Geotechnical Engineering Group, Inc.

RESIDENTIAL SOILS INVESTIGATION
2287 Vista Rio Court
Lot 16, Vista del Rio Subdivision
Grand Junction, Colorado

Prepared For:

Mr. Larry Manchester
2698 Lanai Court
Grand Junction, CO 81506

Job No. 1,160

September 26, 2002

Geotechnical, Environmental and Materials Testing Consultants

(970) 245-4078 • fax (970) 245-7115 • geotechnicalgroup.com
685 West Gunnison Avenue, Suite 110, Grand Junction, Colorado 81505

TABLE OF CONTENTS

SCOPE

This report presents the results of our Residential Soils Investigation for the proposed residence to be located at 2287 Vista Rio Court in Grand Junction, Colorado. Our investigation was conducted to explore subsurface conditions and provide foundation recommendations for the proposed residence. The report includes descriptions of subsoil and groundwater conditions found in two exploratory borings, recommended foundation systems and allowable design soil pressures, and design and construction criteria for details influenced by the subsurface conditions. This investigation was performed in general conformance with our Proposal No. 02-195 dated August 9, 2002.

The report was prepared from data developed during our field exploration, laboratory testing, engineering analysis and experience with similar conditions. A brief summary of our conclusions and recommendations follows. Detailed criteria are presented within the report.

SUMMARY OF CONCLUSIONS

1. Subsoils found in the two exploratory borings consisted of 3 to 6 feet of clayey sand underlain by clayey shale to the maximum depths investigated of 15 and 25 feet below the ground surface. Groundwater was not encountered in the exploratory borings at the

time of drilling but was encountered at exploratory boring, TH-2 at 21 feet below the ground surface when checked 4 days after drilling and at 18 feet below the ground surface when checked 24 days after drilling.

2. We recommend a drilled pier foundation for the proposed residence. A discussion, including detailed design and construction criteria are included in the text of the report.

3. We believe slab-on-grade construction supported by the soils encountered has moderate potential for movement. We recommend structurally supported floors in all finished living areas. Slab-on-grade construction should be limited to unfinished areas, flatwork and garage areas.

4. Surface drainage should be designed for rapid runoff of surface water away from the proposed residence.

SITE CONDITIONS

The subject site consists of 2287 Vista Rio Court in Vista del Rio Court Subdivision, Grand Junction, Colorado. A vicinity map is included as Fig. 1. The subject site was in a developed residential subdivision. The site was barren and generally sloped down towards the south and east at 11 to 13 percent (estimated with hand level and wheel). Scattered gravel and cobble were noted across the surface. A masonry block wall was noted at the approximate north lot line (estimated from site plan). A vacant lot with stockpiles of soil were north. Single family residences were south. Single family residences were west beyond a vacant lot. Single family residences and Vista Rio Court were east. The vicinity

sloped down toward the south and west at approximately 3 to 5 percent (USGS Colorado National Monument, Colorado topographical quadrangle, 1962, photorevised 1973).

PROPOSED CONSTRUCTION

We understand the proposed residence will be a one story, wood framed structure with walkout basement. The plan area will be about 1,800 square feet. We anticipate foundation loads may range from 1,000 to 2,000 pounds per lineal foot of foundation wall. No grading changes are proposed. If proposed construction changes or is different from what is stated, we should be contacted to review actual construction and our recommendations.

SUBSURFACE CONDITIONS

Subsurface conditions at the site were investigated by drilling and sampling two exploratory borings. Locations of exploratory borings are shown on Fig. 2. Graphic logs of the soils found in the exploratory borings and field penetration resistance tests are presented on Figs. 3 and 4. Subsurface conditions

encountered in the two exploratory borings consisted of 3 to 6 feet of clayey sand underlain by clayey shale to the maximum depths investigated of 15 and 25 feet below the ground surface. The clayey sand was gravelly, had cobble noted, medium dense, dry, tan and red. The clayey shale was medium hard to very hard, dry to moist, dark green and dark brown with sulfates noted.

One sand sample tested had a moisture content of 2.7 percent. Four shale samples were tested. These samples had moisture contents of 12.5 to 17.6 percent. Three samples had dry densities of 107 to 121 pcf. One sample was tested for Atterberg limits. This sample exhibited a liquid limit of 40, plasticity index of 19 and 75 percent passing the No. 200 sieve (silt and clay sized particles). Three shale samples were tested for one dimensional swell / consolidation. These samples varied from exhibiting no movement to swelling 1.6 percent when wetted under a confining pressure of 1,000 psf. Groundwater was not encountered in the exploratory borings at the time of drilling but was encountered at 21 feet below the ground surface when checked 4 days later and at 18 feet below the ground surface when checked 24 days later. Results of laboratory testing are included in Figs. 5 and 6 and summarized on Table I.

RESIDENCE FOUNDATIONS

This investigation indicates subsurface conditions at foundation levels consist of expansive clayey shale. The shale exhibited low expansion potential in laboratory tests. Experience indicates the clayey shale stratum is problematic locally. The shale can change significantly over short distances. We recommend a straight-shaft drilled pier foundation system for the proposed residence. The recommended design and construction criteria for drilled piers is presented below. These criteria were developed from analysis of field and laboratory data and our experience. The owner should also consider details established by the structural engineer which may impose additional foundation design and installation requirements.

Drilled Piers Bottomed in Bedrock

1. Piers should be designed for a maximum allowable end bearing pressure of 20,000 psf and an allowable skin friction value of 2,000 psf for the portion of pier in relatively unweathered clayey shale. Skin friction should be neglected for the portion of pier within 3 feet of the bottom of the foundation walls and grade beams.

2. Piers should be designed for a minimum deadload pressure of 10,000 psf based on pier cross-sectional area. If this deadload cannot be achieved, pier length and bedrock penetration should be increased. The clayey shale can be assigned a skin friction value of 1,700 psf for uplift resistance, at least 3 feet below the pier cap.

3. Piers should penetrate at least 10 feet into the relatively unweathered shale strata and have a total length of at least 15 feet.

4. Piers should be reinforced the full length of the pier with at least two No. 5 Grade 60 reinforcing bars to resist tension in the event of swelling. Reinforcement should extend into grade beams and foundation walls.

5. There should be a 4-inch (or thicker) continuous void beneath all grade beams and foundation walls, between piers, to concentrate deadload on the piers.

6. Foundation walls and grade beams should be well reinforced; the reinforcement should be designed by a qualified structural engineer considering large openings in basement walls.

7. Piers should be carefully cleaned prior to placement of concrete. Groundwater was encountered at the time of this investigation. We believe problems associated with pier installation can be significantly reduced by using a "drill and pour" construction procedure; that is, placing concrete immediately after pier holes are drilled, cleaned and inspected. Pumping, tremie placement, vacuum truck or auger cast methods may be required for proper dewatering and installation of the pier holes. Concrete should not be placed in any pier hole containing more than 3 inches water. Due to recent experience with improper installation, we recommend the use of a foundation contractor with previous drilled pier installation experience.

8. Formation of mushrooms or enlargements at the top of piers should be avoided during pier drilling and subsequent construction operations.

9. Installation of drilled piers should be observed by a representative of our firm to identify the proper bearing strata and confirm proper installation technique. Our representative should be called to visit the site at the time of the first pier excavation.

FLOOR SYSTEMS

We believe the soils which will support slab-on-grade floors exhibited moderate movement potential. Some movement must be assumed from an increase in moisture by residential development and associated landscaping and irrigation. To our knowledge, the only reliable solution to control floor movement is the construction of a structurally supported floor with at least a 12-inch air space between the floor and subgrade. In our opinion, structural floors should be used in all finished living areas. Structurally supported floors are normally not used in garage areas or unfinished basements. A slab-on-grade floor can be used in these areas provided the builder and owner is aware of and accepts risk of potential movement. Driveways, sidewalks and exterior patio slabs are also constructed as slabs-on-grade.

We recommend the following precautions for construction of slabs-on-grade at this site. These precautions will not prevent movement in the event the underlying soils become wetted; they tend to reduce damage if movement occurs.

1. Slab-on-grade construction should be limited to areas such as garage, unfinished basements and exterior flatwork. The typical gravel layer, should be omitted to help mitigate potential of wetting the shale subgrade from a single source.

2. Slabs should be separated from exterior walls and interior bearing members with a slip joint which allows for free vertical movement of slabs.

3. The use of slab-bearing partitions should be minimized. Where such partitions are necessary, a slip joint allowing at least 3 inches of free vertical slab movement should be used. The home owner should be advised of potential movement and re-establish this void if it closes. Doorways and stairwells should also be designed for this movement. Sheetrock should not extend to slab-on-grade floors.

4. Underslab plumbing should be eliminated where feasible. Where such plumbing is unavoidable, it should be thoroughly pressure tested during construction for leaks and should be provided with flexible couplings. Gas and water lines leading to slab-supported appliances should be constructed with flexibility.

5. Plumbing and utilities which pass through slabs should be isolated from the slabs. Heating and air conditioning systems supported by the slabs should be provided with flexible connections capable of at least 3 inches of vertical movement so that slab movement is not transmitted to the duct work.

6. Frequent control joints should be provided to reduce problems associated with shrinkage and curling. The American Concrete Institute (ACI) and Portland Cement Association (PCA) recommend a maximum panel size of 8 to 15 feet depending upon concrete thickness and slump, and the maximum aggregate size. We advocate additional control joints 3 feet off and parallel to grade beams and foundation walls.

7. Exterior patio and porch slabs should be designed to function as independent units. Movement of slabs-on-grade should not be transmitted directly to the residence foundations. If stucco finish is used it should be terminated at least six inches above slabs.

BELOW-GRADE CONSTRUCTION

Basement walls should be designed for lateral earth pressures. Recent data and our experience have shown an increase in the incidence of problems due to lateral earth loads on basement walls. Data indicates walls have been designed using lateral equivalent fluid pressures ranging from 40 to 65 pcf. Provided the builder wishes to assume the risk, walls can be designed for pressure in the lower end of this range. The design lateral earth pressure is dependent upon the type of backfill. If the builder wishes to control risk of cracking, we recommend design of basement walls using an equivalent fluid weight of 50 pcf for this site. Use of thicker walls, higher strength concrete and additional steel may be required for the higher pressures. The structural engineer should consider vertical steel reinforcement and the effects of large openings on the behavior of the walls.

Water from surface irrigation of lawns and landscaping frequently flows through relatively permeable backfill placed adjacent to a residence and collects on the surface of relatively impermeable soils occurring at the bottom of the excavation. This can cause wet or moist basement conditions after construction. To help reduce the risk of accumulation of water at basement level, we recommend a foundation drain. The provision of a drain will not eliminate potential slab movement. The drain should consist of a 4-inch diameter open joint or slotted

pipe encased in free draining gravel. The drain should lead to a positive gravity outlet or to a sump where water can be removed by pumping. Typical foundation drain details are presented on Figs. 7 and 8.

CONCRETE

One soils sample tested (TH-1 at 2 feet) had a water soluble sulfate concentration of 280 ppm. Sulfate concentrations in this range are considered to have a moderate effect on concrete that comes into contact with the soils. Sulfate crystals were noted in samples taken. We recommend a Type V (sulfate resistant) cement be used for concrete that comes into contact with the subsoils. We understand that Type V cement is not always available locally. In our experience, a locally available Type I / II modified cement has been used for similar conditions. In addition, concrete should have a maximum water-cement ratio of 0.45.

SURFACE DRAINAGE

Performance of foundations and concrete flatwork is influenced by surface moisture conditions. Risk of wetting foundation soils can be reduced by carefully

planned and maintained surface drainage. Surface drainage should be designed to provide rapid runoff of surface water away from the proposed residence. We recommend the following precautions be observed during construction and maintained at all times after the construction is completed.

1. The ground surface surrounding the exterior of the residence should be sloped to drain away from the residence in all directions. We recommend a slope of at least 12 inches in the first 10 feet around the residence, where possible. In no case should the slope be less than 6 inches in the first 5 feet. The ground surface should be sloped so that water will not pond adjacent to the residence.

2. Backfill around foundation walls should be moistened and compacted.

3. Roof downspouts and drains should discharge well beyond the limits of all backfill. Splash blocks and downspout extenders should be provided at all discharge points.

4. Landscaping should be carefully designed to minimize irrigation. Plants used close to foundation walls should be limited to those with low moisture requirements; irrigated grass should not be located within 5 feet of the foundation. Sprinklers should not discharge within 5 feet of foundations. Irrigation should be limited to the minimum amount sufficient to maintain vegetation; application of more water will increase likelihood of slab and foundation movements.

5. Impervious plastic membranes should not be used to cover the ground surface immediately surrounding the residence. These membranes tend to trap moisture and prevent normal evaporation from occurring. Geotextile fabrics can be used to limit the weed growth and allow for evaporation.

CONSTRUCTION MONITORING

Geotechnical Engineering Group, Inc. should be retained to provide general review of construction plans for compliance with our recommendations. Geotechnical Engineering Group, Inc. should be retained to provide construction monitoring services during all earthwork and foundation construction phases of the work. This is to observe the construction with respect to the geotechnical recommendations, to enable design changes in the event that subsurface conditions differ from those anticipated prior to start of construction and to give the owner a greater degree of confidence that the structure is constructed in accordance with the geotechnical recommendations.

LIMITATIONS

Two exploratory borings were observed, spaced across the subject site. The borings are representative of conditions encountered only at the exact boring locations. Variations in the subsoil conditions not indicated by the exploratory borings are always possible. Our representative should observe open foundation excavations and observe and document drilled pier installation to confirm soils are

as anticipated from the borings and foundations are prepared as recommended herein.

We believe this investigation was conducted in a manner consistent with that level of care and skill ordinarily used by geotechnical engineers practicing in this area at this time. No other warranty, express or implied, is made. If we can be of further service in discussing the contents of this report or the analysis of the influence of the subsurface conditions on the design of the residence, please call.

Sincerely,
GEOTECHNICAL ENGINEERING GROUP, INC.

Gregory G. Poettgen, P.E.
Project Engineer

Reviewed by:

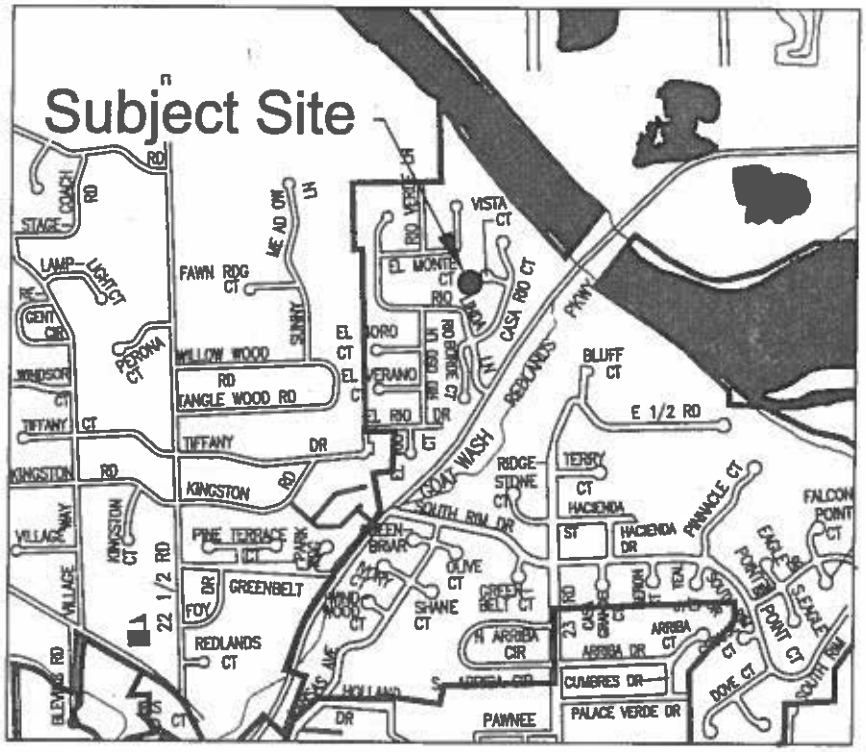
John P. Withers, P.E.
Principal Engineer

GGP:JPW:cd
(2 copies sent)

1 cc: Bemis & Harrell Constructors
Mr. Lynn Bemis
P.O. Box 3648
Grand Junction, CO 81502

Residential Soils Investigation
2287 Vista Rio Court
Lot 16, Vista del Rio Subdivision
Grand Junction, Colorado

N
No Scale

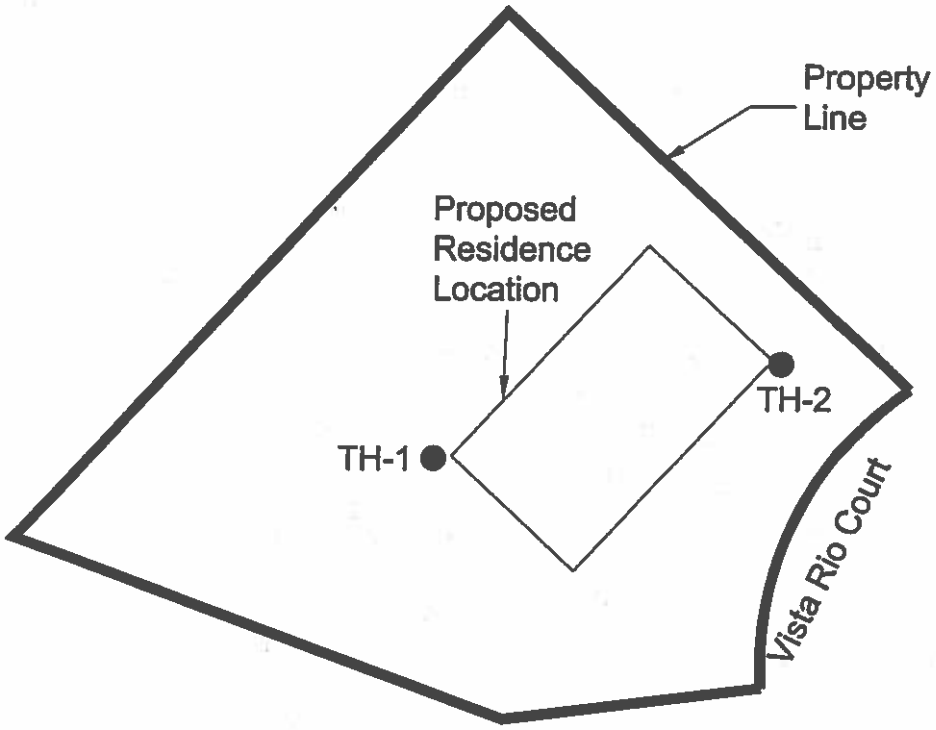


Job No. 1,160

Vicinity Map

Fig. 1

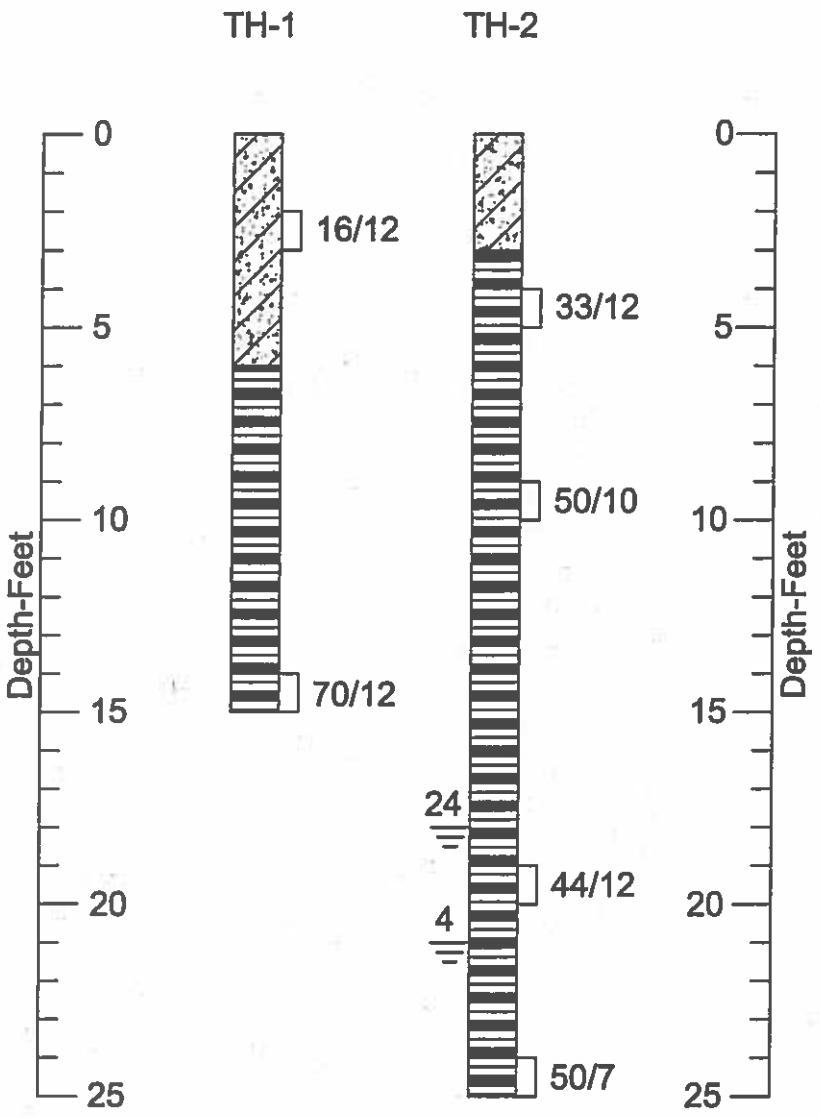
Note: This figure was prepared based on a site plan provided by Larry Manchester.



Legend

● Indicates location of exploratory boring.

Job No. 1,160 **Location of Exploratory Borings** Fig. 2



Job No. 1,160 **Logs of Exploratory Borings** Fig. 3

Legend

Sand, clayey, gravelly, cobbles noted, medium dense, dry, tan red (SC)

Shale, clayey, medium hard to very hard, dry to moist, dark green, dark brown, sulfates noted

Indicates drive sample. The symbol 16/12 indicates that 16 blows of a 140 pound hammer falling 30 inches were required to drive a 2.5 inch O.D. sample barrel 12 inches.

Indicates free water level. Numeral indicates number of days after drilling that measurement was taken.

Notes

1. Exploratory borings were drilled and sampled on August 16, 2002 using a 6- inch diameter solid stem, continuous flight auger and a truck mounted rig.

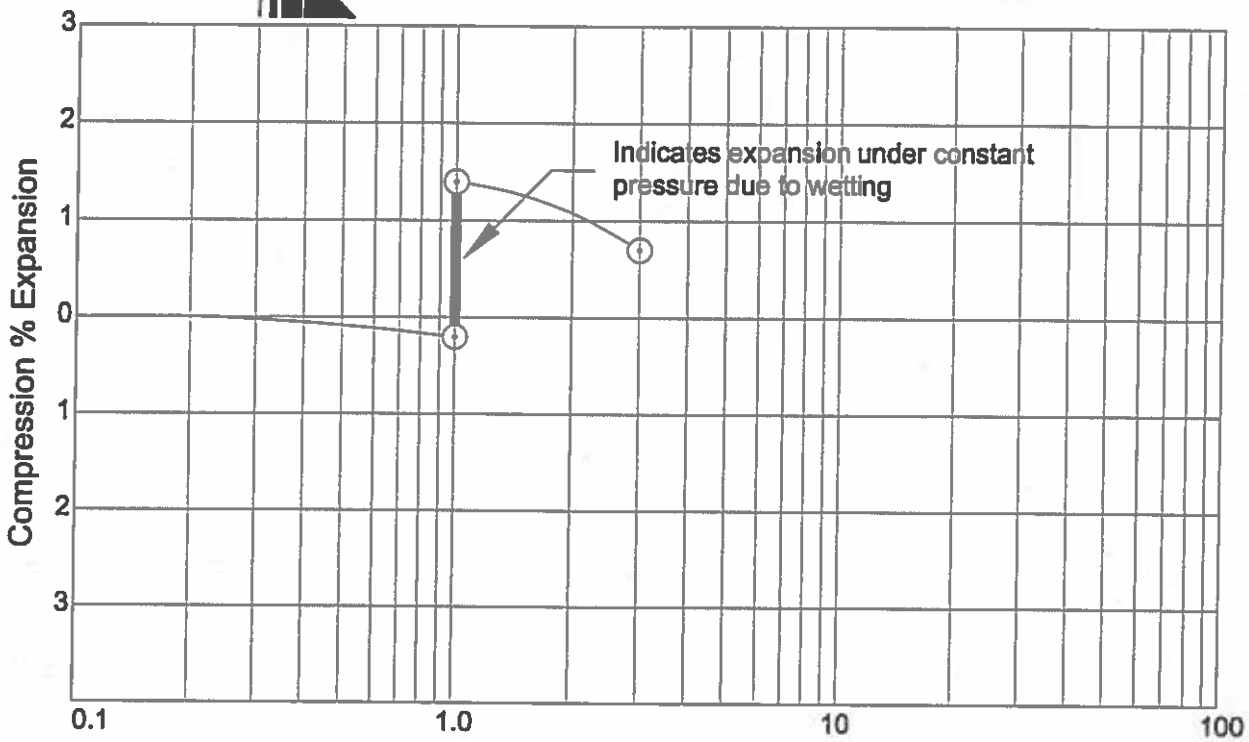
2. These logs are subject to the explanations, limitations and conclusions as contained in this report.

Job No. 1,160

Legend of Logs of Exploratory Borings

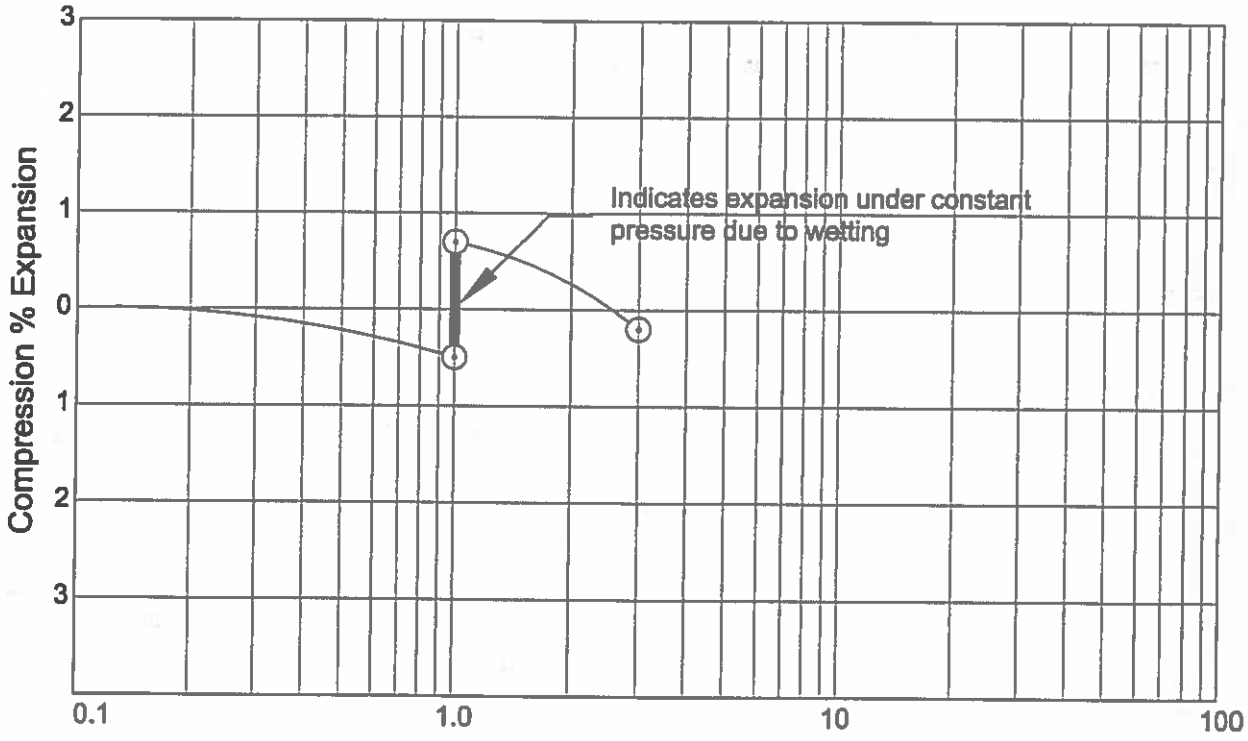
Fig. 4

Geotechnical Engineering Group, Inc.



Sample of: Shale, clayey
From: TH-1 @ 14 feet

Dry Unit Weight= 110 PCF
Moisture Content= 16.3 %

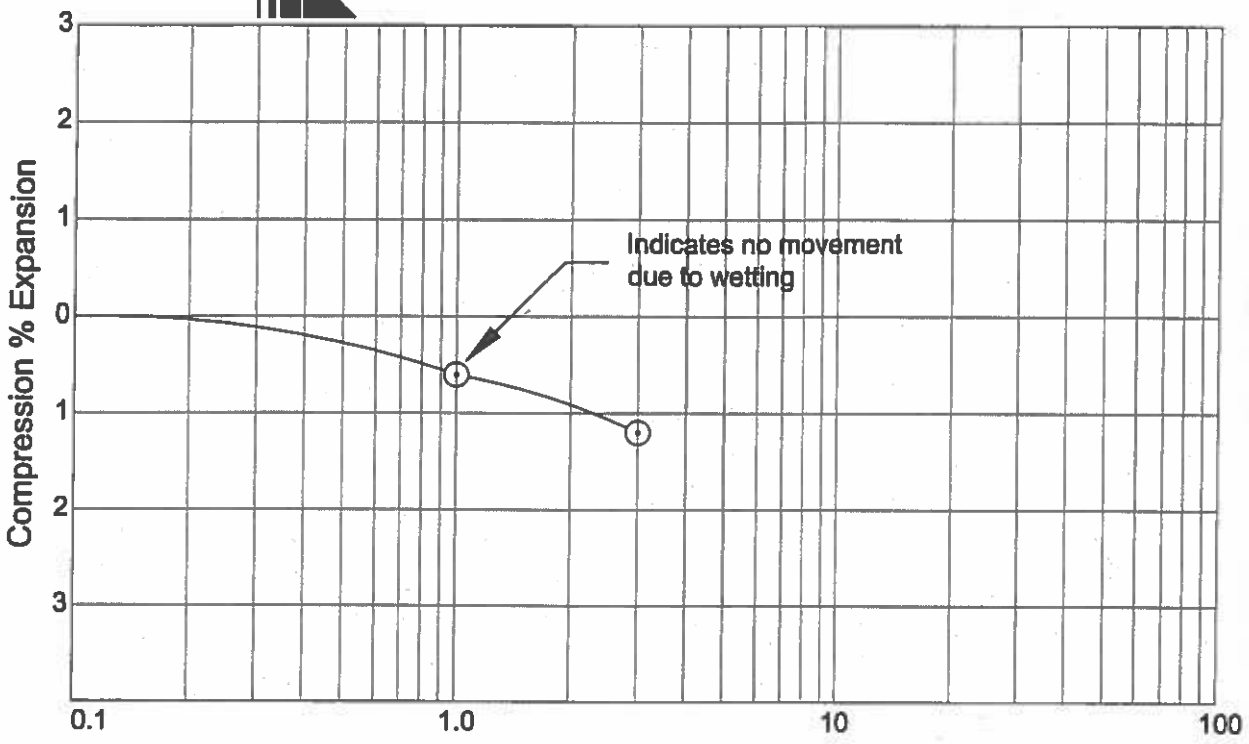


Sample of: Shale
From: TH-2 @ 9 feet

Dry Unit Weight= 121 PCF
Moisture Content= 12.7 %

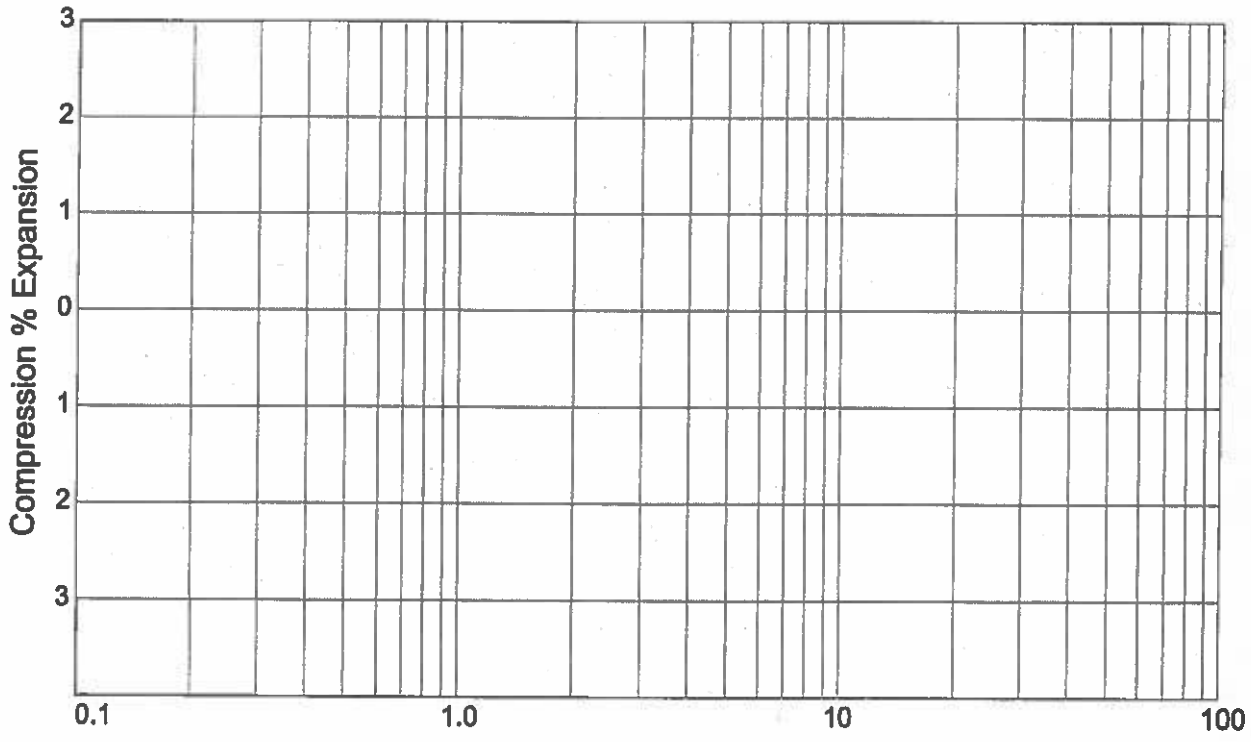
Job No. 1,160 Swell Consolidation Test Results Fig. 5

Geotechnical Engineering Group, Inc.



Sample of: Shale, clayey
From: TH-2 @ 19 feet

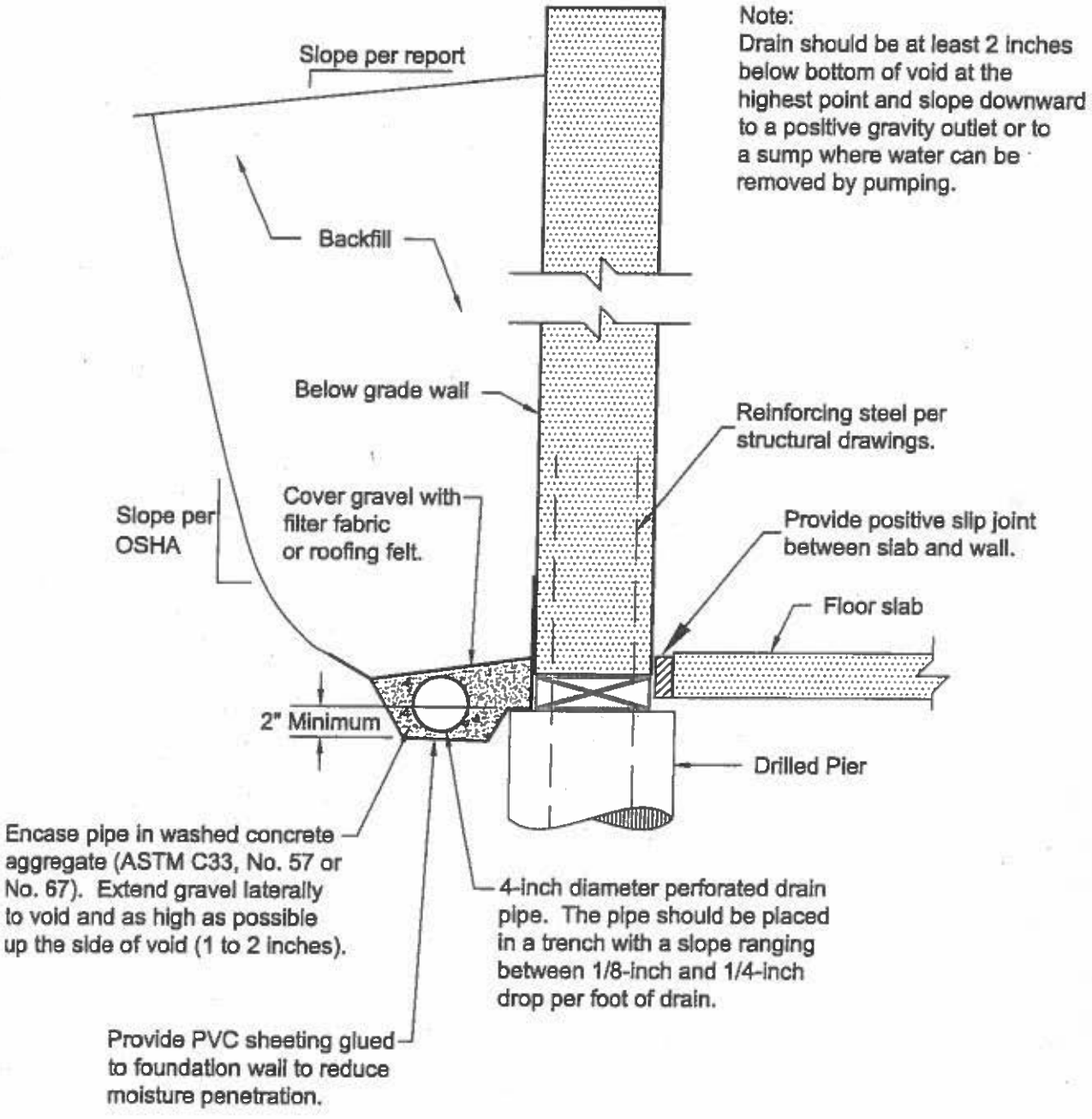
Dry Unit Weight= 107 PCF
Moisture Content= 17.6 %



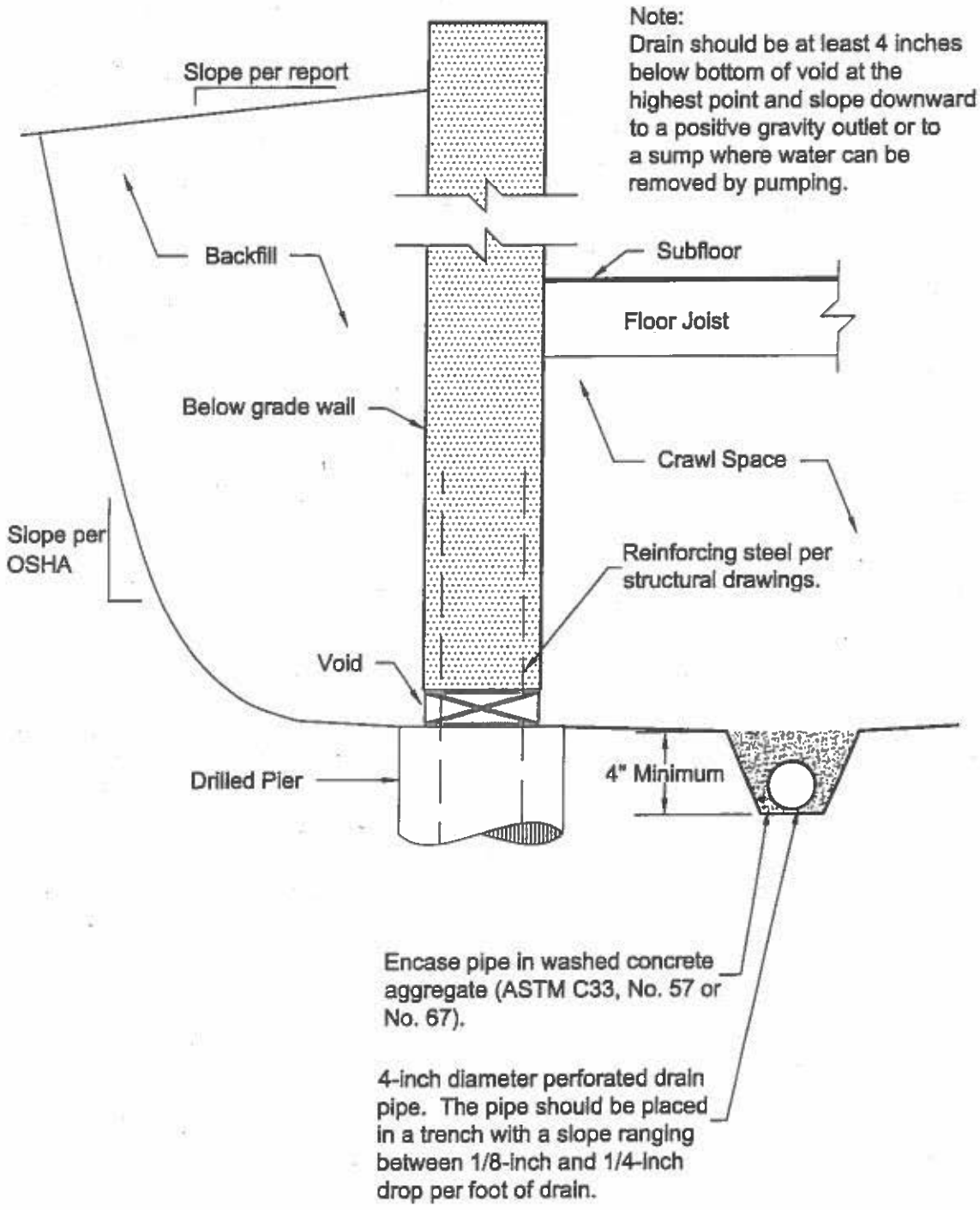
Sample of:
From:

Dry Unit Weight= PCF
Moisture Content= %

Job No. 1,160 Swell Consolidation Test Results Fig. 6



Job No. 1,160 **Exterior Foundation Wall Drain** Fig. 7



Job No. 1,160 **Interior Foundation Wall Drain** Fig. 8

JOB NO. 1,160

Geotechnical Engineering Group, Inc.

TABLE I

SUMMARY OF LABORATORY TEST RESULTS

HOLE	DEPTH (FEET)	NATURAL MOISTURE (%)	DRY DENSITY (PCF)	Atterberg Limits		Swell / Consolidation		PASSING NO. 200 SIEVE (%)	WATER SOLUBLE SULFATES (ppm)	SOIL TYPE
				LIQUID LIMIT (%)	PLASTICITY INDEX (%)	SWELL (%)	CONFINING PRESSURE (PSF)			
TH-1	2	2.7							280	Sand, clayey, gravelly (SC)
	14	16.3	110			+1.6	1,000			Shale, clayey
TH-2	4	12.5	–	40	19			75		Shale, clayey
	9	12.7	121			+1.2	1,000			Shale, clayey
	19	17.6	107			+0.0	1,000			Shale, clayey

SITE:	Roose

LIFT #	PROCTOR	DATE 6-23

Hole 1 NE corner of house

HOLE LOC.	Surface
% PR	
DD	122.0
WD	126.2
% M	3.5
M	

HOLE LOC.	18" BGL
% PR	
DD	115.9
WD	124.6
% M	7.5
M	

HOLE LOC.	3' BGL
% PR	
DD	114.8
WD	124.9
% M	8.8
M	

HOLE LOC.	5' BGL
% PR	
DD	107.4
WD	120.5
% M	12.2
M	

middle of house #2

HOLE LOC.	Surface
% PR	
DD	111.6
WD	117.0
% M	4.9
M	

HOLE LOC.	1' BGL
% PR	
DD	121.0
WD	127.3
% M	5.2
M	

HOLE LOC.	3 BGL
% PR	
DD	106.6
WD	111.1
% M	5.1
M	

HOLE LOC.	5 BGL
% PR	
DD	88.5
WD	97.4
% M	10.1
M	

North west corner of house #3

HOLE LOC.	Surface
% PR	
DD	113.7
WD	118.8
% M	4.5
M	

HOLE LOC.	3' BGL
% PR	
DD	109.4
WD	114.2
% M	4.4
M	

HOLE LOC.	5' BGL
% PR	
DD	99.7
WD	106.7
% M	6.7
M	

HOLE LOC.	7' BGL
% PR	
DD	Not accessable
WD	
% M	
M	

SITE	Poole

LIFT #	PROCTOR	DATE 6-23

SW corner of House #4

HOLE LOC.	Surface	HOLE LOC.	2.5' Down
% PR		% PR	
DD	95.4	DD	88.4
WD	99.1	WD	91.4
% M	4.0	% M	3.4
M		M	

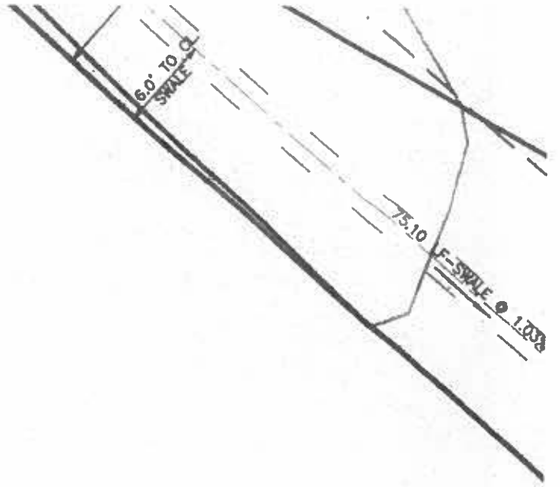
HOLE LOC.	4" BGL	HOLE LOC.	
% PR		% PR	
DD	100.7	DD	
WD	106.5	WD	
% M	5.7	% M	
M		M	

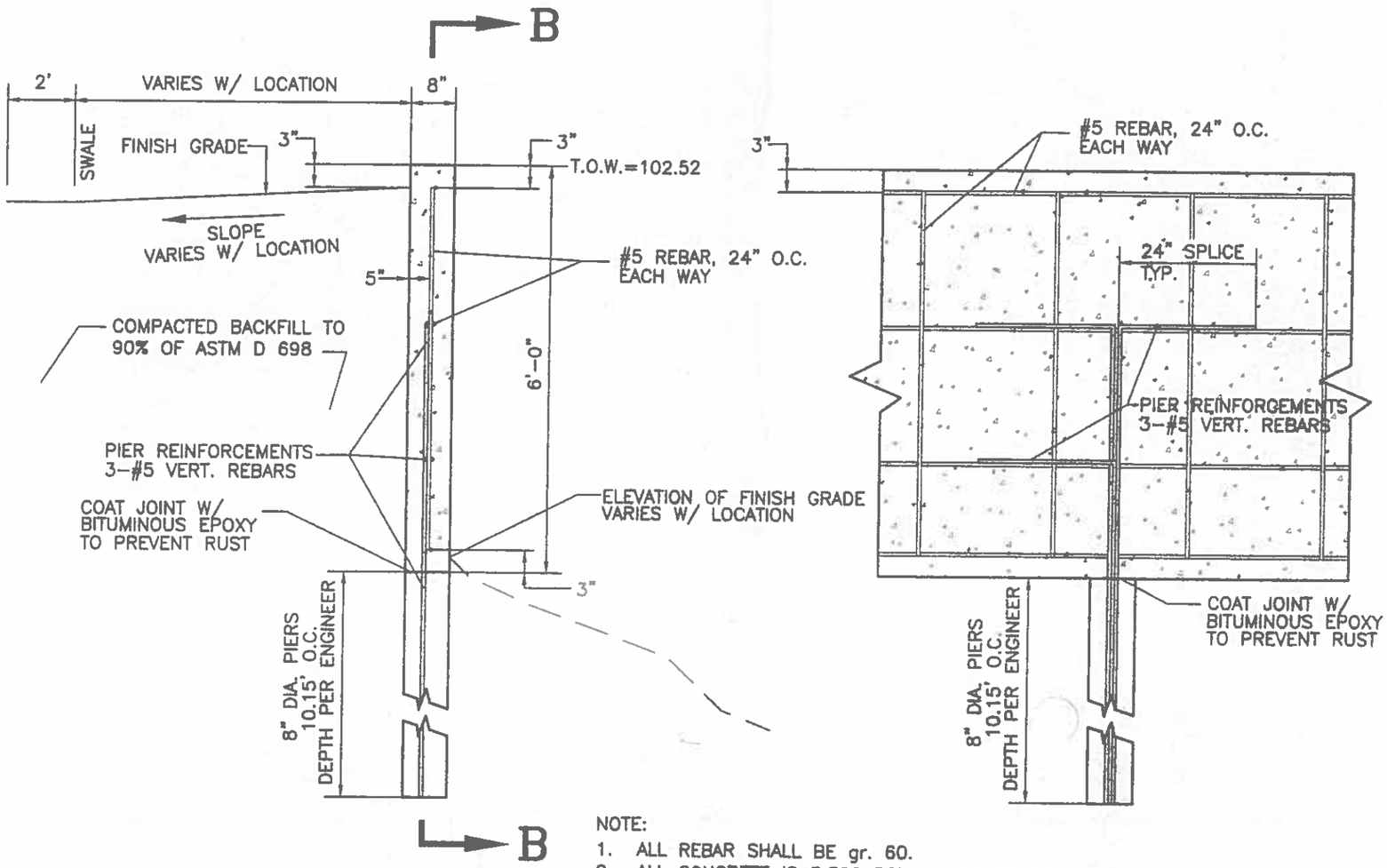
HOLE LOC.		HOLE LOC.	
% PR		% PR	
DD		DD	
WD		WD	
% M		% M	
M		M	

HOLE LOC.		HOLE LOC.	
% PR		% PR	
DD		DD	
WD		WD	
% M		% M	
M		M	

HOLE LOC.		HOLE LOC.	
% PR		% PR	
DD		DD	
WD		WD	
% M		% M	
M		M	

HOLE LOC.		HOLE LOC.	
% PR		% PR	
DD		DD	
WD		WD	
% M		% M	
M		M	





NOTE:
1. ALL REBAR SHALL BE gr. 60.
2. ALL CONCRETE IS 3,500 PSI – SULFATE RESISTANT

SECTION A–A
N.T.S.

SECTION B–B
N.T.S.

RETAINING WALL DETAILS

N:10021.465
E:9979.787

S 43°35'42" E 241.91'

16' Deep
7' Depth of Rebar
(TYP.)

19' Deep
8' D.O.R.

14' Deep
6' DOR

12' Deep
3' DOR

14' Deep
4 DOR

14 Deep
5 DOR

13.5 Deep
6' DOR

17 Deep
11 DOR

17 Deep
17 DOR

10 Deep
10 DOR

12 Deep
12 DOR

16' Deep
8' Depth of Rebar
(DOR)

17 Deep
6' DOR

10.15' O.C.
(TYP.)

0+08.00
EL=102.52

0+00
EL=102.52

LINE

99

100

101

102

103

98

A

A

2:1

4:1

4.0'

2.0' BOTTOM

18.0' CL. SWALE
TO CL. BERM

10.0' TO CL
SWALE

5.80'

10.15'

27.66 LF-SWALE @ 1.0%

17.0 LF-SWALE @ 1.0%

HP/GND
102.19

HP/FL
101.69

61.67'

Hole 14
10 Deep
10 DOR

Hole 15
13 Deep
13 DOR

570 Casa Rio Court
F.F. EL=102.52

50.33'

50.33'

STA. 1+42.46
TOW EL=102.52

STA. 1+30.46
TOW EL=102.52

10' DRN. EASEMENT

TOP OF BERM EL=102

64.95 LF-SWALE @ 1.0%

60.33 LF-SWALE @ 1.0%

20.82 LF-SWALE @ 1.0%

2' BLDG. ENVELOPE LINE

DRAINAGE ESMNT.

EXISTING STORM DRAIN LINE

EMERGENCY OVERFLOW SWALE @ 2.74%±

EXISTING BLOCK RETAINING WALL (TO REMAIN)

S 75°38'14" W 116.06'

02°21'08" W 198.90'

FF 102.52
GND 102.19

FF 102.52
GND 102.19

FL
100.77

16.0'

6.0' TO CL
SWALE

20.0' X 22.0'
CONC. PARKING

20.00' 4.00%

20.00' 4.00%

TOC
101.72

TOC
101.7

22.00'

24.0

FL
100.55

FL
100.55

FL
100.55

EROSION PROTECTION &
TREATMENT OF EMERGE
OVERFLOW SWALE
BY LOT OWNERS.

S 43°55'42" E 241.91'

STA. 0+08.00
TOW EL=102.52

STA. 0+00
TOW EL=102.52

VELOPE LINE

PIER LOC. (TYP.)

HP/GND 102.19

A

A

PIER LOC. (TYP.)

10.15' O.C. (TYP.)

PIER LOC. (TYP.)

STA. 1+30.46
TOW EL=102.52

10' IRR. EASEMENT

STA. 1+42.46
TOW EL=102.52

FL 101.42

27.66 LF-SWALE @ 1.0%

54.01 LF-SWALE @ 1.0%

10.0' TO CL SWALE

HP/FL 101.69

10.0' TO CL SWALE

FL 101.15

2:1

4:1

4.0'

2.0' BOTTOM

18.0' CL. SWALE TO CL BERM

10.0' TO CL SWALE

HP/GND 102.19

61.67'

Hole 3
S = 113.7
3' = 169.4

Hole 1
S = 122.0
3' = 114.8

2.0' BOTTOM

10.0' TO CL SWALE

4:1

99

98

102

103

101

100

TOP OF BERM EL=103

BLDG. ENVELOPE LINE

DRAINAGE ESMNT.

EXISTING STORM DRAIN LINE

EMERGENCY OVERFLOW SWALE @ 2.74%+/-

EXISTING BLOCK RETAINING WALL (TO REMAIN)

S 75°38'14" W 116.06'

64.95 LF-SWALE @ 1.0%

50.33'

570 Casa Rio Court

F.F. EL=102.52

50.33'

Hole 2
S = 111.6
3' = 108.6

60.33 LF-SWALE @ 1.0%

20.62 LF-SWALE @ 1.0%

N 02°21'08" W 198.90'

FF 102.52
GND 102.19

S = 95.4
3' = 96.8
Hole 2

61.67'

FF 102.52
GND 102.19

FL 100.77

16.0'

6.0' TO CL SWALE

20.00' 4.00%

20.0' X 22.0'
CONC. PARKING

20.00' 4.00%

TOC 101.72

22.00'

TOC 101.72

FL 100.55

24.0'

HP/FL 100.55

HP/FL 100.55

FL 100.55

EROSION PROTI
TREATMENT OF
OVERFLOW SWA
BY LOT OWNER

016.209
S.001

A.I.C. – Grand Junction, Inc.
Allied Independent Consultants

303 North Avenue
P.O. Box 41049
Grand Junction, CO 81501
970-244-8703

January 27, 2003

Susan Doose
570 Casa Rio Court
Grand Junction, CO 81

RE: 570 Casa Rio Court, Site Grading Inspection.

Dear Mrs. Doose;

The following is a summary of the Site Grading as found to exist in the field on 01/27/03.

A drainage swale has been installed adjacent to and parallel with the south east property line from Casa Rio Court northeast towards the rear of the lot. This swale drains runoff from the southeast 1/2 of the lot and *potential emergency overflow from the low point in Casa Rio Court*. The grading plan proposes the installation of rip-rap within the swale and adjacent to the retaining wall at the east corner of the lot. This rip-rap was proposed entirely to prevent erosion as a result of the potential emergency overflow from the low point in Casa Rio Court as may result from the plugging of the existing inlet within the public right-of-way. The potential runoff originates offsite of your lot and is separate from and in addition to your lot drainage. The proposed rip-rap is not installed as of this date.

Rain gutters and down spouts were installed. Down spouts were installed at (2) locations along the northwest side of the new structure. These (2) down spouts direct runoff into a swale which flows from the northeast to the southwest along the northeast portion of the lot discharging to Casa Rio Court. Down spouts were installed at (2) locations along the southeast side of the new structure. These (2) down spouts direct runoff into a the swale adjacent to and parallel with the south east property line as defined above.

Lot grading directs runoff away from the rear yard retaining wall on both sides of the wall. Lot grading directs runoff away from the foundation and into or towards the aforementioned drainage swales. Based on our site inspection the lot grading generally conforms to the site Grading Plan.

Sincerely

Monty D. Stroup

cc: kathy portner, city of g jct.
@ FAX 256-4031

KP

City of Grand Junction
Community Development Department
Planning • Zoning • Code Enforcement
250 North 5th Street
Grand Junction, CO 81501-2668

Phone: (970) 244-1430
FAX: (970) 256-4031

January 29, 2003

Margaret S. Doose
P.O. Box 515
Ouray, CO 81427

Re: 570 Casa Rio Court, Vista del Rio subdivision Grand Junction CO

Dear Ms. Doose:

The Planning Clearance that was issued May 29, 2002 for 570 Casa Rio Court, Lot 10, Filing 3 of Vista del Rio subdivision was expressly conditioned on and subject to meeting the requirements of the amended plan for the subdivision. The subdivision plan was amended in April of 2000 and provides the following:

> The plan as amended now also requires that the planning clearance/building permit shall be issued only on condition that the applicant's engineer design, inspect and supervise the excavation and construction and certify at the conclusion of construction, that the site and structure was constructed in accordance with the engineer's approved design.

Because the condition of the initial permit (planning clearance) has not been satisfied the home on 570 Casa Rio Court can not be lawfully occupied. To date the Building Department has not done a final inspection/authorized occupancy of the home and will not do so unless and until full and complete satisfaction of the permit condition occurs.

As you know, Chris Russell P.E. and Monty Stroup of Allied Independent Consultants have recently written concerning this property. Attached are their January 27 and January 28, 2003 letters. I have reviewed both letters and based on that review it is my opinion that the planning clearance condition remains unsatisfied. I have consulted with Eric Hahn P.E., the City Development Engineer and John Shaver, Assistant City Attorney as well. Neither Mr. Hahn nor Mr. Shaver concludes that the development conditions have been satisfied.

I have read the geotechnical report dated May 22, 2002 prepared by Mr. Russell. That report states several recommendations for site preparation, construction and monitoring. Among other things the report stressed the importance of managing and conveying the storm water runoff that originates from and/or is conveyed through and across Lot 10 of Filing 3. The engineering report also specifically recommended a continual inspection program to among other things "ensure that the structure is not compromised." The

frequency of such inspections was recommended ("shall not be"-see paragraph F of the report) to be no less than once a year. The report further provides that "...the edge of the proposed home may be as close as 20 feet from preexisting fault lines. These features are similar in nature to the slope major collapse (sic) that occurred to the West." While this sentence is not perfectly clear it indicates a serious potential for slope failure. In the same portion of the report the engineer states "Recently there has been a major slope failure to the west of this Lot." These conditions fully demand full and complete adherence to the requirements of the development permit and certification as called for in the plan.

The January 28, 2003 letter from Mr. Russell, which is the only document on file with the City, does not satisfy the permit conditions. While Mr. Russell is a professional engineer he fails to address any of the matters I've noted above or those described in his report of May 2002.

In order for the final inspection/occupancy authorization to be issued, Mr. Russell (or the responsible engineer if it was not him) must certify that the engineer designed, inspected and supervised the excavation and construction and certify in writing that at the conclusion of construction, the site and structure was constructed in accordance with the engineer's approved design. The certification must include specific and detailed written descriptions of design and construction practices. As well, the certification must also report how each of the recommendations of the design and geotechnical study on which the design was based were implemented. All supporting documentation must be provided. If any of the specific designs or recommendations of the May 22, 2002 (or supplemental) report were not implemented during construction, then the engineer's certification must specifically identify the design recommendation(s), the change(s) and whether the change(s) was fully designed and implemented. The certification shall include a detailed written description of how the change(s) if any will affect the stability of the lot and the home, garage and other improvements and all other matters addressed in the report. Because monitoring and inspection are mentioned in the report the certification should also detail how the owner and/or engineer will implement that program.

If you have questions please feel free to call.

Katherine M. Portner, AICP
Planning Manager

pc: Eric Hahn
John Shaver

DRAFT

DECLARATION

Peer (correct name??) and Margaret Susan Doose ("Declarants") are the owners of Lot 10, Filing 3 of the Vista del Rio Subdivision, Mesa County Colorado. Lot 10 is commonly known as 570 Casa Rio Court, Grand Junction, CO.

The Planning Clearance that was issued May 29, 2002 for 570 Casa Rio Court was expressly conditioned on and subject to meeting the requirements of the amended plan for the subdivision. The subdivision plan was amended in April of 2000 and provides the following:

> The plan as amended now also requires that the planning clearance/building permit shall be issued only on condition that the applicant's engineer design, inspect and supervise the excavation and construction and certify at the conclusion of construction, that the site and structure was constructed in accordance with the engineer's approved design.

In a report dated May 22, 2002 Chris Russell P.E., Colorado registration #31540, stated several recommendations for site preparation, construction and monitoring. Among other things the report stressed the importance of managing and conveying the storm water runoff that originates from and/or is conveyed through and across Lot 10 of Filing 3. The engineering report also specifically recommended a continual inspection program to among other things "ensure that the structure is not compromised." The frequency of such inspections, as provided by that report, "shall not be" less than once a year. The report further provides that "...the edge of the proposed home may be as close as 20 feet from preexisting fault lines. These features are similar in nature to the slope major collapse (sic) that occurred to the West." The engineer also states "Recently there has been a major slope failure to the west of this Lot." A copy of that report may be viewed at the City of Grand Junction Community Development Department, 250 N. 5th Street, Grand Junction CO.

The Declarants hereby impose upon Lot 10 as a perpetual restriction and covenant to bind the Declarants and any successor in title to annually inspect Lot 10 and the structures and appurtenances to determine whether there exists any indication of slope/geotechnical failure and to "ensure that the structure is not compromised."

The Declarants hereby further impose upon Lot 10 as a perpetual restriction and covenant and condition of occupancy, to bind the Declarants and any successor in title, that Lot 10 shall not be irrigated for landscaping or other purposes unless and until a Colorado Registered Professional Engineer certifies in writing that irrigation will not cause subsidence, slope failure, instability or compromise to Lot 10 and the structures and appurtenances thereon. A copy of that certification, if any, shall be provided to the homeowners association and the Mesa County Building Department.

The Declarants and any successor in title shall notify the homeowners association and the Mesa County Building Department, in writing, if the reporting engineer's opinion as

stated in the annual inspection(s), reveals, shows or discloses subsidence, slope failure, instability or compromise of Lot 10 and/or the structure(s) and appurtenances thereon.

The annual inspections/reports shall include but not be limited to evaluation and assessment of storm water conveyance and irrigation/irrigation practices occurring on Lot 10.

In a letter dated February 4, 2003 Mr. Russell stated ""the foundation and the retaining wall were designed and constructed to help mitigate any potential nearby slope failure. Our firm inspected the construction of both items and found them to be constructed in substantial compliance of our plans within reason, given field condition." A copy of that letter is attached.

On February 7, 2003, in accordance with the February 4, 2003 letter from Mr. Russell, the Mesa County Building Department and the City of Grand Junction authorized occupancy of the 570 Casa Rio Ct.

In accordance with this covenant an inspection is due May of 2003 and each year thereafter. Neither the City nor Mesa County assumes any liability for the use and occupancy of 570 Casa Rio Ct.

This declaration shall run with the land and shall be binding upon all future owners. Acceptance of title to Lot 10, Filing 3, Vista del Rio subdivision by any future owner shall constitute irrevocable acceptance of these declarations, reservations, conditions and restrictions.

In witness hereof I have set my hand this ___ day of February 2003.

_____

_____

State of Colorado
County of Mesa

The foregoing instrument was acknowledged before me by _____ this _____ day of February 2003. Witness my hand and seal.

_____
Notary Public

My commission expires _____

A.I.C. – **Grand Junction, Inc.**
Allied Independent Consultants

303 North Avenue
P.O. Box 41049
Grand Junction, CO 81501
970-244-8703

January 28, 2003

Susan Doose
570 Casa Rio Court
Grand Junction, CO 81503

RE: 570 Casa Rio Court

This office performed the inspection for the referenced location as they occured. Please refer to past letters for approval of structural components.

Respectfully submitted,

COLORADO REGISTERED CHRIS STEVEN RUSSELL 31540 PROFESSIONAL ENGINEER 1-28-03

Chris Steven Russell, PE
Allied Independent Consultants-Grand Junction, Inc.

A.I.C. – Grand Junction, Inc.
Allied Independent Consultants

303 North Avenue
P.O. Box 41049
Grand Junction, CO 81501
970-244-8703

June 25, 2002

Susan Doose
570 Casa Rio Court
Grand Junction, CO 81503

RE: 570 Casa Rio Court

This office was contacted by Susan Doose to perform an inspection as to the depth of the piers on the retaining wall being constructed at the reference address. I, James Orton, under the supervision of Chris Steven Russell, Professional Engineer, inspected the drilling of pier holes and certify that all holes are to a satisfactory depth, and founded on acceptable material. This office advised having at least 3' penetration into the native river gravels. This was not reached on all holes due to the inability of the drill rig performing the drilling to drill through the gravels. It is advised by this office that the pier holes be filled with appropriate concrete as soon as possible to prevent the caving of the holes at depth.

Respectfully submitted,

James Orton
AIC Technician

A.I.C. – Grand Junction, Inc.
Allied Independent Consultants

303 North Avenue
P.O. Box 41049
Grand Junction, CO 81501
970-244-8703

July 11, 2002

Susan Doose
570 Casa Rio Court
Grand Junction, CO 81503

RE: Compaction at 570 Casa Rio Court

This office was contacted by Susan Doose at the referenced location to perform inspections on the compaction of the fill material used to build the pad on which the structure will sit. James Orton, under the supervision of Chris Steven Russell, Professional Engineer, completed these inspections and found that all material was compacted in a manner consistent with design specifications. These inspections were made prior to any utilities being laid into the subsurface of the Monoslab foundation.

Respectfully submitted,

James Orton
AIC Technician

A.I.C. – Grand Junction, Inc.
Allied Independent Consultants

303 North Avenue
P.O. Box 41049
Grand Junction, CO 81501
970-244-8703

July 17, 2002

Susan Doose
570 Casa Rio Court
Grand Junction, CO 81503

RE: Rebar Inspection at 570 Casa Rio Court

This office was contacted by Susan Doose at the referenced location to perform an inspection on the rebar in the retaining wall on said site. An inspection was performed by James Orton, under the supervision of Chris Steven Russell, Professional Engineer, and the rebar was found to be installed per design requirements.

Respectfully submitted,

James Orton
AIC Technician

A.I.C. – Grand Junction, Inc.
Allied Independent Consultants

303 North Avenue
P.O. Box 41049
Grand Junction, CO 81501
970-244-8703

July 29, 2002

Susan Doose
570 Casa Rio Court
Grand Junction, CO 81503

RE: 570 Casa Rio Court, Rebar and Subgrade Inspection

This office was contacted by Pierre Doose to request an inspection on the rebar and subgrade of the Monoslab foundation of the house being built at 570 Casa Rio Court. An inspection was conducted by James Orton, under the supervision of Chris Steven Russell, Professional Engineer, and the rebar and subgrade was found to meet design standards.

Respectfully submitted,

James Orton
AIC Technician

A.I.C. – Grand Junction, Inc.
Allied Independent Consultants

303 North Avenue
P.O. Box 41049
Grand Junction, CO 81501
970-244-8703

August 1, 2002

Susan Doose
570 Casa Rio Court
Grand Junction, CO 81503

RE: Compaction Test at 570 Casa Rio Court

This office was contacted by Pierre Doose to perform a compaction test on the first lift of material being backfilled behind the retention wall at 570 Casa Rio Court. The lift was approximately 18 inches tall. The pit run dirt mix was proctored at 125 pcf and was found to have adequate compaction for the design.

It was noted that this lift was in and compacted before the pouring of the Monoslab foundation of the house on the same property. Only this lift was in, the top of this lift is approximately 1' to 1.5' below the bottom of the thickened edge of the slab, and approximately 5' away.

It was also noted that buried in this slab were 4 concrete blocks approximately 4 to 6 feet long, 2 feet wide and 18 – 24 inches deep. Into these blocks ran 2 ¾" all-thread bars, galvanized and under coated. One of these bars angles upward and goes through the wall 1 foot below the top, the other bar comes out of the block nearly level and goes through the wall 1 foot up from the bottom of the wall on the outside of the wall. There are plates ¾" thick 6" in diameter under the nut on the all thread. The blocks were said to have rebar in them, but this was not observed by this office. The tiebacks are on 28' centers the distance of the wall.

This compaction test was performed by James Orton, under the supervision of Chris Steven Russell, Professional Engineer.

Respectfully submitted,

James Orton
AIC Technician

A.I.C. – Grand Junction, Inc.
Allied Independent Consultants

303 North Avenue
P.O. Box 41049
Grand Junction, CO 81501
970-244-8703

February 4, 2003

City of Grand Junction
Planning Department
Attn: Kathy Portner
250 North 5th Street
Grand Junction, CO 81501

Dear Kathy,

I have read the letter you wrote to Ms. Doose dated January 29, 2003. In response to this letter, as it applies to my firm, I would like to offer the following:

1) Monty Stroup, under my supervision, has inspected the grading and drainage at this site. He states that these items were built in substantial compliance to our plans. Our plans were based on the requirements dictated by the Homeowner's Association. They stated that the bulk of all stormwater drainage should be directed to the Cul de Sac and captured by the stormwater management system installed there. We enhanced this design by providing a swale to capture overflow in the instance that the existing stormwater grate became plugged. This swale is located in a public easement provided for stormwater. Basically the only provision of our design that has not been provided for is the placement of rip-rap. The non-placement of rip-rap most probably will not compromise the adjacent residences anytime soon. Therefore as long as an agreement to place this rip-rap is made sometime in the near future a CO for this residence should be issued. The riprap should most likely be provided by the City, since any overflow will be "public" stormwater. However, alternative agreements may be made.

MUST BE DONE!

2) The foundation and geotechnical work were performed in general accordance to local practices. Past geotechnical reports were reviewed and our firm performed its own geotechnical study, which included a slope stability study. We found that the area around this lot had the potential for sliding but the building site itself was likely stable at this time. The owner was informed of our findings and made a decision to build on the lot.

??

We decided to use a heavily reinforced ribbed monoslab as a foundation. This foundation is designed to spread the loads of the home over a large area, which will lessen the likelyhood of slope failure due to loading. In preparation of the subgrade we excavated down several feet and did not notice any tension cracks or shear planes. The density of the subgrade was reasonable. We then filled the

DEPTH?

TESTS?

excavated area with structural fill, which was compacted to 95% of ASTM D-698. The foundation was placed on this compacted structural fill.

TEST RESULTS ?

In order to make drainage run towards the street a retaining wall was constructed. This retaining wall was placed on 8" diameter piers set on 10' centers. The depth of these piers ranged from 10' to 19' deep. The piers were placed to mitigate any nearby slope failure by pinning the soil across a potential shear plane.

DRILL LOGS ?

AS-BUILT INFO ?

NOT IDENTIFIED

HOW DO YOU KNOW ?

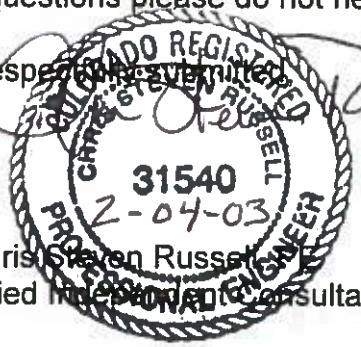
Therefore the foundation and the retaining wall were designed and constructed to help mitigate any potential nearby slope failure. Our firm inspected the construction of both items and found them to be constructed in substantial compliance of our plans within reason given field conditions.

3) Finally our firm does want to perform annual inspections of the property and the structure. We propose that the title to this property is written whereby the owners must notify us or another geotechnical engineer upon transfer of property. The new owners should be instructed on how to take care of this property and what to look for in regard to slope instability. It would then be contingent on the owners to contact us or another geotechnical engineer on an annual basis to inspect the lot and surrounding land.

It is my sincere hope that this letter references all the concerns expressed in the aforementioned January 29, 2003 letter.

Should you have any questions please do not hesitate to call me at 244-8703.

Respectfully submitted,



Christ Steven Russell, P.E.
Allied Independent Consultants-Grand Junction, Inc.

City of Grand Junction
Public Works Department
250 North 5th Street
Grand Junction, CO 81501-2668
Phone: (970) 244-1555
FAX: (970) 256-4022

February 7, 2003

Margaret S. Doose
P.O. Box 515
Ouray, CO 81427

Re: 570 Casa Rio Court, Vista del Rio subdivision Grand Junction CO

Dear Ms. Doose:

As you know, the Planning Clearance that was issued on May 29, 2002, for the property at 570 Casa Rio Court (Lot 10, Filing 3 of Vista del Rio Subdivision) was specifically conditioned to meet the requirements of the amended subdivision plan. The plan was amended in April, 2000, and provides the following:

> The plan as amended now also requires that the planning clearance/building permit shall be issued only on condition that the applicant's engineer design, inspect and supervise the excavation and construction and certify at the conclusion of construction, that the site and structure was constructed in accordance with the engineer's approved design.

Chris Russell, PE, prepared letters (dated Jan. 28, 2003, and Feb. 4, 2003) that were intended to serve as certification of the lot improvements, and that such improvements were constructed according to his design and under his supervision. It was the opinion of City staff that the letters were not sufficient to satisfy the conditions of the Planning Clearance. Mr. Russell has since provided information, or stated that such information does not exist. While the level of care that was exhibited is not fully apparent, Mr. Russell has certified that the improvements meet his engineering design. The City will defer to his professional opinion regarding this matter.

Therefore, City staff acknowledges that the design engineer, Mr. Chris Russell, PE (Colorado registration # 31540), has certified the improvements to 570 Casa Rio Court (Lot 10, Filing 3 of Vista del Rio Subdivision), and that all available information regarding the construction of such improvements has been submitted and is on file. The conditions of the Planning Clearance have been satisfied, and a Certificate of Occupancy may be issued.

Thank you for your cooperation in the completion of this project.

Sincerely,

Eric Hahn, P.E.
City Development Engineer

cc: Bob Lee, Mesa County Building Inspector
Kathy Portner, City Planning Manager
John Shaver, Assistant City Attorney
Chris Russell, A.I.C.
file

NOT TO BE SIGNED AND SENT UNTIL "DECLARATION" IS FINALIZED.

EH 2/7/03

THE ISSUE WAS NOT RESOLVED. LETTER NOT SENT. 2/11/03

City of Grand Junction
Public Works Department
250 North 5th Street
Grand Junction, CO 81501-2668
Phone: (970) 244-1555
FAX: (970) 256-4022

February 6, 2003

Margaret S. Doose
P.O. Box 515
Ouray, CO 81427

Re: 570 Casa Rio Court, Vista del Rio subdivision Grand Junction CO

Dear Ms. Doose:

This letter is in response to the letter from Mr. Chris Russell, dated Feb. 4, 2003, regarding the construction of the residence at 570 Casa Rio Court, that letter was in response to a letter from Kathy Portner, dated Jan. 29, 2003. After reviewing the Feb. 4 letter, it is my opinion that the planning clearance condition remains unsatisfied. I have consulted with John Shaver, Assistant City Attorney. Mr. Shaver concurs that the information provided in the letter is not adequate to satisfy the required development conditions.

The following is an excerpt from Ms. Portner's Jan. 29 letter, with emphasis added here:

> In order for the final inspection/occupancy authorization to be issued, Mr. Russell (or the responsible engineer if it was not him) must certify that the engineer designed, inspected and supervised the excavation and construction and certify in writing that at the conclusion of construction, the site and structure was constructed in accordance with the engineer's approved design. The certification must include specific and detailed written descriptions of design and construction practices. As well, the certification must also report how each of the recommendations of the design and geotechnical study on which the design was based were implemented. **All supporting documentation must be provided.** If any of the specific designs or recommendations of the May 22, 2002 (or supplemental) report were not implemented during construction, then the engineer's certification must specifically identify the design recommendation(s), the change(s) and whether the change(s) was fully designed and implemented. **The certification shall include a detailed written description of how the change(s) if any will affect the stability of the lot and the home, garage and other improvements and all other matters addressed in the report.** Because monitoring and inspection are mentioned in the report the certification should also detail how the owner and/or engineer will implement that program.

Mr. Russell's Feb. 4 letter provides only general information regarding these requirements, there are a number of details that could be more adequately described. Following are brief descriptions of what should be provided, if available. Also noted are issues that remain unresolved after Mr. Russell's Feb. 4 letter:

1. The rip-rap shown on the lot grading and drainage plan must be installed. If the owner fails to install the rip-rap, then a letter from the Homeowners Association must be submitted to the City that indicates this particular portion of the approved grading and drainage plan will not be required by the HOA.
2. A legally binding commitment to an annual geotechnical inspection must be provided.
3. Compaction tests verifying that the foundation subgrade density was "reasonable," and that the structural fill was placed at 95% of ASTM D-698.
4. As-built drawings for the retaining wall indicating the actual depth of each of the piers and the final configuration of the wall.
5. Drill logs of the holes drilled for the piers.
6. A slope failure analysis, indicating both assumed and known locations of possible failure planes and verifying that the piers "mitigate any nearby slope failure by pinning the soil across a potential shear plane."

If any of the above information is not available, please state such in writing. Thank you for your cooperation in the completion of the work on this project.

Sincerely,

Eric Hahn, P.E.
City Development Engineer

cc: Kathy Portner, City Planning Manager
John Shaver, Assistant City Attorney
Chris Russell, A.I.C.

CITY OF GRAND JUNCTION

CITY HALL
250 North 5th Street
Grand Junction, Colorado 81501
Phone: (970) 244-1501

FACSIMILE

DATE:
February 14, 2003

TO: Paul Sunderland

FAX NO: (970) 263-7960

FROM:
John Shaver

RE:
570 Casa Rio Court

PAGES:
3 pages including cover sheet

☐ URGENT ☐ REVIEW ☐ PLEASE COMMENT ☐ PLEASE REPLY ☐ PLEASE RECYCLE

COMMENTS:

PAUL C. SUNDERLAND
ATTORNEY
2638 DAHLIA DRIVE
GRAND JUNCTION, COLORADO 81506
PHONE (970) 243-6215

February 14, 2003

Mr. John Shaver
Assistant City Attorney
City of Grand Junction
250 N. 5th St.
Grand Junction, CO 81501

By facsimile: 244-1456

Re: Doose, Property at 570 Casa Rio Ct., Grand Junction

Dear Mr. Shaver:

As you know from our prior conversations, I represent Mrs. Doose, the owner of the new home located at 570 Casa Rio Ct., Grand Junction.

Mrs. Doose had her home under contract to sell. However, the City's refusal to give Planning approval of the completed home, the resulting inability to obtain a final certificate of occupancy, and the extraordinary conditions which you demanded be placed on the home in the form of a deed restriction, have caused the buyers to withdraw from that contract. Obviously, Mrs. Doose has lost a lot of money as a result. Further, the City's refusal to approve the house although it has passed its engineering review and final building inspection also keeps Mrs. Doose from inhabiting her home, although as of the first part of next month when she must vacate her current home in Ouray, she has no place else to live.

Mrs. Doose has been informed by the City's Development Engineer, Mr. Hahn, that he is satisfied that Mrs. Doose' efforts and my draft deed restriction satisfy all engineering requirements the City imposed on development of Mrs. Doose' lot. However, he advises that your approval of the deed restriction is needed, and only the lack of your approval of the deed restriction now stands between Mrs. Doose and her ability to occupy her property.

The purpose of this letter is to make sure that you are fully aware of the relevant facts and to formally request that you approve the deed restriction so that we can obtain the planning approval and certificate of occupancy so that Mrs. Doose can either occupy or sell her home.

The history of this matter is as follows. In April, 2002, Mrs. Doose submitted her request for Planning Clearance to the City Community Development Department. At the Planning Department's request, she had Mr. Russell, her engineer, prepare his Soils Report and his Slope Stability Study. Both of these were supplied to the Planning Department. On May 29, 2002, the Planning Department issued her Planning Clearance conditioned on her demonstrating

compliance with the amended subdivision plan requirement that her engineer design, inspect and supervise the excavation and construction of the home and, at the conclusion of the construction, certify that the site and structure were constructed in accordance with his design. She then submitted her engineered foundation plans to the Building Department and obtained her building permit. No special conditions were imposed on the building permit.

Upon completion of the home, when Mrs. Doose sought issuance of the certificate of occupancy, she was advised that she needed a further approval from the Planning Department demonstrating that she had satisfied the requirements of the Planning Clearance. In her letter of January 29, 2003 (copy attached), Ms. Portner, the City Planning Manager, indicated that the engineer's first efforts to provide the necessary documentation were inadequate. She further stated the requirements which Mrs. Doose and her engineer needed to satisfy for the City to issue the required planning approval of the home. In response to this letter, Mr. Russell at AIC provided his letter of February 4, 2003 (copy attached). The City responded with Mr. Eric Hahn's letter of February 6, 2003 (copy attached) which requested six more specific items which still needed to be addressed. Mrs. Doose and her engineer provided all of the requested items (as to the rip rap, she provided a written contract to complete the rip rap which the City Planning staff had advised would satisfy the requirement) including a proposed deed restriction requiring annual inspections for geotechnical failure.

The Planning Clearance issued before the house was started, Ms. Portner's letter, and Mr. Hahn's letter all contained no requirements of any sort regarding irrigation of landscaping on the lot. On the contrary, the demand for an engineered irrigation system with certification first appeared when you responded to our draft deed restriction.

The issue of irrigation is briefly addressed in the restrictive covenants of the subdivision. They provide only that xeriscaping is *encouraged*. They certainly do not require an engineered irrigation system nor do they require an engineer's certification that the irrigation system won't affect the house. Similarly, the Lincoln-DeVore report, while it recommends limiting lawn and landscape irrigation, specifically requires only that lawn spray sprinkler heads be located no less than 5 feet away from any building. Finally, Mr. Russell's Soils Report addresses irrigation only by recommending that limited watering be permitted within 5 feet of the house. In short, none of the engineering reports or other materials applicable to this house and lot suggest any need for the engineered and certified irrigation system you are demanding. So far as we can tell, you simply made this requirement up after the house was complete based on your assessment of issues relating to litigation involving the collapse of the house on the river bluffs.

On February 7, 2003, I sent you a revised proposed deed restriction which including much of your requested verbiage the sole purpose of which appears to be to relieve the City of liability. While much of this is probably illegal, or at best ineffective in accomplishing your desired result, we did not object to your demands for verbiage above and beyond that required by the Planning Clearance. However, we objected to your demand for a deed restriction prohibiting any landscaping without a certified engineered landscaping plan largely because of the substantial additional expense of, and delay which would result from, satisfying this requirement (to say nothing of our concern about the lawfulness of the requirement).

Instead, we proposed an alternative which exceeded any requirements of the engineer's reports or the covenants to meet any reasonable concerns you may have. Our proposal required that any irrigation system installed comply with City regulations and permitted only minimal watering within 10 feet of the home (xeriscape or drip irrigation) as opposed to the 5 feet recommended by the engineers. Mr. Hahn told Mrs. Doose that he had reviewed our proposal and that, in his opinion from an engineering standpoint, it was sufficient. All that remains is for you to approve the language which you have refused to do, insisting on pursuing the engineered and certified design which you had previously demanded.

Your insistence means that Mrs. Doose cannot either occupy or sell the house unless she records a deed restriction requiring that a Colorado registered professional engineer certify that irrigation will not contribute to any failure of the lot. Presumably, if such a certification cannot be had, your position is that Mrs. Doose must simply abandon the house and lose the more than $250,000 she has invested in it.

We can find no legal authority for the City's right to demand such a certification this late in the development process, particularly where there appears to be no scientific basis for the demand. Both you and the Planning Staff apparently have indicated to Mrs. Doose that you believe that additional requirements should have been imposed on her construction of her home as a condition of the Planning Clearance and that you are simply attempting to correct the City's oversight in issuing the required clearance and building permits. However, such a course of conduct is plainly illegal. See, e.g. Crawford v. McLaughlin, 473 P. 2d 725 (Colo. 1970)(equitable estoppel precludes City's enforcement of building height limitations after issuance of building permit which contain no height limitation); City of Denver v. Stackhouse, 310 P. 2d 296 (Colo. 1957); Jones v. City of Aurora, 772 P. 2d 645 (Colo. App. 1988).

Mrs. Doose has constructed her home in accordance with the planning clearance and the building permit. The building inspector has inspected the home and found it to have been built in accordance with the permit and the building code. He is ready to issue the certificate of occupancy as soon as the planning department approves. The Planning Department has reviewed

the engineer's certification and all of the supporting materials which have been supplied and have found that they meet the requirements of the planning clearance. They are ready to issue give their approval as soon as you approve the deed restriction. Thus, only your refusal to approve the proposed deed restriction stands in the way of Mrs. Doose's occupancy of her home.

We have indicated a willingness to record a deed restriction putting the world on notice of the existence of the various reports and plans, requiring annual engineering inspections and limiting watering within ten feet of the house, in short, meeting all of the requirements recommended by the engineers or originally demanded by the City and then some. We have even included the language you demanded purporting to insulate the City from liability, though there is no legal basis for such a demand.

In our view, there simply is no legal basis for the City to continue to refuse to issue the planning clearance and certificate of occupancy thereby allowing Mrs. Doose to inhabit her home.

We request that you approve the deed restriction we have proposed and authorize the relevant authorities to issue the necessary clearance and permit no later than close of business Tuesday, February 18, 2003.

Sincerely,

Paul C. Sunderland

Paul C. Sunderland

cc: Susan Doose
City Planning Department

City of Grand Junction, Colorado
250 North 5th Street
81501-2668
Phone: (970) 244-1501
FAX: (970) 244-1456

February 14, 2003

Mr. Paul Sunderland
2638 Dahlia Drive
Grand Junction, CO 81506

Re: 570 Casa Rio Court – your 2nd letter of February 14, 2003

Dear Mr. Sunderland,

Is the xeriscaping within 10 feet of the house proposed and/or agreed to by your client's engineer? If so, how is that any different than my proposed term concerning an irrigation plan? Presumably the 10' (or any other restriction on planting type and/or location) is because of some concern about introduction of water near, around or under the structure. If, as you wrote in your second letter of February 14, 2003 the 10' is more restrictive than the engineer considered 'necessary', how did the engineer determine that 5' was okay? We have not been provided any irrigation plans and the May 22, 2002 report ("limited planting is recommended within 5' of the perimeter of the house. Excessive watering is not recommended in any case and may lead to differential movement of the foundation") is less than definitive.

The whole of this effort has been about avoiding dangers to prospective buyers; having an engineer certify that irrigation will not contribute to subsidence; slope failure; instability or compromise is wholly consistent with that effort. The May 22, 2002 report includes by reference two publications, *A Guide to Swelling Soils for Colorado Home Buyers and Homeowners* and *The Day the House Fell: Homeowner Soil Problems from Landslides to Expansive Clays and Wet Basements.* I suspect that both of those publications address the importance of controlling irrigation to help the homeowner maintain stable soil conditions. The amended covenant has a similar purpose. The proposed covenant did not require a "certified irrigation system" but instead reflected the purposes of the subdivision plan and the cautions and recommendations of the May 22, 2002 report prepared by your client's engineer.

While I understand that your position is "simple," I have seen nothing in writing from Lincoln-Devore or Mr. Russell that supports your conclusion that the proposed covenant is inappropriate, given the known conditions. In fact Mr. Russell's May 22, 2002 report stressed the importance of managing and conveying the storm water runoff that originates from and/or is conveyed through and across Lot 10. That same engineering report also specifically recommended a continual inspection program to, among other things, "ensure that the structure is not compromised." The report further provides that "...the edge of the proposed home may be as close as 20 feet from preexisting fault lines. These features are similar in nature to the slope major collapse (sic) that occurred to the West." Your client's engineer described the situation on a nearby lot to the West of your client's property as a "major slope failure."

Your own consultant has clearly stated the problem but has not stated a/the engineering solution vis a vis irrigation. Because of that I must respectfully disagree with your statement that my draft of the covenant is "far beyond" what the engineer has indicated is necessary.

Last week you told me that an engineer said that the lot was graded such that irrigation would not be a problem (or words to that effect). If you would provide that opinion in writing as well as your suggested declaration addressing irrigation on Lot 10, I would be pleased to consider the same. I look forward to seeing the engineer's report and your proposed covenant.

OFFICE OF THE CITY ATTORNEY

by: _____

John P. Shaver
Assistant City Attorney
250 N. 5th Street
Grand Junction, CO 81501
(970) 244-1501

pc: Kathy Portner
Eric Hahn

City of Grand Junction, Colorado
250 North 5th Street
81501-2668
Phone: (970) 244-1501
FAX: (970) 244-1456

February 14, 2003

Mr. Paul Sunderland
2638 Dahlia Drive
Grand Junction, CO 81506

Re: 570 Casa Rio Court – your letter of February 14, 2003

Dear Mr. Sunderland,

I write in response to your recent letter concerning the Doose property located at 570 Casa Rio Court.

Your conclusion that the City will not authorize occupancy of the home at 570 Casa Rio Court is incorrect. Occupancy will be authorized when the home can be safely occupied.

On Monday, February 10, 2003, your client came to my office requesting that I approve the deed restriction (declaration) that you had authored and faxed to me late in the day on Friday, February 7, 2003. I had at the time of her visit not yet reviewed the fax. Mrs. Doose provided me with a copy of the declaration. She told me that she was not going to leave until the same was approved and occupancy of the home was authorized. Despite having other pressing obligations I immediately reviewed your proposed declaration. I rewrote paragraphs 4 and 5. I gave your client the verbiage that the City would accept and told her that if it was added to the balance of the declaration that you wrote, occupancy would be authorized. She left my office and I have not heard back from her. Did she not provide you with my draft?

Other than the terms of the declaration to be recorded in the chain of title (concerning irrigation and xeriscaping) all other conditions for occupancy appear to have been satisfied. I have not spoken with Mr. Hahn about this since last Friday but it is my understanding that the City has not denied occupancy; we have insisted that the danger of allowing irrigation on this lot must be addressed and I have the written language that will do so.

As you know from the City's correspondence, your client's property is subject to a subdivision plan that "requires that the planning clearance/building permit shall be issued only on condition that the applicant's engineer design, inspect and supervise the excavation and construction and certify at the conclusion of construction, that the site and structure was constructed in accordance with the engineer's approved design." That plan is a result of nearby lots experiencing significant slope instability and failure.

Recordation of a deed restriction was specifically endorsed by your client's engineer in his February 4, 2003 letter to Kathy Portner of the Community Development Department. That letter provides in relevant part:

> "Finally our firm does want to perform annual inspections of the property and the structure. We propose that the title to this property is written whereby the owners must notify us or another geotechnical engineer upon transfer of property. The new owners should be instructed on how to take care of the property and what to look for in regard to slope instability. It would then be contingent on the owners to contact us or another geotechnical engineer on an annual basis to inspect the lot and surrounding land."

In our conversations you have acknowledged the geotechnical problems with Lot 10 (570 Casa Rio Ct.). In fact you told me that your client's engineer has represented that Lot 10 has been graded such that irrigation will pose not problem. Based on that representation and the February 4 letter from Mrs. Doose's engineer, my re-written paragraph should not have been a problem. If she has not already done so please ask your client to provide you with my proposed re-write of your paragraphs 3 and 4. I will of course review any language changes that you propose.

Contrary to your assertion, the term that I authored (to substitute for your paragraphs 3 and 4) did not require a "certified irrigation system"; my term requires that a Colorado registered professional engineer report that irrigation will not contribute to the subsidence or geotechnical failure of the lot. Given the known conditions of the lot/subdivision, the commitment that the lot will be annually inspected, your client's engineer's proposal that owners be "instructed" on slope instability and that our knowledge that water is a known factor contributing to geotechnical/slope failure, it would be irresponsible to not include the same in the covenant that you proposed.

I look forward to hearing from you.

OFFICE OF THE CITY ATTORNEY

by: _____

John P. Shaver
Assistant City Attorney
250 N. 5th Street
Grand Junction, CO 81501
(970) 244-1501

pc: Kathy Portner
Eric Hahn

Margaret S. Doose
P O 515
Ouray, CO 81427
970-270-6264
February 6, 2003

City of Grand Junction
Public Works Department
250 N. 5th St.
Grand Junction, CO 81501

Attn: Eric Hahn, City Development Engineer

Re: 570 Casa Rio Ct. Grand Junction, CO 81503

Dear Eric:

In response to your letter dated February 6, 2003, please be advised of the following:

1. Concerning the rip rap, I propose to resolve this issue by entering into a contract with Stahl Excavating to install this as shown on the drainage plan. A copy of this contract will be delivered to you by February 7, 2003.
2. Regarding the annual geo technical inspection, please find attached a copy of a deed restriction which will be recorded at time of closing. This document was prepared by my attorney Paul Sunderland.
3. Regarding #3,4,and 5 of your letter, please see attached documents from Allied Independent Consultants.
4. Regarding item #6 of your letter, a slope failure analysis was never conducted. A slope stability study was done by Allied Independent Consultants and this document has already been provided to your office.

Chris Russell of Allied Independent Consultants was not available today to provide you with yet another letter concerning these issues.

I believe we have sufficiently addressed your concerns, and would appreciate your ***PROMPT ATTENTION IN THIS MATTER. PLEASE ISSUE A CLEARANCE SO I CAN OBTAIN A CERTIFICATE OF OCCUPANCY.***

I have had to postpone the closing of 570 Casa Rio Ct. on two (2) different occasions. Mr. and Mrs. Stark, the buyers **NEED TO CLOSE AS SOON AS POSSIBLE SINCE ALL OF THEIR BELONGINGS ARE IN A MOVING VAN, THEIR PHONES ARE DISCONNECTED, AND THEY ARE LEAVING TOWN ON FEBRUARY 11, 2003. I MUST MEET MY COMMITMENT DEADLINE. IF YOUR OFFICE FAILS TO ISSUE A CLEARANCE AS SOON AS POSSIBLE, I RUN THE RISK OF LOSING MY BUYERS.**

Sincerely,

Margaret S. Doose

Margaret S. Doose

CITY OF GRAND JUNCTION
GRAND JUNCTION, COLORADO

FOR	)	PLANNING COMMISSION DECISION
City of Grand Junction	)	FPA-2000-065

On April 18, 2000 the Planning Commission approved the City's application for a major amendment to the approved plans for Vista Del Rio Subdivision, Filings 2 and 3. The change now requires a site and structure specific geotechnical investigation; observation and analysis by a Colorado registered professional engineer prior to the City issuing a planning clearance/building permit.

This decision was made after considering all the pertinent testimony and reviewing the data and applies to Vista del Rio, Filing 2, Block 1, Lot 5 and Block 2, Lot 5 and Vista del Rio, Filing 3, Lots 10, 11, 12 and 13. The plan as amended now also requires that the planning clearance/building permit shall be issued only on condition that the applicants engineer design, inspect and supervise the excavation and construction and certify at the conclusion of construction, that the site and structure was constructed in accordance with the engineer's approved design.

I hereby declare that the Planning Commission concluded the same at a duly noticed and constituted hearing held in accordance with the code, laws, rules and regulations of the City of Grand Junction.

Katherine M. Portner

Katherine M. Portner, AICP
Planning Manager

presented. Conditions changed, and what today may seem viable may not be tomorrow. How could the petitioner guarantee that no gas station would ever be constructed on the site?

Commissioner Grout noted that approval of the Growth Plan Amendment did not restrict the type of uses allowed. If approved, any allowed commercial use could be placed on the site.

Commissioner Dibble said that the project offered a type of "philosophy" that something attractive could be constructed to serve as an aesthetic entrance into the City. He felt that any access into the site could be constructed to mitigate stacking and other traffic problems. He agreed that expanding the current 15 acres to 30 acres would give both the petitioner and the project added flexibility. He also agreed that residential uses were not the best uses for the subject property. He wondered if the County would indeed dictate any expansion beyond Parcel A.

Mr. Shaver said that since properties were within the Persigo 201 boundary, they fell within the City's jurisdiction in accordance with the Persigo Agreement as development occurred.

Commissioner Dibble said that traffic issues would require mitigation, regardless of whether or not development occurred on 15 acres or 30 acres. He again expressed support for the request.

Commissioner Prinster said that while some commercial in the area would provide transition, expansion to the north would create too large a commercial node and be out of character with surrounding residential and agricultural uses. He felt that a quality development could be constructed on the existing 15 acres, and he supported denial of the request.

MOTION: (Commissioner Grout) "Mr. Chairman, on item GPA-2000-029, I move that we forward a recommendation of approval to the City Council on the request to amend the Growth Plan for this proposal."

Commissioner Nall seconded the motion. A vote was called and the motion was defeated by a vote of 2-4, with Chairman Elmer and Commissioners Nall, Grout, and Prinster opposing.

VI. PUBLIC HEARING ITEMS ON ITEMS FOR FINAL DECISION, continued

FPA-2000-065 FINAL PLAN AMENDMENT—VISTA DEL RIO SUBDIVISION, FILINGS 2 AND 3
A request for a major amendment to the approved plan requiring geotechnical investigation and/or other analyses prior to the issuance of a planning clearance/building permit for Filing 2, Block 1, Lot 5 and Block 2, Lot 5; and Filing

3, Lots 10, 11, 12, and 13 (2294, 2295, and 2296 El Monte Court; 569, 570, 571, and 572 Casa Rio Court)
Petitioner: City of Grand Junction
Location: 2294, 2295, and 2296 El Monte Court; 569, 570, 571, and 572 Casa Rio Court

FPA-2000-066 FINAL PLAN AMENDMENT—SOUTH RIM SUBDIVISION, FILING 4
A request for a major amendment to the approved plan requiring geotechnical investigation and/or other analyses prior to the issuance of a planning clearance/building permit for Lots 7, 8, 9, 10, and 11 (2342, 2345, 2347, 2349, and 2351 Promontory Court)
Petitioner: City of Grand Junction
Location: 2342, 2345, 2347, 2349, and 2351 Promontory Court

STAFF'S PRESENTATION
Kathy Portner presented an overhead transparency of the site and noted the lots believed to present geologic hazards. In one case, slope failure had occurred, resulting in the owners vacating the home. Mr. Shaver added that a potential issue could exist with Lot 4, Block 1, Filing 2 in the event that continued sliding compromised the integrity of the cul-de-sac.

Ms. Portner said that the proposed plan amendment would apply to any future structure(s) proposed for the lots. Photos of the vacated home on El Monte Court were shown, and the significant slope damage of this lot was highlighted. Based on the recommendations of Jeff Hynes, Colorado Geological Survey, staff proposed adding additional restrictions on the subject lots so that prior to the issuance of planning clearances and/or building permits, applicants must provide a geotechnical investigation specific to the lot and/or other analysis for the City to review, and that an engineer design any structures proposed for the sites. An engineer would be required to inspect the site during construction and require certification at the conclusion of construction attesting that construction conformed with approved plans. Notice to future buyers advising them of the City's restrictions was also suggested by Ms. Portner.

Ms. Portner introduced Jeff Hynes, who was made available via telephone conferencing. Mr. Shaver asked Mr. Hynes to provide a summary of his credentials, experience and background, which was given. Mr. Hynes said that he'd been contacted initially by the City regarding a home located on Lot 11, Filing 4 of South Rim. Mr. Hynes said that he had discussions with the City, the contractor involved in remedial action for the home and other City staff. Mr. Hynes stated that he did a surface inspection of all 5 lots. He noted that the lot surfaces had been disturbed by equipment traveling off the cul-de-sac to Lot 11 to effect repairs on the north side of the house so surface features were not as apparent as they may otherwise have been. Signs of insipient failure had been observed along the bluff, which were noted on a series of maps (Maps 1 and 2).

Mr. Hynes spoke about his investigation of the home at 2296 El Monte Court, which had fallen victim to severe slope damage.

Mr. Hynes said that the owner of the El Monte home contacted him later and they'd engaged in discussions. Continued progression of the slide, he said, would lead to the eventual destruction of the home, if it wasn't demolished beforehand.

Mr. Shaver referenced the maps of which Mr. Hynes had spoken and asked if they represented generalized findings of field conditions observed during his site visits. Mr. Hynes said that they represented findings regarding the stress and failure the two land areas were undergoing. The letter accompanying the maps provided general observations regarding the types of investigations that would be needed. Prior to viewing some of the insipient failure on Promontory Court, he and staff had used the presumption of developability. After the site visitation, he was more inclined to presume undevelopability unless and until it could be demonstrated that they were developable, using the same investigation methodology and tests that would have been required with the first presumption. Again referencing the maps, he said that the dashed and solid lines noted clear lines of failure in both topographical areas. The dashed line referred to a short-term (6 months to a year) timeframe where the physical distress would likely, in his opinion, manifest itself as a landslide. The remedy includes a set of rigorous design standards that must be met to demonstrate that those lots could be developed. Standards would include engineered foundation work, slope stabilization, surface and subsurface moisture management, slope stability analyses and irrigation management. He said that the severe sliding at 2296 El Monte had probably been exacerbated by extensive yard installation and irrigation. The lack of yard and an irrigation system on Lot 11 in South Rim had probably contributed to the structure being salvagable.

Absent specific surface and subsurface investigations, he recommended site-specific engineering detail for homes on subject lots except for Lot 5, Block 2 of Vista Del Rio. He opined that nothing could be done to save that lot; it was effectively unbuildable as shown by the existing condition. If the El Monte Court cul-de-sac were to be saved, grading and drainage management of the slope would have to occur once the vacated home was removed.

Mr. Shaver asked if Mr. Hynes had been retained to render any final opinions on that assumption, to which Mr. Hynes responded negatively. Mr. Shaver asked Mr. Hynes to recall the number of cases where he had been qualified as an "expert," and his associated educational credentials relating to the opinions being given, for which Mr. Hynes complied.

Mr. Hynes said that the general bluff-retreat phenomenon along the river extended at least as far west as Loma. He recalled other areas in Grand Junction, particularly Lamplight Park, where this phenomenon was occurring.

QUESTIONS

Chairman Elmer asked for clarification on the problems related to Lots 10, 11, 12, and 13 at the end of Casa Rio Court. Mr. Hynes said that on an outside bend along the river channel tended to accelerate, resulting in "hydraulic elevation." Thus, the outer bank of the river curve had the tendency to erode faster than the inner bank. He observed that some of the gravel deposit on El Monte existed on Casa Rio as well. He conjectured that some of the fill material from the Casa Rio area had been excavated as "borrow" and used to build the filled wedge for the bridge approach on the south side of the river. By removing that material from the Casa Rio area, it was much more stable than the El Monte Court area. The difference, he said, was in the prognosis—the prognosis being better for the Casa Rio area. There were more opportunities for mitigation of lots along Casa Rio Court; however, stabilization costs for the lots may ultimately be prohibitive. The same situation was evident along Promontory Court.

Commissioner Nall, looking at the contour of the river, asked if installation of rip-rap along the river could help stabilize the bank. Mr. Shaver suggested that mitigation engineering didn't relate to the plan amendments under discussion; he noted that Mr. Hynes was not testifying for that purpose.

Commissioner Ainsworth referenced the El Monte Court cul-de-sac and wondered if additional lots would be affected if the cul-de-sac were pulled back. He asked "would the cul-de-sac even be salvageable?" Mr. Shaver said that the City had retained CTL Thompson to evaluate utilities and transportation impacts of the current situation.

Commissioner Prinster asked if geological data would still be required for Lot 5, Block 2 if deemed unbuildable. Mr. Shaver said that while a general opinion had been rendered by Mr. Hynes, the staff part of the plan amendment being proposed is not asking the Commission to make that decision.

PUBLIC COMMENTS

Richard Cummings (Aspen, CO) referenced the markings on Map 1 and Map 2 and wondered if areas north of lines marked "clear line of failure" could be engineered to make those areas buildable. Mr. Hynes said that there was an area of active landslide on El Monte Court. There was probably no economic way to recover the cost of lots along El Monte, he said, for less than two or three times the value of the lot; development of lots along Promontory may be more economic.

Chairman Elmer said that it would be difficult to know the status of each lot or what kind of mitigation might be possible without further investigation. Mr. Hynes agreed, adding that the depth and orientation of slope failures were crucial to the feasibility and cost of any mitigation efforts.

Skip Behrhorst (no address given), developer of South Rim, said that he had been very aware of the property's geologic constraints. He referenced a booklet (passed around to planning commissioners) which included specific recommendations, requirements and recorded documents included as part of the initial project analysis. Covenants and

specific issues related to geotechnical requirements had also been recorded and included disclosures in the purchase contract and reference to a Lincoln-DeVore study conducted on the property. On the bluff lots, a provision in the deed specifically addressed the area from the bluff line to the building envelope, limiting the amount of fill from the existing grade of 6 inches at the bluff line to not more than 18 inches to the building envelope. In the Architectural Guidelines, an extensive booklet was prepared to address architectural control. A subsurface exploration report conducted by Lincoln-DeVore made irrigation water recommendations and restrictions. Xeriscaping was strongly encouraged, and CC&Rs had been put into place. Referencing page 15, the recommendation was made that the owner provide a subsurface analysis through an open foundation investigation. On page 23 of the CC&Rs, number 4, specific reference to geotechnical requirements was made (read into the record). Another requirement of record prevented building envelopes from being less than 35 feet from the bluff line. Mr. Behrhorst said that no specific investigation or analysis had been undertaken by Mr. Hynes. The City's proposed amendments were no more restrictive than precautions already taken by the owner.

Mr. Shaver stated that by making the documents referenced by Mr. Behrhorst a part of the plan amendment, the City would then have authority to enforce what had already been put into place by the developer. The only other element included site-specific, building-specific design requirements.

Chairman Elmer clarified to the audience that the Planning Commission was not in a position to referee any legal dispute between property owners and the developer.

Edward Morris (no address given), of Lincoln-DeVore said that Lincoln-DeVore had been involved in the subsurface investigation of the subject properties. Mr. Morris expressed concern over Mr. Hynes' testimony and how referenced maps were being used. All lots located on the bluff line shared similar concerns, yet only a few lots had been singled out.

Mr. Morris said that he'd visited Lots 7 and 8 off of Promontory Court yesterday and determined that surface cracking seemed limited to the upper levels of Lots 7, 8 and 9. He said that the cracking represented very thin, graveled, sandy soils that were sliding over the existing shale formation. Excavation determined that cracking did not extend into the shale. Cracking on the central and west ends of Lot 7 of South Rim, Filing 4, related to approximately 9 feet of very low-density sands, gravels and cobbles. While normally quite dry, these materials did get seasonably wet and had undergone minor collapse. In fact, they were deemed by Mr. Morris to be "collapsible soils." Mr. Morris noted a crack along 5 feet of the bluff line that represented old fill that had been pushed over the edge during the gravel removal process and was now beginning to move down the slope. Removing those soils and revegetating the area would involve very complex mitigation efforts. In reviewing the slope's stability, no changes from his initial report were noted. The 35-foot setback referenced previously did not apply to all lots; some lots had setbacks greater than 35 feet.

Mr. Morris referenced the remedial work that occurred on Lot 11 of South Rim and said that expansive soils were present in the central portion of the Lot and settlement had occurred due to the presence of collapsible soils. No evidence of slope instability on Lot 11 was present nor did slope instability have anything to do with damages caused to the home.

Doug Colaric (200 Grand Avenue, #101), representing two lot owners in Vista Del Rio, referenced the 1994 approval of Vista Del Rio Subdivision. He said at that time the Lincoln-DeVore report identified areas of instability. He asked whether the City's request for additional conditions concur with findings in the initial report or had the report been incomplete? Ms. Portner said that the City's amendments would expand on the original report. The report's findings had been very generalized and were neither site-specific nor lot-specific. Mr. Colaric said that both lot owners represented by him were concerned over the fate of the cul-de-sac. Mr. Shaver reiterated that the City had retained CTL Thompson to analyze the situation and prepare a report. Mr. Colaric asked Mr. Hynes if, in his opinion, lots belonging to the two owners—the Scotts and Halpennys (Lot 5, Block 1 and Lot 5, Block 2)—were unbuildable, to which Mr. Hynes replied affirmatively.

Kevin Nourse (564 Casa Rio Court, Grand Junction) said that Vista Del Rio Subdivision had essentially the same covenants and restrictions as South Rim. He questioned the City's singling out a few specific lots for further geotechnical review when his subdivision map noted those lots and others within the Vista Del Rio Subdivision. A newspaper article had identified similar areas of concern as far away as 5 blocks.

Christopher McAnany, representing the owner of Lot 10 in the South Rim Subdivision, noted the three Code requirements for a plan amendment. Testimony from Mr. Behrhorst and Mr. Morris pointed out that concerns had been known for some time and were well documented. A procedure was already in place to enable individual lot owners to seek geotechnical review before any development was undertaken. Since soil conditions were not new and adequate CC&Rs were already in place, new, City-imposed restrictions were not warranted. He asked Mr. Hynes for clarification on the lack of bluff instability notations on Lot 10. Mr. Hynes said that while lots directly to the east and west of Lot 10 showed signs of either distress or failure, his inspection of Lot 10 did not show any evidence of change in the shallow surface. Mr. Hynes was unsure whether Lincoln-DeVore had taken into consideration the fill which had been placed on the southern half of referenced lots to achieve grade for the cul-de-sac. Basing fill at the head of a scarp was an accepted practice, but had a tendency to destabilize a slope, although he couldn't say for sure whether surface features were as a result of any fill work. Mr. Morris's comments, he said, represented the level of findings from a detailed analysis that would likely support development of Lots 7, 8, 9 and 10 on Promontory Court. Mr. Hynes said that his "inspection" included only observations, not in-depth analysis.

Leeds Foyle (2294 El Monte Court, Grand Junction) said that if the cul-de-sac on El Monte failed, would he be notified of what the City intended to do? Would he have input? Mr. Shaver replied affirmatively.

Paul Wisecup (568 Casa Rio Court, Grand Junction), owner of Lot 8 on Casa Rio Court, expressed concern over the additional regulatory layer of control being requested by the City. He wondered what restrictions the City could impose that would be any different from what was already in place. He wondered how or if slope stabilization, surface drainage and irrigation management would be addressed by the City for the subdivisions as a whole. In the event that Lots 5 in both Block 1 and 2 could meet engineering requirements for building on those lots and the cul-de-sac failed, what would the City commit to do to ensure access? It seemed that the City certainly had a vested interest in the integrity of streets and utilities in the subdivisions; therefore, the entire subdivision should be considered.

DISCUSSION

Mr. Shaver said that restrictions could not be imposed to retrofit the subject subdivisions since they were constructed to County standards. With regard to the Code requirements Mr. Shaver said that there were two not three; changes in conditions which occurred after final and changes in the development policy of the community. He said that meeting the condition of "change in conditions," is demonstrated by the failure on El Monte; the change in development policy is that the staff and the Commission are now more aware of the need for engineered foundations.

Commissioner Nall asked Mr. Hynes if a site-specific approach would provide adequate remedy or did the City need to consider a more broad-based approach? Mr. Hynes said that there was a possibility with the current situation to get owners of lots located along Promontory Court to combine their efforts to come up with a common solution which could improve the stability of the area overall while saving money in the process. He suggested an aggressive subsurface moisture collection and conveyance system as one possible option.

Chairman Elmer said that a number of indications existed to encourage property owners to look further. Although falling within the Architectural Control Committee's (ACC) purview, the ACC did not have the expertise to make the level of geotechnical judgments necessary to render an accurate geological conclusion. The City would provide a higher level of review.

Commissioner Ainsworth asked if the City would require a different type of testing than what was already being undertaken. Planning commissioners agreed that all lots located along the bluff had the potential for instability. Mr. Shaver provided clarification on this point.

Commissioner Dibble said that by raising the review to a higher standard, the City would have the opportunity of preventing another occurrence similar to that of 2296 El Monte

Court. Had plans come under City scrutiny prior to their original approval, the currently requested level of review probably would have been required at that time.

Commissioner Nall expressed concern over the site-specific requirement and possible conflicts which might arise in expert opinions. And what would happen if the mitigation of one lot created problems for another lot?

Commissioner Grout said that in his experience most of the reports generated were fairly consistent in their findings.

Mr. Hynes offered that, as one option, a special "management zone" all along the bluff on the south side of the river, from the eastern city limits to its western boundary, be implemented. Where lots weren't in imminent development or failure, he suggested convening a board of vested parties to come up with a management tool that would encompass areas of concern.

MOTION: (Commissioner Grout) "Mr. Chairman, on item FPA-2000-065 and FPA-2000-066, I move we amend the final plans for Vista Del Rio, Filings 2 and 3, and South Rim Filing 4 as recommended by staff."

Commissioner Dibble seconded the motion. A vote was called and the motion passed unanimously by a vote of 6-0.

GENERAL DISCUSSION

Ms. Portner said that City and County staffs were currently undertaking update of the Orchard Mesa Neighborhood Plan. Copies of a meeting schedule were distributed to Planning Commissioners.

With no further business, the hearing was adjourned at 11:50 p.m.

CITY OF GRAND JUNCTION
GRAND JUNCTION, COLORADO

FOR	)	PLANNING COMMISSION DECISION
City of Grand Junction	)	FPA-2000-065

On April 18, 2000 the Planning Commission approved the City's application for a major amendment to the approved plans for Vista Del Rio Subdivision, Filings 2 and 3. The change now requires a site and structure specific geotechnical investigation; observation and analysis by a Colorado registered professional engineer prior to the City issuing a planning clearance/building permit.

This decision was made after considering all the pertinent testimony and reviewing the data and applies to Vista del Rio, Filing 2, Block 1, Lot 5 and Block 2, Lot 5 and Vista del Rio, Filing 3, Lots 10, 11, 12 and 13. The plan as amended now also requires that the planning clearance/building permit shall be issued only on condition that the applicants engineer design, inspect and supervise the excavation and construction and certify at the conclusion of construction, that the site and structure was constructed in accordance with the engineer's approved design.

I hereby declare that the Planning Commission concluded the same at a duly noticed and constituted hearing held in accordance with the code, laws, rules and regulations of the City of Grand Junction.

Katherine M. Portner, AICP
Planning Manager

FEE $	10.00
TCP $	None
SIF $	292.00

PLANNING CLEARANCE

(Single Family Residential and Accessory Structures)

Community Development Department

BLDG PERMIT NO. 88595

Your Bridge to a Better Community

For Report see File MSC-2003-087

BLDG ADDRESS 2287 Vista Rio Court

SQ. FT. OF PROPOSED BLDGS/ADDITION 1700 Finished / 1000 unfinished

TAX SCHEDULE NO. 2945-071-34016

SQ. FT. OF EXISTING BLDGS 0

SUBDIVISION Vista Del Rio

TOTAL SQ. FT. OF EXISTING & PROPOSED 1700

FILING 3 BLK _____ LOT 16

NO. OF DWELLING UNITS:
Before: 0 After: 1 this Construction

(1) OWNER Larry Manchester

NO. OF BUILDINGS ON PARCEL
Before: 0 After: 1 this Construction

(1) ADDRESS _____

USE OF EXISTING BUILDINGS _____

(1) TELEPHONE 260-7867

DESCRIPTION OF WORK & INTENDED USE New Residence

(2) APPLICANT Bemis + Harrell

TYPE OF HOME PROPOSED:
X Site Built ____ Manufactured Home (UBC)
____ Manufactured Home (HUD)
____ Other (please specify) _____

(2) ADDRESS P.O. Box 3648

(2) TELEPHONE Steven 241-9764

REQUIRED: One plot plan, on 8 ½" x 11" paper, showing all existing & proposed structure location(s), parking, setbacks to all property lines, ingress/egress to the property, driveway location & width & all easements & rights-of-way which abut the parcel.

☞ THIS SECTION TO BE COMPLETED BY COMMUNITY DEVELOPMENT DEPARTMENT STAFF ☜

ZONE PD

Maximum coverage of lot by structures _____

SETBACKS: Front 20' from property line (PL)
or ____ from center of ROW, whichever is greater

Permanent Foundation Required: YES X NO ____

Parking Req'mt 2

Side 10' from PL, Rear 20' from PL

Special Conditions Please see attached Letter

Maximum Height _____

CENSUS _____ TRAFFIC _____ ANNX# _____

Modifications to this Planning Clearance must be approved, in writing, by the Community Development Department. The structure authorized by this application cannot be occupied until a final inspection has been completed and a Certificate of Occupancy has been issued, if applicable, by the Building Department (Section 305, Uniform Building Code).

I hereby acknowledge that I have read this application and the information is correct; I agree to comply with any and all codes, ordinances, laws, regulations or restrictions which apply to the project. I understand that failure to comply shall result in legal action, which may include but not necessarily be limited to non-use of the building(s).

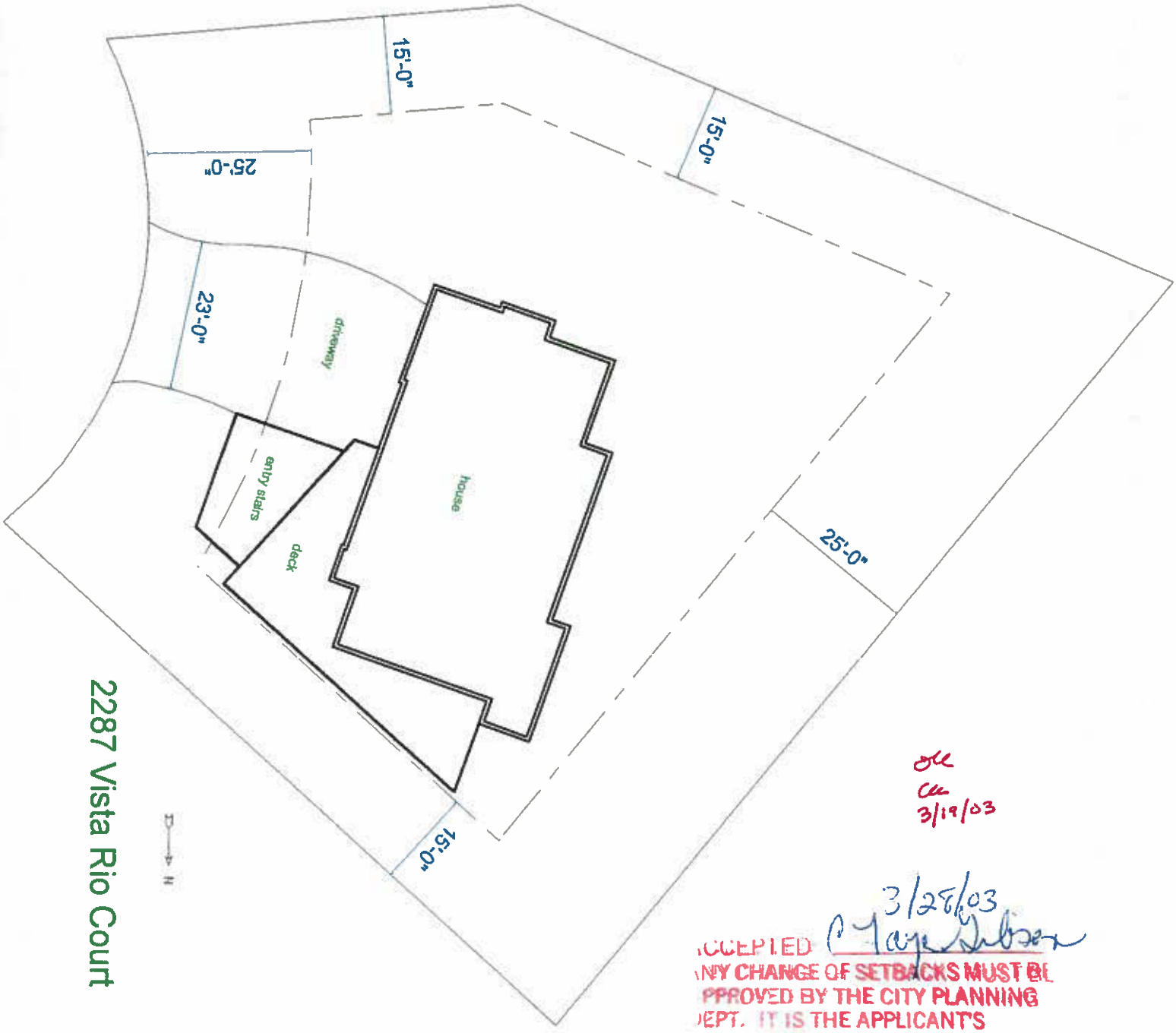
Applicant Signature Steven Harrell Super Date 3/19/03

Department Approval Faye Dibson Date 3/28/03

Additional water and/or sewer tap fee(s) are required:	YES X	NO	W/O No. 15869
Utility Accounting		Date 3/28/03	

VALID FOR SIX MONTHS FROM DATE OF ISSUANCE (Section 9-3-2C Grand Junction Zoning & Development Code)

(White: Planning) *(Yellow: Customer)* *(Pink: Building Department)* *(Goldenrod: Utility Accounting)*



2287 Vista Rio Court

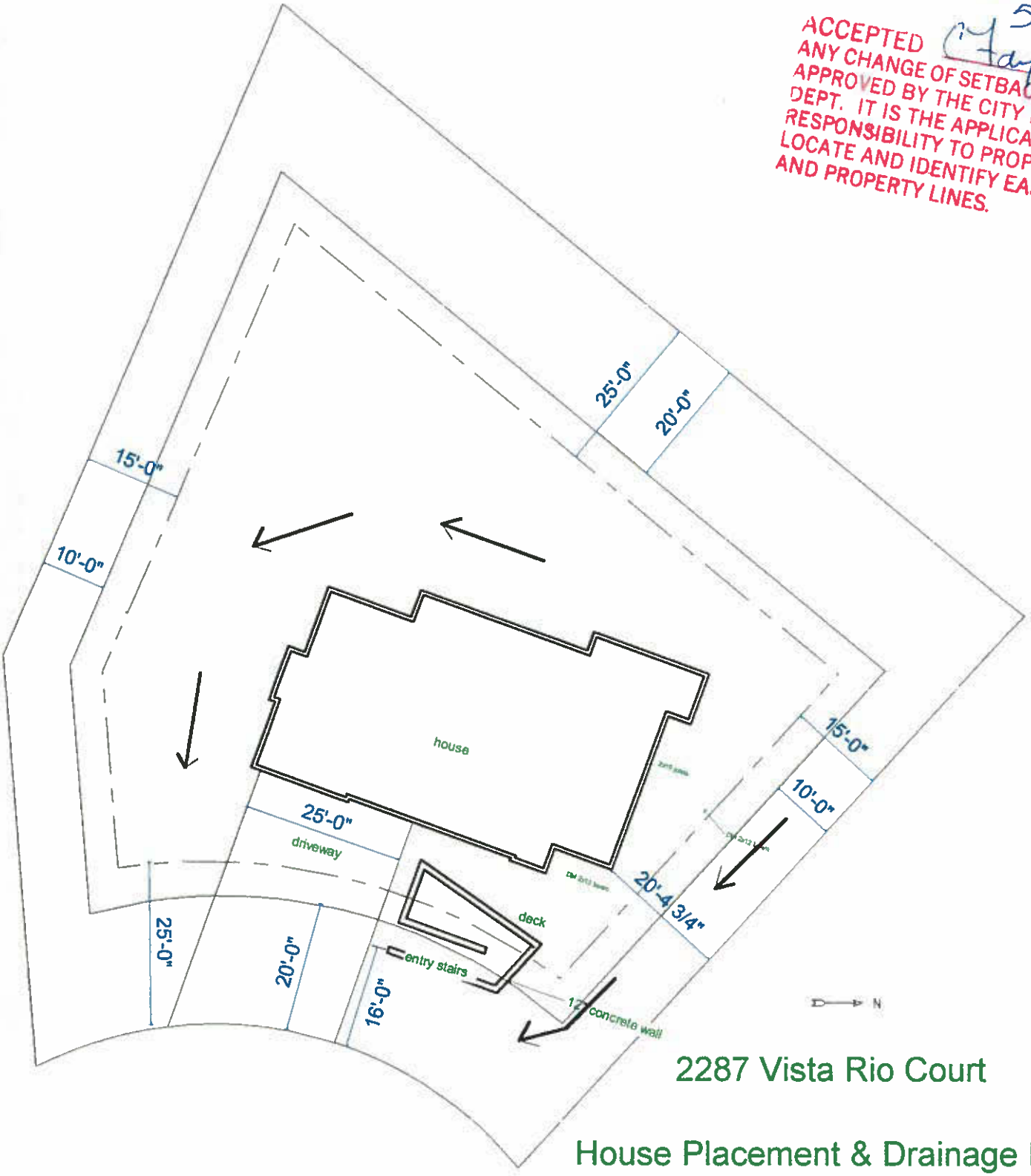
OK
CM
3/19/03

3/28/03

ACCEPTED
ANY CHANGE OF SETBACKS MUST BE APPROVED BY THE CITY PLANNING DEPT. IT IS THE APPLICANT'S RESPONSIBILITY TO PROPERLY LOCATE AND IDENTIFY EASEMENTS AND PROPERTY LINES.

Revised
5/30/03

ACCEPTED
ANY CHANGE OF SETBACKS MUST B
APPROVED BY THE CITY PLANNING
DEPT. IT IS THE APPLICANT'S
RESPONSIBILITY TO PROPERLY
LOCATE AND IDENTIFY EASEMENTS
AND PROPERTY LINES.



2287 Vista Rio Court

House Placement & Drainage Plan

File

City of Grand Junction

Community Development Department
Planning • Zoning • Code Enforcement
250 North 5th Street
Grand Junction, CO 81501-2668

Phone: (970) 244-1430
FAX: (970) 256-4031

April 9, 2003

Margaret S. Doose
P.O. Box 515
Ouray, CO 81427

Re: 570 Casa Rio Court, Vista del Rio subdivision Grand Junction CO

Dear Ms. Doose:

As you know the Planning Clearance for 570 Casa Rio Court, Lot 10, Filing 3 of Vista del Rio subdivision was expressly conditioned on and subject to meeting the requirements of the amended plan for the subdivision. The subdivision plan was amended in April of 2000 and provides the following:

> The plan as amended now also requires that the planning clearance/building permit shall be issued only on condition that the applicant's engineer design, inspect and supervise the excavation and construction and certify at the conclusion of construction, that the site and structure was constructed in accordance with the engineer's approved design.

After meeting with members of the City staff concerning the slope failure and subsidence concerns documented in your engineer's report, your engineers supplemented the record with correspondence. During the process of understanding the risk presented by Lot 10 you recorded a declaration (a copy of which is attached) in the chain of title to the property. While I understand that your attorney and Mr. Shaver of the City Attorney's Office did not come to full agreement on the provisions of the declaration, I find that the declaration that you recorded coupled with the additional work done by your engineer satisfies the development condition. Therefore, the home on 570 Casa Rio Court may be lawfully occupied subject to final inspection and approval by the Mesa County Building Department.

By finding that the development condition has been satisfied the City does not warrant the safety of the home or the lot. The geotechnical report dated May 22, 2002 prepared by your engineer states several recommendations for site preparation, construction and monitoring of the lot. Among other things the report stressed the importance of managing and conveying the storm water runoff that originates from and/or is conveyed through and across your lot. The engineering report also specifically recommended a continual inspection program to among other things "ensure that the structure is not compromised." The frequency of such inspections was recommended ("shall not be"-see paragraph F of the report) to be no less than once a year. The report further provides that "...the edge of

the proposed home may be as close as 20 feet from preexisting fault lines. These features are similar in nature to the slope major collapse (sic) that occurred to the West." While this sentence is not perfectly clear it indicates to the City a serious potential for slope failure. In the same portion of the report your engineer states "Recently there has been a major slope failure to the west of this Lot." Some of the conditions stated or described in your engineer's report are restated or differently stated in the recorded declaration. It is incumbent on you to ensure compliance with the same.

I will forward a copy of this letter to the Building Department. If you have questions please feel free to call.

Robert E. Blanchard, AICP
Director of Community Development

pc: Eric Hahn, City Development Engineer
Bob Lee, Building Inspector
John Shaver, Assistant City Attorney

FEE $	10.00
TCP $	0
SIF $	292.00

PLANNING CLEARANCE

(Single Family Residential and Accessory Structures)

Community Development Department

BLDG PERMIT NO. 84767

Your Bridge to a Better Community

For Geotech Report See File MSC-2003-087

BLDG ADDRESS 570 Casa Rio Ct

TAX SCHEDULE NO. 2945-071-34-010

SUBDIVISION Vista Del Rio

FILING #3 BLK _____ LOT 10

(1) OWNER Peer and Margaret S. Doose

(1) ADDRESS PO Box 515 Query, CO 81427

(1) TELEPHONE 970-325-0470

(2) APPLICANT Same as above

(2) ADDRESS _____

(2) TELEPHONE _____

SQ. FT. OF PROPOSED BLDGS/ADDITION 2089 living 415 garage

SQ. FT. OF EXISTING BLDGS None

TOTAL SQ. FT. OF EXISTING & PROPOSED 2089 living 415 garage

NO. OF DWELLING UNITS:
Before: 0 After: 1 this Construction

NO. OF BUILDINGS ON PARCEL
Before: 0 After: 1 this Construction

USE OF EXISTING BUILDINGS NA

DESCRIPTION OF WORK & INTENDED USE New Home

TYPE OF HOME PROPOSED:
X Site Built ____ Manufactured Home (UBC)
____ Manufactured Home (HUD)
____ Other (please specify) _____

REQUIRED: One plot plan, on 8 ½" x 11" paper, showing all existing & proposed structure location(s), parking, setbacks to all property lines, ingress/egress to the property, driveway location & width & all easements & rights-of-way which abut the parcel.

☞ **THIS SECTION TO BE COMPLETED BY COMMUNITY DEVELOPMENT DEPARTMENT STAFF** ☜

ZONE PD

SETBACKS: Front 25' from property line (PL)
or ____ from center of ROW, whichever is greater

Side 15' from PL, Rear 20' from PL

Maximum Height _____

Maximum coverage of lot by structures _____

Permanent Foundation Required: YES____ NO ____

Parking Req'mt _____ THIS FC MUST BE ACCOMPANIED

Special Conditions BY GEOTECH RPT & PLANNING COMM DECISION FPA-2000-065 DMP

CENSUS _____ TRAFFIC_____ ANNX#_____

Modifications to this Planning Clearance must be approved, in writing, by the Community Development Department. The structure authorized by this application cannot be occupied until a final inspection has been completed and a Certificate of Occupancy has been issued, if applicable, by the Building Department (Section 305, Uniform Building Code).

I hereby acknowledge that I have read this application and the information is correct; I agree to comply with any and all codes, ordinances, laws, regulations or restrictions which apply to the project. I understand that failure to comply shall result in legal action, which may include but not necessarily be limited to non-use of the building(s).

Applicant Signature Margaret S. Doose Date 4-16-02

Department Approval C. Faye Dibson Date 5/29/02

Additional water and/or sewer tap fee(s) are required:	YES ✓	NO	W/O No. 49624
Utility Accounting D Vanover		Date 5-29-02	

VALID FOR SIX MONTHS FROM DATE OF ISSUANCE (Section 2.2.C.1.c(1) Grand Junction Zoning & Development Code)

(White: Planning) *(Yellow: Customer)* *(Pink: Building Department)* *(Goldenrod: Utility Accounting)*

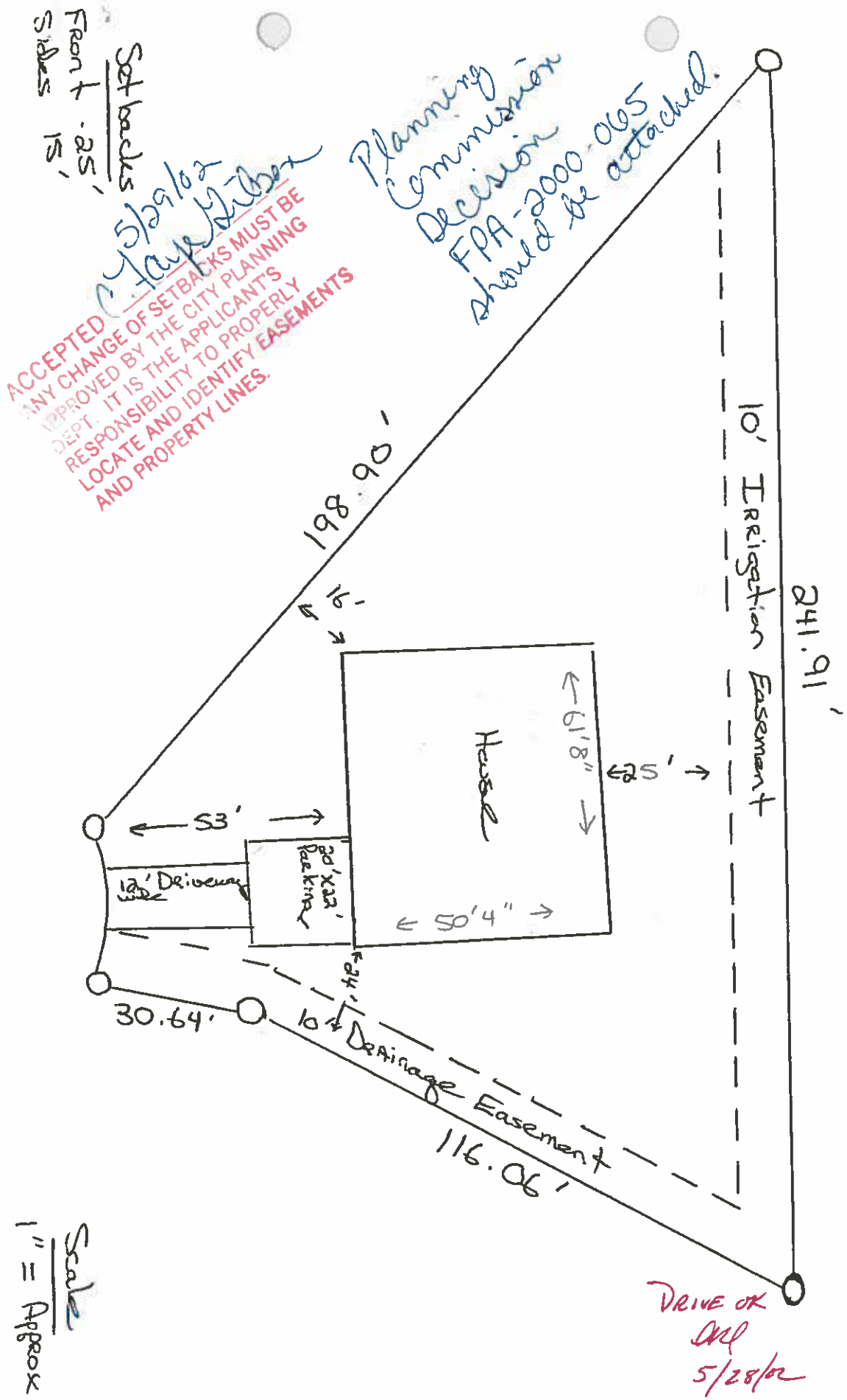
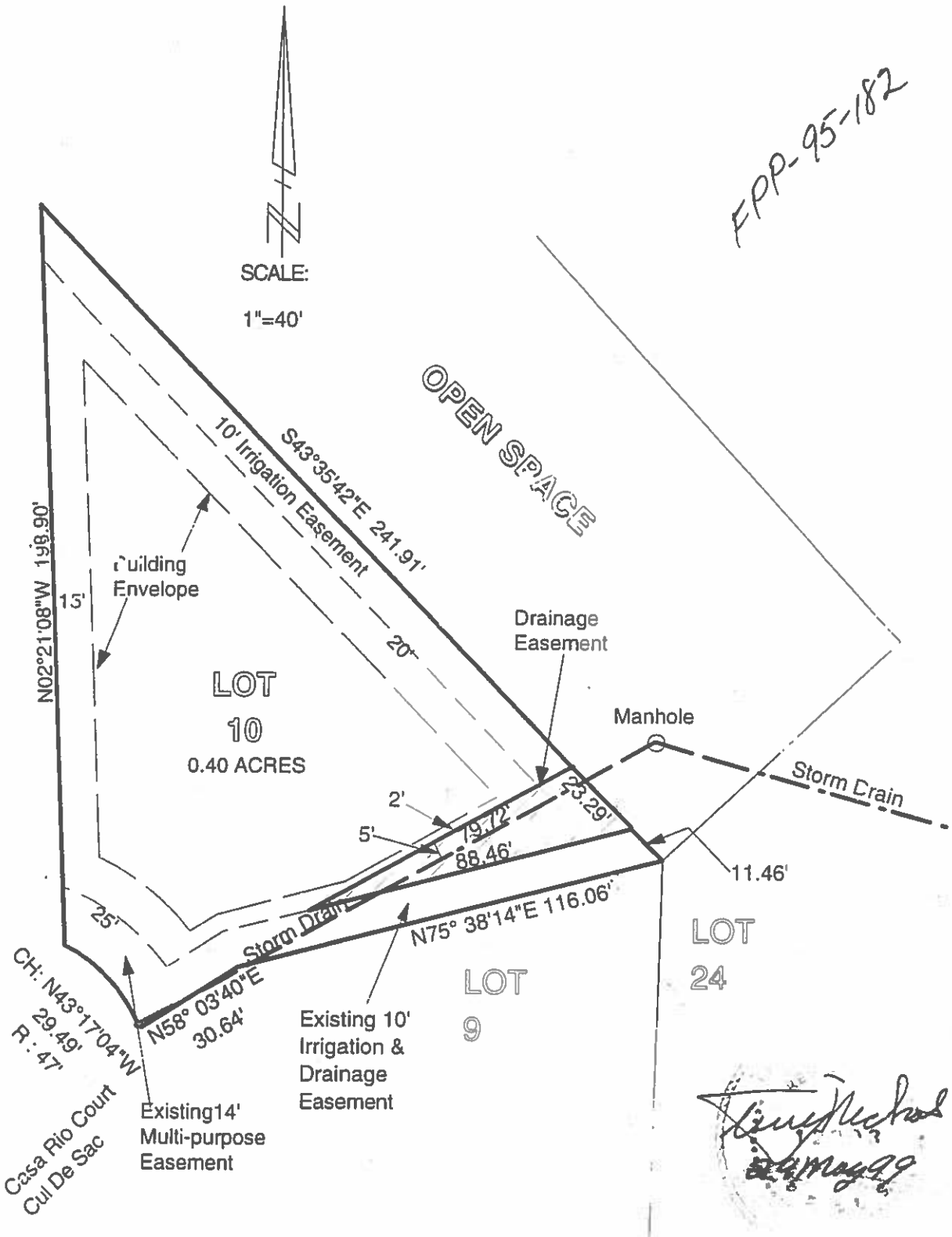

Setbacks
Front - 25'
Sides 15'
5/29/02
ACCEPTED
ANY CHANGE OF SETBACKS MUST BE APPROVED BY THE CITY PLANNING DEPT. IT IS THE APPLICANT'S RESPONSIBILITY TO PROPERLY LOCATE AND IDENTIFY EASEMENTS AND PROPERTY LINES.
Planning Commission Decision FPA-2000-065 should be attached.
198.90'
241.91'
10' Irrigation Easement
16'
House
61'8"
25'
53'
12' Driveway
20' x 22' Parking
50'4"
14'
30.64'
10' Drainage Easement
116.06'
Scale
1" = Approx. 30'
DRIVE OK
5/28/02

EXHIBIT - A
Drainage Easement Dedication
Lot 10, Vista Del Rio Subdivision Filing Three
Grand Junction, CO

FPP-95-182



Prepared by Nichols Associates, Inc. 8 Jan 1998

2 PAGE DOCUMENT

BOOK3297 PAGE241
2108904 03/10/03 0254PM
JANICE WARD CLK&REC MESA COUNTY CO
RECFEE $10.00 SURCHG $1.00

DECLARATION

Margaret Susan Doose ("Declarant") is the owner of Lot 10, Filing 3, Vista del Rio Subdivision, Mesa County, Colorado also known as 570 Casa Rio Ct., Grand Junction, Colorado.

Information concerning the lot and improvements thereon, including a Subsurface Soil Exploration Report dated April 9, 1994, by Lincoln - DeVore, Inc. of Grand Junction, a Slope Stability Study prepared in May, 2002 by Allied Independent Consultants, Inc. of Grand Junction, a Soils Report prepared in May, 2002 by Allied Independent Consultants, Inc. of Grand Junction, together with building and drainage plans and all related correspondence, are available for inspection at the City of Grand Junction, Community Development Dept, 250 No. 5th St., Grand Junction, CO and at the Mesa County Building Dept, 750 Main St., Grand Junction, CO.

In order to ensure that the structure on the lot is not compromised, Declarant hereby adopts and imposes upon said Lot 10 the following conditions, restrictions and covenants:

1. Declarant and any successor in title shall annually have an inspection performed on Lot 10 and the structures and appurtenances thereon to determine whether there exist any indication of slope/geotechnical failure. The annual inspection shall be due in May, 2003 and each year thereafter;

2. Declarant and any successor in title shall notify the homeowners association and the Mesa County Building Department, in writing, if the reporting engineer's opinion as stated in the annual inspection(s) reveals, shows or discloses any subsidence, slope failure, instability or compromise of Lot 10 and/or the structure(s) and appurtenances thereto;

3. Any irrigation system installed on the Lot shall comply with all applicable planning and building regulations then in effect. No irrigation system shall be installed without all necessary permits, clearances and approvals;

4. Only xeriscape (drip) landscaping shall be permitted within ten feet of the house or retaining wall;

5. Neither the City of Grand Junction nor Mesa County shall have any liability for the use and occupancy of 570 Casa Rio Ct.

These conditions, restrictions and covenants shall run with the land and shall be binding upon all future owners of said Lot 10. Acceptance of title to said Lot 10, Filing 3, Vista del Rio Subdivision by any future owner shall constitute irrevocable acceptance of all of the terms of these conditions, reservations, restrictions and covenants.

In witness whereof I have set my hand this 7th day of February, 2003.

Margaret Susan Doose

Margaret Susan Doose

State of Colorado:
County of Mesa:

The foregoing instrument was acknowledged before me by Margaret Susan Doose this 14th day of February, 2003. Witness my hand and seal. My commission expires 12/4/04.

Paul C. Sunderland
Notary Public

PAUL C. SUNDERLAND
NOTARY PUBLIC
STATE OF COLORADO
My Commission Expires

PAUL C. SUNDERLAND
ATTORNEY
2538 Dahlia Drive
Grand Junction, CO 81506
(970) 243-6215
Fax (970) 263-7960

TELECOPIER COVER SHEET

DATE: 2-14-03

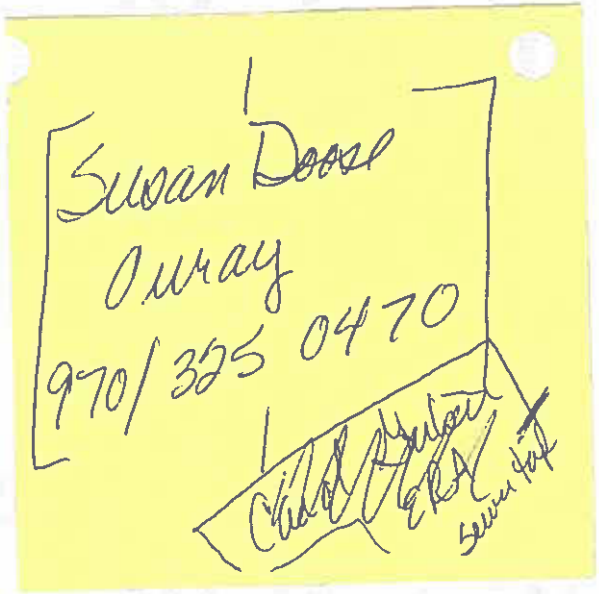
TIME SENT: _____

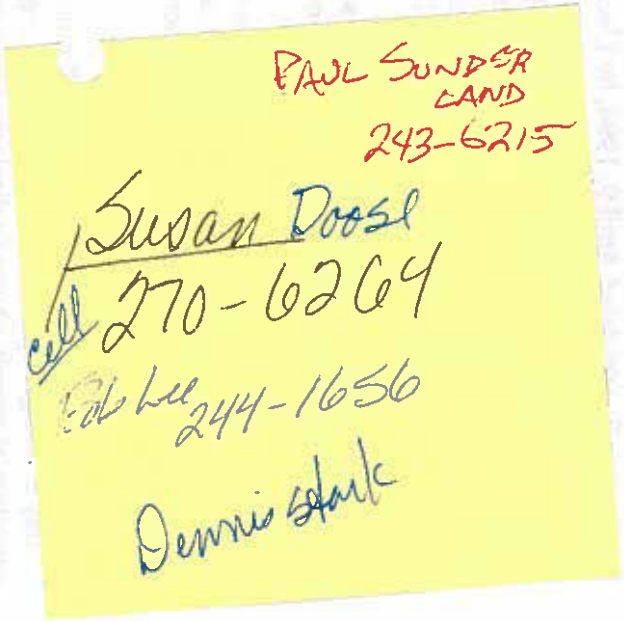
TO: ERIC HANN

Total No. of Pages (incl. cover sheet): 5

Remarks: FOR YOUR INFO.

If there are problems with this transmission,
please call 970-243-6215.


Susan Doose
Olney
970/ 325 0470


PAUL SUNDER
LAND
243-6215
Susan Doosl
cell 270-6264
244-1656
Dennis Stark

A.I.C.
Allied Independent Consultants - Grand Junction, Inc.

303 North Avenue
P.O. Box 41049
Grand Junction, CO 81504
970 -244-8703
Fax - 970-243-2681

Residential Site Geotechnical Report
With Slope Stability Study

prepared by: Chris Steven Russell, PG, PE

570 Casa Rio Court
Grand Junction, Colorado

May 22, 2002

Summary

This office has conducted a geotechnical investigation for the referenced location upon the request of Susan Doose. Two boreholes were examined on this site to approximately 20 feet below ground level and the following soil profile was encountered:

0'- 20' Fine grained red silty sand with cobble

The surface design soils on this site appear to be fill and require compaction. It is recommended that the foundation for the proposed residence at this address be designed as a monoslab over compacted native soil. The site shall be overexcavated to the necessary depth and compacted to 95% of the standard proctor maximum dry density.

The design proposed herein is recommended due to economics and relative stability. Typically, extreme soil conditions are not designed for in the Grand Valley. Since some movement of the home may be encountered, the owner should follow certain guidelines to help minimize this movement. Guidelines for maintaining stable conditions are found in "A Guide to Swelling Soils for Colorado Home Buyers and Homeowners, Special Publication 43, Colorado Geological Society, The Day the House Fell: Homeowner Soil Problems from Landslides to Expansive Clays and Wet Basements, Richard L. Handy, ASCE Stock # 40104, the subdivision soils report and this report. Upon first evidence of cracks in drywall, concrete, or other like items, the homeowner should seek a professional engineer to evaluate the problem and prescribe mitigative efforts. It is our experience that most problems may be mitigated with a small effort when they are found in the initial stages.

Purpose

The purpose of this report is to inform the owner, builder, and engineer of potential geotechnical hazards and typical soil design properties at the referenced site. This report is submitted for use to build one single story residential structure at this address. The use of this report is solely for this purpose.

General Site Characteristics

This site is located on the southside of Grand Junction, Colorado in the Redlands (Figure 1). This area is part of the Uncompahgre Uplift (Figure 2). This site rests on the northern flank of this feature. The nearest structural feature to this area is the Redlands Fault (Figure 3). The area is considered structurally inactive albeit minor earthquakes do occasionally occur in the area. This site sets over alluvium broadcast from the Monument which overlays the Mancos or Dakota Formation (Figure 4). The Soil Conservation Service indicates that the soil found on this site is the Redlands and Mesa soils over bedrock (Figure 5).

The site lays on a slight grade that slopes downward to the North. Storm runoff from the site should be directed to the North toward the Colorado River.

Discussion of Soil Properties

A. General Site Characteristics

1. Soil Classifications: The design soil located below the topsoil is a silty sand. The typical soil properties are as follows:

Borehole #1 – 2' below grade
LL = NL
PL = NP
PI = NA
Passing 200 sieve – less than 50%

2. Geologic Hazards: Unstable Slopes – discussed herein.

3. Potential Unstable Slopes: Yes.

4. Swell Potential: The site's design soil does not exhibit a swell characteristic. The underlying shale may exhibit static swell pressures in excess of 5,000 psf. This formation was not encountered at 20' below grade.

5. Consolidation Potential: The site's design soil has a moderate consolidation characteristic.

6. Water Table: Standing water was not found in the boreholes at approximately 20 feet below ground level. Soils showed to be moist to dry in these holes. The site's water table may rise in the future as more homes are built and begin irrigating their landscape.

7. Corrosivity: All concrete and buried material should be designed to resist corrosion due to local alkaline soil.

8. Rock Outcrops: Bedrock is noted on the bank above the Colorado River.

9. Gamma Radiation: Gamma radiation was not measured.

B. Grading and Excavation Considerations

1. Potential Construction Difficulties: No potential construction difficulties are anticipated.

2. Suitability of Native Material for Trench Backfill and Structural Fill: The native material is suitable for bedding and trench backfill if the larger rocks are removed in the immediate vicinity of the installed utility. The native material is also suitable for structural fill. The engineer, prior to use, shall approve all fill material.

3. Compaction of Subgrades and Fills: All fill and subgrade is to be compacted to 95% of ASTM D 698 maximum dry density as specified. This fill should be tested at minimum 1' lifts to ascertain that compaction standards are met.

C. Retained Earth Information

1. Lateral Earth Pressures: No retaining features are anticipated.

2. Coefficient of Friction to Lateral Movement: The coefficient of friction for the silty sand type soil is typically in the range of 0.4-0.7, depending on moisture content.

3. Backfill Compaction: The backfill compaction should be a minimum of 90% of ASTM D 698.

D. Foundations

1. Allowable Bearing Pressures: The allowable bearing pressure for the silty sand is 1500 psf.

2. Soil Weights: The soils usually test a dry density of 115 pcf at 10% moisture content near the surface.

3. Types of Foundations: It is proposed to use a monoslab foundation. The site shall be overexcavated to the bottom of fill and recompacted to surface. Both this study and the study by Lincoln-Devore in 1997 (included herein) show that the site's surface soils are unconsolidated. The unconsolidated soils under the foundation shall be compacted to 95% of the standard proctor maximum dry density.

The footing shall be designed as follows:

Minimum Depth of Pitrun:	N/A
Minimum Deadload:	N/A
Maximum Bearing on Soil:	1500 psf
Stem Wall Span (simply supported):	N/A

A monoslab should more evenly distribute the weight of the home over the site. This factor should mitigate potential slope failures. It is recommended that the monoslab is ribbed. The ribs will help mitigate foundation failure in the event slight settlement is encountered.

4. Perimeter Drains and Groundwater: All runoff water should be diverted from the building site. Gutters should be used around the perimeter of the roof. The use of v-pans and/or french drains is strongly recommended at each gutter termination. V-pans and like items should transport water away from the building for a minimum of 5' prior to release into soil. The best practice is to drop roof runoff to the concrete garage driveway, which in turn drops water to the street gutter or like conveyance.

E. Drainage and Irrigation

1. Permeability: The "SM" type soil permeability is nearly 2.5 x 10^{-5} cm/sec.

2. Hydrologic Soil Group: The "SM" type soil is a "B" type soil, which has good infiltration rates when thoroughly wet.

3. Irrigation Practices: Limited planting is recommended within 5' of the perimeter of the house. Excessive watering is not recommended in any case and may lead to differential movement of the foundation.

3. Grades around Buildings: It is recommended that the grades around buildings are at least 10% for 10' extending from the perimeter of the building.

F. Slope Stability

It was found that the edge of the proposed home may be as close as 20 feet from preexisting fault lines (Figure S1). These features are similar in nature to the slope major collapse that occurred to the West. It is recommended that this site is inspected on a continual basis to ensure that the structure is not compromised. The frequency of these inspections shall not be less than one year. The owner shall inform the geotechnical

engineer upon the initiation of any new tension crack in the soil or of any cracks in the residence.

Lincoln-Devore noted that the slope bordering the river to the north of this site was unstable in the subdivision's soil report. The map (Figure S2) indicates that the area to the northeast of this Lot ,which contains vertical slopes, is unstable. A small area on this Lot, southwest of the vertical slopes, was marked by Lincoln-Devore as an area that required geotechnical review. The rest of the Lot, as well as the proposed building site, was mapped as an area of stable slopes.

Recently, there has been a major slope failure immediately to the west of this Lot. This area was marked by Lincoln-Devore as unstable and as an area that required geotechnical review. The home that was placed on the slide area is considered a total loss. Our firm was retained by one of the law firms that were engaged in the large lawsuit filed by the owners of the home.

!! Given the recent soil movement in the vicinity, there is a distinct possibility that a slide may occur near this Lot. It has been our experience that slides generally do not suddenly occur. Evidence of minor movement is noted prior to any major movement. Steps may be taken, upon evidence of minor movement, to mitigate slide damage to the home. This may include pinning of the slope through the slide surface.

G. Borings

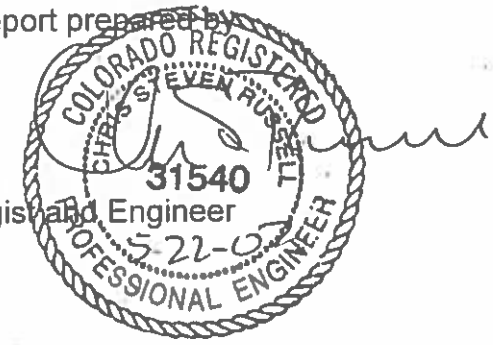
1. Two geotechnical test boreholes were drilled on this site.

Limitations

The content of this report is based on subsurface and surface observations made at the time of the site investigation. The content of this report is also based on laboratory testing and professional literature. Subsurface observations and lab tests results are point-site specific. Subsurface conditions often change in a site both horizontally and vertically. Therefore, depending on the amount of testing and boring performed the resulting data and interpretation thereof may or may not represent the overall site conditions. No warranty or representation either expressed or implied is included or intended in this report.

We recommend that a qualified professional read this report and discuss any portion necessary with us in order that the proper design of the structure may be implemented. Minimum design criteria are given herein, it is the designer's responsibility to use the appropriate safety factors. We recommend that a geotechnical inspection be performed once the site is excavated in order to appraise the findings of this report. The findings of this report are valid for 2 years due to changes in engineering practice.

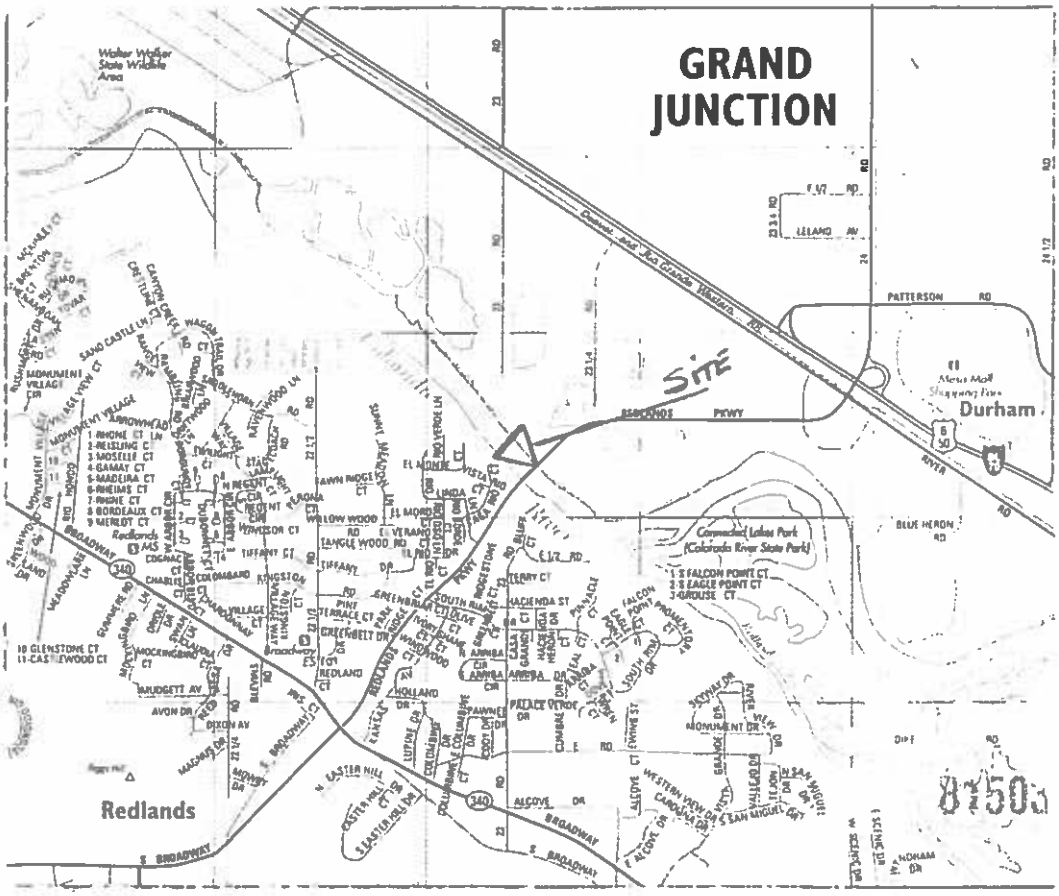
Geotechnical Investigation Report prepared by:



Chris Steven Russell
Colorado Professional Geologist and Engineer
A.I.C. - Grand Junction, Inc.

APPENDIX

Vicinity Map



Geotechnical Report
Doose Residence
570 Casa Rio Ct., Grand Jct., CO

A.I.C. - GRAND JCT., INC.
ALLIED INDEPENDENT CONSULTANTS
303 North Ave.
GRAND JUNCTION, CO 81504
PHONE (970) 244-8703 FAX (970) 243-2681

A-1

Figure 1

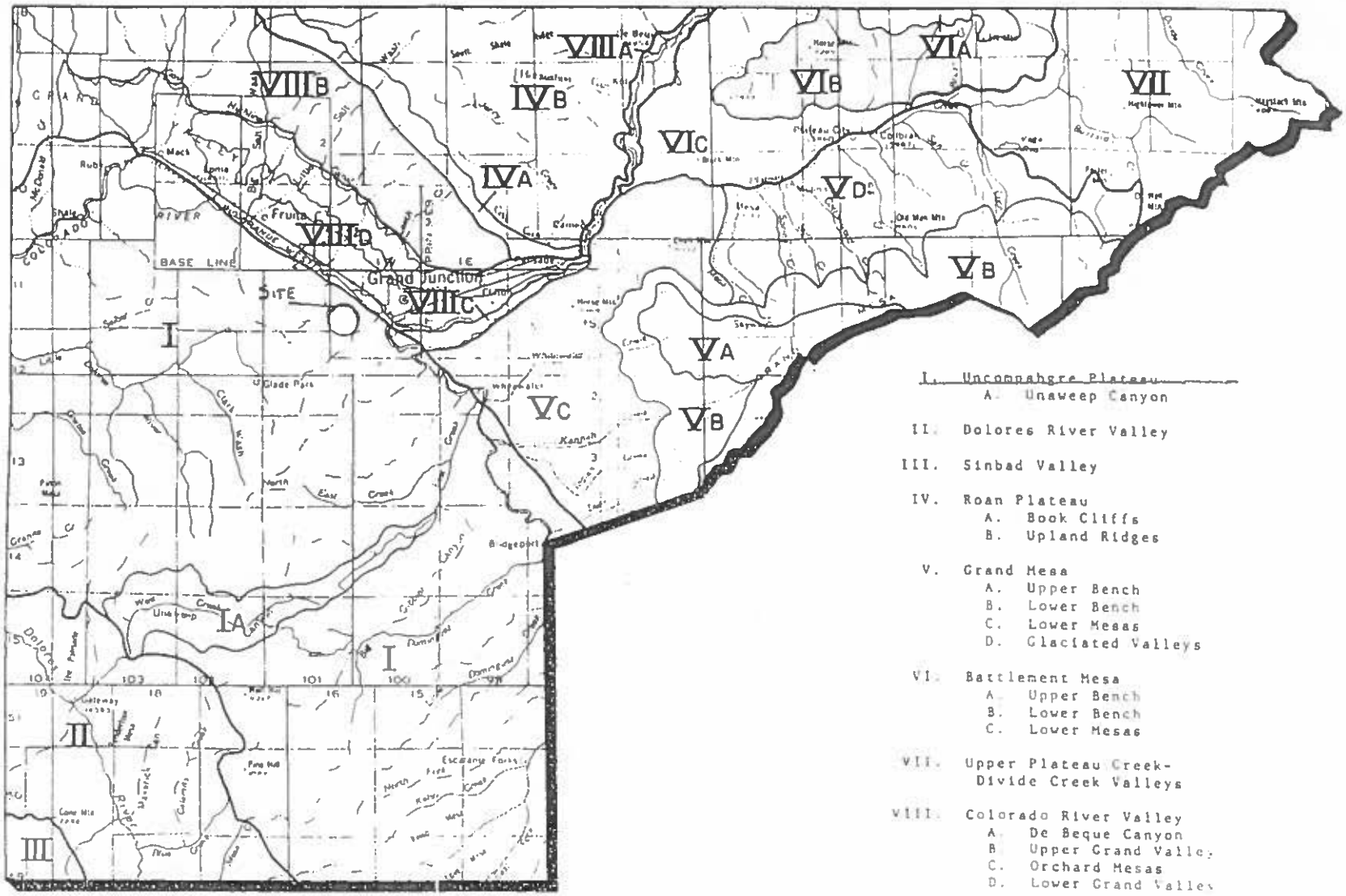
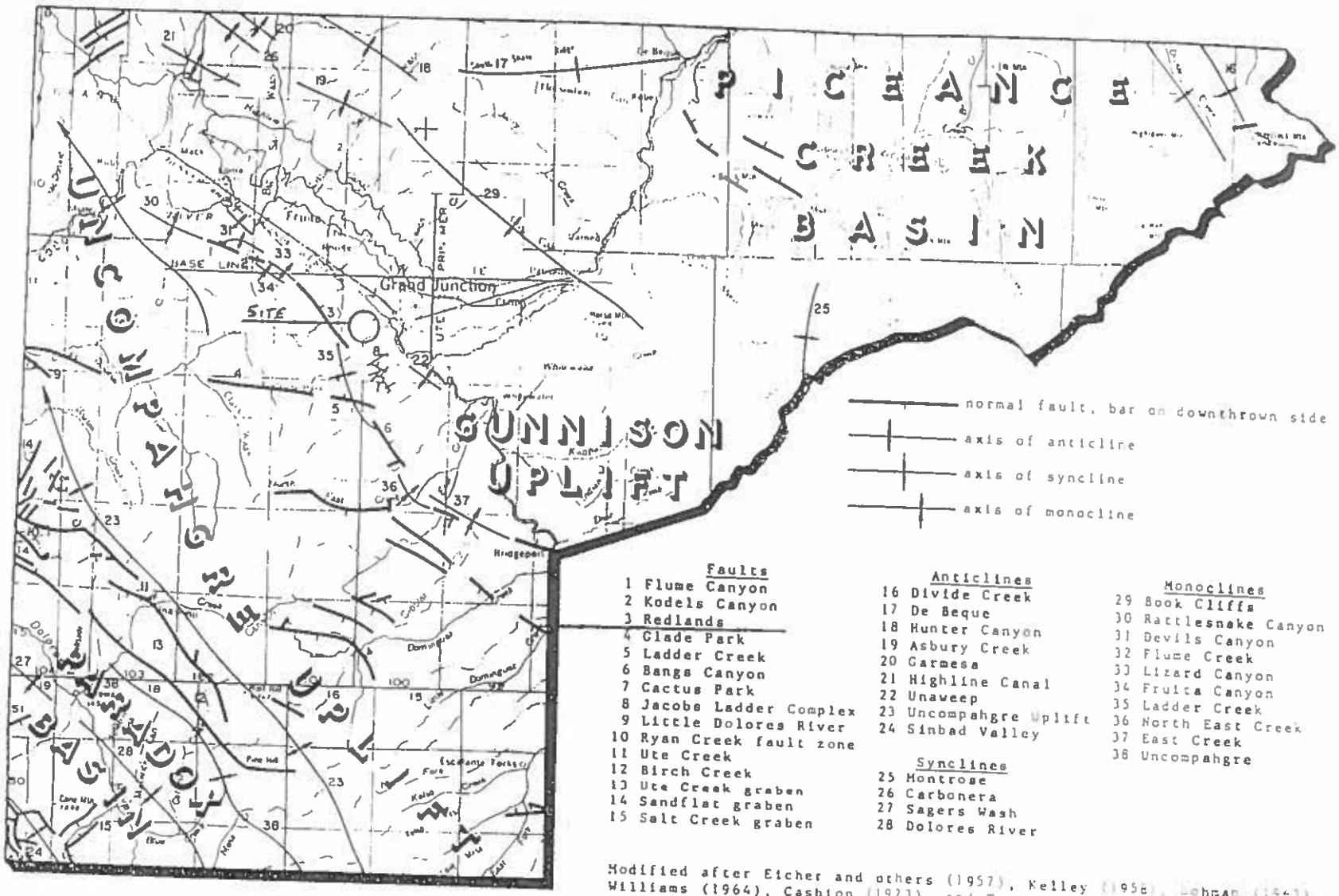


Figure 2

PHYSIOGRAPHY



Modified after Eicher and others (1957), Kelley (1956), Lohman (1965), Williams (1964), Cashion (1973), and Tweto and others (1976)

Figure 3

STRUCTURE

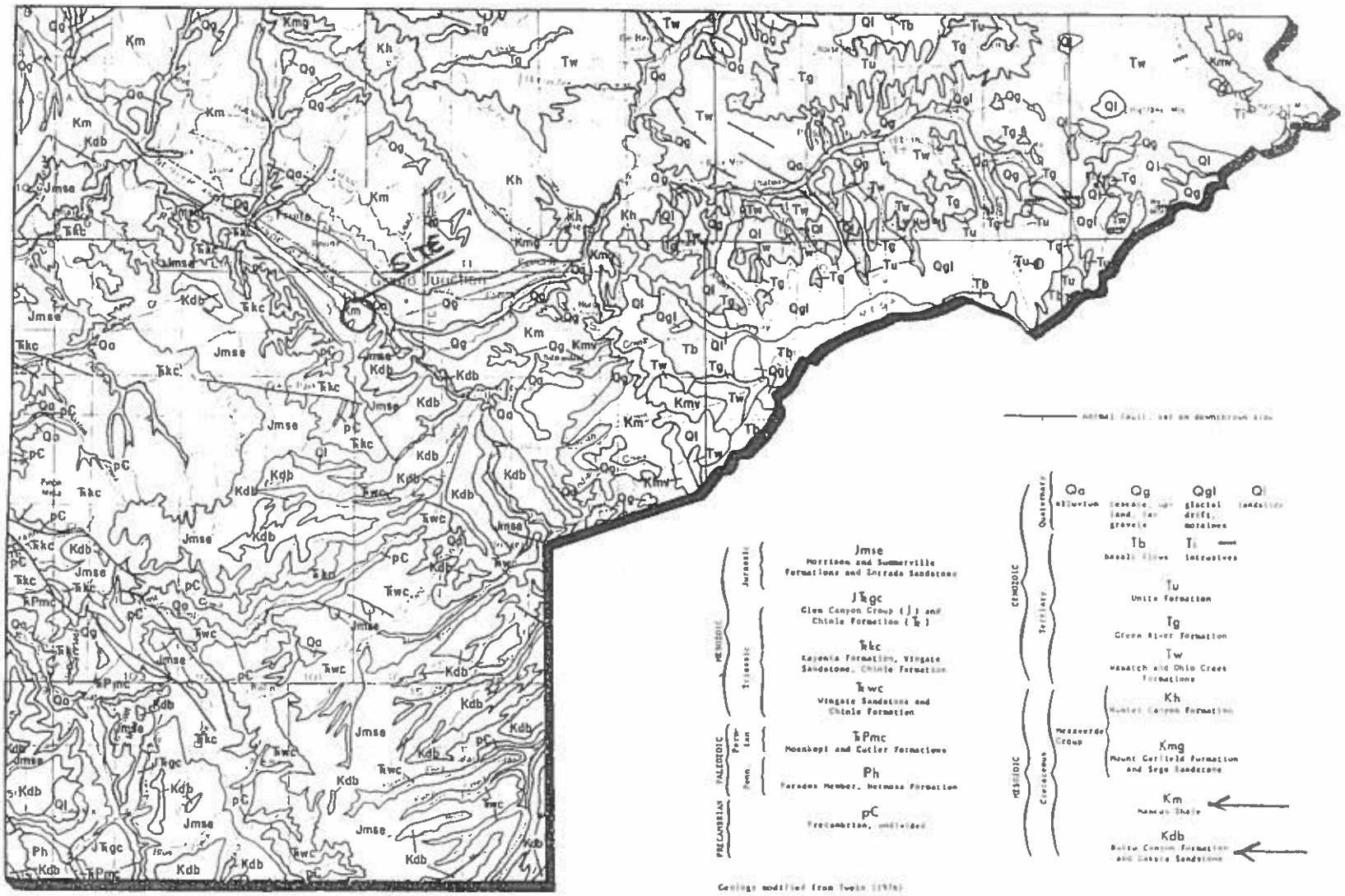
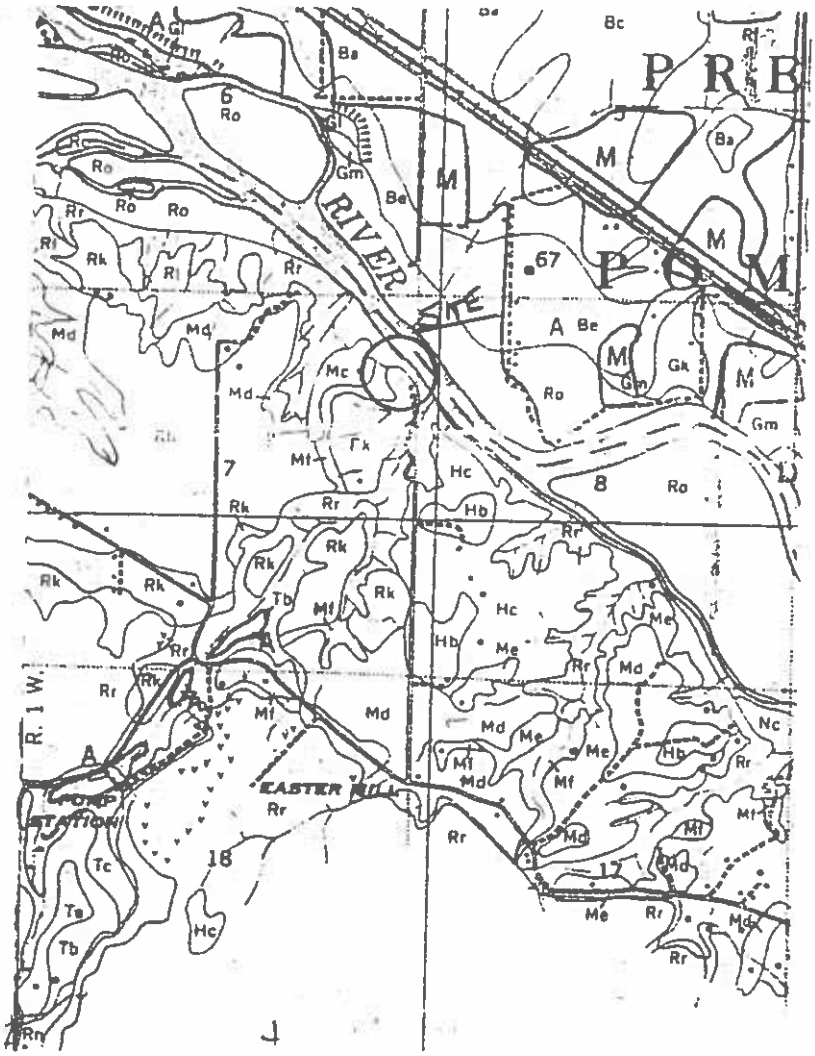


Figure 4

GEOLOGY

SCS Soils Map



Geotechnical Report
Doose Residence
570 Casa Rio Ct., Grand Jct., CO

A.I.C. - GRAND JCT., INC.
ALLIED INDEPENDENT CONSULTANTS
303 North Ave.
GRAND JUNCTION, CO 81504
PHONE (970) 244-8703 FAX (970) 243-2681

A-1

Figure 5

layers underlain by pale-yellow to light-gray subsoil layers of heavy loam. The texture is fairly uniform from the surface down to depths of 4 to 6 feet, or less variable than in the larger areas described in the preceding paragraph.

All areas of this soil have a friable and moderately permeable profile suitable for production of shallow- and deep-rooted crops. Surface runoff is slow, and internal drainage is medium. Well-disseminated lime is present throughout the profile. A few saline areas have developed because of local inadequate drainage and excessive use of irrigation water. The tilth is good in spite of the generally low organic-matter content.

Use and management.—Nearly 95 percent of this soil is cultivated. The chief crops are corn, beans, alfalfa, small grains, and tree fruits. Minor acreages are planted to potatoes, sugar beets, tomatoes, and vegetables. Somewhat more of this soil is in alfalfa and orchard fruits, but the proportionate acreage in the various crops is much the same as for Ravola very fine sandy loam, 0 to 2 percent slopes. Less than 3 percent of the acreage is in tree fruits. Larger areas near Clifton are used to some extent for tree fruits because the climate in that area is better for orchard crops than areas of this soil situated elsewhere.

The management for this soil is practically the same as for Ravola fine and very fine sandy loams. The organic-matter content can be improved by applying manure liberally and by planting legumes such as red clover, sweetclover, and alfalfa. Potatoes, cantaloups, and general truck crops are not so well suited to this soil as corn, clover, alfalfa, pinto beans, and tomatoes.

Redlands loam, 2 to 5 percent slopes (Rk).—This soil is associated with the Thoroughfare fine sandy loams in the Redlands westward from Grand Junction. It has moderately distinct profile layers, in contrast to the very indistinct layers in soils of the Thoroughfare series. It has a more pronounced reddish color than the Mesa soils. The soil material is alluvium derived mainly from sandstone but to lesser extent from shale and granite.

The 8- to 10-inch surface soil consists of light-brown to light reddish brown loam that is slightly hard when dry but very friable when moist. The upper subsoil, a light-brown to light reddish-brown somewhat finer textured loam, contains some white and pink limy spots and some white lime splotches. At depths of 20 to 24 inches, the light-brown to pink subsoil generally contains enough clay to be classed as either a loam or a light clay loam. At this depth, the subsoil is very highly calcareous; the most calcareous material is indicated by pinkish-white or white segregations of lime. Below a depth of 4 feet, the soil has a less reddish hue, becomes more sandy, and shows less visible evidence of lime accumulation.

Small granitic aggregates containing a high proportion of biotite and quartzite particles occur on the surface and throughout the profile. The areas nearest the natural drainageways have moderate quantities of gravel and cobblestones in the deep subsoil and the substratum. The areas in the southernmost parts of the Redlands are underlain at ths of 6 to 10 feet by sandstone but have few or no cobblestones he lower subsoil and substratum.

In spite o. .s low content of organic matter, this soil has good

insures adequate internal drainage. These characteristics, plus a moderate water-holding capacity, favor good root distribution. Saline areas are small and occur where the substratum holds excess irrigation water and forms a water table close to the surface. Massive sandstone bedrock too near the surface causes the water table in most places.

Use and management.—About 81 percent of this soil is cultivated. Approximately 12 percent of the total acreage under cultivation is in orchard fruits, mainly peaches. The soil is desirable for tree fruits but is more susceptible to late spring frosts than the Thoroughfare fine sandy loam soils. The greater danger of frost can be attributed to location. This soil lies in lower places nearest the Colorado River. The Thoroughfare fine sandy loams are on higher places nearer the bluffs. Alfalfa, corn, beans, sugar beets, and small grains are the chief field crops. The soil is well suited to tomatoes, potatoes, other vegetables, melons, and grapes, but only a small acreage is planted to these crops.

The productivity of this soil can be substantially increased by building up its supply of organic matter through application of barnyard manure or the turning under of legumes as green manure.

Redlands loam, 0 to 2 percent slopes (Rh).—Except for its gentler slopes, this soil has the same characteristics and crop suitabilities as Redlands loam, 2 to 5 percent slopes. It ranks with the best soils of the Fruita, Mesa, Mack, and Thoroughfare series. All of the acreage is in the Redlands; that is, south of the Colorado River and westward from Grand Junction.

Surface runoff is slow and internal drainage is medium. Saline areas are small and occur only where the substratum holds excess irrigation water and forms a high water table. Because the subsoil layers are medium-textured, moderately permeable, and friable, this soil has a wide crop suitability range and is easily tilled and irrigated.

Use and management.—Practically all of this soil is cultivated, principally to alfalfa, corn, beans, and truck crops. Melons, tomatoes, potatoes, and other truck crops are well suited. The acreage in truck crops is not large but it is increasing. The danger of frost discourages many farmers from planting this otherwise favorable soil to orchard fruits. Only 15 percent of the area is now in orchards, but the acreage is increasing. Yields from tree fruits compare favorably with those on the Mesa soils. Other crops yield about the same as they do on the Mesa soils located on Orchard Mesa.

Redlands loam, 5 to 10 percent slopes (Rl).—This soil occurs in the Redlands. It is associated mainly with the Thoroughfare fine sandy loams but occupies a somewhat lower position. Most of it lies on terrace slopes along the river or a little way back from it. The soil is essentially like the two units of Redlands loam on slopes of less than 5 percent, but its alluvial mantle is not so deep in several areas, especially in those occurring in the western part of the Redlands. The alluvium apparently has been built up by deposits from two sources. Considerable amounts of cobbles and gravel of the nd underlying the Mesa soils indicate that much of the all al posit consists of overflow sediments left by the Colorado and - nison Rivers. Above these older deposits lies alluvial ma. al

ments of sandstone. Variation in the various alluvial layers is apparent, but not so pronounced as in the areas north of Palisade. Several peach orchards bordering the bluffs east of Palisade contain sandstone boulders 5 to 15 feet in diameter. Most of the smaller rocks and boulders have been removed from these orchards. About 30 acres northeast of Palisade has slopes of 5 to 10 percent.

Considering this soil as a whole, it is moderately permeable to plant roots, air, and moisture but low in water-holding capacity. The successive soil layers are friable and moderately calcareous.

Use and management.—Practically all of this soil lying below the irrigation canals is cultivated. About 99 percent of it is in peaches. In a few places where shale is within 4 or 5 feet of the surface, the trees are not uniform in size, and some have had to be replaced. Although yields generally compare favorably with those from the Ravola soils, the average yield is lower. Considering the favorable climate, peach growing is one of the best uses for this soil.

Mesa clay loam, 0 to 2 percent slopes (Mc).—This soil occupies a former flood plain or high terrace immediately south of the Colorado River. It is largely derived from acid igneous soil-forming materials the streams have brought down from a higher watershed.

In cultivated fields the 8- or 10-inch surface soil consists of very pale-brown, pale-brown, or light-brown calcareous clay loam. It merges with a reddish-yellow to light reddish-brown calcareous clay loam showing white or pinkish-white segregations of lime. Below depths of 12 to 14 inches, the reddish-yellow to light-brown clay loam exhibits numerous white streaks or splotches that have a comparatively vertical or jagged outline along road cuts. A few scattered cobbles and pieces of gravel are common. Beginning at depths of 3 or 4 feet or in places below 6 or 7 feet, about 40 to 50 percent of the soil mass is made up of pieces of gravel, cobbles, and stones derived largely from granite and basalt but to some extent from lava and sandstone. Most of the sandstone is crumbly or partly disintegrated. Mancos shale underlies the gravel-and-cobble substratum in most places at depths below 8 to 12 feet. In some places, however, the shale may be as near the surface as 4 or 5 feet, and in others as far down as 20 feet.

The high lime content of this soil doubtless offers some resistance to penetration of water and plant roots but the entire profile is friable when moist. Judging from many orchards and alfalfa fields, its permeability to deep-rooted crops is sufficient to permit healthy and vigorous plant growth. Underdrainage is adequate; harmful concentrations of salt are negligible.

Because a considerable part of this soil consists of material washed from higher places, the depth to the noticeably lime-splotched zone is variable. Generally, however, the depth ranges from 1½ to 3 feet. Leveling of the soil also accounts for part of the variation in depth to lime splotching. On the whole, the variations in depth to lime have little, if any, agricultural significance.

Use and management.—About 97 percent of this soil is cultivated. It is highly productive and much of it is well-suited to fruit growing. At least 40 percent of the acreage is in orchard fruits, mainly peaches. About 20 percent is in alfalfa, 15 percent in corn, 10 percent in beans, and 8 percent in truck crops, including cantaloups, melons, and tomatoes, the rest is used for small grains and other field crops.

These percentages show the relative importance of the various kinds of crops, though the area used for field crops fluctuates from year to year.

Many of the orchards have been planted in the past 15 years. If well cared for and not severely injured by low temperatures, they should give good yields until the trees reach 30 or 40 years of age. A few orchards more than 50 years old are still producing good yields. The areas having the best climatic location for orchard crops begin south and southeast of Palisade and extend 5 or 6 miles southwestward. Under practices designed to increase the organic-matter content and to control erosion, this soil should remain productive indefinitely.

Mesa clay loam, 2 to 5 percent slopes (Md).—Except for its greater slope and the appearance of lime splotches nearer the surface, this soil is very similar to Mesa clay loam, 0 to 2 percent slopes. The lime splotches normally are 10 or 15 inches from the surface. Small quantities of gravel and cobblestones strewn over the surface in most places indicate that there is a slight continuous removal of the surface soil by sheet erosion. Tilth and workability are good. In most places the soil is underlain by shale at depths of 6 to 20 feet.

Use and management.—The area of this soil occurring below the irrigation canals is about 87 percent under cultivation. It is a productive soil, and practically all field crops of the area can be grown successfully. About 32 percent of the acreage is in orchard fruits, mainly peaches but also some sweet cherries and pears. The fairly large percentage in orchard fruits is accounted for mainly by several rather large areas south and southwest of Palisade that are within a climatic zone well suited to tree fruits. Not including these specialized fruit areas, the proportion of the soil in various crops is about the same as for Mesa clay loam, 0 to 2 percent slopes. Yields are also about the same, but in a few small areas shale occurs at depths of 3½ to 4 feet and yields from deep-rooted crops such as orchard fruits and alfalfa may be slightly lower over a period of years.

If erosion is controlled and the soil is planted to legumes to build up its supply of organic matter, it should be productive indefinitely. In some fields the content of organic matter already has decreased appreciably from that in the virgin soil.

A few small areas (about 12 acres) of this soil located just below Orchard Mesa irrigation canal No. 2 are not suited to deep-rooted field crops or tree fruits. In these areas, Mancos shale is at depths between 2 and 3½ feet and the soil does not have a porous gravelly layer over this shale. Beans, wheat, barley, and oats probably are as suited to these areas as any other crops that could be selected.

Mesa gravelly clay loam, 2 to 5 percent slopes (Me).—This soil is derived from old alluvium deposited on Orchard Mesa. The alluvium consists mainly of materials weathered from acid igneous and mixed igneous rocks, largely granite and basalt, but includes smaller quantities of material from sandstone and shale. The alluvial mantle, for the most part, ranges from 5 to 8 feet deep but it is deeper in places.

The 8- or 10-inch surface soil in cultivated fields is light brown when [illegible] and brown when moist; its organic-matter content is very [illegible]. The subsurface layer is light-brown or pale-brown clay loam conta[illegible]

chert fragments. Beginning at depths below 12 to 14 inches the subsoil is very pale brown to reddish yellow and shows a considerable amount of white lime splotching. Lime encrustations appear on the lower sides of the pieces of gravel, cobblestones, and stones that make up about 50 percent of the soil mass. In some places the cobbly material is more abundant than the gravelly, but in others smaller cobblestones and gravel are more abundant. In a few places the subsoil material is weakly cemented into a semihardpan. Generally, however, it is permeable enough to permit the downward growth of deep-rooted plants.

Surface runoff is medium, and underdrainage is adequate. The excess of gravel, cobblestones, and stones makes workability less favorable than on Mesa clay loam soils. Saline areas occur only in a very few places bordering shale soils.

Included with this soil are areas totaling about 30 acres that have slopes of less than 2 percent but are not appreciably different in tilth, workability, and crop yields. These areas occur 1 to 1½ miles southeast of Grand Junction, in the northeast quarter of section 25, and the northwest quarter of section 30, range 1 west, township 1, south.

Use and management.—Nearly 77 percent of Mesa gravelly clay loam, 2 to 5 percent slopes, is cultivated. Of the cultivated area, 14 percent is used for orchard fruits, mostly peaches but also cherries, apricots, pears, and plums. Alfalfa far surpasses fruit as the principal crop. Lesser crops, in order of their importance, are corn, pinto beans, small grains, and truck crops.

Crop yields on this soil do not average so high as on Mesa clay loam, 2 to 5 percent slopes, probably because of the excess gravel, cobbles, and stones. Orchard fruits and alfalfa produce fairly well. As is true for other soils in the eastern part of Orchard Mesa, this soil is widely used for peach orchards because it is in an area where the climate is favorable.

Mesa gravelly clay loam, 5 to 10 percent slopes (Mr).—This soil occurs principally on terrace slopes or escarpments. Several areas of it are on the outliers, or edges, of three benches that front the broader part of the terrace southeast of Grand Junction. Scattered areas begin about 4 miles west of Grand Junction and extend nearly to the eastern limit of Orchard Mesa. A small belt also occurs north of the Colorado River, 1½ miles southwest of Palisade.

Except for its greater slope, this soil closely resembles Mesa gravelly clay loam, 2 to 5 percent slopes. Its workability is somewhat less favorable, however, as it is more gravelly and cobbly. Harmful concentrations of salts are negligible.

Use and management.—About 62 percent of this soil is cultivated. Most of the cultivated acreage is used for orchard fruits, chiefly peaches. The trees, particularly the older ones, are not quite so vigorous or so uniform in size as those on Mesa clay loam soils. The fruit is more highly colored, and this somewhat offsets the lower average yield. Probably, however, the trees may not live so long on this soil as on the deeper Mesa clay loam soils.

Alfalfa, corn, and beans are the chief field crops on areas not climatically well suited to orchard fruits. Smaller acreages are in tomatoes, melons, grapes, and other truck crops.

The soil is not so productive as the Mesa clay loams, because the profile reduce the moisture-holding capacity. Painstaking application of irrigation water, with special care in regulating rate of flow, is required to prevent unnecessary loss of surface soil. Otherwise, workability becomes increasingly difficult as the finer material washes away and leaves the coarse material behind. Some farmers already have spent considerable time and money in removing cobbles and stones brought up in plowing.

Mesa gravelly clay loam, moderately deep, 2 to 5 percent slopes (Mg).—Except for moderate depth to shale, this inextensive soil is essentially the same as Mesa gravelly clay loam, 2 to 5 percent slopes. Its tilth and workability are similar to but less favorable than for the Mesa clay loam soils. The soil is adequate for shallow-rooted plants, but its moderate depth to shale (2 to 4 feet) does not provide the root zone needed for best results in growing alfalfa and orchard fruits. Both crops yield less on this soil, and orchard trees do not live so long. The soil is low in organic matter. About 30 percent of it is under cultivation, and of this approximately 12 percent is used for orchard fruits.

Mesa gravelly clay loam, moderately deep, 5 to 10 percent slopes (Mh).—This soil is associated with other Mesa soils but generally lies at higher level where the original alluvial deposits were thinner. Aside from having a thinner mantle overlying Mancos shale, the soil differs little from Mesa gravelly clay loam, 5 to 10 percent slopes. The principal areas are scattered over Orchard Mesa from southwest of Palisade to southwest of Grand Junction.

The soil is gravelly and cobbly; hence, its water-holding capacity is low. Some places, however, are seepy because water from Orchard Mesa Canal No. 2 passes through and over the underlying shale. Erosion continues to remove the soil mantle; the soil is becoming thinner and more cobbly all the time.

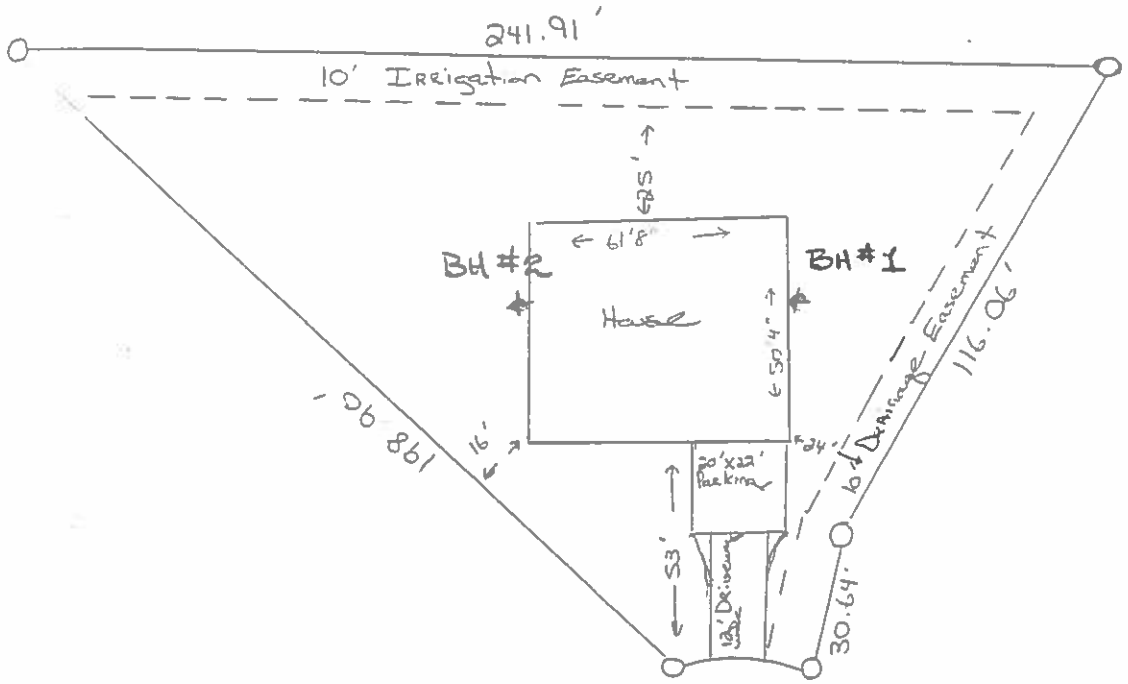
Use and management.—Only about 15 percent of the soil area below Orchard Mesa Canal No. 2 is cultivated. Several areas are in the climatic zone south and southwest of Palisade that favors fruit growing. About 10 percent of the soil in this location is in orchards.

The underlying shale material restricts growth of deep-rooted plants, so this soil is not well suited to orchard fruits or alfalfa. Other crops respond fairly well, though not so well as on the deeper Mesa gravelly clay loams. Peach trees are apparently healthy when young, but they probably do not live so long as those on the deeper Mesa soils. If it is economically feasible, this soil is best used for irrigated pasture most of the time.

Naples clay loam, 0 to 2 percent slopes (Na).—This soil occurs in association with Naples fine sandy loam, 0 to 2 percent slopes, in low positions on the alluvial fan. The alluvial parent material, derived from sandstone and shale and 6 feet or more deep in most places, has been deposited on soils of the river flood plain.

The surface 10 or 12 inches consists of light-brown, slightly hard, light clay loam. The subsoil consists of layers of light-brown loam, fine sandy loam, and very pale-brown loamy fine sand. The thickness and arrangement of these subsoil layers vary from place to place. The soil is calcareous, though no lime is visible in the profile.

Site Map



Geotechnical Report
Doose Residence
570 Casa Rio Ct., Grand Jct., CO

A.I.C.- GRAND JCT., INC.
ALLIED INDEPENDENT CONSULTANTS
303 North Ave.
GRAND JUNCTION, CO 81504
PHONE (970) 244-8703 FAX (970) 243-2681

SHEET A-1

Susan Doose
570 Casa Rio Court
Lot 10 Filing #3

2 Holes / soils log

 # 1 15 Feet SW of NE corner of house. 10 feet inside footer

Starting at

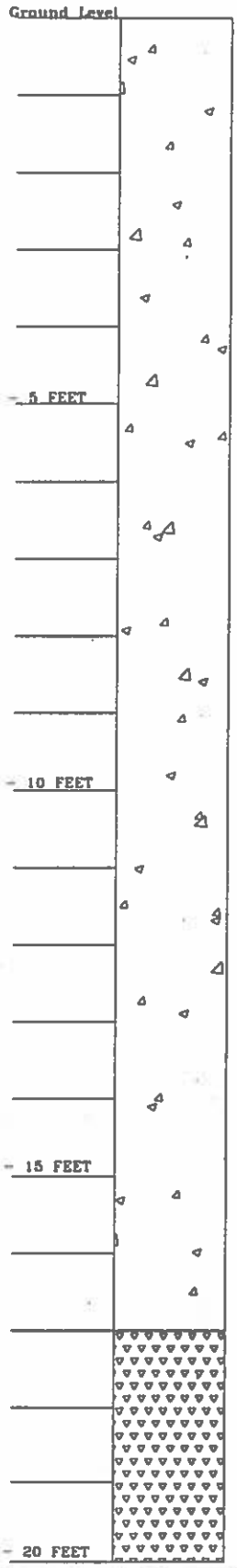
0′	Gravely brown top soil moist
3′	SPT 10/12/12
5′	SPT 8/11/14
10′	Redder dirt, more sand moister than before SPT 9/9/11
10′ – 15′	Brown/red sandy dirt with gravel (1″) moist not plastic, not collusive
17′	Rocky cobbles moist
20′	Very gravely, lower 3 feet of hole collapsed do to gravel. (SPT unavailable).

Hole # 2 20 feet from NW corner on W side. 10 feet out of footer.

0′	Dry brown gravely dirt.
3′	SPT 5/4/5 sandier, siltier, moister
5′	SPT 3/7/7 Reddish sandy soil less gravel.
10′	Brown gravel like 0′ – 5′. SPT 8/12/14
15′	SPT 6/10/14

Borehole # 1

SOIL PROFILE



LEGEND

fine grain red sand with gravel and cobbles

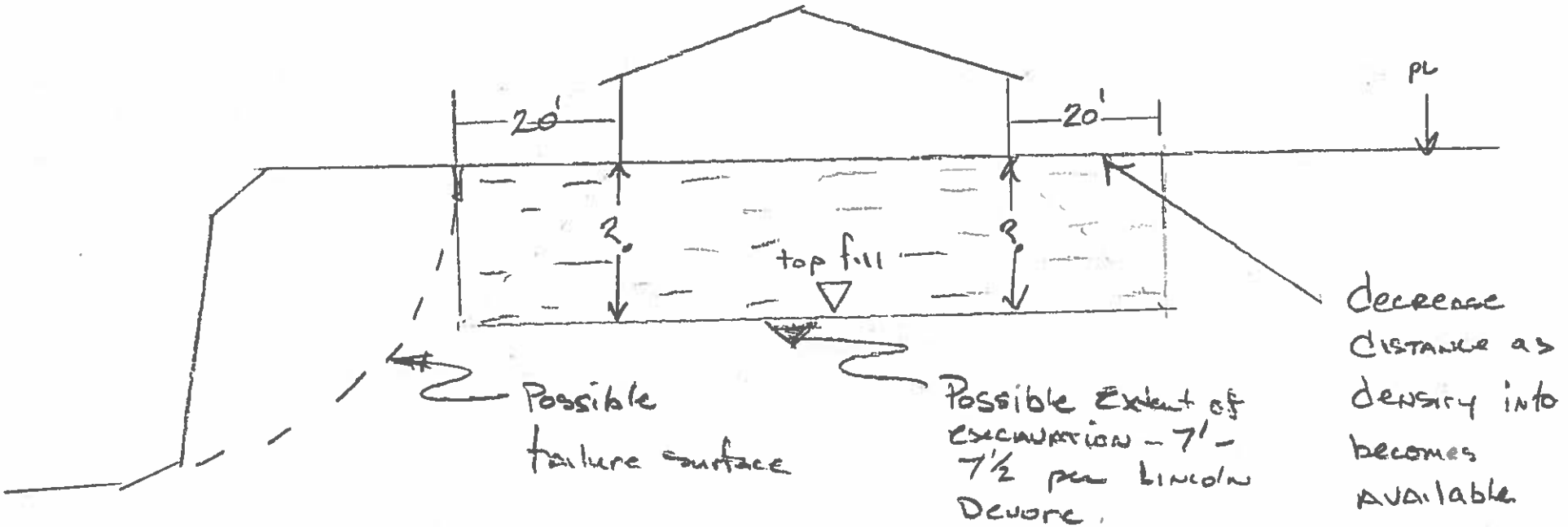
cobble and gravel in fine grain red sand matrix – moist

A-1

Geotechnical Report
Doose Residence
570 Casa Rio Ct., Grand Jct., CO

A.I.C.- GRAND JCT., INC.
ALLIED INDEPENDENT CONSULTANTS
303 North Ave.
GRAND JUNCTION, CO 81504
PHONE (970) 244-8703 FAX (970) 243-2681

Recompaction of Fill



Lincoln DeVore, Inc.
Geotechnical Consultants
1441 Motor St.
Grand Junction, CO 81505
TEL: (970) 242-8968
FAX: (970) 242-1561

May 13, 1997

Tom Tribble
10223 Farralone Ave.
Chatsworth, CA 91311

Re: Subsurface Soils Exploration
570 Casa Rio Ct., Grand Junction, CO

As requested, Lincoln DeVore personnel have completed a geotechnical exploratory program at the above referenced site. One shallow exploration hole was drilled in the approximate center of the proposed building pad. The exploration boring was centered on the lot and approximately 100 feet north northeast of the existing curb and gutter of the Casa Rio Cul-de-Sac. The purpose of these holes were to determine the types and character of the underlying soils and to relate these characteristics to the proposed foundation system. This letter contains general recommendations for construction of a residential foundation, but is not a foundation design and cannot be used as such. Our conclusions and recommendations for this site are presented below.

Soil Classification. The soils on this site were found to consist of approximately 7 ½ feet of man-made fill which overlies a alluvial, gravelly silty sand to the total depth drilled of 15 feet. The man-made fill was placed as part of the over site grading for this tract, some of this over site grading was accomplished several years ago.

The native alluvial, pink to light red silty sands and gravelly silty sands, encountered below 7 ½ feet, were found to be very similar to Soil Type I described in the Lincoln DeVore report of Subsurface Soils Exploration of the Vista Del Rio Subdivision, LD Job 80528-J, 4-9-94.

This Soil Type is classified as a gravelly, silty sand of fine to medium grain size under the Unified Classification System. This soil type is nonplastic 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 1100 psf.

Based upon previous exploration borings in the area, it is believed the underlying shales, claystone, siltstones and sandstones of the Dakota Formation will be encountered between 15 to 20 feet below the present ground surface. It is believed, based upon this exploration boring and our experience in this area that, the expansive clays of the Dakota Formation will not affect the design, construction and performance of a shallow, residential

foundation system on this site. It is our understanding that a full basement is planned for this site. Based upon this exploration boring, a minimum of 5 to 6 feet of alluvial soils will underlie the basement level foundation system, which should provide sufficient separation between the underlying expansive clays of the Dakota Formation and the basement foundation system such that the basement foundation system need not be designed for the expansive clays.

Man-made Fill: The site is on approximately 7 to 7 ½ feet of man-made fill some of which is believed to have been placed under controlled moisture and compactive effort conditions. However, this office has no records regarding the placement of this fill and has not been able to verify its overall condition. If the placement of this fill can be verified, it will probably be suitable for use as a bearing material. If the quality of this fill cannot be confirmed, foundations must either be extended through this fill or the fill should be removed to acceptable native soils and replaced with a structural, controlled fill. The structural controlled fill should be placed according to the following recommendations.

These soils are of moderately to low density and are not judged suitable for support of the proposed shallow foundation system. Owing to the depths to which this low density soil was encountered and the relatively shallow excavation depths anticipated, it is recommended that an overexcavation/replacement scheme be used on this site.

The existing low density soils, man-made fill soils should be removed to the underlying native, gravelly silty sands. Once it is felt that adequate soil removal has been achieved, it is recommended that the excavation be closely examined by a representative of Lincoln-DeVore to ensure that an adequate overexcavation depth has indeed occurred and that the exposed soils are suitable to support the proposed structural man-made fill.

Once this examination has been completed, it is recommended that a coarse-grained, non-expansive, non-free draining man-made structural fill be imported to the site. The native soils may be utilized as structural fill, if specifically approved by the Geotechnical Engineer. This imported fill should be placed in the overexcavated portion of this site in lifts not to exceed 6 inches after compaction. A minimum of 90% of the soils maximum Modified Proctor dry density (ASTM D-1557) must be maintained during the soil placement. These soils should be placed at a moisture content conducive to the required compaction (usually Proctor optimum moisture content ± 2%). The granular material must be brought to the required density by mechanical means. No soaking, jetting or puddling techniques of any type should be used in placement of fill on this site. To ensure adequate lateral support, we must recommend that the zone of overexcavation extend at least 2 feet around the perimeter of the proposed footing. To confirm the quality of the compacted fill product, it is recommended that surface density tests be taken at maximum 2 foot vertical intervals.

When the structural fill is completed, an allowable bearing capacity of 1800 psf maximum may be assumed for proportioning the footings.

Soil Moisture Conditions: No free water was encountered during drilling on this site. In our opinion the true free water surface is fairly deep in this area, and hence, should not affect construction. Seepage moisture may affect construction if surface drainage is not properly controlled.

Foundation Type Recommended: We recommend the use of a conventional shallow foundation system 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 native, alluvial pink gravelly silty sand, may be designed on the basis of an allowable bearing capacity of 1100 psf maximum. A minimum dead load of 150 psf must be maintained.

Contact stresses beneath all continuous walls should be balanced to within + or - 150 psf at all points. Isolated interior column footings should be designed for contact stresses of about 150 psf more 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 ½ live load, for up to 3 stories.

If the design of the upper structure is such that loads can be balanced reasonably well, a floating structural slab or raft type of foundation could be used on this site. Such a slab would require heavy reinforcing to resist differential bending. It is possible to design such a slab either as a solid or ribbed slab, but in either case, a rimwall must be used for confinement. Any such slab must be specifically designed for the anticipated loading. Such a foundation system will settle to some degree as the softer, underlying soils consolidate, but differential movement is held to a minimum. Because the soils may settle in varying amounts, some minor cracking and heave are possible unless the slabs are specifically designed with the movement in mind.

Voids Beneath Foundation Walls: Voids are not required to mitigate expansive pressures, but may be used to attain proper balance around the structure.

Reinforcing: All foundation stem walls should be designed as "grade beams" capable of spanning at least 12 feet. Where the foundation stem walls are relatively shallow in height, vertical reinforcing will not be necessary. However, in the walls retaining soil in excess of 4 feet in height, vertical reinforcing may be necessary to resist the lateral pressures (restrained case) of the soils along the wall exterior. To aid in designing such vertical reinforcing, an equivalent fluid pressure (E.F.P) on the order of 45 pcf would be appropriate for the alluvial silty sands and to include the silty sandy man-made fill. Clayey materials should not be utilized as backfill.

The foundation shall be reinforced as shown on the foundation design. No changes shall be made to this placement of reinforcing without written approval of the design engineer or architect.

Floor Slabs: Non-Structural floor slabs on grade, if any, should be positively separated from all structural portions of this building and allowed to float freely. Frequent scoring (control joints) of the slabs

should be provided to allow for possible shrinkage cracking of the slab. These control joints should be placed to provide maximum slab areas of approximately 200 to 360 square feet. Any man-made fill placed below floor slabs on grade should be compacted to a minimum of 90% of its maximum Modified Proctor dry density, ASTM D-1557. These soils should be placed at a moisture content conducive to the required compaction (usually Proctor optimum moisture content ±2%.

Drainage and Grading: Adequate site drainage should be provided in the foundation area both during and after construction to prevent the ponding of water and the wetting or saturation of the subsurface soils. We recommend that the ground surface around the structure be graded so that surface water will be carried quickly away from the building. The minimum gradient within 10 feet of the building 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 of 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 excavation for foundation construction, a full perimeter drain is recommended for this building. 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.

Should an automatic lawn irrigation system be used on this site, 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.

It is recommended that lawn and landscaping irrigation be reasonably limited, so as to prevent undesirable saturation of subsurface soils or backfilled areas. Several methods of irrigation water control are possible, to include, but not limited to:

- Metering the irrigation water.
- Sizing the irrigation distribution service piping to limit on-site water usage.
- Encourage efficient landscaping practices.
- Enforcing reasonable limits on the size of high water usage landscaping.

Backfill: To reduce settlement and aid in keeping water from reaching beneath this building, all backfill around this building should be mechanically compacted to a minimum of 80% of its maximum Modified Proctor dry density ASTM D-1557. The only exception to this would be the components of the perimeter foundation drain, if any. All backfill should be composed of the native soils and should not be placed by soaking.

jetting or puddling. All backfill placed in utility trenches around this structure or below foundation walls should be mechanically compacted to a minimum of 90% of its maximum Modified Proctor dry density ASTM D-1557. These soils should be placed at a moisture content conducive to the required compaction (usually Proctor optimum content ±2%).

Cement Type: Type II, Type I-II or Type II-V cement is recommended for all concrete which is in contact with the soils on this site. Calcium chloride should not be added to a Type II, Type I-II or Type II-V cement under any circumstances.

Remarks: 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.

Structural slab-on-grade (Monolithic) foundation systems typically have an effective soil cover of less than 12 inches. Under normal use, the building and foundation system radiates sufficient heat that frost heave from the underlying soils is not normally a problem. However, additional protection can be provided by applying an insulation board to the exterior of the foundation and extending this board to approximately 18 inches below the final ground surface grade. This board may be applied either prior to or after the concrete is cast and it is very important that all areas of soil backfill be compacted. Local building officials should be consulted for regulatory frost protection depths.

Senate Bill 13 (CRS 6-6.5-101) Discussion: This particular residence is being constructed on foundation soils which do not possess a "significant potential for expansion". We recommend that the owner receive a copy of this summary report of our soil analysis and site recommendations.

Respectfully submitted,

LINCOLN-DeVORE, INC.

COLORADO REGISTERED EDWARD M. MORRIS 30590 5-13-97 PROFESSIONAL ENGINEER

By: Edward M. Morris PE
Western Slope Manager

LD Job # 86052-2652

X-SEC Analysis

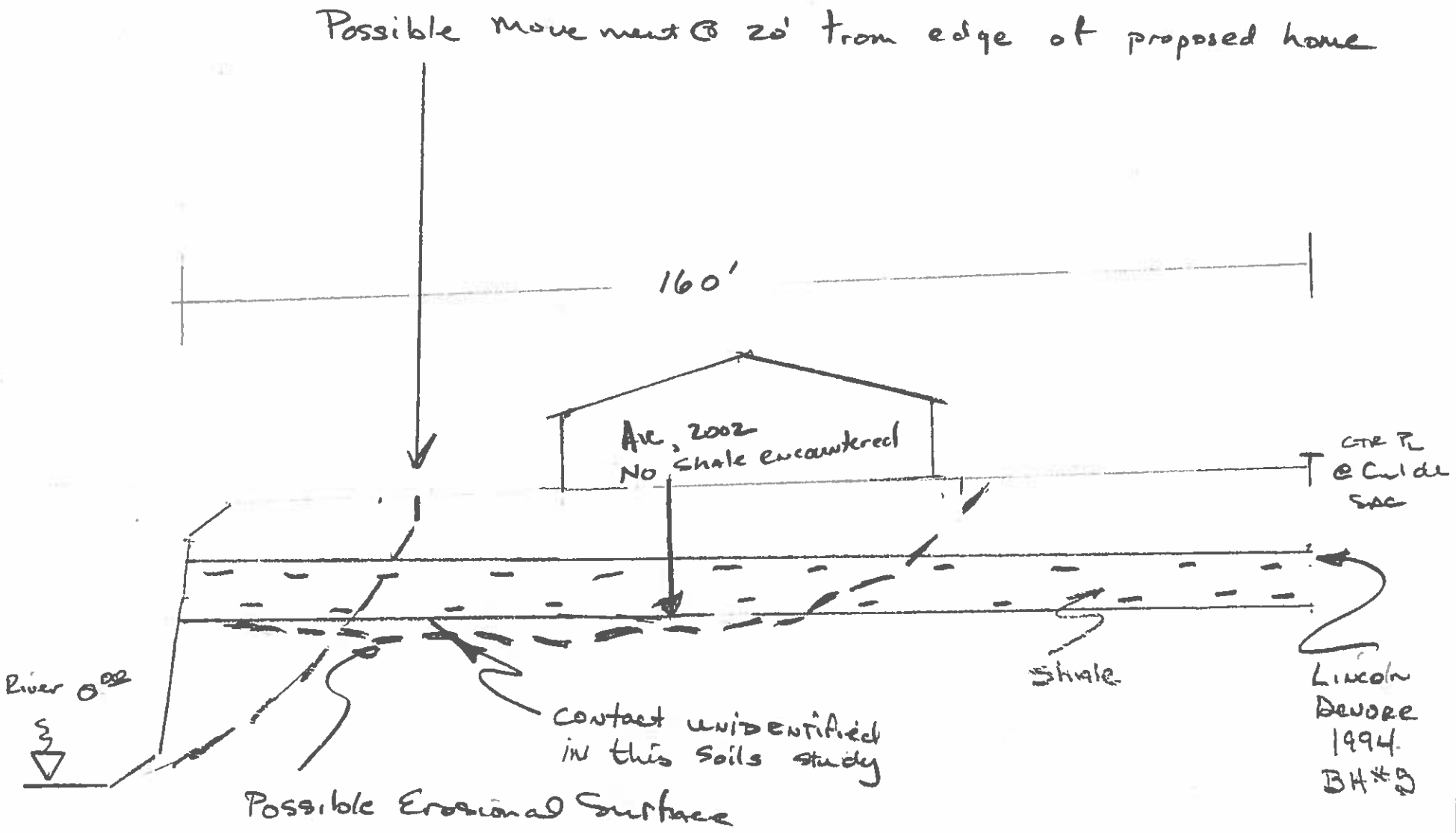
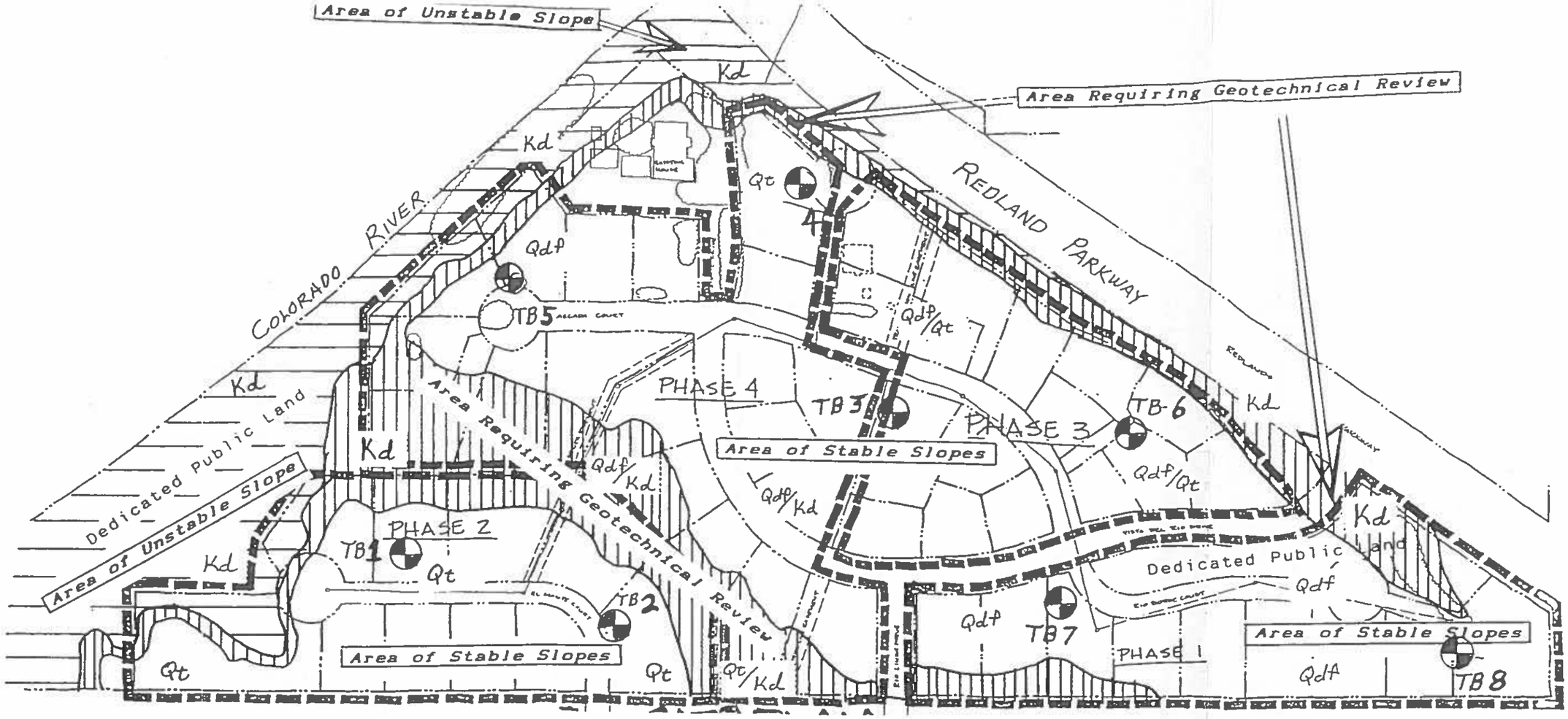


FIG S1



Area of Stable Slopes

Area Requiring Geotechnical Review

Area of Unstable Slope

TB1 TEST EXPLORATION BORING

Qdf Debris Fan Deposits

Qt Alluvial Terrace Deposits

Kd Dakota Formation

DRILLHOLE and GEOLOGY DIAGRAM

VISTA del RIO SUBDIVISION

ALPINE CM

LINCOLN DeVORE ENGINEERS-GEOLOGISTS

1441 MOTOR STREET
GRAND JCT. COLORADO
COLO. SPRINGS–PUEBLO

	J.O.# 80528-J	SHEET 1 OF
DRAWN BY J.L. SPARKS	SCALE No Scale	DATE 4-11-94
CHECKED BY E.M. MORRIS	CONT. INT.	REV.

FIG S2

A.I.C. – Grand Junction, Inc.
Allied Independent Consultants

303 North Avenue
P.O. Box 41049
Grand Junction, CO 81501
970-244-8703

May 14, 2002

Susan Doose
P.O. Box 515
Ouray, CO 81427

RE: 570 Casa Rio Court, Grand Junction, Colorado

I, James Orton, under the supervision of Chris Steven Russell, Professional Engineer, inspected the slopes at the property of Susan Doose at 570 Casa Rio Court, and found there are three types of slopes.

First is the previously stabilized slope on the north and west side of the property where it appears the slope has been artificially cut back to a stable slope of about 25% grade. This slope appears to have no stability issues pertaining to rock fall, slump or creep.

The second type of slope that was found was on the southeast corner of the property where there is a fairly large area of about 10% grade sloping towards the river. Due to the size and shape, as well as the erosion history of the area, this area is most likely a slump block, which was active in the past and under wetter conditions or a higher weight of over burden, would probably become active again. This area should be avoided during the placement of any structures on this property.

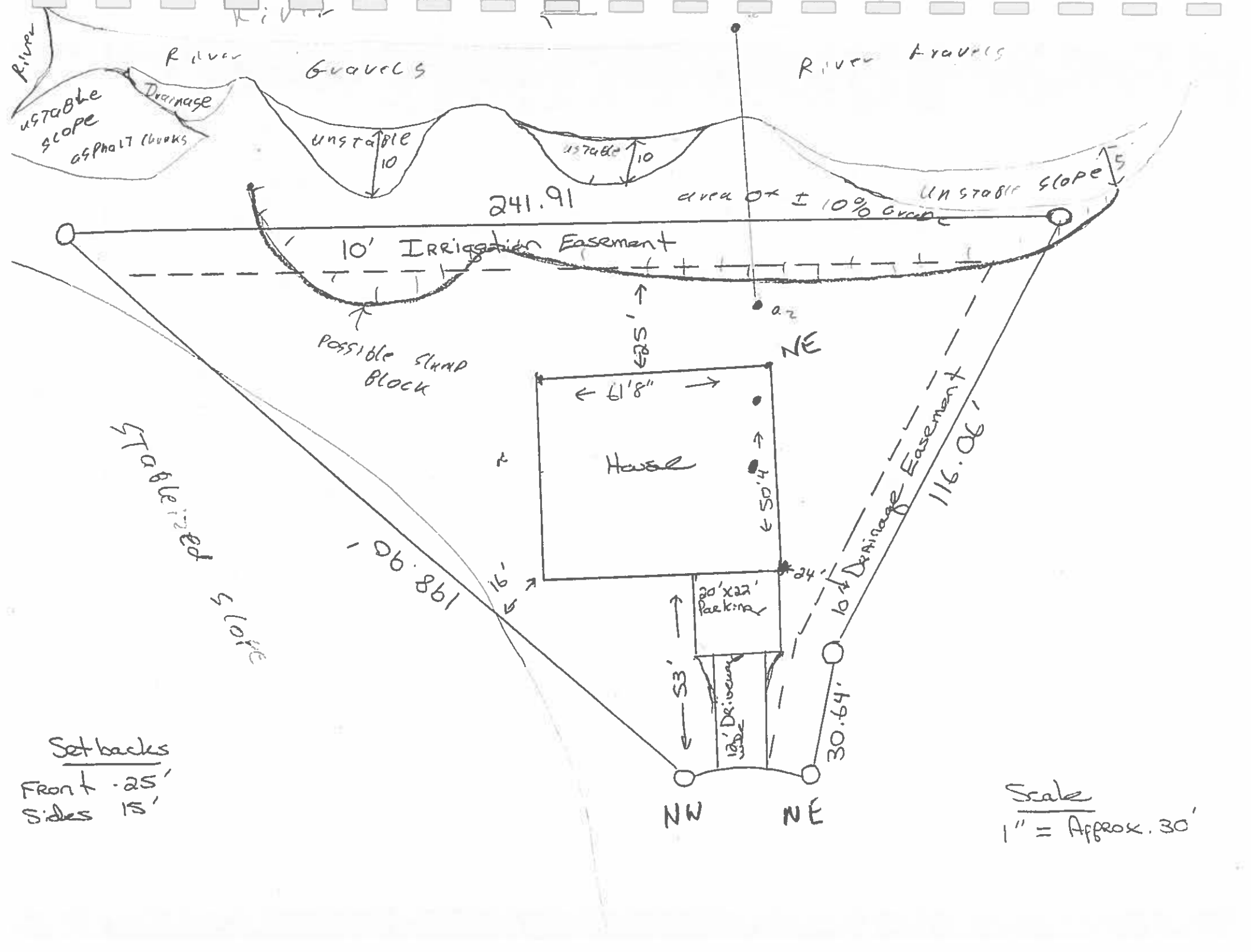
The third area of slope instability is the nearly vertical slope from the terrace on which the property lies down to the level of the river. This slope, as noted in the map attached, has several layers of different formations, contributed differently to the instability of the slope. The uppermost layer is a layer of man made fill, some time containing large pieces of asphalt and concrete. Most of this fill seems to be pit run and may be suitable for construction purposes. On the cliff face this layer extends down about 10 feet. Below that there is about 12 feet of flaky, gray decomposing Mancos Shale this formation may be expansive. Also noted in the shale was an unusually high amount of Gypsum evaporate, which could under wetter circumstances dissolve and lead to the partial collapse of the formation. Beneath the Mancos formation there seemed to be a sandy mudstone formation which was highly permeable as it seemed to carry a higher

moisture content as noted by the high degree of foliation as well as a small open seep from the base of this formation. This slope is in high danger of both rock fall and slump block erosion and proper set backs should be utilized. A drainage was also observed on the west end of the slope where storm run off has run in the past. Preventing of such surface run off in the future would be advisable for erosion protection.

The areas of the property not mentioned previously were found to be stable, and fit for construction.

Respectfully submitted,

James Orton
AIC Technician

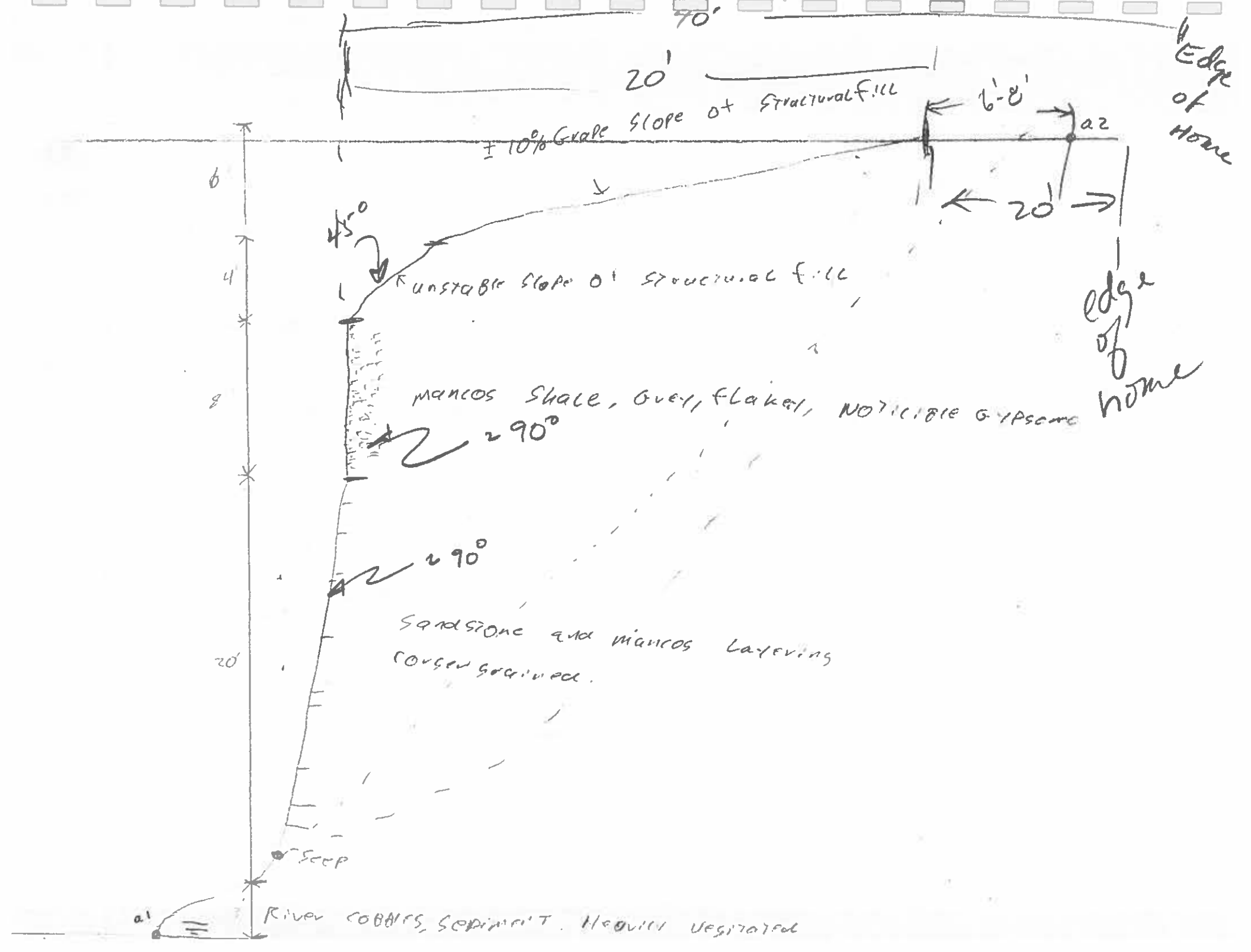


Setbacks

Front 25'
Sides 15'

Scale

1" = Approx. 30'


70'
20'
Edge of Home
6'-8"
a2
± 10% Grade Slope of Structural fill
6
45°
4'
Unstable Slope of Structural fill
edge of home
Mancos Shale, Overly flaker, NOTICIBLE GYPSUM
8
≈ 90°
≈ 90°
Sandstone and Mancos Layering
20'
Seep
a1
River COBBLES, SEDIMENT. HEAVILY VEGITATED

SUBSURFACE SOILS EXPLORATION

VISTA Del RIO SUBDIVISION

GRAND JUNCTION, COLORADO

Prepared For:

ALPINE CM
1111 S. 12th STREET
Grand Junction, Colorado

Prepared By:

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

April 9, 1994

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

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

April 9, 1994

ALPINE CM
1111 S. 12th STREET
Grand Junction, Colorado

Re: SUBSURFACE SOILS EXPLORATION

VISTA Del RIO SUBDIVISION

GRAND JUNCTION, COLORADO

Gentlemen:

Transmitted herein are the results of a Subsurface Soils Exploration for the proposed VISTA Del RIO SUBDIVISION, located on The Redlands, west 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: _____ 4/13/94
George D. Morris, P.E.
Colorado Springs Office

GEORGE D. MORRIS
REGISTERED
2021
PROFESSIONAL
ENGINEER
STATE OF COLORADO

LDTL Job No. 80528-J

EMM/ss

TABLE OF CONTENTS

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 50 to 60 lot, single family, residential subdivision. A vicinity map is included in the Appendix of this report.

To assist in our exploration, we were provided with a preliminary site development plan. The Boring Location Plan attached to this report is based on that plan.

Lincoln-DeVore has not seen plans for any structures for this site, however, based on previous projects, we believe that the proposed structures will consist of single and two story, wood framed structures. The structures will probably be a mix of crawl-space type and full basement with concrete floor slab on grade. Structures of this type typically develop wall loads on the order of 600 to 2000 plf and column loads on the order of 6 to 18 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 between March 21 to April 5, 1994 and consisted of a site reconnaissance by our geotechnical personnel and the drilling of 9 shallow exploration borings. These shallow exploration borings were generally 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 45-B, truck mounted drill rig with continuous flight auger to depths of approximately 14 to 34 feet. Samples were taken with a standard split spoon sampler, a lined 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 Northeast Quarter of Section 7, Township 1 South, Range 1 West of the Ute Principal Meridian, Mesa County, Colorado. More specifically the site is located South of the Colorado River, West of the Redlands Parkway and is in the Redlands area.

The topography of the site is a series of terraces separated with moderate to steep hillsides. The general topography is dropping to the northeast, toward the Colorado River. The slope gradient on this site varies from relatively flat to in excess of 200% at many locations outside the planned building envelopes. The direction of surface runoff on this site will be locally controlled by the proposed construction but, in general, surface runoff will travel to the northeast, eventually entering the Colorado River. Surface drainage is variable, ranging from fair to very good; subsurface drainage ranges from good to very poor.

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 site, 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 two distinct levels of coarse grained gravel terraces, underlain by the Dakota Formation. The site is partially covered with thin deposits of fine-grained colluvial and mudflow/debris flow soils. The geologic and engineering properties of the materials found in our shallow exploration borings will be discussed in the following sections.

The relatively fine-grained surface soils on this site consist of a series of silty sands and gravelly sands which are a product of mud flow/debris flow features. These mud flow/debris flow features originate on the north-facing slopes and canyons (primarily Ute and Red 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. These soils are designated Soil Type I.

This Soil Type is classified as a sandy silt and fine grained silty sand (ML/SM) under the Unified Classification System. This soil type is 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 pres-

sures, which 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 two topographic flat areas on this site are ancient terraces of the Colorado River. The Coarse-grained soils contained within these terraces is designated Soil Type II.

This Soil Type is classified as a silty, sandy gravel (GM) of coarse grain size under the Unified Classification System. This soil type is non-plastic and of low 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 2600 psf.

The surface, alluvial soils are deposited over the dense formational material of the Dakota Formation

of Cretaceous Age. The Dakota Formation can broadly be described as a series of thin to thick Sandstone, Siltstone and sandy Mudstone beds, with interbedded Siltstones, Shales and thin Lignite beds, which are often Carbonaceous, in part. Interbedded Sandstone and Siltstone beds are very prominent on the north slope, adjacent to the Colorado River. Many of the clayey strata have low to medium expansive properties, are of medium to high density and often contain significant sulfate salt deposits. The Dakota Formation was encountered during our subsurface exploration at depths of 2 to 14 feet across the site.

The fine grained clay and mudstones of the Dakota Formation encountered in the exploration borings are designated Soil Type III.

This soil type was classified as a silty clay (CL) under the Unified Classification System. The Standard Penetration Tests are in excess of 50 blows per foot. Penetration tests of this magnitude indicate that the soil is quite stiff and of medium to high density. The moisture content varied from slightly moist to saturated strata. 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 psf were found to be typical. The allowable maximum bearing value was found to be on the order of 5500 psf, for shallow foundation systems. A minimum dead load of 1900 psf will be required. This soil was found to contain sulfates in detrimental quantities.

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.

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.

GEOLOGIC HAZARDS AND DEVELOPMENT CONSTRAINTS

FLOODING

It is our understanding that the 100 year floodplain of the drainage along The Redlands Parkway, east of this tract, will not be addressed as part of the overall drainage plan for the site. The Parkway is between the established drainage flow area and this tract and should afford significant protection against flooding and bank erosion.

The eastern tract boundary is against a steep bank, overlooking the Redlands Parkway and associated constructed drainage features. We recommend that construction be avoided in this area and that drainage ways be kept open and free from debris.

Due to the site topography, on-site drainage and runoff must be properly controlled. During periods of high runoff, debris may cause damming at culverts, resulting in backwater effects which may be damaging. We recommend that a full 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.

EXPANSIVE CLAYS

The Dakota Formation underlies this site and is considered to be bedrock. Some clay and shale strata of the Dakota Formation exhibits a low to moderate expansion potential. Formational clay and shale was encountered in all exploration borings on this site. The depth to the Dakota Formation was

found to be variable across the site. It is anticipated that this formational clay and shale will affect the construction and the performance of the foundations on the site.

GROUND WATER

No free water surface was encountered in any of the test borings to the depths drilled. However, very wet conditions were encountered in some of the test borings. In our opinion this wet condition is the result of seepage from irrigation ditches and from irrigation practices in the vicinity, to the south and west of the site.

Areas of active water seepage have been observed near the base of the small escarpment, along the Colorado River. This seepage is occurring within a siltstone/mudstone strata and thin sandstones, which are quite prominent along the escarpment face. This seepage probably represents the discharges of several small, partially confined water tables within the Dakota Formation.

Several, small partially confined water tables in the Dakota Formation have been identified in nearby areas of the Redlands. These water tables are recharged by landscaping and agricultural irrigation practices on the Redlands, south and west of the site.

Due to the proximity of the Dakota Formation across this tract, there exists a possibility of small perched water tables developing in the alluvial soils which overlie the Formation. These perched waters would probably be

the result of increased irrigation due to the future presence of lawns, landscaping and roof runoff.

The exploration holes indicate that the bedding attitude 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 on some of the lots 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.

RADON GAS

No measurements to detect naturally occurring radioactive materials, to include the Radon Gas daughter product, have been performed by personnel of Lincoln-DeVore. Some very small areas of naturally occurring radioactivity have been identified within the Dakota Formation at other locations on the Redlands.

The measurement of Radon Gas, prior to construction, can produce erratic results which may over or under state the actual conditions. Any field surveys undertaken should be carefully accomplished, using the appropriate protocols.

It is recommended that structures founded on or near the Dakota Formation incorporate features to minimize the collection of Radon Gas. Many of these features are often a part of the normal construction process and need not add a significant amount to the overall cost of the structure. It should be noted that basement and concrete slab on grade construction presents the highest potential exposure to Radon Gas penetration and collection. Such construction features could include, but not be limited to:

- Ventilation of all crawlspace areas.
- Minimize or eliminate open drain sumps and exposed soil areas in basements or living areas.
- Installation of a continuous vapor barrier beneath basement footings and concrete slabs on grade.
- Minimizing open cracks and joints in interior concrete slabs on grade.
- The use of dense construction materials (ie Concrete) for construction of basement walls, rather than concrete masonry units or other relatively low density materials.

SLOPE STABILITY

This tract is bounded on the North and East sides by moderately steep to very steep slopes leading to the Colorado River. Additional areas of moderate to moderately steep slopes are also present in the south west portion of the tract and a narrow strip along the Redlands Parkway. These areas are indicated on the Drill Hole and Geology Diagram, included

with this report, as *Steep Slopes, Possibly Unstable*. These slopes range in height from less than 15 feet to approximately 100 feet. The slope angles range from approximately 3:1 to 1:1, with some areas having near vertical faces up to 15 feet high.

It is our understanding many of the steep slope areas are not to be used for development and to be left undeveloped, as Dedicated Public Land. Some construction is anticipated near the upper extent of the slopes along the Colorado River and on the majority of steep slopes in the interior of the tract. 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 the overlying alluvial and colluvial 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, three (3) building stability areas have been established for planning purposes. These building stability areas are indicated on the enclosed figure and are valid for the planned devel-

opment, uses and construction as detailed in the project scope section of this report. These building stability areas are defined as:

Area of Stable Slopes A Geotechnical Review of the proposed site grading and construction is not required for slopes greater than 20%, unless cuts or fills in excess of 4 feet of height are proposed.

We recommend that slopes constructed of the alluvial silts and sands on the lower terrace or gravels which cap the higher elevations of the site be constructed no steeper than 2:1 (horizontal to vertical). Slopes constructed of these non-cohesive soils tend to ravel and must be protected by suitable erosion control.

Area Requiring Geotechnical Review A Geotechnical Review of the proposed site grading and construction is required for slopes greater than 20%, or when cuts or fills in excess of 5 feet of height are proposed.

Indications of hillside creep were noted on the steeper areas, during the course of the field investigation. The soil on the site appears to be in a relatively stable condition at the time of investigation. However, great care is required to design subsurface drainage and cuts and fills in order to minimize the possibility of a large scale movement. We recommend that buildings be carefully placed on the site, properly and well drained, and that all cuts and fills should be controlled to avoid inadvertent triggering of hillside creep or mass movement.

We recommend that the amount of cut and fill be kept to a minimum on this site. Specifically, we recommend that any cut or fill which reduces the stability of native slopes be avoided. This includes any cut at the toe of a slope and any fill placed at the top of a slope. We recommend that any cut or fill over 4 feet in height be analyzed for stability of the final slope prior to construction.

Notching the structures into the hillside will create some steep cut slopes. While such slopes may stand safely for short periods of time, exposure to the elements for any extended period requires that the slope be braced or surface-protected. We recommend that building walls in contact with such cut slopes be designed as retaining walls. The magnitude of the

forces to which the wall will be subjected are noted in the section on earth retaining structures.

Area of Unstable Slope The slope stability of these areas are marginal to unstable at the time of the exploration. We recommend that no cuts or fills be made on the site without specific analysis of each proposed cut or fill site. We recommend that the natural slope be disturbed as little as possible and that drainage be provided at the toe of any cut or fill. Slow hillside creep in the upper few feet of the soil profile is anticipated. If improper cuts or fills are constructed, a slide may be triggered.

The instability problem is of such magnitude on these areas that it is not considered economically feasible to eliminate all movement. Medium to large cuts and/or fills on these areas will intensify the latent instability. Any major cut or fill of any type should be reviewed by an engineer prior to construction.

The building stability areas shown are only for slope stability considerations and may not be 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 a part of this general slope stability study.

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

1) Water Saturation of the Dakota Formation has occurred and will continue to be present beneath the site after development is completed.

2) The assumed flow direction of the partially confined water tables in the Dakota Formation is toward the Colorado River and is allowed to freely 'seep' from the exposed Formation.

3) No further modification of the slopes adjacent to the Colorado River will occur, north of the *Area Requiring Geotechnical Review*.

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

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

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. Caution: Failure to follow these recommendations will void part or all of the recommendations contained in this report. Based on our investigation to date and the knowledge of the proposed construction, the site conditions which would have the greatest effect on the planned development are the expansive clays of the Dakota Formation bedrock and potentially unstable slopes in the southwest portion of the tract and the area 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 observation 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.

EXCAVATION and STRUCTURAL FILL

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

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.

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 excavation 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 *Area Requiring Geotechnical Review* 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 possible, to include, but not limited to:

* Metering the Irrigation water.
* Sizing the irrigation distribution service piping to limit on-site water usage.
* Encourage efficient landscaping practices.
* Enforcing reasonable limits on the size of high water usage landscaping for each lot and any park areas.

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 Colorado River can be considered potentially unstable due to the slope geometry and the threat of ongoing erosion. This *Area of Unstable Slope* has been established by laboratory analysis of the soil shear strength and calculated stability of specific locations along the banks.

SHALLOW FOUNDATIONS

Soil Types I, II

For foundation systems placed greater than 6 feet above the expansive clays of the Dakota Formation, we recommend that a shallow foundation system be utilized. We recommend the shallow foundation systems consist 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, may be designed on the basis of an allowable bearing capacity of 1200 psf maximum and no minimum dead load is required for Soil Type I. Shallow foundation systems resting on the very coarse granular

soil of Soil Type II may be designed on the basis of allowable bearing capacity of 2600 psf maximum and no minimum dead load required.

Contact stresses beneath all continuous walls should be balanced within + or - 150 psf at all points. Isolated interior column footing 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 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.

If the design of the upper structure is such that loads can be balanced reasonably well, a floating structural slab or raft type of foundation could be used on portions of this site. Such a slab would require heavy reinforcing to resist differential bending. It is possible to design such a slab either as a solid or ribbed slab, but in either case, a rimwall must be used for confinement. Any such slab must be specifically designed for the anticipated loading. Such a foundation system will settle to some degree as any softer, underlying soils consolidate, but differential movement is held

to a minimum. Because the soils may settle in varying amounts, some minor cracking and heave are possible unless the slabs are specifically designed with the movement in mind. Caution: A floating Structural Slab must not be used above Expansive Clays unless specific design and precautions are undertaken.

Stem walls for a shallow foundation system should be designed as grade beams capable of spanning at least 12 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.

FROST PROTECTION

We recommend that the bottom of all shallow 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.

SETTLEMENT:

We anticipate that total and/or differential settlements for the proposed structures may be considered to be within tolerable limits, provided the recommendations presented in this report are fully complied with. In general, we expect total settlements for the proposed structures to be less than 1 inch.

DEEP FOUNDATIONS

DRILLED PIERS - Soil Type III:

We recommend that drilled piers have a minimum shaft length of 10 feet and be embedded at least 7 to 10 feet into the relatively unweathered bedrock. At this level,these piers may be designed for a maximum end bearing capacity of 25000 psf, plus 1800 psf side support considering only the side wall area embedded in the bedrock. Due to the expansive potential of the bedrock, a minimum dead load uplift is required, consisting of a point uplift of 2200 psf and 300 psf side uplift, based on the side wall embedded in the bedrock. Assuming the overburden is soft, no supporting or uplift values will be assigned to this material. The weight of the concrete in the pier may be incorporated into the required dead load.

It is recommended that the bottoms of all piers be thoroughly cleaned prior to the placement of concrete. The amount of reinforcing in each pier will depend on the magnitude and nature of loads involved. As a rule of thumb, reinforcing equal to approximately 1/2 of 1% of the gross cross-sectional concrete area should be used. Additional reinforcing should be used if structural conditions warrant. We recommend that reinforcing extend through the full length of pier.

To minimize the possibility of voids developing in the drilled piers, concrete with a slump of 5 to 6 inches is recommended. We recommend that piers be dewatered and thoroughly cleaned of all loose material prior to placing the steel cage and concrete. The pier excavation should contain no more than 2 inches of free water unless the concrete is placed by

means of a tremie extending to the bottom of the pier. A free fall in excess of 5 feet is not recommended when placing concrete in drilled piers. We recommend that casing be pulled as the concrete is being placed and that a 5 foot head of concrete be maintained while pulling the casing. It is recommended that drilled piers be plumb with 2% of their length and that the shaft maintain a constant diameter for the full length of the pier and not allowed to "mushroom" at the top.

DRILLED PIER OBSERVATION:

The foundation installation for drilled piers should be continuously observed by a representative of Lincoln DeVore to determine that the recommended bearing material has been adequately penetrated and that soil conditions are as anticipated by the exploration. This observation will aid in attaining an adequate foundation system. In addition, abnormalities in the subsurface conditions encountered during foundation installation can be identified and corrective measures taken as required. Lincoln DeVore requires a minimum of one working day's notice, and a copy of the foundation plan, to schedule any field observation.

GRADE BEAMS:

A reinforced concrete grade beam is recommended to carry the exterior wall loads in conjunction with the deep foundation system. We recommend that this grade beam be designed to span from bearing point to bearing point and not be allowed to rest on the ground surface between these points. We

recommend a void space be left between the bottom of the grade beam and the subgrade below due to the expansive nature of the subgrade 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.

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 to 400 square feet, maximum. Also, additional control joints are recommended at all inside corners and at all columns to control cracking in these areas.

If the slab is to be placed directly on the expansive clays of the Dakota Formation or on a thin fill overlying these soils, the risk of slab movement is high and stringent mitigation techniques are recommended. No design method known at this time will prevent slab movement should moisture enter the expansive soils below. Therefore, to mitigate the effects of slab movement should they occur, we recommend the following, in addition to the above recommendations:

1. We recommend that all slabs on grade be isolated from structural members of the building. This is generally accomplished by an expansion joint at the floor slab / foundation interface. In addition, positive separation should be maintained between the slab and all interior columns, pipes and mechanical systems extending through the slab.

2. The slab subgrade should be kept moist 3 to 4 days prior to placing the slab. This is done by periodically sprinkling the subgrade with water. However, under no circumstances should the subgrade be kept wet by the flooding or ponding water.

3. Any partitions which will rest on the slabs on grade should be constructed with a minimum void space of 2 inches at the bottom of the wall (see figure in the Appendix). This base should allow for future upward movement of the floor slabs and minimize movement and damage in walls and floors above the slabs. This void may require rebuilding after a period of time, should heave exceed 2 inches.

EARTH RETAINING STRUCTURES

Soil Types I and II:

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.

Soil Type III:

The active soil pressure for the design of earth retaining structures may be based on an equivalent fluid pressure of 71 pounds per cubic foot for the clayey soils of the Dakota Formation. 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 90

pounds per cubic foot may be used for the clayey 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 159 pcf per foot of depth for the alluvial soils. The coefficient of friction for concrete to soil may be assumed to be .14 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 never be added to a Type II, Type I-II or Type II-V cement.

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 - Reddish Clayey Sands, with gravels mixture in upper road cuts.

R = 46
Expansion @ 300 psi = 0.0
Displacement @ 300 psi = 4.41

Soil Type III Clayey Soils of the Dakota Formation

R < 5
Expansion is critical for this soil. Samples extruded from mold bottom during the Exudation portion of the test procedure.

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:

Residential Roadway:

Soil Type - Reddish Clayey Sands, with gravels mixture in upper road cuts.

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

Soil Type III Clayey Soils of the Dakota Formation

3 inches of asphaltic concrete pavement
on 12 inches of aggregate base course
on 8 inches of recompacted native material

Full Depth Asphalt:

Soil Type - Reddish Clayey Sands, with gravels mixture in upper road cuts.

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

Rigid Concrete:

Soil Type - Reddish Clayey Sands, with gravels mixture in upper road cuts.

6 inches of portland cement pavement
on 8 inches of recompacted native material

The use of either Full Depth Asphalt or Rigid Concrete Pavements are Not recommended for Soil Type III, the Clayey Soils of the Dakota Formation.

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.

All pavement, whether flexible or rigid, 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

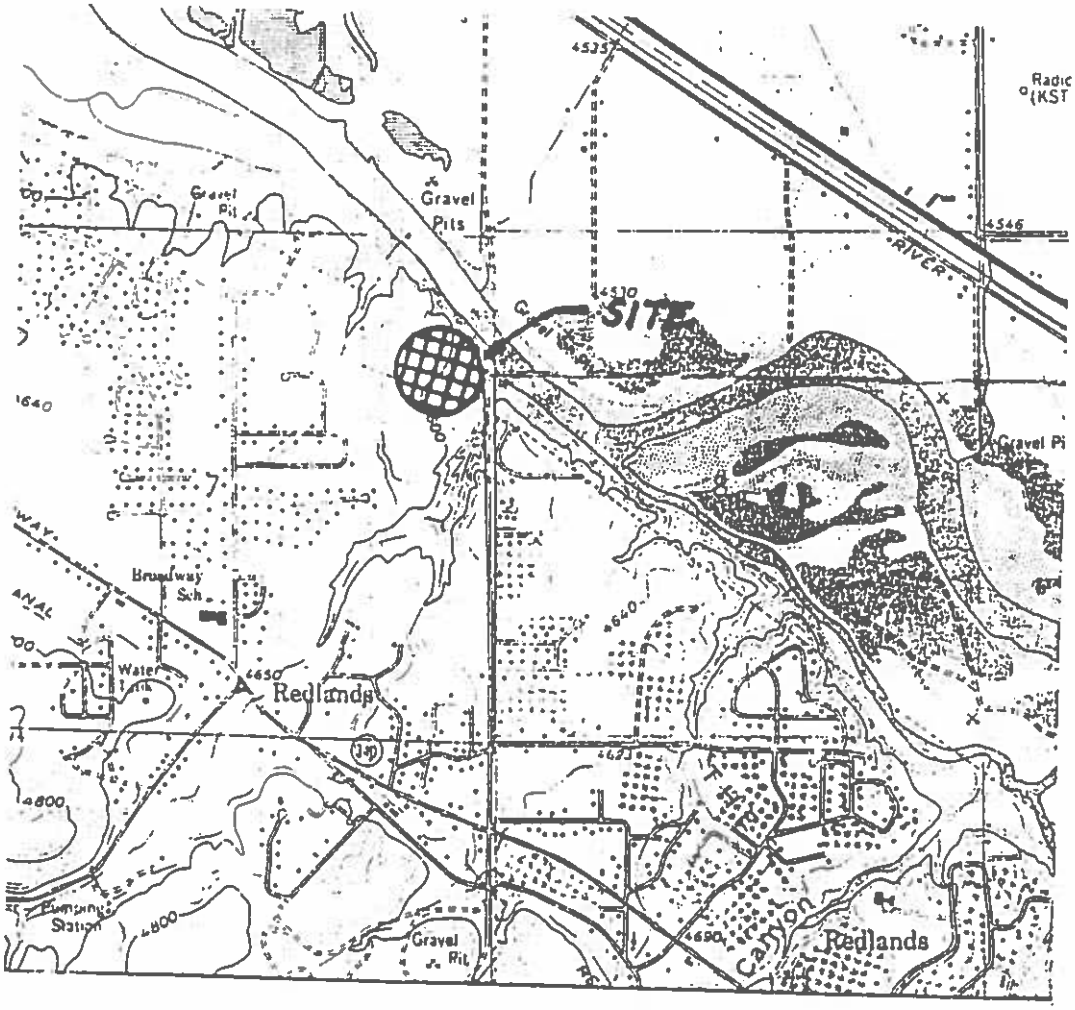
This report is issued with the understanding that it is the responsibility of the owner, or his representative to ensure that the information and recommendations contained herein are brought to the attention of the individual lot purchasers for the subdivision. In addition, it is the responsibility of 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 the appropriate 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 and should not be relied upon after a period of 3 years.

The recommendations of this report pertain only to the site investigated and are based on the as-

sumption 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 makes no warranty, either expressed or implied, as to the findings, recommendations, specifications or professional advice, except that they were prepared in accordance with generally accepted professional engineering practice in the field of geotechnical engineering.



SCALE - 1" = 2000'

U.S.G.S. 7-1/2' Quadrangle Series

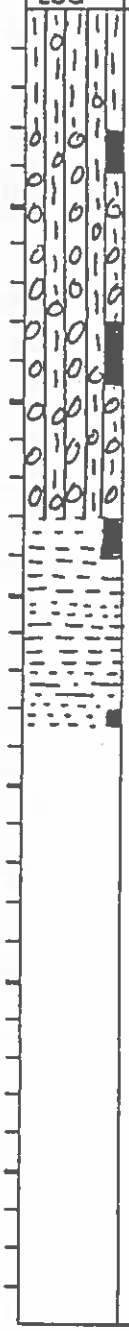
GENERAL SITE LOCATION DIAGRAM

Lincoln DeVore, Inc.
Geotechnical Consultants

	DATE
JOB NO.	DRAWN

BORING NO. 1

BORING ELEVATION:



DEPTH (FT.)	DESCRIPTION				BLOW COUNT	SOIL DENSITY pcf	WATER %
	I Silty Sand, Gravelly	Pink to Lt. Red		Debris Fan			
	SM Fine grained						
	II Alluvial, River Terrace Deposit		Medium Density				
	GM Coarse Grained Gravel and Some Cobble			Moist	CS	8/6	106.6	5.5%
5		Very Sandy			5	16/12		
	Slightly Compressible		Stratified					
	II Alluvial, River Terrace Deposit		White to Gray Sands				
	GM Coarse Grained Gravel and Cobble		Very Sandy		SPT	8/6		2.0%
10		Stratified	Medium Density		10	22/12		
		Pink to Red Sands		Damp		42/18		
	Coarse Grained Gravel and Cobble						
	Kd Dakota Formation	Very Firm	Very Moist		SPT	15/6		15.1%
15	III Gray - Black Claystone and Shale		Carbonaceous		15	35/12		
	Expansive	Thin, Yellow-Brown Sandstones					
	Sandstone, Hard at top	Friable in lower portion		Stratified			
	No Sample retained in Drive				SPT	75/1		13.9%
20					20			
	TD @ 18'						
25					25		
30					30		

Blow Counts are cumulative for each 6 inches of sampler penetration.

NO Free Water During Drilling 3/24/94

LOG OF SUBSURFACE EXPLORATION

Vista del Rio Subdivision
Grand Junction, Colorado

LINCOLN - DeVORE, Inc.

Grand Junction, Colorado

ALPINE - CM

Date: 4/11/94

Job No.: 80526-J

Drawn: EMM

BORING NO. 2

BORING ELEVATION:

DEPTH (FT.)	SOIL LOG	DESCRIPTION				BLOW COUNT	SOIL DENSITY pcf	WATER %
		I	Silty Sand, Gravelly	Pink to Lt. Red	Alluvial			
		II	Alluvial, River Terrace Deposit	Medium Density				
		GM	Coarse Grained Gravel and Cobble	Some Large Cobbles		SPT	13/6	4.5%
5			Very Sandy	Moist		5	35/12	
			Slightly Compressible	Stratified				
			Large Cobbles	Difficult to Drill				
		II	Alluvial, River Terrace Deposit	Gray Sands				
		GM	Coarse Grained Gravel and Cobble	Very Sandy		SPT	36/6	2.8%
10		Kd	Dakota Formation	Very Firm	Very Moist	10	58/12	
		III	Gray - Black Claystone and Shale	Carbonaceous				
			Expansive	Thin, Yellow-Brown Sandstones				
			No Sample, Gravels above caving in hole					
15						15		
			TD @ 13'					
20						20		
25						25		
30						30		

Blow Counts are cumulative for each 6 inches of sampler penetration.

NO Free Water During Drilling 3/24/94

LOG OF SUBSURFACE EXPLORATION

Vista del Rio Subdivision
Grand Junction, Colorado

LINCOLN - DeVORE, Inc.

Grand Junction, Colorado

ALPINE - CM

Date 4/11/94

Job No. 80528-J

Drawn EMM

BORING NO. 3

BORING ELEVATION:

DEPTH (FT.)	SOIL LOG	DESCRIPTION				BLOW COUNT	SOIL DENSITY pcf	WATER %
		II Alluvial, River Terrace Deposit	Medium Density					
		GM Coarse Grained Gravel and Large Cobble		Very Moist				
		Very Sandy	Stratified					
		Kd Dakota Formation	Very Firm	Very Moist	CS	16/6	110.8	15.3%
5		III Brown Claystone and Thin yellow Sandstones			5	44/12		
		Some Yellow Clays						
		Some clays are expansive						
		Gray - Black Claystone and Shale	Carbonaceous					
		Kd Dakota Formation	Very Firm to Hard		SPT	32/6		2.0%
10		III Sandstone, very firm	Friable in some strata	Stratified	10	107/12		
					BULK			
		Gray - Black, Carbonaceous Shale and Sandstone						
		Expansive						
15		TD @ 13'			15			
								13.9%
20					20			
25					25			
30					30			

Blow Counts are cumulative for each 6 inches of sampler penetration.

NO Free Water During Drilling 3/21/94

LOG OF SUBSURFACE EXPLORATION

Vista del Rio Subdivision
Grand Junction, Colorado

LINCOLN - DeVORE, Inc.

Grand Junction, Colorado

ALPINE - CM

Date: 4/11/94

Job No.: 80528-J

Drawn: EMM

BORING NO. 4

BORING ELEVATION:

DEPTH (FT.)	SOIL LOG	DESCRIPTION				BLOW COUNT	SOIL DENSITY pcf	WATER %
		SM Debris Fan Silty Sands	Medium Density					
		GM Coarse Grained Gravel and Large Cobbles						
		II Alluvial, River Terrace Deposit	Stratified					
		Very Sandy, In Some Strata		Slightly Moist	SPT	10/6		3.2%
5			Medium Density		5	20/12		
		Hole is Caving, due to Low Moisture				28/18		
						36/24		
		Coarse Grained Gravel and Cobbles						
		GM Alluvial, River Terrace Deposit		Slightly Moist	SPT	18/6		2.6%
10		II			10	47/12		
		Kd Dakota Formation	Stratified			108/18		
		III Brown Claystone and Thin yellow Sandstones						
		Some Yellow Clays	Expansive	Moist	BULK			8.4%
		Gray - Black, Carbonaceous Shale and Sandstone						
15		Poor Sample due to Hole Caving in Gravels			15			
		TD @ 13'						
20					20			
25					25			
30					30			

Blow Counts are cumulative for each 6 inches of sampler penetration.

NO Free Water During Drilling 4/11/94

LOG OF SUBSURFACE EXPLORATION

Vista del Rio Subdivision
Grand Junction, Colorado

LINCOLN - DeVORE, Inc.

Grand Junction, Colorado

ALPINE - CM

Date 4/11/94

Job No. 80528-J

Drawn EMM

BORING NO. 5

BORING ELEVATION:

DEPTH (FT.)	DESCRIPTION			BLOW COUNT	SOIL DENSITY pcf	WATER %
	SM Debris Fan Silty Sands	Low Density				
	GM Coarse Grained Gravel and Large Cobbles					
	II Alluvial, River Terrace Deposit					
	Stratified		Dry	SPT 21/6		2.4%
5	Medium Density			5 65/12		
	Very Sandy, in Some Strata					
	Hole is Caving, due to Low Moisture					
	Coarse Grained Gravel and Cobbles					
	GM Alluvial, River Terrace Deposit	Dry		SPT 14/6		1.8%
10	II			10 40/12		
				65/18		
	Kd Dakota Formation	Very Firm	Stratified			
	III Brown Claystone and Thin yellow Sandstones		Moist	ST	113.7	13.0%
	Gray - Black, Carbonaceous Shale and Sandstone			SPT 18/6		
15	Poor Sample due to Hole Caving in Gravels			15 40/12		
				80/18		
	TD @ 15'					
						13.9%
20				20		
25				25		
30				30		

Blow Counts are cumulative for each 6 inches of sampler penetration.

NO Free Water During Drilling 4/11/94

LOG OF SUBSURFACE EXPLORATION

Vista del Rio Subdivision
Grand Junction, Colorado

LINCOLN - DeVORE, Inc.

Grand Junction, Colorado

ALPINE - CM

Date 4/11/94

Job No. 80528-J

Drawn EMM

BORING NO. 6

BORING ELEVATION:

DEPTH (FT.)	SOIL LOG	DESCRIPTION				BLOW COUNT	SOIL DENSITY pcf	WATER %
	I SM	Silty Sand, Gravelly Fine grained	Pink to Lt. Red Pink to Red Sands	Debris Fan Damp Low Density				
				Moist	BULK			5.6%
5		Slightly Compressible		Stratified	5			
		Color Change, Purple Tint		Small Mudstone Fragments				
	I SM	Very Silty Sand Fine grained	Very Low Moisture		SPT	13/6		1.8%
10			Stratified	Medium Density	10	39/12		
		Occ. Thin Gravelly Strata				54/18		
	Kd Dakota Formation III	Gray - Black Claystone and Shale	Very Firm	Very Moist	ST		111.6	8.8%
15				Carbonaceous	CS 15	32/6		3.8%
		Expansive Sandstones are quite Hard	Brown Sandstone	Stratified		92/12		
		TD @ 15'						
20					20			
25					25			
30					30			

Blow Counts are cumulative for each 6 inches of sampler penetration.

NO Free Water During Drilling 4/11/94

LOG OF SUBSURFACE EXPLORATION

Vista del Rio Subdivision
Grand Junction, Colorado

LINCOLN - DeVORE, Inc.

Grand Junction, Colorado

ALPINE - CM

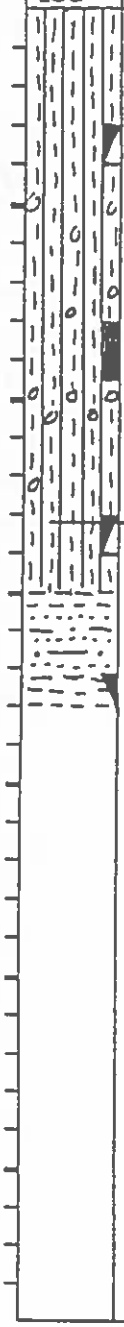
Date 4/11/94

Job No. 80528-J

Drawn EMM

BORING NO. 7

BORING ELEVATION:



DEPTH (FT.)	DESCRIPTION				BLOW COUNT	SOIL DENSITY pcf	WATER %
	I Silty Sand	Very Silty		Debris Fan			
	SM Fine grained	Pink to Red Sands		Damp			
			Low Density				
	Slightly Compressible			Moist	ST		
5			Stratified		5	98.2	10.5%
	Color Change, Purple Tint		Small Mudstone Fragments				
	I Very Silty Sand	Moist					
	SM Fine grained				SPT	7/6	7.8%
10		Stratified	Medium Density		10	14/12	
	Occ. Thin Gravelly Strata		Very Moist			22/18	
	Free Water						
	I Reddish - Brown Silty Sand				ST		
15	SM	Firm		CS	15	32/6	14.6%
	Kd Dakota Formation		Carbonaceous			92/12	22.5%
	III Brown, Firm to Hard Sandstone		Stratified				
	Very Moist	Gray - Black Claystone and Shale					
		Expansive	Very Firm				
20					20		
	TD @ 18'						
25					25		
30					30		

Blow Counts are cumulative for each 6 inches of sampler penetration.

Free Water @ 13-1/2'
During Drilling 4/11/94

LOG OF SUBSURFACE EXPLORATION

Vista del Rio Subdivision
Grand Junction, Colorado

LINCOLN - DeVORE, Inc.

Grand Junction, Colorado

ALPINE - CM

Date: 4/11/94

Job No.: 80528-J

Drawn: EMM

BORING NO. 8

BORING ELEVATION:

DEPTH (FT.)	SOIL LOG	DESCRIPTION		BLOW COUNT	SOIL DENSITY pcf	WATER %
		SM Debris Fan Silty Sands	Medium Density			
		Hole is Caving, due to Low Moisture				
		GM Alluvial, River Terrace Deposit	Slightly Moist	SPT 20/6		3.3%
5		II Coarse Grained Gravel and Large Cobbles		5 44/12		
		Stratified		70/18		
		Kd Dakota Formation	Stratified	108/24		
		III Gray - Black, Carbonaceous Shale and Sandstone				
		Expansive		ST	112.9	9.4%
10				10		
		Kd Dakota Formation	Stratified			
		III				
		Some Yellow Clays	Expansive Moist			
		Gray - Black, Carbonaceous Shale and Sandstone		SPT 16/6		16.8%
15				15 37/12		
		TD @ 14'				
20				20		
25				25		
30				30		

Blow Counts are cumulative for each 6 inches of sampler penetration.

NO Free Water During Drilling 4/11/94

LOG OF SUBSURFACE EXPLORATION

Vista del Rio Subdivision
Grand Junction, Colorado

LINCOLN - DeVORE, Inc.

Grand Junction, Colorado

ALPINE - CM

Date 4/11/94

Job No. 80528-J

Drawn EMM

SOILS DESCRIPTIONS

SYMBOL	USCS	DESCRIPTION
		Topsoil - Organic
		Man-Made Fill
	GW	Gravel Well-Graded
	GP	Gravel Poorly-Graded
	GM	Silty Gravel
	GC	Clayey Gravel
	SW	Sand Well-Graded
	SP	Sand Poorly-Graded
	SM	Silty Sand
	SC	Clayey Sand
	ML	Silt Low-Plastic
	CL	Silty Clay Low-Plastic
	OL	Organic Silt & Clay Low-Plastic
	MH	Silt High-Plastic
	CH	Clay High-Plastic
	OH	Organic Clay High-Plastic
	Pt	Peat
	GW/GM	Silty Gravel Well-Graded
	GW/GC	Clayey Gravel Well-Graded
	GP/GM	Silty Gravel Poorly-Graded
	GP/GC	Clayey Gravel Poorly-Graded
	GM/GC	Silty Clayey Gravel
	SW/SM	Silty Sand Well-Graded
	SW/SC	Clayey Sand Well-Graded
	SP/SM	Silty Sand Poorly-Graded
	SP/SC	Clayey Sand Poorly-Graded
	SM/SC	Silty Clayey Sand
	CL/ML	Silty Clay-Clayey Silt Low-Plastic

ROCK DESCRIPTIONS

SYMBOL	DESCRIPTION
	Sedimentary Rocks
	CONGLOMERATE
	SANDSTONE
	SILTSTONE
	SHALE
	CLAYSTONE
	MUDSTONE
	COAL
	LIMESTONE
	DOLOMITE
	MARLSTONE
	GYPSUM
	Other Sedimentary Rocks
	Igneous Rocks
	GRANITIC ROCKS
	DIORITIC ROCKS
	GABBRO
	BASALT
	RHYOLITE
	TUFF & ASH FLOWS
	BRECCIA & Other Volcanics
	Other Igneous Rocks
	Metamorphic Rocks
	GNEISS
	SCHIST
	PHYLLITE
	HORNFELS
	METAQUARTZITE
	MARBLE
	Other Metamorphic Rocks

SYMBOLS & NOTES

SYMBOL	DESCRIPTION
SPT 09/12	Standard Penetration Drive ASTM D-1586 Disturbed Sample Numbers indicate 9 Blows To drive the Spoon 12" into ground.
CS 09/12	'California Lined Sampler' Modified Penetration Drive ASTM D- Disturbed Sample Numbers indicate 9 Blows To drive the Spoon 12" into ground.
D&M 09/12	'Dames & Moore Lined Sampler' Modified Penetration Drive ASTM D- Disturbed Sample Numbers indicate 9 Blows To drive the Spoon 12" into ground.
ST	Thin-Walled 'Shelby' Tube ASTM D-1586 - 2.625"od 2.5" id 'Relatively Undisturbed Sample'
BULK	Disturbed, Bulk Sample ASTM D- Disturbed Sample
	Free Water Table
Wx	Weathered Rock Formation
	Test Boring Location
	Test Pit Location
	Seismic or Resistivity Station

Standard Penetration Drives are made by driving a standard 2" od, 1-5/8" id Split Spoon Sampler into the ground by dropping a 140 lb. weight 30".
No Thinwall Shoe Extension and the Sample is Disturbed.

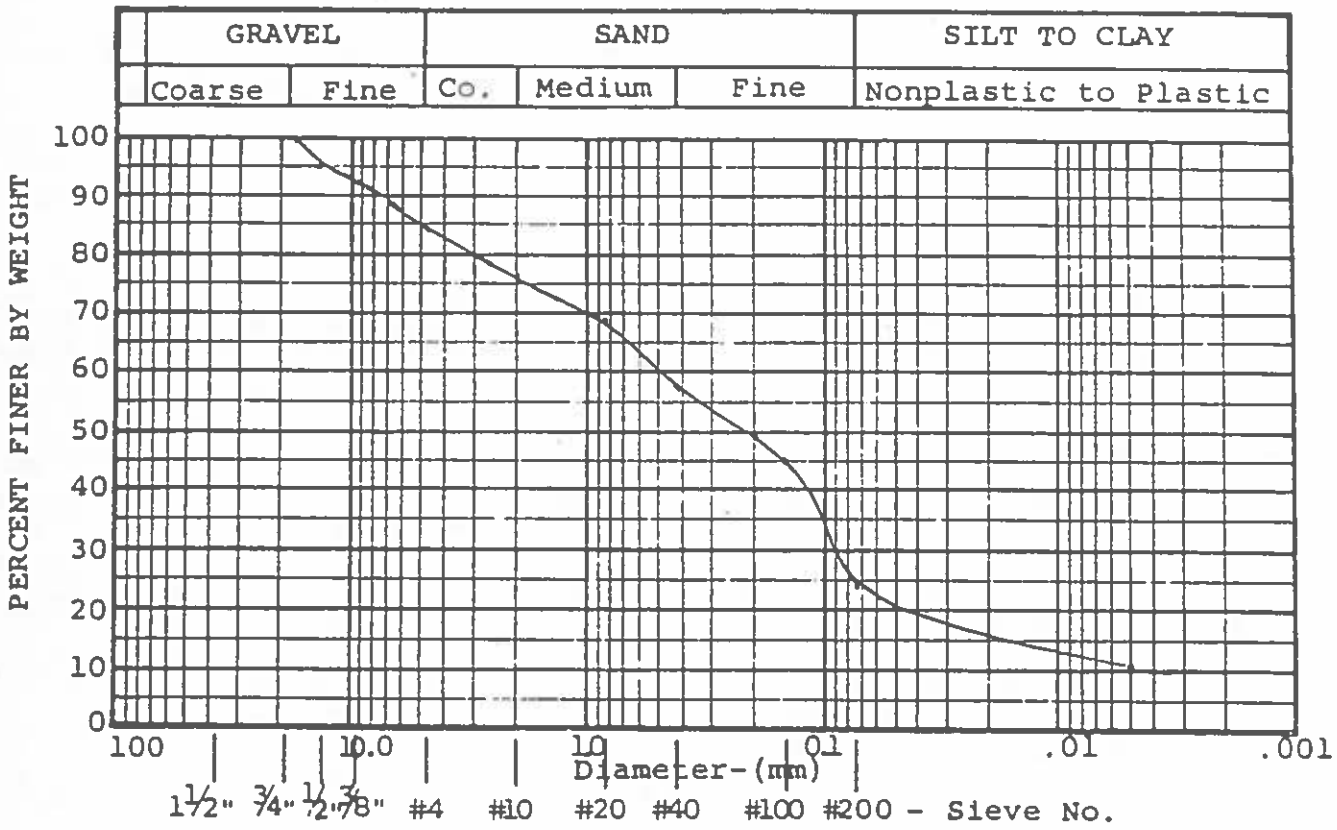
Modified Penetration Drives are made by driving a 2-1/2" od, 1.875" id California Spoon Sampler or a 3" od, 2-3/8" id California Spoon Sampler into the ground by dropping a 140 lb. weight 30".
No Thinwall Shoe Extension and the Sample is Disturbed.

The Boring Logs show subsurface conditions at the dates and locations shown, and it is not warrented that they are representative of subsurface conditions at times and other locations.

GRAND JUNCTION
LINCOLN - DeVORE, Inc.
Geotechnical Consultants
Grand Junction, Colorado

EXPLANATION OF BOREHOLE LOGS AND LOCATION DIAGRAMS

Form No.	Drawn	Date
GJLDFORM-EXPL	EMM	10-15-98



Soil Sample GRAVELLY SILTY SAND (SM) Sample Location T.H. #7 @ 4'

Sample No. I

Specific Gravity

Moisture Content 10.5%

Effective Size .004

Cu

Cc

Fineness Modulus

L.L. 19.7 % P.I. NP %

Bearing SEE REPORT ≈ 1200 psf

Sulfates 250 ppm

Sieve Size	% Passing
1-1/2"	
1"	
3/4"	100
1/2"	95
3/8"	92
#4	84
#10	76
#20	69
#40	58
#100	45
#200	24
0.0200	16
0.0050	11

Lincoln DeVore, Inc.
Geotechnical Consultants

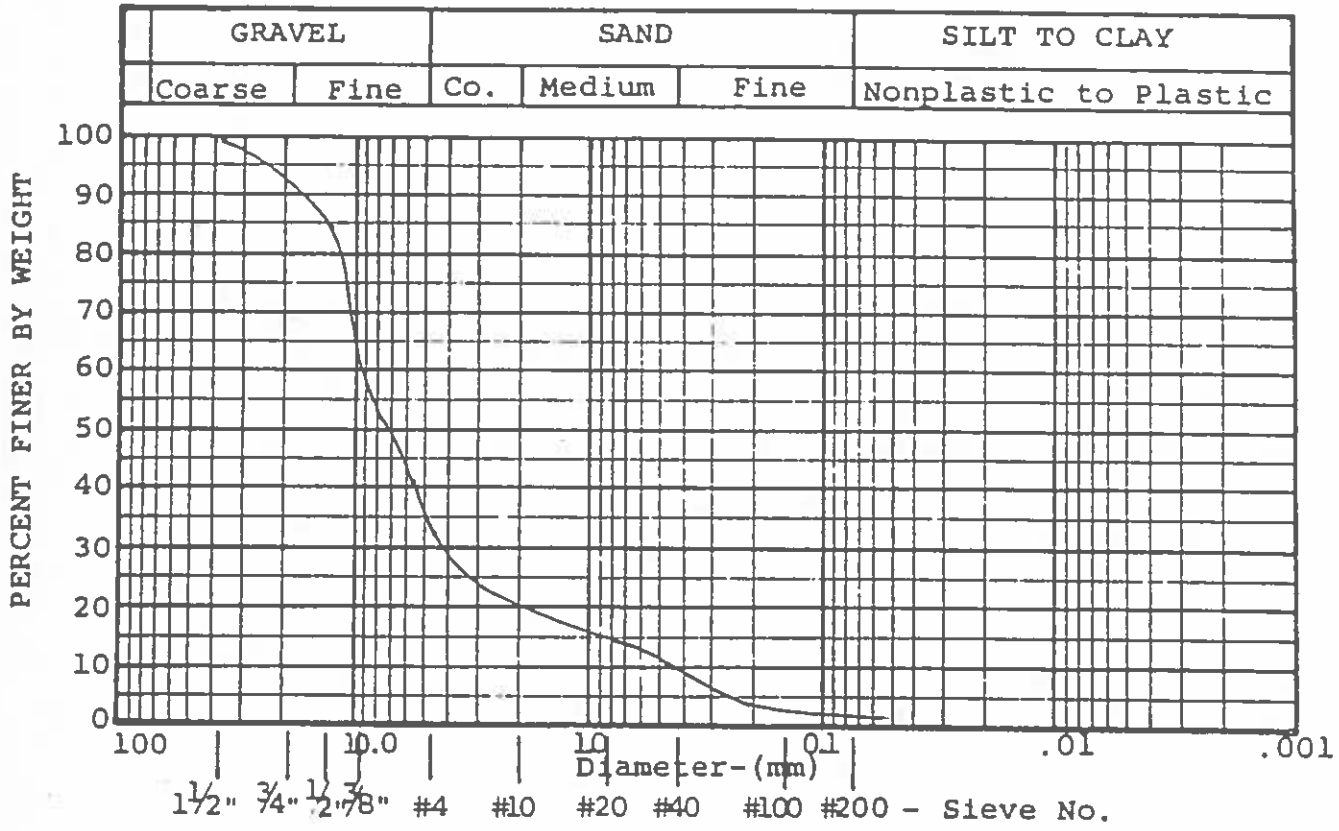
VISTA del RIO SUB. GRAND JUNCTION, CO

ALPINE - C.M.

DATE 4-11-94

JOB NO. 20538-1

DRAWN EMH



Soil Sample SILTY, SANDY GRAVEL (GM) Sample Location TB-1 @ 4'

Sample No. II

Specific Gravity

Moisture Content 5.5%

Effective Size .43 mm

Cu

Cc

Fineness Modulus

L.L. % P.I. NP %

Bearing SEE REPORT ≈ 2600 psf

Sulfates <50 ppm

Sieve Size	% Passing
1-1/2" (MAX SAMPLER SIZE)	100
1"	95
3/4"	92
1/2"	84
3/8"	60
#4	32
#10	20
#20	15
#40	9
#100	3
#200	2
0.0200	
0.0050	

Lincoln DeVore, Inc.
Geotechnical Consultants

VISTA del RIO SUB. GRAND JUNCTION, CO

ALPINE · C.M.

DATE 4-11-94

JOB NO. 80528-7

DRAWN EHH

SUMMARY SHEET

CLAYSTONE - DAKOTA FM.

Soil Sample Low to Medium Plastic Clay (CL)

Test No. 80528-J

Location VISTA del RIO SUB. GRAND JUNCTION

Date 4-11-84

Boring No. 5 Depth 12

Sample No. III - CLAYEY PORTION ONLY Some Sandstone Mixed

Test by LRS

Natural Water Content (w) 13.0 %

Specific Gravity (Gs) _____

In Place Density (γ_o) 113.7* pcf

SIEVE ANALYSIS:

Sieve No.	% Passing
1 1/2"	
1"	
3/4"	
1/2"	100
4	99
10	99
20	98
40	91
100	65
200	41

HYDROMETER ANALYSIS:

Grain size (mm)	%
.02	33
.005	23

Plastic Limit P.L. 22 %

Liquid Limit L. L. 41 %

Plasticity Index P.I. 19 %

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: 1 Days _____ %

Swell against 1600 psf Wo gain _____ %

BEARING:

Housel Penetrometer (av) 5500 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

A.I.C. – Grand Junction, Inc.
Allied Independent Consultants

303 North Avenue
P.O. Box 41049
Grand Junction, CO 81501
970-244-8703

February 7, 2003

Margaret S. Doose
P.O. Box 515
Ouray, CO 81427

RE: 570 Casa Rio Court, Vista del Rio Subdivision, Grand Junction, CO

Please find attached the documentation that Eric Hahn requested in his February 6, 2003, letter. In regards to # 4, the retaining wall was built in substantial compliance to the design. Tiebacks were also added and are described in an attached inspection letter. In regards to # 6, I do not believe the piers go through any shear plane. They were added for any future movement that may occur.

In addition to reviewing the Lincoln-Devore Report, we asked to review studies regarding the major slope failure to the west. This data was not available due to the pending lawsuit. Information on that slide would have been valuable in designing for this site.

Thank you for the opportunity to serve you. I hope that this information will satisfy the concerns of Eric Hahn.

Respectfully submitted,

Chris Steven Russell, PE
Allied Independent Consultants-Grand Junction, Inc.

cc: Eric Hahn

Inspection Letters

A.I.C. – Grand Junction, Inc.
Allied Independent Consultants

303 North Avenue
P.O. Box 41049
Grand Junction, CO 81501
970-244-8703

June 25, 2002

Susan Doose
570 Casa Rio Court
Grand Junction, CO 81503

RE: 570 Casa Rio Court

This office was contacted by Susan Doose to perform an inspection as to the depth of the piers on the retaining wall being constructed at the reference address. I, James Orton, under the supervision of Chris Steven Russell, Professional Engineer, inspected the drilling of pier holes and certify that all holes are to a satisfactory depth, and founded on acceptable material. This office advised having at least 3' penetration into the native river gravels. This was not reached on all holes due to the inability of the drill rig performing the drilling to drill through the gravels. It is advised by this office that the pier holes be filled with appropriate concrete as soon as possible to prevent the caving of the holes at depth.

Respectfully submitted,

James Orton
AIC Technician

A.I.C. – **Grand Junction, Inc.**
Allied Independent Consultants

303 North Avenue
P.O. Box 41049
Grand Junction, CO 81501
970-244-8703

June 27, 2002

Susan Doose
570 Casa Rio Court
Grand Junction, CO 81503

RE: Filling of Piers and Rebar at 570 Casa Rio Court

This office was contacted by Susan Doose to perform an inspection on the filling of piers and the rebar placement within the pier holes. An inspection was performed by James Orton, under the supervision of Chris Steven Russell, Prosfessional Engineer, and it was found that due to the type of pump used to fill the pier holes (a pump with the hose moved by hand) there was some contamination of the concrete, as the hose knocked against the sides of the holes. Also there were problems with the placement of rebar. The first ten holes were filled before rebar was attempted to be placed. Due to the time lapse between pouring the piers and sticking in the rebar the first holes were already beginning to cure and prevented the placement of the rebar. A map of the depths of the piers and the depths to which rebar was placed is attached. Another discrepancy was that 15 piers were marked out by the contractor, drilled by the pier drillers, and filled. The plans from the engineer only called for 13. With these exceptions the piers were drilled to satisfactory depth and filled in a satisfactory manner.

Respectfully submitted,

James Orton
AIC Technician

A.I.C. – Grand Junction, Inc.
Allied Independent Consultants

303 North Avenue
P.O. Box 41049
Grand Junction, CO 81501
970-244-8703

July 11, 2002

Susan Doose
570 Casa Rio Court
Grand Junction, CO 81503

RE: Compaction at 570 Casa Rio Court

This office was contacted by Susan Doose at the referenced location to perform inspections on the compaction of the fill material used to build the pad on which the structure will sit. James Orton, under the supervision of Chris Steven Russell, Professional Engineer, completed these inspections and found that all material was compacted in a manner consistent with design specifications. These inspections were made prior to any utilities being laid into the subsurface of the Monoslab foundation.

Respectfully submitted,

James Orton
AIC Technician

A.I.C. – Grand Junction, Inc.
Allied Independent Consultants

303 North Avenue
P.O. Box 41049
Grand Junction, CO 81501
970-244-8703

July 16, 2002

Susan Doose
570 Casa Rio Court
Grand Junction, CO 81503

RE: Compaction at 570 Casa Rio Court, Trenches

It has come to the attention of this office that the subsurface pad constructed prior to and inspected on July 11, 2002 has since had several trenches of substantial depth dug across it. This office would like to clarify its stance on these and any other likewise proceedings which may occur during the construction of the structure at 570 Casa Rio Court.

First, any trenches dug in the subsurface pad for the purpose of laying in utilities must be backfilled and compacted in a manner satisfactory to this office, namely compaction of the trench fill material must be inspected and found to have sufficient density to conform to the rest of the pad.

Second, the retaining wall on the same site must be finished and properly backfilled before pouring the Monoslab foundation of the main structure.

Questions about these requirements on requesting inspections may be resolved through further contact with this office.

Respectfully submitted,

James Orton
AIC Technician

FAX Immediately to Contractor
or Homeowner CR 7/16

A.I.C. – Grand Junction, Inc.
Allied Independent Consultants

303 North Avenue
P.O. Box 41049
Grand Junction, CO 81501
970-244-8703

July 17, 2002

Susan Doose
570 Casa Rio Court
Grand Junction, CO 81503

RE: Rebar Inspection at 570 Casa Rio Court

This office was contacted by Susan Doose at the referenced location to perform an inspection on the rebar in the retaining wall on said site. An inspection was performed by James Orton, under the supervision of Chris Steven Russell, Professional Engineer, and the rebar was found to be installed per design requirements.

Respectfully submitted,

James Orton
AIC Technician

A.I.C. – Grand Junction, Inc.
Allied Independent Consultants

303 North Avenue
P.O. Box 41049
Grand Junction, CO 81501
970-244-8703

July 29, 2002

Susan Doose
570 Casa Rio Court
Grand Junction, CO 81503

RE: 570 Casa Rio Court, Rebar and Subgrade Inspection

This office was contacted by Pierre Doose to request an inspection on the rebar and subgrade of the Monoslab foundation of the house being built at 570 Casa Rio Court. An inspection was conducted by James Orton, under the supervision of Chris Steven Russell, Professional Engineer, and the rebar and subgrade was found to meet design standards.

Respectfully submitted,

James Orton
AIC Technician

A.I.C. – Grand Junction, Inc.
Allied Independent Consultants

303 North Avenue
P.O. Box 41049
Grand Junction, CO 81501
970-244-8703

August 1, 2002

Susan Doose
570 Casa Rio Court
Grand Junction, CO 81503

RE: Compaction Test at 570 Casa Rio Court

This office was contacted by Pierre Doose to perform a compaction test on the first lift of material being backfilled behind the retention wall at 570 Casa Rio Court. The lift was approximately 18 inches tall. The pit run dirt mix was proctored at 125 pcf and was found to have adequate compaction for the design.

It was noted that this lift was in and compacted before the pouring of the Monoslab foundation of the house on the same property. Only this lift was in, the top of this lift is approximately 1' to 1.5' below the bottom of the thickened edge of the slab, and approximately 5' away.

It was also noted that buried in this slab were 4 concrete blocks approximately 4 to 6 feet long, 2 feet wide and 18 – 24 inches deep. Into these blocks ran 2 ¾" all-thread bars, galvanized and under coated. One of these bars angles upward and goes through the wall 1 foot below the top, the other bar comes out of the block nearly level and goes through the wall 1 foot up from the bottom of the wall on the outside of the wall. There are plates ¾" thick 6" in diameter under the nut on the all thread. The blocks were said to have rebar in them, but this was not observed by this office. The tiebacks are on 28' centers the distance of the wall.

This compaction test was performed by James Orton, under the supervision of Chris Steven Russell, Professional Engineer.

Respectfully submitted,

James Orton
AIC Technician

Field Notes

Compaction Testing

SITE	Roose

LIFT #	PROCTOR	DATE 6-23

Hole 1 NE corner of house

HOLE LOC.	Surface
% PR	
DD	122.0
WD	126.2
% M	7.5
M	

HOLE LOC.	18" BGL
% PR	
DD	115.9
WD	124.6
% M	7.5
M	

HOLE LOC.	3' BGL
% PR	
DD	114.8
WD	124.9
% M	8.8
M	

HOLE LOC.	5' BGL
% PR	
DD	107.4
WD	120.5
% M	12.2
M	

middle of house #2

HOLE LOC.	Surface
% PR	
DD	111.6
WD	112.0
% M	1.9
M	

HOLE LOC.	1' BGL
% PR	
DD	121.0
WD	127.3
% M	5.2
M	

HOLE LOC.	3 BGL
% PR	
DD	106.6
WD	111.1
% M	5.1
M	

HOLE LOC.	5 BGL
% PR	
DD	88.5
WD	97.4
% M	10.1
M	

North west corner of house #3

HOLE LOC.	Surface
% PR	
DD	113.7
WD	118.8
% M	4.5
M	

HOLE LOC.	3' BGL
% PR	
DD	109.4
WD	114.2
% M	4.4
M	

HOLE LOC.	5' BGL
% PR	
DD	99.7
WD	106.7
% M	6.7
M	

HOLE LOC.	7' BGL
% PR	
DD	Not accessable
WD	
% M	
M	

SITE	Poose

LIFT #	PROCTOR	DATE 6-23

SW corner of House #4

HOLE LOC. Surface	HOLE LOC. 2.5' Down
% PR	% PR
DD 95.4	DD 88.4
WD 99.1	WD 91.4
% M 4.0	% M 3.4
M	M

HOLE LOC. 4" BGL	HOLE LOC.
% PR	% PR
DD 100.7	DD
WD 106.5	WD
% M 5.7	% M
M	M

HOLE LOC.	HOLE LOC.
% PR	% PR
DD	DD
WD	WD
% M	% M
M	M

HOLE LOC.	HOLE LOC.
% PR	% PR
DD	DD
WD	WD
% M	% M
M	M

HOLE LOC.	HOLE LOC.
% PR	% PR
DD	DD
WD	WD
% M	% M
M	M

HOLE LOC.	HOLE LOC.
% PR	% PR
DD	DD
WD	WD
% M	% M
M	M

SITE		
LIFT #	PROCTOR 125	DATE

HOLE LOC. 1	
% PR	~~[illegible]~~ 93.4
DD	~~[illegible]~~ 116.4
WD	126.1
% M	8.9
M	

HOLE LOC. 2	
% PR	95.5
DD	119.5
WD	130.5
% M	9.2
M	

HOLE LOC. 3	
% PR	97.5
DD	121.9
WD	132.9
% M	9.0
M	

HOLE LOC. 4	
% PR	
DD	125.0
WD	134.5
% M	7.7
M	

HOLE LOC. (5)	
% PR	95.5
DD	119.4
WD	132.0
% M	10.5
M	

HOLE LOC. (6) c	
% PR	96.8
DD	123.5
WD	134.6
% M	9.2
M	

HOLE LOC. (7)	
% PR	94.6
DD	118.7
WD	129.2
% M	9.3
M	

HOLE LOC. 8	
% PR	94.4
DD	118.0
WD	130.4
% M	10.5
M	

HOLE LOC. 1	
% PR	94.6
DD	118.3
WD	129.6
% M	9.6
M	

HOLE LOC. 7	
% PR	96.6
DD	123.3
WD	132.2
% M	7.3
M	

HOLE LOC. 8	
% PR	96.3
DD	~~[illegible]~~ 120.4
WD	133.6
% M	11.1
M	

HOLE LOC.	
% PR	
DD	
WD	
% M	
M	

SITE	Goose

LIFT #	1	PROCTOR	122	DATE	7-2-02

HOLE LOC.	(1)
% PR	
DD	124.4
WD	135.4
% M	9.2
M	

HOLE LOC.	(2)
% PR	
DD	116.2
WD	129.0
% M	11.9
M	

HOLE LOC.	(3)
% PR	
DD	121.8
WD	134.1
% M	10.1
M	

HOLE LOC.	(4)
% PR	
DD	119.4
WD	136.2
% M	13.6
M	

HOLE LOC.	(5)
% PR	
DD	123.8
WD	136.7
% M	10.4
M	

HOLE LOC.
% PR
DD
WD
% M
M

HOLE LOC.
% PR
DD
WD
% M
M

HOLE LOC.
% PR
DD
WD
% M
M

HOLE LOC.
% PR
DD
WD
% M
M

HOLE LOC.
% PR
DD
WD
% M
M

HOLE LOC.
% PR
DD
WD
% M
M

SITE	DOESC

LIFT #	4	PROCTOR	134	DATE	7-9-02

HOLE LOC.	(1)
% PR	92.0
DD	123.9
WD	131.3
% M	6.0
M	

HOLE LOC.	(2)
% PR	94.7
DD	126.9
WD	136.2
% M	8.9
M	

HOLE LOC.	(4)
% PR	
DD	130.3
WD	138.4
% M	6.2
M	

HOLE LOC.	(3)
% PR	
DD	127
WD	129.1
% M	5.7
M	

HOLE LOC.	(5)	
% PR	~~126.4~~	94.4
DD	126.4	
WD	133.3	
% M	5.4	
M		

HOLE LOC.	(3)
% PR	94.9
DD	127.2
WD	135.2
% M	8.3
M	

HOLE LOC.
% PR
DD
WD
% M
M

HOLE LOC.
% PR
DD
WD
% M
M

HOLE LOC.
% PR
DD
WD
% M
M

HOLE LOC.
% PR
DD
WD
% M
M

HOLE LOC.
% PR
DD
WD
% M
M

HOLE LOC.
% PR
DD
WD
% M
M

SITE		
Dodge 6" Roadbase		
LIFT #	PROCTOR	DATE

HOLE LOC.	1	HOLE LOC.	2
% PR	[illegible]	% PR	
DD	131.5	DD	131.5
WD	138.0	WD	138.6
% M	4.9	% M	5.4
M		M	

HOLE LOC.	3	HOLE LOC.	4
% PR		% PR	95.5
DD	133.8	DD	129.9
WD	139.4	WD	135.5
% M	4.1	% M	4.2
M		M	

HOLE LOC.	5	HOLE LOC.	
% PR	98.1	% PR	
DD	133.4	DD	
WD	139.4	WD	
% M	4.5	% M	
M		M	

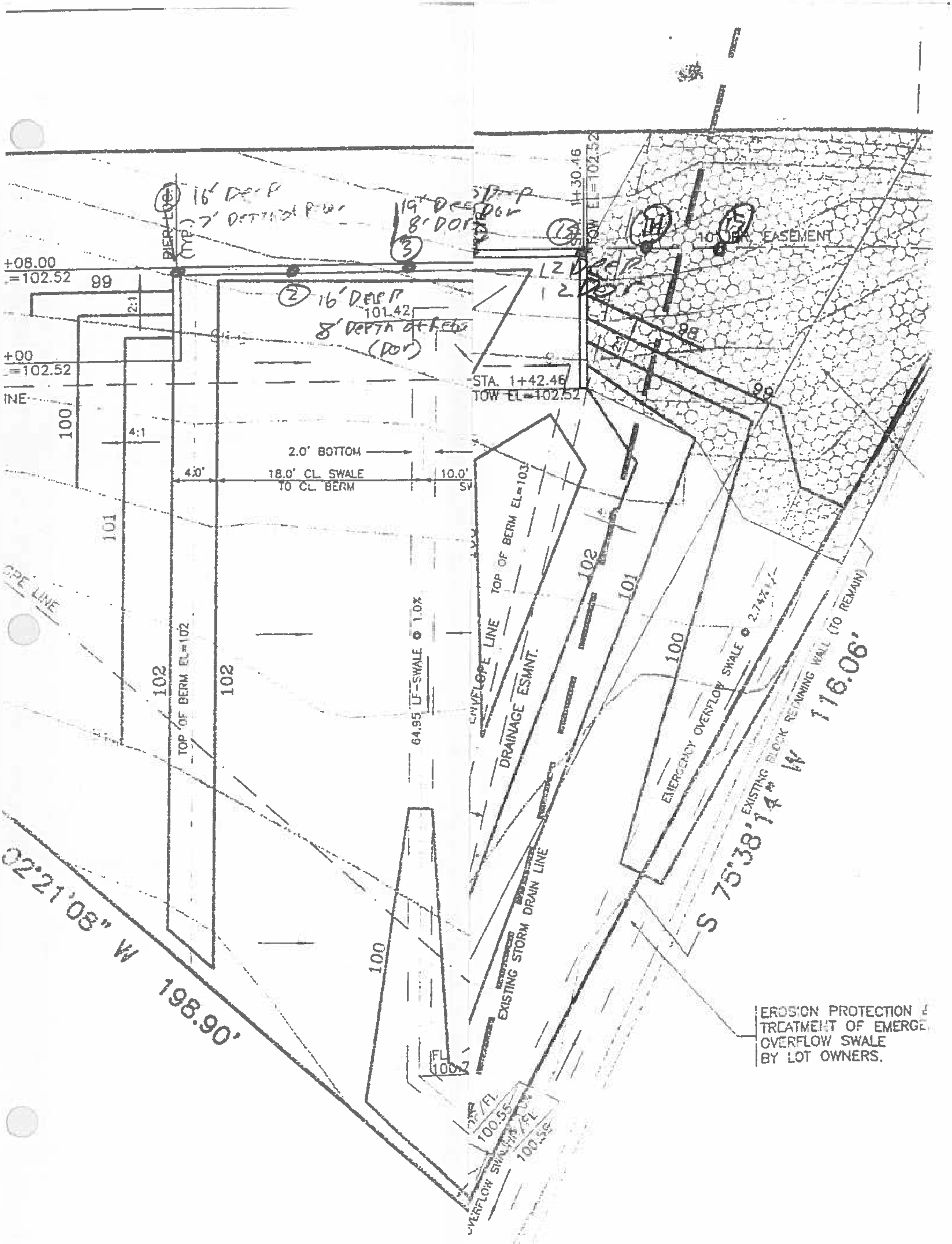
HOLE LOC.		HOLE LOC.	
% PR		% PR	
DD		DD	
WD		WD	
% M		% M	
M		M	

HOLE LOC.		HOLE LOC.	
% PR		% PR	
DD		DD	
WD		WD	
% M		% M	
M		M	

HOLE LOC.		HOLE LOC.	
% PR		% PR	
DD		DD	
WD		WD	
% M		% M	
M		M	

Bore Hole Logs

For Retaining Wall


PIER LOC. (TYP.)
16' Deep
7' Depth of Rebar
19' Deep
8' Dor
(3)
(2) 16' Deep
8' Depth of Rebar (Dor)
12' Deep
2 Dor
STA. 1+30.46
TOW EL=102.52
(1H)
(15)
10' DR. EASEMENT
+08.00
=102.52
99
2:1
101.42
+00
=102.52
INE
STA. 1+42.46
TOW EL=102.52
98
99
100
4:1
2.0' BOTTOM
4.0'
18.0' CL. SWALE TO CL. BERM
10.0'
101
TOP OF BERM EL=103
102
101
100
ENVELOPE LINE
DRAINAGE ESMNT.
64.95 LF-SWALE @ 1.0%
TOP OF BERM EL=102
102
102
EMERGENCY OVERFLOW SWALE @ 2.74% +/-
EXISTING BLOCK RETAINING WALL (TO REMAIN)
S 75°38'14" W 116.06'
EXISTING STORM DRAIN LINE
100
FL 100.7
02°21'08" W
198.90'
100.55
OVERFLOW SWALE
100.55
EROSION PROTECTION & TREATMENT OF EMERGENCY OVERFLOW SWALE BY LOT OWNERS.

Field Mapping

Slope Stability

A.I.C. – **Grand Junction, Inc.**
Allied Independent Consultants

303 North Avenue
P.O. Box 41049
Grand Junction, CO 81501
970-244-8703

May 14, 2002

Susan Doose
P.O. Box 515
Ouray, CO 81427

RE: 570 Casa Rio Court, Grand Junction, Colorado

I, James Orton, under the supervision of Chris Steven Russell, Professional Engineer, inspected the slopes at the property of Susan Doose at 570 Casa Rio Court, and found there are three types of slopes.

First is the previously stabilized slope on the north and west side of the property where it appears the slope has been artificially cut back to a stable slope of about 25% grade. This slope appears to have no stability issues pertaining to rock fall, slump or creep.

The second type of slope that was found was on the southeast corner of the property where there is a fairly large area of about 10% grade sloping towards the river. Due to the size and shape, as well as the erosion history of the area, this area is most likely a slump block, which was active in the past and under wetter conditions or a higher weight of over burden, would probably become active again. This area should be avoided during the placement of any structures on this property.

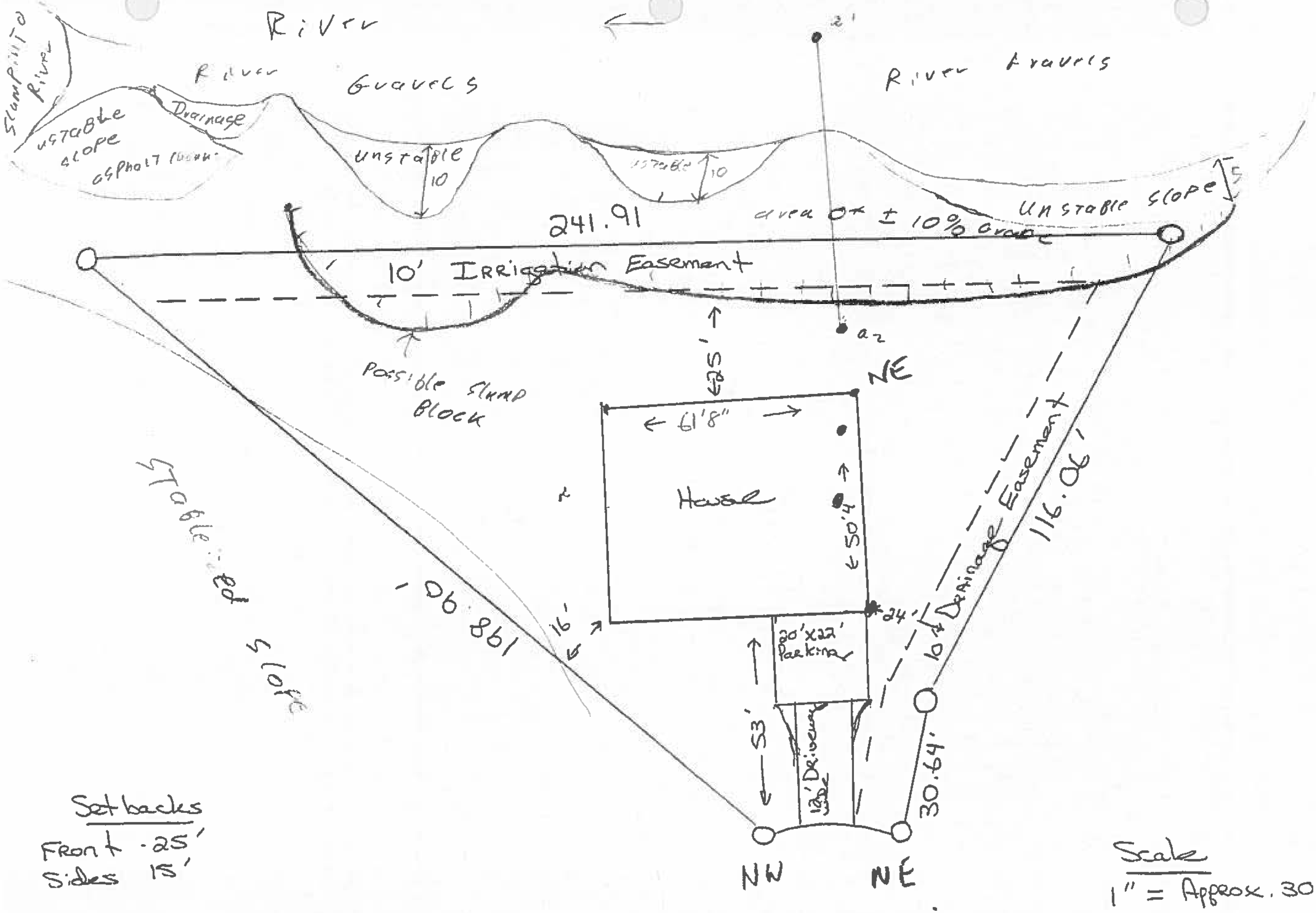
The third area of slope instability is the nearly vertical slope from the terrace on which the property lies down to the level of the river. This slope, as noted in the map attached, has several layers of different formations, contributed differently to the instability of the slope. The uppermost layer is a layer of man made fill, some time containing large pieces of asphalt and concrete. Most of this fill seems to be pit run and may be suitable for construction purposes. On the cliff face this layer extends down about 10 feet. Below that there is about 12 feet of flaky, gray decomposing Mancos Shale this formation may be expansive. Also noted in the shale was an unusually high amount of Gypsum evaporate, which could under wetter circumstances dissolve and lead to the partial collapse of the formation. Beneath the Mancos formation there seemed to be a sandy mudstone formation which was highly permeable as it seemed to carry a higher

moisture content as noted by the high degree of foliation as well as a small open seep from the base of this formation. This slope is in high danger of both rock fall and slump block erosion and proper set backs should be utilized. A drainage was also observed on the west end of the slope where storm run off has run in the past. Preventing of such surface run off in the future would be advisable for erosion protection.

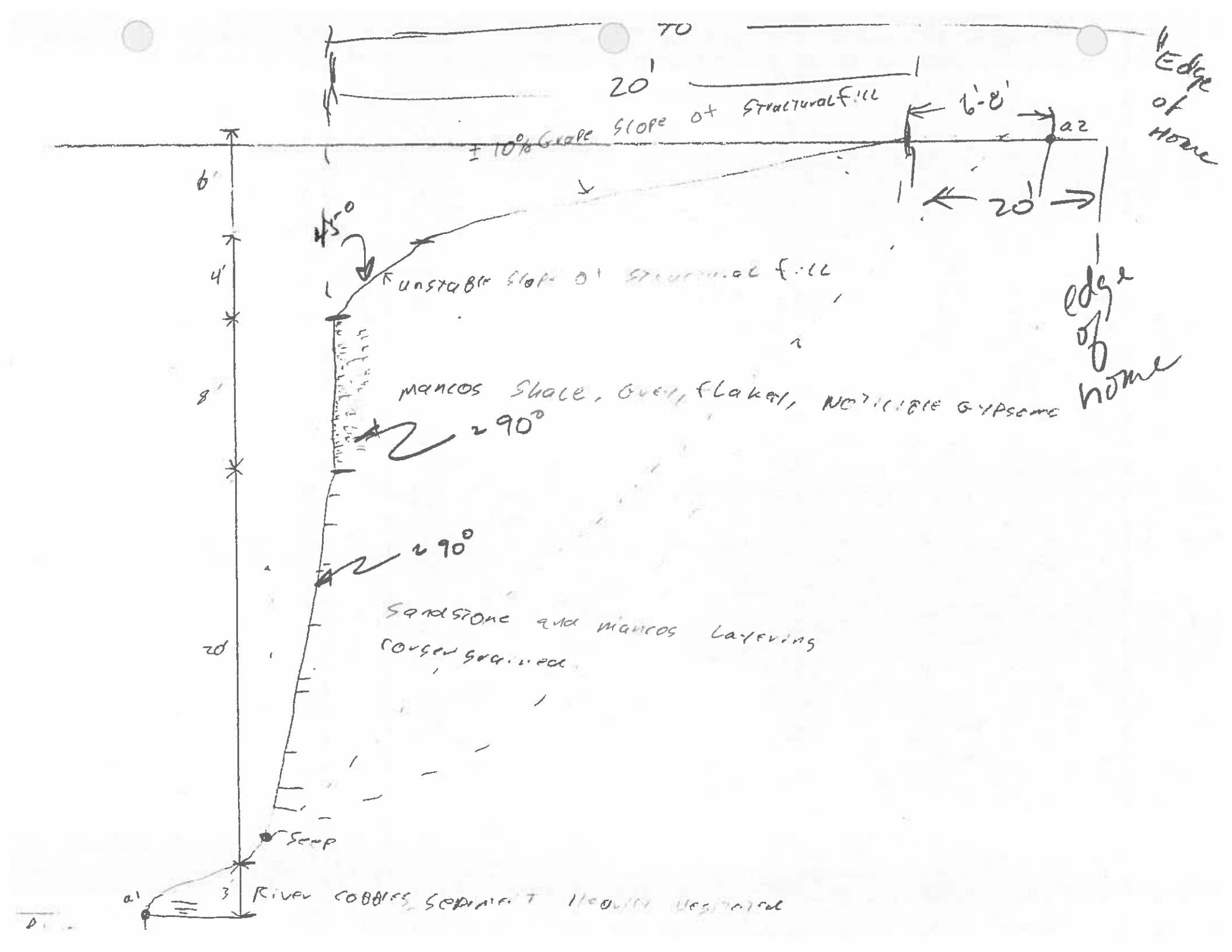
The areas of the property not mentioned previously were found to be stable, and fit for construction.

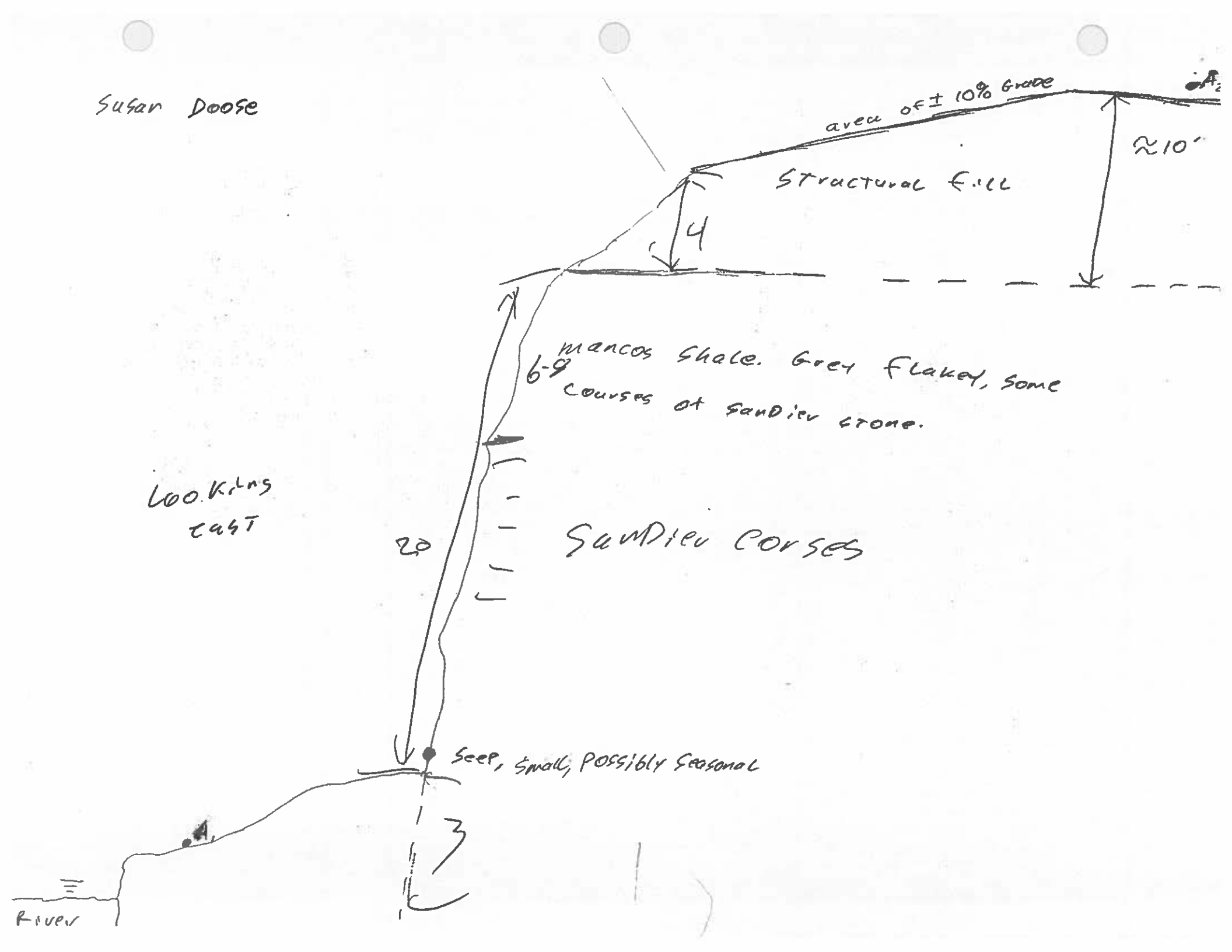
Respectfully submitted,

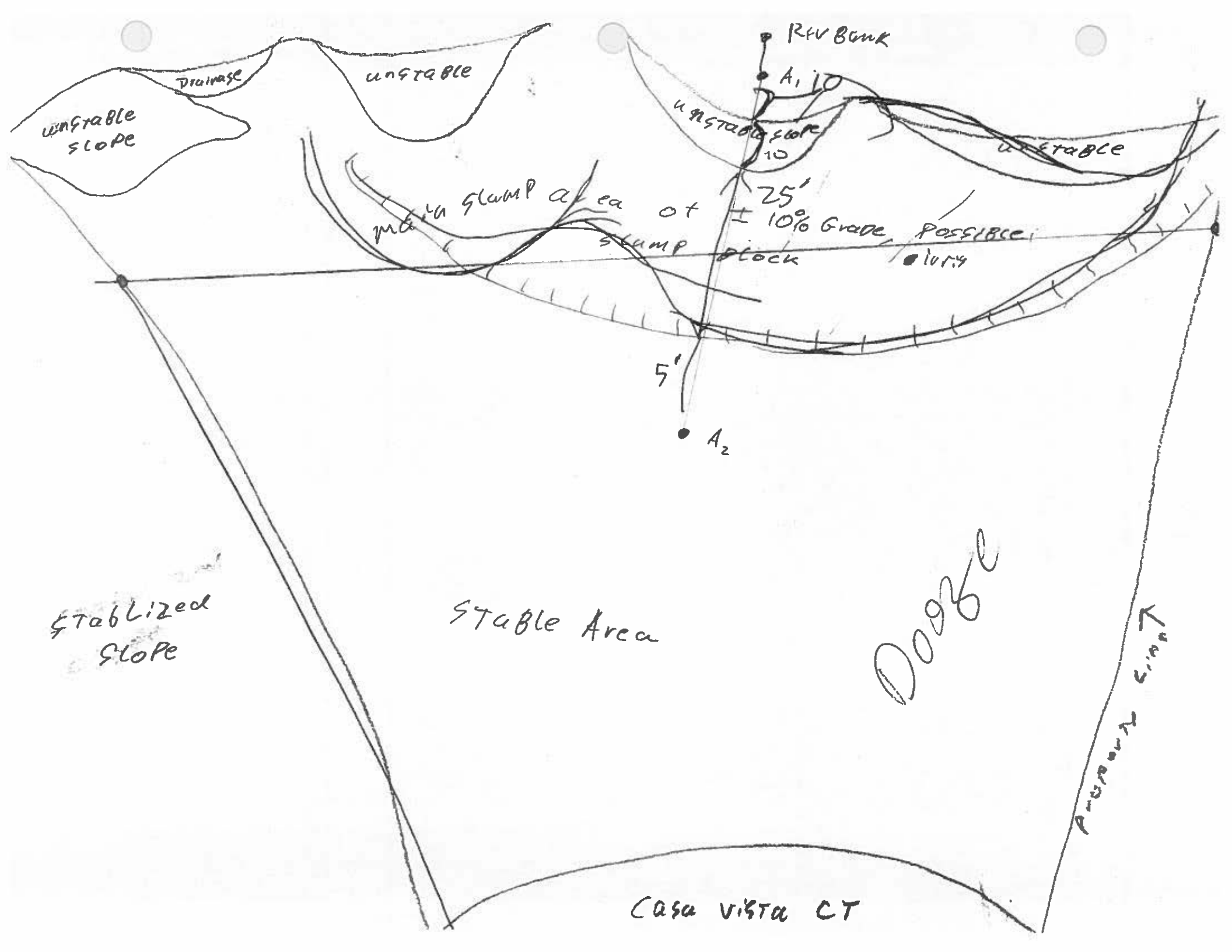
James Orton
AIC Technician

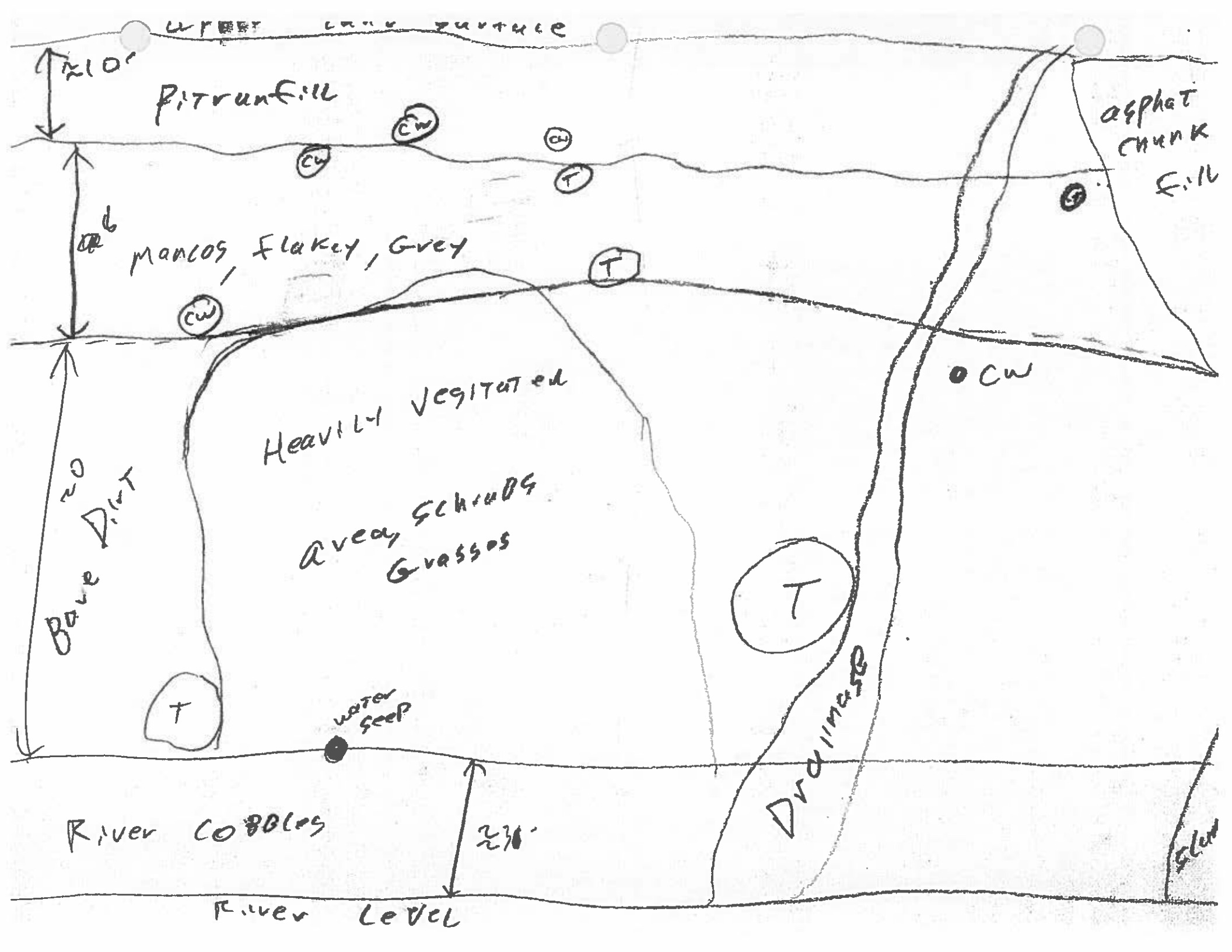


River
River Gravels
River Gravels
Drainage
unstable slope
asphalt
unstable 10
unstable 10
Unstable slope
5
area of ± 10% grade
241.91
10' Irrigation Easement
Possible slump Block
25'
NE
61'8"
House
50'4"
16'
198.06'
24'
20'x22' Parking
53'
12' Driveway
10'
Drainage Easement
116.06'
30.64'
NW
NE
Stabilized slope
Setbacks
Front 25'
Sides 15'
Scale
1" = Approx. 30'


TO
20'
Edge of Home
± 10% Grade Slope of Structural fill
6'-0"
a2
20'
6'
45°
4'
unstable slope of structural fill
edge of home
8'
mancos shale, over, flaker, noticible gypsome
≥ 90°
≥ 90°
20'
Sandstone and mancos layering
course grained
Seep
a1
3'
River cobbles sediment


Susan Doose
area of ± 10% Grade
≈10'
Structural Fill
4
6-9
Mancos Shale. Grey Flakey, some courses of Sandiev Stone.
Looking East
20
Sandiev Corses
Seep, Small, Possibly Seasonal
3
River


Rev Bank
A, 10
unstable slope
10
unstable
unstable slope
Drainage
unstable
25'
± 10% Grade Possible
mid-un slump area of
slump block
5'
A2
Stabilized Slope
Stable Area
Casa Vista CT
Property Line


Upper Level Surface
~10'
Pit run Fill
CW
T
asphalt chunk Fill
G
~6'
Mancos, Flakey, Grey
Heavily Vegitated
Areas Shrubs Grasses
CW
~0
Bare Dirt
T
water seep
Drainage
River Cobbles
~3'
River Level

2 PAGE DOCUMENT

BOOK3297 PAGE241
2108904 03/10/03 0254PM
JANICE WARD CLK&REC MESA COUNTY CO
RECFEE $10.00 SURCHG $1.00

DECLARATION

Margaret Susan Doose ("Declarant") is the owner of Lot 10, Filing 3, Vista del Rio Subdivision, Mesa County, Colorado also known as 570 Casa Rio Ct., Grand Junction, Colorado.

Information concerning the lot and improvements thereon, including a Subsurface Soil Exploration Report dated April 9, 1994, by Lincoln - DeVore, Inc. of Grand Junction, a Slope Stability Study prepared in May, 2002 by Allied Independent Consultants, Inc. of Grand Junction, a Soils Report prepared in May, 2002 by Allied Independent Consultants, Inc. of Grand Junction, together with building and drainage plans and all related correspondence, are available for inspection at the City of Grand Junction, Community Development Dept, 250 No. 5th St., Grand Junction, CO and at the Mesa County Building Dept, 750 Main St., Grand Junction, CO.

In order to ensure that the structure on the lot is not compromised, Declarant hereby adopts and imposes upon said Lot 10 the following conditions, restrictions and covenants:

1. Declarant and any successor in title shall annually have an inspection performed on Lot 10 and the structures and appurtenances thereon to determine whether there exist any indication of slope/geotechnical failure. The annual inspection shall be due in May, 2003 and each year thereafter;

2. Declarant and any successor in title shall notify the homeowners association and the Mesa County Building Department, in writing, if the reporting engineer's opinion as stated in the annual inspection(s) reveals, shows or discloses any subsidence, slope failure, instability or compromise of Lot 10 and/or the structure(s) and appurtenances thereto;

3. Any irrigation system installed on the Lot shall comply with all applicable planning and building regulations then in effect. No irrigation system shall be installed without all necessary permits, clearances and approvals;

4. Only xeriscape (drip) landscaping shall be permitted within ten feet of the house or retaining wall;

5. Neither the City of Grand Junction nor Mesa County shall have any liability for the use and occupancy of 570 Casa Rio Ct.

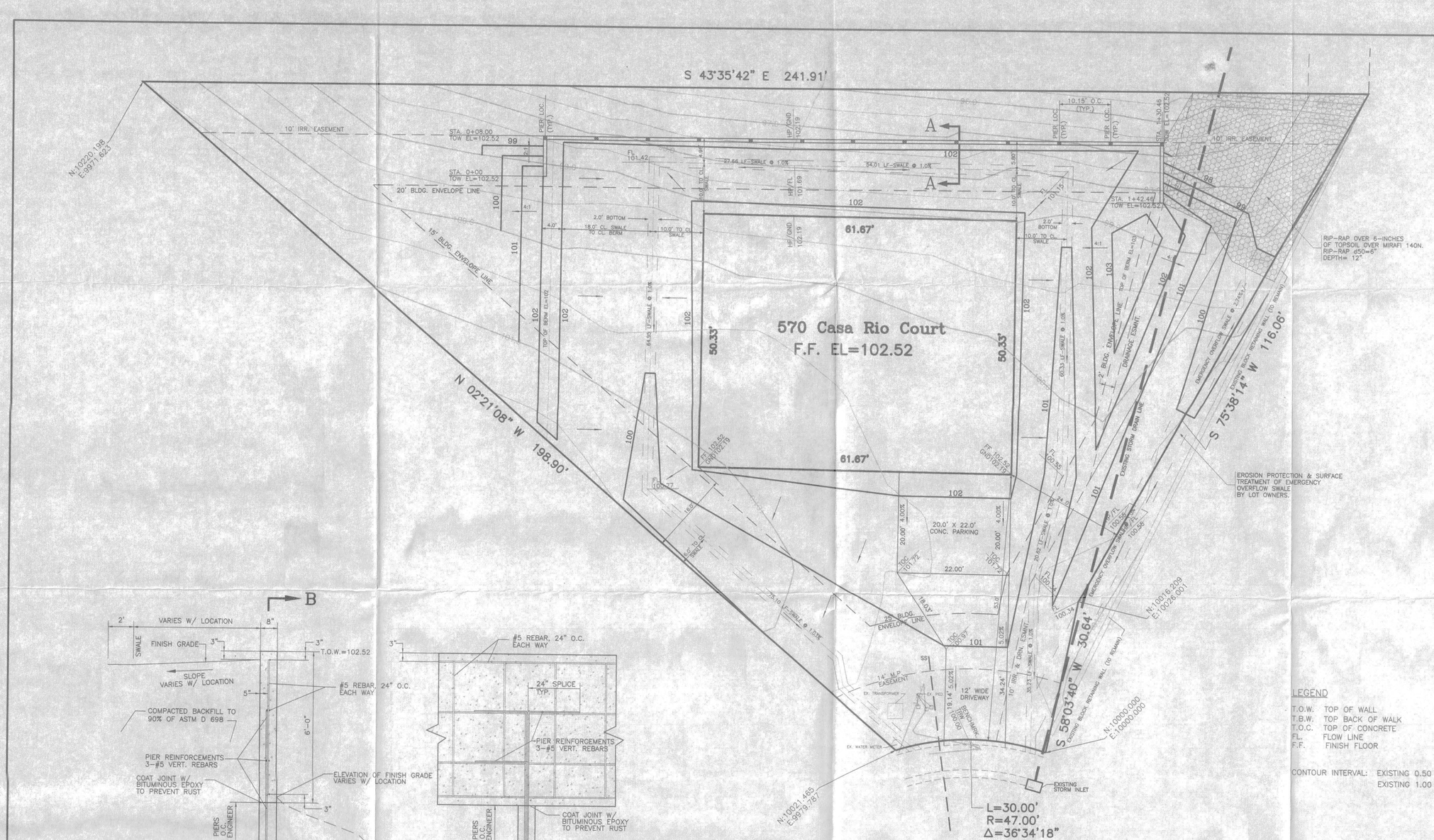
These conditions, restrictions and covenants shall run with the land and shall be binding upon all future owners of said Lot 10. Acceptance of title to said Lot 10, Filing 3, Vista del Rio Subdivision by any future owner shall constitute irrevocable acceptance of all of the terms of these conditions, reservations, restrictions and covenants.

In witness whereof I have set my hand this 7th day of February, 2003.

Mary Susan Doose

Margaret Susan Doose

680-E0



SECTION A–A
N.T.S.

SECTION B–B
N.T.S.

NOTE:
1. ALL REBAR SHALL BE gr. 60.
2. ALL CONCRETE IS 3,500 PSI – SULFATE RESISTANT

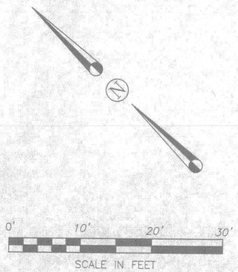
RETAINING WALL DETAILS

LEGEND

T.O.W. TOP OF WALL
T.B.W. TOP BACK OF WALK
T.O.C. TOP OF CONCRETE
FL. FLOW LINE
F.F. FINISH FLOOR

CONTOUR INTERVAL: EXISTING 0.50 FEET
EXISTING 1.00 FEET

PLOTTED
6/24/02



A.I.C. – GRAND JCT., INC.
ALLIED INDEPENDENT CONSULTANTS
303 NORTH AVENUE
GRAND JUNCTION, CO 81501
PHONE (970) 244-8703 FAX (970) 243-2681

GRADING PLAN
DOOSE RESIDENCE
GRAND JUNCTION, COLORADO

NO.	REVISION/ISSUE	DATE

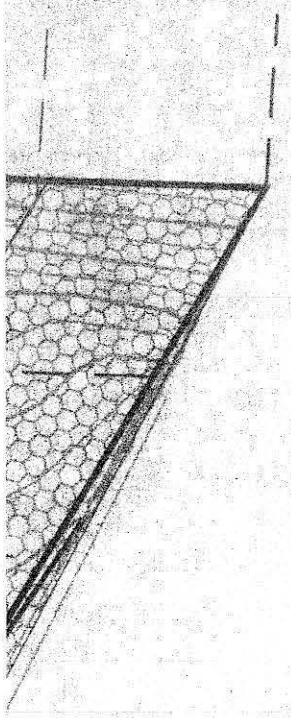
DATE 6/14/02
SCALE 1"=10'
DRAWN BY B.D.W.
CHECKED BY

SHEET 1 OF 1

FILE: dic.dwg

L80-E0

WHOLE STREET HAS RAISED CURB, EXCEPT NEIGHBORS.



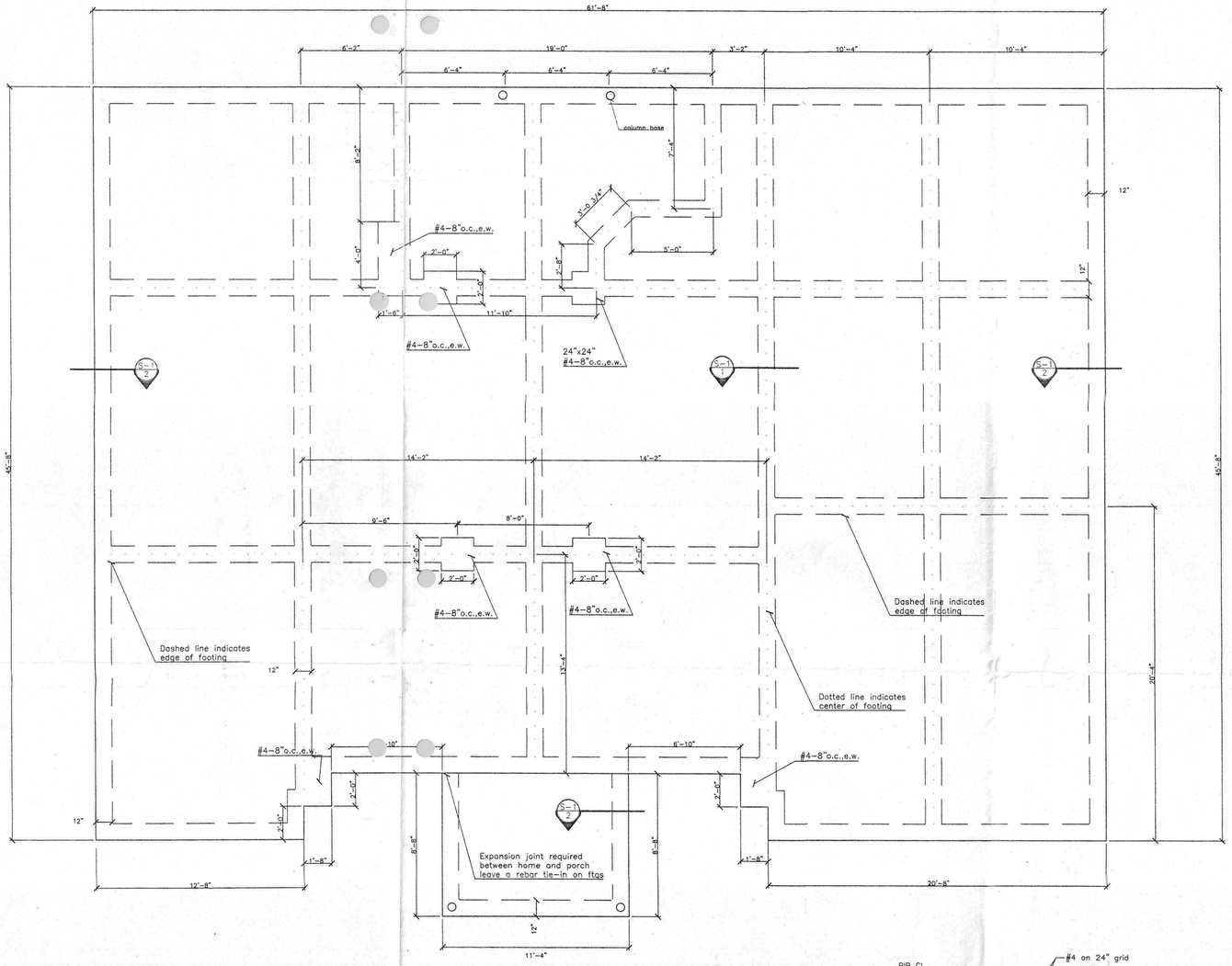
RIP-RAP OVER 6-INCHES
OF TOPSOIL OVER MIRAFI 140N.
RIP-RAP d50=6"
DEPTH= 12"

Retaining Wall Design — also see letters & Inspection — tiebacks were used also

: SURFACE
NCY

A.I.C. - GRAND JCT., INC.
ALLIED INDEPENDENT CONSULTANTS
303 NORTH AVENUE
GRAND JUNCTION, CO 81501
PHONE (970) 244-8703 FAX (970) 243-2681

ICE
ORADO



Foundation Plan

Scale: 1/4" = 1'-0"

0' 4' 8' 12'

SCALE IN FEET

MONOSLAB WITH INTERIOR RIBS AND FOOTINGS

GENERAL NOTES

1. Dimensions shown are based on latest available floor plans.
2. All dimensions to be confirmed by contractor prior to construction.
3. Foundation design based on soil investigation by AIC. That report shall be followed in all aspects.
4. Contractor and homeowner must make provisions to divert all water away from foundation.
5. Contractor to comply with strictest IBC 2000 specifications. If requirements are more stringent than those in plan, IBC 2000 code to be followed.
6. All forms must be inspected and approved prior to concrete pour.
7. Any design or material changes must be approved by the professional engineer on record.
8. Backfilling and compaction against walls shall take place only after adequate curing time.
9. The geotechnical engineer shall inspect and approve soil conditions prior to concrete pour.
10. All concrete will have at least a 3000 psi yield strength @28 days and be Type V Sulfate Resistant.
11. All concrete reinforcing steel bars will meet ASTM A-615 and shall be Grade 60.
12. Material under all floor slabs and footers will be compacted per geotechnical engineer.
13. Concrete pads for entrances, sidewalks, air conditioners, etc. shall not be connected to foundation.
14. See framing plans for anchor bolt setting locations.
15. Conventional light framed house construction assumed for design.

Concrete Notes

1) Concrete Specifications:
   - A) Minimum 28 day compressive strength: 3000 psi
   - B) Minimum Class B Concrete Content: 565 lb/cu yd
   - C) Air Content Range: 5% – 7%
   - D) Slump per mix design not to be exceeded by 1 1/2 inches
   - E) Aggregate Content per mix design not to exceed 3/4" in diameter
2) All concrete shall be transported, mixed, cured and tested in accordance with ACI 318 – 77 or the latest edition relating to those portions of ACI specifications. The owner or contractor shall be responsible for quality control.
3) All concrete walls shall be mechanically vibrated during placement.
4) All concrete in footings and walls shall be placed continuously. Vertical breaks in pours shall not be permitted.

COLORADO REGISTERED CHRISTOPHER S. RIVERA 31540 5/31/02 PROFESSIONAL ENGINEER

LOADING SCHEDULE

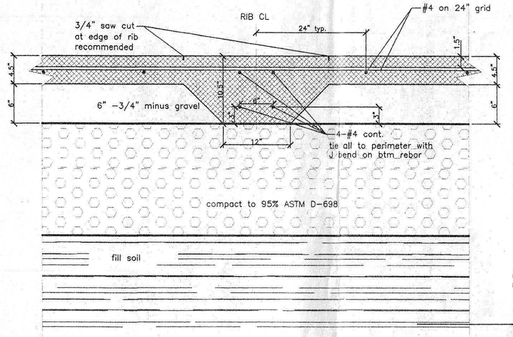
Loading		PSF
Live Load	Roof	30
	Floor	SLAB
Dead Load	Roof	20
	1st Floor	SLAB

NOTE: CONTRACTOR TO FIELD VERIFY THAT DEAD LOADS ARE SATISFACTORY.

NOTE: PORCH COLUMNS TO HAVE HAVE ADJUSTABLE STANDS PER IBC 2000 SPECS.

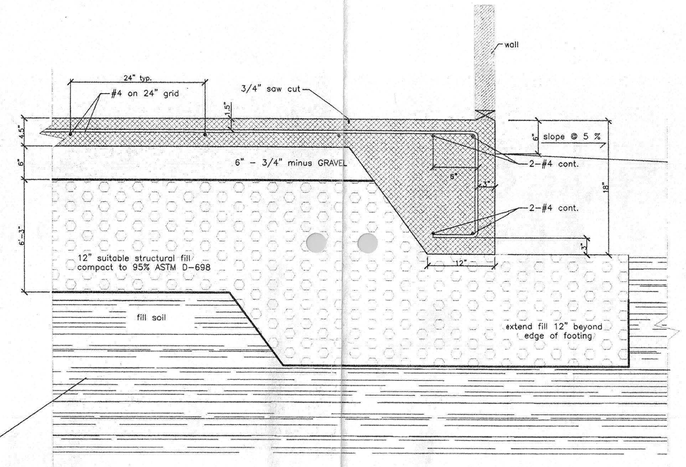
NOTE: DIMENSIONS BASED ON LATEST FLOORPLAN, CONTRACTOR TO FIELD VERIFY ALL DIMENSIONS SHOWN.

GEOTECHNICAL ENGINEER SHALL INSPECT AND APPROVE EXCAVATED FOOTING AREA AND OTHER ITEMS NOTED IN SOILS REPORT



1 Typical 12" Rib Monofooting Detail

Scale: N.T.S.



2 Typical 12" Perimeter Monofooting Detail

Scale: N.T.S.

A.I.C.- GRAND JCT., INC.
ALLIED INDEPENDENT CONSULTANTS
303 NORTH AVE.
GRAND JUNCTION, CO 81501
PHONE (970) 244-8703 FAX (970) 243-2681

FOUNDATION PLANS
DOOSE RESIDENCE
570 CASA RIO CT., GRAND JCT., CO

NO.	REVISION/ISSUE	DATE

DATE

SCALE 1/4"=1'-0"

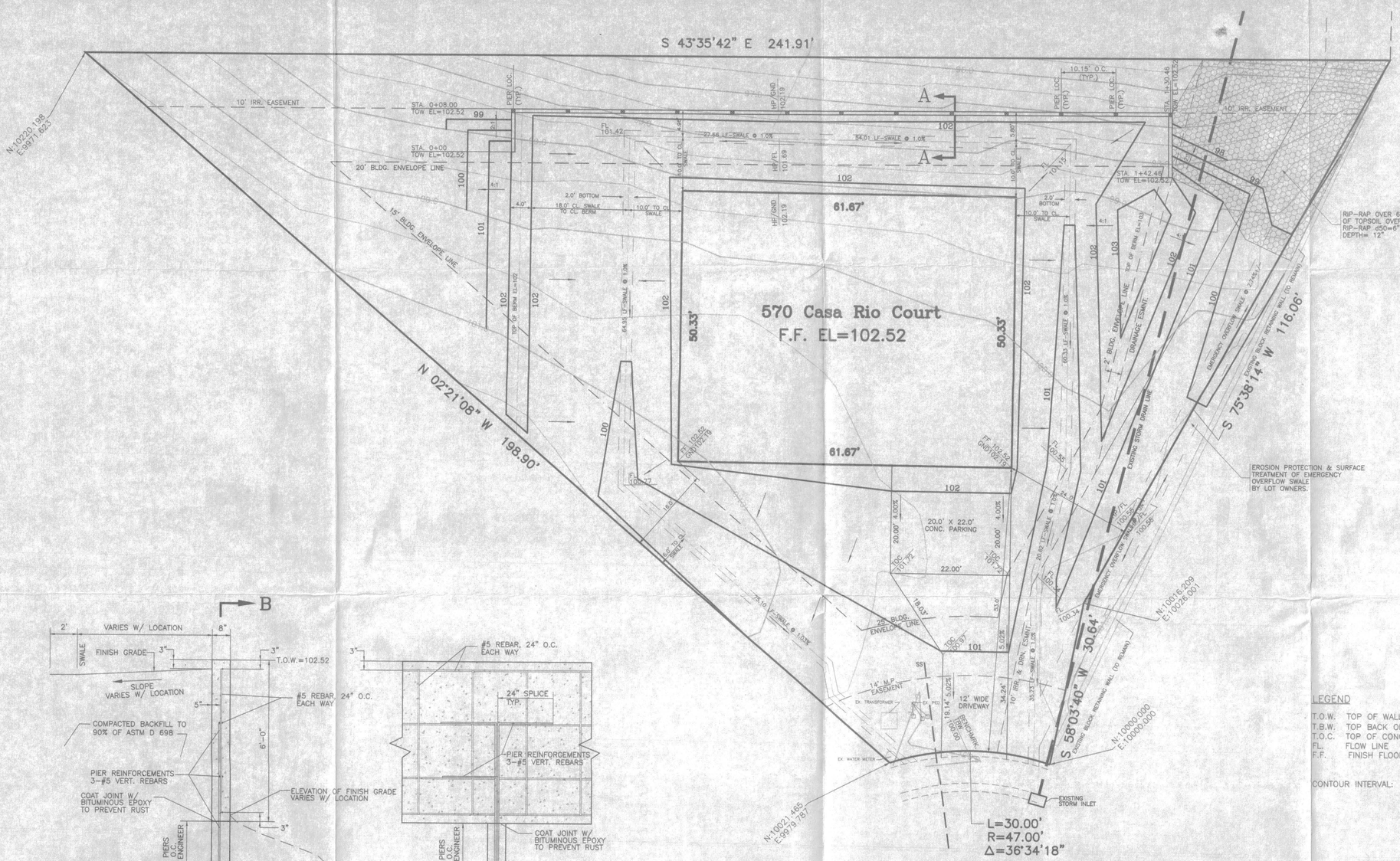
DRAWN BY CSR

CHECKED BY

SHEET S-1

03-087

L80-60



NOTE:
1. ALL REBAR SHALL BE gr. 60.
2. ALL CONCRETE IS 3,500 PSI - SULFATE RESISTANT

SECTION A-A
N.T.S.

SECTION B-B
N.T.S.

RETAINING WALL DETAILS

LEGEND

T.O.W. TOP OF WALL
T.B.W. TOP BACK OF WALK
T.O.C. TOP OF CONCRETE
FL. FLOW LINE
F.F. FINISH FLOOR

CONTOUR INTERVAL: EXISTING 0.50 FEET
EXISTING 1.00 FEET

PLOTTED
6/24/02

0' 10' 20' 30'
SCALE IN FEET

FILE: alc.dwg

A.I.C. - GRAND JCT., INC.
ALLIED INDEPENDENT CONSULTANTS
303 NORTH AVENUE
GRAND JUNCTION, CO 81501
PHONE (970) 244-8703 FAX (970) 243-2681

GRADING PLAN
DOOSE RESIDENCE
GRAND JUNCTION, COLORADO

NO.	REVISION/ISSUE	DATE

DATE 6/14/02
SCALE 1"=10'
DRAWN BY B.D.W.
CHECKED BY

SHEET 1 OF 1