

PRELIMINARY GEOTECHNICAL ENGINEERING REPORT

**PROPOSED RESIDENTIAL DEVELOPMENT
1ST STREET AND CHEYENNE AVE
EATON, COLORADO**

**NORTHERN COLORADO GEOTECH
PROJECT NO. 086-24
AUGUST 8, 2024**

Prepared for:

**Eaton School District RE-2
211 1st Street
Eaton, Colorado 80615
Attn: Jay Tapia**





Northern
Colorado
Geotech

2956 29th Street, Unit 21
Greeley, Colorado 80631
Phone: (970) 506-9244
Fax: (970) 506-9242

August 8, 2024

Eaton School District
211 1st Street
Eaton, Colorado 80615

Attn: Jay Tapia

**Re: Preliminary Geotechnical Engineering Report
1st Street and Cheyenne Ave
Northern Colorado Geotech Project No. 086-24**

Northern Colorado Geotech has completed a preliminary geotechnical engineering exploration for the proposed multi-family residential development to be located between 1st Street and Cheyenne Ave in Eaton, Colorado. This study was performed in general accordance with our proposal number p24001g dated January 16, 2024.

The subsurface soils at the site consisted of varying layers of silty sand, silty clayey sand, and silty clayey sand with gravel. We did encounter approximately 3 to 3½ feet of fill material in several of the test bores. We expect that other areas of fill will be encountered due to the removal of previous structures at the site. The results of our preliminary field exploration and laboratory testing indicate that the soils have low expansive potential and low to moderate load bearing capabilities.

Based on the anticipated construction and the results of our preliminary engineering exploration, it is our opinion that proposed structures can likely be supported on spread footing foundations.

If you have any questions concerning this report or any of our consulting services, please do not hesitate to contact us.

Sincerely,
NORTHERN COLORADO GEOTECH

Prepared by:

Doug Leafgren
Doug Leafgren, P.G.
President

Digitally signed by Doug Leafgren
DN: C=US, OU=President, O=Northern
Colorado Geotech, CN=Doug Leafgren,
E=dleafgren@ncg.com
Reason: I am the author of this document
Location: your signing location here
Date: 2024.08.08 09:39:45-06'00'
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Reviewed by:

Gary Weeks
Gary G. Weeks, P.E.
Vice President

Digitally signed by Gary Weeks
DN: C=US,
E=gary.weeks@weeksinc.com,
CN=Gary Weeks
Date: 2024.08.09 09:40:59-06'00'



Copies to: Addressee (3)

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PRELIMINARY GEOTECHNICAL ENGINEERING REPORT

PROPOSED RESIDENTIAL DEVELOPMENT 1ST STREET AND CHEYENNE AVE NORTHERN COLORADO GEOTECH PROJECT NO. 086-24 AUGUST 8, 2024

SCOPE

This report contains the results of our preliminary geotechnical engineering exploration for the proposed multi-family residential development to be located at 1st Street and Cheyenne Ave.

This report includes descriptions of, and geotechnical engineering recommendations relative to:

- subsurface soil conditions
- groundwater conditions
- foundation design and construction
- basement construction
- drainage
- floor slab design and construction
- earthwork

The recommendations contained in this report are based upon the results of preliminary field and laboratory testing, engineering analyses, and experience with similar soil conditions, structures and our understanding of the proposed project.

SITE CONDITIONS

The site was home to the old elementary school which has since been demolished. The area is now covered in native grass and weeds. On site, there is still some remnants of the old school that have not been fully removed. The property is surrounded by streets with Cheyenne Avenue and Maple Avenue bordering the site to the west and east, respectively. Collins Street and 1st Street border the site to the south and north, respectively. On the north and west of sides of the property we observed single-family residences. Commercial buildings and the Eaton Town Square were observed to the south and east.

PROPOSED CONSTRUCTION

As we understand it, the project will consist of developing the parcel for multi-family structures. Both slab on grade structures and buildings with basements are anticipated. Final development site grades were not available at this time, although we assume existing site grades will not change significantly.

SITE EXPLORATION

A total of five test borings were drilled on July 10, 2024. The borings were drilled to approximate depths of 15 feet at the locations shown on the Site Plan, Figure 1. The borings were advanced with a truck-mounted drilling rig, utilizing 4-inch diameter solid stem augers.

The borings were located in the field by pacing from property lines and/or existing site features. The accuracy of boring locations should only be assumed to the level implied by the methods used.

Lithologic logs of each boring were recorded by an engineering geologist during the drilling operations. At selected intervals, samples of the subsurface materials were taken by driving split-spoon and/or ring samplers. Standard penetration measurements were recorded while driving a split-spoon and/or ring sampler into the subsurface materials. The standard penetration test is a useful index in estimating the density of the materials encountered.

Groundwater conditions were evaluated in each boring at the time of subsurface exploration, and one day after the drilling.

Laboratory Testing

The samples retrieved during the subsurface exploration were returned to our laboratory for observation by the project manager. The soils were classified in general accordance with the Unified Soil Classification System. At that time, the field descriptions were confirmed or modified and an applicable laboratory testing program was formulated. Boring logs were prepared and are attached with this report.

Laboratory tests were conducted on selected samples and are presented on the boring logs and attached laboratory test sheets. The test results were used for the geotechnical engineering analyses, and the development of foundation and earthwork recommendations.

Selected samples were tested for the following engineering properties:

- Water Content
- Dry Density
- Consolidation
- Compressive Strength
- Expansion
- Atterberg Limits

SUBSURFACE CONDITIONS

Soil Conditions

Soils at the site generally consisted of varying layers of silty sand, silty clayey sand, and silty clayey sand with gravel to depths of approximately 15 feet. We encountered roughly 3 to 3½ feet of fill material in several test bores. This is likely related to the previous structure. At this time we are unaware of any density test results on the fill material to verify proper placement and compaction. Summary boring logs are attached with this report.

Groundwater Conditions

Groundwater was not observed in any test boring at the time of field exploration, nor when checked one day after the drilling. These observations represent groundwater conditions at the time of the field exploration, and may not be indicative of other times, or at other locations. Groundwater conditions can be expected to fluctuate with varying seasonal and weather conditions, and other factors.

Field and Laboratory Test Results

Field test results indicate that the sand soils vary from loose to medium dense in relative density. Laboratory test results indicate that the soils at anticipated foundation depths have low expansive potential.

DESIGN RECOMMENDATIONS

Foundation Design

Based on the results of our preliminary subsurface exploration and laboratory testing, it is our opinion that spread footing foundations are likely feasible for the majority of structures at the site. Further subsurface explorations providing building specific design criteria should be conducted prior to the start of construction.

Existing fill on the site should not be used for support of foundations without removal and recompaction. There are several unknowns regarding the removal of the previous structure including questions about foundation removal, depth of the demolition process, whether the previous boiler room (that was 10 – 12 feet deep) was also removed. Due to the unknowns regarding the previous demolition, consideration should be given to obtaining price quotes for potential removal of untested fill or removal of debris from the site.

**Eaton School District
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Northern Colorado Geotech Project No. 086-24**

Exterior footings should be placed a minimum of 30 inches below finished grade for frost protection and to provide confinement for the bearing soils. Finished grade is the lowest adjacent grade for perimeter footings.

Foundation excavations should be observed by Northern Colorado Geotech. If the soil conditions encountered differ significantly from those presented in this report, supplemental recommendations may be required.

Below Grade Construction

Groundwater was not encountered on the site to the maximum depth of exploration, 15 feet. Therefore, full-depth basement construction is considered acceptable on the site if desired.

To reduce the potential for groundwater to impact foundation bearing soils and enter the lower level of structures, installation of perimeter drainage systems are recommended. The drainage systems should be constructed around the exterior perimeter of basement foundations, and sloped at a minimum 1/8 inch per foot to a suitable outlet, such as a sump and pump system.

Surface Drainage

Positive drainage should be provided during construction and maintained throughout the life of the proposed project. Infiltration of water into utility or foundation excavations must be prevented during construction. Planters and other surface features which could retain water in areas adjacent to the building or pavements should be sealed or eliminated. In areas where sidewalks or paving do not immediately adjoin the structure, we recommend that protective slopes be provided with a minimum grade of approximately 10 percent for at least 10 feet from perimeter walls. Backfill against footings, exterior walls, and in utility and sprinkler line trenches should be well compacted and free of all construction debris to reduce the possibility of moisture infiltration.

Downspouts, roof drains or scuppers should discharge into splash blocks or extensions when the ground surface beneath such features is not protected by exterior slabs or paving. Sprinkler systems should not be installed within 5 feet of foundation walls. Landscaped irrigation adjacent to the foundation system should be minimized or eliminated.

Floor Slab Design and Construction

Some differential movement of slab-on-grade floor systems is possible should the subgrade soils become elevated in moisture content. To reduce potential slab movements, the subgrade soils should be prepared as outlined in the earthwork section of this report.

Additional floor slab design and construction recommendations are as follows:

- Positive separations and/or isolation joints should be provided between slabs and all foundations, columns or utility lines to allow independent movement.
- Control joints should be provided in slabs to control the location and extent of cracking.
- A minimum 2-inch void space should be constructed above, or below non-bearing partition walls placed on the floor slab. Special framing details should be provided at door jambs and frames within partition walls to avoid potential distortion. Partition walls should be isolated from suspended ceilings.
- Interior trench backfill placed beneath slabs should be compacted in accordance with recommended specifications outlined below.
- In areas subjected to normal loading, a minimum 4-inch layer of clean-graded gravel should be placed beneath interior slabs.
- Floor slabs should not be constructed on frozen subgrade.

Exterior slabs-on-grade, exterior architectural features, and utilities founded on, or in backfill may experience some movement due to the volume change of the backfill. Potential movement could be reduced by:

- minimizing moisture increases in the backfill
- controlling moisture-density during placement of backfill
- using designs which allow vertical movement between the exterior features and adjoining structural elements
- placing effective control joints on relatively close centers

General Earthwork

All earthwork on the project should be observed and evaluated by Northern Colorado Geotech. The evaluation of earthwork should include observation and testing of engineered fill, subgrade preparation, foundation bearing soils, and other geotechnical conditions exposed during the construction of the project.

Site Preparation

Strip and remove existing vegetation, debris, and other deleterious materials from proposed building and pavement areas. All exposed surfaces should be free of mounds and depressions which could prevent uniform compaction.

Stripped materials consisting of vegetation and organic materials should be wasted from the site, or used to revegetate landscaped areas or exposed slopes after completion of grading operations.

Demolition of the previous building has already been accomplished. However, there are unknown elements of the demolition and backfill including if all the foundation material was removed, if the deeper section of the boiler room (up to 10 – 12 feet deep) was completely removed, and if backfill of the demolition was performed with testing to confirm proper placement and compaction of the backfill. All materials derived from the demolition of the previous structures and pavements should be removed from the site, and not be allowed for use in any on-site fills.

If unexpected fills or underground facilities are encountered, such features should be removed and the excavation thoroughly cleaned prior to backfill placement and/or construction.

It is anticipated that excavations for the proposed construction can be accomplished with conventional earthmoving equipment.

The individual contractor(s) is responsible for designing and constructing stable, temporary excavations as required to maintain stability of both the excavation sides and bottom. All excavations should be sloped or shored in the interest of safety following local, and federal regulations, including current OSHA excavation and trench safety standards.

Fill Materials and Placement

All exposed areas which will receive fill should be scarified to a minimum depth of eight inches, conditioned to near optimum moisture content, and compacted.

The placement of soils on the site should be observed by Northern Colorado Geotech. The fill should be assessed for suitability of use in the proposed fill and tested for placement including compaction percentage and moisture content.

Engineered fill should be placed and compacted in horizontal lifts, using equipment and procedures that will produce recommended moisture contents and densities throughout the lift. Recommended compaction criteria for engineered fill materials are as follows:

Clean on-site soils or approved imported materials may be used as fill material.

On-site soils with significant amounts of debris from previous demolition are not recommended for use as compacted fill beneath interior or exterior floor slabs.

Imported soils (if required) should conform to the following:

<u>Gradation</u>	<u>Percent fines by weight (ASTM C136)</u>
6".....	100
3".....	70-100
No. 4 Sieve.....	50-100
No. 200 Sieve.....	50 (max)
Liquid Limit	30 (max)
Plasticity Index.....	5 (max)
<u>Material</u>	<u>Minimum Percent (ASTM D698)</u>
Scarified subgrade soils	95
On-site and imported fill soils:	
Beneath foundations	95
Beneath slabs	95

On-site or imported granular soils should be compacted within a moisture range of 3 percent below to 3 percent above optimum unless modified by the project geotechnical engineer.

GENERAL COMMENTS

The analysis and recommendations presented in this report are based upon data obtained from borings performed to obtain representative subsurface conditions at the site. Variations in the soil

**Eaton School District
1st Street and Cheyenne Ave
Northern Colorado Geotech Project No. 086-24**

between borings will occur. Northern Colorado Geotech should be present during construction to observe the excavation and construction procedures and confirm or modify our recommendations.

The scope of services for this project does not include either specifically or by implication any environmental assessment of the site.

This report is intended exclusively for the use by the client. Any use or reuse of the findings and/or recommendations of this report by parties other than the client without the written consent of Northern Colorado Geotech is undertaken at said parties' sole risk.

This report has been prepared in accordance with generally accepted geotechnical engineering practices in this area at this time. No warranties, either express or implied, are intended or made.

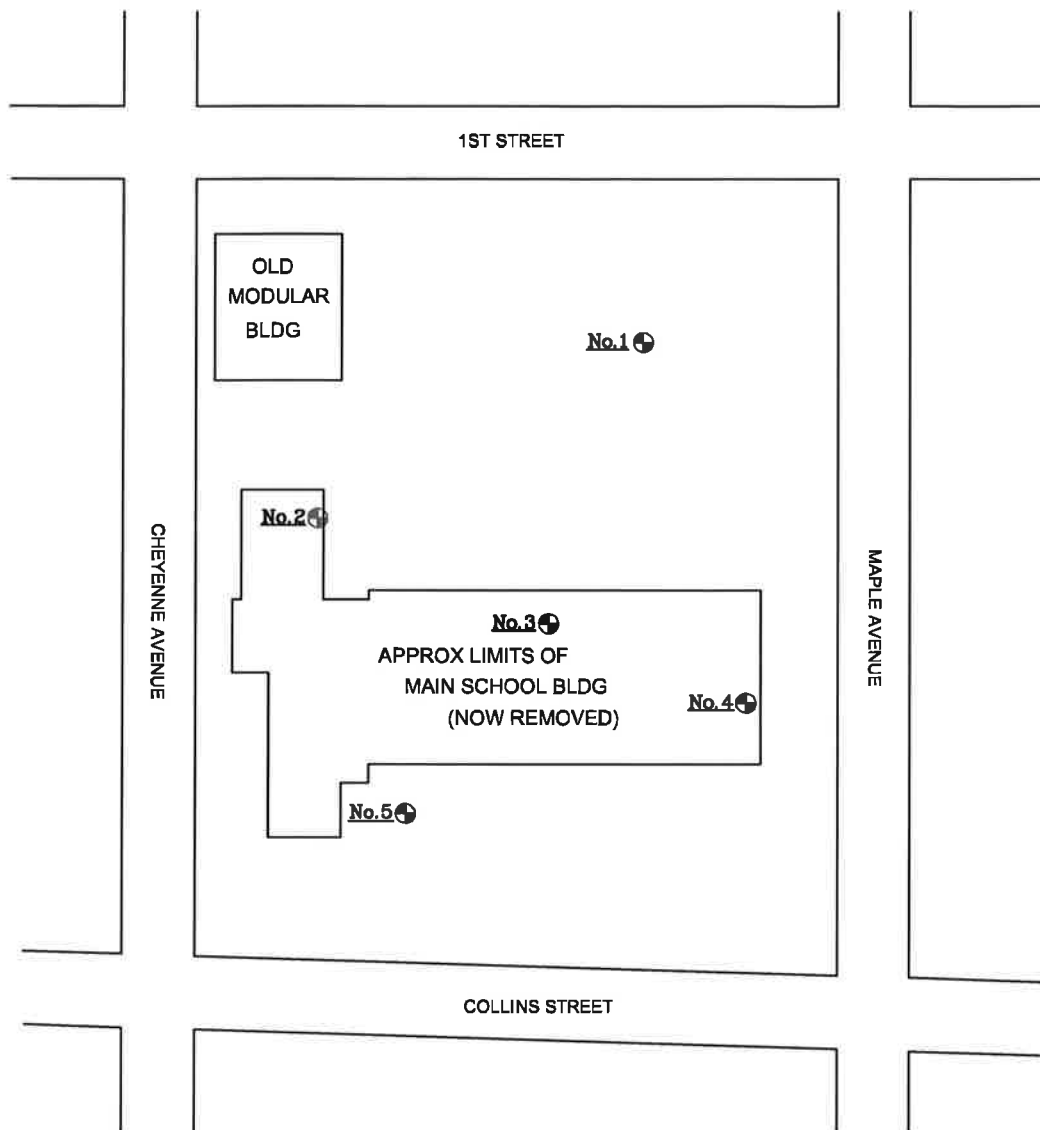


DIAGRAM IS FOR GENERAL LOCATION ONLY,
AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

**BORING LOCATION PLAN
PRELIMINARY DEVELOPMENT**
1ST STREET AND CHEYENNE AVENUE
EATON, COLORADO
FOR EATON SCHOOL DISTRICT RE-2



2956 29th Street, Unit 21
Greeley, Colorado 80631
Phone: (970) 508-9244
Fax: (970) 508-9242

Project No.	086-24
Scale:	1" = 100'
Date:	8-7-24
Project Mgr:	DML
Figure No.	1

LOG OF BORING No. 1

Sheet 1 of 1

CLIENT Eaton School Distric RE-2		ARCHITECT/ENGINEER									
SITE 1st Street and Cheyenne Ave Eaton, Colorado		PROJECT Proposed Multi-Family Development									
		GRAPHIC LOG	DEPTH (FT.)	SAMPLES				TESTS			
				BLOWS/12" N-VALUE	NUMBER	TYPE	IN. DRIVEN IN. RECOVERED	MOISTURE, %	DRY DENSITY PCF	HAND PENE- TROMETER psf	LIQUID LIMIT PLASTIC INDEX PERCENT FINES
0.5	6" TOPSOIL <u>FILL - Silty Clayey Sand</u> Brown to tan, moist, loose										
2.0	<u>SILTY CLAYEY SAND</u> Brown, moist, loose										
			7	2	RS	12	11	108	8,000	0.6% Swell	
9.5	<u>SILTY SAND</u> Tan, moist, medium dense		11	3	SS	12	15				
15.0	BOTTOM OF BORING		13	4	SS	12	10				

WATER LEVEL OBSERVATIONS

WL	None	W.D.
WL	None	A.B.
When Checked 1 Day A.B.		

**Northern
Colorado
Geotech**
2956 29th Street, Unit 21
Greeley, Colorado 80631
Phone: 970-506-9244
Fax: 970-506-9242

STARTED	7/10/24	FINISHED	7/10/24
DRILL CO.	Quality Drilling	DRILL RIG	CME-75
LOGGED BY	DML	APPROVED	DML
NCG PROJECT NO.	086-24		

086-24.GPJ

LOG OF BORING No. 2

Sheet 1 of 1

CLIENT		ARCHITECT/ENGINEER								
SITE		PROJECT								
Eaton School Distric RE-2		Proposed Multi-Family Development								
		GRAPHIC LOG	DEPTH (FT.)	SAMPLES				TESTS		
				BLOWS/12" N-VALUE	NUMBER	TYPE	IN. DRIVEN IN. RECOVERED	MOISTURE, %	DRY DENSITY PCF	HAND PENE- TROMETER psf
FILL - Silty Clayey Sand Brown to tan, moist, medium dense			10	1	SS	18	8			26/6/43
3.5 SILTY CLAYEY SAND Brown, moist, loose to medium dense			11	2	SS	12	6			
			5							
			15	3	RS	12	25	101	7,000	0.2% Swell
10.0 SILTY SAND WITH GRAVEL Tan, moist, medium dense			10							
			17	4	SS	12	9			
15.0 BOTTOM OF BORING			15							

WATER LEVEL OBSERVATIONS

WL	None	W.D.
WL	None	A.B.
When Checked 1 Day A.B.		

**Northern
Colorado
Geotech**
2956 29th Street, Unit 21
Greeley, Colorado 80631
Phone: 970-506-9244
Fax: 970-506-9242

STARTED	7/10/24	FINISHED	7/10/24
DRILL CO.	Quality Drilling	DRILL RIG	CME-75
LOGGED BY	DML	APPROVED	DML
NCG PROJECT NO.	086-24		

LOG OF BORING No. 3

Sheet 1 of 1

CLIENT Eaton School Distric RE-2		ARCHITECT/ENGINEER							
SITE 1st Street and Cheyenne Ave Eaton, Colorado		PROJECT Proposed Multi-Family Development							
	GRAPHIC LOG	DEPTH (FT.)	SAMPLES				TESTS		
			BLOWS/12" N-VALUE	NUMBER	TYPE	IN. DRIVEN IN. RECOVERED	MOISTURE, %	DRY DENSITY PCF	HAND PENE- TROMETER psf
<u>FILL - Silty Clayey Sand</u> Brown to tan, dry to moist, loose to medium dense			12	1	SS	18	3		
3.0									
<u>SILTY CLAYEY SAND</u> Brown, moist, loose to medium dense			14	2	RS	12	8	104	9,000
		5							0.3% Swell
10.0			9	3	SS	12	8		
<u>SILTY SAND WITH GRAVEL</u> Tan, dry to moist, medium dense		10							
			9	4	SS	12	2		
15.0		15							
BOTTOM OF BORING									

WATER LEVEL OBSERVATIONS

WL	None	W.D.
WL	None	A.B.
When Checked 1 Day A.B.		

**Northern
Colorado
Geotech**
2956 29th Street, Unit 21
Greeley, Colorado 80631
Phone: 970-506-9244
Fax: 970-506-9242

STARTED	7/10/24	FINISHED	7/10/24
DRILL CO.	Quality Drilling	DRILL RIG	CME-75
LOGGED BY	DML	APPROVED	DML
NCG PROJECT NO.	086-24		

LOG OF BORING No. 4

Sheet 1 of 1

CLIENT Eaton School Distric RE-2		ARCHITECT/ENGINEER							
SITE 1st Street and Cheyenne Ave Eaton, Colorado		PROJECT Proposed Multi-Family Development							
	GRAPHIC LOG	DEPTH (FT.)	SAMPLES				TESTS		
			BLOWS/12" N-VALUE	NUMBER	TYPE	IN. DRIVEN IN. RECOVERED	MOISTURE, %	DRY DENSITY PCF	HAND PENE- TROMETER psf
<u>FILL - Silty Clayey Sand</u> Brown to tan, moist, medium dense			6	1	SS	18	4		
3.0 <u>SILTY CLAYEY SAND</u> Brown, moist, loose to medium dense			24	2	SS	12	5		
9.0 <u>SILTY SAND WITH GRAVEL</u> Tan, dry to moist, loose to medium dense			8	3	RS	12	5	105	9,000
15.0 BOTTOM OF BORING			7	4	SS	12	7		
									0% swell

WATER LEVEL OBSERVATIONS

WL	None	W.D.
WL	None	A.B.
When Checked 1 Day A.B.		



STARTED	7/10/24	FINISHED	7/10/24
DRILL CO.	Quality Drilling	DRILL RIG	CME-75
LOGGED BY	DML	APPROVED	DML
NCG PROJECT NO.	086-24		

086-24.GPJ

LOG OF BORING No. 5

Sheet 1 of 1

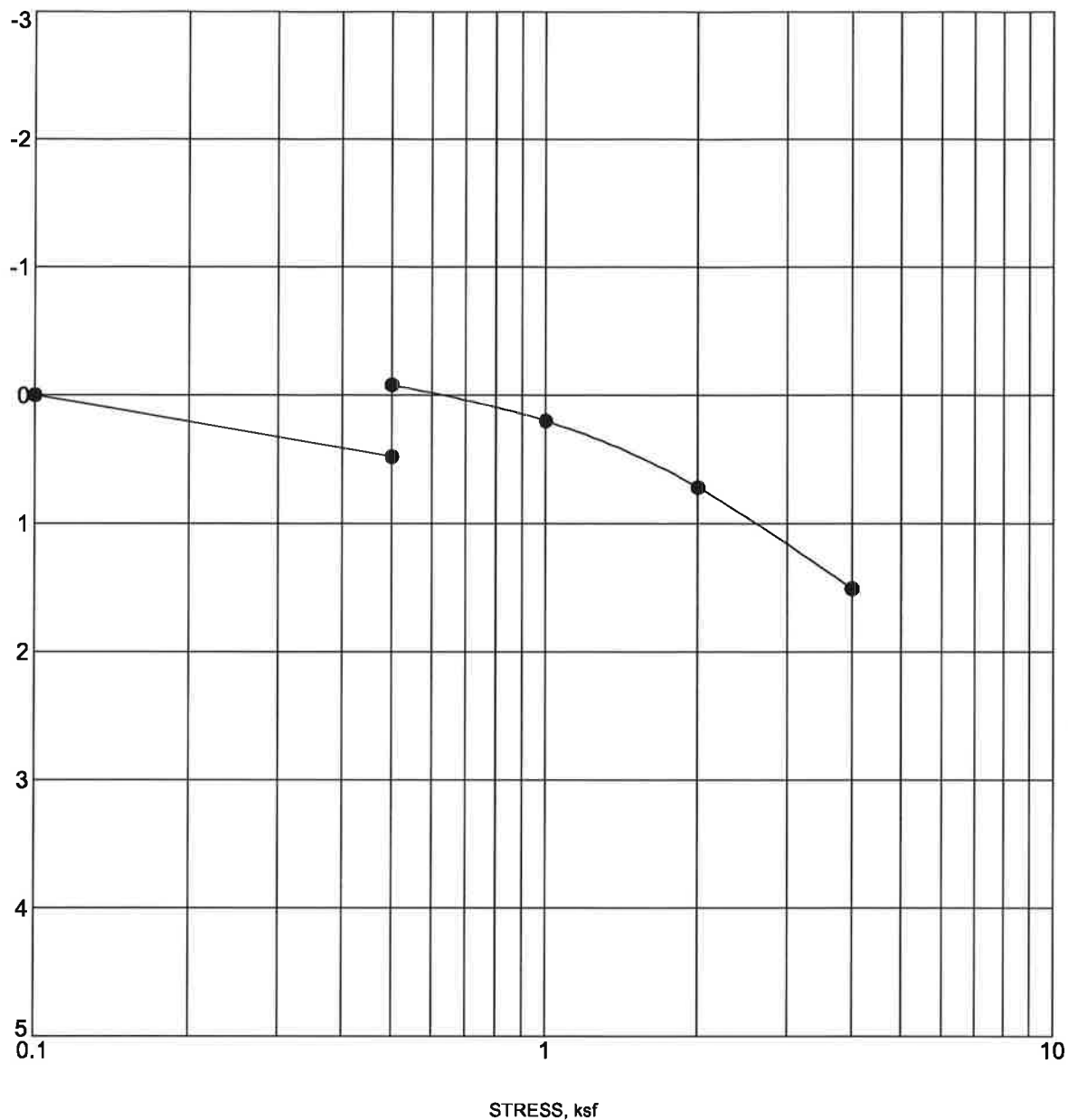
CLIENT		ARCHITECT/ENGINEER									
SITE		PROJECT									
Eaton School Distric RE-2		Proposed Multi-Family Development									
		GRAPHIC LOG	DEPTH (FT.)	SAMPLES				TESTS			
				BLOWS/12" N-VALUE	NUMBER	TYPE	IN. DRIVEN IN. RECOVERED	MOISTURE, %	DRY DENSITY PCF	HAND PENE- TROMETER psf	LIQUID LIMIT PLASTIC INDEX PERCENT FINES
0.5	6" TOPSOIL		7	1	SS	18	13			1.2% Swell	
	<u>SILTY CLAYEY SAND WITH GRAVEL</u> Brown, moist, loose		10	2	RS	12	11	102	9,000		
			5								
			7	3	SS	12	16				
10.0	<u>SILTY SAND WITH GRAVEL</u> Tan, dry to moist, loose		10								
							</				

WATER LEVEL OBSERVATIONS			STARTED 7/10/24		FINISHED 7/10/24	
WL	None	W.D.	DRILL CO. Quality Drilling		DRILL RIG CME-75	
WL	None	A.B.	LOGGED BY DML		APPROVED DML	
When Checked 1 Day A.B.			NCG PROJECT NO.		086-24	

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Colorado
Geotech**
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Greeley, Colorado 80631
Phone: 970-506-9244
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086-24.GPJ

STRAIN, %



Specimen Identification			Classification	γ_d	MC%
●	1	4.0	Silty Clayey Sand	108	11



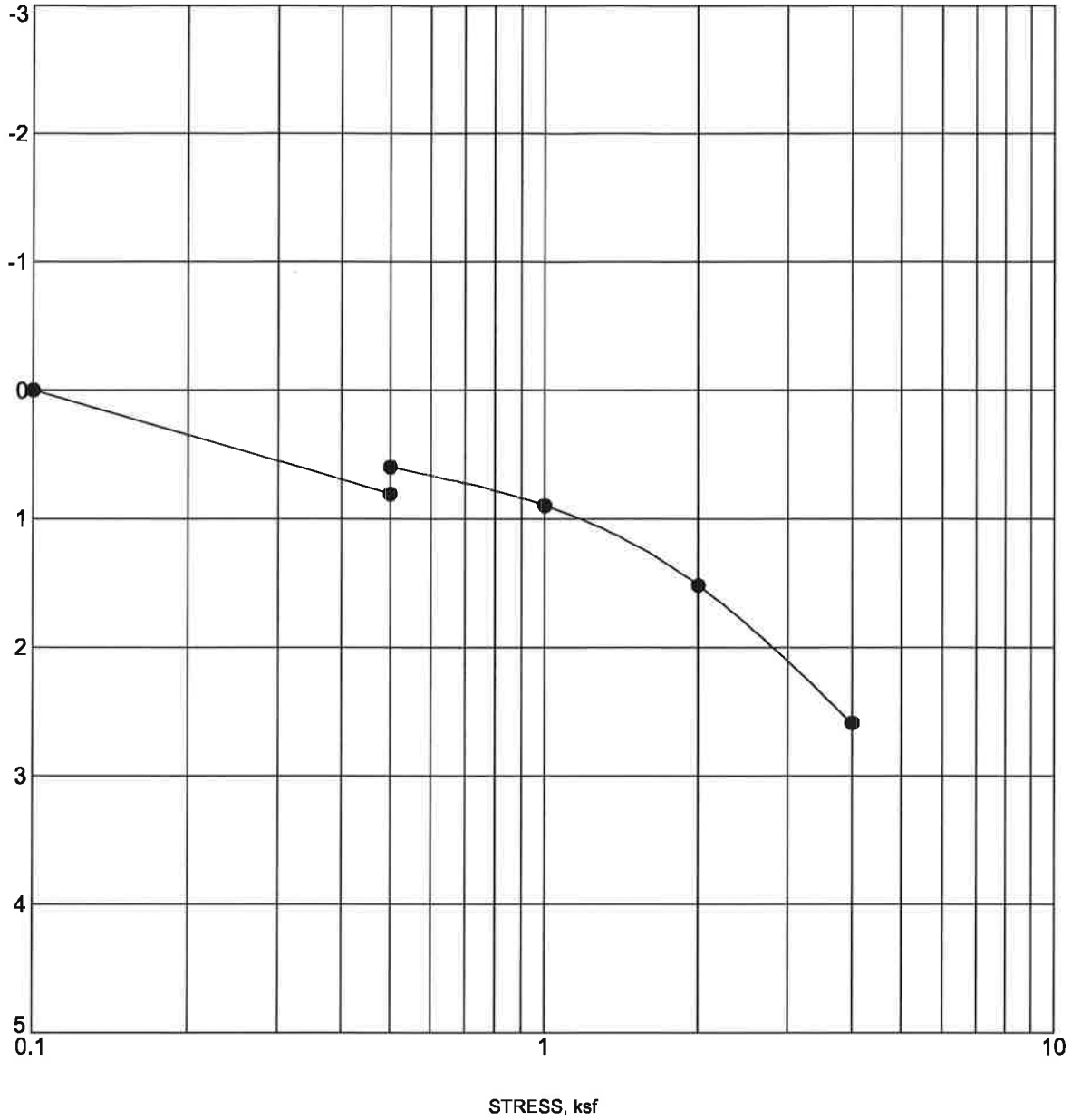
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Colorado
Geotech**

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Phone: 970-506-9244
Fax: 970-506-9242

CONSOLIDATION TEST

Client: Eaton School Distric RE-2 Number: 086-24
Project: Proposed Multi-Family Development
Location: 1st Street and Cheyenne Ave

STRAIN, %



Specimen Identification		Classification	γ_d	MC%
● 2	9.0	Silty Clayey Sand	101	25



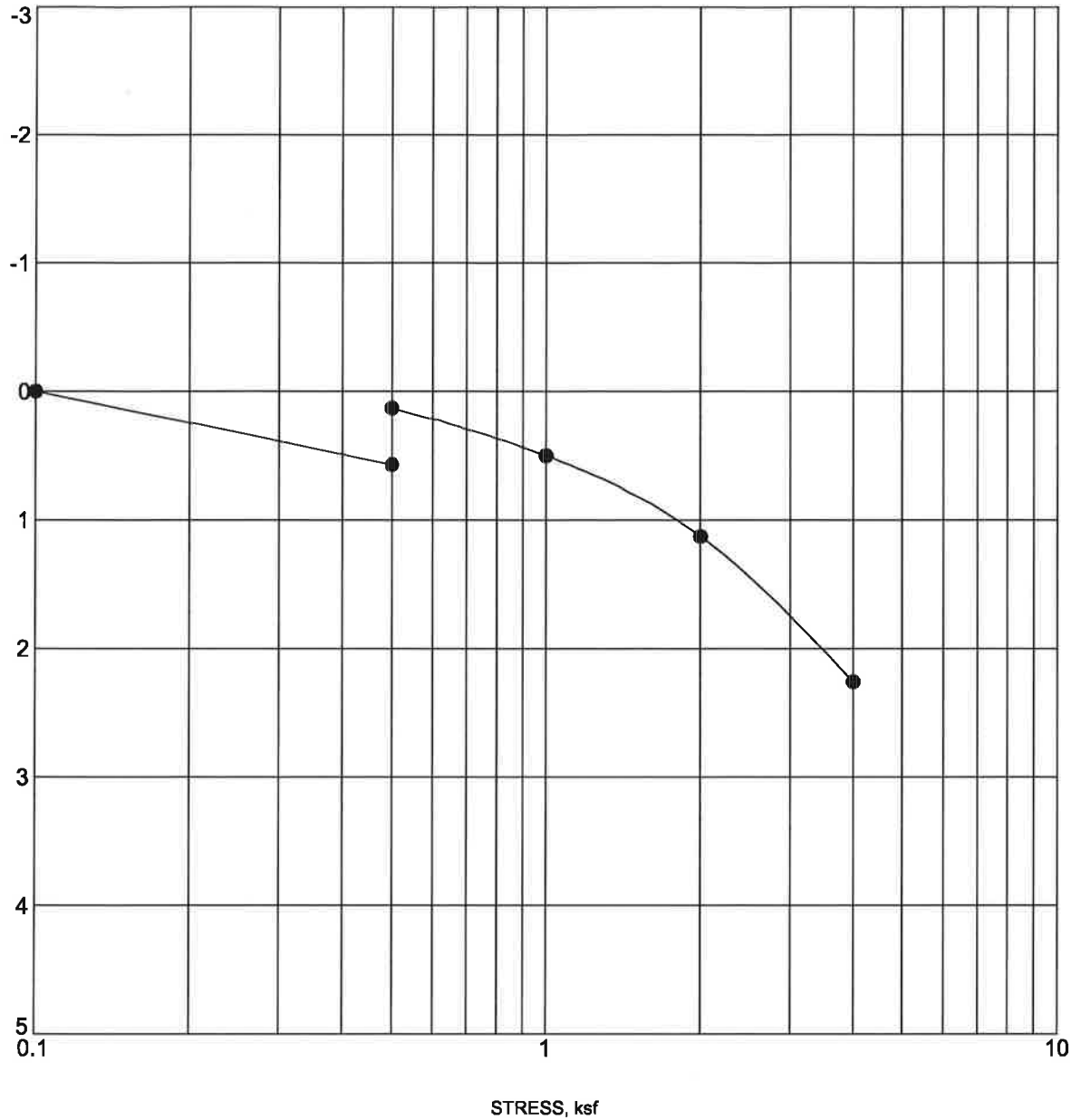
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CONSOLIDATION TEST

Client: Eaton School District RE-2 Number: 086-24
Project: Proposed Multi-Family Development
Location: 1st Street and Cheyenne Ave

STRAIN, %



Specimen Identification			Classification	γ_d	MC%
●	3	4.0	Silty Clayey Sand	104	8



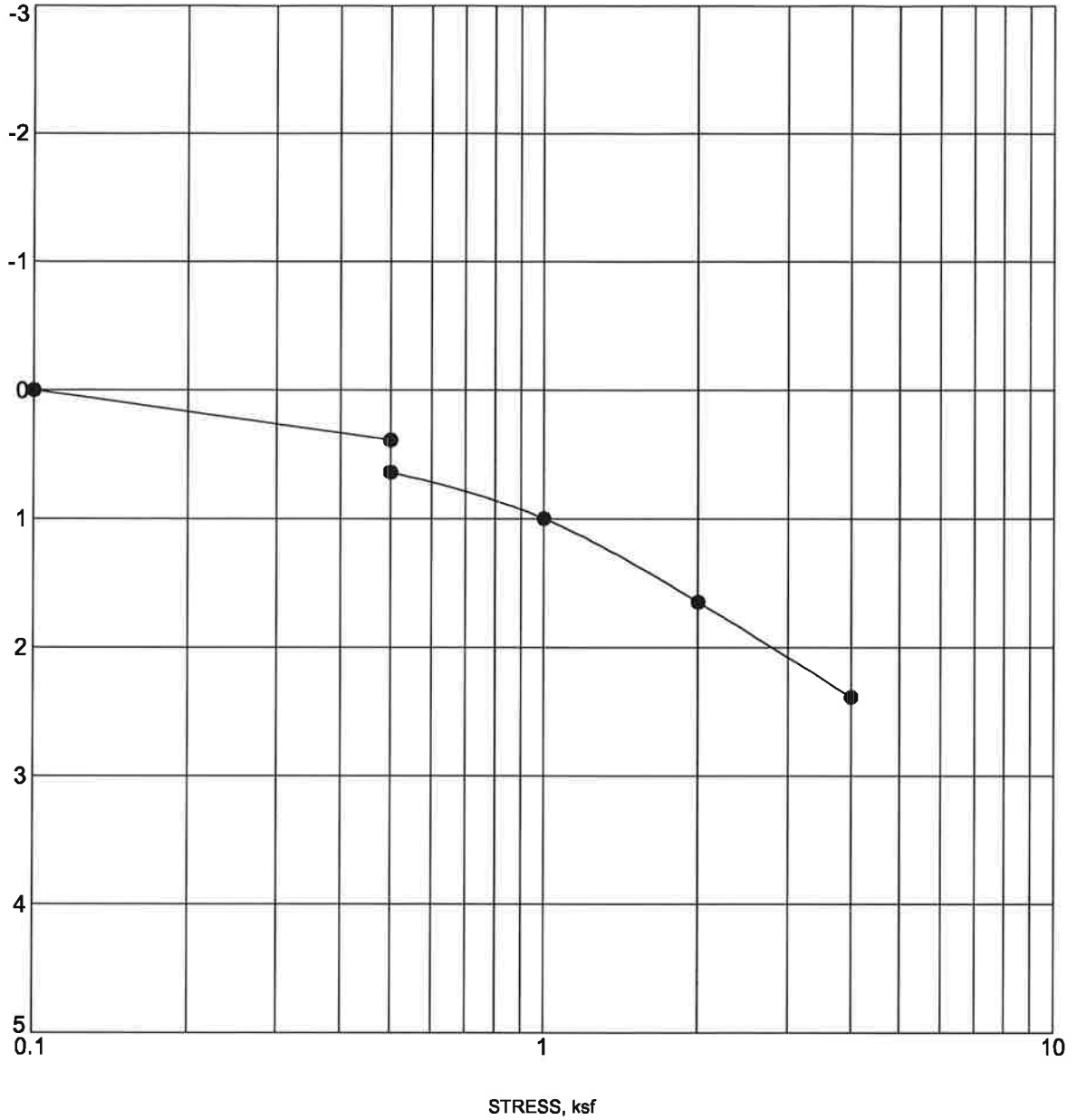
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CONSOLIDATION TEST

Client: Eaton School Distric RE-2 Number: 086-24
Project: Proposed Multi-Family Development
Location: 1st Street and Cheyenne Ave

STRAIN, %



Specimen Identification			Classification	γ_d	MC%
●	4	9.0	Silty Sand with Gravel	105	5



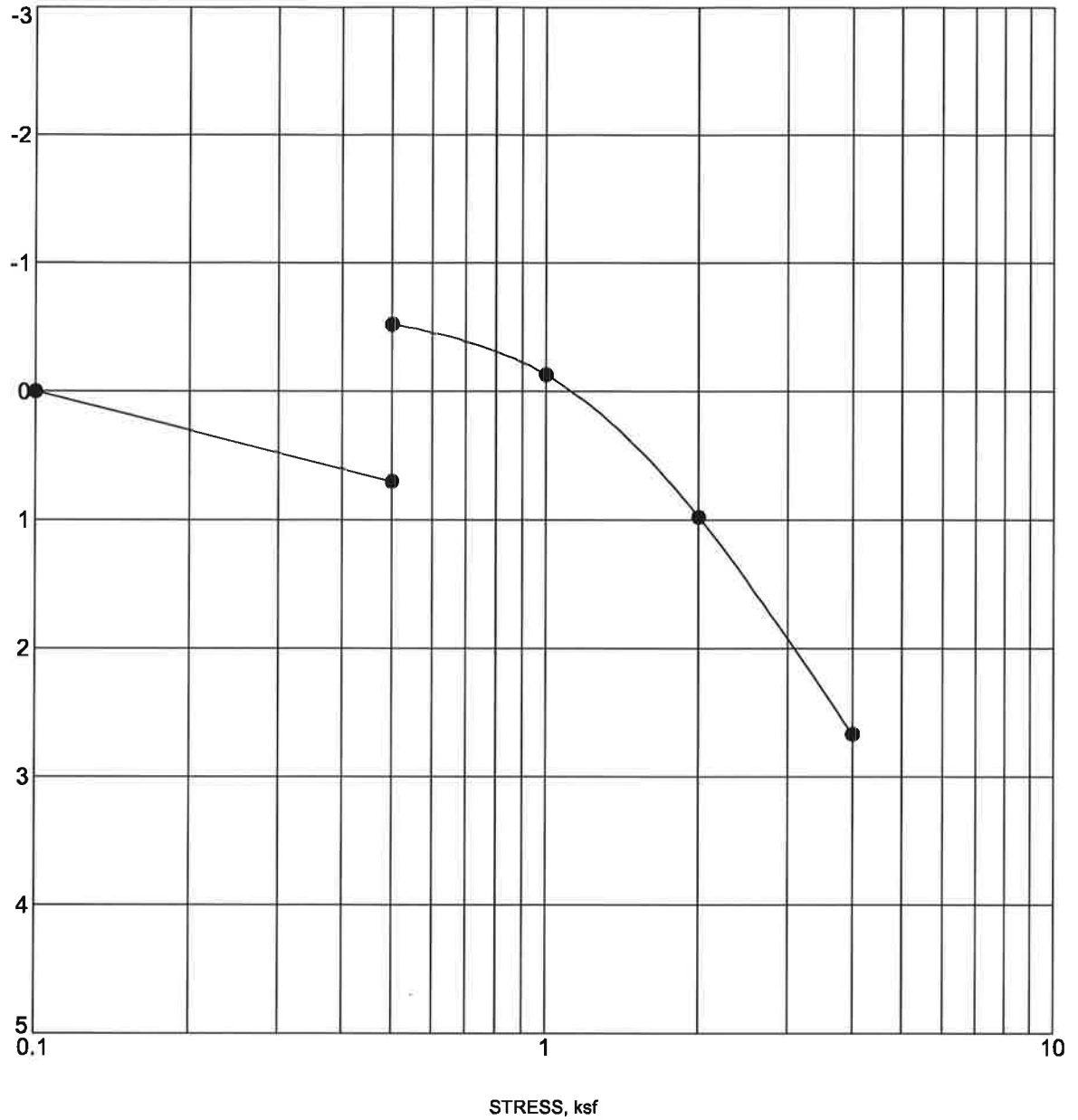
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CONSOLIDATION TEST

Client: Eaton School Distric RE-2 Number: 086-24
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STRAIN, %



Specimen Identification			Classification	γ_d	MC%
●	5	4.0	Silty Clayey Sand	102	11



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