APPENDIX B

Exploration and Well Construction Logs by AESI

APPENDIX B
Exploration and Well Construction Logs by AESI

TABLE B-1: GEOLOGIC CONTACTS

Location	Ground Surface Elevation	Total Depth	Depth Below Ground Surface			Top of Unit Elevation		
			Till	Pre-Vashon	Bedrock	Till	Pre-Vashon	Bedrock
			(Qvt)	(Qpv)	(Tp)	(Qvt)	(Qpv)	(Tp)
EB-1W	830.02	175	NE	147	>175	NE	683	<655
EB-2W	825.05	75	NE	NE	68	NE	NE	757
EB-3W	780.52	105	64	NE	92	717	NE	689
EB-4W	790.80	157	NE	125	153	NE	666	638
EB-5W	771.00	85	72.5	NE	76	699	NE	695
EB-6W	825.95	130	83	NE	124	743	NE	702
EB-7W	844.90	245	151	154	>245	694	691	<600
EB-8W	845.61	150	100	110	142	746	736	704
EB-9W	807.77	197	138	142	191	670	666	617
EB-10W	850.22	60	NE	NE	51	NE	NE	799
EB-11W	849.92	40	NE	NE	NE	NE	NE	NE
EB-12W	842.83	95	83	85	92	760	758	751
EB-13	844.8	90	NE	NE	74	NE	NE	771
B-1	867	60	NE	NE	>60	NE	NE	<807
B-2	848.62	70	NE	NE	50.5	NE	NE	798
B-3	843.68	105	78.5	81	93.5	765	763	750
B-4	790.24	75	NE	NE	>75	NE	NE	<715
B-5	806.87	45	NE	NE	33.5	NE	NE	773
B-6	901	120	NE	NE	114	NE	NE	787
B-7	801	70	NE	NE	64.5	NE	NE	737

All units reported in feet. N/A = not applicable, no well completed. NE = not encountered.
Ground surface elevations presented as surveyed data to the nearest tenth or hundredth. Non-surveyed ground surface elevations reported to the nearest foot as reported on the log.

Coarse-Grained Soils - More than 50%[1] Retained on No. 200 Sieve	Gravels - More than 50%[1] of Coarse Fraction Retained on No. 4 Sieve	≤5% Fines[2]	GW	Well-graded gravel and gravel with sand, little to no fines
			GP	Poorly-graded gravel and gravel with sand, little to no fines
		≥12% Fines[2]	GM	Silty gravel and silty gravel with sand
			GC	Clayey gravel and clayey gravel with sand
	Sands - 50%[1] or More of Coarse Fraction Passes No. 4 Sieve	≤5% Fines[2]	SW	Well-graded sand and sand with gravel, little to no fines
			SP	Poorly-graded sand and sand with gravel, little to no fines
		≥12% Fines[2]	SM	Silty sand and silty sand with gravel
			SC	Clayey sand and clayey sand with gravel
Fine-Grained Soils - 50%[1] or More Passes No. 200 Sieve	Silts and Clays Liquid Limit Less than 50		ML	Silt, sandy silt, gravelly silt, silt with sand or gravel
			CL	Clay of low to medium plasticity; silty, sandy, or gravelly clay, lean clay
			OL	Organic clay or silt of low plasticity
	Silts and Clays Liquid Limit 50 or More		MH	Elastic silt, clayey silt, silt with micaceous or diatomaceous fine sand or silt
			CH	Clay of high plasticity, sandy or gravelly clay, fat clay with sand or gravel
			OH	Organic clay or silt of medium to high plasticity
Highly Organic Soils			PT	Peat, muck and other highly organic soils

Terms Describing Relative Density and Consistency

Coarse-Grained Soils	Density	SPT[3] blows/foot
	Very Loose	0 to 4
	Loose	4 to 10
	Medium Dense	10 to 30
	Dense	30 to 50
	Very Dense	>50

Fine-Grained Soils	Consistency	SPT[3] blows/foot
	Very Soft	0 to 2
	Soft	2 to 4
	Medium Stiff	4 to 8
	Stiff	8 to 15
	Very Stiff	15 to 30
	Hard	>30

Test Symbols

G = Grain Size
M = Moisture Content
A = Atterberg Limits
C = Chemical
DD = Dry Density
K = Permeability

Component Definitions

Descriptive Term	Size Range and Sieve Number
Boulders	Larger than 12"
Cobbles	3" to 12"
Gravel	3" to No. 4 (4.75 mm)
Coarse Gravel	3" to 3/4"
Fine Gravel	3/4" to No. 4 (4.75 mm)
Sand	No. 4 (4.75 mm) to No. 200 (0.075 mm)
Coarse Sand	No. 4 (4.75 mm) to No. 10 (2.00 mm)
Medium Sand	No. 10 (2.00 mm) to No. 40 (0.425 mm)
Fine Sand	No. 40 (0.425 mm) to No. 200 (0.075 mm)
Silt and Clay	Smaller than No. 200 (0.075 mm)

[4] Estimated Percentage

Component	Percentage by Weight
Trace	<5
Some	5 to <12
Modifier (silty, sandy, gravelly)	12 to <30
Very *modifier* (silty, sandy, gravelly)	30 to <50

Moisture Content

Dry - Absence of moisture, dusty, dry to the touch
Slightly Moist - Perceptible moisture
Moist - Damp but no visible water
Very Moist - Water visible but not free draining
Wet - Visible free water, usually from below water table

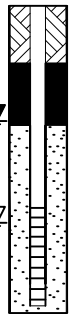
Symbols

Sampler Type and Description

- 10 / 15 / 20 Blows/6" or portion of 6"
- Split-Spoon Sampler (SPT)
- California Sampler
- Ring Sampler
- Continuous Sampling
- Grab Sample
- Portion not recovered

Groundwater depth

- ATD At time of drilling
- Static water level (date)



- Cement grout surface seal
- Bentonite seal
- Filter pack with blank casing section
- Screened casing or Hydrotip with filter pack
- End cap

Classifications of soils in this report are based on visual field and/or laboratory observations, which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field or laboratory testing unless presented herein. Visual-manual and/or laboratory classification methods of ASTM D-2487 and D-2488 were used as an identification guide for the Unified Soil Classification System.

(1) Percentage by dry weight
(2) Combined USCS symbols used for fines between 5% and 12%
(3) (SPT) Standard Penetration Test (ASTM D-1586)
(4) In General Accordance with Standard Practice for Description and Identification of Soils (ASTM D-2488)

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EXPLORATION LOG KEY

FIGURE: A1

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-1W	1 of 8

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	~832.1	Surface Elevation (ft)	~829.6 (Lidar, NAVD88)
Water Level Elevation	~713	Date Start/Finish	11/23/20,11/25/20
Drilling/Equipment	Cascade Drilling / TSi 150CC Sonic	Hole Diameter (in)	6" casing / 4" core barrel
Hammer Weight/Drop	N/A	Well Tag #	BLZ 356

Depth (ft)	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
	Stick up -2.5 to 0 feet Cement 0 to 3 feet				**Forest Duff** Moist, dark yellowish brown (10YR), silty, gravelly, fine to coarse SAND; abundant roots and rootlets; scattered charcoal; no apparent bedding (SM).
					Weathered Vashon Recessional Outwash Moist to very moist, yellowish brown to strong brown (7.5YR), silty, gravelly, fine to coarse SAND; occasional to scattered rootlets; massive (SM).
					Vashon Recessional Outwash Moist, grayish brown, sandy, fine to coarse GRAVEL, trace to some silt; occasional cobbles; sand is predominantly medium to coarse; stratified (gravel lenses <1/2 foot thick) (GP-GM).
5	Bentonite chips 3 to 120 feet				Cobble stuck in drill bit. Becomes sandy to very sandy.
10	2-inch I.D. Sch 40 PVC casing 0 to 123 feet				Becomes very sandy.
					Moist (slightly baked), fine to coarse GRAVEL, some sand to sandy, trace to some silt and cobbles; slight normal grading with upper contact (GP).
15					Many pulverized cobbles.
20					Moist to very moist, gray, sandy, fine to coarse GRAVEL, some silt; scattered cobbles; abundance of volcanic rock, broken gravels (red/gray) (GP-GM). No recovery 20 to 25 feet. Recovery all slough, cobble stuck in bit, driller runs casing after previous drive. Adjacent boring: recovery from 20 to 22 feet is moist to very moist, sandy, fine to coarse GRAVEL, some silt, abundant cobbles (GP-GM). No recovery 22 to 25 feet.

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (2/11/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 200367H001.GPJ BORING.GDT 5/15/23

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-1W	2 of 8

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	~832.1	Surface Elevation (ft)	~829.6 (Lidar, NAVD88)
Water Level Elevation	~713	Date Start/Finish	11/23/20,11/25/20
Drilling/Equipment	Cascade Drilling / TSi 150CC Sonic	Hole Diameter (in)	6" casing / 4" core barrel
Hammer Weight/Drop	N/A	Well Tag #	BLZ 356

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
						No recovery 25 to 30 feet. Cobble stuck in bit, driller redrills and recovers slough on next run. Adjacent boring: recovery from 25 to 27 feet is as above (GP-GM). No recovery 27 to 30 feet.
30						**Vashon Ice-Contact Deposits** Moist to very moist, grayish brown (2.5Y), silty, sandy, fine GRAVEL; occasional cobble; cohesive plastic matrix; appears matrix supported; unsorted; diamict (GM). Moist to very moist, grayish brown and gray (2.5Y), silty, fine to medium SAND, some gravel and sandy, SILT, trace to some clay; interbedded; cohesive; plastic; distorted bedding (SM/MH). No recovery 33 to 35 feet.
35		Bentonite chips 3 to 120 feet				Very moist, grayish brown to light yellowish brown, silty, sandy, fine to coarse GRAVEL, trace clay; cohesive plastic matrix; clast supported; poorly sorted to massive (GM). Grades to very pale brown, volcanic gravels occasionally have >3mm weathering rinds.
40		2-inch I.D. Sch 40 PVC casing 0 to 123 feet				Very moist, gray, silty, sandy, fine to coarse GRAVEL, some clay; scattered cobbles; cohesive plastic matrix; stratified (GM/GC). Contains pulverized cobbles. Moist (baked), grayish brown (2.5Y) with lesser pale brown and light and dark reddish brown, silty, gravelly to very gravelly, fine to coarse SAND; unsorted; diamicton; scattered black charcoal lenses (GM).
45						Very moist, grayish brown (10YR) with brownish yellow, silty, sandy, fine to coarse GRAVEL, some clay; scattered charcoal; cohesive plastic matrix (GM).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (2/11/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-1W	3 of 8

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	~832.1	Surface Elevation (ft)	~829.6 (Lidar, NAVD88)
Water Level Elevation	~713	Date Start/Finish	11/23/20,11/25/20
Drilling/Equipment	Cascade Drilling / TSi 150CC Sonic	Hole Diameter (in)	6" casing / 4" core barrel
Hammer Weight/Drop	N/A	Well Tag #	BLZ 356

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
						Very moist, grayish brown (10YR), silty, fine to coarse SAND, some clay; scattered charcoal; cohesive plastic binder; faintly stratified (SM).
						As above; dark gray (10YR) (SM/SC). Grades to very gravelly (SM).
55						Moist to very moist, grayish brown (10YR), gravelly, fine to medium SAND, some silt to silty; scattered charcoal (SP-SM).
						Moist to very moist, grayish brown and black (10YR), very sandy, silty, fine to coarse GRAVEL; abundant charcoal; no apparent bedding; appears lightly cemented; local Puget Group provenance and volcanics (GM).
60						Moist to very moist (baked), grayish brown (10YR), very gravelly, fine to coarse SAND, some silt to silty; scattered cobbles and charcoal; abundant Puget Group sandstone gravels (SP-SM).
65		Bentonite chips 3 to 120 feet				Very moist to wet, grayish brown (10YR), fine to coarse SAND, some gravel to gravelly, trace to some silt; faintly stratified; local provenance (coal clasts) (SP).
						Very moist to wet, light brownish gray (10YR), very sandy, fine GRAVEL, some silt; bedded (GP-GM).
						End drilling at 70 feet on 12/23/20. Hole dry start of 12/24/20.
70		2-inch I.D. Sch 40 PVC casing 0 to 123 feet				Very moist, grayish brown (2.5Y) weathering to brown (7.5YR), silty, sandy, GRAVEL, trace to some clay; occasional cobble; faint bedding to massive (GM).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (2/11/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-1W	4 of 8

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	~832.1	Surface Elevation (ft)	~829.6 (Lidar, NAVD88)
Water Level Elevation	~713	Date Start/Finish	11/23/20,11/25/20
Drilling/Equipment	Cascade Drilling / TSi 150CC Sonic	Hole Diameter (in)	6" casing / 4" core barrel
Hammer Weight/Drop	N/A	Well Tag #	BLZ 356

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
						Moist to very moist, grayish brown, (2.5Y), silty to very silty, gravelly, fine to coarse SAND; rare cobbles; gravel is fine; diamicton; cohesive; plastic; unsorted (SM).
						Moist to very moist, black and yellowish brown (10YR), silty, gravelly, fine to coarse SAND; gravel is fine to coarse; sheared texture (SM).
						Moist to very moist, grayish brown (2.5Y), silty to very silty, fine to coarse SAND, some gravel to gravelly, trace clay; gravel is fine to coarse; unsorted; diamicton; cohesive; plastic matrix (SM).
80						Light olive brown (2.5Y) clayey, silt rip-up clasts?
						Grades to silty, some gravel. Moist (baked), grayish brown to brown (10YR) and yellowish brown mottled, silty, gravelly, fine to coarse SAND; unsorted; diamicton (SM).
85						Moist (baked), dark grayish brown to brown (10YR) weathering to brown (7.5YR), gravelly to very gravelly, fine to coarse SAND, some silt to silty; scattered cobbles and charcoal; gravel lenses (≤0.5 feet thick); bedded (SM). Driller notes tight drill action.
90						As above; grades to some silt (SW-SM),
95		Bentonite chips 3 to 120 feet				Moist to very moist, dark grayish brown (10YR), fine to coarse SAND, trace to some silt, trace gravel; massive to faintly stratified; alluvium (SP).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (2/11/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-1W	5 of 8

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	~832.1	Surface Elevation (ft)	~829.6 (Lidar, NAVD88)
Water Level Elevation	~713	Date Start/Finish	11/23/20,11/25/20
Drilling/Equipment	Cascade Drilling / TSi 150CC Sonic	Hole Diameter (in)	6" casing / 4" core barrel
Hammer Weight/Drop	N/A	Well Tag #	BLZ 356

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		2-inch I.D. Sch 40 PVC casing 0 to 123 feet				As above; becomes very moist; driller vibed out sample; low recovery (SP).
						No recovery 101 to 105 feet.
105						Recovery is redrilled slough lost previous drive, includes pulverized cobbles (rock flour) and drilling altered sediment (GM?).
110						Moist (baked), brown (10YR) with strong brown weathering, very sandy, fine GRAVEL, some silt to silty; scattered charcoal; occasional cobbles; faint bedding (GW-GM).
	▽					Cobble pulverized (rock flour).
115						Moist to very moist, dark grayish brown, gravelly, fine to coarse SAND, some silt; faintly stratified (SW-SM).
	▼					Moist to very moist, gray, silty, fine to coarse SAND, some gravel to gravelly; massive (SM).
						Moist (baked), grayish brown, very sandy, fine GRAVEL, some silt to silty; occasional cobble; faintly stratified (GW-GM).
120						Becomes wet and grades to gravelly, fine to coarse SAND, trace to some silt (SP-SM).
		#2/12 Monterey sand 120 to 153 feet				Wet, dark grayish brown, fine to coarse SAND, trace to some silt, trace gravel; Northern Provenance(?); massive (SP).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- ▽ Water Level (2/11/22)
- ▼ Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-1W	6 of 8

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	~832.1	Surface Elevation (ft)	~829.6 (Lidar, NAVD88)
Water Level Elevation	~713	Date Start/Finish	11/23/20,11/25/20
Drilling/Equipment	Cascade Drilling / TSi 150CC Sonic	Hole Diameter (in)	6" casing / 4" core barrel
Hammer Weight/Drop	N/A	Well Tag #	BLZ 356

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
130						Grades to gravelly. Wet, light yellowish brown, sandy, SILT; cored through sandstone boulder biasing fines content and sediment color (ML). Wet, grayish brown, gravelly, medium to coarse SAND, trace to some silt; bedded (SP).
135						Wet, grayish brown, silty, sandy, fine to coarse GRAVEL; abundant cobbles; thin sand interbeds; stratified (GM). Grades to light yellowish brown. Sandstone gravels present.
140		2-inch I.D. Sch 40 PVC well screen 0.020-inch slot width 123 to 153 feet				Wet, grayish brown to brown (10YR), very sandy, fine to coarse GRAVEL, some silt to silty; stratified/bedded (GM). Grades to some silt with scattered cobbles (GP-GM). Zones of pulverized cobbles.
145						Grades to silty (GM). **Pre-Vashon Deposits** Very moist, dark yellowish brown to brown (10YR), gravelly, silty, fine SAND; scattered charcoal; distorted bedding; nodules of silt (weathered sandstone) (SM). Very moist to wet, brown to dark yellowish brown (10YR), silty, fine SAND, some gravel; scattered very pale brown, weathered Puget Group sandstone gravels; lenses of black charcoal (SM).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (2/11/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-1W	7 of 8

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	~832.1	Surface Elevation (ft)	~829.6 (Lidar, NAVD88)
Water Level Elevation	~713	Date Start/Finish	11/23/20,11/25/20
Drilling/Equipment	Cascade Drilling / TSi 150CC Sonic	Hole Diameter (in)	6" casing / 4" core barrel
Hammer Weight/Drop	N/A	Well Tag #	BLZ 356

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
						End of drilling 11/24/20.
						Very moist, olive gray to olive (5Y), silty, fine to medium SAND, some gravel to gravelly; faint plane bedding; local clasts (Puget Group sandstone and coal) provenance; silt interbeds; alluvium (SM).
		Threaded end cap				
155						Very moist, dark gray and black (GLEY1), silty to very silty, fine SAND, some gravel; thinly bedded to laminated; contains abundant Puget Group coal; overbank deposits (SM).
						Very moist to wet, dark gray (GLEY1 to 5Y), fine to medium SAND, some gravel, some silt to silty; faintly bedded to massive (SP-SM).
160						Very moist, dark gray (GLEY1), silty, very sandy, fine to coarse GRAVEL to very gravelly, silty, fine to medium SAND; normally graded; cobbles near lower contact; cohesive non-plastic matrix (SM/GM).
						Very moist, dark gray, very sandy, SILT and SILT interbedded; thinly bedded to laminated; low plasticity; lacustrine deposits; mildly effervescent (ML).
165		Native cave-in backfill 153 to 175 feet				Very moist, dark gray, fine SAND, some silt to silty, trace medium to coarse sand; faint cross bedding; alluvium (SP-SM).
						Very moist, black (GLEY1), silty, fine to coarse SAND, some gravel; >90% coal; bedded (SM).
						Very moist, dark gray (GLEY1), sandy to very sandy, SILT; occasional thin lenses of black silty, sand with some gravel; bedded to massive; overbank deposits; mildly effervescent (ML).
170						
						Very moist, dark gray, silty to very silty, fine to medium SAND, trace coarse sand; inversely graded; massive (SM).
						Very moist, dark gray, very sandy, SILT; massive; overbank to lacustrine; weakly effervescent (ML).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (2/11/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-1W	8 of 8

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	~832.1	Surface Elevation (ft)	~829.6 (Lidar, NAVD88)
Water Level Elevation	~713	Date Start/Finish	11/23/20,11/25/20
Drilling/Equipment	Cascade Drilling / TSi 150CC Sonic	Hole Diameter (in)	6" casing / 4" core barrel
Hammer Weight/Drop	N/A	Well Tag #	BLZ 356

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
180						Boring terminated at 175 feet Well completed at 153 feet on 11/25/20. Adjacent boring terminated at 30 ft on 11/25/20. Groundwater encountered at 116.5 ft ATD with hole open 120 - 135 ft, 117 ft ATD with hole open 130 - 140 ft, 117.5 feet with hole open 140 - 150 ft, 121 ft ATD with hole open 150 - 160 ft, 119.5 ft ATD with hole open 160 - 175 ft, and at 117 ft after well completion & before well development. Water level at 112.4 ft after well development on 2/11/22. ~3 ft of sediment in well after completion that was bailed from well during well development. 12 volt stainless steel sample champ XL pump installed on 3/11/22.
185						
190						
195						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (2/11/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 200367H001.GPJ BORING.GDT 5/15/23

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-2W	1 of 4

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	827.38 (Surveyed)	Surface Elevation (ft)	825.05
Water Level Elevation	~790	Date Start/Finish	1/31/22,2/2/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	9":0-70', 8":70-75"
Hammer Weight/Drop	N/A	Well Tag #	BNY 894

Depth (ft)	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
	Above ground monument with bollards Concrete 0 to 2 feet				**Topsoil - 2 inches** Moist to very moist, brown to dark brown, gravelly, silty, fine to coarse SAND; abundant organics (SM). **Weathered Vashon Recessional Outwash** Very moist, dark yellowish brown, sandy, fine to coarse GRAVEL, some silt; abundant cobbles; scattered rootlets (GP-GM). **Vashon Recessional Outwash** Driller adds water at 2 feet. Boulder from 2 to 5 feet; chews up drill bit.
	Bentonite chips 2 to 5 feet				
5					Very moist (added water), grayish brown, coarse GRAVEL, some sand, trace silt; abundant cobbles; bedded; coarsens upward (GP).
					Moist to very moist (added water), grayish brown, sandy, fine to coarse GRAVEL, trace to some silt; bedded; subrounded gravel; oblate, prolate, and bladed clast shapes; coarsening upwards (GP).
	18-inch centralizer at 8 feet				
10	Bentonite grout 5 to 53 feet				No recovery 10 to 12 feet.
					Moist, grayish brown, very sandy, fine to coarse GRAVEL, trace silt; scattered cobbles; bedded (GP).
15	4-inch I.D. Sch 40 PVC riser with threaded connections -2.05 to 60.7 feet				**Vashon Ice Contact Deposits** Moist to very moist, pale brown to light yellowish brown (10YR), fine to medium SAND, trace to some coarse sand, trace silt; faintly stratified/bedded (SP).
20					Driller switches from straight bit to auger bit at 20 feet, notes easy drilling.
					Occasional thin interbeds (<3 inches thick) of grayish brown to gray (10YR), silty, fine to medium sand with minor coal fragments (SP).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (2/2/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

associated earth sciences incorporated

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-2W	2 of 4

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	827.38 (Surveyed)	Surface Elevation (ft)	825.05
Water Level Elevation	~790	Date Start/Finish	1/31/22,2/2/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	9":0-70', 8":70-75"
Hammer Weight/Drop	N/A	Well Tag #	BNY 894

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		Bentonite grout 5 to 53 feet				
		18-inch centralizer at 28 feet				
30		4-inch I.D. Sch 40 PVC riser with threaded connections -2.05 to 60.7 feet				No recovery 30 to 32 feet.
						Interbeds are scattered/more frequent, samples are partially baked (moist) (SP/SP-SM).
35	▼					
40						Wet, brown (10YR), fine to medium SAND, trace to some coarse sand, trace to some silt; bedded/stratified (SP-SM).
45		Bentonite grout 5 to 53 feet				
		18-inch centralizer at 48 feet				

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (2/2/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

associated earth sciences incorporated

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-2W	3 of 4

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	827.38 (Surveyed)	Surface Elevation (ft)	825.05
Water Level Elevation	~790	Date Start/Finish	1/31/22,2/2/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	9":0-70', 8":70-75"
Hammer Weight/Drop	N/A	Well Tag #	BNY 894

Depth (ft)	WELL CONSTRUCTION	DESCRIPTION
	4-inch I.D. Sch 40 PVC riser with threaded connections -2.05 to 60.7 feet	Casing at 40 feet; water level at 36.3 feet; hole staying open.
		Wet, yellowish brown (10YR), fine to medium SAND, trace to some coarse sand, trace silt; faintly bedded; <1% fine gravel (SP).
	Medium bentonite chips 53 to 58 feet	
55		
	10/20 silica sand 58 to 71.1 feet	Wet, very dark grayish brown to brown (10YR), sandy, fine to coarse GRAVEL, trace to some silt; occasional cobbles; faintly bedded (GP-GM).
60		No recovery 60 to 62 feet; slough. Casing at 50 feet; water level ay 35.5 feet.
	4-inch I.D. Sch 40 PVC well screen 0.020-inch slot width 60.7 to 70.7 feet	
65		Wet, yellowish brown (10YR), fine to coarse GRAVEL, some sand, trace silt (GP).
		Puget Group Bedrock Driller switches to straight bit, unable to advance with auger bit at 68 feet. Pulverized rock at bottom of drive to 68 feet.
70		No recovery 70 to 72 feet; slough is mix of upper gravel and rock fragments.
	Threaded end cap 70.7 to 71.1	
		Slightly weathered to fresh, faintly thinly bedded to massive, dark gray (7.5YR), moderately strong (R3), fine grained, SANDSTONE/SILTSTONE.
	Bentonite chips 71.1 to 75 feet	

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (2/2/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-2W	4 of 4

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	827.38 (Surveyed)	Surface Elevation (ft)	825.05
Water Level Elevation	~790	Date Start/Finish	1/31/22,2/2/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	9":0-70', 8":70-75"
Hammer Weight/Drop	N/A	Well Tag #	BNY 894

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
80						Boring terminated at 75 feet Well completed at 71.1 feet on 2/2/22. Well settled ~3 feet during install. Groundwater encountered at 34.8 feet ATD with casing at 67.5 feet. Groundwater measured at 34.9 feet on 2/2/22.
85						
90						
95						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (2/2/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-3W	1 of 5

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	782.52 (Surveyed)	Surface Elevation (ft)	780.52
Water Level Elevation	~743	Date Start/Finish	12/21/21,12/22/21
Drilling/Equipment	Cascade Drilling / TSI 150CC (Sonic)	Hole Diameter (in)	8.5":0-95', 8":95-105'
Hammer Weight/Drop	N/A	Well Tag #	BNW 200

Depth (ft)	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
	Above ground monument with bollards Concrete 0 to 2 feet				**Topsoil** Moist to very moist, brown (7.5YR), silty, gravelly, fine to coarse SAND; abundant organics; massive (SM).
					Weathered Vashon Ice Contact Deposits Moist, light yellowish brown to light brownish yellow (10YR), gravelly, very sandy, SILT; low plasticity; normally graded; massive (ML).
					Vashon Ice Contact Deposits Moist, light yellowish brown (10YR to 2.5Y), silty, sandy, fine to coarse GRAVEL; low plasticity matrix; clast-supported; massive (GM).
5	Bentonite chips 1.5 to 51 feet				Very moist, light yellowish brown (2.5Y), silty, sandy, fine to coarse GRAVEL; faintly bedded (GM).
					Very moist to wet, light yellowish brown to light olive brown (2.5Y), sandy, fine to coarse GRAVEL, some silt to silty; bedded (GM).
					No added water.
10	4-inch I.D. Sch 40 PVC riser -1.9 to 54.2 feet				
					Very moist to wet, light olive brown, sandy to very sandy, fine to coarse GRAVEL, some silt; scattered cobbles; bedded (GP-GM).
15					
20					No recovery; driller encountered gravelly cobble zone from 20 to 34 feet that stuffed up/blocked core barrel. Driller pushed through loose material.

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (2/11/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

associated earth sciences incorporated

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-3W	2 of 5

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	782.52 (Surveyed)	Surface Elevation (ft)	780.52
Water Level Elevation	~743	Date Start/Finish	12/21/21,12/22/21
Drilling/Equipment	Cascade Drilling / TSI 150CC (Sonic)	Hole Diameter (in)	8.5":0-95', 8":95-105'
Hammer Weight/Drop	N/A	Well Tag #	BNW 200

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		Bentonite chips 1.5 to 51 feet				
30		4-inch I.D. Sch 40 PVC riser -1.9 to 54.2 feet				
35						Very moist, light olive brown, sandy to very sandy, fine to coarse GRAVEL, some silt; scattered cobbles; bedded (GP-GM). 34 to 36 feet may be slough.
40						Very moist, light yellowish brown, silty, gravelly, fine to coarse SAND; normally graded (SM).
						Very moist, brown (10YR), clayey, sandy, fine to coarse GRAVEL, some silt; massive (GC).
						Very moist to wet, grayish brown, sandy, fine to coarse GRAVEL, some silt; abundant cobbles; inversely graded; increased silt content due to pulverization; trace boulder (GP-GM).
45		Bentonite chips 1.5 to 51 feet				
						Very moist to wet, light olive brown, sandy, fine to coarse GRAVEL, some silt; bedded (GP-GM).
						Wet at 49.5 feet.

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (2/11/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-3W	3 of 5

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	782.52 (Surveyed)	Surface Elevation (ft)	780.52
Water Level Elevation	~743	Date Start/Finish	12/21/21,12/22/21
Drilling/Equipment	Cascade Drilling / TSI 150CC (Sonic)	Hole Diameter (in)	8.5":0-95', 8":95-105'
Hammer Weight/Drop	N/A	Well Tag #	BNW 200

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		4-inch I.D. Sch 40 PVC riser -1.9 to 54.2 feet				
		#2/12 silica sand 51 to 65 feet				Wet, light olive brown to grayish brown, sandy to very sandy, fine to coarse GRAVEL, trace to some silt; scattered cobbles; bedded; polymictic; gradational bedding/contact with underlying sandy unit (GP/GW).
55		4-inch I.D. Sch 40 PVC well screen 0.010-inch slot width 54.2 to 64.2 feet				
						Wet, grayish brown to dark grayish brown, fine to medium SAND, some gravel, trace silt; beds (<0.5 inches thick) of gravel; occasional cobbles (SP).
60						Becomes fine to medium SAND, some gravel to gravelly, trace silt (SP).
		Threaded end cap 64.2 to 64.6				**Vashon Lodgement Till**
65						Moist, gray (GLEY1), silty to very silty, sandy, fine to coarse GRAVEL; unsorted; diamict; matrix supported; low plasticity to non-plastic; occasional cobbles; subrounded to rounded bladed and equate clasts; few prolate clasts; sharp contact; strongly effervescent (GM).
						Change in provenance to dark and green, trace red and white rocks.
70		Bentonite chips 65 to 105 feet				

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (2/11/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-3W	4 of 5

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	782.52 (Surveyed)	Surface Elevation (ft)	780.52
Water Level Elevation	~743	Date Start/Finish	12/21/21,12/22/21
Drilling/Equipment	Cascade Drilling / TSI 150CC (Sonic)	Hole Diameter (in)	8.5":0-95', 8":95-105'
Hammer Weight/Drop	N/A	Well Tag #	BNW 200

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
80		Bentonite chips 65 to 105 feet				Boulder (calcite-cemented Puget Group sandstone) at 75 feet. Very moist, gray (GLEY1), sandy, fine to coarse GRAVEL, some silt to silty; gravel bed (GM). Moist to very moist, gray, silty, sandy, fine to coarse GRAVEL; diamict; non-plastic matrix (GM). Moist, gray (5Y) to dark gray, silty, sandy, fine to coarse GRAVEL; abundant cobbles; unsorted diamict (GM).
85						Very moist, gray (5Y), very gravelly, fine to medium SAND, some silt to silty; gap graded; faintly bedded (SP-SM). Very moist, gray (5Y), fine to medium SAND, some gravel, some coarse sand, trace silt; faintly bedded (SP). Grades to silty (SM).
90						Moist, gray (5Y) to dark gray, silty, sandy, fine to coarse GRAVEL; abundant cobbles; unsorted; diamict (GM).
95						**Ohanapecosh Bedrock** Fresh, thinly bedded, pale olive (10Y6/2) to light olive gray (5Y5/2), moderately weak (R2) fine to medium grained GRAYWACKE; closely to very closely spaced fractures; RQD=0% (fractures induced by drilling); very thin non-contiguous seams of quartz and shiny purplish- black extremely weak mineralization along recovered joint surfaces. **Puget Group Bedrock** Fresh laminated to thinly bedded, grayish black (N2), moderately weak (R2), carbonaceous (with thin coal seams), SHALE; RQD=0% (fractured by drilling).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (2/11/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

associated earth sciences incorporated

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-3W	5 of 5

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	782.52 (Surveyed)	Surface Elevation (ft)	780.52
Water Level Elevation	~743	Date Start/Finish	12/21/21,12/22/21
Drilling/Equipment	Cascade Drilling / TSI 150CC (Sonic)	Hole Diameter (in)	8.5":0-95', 8":95-105'
Hammer Weight/Drop	N/A	Well Tag #	BNW 200

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
						Fresh, thinly bedded, medium gray to light olive gray (5Y 6/1), moderately weak (R2); fine to medium grained SANDSTONE; RQD=0% (fractured by drilling); with very thin non-contiguous coal/organic (leaf prints?) scattered throughout; non-calcareous; bedded.
105						Boring terminated at 105 feet Well completed at 64.5 feet on 12/22/21. Groundwater encountered at 49.5 feet ATD (estimated from samples). Groundwater measured at 44.2 feet on 12/22/21, at 37.4 feet on 1/12/22, and at 37.6 feet on 2/11/22.
110						
115						
120						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (2/11/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

associated earth sciences incorporated

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-4W	1 of 7

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	793.51 (Surveyed)	Surface Elevation (ft)	790.8
Water Level Elevation		Date Start/Finish	2/7/22,2/8/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	8":0-150', 7":150-157'
Hammer Weight/Drop	N/A	Well Tag #	BNY 896

Depth (ft)	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
	Above ground monument with bollards Concrete 0 to 1 foot				**Forest Duff - 6 inches** Very moist, very dark brown (10YR), medium to coarse sandy, fine to coarse GRAVEL, trace to some silt; abundant wood debris and roots (GP-GM). ~6 to 9 inches stripped prior to boring.
					Vashon Recessional Outwash Moist to very moist, yellowish brown (10YR), sandy, fine to coarse GRAVEL, some silt; scattered rootlets; faintly bedded (GP-GM). Moist, brown to grayish brown (10YR), medium to coarse sandy to very sandy, fine to coarse GRAVEL, trace silt; scattered cobbles; faintly bedded; subrounded gravel (GP).
5	Bentonite grout 1 to 132 feet				
					No recovery 9 to 10 feet.
10	18-inch centralizer at 10 feet				
					Moist, grayish brown, medium to coarse sandy, fine to coarse GRAVEL, trace to some silt; abundant cobbles; faintly stratified; pulverized/fractured cobbles (GP).
15	4-inch I.D. Sch 40 PVC casing with threaded connections -3.5 to 139.3 feet				
					No recovery 19 to 20 feet.
20					**Vashon Ice Contact Deposits** Slightly moist (baked) to moist, grayish brown to dark grayish brown (2.5Y to 10YR), silty, fine to coarse very gravelly, fine to coarse SAND to very sandy, fine to coarse GRAVEL; scattered cobbles; nonstratified; cohesive nonplastic matrix; clast supported (SM). Medium tight drilling.

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (2/11/22)
- Water Level at time of drilling (ATD)

Logged by: MJP/LBK

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

associated earth sciences incorporated

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-4W	2 of 7

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	793.51 (Surveyed)	Surface Elevation (ft)	790.8
Water Level Elevation		Date Start/Finish	2/7/22,2/8/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	8":0-150', 7":150-157'
Hammer Weight/Drop	N/A	Well Tag #	BNY 896

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		Bentonite grout 1 to 132 feet				
						Moist, grayish brown (10YR), fine to coarse gravely, medium to coarse SAND, some silt to silty; cohesive; nonplastic matrix; poorly stratified with gaps in matrix (SP-SM).
30		18-inch centralizer at 30 feet				Slightly moist (baked) to moist, grayish brown to dark grayish brown (2.5Y to 10YR), silty, sandy, fine to coarse GRAVEL, to very sandy; abundant cobbles; cohesive non plastic matrix; clast supported; nonstratified; mostly bladed, some prolate and oblate, few equate gravel shapes; pulverized/baked from drilling (GM).
35		4-inch I.D. Sch 40 PVC casing with threaded connections -3.5 to 139.3 feet				
40						
45		Bentonite grout 1 to 132 feet				Boulder from 46 to 48 feet.
						Moist to very moist, grayish brown (2.5Y), silty, fine to coarse sandy, fine to coarse GRAVEL, trace clay; scattered cobbles; cohesive non plastic to

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (2/11/22)
- Water Level at time of drilling (ATD)

Logged by: MJP/LBK

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

associated earth sciences incorporated

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-4W	3 of 7

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	793.51 (Surveyed)	Surface Elevation (ft)	790.8
Water Level Elevation		Date Start/Finish	2/7/22,2/8/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	8":0-150', 7":150-157'
Hammer Weight/Drop	N/A	Well Tag #	BNY 896

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		18-inch centralizer at 50 feet				low plasticity matrix; poorly stratified with gaps in matrix (GM).
						Moist (baked), grayish brown (2.5Y), sandy, fine to coarse GRAVEL, some silt to silty; scattered to abundant cobbles; nonstratified (GP-GM).
55		4-inch I.D. Sch 40 PVC casing with threaded connections -3.5 to 139.3 feet				
						Zone of cobbles from 58 to 60 feet.
60						Very moist, grayish brown, fine to coarse sandy, fine to coarse GRAVEL, some silt to silty, trace clay; abundant cobbles; faintly bedded/stratified; cohesive nonplastic to low plasticity matrix; subrounded gravel; silty beds are bound with gaps in the matrix (GP-GM/GM).
65		Bentonite grout 1 to 132 feet				
						Becomes very moist to wet.
70	▼	18-inch centralizer at 70 feet				
	▽					Becomes very moist.

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- ▽ Water Level (2/11/22)
- ▼ Water Level at time of drilling (ATD)

Logged by: MJP/LBK

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

associated earth sciences incorporated

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-4W	4 of 7

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	793.51 (Surveyed)	Surface Elevation (ft)	790.8
Water Level Elevation		Date Start/Finish	2/7/22,2/8/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	8":0-150', 7":150-157'
Hammer Weight/Drop	N/A	Well Tag #	BNY 896

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		4-inch I.D. Sch 40 PVC casing with threaded connections -3.5 to 139.3 feet				
						Casing at 80 feet; water level at 70.4 feet.
80						Wet, grayish brown to light olive brown (2.5Y), fine to coarse sandy, fine to coarse GRAVEL, some silt; bedded; water bearing (GP-GM).
						Wet, grayish brown to light olive brown (2.5Y), very gravelly, fine to medium SAND, trace to some silt; bedded; water bearing (SP-SM).
						Wet, grayish brown to light olive brown (2.5Y), fine to medium SAND, some gravel, trace silt; bedded; water bearing (SP).
85		Bentonite grout 1 to 132 feet				Very moist to wet, light olive brown (2.5Y), gravelly, fine to medium SAND, some silt; scattered cobbles; bedded (SP-SM).
						Very moist, dark gray (10YR), silty, gravelly, fine to medium SAND; unsorted; diamicton; cohesive nonplastic matrix; sharp contact; subrounded gravel; non-effervescent; no cobbles; till rip-up (?) (SM).
						Moist to very moist, dark yellowish brown to brown (10YR), silty, very gravelly, fine to medium SAND; unsorted diamicton; mottled (SM).
						Wet, yellowish brown, silty, fine to coarse sandy, fine to coarse GRAVEL; massive (GM). Water bearing below 89 feet.
90		18-inch centralizer at 90 feet				Wet, grayish brown (10YR), fine to medium SAND, some gravel, trace silt; bedded (SP).
						Wet, grayish brown, fine to coarse GRAVEL, some sand to coarse sandy, trace to some silt; occasional cobbles; bedded (GP).
						Wet, grayish brown (10YR), gravelly, fine to coarse SAND, trace to some silt; occasional cobbles; bedded (SP).
95		4-inch I.D. Sch 40 PVC casing with threaded connections -3.5 to 139.3 feet				Wet, grayish brown, fine to coarse SAND, trace to some gravel, trace to some silt; faintly bedded to massive (SP).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (2/11/22)
- Water Level at time of drilling (ATD)

Logged by: MJP/LBK

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

associated earth sciences incorporated

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-4W	5 of 7

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	793.51 (Surveyed)	Surface Elevation (ft)	790.8
Water Level Elevation		Date Start/Finish	2/7/22,2/8/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	8":0-150', 7":150-157'
Hammer Weight/Drop	N/A	Well Tag #	BNY 896

Depth (ft)	WELL CONSTRUCTION	DESCRIPTION
105	Bentonite grout 1 to 132 feet	Wet, grayish brown, gravelly, fine to coarse SAND, trace silt; interbeds of gray, silty, fine to coarse sand; stratified/bedded (SP-SM).
		Very moist, grayish brown to brown (10YR), sandy, fine to coarse GRAVEL, some silt to silty; faintly bedded/stratified (GP-GM).
110	18-inch centralizer at 110 feet	Very moist to wet, brown (10YR), gravelly, fine to coarse SAND, some silt; occasional to scattered cobbles; bedded/stratified (SP-SM). Casing at 110 feet; water level at 72.7 feet. Moist to very moist, brown (10YR), fine SAND, some gravel, some silt; weakly bedded (SP-SM).
		Very moist, light yellowish brown (2.5YR), silty, gravelly, fine to coarse SAND; thickly bedded (SM).
115	4-inch I.D. Sch 40 PVC casing with threaded connections -3.5 to 139.3 feet	Very moist, light yellowish brown (2.5YR), very silty, fine to coarse GRAVEL, some sand; thickly bedded (GM).
		Sand decreasing to trace.
120	Bentonite grout 1 to 132 feet	Trace cobbles.
		Becomes grayish brown.
		Becomes gray.

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (2/11/22)
- Water Level at time of drilling (ATD)

Logged by: MJP/LBK

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

associated earth sciences incorporated

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-4W	6 of 7

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	793.51 (Surveyed)	Surface Elevation (ft)	790.8
Water Level Elevation		Date Start/Finish	2/7/22,2/8/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	8":0-150', 7":150-157'
Hammer Weight/Drop	N/A	Well Tag #	BNY 896

Depth (ft)	WELL CONSTRUCTION	DESCRIPTION
	4-inch I.D. Sch 40 PVC casing with threaded connections -3.5 to 139.3 feet	**Pre-Vashon Deposits** Wet, gray (5Y) with occasional yellow staining, silty, gravelly, fine to coarse SAND; thickly bedded (SM).
		Wet, gray (5Y) with occasional yellow staining, very silty, fine to coarse GRAVEL, some fine to coarse sand; thickly bedded (GM).
		Decreasing sand. Cobble.
130	18-inch centralizer at 130 feet	Wet, gray (5Y), very silty, GRAVEL, trace cobble (GM).
		Wet, gray (5Y), very silty, fine GRAVEL, some coarse gravel, some fine to coarse sand AND wet, gray (5Y), very silty, fine to coarse SAND, some gravel to gravelly; interbedded (6 to 18 inches thick) (GM/SM).
	Bentonite chips 132 to 137 feet	
135		
		Wet, gray (5Y), very silty, fine GRAVEL, some fine to coarse sand; faintly bedded (GM).
	Sand pack 137 to 157 feet	
		Wet, gray (5Y), very silty, fine to coarse SAND, some fine gravel; faintly bedded (SM).
140		Wet, gray (5Y) to greenish gray (GLEY 1), silty, sandy, fine GRAVEL, some coarse gravel; thickly bedded (GM).
		Interbed (6 inches thick) of wet, gray (5Y) to greenish gray (GLEY 1), medium to coarse SAND, some silt to silty, some gravel (SP-SM/SM).
145	4-inch I.D. Sch 40 PVC well screen 0.020-inch slot width with threaded connections 139.3 to 149.3 feet	Occasional cobbles.
		Wet, very dark bluish gray (GLEY 2, 3/5B-10B), gravelly, medium to coarse SAND, some silt; thickly bedded (SP-SM).
	Threaded end cap 149.3 to	Wet, very dark bluish gray (GLEY 2,3/5B-10B), medium to coarse SAND, some fine gravel, trace silt; bedded (SP).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (2/11/22)
- Water Level at time of drilling (ATD)

Logged by: MJP/LBK

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

associated earth sciences incorporated

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-4W	7 of 7

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	793.51 (Surveyed)	Surface Elevation (ft)	790.8
Water Level Elevation		Date Start/Finish	2/7/22,2/8/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	8":0-150', 7":150-157'
Hammer Weight/Drop	N/A	Well Tag #	BNY 896

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		149.7 feet				Wet, very dark to dark bluish gray, silty, fine to coarse SAND, some fine gravel; faintly bedded (SM). Driller notes that recovery from 150 to 153 is possibly slough. Drill progress slows and action smooths; driller switches.
155						**Puget Group Bedrock** Moderately weathered, bedded with areas of laminae, very light gray (N8) to light gray (N7), strong (R4) SANDSTONE with thin beds of light olive gray, very weak, SILTSTONE. Becomes slightly weathered.
160						Boring terminated at 157 feet Well completed at 149.7 feet on 2/8/22. Groundwater encountered at 70.4 feet ATD. Groundwater measured at 71.2 feet after boring on 2/10/22 and at 73.1 feet in well on 2/11/22.
165						
170						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (2/11/22)
- Water Level at time of drilling (ATD)

Logged by: MJP/LBK

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

associated earth sciences incorporated

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-5W	1 of 4

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	774.31 (Surveyed)	Surface Elevation (ft)	771.00
Water Level Elevation	~704	Date Start/Finish	12/20/21,12/21/21
Drilling/Equipment	Cascade Drilling / TSI 150CC (Sonic)	Hole Diameter (in)	8":0-73', 7":73-85'
Hammer Weight/Drop	N/A	Well Tag #	BNW 198

Depth (ft)	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
	Above ground monument with bollards Cement 0 to 2 feet				**Weathered Vashon Ice Contact Deposits** Moist to very moist, brown (7.5YR), silty, fine to medium SAND, some gravel; massive; scattered roots and rootlets oxidized; ~9 to 12 inches of topsoil stripped at boring prior to start (SM). Becomes gravelly.
5	Bentonite chips 2 to 59 feet (Hydrated 56 to 59 feet)				**Vashon Ice Contact Deposits** Moist (baked), grayish brown, silty, sandy, cobbly, fine to coarse GRAVEL; pulverized; massive (GM).
					Moist to very moist, grayish brown, gravelly, fine to coarse SAND, trace silt; scattered cobbles; faintly stratified (SP).
10	4-inch I.D. Sch 40 PVC riser -3.1 to 62 feet				No recovery; driller noted soft sediment pushed out from core barrel.
15					Moist to very moist, grayish brown, gravelly, fine to coarse SAND, trace silt; scattered cobbles; faintly stratified (SP). Very moist, light olive brown (2.5Y), sandy, fine to coarse GRAVEL, some silt; bedded (GP-GM). Moist to very moist (baked), light olive brown to grayish brown, sandy, fine to coarse GRAVEL, some silt to silty; bedded (GM).
20					Charcoal at 19.5 feet; scattered abundant cobbles. As above; grades to some silt; occasional cobbles (GP-GM).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (1/12/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

associated earth sciences incorporated

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-5W	2 of 4

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	774.31 (Surveyed)	Surface Elevation (ft)	771.00
Water Level Elevation	~704	Date Start/Finish	12/20/21,12/21/21
Drilling/Equipment	Cascade Drilling / TSI 150CC (Sonic)	Hole Diameter (in)	8":0-73', 7":73-85'
Hammer Weight/Drop	N/A	Well Tag #	BNW 198

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		Bentonite chips 2 to 59 feet (Hydrated 56 to 59 feet)				Becomes sandy to very sandy, contains local Puget Group clasts.
30		4-inch I.D. Sch 40 PVC riser -3.1 to 62 feet				Moist (baked), brown (7.5YR to 10YR), silty, sandy, fine to coarse GRAVEL, trace clay; scattered cobbles; massive; cohesive, non-plastic matrix (GM).
35						Moist (baked), grayish brown to brown (10YR), gravelly, fine to coarse SAND, trace silt; scattered silty interbedding with black and strong brown mottling (SP-SM).
40						No recovery 40 to 42 feet.
						Moist (baked), grayish brown to brown (10YR), gravelly, fine to coarse SAND, trace silt; scattered silty interbedding with black and strong brown mottling (SP-SM).
						Moist (baked), grayish brown to brown (10YR) and brown (7.5YR) mottled, silty, sandy to very sandy, fine to coarse GRAVEL; stratified; hard silty interbeds abundant; non-cohesive; non-plastic matrix, clast supported; driller notes difficult drilling (GM).
45		Bentonite chips 2 to 59 feet (Hydrated 56 to 59 feet)				

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (1/12/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

associated earth sciences incorporated

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-5W	3 of 4

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	774.31 (Surveyed)	Surface Elevation (ft)	771.00
Water Level Elevation	~704	Date Start/Finish	12/20/21,12/21/21
Drilling/Equipment	Cascade Drilling / TSI 150CC (Sonic)	Hole Diameter (in)	8":0-73', 7":73-85'
Hammer Weight/Drop	N/A	Well Tag #	BNW 198

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		4-inch I.D. Sch 40 PVC riser -3.1 to 62 feet				
						Very moist, grayish brown to brown (10YR), gravelly, medium to coarse SAND, trace to some silt; frequent hard silty interbeds; stratified; occasional cobbles (SP-SM).
55						
						Very moist to wet, grayish brown, sandy to very sandy, fine to coarse GRAVEL, some silt; scattered to abundant cobbles; bedded (GP-GM).
60		#2/12 Silica sand 59 to 73 feet				
						Boulder at 64 feet.
65		4-inch I.D. Sch 40 PVC well screen 0.010-inch slot width 62 to 72 feet				
						Very moist, brown, silty, sandy, fine to coarse GRAVEL; massive; slight normal grading (GM).
70		Threaded end cap 72 to 72.4				
						Vashon Lodgement Till Moist to very moist, gray (2.5Y to 5Y), silty, gravelly, fine to medium SAND; unsorted diamict; matrix supported; subrounded to rounded clasts; cohesive; non-plastic matrix; mildly effervescent (SM).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (1/12/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

associated earth sciences incorporated

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-5W	4 of 4

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	774.31 (Surveyed)	Surface Elevation (ft)	771.00
Water Level Elevation	~704	Date Start/Finish	12/20/21,12/21/21
Drilling/Equipment	Cascade Drilling / TSI 150CC (Sonic)	Hole Diameter (in)	8":0-73', 7":73-85'
Hammer Weight/Drop	N/A	Well Tag #	BNW 198

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		Bentonite chips 73 to 85 feet				
80						**Puget Group** Fresh, massive to bedded, very light gray (5Y 8/1) to very light gray (N8), moderately strong (R3) to strong (R4); medium grained SANDSTONE; RQD=69%; calcite cemented; highly effervescent; closely to moderately spaced joints. As above.
85						Boring terminated at 85 feet Well completed at 72.5 feet on 12/21/21. Groundwater measured at 66.7 feet after drilling on 12/21/21 and at 67.1 feet on 2/11/22. 12 volt stainless steel sample change XL pump installed on 4/11/22.
90						
95						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (1/12/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-6W	1 of 6

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	827.87 (Surveyed)	Surface Elevation (ft)	825.95
Water Level Elevation	~706	Date Start/Finish	2/2/22,2/4/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	8":0-120', 7": 120-130'
Hammer Weight/Drop	N/A	Well Tag #	BNY 895

Depth (ft)	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
	Above ground monument with bollards Concrete 0 to 2 feet				**Forest Duff - 6 inches** Very moist, dark brown (7.5YR), silty, gravelly, fine to medium SAND; abundant organics; massive (SM). 3 inches of forest duff stripped prior to drilling.
					Weathered Vashon Recessional Outwash Moist to very moist, brown (7.5YR), silty, gravelly to very gravelly, fine to medium SAND; fining upwards; weathered (SM).
					Vashon Recessional Outwash Moist, pale brown to grayish brown (10YR), medium to coarse sandy, fine to coarse GRAVEL, some silt; abundant cobbles; bedded (GP-GM).
					Grades to trace silt (GP) at 4 feet.
5	Medium bentonite chips 2 to 33 feet				
					No recovery 7 to 10 feet; pushed through formation.
10	4-inch I.D. Sch 40 PVC riser with threaded connections -1.9 to 113.3 feet				
					Becomes very moist.
15					
					No recovery 17 to 20 feet; pushed through formation.
20					Moist, grayish brown, fine to coarse sandy, fine to coarse GRAVEL, some silt; abundant cobbles; fractured gravel; faintly stratified; baked/pulverized from drilling (GP-GM).
	18-inch centralizer at 23 feet				

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (3/9/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-6W	2 of 6

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	827.87 (Surveyed)	Surface Elevation (ft)	825.95
Water Level Elevation	~706	Date Start/Finish	2/2/22,2/4/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	8":0-120', 7": 120-130'
Hammer Weight/Drop	N/A	Well Tag #	BNY 895

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		Medium bentonite chips 2 to 33 feet				No recovery 26 to 30 feet; pushed through formation.
30		4-inch I.D. Sch 40 PVC riser with threaded connections -1.9 to 113.3 feet				**Vashon Ice Contact Deposits** Moist (baked), grayish brown (10YR), silty, sandy, fine to coarse GRAVEL; scattered to abundant cobbles; cohesive; nonplastic matrix; clast supported; faintly stratified; subrounded prolate, oblate, and bladed clasts (GM).
35		Bentonite grout 33 to 106 feet				No recovery 37 to 40 feet.
40		18-inch centralizer at 43 feet				Highly pulverized from drilling. Several large fractured cobbles in core, drill action consistent with large cobbles.
45						Slightly moist to moist (baked), grayish brown (10YR), fine to coarse sandy, fine to coarse GRAVEL, some silt to silty; cohesive non plastic matrix; clast supported; abundant cobbles; highly fractured/pulverized; a lot of drill chatter consistent with large cobbles and boulders; subrounded prolate, oblate, and bladed clasts; massive (GM).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (3/9/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

associated earth sciences incorporated

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-6W	3 of 6

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	827.87 (Surveyed)	Surface Elevation (ft)	825.95
Water Level Elevation	~706	Date Start/Finish	2/2/22,2/4/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	8":0-120', 7": 120-130'
Hammer Weight/Drop	N/A	Well Tag #	BNY 895

Depth (ft)	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
	Bentonite grout 33 to 106 feet				No recovery 49 to 50 feet.
55	4-inch I.D. Sch 40 PVC riser with threaded connections -1.9 to 113.3 feet				Very moist, grayish brown (10YR), medium to coarse very sandy, fine to coarse GRAVEL to very gravelly, medium to coarse SAND; occasional cobbles; faintly bedded (GP/SP).
60					Moist (baked), grayish brown (10YR), silty, fine to coarse sandy, fine to coarse GRAVEL; abundant cobbles; cohesive nonplastic matrix; clast supported; pulverized; drill chatter consistent with large cobbles (GM).
	18-inch centralizer at 63 feet				
65					Very moist, grayish brown (10YR), gravelly, fine to coarse SAND, trace to some silt; bedded (SP).
70	Bentonite grout 33 to 106 feet				Grades to very gravelly and some silt (SP-SM).
					Moist to very moist, grayish brown (10YR), medium to coarse sandy, fine to coarse GRAVEL, some fractured gravel, trace to some silt; scattered cobbles; stratified; pulverized (GP-GM).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (3/9/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

associated earth sciences incorporated

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-6W	4 of 6

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	827.87 (Surveyed)	Surface Elevation (ft)	825.95
Water Level Elevation	~706	Date Start/Finish	2/2/22,2/4/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	8":0-120', 7": 120-130'
Hammer Weight/Drop	N/A	Well Tag #	BNY 895

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
80		4-inch I.D. Sch 40 PVC riser with threaded connections -1.9 to 113.3 feet				Brown (7.5YR) weathering at 82 feet.
85		18-inch centralizer at 83 feet				**Vashon Lodgement Till (Cavity Fill)** Moist (baked), dark grayish brown (10YR) to reddish yellow (7.5YR), silty, sandy, fine to coarse GRAVEL; scattered cobbles; cohesive nonplastic matrix; clast supported; thinly bedded to bedded; driller notes hard drilling; glacially consolidated; provenance is ~70% local volcanic/sandstone/volcaniclastic, ~20% undifferentiated intrusive rocks, ~10% other subrounded to rounded (dropstone) clasts (GM).
90		Bentonite grout 33 to 106 feet				Contains thin beds of brownish yellow (10YR) and black (7.5YR) fine to medium sand.
95		4-inch I.D. Sch 40 PVC riser with threaded connections -1.9 to 113.3 feet				Moist to very moist, dark grayish brown (10YR), silty, sandy, fine to coarse GRAVEL, some clay, scattered cobbles; faintly bedded to massive; cohesive; low to moderate plasticity matrix; gaps in matrix (GM/GC).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (3/9/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

associated earth sciences incorporated

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-6W	5 of 6

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	827.87 (Surveyed)	Surface Elevation (ft)	825.95
Water Level Elevation	~706	Date Start/Finish	2/2/22,2/4/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	8":0-120', 7": 120-130'
Hammer Weight/Drop	N/A	Well Tag #	BNY 895

Depth (ft)	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
105	18-inch centralizer at 103 feet				
	Medium bentonite chips 106 to 110 feet				Moist (baked), dark grayish brown (10YR), silty, sandy, fine to coarse GRAVEL; abundant cobbles; cohesive nonplastic matrix (GM).
110	12/20 silica sand 110 to 124 feet				Very moist, brown to yellowish brown (10YR), clayey, silty, fine to coarse GRAVEL, some sand to sandy; abundant cobbles; cohesive moderate plasticity matrix; gaps in matrix; subrounded gravel; faintly bedded (GC).
115	4-inch I.D. Sch 40 PVC well screen 0.030-inch slot width 113.3 to 123.3 feet				Partially pulverized with large cobbles.
120	Threaded end cap 123.3 to 123.7 feet				Very moist to wet, brown (10YR) to grayish brown, silty, medium to coarse sandy, fine to coarse GRAVEL, to some silt, trace clay; scattered cobbles; faintly bedded; cohesive/sticky; nonplastic fines (GM).
					Regolith Moist, mottled dark gray (GLEY1) and grayish brown (2.5Y), gravelly, clayey, fine to coarse SAND, trace to some silt; nonstratified with subangular chunks of weathered sandstone; regolith (SC).
					Puget Group Bedrock Fresh, faintly thinly bedded to massive, dark gray (7.5YR), moderately

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (3/9/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

associated earth sciences incorporated

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-6W	6 of 6

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	827.87 (Surveyed)	Surface Elevation (ft)	825.95
Water Level Elevation	~706	Date Start/Finish	2/2/22,2/4/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	8":0-120', 7": 120-130'
Hammer Weight/Drop	N/A	Well Tag #	BNY 895

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
	▼	Medium bentonite chips 124 to 130 feet				strong (R3), fine grained SANDSTONE/SILTSTONE.
130						Boring terminated at 130 feet Well completed at 123.3 feet on 2/4/22. Groundwater encountered at 126.7 feet after 80 minutes ATD. Groundwater measured at 119.4 feet on 2/7/22 and at 117.6 feet on 3/9/22.
135						
140						
145						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (3/9/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

associated earth sciences incorporated

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-7W	1 of 10

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	847.27 (Surveyed)	Surface Elevation (ft)	844.90
Water Level Elevation	~724	Date Start/Finish	12/13/21,12/17/21
Drilling/Equipment	Cascade Drilling / TSI 150CC (Sonic)	Hole Diameter (in)	8":0-235', 7":235-245'
Hammer Weight/Drop	N/A	Well Tag #	BNW 199

Depth (ft)	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
	Above ground monument with bollards Concrete 0 to 1.5 feet				**Topsoil / Fill** Moist to very moist, dark brown, silty, gravelly, fine to coarse SAND; abundant organics (roots and rootlets) (SM). ~2 to 3 inches stripped prior to drilling. Layer of charcoal at 2 feet.
					Weathered Vashon Ice Contact Deposits Moist to very moist, oxidized light yellowish brown, silty, fine to medium SAND, some gravel; massive to faintly stratified; roots and scattered charcoal in upper foot (SM).
5	Bentonite chips and native cave-in 1.5 to 120 feet				**Vashon Ice Contact Deposits** Moist to very moist, light olive brown, sandy, fine to coarse GRAVEL; abundant cobbles; fining upwards; massive bed; increased silt from pulverization; some silt (GP-GM).
10	4-inch I.D. Sch 40 PVC riser -2.4 to 210.3 feet				Drill action consistent with boulders at 11 feet. Very moist, light olive brown to grayish brown, sandy to very sandy, fine to coarse GRAVEL; trace to some silt; occasional cobbles; faintly bedded (GW).
15					
20					Moist to very moist, grayish brown to gray, silty, sandy, fine to coarse GRAVEL, scattered cobbles; massive (GM). Very moist, grayish brown to light olive brown, slight silt to silty, medium to coarse sandy, fine to coarse GRAVEL; scattered cobbles; faintly bedded; broken gravel (GP-GM).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (2/11/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-7W	2 of 10

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	847.27 (Surveyed)	Surface Elevation (ft)	844.90
Water Level Elevation	~724	Date Start/Finish	12/13/21,12/17/21
Drilling/Equipment	Cascade Drilling / TSI 150CC (Sonic)	Hole Diameter (in)	8":0-235', 7":235-245'
Hammer Weight/Drop	N/A	Well Tag #	BNW 199

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		Bentonite chips and native cave-in 1.5 to 120 feet				Moist to very moist, grayish brown to light olive brown, silty, sandy, fine to coarse GRAVEL; scattered cobbles; faintly bedded (GM).
30		4-inch I.D. Sch 40 PVC riser -2.4 to 210.3 feet				
35						Bed (1/2 foot thick) of very moist, grayish brown, fine to medium SAND, some silt; massive (SP-SM). Very moist, grayish brown, sandy, fine to coarse GRAVEL, trace to some silt; scattered cobbles; massive bed to faintly bedded (GW-GM/GP-GM).
40						Moist to very moist, grayish brown, silty, sandy, fine to coarse GRAVEL; scattered cobbles; massive (GM).
45		Bentonite chips and native cave-in 1.5 to 120 feet				Very moist, grayish brown, very sandy, fine to coarse GRAVEL, trace to some silt; occasional cobbles; faintly bedded (GW).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (2/11/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

associated earth sciences incorporated

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-7W	3 of 10

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	847.27 (Surveyed)	Surface Elevation (ft)	844.90
Water Level Elevation	~724	Date Start/Finish	12/13/21,12/17/21
Drilling/Equipment	Cascade Drilling / TSI 150CC (Sonic)	Hole Diameter (in)	8":0-235', 7":235-245'
Hammer Weight/Drop	N/A	Well Tag #	BNW 199

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		4-inch I.D. Sch 40 PVC riser -2.4 to 210.3 feet				As above; grades to silty (GW-GM).
						Very moist, grayish brown, silty, sandy, fine to coarse GRAVEL; occasional cobbles; mix of spherical prolate clasts in cohesive non-plastic matrix; gaps in matrix (GM).
55						
						Moist to very moist, grayish brown, silty, sandy to very sandy, fine to coarse GRAVEL; lenses of cleaner sand and gravel; highly stratified (GM/GP).
60						Very moist, grayish brown, fine to coarse GRAVEL, some sand, some silt; slight silt coating on gravels; open framework (GP-GM).
						Very moist, grayish brown, silty, sandy, fine to coarse GRAVEL; massive; scattered cobbles (GM).
65		Bentonite chips and native cave-in 1.5 to 120 feet				
						Very moist, grayish brown to dark grayish brown, sandy to very sandy, fine to coarse GRAVEL, trace to some silt; bedded; scattered cobbles (GW-GM).
70		4-inch I.D. Sch 40 PVC riser -2.4 to 210.3 feet				

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (2/11/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-7W	4 of 10

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	847.27 (Surveyed)	Surface Elevation (ft)	844.90
Water Level Elevation	~724	Date Start/Finish	12/13/21,12/17/21
Drilling/Equipment	Cascade Drilling / TSI 150CC (Sonic)	Hole Diameter (in)	8":0-235', 7":235-245'
Hammer Weight/Drop	N/A	Well Tag #	BNW 199

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
80						Moist to very moist, dark grayish brown, very gravelly, silty, fine to coarse SAND, non-cohesive; non-plastic matrix (SM).
						Very moist, dark gray to very dark gray, very sandy, fine GRAVEL, trace silt, some coarse gravel; bedded (GW).
						End of drilling 12/13/21; start drilling 12/14/21. Moist to very moist, grayish brown, silty, sandy, fine to coarse GRAVEL; massive/unsorted; cohesive non-plastic matrix (GM).
						Very moist, grayish brown, sandy, fine to coarse GRAVEL, trace to some silt; scattered cobbles (GW/GP).
85		Bentonite chips and native cave-in 1.5 to 120 feet				Moist to very moist, grayish brown, silty, sandy to very sandy, fine to coarse GRAVEL; cohesive non-plastic matrix; thin lenses (2 to 3 inches thick) of cleaner gravel, some silt to silty; stratified (GP-GM).
						Moist to very moist (baked), grayish brown, fine to coarse GRAVEL, some sand, trace silt; abundant cobbles; bedded (GP).
90		4-inch I.D. Sch 40 PVC riser -2.4 to 210.3 feet				Very moist, grayish brown, silty, sandy, fine to coarse GRAVEL, trace silt; scattered cobbles; roughly bedded (GM).
95						Very moist, grayish brown to light olive brown, sandy, fine to coarse GRAVEL, some silt; abundant cobbles; bedded (GP-GM).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (2/11/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-7W	5 of 10

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	847.27 (Surveyed)	Surface Elevation (ft)	844.90
Water Level Elevation	~724	Date Start/Finish	12/13/21,12/17/21
Drilling/Equipment	Cascade Drilling / TSI 150CC (Sonic)	Hole Diameter (in)	8":0-235', 7":235-245'
Hammer Weight/Drop	N/A	Well Tag #	BNW 199

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
105		Bentonite chips and native cave-in 1.5 to 120 feet				Becomes very sandy, GRAVEL, some silt. Very moist, grayish brown, silty, sandy, fine to coarse GRAVEL; occasional cobbles; cohesive non-plastic matrix (GM). Very moist, grayish brown to light olive brown, sandy, fine to coarse GRAVEL, some silt to silty; scattered cobbles; bedded (GP-GM). Moist to very moist, grayish brown, silty, sandy, fine to coarse GRAVEL, cohesive non-plastic matrix (GM). Moist to very moist, grayish brown, fine to coarse GRAVEL, some sand to sandy, trace to some silt; fining upwards sequence (fine over coarse gravel); open framework (GP). Driller notes heavy caving.
						Pulverized cobbles at 107 feet.
110		4-inch I.D. Sch 40 PVC riser -2.4 to 210.3 feet				Moist (baked), brown (10YR), silty, sandy, fine to coarse GRAVEL; occasional cobbles; unsorted; diamict; matrix supported; cohesive non-plastic (GM). Very moist, grayish brown to brown, silty, sandy, fine to coarse GRAVEL; scattered abundant cobbles; bedded fining upwards sequences, cohesive low-plasticity matrix; clasts supported (GM).
115						Moist to very moist (baked), brown, silty, sandy, fine to coarse GRAVEL, trace boulders; abundant cobbles; cohesive low-plasticity matrix; appears clast supported; bedded; fabric in matrix (GM). Driller notes spinning boulders/cobbles during drive.
120	▽					Very moist to wet, light olive brown, silty, sandy, fine to coarse GRAVEL; bedded; occasional cobbles (GM). No recovery, debris from caving.
						Very moist to wet, light olive brown, silty, sandy, fine to coarse GRAVEL; bedded; occasional cobbles (GM).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (2/11/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-7W	6 of 10

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	847.27 (Surveyed)	Surface Elevation (ft)	844.90
Water Level Elevation	~724	Date Start/Finish	12/13/21,12/17/21
Drilling/Equipment	Cascade Drilling / TSI 150CC (Sonic)	Hole Diameter (in)	8":0-235', 7":235-245'
Hammer Weight/Drop	N/A	Well Tag #	BNW 199

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		Medium bentonite chips 120 to 207 feet				Wet, light olive brown, medium to coarse sandy, fine to coarse GRAVEL, trace to some silt; occasional cobbles; well sorted; bedded; water bearing (GP).
130		4-inch I.D. Sch 40 PVC riser -2.4 to 210.3 feet				Very moist to wet, light olive brown, sandy, fine to coarse GRAVEL; abundant cobbles, some silt; increased silt from pulverization; bedded; water-bearing (GP-GM).
	▼					Wet, grayish brown to light olive brown, medium to coarse sandy, fine to coarse GRAVEL, scattered lenses of cobbles, trace to some silt; bedded; water-bearing (GP).
135						
140						Becomes some silt to silty (GP-GM).
						Moist to very moist, grayish brown to gray, silty to very silty, gravelly, fine to coarse SAND; unsorted; diamict; cohesive low-plasticity matrix; mass wastage deposit (?) (SM).
145		Medium bentonite chips 120 to 207 feet				Very moist to wet, light olive brown, medium to coarse sandy, fine to coarse GRAVEL, trace to some silt; bedded; occasional cobbles; water-bearing (GP-GM).
						As above, some silt to silty; faintly bedded (GW-GM).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (2/11/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-7W	7 of 10

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	847.27 (Surveyed)	Surface Elevation (ft)	844.90
Water Level Elevation	~724	Date Start/Finish	12/13/21,12/17/21
Drilling/Equipment	Cascade Drilling / TSI 150CC (Sonic)	Hole Diameter (in)	8":0-235', 7":235-245'
Hammer Weight/Drop	N/A	Well Tag #	BNW 199

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		4-inch I.D. Sch 40 PVC riser -2.4 to 210.3 feet				Wet, gray to brown, gravelly, fine to coarse SAND, some silt, faintly bedded; water-bearing (SW-SM).
						Vashon Lodgement Till Moist, gray (GLEY 1 to 5Y), very silty, gravelly, fine SAND; diamict; subrounded to rounded spherical gravel; low- to medium-plasticity matrix; lodgement till; sharp contact; strongly effervescent (SM).
						Pre-Vashon Deposits Very moist, gray (GLEY1), fine SAND, some silt, trace gravel; bedded; sharp contact; rip-up gray to dark gray diamict clast at 156 feet (SP-SM).
155						Wet, dark gray, fine to coarse SAND, some fine gravel, trace silt; bedded, water-bearing (SW).
160						Very moist to wet, gray, fine SAND, some silt, trace gravel; bedded (SP-SM).
						Very moist to wet, dark gray, fine to coarse SAND, some fine gravel to gravelly; bedded (SP).
						Radiocarbon age: 18,202 - 17,890 cal BP (wood) Wet, gray, medium to coarse SAND, some fine gravel to gravelly; bedded (SP).
165		Medium bentonite chips 120 to 207 feet				Very moist to wet, gray, silty, fine SAND; bedded (SM).
						Very moist to wet, gray, medium SAND, trace silt; bedded (SP).
						Very moist to wet, gray, fine to medium SAND, some silt to silty; bedded (SM).
170		4-inch I.D. Sch 40 PVC riser -2.4 to 210.3 feet				Very moist to wet, gray, fine to medium SAND, some silt; bedded (SP-SM).
						Very moist, gray, silty, fine SAND, trace gravel; faintly cross-bedded (SM).
						As above, some gravel; contains drop stones? (SM).
						Grades to some silt to silty; massive; mildly effervescent (SM).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (2/11/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-7W	8 of 10

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	847.27 (Surveyed)	Surface Elevation (ft)	844.90
Water Level Elevation	~724	Date Start/Finish	12/13/21,12/17/21
Drilling/Equipment	Cascade Drilling / TSI 150CC (Sonic)	Hole Diameter (in)	8":0-235', 7":235-245'
Hammer Weight/Drop	N/A	Well Tag #	BNW 199

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
						Moist, gray to dark gray (5Y), silty, gravelly, fine to medium SAND, trace coarse sand; occasional cobbles; subrounded, oblate to spherical, and bladed clasts; non-plastic matrix; diamicton; mass wastage (?); effervescent (SM).
180						**Pre-Vashon Deposits** Recovered but drill string water blasted out sample during retrieval; driller notes lots of heave below 180 feet.
						Wet, gray, gravelly, medium to coarse SAND, trace silt; bedded (SP).
						Wet, gray, sandy, fine to coarse GRAVEL, some silt to silty; abundant cobbles; bedded (GP-GM).
185		Medium bentonite chips 120 to 207 feet				
						Wet, gray, gravelly to very gravelly, medium to coarse SAND, trace silt; occasional cobbles; bedded (SP/SW).
190		4-inch I.D. Sch 40 PVC riser -2.4 to 210.3 feet				
						Recovered 192 to 195 feet on clean out run but accidentally flushed out of casing by driller; recovered sandy material looks like above (SP/SW?)
195						Wet, gray, gravelly to very gravelly, medium to coarse SAND, trace silt; occasional cobbles; bedded (SP/SW).
						Wet, gray to olive gray, fine to coarse GRAVEL, some sand, trace to some silt; scattered cobbles; bedded (GP).
						Wet, gray, very gravelly, medium to coarse SAND, trace silt, ranging to very sandy, fine GRAVEL, trace silt; bedded (SP to GP).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (2/11/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-7W	9 of 10

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	847.27 (Surveyed)	Surface Elevation (ft)	844.90
Water Level Elevation	~724	Date Start/Finish	12/13/21,12/17/21
Drilling/Equipment	Cascade Drilling / TSI 150CC (Sonic)	Hole Diameter (in)	8":0-235', 7":235-245'
Hammer Weight/Drop	N/A	Well Tag #	BNW 199

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
						Wet, gray (5Y), fine to coarse GRAVEL, some sand to sandy, trace silt; abundant cobbles; bedded (GP).
205						
						Wet, gray (GLEY 1) to slight olive/greenish gray (between 5Y and GLEY 1), sandy to very sandy, fine to coarse GRAVEL, trace to some silt, scattered cobbles; bedded; subrounded to subangular; prolate and bladed clasts; some oblate clasts; few equate/spherical clasts; fluvial deposits (GP).
		#2/12 Silica sand 207 to 221 feet				
210						
215		4-inch I.D. Sch 40 PVC well screen 0.010-inch slot width 210.3 to 220.3 feet				
220		Threaded end cap 220.3 to 220.7 feet				Wet, gray, gravelly, medium to coarse SAND, trace to some silt; bedded (SP).
						Wet, dark gray, sandy, coarse GRAVEL, trace silt; cobbles; gravel bed (GP).
						Wet, gray, gravelly to very gravelly, medium to coarse SAND, trace to some silt, bedded (SP).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (2/11/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-7W	10 of 10

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	847.27 (Surveyed)	Surface Elevation (ft)	844.90
Water Level Elevation	~724	Date Start/Finish	12/13/21,12/17/21
Drilling/Equipment	Cascade Drilling / TSI 150CC (Sonic)	Hole Diameter (in)	8":0-235', 7":235-245'
Hammer Weight/Drop	N/A	Well Tag #	BNW 199

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
230		Medium bentonite chips 221 to 240 feet				Wet, gray, sandy to very sandy, fine to coarse GRAVEL, some silt; scattered cobbles; large cobbles near lower contact (GP-GM).
						Wet, greenish gray (GLEY1), coarse sandy, fine to coarse GRAVEL, some silt, with large cobbles and small boulders; drilling action consistent with cobbles and boulders; difficulty advancing casing (GP-GM).
235						Very moist, greenish gray, silty, sandy, fine to coarse GRAVEL; fractured and abundant cobbles; cohesive non-plastic to low-plasticity matrix; stratified; clast supported; increased silt due to pulverization (GM).
						Very moist, gray, silty, sandy, fine to coarse GRAVEL; abundant cobbles; diamict with coarse sand lenses; stratified; low-plasticity matrix (GM).
240		Native cave-in 240 to 245 feet				Wet, gray (GLEY1), gravelly to very gravelly, medium to coarse SAND, trace to some silt; scattered cobbles (SP-SM).
245						**Regolith(?)** - Wet, gray (2.5Y), sandy, fine to coarse gravel, some silt to silty; abundant cobbles; layer (few in. thick) of dark brown weathered coal(?) (GP-GM). Very moist, gray (2.5Y to 10YR) mottled, silty, gravelly, fine to coarse SAND; thinly bedded, low-plasticity; small weathered Sandstone Regolith (SM).

Boring terminated at 245 feet

Well completed at 220 feet on 12/17/21.
Groundwater encountered at 125 feet ATD. Groundwater measured at 132.0 feet after drilling on 12/17/21, 125.3 feet after development on 12/23/21, at 122.5 feet on 1/12/22, and at 120.6 feet on 2/11/22.
240 volt grundfos
5-SQE-180 pump installed on 4/11/22

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (2/11/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-8W	1 of 7

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	848.66 (Surveyed)	Surface Elevation (ft)	845.61
Water Level Elevation	~719	Date Start/Finish	1/26/22,1/31/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	9":0-90', 8": 90-140', 7":140-150'
Hammer Weight/Drop	N/A	Well Tag #	BNY 893

Depth (ft)	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
	Above ground monument with bollards Concrete 0 to 2 feet				**Vashon Recessional Outwash** Moist, brown (7.5YR), silty, medium to coarse sandy, fine to coarse GRAVEL; abundant cobbles; scattered rootlets; fractured gravel; clast supported (GM). Driller notes rocky conditions.
					Moist, grayish brown to gray (10YR), fine to coarse sandy, fine to coarse GRAVEL, trace to some silt; abundant cobbles; subrounded clasts; faintly stratified (GP-GM).
5	Bentonite chips 2 to 29 feet				Moist to very moist, grayish brown to dark grayish brown (10YR), very gravelly, fine to coarse SAND to very sandy, fine to coarse GRAVEL, trace silt; scattered cobbles; faintly stratified (SW to GW).
10	4-inch I.D. Sch 40 PVC riser with threaded connections -2.95 to 130.8 feet				No recovery 10 to 12 feet.
					Very moist to wet (from added water), grayish brown, sandy, fine to coarse GRAVEL, trace to some silt; scattered cobbles; faintly stratified (GP).
15					Moist to very moist, grayish brown to dark grayish brown (10YR), medium to coarse sandy, fine to coarse GRAVEL, some fractured gravel; trace to some silt; abundant cobbles; faintly stratified; one weathered sandstone clast (GP).
					Moist to very moist, grayish brown, gravelly, fine to coarse SAND, trace to some silt (SP-SM).
20	18-inch centralizer at 20 feet				
	Bentonite chips 2 to 29 feet				**Vashon Ice Contact Deposits** Moist (baked), dark grayish brown, medium to coarse sandy, fine to coarse GRAVEL, some silt; fractured clasts; increased silt from pulverization; sharp contact with above (GP-GM). Moist to very moist, yellowish brown to brown (10YR), fine sandy, fine to coarse GRAVEL, trace silt; gap graded; clast supported; massive (GP).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (2/11/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

associated earth sciences incorporated

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-8W	2 of 7

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	848.66 (Surveyed)	Surface Elevation (ft)	845.61
Water Level Elevation	~719	Date Start/Finish	1/26/22,1/31/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	9":0-90', 8": 90-140', 7":140-150'
Hammer Weight/Drop	N/A	Well Tag #	BNY 893

Depth (ft)	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
	4-inch I.D. Sch 40 PVC riser with threaded connections -2.95 to 130.8 feet				Very moist, brown (10YR) to light olive brown (2.5Y), fine to coarse sandy, fine to coarse GRAVEL, trace silt; scattered cobbles; faintly stratified; one weathered sandstone clast (GP).
30					Very moist, brown to light olive brown, silty, sandy, fine to coarse GRAVEL; clast supported (GM).
					Very moist, brown to light olive brown, fine to coarse sandy, fine to coarse GRAVEL to gravelly, fine to coarse SAND, trace silt; occasional cobbles; bedded (GP to SP).
35	Bentonite grout 29 to 124 feet				
					Moist to very moist, grayish brown, sandy, fine to coarse GRAVEL, some silt; abundant cobbles; fractured gravel; increased silt from pulverization; faintly bedded (GP-GM).
40	18-inch centralizer at 40 feet				
					Very moist, light olive brown (2.5Y), sandy, fine to coarse GRAVEL, trace to some silt; scattered cobbles; bedded (GP).
					Very moist, light olive brown, fine to coarse GRAVEL, some sand to sandy, trace to some silt; abundant cobbles; bedded (GP).
45	Bentonite grout 29 to 124 feet				
					No recovery 47 to 50 feet, boulder stuck in bit at 47 feet.

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (2/11/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

associated earth sciences incorporated

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-8W	3 of 7

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	848.66 (Surveyed)	Surface Elevation (ft)	845.61
Water Level Elevation	~719	Date Start/Finish	1/26/22,1/31/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	9":0-90', 8": 90-140', 7":140-150'
Hammer Weight/Drop	N/A	Well Tag #	BNY 893

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		4-inch I.D. Sch 40 PVC riser with threaded connections -2.95 to 130.8 feet				No recovery 50 to 52 feet, boulder stuck but then pushed through.
						Moist (baked), grayish brown, sandy, fine to coarse GRAVEL, some silt (GP). Pulverized boulder at 52 feet.
55						Very moist to wet, light olive brown, very gravelly, medium to coarse SAND, trace silt; abundant cobbles; bedded (SP).
						Very moist, dark grayish brown, fine gravelly, fine to coarse SAND; occasional cobbles; bedded (SP).
60		18-inch centralizer at 60 feet				Moist to very moist, grayish brown, silty, fine gravelly, fine to coarse SAND; unsorted; diamicton; noncohesive matrix; matrix supported (SM). Moist to very moist, grayish brown, very gravelly, fine to coarse SAND, trace to some silt; faintly stratified (SP).
						Very moist, grayish brown to light olive brown, medium to coarse sandy, fine to coarse GRAVEL, trace to some silt; faintly bedded; scattered cobbles; subrounded gravel (GP-GM).
65		Bentonite grout 29 to 124 feet				Becomes very moist to wet.
						Very moist, light olive brown, sandy, fine to coarse GRAVEL, some silt within beds of medium to coarse SAND; scattered cobbles; partially pulverized/some fractured gravel; increased silt from drilling (GP-GM).
70		4-inch I.D. Sch 40 PVC riser with threaded connections -2.95 to 130.8 feet				
						Very moist to wet, light olive brown, fine to coarse GRAVEL, some sand to sandy, trace silt; subrounded to rounded gravel; bedded (GP).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (2/11/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

associated earth sciences incorporated

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-8W	4 of 7

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	848.66 (Surveyed)	Surface Elevation (ft)	845.61
Water Level Elevation	~719	Date Start/Finish	1/26/22,1/31/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	9":0-90', 8": 90-140', 7":140-150'
Hammer Weight/Drop	N/A	Well Tag #	BNY 893

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
						Very moist, grayish brown to light olive brown, sandy to very sandy, fine to coarse GRAVEL, trace silt; abundant cobbles; subrounded gravel; faintly bedded; mix of clast shapes (bladed, prolate, oblate, few equate) (GP).
80		18-inch centralizer at 80 feet				
85		Bentonite grout 29 to 124 feet				
						No recovery 88 to 90 feet, drill action consistent with below.
90		4-inch I.D. Sch 40 PVC riser with threaded connections -2.95 to 130.8 feet				Driller down sizes casing and core barrel at 90 feet. Slightly moist (baked), grayish brown, fine to coarse GRAVEL, some sand to sandy, trace silt; abundant cobbles; highly pulverized and altered from drilling; increased fines from pulverization (GP). Drill action recovery, and pulverization consistent with cobbles and boulders.
95	▼					Moist to very moist, grayish brown, medium to coarse sandy, fine to coarse GRAVEL, trace to some silt; abundant cobbles; faintly bedded (GP). Thin groundwater interpreted based on nearby spring/stratigraphic correlations.

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (2/11/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

associated earth sciences incorporated

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-8W	5 of 7

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	848.66 (Surveyed)	Surface Elevation (ft)	845.61
Water Level Elevation	~719	Date Start/Finish	1/26/22,1/31/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	9":0-90', 8": 90-140', 7":140-150'
Hammer Weight/Drop	N/A	Well Tag #	BNY 893

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		18-inch centralizer at 100 feet				**Vashon Lodgement Till** Moist, mottled grayish brown (10YR) and brown (7.5YR), silty,very gravelly, fine to medium SAND; nonstratified; matrix supported; low plasticity to nonplastic; weathered (SM). Moist, dark gray (7.5YR to 10YR), silty, very gravelly, fine to medium SAND; unsorted; diamicton; low plasticity to nonplastic matrix; matrix supported scattered cobbles; subrounded to rounded gravel; equate to bladed clast shape; cascade (volcanic) provenance is 50-60%; polymictic; strongly effervescent (SM).
105		Bentonite grout 29 to 124 feet				
110		4-inch I.D. Sch 40 PVC riser with threaded connections -2.95 to 130.8 feet				**Pre-Vashon Deposits** Moist to very moist, dark gray (GLEY1), gravelly, fine to coarse SAND, some silt; thin silty interbeds (1 to 2 inches thick); stratified (SP-SM).
115						Very moist, dark gray (GLEY1), fine to coarse SAND, trace to some gravel, trace to some silt; faintly bedded (SP).
120		18-inch centralizer at 120 feet				Contains fragments of weathered sandstone at 123 feet.

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (2/11/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-8W	6 of 7

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	848.66 (Surveyed)	Surface Elevation (ft)	845.61
Water Level Elevation	~719	Date Start/Finish	1/26/22,1/31/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	9":0-90', 8": 90-140', 7":140-150'
Hammer Weight/Drop	N/A	Well Tag #	BNY 893

Depth (ft)	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
	Bentonite chips (hydrated) 124 to 127 feet				
					Wet, dark gray, gravelly, coarse SAND, trace silt; bedded (SP).
	10/20 filter sand 127 to 141 feet				Wet, dark gray, fine to coarse SAND, trace to some gravel; bedded (SP).
130					Recovered but sample missing, as below (GP-GM).
					Wet, grayish brown, medium to coarse sandy, fine to coarse GRAVEL, some silt; scattered cobbles; bedded (GP-GM).
135	4-inch I.D. Sch 40 PVC well screen 0.020-inch slot width 130.8 to 140.8 feet				Wet, dark gray, medium to coarse SAND, some gravel to gravelly, trace silt; bedded (SP).
140					Very moist to wet, dark gray, very gravelly, fine to coarse SAND, some silt to silty (SP-SM).
	Threaded end cap 140.8 to 141.2 feet				Moist, gray to dark gray (5Y), silty, sandy, fine to coarse GRAVEL, some clay; unsorted; diamicton; matrix supported; moderate plasticity; ~90% cascade volcanics and ~10% local Tp sandstone (GM).
					Puget Group Bedrock Slightly weathered, thinly bedded, light olive, gray (5Y6/1) to medium light gray (N6), fine grained, moderately weak (R2), SANDSTONE, highly fractured from drilling. Becomes fresh (un-weathered).
145	Bentonite chips 141 to 150 feet				

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (2/11/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-8W	7 of 7

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	848.66 (Surveyed)	Surface Elevation (ft)	845.61
Water Level Elevation	~719	Date Start/Finish	1/26/22,1/31/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	9":0-90', 8": 90-140', 7":140-150'
Hammer Weight/Drop	N/A	Well Tag #	BNY 893

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
155						Boring terminated at 150 feet Well completed at 140.8 feet on 1/31/22. Groundwater encountered at 98 and 127 feet ATD. Groundwater measured at 126.6 on 2/11/22. Groundwater present above till at 100 feet; water level inferred from moisture content in bags. Water in drill rods after 110 to 120 foot drive with casing at 100 feet.
160						
165						
170						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (2/11/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-9W	1 of 8

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	810.42 (Surveyed)	Surface Elevation (ft)	807.77
Water Level Elevation		Date Start/Finish	4/25/22,4/28/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	8": 0-190', 7": 190-197'
Hammer Weight/Drop	N/A	Well Tag #	BPK 505

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		Stand up steel monument with lid and 3 bollards Stick up casing -2.66 to 0 feet Plastic compression well cap Concrete 0 to 3 feet				**Topsoil - 6 inches** **Vashon Recessional Outwash** Yellowish brown (10YR4/2), gravelly, fine to coarse SAND, trace silt; appears stratified (SP). Single fine sand interbed with some silt at 3 feet.
5		Bentonite chips 3 to 177 feet				
10		4-inch I.D. PVC casing with threaded connections 0 to 179.2 feet				Grayish brown (10YR3/2), sandy, GRAVEL, trace cobbles, trace silt (GP). Cobble and pulverized rock 14 to 15 feet.
15						Moist, grayish brown, sandy, GRAVEL, trace silt, trace cobbles (GP).
20						Slightly baked entire run; hot enough to evaporate moisture. Moist to slightly moist, grayish brown, gravelly, SAND to sandy, GRAVEL, trace silt, trace cobbles; small areas of increased silt; content near pulverized cobbles; appears stratified (SP/GP).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (5/13/22)
- Water Level at time of drilling (ATD)

Logged by: JG

Approved by: CJK

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-9W	2 of 8

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	810.42 (Surveyed)	Surface Elevation (ft)	807.77
Water Level Elevation		Date Start/Finish	4/25/22,4/28/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	8": 0-190', 7": 190-197'
Hammer Weight/Drop	N/A	Well Tag #	BPK 505

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		Bentonite chips 3 to 177 feet				
						Cobble with pulverized rock flour 29 to 30 feet.
30		4-inch I.D. PVC casing with threaded connections 0 to 179.2 feet				**Vashon Ice Contact Deposits** Slightly moist, gray, silty, sandy, GRAVEL; abundant cobbles; possible boulders; baked and altered due to drilling; fractured (angular) in silty matrix (GM).
35						Becomes sandy, GRAVEL; some silt due to abundant cored cobbles and boulders (GP-GM).
40						Only ~7 feet of recovery from 30 to 40 feet. Slow progress due to cobbles.
						Slightly moist (baked), gray, silty (due to drilling), sandy, GRAVEL; frequent angular gravel fragments (GM).
45		Bentonite chips 3 to 177 feet				Moist, grayish brown, GRAVEL, some sand, trace silt (GP).
						Moist, orangish brown, sandy, GRAVEL, trace silt; gravel is rounded to subrounded (GP). Becomes moist to very moist (less baked).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (5/13/22)
- Water Level at time of drilling (ATD)

Logged by: JG

Approved by: CJK

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-9W	3 of 8

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	810.42 (Surveyed)	Surface Elevation (ft)	807.77
Water Level Elevation		Date Start/Finish	4/25/22,4/28/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	8": 0-190', 7": 190-197'
Hammer Weight/Drop	N/A	Well Tag #	BPK 505

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		4-inch I.D. PVC casing with threaded connections 0 to 179.2 feet				Slightly moist, silty, fine SAND, some gravel (interpreted as pulverized cobbles and rock flour); baked and altered due to drill action.
						Moist, grayish brown, GRAVEL, some sand, trace silt (GP).
						Moist, brown, medium to coarse SAND, some gravel (SP).
55						
						Slightly moist, gray, sandy, GRAVEL, some silt; frequent pulverized cobbles (GP-GM).
60						
						Extremely high drill action; consistent with boulder as previous hole. Cobbles surrounded by rock flour.
						Moist to very moist, grayish brown, GRAVEL, some sand, trace silt (GP).
65		Bentonite chips 3 to 177 feet				Becomes brown with frequent rock chips (dacite boulder) 60 to 65 feet. Very high drill action, very slow progress.
						Very moist, grayish brown, sandy, GRAVEL (GP).
						Grades to some silt (GP-GM).
70		4-inch I.D. PVC casing with threaded connections 0 to 179.2 feet				Pulverized cobbles 70 to 71 feet.
						Moist, brownish gray, silty, sandy, GRAVEL; occasional cobbles; clast supported (GM).
	▼					Moist, grayish brown, silty, gravelly, fine SAND, trace cobbles; unsorted; matrix supported (GM).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (5/13/22)
- Water Level at time of drilling (ATD)

Logged by: JG

Approved by: CJK

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

associated earth sciences incorporated

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-9W	4 of 8

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	810.42 (Surveyed)	Surface Elevation (ft)	807.77
Water Level Elevation		Date Start/Finish	4/25/22,4/28/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	8": 0-190', 7": 190-197'
Hammer Weight/Drop	N/A	Well Tag #	BPK 505

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
80	▽					Water in drill rods during removal of 80 to 100 foot sample run.
						Wet, grayish brown, sandy, GRAVEL, trace to some silt; silt grades from some at 82 feet to trace at 90 feet (GP-GM).
85		Bentonite chips 3 to 177 feet				
90		4-inch I.D. PVC casing with threaded connections 0 to 179.2 feet				Wet, gray, GRAVEL, trace sand, trace silt (GP).
95						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (5/13/22)
- Water Level at time of drilling (ATD)

Logged by: JG

Approved by: CJK

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

associated earth sciences incorporated

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-9W	5 of 8

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	810.42 (Surveyed)	Surface Elevation (ft)	807.77
Water Level Elevation		Date Start/Finish	4/25/22,4/28/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	8": 0-190', 7": 190-197'
Hammer Weight/Drop	N/A	Well Tag #	BPK 505

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
						Very moist, gray, GRAVEL, trace to some silt; occasional cobbles (GP/GP-GM).
105		Bentonite chips 3 to 177 feet				Wet, gray, GRAVEL, trace sand, trace silt; occasional cobbles; gravel is silt coated (GP).
110		4-inch I.D. PVC casing with threaded connections 0 to 179.2 feet				Wet, gray, GRAVEL, trace silt, trace sand; washed clean (GP).
115						Cored cobbles 114.5 to 115.5 feet, holding water.
						Grades to some silt, some sand (GP-GM).
120						Wet, gray, coarse sandy, GRAVEL, trace silt (wet coating?); occasional cobbles (GP).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (5/13/22)
- Water Level at time of drilling (ATD)

Logged by: JG

Approved by: CJK

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

associated earth sciences incorporated

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-9W	6 of 8

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	810.42 (Surveyed)	Surface Elevation (ft)	807.77
Water Level Elevation		Date Start/Finish	4/25/22,4/28/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	8": 0-190', 7": 190-197'
Hammer Weight/Drop	N/A	Well Tag #	BPK 505

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
130		Bentonite chips 3 to 177 feet 4-inch I.D. PVC casing with threaded connections 0 to 179.2 feet				
135						
140						**Vashon Lodgement Till** Very moist, brownish gray to gray, silty, sandy, GRAVEL; strongly effervescent; unsorted; diamicton (GM). Cored cobble 141 to 142 feet. **Pre-Vashon Deposits** Very moist to wet, grayish brown, sandy, GRAVEL to gravelly, SAND, trace to some silt; washed (SP).
145		Bentonite chips 3 to 177 feet				Very moist, dark gray, silty, fine SAND, trace gravel, trace medium to coarse sand; massive; mildly effervescent (SM).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (5/13/22)
- Water Level at time of drilling (ATD)

Logged by: JG

Approved by: CJK

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

associated earth sciences incorporated

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-9W	7 of 8

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	810.42 (Surveyed)	Surface Elevation (ft)	807.77
Water Level Elevation		Date Start/Finish	4/25/22,4/28/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	8": 0-190', 7": 190-197'
Hammer Weight/Drop	N/A	Well Tag #	BPK 505

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		4-inch I.D. PVC casing with threaded connections 0 to 179.2 feet				Very moist, dark gray, fine SAND, some silt; massive (SP-SM).
						Silty interbeds (4 inches thick) at 152 feet. Strong reaction with hydrochloric acid (strongly effervescent).
155						Silty interbeds (8 inches thick) 156 to 158 feet (SM).
						Silt 157.5 to 158 feet. Very moist to wet, grayish brown, very gravelly, medium to coarse SAND, trace silt (SP).
160						Very moist to wet, gray ranging to brownish gray with depth, medium to coarse SAND, some gravel to gravelly, trace silt, trace cobbles; stratified (SP).
165		Bentonite chips 3 to 177 feet				Gravel interbeds at 165 feet.
						Wet, grayish brown, sandy, GRAVEL, trace silt (?) (GP).
170		4-inch I.D. PVC casing with threaded connections 0 to 179.2 feet				Very moist to wet, brownish gray, sandy, GRAVEL, trace silt; frequent cobbles (GP).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (5/13/22)
- Water Level at time of drilling (ATD)

Logged by: JG

Approved by: CJK

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-9W	8 of 8

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	810.42 (Surveyed)	Surface Elevation (ft)	807.77
Water Level Elevation		Date Start/Finish	4/25/22,4/28/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	8": 0-190', 7": 190-197'
Hammer Weight/Drop	N/A	Well Tag #	BPK 505

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
180		10-20 filter sand 177 to 190 feet				Becomes gray at 176 feet. Becomes some sand at 178 feet. Missing 180 to 186 feet.
185		4-inch I.D. PVC well screen 0.010-inch slot width and threaded connections 179.2 to 189.2 feet				Very moist to wet, brownish gray to gray, GRAVEL, some sand, trace silt (GP). Sandy 188 to 189 feet. Some sand 189 to 190 feet.
190		End cap with threaded connections and O-rings 189.2 to 189.6 feet Bentonite chips 190 to 197 feet				Slough likely 190 to 191 feet. **Puget Group Bedrock** Slightly weathered, weak (R1), grayish black, coaly, SHALE; pulverized by drilling. Pulverized sedimentary rock (siltstone) 192 to 195 feet. Very high drill action, slow progress.
195						Fresh, moderately weak (R2), gray, massive, SILTSTONE.
						Boring terminated at 197 feet Well completed at 189.2 feet on 4/28/22. Groundwater encountered at 73.5 feet ATD. Groundwater measured at 77.5 feet on 5/13/22.

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (5/13/22)
- Water Level at time of drilling (ATD)

Logged by: JG

Approved by: CJK

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-10W	1 of 3

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	852.64	Surface Elevation (ft)	850.22
Water Level Elevation		Date Start/Finish	7/21/22,7/22/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	8"
Hammer Weight/Drop	N/A	Well Tag #	BPK 530

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
	▼	Concrete 0 to 1.5 feet				**Recent Alluvium** Very moist, dark brown to very dark brown, SILT, trace sand; abundant organics/rootlets; nonplastic (OM/ML). Moist, yellowish brown and light gray mottled, clayey, SILT, trace sand; scattered rootlets; moderate plasticity; faint laminae (ML).
						Wet, pale brown, silty, fine to coarse SAND; massive (SM).
						Wet, yellowish brown grading to light gray, very silty, fine to coarse SAND to very sandy, SILT; nonplastic; few roots and charcoal (SM/ML).
5		Medium bentonite chips 1.5 to 47 feet				Wet, light gray to gray (2.5Y), medium SAND, trace to some silt; faintly stratified; locally derived (SP).
						Older Alluvium Very moist, gray (2.5Y to 10YR), spotted with dark olive, silty, CLAY, moderate to high plasticity; faint laminae (CH).
10		4-inch I.D. Sch 40 PVC riser with threaded connections -2.6 to 51 feet				Wet, grayish brown, medium SAND, trace to some silt; interbeds (≤6 inches thick) of clayey silt; stratified (SP-SM). Moist, gray and dark yellowish brown to olive mottled, silty, CLAY; faint laminae; high plasticity (CH).
						Very moist, dark grayish brown, medium to coarse SAND, trace gravel, trace silt; few rip-up clasts of gray to greenish gray clayey silt (SP).
15						
						Very moist, dark grayish brown to brownish gray, sandy, SILT; nonplastic; massive (ML).
20						**Lacustrine Deposits** Moist to very moist, gray (GLEY1 to 5Y) to occasionally greenish gray, clayey, SILT; scattered wood fragments; inclusions of organic sediment; rhythmite; occasional, very thin interbeds (≤1 cm thick) of fine sand; moderate to high plasticity; not glacially consolidated; drills smooth (MH). **Radiocarbon age: 14,940 to 14,315 cal BP (plant material)**

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (7/22/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-10W	2 of 3

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	852.64	Surface Elevation (ft)	850.22
Water Level Elevation		Date Start/Finish	7/21/22,7/22/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	8"
Hammer Weight/Drop	N/A	Well Tag #	BPK 530

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
						Sand interbeds are more frequent.
30						Disturbed during drilling by underlying wet sand. Water under pressure?
						Wet, grayish brown, medium SAND, trace to some silt, trace gravel; faintly stratified (SP-SM).
35						Wet, grayish brown, medium to coarse SAND, trace silt, trace gravel; faintly stratified (SP).
						Very moist, gray (GLEY1 to 5Y), clayey, SILT; rhythmite; moderate to high plasticity (MH).
						As above; contains scattered gravel (MH).
40						Moist to very moist, grayish brown to gray (5Y to 3.5YR), gravelly, clayey, SILT, some sand; gradational contact with underlying unit; fining upwards (MH).
						Vashon Ice Contact
						Moist (baked?), brown (10YR), silty, sandy, fine to coarse GRAVEL; scattered to abundant cobbles; faintly bedded; gradational contact with overlying unit (GM). Drill action consistent with cobbles; top drive spins are unimpeded.
45						Very moist, grayish brown to brown, sandy, fine to coarse GRAVEL, some silt; faintly bedded; scattered cobbles (GP-GM).
		#12/20 silica sand 47 to 60 feet				

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (7/22/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-10W	3 of 3

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	852.64	Surface Elevation (ft)	850.22
Water Level Elevation		Date Start/Finish	7/21/22,7/22/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	8"
Hammer Weight/Drop	N/A	Well Tag #	BPK 530

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
						Very moist to wet, grayish brown, coarse sandy, fine to coarse GRAVEL, trace silt; sharp contact with bedrock (GP).
						Weathered Puget Group Bedrock Slightly to highly weathered, gray to dark yellowish orange to light brown, very weak (R1) to moderately weak (R2) SILTSTONE and fine to medium grained SANDSTONE; highly fractured, sediment and water within fractures. Drilling progress slows.
55	▼	4-inch I.D. Sch 40 PVC well screen 0.010-inch slot width 51 to 60 feet				Appears to be less weathered/fractured; little to no water.
60		PVC Slip End Cap				Boring terminated at 60 feet Well completed at 60 feet on 7/22/22. Perched groundwater encountered at 3 feet ATD. Groundwater encountered at 53 feet ATD. Water bearing zone encountered 32 to 36 feet ATD. Groundwater measured at 53.3 feet in completed well on 7/22/22.
65						
70						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (7/22/22)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-11W	1 of 2

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	852.95	Surface Elevation (ft)	849.92
Water Level Elevation		Date Start/Finish	8/25/22,8/26/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	8"
Hammer Weight/Drop	N/A	Well Tag #	BPK 532

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		Above ground steel monument with locking cover and bollards Plastic compression well cap				**Topsoil**
		Concrete 0 to 3 feet				**Recent Alluvium** Moist, light brown with oxidation mottling, SILT, some fine sand; highly plastic (ML).
5	▼	Bentonite chips 3 to 13 feet				Very moist to wet, gray, silty, fine SAND, trace coal fragments; bedded (SM). Seepage and mud on barrel 5 to 10 feet.
	▽					
10	▼	4-inch I.D. PVC casing with threaded connections 0 to 15 feet				**Older Alluvium** Moist, brownish gray, silty, CLAY; massive (CL).
		Sand pack 13 to 21.5 feet				Wet, gray, fine SAND, trace to some silt; massive (SP/SP-SM).
15		4-inch I.D. PVC well screen 0.020-inch slot width and threaded connections 15 to 20 feet				
20						**Lacustrine Deposits** Moist ranging to very moist (inferred due to high plasticity), gray, silty, CLAY, trace sand; massive; rhythmite (CL).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- ▽ Water Level (1/31/23)
- ▼ Water Level at time of drilling (ATD)

Logged by: JG

Approved by: JHS

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-11W	2 of 2

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	852.95	Surface Elevation (ft)	849.92
Water Level Elevation		Date Start/Finish	8/25/22,8/26/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	8"
Hammer Weight/Drop	N/A	Well Tag #	BPK 532

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
30		Bentonite chip backfill				**Vashon Ice-Contact** Moist, brown, silty, gravelly, medium to coarse SAND (SM). Becomes silty, sandy, GRAVEL (GM). Very moist to wet (likely due to water from above), gray, silty, sandy, GRAVEL (GM). Becomes moist and brown. Cobble at 40 feet.
35						
40						Boring terminated at 40 feet Well completed at 21.5 feet on 8/26/22. Groundwater encountered from 4 to 10 feet and 13 to 20 feet ATD. Groundwater encountered at 7.8 feet on 1/31/2023.
45						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (1/31/23)
- Water Level at time of drilling (ATD)

Logged by: JG

Approved by: JHS

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-12W	1 of 4

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	845.46	Surface Elevation (ft)	842.83
Water Level Elevation		Date Start/Finish	8/15/22,8/22/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	8"
Hammer Weight/Drop	N/A	Well Tag #	BPK 533

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		Concrete 0 to 2 feet				**Vashon Ice Contact** Slightly moist, strong brown (7.5YR), silty, gravelly, fine SAND; scattered roots; fining upward; topsoil/duff stripped for drill pad prior to boring (SM). Becomes as above; sandy, fine to coarse GRAVEL, some silt to silty (GP-GM). No recovery; driller pushed through formation.
5		Coarse grade bentonite 2 to 85 feet				Moist, light olive brown (2.5Y 5/3), fine to coarse GRAVEL, some sand to coarse sandy, trace silt; partially pulverized; abundant cobbles; faintly bedded (GP). Drills loose.
10		4-inch I.D. Sch 40 PVC riser with threaded connections -2.3 to 87 feet				Moist, grayish brown (10YR), medium to coarse sandy, fine to coarse GRAVEL; trace silt; scattered cobbles; subrounded gravel (GP).
15						Slightly moist (baked), dark grayish brown (2.5Y to 10YR), medium to coarse sandy, fine to coarse GRAVEL, trace to some silt; abundant cobbles; pulverized; interstratified with very gravelly, silty, fine to medium sand; unsorted diamicton; highly stratified (GP/SM). Boulder 15 to 17 feet.
20						Moist, grayish brown, medium to coarse sand, fine to coarse GRAVEL, some silt to silty, trace clay; stratified; scattered cobbles (GM).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (1/4/23)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-12W	2 of 4

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	845.46	Surface Elevation (ft)	842.83
Water Level Elevation		Date Start/Finish	8/15/22,8/22/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	8"
Hammer Weight/Drop	N/A	Well Tag #	BPK 533

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
30						Becomes very moist at 26 feet.
						Moist to very moist, grayish brown, sandy, fine to coarse GRAVEL, some silt; abundant cobbles; pulverized; low recovery due to oversize (GP-GM).
						Very moist, grayish brown, fine to coarse sandy, fine to coarse GRAVEL, some silt; scattered cobbles; bedded (GP-GM).
35						Very moist, brown to olive brown, fine to coarse GRAVEL, some sand, trace to some silt; bedded; subrounded to subangular gravel (GP).
						Very moist, light olive brown, fine to coarse GRAVEL, some sand to coarse sandy, some silt, trace clay; faintly bedded (GP-GM).
40						Very moist, grayish brown, sandy, fine to coarse GRAVEL, some silt to silty; abundant cobbles; pulverized; low recovery due to oversize (GP-GM). No recovery. Cobble plugged up pit and pushed through formation. Redrilled material shows baked, drilling altered sediment. Appears similar to above but not representative.
45						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (1/4/23)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-12W	3 of 4

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	845.46	Surface Elevation (ft)	842.83
Water Level Elevation		Date Start/Finish	8/15/22,8/22/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	8"
Hammer Weight/Drop	N/A	Well Tag #	BPK 533

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
						Slightly moist to moist (baked), grayish brown to light olive brown, coarse GRAVEL, some coarse sand to sandy, trace to some silt; abundant cobbles and oversize; pulverized; massive; cobble zone (GP).
55						Grades to medium to coarse sandy, fine to coarse GRAVEL, trace to some silt; abundant cobbles; pulverized; faintly bedded (GP).
						Small boulder at 58 feet.
60						Wet from added water, dark gray (GLEY 1) to dark bluish gray (GLEY 2), coarse GRAVEL, some sand, some silt (increased silt from pulverization); abundant cobbles; boulder encountered (GP-GM(.
						Becomes silty, sandy, fine to coarse GRAVEL; increased silt from pulverization (GM).
65						No recovery 65 to 67 feet. Driller uses hammer bit.
						Contains dry to slightly moist (baked), fine to coarse GRAVEL; open framework (GP).
70						Moist (baked), grayish brown to brown, sandy, fine to coarse GRAVEL, trace to some silt; pulverized and fractured gravel; abundant cobbles; faintly bedded (GP).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (1/4/23)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
20200367H001	EB-12W	4 of 4

Project Name	Cumberland Property	Location	King County, WA
Elevation (Top of Well Casing)	845.46	Surface Elevation (ft)	842.83
Water Level Elevation		Date Start/Finish	8/15/22,8/22/22
Drilling/Equipment	Holt Services / TSI 150CC (Sonic)	Hole Diameter (in)	8"
Hammer Weight/Drop	N/A	Well Tag #	BPK 533

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
						No recovery 75 to 77 feet due to oversize.
						Large cobbles, boulders, and rock flour from pulverization 77 to 80 feet.
80	▽					Very moist, brown (10YR), silty, coarse sandy, fine to coarse GRAVEL; abundant cobbles; faintly bedded (GM).
	▼					Becomes wet, light olive brown, some silt at 81 feet (GP-GM).
						Vashon Lodgement Till Moist to very moist, dark gray (5Y), silty, gravelly, fine SAND; unsorted diamicton; dark gray/green rounded gravel and fragments of weathered sandstone, till; weathered upper 6 inches to yellowish brown (SM).
85		#12/20 silica sand 85 to 92 feet				**Pre-Vashon Deposits** Wet, gray (5Y to GLEY1), coarse sandy, fine to coarse GRAVEL, trace silt; occasional cobbles; bedded; subrounded gravel; abundant green/gray rocks (>95%) (Cascade derived) (GP).
90		4-inch I.D. Sch 40 PVC well screen 0.010-inch slot width 87 to 92 feet Threaded end cap				
		Native cave-in 92 to 95 feet.				**Puget Group Bedrock** Fresh, laminated to thinly bedded, grayish black (N2) to black (N1), shaley, COAL; extremely weak to very weak (R0 to R1). Fresh, thinly bedded to bedded, white (N9) to very light gray (N8), very weak (R1), fine to medium grained SANDSTONE with interbeds of light gray (N7) SILTSTONE; contains thin lenses of organics or leaf prints ; effervescent cement.
95						Boring terminated at 95 feet Well completed at 92 feet on 8/22/22. Groundwater encountered at 81 feet ATD. Groundwater measured at 79.1 feet on 1/4/2023.

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (1/4/23)
- Water Level at time of drilling (ATD)

Logged by: MJP

Approved by: JHS

NWWELL-B 20200367H001.GPJ BORING.GDT 5/15/23

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Exploration Boring

Project Number	Exploration Number	Sheet
20200367H001	EB-13	1 of 4

Project Name	Cumberland Property	Ground Surface Elevation (ft)	844.8
Location	King County, WA	Datum	N/A
Driller/Equipment	Holt Services / TSI 150CC (Sonic)	Date Start/Finish	8/22/22,8/23/22
Hammer Weight/Drop	N/A	Hole Diameter (in)	8"

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot 10 20 30 40	Other Tests
				Vashon Ice Contact Deposits Dry to slightly moist, strong brown to reddish yellow (7.5YR). silty, gravelly to very gravelly, fine to coarse SAND; scattered roots/rootlets; fining upwards; drills loose (SM).					
				Slightly moist, grayish brown, medium to coarse sandy, fine GRAVEL, trace silt; bedded (GP).					
5				Slightly moist to moist, grayish brown, coarse GRAVEL, some sand to sandy, trace silt; scattered cobbles; bedded (GP).					
				No recovery 7 to 10 feet due to oversize/loose formation.					
10				Dry to slightly moist (baked), light brownish gray, coarse sandy, fine to coarse GRAVEL, trace to some silt; pulverized; increase silt from pulverization; abundant cobbles (GP).					
				No recovery; cobble stuck in bit.					
15				Moist, brownish gray, medium to coarse sandy, fine GRAVEL, some coarse gravel, trace silt; bedded (GP).					
				Slightly moist (baked), light brownish gray, coarse GRAVEL, some sand, trace silt; fractured gravel (GP).					
				Moist, brown, sandy, fine to coarse GRAVEL, trace to some silt; scattered cobbles; faintly bedded; pulverized/altered by drilling from 18 to 20 feet; fractured gravel; bedded (GP-GM).					
20				Becomes moist to very moist at 21 feet.					
				Slightly moist (baked), light brownish gray, fine to coarse GRAVEL, some sand to sandy, trace to some silt; abundant cobbles; pulverized; bedded (GP).					

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: MJP
Approved by: JHS

AESIBOR 20200367H001.GPJ May 15, 2023

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Exploration Boring

Project Number	Exploration Number	Sheet
20200367H001	EB-13	2 of 4

Project Name	Cumberland Property	Ground Surface Elevation (ft)	844.8
Location	King County, WA	Datum	N/A
Driller/Equipment	Holt Services / TSI 150CC (Sonic)	Date Start/Finish	8/22/22,8/23/22
Hammer Weight/Drop	N/A	Hole Diameter (in)	8"

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				As above; encountered boulder (GP).					
				Very moist, brown, medium to coarse sandy, fine to coarse GRAVEL, trace to some silt; scattered to abundant cobbles; faintly bedded; subrounded clasts (GP).					
30				60% recovery from 30 to 40 feet due to loose formation.					
				Becomes grayish brown to light olive brown.					
35		S-1							
				Very moist, light olive brown, coarse sandy, fine to coarse GRAVEL, trace silt; scattered cobbles; bedded; drills easy (GP).					
40				50% recovery from 40 to 50 feet due to loose, gravelly formation.					
45		S-2							
				Very moist, brown, fine to coarse sandy, fine to coarse GRAVEL, trace silt; scattered cobbles (GP).					

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: MJP
Approved by: JHS

AESIBOR 20200367H001.GPJ May 15, 2023

associatec earth sciences incorporatec

Exploration Boring

Project Number	Exploration Number	Sheet
20200367H001	EB-13	3 of 4

Project Name	Cumberland Property	Ground Surface Elevation (ft)	844.8
Location	King County, WA	Datum	N/A
Driller/Equipment	Holt Services / TSI 150CC (Sonic)	Date Start/Finish	8/22/22,8/23/22
Hammer Weight/Drop	N/A	Hole Diameter (in)	8"

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot 10 20 30 40	Other Tests
				Moist to very moist, brown to grayish brown, fine to coarse GRAVEL, some sand, trace silt; scattered cobbles; bedded (GP).					
				Very moist, grayish brown, medium to coarse sandy to very sandy, coarse GRAVEL; abundant cobbles; faintly bedded (GP/GW).					
55		S-3							
				No recovery 58 to 60 feet due to cobble stuck in bit.					
60				50% recovery due to loose, gravelly formation.					
65				Very moist, brown, medium to coarse sandy, fine to coarse GRAVEL, trace silt; scattered to abundant cobbles; faintly bedded (GP).					
				As above; grades to some silt (GP-GM).					
70				Slightly moist (baked), light brownish gray, coarse sandy, fine to coarse GRAVEL; abundant cobbles; boulder encountered (GP).					
				Slightly moist to moist (baked), light brownish gray, fine gravelly, medium to coarse SAND, trace silt; no cobbles (SP).					
				Puget Group Bedrock Slightly weathered, thinly bedded to bedded, light gray (N7) and light brown					

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: MJP
Approved by: JHS

associatec earth sciences incorporatec

Exploration Boring

Project Number	Exploration Number	Sheet
20200367H001	EB-13	4 of 4

Project Name	Cumberland Property	Ground Surface Elevation (ft)	844.8
Location	King County, WA	Datum	N/A
Driller/Equipment	Holt Services / TSI 150CC (Sonic)	Date Start/Finish	8/22/22,8/23/22
Hammer Weight/Drop	N/A	Hole Diameter (in)	8"

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot 10 20 30 40	Other Tests
				(5YR 5/6) speckled, very weak (R1), fine grained SANDSTONE, and weathered to dark yellowish orange (10YR 6/6) at upper contact; metal minerals disseminated. Fresh, very light gray (N8) to light gray (N7), bedded, very weak (R1), fine grained SANDSTONE with thin beds of siltstone.					
80				As above; contains veins of (manganese?) metal oxide minerals and calcite grains. Calcite grains disseminated.					
85				Becomes moderately weak (R2).					
90				Few veins of metal oxides (manganese?). Bottom of exploration boring at 90 feet No groundwater encountered. No well completed.					
95									

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: MJP
Approved by: JHS

AESIBOR 20200367H001.GPJ May 15, 2023

APPENDIX C

Laboratory Testing

APPENDIX C
Laboratory Testing

Visual Classification

Soil samples recovered from the explorations were visually classified in the field at the time of drilling/excavation by a representative from Associated Earth Sciences, Inc. (AESI). Soil samples were also brought back to AESI's laboratory for further visual classification and comparison. Soil samples were visually classified using a system based on *ASTM International* (ASTM) Designation ASTM D-2488, "Standard Practice for Description and Identification of Soils" in conjunction with the Unified Soil Classification System. These visual classification methods allow for consistent comparison of soils from widespread geographic areas. Individual soil sample classifications have been incorporated into the boring logs presented in Appendix B.

Mechanical Grain-Size Distribution

Grain-size analysis was performed on selected soil samples obtained from our explorations. Mechanical grain-size testing was performed in general accordance with ASTM D-422, "Standard Method for Particle-Size Analysis of Soils." Grain-size distribution results were used to assist in classifying soils and to provide correlation with soil hydraulic properties. Laboratory data sheets are attached.

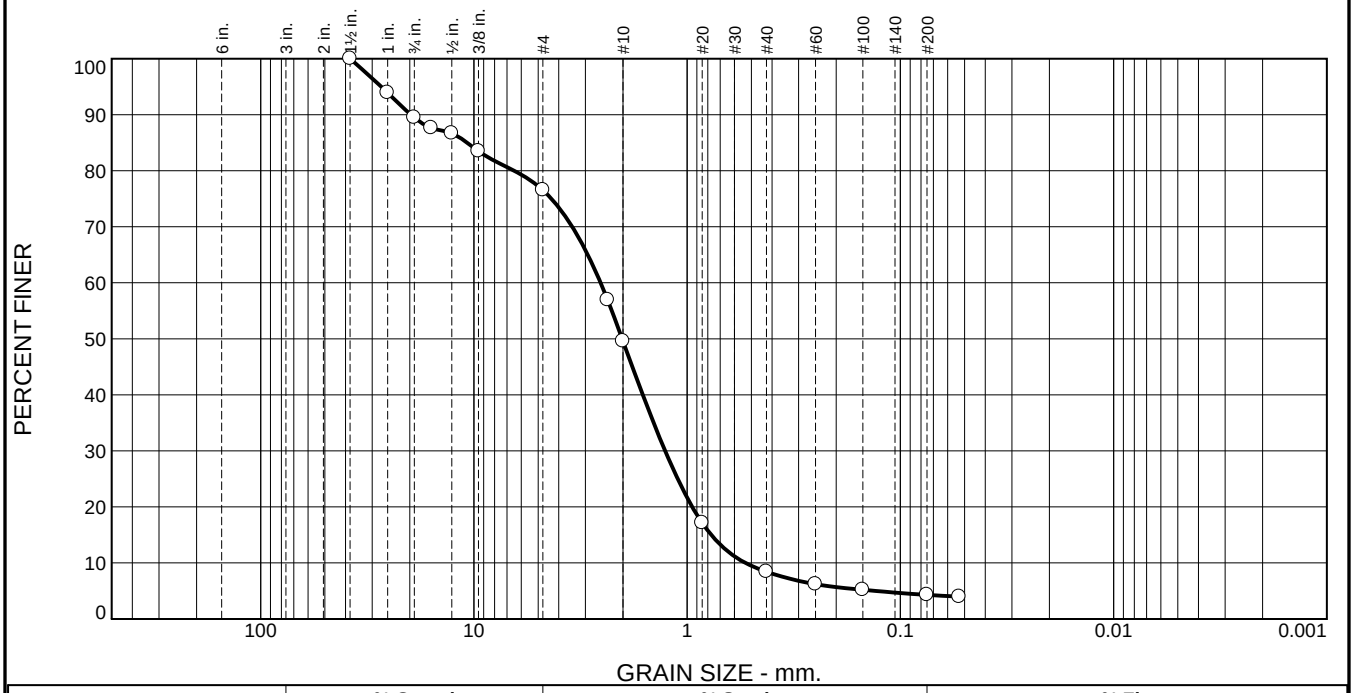
Radiocarbon Dating

The wood sample was selected in the field and retained in a plastic bag. The sample was sent to Beta Analytic, Inc. (Beta) who performed sample pretreatment and Accelerator Mass Spectrometry (AMS) technique for radiocarbon dating. Calibrated age dates, such as those shown on the exploration log, were calculated by Beta and based on the High-Probability Density (HPD) range method. AMS laboratory detection limits cannot quantitatively or statistically differentiate age beyond about 43,500 years before present.

Attachments:

Mechanical Grain-Size Distribution Data Sheets
Radiocarbon Dating Reports

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	10.5	13.0	26.9	41.2	4.1	4.3	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1-1/2"	100.0		
1"	93.9		
3/4"	89.5		
5/8"	87.6		
1/2"	86.7		
3/8"	83.5		
#4	76.5		
#8	56.9		
#10	49.6		
#20	17.1		
#40	8.4		
#60	6.2		
#100	5.2		
#200	4.3		
#270	4.0		

* (no specification provided)

Material Description

gravelly SAND, trace silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=**

Classification

USCS (D 2487)= SP **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 19.7629 D_{85}= 10.7571 D_{60}= 2.5449
D_{50}= 2.0183 D_{30}= 1.2686 D_{15}= 0.7711
D_{10}= 0.5330 C_u= 4.77 C_c= 1.19

Remarks

Date Received: 12/11/2020 **Date Tested:** 12/21/2020

Tested By: NAS

Checked By: MJP/CJK

Title:

Location: Onsite
Sample Number: EB-1W **Depth:** 127.5'

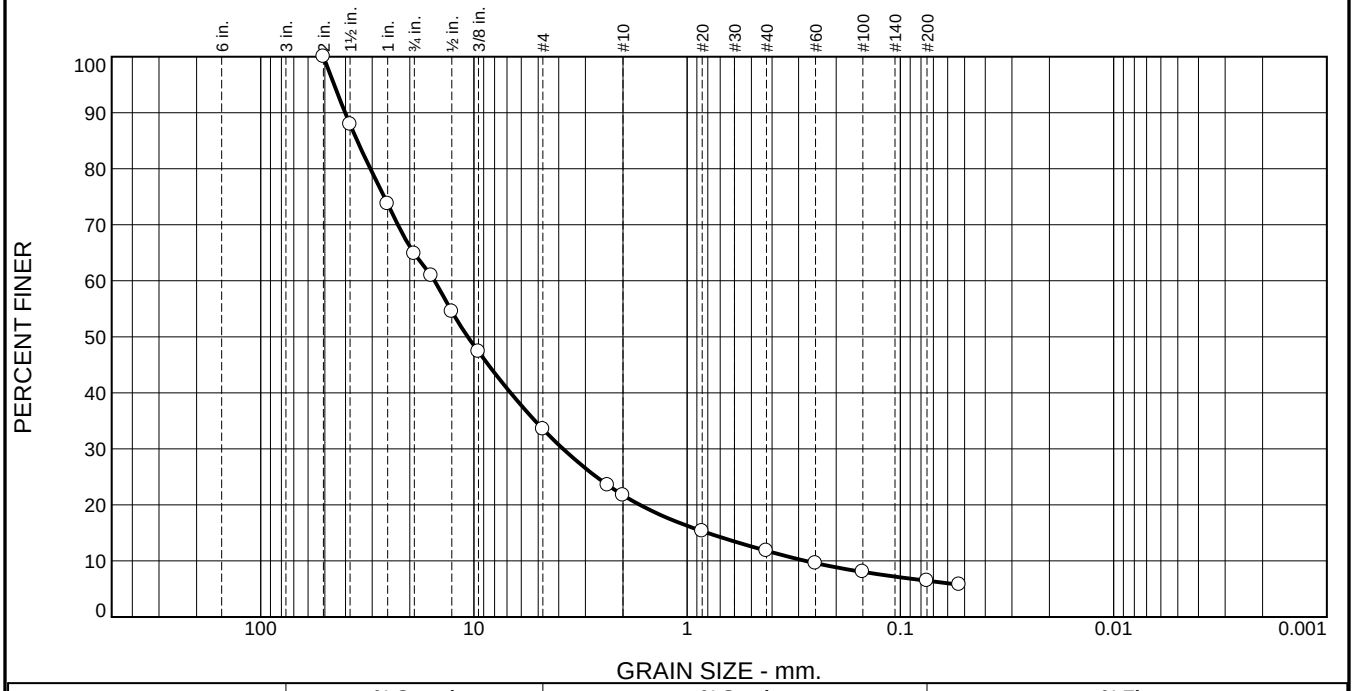
Date Sampled: 11/25/2020

associated earth sciences incorporated

Client: Segale Properties
Project: Cumberland Property

Project No: 20200367 H001 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	35.2	31.3	11.8	9.9	5.3	6.5	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
2"	100.0		
1-1/2"	87.9		
1"	73.7		
3/4"	64.8		
5/8"	60.9		
1/2"	54.5		
3/8"	47.4		
#4	33.5		
#8	23.5		
#10	21.7		
#20	15.3		
#40	11.8		
#60	9.6		
#100	8.0		
#200	6.5		
#270	5.8		

* (no specification provided)

Material Description

sandy GRAVEL, some silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=**

Classification

USCS (D 2487)= GP-GM **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 40.1683 D_{85}= 35.2720 D_{60}= 15.3033
D_{50}= 10.6855 D_{30}= 3.8198 D_{15}= 0.8030
D_{10}= 0.2781 C_u= 55.03 C_c= 3.43

Remarks

possible carbonate shell fragment found in wash

Date Received: 12/11/2020 **Date Tested:** 12/21/2020

Tested By: NAS

Checked By: MJP/CJK

Title:

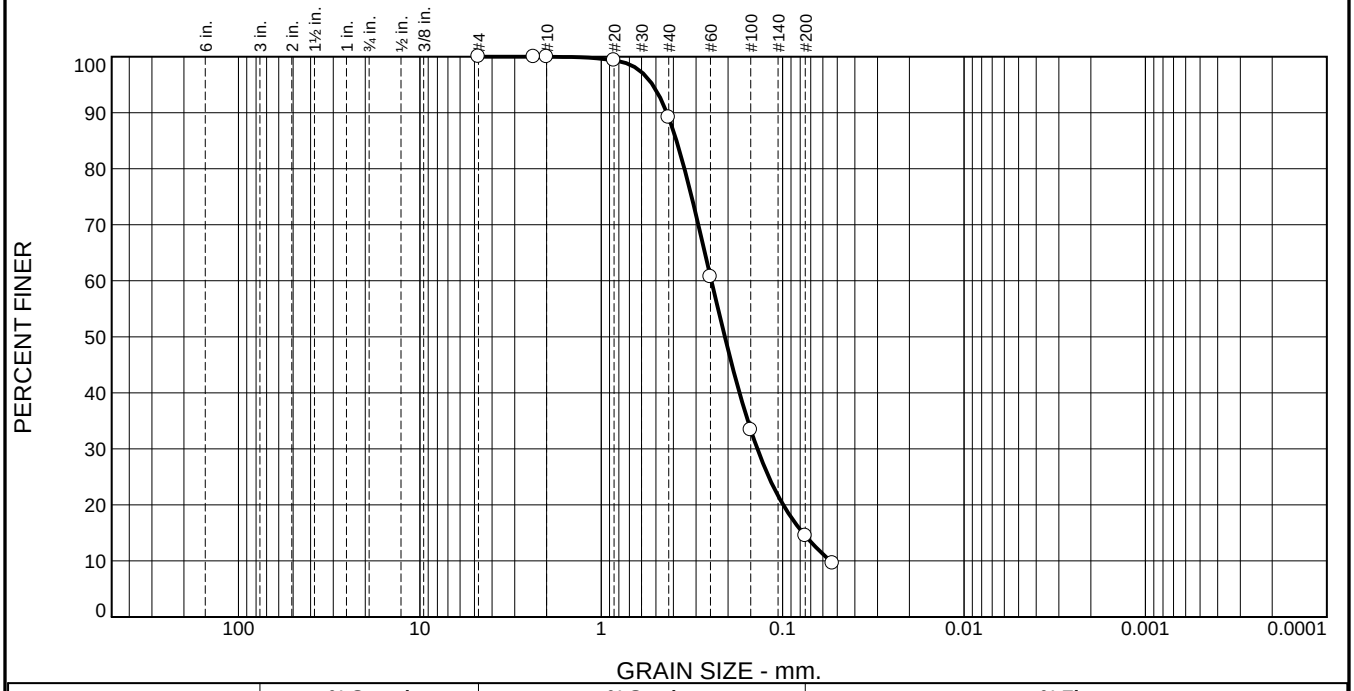
Location: Onsite - composite **Date Sampled:** 11/25/2020
Sample Number: EB-1W **Depth:** 140',142.5', & 145'

associated earth sciences incorporated

Client: Segale Properties
Project: Cumberland Property

Project No: 20200367 H001 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	10.8	74.7	14.5	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#8	100.0		
#10	100.0		
#20	99.3		
#40	89.2		
#60	60.7		
#100	33.4		
#200	14.5		
#270	9.6		

* (no specification provided)

Material Description

silty SAND

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=**

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 0.4347 D_{85}= 0.3848 D_{60}= 0.2471
D_{50}= 0.2083 D_{30}= 0.1379 D_{15}= 0.0774
D_{10}= 0.0547 C_u= 4.51 C_c= 1.41

Remarks

2 bag composite

Date Received: 2/18/2022 **Date Tested:** 2/24/2022

Tested By: CI

Checked By: MJP/CJK

Title:

Location: Onsite - Qva Sand
Sample Number: EB-2W **Depth:** 51' and 56'

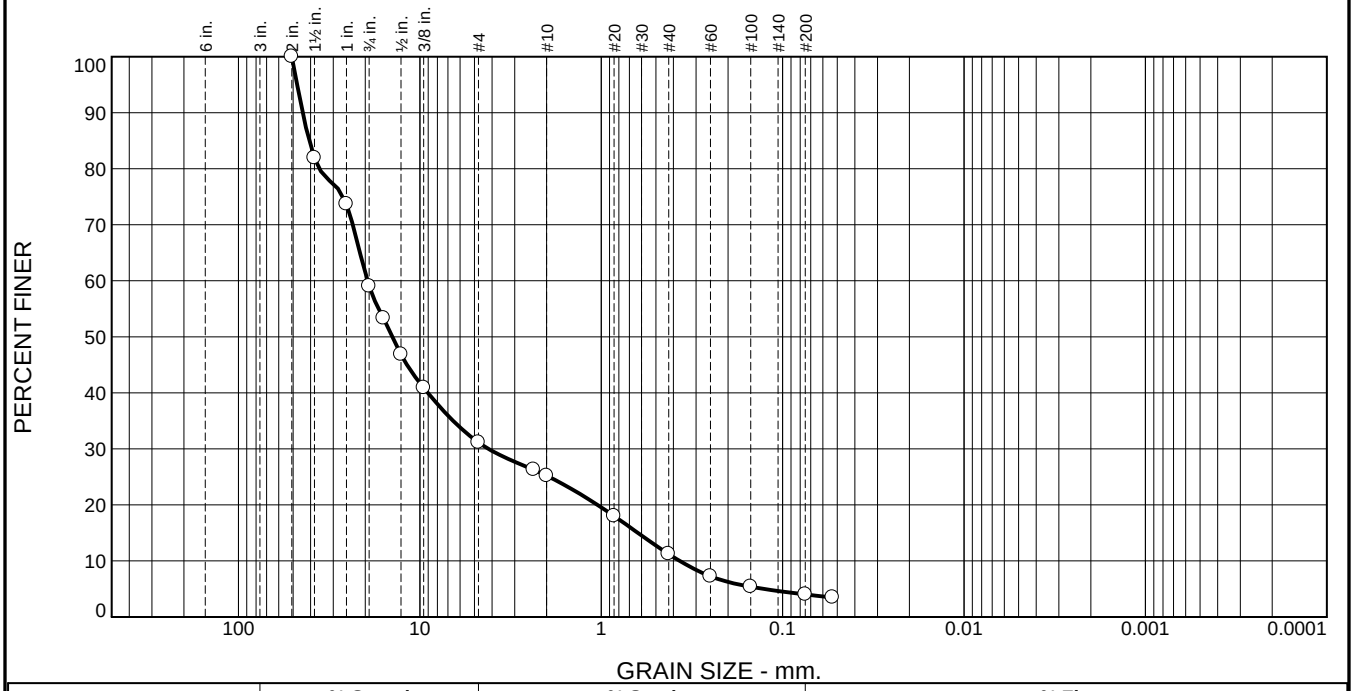
Date Sampled: 2/1/2022

associated earth sciences incorporated

Client: Segale Properties
Project: Cumberland Property

Project No: 20200367 H001 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	40.9	28.0	5.9	14.0	7.2	4.0	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
2"	100.0		
1.5"	81.9		
1"	73.7		
3/4"	59.1		
5/8"	53.3		
1/2"	46.8		
3/8"	40.9		
#4	31.1		
#8	26.3		
#10	25.2		
#20	18.0		
#40	11.2		
#60	7.3		
#100	5.4		
#200	4.0		
#270	3.5		

* (no specification provided)

Material Description

sandy GRAVEL, trace silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=**

Classification

USCS (D 2487)= GW **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 44.2449 D_{85}= 40.7388 D_{60}= 19.4550
D_{50}= 14.1869 D_{30}= 4.1884 D_{15}= 0.6278
D_{10}= 0.3693 C_u= 52.68 C_c= 2.44

Remarks

Date Received: 2/18/2022 **Date Tested:** 2/24/2022

Tested By: CI

Checked By: MJP/CJK

Title:

Location: Onsite - Qpf Gravel
Sample Number: EB-2W **Depth:** 64'

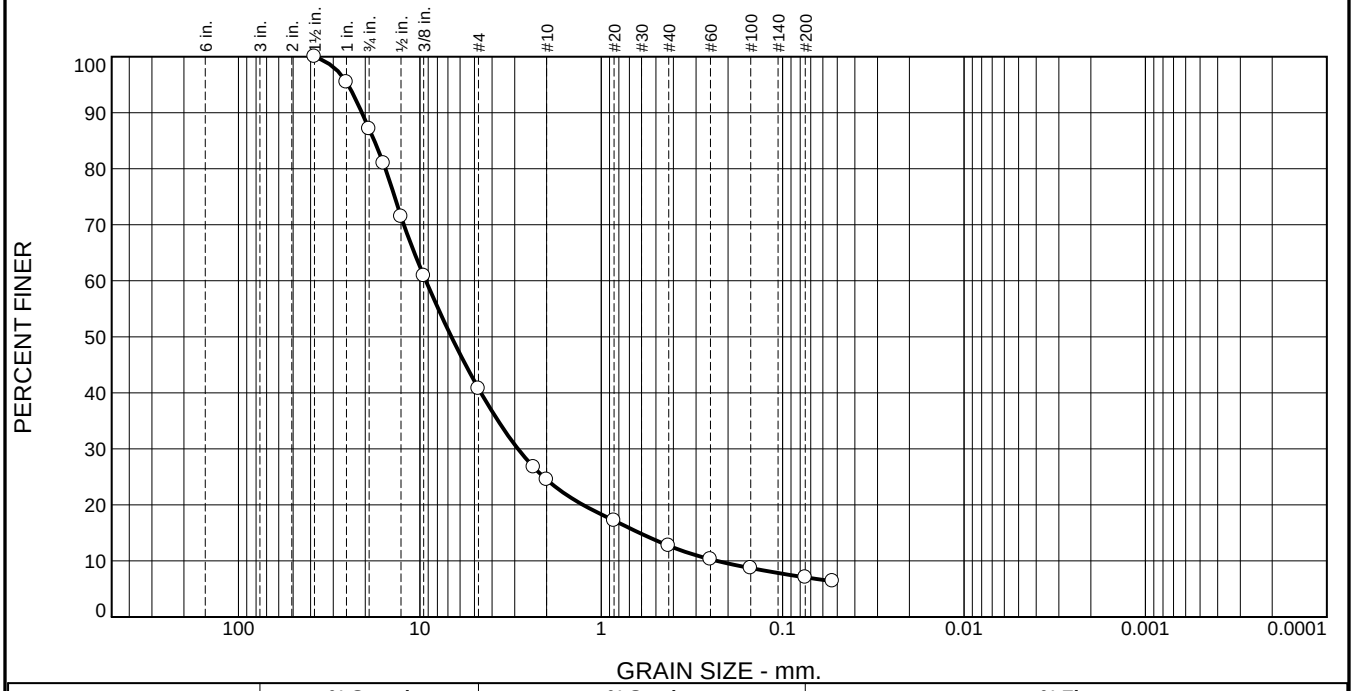
Date Sampled: 2/1/2022

associated earth sciences incorporated

Client: Segale Properties
Project: Cumberland Property

Project No: 20200367 H001 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	12.9	46.3	16.3	11.8	5.6	7.1	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	95.5		
3/4"	87.1		
5/8"	81.0		
1/2"	71.5		
3/8"	60.9		
#4	40.8		
#8	26.7		
#10	24.5		
#20	17.2		
#40	12.7		
#60	10.3		
#100	8.7		
#200	7.1		
#270	6.4		

* (no specification provided)

Material Description

very sandy GRAVEL, some silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=**

Classification

USCS (D 2487)= GP-GM **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 20.8705 D_{85}= 17.8279 D_{60}= 9.2656
D_{50}= 6.6989 D_{30}= 2.8785 D_{15}= 0.6145
D_{10}= 0.2310 C_u= 40.12 C_c= 3.87

Remarks

2 bags composite

Date Received: 2/18/2022 **Date Tested:** 2/24/2022

Tested By: CI

Checked By: MJP/CJK

Title:

Location: Onsite - Qponc Gravel
Sample Number: EB-4W **Depth:** 140'-141'

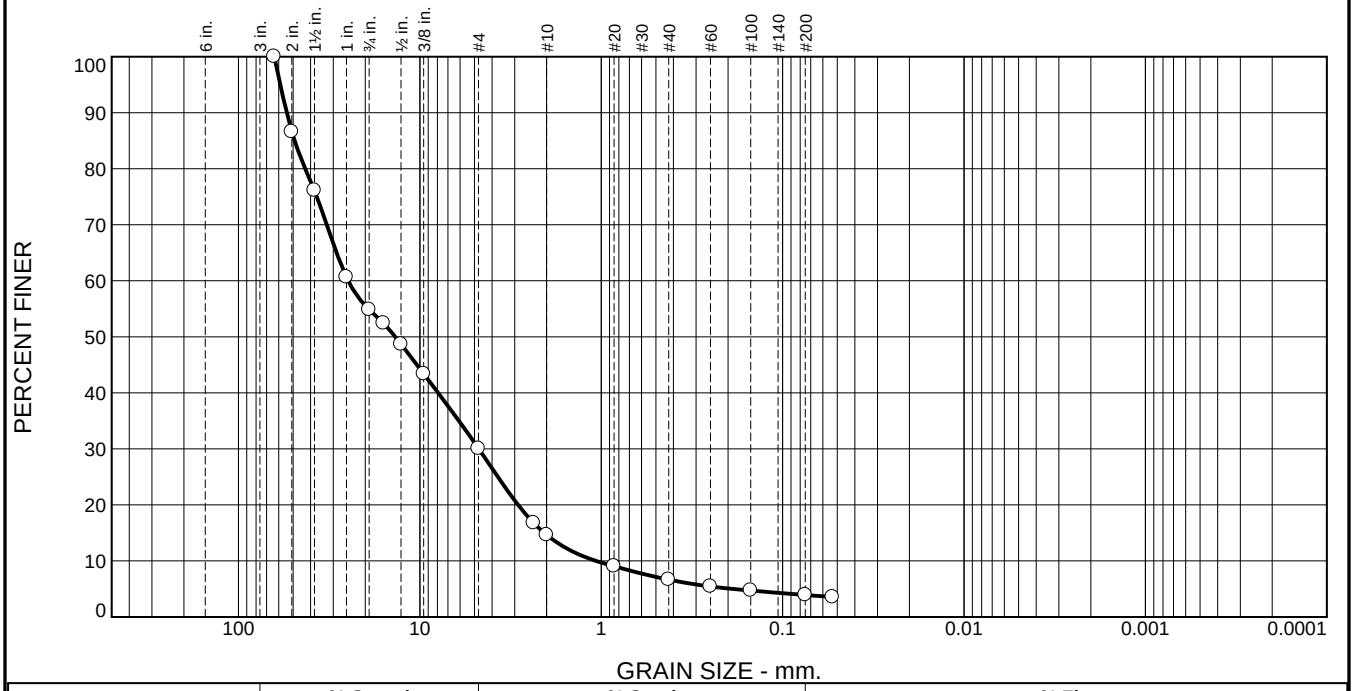
Date Sampled: 2/10/2022

associated earth sciences incorporated

Client: Segale Properties
Project: Cumberland Property

Project No: 20200367 H001 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	45.1	24.8	15.5	7.9	2.8	3.9	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
2.5"	100.0		
2"	86.6		
1.5"	76.1		
1"	60.6		
3/4"	54.9		
5/8"	52.4		
1/2"	48.7		
3/8"	43.4		
#4	30.1		
#8	16.8		
#10	14.6		
#20	9.0		
#40	6.7		
#60	5.4		
#100	4.7		
#200	3.9		
#270	3.6		

* (no specification provided)

Material Description

sandy GRAVEL, trace silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=**

Classification

USCS (D 2487)= GP **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 54.1759 D_{85}= 49.0620 D_{60}= 24.8452
D_{50}= 13.6816 D_{30}= 4.7365 D_{15}= 2.0646
D_{10}= 1.0681 C_u= 23.26 C_c= 0.85

Remarks

2 bags composite

Date Received: 2/18/2022 **Date Tested:** 2/24/2022

Tested By: CI

Checked By: MJP/CJK

Title:

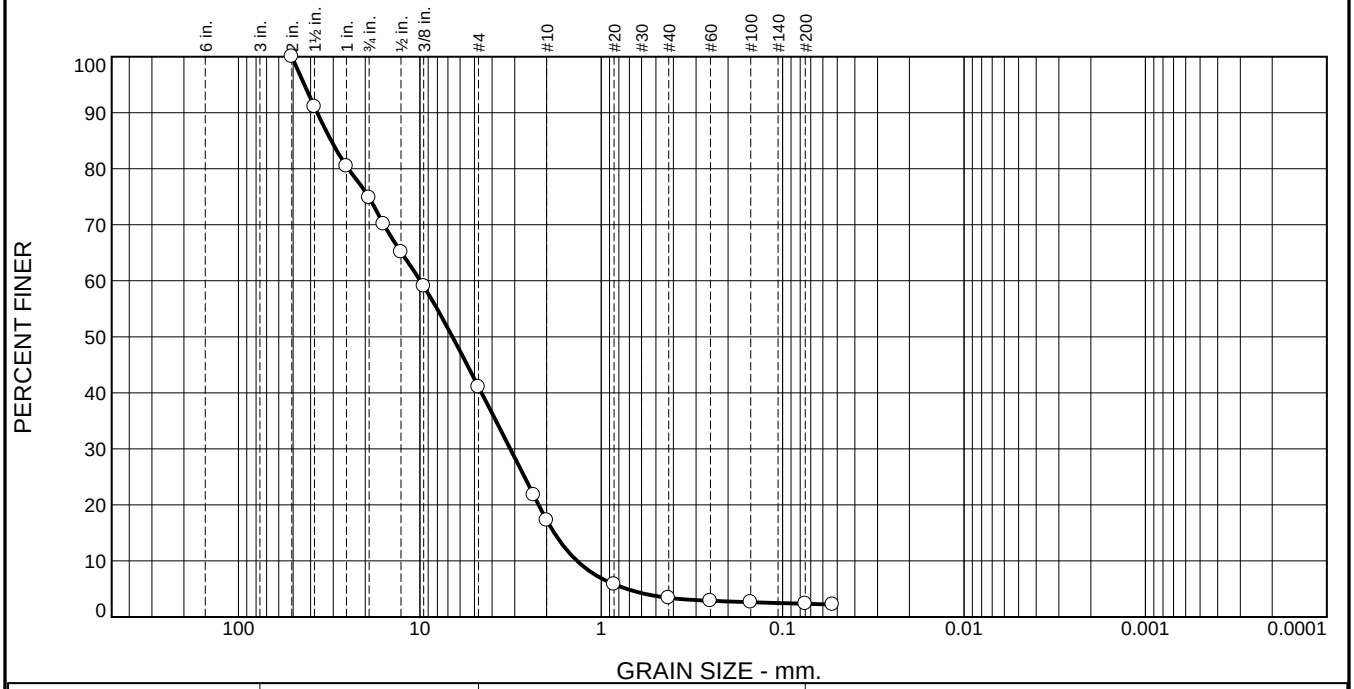
Location: Onsite - Qpfnc Gravel **Date Sampled:** 2/10/2022
Sample Number: EB-4W **Depth:** 144.5'-145.5'

associated earth sciences incorporated

Client: Segale Properties
Project: Cumberland Property

Project No: 20200367 H001 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	25.2	33.8	23.7	13.9	1.1	2.3	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
2"	100.0		
1.5"	91.1		
1"	80.5		
3/4"	74.8		
5/8"	70.1		
1/2"	65.1		
3/8"	59.0		
#4	41.0		
#8	21.8		
#10	17.3		
#20	5.8		
#40	3.4		
#60	2.9		
#100	2.6		
#200	2.3		
#270	2.2		

* (no specification provided)

Material Description

very sandy GRAVEL, trace silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=**

Classification

USCS (D 2487)= GP **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 36.7628 D_{85}= 30.8034 D_{60}= 9.9532
D_{50}= 6.6111 D_{30}= 3.1735 D_{15}= 1.8171
D_{10}= 1.3606 C_u= 7.32 C_c= 0.74

Remarks

2 bags composite

Date Received: 2/18/2022 **Date Tested:** 2/24/2022

Tested By: CI

Checked By: MJP/CJK

Title:

Location: Onsite - Qpfnc Gravel
Sample Number: EB-4W **Depth:** 149'-150'

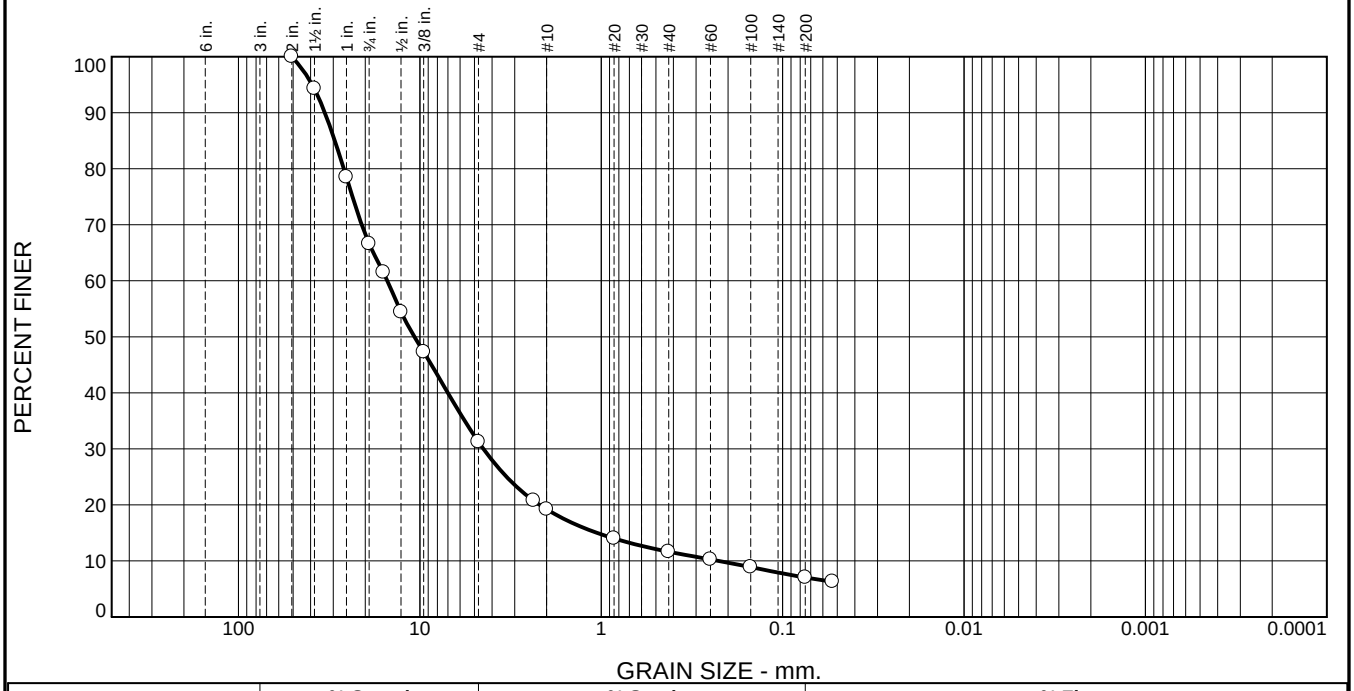
Date Sampled: 2/10/2022

associated earth sciences incorporated

Client: Segale Properties
Project: Cumberland Property

Project No: 20200367 H001 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	33.4	35.4	12.0	7.6	4.6	7.0	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
2"	100.0		
1.5"	94.3		
1"	78.5		
3/4"	66.6		
5/8"	61.5		
1/2"	54.4		
3/8"	47.3		
#4	31.2		
#8	20.7		
#10	19.2		
#20	14.0		
#40	11.6		
#60	10.3		
#100	8.9		
#200	7.0		
#270	6.3		

* (no specification provided)

Material Description

sandy GRAVEL, some silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=**

Classification

USCS (D 2487)= GP-GM **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 33.3705 D_{85}= 29.4248 D_{60}= 15.1126
D_{50}= 10.7209 D_{30}= 4.4651 D_{15}= 1.0547
D_{10}= 0.2255 C_u= 67.03 C_c= 5.85

Remarks

Date Received: 2/18/2022 **Date Tested:** 2/24/2022

Tested By: CI

Checked By: MJP/CJK

Title:

Location: Onsite - Qpfz Gravel
Sample Number: EB-6W **Depth:** 120'-121'

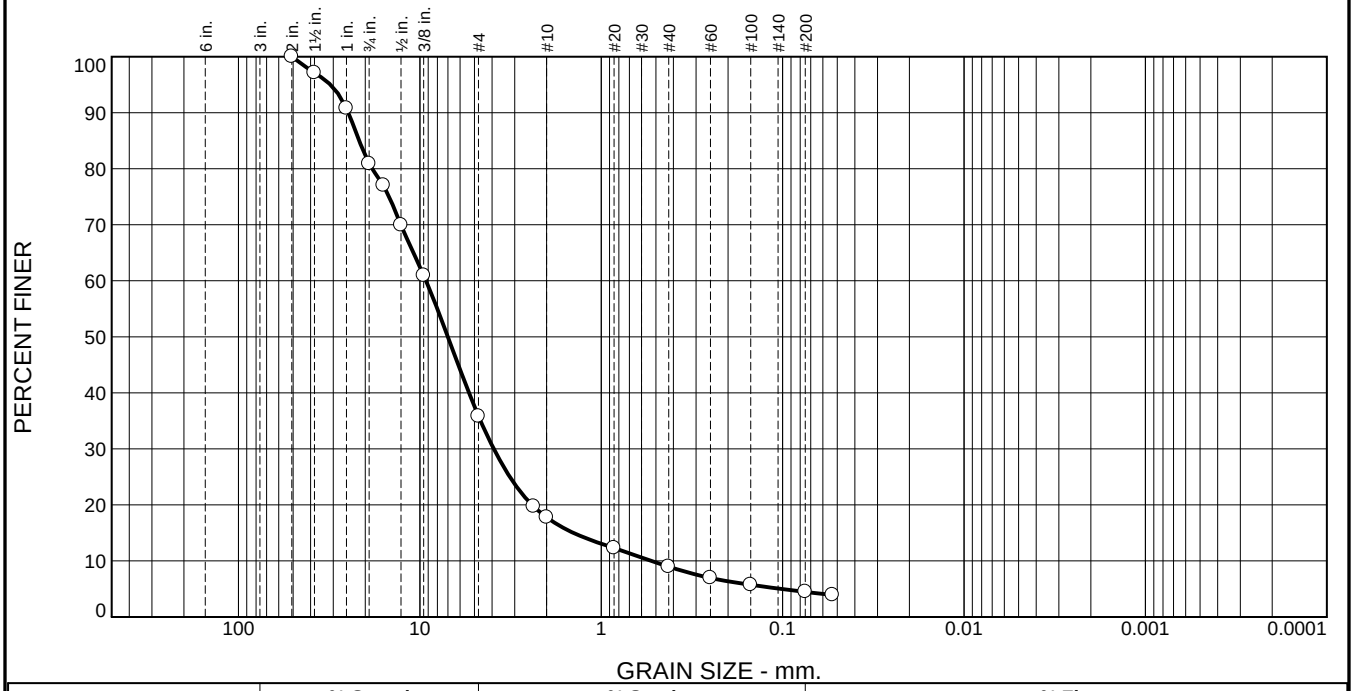
Date Sampled: 2/4/2022

associated earth sciences incorporated

Client: Segale Properties
Project: Cumberland Property

Project No: 20200367 H001 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	19.1	45.1	18.0	8.8	4.5	4.5	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
2"	100.0		
1.5"	97.1		
1"	90.8		
3/4"	80.9		
5/8"	77.0		
1/2"	69.9		
3/8"	60.9		
#4	35.8		
#8	19.7		
#10	17.8		
#20	12.3		
#40	9.0		
#60	7.0		
#100	5.7		
#200	4.5		
#270	3.9		

* (no specification provided)

Material Description

very sandy GRAVEL, trace silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=**

Classification

USCS (D 2487)= GP **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 24.7946 D_{85}= 21.6020 D_{60}= 9.2557
D_{50}= 7.0106 D_{30}= 3.9143 D_{15}= 1.4233
D_{10}= 0.5297 C_u= 17.47 C_c= 3.13

Remarks

2 bag composite

Date Received: 2/18/2022 **Date Tested:** 2/25/2022

Tested By: CI

Checked By: MJP/CJK

Title:

Location: Onsite - Qpf Gravel
Sample Number: EB-7W **Depth:** 133' and 135'

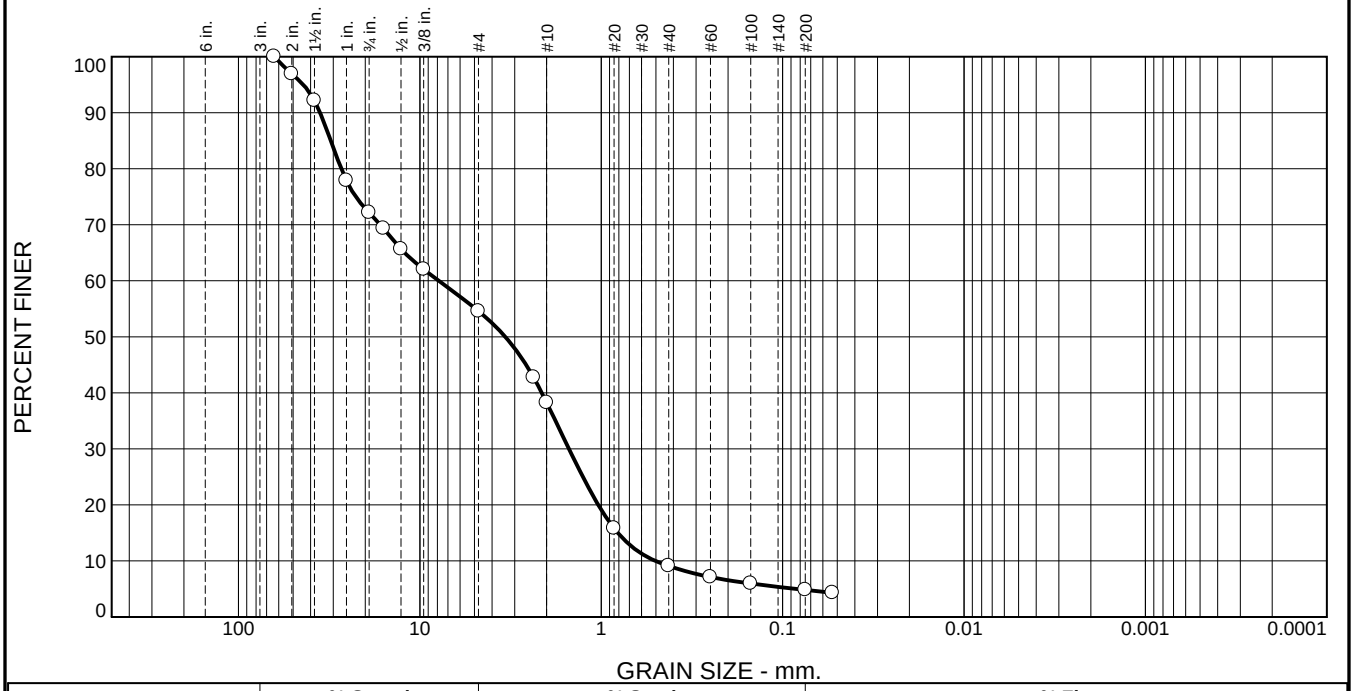
Date Sampled: 12/14/2021

associated earth sciences incorporated

Client: Segale Properties
Project: Cumberland Property

Project No: 20200367 H001 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	27.8	17.6	16.4	29.1	4.3	4.8	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
2.5"	100.0		
2"	96.9		
1.5"	92.2		
1"	77.9		
3/4"	72.2		
5/8"	69.3		
1/2"	65.7		
3/8"	62.0		
#4	54.6		
#8	42.7		
#10	38.2		
#20	15.8		
#40	9.1		
#60	7.1		
#100	6.0		
#200	4.8		
#270	4.3		

* (no specification provided)

Material Description

very gravelly SAND, trace silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=**

Classification

USCS (D 2487)= SP **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 35.4580 D_{85}= 30.9726 D_{60}= 7.8694
D_{50}= 3.3814 D_{30}= 1.5068 D_{15}= 0.8109
D_{10}= 0.5027 C_u= 15.65 C_c= 0.57

Remarks

3 bag composite

Date Received: 2/18/2022 **Date Tested:** 2/25/2022

Tested By: CI

Checked By: MJP/CJK

Title:

Location: Onsite **Date Sampled:** 12/15-16/

Sample Number: EB-7W **Depth:** 214', 219', & 225'

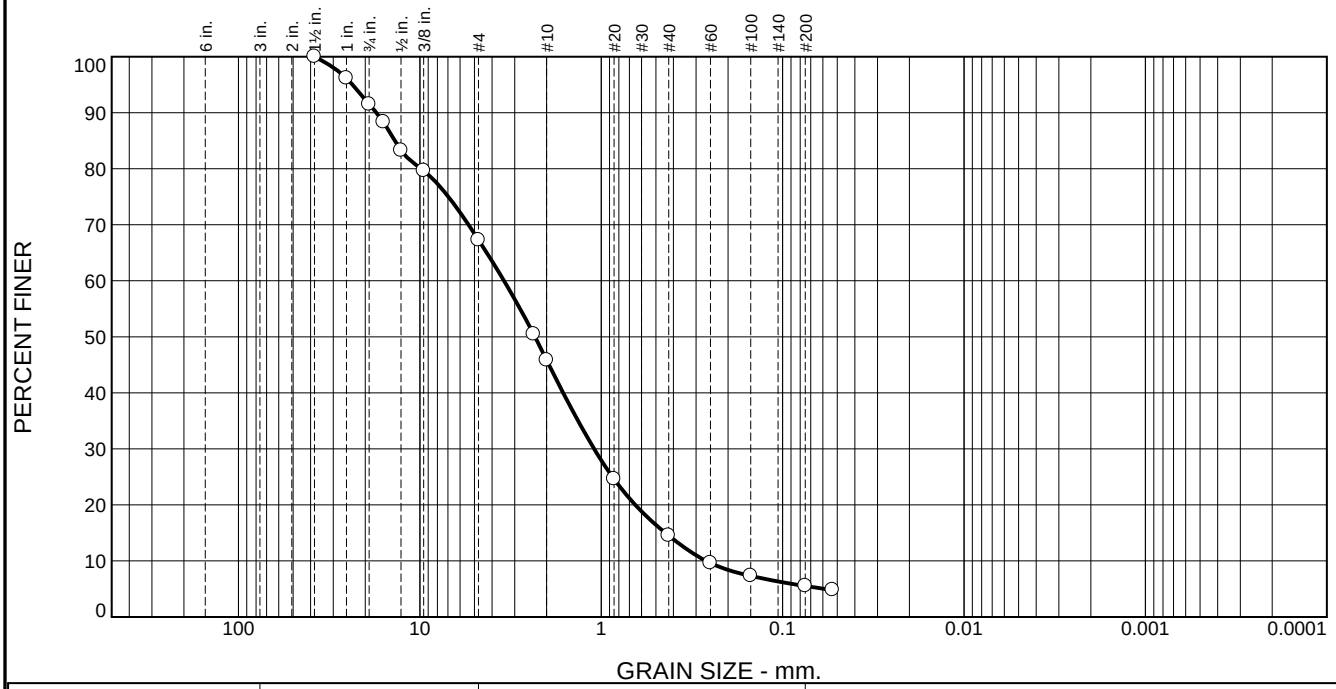
associated earth sciences incorporated

Client: Segale Properties

Project: Cumberland Property

Project No: 20200367 H001 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	8.5	24.2	21.5	31.3	9.0	5.5	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	96.1		
3/4"	91.5		
5/8"	88.3		
1/2"	83.3		
3/8"	79.6		
#4	67.3		
#8	50.5		
#10	45.8		
#20	24.6		
#40	14.5		
#60	9.6		
#100	7.3		
#200	5.5		
#270	4.8		

* (no specification provided)

Material Description

very gravelly SAND, some silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=**

Classification

USCS (D 2487)= SW-SM **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 17.3739 D_{85}= 13.7607 D_{60}= 3.4369
D_{50}= 2.3200 D_{30}= 1.0944 D_{15}= 0.4434
D_{10}= 0.2644 C_u= 13.00 C_c= 1.32

Remarks

2 bag composite

Date Received: 2/18/2022 **Date Tested:** 2/28/2022

Tested By: CI

Checked By: MJP/CJK

Title:

Location: Onsite - Qponc Sand
Sample Number: EB-8W **Depth:** 134' and 139'

Date Sampled: 1/28/2022

associated earth sciences incorporated

Client: Segale Properties
Project: Cumberland Property

Project No: 20200367 H001 **Figure**

Beta Analytic, Inc.
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ISO/IEC 17025:2017-Accredited Testing Laboratory

January 20, 2022

Mr. Curtis J. Koger
Associated Earth Sciences, Incorporated
911 Fifth Avenue
Suite 100
Kirkland, WA 98033
United States

RE: Radiocarbon Dating Results

Dear Mr. Koger,

Enclosed is the radiocarbon dating result for one sample recently sent to us. As usual, specifics of the analysis are listed on the report with the result and calibration data is provided where applicable. The Conventional Radiocarbon Age has been corrected for total fractionation effects and where applicable, calibration was performed using 2020 calibration databases (cited on the graph pages).

The web directory containing the table of results and PDF download also contains pictures, a cvs spreadsheet download option and a quality assurance report containing expected vs. measured values for 3-5 working standards analyzed simultaneously with your samples.

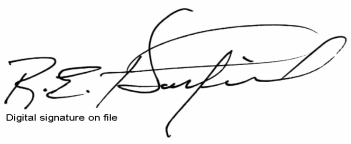
The reported result is accredited to ISO/IEC 17025:2017 Testing Accreditation PJLA #59423 standards and all pretreatments and chemistry were performed here in our laboratories and counted in our own accelerators here in Miami. Since Beta is not a teaching laboratory, only graduates trained to strict protocols of the ISO/IEC 17025:2017 Testing Accreditation PJLA #59423 program participated in the analysis.

As always Conventional Radiocarbon Ages and sigmas are rounded to the nearest 10 years per the conventions of the 1977 International Radiocarbon Conference. When counting statistics produce sigmas lower than +/- 30 years, a conservative +/- 30 BP is cited for the result unless otherwise requested. The reported d13C was measured separately in an IRMS (isotope ratio mass spectrometer). It is NOT the AMS d13C which would include fractionation effects from natural, chemistry and AMS induced sources.

When interpreting the result, please consider any communications you may have had with us regarding the sample. As always, your inquiries are most welcome. If you have any questions or would like further details of the analysis, please do not hesitate to contact us.

Thank you for prepaying the analysis. As always, if you have any questions or would like to discuss the results, don't hesitate to contact us.

Sincerely,



Ronald E. Hatfield President

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ISO/IEC 17025:2017-Accredited Testing Laboratory

REPORT OF RADIOCARBON DATING ANALYSES

Curtis J. Koger

Associated Earth Sciences, Incorporated

Report Date: January 20, 2022

Material Received: December 22, 2021

Laboratory Number	Sample Code Number	Conventional Radiocarbon Age (BP) or Percent Modern Carbon (pMC) & Stable Isotopes	
Beta - 614264	**200367EB7W@162.5**	**14720 +/- 40 BP**	IRMS δ13C: -23.3 o/oo

(95.4%) 16253 - 15941 cal BC (18202 - 17890 cal BP)

Submitter Material: Woody Material
Pretreatment: (wood) acid/alkali/acid
Analyzed Material: Wood
Analysis Service: AMS-Standard delivery
Percent Modern Carbon: 16.00 +/- 0.08 pMC
Fraction Modern Carbon: 0.1600 +/- 0.0008
D14C: -839.98 +/- 0.80 o/oo
Δ14C: -841.37 +/- 0.80 o/oo (1950:2022)
Measured Radiocarbon Age: (without d13C correction): 14690 +/- 40 BP
Calibration: BetaCal4.20: HPD method: INTCAL20

Results are ISO/IEC-17025:2017 accredited. No sub-contracting or student labor was used in the analyses. All work was done at Beta in 4 in-house NEC accelerator mass spectrometers and 4 Thermo IRMSs. The "Conventional Radiocarbon Age" was calculated using the Libby half-life (5568 years), is corrected for total isotopic fraction and was used for calendar calibration where applicable. The Age is rounded to the nearest 10 years and is reported as radiocarbon years before present (BP), "present" = AD 1950. Results greater than the modern reference are reported as percent modern carbon (pMC). The modern reference standard was 95% the 14C signature of NIST SRM-4990C (oxalic acid). Quoted errors are 1 sigma counting statistics. Calculated sigmas less than 30 BP on the Conventional Radiocarbon Age are conservatively rounded up to 30. d13C values are on the material itself (not the AMS d13C). d13C and d15N values are relative to VPDB. References for calendar calibrations are cited at the bottom of calibration graph pages.

BetaCal 4.20

Calibration of Radiocarbon Age to Calendar Years

(High Probability Density Range Method (HPD): INTCAL20)

(Variables: d13C = -23.3 o/oo)

Laboratory number **Beta-614264**

Conventional radiocarbon age **14720 ± 40 BP**

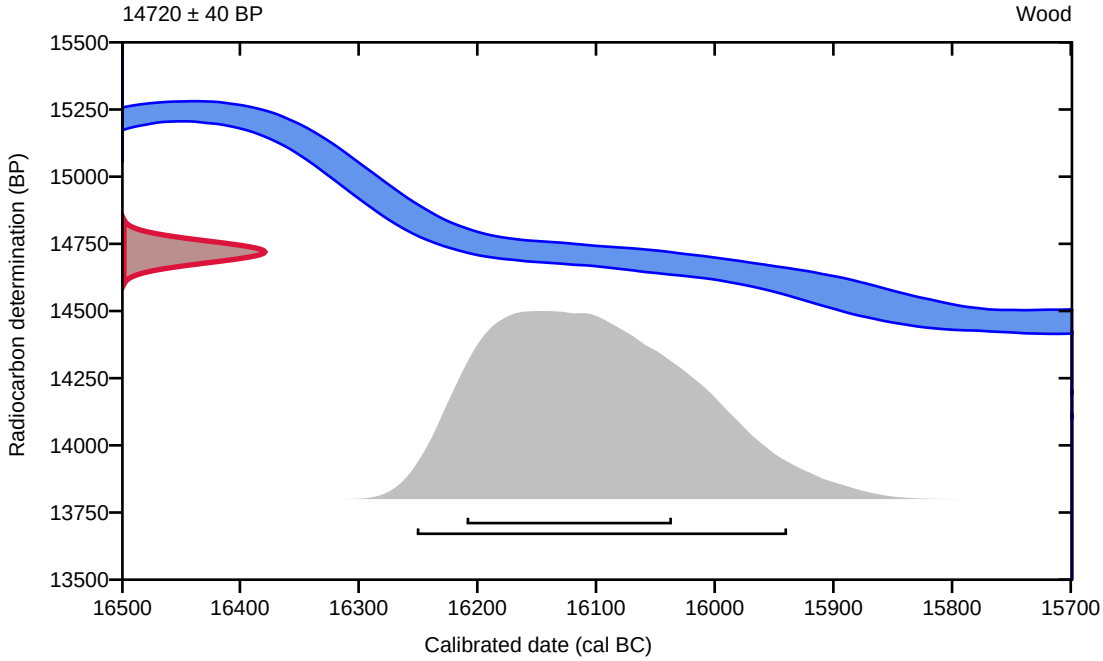
95.4% probability

(95.4%) 16253 - 15941 cal BC (18202 - 17890 cal BP)

68.2% probability

(68.2%) 16211 - 16038 cal BC (18160 - 17987 cal BP)

200367EB7W@162.5



Database used

INTCAL20

References

References to Probability Method

Bronk Ramsey, C. (2009). Bayesian analysis of radiocarbon dates. Radiocarbon, 51(1), 337-360.

References to Database INTCAL20

Reimer, et al., 2020, Radiocarbon 62(4):725-757.

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ISO/IEC 17025:2017-Accredited Testing Laboratory

Quality Assurance Report

This report provides the results of reference materials used to validate radiocarbon analyses prior to reporting. Known-value reference materials were analyzed quasi-simultaneously with the unknowns. Results are reported as expected values vs measured values. Reported values are calculated relative to NISTSRM-1990C and corrected for isotopic fractionation. Results are reported using the direct analytical measure percent modern carbon (pMC) with one relative standard deviation. Agreement between expected and measured values is taken as being within 2 sigma agreement (error x 2) to account for total laboratory error.

Report Date: January 20, 2022
Submitter: Mr. Curtis J. Koger

QA MEASUREMENTS

Reference 1	
Expected Value:	0.42 +/- 0.04 pMC
Measured Value:	0.41 +/- 0.03 pMC
Agreement:	Accepted
Reference 2	
Expected Value:	129.41 +/- 0.06 pMC
Measured Value:	129.59 +/- 0.34 pMC
Agreement:	Accepted
Reference 3	
Expected Value:	96.69 +/- 0.50 pMC
Measured Value:	97.02 +/- 0.27 pMC
Agreement:	Accepted

COMMENT: All measurements passed acceptance tests.

Validation: Digital signature on file

Date: January 20, 2022

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ISO/IEC 17025:2017-Accredited Testing Laboratory

September 01, 2022

Mr. Curtis J. Koger
Associated Earth Sciences, Incorporated
911 Fifth Avenue
Suite 100
Kirkland, WA 98033
United States

RE: Radiocarbon Dating Results

Dear Mr. Koger,

Enclosed is the radiocarbon dating result for one sample recently sent to us. As usual, specifics of the analysis are listed on the report with the result and calibration data is provided where applicable. The Conventional Radiocarbon Age has been corrected for total fractionation effects and where applicable, calibration was performed using 2020 calibration databases (cited on the graph pages).

The web directory containing the table of results and PDF download also contains pictures, a cvs spreadsheet download option and a quality assurance report containing expected vs. measured values for 3-5 working standards analyzed simultaneously with your samples.

The reported result is accredited to ISO/IEC 17025:2017 Testing Accreditation PJLA #59423 standards and all pretreatments and chemistry were performed here in our laboratories and counted in our own accelerators here in Miami. Since Beta is not a teaching laboratory, only graduates trained to strict protocols of the ISO/IEC 17025:2017 Testing Accreditation PJLA #59423 program participated in the analysis.

As always Conventional Radiocarbon Ages and sigmas are rounded to the nearest 10 years per the conventions of the 1977 International Radiocarbon Conference. When counting statistics produce sigmas lower than +/- 30 years, a conservative +/- 30 BP is cited for the result unless otherwise requested. The reported d13C was measured separately in an IRMS (isotope ratio mass spectrometer). It is NOT the AMS d13C which would include fractionation effects from natural, chemistry and AMS induced sources.

When interpreting the result, please consider any communications you may have had with us regarding the sample. As always, your inquiries are most welcome. If you have any questions or would like further details of the analysis, please do not hesitate to contact us.

Thank you for prepaying the analysis. As always, if you have any questions or would like to discuss the results, don't hesitate to contact us.

Sincerely,

Chris Patrick
Vice President of Laboratory Operations

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ISO/IEC 17025:2017-Accredited Testing Laboratory

REPORT OF RADIOCARBON DATING ANALYSES

Curtis J. Koger

Associated Earth Sciences, Incorporated

Report Date: September 01, 2022

Material Received: August 09, 2022

Laboratory Number	Sample Code Number	Conventional Radiocarbon Age (BP) or Percent Modern Carbon (pMC) & Stable Isotopes	
Beta - 635682	**200367_EB10W@22'**	**12450 +/- 40 BP**	IRMS δ13C: -26.4 o/oo

(72.3%) 12803 - 12366 cal BC (14752 - 14315 cal BP)
(23.1%) 12991 - 12815 cal BC (14940 - 14764 cal BP)

Submitter Material: Woody Material
Pretreatment: (plant material) acid/alkali/acid
Analyzed Material: Plant material
Analysis Service: AMS-Standard delivery
Percent Modern Carbon: 21.23 +/- 0.11 pMC
Fraction Modern Carbon: 0.2123 +/- 0.0011
D14C: -787.72 +/- 1.06 o/oo
Δ14C: -789.57 +/- 1.06 o/oo (1950:2022)
Measured Radiocarbon Age: (without d13C correction): 12470 +/- 40 BP
Calibration: BetaCal4.20: HPD method: INTCAL20

Results are ISO/IEC-17025:2017 accredited. No sub-contracting or student labor was used in the analyses. All work was done at Beta in 4 in-house NEC accelerator mass spectrometers and 4 Thermo IRMSs. The "Conventional Radiocarbon Age" was calculated using the Libby half-life (5568 years), is corrected for total isotopic fraction and was used for calendar calibration where applicable. The Age is rounded to the nearest 10 years and is reported as radiocarbon years before present (BP), "present" = AD 1950. Results greater than the modern reference are reported as percent modern carbon (pMC). The modern reference standard was 95% the 14C signature of NIST SRM-4990C (oxalic acid). Quoted errors are 1 sigma counting statistics. Calculated sigmas less than 30 BP on the Conventional Radiocarbon Age are conservatively rounded up to 30. d13C values are on the material itself (not the AMS d13C). d13C and d15N values are relative to VPDB. References for calendar calibrations are cited at the bottom of calibration graph pages.

BetaCal 4.20

Calibration of Radiocarbon Age to Calendar Years

(High Probability Density Range Method (HPD): INTCAL20)

(Variables: d13C = -26.4 o/oo)

Laboratory number **Beta-635682**

Conventional radiocarbon age **12450 ± 40 BP**

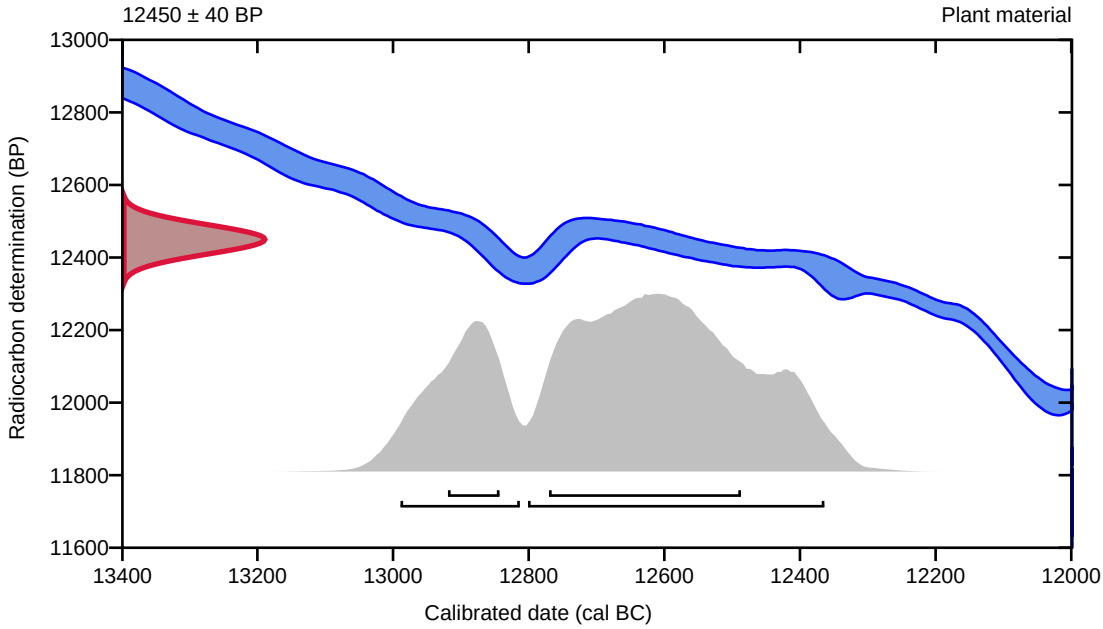
95.4% probability

(72.3%)	12803 - 12366 cal BC	(14752 - 14315 cal BP)
(23.1%)	12991 - 12815 cal BC	(14940 - 14764 cal BP)

68.2% probability

(55.2%)	12772 - 12489 cal BC	(14721 - 14438 cal BP)
(13%)	12921 - 12845 cal BC	(14870 - 14794 cal BP)

200367_EB10W@22'



Database used

INTCAL20

References

References to Probability Method

Bronk Ramsey, C. (2009). Bayesian analysis of radiocarbon dates. Radiocarbon, 51(1), 337-360.

References to Database INTCAL20

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Report Date: September 01, 2022
Submitter: Mr. Curtis J. Koger

QA MEASUREMENTS

Reference 1	
Expected Value:	0.44 +/- 0.04
Measured Value:	0.44 +/- 0.04 pMC
Agreement:	Accepted
Reference 2	
Expected Value:	129.41 +/- 0.06 pMC
Measured Value:	129.49 +/- 0.39 pMC
Agreement:	Accepted
Reference 3	
Expected Value:	96.69 +/- 0.50 pMC
Measured Value:	96.76 +/- 0.31 pMC
Agreement:	Accepted

COMMENT: All measurements passed acceptance tests.

Validation: Chris Patrick
Digital signature on file

Date: September 01, 2022