DRAINAGE INFORMATION SHEET

(REV. 1/28/2003rd)

J-9/D19C

PROJECT TITLE: SUNDORO SOUTH UNIT 9 SUBDIVISION ZONE MAP/DRG. FILE #: J9
DRB #: _____ EPC #: _____ WORK ORDER#: _____

LEGAL DESCRIPTION: LOT 37, TOWN OF ATRISCO GRANT
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: Dragonfly Development, 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: Wayjohn Surveying, Inc.
ADDRESS: 330 Louisiana Blvd. NE
CITY, STATE: Albuquerque, NM
CONTACT: Thomas Johnston
PHONE: 255-2052
ZIP CODE: 87108

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
__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
NOV 16 2005
HYDROLOGY SECTION

DATE SUBMITTED: November 16, 2005 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

November 17, 2005

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

Re: Sundoro South Unit 9 Subdivision, Lot 37, Town of Atrisco Grant
Grading & Drainage Plan-Engineer's Stamp dated 11-14-05 (J9-D19C)

Dear Mr. Thompson,

Based upon the information provided in your submittal dated 11-16-05, the above referenced plan is approved as amended. This will be the plan that must be certified for Release of Financial Guaranty.

If you have any other questions, you can contact me at 924-3990.

Sincerely,

Phillip J. Lovato, E.I., C.F.M.
Engineering Associate, Hydrology,
Development and Building Services,
Planning Department

cc: file

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

JB/D019C

David Soule

From: Thompson Engineering consultan [tecnm@yahoo.com]
Sent: Friday, November 01, 2013 11:58 AM
To: David Soule
Subject: Re: Sundoro Grading

David,

I authorize you to prepare the Grading Certification for the Sundoro Unit 9 Subdivision.

Good Luck,

David B. Thompson, P.E.
Thompson Engineering Consultants, Inc.
P.O. Box 65760
Albuquerque, NM 87193
Office: (505) 271-2199
Fax: (505) 830-9248

On Friday, November 1, 2013 11:11 AM, David Soule <david@riograndeengineering.com> wrote:
Dave, the project is complete,the close out package approved. The only item I need to complete is the grading certification. Do you want me to send you the shots from Surv-tek or can you send me an email authorizing me to make the call. The site is good, please let me know
David

CITY OF ALBUQUERQUE

November 8, 2013

David Soule, P.E.
Rio Grande Engineering
P.O. Box 93924
Albuquerque, NM 87199

Re: SUNDORO Unit 9
Lots 1-53, SUNDORO Unit 9
Grading Plan Certification—Accepted
Engineer's Stamp date 05-05-11 (J09D019C)
Certification date 11-06-13

Dear Mr. Soule,

Based upon the information provided in your submittal received 11-06-13, the above referenced Certification is accepted for the SIA/Financial Guarantee release (Work Order 7270.80).

Hydrology is asking for an electronic copy, in PDF format, of this certification for our records. This PDF file can be e-mailed to me at: sbiazar@cabq.gov.

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

Sincerely,

Shahab Biazar, P.E.
Senior Engineer, Planning Dept.
Development Review Services

C: E-mail

PO Box 1293
Albuquerque
New Mexico 87103
www.cabq.gov

City of Albuquerque

Planning Department

Development & Building Services Division

DRAINAGE AND TRANSPORTATION INFORMATION SHEET

(REV 02/2013)

Project Title: SUNDORO UNIT 9 Building Permit #: _____ City Drainage #: J9-D19C

DRB#: _____ EPC#: _____ Work Order#: _____

Legal Description: LOTS 1-53 SUNDORO UNIT 9

City Address: ENDEE ROAD AND EKARMA

Engineering Firm: RIO GRANDE ENGINEERING Contact: DAVID SOULE

Address: PO BOX 93924, ALBUQUERQUE, NM 87199

Phone#: 505.321.9099 Fax#: 505.872.0999 E-mail: DAVID@RIOGRANDEENGINEERING.COM

Owner: DRAGONFLY DEVELOPMENT Contact: _____

Address: DONNETTE

Phone#: _____ Fax#: _____ E-mail: _____

Architect: _____ Contact: _____

Address: _____

Phone#: _____ Fax#: _____ E-mail: _____

Surveyor: CSURV-TEK Contact: JRUSS HUGG

Address: _____

Phone#: 917.8921 Fax#: _____ E-mail: _____

Contractor: _____ Contact: _____

Address: _____

Phone#: _____ Fax#: _____ E-mail: _____

TYPE OF SUBMITTAL:

____ DRAINAGE REPORT
____ DRAINAGE PLAN 1st SUBMITTAL
____ DRAINAGE PLAN RESUBMITTAL
____ CONCEPTUAL G & D PLAN
____ GRADING PLAN
____ EROSION & SEDIMENT CONTROL PLAN (ESC)
x ENGINEER'S CERT (HYDROLOGY)
____ CLOMR/LOMR
____ TRAFFIC CIRCULATION LAYOUT (TCL)
____ ENGINEER'S CERT (TCL)
____ ENGINEER'S CERT (DRB SITE PLAN)
____ ENGINEER'S CERT (ESC)
____ SO-19
____ OTHER (SPECIFY)

CHECK TYPE OF APPROVAL/ACCEPTANCE SOUGHT:

x SIA/FINANCIAL GUARANTEE RELEASE
____ PRELIMINARY PLAT APPROVAL
____ S. DEV. PLAN FOR SUB'D APPROVAL
____ S. DEV. FOR BLDG. PERMIT APPROVAL
____ SECTOR PLAN APPROVAL
____ FINAL PLAT APPROVAL
____ CERTIFICATE OF OCCUPANCY (PERM)
____ CERTIFICATE OF OCCUPANCY (TCL TEMP)
____ FOUNDATION PERMIT APPROVAL
____ BUILDING PERMIT APPROVAL
____ GRADING PERMIT APPROVAL
____ PAVING PERMIT APPROVAL
____ WORK ORDER APPROVAL
____ GRADING CERTIFICATION

____ SO-19 APPROVAL
____ ESC PERMIT APPROVAL
____ ESC CERT. ACCEPTANCE
____ OTHER (SPECIFY)

RECEIVED
NOV 06 2013
LAND DEVELOPMENT SECTION

WAS A PRE-DESIGN CONFERENCE ATTENDED: ____ Yes x No ____ Copy Provided

DATE SUBMITTED: 11/5/13 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 to the proposed development defines the degree of drainage detail. One or more of the following levels of submittal may be required based on the followin

1. **Conceptual Grading and Drainage Plan**: Required for approval of Site Development Plans greater than five (5) acres and Sector Plans
2. **Drainage Plans**: Required for building permits, grading permits, paving permits and site plans less than five (5) acres
3. **Drainage Report**: Required for subdivision containing more than ten (10) lots or constituting five (5) acres or more
4. **Erosion and Sediment Control Plan:** Required for any new development and redevelopment site with 1-acre or more of land disturbing area, including project less than 1-acre than are part of a larger common plan of development

CITY OF ALBUQUERQUE

August 3, 2005

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

Re: Sundoro South Unit 9 Subdivision, Lot 37, Town of Atrisco Grant
Drainage Report - Engineer's Stamp dated 7-21-05 (J9-D19C)

Dear Mr. Thompson,

Based upon the information provided in your submittal dated 7-21-05, the above referenced plan is approved for Preliminary Plat action by the DRB. Once that board has approved the plan, please submit a mylar copy of the grading plan for my signature in order to obtain a Grading Permit.

This project requires a National Pollutant Discharge Elimination System (NPDES) permit. Refer to the attachment that is provided with this letter for details. If you have any questions 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 924-3990.

Sincerely,

Phillip J. Lovato, E.I., C.F.M.
Engineering Associate, Hydrology,
Development and Building Services,
Planning Department

cc: Charles Caruso, DMD
file

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

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

PROJECT TITLE: SUNDORO SOUTH UNIT 9 SUBDIVISION ZONE MAP/DRG. FILE #: J9/D19C
DRB #: _____ EPC #: _____ WORK ORDER#: _____

LEGAL DESCRIPTION: LOT 37, TOWN OF ATRISCO GRANT
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: Dragonfly Development, 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: Wayjohn Surveying, Inc.
ADDRESS: 330 Louisiana Blvd. NE
CITY, STATE: Albuquerque, NM
CONTACT: Thomas Johnston
PHONE: 255-2052
ZIP CODE: 87108

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
- _____ 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

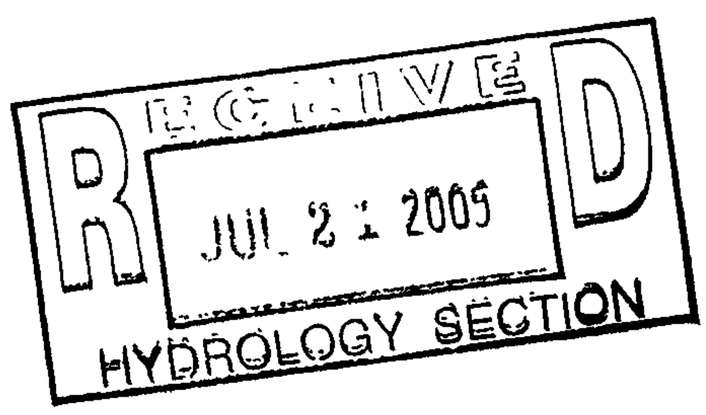
RECEIVED
JUL 21 2005
HYDROLOGY SECTION

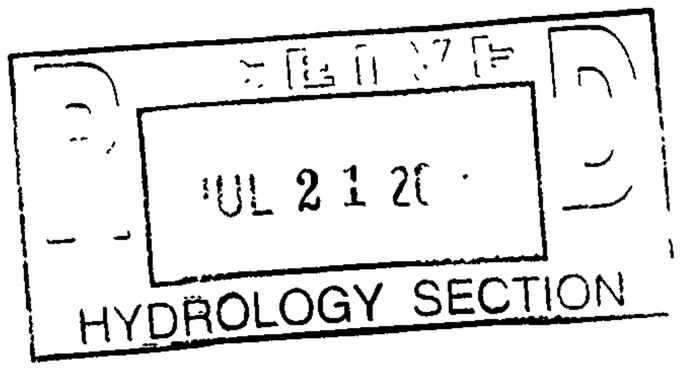
DATE SUBMITTED: July 21, 2005 BY: _____

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

DRAINAGE REPORT
FOR
SUNDORO SOUTH UNIT 9
SUBDIVISION





July 2005

DRAINAGE REPORT
FOR
SUNDORO SOUTH UNIT 9
SUBDIVISION

Prepared for:
DRAGONFLY DEVELOPMENT, INC.

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

July 2005

TABLE OF CONTENTS

PAGE

INTRODUCTION AND SITE LOCATION 1

METHODOLOGY 1

EXISTING DRAINAGE CONDITIONS 1

INTRODUCTION 1
OFF-SITE FLOWS 1
ON-SITE FLOWS 2

DEVELOPED DRAINAGE CONDITIONS 2

DRAINAGE BASIN DELINEATION 2
HYDROLOGIC ANALYSIS 4
DRAINAGE CONCEPT 4
Introduction 4
Street Hydraulic Analysis 5
Grading Plan 5

APPENDIX A -- HYDROLOGIC CALCULATIONS

APPENDIX B -- HYDRAULIC CALCULATIONS

LIST OF PLATES

PAGE

PLATE 1 – GRADING PLAN POCKET
PLATE 2 – DRAINAGE PLAN POCKET
PLATE 3 – GOODWIN DMP DRAINAGE MAP POCKET

LIST OF FIGURES

PAGE

FIGURE 1 FEMA FLOOD INSURANCE RATE MAP 3

LIST OF TABLES

PAGE

TABLE 1 EXISTING DRAINAGE CONDITIONS 2
TABLE 2 DEVELOPED DRAINAGE CONDITIONS 4
TABLE 3 STREET HYDRAULIC ANALYSIS 5

INTRODUCTION AND SITE LOCATION

The proposed Sundoro South Unit 9 Subdivision is located between Endee Road and I-40 just west of Sundoro South Unit 6 Subdivision. The 6.8-acre site is included in the Sundoro South Masterplan area. The property will be subdivided into 41 residential lots. This report specifically addresses the grading and drainage plan and analysis for Sundoro South Unit 9. following the Drainage Management Plan for Sundoro South Units 5,6, and 7 by Mark Goodwin and Associates dated October 29, 2004.

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 Sundoro South Unit 9 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 northwest to southeast at an average slope of about 2%. The site is sparsely vegetated with native grasses and scrub brush.

The FEMA Flood Insurance Rate Map Number 35001C0328 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.

OFF-SITE FLOWS

There are no offsite flows that reach the site.

ON-SITE FLOWS

For the existing conditions hydrologic analysis, Land Treatment Type A was used to determine peak flows. The peak flow from the site is 9.0 cfs. The majority of the site runoff drains to the southeast to an existing retention pond south of the site.

Table 1 Existing Drainage Conditions

BASINS	Area (acres)	100yr-6hr Peak Flow (cfs)	100yr- 6hr Runoff Volume (acre-ft)	Land Treatment
110	3.57	4.72	0.131	100%A
120	2.76	3.65	0.101	100%A
130	0.50	0.67	0.232	100%A

DEVELOPED DRAINAGE CONDITIONS

DRAINAGE BASIN DELINEATION

This drainage plan follows the Drainage Management Plan for "Sundoro South Units 5, 6, and 7" dated October 29, 2004 by Mark Goodwin & Associates. Plate 2 shows that the site is divided into three drainage basins. Basins 110, 120, and 130 drain to Sundoro South Unit 6 Subdivision in Silica Avenue and is collected in a 24" storm drain. Basins 110, 120, and 130 are the same as basin OF-4 in the Goodwin DMP (see Plate 3).

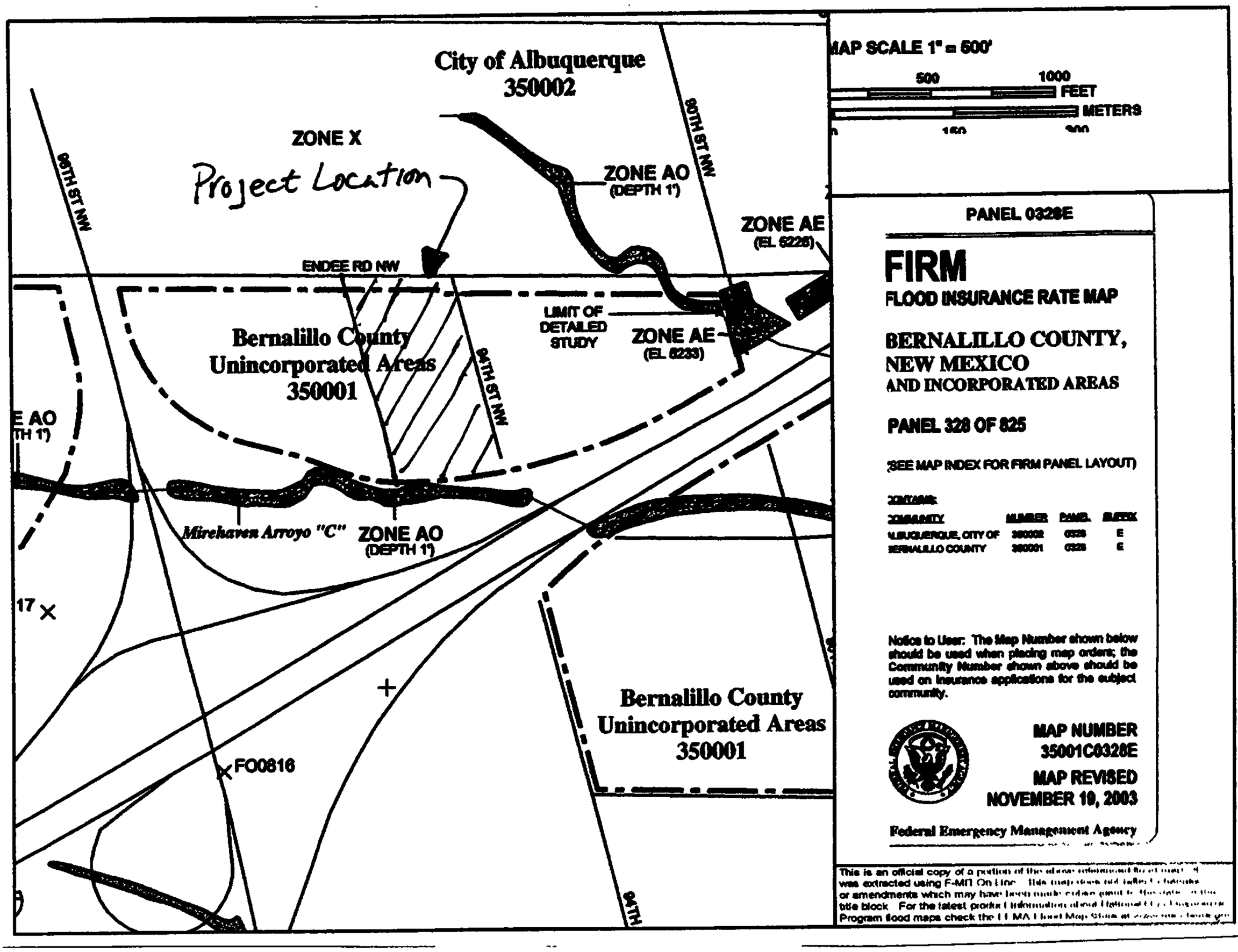


Figure 1 FEMA Flood Insurance Rate Map

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 1, which has a 100-year 6-hour storm event of 2.20 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)	100-yr 10day Runoff Volume (acre-ft)	Land Treatment
110	3.57	12.84	0.438	0.687	21% B, 22% C, 57% D
120	2.76	9.86	0.336	0.526	22% B, 22% C, 56% D
300	0.50	1.85	0.063	0.101	19% B, 20% C, 61% D

DRAINAGE CONCEPT

Introduction

As stated previously, this drainage plan follows the Drainage Management Plan for "Sundoro South Units 5, 6, and 7" dated October 29, 2004 by Mark Goodwin & Associates. All of the developed runoff from Sundoro South Unit 9 is to be captured by the storm sewer system in Silica Avenue and discharged to a temporary retention pond located south of Molten Drive. The temporary retention pond is sized to retain the 100-year, 10-day storm. According to the Goodwin DMP, at Silica Avenue a total of 24.5 cfs (basin OF-4) is allowed to be discharged to the storm sewer.

Basins 110, 120, and 130 are the same as basin OF-4 (29.6) in the Goodwin DMP. The total peak flow from basins 110, 120, and 130 is 24.5 cfs, which is about equal to the peak flow allowed by the Goodwin DMP. The runoff from basins 110, 120, and 130 is collected in a series of storm inlets in Silica Avenue just west of Echelon Drive. A single type "A" inlet and two double type "C" inlets along each curb line connected by 18" RCP storm sewers collect a total of 20.6 cfs (see Appendix B). The street will have 22.7 cfs just east of the inlets. Further west a double "C" inlet along each curb line will collect a total of 7.6 cfs leaving 7.16 cfs in the street. At the second double "C" inlets a total of 9.0 cfs is flowing in the street. The second double "C" inlets will collect 5.0 cfs leaving 4.0

cfs in the street to be collected down stream by the Silica storm drain system. A 24" RCP will convey the flows collected by all of the inlets to the Silica storm sewer system.

Street Hydraulic Analysis

A hydraulic analysis of the street flows was completed to determine normal depth and sequent depth of the flow (see Appendix B). The sequent depth must remain within the street right-of-way. Therefore, the sequent depth must be equal to or less than 0.51 feet or 0.85 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 0.51 feet for a street section with mountable curb and gutter, then the sequent depth is also less than 0.51 feet. Mountable curb and gutter is used throughout the subdivision except at the storm inlets in Silica Avenue. 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)
Echelon Drive	28	1.18	Mountable	9.86	0.26	0.39
Silica Avenue west of subdivision	28	2.50	Mountable	12.84	0.25	0.51
Silica Avenue west of 1st Inlets	28	0.50	Standard	22.71	0.43	0.55
Silica Avenue west of 2nd Inlets	28	0.50	Standard	14.71	0.36	0.45
Silica Avenue west of 3rd Inlets	28	0.50	Standard	8.96	0.30	0.36

Grading Plan

Plate 1 shows the Mass Grading Plan for the subdivision. The grading plan shows that the subdivision will drain from northwest to southeast and into the proposed storm drain in Silica Avenue.

APPENDIX A
HYDROLOGIC CALCULATIONS

AHYMO PROGRAM SUMMARY TABLE (AHYMO_97) - - VERSION: 1997.02c RUN DATE (MON/DAY/YR) =07/20/2005
INPUT FILE = C:\Projects\SUNDOR~2\HYDEXST9.txt USER NO.= AHYMO-I-9702a01000K21-AH

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
START										TIME= .00
RAINFALL TYPE= 1										RAIN6= 2.200
*S**********										
*S BASIN 110										
*S**********										
COMPUTE NM HYD	110.00	-	1	.00558	4.72	.131	.43922	1.533	1.322	PER IMP= .00
*S**********										
*S BASIN 120										
*S**********										
COMPUTE NM HYD	120.00	-	2	.00431	3.65	.101	.43922	1.533	1.322	PER IMP= .00
*S COMBINE 110 AND 120										
ADD HYD	120ADD	2& 1	11	.00989	8.37	.232	.43921	1.533	1.322	
*S**********										
*S BASIN 130										
*S**********										
COMPUTE NM HYD	130.00	-	3	.00078	.67	.018	.43922	1.533	1.332	PER IMP= .00
*S COMBINE 120ADD AND 130										
ADD HYD	130ADD	3&11	13	.01067	9.03	.250	.43921	1.533	1.323	
FINISH										

AHYMO PROGRAM SUMMARY TABLE (AHYMO_97) - - VERSION: 1997.02c RUN DATE (MON/DAY/YR) =07/20/2005
INPUT FILE = C:\Projects\SUNDOR~2\HYDDEV9.txt USER NO.= AHYMO-I-9702a01000K21-AH

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
START										TIME= .00
RAINFALL TYPE= 1										RAIN6= 2.200
*S**********										
*S BASIN 110										
*S**********										
COMPUTE NM HYD	110.00	-	1	.00558	12.84	.438	1.47264	1.500	3.597	PER IMP= 57.00
*S**********										
*S BASIN 120										
*S**********										
COMPUTE NM HYD	120.00	-	2	.00431	9.86	.336	1.45956	1.500	3.575	PER IMP= 56.00
*S COMBINE 110 AND 120										
ADD HYD	120ADD	2& 1	11	.00989	22.71	.774	1.46689	1.500	3.587	
*S**********										
*S BASIN 130										
*S**********										
COMPUTE NM HYD	130.00	-	3	.00078	1.85	.063	1.51863	1.500	3.702	PER IMP= 61.00
*S COMBINE 120ADD AND 130										
ADD HYD	130ADD	3&11	13	.01067	24.55	.837	1.47064	1.500	3.596	
FINISH										

```
    AHYMO PROGRAM (AHYMO_97) -                          - Version:  1997.02c
         RUN DATE (MON/DAY/YR) = 07/20/2005
         START TIME (HR:MIN:SEC) = 18:05:07     USER NO.= AHYMO-I-9702a01000K21-AH
         INPUT FILE = C:\Projects\SUNDOR~2\HYDDEV9.txt

*
*                    SUNDORO UNIT 9 SUBDIVISION
*                HYDROLOGIC MODEL--DEVELOPED CONDITIONS
*                          21 MARCH 2005
*
*
*******************************************************************************
*
*       HYDROLOGIC MODEL FOR OFFSITE AND ONSITE BASINS
*       100-YEAR, 6-HOUR STORM:
*
*
*
*       PRECIPITATION:
*               P60 =   1.87"
*               P360 =  2.20"
*               P1440 = 2.66"
*
*
*
*******************************************************************************
*
START                TIME=0.0 HR  PUNCH CODE=0
*
*
*
RAINFALL             TYPE=1   RAIN QUARTER=0.0 IN
                              RAIN ONE=1.87 IN  RAIN SIX=2.20 IN
                              RAIN DAY=2.66 IN  DT=0.033333 HRS

                  COMPUTED 6-HOUR RAINFALL DISTRIBUTION BASED ON NOAA ATLAS 2 - PEAK AT 1.40 HR.
                  DT =     .033333 HOURS       END TIME =     5.999940 HOURS
                     .0000   .0016   .0033   .0050   .0067   .0085   .0103
                     .0122   .0141   .0160   .0180   .0201   .0222   .0243
                     .0266   .0289   .0312   .0337   .0362   .0388   .0415
                     .0443   .0472   .0502   .0534   .0567   .0601   .0637
                     .0675   .0715   .0758   .0810   .0865   .0924   .1051
                     .1335   .1773   .2400   .3257   .4384   .5820   .7607
                     .9789  1.1808  1.2652  1.3365  1.4000  1.4577  1.5108
                    1.5602  1.6063  1.6495  1.6902  1.7285  1.7648  1.7991
                    1.8316  1.8624  1.8917  1.9194  1.9458  1.9519  1.9576
                    1.9631  1.9683  1.9732  1.9780  1.9826  1.9870  1.9912
                    1.9953  1.9993  2.0031  2.0068  2.0105  2.0140  2.0174
                    2.0207  2.0240  2.0272  2.0303  2.0333  2.0363  2.0392
                    2.0420  2.0448  2.0476  2.0502  2.0529  2.0554  2.0580
                    2.0605  2.0629  2.0653  2.0677  2.0701  2.0724  2.0746
                    2.0769  2.0791  2.0812  2.0834  2.0855  2.0876  2.0896
                    2.0916  2.0936  2.0956  2.0976  2.0995  2.1014  2.1033
                    2.1052  2.1070  2.1088  2.1106  2.1124  2.1142  2.1159
                    2.1176  2.1193  2.1210  2.1227  2.1244  2.1260  2.1276
                    2.1292  2.1308  2.1324  2.1340  2.1355  2.1371  2.1386
                    2.1401  2.1416  2.1431  2.1446  2.1461  2.1475  2.1489
                    2.1504  2.1518  2.1532  2.1546  2.1560  2.1573  2.1587
                    2.1601  2.1614  2.1627  2.1641  2.1654  2.1667  2.1680
                    2.1693  2.1705  2.1718  2.1731  2.1743  2.1756  2.1768
                    2.1780  2.1793  2.1805  2.1817  2.1829  2.1841  2.1852
                    2.1864  2.1876  2.1887  2.1899  2.1911  2.1922  2.1933
```

```
                2.1945  2.1956  2.1967  2.1978  2.1989  2.2000

*
*
*
*
*S***************************************************************************
*
*
*
*S**********
*S BASIN 110
*S**********
*
*
COMPUTE NM HYD      ID=1  HYD NO=110  DA=.00558 SQ MI
                            %A=0  %B=21  %C=22 %D=57
                          TP=0.13 HR
                          MASS RAINFALL=-1

     K =   .070850HR    TP =   .130000HR    K/TP RATIO =   .545000     SHAPE CONSTANT, N =  7.106420
     UNIT PEAK =   12.876    CFS   UNIT VOLUME =    .9992       B =   526.28      P60 = 1.8700
     AREA =      .003181 SQ MI    IA =    .10000 INCHES    INF =    .04000 INCHES PER HOUR
     RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =   .033333


     K =   .115213HR    TP =   .130000HR    K/TP RATIO =   .886251     SHAPE CONSTANT, N =  4.003041
     UNIT PEAK =   6.5591    CFS   UNIT VOLUME =    .9982       B =   355.37      P60 = 1.8700
     AREA =      .002399 SQ MI    IA =    .42326 INCHES    INF =   1.03512 INCHES PER HOUR
     RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =   .033333

PRINT HYD           ID=1 CODE=1

                                PARTIAL HYDROGRAPH   110.00

    RUNOFF VOLUME =     1.47264 INCHES     =        .4383 ACRE-FEET
    PEAK DISCHARGE RATE =      12.84 CFS  AT   1.500 HOURS   BASIN AREA =   .0056 SQ. MI.


*
*
*S**********
*S BASIN 120
*S**********
*
COMPUTE NM HYD      ID=2  HYD NO=120  DA=.00431 SQ MI
                            %A=0  %B=22  %C=22 %D=56
                          TP=0.13 HR
                          MASS RAINFALL=-1

     K =   .070850HR    TP =   .130000HR    K/TP RATIO =   .545000     SHAPE CONSTANT, N =  7.106420
     UNIT PEAK =   9.7709    CFS   UNIT VOLUME =    .9989       B =   526.28      P60 = 1.8700
     AREA =      .002414 SQ MI    IA =    .10000 INCHES    INF =    .04000 INCHES PER HOUR
     RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =   .033333


     K =   .115498HR    TP =   .130000HR    K/TP RATIO =   .888442     SHAPE CONSTANT, N =  3.992480
     UNIT PEAK =   5.1738    CFS   UNIT VOLUME =    .9977       B =   354.67      P60 = 1.8700
     AREA =      .001896 SQ MI    IA =    .42500 INCHES    INF =   1.04000 INCHES PER HOUR
     RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =   .033333
```

```
PRINT HYD           ID=2 CODE=1

                                  PARTIAL HYDROGRAPH   120.00


    RUNOFF VOLUME =     1.45956 INCHES     =         .3355 ACRE-FEET
    PEAK DISCHARGE RATE =       9.86 CFS  AT   1.500 HOURS   BASIN AREA =    .0043 SQ. MI.



*
*S COMBINE 110 AND 120
*
ADD HYD                     ID=11 HYD NO=120ADD ID I=2 ID II=1
PRINT HYD                   ID=11 CODE=1

                                     HYDROGRAPH FROM AREA 120ADD


    RUNOFF VOLUME =     1.46689 INCHES     =         .7737 ACRE-FEET
    PEAK DISCHARGE RATE =      22.71 CFS  AT   1.500 HOURS   BASIN AREA =    .0099 SQ. MI.



*
*
*S**********
*S BASIN 130
*S**********
*
COMPUTE NM HYD      ID=3  HYD NO=130  DA=.00078 SQ MI
                                %A=0  %B=19  %C=20 %D=61
                                TP=0.13 HR
                                MASS RAINFALL=-1

     K =    .070850HR     TP =    .130000HR     K/TP RATIO =    .545000      SHAPE CONSTANT, N =  7.106420
     UNIT PEAK =    1.9262     CFS    UNIT VOLUME =     .9937        B =    526.28       P60 = 1.8700
     AREA =       .000476 SQ MI     IA =     .10000 INCHES     INF =     .04000 INCHES PER HOUR
     RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =    .033333


     K =    .115183HR     TP =    .130000HR     K/TP RATIO =    .886026      SHAPE CONSTANT, N =  4.004124
     UNIT PEAK =    .83174     CFS    UNIT VOLUME =     .9845        B =    355.44       P60 = 1.8700
     AREA =       .000304 SQ MI     IA =     .42308 INCHES     INF =    1.03462 INCHES PER HOUR
     RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =    .033333

PRINT HYD           ID=3 CODE=1

                                  PARTIAL HYDROGRAPH   130.00


    RUNOFF VOLUME =     1.51863 INCHES     =         .0632 ACRE-FEET
    PEAK DISCHARGE RATE =       1.85 CFS  AT   1.500 HOURS   BASIN AREA =    .0008 SQ. MI.



*
*
*S COMBINE 120ADD AND 130
*
ADD HYD                     ID=13 HYD NO=130ADD ID I=3 ID II=11
PRINT HYD                   ID=13 CODE=1
```

HYDROGRAPH FROM AREA 130ADD

RUNOFF VOLUME = 1.47064 INCHES = .8369 ACRE-FEET
PEAK DISCHARGE RATE = 24.55 CFS AT 1.500 HOURS BASIN AREA = .0107 SQ. MI.

*
*
*
*
*
*
*
*
*
*
*
*
*
*
*
FINISH

NORMAL PROGRAM FINISH END TIME (HR:MIN:SEC) = 18:05:07

```
*
*                    SUNDORO UNIT 9 SUBDIVISION
*                HYDROLOGIC MODEL--DEVELOPED CONDITIONS
*                          21 MARCH 2005
*
*
*******************************************************************************
*
*       HYDROLOGIC MODEL FOR OFFSITE AND ONSITE BASINS
*       100-YEAR, 6-HOUR STORM:
*
*
*
*       PRECIPITATION:
*               P60 =   1.87"
*               P360 =  2.20"
*               P1440 = 2.66"
*
*
*
*******************************************************************************
*
START                TIME=0.0 HR  PUNCH CODE=0
*
*
*
RAINFALL             TYPE=1   RAIN QUARTER=0.0 IN
                    RAIN ONE=1.87 IN✓ RAIN SIX=2.20 IN ✓
                    RAIN DAY=2.66 IN✓ DT=0.033333 HRS
*
*
*
*
*S*******************************************************************************
*
*
*
*S**********
*S BASIN 110
*S**********
*
*
COMPUTE NM HYD       ID=1  HYD NO=110  DA=.00558 SQ MI
                        %A=0  %B=21  %C=22 %D=57
                     TP=0.13 HR
                     MASS RAINFALL=-1
PRINT HYD            ID=1 CODE=1
*
*
*S**********
*S BASIN 120
*S**********
*
COMPUTE NM HYD       ID=2  HYD NO=120  DA=.00431 SQ MI
                        %A=0  %B=22  %C=22 %D=56
                     TP=0.13 HR
                     MASS RAINFALL=-1
PRINT HYD            ID=2 CODE=1
*
*S COMBINE 110 AND 120
*
ADD HYD          ID=11 HYD NO=120ADD ID I=2 ID II=1
PRINT HYD                ID=11 CODE=1
```

```
*
*
*S**********
*S BASIN 130
*S**********
*
COMPUTE NM HYD       ID=3  HYD NO=130  DA=.00078 SQ MI
                          %A=0  %B=19  %C=20 %D=61
                        TP=0.13 HR
                        MASS RAINFALL=-1
PRINT HYD            ID=3 CODE=1
*
*
*S COMBINE 120ADD AND 130
*
ADD HYD           ID=13 HYD NO=130ADD ID I=3 ID II=11
PRINT HYD                 ID=13 CODE=1
*
*
*
*
*
*
*
*
*
*
*
*
*
*
*
FINISH
```

Calculate 10 day Volume for Sundoro Unit 9

Zone 1 6hr = 2.20 inches 10 days = 3.67 inches

$$V_{10} = V_{6hrs} + A_D * (P_{10days} - P_{6hrs})/12$$

1.97

Basin	Area	%D	Area D	V6hr	V10day
110	3.57ac	57	2.03ac	0.438ac-ft	0.687
120	2.76ac	56	1.55ac	0.336	0.526
130	0.50ac	61	0.31ac	0.063	0.101
			3.89ac	Total	1.314ac-ft
			> 3.75ac		
			Type D allowed in Goodwin Report		

APPENDIX B
HYDRAULIC CALCULATIONS

Echelon Drive
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	0.011800 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	
24.00	0.28	
36.00	0.04	
38.00	0.00	
38.10	0.33	
44.00	0.45	
48.00	0.53	
Discharge	9.86	cfs

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	36.00	0.017
36.00	38.10	0.013
38.10	44.00	0.025
44.00	48.00	0.013

Results		
Wtd. Mannings Coefficient	0.015	
Water Surface Elevation	0.26	ft
Flow Area	3.47	ft²
Wetted Perimeter	26.80	ft
Top Width	26.40	ft
Height	0.26	ft
Critical Depth	0.30	ft
Critical Slope	0.006138	ft/ft
Velocity	2.84	ft/s
Velocity Head	0.13	ft
Specific Energy	0.39	ft
Froude Number	1.38	
Flow is supercritical.		
Flow is divided.		

Silica Ave West End of Subdivision
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	0.025000 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
24.00	0.28
36.00	0.04
38.00	0.00
38.10	0.33
44.00	0.45
48.00	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	36.00	0.017
36.00	38.10	0.013
38.10	44.00	0.025
44.00	48.00	0.013

Discharge	12.84	cfs

Results		
Wtd. Mannings Coefficient	0.014	
Water Surface Elevation	0.25	ft
Flow Area	3.17	ft²
Wetted Perimeter	25.64	ft
Top Width	25.26	ft
Height	0.25	ft
Critical Depth	0.33	ft
Critical Slope	0.006066	ft/ft
Velocity	4.05	ft/s
Velocity Head	0.25	ft
Specific Energy	0.51	ft
Froude Number	2.01	
Flow is supercritical.		
Flow is divided.		

Silica Ave just west of Echelon Drive
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	0.005000 ft/ft	
Elevation range: 0.00 ft to 0.87 ft.		

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	0.87	0.00	4.00	0.013
4.00	0.79	4.00	10.00	0.025
10.00	0.67	10.00	12.00	0.013
10.10	0.00	12.00	36.00	0.017
12.00	0.04	36.00	38.10	0.013
24.00	0.28	38.10	44.00	0.025
36.00	0.04	44.00	48.00	0.013
38.00	0.00			
38.10	0.67			
44.00	0.79			
48.00	0.87			

Discharge	22.71	cfs

Results		
Wtd. Mannings Coefficient	0.016	
Water Surface Elevation	0.43	ft
Flow Area	8.01	ft²
Wetted Perimeter	28.77	ft
Top Width	28.03	ft
Height	0.43	ft
Critical Depth	0.41	ft
Critical Slope	0.005771	ft/ft
Velocity	2.83	ft/s
Velocity Head	0.12	ft
Specific Energy	0.55	ft
Froude Number	0.93	
Flow is subcritical.		

Silica west of Echelon at 2nd Inlets
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 0.005000 ft/ft

Elevation range: 0.00 ft to 0.87 ft.

Station (ft)	Elevation (ft)
0.00	0.87
4.00	0.79
10.00	0.67
10.10	0.00
12.00	0.04
24.00	0.28
36.00	0.04
38.00	0.00
38.10	0.67
44.00	0.79
48.00	0.87

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	36.00	0.017
36.00	38.10	0.013
38.10	44.00	0.025
44.00	48.00	0.013

Discharge 14.71 cfs

Results

Wtd. Mannings Coefficient	0.016	
Water Surface Elevation	0.36	ft
Flow Area	6.09	ft²
Wetted Perimeter	28.63	ft
Top Width	28.01	ft
Height	0.36	ft
Critical Depth	0.35	ft
Critical Slope	0.006049	ft/ft
Velocity	2.41	ft/s
Velocity Head	0.09	ft
Specific Energy	0.45	ft
Froude Number	0.91	

Flow is subcritical.

Silica west of Echelon at 3rd Inlets
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 0.005000 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	36.00	0.017
12.00	0.04	36.00	38.10	0.013
24.00	0.28	38.10	44.00	0.025
36.00	0.04	44.00	48.00	0.013
38.00	0.00			
38.10	0.33			
44.00	0.45			
48.00	0.53			

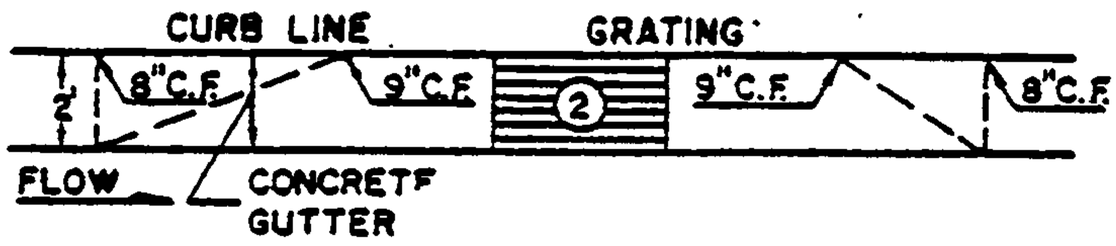
Discharge 8.96 cfs

Results

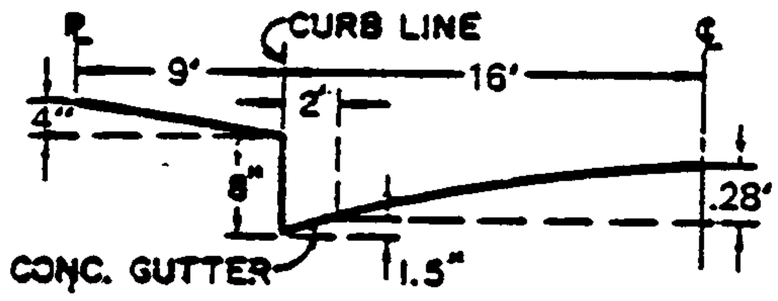
Wtd. Mannings Coefficient	0.015	
Water Surface Elevation	0.30	ft
Flow Area	4.41	ft²
Wetted Perimeter	28.53	ft
Top Width	28.08	ft
Height	0.30	ft
Critical Depth	0.29	ft
Critical Slope	0.006144	ft/ft
Velocity	2.03	ft/s
Velocity Head	0.06	ft
Specific Energy	0.36	ft
Froude Number	0.90	

Flow is subcritical.

GRATING CAPACITIES FOR TYPE "A" , "C" and "D"



GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)

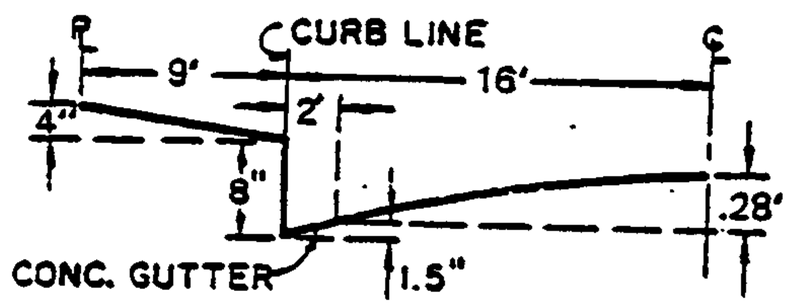
Silica Ave. just west of Echelon Drive
Q = 22.71 CFS S = 0.50% D = 0.41 ft
Q per inlet = 4.0 CFS x 2 inlets = 8.0 CFS
Q Remaining = 14.71 CFS

REV. 3-83

PLATE 22.3 D-5

GRATING CAPACITIES FOR TYPE DOUBLE "C," AND "D"

GRATING & GUTTER PLAN



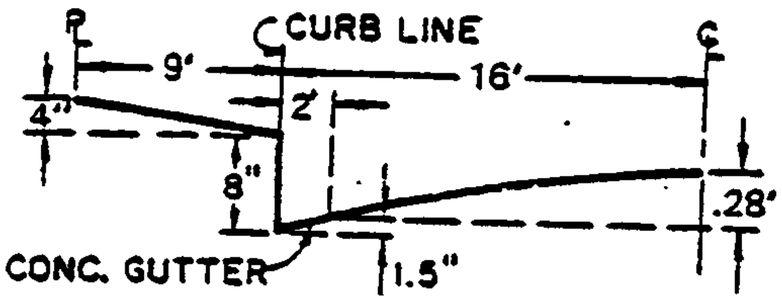
TYPICAL HALF STREET SECTION
(ABOVE BASIN)

D = DEPTH OF FLOW (FT.) ABOVE NORMAL GUTTER GRADE

Silica Ave west of Echelon Drive at 2nd Inlets
Q = 14.71 CFS S = 0.50% D = 0.36'
Q per inlet = 3.8CFS x 2 inlets = 7.6 CFS
Q remaining = 7.11 CFS

GRATING CAPACITIES FOR TYPE DOUBLE "C," AND "D"

GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)

D = DEPTH OF FLOW (FT.) ABOVE NORMAL GUTTER GRADE

Silica Avenue west of Echelon at 3rd Inlets
Q = 8.96 CFS S = 0.5% D = 0.30'
Q per inlet = 2.5 CFS X 2 inlets = 5.0 CFS
Q remaining = 3.96 CFS

CITY OF ALBUQUERQUE

April 20, 2011

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

Re: Sundoro South Unit 9 Subdivision, Grading and Drainage Plan and Drainage Report

Engineer's Stamp date Drainage Report 3-24-11 Grading Plan 4-18-11 (J09/D019C)

Dear Mr. Thompson,

Based upon the information provided in your submittal received 4-18-11, the above referenced report and plan are approved for Preliminary Plat action by the DRB.

Once that board approves the Grading Plan, Hydrology will issue a letter approving Grading Permit.

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

Sincerely,

Curtis A. Cherne

Curtis A. Cherne, P.E.
Principal Engineer, Planning Dept.
Development and Building Services

Copy: file

Scanned

PO Box 1293

Albuquerque

NM 87103

www.cabq.gov

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

PROJECT TITLE: SUNDORO SOUTH UNIT 9 SUBDIVISION ZONE MAP/DRG. FILE #: J9/D019C
DRB #: _____ EPC #: _____ WORK ORDER#: _____

LEGAL DESCRIPTION: LOT 37, TOWN OF ATRISCO GRANT
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: Dragonfly Development, 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: Wayjohn Surveying, Inc.
ADDRESS: 330 Louisiana Blvd. NE
CITY, STATE: Albuquerque, NM
CONTACT: Thomas Johnston
PHONE: 255-2052
ZIP CODE: 87108

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
__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

DATE SUBMITTED: April 18, 2011 BY: _____

RECEIVED
APR 18 2011

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

April 7, 2011

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

Re: Sundoro South Unit 9 Subdivision, Grading and Drainage Plan and Drainage Report

Engineer's Stamp dated 3-24-11 (J09/D019C)

Dear Mr. Thompson,

Based upon the information provided in your submittal received 3-25-11, the above referenced plan can not be approved for Preliminary Plat action by the DRB until the following comments are addressed.

- Provide a distance between the proposed retaining wall in the northeast corner of the subdivision and the existing retaining wall.
- It appears the retaining wall is an existing condition along the west edge of the subdivision.
- Please show the existing wall south of the subdivision.

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

Sincerely,

Curtis A. Cherne

Curtis A. Cherne, P.E.
Senior Engineer, Planning Dept.
Development and Building Services

Copy: file

PO Box 1293
Albuquerque
NM 87103
www.cabq.gov

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

PROJECT TITLE: SUNDORO SOUTH UNIT 9 SUBDIVISION ZONE MAP/DRG. FILE #: ~~J-9~~ J-09 D029C
DRB #: _____ EPC #: _____ WORK ORDER#: _____

LEGAL DESCRIPTION: LOT 37, TOWN OF ATRISCO GRANT
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: Dragonfly Development, 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: Wayjohn Surveying, Inc.
ADDRESS: 330 Louisiana Blvd. NE
CITY, STATE: Albuquerque, NM
CONTACT: Thomas Johnston
PHONE: 255-2052
ZIP CODE: 87108

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
__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
MAR 25 2011
HYDROLOGY SECTION

DATE SUBMITTED: March 25, 2011 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

May 11, 2011

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

Re: Sundoro South Unit 9 Subdivision, Grading and Drainage Plan and Drainage Report

Engineer's Stamp date Drainage Report 3-24-11 Grading Plan 5-5-11
(J09/D019C)

Dear Mr. Thompson,

Since the DRB approved the grading plan on 5-11-11, the above referenced plan is approved for the Grading Permit.

If you have any questions, you can contact me at 924-3986.

Sincerely,

Curtis A. Cherne, P.E.
Principal Engineer, Planning Dept.
Development and Building Services

Copy: file

PO Box 1293

Albuquerque

NM 87103

www.cabq.gov

CITY OF ALBUQUERQUE

May 6, 2011

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

Re: Sundoro South Unit 9 Subdivision, Grading and Drainage Plan and Drainage Report

Engineer's Stamp date Drainage Report 3-24-11 Grading Plan 5-5-11 (J09/D019C)

Dear Mr. Thompson,

Based upon the information provided in your submittal received 5-6-11, the above referenced report and plan are approved for Preliminary Plat action by the DRB.

Once that board approves the Grading Plan, Hydrology will issue a letter approving Grading Permit.

If you have any questions, you can contact me at 924-3986.

Sincerely,

Curtis A. Cherne

Curtis A. Cherne, P.E.
Principal Engineer, Planning Dept.
Development and Building Services

Copy: file

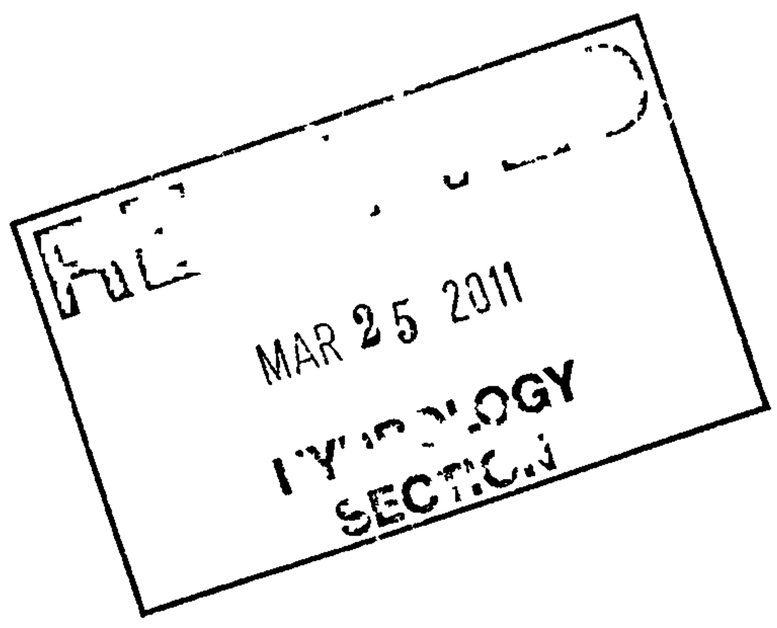
PO Box 1293

Albuquerque

NM 87103

www.cabq.gov

DRAINAGE REPORT
FOR
SUNDORO SOUTH UNIT 9
SUBDIVISION



MARCH 2011

DRAINAGE REPORT
FOR
SUNDORO SOUTH UNIT 9
SUBDIVISION

Prepared for:
DRAGONFLY DEVELOPMENT, INC.

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

March 2011

TABLE OF CONTENTS

PAGE

INTRODUCTION AND SITE LOCATION **1**

METHODOLOGY **1**

EXISTING DRAINAGE CONDITIONS **1**

INTRODUCTION 1
OFF-SITE FLOWS 1
ON-SITE FLOWS 2

DEVELOPED DRAINAGE CONDITIONS **2**

DRAINAGE BASIN DELINEATION 2
HYDROLOGIC ANALYSIS 4
DRAINAGE CONCEPT 4
Introduction *4*
Street Hydraulic Analysis *5*
Grading Plan *6*

APPENDIX A -- HYDROLOGIC CALCULATIONS

APPENDIX B -- HYDRAULIC CALCULATIONS

LIST OF PLATES

PAGE

PLATE 1 – GRADING PLAN — POCKET
PLATE 2 – DRAINAGE PLAN — POCKET
PLATE 3 – GOODWIN DMP DRAINAGE MAP — POCKET

LIST OF FIGURES

PAGE

FIGURE 1 FEMA FLOOD INSURANCE RATE MAP 3

LIST OF TABLES

PAGE

TABLE 1 EXISTING DRAINAGE CONDITIONS.....2
TABLE 2 DEVELOPED DRAINAGE CONDITIONS.....4
TABLE 3 STREET HYDRAULIC ANALYSIS 5

INTRODUCTION AND SITE LOCATION

The proposed Sundoro South Unit 9 Subdivision is located between Endee Road and I-40 just west of Sundoro South Unit 6 Subdivision. The 6.8-acre site is included in the Sundoro South Masterplan area. The property will be subdivided into 53 residential lots. This report specifically addresses the grading and drainage plan and analysis for Sundoro South Unit 9. following the Drainage Management Plan for Sundoro South Units 5,6, and 7 by Mark Goodwin and Associates dated October 29, 2004.

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 Sundoro South Unit 9 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 northwest to southeast at an average slope of about 2%. The site is sparsely vegetated with native grasses and scrub brush.

The FEMA Flood Insurance Rate Map Number 35001C0328 G, effective date September 26, 2008, 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.

OFF-SITE FLOWS

There are no offsite flows that reach the site.

ON-SITE FLOWS

For the existing conditions hydrologic analysis, Land Treatment Type A was used to determine peak flows. The peak flow from the site is 9.0 cfs. The majority of the site runoff drains to the southeast to an existing retention pond south of the site.

Table 1 Existing Drainage Conditions

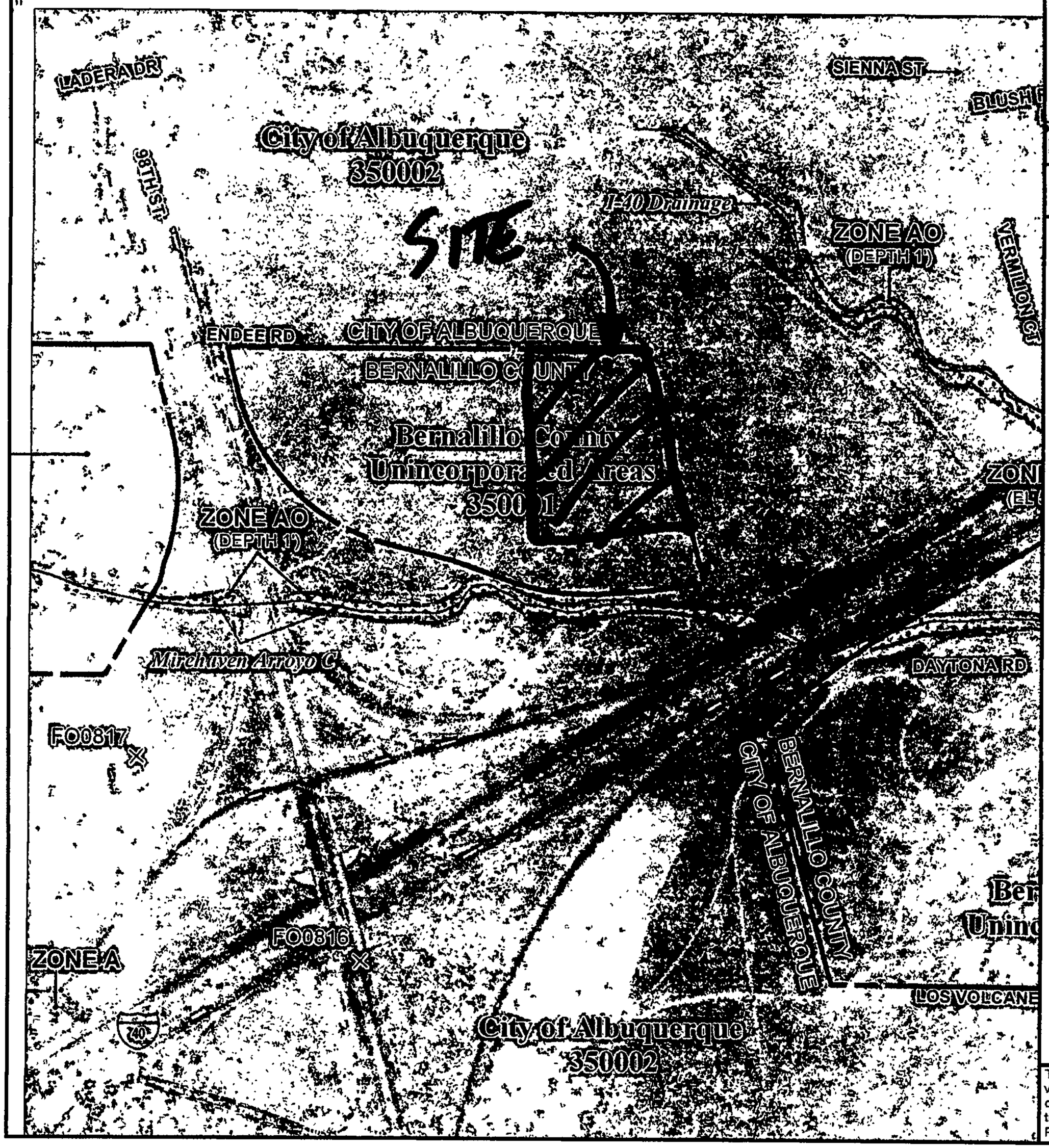
BASINS	Area (acres)	100yr-6hr Peak Flow (cfs)	100yr- 6hr Runoff Volume (acre-ft)	Land Treatment
ONSITE	6.8	9.04	0..250	100%A

6.69

DEVELOPED DRAINAGE CONDITIONS

DRAINAGE BASIN DELINEATION

This drainage plan follows the Drainage Management Plan for "Sundoro South Units 5, 6, and 7" dated October 29, 2004 by Mark Goodwin & Associates. Plate 2 shows that the site is divided into three drainage basins. Basins 110, 120, and 130 drain to Sundoro South Unit 6 Subdivision in Silica Avenue and is collected in a 24" storm drain, which discharges to a temporary detention pond at the southeast corner of the Sundoro subdivisions. BASINS 210 and 220 drain to Endee Road to the north and continue east until the street flows are collected by a storm drain system and discharged to the temporary detention pond. Basins 110, 120,130, 210, and 220 are the same as basin OF-4 in the Goodwin DMP (see Plate 3).



MAP SCALE 1" = 500'

0 500 1000 FEET

NFIP

PANEL 0328G

FIRM

FLOOD INSURANCE RATE MAP

BERNALILLO COUNTY, NEW MEXICO

AND INCORPORATED AREAS

PANEL 328 OF 825

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS

COMMUNITY	NUMBER	PANEL	SUFFIX
ALBUQUERQUE CITY OF	350002	0328	G
BERNALILLO COUNTY UNINCORPORATED AREAS	350001	0328	G

Notice to User The Map Number shown below should be used when placing map orders the Community Number shown above should be used on insurance applications for the subject community

MAP NUMBER
35001C0328G

MAP REVISED
SEPTEMBER 26, 2008

Federal Emergency Management Agency

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 1, which has a 100-year 6-hour storm event of 2.20 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)	100-yr 10day Runoff Volume (acre-ft)	Land Treatment
110	3.35	12.04	0.411	0.645	21% B, 22% C, 57% D
120	2.34	8.47	0.289	0.456	21% B, 21% C, 58% D
130	0.58	2.20	0.076	0.123	17% B, 18% C, 65% D
210	0.16	0.59	0.020	0.031	21% B, 22% C, 57% D
220	0.41	1.49	0.051	0.080	21% B, 21% C, 58% D

DRAINAGE CONCEPT

Introduction

As stated previously, this drainage plan follows the Drainage Management Plan for "Sundoro South Units 5, 6, and 7" dated October 29, 2004 by Mark Goodwin & Associates. Most of the developed runoff from Sundoro South Unit 9 (Basins 110, 120, and 130) is to be captured by the storm drain system in Silica Avenue and discharged to a temporary retention pond located south of Molten Drive. A small portion of the developed runoff (Basins 210 and 220) will drain to Endee Road and will also be captured by the storm drain system and discharge to the temporary retention pond. The temporary retention pond is sized to retain the 100-year, 10-day storm. According to the Goodwin DMP, at Silica Avenue a total of 24.5 cfs (Basin OF-4) is allowed to be discharged to the storm sewer.

Basins 110, 120, 130, 210, and 220 are the same as basin OF-4 in the Goodwin DMP. The total peak flow from basins 110, 120, 130, 210 and 220 is 24.78 cfs, which is slightly greater than the peak flow allowed by the Goodwin DMP.

The runoff from basins 110, 120, and 130 is collected in a series of storm inlets in Silica Avenue just west of Echelon Drive. A single type "A" inlet and two double type "C" inlets along each curb line connected by 18" RCP storm sewers collect a total of 20.5 cfs (see Appendix B). The street will have 20.5 cfs just east of the inlets. Further west a double "C" inlet along each curb line will collect a total of 7.6 cfs leaving 5.3 cfs in the street. At the second double "C" inlets a total of 7.5 cfs is flowing in the street. The second double "C" inlets will collect 5.0 cfs leaving 2.5 cfs in the street to be collected down stream by the Silica storm drain system. A 24" RCP will convey the flows collected by all of the inlets to the Silica storm sewer system.

The runoff from basins 210 and 220 will discharge directly to Endee Road. This runoff will be collected by a storm drain system further downstream in Endee Road. This storm drain system discharges to the same temporary retention pond that the Silica storm drain system discharges to. A total of 2.08 CFS will discharge to Endee Road from these basins.

Street Hydraulic Analysis

A hydraulic analysis of the street flows was completed to determine normal depth and sequent depth of the flow (see Appendix B). The sequent depth must remain within the street right-of-way. Therefore, the sequent depth must be equal to or less than 0.51 feet or 0.85 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 0.51 feet for a street section with mountable curb and gutter, then the sequent depth is also less than 0.51 feet. Mountable curb and gutter is used throughout the subdivision except at the storm inlets in Silica Avenue. 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)
Ekarma Drive	28	1.18	Mountable	8.47	0.25	0.37
Silica Avenue west of Ekarma	28	2.50	Mountable	12.04	0.24	0.49
Silica Avenue west of 1st Inlets	28	0.50	Standard	20.50	0.40	0.50

Grading Plan

Plate 1 shows the Mass Grading Plan for the subdivision. The grading plan shows that the subdivision will drain from northwest to southeast and into the proposed storm drain in Silica Avenue.

APPENDIX A
HYDROLOGIC CALCULATIONS

AHYMO PROGRAM SUMMARY TABLE (AHYMO_97) - - VERSION: 1997.02c RUN DATE (MON/DAY/YR) =03/24/2011
INPUT FILE = C:\PROGRA~1\AHYMO_97\HYDEXT~1.TXT USER NO.= AHYMO-I-9702a01000K21-AH

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
START										TIME= .00
RAINFALL TYPE= 1										RAIN6= 2.200
*S**********										
*S**********										
*S BASIN ON-SITE										
*S**********										
COMPUTE NM HYD	ON-SITE	-	1	.01069	9.04	.250	.43922	1.533	1.321	PER IMP= .00
FINISH										

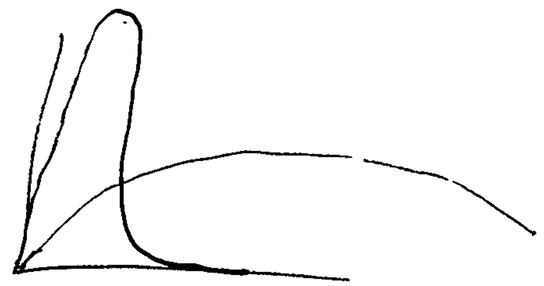
AHYMO PROGRAM SUMMARY TABLE (AHYMO_97) - - VERSION: 1997.02c RUN DATE (MON/DAY/YR) =03/24/2011
INPUT FILE = C:\PROGRA~1\AHYMO_97\HYDDEV~1.TXT USER NO.= AHYMO-I-9702a01000K21-AH

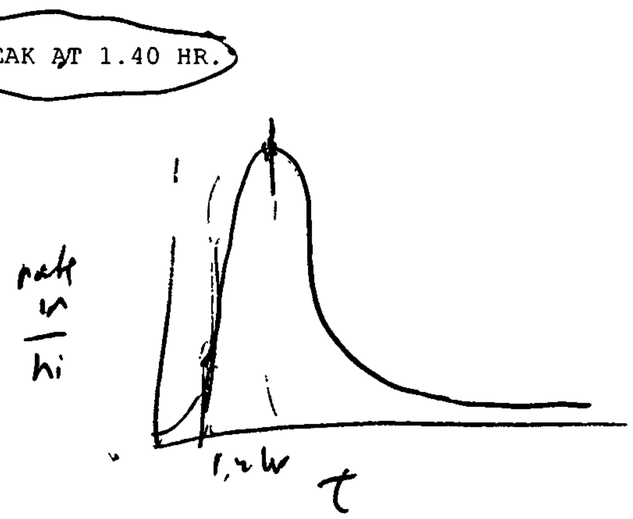
COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION	
START										TIME=	.00
RAINFALL TYPE= 1										RAIN6=	2.200
*S**********											
*S BASIN 110											
*S**********											
COMPUTE NM HYD	110.00	-	1	.00523	12.04	.411	1.47264	1.500	3.597	PER IMP=	57.00
*S**********											
*S BASIN 120											
*S**********											
COMPUTE NM HYD	120.00	-	2	.00366	8.47	.289	1.48256	1.500	3.614	PER IMP=	58.00
*S COMBINE 110 AND 120											
ADD HYD	120ADD	2& 1	11	.00889	20.51	.700	1.47666	1.500	3.604		
*S**********											
*S BASIN 130											
*S**********											
COMPUTE NM HYD	130.00	-	3	.00091	2.20	.076	1.56462	1.500	3.774	PER IMP=	65.00
*S COMBINE 120ADD AND 130											
ADD HYD	130ADD	3&11	13	.00980	22.70	.776	1.48480	1.500	3.620		
*S**********											
*S BASIN 210											
*S**********											
COMPUTE NM HYD	210.00	-	4	.00025	.59	.020	1.47264	1.500	3.693	PER IMP=	57.00
*S**********											
*S BASIN 220											
*S**********											
COMPUTE NM HYD	220.00	-	5	.00064	1.49	.051	1.48256	1.500	3.646	PER IMP=	58.00
FINISH											

```
    AHYMO PROGRAM (AHYMO_97) -                          - Version:  1997.02c
         RUN DATE (MON/DAY/YR) = 03/24/2011
         START TIME (HR:MIN:SEC) = 13:27:45     USER NO.= AHYMO-I-9702a01000K21-AH
         INPUT FILE = C:\PROGRA~1\AHYMO_97\HYDDEV~1.TXT

*
*                    SUNDORO UNIT 9 SUBDIVISION
*                HYDROLOGIC MODEL--DEVELOPED CONDITIONS
*                           24 MARCH 2011
*
*
*******************************************************************************
*
*       HYDROLOGIC MODEL FOR OFFSITE AND ONSITE BASINS
*       100-YEAR, 6-HOUR STORM:
*
*
*
*       PRECIPITATION:
*               P60 =   1.87"
*               P360 =  2.20"
*               P1440 = 2.66"
*
*
*
*******************************************************************************
*
START               TIME=0.0 HR  PUNCH CODE=0
*
*
RAINFALL            TYPE=1   RAIN QUARTER=0.0 IN
                             RAIN ONE=1.87 IN  RAIN SIX=2.20 IN
                             RAIN DAY=2.66 IN  DT=0.033333 HRS

COMPUTED 6-HOUR RAINFALL DISTRIBUTION BASED ON NOAA ATLAS 2 - PEAK AT 1.40 HR.
DT =     .033333 HOURS        END TIME =     5.999940 HOURS
   .0000   .0016   .0033   .0050   .0067   .0085   .0103
   .0122   .0141   .0160   .0180   .0201   .0222   .0243
   .0266   .0289   .0312   .0337   .0362   .0388   .0415
   .0443   .0472   .0502   .0534   .0567   .0601   .0637
   .0675   .0715   .0758   .0810   .0865   .0924   .1051
   .1335   .1773   .2400   .3257   .4384   .5820   .7607
   .9789  1.1808  1.2652  1.3365  1.4000  1.4577  1.5108
  1.5602  1.6063  1.6495  1.6902  1.7285  1.7648  1.7991
  1.8316  1.8624  1.8917  1.9194  1.9458  1.9519  1.9576
  1.9631  1.9683  1.9732  1.9780  1.9826  1.9870  1.9912
  1.9953  1.9993  2.0031  2.0068  2.0105  2.0140  2.0174
  2.0207  2.0240  2.0272  2.0303  2.0333  2.0363  2.0392
  2.0420  2.0448  2.0476  2.0502  2.0529  2.0554  2.0580
  2.0605  2.0629  2.0653  2.0677  2.0701  2.0724  2.0746
  2.0769  2.0791  2.0812  2.0834  2.0855  2.0876  2.0896
  2.0916  2.0936  2.0956  2.0976  2.0995  2.1014  2.1033
```





```
                2.1052  2.1070  2.1088  2.1106  2.1124  2.1142  2.1159
                2.1176  2.1193  2.1210  2.1227  2.1244  2.1260  2.1276
                2.1292  2.1308  2.1324  2.1340  2.1355  2.1371  2.1386
                2.1401  2.1416  2.1431  2.1446  2.1461  2.1475  2.1489
                2.1504  2.1518  2.1532  2.1546  2.1560  2.1573  2.1587
                2.1601  2.1614  2.1627  2.1641  2.1654  2.1667  2.1680
                2.1693  2.1705  2.1718  2.1731  2.1743  2.1756  2.1768
                2.1780  2.1793  2.1805  2.1817  2.1829  2.1841  2.1852
                2.1864  2.1876  2.1887  2.1899  2.1911  2.1922  2.1933
                2.1945  2.1956  2.1967  2.1978  2.1989  2.2000

*
*
*
*
*S*************************************************************************
*
*
*
*S**********
*S BASIN 110
*S**********
*
*
COMPUTE NM HYD      ID=1  HYD NO=110  DA=.00523 SQ MI
                            %A=0  %B=21  %C=22 %D=57
                          TP=0.13 HR
                          MASS RAINFALL=-1
     K =    .070850HR    TP =    .130000HR    K/TP RATIO =    .545000     SHAPE CONSTANT, N =  7.106420
     UNIT PEAK =  12.068  CFS   UNIT VOLUME =     .9991       B =   526.28      P60 = 1.8700
     AREA =      .002981 SQ MI    IA =     .10000 INCHES    INF =    .04000 INCHES PER HOUR
     RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =    .033333


     K =    .115213HR    TP =    .130000HR    K/TP RATIO =    .886251     SHAPE CONSTANT, N =  4.003041
     UNIT PEAK =  6.1477  CFS   UNIT VOLUME =     .9982       B =   355.37      P60 = 1.8700
     AREA =      .002249 SQ MI    IA =     .42326 INCHES    INF =   1.03512 INCHES PER HOUR
     RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =    .033333

PRINT HYD           ID=1 CODE=1

                                PARTIAL HYDROGRAPH   110.00


    RUNOFF VOLUME =     1.47264 INCHES      =        .4108 ACRE-FEET
    PEAK DISCHARGE RATE =     12.04 CFS   AT   1.500 HOURS   BASIN AREA =    .0052 SQ. MI.


*
*
*S**********
*S BASIN 120
```

```
*S**********
*
COMPUTE NM HYD      ID=2  HYD NO=120  DA=.00366 SQ MI
                                %A=0  %B=21  %C=21 %D=58
                               TP=0.13 HR
                               MASS RAINFALL=-1

     K =   .070850HR    TP =   .130000HR    K/TP RATIO =   .545000     SHAPE CONSTANT, N =  7.106420
     UNIT PEAK =  8.5937   CFS   UNIT VOLUME =    .9987       B =   526.28      P60 = 1.8700
     AREA =      .002123 SQ MI    IA =    .10000 INCHES    INF =    .04000 INCHES PER HOUR
     RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =   .033333


     K =   .115498HR    TP =   .130000HR    K/TP RATIO =   .888442     SHAPE CONSTANT, N =  3.992480
     UNIT PEAK =  4.1938   CFS   UNIT VOLUME =    .9972       B =   354.67      P60 = 1.8700
     AREA =      .001537 SQ MI    IA =    .42500 INCHES    INF =   1.04000 INCHES PER HOUR
     RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =   .033333

PRINT HYD           ID=2 CODE=1

                                  PARTIAL HYDROGRAPH   120.00


    RUNOFF VOLUME =     1.48256 INCHES     =        .2894 ACRE-FEET
    PEAK DISCHARGE RATE =      8.47 CFS AT   1.500 HOURS   BASIN AREA =    .0037 SQ. MI.

*
*S COMBINE 110 AND 120
*
ADD HYD                    ID=11 HYD NO=120ADD ID I=2 ID II=1
PRINT HYD                  ID=11 CODE=1

                                  HYDROGRAPH FROM AREA 120ADD


    RUNOFF VOLUME =     1.47666 INCHES     =        .7001 ACRE-FEET
    PEAK DISCHARGE RATE =     20.51 CFS AT   1.500 HOURS   BASIN AREA =    .0089 SQ. MI.


*
*
*S**********
*S BASIN 130
*S**********
*
COMPUTE NM HYD      ID=3  HYD NO=130  DA=.00091 SQ MI
                                %A=0  %B=17  %C=18 %D=65
                               TP=0.13 HR
                               MASS RAINFALL=-1

     K =   .070850HR    TP =   .130000HR    K/TP RATIO =   .545000     SHAPE CONSTANT, N =  7.106420
```

```
     UNIT PEAK =    2.3946    CFS   UNIT VOLUME =     .9954       B =    526.28      P60 = 1.8700
     AREA =       .000592 SQ MI    IA =     .10000 INCHES    INF =     .04000 INCHES PER HOUR
     RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =    .033333


     K =    .115147HR    TP =    .130000HR    K/TP RATIO =    .885750     SHAPE CONSTANT, N =  4.005468
     UNIT PEAK =    .87106    CFS   UNIT VOLUME =     .9845       B =    355.53      P60 = 1.8700
     AREA =       .000319 SQ MI    IA =     .42286 INCHES    INF =   1.03400 INCHES PER HOUR
     RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =    .033333

PRINT HYD           ID=3 CODE=1

                                  PARTIAL HYDROGRAPH   130.00


    RUNOFF VOLUME =     1.56462 INCHES      =        .0759 ACRE-FEET
    PEAK DISCHARGE RATE =      2.20 CFS  AT   1.500 HOURS   BASIN AREA =    .0009 SQ. MI.


*
*
*S COMBINE 120ADD AND 130
*
ADD HYD                    ID=13 HYD NO=130ADD ID I=3 ID II=11
PRINT HYD                  ID=13 CODE=1

                                  HYDROGRAPH FROM AREA 130ADD

    RUNOFF VOLUME =     1.48480 INCHES      =        .7761 ACRE-FEET
    PEAK DISCHARGE RATE =     22.70 CFS  AT   1.500 HOURS   BASIN AREA =    .0098 SQ. MI.


*
*
*S**********
*S BASIN 210
*S**********
*
COMPUTE NM HYD      ID=4  HYD NO=210  DA=.00025 SQ MI
                                %A=0  %B=21  %C=22 %D=57
                              TP=0.13 HR
                              MASS RAINFALL=-1

     K =    .070850HR    TP =    .130000HR    K/TP RATIO =    .545000     SHAPE CONSTANT, N =  7.106420
     UNIT PEAK =    .57688    CFS   UNIT VOLUME =     .9809       B =    526.28      P60 = 1.8700
     AREA =       .000143 SQ MI    IA =     .10000 INCHES    INF =     .04000 INCHES PER HOUR
     RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =    .033333


     K =    .115213HR    TP =    .130000HR    K/TP RATIO =    .886251     SHAPE CONSTANT, N =  4.003041
     UNIT PEAK =    .29387    CFS   UNIT VOLUME =     .9546       B =    355.37      P60 = 1.8700
```

```
     AREA =      .000108 SQ MI    IA =     .42326 INCHES    INF =    1.03512 INCHES PER HOUR
     RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =    .033333

PRINT HYD           ID=4 CODE=1

                                   PARTIAL HYDROGRAPH   210.00


    RUNOFF VOLUME =     1.47264 INCHES      =        .0196 ACRE-FEET
    PEAK DISCHARGE RATE =       .59 CFS AT   1.500 HOURS   BASIN AREA =    .0003 SQ. MI.


*
*
*S**********
*S BASIN 220
*S**********
*
COMPUTE NM HYD      ID=5  HYD NO=220  DA=.00064 SQ MI
                            %A=0  %B=21  %C=21 %D=58
                          TP=0.13 HR
                          MASS RAINFALL=-1

     K =    .070850HR    TP =    .130000HR    K/TP RATIO =    .545000     SHAPE CONSTANT, N =  7.106420
     UNIT PEAK =  1.5027   CFS  UNIT VOLUME =     .9926       B =    526.28      P60 = 1.8700
     AREA =      .000371 SQ MI    IA =     .10000 INCHES    INF =     .04000 INCHES PER HOUR
     RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =    .033333

     K =    .115498HR    TP =    .130000HR    K/TP RATIO =    .888442     SHAPE CONSTANT, N =  3.992480
     UNIT PEAK =  .73335   CFS  UNIT VOLUME =     .9828       B =    354.67      P60 = 1.8700
     AREA =      .000269 SQ MI    IA =     .42500 INCHES    INF =    1.04000 INCHES PER HOUR
     RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =    .033333

PRINT HYD           ID=5 CODE=1

                                   PARTIAL HYDROGRAPH   220.00


    RUNOFF VOLUME =     1.48256 INCHES      =        .0506 ACRE-FEET
    PEAK DISCHARGE RATE =      1.49 CFS AT   1.500 HOURS   BASIN AREA =    .0006 SQ. MI.


*
*
*
*
*
*
*
*
*
*
```

```
*
*
*
*
*
FINISH

    NORMAL PROGRAM FINISH          END TIME (HR:MIN:SEC) = 13:27:45
```

Calculate 10 day Volume for Basins

Zone 1 6hr = 2.20 inches 10day = 3.67 inches

$$V_{10day} = V_{6hrs} + A_D\,(P_{10days} - P_{6hrs})/12$$

Basin	Area	% D	Area D	V6hr	V10day
110	3.35ac	57	1.91	0.411ac-ft	0.645
120	2.34	58	1.36	0.289	0.456
130	0.58	65	0.38	0.076	0.123
210	0.16	57	~~0.10~~ 0.09	0.020	~~0.030~~ 0.031
220	0.41	58	0.24	0.051	0.080

TOTAL V_{10day} ~~1.335~~ 1.335 ac-ft

APPENDIX B
HYDRAULIC CALCULATIONS

E Karma
~~Echelon~~ Drive

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 0.011800 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	36.00	0.017
12.00	0.04	36.00	38.10	0.013
24.00	0.28	38.10	44.00	0.025
36.00	0.04	44.00	48.00	0.013
38.00	0.00			
38.10	0.33			
44.00	0.45			
48.00	0.53			

Discharge 9.86 cfs

Results

Wtd. Mannings Coefficient	0.015	
Water Surface Elevation	0.26	ft
Flow Area	3.47	ft²
Wetted Perimeter	26.80	ft
Top Width	26.40	ft
Height	0.26	ft
Critical Depth	0.30	ft
Critical Slope	0.006138	ft/ft
Velocity	2.84	ft/s
Velocity Head	0.13	ft
Specific Energy	0.39	ft
Froude Number	1.38	

Flow is supercritical.

Flow is divided.

Silica Ave West End of Subdivision
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	0.025000 ft/ft	
Elevation range: 0.00 ft to 0.53 ft.		
Discharge	12.84	cfs

Station (ft)	Elevation (ft)
0.00	0.53
4.00	0.45
10.00	0.33
10.10	0.00
12.00	0.04
24.00	0.28
36.00	0.04
38.00	0.00
38.10	0.33
44.00	0.45
48.00	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	36.00	0.017
36.00	38.10	0.013
38.10	44.00	0.025
44.00	48.00	0.013

Results		
Wtd. Mannings Coefficient	0.014	
Water Surface Elevation	0.25	ft
Flow Area	3.17	ft²
Wetted Perimeter	25.64	ft
Top Width	25.26	ft
Height	0.25	ft
Critical Depth	0.33	ft
Critical Slope	0.006066	ft/ft
Velocity	4.05	ft/s
Velocity Head	0.25	ft
Specific Energy	0.51	ft
Froude Number	2.01	
Flow is supercritical.		
Flow is divided.		

EKarma

Silica Ave just west of Echelon Drive
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	0.005000 ft/ft	
Elevation range: 0.00 ft to 0.87 ft.		
Discharge	22.71	cfs

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	0.87	0.00	4.00	0.013
4.00	0.79	4.00	10.00	0.025
10.00	0.67	10.00	12.00	0.013
10.10	0.00	12.00	36.00	0.017
12.00	0.04	36.00	38.10	0.013
24.00	0.28	38.10	44.00	0.025
36.00	0.04	44.00	48.00	0.013
38.00	0.00			
38.10	0.67			
44.00	0.79			
48.00	0.87			

Results		
Wtd. Mannings Coefficient	0.016	
Water Surface Elevation	0.43	ft
Flow Area	8.01	ft²
Wetted Perimeter	28.77	ft
Top Width	28.03	ft
Height	0.43	ft
Critical Depth	0.41	ft
Critical Slope	0.005771	ft/ft
Velocity	2.83	ft/s
Velocity Head	0.12	ft
Specific Energy	0.55	ft
Froude Number	0.93	
Flow is subcritical.		

Silica west of Echelon at 2nd Inlets
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	0.005000 ft/ft	
Elevation range: 0.00 ft to 0.87 ft.		
Discharge	14.71	cfs

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	0.87	0.00	4.00	0.013
4.00	0.79	4.00	10.00	0.025
10.00	0.67	10.00	12.00	0.013
10.10	0.00	12.00	36.00	0.017
12.00	0.04	36.00	38.10	0.013
24.00	0.28	38.10	44.00	0.025
36.00	0.04	44.00	48.00	0.013
38.00	0.00			
38.10	0.67			
44.00	0.79			
48.00	0.87			

Results		
Wtd. Mannings Coefficient	0.016	
Water Surface Elevation	0.36	ft
Flow Area	6.09	ft²
Wetted Perimeter	28.63	ft
Top Width	28.01	ft
Height	0.36	ft
Critical Depth	0.35	ft
Critical Slope	0.006049	ft/ft
Velocity	2.41	ft/s
Velocity Head	0.09	ft
Specific Energy	0.45	ft
Froude Number	0.91	
Flow is subcritical.		

Silica west of Echelon at 3rd Inlets
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	0.005000 ft/ft	
Elevation range: 0.00 ft to 0.53 ft.		

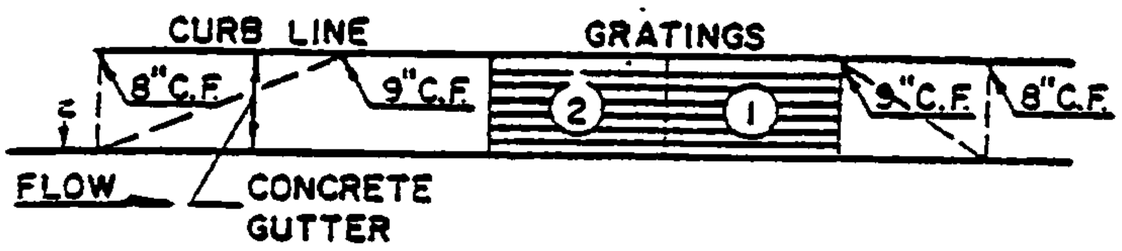
Station (ft)	Elevation (ft)
0.00	0.53
4.00	0.45
10.00	0.33
10.10	0.00
12.00	0.04
24.00	0.28
36.00	0.04
38.00	0.00
38.10	0.33
44.00	0.45
48.00	0.53

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	36.00	0.017
36.00	38.10	0.013
38.10	44.00	0.025
44.00	48.00	0.013

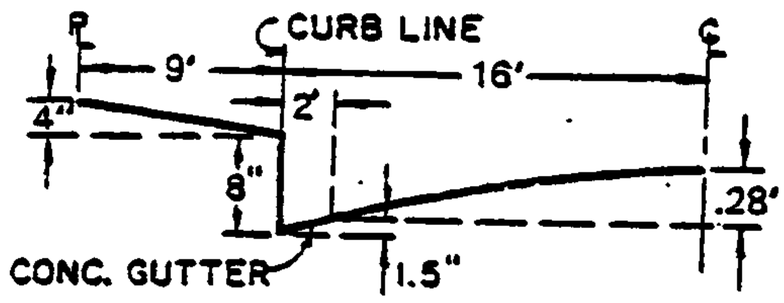
Discharge	8.96	cfs

Results		
Wtd. Mannings Coefficient	0.015	
Water Surface Elevation	0.30	ft
Flow Area	4.41	ft^2
Wetted Perimeter	28.53	ft
Top Width	28.08	ft
Height	0.30	ft
Critical Depth	0.29	ft
Critical Slope	0.006144	ft/ft
Velocity	2.03	ft/s
Velocity Head	0.06	ft
Specific Energy	0.36	ft
Froude Number	0.90	
Flow is subcritical.		

GRATING CAPACITIES FOR TYPE DOUBLE "C," AND "D"



GRATING & GUTTER PLAN

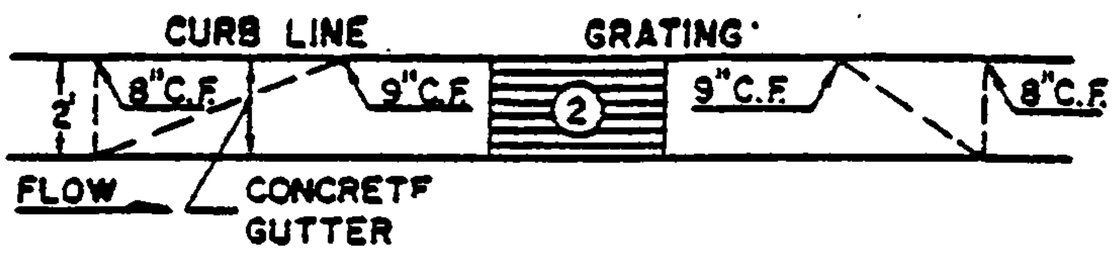


TYPICAL HALF STREET SECTION
(ABOVE BASIN)

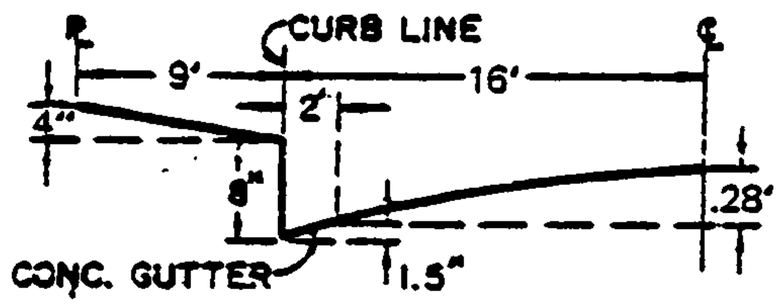
D = DEPTH OF FLOW (FT.) ABOVE NORMAL GUTTER GRADE

Silica Ave west of Echelon Drive at 2nd Inlets
Q = 14.71 CFS S = 0.50% D = 0.36'
$Q_{per\ inlet}$ = 3.8CFS x 2 Inlets = 7.6 CFS
$Q_{remaining}$ = 7.11 CFS

GRATING CAPACITIES FOR TYPE "A" , "C" and "D"



GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)

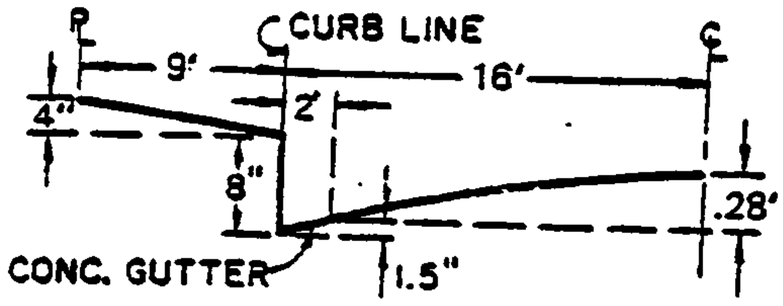
Silica Ave. just west of Eucalyptus Drive
Q = 22.71 CFS S = 0.50% L = 0.41 ft
Q per inlet = 40 CFS x 2 inlets = 80.0 CFS
Q Remaining = 14.71 CFS

REV. 3-83

PLATE 22.3 D-5

GRATING CAPACITIES FOR TYPE DOUBLE "C," AND "D"

GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)

D = DEPTH OF FLOW (FT.) ABOVE NORMAL GUTTER GRADE

Silica Avenue west of Echelon at 3rd Inlets
Q = 8.96 CFS S = 0.5% D = 0.30'
Q per inlet = 2.5 CFS X 2 inlets = 5.0 CFS
Q remaining = 3.96 CFS