CITY OF ALBUQUERQUE

July 5, 2007

David Thompson, P.E.
Thompson Engineering Consultants, Inc.
P.O. Box 65760
Albuquerque, NM 87193

Re: The Bluffs at Encantado Subdivision, SIA/Financial Guarantee Release
Engineer's Stamp dated 8-04-06 (K23-D27)
Certification dated 7-03-07

Dear Mr. Thompson,

Based upon the information provided in your submittal received 7-03-07, the above referenced certification is approved for release of SIA and Financial Guarantee.

If you have any questions, you can contact me at 924-3981.

Sincerely,

Kristal D. Metro, P.E.
Senior Engineer, Planning Dept.
Development and Building Services

C: Marilyn Maldonado, COA# 790281
File

P.O. Box 1293
Albuquerque
New Mexico 87103
www.cabq.gov

DRAINAGE INFORMATION SHEET
(REV. 1/28/2003rd)

K-23/D27

PROJECT TITLE: THE BLUFFS AT ENCANTADOSUBDIVISION ZONE MAP/DRG. FILE #: K23-D27
DRB #: _____ EPC #: _____ WORK ORDER#: _____

LEGAL DESCRIPTION: LOTS 1A, 1C, & 1C, BLOCK K; AND A PORTION OF LOT 1, BLOCK K; CENOROCA SUBDIVISION
CITY ADDRESS: _____

ENGINEERING FIRM: Thompson Engineering Consultants, Inc.
ADDRESS: P.O. Box 65760
CITY, STATE: Albuquerque, NM

CONTACT: David Thompson
PHONE: 271-2199
ZIP CODE: 87193

OWNER: Tramway Associates, Inc.
ADDRESS: 12809 Donette Ct. NE
CITY, STATE: Albuquerque, NM

CONTACT: Philip Lindborg
PHONE: 291-0353
ZIP CODE: 87112

ARCHITECT: _____
ADDRESS: _____
CITY, STATE: _____

CONTACT: _____
PHONE: _____
ZIP CODE: _____

SURVEYOR: Cartesian Surveys, Inc.
ADDRESS: P.O. Box 44414
CITY, STATE: Rio Rancho, NM

CONTACT: Will Plotner
PHONE: 896-3050
ZIP CODE: 87124

CONTRACTOR: _____
ADDRESS: _____
CITY, STATE: _____

CONTACT: _____
PHONE: _____
ZIP CODE: _____

CHECK TYPE OF SUBMITTAL:
- _____ DRAINAGE REPORT
- _____ DRAINAGE PLAN 1st SUBMITTAL, REQUIRES TCL or equal
- _____ DRAINAGE PLAN RESUBMITTAL
- _____ CONCEPTUAL GRADING & DRAINAGE PLAN
- _____ GRADING PLAN
- _____ EROSION CONTROL PLAN
- XX ENGINEER'S CERTIFICATION (HYDROLOGY)
- _____ CLOMR/LOMR
- _____ TRAFFIC CIRCULATION LAYOUT (TCL)
- _____ ENGINEER'S CERTIFICATION(TCL)
- _____ ENGINEER'S CERTIFICATION (DRB APPR. SITE PLAN)
- _____ OTHER CPN 790281

Approved stamp date 8-4-06 ✓
Cert dated 7-3-07

CHECK TYPE OF APPROVAL SOUGHT:
- XX SIA/FINANCIAL GUARANTEE RELEASE
- _____ PRELIMINARY PLAT APPROVAL
- _____ S. DEV. PLAN FOR SUB'D. APPROVAL
- _____ S. DEV PLAN FOR BLDG. PERMIT APPROVAL
- _____ SECTOR PLAN APPROVAL
- _____ FINAL PLAT APPROVAL
- _____ FOUNDATION PERMIT APPROVAL
- _____ BUILDING PERMIT APPROVAL
- _____ CERTIFICATE OF OCCUPANCY (PERM.)
- _____ CERTIFICATE OF OCCUPANCY (TEMP.)
- _____ GRADING PERMIT APPROVAL
- _____ PAVING PERMIT APPROVAL
- _____ WORK ORDER APPROVAL
- _____ OTHER (SPECIFY)

WAS A PRE-DESIGN CONFERENCE ATTENDED:
- _____ YES
- XX NO
- _____ COPY PROVIDED

RECEIVED
JUL 03 2007
HYDROLOGY SECTION

DATE SUBMITTED: July 3, 2007 BY: _____

Requests for approvals of Site Development Plans and/or Subdivision Plats shall be accompanied by a drainage submittal. The particular nature, location and scope of the proposed development defines the degree of drainage detail. One or more of the following levels of submittal may be required based on the following:

1. **Conceptual Grading and Drainage Plan:** Required for approval of Site Development Plans greater than five acres
2. **Drainage Plans:** Required for building permits, grading permits, paving permits, and site plans less than five (5)
3. **Drainage Report:** Required for subdivisions containing more than ten (10) lots or constituting five (5) acres or

CITY OF ALBUQUERQUE

August 16, 2006

David B. Thompson, P.E.
Thompson Engineering Consultants, Inc.
P.O. Box 65760
Albuquerque, NM 87193

Re: Bluffs at Encantado Grading and Drainage Plan
Engineer's Stamp dated 8-4-06 (K23/D27)

Dear Mr. Thompson,

Based upon the information provided in your submittal received 8-4-06, the above referenced plan is approved for Preliminary Plat action by the DRB. Once that board approves the grading plan, please submit a mylar copy for my signature in order to obtain a Rough Grading Permit.

This is now the plan that must be certified for release of SIA and Financial Guarantees and all previous plans are void.

This project requires a National Pollutant Discharge Elimination System (NPDES) permit. If you have any questions about this permit, please feel free to call the Municipal Development Department, Hydrology section at 768-3654 (Charles Caruso).

If you have any questions, you can contact me at 924-3695.

Sincerely,

Curtis A. Cherne, E.I.
Engineering Associate, Planning Dept.
Development and Building Services

C: file
Brad Bingham
Charles Caruso

P.O. Box 1293
Albuquerque
New Mexico 87103
www.cabq.gov

DRAINAGE INFORMATION SHEET
(REV. 1/28/2003rd)

PROJECT TITLE: THE BLUFFS AT ENCANTADOSUBDIVISION ZONE MAP/DRG. FILE #: K23-D27
DRB #: _____ EPC #: _____ WORK ORDER#: _____

LEGAL DESCRIPTION: LOTS 1A, 1C, & 1C, BLOCK K; AND A PORTION OF LOT 1, BLOCK K; CENOROCA SUBDIVISION
CITY ADDRESS: _____

ENGINEERING FIRM: Thompson Engineering Consultants, Inc.
ADDRESS: P.O. Box 65760
CITY, STATE: Albuquerque, NM
CONTACT: David Thompson
PHONE: 271-2199
ZIP CODE: 87193

OWNER: Tramway Associates, Inc.
ADDRESS: 12809 Donette Ct. NE
CITY, STATE: Albuquerque, NM
CONTACT: Philip Lindborg
PHONE: 291-0353
ZIP CODE: 87112

ARCHITECT: _____
ADDRESS: _____
CITY, STATE: _____
CONTACT: _____
PHONE: _____
ZIP CODE: _____

SURVEYOR: Cartesian Surveys, Inc.
ADDRESS: P.O. Box 44414
CITY, STATE: Rio Rancho, NM
CONTACT: Will Plotner
PHONE: 896-3050
ZIP CODE: 87124

CONTRACTOR: _____
ADDRESS: _____
CITY, STATE: _____
CONTACT: _____
PHONE: _____
ZIP CODE: _____

CHECK TYPE OF SUBMITTAL:
_____ DRAINAGE REPORT
_____ DRAINAGE PLAN 1st SUBMITTAL, REQUIRES TCL or equal
__XX__ DRAINAGE PLAN RESUBMITTAL
_____ CONCEPTUAL GRADING & DRAINAGE PLAN
_____ GRADING PLAN
_____ EROSION CONTROL PLAN
_____ ENGINEER'S CERTIFICATION (HYDROLOGY)
_____ CLOMR/LOMR
_____ TRAFFIC CIRCULATION LAYOUT (TCL)
_____ ENGINEER'S CERTIFICATION(TCL)
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_____ OTHER

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_____ CERTIFICATE OF OCCUPANCY (TEMP.)
__XX__ GRADING PERMIT APPROVAL
_____ PAVING PERMIT APPROVAL
_____ WORK ORDER APPROVAL
_____ OTHER (SPECIFY)

WAS A PRE-DESIGN CONFERENCE ATTENDED:
_____ YES
__XX__ NO
_____ COPY PROVIDED

RECEIVED
AUG 04 2006
HYDROLOGY SECTION

DATE SUBMITTED: August 4, 2006 BY: _____

Requests for approvals of Site Development Plans and/or Subdivision Plats shall be accompanied by a drainage submittal. The particular nature, location and scope of the proposed development defines the degree of drainage detail. One or more of the following levels of submittal may be required based on the following:

1. **Conceptual Grading and Drainage Plan:** Required for approval of Site Development Plans greater than five acres
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CITY OF ALBUQUERQUE

June 20, 2006

David Thompson, P.E.
Thompson Engineering Consultants, Inc.
P.O. Box 65760
Albuquerque, NM 87193

Re: The Bluffs at Encantado Subdivision, Preliminary Plat Engineer's Stamp dated 6-18-06 (K23-D27)

Dear Mr. Thompson,

Based upon the information provided in your submittal received 6-19-06, the above referenced plan is approved for Preliminary Plat action by the DRB. Once the DRB has approved the plan, please submit a mylar copy to me in order to obtain rough grading approval.

This project requires a National Pollutant Discharge Elimination System (NPDES) permit. If you have any questions regarding this permit please feel free to call the DMD Storm Drainage Design section at 768-3654 (Charles Caruso).

If you have any questions, you can contact me at 924-3981.

Sincerely,

Kristal D. Metro, P.E.
Senior Engineer, Planning Dept.
Development and Building Services

C: Charles Caruso, DMD Storm Drainage Design
Bradley Bingham, DRB
File

P.O. Box 1293
Albuquerque
New Mexico 87103
www.cabq.gov

CITY OF ALBUQUERQUE

June 12, 2006

David Thompson, P.E.
Thompson Engineering Consultants, Inc.
P.O. Box 65760
Albuquerque, NM 87193

Re: The Bluffs at Encantado Subdivision, Preliminary Plat
Engineer's Stamp dated 6-09-06 (K23-D27)

Dear Mr. Thompson,

Based upon the information provided in your submittal received 6-12-06, the above referenced plan is approved for Preliminary Plat action by the DRB. Once the DRB has approved the plan, please submit a mylar copy to me in order to obtain rough grading approval.

This project requires a National Pollutant Discharge Elimination System (NPDES) permit. If you have any questions regarding this permit please feel free to call the DMD Storm Drainage Design section at 768-3654 (Charles Caruso).

If you have any questions, you can contact me at 924-3981.

Sincerely,

Kristal D. Metro, P.E.
Senior Engineer, Planning Dept.
Development and Building Services

C: Charles Caruso, DMD Storm Drainage Design
Bradley Bingham, DRB
File

P.O. Box 1293

Albuquerque

New Mexico 87103

www.cabq.gov

DRAINAGE INFORMATION SHEET
(REV. 1/28/2003rd)

PROJECT TITLE: THE BLUFFS AT ENCANTADOSUBDIVISION ZONE MAP/DRG. FILE #: K23-D27
DRB #: _____ EPC #: _____ WORK ORDER#: _____

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CITY ADDRESS: _____

ENGINEERING FIRM: Thompson Engineering Consultants, Inc.
ADDRESS: P.O. Box 65760
CITY, STATE: Albuquerque, NM
FAX 830-9248
CONTACT: David Thompson
PHONE: 271-2199
ZIP CODE: 87193

OWNER: Tramway Associates, Inc.
ADDRESS: 12809 Donette Ct. NE
CITY, STATE: Albuquerque, NM
CONTACT: Philip Lindborg
PHONE: 291-0353
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ARCHITECT: _____
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ADDRESS: P.O. Box 44414
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CONTACT: Will Plotner
PHONE: 896-3050
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_____ DRAINAGE REPORT
_____ DRAINAGE PLAN 1st SUBMITTAL, REQUIRES TCL or equal
__XX__ DRAINAGE PLAN RESUBMITTAL
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_____ WORK ORDER APPROVAL
_____ OTHER (SPECIFY)

WAS A PRE-DESIGN CONFERENCE ATTENDED:
_____ YES
__XX__ NO
_____ COPY PROVIDED

RECEIVED
JUN 09 2006
HYDROLOGY SECTION

DATE SUBMITTED: June 9, 2006 BY: _____

Requests for approvals of Site Development Plans and/or Subdivision Plats shall be accompanied by a drainage submittal. The particular nature, location and scope of the proposed development defines the degree of drainage detail. One or more of the following levels of submittal may be required based on the following:

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3. **Drainage Report:** Required for subdivisions containing more than ten (10) lots or constituting five (5) acres or

DRAINAGE REPORT
FOR
THE BLUFFS AT ENCANTADO
SUBDIVISION

June 2006

DRAINAGE REPORT
FOR
THE BLUFFS AT ENCANTADO
SUBDIVISION

Prepared for:
TRAMWAY ASSOCIATES, INC.

Prepared by:
Thompson Engineering Consultants, Inc.
P.O. Box 65760
Albuquerque, NM 87193

June 2006

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INTRODUCTION AND SITE LOCATION

The proposed Bluffs at Encantado Subdivision is located east of Tramway Boulevard between Encantado Road and Skyline Road. The 3.59 acre property (including the existing 20 foot-wide public ROW) will be subdivided into 28 town home lots. This report specifically addresses the grading and drainage plan and analysis for the Bluffs at Encantado subdivision.

METHODOLOGY

The hydrologic and hydraulic criteria in Section 22 of the City of Albuquerque Development Process Manual (DPM), entitled "Drainage, Flood Control, and Erosion Control," was followed to perform the analyses given in this report. The design storm used for both the existing undeveloped and developed conditions of the Bluffs at Encantado Subdivision is the 100-year, 6-hour storm event for peak flow computations.

Street capacities were modeled using Haested Flowmaster program to determine normal depths and conjugate depths. A hydraulic analysis of the storm sewer collection system was performed to assist in the sizing of the infrastructure.

EXISTING DRAINAGE CONDITIONS

INTRODUCTION

The site drains from east to west at an average slope of about 5%. A rundown and 24" storm drain exists in the existing Huerfano Right-of-Way. The storm drain discharges to a concrete channel east of Tramway Boulevard. The rundown and storm drain system is clogged so runoff from Huerfano sheet flows into the Tramway Channel. As part of this project Huerfano within the property boundaries will be vacated and replaced with a storm inlet and storm drain system to collect flows from Huerfano upstream. The site is sparsely vegetated with native grasses and scrub brush.

The FEMA Flood Insurance Rate Map Number 35001C0378 E, effective date November 19, 2003, shown in Figure 1, indicates the presence of a Zone X flood hazard zone on the site. Zone X is an area in the 500-year flood or areas less than 1 foot deep 100-year flood. Adjacent to the site, Encantado Road is encumbered with a Zone AO flood hazard zone and the channel east of Tramway is encumbered with a Zone A flood hazard zone.

OFF-SITE FLOWS

Offsite flows drain onto the site from the east (see basin exhibit at end of report). Basin 1 includes the area that drains to Monte Alto Road from Turner Drive on the east to Monte Alto Drive. Based on the valley gutter at the intersection of Monte Alto Road and Monte

Alto Drive, the street flows are supposed to drain to Skyline Road, but because there is no water block at the intersection about half of the street flows (19.55 CFS) will drain to Monte Alto Drive and then to Huerfano Road. Basin 2 includes the area that drains to Monte Alto and Huerfano Road. With the Basin 2 peak runoff of 9.11 CFS, the total flow entering the site at Huerfano Road is 28.66 CFS. Basins 3 & 4 drain directly onto the site from the east.

ON-SITE FLOWS

For the existing conditions hydrologic analysis, since the eastern 20 feet of the site is used as an access road, that portion of the site is included as land treatment C with the remaining site land treatment type A. The peak flow from the site is 9.0 CFS.

Table 1 Existing Drainage Conditions

BASINS	Area (acres)	100yr-6hr Peak Flow (cfs)	100yr- 6hr Runoff Volume (acre-ft)	Land Treatment
OFFSITE				
1	10.23	39.10	1.386	37% B, 37% C, 26% D
2	2.37	9.11	0.324	37% B, 37% C, 26% D
3	1.91	7.34	0.261	37% B, 37% C, 26% D
4	1.84	7.10	0.253	36% B, 36% C, 28% D
ONSITE				
	3.59	9.00	0.279	80% A, 20% C

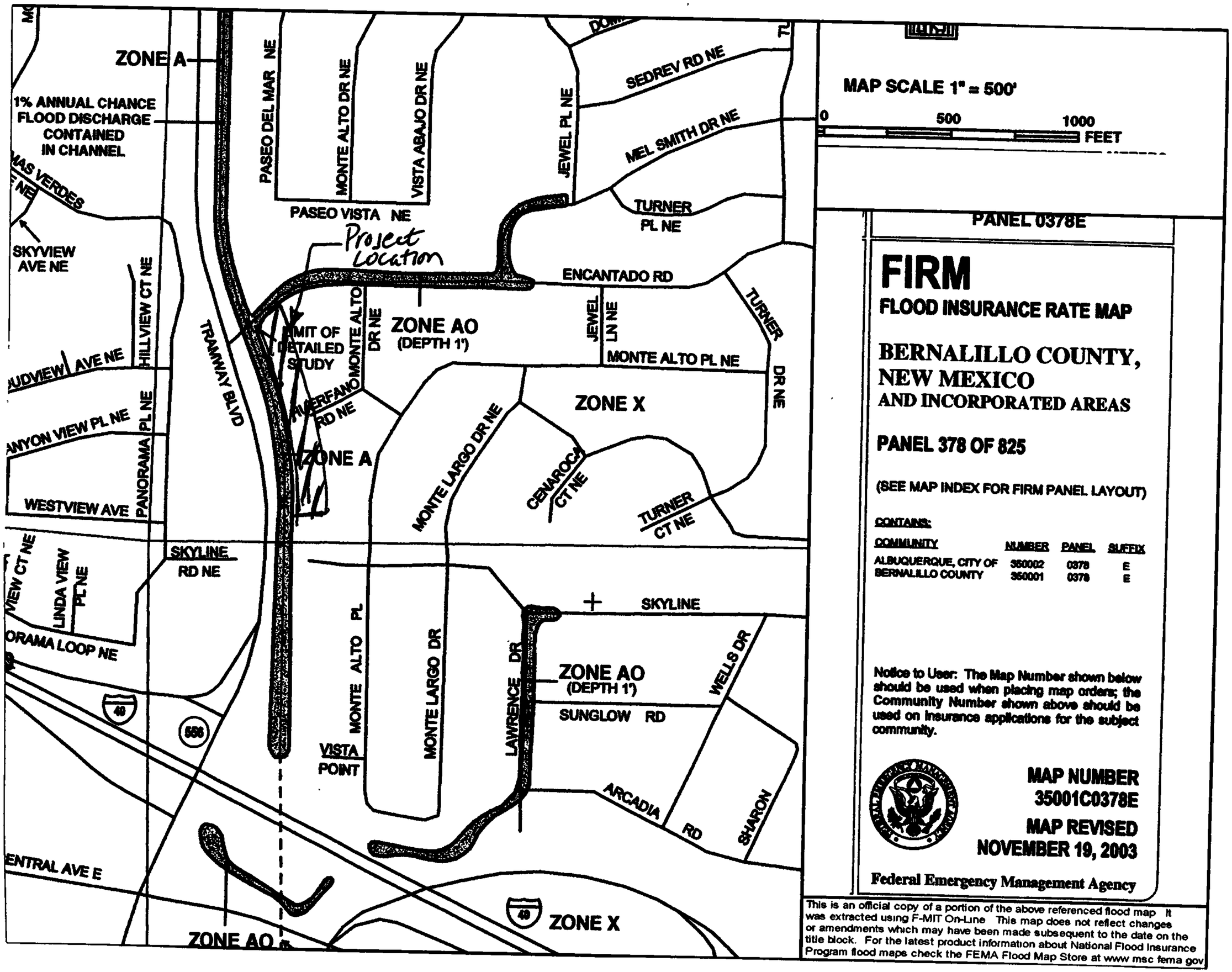

Figure 1 FEMA Flood Insurance Rate Map

DEVELOPED DRAINAGE CONDITIONS

DRAINAGE BASIN DELINEATION

The exhibit at the end of the report shows that the site is divided into four drainage basins. Basins 110 and 120 drain to Avital Drive north of Huerfano Road. Basins 210 and 220 drain to Avital Drive south of Huerfano Road. Avital Drive south of Huerfano drains south to Skyline Road and eventually into the Tramway Channel.

HYDROLOGIC ANALYSIS

To determine the peak flows of each basin a hydrologic analysis was performed in accordance to section 22.2 of the Development Process Manual (DPM). The 100-year 6-hour storm was the basis for determining peak flows to size the storm sewer inlets (see Appendix A). The 100-year 6-hour storm was also the basis for determining peak flows to calculate the size of the proposed storm sewer lines (see Appendix A). The property is located in Zone 4, which has a 100-year 6-hour storm event of 2.90 inches.

The site was assigned land treatment values in accordance with Tables A-4 and A-5 of the DPM's section 22.2. Table 1 shows the Land Treatments and peak flows for each basin. See Appendix A for hydrologic calculations.

Table 2 Developed Drainage Conditions

BASINS	Area (acres)	100yr-6hr Peak Flow (cfs)	100yr- 6hr Runoff Volume (acre-ft)	Land Treatment
110	0.46	2.15	0.085	15% B, 15% C, 70% D
120	1.35	6.18	0.243	17% B, 17% C, 66% D
210	0.55	2.58	0.103	15% B, 15% C, 70% D
220	1.23	5.69	0.225	16% B, 16% C, 68% D

~17 cfs 142 cfs offsite / 60 cfs

DRAINAGE CONCEPT

Introduction

All of the offsite runoff and the developed runoff from The Bluffs at Encantado Subdivision eventually drains to the Tramway Channel. The drainage concept includes collecting the flow in Huerfano Road and in Avital Drive north of Huerfano Road in a double C storm inlet in a sump condition along the west curb of Avital at Huerfano. The double C storm inlet drains to a 24" RCP which ties into an existing 24" RCP storm drain along the west side of the property. The existing 24" storm drain currently discharges into the Tramway Channel west of the subdivision. The flows in Avital Drive south of

Huerfano Road will drain south in the street and public access road, located south of the subdivision, to Skyline Road which discharges to the Tramway Channel through a concrete rundown at the west end of the street.

North of Huerfano Road, runoff from Offsite Basin 3 drains directly onto Avital Drive from the backyards of the lots east of Avital. Runoff from the lots north of Huerfano drain onto Avital Drive. The roof of each town home drains to the front of the home to the front yard which in turn drains to the street. The backyards of each lot drains to a small pond located at the east end of the lot (no credit is allowed for the backyard drainage). A total of 15.67 CFS drains in Avital Drive at Huerfano Road. Adding the offsite flow in Huerfano Road from the east, a total of 44.33 CFS is collected in the triple C storm inlets at the intersection of the two streets. The triple C storm inlets are in a sump condition. Assuming a 50% clogging factor for the storm inlet grates, the total flow collected in the storm inlets at a 0.67 foot depth is 47.1 CFS and at a 0.87 foot depth the capacity is 56.7 CFS. A 24" RCP will convey the flow that is collected in the triple C storm inlets and run east and then south and tie into the existing 24" RCP that discharges into the Tramway Channel. A 20 foot-wide drainage easement will be granted for the storm drain. The hydraulic grade line calculations for the storm drain are shown in Appendix B.

South of Huerfano Road, runoff from Offsite Basin 4 drains directly onto Avital Drive from the backyards of the lots east of Avital. Runoff from the lots south of Huerfano drain onto Avital Drive similar to the lots north of Huerfano discussed above. A total of 15.37 CFS drains in Avital Drive and the public access row at Skyline Road. This runoff is then collected in Skyline Road and drains to the Tramway Channel at the west end of Skyline through a concrete rundown.

All 28 town home lots will have ponds located in the back yard that retain the runoff from the back yard only. As stated previously, all roofs will drain to the front yards and then to Avital Drive. The backyard ponds will range in size from 32 cubic feet of storage for the lots on the south side of the subdivision to 277 cubic feet for Lot 8, which has the most area draining to the pond. It was assumed that half of the area draining to the ponds will be Land Treatment Type A and the other half will be Land Treatment Type C. All of the ponds will have a maximum depth of 1.5 feet.

Street Hydraulic Analysis

A hydraulic analysis of the street flows in the off site basins and onsite basins was completed to determine normal depth and sequent depth of the flow (see Appendix B). For the onsite basins the sequent depth must remain within the street right-of-way. Therefore, the sequent depth must be equal to or less than 0.53 feet or 0.87 feet, for the streets that have 4" mountable curb and gutter or standard curb and gutter, respectively . A normal depth analysis using Haested Methods Flowmaster program was completed. Flowmaster automatically calculates the energy grade depth, which is always greater than the sequent depth. Therefore, if the energy grade depth is equal to or less than 0.53 feet

for a street section with mountable curb and gutter, then the sequent depth is also less than 0.53 feet. For the 20 foot-wide Public Access ROW the Energy Grade Depth is greater than 0.53 feet, therefore the sequent depth was calculated and found to be 0.45 feet. Mountable curb and gutter is used throughout the subdivision except at the storm inlets in Avital Drive. Table 2 shows the results of the analysis including the energy grade depth.

Table 3 Street Hydraulic Analysis

Street	Width (ft)	Slope (%)	Curb and Gutter Type	Flow (cfs)	Normal Depth (ft)	Energy Grade Depth (ft)	Sequent Depth (ft)
OFFSITE							
Monte Alto Road	32	3.71	Standard	39.10	0.37	0.90	
Huerfano Road	32	4.45	Standard	28.66	0.32	0.79	
ONSITE							
Avital Drive North of Huerfano	26	1.00	Mountable	15.67	0.32	0.48	
Avital Drive South of Huerfano	26	2.00	Mountable	15.37	0.28	0.52	
Public Access ROW	20	2.00	Mountable	15.37	0.28	0.57	0.45

Grading Plan

Plate 1 shows the Mass Grading Plan for the subdivision. The grading plan shows that the subdivision will drain from west to east and into Avital Drive which eventually drains into the Tramway channel.

Thompson Engineering Consultants, Inc.
P.O. BOX 65760
ALBUQUERQUE, NM 87193
PHONE: (505) 271-2199
FAX: (505) 830-8246

CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT
TRANSPORTATION DEVELOPMENT

ONSITE AND OFFSITE BASIN EXHIBIT
BLUFFS AT ENCANTADO

DESIGN REVIEW COMMITTEE	CITY ENGINEER APPROVAL	MO./DAY/YR.	MO./DAY/YR.

City Project No.	Zone Map No.	Sheet	Of
	K & L-23-Z	1	1

NO.	DATE	REMARKS	BY

DESIGN		
DESIGNED BY	DBT	DATE
DRAWN BY	DEN	DATE
CHECKED BY	DBT	DATE

ENGINEER'S SEAL

SURVEY INFORMATION

FIELD NOTES		
NO.	BY	DATE

BENCH MARK

AS BUILT INFORMATION

CONTRACTOR	
WORK STAKED BY	DATE
INSPECTOR'S ACCEPTANCE BY	DATE
FIELD VERIFICATION BY	DATE
DRAWINGS CORRECTED BY	DATE

MICRO-FILM INFORMATION

RECORDED BY	DATE
NO	

Z:\projects\lindborg-hahn\ENCANTADO\BASINS.dwg 5/4/2006 1:42:22 PM MST

APPENDIX A
HYDROLOGIC CALCULATIONS

HYDROLOGIC CALCULATIONS
SECTION 22.2 OF THE DPM
24-Apr-06

TRAMWAY-ENCANTADO
ZONE 4

	6-HOUR	24-HOUR	10-DAY
100-YEAR RAINFALL	2.90	3.65	5.95

	TYPE A	TYPE B	TYPE C	TYPE D
PEAK DISCHARGE	2.2	2.92	3.73	5.25
EXCESS RUNOFF	0.8	1.08	1.465	2.64

BASIN	AREA	LAND TREATMENT				PEAK FLOW	RUNOFF 6-HR	RUNOFF 24-HR	RUNOFF 10-DAY	RUNOFF 10-DAY	CFS/AC
		TYPE A	TYPE B	TYPE C	TYPE D						
	acres					CFS	ac-ft	ac-ft	ac-ft	CF	CFS
EXISTING											
	3.590	2.870	0.000	0.720	0.000	9.00	0.279	0.279	0.279	12163	2.51
TOTAL	3.590					9.00	0.28	0.28	0.28	12163	2.51
DEVELOPED											
OFFSITE											
1	10.230	0.000	3.795	3.795	2.640	39.10	1.386	1.551	2.057	89588	3.82
2	2.370	0.000	0.865	0.865	0.640	9.11	0.324	0.364	0.487	21210	3.84
3	1.910	0.000	0.698	0.698	0.514	7.34	0.261	0.293	0.392	17065	3.84
4	1.840	0.000	0.666	0.666	0.508	7.10	0.253	0.285	0.382	16645	3.86
ONSITE											
110	0.460	0.000	0.070	0.070	0.320	2.15	0.085	0.105	0.167	7256	4.66
120	1.350	0.000	0.235	0.235	0.880	6.18	0.243	0.298	0.467	20347	4.58
210	0.550	0.000	0.080	0.080	0.390	2.58	0.103	0.127	0.202	8794	4.69
220	1.230	0.000	0.200	0.200	0.830	5.69	0.225	0.277	0.436	18991	4.62
TOTAL	3.590					16.595	0.656	0.808	1.272	55389	

Hydro Conduit Division
P.O. Box 5190
3700 Hwy 528
Bernalillo, NM 87004
505•867•2394
Fax 505•867•2563

DATE _____

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PROJECT _____

Determine Land Treatment D for Offsite Basins

Use Equation $D = 7\sqrt{((N \times N) + (5 \times N))}$ N = DU's/AC

Basin	Area	# DUs	DU/AC	Type D Treatment
1	10.23ac	20	1.96	25.8%
2	2.37	5	2.10	27.0%
3	1.91	4	2.09	26.9%
4	1.89	4	2.17	27.6%

APPENDIX B
HYDRAULIC CALCULATIONS

SUMMARY OF HYDRAULIC CALCULATIONS
CLOSED CONDUIT

BY DBT
DATE 5/3/2006
SHEET 1 of 1

PROJECT: THE BLUFFS AT ENCANTADO
100 year

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
										JUNCTION		LOSSES										
STATION	STRUCT	D	Q	A	V	K	Sf	L	DELTA	D	ANGLE	hf	hb	hj	hmh	ht	hmisc	SUM	E G.	hv	H G.	GROUND ELEV.
																					519.50	
CHANNEL	OUTLET												0 00				0 00	0 00	522 59	3.09	519.50	
		24	44 3	3.14	14.10	226 29	0 0383	62				2.38						2 38	524.96	3 09	521.88	
	MH 1								90				0 62	0.00	0.15	0 00		0.77	525.74	3 09	522.65	5734.00
		24	44.3	3.14	14.10	226 29	0.0383	40				1.53						1 53	527.27	3.09	524.18	
	MH 2								90				0.62	0.00	0.15	0 00		0 77	528.04	3 09	524.95	5734.00
		24	44.3	3.14	14 10	226.29	0 0383	120				4 60						4.60	532 64	3.09	529 55	
	INLET												0.00	0.00	0.15	0 00		0 15	532.79	3.09	529 71	5740 00
		24	44 3	3 14	14 10	226 29	0 0383	0				0 00						0.00	532 79	3 09	529 71	
REMARKS:										Manning's n 0.013												

Monte Alto Street Capacity at Huerfáno
Worksheet for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\roanoke.fm2
Worksheet	Roanoke Avenue NW
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data		
Channel Slope	0.037100 ft/ft	
Elevation range: 0.00 ft to 0.85 ft.		
Discharge	39.10	cfs

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	0.85	0.00	4.00	0.013
4.00	0.77	4.00	9.00	0.025
9.00	0.67	9.00	9.10	0.013
9.10	0.00	9.10	41.00	0.017
25.00	0.32	41.00	41.10	0.013
41.00	0.00	41.10	46.00	0.025
41.10	0.67	46.00	50.00	0.013
46.00	0.77			
50.00	0.85			

Results		
Wtd. Mannings Coefficient	0.017	
Water Surface Elevation	0.37	ft
Flow Area	6.67	ft²
Wetted Perimeter	32.65	ft
Top Width	32.01	ft
Height	0.37	ft
Critical Depth	0.52	ft
Critical Slope	0.006062	ft/ft
Velocity	5.87	ft/s
Velocity Head	0.53	ft
Specific Energy	0.90	ft
Froude Number	2.27	
Flow is supercritical.		

Huerfano Street Capacity at Monte Alto
Worksheet for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\roanoke.fm2
Worksheet	Roanoke Avenue NW
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data

Channel Slope 0.044500 ft/ft

Elevation range: 0.00 ft to 0.85 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	0.85	0.00	4.00	0.013
4.00	0.77	4.00	9.00	0.025
9.00	0.67	9.00	9.10	0.013
9.10	0.00	9.10	41.00	0.017
25.00	0.32	41.00	41.10	0.013
41.00	0.00	41.10	46.00	0.025
41.10	0.67	46.00	50.00	0.013
46.00	0.77			
50.00	0.85			

Discharge 28.66 cfs

Results

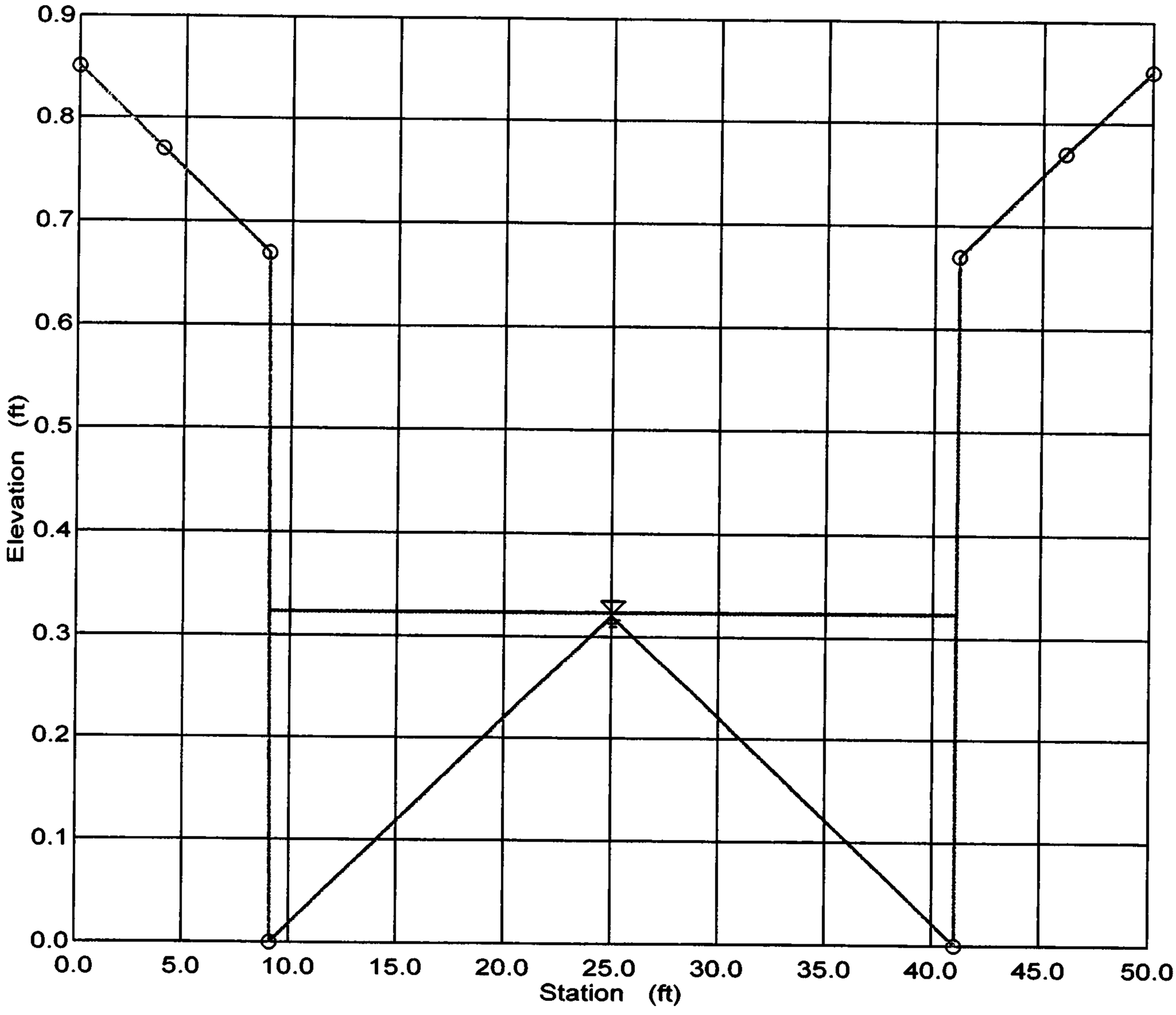
Wtd. Mannings Coefficient	0.017	
Water Surface Elevation	0.32	ft
Flow Area	5.23	ft²
Wetted Perimeter	32.56	ft
Top Width	32.00	ft
Height	0.32	ft
Critical Depth	0.45	ft
Critical Slope	0.006477	ft/ft
Velocity	5.48	ft/s
Velocity Head	0.47	ft
Specific Energy	0.79	ft
Froude Number	2.39	

Flow is supercritical.

Huerfano Street Section at Monte Alto
Cross Section for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\roanoke.fm2
Worksheet	Roanoke Avenue NW
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data		
Wtd. Mannings Coefficient	0.017	
Channel Slope	0.044500	ft/ft
Water Surface Elevation	0.32	ft
Discharge	28.66	cfs



AVITAL COURT NORTH OF HUERFANO
Worksheet for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\bluewate.fm2
Worksheet	SUBDIVISION STREET
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data		
Channel Slope	0.010000	ft/ft

Elevation range: 0.00 ft to 0.53 ft.

Station (ft)	Elevation (ft)
0.00	0.53
4.00	0.45
10.00	0.33
10.10	0.00
12.00	0.04
23.00	0.26
34.00	0.04
36.00	0.00
36.10	0.33
42.00	0.45
46.00	0.53

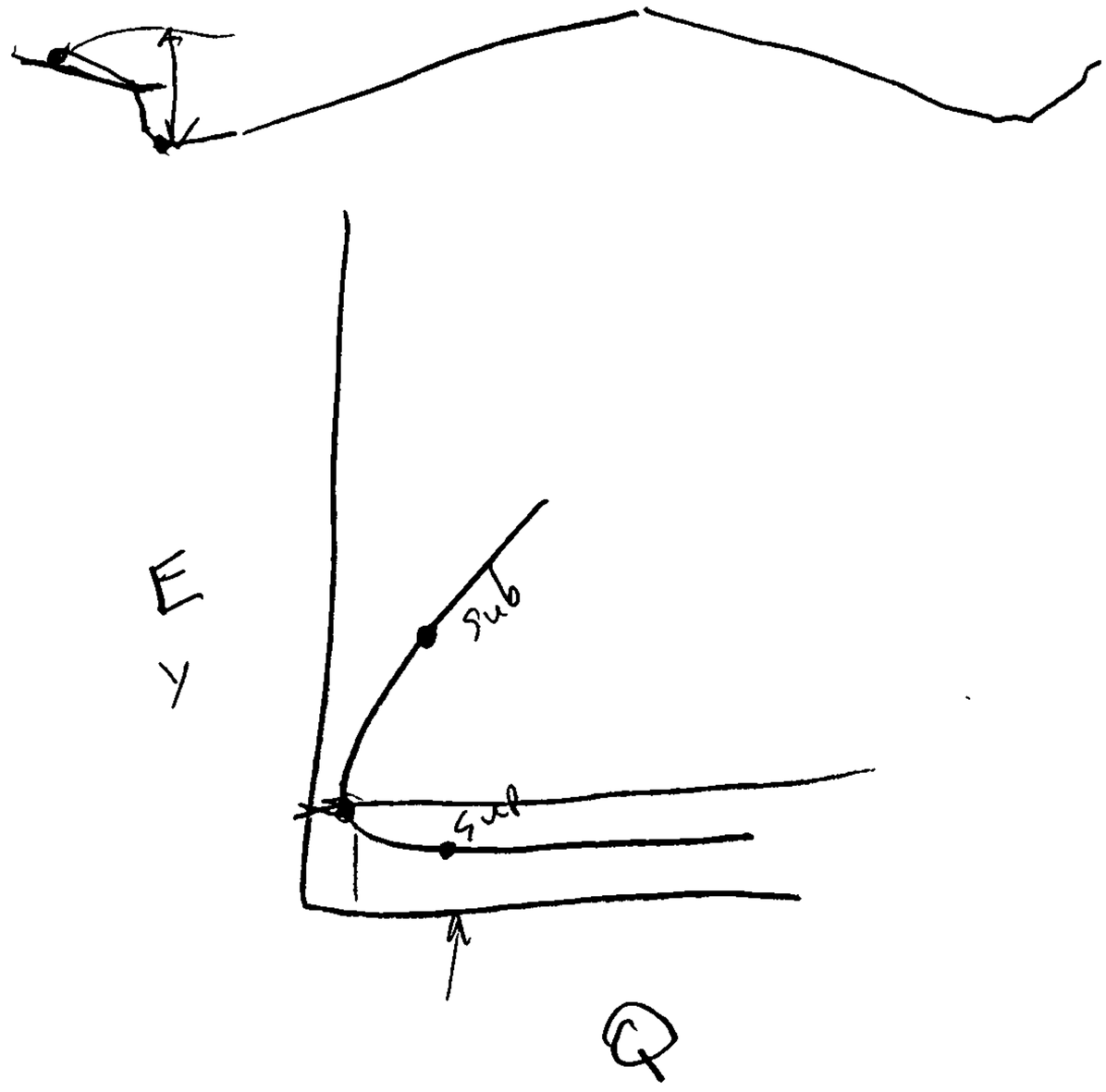
Start Station	End Station	Roughness
0.00	4.00	0.013
4.00	10.00	0.025
10.00	12.00	0.013
12.00	34.00	0.017
34.00	36.10	0.013
36.10	42.00	0.025
42.00	46.00	0.013

Discharge	15.67	cfs

Results		
Wtd. Mannings Coefficient	0.015	
Water Surface Elevation	0.32	ft
Flow Area	4.94	ft²
Wetted Perimeter	26.57	ft
Top Width	26.09	ft
Height	0.32	ft
Critical Depth	0.36	ft
Critical Slope	0.005363	ft/ft
Velocity	3.17	ft/s
Velocity Head	0.16	ft
Specific Energy	0.48	ft
Froude Number	1.28	
Flow is supercritical.		

Froude Number = 1

Super-critical



AVITAL COURT SOUTH OF HUERFANO To Public Access ROW

Worksheet for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\bluewate.fm2
Worksheet	SUBDIVISION STREET
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data

Channel Slope 0.020000 ft/ft

Elevation range: 0.00 ft to 0.53 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	0.53	0.00	4.00	0.013
4.00	0.45	4.00	10.00	0.025
10.00	0.33	10.00	12.00	0.013
10.10	0.00	12.00	34.00	0.017
12.00	0.04	34.00	36.10	0.013
23.00	0.26	36.10	42.00	0.025
34.00	0.04	42.00	46.00	0.013
36.00	0.00			
36.10	0.33			
42.00	0.45			
46.00	0.53			

Discharge 15.37 cfs MGF

Results

Wtd. Mannings Coefficient	0.015	
Water Surface Elevation	0.28	ft
Flow Area	3.89	ft²
Wetted Perimeter	26.49	ft
Top Width	26.07	ft
Height	0.28	ft
Critical Depth	0.36	ft
Critical Slope	0.005421	ft/ft
Velocity	3.95	ft/s
Velocity Head	0.24	ft
Specific Energy	0.52	ft
Froude Number	1.80	

Flow is supercritical.

PUBLIC ACCESS ROW NORTH OF SKYLINE

Worksheet for Irregular Channel

20' F-F (per Dave Thompson)

Project Description	
Project File	c:\haestad\fmw\bluewate.fm2
Worksheet	SUBDIVISION STREET
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

slope 2%

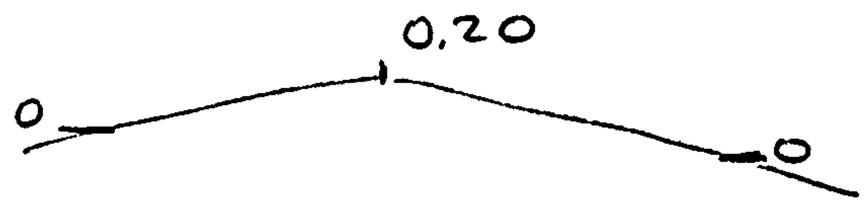
Input Data		
Channel Slope	0.020000	ft/ft

Elevation range: 0.00 ft to 0.53 ft.

Station (ft)	Elevation (ft)
0.00	0.53
4.00	0.45
10.00	0.33
10.10	0.00
12.00	0.04
20.00	0.20
28.00	0.04
30.00	0.00
30.10	0.33
36.00	0.45
40.00	0.53

Start Station	End Station	Roughness
0.00	4.00	0.013
4.00	10.00	0.025
10.00	12.00	0.013
12.00	28.00	0.017
28.00	30.10	0.013
30.10	36.00	0.025
36.00	40.00	0.013

Discharge	15.37	cfs

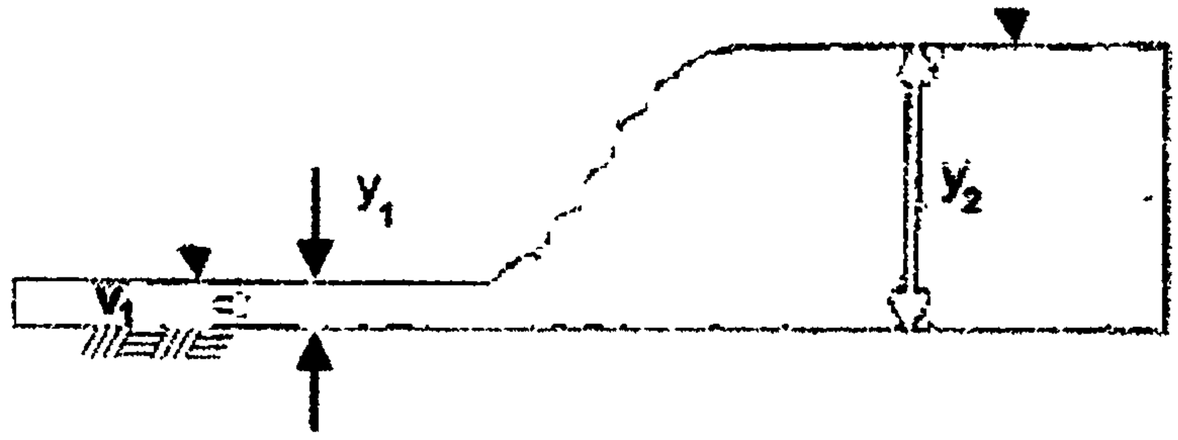


Results		
Wtd. Mannings Coefficient	0.015	
Water Surface Elevation	0.28	ft
Flow Area	3.56	ft²
Wetted Perimeter	20.48	ft
Top Width	20.07	ft
Height	0.28	ft
Critical Depth	0.38	ft
Critical Slope	0.004793	ft/ft
Velocity	4.32	ft/s
Velocity Head	0.29	ft
Specific Energy	0.57	ft
Froude Number	1.81	
Flow is supercritical.		

Segment Depth = 0.53'

for 4" mountable curb & gutter

onlinechannel11.php: Calculation of the sequent depth [y_2] of a hydraulic jump



The hydraulic jump in a horizontal channel

Formulas:

$$F_1 = v_1 / (g y_1)^{1/2}$$

$$q = v_1 y_1$$

$$y_2 = (y_1/2) [(1 + 8F_1^2)^{1/2} - 1]$$

$$v_2 = q/y_2$$

$$F_2 = v_2 / (g y_2)^{1/2}$$

INPUT DATA:

Select:

SI units (metric)
U.S. Customary units

Flow depth y_1: 0.28 ft

Flow velocity v_1: 4.32 fps

INTERMEDIATE CALCS:

Units selected: U.S. Customary

Grav. accel. [g]: 32.17 ft s^{-2}

Discharge q: 1.209 cfs ft^{-1}

Froude number F_1: 1.439

OUTPUT:

Flow depth y_2: 0.446 ft

Flow velocity v_2: 2.706 fps

Froude number F_2: 0.713

Press button to Calculate **or recalculate**

Your request was processed at 12:37:32 pm on June 9th,

Rinker MATERIALS™

Hydro Conduit Division
P.O. Box 5190
3700 Hwy 528
Bernalillo, NM 87004
505•867•2394
Fax 505•867•2563

DATE _____

PAGE _____ OF _____ PAGES

PROJECT _____

CAPACITY OF SINGLE C STORM INLET IN SUMP CONDITION

L = 40" - 2(½" end) - 2(½" middle bars
= 35.5" = 2.958'

W = 25.5" - 13(½" middle bars)
= 19" = 1.583'

Area = 2.958 x 1.583 = 4.683 SF

Effective area = 4.68 - 4.68(0.5 clogging factor) = 2.34SF

Orifice equation $Q = CA\sqrt{2gh}$ C = 0.6

0.67' Depth
$Q = 0.6(2.34)\sqrt{2(32.2)\,0.67}$
Q = 9.22 cfs

0.87' DEPTH
Q = 10.51 cfs

Note: this height precludes the use of mountable curb in this area

Capacity of Throat
L = 3.95'
Area = 3.95 x 0.67 = 2.647 SF

Weir Equation $Q = CLH^{3/2}$ C is closer to 3.3
0.67' DEPTH
$Q = 3.0(3.95)\,0.67^{3/2}$
Q = 6.50 CFS

Orifice Equation at 0.87' Depth since throat is submerged

$Q = 0.6(2.647)\sqrt{2(32)\,.435} = 8.41$ CFS

Capacity per inlet
at 0.67' Depth = 9.22 + 6.50 = 15.7 CFS x 3 = 47.1 CFS > 44.33 CFS OK

At 0.87' Depth = 10.51 + 8.41 = 18.9 CFS x 3 = 56.7 CFS > 44.33 CFS OK

CITY OF ALBUQUERQUE

June 1, 2006

David Thompson, P.E.
Thompson Engineering Consultants, Inc.
P.O. Box 65760
Albuquerque, NM 87193

Re: The Bluffs at Encantado Subdivision, Preliminary Plat Engineer's Stamp dated 5-05-06 (K23-D27)

Dear Mr. Thompson,

Based upon the information provided in your submittal received 5-05-06, the above referenced plan cannot be approved for Preliminary Plat until the following comments are addressed:

1. A manhole may not be located on private property, due to maintenance issues. Our records show that the existing manhole located near the Tramway Channel is located within the Right of Way. Please provide As-Built information. If the manhole is located on private property, this will have to be rectified during this project.
2. A 50% clogging factor must be used in your inlet calculations. In addition, please be aware that using a height of 0.67 feet in your inlet calculations precludes the use of mountable curb in this area.
3. More information (including capacity calculations) must be provided for the proposed backyard ponds.
4. The worksheet provided for the public access right of way north of Skyline needs to be done assuming a 17-foot pavement width, not an 18-foot width. In addition, please be aware that using a height of 0.67 feet in your channel calculations precludes the use of mountable curb in this area.
5. Provide a typical lot layout. Show the roof flows on this layout.
6. Show the ponding limits in the area surrounding the proposed double "C" inlets. Note that this area will need to have standard curb and gutter.

P.O. Box 1293

Albuquerque

New Mexico 87103

www.cabq.gov

7. The drainage report states that "The majority of the site runoff drains to the southeast to an existing retention pond south of the site," under the heading "Offsite Flows." This is incorrect.
8. Table 1 defines the onsite project area as 3.59 acres, but the introduction defines the onsite project area as 2.58 acres. Please clarify this. If possible, a copy of the preliminary plat would be helpful.
9. Be aware that the footing of the proposed retaining wall may not intrude upon the Right of Way.

If you have any questions, you can contact me at 924-3981.

Sincerely,

Kristal D. Metro, P.E.
Senior Engineer, Planning Dept.
Development and Building Services

C: File

P.O. Box 1293

Albuquerque

New Mexico 87103

www.cabq.gov

DRAINAGE INFORMATION SHEET
(REV. 1/28/2003rd)

K-23/D27

PROJECT TITLE: THE BLUFFS AT ENCANTADOSUBDIVISION ZONE MAP/DRG. FILE #: ~~K23-J23~~
DRB #: _____ EPC #: _____ WORK ORDER#: _____

LEGAL DESCRIPTION: LOTS 1A, 1C, & 1C, BLOCK K; AND A PORTION OF LOT 1, BLOCK K; CENORÓCA SUBDIVISION
CITY ADDRESS: _____

ENGINEERING FIRM: Thompson Engineering Consultants, Inc.
ADDRESS: P.O. Box 65760
CITY, STATE: Albuquerque, NM
CONTACT: David Thompson
PHONE: 271-2199
ZIP CODE: 87193

OWNER: Tramway Associates, Inc.
ADDRESS: 12809 Donette Ct. NE
CITY, STATE: Albuquerque, NM
CONTACT: Philip Lindborg
PHONE: 291-0353
ZIP CODE: 87112

ARCHITECT: _____
ADDRESS: _____
CITY, STATE: _____
CONTACT: _____
PHONE: _____
ZIP CODE: _____

SURVEYOR: Cartesian Surveys, Inc.
ADDRESS: P.O. Box 44414
CITY, STATE: Rio Rancho, NM
CONTACT: Will Plotner
PHONE: 896-3050
ZIP CODE: 87124

CONTRACTOR: _____
ADDRESS: _____
CITY, STATE: _____
CONTACT: _____
PHONE: _____
ZIP CODE: _____

CHECK TYPE OF SUBMITTAL:
- XX DRAINAGE REPORT
- ____ DRAINAGE PLAN 1st SUBMITTAL, REQUIRES TCL or equal
- ____ DRAINAGE PLAN RESUBMITTAL
- ____ CONCEPTUAL GRADING & DRAINAGE PLAN
- XX GRADING PLAN
- ____ EROSION CONTROL PLAN
- ____ ENGINEER'S CERTIFICATION (HYDROLOGY)
- ____ CLOMR/LOMR
- ____ TRAFFIC CIRCULATION LAYOUT (TCL)
- ____ ENGINEER'S CERTIFICATION(TCL)
- ____ ENGINEER'S CERTIFICATION (DRB APPR. SITE PLAN)
- ____ OTHER

CHECK TYPE OF APPROVAL SOUGHT:
- ____ SIA/FINANCIAL GUARANTEE RELEASE
- XX PRELIMINARY PLAT APPROVAL
- ____ S. DEV. PLAN FOR SUB'D. APPROVAL
- ____ S. DEV PLAN FOR BLDG. PERMIT APPROVAL
- ____ SECTOR PLAN APPROVAL
- ____ FINAL PLAT APPROVAL
- ____ FOUNDATION PERMIT APPROVAL
- ____ BUILDING PERMIT APPROVAL
- ____ CERTIFICATE OF OCCUPANCY (PERM.)
- ____ CERTIFICATE OF OCCUPANCY (TEMP.)
- XX GRADING PERMIT APPROVAL
- ____ PAVING PERMIT APPROVAL
- ____ WORK ORDER APPROVAL
- ____ OTHER (SPECIFY)

WAS A PRE-DESIGN CONFERENCE ATTENDED:
- ____ YES
- XX NO
- ____ COPY PROVIDED

RECEIVED
MAY 05 2006
HYDROLOGY SECTION

DATE SUBMITTED: May 5, 2006 BY: _____

Requests for approvals of Site Development Plans and/or Subdivision Plats shall be accompanied by a drainage submittal. The particular nature, location and scope of the proposed development defines the degree of drainage detail. One or more of the following levels of submittal may be required based on the following:

1. **Conceptual Grading and Drainage Plan:** Required for approval of Site Development Plans greater than five acres
2. **Drainage Plans:** Required for building permits, grading permits, paving permits, and site plans less than five (5)
3. **Drainage Report:** Required for subdivisions containing more than ten (10) lots or constituting five (5) acres or