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File 1991-0065 Name: Fire Station #2 - 28 ¼ Road and Patterson Road

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		A few items are denoted with an asterisk (*), which means they are to be scanned for permanent record on the ISYS retrieval system. In some instances, items are found on the list but are not present in the scanned electronic development file because they are already scanned elsewhere on the system. These scanned documents are denoted with (**) and will be found on the ISYS query system in their designated categories. Documents specific to certain files, not found in the standard checklist materials, are listed at the bottom of the page. Remaining items, (not selected for scanning), will be listed and marked present. This index can serve as a quick guide for the contents of each file.
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X	X	**Review Sheet Summary**
X	X	Application form
X		Review Sheets
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		***Submittal checklist**
		***General project report**
		Reduced copy of final plans or drawings
X		Reduction of assessor's map.
		Evidence of title, deeds, easements
X	X	***Mailing list to adjacent property owners**
		Public notice cards
		Record of certified mail
X		Legal description
		Appraisal of raw land
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X	X	***Final reports for drainage and soils (geotechnical reports)**
		Other bound or non-bound reports
		Traffic studies
		***Petitioner's response to comments**
		***Staff Reports**
		***Planning Commission staff report and exhibits**
		***City Council staff report and exhibits**
		***Summary sheet of final conditions**

DOCUMENT DESCRIPTION:

X	X	Action Sheet	X		Sand and Oil Trap
X	X	2 Planning Clearances - **	X		Heating and Piping Plan
X	X	Geotechnical Engineering Study - 6/3/91	X		Floor Plan
X		Warranty Deed - not conveyed to City	X		Wall Sections
X		Expenditure Authorization Form - 9/20/91	X		Foundation Plan
X	X	Correspondence	X		Floor Framing Plan
X	X	Landscape Plan	X		Roof Framing Plan
X		City water and /or Sewer Tap Order - 12/26/91	X		Landscape Plan
		Certificate of Occupancy - 7/27/92	X		Elevation Map
	X	E-mail from Don Newton re: Fire Station inspection	X		The Falls Site Plan
X	X	Site Plan	X		Mantey Heights Water Tank Plan
X		Schematic Wiring Diagram Exterior Lighting Control			

X		Systems Plan			
X		Roof Plan			
X		Lighting Pole Base Detail			
		Waste Riser Diagram B			

A

Receipt #_____

Date Rec._____

Received By_____

DEVELOPMENT APPLICATION

We, the undersigned, Being the owners of property situated in Mesa County, State of Colorado, as described on the attached legal description form do hereby petition this:

Type of Petition	Acres ~~Sq.Ft~~	Phase	Common Location	Zone	Type of Usage
○ Subdivision Plat/Plan		○ Minor ○ Major			
○ Rezone				Frm ▷ To	
○ Planned Development		○ ODP ○ Prelim ○ Final			
○ Conditional Use					
○ Hwy-Oriented Development				H.O.	
○ Text Amendment					
● Special Use	~3		SE corner of Patterson Rd & 28¼ Rd	PZ	New Fire Station
○ Vacation					○ Right-of-way ○ Easement

PROPERTY OWNER ●	DEVELOPER ●	REPRESENTATIVE ●
City of Grand Jct.	Grand Jct. Fire Dept	John Knudsen
Name	Name	Name
520 N. 5th St.	330 S. 6th St.	
Address	Address	Address
Grand Jct., Co	Grand Jct., CO	
City/State	City/State	City/State
244-1501	244-1406	244-1415
Business Phone #	Business Phone #	Business Phone #

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

WE HEREBY ACKNOWLEDGE THAT WE HAVE FAMILIARIZED OURSELVES WITH THE RULES AND REGULATIONS WITH RESPECT TO THE PREPARATION OF THIS SUBMITTAL, THAT THE FOREGOING INFORMATION IS TRUE & COMPLETE TO THE BEST OF OUR KNOWLEDGE, AND THAT WE ASSUME THE RESPONSIBILITY TO MONITOR THE STATUS OF THE APPLICATION AND THE REVIEW SHEET COMMENTS. WE RECOGNIZE THAT WE OURSELVES, OR OUR REPRESENTATIVE(s) MUST BE PRESENT AT ALL HEARINGS. IN THE EVENT THAT THE PETITIONER IS NOT REPRESENTED, THE ITEM WILL BE DROPPED FROM THE AGENDA, AND AN ADDITIONAL FEE CHARGED TO COVER RE-SCHEDULING EXPENSES BEFORE IT CAN AGAIN BE PLACED ON THE AGENDA

X John Knudsen 9/16/91

Signature of person completing application Date

X _____ _____

Signature of property owner(s) - attach additional sheets if necessary

Do Not Remove From Office #65 91

Fire Station #2

Ray Werner
1615 D 10 Rd
Delta Co.
81416

Leo H. Warren
2815 Patterson Dr.
Grand Jct, Co. 81506

John A. Siefried
P.O Box 60214
Grand Jct Co. 81506

MTC West, Inc.
1465 Kelly Johnson Blvd #200
Colorado Springs, CO 80920

Paul Dibble
2835 Grand Falls Cr.
Grand Jct. Co. 81501

Richard Carter
6761 Perfidio
Huntington beach, Ca.
92648

Marlene Pelter
2835 Grand Falls Dr.#7
Grand Jct, Co. 81501

John Siegfield
P.O Box 60214
Grand Jct, Co. 81506

John Siegfield
P.O Box 60214
Grand Jct, Co, 81506

John Siegfield
P.O. Box 60214
Grand Jct, Co. 81506

Keneth Matchett
2844 F Rd
Grand Jct, Co. 81506

Keneth Matchett
2844 F Rd
Grand Jct, Co. 81506

REVIEW SHEET SUMMARY

FILE NO. #65-91 **TITLE HEADING:** Special Use - Fire Station

ACTIVITY: Fire Station

PETITIONER: City of Grand Jct, Fire Dept.

REPRESENTATIVE: John Knudsen

LOCATION: 28 1/4 Road & Patterson Road

PHASE: Final **ACRES:**

PETITIONER'S ADDRESS: 330 S. 6th St., Grand Junction
(303) 244-1400

ENGINEER:

STAFF REPRESENTATIVE: Kathy Portner

NOTE: WRITTEN RESPONSE BY THE PETITIONER TO THE REVIEW COMMENTS IS REQUIRED A MINIMUM OF 48 HOURS PRIOR TO THE FIRST SCHEDULED PUBLIC HEARING.

CITY POLICE DEPARTMENT 09/24/91
Captain Gorby 244-3563

This project will have no impact on the Grand Junction Police Department. No problems.

CITY PROPERTY AGENT 10/3/91
Tim Woodmansee 244-1565

A legal survey of this property indicates that the boundary lines extend into a portion of the 28 1/4 and Patterson Road street improvements. This office will prepare the required documents and present the same to the City Council so that the right-of-way situation can be cleared up.

CITY FIRE DEPARTMENT 09/25/91
George Bennett 244-1400

1. A fire flow survey is needed to determine the required flows. Please submit a stamped set of plans to accomplish this.

2. Access appears adequate at this time.

3. A review of the building and site plans is required to determine if any further requirements are to be met.

U.S. WEST 09/24/91
Leon Peach 244-4964

No comments at this time.

CITY ENGINEER **10/02/91**
Don Newton **244-1559**

The site plans are incomplete. The following information will need to be submitted for my review:

1. Site grading and drainage plan showing existing and proposed contours at one foot intervals.

2. Drainage calculations for historic and developed conditions. On site detention of runoff in excess on historic rates will be required. Detention volume should be calculated using the modified rational method of other approved procedures.

3. Horizontal and vertical control for location and layout of all site paving and concrete curbing, gutter, sidewalk, driveways, utilities, etc.

4. Copy of soil report including building foundation design and pavement design calculations.

5. Details and structural sections for all concrete and asphalt pavement.

6. Details of any earth retaining structures that may be required.

7. Show description of the property boundaries and dimensions of parking lot layout.

8. What is planned in the area between the proposed development and 28.25 Road? How will weeds be kept from growing in this area and in the native grass areas?

CITY UTILITIES **09/30/91**
Bill Cheney **244-1590**

1. A "utility composite" will be required on this submittal since off-site improvements are being constructed.

2. It appears there may not be adequate grade to construct the sewer service as shown.

3. What provisions are being made for on-site detention of storm runoff?

4. A revocable permit will be required for the sewer service if constructed as shown in Patterson Road.

GRAND VALLEY WATER USERS **10/08/91**
G.W. Klapwyk **242-5065**

Grand Valley Water Users Assoc. (GVWUA) would like to point out that it has an approx. 18" concrete pipeline located inside the Patterson Road curb, along the north side of this site. As part of such pipeline, there is a concrete riser chamber, above ground, located near the existing sidewalk at the northwest of the site and is essential to operation and maintenance of the pipeline which flows west under 28 1/4 Road and beyond. GVWUA has no facilities along 28 1/4 Road at this site. We, of course, ask that our pipeline and related facilities be protected during construction and in the future use of the property.

MESA COUNTY DEPARTMENT OF PUBLIC WORKS, DIVISION OF ENGINEERING AND DESIGN DEVELOPMENT **10/02/91**
Jaci Gould, P.E.

1. Landscaping will not be allowed in the Patterson Road right-of-way or in the sight distance triangles for driveways. Any landscaping proposed should remain on private property. Please refer to the Mesa County Road Standards for sight distance triangle specifications.

2. Driveway permits need to be obtained from the Division of Engineering and Design for any new accesses off of Patterson and 28 1/4 Roads. These accesses will not be allowed closer than 100 feet from the curb line of the intersecting road.

MESA COUNTY PLANNING 10/03/91
Linda Dannenberger 244-1636

We object to the lack of landscaping in this very visible area at the intersection of 28 1/4 and Patterson Roads. If the slope in this area makes it impractical, some kind of decorative ground cover along the rights-of-way would be preferable to nothing.

A few trees should be added on the east side to buffer the parking area from the neighboring property.

Good plan!

PUBLIC SERVICE 09/25/91
Carl Barnkow 244-2658

GAS & ELECTRIC: No objections.

GRAND JUNCTION PARKS & RECREATION DEPT. 09/30/91
Don Hobbs 244-1545

None.

COMMUNITY DEVELOPMENT DEPARTMENT 10/14/91
Kathy Portner 244-1446

The property proposed for the fire station is currently zoned PZ (Public Zone) because it is owned by the City and was previously used as a water tank site. A fire station requires a Special Use Permit in the PZ Zone.

The proposed use must meet the criteria set forth in Section 4-8 of the Zoning and Development Code.

4-8-1 A. - The proposed use does seem to be compatible with adjacent uses in terms of scale, site design and architecture. The landscaping of the site will be very important in carrying through that compatibility.

4-8-1 B. - The design features of the site such as pedestrian and vehicular circulation and ingress/egress are sufficient to protect adjacent uses. Buffering of the site from the residential uses to the south could be better with the addition of some trees along the south side of the driveway, at least in front of the building.

4-8-1 C. - Not applicable.

4-8-1 D. - Adequate public services are available; however, many technical issues must be resolved for final delivery of those services.

4-8-1 E. - Not applicable.

4-8-1 F. - Maintenance of the site will be provided by the Fire Department.

4-8-1 G. - Satisfied.

4-8-2 - The proposal satisfies the criteria as set forth in the specific criteria matrix (F4-8-2).

The proposal meets the required setbacks for the zone.

50% of the required frontyard setbacks must be landscaped. Along Patterson Road, the setback is 15 feet from property line. The landscaping requirement is 15 feet x 300 feet (frontage) x .50 = 2,250 square feet. The landscaping requirement along 28 1/4 is 23 feet x 330 feet x .50 = 3,795 square feet.

At least 13 trees are required (one per each 500 square feet). 40% of the required landscaped area must contain shrubs and 75% of this shrub area shall be covered by a minimum of 75% plant material. Please calculate the square feet of the landscaped areas shown on the plan.

The parkway strips between the sidewalks and streets could use some type of ground cover or decorative rock if allowed in the right-of-way. (28 1/4 right-of-way is within the City limits and Patterson Rd ROW is not.)

The steep slope on the south side of the property is quite barren. Some type of ground cover, even flagstones, would improve the view from the adjacent homes and 28 1/4 Road.

What are the plans for the excess property at the corner of Patterson and 28 1/4 Road? Who will maintain it?

How will traffic coming in off of 28 1/4 Road be directed to the parking lot?

CENTRAL GRAND VALLEY SANITATION 09/30/91
Stephen T. LaBonde, District Engineer 464-5134

(See Attached Letter)

MISSING COMMENTS FROM:
City Attorney

WestWater Engineering

Consulting Engineers

502 WEST EIGHTH ST. P.O. BOX 1470 - PALISADE, COLORADO 81526 (303) 464-5134

September 27, 1991

John Knudsen
City of Grand Junction Fire Department
330 South 6th Street
Grand Junction, CO 81501

RE: Review Comments for Sewer Service to the Proposed New Fire Station for the Central Grand Valley Sanitation District

Dear Mr. Knudsen,

The following are our review comments on the sanitary sewer extension to the proposed fire station at the southeast corner of 28 1/4 Road and Patterson Road for the Central Grand Valley Saniation District:

1. The proposed sewerline extension from the existing manhole in Patterson Road (approximately 180 ft. to the east of proposed fire station) will require detailed design plans prepared by a Professional Engineer, and submittal to the District for review and approval.

2. Because of the adverse grade that exists west of the manhole along Patterson Road, cover over the sewerline and service line to the fire station may not be adequate at the end of the sewerline extension. This should be investigated further to determine if adequate cover can be maintained and still provide gravity service to the fire station.

3. Because of the adverse grade and required excavation of Patterson Road for the proposed sewerline extension, another option may be to extend a sewerline from manhole MACV4, located approximately 250 ft. east of the southeast corner of the fire station property. It would be necessary for the City to negotiate and obtain an easement for this sewerline routing that crosses private property; however this may be more attractive than excavating Patterson Road, as is presently proposed. We have enclosed a copy of the District's collection system near the fire station, highlighting this alternative routing.

4. All sanitary sewer mains shall be 8 inches and require a manhole at the end of the extension.

5. The City will be required to process and execute the District's Sewerline Extension Application and Agreement prior to any construction of the new sewer main. We have enclosed both the Application and Agreement for your use.

Please have the City submit detailed design plans of the slected sewerline extension routing to our office. A 30 day review and approval time is usually required for any new sewerline extension within the District.

Respectfully,

Stephen T. LaBonde
District Engineer

STL/sc

cc: Edith Kinder, Central Grand Valley Sanit. Dist.
Fred Bishop, Bishop Construction
Bill Cheney, City of Grand Junction
City of Grand Junction Planning Dept.

encl.

COMMUNITY DEVELOPMENT DEPARTMENT
M E M O R A N D U M

TO: Mark Achen, City Manager
Jody Kole, Assistant to the City Manager
Darold Sloan, Chief of Police
Mike Thompson, Fire Chief
Ted Novack, Parks & Recreation Director
Ron Lappi, Administrative Services Director
Jim Shanks, Public Works Director
Dan Wilson, City Attorney
John Shaver, Assistant City Attorney
Don Newton, City Engineer
Bill Cheney, City Utilities Engineer
Tim Woodmansee, Property Agent
Community Development Department Staff

FROM: Bennett Boeschenstein, Community Development Director BB

DATE: October 17, 1991

RE: Development Project Meeting

A Development Project meeting has been scheduled for Tuesday, October 22, 1991 at 10:00 a.m., in Conference Room A, City Hall.

The following is a list of current agenda items. If anyone has additional items which need to be addressed at the meeting, please let me know.

✓ 1.	#64-91	**Vacation of Right-of-Way** **West side of 6th Street between Ouray North to alley**
✓ 2.	#68-91	**Independence Center Minor Subdivision Final Plat** **Independent Avenue and Highway 6 & 50**
✓ 3.	#65-91	**Special Use - Fire Station #2** **28 1/4 Rd & Patterson Rd**
✓ 4.	#66-91	**Resubdivision - Part of Lot 3 Colo West Dev Park** **711 South 15th Street**
5.	#67-91	**Blue Heron Annex** **Redlands Parkway & River Rd & portions of D&RGW RR**
6.	#?	**Pace Warehouse** - annexation process **29 1/2 Road & North Avenue**

Mesa View
Nello Bechtel

TO: Community Development

FROM: Bill Cheney, Utility Engineer

DATE: October 22, 1991

RE: Fire Station No. 2 - Review Comments

Sheet C1.2

1. There is nothing shown on the plan that relates to a reference bearing from the "point of beginning" and there are no lot dimensions shown as requested by the City Engineer.

2. Not enough information has been provided to accurately lay out the driveways, parking lots or building. Coordinates should be provided for all building corners, PCs and PTs of curves.

3. The concrete curb detail 3-C1.2, although adequate, is not to City standards and will probably cost more to construct.

4. Sheet C1.3 shows curb and gutter on both sides of the driveway to 28 1/4 Road. Sheet C1.2 shows it ending on the north side of the driveway approximately 100 feet east of 28 1/4 Road. Unless the driveway slopes from north to south through this area the gutter should be extended all the way to 28 1/4 Road.

5. No gutter is shown on the east side of the driveway off Patterson Road. Is there a cross slope from east to west across the driveway? It is impossible to tell from the drawings since no elevations have been provided along the driveways.

6. Where is the driveway cut off 28 1/4 Road located in relation to the southwest property corner?

7. A number of dimensions are still missing around the edge of the curb for the parking lots.

Sheet C1.3

1. Additional elevations at back of curb will need to be provided to build the parking lots and driveways as designed. This was requested earlier by the City Engineer.

2. It appears a vertical curve will be needed in the driveway off 28 1/4 Road. No information has been provided to construct the curve.

3. A "Benchmark" has not been shown on the plans. A "Benchmark" is required to provide vertical control.

4. Critical elevations that pertain to drainage have not been shown on the plans.

5. Drainage off the southeast corner of the site appears to be routed through adjoining private property. What provisions are being made to prevent erosion, both on the City property and across the private property.

6. No drainage report has been submitted as requested by the City Engineer.

7. No on-site detention is shown. How will runoff that exceeds historic be handled?

8. Concrete curb and Gutter detail 2-C1.3 is not to City standards. The detail as shown will cost more to construct than the City standard.

Sheet A1.1

1. A sand and grease trap will be required if the trench drains as shown connect into the sanitary sewer.

Sheet M-1

1. The sewer line as proposed will be 10 feet deep at the building. A depth of 5 feet is more than adequate and will reduce the cost of construction.

2. Profiles will be required for the off-site sewer since it will be maintained by the City/County sewer system.

3. Calculated grade between existing manhole and manhole 482-1 is 4.88%, not 2% as shown.

4. Connection as proposed to existing manhole is not allowed due to the angle point in the line. A new manhole will have to be constructed or connection to the existing manhole will be required.

5. No lineal dimensions are shown for the new sewer line construction.

6. Service connections are not allowed to be connected to the manhole. The connection will have to be made east of the proposed manhole.

7. No easement has been provided or is shown across the private property for the sewer line installation.

8. The pumps as proposed, CP 4 and CP 5, are shown to be located in the Ute Water vault. This is not acceptable to the City unless arrangements can be worked out with Ute to assure access to the vault at all times.

9. The minimum depth of bury on the fire line should be 54" instead of 48" as shown.

10. Indicate whether Contractor or Ute Water makes connection to Ute line for fire line.

November 12, 1991

City of Grand Junction, Colorado
81501-2668
250 North Fifth Street

Ed Chamberlin
Chamberlin Architects
437 Main Street
Grand Junction, CO 81501

Dear Mr. Chamberlin:

I have reviewed the site plans for Fire Station No. 2 which were received on November 7, 1991 and have the following comments:

Sheet C1.3:

1. The proposed diversion of drainage water from the curb and gutter to the retention ponds will probably not work.

   It appears that the water would remain in the curb and gutter, bypassing the retention ponds. Show details of how water is to be diverted to retention ponds.

2. Where 4" pipe outlet from the detention ponds and connect to the curb and gutter is a detail is needed. If pipes are extended to face of curb, then the curb height should be increased to provide 4" thick concrete over top of pipe.

3. Please show elevations at both ends of pipes or pans carrying water in and out of retention ponds.

4. Need additional vertical control for site curbing. Elevation should be shown at each horizontal P.C. and P.T. along the curbing.

5. Although calculated drainage from the southeast corner of the developed site is only slightly greater than historic conditions, I am concerned that the proposed grading will increase erosion of the slope. I would recommend that roof gutters be installed to direct as much runoff as possible away from the southeast corner which discharges onto private property.

Sincerely,

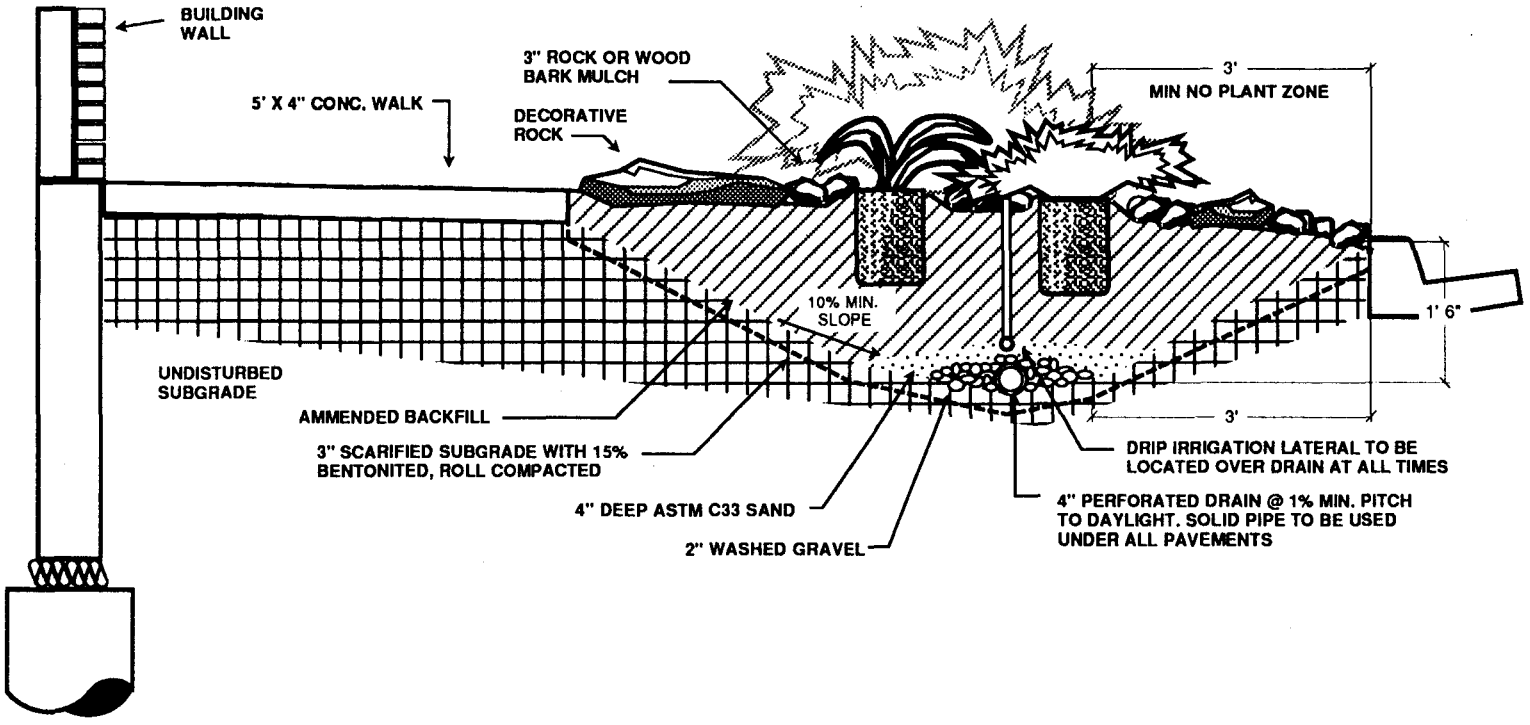
Don Newton

J. Don Newton

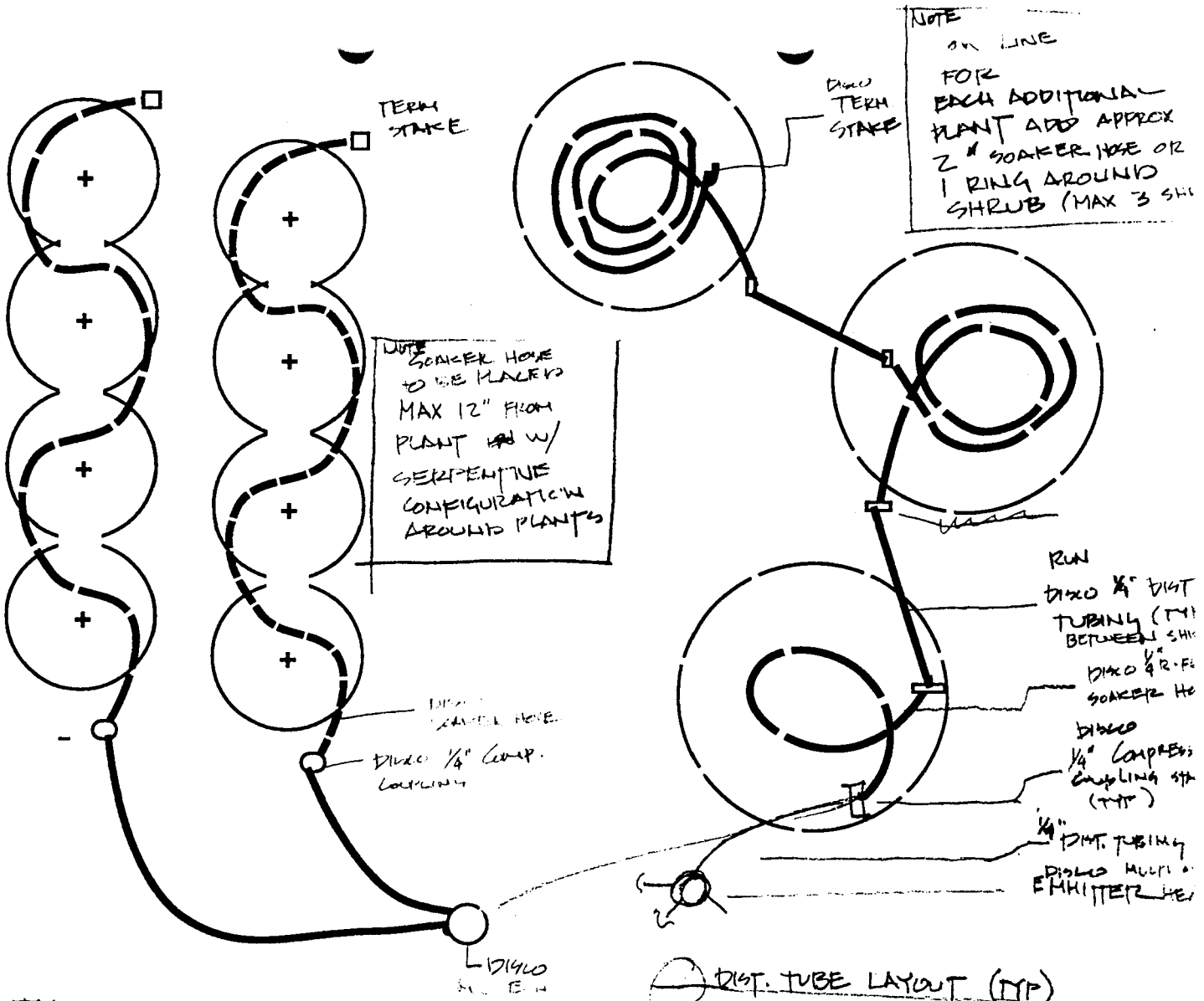
xc: John Knudsen
Kathy Portner

file\DN\chamberl

NOTE: DRIP IRRIGATION ONLY. ASSUME 1 TO 3 EMMITTOR TUBES/PLANT, APPROX. 3-9 GALS/WEEK/PLANT



A/2 DRIP/DRAIN PLANTER BED



TYPICAL ALIGNMENT OF SOAKER HOSE

SOAKER HOSE ALIGNMENT (TYP)
NOT TO SCALE

DIST. TUBE LAYOUT (TYP)
NOT TO SCALE

SOAKER HOSE FLOW RATE
PREVIOUSLY PRODUCT INFO SUGGESTED 8" MAX FOR 2GPH HEAD FLOW REL. 4

PLANT LIST

QTY	KEY	COMMON NAME	SCIENTIFIC NAME	SIZE
Deciduous Trees				
3	AMP	Amur Maple	Acer ginnala	1-1/2"
9	GRA	Green Ash	Fraxinus pennsylvanica lanceolota	1-1/2"
4	RUO	Russian Olive	Eleaagnus angustifolia	1-1/2"
Deciduous Shrubs				
28	APP	Apache Plume	Fallugia paradoxa	5 gal
8	BBY	Buffalo Berry (Silver)	Shepherdia argentea	5 gal
36	BMS	Blue Mist Spiraea	Caryopteris incana	5 gal
3	CFR	Cliffrose	Cowania mexicana	1 gal
16	DYC	Datil Yucca	Yucca baccata	5 gal
6	FNM	Foresteria	Foresteria neo-mexicana	5 gal
9	FWS	Four Wing Saltbrush	Atriplex canescens	5 gal
11	GBS	Great Basin Sage	Artemesia	5 gal
14	GFP	Goldfinger Potentilla	Potentilla fruticosa "Goldfinger"	5 gal
13	LED	Leadplant	Amorpha Canescens	1 gal
13	MMH	Mountain Mahogany	Cercocarpus montanus	5 gal
11	MNZ	Manzanita	Arctostaphylos X nevadanensis	1 gal
5	MOR	Mockorange	Philadelphus microphyllus	1 gal
14	NSS	Native Smooth Sumac	Rhus glabra "cismontana"	5 gal
14	RBB	Rabbitbrush	Chrysothamnus nauseosus	5 gal
29	RLR	Red-leaf Rose	Rosa rubrifolia	5 gal
13	SQB	Squawbush	Rhus trilobata	5 gal
10	WNF	Winter-fat	Eurotia lanata	1 gal
Evergreen Shrubs				
5	MMT	Mormon Tea	Ephedra virdis	1 gal
Perennials/Groundcovers				
54	BES	Black-eyed Susan	Rudbekia fulgida "Goldstrum"	1 gal
104	BFC	Blue Fescue	Festuca ovinia glauca	1 gal
45	BRG	Burgundy Gaillardia	Gaillardia "Burgundy"	1 gal
18	COR	Coreopsis	Coreopsis grandiflora	1 gal
25	DBF	Dwarf Blanket Flower	Gaillardia "Goblin"	1 gal
40	DEP	Desert Evening Primrose	Oenothera Caespitosa	1 gal
104	DFG	Dwarf Fountain Grass	Pennisetum alopecuroides "Hamein"	1 gal
129	DFO	Desert Four O'clock	Mirabilis multiflora	1 gal
	JUB	Junpiter's Beard	Centranthus reber	
5	MGR	Maiden Grass	Miscanthus sinensis "Gracillimus"	1 gal
~~14~~	~~NEA~~	~~New England Aster~~	~~Aster novae-angliae~~	~~1 gal~~
36	RUS	Russian Sage	Perovskia atriplicifolia	1 gal
59	SIS	Snow in summer	Cerastium tomentosum	1 gal
34	SMD	Silvermound	Artemesia schmidtiana	1 gal

Lambert and Associates

CONSULTING GEOTECHNICAL ENGINEERS AND MATERIAL TESTING

June 3, 1991

City of Grand Junction
250 North 5th Street
Grand Junction, Colorado 8501

PN: M9105 6GE

Subject: Geotechnical Engineering Study for the
Proposed Fire Station near
28 1/4 Road and Patterson Road
Grand Junction, Colorado

Gentlemen:

Lambert and Associates is pleased to present our geotechnical engineering study for the subject project. The field study was completed on May 14, 1991. The laboratory study was completed on May 30, 1991. The geotechnical engineering suggestions and recommendations were discussed with Ms. Cheryl Bishop on May 31, 1991. The analysis was performed and the report prepared from May 30, 1991 through June 3, 1991. Our geotechnical engineering report is attached.

Section 2.0 provides a technical guide for design team members for rapid information retrieval from our report. We are available to review the geotechnical engineering aspects of your plans and specifications for the project including the earthwork specifications as discussed in this report.

If you have any questions concerning the geotechnical aspects of your project please contact us. Thank you for the opportunity to perform this study for you.

Respectfully submitted,

LAMBERT AND ASSOCIATES

Norman W. Johnston, P.E.

NWJ/nr

#65 91

Original
Do NOT Remove
From Office

P.O. BOX 3986
GRAND JUNCTION, CO 81502
(303) 245-6506

P.O. BOX 0045
MONTROSE, CO 81402
(303) 249-2154

463 TURNER, 104 A
DURANGO, CO 81301
(303) 259-5095

Lambert and Associates

CONSULTING GEOTECHNICAL ENGINEERS AND MATERIAL TESTING

GEOTECHNICAL ENGINEERING STUDY

PROPOSED FIRE STATION NEAR 28 1/4 ROAD AND PATTERSON ROAD

GRAND JUNCTION, COLORADO

Prepared for:

CITY OF GRAND JUNCTION

PROJECT NUMBER: M91Ø56GE

June 3, 1991

P.O. BOX 3986
GRAND JUNCTION, CO 81502
(303) 245-6506

P.O. BOX 0045
MONTROSE, CO 81402
(303) 249-2154

463 TURNER, 104 A
DURANGO, CO 81301
(303) 259-5095

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1.Ø INTRODUCTION

This report presents the results of the geotechnical engineering study we conducted for the proposed Fire Station near 28 1/4 Road and Patterson Road, Grand Junction, Colorado. The study was conducted at the request of Mr. Jim Shanks, City of Grand Junction, Colorado.

The conclusions, suggestions and recommendations presented in this report are based on the data gathered during our site and laboratory study and on our experience with similar soil conditions. Factual data gathered during the field and laboratory work are summarized in Appendices A and B.

1.1 Proposed Construction

It is our understanding that the proposed structure will be a multi-level superstructure supported on reinforced concrete foundations. The lower level floor will be a concrete slab-on-grade and will be used to support fire trucks. The proposed construction will include a paved driveway.

1.2 Scope of Services

Our services included geotechnical engineering field and laboratory studies, and analysis and report preparation for the proposed site. The scope of our services is outlined below.

- The field study consisted of describing and sampling the soils encountered in six (6) auger advanced test borings at the proposed building location.

- The soils encountered in the test borings were described and samples retrieved for the subsequent laboratory study.

- The laboratory study included tests of select soil samples obtained during the field study to help assess the strength and swell/consolidation potential of the soils tested. A soil sample was tested for sulfate chemicals which may be potentially corrosive to concrete.

- This report presents our geotechnical engineering suggestions and recommendations for planning and design of site development including:

  . Viable foundation types for the conditions encountered,
  . Allowable bearing pressures for the foundation types,
  . Geotechnical considerations and recommendations for concrete slab-on-grade floors,
  . Flexible pavement thickness recommendations, and
  . Rigid pavement thickness recommendations.

- Our recommendations and suggestions are based on the subsoil and ground water conditions encountered during our site and laboratory studies.

2.Ø TECHNICAL GUIDE FOR DESIGN TEAM

This report contains geotechnical engineering suggestions and recommendations with background and support information. Design specific values may be difficult to locate quickly within the sections that present each design criteria. Therefore, some of the design values are discussed briefly in this section. The values presented here are a brief synopsis of the design values presented in the appropriate sections of this report and therefore do not present all of the pertinent information for that section.

The design soil bearing capacity for spread footings will depend on the minimum depth of embedment of the bottom of the

footing below the lowest adjacent grade and is 6ØØØ pounds per square foot, with a minimum dead load of 2ØØØ pounds per square foot a minimum depth of embedment of one (1) foot into the undisturbed formational material. The soil bearing capacity may be increased by about 2Ø percent for transient loads such as wind and seismic loads. Foundation design considerations are presented in section 5.Ø.

Drilled pier foundations may be used. They should be drilled a minimum of ten (1Ø) feet into the hard unweathered formational material and designed for end bearing only using an end bearing capacity of 2Ø,ØØØ pounds per square foot and a minimum dead load of 5ØØØ pounds per square foot. Drilled pier foundations are discussed in section 6.3.

Concrete slab-on-grade floors should be separated from all bearing members and placed on a blanket of compacted structural fill which is at least two (2) feet thick. We suggest the floor slab be reinforced with a 6 x 6 - W2.9 x W2.9 (6 x 6 - 6 x 6) welded wire mesh as a minimum reinforcement. Concrete floor slabs should be jointed with jointed areas about 2ØØ square feet and approximately square. Concrete floor slabs are discussed in section 7.Ø.

We recommend that we be contacted to observe foundation excavations during construction.

3.Ø SITE CHARACTERISTICS

Site characteristics include observed existing and pre-existing site conditions that may influence the geotechnical engineering aspects of the proposed site development.

3.1 Site Location

The proposed building site is located in the southeast quadrant of the intersection of Patterson Road and 28 1/4 Road, Grand Junction, Colorado. a project vicinity map is shown on Figure 1.

3.2 Site Conditions

The proposed building site slopes down to the north with about one (1) foot of topographic relief across the building site. A steep slope is located south of the building site with inclinations near vertical. The slope appears to be a man-made cut slope. A large city water reservoir tank is located west of the proposed building site. The site was vacant of vegetation at the time of our field study.

3.3 Subsurface Conditions

The subsurface exploration consisted of observing, describing and sampling the soils encountered in six (6) test borings. The approximate locations of the test borings are shown on Figure 2. The logs describing the soils encountered in the test borings are presented in appendix A.

The soils encountered in the test borings consisted generally of one (1) to three (3) feet of silty clay which appeared to be weathered shale.

Formational material was encountered in the test borings at a depth of one (1) to three (3) feet. The formational material is a silty clay shale of the Mancos formation. The Mancos formational shales typically have a moderate to high swell potential when only slightly weathered.

No free subsurface water was encountered in the test borings at the time of our field study. Due to the shallow nature of the formational material we do not anticipate that ground water will be encountered in the test borings.

4.Ø ON-SITE DEVELOPMENT CONSIDERATIONS

Excavations should be well braced or sloped to prevent wall collapse. Federal, state and local safety codes should be observed.

The formational material encountered in the test borings was very hard. We anticipate that it may be possible to excavate this material, however additional effort may be necessary. We do not recommend blasting to aid in excavation of the material. Blasting may fracture the formational material which will reduce the integrity of the support characteristics of the formational material.

It has been our experience that sites in developed areas may contain existing subterranean structures or poor quality man-placed fill. If subterranean structures or poor quality man-placed fill are suspected or encountered, they should be removed and replaced with compacted structural fill as discussed under COMPACTED STRUCTURAL FILL below.

5.Ø FOUNDATION DISCUSSION

Two criteria for any foundation which must be satisfied for satisfactory foundation performance are:

1) contact stresses must be low enough to preclude shear failure of the foundation soils which would result in lateral movement of the soils from beneath the foundation, and

2) settlement or heave of the foundation must be within amounts tolerable to the superstructure.

The soils encountered in the test borings have varying engineering characteristics that may influence the design and construction considerations of the foundations. The characteristics include swell potential, settlement potential, bearing capacity and the bearing conditions of the soils supporting the foundations. These are discussed below.

5.1 Swell Potential

Some of the materials encountered in the test borings at the anticipated foundation depth may have swell potential. Swell potential is the tendency of the soil to increase in volume when it becomes wetted. The volume change occurs as moisture is

absorbed into the soil and water molecules become attached to or adsorbed by the individual clay platlets. Associated with the process of volume change is swell pressure. The swell pressure is the force the soil applies on its surroundings when moisture is absorbed into the soil. Foundation design considerations concerning swelling soils include structure tolerance to movement and dead load pressures to help restrict uplift. The structure's tolerance to movement should be addressed by the structural engineer and is dependent upon many facets of the design including the overall structural concept and the building material. The uplift forces or pressure due to wetted clay soils can be addressed by designing the foundations with a minimum dead load. Suggestions and recommendations for design dead load are presented below.

5.2 Settlement Potential

Settlement potential of a soil is the tendency for a soil to experience volume change when subjected to a load. Settlement is characterized by downward movement of all or a portion of the supported structure as the soil particles move closer together resulting in decreased soil volume. Settlement potential is a function of foundation loads, depth of footing embedment, the width of the footing and the settlement potential or compressibility of the influenced soil. Foundation design considerations concerning settlement potential include the amount of movement tolerable to the structure and the design and

construction concepts to help reduce the potential movement. The anticipated post construction settlement potential is based on site specific soil conditions and is presented below.

5.3 Soil Support Characteristics

The soil bearing capacity is a function of the engineering properties of the soils supporting the foundations, the foundation width, the depth of embedment of the bottom of the foundation below the lowest adjacent grade, the influence of the ground water and the amount of settlement tolerable to the structure. Soil bearing capacity and associated minimum depth of embedment are presented below.

The foundation for the structure should be placed on relatively uniform bearing conditions. Varying support characteristics of the soils supporting the foundation may result in nonuniform or differential performance of the foundation. Formational material was encountered in the test borings at shallow and varying depths. We anticipate that the surface of the formational material may undulate throughout the building site. If this is the case it may result in a portion of the foundation for the structure being placed on the formational material and a portion of the foundation being placed on the overlying soils. Varying support material will result in nonuniform bearing conditions. The influence of nonuniform bearing conditions may be reduced by placing the footings entirely on the formational material.

6.Ø FOUNDATION RECOMMENDATIONS

We have analyzed spread footings and drilled piers as potential foundation systems for the proposed structure. These are discussed below. We have provided design parameters for several foundation types. Of these, because of the expansion potential of the site soils, we feel that the drilled piers will provide the foundation with the least likelihood of significant post construction movement. All of the design parameters are based on extraordinary craftsmanship, care during construction and post construction cognizance of the potential swelling soil hazard, with appropriate home owner maintenance.

6.1 Spread Footings

The structure may be founded on spread footings which are placed entirely on the natural undisturbed formational material. The soil bearing capacity will depend on the minimum depth of embedment of the bottom of the footing below the lowest adjacent grade. The embedment concept is shown on Figure 3. The footings may be designed using a soil bearing capacity of 6ØØØ pounds per square foot with a minimum dead load of 2ØØØ pounds per square foot and a minimum depth of embedment of at least one (1) foot when placed entirely on the natural undisturbed formational material.

If the foundations are designed and constructed as discussed above we anticipate that the post construction total settlement may be in the range of one half (1/2) inch.

We recommend that we be contacted to observe the foundation excavations during construction to verify the soil support conditions and our recommendations. We will then revise our recommendations based on our observations if necessary.

6.2 General Spread Footing Considerations

In our analysis it was necessary to assume that the material encountered in the test borings extended throughout the building site and to a depth below the maximum depth of the influence of the footings. We should be contacted to observe the soils exposed in the foundation excavations prior to placement of foundations to verify the assumptions made during our analysis.

We anticipate that the surface of the formational material may undulate which may result in a portion of the footings supported on the overlying soils. If this happens the foundations will perform differently between the areas supported on formational material and the areas supported on the non-formational material. For this reason we suggest that if formational material is encountered only in portions of the foundation excavations at footing depth the foundation in all areas should be extended to support all footings on the formational material.

The bottom of any footings exposed to freezing temperatures should be placed below the maximum depth of frost penetration for the area. Refer to the local building code for details.

The bottom of the foundation excavations should be observed to assure that the footings are supported on undisturbed formational material. The bottom of the footing excavations should be thoroughly cleaned to remove all disturbed formational material.

All footings should be proportioned as much as practicable to reduce the post construction differential settlement. Footings for large localized loads should be designed for bearing pressures and footing dimensions in the range of adjacent footings to reduce the potential for differential settlement. We are available to discuss this with you.

Foundation walls may be reinforced, for geotechnical purposes. We suggest at least two (2) number 5 bars, continuous at the top and the bottom (4 bars total), at maximum vertical spacing. This will help provide the walls with additional beam strength and help reduce the effects of slight differential settlement. The walls may need additional reinforcing steel for structural purposes. The structural engineer should be consulted for foundation design. The structural engineering reinforcing design tailored for this project will be more appropriate than the suggestions presented above.

6.3 Drilled Piers

Drilled piers or caissons that are drilled into the unweathered formational material may be used to support the proposed structure. The piers should be drilled into the

formational material a distance equal to at least two (2) pier diameters, or ten 1Ø) feet, whichever is deeper. The piers should be designed as end bearing piers using a formational material bearing capacity of 2Ø,ØØØ pounds per square foot and a side friction of 2,ØØØ pounds per square foot for the portion of the pier in the unweathered formational material. We suggest that piers be designed using end bearing capacity only. The side shear may be used for the design to resist uplift forces. When using skin friction for resisting uplift we suggest that you discount the upper portion of the pier embedment in the formational material to a depth of at least one and one half (1 1/2) pier diameters into the formational material. The bottom of the pier holes should be cleaned to insure that all loose and disturbed materials are removed prior to placing pier concrete. Because of the rebounding potential in the formational materials when unloaded by excavation and the possibility of desiccation of the newly exposed material we suggest that concrete be placed in the pier holes immediately after excavation and cleaning. If the piers are designed and constructed as discussed above we anticipate that the post construction settlement potential of each pier may be less than about one quarter (1/4) inch.

The portion of the pier above the formational surface and in the weathered formational material should be cased with a sono tube or similar casing to help prevent flaring on the top of the pier holes and help provide a positive separation of the pier

concrete and the adjacent soils. Construction of the piers should include extreme care to prevent flaring of the top of the piers. This is to help reduce the potential of swelling soils to impose uplift forces which will put the pier in tension. The drilled piers should be vertically reinforced to provide tensile strength in the piers should swelling on-site soils apply tensile forces on the piers. The structural engineer should be consulted to provide structural design recommendations.

The grade beams between piers should be provided with void spaces between the soil and the grade beam. The grade beam should not come in contact with the soils. This is to help reduce the potential for heave of the foundations should the soils swell.

We anticipate that ground water will not be encountered in the pier holes. However, if ground water is encountered, the pier holes should be dewatered prior to placing pier concrete and no pier concrete should be placed when more than six (6) inches of water exists in the bottom of the pier holes. The piers should be filled with a tremie placed concrete immediately after the drilling and cleaning operation is complete. It may be necessary to case the pier holes with temporary casing to prevent caving during pier construction.

Very difficult drilling conditions were encountered in the formational material during our field study. We anticipate that the formational material may be very difficult to drill with pier drilling equipment readily available in western Colorado. It may

be necessary to obtain specialty pier drilling equipment to drill piers into the formational material encountered in our test borings.

The structural engineer should be consulted to provide structural design recommendations for the drilled piers and grade beam foundation system.

7.Ø INTERIOR FLOOR SLAB DISCUSSION

It is our understanding that, as currently planned, the floor may be a concrete slab-on-grade floor. The natural soils that will support interior floor slabs are stable at their natural moisture content. However, the owner should realize that when wetted, the site soils may experience volume changes.

Engineering design dealing with swelling soils is an art which is still in its infancy. The owner is cautioned that the soils on this site may have swelling potential and concrete slab-on-grade floors and other lightly loaded members may experience movement when the supporting soils become wetted. We suggest you consider floors suspended from the foundation systems as structural floors or a similar design that will not be influenced by subgrade volume changes. If the owner is willing to accept the risk of possible damage from swelling soils supporting concrete slab-on-grade floors, the following recommendations to help reduce the damage from swelling soils should be followed. These recommendations are based on generally accepted design and

construction procedures for construction on soils that tend to experience volume changes when wetted and are intended to help reduce the damage caused by swelling soils. Lambert and Associates does not intend that the owner, or the owner's consultants should interpret these recommendations as a solution to the problems of swelling soils, but as measures to reduce the influence of swelling soils.

Concrete flatwork, such as concrete slab-on-grade floors, should be underlain by compacted structural fill. The layer of compacted fill should be at least two (2) feet thick and constructed as discussed under COMPACTED STRUCTURAL FILL below.

The natural soils exposed in the areas supporting concrete slab-on-grade floors should be kept very moist during construction prior to placement of concrete slab-on-grade floors. This is to help increase the moisture regime of the potentially expansive soils supporting floor slabs and help reduce the expansion potential of the soils. We are available to discuss this concept with you.

Concrete slab-on-grade floors should be provided with a positive separation, such as a slip joint, from all bearing members and utility lines to allow their independent movements and to help reduce possible damage that could be caused by movement of soils supporting interior slabs. The floor slab should be constructed as a floating slab. All water and sewer pipe lines should be isolated from the slab. Any appliances,

such as a water heater or furnace, placed on the floating floor slab should be constructed with flexible joints to accommodate future movement of the floor slab with respect to the structure. We suggest partitions constructed on the concrete slab-on-grade floors be provided with a void space above or below the partitions to relieve stresses induced by elevation changes in the floor slab.

The concrete slabs should be scored or jointed to help define the locations of any cracking. The areas defined by scoring and jointing should be about square and enclose about 2ØØ square feet. Also, joints should be scored in the floors a distance of about three (3) feet from, and parallel to, the walls.

If moisture rise through the concrete slab-on-grade floors will adversely influence the performance of the floor or floor coverings a moisture barrier may be installed beneath the floor slab to help discourage capillary and vapor moisture rise through the floor slab. The moisture barrier may consist of a heavy plastic membrane, six (6) mil or greater, protected on the top and bottom by at least two (2) inches of clean sand. The plastic membrane should be lapped and taped or glued and protected from punctures during construction.

The Portland Cement Association suggests that welded wire reinforcing mesh is not necessary in concrete slab-on-grade floors when properly jointed. It is our opinion that welded wire

mesh may help improve the integrity of the slab-on-grade floors. We suggest that concrete slab-on-grade floors should be reinforced, for geotechnical purposes, with at least 6 x 6 - W2.9 x W2.9 (6 x 6 - 6 x 6) welded wire mesh positioned midway in the slab. The structural engineer should be contacted for structural design of floor slabs.

8.Ø COMPACTED STRUCTURAL FILL

Compacted structural fill is typically a material which is constructed for direct support of structures or structural components.

There are several material characteristics which should be examined before choosing a material for potential use as compacted structural fill. These characteristics include; the size of the larger particles, the engineering characteristics of the fine grained portion of material matrix, the moisture content that the material will need to be for compaction with respect to the existing initial moisture content, the organic content of the material, and the items that influence the cost to use the material.

Compacted fill should be a non-expansive material with the maximum aggregate size less than about two (2) to three (3) inches and less than about twenty five (25) percent coarser than three quarter (3/4) inch size.

The reason for the maximum size is that larger sizes may have too great an influence on the compaction characteristics of the material and may also impose point loads on the footings or floor slabs that are in contact with the material. Frequently pit-run material or crushed aggregate material is used for structural fill material. Pit-run material may be satisfactory, however crushed aggregate material with angular grains is preferable. Angular particles tend to interlock with each other better than rounded particles.

The fine grained portion of the fill material will have a significant influence on the performance of the fill. Material which has a fine grained matrix composed of silt and/or clay which exhibits expansive characteristics should be avoided for use as structural fill. The moisture content of the material should be monitored during construction and maintained near optimum moisture content for compaction of the material.

Soil with an appreciable organic content may not perform adequately for use as structural fill material due to the compressibility of the material and ultimately due to the decay of the organic portion of the material.

The natural on-site soils are not suitable for use as compacted structural fill material supporting building or structure members because of their clay content and swell potential. The natural on-site soils may be used as compacted fill in areas that will not influence the structure such as to

establish general site grade. We are available to discuss this with you.

All areas to receive compacted structural fill should be properly prepared prior to fill placement. The preparation should include removal of all organic or deleterious material and the areas to receive fill should be proof rolled after the organic deleterious material has been removed. Any areas of soft, yielding, or low density soil, evidenced during the proof rolling operation should be removed. Fill should be moisture conditioned, placed in thin lifts not exceeding six (6) inches in compacted thickness and compacted to at least 9Ø percent of maximum dry density as defined by ASTM D1557, modified Proctor.

We recommend that the geotechnical engineer or his representative be present during the proof rolling and fill placement operations to observe and test the material.

9.Ø LATERAL EARTH PRESSURES

It is our understanding that as currently planned the proposed construction will not include basement or other retaining walls. If in the future, the plans are changed we should be contacted to provide geotechnical engineering considerations and recommendations for lateral earth pressures.

1Ø.Ø FLEXIBLE PAVEMENT SECTION THICKNESS DESIGN RECOMMENDATIONS

It is our understanding that an asphalt paved driveway will be construction for the site.

Pavement sections tabulated below are based on estimated traffic volumes and the subgrade resistance value (R-Value) obtained from test results of samples retrieved from the site. The R-Value was calculated from a California Bearing Ratio (CBR) of 2 1/2 using "Thickness Design-Asphalt Pavements for Highways and Streets", by the Asphalt Institute, Manual Series Number 1, (MS-1) dated September, 1981. The R-Value used in our analysis was 5. The suggested pavement thicknesses based on a calculated theoretical design life of 2Ø years are presented below.

ASPHALTIC CONCRETE (INCHES)	CRUSHED ROAD BASE AGGREGATE MINIMUM R=78 (INCHES)	AGGREGATE SUBBASE COURSE MINIMUM R=5Ø (INCHES)	RECONDITIONED SUBGRADE (INCHES)
3	6	12	12
3	15	Ø	12
4	6	7 1/2	12
4	12	Ø	12
7 1/2	Ø	Ø	12

We suggest that the construction of the pavement section be done after the completion of other construction activities on the site. The reason for this is that the above sections are not designed to accommodate high frequency heavy vehicle loads which are often associated with construction operations.

Prior to the construction of the pavement section the areas for payment should be stripped of vegetation, if any, any existing poor quality fill, debris or any deleterious materials.

The natural subgrade soils exposed by stripping operations, should be scarified to a depth of at least six (6) inches and replaced with compacted fill to subgrade elevation or scarified to one (1) foot below subgrade elevation and recompacted, whichever will provide at least one (1) foot of reconditioned subgrade soil. The subgrade soil should be moisture conditioned prior to compaction and should be compacted to at least ninety (9Ø) percent of maximum dry density as defined by ASTM D1557, modified Proctor density.

The aggregate base course material and aggregate subbase course material should conform to Colorado State Highway Specifications for Class 6 and Class 2 materials, respectively. We recommend material testing of these products prior to their use to determine conformance with the specifications. The base course and subbase course materials should be moisture conditioned prior to compaction. Individual lift thickness during compaction should not exceed six (6) inches. The base course and subbase course materials should be compacted to at least ninety (9Ø) percent of maximum dry density as defined by ASTM D1557, modified moisture-density relationship test.

Asphalt pavement materials should be mixed form an approved mix design stating the Marshall properties, optimum asphalt content, job mix formula, recommended mixing and placing temperatures, and the date of the mix design. We recommend verification of the mix design prior to paving. The asphalt

materials should be placed in lifts not exceeding three (3) inches and compacted to a maximum of ninety-five (95) percent of the Marshall density. Rolling patterns for compaction should be established during pavement construction to help determine proper compaction technique.

11.Ø RIGID PAVEMENT THICKNESS DESIGN RECOMMENDATIONS

Our pavement thickness recommendations for rigid Portland cement concrete pavement are based on an assumed traffic volume, a twenty (2Ø) year design life and a modulus of subgrade reaction obtained from the California Bearing Ratio test performed on the subgrade soil sample obtained during our field study. A modulus of subgrade reaction of 9Ø psi/inch was used in our analysis. The rigid pavement may be designed using a concrete thickness of at least five and one half (5 1/2) inches. The concrete should be supported on prepared subgrade which is at least one (1) foot thick. The prepared subgrade should consist of either compacted structural fill to establish subgrade elevation or of natural soils which are scarified to a depth of one (1) foot moisture conditioned to near optimum moisture content and recompacted to at least 9Ø percent of the maximum dry density as defined by ASTM D1557, modified moisture density relationship test. If during subgrade preparation an loose or yielding areas or any areas of poorly constructed man-placed fill are encountered they should be removed and replaced with compacted structural fill. Suggestions

for constructing compacted structural fill are presented above.

The Portland cement concrete should be mixed from an approved concrete mix design stating the proportions and mixtures of the mix. We recommend verification of the mix design prior to paving. The coarse and fine aggregate used in the concrete mix should be tested for their suitability for use as concrete aggregate.

The concrete pavement should be appropriately jointed and structurally reinforced to help control the location of cracking. The structural engineer should be contacted to provide structural design recommendations or structural reinforcement and joint design of the concrete pavement.

12.Ø BACKFILL

Backfill areas and utility trench backfill should be constructed such that the backfill will not settle after completion of construction, and that the backfill is relatively impervious for the upper few feet. The backfill material should be free of trash and other deleterious material. It should be moisture conditioned and compacted to at least 9Ø percent relative compaction using a modified Proctor density (ASTM D1557). Only enough water should be added to the backfill material to allow proper compaction. Do not pond, puddle, float or jet backfill soils.

Backfill placement techniques should not jeopardize the integrity of existing structural members. We recommend recently constructed concrete structural members be appropriately cured prior to adjacent backfilling.

13.Ø SURFACE DRAINAGE

The foundation soils should be prevented from becoming wetted after construction. This can be aided by providing positive and rapid drainage of surface water away from the building.

The final grade of the ground surface adjacent to the building should have a definite slope away from the foundation walls on all sides. We suggest a minimum fall of about one (1) foot in the first ten (1Ø) feet away from the foundation. Downspouts and faucets should discharge onto splash blocks that extend beyond the limits of the backfill areas. Splash blocks should be sloped away from the foundation walls. Snow storage areas should not be located next to the structure. Proper surface drainage should be maintained from the onset of construction through the proposed project life.

14.Ø LANDSCAPE IRRIGATION

An irrigation system should not be installed next to foundation walls, concrete flatwork or asphalt paved areas. If an irrigation system is installed, the system should be placed so that the irrigation water does not fall or flow near foundation

walls, flatwork or pavements. The amount of irrigation water should be controlled.

We recommend that wherever possible xeriscaping concepts be used. Generally the xeriscape includes planning and design concepts which will reduce irrigation water. The reason we suggest xeriscape concepts for landscaping is because the reduced landscape water will decrease the potential for water to influence the long term performance of the structure foundations and flatwork. Many publications are available which discuss xeriscape. Colorado State University Cooperative Extension has several useful publications and most landscape architects are familiar with the subject.

15.Ø SOIL CORROSIVITY TO CONCRETE

Chemical tests were performed on a sample of soil obtained during the field study. The soil sample was tested for pH, water soluble sulfates, and total dissolved salts. The results are presented in Appendix B. The test results indicate a water soluble sulfate content of Ø.63 to Ø.96 percent. Based on the American Concrete Institute (ACI) information a water soluble sulfate content of Ø.63 to Ø.96 percent indicates severe exposure to sulfate attack on concrete. We suggest sulfate resistant cement be used in concrete which will be in contact with the on-site soils. American Concrete Institute recommendations for sulfate resistant cement based on the water soluble sulfate

content should be used. The American Concrete Institute recommends a maximum water/cement ratio of Ø.45 for concrete where severe exposure to sulfate attack will occur.

16.Ø CONCRETE QUALITY

It is our understanding current plans include reinforced structural concrete for building foundations and walls, and may include concrete slabs-on-grade and pavement. To insure concrete members perform as intended the structural engineer should be consulted and should address factors such as design loadings, anticipated movement and deformations.

The quality of concrete is influenced by proportioning of the concrete mix, placement, consolidation and curing. Desirable qualities of concrete include compressive strengths, water tightness and resistance to weathering. Engineering observations and testing of concrete during construction is essential as an aid to safeguard the quality of the completed concrete. Testing of the concrete is normally performed to determine compressive strength, entrained air content, slump and temperature. We recommend that your budget include provisions for testing of concrete during construction and that the testing consultant be retained by the owner or the owner's engineer or architect, not the contractor, to maintain third party credibility.

17.Ø POST DESIGN CONSIDERATIONS

This subsoil and foundation study is based on limited sampling, therefore it is necessary to assume that the subsurface conditions do not vary greatly from those encountered in the test borings. Our experience has shown that significant variations are likely to exist and can become apparent only during additional on-site excavation. For this reason, and because of our familiarity with the project, Lambert and Associates should be retained to observe foundation excavations prior to foundation construction, to observe the geotechnical aspects of the construction, and to be available in the event any unusual or unexpected conditions are encountered. The cost of the geotechnical engineering observations and material testing during construction or additional engineering consultation is not included in the fee for this report. We recommend that your construction budget include site visits early during construction for the project geotechnical engineer to observe foundation excavations and for additional site visits to test compacted soil. We recommend that the observation and material testing services during construction be retained by the owner or the owner's engineer or architect, not the contractor, to maintain third party credibility. We are experienced and available to provide material testing services. We have included a copy of a report prepared by Van Gilder Insurance which discusses testing services during construction. It is our opinion that the owner,

architect and engineer be familiar with the information. If you have any questions regarding this concept please contact us.

It is difficult to predict if unexpected subsurface conditions will be encountered during construction. Since such conditions may be found we suggest that the owner and the contractor make provisions in their budget and construction schedule to accommodate unexpected subsurface conditions.

This report does not provide earthwork specifications. We can provide guidelines for your use in preparing project specific earthwork specifications. Please contact us if you need these for your project.

18.Ø LIMITATIONS

It is the owner's and the owner's representatives responsibility to read this report and become familiar with the recommendations and suggestions presented. We should be contacted if any questions arise concerning the geotechnical engineering aspects of this project as a result of the information presented in this report.

The recommendations outlined above are based on our understanding of the currently proposed construction. We are available to discuss the details of our recommendations with you, and revise them where necessary. This geotechnical engineering report is based on the proposed site development and scope of services as provided to us by Mr. Jim Shanks, on the type of

construction planned, existing site conditions at the time of the field study, and on our findings. Should the planned, proposed use of the site be altered, Lambert and Associates must be contacted, since any such changes may make our suggestions and recommendations given inappropriate. This report should be used ONLY for the planned development for which this report was tailored and prepared, and ONLY to meet information needs of the owner and the owner's representatives. In the event that any changes in the future design or location of the building are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of this report are modified or verified in writing. It is recommended that the geotechnical engineer be provided the opportunity for a general review of the final project design and specifications in order that the earthwork and foundation recommendations may be properly interpreted and implemented in the design and specifications.

This report presents both suggestions and recommendations. The suggestions are presented so that the owner and the owner's representatives may compare the cost to the potential risk or benefit for the suggested procedures.

We represent that our services were performed within the limits prescribed by you and with the usual thoroughness and competence of the current accepted practice of the geotechnical engineering profession in the area. No warranty or

representation either expressed or implied is included or intended in this report or our contract. We are available to discuss our findings with you. If you have any questions please contact us. The supporting data for this report is included in the accompanying figures and appendices.

This report is a product of Lambert and Associates. Excerpts from this report used in other documents may not convey the intent or proper concepts when taken out of context or they may be misinterpreted or used incorrectly. Reproduction, in part or whole, of this document without prior written consent of Lambert and Associates is prohibited.

This report and information presented can be used only for this site, for this proposed development and only for the client for which our work was performed. Any other circumstances are not appropriate applications of this information. Other development plans will require project specific review by us of the project.

We have enclosed a copy of a brief discussion about geotechnical reports published by Association of Soil and Foundation Engineers for your reference.

Please call when further consultation or observations and tests are required.

If you have any questions concerning this report or if we may be of further assistance, please contact us.

Respectfully submitted;

LAMBERT AND ASSOCIATES

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WHO HIRES THE TESTING LABORATORY?

It is one of those relatively small details in the overall scheme of things. Independent testing may be required by local building codes, or it may be insisted upon by lenders. Additional testing can usually be ordered by the design team during construction. Whatever the source of the requirement, many owners perceive it to be an unnecessary burden—an additional cost imposed principally for someone else's benefit.

What does this have to do with you? You may be the only one in a position to influence the use of testing and inspection services so they become more, rather than less likely to contribute to a successful outcome. There seems to be an almost irresistible inclination on the part of some owners to cast aside their potential value to the project in favor of the administrative and financial convenience of placing responsibility for their delivery into the hands of the general contractor.

Resist this inclination where you can. It is not in your client's best interests, and it is certainly not in yours. There are important issues of quality and even more important issues of life safety at stake. In the complex environment of today's construction arena, it makes very little sense for either of you to give up your control of quality control. Yet it happens altogether too often.

What's Behind this Misadventure?

The culprit seems to be the Federal Government. In the 1960's, someone came up with the idea that millions could be saved by eliminating the jobs of Federal workers engaged in construction inspection. The procurement model used to support this stroke of genius was the manufacturing segment of the economy, where producers of goods purchased by the Government had been required for years to conduct their own quality assurance programs. The result was a trendy new concept in Federal construction known as Contractor Quality Control (CQC).

It was a dumb idea. Costs were simply shifted from the Federal payroll to capital improvement budgets. Government contractors, selected on the basis of the lowest bid, were handed resources to assure the quality of their own performance. Some did so; many did not. All found themselves caught up in an impossible conflict between the demands of time and cost, on one hand, and the dictates of quality, on the other.

CQC was opposed by the Associated General Contractors of America, by independent testing laboratories, by the design professions, and by those charged with front-line responsibility for quality control in the Federal Agencies. Eventually, even the General Accounting Office came to the conclusion that it ought to be abandoned. But, once set in motion and fueled by the pervasive influence of the Federal Government, the idea spread—first to state and local governments; finally, to the private sector.

Why would the private sector embrace such an ill-conceived notion? Because so many

owners view testing and inspection as an undertaking which simply duplicates something they are entitled to in any event. They are confident they will be protected by contract documents which cover every detail and contingency. They look to local building inspectors to assure compliance with codes. And they fully expect the design team to fulfill its obligation to safeguard the quality of the work.

A Fox in the Henhouse

If testing is perceived as little more than an 'unnecessary, but unavoidable expense, why not make the general contractor responsible for controlling the cost? It may produce a savings, and it certainly eliminates an adminstrative headache. If contractual obligations dealing with the project schedule and budget can be enforced, surely those governing quality can be enforced, as well. Possibly so, but who is going to do it?

Some testing consultants will not accept CQC work. The reasons they give come from firsthand experience. They include: 1) inadequate to barely adequate scope, 2) selection based on the lowest bid; 3) non-negotiable contract terms inappropriate to the delivery of a professional service; 4) intimidation of inspectors by field supervisors; and 5) suppression of low or failing test results. This ought to be fair warning to any owner.

Keeping Both Hands on the Wheel

The largest part of the problem, from your point of view, is one of artful persuasion. If you cannot convince your client of the value of independent testing and inspection, no one can. Yet, if you do not, you are likely to find yourself responsible for an assurance of quality you are in no position to deliver. How can you keep quality control where it belongs and, in the process, prevent the owner from compromising his or her interests in the project as well as yours? Consider these suggestions:

1. Put the issue on an early agenda. It needs your attention. Anticipate the owner's inclination to avoid dealing with testing and inspection, and explain its importance to the success of the project. Persist, if you can, until your client agrees to hire the testing laboratory independently and to establish an adequate budget to meet the anticipated costs. A testing consultant hired by the owner cannot be fired by the general contractor for producing less than favorable results.

2. Tailor the testing requirements carefully. Scissors and paste can be your very worst enemies. Specify what the job requires, retain control of selection and hiring, make certain the contractor's responsibilities for notification for scheduling purposes are clear, and require that copies of all reports be distributed by the laboratory directly to you.

3. Insist on a preconstruction testing conference. It can be an essential element of effective coordination. Include the owner, the general contractor, major subcontractors, the testing consultant, and the design team. Review your requirements, the procedures to be followed, and the responsibilities of each of the parties. Have the testing consultant prepare a conference memorandum for distribution to all participants.

4. Monitor tests and inspections closely. Make certain your field representative is present during tests and inspections, so that deficiencies in procedures or results can be reported and acted upon quickly. Scale back testing if it becomes clear it is appropiate to do so under the circumstances; do not hesitate to order additional tests if they are required.

5. Finally, keep your client informed. Without your help, he or she is not likely to understand what the test results mean, nor will your actions in response to them make much sense. If additional testing is called for, explain why. Remember, it is an unexpected and, possibly, unbudgeted additional cost for which you will need to pave the way. In this sense, independent testing and inspection can serve an important, secondary purpose. You might view it as a communications resource. Use it in this way, and it just may yield unexpected dividends.

IMPORTANT INFORMATION
ABOUT YOUR
GEOTECHNICAL ENGINEERING REPORT

More construction problems are caused by site subsurface conditions than any other factor. As troublesome as subsurface problems can be, their frequency and extent have been lessened considerably in recent years, due in large measure to programs and publications of ASFE/ The Association of Engineering Firms Practicing in the Geosciences.

The following suggestions and observations are offered to help you reduce the geotechnical-related delays, cost-overruns and other costly headaches that can occur during a construction project.

A GEOTECHNICAL ENGINEERING REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

A geotechnical engineering report is based on a subsurface exploration plan designed to incorporate a unique set of project-specific factors. These typically include: the general nature of the structure involved, its size and configuration; the location of the structure on the site and its orientation; physical concomitants such as access roads, parking lots, and underground utilities, and the level of additional risk which the client assumed by virtue of limitations imposed upon the exploratory program. To help avoid costly problems, consult the geotechnical engineer to determine how any factors which change subsequent to the date of the report may affect its recommendations.

Unless your consulting geotechnical engineer indicates otherwise, *your geotechnical engineering report should not be used:*

- When the nature of the proposed structure is changed, for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one;
- when the size or configuration of the proposed structure is altered;
- when the location or orientation of the proposed structure is modified;
- when there is a change of ownership, or
- for application to an adjacent site.

Geotechnical engineers cannot accept responsibility for problems which may develop if they are not consulted after factors considered in their report's development have changed.

MOST GEOTECHNICAL "FINDINGS" ARE PROFESSIONAL ESTIMATES

Site exploration identifies actual subsurface conditions only at those points where samples are taken, when they are taken. Data derived through sampling and subsequent laboratory testing are extrapolated by geotechnical engineers who then render an opinion about overall subsurface conditions, their likely reaction to proposed construction activity, and appropriate foundation design. Even under optimal circumstances actual conditions may differ from those inferred to exist, because no geotechnical engineer, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than a report indicates. Actual conditions in areas not sampled may differ from predictions. *Nothing can be done to prevent the unanticipated, but steps can be taken to help minimize their impact.* For this reason, *most experienced owners retain their geotechnical consultants through the construction stage,* to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

SUBSURFACE CONDITIONS CAN CHANGE

Subsurface conditions may be modified by constantly-changing natural forces. Because a geotechnical engineering report is based on conditions which existed at the time of subsurface exploration, *construction decisions should not be based on a geotechnical engineering report whose adequacy may have been affected by time.* Speak with the geotechnical consultant to learn if additional tests are advisable before construction starts.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical report. The geotechnical engineer should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND PERSONS

Geotechnical engineers' reports are prepared to meet the specific needs of specific individuals. A report prepared for a consulting civil engineer may not be adequate for a construction contractor, or even some other consulting civil engineer. Unless indicated otherwise, this report was prepared expressly for the client involved and expressly for purposes indicated by the client. Use by any other persons for any purpose, or by the client for a different purpose, may result in problems. *No individual other than the client should apply this report for its intended purpose without first conferring with the geotechnical engineer. No person should apply this report for any purpose other than that originally contemplated without first conferring with the geotechnical engineer.*

A GEOTECHNICAL ENGINEERING REPORT IS SUBJECT TO MISINTERPRETATION

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a geotechnical engineering report. To help avoid these problems, the geotechnical engineer should be retained to work with other appropriate design professionals to explain relevant geotechnical findings and to review the adequacy of their plans and specifications relative to geotechnical issues.

BORING LOGS SHOULD NOT BE SEPARATED FROM THE ENGINEERING REPORT

Final boring logs are developed by geotechnical engineers based upon their interpretation of field logs (assembled by site personnel) and laboratory evaluation of field samples. Only final boring logs customarily are included in geotechnical engineering reports. *These logs should not under any circumstances be redrawn* for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process. Although photographic reproduction eliminates this problem, it does nothing to minimize the possibility of contractors misinterpreting the logs during bid preparation. When this occurs, delays, disputes and unanticipated costs are the all-too-frequent result.

To minimize the likelihood of boring log misinterpretation, *give contractors ready access to the complete geotechnical engineering report* prepared or authorized for their use. Those who do not provide such access may proceed under the *mistaken* impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes which aggravate them to disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY

Because geotechnical engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against geotechnical consultants. To help prevent this problem, geotechnical engineers have developed model clauses for use in written transmittals. These are *not* exculpatory clauses designed to foist geotechnical engineers' liabilities onto someone else. Rather, they are definitive clauses which identify where geotechnical engineers' responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your geotechnical engineering report, and you are encouraged to read them closely. Your geotechnical engineer will be pleased to give full and frank answers to your questions.

OTHER STEPS YOU CAN TAKE TO REDUCE RISK

Your consulting geotechnical engineer will be pleased to discuss other techniques which can be employed to mitigate risk. In addition, ASFE has developed a variety of materials which may be beneficial. Contact ASFE for a complimentary copy of its publications directory.

Published by

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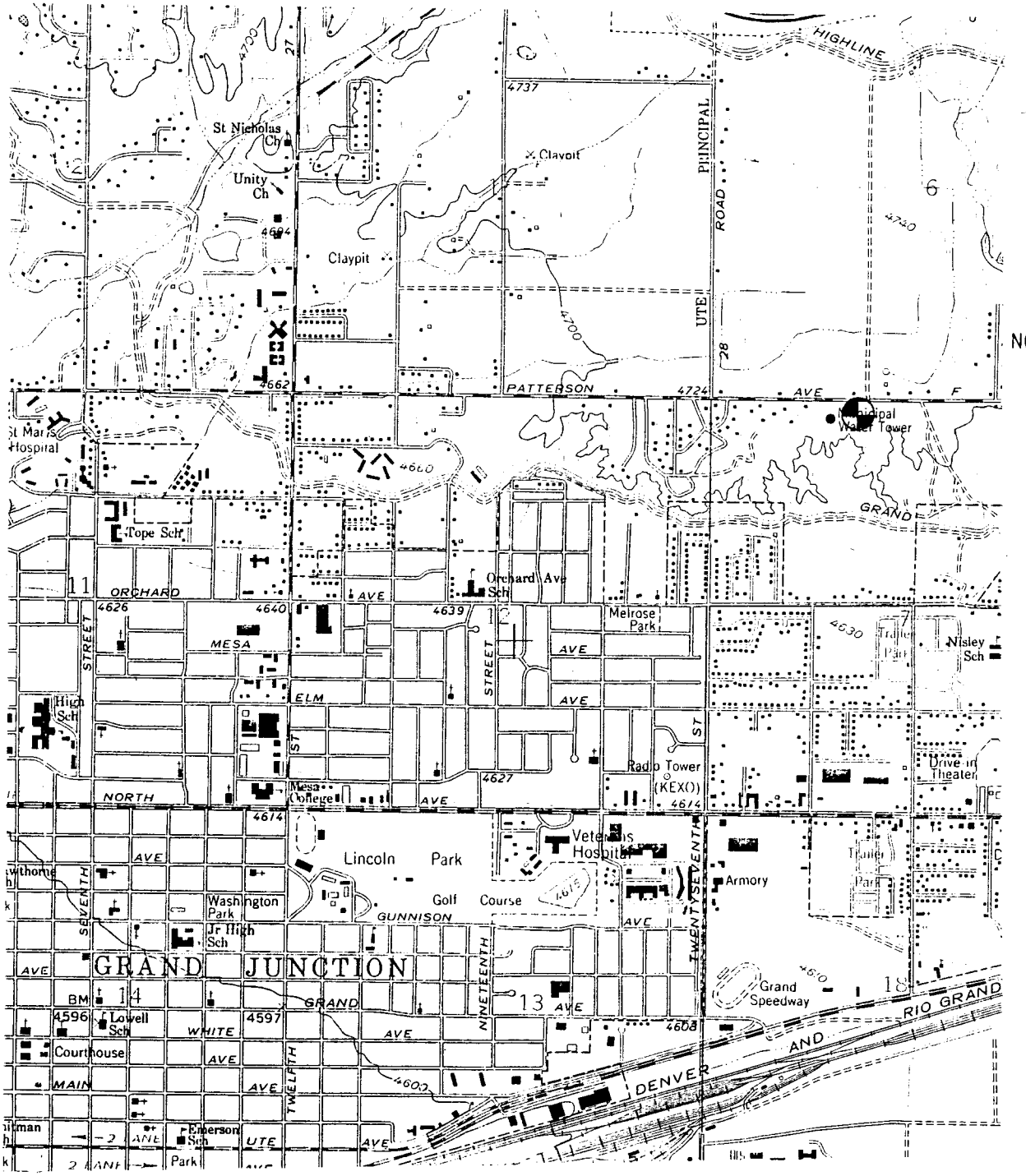


NO SCALE

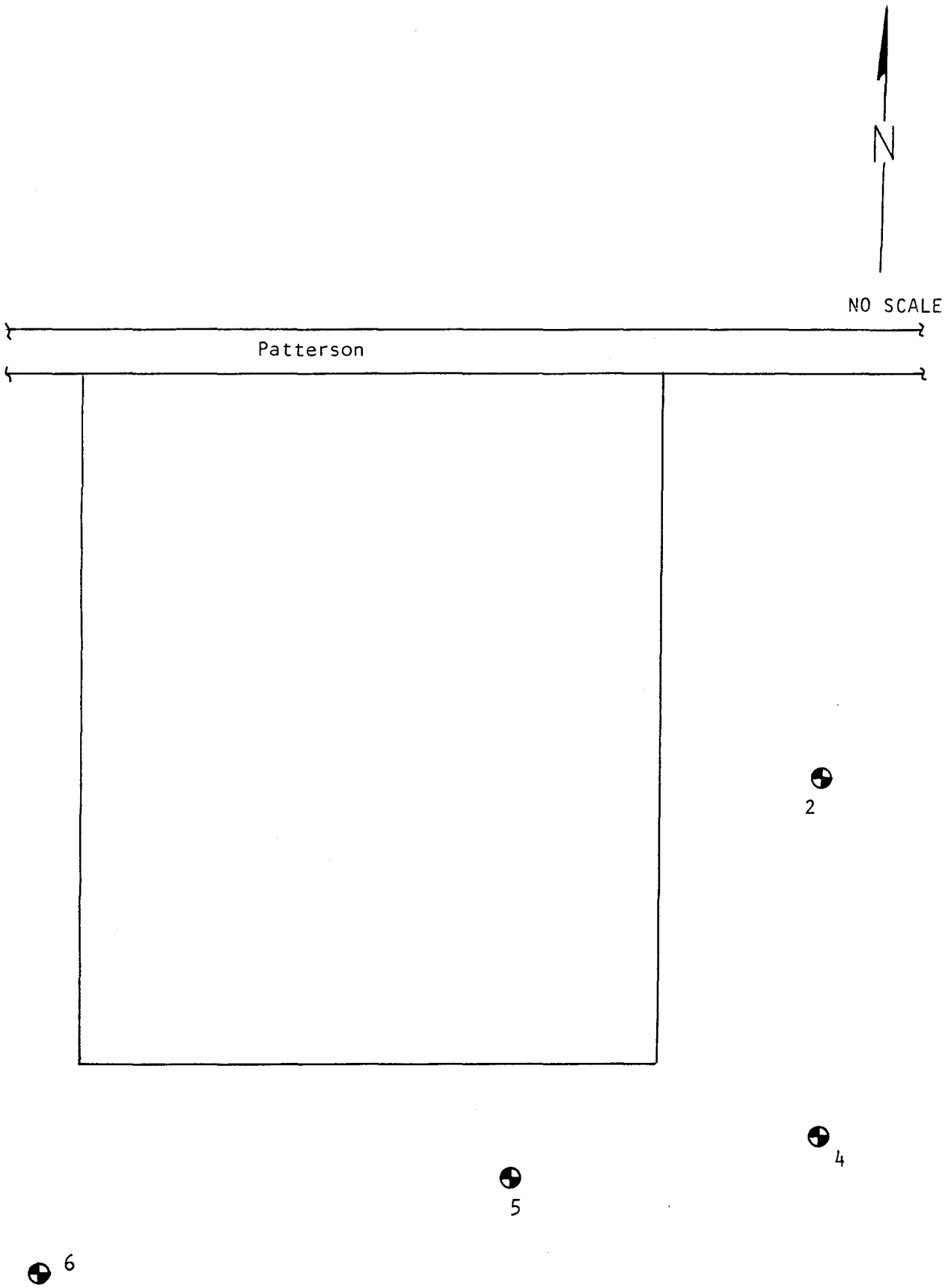
Indicates approximate project location

This map was excerpted from a map provided by United States Geologic Survey and is intended to present geotechnical data only

PROJECT VICINITY MAP

Lambert and Associates

Project No.:	M91056GE
Date:	6/3/91
Figure:	1

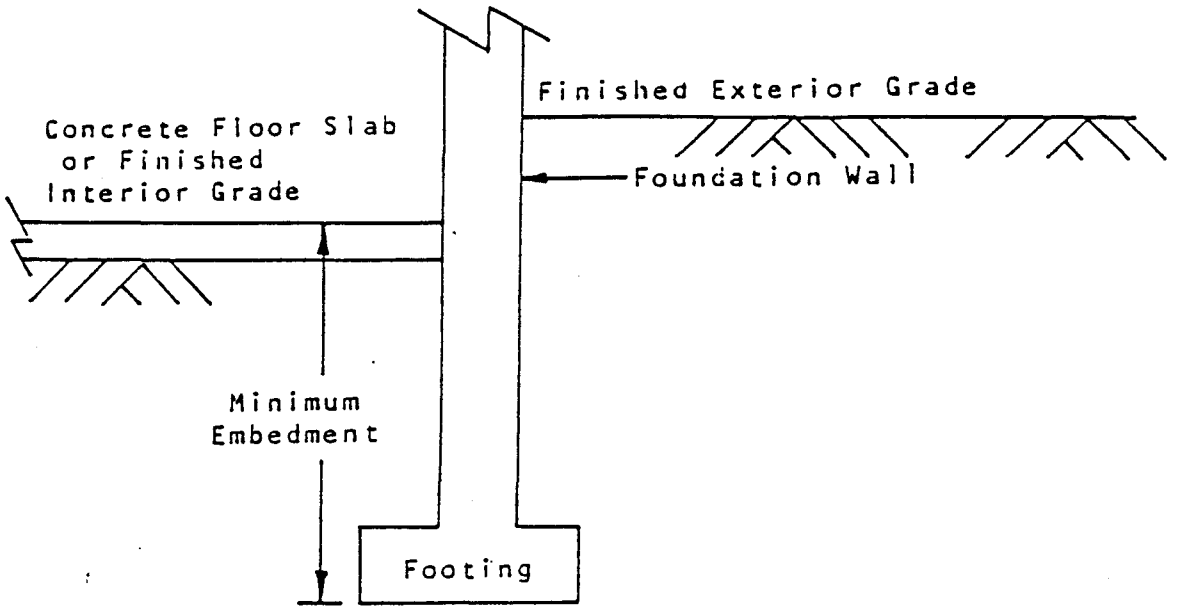


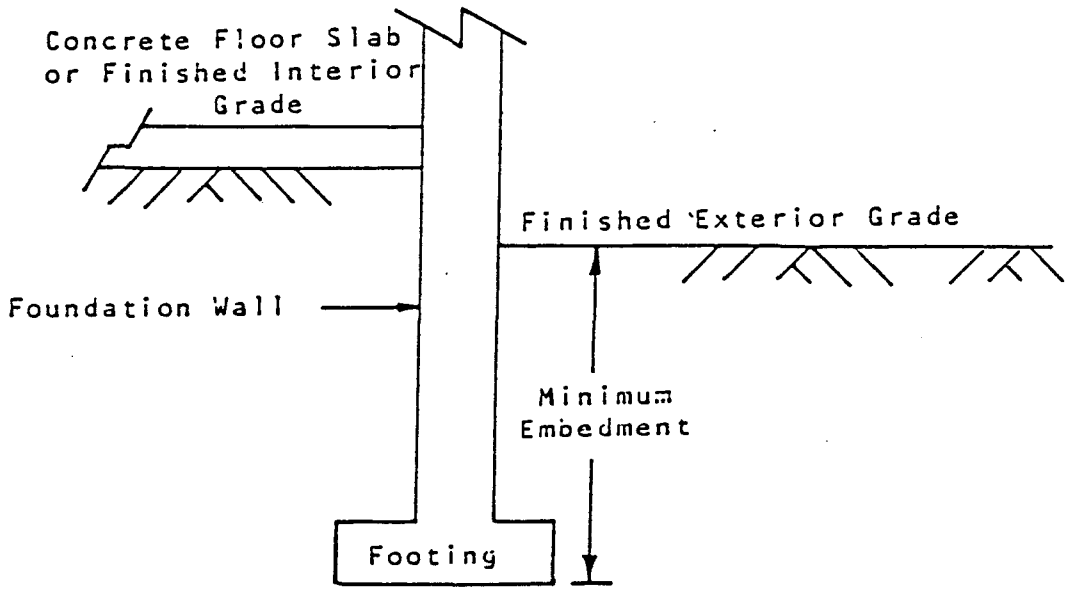
6 Indicates approximate test boring locations

TEST BORING LOCATION SKETCH

Lambert and Associates

Project No.:	M91056GE
Date:	6/3/91
Figure:	2





EMBEDMENT CONCEPT

NO SCALE

Lambert and Associates

Project No.:	M91056GE
Date:	6/3/91
Figure:	3

APPENDIX A

The field study was performed on May 14, 1991. The field study consisted of logging and sampling the soils encountered in six (6) test borings. The approximate locations of the test borings are shown on Figure 2. The log of the soils encountered in the test borings are presented on Figures A2 through A7.

The test borings were logged by Lambert and Associates and samples of significant soil types were obtained. The samples were obtained from the test borings using a Modified California Barrel sampler and bulk disturbed samples were obtained. Penetration blow counts were determined using a 14Ø pound hammer free falling 3Ø inches. The blow counts are presented on the logs of the test borings such as 5Ø/2 where 5Ø blows with the hammer were required to drive the sampler 2 inches.

The engineering field description and major soil classification are based on our interpretation of the materials encountered and are prepared according to the Unified Soil Classification System, ASTM D2488. Since the description and classification which appear on the test boring log is intended to be that which most accurately describes a given interval of the test boring (frequently an interval of several feet) discrepancies do occur in the Unified Soil Classification System nomenclature between that interval and a particular sample in the

interval. For example, an interval on the test boring log may be identified as a silty sand (SM) while one sample taken within the interval may have individually been identified as a sandy silt (ML). This discrepancy is frequently allowed to remain to emphasize the occurrence of local textural variations in the interval.

The stratification lines presented on the logs are intended to present our interpretation of the subsurface conditions encountered in the test borings. The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

KEY TO
LOG OF TEST BORING

Date Drilled _____ Field Engineer _____ Boring Number _____

Location _____ Elevation _____

Diameter _____ Total Depth _____ Water Table _____

Symbol	Depth	Sample Type	Sample N	Soil Description	Laboratory Test Results
				Sand, silty, medium dense, moist, tan, (SM) ↑ Unified Soil Classification	Notes in this column indicate tests performed and test results if not plotted.
				← Indicates Bulk Bag Sample	DD: Indicates dry density in pounds per cubic foot
		C		← Indicates Drive Sample	MC: Indicates moisture content as percent of dry unit weight
	5			↑ Indicates Sampler Type: C - Modified California St - Standard Split Spoon H - Hand Sampler	LL: Indicates Liquid Limit
			7/12	Indicates seven blows required to drive the sampler twelve inches with a hammer that weighs one hundred forty pounds and is dropped thirty inches.	PL: Indicates Plastic Limit
					PI: Indicates Plasticity Index
	10			BOUNCE: Indicates no further penetration occurred with additional blows with the hammer	
				NR: Indicates no sample recovered	
				CAVED: Indicates depth the test boring caved after drilling	
	15				
▽				← Indicates the location of free subsurface water when measured	
				CLAY SILT SAND GRAVEL CLAYSTONE SANDSTONE	NOTE: Symbols are often used only to help visually identify the described information presented on the log.
	20				
	25				

Project Name Fire Station Project Number M91056GE Figure A1

Lambert and Associates

CONSULTING GEOTECHNICAL ENGINEERS AND MATERIAL TESTING

LOG OF TEST BORING

Date Drilled 5/14/91 **Field Engineer** Woods **Boring Number** 1

Location See test boring location sketch **Elevation** _____

Diameter 4 inches **Total Depth** 9 feet **Water Table** None encountered

Symbol	Depth	Sample Type	Sample N	Soil Description	Laboratory Test Results
		Bulk		Clay,silty,medium stiff,slightly moist,brown (CL)	
	5			Formational material,clay shale, medium hard,brown to gray,Mancos formation	
	10			Bottom of test boring 1 at 9 feet	
	15				
	20				
	25				

Project Name Fire Station **Project Number** M91056GE **Figure** A2

Lambert and Associates

CONSULTING GEOTECHNICAL ENGINEERS AND MATERIAL TESTING

LOG OF TEST BORING

Date Drilled 5/14/91 **Field Engineer** Woods **Boring Number** 2

Location See test boring location sketch **Elevation** _____

Diameter 4 inches **Total Depth** 14 feet **Water Table** None encountered

Symbol / Depth	Sample Type	Sample N	Soil Description	Laboratory Test Results
	Bulk		Clay,silty,slightly stiff,slightly moist,brown (CL)	
			Formational material, clay shale, medium hard,brown to gray, Mancos formation, Chemical deposits	
5	C	21/6 23/6		Swell Consolidation Test: MC: 7.8% DD: 112.0 pcf
	C	50/6		
10			Harder with depth	
			Bottom of test boring 2 at 19 feet	
15				
20				
25				

Project Name Fire Station **Project Number** M91056GE **Figure** A3

Lambert and Associates

CONSULTING GEOTECHNICAL ENGINEERS AND MATERIAL TESTING

LOG OF TEST BORING

Date Drilled 5/14/91 **Field Engineer** Woods **Boring Number** 3

Location See test boring location sketch **Elevation** _____

Diameter 4 inches **Total Depth** 14 feet **Water Table** None encountered

Symbol	Depth	Sample Type	Sample N	Soil Description	Laboratory Test Results
				Clay,silty,medium stiff,slightly moist,brown (CL)	
	5	C	30/6 40/2	Formational material,clay shale, medium hard,brown to gray,Mancos formation Harder with depth	Direct Shear Strength Test: MC: 10.2% DD:116.0 pcf
	10				
	15			Bottom of test boring 3 at 14 feet	
	20				
	25				

Project Name Fire Station **Project Number** M91056GE **Figure** A4

Lambert and Associates

CONSULTING GEOTECHNICAL ENGINEERS AND MATERIAL TESTING

LOG OF TEST BORING

Date Drilled 5/14/91 **Field Engineer** Woods **Boring Number** 4

Location See test boring location sketch **Elevation**

Diameter 4 inches **Total Depth** 10 feet **Water Table** None encountered

Symbol	Depth	Sample Type	Sample N	Soil Description	Laboratory Test Results
				Clay, silty, medium stiff, slightly moist, brown (CL)	
		C	29/6 20/3	Formational material, clay shale, medium hard, brown to gray, Mancos formation Harder with depth	Swell Consolidation Test: MC: 8.2% DD: 124.0 pcf
	5				
		C	50/6		
	10			Bottom of test boring 4 at 10 feet	
	15				
	20				
	25				

Project Name Fire Station **Project Number** M91056GE **Figure** A5

Lambert and Associates

CONSULTING GEOTECHNICAL ENGINEERS AND MATERIAL TESTING

LOG OF TEST BORING

Date Drilled 5/14/91 **Field Engineer** Woods **Boring Number** 5

Location See test boring location sketch **Elevation** _____

Diameter 4 inches **Total Depth** 14 feet **Water Table** None encountered

Symbol	Depth	Sample Type	Sample N	Soil Description	Laboratory Test Results
		Bulk		Clay, silty, medium stiff, slightly moist, brown (CL)	
				Formational material, clay shale, medium hard, brown to gray	
	5				
	10				
	15			Bottom of test boring 5 at 14 feet	
	20				
	25				

Project Name Fire Station **Project Number** M91056GE **Figure** A6

Lambert and Associates

CONSULTING GEOTECHNICAL ENGINEERS AND MATERIAL TESTING

LOG OF TEST BORING

Date Drilled 5/14/91 **Field Engineer** Woods **Boring Number** 6

Location See test boring location sketch **Elevation** _____

Diameter 4 inches **Total Depth** 2 feet **Water Table** None encountered

Symbol	Depth (ft)	Sample Type	Sample N	Soil Description	Laboratory Test Results
		Bulk		Clay,silty,medium stiff,slightly moist,brown (CL)	
				Formational material,clay shale, medium hard,brown to gray,Mancos formation	
				Bottom of test boring 6 at 2 feet	
	5				
	10				
	15				
	20				
	25				

Project Name Fire Station **Project Number** M91056GE **Figure** A7

Lambert and Associates

CONSULTING GEOTECHNICAL ENGINEERS AND MATERIAL TESTING

APPENDIX B

The laboratory study consisted of performing:

- Moisture content and dry density tests,
- Swell-consolidation tests,
- Direct Shear Strength tests,
- Moisture-density relationship tests,
- California bearing ratio tests, and
- Chemical tests.

It should be noted that samples obtained using a drive type sleeve sampler may experience some disturbance during the sampling operations. The test results obtained using these samples are used only as indicators of the in situ soil characteristics.

TESTING

Moisture Content and Dry Density

Moisture content and dry density were determined for each sample tested of the samples obtained. The moisture content was determined according to ASTM Test Method D2216 by obtaining the moisture sample from the drive sleeve. The dry density of the sample was determined by using the wet weight of the entire sample tested. The results of the moisture and dry density determinations are presented on the log of test borings, Figures A2 through A7.

Swell Tests

Loaded swell tests were performed on drive samples obtained during the field study. These tests are performed in general accordance with ASTM Test Method D2435 to the extent that the same equipment and sample dimensions used for consolidation testing are used for the determination of expansion. A sample is subjected to static surcharge, water is introduced to produce saturation, and volume change is measured as in ASTM Test Method D2435. Results are reported as percent change in sample height.

Consolidation Tests

One dimensional consolidation properties of drive samples were evaluated according to the provisions of ASTM Test Method D2435. Water was added in all cases during the test. Exclusive of special readings during consolidation rate tests, readings during an increment of load were taken regularly until the change in sample height was less than Ø.ØØ1 inch over a two hour period. The results of the swell-consolidation load test are summarized on Figures B1 and B2, swell-consolidation tests.

It should be noted that the graphic presentation of consolidation data is a presentation of volume change with change in axial load. As a result, both expansion and consolidation can be illustrated.

Direct Shear Strength Tests

Direct shear strength properties of sleeve samples were evaluated in general accordance with testing procedures defined by ASTM Test Method D3Ø8Ø. The direct shear strength test was performed on a sample obtained from test boring 3 at a depth of four (4) to five (5) feet. Based on the results of the direct shear strength tests an internal angle of friction of 25 degrees and a cohesion of 9ØØ pounds per square foot were used in our analysis for the formational material.

California Bearing Ratio Tests

California bearing ratio tests were conducted on select soil samples obtained during our field study. The California Bearing Ratio tests were conducted in accordance with ASTM Test Method D1883. The results of the California Bearing Ratio tests are presented on Figure B3.

Moisture-Density Relationship Tests

Moisture-density relationship tests were conducted on select soil subgrade samples obtained during our field study. The moisture-density relationship tests were conducted in accordance with ASTM Test Method D1557. The results of the moisture-density relationship tests are presented on Figure B3.

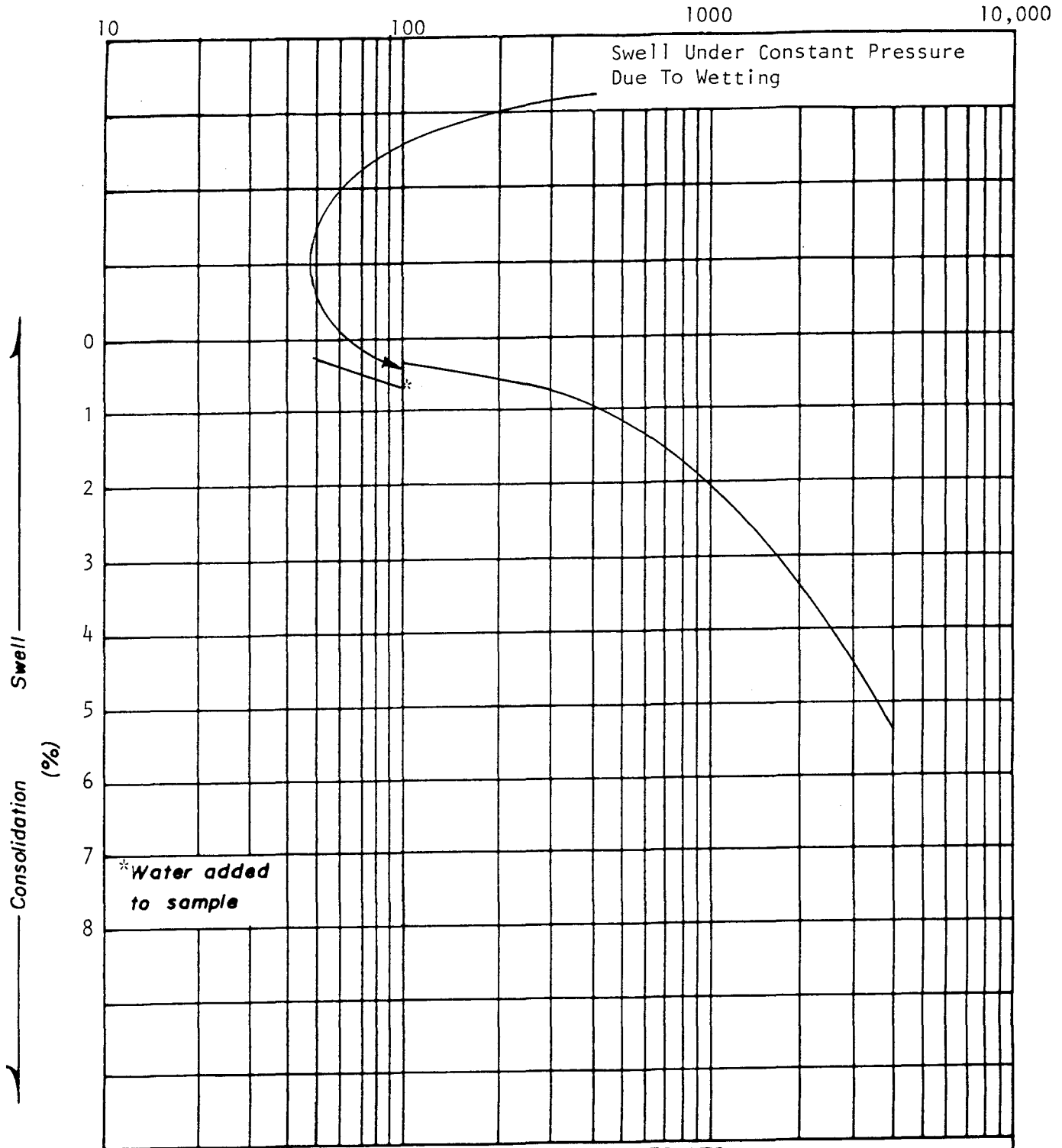
Chemical Tests

Chemical tests for water soluble sulfates, pH, and total dissolved salts were performed by Grand Junction Laboratories on

select samples obtained during the field study. The results of the chemical tests are tabulated below.

TEST BORING	DEPTH FEET	PH	TOTAL DISSOLVED SALTS	WATER SOLUBLE SULFATE
4	1 to 3	8.1	1.Ø3%	Ø.63%
2	1 to 2	8.6	1.37%	Ø.96%

PRESSURE (POUNDS PER SQUARE FOOT)



Boring No. 2 Depth 4-5 ft.	SUMMARY OF TEST RESULTS				
	Moisture Content (%)	Dry Density (P.C.F.)	Height (in.)	Diameter (in.)	Swell Pressure (P.S.F.)
Initial	7.8	112.0	1.0	1.94	500 ±
Final	17.0	118.0	.947	1.94	
Soil Description	Shale, black to dark brown				

SWELL - CONSOLIDATION TEST

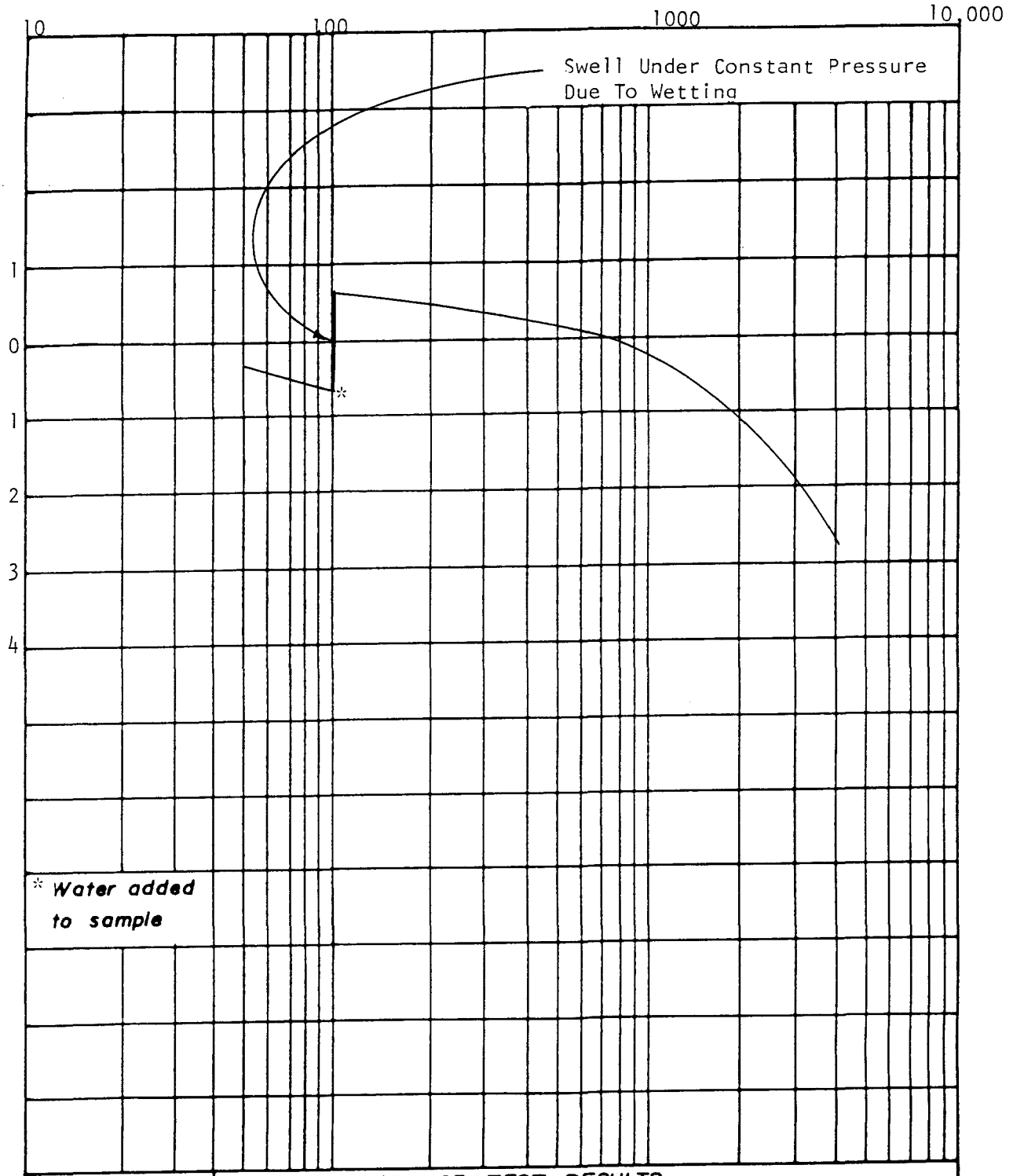
Lambert and Associates

Project No.: M91056GE

Date: 6/3/91

Figure: B1

PRESSURE (POUNDS PER SQUARE FOOT)



Boring No. 4 Depth 4-5 feet	SUMMARY OF TEST RESULTS				
	Moisture Content (%)	Dry Density (P.C.F.)	Height (in.)	Diameter (in.)	Swell Pressure (P.S.F.)
Initial	8.2	124.0	1.0	1.94	1200 ±
Final	13.9	127.0	.970	1.94	
Soil Description	Shale, dark brown				

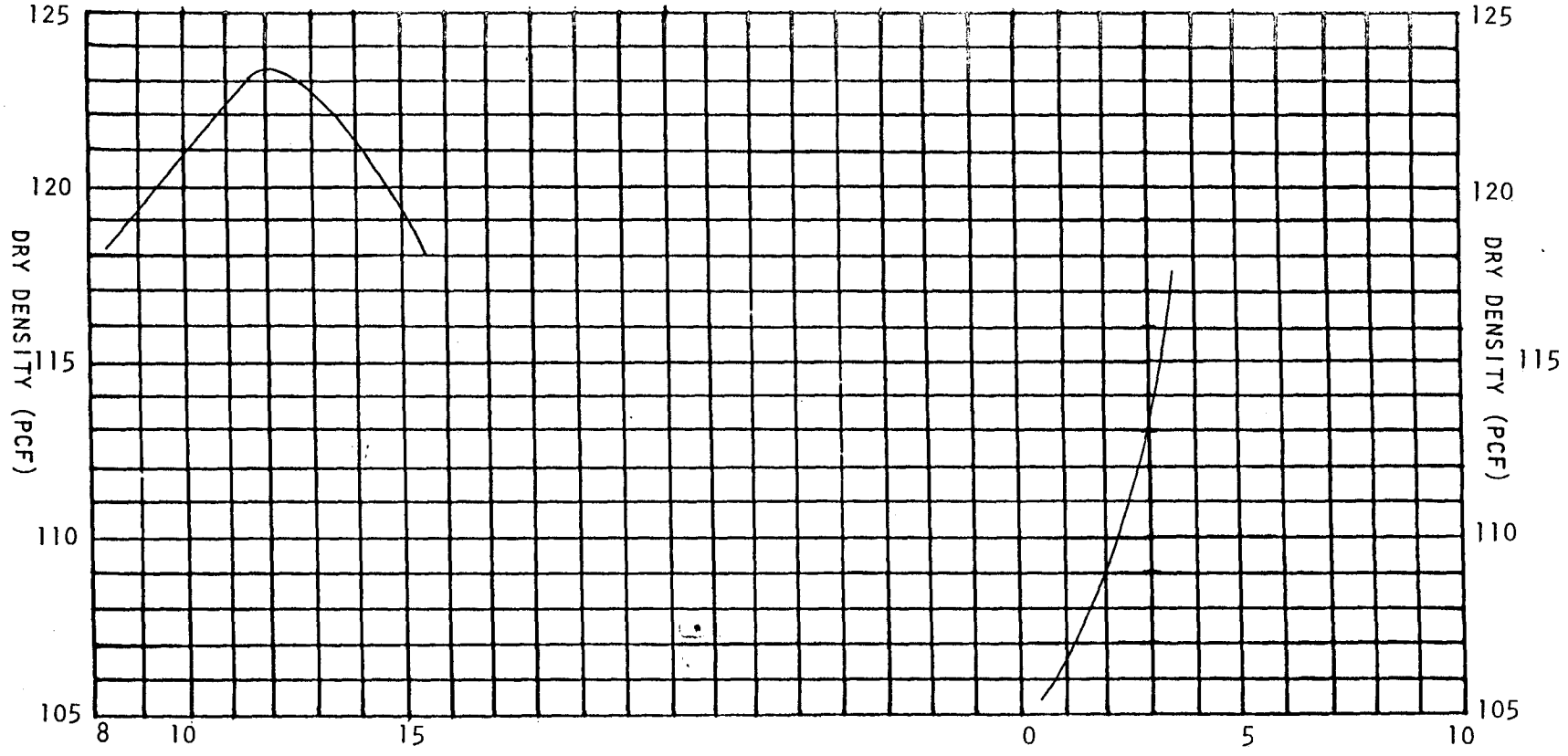
SWELL - CONSOLIDATION TEST

Lambert and Associates

Project No.:	M91056GE
Date:	6/3/91
Figure:	B2

Lambert and Associates

Project No.:	M91056GE
Date:	6/3/91
Figure:	B3



MOISTURE-DENSITY RELATIONSHIP
ASTM D1557

MAXIMUM DRY DENSITY = 123.5 pcf
OPTIMUM MOISTURE CONTENT = 12.0%

SAMPLE DESCRIPTION: Clay,brown

SAMPLE LOCATION: Blend of TH5 and TH6

CALIFORNIA BEARING RATIO
ASTM D1883 (Soaked 96 hours)

METHOD OF COMPACTION: ASTM D1557 Method B

PRE-SOAK		AFTER SOAK		
DRY DENSITY (PCF)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	SWELL (%)
105.4	11.6	101.4	25.7	3.9
111.8	11.6	110.4	22.2	1.3
117.2	11.6	113.0	22.7	3.7

CBR @ 90% relative compaction = 2.5

City of Grand Junction, Colorado
81501-2668
250 North Fifth Street

December 10, 1991

Mr. Tim Ryan
Mesa County Building Department
P.O. Box 20,000-5005
Grand Junction, CO 81502

Re: City of Grand Junction, Fire Station No. 2

Dear Tim,

The City has issued a Planning Clearance for a "Foundation Permit" only to the contractor for the new fire station so they can get started on the foundation. Planning and sewer clearances for a "Building Permit" will not be issued until the sewer design has been approved by Central Grand Valley Sanitation and the landscape plan approved by Community Development. It appears the above information will probably be approved sometime next week.

Please contact either Kathy Portner with Community Development or myself if you have any questions.

Sincerely,
FOR THE CITY OF GRAND JUNCTION

Bill Cheney
Utility Engineer

cc: Community Development
Burke Construction, Contractor
Terry Franklin, Project Manager

WestWater Engineering

Consulting Engineers

502 WEST EIGHTH ST. P.O. BOX 1470 - PALISADE, COLORADO 81526 (303) 464-7474

December 19, 1991

Mark Young
Rolland Engineering
518 28 Road
Grand Junction, CO 81501

RE: Central Grand Valley Sanitation District Review Comments on the Sewerline Extension to the new Fire Station

Dear Mark,

The following are Central Grand Valley Sanitation District's review comments regarding the sewerline extension to the new City of Grand Junction Fire Station at the corner of Patterson and 28 1/4 Roads.

1. As you are aware, prior to execution of the Sewerline Extension Agreement and any construction, an easement will need to be executed for the portion of sewerline that crosses private property to the east of the fire station site. The perpetual easement shall be 20 ft. in width (10 ft. each side of centerline), and shall be shown on the Plans. Upon execution of the easement it shall be recorded at the County Clerk and Recorder's Office with the Book and Page number shown on the as-built Plans.

2. It will be necessary to chip and grout the existing manhole base to provide for the new invert at the existing manhole. A note should be added to the Plans specifying this.

3. The existing manhole needs to be re-numbered to CV-4 to correspond with the present District Plans.

4. If the existing stub-out at Manhole CV-4 is removed, a note should be added that the inlet to the manhole shall be repaired with either non-shrink grout or concrete to insure a watertight manhole.

5. The present policy is that the District is only responsible for the sewer main. All service line construction from the sewer tap is the responsibility of the property owner. The UPC or the City's regulations on service line installation should be followed.

6. The District is in receipt of the Sewerline Extension Application and process fee. The City of Grand Junction will also need to submit the Sewerline Extension Agreement to the District prior to construction, which we have forwarded to John Knudsen of the Fire Dept. We should note that all of the District's policies for sewerline extensions are to be followed, similar to other sewerline extensions for developments that you have completed in the past within the District.

Please revise the Plans to reflect the aforementioned review comments and process the required easement documents and Extension Agreement prior to the January 13th Board meeting. We anticipate final approval by the board can be granted at that time.

Respectfully,

Stephen T. LaBonde
District Engineer

STL/sc

cc: Bill Cheney, City of Grand Junction
John Knudsen, City of Grand Junction Fire Dept.
Edith Kinder, Central Grand Valley Sanit. Dist.
Fred Bishop, Bishop Construction Co.

C H A M B E R L I N
A R C H I T E C T S

December 20, 1991

Mr. Bennett Boeschenstein
Director of Community Development
City of Grand Junction
250 S. Fifth Street
Grand Junction, CO 81501

Dear Bennet:

At our meeting yesterday, you required that Ted Ciavonne be under contract to us for landscape architecture design services prior to your issuance of a planning clearance required to release the Fire Station No. 2 building permit. At the time, I didn't think that this was a problem. Later that afternoon, I told Ted that I needed a proposal by Friday because I will be out of town until after Christmas and needed to execute a contract Friday to the contractor's deadline of December 23. Ted advised me that he was too busy to write a proposal on such short notice.

We fully intend to hire Ted's firm to complete the landscape architecture drawings, however, I cannot commit to using his firm until we have a satisfactory proposal. If we are unable to reach agreement with Ted, we will hire another licensed landscape architect to complete this work in accordance with the requirements of the City of Grand Junction.

I hope this commitment is adequate to secure the release of planning clearance without delay to the project. Please call me if you have any questions.

Sincerely,

Edward J. Chamberlin, AIA

EJC/sr12-20boe.153

A PROFESSIONAL CORPORATION

437 MAIN STREET
GRAND JUNCTION, COLORADO 81501-2511
TELEPHONE (303) 242-6804
FAX (303) 245-4303

C H A M B E R L I N
. . . . . .
A R C H I T E C T S

February 12, 1992

Mr. Mike Thompson, Chief
Grand Junction Fire Department
330 S. Sixth Street
Grand Junction, CO 81501

Dear Mike:

Please find enclosed copies of progress drawings for the landscaping plan at Fire Station 2 produced by Ted Ciavonne. As I have discussed with you, Ted and Bennett, I am uncomfortable with irrigation anywhere near site improvements due to the highly expansive soils found on this site. As I have explained, we had structural problems with a house located approximately 1/4 mile to the west ten years ago which also had a drip irrigation system. We never could find the source of the problem and even though reconstruction of structural portions of the building has been completed, the building still may not be stabilized.

The landscaping scheme as required by Bennett and as drawn by Ted is very attractive and will certainly compliment the new building. The fact that there are a number of other buildings in the neighborhood which have irrigated landscaping and apparently are not experiencing expansive soil problems, combined with the careful detailing that Ted has shown will probably result in a workable scheme. However, there is an element of risk no matter what level of technical mitigation we design.

We can include many safeguards but they may not be 100% effective for the life of the building. For example:

1. The drain line may get plugged.
2. The bentonite layer may not get installed perfectly or it may be breached by future digging.
3. The irrigation piping or valves may be damaged or wear out and leak.
4. A leak detector, if installed, may not work or may not be understood by personnel on site.

· A P R O F E S S I O N A L C O R P O R A T I O N ·

437 MAIN STREET
GRAND JUNCTION, COLORADO 81501-2511
TELEPHONE (303) 242-6804
FAX (303) 245-4303

This combination of events can lead to structural damage if the moisture content changes in the soil under the building or pavements.

If the City expects our office to be responsible for this risk, then we must recommend that irrigation not be included on this site. If, however, the City is willing to assume this risk, we will work with the soils engineer and the landscape architect to produce an attractive but conservative design recognizing the given site conditions.

Please let me know your response as soon as possible as these drawings are currently being finalized. If you have any questions, please call me.

Sincerely,

Edward J. Chamberlin, AIA

EJC/2-12thom.153

Enclosures

PC: Bennett Boeschenstein
Ted Ciavonne w/o Enclosures
Dennis Lambert

Grand Junction Community Development
Planning • Zoning • Code Enforcement
250 North Fifth Street
Grand Junction, Colorado 81501
(303) 244-1430 FAX (303) 244-1599

March 3, 1992

John Knudsen
Grand Junction Fire Department
330 S. 6th St.
Grand Junction, CO 81501

Dear John:

We have reviewed the proposed landscaping plan for Fire Station #2, located at 2827 F Road. The plan has been approved with the attached comments made by Ann Barrett of our office. The only exception we take to the plan is the use of pink shale mulch. We would encourage you to consider Ann's recommendation to use aspen bark mulch. The planned landscaping will greatly enhance the site and offer a good example of the use of xeric plant material.

With the completion of the landscaping plan, all requirements for the Special Use Permit have been met. I understand that negotiations are underway for a sewer easement. This letter will serve as official notice of approval of the Special Use Permit.

Thank you for your cooperation through this process. Because of careful attention to design Fire Station #2 will be an asset to the neighborhood and the City.

Sincerely,

Katherine M. Portner

Katherine M. Portner
Senior Planner

REVIEW COMMENTS - LANDSCAPE PLAN

FIRE STATION II

The overall Landscape Plan for the fire station submitted by Ciavonne and Associates is innovative for our area in its use of Xeric plant material. This is a very difficult site in that it has poor soil conditions and the soils engineer has recommended that very little water be used near the foundation. The site is also very exposed to public view, so it was important that it have a pleasant looking landscape.

Detailing for irrigation and proper drainage is extensive and seems to address the problems inherent in the site. As long as the drip irrigation system is maintained on a regular basis, it should prove the best way to water the plants of plants on the site.

The plant material specified should, once established, be able to thrive on much less water than conventional planted landscapes. Other than a question regarding a couple of the plant choices, I think that these plants have a very good chance of surviving the harsh conditions of the site with so little water. The plants I questioned are, 1) Amur Maple, which has difficulty in heavy, salty soils with iron uptake and becomes chlorotic; 2) Manzanita, which is usually found in more acid soil conditions; and 3) New England Aster, which bears very little resemblance to our native aster, the Aster biglovii in that it would prefer acid soil and some afternoon shade. I discussed these with Craig Roberts who thought that soil amendments that were recommended for the site would lessen problems with these plants. We agreed to go ahead as he had specified, since the design is somewhat experimental.

A rock mulch is specified that is beige in color. But due to availability and cost this may be replaced by a pink shale mulch. This would not be as acceptable for aesthetic reasons on this site. Weeds may not be as large a problem with the use of drip irrigation so it may not be necessary to use a mulch for weed control. For moisture retention, perhaps a wood chip mulch such as aspen bark mulch would help to establish the plants, then biodegrade into the soil to upgrade nutrients.

To: ClaudiaH,TerryF
Cc: Jims,DavidT,MarkR
From: Don Newton
Subject: Fire Station Inspection
Date: 8/05/92 Time: 12:47p

Dave Thornton, Chris Ashbeck and I inspected the new fire station site work on Monday, August 3. At this inspection I observed the following drainage problems:

1. Where the roof drain down spouts discharge onto the sidewalk there is no way for water to enter the drain troughs in the sidewalk. These drain troughs are improperly designed and/or constructed and will not function. The drain trough on the south side of the building is only about an inch or two deep and cannot possibly convey drainage to the curb in the parking lot. The entire system will need to be removed and reconstructed.

2. Where site drainage is to be diverted into and out of the storm water detention ponds, the curbing, gutters and piping are not constructed in accordance with details prepared by the Chamberlin Architects. As a result, water flowing along the curb cannot get into the detention ponds. Also where the detention ponds discharge pipes intersect the street curb there is supposed to be a concrete transition between the pipes and the curb. These transitions do not exist.

3. Where drainage leaves the curb and gutter and enters a concete V pan at the top of the south driveway, the gutter is sloped in the wrong direction trapping water against the curb. This curb, gutter and pan will need to be reconstructed to properly drain.

These items should be corrected prior to final payment to the contractor and issuing of a C.O.

FF — ACTION SHEET

SPECIAL USE

ACRES ~3
UNITS
DENSITY
ACTIVITY New Fire Station
PHASE Final
COMMON LOCATION SE corner of Patterson and 28¼ Rd

FILE NUMBER 65-91
ZONE PZ
TAX SCHEDULE # 2943-072-00-944

DATE SUBMITTED ____ DATE MAILED OUT ____ DATE POSTED ____

____ DAY REVIEW PERIOD RETURN BY ____

OPEN SPACE DEDICATION (acreage) ____ OPEN SPACE FEE REQUIRED $____ PAID RECEIPT # ____

RECORDING FEE REQUIRED $~~11.00~~ 2 PAID (Date) ____ DATE RECORDED ____

REVIEW AGENCIES

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	BB	CC	DD	EE	FF	GG
● Planning Department	●	●		●	●		●	●		●					●		●	●	●	●	●	●		●	●	●	●	●	●	●		●	
● City Engineer ✓	●	●													●		●		●	●		●		●	●	●			●				
○ Transportation Engineer	●	●													●		●			●	●	●		●	●	●			●				
● City Parks/Recreation ✓	●	●		●											●		●			●	●	●		●	●	●			●				
● City Fire Department ✓	●	●													●		●			●		●		●	●	●			●				
● City Police Department ✓	●	●													●		●			●		●		●	●	●			●				
● County Planning ✓	●	●													●		●			●		●		●	●	●			●				
● County Engineer ✓	●	●													●		●			●		●		●	●	●			●				
○ County Health	●	●													●		●			●		●		●	●	●			●				
○ Floodplain Administration	●	●													●		●			●		●		●	●	●			●				
○ G.J. Dept. of Energy	●	●													●		●			●		●		●	●	●			●				
● Walker Field	●	●													●		●			●		●		●	●	●			●				
○ School District	●	●													●		●			●		●		●	●	●			●				
● Irrigation } G.V. Water Users ✓	●	●													●		●			●		●		●	●	●			●				
● Drainage }	●	●													●		●			●		●		●	●	●			●				
○ Water (Ute, Clifton)	●	●													●		●			●		●		●	●	●			●				
● Sewer Dist. (FV, (CGV), OM) ✓	●	●													●		●			●		●		●	●	●			●				
● U.S. West ✓	●	●													●		●			●		●		●	●	●			●				
2 ● Public Service (2 sets) ✓	●	●													●		●			●		●		●	●	●			●				
○ State Highway Department	●	●													●		●			●		●		●	●	●			●				
○ State Geological	●	●													●		●			●		●		●	●	●			●				
○ State Health Department	●	●													●		●			●		●		●	●	●			●				
● City Property Agent ✓	●	●													●		●			●		●		●	●	●			●				
● City Utilities Engineer ✓	●	●													●		●			●		●			●	●			●				
● City Attorney	●	●			●										●		●									●			●				
○ Building Department	●	●													●		●					●				●			●				
○ DDA	●	●													●		●												●				
○ GJPC (7 packets)	●	●													●							●		●	●	●			●	●			
○ CIC (11 packets)	●	●													●										●				●	●			
○ Other	●	●													●		●			●		●		●	●	●			●				
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TOTALS																																	

BOARDS **DATE**

T6 59#

STAFF

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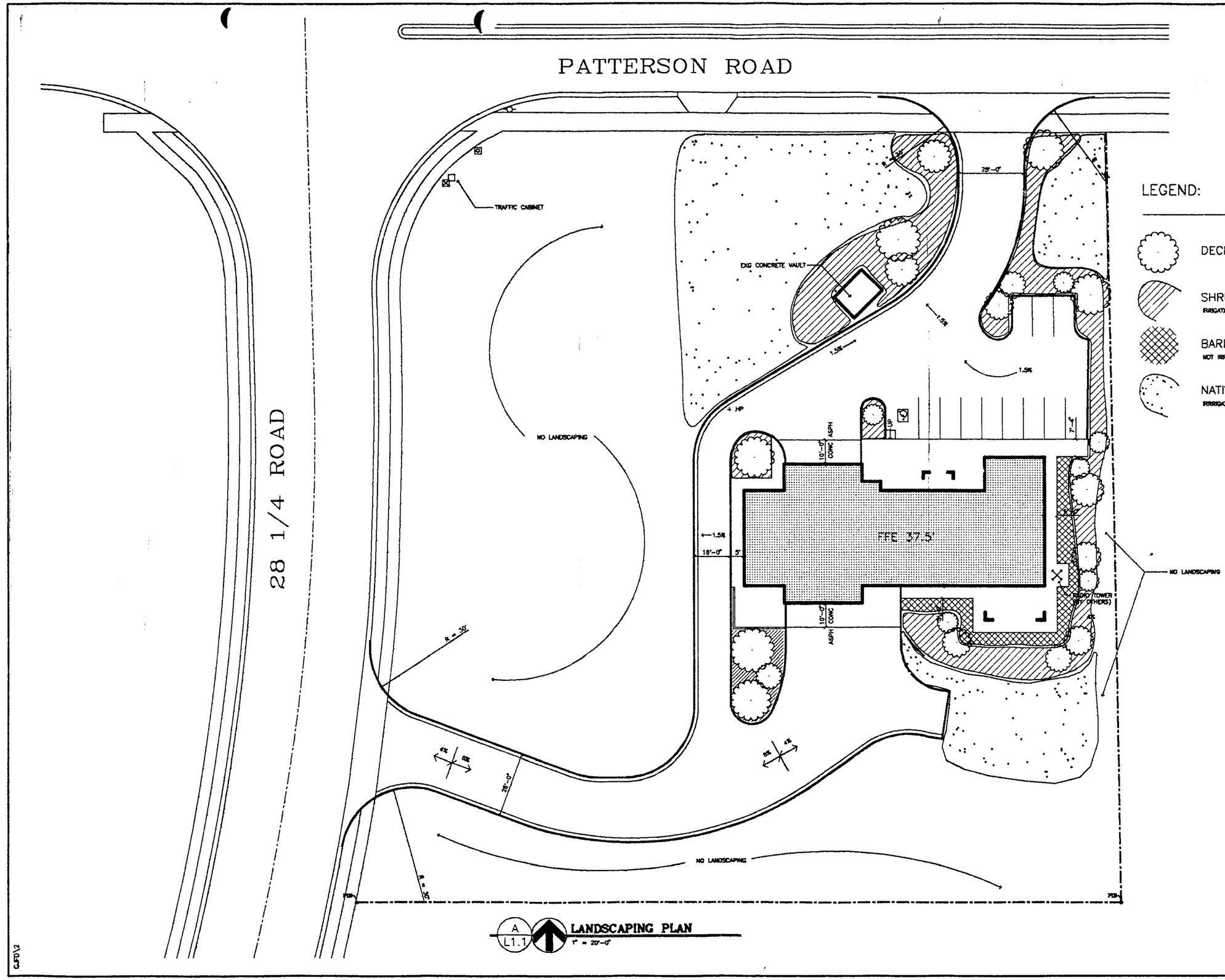
APPLICATION FEE REQUIREMENTS

$115.00 payable to City of G.J. at time of submittal

GRAND JUNCTION PLANNING



A L1.1 **LANDSCAPING PLAN**
1" = 20'-0"

#65 91

Original
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from Office

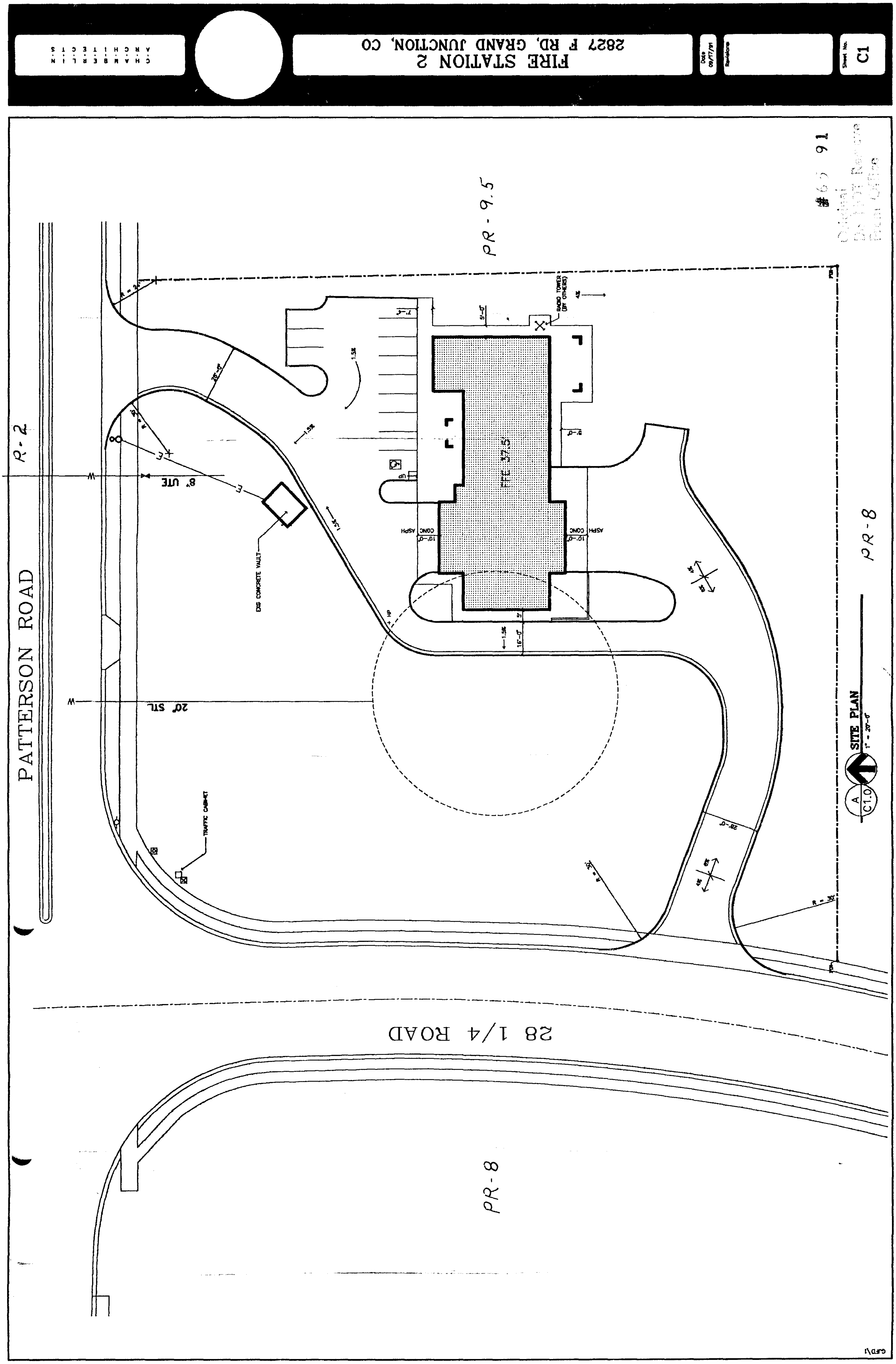
CHAMBERLIN ARCHITECTS

FIRE STATION 2
2827 F RD, GRAND JUNCTION, CO

Date 09/18/91

Revisions

Sheet No. L1


CHAMBERLIN ARCHITECTS
FIRE STATION 2
2827 F RD, GRAND JUNCTION, CO
Date 08/17/91
Revisions
Sheet No. C1
PATTERSON ROAD
28 1/4 ROAD
R-2
PR-9.5
PR-8
PR-8
8" UTE
20" STL
EXG CONCRETE VAULT
TRAFFIC CABINET
RADIO TOWER (BY OTHERS)
FFE 37.5
CONC
ASPH
10'-0"
16'-0"
28'-0"
7'-4"
5'-0"
R = 24'
R = 30'
R = 30'
1.5%
HP
UP
A
C1.0
SITE PLAN
1" = 20'-0"

G G

SANITARY SEWER

28 1/4 ROAD

FIRE HYDRANT

8" CW

2" CW

C.O.T.G

#65 91

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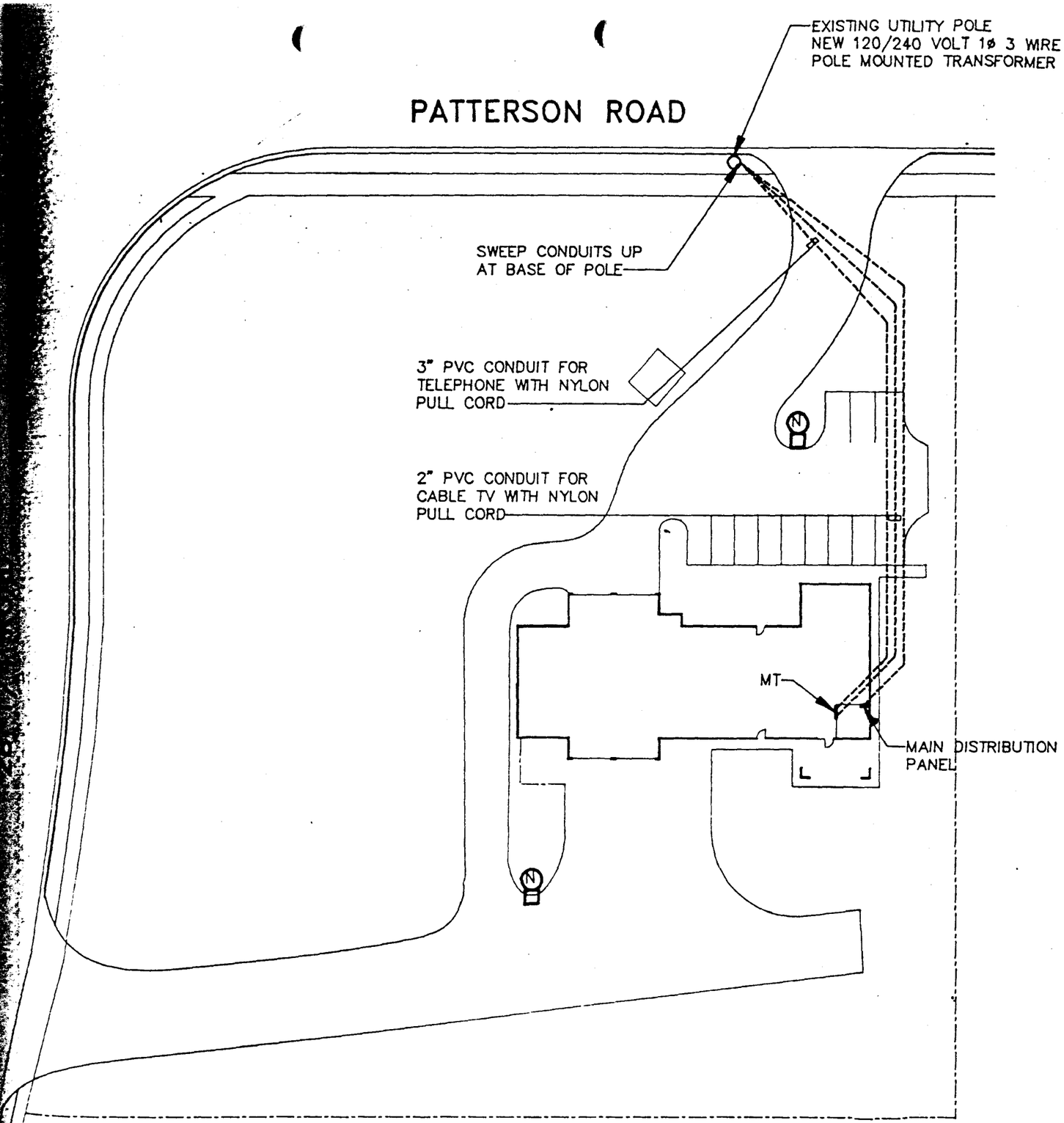

SITE PLAN

#65 91