FGMARCHITECTS

LOCKPORT TOWNSHIP FIRE PROTECTION DISTRICT TRAINING GROUNDS STUDY

LOCKPORT TOWNSHIP FIRE PROTECTION DISTRICT

FIRE TRAINING GROUNDS STUDY

SUBMITTED TO:

Lockport Township Fire Protection District
Fire Chief John O'Connor
Email: joconnor@lockportfire.org
19623 W. Renwick Road
Lockport, Illinois 60441

FGM Architects, Inc.
1211 W. 22nd Street, suite 700
Oak Brook, Illinois 60523
630.574.8300

June 2023
FGMA# 23-3640.01

Fire Protection Team
John O'Connor, Fire Chief
Frank Blaskey, Deputy Chief
Ed Rosetto, Deputy Chief
Stephen Beal, Training Director
David Izquierdo, Captain

FGM Architects Team
Jason Estes, AIA – Principal
Andy Jasek, AIA - Principal
Louise Kowalczyk, AIA – Principal
Randy McRoberts

Jason Estes, AIA | Principal
jasone@fgmarchitects.com

Background

The Lockport Township Fire Protection District is looking to develop a new site for fire training purposes. FGM Architects, Inc. (FGMA) was selected by the Lockport Township Fire Protection District to complete a study of the proposed site, develop site diagrams, determine possible phasing options for funding, and develop budgets so the District can master plan their efforts moving forward.

Program

The Fire District and FGMA began meeting in November 2022 and continue to review and develop program through May 2023. Initial discussions were focused on needs and wants, discussing possible future uses and operations. Prioritization of site elements were discussed to focus initial efforts and funding to correspond with the District's budgets.

The program included providing site pavement and circulation for various training drills (extrication, driving, props, boat access, etc.). A main burn tower was included on the site with site circulation. A future training classroom building was included, along with a maintenance division and storage for future. A pond was included on the site for boat, dive, and other training approaches. To accommodate potential future joint training with law enforcement, a future outside long gun range was also planned for. Site utilities, security, and staffing parking were reviewed. Site detention was reviewed, along with soil capacity and composition for a full site study review.

The program and budgets were reviewed with the District project team to ensure that all program requirements were met and that budgets were more aligned with anticipated schedules. Adjustments were made therein to support the District's goals for the training grounds.

Site Diagrams

The final site solution represents the best solutions for all needs, budget, and phasing. It allows for future and flexible spaces for possible training evolutions and scenarios. Included in the diagram are the anticipated phases that correlate to the proposed budgets.

Budget

Once the program was confirmed and the site diagram was completed, conceptual budgets were developed. The conceptual budgets are fully developed project budgets, allowing the District to properly budget for the design, construction, and miscellaneous items for the training grounds project. Included in the budgets are hard construction costs (items that bid out and items that are built by the contractor) and soft construction costs (professional services fees, permits, utility fees and other non-construction elements). The budgets reflect historical construction and bidding data from recent fire station projects. The budgets also include an estimated inflation cost for each year of inaction to allow the District to understand the cost implications of delaying a project within the budgeting process.

Since this is broken into phases for financial reasons, phase one is shown only at this time. But inflation for each year not completed has been included to highlight the impact of non-action. The majority of the work is being completed in Phase 1. Additional phases are training props, fencing, gates, and other components. If a phase is delayed more than 1 year, and additional year of inflation should be included

so that budgets are adequate for anticipated scope.

Recommendation

It is FGMA's recommendation that the District utilize this study to align budgets to proceed with as much scope as possible. It is understood that the District would like to get to an operational status as quickly as possible. The needs of training within the fire service is a growing need. Utilizing out of district training grounds and props puts stress on staffing and funding, while also limiting the actual amount of training that can be completed each year. Having facilities within District will improve operations and staff abilities.

The District should utilize the budgets included to develop capital improvement plans so that this need for the District can become a reality.

Final Report

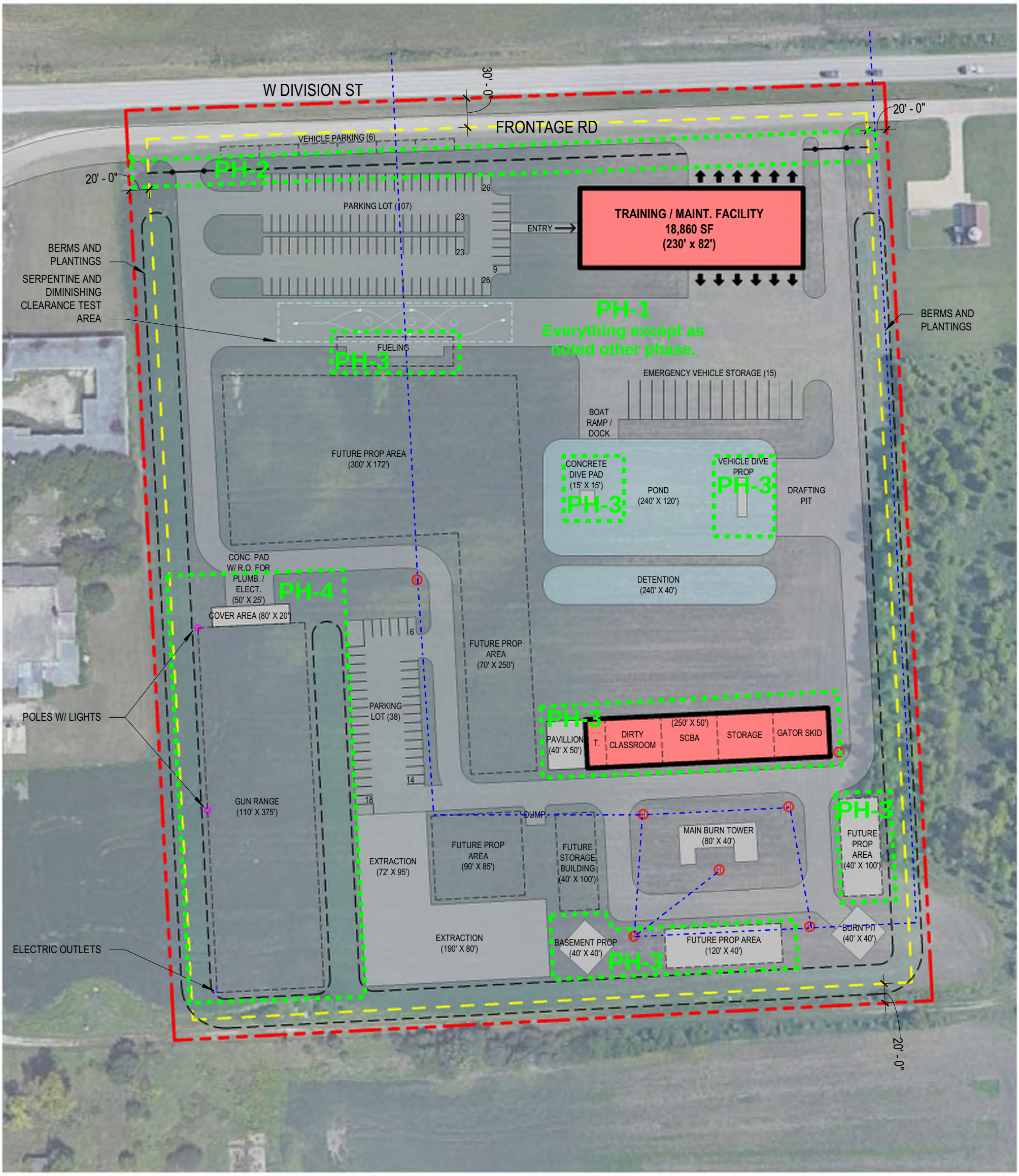
The completed report is included herewith for reference. This developed training study will meet the District's needs very well. This report will allow the District to determine the best financing options available, which would allow the District to move forward into the next step, implementation, when appropriate. FGMA has also provided a fee for the required Architectural and Engineering services to take this into the next stage of a full project, and ultimately a completed training grounds which the District would utilize to better serve their public. When the District is ready to move forward, FGMA would love the opportunity to continue our working relationship and have the ability to help the citizens of the Lockport Township Fire Protection District.

Thank you again for choosing FGM Architects.

LOCKPORT FPD TRAINING GROUNDS

W DIVISION ST, LOCKPORT, IL 60441

LOCKPORT FIRE PROTECTION DISTRICT
Job No. 23-3640.01
Published 05/24/23



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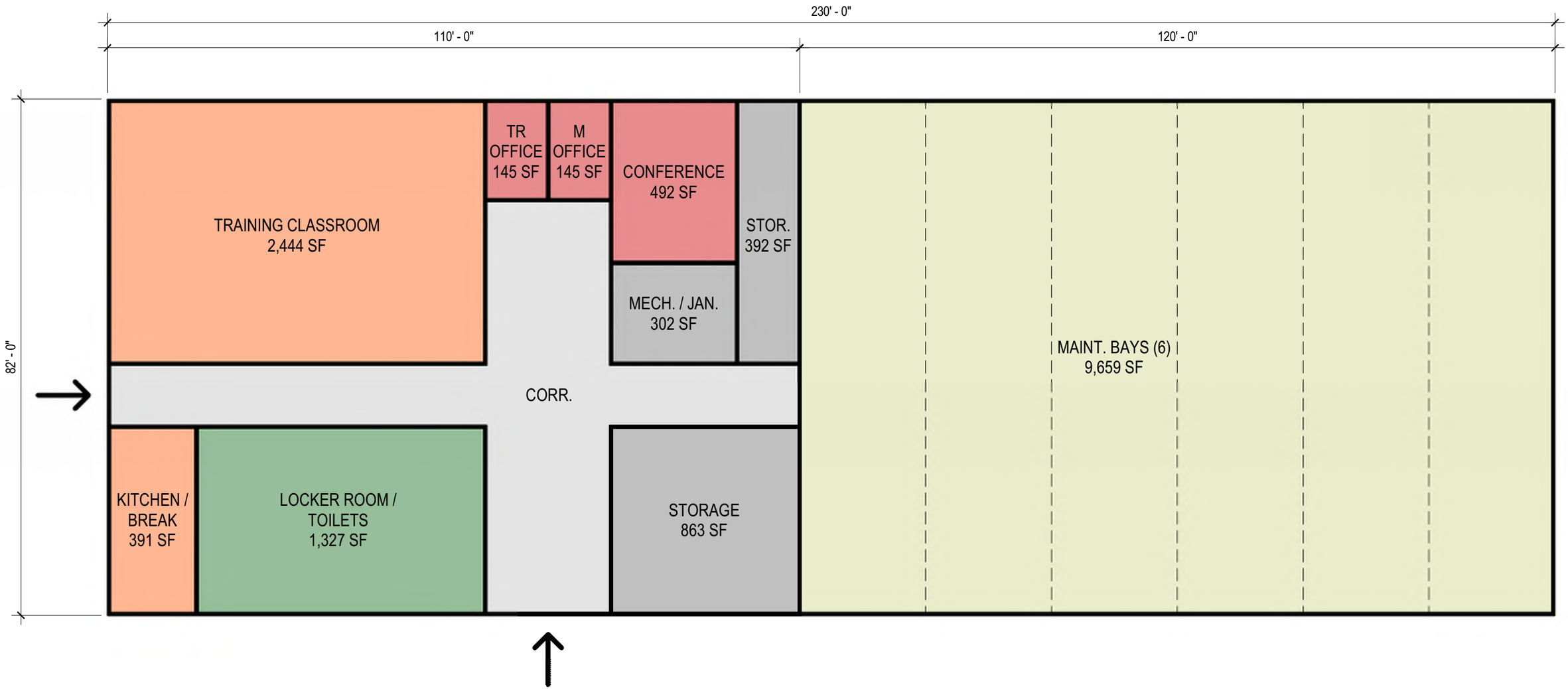
SCALE : 1" = 100' - 0"

SITE PLAN DIAGRAM

fgma

LOCKPORT FPD TRAINING GROUNDS

W DIVISION ST, LOCKPORT, IL 60441



MAINT. / TRAINING FACILITY DIAGRAM

1/16"=1'-0"

0' 8' 16' 32' 64'

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LOCKPORT FIRE PROTECTION DISTRICT
Job No. 23-3640.01

Published 05/24/23

fgma

Lockport Township Fire Protection District

Fire Training Grounds

FGMARCHITECTS

June 12, 2023

Training Grounds Study - Budget

FGMA#: 23-3640.01

	Item	Quantity	Unit	Cost/Unit Low	Cost/Unit High	Construction Cost Low	Construction Cost High	Remarks
1.0	**FIRE TRAINING CONSTRUCTION - PHASE 1**							Majority of site pavement, earthwork, training tower foundations, maint facility, training storage facility, boat launch, drafting pit, utilities, etc.
1.1	Heavy Duty Concrete Pavement	36,300	s.f.	$ 11	$ 14	$ 399,300	$ 508,200	includes building aprons, boat launch, drafting pit, pavement at fuel area/ drivers course. in Phase 1
1.2	Heavy Duty Asphalt Pavement	84,500	s.f.	$ 5	$ 6	$ 422,500	$ 507,000	Includes main roadway, loop drive around tower, etc.
1.3	Gravel Drive Areas	40,800	s.f.	$ 2	$ 3	$ 81,600	$ 122,400	Includes extracation pad, tower area, burn pit area, and dump area.
1.4	Frontage Road Improvements	29,428	s.f.	$ -	$ -	$ -	$ -	No improvements at this time.
1.5	Site Stripping & Grading	180,000	s.f.	$ 0.50	$ 0.75	$ 90,000	$ 135,000	final grades, development of berms
1.6	Fencing	-	l.f.	$ 75	$ 85	$ -	$ -	no fencing at this time
1.7	Tube Foundations for Training Tower	2,500	s.f.	$ 16	$ 20	$ 40,000	$ 50,000	
1.8	Drafting Pit	1	allow			$ 50,000	$ 60,000	dry well fed from pond
1.9	Site Restoration	200,000	s.f.	0.50	0.75	$ 100,000	$ 150,000	berms, drainage, plantings, etc.
1.10	Detention & Filtration infrastructure	15,000	s.f.	$ 11	$ 13	$ 165,000	$ 195,000	
1.11	Pond	28,600	s.f.	$ 5	$ 6	$ 143,000	$ 171,600	Pond depth of 25 feet. No props included in Phase 1
1.12	Main Parking Lot & Rear Parking Lot	55,000	s.f.	$ 3	$ 4	$ 165,000	$ 220,000	asphalt light duty
1.13	Training/ Maintenance Building	18,860	s.f.	$ 270	$ 290	$ 5,092,200	$ 5,469,400	Prefab Metal building, Includes partial masonry front.
1.14	Water Main Loop & Hydrants	2,600	l.f.	$ 80	$ 90	$ 208,000	$ 234,000	includes new service, hydrants, taps, etc.
1.15	New Electrical Service	1,600	l.f.	$ 75	$ 90	$ 120,000	$ 144,000	includes new service, lines, MDP, etc.
1.16	Site Lighting & Power	1	allow			$ 100,000	$ 120,000	either hard wire or solar pole lights, sub panels for power
1.17	**SUB-TRADE TOTAL - PHASE 1**					**$ 7,176,600**	**$ 8,086,600**	
2.0	**GENERAL CONDITIONS AND OH&P**							
2.1	General Contractor General Conditions (5%)					$ 358,830	$ 404,330	
2.2	General Contractor Bonds & Insurance (1.5%)					$ 107,649	$ 121,299	
2.3	General Contractor Overhead and Profit (5%)					$ 358,830	$ 404,330	
3.0	**TOTAL CONSTRUCTION COSTS - PHASE 1**					**$ 8,001,909**	**$ 9,016,559**	
4.0	Project Economy of Scale Savings (10%)					$ (800,191)	$ (901,656)	
5.0	DESIGN AND CONSTRUCTION CONTINGENCY (10%)					$ 800,191	$ 901,656	
6.0	**TOTAL CONSTRUCTION BUDGET - PHASE 1**					**$ 8,001,909**	**$ 9,016,559**	Includes contingency. Assumed construction in 2024
7.0	**Allowances for Items to be Purchased by the Owner**							TBD
7.1	Furniture and Furnishings					$ 152,766	$ 164,082	for Training/ Maintenance Building, 3% of that building's construction cost.
7.2	Training Components					TBD	TBD	training tower, intermodule units, props, etc. - purchased and installed by Owner/ Owner Vendor
7.3	**Total Allowances for Items to be Purchased by the Owner**					**$ 152,766**	**$ 164,082**	

Lockport Township Fire Protection District
Fire Training Grounds

FGMARCHITECTS

June 12, 2023

Training Grounds Study - Budget

FGMA#: 23-3640.01

	Item	Quantity	Unit	Cost/Unit		Construction Cost		Remarks
				Low	High	Low	High	
8.0	**Allowances for Items Fees and Soft Costs**							Incl. Struct, MEP&FP, Civil, Landscape
8.1	Architectural and Engineering Fees (9%)					$ 720,172	$ 811,490	
8.2	Material Testing During Construction					$ 30,000	$ 50,000	
8.3	Printing Costs					$ 2,000	$ 2,500	
8.4	Utility Company Charges (Electric, Gas, Telephone, Water)					$ -	$ -	unknown at this time.
8.5	Moving Costs					TBD	TBD	unknown at this time.
8.6	Utility costs during construction					$ -	$ -	
8.7	**Total Allowances for Fees and Soft Costs**					**$ 752,172**	**$ 863,990**	
9.0	**Owner's Contingency (5%)**					**$ 400,095**	**$ 450,828**	
10.0	**TOTAL PROJECT BUDGET - PHASE 1**					**$ 9,306,942**	**$ 10,495,459**	
11.0	Inflation per annum (4%)					$ 372,278	$ 419,818	1 year of interest. Add 4% for each add. year
11.1	2025 Construction Cost					$ 9,679,220	$ 10,915,278	build in 2025
12.0	**Notes:**							
12.1	The budget is based upon a Phase 1 start 2024, Phase 2 TBD							
12.2	The budget for this project is preliminary and is based on historical information. These costs may vary significantly as the project becomes more fully developed.							
12.3	Estimate excludes: land purchase, premium costs for work done in phases, out of sequence, out of normal working hours, hazardous material removal, foundation obstructions, traffic signalization costs, environmental costs which are unknown at this time, extraordinary site development costs.							
12.4	Project Budgets do not include legal fees or financing costs.							
12.5	Construction Costs are based utilizing a Design-Bid-Build project delivery method.							

Lockport Township Fire Protection District
Fire Training Grounds

FGMARCHITECTS

June 12, 2023

Training Grounds Study - Budget

DRAFT

FGMA#: 23-3640.01

	Item	Quantity	Unit	Cost/Unit Low	Cost/Unit High	Construction Cost Low	Construction Cost High	Remarks
1.0	**FIRE TRAINING CONSTRUCTION - PHASE 2-4**							
1.1	Frontage Road Widening/ Improvements	20,500	s.f.	$ 8	$ 10	$ 164,000	$ 205,000	To improve weights, width, and condition of the road to heavy duty asphalt
1.2	Fencing	900	l.f.	$ 75	$ 85	$ 67,500	$ 76,500	fencing along front property line, includes manual gates
1.3	Training Storage Building	14,670	s.f.	$ 200	$ 250	$ 2,934,000	$ 3,667,500	
1.4	Fueling Depot	1	allow			$ 300,000	$ 400,000	pump count and tank sizes need to be verified
1.5	Future Prop Development	1	allow			TBD	TBD	unknown at this time.
1.6	Long Gun Outdoor Range	79,400	s.f.	$ 20	$ 25	$ 1,588,000	$ 1,985,000	includes berms, backstop, covered shooting position, and potentially futue facilities
1.7	**SUB-TRADE TOTAL - PHASE 2-4**					**$ 3,465,500**	**$ 4,349,000**	
2.0	**GENERAL CONDITIONS AND OH&P**							
2.1	General Contractor General Conditions (5%)					$ 173,275	$ 217,450	
2.2	General Contractor Bonds & Insurance (1.5%)					$ 51,983	$ 65,235	
2.3	General Contractor Overhead and Profit (5%)					$ 173,275	$ 217,450	
3.0	**TOTAL CONSTRUCTION COSTS - PHASE 2-4**					**$ 3,864,033**	**$ 4,849,135**	
4.0	Inflation					$ 463,684	$ 581,896	Inflation for bidding in 2026
5.0	**DESIGN AND CONSTRUCTION CONTINGENCY (10%)**					$ 386,403	$ 484,914	
6.0	**TOTAL CONSTRUCTION BUDGET - PHASE 2-4**					**$ 4,714,120**	**$ 5,915,945**	Includes contingency. Assumed construction in 2023
7.0	**Allowances for Items to be Purchased by the Owner**							TBD
7.1	Furniture and Furnishings					$ 103,965	$ 130,470	for Training Stor Building and props, 3% of construction cost.
7.2	Training Components					TBD	TBD	training tower, intermodule units, props, etc. - purchased and installed by Owner/ Owner Vendor
7.3	**Total Allowances for Items to be Purchased by the Owner**					**$ 103,965**	**$ 130,470**	
8.0	**Allowances for Items Fees and Soft Costs**							Incl. Struct, MEP&FP, Civil, Landscape
8.1	Architectural and Engineering Fees (10%)					$ 386,403	$ 484,914	
8.2	Material Testing During Construction					$ 15,000	$ 20,000	
8.3	Printing Costs					$ 1,200	$ 1,500	
8.4	Utility Company Charges (Electric, Gas, Telephone, Water)					$ -	$ -	unknown at this time.
8.5	Moving Costs					TBD	TBD	unknown at this time.
8.6	Utility costs during construction					$ -	$ -	
8.7	**Total Allowances for Fees and Soft Costs**					**$ 402,603**	**$ 506,414**	
9.0	**Owner's Contingency (10%)**					**$ 386,403**	**$ 484,914**	

Lockport Township Fire Protection District
Fire Training Grounds

FGMARCHITECTS

June 12, 2023

Training Grounds Study - Budget

DRAFT

FGMA#: 23-3640.01

	Item	Quantity	Unit	Cost/Unit		Construction Cost		Remarks
				Low	High	Low	High	
10.0	**TOTAL PROJECT BUDGET - PHASE 2-4**					**$ 5,607,091**	**$ 7,037,742**	
11.0	Inflation per annum (4%)					$ 224,284	$ 281,510	1 year of interest. Add 4% for each add. year
11.1	2024 Construction Cost					$ 5,831,375	$ 7,319,251	build in 2024
12.0	**Notes:**							
12.1	The budget is based upon a Phase 2 start 2026							
12.2	The budget for this project is preliminary and is based on historical information. These costs may vary significantly as the project becomes more fully developed.							
12.3	Estimate excludes: land purchase, premium costs for work done in phases, out of sequence, out of normal working hours, hazardous material removal, foundation obstructions, traffic signalization costs, environmental costs which are unknown at this time, extraordinary site development costs.							
12.4	Project Budgets do not include legal fees or financing costs.							
12.5	Construction Costs are based utilizing a Design-Bid-Build project delivery method.							

Construction & Geotechnical Material Testing, Inc.

60 Martin Lane, Elk Grove Village, Illinois 60007
Telephone (630) 595-1111 ♦ Fax (630) 595-1110

May 23, 2023

Mr. Jason M. Estes, AIA
FGM Architects, Inc.
1211 W. 22nd Street, Suite 700
Oak Brook, Illinois 60523

CGMT Project No. 23G0270

Reference: ***Report of Subsurface Exploration and Geotechnical Engineering Services, Proposed New Training Grounds, Lockport Fire Protection District, Division Street, East of Borio Drive, Lockport, Illinois***

Dear Mr. Estes:

CGMT, Inc. has completed the subsurface exploration and geotechnical engineering analyses for the proposed New Training Grounds to be located at Division Street, East of Borio Drive, in Lockport, Illinois. This report describes the subsurface exploration procedures, laboratory testing, and geotechnical recommendations for project construction. A Boring Location Plan is included in the Appendix of this report along with the Boring Logs performed for the exploration.

We appreciate this opportunity to be of service to the Lockport Fire Protection District and FGM Architects, Inc. during the design phase of this project. If you have any questions with regard to the information and recommendations presented in this report, or if we can be of further assistance to you in any way during the planning or construction of this project, please do not hesitate to contact us.

Respectfully,

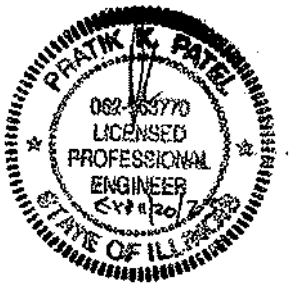
CONSTRUCTION AND GEOTECHNICAL MATERIAL TESTING, INC.

Pratik Patel, P.E.
Vice President

3pc: Encl.

REPORT OF

SUBSURFACE EXPLORATION AND
GEOTECHNICAL ENGINEERING SERVICES



NEW TRAINING GROUNDS
LOCKPORT FIRE PROTECTION DISTRICT
DIVISION STREET, EAST OF BORIO DRIVE
LOCKPORT, ILLINOIS

CGMT PROJECT NO. 23G0270

FOR

FGM ARCHITECTS, INC.
OAK BROOK, ILLINOIS

MAY 23, 2023

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Construction & Geotechnical Material Testing, Inc. (CGMT) has completed your subsurface exploration and geotechnical engineering project. The subsurface conditions encountered during our exploration and CGMT's conclusions and recommendations are summarized below. This summary should not be considered apart from the entire text of the report with all the qualifications and considerations mentioned herein. Details of our conclusions and recommendations are discussed in the following sections and in the Appendix of this report.

The project site is located at Division Street, East of Borio Drive in Lockport, Illinois. A total of sixteen (16) exploratory borings, B-1 through B-16, were performed for this project. The soil conditions encountered at the borings performed at the site are summarized as follows.

Approximately 8 to 22 inches of topsoil was encountered at the ground surface at the boring locations. Beneath the topsoil, the borings encountered dark brown and brown, stiff to hard silty clay and sandy clay fill soils that extended to depths of approximately 3½ to 6 feet below the existing ground surface below the existing ground surface. The clay fill soils were underlain by brown, dense gravel fill soils that extended to a depth of approximately 8½ feet below grade, where brown, stiff sandy clay fill that extended to a depth of approximately 13½ feet below grade. Beneath the fill, the borings encountered natural, stiff to hard silty clay soils that continued to the boring termination depths of approximately 20 feet below the existing ground surface. Boring B-7 encountered a layer of brown, medium dense silt between depths of approximately 8½ to 13½ feet below grade.

If available, records of compaction obtained during the mass earthwork phase of the project should be provided to CGMT for our review. However, if records are not available, the existing fill soils appear to have been placed with some measure of control of moisture content and density and it should be feasible to support floor slabs, pavements, and new fill.

If the Lockport Fire Protection District is willing to accept some risk of total and differential settlement and associated long term maintenance, the existing fill material similar to those encountered in the borings extending to depths of approximately 3½ to 13½ feet below the surrounding grade may remain in place below floor slabs and pavements but the subgrade must pass a proofroll under the observation of a CGMT geotechnical engineer or soils technician. However, if the Lockport Fire Protection District is unwilling to accept the risk, then the existing fill soils should be completely removed and replaced with new engineered fill.

Based on the anticipated structural loading and subsurface conditions, conventional shallow foundation systems consisting of spread and/or continuous footings, extended through existing fill soils (encountered in the borings to depths of approximately 3½ to 13½ feet below the existing ground surface) bearing on the natural, stiff to hard silty clay and sandy clay is considered feasible and appropriate to support the proposed training center improvements. For footings, extended through existing fill soils, bearing at depths of at least 3½ feet below grade on natural, stiff to hard silty clay and sandy clay or new, properly compacted engineered fill, we recommend a maximum net allowable soil bearing pressure of 3,000 psf be used to proportion the footings.

We recommend that the excavation of building foundations be monitored full-time by a CGMT geotechnical engineer or his representative to verify that the exposed subgrade materials and the soil bearing pressure will be suitable for the proposed structure.

Report Prepared By:

Nicholas Wolff

Nicholas P. Wolff, P.E.
Geotechnical Engineer

Report Reviewed By:

Pratik Patel

Pratik K. Patel, P.E.
Vice President

1
PROJECT OVERVIEW

Introduction

This report presents the results of our subsurface exploration and engineering services for the proposed new training grounds for the Lockport Fire Protection District in Lockport, Illinois. A General Location Plan included in the Appendix of this report, shows the approximate location of this project.

Project Description

ITEM	DESCRIPTION
Site Layout	See Boring Location Diagram in the Appendix
Proposed Construction	The new fire station training facility will include a single story, CMU framed fire station building covering 18,860 square feet, training/maintenance facility, burn tower, and several other training accessories.
Structural Loads	Max. column loads: 200 kips (Anticipated); Max. wall loads: 4 kips per lineal foot (Anticipated)
Grading and Existing Site Considerations	We estimate less than 2 to 3 feet of grade changes will be necessary to establish final site grades.
Ancillary Improvements	Parking for several passenger vehicles, drive areas and a central retention area are also planned.

Scope of Work

The conclusions and recommendations contained in this report are based on the soil borings performed in the vicinity of the proposed building and pavement areas, and associated laboratory testing of selected soil samples. The scope of the subsurface exploration included the following.

Number of Borings	Depth (feet)
16	20

The results of the soil borings, along with a Boring Location Plan showing the approximate locations where the borings were performed, are included in the Appendix of this report. Once the samples were returned to our laboratory we laboratory tests on selected representative soil samples from the borings to evaluate pertinent engineering properties, and, we analyzed the field and laboratory data to develop appropriate engineering recommendations.

The purpose of this report is to provide information and geotechnical engineering recommendations with regard to:

- Subsurface Soil and Groundwater Conditions
- Seismic Considerations
- Site Preparation and Earthwork
- Foundation Design and Construction
- Floor Slab Design and Construction
- Pavement Design and Construction

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EXPLORATION RESULTS

Site Description

ITEM	DESCRIPTION
Project Location	The project site is located on the south side of Division Street, approximately 3,000 east of Borio Drive, in Lockport, Illinois.
Existing Site Improvements	At the time of our exploration, the project site was an agricultural field.
Existing Topography	The site is rolling with the lowest site grades located at the southwest corner of the project site. Site grades across the site ranged from approximately 624 feet down to 619 feet.

Soil Conditions

A total of sixteen (16) borings, B-1 through B-16 were performed for this project. The subsurface conditions encountered at the borings performed at the site can be summarized as follows.

Approximately 8 to 22 inches of topsoil was encountered at the ground surface at the boring locations. Beneath the topsoil, the borings encountered dark brown and brown, stiff to hard silty clay and sandy clay fill soils that extended to depths of approximately 3½ to 6 feet below the existing ground surface below the existing ground surface. The clay fill soils were underlain by brown, dense gravel fill soils that extended to a depth of approximately 8½ feet below grade, where brown, stiff sandy clay fill that extended to a depth of approximately 13½ feet below grade. Beneath the fill, the borings encountered natural, stiff to hard silty clay soils that continued to the boring termination depths of approximately 20 feet below the existing ground surface. Boring B-7 encountered a layer of brown, medium dense silt between depths of approximately 8½ to 13½ feet below grade.

SOILS	SOIL CHARACTERISTICS
Silty Clay & Sandy Clay (Existing Fill)	Unconfined Compressive Strengths: 1.0 to 4.5+ tsf Dry Density Determinations: 89.6 to 105.3 pcf Moisture Contents: 13.3 to 26.4 percent
Gravel (Existing Fill)	Dense; 36 blows per foot
Silty Clay & Sandy Clay (Existing Fill)	Unconfined Compressive Strengths: 1 to 4.5+ tsf Moisture Contents: 10.5 to 22.1 percent
Silt (Natural)	Medium dense; 10 blows per foot

The specific soil types observed at the borings are noted on the boring logs, enclosed in the Appendix.

Groundwater Observations

Observations for groundwater were made during sampling and upon completion of the drilling operations at the boring locations. In auger drilling operations, water is not introduced into the boreholes, and the groundwater position can often be obtained by observing water flowing into or out of the boreholes. Furthermore, visual observation of the soil samples retrieved during the auger drilling exploration can often be used in evaluating the groundwater conditions. Groundwater levels were observed during drilling and immediately the completion of drilling. Groundwater measurements are summarized in the table below.

BORINGS	GROUNDWATER LEVELS (FEET)	
	DURING DRILLING	IMMEDIATELY AFTER COMPLETION
B-1 through B-4	6 to 13.5	3.5 to 6
B-5 through B-16	None	None

Glacial till soils in the Midwest frequently oxidize from gray to brown above the level at which the soil remains saturated. The seasonal high water table is often interpreted to be near this zone of color change. Based on the results of this exploration, the seasonal high water table may be located at depths of approximately 6 to 13½ feet below current grade.

More definitive evidence of prevailing groundwater levels could be obtained through the use of groundwater monitoring wells, which CGMT could install and monitor if requested.

It should be noted that the groundwater level can vary based on precipitation, evaporation, surface run-off and other factors not immediately apparent at the time of this exploration. Surface water runoff will be a factor during general construction, and steps should be taken during construction to control surface water runoff and to remove any water that may accumulate in the proposed excavations as well as floor slab and pavement areas. Precipitation generally varies seasonally. To assist in anticipating groundwater fluctuations changes throughout the year, average monthly precipitation is provided in the table below. Average precipitation levels were obtained from wunderground.com.

Seasonal Precipitation													
Month	January	February	March	April	May	June	July	August	September	October	November	December	Total
Normal Precipitation (inches)	1.73	1.79	2.50	3.38	3.68	3.45	3.70	4.90	3.21	3.15	3.15	2.25	36.89

Seismic Zone

Based on the 2015 International Building Code, Table 1615.1.1 Site Class Definitions, the site soils can be characterized as Site Class D. Site Class D is described as Stiff Soil Profile for the top 100 ft of the site soil profile. Since we drilled to a maximum depth of 20 feet for this exploration, based on our experience with the soils in this area, the available geologic maps and following the direction of IBC 2015 when there are no borings to 100 feet deep, it is our opinion the site would be defined as Site Class D.

CGMT also calculated the spectral response factors based on the site class as well as the latitude and longitude of the project location using United States Geological Survey (USGS) seismic calculator software. The calculated values are presented in the table below.

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Seismic Design Criteria					
Lockport FPD Training Grounds					
Lockport, Illinois					
Latitude	41.580468	Longitude	-88.105588	Site Class	D
S_s	0.160g	S_{MS}	0.255g	S_{DS}	0.170g
S_1	0.068g	S_{M1}	0.164g	S_{D1}	0.110g

5
ANALYSIS AND RECOMMENDATIONS

Overview

The following recommendations have been developed on the basis of the previously described project characteristics and subsurface conditions encountered. If there are any changes to the project characteristics or if different subsurface conditions are encountered during construction, CGMT should be consulted so that the recommendations of this report can be reviewed.

A summary of the results of the exploration are provided in the table below.

Preliminary Bearing Table

Boring	Boring Depth (feet)	Depth to Groundwater (feet)		Approximate Depth to Soils Suitable for a Net Allowable Bearing Pressure of 3,000 psf*
		During Drilling	After Completion	
B-1	20	13.5	12.5	3.5
B-2	20	6	10	6
B-3	20	13	12	6
B-4	20	13.5	15	3.5
B-5	20	None	None	3.5
B-6	20	None	None	3.5
B-7	20	None	None	3.5
B-8	20	None	None	3.5
B-9	20	None	None	3.5
B-10	20	None	None	3.5
B-11	20	None	None	3.5
B-12	20	None	None	3.5
B-13	20	None	None	3.5
B-14	20	None	None	3.5
B-15	20	None	None	13.5
B-16	20	None	None	3.5

* To be used a minimum of 3½ feet below adjacent outside grade.

Subgrade Preparation and Engineered Fill

Subgrade Preparation

Initial subgrade preparation should consist of complete stripping/removal of topsoil, asphalt pavement course, existing base course materials, vegetation, and any other soft or unsuitable/deleterious materials from the location of the new FPD training grounds, as well as, pavement areas. Unsuitable materials, such as topsoil/buried topsoil or organic soils, should either be stockpiled for later use in landscaping fills or placed in approved disposal areas either on-site or off-site.

We recommend that the project geotechnical engineer or his representative should be on site to monitor stripping and site preparation operations and observe that unsuitable soils have been satisfactorily removed and to observe proofrolling.

Due to the widely spaced distribution of borings combined with the potential for soil disturbance, the accuracy of topsoil thicknesses based upon measurements at the boring locations is limited. In addition, the density of the surface soils also may impact the measured topsoil thickness. As such, the thicknesses reported on the boring logs should be considered approximate. To provide improved estimates for stripping volumes, CGMT recommends a supplemental topsoil survey be performed.

The presence of field tiles should be considered when developing plans and specifications. Where field tiles are encountered, we recommend that they be rerouted to a storm sewer system or properly abandoned upgradient from the site. Field tiles in new building and pavement areas should be removed or grouted.

After removal of unsuitable/deleterious materials and stripping to the desired grade, and prior to fill placement, we recommend the stripped/exposed subgrades be observed by an experienced geotechnical engineer or his authorized representative at the time of construction in order to aid in identifying localized soft/loose or unsuitable materials which should be removed. Proofrolling using a loaded dump truck having an axle weight of at least 10 tons, may be used at this time to aid in identifying localized soft or unsuitable material which should be removed. Any soft or unsuitable materials encountered during proofrolling should be compacted in place or removed and replaced with an approved backfill compacted to the criteria given below. Prior to proofrolling, pavement and floor slab areas that will receive less than 1 foot of new fill, should be scarified to a depth of about 9 inches, moisture conditioned, and recompacted as recommended below.

If available, records of compaction obtained during the mass earthwork phase of the project should be provided to CGMT for our review. However, if records are not available, the existing fill soils appear to have been placed with some measure of control of moisture content and density and it should be feasible to support floor slabs, pavements, and new fill.

If the Lockport Fire Protection District is willing to accept some risk of total and differential settlement and associated long term maintenance, the existing fill material similar to those encountered in the borings extending to depths of approximately 3½ to 13½ feet below the surrounding grade may remain in place below floor slabs and pavements but the subgrade must pass a proofroll under the observation of a CGMT geotechnical engineer or soils technician. However, if the Lockport Fire Protection District is unwilling to accept the risk, then the existing fill soils should be completely removed and replaced with new engineered fill.

During final preparation of subgrades, a smooth drum roller is often used to provide a flat surface and provide for better drainage to reduce the negative impact of rain events. Due to the relative sensitivity of the silty clay and sandy clay soils, we recommend that these materials be static rolled (no vibrations) to reduce the potential for subgrade soil disturbance. We also recommend crowning the subgrade to provide positive drainage off the building and pavement area subgrades.

Engineered Fill

Where new fill material is required for backfill or to otherwise reach the design subgrade elevation beneath slabs-on-grade and pavements, we recommend that engineered fill be used. Any soil placed as engineered fill should be an approved material, free of organic matter or debris, be a non-frost susceptible soil, and have a liquid limit and plasticity index less than 40 and 15, respectively. The project geotechnical engineer should be consulted to determine the suitability of off-site/on-site materials for use as engineered fill, prior to use or placement. We do not recommend the use of 3-inch stone as engineered fill to backfill undercuts, particularly under floor slabs and foundations. Fill materials containing large voids are more susceptible to future movement that may become unstable resulting in excessive and variable settlement.

Fill should be placed in lifts not exceeding 8 inches in loose thickness, moisture conditioned to within 2 percent of the optimum moisture content, and compacted to at least 95 percent of the maximum dry density obtained in accordance with ASTM Specification D 1557, Modified Proctor Method. Fill placed below footing base elevations should be compacted to at least 95 percent of the material's modified Proctor maximum dry density (ASTM D 1557). Engineered fill placed to support foundations should extend 1 foot beyond the outside edges of the footings and from that point outward laterally 1 foot for every 2 feet of fill thickness below the footings. Laboratory proctor tests should be performed on fill materials to determine the maximum dry density and optimum moisture content. A shrinkage factor of 15 percent can be assumed for estimating earthwork quantities for bidding purposes.

We recommend suitable silty clays used to raise the grade or backfill undercuts should be compacted with a sheepsfoot roller. Granular engineered fill should be compacted with a smooth drum roller or adequate heavy vibratory plate. Moisture control during earthwork operations, including the use of disking or appropriate drying equipment and techniques, should be expected.

In-place density tests should be performed with a minimum of 1 test per 2,000 square feet of fill area for each lift of fill placed. We recommend that the placement of engineered fill be monitored full-time by CGMT representative and in-place density tests should be performed to verify the adequacy of the compaction for each lift of fill placed.

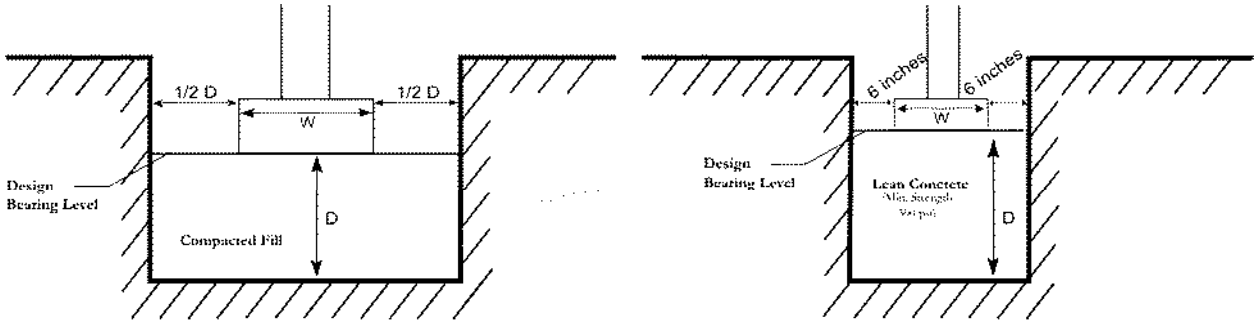
Footing Foundations

Based on the anticipated structural loading and subsurface conditions, conventional shallow foundation systems consisting of spread and/or continuous footings, extended through existing fill soils (encountered in the borings to depths of approximately 3½ to 13½ feet below the existing ground surface) bearing on the natural, stiff to hard silty clay and sandy clay is considered feasible and appropriate to support the proposed training center improvements. For footings, extended through existing fill soils, bearing at depths of at least 3½ feet below grade on natural, stiff to hard silty clay and sandy clay or new, properly compacted engineered fill, we recommend a maximum net allowable soil bearing pressure of 3,000 psf be used to proportion the footings.

To reduce the potential for foundation bearing failure and excessive settlement due to local shear or "punching" action, we recommend that continuous footings have a minimum width of 18 inches and that isolated column footings have a minimum lateral dimension of 30 inches. In addition, footings should be placed at a depth to provide adequate frost cover protection. We recommend the footings be placed at a minimum depth of 3½ feet below finished grade.

We recommend that the excavation of building foundations be monitored on a full-time basis by a CGMT geotechnical engineer or his representative to verify that the exposed subgrade materials and the soil bearing capacity will be suitable for the proposed building and is consistent with the boring log information obtained during the geotechnical exploration.

The contractor should be prepared to undercut/overexcavate and extend the footings to soils of adequate bearing capacity. As an alternative, after overexcavation and removal of weaker/low bearing capacity soils or unsuitable soils, the foundation subgrade can be raised using compacted engineered fill or lean concrete to a minimum frost depth of 3½ feet below final exterior grade. Engineered fill should be compacted to a minimum of 95 percent of the maximum dry density as discussed in the **Subgrade Preparation and Engineered Fill** section. The zone of the engineered fill placed below the foundations should extend 1 foot beyond the outside edges of the footings and from that point, outward laterally 1 foot inches for every 2 feet of fill thickness below the footing. The overexcavation and backfill procedure is depicted in the figure below. If lean concrete is used to replace weaker/low bearing soils or unsuitable soils, no lateral overexcavation will be necessary, but the excavation should be 1 foot wider than the footing (6 inches on each side).



Settlement of the conventional shallow foundations, designed in accordance with our recommendations presented in this report, is expected to be within tolerable limits for the proposed building. For footings, extended through existing fill soils, placed on natural, stiff to hard silty clay, sandy clay, or properly compacted engineered fill and designed as discussed above, maximum total settlement is expected to be in the range of 1 inch or less. These settlement values are based on our engineering experience with the soil and the anticipated structural loading, and are to guide the structural engineer with his design.

Floor Slab Design

For the design and construction of the new building slabs-on-grade for the proposed building, we recommend that all existing vegetation, topsoil or organic soils, and any unsuitable/deleterious materials should be removed and replaced with compacted engineered fill as discussed in the **Site Preparation and Engineered Fill** section. If the removal is performed in accordance with these recommendations, we anticipate floor slabs for the structures will be supported on stable and approved subgrades consisting of silty clay, or on new engineered fill.

It is assumed that the existing floor slab subgrade has performed satisfactorily during the proofroll discussed in the Subgrade Preparation subsection, even though existing fill soils were encountered to depths of 3½ to 13½ feet. Provided that the floor slab subgrade passes a proofroll, the risk of excessive settlement is low. However, if the floor slab subgrade does not pass the proofroll, some undercutting and placement of controlled backfill will be required.

We recommend that floor slabs be underlain by a minimum of 6 inches of granular material having a maximum aggregate size of 1½ inches and no more than 2 percent of fines. Prior to placing the granular material, the floor subgrade soil should be properly compacted, proofrolled, and free of standing water, mud, and frozen soil. For design of Portland cement concrete slabs-on-grade, a modulus of subgrade reaction (k) of 100 pounds per cubic inch (pci) can be used for slabs constructed on subgrade prepared as discussed herein.

A properly designed and constructed capillary break layer can often mitigate the need for a moisture retarder and can assist in more uniform curing of concrete. If a vapor retarder is considered to provide additional moisture protection, special attention should be given to the surface curing of the slabs to reduce uneven drying of the slabs and associated cracking and/or slab curling. The use of a blotter or cushion layer above the vapor retarder can also be considered for project specific reasons. Please refer to ACI 302.1R96 *Guide for Concrete Floor and Slab Construction* and ASTM E 1643 *Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs* for additional guidance on this issue.

We recommend that the floor slab be isolated from the foundation footings so differential settlement of the structure will not induce shear stresses on the floor slab. Also, in order to reduce the crack width of any shrinkage cracks that may develop near the surface of the slab, we recommend mesh reinforcement as a minimum be included in the design of the floor slab. Temperature and shrinkage reinforcements in slabs on ground should be positioned in the upper third of the slab thickness. The Wire Reinforcement Institute recommends the mesh reinforcement be placed 2 inches below the slab surface or upper one-third of slab thickness, whichever is closer to the surface. Adequate construction joints, contraction joints and isolation joints should also be provided in the slab to reduce the impacts of cracking and shrinkage. Please refer to ACI 302.1R96 *Guide for Concrete Floor and Slab Construction* for additional information regarding concrete slab joint design.

Pavements

For the design and construction of exterior pavements, we recommend that topsoil and otherwise unsuitable soils be removed before construction of new pavements and that new pavements will be supported by stable and approved subgrades consisting of silty clay or on new engineered fill.

It is assumed that the existing pavement subgrade has performed satisfactorily during the proofroll discussed in the **Subgrade Preparation** subsection, even though existing fill soils were encountered to depths of 3½ to 13½ feet. Provided that the pavement subgrade passes a proofroll, the risk of excessive settlement is low. However, if the pavement subgrade does not pass the proofroll, some undercutting and placement of controlled backfill will be required.

We anticipate the new pavement will be constructed of asphaltic concrete or Portland cement concrete. We expect that the proposed parking lot will generally be utilized for light duty traffic, and the driveways and loading and unloading areas be utilized for light to medium duty traffic. Heavy traffic loads would be anticipated for areas near any dumpsters where garbage trucks would often cross. We recommend the pavement subjected to light traffic be underlain by a minimum of 8 inches of base course granular material, similar to Illinois Department of Transportation gradation CA-6.

Assuming the pavement subgrade will consist predominantly of the cohesive soils and new fill prepared in accordance with the recommendations given in this report, an estimated IBR value of 3 could be used in proportioning a flexible pavement section. Similarly, an estimated modulus of subgrade reaction value equal to 100 pounds per cubic inch could be used for design of rigid concrete pavement sections. A Subgrade Stability Rating (SSR) rating of (Poor) should be used for pavement design. Concrete pavements should be air-entrained Portland cement concrete with a minimum compressive strength of 4,000 psi and a minimum flexural strength of 650 psi. Concrete strength requirements are outlined in article 1020.04 of the Standard Specifications for Road and Bridge Construction, effective April 1, 2016.

Some typical pavement sections used in this region of the country are given below which could be considered for preliminary estimating purposes. Other sections can also be considered. These sections assume a low volume of light vehicle loads (automobiles, vans, pickups, etc.). They should also be considered minimum thicknesses, and, as such, periodic maintenance should be anticipated. Final design sections should consider details such as final grades, traffic loadings, traffic volumes, the desired design life and any local, county or city codes. If you wish, we would be pleased to perform a detailed pavement section design using AASHTO or Asphalt Institute procedures when this information is available. It should also be noted that these sections do not consider if the binder course will be subject to construction vehicle traffic for an extended period of time. Some distress to the binder course and aggregate base could occur, if this is the case.

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TYPICAL PAVEMENT SECTIONS*

	Light Duty (Parking Lots)	Heavy Duty ** (Drives)
Portland Cement Concrete	5 inches	6 inches
Full Depth Asphalt	5.5 inches	7 inches
Combined Section:		
Asphalt	3 inches	4 inches
Crushed Stone Base Course	8 inches	10 inches

* All materials should meet the current Illinois Department of Transportation Standard Specifications for Road and Bridge Construction requirements.

** In areas of anticipated heavy traffic, delivery trucks, or concentrated loads, a minimum concrete thickness of 7 inches is recommended but should be evaluated further when loading conditions are known.

Minimum design requirements for hot-mix asphalt (HMA) shall follow Article 1030.05 of the Standard Specifications for Road and Bridge Construction, effective April 1, 2016. During asphalt pavement construction, the wearing and leveling course should be compacted to a minimum of 93 percent of the theoretical density value. Prior to placing the granular material, the pavement subgrade soil should be properly compacted, proofrolled, and free of standing water, mud, and frozen soil.

An important consideration with the design and construction of pavements is surface and subsurface drainage. Where standing water develops, either on the pavement surface or within the base course layer, softening of the subgrade and other problems related to the deterioration of the pavement can be expected. Furthermore, good drainage should reduce the possibility of the subgrade materials becoming saturated over a long period of time. We would be pleased to be of further assistance to you in the design of the project pavements by providing additional recommendations during construction of the project.

Periodic maintenance of pavements should be anticipated. The subgrade parameters provided in this report consider that significant changes in the subgrade moisture content do not occur. To reduce the potential for changes in subgrade moisture, all paved areas should be sloped to provide rapid drainage of surface water and to drain water away from the pavement edges. Water that is allowed to pond on or adjacent to the pavement can saturate and soften the subgrade soils and subsequently accelerate pavement deterioration.

Granular base or subbase materials directly below pavement sections can also collect infiltrated surface water and soften the subgrade as well as increase the effects of frost action, both of which can be detrimental to pavements. For these reasons, where granular materials are used over a cohesive soil subgrade or where the groundwater level is within 3.5 feet of finished pavement subgrade, we recommend that consideration be given to using pavement underdrains hydraulically connected to the granular base or subbase to improve the pavement performance and extend its service life. Underdrains should be installed at 300 to 500 feet intervals and at low points in the roadway profile. Pipe underdrains shall be installed according to Check Sheet #19 of the Supplemental Specifications and Recurring Special Provisions, effective January 1, 2015.

Stormwater Detention Ponds

The soils encountered in most borings generally consisted of silty clay. A clay liner will be needed if significant sandy textured soils are encountered during pond excavation. Recommendations for construction of low permeability clay liners are included below. For the most part, reworking of the exposed clay soils on the sides and bottom of the pond should develop a satisfactory liner.

The silty clay soils encountered at the site generally appear suitable for liner material provided they include relatively small amounts of sand and silt. We would recommend that further evaluation of the on-site soils (or any off-site borrow materials) for use as liner material be performed at the time of construction.

We recommend that compacted low permeability clay liners have a minimum thickness of 24 inches. For construction of the clay liners, it may be necessary to bench side walls of the ponds horizontally, with 1 to 3-foot vertical steps. This would allow horizontal placement and compaction of the liner section. However, adequate compaction for the purpose of detention is probably possible for cohesive fill placed in lifts parallel to the cut slope. Permanent slopes should be constructed at 3(H) on 1(V) or flatter, and erosion control measures should also be used.

Suitable low permeability clay liner material should be placed horizontally in loose lifts of 9 inches or less and compacted to a minimum of 93 percent of the material's maximum modified Proctor dry density (ASTM D-1557). Formation of the liner in three or more lifts would be conducive to constructing a low permeability liner. Clay liner materials should be placed and compacted at moisture contents within about 0 to +4 percent of the material's optimum moisture content. The moisture contents of the liner materials should be maintained to avoid desiccation and shrinkage cracking of the clay liner.

In general, infiltration rates in soil decrease during rain events as the pore spaces between soil grains fill with stored water. The infiltration rates provided here are estimations based on relevant literature and our empirical observations with local soils. On site testing, with the use of a double-ring infiltrometer for example, would provide better site-specific infiltration estimates. For clays, initial estimated infiltration rates may be on the order of ½ inch per hour but would drop to the saturated steady-state infiltration rate of approximately 0.1 inches per hour within 30 minutes to 1 hour, or less in the case of well compacted or desiccated subgrades.

General Construction Considerations

We recommend that the subgrade preparation, installation of the foundations, and construction of slabs-on-grade be monitored by a CGMT geotechnical engineer or his representative. Methods of verification and identification such as proofrolling, DCP testing and hand auger probe holes will be necessary to further evaluate the subgrade soils and identify unsuitable soils. The contractor should be prepared to overexcavate footing excavations at isolated locations. We recommend that excavations of new foundations be monitored on a full-time basis by a CGMT geotechnical engineer or his representative to verify that the soil bearing pressure and the exposed subgrade materials will be suitable for the proposed training grounds and are consistent with the boring log information obtained during this geotechnical exploration. We would be pleased to provide these services.

Since localized areas of soft/unsuitable soils may be present below the bearing elevation of foundations, we recommend that hand-auger borings be performed to at least half the footing width, or a minimum of 3 feet below each isolated column footing and to at least 2 feet below continuous footings. Hand auger borings should be performed at each column footing and at approximately 20-foot intervals along continuous footings to verify the suitability of the soils to support the recommended maximum net allowable bearing pressure. If soft/unsuitable soils are encountered, the footings should be extended until suitable bearing soils are encountered or the unsuitable soils should be removed beneath the base of the footing and replaced with compacted engineered fill or lean concrete. The foundation contractor should expect undercutting/overexcavation or removal of unsuitable material without delay and replacement with engineered fill at the time of foundation excavation/construction.

All loose or soft soils in the subgrade or foundation excavation areas should be densified or removed before placing any concrete or fill. Accumulated water or runoff water at the base of the foundation excavations should also be promptly removed. Groundwater seepage is anticipated not to be a major factor during foundation excavations or undercutting. If encountered, we believe sump and pump system should be adequate to remove accumulated seepage from the bottom of excavations prior to placement of concrete or crushed stone. Concrete should not be placed in water. To reduce the potential for frost heave related problems; forms should be used prior to the placement of foundation concrete.

Exposure to the environment may weaken the soils at the foundations bearing level if the excavations remain open for too long a time. Therefore, foundation concrete should be placed the same day that excavations are opened, when possible. If the bearing soils are softened by surface water intrusion or exposure, the softened soils must be removed from the immediately prior to placement of concrete.

We recommend adequate surface and subsurface drainage be considered in the design and construction of floor slabs and pavements. Where standing water develops, either on slab or pavement surfaces or within the base course layer, softening of the subgrade and other problems related to the deterioration of the floor slabs and pavements can be expected. Adequate drainage should reduce the possibility of the subgrade materials becoming saturated over a long period of time. To reduce water infiltration to the pavement section and within the base course layer resulting in softening of the subgrade and deterioration of the slabs and pavements, we recommend the timely repair or sealing of joints and cracks in slabs and pavement.

All unsuitable materials should be removed and replaced with environmentally clean, inorganic fill and free of debris or harmful matter. Unsuitable materials removed from the project site should be disposed of in accordance with all applicable federal, state, and local regulations.

The contractor should avoid stockpiling excavated materials immediately adjacent to the excavation walls. We recommend that stockpile materials be kept back from the excavation a minimum distance equal to the excavation depth to avoid surcharging the excavation walls. If this is impractical due to space constraints, the excavation walls should be retained with bracing designed for the anticipated surcharge loading.

Excavations should comply with the requirements of OSHA 29CFR, Part 1926, Subpart P, "Excavations" and its appendices, as well as other applicable codes. This document states that the contractor is solely responsible for the design and construction of stable, temporary excavations. The excavations should not only be in accordance with current OSHA excavation and trench safety standards but also with applicable local, state, and federal regulations. The contractor should shore, slope or bench the excavation sides when appropriate. In no case should excavations extend below the level of adjacent structures, utilities or pavements, unless underpinning or other adequate support is provided. Site safety is the sole responsibility of the contractor, who shall also be responsible for the means, methods and sequencing of construction operations.

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EXPLORATION PROCEDURES

Subsurface Exploration Procedures

The soil borings were located in the field by a CGMT Field Engineer based on the proposed boring site plan provided to us. As required by the State of Illinois, the driller notified Illinois One-Call System, JULIE, to verify underground utilities in the vicinity of the project site prior to drilling operations.

The soil borings were performed with a truck-mounted rotary-type auger drill rig, which utilized continuous hollow stem augers to advance the boreholes. Representative soil samples were obtained at 2½ foot intervals for the first 10 feet and 5 foot intervals thereafter by means of conventional split-barrel sampling procedures. In this procedure, a 2-inch O.D., split-barrel sampler is driven into the soil a distance of 18 inches by a 140-pound hammer falling 30 inches. The number of blows required to drive the sampler through a 12-inch interval, after initial setting of 6 inches, is termed the Standard Penetration Test (SPT) or N-value and is indicated for each sample on the boring logs. The SPT value can be used as a qualitative indication of the in-place relative density of cohesionless soils. In a less reliable way, it also indicates the consistency of cohesive soils. This indication is qualitative, since many factors can significantly affect the standard penetration resistance value and prevent a direct correlation between drill crews, drill rigs, drilling procedures, and hammer-rod-sampler assemblies. The drill rig utilized an automatic trip hammer to drive the sampler. Consideration of the effect of the automatic hammer's efficiency was included in the interpretation of subsurface information for the analyses prepared for this report.

The drill crew maintained a field log of the soils encountered in the borings. After recovery, each geotechnical soil sample was removed from the sampler and visually classified. Representative portions of each soil sample were then sealed in jars and brought to our laboratory in Elk Grove Village, Illinois for further visual examination and laboratory testing. After completion of the drilling operations, the boreholes were backfilled with auger cuttings to the existing ground surface.

Laboratory Testing Program

Representative soil samples were selected and tested in our laboratory to check field classifications and to determine pertinent engineering properties. The laboratory testing program included visual classifications and unconfined compressive strength and moisture content determinations. Dry density determinations were performed on selected samples of existing fill soils.

An experienced geotechnical engineer classified each soil sample on the basis of texture and plasticity in accordance with the Unified Soil Classification System. The group symbols for each soil type are indicated in parentheses following the soil descriptions on the boring logs. A brief explanation of the Unified System is included with this report. The geotechnical engineer grouped the various soil types into the major zones noted on the boring logs. The stratification lines designating the interfaces between earth materials on the boring logs and profiles are approximate; in situ, the transitions may be gradual.

Unconfined compressive strength tests were performed on cohesive soil samples with the use of a calibrated hand penetrometer. In the hand penetrometer test, the unconfined compressive strength of a soil sample is estimated, to a maximum of 4½ tons per square foot (tsf) by measuring the resistance of a soil sample to penetration of a small, calibrated spring-loaded cylinder.

The soil samples will be retained in our laboratory for a period of 60 days, after which, they will be discarded unless other instructions are received as to their disposal.

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CLOSING

We recommend that the construction activities be monitored by CGMT to provide the necessary overview and to check the suitability of the subgrade soils for supporting the foundations. Once final loads become available, CGMT must be contacted to review the recommendations presented herein.

This report has been prepared in order to aid in the evaluation of this property and to assist the architect and/or engineer in the design of this project. The scope is limited to the specific project and locations described herein and our description of the project represents our understanding of the significant aspects relative to soil and foundation characteristics. In the event that any change in the nature or location of the proposed construction outlined in this report are planned, we should be informed so that the changes can be reviewed and the conclusions of this report modified or approved in writing by the geotechnical engineer. It is recommended that all construction operations dealing with earthwork and foundations be reviewed by an experienced geotechnical engineer to provide information on which to base a decision as to whether the design requirements are fulfilled in the actual construction. If you wish, we would welcome the opportunity to provide field construction services for you during construction.

The analysis and recommendations submitted in this report are based upon the data obtained from the soil borings and tests performed at the locations as indicated on the Boring Location Plan and other information referenced in this report. This report does not reflect any variations, which may occur between the borings. In the performance of the subsurface exploration, specific information is obtained at specific locations at specific times. However, it is a well known fact that variations in soil conditions exist on most sites between boring locations and also such situations as groundwater levels vary from time to time. The nature and extent of variations may not become evident until the course of construction. If variations then appear evident, after performing on-site observations during the construction period and noting characteristics and variations, a reevaluation of the recommendations for this report will be necessary.

APPENDIX

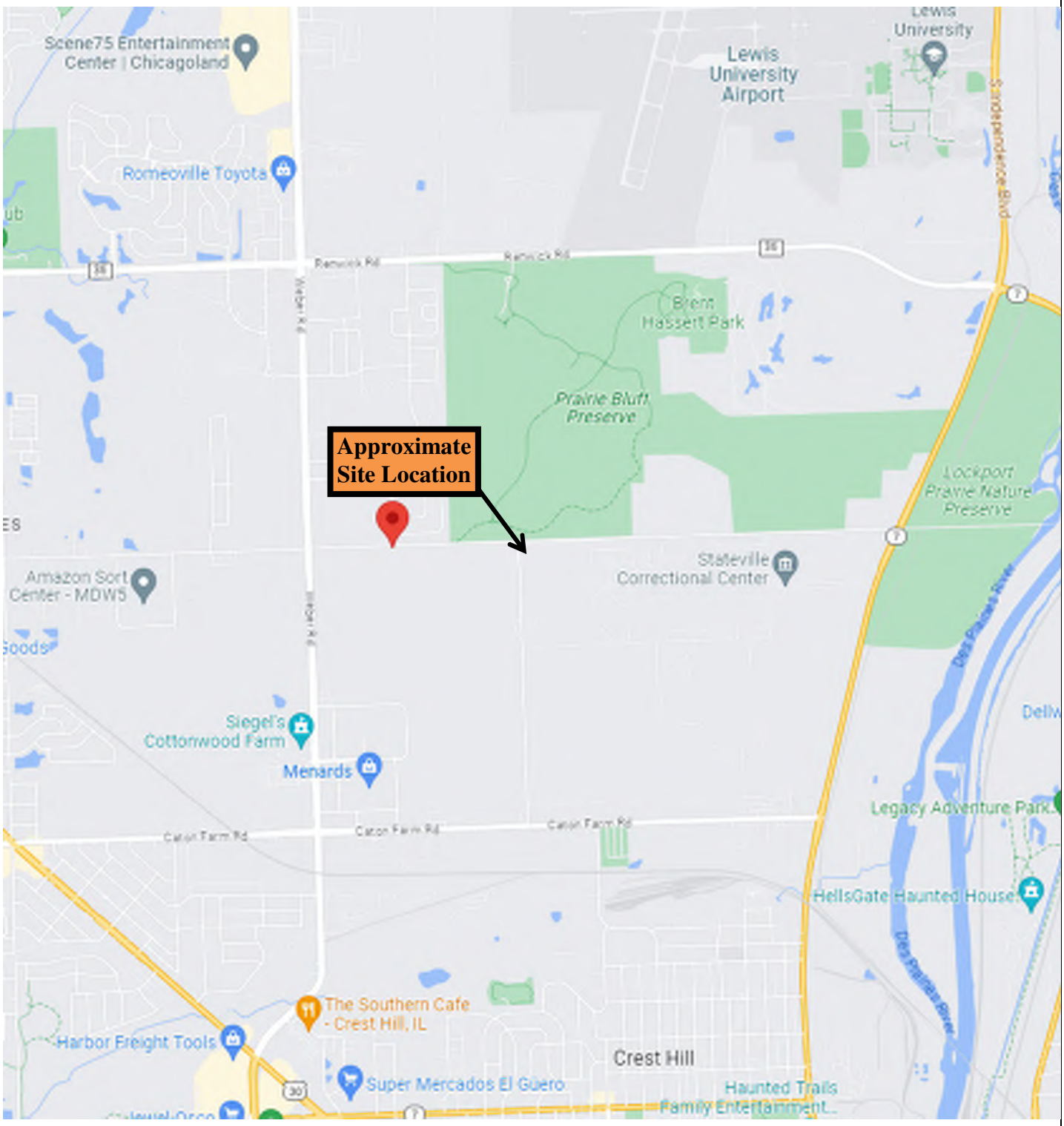
Vicinity Map

Boring Location Plan

Boring Logs

Unified Soil Classification System

Reference Notes for Boring Logs



	VICINITY MAP	N	**CGMT Project No. 23G0270** **New Training Grounds** **Division Street, East of Borio Drive** **Lockport, Will County, Illinois**

Drawing Not To Scale

N

LEGEND

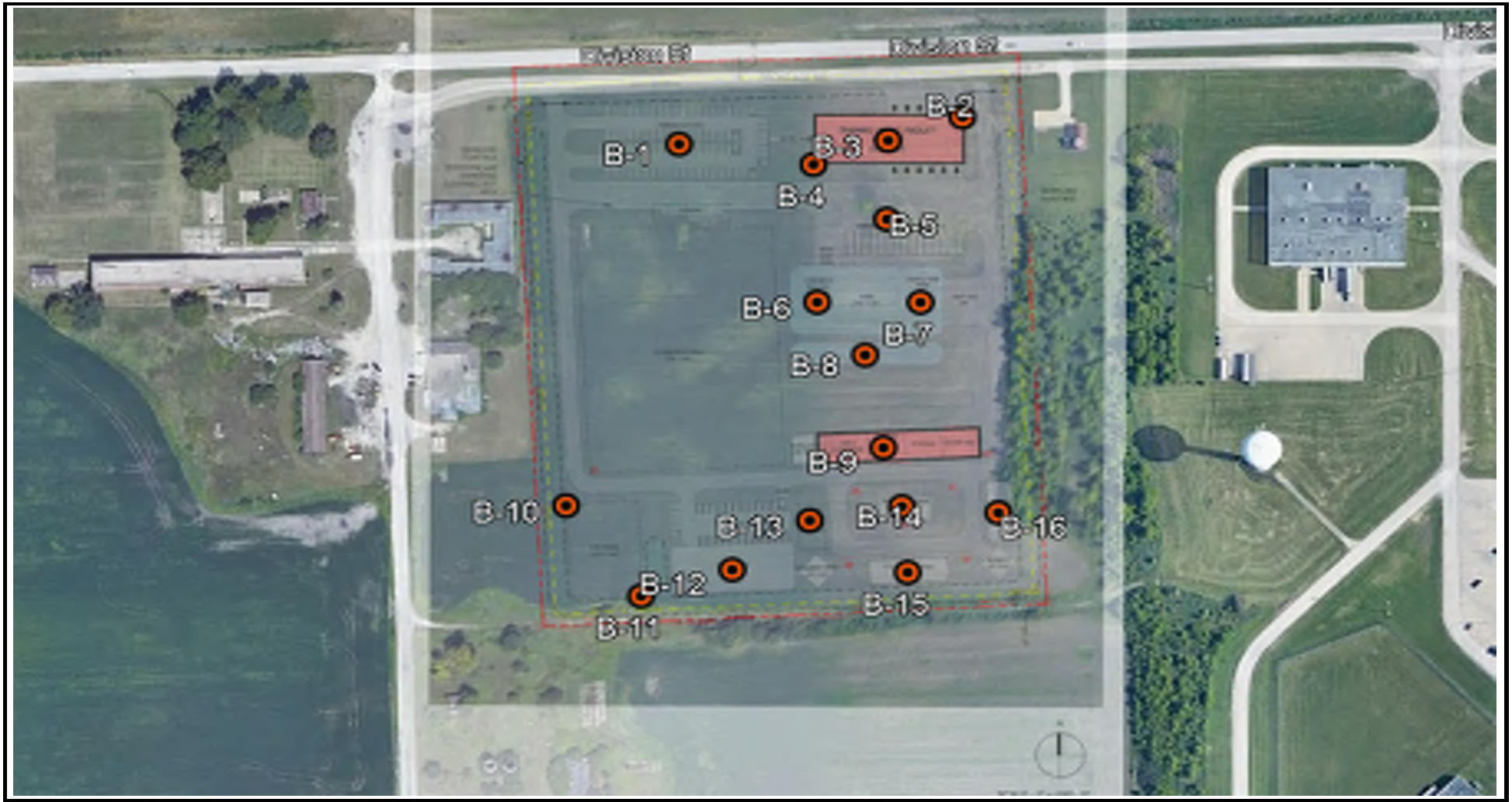
- Approximate Soil Boring Location

Soil Boring Location Diagram

Lockport FPD Training Grounds

W. Division Street
Lockport, Illinois 60441

Project Manager	Project Number
P. Patel	23G0270
Date	Sheet Number
5/23/2023	Fig. 1



Drawing Not To Scale

N

LEGEND

- Approximate Soil Boring Location

Soil Boring Location Diagram

Lockport FPD Training Grounds

W. Division Street
Lockport, Illinois 60441

Project Manager	Project Number
P. Patel	23G0270
Date	Sheet Number
5/23/2023	Fig. 2

Drawing Not To Scale

LEGEND

- Approximate Soil Boring Location

N

Soil Boring Location Diagram

Lockport FPD Training Grounds

W. Division Street
Lockport, Illinois 60441

Project Manager	Project Number
P. Patel	23G0270
Date	Sheet Number
5/23/2023	Fig. 3

Soil Boring Log

Construction & Geotechnical Material Testing, Inc.
60 Martin Lane, Elk Grove Village, Illinois 60007
Telephone (630) 595-1111 ♦ Fax (630) 595-1110

Boring No.: B-01
Date: Thursday, May 11, 2023
Project: Lockport FPD Training Grounds
W. Division Street, Lockport, Illinois 60441
Project No.: 23G0270
Boring Location: See Boring Location Diagram
Logged By: L.S.H.
Ground Elevation:

Soil Boring Prepared for:
Mr. Jason M. Estes, AIA
FGM Architects, Inc.
1211 W. 22nd Street, Suite 700
Oak Brook, Illinois 60523

Elevation	Depth	Strata	Soil / Rock Description	Sample Type & No. Depth Interval (Ft) Recovery (in)	Blow Count	Moisture Content (%)	Unconfined Compressive Strength (TSF)	Notes & Test Results
	0.0		Approximately 12" of Topsoil					Unconfined compressive strength of soil samples estimated using a calibrated penetrometer.
	1.0		Silty Clay, Trace Sand and Gravel, brown, very stiff (CL FILL)	SS-1 1.0' - 2.5' 8" Recovery	2 3 4	18.0	2.25	
	2.0							
	3.0		Silty Clay, Trace Sand and Gravel, brown and gray, stiff to hard (CL)	SS-2 3.5' - 5.0' 18" Recovery	4 6 6	17.1	4.5+	
	4.0							
	5.0							
	6.0			SS-3 6.0' - 7.5' 18" Recovery	4 6 8	16.5	4.5+	
	7.0							
	8.0							
	9.0			SS-4 8.5' - 10.0' 15" Recovery	3 5 7	18.8	1.0	
	10.0							
	11.0							
	12.0							
	13.0							
	14.0		Silty Clay, Trace Sand and Gravel, gray, very stiff (CL)	SS-5 13.5' - 15.0' 18" Recovery	3 6 8	18.1	2.0	
	15.0							
	16.0							
	17.0							
	18.0							
	19.0			SS-6 18.5' - 20.0' 18" Recovery	4 6 8	22.1	2.75	
	20.0		END of BORING at 20 Feet					

Drilling Contractor: CGMT, Inc.
Drilling Method: 3¼" O.D. H.S.A. Split Spoon Sampling
Drilling Equipment: CME-45C Truck Mounted Drill Rig
REVIEWED BY: NPW

Water Level (Ft.)
During Drilling: 13½ feet
Immediately After Drilling: 12½ feet

Soil Boring Log

Construction & Geotechnical Material Testing, Inc.
60 Martin Lane, Elk Grove Village, Illinois 60007
Telephone (630) 595-1111 ♦ Fax (630) 595-1110

Boring No.: B-02
Date: Thursday, May 11, 2023
Project: Lockport FPD Training Grounds
W. Division Street, Lockport, Illinois 60441
Project No.: 23G0270
Boring Location: See Boring Location Diagram
Logged By: L.S.H.
Ground Elevation:

Soil Boring Prepared for:
Mr. Jason M. Estes, AIA
FGM Architects, Inc.
1211 W. 22nd Street, Suite 700
Oak Brook, Illinois 60523

Elevation	Depth	Strata	Soil / Rock Description	Sample Type & No. Depth Interval (Ft) Recovery (in)	Blow Count	Moisture Content (%)	Unconfined Compressive Strength (TSF)	Notes & Test Results
	0.0		Approximately 12" of Topsoil					Unconfined compressive strength of soil samples estimated using a calibrated penetrometer.
	1.0		Silty Clay, Trace Sand and Gravel, dark brown, stiff (CL FILL)	SS-1 1.0' - 2.5' 12" Recovery	2 2 2	26.4	1.75	**Dry Density:** 1.0' - 2.5'= 89.6 lbs/ft^3
	2.0		Saturated					
	3.0							
			Sandy Clay, Trace Gravel, brown, stiff (CL FILL)	SS-2 3.5' - 5.0' 15" Recovery	- 2 2	16.5	1.75	
	4.0							
	5.0							
	6.0		Silty Clay, Trace Sand and Gravel, gray, very stiff (CL)	SS-3 6.0' - 7.5' 18" Recovery	3 2 2	19.9	2.0	
	7.0							
	8.0							
	9.0			SS-4 8.5' - 10.0' 18" Recovery	2 5 6	16.7	3.0	
	10.0							
	11.0							
	12.0							
	13.0							
	14.0			SS-5 13.5' - 15.0' 18" Recovery	3 6 8	19.3	2.5	
	15.0							
	16.0							
	17.0							
	18.0							
	19.0			SS-6 18.5' - 20.0' 18" Recovery	3 6 8	20.0	2.25	
	20.0		END of BORING at 20 Feet					

Drilling Contractor: CGMT, Inc.
Drilling Method: 3¼" O.D. H.S.A. Split Spoon Sampling
Drilling Equipment: CME-45C Truck Mounted Drill Rig
REVIEWED BY: NPW

Water Level (Ft.)
During Drilling: 6 feet
Immediately After Drilling: 10 feet

Soil Boring Log

Construction & Geotechnical Material Testing, Inc.
60 Martin Lane, Elk Grove Village, Illinois 60007
Telephone (630) 595-1111 ♦ Fax (630) 595-1110

Boring No.: B-03
Date: Thursday, May 11, 2023
Project: Lockport FPD Training Grounds
W. Division Street, Lockport, Illinois 60441
Project No.: 23G0270
Boring Location: See Boring Location Diagram
Logged By: L.S.H.
Ground Elevation:

Soil Boring Prepared for:
Mr. Jason M. Estes, AIA
FGM Architects, Inc.
1211 W. 22nd Street, Suite 700
Oak Brook, Illinois 60523

Elevation	Depth	Strata	Soil / Rock Description	Sample Type & No. Depth Interval (Ft) Recovery (in)	Blow Count	Moisture Content (%)	Unconfined Compressive Strength (TSF)	Notes & Test Results
	0.0		Approximately 18" of Topsoil					Unconfined compressive strength of soil samples estimated using a calibrated penetrometer.
	1.0			SS-1	2	-	-	
			Silty Clay, Trace Sand and Gravel, brown, very stiff (CL FILL)	1.0' - 2.5'	2	23.2	2.25	
	2.0			10" Recovery	3			
	3.0							
			Sandy Clay, Trace Gravel, brown, stiff (CL FILL)	SS-2	2			
	4.0			3.5' - 5.0'	5	17.7	1.0	
	5.0			8" Recovery	7			
	6.0		Silty Clay, Trace Sand and Gravel, brown and gray, very stiff to hard (CL)	SS-3	3			
				6.0' - 7.5'	6	21.4	3.0	
	7.0			18" Recovery	6			
	8.0							
				SS-4	2			
	9.0			8.5' - 10.0'	4	16.8	4.5+	
	10.0			17" Recovery	8			
	11.0							
	12.0							
	13.0							
			Silty Clay, Trace Sand and Gravel, gray, very stiff (CL)	SS-5	3			
	14.0			13.5' - 15.0'	6	15.2	3.25	
	15.0			18" Recovery	8			
	16.0							
	17.0							
	18.0							
				SS-6	3			
	19.0			18.5' - 20.0'	5	20.0	2.5	
				18" Recovery	6			
	20.0		END of BORING at 20 Feet					

Drilling Contractor: CGMT, Inc.
Drilling Method: 3¼" O.D. H.S.A. Split Spoon Sampling
Drilling Equipment: CME-45C Truck Mounted Drill Rig
REVIEWED BY: NPW

Water Level (Ft.)
During Drilling: 13 feet
Immediately After Drilling: 12 feet

Soil Boring Log

Construction & Geotechnical Material Testing, Inc.
60 Martin Lane, Elk Grove Village, Illinois 60007
Telephone (630) 595-1111 ♦ Fax (630) 595-1110

Boring No.: B-04
Date: Thursday, May 11, 2023
Project: Lockport FPD Training Grounds
W. Division Street, Lockport, Illinois 60441
Project No.: 23G0270
Boring Location: See Boring Location Diagram
Logged By: L.S.H.
Ground Elevation:

Soil Boring Prepared for:
Mr. Jason M. Estes, AIA
FGM Architects, Inc.
1211 W. 22nd Street, Suite 700
Oak Brook, Illinois 60523

Elevation	Depth	Strata	Soil / Rock Description	Sample Type & No. Depth Interval (Ft) Recovery (in)	Blow Count	Moisture Content (%)	Unconfined Compressive Strength (TSF)	Notes & Test Results
	0.0		Approximately 14" of Topsoil					Unconfined compressive strength of soil samples estimated using a calibrated penetrometer.
	1.0		Silty Clay, Trace Sand and Gravel, brown, very stiff (CL FILL)	SS-1 1.0' - 2.5' 9" Recovery	2 3 4	17.1	3.0	
	2.0							
	3.0		Silty Clay, Trace Sand and Gravel, brown and gray, hard (CL)	SS-2 3.5' - 5.0' 12" Recovery	4 6 7	16.6	4.5+	
	4.0							
	5.0							
	6.0			SS-3 6.0' - 7.5' 17" Recovery	3 7 9	15.0	4.5+	
	7.0							
	8.0							
	9.0			SS-4 8.5' - 10.0' 18" Recovery	3 8 9	15.2	4.5+	
	10.0							
	11.0							
	12.0							
	13.0							
	14.0		Silty Clay, Trace Sand and Gravel, gray, stiff to very stiff (CL)	SS-5 13.5' - 15.0' 18" Recovery	2 6 7	15.1	2.0	
	15.0							
	16.0							
	17.0							
	18.0							
	19.0			SS-6 18.5' - 20.0' 18" Recovery	2 4 6	21.1	1.75	
	20.0		END of BORING at 20 Feet					

Drilling Contractor: CGMT, Inc.
Drilling Method: 3¼" O.D. H.S.A. Split Spoon Sampling
Drilling Equipment: CME-45C Truck Mounted Drill Rig
REVIEWED BY: NPW

Water Level (Ft.)
During Drilling: 13½ feet
Immediately After Drilling: 15 feet

Soil Boring Log

Construction & Geotechnical Material Testing, Inc.
60 Martin Lane, Elk Grove Village, Illinois 60007
Telephone (630) 595-1111 ♦ Fax (630) 595-1110

Boring No.: B-05
Date: Thursday, May 11, 2023
Project: Lockport FPD Training Grounds
W. Division Street, Lockport, Illinois 60441
Project No.: 23G0270
Boring Location: See Boring Location Diagram
Logged By: L.S.H.
Ground Elevation:

Soil Boring Prepared for:
Mr. Jason M. Estes, AIA
FGM Architects, Inc.
1211 W. 22nd Street, Suite 700
Oak Brook, Illinois 60523

Elevation	Depth	Strata	Soil / Rock Description	Sample Type & No. Depth Interval (Ft) Recovery (in)	Blow Count	Moisture Content (%)	Unconfined Compressive Strength (TSF)	Notes & Test Results
	0.0		Approximately 15" of Topsoil					Unconfined compressive strength of soil samples estimated using a calibrated penetrometer.
	1.0		Silty Clay, Trace Sand and Gravel, brown, very stiff (CL FILL)	SS-1 1.0' - 2.5' 11" Recovery	2 4 4	19.7	3.75	**Dry Density:** 1.0' - 2.5'= 105.3 lbs/ft^3
	2.0							
	3.0		Silty Clay, Trace Sand and Gravel, brown and gray, very stiff to hard (CL)	SS-2 3.5' - 5.0' 14" Recovery	3 4 5	15.9	4.5+	
	4.0							
	5.0							
	6.0			SS-3 6.0' - 7.5' 18" Recovery	3 4 13	16.6	3.25	
	7.0							
	8.0							
	9.0		Silty Clay, Trace Sand and Gravel, gray, stiff to very stiff (CL)	SS-4 8.5' - 10.0' 18" Recovery	3 4 6	15.4	2.75	
	10.0							
	11.0							
	12.0							
	13.0			SS-5 13.5' - 15.0' 18" Recovery	3 4 7	15.1	2.75	
	14.0							
	15.0							
	16.0							
	17.0							
	18.0			SS-6 18.5' - 20.0' 18" Recovery	2 3 6	21.8	1.25	
	19.0							
	20.0		END of BORING at 20 Feet					

Drilling Contractor: CGMT, Inc.
Drilling Method: 3¼" O.D. H.S.A. Split Spoon Sampling
Drilling Equipment: CME-45C Truck Mounted Drill Rig
REVIEWED BY: NPW

Water Level (Ft.)
During Drilling: None
Immediately After Drilling: None

Soil Boring Log

Construction & Geotechnical Material Testing, Inc.
60 Martin Lane, Elk Grove Village, Illinois 60007
Telephone (630) 595-1111 ♦ Fax (630) 595-1110

Boring No.: B-06
Date: Thursday, May 11, 2023
Project: Lockport FPD Training Grounds
W. Division Street, Lockport, Illinois 60441
Project No.: 23G0270
Boring Location: See Boring Location Diagram
Logged By: L.S.H.
Ground Elevation:

Soil Boring Prepared for:
Mr. Jason M. Estes, AIA
FGM Architects, Inc.
1211 W. 22nd Street, Suite 700
Oak Brook, Illinois 60523

Elevation	Depth	Strata	Soil / Rock Description	Sample Type & No. Depth Interval (Ft) Recovery (in)	Blow Count	Moisture Content (%)	Unconfined Compressive Strength (TSF)	Notes & Test Results
	0.0		Approximately 17" of Topsoil					Unconfined compressive strength of soil samples estimated using a calibrated penetrometer.
	1.0			SS-1	2	-	-	
			Silty Clay, Trace Sand and Gravel, brown, very stiff (CL FILL)	1.0' - 2.5'	3	19.2	2.0	
	2.0			16" Recovery	3			
	3.0							
			Silty Clay, Trace Sand and Gravel, brown and gray, very stiff (CL)	SS-2	2			
	4.0			3.5' - 5.0'	3	17.8	3.75	
				12" Recovery	4			
	5.0							
	6.0		Silty Clay, Trace Sand and Gravel, gray, very stiff (CL)	SS-3	3			
				6.0' - 7.5'	5	15.5	3.5	
	7.0			16" Recovery	7			
	8.0							
				SS-4	4			
	9.0			8.5' - 10.0'	6	13.9	3.0	
				11" Recovery	8			
	10.0							
	11.0							
	12.0							
	13.0							
				SS-5	3			
	14.0			13.5' - 15.0'	4	17.5	2.0	
				7" Recovery	7			
	15.0							
	16.0							
	17.0							
	18.0							
				SS-6	3			
	19.0			18.5' - 20.0'	4	21.1	2.0	
				18" Recovery	5			
	20.0		END of BORING at 20 Feet					

Drilling Contractor: CGMT, Inc.
Drilling Method: 3¼" O.D. H.S.A. Split Spoon Sampling
Drilling Equipment: CME-45C Truck Mounted Drill Rig
REVIEWED BY: NPW

Water Level (Ft.)
During Drilling: None
Immediately After Drilling: None

Soil Boring Log

Construction & Geotechnical Material Testing, Inc.
60 Martin Lane, Elk Grove Village, Illinois 60007
Telephone (630) 595-1111 ♦ Fax (630) 595-1110

Boring No.: B-07
Date: Thursday, May 11, 2023
Project: Lockport FPD Training Grounds
W. Division Street, Lockport, Illinois 60441
Project No.: 23G0270
Boring Location: See Boring Location Diagram
Logged By: L.S.H.
Ground Elevation:

Soil Boring Prepared for:
Mr. Jason M. Estes, AIA
FGM Architects, Inc.
1211 W. 22nd Street, Suite 700
Oak Brook, Illinois 60523

Elevation	Depth	Strata	Soil / Rock Description	Sample Type & No. Depth Interval (Ft) Recovery (in)	Blow Count	Moisture Content (%)	Unconfined Compressive Strength (TSF)	Notes & Test Results
	0.0		Approximately 13" of Topsoil					Unconfined compressive strength of soil samples estimated using a calibrated penetrometer.
	1.0		Silty Clay, Trace Sand and Gravel, brown, hard (CL FILL)	SS-1 1.0' - 2.5' 13" Recovery	3 4 8	13.3	4.5+	
	2.0							
	3.0		Silty Clay, Trace Sand and Gravel, brown and gray, very stiff to hard (CL)	SS-2 3.5' - 5.0' 12" Recovery	3 4 6	14.9	4.5+	
	4.0							
	5.0							
	6.0			SS-3 6.0' - 7.5' 16" Recovery	1 3 5	16.8	3.0	
	7.0							
	8.0							
	9.0		Silt, Trace Sand and Gravel, brown, medium dense (ML)	SS-4 8.5' - 10.0' 14" Recovery	3 6 4	23.1	-	
	10.0							
	11.0							
	12.0							
	13.0							
	14.0		Silty Clay, Trace Sand and Gravel, gray, very stiff (CL)	SS-5 13.5' - 15.0' 18" Recovery	2 3 6	16.6	3.5	
	15.0							
	16.0							
	17.0							
	18.0							
	19.0			SS-6 18.5' - 20.0' 16" Recovery	2 4 6	20.6	2.5	
	20.0		END of BORING at 20 Feet					

Drilling Contractor: CGMT, Inc.
Drilling Method: 3¼" O.D. H.S.A. Split Spoon Sampling
Drilling Equipment: CME-45C Truck Mounted Drill Rig
REVIEWED BY: NPW

Water Level (Ft.)
During Drilling: None
Immediately After Drilling: None

Soil Boring Log

Construction & Geotechnical Material Testing, Inc.
60 Martin Lane, Elk Grove Village, Illinois 60007
Telephone (630) 595-1111 ♦ Fax (630) 595-1110

Boring No.: B-08
Date: Thursday, May 11, 2023
Project: Lockport FPD Training Grounds
W. Division Street, Lockport, Illinois 60441
Project No.: 23G0270
Boring Location: See Boring Location Diagram
Logged By: L.S.H.
Ground Elevation:

Soil Boring Prepared for:
Mr. Jason M. Estes, AIA
FGM Architects, Inc.
1211 W. 22nd Street, Suite 700
Oak Brook, Illinois 60523

Elevation	Depth	Strata	Soil / Rock Description	Sample Type & No. Depth Interval (Ft) Recovery (in)	Blow Count	Moisture Content (%)	Unconfined Compressive Strength (TSF)	Notes & Test Results
	0.0		Approximately 20" of Topsoil					Unconfined compressive strength of soil samples estimated using a calibrated penetrometer.
	1.0			SS-1	2	-	-	
			Silty Clay, Trace Sand and Gravel, brown, very stiff (CL FILL)	1.0' - 2.5'	3	16.3	2.0	
	2.0			7" Recovery	3			
	3.0							
			Silty Clay, Trace Sand and Gravel, brown and gray, hard (CL)	SS-2	3			
	4.0			3.5' - 5.0'	3	14.8	4.0	
				13" Recovery	3			
	5.0							
	6.0			SS-3	3			
				6.0' - 7.5'	4	16.6	4.5+	
	7.0			18" Recovery	8			
	8.0							
				SS-4	3			
	9.0			8.5' - 10.0'	5	15.7	4.5+	
				17" Recovery	7			
	10.0							
	11.0							
	12.0							
	13.0							
			Silty Clay, Trace Sand and Gravel, gray, very stiff (CL)	SS-5	4			
	14.0			13.5' - 15.0'	5	18.9	3.25	
				13" Recovery	8			
	15.0							
	16.0							
	17.0							
	18.0							
				SS-6	3			
	19.0			18.5' - 20.0'	5	19.2	2.0	
				18" Recovery	6			
	20.0		END of BORING at 20 Feet					

Drilling Contractor: CGMT, Inc.
Drilling Method: 3¼" O.D. H.S.A. Split Spoon Sampling
Drilling Equipment: CME-45C Truck Mounted Drill Rig
REVIEWED BY: NPW

Water Level (Ft.)
During Drilling: None
Immediately After Drilling: None

Soil Boring Log

Construction & Geotechnical Material Testing, Inc.
60 Martin Lane, Elk Grove Village, Illinois 60007
Telephone (630) 595-1111 ♦ Fax (630) 595-1110

Boring No.: B-09
Date: Thursday, May 11, 2023
Project: Lockport FPD Training Grounds
W. Division Street, Lockport, Illinois 60441
Project No.: 23G0270
Boring Location: See Boring Location Diagram
Logged By: L.S.H.
Ground Elevation:

Soil Boring Prepared for:
Mr. Jason M. Estes, AIA
FGM Architects, Inc.
1211 W. 22nd Street, Suite 700
Oak Brook, Illinois 60523

Elevation	Depth	Strata	Soil / Rock Description	Sample Type & No. Depth Interval (Ft) Recovery (in)	Blow Count	Moisture Content (%)	Unconfined Compressive Strength (TSF)	Notes & Test Results
	0.0		Approximately 11" of Topsoil					Unconfined compressive strength of soil samples estimated using a calibrated penetrometer.
	1.0		Sandy Clay, Trace Gravel, brown, very stiff (CL FILL)	SS-1 1.0' - 2.5' 16" Recovery	2 3 4	18.1	2.25	
	2.0							
	3.0		Silty Clay, Trace Sand and Gravel, brown and gray, very stiff to hard (CL)	SS-2 3.5' - 5.0' 15" Recovery	3 4 4	14.9	3.5	
	4.0							
	5.0							
	6.0			SS-3 6.0' - 7.5' 16" Recovery	3 5 6	13.9	4.0	
	7.0							
	8.0							
	9.0			SS-4 8.5' - 10.0' 14" Recovery	5 7 7	16.4	4.5+	
	10.0							
	11.0							
	12.0							
	13.0							
	14.0		Silty Clay, Trace Sand and Gravel, gray, very stiff (CL)	SS-5 13.5' - 15.0' 13" Recovery	2 5 6	13.6	2.0	
	15.0							
	16.0							
	17.0							
	18.0							
	19.0			SS-6 18.5' - 20.0' 16" Recovery	4 5 6	10.5	2.75	
	20.0		END of BORING at 20 Feet					

Drilling Contractor: CGMT, Inc.
Drilling Method: 3¼" O.D. H.S.A. Split Spoon Sampling
Drilling Equipment: CME-45C Truck Mounted Drill Rig
REVIEWED BY: NPW

Water Level (Ft.)
During Drilling: None
Immediately After Drilling: None

Soil Boring Log

Construction & Geotechnical Material Testing, Inc.
60 Martin Lane, Elk Grove Village, Illinois 60007
Telephone (630) 595-1111 ♦ Fax (630) 595-1110

Boring No.: B-10
Date: Thursday, May 11, 2023
Project: Lockport FPD Training Grounds
W. Division Street, Lockport, Illinois 60441
Project No.: 23G0270
Boring Location: See Boring Location Diagram
Logged By: L.S.H.
Ground Elevation:

Soil Boring Prepared for:
Mr. Jason M. Estes, AIA
FGM Architects, Inc.
1211 W. 22nd Street, Suite 700
Oak Brook, Illinois 60523

Elevation	Depth	Strata	Soil / Rock Description	Sample Type & No. Depth Interval (Ft) Recovery (in)	Blow Count	Moisture Content (%)	Unconfined Compressive Strength (TSF)	Notes & Test Results
	0.0		Approximately 12" of Topsoil					Unconfined compressive strength of soil samples estimated using a calibrated penetrometer.
	1.0		Silty Clay, Trace Sand and Gravel, dark brown, very stiff (CL FILL)	SS-1 1.0' - 2.5' 10" Recovery	2 4 4	21.4	2.0	**Dry Density:** 1.0' - 2.5'= 97.1 lbs/ft^3
	2.0							
	3.0		Silty Clay, Trace Sand and Gravel, brown and gray, very stiff to hard (CL)	SS-2 3.5' - 5.0' 14" Recovery	2 5 4	17.2	2.5	
	4.0							
	5.0							
	6.0			SS-3 6.0' - 7.5' 18" Recovery	3 3 6	15.7	4.5+	
	7.0							
	8.0							
	9.0			SS-4 8.5' - 10.0' 15" Recovery	4 8 10	14.3	4.5+	
	10.0							
	11.0							
	12.0							
	13.0							
	14.0		Silty Clay, Trace Sand and Gravel, gray, very stiff (CL)	SS-5 13.5' - 15.0' 15" Recovery	3 5 9	19.3	3.0	
	15.0							
	16.0							
	17.0							
	18.0							
	19.0			SS-6 18.5' - 20.0' 18" Recovery	3 6 7	16.6	3.75	
	20.0		END of BORING at 20 Feet					

Drilling Contractor: CGMT, Inc.
Drilling Method: 3¼" O.D. H.S.A. Split Spoon Sampling
Drilling Equipment: CME-45C Truck Mounted Drill Rig
REVIEWED BY: NPW

Water Level (Ft.)
During Drilling: None
Immediately After Drilling: None

Soil Boring Log

Construction & Geotechnical Material Testing, Inc.
60 Martin Lane, Elk Grove Village, Illinois 60007
Telephone (630) 595-1111 ♦ Fax (630) 595-1110

Boring No.: B-11
Date: Thursday, May 11, 2023
Project: Lockport FPD Training Grounds
W. Division Street, Lockport, Illinois 60441
Project No.: 23G0270
Boring Location: See Boring Location Diagram
Logged By: L.S.H.
Ground Elevation:

Soil Boring Prepared for:
Mr. Jason M. Estes, AIA
FGM Architects, Inc.
1211 W. 22nd Street, Suite 700
Oak Brook, Illinois 60523

Elevation	Depth	Strata	Soil / Rock Description	Sample Type & No. Depth Interval (Ft) Recovery (in)	Blow Count	Moisture Content (%)	Unconfined Compressive Strength (TSF)	Notes & Test Results
	0.0		Approximately 8" of Topsoil					Unconfined compressive strength of soil samples estimated using a calibrated penetrometer.
	1.0		Sandy Clay, Trace Gravel, brown, hard (CL FILL)	SS-1 1.0' - 2.5' 9" Recovery	2 5 7	14.8	4.5+	
	2.0							
	3.0		Silty Clay, Trace Sand and Gravel, brown and gray, very stiff to hard (CL)	SS-2 3.5' - 5.0' 8" Recovery	2 5 6	15.5	4.5+	
	4.0							
	5.0							
	6.0			SS-3 6.0' - 7.5' 18" Recovery	3 6 8	17.5	4.5+	
	7.0							
	8.0							
	9.0			SS-4 8.5' - 10.0' 18" Recovery	6 6 6	17.2	3.75	
	10.0							
	11.0							
	12.0							
	13.0							
	14.0		Silty Clay, Trace Sand and Gravel, gray, stiff (CL)	SS-5 13.5' - 15.0' 18" Recovery	3 5 6	21.2	1.5	
	15.0							
	16.0							
	17.0							
	18.0							
	19.0			SS-6 18.5' - 20.0' 18" Recovery	3 4 6	21.7	1.5	
	20.0		END of BORING at 20 Feet					

Drilling Contractor: CGMT, Inc.
Drilling Method: 3¼" O.D. H.S.A. Split Spoon Sampling
Drilling Equipment: CME-45C Truck Mounted Drill Rig
REVIEWED BY: NPW

Water Level (Ft.)
During Drilling: None
Immediately After Drilling: None

Soil Boring Log

Construction & Geotechnical Material Testing, Inc.
60 Martin Lane, Elk Grove Village, Illinois 60007
Telephone (630) 595-1111 ♦ Fax (630) 595-1110

Boring No.: B-12
Date: Thursday, May 11, 2023
Project: Lockport FPD Training Grounds
W. Division Street, Lockport, Illinois 60441
Project No.: 23G0270
Boring Location: See Boring Location Diagram
Logged By: L.S.H.
Ground Elevation:

Soil Boring Prepared for:
Mr. Jason M. Estes, AIA
FGM Architects, Inc.
1211 W. 22nd Street, Suite 700
Oak Brook, Illinois 60523

Elevation	Depth	Strata	Soil / Rock Description	Sample Type & No. Depth Interval (Ft) Recovery (in)	Blow Count	Moisture Content (%)	Unconfined Compressive Strength (TSF)	Notes & Test Results
	0.0		Approximately 13" of Topsoil					Unconfined compressive strength of soil samples estimated using a calibrated penetrometer.
	1.0		Sandy Clay, Trace Gravel, brown, stiff (CL FILL)	SS-1 1.0' - 2.5' 6" Recovery	2 3 3	14.7	1.0	
	2.0							
	3.0		Silty Clay, Trace Sand and Gravel, brown and gray, hard (CL)	SS-2 3.5' - 5.0' 12" Recovery	4 6 10	13.4	4.5+	
	4.0							
	5.0			SS-3 6.0' - 7.5' 18" Recovery	4 5 8	16.3	4.5+	
	6.0							
	7.0							
	8.0			SS-4 8.5' - 10.0' 15" Recovery	5 7 13	15.7	4.5+	
	9.0							
	10.0							
	11.0							
	12.0							
	13.0		Silty Clay, Trace Sand and Gravel, gray, very stiff (CL)	SS-5 13.5' - 15.0' 16" Recovery	3 5 7	17.2	3.25	
	14.0							
	15.0							
	16.0							
	17.0							
	18.0			SS-6 18.5' - 20.0' 18" Recovery	3 5 5	21.2	2.0	
	19.0							
	20.0		END of BORING at 20 Feet					

Drilling Contractor: CGMT, Inc.
Drilling Method: 3¼" O.D. H.S.A. Split Spoon Sampling
Drilling Equipment: CME-45C Truck Mounted Drill Rig
REVIEWED BY: NPW

Water Level (Ft.)
During Drilling: None
Immediately After Drilling: None

Soil Boring Log

Construction & Geotechnical Material Testing, Inc.
60 Martin Lane, Elk Grove Village, Illinois 60007
Telephone (630) 595-1111 ♦ Fax (630) 595-1110

Boring No.: B-13
Date: Thursday, May 11, 2023
Project: Lockport FPD Training Grounds
W. Division Street, Lockport, Illinois 60441
Project No.: 23G0270
Boring Location: See Boring Location Diagram
Logged By: L.S.H.
Ground Elevation:

Soil Boring Prepared for:
Mr. Jason M. Estes, AIA
FGM Architects, Inc.
1211 W. 22nd Street, Suite 700
Oak Brook, Illinois 60523

Elevation	Depth	Strata	Soil / Rock Description	Sample Type & No. Depth Interval (Ft) Recovery (in)	Blow Count	Moisture Content (%)	Unconfined Compressive Strength (TSF)	Notes & Test Results
	0.0		Approximately 22" of Topsoil					Unconfined compressive strength of soil samples estimated using a calibrated penetrometer.
	1.0			SS-1 1.0' - 2.5' 10" Recovery	2 3 6	-	-	
	2.0		Silty Clay, Trace Sand and Gravel, dark brown, very stiff (CL FILL)			23.9	2.5	
	3.0							
	4.0		Silty Clay, Trace Sand and Gravel, brown and gray, very stiff to hard (CL)	SS-2 3.5' - 5.0' 12" Recovery	4 5 6	20.5	3.0	
	5.0							
	6.0			SS-3 6.0' - 7.5' 18" Recovery	2 3 7	14.8	4.5+	
	7.0							
	8.0							
	9.0		Silty Clay, Trace Sand and Gravel, gray, very stiff (CL)	SS-4 8.5' - 10.0' 17" Recovery	2 6 8	14.9	3.75	
	10.0							
	11.0							
	12.0							
	13.0							
	14.0			SS-5 13.5' - 15.0' 18" Recovery	2 6 7	14.9	3.0	
	15.0							
	16.0							
	17.0							
	18.0							
	19.0			SS-6 18.5' - 20.0' 18" Recovery	3 3 6	20.1	2.0	
	20.0		END of BORING at 20 Feet					

Drilling Contractor: CGMT, Inc.
Drilling Method: 3¼" O.D. H.S.A. Split Spoon Sampling
Drilling Equipment: CME-45C Truck Mounted Drill Rig
REVIEWED BY: NPW

Water Level (Ft.)
During Drilling: None
Immediately After Drilling: None

Soil Boring Log

Construction & Geotechnical Material Testing, Inc.
60 Martin Lane, Elk Grove Village, Illinois 60007
Telephone (630) 595-1111 ♦ Fax (630) 595-1110

Boring No.: B-14
Date: Thursday, May 11, 2023
Project: Lockport FPD Training Grounds
W. Division Street, Lockport, Illinois 60441
Project No.: 23G0270
Boring Location: See Boring Location Diagram
Logged By: L.S.H.
Ground Elevation:

Soil Boring Prepared for:
Mr. Jason M. Estes, AIA
FGM Architects, Inc.
1211 W. 22nd Street, Suite 700
Oak Brook, Illinois 60523

Elevation	Depth	Strata	Soil / Rock Description	Sample Type & No. Depth Interval (Ft) Recovery (in)	Blow Count	Moisture Content (%)	Unconfined Compressive Strength (TSF)	Notes & Test Results
	0.0		Approximately 16" of Topsoil					Unconfined compressive strength of soil samples estimated using a calibrated penetrometer.
	1.0			SS-1	2	-	-	
			Sandy Clay, Trace Gravel, brown, very stiff (CL FILL)	1.0' - 2.5'	2	15.7	2.5	
	2.0			17" Recovery	4			
	3.0							
			Silty Clay, Trace Sand and Gravel, brown and gray, very stiff to hard (CL)	SS-2	5			
	4.0			3.5' - 5.0'	5	14.2	4.5+	
	5.0			18" Recovery	5			
	6.0			SS-3	3			
				6.0' - 7.5'	5	18.2	4.5+	
	7.0			18" Recovery	7			
	8.0							
				SS-4	2			
	9.0			8.5' - 10.0'	5	18.6	3.0	
	10.0			18" Recovery	6			
	11.0							
	12.0							
	13.0							
			Silty Clay, Trace Sand and Gravel, gray, very stiff (CL)	SS-5	2			
	14.0			13.5' - 15.0'	3	15.2	3.0	
	15.0			18" Recovery	5			
	16.0							
	17.0							
	18.0							
				SS-6	2			
	19.0			18.5' - 20.0'	3	20.3	2.5	
				18" Recovery	6			
	20.0		END of BORING at 20 Feet					

Drilling Contractor:	CGMT, Inc.	**Water Level (Ft.)**	
Drilling Method:	3¼" O.D. H.S.A. Split Spoon Sampling	**During Drilling:**	None
Drilling Equipment:	CME-45C Truck Mounted Drill Rig	**Immediately After Drilling:**	None
	REVIEWED BY: NPW		

Soil Boring Log

Construction & Geotechnical Material Testing, Inc.
60 Martin Lane, Elk Grove Village, Illinois 60007
Telephone (630) 595-1111 ♦ Fax (630) 595-1110

Boring No.: B-15
Date: Thursday, May 11, 2023
Project: Lockport FPD Training Grounds
W. Division Street, Lockport, Illinois 60441
Project No.: 23G0270
Boring Location: See Boring Location Diagram
Logged By: L.S.H.
Ground Elevation:

Soil Boring Prepared for:
Mr. Jason M. Estes, AIA
FGM Architects, Inc.
1211 W. 22nd Street, Suite 700
Oak Brook, Illinois 60523

Elevation	Depth	Strata	Soil / Rock Description	Sample Type & No. Depth Interval (Ft) Recovery (in)	Blow Count	Moisture Content (%)	Unconfined Compressive Strength (TSF)	Notes & Test Results
	0.0		Approximately 12" of Topsoil					Unconfined compressive strength of soil samples estimated using a calibrated penetrometer.
	1.0		Silty Clay, Trace Sand and Gravel, dark brown, very stiff (CL FILL)	SS-1 1.0' - 2.5' 9" Recovery	2 2 4	18.6	2.5	
	2.0							
	3.0		Silty Clay, Trace Sand and Gravel, brown, hard (CL FILL)	SS-2 3.5' - 5.0' 18" Recovery	3 4 5	17.8	4.5+	
	4.0							
	5.0							
	6.0		Gravel, Trace Sand, brown, Dense (GP FILL)	SS-3 6.0' - 7.5' 4" Recovery	24 22 14	5.4	-	
	7.0							
	8.0							
	9.0		Sandy Clay, Trace Gravel, brown, stiff (CL FILL)	SS-4 8.5' - 10.0' 16" Recovery	11 10 9	14.6	1.5	
	10.0							
	11.0							
	12.0							
	13.0							
	14.0		Silty Clay, Trace Sand and Gravel, gray, very stiff (CL)	SS-5 13.5' - 15.0' 18" Recovery	4 6 8	18.2	3.0	
	15.0							
	16.0							
	17.0							
	18.0							
	19.0			SS-6 18.5' - 20.0' 18" Recovery	4 5 6	21.2	2.5	
	20.0		END of BORING at 20 Feet					

Drilling Contractor: CGMT, Inc.
Drilling Method: 3¼" O.D. H.S.A. Split Spoon Sampling
Drilling Equipment: CME-45C Truck Mounted Drill Rig
REVIEWED BY: NPW

Water Level (Ft.)
During Drilling: None
Immediately After Drilling: None

Soil Boring Log

Construction & Geotechnical Material Testing, Inc.
60 Martin Lane, Elk Grove Village, Illinois 60007
Telephone (630) 595-1111 ♦ Fax (630) 595-1110

Boring No.: B-16
Date: Thursday, May 11, 2023
Project: Lockport FPD Training Grounds
W. Division Street, Lockport, Illinois 60441
Project No.: 23G0270
Boring Location: See Boring Location Diagram
Logged By: L.S.H.
Ground Elevation:

Soil Boring Prepared for:
Mr. Jason M. Estes, AIA
FGM Architects, Inc.
1211 W. 22nd Street, Suite 700
Oak Brook, Illinois 60523

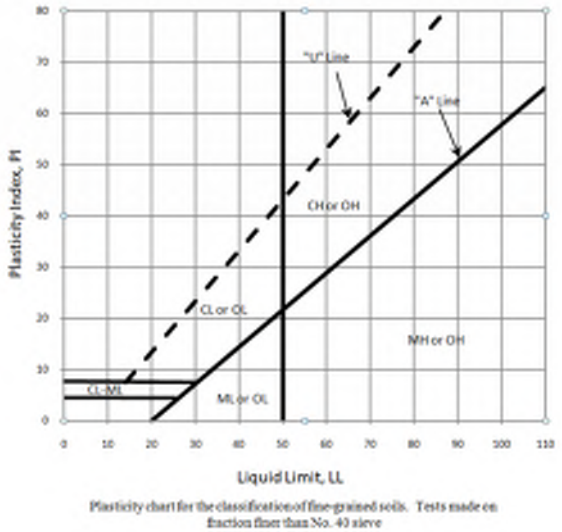
Elevation	Depth	Strata	Soil / Rock Description	Sample Type & No. Depth Interval (Ft) Recovery (in)	Blow Count	Moisture Content (%)	Unconfined Compressive Strength (TSF)	Notes & Test Results
	0.0		Approximately 13" of Topsoil					Unconfined compressive strength of soil samples estimated using a calibrated penetrometer.
	1.0		Silty Clay, Trace Sand and Gravel, brown, very stiff (CL FILL)	SS-1 1.0' - 2.5' 14" Recovery	2 4 6	14.4	3.25	
	2.0							
	3.0		Silty Clay, Trace Sand and Gravel, brown and gray, stiff to hard (CL)	SS-2 3.5' - 5.0' 15" Recovery	3 5 5	16.4	4.5+	
	4.0							
	5.0							
	6.0			SS-3 6.0' - 7.5' 18" Recovery	4 6 10	16.6	4.5+	
	7.0							
	8.0							
	9.0			SS-4 8.5' - 10.0' 18" Recovery	3 4 6	16.3	3.75	
	10.0							
	11.0							
	12.0							
	13.0							
	14.0			SS-5 13.5' - 15.0' 18" Recovery	3 4 7	15.9	3.25	
	15.0							
	16.0							
	17.0							
	18.0							
	19.0			SS-6 18.5' - 20.0' 16" Recovery	3 4 4	20.7	1.5	
	20.0		END of BORING at 20 Feet					

Drilling Contractor: CGMT, Inc.
Drilling Method: 3¼" O.D. H.S.A. Split Spoon Sampling
Drilling Equipment: CME-45C Truck Mounted Drill Rig
REVIEWED BY: NPW

Water Level (Ft.)
During Drilling: None
Immediately After Drilling: None

UNITED SOIL CLASSIFICATION SYSTEM
(ASTM D-2487)

Major Division		Group Symbol	Typical Names	Classification on basis of percentage of fines	Classification Criteria
Coarse-grained soils: More than 50% retained on No. 200 sieve	Gravels: More than 50% of coarse fraction retained on No. 4 sieve	GW	Well-graded gravels and gravel-sand mixtures, little or no fines	Less than 5% pass No. 200 sieve	$C_u = D_{60}/D_{10}$ greater than 4 $C_z = (D_{30})^2/(D_{10}XD_{60})$ between 1 & 3
		GP	Poorly graded gravels and gravel-sand mixtures, little or no fines		Not meeting both criteria for GW
		GM	Silty gravels, gravel-sand-silt mixtures	More than 12% pass No. 200 sieve	Atterberg limits plot below "A" line or plasticity index less than 4
		GC	Clayey gravels, gravel-sand-clay mixtures		Atterberg limits plot above "A" line and plasticity index greater than 7
	Sands: More than 50% of coarse fraction passes No. 4 sieve	SW	Well-graded sands and gravelly sands, little or no fines	5% to 12% pass No. 200 sieve	$C_u = D_{60}/D_{10}$ greater than 6 $C_z = (D_{30})^2/(D_{10}XD_{60})$ between 1 & 3
		SP	Poorly graded sands and gravelly sands, little or no fines		Not meeting both criteria for SW
		SM	Silty sands, sand-silt mixtures	GW, GP, SW, SP GM, GC, SM, SC Borderline classification requiring use of dual symbol	Atterberg limits plot below "A" line or plasticity index less than 4
		SC	Clayey sands, sand-clay mixtures		Atterberg limits plot above "A" line and plasticity index greater than 7
Fine-grained soils: 50% or more passing No. 200 sieve	Silts and Clays: Liquid limit 50% or less	ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands	Note: U-line represents approximate upper limit of LL and PI combinations natural soils (empirically determined). ASTM D-2487	
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays		
		OL	Organic silts and organic silty clays of low plasticity		
	Silts and Clays: Liquid limit greater than 50%	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts		
		CH	Inorganic clays of high plasticity, fat clays		
		OH	Organic clays of medium to high plasticity		
Highly organic soils		Pt	Peat, muck and other highly organic soils		Fibrous organic matter; will char, burn or glow



Plasticity chart for the classification of fine-grained soils. Tests made on fraction finer than No. 40 sieve

Borderline classifications, used for soils possessing characteristics of two groups, are designated by combinations of group symbols. For example: GW-GC, well-graded gravel-sand mixture with clay binder

UNIFIED SOIL CLASSIFICATION SYSTEM

REFERENCE NOTES FOR BORING LOGS

I. Drilling and Sampling Symbols:

SS – Split Spoon Sampler
ST – Shelby Tube Sampler
RC – Rock Core: NX, BX, AX
PM – Pressuremeter
DC – Dutch Cone Penetrometer
RB – Rock Bit Drilling
BS – Bulk Sample of Drilling
PA – Power Auger (no sample)
HSA – Hollow Stem Auger
WS – Wash Sample

Standard Penetration (Blows/Ft) refers to the blows per foot of a 140 lb. hammer falling 30 inches on a 2 inch O.D. split spoon sampler, as specified in ASTM D-1586. The blow count is commonly referred to as the N-value.

II. Correlation of Penetration Resistances to Soil Properties:

Relative Density-Sands, Silts

SPT – N	Relative Density
0 – 3	Very Loose
4 – 9	Loose
10 – 29	Medium Dense
30 – 49	Dense
50 – 80	Very Dense

Consistency of Cohesive Soils

Unconfined Compressive Strength, Qp, tsf	Consistency
under 0.25	Very Soft
0.25 – 0.49	Soft
0.50 – 0.99	Firm
1.00 – 1.99	Stiff
2.00 – 3.99	Very Stiff
4.00 – 8.00	Hard
over 8.00	Very Hard

III Unified Soil Classification Symbols:

GP – Poorly Graded Gravel
GW – Well Graded Gravel
GM – Silty Gravel
GC – Clayey Gravel
SP – Poorly Graded Sand
SW – Well Graded Sand
SM – Silty Sand
SC – Clayey Sand
ML – Low Plasticity Silt
MH – High Plasticity Silt
CL – Low Plasticity Clay
CH – High Plasticity Clay
OL – Low Plasticity Organic
OH – High Plasticity Organic
CL-ML – Dual Classification (Typical)

IV. Water Level Measurement Symbol:

WL – Water Level
WS – While Sampling
WD – While Drilling
BCR – Before Casing Removal
ACR – After Casing Removal
WCI – Wet Cave In
DCI – Dry Cave In

The water levels are those water levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in a granular soil. In clays and plastic silts, the accurate determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally applied.