

Soil Profile Documentation April 2015

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1

OBJECTIVES

- Define and describe requirements for correct soil profile documentation for OSTDS permitting

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2

The Site Evaluation Form

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DUE TO RULE RESTRICTION,
USDA NRCS TEXTURES AND
METHODOLOGIES ARE THE
ONLY ONES THAT ARE
ACCEPTABLE FOR DOH USE

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- "Texture" column: completed using the correct USDA NRCS texture for each horizon
- The use of non-standard abbreviations cannot be accepted. The use of the term "fill" in this column should be used when necessary, *along with the corresponding texture(s) of the fill material*

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- Note that ONLY the USDA NRCS particle sizes are used
- Textures given in any other particle size or texture classification system are not acceptable
- Some examples: Mucky Peat would be abbreviated as MK Peat. Note that the term "organic" is not listed
- Organic soils are listed as muck, mucky peat or peat

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Soil Profile Documentation

- All soil profiles must be completely and correctly documented
- Department required information must be presented by the evaluator
- CHD personnel reviewing information must use the information presented by the evaluator as basis for review
- CHD personnel can use personal knowledge during review

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13

Soil Profile Documentation

- The fully completed evaluation will be reviewed by the CHD using their knowledge of the area and required references to judge compliance of the information regarding the SHWT
- If information is not sufficient to validate the SHWT the CHD cannot presume other information

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14

Soil Profile Documentation

- Remember that each drainfield must have at least two profiles
- Example: 15,000 square feet total absorption area
- Designed for ten drainfields, each 1500 square feet
- Need minimum two profiles for each drainfield area, so 20 profiles minimum

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15

Each soil profile:

- Establishes *facts* (something determined by evidence) i.e. soil colors, textures, SHWT indicators, etc.
- Must be performed/documented correctly
- Must use USDA NRCS methodology
- Indicated on site plan along with benchmark or reference point(s)
- Stands on its own (see next slide)

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Stands on it's own

- This means that each profile must be able to allow the system to be installed according to regulations when using the profile by itself
- Why? The system is being installed where the profiles are performed
- Most restrictive conditions *must be used*

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Point of Refusal

- Point of refusal (termination, etc.) indicates that the soil profile could not be advanced to the required 72" depth
- Once 72" is reached, point of refusal is not used due to required depth having been reached)
- Point of refusal must be clearly documented as to reason for said "refusal"

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Examples of Refusal

- Hole collapses due to: excessive water, ironstone, excessive roots, excessive debris, etc.
- “Didn’t want to dig” is not a reason
- In all cases, the evaluator must not be able to proceed further
- The reason must be given and clearly recorded on the profile information or remarks section

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Spatially Variability of Soil

- Cannot assume what lies below point of profile termination (Spodic, limestone, clay?)

Note: Termination point influences bottom of the drainfield due to the effective soil depth requirements and could raise the system more than the separation to SHWT requirement

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Example

- Soil profile one has FS down to 72”
- Soil profile two has FS down to 42”, refusal due to limestone
- Profile that goes down to 72” *cannot* be used to justify the effective soil depth in any other profile
- The profile with the 42” point of refusal is the more restrictive profile and therefore must be used to install the system

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Spodic layers

- By definition, spodic layers are a sandy material coated with only a small percentage of organic coatings
- They can be any texture sand. As long as it has the word "sand" and is a REAL texture, it can be used
- Proper Examples: LFS, S, FS, VFS
- UNACCEPTABLE Examples: Muck, SiL, organics

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Spodic layers

- Spodic (Bh) horizons should be noted as such
- While a spodic layer contains organic matter that coats mineral soil particles, it is not an organic soil layer nor mucky mineral due to the small amount (<5%) of organic matter (carbon)

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Spodic layer documetation

- 10YR 2/1 FS Spodic 16-23 inches
- This entry indicates a horizon of black fine sand that exists as a spodic layer from 16 to 23 inches
- This is NOT an organic layer. Mucky mineral must have at least 5% organics and muck must have at least 12% organics, depending on percent clay
- A spodic contains <5% organic matter (carbon), generally 1-3%

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Particle Sizes Larger Than The Fine Earth Fraction (2mm)

- Soil texture name is modified when the volume of particles >2mm in size in the horizon is $\geq 15\%$ (*note: this is a three-dimensional observation*)
- Don't forget to use proper nomenclature such as Gravelly (GR), etc.

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Redox Feature Identification

- The site evaluation form asks for indications of "mottles." What is required here are SHWT indicators (including hydric soil indicators)
- Includes all redox features

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Redox Feature Identification

- Note that not all mottles are associated with the seasonal high water table (SHWT). Do not put the depth of non-redox features in the "mottling" depth location
- Redoximorphic features must be described in quantity, contrast and color
- Where present, must be described in all profiles

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Redox Feature Identification

- The department accepts the following abbreviations for quantity and visual contrast of redox features, which can be abbreviated as RF
- Quantity of feature: Common - CMN; Many - write out
- Visual Contrast of feature: Faint, write out (stripped matrix only); Distinct - DST; Prominent - PRM

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The presence of the redoximorphic features (if existing) must be indicated in the soil profile or must be listed in the remarks section of the profile

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- 10YR 3/2 FS 0-5"
- 10YR 5/3 FS 5-14"
- 10YR 7/4 FS 14-20"
- 7.5YR 6/8 CMN/PRM RF 16-20"
- 10YR 8/1 FS 20-72"

- Alternately, the row with the redoximorphic information could be omitted in the soil profile information if the information was placed in the remarks section

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- In the column heading "Depth", the beginning and ending depth of the soil horizon (layer) is recorded
- Requires soil profile description, not a soil log
- Soil logs are NOT acceptable (specified increments such as 0-6", 6-12", etc.)
- While soil profiles may on occasion match, one should expect differences in the depths, thicknesses and colors of each horizon in individual profiles

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- *Soil profile must contain all information to properly document and validate corresponding conclusions drawn from the profiles*
- *Includes estimated seasonal high water table determination, soil textures and effective soil depth*
- *Lack of or inconsistency between any required information is scientific basis to question the evaluation*

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- Example: a profile that indicates no SHWT indicators
- Mottling indicated as "no"
- Site evaluator indicates an estimated seasonal high water table at 10 inches
- Unacceptable by department standards as there is no scientific basis for the estimation of the seasonal high water table

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Another Improper Phrase

- Using a phrase such as “Seasonal high water table determined to be ___ inches above spodic layer” when no data is present to validate that claim is unacceptable
- Must validate all SHWT determinations

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**CAN A SOIL THAT IS NOT
 MAPPED IN THE COUNTY
 ACTUALLY OCCUR IN
 THE COUNTY?**

YES

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Soils Mapped by Counties

- Just because a soil is not actually mapped in the county DOES NOT mean that the soil cannot be found there (assuming same temperature region)
- Therefore you may find a soil (or be given a soil name) that you do not recognize as mapped in the county
- Look name up using the Official Soils Series Description to find out more about the soil

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What to do when there is a lack of SHWT (REDOX) FEATURES

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- SHWT (redox) features need certain conditions in which to form
- In certain cases, these conditions will not be present and redox features will not be found
- This can happen in naturally occurring soils where there is very little organic matter or iron content, such as in beach areas, or in the situation where fill material has been moved on top of an otherwise natural soil

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- The fill material can be anywhere from a few inches to several feet thick, and have been in place for a few days to decades (anthropogenic soils), and can vary greatly in texture
- These soils can be very problematic
- The SHWT can still be higher in the profile, even within the fill material

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Contemporary Features

- Soil morphological features that reflect current hydrologic conditions of saturation and anaerobiosis
- These are the features used to determine SHWT

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Relict Features

- Soil morphological features that reflect past hydrologic conditions of saturation and anaerobiosis
- These would normally occur in natural conditions and are NOT used to determine SHWT
- Would also include any SHWT indicators that have been transported in fill material

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Absence of SHWT indicators

- Evaluator's experience and judgment comes into play
- Observed water table could be clue
- Where observed water table found compare when last significant rainfall occurred, including amount
- Three days or three weeks
- Longer without rain means water could have been higher

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Absence of SHWT indicators

- Amount of consideration based on the individual evaluator's experience and judgment
- Evaluator with years of experience in the physical area where the evaluation is being performed may have knowledge that water tables exist for several days or weeks at a time even though no redox features are present

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Absence of SHWT indicators

- An evaluator with less experience may not reach same conclusion
- Would have to fall back on their limited experience
- Use all sources required by rule, document same
- May need to ask for soil scientist assistance
- SHWT must still be validated using all available information

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Absence(?) of SHWT indicators

- Historically is not uncommon for some indicators to be missed or misused
- Common issue is not using USDA NRCS methodology
- Results in improper documentation and SHWT determinations

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VALIDATION OF SHWT

- Where no indicators are found still can have a SHWT within the soil profile
- Validation includes all sources required by rule along with the professional judgment of the evaluator to explain why the SHWT was determined to be at a specific level

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VALIDATION OF SHWT

- No specific statements that have been used to cover all scenarios
- Trying to guard against the evaluator that is not using contemporary indicators (when present) and from stating a depth and "the call was based on my professional experience"

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Consider the following information

- 10YR 3/1; 5/4; 6/3 FS Fill 0-21"
- 10YR 4/1 FS 21-27"
- 10YR 4/1; 5/2 FS 27-35"
- 10YR 2/1 Spodic Material 35-50"
- REFUSAL REFUSAL 50"
- REMARKS: Observed water table at 34", refusal due to hole caving in. No rain in 5 weeks. SHWT 21".

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Example of WRONG reasoning for previous slide:

No clear indicators of seasonal high water could be observed. Due to filled nature of lot, 21" represents "natural grade." Set SHWT at natural grade; this is conservative call for SHWT.

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Proper Statement

SHWT based on combination of following:

No specific redox features were observed, the several inches of generally gray (low chroma) soils that exist in the upper part of the natural soils is normally indicative of SHWT being closer to the ground surface when viewed in relation to the spodic horizon, and considering the observed water table of 34" during this time of year, also no rainfall has occurred in the last 5 weeks (continued next slide)

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Proper Statement continued

Landscape position was indicative of [make statement – was area fairly flat, no water outlets?]. The soils that are mapped in this area indicates that seasonal high water tables would normally be within a few inches of the natural soil surface. Using all available information, my professional judgment is that the SHWT is most likely to be at the top of what was determined to be the natural soil.

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Proper Statement

- Preceding was example only
- Not the only format that could be approved
- Note that using the soil profile stripped matrix could have been present, just not identified

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55

DOH PERSONNEL MUST REQUIRE FULL DOCUMENTATION AND VALIDATION OF SHWT DETERMINATIONS

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For example, the following statements DO NOT validate SHWT determinations:

- “Redox feature found at ___ inches” (when no RF are documented in the evaluation)
- SHWT based on Florida Administrative Code rule 64E-6.004(2)(a)

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USDA NRCS Determinations

What happens when a USDA NRCS Soil Scientist reviews the site

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DOH USES MOST RESTRICTIVE SHWT DETERMINATION

- Get a report if at all possible
- Where the USDA NRCS Soil Scientist gives a range for the SHWT the more restrictive measurement must be used
- Example: "SHS at 7-10 inches below soil surface" would mean that a 7 inch SHWT would be used by DOH
- Cannot average the depths

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DEPTH TO INDICATORS

- Where SHWT indicators exist in a profile, depth to indicators must be shown for all profiles (should it be routine to only find them in one profile?)

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DEPTH TO INDICATORS

- Use proper methodology
- Document correctly and completely
- Verify soil color contrast is correct for indicator use
- If not correct must be fixed

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The Correct Soil Profile (Field Copy)

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EXAMPLE 1. HIGH CHROMA REDOXIMORPHIC FEATURE IN SAND

10YR 3/1	S	0-3"
10YR 4/4	S	3-9"
10YR 6/6	S	9-31"
7.5YR 6/8	CMN/DST RF	27-30"
10YR 7/2	S	31-54"
10YR 8/1	S	54-72"

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EXAMPLE 1

- Shows entry for redox feature within the soil profile
- RF entry follows the horizon in which it is located
- The 10YR 6/6 sandy soil matrix has common ($\geq 2\%$, but $< 20\%$) 7.5YR 6/8 mottles
- Mottles qualify as redox features based on RF criteria

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EXAMPLE 2A. STRIPPED MATRIX

- 2.5Y 2.5/1 FS 0-2"
- 2.5Y 4/1 FS 2-5"
- 2.5Y 5/1 FS 5-12"
- 2.5Y 7/2 FS 5-12"
- 2.5Y 8/1 FS 12-25"
- N 8/ FS 25-72"

REMARKS: Splotchy colors with diffuse boundaries from 5-12" exist as faint soil color contrast and the lighter areas are at least 10% of the volume, meeting the definition of stripped matrix beginning at 5".

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EXAMPLE 2A

- The above example shows the entry for the redox feature in the soil profile occurring on two lines
- The redox feature is stripped matrix, documented/validated in remarks
- Compare with the following example

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EXAMPLE 2B. STRIPPED MATRIX

2.5Y 2.5/1	FS	0-2"
2.5Y 4/1	FS	2-5"
2.5Y 5/1; 7/2	FS	5-12"
2.5Y 8/1	FS	12-25"
N 8/	FS	25-72"

REMARKS: Splotchy colors with diffuse boundaries from 5-12" exist as faint soil color contrast and the lighter areas are at least 10% of the volume, meeting the definition of stripped matrix beginning at 5".

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EXAMPLE 2B

- Only difference from 2A is how the soil colors were written for the 5-12" horizon
- This example has one hue shown with 2 different colors on the same line
- Both colors therefore have a hue of 2.5Y (note this can't be done in EHD)
- The remarks are the same

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EXAMPLE 3. LOW CHROMA REDOX DEPLETIONS

7.5YR 3/1	FS	0-4"
7.5YR 4/2	LFS	4-9"
5YR 5/6	FSL	9-43"
5YR 5/8	FSL	43-72"
5YR 6/3	MANY/PRM RF	65-72"

REMARKS: SHWT at 65" due to low chroma depletions as noted

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EXAMPLE 3

- Exemplifies entry for low chroma redox depletions in the soil profile
- The 5YR 5/8 FSL soil matrix has many (>20%) 5YR 6/3 redox depletions
- The indicated feature is acceptable in this soil at a depth of below one meter (39.37")

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EXAMPLE 4. LOW CHROMA REDOX AS A MATRIX

7.5YR 2.5/1	FS	0-3"
7.5YR 4/1	FS	3-7"
7.5YR 6/6	FSL	7-34"
7.5YR 7/1	FSL	34-72"

REMARKS: The horizon beginning at 34" is the redox feature in that the colors meet value ≥ 5 and chroma ≤ 2 above one meter

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EXAMPLE 5. MUCK SOIL SURFACE (SAMPLE IN LRR U)

N 2.5/	MUCK	0-0.25"
5Y 4/1	FS	0.25-6"
5Y 7/1;8/1	FS	6-15"
10BG 6/1	FS	15-22"
Refusal	Refusal	22-22"

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EXAMPLE 5. MUCK SOIL SURFACE (SAMPLE IN LRR U)

- REMARKS: Refusal due to hole caving in and filling with water. Muck is the SHWT indicator as it qualifies as a hydric soil indicator A8 (Muck Presence). Site is level, not depressional. Also of note is stripped matrix indicator is met beginning at 6", and gleyed matrix is met at 15"

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EXAMPLE 6: H₂S SMELL

N 2.5/	FS	0-1"
5Y 4/1	FS	1-6"
5Y 7/1	FS	6-15"
10BG 6/1	SCL	15-22"

Refusal due to hole caving in and filling with water.

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EXAMPLE 6: H₂S SMELL

REMARKS: Hydrogen sulfide (H₂S) smell observed at 2" which is hydric soil indicator A4, hydrogen sulfide. Also of note is gleyed matrix is met at 15". Seasonal high water table is determined to be at 2"

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Anything wrong with the following profile?

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SOIL PROFILE INFORMATION SITE 1			SOIL PROFILE INFORMATION SITE 2		
MUNSELL #/COLOR	TEXTURE	DEPTH	MUNSELL #/COLOR	TEXTURE	DEPTH
10YR 5/2	FS GRAVEL FILL	0 TO 8"	10YR 5/2	FS GRAVEL FILL	0 TO 10"
10YR 5/1	FS	8" TO 15"	10YR 5/1	FS	10 TO 17"
10YR 7/3	FS	15" TO 24"	10YR 7/3	FS	17 TO 25"
10YR 5/4	FS	24" TO 30"	10YR 5/4	FS	25 TO 29"
10YR 8/3	MACROSCOPIC FS	30 TO 35"	10YR 8/3	MACROSCOPIC FS	29 TO 36"
10YR 7/4	FS	35 TO 47"	10YR 7/4	FS	36 TO 49"
10YR 5/6	SC	47 TO 53"	10YR 5/6	SC	49 TO 57"
10YR 8/3	SAND & SHELL	53 TO 82"	10YR 8/3	SAND & SHELL	57 TO 82"

USDA SOIL SERIES: Evansville / MYNNA FS
(changed to 5 similar to)

USDA SOIL SERIES: Evansville / Myrtle FS
(changed to 5 similar to)

OBSERVED WATER TABLE: 7000 INCHES (ABOVE / BELOW) EXISTING GRADE. TYPE: [SEARCHED / APPARENT]

ESTIMATED WET SEASON WATER TABLE ELEVATION: 3.2 INCHES (ABOVE / BELOW) EXISTING GRADE

HIGH WATER TABLE VEGETATION: [] YES [X] NO MOTTLING: [X] YES [] NO DEPTH: 30 INCHES

SOIL TEXTURE/LOADING RATE FOR SYSTEM SIZING: _____ DEPTH OF EXCAVATION: 53 INCHES

DRAINFIELD CONFIGURATION: [] TRENCH [] BED [] OTHER (SPECIFY) _____

REMARKS/ADDITIONAL CRITERIA: *RF - Redox morphic features observed on 10YR 5/6 in lowest, common & distinct @ 30-53 inches

SITE EVALUATED BY: _____ DATE: _____

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Problems

- RFs were prominent, not distinct
- What is actual depth to redox features-Inconsistent data presented
- FS and gravel fill – what is actual texture?

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Problems

- Sand and Shell? Need correct soil texture, may be severely limited
- Myakka or EauGallie required to have spodic, not identified here
- EauGallie has Btg horizon, Myakka doesn't

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MUNSELL #/COLOR	TEXTURE	DEPTH
10R5/2	FS (SANDY FILL)	0 TO 8"
10R5/1	FS	8 TO 16"
10R4/3	FS	16 TO 24"
10R5/3	FS	24 TO 32"
10R6/2	*R/FAV/S/FS	32 TO 35"
10R4/4	FS	35 TO 41"
10R5/8	SC	41 TO 53"
10R8/3	SAND & SHELL	53 TO 82"

MUNSELL #/COLOR	TEXTURE	DEPTH
10R5/2	FS (SANDY FILL)	0 TO 10"
10R5/1	FS	10 TO 17"
10R4/3	FS	17 TO 26"
10R5/4	FS	26 TO 29"
10R6/2	*R/FAV/S/FS	29 TO 36"
10R4/4	FS	36 TO 42"
10R5/8	SC	42 TO 54"
10R8/3	SAND & SHELL	54 TO 82"

OBSERVED WATER TABLE: 14 INCHES (ABOVE / BELOW) EXISTING GRADE. TYPE: (PERCHED / APPARENT)
ESTIMATED WET SEASON WATER TABLE ELEVATION: 32.2 INCHES (ABOVE / BELOW) EXISTING GRADE
HIGH WATER TABLE VEGETATION: () YES (X) NO NOTULING: (X) YES () NO DEPTH: 32 INCHES

SOIL TEXTURE/LOADING RATE FOR SYSTEM SIZING: DEPTH OF EXCAVATION: 53 INCHES
DRAINFIELD CONFIGURATION: () TRENCH () BED (X) OTHER (SPECIFY)
REMARKS/ADDITIONAL CRITERIA: *R/FAV/S/FS features observed on 10R5/6 inclusion, common & distinct @ 32-35 inches

SITE EVALUATED BY: _____ DATE: _____
DH 4015, 08/09 (obsoletes previous editions which may not be used) Incorporated 64E-6.001.FAC Page 3 of 4

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Documentation of Lamellae

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USDA Soil Series

- Input name of soil series immediately below the soil profiles using “like” or “similar to”, e.g. “Lakeland-like” or “Similar to Myakka”
- Can put Unknown
- Can be transitional
- What soil is mapped as is not as important as what you find

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91

SOIL PROFILE INFORMATION SITE 1

MUNSELL #/COLOR	TEXTURE	DEPTH
_____	_____	TO

USDA SOIL SERIES: _____

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92

End of Presentation

QUESTIONS?

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