### WELTI GEOTECHNICAL, P.C.

Formerly Dr. Clarence Welti, PE. PC.

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(860) 633-4623 / FAX (860) 657-2514

November 13, 2017

Mr. John D. Ritson, Esq 146 Hopmeadow Street Simsbury, CT 060899

Re: Geotechnical Study for Proposed Apartment Building 894 Hopmeadow Street, Simsbury, CT

Dear Mr. Ritson:

- **1.0** Herewith are the boring data pertaining to the above. Eight borings were drilled at the proposed building footprint to a maximum depth of 61.5 feet. A water level observation well was placed in one of the borings. The boring locations are shown on the attached plan. The borings were drilled by Clarence Welti Associates, Inc. and sampling was conducted by this firm solely to obtain indications of subsurface conditions as part of a geotechnical exploration program. No services were performed to evaluate subsurface environmental conditions. Grain size gradation and water content tests were performed on 5 soil samples and permeability tests on 3 soil samples. The results of those tests are in the Appendix.
- **2.0** The **Subject Project** will include an apartment building with a ground floor parking level and three levels of apartments above the garage level. The building will have a footprint of about 28,000 sf. There is about 20 feet of topographic relief across the building footprint (Elev. 160 to Elev. 180). The lowest floor (garage level) will range from about Elev.170 to Elev.172. The west end of the lowest floor will be about 10 feet below the existing and finish grades. The building footprint is close to a wetlands area at the east end of the site. There is an existing retail (ice cream) store on the Hopmeadow side of the site, which will be removed. There is a requirement to infiltrate storm water into the soils beneath the structure.
- **3.0** The **Geologic Origin** of the natural inorganic soils at the site and environs is from glacial lake deposits. These deposits consist generally of medium compact stratified sand with trace to little silt and gravel to about 18 to 36 feet overlying a silt and fine sand to 60+ feet below grade. There will be fills around the existing structure and utilities.
- **3.1** The **Soils Cross Sections** from the borings are generally as follows:

Topsoil to 5" to 12"; or Asphalt to 2" to 3" atop Processed base to 6" to 8"

Locally FILL; fine to medium SAND, little to some Silt, trace Roots to 3 to 4 feet, loose *Note: There will be existing fills around the existing structure and utilities.* 

Fine to coarse SAND, trace to little Silt, trace Gravel, with a few layers of fine Sand and Silt to 18 to 36 feet, medium compact

SILT and fine SAND, trace Clay, trace (in thin strata) fine to medium Sand to 61.5+ feet, loose to medium compact

**3.2** The **Water Table** in the water level observation well placed at boring B-4 was at 25.3 feet below grade (Elev. 155±) at the completion of the boring. At boring B-7 (i.e., proposed infiltration area) the water table was at about Elev. 154 at boring completion. At the low end of the site water table was at about Elev.150. The water table should normally not effect the construction or long term performance of the building. The proposed recharge of storm water beneath part of the building may cause temporary mounding of the water table.

#### 4.0 The Criteria for Foundation Type and Loading are as follows:

- 1. The maximum total settlement should not exceed 3/4" and the maximum differential settlement shall not exceed ½ the maximum settlement.
- 2. The Foundations and Structures must address the seismic section of the building code
- 3. Slab at Grade floors should not settle differentially more than 1/4" in excess of the main structure subsidence.
- **4.1** Regarding item 2 (above), the seismic site soil profile classification can be "**D**". The mapped MCE spectral response acceleration values for Simsbury, CT are  $S_1 = 0.064$  for a one second period and  $S_S = 0.179$  for short period. For transfer of ground shear from footings into the soil, the ultimate friction factor is **0.60**.
- **5.0** Regarding **Foundation Type**, the building can be supported on spread footings. The footings should be on the natural inorganic soils, or on a controlled fill placed after the removal of any existing fills, structures, topsoil or subsoils. There should be a minimum 4" thick layer of compacted 3/8" crushed stone beneath the footings falling on the natural soils to provide a uniformly stiff surface to receive the footings. Controlled fills should conform to section 6.0 and should extend beyond the footings for a horizontal distance equal to the depth of fill beneath the footings.
- **5.0.1** At the proposed storm water mitigation area there may be a requirement for an increased depth of crushed stone under the footings and the slab on grade, dependent on the depth and influence zone of the storm water infiltration system. The crushed stone layer (with substantial voids) would minimize seepage pressures on the soil beneath the foundation.

- **5.1** The **Allowable Bearing Pressure** for foundations on the natural inorganic soils or on controlled fill can be 4,000 psf. The allowable bearing pressure can be increased by 1/3 for seismic or wind loading. At retaining walls the maximum pressure on the toe can be 50% higher than the average pressures, cited above.
- **5.2** The **Static Lateral Soil Loading** on retaining walls that are part of the building should be based on at-rest pressure using the coefficient  $K_0 = 0.45$ , to be multiplied by unit weight of backfill. Lateral soil loading on retaining walls apart from the building can be designed with active pressure using the active coefficient  $K_A = 0.28$  (for level backfill). The ultimate sliding coefficient for concrete on crushed stone or on controlled fill is 0.60.
- **5.2.1** Seismic lateral loading for retaining walls that are part of the building should be with a total lateral force (seismic plus static at-rest pressure) equal to 24H<sup>2</sup> lb/ft located at ½H above the bottom. The above value is based on the Mononobe-Okabe solution for the case with level backfill, no wall friction and no hydrostatic pressure. This value excludes the inertia of the soil and wall mass. The requirements for the seismic analyses of earth retention structures as part of the building shall be determined from the Connecticut Building Code (IBC) or the ASCE-7.
- **5.3** The **Frost Protection Depth** in the Building Code is 3.5 feet below finish grades in areas, which are exposed to weather.

### **5.4 Summary of Foundation Design Parameters:**

Parameter	Value
Allowable Bearing Pressure for footings on crushed stone layer atop natural soils or footings on controlled fill	4,000 psf
Soil Unit Weight (Backfill) *	125 pcf
Internal Friction Angle (Backfill) *	34°
At-Rest Pressure Coefficient, K <sub>o</sub>	0.45
Active Pressure Coefficient, K <sub>A</sub> (level backfill)	0.28
Ultimate Sliding Coefficient, concrete on controlled fill, or on crushed stone over soil	0.60
Seismic Site Soil Profile Classification	D
Mapped MCE Spectral Response Acceleration for 1 second period, S <sub>1</sub>	0.064

Mapped MCE Spectral Response Acceleration for short period, $S_s$	0.179
Frost Protection Depth	3.5 feet

<sup>\*</sup> Backfill material conforming to section 6.0 below

**6.0** Regarding Controlled Fill, Backfill for Retaining Walls and Excavations at Columns and Walls, plus Slab at Grade Underlayment (to within 8" of the slab bottom), the material should conform to the following or should be 3/8" crushed stone:

Percent Passing	Sieve Size
100	3.5"
50 - 100	3/4"
25 - 75	No.4

The fraction, passing the No.4 sieve should have less than 15%, passing the No. 200 sieve.

All backfill and controlled fill must be compacted to at least 95% of modified optimum density.

- **6.1** Based on the proposed requirement of infiltrating storm water beneath the slab on grade, it is recommended that there be at least 8" of crushed 3/8" stone beneath the floor slab. While normally the highly permeable sands would not require footing drains, the possibly of temporary mounding of the water table from storm water infiltration should dictate the drains to avoid water in proximity to the slab.
- **6.1.1 As noted in section 5.0.1 above** there may be special requirements for the slab on grade and pavement underlay at the storm water infiltration area.
- **7.0** Regarding **Earthwork**, excavations in soil will largely fall in OSHA Class C. This will require sloping excavations, which are unshored and exceed 5 feet in height, to be cut back to slopes less than 34° from the horizontal.
- **8.0 Regarding New Pavements outside the building** the soils at subgrade are generally non-frost susceptible and pavement design can be based on vehicle load and load repetition. It is assumed that the pavement subgrade is either on the natural fine to coarse sand or on a controlled fill. The proposed driveway between Hopmeadow Street and Ironhorse Boulevard would probably be accessible to trucks. The recommended pavement section above the sub grade is as follows:

For truck Access; 4.5" of bituminous concrete on 8" of processed stone base.

**9.0** The **permeability testing** indicated an average permeability value of about 40 feet/day.

**10.0** This report has been prepared for specific application to the subject project in accordance with generally accepted soil and foundation engineering practices. No other warranty, express or implied, is made. In the event that any changes in the nature, design and location of structures are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing.

The analyses and recommendations submitted in this report are based in part upon data obtained from referenced explorations. The extent of variations between explorations may not become evident until construction. If variations then appear evident, it will be necessary to re-evaluate the recommendations of this report.

Welti Geotechnical, P.C., should perform a general review of the final design and specifications in order that geotechnical design recommendations may be properly interpreted and implemented as they were intended.

If you have any questions, please call our office.

Very truly yours,

Max Welti, P. E.

President, Welti Geotechnical, PC

The elect

Clarence Welti, PhD, P.E.

Vice President

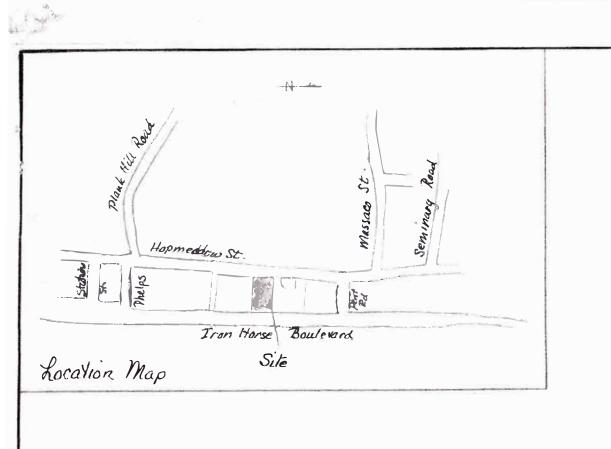
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### **APPENDIX**

BORING LOCATION PLAN

+
TEST BORING LOGS

+
LABORATORY TEST RESULTS



TEST BORING LOCATIONS
CLARENCE WELTI ASSOCIATES, INC.
10/31/18

N/7 Captain. Barber House Joseph. D. Digiacomo

N/7 DEG Associates "Simsburytown Shops" 5 77°-53'-13" E -292.26' (:292.00Deed)  $\bullet$  B-3 B-1 maple  $\bigcirc$  B-2 THE THE PARTY OF T 1.234 Acres Zone-SCI  $\bullet$  B-4  $\bullet$  B-5 Existing Street • *B-8* Son. MH 1 ME LIGHTHANGEN ROSATIVAN TOUND AND MICHINET AND THE WARRENCE WARRE 302.23' (302.00 Deed) N 770-55'-12" W 11/4 Vincent Luneral Homes Inc.

Map Peterence:

Topographic Survey of hand Owned by Form f. Antres, 628-834 & 652 Hopmendow Street, Simsbury, Connecticul, Seale I": 20', November 1984 " Revised Dec. 6, 1984. Prepared by Neriani Surveying, Simsbury, Connecticut.

"Subdivision Plan, Property of Simsburytown hand trust, Hopmeadow Street, Simsbury, Connecteut, Scale 1" 100; Sanuary 1915" Sunderson i Washburn, Ce IRS.

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"Property of Mary P. Ensign, Hopmonton Rand, Simsbury Connecticut, Scale 1" 46; Jan. 1952 - Revised May 12, 1952" Perry Close, C.E.

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1. Wetlands delineated by Michael Neix, Soil Scientist. and gield located by this office on Det. 16, 1996.

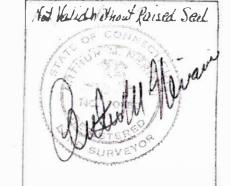
2. Topography taken from enlargement of "Town of Simsbury, Connecticut, topographic May, Scale 1" 100', Date of Photography May 1978, Date of Mapping June 1974, Sheet 14-9."

Certified substantially correct and no zoning regulations are violated in reference to the location of the existing foundation, to the best of my information, knowledge and order

To: The Simsbury Bank! Trust Company Gillman i Marts Connecticut Altorneys Title Insurance Company

To the best of my information, knowledge and belief, hereby certify that this map and survey were prepared in accordance with the standards of a Class A-2 survey as defined in the Code of Practice for Standards of Accuracy of Surveys and Maps, accorded September 3 1954 as amended by the Connecticut Association of Land Surveyors, Inc.

Arthur M. Neriani, Land Surveyor # 10250



DEC C

Map Showing Land to be Conveyed to

Thomas J. Herlihy

894 Hopmeadow Street

Simsbury

Connecticut October 1996

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Prepared By Neriani Surveying ~ Avon, Connecticut

Revised: November 8,1996 - add deep dimensions Revised: November 8,1996 - Certification



Scale 1"= 20

Drawn By

Checked By Job No. M-96-51

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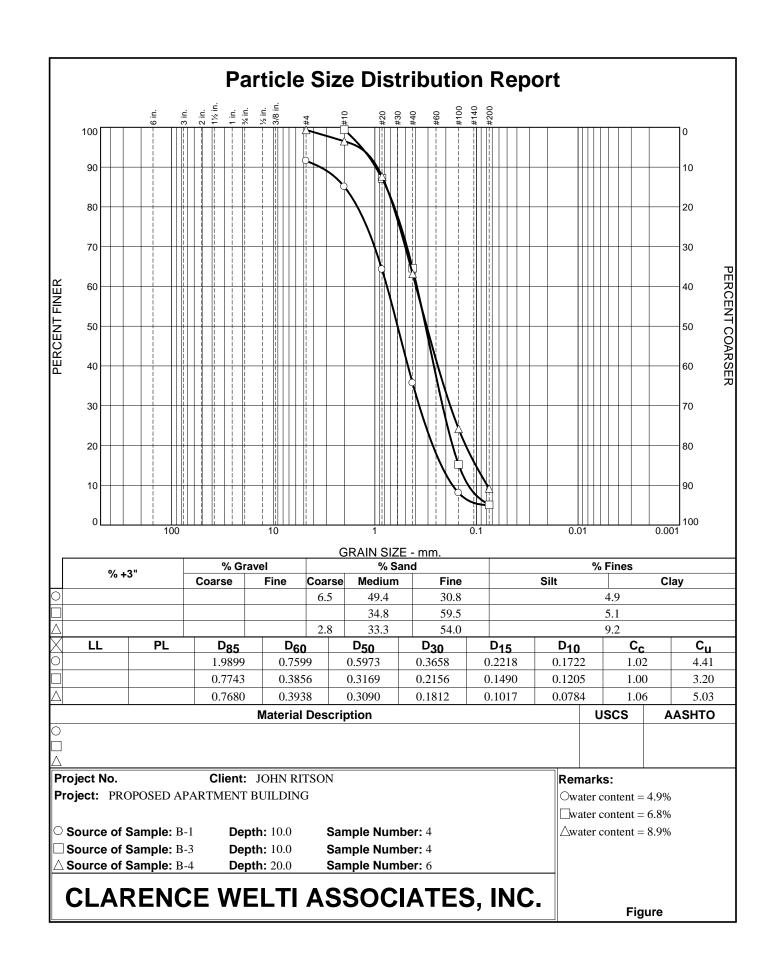
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P.O.	BOX 39					PROPOSED LOCATION	APARTMENT BUILI	DING
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40 —	10	2-5-5	40.0'-41.5'					
45 –	44	2.2.2	45 01 46 51					
	11	2-2-2	45.0'-46.5'					
50 –	12	2-3-2	50.0'-51.5'					
55 —	13	2-3-3	55.0'-56.5'					
60 –	14	3-3-3	60.0'-61.5'					
					BOTTOM OF BORING @ 61.5' 2" DIA. WELL SET @ 58'			5
65 –					10' OF (.010 SLOT) SCREEN  48' OF RISER  SAND FROM 61.5' TO 46.0'  BENTONITE SEAL FROM 46.0'	TO 44.0'		
70 –					BACKFILLED FROM 44.0' TO 0.  CONCRETE FROM 0.5' TO SUR  7" DIA. ROADWAY BOX COVER	RFACE		
75 _ LEGE	ND: CO	L. A:				DRILLER: J. BREWE	ER	
					ED PISTON S=SPLIT SPOON	SHEET 2 OF 2	HOLE NO.	3-4

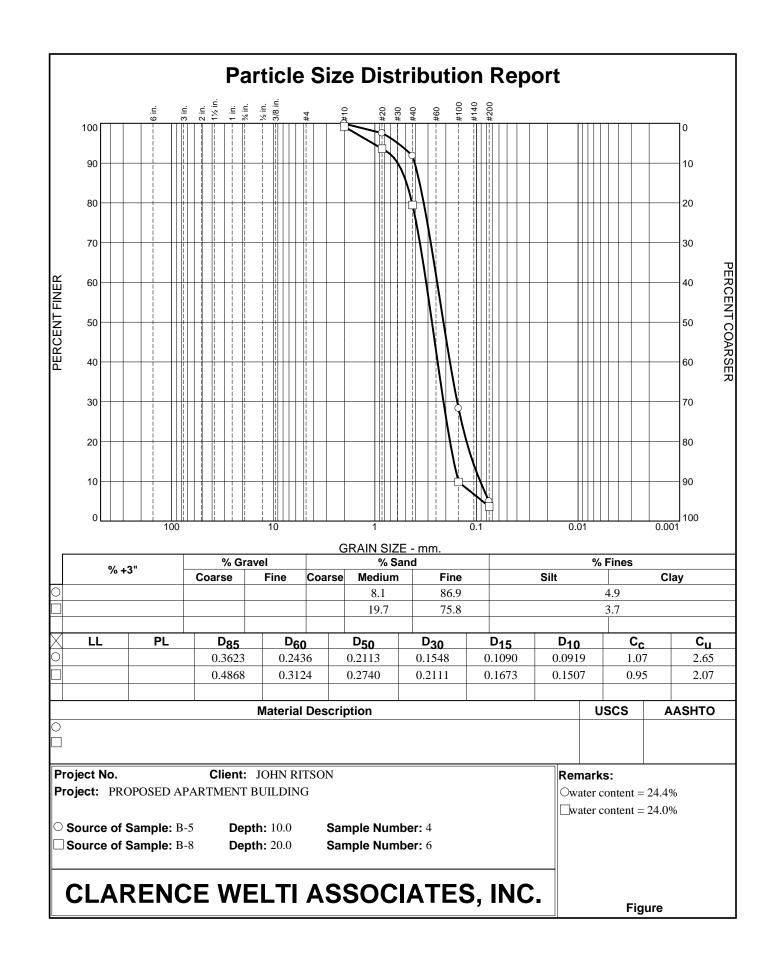
	DENC	- \A/=  +	VCCOC	INIC	CLIENT				PROJECT NAME					
		E WELTI A	4550C., I	INC.					PROPOSED APARTMENT BUILDING					
	BOX 397		00000						LOCATION					
GLAS	ONBU	IRY, CONN	06033				JC	OHN RITSON	894 HOPMEADO	OW STREE	T. SIMS	BUR	Y. CT	
		AUGER	CASING	SAMPL	LER	CORE B		OFFSET	SURFACE ELEV.	HOLE		B-		
TYPE		HSA		SS				LINE & STA.		HOLE		ъ.	-5	
					-			LINE & STA.	GROUND WATER OBSE	RVATIONS	START DATE	11/1	/18	
SIZE I.D		3.75"		1.375				N. COORDINATE	AT 11.3 FT. AFTER	0 Hours	DAIL			
HAMME	R WT.			140lb	os			E. COORDINATE	AT FT. AFTER	HOURS	FINISH DATE	11/1	/18	
HAMME	R FALL			30"				E. COORDINATE			DATE	, .	,	
DEPTH		SAM	PLE		A			STRATUM	DESCRIPTION				ELEV.	
	NO.	BLOWS/6"	DEI	PTH	А	<u> </u>			+ REMARKS				ELEV.	
0	1	1-2-1-2	0.0'	-2.0'				PSOIL			0	.40		
							BK	FINE-MED.SAND, LITTLE S	SILT, TRACE ROOTS -	FILL				
	2	2-2-2-3	2.0'-	-4.0'		<b>-</b>								
						<b>⊣</b> ∷∷∷∷					<u> </u>	3.5		
	_							FINE-MED.SAND, TRACE S	SILT, LITTLE LAYERS	OF FINE	\	3.5		
5 –	3	3-2-3-4	4.0	-6.0'		_:::::::	SA	ND AND SILT						
						_:::::::								
10 -			40.0	44.51										
	4	5-4-5	10.0	-11.5'		_:::::::								
						_:::::::								
15 –	5	4-3-8	15.0'	-16.5'		<del></del> :::::::								
	-	4-5-0	13.0	-10.5										
						<b>⊣</b> ∷∷∷∷								
						_:::::::								
						:::::::								
						:::::::								
20 –	6	9-10-10	20.0'-	-21.5'		7::::::								
						-::::::	BR	FINE SAND, TRACE TO LIT	TTLE SILT			1.0		
						$\dashv$		OTTOM OF BORING @ 21.5'				1.5		
						_								
25 –						_								
20 7														
						7								
						-								
30 -														
						$\dashv$								
35_					l									
LEGEND: COL. A:									DRILLER: J. BREWE	R				
SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UNDIS						STURBER	) PIST	ON S=SPLIT SPOON	INSPECTOR:					
PROPORTIONS USED: TRACE=0-10% LITTLE=10-20%								[	CHEET 1 OF 4	HOLENG	١	Р,	=	
		0 10/0		- 2070		/		SHEET 1 OF 1	HOLE NO	<i>י</i> .	B-5	)		

CL A	DENCE	VCCCC	NC	CLIENT				PROJECT NAME						
	BOX 397	E WELTI A	4550C., I	NC.					PROPOSED APARTMENT BUILDING					
		IRY, CONN	06033						LOCA'	TION				
OLA	7101100	ici, oom	00000				JC	OHN RITSON	894	4 HOPMEADO	W STREE	T, SIMS	BURY, CT	
		AUGER	CASING	SAMPI	LER	CORE BA	AR.	OFFSET	SURFAC	E ELEV.	HOLE	NO.	B-6	
TYPE		HSA		SS				LINE & STA.	CDOU	ND WATER OBSER	VATIONG	START		
SIZE I.D		3.75"		1.37	5"			N. COORDINATE		ne ft. after 0		DATE	10/31/18	
HAMME	R WT.			140lk	s			IN. COORDINATE				EINICH		
HAMME				30"				E. COORDINATE	AT	FT. AFTER	HOURS	FINISH DATE	10/31/18	
		SAM	PLE.			1		STRATUM	DESCRI	OTION				
DEPTH	NO.	BLOWS/6"		PTH	Α			SIRATUM	+ REM				ELEV.	
0							∖AS	PHALT				0.	10	
	1	2-1-1-2	1.0'	-3.0'				REY FINE-CRS.SAND AND G				0.	50	
	'	2-1-1-2	1.0	3.0			DA	RK BR.FINE-MED.SAND, SC	IME SILI					
		4004	0.01	<b>5</b> 0!										
	2	1-2-3-4	3.0	-5.0'			DD	FINE-MED.SAND, TRACE T	O LITTI I	E OII T			4.0	
5 –						_::::::	DK	FINE-WED.SAND, TRACE I	O LITTL	E SIL I				
						_::::::								
10 –	3	5-6-7	10.0	-11.5'		7::::::								
			10.0											
15 –						_:::::::								
	4	9-9-10	15.0	-16.5'		_:::::::								
						<b></b>								
20 –	5	8-10-7	20.0'	-21.5'		<b>-</b>  ::::::								
		0 10 7	20.0	21.0									1.5	
						-	ВО	OTTOM OF BORING @ 21.5'						
						-								
						4								
25 —						4								
						_								
						7								
30 –														
	+					1								
						-								
-						-								
						4								
35_														
LEGEND: COL. A:									DRILLEI	R: J. BREWER	₹			
						STURRED	ріст	ON S-SPLIT SPOON	INSPECT	ΓOR:				
SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UN  PROPORTIONS USED. TRACE=0.10% LUTTLE=10.2								V AND 25 500/	ourre.	4 05 :	1107 5 3 3			
INOP	PROPORTIONS USED: TRACE=0-10% LITTLE					5OME-2	.0-337	V 111D-33-30/0	SHEET	1 OF 1	HOLE NO	·.	B-6	

CL A	DENC	C \A/C  T  /	VCCOC	NC	CLIENT				PROJECT NAME					
	BOX 39	E WELTI A	4550C., I	NC.					PROPOSED APARTMENT BUILDING					
		, JRY, CONN	06033						LOCA'	ΓΙΟΝ				
OLA	JIONDO	orti, oortiv	00000					HN RITSON	894	HOPMEADC	W STREE	ET, SIMS	BUR	Y, CT
		AUGER	CASING	SAMP	LER	CORE BA	AR.	OFFSET	SURFAC	E ELEV.	HOLE	NO.	В	-7
TYPE		HSA		SS				LINE & STA.	Chorn	ND WATER OBSEI	N/A TIONS	CTADT		
SIZE I.D		3.75"		1.37	5"			N. COORDINATE		.0 ft. after (		START DATE	11/	1/18
HAMME	ER WT			1401	os			N. COORDINATE				FWWGII		
HAMME				30'				E. COORDINATE	AT	FT. AFTER	HOURS	FINISH DATE	11/	I/18
112 (1011/11)	IN TABLE	SAM	DI E			1		CTD ATLIM	DESCRI	TION			T	
DEPTH	NO.	BLOWS/6"		PTH	A			STRATUM	+ REM.					ELEV.
0	1	1-5-5-6		-2.0'			_ TOI	PSOIL				0	.50	
	-							.FINE-MED.SAND, LITTLE T	O SOME	SILT, TRACE	ROOTS -			
	2	4-5-3-6	2.0'	-4.0'		<del>- </del> ::::::	FILI	L						
		4-5-5-0	2.0	-4.0										
							DD	.FINE-MED.SAND, TRACE S	III TDA	CELAVEDO	OE EINE		4.0	
5 –	3	4-7-7-8	4.0'	-6.0'		_::::::	SAI	ND WITH SOME SILT	OILI, IKA	CE LATERS	OF FINE			
						_::::::								
						_::::::								
10 –	4	7-10-12	10.0'-	-11.5'		<b></b>								
						<b>-</b>  ::::::								
						-								
15 –		111010	45.01	40.51										
	5	14-13-12	15.0	-16.5'										
						_::::::								
						_::::::								
						_::::::								
20 –						_::::::								
	6	11-14-13	20.0	-21.5'		_::::::								
							ВО	TTOM OF BORING @ 21.5'					1.5	
						_								
						_								
OF .														
25 –														
						]								
						7								
						7								
						╡ │								
30 –						┪								
						$\dashv$								
						$\dashv$								
35_								Т						
LEGEND: COL. A:										R: J. BREWE	R			
SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UNDIST						STURBED	PIST	ON S=SPLIT SPOON	INSPECT	OK:				
PROP	ROPORTIONS USED: TRACE=0-10% LITTLE=10-2						0-35%	6 AND=35-50%	SHEET	1 OF 1	HOLE NO	).	В-	7

CLA	veenc i	INC	CLIENT				PROJECT NAME							
	BOX 39	E WELTI A	455UC., I	INC.					PROPOSED APARTMENT BUILDING					
		, JRY, CONN	06033						LOCA	ΓΙΟΝ				
OL.	TONDO	orti, comi	00055				JO	HN RITSON	894	HOPMEADO	W STREE	T, SIMS	BUR	Y, CT
		AUGER	CASING	SAMPI	LER	CORE B	AR.	OFFSET	SURFAC	E ELEV.	HOLE	NO.	В-	-8
TYPE		HSA		SS				LINE & STA.	GD GV	TO WATER ORGER				
SIZE I.D		3.75"		1.375	5"			N. COODDINATE		ND WATER OBSER O FT. AFTER  C		START DATE	11/1	/18
HAMME				140lb				N. COORDINATE						
HAMME				30"				E. COORDINATE	AT	FT. AFTER	HOURS	FINISH DATE	11/1	/18
TIAWWIL	KIALL	SAM	DI E			1		COMP 4 TO A	DEGGDIE	ATTICAL.				
DEPTH	NO.	BLOWS/6"		PTH	Α			STRATUM	+ REM					ELEV.
0	1	2-2-2-3		-2.0'		1	TOF	PSOIL						
		2220	0.0	2.0		<b>-</b>  :::::::		FINE-MED.SAND, TRACE S	SILT			0	.75	
-	_					-								
-	2	2-3-3-4	2.0	-4.0'		<b>-</b>  :::::::								
						_:::::::								
5 –	3	4-5-7-7	4.0'-	-6.0'		_:::::::								
						:::::::								
İ						<b>-</b> :::::::								
						-								
10	4	5-6-11	10.0'	-11.5'		-						1	0.5	
-	4	3-0-11	10.0	-11.5		-	BR.	FINE-CRS.SAND, TRACE S	ILT				0.5	
						_:::::::								
						_:::::::								
						_:::::::								
45														
15 –	5	4-7-9	15.0'-	-16.5'		7::::::								
						<b>-</b>								
l						<b>⊣∷∷∷</b>								
						-								
}														
20 –						- ::::::								
	6	6-9-11	20.0'-	-21.5'		_:::::::								
							ВОТ	TTOM OF BORING @ 21.5'				2	1.5	
	T													
[														
25						┦								
	+					-								
	+					-								
	+					-								
30						4								
						1								
35								Г	DDILLE	. I DDEWE				
LEGEND: COL. A:									INSPECT	R: J. BREWEI	`			
SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UND					UNDIS	STURBED	PIST(	ON S=SPLIT SPOON	1101 EC	. JR.				
PROPO	COPORTIONS USED: TRACE=0-10% LITTLE					SOME=2	20-35%	AND=35-50%	SHEET	1 OF 1	HOLE NO	).	B-8	3





### Proposed Apartment Building 894 Hopmeadow Street, Simsbury, CT

## Permeability Tests 11/6/18

Boring /Depth	Permeability (feet/day)
B-1@ 15 to 16 feet	40.6
B-4 @ 10 to 11 feet	33
B-4 @ 15 to 16 feet	52.5