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File FPP-1995-181
Date 11/15/99

Present	Scanned	
		A few items are denoted with an asterisk (*), which means they are to be scanned for permanent record on the ISYS retrieval system. In some instances, not all entries designated to be scanned, are present in the file. There are also documents specific to certain files, not found on the standard list. For this reason, a checklist has been included. **Remaining items, (not selected for scanning), will be marked present on the checklist. This index can serve as a quick guide for the contents of each file.** **Files denoted with (**) are to be located using the ISYS Query System. Planning Clearance will need to be typed in full, as well as other entries such as Ordinances, Resolutions, Board of Appeals, and etc.**
X	X	***Summary Sheet – Table of Contents**
X	X	Application form
		Receipts for fees paid for anything
X	X	***Submittal checklist**
X	X	***General project report**
		Reduced copy of final plans or drawings
X	X	Reduction of assessor's map
		Evidence of title, deeds
X	X	***Mailing list**
		Public notice cards
		Record of certified mail
X		Legal description
		Appraisal of raw land
		Reduction of any maps – final copy
		***Final reports for drainage and soils (geotechnical reports)**
		Other bound or nonbound reports
		Traffic studies
X		Individual review comments from agencies
X	X	***Consolidated review comments list**
X	X	***Petitioner's response to comments**
X	X	***Staff Reports**
		***Planning Commission staff report and exhibits**
		***City Council staff report and exhibits**
		***Summary sheet of final conditions**
		***Letters and correspondence dated after the date of final approval (pertaining to change in conditions or expiration date)**

DOCUMENTS SPECIFIC TO THIS DEVELOPMENT FILE:

X	X	South Rim – Filing No. 4 - Map	X		Letter from Jody Kliska to David Berhorst – 7/24/96
X	X	Street Plan & Profile	X		Articles of Incorporation
X	X	Bicycle Path Plan	X		Certificate of Incorporation to South Rim
X	X	Location Map	X	X	Letter from Philip Hart to Jody Kliska – 12/8/95
X	X	Letter from Michael T. Drollinger – 9/5/95	X		Posting of Public Notice Signs
X	X	Aerial Map	X	X	Planning Commission Public Hearing - ** - 11/7/95
X		Pre-Annexation Agreement	X		Development Fees
X	X	Development Improvements Agreement - **	X		First American Title Company
X	X	Disbursement Agreement - **	X		Treasurer's Certificate of Taxes Due – 9/29/95
X		Amendment and Third Supplement to the Declaration of Covenants, conditions and Restrictions	X	X	Subsurface Soils Exploration
X		By-laws of South Rim Homeowners Asoc., Inc.			
X		Form for approval of fiing & recording – 1/10/95			
X		UCC sign-off			
X	X	Letter from Jody Kliska to David Berhorst – 12/16/95			

SUBMITTAL CHECKLIST

MAJOR SUBDIVISION: FINAL

Location: End of South Rim Drive Project Name: South Rim Filing #4

Date Received _____

Receipt # 2986

File # FFP-95-181

DESCRIPTION $855.00

ITEMS	SSID REFERENCE	● City Community Development	● City Dev. Eng.	● City Utility Eng.	● City Property Agent	● ~~City Parks & Recreation~~	● City Fire Department	● City Attorney	● City G.J.P.C. (8 sets)	O City Downtown Dev. Auth.	● City Police	O County Planning	O County Building Department	● County Surveyor	O Walker Field	● School Dist. #51	O Irrigation District	● Drainage District – Redlands	● Water District – Ute	O Sewer District	● U.S. West	● Public Service	O GVRP	O CDOT	O Corps of Engineers	O Colorado Geologic Survey	O U.S. Postal Service	● ~~CANWWTF~~	● TCI Cable			TOTAL REQ'D.
● Application Fee – see fee sheet	VII-1	1																														
● Submittal Checklist*	VII-3	1																														
● Review Agency Cover Sheet*	VII-3	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
● Application Form*	VII-1	1	1	1	1	1	1	1	8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
● Reduction of Assessor's Map 2445-08	VII-1	1	1	1	1	1	1	1	8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
● Evidence of Title	VII-2	1			1			1																								
O Appraisal of Raw Land	VII-1	1			1	1																										
● Names and Addresses* Assessors OFFICE	VII-2	1																														
● Legal Description*	VII-2	1			1																											
O Deeds	VII-1	1			1			1																								
O Easements	VII-2	1	1	1	1			1													1	1	1						1			
O Avigation Easement	VII-1	1			1			1							1																	
O ROW	VII-2	1	1	1	1			1													1	1	1						1			
O Covenants, Conditions & Restrictions	VII-1	1	1					1																								
O Common Space Agreements	VII-1	1	1					1																								
● County Treasurer's Tax Cert. 2445-08 11/6	VII-1	1																														
X ● Improvements Agreement/Guarantee*	VII-2	1	1	1				1																								
O CDOT Access Permit	VII-3	1	1																													
O 404 Permit	VII-3	1	1																													
O Floodplain Permit*	VII-4	1	1																													
● General Project Report	X-7	1	1	1	1	1	1	1	8	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1		
X ● Composite Plan	IX-10	1	2	1	1																											
X ● 11"x17" Reduction Composite Plan	IX-10	1				1	1	1	8	1	1	1	1				1	1	1	1	1	1	1	1	1	1		1	1			
● Final Plat	IX-15	1	2	1	1	1	1	1	8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
O 11"X17" Reduction of Final Plat	IX-15	1							8	1	1	1			1	1	1	1	1	1	1	1	1				1		1			
● Cover Sheet	IX-11	1	2																													
● Grading & Stormwater Mgmt Plan	IX-17	1	2															1							1	1			1			
O Storm Drainage Plan and Profile	IX-30	1	2															1			1	1	1						1			
● Water and Sewer Plan and Profile	IX-34	1	2	1			1												1	1	1	1	1					1	1			
● Roadway Plan and Profile	IX-28	1	2															1														
O Road Cross-sections	IX-27	1	2																													
O Detail Sheet	IX-12	1	2																													
O Landscape Plan	IX-20	2	1	1					8																							
● Geotechnical Report	X-8	1	1																							1						
O Phase I & II Environmental Report	X-10,11	1	1																													
● Final Drainage Report	X-5,6	1	2															1														
O Stormwater Management Plan	X-14	1	2															1							1							
O Sewer System Design Report	X-13	1	2	1																1												
O Water System Design Report	X-16	1	2	1															1													
O Traffic Impact Study	X-15	1	2																					1								
● Site Plan w/ bldg envelopes	IX-29	1	2	1	1		1		8																							

NOTES: * An asterisk in the item description column indicates that a form is supplied by the City.

DEVELOPMENT APPLICATION

Community Development Department
250 North 5th Street, Grand Junction, CO 81501
(303) 244-1430

Receipt _____
Date _____
Rec'd By _____
File No. FPP-95-181

We, the undersigned, being the owners of property situated in Mesa County, State of Colorado, as described herein do hereby petition this:

PETITION	PHASE	SIZE	LOCATION	ZONE	LAND USE
☒ Subdivision Plat/Plan	☐ Minor ☒ Major ☐ Resub	8.602 ac.	City of Grand Junction, Mesa County, Colorado		Single Family Residential
☐ Rezone				From: To:	
☒ Planned Development	☐ ODP ☐ Prelim ☒ Final				
☐ Conditional Use					
☐ Zone of Annex					
☐ Variance					
☐ Special Use					
☐ Vacation					☐ Right-of Way ☐ Easement
☐ Revocable Permit					

☒ PROPERTY OWNER	☐ DEVELOPER	☐ REPRESENTATIVE
Lowe Development Corp David G. Behrhorst, V.P.	See Property Owner	Philip Hart, LANDesign,I
Name	Name	Name
1280 Ute, Ste 32		200 N. 6th Street
Address	Address	Address
Aspen, CO 81611		Grand Junction, Co. 8150
City/State/Zip	City/State/Zip	City/State/Zip
925-4497		
Business Phone No.	Business Phone No.	Business Phone No.

NOTE: Legal property owner is owner of record on date of submittal.

We hereby acknowledge that we have familiarized ourselves with the rules and regulations with respect to the preparation of this submittal, that the foregoi information is true and complete to the best of our knowledge, and that we assume the responsibility to monitor the status of the application and the revi comments. We recognize that we or our representative(s) must be present at all required hearings. In the event that the petitioner is not represented, the it will be dropped from the agenda, and an additional fee charged to cover rescheduling expenses before it can again be placed on the agenda.

Philip M Hart — 10/2/95
Signature of Person Completing Application — Date

David D Behrhorst, Vice President
Signature of Property Owner(s) - attach additional sheets if necessary — Date

October 2, 1995

Planning Commission
City of Grand Junction
250 5th. Street
Grand Junction, CO 81501

RE: GENERAL PROJECT REPORT for: SOUTH RIM, FILING FOUR, FINAL PLAT & PLAN.

Dear Members:

Accompanying is the Final Plat and Plan Application for South Rim Subdivision, Filing No. Four located on the Redlands. This is a continuation of single family development based on the previously approved Overall Development Plan. This filing consists of 15 single family building sites on 8.602 acres resulting in a density of 1.74 dwelling units per acre in a PD 3.5 zone.

The overall development proposal and the first filing for South Rim was originally accepted by Mesa County. Since that time the entire property has been annexed by the City of Grand Junction and the first two filings are fully developed. Construction on Filing No. Three is nearing completion. The overall development proposal calls for the ultimate development of 137 single family building sites on the 91.5 acre site. The resulting density is 1.5 dwelling units per acre in a P.D. Zone allowing 3.5 dwelling units per acre. Approximately 42.5% or 38.9 acres of the total site area has been dedicated as open space, some of which is part of the new Connected Lakes state park. (14.6 acres) and 23.9 acres which was recently dedicated to the City as Public Open Space. Open Space requirements for the entire P.D. have been satisfied at this time.

As was the case with Filings No. One, Two and Three, all street improvements will be constructed in accordance with the City's current standards. The construction plans, drainage study, soils report, sanitary sewer study and stormwater management plan for Filing No. Four were previously submitted with the Filing No. Three Final Plat and Plan Application. For purposes of this application the construction plans for Filing No. Four have been revised to show limits of construction for this particular phase as requested. Construction necessary to complete Filing No. Four includes the installation of domestic water lines, sewer lines, curb, gutter, sidewalk and dry utilities. The Sanitary sewer service will be provided by the City of Grand Junction. The Ute Water Conservancy District will provide domestic water to South Rim. The existing central pressurized irrigation system has been expanded with the construction of Filing No. Three and will

200 NORTH 6TH ST. • GRAND JUNCTION, CO 81501 • FAX (970) 245-3076 • (970) 245-4099

provide pressurized irrigation water to each of the building sites within the proposal for Filing No. Four.

Lowe Development Corporation, the applicant, and myself will be present at the scheduled public meeting to discuss this application and answer any questions which may arise.

Respectfully,

Philip M. Hart, P.E.

cc: David G. Behrhorst, Lowe Development Corporation

2945-084-01-011
GARY L JONES
DEBRA
2355 MONUMENT DR
GRAND JUNCTION, CO 81503-1411

2945-084-01-012
GARY D MORRIS
SHERYL ANN
2353 MONUMENT DR
GRAND JUNCTION, CO 81503-1411

2945-084-01-023
GEORGE E HANNA
GLADYS E
520 RIVER VIEW DR
GRAND JUNCTION, CO 81503-1414

2945-084-01-024
KATE K DENNING
ROBERT R
518 RIVER VIEW DR
GRAND JUNCTION, CO 81503-1414

2945-084-01-025
GRANT H WALDREF
BRENDA J BURDICK
516 RIVER VIEW DR
GRAND JUNCTION, CO 81503-1414

2945-084-01-026
KENNETH M HETZEL
HILDA L
514 RIVER VIEW DR
GRAND JUNCTION, CO 81503-1414

2945-084-01-029
LESTER A SMITH
ALICE L SMITH
508 RIVER VIEW DR
GRAND JUNCTION, CO 81503-1414

2945-084-01-030
JAMES W HILL
N G
506 RIVER VIEW DR
GRAND JUNCTION, CO 81503-1414

2945-084-01-031
MERRILL LAURENCE
504 RIVER VIEW DR
GRAND JUNCTION, CO 81503-1414

2945-084-01-032
JESS W FELIN
502 RIVER VIEW DR
GRAND JUNCTION, CO 81503-1414

2945-084-01-034
GEORGE E HANNA
GLADYS E
520 RIVER VIEW DR
GRAND JUNCTION, CO 81503-1414

2945-084-01-035
RUDLOPH H COOK
LYDIA M
522 RIVER VIEW DR
GRAND JUNCTION, CO 81503-1414

2945-084-01-036
GEORGE E HANNA
GLADYS E
520 RIVER VIEW DR
GRAND JUNCTION, CO 81503-1414

2945-084-01-038
GEORGE E HANNA
GLADYS E
520 RIVER VIEW DR
GRAND JUNCTION, CO 81503-1414

2945-084-01-045
THOMAS H MOORE
B J
500 RIVER VIEW DR
GRAND JUNCTION, CO 81503-1414

2945-084-01-046
PETER H PETERS
RUBY M PETERS
512 RIVER VIEW DR
GRAND JUNCTION, CO 81503-1414

2945-084-01-047
MARY A RHOADES
510 RIVER VIEW DR
GRAND JUNCTION, CO 81503-1414

2945-084-01-014
DANIEL P MOSS
JOAN C MOSS
507 SKYWAY DR
GRAND JUNCTION, CO 81503-1419

2945-084-01-015
JUDY S LUNDGREN
509 SKYWAY DR
GRAND JUNCTION, CO 81503-1419

2945-084-01-016
EVA E THEUR
511 SKYWAY DR
GRAND JUNCTION, CO 81503-1419

2945-084-01-017
RICHARD L SCHNELL
WENDY T
513 SKYWAY DR
GRAND JUNCTION, CO 81503-1419

2945-084-01-018
DENNIS K COSTLOW
WANDA J COSTLOW
515 SKYWAY DR
GRAND JUNCTION, CO 81503-1419

2945-084-01-019
WARNER J RHODES
MARGARET W
517 SKYWAY DR
GRAND JUNCTION, CO 81503-1419

2945-084-01-020
THOMAS L GOERKE
519 SKYWAY DR
GRAND JUNCTION, CO 81503-1419

2945-084-01-021
ROBERT A CARRINGTON
SHEILA F ANDERSON
521 DKYWAY DR
GRAND JUNCTION,CO 81503-1419

2945-084-01-042
EDMAN E STURGEON
ELINOR M STURGEON
505 SKYWAY DR
GRAND JUNCTION, CO 81503-1419

2945-084-01-007
JESSE DAVID WOOLEY
MONIKA ELISABETH WOOLEY
501 VISTA GRANDE DR
GRAND JUNCTION, CO 81503-1435

2945-084-01-008
DAVID J GREEN
LYNNE A
503 VISTA GRANDE DR
GRAND JUNCTION, CO 81503-1435

2945-084-01-002
JAMES L GROVES
GEORGE ANNE
2350 E RD
GRAND JUNCTION, CO 81503-1491

2945-084-01-003
CHARLES L RUTHERFORD
JUANITA L
2352 E RD
GRAND JUNCTION, CO 81503-1491

2945-084-01-004
FAYE ANN WEISER
2354 E RD
GRAND JUNCTION, CO 81503-1491

2945-084-01-005
ROBERT W SMITH
MIRIAM B
2356 E ED
GRAND JUNCTION, CO 81503-1491

2945-084-01-006
FRED L CROCKER
DIANE F
2358 E RD
GRAND JUNCTION, CO 81503-1491

2945-084-03-007
MARTHA L KENT
2360 MONUMENT DR
GRAND JUNCTION, CO 81503-1412

2945-084-03-001
JAMES L QUINLAN
SHARON J
506 SKYWAY DR
GRAND JUNCTION, CO 81503-1420

2945-084-03-002
MARGARET V WHITE
508 SKYWAY DR
GRAND JUNCTION, CO 81503-1420

2945-084-03-003
GARY T HARRISON
APRIL L
512 SKYWAY DR
GRAND JUNCTION, CO 81503-1420

2945-084-03-004
ALICE A BENSLEY
HARLAN L
511 VISA GRANDE DR
GRAND JUNCTION, CO 81503-4404

2945-084-03-005
EMORY E CALHOUN
BETTY I
509 VISTA GRANDE DR
GRAND JUNCTION, CO 81503-4404

2945-084-03-006
WILLIAM A MARSH
507 VISTA GRANDE DR
GRAND JUNCTION, CO 81503-4404

2945-083-22-016
WILLIAM C JONES
ELIZABETH B JONES
7 BLUE SAGE
LITTLETON, CO 80127

2945-083-21-009
STANLEY KRASNODEBSKI
TERESA Z KRASNODEBSKI
4467 GALLEY CT
BOULDER CO 80301-3106

2945-083-21-003
D DENNIS WILTGEN
DBA WILCO ENTERPRISES
PO BOX 3741
GRAND JUNCTION, CO 81502

2945-083-22-010
D DENNIS WILTGEN
DBA WILCO ENTERPRISES
PO BOX 3741
GRAND JUNCTION, CO 81502

2945-083-19-002
MELVIN J NIEMEYER
LISELOTTE NIEMEYER
2326 1/2 SOUTH RIM DR
GRAND JUNCTION, CO 81503

2945-083-19-003
PAUL A JONES
SYLVIA M JONES
2328 SOUTH RIM RD
GRAND JUNCTION, CO 81503

2945-083-21-001
ROBERT L SPENCER
LORENA F SPENCER
2066 RIM SHADOW CT
GRAND JUNCTION, CO 81503

2945-083-21-008
MERRITT CONSTRUCTION INC
405 W MAYFIELD DR
GRAND JUNCTION, CO 81503

2945-083-22-012
MERRITT CONSTRUCTION INC
405 W MAYFIELD DR
GRAND JUNCTION, CO 81503

2945-083-22-013
MERRITT CONSTRUCTION INC
405 W MAYFIELD
GRAND JUNCTION, CO 81503

2945-083-22-015
JOHN CHAPMAN
MARY CHAPMAN
502 DOVE CT
GRAND JUNCTION,CO 81503

2945-083-22-017
JOHN A NELSON
414 RIDGEWAY
GRAND JUNCTION, CO 81503

2945-083-22-022
ROBERT J STRATTON
JOANNE E STRATTON
2330 WREN CT
GRAND JUNCTION, CO 81503

2945-083-22-023
SPENCER HEALEY
JENNIFER HEALEY
2328 WREN CT
GRAND JUNCTION, CO 81503

2945-083-22-024
ROSS GORDON HOFFMAN
NANCY KETOVER HOFFMAN
2326 WREN CT
GRAND JUNCTION, CO 81503

2945-083-22-025
STEVEN R DURTSCHI
CHARLENE F DUTSCHI
2324 WREN CT
GRAND JUNCTION, CO 81503

2945-083-22-027
STEVEN S RENSTROM
MICHELLE J RENSTROM
516 DOVE CT
GRAND JUNCTION, CO 81503

2945-083-22-028
RICHARD DEAN PALMER
CHARLOTTE ANN PALMER
518 DOVE CT
GRAND JUNCTION, CO 81503

2945-083-19-001
BOYD JAMES BAIR
COY MICHELLE BAIR
537 KIRBY DR
GRAND JUNCTION, CO 81504

2945-083-20-003
JAMES C BURKE
KIOTA J BURKE
2907 SANDRA AVE APT A
GRAND JUNCTION, CO 81504

2945-083-21-012
SCOTT RAND SMITH
3026 N MOORLAND CR
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2945-083-22-004
DELBERT E DAWSON
KATHRYN J DAWSON
3197 F 1/2 RD
GRAND JUNCTION, CO 81504

2945-083-22-020
DUANE L MEANS
HOLLI DAWN MEANS
3002 COUNTRY RD
GRAND JUNCTION, CO 81504

2945-083-20-004
DICK OLSEN
DORRIS JEAN OLSEN
3510 PONDEROSA
GRAND JUNCTION, CO 81506

2945-083-21-004
NIEL J BRADFORD
KATHLEEN M PARKER
2675 SPRINGSIDE CT #1-H
GRAND JUNCTION, CO 81506

2945-083-21-006
MICHAEL C BUTHERUS
JULIE A BUTHERUS
3435 PONDEROSA CT
GRAND JUNCTION, CO 81506

2945-083-21-007
DICK OLSEN
DORRIS JEAN OLSEN
3510 PONDEROSA WAY
GRAND JUNCTION, CO 81506

2945-083-22-003
DOUG SKELTON
706 IVY PL
GRAND JUNCTION, CO 81506

2945-083-22-019
SKELTON CONSTRUCTION INC
706 IVY PL
GRAND JUNCTION, CO 81506

2945-083-21-011
TIMOTHY NICHOLAS PRINSTER
706 CENTAURI DR
GRAND JUNCTION, CO 81506-184

2945-083-20-005
ERNEST L MCKEEVER
DJ MCKEEVER & JOYCE L MAUGLE
2419 HAWTHORNE AVE
GRAND JUNCTION, CO 81506-4130

2945-083-20-002
JAMES E FITZGERALD
MARY JANE FITZGERALD
2931 PHEASANT RUN ST
GRAND JUNCTION, CO 81506-6049

2945-083-21-010
MICHAEL R CHRISCO
EMILY R CHRISCO
611 E INDIAN CREEK DR
GRAND JUNCTION, CO 81506-6073

2945-083-22-009
RICHARD D WEBER
6800 REEDER MESA RD
WHITEWATER, CO 81527

2945-083-22-011
RICHARD CUMMINS
PROFIT SHARING PLAN
450 S GALENA ST STE 201
ASPRN, CO 81611-1857

2945-083-20-001
LOWE DEVELOPMENT CORP
11777 SAN VICENTE BLVD STE 90
LOS ANGELES, CA 90049-5011

2945-083-21-002
LOWE DEVELOPMENT CORP
11777 SAN VICENTE BLVD STE 900
LOS ANGELES, CA 90049-5011

2945-083-21-005
LOWE DEVELOPMENT CORP
11777 SAN VICENTE BLVD STE 900
LOS ANGELES, CA 90049-5011

2945-083-22-001
LOWE DEVELOPMENT CORP
11777 SAN VICENTE BLVD STE 900
LOS ANGELES, CA 90049-5011

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LOWE DEVELOPMENT CORP
11777 SAN VICENTE BLVD STE 900
LOS ANGELES, CA 90049-5011

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LOWE DEVELOPMENT CORP
11777 SAN VICENTE BLVD STE900
LOS ANGELES, CA 90049-5011

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LOWE DEVELOPMENT CORP
11777 SAN VICENTE BLVD STE 900
LOS ANGELES, CA 90049-5011

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LOWE DEVELOPMENT CORP
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LOS ANGELES, CA 90049-5011

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LOWE DEVELOPMENT CORP
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LOS ANGELES, CA 90049-5011

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LOWE DEVELOPMENT CORP
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LOS ANGELES, CA 90049-5011

2945-083-22-018
LOWE DEVELOPMENT CORP
11777 SAN VICENTE BLVD STE 900
LOS ANGELES, CA 90049-5011

2945-083-22-026
LOWE DEVELOPMENT CORP
11777 SAN VICENTE BLVD STE 900
LOS ANGELES, CA 90049-5011

2945-083-22-021
ROBERT J HARTMAN
BARBARA M HARTMAN
1044 TULIPAN DR
SAN JOSE, CA 95129

2945-083-00-029
MEYER BERNARD SUSSMAN
JESSIE - TRUSTEES
2330 E RD
GRAND JUNCTION, CO 81503-1410

2945-083-00-078
TROY CAROLINE TOPPER
2323 E 1/2 RD
GRAND JUNCTION, CO 81503-4406

2945-083-00-079
LUCIA CABOT CIPOLLA
2325 E 1/2 RD
GRAND JUNCTION, CO 81503-440

2945-083-00-082
E A WILLIAMS
ANZALETTA
2312 HACIENDA ST
GRAND JUNCTION, CO 81503-140

2945-083-00-088
PATRICIA PAIZ
R C OLSON C/O P PAIZ
475 APPALOOSA LN
GRAND JUNCTION, CO 81504

2945-083-00-117
LOWE DEVELOPMENT CORP
11777 SAN VICENTE BLVD STE 9
LOS ANGELES, CA 90049-5011

2945-083-16-001
LORI S CURTIS
2328 E RD
GRAND JUNCTION, CO 81503-141

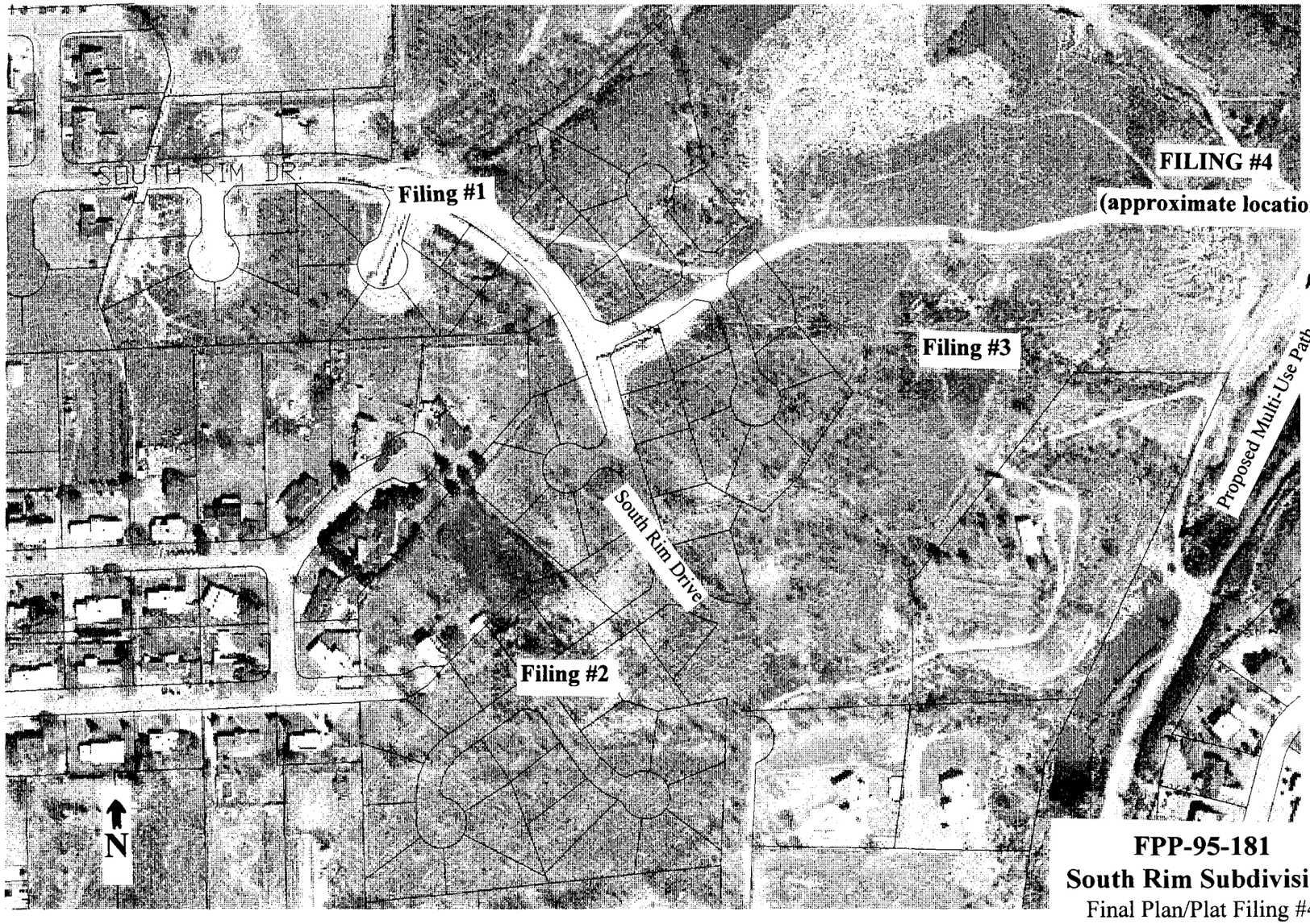
2945-083-16-002
MICHAEL C BENNETT
BEVERLY J
2328 1/2 E RD
GRAND JUNCTION, CO 81503-141

2945-082-00-051
ROYCE H ELLIOTT
KAREN K
2324 E 1/2 RD
GRAND JUNCTION, CO 81503-440

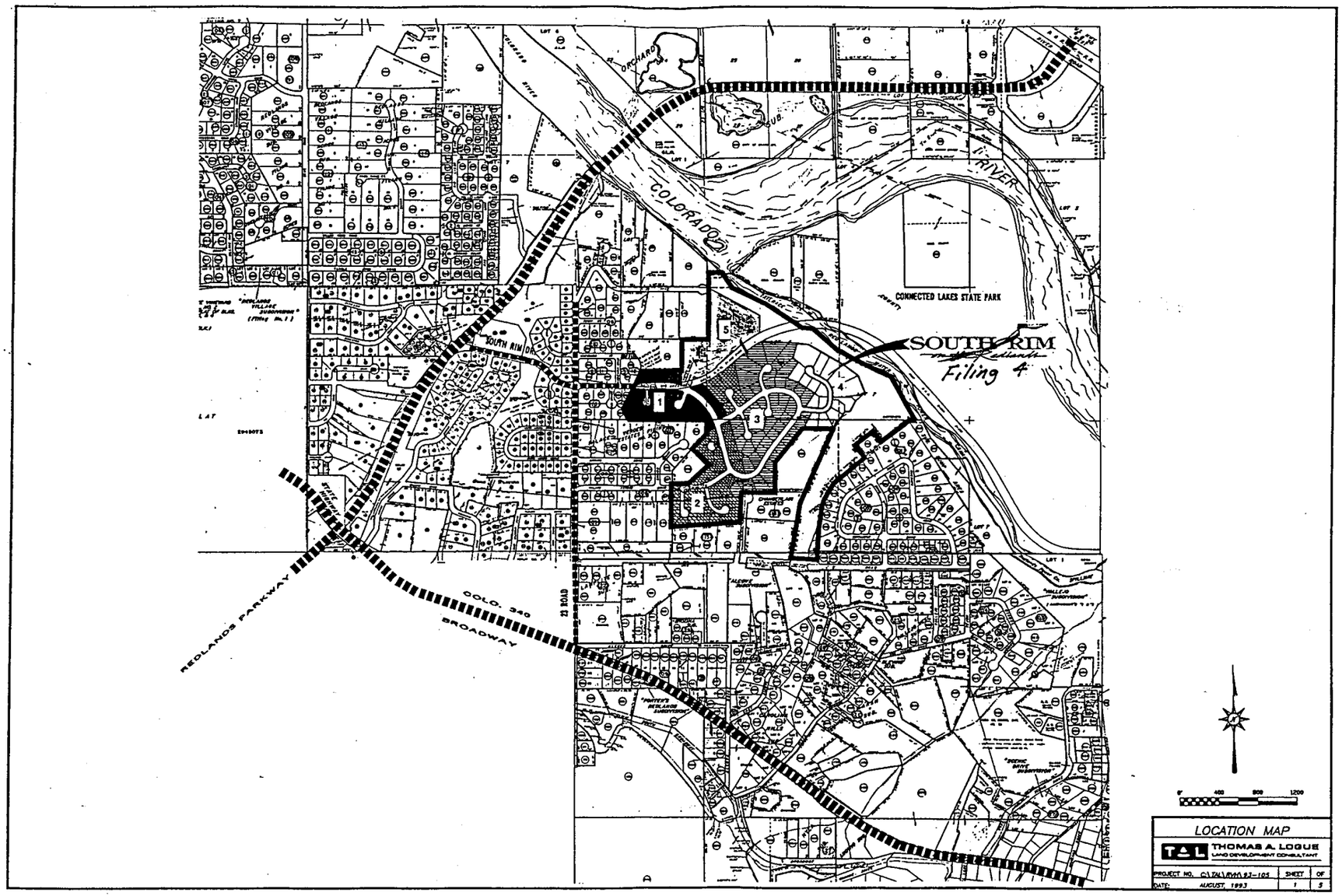
2945-084-00-922
DEPARTMENT OF PARKS & OUTDOO
RECREATION
1313 SHERMAN ST
DENVER, CO 80203-2236

2945-084-01-009
VIRGINIA A STODDARD
ETAL
2361 MONUMENT DR
GRAND JUNCTION, CO 81503-141

2945-084-01-010
ROBERT B RICHARDSON
MARJORIE D
2359 MONUMENT DR
GRAND JUNCTION, CO 81503-141

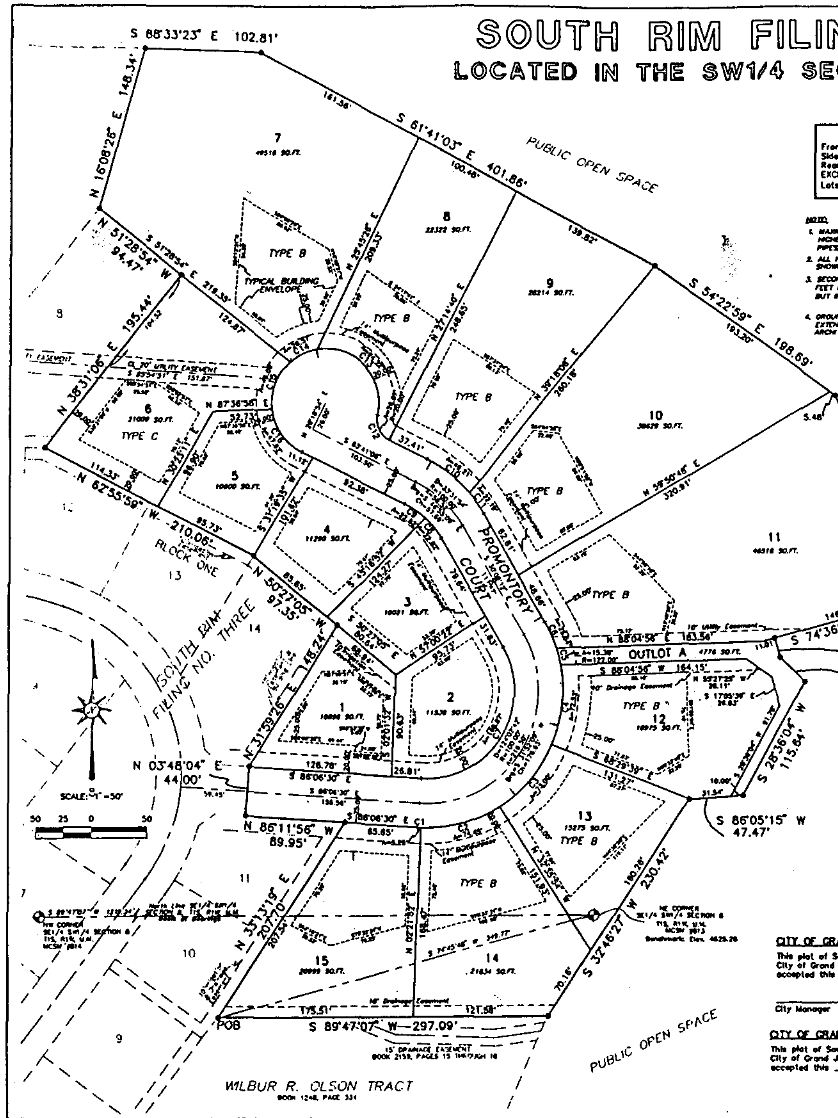


FPP-95-181
South Rim Subdivision
Final Plan/Plat Filing #4
AERIAL MAP


COLORADO
RIVER
CONNECTED LAKES STATE PARK
SOUTH RIM
Filing 4
SOUTH RIM DR.
REDLANDS PARKWAY
COLO. 340
BROADWAY
23 ROAD
1
2
3
4
5
0
400
800
1200
LOCATION MAP
THOMAS A. LOGUE
LAND DEVELOPMENT CONSULTANT
PROJECT NO. C:\TAL\WP\93-105
SHEET 1 OF 5
DATE: AUGUST, 1993

SOUTH RIM FILING NO. FOUR

LOCATED IN THE SW1/4 SECTION 8, T1S, R1W, U.M.

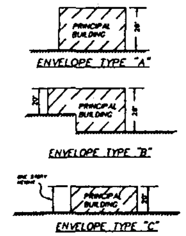


BUILDING SETBACK TABLE

Front Yard = 25 Feet, Except at Corner Lots = 20 Feet
Side Yard = 10 Feet
Rear Yard = 20 Feet
EXCEPT the following Platted Building Envelopes, as shown:
Lots 1, 2, and Lots 5 through 15.

NOTE:

1. MAXIMUM BUILDING HEIGHT MEASURED FROM FINISHED FLOOR TO TOP OF HIGHEST ROOF LINE RIDGE, EXCLUDING CHIMNEYS, CUPOLAS, FLUES, AND VENT PIPES, OR SIMILAR ROOF PENETRATIONS.
2. ALL HEIGHT RESTRICTION ENVELOPES ARE TYPE "A", TYPICALLY, EXCEPT AS SHOWN.
3. SECOND STORY OPEN AND UNCOVERED BALCONY DECK MAY ENCROACH SIX FEET MAXIMUM OUTSIDE OF BUILDING ENVELOPE ON REAR OR SIDE YARD ONLY, BUT IN NO CASE CLOSER THAN FOUR FEET TO ANY PROPERTY LINE.
4. GROUND LEVEL OPEN AND UNCOVERED PORCHES, DECKS, AND PATIOS MAY EXTEND BEYOND BUILDING ENVELOPES SUBJECT TO SOUTH RIM ARCHITECTURAL CONTROL COMMITTEE WRITTEN APPROVAL.



CURVE TABLE						
CURVE #	DELTA ANGLE	RADIUS	LENGTH	TANGENT	CHORD BEARING	CHORD
C1	01°31'38"	122.00'	3.25'	1.63'	S 86°52'19" E	3.25'
C2	34°57'46"	122.00'	74.45'	38.42'	N 74°52'59" E	73.30'
C3	34°16'53"	122.00'	73.00'	37.63'	S 40°15'40" W	71.91'
C4	34°03'24"	122.00'	72.52'	37.37'	S 06°05'31" W	71.45'
C5	07°13'27"	122.00'	15.38'	7.70'	S 14°32'54" E	15.37'
C6	11°59'34"	122.00'	25.54'	12.82'	S 24°09'25" E	25.49'
C7	124°02'42"	78.00'	168.87'	146.84'	S 31°52'09" W	137.77'
C8	16°45'57"	78.00'	22.82'	11.49'	S 38°32'11" E	22.74'
C9	16°45'57"	78.00'	22.82'	11.49'	S 55°18'08" E	22.74'
C10	23°06'36"	122.00'	49.21'	24.94'	S 52°07'48" E	48.88'
C11	10°25'18"	122.00'	22.19'	11.13'	S 35°21'51" E	22.16'
C12	76°23'28"	20.00'	26.67'	15.74'	N 25°29'22" W	24.73'
C13	112°27'44"	48.00'	94.22'	71.79'	S 43°31'30" E	79.80'
C14	31°42'37"	48.00'	26.57'	13.63'	N 64°23'20" E	26.23'
C15	55°00'57"	48.00'	46.09'	25.00'	N 21°01'33" E	44.34'
C16	57°12'10"	48.00'	47.92'	26.17'	N 35°05'01" W	45.96'

Basis of bearings assume the North line of the SE1/4 SW1/4 of Section 8 to bear N 89°47'07" E, 1319.34 feet, as shown on the recorded Plat of South Rim Filing No. One, in Plat Book 14, Pages 198–199.
Both monuments on this line are Mesa County Survey Markers.

Note: Property corners located during this survey that were within 0.25± feet of the calculated point were accepted as being "in position".

AREA SUMMARY		
AREA IN LOTS	=	7.750 ACRES
AREA IN ROWS	=	0.742 ACRES
OUTLOT A	=	0.110 ACRES
TOTAL	=	8.602 ACRES

LEGEND

- MESA COUNTY OR BLM SURVEY MARKER
- CALCULATED POSITION (NOT SET)
- SET ALUMINUM CAP ON No. 5 REBAR, PLS 16835 IN CONCRETE
- (R) RECORD MEASUREMENT
- FOUND REBAR, AS NOTED
- INDICATES PC & PT OF ARCS

SET ALUMINUM CAP ON No. 5 REBAR, PLS 16835 AT ALL LOT CORNERS

DEDICATION

KNOW ALL MEN BY THESE PRESENTS:

That Lowe Development Corporation, a California Corporation, is the owner of that real property located in part of the Southwest Quarter of Section 8, Township 1 South, Range 1 West of the Ute Meridian, Mesa County, Colorado, being more particularly described as follows: (Being a portion of that property as described in Original Warranty Deed Book 1839, Pages 87 through 90.)

Commencing at the Mesa County Brass Cap at the Northeast Corner of the Southeast Quarter of the Southwest Quarter (SE1/4 SW1/4) of Section 8, Township 1 South, Range 1 West of the Ute Meridian, Mesa County, Colorado, whence the Mesa County Brass Cap at the Northwest Corner of the Southeast Quarter of the Southwest Quarter (SE1/4 SW1/4) of Section 8 bears South 89 degrees 47 minutes 07 seconds West (S 89°47'07" W), 1319.34 feet for a basis of bearings with all bearings contained herein relative thereto;

BEGINNING at a point bearing South 74 degrees 45 minutes 48 seconds West (S 74°45'48" W), a distance of 349.77 feet from the aforementioned Northeast Corner of the SE1/4 SW1/4; thence North 33 degrees 13 minutes 19 seconds East (N 33°13'19" E), a distance of 207.70 feet; thence North 86 degrees 11 minutes 56 seconds West (N 86°11'56" W), a distance of 89.95 feet; thence North 03 degrees 48 minutes 04 seconds East (N 03°48'04" E), a distance of 44.00 feet; thence North 31 degrees 59 minutes 26 seconds East (N 31°59'26" E), a distance of 148.24 feet; thence North 50 degrees 27 minutes 05 seconds West (N 50°27'05" W), a distance of 97.35 feet; thence North 62 degrees 55 minutes 59 seconds West (N 62°55'59" W), a distance of 210.08 feet; thence North 38 degrees 31 minutes 06 seconds East (N 38°31'06" E), a distance of 195.44 feet; thence North 51 degrees 28 minutes 54 seconds West (N 51°28'54" W), a distance of 94.47 feet; thence North 16 degrees 08 minutes 26 seconds East (N 16°08'26" E), a distance of 148.34 feet; thence South 88 degrees 33 minutes 23 seconds East (S 88°33'23" E), a distance of 102.81 feet; thence South 61 degrees 41 minutes 03 seconds East (S 61°41'03" E), a distance of 401.86 feet; thence South 54 degrees 22 minutes 59 seconds East (S 54°22'59" E), a distance of 198.69 feet; thence South 23 degrees 31 minutes 15 seconds East (S 23°31'15" E), a distance of 194.47 feet; thence South 74 degrees 36 minutes 17 seconds West (S74°36'17" W), a distance of 135.46 feet; thence South 15 degrees 23 minutes 43 seconds East (S 15°23'43" E), a distance of 18.06 feet; thence South 46 degrees 45 minutes 25 seconds East (S 46°45'25" E), a distance of 30.55 feet; thence South 28 degrees 36 minutes 04 seconds West (S 28°36'04" W), a distance of 115.64 feet; thence South 86 degrees 05 minutes 15 seconds West (S 86°05'15" W), a distance of 47.47 feet; thence South 32 degrees 48 minutes 27 seconds West (S 32°48'27" W), a distance of 230.42 feet; thence South 89 degrees 47 minutes 07 seconds West (S 89°47'07" W), a distance of 297.09 feet to the POINT OF BEGINNING; Said parcel containing 8.602 acres, as described.

That said owner does hereby dedicate and set apart real property as shown and labeled on the accompanying plat, which is a part of a Planned Common Interest Community known as SOUTH RIM PLANNED UNIT DEVELOPMENT, subject to those certain restrictions as recorded in the "Covenants, Conditions, and Restrictions" as recorded in Book 255, Pages 317 through 414, of the Official Records of Mesa County, Colorado, as amended.

All Streets and Rights-of-way to the City of Grand Junction for the use of the public forever;

All sign, landscaping, and multipurpose easements to the City of Grand Junction for the use of the public utilities as perpetual easements for the installation, operation, maintenance and repair of utilities and appurtenances thereto including, but not limited to electric lines, cable TV lines, natural gas pipelines, sanitary sewer lines, water lines, telephone lines, and also for the installation and maintenance of traffic control facilities, street lighting, street trees and grade structures, and to the South Rim Homeowners Association, Inc. for the purpose of Signage and Landscaping purposes;

All Multipurpose Easements to the City of Grand Junction for the use of the public utilities as perpetual easements for the installation, operation, maintenance and repair of utilities and appurtenances thereto including, but not limited to electric lines, cable TV lines, natural gas pipelines, sanitary sewer lines, water lines, telephone lines, and also for the installation and maintenance of traffic control facilities, street lighting, street trees and grade structures;

Outlot A as Public Open Space to the City of Grand Junction for the purpose of public access to the Public Open Space adjoining subdivision boundary and for the installation of underground utilities and appurtenances thereto including electric lines, sanitary sewer lines, telephone lines, and also for the installation and maintenance a bicycle and pedestrian path, traffic control facilities, landscaping subject to a right of the owners of Lots 11 and 12 to construct fencing along the common boundaries, as approved by the South Rim Architectural Control Committee for aesthetic and safety purposes, and grade structures;

All Utility Easements to the City of Grand Junction for the use of public utilities as perpetual easements for the installation, operation, maintenance and repair of utilities and appurtenances thereto including, but not limited to electric lines, cable TV lines, natural gas pipelines, sanitary sewer lines, water lines, and telephone lines.

All Irrigation Easements as set forth on this plat to the South Rim Homeowners Association, Inc., as perpetual easements for the installation, operation, maintenance and repair of private irrigation systems;

All Drainage Easements hereby platted to the South Rim Homeowners Association, Inc., as perpetual easements for the conveyance of runoff water which originates within the area hereby platted or from upstream areas, through natural or man-made facilities above or below ground;

All easements include the right of ingress and egress on, along, over, under, and through and across by the beneficiaries, their successors, or assigns, together with the right to trim or remove interfering trees and brush. Provided, however, that the beneficiaries of said easements shall utilize the same in a reasonable and prudent manner. Furthermore, the owners of lots or tracts hereby platted shall not burden nor overburden said easements by erecting or placing any improvements thereon which may prevent reasonable ingress and egress to and from the easement.

IN WITNESS WHEREOF, said owners have caused their names to be hereunto subscribed this ______ day of ____________ A.D. 1995.

Lowe Development Corporation, a California Corporation

____
by: David G. Behrhorst, Vice President

STATE OF COLORADO } ss
COUNTY OF MESA }

The foregoing instrument was acknowledged before me by David G. Behrhorst, Vice President this ______ day of ____________ A.D., 1995.
Witness my hand and official seal:

____
Notary Public

My Commission Expires ______________________

CITY OF GRAND JUNCTION APPROVAL

This plat of South Rim Filing No. Four, a subdivision of a part of the City of Grand Junction, County of Mesa, State of Colorado, is approved and accepted this __________ day of ____________A.D., 1995.

______________________ City Manager

______________________ President of City Council

CITY OF GRAND JUNCTION PLANNING COMISSION CERTIFICATE

This plat of South Rim Filing No. Four, a subdivision of a part of the City of Grand Junction, County of Mesa, State of Colorado, is approved and accepted this __________ day of ____________A.D., 1995.

____
CHAIRMAN

CLERK AND RECORDER'S CERTIFICATE

STATE OF COLORADO)ss
COUNTY OF MESA)

I hereby certify that this instrument was filed in my office at ______________ o'clock __________M., ____________________

A.D., 1995, and was duly recorded in Plat Book No.______________ Page No.____________

____
Clerk and Recorder

SURVEYOR'S CERTIFICATION

I, DENNIS W. JOHNSON, DO HEREBY CERTIFY THAT THE ACCOMPANYING PLAT OF SOUTH RIM FILING NO. FOUR, A SUBDIVISION OF A PART OF THE CITY OF GRAND JUNCTION, COLORADO HAS BEEN PREPARED UNDER MY DIRECT SUPERVISION AND REPRESENTS A FIELD SURVEY OF SAME. THIS PLAT CONFORMS TO THE REQUIREMENTS FOR SUBDIVISION PLATS SPECIFIED IN THE CITY OF GRAND JUNCTION DEVELOPMENT CODE AND THE APPLICABLE LAWS OF THE STATE OF COLORADO.

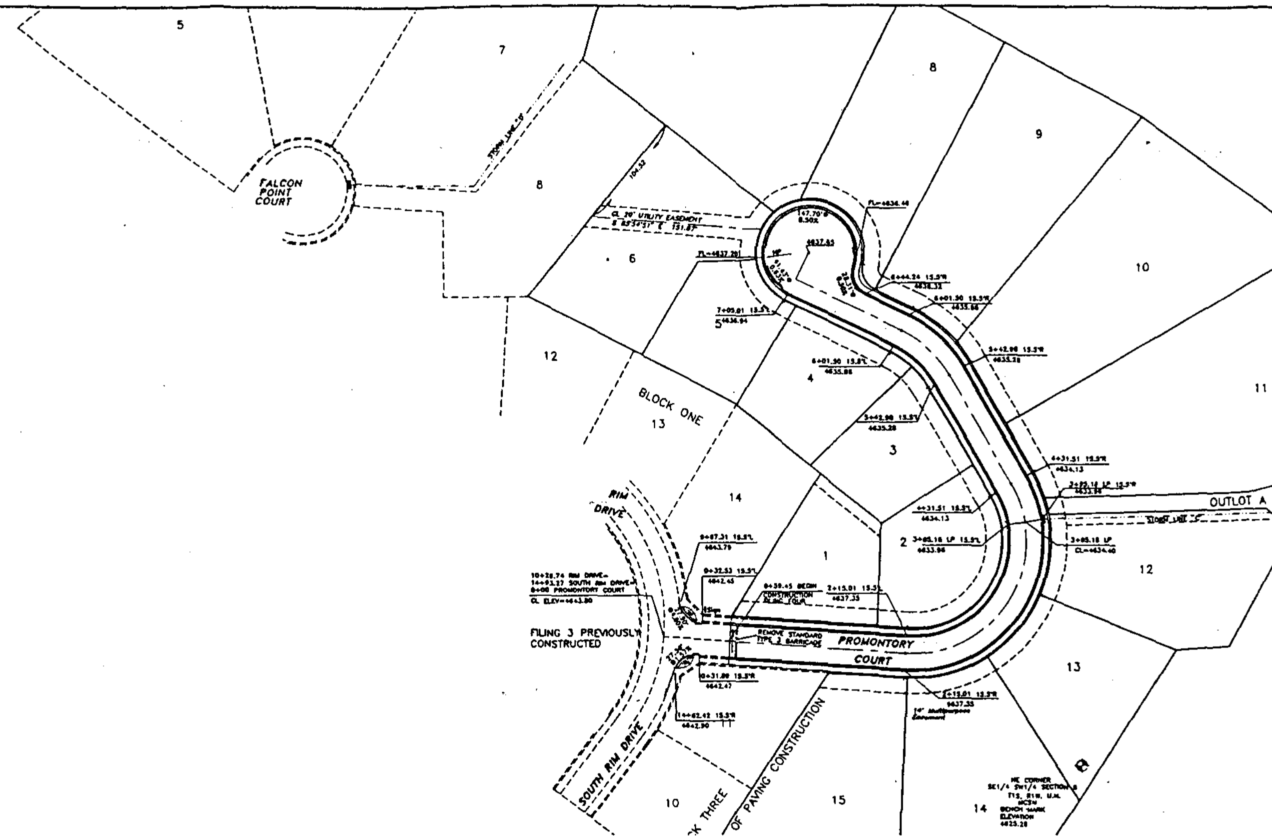
Date certified ______________________

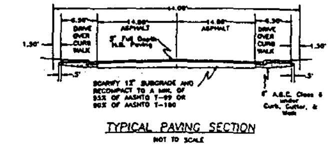
DENNIS W. JOHNSON, PLS
COLORADO PROFESSIONAL LAND SURVEYOR
P.L.S. No. 16835

SOUTH RIM FILING NO. FOUR
SW1/4 SECTION 8
T1S, R1W, UTE MERIDIAN
MESA COUNTY, COLORADO

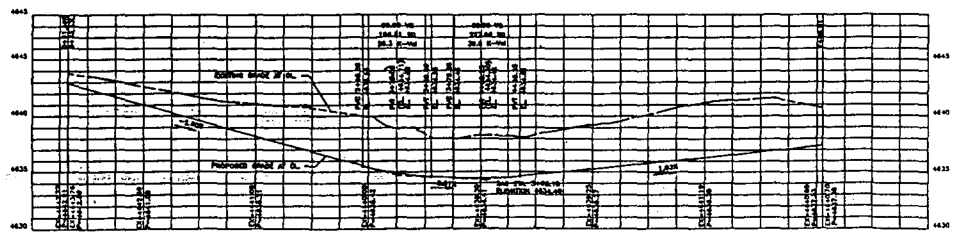
Professional Surveying Services
P.O. BOX 4306, Grand Jct., CO 81502
970-241-3841

SUR. BY: LB/MT	DRAWN BY: RSW
JOB NO. 94119FL4	SHEET 1 OF 1





SCALE 1" = 50'



PROMONTORY COURT
CENTERLINE PROFILE

NOTE: THE LOCATION AND PLACEMENT OF STREET LIGHTS BY PUBLIC SERVICE COMPANY.

CITY OF GRAND JUNCTION	
APPROVED FOR CONSTRUCTION FOR ONE YEAR FROM THIS DATE.	
BY:	DATE:
ACCEPTED AS CONSTRUCTED	
BY:	DATE:

NO.	REVISIONS DATE
1	10/24/95 PER CITY COMMENTS

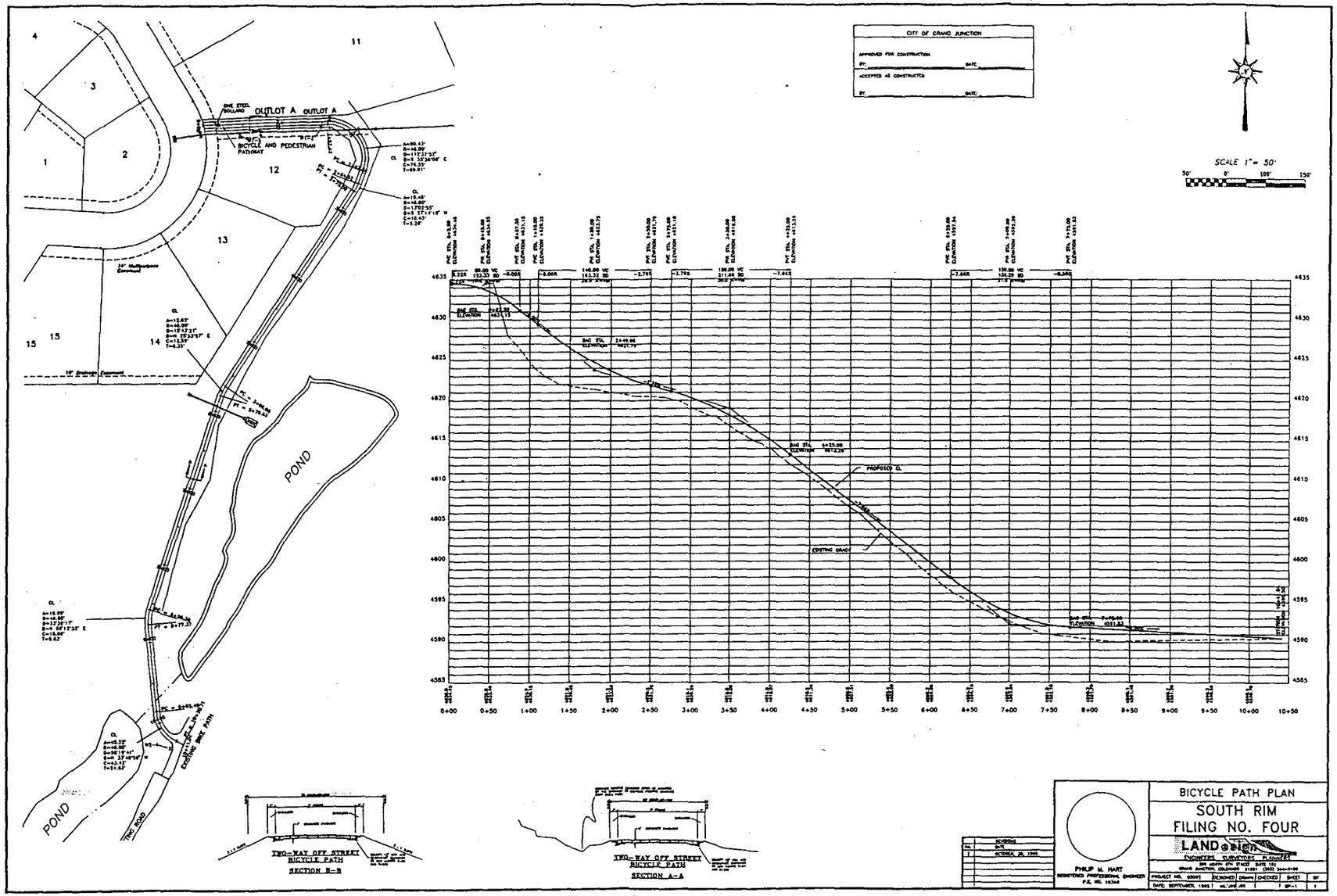
PHILIP M. HART
REGISTERED PROFESSIONAL ENGINEER
P.E. NO. 16346

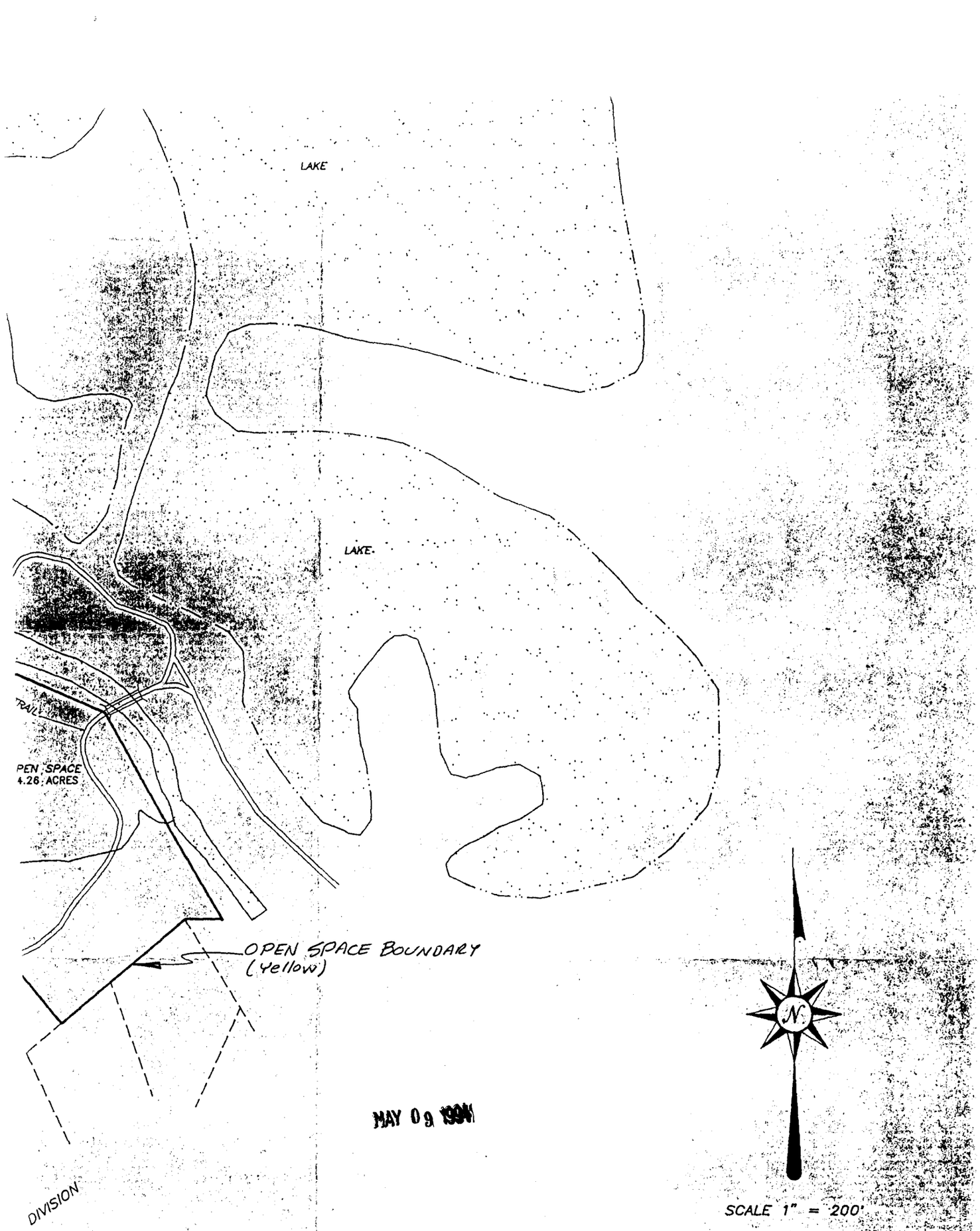
STREET PLAN & PROFILE

SOUTH RIM FILING NO. FOUR

LANDesign
ENGINEERS SURVEYORS PLANNERS
GRAND JUNCTION, COLORADO 81501

PROJECT NO. 95092	DESIGNED	DRAWN	CHECKED	SHEET	OF
DATE: SEPTEMBER, 1995	PH	JOE		ST-1	1


CITY OF GRAND JUNCTION
APPROVED FOR CONSTRUCTION
BY: DATE:
ACCEPTED AS CONSTRUCTED
BY: DATE:
SCALE 1" = 50'
OUTLOT A
BICYCLE AND PEDESTRIAN PATHWAY
POND
TWO ROAD
EXISTING BIKE PATH
TWO-WAY OFF STREET BICYCLE PATH
SECTION B-B
TWO-WAY OFF STREET BICYCLE PATH
SECTION A-A
PROPOSED GL
EXISTING GRADE
BICYCLE PATH PLAN
SOUTH RIM
FILING NO. FOUR
LANDesign
PHILIP M. HART
REGISTERED PROFESSIONAL ENGINEER
P.E. NO. 19348



MAY 09 1994

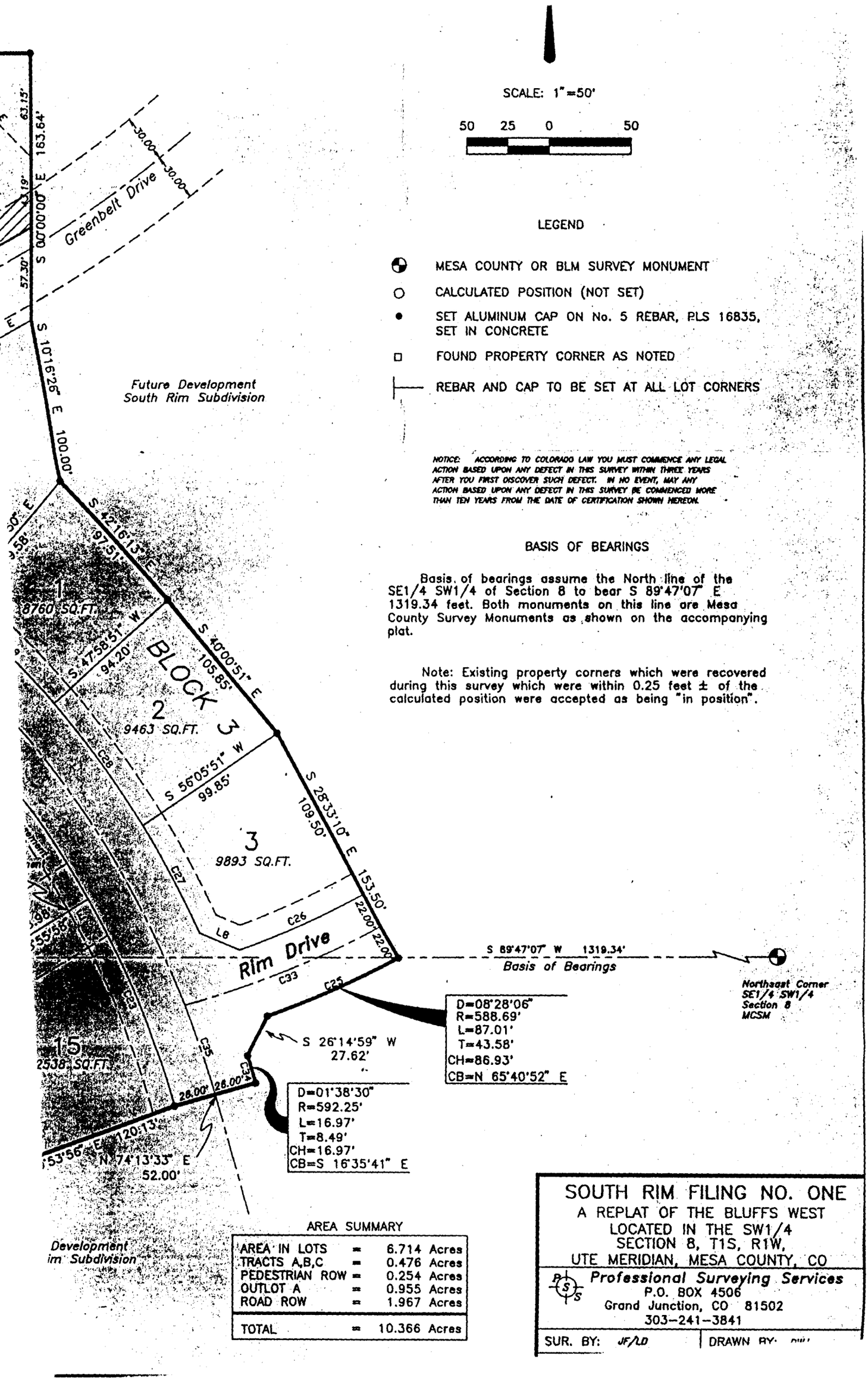
EXHIBIT
"B-1"

SOUTH RIM

OUTLINE DEVELOPMENT PLAN

THOMAS A. LOGUE
LAND DEVELOPMENT CONSULTANTS
227 SOUTH 9TH STREET GRAND JUNCTION, COLORADO 81501
(303) 245-4099

PROJECT NO. C:\TAL\RIM\9310SP | SHEET



AREA SUMMARY

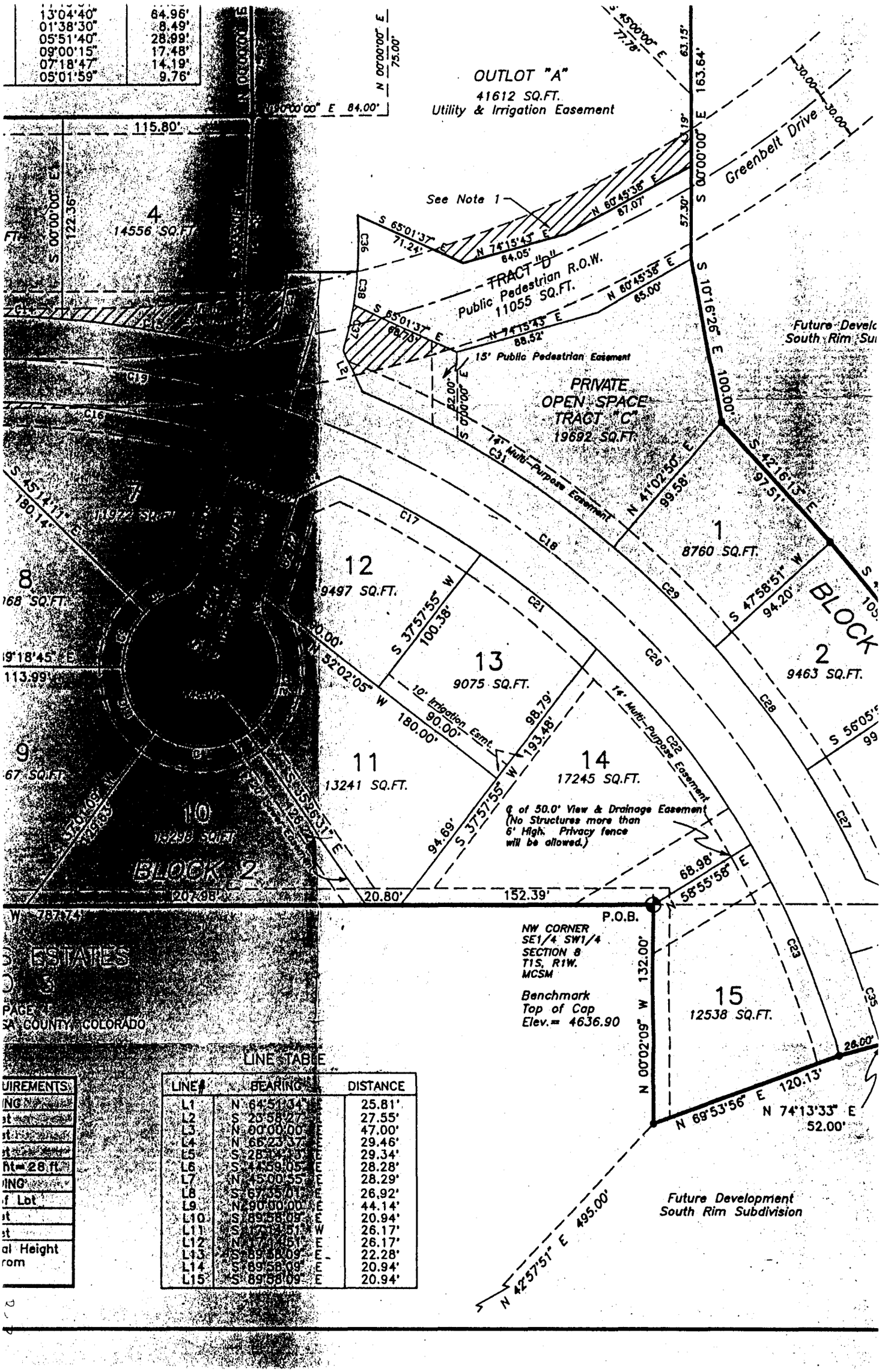
AREA IN LOTS	=	6.714 Acres
TRACTS A,B,C	=	0.476 Acres
PEDESTRIAN ROW	=	0.254 Acres
OUTLOT A	=	0.955 Acres
ROAD ROW	=	1.967 Acres
TOTAL	=	10.366 Acres

SOUTH RIM FILING NO. ONE

A REPLAT OF THE BLUFFS WEST
LOCATED IN THE SW1/4
SECTION 8, T1S, R1W,
UTE MERIDIAN, MESA COUNTY, CO

Professional Surveying Services
P.O. BOX 4506
Grand Junction, CO 81502
303-241-3841

SUR. BY: JF/LD | DRAWN BY:



13°04'40"	64.96'
01°38'30"	8.49'
05°51'40"	28.99'
09°00'15"	17.48'
07°18'47"	14.19'
05°01'59"	9.76'

LINE TABLE

LINE	BEARING	DISTANCE
L1	N 64°51'34" E	25.81'
L2	S 23°58'27" E	27.55'
L3	N 00°00'00" E	47.00'
L4	N 65°23'37" E	29.46'
L5	S 28°34'23" E	29.34'
L6	S 44°59'05" E	28.28'
L7	N 45°00'55" E	28.29'
L8	S 67°35'01" E	26.92'
L9	N 90°00'00" E	44.14'
L10	S 89°58'09" E	20.94'
L11	S 45°14'51" W	26.17'
L12	N 45°14'51" E	26.17'
L13	S 89°58'09" E	22.28'
L14	S 89°58'09" E	20.94'
L15	S 89°58'09" E	20.94'

UIREMENTS
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ht= 26 ft.
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ESTATES
3
PAGE 2
SA, COUNTY, COLORADO

SOUTH RIM FILING N

A REPLAT OF THE BLUFFS WEST AS RECORDED IN
AND PORTIONS OF ADJOINING PA

CURVE DATA TABLE

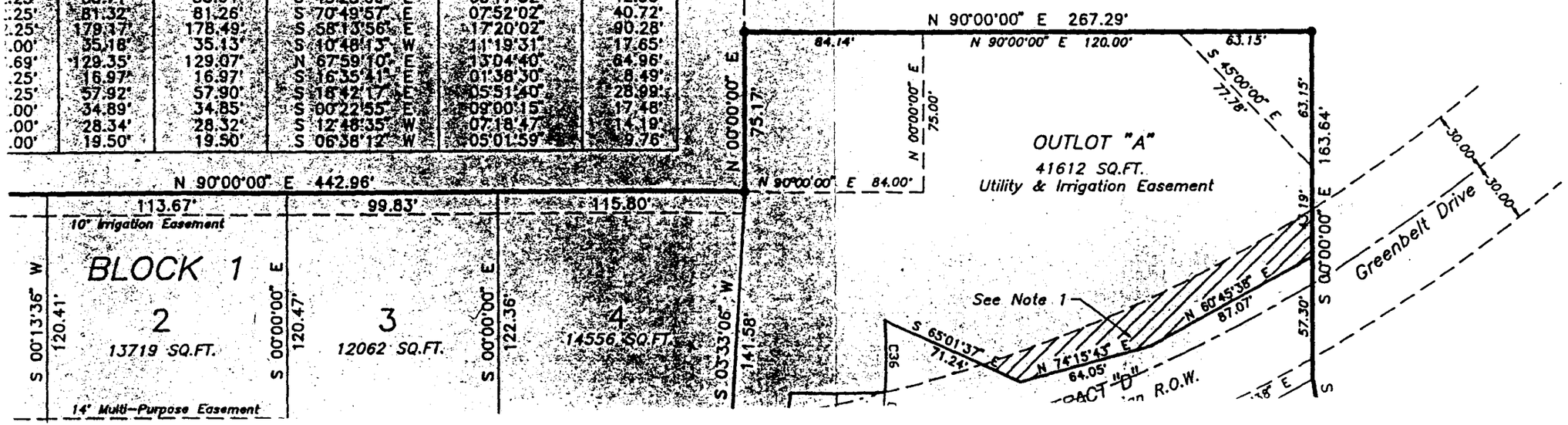
ADIUS	LENGTH	CHORD	CHORD BEARING	DELTA ANGLE	TANGENT
0.00'	18.10'	17.49'	S 25°56'40" W	51°51'20"	9.72'
8.00'	63.06'	58.62'	N 14°13'06" E	75°16'27"	37.01'
8.00'	55.78'	52.69'	S 56°42'34" E	66°34'53"	31.52'
8.00'	52.72'	50.11'	N 58°32'05" E	62°55'51"	29.37'
8.00'	66.12'	61.01'	S 12°23'35" E	78°55'29"	39.52'
0.00'	18.10'	17.49'	N 25°55'40" W	51°51'20"	9.72'
0.00'	18.10'	17.49'	S 44°52'43" W	51°51'20"	9.72'
8.00'	21.62'	21.63'	N 57°47'06" E	26°02'33"	11.10'
8.00'	36.93'	36.02'	N 22°43'32" E	44°04'34"	19.43'
8.00'	44.96'	43.34'	N 26°08'48" W	53°40'06"	24.28'
8.00'	60.70'	56.74'	S 89°12'41" E	72°27'40"	35.17'
8.00'	73.27'	66.36'	S 10°49'36" W	87°27'45"	45.92'
0.00'	18.10'	17.49'	N 06°58'37" W	51°51'20"	9.72'
2.25'	48.33'	48.31'	S 87°37'54" E	04°40'31"	24.18'
2.25'	108.82'	108.67'	S 80°01'48" E	10°31'40"	54.56'
0.25'	137.14'	136.77'	S 82°41'49" E	14°32'40"	68.94'
0.25'	97.73'	97.59'	S 60°58'52" E	10°21'52"	49.00'
6.25'	733.26'	683.09'	S 52°52'18" E	74°11'42"	428.21'
6.25'	189.29'	188.41'	S 80°23'32" E	19°09'13"	95.54'
6.25'	543.97'	523.29'	S 43°17'41" E	55°02'29"	295.03'
0.25'	90.12'	90.01'	S 51°01'13" E	09°33'27"	45.16'
0.25'	149.61'	149.13'	S 38°18'28" E	15°52'01"	75.29'
0.25'	137.67'	137.29'	S 23°04'27" E	14°36'01"	69.21'
0.00'	30.48'	27.62'	N 26°14'59" E	87°19'52"	19.09'
3.69'	87.01'	86.93'	N 65°40'52" E	08°28'06"	43.58'
3.69'	82.43'	82.35'	N 65°46'57" E	08°40'15"	41.29'
2.25'	73.10'	73.05'	S 28°49'16" E	07°04'19"	36.60'
2.25'	92.16'	92.07'	S 36°48'54" E	08°54'58"	46.17'
2.25'	85.71'	85.64'	S 45°25'09" E	08°17'32"	42.93'
2.25'	81.32'	81.26'	S 70°49'57" E	07°52'02"	40.72'
2.25'	179.37'	178.49'	S 58°13'56" E	17°20'02"	90.28'
0.00'	35.16'	35.13'	S 10°48'13" W	11°19'31"	17.65'
3.69'	129.35'	129.07'	N 67°59'10" E	13°04'40"	64.96'
2.25'	16.97'	16.97'	S 16°35'41" E	01°38'30"	8.49'
2.25'	57.92'	57.90'	S 18°42'17" E	05°51'40"	28.99'
0.00'	34.89'	34.85'	S 00°22'55" E	09°00'15"	17.48'
0.00'	28.34'	28.32'	S 12°48'35" W	07°18'47"	14.19'
0.00'	19.50'	19.50'	S 06°38'12" W	05°01'59"	9.76'

GENERAL NOTES

Note 1. Greenbelt Drive as Recorded in Book 1061, Page 892, is vacated within the hatched portions as shown on this plat, per Mesa County Planning Department Resolution MCM 94-12. dated Jan.18, 1994. The remaining portions are to be re-dedicated as a Public Pedestrian Right-of-Way and Road Right-of-Way for South Rim Drive.

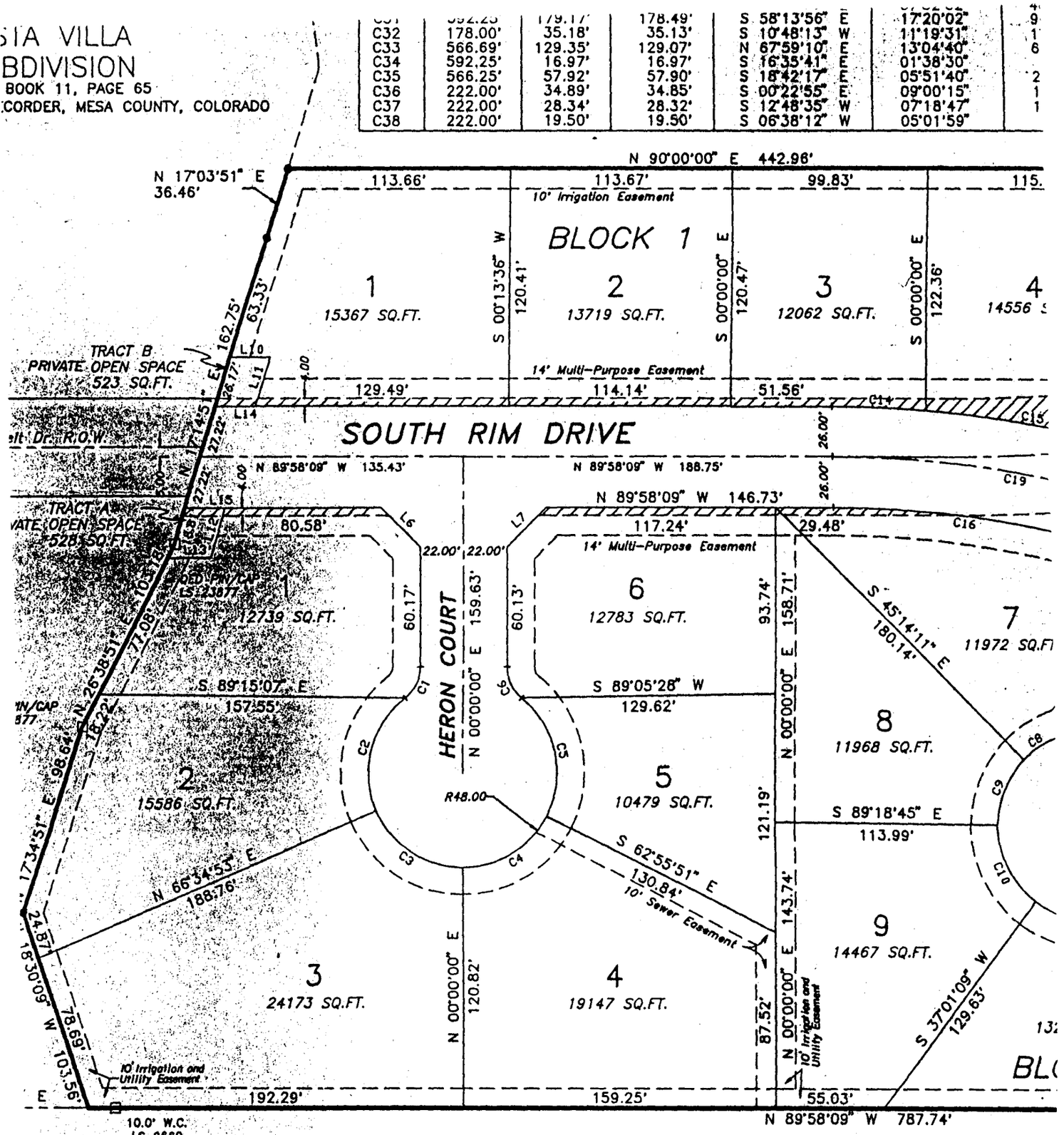
Note 2. All foundation construction must meet the requirements contained within "Subsurface Soils Exploration" by Lincoln-Devore, Inc. as dated August 3, 1993, and as ammended Dec. 7, 1993.

Future Development
South Rim Subdivision



SIA VILLA
BDIVISION
BOOK 11, PAGE 65
CORDER, MESA COUNTY, COLORADO

C31	592.25'	179.17'	178.49'	S 58°13'56" E	17°20'02"	9
C32	178.00'	35.18'	35.13'	S 10°48'13" W	11°19'31"	1
C33	566.69'	129.35'	129.07'	N 67°59'10" E	13°04'40"	6
C34	592.25'	16.97'	16.97'	S 16°35'41" E	01°38'30"	
C35	566.25'	57.92'	57.90'	S 18°42'17" E	05°51'40"	2
C36	222.00'	34.89'	34.85'	S 00°22'55" E	09°00'15"	1
C37	222.00'	28.34'	28.32'	S 12°48'35" W	07°18'47"	1
C38	222.00'	19.50'	19.50'	S 06°38'12" W	05°01'59"	



PALACE VERDES ESTATES
FILING NO. 3

PLAT BOOK 11, PAGE 4
OFFICE OF THE RECORDER, MESA COUNTY, COLORADO

RTIFICATION

ertify that this plat of SOUTH RIM FILING NO. 1 and the were completed under my direct supervision, and that completed according to the standards of practice and State of Colorado, and are correct to the best of my

DENNIS W JOHNSON REGISTERED 16835 LAND SURVEYOR STATE OF COLORADO

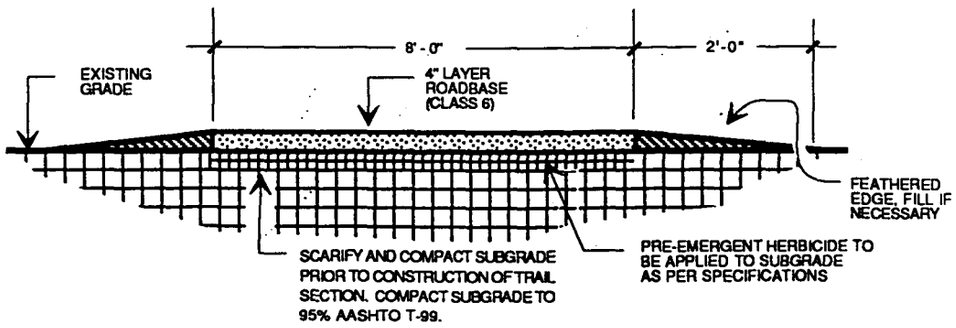
DENNIS W. JOHNSON
COLORADO REGISTERED SURVEYOR, No. 16835

Certified this 20th day of FEB, 1994

MINIMUM SETBACK REQUIREMENTS	
PRINCIPAL BUILDING	
Front	20 Feet
Side	10 Feet
Rear	20 Feet
Maximum Building Height= 28 ft.	
ACCESSORY BUILDING	
Front	Rear 1/2 of Lot
Side	0 Feet
Rear	0 Feet
Height	Max. 6.0' total Height and fenced from public view.

4" THICK ROADBASE TRAIL SECTION

NOT TO SCALE



4" OR 6" THICK CONCRETE TRAIL SECTION

NOT TO SCALE

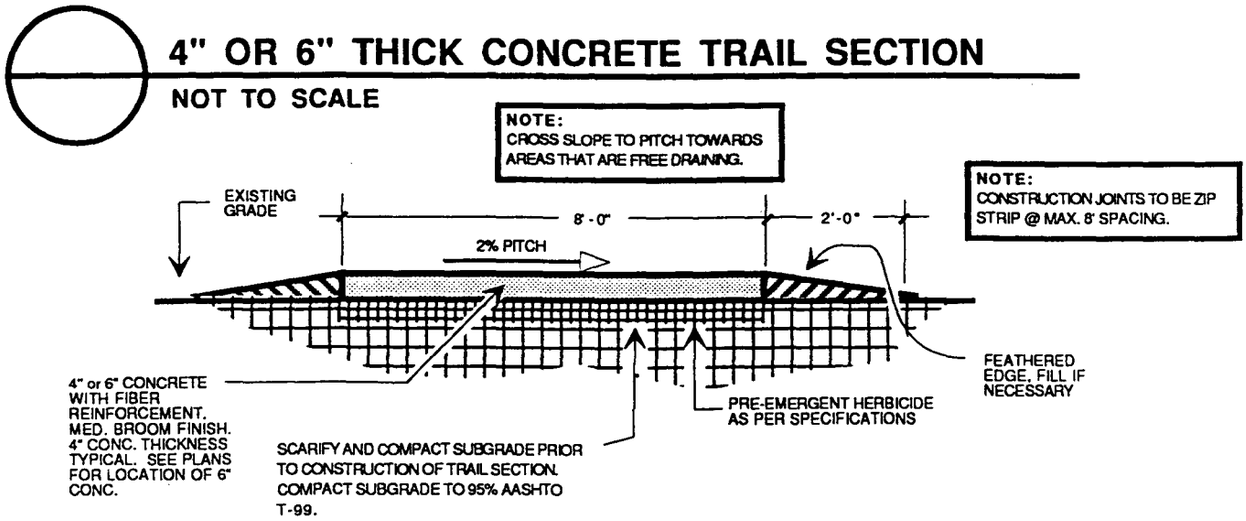


EXHIBIT "C"

FINAL DRAINAGE REPORT

FOR

SOUTH RIM ON THE REDLANDS FILINGS 3 and 4

May, 1995

Prepared for:
LOWE DEVELOPMENT CO.
c/o David "Skip" Behrorst
1280 Ute Avenue, Suite 32
Aspen, CO. 81611 (970) 925-4497

Prepared by:
LANDesign LTD.
200 N. 6th. Street, Grand Junction, CO 81501

Prepared by: MDS
Monty D. Stroup

" I hereby certify that this report for the final drainage design of South Rim on the Redlands, Filings No. 3 and 4 was prepared under my direct supervision."

Reviewed by: Philip M. Hart
Philip M. Hart, PE
State of Colorado, #19346

I. Location and Description of Property

A. Property Location:

South Rim on the Redlands is located in the City of Grand Junction, County of Mesa, State of Colorado, more particularly being located in the SW 1/4 of Section 8, T.1 S., R.1 W. of the Ute Meridian, (Tax I.D. #2945-08-083, 087 and 091).

Existing streets within the area of the project include 23 Road to the west and South Rim Drive (aka Greenbelt Drive) which runs west to east and is to be used as primary access to the site.

The South Rim development is bounded to the northeast by the Tailrace Redlands Power Canal and to the northwest by undeveloped lands. To the west lies Vista Villa Subdivision and Palace Verdes Estates, best described as medium density residential developments. To the south lies Haas Subdivision and Chamberlain Estates, undeveloped pasture lands. To the southeast lies Rio Vista Subdivision a medium density residential development.

B. Description of Property:

The overall South Rim Development contains approximately 91.5 acres including 38.9 acres of area designated for open-space. The third phase of development, South Rim Filing Three contains approximately 16.26 acres planned for 40 single family residential lots and is located in the northeast portion of the South Rim development. South Rim Filing No. 4 (Future Development) is located along the east boundary of the South Rim development and is adjacent to Filing No. 3. Filing No. 4 is not being platted at this time however due to the site topography and it's proximity to Filing No. 3 it is analyzed and included is this study.

Ground cover on upland areas includes native grasses and isolated pockets of trees and brush. Lowland areas, gullies and washes are host to a variety of ground covers including thick brush, dense willows, native grasses and trees.

The site soils are classified as (Hc) Hinman clay loam, 0 to 2 percent slopes and falls within the hydrological soil group "C".

Soils along gullies and washes are classified as (Rr) Rough broken land, Mesa, Chipeta and Persayo soils materials and falls within the hydrological soils group "D" (Reference 4, Exhibit 2.0).

Irrigation facilities shall include a pressurized under ground system supplied by an existing storage pond located northeast of and adjacent to Filing One.

II. Drainage Basins and Sub-Basins

A. Major Basin Description:

The project site is bounded to the northeast by the Tailrace Redlands Power canal flowing from the southeast to the northwest.

The canal serves to convey return irrigation water and storm water runoff from areas southeast of the site.

As defined in the detailed drainage study entitled "Flood Hazard Information, Colorado River and Tributaries" (Reference e, Exhibit 1.0) South Rim Filing One is not within the 100 and 500 year floodplains.

The entire South Rim Development is bisected by a ridgeline running southwest to northeast, dividing the site in half. For purposes of this phase of development the limits of this study shall be confined to the area and associated basins northeast of the ridgeline.

B. Sub-Basin Description:

Historically the property drains in a sheetflow fashion from the southwest to the northeast at slopes of 3 to 4 percent towards a series of natural gullies. Drainage within the Gullies is ultimately conveyed and discharged to the Redlands Power Canal.

The subject property is located adjacent to the aforementioned ridgeline and is not affected by offsite stormwater runoff.

III. Drainage Design Criteria

A. Regulations:

The City of Grand Junction's (SWMM), (Reference 1) was used as the basis for analysis and facility design.

B. Development Criteria Reference and Constraints:

Drainage studies prepared for previous phases of this development are listed herein as References 8 and 9 and are on file with the City of Grand Junction's Department of Public Works.

The primary design constraints for the project site are the routing and conveyance of developed flows to and along the existing Gullies while mitigating the potential for erosion. The existing Gullies are relatively steep and are host to a variety of vegetation including but not limited to native grasses, trees and thick pockets of brush.

Due to the projects proximity to the Tailrace Redlands Power Canal and the Colorado River, developed flows will have a insignificant affect on the peak hydrograph for the regional basin and resultant flows in the canal. Therefore onsite detention requirements are considered mitigated. Historic flow rates are not calculated.

C. Hydrological Criteria:

Since the project is a single family residential development containing approximately 16.. 6 acres the "Rational Method" was used to calculate developed flow rates. The minor storm is not calculated as the major storm (the 100 year frequency rainfall event) was used to size all conveyance elements and structures.

Runoff Coefficients used in the computations are based on the most recent City of Grand Junction criteria as defined in Reference 1 and shown on Exhibit 3.0. Coefficients used in the calculations were assigned based on land use and hydrological soils groups "C".

The Intensity Duration Frequency Table (IDF) shown on Exhibit 4.0 was used for design and analysis.

Times of Concentration were calculated based on the Average Velocities For Overland Flow and the Overland Flow Graph as provided in Reference 1 and shown on Exhibit 5.0. Where applicable Tc values were calculated as shown of Exhibit 7.0.

D. Hydraulic Criteria:

Minimum standards for analysis and design of drainage facilities are based on the City of Grand Junction criteria (Reference 1).

The computer program "Flowmaster" (Reference 7) was used to aid in the determination of pipe capacities and minimum pipe slopes.

Information contained in Reference 5 was used to determine outlet treatment on storm sewers.

IV. Drainage Facility Design:

A. General Concept:

Based on the proposed land use plan, significant changes to the existing drainage patterns are not anticipated. The proposed roadway alignments and lot grading divides the site into 11 sub-basins labeled A1 thru A3, B1 thru B3, C1 and CC, D1 and DD, E1 and EE. Sub-basin AA is developed land within Filing No. two which contributes flow to Filing No. 3. The proposed drainage patterns shall continue to direct runoff from sub-basins to Gullies ultimately discharging to the Tailrace Redlands Power Canal.

Times of concentration and calculated flow rates at select design points are presented on Exhibits 7.0 and 8.0 respectively. Facility design including storm sewers, inlets, street capacities and minimum pipe slopes are presented on Exhibits 9.0 thru u0.0. Proposed drainage patterns, roadway alignments and drainage facilities are presented on the "Grading and Drainage Plan" sheets GD-1 and GD--.

B. Specific Details:

Runoff from all offsite and onsite sub-basins is routed to the existing overland flow paths and Gullies and ultimately to the Redlands Power Canal.

Drainage improvements associated with the development of South Rim Filings No. Three and Four shall be limited to the installation of Storm Sewer Lines "A", "B1", "BB, "C" and "D" as shown on the Grading and Drainage Plan.

Sub-basins "A1 thru A3"

Line "A" shall be installed parallel to the common line of Lots s and 3, Block 3. It shall consist of single combination curb opening inlets in sump condition at design points 1 and d. A 11" diameter RCP pipe shall be installed crossing S. Rim Drive between the inlets and then transition to 11" PVC pipe for the remainder of it's run. A concrete outlet headwall and rip-rap protection are to be installed at the outlet end of the sewer. Discharge from this storm sewer shall continue easterly along Gully "A" to an existing City owned irrigation pond to the east of the project. The entire reach of Gully "A" is very well protected from erosion by thick vegetation including grass, brush and trees. Additional improvement to the reach from the outlet of the storm sewer to the existing pond is not necessary.

Sub-basins "B1 thru B3"

Line "B1" shall be installed parallel to the common line of Lots 9 and 10, Block 3. It shall consist of single combination curb opening inlets in sump condition at design points 3 and 4. A 11" diameter RCP pipe shall be installed crossing S. Rim Drive between the inlets and then transition to 11" PVC pipe for the remainder of it's run. A concrete baffled outlet structure and rip-rap protection are to be installed at the outlet end of the sewer. Discharge from this storm sewer shall continue easterly along Gully "B" to Line "BB" at design point 5. Line "BB" shall convey runoff under the irrigation pond access road directly to an existing City owned pond to the east of the project. The entire reach of Gully "B" is well protected from erosion by vegetation including grass, brush and trees. Additional improvement to the reach from the outlet of storm sewer "B1" to storm sewer "BB" is not necessary.

Sub-basins "C1 and CC"

Line "C" shall be installed parallel to the common line of Lots within future Filing No. 4 as shown on the Grading and Drainage Plan. It shall consist of single combination curb opening inlets in sump condition at design points 6 and 7. A 11" diameter RCP pipe shall be installed crossing Promontory Court between the inlets and then transition to PVC pipe for the remainder of it's run. A concrete outlet headwall and rip-rap protection are to be installed at the outlet end of the sewer. Discharge from this storm sewer shall continue easterly under ground to the main "outlet channel" from the irrigation ponds. The entire reach of the outlet channel well established and protected from erosion by thick vegetation including grass, brush and other plant life indigenous to wetlands. The plan calls for minimal disturbance to the channel overbanks in this area.

Sub-basin "D1"

Line "D" shall be installed along the common line of Lots 7 and 8, Block 1. It shall consist of a single combination curb opening inlet in sump condition at design point 8. A 11" diameter PVC pipe shall be installed from the inlet to its point of terminus. A concrete baffled outlet structure and rip-rap protection are to be installed at the outlet end of the sewer. A rip-rap check structure is to be constructed down stream of the outlet to augment sedimentation and erosion control. Discharge from this storm sewer shall continue northeast via Gully "D" to a large "low area" adjacent to the canal. Field inspection indicates that this "low area" is heavily vegetated with grass, brush, trees and other plant life indigenous to wetlands. Combined, the size, topography and ground cover associated with this area indicate that it will function as a natural impound area providing sediment control.

Sub-basins "DD, E1 and EE"

Runoff from these areas shall continue to be overland in nature across the rear yards residential lots following existing natural drainage patterns and gullies towards the canal.

Sub-basin "P1"

Area within this sub-basin was analyzed with the drainage reports for Filings No. One and Two (References 8 and 9). Runoff from this area flows away from this phase.

IV. Conclusion

This Final Drainage Report has been prepared to address site specific drainage concerns in accordance with the requirements of the City of Grand Junction, Colorado. The Appendix of this report includes criteria, exhibits, tables and design nomographs used in the analysis and design.

V. References

1. Stormwater Management Manual (SWMM), City of Grand Junction, Colorado, Department of Public Works, June 1994.

.. Flood Hazard Information, Colorado River and Tributaries, Grand Junction, Colorado, prepared for the City of Grand Junction and Mesa County, by The Department Of The Army, Sacramento District, Corps Of Engineers, Sacramento, California, November, 1976.

3. Flood Insurance Rate Map, Mesa County, Colorado, (Unincorporated Areas), Community Panel Number 080115 0480 C, Federal Emergency Management Agency, Map Revised July 15th, 1999.

4. Soil Survey, Grand Junction Area, Colorado, Series 1940, No. 19, U.S. Department of Agriculture, issued November, 1955.

5. Urban Storm Drainage Criteria Manual, Urban Drainage and Flood Control District, prepared by Wright-McLaughlin Engineers, March 1969, Revised May, 1984.

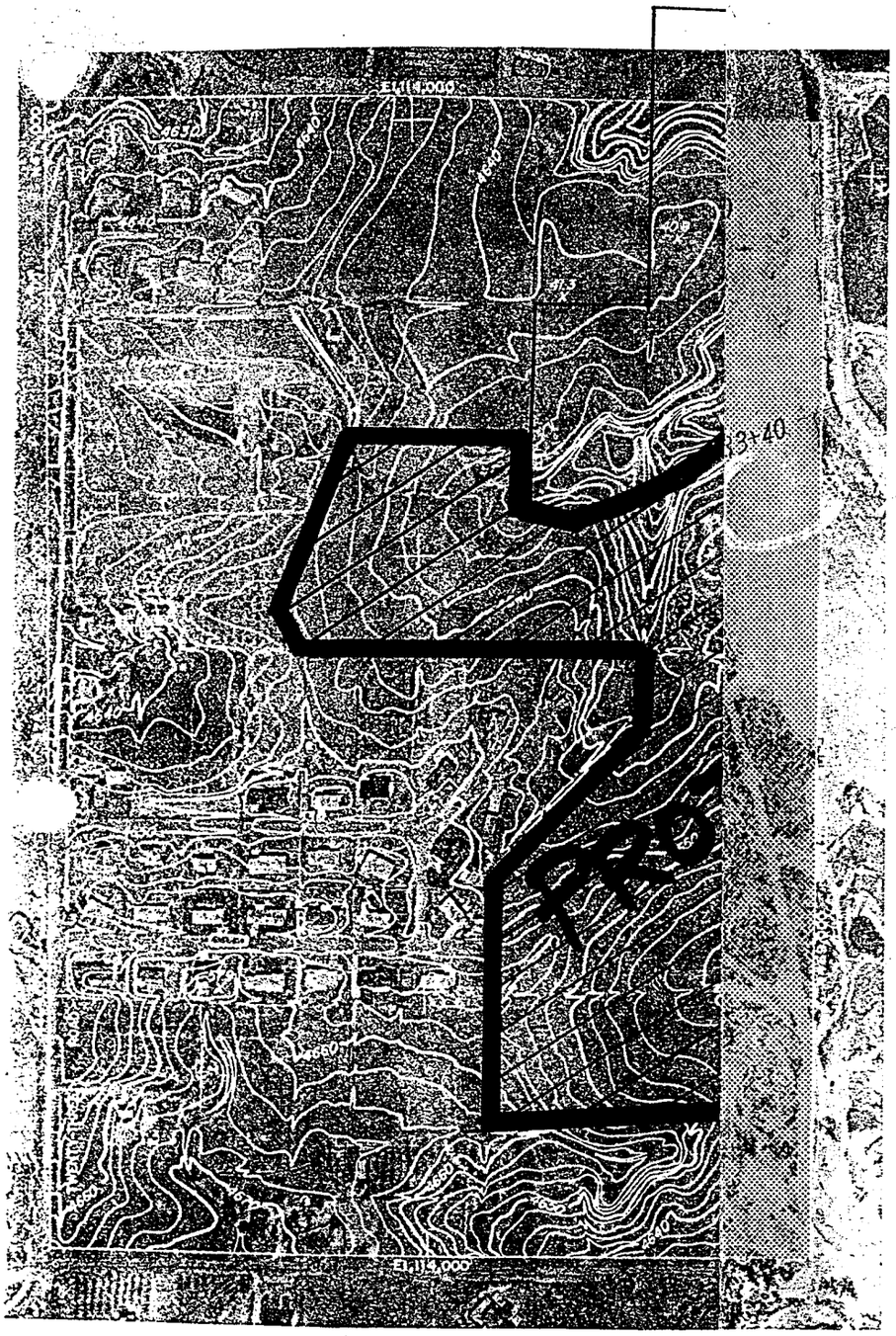
6. Concrete Pipe Design Manual, American Concrete Pipe Association, Fifth Printing (revised) June, 1980.

7. Flowmaster I, Version 3.16, Haestad Methods, Inc., Copyright 1990.

8. Final Drainage Report for South Rim of The Redlands, Filing No. One, Prepared by LANDesign LTD., December 10, 1993.

9. Final Drainage Report for South Rim of The Redlands, Filing No. Two, Prepared by LANDesign LTD., April 1, 1994.

APPENDIX



LEGEND

Overflow Limits

100 Year Flood

500 Year Flood

N

383+40 Distance in miles upstream from Lees Ferry along the Colorado River, or from mouth along the Gunnison River.

NOTES

Map based on April 1975 orthophoto map provided by the U.S. Bureau of Reclamation. Minor additions and adjustments made by Corps of Engineers.

Sheet number agrees with sheet number shown on Bureau of Reclamation maps.

Limits of overflow shown may vary from actual locations on the ground because of accuracy of available topography.

Areas outside the overflow limits shown may be subject to flooding from local runoff.

SCALE IN FEET

200 0 200 400 600

CONTOUR INTERVAL 2 FEET
MEAN SEA LEVEL DATUM

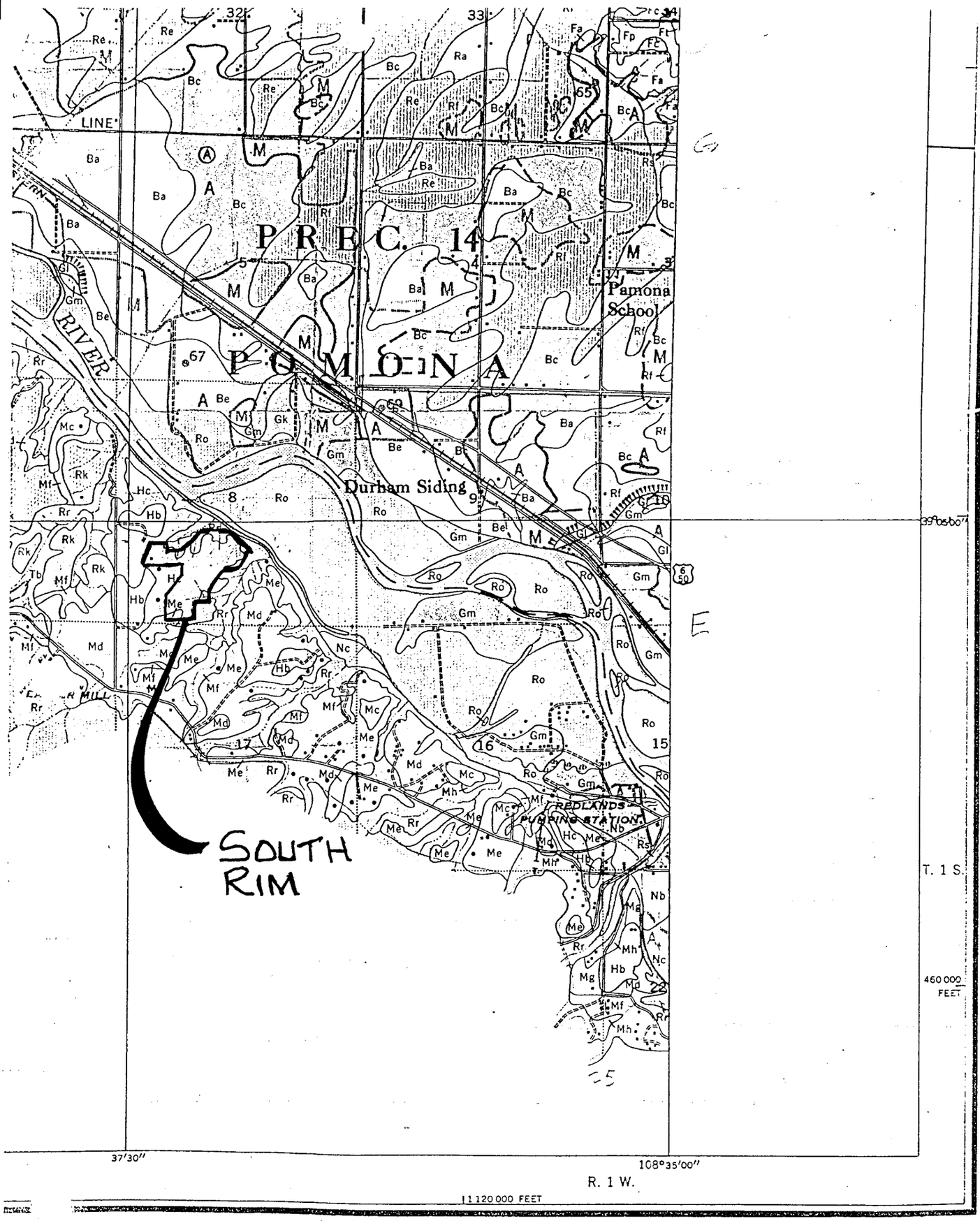
DEPARTMENT OF THE ARMY
SACRAMENTO DISTRICT, CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

FLOOD HAZARD INFORMATION
COLORADO RIVER AND TRIBUTARIES
GRAND JUNCTION, COLORADO

FLOODED AREAS
NOVEMBER 1976

SHEET 294 PLATE 8

EXHIBIT 1.0



NOTE:

See sheet No. 1 for Alphabetical Legend and Conventional Signs; sheet No. 3 for Color Grouping.

Map compilation by Division of Cartography, Soil Conservation Service, from controlled 1939 aerial mosaics.
Polyconic projection. 1927 North American datum.
10000 [illegible] Colorado [illegible]ral)

EXHIBIT 2.0

LAND USE OR SURFACE CHARACTERISTICS	SCS HYDROLOGIC SOIL GROUP (SEE APPENDIX "C" FOR DESCRIPTIONS)											
	A			B			C			D		
	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+
UNDEVELOPED AREAS Bare ground	.10 - .20 .14 - .24	.16 - .26 .22 - .32	.25 - .35 .30 - .40	.14 - .22 .20 - .28	.22 - .30 .28 - .36	.30 - .38 .37 - .45	.20 - .28 .26 - .34	.28 - .36 .35 - .43	.36 - .44 .40 - .48	.24 - .32 .30 - .38	.30 - .38 .40 - .48	.40 - .48 .50 - .58
Cultivated/Agricultural	.08 - .18 .14 - .24	.13 - .23 .18 - .28	.16 - .26 .22 - .32	.11 - .19 .16 - .24	.15 - .23 .21 - .29	.21 - .29 .28 - .36	.14 - .22 .20 - .28	.19 - .27 .25 - .33	.26 - .34 .34 - .42	.18 - .26 .24 - .32	.23 - .31 .29 - .37	.31 - .39 .41 - .49
Pasture	.12 - .22 .15 - .25	.20 - .30 .25 - .35	.30 - .40 .37 - .47	.18 - .26 .23 - .31	.28 - .36 .34 - .42	.37 - .45 .45 - .53	.24 - .32 .30 - .38	.34 - .42 .42 - .50	.44 - .52 .52 - .60	.30 - .38 .37 - .45	.40 - .48 .50 - .58	.50 - .58 .62 - .70
Meadow	.10 - .20 .14 - .24	.16 - .26 .22 - .32	.25 - .35 .30 - .40	.14 - .22 .20 - .28	.22 - .30 .28 - .36	.30 - .38 .37 - .45	.20 - .28 .26 - .34	.28 - .36 .35 - .43	.36 - .44 .44 - .52	.24 - .32 .30 - .38	.30 - .38 .40 - .48	.40 - .48 .50 - .58
Forest	.05 - .15 .08 - .18	.08 - .18 .11 - .21	.11 - .21 .14 - .24	.08 - .16 .10 - .18	.11 - .19 .14 - .22	.14 - .22 .18 - .26	.10 - .18 .12 - .20	.13 - .21 .16 - .24	.16 - .24 .20 - .28	.12 - .20 .15 - .23	.16 - .24 .20 - .28	.20 - .28 .25 - .33
RESIDENTIAL AREAS 1/8 acre per unit	.40 - .50 .48 - .58	.43 - .53 .52 - .62	.46 - .56 .55 - .65	.42 - .50 .50 - .58	.45 - .53 .54 - .62	.50 - .58 .59 - .67	.45 - .53 .53 - .61	.48 - .56 .57 - .65	.53 - .61 .64 - .72	.48 - .56 .56 - .64	.51 - .59 .60 - .68	.57 - .65 .69 - .77
1/4 acre per unit	.27 - .37 .35 - .45	.31 - .41 .39 - .49	.34 - .44 .42 - .52	.29 - .37 .38 - .46	.34 - .42 .42 - .50	.38 - .46 .47 - .55	.32 - .40 .41 - .49	.36 - .44 .45 - .53	.41 - .49 .52 - .60	.35 - .43 .43 - .51	.39 - .47 .47 - .55	.45 - .53 .57 - .65
1/3 acre per unit	.22 - .32 .31 - .41	.26 - .36 .35 - .45	.29 - .39 .38 - .48	.25 - .33 .33 - .41	.29 - .37 .38 - .46	.33 - .41 .42 - .50	.28 - .36 .36 - .44	.32 - .40 .41 - .49	.37 - .45 .48 - .56	.31 - .39 .39 - .47	.35 - .43 .43 - .51	.42 - .50 .53 - .61
1/2 acre per unit	.16 - .26 .25 - .35	.20 - .30 .29 - .39	.24 - .34 .32 - .42	.19 - .27 .28 - .36	.23 - .31 .32 - .40	.28 - .36 .36 - .44	.22 - .30 .31 - .39	.27 - .35 .35 - .43	.32 - .40 .42 - .50	.26 - .34 .34 - .42	.30 - .38 .38 - .46	.37 - .45 .48 - .56
1 acre per unit	.14 - .24 .22 - .32	.19 - .29 .26 - .36	.22 - .32 .29 - .39	.17 - .25 .24 - .32	.21 - .29 .28 - .36	.26 - .34 .34 - .42	.20 - .28 .28 - .36	.25 - .33 .32 - .40	.31 - .39 .40 - .48	.24 - .32 .31 - .39	.29 - .37 .35 - .43	.35 - .43 .46 - .54
MISC. SURFACES Pavement and roofs	.93 .95	.94 .96	.95 .97	.93 .95	.94 .96	.95 .97	.93 .95	.94 .96	.95 .97	.93 .95	.94 .96	.95 .97
Traffic areas (soil and gravel)	.55 - .65 .65 - .70	.60 - .70 .70 - .75	.64 - .74 .74 - .79	.60 - .68 .68 - .76	.64 - .72 .72 - .80	.67 - .75 .75 - .83	.64 - .72 .72 - .80	.67 - .75 .75 - .83	.69 - .77 .77 - .85	.72 - .80 .79 - .87	.75 - .83 .82 - .90	.77 - .85 .84 - .92
Green landscaping (lawns, parks)	.10 - .20 .14 - .24	.16 - .26 .22 - .32	.25 - .35 .30 - .40	.14 - .22 .20 - .28	.22 - .30 .28 - .36	.30 - .38 .37 - .45	.20 - .28 .26 - .34	.28 - .36 .35 - .43	.36 - .44 .42 - .52	.24 - .32 .30 - .38	.30 - .38 .40 - .48	.40 - .48 .50 - .58
Non-green and gravel landscaping	.30 - .40 .34 - .44	.36 - .46 .42 - .52	.45 - .55 .50 - .60	.45 - .55 .50 - .60	.42 - .50 .48 - .56	.50 - .58 .57 - .65	.40 - .48 .46 - .54	.48 - .56 .55 - .63	.56 - .64 .64 - .72	.44 - .52 .50 - .58	.50 - .58 .60 - .68	.60 - .68 .70 - .78
Cemeteries, playgrounds	.20 - .30 .24 - .34	.26 - .36 .32 - .42	.35 - .45 .40 - .50	.35 - .45 .40 - .50	.32 - .40 .38 - .46	.40 - .48 .47 - .55	.30 - .38 .36 - .44	.38 - .44 .45 - .53	.46 - .54 .54 - .62	.34 - .42 .40 - .48	.40 - .48 .50 - .58	.50 - .58 .60 - .68

NOTES:
1. Values above and below pertain to the 2-year and 100-year storms, respectively.
2. The range of values provided allows for engineering judgement of site conditions such as basic shape, homogeneity of surface type, surface depression storage, and storm duration. In general, during shorter duration storms (Tc ≤ 10 minutes), infiltration capacity is higher, allowing use of a "C" value in the low range. Conversely, for longer duration storms (Tc) 30 minutes), use a ""C value in the higher range.
3. For residential development at less than 1/8 acre per unit or greater than 1 acre per unit, and also for commercial and industrial areas, use values under MISC SURFACES to estimate "C" value ranges for use.

RATIONAL METHOD RUNOFF COEFFICIENTS
(Modified from Table 4, UC-Davis, which appears to be a modification of work done by Rawls)

TABLE "B-1"

TABLE "A-1"
INTENSITY-DURATION-FREQUENCY (IDF) TABLE

Time (min)	2-Year Intensity (in/hr)	100-Year Intensity (in/hr)	Time (min)	2-Year Intensity (in/hr)	100-Year Intensity (in/hr)
5	1.95	4.95	33	0.83	2.15
6	1.83	4.65	34	0.82	2.12
7	1.74	4.40	35	0.81	2.09
8	1.66	4.19	36	0.80	2.06
9	1.59	3.99	37	0.79	2.03
10	1.52	3.80	38	0.78	2.00
11	1.46	3.66	39	0.77	1.97
12	1.41	3.54	40	0.76	1.94
13	1.36	3.43	41	0.75	1.91
14	1.32	3.33	42	0.74	1.88
15	1.28	3.24	43	0.73	1.85
16	1.24	3.15	44	0.72	1.82
17	1.21	3.07	45	0.71	1.79
18	1.17	2.99	46	0.70	1.76
19	1.14	2.91	47	0.69	1.73
20	1.11	2.84	48	0.68	1.70
21	1.08	2.77	49	0.67	1.67
22	1.05	2.70	50	0.66	1.64
23	1.02	2.63	51	0.65	1.61
24	1.00	2.57	52	0.64	1.59
25	0.98	2.51	53	0.63	1.57
26	0.96	2.46	54	0.62	1.55
27	0.94	2.41	55	0.61	1.53
28	0.92	2.36	56	0.60	1.51
29	0.90	2.31	57	0.59	1.49
30	0.88	2.27	58	0.58	1.47
31	0.86	2.23	59	0.57	1.45
32	0.84	2.19	60	0.56	1.43

Source: Mesa County 1991

EXHIBIT 4.0

REPRODUCED FROM FIGURE 15.2, SCS 1972

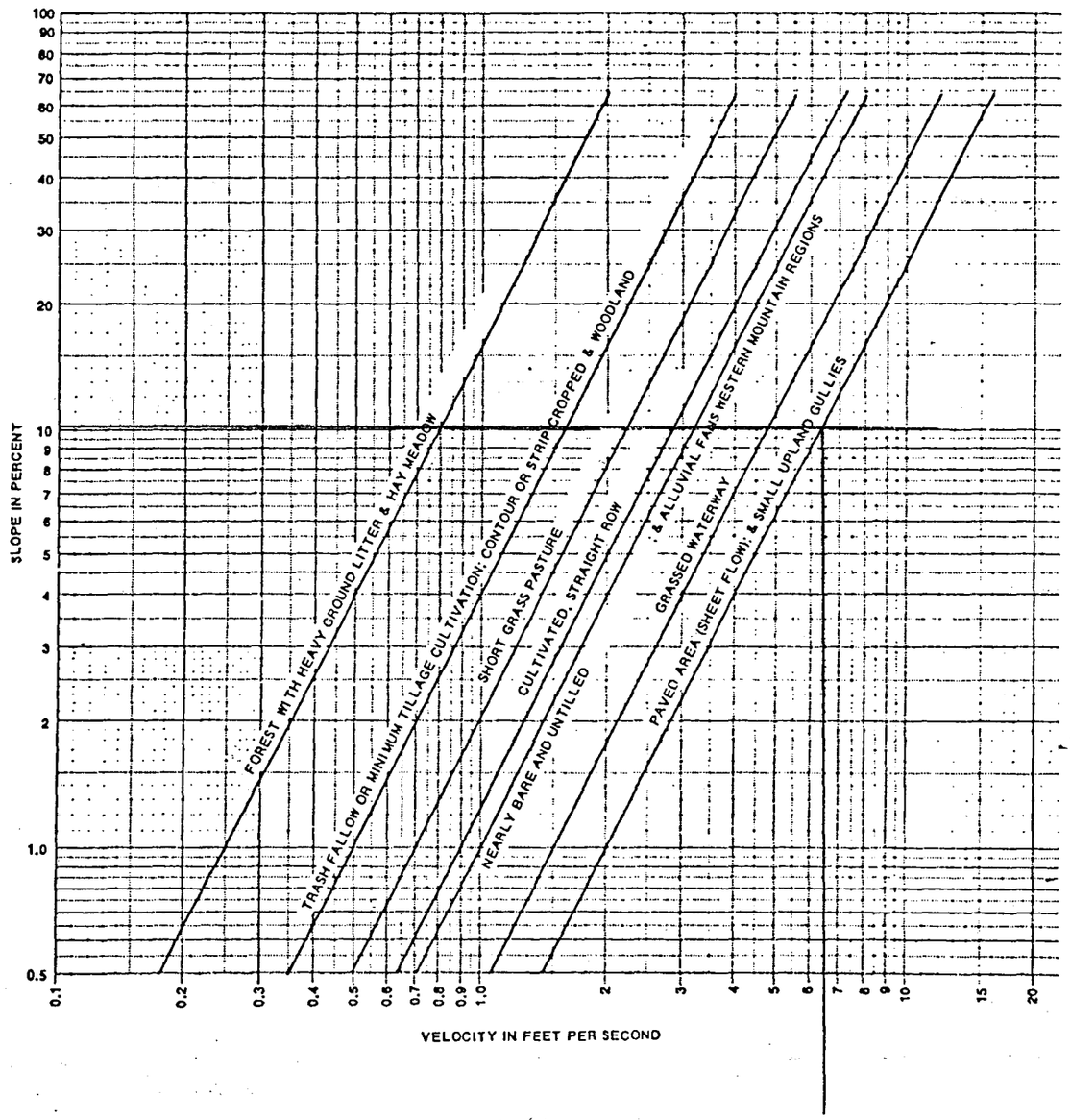


EXHIBIT 5.0

DETERMINATION OF "Ts"	FIGURE "E-3"

NOTE: THIS IS A REPRODUCTION OF TABLE I, APPENDIX A, "DESIGN CHARTS FOR OPEN CHANNEL FLOW", (HDS #3)

	Manning's *n* range [3]
I. Closed conduits:	
A. Concrete pipe	0.011–0.013
B. Corrugated-metal pipe or pipe-arch:	
1. 2⅔ by ½-in. corrugation (riveted pipe): [3]	
a. Plain or fully coated	0.024
b. Paved invert (range values are for 25 and 50 percent of circumference paved):	
(1) Flow full depth	0.021–0.018
(2) Flow 0.8 depth	0.021–0.016
(3) Flow 0.6 depth	0.019–0.013
2. 6 by 2-in. corrugation (field bolted)	0.03
C. Vitrified clay pipe	0.012–0.014
D. Cast-iron pipe, uncoated	0.013
E. Steel pipe	0.009–0.011
F. Brick	0.014–0.017
G. Monolithic concrete:	
1. Wood forms, rough	0.015–0.017
2. Wood forms, smooth	0.012–0.014
3. Steel forms	0.012–0.013
H. Cemented rubble masonry walls:	
1. Concrete floor and top	0.017–0.022
2. Natural floor	0.019–0.025
I. Laminated treated wood	0.015–0.017
J. Vitrified clay liner plates	0.015
II. Open channels, lined [4] (straight alinement): [5]	
A. Concrete, with surfaces as indicated:	
1. Formed, no finish	0.013–0.017
2. Trowel finish	0.012–0.014
3. Float finish	0.013–0.015
4. Float finish, some gravel on bottom	0.015–0.017
5. Gunite, good section	0.016–0.019
6. Gunite, wavy section	0.018–0.022
B. Concrete, bottom float finished, sides as indicated:	
1. Dressed stone in mortar	0.015–0.017
2. Random stone in mortar	0.017–0.020
3. Cement rubble masonry	0.020–0.025
4. Cement rubble masonry, plastered	0.016–0.020
5. Dry rubble (riprap)	0.020–0.030
C. Gravel bottom, sides as indicated:	
1. Formed concrete	0.017–0.020
2. Random stone in mortar	0.020–0.023
3. Dry rubble (riprap)	0.023–0.033
D. Brick	0.014–0.017
E. Asphalt:	
1. Smooth	0.013
2. Rough	0.016
F. Wood, planed, clean	0.011–0.013
G. Concrete-lined excavated rock:	
1. Good section	0.017–0.020
2. Irregular section	0.022–0.027
III. Open channels, excavated [4] (straight alinement,[5] natural lining):	
A. Earth, uniform section:	
1. Clean, recently completed	0.016–0.018
2. Clean, after weathering	0.018–0.020
3. With short grass, few weeds	0.022–0.027
4. In gravelly soil, uniform section, clean	0.022–0.025
B. Earth, fairly uniform section:	
1. No vegetation	0.022–0.025
2. Grass, some weeds	0.025–0.030
3. Dense weeds or aquatic plants in deep channels	0.030–0.035
4. Sides clean, gravel bottom	0.025–0.030
5. Sides clean, cobble bottom	0.030–0.040
C. Dragline excavated or dredged:	
1. No vegetation	0.028–0.033
2. Light brush on banks	0.035–0.050
D. Rock:	
1. Based on design section	0.035
2. Based on actual mean section:	
a. Smooth and uniform	0.035–0.040
b. Jagged and irregular	0.040–0.045
E. Channels not maintained, weeds and brush uncut:	
1. Dense weeds, high as flow depth	0.08–0.12
2. Clean bottom, brush on sides	0.05–0.08
3. Clean bottom, brush on sides, highest stage of flow	0.07–0.11
4. Dense brush, high stage	0.10–0.14

	Manning's *n* range [2]
IV. Highway channels and swales with maintained vegetation [6] [7] (values shown are for velocities of 2 and 6 f.p.s.):	
A. Depth of flow up to 0.7 foot:	
1. Bermudagrass, Kentucky bluegrass, buffalograss:	
a. Mowed to 2 inches	0.07–0.045
b. Length 4–6 inches	0.09–0.05
2. Good stand, any grass:	
a. Length about 12 inches	0.18–0.09
b. Length about 24 inches	0.30–0.15
3. Fair stand, any grass:	
a. Length about 12 inches	0.14–0.08
b. Length about 24 inches	0.25–0.13
B. Depth of flow 0.7–1.5 feet:	
1. Bermudagrass, Kentucky bluegrass, buffalograss:	
a. Mowed to 2 inches	0.05–0.035
b. Length 4 to 6 inches	0.06–0.04
2. Good stand, any grass:	
a. Length about 12 inches	0.12–0.07
b. Length about 24 inches	0.20–0.10
3. Fair stand, any grass:	
a. Length about 12 inches	0.10–0.06
b. Length about 24 inches	0.17–0.09
V. Street and expressway gutters:	
A. Concrete gutter, troweled finish	0.012
B. Asphalt pavement:	
1. Smooth texture	0.013
2. Rough texture	0.016
C. Concrete gutter with asphalt pavement:	
1. Smooth	0.013
2. Rough	0.015
D. Concrete pavement:	
1. Float finish	0.014
2. Broom finish	0.016
E. For gutters with small slope, where sediment may accumulate, increase above values of *n* by	*0.002*
VI. Natural stream channels:[8]	
A. Minor streams [9] (surface width at flood stage less than 100 ft.):	
1. Fairly regular section:	
a. Some grass and weeds, little or no brush	0.030–0.035
b. Dense growth of weeds, depth of flow materially greater than weed height	0.035–0.05
c. Some weeds, light brush on banks	0.035–0.05
d. Some weeds, heavy brush on banks	0.05–0.07
e. Some weeds, dense willows on banks	0.06–0.08
f. For trees within channel, with branches submerged at high stage, increase all above values by	*0.01–0.02*
2. Irregular sections, with pools, slight channel meander; increase values given in 1a–e about	*0.01–0.02*
3. Mountain streams, no vegetation in channel, banks usually steep, trees and brush along banks submerged at high stage:	
a. Bottom of gravel, cobbles, and few boulders	0.04–0.05
b. Bottom of cobbles, with large boulders	0.05–0.07
B. Flood plains (adjacent to natural streams):	
1. Pasture, no brush:	
a. Short grass	0.030–0.035
b. High grass	0.035–0.05
2. Cultivated areas:	
a. No crop	0.03–0.04
b. Mature row crops	0.035–0.045
c. Mature field crops	0.04–0.05
3. Heavy weeds, scattered brush	0.05–0.07
4. Light brush and trees: [10]	
a. Winter	0.05–0.06
b. Summer	0.06–0.08
5. Medium to dense brush: [10]	
a. Winter	0.07–0.11
b. Summer	0.10–0.16
6. Dense willows, summer, not bent over by current	0.15–0.20
7. Cleared land with tree stumps, 100–150 per acre:	
a. No sprouts	0.04–0.05
b. With heavy growth of sprouts	0.06–0.08
8. Heavy stand of timber, a few down trees, little undergrowth:	
a. Flood depth below branches	0.10–0.12
b. Flood depth reaches branches	0.12–0.16
C. Major streams (surface width at flood stage more than 100 ft.): Roughness coefficient is usually less than for minor streams of similar description on account of less effective resistance offered by irregular banks or vegetation on banks. Values of *n* may be somewhat reduced. Follow recommendation in publication cited [8] if possible. The value of *n* for larger streams of most regular section, with no boulders or brush, may be in the range of	0.028–0.033

EXHIBIT 6.0

TYPICAL MANNING "n" VALUES | TABLE "F-1a"

TIME OF CONCENTRATION CALCULATIONS **(100 YEAR STORM EVENT)**

PROJECT: ERR
JOB # ERR
LANDesign LTD.

(OVERLAND FLOW)
DEVELOPED CONDITION

DATE:
27-Apr-95

SUB-BASIN DATA			INITIAL / OVERLAND TIME (Ti)			TRAVEL TIME TIME (Tt)				INITIAL	Tc CHECK (URBANIZED BASINS)		FINAL	REMARKS
BASIN	C 100	AREA AC.	LENGTH FT.	SLOPE %	Ti MIN.	LENGTH FT.	SLOPE %	VEL F.P.S.	Tt MIN.	Tc MIN.	TOTAL LENGTH FT.	Tc = (L/180)+10 MIN.	Tc MIN.	
A1	0.53	2.12	255.0	3.37	10.93									OVERLAND SHEETFLOW RESIDENTIAL LOTS
						54.0	1.28	4.14	0.22	11.15	309.00	11.72	11.15	FLOW IN S. RIM DRIVE TO SUMP INLET / SEWER "A"
--	--	--	--	--	--	--	--	--	--	--	--	--	--	---
A2	0.53	3.98	140.0	5.00	7.10									OVERLAND SHEETFLOW RESIDENTIAL LOTS / FILING NO. 2
						1008.0	1.07	3.78	4.44	11.54	1148.00	16.38	11.54	FLOW IN DOVE COURT & S. RIM DRIVE TO SUMP INLET / SEWER "A
--	--	--	--	--	--	--	--	--	--	--	--	--	--	---
B1	0.53	1.71	150.0	2.92	8.79									OVERLAND SHEETFLOW RESIDENTIAL LOTS
						397.0	1.23	4.06	1.63	10.42	547.00	13.04	10.42	FLOW IN S. RIM DRIVE TO SUMP INLET / SEWER "B1"
--	--	--	--	--	--	--	--	--	--	--	--	--	--	---
B2	0.53	0.76	50.0	1.00	7.25									OVERLAND SHEETFLOW RESIDENTIAL LOTS
						397.0	1.23	4.06	1.63	8.88	447.00	12.48	8.88	FLOW IN S. RIM DRIVE TO SUMP INLET / SEWER "B1"
--	--	--	--	--	--	--	--	--	--	--	--	--	--	---
B3	0.53	2.53	210.0	13.67	6.22									OVERLAND SHEETFLOW RESIDENTIAL LOTS TO GULLIE "B"
						188.0	10.19	4.03	0.78	7.00	398.00	12.21	7.00	OPEN CHANNEL FLOW IN GULLIE "B" TO SUMP INLET / SEWER "B2"
--	--	--	--	--	--	--	--	--	--	--	--	--	--	---
C1	0.53	2.02	185.0	5.52	7.90									OVERLAND SHEETFLOW RESIDENTIAL LOTS
						310.0	1.03	3.71	1.39	9.29	495.00	12.75	9.29	FLOW IN PROMONTORY COURT TO SUMP INLET / SEWER "C"
--	--	--	--	--	--	--	--	--	--	--	--	--	--	---
C2	0.53	1.28	135.0	1.31	10.89									OVERLAND SHEETFLOW RESIDENTIAL LOTS
						486.0	0.70	3.06	2.65	13.54	621.00	13.45	13.54	FLOW IN PROMONTORY COURT TO SUMP INLET / SEWER "C"
--	--	--	--	--	--	--	--	--	--	--	--	--	--	---
D1	0.53	1.78	33.0	6.06	3.23									OVERLAND SHEETFLOW RESIDENTIAL LOTS
						573.0	1.98	5.15	1.85	5.09	606.00	13.37	5.09	FLOW IN RIM DR. & FALCON PT. CT TO SUMP INLET / SEWER "D"

FORMULAS

$$Ti = \frac{1.8(1.1-C)(L)^{1/2}}{S^{1/3}} \qquad Tt = \frac{(L)}{60 \text{ SEC/MIN. } (V \text{ F.P.S.})}$$

EXHIBIT 7.0

STORM DRAINAGE SYSTEM DESIGN DATA

PROJECT: SOUTH RIM FILING NO. 3
JOB # 94119
LANDesign LTD.

DATE: 28-Apr-95

LOCATION OR NODE	BASINS	LENGTH FEET	INLET TIME min.	FLOW STREET	TIME PIPE	ANNEL LOC. P.S.	REMARKS
1	A1						FLOW IN S. RIM DRIVE TO SUMP INLET / SEWER "A"
2	A2						FLOW IN S. RIM DRIVE TO SUMP INLET / SEWER "A"
" "	A1						FLOW IN S. RIM DRIVE TO SUMP INLET / SEWER "A"
	A2						FLOW IN S. RIM DRIVE TO SUMP INLET / SEWER "A"
							SUM OF FLOW IN STORM SEWER "A" TO GULLIE "A"
3	B1						FLOW IN S. RIM DRIVE TO SUMP INLET / SEWER "B1"
4	B2						FLOW IN S. RIM DRIVE TO SUMP INLET / SEWER "B1"
" "	B1						FLOW IN S. RIM DRIVE TO SUMP INLET / SEWER "B1"
	B2						FLOW IN S. RIM DRIVE TO SUMP INLET / SEWER "B1"
							SUM OF FLOW IN STORM SEWER "B1" TO GULLIE "B"
5	B1						FLOW IN S. RIM DRIVE TO SUMP INLET / SEWER "B1"
	B2						FLOW IN S. RIM DRIVE TO SUMP INLET / SEWER "B1"
	B3	264.0			0.28		FLOW IN STORM SEWER "B1"
		188.0			0.78		FLOW IN GULLIE "B" TO STORM SEWER "B2"
							SUM OF FLOW IN STORM SEWER "B2" TO EX. IRRIGATION POND
6	C1						FLOW IN PROMONTORY CRT. TO SUMP INLET / SEWER "C"
7	C2						FLOW IN PROMONTORY CRT. TO SUMP INLET / SEWER "C"
" "	C1						FLOW IN PROMONTORY CRT. TO SUMP INLET / SEWER "C"
	C2						FLOW IN PROMONTORY CRT. TO SUMP INLET / SEWER "C"
							SUM OF FLOW IN STORM SEWER "C" TO EX. OUTFALL CHANNEL
8	D1						SUM OF FLOW IN STORM SEWER "D" TO GULLIE "D"

EXHIBIT 8.0

STREET CARRING CAPACITY (2 YEAR)

PROJECT: SOUTH RIM FILING NO. 3
LOCATION: CITY OF GRAND JUNCTION, COLORADO
DATE: Apr-95

Street Information:					
	R.O.W. Width =	44.00	FT.	Flow Area =	3.76 SF.
	Flowline Width =	31.00	FT.		
	Classification =	URBAN			
	Mannings =	0.015			
	Max. Depth =	0.42	FT.	Above Gutter Flowline	
	Str/ X-Slope =	1.00	%		
	Gutter Slope =	8.33	%	Drive Over Curb, Gutter and Walk	
	Sidewalk Slope =	2.08	%	1/4" / FT.	
	Roadside Slope =	2.08	%	1/4" / FT.	

SLOPE OF STREET %	** REDUCTION FACTOR FOR SLOPE	ALLOWABLE CAPACITY C.F.S.	VELOCITY F.P.S.
0.50	1.00	9.72	2.59
0.99	1.00	13.68	3.64
1.00	1.00	13.75	3.66
1.03	1.00	13.96	3.71
1.23	1.00	15.25	4.06
1.28	1.00	15.56	4.14
1.50	1.00	16.84	4.48
1.85	1.00	18.70	4.97
1.88	1.00	18.85	5.01
2.56	1.00	22.00	5.85
2.71	1.00	22.64	6.02
2.80	1.00	23.01	6.12
2.97	1.00	23.70	6.30

Formula: $Qa = F \times (1.49/N) \times R^{2/3} \times S^{1/2} \times A$

F = Reduction Factor For Slope
N = Mannings Coefficient = 0.0150
R = Hydraulic Radius = A/WP = 0.2234
A = Cross Sectional Area Sq.Ft. = 3.760
WP = Wetted Perimeter Ft. = 16.83
S = Street Slope FT./FT.

** APPLY REDUCTION FACTOR WHEN APPROACHING AN INTERSECTION.

EXHIBIT 9.0

STREET CARRING CAPACITY (100 YEAR)

PROJECT: SOUTH RIM FILING NO. 3
LOCATION: CITY OF GRAND JUNCTION, COLORADO
DATE: Apr-95

Street Information:

R.O.W. Width =	44.00	FT.	Flow Area = 15.49 SF.
Flowline Width =	31.00	FT.	
Classification =	URBAN		
Mannings =	0.015		
Max. Depth =	1.00	FT.	Above Gutter Flowline
Str/ X-Slope =	1.00	%	
Gutter Slope =	8.33	%	Drive Over Curb, Gutter and Walk
Sidewalk Slope =	2.08	%	1/4" / FT.
Roadside Slope =	2.08	%	1/4" / FT.

SLOPE OF STREET %	** REDUCTION FACTOR FOR SLOPE	ALLOWABLE CAPACITY C.F.S.	VELOCITY F.P.S.
0.50	1.00	86.34	5.57
0.99	1.00	121.50	7.84
1.00	1.00	122.11	7.88
1.03	1.00	123.93	8.00
1.23	1.00	135.43	8.74
1.28	1.00	138.15	8.92
1.50	1.00	149.55	9.65
1.85	1.00	166.09	10.72
1.88	1.00	167.43	10.81
2.56	1.00	195.37	12.61
2.71	1.00	201.02	12.98
2.80	1.00	204.33	13.19
2.97	1.00	210.44	13.59

Formula: $Qa = F \times (1.49/N) \times R^{2/3} \times S^{1/2} \times A$

F = Reduction Factor For Slope
N = Mannings Coefficient = 0.0150
R = Hydraulic Radius = A/WP = 0.7070
A = Cross Sectional Area Sq.Ft. = 15.490
WP = Wetted Perimeter Ft. = 21.91
S = Street Slope FT./FT.

** APPLY REDUCTION FACTOR WHEN APPROACHING AN INTERSECTION.

Exhibit 10.D

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: GULLIE "B"

Comment: GULLIE "B" FROM STORM SEWER "B1" TO "B2"

Solve For Depth

Given Input Data:

Bottom Width.....	2.00 ft
Left Side Slope..	1.00:1 (H:V)
Right Side Slope.	1.00:1 (H:V)
Manning's n.....	0.060 — WEEDS, BRUSH AND ROCKS
Channel Slope....	0.1019 ft/ft — 10.19%
Discharge.....	5.00 cfs — ASSUME 1.0 CFS/AC

Computed Results:

Depth.....	0.50 ft
Velocity.....	4.03 fps — USE FOR TC CALCS.
Flow Area.....	1.24 sf
Flow Top Width...	2.99 ft
Wetted Perimeter.	3.40 ft
Critical Depth...	0.53 ft
Critical Slope...	0.0827 ft/ft
Froude Number....	1.10 (flow is Supercritical)

Open Channel Flow Module, Version 3.16 (c) 1990
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EXHIBIT 12.0

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: STORM SEWER "A"

Comment: MINIMUM GRADE CALC. INLET #1 TO INLET #2

Solve For Full Flow Slope

Given Input Data:

Diameter.....	1.00 ft
Manning's n.....	0.010
Discharge.....	4.09 cfs

Computed Results:

Full Flow Channel Slope	0.0078 ft/ft
Full Flow Depth.....	1.00 ft
Velocity.....	5.21 fps
Flow Area.....	0.79 sf
Critical Depth....	0.86 ft
Critical Slope....	0.0073 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	4.09 cfs
QMAX @.94D.....	4.40 cfs
Froude Number.....	FULL

EXHIBIT 13.0

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: STORM SEWER "A"

Comment: MINIMUM GRADE CALC. INLET #2 TO OUTLET

Solve For Full Flow Slope

Given Input Data:

Diameter.....	1.00 ft
Manning's n.....	0.010
Discharge.....	11.64 cfs

Computed Results:

Full Flow Channel Slope	0.0632 ft/ft
Full Flow Depth.....	1.00 ft
Velocity.....	14.82 fps
Flow Area.....	0.79 sf
Critical Depth....	1.00 ft
Critical Slope....	0.0602 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	11.64 cfs
QMAX @.94D.....	12.52 cfs
Froude Number.....	FULL

EXHIBIT 14.0

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: STORM SEWER "B1"

Comment: MINIMUM GRADE CALC. INLET #1 TO INLET #2

Solve For Full Flow Slope

Given Input Data:

Diameter.....	1.00 ft
Manning's n.....	0.010
Discharge.....	3.39 cfs

Computed Results:

Full Flow Channel Slope	0.0054 ft/ft
Full Flow Depth.....	1.00 ft
Velocity.....	4.32 fps
Flow Area.....	0.79 sf
Critical Depth....	0.79 ft
Critical Slope....	0.0058 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	3.39 cfs
QMAX @.94D.....	3.65 cfs
Froude Number.....	FULL

EXHIBIT 15.0

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: STORM SEWER "B1"

Comment: MINIMUM GRADE CALC. INLET #2 TO OUTLET

Solve For Full Flow Slope

Given Input Data:

Diameter.....	1.00 ft
Manning's n.....	0.010
Discharge.....	4.90 cfs

Computed Results:

Full Flow Channel Slope	0.0112 ft/ft
Full Flow Depth.....	1.00 ft
Velocity.....	6.24 fps
Flow Area.....	0.79 sf
Critical Depth....	0.91 ft
Critical Slope....	0.0098 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	4.90 cfs
QMAX @.94D.....	5.27 cfs
Froude Number.....	FULL

EXHIBIT 16.0

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: STORM SEWER "B2"

Comment: MINIMUM GRADE CALC. INLET #1 TO OUTFALL

Solve For Full Flow Slope

Given Input Data:

Diameter.....	1.00 ft
Manning's n.....	0.010
Discharge.....	9.54 cfs

Computed Results:

Full Flow Channel Slope	0.0424 ft/ft
Full Flow Depth.....	1.00 ft
Velocity.....	12.15 fps
Flow Area.....	0.79 sf
Critical Depth....	0.99 ft
Critical Slope....	0.0395 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	9.54 cfs
QMAX @.94D.....	10.26 cfs
Froude Number.....	FULL

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EXHIBIT 17.0

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: STORM SEWER "C"

Comment: MINIMUM GRADE CALC. INLET #2 TO OUTLET

Solve For Full Flow Slope

Given Input Data:

Diameter.....	1.00 ft
Manning's n.....	0.010
Discharge.....	5.91 cfs

Computed Results:

Full Flow Channel Slope	0.0163 ft/ft
Full Flow Depth.....	1.00 ft
Velocity.....	7.52 fps
Flow Area.....	0.79 sf
Critical Depth....	0.95 ft
Critical Slope....	0.0141 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	5.91 cfs
QMAX @.94D.....	6.36 cfs
Froude Number.....	FULL

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Exhibit 19.0

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: STORM SEWER "D"

Comment: MINIMUM GRADE CALC. INLET # 1 TO OUTLET

Solve For Full Flow Slope

Given Input Data:

Diameter.....	1.00 ft
Manning's n.....	0.010
Discharge.....	4.64 cfs

Computed Results:

Full Flow Channel Slope	0.0100 ft/ft
Full Flow Depth.....	1.00 ft
Velocity.....	5.91 fps
Flow Area.....	0.79 sf
Critical Depth....	0.90 ft
Critical Slope....	0.0089 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	4.64 cfs
QMAX @.94D.....	4.99 cfs
Froude Number.....	FULL

Open Channel Flow Module, Version 3.16 (c) 1990
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EXHIBIT 20.0

STORMWATER MANAGEMENT PLAN

FOR

SOUTH RIM ON THE REDLANDS FILINGS 3 and 4

May, 1995

Prepared for:

LOWE DEVELOPMENT CO.
c/o David "Skip" Behrhorst
1280 Ute Avenue, Suite 32
Aspen, CO. 81611
303-925-4497

Prepared by:

LANDesign LTD.
200 N. 6th. Street, Grand Junction, CO. 81501
Grand Junction, Colorado 81501

Stormwater Management Plan For South Rim On The Redlands Filings 3 and 4.

Prepared by: _____
Monty D. Stroup

Reviewed and Approved by: _____
Philip M. Hart P.E.
State of Colorado, #19346

A. Site and Project Description

1. Site Location:

South Rim on the Redlands is located in the City of Grand Junction, County of Mesa, State of Colorado, more particularly being located in the SW 1/4 of Section 8, T.1 S., R.1 W. of the Ute Meridian, (Tax I.D. #2945-08-083, 087 and 091). The project is located at 39-04-53 Latitude and 108-37-09 Longitude.

Existing streets within the area of the project include 23 Road to the west and South Rim Drive which runs west to east and is to be used as primary access to the site.

The South Rim development is bounded to the northeast by the Tailrace Redlands Power Canal and to the northwest by undeveloped lands. To the west lies Vista Villa Subdivision and Palace Verdes Estates, best described as medium density residential developments. To the south lies Haas Subdivision and Chamberlain Estates, undeveloped pasture lands. To the southeast lies Rio Vista Subdivision a medium density residential development.

South Rim Filing Three is located east of and is contiguous with South Rim Filing No. Two which currently holds a "Certification CDPS General Permit, Stormwater Discharges Associated With Construction, Permit No. COR-030000, Facility No. COR-030921". South Rim Filing No. Four is to be located east of and contiguous with Filing No. Three as shown of Exhibit 1.0.

2. Description of Property:

The entire South Rim Development contains approximately 91.5 acres including 38.9 acres of area designated for open-space. The third and fourth phases of development, South Rim Filings Three and Four contain approximately 16.26 and 8.60 acres respectively. Filing No. Three is planned for 40 single family residential lots being a minimum of 10,000 square feet is size. Filing No. Four is planned for 15 single family residential lots being a minimum of 10,000 square feet is size.

3. Description of Proposed Construction Activity:

Activity shall include the construction of roadway, water, sanitary sewer, storm sewer, irrigation, dry utility infrastructures followed by the construction of 55 single family residential structures and associated landscaping.

4. Proposed Sequence of Major Construction Activities:

Phase I Clearing and grubbing of both Filings Three and Four. Disposal of construction debris to County approved facility.

Phase II Installation silt fence and Overlot (mass) grading of site to form individual site building pads per the "Grading and Drainage Plan".

Phase III Construction of roadways to proposed subgrade elevations including cut and fill activities as required.

Phase IV Utility infrastructures to be installed including storm sewers and culverts, swales and permanent erosion control features.

Phase V Curb, gutter and sidewalks installed for Filing No. Three.

Phase VI Construction of single or multiple building structures as sales and market conditions allow.

Phase VII Final landscaping of individual lots as required by the project Covenants, Conditions and Restrictions.

5. Estimate of Areas Subject to Clearing, Grubbing and Excavation:

South Rim on The Redlands Filings No. Three and Four contain a total of 24.86 acres.

6. Preconstruction and Postconstruction Runoff Coefficients:

As defined in the Final Drainage Report For South Rim Filing No. 3 and 4 (References 9 and 13) the historic runoff coefficients for the 2 year and 100 year storm events respectively are 0.36 and 0.43.

With the construction of proposed roadways and building structures coefficients are expected to increase to 0.44 and 0.53 respectively.

7. Soil Erosion Potential:

The site soils are classified as (Hc) Hinman clay loam, 0 to 6 percent slopes and falls within the hydrological soil group "C".

Soils along gullies and washes are classified as (Rr) Rough broken land, Mesa, Chipeta and Persayo soils materials and falls within the hydrological soils group "D" (Reference 4). The soils report for the development (Reference 10) characterizes the potential for erosion as significant in areas where drainage and vegetation are not carefully controlled.

8. Existing Vegetation:

Ground cover on upland areas includes native grasses and isolated pockets of trees and brush. Lowland areas, gullies and washes are host to a variety of ground covers

including thick brush, dense willows, native grasses and trees. The estimated ground cover for Filing No. Two is 60 to 80 percent.

9. Storage of Fuel Oils, Chemicals, Fertilizers or Other Potential Pollution Sources:

The storage of fuel oils, chemicals, fertilizers or other potential pollutants is prohibited without prior written notice to the owner by the contractor, subcontractor or other persons doing work on the site. In the event in becomes necessary to store such items, storage areas shall be designated. Storage areas shall be located above and away from drainages, waterways and other apparent conveyance elements. Appropriate measures shall be taken to protect such areas from spills or vandalism including but not limited to spill control berms and fencing.

10. Anticipated Non-Stormwater Components of Discharge:

Irrigation facilities include a pressurized under ground system supplied by a storage pond located northeast of and adjacent to Filing One. Offsite residual irrigation runoff is collected and routed underground to the storage pond upon entering the site.

11. Name and Location of Receiving Waters:

The project site is bounded to the northeast by the Tailrace Redlands Power canal flowing from the southeast to the northwest.

The canal serves to convey return irrigation water and storm water runoff from areas southeast of the site.

As defined in the detailed drainage study entitled "Flood Hazard Information, Colorado River and Tributaries" (Reference 2), South Rim Filings No. 3 and 4 are not within the 100 and 500 year floodplains.

B. Management During Construction

1. Anticipated Problems and Corrective (BMPs) Best Management Practices:

Structural Erosion Control Areas below the toe of fill slopes shall be isolated from fill areas by the installation of prefabricated silt fences as shown on the Grading and Drainage Plan and as detailed on the Erosion Control Plan. Straw bales shall be installed along side and rear yard swales at the locations shown on the plans. Bonterra "S2" Straw Erosion Control Blanket shall be installed on top of storm sewer trench backfill in the locations as shown on the Grading and Drainage Plan.

Non-Structural Erosion Control Disturbed areas not designated for immediate construction or permanent landscaping shall be temporarily re-vegetated. In the event

construction activity ceases for a period of 60 calendar days disturbed areas including cut and fill slopes shall be re-vegetated with a annual and perennial seed mixture as indicated on the Erosion Control Plan.

Dust Abatement The contractor shall be required to provide a consistent and reliable source of construction water. Watering to prevent dust shall be ongoing for the duration of the project. In the event high winds and heavy traffic loads create a situation where watering by itself is not sufficient the contractor is to apply an approved dust palliative other than or in addition to water.

Soil Tracking Access to Filings No. Three and Four shall be from South Rim Drive and Rim Drive which were constructed with Filing No. 2. Where construction traffic enters or exits unimproved areas onto asphalted public roadways a crushed rock construction staging pad shall be installed to minimize soil tracking.

Waste Disposal Construction debris shall be stockpiled in a central location. Debris shall be removed from the site and disposed of at appropriate locations secured by the contractor.

Sedimentation Control The contractor shall be responsible for inspecting the entire site on a weekly basis to ensure compliance and identify existing or potential sedimentation problems. The Final Drainage Reports For South Rim On The Redlands Filings No. 3 and 4 (Reference 13) identify two major drainageways which receive stormwater runoff from the site. Each of these natural drainages is heavily vegetated with dense pockets of brush, willows, trees and native grasses. Based on field investigations the mannings (N) value for each approaches 0.08. These drainages will provide an excellent sediment control and filtering effect and are to be maintained in their natural state.

C. Final Stabilization and Long Term Management

The project's Covenants Conditions and Restrictions (Reference 12) obligate each lot owner to fully landscape front yard within 60 days and the rear yard within 1 year from the issuance of a Certificate of Occupancy. Other areas including open-space are to be landscaped by the developer and maintained by the Homeowners Association.

Permanent structural BMP's include pipe outlet protection, Rip-Rap Plunge Pools over filter fabric and grassed swales as shown on the Grading and Drainage Plan.

D. Inspection and Maintenance

The Contractor shall be ultimately responsible for compliance and maintenance during construction. The owners representative and the contractor shall make weekly inspections of the site to assure compliance and implementation of the proposed BMPs.

E. Conclusion

The information contained herein is augmented by the information, calculations and requirements as presented in the Final Drainage Study For South Rim On The Redlands Filings No. 3 and 4 (Reference 13). A copy of this report shall accompany the General Permit application for Stormwater Discharges Associated With Construction Activity.

F. References

1. Mesa County Storm Drainage Criteria Manual, Final Draft, Mesa County, Colorado, March 1992.

2. Flood Hazard Information, Colorado River and Tributaries, Grand Junction, Colorado, prepared for the City of Grand Junction and Mesa County, by The Department Of The Army, Sacramento District, Corps Of Engineers, Sacramento, California, November, 1976.

3. Flood Insurance Rate Map, Mesa County, Colorado, (Unincorporated Areas), Community Panel Number 080115 0480 C, Federal Emergency Management Agency, Map Revised July 15th, 1992.

4. Soil Survey, Grand Junction Area, Colorado, Series 1940, No. 19, U.S. Department of Agriculture, issued November, 1955.

5. Urban Storm Drainage Criteria Manual, Urban Drainage and Flood Control District, prepared by Wright-McLaughlin Engineers, March 1969, Revised May, 1984.

6. Stormwater Management Manual (SWMM), City of Grand Junction, Colorado, Department of Public Works, June 1994.

7. Douglas County Storm Drainage Design and Technical Criteria, Addendum A, Erosion Control Criteria, prepared by HydroDynamics Incorporated, Parker, Colorado, October, 1992.

8. Final Drainage Report For South Rim On The Redlands, Filing No. One, prepared by Philip M. Hart, P.E., December 10, 1993.

9. Final Drainage Report For South Rim On The Redlands, Filing NO. Two, prepared by HART GROUP, PC, Engineers Designers Planners, A Division Of LANDesign, Grand Junction, Colorado, April 1, 1994.

10. Subsurface Soils Exploration, South Rim Subdivision, Grand Junction, Colorado, prepared by Lincoln-DeVore, Inc., Grand Junction, Colorado, August 3, 1993.

11. Colorado Department of Transportation, Erosion Control and Stormwater Quality Guide, Draft version, November 27, 1992.

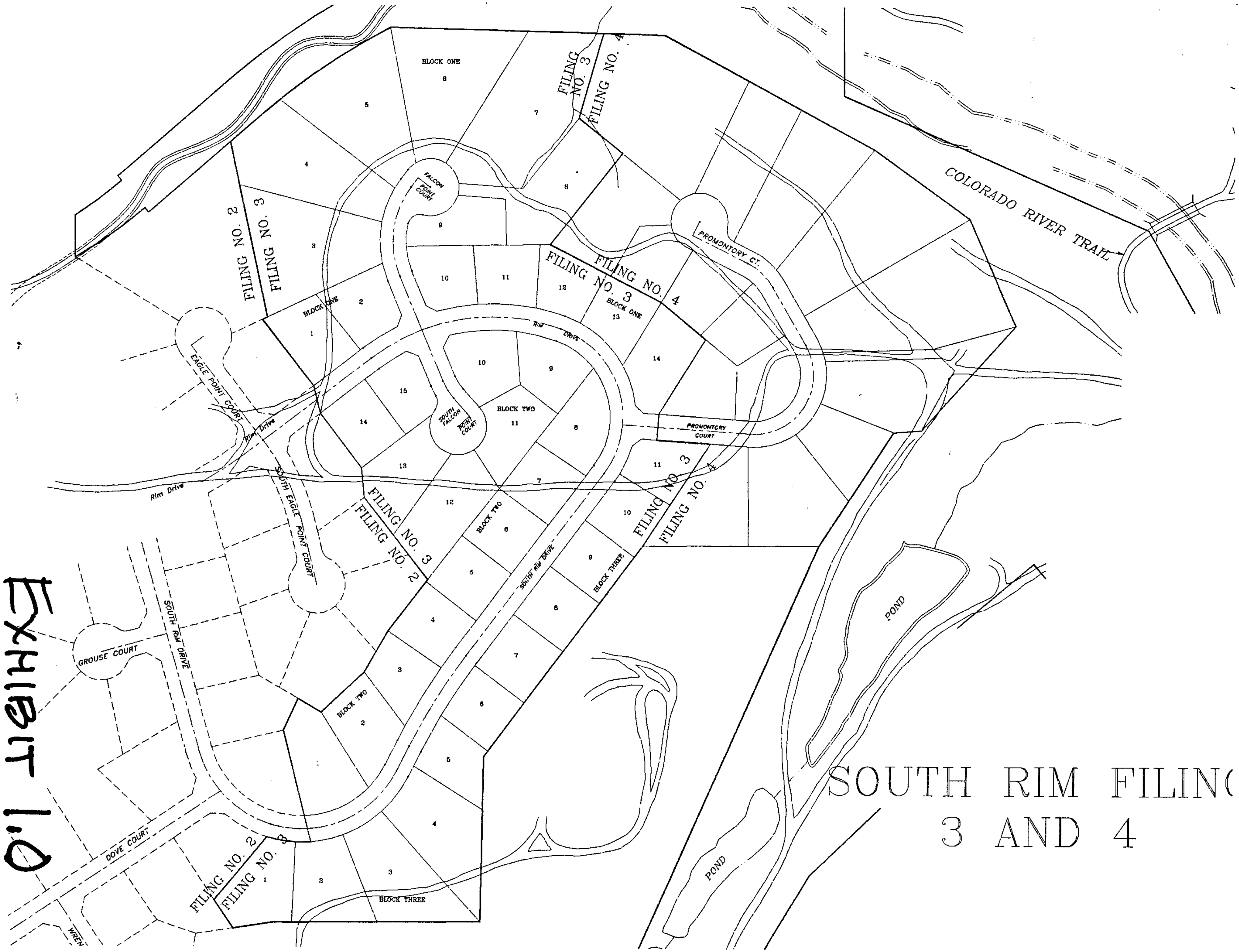
12. Declaration Of Covenants, Conditions, And Restrictions Of South Rim Subdivision, Recorded in Book 2055, Pages 317 to 414 of the Mesa County Clerk and Recorders Office.

F. References

13. Final Drainage Report For South Rim On The Redlands, Filing No. 3 and 4, prepared by LANDesign LTD., Grand Junction, Colorado, May 1995.

APPENDIX

EXHIBIT 1.0



SOUTH RIM FILING
3 AND 4

Seeding

Planting of temporary or permanent vegetation on all disturbed area.

I. Application

Disturbed areas not designated for immediate construction or permanent landscaping shall be temporarily re-vegetated. In the event construction activity ceases for a period of sixty (60) calendar days, disturbed areas including cut and fill slopes shall be re-vegetated with an annual and perennial seed mixture as indicated on the Erosion Control Plan.

II. Site Seed Mixture

15% Annual Rye Grass
25% Perennial Rye Grass
12% Nordan Crested Wheatgrass
12% Fairway Crested Wheatgrass
12% Blue Gramma
12% Red Fescue
12% Buffalo Grass

A minimum of 5 lbs/acre shall be used and planted using drill seeding methods and 10 lbs/acre when using a broadcast method.

III. Construction Guidelines

Seeding in areas that are unirrigated or that are not provided with sprinkling or watering systems, shall be restricted to the seasons described in Table S-1.

Table S-1
Seeding Seasons

ZONE	SPRING SEEDING	FALL SEEDING
Below 6000'	Spring thaw - June 15th	Sept. 1st - Consistent ground freeze
6000' - 7000'	Spring thaw - July 1st	Aug. 15th - Consistent ground freeze
7000' - 8000'	Spring thaw - July 15th	Aug. 1st - Consistent ground freeze
Above 8000'	Spring thaw (starts)	Consistent ground freeze (ends)

For the purpose of Table S-1 "spring thaw" is the earliest date when seed can be buried 1/2 inch into the soil through normal drill seeding methods. "Consistent ground freeze" is that latest date when seed can no longer be buried 1/2 into the soil through normal drill seeding methods. During permanent seeding, apply topsoil prior to applying seed.

When use of fertilizers and herbicides is required, apply according to the manufacturer's recommended rates.

All seeding operations shall be performed at right angles to the slope.

When needed to improve germination of seeds, apply mulching immediately after seeding. Use soil retention blankets on steep slopes (2:1 and steeper). Some locations with 3:1 slopes facing south or west or 20 feet or more high may also require soil retention blankets.

Seeded areas shall be inspected frequently. Areas with failures shall be repaired and reseeded within the planting season.

Mulching

Application of plant residues or other suitable material to the soil surface. Typical mulching material includes straw, hay, and wood cellulose fiber.

I. Application

Used to provide temporary protection for exposed soils against erosion where temporary or permanent seeding operations are not feasible, especially during adverse growing seasons.

Used as part of seeding practices to protect newly seeded areas.

Used to protect soil stockpiles.

II. Use Limitations

Use only on disturbed areas as a temporary cover.

Hydraulic mulching with wood cellulose fibers shall be limited to slopes steeper than 3:1 or where access is limited.

III. Construction Guidelines

Material

Hay shall consist of native grasses free of noxious weed seeds.

Straw shall consist of clean cereal grain.

Wood cellulose fiber shall consist of virgin wood cellulose processed into a uniform fibrous physical state.

Tackifiers (for anchoring) shall consist of a free flowing non-corrosive powder produced from the natural plant gum of Plantago Insularis (Desert Indianwheat). This material shall not contain any mineral filler, recycled cellulose fiber, clays, or other substances which may inhibit germination or growth of plants.

Spreading Procedure

Hay and straw mulch shall be spread at a rate of two tons per acre.

At a minimum, 50% of the mulch, by weight, shall be 10 inches or more than two inches.

Applied mulch shall reach a uniform distribution so that no more than 10% of the soil surface shall be exposed.

Hay and straw mulch shall be anchored to the soil surface using Tackifiers, blankets, or nets, or with a mulch crimping machine., Mechanical anchoring is preferred and recommended for slopes flatter than 3:1. When using blankets or nets, these may need to be anchored to the soil with staples, or as required by the manufacturer's specifications.

Wood cellulose fiber mulch shall be mixed with water (maximum 50 lbs. of wood cellulose per 100 gallons of water) and a tackifying agent. Application shall be at a rate of 1500 pounds per acre with a hydraulic seeder or mulcher.

Tackifiers (for anchoring) shall be applied in a slurry with water and wood fiber (100 lbs. of powder and 150 lbs. of fiber per 700 gallons of water). Application rate of the powder shall be 100 lbs. per acre.

Erosion Bale

A temporary sediment barrier consisting of a row of entrenched and anchored straw, or hay bales.

I. Application

Use as filters along the toe of fills.

Use as erosion checks in ditches.

Use for diversions and filters in unfinished drop inlets, culvert inlets, and outlets.

II. Use Limitations

Do not use if size of the drainage area is greater than 1/4 acre per 100 feet of barrier length.

Maximum slope length behind the barrier is 100 feet.

Maximum slope gradient behind the barrier is 50%.

In minor swales or ditch lines where the maximum contributing drainage area is no greater than one acre.

Where effectiveness is required for less than 3 months.

Under no circumstances should erosion bale barriers be constructed in active streams or in swales where there is the possibility of a washout.

Should be used only in areas of sheet flow or very low flow.

Not to be used where the control of sediment is critical or in high risk areas.

Not to be used where it cannot be entrenched as required and firmly anchored. Useful life of erosion bale barriers is relatively short; the barrier may have to be replaced one or more times during construction.

III. Construction Guidelines

All bales shall be either wire-bound or string-tied. Erosion bales shall be installed so that bindings are oriented around the sides rather than along the tops and bottoms of the bales (in order to prevent deterioration of bindings).

The barrier shall be entrenched and backfilled. A trench shall be excavated the width of a bale and the length of the proposed barrier to a minimum depth of 4 inches. After the bales are staked, the excavated soil shall be backfilled against the barrier. Backfill soil shall conform to the ground level on the downhill side and shall be built up to 4 inches against the uphill side of the barrier.

Each base shall be securely anchored by at least two 2"X2" stakes or #4 rebars driven toward the previously laid bale to force the bales together. Stakes or rebars shall be driven 12 inches minimum into the ground to securely anchor the bales.

The gaps between bales shall be filled by wedging with straw to prevent water from escaping between the bales. The main consideration is to obtain tight joints. Erosion bales will not filter sediment out of the water if the water is allowed to flow between, around, or under the bales. Loose straw or hay scattered over the area immediately uphill from an erosion bale barrier tends to increase barrier efficiency.

Since erosion bales deteriorate quickly, the inspection during construction shall be frequent and repair or replacement shall be made promptly as needed.

Erosion bales shall be removed when they have served their usefulness, but not before the upslope areas have been permanently stabilized.

Trenches where erosion bales were located shall be graded and stabilized.

Sheet Flow Applications

Bales shall be placed in a single row, lengthwise on the contour with ends of adjacent bales tightly abutting.

Channel Flow Applications

Bales shall be placed in a single row, lengthwise, oriented perpendicular to the contour, with ends of adjacent bales tightly abutting one another.

The barrier shall be extended to such a length that the bottoms of the end bales are higher in elevation than the top of the lowest middle bale to assure that sediment-laden runoff will flow either through or over the barrier but not around it.

Silt Fence

A temporary vertical barrier of filter fabric attached and supported by posts and entrenched to the ground.

I. Application

Used to intercept and detain small amounts of sediment from disturbed areas during construction operations to prevent sediment from leaving the site.

Used to decrease the velocity of sheet flows and low-to-moderate level channel flows.

Typically used along the toe of fills, in transition areas between cut and fills, adjacent to streams and along private property.

Also used around median and yard inlets as applicable, and behind curb and gutter to prevent silting of the pavement.

II. Use Limitations

Where the size of the drainage areas is no more than 1/4 acre per 100 feet of silt fence length; the maximum slope length behind the barrier is 100 feet; and the maximum gradient behind the barrier is 50% (2:1).

On steep slopes care should be given to placing alignment of fence perpendicular to the general direction of the flow.

Should not be used in areas where rocky soils will prevent keying in the filter fabric.

III. Construction Guidelines

Materials

The synthetic filter fabric shall conform to the requirements described in CDOT's Standard Specifications for Road and Bridge Construction.

The Synthetic filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of 6 months of expected usable construction life at a temperature range of 0 to 120 degrees F.

If a burlap is used, it shall be purchased in a continuous roll and cut to the length of the barrier to avoid than use of joints and thus improve the strength and efficiency of the barrier.

Posts for silt fences shall be metal or hardwood with a minimum length of 42 inches. Pine wood shall not be used. Wood posts shall have a minimum diameter or cross section of 1.25 inches. Metal posts shall be "studded tee" or "U" type with minimum weight of 1.33 lbs/lin. ft., and they shall be protected against corrosion. Metal posts should also have projections for fastening wire to them.

Wire fence reinforcement for silt fences using standard strength filter cloth shall be a minimum of 42 inches in height, a minimum of 14 gauge and shall have a maximum mesh spacing of 6 inches.

Installation

Silt fences must be located along a terrain contour and the area below the fence must be undisturbed or stabilized.

The posts shall be driven vertically into the ground to a minimum depth of 18 inches.

A trench shall be excavated approximately 6 inches wide and 6 inches deep along the line of posts and upslope from the barrier; the bottom one foot of the filter fabric shall be buried into this trench.

The trench shall be backfield and the soil compacted.

The filter materials shall be fastened securely to metal or wood posts using wire ties, or to the wood posts with 3/4 inches long #9 heavy duty staples. Filter material shall not be stapled to existing trees.

If a filter barrier is to be constructed across a ditch line or swale, the barrier shall be of sufficient length to eliminate end flow, and the plan configuration shall resemble an arc or horseshoe with the ends oriented upslope.

When joints are necessary, filter cloth shall be spliced together only at a support post, with a minimum 6-inch overlap, and securely sealed.

When standard strength filter fabric is used, a wire mesh support fence shall be fastened securely to the upslope side of the posts using heavy duty wire staples at least 3/4 inch long, tie wires or hog rings. The wire shall extend into the trench a minimum of 2 inches and shall not extend more than 36 inches above the original ground surface.

When extra strength filter fabric and closer post spacing are used, the wire mesh support fence may be eliminated. In such a case, the filter fabric is stapled or wired directly to the posts with all other provisions of the above item applying.

Silt fences shall be periodically maintained to prevent sediment from passing over or under the fence. Sediments shall be removed from behind the silt fence when it accumulates to one-half the exposed fabric height.

Filter barriers shall be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized.

Sheet Flow Applications

The height of the silt fence shall be minimum 22 inches and shall not exceed 36 inches; higher fences may impound volumes of water sufficient to cause failure of the structure.

Posts shall be spaced a maximum of 10 feet apart. If an extra strength filter fabric without the wire support fence is used, maximum space shall not exceed 6 feet.

Channel Flow Applications

The height of the silt fence shall be a minimum of 15 inches and shall not exceed 18 inches.

Posts shall be spaced a maximum of 3 feet apart.

GENERAL PERMIT APPLICATION

STORMWATER DISCHARGES ASSOCIATED WITH:

CONSTRUCTION ACTIVITY

(Permit No. COR-030000)

FOR AGENCY USE ONLY									
Certification Number									
C	O	R	-	0	3				

Date Received	Fee Category
Year Month Day	

Please print or type. All items must be completed accurately and in their entirety or the application will be deemed incomplete and processing of the permit will not begin until all information is received. Please refer to the instructions for information about the required items. **An original signature of the applicant is required.**

1. **Name and address of the permit applicant:**

Name Lowe Development Corp., c/o/ David G. Behrhorst

Mailing Address 1280 Ute Ave., Ste. 32

City, State and Zip Code Aspen, CO 81611

Phone Number (970) 925-4497 Taxpayer (or Employer) ID 95-2788746

Who is applying? Owner [X] Developer [ ] Contractor [ ]

Entity Type: Private [X] Federal [ ] State [ ] County [ ] City [ ] Other: _____

Local Contact LANDesign, LLC

Title Project Engineers Phone Number (970) 245-4099

2. **Location of the construction site:**

Street Address South Rim Drive and Rim Drive

City, State and Zip Code Grand Junction, CO 81503

County Mesa Name of plan of development South Rim on the Redlands, Filing No. 3

Township, Range, section, 1/4 section SW 1/4, Section 8, T.1.S., R.1.W., Ute Meridian

Latitude and Longitude 39° 04'53", 108° 37'09"

3. **Briefly describe the nature of the construction activity:**

Overlot grading, street, utility, storm sewer, water and sanitary sewer construction associated with residential development.

4. **Anticipated construction schedule:**

Commencement date: June 15, 1995 Completion date: November 1, 1995

5. **Area of the construction site:** Total area 16.26 ac.

Area to undergo excavation or grading: 16.26 ac.

6. **The name of the receiving stream(s). (If discharge is to a ditch or storm sewer, also include the name of the ultimate receiving water):** Tailrace Redlands Power Canal to Colorado River

7. **Other environmental permits held for this construction activity (include permit number):**

None

8. **Stormwater Management Plan Certification:**

I certify under penalty of law that a complete Stormwater Management Plan, as described in Appendix A of this application, has been prepared for my facility. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the Stormwater Management Plan is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for falsely certifying the completion of said SWMP, including the possibility of fine and imprisonment for knowing violations.

Signature of Applicant Date Signed

Name (printed) Title

9. **Signature of applicant:**

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment.

Signature of Applicant Date Signed

David G. Behrhorst Vice President

Name (printed) Title

GENERAL PERMIT APPLICATION

STORMWATER DISCHARGES ASSOCIATED WITH:

CONSTRUCTION ACTIVITY

(Permit No. COR-030000)

FOR AGENCY USE ONLY									
Certification Number									
C	O	R	-	0	3				
Date Received						Fee Category			
Year		Month		Day					

Please print or type. All items must be completed accurately and in their entirety or the application will be deemed incomplete and processing of the permit will not begin until all information is received. Please refer to the instructions for information about the required items. An original signature of the applicant is **required.**

1. **Name and address of the permit applicant:**

Name Lowe Development Corp., c/o/ David G. Behrhorst

Mailing Address 1280 Ute Ave., Ste. 32

City, State and Zip Code Aspen, CO 81611

Phone Number (970) 925-4497 Taxpayer (or Employer) ID 95-2788746

Who is applying? Owner [X] Developer [ ] Contractor [ ]

Entity Type: Private [X] Federal [ ] State [ ] County [ ] City [ ] Other: _____

Local Contact LANDesign, LLC

Title Project Engineers Phone Number (970) 245-4099

2. **Location of the construction site:**

Street Address South Rim Drive and Rim Drive

City, State and Zip Code Grand Junction, CO 81503

County Mesa Name of plan of development South Rim on the Redlands, Filing No. 4

Township, Range, section, 1/4 section SW 1/4, Section 8, T.1.S., R.1.W., Ute Meridian

Latitude and Longitude 39° 04'53", 108° 37'09"

3. **Briefly describe the nature of the construction activity:**

Overlot grading, street, utility, storm sewer, water and sanitary sewer construction associated with residential development.

4. **Anticipated construction schedule:**

Commencement date: June 15, 1995 Completion date: November 1, 1995

5. **Area of the construction site:** Total area 8.60 ac.

Area to undergo excavation or grading: 8.60 ac.

6. **The name of the receiving stream(s). (If discharge is to a ditch or storm sewer, also include the name of the ultimate receiving water):** Tailrace Redlands Power Canal to Colorado River

7. **Other environmental permits held for this construction activity (include permit number):**

None

8. **Stormwater Management Plan Certification:**

I certify under penalty of law that a complete Stormwater Management Plan, as described in Appendix A of this application, has been prepared for my facility. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the Stormwater Management Plan is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for falsely certifying the completion of said SWMP, including the possibility of fine and imprisonment for knowing violations.

Signature of Applicant Date Signed

Name (printed) Title

9. **Signature of applicant:**

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment.

David D Behrhorst

Signature of Applicant Date Signed

David G. Behrhorst Vice President

Name (printed) Title

EXHIBIT C

SUBSURFACE SOILS EXPLORATION

SOUTH RIM SUBDIVISION

GRAND JUNCTION, COLORADO

Prepared For:

LOWE DEVELOPMENT CORPORATION
c/o Skip Behrhorst
c/o Thomas A. Logue
227 South 9th St.
Grand Junction, Colorado, 81501

Prepared By:

LINCOLN-DeVORE, INC.
1441 Motor Street
Grand Junction, CO 81505

August 3, 1993

Lincoln DeVore, Inc.
Geotechnical Consultants
1441 Motor St.
Grand Junction, CO 81505

TEL: (303) 242-8968
FAX: (303) 242-1561

August 3, 1993

LOWE DEVELOPMENT CORPORATION
c/o Skip Behrhorst
c/o Mr. Thomas Logue
227 South 9th Street
Grand Junction, Colorado

Re: SUBSURFACE SOILS EXPLORATION

SOUTH RIM SUBDIVISION

Grand Junction, Colorado

Dear Sir:

Transmitted herein are the results of a Subsurface Soils Exploration for the proposed SOUTH RIM residential Subdivision, to be located on the Redlands, west of the City of Grand Junction, Colorado.

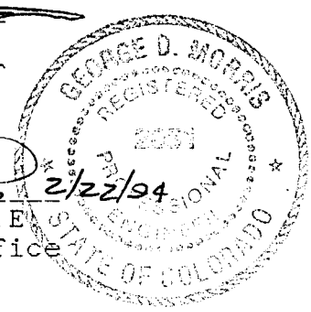
If you have any questions after reviewing this report, please feel free to contact this office at any time. This opportunity to provide Geotechnical Engineering services is sincerely appreciated.

Respectfully submitted,

LINCOLN-DeVORE, INC.

By: _____
Edward M. Morris, E.I.T.
Western Slope Branch Manager
Grand Junction, Office

Reviewed by: _____ 2/22/94
George D. Morris, P.E.
Colorado Springs Office



EMM/ss

LDTL Job No. 78619-J

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INTRODUCTION

PROJECT DESCRIPTION

This report presents the results of our geotechnical evaluation performed to determine the general subsurface conditions of the site applicable to construction of a proposed residential subdivision containing approximately 125 single family building lots and a multi-family portion containing approximately 92 units. A vicinity map is included in the Appendix of this report.

To assist in our exploration, we were provided with a site location diagram and a topographic map. The Boring Location Plan attached to this report is based on that plan provided to us. Reference is also made to previous Subsurface Soils Exploration studies completed by Lincoln DeVore: LDTL # 14243-GS, 11-19-1976 and LDTL # 48504-J, 4-28-1993.

We understand that the proposed structures will consist of one and two story, wood frame buildings with the possibility of full basements and concrete floor slabs on grade. Lincoln DeVore has not seen a set of building plans for any of the units, but residential structures of this type typically develop wall loads on the order of 900 to 1600 plf and column loads on the order of 6 - 15 kips.

The characteristics of the subsurface materials encountered were evaluated with regard to the type of construction described above. Recommendations are included herein to match the described construction to the soil characteristics found. The information contained herein may or may not be

valid for other purposes. If the proposed site use is changed or types of construction proposed, other than noted herein, Lincoln DeVore should be contacted to determine if the information in this report can be used for the new construction without further field evaluations.

PROJECT SCOPE

The purpose of our exploration was to evaluate the surface and subsurface soil and geologic conditions of the site and, based on the conditions encountered, to provide recommendations pertaining to the geotechnical aspects of the site development as previously described. The conclusions and recommendations included herein are based on an analysis of the data obtained from our field explorations, laboratory testing program, and on our experience with similar soil and geologic conditions in the area.

The scope of our geotechnical exploration consisted of a surface reconnaissance, a geophoto study, subsurface exploration, obtaining representative samples, laboratory testing, analysis of field and laboratory data, and a review of geologic literature.

Specifically, the intent of this study is to:

1. Explore the subsurface conditions to the depth expected to be influenced by the proposed construction.
2. Evaluate by laboratory and field tests the general engineering properties of the various strata which could influence the development.
3. Define the general geology of the site including likely geologic hazards which could have an effect on site development.

4. Develop geotechnical criteria for site grading and earthwork.

5. Identify potential construction difficulties and provide recommendations concerning these problems.

6. Recommend an appropriate foundation system for the anticipated structure and develop criteria for foundation design.

FIELD EXPLORATION AND LABORATORY TESTING

A field evaluation was performed on June 28, July 1 and July 2, 1993, and consisted of a site reconnaissance by our geotechnical personnel and the drilling of 19 exploration borings. These 19 shallow exploration borings were drilled within the proposed building envelopes near the locations indicated on the Boring Location Plan. The exploration borings were located to obtain a reasonably good profile of the subsurface soil conditions. All exploration borings were drilled using a CME 45B, truck mounted drill rig with continuous flight auger to depths of approximately 13 to 25 feet. Samples were taken with a standard split spoon sampler, California sampler, thin wall Shelby tubes, and by bulk methods. Logs describing the subsurface conditions are presented in the attached figures.

Laboratory tests were performed on representative soil samples to determine their relative engineering properties. Tests were performed in accordance with test methods of the American Society for Testing and Materials or other accepted standards. The results of our laboratory tests are included in this report. The in-place moisture content and the standard penetration test values are presented on the attached drilling logs.

FINDINGS

SITE DESCRIPTION

The project site is located in the South half of Section 8, Township 1 West, Range 1 South of the Ute Principal Meridian, Mesa County, Colorado. More specifically the site is located South and West of the Redlands power tail water canal, is East of the temporary cul-de-sac of the Greenbelt Drive and is located between two small, unnamed drainages which originate on the Redlands to the South West and drain to the Colorado River to the North East.

The topography of the site is quite variable, with the majority of the site being located on an ancient, elevated alluvial plain on the Colorado River. The North East boundary of the study area is a moderate to moderately steep bluff overlooking the Colorado River and two gullies are present on the South boundary and near the North West boundary of the study area. The North West gully separates the single family residential area to the South from the multi-family area to the North. The exact direction of surface run off on this site will be controlled somewhat by the proposed construction and therefore will be variable. In general, the surface run off is expected to travel to the main gully areas to the North West and South of the main study area, eventually entering the Colorado River to the North East. Surface and subsurface drainage on this site could be described as fair to good in the areas proposed for construction.

Subsurface drainage along the margins of

the developed area (gully areas) may be described as fair to poor depending upon the soils and rock formations encountered in the specific areas.

On-site erosion can be a significant problem if drainage and vegetation are not carefully controlled. Vegetation will probably be maintained in the immediate area around the building sites, but special care should be taken to maintain vegetation on the steeper slopes. We recommend that runoff from these slopes be carefully controlled to prevent erosion caused by irrigation practices, sheetwash or seepage. It may be necessary to provide culverts or drainage ways to prevent excessive erosion along steeper slopes.

GENERAL GEOLOGY AND SUBSURFACE DESCRIPTION

The geologic materials encountered under the site consist of alluvial gravel terrace deposit of the ancient Colorado River which overlies the Dakota formation which is considered bedrock on this site. In the East portion of the site, some alluvial and colluvial mud flow/debris flow sands overly the gravel terrace deposit. The geologic and engineering properties of the materials found in our 19 exploration borings will be discussed in the following sections. The fine grained, reddish colored soils encountered in the South and South West portions of the site have been designated Soil Type I. These soils are of variable thickness and rapidly become thin to non-existant toward the Center, North and East portions of the property.

This Soil Type is classified as a silty sand (SM) of fine grain size under the Unified Classification System. This soil type is low to non-plastic and of low to medium density. This soil will have virtually no tendency to expand upon the addition of moisture. Settlement will be minimal under the recommended foundation loads. This soil will undergo elastic settlement upon application of static foundation pressures. Such settlement is characteristically rapid and should be virtually complete by the end of construction. If the recommended allowable bearing values are not exceeded, and if all other recommendations are followed, differential movement will be within tolerable limits. At shallow foundation depths this soil was found to have an average allowable bearing capacity of 1200 psf.

The soil Type I consists of a series of silty sands and gravelly sands which are a product of mud flow/debris flow features which originate on the north-facing slopes and canyons of the Colorado National Monument. These mud flow/debris flow features are a small part of a very extensive mud flow/debris flow complex along the base of The Colorado National Monument, extending across the Redlands Area and eventually to the Colorado River. Utilizing recent events and standard evaluation techniques, this tract is not considered to be within with an active debris flow hazard area. The surface soils are an erosional product of the sandstones, mudstones and metamorphic Rock Formations which are exposed on the slopes of the Colorado National Monument. The soils contained within these mud

flow/debris flow features normally exhibit a metastable condition which can range from very slight to moderate. Metastable soil is subject to internal collapse and is very sensitive to changes in the soil moisture content. Based on the field and laboratory testing of the soils on this site, the severity of the metastable soils can be described as very slight.

The gravel terrace deposit of the ancient Colorado River is exposed on the majority of the flatter areas of the site. This soil has been designated Soil Type II for the purposes of this report.

This Soil Type is classified as a silty, sandy gravel (GM) of course grain size under the Unified Classification System. This soil type is alluvial in origin, nonplastic and of medium density. This soil will have virtually no tendency to expand upon the addition of moisture. Settlement will be minimal under the recommended foundation loads. This soil will undergo elastic settlement upon application of static foundation pressures. Such settlement is characteristically rapid and should be virtually complete by the end of construction. If the recommended allowable bearing values are not exceeded, and if all other recommendations are followed, differential movement will be within tolerable limits. At shallow foundation depths this soil was found to have an average allowable bearing capacity of 2800 psf.

The bedrock beneath this site is the Dakota Formation. The Dakota Formation is described as a series of sandstones, siltstones, mudstones, claystones and shales with some areas of carbonaceous materials, to include lignite and low

grade coals. The rock section of the Dakota formation is quite erratic and may change rapidly both horizontally and vertically. The majority of rock types found near the development areas and beneath the gravel terrace deposits are primarily claystones and shales, which have been designated as Soil Type III.

This soil type was classified as a low plastic clay (CL) under the Unified Classification System. Some strata or isolated lenses of claystone classified as a high plastic clay (CH). The Standard Penetration Tests ranged from 23 blows per foot to in excess of 90 blows per foot. Penetration tests of this magnitude indicate that the soil is somewhat erratic in consistency and of medium to high density. The moisture content varied from 1.1 % to 21.3 %, indicating very dry to very moist soil. This soil is plastic and is sensitive to changes in moisture content. With decreased moisture, it will tend to shrink, with some cracking upon desiccation. Upon increasing moisture, it will tend to expand. Expansion tests were performed on typical samples of the soil and expansive pressures on the order of 1600 to 2400 psf were found to be typical. Samples of strata of high plastic clay were subjected to expansion testing and expansions pressures on the order of 5100 to 5700 psf were found to be possible. The allowable maximum bearing value for the low expansive portions was found to be on the order of 5500 to 6500 psf, for shallow foundation systems. A minimum dead load of 2500 psf would be required for shallow foundation systems founded on the low plastic clays. If the high plastic clays are within 8 feet of the proposed bottom of the foundation sys-

tem, it is not recommended that a shallow foundation be utilized.

For the areas which may have high plastic clays within 8 feet of the proposed foundation bottom elevation, it is recommended a deep foundation system or a thick structural fill be utilied. Specific information for either a deep foundation system, consisting of drilled piers or a thick structural fill will not be given in this report due to the variable nature of the soils and the many possible foundation configurations due to depths of excavation and loading characteristics of the individual structures. It is recommended a specific site investigation be performed for each structure which may have a foundation system with 8 feet of the expansive shales of the Dakota formation.

The boring logs and related information show subsurface conditions at the date and location of this exploration. Soil conditions may differ at locations other than those of the exploratory borings. If the structure is moved any appreciable distance from the locations of the borings, the soil conditions may not be the same as those reported here. The passage of time may also result in a change in the soil conditions at the boring locations.

The lines defining the change between soil types or rock materials on the attached boring logs and soil profiles are determined by interpolation and therefore are approximations. The transition between soil types may be abrupt or may be gradual.

GEOLOGIC HAZARDS AND DEVELOPMENT CONSTRAINTS

SLOPE STABILITY

The study area of this tract is bounded on the North and North East sides by moderate to moderately steep slopes overlooking the Colorado River and the Redlands power tail water way. This study area is indicated on the Drill Hole and SetBack Diagram, included with this report, as Steep Slopes, Possibly Unstable. This slope ranges in height from 15 feet to slightly less than 100 feet. The slope angles range from approximately 3:1 to 1:1 in the areas where the slope stability was believed to be in question or needed proper definition. At the time of Lincoln DeVore's field investigation, it is our understanding the steep slope areas are not to be used for development and to be left as open space. Some construction is anticipated near the upper extent of the slopes and studies have been undertaken to determine the slope stability and define a building set-back for site planning and construction purposes.

The areas of steeper slopes were carefully investigated and found to consist of exposures of the Dakota Formation. In many areas of steep slopes, the Dakota formation is somewhat obscured by thin soils which are derived partially from in-situ weathering of the Dakota Formation and ongoing soil creep of these thin soils.

Slope stability computations were completed by personnel of Lincoln DeVore, based on the results of site reconnaissance, geophoto studies, on site exploration borings and laboratory testing to determine specific engineering

properties. Based upon the existing topography, proposed site grading and development plans available at the time of this study, a building set-back line has been established. This building setback is defined, for planning purposes, as a line 35 feet back from the major slope, upper scarp edge. This building set-back line is indicated on the enclosed figure and is valid for the planned development, uses and construction as detailed in the project scope section of this report and as further detailed on the attached figure. The building set-back line shown is only for slope stability considerations and is not applicable for other, specific on-site geological or geotechnical considerations. For instance, areas of seasonal high soil moisture or possible ground water may be present in some of the drainage areas and would have some impact on individual site stability of excavations, but is not considered as part of the general slope stability study.

The general assumptions utilized for the slope stability computations include, but are not limited to:

Water Saturation of the bedrock formation has occured and will continue to be present beneath the site.

No further modification of the slopes will occur, from the present 'crest' to the north bank of the Redlands Power tail water way.

A perched water table will develop in the alluvial soils which 'cap' the bedrock formation.

The surface exposure and shallow drill hole penetrations sufficiently define the surficial soils and bedrock materials for a study of this type.

FLOODING

The 100 year floodplain of the two intermittent drainages which cross the site from the South West and empty into the Colorado River, should be addressed as part of the overall drainage plan for the site. We recommend that construction be avoided in this area and that drainageways be kept open and free from debris. During periods of high runoff, debris may cause damming at bridges and culverts, resulting in backwater effects which may be damaging. We recommend that this drainage plan be completed by a hydrologic or drainage engineer fully experienced in this area. Such a plan is beyond the scope of this report.

RADIOACTIVITY

A small area of naturally occurring radioactivity has been identified on a small portion of this tract, in the East portion. This area of naturally occurring radioactivity is the subject of a report prepared by the engineering firm of Nelson, Haley, Patterson & Quirk, Inc., which is undated but, apparently was completed in December of 1975. This N.H.P.Q. report is hereby referenced for the definition of the extent of this deposit and any possible hazards or preliminary mitigation measures which may be required.

GROUND WATER:

A free water table came to equilibrium during drilling at 16 to 23 feet below the present ground surface in the exploration borings toward the West and Southwest portion of the tract. Free water was encountered in Exploration Borings nos. 2, 3 & 4. This is probably not a true phreatic surface but is an accumulation of subsurface seepage moisture (perched water) probably associated with area-wide irrigation practices toward the South and West of the site. In our opinion the subsurface water conditions shown are a permanent feature on this site and may increase in extent with increased development. The depth to free water would be subject to fluctuation, depending upon external environmental effects.

Data presented in this report concerning ground water levels are representative of those levels at the time of our field exploration. Groundwater levels are subject to change seasonally or by changed environmental conditions. Quantitative information concerning rates of flow into excavations or pumping capacities necessary to dewater excavations is not included and is beyond the scope of this report. If this information is desired, permeability and field pumping tests will be required.

Based upon evidence of seepage in the slopes immediately above the Colorado River, it is believed a true, confined water table is present in some beds of the Dakota Formation. This confined water is discharging from the Dakota Formation along the lower slope areas, near the Redlands Power Tail Water Canal. This water is apparently being recharged by

area wide irrigation on the Redlands and some natural recharge at the base of the Colorado National Monument. This water must be considered a permanent feature of the site.

Due to the proximity of the Dakota Formation beneath this entire site, there exists a possibility of a perched water table developing in the alluvial soils which overlie the Dakota formation, in the North and East portion of the tract. This perched water table would be quite similar to that encountered in the exploration program in the West and South portion of this tract. This perched water would probably be the result of increased irrigation due to the presence of lawns and landscaping and roof runoff. The exploration holes indicate that the top of the Dakota Formation is relatively flat and that subsurface drainage would probably be quite slow.

While it is believed that under the existing conditions at the time of this exploration the construction process would not be effected by any free-flow waters, it is very possible that several years after development is initiated, a troublesome perched water condition may develop which will provide construction difficulties. In addition, this potential perched water could create some problems for existing or future foundations on this tract. Therefore it is recommended that the future presence of a perched water table be considered in all design and construction of both the proposed residential structures and any subdivision improvements.

CONCLUSIONS AND RECOMMENDATIONS

GENERAL DISCUSSION

No geologic conditions were apparent during our reconnaissance which would preclude the site development as planned, provided the recommendations contained herein are fully complied with. Based on our investigation to date and the knowledge of the proposed construction, the site condition which would have the greatest effect on the planned development aree expansive clays of the Dakota Formation bedrock and potentially unstable slopes overlooking the Colorado River.

Since the exact magnitude and nature of the foundation loads are not precisely known at the present time, the following recommendations must be somewhat general in nature. Any special loads or unusual design conditions should be reported to Lincoln DeVore so that changes in these recommendations may be made, if necessary. However, based upon our analysis of the soil conditions and project characteristics previously outlined, the following recommendations are made.

OPEN FOUNDATION OBSERVATION

Since the recommendations in this report are based on information obtained through random borings, it is possible that the subsurface materials between the boring points could vary. Therefore, prior to placing forms or pouring concrete, an open excavation observation should be performed by representatives of Lincoln DeVore. The purpose of this observa-

tion is to determine if the subsurface soils directly below the proposed foundations are similar to those encountered in our exploration borings. If the materials below the proposed foundations differ from those encountered, or in our opinion, are not capable of supporting the applied loads, additional recommendations could be provided at that time.

SITE PREPARATION

It is recommended that site preparation for individual structures begin with the removal of all vegetation, existing man-made fill and other deleterious materials. This applies both to areas to be filled and areas to be cut. The removed materials should be legally disposed of off-site or, if appropriate, stockpiled for later use in non-structural areas or landscaping. In the case of existing man-made fill, we recommend that it be removed completely. It is recommended that the exposed native soil be scarified to a depth of 12 inches, brought to near optimum moisture conditions and recompacted to a minimum of 90% of maximum dry density as determined by ASTM D 1557.

Prior to placing any fill, the exposed ground should be observed by representatives of Lincoln DeVore to determine that all deleterious material, man-made fill and soft areas have been adequately removed. The removed material may then be replaced with uniformly compacted lifts of structural fill until the desired slab or footing elevation is achieved. We recommend that the structural fill be placed within 2% of the optimum moisture content of the material and compacted to a

minimum of 90% of its maximum dry density, ASTM D 1557. These lifts should not be greater than six (6) inches in thickness after compaction.

STRUCTURAL FILL SOIL:

It appears that the majority of the material excavated from probable cut areas across the site is suitable for reuse as structural fill. Material to be approved shall be free of deleterious matter and oversized hard rock. We recommend that no predominantly clayey soils, claystones, shales or radioactive soils be included in any structural fill.

FILL PLACEMENT AND COMPACTION:

We recommend that structural fill placed beneath floor slabs, foundations and parking lots be compacted to a minimum of 90% of its maximum modified Proctor dry density (ASTM D 1557). The structural fill shall be placed and compacted at a moisture content within +/- 2% of optimum moisture. These lifts should not be greater than six (6) inches in thickness after compaction.

During the placement of any structural fill, it is recommended that a sufficient amount of field tests and observation be performed under the direction of the geotechnical engineer. The geotechnical engineer should determine the amount of observation time and field density tests required to determine substantial conformance with these recommendations.

Based on slope stability computations,

for the alluvial on this site, the maximum stable cut slope which can be constructed in this material is 2:1 (horizontal to vertical). Based on similar calculations, the maximum fill slope which can be constructed using the proposed fill soils is 2:1 (horizontal to vertical). At points where fill is placed against an existing slope steeper than 10 degrees, we recommend that the existing slope be "benched" and fill placed against the benches in horizontal lifts. We recommend that the fill soil be brought to the optimum moisture content (+/- 2%) prior to placing, then compacted mechanically to at least 95% of the maximum standard Proctor dry density, ASTM D 698.

No major difficulties are anticipated in the course of excavating into the surficial soils on the site. It is probable that safety provisions such as sloping or bracing the sides of excavations over 4 feet deep will be necessary. Any such safety provisions shall conform to reasonable industry safety practices and to applicable OSHA regulations. The OSHA Classification for excavation purposes on this site is Soil Class B for the native alluvial soils on this site excluding the areas of high soil moisture content in the drainage areas.

We recommend that all backfill placed around the exterior of all buildings, and in utility trenches which are outside the perimeter of any buildings and not located beneath roadways or parking lots, be compacted to a minimum of 85% of its maximum Proctor dry density (ASTM D 698).

In general, we recommend all structural fill in the area beneath any proposed structure or roadway be

compacted to a minimum of 90% of its maximum modified Proctor dry density (ASTM D1557). This structural fill should be placed in lifts not to exceed six (6) inches after compaction. We recommend that fill be placed and compacted at approximately its optimum moisture content (+/-2%) as determined by ASTM D 1557. Structural fill should be a granular, non-expansive soil.

DRAINAGE AND GRADIENT:

Adequate site drainage should be provided in the foundation area both during and after construction to prevent the ponding of water and the saturation of the subsurface soils. We recommend that the ground surface around the structures be graded so that surface water will be carried quickly away from the buildings. The minimum gradient within 10 feet of the buildings will depend on surface landscaping. We recommend that paved areas maintain a minimum gradient of 2%, and that landscaped areas maintain a minimum gradient of 8%.

It is further recommended that roof drain downspouts be carried across all backfilled areas and discharged at least 10 feet away from the structure. Proper discharge of roof drain downspouts may require the use subsurface piping in some areas. Planters, if any, should be so constructed that moisture is not allowed to seep into foundation areas or beneath slabs or pavements.

If adequate surface drainage cannot be maintained, or if subsurface seepage is encountered during exca-

vation for foundation construction, a full perimeter drain is recommended for future buildings. It is further recommended the buildings placed on the lots included within the Recommended Building SetBack Line be constructed with perimeter drains, unless a site specific Geotechnical Exploration indicates such a drain is not required.

It is recommended that this drain consist of a perforated drain pipe and a gravel collector, the whole being fully wrapped in a geotextile filter fabric. We recommend that this drain be constructed with a gravity outlet. If sufficient grade does not exist on the site for a gravity outlet, then a sealed sump and pump is recommended. Under no circumstances should a dry well be used on this site.

The existing drainage all the sites must either be maintained carefully or improved. We recommend that water be drained away from structures as rapidly as possible and not be allowed to stand or pond near the building. We recommend that water removed from one building not be directed onto the backfill areas of adjacent buildings. We recommend that a hydrologist or drainage engineer experienced in this area be retained to complete a drainage plan for this site.

To give the buildings extra lateral stability and to aid in the rapidity of runoff, it is recommended that all backfill around any building and in utility trenches in the vicinity of the building be compacted to a minimum of 85% of its maximum Proctor dry density, ASTM D 698. The native soils on this site may be used for such backfill. We recommend that all

backfill be compacted using mechanical methods. No water flooding techniques of any type may be used in placement of fill on this site.

It is recommended that lawn and landscaping irrigation be reasonably limited, so as to prevent complete saturation of subsurface soils. Several methods of irrigation water control are availible, to include, but not necessarily limited to: water metering, downsizing the distribution pipe sizes to limit usage, encouraging efficient landscaping and putting reasonable limits on the per lot sizes of high water use landscaping.

Should automatic lawn irrigation systems be used on these sites, we recommend that the sprinkler heads be installed no less than 5 feet from the building. In addition, these heads should be adjusted so that spray from the system does not fall onto the walls of the building and that such water does not excessively wet the backfill soils.

The steep slope areas immediately adjacent to the major drainage ways which cross divide this site and the steep slopes overlooking the Colorado River can be considered potentially unstable due to the threat of ongoing erosion. A minimum set-back of 35 feet has been preliminarily established between the proposed construction and the edge of existing slope scarps. This set-back distance has been established by laboratory analysis of the soil shear strength and calculated stability of specific locations along the banks.

FOUNDATIONS

We recommend the use of conventional shallow foundation systems consisting of continuous spread footings beneath all bearing walls and isolated spread footings beneath all columns and other points of concentrated load. Such a shallow foundation system, resting on the alluvial, granular soils of soil Type I & II, may be designed on the basis of an allowable bearing capacity of 1100 psf maximum and no minimum dead load is required for soil Type I. Shallow foundation systems resting on the very course granular soil of soil Type II may be designed on the basis on allowable bearing capacity of 2800 psf maximum and no minimum dead load pressure will be required.

Contact stresses beneath all continuous walls should be balanced within + or - 150. psf at all points. Isolated interior column footings should be designed for contact stresses of about 150 psf less than the average used to balance the continuous walls. The criterion for balancing will depend somewhat upon the nature of the structure. Single-story, slab on grade structures may be balanced on the basis of dead load only. Multi-story structures may be balanced on the basis of dead load plus 1/2 live load, for up to 3 stories.

It should be noted that the term "footings" as used above includes the wall on grade or "no footing" type of foundation system. On this particular site, the use of a more conventional footing, the use of a "no footing", or the use of voids will depend entirely upon the foundation loads exerted by the structure. We would anticipate the use of a standard

footing and stemwall on the alluvial soils on this tract.

Stem walls for a shallow foundation system should be designed as grade beams capable of spanning at least 10 feet. These "grade beams" should be horizontally reinforced both near the top and near the bottom. The horizontal reinforcement required should be placed continuously around the structure with no gaps or breaks. A foundation system designed in this manner should provide a rather rigid system and, therefore, be better able to tolerate differential movements associated with isolated, low bearing soil strata which may be present in the soil deposits.

It is conceivable that some foundation systems near the areas of building set-back line, designated for the slope stability considerations, may be founded sufficiently close to the expansive clays of the Dakota formation that special foundation systems may be required. Foundations in these areas, which are founded within 6 feet of the Dakota Formation, should be individually investigated to determine the geotechnical characteristics of the underline soils and properly match an effecient and proper foundation system with the foundation soils. It is conceivable that over excavation and soil replacement techniques, shallow foundation systems such as voided stemwall on grade, stemwall on isolated pads or a deep foundation system such as drilled piers may be required in this area.

FROST PROTECTION

We recommend that the bottom of all foundation components rest a minimum of 1 1/2 feet below finished grade or as required by the local building codes. Foundation components must not be placed on frozen soils.

CONCRETE SLABS ON GRADE

Slabs could be placed directly on the natural soils or on a structural fill. We recommend that all slabs on grade be constructed to act independently of the other structural portions of the building. One method of allowing the slabs to float freely is to use expansion material at the slab-structure interface.

Any interior partitions which will be located on slabs on grade should be constructed with a minimum space of 1 1/2 inches at the bottom of the wall. This space should allow for any future potential upward movement of the floor slabs and minimize damage to the walls and roof sections above the slabs.

In general, we recommend that all on-grade slabs be isolated from other structural portions of the building. This is generally accomplished by an expansion joint at the slab-foundation wall interface.

In areas of high soil moisture or relatively high ground water conditions, it is recommended that

slabs on grade be constructed over a capillary break of approximately 6 inches in thickness. We recommend that the material used to form the capillary break be free draining, granular material and not contain significant fines. A free draining outlet is also recommended for this break so that it will not trap water beneath the slab. A vapor barrier is recommended beneath the floor slab and above the capillary break. To prevent difficulty in finishing concrete, a 2 inch sand layer should be placed above the break. An alternate method of reducing finishing problems would be to place the vapor barrier beneath approximately 6 inches of a minus 3/4 inch gravel fill. This method must be very carefully accomplished to minimize excessive puncturing and tearing of the vapor barrier.

It is recommended that floor slabs on grade be constructed with control joints placed to divide the floor into sections not exceeding 360 square feet, maximum. Also, additional control joints are recommended at all inside corners and at all columns to control cracking in these areas.

EARTH RETAINING STRUCTURES

The active soil pressure for the design of earth retaining structures may be based on an equivalent fluid pressure of 42 pounds per cubic foot for the alluvial soils. The active pressure should be used for retaining structures which are free to move at the top (unrestrained walls). For earth retaining structures which are fixed at the top, such as basement walls, an equivalent fluid pressure of 55 pounds per cubic foot may be used for the alluvial soils. It should be noted that the above values should be modified to take into account any surcharge loads, sloping backfill or other externally applied forces. The above equivalent fluid pressures should also be modified for the effect of free water, if any.

The passive pressure for resistance to lateral movement may be considered to be 320 pcf per foot of depth for the alluvial soils. The coefficient of friction for concrete to soil may be assumed to be .35 for resistance to lateral movement. When combining frictional and passive resistance, the latter must be reduced by approximately 1/3.

We recommend that the backfill behind any retaining wall be compacted to a minimum of 85% of its maximum modified Proctor dry density, ASTM D-1557. The backfill material should be approved by the Soils Engineer prior to placing and a sufficient amount of field observation and density tests should be performed during placement. Placing backfill behind retaining walls before the wall has gained sufficient strength to resist the applied lateral earth pressures is <u>not</u> recommended.

REACTIVE SOILS

Since groundwater in the Redlands area of Grand Junction typically contains sulfates in quantities detrimental to a Type I cement, a Type II or Type I-II or Type II-V cement is recommended for all concrete which is in contact with the subsurface soils and bedrock. Calcium chloride should not be added to a Type II, Type I-II or Type II-V cement under any circumstances.

PAVEMENTS

Samples of the surficial native soils at this property that may be required to support pavements have been evaluated using the Hveem-Carmany method to determine their support characteristics. The results of the laboratory testing are as follows:

Soil Type I Reddish Silty Sands, some clayey zones

R =	14
Expansion @ 300 psi =	4.5
Displacement @ 300 psi =	3.85

Soil Type II Coarse Gravel and Cobble Terrace Deposit

R =	54
Expansion @ 300 psi =	1.5
Displacement @ 300 psi =	3.38

No estimates of traffic volumes have been provided to Lincoln DeVore. However, we assume that the roads will be classified as low volume, residential. The design procedures utilized are those recognized by the Colorado Department of Highways and the 1986 AASHTO design procedure. The terminal Serviceability Index of 2.0, a Reliability of 70 and a design life of 20 years have been utilized, based on recommendations by the Highway Department. An 18 kip ESAL of 5, also recommended by the Highway Department, was used for the analysis.

Based on the soil support characteristics outlined above, the following pavement sections are recommended:.LS1

Residential Roadway:

3 inches of asphaltic concrete pavement
on 6 inches of aggregate base course
on 8 inches of recompacted native material

Full Depth Asphalt:

5 inches of asphaltic concrete pavement
on 12 inches of recompacted native material

Rigid Concrete:

6 inches of portland cement pavement
on 4 inches of aggregate base course (for Soil Type I, only)
on 8 inches of recompacted native material

We recommend that the asphaltic concrete pavement have a minimum R_t value of 95, and meet the State of Colorado requirements for a Grade C mix. In addition, the asphaltic concrete pavement should be compacted to a minimum of 95% of its maximum Hveem density. The aggregate base course should meet the requirements of State of Colorado Class 5 or Class 6 material, and have a minimum R value of 78. We recommend that the base course be compacted to a minimum of 95% of its maximum Modified Proctor dry density (ASTM D-1557), at a moisture content within + or -2% of optimum moisture. The native subgrade shall be scarified and recompacted to a minimum of 90% of their maximum Modified Proctor dry density (ASTM D-1557) at a moisture content within + or -2% of optimum moisture.

We recommend that the rigid concrete pavement have a minimum flexural strength (F_t) of 650 psi at 28 days. This strength requirement can be met using Class P or AX or A or B Concrete as defined in Section 600 of the Standard Specifications for Road and Bridge Construction, Colorado DOT. It is

recommended that field control of the concrete mix be made utilizing compressive strength criteria. Flexural Strength should only be used for the design process. Control joints should be placed at a minimum distance of 12 feet in all directions. If it is desired to increase the spacing of control joints, then 66-66 welded wire fabric should be placed in the mid-point of the slab. If the welded wire fabric is used, the control joint spacing can be increased to 40 feet. Construction joints designed so that positive joint transfer is maintained by the use of dowels is recommended.

Concrete with a lower flexural strength may be allowed by the agency having jurisdiction however, the design section thicknesses should be confirmed. In addition, the final durability of the pavement should be carefully considered.

Control joints should be placed at a minimum distance of 12 feet along the slab/road lane length or to match curb and gutter jointing and 15 feet in width. If it is desired to increase the spacing of control joints, then 66-66 welded wire fabric should be placed in the mid-point of the slab. If the welded wire fabric is used, the control joint spacing can be increased to a maximum of 40 feet.

All pavement should be protected from moisture migrating beneath the pavement structure. If surface drainage is allowed to pond behind curbs, islands or other areas of the site and allowed to seep beneath pavement, premature deterioration or possibly pavement failure could result.

LIMITATIONS

This report is issued with the understanding that it is the responsibility of the owner, or his representative to ensure that the information and recommendations contained herein are brought to the attention of the individual lot purchasers for the subdivision. In addition, it is the responsibility of the individual lot owners that the information and recommendations contained herein are brought to the attention of the architect and engineer for the individual projects and the necessary steps are taken to see that the contractor and his subcontractors carry out these recommendations during construction.

The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they be due to natural processes or the works of man on this or adjacent properties. In addition, changes in acceptable or appropriate standards may occur or may result from legislation or the broadening of engineering knowledge. Accordingly, the findings of this report may be invalid, wholly or partially, by changes outside our control. Therefore, this report is subject to review should not be relied upon after a period of 6 years unless reviewed and extended, in writing, by the Geotechnical Engineer.

The recommendations of this report pertain only to the site investigated and are based on the assumption that the soil conditions do not deviate from those described in this report. If any variations or undesirable conditions are encountered during construction or the proposed

construction will differ from that planned on the day of this report, Lincoln DeVore should be notified so that supplemental recommendations can be provided, if appropriate.

Lincoln DeVore has prepared this report in accordance with generally accepted professional engineering practice in the field of geotechnical engineering.

SOILS DESCRIPTIONS:

SYMBOL	USCS	DESCRIPTION
		Topsoil
		Man-made Fill
	GW	Well-graded Gravel
	GP	Poorly-graded Gravel
	GM	Silty Gravel
	GC	Clayey Gravel
	SW	Well-graded Sand
	SP	Poorly-graded Sand
	SM	Silty Sand
	SC	Clayey Sand
	ML	Low-plasticity Silt
	CL	Low-plasticity Clay
	OL	Low-plasticity Organic Silt and Clay
	MH	High-plasticity Silt
	CH	High-plasticity Clay
	OH	High-plasticity Organic Clay
	Pt	Peat
	GW/GM	Well-graded Gravel, Silty
	GW/GC	Well-graded Gravel, Clayey
	GP/GM	Poorly-graded Gravel, Silty
	GP/GC	Poorly-graded Gravel, Clayey
	GM/GC	Silty Gravel, Clayey
	GC/GM	Clayey Gravel, Silty
	SW/SM	Well-graded Sand, Silty
	SW/SC	Well-graded Sand, Clayey
	SP/SM	Poorly-graded Sand, Silty
	SP/SC	Poorly-graded Sand, Clayey
	SM/SC	Silty Sand, Clayey
	SC/SM	Clayey Sand, Silty
	CL/ML	Silty Clay

ROCK DESCRIPTIONS:

SYMBOL	DESCRIPTION
	SEDIMENTARY ROCKS
	CONGLOMERATE
	SANDSTONE
	SILTSTONE
	SHALE
X X X X X X	CLAYSTONE
	COAL
	LIMESTONE
	DOLOMITE
	MARLSTONE
	GYPSUM
	Other Sedimentary Rocks
	IGNEOUS ROCKS
	GRANITIC ROCKS
+ + + + + +	DIORITIC ROCKS
	GABBRO
	RHYOLITE
	ANDESITE
	BASALT
	TUFF & ASH FLOWS
	BRECCIA & Other Volcanics
	Other Igneous Rocks
	METAMORPHIC ROCKS
	GNEISS
	SCHIST
	PHYLLITE
	SLATE
	METAQUARTZITE
	MARBLE
	HORNFELS
	SERPENTINE
	Other Metamorphic Rocks

SYMBOLS & NOTES:

SYMBOL	DESCRIPTION
	9/12 Standard penetration drive Numbers indicate 9 blows to drive the spoon 12" into ground.
	ST 2-1/2" Shelby thin wall sample
	W_o Natural Moisture Content
	W_x Weathered Material
Free water	Free water table
	γ^o Natural dry density
	T.B. – Disturbed Bulk Sample
	② Soil type related to samples in report
15' W_x Form.	Top of formation
	Test Boring Location
	Test Pit Location
	Seismic or Resistivity Station. Lineation indicates approx. length & orientation of spread (S = Seismic, R = Resistivity)

Standard Penetration Drives are made by driving a standard 1.4" split spoon sampler into the ground by dropping a 140 lb. weight 30". ASTM test des. D-1586.

Samples may be bulk, standard split spoon (both disturbed) or 2-1/2" I.D. thin wall ("undisturbed") Shelby tube samples. See log for type.

The boring logs show subsurface conditions at the dates and locations shown, and it is not warranted that they are representative of subsurface conditions at other locations and times.

LINCOLN DeVORE TESTING LABORATORY

COLORADO: Colorado Springs, Pueblo, Glenwood Springs, Montrose, Gunnison, Grand Junction. – WYO. – Rock Springs

EXPLANATION OF BOREHOLE LOGS AND LOCATION DIAGRAMS

BORING NO. 1

ELEVATION: 4639

DEPTH [FT]	SYMBOL	SAMPLE	DESCRIPTION	PENETRATION RESISTANCE	IN-SITU DENSITY [PCF]	MOISTURE CONTENT [%]
			SILTY SAND on SURFACE			
			MEDIUM DENSITY SILTY, SANDY			
			GRAVELS 5% MOIST			
		II	INCREASING SIZES	SPT 21/6 50/9		2-3%
5			ANCIENT COLORADO RIVER TERRACE			
			DECREASING MOISTURE			
		II	SANDY STRATA	SPT 18/6 43/12		1-5%
10			NON PLASTIC			
			MEDIUM DENSITY			
			STRATIFIED			
		II	GRAVEL SILTY, SANDY FINES	BULK		0-5%
15			HOLE CAVING -			
			NO FREE WATER IN BORING			
			6-28-93			

LOG OF SUBSURFACE EXPLORATION

Lincoln DeVore, Inc.
Geotechnical Consultants

RIVERVIEW TERRACE - GRAND JUNCTION

DATE 7-29-93

JOB NO. 7R619-J

DRAWN EHM

BORING NO. 2

ELEVATION: 4637

DEPTH (FT)	SYMBOL	SAMPLE	DESCRIPTION		PENETRATION RESISTANCE	IN-SITU DENSITY (PCF)	MOISTURE CONTENT (%)
			GRAVELS VERY SILTY, SANDY				
		II	SL. MOIST	SPT	35/6 68/12		1.7%
5			MEDIUM DENSITY				
			COBBLES UP TO 4" diameter, larger?				
			COLORADO RIVER TERRACE				
			NON PLASTIC FINES				
10		II	HOLE IS CAVING	BULK			1.7%
			SOME STRATA - LARGER COBBLE				
15		II	SILTY, SANDY COBBLE & GRAVEL	SPT	19/6 50/10		0.6%
			STRATIFIED				
		II	INCREASING MOISTURE	BULK			1.9%
20			MEDIUM DENSITY				
22			Wx DAKOTA FORM.				
23			FREE WATER ▽ SANDSTONE - VERY WEATHERED				
			CARBONACEOUS SHALES & CLAYSTONES	BULK			42.8%
25		IV	FIRM SATURATED				
			MOISTURE @ 24' IS OF AUGER SAMPLE				
			FREE WATER @ 23' 6-28-98				
			HOLE CAVED AFTER DRILLING				

LOG OF SUBSURFACE EXPLORATION

Lincoln DeVore, Inc.
Geotechnical Consultants

RIVERVIEW TERRACE - GRAND JUNCTION

DATE 7-29-93

JOB NO. 7819-J

DRAWN BHM

BORING NO. 3

ELEVATION: 4639

DEPTH (FT)	SYMBOL	SAMPLE	DESCRIPTION		PENETRATION RESISTANCE	IN-SITU DENSITY (PCF)	MOISTURE CONTENT (%)
			SLIGHTLY MOIST				
		II	GRAVEL & COBBLE - MEDIUM DENSITY	SPT	35/6 58/12		1.8%
5			NON PLASTIC - SILTY SAND FINES				
			COLORADO RIVER TERRACE				
			VERY SANDY STRATA -				
10			SMALLER COBBLES				
		II	HOLE CAVING	BULK			1.6%
			INCREASING COBBLE SIZE				
15			DIFFICULT TO DRILL				
		II	HOLE CAVING	BULK			0.8%
			COARSE SAND - VERY GRAVELLY - FEW COBBLES				
20			Wx DAKOTA FORM.				
			V. WEATHERED SANDSTONE	BULK			5.0%
22			FREE WATER ▼ FIRM				
			SHALE STRATA	LOW EXPANSION			
		IV	CARBONACEOUS - FIRM	SATURATED BULK			24.3%
25			CL LOW PLASTIC	EXPANSIVE			
			SOME SULFATES				
			FREE WATER @ 22' DURING DRILLING. 6-28-93				
			HOLE CAVED				

LOG OF SUBSURFACE EXPLORATION

Lincoln DeVore, Inc.
Geotechnical Consultants

RIVER VIEW TERRACE - GRAND JUNCTION

DATE 7-30-93

JOB NO. 7819-J

DRAWN EHM

DEPTH (FT)	SYMBOL	SAMPLE	BORING NO. 4 ELEVATION: 4639 DESCRIPTION		PENETRATION RESISTANCE	IN-SITU DENSITY (PCF)	MOISTURE CONTENT (%)
			SILTY SAND @ SURFACE				
			GRAVEL & COBBLE				
		II	SILTY SAND - NON PLASTIC	SPT	27/6 51/12		1.1%
5			Sl. MOIST				
			MEDIUM DENSITY				
			STRATIFIED				
			INCREASING COBBLE SIZE				
10		II	HOLE CAVING	BULK			0.9%
			DRY TO Sl. MOIST				
15			MEDIUM DENSITY				
			COBBLES and GRAVELS				
18			Wx DAKOTA FORM.				
			STRATIFIED SANDSTONE & SHALE				
20		IV	SOME SILTSTONE CARBONACEOUS	BULK			4.0%
			DAMP TO MOIST				
			FIRM TO DRILL				
23			▼				
			SILTY CLAYSTONE & SHALE - CARBONACEOUS				
25			LOW PLASTIC LOW EXPANSION				
			FREE WATER @ 23 FEET 6-28-93				
			HOLE CAVED				

LOG OF SUBSURFACE EXPLORATION

RIVER VIEW TERRACE GRAND JUNCTION

DATE 7-30-93

JOB NO. 76119-T

DRAWN EHH

Lincoln DeVore, Inc.
Geotechnical Consultants

BORING NO. 5

ELEVATION: 1634

DEPTH (FT)	SYMBOL	SAMPLE	DESCRIPTION		PENETRATION RESISTANCE	IN-SITU DENSITY (PCF)	MOISTURE CONTENT (%)
			GRAVEL & SMALL COBBLES VERY SANDY				
		II	MEDIUM DENSITY				
			Hole CAVING				
5							1.9%
			COLORADO RIVER TERRACE				
			INCREASING COBBLE SIZE				
			SILTY SANDY FINES				
10			NONE PLASTIC				
		II					
			Wx DAKOTA FORM.	BULK			1.0%
15			SANDSTONE, SILTSTONE, THIN SHALES				
			CARBONACEOUS – SOFT TO SL-FIRM				
		IV	VERY WEATHERED – BLACK – GRAY	SPT	16/6 39/12		9.3%
			GRAY TO BUFF SANDSTONES				
20			THIN LIGNITE BEDS IN SHALE	BULK			12.1%
			GRAY BROWN TO GRAY BLACK				
			FIRM				
			LOW EXPANSION				
25							
			NO FREE WATER IN BORING 6-28-93				

LOG OF SUBSURFACE EXPLORATION

Lincoln DeVore, Inc.
Geotechnical Consultants

RIVER VIEW TERRACE GRAND JUNCTION

DATE 7-30-93

JOB NO. 7819-J

DRAWN EMH

BORING NO. 6

ELEVATION: 4633

DEPTH (FT)	SYMBOL	SAMPLE	DESCRIPTION		PENETRATION RESISTANCE	IN-SITU DENSITY (PCF)	MOISTURE CONTENT (%)
		II	COBBLES and GRAVELS SILTY SAND FINES MEDIUM DENSITY DRY to SL. MOIST	BULK	31/6 54/12		0-8%
5			STRATIFIED NON PLASTIC HOLE CAVING				
10		II	DRY to SL. MOIST	BULK			0-7%
			GRAVEL & COBBLE SILTY, SANDY FINES				
15			SL. MOIST				
			Wx. DAKOTA FORMATION				
20		IV	CARBONACEOUS SHALES and SILTSTONES SL. MOIST - V. FIRM to DRILL LOW EXPANSION	SPT	17/6 31/12 54/18 75/24		5.0%
25							

NO FREE WATER IN BORING 6-28-93

LOG OF SUBSURFACE EXPLORATION

Lincoln DeVore, Inc
Geotechnical Consultants

RIVERVIEW TERRACE GRAND JUNCTION

DATE 7-30-93

JOB NO. 78619-J

DRAWN EMM

BORING NO. 7

ELEVATION: 4633

DEPTH [FT]	SYMBOL	SAMPLE	DESCRIPTION	PENETRATION RESISTANCE	IN-SITU DENSITY [PCF]	MOISTURE CONTENT [%]
5		II	COLORADO RIVER TERRACE SILTY SANDY GRAVELS & COBBLES DRY TO SL. MOIST HOLE CAVING MEDIUM DENSITY	BULK		3%
10		II	STRATIFIED DRY TO SL. MOIST	BULK		4%
15		II	VERY SANDY - GRAVELS - DRY	SPT 13/6, 31/12		3%
			W/ DAKOTA FORM -	50/14		
20		IV	WEATHERED SANDSTONE, SILTSTONE and SHALE GRAY, BUFF TO DARK GRAY LOW PLASTIC, SL. MOIST CARBONACEOUS — LOW EXPANSION V. FIRM TO DRILL	BULK		8.4%
25			NO FREE WATER DURING BORING 6-28-93			

LOG OF SUBSURFACE EXPLORATION

Lincoln DeVore, Inc.
Geotechnical Consultants

RIVER VIEW TERRACE GRAND JUNCTION

DATE 7-30-93

JOB NO. 7B614-J

DRAWN EMH

BORING NO. 8

ELEVATION: 4635

DEPTH (FT)	SYMBOL	SAMPLE	DESCRIPTION		PENETRATION RESISTANCE	IN-SITU DENSITY (PCF)	MOISTURE CONTENT (%)
			SANDY, SILTY GRAVELS & COBBLES				
		II	SOME LARGE COBBLES	SPT	31/6, 55/12		1.7%
5			MORE GRAVEL - MEDIUM DENSITY				
			DRY TO SL. MOIST				
10		II	CAVING - STRATIFIED	BULK			1.0%
			NON PLASTIC FINES				
			VERY SANDY - DECREASING COBBLE				
15		II		BULK			1.3%
			W. DAKOTA FORM.				
		III	LOW PLASTIC SILTSTONE and CLAYSTONE SL. MOIST	SPT	29/6, 65/12		8.1%
20			VERY FIRM LOW EXPANSION				

NO FREE WATER IN BORING 7-1-93

LOG OF SUBSURFACE EXPLORATION

Lincoln DeVore, Inc.
Geotechnical Consultants

RIVERVIEW TERRACE GRAND JUNCTION

DATE 7-30-93

JOB NO. 78619-J

DRAWN EHM

BORING NO. 9

ELEVATION: 4637

DEPTH (FT)	SYMBOL	SAMPLE	DESCRIPTION		PENETRATION RESISTANCE	IN-SITU DENSITY (PCF)	MOISTURE CONTENT (%)
		II	GRAVEL & COBBLE — Non Plastic SILTY SANDY FINES COLORADO RIVER TERRACE MEDIUM DENSITY	BULK			2.1%
5							
		II	Slightly Moist	SPT	29/6 7½/12		1.2%
10							
			GRAVEL & COBBLE Non PLASTIC FINES				
15		II		BULK			1.1%
			Klx DAKOTA FORM. SILTSTONE, CLAYSTONE & SHALE CARBONACEOUS — PLASTIC LOW EXPANSION				
20		IV	Thin Sandstone strata — Firm LOW MOISTURE	SPT	23/6 50/12		5.6%
25							
			NO FREE WATER DURING DRILLING 7-1-93				

LOG OF SUBSURFACE EXPLORATION

Lincoln DeVore, Inc.
Geotechnical Consultants

RIVER VIEW TERRACE GRAND JUNCTION

DATE 7-30-93

JOB NO. 7961-J

DRAWN EHM

BORING NO. 10

ELEVATION: 4622

DEPTH (FT)	SYMBOL	SAMPLE	DESCRIPTION	PENETRATION RESISTANCE	IN-SITU DENSITY (PCF)	MOISTURE CONTENT (%)
			WEATHERED DAKOTA FORM.			
			LOW PLASTIC CLAYSTONE			
		C	IV CL CARBONACEOUS STRATA	11/6 28/12 SPT		14.1%
5			III CH HIGH PLASTIC STRATA MED. EXPANSION	47/18 BULK		15.9%
			BROWN, some silty strata			
			IV CL GRAY & BROWN CLAY SULFATES	13/6 30/12 SPT		18.5%
10			LOW TO MEDIUM EXPANSION	59/18 75/24		
			PLASTIC - MEDIUM TO HIGH DENSITY	CSP		
			IV CL VERY MOIST - YELLOW & WHITE MINERALS	13/6 31/12	93.4	21.3%
15			CALICHE' ZONE?			
			MOIST LOW PLASTIC CLAY			
		C	IV CL EXPANSNE - SOME SILT	19/6 23/12 SPT		18.9%
20			CARBONACEOUS STRATA	38/18 57/24		
			III CH HIGH PLASTIC CLAY	15/6 35/12 SPT		19.8%
25			MEDIUM EXPANSION	56/18 81/24		
			MEDIUM TO HIGH DENSITY			

SHRINKAGE CRACKS ON SURFACE

NO FREE WATER DURING DRILL.

7-1-93

LOG OF SUBSURFACE EXPLORATION

Lincoln DeVore, Inc.
Geotechnical Consultants

RIVERVIEW TERRACE GRAND JUNCTION

DATE 7-30-93

JOB NO. T8612-J

DRAWN ERM

BORING NO. 11

ELEVATION: 4624

DEPTH (FT)	SYMBOL	SAMPLE	DESCRIPTION	PENETRATION RESISTANCE	IN-SITU DENSITY (PCF)	MOISTURE CONTENT (%)
			REWORKED NATIVE ALLUVIAL SOILS			
			CLAYSTONE - Wx DAKOTA FORMATION			
5			THIN SILTSTONE BEDS			
		IV	VERY FIRM - EXPANSIVE			11-1%
			MOIST			
			TAN TO BROWN - SOME SILTY STRATA			
10	C		CARBONACEOUS SILTSTONE & SHALE			
		IV	CLAYSTONE - PLASTIC - EXPANSIVE SPT	17/6 24/12		15-8%
			VERY MOIST			
15			MINERALIZED SANDSTONE & SILTSTONE - FIRM	44/18		
		IV	CLAYSTONE	BULK		14-7%
			THIN STRATA OF HIGH PLASTIC CLAY			
20			MEDIUM EXPANSION			

SHRINKAGE CRACKS ON SURFACE

NO FREE WATER IN BORING 7-1-93

LOG OF SUBSURFACE EXPLORATION

Lincoln DeVore, Inc.
Geotechnical Consultants

RIVER VIEW TERRACE GRAND JUNCTION

DATE 7-30-93

JOB NO. 78612-J

DRAWN EHM

BORING NO. 12

ELEVATION: 4621

DEPTH (FT)	SYMBOL	SAMPLE	DESCRIPTION	PENETRATION RESISTANCE	IN-SITU DENSITY (PCF)	MOISTURE CONTENT (%)
			REWORKED ALLUVIAL SOILS - GRAVELS LOW TO MEDIUM DENSITY			
				BULK		1-9%
5			WK DAKOTA FORM.			
		IV	CARBONACEOUS STRATA			
			SILTSTONE, SHALE and MUDSTONE	BULK		8-4%
			VERY FIRM TO HARD			
			SL. MOIST			
10			DRILL CUTTINGS are Powdery			
		IV	SULFATES	BULK		6-8%
			SHALE & SILTSTONE	SPT		9-3%
15				20/6 43/12 82/18 135/24		

SOME SHRINKAGE CRACKS IN VICINITY of BORING.

NO FREE WATER IN BORING 7-1-93

LOG OF SUBSURFACE EXPLORATION

Lincoln DeVore, Inc.
Geotechnical Consultants

RIVER VIEW TERRACE GRAND JUNCTION

DATE 7-30-93

JOB NO. 78619-J

DRAWN EMH

BORING NO. 13

ELEVATION: 4641

DEPTH (FT)	SYMBOL	SAMPLE	DESCRIPTION	PENETRATION RESISTANCE	IN-SITU DENSITY (PCF)	MOISTURE CONTENT (%)
			Slightly Clayey SILTY SAND Sulfates – Sl. Compressive			
5		I	ALLUVIAL SILTY SAND – STRATIFIED DEBRIS FLOW REDDISH TAN MOIST	SPT 9/6 21/12		7.4%
		II	GRAVEL & COBBLE with Silty Sand Fines	D&K		
10			COLORADO RIVER DEPOSIT, MEDIUM DENSITY Non Plastic			7.2%
15						
			NO FREE WATER 7-2-93			

LOG OF SUBSURFACE EXPLORATION

Lincoln DeVore, Inc.
Geotechnical Consultants

RIVER VIEW TERRACE GRAND JUNCTION

DATE 7-30-93

JOB NO. 7861J-J

DRAWN EHM

BORING NO. 14

ELEVATION:

DEPTH (FT)	SYMBOL	SAMPLE	DESCRIPTION	PENETRATION RESISTANCE	IN-SITU DENSITY (PCF)	MOISTURE CONTENT (%)
			DRY			
			CLAY, Very Silty SAND			
			VERY FINE GRAINED — Low Plastic			
			VERY STRATIFIED			
5			DEBRIS FLOW — ALLUVIAL			
			REDDISH			
				BULK		7.0%
			FINE SILTY SAND	SPT 5/6 13/12		8.0%
10			(II) COARSE STRATA	21/18 31/24		
			DULL YELLOW TO WHITE — Moist			
			MEDIUM DENSITY			
			Y. MOIST			
			(I) VERY SOFT STRATA — SILT & SAND STRATA			
15			SILTY SAND — TAN — DAMP TO MOIST	SPT 1/6 3/12		7.5%
			(II) FINE COBBLE? and GRAVELS	5/18 7/24		
			VERY MOIST			
20			MEDIUM DENSITY	BULK		5.5%
			SILTY SANDY FINES			

No Free Water In Boring 7-8-93

LOG OF SUBSURFACE EXPLORATION

Lincoln DeVore, Inc.
Geotechnical Consultants

River View Terrace — Grand Junction		
		DATE 7-30-93
JOB NO. 78619-J	DRAWN EAH	

BORING NO. 15

ELEVATION:

DEPTH (FT)	SYMBOL	SAMPLE	DESCRIPTION		PENETRATION RESISTANCE	IN-SITU DENSITY (PCF)	MOISTURE CONTENT (%)
			Slightly Clayey - Silty Sand Very Fine Grained				
		I	ALLUVIAL - TAN - SL. MOIST	SPT			4.9%
5			HIGH SULFATES				
			STRATIFIED SILT - SAND CLAYEY STRATA				
		I	VERY FIRM Silt & Silty Sand	CS	15/6 33/12 51/18		18.7%
10			SATURATED PERCHED WATER?				
		I	VERY MOIST — DECREASING	SPT	7/6 14/12 21/18		7.2%
15			SILTY SANDY GRAVEL & COBBLE				
		II	MEDIUM DENSITY	BULK			5.9%
20							

NO FREE WATER DURING DRILLING

7-8-93

VERY MOIST TO WET STRATA 8'-12'

LOG OF SUBSURFACE EXPLORATION

Lincoln DeVore, Inc.
Geotechnical Consultants

RIVERVIEW TERRACE GRAND JUNCTION

DATE 7-30-93

JOB NO. 78619-J

DRAWN EMH

BORING NO. 16

ELEVATION:

DEPTH [FT]	SYMBOL	SAMPLE	DESCRIPTION	PENETRATION RESISTANCE	IN-SITU DENSITY [PCF]	MOISTURE CONTENT [%]
			· RED · SILTY SAND · FINE GRAINED			
			SL. MOIST MEDIUM DENSITY			
		Ⓘ	STRATIFIED SL. COMPRESSIVE			
5				SPT 8/6 20/12		2.8%
			COBBLE and GRAVELS	27/18		
		Ⓘ	SILT + SAND FINES MOIST			
			MEDIUM DENSITY NON-PLASTIC	SPT 19/6 27/12		3.3%
10						

NO FREE WATER DURING DRILLING
7-8-93

LOG OF SUBSURFACE EXPLORATION

Lincoln DeVore, Inc.
Geotechnical Consultants

RIVER VIEW TERRACE GRAND JUNCTION

DATE 7-30-93

JOB NO. 78619-J

DRAWN EMH

BORING NO. 17

ELEVATION: 4644

DEPTH (FT)	SYMBOL	SAMPLE	DESCRIPTION	PENETRATION RESISTANCE	IN-SITU DENSITY (PCF)	MOISTURE CONTENT (%)
			Very Silty Sand & Sandy Silt			
			ALLUVIAL Scattered Gravels			
		I		ST		5.2%
5			GRAVEL - SILTY SAND FINES REDDISH			
			INCREASING GRAVELS and COBBLES TRANSITION TO			
		II	COBBLE and GRAVEL, SILTY SANDY	SPT 9/6 29/12 30/18		4.3%
10			COLORADO RIVER TERRACE			
			MEDIUM DENSITY			
15						
			NO FREE WATER IN BORING 7-2-93			

LOG OF SUBSURFACE EXPLORATION

Lincoln DeVore, Inc.
Geotechnical Consultants

RIVERVIEW TERRACE GRAND JUNCTION

DATE 7-30-93

JOB NO. 78619-J

DRAWN EHM

BORING NO. 18

ELEVATION:

DEPTH [FT]	SYMBOL	SAMPLE	DESCRIPTION		PENETRATION RESISTANCE	IN-SITU DENSITY [PCF]	MOISTURE CONTENT [%]
		(I)	FINE GRAINED SILTY SAND - COBBLES and GRAVELS SCATTERED - DESSICATED SURFACE				
		(II)	SILTY SANDY COBBLES and GRAVELS Sl. MOIST MEDIUM DENSITY	SPT	9/6 23/12		3.7%
5			ANCIENT COLORADO RIVER TERRACE NON PLASTIC FINES				
		(II)	COARSE STRATA Sl. MOIST	SPT	33/6 54/12		2.6%
10			VERY SANDY - MEDIUM DENSITY				
		(II)	INCREASING COBBLES NEAR TO DRILL REFUSAL	SPT	38/6		2.2%
15							

NO FREE WATER IN BORING
7-8-93

LOG OF SUBSURFACE EXPLORATION

Lincoln DeVore, Inc.
Geotechnical Consultants

RIVER VIEW TERRACE - GRAND JUNCTION

DATE 7-30-93

JOB NO. 78619-J

DRAWN EMM

BORING NO. 19

ELEVATION:

DEPTH [FT]	SYMBOL	SAMPLE	DESCRIPTION		PENETRATION RESISTANCE	IN-SITU DENSITY [PCF]	MOISTURE CONTENT [%]
		I	SILTY SAND - REDDISH - SCATTERED GRAVELS				
			FINE-GRAINED - ALLUVIAL				
			GRAVEL & COBBLES				
		II		SPT	35/6		3.5%
5			FIRM - SLIGHTLY MOIST		50/9		
			COLORADO RIVER TERRACE				
		II	STRATIFIED	SPT	16/6		1.8%
10			NON PLASTIC - SILTY SANDY FINES				
		II	DIFFICULT DRILLING				
				BULK			2.1%
15							
			NO FREE WATER IN BORING 7-8-93				

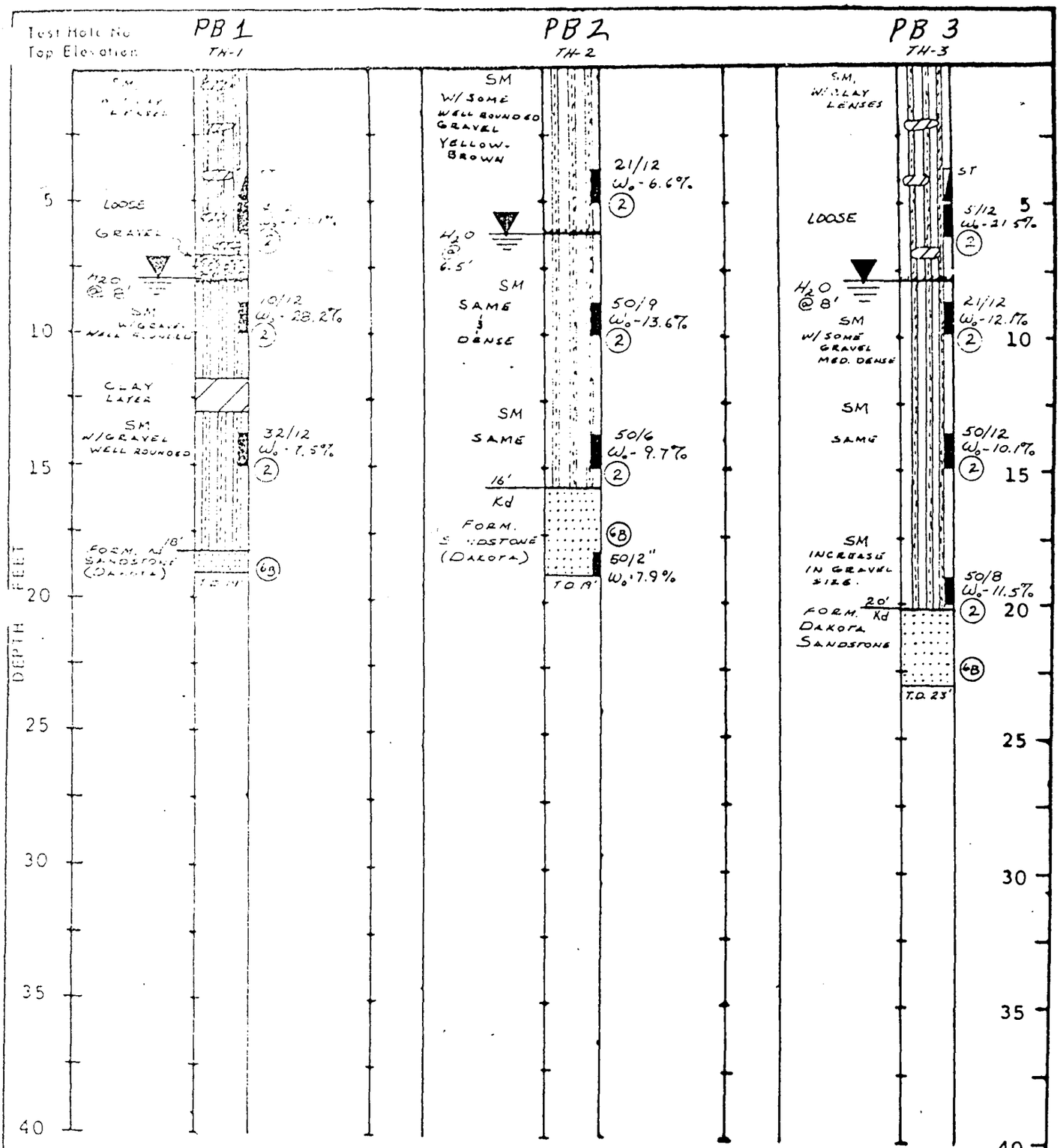
LOG OF SUBSURFACE EXPLORATION

Lincoln DeVore, Inc.
Geotechnical Consultants

NO FREE WATER — GRAND JUNCTION

DATE 7-30-93

JOB NO. 78619-J | DRAWN EMH

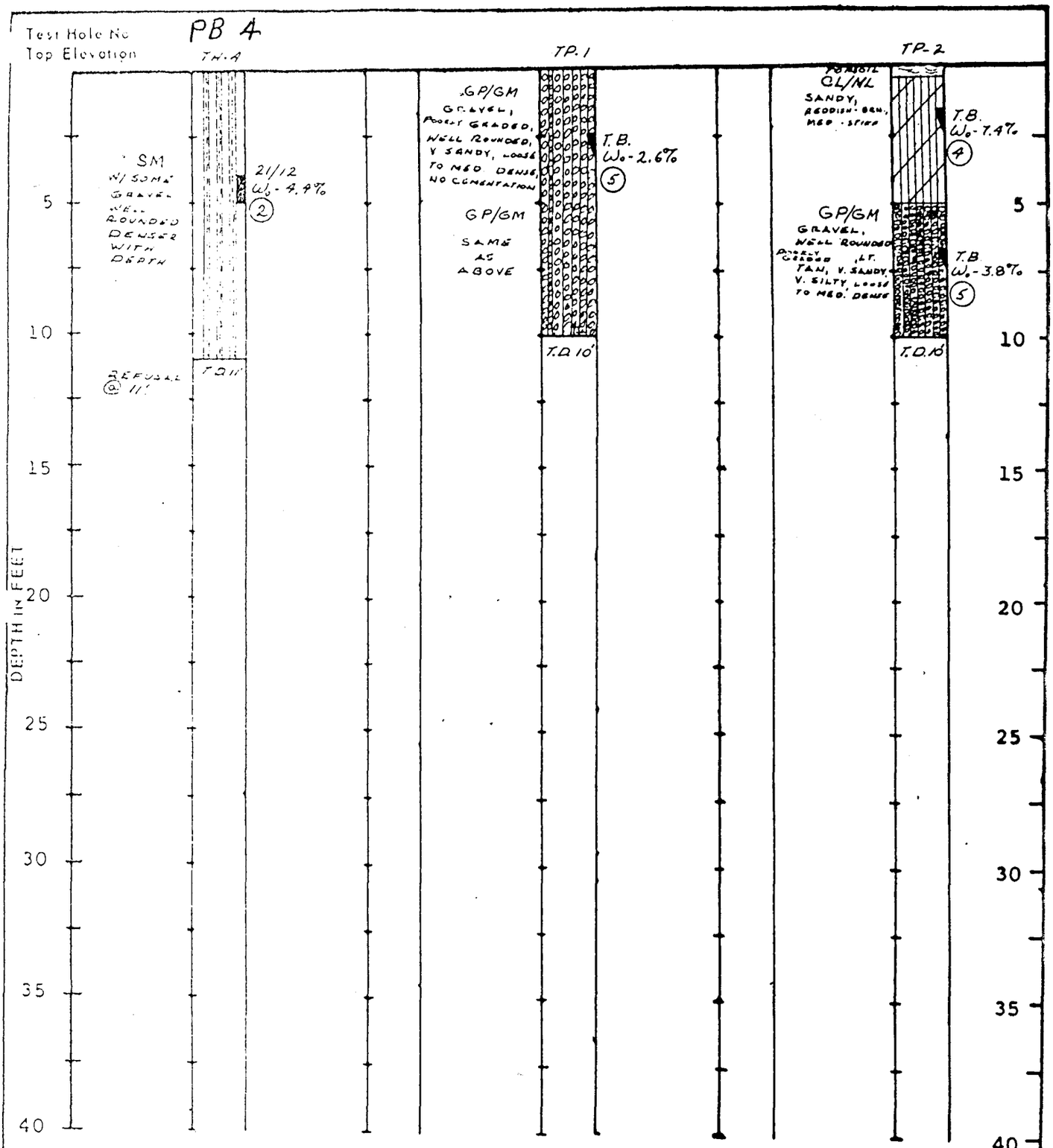


DRILLED - 1976

LDTL# 14243-GS

DRILLING LOGS

LINCOLN-DeVORE TESTING LABORATORY
COLORADO SPRINGS-PUEBLO, COLORADO

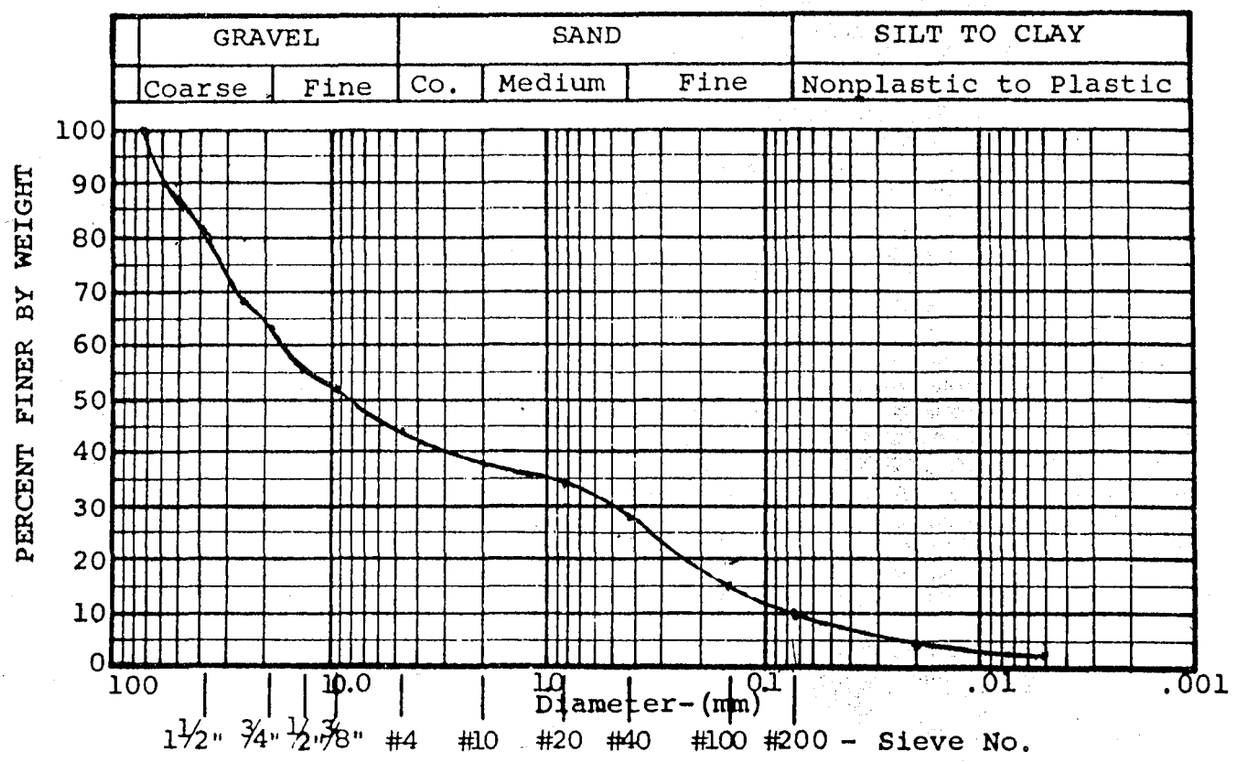


DRILLED - 1976

LOTL # 14243-GS

DRILLING LOGS

LINCOLN-DeVORE TESTING LABORATORY
COLORADO SPRINGS-PUEBLO, COLORADO



Soil Sample COBBLE, SILTY GRAVEL

Sample Location BANK CUT NEAR TB 9 @ 4-8

Sample No. II

Specific Gravity

Moisture Content 1.3%

Effective Size .076 mm

Cu

Cc

Fineness Modulus

L.L. % P.I. NP %

Bearing 2800 psf

Sulfates 250 ppm

Sieve Size	3" Max. Size % Passing
1-1/2"	90.
1"	68
3/4"	63
1/2"	56
3/8"	52
#4	44
#10	38
#20	34
#40	28
#100	15
#200	10
0.0200	4
0.0050	2

Lincoln DeVore, Inc.
Geotechnical Consultants

DATE

JOB NO. DRAWN

SUMMARY SHEET

Soil Sample HIGH PLASTIC CLAY DAKOTA FORMATION - (CH)

Test No. 78619-J

Location RIVERVIEW TERRACE GJ.

Date 7-17-93

Boring No. 10 Depth 5

Sample No. III

Test by JLS

Natural Water Content (w)____%

Specific Gravity (Gs)____

In Place Density (γ_o)____pcf

SIEVE ANALYSIS:

Sieve No.	% Passing
1 1/2"	
1"	
3/4"	
1/2"	
4	
10	100
20	99
40	99
100	98
200	96

HYDROMETER ANALYSIS:

Grain size (mm)	%
.02	68
.005	54

Plastic Limit P.L. 22 %

Liquid Limit L. L. 57 %

Plasticity Index P.I. 35 %

Shrinkage Limit____%

Flow Index____

Shrinkage Ratio____%

Volumetric Change____%

Lineal Shrinkage____%

MOISTURE DENSITY: ASTM METHOD

Optimum Moisture Content - w_o____%

Maximum Dry Density - γ_d____pcf

California Bearing Ratio (av)____%

Remolded Swell: 1 Days____%

Swell against____psf Wo gain____%

BEARING:

Housel Penetrometer (av)____psf

Unconfined Compression (qu)____psf

Plate Bearing:____psf

Inches Settlement____

Consolidation % under psf

PERMEABILITY:

K (at 20°C)____

Void Ratio____

Sulfates 1000 ppm.

SOIL ANALYSIS

LINCOLN-DeVORE TESTING LABORATORY
COLORADO SPRINGS, COLORADO

SUMMARY SHEET

Low Plastic - Lignitic Clay

Soil Sample DAKOTA FORMATION (CL) Test No. 78619-J

Location RIVER VIEW TERRACE G.J. Date 7-9-93

Boring No. _____ Depth _____

Sample No. IV Test by DLS

Natural Water Content (w) _____ %

Specific Gravity (Gs) _____ In Place Density (γ_o) _____ pcf

SIEVE ANALYSIS:

Sieve No.	% Passing
1 1/2"	
1"	
3/4"	
1/2"	100
4	99
10	98
20	96
40	92
100	89
200	81

HYDROMETER ANALYSIS:

Grain size (mm)	%
.02	64
.005	39

Plastic Limit P.L. 29 %

Liquid Limit L. L. 20 %

Plasticity Index P.I. 9 %

Shrinkage Limit _____ %

Flow Index _____

Shrinkage Ratio _____ %

Volumetric Change _____ %

Lineal Shrinkage _____ %

MOISTURE DENSITY: ASTM METHOD

Optimum Moisture Content - w_o _____ %

Maximum Dry Density - γ_d _____ pcf

California Bearing Ratio (av) _____ %

Swell: _____ Days _____ %

Swell against _____ psf Wo gain _____ %

BEARING:

Housel Penetrometer (av) _____ psf

Unconfined Compression (qu) _____ psf

Plate Bearing: _____ psf

Inches Settlement _____

Consolidation _____ % under _____ psf

PERMEABILITY:

K (at 20°C) _____

Void Ratio _____

Sulfates 1500 ppm.

SOIL ANALYSIS

LINCOLN-DeVORE TESTING LABORATORY
COLORADO SPRINGS, COLORADO

South Row 4

Bicycle Path Horizontal Alignment and Superelevation

The minimum radius of curvature negotiable by a bicycle is a function of the superelevation rate at a bicycle path surface, the coefficient of friction between the bicycle tires and the bicycle path surface, and the speed of the bicycle. The minimum design radius of curvature can be derived from the following formula.

$$R = \frac{V2}{15\,(e + f)}$$

Where R = Minimum radius of curvature (ft.)
V = Design speed (mph)
e = Rate of superelevation
f = Coefficient of friction

For most bicycle path applications, the superelevation rate will vary from a minimum of 2 percent (the minimum necessary to encourage adequate drainage) to a maximum of approximately 5 percent (beyond which maneuvering difficulties by slow bicyclists and adult tricyclists might be expected). The minimum super-elevation rate of 2 percent will be adequate for most conditions and will simplify construction.

The coefficient of friction depends upon speed; surface type, roughness, and condition; tire type and condition; and whether the surface is wet or dry. Friction factors used for design should be selected based upon the point at which centrifugal force causes the bicyclist to recognize a feeling of discomfort and instinctively act to avoid higher speed. Extrapolating from values used in highway design, design friction factors for paved bicycle paths can be assumed to vary from 0.30 at 15 mph (24km/h), to 0.22 at 30 mph (48km/h). Although there are no data available for unpaved surfaces, it is suggested that friction factors be reduced by 50 percent to allow a sufficient margin of safety.

Based upon a superelevation rate (e) of 2 percent, minimum radii of curvature can be selected from Table 1.

When substandard radius curves must be used on bicycles paths because of right-of-way, topographical, or other considerations, standard curve warning signs and supplemental pavement markings shall be installed in accordance with the MUTCD. The negative effects of substandard curves can also be partially offset by widening the pavement through the curves.

TABLE 1

DESIGN RADII FOR PAVED BICYCLE PATHS

Design Speed - V (mph) (1 mph = 1/6km/hr)	(e = 2 percent) Friction Factor - f	Design Radius (feet) (1 ft. = 0.3m)
20	0.27	95
25	0.25	155
30	0.22	250
35	0.19	390
40	0.17	565

Grades on Bicycle Paths

Grades on bicycle paths should be kept to a minimum, especially on long inclines. Grades greater than 5 percent are undesirable because the ascents are difficult for many bicyclists to climb and the descents cause some bicyclists to exceed the speeds at which they are competent. Where terrain dictates, grades over 5 percent and less than 500 feet (150m) long are acceptable when a higher design speed is used and additional width is provided.

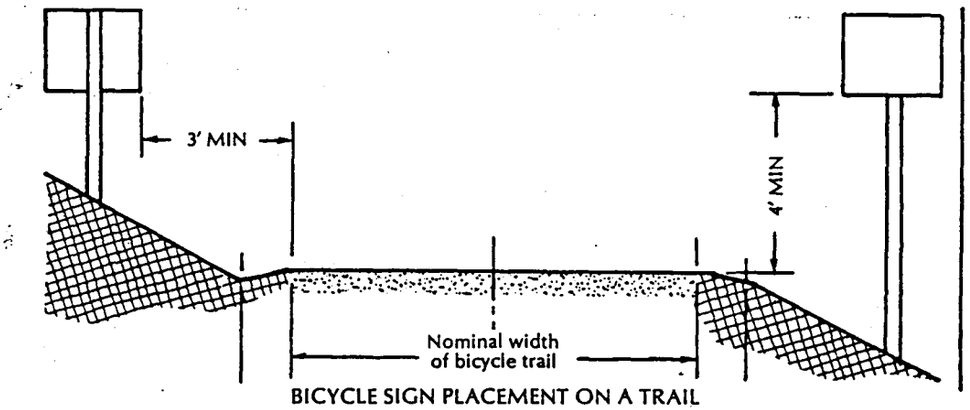
Bicycle Path Sight Distance

To provide bicyclists with an opportunity to see and react to the unexpected, a bicycle path should be designed with adequate stopping distances. The distance required to bring a bicycle to a full controlled stop is a function of the bicyclist's perception and brake reaction time, the initial speed of the bicycle, the coefficient of friction between the tires and the pavement, and the braking ability of the bicycle. [3]

Figure 8 indicates the minimum stopping sight distance for various design speeds and grades based on a total perception and brake reaction time of 2.5 seconds and a coefficient of friction of 0.25 to account for the poor wet weather braking character-istics of many bicycles. For two-way bicycle paths, the sight distance in the descending direction, that is, where "G" is negative, will control the design.

Figure 9 is used to select the minimum length of vertical curve necessary to provide minimum stopping sight distance at various speeds on crests. The eye height of the bicyclist is assumed to be 4.5 feet (1.4m) and the object height is assumed to be zero to recognize that hazards to bicycle travel exist at pavement level.

Figure 10 indicates the minimum clearance that should be used to line-of-sight obstructions for horizontal curves. The desired lateral clearance is obtained by entering Figure 10 with the stopping sight distance from Figure 8 and the proposed horizontal radius of curvature.



BICYCLE SIGN PLACEMENT ON A TRAIL

Figure 23

The sign dimensions shown in this part of the Manual shall be considered standard for application on all types of bicycle facilities. Where signs shown in other parts of this Manual are intended for exclusive bicycle use, smaller sign sizes from that specified may be used. Incremental increases in special bicycle facility signs are also desirable to make the sizes compatible with signs for motor vehicles, where both motorists and bicyclists benefit by a particular sign.

The sign lettering shall be in upper-case letters of the type shown in the Standard Alphabets for Highway Signs and Pavement Markings.

All signs should be reflectorized for bicycle trails as well as for shared roadway and designated bicycle lane facilities.

9B-4 Regulatory Signs

Regulatory signs are to inform bicyclists, pedestrians, and motorists of traffic laws or regulations and indicate the applicability of legal requirements that would not otherwise be apparent.

Regulatory signs normally shall be erected at the point where the regulations apply. The sign message shall clearly indicate the requirements imposed by the regulations and shall be easily visible and legible to bicyclists and where appropriate, motorists and pedestrians.

9B-5 Bicycle Prohibition Sign (R5-6)

This sign is intended for use at the entrance to facilities, such as freeways, where bicycling is prohibited. Where pedestrians and motor-driven cycles are also prohibited from using these facilities, it may be more desirable to use the R5-10a word message sign (sec. 2B-28).

In reduced size (18 x 18 inches), this sign may be used on sidewalks where bicycle riding is prohibited.

R5-6
24" x 24"

9B-6 Motor Vehicle Prohibition Sign (R5-3)

This sign is intended for use at the entrance to a bicycle trail.

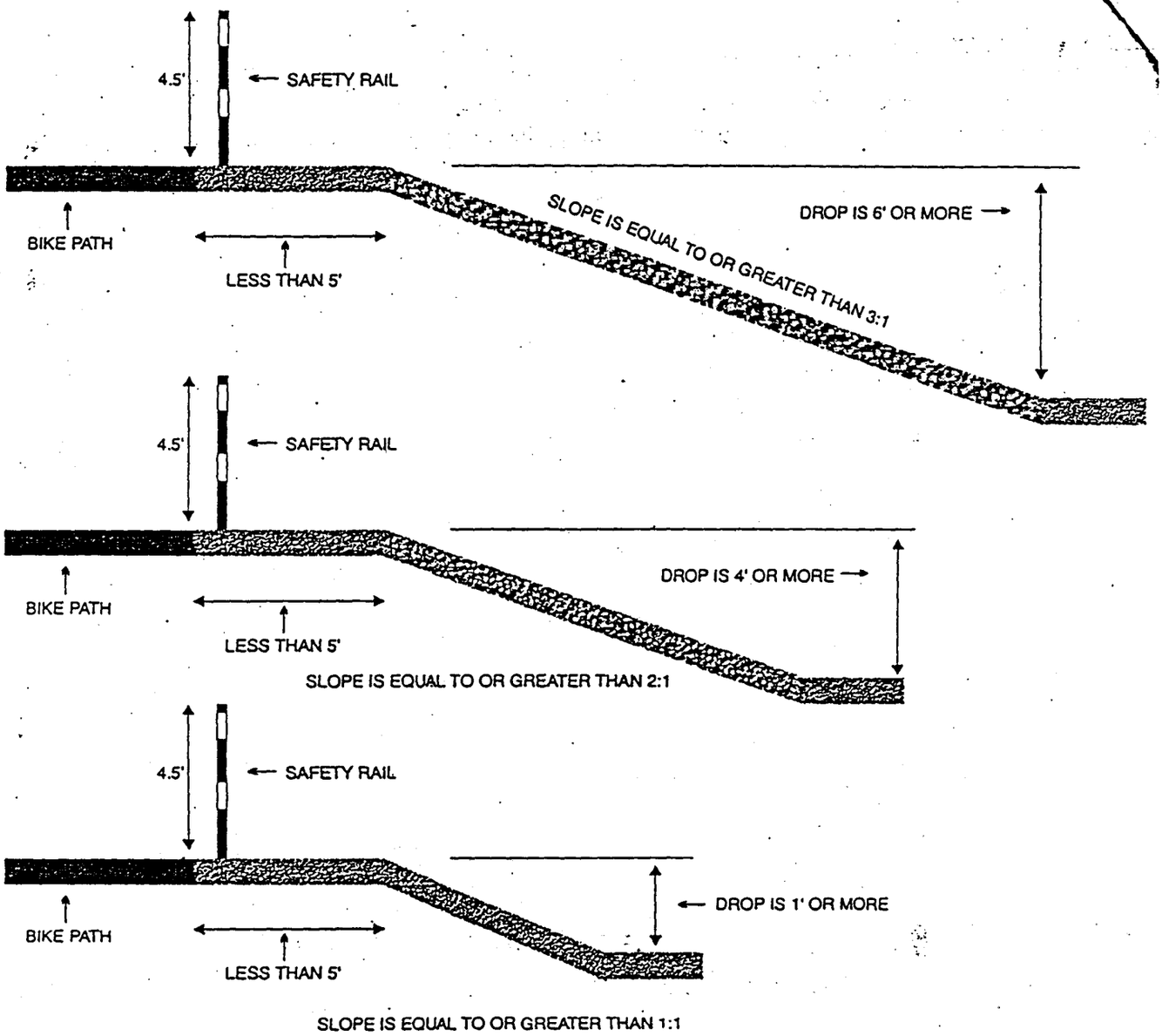
R5-3
24" x 24"

9B-7 Bicycle Restriction Signs (R9-5 & 6)

This series of signs is intended for use where pedestrian facilities are being used for bicycle travel. They should be erected off the edge of the sidewalk, near the crossing location, where bicyclists are expected to dismount and walk with pedestrians while crossing the street.

The R9-5 sign may be used where bicycles can cross the street only on the pedestrian walk signal indication.

The R9-6 sign may be used where bicycles are required to cross or share a facility used by pedestrians and are required to yield to the pedestrians.



Safety Railings are Needed Where the Slope & Drop Equal or Exceed the Above Parameters & the Clear Zone is Less Than 5 Feet

Figure 17-26

17.5.2.10 Restriction of Motor Vehicle Traffic

Motor vehicle traffic on bike paths is best restricted with signage. Black on white "No Unauthorized Motor Vehicles" signs are most appropriate. An alternate method of restricting

9B-11 No Parking Signs (R7-9, & 9a)

Where it is necessary to restrict parking, standing, or stopping in a designated bicycle lane, appropriate signs as described in sections 2B-31 through 2B-33 may be used, or signs R7-9 or R7-9a shall be used.

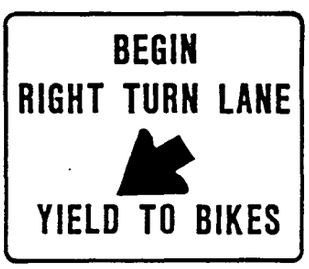
R7-9
12" x 18"

R7-9a
12" x 18"

9B-12 Lane Use Control Signs (R3-7, R4-4)

Where right-turning motor vehicles must merge with bicycle traffic on designated bike lanes, the R3-7 and R4-4 signs may be used. The R4-4 sign in intended to inform both the motorist and the bicyclist of this merging maneuver. Where a designated bicycle lane is provided near the stop line, an R3-7 sign may be used to prevent motorists from crossing back over the bike lane.

R3-7
30" x 30"



R4-4
36" x 30"

9B-13 Warning Signs

Warning signs are used when it is deemed necessary to warn bicyclists or motorists of existing or potentially hazardous conditions on or adjacent to a highway or trail. The use of warning signs should be kept to a minimum because the unnecessary use of them to warn of conditions which are apparent tends to breed disrespect for all signs.

Warning signs specified herein cover most conditions that are likely to be met. If other warnings are needed, the signs shall be of standard shape and color for warning signs, and the legends shall be brief and easily understood.

9B-14 Bicycle Crossing Sign (W11-1)

The Bicycle Crossing sign is intended for use on highways in advance of a point where a bikeway crosses the roadway. It should be erected about 750 feet in advance of the crossing location in rural areas where speeds are high, and at a distance of about 250 feet in urban residential or business areas, where speeds are low.

If the approach to an intersection is controlled by a traffic control signal, stop sign or yield sign, the W11-1 sign may not be needed.

W11-1
30" x 30"

9B-15 Hazardous Condition Sign (W8-10)

The Hazardous Condition sign is intended for use where roadway or bicycle trail conditions are likely to cause a bicyclist to lose control of his bicycle. These conditions could include slippery pavement, slick bridge, decking, rough or grooved pavement, or water or ice on the roadway. The W8-10 sign may be used with a supplemental plaque describing the particular roadway or bicycle trail feature which might be of danger to the bicyclist such as SLIPPERY WHEN WET, STEEL DECK, ROUGH PAVEMENT, BRIDGE JOINT, or FORD.

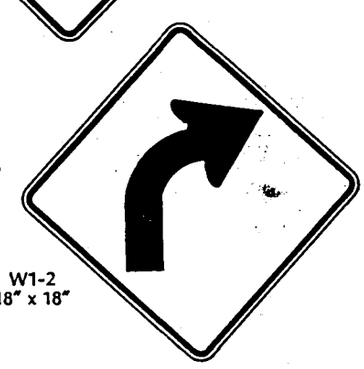
W8-10

Roadway Signs	Bicycle Trail Signs
30" x 30"	18" x 18"
24" x 18"	12" x 9"

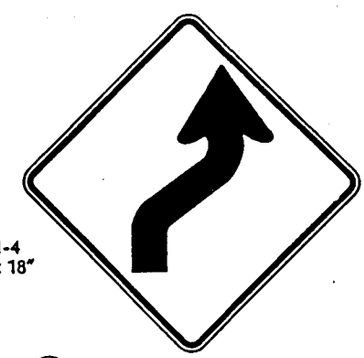
9B-16 Turn and Curve Signs (W1-1, 2, 4, 5, 6, 7)

On bicycle trails where it is necessary to warn bicyclists of unexpected changes in path direction, appropriate turn or curve signs should be used. They should normally be installed no less than 50 feet in advance of the beginning of the change of alignment.

W1-1
18" x 18"

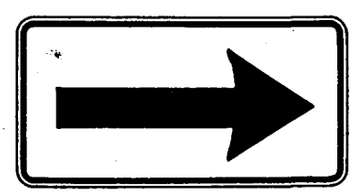


W1-2
18" x 18"

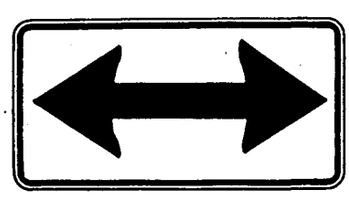


W1-4
18" x 18"

W1-5
18" x 18"



W1-6
24" x 12"



W1-7
24" x 12"

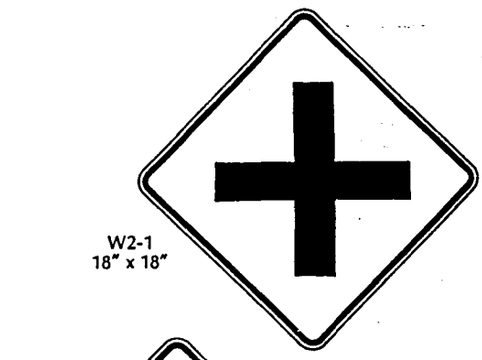
9B-17 Intersection signs (W2-1, 2, 3, 4, 5)

Intersection signs are intended for use as appropriate to fit the prevailing geometric pattern on bike trails where connecting routes join and where no STOP or YIELD signs are required. They should be used wherever sight distance at the intersection is severely limited, and may be used for supplemental warning at intersections where STOP and YIELD signs are erected.

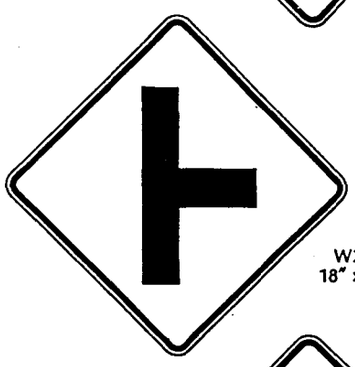
9B-18 Warning Signs

Other warning signs may be required on bicycle facilities to warn riders of unexpected conditions. The intended use of these signs generally is self-explanatory. They should normally be installed no less than 50 feet in advance of the beginning of hazards.

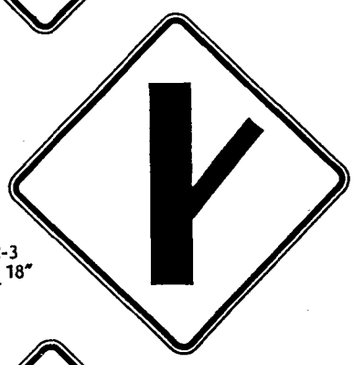
Where construction or maintenance activity is present on bicycle trails, appropriate signs from Part VI of the Manual should be used.



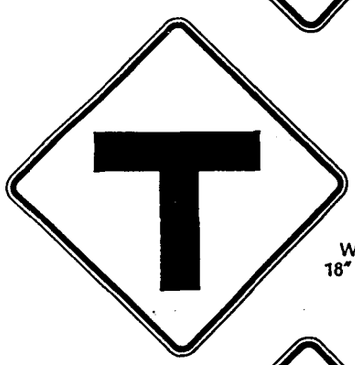
W2-1
18" x 18"



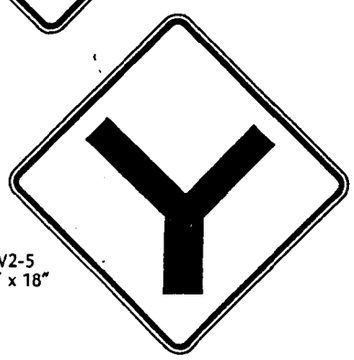
W2-2
18" x 18"



W2-3
18" x 18"

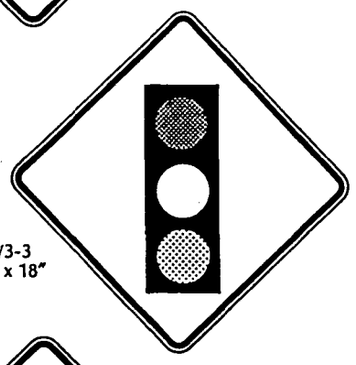


W2-4
18" x 18"



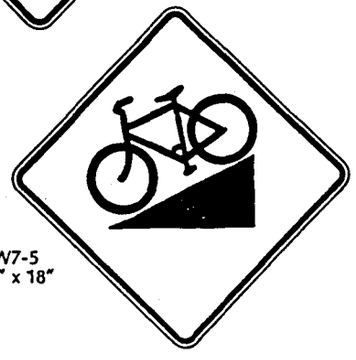
W2-5
18" x 18"

W3-1
18" x 18"



W3-3
18" x 18"

W5-4
18" x 18"



W7-5
18" x 18"

W11A-2
18" x 18"

W12-2
18" x 18"

W10-1
18" Diameter

9B-19 Guide Signs

On highways where a bicyclist is sharing a lane with motor vehicles or is using an adjacent bikeway, the regular guide signing as described in Part II of the Manual will serve both modes of travel. Where a designated bikeway exists, special bicycle route signing should be provided at decision points, including signs to inform cyclists of bicycle route direction changes and confirmatory signs to ensure that route direction has been accurately comprehended.

Figure 24 shows an example of the signing for the junction of a bicycle trail with a highway. Figure 25 shows the signing and marking for the beginning and ending of designated bikeways. Guide signing should be repeated at regular intervals to ensure that bicyclists approaching from side streets know they are traveling on an officially designated bikeway. Similar guide signing should be used for shared lane bikeways with intermediate signs placed frequently enough to ensure that cyclists already on the bikeway do not stray from it and lose their way.

9B-20 Bicycle Route Sign (D11-1)

This sign is intended for use where no unique designation of routes is desired. It should be placed at intervals frequent enough to keep bicyclists informed of changes in route direction and to remind motorists of the presence of bicyclists.

D11-1
24" x 18"

9B-21 Bicycle Route Markers (M1-8, M1-9)

Where it is desired to establish a unique identification (route designation) for a State or local bicycle route, the standard Bike Route Marker (M1-8) should be used. The route marker (M1-8) shall contain a numerical designation and shall have a green background with a reflectorized white legend and border.

Where a bicycle route extends for long distances in two or more States, it is desirable to establish a unique numerical designation for that route. A coordinated submittal by the affected States for assignment of route number designations should be sent to the American Association of State Highway and Transportation Officials, 444 North Capitol Street NW., Suite 225, Washington, D.C. 20001. The route marker (M1-9) shall contain the assigned numerical designation and have a black legend and border with a reflectorized white background.

Bike Route Markers are intended for use on both shared facilities and on designated bikeways, as required, to provide guidance for bicyclists.

M1-8
12" x 18"

M1-9
18" x 24"

9B-22 Supplemental Plaques for Route Signs and Markers

Where desired, supplemental plaques can be used with the D11-1 and M1-8 signs to furnish additional information, such as directional changes in the route, and intermediate range distance and destination information.

The M4-11 through M4-13 signs may be mounted above the appropriate Route Signs or Route Marker. Supplemental plaques D1-1b and c are intended for use with the D11-1 Bicycle Route Sign. The appropriate arrow sign (M7-1 through M7-7), if used, should be placed below the Route Sign or Route Marker. These signs shall have a white arrow on a green background.

M4-11
24".x 6" x 4"

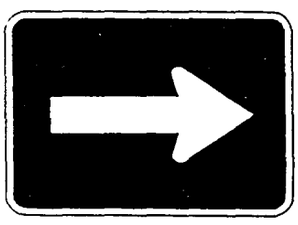
D1-1b(L)
24" x 6"

M4-12
24" x 6" x 4"

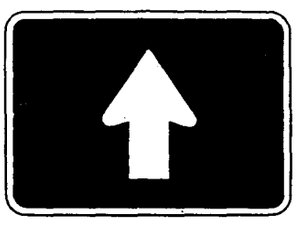
D1-1b(R)
24" x 6"

M4-13
24" x 6" x 4"

D1-1(C)
24" x 6"



M7-1



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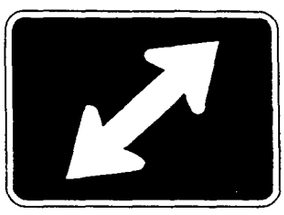

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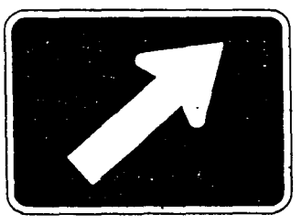
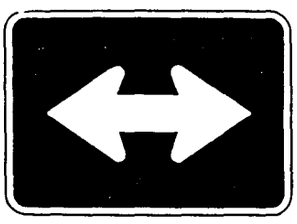
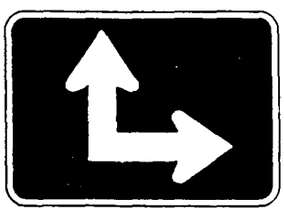


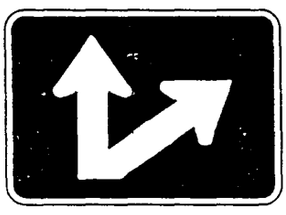
M7-4



M7-5

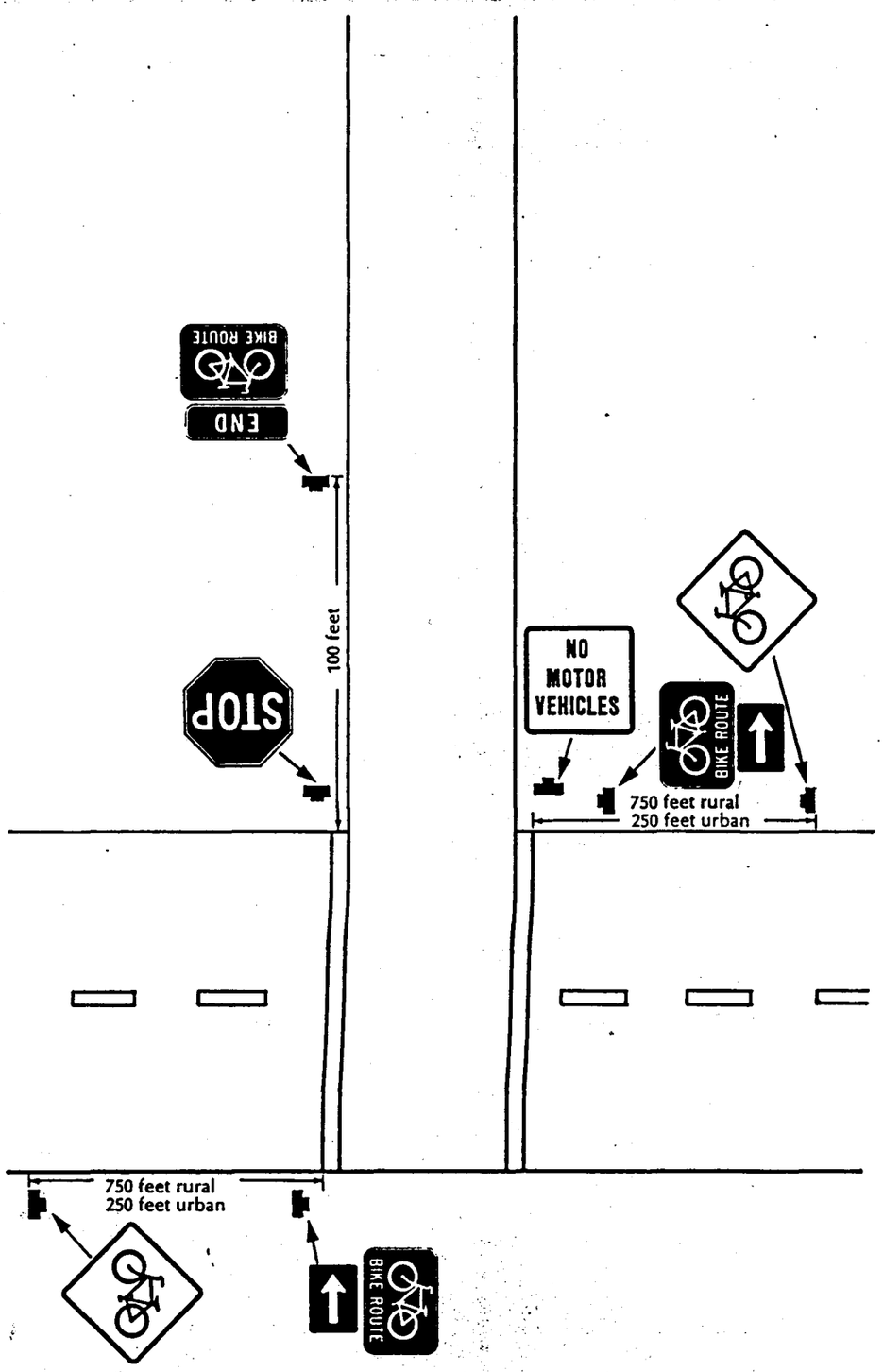


M7-6



M7-7

M7-1 through M7-7
12" x 9"



TYPICAL SIGNING FOR BEGINNING AND ENDING OF BICYCLE TRAIL

Figure 24

REVIEW COMMENTS

FILE #FPP-95-181 **TITLE HEADING:** South Rim Subdivision, Filing #4

LOCATION: E end of South Rim Drive

PETITIONER: David G. Behrhorst

PETITIONER'S ADDRESS/TELEPHONE: Lowe Development Corp.
1280 Ute, Suite 32
Aspen, CO 81611
924-4479

PETITIONER'S REPRESENTATIVE: Phil Hart, Landesign, LLC

STAFF REPRESENTATIVE: Michael Drollinger

NOTE: THE PETITIONER IS REQUIRED TO SUBMIT FOUR (4) COPIES OF WRITTEN RESPONSE AND REVISED DRAWINGS ADDRESSING ALL REVIEW COMMENTS ON OR BEFORE 5:00 P.M., OCTOBER 26, 1995.

U.S. WEST **10/4/95**
Max Ward **244-4721**

New or additional telephone facilities necessitated by this project may result in a "contract" and up-front monies required from developer, prior to ordering or placing of said facilities. For more information, please call 1-800-526-3557.

GRAND JUNCTION FIRE DEPARTMENT **10/10/95**
Hank Masterson **244-1414**

The Fire Department has no problems with this proposal.

CITY DEVELOPMENT ENGINEER **10/11/95**
Jody Kliska **244-1591**

STREET PLAN

1. On the typical section for the pavement, the City Standards require compaction of subgrade under pavement to either 95% of AASHTO T-99 or 90% of AASHTO T-180.
2. Indicate street light installation.
3. No labels were provided on the profile. is centerline?

BICYCLE PATH PLAN

1. The plan is deficient and needs to address the following: show a profile, grades, and a cross section which shows maximum cut and fill slopes. Provide a scale for the drawing. Signing will be required as part of the construction. A bollard or other deterrent to motorized vehicles may be required by Parks at the trail entry on Promontory Court. Some useful information on bike path design and signing is attached.

PUBLIC SERVICE COMPANY **10/9/95**
G. Lewis **244-2698**

Will require additional 10' easement along south side of Lot 11 to accommodate electric lines installed to serve sewer lift station located on "Outlot A". 14' front lot easements along Promontory Court per City of Grand Junction specifications should be adequate to install remaining gas and electric distribution.

CITY PROPERTY AGENT **10/11/95**
Steve Pace **244-1452**

1. The P.O.B. tie on the plat shows a bearing of S74°45'48"W, the description in the dedication shows a bearing of S75°45'48"W.
2. The bearing on the northerly line of Lot 7 should read S.E. to match the description.
3. The type of monumentation is shown in the legend but not on the platted boundary, interior lots and PC's and PT's of arcs.

MESA COUNTY SCHOOL DISTRICT #51 **10/16/95**
Lou Grasso **242-8500**

SCHOOL - ENROLLMENT / CAPACITY - IMPACT
Scenic Elementary - 298 / 325 - 4
Redlands Middle School - 552 / 650 - 2
Fruita Monument High School - 1337 / 1100 - 3

COMMUNITY DEVELOPMENT DEPARTMENT **10/12/95**
Michael Drollinger **244-1439**

1. All non plat-related information (e.g. building envelopes, lot types, area summary, building setback table) must be on separate sheet to be recorded simultaneously with plat.
2. The start and end of bicycle path construction shall be identified on the Bicycle Path Plan. Also, the maximum grade proposed shall be calculated and identified on the plan.

CITY POLICE DEPARTMENT **10/16/95**
Dave Stassen **244-3587**

This filing poses no problems for the Police Department. Use of a cul-de-sac and a curved street follows current crime prevention practices pertaining to public surveillance and limited access.

UTE WATER **10/16/95**
Gary R. Mathews **242-7491**

1. Water mains shall be c-900, class 150. Installation of pipe fittings, valves and services including testing and disinfection shall be in accordance with Ute Water standard specifications and drawings.
2. Developer is responsible for installing meter pits and yokes. Ute Water will furnish the meter pits and yokes.
3. An 8" C-900 main line is required for Promontory Court.
4. Policies and fees in effect at the time of application will apply.

REDLANDS WATER & POWER **10/13/95**
Gregg Strong **243-2173**

All comments on the Overall Development Plan have been taken care of satisfactorily. Therefore we have no comment on this filing.

CITY UTILITY ENGINEER **10/18/95**
Trent Prall **244-1590**

SEWER - CITY OF GRAND JUNCTION

1. Please reconfigure Outlot A and Drainage easement so that bikepath is in between the sewer/forcemain and the proposed storm drain rather than on top of sewer and forecemain.

WATER - UTE

TO DATE, COMMENTS HAVE NOT BEEN RECEIVED FROM:

City Attorney
Mesa County Surveyor
TCI Cablevision

We're taking television into tomorrow.

TCI Cablevision of Western Colorado, Inc.

March 14, 1996

South Rim Sub. Fil. 5
Lowe Development Corp.
% Community Development Department
250 North 5th Street
Grand Junction, CO 81501

Ref. No. CON19610

Dear Sir or Madame;

We are in receipt of the plat map for your new subdivision, **South Rim Sub. Fil 5**. We will be working with the other utilities to provide service to this subdivision in a timely manner.

I would like to take this opportunity to bring to your attention a few details that will help both of us provide the services you wish available to the new home purchasers. These items are as follows:

1. We require the developers to provide, at no charge to TCI Cablevision, an open trench for cable service where underground service is needed and when a roadbore is required, that too must be provided by the developer. The trench and/or roadbore may be the same one used by other utilities so long as there is enough room to accommodate all necessary lines.

2. We require developers to provide, at no charge to TCI Cablevision, fill-in of the trench once cable has been installed in the trench.

3. We require developers to provide, at no charge to TCI Cablevision, a 4" PVC conduit at all utility road crossings where cable TV will be installed. This 4" conduit will be for the sole use of cable TV.

4. Should your subdivision contain cul-de-sac's the driveways and property lines (pins) must be clearly marked prior to the installation of underground cable. If this is not done, any need to relocate pedestals or lines will be billed directly back to your company.

5. TCI Cablevision will provide service to your subdivision so long as it is within the normal cable TV service area. Any subdivision that is out of the existing cable TV area may require a construction assist charge, paid by the developer, to TCI Cablevision in order to extend the cable TV service to that subdivision.

6. TCI will normally not activate cable service in a new subdivision until it is approximately 30% developed. Should you wish cable TV service to be available for the first home in your subdivision it will, in most cases, be necessary to have you provide a construction assist payment to cover the necessary electronics for that subdivision.

Should you have any other questions or concerns please feel free to contact me at any time. If I am out of the office when you call please leave your name and phone number with our office and I will get back in contact with you as soon as I can.

Sincerely,

Glen Vancil

Glen Vancil,
Construction Supervisor 245-8777

2502 Foresight Circle
Grand Junction, CO 81505
(970) 245-8750

October 30, 1995

City of Grand Junction
Community Development Department
250 North 5th. Street
Grand Junction, Colorado 81501

Attn: Mr. Michael Drollinger.

Re: **South Rim Subdivision Filing No. Four, Response To Review Comments, File #FPP-95-181.**

Dear Mr. Drollinger;

In response to the review comments for this project we present the following:

U.S. West

The developer acknowledges this requirement and will request a Land Development Extension Agreement for telephone service prior to construction.

Grand Junction Fire Department

The fire department's comments are acknowledged.

City Development Engineer

Street Plan:

1. The typical street cross section is revised to read that compaction of subgrade under roadways shall be a minimum of "95% of AASHTO T-99 or 90% of AASHTO T-180".

2. A note is added indicating that the location and placement of street lights shall be per Public Service Company.

3. The profiles are corrected to read proposed and existing grade at centerline.

200 NORTH 6TH ST. • GRAND JUNCTION, CO 81501 • FAX (970) 245-3076 • (970) 245-4099

City Development Engineer

Bicycle Path Plan:

1. A Plan and Profile sheet showing proposed grades, cross sections, storm sewer crossings and scale is submitted and attached.

2. A bollard is provided at the intersection of the proposed pathway at Promontory Court. Bike trail signing is indicated (type and location) per meeting with the City engineering and planning departments.

Public Service Company

1. A 10' utility easement has been added along the south line of lot 11 as requested.

2. 14' front lot utility easements are provided and are dedicated on the final plat.

3. The developer acknowledges the requirement for and will request a Land Development Extension Agreement for electrical and gas service prior to construction.

City Property Agent

1. The tie (bearing) to P.O.B. on the plat and the written legal have been checked and are corrected.

2. The bearing on lot 7 has been corrected.

3. The plat is revised to defined the type of monumentation in the legend and shown is shown along the platted boundary, lots, PC's and PT"s.

Mesa County School District #51

The districts comments are acknowledged.

Community Development Department

1. Based on a meeting between city staff and the developer the "non plat-related information" will be shown on the final plat in keeping with the format presented with previous filings of South Rim Subdivision.

2. A Plan and Profile sheet showing proposed grades, cross sections, storm sewer crossings and scale is submitted and attached.

City Police Department

The department's comments indicating no objection are acknowledged.

Ute Water

A note was included on the sewer and water plan indicating that all water mains are to be 8" C900, CL-150 unless otherwise noted. Remaining Ute Water comments are acknowledged.

Redlands Water & Power

The Redlands Water & Power comments indicating no objection are acknowledged.

City Utility Engineer

1. This comment has been resolved by meeting between the developer and Mr. Prall.

Please contact our office if you have any questions or concerns regarding this response.

Sincerely

Monty D. Stroup
Project Manager

cc: J. Kliska
T. Prall

STAFF REVIEW

FILE: #FPP- 95-181
DATE: October 12, 1995
STAFF: Michael Drollinger
REQUEST: Final Plan & Plat - South Rim Filing #4
LOCATION: E end of South Rim Drive
ZONING: PR-3.5

STAFF COMMENTS:

1. All non plat-related information (e.g. building envelopes, lot types, area summary, building setback table) must be on separate sheet to be recorded simultaneously with plat.

2. The start and end of bicycle path construction shall be identified on the Bicycle Path Plan. Also, the maximum grade proposed shall be calculated andidentified on the plan.

Please contact the Community Development Department if you have any questions or require further explanation of any item.

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STAFF REVIEW

FILE: #FPP- 95-181

DATE: October 31, 1995

STAFF: Michael T. Drollinger

REQUEST: Final Major Subdivision Plan/Plat Filing #4
SOUTH RIM SUBDIVISION

LOCATION: East End of South Rim Drive (Redlands)

APPLICANT: David G. Behrhorst
Lowe Development Corp.
1280 Ute Street; Suite 32
Aspen CO 81611

EXECUTIVE SUMMARY:

Petitioner is requesting final plan/plat approval for South Rim Filing #4 located at the end of South Rim Drive in the Redlands. Filing #4 consists of 15 single family lots on 8.6 acres and is generally consistent with the approved preliminary plan for the project. Staff recommends approval of the application.

EXISTING LAND USE: Vacant

PROPOSED LAND USE: Single Family Residential

SURROUNDING LAND USE:

NORTH:	Open Space (River Trail)
SOUTH:	Single Family Residential
EAST:	Single Family Residential/Open Space (River Trail)
WEST:	Single Family Residential (South Rim Filing #3)

EXISTING ZONING: PR-3.5

PROPOSED ZONING: No change

SURROUNDING ZONING:

NORTH:	PR-3.5

SOUTH: R-2
EAST: R-2
WEST: PR-3.5

RELATIONSHIP TO COMPREHENSIVE PLAN:

No comprehensive plan exists for this area

STAFF ANALYSIS:

The site is located east of the Redlands Parkway at the east end of South Rim (formerly Greenbelt) Drive and consists of approximately 8.6 acres. The property is zoned PR-3.5. The petitioner is requesting Final Plat/Plan approval for Filing #4 consisting of 15 single family lots. Further details of the proposal are in the attached project narrative. Also, the plat and other supporting maps are attached for orientation and reference. The proposal is generally consistent with the preliminary plan approval.

A multi-use path is being constructed as part of this filing which will link Promontory Court with the existing multi-use path adjacent to the north of the project that is part of the River Trail network.

As of the date of this staff report, the petitioner is completing revisions to the plans based upon review agency comments.

STAFF RECOMMENDATION:

Staff recommends approval of the Final Plan & Plat for Filing #4.

SUGGESTED PLANNING COMMISSION MOTION:

Mr. Chairman, on item #FPP-95-181, a request for final plat/plan approval for Filing #4, I move that the final plat/plan be approved.

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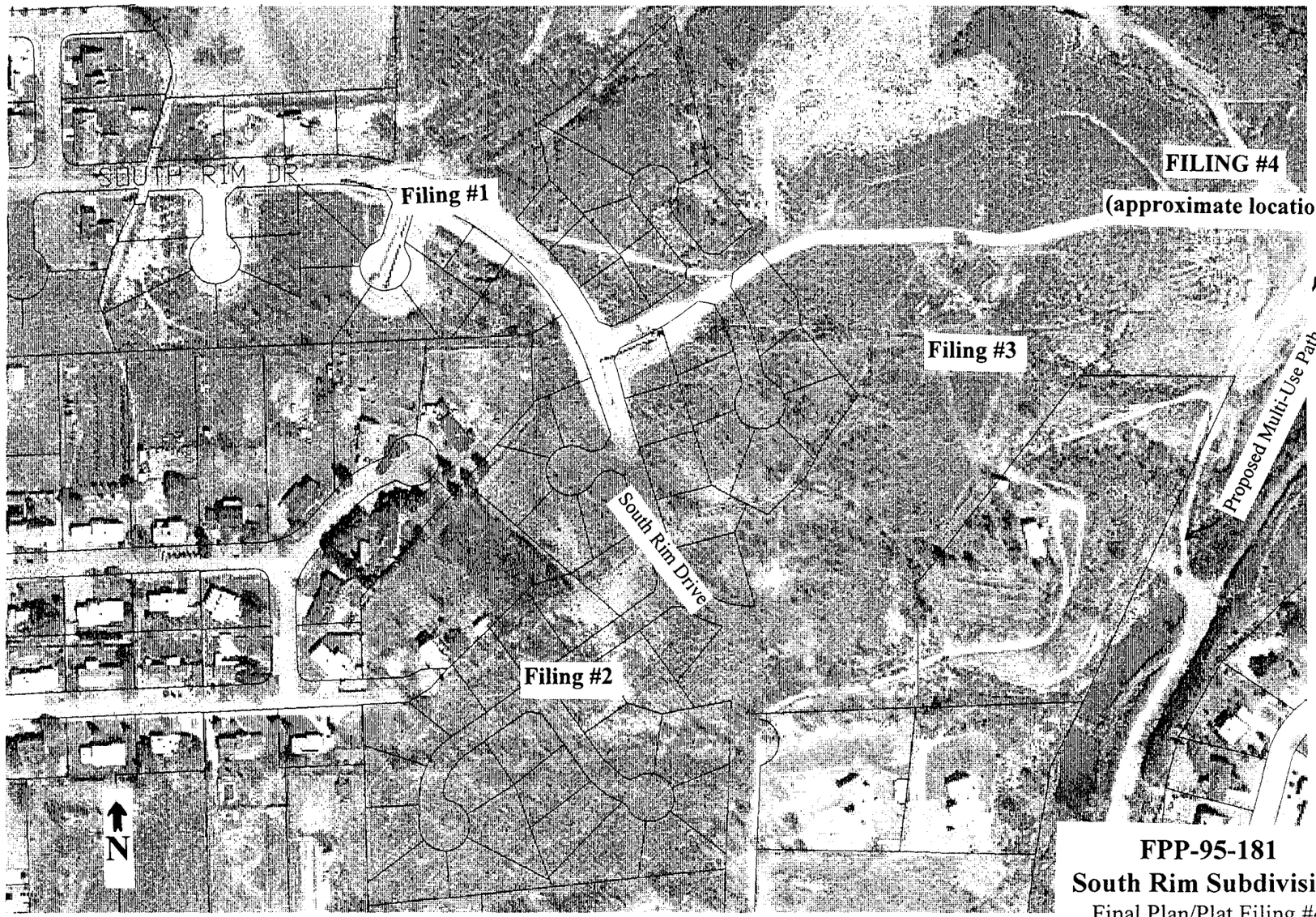

FPP-95-181
South Rim Subdivision
Final Plan/Plat Filing #4
AERIAL MAP