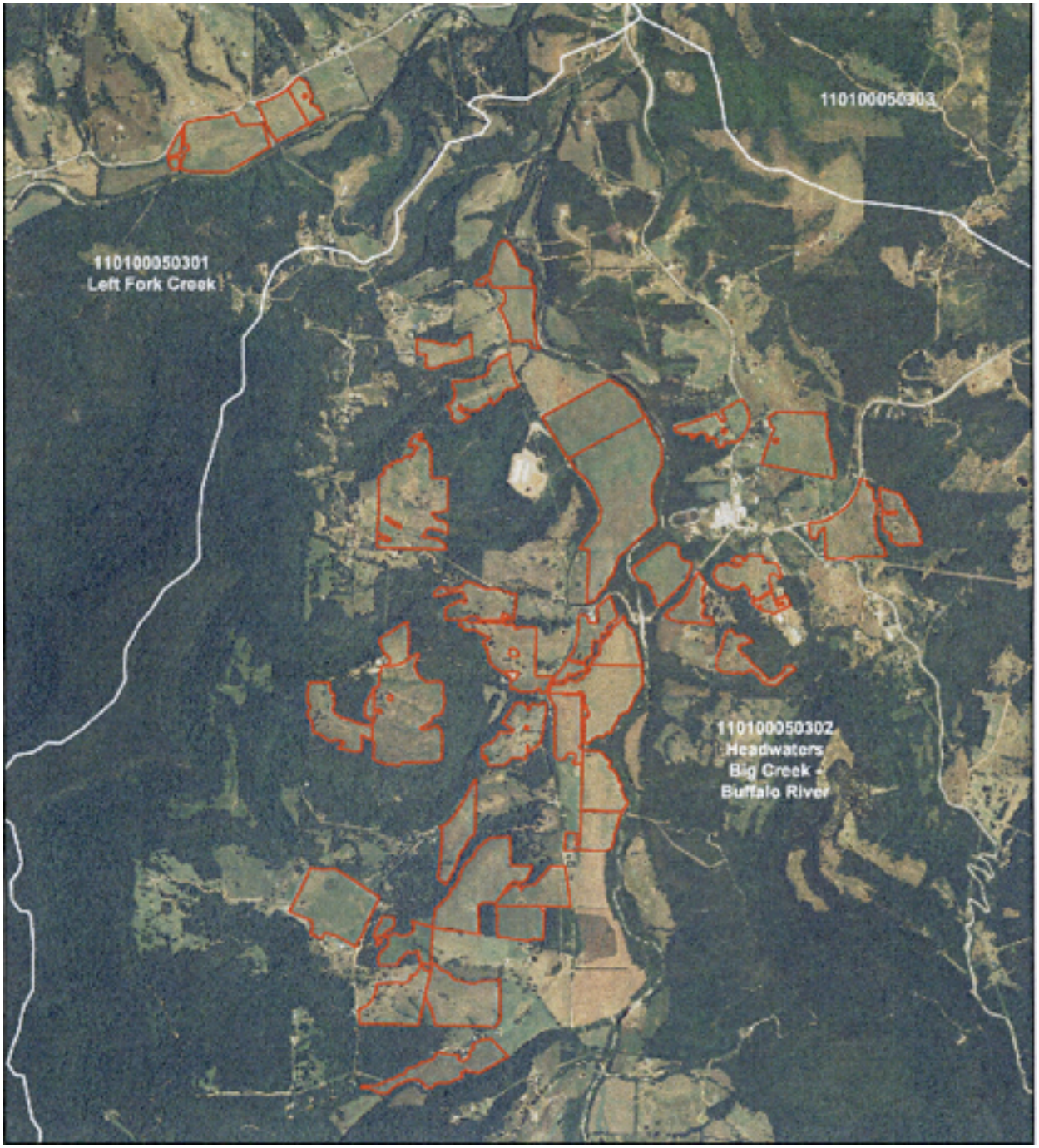
Reg 5 Comment Appendices

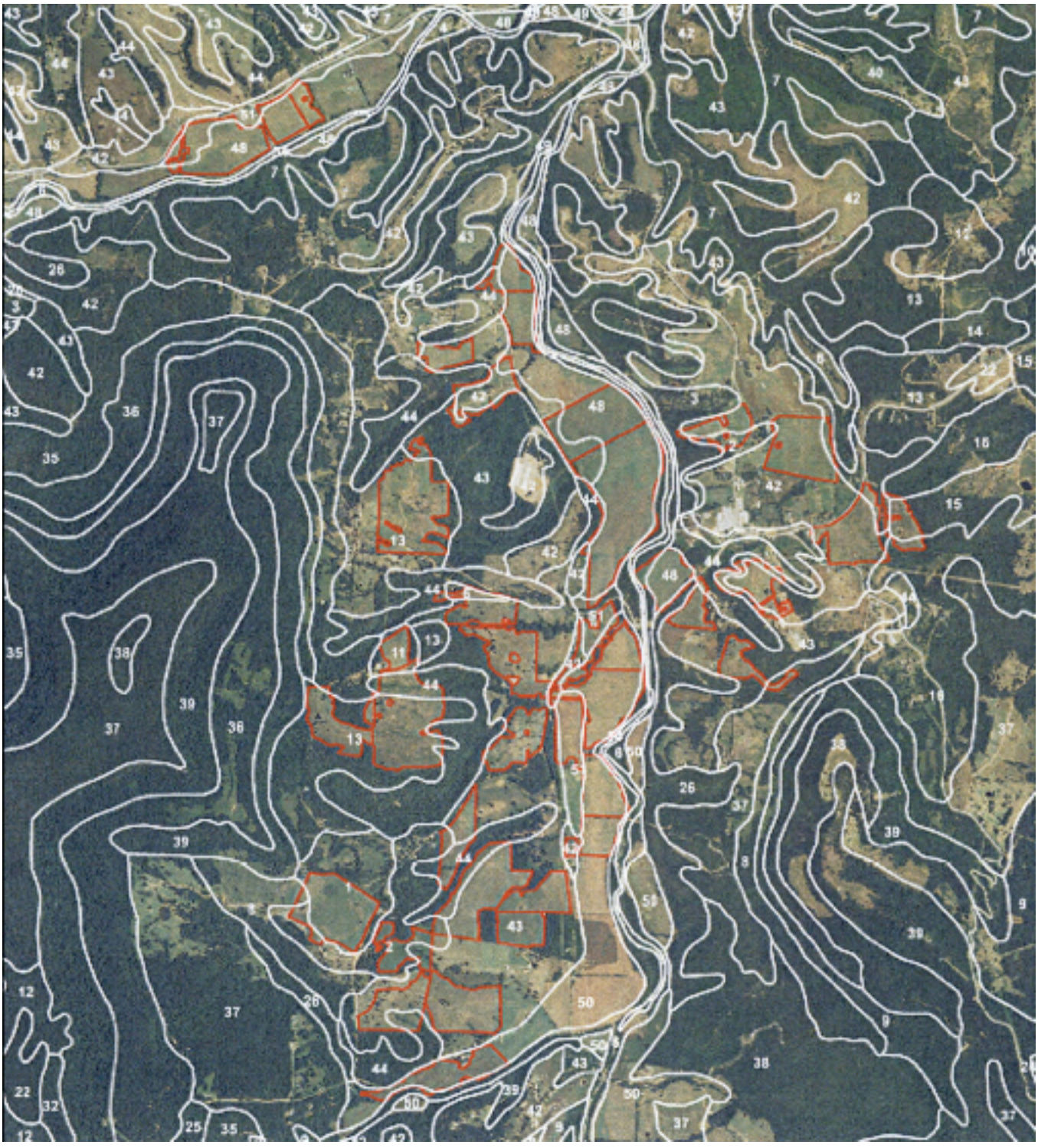
Appendix B1

Map of proposed spreading fields:



Appendix B2 - Soil types, flood plains 1 of 3

Map of soil types:



Appendix B2 - Soil types, flood plains Page 2 of 3

Soil types:

SYMBOL	NAME
1	Arkana very cherty silt loam, 3 to 8 percent slopes
2	Arkana-Moko complex, 8 to 20 percent slopes 1/
3	Arkana-Moko complex, 20 to 40 percent slopes 1/
4	Britwater gravelly silt loam, 3 to 8 percent slopes
5	Ceda cobbly loam, frequently flooded
6	Ceda-Kenn complex, frequently flooded
7	Clarksville very cherty silt loam, 20 to 50 percent slopes
8	Eden-Newnata complex, 8 to 20 percent slopes 1/
9	Eden-Newnata complex, 20 to 40 percent slopes 1/
10	Eden-Newnata-Rock outcrop complex, 40 to 60 percent slopes 1/
11	Enders gravelly loam, 3 to 8 percent slopes
12	Enders gravelly loam, 8 to 20 percent slopes
13	Enders stony loam, 3 to 20 percent slopes
14	Enders stony loam, 20 to 40 percent slopes
15	Enders-Leesburg stony loams, 8 to 20 percent slopes 1/
16	Enders-Leesburg stony loams, 20 to 40 percent slopes 1/
17	Estate-Lily-Portia complex, 8 to 20 percent slopes 1/
18	Estate-Lily-Portia complex, 20 to 40 percent slopes 1/
19	Leadvale silt loam, 3 to 8 percent slopes
20	Lily-Udorthents-Rock outcrop complex, 8 to 20 percent slopes 1/
21	Lily-Udorthents-Rock outcrop complex, 20 to 40 percent slopes 1/
22	Linker loam, 3 to 8 percent slopes
23	Linker gravelly loam, 3 to 8 percent slopes
24	Linker-Mountainburg complex, 3 to 8 percent slopes
25	Linker-Mountainburg complex, 8 to 20 percent slopes
26	Moko-Rock outcrop complex, 15 to 50 percent slopes 1/
27	Mountainburg gravelly fine sandy loam, 3 to 8 percent slopes
28	Mountainburg very stony fine sandy loam, 3 to 8 percent slopes
29	Mountainburg very stony fine sandy loam, 8 to 20 percent slopes
30	Mountainburg very stony fine sandy loam, 20 to 40 percent slopes
31	Nella gravelly loam, 3 to 12 percent slopes
32	Nella gravelly loam, 12 to 20 percent slopes
33	Nella stony loam, 8 to 20 percent slopes
34	Nella stony loam, 20 to 40 percent slopes
35	Nella-Enders stony loams, 8 to 20 percent slopes 1/
36	Nella-Enders stony loams, 20 to 40 percent slopes 1/
37	Nella-Steprock complex, 8 to 20 percent slopes 1/
38	Nella-Steprock-Mountainburg very stony loams, 20 to 40 percent slopes 1/
39	Nella-Steprock-Mountainburg very stony loams, 40 to 60 percent slopes 1/
40	Nixa very cherty silt loam, 3 to 8 percent slopes
41	Nixa very cherty silt loam, 8 to 12 percent slopes
42	Noark very cherty silt loam, 3 to 8 percent slopes
43	Noark very cherty silt loam, 8 to 20 percent slopes
44	Noark very cherty silt loam, 20 to 40 percent slopes
45	Peridge silt loam, 3 to 8 percent slopes
46	Portia sandy loam, 3 to 8 percent slopes
47	Portia sandy loam, 8 to 12 percent slopes
48	Razort loam, occasionally flooded
49	Riverwash, frequently flooded
50	Spadra loam, occasionally flooded
51	Spadra loam, 2 to 5 percent slopes
52	Steprock gravelly loam, 3 to 8 percent slopes
53	Wideman loamy fine sand, frequently flooded

Photo uses Reg 6 NOI field numbering

TABLE 1 SOIL P-STATUS, FERTILITY RECOMMENDATION, AND SUITABILITY FOR WASTE APPLICATION BASED ON STEEPNESS AND SHAPE OF APPLICATION AREA

Field	spread-able ac	STP	P-Nutrient Status	Recommendation P2O5 lb/ac	Suitability for waste application
Field 1	8.4	95	Above Optimum	0	Fair – contorted
Field 2	6	108	Above Optimum	0	Poor – Steep, contorted
Field 3	15	89	Above Optimum	0	Good
Field 4	7.2	75	Above Optimum	0	Poor – steep, contorted
*Field 5**	9.7	63	Above Optimum	0	Good
*Field 6**	5.6	116	Above Optimum	0	Good
Field 7	64	89	Above Optimum	0	Good
Field 8	7.2	82	Above Optimum	0	Good
Field 9	25	82	Above Optimum	0	Good
Field 10	14	72	Above Optimum	0	Good
Field 11	14	62	Above Optimum	0	Poor - contorted
Field 12	11	88	Above Optimum	0	Good
Field 13	12	86	Above Optimum	0	Good
Field 14	8.1	75	Above Optimum	0	Fair - steep
Field 15	23	72	Above Optimum	0	Good
Field 16	15	66	Above Optimum	0	Good
Field 17	32	86	Above Optimum	0	Good
*Field 6A**	7.9	111	Above Optimum	0	Poor - contorted
*Field 7A***	28	38	Optimum	45	Good
*Field 8a***	1.4	82	Above Optimum	0	Good
*Field 9a***	10	57	Above Optimum	0	Good
*Field 10A***	16	100	Above Optimum	0	Good
*Field 13A***	31	75	Above Optimum	0	Good
*Field 13B***	8.5	61	Above Optimum	0	Poor – steep, contorted
*Field 15A***	10	18	Low	80	Fair - contorted
*Field 15B***	15	66	Above Optimum	0	Poor – contorted, steep
*Field 18**	23	42	Optimum	45	Good
*Field 19**	11	66	Above Optimum	0	Good
*Field 20**	22	63	Above Optimum	0	Good
*Field 21**	20	12	Very Low	120	Very Poor – contorted, steep
*Field 21A**	6	21	Low	80	Fair - steep
*Field 21B**	6	38	Optimum	45	Very Poor - contorted
*Field 22**	36	38	Optimum	60	Good - steep
*Field 23**	28	56	Above Optimum	0	Good
*Field 24**	8	45	Optimum	45	Good
*Field 32**	10	57	Above Optimum	0	Good
*Field 33**	4	52	Above Optimum	0	Good
*Field 34**	14	56	Above Optimum	0	Good
*Field 35**	18	40	Optimum	45	Good - contorted
*Field36**	9.3	20	Low	110	Fair - contorted

*Fields newly designated in this plan

**Fields created by subdividing fields used in previous plans

Example:

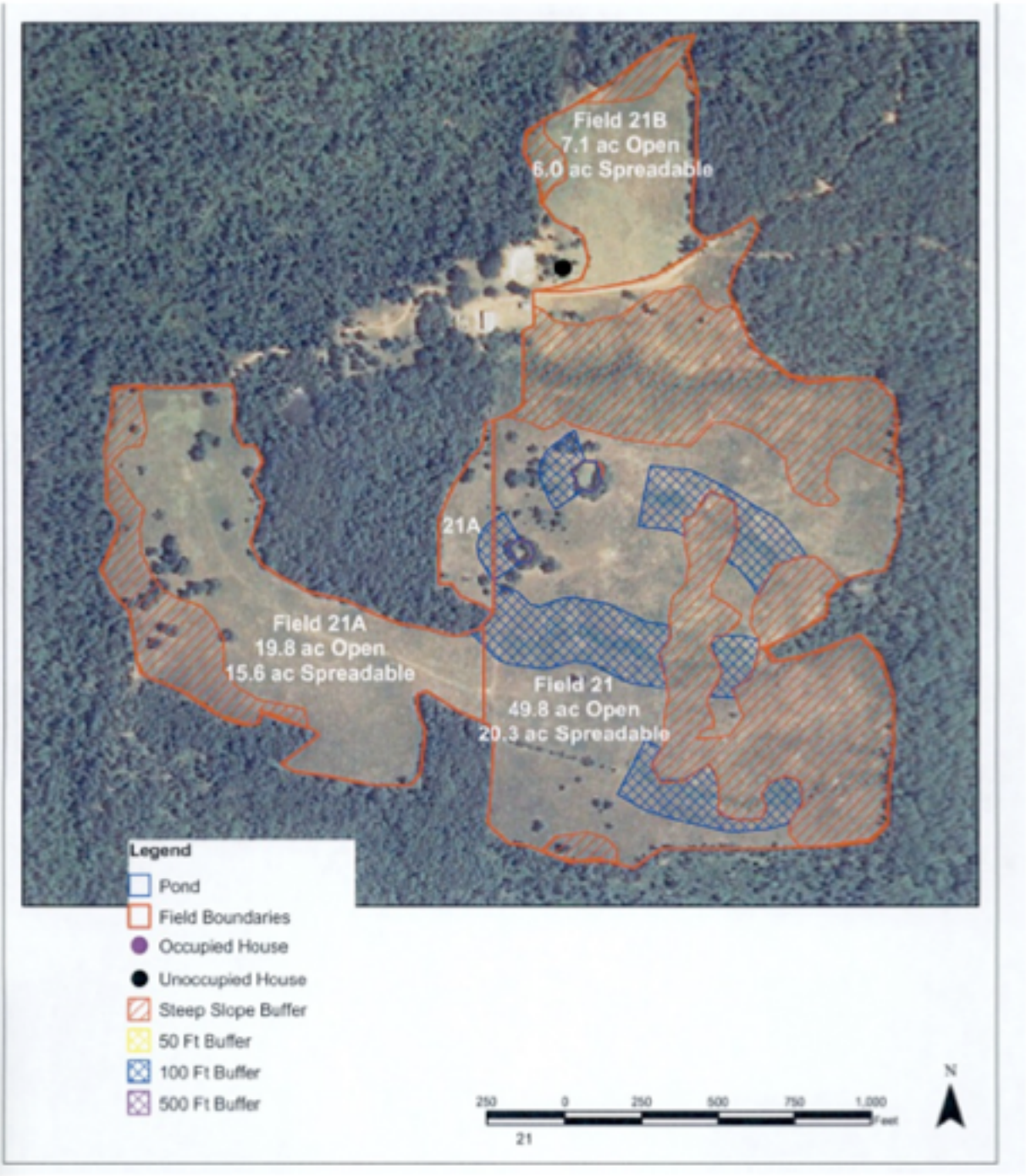
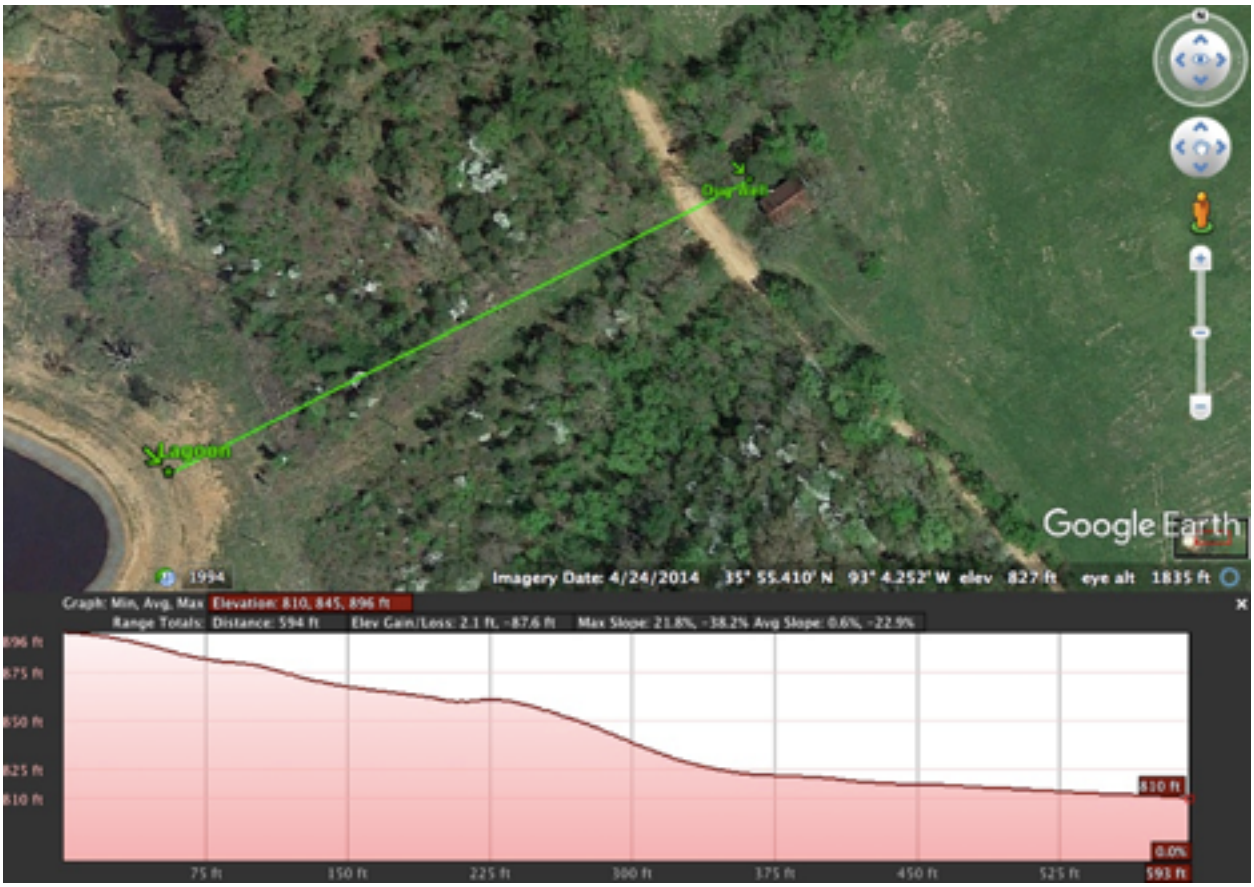


FIGURE 1 EXAMPLE OF A FIELD 21A, WHICH IS CONTORTED AND INAPPROPRIATE FOR WASTE APPLICATION

FIGURE 2 PHOTOGRAPH OF FIELD 2 SHOWING POOR MANAGEMENT OF FORAGE PRODUCTION AND GRAZING. PHOTO BY BRWA TAKEN FEBRUARY 17, 2017.

FIGURE 3 AERIAL VIEW OF FIELDS 2 AND 3 SHOWING COW TRAILS AND OTHER EVIDENCE OF ERODIBLE CONDITIONS.

Hand dug well with distance and gradient:



B39 - Wheeler well with distance and gradient:

B-40 Drilled Well

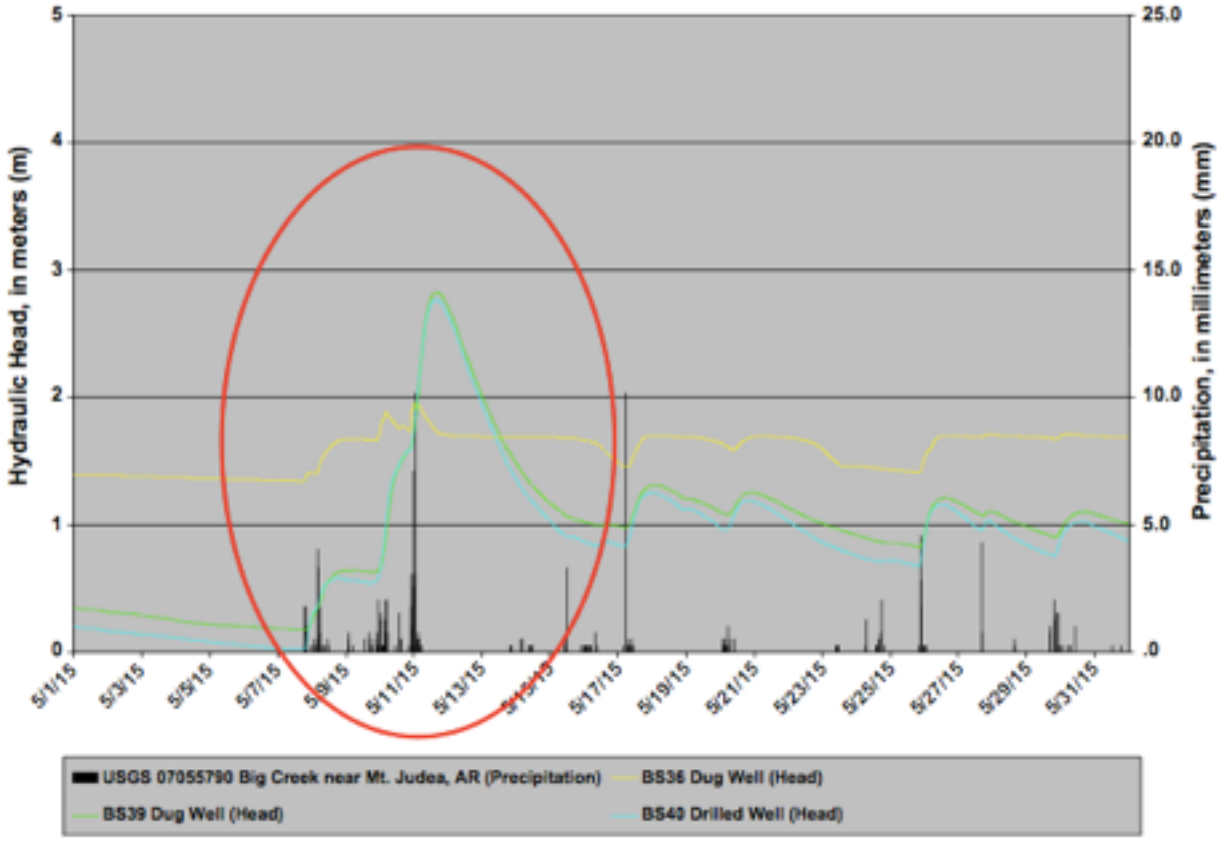
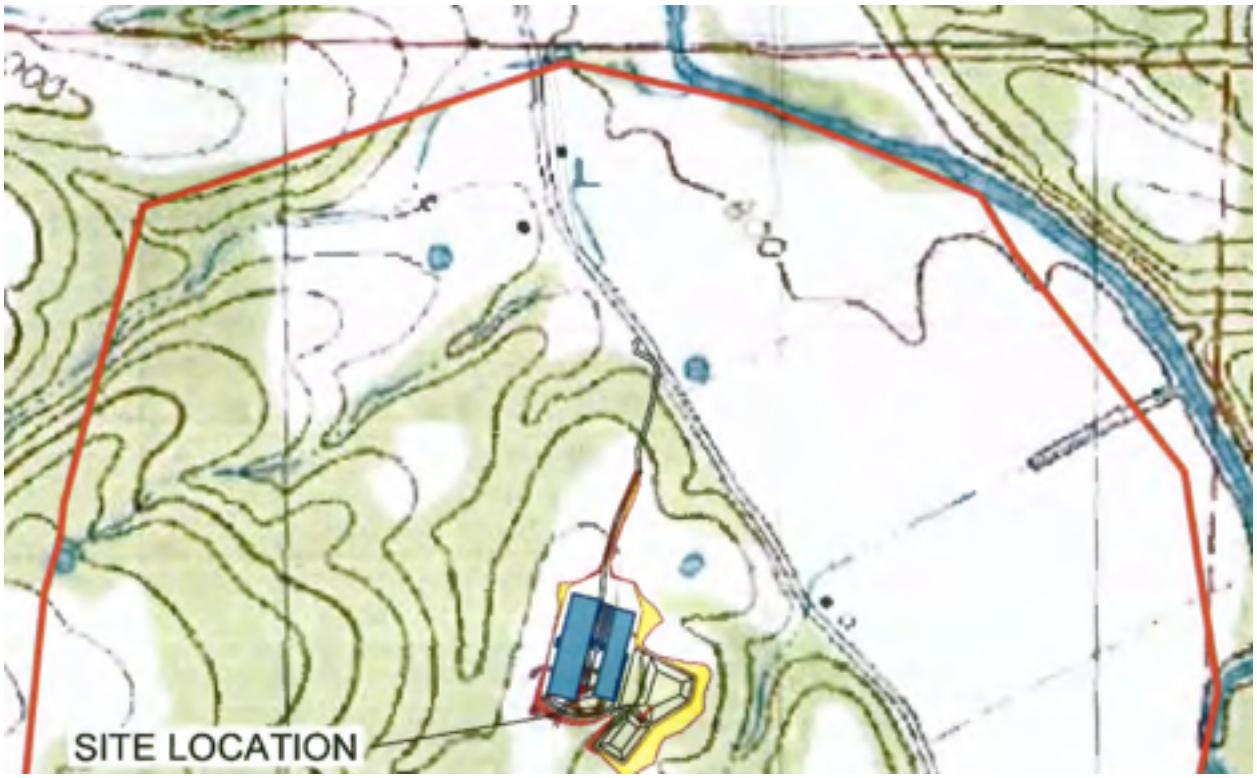


Fig. 13 Hydrographs of three groundwater wells, BS-36, BS-39, and BS-40 for the month of May 2015. The hydrographs show the groundwater level (rise and fall) on the *vertical axis* plotted against time on the *horizontal axis*. As in Fig. 12, precipitation is shown by the *vertical lines* and the scales for the figures are presented in the same locations. The timing of the causes (precipitation) and effects (groundwater-level response) can be subtracted, and is called the lag time. In this case, the time lag was essentially zero, indicating that groundwater levels started rising as soon as the precipitation started. The magnitude of the water-level increases is a reflection of the change in storage as the groundwater moves downgradient, and varies for different hydrologic settings in the Boone Formation (BS-36), the epikarst at the top of the Boone (BS-39), and the Big Creek alluvium and terrace deposits (BS-40) that lie above the Boone in Big Creek Valley

Appendix C2-B 2,000 ft radius from facility



Appendix C3 - Review of permeability determination

3. *Geologic Investigation*

The USDA Soil Survey predicts that the soil in the location of the storage structures is primarily a Noark very cherty silt loam, 3 to 8% slopes, (42). The soil profile for 42 from 0 to 14 inches is very gravelly silt loam, from 14-43 inches is very gravelly silty clay, and from 43-72 inches is very gravelly clay.

The holding ponds will be constructed with an 18-inch thick liner.

Geotechnical & Testing Services conducted laboratory tests on some of the samples. Atterburg limits were run on the soil samples for the sandy lean clay. The results were as follows:

Boring #	Depth (ft)	Description	LL	PL	PI
2	3.0– 4.5'	Silty Lean Clay	38	22	16
2	4.5 – 6.0'	Sandy Lean Clay	44	24	20
2	7.0 – 8.5'	Fat Clay w/sand	93	38	55
2	9.5-11'	Sandy Fat Clay	64	23	41
3	7-8.5'	Fat Clay w/sand	58	36	22
3	9.5-11'	Clayey Gravel with Sand	81	44	37

The soil proposed for the holding pond liner is Fat Clay w/sand and Fat Clay w/sand (CL) identified in the soils report at the depths of 7-11' feet in boring numbers 2-3.

Recompacted soil test are currently being run to determine the Coefficient of Permeability using Darcy's Law. Results will be forwarded on once they are completed by the testing lab.

Currently it is recommended that the liner be constructed at 95% compaction +-2% Optimum Moisture to meet seepage requirements. This may change based off results from the Recompacted Permeability.

The seepage rate of any compacted liner that will be used will be less than the maximum allowable seepage rate of 5,000 Gallons/acre/per day as required by Arkansas Department of environment Quality.

1) Here is where they will get the liner material.

Appendix C3 - Review of permeability determination

LOG OF BORING NO.B-2
Proposed Pond and Building Pads
Mt. Judea, Arkansas

GTS, Inc.
Fayetteville, AR

Project No.: 12-15049 Location: Shown on Boring Location Diagram

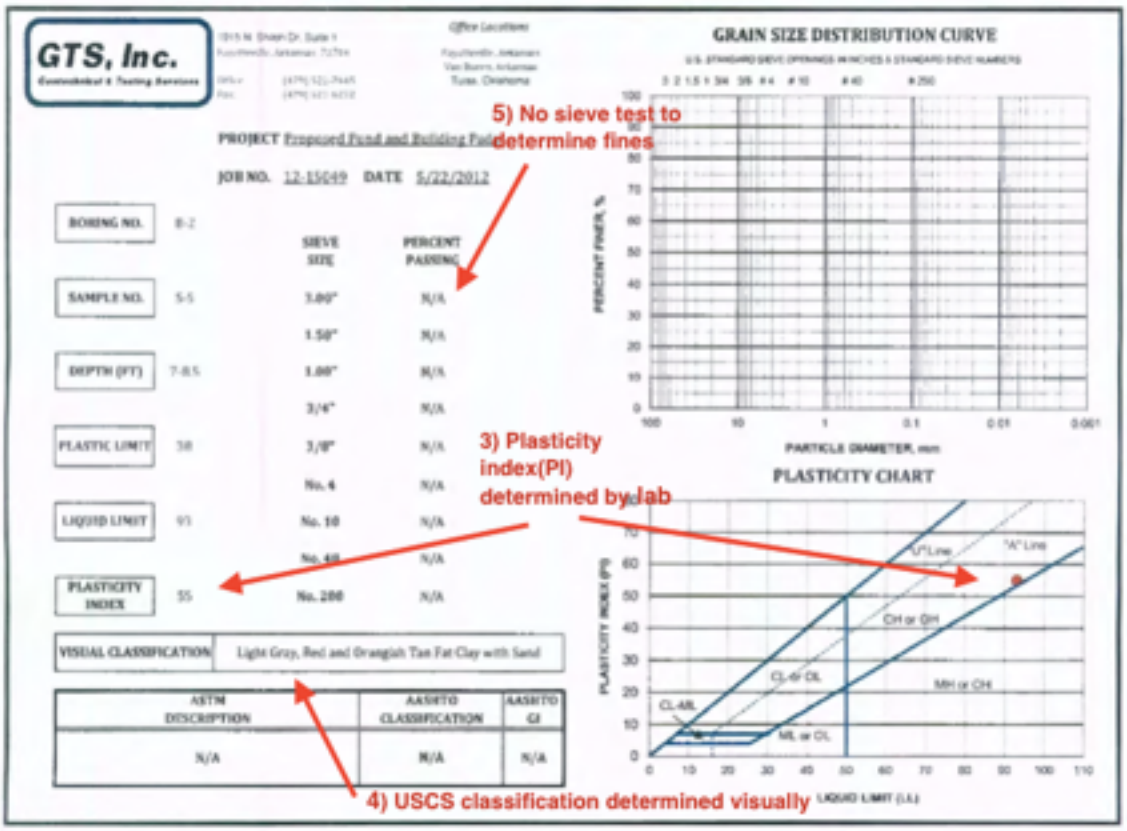
DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL Surface Description=Grass Cover Rootmat = 2"	USCS	%-#200	HAND PENETROMETER, TSF ● LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) WATER CONTENT, % ● (PL, LL; 20, 40, 60, 80)	BLOWS PER FT
0			1	13	SILT, with sand medium dense, brown with organics	SM			25
2.5			2	15	CLAYEY GRAVEL, with sand dense, red and tan with chert fragments	GC			30
5			3	18	CLAYEY SAND / SANDY LEAN CLAY dense, very stiff, red and tan with extremely weathered sandstone fragments and chert fragments	CL			30
			4	18		SC			26
7.5			5	18	FAT CLAY, with sand very stiff, light gray, red and orangish tan	CH			22
10			6	17	SANDY FAT CLAY very stiff, light gray, red and orangish tan	CH			25
12.5			7	15	GRAVELLY FAT CLAY very stiff, light gray, red and orangish tan with chert fragments	CH			65
15			8	18	FAT CLAY, with gravel very stiff, light gray and tan with chert fragments	CH			34
17.5					FAT CLAY very stiff, tan with ferrous nodules	CH			

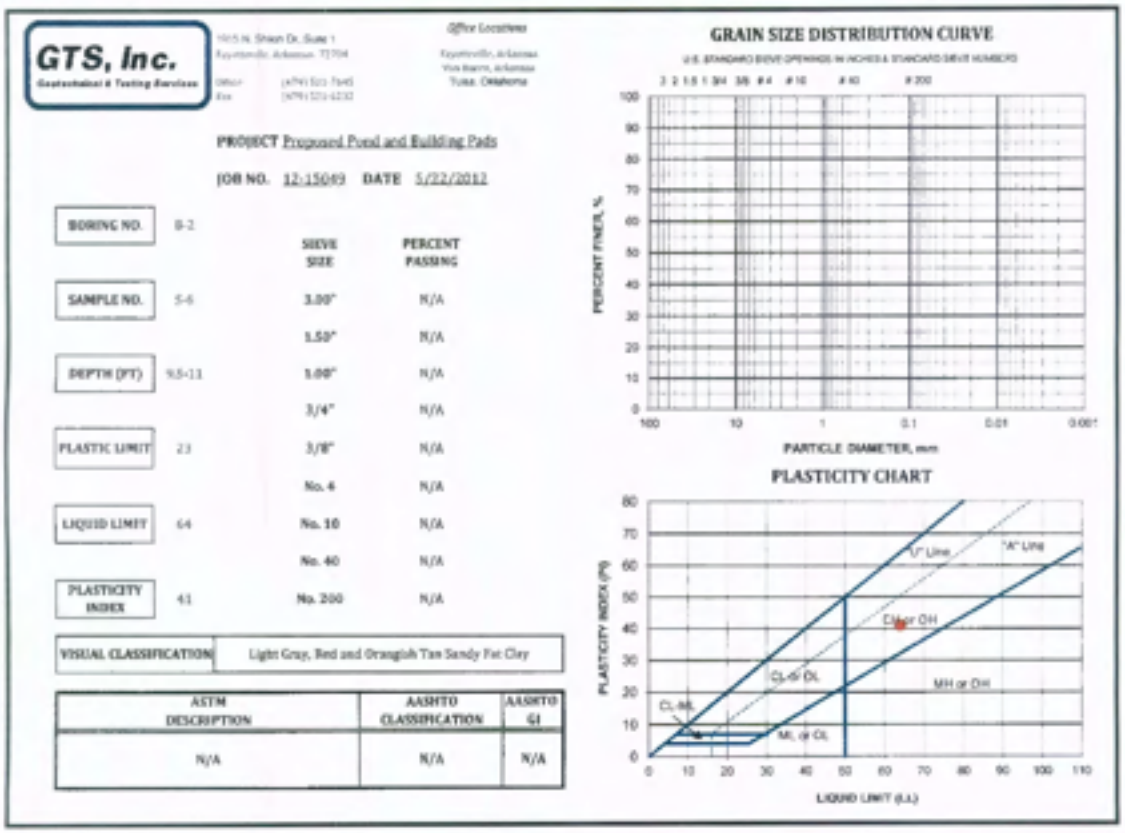
COMPLETION DEPTH: 18.5 ft.
DATE: 5/15/2012
RIG: Diedrich D-50

DEPTH TO WATER: DURING DRILLING: DRY
AT COMPLETION: DRY
AT 24 HOURS: N/A

Page 1 of 2

2) Samples 5 & 6 from Boring No B-2. B-3 samples 5 and 6 are also used but not shown here. USCS designations are not determined yet.


GTS, Inc.
GRAIN SIZE DISTRIBUTION CURVE
PROJECT Proposed Pond and Building Pads
JOB NO. 12-15049 DATE 5/22/2012
BORING NO. B-2
SAMPLE NO. S-5
DEPTH (FT) 7-8.5
PLASTIC LIMIT 38
LIQUID LIMIT 93
PLASTICITY INDEX 55
SIEVE SIZE
PERCENT PASSING
3.00" N/A
1.50" N/A
1.00" N/A
3/4" N/A
3/8" N/A
No. 4 N/A
No. 10 N/A
No. 40 N/A
No. 200 N/A
PERCENT FINER, %
PARTICLE DIAMETER, mm
PLASTICITY CHART
PLASTICITY INDEX (PI)
LIQUID LIMIT (LL)
"U" Line
"A" Line
CH or OH
CL-ML
CL or OL
MH or OH
ML or OL
VISUAL CLASSIFICATION
Light Gray, Red and Orangish Tan Fat Clay with Sand
ASTM DESCRIPTION
AASHTO CLASSIFICATION
AASHTO GI
N/A
N/A
N/A
5) No sieve test to determine fines
3) Plasticity index(PI) determined by lab
4) USCS classification determined visually


GTS, Inc.
GRAIN SIZE DISTRIBUTION CURVE
PROJECT Proposed Pond and Building Pads
JOB NO. 12-15049 DATE 5/22/2012
BORING NO. B-2
SAMPLE NO. S-6
DEPTH (FT) 9.5-11
PLASTIC LIMIT 23
LIQUID LIMIT 64
PLASTICITY INDEX 41
SIEVE SIZE
PERCENT PASSING
3.00" N/A
1.50" N/A
1.00" N/A
3/4" N/A
3/8" N/A
No. 4 N/A
No. 10 N/A
No. 40 N/A
No. 200 N/A
PERCENT FINER, %
PARTICLE DIAMETER, mm
PLASTICITY CHART
PLASTICITY INDEX (PI)
LIQUID LIMIT (LL)
"U" Line
"A" Line
CH or OH
CL-ML
CL or OL
MH or OH
ML or OL
VISUAL CLASSIFICATION
Light Gray, Red and Orangish Tan Sandy Fat Clay
ASTM DESCRIPTION
AASHTO CLASSIFICATION
AASHTO GI
N/A
N/A
N/A

6) Unified soil classification system (USCS) classification is based on sieve

Symbol chart [edit]

Major divisions			Group symbol	Group name
Coarse grained soils more than 50% retained on or above No.200 (0.074 mm) sieve	gravel > 50% of coarse fraction retained on No.4 (4.75 mm) sieve	clean gravel <5% smaller than No.200 Sieve	GW	well-graded gravel, fine to coarse gravel
			GP	poorly graded gravel
		gravel with >12% fines	GM	silty gravel
			GC	clayey gravel
	sand ≥ 50% of coarse fraction passes No.4 (4.75 mm) sieve	clean sand	SW	well-graded sand, fine to coarse sand
			SP	poorly graded sand
		sand with >12% fines	SM	silty sand
			SC	clayey sand
Fine grained soils 50% or more passing the No.200 (0.074 mm) sieve	silt and clay liquid limit < 50	inorganic	ML	silt
			CL	clay of low plasticity, lean clay
		organic	OL	organic silt, organic clay
	silt and clay liquid limit ≥ 50	inorganic	MH	silt of high plasticity, elastic silt
			CH	clay of high plasticity, fat clay
		organic	OH	organic clay, organic silt
Highly organic soils			Pt	peat

Visually determined USGS group →

Table 10D–4 Unified classification versus soil permeability groups 1/

Unified Soil Classification System Group Name	Soil permeability group number and occurrence of USCS group in that soil			
	I	II	III	IV
CH	N	N	S	U
MH	N	S	U	S
CL	N	S	U	S
ML	N	U	S	N
CL–ML	N	A	N	N
GC	N	S	U	S
GM	S	U	S	S
GW	A	N	N	N
SM	S	U	S	S
SC	N	S	U	S
SW	A	N	N	N
SP	A	N	N	N
GP	A	N	N	N

1/ ASTM Method D–2488 has criteria for use of index test data to classify soils by the USCS.

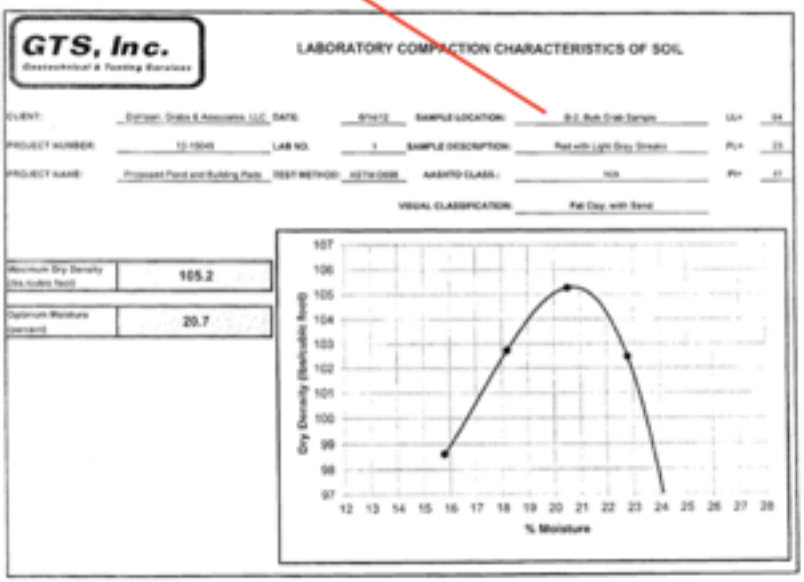
A = Always in this permeability group

N = Never in this permeability group

S = Sometimes in this permeability group (less than 10 percent of samples fall in this group)

U = Usually in this permeability group (more than 90 percent of samples fall in this group)

B-2 Bulk Grab Sample



1915 North Shiloh Drive, Suite 1
Fayetteville, Arkansas 72704
Office: (479) 521-7645
Fax: (479) 521-6232

GTS, Inc.

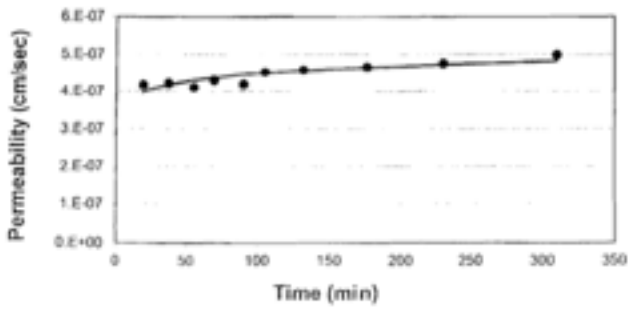
Hydraulic Conductivity Test Procedures Performed
In Accordance With ASTM D 5084 Method C
(Flexible Wall - Falling Head - Rising Tail)

HYDRAULIC CONDUCTIVITY TEST RESULTS

PROJECT: Mt. Judea - Proposed Pond and Building Pads
PROJECT NUMBER: 12-15049
BORING: B-2
SAMPLE: N/A
DEPTH (ft): 7 - 11
SAMPLE TYPE: Recompacted

Hydraulic Conductivity, k (cm/s): 5.E-07

Test Parameters	*Initial Sample Data*	*Final Sample Data* (after consolidation and testing)
Cell Pressure (psi): 8	Diameter (in): 2.57	Diameter (in): 2.55
Inflow Pressure (psi): 4	Length (in): 4.58	Length (in): 4.54
Outflow Pressure (psi): 3	Moisture Content: 21.3%	Moisture Content: 25.3%
Back Pressure (psi): 3	Wet Unit Weight (pcf): 125.2	Wet Unit Weight (pcf): 130.3
Confining Pressure (psi): 4	Dry Unit Weight (pcf): 103.2	Dry Unit Weight (pcf): 103.9
	Initial Hydraulic Gradient: 5.29	Final Hydraulic Gradient: 5.03



Notes: Sample was recompacted at 98.1% of MDD at a moisture content of 21.2% (at OMC +0.5%)

Appendix
C5 - ADEQ inspection photos

Arkansas Department of Environmental Quality
CONCENTRATED ANIMAL FEEDING OPERATION (CAFO) INSPECTION REPORT

Water Division NPDES Photographic Evidence Sheet

Location:	C&H Hog Farm, Newton County						
Photographer:	Tony Morris			**Witness:**	Phillip Campbell		
Photo #	5	**Of**	6	**Date:**	07/23/13	**Time:**	12:03
Description:	Rill erosion in Settling Basin liner; large rocks in liner. Signs of liner deterioration.						

Photographer:	Tony Morris			**Witness:**	Phillip Campbell		
Photo #	6	**Of**	6	**Date:**	07/23/13	**Time:**	17:21
Description:	Rill erosion and desiccation cracks in Holding Pond liner due to extended exposure.						

Appendix C5 - ADEQ inspection photos

Water Division Photographic Evidence Sheet					
Location:	C&H Hog Farms				
Photographer:	Jason Bolenbaugh	Date:	1/23/2014	Time:	12:02
Witness:	John Bailey, Jason Henson			Photo #:	1
Description:	Inside of Holding Pond 2. Note erosion rills and unstabilized banks. Holding Pond Must Pumpdown elevation is indicated in red on the Must Pumpdown gauge.				

Photographer:	Jason Bolenbaugh	Date:	1/23/2014	Time:	12:16
Witness:	John Bailey, Jason Henson			Photo #:	2
Description:	Inside of Holding Pond 1. Note the unstabilized banks. Waste water is not currently running over the spillway into Holding Pond 2.				

Appendix C6 - Original NOI bore holes

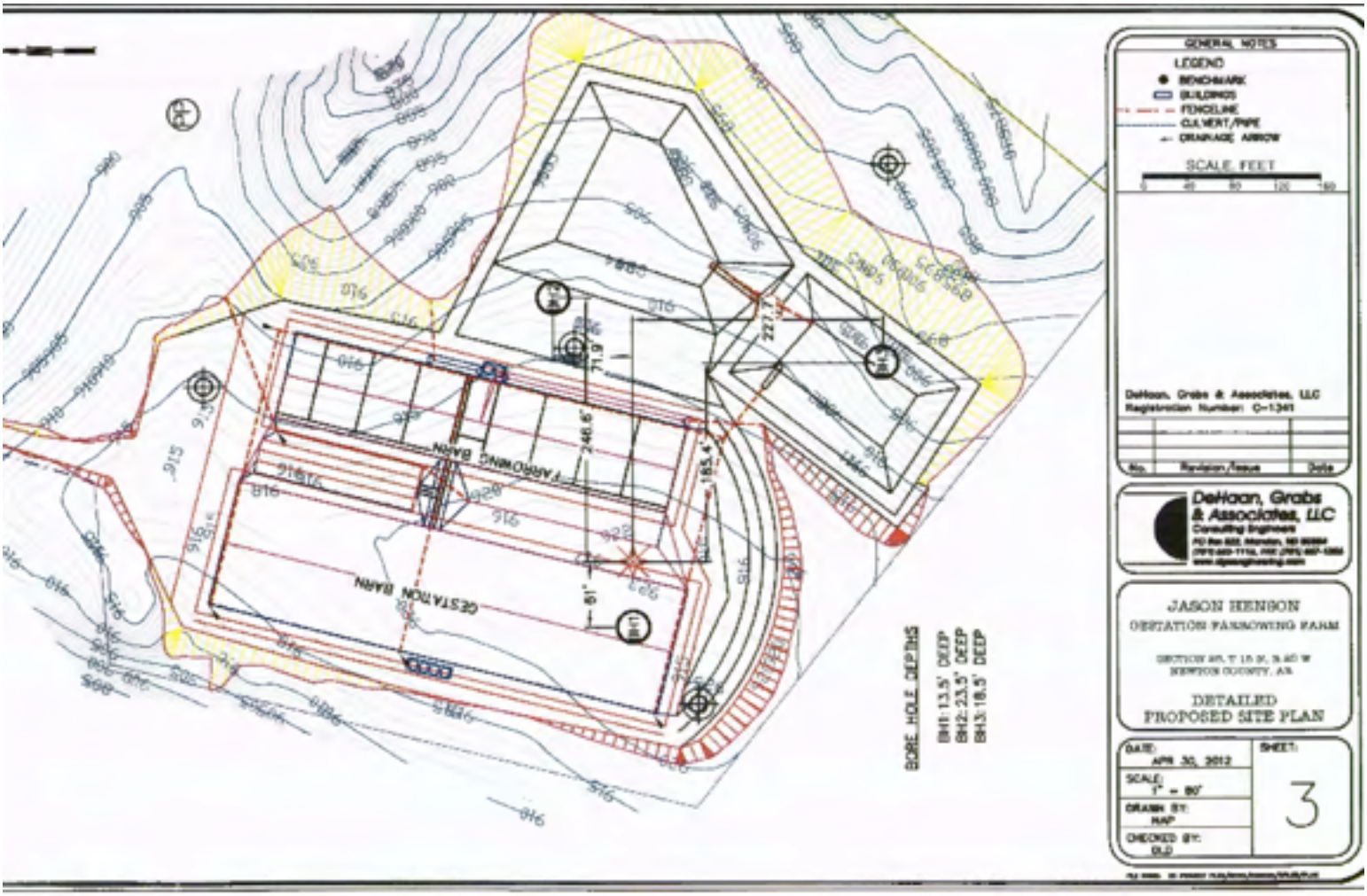
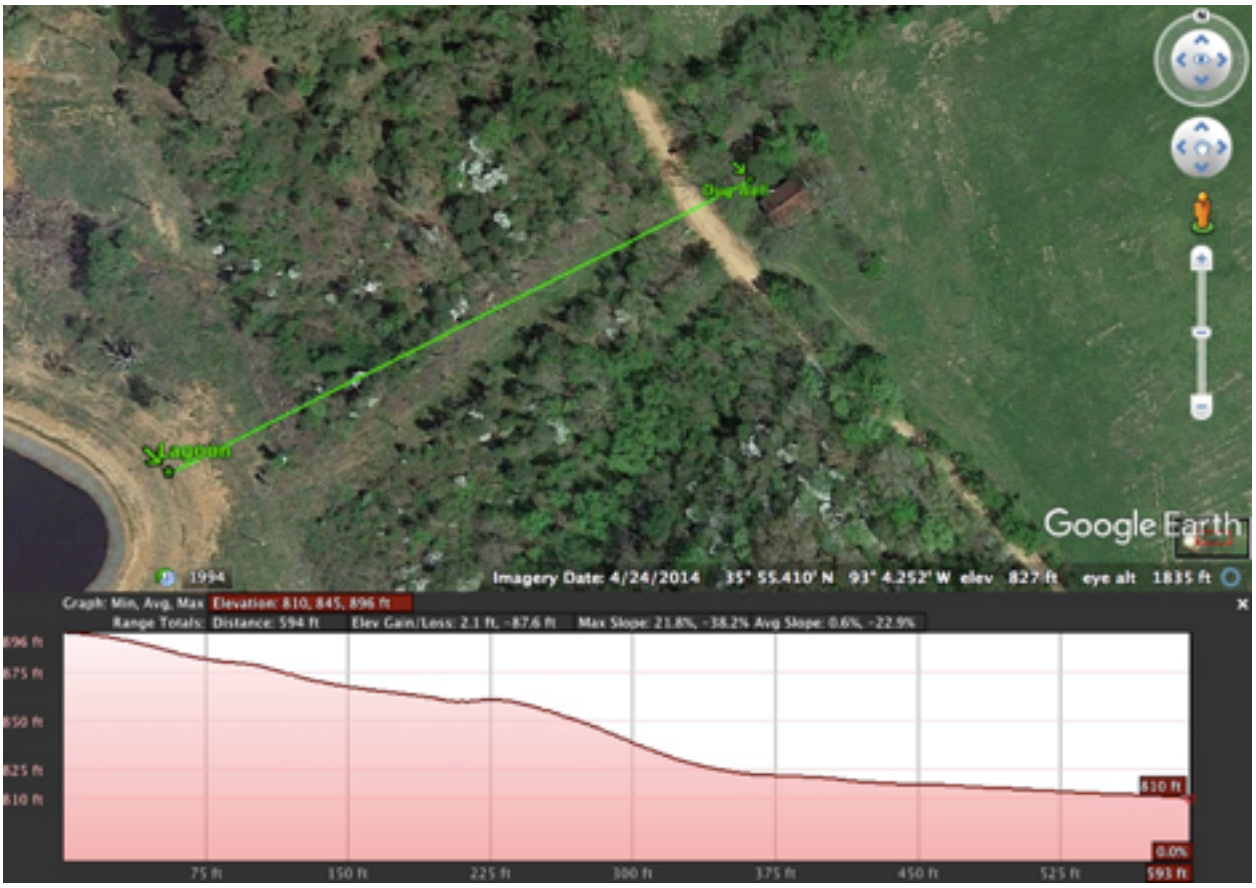


Table 10–4 Criteria for siting, investigation, and design of liquid manure storage facilities

Vulnerability ↓ / Risk →	**Very high** <1,500 ft from public drinking water supply wells; **OR** <100 ft from any domestic well or Class 1 stream	**High** Does not meet Very High Risk criteria; **AND** Recharge areas for Sole Source aquifers; **OR** 100 to 600 ft from unconfined domestic water supply well (or where degree of aquifer confinement is unknown) or Class 1 stream	**Moderate** Does not meet High Risk criteria; **AND** 600 to 1,000 ft from unconfined domestic well (or where degree of aquifer confinement is unknown) or Class 1 stream; **OR** <600 ft from unconfined nondomestic water supply well (or where degree of aquifer confinement is unknown) or Class 2 stream	**Slight** Does not meet Moderate Risk criteria; **AND** >1,000 ft from unconfined domestic well (or where degree of aquifer confinement is unknown) or Class 1 stream; **AND** >600 ft from unconfined nondomestic water supply well (or where degree of aquifer confinement is unknown) or Class 2 stream
Very high Large voids (e.g., karst, lava tubes, mine shafts); **OR** Highest anticipated ground water elevation within 5 ft of invert; **OR** <600 ft from improperly abandoned well*	**Evaluate other storage alternatives** * (or properly seal well and reevaluate vulnerability)	**Evaluate other storage alternatives** * (or properly seal well and reevaluate vulnerability)		
High Does not meet Very High Vulnerability criteria **AND** Bedrock (assumed fractured) within 2 ft of invert; **OR** Coarse soils/parent material (Permeability Group I soils as defined in AWMFH, always including GP, GW, SP, SW); **OR** Highest anticipated groundwater elevation is between 5 to 20 ft below invert; **OR** 600 to 1,000 ft from improperly abandoned well*		**Synthetic liner required** * (or properly seal well and reevaluate vulnerability) No additional site characterization required	**Liner required** * (or properly seal well and reevaluate vulnerability) Specific discharge $\leq 1\times10^{-6}$ cm³/cm²/s No manure sealing credit Earthen liner design includes sampling and testing of liner material (Classification, Standard Proctor compaction, Permeability)	**Liner required** * (or properly seal well and reevaluate vulnerability). Specific Discharge $\leq 1\times10^{-6}$ cm³/cm²/s No manure sealing credit Earthen liner design includes sampling and classification testing of liner material Published permeability data and construction method specifications may be used
Moderate Does not meet High Vulnerability criteria; **AND** Medium soils/parent material (Permeability Group II soils as defined in AWMFH, usually including CL-ML, GM, SM, ML); **OR** Flocculated or blocky clays (typically associated with high Ca); **OR** Complex stratigraphy (discontinuous layering); **OR** Highest anticipated ground water elevation is between 21 to 50 ft below invert; **OR** 600–1,000 ft from improperly abondoned well*	**Evaluate other alternatives or synthetic liner as allowed** Local regulations may apply Consult with area engineer	**Further evaluate need for liner** Specific discharge $\leq 1\times10^{-6}$ cm³/m²/s No manure sealing credit Earthen liner/no liner design includes sampling and testing of liner/in-place material (Classification, Standard Proctor compaction/in-place density, Remolded/Undisturbed sample Permeability)	**Further evaluate need for liner** Specific discharge $\leq 1\times10^{-6}$ cm³/cm²/s No manure sealing credit Earthen liner/no liner design includes sampling and testing of liner/in-place material (Classification, Standard Proctor compaction/ in-place density, Remolded/Undisturbed sample Permeability)	**Further evaluate need for liner** Specific discharge $\leq 1\times10^{-6}$ cm³/cm²/s No manure sealing credit Earthen liner/no liner design includes sampling and classification testing of liner/ in-place material + in-place density Published permeability data and construction method specifications may be used
Low Does not meet Moderate Vulnerability criteria; **AND** Fine soils/parent material (Permeability Group III and IV soils as defined in AWMFH, usually including GC, SC, MH, CL, CH); **AND** Highest anticipated ground water elevation is >50 ft below invert		**Further evaluate need for liner** Specific discharge $\leq 1\times10^{-6}$ cm³/cm²/s No manure sealing credit Earthen liner/no liner design includes sampling and testing of liner/ in-place material (Classification, Standard Proctor compaction/ in-place density, Remolded/ Undisturbed sample Permeability) Scarify and recompact surface to seal cracks and break down soil structure as appropriate	**Liner not required** Specific discharge $\leq 1 \times 10^{-6}$ cm³/cm²/s Field classification and published permeability data may be used Construction method specifications may be used Scarify and recompact surface to seal cracks and break down soil structure as appropriate	

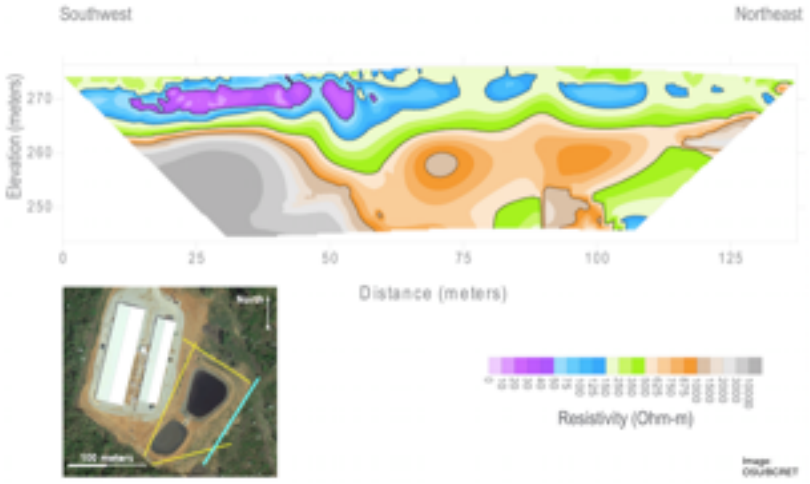
*See local regulations

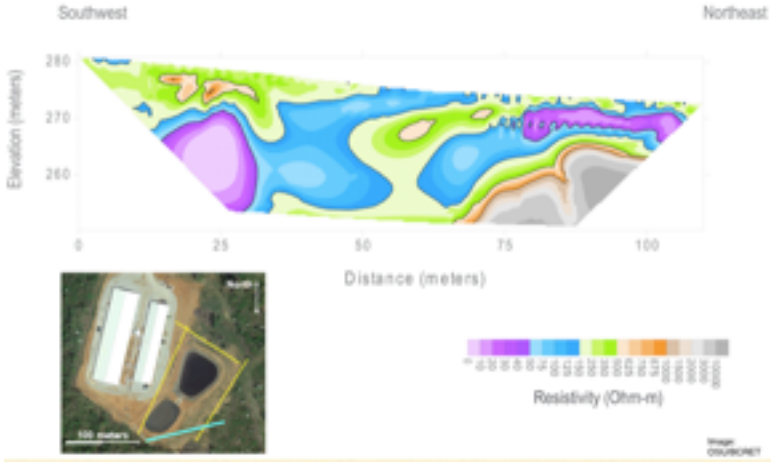
Appendix C10B - Improperly Abandoned well

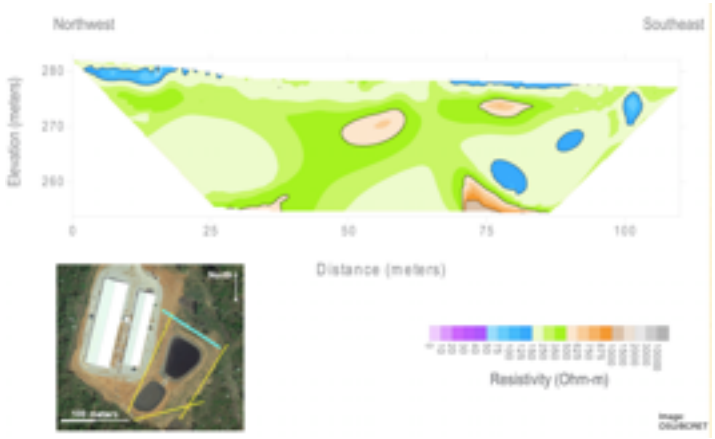


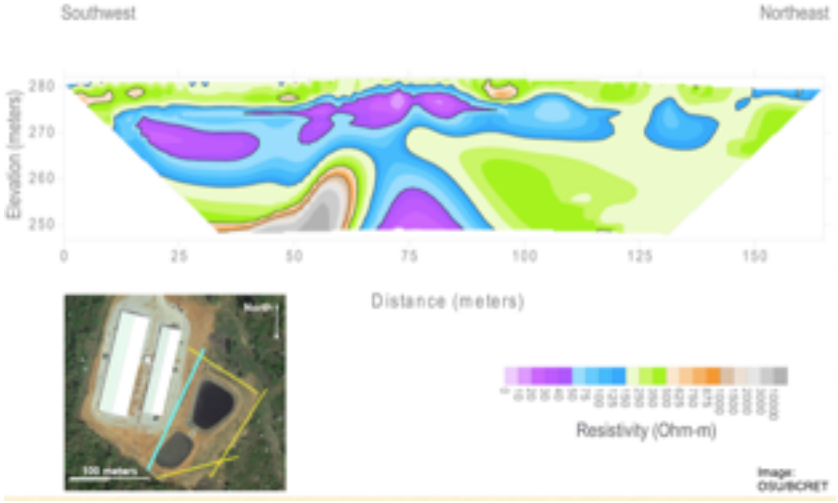
Appendix C10B - Improperly Abandoned well

Appendix C11 - OK State Resistivity Study Transects





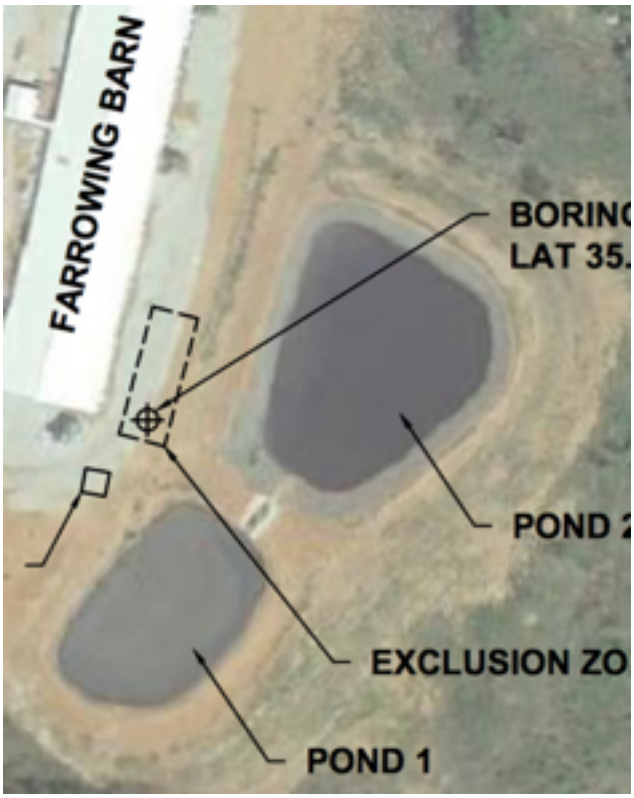


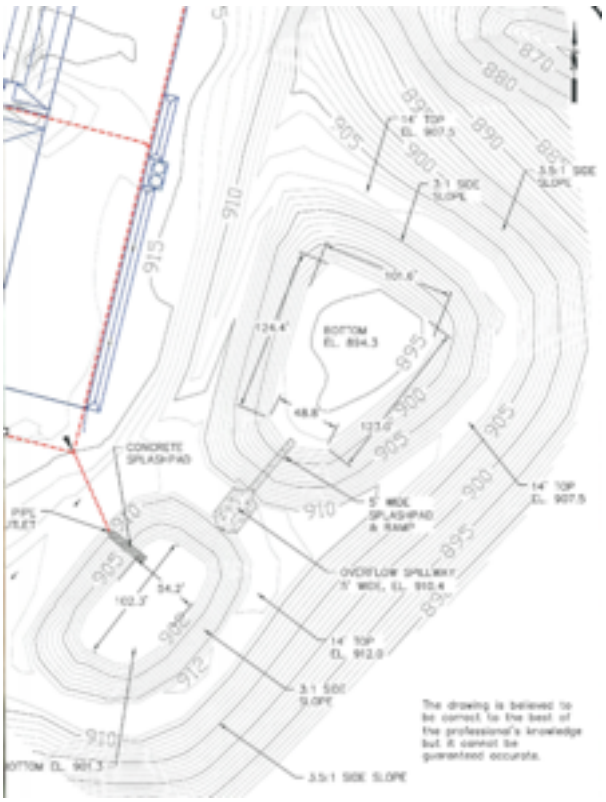


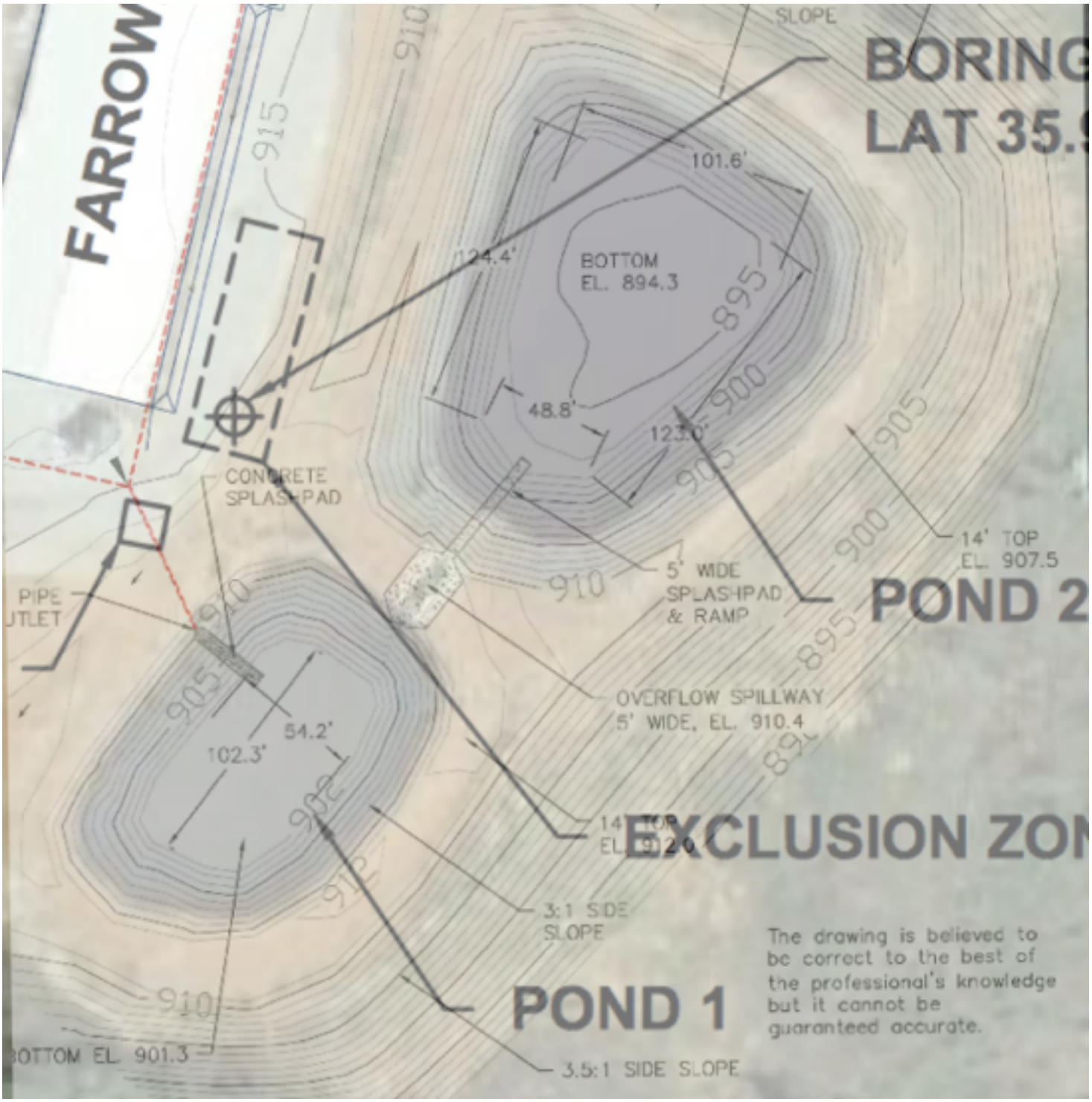
Appendix C12 - Determination of Elevations

Photo is from the Harbor Environmental Study: FIGURE 2 C & H Hog Farm - Site Layout map

2nd item is the AS BUILT elevations - Engineering Plan Sheets April 12, 2013

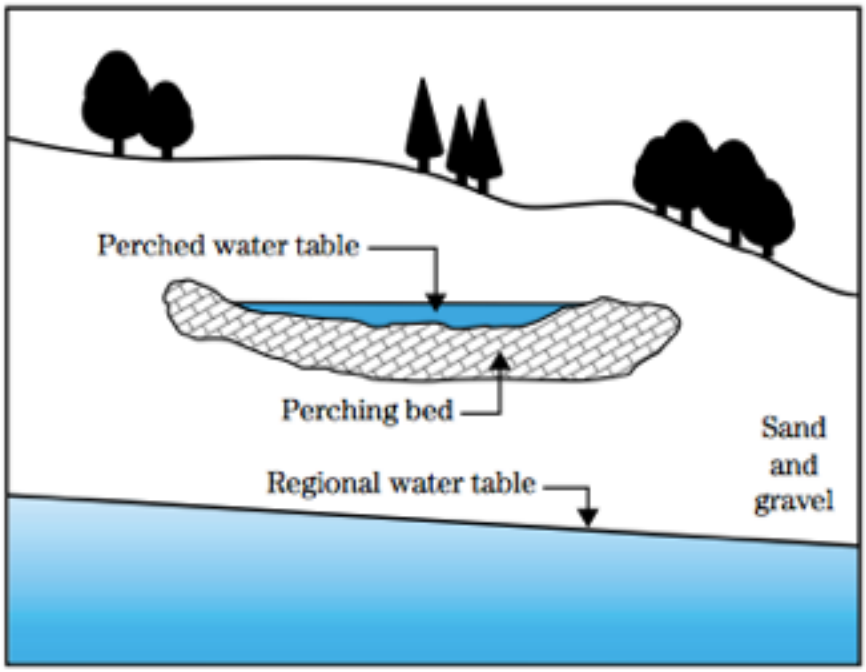


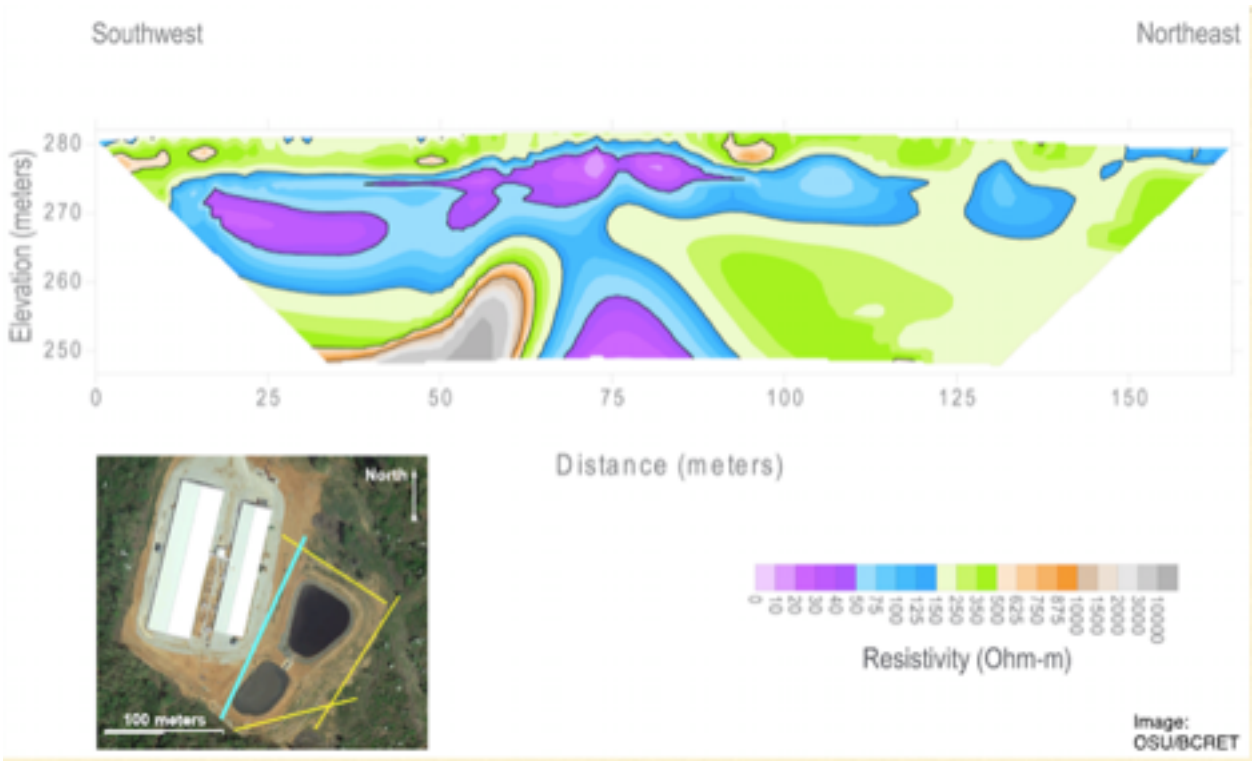



FARROW
915
910
SLOPE
BORING
LAT 35.
101.6'
124.4'
BOTTOM
EL. 894.3
895
48.8'
123.0'
900
905
CONCRETE
SPLASHPAD
14' TOP
EL. 907.5
5' WIDE
SPLASHPAD
& RAMP
POND 2
PIPE
UTLET
910
905
895
OVERFLOW SPILLWAY
5' WIDE, EL. 910.4
54.2'
102.3'
EXCLUSION ZON
3:1 SIDE
SLOPE
The drawing is believed to
be correct to the best of
the professional's knowledge
but it cannot be
guaranteed accurate.
POND 1
910
OTTOM EL. 901.3
3.5:1 SIDE SLOPE

Appendix C13 Evidence of perched groundwater.

Figure 7–8 Perched aquifer





Appendix C15 - Leakage Standards - Other States

Table 1 Comparison of state liner design rules for selected states

State	Year	Rule*	Seepage at 6 ft depth
Georgia	2002	391-3-6-21. maximum of 1/8 inch per day (3.67 x 10-6 cm/sec). (or if) located within significant ground water recharge areas must be provided with either a compacted clay or synthetic liner such that the vertical hydraulic conductivity does not exceed 5 x 10-7 cm/sec	3394 gal/ac-day Or 1108 gal/ac-day
Iowa	2006	327 IAC 19-12-5. (a) maximum specific discharge of 1/16 in /day (1.8x10 -6 cm/ sec).	1697 gal/ac/day
Ohio	2010	901:10-2-06. A minimum of three feet of *in situ* soils with a hydraulic conductivity of 1 x 10-7 cm/sec or (b) soil liners designed and constructed using procedures in section 651.1080 of the USDA, Ohio NRCS FOTG CP Standard 521 D. (10) (a) Manure storage ponds or manure treatment lagoons may be constructed within a karst area provided that the facility is designed to prevent seepage of manure to groundwater.	277 gal/ac/day
Missouri	2012	CSR 20-8.300. A. The design permeability of the basin seal shall not exceed 500 gallons per acre per day in areas where potable groundwater might become contaminated or when the wastewater contains industrial contributions of concern. Design seepage rates up to 3,500 gallons per acre per day may be considered in other areas where potable groundwater contamination is not a concern	500 gal/ac/day Or 3,500 gal/ac/day
Iowa	2000	IAC 65.15(11) . The percolation rate shall not exceed 1/16 inch per day at the design depth of the structure.	1,697 gal/ac/day
Nebraska	2000	130-8-007. materials and construction methods so that percolation does not exceed 0.13 inches per day (3.82 x 10-6cm/sec).	3,530 gal/ac/day
Oklahoma		35:17-4-11. Hydraulic conductivities of no greater than I x 10-7 cm/sec. ...(B) At least four (4) representative undisturbed core samples, one from each corner of the waste retention structure bottom Minimum thickness of one and one half (1.5) feet. For Maximum hydrostatic head of 10.5 feet	462 gal/ac/day
North Carolina	2006	15A NCAC 02T .1005 . (IF) less than four feet above bedrock shall have a liner with a hydraulic conductivity no greater than 1 x 10^{-7} centimeters per second.	462 gal/ac/day
NRCS FOTG PART 651 Chapter 10* (Table 10-4)	2010	**VERY HIGH RISK - VERY HIGH VULNERABILITY (KARST)** – evaluate other alternatives **HIGH RISK AREA – HIGH VULNERABILITY.** – synthetic liner required (or seal and reevaluate vulnerability) **HIGH RISK AREA – MODERATE VULNERABILITY** – specific discharge 1 x 10-6 cm/sec (no manure sealing credit)	no discharge no discharge 6500 gal/ac/day with no credit for manure sealing
10 State Standard**	2005	seal shall not exceed the value derived from the following expression where L equals the thickness of the seal in centimeters. k = 2.6 x 10-9L the "k" obtained by the above expression corresponds to a percolation rate	500 gal/ac/day

* Extracted from Table 10-4 (page 10-26) Criteria for siting, investigation, and design of liquid manure storage facilities, based on Risk and Vulnerability.
**Recommended Standards for Wastewater Facilities. 2004 Edition. Health Research Inc.

United States Department of the Interior
NATIONAL PARK SERVICE
Buffalo National River
402 N. Walnut, Suite 136
Harrison, AR 72601

IN REPLY REFER TO
1.A.2

March 16, 2016

Becky Keogh
Director
Arkansas Department of Environmental Quality
5301 Northshore Drive
North Little Rock, AR 72118-5317

REFERENCE: Arkansas 2016 list of impaired streams, 303(d) list

Dear Director Keogh:

Natural resource staff at Buffalo National River has recently conducted an analysis of the Big Creek Research and Extension Team (BCRET) water quality data. Two stations of particular interest are on the main stem of Big Creek, Newton County, above its confluence with the Left Fork of Big Creek. Analysis of this data indicates that this reach of stream, Headwaters Big Creek, [12-digit Hydrologic Unit Code (HUC12) 110100050302] was impaired for *Escherichia coli* (*E. coli*) bacteria based upon Regulation 2.507 during the primary contact period of May 1 to September 30, 2014. According to the Arkansas Water Information System, this HUC12 has an area of approximately 45 square miles, making this segment of Big Creek a Primary Contact Stream. The BCRET sites BC 6 and 7 (Figure 1) are located on the main stem of Big Creek within this segment, topographically upstream and downstream, respectively, of the C&H Hog Farm, Inc. facility and manure spreading fields.

Assuming that Big Creek is not part of an Extraordinary Resource Water, Ecologically Sensitive Waterbody, or Natural and Scenic Waterway (ERW, ESW, or NSW) the upper *E. coli* limit is 410 colonies per 100 ml (410 col/100ml). Data from BCRET, during the primary contact period in 2014, shows *E. coli* exceeded 410 col/100ml in six of twenty-two samples for a 27% exceedance. According to Regulation 2.507, for assessment of ambient waters as impaired by bacteria, the *E. coli* standard shall not be exceeded in more than 25% of samples in no less than eight samples taken during the primary contact season.

The regulations enacting the Federal Clean Water Act appear to take a more conservative approach to Outstanding National Resource Waters (ONRW) [40 CFR§131.12(a)(3)] which streams are analogous to ERW, WSW, and NSW streams. Buffalo National River certainly meets the criteria as an ONRW. 40 CFR indicates that the watershed of ONRWs is part and

parcel with the ONRW itself, and strongly encourages watershed protection for maintenance and protection of the ONRW. Taking this more conservative approach to *E. coli*, the standard for Big Creek should be 298 col/100ml for an individual sample and 126 col/100ml for a geometric mean of at least five samples over a 30-day period.

During the primary contact period of 2014, BCRET Station BC 6 exceeded 298 col/100ml in eight of twenty-two samples for a 36% exceedance. Also, during the primary contact period there were three periods when the geometric mean was exceeded. These were: May 13 through June 9, 2014 when the geometric mean was 339 col/100ml; June 19 through July 15, 2014 when the geometric mean was 783 col/100ml; and August 20 through September 18, 2014 when the geometric mean was 146 col/100ml.

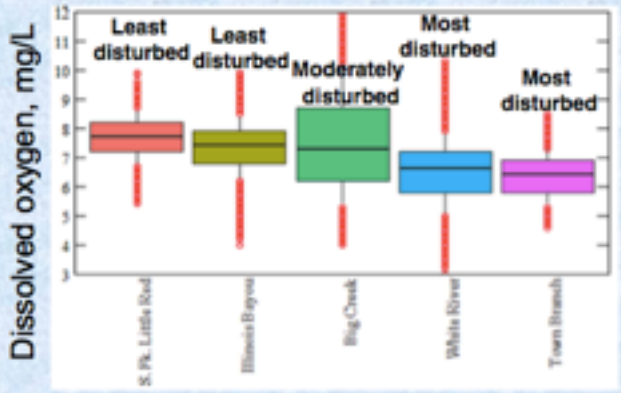
BCRET BC 7 is a station on the main stem of Big Creek downstream of the C&H Hog Farm, Inc. facility and manure spreading fields. During the primary contact period in 2014, the stream exceeded 410 col/100ml in seven out of twenty-two samples for a 32% exceedance of the standard. The stream exceeded 298 col/100 ml in seven out of twenty-two samples for a 32% exceedance of the ERW standard. The stream had two periods where the ERW geometric mean was exceeded. These were: May 13 to June 9, 2014 with a geometric mean of 283 col/100ml and June 24 to July 23, 2014 with a geometric mean of 697 col/100ml.

To further corroborate the BCRET observations from the Headwaters Big Creek hydrologic unit further down the system at ADEQ monitoring site BUFT06, data were collected by Buffalo National River within the park's boundary. *E. coli* concentrations were also elevated during the primary contact period in 2014, similar to the BCRET observations. Geometric means (five samples within a 30-day period) of *E. coli* concentrations observed two months above 126 col/100ml during that same time (Figure 2). Although the causality linkages between the *E. coli* concentrations at the BCRET sites and within the park are not fully documented, the similarity in timeframe and exceedingly high concentrations of *E. coli* at all sites during this primary contact period clearly shows the connectivity of the watershed, and what happens within the headwaters directly impacts the quality of water further downstream, in this case within the Buffalo National River. Please give this evidence strong consideration when evaluating any site within Big Creek (BUFT06) for 303(d) listing.

Data from the BCRET researchers indicate that Big Creek is indeed impaired for *E. coli* upstream of the Left Fork. Impairment of that segment can also lead to impairment within the national river as shown in our data for *E. coli* at BUFT06. *E. coli* contamination of the Buffalo River and its tributaries adversely and directly impacts the public's ability to enjoy water-based recreation within Buffalo National River.

On a final note, during a number of email exchanges between Aquatic Ecologist Faron Usrey of my staff and Craig Uyeda and Sarah Clem of ADEQ, we noted depressed dissolved oxygen values in Big Creek. The dates of these emails are July 23 and 27, 2013 and August 6 and 27, 2013. The data and information in these emails should be added to the dataset for determination of impairment for Big Creek.

Continuous DO statistics indicated a strong connection between the nutrient and land-use indices and DO concentrations



Stream name	Site no.	No. of unit values	No. of unit values < 6 mg/L	Percent of unit values < 6 mg/L
South Fork Little Red River	07075250	21,715	75	0.03
Illinois Bayou	07257500	27,986	1,046	3.7
Big Creek	07055814	14,623	2,992	20.5
White River	07048600	11,007	2,976	27.0
Town Branch	07048495	7,488	2,494	33.0

USGS

Preliminary Information—Subject to Revision. Not for Citation or Distribution

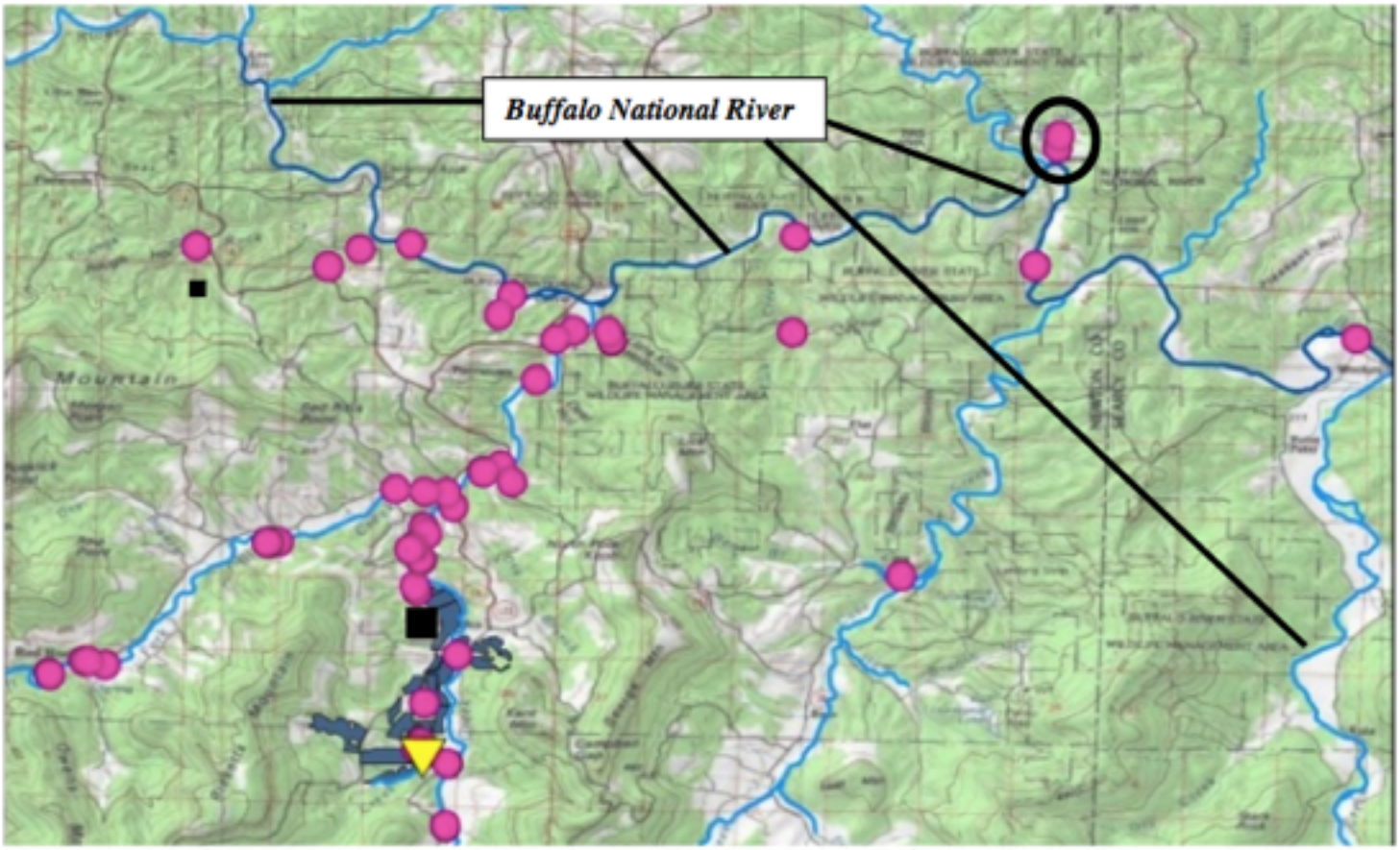


Figure 9. Flow from BS-36 where eosin input was positively traced to outflow springs and streams. This trace shows the full dispersive extent of karst flow in the subsurface into other surface water basins, the Buffalo National River, and even beneath the river to Mitch Hill Spring, identified by the black circle in the northeast quadrant. The yellow triangle is dye input well BS-36, blue shapes are hog-waste spreading fields, and the black rectangle is the CAFO. The Buffalo Nation River is the blue irregular sinuous feature that extends from the northwest to the southeast corner of the map. Pink circles are positive dye detections, five of which were retrieved from the rivet