TERRA ASSOCIATES, Inc.
Consultants in Geotechnical Engineering, Geology
and
Environmental Earth Sciences

October 14, 2022
Project No. T-8565

Mr. Tyler Litzenberger
Vector Development Company
11335 Northeast 122nd Way, Suite 105
Kirkland, Washington 98034

Subject: Geotechnical Engineering Evaluation
Freeman Logistics
48th Street East and Freeman Road East/North Levee Road East and Freeman Road East
Pierce County, Washington

Reference: Geotechnical Report, Freeman Logistics, Freeman Road East and 19th Avenue Northwest, Pierce County, Washington, Project No. T-8565, prepared by Terra Associates, Inc., revised July 11, 2022

Dear Mr. Litzenberger:

As requested, we have completed a geotechnical engineering evaluation for the Freeman Logistics project in Pierce County, Washington. The purpose of our evaluation was to determine if the existing pavement along 48th Street East, Freeman Road East, and North Levee Road East could be incorporated into the final pavement section for the subject project and to provide a pavement design for future roadway improvements.

In order to determine the existing pavement structure, we completed eight borings along Freeman Road East, north of the intersection with North Levee Road East, four borings along 48th Road East, west of Freeman Road East and two borings at the intersection of North Levee Road East and Freeman Road East. The approximate location of the test borings is shown on attached Figure 1.

48th Street East

Surface pavement conditions were observed to be in poor condition. Pavement generally had several areas of old patching, large amounts of alligator cracking and lesser amounts of parallel and perpendicular cracking. Pavement appeared to be in marginally better condition heading west.

Surface conditions along 48th Street East consisted of approximately one to two inches of hot mix asphalt (HMA) overlying approximately four to seven inches of crushed rock base (CRB) on top of subgrade soil. The soil subgrade generally consists of loose to medium dense silty sand to sandy silt with various amounts of gravel overlying medium stiff to stiff sandy silt or loose to medium dense silty sand. Test Borings B-103 exposed medium dense sand with silt underlying the stiff silts at a depth of approximately 5 feet.

Freeman Road East

Surface pavement conditions were observed to be in fair condition. Pavement generally had a larger concentration of parallel cracking closer to the intersection of 48th Road East and Freeman Road East with lesser of alligator and perpendicular cracking. Surface pavement conditions appeared to be in relatively good condition closer towards North Levee Road East with few parallel cracks.

Surface conditions along Freeman Road East consisted of approximately four-and-one-half to six inches of HMA overlying subgrade. No CRB was observed in the borings underlying the paved sections of the roadway along Freeman Road East. The soil subgrade generally consists of loose to medium dense silty sand to silty sand with gravel overlying soft to stiff silts. Test Borings B-1 and B-2 exposed medium dense sands underlying the stiff silts at a depth of approximately 6 feet, and Test Borings B-7 and B-8 exposed medium dense to very dense potential fills consisting of silty sand with gravel in the upper approximately 5 feet. We did not observe any silts in Test Borings B-4 and B-5.

North Levee Road East

Surface pavement conditions were observed to be in relatively fair to good condition. Pavement generally had a larger concentration of parallel cracking in the westbound lane, west of Freeman Road East with lesser of alligator and perpendicular cracking. Surface pavement conditions appeared to be in good condition east of Freeman Road East with only minor parallel cracking, typically in the eastbound lane.

Surface conditions along North Levee Road East consisted of approximately 11 to 12 inches of HMA overlying subgrade. Very minor amounts of CRB were observed in the borings. The soil subgrade generally consists of medium dense fill material consisting of silty sand with gravel overlying possible fill material consisting of very loose to medium dense silty sand with gravel or sand with some to trace silt.

Recommendations

48th Street East

Based on the current asphalt thickness and subgrade soils, it is our opinion that there is insufficient asphalt to support a grind and overlay option along 48th Street East. Therefore, we recommend that for any roadway improvements along 48th Street East the soil subgrade should be exposed, scarified and compacted to a firm and dense condition that follows the recommendations outlined in the referenced geotechnical report. Following the subgrade improvement, the roadway section could be constructed following the improved subgrade pavement section recommendations below.

Freeman Road East

While the existing pavement section along Freeman Road East has sufficient depth to support a grind and overlay option, the subgrade soils and lack of crushed rock base would result in a relatively thick pavement section. The asphalt thickness for the grind and overlay option is included in the pavement sections below. If this asphalt thickness is not suitable for the project, we recommend the subgrade soils along Freeman Road East be exposed, scarified and compacted to a firm and dense condition that follows the recommendations outlined in the referenced geotechnical report. Following the subgrade improvement, the roadway section could be constructed following the improved subgrade pavement section recommendations below.

North Levee Road East

The existing pavement section along North Levee Road East would support a grind and overlay option should it be required. We would note that the existing pavement section along North Levee Road East exceeds the pavement sections outlined below and in our opinion is suitable to support the expected traffic loading from the proposed project.

Pavement Sections

To evaluate the pavement sections, we used the American Association of State Highway and Transportation Officials (AASHTO) procedures. For this procedure, we calculated the structural number required for the pavement section using a design ESAL of 3,000,000. This value is based on estimated traffic data and the City of Fife's Public Works website. We used the structural coefficients of 0.44 for HMA and 0.14 for CRB in determining the the pavement section. Additional design parameters required for the AASHTO procedure and selected for our analysis include the following:

- Reliability – 85 percent
- Standard deviation – 0.45
- Present serviceability index – 4.5
- Terminal serviceability index – 2.0

The supporting capability of the pavement subgrade is represented in the AASHTO procedure by the resilient modulus (M_r). Based on our explorations, the subgrade soils that support the roadway consist predominantly of loose to medium dense silty sand to silty sand with gravel and medium stiff to stiff sandy silt material. Based on correlation with published data and our experience with similar soils, we have assigned the unimproved subgrade an M_r value of 7,000 pounds per square inch (psi) and the improved subgrade an M_r value of 12,000 psi.

The following pavement sections should be used based on unimproved or improved subgrade conditions:

Unimproved subgrade with Grind and Overlay (Freeman Road)

- Seven inches of new HMA over two- and one-half inches of existing HMA

Improved subgrade

- Five inches of HMA over seven inches of CRB

Pavement subgrades should be prepared in accordance with recommendations as outlined in the Site Preparation and Grading Section of the referenced report. All subgrades must be in a firm, relatively non-yielding condition prior to paving. Pavement subgrade should be proof rolled with heavy rubber-tired equipment such as a loaded dump truck to verify firm and stable conditions are present, prior to paving.

We trust the information presented in this report is sufficient for your current needs. If you have any questions or require additional information, please call.

Sincerely yours,
TERRA ASSOCIATES, INC.

Stephanie L. King, E.I.T.
Staff Engineer

CAROLYN S. DECKER
STATE OF WASHINGTON
47016
REGISTERED
PROFESSIONAL ENGINEER

10-14-2022
Carolyn S. Decker, P.E.
President

Enclosure: Figure 1 – Exploration Location Plan
Figures 2 through 15 – Boring Logs
Figures 16 through 18 – Grain Size Analyses

NOTE:

THIS SITE PLAN IS SCHEMATIC. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE. IT IS INTENDED FOR REFERENCE ONLY AND SHOULD NOT BE USED FOR DESIGN OR CONSTRUCTION PURPOSES.

REFERENCE: SITE PLAN PROVIDED BY BING MAPS.

LEGEND:

APPROXIMATE BORING LOCATION

0 200 400

APPROXIMATE SCALE IN FEET

Terra Associates, Inc.
Consultants in Geotechnical Engineering
Geology and
Environmental Earth Sciences

EXPLORATION LOCATION PLAN
FREEMAN LOGISTICS
PIERCE COUNTY, WASHINGTON

Proj.No. T-8565	Date: OCT 2022	Figure 1

LOG OF BORING NO. B-1

Figure No. 2

Project: Freeman Logistics **Project No:** T-8565 **Date Drilled:** November 3, 2021

Client: Vector Development Company **Driller:** BoreTec **Logged By:** MJX

Location: Pierce County, Washington **Depth to Groundwater:** -2.5 ft **Approx. Elev:** NA

Depth (ft)	Sample Interval	Soil Description	Consistency/ Relative Density	SPT (N) Blows / foot (10 30 50)		Moisture Content (%)
0		(5.5-inches ASPHALT)				
		Brown silty SAND with gravel, fine to medium sand, fine to coarse gravel, moist. (SM)	loose		8	8.0
		Brown to gray SILT, moist to wet, mottled, occasional gravel, occasional organic, occasional sand seam. (ML)	stiff		6	40.6
5					10	34.9
		Blackish-gray SAND, fine to medium sand, moist, interbedded silt seams. (SP)	medium dense			22.7
		Test Boring terminated at approximately 5 feet. Perched groundwater seepage observed at approximately 2.5 feet.				

NOTE: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpeted as being indicative of other areas of the site

Terra Associates, Inc.
Consultants in Geotechnical Engineering
Geology and
Environmental Earth Sciences

LOG OF BORING NO. B-2

Figure No. 3

Project: Freeman Logistics **Project No:** T-8565 **Date Drilled:** November 3, 2021

Client: Vector Development Company **Driller:** BoreTec **Logged By:** MJX

Location: Pierce County, Washington **Depth to Groundwater:** 4.5 ft **Approx. Elev:** NA

Depth (ft)	Sample Interval	Soil Description	Consistency/ Relative Density	SPT (N) Blows / foot (10 30 50)		Moisture Content (%)
0		(4.5-inches ASPHALT) Brown silty SAND with gravel, fine to coarse sand, fine to coarse gravel, moist, occasional silt inclusion. (SM)	medium dense		18	8.6
			loose		4	10.2
5		Brown SILT, moist to wet, mottled, occasional sand seam. (ML)	stiff		10	44.3
		Black SAND, fine to medium sand, moist. (SP)	medium dense			14.4
		Test Boring terminated at approximately 5 feet. Perched groundwater seepage observed at approximately 4.5 feet.				

NOTE: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpeted as being indicative of other areas of the site

Terra Associates, Inc.
Consultants in Geotechnical Engineering
Geology and
Environmental Earth Sciences

LOG OF BORING NO. B-3

Figure No. 4

Project: Freeman Logistics **Project No:** T-8565 **Date Drilled:** November 3, 2021

Client: Vector Development Company **Driller:** BoreTec **Logged By:** MJX

Location: Pierce County, Washington **Depth to Groundwater:** -2.5 ft **Approx. Elev:** NA

Depth (ft)	Sample Interval	Soil Description	Consistency/ Relative Density	SPT (N) Blows / foot (10 30 50)		Moisture Content (%)
0		(5-inches ASPHALT) Brown silty SAND with gravel, fine to coarse sand, fine to coarse gravel, moist. (SM)	loose		8	7.8
		Brown SILT with sand, fine sand, moist to wet, mottled, occasional gravel. (ML) *No retrievable sample*	medium stiff		4	
5			stiff		9	27.6
		Test Boring terminated at approximately 5 feet. Perched groundwater seepage observed at approximately 2.5 feet.				

NOTE: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpeted as being indicative of other areas of the site

Terra Associates, Inc.
Consultants in Geotechnical Engineering
Geology and
Environmental Earth Sciences

LOG OF BORING NO. B-4

Figure No. 5

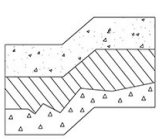
Project: Freeman Logistics **Project No:** T-8565 **Date Drilled:** November 3, 2021

Client: Vector Development Company **Driller:** BoreTec **Logged By:** MJX

Location: Pierce County, Washington **Depth to Groundwater:** NA **Approx. Elev:** NA

Depth (ft)	Sample Interval	Soil Description	Consistency/ Relative Density	SPT (N) Blows / foot (10 30 50)		Moisture Content (%)
0		(5-inches ASPHALT)		•	4	6.5
		Brown silty SAND, fine sand, moist, occasional gravel, occasional organic, occasional silt layer. (SM)				24.2
				•	7	10.3
			loose			
5				•	5	11.3
		Test Boring terminated at approximately 5 feet.				
		No groundwater seepage observed.				

NOTE: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpeted as being indicative of other areas of the site



Terra Associates, Inc.
Consultants in Geotechnical Engineering
Geology and
Environmental Earth Sciences

LOG OF BORING NO. B-5

Figure No. 6

Project: Freeman Logistics **Project No:** T-8565 **Date Drilled:** November 3, 2021

Client: Vector Development Company **Driller:** BoreTec **Logged By:** MJX

Location: Pierce County, Washington **Depth to Groundwater:** NA **Approx. Elev:** NA

Depth (ft)	Sample Interval	Soil Description	Consistency/ Relative Density	SPT (N) Blows / foot (10 30 50)		Moisture Content (%)
0		(5.5-inches ASPHALT)		•	6	5.9
		Brown silty SAND to silty SAND with gravel, fine sand, fine to coarse gravel, moist. (SM)				
				•	4	20.0
			loose			
5				•	6	18.6
		Test Boring terminated at approximately 5 feet.				
		No groundwater seepage observed.				

NOTE: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpeted as being indicative of other areas of the site

Terra Associates, Inc.
Consultants in Geotechnical Engineering
Geology and
Environmental Earth Sciences

LOG OF BORING NO. B-6

Figure No. 7

Project: Freeman Logistics **Project No:** T-8565 **Date Drilled:** November 3, 2021

Client: Vector Development Company **Driller:** BoreTec **Logged By:** MJX

Location: Pierce County, Washington **Depth to Groundwater:** NA **Approx. Elev:** NA

Depth (ft)	Sample Interval	Soil Description	Consistency/ Relative Density	SPT (N) Blows / foot (10 30 50)		Moisture Content (%)
0		(5-inches ASPHALT)				
		Brown silty SAND, fine to coarse sand, moist, mottled, occasional gravel. (SM)	medium dense		18	12.5
			loose		5	12.2
5		Brownish-gray SILT, moist, mottled. (ML)	soft		2	18.5
						50.9
		Test Boring terminated at approximately 5 feet.				
		No groundwater seepage observed.				

NOTE: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpeted as being indicative of other areas of the site

Terra Associates, Inc.
Consultants in Geotechnical Engineering
Geology and
Environmental Earth Sciences

LOG OF BORING NO. B-7

Figure No. 8

Project: Freeman Logistics **Project No:** T-8565 **Date Drilled:** November 3, 2021

Client: Vector Development Company **Driller:** BoreTec **Logged By:** MJX

Location: Pierce County, Washington **Depth to Groundwater:** NA **Approx. Elev:** NA

Depth (ft)	Sample Interval	Soil Description	Consistency/ Relative Density	SPT (N) Blows / foot (10 / 30 / 50)		Moisture Content (%)
0		(5-inches ASPHALT)			29	4.1
		FILL?: Brown silty SAND with gravel, fine to medium sand, fine to coarse gravel, moist, trace silt inclusions. (SM)	medium dense		11	12.0
5		FILL?: Brown GRAVEL with silt and sand, fine to coarse sand, fine to coarse gravel, moist. (GP-GM)			7	8.4
		Test Boring terminated at approximately 5 feet. No groundwater seepage observed.				

NOTE: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpeted as being indicative of other areas of the site

Terra Associates, Inc.
Consultants in Geotechnical Engineering
Geology and
Environmental Earth Sciences

LOG OF BORING NO. B-8

Figure No. 9

Project: Freeman Logistics **Project No:** T-8565 **Date Drilled:** November 3, 2021

Client: Vector Development Company **Driller:** BoreTec **Logged By:** MJX

Location: Pierce County, Washington **Depth to Groundwater:** NA **Approx. Elev:** NA

Depth (ft)	Sample Interval	Soil Description	Consistency/ Relative Density	SPT (N) Blows / foot (10 / 30 / 50)	Moisture Content (%)
0		(6-inches ASPHALT)		50/4"	2.4
		FILL?: Brown silty SAND with gravel, fine to medium sand, fine to coarse gravel, dry to moist, occasional organic. (SM)	very dense	84	6.0
5		Brown SAND with silt, fine to medium sand, moist, trace gravel. (SP-SM)	medium dense	20	5.5 5.2
		Test Boring terminated at approximately 5 feet. No groundwater seepage observed.			

NOTE: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpeted as being indicative of other areas of the site

Terra Associates, Inc.
Consultants in Geotechnical Engineering
Geology and
Environmental Earth Sciences

LOG OF BORING NO. B-101

Figure No. 10

Project: Freeman Logistics (Offsite Roadway Improvements) **Project No:** T-8565 **Date Drilled:** September 21, 2022

Client: Vector Development Company **Driller:** BoreTec **Logged By:** SLK

Location: Pierce County, Washington **Depth to Groundwater:** N/A **Approx. Elev:** N/A

Depth (ft)	Sample Interval	Soil Description	Consistency/ Relative Density	SPT (N) Blows / foot (10 / 30 / 50)	Moisture Content (%)
0		(11 inches ASPHALT) (<1-inch BASE COURSE) FILL: Brown grading to brown-orange silty SAND with gravel, fine to medium sand, fine to coarse gravel, moist, some crushed rock fragments. (SM)	Medium Dense		5.1
		FILL: Brown silty SAND with gravel, fine to medium sand, fine to coarse gravel, moist. (SM)		15	8.9
					5.4
			Loose	8	
5				5	4.7
		Test Boring terminated at approximately 6.5 feet. No groundwater seepage observed.			

NOTE: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpeted as being indicative of other areas of the site

Terra Associates, Inc.
Consultants in Geotechnical Engineering
Geology and
Environmental Earth Sciences

LOG OF BORING NO. B-102

Figure No. 11

Project: Freeman Logistics (Offsite Roadway Improvements) **Project No:** T-8565 **Date Drilled:** September 21, 2022

Client: Vector Development Company **Driller:** BoreTec **Logged By:** SLK

Location: Pierce County, Washington **Depth to Groundwater:** N/A **Approx. Elev:** N/A

Depth (ft)	Sample Interval	Soil Description	Consistency/ Relative Density	SPT (N) Blows / foot (10 / 30 / 50)	Moisture Content (%)
0		(12 inches ASPHALT) (<1-inch BASE COURSE) FILL: Brown silty SAND with gravel, fine to medium sand, fine to coarse gravel, moist, trace brick debris. (SM)	Medium Dense		8.2
		FILL (?): Dark gray SAND with silt and gravel, moist, fine to coarse sand, fine to coarse gravel. (SP-SM)		20	3.5
		*4-inch layer of intermixed light gray silty sand and crushed rock observed at approximately 3 feet.	Very Loose	3	5.1 4.0
		FILL (?): Dark gray SAND with grading to trace silt, fine to medium sand, moist, scattered gravel. (SP-SM/SP)			
5			Medium Dense	13	5.0
		Test Boring terminated at approximately 6.5 feet. No groundwater seepage observed.			

NOTE: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpeted as being indicative of other areas of the site

Terra Associates, Inc.
Consultants in Geotechnical Engineering
Geology and
Environmental Earth Sciences

LOG OF BORING NO. B-103

Figure No. 12

Project: Freeman Logistics (Offsite Roadway Improvements) **Project No:** T-8565 **Date Drilled:** September 21, 2022

Client: Vector Development Company **Driller:** BoreTec **Logged By:** SLK

Location: Pierce County, Washington **Depth to Groundwater:** N/A **Approx. Elev:** N/A

Depth (ft)	Sample Interval	Soil Description	Consistency/ Relative Density	SPT (N) Blows / foot (10 / 30 / 50)	Moisture Content (%)
0		(1-inch ASPHALT) (2 inches SILTY SAND) (5 inches BASE COURSE)			
		FILL: Dark brown silty SAND, fine to medium sand, moist, scattered gravel. (SM)			19.0
		Gray and brown sandy SILT, fine to medium sand, moist, mottled. (ML)		7	30.6
			Loose		32.7
				6	
5					26.5
		Brown SAND with silt, fine to medium sand, moist. (SP-SM)	Medium Dense	12	6.8
		Test Boring terminated at approximately 6.5 feet. No groundwater seepage observed.			

NOTE: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpeted as being indicative of other areas of the site

Terra Associates, Inc.
Consultants in Geotechnical Engineering
Geology and
Environmental Earth Sciences

LOG OF BORING NO. B-104

Figure No. 13

Project: Freeman Logistics (Offsite Roadway Improvements) **Project No:** T-8565 **Date Drilled:** September 21, 2022

Client: Vector Development Company **Driller:** BoreTec **Logged By:** SLK

Location: Pierce County, Washington **Depth to Groundwater:** N/A **Approx. Elev:** N/A

Depth (ft)	Sample Interval	Soil Description	Consistency/ Relative Density	SPT (N) Blows / foot (10 / 30 / 50)	Moisture Content (%)
0		(1-inch ASPHALT) (3 inches GRAVEL BASE COURSE) (4 inches SAND BASE COURSE)			
		FILL: Brown sandy SILT, fine to medium sand, moist. (ML)			20.2
		FILL (?): Brown-gray silty SAND, fine to medium sand, moist. (SM)			
		Brown-gray SILT with sand, fine sand, moist. (ML)		5	17.5
					34.2
		Bedded layers of gray and orange sandy SILT, brown SAND with silt and brown-gray silty SAND, fine to medium sand, moist, heavily mottled. (ML/SP-SM/SM)			30.2
			Loose	6	
5					30.5
				5	
		Test Boring terminated at approximately 6.5 feet. No groundwater seepage observed.			

NOTE: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpeted as being indicative of other areas of the site

Terra Associates, Inc.
Consultants in Geotechnical Engineering
Geology and
Environmental Earth Sciences

LOG OF BORING NO. B-105

Figure No. 14

Project: Freeman Logistics (Offsite Roadway Improvements) **Project No:** T-8565 **Date Drilled:** September 21, 2022

Client: Vector Development Company **Driller:** BoreTec **Logged By:** SLK

Location: Pierce County, Washington **Depth to Groundwater:** N/A **Approx. Elev:** N/A

Depth (ft)	Sample Interval	Soil Description	Consistency/ Relative Density	SPT (N) Blows / foot (10 / 30 / 50)	Moisture Content (%)
0		(1.5 inches ASPHALT) (4 inches BASE COURSE)			
		FILL: Black silty SAND with gravel, fine to medium sand, fine to coarse gravel, moist. (SM)			17.5
		Intermixed gray-brown grading to dark gray sandy SILT and silty SAND, fine to medium sand, moist, mottled, scattered gravel. (ML/SM)	Loose to Medium Dense	10	23.4
					20.2
		Gray to gray-brown SILT, moist to wet, moderatly to heavily mottled, trace sand. (ML) (97.8% F)		5	41.4
			Medium Stiff		
5					37.8
		*Approximate 1-inch layer of gray silty sand observed at about 5.5 feet.		6	
		Test Boring terminated at approximately 6.5 feet. No groundwater seepage observed. Soils below approximately 3 feet were noted to be slightly wetter.			

NOTE: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpeted as being indicative of other areas of the site

Terra Associates, Inc.
Consultants in Geotechnical Engineering
Geology and
Environmental Earth Sciences

LOG OF BORING NO. B-106

Figure No. 15

Project: Freeman Logistics (Offsite Roadway Improvements) **Project No:** T-8565 **Date Drilled:** September 21, 2022

Client: Vector Development Company **Driller:** BoreTec **Logged By:** SLK

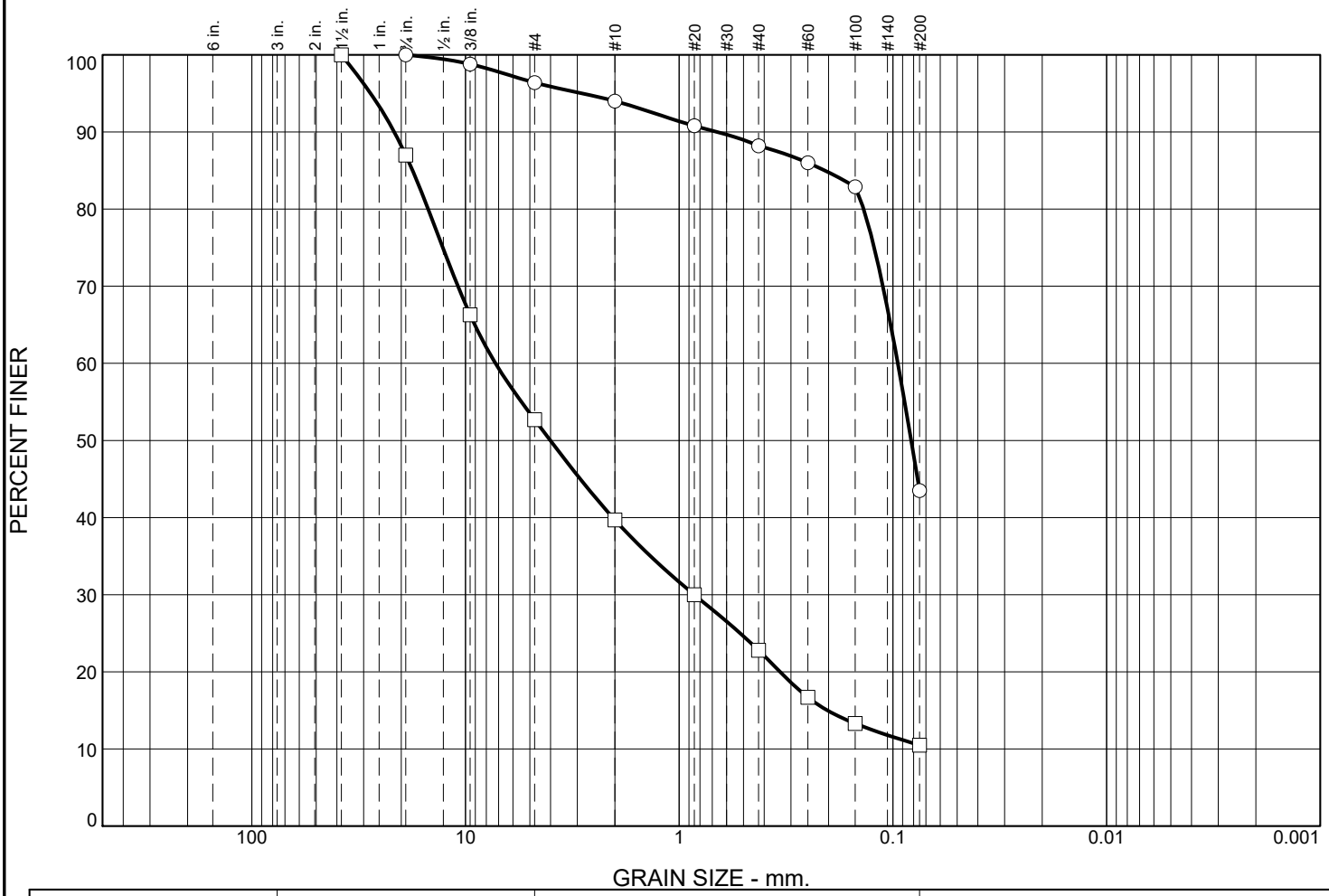
Location: Pierce County, Washington **Depth to Groundwater:** N/A **Approx. Elev:** N/A

Depth (ft)	Sample Interval	Soil Description	Consistency/ Relative Density	SPT (N) Blows / foot (10 / 30 / 50)	Moisture Content (%)
0		(2 inches ASPHALT) (4 inches BASE COURSE) FILL (?): Dark gray sandy SILT to silty SAND, fine to medium sand, moist, scattered gravel. (ML/SM)			28.1
		Bedded layers of gray-brown sandy SILT and silty SAND, fine to medium sand, moist, trace to some mottling. (ML/SM)	Loose to Medium Dense	10	15.2
					35.3
			Loose	5	
5					23.7
				9	
		Test Boring terminated at approximately 6.5 feet. No groundwater seepage observed. Soils at approximately 3 feet were noted to be slightly wetter.			

NOTE: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpeted as being indicative of other areas of the site

Terra Associates, Inc.
Consultants in Geotechnical Engineering
Geology and
Environmental Earth Sciences

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	3.6	2.4	5.8	44.7	43.5	
□	0.0	13.0	34.3	13.0	16.9	12.3	10.5	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.2082	0.0948	0.0821					
□			17.6961	7.2404	4.0092	0.8500	0.2025			

	Material Description	USCS	AASHTO
○	silty SAND	SM	
□	GRAVEL with silt and sand	GP-GM	

Project No. T-8565 **Client:** Vector Development Company

Project: Freeman Logistics (Offsite Roadway Improvements)

○ **Location:** Test Boring B-6 **Depth:** 2.5 ft **Sample Number:** 2

□ **Location:** Test Boring B-7 **Depth:** 5 ft **Sample Number:** 3

Remarks:

○ Tested on November 23, 2021

□ Tested on November 23, 2021

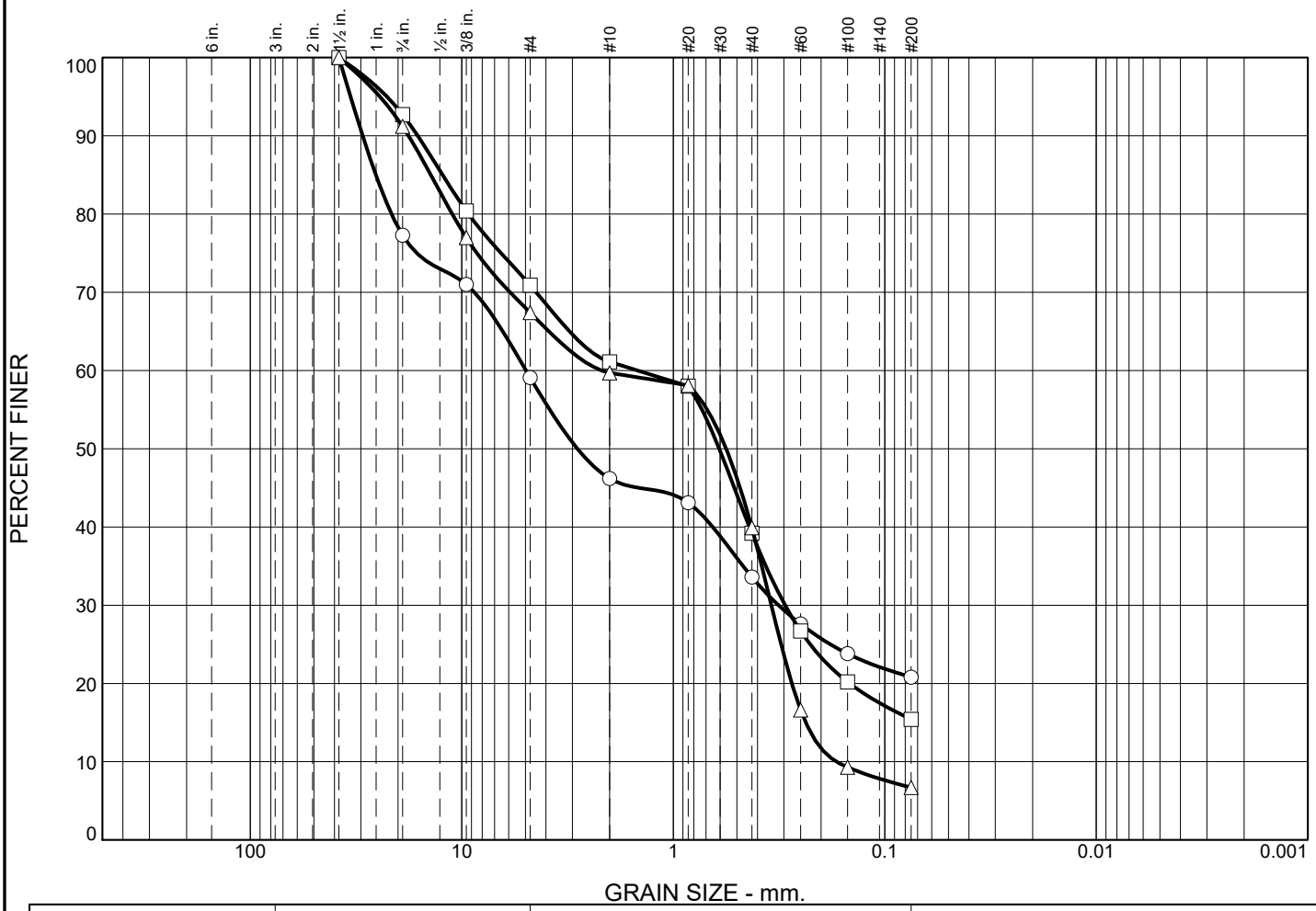
Terra Associates, Inc.

Kirkland, WA

Figure 16

Tested By: FQ

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	22.7	18.2	12.9	12.6	12.8	20.8	
□	0.0	7.3	21.8	9.8	21.9	23.8	15.4	
△	0.0	8.8	23.8	7.7	19.8	33.2	6.7	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			25.4879	4.9685	2.8401	0.3183				
□			12.3245	1.4763	0.6063	0.2960				
△			14.0097	2.1821	0.5623	0.3438	0.2365	0.1692	0.32	12.90

Material Description	USCS	AASHTO
○ silty GRAVEL with sand	GM	
□ silty SAND with gravel	SM	
△ poorly graded SAND with silt and gravel	SP-SM	

Project No. T-8565 **Client:** Vector Development Company

Project: Freeman Logistics (Offsite Roadway Improvements)

○ **Location:** B-101 **Depth:** -1.5 feet

□ **Location:** B-101 **Depth:** -5 feet

△ **Location:** B-102 **Depth:** -1.5 feet

Remarks:

○ Tested on September 27, 2022

□ Tested on September 27, 2022

△ Tested on September 27, 2022

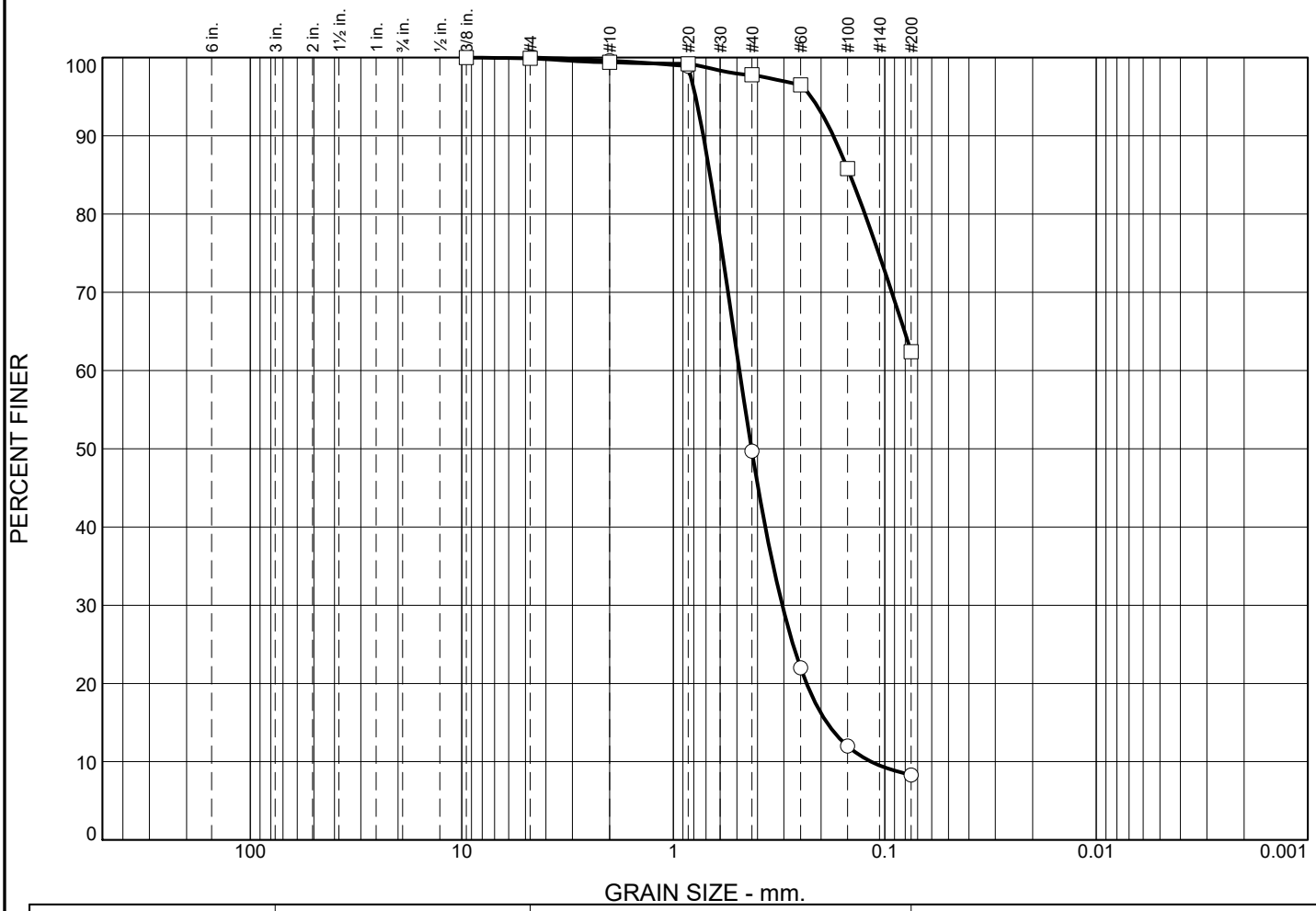
Terra Associates, Inc.

Kirkland, WA

Figure 17

Tested By: KJ

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.4	49.9	41.4	8.3	
□	0.0	0.0	0.1	0.5	1.6	35.4	62.4	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.6696	0.4865	0.4268	0.3052	0.1880	0.1161	1.65	4.19
□			0.1459							

Material Description	USCS	AASHTO
○ poorly graded SAND with silt	SP-SM	
□ sandy SILT	ML	

Project No. T-8565 **Client:** Vector Development Company

Project: Freeman Logistics (Offsite Roadway Improvements)

○ **Location:** B-103 **Depth:** -3 feet

□ **Location:** B-106 **Depth:** -5 feet

Remarks:

○ Tested on September 27, 2022

□ Tested on September 27, 2022

Terra Associates, Inc.

Kirkland, WA

Figure 18

Tested By: KJ