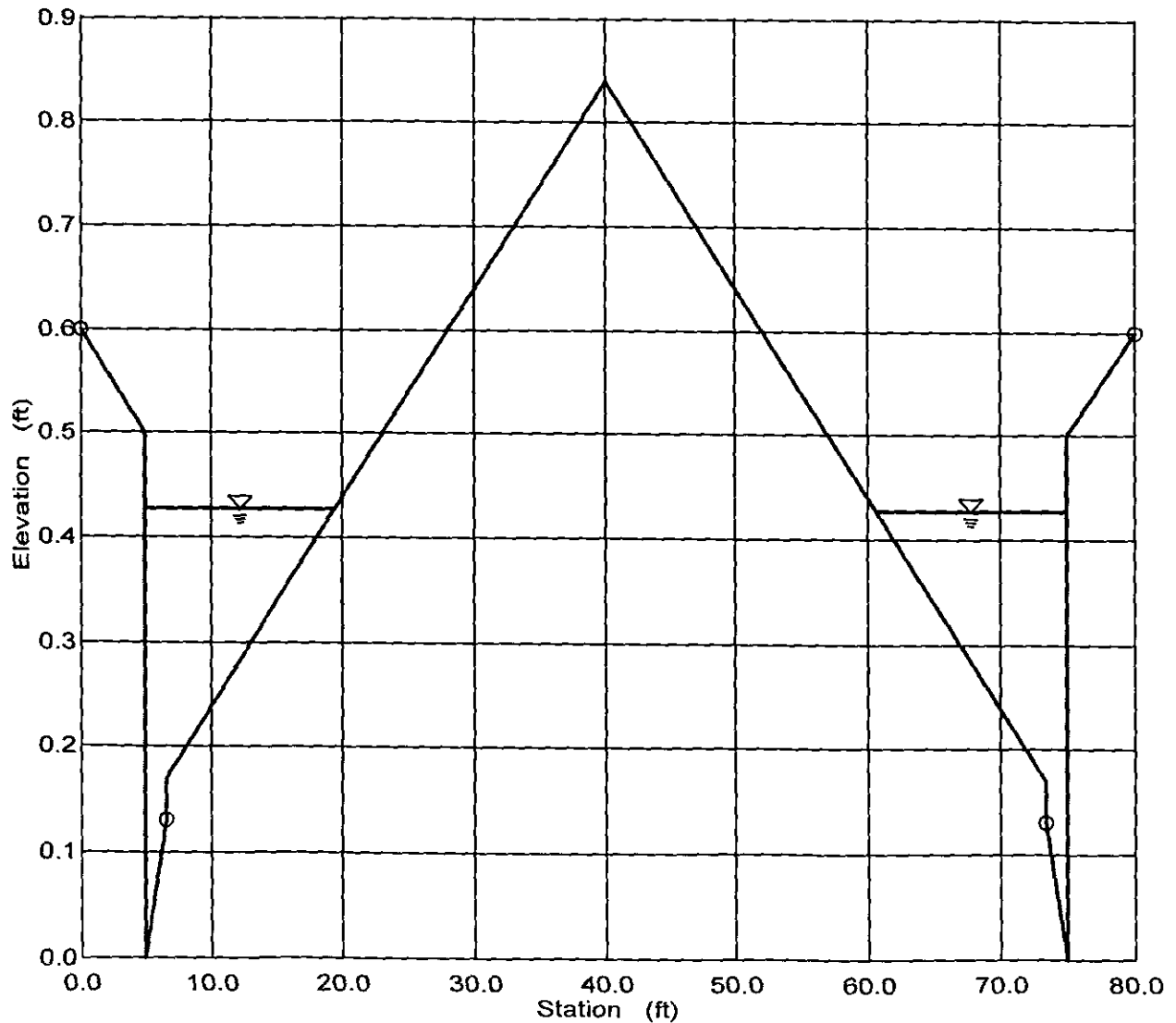
Results		
Wtd. Mannings Coefficient	0.014	
Water Surface Elevation	0.43	ft
Flow Area	4.39	ft <sup>2</sup>
Wetted Perimeter	29.64	ft
Top Width	28.69	ft
Height	0.43	ft
Critical Depth	0.40	ft
Critical Slope	0.005825	ft/ft
Velocity	1.82	ft/s
Velocity Head	0.05	ft
Specific Energy	0.48	ft
Froude Number	0.82	
Flow is subcritical.		
Flow is divided.		

SECTION B - B

Bradley Road Q10 = 8 cfs  
Cross Section for Irregular Channel

Project Description	
Project File	i:\fmw\00041.fm2
Worksheet	Bradley Road Q10 = 8 cfs (REV)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data	
Wtd. Mannings Coefficient	0.014
Channel Slope	0.40 %
Water Surface Elevation	0.43 ft
Discharge	8.00 cfs



SECTION C - C

El Campo Grande Avenue CC Q100 = 13cfs  
Worksheet for Irregular Channel

Project Description	
Project File	i:\fmw\00041.fm2
Worksheet	El Campo Grande Avenue CC Q100 = 13 cfs
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data					
Channel Slope	1.80 %				
Elevation range: 0.00 ft to 1.54 ft.					
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness	
0.00	1.54	0.00	6.50	0.013	
5.00	1.44	6.50	53.50	0.017	
5.00	0.94	53.50	60.00	0.013	
6.50	1.07				
6.50	1.11				
53.50	0.17				
53.50	0.13				
55.00	0.00				
55.00	0.50				
60.00	0.60				
Discharge	13.00 cfs				

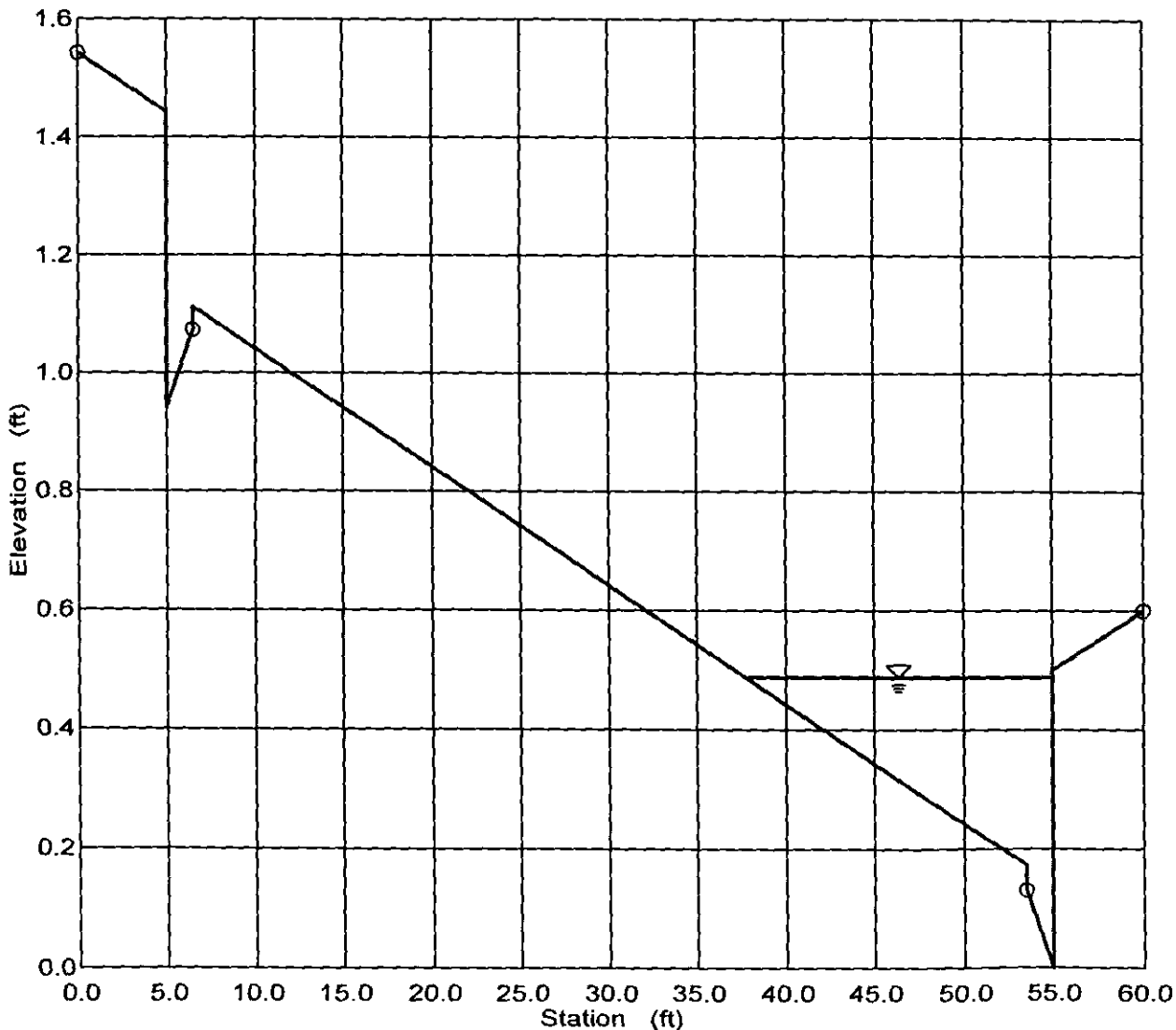
Results		
Wtd. Mannings Coefficient	0.015	
Water Surface Elevation	0.49	ft
Flow Area	3.12	ft <sup>2</sup>
Wetted Perimeter	17.81	ft
Top Width	17.28	ft
Height	0.49	ft
Critical Depth	0.58	ft
Critical Slope	0.006681	ft/ft
Velocity	4.17	ft/s
Velocity Head	0.27	ft
Specific Energy	0.76	ft
Froude Number	1.73	
Flow is supercritical.		

SECTION C - C

El Campo Grande Avenue CC Q100 = 13 cfs  
 Cross Section for Irregular Channel

Project Description	
Project File	i:\fmw\00041.fm2
Worksheet	El Campo Grande Avenue CC Q100 = 13 cfs
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data	
Wtd. Mannings Coefficient	0.015
Channel Slope	1.80 %
Water Surface Elevation	0.49 ft
Discharge	13.00 cfs



**SECTION C - C**

El Campo Grande Avenue CC Q10 = 7 cfs  
Worksheet for Irregular Channel

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<b>Project Description</b>	
Project File	i:\fmw\00041.fm2
Worksheet	El Campo Grande Avenue CC Q10 = 7 cfs
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

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<b>Input Data</b>				
Channel Slope	1.80 %			
Elevation range: 0.00 ft to 1.54 ft.				
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	1.54	0.00	6.50	0.013
5.00	1.44	6.50	53.50	0.017
5.00	0.94	53.50	60.00	0.013
6.50	1.07			
6.50	1.11			
53.50	0.17			
53.50	0.13			
55.00	0.00			
55.00	0.50			
60.00	0.60			
Discharge	7.00 cfs			

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<b>Results</b>	
Wtd. Mannings Coefficient	0.014
Water Surface Elevation	0.40 ft
Flow Area	1.86 ft <sup>2</sup>
Wetted Perimeter	13.60 ft
Top Width	13.15 ft
Height	0.40 ft
Critical Depth	0.48 ft
Critical Slope	0.006011 ft/ft
Velocity	3.75 ft/s
Velocity Head	0.22 ft
Specific Energy	0.62 ft
Froude Number	1.76
Flow is supercritical.	

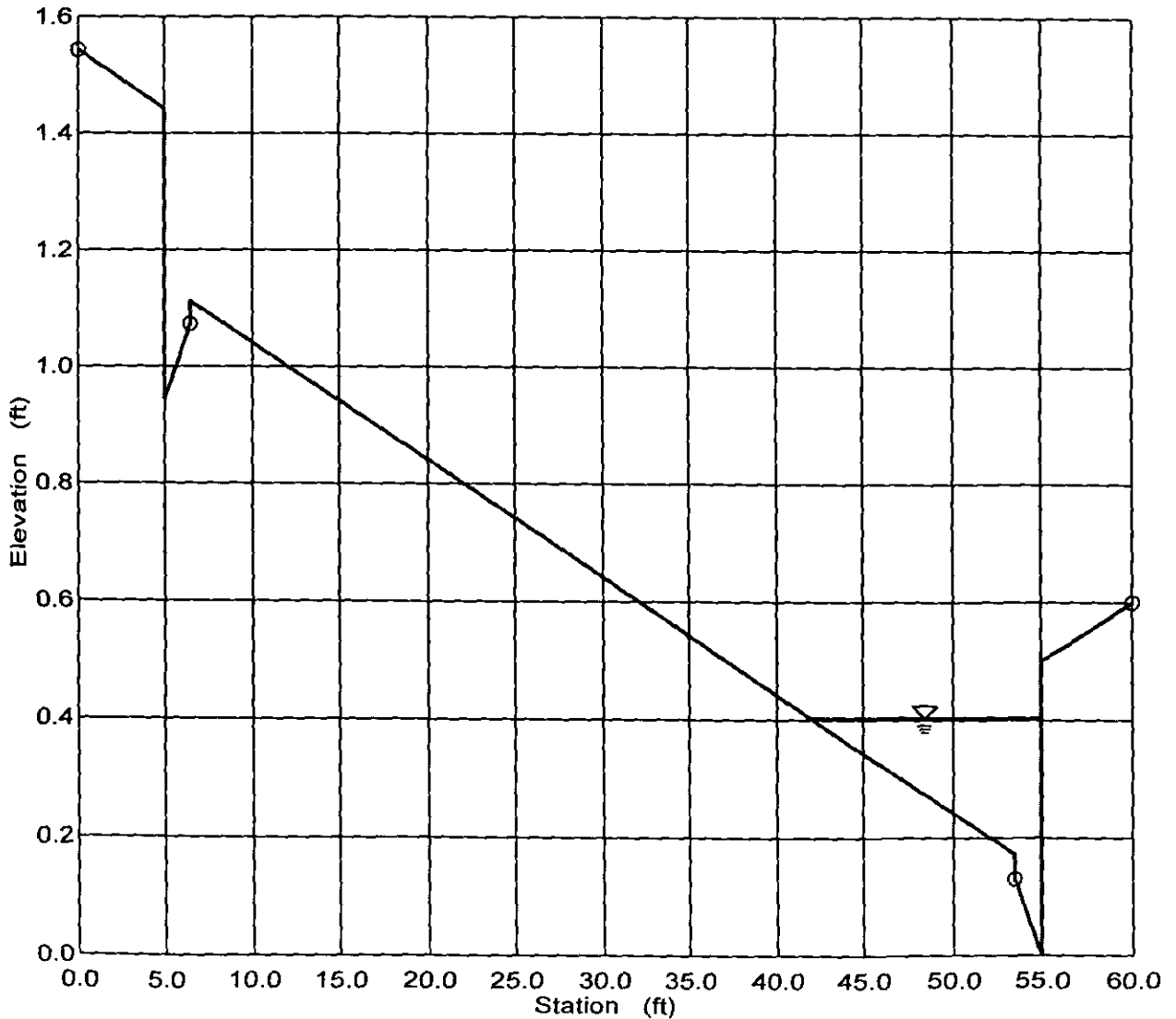
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SECTION C - C

El Campo Grande Avenue CC Q10= 7 cfs  
 Cross Section for Irregular Channel

Project Description	
Project File	i:\fmw\00041.fm2
Worksheet	El Campo Grande Avenue CC Q10 = 7 cfs
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data	
Wtd. Mannings Coefficient	0.014
Channel Slope	1.80 %
Water Surface Elevation	0.40 ft
Discharge	7.00 cfs



**SECTION D - D**

El Campo Grande Avenue DD Q100 = 14 cfs  
Worksheet for Irregular Channel

Project Description	
Project File	i:\fmw\00041.fm2
Worksheet	El Campo Grande Avenue DD Q100 = 14 cfs
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data					
Channel Slope	0.64 %				
Elevation range: 0.00 ft to 1.54 ft.					
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness	
0.00	1.54	0.00	6.50	0.013	
5.00	1.44	6.50	53.50	0.017	
5.00	0.94	53.50	60.00	0.013	
6.50	1.07				
6.50	1.11				
53.50	0.17				
53.50	0.13				
55.00	0.00				
55.00	0.50				
60.00	0.60				
Discharge	14.00 cfs				

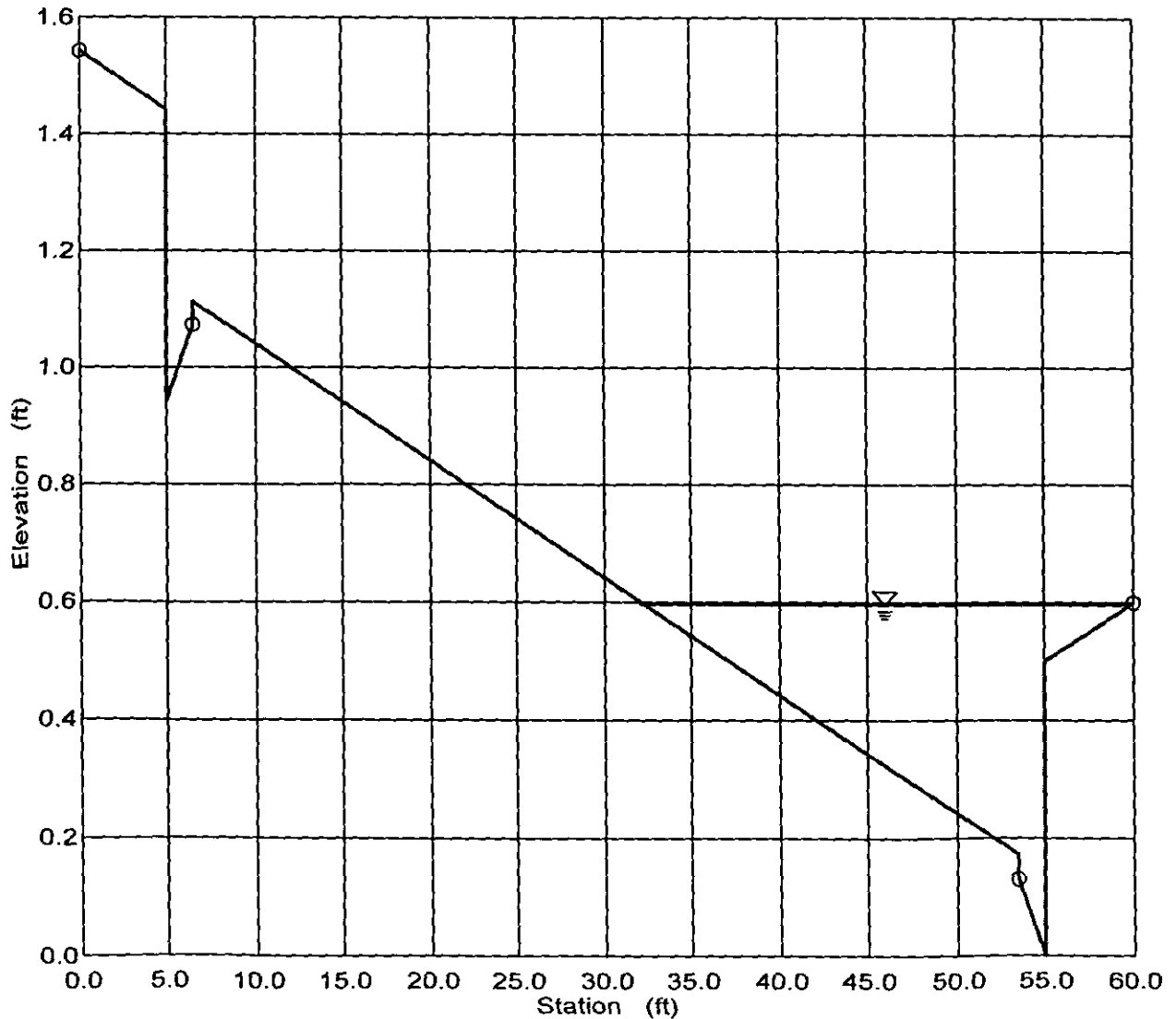
Results		
Wtd. Mannings Coefficient	0.016	
Water Surface Elevation	0.60	ft
Flow Area	5.58	ft <sup>2</sup>
Wetted Perimeter	28.20	ft
Top Width	27.65	ft
Height	0.60	ft
Critical Depth	0.59	ft
Critical Slope	0.006606	ft/ft
Velocity	2.51	ft/s
Velocity Head	0.10	ft
Specific Energy	0.69	ft
Froude Number	0.99	
Flow is subcritical.		

SECTION D - D

El Campo Grande Avenue DD Q100 = 14 cfs  
 Cross Section for Irregular Channel

Project Description	
Project File	i:\fmw\100041.fm2
Worksheet	El Campo Grande Avenue DD Q100 = 14 cfs
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data	
Wtd. Mannings Coefficient	0.016
Channel Slope	0.64 %
Water Surface Elevation	0.60 ft
Discharge	14.00 cfs



**SECTION D - D**

El Campo Grande Avenue DD Q10 = 7 cfs  
Worksheet for Irregular Channel

Project Description	
Project File	i:\fmw\00041.fm2
Worksheet	El Campo Grande Avenue DD Q10 = 7 cfs
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

**Input Data**

Channel Slope	0.64 %				
Elevation range: 0.00 ft to 1.54 ft.					
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness	
0.00	1.54	0.00	6.50	0.013	
5.00	1.44	6.50	53.50	0.017	
5.00	0.94	53.50	60.00	0.013	
6.50	1.07				
6.50	1.11				
53.50	0.17				
53.50	0.13				
55.00	0.00				
55.00	0.50				
60.00	0.60				
Discharge	7.00 cfs				

**Results**

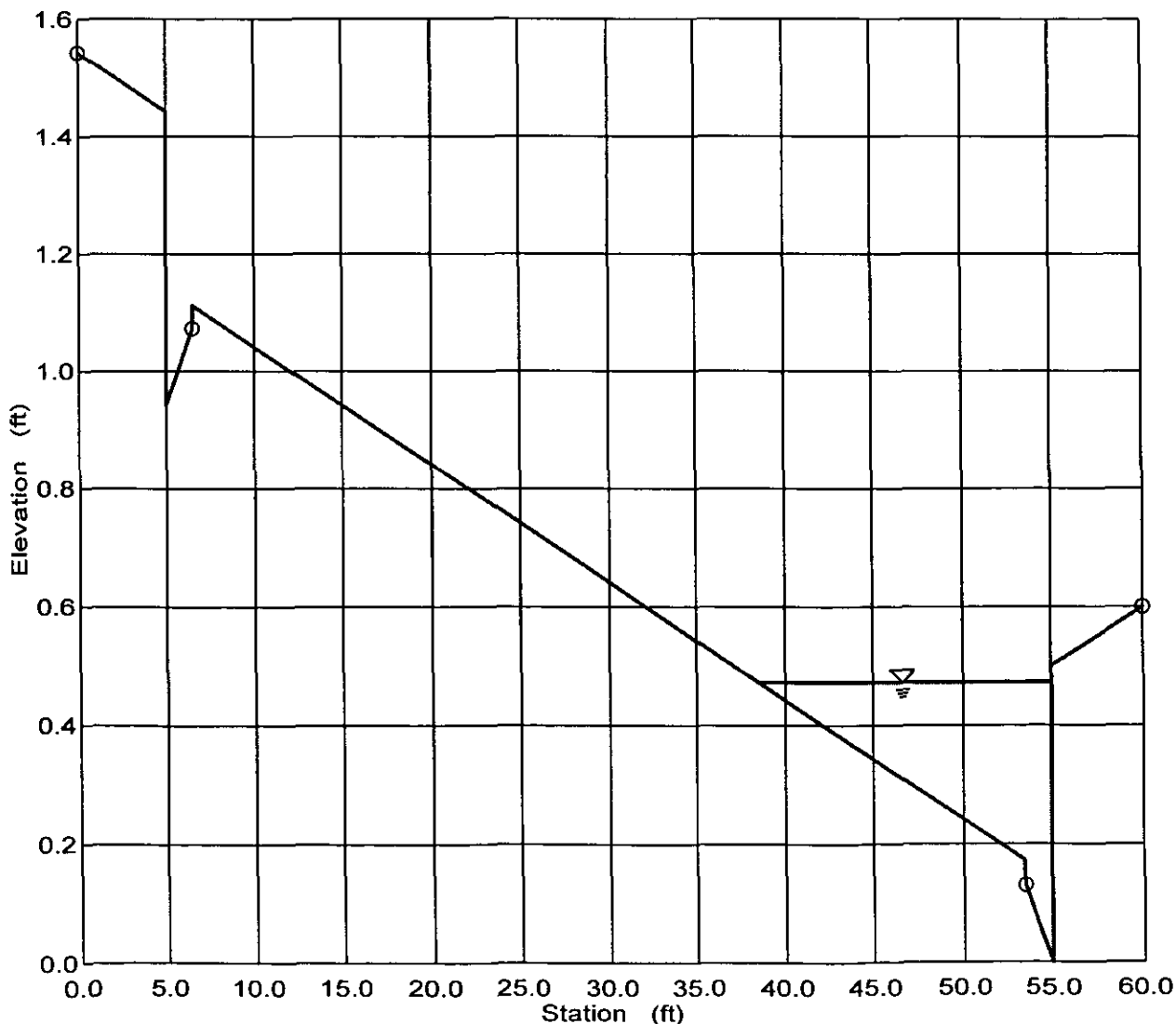
Wtd. Mannings Coefficient	0.015	
Water Surface Elevation	0.47	ft
Flow Area	2.87	ft <sup>2</sup>
Wetted Perimeter	17.06	ft
Top Width	16.54	ft
Height	0.47	ft
Critical Depth	0.48	ft
Critical Slope	0.006010	ft/ft
Velocity	2.44	ft/s
Velocity Head	0.09	ft
Specific Energy	0.56	ft
Froude Number	1.03	
Flow is supercritical.		

SECTION D - D

El Campo Grande Avenue DD Q10 = 7 cfs  
 Cross Section for Irregular Channel

Project Description	
Project File	i:\fmw\00041.fm2
Worksheet	El Campo Grande Avenue DD Q10 = 7 cfs
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data	
Wtd. Mannings Coefficient	0.015
Channel Slope	0.64 %
Water Surface Elevation	0.47 ft
Discharge	7.00 cfs



L Curb @ Wall Q100 = 11cfs  
Worksheet for Irregular Channel

Project Description	
Project File	i:\fmw\00041.fm2
Worksheet	L Curb @ Wall Q100 = 11cfs
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

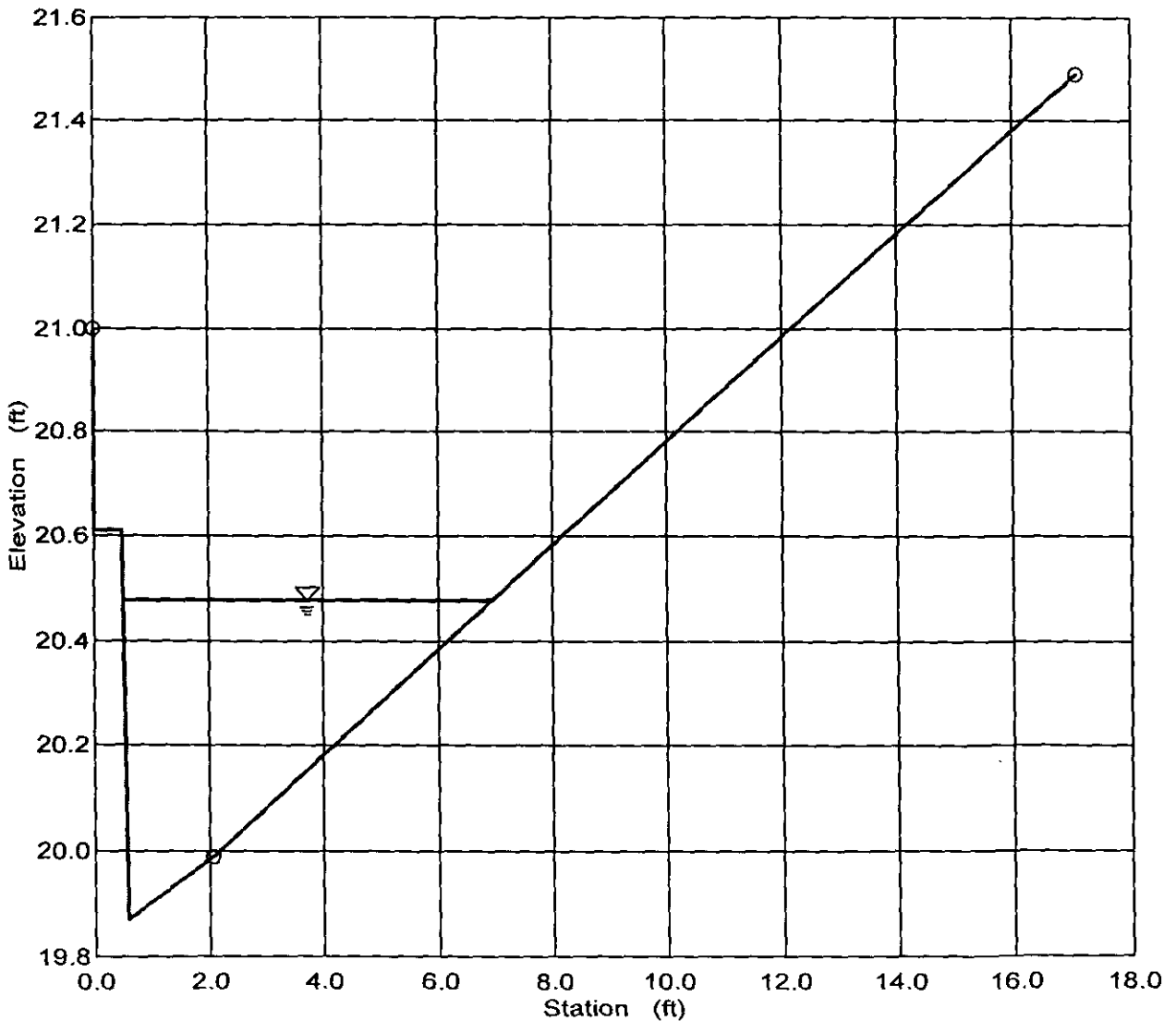
Input Data					
Channel Slope	2.19 %				
Elevation range: 19.87 ft to 21.49 ft.					
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness	
0.00	21.00	0.00	2.08	0.013	
0.00	20.61	2.08	17.08	0.030	
0.50	20.61				
0.58	19.87				
2.08	19.99				
17.08	21.49				
Discharge	11.00 cfs				

Results		
Wtd. Mannings Coefficient	0.018	
Water Surface Elevation	20.48	ft
Flow Area	2.02	ft <sup>2</sup>
Wetted Perimeter	6.99	ft
Top Width	6.42	ft
Height	0.61	ft
Critical Depth	20.63	ft
Critical Slope	0.008979	ft/ft
Velocity	5.46	ft/s
Velocity Head	0.46	ft
Specific Energy	20.94	ft
Froude Number	1.72	
<i>Flow is supercritical.</i>		

L Curb @ Wall Q100 = 11 cfs  
 Cross Section for Irregular Channel

Project Description	
Project File	i:\fmw\00041.fm2
Worksheet	L Curb @ Wall Q100 = 11cfs
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data	
Wtd. Mannings Coefficient	0.018
Channel Slope	2.19 %
Water Surface Elevation	20.48 ft
Discharge	11.00 cfs



L Curb @ Wall Q10 = 6 cfs  
Worksheet for Irregular Channel

Project Description	
Project File	i:\fmw\00041.fm2
Worksheet	L Curb @ Wall Q10 = 6 cfs
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

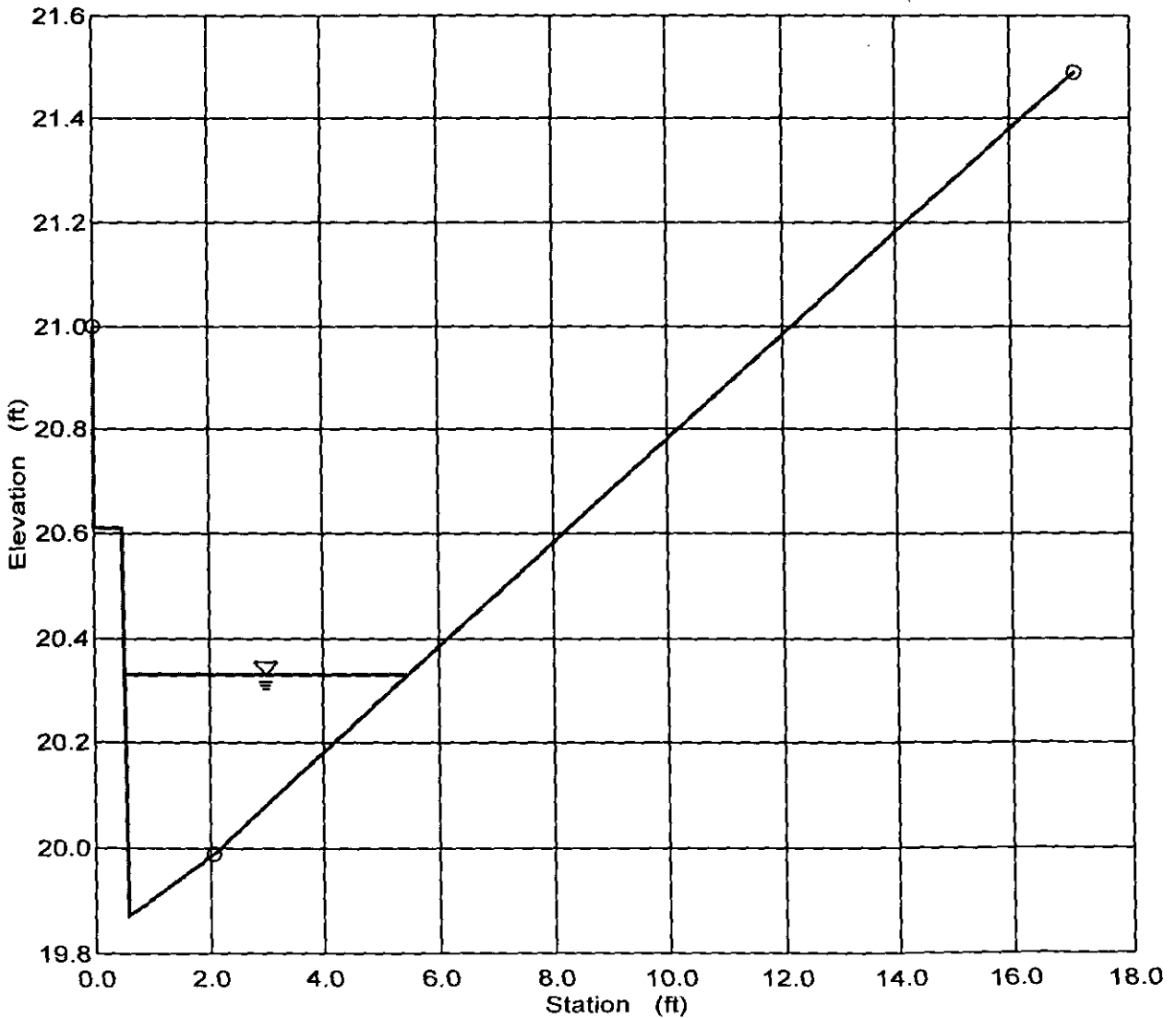
Input Data				
Channel Slope	2.19 %			
Elevation range: 19.87 ft to 21.49 ft.				
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	21.00	0.00	2.08	0.013
0.00	20.61	2.08	17.08	0.030
0.50	20.61			
0.58	19.87			
2.08	19.99			
17.08	21.49			
Discharge	6.00 cfs			

Results	
Wtd. Mannings Coefficient	0.016
Water Surface Elevation	20.33 ft
Flow Area	1.18 ft <sup>2</sup>
Wetted Perimeter	5.37 ft
Top Width	4.94 ft
Height	0.46 ft
Critical Depth	20.46 ft
Critical Slope	0.007345 ft/ft
Velocity	5.07 ft/s
Velocity Head	0.40 ft
Specific Energy	20.73 ft
Froude Number	1.83
Flow is supercritical.	

L Curb @ Wall Q10 = 6 cfs  
Cross Section for Irregular Channel

Project Description	
Project File	i:\fmw\00041.fm2
Worksheet	L Curb @ Wall Q10 = 6 cfs
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data	
Wtd. Mannings Coefficient	0.016
Channel Slope	2.19 %
Water Surface Elevation	20.33 ft
Discharge	6.00 cfs



## → RATIONAL METHOD

$$Q = K C I A, \quad K = 0.5 \text{ (Regional Adjustment Factor)}$$

$$C_{100} = 0.93 \text{ (Table 601 - 100\% impervious)}$$

$$I_{100} = 7.6 \text{ in/hr. (fig. 517 } T_c = 5.0 \text{ min.)}$$

$$A = 0.10 \text{ ac.}$$

$$\Rightarrow Q_{100} = (0.5)(0.93)(7.6)(0.10) = 0.35 \text{ cfs}$$

$$\text{Use } 0.5 \text{ cfs} \Rightarrow 0.25 \text{ cfs/drain for 2 drains}$$

$\Rightarrow 0.25 \text{ cfs/drain}$

## → Size the floor drains

→ Type: Neenah R-4937 B Cast Iron w/Grate  
Inlet capacity per manufacturer's recommendation guidelines  $\Rightarrow Q = CA\sqrt{2gh}$

→ where  $C = 0.6$  (coeff. of opn. orifice)

$$A = \text{area of opn.} = 0.20 \text{ sf}$$

$$g = 32.2 \text{ ft./s}^2$$

$$h = 0.1 \text{ ft.}$$

$$\Rightarrow Q_{\text{CAPACITY}} = 0.6(0.2)\sqrt{2(32.2)(0.1)} = 0.3 \text{ cfs}$$

$$\Rightarrow 0.3 \text{ cfs.} > 0.25 \text{ cfs}$$

Court Yard C. Basin Q100  
Worksheet for Irregular Channel

Project Description	
Project File	i:\fmw\00041.fm2
Worksheet	Court Yard C. Basin Q100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

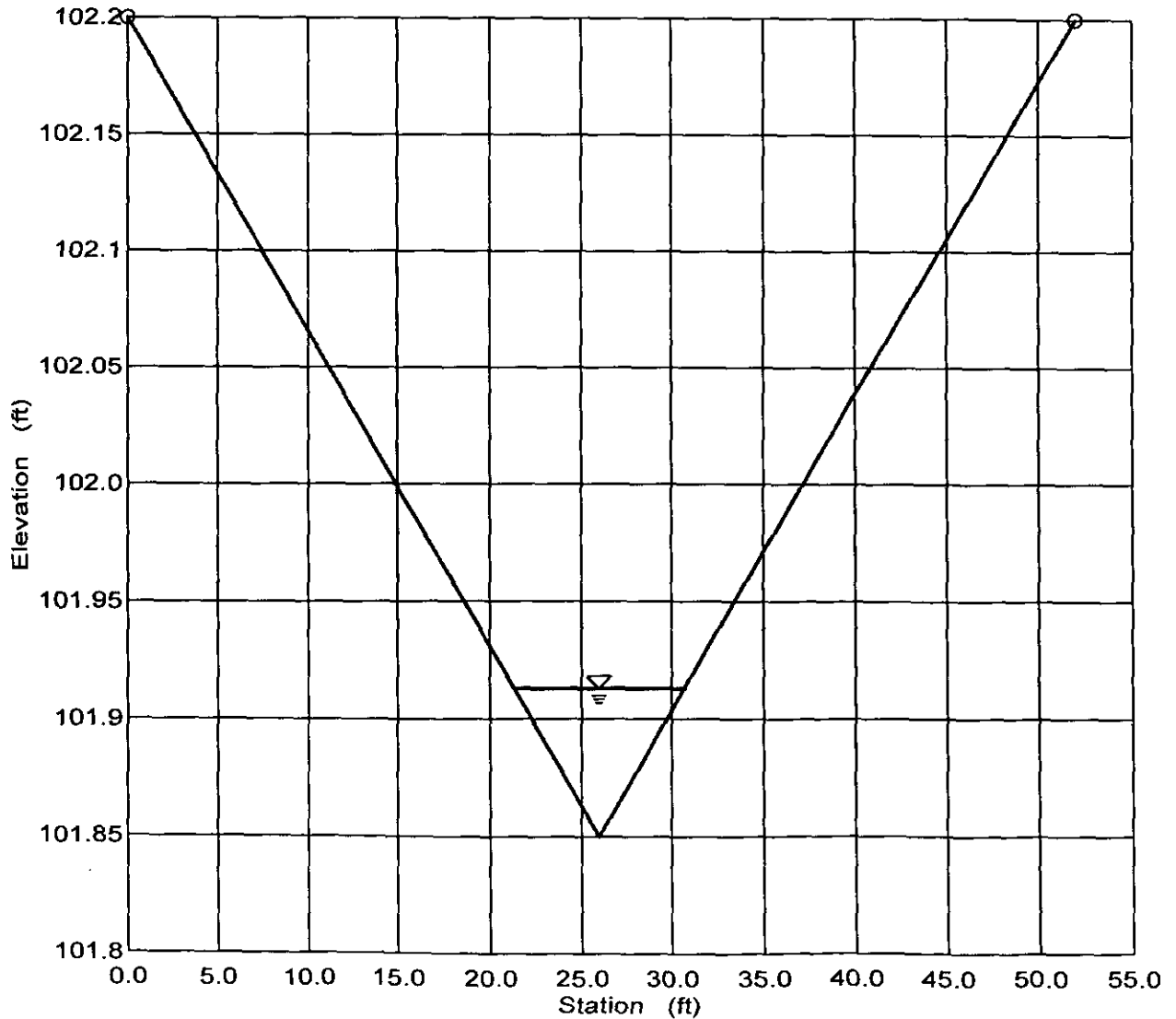
Input Data					
Channel Slope	2.19 %				
Elevation range: 101.85 ft to 102.20 ft.					
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness	
0.00	102.20	0.00	52.00	0.013	
26.00	101.85				
52.00	102.20				
Discharge	0.50 cfs				

Results		
Wtd. Mannings Coefficient	0.013	
Water Surface Elevation	101.91	ft
Flow Area	0.30	ft <sup>2</sup>
Wetted Perimeter	9.38	ft
Top Width	9.38	ft
Height	0.06	ft
Critical Depth	101.93	ft
Critical Slope	0.007272	ft/ft
Velocity	1.69	ft/s
Velocity Head	0.04	ft
Specific Energy	101.96	ft
Froude Number	1.68	
Flow is supercritical.		

Court Yard C. Basin Q100  
Cross Section for Irregular Channel

Project Description	
Project File	i:\fmw\00041.fm2
Worksheet	Court Yard C. Basin Q100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data	
Wtd. Mannings Coefficient	0.013
Channel Slope	2.19 %
Water Surface Elevation	101.91 ft
Discharge	0.50 cfs



Court Yard Storm Drain  
Worksheet for Circular Channel

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Project Description	
Project File	i:\fmw\00041.fm2
Worksheet	Court Yard Storm Drain
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

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Input Data	
Mannings Coefficient	0.013
Channel Slope	0.50 %
Diameter	8.00 in
Discharge	0.50 cfs

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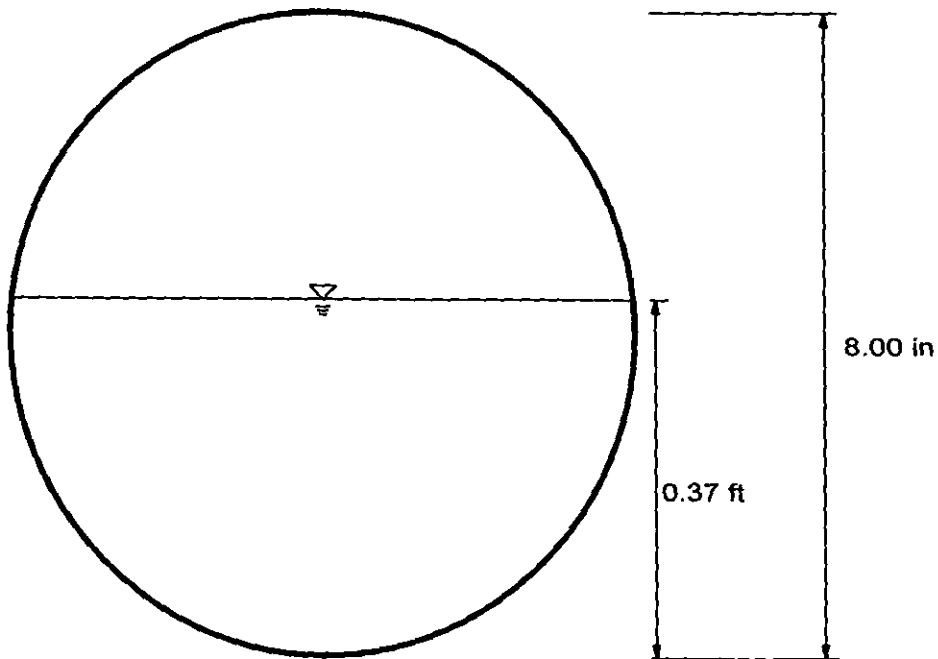
Results		
Depth	0.37	ft
Flow Area	0.20	ft <sup>2</sup>
Wetted Perimeter	1.11	ft
Top Width	0.66	ft
Critical Depth	0.33	ft
Percent Full	54.97	
Critical Slope	0.007009	ft/ft
Velocity	2.54	ft/s
Velocity Head	0.10	ft
Specific Energy	0.47	ft
Froude Number	0.82	
Maximum Discharge	0.92	cfs
Full Flow Capacity	0.85	cfs
Full Flow Slope	0.001712	ft/ft
Flow is subcritical.		

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Court Yard Storm Drain  
Cross Section for Circular Channel

Project Description	
Project File	i:\fmw\00041.fm2
Worksheet	Court Yard Storm Drain
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.013
Channel Slope	0.50 %
Depth	0.37 ft
Diameter	8.00 in
Discharge	0.50 cfs



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H 1  
NTS

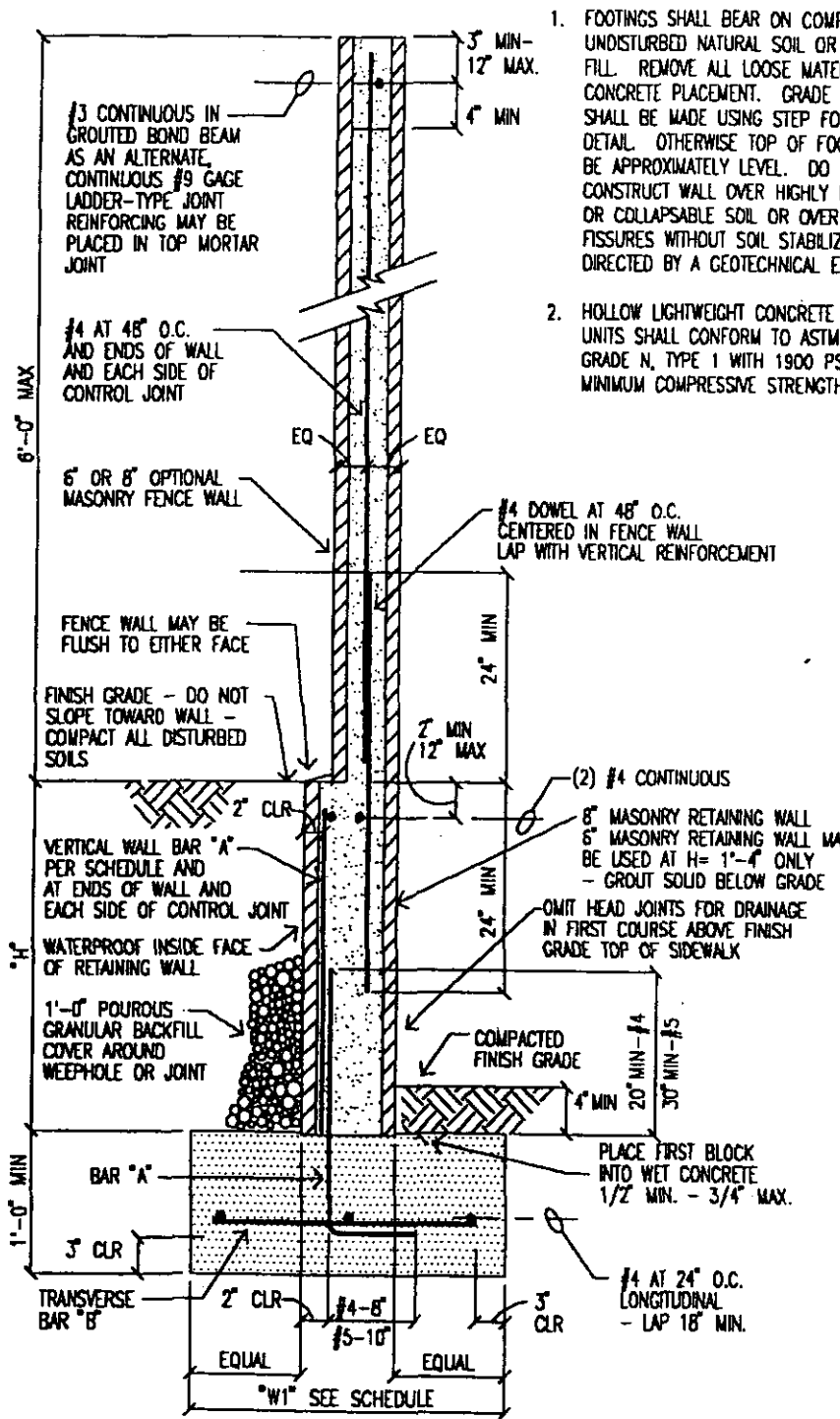
# STANDARD RETAINING WALL and OPTIONAL MASONRY FENCE

B-101  
08/10/98  
Pg. 1 of 2

## PROPOSED 6' SCREEN/RETAINING WALL WEST SIDE LEON AVE.

C:\ACADWIN\... \HANDOUT\B-10

### GENERAL NOTES



- FOOTINGS SHALL BEAR ON COMPETANT UNDISTURBED NATURAL SOIL OR COMPACTED FILL. REMOVE ALL LOOSE MATERIAL BEFORE CONCRETE PLACEMENT. GRADE CHANGES SHALL BE MADE USING STEP FOOTING DETAIL. OTHERWISE TOP OF FOOTING SHALL BE APPROXIMATELY LEVEL. DO NOT CONSTRUCT WALL OVER HIGHLY EXPANSIVE OR COLLAPSABLE SOIL OR OVER SOIL FISSURES WITHOUT SOIL STABILIZATION AS DIRECTED BY A GEOTECHNICAL ENGINEER.
- HOLLOW LIGHTWEIGHT CONCRETE MASONRY UNITS SHALL CONFORM TO ASTM C90, GRADE N, TYPE 1 WITH 1900 PSI MINIMUM COMPRESSIVE STRENGTH.
- STEEL REINFORCING BARS SHALL BE ASTM A615, GRADE 40 FOR #4, GRADE 60 FOR #5 AND LARGER.
- DO NOT SLOPE RETAINED SOIL TOWARD WALL. PROVIDE POSITVE DRAINAGE AWAY FROM WALL ON BOTH SIDES.
- VERTICAL EXPANSION OR CONTROL JOINTS SHALL BE MADE ON FENCE WALLS AT INTERVALS NOT TO EXCEED 6 TIMES THE FENCE WALL HEIGHT. JOINTS ON FENCE SHALL BE MADE BY MEANS OF PLASTER BLOCK OR CONTINUOUS VERTICAL RAKE JOINT. HORIZONTAL REINFORCING NEED NOT BE CONTINUOUS THRU JOINT WHERE PLASTER BLOCK IS USED.
- VERTICAL EXPANSION OR CONTROL JOINTS ON RETAINING WALL ARE OPTIONAL FOR BEST RESULTS, JOINTS ARE RECOMMENDED AT INTERVALS NOT EXCEEDING 8 TIMES THE WALL HEIGHT.
- DO NOT LOCATE WITHIN DISTANCE "H" OF UPPER SIDE OF WALL ANY BUILDING FOUNDATION, PARKING, ROADWAYS, LARGE TREES OR ADDITIONAL RETAINING WALLS.
- THE BUILDER/CONTRACTOR OR ANY OTHER PARTY USING THIS DESIGN RELIEVES THE BUILDING AGENCY FROM ANY LIABILITY FOR ALL INJURIES, CLAIMS, EXPENSES OR DAMAGES RESULTING FROM CONSTRUCTION OF THIS DESIG
- LOCATIONS REQUIRING DESIGNS EXCEEDING LIMITATIONS OF THIS STANDARD SHALL BE PREPARED BY A NEVADA REGISTERED PROFESSIONAL ENGINEER OR ARCHITECT AND APPROVED BY THE BUILDING AGENCY FOR A SPECIFIC LOCATION.
- INSPECTION OF CONSTRUCTION SHALL BE ACCOMPLISHED ACCORDING TO ALL DIRECTIVES GIVEN BY BUILDING DEPARTMENT OFFICIALS.
- GROUTED CELLS SHALL BE MECHANICALLY VIBRATED.
- USE SPECIAL CONCRETE MIX, DESIGNED BY A REGISTERED ENGINEER WHERE SOIL SULFATE EXPOSURE EXCEEDS NEGLIGIBLE LEVELS PER UBC TABLE 19-A-4.

City of Boulder City  
Building Department  
401 California Avenue  
Boulder City, NV 89005  
(702)293-9282

City of Las Vegas  
Building and Safety Dept.  
731 S. 4th Street  
Las Vegas, Nevada 89101  
(702)229-6916

CLARK COUNTY  
Department of Building  
500 S. Grand Central Pky.  
Las Vegas, Nevada 89115-3530  
(702)455-3000

# STANDARD RETAINING WALL and OPTIONAL MASONRY FENCE

B-101  
08/10/98  
Pg. 2 of 2

PLD

C:\ACAD\DWG\HANDOUT\B-101B

### CONCRETE:

CONCRETE SHALL BE 5 SACK MINIMUM TYPE V CEMENT WITH A 6" MAXIMUM SLUMP. 28 DAY STRENGTH SHALL EXCEED 2500 PSI. PLACE CONCRETE TO MINIMUM DIMENSIONS SHOWN WITH 3 INCHES COVER TO ALL REINFORCING STEEL. SEE NOTE 12.

A GOOD CONCRETE MIXTURE FOR FOOTINGS IS BY VOLUME: 1 PART PORTLAND CEMENT, 2.75 PARTS SAND, 4 PARTS GRAVEL NOT LARGER THAN 1.5 INCHES, AND JUST ENOUGH WATER TO MAKE THE MIXTURE "MUSHY" AND WORKABLE, BUT NOT "SOUPY." THE WATER CONTENT SHOULD NOT BE MORE THAN 7.5 GALLONS PER SACK OF CEMENT FOR THE ABOVE MIX.

### MORTAR:

MORTAR SHALL BE 2000 PSI TYPE S.

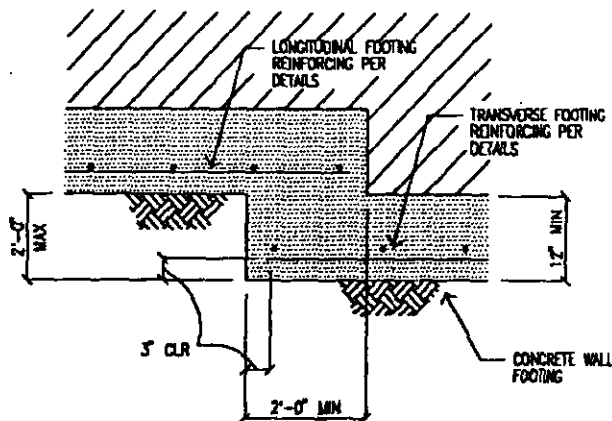
A GOOD MORTAR MIXTURE SHOULD BE IN PROPORTIONS OF 1 PART PORTLAND CEMENT, 1/3 PART LIME (HYDRATED),

AND 3 PARTS SAND. THE WATER CONTENT SHOULD BE ACCORDING TO ABSORPTION AND SUCTION ABILITY TO ASSURE NORMAL FLOW AND SPREADING WITH A TROWEL.

### GROUT:

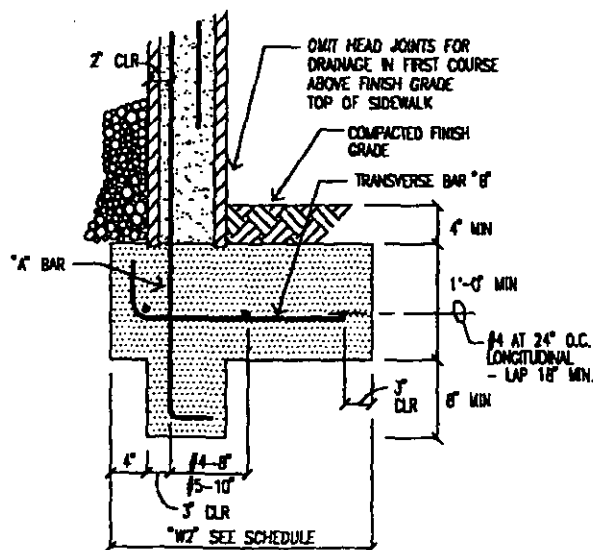
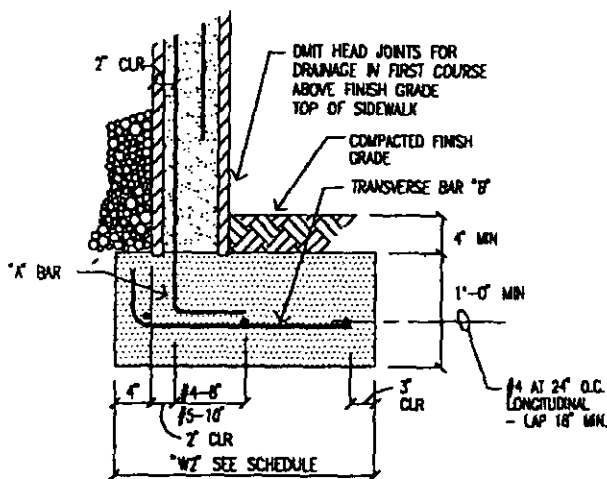
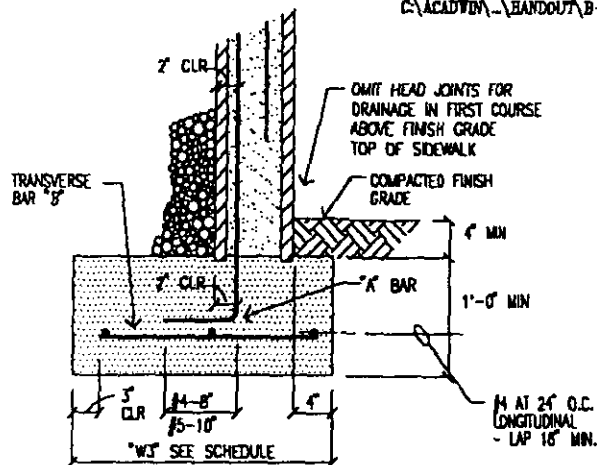
GROUT SHALL BE 2000 PSI WITH A 6" MAXIMUM SLUMP. A GOOD GROUT MIXTURE SHOULD BE COMPOSED BY VOLUME OF 1 PART

PORTLAND CEMENT, 2 PARTS SAND, AND 1 PART PEA GRAVEL. SUFFICIENT WATER SHALL BE ADDED TO PRODUCE CONSISTENCY FOR POURING WITHOUT SEGREGATION.



TYPICAL STEPPED CONCRETE FOOTING

MAXIMUM RETAINING WALL HEIGHT "H"	MINIMUM FOOTING WIDTH TRANSVERSE BAR "B"			BAR "A"
	"W1"	"W2"	"W3"	
	BAR "B"	BAR "B"	BAR "B"	
1'-4"	2'-0"	2'-0"	2'-0"	#4 AT 48" O.C.
2'-8"	2'-8"	3'-6"	2'-4"	#4 AT 48" O.C.
4'-0"	4'-8"	5'-6"	3'-8"	#5 AT 24" O.C.
	24"	12"	24"	



ALTERNATE FOOTING TYPES

City of Boulder City  
Building Department  
401 California Avenue  
Boulder City, NV 89005  
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CLARK COUNTY  
Department of Building  
500 S. Grand Central Pkwy.  
Las Vegas, Nevada 89115-3530  
(702)455-3000