SOIL & SITE EVALUATION

Lot 7 Stillwood Drive
PIN: 1803861912
Wake County, NC
Three Oaks Job # 18-789

Prepared For:

Dennis Williams
[redacted]
Wake Forest, NC 27587

Prepared By:

324 Blackwell Street, Suite 1200
Durham, NC 27701
(919) 732-1300

October 17, 2019

Evan Morgan

LICENSED SOIL SCIENTIST
EVAN T. MORGAN
1340
STATE OF NORTH CAROLINA

INTRODUCTION & SITE DESCRIPTION

A Soil & Site Evaluation was performed on Lot 7 located on the south side of Stillwood Drive in Springwood Acres Subdivision in Wake County, NC (PIN: 1803861912). Three Oaks Engineering (Three Oaks) was retained to evaluate the soil and site conditions and identify any suitable areas for placement of on-site wastewater systems to subdivide the property in accordance with Section V of the Wake County regulations. The property was evaluated in accordance with Wake County and North Carolina statutes for waste disposal ("Regulations Governing Wastewater Treatment and Dispersal Systems in Wake County", effective October 27, 2011 and "Laws and Rules for Sewage Treatment and Disposal Systems", amended December 6, 2018).

The property consists of mature hardwood forest and interspersed pines with a buffered stream dissecting the lot. Three Oaks had previously conducted a Reconnaissance Soil & Site Evaluation on the lot, report dated September 28, 2018, that served as the basis of this report. A proposed plat was provided to Three Oaks by Credle Engineering Company, Inc. and the two proposed lots are identified as Lot 7a and Lot 7b. Lots 7a and 7b are located in the watershed of a Class I, II, or III Reservoir as designated by Wake County. The two lots will be serviced by private well.

INVESTIGATION METHODOLOGY

The field survey was conducted on June 4, 2019, by Evan T. Morgan, LSS. Soil borings were advanced with a hand-auger and soil color was determined using a Munsell Soil Color Chart. Observations of the landscape as well as soil properties (depth, texture, structure, soil wetness, restrictive horizons, etc.) were recorded. Soil borings were described per the USDA-NRCS, *Field Book for Describing and Sampling Soils, Version 3.0.* Soil borings were marked in the field with various colored flagging. A laser level was used to demonstrate septic drainlines, on contour, on nine-foot centers. Septic drainlines were marked in the field with various colored pin flags. Soil borings were located using a hand-held GPS with sub-meter accuracy. Property lines and corners had been flagged and staked on the day of the investigation.

FINDINGS

Soils

Twenty-six (26) soil borings were advanced and their locations noted on Figure 1. Detailed soil boring descriptions are attached.

Soil borings rated as Provisionally Suitable for Conventional Systems typically exhibited a friable sandy loam textured surface with a friable or firm sandy clay loam or clay textured subsurface that ranged from 30 to 36 inches below the existing surface. These soils appeared adequate to support long-term acceptance rates (LTAR) of 0.275 to 0.3 GPD/sq-ft.

Soil borings rated as Provisionally Suitable for Modified/Alternative Systems typically exhibited a friable sandy loam textured surface with a friable or firm sandy clay loam or clay

textured subsurface ranging from 24 to 30 inches from the existing surface. These soils appeared adequate to support long-term acceptance rates (LTAR) of 0.25 to 0.3 GPD/sq-ft.

Soil borings rated as Provisionally Suitable for Subsurface Drip Systems typically exhibited a friable sandy loam textured surface with a friable or firm sandy clay loam, clay loam, or clay textured subsurface ranging from 18 to 24 inches from the existing surface. These soils appeared adequate to support long-term acceptance rates (LTAR) of 0.075 to 0.1 GPD/sq-ft.

Borings rated as Unsuitable exhibited soil wetness and expansive (shrink/swell) mineralogy within 12 inches of the existing surface.

DISCUSSION

Lot 7a

An area of soil rated as Provisionally Suitable for Modified/Alternative Systems was identified and encompasses approximately 25,750 sq-ft (Figure 1). A septic system layout was completed within this soil area and eight drainlines demonstrated (Table 1), lines L1 – L8, totaling 887 feet (Figure 2). Based on the recommended LTAR (0.3 GPD/sq-ft) and the design flow for a four-bedroom single-family residence (480 GPD), 400 feet of "Accepted Systems" drainline, utilizing 25% reduction in total length, would be needed to support the initial system. Lines L1-L4 are proposed to be used for the initial system at a length of 100-ft each. Lines L5-L8 are proposed as repair. A soil capping up to 6 inches deep may need to be placed over the entire drainfield.

Table 1. Demonstrated Drainlines Lot 7a

Line #	Color	Field Length (ft)	System Length (ft)	Initial/Repair
1	Blue	100	100	Initial
2	Yellow	100	100	Initial
3	Red	140	100	Initial
4	White	104	100	Initial
5	Orange	125	100	Repair
6	Blue	118	100	Repair
7	Yellow	100	100	Repair
8	Red	100	100	Repair

The proposed drainlines for the initial system and repair area are outside of the 50-foot stream buffer and 50-foot watershed buffer.

Additional soil rated as Provisionally Suitable for Modified/Alternative Systems remains available to the east of the septic layout. As well as an area of soil rated as Provisionally Suitable for Subsurface Drip Systems that was identified further east on the slope and directly downslope of the system layout. This area encompasses approximately 7,500 sq-ft (Figure 1).

Lot 7b

An area of soil rated as Provisionally Suitable for Modified/Alternative Systems was identified and encompasses 40,000 sq-ft (Figure 1). An LTAR of 0.3GPD/sq-ft is recommended for this area. A septic system layout was completed within this soil area and eight drainlines demonstrated (Table 2), lines L9 – L16, totaling 800 feet (Figure 3). Based on the recommended LTAR (0.3 GPD/sq-ft) and the design flow for a four-bedroom single-family residence (480 GPD), 400 feet of "Accepted Systems" drainline, utilizing 25% reduction in total length, would be needed to support the initial system. Lines L9-L12 are proposed to be used for the initial system at a length of 100-ft each. Lines L13-L16 are proposed as repair. Usable soil depths in this area ranged from 26 to 36 inches below the existing surface. A soil cap of up to 6 inches may need to be placed over the entire drainfield.

Table 1. Demonstrated Drainlines Lot 7b

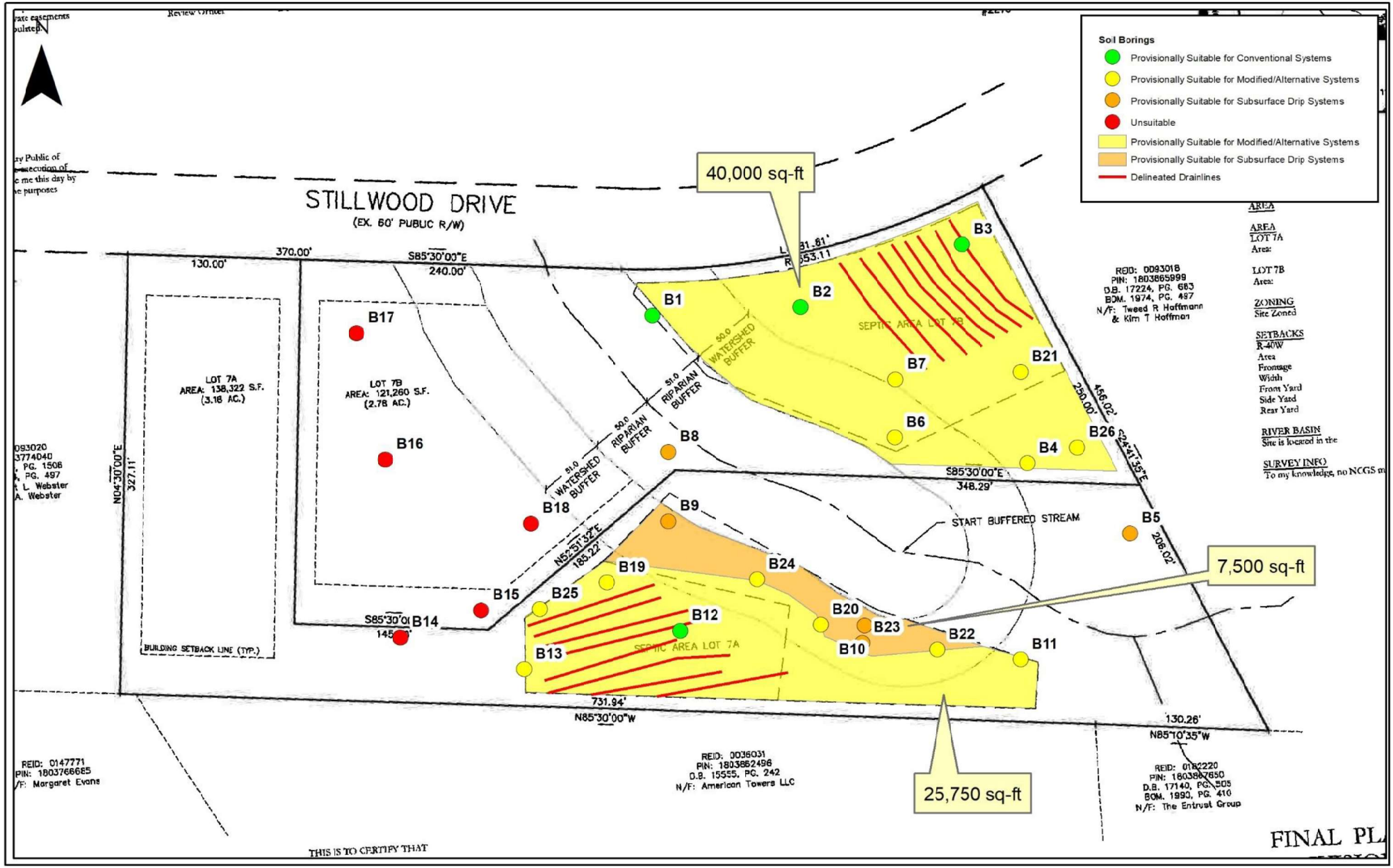
Line #	Color	Field Length (ft)	System Length (ft)	Initial/Repair
9	Yellow	100	100	Initial
10	Blue	100	100	Initial
11	White	100	100	Initial
12	Orange	100	100	Initial
13	Red	100	100	Repair
14	Yellow	100	100	Repair
15	Blue	100	100	Repair
16	White	100	100	Repair

A portion of the Provisionally Suitable soil on Lot 7b is mapped as the Worsham soil series in the Wake County Soil Survey. The Worsham soil series is identified as a Flood Hazard Soil in Wake County Unified Development Ordinance. It is Three Oaks' opinion that the Worsham soil series did not exist within the area identified as Provisionally Suitable.

CONCLUSIONS

The findings presented herein represent Three Oaks' professional opinion based on our Soil and Site Evaluation and knowledge of the current laws and rules governing on-site wastewater systems in Wake County and North Carolina. A septic system layout was completed on Lot 7a and Lot 7b demonstrating adequate usable area to support a subsurface septic system and 100% repair area for a four-bedroom home, utilizing an LTAR of 0.3 GPD/sq-ft and 25% reduction from "Accepted Systems" drainline.

Soils naturally change across a landscape and contain many inclusions. As such, attempts to quantify them are not always precise and exact. Due to this inherent variability of soils and the subjectivity when determining limiting factors, there is no guarantee that a regulating authority will agree with the findings of this report. An Improvement Permit for a subsurface septic system would be issued by Wake County Environmental Health. Any concurrence with the findings of this report would be made by Wake County Environmental Health at the time an Improvement Permit is issued.



THREE OAKS ENGINEERING

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Soil & Site Evaluation

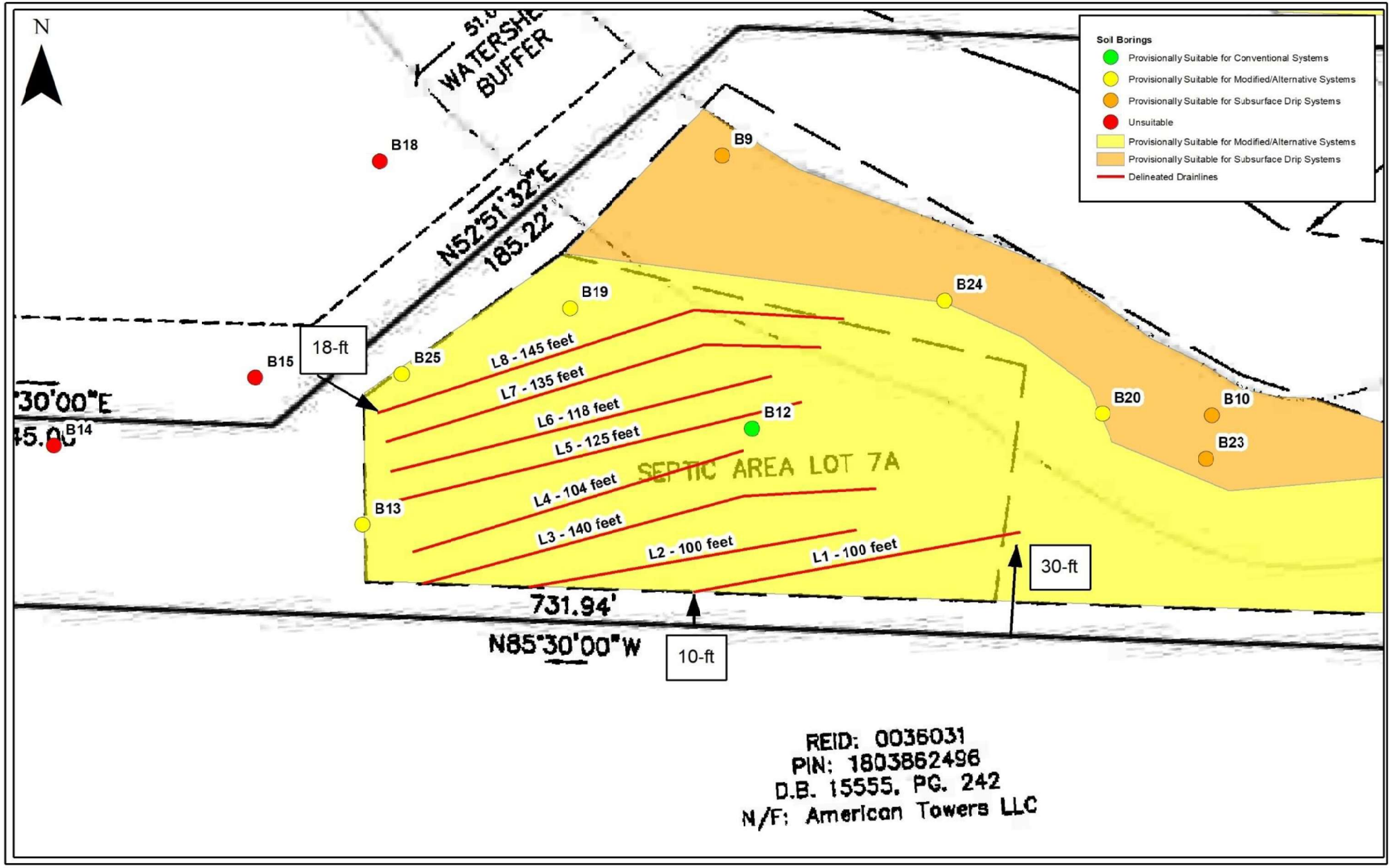
Lot 7 Stillwood Drive

Wake County, North Carolina

Date:	October 2019
Scale:	0 25 50 Feet
Job No.:	18-789
Drawn By:	ETM
Checked By:	MGW

Figure

1



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Soil & Site Evaluation

Lot 7 Stillwood Drive

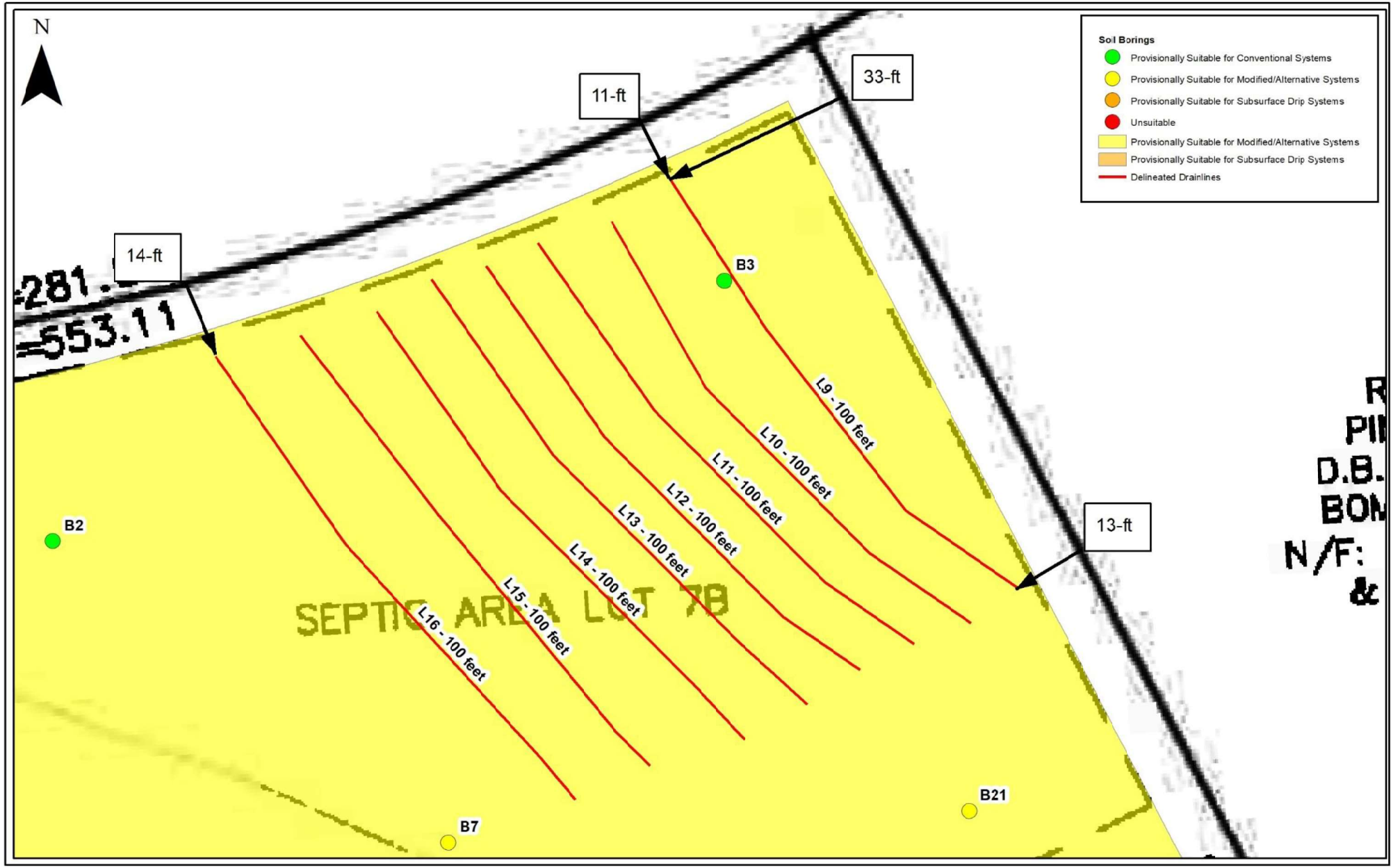
Lot 7a Delineated Drainlines

Wake County, North Carolina

Date:	June 2019
Scale:	0 10 20 Feet
Job No.:	18-789
Drawn By:	ETM
Checked By:	MGW

Figure

2



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Soil & Site Evaluation

Lot 7 Stillwood Drive

Lot 7b Delineated Drainlines

Wake County, North Carolina

Date:	October 2019
Scale:	0 7 14 Feet
Job No.:	18-789
Drawn By:	ETM
Checked By:	MGW

Figure

3

Soil Evaluation Form

Three Oaks Engineering
324 Blackwell Street, Suite 1200
Durham, NC 27701
919.732.1300

Sheet 1 of 2
Job: 18-791
County: Wake
Date: 9-13-18

Soil Borings

	1	2	3	4	5	6	7	8	9	10
Landscape Position	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS
Slope (%)	6	6	6	2	2	2	6	4	6	8
Horizon 1 Depth	12	12	10	24	18	18	20	8	8	8
Texture	SL	SL	SL	SL	SL	SL	SL	SL	SL	SL
Consistence	FR	FR	FR	FR	FR	FR	FR	FR	FR	FR
Structure	SBK	SBK	SBK	SBK	SBK	SBK	SBK	SBK	SBK	SBK
Clay Mineralogy	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Horizon 2 Depth	32	36	36	30		26	26	18	18	21
Texture	SCL	C	C	SCL		SCL	SCL	CL	C	CL
Consistence	FI	FI	FI	FR		FR	FR	FI	FI	FI
Structure	SBK	SBK	SBK	SBK		SBK	SBK	SBK	SBK	SBK
Clay Mineralogy	SE	SE	SE	SE		SE	SE	SE	SE	SE
Horizon 3 Depth										
Texture										
Consistence										
Structure										
Clay Mineralogy										
Horizon 4 Depth										
Texture										
Consistence										
Structure										
Clay Mineralogy										
Horizon 5 Depth										
Texture										
Consistence										
Structure										
Clay Mineralogy										
Soil Wetness	32			30	18	26		18		21
Restrictive Horizon										
Saprolite										
Other							AR-26		AR-18	
CLASSIFICATION	PS	PS	PS	PS	PS-Drip	PS	PS	PS-Drip		PS-Drip
LTAR (gpd/ft^2)	0.35	0.275	0.225	0.3						

Comments:
Pits @ B7
AR - Auger Refusal
PM - >50% Parent Material

Evaluated by: JCR

Soil Evaluation Form

Three Oaks Engineering
324 Blackwell Street, Suite 1200
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Sheet 2 of 2
Job: 18-789
County: Wake
Date: 9-13-18

Soil Borings

	11	12	13	14	15	16	17	18	19	20	21
Landscape Position	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS
Slope (%)	5	5	4	2	2	2	2	6	6	6	6
Horizon 1 Depth	12	8	6	<12	<12	<12	<12	<12	6	6	10
Texture	SL	SL	SL	C	C	C	C	SCL	SL	SL	SL
Consistence	FR	FR	FR	FI	FI	FI	FI	FI	FR	FR	FR
Structure	SBK	SBK	SBK	SBK	SBK	SBK	SBK	SBK	SBK	SBK	SBK
Clay Mineralogy	NE	NE	NE	EXP	EXP	EXP	EXP	SE	NE	NE	NE
Horizon 2 Depth	27	36	30						30	26	30
Texture	SCL	C	C						C	CL	CL
Consistence	FR	FI	FI						FI	FI	FI
Structure	SBK	SBK	SBK						SBK	SBK	SBK
Clay Mineralogy	SE	SE	SE						SE	SE	SE
Horizon 3 Depth											
Texture											
Consistence											
Structure											
Clay Mineralogy											
Horizon 4 Depth											
Texture											
Consistence											
Structure											
Clay Mineralogy											
Horizon 5 Depth											
Texture											
Consistence											
Structure											
Clay Mineralogy											
Soil Wetness	27			<12	<12	<12	<12	<12			
Restrictive Horizon											
Saprolite											
Other			PM-30						PM-30	PM-26	PM-30
CLASSIFICATION	PS	PS	PS	U	U	U	U	U	PS	PS	PS
LTAR (gpd/ft^2)											

Comments:

Evaluated by: JCR

Soil Evaluation Form

Three Oaks Engineering
324 Blackwell Street, Suite 1200
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Sheet 3 of 3
Job: 18-789 Lot 7 Stillwood
County: Wake
Date: 6-4-2019

Soil Borings

	B22	B23	B24	B25	B26					
Landscape Position	L	L	L	L	L					
Slope (%)	6	6	6	6	4					
Horizon 1 Depth	10	10	6	10	22					
Texture	SL	SL	CL	CL	SL					
Consistence	FR	FR	FI	FI	FR					
Structure	SBK	SBK	SBK	SBK	SBK					
Clay Mineralogy	NE	NE	SE	SE	NE					
Horizon 2 Depth	20	18	30	28	28					
Texture	SCL	SCL	C	C	SCL					
Consistence	FI	FI	FI	FI	FI					
Structure	SBK	SBK	SBK	SBK	SBK					
Clay Mineralogy	SE	SE	SE	SE	SE					
Horizon 3 Depth	36	AR								
Texture	C									
Consistence	FI									
Structure	SBK									
Clay Mineralogy	SE									
Horizon 4 Depth										
Texture										
Consistence										
Structure										
Clay Mineralogy										
Horizon 5 Depth										
Texture										
Consistence										
Structure										
Clay Mineralogy										
Soil Wetness										
Restrictive Horizon										
Saprolite										
Other		AR-18	PM-30	PM-28	PM-25					
CLASSIFICATION	PS	PS-Drip	PS	PS	PS					
LTAR (gpd/ft^2)	0.3		0.3	0.3	0.3					

Comments:
AR = Auger Refusal
PM > 50% Parent Material

Evaluated by: ETM