INDOOR RADON STUDY-GAMMA SCREENING FORM

CARD	LOCATION No.	CITY	COUNTY	STATE	DATE FORM COMPLETED MONTH	YEAR
A	13438	0240	07	05	08	71
1	2 3 4 5 6	7 8 9 10	11 12 13	14 15	16 17	18 19

25

ADDRESS

NUMBER		DIR.	NAME
00626			30 RD
20 21 22 23 24	25	26	27 28 29 30 31 32 33 34 35 36 37 38 39 40

OCCUPANTS NAME (Last Name First - Initials for first and middle name-husband and wife)

KRIZMAN W F
41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58

OWNERS NAME (Last Name First - Initials for first and middle name - husband and wife)

KRIZMAN W F
59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76

(OWNERS ADDRESS Same)

CLASSIFICATION

1
77

0. Vacant Lot
1. Residence single family
2. Multiple (<4 families)
3. Apartment (>4)
4. Motel, hotel, or hospital
5. Single business (in one unit)
6. Multiple business unit(connected)
7. School
8. Church
9. Other

GAMMA SCREEN

1
78

0. None
1. Completed
2. Occupant refusal
3. No - ask owner
4. Owner refusal
5. No one to contact
6. No bad address
7. Outside only
8. Special scheduling
9. Other

TAILINGS USE

4 4
79

0. None
1. Under
2. Away
3. Under-Away
4. Possible
9. Unknown

GAMMA MAP

6
80

0. None
1. Yes
2. Occupant - No
3. No ask owner
4. Owner - No
5. No one to see
6. Not required

CARD	LOCATION NUMBER	CITY	COUNTY	STATE
B	13438	02[illegible]0	07[illegible]	05
1	2 3 4 5 6	7 8 9 10	11 12 13	14 15

LOCATION CODE	Township	Section 1/4 Sec.	Block	Owner Number	Lot
	16 17 18 19	20 21 22	24 25	26 27 28	29 30

HOG	LOG	HIG	LOCATION HIG
00110	00010	0[illegible]014	6
31 32 33 34 35	36 37 38 39 40	41 42 43 44 45	46

TYPE OF HOUSE

1
47

1. Basement
2. Slab on grade
3. Crawl space
9. Unknown

NUMBER OF LEVELS

1
48

MATERIAL

2
49

1. Masonry
2. Non masonry

0. Bedroom
1. Living Room
2. Kitchen
3. Den - Family Rm.
4. Dining Rm
5. Attached Garage
6. Basement
7. Work shop
8. Other
9. More than one location

FREE PUNCH COMMENT

4 [illegible] R [illegible] R [illegible] K [illegible] I N [illegible] P L H
50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65

N T E R [illegible] S W [illegible] L [illegible] W N [illegible] [illegible] [illegible]
66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

LOC #13438

COLORADO DEPARTMENT OF HEALTH

OFFICIAL SURVEY REPORT

Property Address 626 30 Rd Grand Jct Co 81501

Property Owner KRIZMAN WF

Owner Address (if different than above) — NA —

Date of Report JUN 4 1973

I. ☐ No indication of uranium mill tailings has been found on this property. See Item III below.

☒ Uranium Mill tailings are indicated to be on this property and are located:

- ☒ in yard only planter southwest lawn
- ☐ under or around garage or patio only
- ☐ under or around the house
- ☐ under or around the house and in yard
- ☐ under or around the building (business, church, etc.)

II. RESULTS OF THE RADIATION SURVEY IN THE STRUCTURE INDICATE:

☒ Average gamma radiation exposure rate of ES BKG mR/hr. This compares with the Surgeon General's recommendation for corrective action at 0.05 mR/hr.

☐ Average radon daughter concentration of CANNOT BE OBTAINED WL. This compares with the Surgeon General's recommendation for corrective action at 0.010 WL.

☐ The presence of uranium tailings under occupied areas necessitating corrective action.

III. RECOMMENDATION:

☐ You are advised to remove tailings if feasible or take other means of corrective action to reduce the radiation exposure.

☒ Location of identified tailings and radiation levels [redacted] tion. However, if use of the identified [redacted] is changed in the future, removal if feasible or other corrective action or control should be considered.

☐ Recommendations will be provided to you when measurements of radon daughter concentration have been completed.

☐ Other radiation sources (non-tailings) have been identified on your property, such as instrument dials, ore samples, etc. Removal is suggested, if practical.

RG

ORH-42
1-72

June 4, 1973

W. F. Krizman
626 30 Road
Grand Junction, CO 81501

RE: Location #13,438

Dear Owner:

We are pleased to report to you that [redacted]on of uranium mill tailings was found [redacted] structure in our survey of your property.

We must, however, inform you that tailings have been located on your property as indicated on the attached survey report. This location does not present any problem of radiation exposure to you at this time. If, at a later date, construction is considered over the indicated area, we recommend corrective action be considered.

Our survey in Grand Junction is continuing. Because of the time-consuming nature of this evaluation, we are not able to notify all property owners simultaneously of our findings. Thus, some of your friends and neighbors whose homes we have evaluated may not receive notification letters, indicating either the presence or absence of tailings, for some months.

We appreciate your cooperation in this survey. If you have any questions, please feel free to call our Grand Junction Office at 243-7830.

Sincerely,

Roy L. Cleere

Roy L. Cleere, M.D., M.P.H.
Executive Director

Attachment

RI TC HAL 01/08/88

JAN 14 1988

CONSENT FOR ACCESS TO CONDUCT SURVEYS AND ENGINEERING STUDIES

VICINITY PROPERTY NO.: GJ13438

PROPERTY ADDRESS: 626 30 RD

PROPERTY PARCEL NUMBER OR DESCRIPTION: 294304300150

I (We) acknowledge that I (We) own the property described above, and grant permission to employees, contractor and subcontractor personnel, and other representatives of the U.S. Department of Energy and the State of COLORADO to enter upon the property at a reasonable time or times during the next 36 months to conduct radiation surveys to determine the nature and extent of any radioactive material that might be present. In addition, permission is given to perform engineering assessments, if necessary, to evaluate the remedial measures that might be taken, as well as to evaluate the extent of the work required and the cost.

I (We) understand that DOE's and the State's responsibility for any damage or disturbance to my (our) property caused by its activities shall be any backfilling, seeding, sodding, landscaping, rebuilding or repair of the property required to restore it to a condition comparable to its apparent physical condition immediately prior to entry upon the property.

I (We) understand that the DOE and the State of COLORADO are not obligated to perform remedial action upon the property. I (We) understand that no remedial action shall be performed until the DOE, the State, and the property owner have entered into a separate written agreement setting forth terms, conditions, and plans for remedial action.

I (We) understand that the DOE and the State have the right to disclose to the public, in the form of technical data and reports, the results of its data-gathering on the above-described property.

( ) I grant access for the conduct of surveys and engineering studies as provided in this Consent-for-Access.

Signature of Owner(s) ____________ Date ____________

(X) I have decided not to participate in the UMTRA Project.

Mary R. Kuzman 1/13/88
Signature of Owner(s) Date

OWNER DATA: (PLEASE PRINT CLEARLY)

NAME Mary R. Kuzman

STREET 626 - 30 Road

CITY Grand Junction

STATE Colo. ZIP 81504

HOME PHONE (_____)__________

BUS. PHONE (_____)__________

TENANT DATA: (IF APPLICABLE)

NAME

HOME PHONE ( )

BUS. PHONE ( )

COMMENTS

(REV 05 86)

SIGN AND RETURN WHITE COPY

Department of Energy
Grand Junction Projects Office
Post Office Box 2567
Grand Junction, Colorado 81502-2567

October 10, 1989

Location No.: GJ-13438

Address: 626 30 Road
Grand Junction, CO

Mary Krizman
626 30 Road
Grand Junction, CO 81504

Dear Ms. Krizman:

Under the Uranium Mill Tailings Radiation Control Act of 1978 (Public Law 95-604), the U.S. Department of Energy (DOE) has determined the property referenced above is eligible for investigation. However, a survey was not performed due to your informed decision to not participate in the program. Therefore, the DOE cannot ascertain if the property is in compliance with the Environmental Protection Agency (40 CFR Part 192). The file on this property is hereby closed out and no further initiatives on the part of the DOE will be taken.

The current status of your property will be reported to the state per requirements of Public Law 95-604. Records of Uranium Mill Tailings Remedial Action vicinity properties are archived with both the state and the DOE.

Should you have any questions regarding the project or your property, please write to me at the above address or telephone me at (303) 248-6014.

Sincerely,

R. Eldon Bray
Project Officer
Uranium Mill Tailings Project

cc: Property File - UNC
C. Little, ORNL
State Representative

13438

Department of Energy
Grand Junction Projects Office
Post Office Box 2567
Grand Junction, Colorado 81502-2567

RECEIVED
OCT 13 1989
Colo. Dept. of Health
Grand Jct Office

DATE: October 10, 1989

TO: Official Location Folder

SUBJECT: CLOSE OUT OF VICINITY PROPERTY FROM THE URANIUM MILL TAILINGS REMEDIAL ACTION PROGRAM

LOCATION NO.: GJ-13438

ADDRESS: 626 30 Road
Grand Junction, CO

Vicinity Property Number GJ-13438, referenced above, will not be surveyed to determine eligibility for remedial action under the Uranium Mill Tailings Remedial Action (UMTRA) Project. The survey will not be performed due to the owner's informed decision to not participate in the UMTRA Project. Documentation of refusals are contained in the folder. The file on this property is hereby closed out and no further initiatives on the part of the U.S. Department of Energy will be taken.

R. Eldon Bray
Project Officer
Uranium Mill Tailings Project

cc: Property File - UNC
C. Little, ORNL
State Representative

U.S. DEPARTMENT OF ENERGY

Grand Junction Projects Office
P.O. Box 2567
Grand Junction, Colorado 81502

RECORD OF CONTACTS WITH VICINITY PROPERTY OWNER(S)

PROPERTY ID NO.: GJ 13438

ADDRESS: 626 - 30 Rd

OWNER NAME: Mary Krizman 303/434-8191
MAILING ADDRESS: 626 - 30 Rd
Grand Jct 81504

CONTACTS:

		YES	NO
RECORD FINAL DECISION MAILED: _____	CERTIFIED	[ ]	[ ]
REQUEST ACCESS UNSURVEYED PART: ____	CERTIFIED	[ ]	[ ]

OTHER: _____

DATE OF PERSONAL CONTACT: (PHONE) 2/15/89
(VISIT) _____

RESPONSE FROM PERSONAL CONTACT: Mary Krizman not home; call "maybe later."

08 Sep 89 - Mary Krizman says the survey is not necessary & she doesn't want it done. I explained situation further but she still says "No".

PERSON MAKING CONTACT: R Elden Bray
SIGNATURE: R Elden Bray

FUTURE ACTION REQUIRED: _____

NEW OWNER INFORMATION: YES [ ] NO [ ]
NEW OWNER NAME: _____
NEW OWNER ADDRESS: _____

COMMENTS: _____

PRELIMINARY DRAINAGE REPORT

For

Monarch Glen Subdivision
Preliminary Plan

216-2991

243-4164

Developer:
Just Companies, Inc.
2505 Foresight Circle Unit A
Grand Junction, Colorado 81505
(970) 245-9316

Prepared By:
LANDesign LLC
244 North 7th Street
Grand Junction, Colorado 81501
(970) 245-4099

Job Number 203003

March 28, 2003

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- B. Site

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- A. Changes in Drainage Patterns
- B. Maintenance Issues

IV. Design Criteria & Approach.....5
- A. General considerations
- B. Hydrology
- C. Hydraulics

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I. General Location and Description

A. Site and Major Basin Location

Monarch Glen Subdivision is located directly east of 30 Road at the intersection of F 3/10 Road. The property is surrounded by subdivisions in each direction; Lauradale Subdivision is located to the north, Mountain Vista is located to the east, Village East Subdivision is located to the south, Trading Post Subdivision is located to the southwest, and Little Trio, Single Tree, and Aspenwood Meadows Subdivisions are located to the west. There are three streets stubbed to the property, Starlight Drive to the north and south, Milburn Drive to the east and 30 Road defines the western boundary of the property. Exhibit 1 shows the general location of the proposed project, Exhibit 2 shows the general topography of the site and Exhibit 3 shows the topography of the surrounding area.

The major basin in which the project is located is commonly known as the Indian Wash Basin and encompasses approximately 17 square miles. Exhibit 4 shows the drainage basin map provided on the Mesa County interactive map internet web page.

B. Site and Major Basin Description

The site is approximately 18.5 acres in size and contains one house and accessory buildings that are located near the southwest corner of the site. The property does have a recent agricultural past and the groundcover can be described as 100% cultivated agricultural rows. Exhibit 5 shows the preliminary plan for the site.

The soils located on the site are described as 80% Ravola clay loam, 0-2% slopes (R_A) hydro-group 'B' and 20% Billings silty clay loam, 0-2% slopes (B_C) hydro-group 'C'. Exhibit 6 shows the soils map for the area.

The Indian Wash Basin is a large basin that drains approximately 17 square miles between the Bookcliffs and the Colorado River. The basin drains from the north to the south and the basin can be described as approximately 35% developed and 65% undeveloped. The undeveloped areas of the basin are located north of Interstate 70 and the developed areas of the channel are located south of Interstate 70 and are comprised of both residential and commercial land uses. The main channel of the basin is located west of the property and passes under Patterson Road at the intersection of 29 Road, which is approximately one mile west of the property.

II. Existing Drainage Conditions

A. Major Basin

The general topography of the Indian Wash Basin is moderately sloping to rolling although the northern extents of the basin are steep near the Bookcliffs. In general, the basin drains north to south crossing vacant and developed areas, passing underneath I-70, through the Fruitvale area, underneath I-70B and continuing to the Colorado River.

B. Site

Stormwater inflow from offsite enters the property from the north and east sides, but only from the rear yards of the adjacent subdivisions in a sheetflow fashion. Stormwater does not enter the property from the south as the topography drains away from the property. In addition, 30 Road prevents stormwater from entering the subject property from the west and the Krizman property located at the northwest corner of the site drains to the west. There is a ditch that runs along 30 Road that conveys runoff from a portion of the street and continues in the ditch to the south. This ditch drains to a 12-inch corrugated metal culvert that is connected to a 12-inch concrete drain line maintained by Grand Junction Drainage District (GJDD).

Stormwater on-site generally drains from the north to south at approximately 1-1.5 percent. As previously mentioned, the property has recently been used for agriculture, with the cultivated rows still very evident. The property drains to a tailwater ditch along the south boundary of the project. This tailwater ditch drains to a 12-inch concrete drain line that is owned and maintained by the GJDD.

The 12-inch GJDD line which drains the site and the 12-inch corrugated metal culvert adjacent to 30 Road is known as the Village East Tile line. This line continues south-southwest and connects to the F Road Storm Sewer line near the intersection of Hudson Bay Drive, which is west of 30 Road. The Village East Tile is shown on Exhibit 7.

The F Road Storm Sewer line is a 27-inch concrete line at the connection location with the Village East Tile. The F Road Storm Sewer line continues west increasing in size to a 48-inch concrete line near the intersection of 29 and F Roads. The 48-inch line

discharges stormwater to the main channel of the Indian Wash Basin.

The subject property is not located within any established floodplain according to the Grand Junction or Mesa County floodplain maps.

III. Proposed Drainage Conditions

A. Changes in Drainage Patterns

There are no changes proposed to the major basin's historic drainage pattern in conjunction with this project.

There are no changes proposed to the project site's historical drainage pattern in conjunction with this project.

B. Maintenance Issues

The maintenance of the stormwater control basin will be the responsibility of the Monarch Glen Homeowner's Association. The City of Grand Junction will maintain any surface or storm sewer facilities located within the public right-of-way. The Grand Junction Drainage District will be responsible for maintaining the Village East Tile drain line and the Final Plat application will provide access to the line as necessary.

IV. Design Criteria & Approach

A. General Considerations

There have been a number of drainage studies for projects near the subject property.

Mountain Vista Subdivision is located directly to the east of the subject property and, according to the drainage report prepared by Thompson-Langford Corporation, drains to a retention pond located approximately 800 feet southeast of the Monarch Glen project. The Mountain Vista Subdivision does not contribute stormwater to the subject property except from the rear yards of 6 lots directly east of the subject property.

Brookside Subdivision is located northwest of the intersection of F ½ Road and 30 Road. Based on a site visit, the subdivision drains to a detention pond that releases runoff to the west to an open

drain which is located near the intersection of 29 ½ and F ½ Roads. Brookside Subdivision does not contribute stormwater to the subject property.

Faircloud Subdivision is located northeast of the intersection of F ½ Road and 30 Road. According to the drainage report prepared by LANDesign, the subdivision drains to a detention pond that release runoff to the GJDD Indian Joe line, which drains to the west to an open drain located near the intersection of 29 ½ and F ½ Roads. Faircloud Subdivision does not contribute stormwater to the subject property.

The remaining subdivisions in the surrounding area are all older than 1982, and in general, subdivisions that old did not submit drainage reports to the County or City.

There is an inlet at the intersection of 30 Road and Country Road at the west extent of Lauradale Subdivision. This inlet drains to the north to the GJDD Indian Joe Drain line and does not contribute stormwater to the subject property.

The Village East Tile line is the primary facility to consider regarding master planning issues for the drainage of the site and the immediate area. The line drains the subject property, a portion of the east side of 30 Road from Country Road to F ¼ Road and the line also serves as overflow for the Village East irrigation system. While the Village East Tile line does pass through the Trading Post Subdivision, which is located southwest of the subject property, the line does not appear accept surface runoff from the subdivision. Irrigation tailwater may drain to the line, although this could not be verified during a site visit.

The GJDD has stated that the capacity of the Village East Tile line probably can not handle full historic runoff from the subject property, even though the property clearly drains to the line. In addition, this line excepts frequent irrigation overflow from the Village East Subdivision irrigation system. These two issues are the most important factors to consider in planning stormwater control for the project. For these reasons, stormwater runoff will be controlled using a detention pond, but with a maximum release rate of 1 cfs. This flow is equal to the amount of tailwater generated from the irrigation shares available to the property, which is presumably the most flow that is frequently discharged by the Village East Tile line. The Final Drainage Report will provide the calculations and design details for the planned detention pond.

Constraints that would affect the drainage design would be the limited capacity to the Village East tile, the discharge locations and offsite flows.

B. Hydrology

The Stormwater Management Manual (SWMM) for the City of Grand Junction will be used for the preparation of the Final Drainage Report. The design storms are defined in the SWMM as the 2-year and 100-year events. As the site is within the 201 Boundary, the Grand Junction area precipitation information will be used which are outlined within the SWMM.

The rational method will be used for the hydrological analysis. The drainage design and report for the detention pond facility will conform to the City of Grand Junction SWMM.

C. Hydraulics

All hydraulic calculations for conveyance elements will be designed according the SWMM. The primary features of the drainage design for the project will be outlined in the Final Drainage Report in conjunction with the future Final Plan and Plat application.

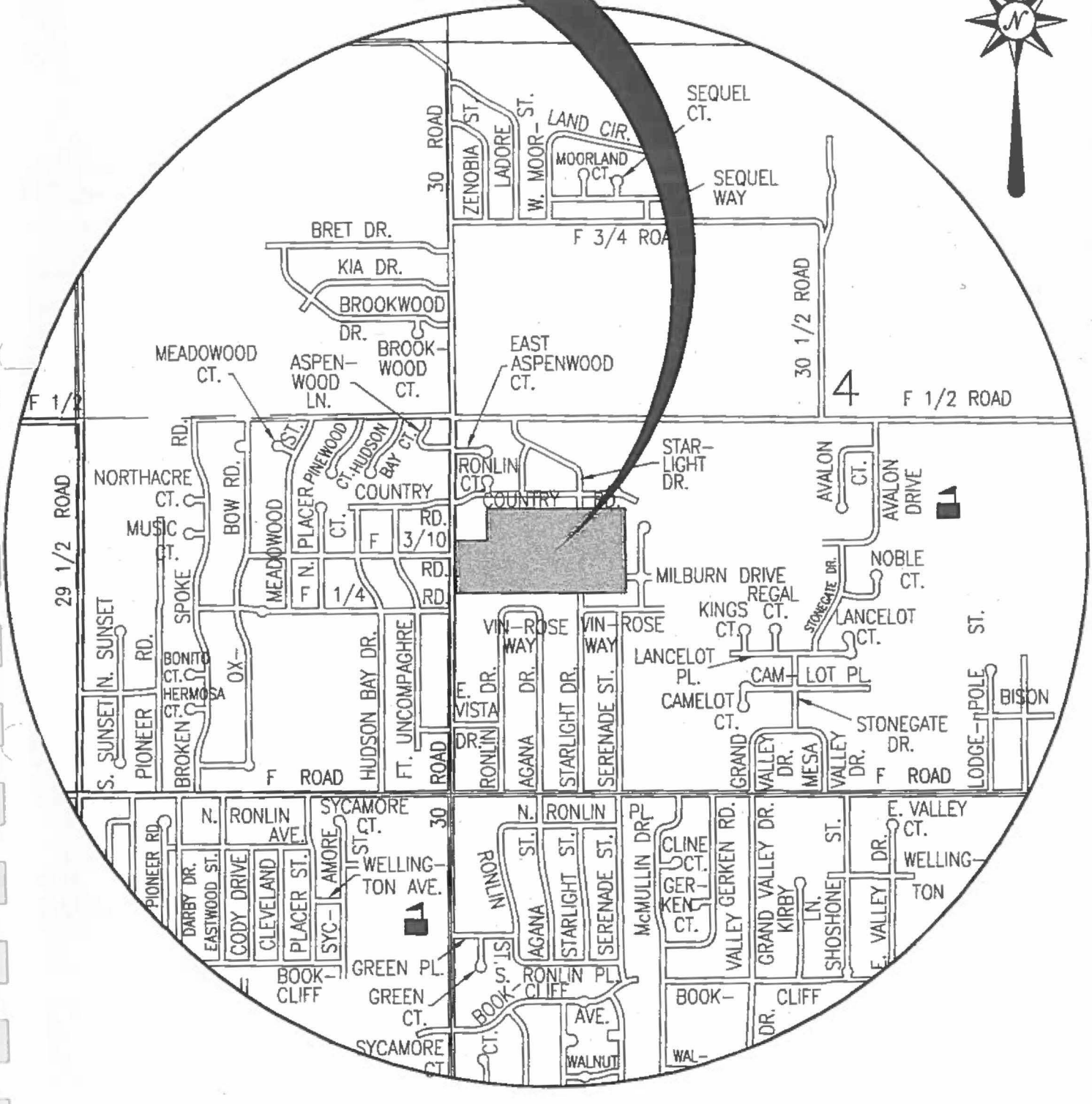
VI. References

1. Stormwater Management Manual, (SWMM), City of Grand Junction, May 1996.

2. Flood Insurance Rate Map, Mesa County, Colorado, Prepared for the City of Grand Junction, Colorado and Mesa County by the Federal Emergency Management Agency, revised 1992.

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

PROJECT LOCATION

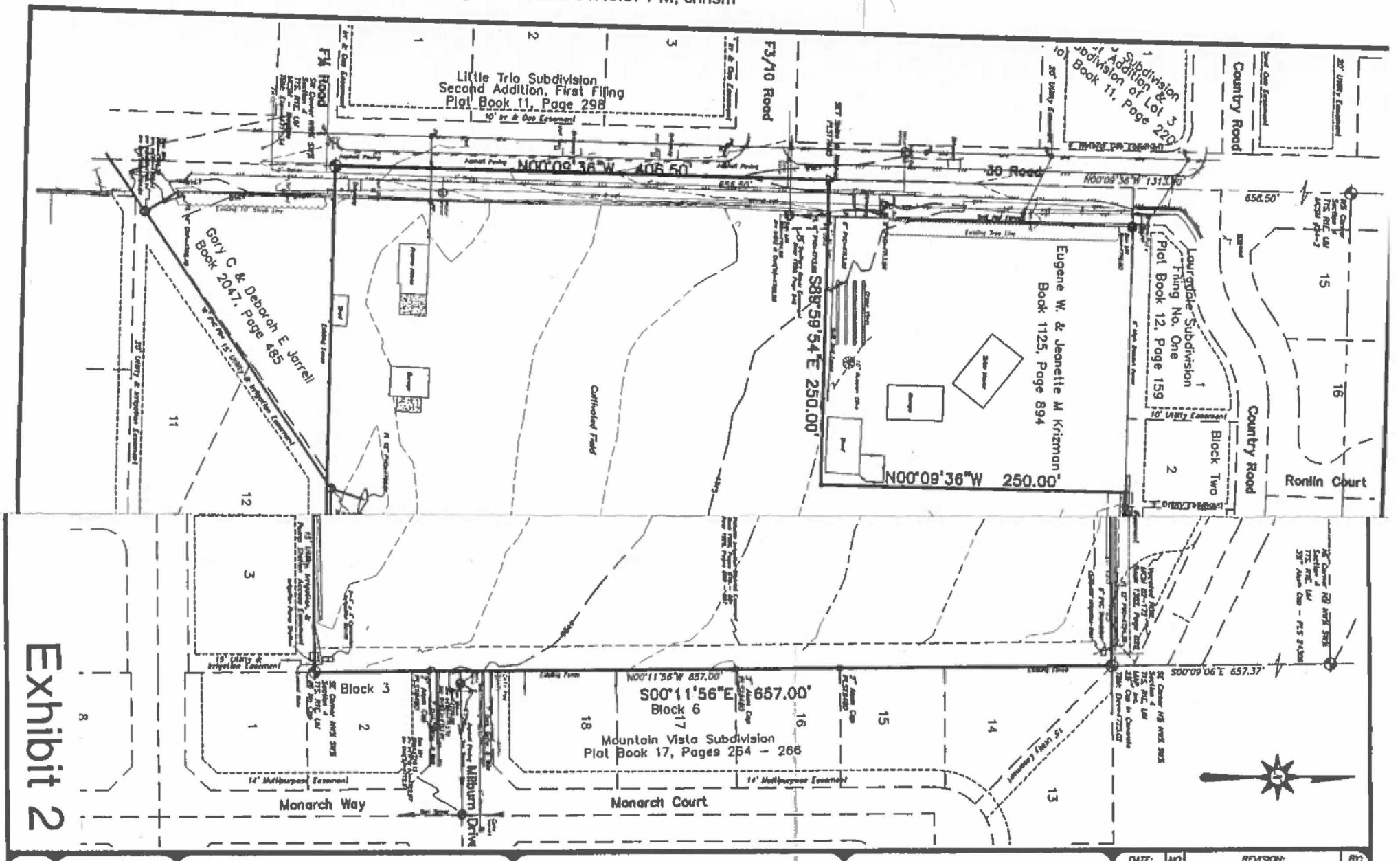


VICINITY MAP

NTS

Exhibit 1

C:\scadces\WORK\2003\203003\203003-base.dwg, 0? '2003 04:49:37 PM, chrism



SHEET 1 OF 1

LANDesign
ENGINEERS • SURVEYORS • PLANNERS
244 NORTH 7th STREET
GRAND JUNCTION, COLORADO 81501 (970) 245-4099

MONARCH GLEN SUBDIVISION

BASE MAP

PROJECT NO.: 203003 | FILE NAME: 203003-base | DATE: 02/13/03 | DRAWN: CJM | CHK'D: BCH

DATE:	NO.	REVISION:	BY:

Monarchic Map

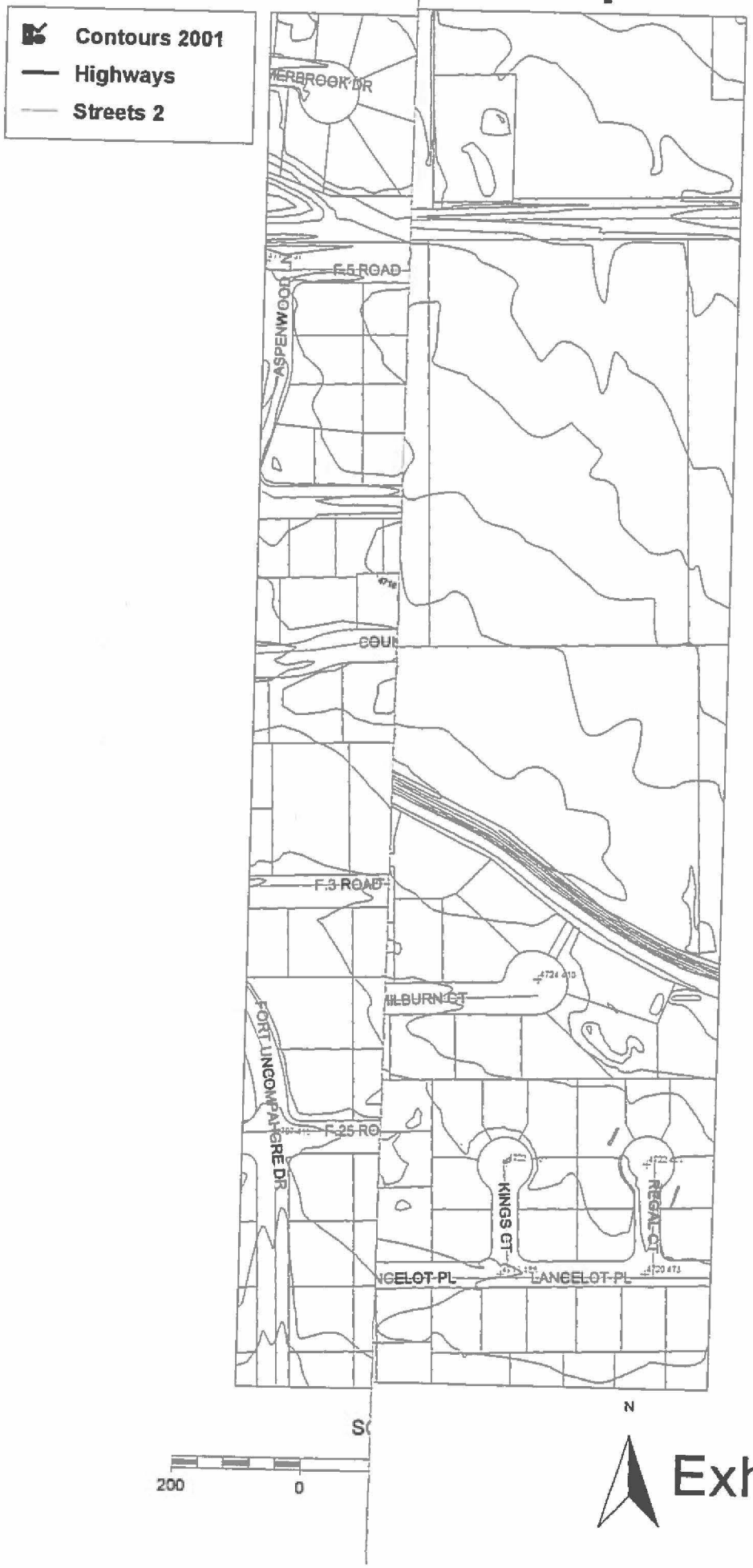


Exhibit 3

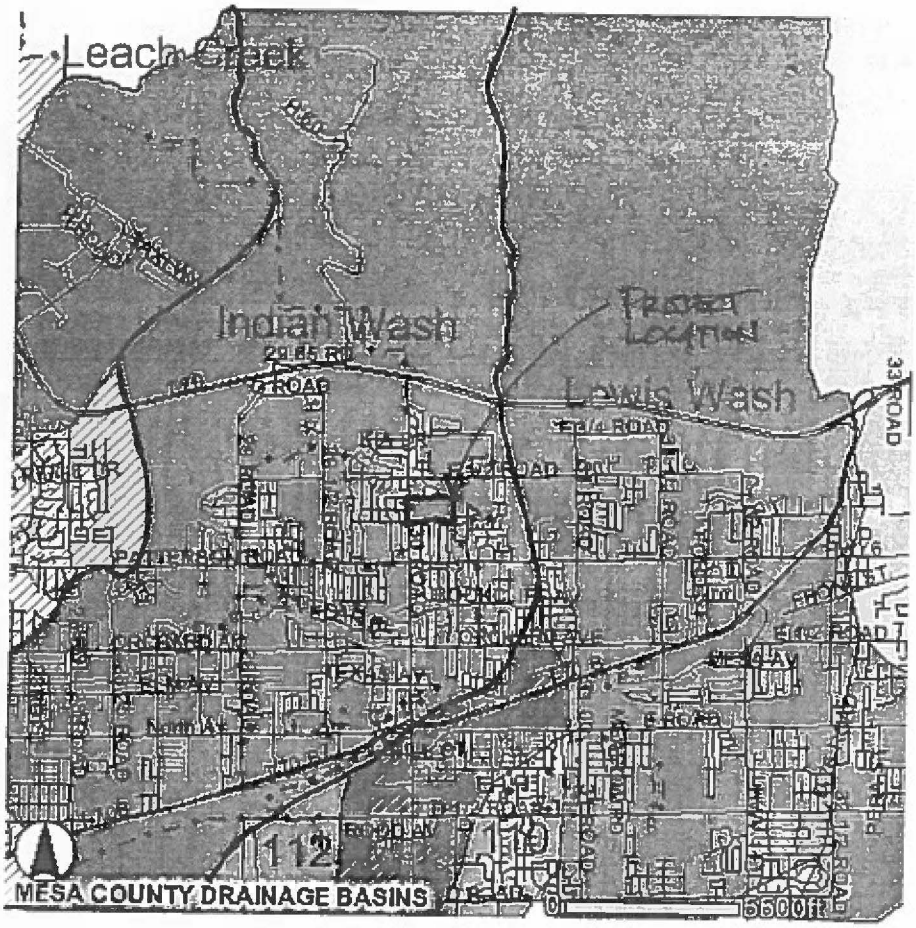
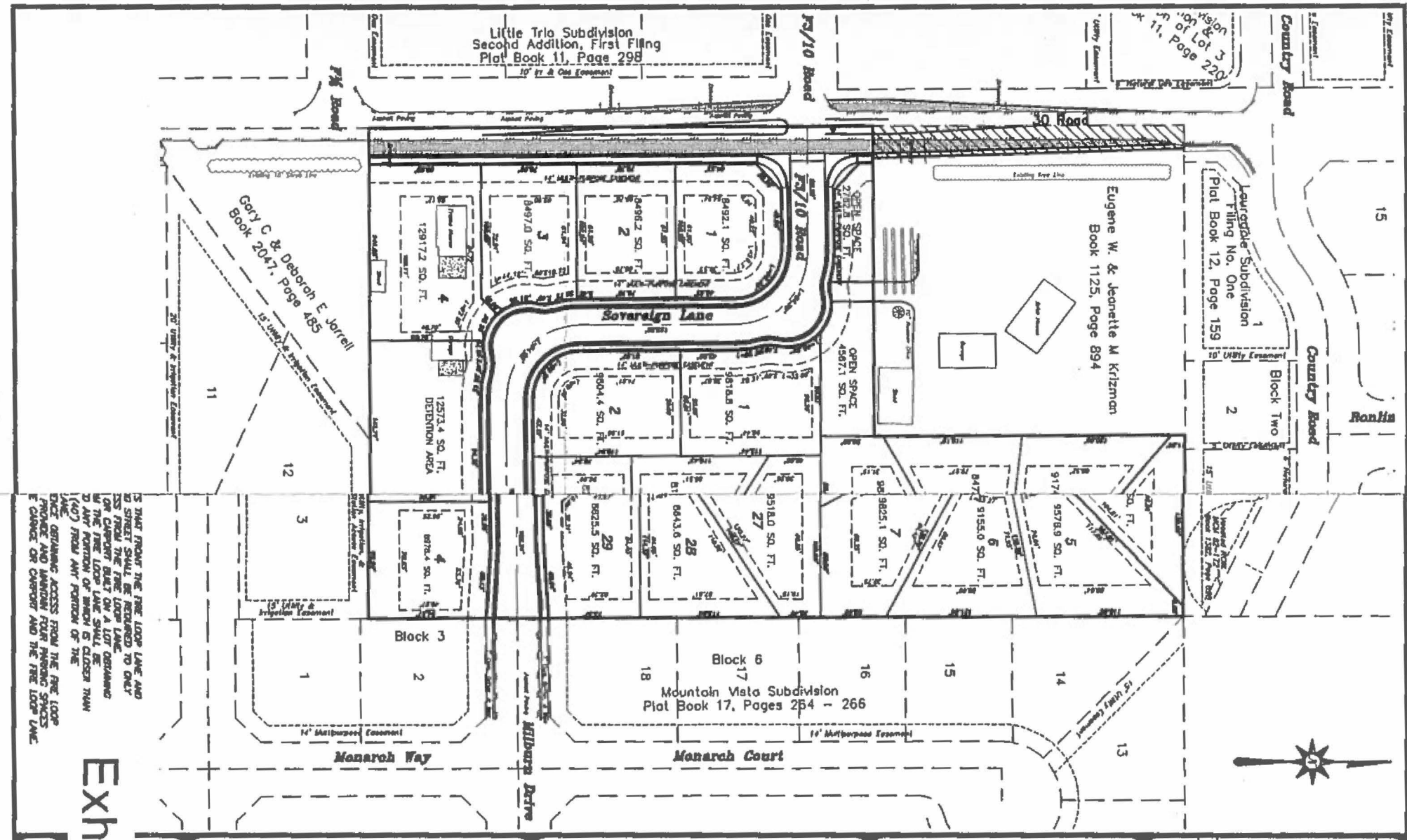

Leach Creek
Indian Wash
PROJECT LOCATION
Lewis Wash
G ROAD
33 ROAD
112
MESA COUNTY DRAINAGE BASINS
0
5600ft

Exhibit 4

C:\scadces\WORK\2003\203003\203003-prelim-sitepla vg, 03/24/2003 04:49:57 PM, chrism



IS THAT FRONT THE FIRE LOOP LANE AND
ID STREET SHALL BE RESTRICTED TO ONLY
ISS FROM THE FIRE LOOP LANE.
OR CARPORT BUILT ON A LOT OBTAINING
M THE FIRE LOOP LANE SHALL BE
D ANY PORTION OF WHICH IS CLOSER THAN
(40') FROM ANY PORTION OF THE
LANE.
DACE OBTAINING ACCESS FROM THE FIRE LOOP
FRONAGE AND MAINTAIN FOUR PARKING SPACES
E GARAGE OR CARPORT AND THE FIRE LOOP LANE.

Exhibit 5

SHEET 1 OF 1

LANDesign
ENGINEERS • SURVEYORS • PLANNERS
244 NORTH 7th STREET
GRAND JUNCTION, COLORADO 81501 (970) 245-4099

MONARCH GLEN SUBDIVISION

PRELIMINARY PLAN

PROJECT NO.: 203003 | FILE NAME: 203003-prelim-siteplan | DATE: 02/13/03 | DRAWN: CJM | CHK'D: BCH

DATE:	NO.	REVISION:	BY:

Naples clay loam, 0-2 percent slopes

Ravola clay loam, 0-2 percent slopes

Ravola clay loam, 2-5 percent slopes

Redlanc

SLIGHTLY TO MODERAT

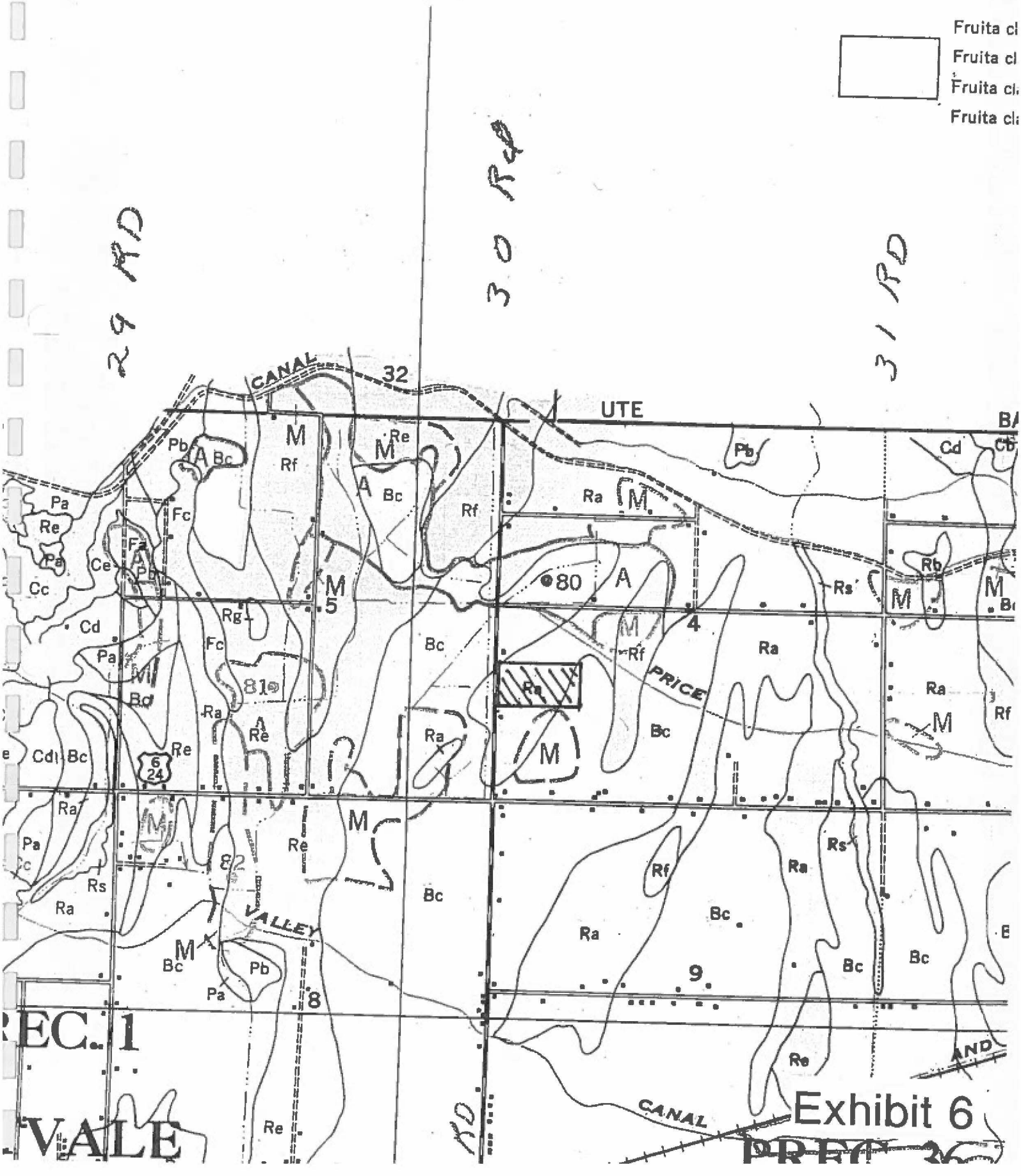
SOILS WITH MODERATE

Fruita cl

Fruita cl

Fruita cl

Fruita cl



EC. 1

VALE

Exhibit 6

PREC 26

Grand Junction Drainage District - Village East Tile

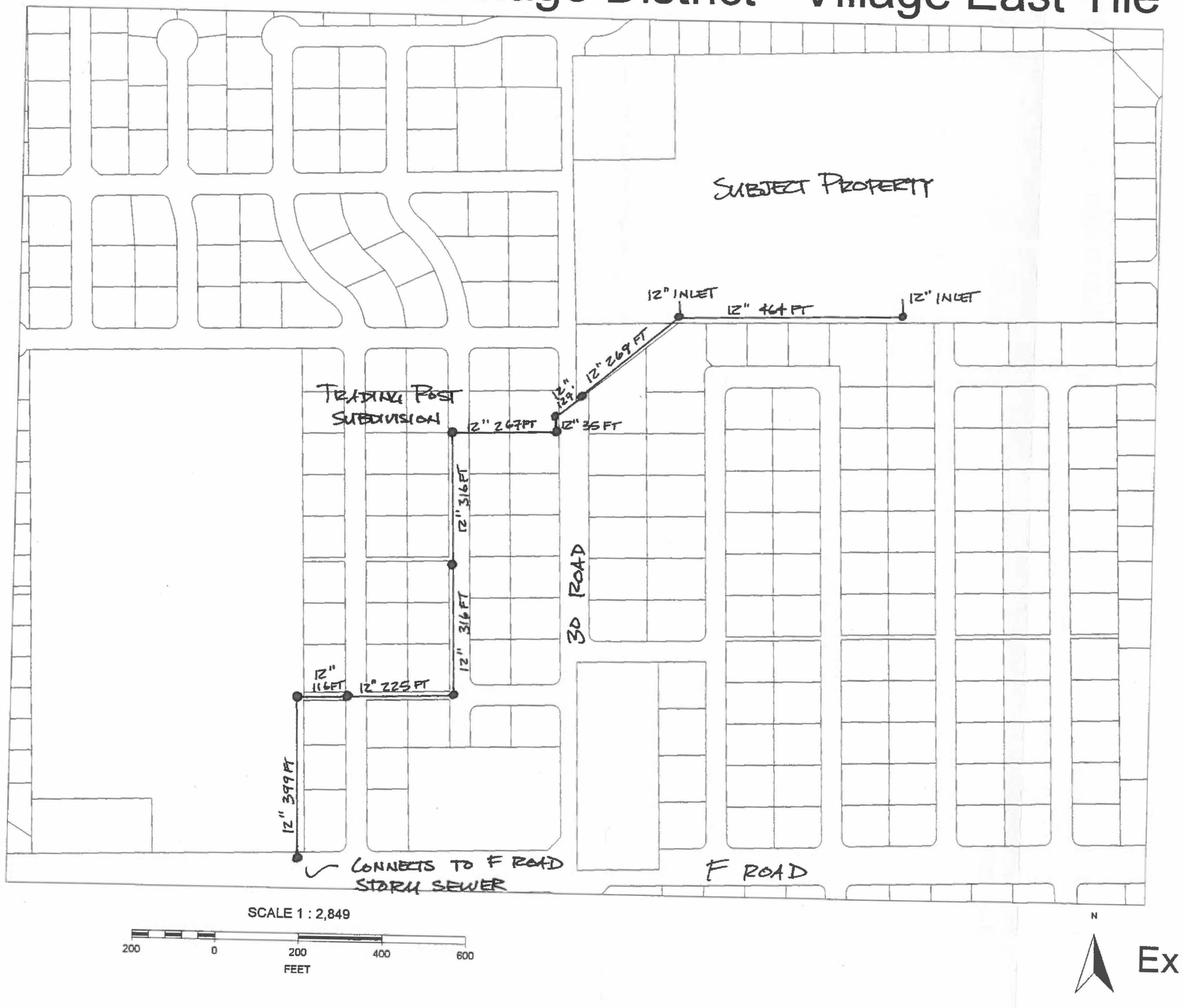


Exhibit 7

Geotechnical Engineering Group, Inc.

May 28, 2003

Just Companies, Inc.
2505 Foresight Circle, #A
Grand Junction, CO 81505

Attention: Mr. Ed Lenhart

Subject: Geotechnical Investigation – Addendum No. 1
Monarch Glen Subdivision
626 30 Road
Grand Junction, Colorado
Job No. 1,330

Dear Mr. Lenhart,

As requested, Geotechnical Engineering Group, Inc., prepared this addendum of subgrade investigation and pavement design for the proposed 30 Road ½ street improvements to be located west of the proposed subdivision site. Our services were completed to include review of previous investigation, sample three exploratory test pits and provide pavement design recommendations for the proposed construction. This addendum includes a brief description of the previous investigation, recommended pavement sections and design and construction criteria for details influenced by the subsurface conditions.

This report was prepared from data developed from review of previous investigation, field investigation, laboratory testing, engineering analysis and experience with similar conditions. Detailed criteria are presented within the letter.

Site Conditions

The subject site was located west of the proposed Monarch Glen Subdivision, as 626 30 Road, in Grand Junction, Colorado, Fig. 1. The subject site consisted of 30 Road and the east and west shoulder of 30 Road. Thirty Road was north / south oriented, basically flat and level. An approximate 1 foot depth drainage ditch paralleled the east side of 30 Road. No water was flowing in the ditch at the time of this investigation. Relatively minor cracking and rutting was noted in the asphalt surface of

30 Road. The shoulders predominately consisted of a gravel covered surface. Areas of landscaping were also noted. Areas of potential existing fill were noted in the shoulder area. Single family residence subdivisions were north, south and west. Vacant land and single family residences were east. The vicinity sloped down toward the south at grades of 1 percent or less (USGS Grand Junction and Clifton, Colorado topographic quadrangle dated 1962, photo revised 1973).

Proposed Construction

We understand the proposed construction includes approximately 635 lineal feet of ½ street improvements on the east side of 30 Road and a potential 480 lineal feet of acceleration / deceleration lane on the west side of 30 Road. We anticipate no grading changes. If proposed construction changes or is different from what is stated, we should be contacted to review actual construction and our recommendations.

Previous Investigation

In preparing this report we reviewed the previous investigation "**GEOTECHNICAL INVESTIGATION, MONARCH GLEN SUBDIVISION, 626 30 ROAD, GRAND JUNCTION, COLORADO**", GEG Job No. 1,330, dated April 1, 2003. We identified three exploratory test pits within approximately 170 feet of the proposed deceleration lane. Previous soil testing results related to the pavement design portion of the previous investigation are presented in Appendix A.

Pavement

We used a hand augur to excavate and sample three additional test pits, TP-20 through TP-22 (see Fig. 2), and reviewed exploratory test pits of the previous investigation (Fig. 2 and Appendix A). We identified exploratory test pits, TP-1, TP-5 and TP-9 were within 170 feet of the proposed construction. We visually classified each sample and tested a combined sample obtained from exploratory test pits, TP-20 through TP-22, for gradation and Atterberg limits. We compared these results to laboratory testing reported by the previous investigation. Soils testing completed during the previous investigation included Atterberg limits, gradation, standard Proctor and California Bearing Ratio (CBR). Laboratory testing completed during this investigation showed these samples to be similar to those obtained in the previous investigation. Results of laboratory testing from previous investigation are presented in Appendix A. The previous investigation used a design CBR value of 2.0. We used a CBR value of 2.0 for this investigation.

This pavement section design utilized the computer program WinPAS, based on the 1993 AASHTO Guide for Design of Pavements Structures, a 30 year design period, and our experience. We understand pavements will be used for ½ street improvements and a potential acceleration / deceleration lane on the west side of 30 Road. We obtained an average daily traffic count of 4,971 for 30 Road (Station No. 56, February, 2003, obtained from the City of Grand Junction website, May 22, 2003). We used a 30 year flexible pavement Equivalent Single Axle Load (ESAL) of 341,640 and rigid pavement Equivalent Single Axle Load (ESAL) of 367,920 for the ½ street improvements. A non-linear relationship developed by CDOT to relate the CBR value to the subgrade resilient modulus (Mr) was used for flexible pavement. Using this relationship, we calculated a Mr value of 3,623 psi. We converted the subgrade resilient modulus (Mr) to the modulus of subgrade reaction (k) using the relationship k = Mr / 19.4, for rigid pavements. Using this equation, we calculated a k value of 187 psi / in. We used a regional factor of 2.0 and a design serviceability index of 2.5. Pavement design calculations are included in Appendix A. Table A below shows our recommendations.

TABLE A
SUMMARY OF RECOMMENDED PAVEMENT SECTIONS

Anticipated Traffic Type	Asphaltic Concrete	Asphalt and Aggregate Base Course	Asphalt, Aggregate Base Course and Aggregate Sub Base Course	Portland Cement Concrete
30 Road ½ Street Improvements	8.75"	3.0" +19.0" 4.0" + 15.5" 5.0" + 12.0"	3.0" + 6.0" + 15.5" 4.0" + 6.0" + 11.5"	6.0"

Existing fill, if encountered, should be removed full depth and replaced with a suitable structural fill soil with similar or better pavement support characteristics. The structural fill should be placed in 10-inch maximum loose lifts and compacted as stated below. The pavement subgrade should be scarified a depth of 10-inches, moisture conditioned to within 2 percent of optimum moisture content and compacted to at least 95 percent of standard Proctor (ASTM D698) maximum dry density. Soft areas that require stabilization may be encountered. A Geotechnical Engineering Group, Inc. representative should be called to observe a "proof roll" of the completed subgrade, made by a heavy pneumatic tired vehicle. Soft subgrade conditions that require stabilization may be identified. Care should be taken to avoid excessive construction traffic.

Our experience indicates asphalt pavement in areas which will be subjected to heavy trucks stopping and turning does not perform satisfactorily. We recommend placing a 6 inch thick Portland cement concrete pavement in all areas where this heavy truck traffic may occur, including access aprons and trash dumpster locations.

The design of a pavement system is as much a function of paving materials as supporting characteristics of the subgrade. The quality of each construction material is reflected by the strength coefficient used in the calculations. If the pavement system is constructed of inferior material, then the life and serviceability of the pavement will be substantially reduced.

The asphalt component of the pavement was designed assuming at least 1,650 pounds Marshall stability. Normally, an asphaltic concrete should be relatively impermeable to moisture and should be designed with a well-graded sand/gravel mix. The oil content, void ratio, flow and gradation need to be considered in the design. We recommend a job mix design be performed and periodic checks are made to verify compliance with these specifications.

If construction materials cannot meet the above requirements, then the pavement design should be evaluated based upon available materials. We recommend the materials and placement methods conform to the requirements listed in the Colorado Department of Transportation "Standard Specifications for Road and Bridge Construction". All materials planned for construction should be submitted and tested to confirm their compliance with these specifications.

A primary cause of early pavement deterioration is water infiltration into the pavement system. The addition of moisture usually results in softening of untreated base course and subgrade and eventual failure of the pavement. We recommend drainage be designed for rapid removal of surface runoff. Curb and gutter should be backfilled and the backfill compacted to reduce ponding adjacent to pavements. Final grading of the subgrade should be carefully controlled so that design cross-slope is maintained and low spots in the subgrade which could trap water are eliminated. Seals should be provided between curb and pavement and at all joints to reduce moisture infiltration. Landscaped areas and detention ponds in pavements should be avoided.

We have included construction recommendations for flexible and rigid pavement construction in Appendix B. Routine maintenance, such as sealing and repair of cracks annually and overlays at 5 to 7-year intervals, are necessary to achieve the long-term life of an asphalt pavement system. If the design and construction recommendations cannot be followed or anticipated traffic loads change considerably, we should be contacted to review our recommendations.

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 pavement is constructed in accordance with the geotechnical recommendations.

Limitations

Three exploratory test pits were hand augered and sampled, spaced across the subject site. We also reviewed a previous investigation in preparation for this report. We identified three exploratory test pits within 170 feet of the proposed ½ street improvements. The exploratory test pits are representative of conditions encountered only at the exact test pit locations. Variations in the subsoil conditions not indicated by the test pits are always possible. Our representative should observe completed pavement subgrade to confirm soils are as anticipated from the test pits. Subgrade soils compaction, sub base course compaction, base course compaction and pavement materials should also be tested during construction.

This letter is published as an addendum to the Geotechnical Investigation, report dated April 1, 2003, our Job No. 1,330. The design and construction recommendations contained in the previous report should be followed. We believe this addendum was prepared 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 addendum, or in the analysis of the influence of the subsurface conditions on the design of the proposed construction, please call.

Sincerely,
GEOTECHNICAL ENGINEERING GROUP, INC.

Gregory G. Poettgen, P.E.
Project Engineer

COLORADO REGISTERED GREGORY G. POETTGEN 36618 05/28/03 PROFESSIONAL ENGINEER

Reviewed by:

John P. Withers, P.E.
Principal Engineer

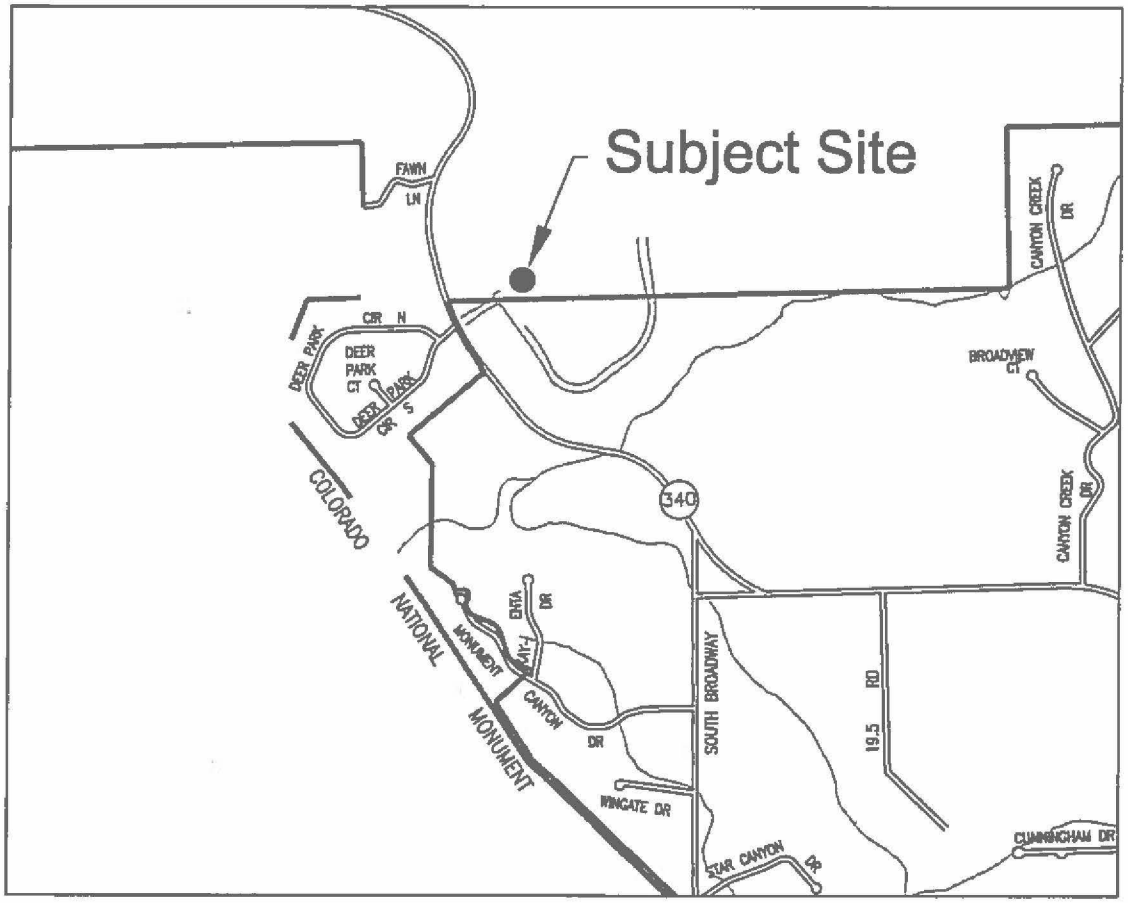
COLORADO REGISTERED JOHN P. WITHERS 30324 5-28-3 PROFESSIONAL ENGINEER

GGP:JPW:cd
(3 copies sent)

1 cc: LANDesign
Mr. Brian Hart, P.E.
244 North 7th Street
Grand Junction, CO 81501

Residential Soils Investigation
Lot 7, Block 2, River Terrace Subdivision, Filing No. 2
Mesa County, Colorado

N
No Scale



Job No. 1,355

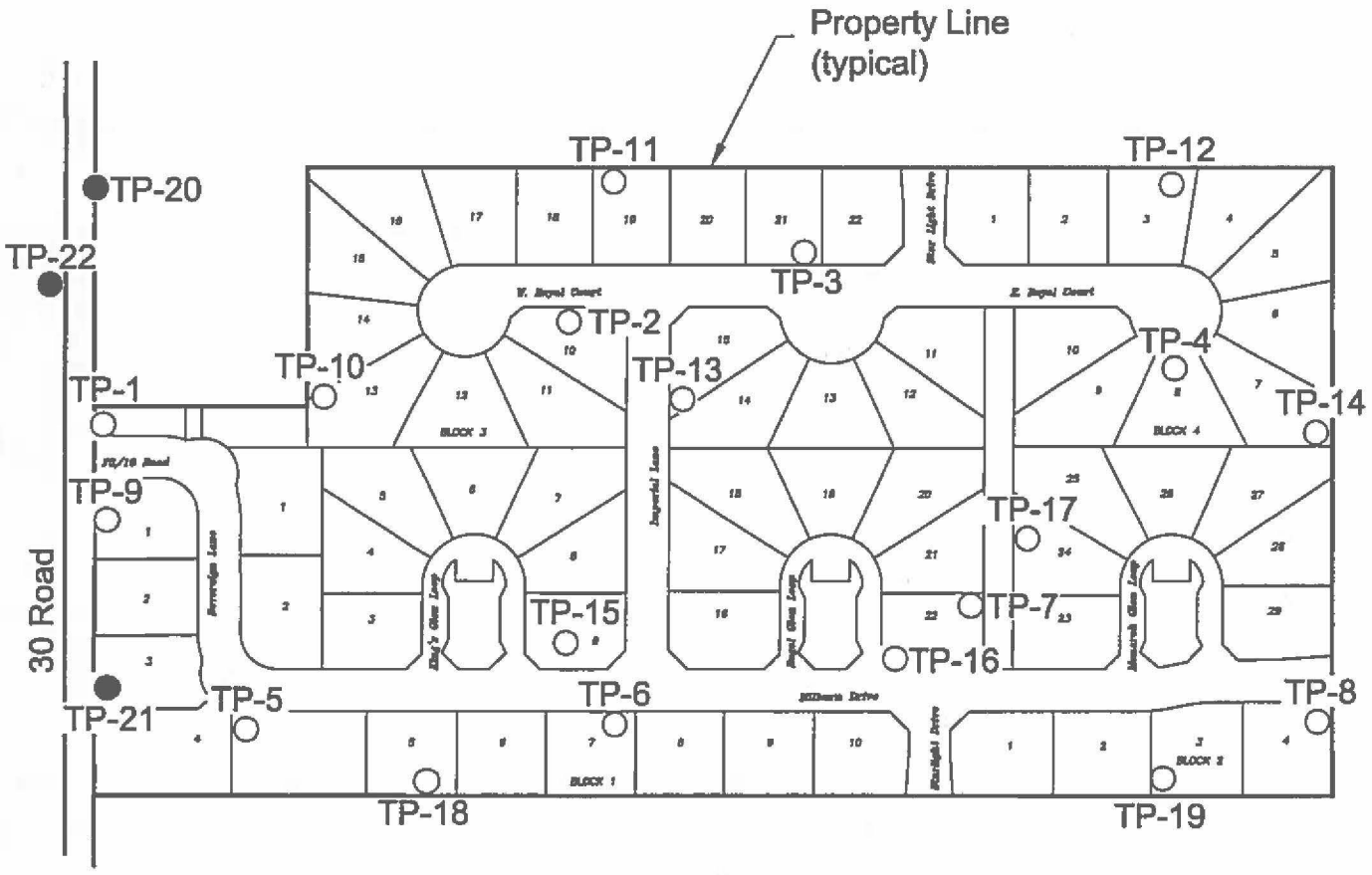
Vicinity Map

Fig. 1

Note: This figure was prepared based on a computer file provided by LANDesign.

N

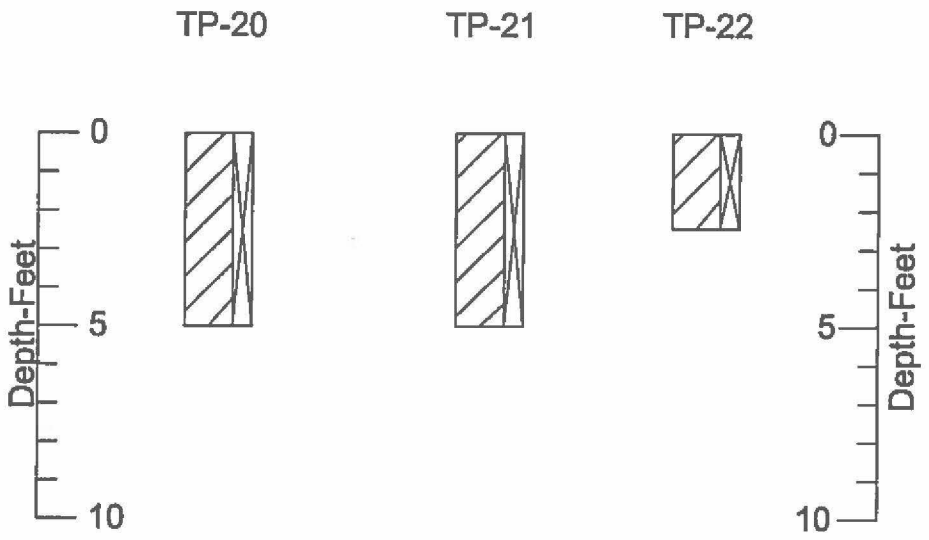
Scale: 1" = 200'



Legend

- ● Indicates location of exploratory test pit.
- ○ Indicates location of exploratory test pit from previous investigation.

Job No. 1,330 **Location of Exploratory Test Pits** Fig. 2



Job No. 1,330 **Logs of Exploratory Test Pits** Fig. 3

Legend

Clay, silty, sandy with Sand, clayey lenses, moist to very moist, brown, sulfates noted (CL,SC)

Indicates location of penetration test. The symbol 19/12 indicates that 19 blows of a 15 pound hammer falling 26 inches were required to drive a 1.0 inch diameter penetrometer 12 inches. The symbol HD indicates hand drive using modified California (2.0-inch O.D.) liner.

Indicates location of bulk sample collected from test pit walls.

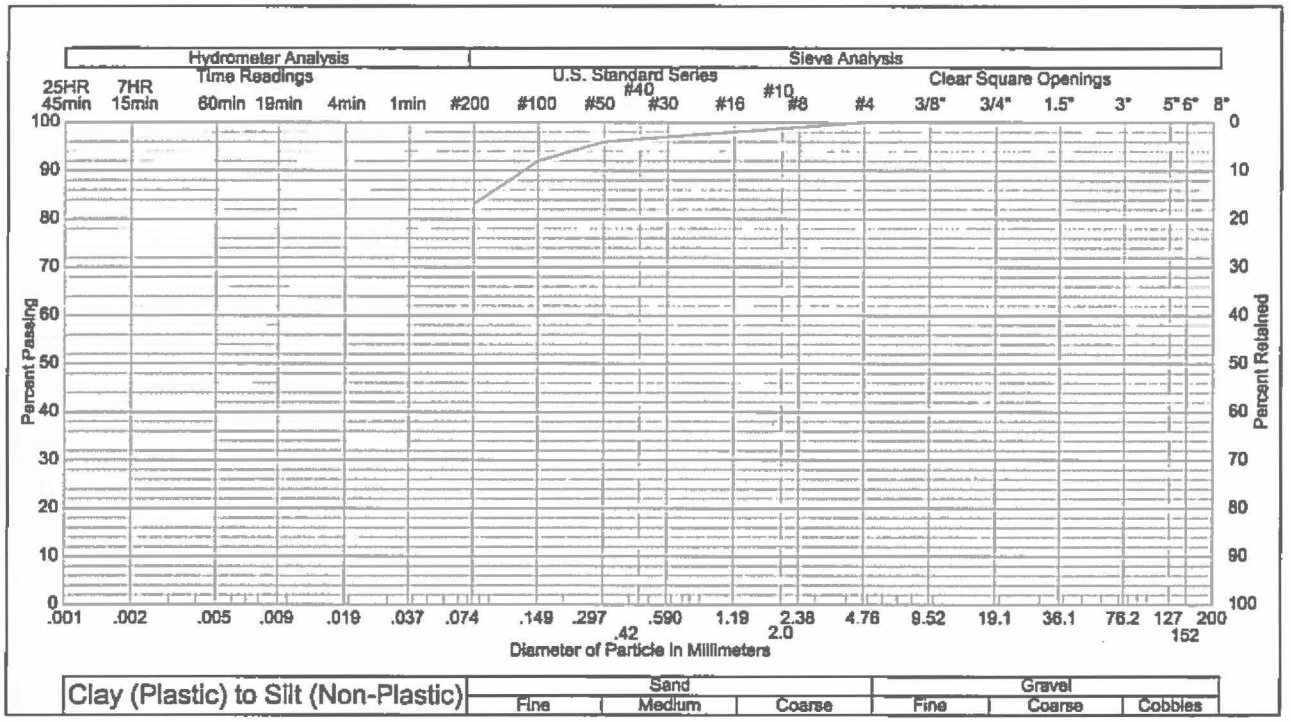
Notes

1. Test pits were observed and sampled May 14 and 17, 2003.
2. These logs are subject to the explanations, limitations and conclusions as contained in this report.

Job No. 1,330

Legend of Logs of Exploratory Test Pits

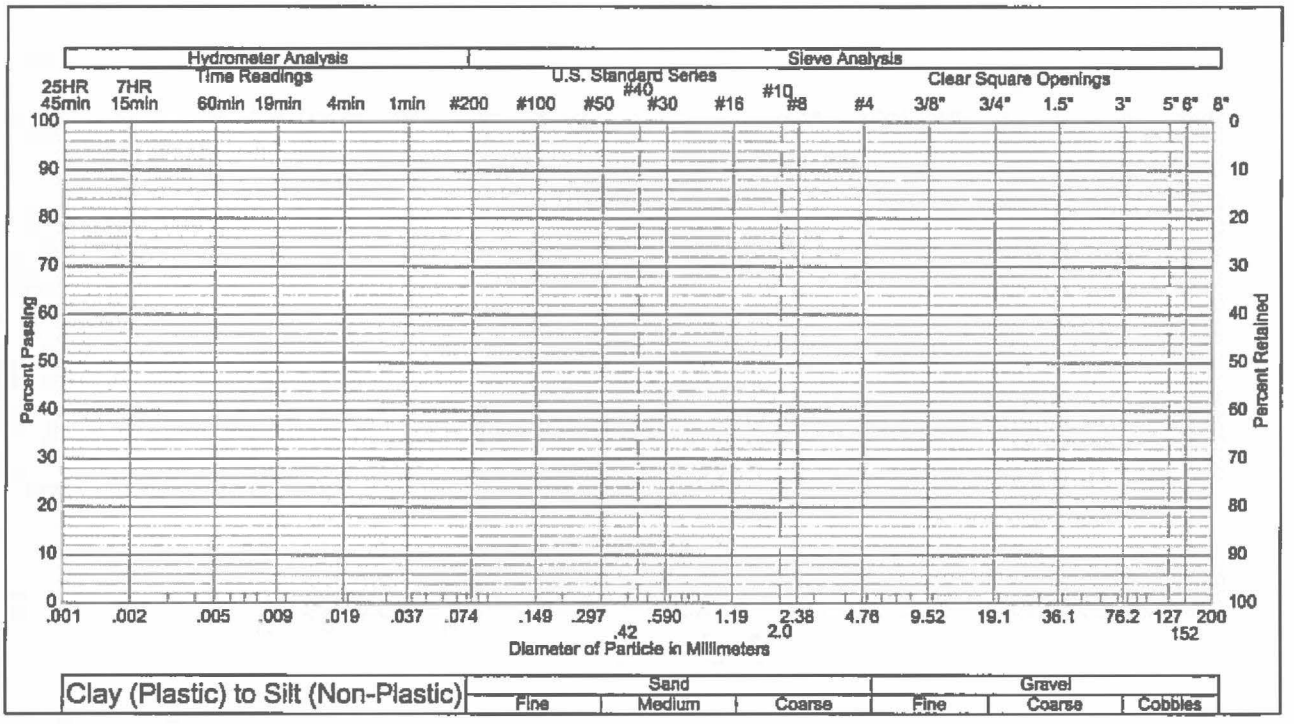
Fig. 4



Sample of: Clay, silty, sandy (CL)
From: TH-20 through 21 @ 0 to 5 feet depth, bulk combined

Gravel: 0 %
Silt & Clay: 83 %
Plasticity Index:

Sand: 17 %
Liquid Limit:



Sample of:
From:

Gravel: %
Silt & Clay: %
Plasticity Index:

Sand: %
Liquid Limit:

Gradation Test Results

Job No. 1,330

Date: May, 2003

Fig. 5

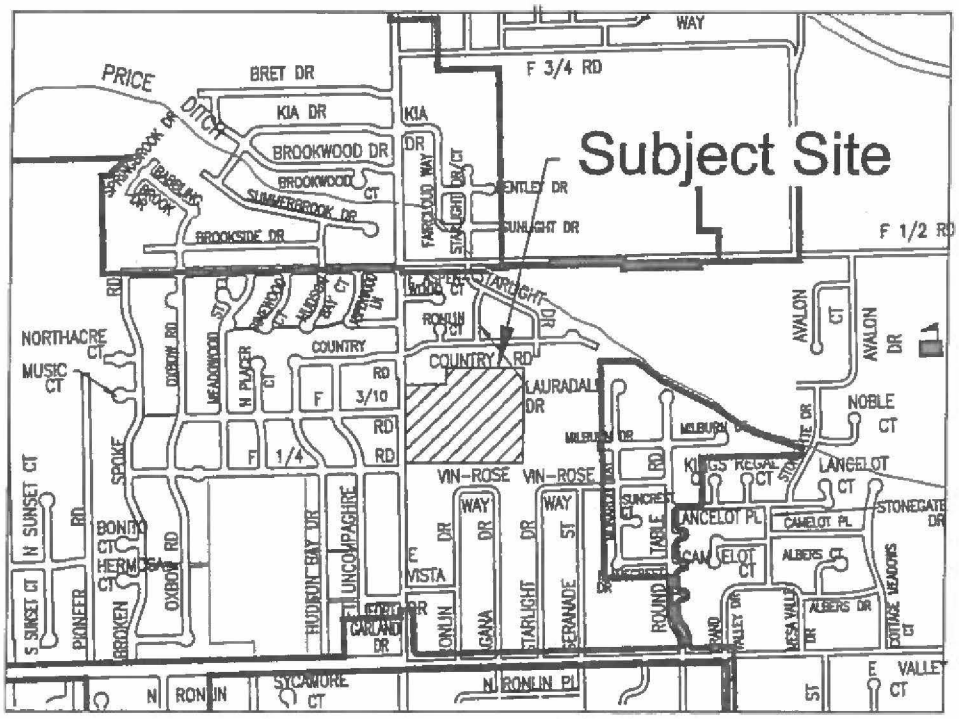
Geotechnical Engineering Group, Inc.

APPENDIX A

EXCERPTS FROM PREVIOUS INVESTIGATION
(Figs. 1 through 8, Fig. 13, Table I, Figs. A-1 and A-2)
GEOTECHNICAL INVESTIGATION
MONARCH GLEN SUBDIVISION
626 30 ROAD
GRAND JUNCTION, COLORADO
Dated April 1, 2003

Geotechnical Investigation
Monarch Glen Subdivision
626 30 Road
Grand Junction, Colorado

N
No Scale



Job No. 1,330

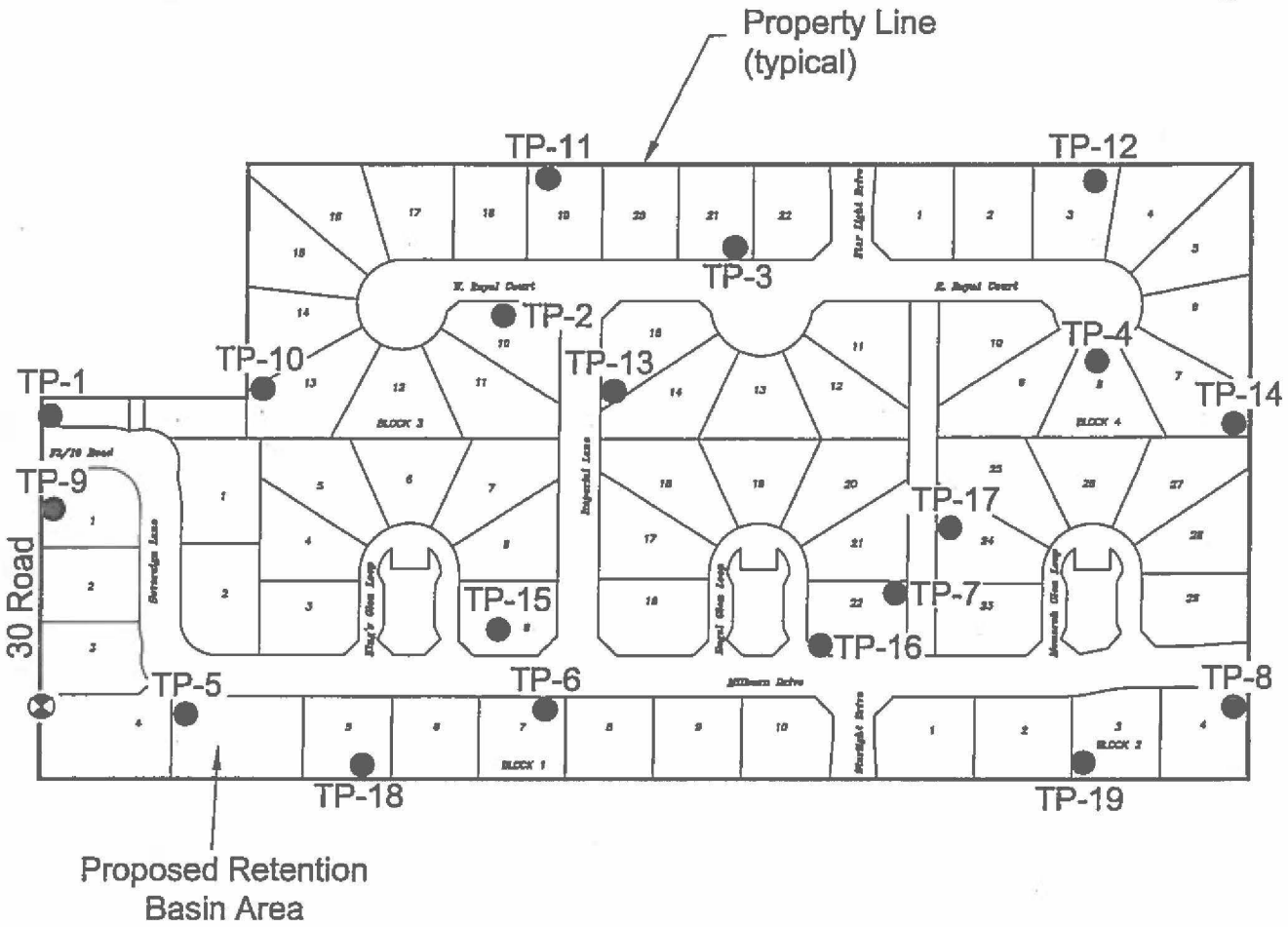
Vicinity Map

Fig. 1

Note: This figure was prepared based on a computer file provided by LANDesign.

N

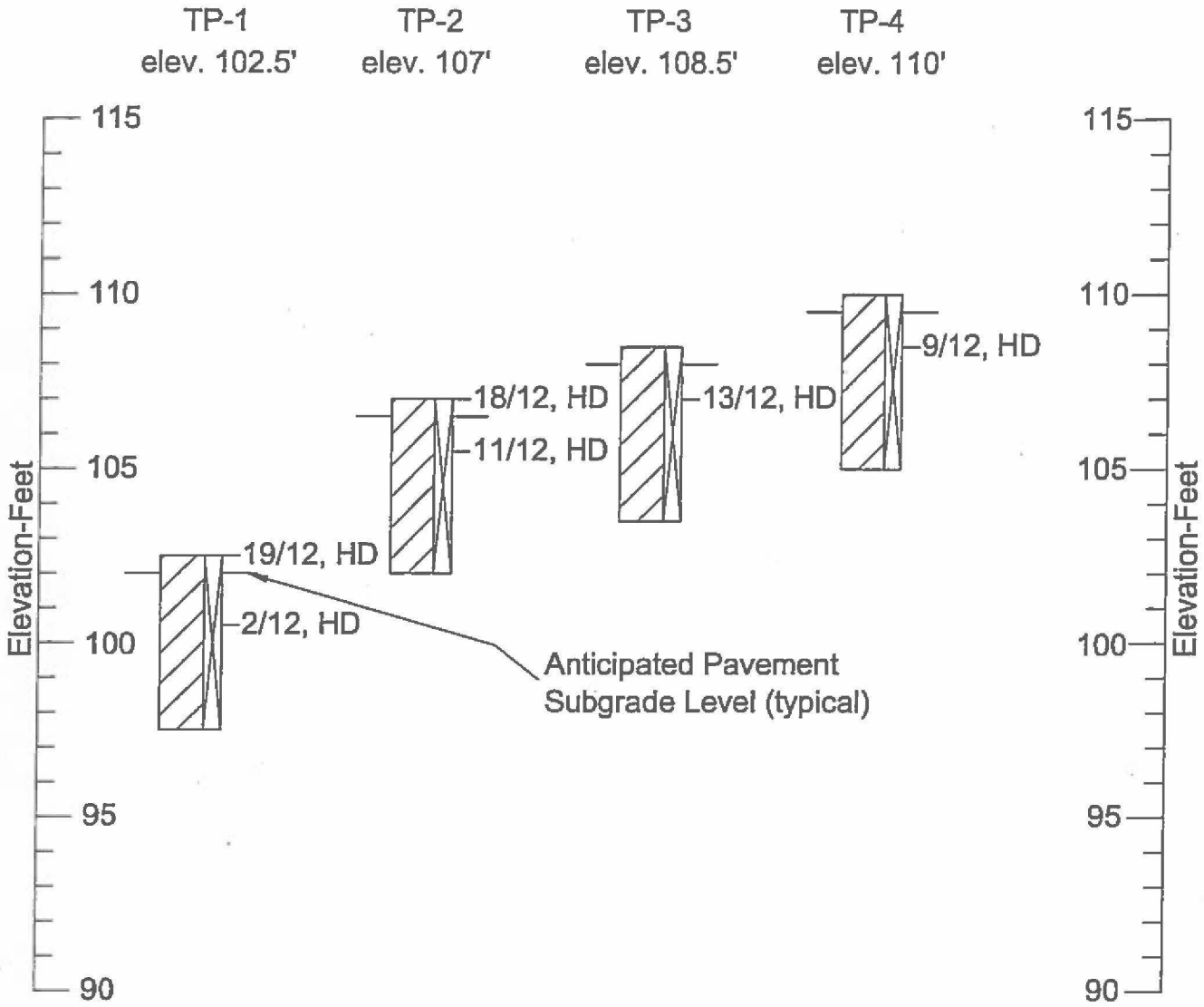
Scale: 1" = 200'



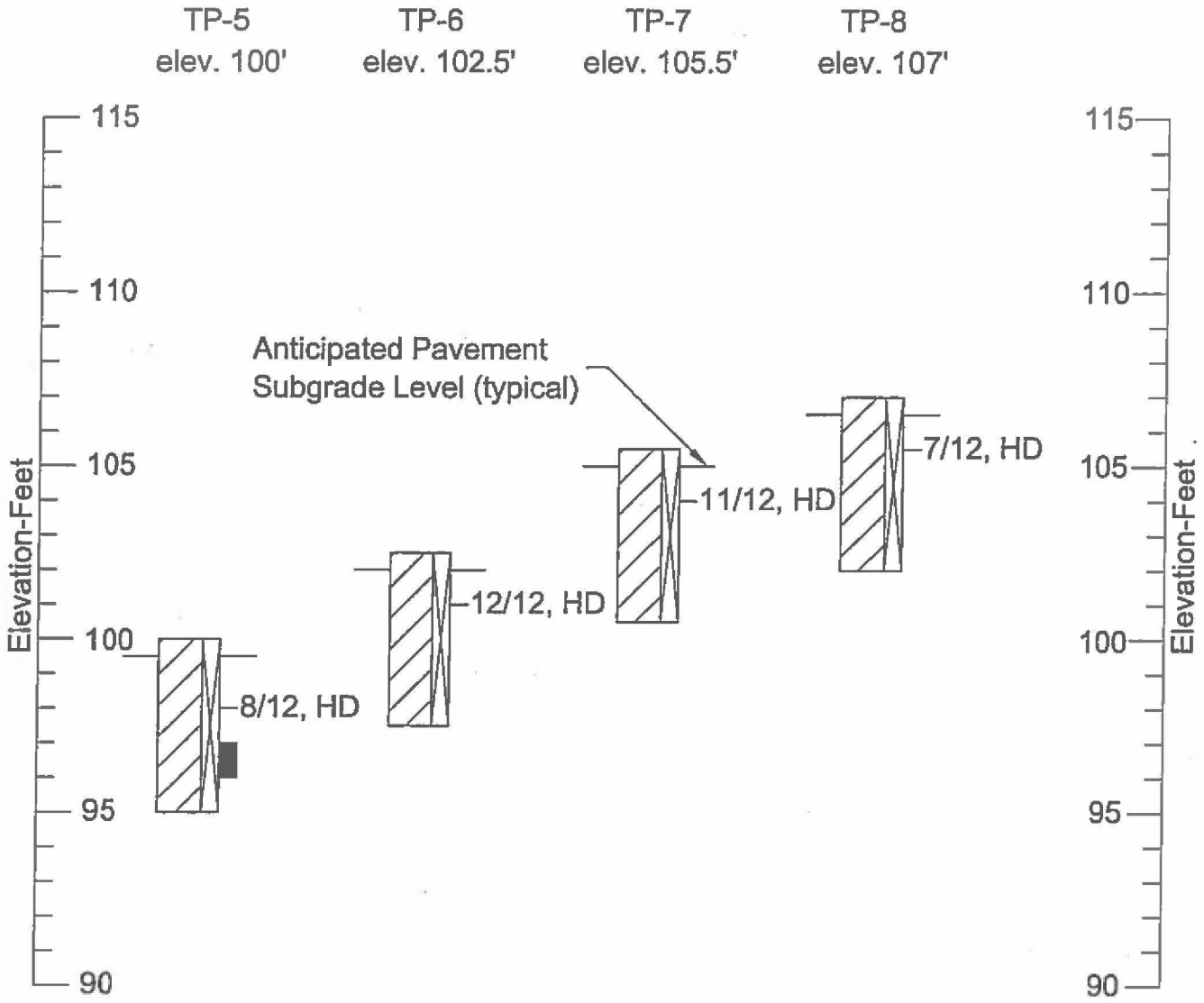
Legend

- ● Indicates location of exploratory test pit.
- ⊗ TBM: Center of Water Meter Cover Approximately 80' North of Southwest Property Corner. Datum= 100.0'

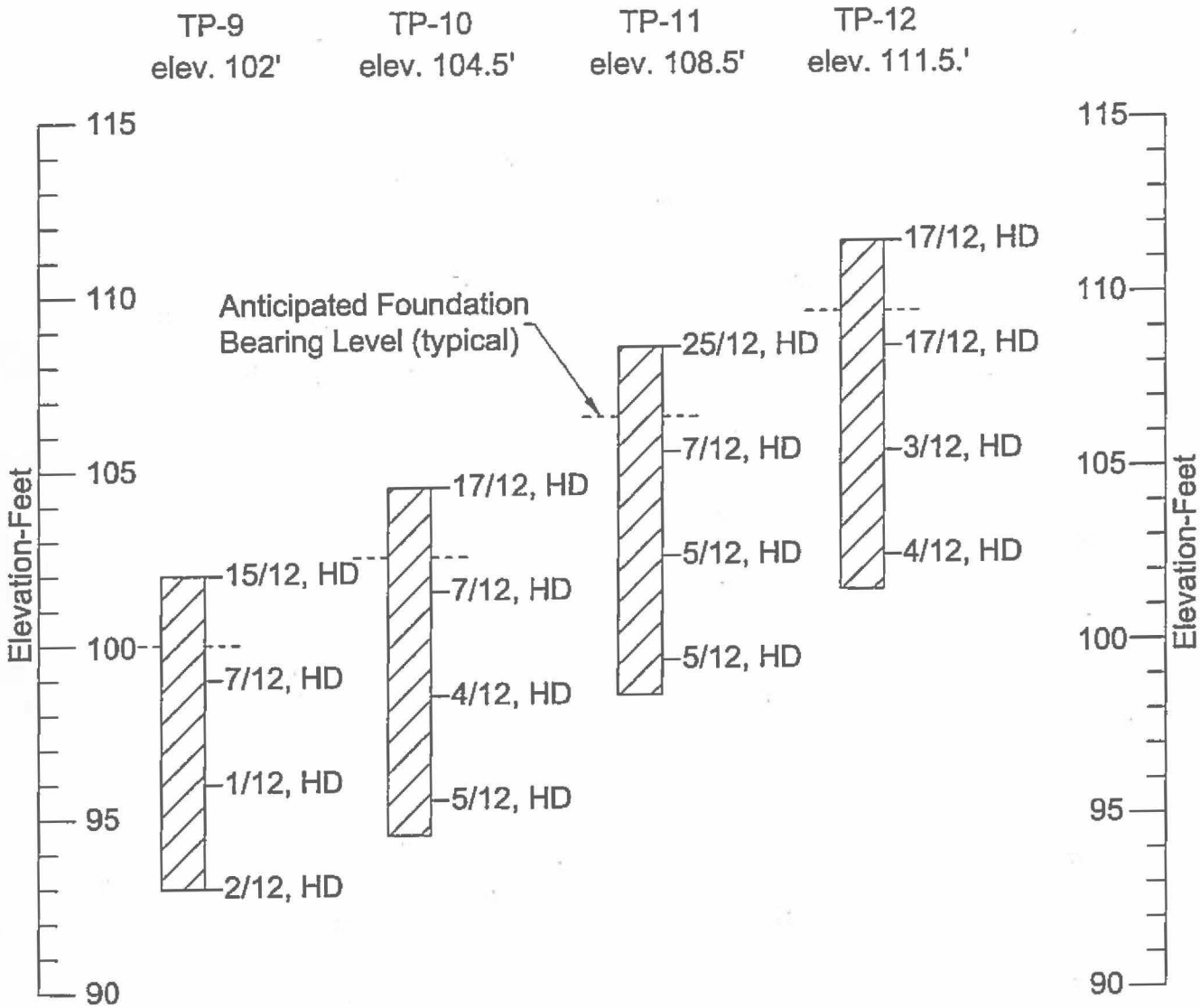
Job No. 1, 330 Location of Exploratory Test Pits Fig. 2



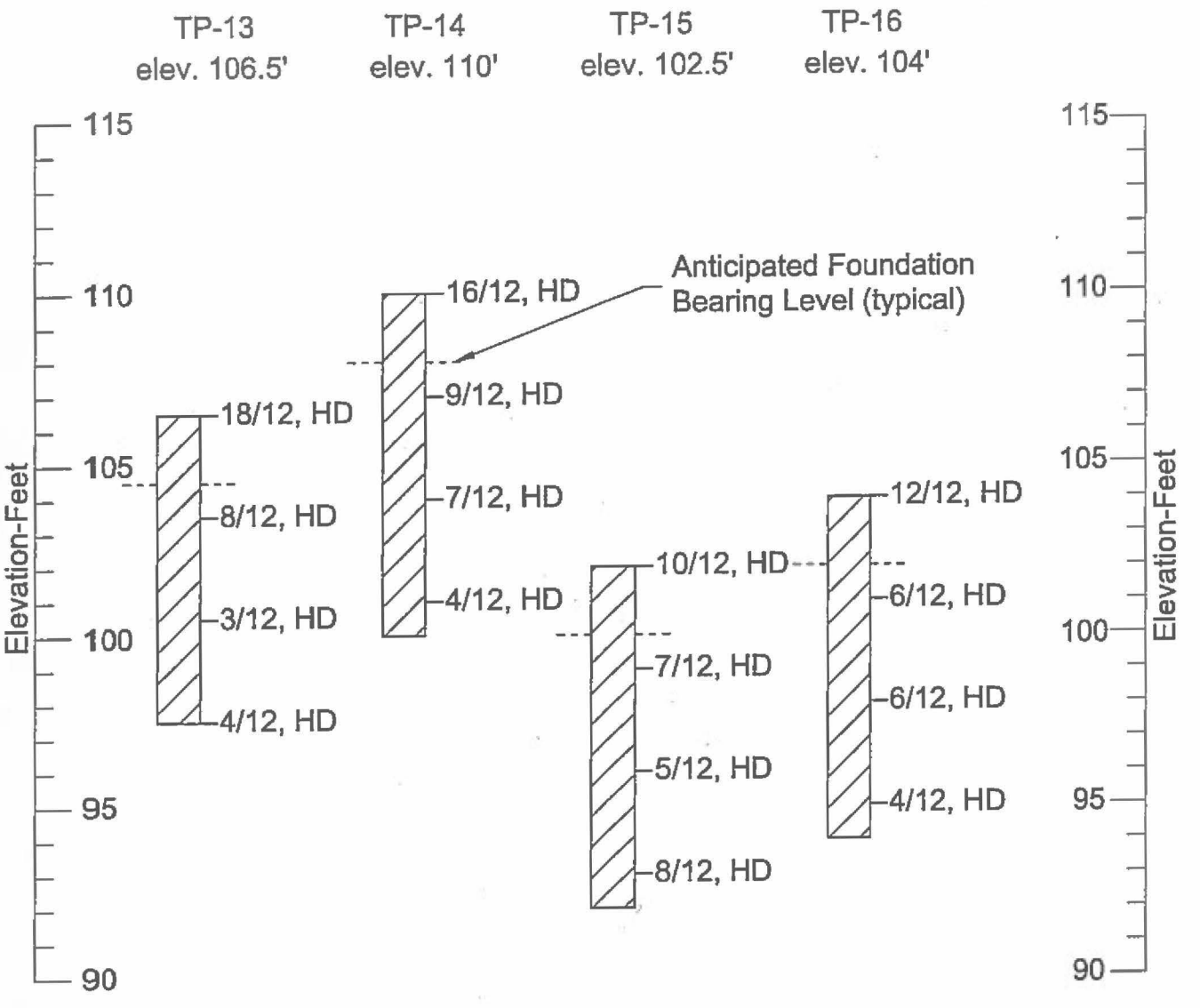
Job No. 1,330 **Logs of Exploratory Test Pits** Fig. 3



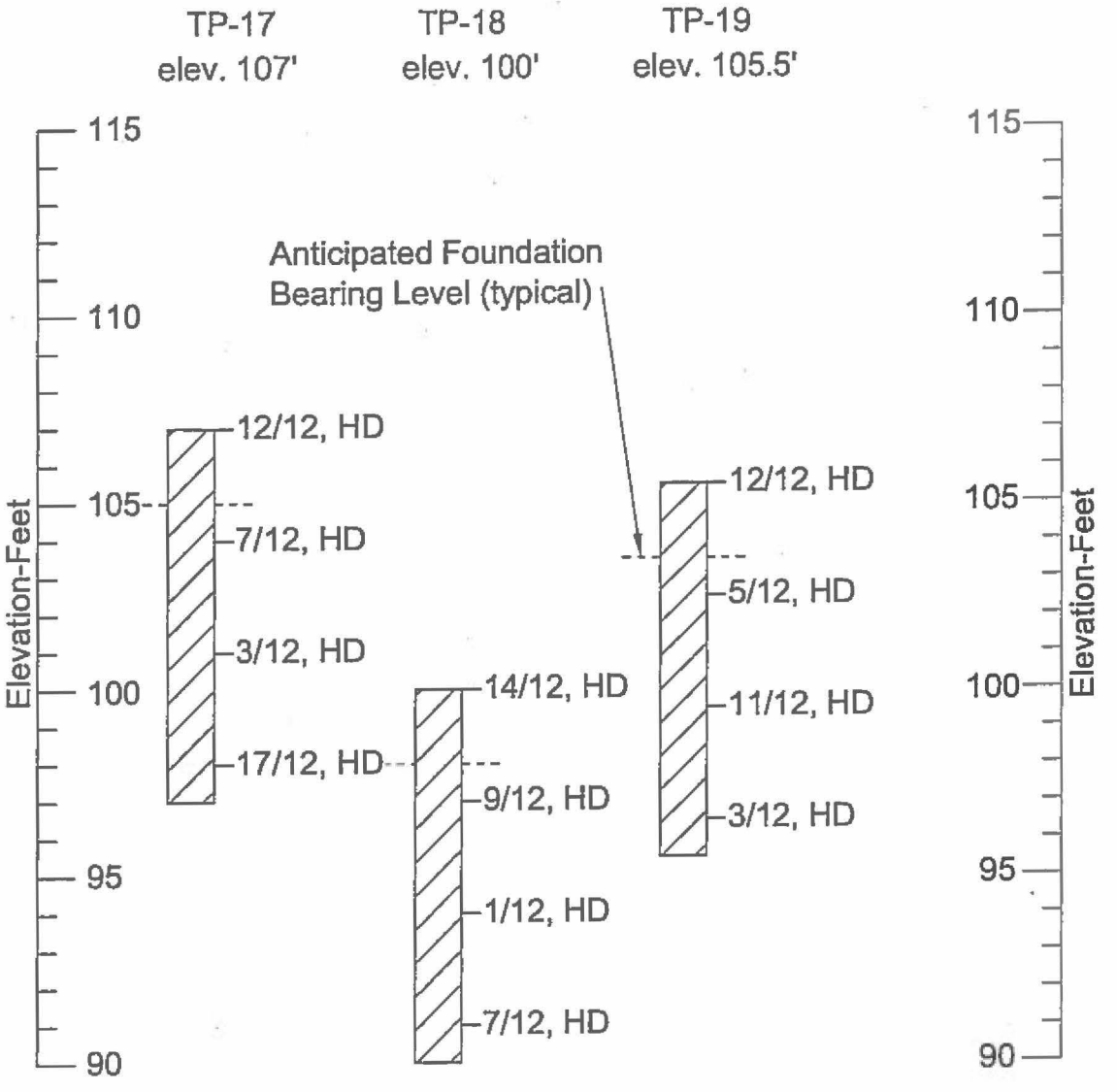
Job No. 1,330 **Logs of Exploratory Test Pits** Fig. 4



Job No. 1,330 **Logs of Exploratory Test Pits** Fig. 5



Job No. 1,330 **Logs of Exploratory Test Pits** Fig. 6



Job No. 1,330 **Logs of Exploratory Test Pits** Fig. 7

Legend

Clay, silty, sandy with Sand, clayey lenses, very soft to stiff, moist to very moist, brown, sulfates noted (CL,SC)

Indicates location of penetration test. The symbol 19/12 indicates that 19 blows of a 15 pound hammer falling 26 inches were required to drive a 1.0 inch diameter penetrometer 12 inches. The symbol HD indicates hand drive using modified California (2.0-inch O.D.) liner.

Indicates location of bulk sample collected from test pit walls.

Indicates location of 3- inch O.D. Shelby Tube Sample.

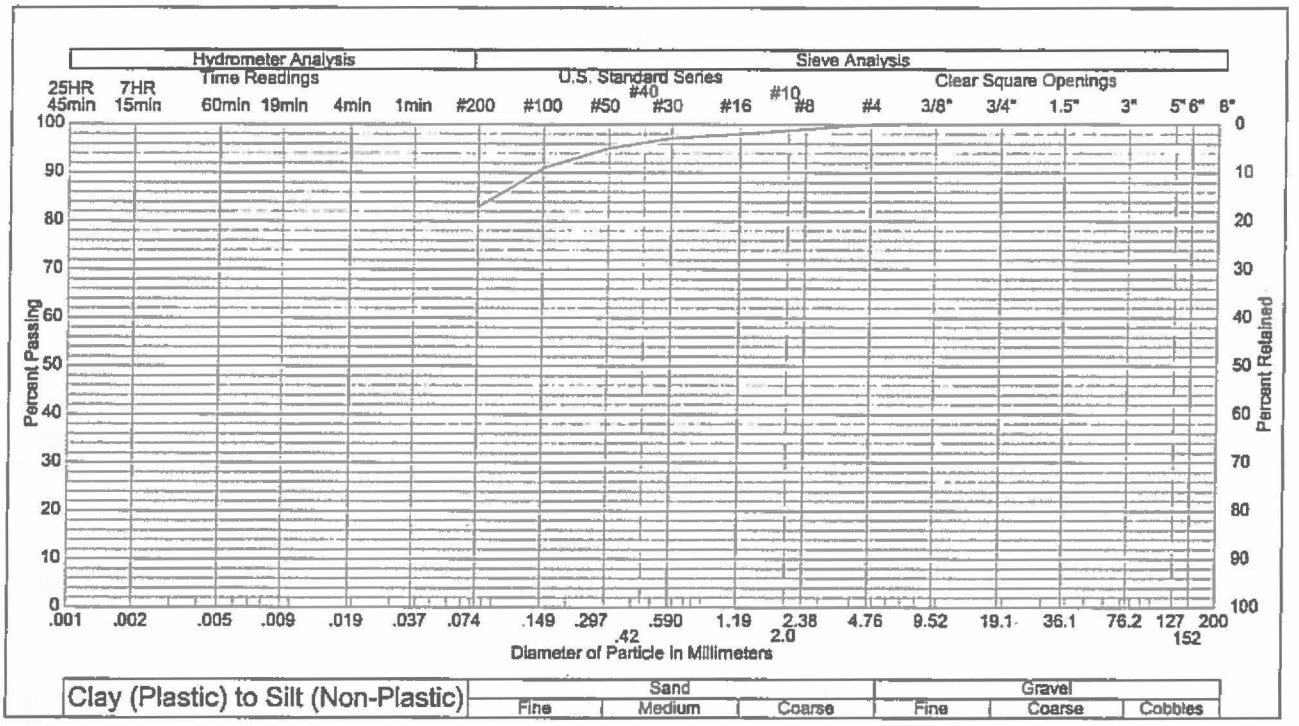
Notes

1. Test pits were observed and sampled Febraury 27, 2003.
2. Elevations of borings were determined using an automatic level and the temporary benchmark (TBM) shown on Fig. 2.
3. These logs are subject to the explanations, limitations and conclusions as contained in this report.

Job No. 1,330

Legend of Logs of Exploratory Test Pits

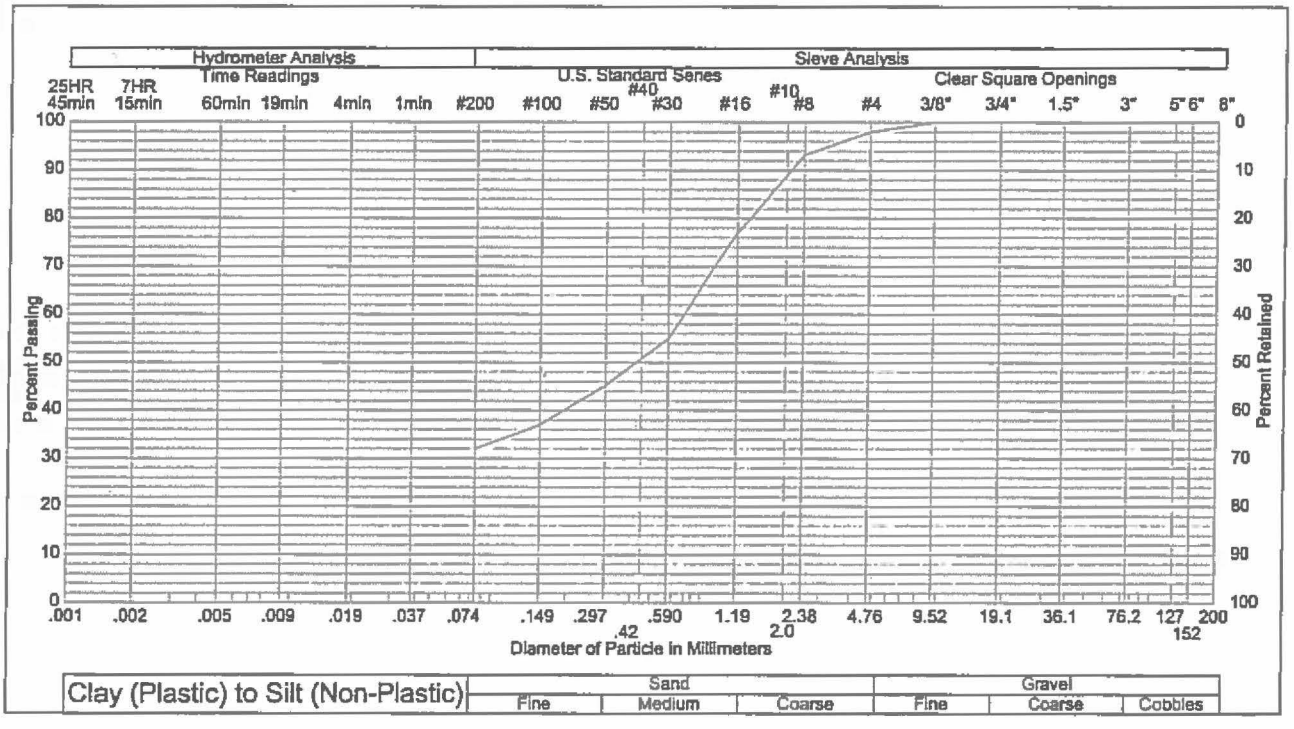
Fig. 8



Sample of: Clay, silty, sandy (CL)
From: TP-1, 2, 3, 4, 5, 6, 7 @ 0 to 5 foot depth, bulk combined

Gravel: 0 %
Silt & Clay: 83 %
Plasticity Index: 11

Sand: 17 %
Liquid Limit: 26



Sample of: Sand, clayey (SC)
From: TP-15 @ 9 foot depth

Gravel: 2 %
Silt & Clay: 32 %
Plasticity Index:

Sand: 66 %
Liquid Limit:

Gradation Test Results

Geotechnical Engineering Group, Inc.

Job No. 1,330

Date: March, 2003

Fig. 13

JOB NO. 1,330

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)			
TP-1 through 7 Bulk Combined	0 – 5	--	--	26	11			83	3,100	Clay, silty, sandy (CL)
TP-9	3	20.2	99			+0.0	500			Clay, silty, sandy (CL)
TP-10	6	26.7	91	32	12			94		Clay, silty, sandy (CL)
TP-11	3	17.0	99			+0.0	500			Clay, silty, sandy (CL)
TP-12	6	24.7	99	28	12			91		Clay, silty, sandy (CL)
	9									Clay, silty, sandy (CL)
TP-13	3	18.1	96			+0.1	500			Clay, silty, sandy (CL)
TP-14	0	12.2	101			+0.0	500			Clay, silty, sandy (CL)
	6	23.4	91	28	9			92		Clay, silty, sandy (CL)
TP-15	3	24.6	94			+0.1	500			Clay, silty, sandy (CL)
	9	15.7	100					32		Sand, clayey (CL)
TP-16	3	23.7	97	31	12			97		Clay, silty (CL)
	6	20.2	103			-0.1	1,000			Clay, silty, sandy (CL)
TP-17	3	19.7	100			+0.2	500			Clay, silty, sandy (CL)

JOB NO. 1,330

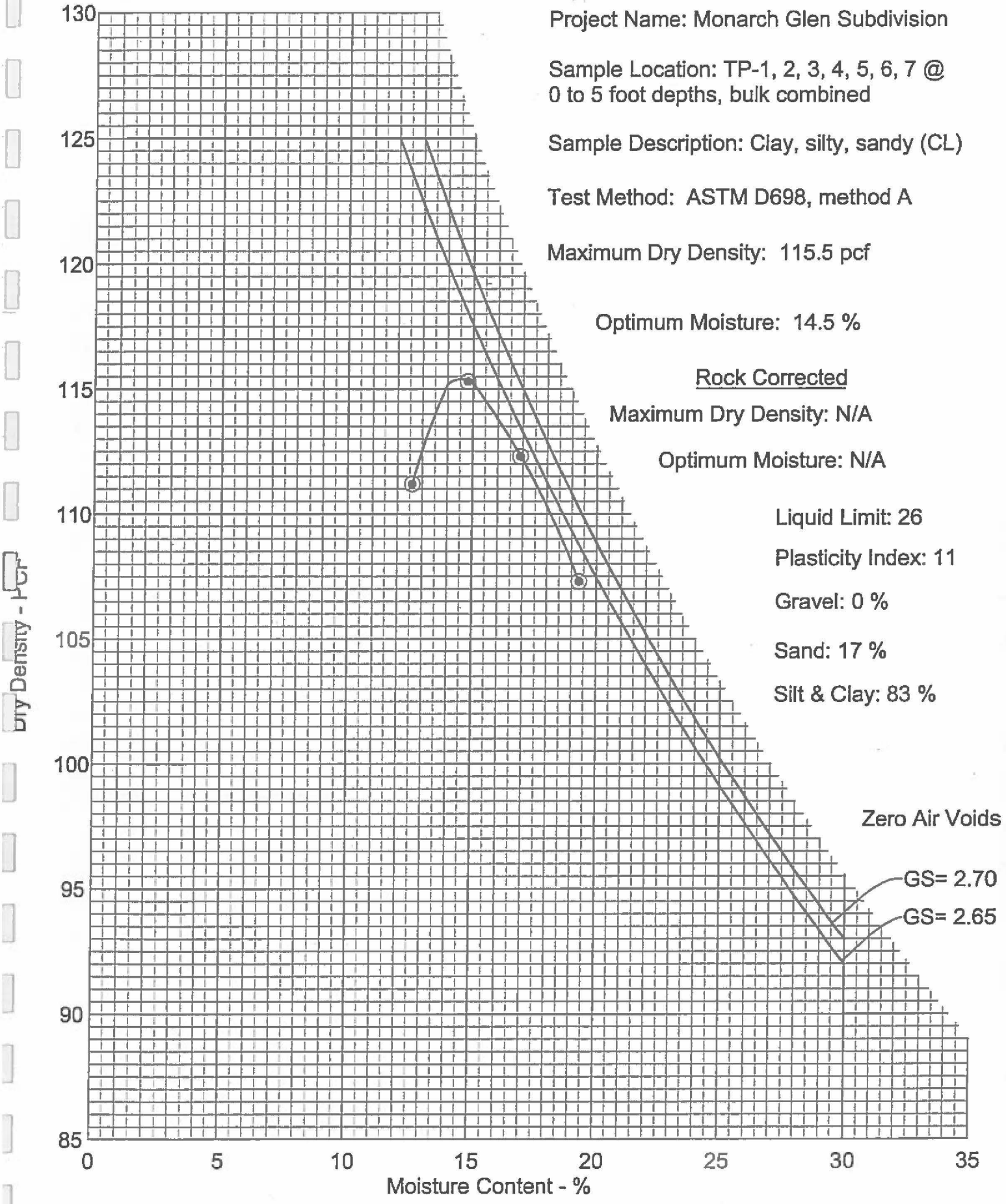
Geotechnical Engineering Group, Inc.

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)			
TP-18	0	13.5	102							Clay, silty, sandy (CL)
	3	15.6	105					59		Clay, silty, sandy (CL)
	6	28.6	95							Clay, silty, sandy (CL)
	9	25.3	103							Clay, silty, sandy (CL)
TP-19	3	23.1	90			+0.1	500			Clay, silty, sandy (CL)

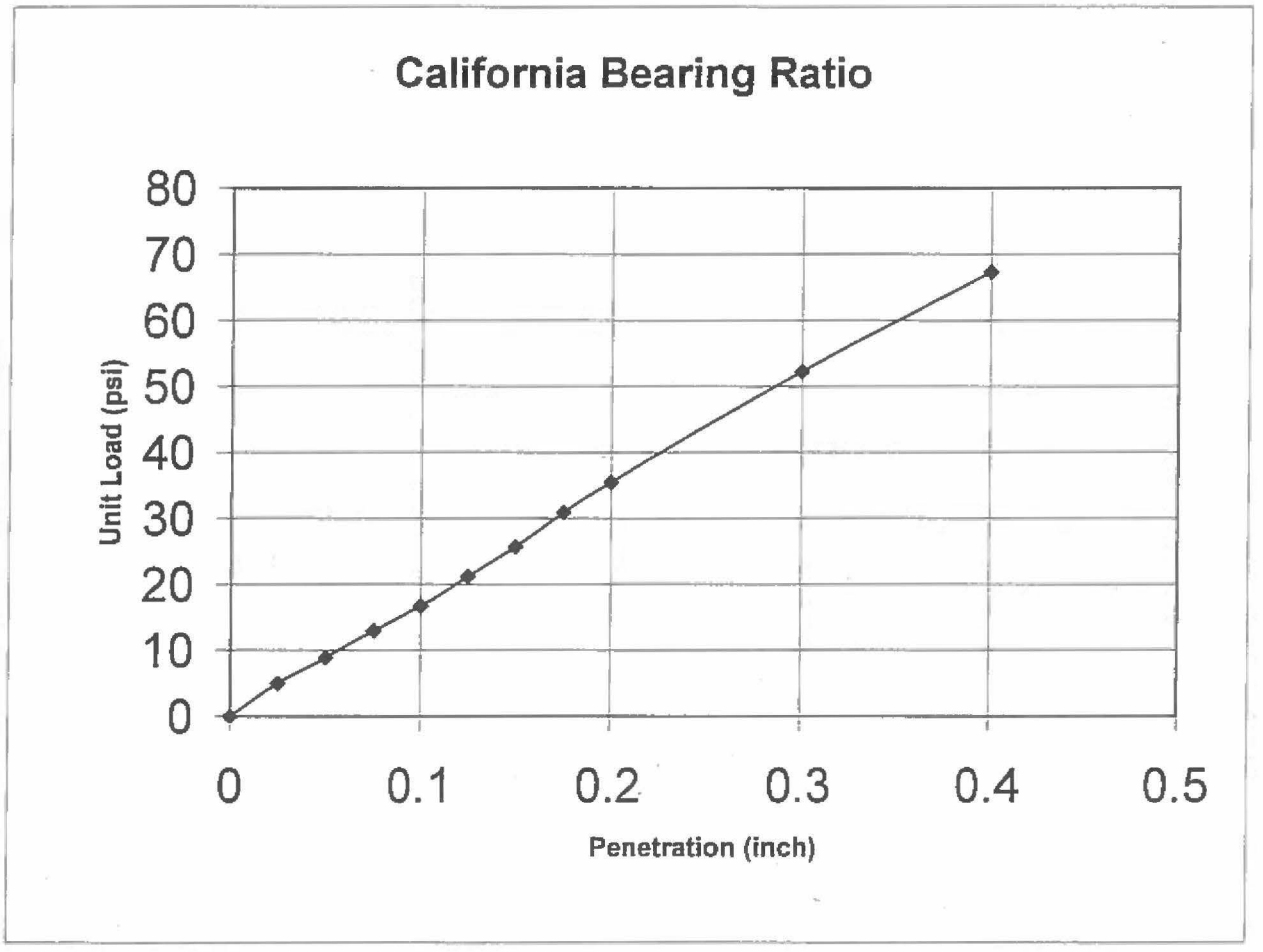
Geotechnical Engineering Group, Inc.
Moisture- Density Relationship



Job No. 1,330

Fig. A-1

Geotechnical Engineering Group, Inc.



CBR @ 0.1" Penetration	1.7
CBR @ 0.2" Penetration	2.4
Maximum Dry Density (pcf)	115.5
Optimum Moisture Content (%)	14.5
Dry Density (pcf)	114.7
Dry Density (% Maximum)	99.8
Surcharge Weight (lbs)	10.0
Swell (%)	
Before Soaking Moisture Content	14.5
After Soaking Moisture Content:	
Top Inch	20.3
Average	16.9

Job No. 1,330

Fig. A-2

APPENDIX B
DESIGN CALCULATIONS

WinPAS

Pavement Thickness Design According to
1993 AASHTO Guide for Design of Pavements Structures
American Concrete Pavement Association

Flexible Design Inputs

Agency:	GEG Job No. 1,330
Company:	
Contractor:	
Project Description:	Monarch Glen Subdivision, 30 Road ½ Street Improvements
Location:	626 30 Road

Flexible Pavement Design/Evaluation

Structural Number	3.46		**Soil Resilient Modulus**	3,623.00	psi
Design ESALs	341,640.00		**Initial Serviceability**	4.50	
Reliability	80.00	percent	**Terminal Serviceability**	2.50	
Overall Deviation	0.45				

Layer Pavement Design/Evaluation

Layer Material	Layer Coefficient	Drainage Coefficient	Layer Thickness	Layer SN
Asphalt Cement Concrete	0.40	1.00	8.64	3.46
Crushed Stone Base	0.12	1.00	0.00	0.00
	0.10	1.00	0.00	0.00
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
			Σ SN	3.46

WinPAS

Pavement Thickness Design According to
1993 AASHTO Guide for Design of Pavements Structures
American Concrete Pavement Association

Flexible Design Inputs

Agency:	GEG Job No. 1,330
Company:	
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Project Description:	Monarch Glen Subdivision, 30 Road ½ Street Improvements
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Flexible Pavement Design/Evaluation

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Design ESALs	341,640.00		**Initial Serviceability**	4.50	
Reliability	80.00	percent	**Terminal Serviceability**	2.50	
Overall Deviation	0.45				

Layer Pavement Design/Evaluation

Layer Material	Layer Coefficient	Drainage Coefficient	Layer Thickness	Layer SN
Asphalt Cement Concrete	0.40	1.00	3.00	1.20
Crushed Stone Base	0.12	1.00	18.81	2.26
	0.10	1.00	0.00	0.00
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
			Σ SN	3.46

WinPAS

Pavement Thickness Design According to
1993 AASHTO Guide for Design of Pavements Structures
American Concrete Pavement Association

Flexible Design Inputs

Agency:	GEG Job No. 1,330
Company:	
Contractor:	
Project Description:	Monarch Glen Subdivision, 30 Road ½ Street Improvements
Location:	626 30 Road

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Structural Number	3.46		**Soil Resilient Modulus**	3,623.00	**psi**
Design ESALs	341,640.00		**Initial Serviceability**	4.50	
Reliability	80.00	**percent**	**Terminal Serviceability**	2.50	
Overall Deviation	0.45				

Layer Pavement Design/Evaluation

Layer Material	Layer Coefficient	Drainage Coefficient	Layer Thickness	Layer SN
Asphalt Cement Concrete	0.40	1.00	4.00	1.60
Crushed Stone Base	0.12	1.00	15.47	1.86
	0.10	1.00	0.00	0.00
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
			Σ SN	3.46

WinPAS

Pavement Thickness Design According to
1993 AASHTO Guide for Design of Pavements Structures
American Concrete Pavement Association

Flexible Design Inputs

Agency:	GEG Job No. 1,330
Company:	
Contractor:	
Project Description:	Monarch Glen Subdivision, 30 Road ½ Street Improvements
Location:	626 30 Road

Flexible Pavement Design/Evaluation

Structural Number	3.46		**Soil Resilient Modulus**	3,623.00	**psi**
Design ESALs	341,640.00		**Initial Serviceability**	4.50	
Reliability	80.00	**percent**	**Terminal Serviceability**	2.50	
Overall Deviation	0.45				

Layer Pavement Design/Evaluation

Layer Material	Layer Coefficient	Drainage Coefficient	Layer Thickness	Layer SN
Asphalt Cement Concrete	0.40	1.00	5.00	2.00
Crushed Stone Base	0.12	1.00	12.14	1.46
	0.10	1.00	0.00	0.00
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
			Σ SN	3.46

WinPAS

Pavement Thickness Design According to
1993 AASHTO Guide for Design of Pavements Structures
American Concrete Pavement Association

Flexible Design Inputs

Agency:	GEG Job No. 1,330
Company:	
Contractor:	
Project Description:	Monarch Glen Subdivision, 30 Road ½ Street Improvements
Location:	626 30 Road

Flexible Pavement Design/Evaluation

Structural Number	3.46		**Soil Resilient Modulus**	3,623.00	**psi**
Design ESALs	341,640.00		**Initial Serviceability**	4.50	
Reliability	80.00	**percent**	**Terminal Serviceability**	2.50	
Overall Deviation	0.45				

Layer Pavement Design/Evaluation

Layer Material	Layer Coefficient	Drainage Coefficient	Layer Thickness	Layer SN
Asphalt Cement Concrete	0.40	1.00	3.00	1.20
Crushed Stone Base	0.12	1.00	6.00	0.72
	0.10	1.00	15.37	1.54
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
			Σ SN	3.46

WinPAS

Pavement Thickness Design According to
1993 AASHTO Guide for Design of Pavements Structures
American Concrete Pavement Association

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Structural Number	3.46		**Soil Resilient Modulus**	3,623.00	**psi**
Design ESALs	341,640.00		**Initial Serviceability**	4.50	
Reliability	80.00	**percent**	**Terminal Serviceability**	2.50	
Overall Deviation	0.45				

Layer Pavement Design/Evaluation

Layer Material	Layer Coefficient	Drainage Coefficient	Layer Thickness	Layer SN
Asphalt Cement Concrete	0.40	1.00	4.00	1.60
Crushed Stone Base	0.12	1.00	6.00	0.72
	0.10	1.00	11.37	1.14
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
			Σ SN	3.46

WinPAS

Pavement Thickness Design According to
1993 AASHTO Guide for Design of Pavements Structures
American Concrete Pavement Association

Rigid Design Inputs

Agency:
Company: Job No. 1,330
Contractor:
Project Description: Monarch Subdivision, 30 Road ½ Street Improvements
Location: 626 30 Road

Rigid Pavement Design/Evaluation

PCC Thickness	5.98	inches	**Load Transfer, J**	3.20	
Design ESALs	367, 920.00		**Mod. Subgrade Reaction, k**	187	psi/in
Reliability	80.00	percent	**Drainage Coefficient, Cd**	1.00	
Overall Deviation	0.35		**Initial Serviceability**	4.50	
Modulus of Rupture	500	psi	**Terminal Serviceability**	2.50	
Modulus of Elasticity	3,375,000	psi			

Modulus of Subgrade Reaction (k-value) Determination

Resilient Modulus of the Subgrade	3,623.90	psi
Resilient Modulus of the Subbase	0.0	psi
Subbase Thickness	0.0	inches
Depth to Rigid Foundation	0.0	feet
Loss of Support Value (0,1,2,3)	0.0	

Modulus of Subgrade Reaction	187.00	psi/in

Job No. 1,330 Pavement Design Calculations Fig. B-7

APPENDIX C

CONSTRUCTION RECOMMENDATIONS FOR FLEXIBLE AND RIGID PAVEMENT

FLEXIBLE PAVEMENT CONSTRUCTION RECOMMENDATIONS

Experience has shown that construction methods can have a significant effect on the life and serviceability of a pavement system. We recommend the proposed pavement be constructed in the following manner:

1. Existing fill, if encountered, should not be relied upon for pavement support. The existing fill should be removed full depth and replaced as a well compacted structural fill. The resulting native subgrade should be scarified 10-inches, moisture conditioned to within 2 percent of optimum moisture content and compacted to at least 95 percent standard Proctor (ASTM D698) maximum dry density. Structural fill should be placed in 10-inch maximum loose lifts, moisture conditioned to within 2 percent of optimum moisture content and compacted to at least 95 percent standard Proctor (ASTM D698) maximum dry density. If documentation of compaction tests are available they should be provided to our office for review.

2. After final subgrade elevation has been reached and the subgrade compacted, the area should be proof-rolled with a heavy pneumatic-tired vehicle (i.e., a loaded 10-wheel dump truck). Subgrade that is pumping or deforming excessively should be stabilized.

3. If areas of soft or wet subgrade soils are encountered, the material should be subexcavated and replaced with properly compacted structural backfill. Where extensively soft, yielding subgrade is encountered, we recommend the excavation be inspected by a representative of our office.

4. Aggregate base course should be laid in thin, loose lifts, moisture treated to within 2 percent of optimum moisture content, and compacted to at least 95 percent of maximum modified Proctor dry density (ASTM D 1557, AASHTO T 180).

5. Aggregate subbase course should be laid in thin, loose lifts, moisture treated to within 2 percent of optimum moisture content, and compacted to at least 95 percent of maximum standard Proctor dry density (ASTM D 698, AASHTO T 99).

6. Asphaltic concrete should be hot plant-mixed material compacted to between 92 to 96 percent of maximum theoretical density. The temperature at laydown time should be at least 235 degrees F. The maximum compacted lift should be 3.0 inches and joints should be staggered.

7. The subgrade preparation and the placement and compaction of all pavement material should be observed and tested. Compaction criteria should be met prior to the placement of the next paving lift. The additional requirements of the Colorado Department of Transportation and City of Grand Junction Specifications should apply.

RIGID PAVEMENT CONSTRUCTION RECOMMENDATIONS

Rigid pavement sections are not as sensitive to subgrade support characteristics as flexible pavement. Due to the strength of the concrete, wheel loads from traffic are distributed over a large area and the resulting subgrade stresses are relatively low. The critical factors affecting the performance of a rigid pavement are the strength and quality of the concrete, and the uniformity of the subgrade. We recommend subgrade preparation and construction of the rigid pavement section be completed in accordance with the following recommendations:

1. Existing fill, if encountered, should not be relied upon for pavement support. The existing fill should be removed full depth and replaced as a well compacted structural fill. The resulting native subgrade should be scarified 10-inches, moisture conditioned to within 2 percent of optimum moisture content and compacted to at least 95 percent standard Proctor (ASTM D698) maximum dry density. Structural fill should be placed in 10-inch maximum loose lifts, moisture conditioned to within 2 percent of optimum moisture content and compacted to at least 95 percent standard Proctor (ASTM D698) maximum dry density. If documentation of compaction testes are available they should be provided to our office for review.

2. The resulting subgrade shall be checked for uniformity and all soft or yielding materials should be replaced prior to paving. Concrete should not be placed on soft, spongy, frozen, or otherwise unsuitable subgrade.

3. The subgrade shall be kept moist prior to paving.

4. Concrete should not be placed in cold weather nor on frozen subgrade.

5. Curing procedures should protect the concrete against moisture loss, rapid temperature change, freezing, and mechanical injury for at least 3 days after placement. Traffic should not be allowed on the pavement for at least one week.

6. A white, liquid membrane curing compound, applied at the rate of 1 gallon per 150 square feet, should be used.

7. Construction joints, including longitudinal joints and transverse joints, should be formed during construction or should be sawed shortly after the concrete has begun to set, but prior to uncontrolled cracking. All joints should be sealed.

8. Construction control and inspection shall be carried out during the subgrade preparation and paving procedures. Concrete shall be carefully monitored for quality control. The additional requirements of the City of Grand Junction and Colorado Department of Transportation Specifications should apply.

9. Deicing salts should not be used for the first year after placement.

Geotechnical
Engineering
Group, Inc.

GEOTECHNICAL INVESTIGATION
Monarch Glen Subdivision
626 30 Road
Grand Junction, Colorado

Prepared For:

Just Companies, Inc.
2505 Foresight Circle, # A
Grand Junction, CO 81505

Attention: Mr. Ed Lenhart

Job No. 1,330

April 1, 2003

Geotechnical, Environmental and Materials Testing Consultants

(970) 245-4078 • fax (970) 245-7115 • geotechnicalgroup.com
2308 Interstate Avenue, Grand Junction, Colorado 81505

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SCOPE

This report presents the results of a Geotechnical Investigation for the proposed Monarch Glen Subdivision to be located at 626 30 Road, in Grand Junction, Colorado. Our investigation was conducted to explore subsurface conditions, provide pavement recommendations and provide foundation recommendations for the proposed residences. The report includes descriptions of subsoil and groundwater conditions found in nineteen exploratory test pits, recommended pavement sections, 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. 03-050 dated February 17, 2003.

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 nineteen exploratory test pits consisted of silty, sandy clay to the maximum depths explored of 5 to 10 feet below the ground surface. Groundwater was not encountered to the maximum depth explored the day of observation or when checked five days later.

2. Relatively soft soil conditions were identified near anticipated pavement subgrade and foundation levels. Alternatives for mitigating potential of encountering yielding soil conditions include elevating these levels or placing a grading fill. These alternatives may not be completely practical. In any case, we recommend avoiding excessive construction traffic. Irrigation of the subject site should not be allowed to occur and discontinued immediately.

3. We believe shallow foundations can perform satisfactorily for the proposed residences. A discussion, including detailed design and construction criteria are included in the text of the report.

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

5. An asphalt thickness of 6.5 inches or 3.0 inches asphalt over 11.5 inches base course supported by well compacted subgrade soils are recommended for interior residential streets, ESAL = 54,750. Additional pavement section alternatives and design and construction criteria are presented in the text of the report.

6. Surface drainage should be designed for rapid runoff of surface water away from the proposed residences and pavements.

SITE CONDITIONS

The subject site was located south and east of Country Road and 30 Road at 626 30 Road in Grand Junction, Colorado. A vicinity map is included as Fig. 1. The subject site was basically flat and nearly level, barren, vacant land. North / south oriented furrows were identified across the site. The subject site sloped down towards the south at 1 percent or less (measured with automatic level). The vicinity was developed subdivisions for single family residences. We noted a single family residence in the south and west portion of the subject site. Developed single family residences were north, east and south. Fences divided the subject site from the surrounding subdivisions. Single family residences were west, beyond 30 Road. The vicinity sloped down toward the south and west at slopes of 1 to 2 percent (USGS Clifton, Colorado topographical quadrangle, 1962, photorevised 1973).

PROPOSED CONSTRUCTION

We understand the subject site is proposed for development and construction of 66 lots for single family residential construction. Maximum utility trench excavation depths of 6 to 8 feet are anticipated. There will be about 4,000 lineal feet of paving for interior streets. There will be no offsite improvements such

as a turn lane or street widening. We understand there will be one retention basin located in the south and west portion of the site. Residences will be wood framed, single story structures with no below grade construction. Shallow, turned down slab or footing type foundations are desired. There will be no site grading changes. We anticipate foundation loads may range from 1,000 to 2,000 pounds per lineal foot of foundation wall. If proposed construction is different than what is described above, we should be notified so that we can re-evaluate the recommendations presented in this report in light of the differences.

SUBSURFACE CONDITIONS

Subsurface conditions at the site were investigated by observing and sampling nineteen (19) exploratory test pits. Locations of test pits are shown on Fig. 2. Replacement of test pit excavations as a well compacted fill should be confirmed at the time of construction. Graphic logs of the soils found in the exploratory test pits and field penetration resistance tests are presented on Figs. 3 through 8. Subsurface conditions encountered in the exploratory test pits consisted of silty, sandy clay to the maximum depths explored of 5 to 10 feet below the ground surface.

The silty, sandy clay had clayey sand lenses, was very soft to stiff, moist to very moist and brown with sulfates noted. One sand sample tested had a moisture content of 15.7 percent, a dry density of 100 pcf and 32 percent passing the No. 200 sieve (silt and clay sized particles). Nineteen clay samples tested had moisture contents of 12.2 percent to 28.6 percent and dry densities of 90 pcf to 105 pcf. Five samples were tested for Atterberg limits. These samples ranged from exhibiting liquid limits of 26 to 32, plasticity indices of 9 to 12 and 59 to 97 percent passing the No. 200 sieve (silt and clay sized particles). Eight clay samples were tested for one-dimensional swell / consolidation characteristics. These samples ranged from compressing 0.1 percent to swelling 0.2 percent when wetted under a confining pressure of 500 or 1,000 psf. Groundwater was not encountered to the maximum depths explored the day of excavation or when checked five days later. Results of laboratory testing are included in Figs. 9 through 14 and summarized on Table I.

SITE DEVELOPMENT

We understand there will be no site grading changes. We believe utility installation in the silty, sandy clay soils may be accomplished using conventional excavation equipment to the depths investigated. Utility trenches should be sloped or shored to meet local, State and Federal safety regulations. Based on our

investigation, we believe soils at this site may be classified as either Type B and / or Type C, based on OSHA standards. Excavation slopes specified by OSHA are dependent upon types of soils and groundwater conditions encountered. Contractors should identify the conditions encountered in the excavation and refer to OSHA standards to determine appropriate slopes.

Water and sewer lines will be constructed beneath pavements. Compaction of trench backfill can have a significant effect on the life and serviceability of pavements. Relatively soft soil conditions were identified in anticipated utility trench areas, stabilization of trench bottoms may be required. We recommend trench backfill be placed in thin, loose lifts, moisture conditioned to within 2 percent of optimum moisture content and compacted to at least 95 percent of standard Proctor maximum dry density (ASTM D 698). The placement and compaction of utility trench backfill should be observed and tested by a geotechnical engineer during construction.

We did not identify groundwater during this investigation to depths of 5 to 10 feet below the ground surface. We anticipate groundwater levels may rise during irrigation season. As a result, there may be groundwater concerns during construction, which were not identified by this investigation. Soft and very soft soils were identified in areas across the site at depths of 3 to 6 feet. Utility trench bottom areas may require stabilization if soft conditions are encountered at the

time of excavation. Our representative should be called to observe and make recommendations for stabilization (as applicable) at that time.

Retention Basin

We obtained one sample (TH-5 at 3 foot depth) in the proposed retention basin area. A relatively undisturbed sample was obtained from a depth of approximately 3 feet below the existing grade and tested for hydraulic conductivity in a flexible wall permeameter (ASTM D5084). The sample exhibited a hydraulic conductivity (k) of 1.6×10^{-7} cm/sec. No groundwater was encountered in the test pit to the total depth excavated at the time of investigation.

RESIDENCE FOUNDATIONS

This investigation indicates subsurface conditions at anticipated foundation levels consist of soft to medium stiff, silty, sandy clay soils. One method of support to help reduce settlement concerns is the use of deep foundations such as drilled or helical piers bedded in an underlying competent stratum. This investigation did not identify an underlying competent bearing stratum. Additional investigation would be required to provide deep foundation recommendations, as requested. We understand shallow turned down slab or footing foundations are desired. In our experience, shallow foundations have been used in this area with satisfactory

performance for conditions similar to those identified at this site. Footings generally offer better performance than turned down slabs because the floor would be structurally supported and therefore isolated from differential ground movements. Turned down slabs would likely be less expensive to install. We recommend that shallow foundations bear as shallow as practical (12-inches if possible to 24-inches maximum depth). To provide a more uniform foundation subgrade, we recommend the subgrade be well compacted. Areas of soft conditions were encountered and stabilization may be necessary across the site. We also recommend the subgrade be "proof rolled" using a heavy, pneumatic tired vehicle to identify soft areas.

We present design and construction criteria for spread footing foundations below. These criteria were developed from analysis of field and laboratory data and our experience. The additional requirements (if any) of the structural engineer and structural warrantor should also be considered.

Spread Footing Foundations

1. Spread footing foundations, bearing on well compacted native soils, can be designed for a maximum soils bearing pressure of 1,000 psf. Footings should bottom as shallow (12-inches as practical) and no deeper than 24-inches below the existing ground surface. Loose soils should be completely removed from foundation bearing areas, prior to placing concrete.

2. The completed excavation, within 2 feet horizontally of bearing areas, should be scarified 10 inches, moisture conditioned to within 2 percent of optimum moisture content and compacted to at least 95 percent of standard Proctor maximum dry density (ASTM D698). Our representative should be called to test compaction of subgrade soils and observe a proof roll of entire subgrade, performed by a heavy pneumatic tired vehicle such as a 10-wheeled, loaded dump truck prior to forming. If soft or yielding conditions are encountered then stabilization may be required. Our representative should make specific stabilization recommendations depending on conditions encountered, at the time of our site visit. If porous fabric is noted, up to 2 feet of soil removal beneath foundations may be required, replaced with a well compacted structural fill.

3. We recommend a minimum width of 18 inches for continuous footings. Isolated pads should be at least 30 inches by 30 inches. Foundation walls should be well reinforced top and bottom. We recommend reinforcement sufficient to span an unsupported distance of at least 12 feet. Reinforcement should be designed by the structural engineer.

4. Exterior walls must be protected from frost action. We understand 2 feet for frost cover is typically assumed in the Mesa County area.

5. The completed foundation excavation should be observed by our representative prior to placing forms, to verify the foundation bearing conditions and test compaction.

Turned Down Slabs

1. Turned down portions, bearing on well compacted native soils or well compacted site grading fill can be designed for a maximum soils bearing pressure of 1,000 psf. Footings should bottom as shallow as practical and no deeper than 24-inches below the existing ground surface. Loose soils should be completely removed from foundation bearing areas, prior to placing concrete.

2. The completed excavation, within 2 feet horizontally of bearing areas, should be scarified 10 inches, moisture conditioned to within 2 percent of optimum moisture content and compacted to at least

95 percent of standard Proctor maximum dry density (ASTM D698). Our representative should be called to test compaction of subgrade soils.

3. We recommend thickened slab portions be at least 18 inches wide continuous, where required. Perimeter foundations should be well reinforced both top and bottom so that they will span an unsupported distance of at least 12 feet.

4. The soils under footings should be protected from freezing. The depth of frost protection usually assumed in the Mesa County area is 2 feet.

5. Completed excavations should be observed by a representative of our firm, prior to forming, to confirm that the soils are as anticipated from test pits and to test compaction.

FLOOR SYSTEMS – Spread Footing Foundations

We believe the near-surface soils which will support slab-on-grade floors exhibited low 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. A slab-on-grade floor can be used in garages 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 and exterior flatwork.

2. Slab subgrade areas should be scarified, moisture conditioned and compacted as described in the **"RESIDENCE FOUNDATIONS"** section of this report.

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

4. The use of slab-bearing partitions should be minimized. Where such partitions are necessary, a slip joint allowing at least 1.5 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.

5. 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.

6. 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 1.5 inches of vertical movement so that slab movement is not transmitted to the duct work.

7. 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.

8. 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. Stucco finish (if any) should terminate at least 6 inches above any flatwork.

FLOOR SLABS – Turned Down Slab-Type Foundations

As proposed, floor slabs may be constructed as a portion of the foundation system. Where building loads are supported by the slab, thickened portions and heavy slab reinforcing may be required. Hair pin type reinforcing should be avoided where possible. If hair pin type reinforcing can not be avoided, it should be carefully designed by the structural engineer to consider differential movements and effects on floor slab cracking and damage. A joint should be installed in these areas to control areas of likely cracking. Plumbing and utilities which pass through the slabs should be isolated from the slab. Slabs should be well reinforced to function as rigid bodies. Frequent control joints should be provided to reduce problems associated with shrinkage and curling. We recommend 8 to 15 foot joint spacing, depending on slump, aggregate size and slab thickness.

BELOW-GRADE CONSTRUCTION

No below-grade construction is anticipated at this site. Typically, foundation drains are not required for construction of this type. Crawl space areas should be sloped so that potential moisture will not collect in these areas, but flow out of the crawl space. Crawl space areas (where applicable) should also be well ventilated to mitigate potential musty odors. We can provide foundation drain details if requested.

PAVEMENT

The pavement subgrade soils include medium stiff to very stiff, silty, sandy clay. We visually classified each sample obtained from the test pits and tested samples in our laboratory. We tested a combined sample from exploratory test pits, TP-1 through TP-7 at 0 to 5 feet for pavement design purposes. The sample was tested for Atterberg limits, gradation, standard Proctor, and California Bearing Ratio (CBR). The sample tested exhibited a maximum dry density of 115.5 pcf, optimum moisture of 14.5 percent and a California Bearing Ratio (CBR) of 2.4. We used a design CBR value of 2.0. The results of laboratory testing are shown on Table I and included in Figs. A-1 and A-2.

Our design utilized the computer program WinPAS, based on the 1993 AASHTO Guide for Design of Pavements Structures, a 30 year design period, and our experience. We understand pavements will be used to for interior residential streets and acceleration / deceleration lane improvements. We used a 30 year Equivalent Single Axle Load (ESAL) of 54,750 for the interior streets (converted from an equivalent daily load application, EDLA=5) for interior streets. A non-linear relationship developed by CDOT to relate the CBR value to the subgrade resilient modulus (Mr) was used for flexible pavement. Using this relationship, we calculated a Mr value of 3,623 psi. We converted the subgrade resilient modulus (Mr) to the modulus of subgrade reaction (k) using the relationship K = Mr / 19.4, for rigid pavements. Using this equation, we calculated a k value of 187 psi / in. We used a regional factor of 2.0 and a design serviceability index of 2.0. Pavement design calculations are included in Appendix A. Table A below shows our recommendations.

TABLE A
SUMMARY OF RECOMMENDED PAVEMENT SECTIONS

Anticipated Traffic Type	Asphaltic Concrete	Asphalt and Aggregate Base Course	Asphalt, Aggregate Base Course and Aggregate Sub Base Course	Portland Cement Concrete
Interior Streets (ESAL = 54,750)	6.5"	3.0" +11.5" 4.0" + 8.0"	3.0" + 6.0" + 10.0"	5.0"

The pavement subgrade should be scarified a depth of 10-inches, moisture conditioned to within 2 percent of optimum moisture content and compacted to at least 95 percent of standard Proctor (ASTM D698) maximum dry density. Soft areas that require stabilization may be encountered. A Geotechnical Engineering Group, Inc. representative should be called to observe a "proof roll" of the completed subgrade, made by a heavy pneumatic tired vehicle. Soft subgrade conditions that require stabilization may be identified. Care should be taken to avoid excessive construction traffic.

Our experience indicates asphalt pavement in areas which will be subjected to heavy trucks stopping and turning does not perform satisfactorily. We recommend placing a 6 inch thick Portland cement concrete pavement in all areas where this heavy truck traffic may occur, including access aprons and trash dumpster locations.

The design of a pavement system is as much a function of paving materials as supporting characteristics of the subgrade. The quality of each construction material is reflected by the strength coefficient used in the calculations. If the pavement system is constructed of inferior material, then the life and serviceability of the pavement will be substantially reduced.