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EXECUTIVE SUMMARY

In summer 2003, ACOG staff sampled pathogen bacteria (enterococci, and E. coli) on the North Canadian River in Canadian, Oklahoma, and Pottawatomie Counties and calculated load duration curves which led eventually to the adoption of a Total Daily Maximum Load (TMDL) in 2009 for the river and several tributaries. This TMDL was incorporated into Oklahoma Pollutant Discharge Elimination System (OPDES) permits, especially those relating to storm water.

Another survey in 2011 collected information on flow, pathogen concentrations, and fluorescence on the North Canadian River. The fluorometer data was thought to help characterize the reaches of the river affected by human activity in the watershed such as sewage discharge. In addition, the data collection would indicate if the bacteria levels have significantly reduced since 2003. Since the 2003 collection, several Phase II programs in the various cities along this reach of the river have been initiated.

The bacteriological sampling performed in summer 2011 duplicated eight locations sampled in 2003. Fecal coliform in summer 2011 decreased significantly from the summer 2003 sampling event. However, there is no statistical difference between the e. coli concentrations between the two sampling events. Enterococci decreased in two of the sampled tributaries (Crutcho Creek and Choctaw Creek) as wells as the sampling location on Triple-X road (NC07).

Fluorometer data was inconclusive as a tool to define detergents (and thus failing septic tanks). The main stem of the river had consistent luminescence. The tributaries had higher luminescence, but had no relationship to flow or turbidity. In addition, the data did not correlate to the density or number of septic tanks in the watershed.

ACKNOWLEDGEMENT

This report was funded through the federal grant program authorized under the federal Clean Water Act Section 604(b) and administered through Region VI of the Environmental Protection Agency and the Oklahoma Secretary of Environment. We gratefully acknowledge the time and help these partnership agencies provide to further the goals of environmental stewardship both regionally and at a local scale.

A. INTRODUCTION

In summer 2003, ACOG staff sampled pathogen bacteria (enterococci, and E. coli) on the North Canadian River in Canadian, Oklahoma, and Pottawatomie Counties and calculated load duration curves which led eventually to the adoption of a Total Daily Maximum Load (TMDL) in 2009 for the river and several tributaries. This TMDL was incorporated into Oklahoma Pollutant Discharge Elimination System (OPDES) permits, especially those relating to storm water.

Although the study showed that pathogen levels in the river were in some locations nearly two orders of magnitude above water quality standards, the study did not address sources. Much discussion has ensued as to the nature of the sources, since water quality violations occurred in virtually all reaches of the river and all types of land use – both urban and rural.

Preliminary studies from the Indian Nations Council of Government (INCOG) has shown that the field use of a fluorometer may be instrumental in helping to define pathogen sources coming from human activity. Fluorometers are useful to determine human activity in areas of high bacteria because human sewage usually contains soaps which exhibit chemiluminescence.

A field survey was proposed to collect information on flow, pathogen concentrations, and fluorescence on the North Canadian River. The data would help characterize the reaches of the river affected by human activity in the watershed such as sewage discharge.

In addition, the data collection would indicate if the bacteria levels have significantly reduced since 2003. Since the 2003 collection, several Phase II programs in the various cities along this reach of the river have been initiated.

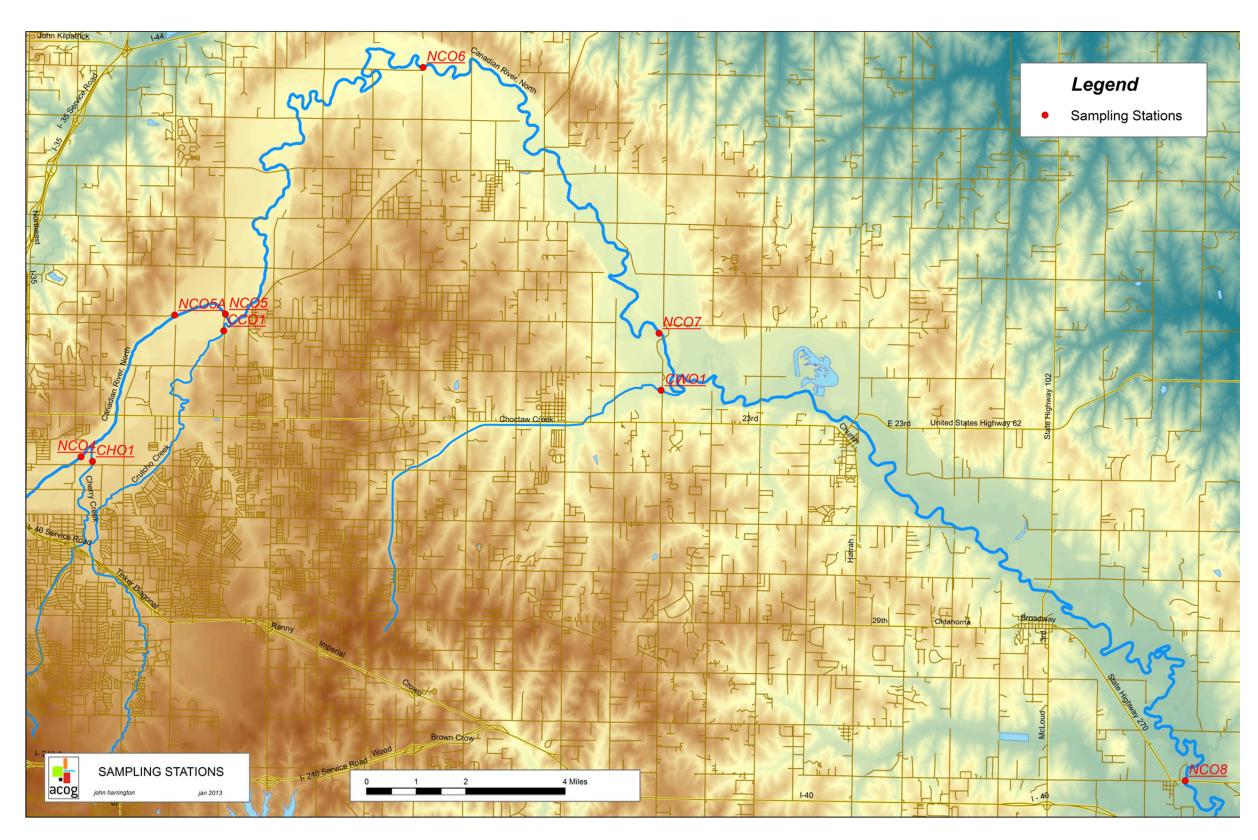
B. DATA COLLECTION ACTIVITY

B1. LOCATION AND TIME

Sampling locations are shown in Figure 1. These locations were part of the original pathogen TMDL sampling locations in 2003 and exhibited water quality violations that exceeded two orders of magnitude above state water quality standards. It was thought that fluorometer data would help to define sources if these violations are due to human activity issues. This information would allow communities affected by the new TMDL requirements to concentrate their efforts in areas where there would be the largest impact on the water quality. This information would also further test the usefulness of the fluorometer in several different watershed subbasins with different land use characteristics.

Data collection activity was commenced in July 2011 and completed in September 2011. All data locations were identical to the 2003 sampling program with the exception of Station NC05. At this location a very large beaver dam was built, which made flow measurements impossible to acquire due to the depth of the water. An alternate site was established a mile upstream at NC05A.

Figure 1 Station Locations



B2. QUALITY ASSURANCE

As part of the quality assurance process, it is necessary to address the quality of the data acquired in the survey. This section addresses the objectives of precision, accuracy, representativeness, completeness, and comparability.

B2.1. Precision

Acceptable precision and methodology is summarized in Table 1Error! Reference source **not found.** Precision for the microbiological parameters of interest (E. coli, Fecal Coliform, Enterococci), was addressed by using a duplicate sample each week, rotating randomly among stations.

Duplicate samples are used to determine the variation of the value of the samples. Bacteria samples appear to have a high coefficient of variation compared to other water quality analyses because they have a positively skewed distribution (APHA, 1995). Because of this property, the data has been lognormally transformed for computation of the Relative Percentage Difference (RPD).

The calculation spreadsheet for this procedure is shown in Table 2. The acceptable precision was achieved 26 out of 27 times; five of those times the measurement was at the upper limits of detection. A possible transcription error may be the problem with the one poor precision result. The acceptable precision was achieved 96.3% of the time.

For comparative purposes, acceptable precision was achieved 66.7% of the time in the 2003 survey using the same collection techniques (Table 3).

Table 1 Acceptable Precision and Methodology Limits

Bacterial Analyses					
	Enterococci	E. Coli			
Practical Quantification Limit	1 cfu/100 ml	1 cfu/100 ml			
Detection Limit	1 cfu/100 ml	1 cfu/100 ml			
Turbidity & YSI 6820 Field Measurements					
	Turbidity	DO	Conductivity	pН	Temperature
Detection Limit	0.01 NTU	0.01 mg/L	100-1.0 uS/cm (range dependant)	0.01 SU	0.01° C
Method Precision (RPD) > 2 orders of magnitude above MDL	±10 percent	±10 percent	±10 percent	±10 percent	±10 percent
Method Precision (RPD) > 1 order of magnitude above MDL	±25 percent	±25 percent	±25 percent	±25 percent	±25 percent
Method Precision (RPD) < 1 order of magnitude above MDL	±50 percent	±50 percent	±50 percent	±50 percent	±50 percent

Table 2 Acceptable Precision and Methodology – 2011 Survey Bacteria

	RAW DATA			LOGNORMAL TRANSFORM			RFD			PRECISION			
DATE	LOCATION	ENTEROCOCCI	FECAL COLIFORM	E.COLI	ENTEROCOCCI	FECAL COLIFORM	E.COLI	ENTEROCOCCI	FECAL COLIFORM	E.COLI	ENTEROCOCCI	FECAL COLIFORM	E.COLI
7/14/11	AC01	1203.3	12.1	<1.0	3.08	1.08	0.00						
7/14/11	NC04	1119.9	28.8	31.8	3.05	1.46	1.50	0.00	0.07	#VALUE!	ACCEPTABLE	ACCEPTABLE	NOT ACCEPTABLE
7/19/11	AC02	38.4	27.2	38.5	1.58	1.43	1.59						
7/19/11	NC08	35.0	35.5	14.2	1.54	1.55	1.15	0.00	0.01	0.00	ACCEPTABLE	ACCEPTABLE	ACCEPTABLE
8/1/11	AC01	2419.0	46.5	38.8	3.38	1.67	1.59						
8/1/11	NC05A	2419.0	56.3	47.9	3.38	1.75	1.68	0.00	0.00	0.00	ACCEPTABLE	ACCEPTABLE	ACCEPTABLE
8/8/11	AC01	2419.0	2419.0	2419.0	3.38	3.38	3.38						
8/8/11	CH01	2419.0	2419.0	2419.0	3.38	3.38	3.38	0.00	0.00	0.00	ACCEPTABLE	ACCEPTABLE	ACCEPTABLE
8/15/11	AC01	113.7	185.0	77.1	2.06	2.27	1.89						
8/15/11	NC05A	107.6	186.0	141.4	2.03	2.27	2.15	0.00	0.00	0.00	ACCEPTABLE	ACCEPTABLE	ACCEPTABLE
8/22/11	AC01	648.8	135.4	172.5	2.81	2.13	2.24						
8/22/11	NC05A	727.0	165.8	143.9	2.86	2.22	2.16	0.00	0.00	0.00	ACCEPTABLE	ACCEPTABLE	ACCEPTABLE
8/29/11	AC01	2419.0	547.5	770.1	3.38	2.74	2.89						
8/29/11	CH01	2419.0	770.1	770.1	3.38	2.89	2.89	0.00	0.00	0.00	ACCEPTABLE	ACCEPTABLE	ACCEPTABLE
9/6/11	AC01	307.6	69.7	110.6	2.49	1.84	2.04						
9/6/11	CC01	275.5	88.6	123.6	2.44	1.95	2.09	0.00	0.00	0.00	ACCEPTABLE	ACCEPTABLE	ACCEPTABLE
9/12/11	AC01	1553.1	214.3	547.5	3.19	2.33	2.74						
9/12/11	CH01	686.7	344.8	517.2	2.84	2.54	2.71	0.00	0.00	0.00	ACCEPTABLE	ACCEPTABLE	ACCEPTABLE

Table 3 Acceptable Precision and Methodology – 2003 Survey Bacteria

Station	Date Collected:	E. Coli	Fecal Coliform	Enterococci			
NC05	5/20/2003	6.6%	0.4%	0.2%	ACCEPTABLE	ACCEPTABLE	ACCEPTABLE
NC01	5/28/2003	7.0%	5.5%	4.9%	ACCEPTABLE	ACCEPTABLE	ACCEPTABLE
NC03	5/27/2003	9.7%	5.5%	4.4%	ACCEPTABLE	ACCEPTABLE NOT	ACCEPTABLE
CH01	4/6/2003	3.4%	17.5%	0.9%	ACCEPTABLE	ACCEPTABLE	ACCEPTABLE NOT
OC01	3/6/2003	6.2%	0.0%	31.0%	ACCEPTABLE NOT	ACCEPTABLE NOT	ACCEPTABLE NOT
NC08	6/18/2003	39.4%	68.5%	11.7%	ACCEPTABLE	ACCEPTABLE	ACCEPTABLE
NC02	7/14/2003	0.5%	0.0%	6.7%	ACCEPTABLE NOT	ACCEPTABLE	ACCEPTABLE
CC01	7/29/2003	12.4%	6.7%	5.3%	ACCEPTABLE	ACCEPTABLE NOT	ACCEPTABLE
OC01	12/8/2003	0.0%	11.5%	0.0%	ACCEPTABLE	ACCEPTABLE NOT	ACCEPTABLE
NC02	8/18/2003	3.8%	29.2%	4.9%	ACCEPTABLE	ACCEPTABLE NOT	ACCEPTABLE
OC01	8/26/2004	3.2%	21.9%	8.1%	ACCEPTABLE NOT	ACCEPTABLE NOT	ACCEPTABLE
NC01	2/9/2004	18.7%	15.4%	4.4%	ACCEPTABLE	ACCEPTABLE	ACCEPTABLE NOT
NC01	8/9/2004	0.0%	0.0%	34.8%	ACCEPTABLE	ACCEPTABLE NOT	ACCEPTABLE
CC01	9/16/2004	1.5%	24.7%	9.0%	ACCEPTABLE	ACCEPTABLE NOT	ACCEPTABLE NOT
NC03	9/22/2004	4.7%	20.7%	48.2%	ACCEPTABLE	ACCEPTABLE	ACCEPTABLE

B2.2. Accuracy

Trip blank samples are utilized to determine if contamination of samples is possible during the implementation of field protocols. This also insures the accuracy of the measurement of interest. Table 4 displays the results of the blank samples analysis.

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Table 4 Blank Data Collection

BLANK DATA										
DATE	LOCATION	ENTEROCOCCI	FECAL COLIFORM	E.COLI						
7/14/11	AC02	<1.0	<1.0	<1.0						
7/26/11	AC01	<1.0	<1.0	<1.0						
7/27/11	AC02	<1.0	<1.0	<1.0						
8/2/11	AC02	<1.0	<1.0	<1.0						
8/9/11	AC02	<1.0	<1.0	<1.0						
8/16/11	AC02	<1.0	<1.0	<1.0						
8/23/12	AC02	<1.0	<1.0	<1.0						
8/30/12	AC02	<1.0	<1.0	<1.0						
9/7/11	AC02	<1.0	<1.0	<1.0						
9/14/12	AC02	<1.0	<1.0	<1.0						

B2.3. Representativeness

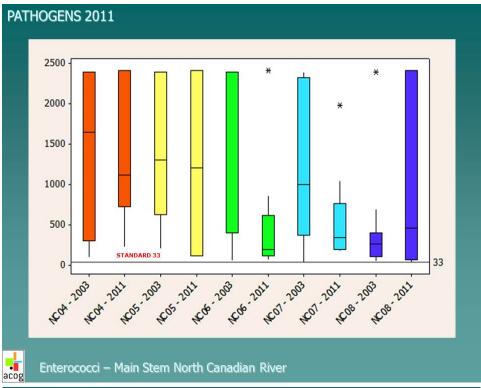
Representativeness of the bacteriological data is charted in Figure 2 to Figure 4. Although there is statistically significant differences in some of the groupings, the median of the population groups sampled in 2011 are within the same orders of magnitude as the 2003 population. Given the similarity of the sampling locations, sampling times, and the results, it can be concluded that the data set is representative of the conditions in the main stem and tributaries.

B2.4. Completeness

Table 5 shows the target goals and the actual data collected for flow data and bacteriological data. The completeness goal for the flow data was 95% overall – high flows at the beginning of data acquisition was a problem for two of the data collection sites. The bacteriological data was 98% complete. This met with the target goal of 90% established for completeness of all data acquisition, with no less than 80% for one station location.

All data attempted with the YSI field meter data was acquired (100% completeness).

Figure 2 Enterococci Data Boxplot



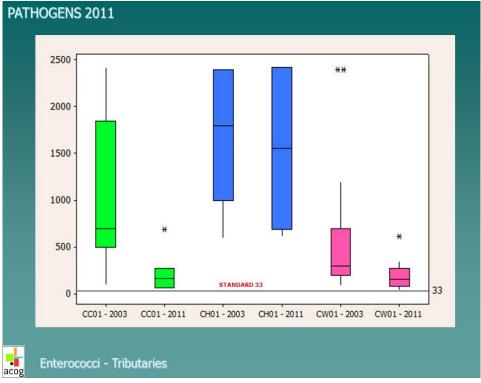
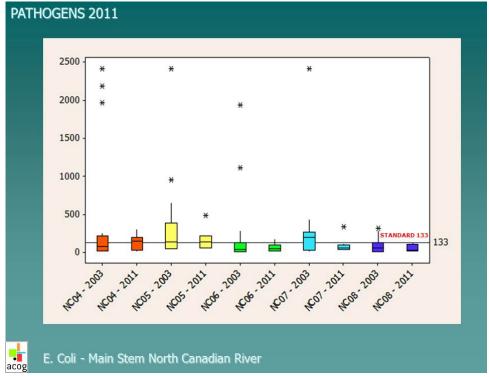


Figure 3 E. Coli Data Boxplot



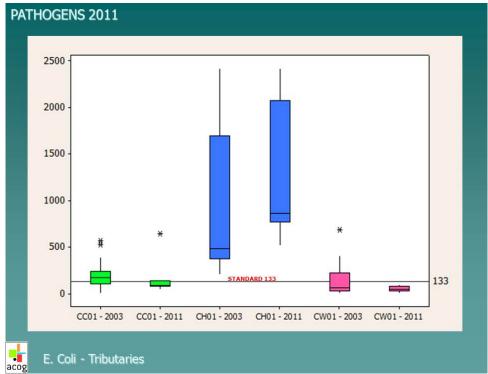
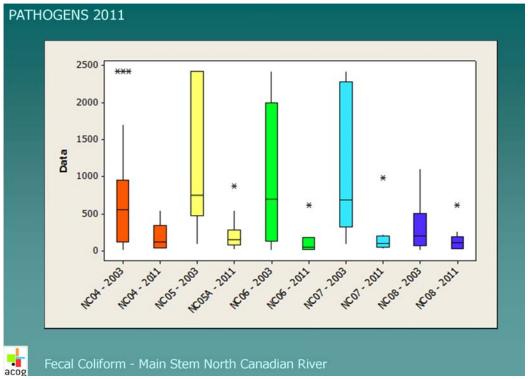
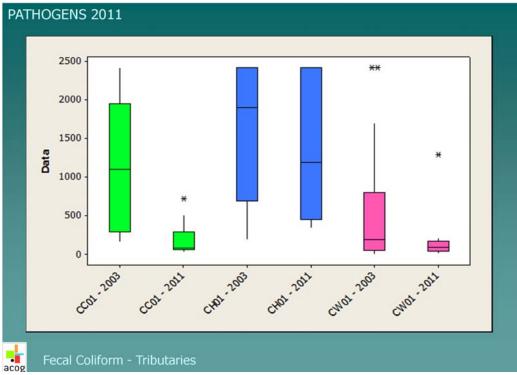


Figure 4 Fecal Coliform Data Boxplot





OVERALL COMPLETENESS

95%

	BA	CTERIOLO	GICAL SA	AMPLES				
DATE	NC04	CH01	CC01	NC05A	NC06	NC07	NC08	CW01
7/12/11	1	1	1					
7/14/11					1	1	1	1
7/18/11	1	1	1					
7/19/11					1	1	1	1
7/26/13	1	1	1	1				
7/27/13					1	1	1	1
8/1/11	1	1	1	1				
8/2/11				-	1	1	1	1
8/8/11	1	1	1	1	•	•	•	
8/9/11			•	•	1	1	1	1
8/15/11	1	1	1	1		•		•
8/16/11	<u> </u>	'	'		1	1	1	1
8/22/11	1	1	1	1	'	!	'	•
8/23/11	<u> </u>				1	1	1	1
8/23/11 8/29/11	1	1	1	1	1	I	I	1
		1	1	1	4		4	4
8/30/11					1	1	1	1
9/6/11	1	1	1	1				
9/7/13					1	1	1	1
9/12/13	1	1	1	1				
9/14/13					1	1	1	1
PLANNED BACTERIA SAMPLES	10	10	10	10	10	10	10	10
COMPLETED	10	10	10	8	10	10	10	10
	100%	100%	100%	80%	100%	100%	100%	100%
OVERALL COMPLETENESS	98%							
)W DATA					
DATE	NC04	CH01	CC01	NC05A	NC06	NC07	NC08	CW01
7/12/11	1	1	1					
7/14/11					1			1
7/18/11	1	1	1					
7/19/11					1	1	1	1
7/26/13	1	1	1	1				
7/27/13					1	1	1	1
8/1/11	1	1	1	1				
8/2/11		-		-	1	1	1	1
8/8/11	1	1	1	1	-	-	-	
8/9/11	'				1	1	1	1
8/15/11	1	1	1	1		,	,	•
8/16/11	'	1	1	1	1	1	1	1
8/22/11	1	1	1	1	'	1	'	
8/23/11		1			1	1	1	1
	1	1	1	1	ı		1	- 1
8/29/11 8/30/11			ı		1	1	4	4
				4	ı	1	1	1
9/6/11	1	1	1	1				
9/7/13					1	1	1	1
	1	1	1	1				
9/12/13								
9/14/13					1	1	1	1
9/14/13 PLANNED BACTERIA SAMPLES	10	10	10	10	10	10	10	10
9/14/13	10	10	10	8	10 10	10 9	10	10 10
9/14/13 PLANNED BACTERIA SAMPLES					10	10	10	10

B2.5. Comparability

With the exception of station NC05, all station locations were identical to the 2003 survey. NC05 was sampled twice, but the location had very large beaver dams which made flow measurements impossible. The characteristics of the site had changed significantly in seven years and a decision was made to move the site one mile upstream. The 2003 NC05 dataset and the 2011 NC05A dataset are quite similar and one can probably compare the two on at least a qualitative basis.

All bacteriological samples were processed in the laboratory using the same methodology as the 2003 survey.

C. PROJECT RESULTS

C1. BACTERIA ANALYSIS

Several statistical analyses were used to determine if the water quality for the project area has improved and how the bacteriological standards in the Oklahoma Water Quality Standards compared with the 2011 dataset.

Using a rank-sum test (Mann-Whitney), the following table was generated to show the differences between the 2003 dataset with the 2011 dataset (Helsel, et al., 1992).

Table 6 Rank-Sum Test 2003 vs. 2011

				ACCEPT/REJECT	
STATION	PARAMETER	H_0	P-VALUE	H_0 AT α =0.05	CONCLUSION
CC01	Enterococci	2003 = 2011	0.0017	REJECT	DECREASE FROM 2003
CH01	Enterococci	2003 = 2011	0.3012	ACCEPT	SAME AS 2003
CW01	Enterococci	2003 = 2011	0.0141	REJECT	DECREASE FROM 2003
NC04	Enterococci	2003 = 2011	0.3751	ACCEPT	SAME AS 2003
NC05 & NC05A	Enterococci	2003 = 2011	0.9427	ACCEPT	SAME AS 2003
NC06	Enterococci	2003 = 2011	0.1243	ACCEPT	SAME AS 2003
NC07	Enterococci	2003 = 2011	0.0453	REJECT	DECREASE FROM 2003
NC08	Enterococci	2003 = 2011	0.7414	ACCEPT	SAME AS 2003
CC01	E. Coli	2003 = 2011	0.1524	ACCEPT	SAME AS 2003
CH01	E. Coli	2003 = 2011	0.1466	ACCEPT	SAME AS 2003
CW01	E. Coli	2003 = 2011	0.8364	ACCEPT	SAME AS 2003
NC04	E. Coli	2003 = 2011	0.7553	ACCEPT	SAME AS 2003
NC05 & NC05A	E. Coli	2003 = 2011	0.4574	ACCEPT	SAME AS 2003
NC06	E. Coli	2003 = 2011	0.6965	ACCEPT	SAME AS 2003
NC07	E. Coli	2003 = 2011	0.2437	ACCEPT	SAME AS 2003
NC08	E. Coli	2003 = 2011	0.8431	ACCEPT	SAME AS 2003
CC01	Fecal Coliform	2003 = 2011	0.0007	REJECT	DECREASE FROM 2003
CH01	Fecal Coliform	2003 = 2011	0.5663	ACCEPT	SAME AS 2003
CW01	Fecal Coliform	2003 = 2011	0.094	ACCEPT	SAME AS 2003
NC04	Fecal Coliform	2003 = 2011	0.0228	REJECT	DECREASE FROM 2003
NC05 & NC05A	Fecal Coliform	2003 = 2011	0.0012	REJECT	DECREASE FROM 2003
NC06	Fecal Coliform	2003 = 2011	0.0041	REJECT	DECREASE FROM 2003
NC07	Fecal Coliform	2003 = 2011	0.0006	REJECT	DECREASE FROM 2003
NC08	Fecal Coliform	2003 = 2011	0.1528	ACCEPT	SAME AS 2003

From Table 6 one can conclude that the two regulated bacteriological parameters (enterococci and e. coli) have populations that are not significantly different at the 95% degree of confidence, especially along the North Canadian River. Exceptions are the enterococci levels in Crutcho Creek (CH01), Choctaw Creek (CW01), and NC07 on the North Canadian River near Triple-X road. Fecal coliform, no longer a regulated parameter, has decreased significantly in the North Canadian River and in Crutcho Creek (CC01).

Bacteriological standards for water quality can be found in the Oklahoma Water Quality Standards. The waterbodies of concern are listed as being primary body contact waterbodies and are thus subject to §785:45-5-16. Primary Body Contact Recreation:

- (a) Primary Body Contact Recreation involves direct body contact with the water where a possibility of ingestion exists. In these cases the water shall not contain chemical, physical or biological substances in concentrations that are irritating to skin or sense organs or are toxic or cause illness upon ingestion by human beings.
- (b) In waters designated for Primary Body Contact Recreation the following limits for bacteria set forth in (c) of this section shall apply only during the recreation period of May 1 to September 30. The criteria for Secondary Body Contact Recreation will apply during the remainder of the year.
- (c) Compliance with 785:45-5-16 shall be based upon meeting the requirements of one of the t options specified in (1) or (2) of this subsection (c) for bacteria. Upon selection of one (1) group or test method, said method shall be used exclusively over the time period prescribed therefor. Provided, where concurrent data exist for multiple bacterial indicators on the same waterbody or waterbody segment, no criteria exceedances shall be allowed for any indicator group.
 - (1) Escherichia coli (E. coli): The E. coli geometric mean criterion is 126/100 ml. For swimming advisory and permitting purposes, E. coli shall not exceed a monthly geometric mean of 126/100 ml based upon a minimum of not less than five (5) samples collected over a period of not more than thirty (30) days. For swimming advisory and permitting purposes, no sample shall exceed a 75% one-sided confidence level of 235/100 ml in lakes and high use waterbodies and the 90% one-sided confidence level of 406/100 ml in all other Primary Body Contact Recreation beneficial use areas. These values are based upon all samples collected over the recreation period. For purposes of sections 303(d) and 305(b) of the federal Clean Water Act as amended, beneficial use support status shall be assessed using only the geometric mean criterion of 126/100 milliliters compared to the geometric mean of all samples collected over the recreation period.
 - (2) Enterococci: The Enterococci geometric mean criterion is 33/100 ml. For swimming advisory and permitting purposes, Enterococci shall not exceed a monthly geometric mean of 33/100 ml based upon a minimum of not less than five (5) samples collected over a period of not more than thirty (30) days. For swimming advisory and permitting purposes, no sample shall exceed a 75% one-sided confidence level of 61/100 ml in lakes and high use waterbodies and the 90% one-sided confidence level of 108/100 ml in all other Primary Body Contact Recreation beneficial use areas. These values are based upon all samples collected over the recreation period. For purposes of sections 303(d) and 305(b) of the federal Clean Water Act as amended, beneficial use support status shall be assessed using only the geometric mean criterion of 33/100 milliliters compared to the geometric mean of all samples collected over the recreation period.

Table 7 illustrates the results using the procedures outlined in the Oklahoma Water Quality Standards. As one can see, the waterbodies meet the e.coli standards with the exception of Cherry Creek. All the waterbodies fail the test for enterococci.

To summarize the analysis of the data, the main stem of the North Canadian River and Crutcho Creek showed a statistically significant decrease in the amount of fecal coliforms from 2003 to 2011. However, the regulatory bacteriological parameters enterococci and e.coli are essentially the same in 2011 as in 2003 for the main stem of the North Canadian River and Cherry Creek. Crutcho Creek and Choctaw Creek showed some improvement in 2011 from the 2003 dataset for enterococci.

All stations met the e.coli standard, but exceeded by two orders of magnitude the enterococci standard for Primary Body Contact Recreation.

Table 7	Geometric Means	Test and 90%	Confidence	Level Standard
I able 1	Occinculo Means	1 C3L allu 30 /0	COHINGENCE	Level Stariuaru

Table 7 Geometric Means Test and 90% Confidence Level Standard								
ENTEROCOCCI	CC01 - 2011	CH01 - 2011	CW01 - 2011	NC04 - 2011	NC05A - 2011	NC06 - 2011	NC07 - 2011	NC08 - 2011
	50.4	290.9	36.4	191.8	107.6	68.9	172.2	35.0
	63.7	613.1	38.8	222.4	116.9	112.6	178.9	40.2
	66.3	686.7	116.0	727.0	165.0	118.7	186.0	46.4
	93.3	980.4	155.3	770.1	648.8	195.6	201.4	93.3
	117.8	980.4	159.7	1119.9	727.0	198.9	224.7	127.4
	161.6	1119.9	172.6	1119.9	1203.3	280.9	344.1	461.1
	167.0	1553.1	178.2	2419.6	2419.6	365.4	435.2	1046.2
	275.5	1732.9	203.5	2419.6	2419.6	866.4	488.4	2419.6
	686.7	2419.6	344.8	2419.6	2419.6	2419.6	1046.2	2419.6
	866.4	2419.6	613.1	2419.6	2419.6	2419.6	1986.3	2419.6
GEOMETRIC MEAN	159.0	1075.8	149.0	1002.6	725.5	336.6	362.7	296.8
STANDARD	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0
% EXCEEDANCE	482%	3260%	451%	3038%	2198%	1020%	1099%	899%
90% ONE-SIDED CONFIDENCE LEVEL	287.4	1753	207.6	2420	2420	911	505	2420
STANDARD	108	108	108	108	108	108	108	108
E. COLI					NC05 - 2011			
	51.2		8.5	17.1	8.5		27.2	13.4
	79.4			17.5	47.9		43.7	14.2
	79.4				58.1		44.1	15.5
	82.3				67.0		45.7	
	90.8				85.5		62.0	24.3
	104.6			151.5	141.4		64.4	31.7
	123.6				143.9		77.6	75.4
	141.4				167.0		79.8	109.5
	142.1			201.4	224.7		117.2	121.1
0500.05	648.8			307.6	488.4		344.8	133.3
GEOMETRIC MEAN	115.1				93.4		68.9	38.2
STANDARD	126.0				126.0		126.0	126.0
% EXCEEDANCE	91%	843%	53%	62%	74%	34%	55%	30%
90% ONE-SIDED CONFIDENCE LEVEL	141	2420	96.5	185.5	168.7	99.1	80.9	109.8
STANDARD	406		406	406	406		406	406

C2. FLUOROMETER DATA ANALYSIS

Fluorometers are useful to determine human activity in areas of high bacteria because human sewage usually contains soaps which exhibit chemiluminescence. A fluorometer was used in this project to determine the usefulness of the unit to track areas of high bacteria and the location of the sources.

Chemiluminescence is the emission of light as a result of a chemical reaction without an apparent change in temperature. In nature there are many animals and plants that exhibit chemiluminescence, usually referred to as bioluminescence. Fungi can also exhibit bioluminescence (Bryner, 2009) as well as some algae. A fluorometer can be calibrated with a known source and wavelength, or calibrated with a consistent standard. Since it was not known what sources would be luminescing, a standard was made with water at the NC04 site at the beginning of the project and the meter was calibrated weekly against that water sample as a standard (Turner Designs, 2012).

The results are shown in Figure 5. Several relationships are immediately apparent. The main-stem data is quite different from the tributaries, indicating that the tributaries have more chemi-luminescence. NC07 also has higher readings than the other mainstem data. NC07 is downstream from the North Canadian River WWTP; the flow in the river doubles at this point due to the effluent coming from the plant.

Using the Mann-Whitney test to compare the populations, a chart was created to show significant variations between the stations (Table 8). The analysis shows that NC05A, NC06, and NC08 have essentially the same luminescence; thus, one can consider this to be "background noise". NC04 is at the headwaters of the system and has no inputs other than the dam system above 10th street; thus the luminescence is low.

NC07 is probably influenced by the treatment plant, and gives one confidence that the technique has some merit, since one can pick up the detergents that made it through the treatment process. However, the rather poor luminescence spike compared to the background suggests that using a fluorometer on the main stem of the North Canadian River may not be a fruitful endeavor.

The tributaries have much higher luminescence and are much different from one another. Assuming that this from detergents that have made it into the storm sewers or poorly maintained septic systems, a relationship with turbidity and flow should exist. Figure 6 shows this relationship, or lack thereof. It appears that some other luminescent agent that is independent of flow and turbidity is dominant in the tributaries. It is suspected that algae may be the culprit – if so, then there the fluorometer may have limited use.

As a further check on the fluorometer data, the number of septic tanks in each watershed was tallied up, using Census Bureau data (US Census Bureau, 2009). Although the Crutcho and Choctaw Creek watersheds had the highest number of septic tanks (248 and 291, respectively), the Cherry Creek watershed has only 14. It seems counterintuitive that the watershed with the most luminescence has the least septic tanks by an order of magnitude. It should be concluded that the fluorometer data in these watersheds probably is not a reliable indicator of detergents associated with failing septic tanks.

Figure 5 Fluorometer Data Chart

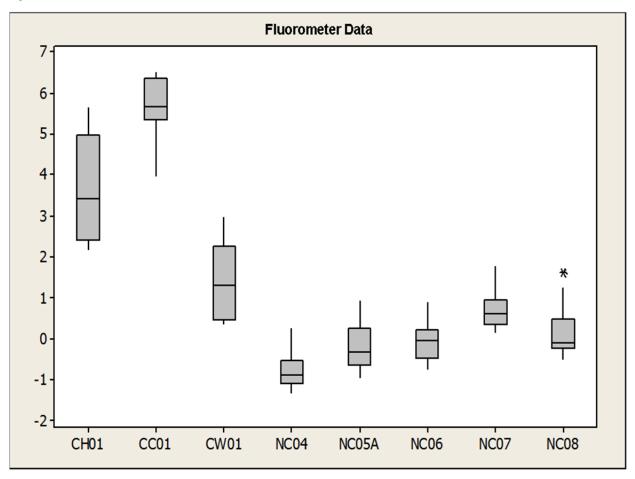
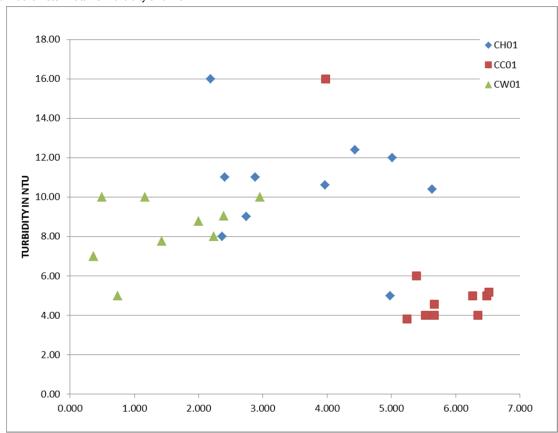
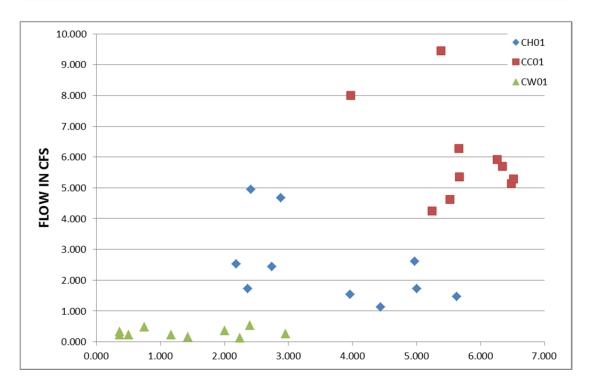


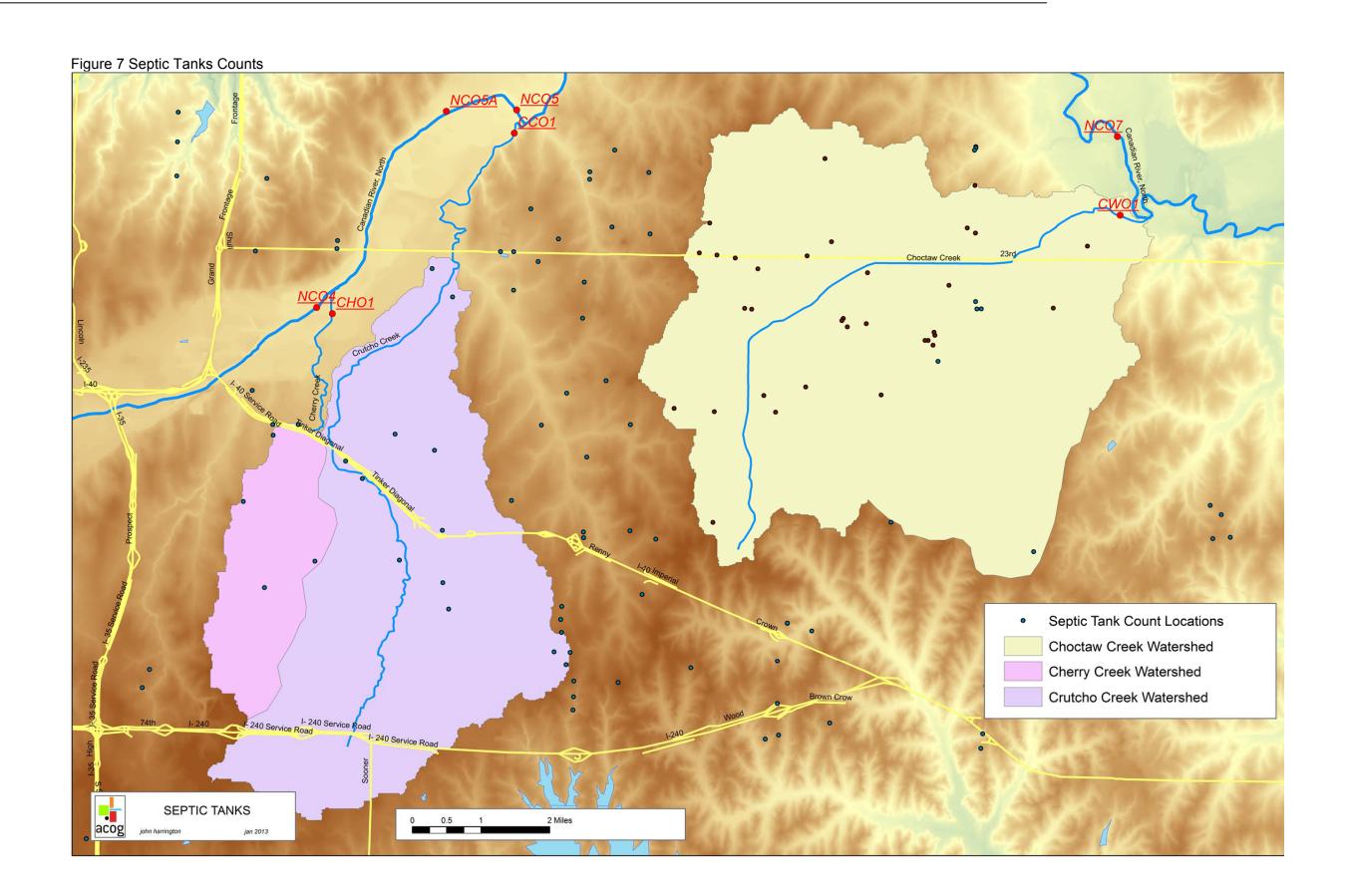
Table 8 Rank-Sum Test Fluorometer Data α = 0.95

	CH01	CC01	CW01	NC04	NC05A	NC06	NC07	NC08
CH01		0.0013	0.0017	0.0002	0.0004	0.0002	0.0002	0.0002
CC01	0.0013		0.0002	0.0002	0.0004	0.0002	0.0002	0.0002
CW01	0.0017	0.0002		0.0002	0.0016	0.0006	0.1041	0.0036
NC04	0.0002	0.0002	0.0002		0.0368	0.0058	0.0003	0.0022
NC05A	0.0004	0.0004	0.0016	0.0368		0.5636	0.0088	0.2303
NC06	0.0002	0.0002	0.0006	0.0058	0.5636		0.0046	0.6776
NC07	0.0002	0.0002	0.1041	0.0003	0.0088	0.0046		0.0211
NC08	0.0002	0.0002	0.0036	0.0022	0.2303	0.6776	0.0211	

Figure 6 Fluorometer Data vs. Turbidity and Flow







D. CONCLUSIONS

Bacteriological sampling on the North Canadian River and several tributaries was performed in summer 2011 duplicating eight locations sampled in 2003. Fecal coliform in summer 2011 decreased significantly from the summer 2003 sampling event. However, there is no statistical difference between the e.coli concentrations between the two sampling events. Enterococci decreased in two of the sampled tributaries (Crutcho Creek and Choctaw Creek) as wells as the sampling location on Triple-X road (NC07).

Fluorometer data was inconclusive as a tool to define detergents (and thus failing septic tanks). The main stem of the river had consistent luminescence. The tributaries had higher luminescence, but had no relationship to flow or turbidity. In addition, the data did not correlate to the density or number of septic tanks in the watershed.

E. REFERENCES

APHA, 1995. Standard Methods for the Analysis of Water and Wastewater. 19th Edition. American Public Health Assn., Washington, D.C.

Bryner, Jeanna (5 October 2009). "Glow-in-the-Dark Mushrooms Discovered". Live Science. Retrieved 6 October 2009

Helsel, D.R., and Hirsch, R.M., 1992, "Statistical Methods in Water Resources", Elsevier Publishing, 529 p.

Turner Designs, 2012, AquaFluor® User's Manual, 23p.

US Census Bureau, "State & County QuickFacts", 1. 04/14/2009 http://quickfacts.census.gov/qfd/maps/oklahoma_map.html

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APPENDIX A BACTERIOLOGICAL DATA

Analysis Date	Sample No Station	FLUOROMETER	TURBIDITY NTU	Enterococi	Fecal Coliform	E. Coli	Comments
12-Ju	4042.003 CC01	6.35	4.0	50.4	81.6	142.1	
18-Ju	4605.003 CC01	6.48	5.0	93.3	68.9	104.6	
26-Ju	4757.003 CC01	5.39	6.0	63.7	727.0	648.8	
1-Aug	4875.003 CC01	5.52	4.0	117.8	49.6	51.2	
8-Aug	5008.003 CC01	5.66	4.0	161.6	101.7	90.8	
15-Aug		3.98	16.0	167.0	517.2	141.4	
22-Au		6.26	5.0	866.4	65.0	79.4	
29-Aug		5.67	4.6	686.7	224.7	82.3	
6-Ser		6.52	5.2	275.5	88.6	123.6	
12-Sep		5.24	3.8	66.3	38.4	79.4	
12-Ju	4042.002 CH01	4.98	5.0	290.9	980.4	1413.6	
18-Ju	4605.002 CH01	5.01	12.0	980.4	365.4	290.9	
26-Ju	4757.002 CH01	2.41	11.0	613.1	2419.6	1046.2	
1-Aug	4875.002 CH01	2.36	8.0	1119.9	488.4	866.4	
8-Aug	5008.002 CH01	2.74	9.0	2419.6	2419.6	2419.6	
15-Aug	5586.002 CH01	2.19	16.0	1553.1	1413.6	866.4	
22-Au	5726.002 CH01	2.88	11.0	980.4	2419.6	2419.6	
29-Au	5882.002 CH01	3.97	10.6	2419.6	770.1	770.1	
6-Sep		5.63	10.4	1732.9	1553.1	2419.6	
12-Sep		4.44	12.4	686.7	344.8	517.2	
14-Ju		2.96	10.0	613.1	1299.7	770.1	
19-Ju	4642.003 CW01	2.24	8.0	172.6	107.1	111.9	
27-Ju	4794.003 CW01	0.74	5.0	36.4	53.8	8.5	
2-Aug		0.36	7.0	38.8	18.7	29.5	
9-Aug		0.36	7.0	178.2	98.7	45.9	
16-Aug		0.50	10.0	116.0	55.4	44.1	
23-Aug		1.17	10.0	159.7	218.7	80.9	
30-Aug		1.43	7.8	203.5	155.3	59.1	
7-Sep		2.00	8.8	155.3	39.7		Samples 6044.001005 were added to incorrect batch on 9/7/2011. They were removed from that batch today an
14-Sep		2.39	9.1	344.8	95.9	96.0	
12-Ju	4042.001 NC04	0.25	9.0	1119.9	28.8	31.8	
18-Ju	4605.001 NC04	-0.88	20.0	2419.6	157.6	185.0	
26-Ju	4757.001 NC04	-1.23	7.0	2419.6	547.5	201.4	
1-Aug	4875.001 NC04	-1.30	6.0	2419.6	35.5	17.5	
8-Aug	5008.001 NC04	-0.78	8.0	2419.6	435.2	160.7	
15-Aug	5586.001 NC04	-1.03	10.0	770.1	307.6	151.5	
22-Aug	5726.001 NC04	-0.94	7.0	191.8	26.2	17.1	
29-Aug	5882.001 NC04	-0.89	5.9	1119.9	73.3	37.3	
6-Sep	6015.001 NC04	-0.40	9.7	222.4	81.3	90.6	
12-Sep	6098.001 NC04	-0.57	10.7	727.0	224.7	307.6	
12-Ju		0.74	9.0	648.8	16.8	8.5	
18-Ju		0.47	18.0	2419.6	129.6	58.1	
26-Ju	4757.004 NC05A	-0.66	9.0	2419.6	866.4	224.7	
1-Aug		-0.94	9.0	2419.6	56.3	47.9	
8-Aug	5008.004 NC05A	-0.24	9.0	1203.3	547.5	488.4	
15-Au	5586.004 NC05A	-0.66	11.0	107.6	186.0	141.4	
22-Au		-0.39	7.0	727.0	165.8	143.9	
29-Au	5882.004 NC05A	0.93	5.5	2419.6	120.1	85.5	
6-Sep	6015.004 NC05A	0.01	7.9	165.0	83.3	67.0	
12-Sep	6098.004 NC05A	0.35	3.8	116.9	166.4	167.0	

Analysis Date	Sample No Station	FLUOROMETER	TURBIDITY NTU	Enterococi	Fecal Coliform	E. Coli	Comments
14-Jul	4315.001 NC06	0.32	34.0	365.4	613.1	109.2	
19-Jul	4642.001 NC06	0.91	16.0	2419.6	29.2	27.5	
27-Jul	4794.001 NC06	-0.35	19.0	280.9	46.2	45.5	
2-Aug	4894.001 NC06	-0.42	13.0	198.9	14.8	17.5	
9-Aug	5043.001 NC06	0.18	15.0	866.4	156.5	186.0	
16-Aug	5612.001 NC06	-0.72	21.0	68.9	44.3	31.8	
23-Aug	5757.001 NC06	-0.10	20.0	112.6	186.0	8.5	
30-Aug	5924.001 NC06	0.15	17.8	2419.6	172.3	98.8	
7-Sep	6044.001 NC06	0.02	18.0	195.6	13.1	55.6	
14-Sep	6369.001 NC06	-0.65	23.4	118.7	8.6	30.9	
14-Jul	4315.002 NC07	1.42	56.0	435.2	980.4	344.8	
19-Jul	4642.002 NC07	1.77	15.0	172.2	30.1	27.2	
27-Jul	4794.002 NC07	0.69	17.0	1986.3	85.7	43.7	
2-Aug	4894.002 NC07	0.42	23.0	1046.2	45.7	45.7	
9-Aug	5043.002 NC07	0.42	23.0	488.4	139.6	64.4	
16-Aug	5612.002 NC07	0.18	30.0	178.9	81.3	79.8	
23-Aug	5757.002 NC07	0.18	30.0	224.7	214.3	44.1	
30-Aug	5924.002 NC07	0.62	18.6	344.1	193.5	77.6	
7-Sep	6044.002 NC07	0.81	20.9	201.4	53.0	62.0	Samples 6044.001005 were added to incorrect batch on 9/7/2011.They were removed from that batch today an
14-Sep	6369.002 NC07	0.59	21.2	186.0	101.7	117.2	
14-Jul	4315.004 NC08	1.26	124.0	2419.6	613.1	109.5	
19-Jul	4642.004 NC08	1.62	20.0	35.0	35.5	14.2	
27-Jul	4794.004 NC08	-0.32	20.0	2419.6	261.3	133.3	
2-Aug	4894.004 NC08	-0.22	19.0	2419.6	101.7	121.1	
9-Aug		-0.12	21.0	1046.2	112.6	75.4	
16-Aug	5612.004 NC08	-0.51	25.0	40.2	26.2	15.5	
23-Aug	5757.004 NC08	-0.16	15.0	93.3	165.0	24.3	
30-Aug	5924.004 NC08	0.25	18.1	127.4	104.6	31.7	
7-Sep	6044.004 NC08	-0.08	23.7	461.1	13.5	13.4	Samples 6044.001005 were added to incorrect batch on 9/7/2011. They were removed from that batch today an
14-Sep	6369.004 NC08	-0.04	18.6	46.4	30.9	21.6	

APPENDIX B PHYSICAL AND CHEMICAL DATA

Analysis Date	Station	DATE	FLOW CF/S	TEMP ° _F	SpCond uS/cm	рН	Chloride mg/l	DO %	DO mg/l	NOTES
12-Jul	CC01	12-Jul	5.70	78.9	771	7.50	66.42	ND	ND	
18-Jul	CC01	18-Jul	5.14	80.1	709	7.65	120.00	25.50	2.04	
26-Jul	CC01	26-Jul	9.45	80.1	709	7.65	120.00	25.50	2.04	
1-Aug	CC01	1-Aug	4.62	80.1	870	7.50	124.25	22.40	1.79	
8-Aug	CC01	8-Aug	6.28	78.6	827	7.41	122.00	26.00	2.11	
15-Aug	CC01	15-Aug	8.00	78.9	659	7.45	98.98	75.50	6.11	
22-Aug	CC01	22-Aug	5.93	79.6	817	7.50	126.30	29.05	2.33	
29-Aug	CC01	29-Aug	5.36	79.8	796	7.47	135.90	29.65	2.38	
6-Sep	CC01	6-Sep	5.29	70.7	835	7.58	166.95	35.70	3.15	
12-Sep	CC01	12-Sep	4.24	73.9	800	7.54	178.25	33.60	2.86	
12-Jul	CH01	12-Jul	2.61	77.4	727	7.50	56.98	ND	ND	
18-Jul	CH01	18-Jul	1.73	78.6	811	8.60	207.70	ND	ND	
26-Jul	CH01	26-Jul	4.94	78.8	884	7.73	136.80	40.60	3.29	
1-Aug	CH01	1-Aug	1.72	79.3	563	7.62	94.67	53.10	4.28	
8-Aug	CH01	8-Aug	2.44	78.4	819	7.60	112.40	53.40	4.34	
15-Aug	CH01	15-Aug	2.52	77.3	740	7.54	110.80	55.30	4.54	
22-Aug	CH01	22-Aug	4.68	79.3	755	7.55	112.10	50.85	4.10	
29-Aug	CH01	29-Aug	1.54	78.9	779	7.55	117.55	41.25	3.34	
6-Sep	CH01	6-Sep	1.46	68.6	846	7.61	165.60	49.90	4.50	
12-Sep	CH01	12-Sep	1.13	71.5	790	7.65	162.10	55.60	4.85	
14-Jul	CW01	14-Jul	0.52	81.3	785	7.98	80.97	ND	ND	After 4" rainfall event
14-Jul 19-Jul	CW01 CW01	14-Jul 19-Jul	0.52 0.36	81.3 83.5	785 788	7.98 7.89	80.97 120.30	ND ND	ND ND	After 4" rainfall event
										After 4" rainfall event
19-Jul	CW01	19-Jul	0.36	83.5	788	7.89	120.30	ND	ND	After 4" rainfall event
19-Jul 27-Jul	CW01 CW01	19-Jul 27-Jul	0.36 0.16	83.5 82.3	788 882	7.89 7.84	120.30 121.40 99.65 ND	ND 17.40	ND 1.36	After 4" rainfall event
19-Jul 27-Jul 2-Aug	CW01 CW01 CW01	19-Jul 27-Jul 2-Aug	0.36 0.16 0.23	83.5 82.3 83.5	788 882 756	7.89 7.84 7.77	120.30 121.40 99.65	ND 17.40 20.10	ND 1.36 1.55	After 4" rainfall event
19-Jul 27-Jul 2-Aug 9-Aug	CW01 CW01 CW01 CW01	19-Jul 27-Jul 2-Aug 9-Aug	0.36 0.16 0.23 0.22	83.5 82.3 83.5 ND	788 882 756 ND	7.89 7.84 7.77 ND 7.69 7.61	120.30 121.40 99.65 ND 96.16 111.85	ND 17.40 20.10 ND	ND 1.36 1.55 ND	After 4" rainfall event
19-Jul 27-Jul 2-Aug 9-Aug 16-Aug	CW01 CW01 CW01 CW01 CW01	19-Jul 27-Jul 2-Aug 9-Aug 16-Aug	0.36 0.16 0.23 0.22 0.33	83.5 82.3 83.5 ND 80.6	788 882 756 ND 722 743 775	7.89 7.84 7.77 ND 7.69	120.30 121.40 99.65 ND 96.16	ND 17.40 20.10 ND 30.80	ND 1.36 1.55 ND 2.44	After 4" rainfall event
19-Jul 27-Jul 2-Aug 9-Aug 16-Aug 23-Aug	CW01 CW01 CW01 CW01 CW01	19-Jul 27-Jul 2-Aug 9-Aug 16-Aug 23-Aug	0.36 0.16 0.23 0.22 0.33 0.22	83.5 82.3 83.5 ND 80.6 81.1	788 882 756 ND 722 743	7.89 7.84 7.77 ND 7.69 7.61 7.68 7.72	120.30 121.40 99.65 ND 96.16 111.85 116.60 161.40	ND 17.40 20.10 ND 30.80 21.25	ND 1.36 1.55 ND 2.44 1.68	After 4" rainfall event
19-Jul 27-Jul 2-Aug 9-Aug 16-Aug 23-Aug 30-Aug 7-Sep 14-Sep	CW01 CW01 CW01 CW01 CW01 CW01 CW01 CW01	19-Jul 27-Jul 2-Aug 9-Aug 16-Aug 23-Aug 30-Aug 7-Sep 14-Sep	0.36 0.16 0.23 0.22 0.33 0.22 0.48 0.12 0.26	83.5 82.3 83.5 ND 80.6 81.1 79.1	788 882 756 ND 722 743 775 739 768	7.89 7.84 7.77 ND 7.69 7.61 7.68 7.72 7.59	120.30 121.40 99.65 ND 96.16 111.85 116.60 161.40 163.05	ND 17.40 20.10 ND 30.80 21.25 20.80 36.30 23.70	ND 1.36 1.55 ND 2.44 1.68 1.68 3.42 2.05	After 4" rainfall event
19-Jul 27-Jul 2-Aug 9-Aug 16-Aug 23-Aug 30-Aug 7-Sep 14-Sep 12-Jul	CW01 CW01 CW01 CW01 CW01 CW01 CW01	19-Jul 27-Jul 2-Aug 9-Aug 16-Aug 23-Aug 30-Aug 7-Sep	0.36 0.16 0.23 0.22 0.33 0.22 0.48 0.12	83.5 82.3 83.5 ND 80.6 81.1 79.1 64.7	788 882 756 ND 722 743 775	7.89 7.84 7.77 ND 7.69 7.61 7.68 7.72 7.59	120.30 121.40 99.65 ND 96.16 111.85 116.60 161.40 163.05 99.71	ND 17.40 20.10 ND 30.80 21.25 20.80 36.30	ND 1.36 1.55 ND 2.44 1.68 1.68 3.42	After 4" rainfall event
19-Jul 27-Jul 2-Aug 9-Aug 16-Aug 23-Aug 30-Aug 7-Sep 14-Sep 12-Jul	CW01 CW01 CW01 CW01 CW01 CW01 CW01 CW01	19-Jul 27-Jul 2-Aug 9-Aug 16-Aug 23-Aug 30-Aug 7-Sep 14-Sep 12-Jul 18-Jul	0.36 0.16 0.23 0.22 0.33 0.22 0.48 0.12 0.26 44.13 19.66	83.5 82.3 83.5 ND 80.6 81.1 79.1 64.7 72.4 79.5	788 882 756 ND 722 743 775 739 768 1023 1066	7.89 7.84 7.77 ND 7.69 7.61 7.68 7.72 7.59 7.70	120.30 121.40 99.65 ND 96.16 111.85 116.60 161.40 163.05 99.71 342.70	ND 17.40 20.10 ND 30.80 21.25 20.80 36.30 23.70	ND 1.36 1.55 ND 2.44 1.68 1.68 3.42 2.05 ND	After 4" rainfall event
19-Jul 27-Jul 2-Aug 9-Aug 16-Aug 23-Aug 30-Aug 7-Sep 14-Sep 12-Jul 18-Jul 26-Jul	CW01 CW01 CW01 CW01 CW01 CW01 CW01 CW01	19-Jul 27-Jul 2-Aug 9-Aug 16-Aug 23-Aug 30-Aug 7-Sep 14-Sep 12-Jul 18-Jul 26-Jul	0.36 0.16 0.23 0.22 0.33 0.22 0.48 0.12 0.26 44.13 19.66 29.99	83.5 82.3 83.5 ND 80.6 81.1 79.1 64.7 72.4 79.5 81.1	788 882 756 ND 722 743 775 739 768 1023 1066	7.89 7.84 7.77 ND 7.69 7.61 7.68 7.72 7.59 7.70 8.77	120.30 121.40 99.65 ND 96.16 111.85 116.60 161.40 163.05 99.71 342.70 181.20	ND 17.40 20.10 ND 30.80 21.25 20.80 36.30 23.70 ND ND	ND 1.36 1.55 ND 2.44 1.68 1.68 3.42 2.05 ND ND 3.83	After 4" rainfall event
19-Jul 27-Jul 2-Aug 9-Aug 16-Aug 23-Aug 30-Aug 7-Sep 14-Sep 12-Jul	CW01 CW01 CW01 CW01 CW01 CW01 CW01 CW01	19-Jul 27-Jul 2-Aug 9-Aug 16-Aug 23-Aug 30-Aug 7-Sep 14-Sep 12-Jul 18-Jul	0.36 0.16 0.23 0.22 0.33 0.22 0.48 0.12 0.26 44.13 19.66	83.5 82.3 83.5 ND 80.6 81.1 79.1 64.7 72.4 79.5	788 882 756 ND 722 743 775 739 768 1023 1066 1063	7.89 7.84 7.77 ND 7.69 7.61 7.68 7.72 7.59 7.70 8.77 7.92 7.78	120.30 121.40 99.65 ND 96.16 111.85 116.60 161.40 163.05 99.71 342.70 181.20 135.20	ND 17.40 20.10 ND 30.80 21.25 20.80 36.30 23.70 ND ND 47.80	ND 1.36 1.55 ND 2.44 1.68 1.68 3.42 2.05 ND	After 4" rainfall event
19-Jul 27-Jul 2-Aug 9-Aug 16-Aug 23-Aug 30-Aug 7-Sep 14-Sep 12-Jul 18-Jul 26-Jul	CW01 CW01 CW01 CW01 CW01 CW01 CW01 CW01	19-Jul 27-Jul 2-Aug 9-Aug 16-Aug 23-Aug 30-Aug 7-Sep 14-Sep 12-Jul 18-Jul 26-Jul	0.36 0.16 0.23 0.22 0.33 0.22 0.48 0.12 0.26 44.13 19.66 29.99	83.5 82.3 83.5 ND 80.6 81.1 79.1 64.7 72.4 79.5 81.1	788 882 756 ND 722 743 775 739 768 1023 1066 1063 1008	7.89 7.84 7.77 ND 7.69 7.61 7.68 7.72 7.59 7.70 8.77 7.92 7.78 7.71	120.30 121.40 99.65 ND 96.16 111.85 116.60 161.40 163.05 99.71 342.70 181.20 135.20 168.80	ND 17.40 20.10 ND 30.80 21.25 20.80 36.30 23.70 ND ND 47.80 39.10 47.40	ND 1.36 1.55 ND 2.44 1.68 1.68 3.42 2.05 ND ND 3.83 3.05 3.90	After 4" rainfall event
19-Jul 27-Jul 2-Aug 9-Aug 16-Aug 23-Aug 30-Aug 7-Sep 14-Sep 12-Jul 18-Jul 26-Jul 1-Aug	CW01 CW01 CW01 CW01 CW01 CW01 CW01 CW01	19-Jul 27-Jul 2-Aug 9-Aug 16-Aug 23-Aug 30-Aug 7-Sep 14-Sep 12-Jul 18-Jul 26-Jul 1-Aug	0.36 0.16 0.23 0.22 0.33 0.22 0.48 0.12 0.26 44.13 19.66 29.99 27.75 24.50 32.49	83.5 82.3 83.5 ND 80.6 81.1 79.1 64.7 72.4 79.5 81.1 79.7 82.7 77.1	788 882 756 ND 722 743 775 739 768 1023 1066 1063	7.89 7.84 7.77 ND 7.69 7.61 7.68 7.72 7.59 7.70 8.77 7.92 7.78 7.71 7.81	120.30 121.40 99.65 ND 96.16 111.85 116.60 161.40 163.05 99.71 342.70 181.20 135.20 168.80	ND 17.40 20.10 ND 30.80 21.25 20.80 36.30 23.70 ND ND 47.80 39.10 47.40 65.60	ND 1.36 1.55 ND 2.44 1.68 1.68 3.42 2.05 ND ND 3.83 3.05 3.90 5.36	After 4" rainfall event
19-Jul 27-Jul 2-Aug 9-Aug 16-Aug 23-Aug 30-Aug 7-Sep 14-Sep 12-Jul 18-Jul 26-Jul 1-Aug 8-Aug 15-Aug 22-Aug	CW01 CW01 CW01 CW01 CW01 CW01 CW01 CW01	19-Jul 27-Jul 2-Aug 9-Aug 16-Aug 23-Aug 30-Aug 7-Sep 14-Sep 12-Jul 18-Jul 26-Jul 1-Aug 8-Aug	0.36 0.16 0.23 0.22 0.33 0.22 0.48 0.12 0.26 44.13 19.66 29.99 27.75 24.50	83.5 82.3 83.5 ND 80.6 81.1 79.1 64.7 72.4 79.5 81.1 79.7 82.7 77.1	788 882 756 ND 722 743 775 739 768 1023 1066 1063 1008	7.89 7.84 7.77 ND 7.69 7.61 7.68 7.72 7.59 7.70 8.77 7.92 7.78 7.71	120.30 121.40 99.65 ND 96.16 111.85 116.60 161.40 163.05 99.71 342.70 181.20 135.20 168.80	ND 17.40 20.10 ND 30.80 21.25 20.80 36.30 23.70 ND ND 47.80 39.10 47.40	ND 1.36 1.55 ND 2.44 1.68 1.68 3.42 2.05 ND ND 3.83 3.05 3.90	After 4" rainfall event
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19-Jul 27-Jul 2-Aug 9-Aug 16-Aug 23-Aug 30-Aug 7-Sep 14-Sep 12-Jul 18-Jul 26-Jul 1-Aug 8-Aug 15-Aug 22-Aug	CW01 CW01 CW01 CW01 CW01 CW01 CW01 CW01	19-Jul 27-Jul 2-Aug 9-Aug 16-Aug 23-Aug 30-Aug 7-Sep 14-Sep 12-Jul 18-Jul 26-Jul 1-Aug 8-Aug 15-Aug 22-Aug	0.36 0.16 0.23 0.22 0.33 0.22 0.48 0.12 0.26 44.13 19.66 29.99 27.75 24.50 32.49 13.22	83.5 82.3 83.5 ND 80.6 81.1 79.1 64.7 72.4 79.5 81.1 79.7 82.7 77.1 77.8	788 882 756 ND 722 743 775 739 768 1023 1066 1063 1008 1080 988	7.89 7.84 7.77 ND 7.69 7.61 7.68 7.72 7.59 7.70 8.77 7.92 7.78 7.71 7.81 7.66	120.30 121.40 99.65 ND 96.16 111.85 116.60 161.40 163.05 99.71 342.70 181.20 135.20 168.80 166.80 206.00	ND 17.40 20.10 ND 30.80 21.25 20.80 36.30 23.70 ND ND 47.80 39.10 47.40 65.60 53.80	ND 1.36 1.55 ND 2.44 1.68 1.68 3.42 2.05 ND ND 3.83 3.05 3.90 5.36 4.32	After 4" rainfall event

Analysis Date	Station	DATE	FLOW CF/S	TEMP °F	SpCond uS/cm	рН	Chloride mg/l	DO %	DO mg/l	NOTES
12-Jul	NC05	12-Jul	ND	82.0	950	8.20	90.85	ND	ND	
18-Jul	NC05	18-Jul	ND	82.2	960	9.25	265.50	ND	ND	
26-Jul	NC05A	26-Jul	33.50	79.7	1005	8.12	196.20	84.20	6.75	
1-Aug	NC05A	1-Aug	33.69	81.3	972	7.97	153.50	72.10	5.69	
8-Aug	NC05A	8-Aug	29.30	76.4	1121	8.03	192.60	91.85	7.61	
15-Aug	NC05A	15-Aug	30.40	77.1	992	8.00	178.70	84.15	6.93	
22-Aug	NC05A	22-Aug	PAGE 778.77	78.4	1075	7.88	182.30	88.20	7.16	
29-Aug	NC05A	29-Aug	5.22	77.2	1143	8.38	258.90	81.70	6.72	
6-Sep	NC05A	6-Sep	24.44	61.4	1267	8.08	274.00	88.80	8.67	
12-Sep	NC05A	12-Sep	8.99	67.3	1269	7.94	269.70	91.50	8.35	
14-Jul	NC06	14-Jul	121.56	83.1	506	8.34	74.11	ND	ND	After 4" rainfall event
19-Jul	NC06	19-Jul	28.91	84.4	903	9.33	211.20	ND	ND	
27-Jul	NC06	27-Jul	41.13	82.3	1019	8.86	174.60	68.20	5.33	
2-Aug	NC06	2-Aug	34.98	84.7	979	8.62	131.60	64.10	4.89	
9-Aug	NC06	9-Aug	29.51	ND	ND	ND	ND	ND	ND	
16-Aug	NC06	16-Aug	45.66	81.4	811	8.49	131.00	75.80	5.98	
23-Aug	NC06	23-Aug	21.16	80.3	987	8.68	170.90	70.70	5.64	
30-Aug	NC06	30-Aug	24.42	78.8	900	8.88	142.80	66.40	5.38	
7-Sep	NC06	7-Sep	29.61	67.1	1240	8.61	265.70	80.30	7.35	
14-Sep	NC06	14-Sep	11.27	73.6	1193	8.77	254.10	72.70	6.21	
14-Jul	NC07	14-Jul	ND	82.9	740	8.20	85.62	ND	ND	After 4" rainfall event
19-Jul	NC07	19-Jul	88.51	82.4	1069	8.98	234.60	ND	ND	
27-Jul	NC07	27-Jul	100.68	81.1	1205	8.88	197.20	76.00	6.01	
2-Aug	NC07	2-Aug	92.79	83.8	1200	8.55	167.70	72.90	5.61	
9-Aug	NC07	9-Aug	87.78	ND	ND	ND	ND	ND	ND	
16-Aug	NC07	16-Aug	107.46	80.6	722	7.69	96.48	30.80	2.45	
23-Aug	NC07	23-Aug	84.10	79.3	1149	8.09	190.70	78.40	6.31	
30-Aug	NC07	30-Aug	71.27	76.8	1219	8.01	184.55	78.60	6.49	
7-Sep	NC07	7-Sep	87.24	67.7	1157	8.43	233.65	86.80	7.90	
14-Sep	NC07	14-Sep	55.69	74.0	1176	8.15	272.50	80.80	6.86	
14-Jul	NC08	14-Jul	ND	83.7	935	8.63	103.00	ND	ND	After 4" rainfall event
19-Jul	NC08	19-Jul	87.71	84.9	965	9.85	201.00	ND	ND	
27-Jul	NC08	27-Jul	72.84	82.0	1282	9.57	196.40	114.70	8.98	
2-Aug	N C 08	2-Aug	61.70	84.5	1219	9.34	163.60	95.80	7.33	
9-Aug	NC08	9-Aug	67.44	ND	ND	ND	ND	ND	ND	
16-Aug	NC08	16-Aug	93.33	82.1	853	8.89	126.60	95.05	7.45	
16-Aug 23-Aug	NC08 NC08	16-Aug 23-Aug		82.1 81.5	853 1164	8.89 8.91	126.60 182.70	95.05 99.60	7.45 7.84	
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23-Aug	NC08	23-Aug	59.03	81.5	1164	8.91	182.70	99.60	7.84	

APPENDIX C CHAIN OF CUSTODY PAPERWORK



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Company/Individual Name: ASSOCIATION O	The state of the s	Samplers (Prin				Project Name: (Lab Use Only)
Company/Individual Zip Code: 73104	JOHN HA					
SA	MPLE INFORMATION					TESTING REQUIRED
Sample Location or Address (Please include ZIP code)	Sample Description	# of Containers	Date (M/D/Y)	Time Ma (Circle AM or PM)		assistance selecting the proper testing for general inquiries call 1-800-869-1400
NC06	BACTEROLOGICAL SAM	PLE 3	7/14/11	6:48 AM W	FEC	CAL COLIFORM, ENTEROCOCCI, E. COLI
NC07	BACTEROLOGICAL SAM	The second secon	1	7:200 W		CAL COLIFORM, ENTEROCOCCI, E. COLI
CW01 .	BACTEROLOGICAL SAM	PLE 3		8:14 W		AL COLIFORM, ENTEROCOCCI, E. COLI
NC08	BACTEROLOGICAL SAM			9:05 M	FEC	CAL COLIFORM, ENTEROCOCCI, E. COLI
AC02	BACTEROLOGICAL SAM	10		5:50 M W		CAL COLIFORM, ENTEROCOCCI, E. COLI
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JOHN HARRINGTON ACOG TIC Relinquished By: Agency: Date	Time: Hand delive		Received By:			Agency: Date/Time;
9800-QSF3-R1.0-042811 - Page 1 of 1	707 NORTH ROBINSON, P.O. B		OMA CITY, OKL	AHOMA 73101-1	77	



C. K. E. Y. H. O. W. Y.					
Company/Individual Name: ASSOCIATION OF C		Samplers (Prin	CONTRACTOR DESIGNATION		Project Name: (Lab Use Only)
Company/Individual Zip Code: 73104		JOHN HA	RRINGTON		
SAMI	PLE INFORMATION				TESTING REQUIRED
Sample Location or Address (Please include ZIP code)	Sample Description	# of Containers	Date (M/D/Y)	Time Matrix (Circle AM or PM)	For assistance selecting the proper testing or for general inquiries call 1-800-869-1400
NC06	BACTEROLOGICAL SAMI	PLE 3	7/14/11	6:48 MM W	FECAL COLIFORM, ENTEROCOCCI, E. COLI
NC07	BACTEROLOGICAL SAMI	PLE 3	1	7:20MW	FECAL COLIFORM, ENTEROCOCCI, E. COLI
CW01	BACTEROLOGICAL SAMI	PLE 3		8:14M W	FECAL COLIFORM, ENTEROCOCCI, E. COLI
NC08	BACTEROLOGICAL SAMI	PLE 3		9:05 W	FECAL COLIFORM, ENTEROCOCCI, E. COLI
AC02	BACTEROLOGICAL SAMI	PLE 3		5:50 M W	FECAL COLIFORM, ENTEROCOCCI, E. COLI
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Company/Individual Name: ASSOCIATION OF COMPANY/Individual Zip Code: 73104		Samplers (Prin				Project Name: (Lab Use Only)		
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Sample Location or Address (Please include ZIP code)	Sample Description	# of Containers	Date (M/D/Y)	Time (Circle AM or PM)		r assistance selecting the proper testing for general inquiries call 1-800-869-1400		
NC04	BACTEROLOGICAL SAMP		7/18	GLO AM	CONTRACTOR OF THE PARTY OF THE	CAL COLIFORM, ENTEROCOCCI, E. COLI		
CH01	BACTEROLOGICAL SAMP	LE 3	(705AM	V FEC	CAL COLIFORM, ENTEROCOCCI, E. COLI		
CC01	BACTEROLOGICAL SAMP	LE 3	·)	SZAIM V	V FEC	CAL COLIFORM, ENTEROCOCCI, E. COLI		
NC05	BACTEROLOGICAL SAMP	LE 3		847AM 1	N FEC	CAL COLIFORM, ENTEROCOCCI, E. COLI		
AC01	BACTEROLOGICAL SAMP	LE Z		627AM 1	V FEC	CAL COLIFORM, ENTEROCOCCI, E. COLI		
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PLEASE SEND FULL CHAIN OF CUSTODY TO ACOG FAX 405-234-2264								
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Company/Individual Name: ASSOCIATION OF CO	Samplers (P JOHN F	rint	east of an experience of the second	*	Project Name: (Lab Use Only)		
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Sample Location or Address (Please include ZIP code)	Sample Description	# of Containers	# GI COLIGINALS	Date (M/D/Y)	Time (Circle AM or PM)	Matrix	For assistance selecting the proper testing or for general inquiries call 1-800-869-1400
NC06	BACTEROLOGICAL SAMP	LE 3		7/19	6481M		FECAL COLIFORM, ENTEROCOCCI, E. COLI
NC07	BACTEROLOGICAL SAMP	LE 3		J.	75~鄉	W	FECAL COLIFORM, ENTEROCOCCI, E. COLI
CW01	BACTEROLOGICAL SAMP	LE 3		.]	MARS 8		FECAL COLIFORM, ENTEROCOCCI, E. COLI
· NC08	BACTEROLOGICAL SAMP	LE 3			93 a	w	FECAL COLIFORM, ENTEROCOCCI, E. COLI
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NCOBZOAC PLEASE SEND FL	JLL CHAIN OF CUSTODY TO	ACOG FAX	X 4	05-234-2264	ļ.		
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JOHN HARRINGTON ACOG Relinquished By Agency: Date/Time	Courier (Fedi US Mail		1	eceived By:			Agency: Date/Time:
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9800-OSE3-R1 0-042811/- Page 1 of 1	707 NORTH PORINSON P.O. BO	V 4077 OKLA	LIC	ALLO VITTO ALL	110044 72404	4677	CONTRACTOR



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的变形的现在分词	The production of the second o	TINFORMA	2012 COLINE STATES		
Company/Individual Name: ASSOCIATION	ON OF CENTRAL OK GOVTS	Samplers (Prin	*	Project Name: (Lab Use Only)	
Company/Individual Zip Code: 73104		JOHN HA	RRINGTON		
	SAMPLE INFORMATION				TESTING REQUIRED
Sample Location or Address (Please include ZIP code)	Sample Description	# of Containers	Date (M/D/Y)	Time Matrix (Circle AM or PM)	For assistance selecting the proper testing or for general inquiries call 1-800-869-1400
NC04	BACTEROLOGICAL SAME	PLE 3	7/26/11	6:31AM W	FECAL COLIFORM, ENTEROCOCCI, E. COLI
CH01	BACTEROLOGICAL SAME	PLE 3		TILG AND W	FECAL COLIFORM, ENTEROCOCCI, E. COLI
CC01	BACTEROLOGICAL SAME	PLE 3		7:55 AN W	FECAL COLIFORM, ENTEROCOCCI, E. COLI
NC05 A	BACTEROLOGICAL SAME	PLE 3		8:450M W	FECAL COLIFORM, ENTEROCOCCI, E. COLI
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	SAMPLE	R'S COMME	NTS		
PLEASE	SEND FULL CHAIN OF CUSTODY T	O ACOG FAX	405-234-226	4	
JENEY WAR BETTER THE STATE	SAMPLE REC	EIVING COI	MENTS		1500 Sept. 18.18 19.18 19.18 19.18
ACOILOCA, ACOLA Drain					
以为为 自己的主义。	CUSTODY REC	ORD MUST	BE SIGNED		
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Company/Individual Name: ASSOCIATION OF C	A DESCRIPTION OF THE PROPERTY OF THE PROPERTY OF THE PARTY OF THE PART	Camples /P	0.00	and the management of			Project Name: (Lab Use Only)						
Company/Individual Zip Code: 73104						Samplers (Print Names): Project Name: (Lab Use Only) JOHN HARRINGTON							
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SAM	PLE INFORMATION						TESTING REQUIRED						
Sample Location or Address (Please include ZIP code)	Sample Description	# of Containers	# Of CONTAINED	Date (M/D/Y)	(Circle AM or PM)	Matrix	For assistance selecting the proper testing or for general inquiries call 1-800-869-1400						
NC06	BACTEROLOGICAL SAME	PLE 3		7/27/4	644AM	w	FECAL COLIFORM, ENTEROCOCCI, E. COLI						
NC07	BACTEROLOGICAL SAME	PLE 3		1	745AM	W	FECAL COLIFORM, ENTEROCOCCI, E. COLI						
CW01	BACTEROLOGICAL SAME	LE 3			1238 M		FECAL COLIFORM, ENTEROCOCCI, E. COLI						
NC08	BACTEROLOGICAL SAME	PLE 3			978	w	FECAL COLIFORM, ENTEROCOCCI, E. COLI						
AC02	BACTEROLOGICAL SAMP	LE 3			50LANG		FECAL COLIFORM, ENTEROCOCCI, E. COLI						
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State part of the Commission o	CUSTODY RECO	RD MUST	8	E SIGNED			建设。从于"水"对于地方 对于中部						
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Relinquished By: Agency: Date/Tim	e: Hand deliver Courier (Fed US Mail COURIER	Ex. UPS, etc.)		Received By:			Agency: Date/Time:						



Company/Individual Name: ASSOCIATION OF CE	mpany/Individual Name: ASSOCIATION OF CENTRAL OK GOVTS Sam					Project Name: (Lab Use Only)		
	Company/Individual Zip Code: 73104 SAMPLE INFORMATION					TESTING REQUIRED		
Sample Location or Address (Please include ZIP code)	Sample Description	# of Containers	Date (M/D/Y)	Time M (Circle AM or PM)		assistance selecting the proper testing or general inquiries call 1-800-869-1400		
NC04	BACTEROLOGICAL SAMP	LE 3	Blilie	638AM V	/ FECA	AL COLIFORM, ENTEROCOCCI, E. COLI		
CH01	BACTEROLOGICAL SAMP	PLE 3		7.24APM V	/ FECA	AL COLIFORM, ENTEROCOCCI, E. COLI		
CC01	BACTEROLOGICAL SAMP	LE 3	-	81 WARE V		AL COLIFORM, ENTEROCOCCI, E. COLI		
NC05	BACTEROLOGICAL SAMP	PLE 3		8:58M V		AL COLIFORM, ENTEROCOCCI, E. COLI		
AC01	BACTEROLOGICAL SAMP	LE 3		8:0AM V	/ FECA	AL COLIFORM, ENTEROCOCCI, E. COLI		
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	SAMPLER	'S COMME	NTS					
PLEASE SEND FU	JLL CHAIN OF CUSTODY TO	O ACOG FAX	405-234-226	4				
	SAMPLEREC	EIVING CO	MENTS					
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	GUSTODY/REGO)RD MUST	ar Signed					
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		TINFORE	IAI	ION					
Company/Individual Name: ASSOCIATION OF CI	ENTRAL OK GOVTS	Samplers (Print Names): Project Name: (Lab Use Only							
Company/Individual Zip Code: 73104		JOHN HARRINGTON							
SAMP	LE INFORMATION						TESTING REQUIRED		
Sample Location or Address (Please include ZIP code)	Sample Description		# of Containers	Date (M/D/Y)	Time (Circle AM or PM)	Matrix	For assistance selecting the proper testing or for general inquiries call 1-800-869-1400		
NC06	BACTEROLOGICAL SAME	PLE	3	nIsla	G47AM	w	FECAL COLIFORM, ENTEROCOCCI, E. COLI		
NC07	BACTEROLOGICAL SAME	PLE	3	1	749 AN	W	FECAL COLIFORM, ENTEROCOCCI, E. COLI		
CW01	BACTEROLOGICAL SAMP	LE	3	7.	B: ZZAIM		FECAL COLIFORM, ENTEROCOCCI, E. COLI		
NC08	BACTEROLOGICAL SAME	PLE	3		9: 28 AM		FECAL COLIFORM, ENTEROCOCCI, E. COLI		
ACO2	BACTEROLOGICAL SAME	PLE	3		5:4CAM		FECAL COLIFORM, ENTEROCOCCI, E. COLI		
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PLEASE SEND FL	JLL CHAIN OF CUSTODY T	O ACOG F	AX 4	105-234-226	4				
. CEASE SERVE	SAMPLE REC								
ACOZZOCA	a grand and the state of the st		ne ministra						
	CUSTODYREC	ORD MUS	T E	ESIGNED					
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Company/Individual Name: ASSOCIATION OF CE	NTRAL OK GOVTS	Samplers (F					Project Name: (Lab Use Only)
Company/Individual Zip Code: 73104		JOHN	HA	RRINGTON			
SAMP	SEINFORMATION						TESTING REQUIRED
Sample Location or Address (Please include ZIP code)	Sample Description		# of Confainers	Date (M/D/Y)	Time (Circle AM or PM)	Matrix	For assistance selecting the proper testing or for general inquiries call 1-800-869-1400
NC04	BACTEROLOGICAL SAME	LE 3	3	818111	6:4CAM	W	FECAL COLIFORM, ENTEROCOCCI, E. COLI
CH01	BACTEROLOGICAL SAME	PLE :	3	(7:28AM		FECAL COLIFORM, ENTEROCOCCI, E. COLI
CC01	BACTEROLOGICAL SAME	LE 3	3		8: 15AM		FECAL COLIFORM, ENTEROCOCCI, E. COLI
NC05 A	BACTEROLOGICAL SAME	LE :	3		goe A開	W	FECAL COLIFORM, ENTEROCOCCI, E. COLI
AC01	BACTEROLOGICAL SAME	LE 3	3		B: 27AM	w	FECAL COLIFORM, ENTEROCOCCI, E. COLI
					AM PM		
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Relinquished By (Sampler): Agency: Date/Time	CUSTODY RECO	red		Received By:			Agency: Date/Time:
JOHN HARRINGTON James ACOG 8/8/1	9:11 Courier (Fed	IEx, UPS, etc.)		•			
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Company/Individual Name: ASSOCIATION OF CO	PROJECT Company/Individual Name: ASSOCIATION OF CENTRAL OK GOVTS Company/Individual Zip Code: 73104					Project Name: (Lab Use Only)
SAMP			i ir		TESTING REQUIRED	
Sample Location or Address (Please include ZIP code)	Sample Description	# of Containers	Date (M/D/Y)	Time (Circle AM or PM)	Matrix	For assistance selecting the proper testing or for general inquiries call 1-800-869-1400
NC06	BACTEROLOGICAL SAMI	PLE 3	8/9ln	654 AM	W	FECAL COLIFORM, ENTEROCOCCI, E. COLI
NC07	BACTEROLOGICAL SAMI	PLE 3	1	753 AIM	W	FECAL COLIFORM, ENTEROCOCCI, E. COLI
CW01	BACTEROLOGICAL SAME	PLE 3		BEL AIM	W	FECAL COLIFORM, ENTEROCOCCI, E. COLI
NC08	BACTEROLOGICAL SAMI	PLE 3		928 AM		FECAL COLIFORM, ENTEROCOCCI, E. COLI
AC02	BACTEROLOGICAL SAMI	PLE 3)	SULAM	W	FECAL COLIFORM, ENTEROCOCCI, E. COLI
				AM PM		
				AM PM		
				AM PM		
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	*AMPLE	R'S COMM	ENTS			
PLEASE SEND F	ULL CHAIN OF CUSTODY T	O ACOG FA	(405-234-22	54		
	SAMPLEREC	EIVING CO	MMEATS			
			W			
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JOHN HARRINGTON ACOG 819 Relinquished By: Agency: Date/Tim	e: 🔲 Hand delive	ered dEx, UPS, etc.)	Received By:			Agency: Date/Time:

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ompany/Individual Name: Association of ompany/Individual Zip Code: 73104						Project N	Project Name: (Lab Use Only)	
	PLEINFORMATION							IG REQUIRE
Sample Location or Address (Please include ZIP code)	Sample Description	on	# of Containers	Date (M/D/Y)	Time (Circle AM or PM)	Matrix	For analstance as or for general loc	electing the proper testinguiries call 1-800-809-140
NC04	BACTEROLOGICAL SAN	1PLE	3	8/15/11	652AM	w	FECAL COLIFORM	M, ENTEROCOCCI, E. C
CH01	BACTEROLOGICAL SAN	1PLE	3	1	TER PST	W		M, ENTEROCOCCI, E. C
CC01	BACTEROLOGICAL SAN	PLE.	3		8:11 ANT	w	FECAL COLIFORN	A, ENTEROCOCCI, E. CO
NCO5 A	BACTEROLOGICAL SAN	IPLE	3		856 AM	w	FECAL COLIFORN	A, ENTEROCOCCI, E. C
AC01	BACTEROLOGICAL SAM	IPLE	3	(658 ANA	w	FECAL COLIFORN	A, ENTEROCOCCI, E. C
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	E SECURE SEASON DE	TANK OF	than a	ot same at	APPENDED		100000000000000000000000000000000000000	
COSAASUCN PLEASE SEND	FULL CHAIN OF CUSTODY	ro acog	FAX 4	05-234-226	4			
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	er en komendakken	PERSONAL PROPERTY.	高さは アムア	ESTONEDA				
quished By (Sampler): Agency: Date/Ti		ered dEx, UPS, eld	2)	Received By:			Agency	Date/Time:
		ared		leceived By:				



Company/Individual Name: ASSOCIATION OF C		Samplers (P	rint	Day of the Control of			Project Name: (Lab Use Only)
SAMI	SAMPLE INFORMATION						TESTING REQUIRED
Sample Location or Address (Please include ZIP code)	Sample Description	# of Containers	# OI OGHGHIDIO	Date (M/D/Y)	Time (Circle AM or PM)	Matrix	For assistance selecting the proper testing or for general inquiries call 1-800-869-1400
NC06	BACTEROLOGICAL SAME	PLE 3		8/16/11	656AM	W	FECAL COLIFORM, ENTEROCOCCI, E. COL
NC07	BACTEROLOGICAL SAME	PLE 3			75ZAIN		FECAL COLIFORM, ENTEROCOCCI, E. COL
CW01	BACTEROLOGICAL SAMP	LE 3			MA OS 8	W	FECAL COLIFORM, ENTEROCOCCI, E. COL
NC08	BACTEROLOGICAL SAME	LE 3			927 AN	w	FECAL COLIFORM, ENTEROCOCCI, E. COL
AC02	BACTEROLOGICAL SAMP	LE 3			647AM	w	FECAL COLIFORM, ENTEROCOCCI, E. COL
					AM PM		
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PLEASE SEND F	ULL CHAIN OF CUSTODY TO	ACOG FAX	(4	05-234-2264			
的"自己"的"是特别。"特别是"特别"。"他们是是不是一个一个。	SAMPLE REC	EIVING CO	膼	MENTS	100	- 42	Carlos de agradades de la comité destructions de la comité destruction de la comité destruction de la comité destruction destructions de la comité destruction de la comité destruction de la comité de la comité de la comité de la comité des
ACOZZOCA GET SAMPLE BOTH	es!						
	CUSTODY RECO	ORD MUST	В	ESIGNED			· · · · · · · · · · · · · · · · · · ·
Reinquished By (Sampler) JOHN HARRINGTONE ACOG 81.16/	I Course /Fod	ed Ex, UPS, etc.)	R	Received By:	and the second	and more last	Agency Date/Time:
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707 NORTH ROBINSON, P.O. BOX 1677, OKLAHOMA CITY, OKLAHOMA 73101-1677



Company/Individual Name: ASSOCIATION OF		Samplers (F		Approximation of the party		100	Project Nan	ne: (Lab Use Only)
company/Individual Zip Code: 73104	pany/Individual Zip Code: 73104 JOHN HARRINGTON							
SAMPLE INFORMATION						TESTING	REQUIRED	
Sample Location or Address (Please include ZIP code)	Sample Descriptio	n G	# or Containers	Date (M/D/Y)	Time (Circle AM or PM)	Matrix		ecting the proper testing Iries call 1-800-869-1400
NC04	BACTEROLOGICAL SAM	PLE 3		1115518	701 AM	w	FECAL COLIFORM	ENTEROCOCCI, E. COI
CH01	BACTEROLOGICAL SAM	PLE 3	3	1	137 AN	W	FECAL COLIFORM	, ENTEROCOCCI, E. COI
CC01	BACTEROLOGICAL SAM	PLE 3			B SO AIN		FECAL COLIFORM	ENTEROCOCCI, E. COI
NC05A	BACTEROLOGICAL SAM	PLE 3	3		903 AM	w	FECAL COLIFORM	, ENTEROCOCCI, E. COI
AC01	BACTEROLOGICAL SAM	PLE 3			915 AN		FECAL COLIFORM	ENTEROCOCCI, E. CO
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	CUSTODY REC	ORD MUST	18	E SIGNED			76 T TO 18 18 18 18 18 18 18 18 18 18 18 18 18	
nquished By (Sampler) Agency: Date/ HN HARRINGTON ACOG 8/2	ime: Hand delwi LIN 9:37 Counter (Fo	ered edEx, UPS, etc.)	F	Received By:		AND DESCRIPTION OF THE PERSON	Agency	Date/Time:
nquished By: Agency: Date()	ime: Hand deliv		R	Received By:			Agency	Date/Time:



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Company/Individual Name: ASSOCIATION OF C	PROJEC	Samplers (200	- Factor and the second second			Project Name: (Lab Use Only)		
Company/Individual Zip Code: 73104	ENTRAL OR GOV13			RRINGTON			, , , , , , , , , , , , , , , , , , , ,		
SAMPLE INFORMATION							TESTING REQUIRED		
Sample Location or Address (Please include ZIP code)	Sample Description		# of Containers	Date (M/D/Y)	Time (Circle AM or PM)	Matrix	For assistance selecting the proper testing or for general inquiries call 1-800-869-1400		
NC06	BACTEROLOGICAL SAME	PLE	3	8/23/11	706AM	w	FECAL COLIFORM, ENTEROCOCCI, E. COLI		
NC07	BACTEROLOGICAL SAME	PLE	3	1	806 AN	W	FECAL COLIFORM, ENTEROCOCCI, E. COLI		
CW01	BACTEROLOGICAL SAMP	LE	3		BSI AN	W	FECAL COLIFORM, ENTEROCOCCI, E. COLI		
NC08	BACTEROLOGICAL SAME	PLE	3		937AM	W	FECAL COLIFORM, ENTEROCOCCI, E. COLI		
AC02	BACTEROLOGICAL SAME	PLE	3	(SYLAM	W	FECAL COLIFORM, ENTEROCOCCI, E. COLI		
					AM PM AM PM				
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	SAMPLE	R'S COMI	ME	NTS					
PLEASE SEND F	ULL CHAIN OF CUSTODY TO	O ACOG F	AX 4	105-234-2264	1				
	SAMPLE REC	EIVING C	ON	MENTS					
ACOZZOCA									
	CUSTODY RECO	ORD MUS	T E	E SIGNED					
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Profession from the Country						
Company/Individual Name: ASSOCIATION OF O		T INFORMA Samplers (Pri			110	Project Name: (Lab Use Only)
Company/Individual Zip Code: 73104	LENTRAL OR GOVIS	JOHN H	report rains. (222 osc only)			
SAM					TESTING REQUIRED	
Sample Location or Address (Please include ZIP code)	Sample Description	# of Containers	Date (M/D/Y)	Time (Circle AM or PM)	Matrix	For assistance selecting the proper testing or for general inquiries call 1-800-869-1400
NC04	BACTEROLOGICAL SAME	PLE 3	8/29/11	703AM	w	FECAL COLIFORM, ENTEROCOCCI, E. COLI
CH01	BACTEROLOGICAL SAME	PLE 3		740 ANT	W	FECAL COLIFORM, ENTEROCOCCI, E. COLI
CC01	BACTEROLOGICAL SAME	PLE 3		BZ4 ARM	W	FECAL COLIFORM, ENTEROCOCCI, E. COLI
NC05.4	BACTEROLOGICAL SAME	PLE 3		204AM	w	FECAL COLIFORM, ENTEROCOCCI, E. COLI
AC01	BACTEROLOGICAL SAMP	PLE 3	7	704AM	W	FECAL COLIFORM, ENTEROCOCCI, E. COLI
				AM PM		
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	SAMPLE	R'S COMME	NTS			
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elinquished By (Sampler): Agency: Date/Tir		ed IEx, UPS, etc.)	Received By:			Agency: Date/Time:
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C X 1 A 4 C X A .									
		TINFORM	- Contraction						
Company/Individual Name: ASSOCIATION OF CE	ENTRAL OK GOVTS	Samplers (Print Names): Project Name: (Lab Use Only							
Company/Individual Zip Code: 73104		JOHN F	IARRINGTO	N					
SAMP	LE INFORMATION					TESTING REQUIRED			
Sample Location or Address (Please include ZIP code)	Sample Description	# of Containare	Date (M/D/Y	Time (Circle AM or PM)	Matrix	For assistance selecting the proper testing or for general inquiries call 1-800-869-1400			
NC06	BACTEROLOGICAL SAMP	PLE 3	8/30	1 71ZAN	w	FECAL COLIFORM, ENTEROCOCCI, E. COLI			
NC07	BACTEROLOGICAL SAMP	PLE 3	1	807AN	W	FECAL COLIFORM, ENTEROCOCCI, E. COLI			
CW01	BACTEROLOGICAL SAMP	PLE 3		836 AN	w	FECAL COLIFORM, ENTEROCOCCI, E. COLI			
NC08	BACTEROLOGICAL SAMP	PLE 3		940 AM	W	FECAL COLIFORM, ENTEROCOCCI, E. COLI			
AC02	BACTEROLOGICAL SAMP	PLE 3		719 AN	w	FECAL COLIFORM, ENTEROCOCCI, E. COLI			
				AM PM					
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	SAMPLE	R'S COMM	ENTS						
PLEASE SEND FU	JLL CHAIN OF CUSTODY TO	O ACOG FAX	(405-234-2	2264					
	SAMPLE REC	EIVING CO	MMENTS			en process and the second second			
A02200A									
	CUSTODY RECO	ORD MUST	BE SIGNE	D		A PART OF THE PROPERTY OF THE PART			
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delinquished By: Agency Date/Time		red	Received By			Agency: Date/Time;			
BRAD OCES DA O MOSAL D		NI 4077 010 1	LICHA OFFICE	214 4:10111 7242	4077				



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Company (Individual Name	THE RESIDENCE OF THE PARTY OF T	Samplers (P	Contract to the			Project Name: (Lab Use Only)
Company/Individual Name: ASSOCIATION OF C Company/Individual Zip Code: 73104	ENTRAL OK GOVIS	-	IARRINGT			Project Name. (Lab use Only)
		JOHN	AKKINGT	JN		
SAMI	LE INFORMATION				- 787	TESTING REQUIRED
Sample Location or Address (Please include ZIP code)	Sample Description	# of Containers	Date (M/D/		Matrix	For assistance selecting the proper testing or for general inquiries call 1-800-869-1400
NC04	BACTEROLOGICAL SAM	PLE 3	9/6/11	705AM	W	FECAL COLIFORM, ENTEROCOCCI, E. COLI
CH01	BACTEROLOGICAL SAM	PLE 3	1	745-AN	W	FECAL COLIFORM, ENTEROCOCCI, E. COLI
CC01	BACTEROLOGICAL SAM	PLE 3		832AN	w	FECAL COLIFORM, ENTEROCOCCI, E. COLI
NC05A	BACTEROLOGICAL SAM	IPLE 3		MASSP		FECAL COLIFORM, ENTEROCOCCI, E. COLI
AC01	BACTEROLOGICAL SAM	PLE 3)	MASSS		FECAL COLIFORM, ENTEROCOCCI, E. COLI
				AM PM		
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	SAMPLE	R'S COMM	ENTS			
CC0110CC PLEASE SEND F	ULL CHAIN OF CUSTODY 1	TO ACOG FAX	405-234	2264		
	SAMPLE REC	CEIVING CO	MMENTS	l de la comp		
	CUSTODY REC	ORD MUST	BE SIGN	ED		
Relinquished By (Sampler): Agency: Date/Tin JOHN HARRINGTON 24 AGENCY: Date/Tin ACOG 9/6/	ne: Hand deliver Courier (Fo	ered edEx_UPS, etc.)	Received E	ly:	Canada and Colonia	Agency Date/Time:
Relinquished By: Agency Date/Tin	ne: 🔲 Hand delive		Received 5	у:		Agency: Date/Time;



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	The state of the s	TINFORM	2012/01/20	STATES INCHES HOLD	2, 2, 6	100		
Company/Individual Name: ASSOCIATION OF CO	ENTRAL OK GOVTS	Samplers (F	rint N	lames):			Project Nan	ne: (Lab Use Only)
Company/Individual Zip Code: 73104		JOHN	HARF	RINGTON				
SAMP	LE INFORMATION			1 m/m			TESTING	REQUIRED
Sample Location or Address (Please include ZIP code)	Sample Description	of designation of the second o	# OI CONTAINERS	Date (M/D/Y)	Time (Circle AM or PM)	Matrix		ecting the proper testing Irles call 1-800-869-1400
NC06	BACTEROLOGICAL SAMP	LE 3	9	17/11	JS-FAIN!	W	FECAL COLIFORM	ENTEROCOCCI, E. COLI
NC07	BACTEROLOGICAL SAMP	LE 3)	S23AN	W	FECAL COLIFORM	ENTEROCOCCI, E. COLI
CW01	BACTEROLOGICAL SAMP	LE 3			852 AN	w	FECAL COLIFORM	ENTEROCOCCI, E. COLI
NC08	BACTEROLOGICAL SAMP	LE 3			957 AM	W	FECAL COLIFORM	, ENTEROCOCCI, E. COLI
AC02	BACTEROLOGICAL SAMP	LE 3		-	TIY AN	w	FECAL COLIFORM	ENTEROCOCCI, E. COLI
					AM PM			
			Т		AM PM			
					AV. PV.			
					AM PM			
					AM PM			
			T		AM PM			
			\top		AM PM			
	SAMPLE	'S COMM	ENT	s				
PLEASE SEND FI	ULL CHAIN OF CUSTODY TO	O ACOG FA	X 40	5-234-2264				
	SAMPLE REC							
ACOZZOCA								
	CUSTODY RECO		BE	SIGNED				
Relinquished By (Sampler) Agency: Date/Time ACOG 9/7/1	Courier (Fed	ed Ex, UPS, etc.)		ceived By:				Date/Time:
Relinquished By: Agency Date/Time		red	Rei	ceived By:			Agency:	Date/Time;
200 OCES D4 0 042044 Days 4 -44		N 4077 OIG	HION	A CITY OVI A	1101/14 7340	1.4077		



Unatració de haradagnica, dicarer							
	Management of the Committee of the Commi	T INFORMA	Company.	SANDARDO LEGISLACIONES		140	
Company/Individual Name: ASSOCIATION OF CE	NTRAL OK GOVTS	Samplers (Print Names):					Project Name: (Lab Use Only)
Company/Individual Zip Code: 73104		JOHN H	AR	RINGTON			
SAMP	LE INFORMATION						TESTING REQUIRED
Sample Location or Address (Please include ZIP code)	Sample Description	# of Containers		Date (M/D/Y)	Time (Circle AM or PM)	Matrix	For assistance selecting the proper testing or for general inquiries call 1-800-869-1400
NC04	BACTEROLOGICAL SAMP	LE 3	1	glielu	708AM	w	FECAL COLIFORM, ENTEROCOCCI, E. COLI
CH01	BACTEROLOGICAL SAMP	LE 3		1	744 AN		FECAL COLIFORM, ENTEROCOCCI, E. COLI
CC01	BACTEROLOGICAL SAMP	LE 3	T		B3LAN		FECAL COLIFORM, ENTEROCOCCI, E. COLI
NC05 A	BACTEROLOGICAL SAMP	PLE 3	T		913 AM	w	FECAL COLIFORM, ENTEROCOCCI, E. COLI
AC01	BACTEROLOGICAL SAMP	LE 3	T	C	809 AM	w	FECAL COLIFORM, ENTEROCOCCI, E. COLI
			T		AM PM		
			T		AM PM		
			T		AM PM		
			T		AM PM		
			T		AM PM		
			T		AM PM		
			T		AM PM		
	SAMPLE	R'S COMMI	EN	TS			
PLEASE SEND FU	JLL CHAIN OF CUSTODY TO	O ACOG FAX	(40	05-234-2264	1		
	SAMPLE REC	EIVING CO	M	WENTS			
CHOIIOHC							
	CUSTODY RECO		BE	SIGNED			在1767年中,西班牙克州村
Relinquished By (Sampler): Agency: Date/Time		ed Ex, UPS, etc.)	Re	eceived By:			Agency: Date/Time:
Relinquished By: Agency: Date/Time	Hand deliver Courier (Fed	red Ex. UPS. etc.)	Re	eceived By:			Agency: Date/Time;



	PROJEC	TINFORMA	TION			
Company/Individual Name: ASSOCIATION C	F CENTRAL OK GOVTS	Samplers (Pr	nt Names):			Project Name: (Lab Use Only)
Company/Individual Zip Code: 73104		JOHN H	ARRINGTON			
SA	MPLE INFORMATION					TESTING REQUIRED
Sample Location or Address (Please include ZIP code)	Sample Description	# of Containers	Date (M/D/Y)	Time M (Circle AM or PM)	atrix	For assistance selecting the proper testing or for general inquiries call 1-800-869-1400
NC06	BACTEROLOGICAL SAME	PLE 3	96460	719 AM	,	FECAL COLIFORM, ENTEROCOCCI, E. COL
NC07	BACTEROLOGICAL SAME	PLE 3	1	818 AIN V		FECAL COLIFORM, ENTEROCOCCI, E. COL
CW01	BACTEROLOGICAL SAME	PLE 3		845ANH V		FECAL COLIFORM, ENTEROCOCCI, E. COL
NC08	BACTEROLOGICAL SAMI	PLE 3		953AM V	/	FECAL COLIFORM, ENTEROCOCCI, E. COL
AC02	BACTEROLOGICAL SAME	PLE 3	C	1 1 1 1 1 1 1 V	,	FECAL COLIFORM, ENTEROCOCCI, E. COL
				AM PM		
				AM PM		
				AM PM		
the state of the s				AM PM		
				AM PM		
				AM PM		
				AM PM		
基础的工作。	SAMPLE	R'S COMME	NTS			
PLEASE SEN	D FULL CHAIN OF CUSTODY T	O ACOG FAX	405-234-226	54		
型的数数12 使多种的数据的数据。	SAMPLE REC	EIVING CO	MMENTS			
ACOZZOCA						
	CUSTODY RECO	PERSONAL PROPERTY OF THE PARTY OF	BE SIGNED			
HN HARRINGTON / ALOG 9	Time: Hand deliver Courier (Fed		Received By:			Agency: Date/Time:
inquished By: Agency Date	/Time: Hand delive Courier (Fee	red iEx, UPS, etc.)	Received By:			Agency: Date/Time:

APPENDIX D CALIBRATION DATA

Radius	2.00		Formulas									[e	edit]
d+R (Wetted Depth)	2.75		Let R be the radius of the c	ircle, θ is the c	central angle, c the chord le	ength, s the arc length	, h the height of the	e segment, and d the	e		_		
Depth (h)	1.25		height of the triangular porti	ion.							5		
Angle	1.79		ullet The radius is $R=h$	+d=h/2	$2 + c^2/8h$					h\ \			
Area of Chord	1.63		The arc length is s =		3					$n \downarrow \nu$	C	1	
Wetted Area	10.94	sq in) _ (*			1
Wetted Area	0.08	sq ft	• The chord length is $_{\mathcal{C}}$ =	$=2R\sin\frac{\pi}{2}$	$\frac{1}{2} = R\sqrt{2} - 2\cos\theta$					d /	θ	//	\
				θ		2				'		R	1_
Volume	5.00	gal	• The height is $h=R($	$1 - \cos \frac{1}{2}$	$= R - \sqrt{R^2 - \frac{\pi}{4}}$					\			/
Volume in cf	0.67	cf		d								/	/
Time	34.50	sec	ullet The angle is $ heta=2$ as	$rccos \frac{\pi}{R}$,			
Flow Rate	0.02	cfs		10					f 200			/	
			Area	2020		120	93119		[edit]		gment (in green) is ord (the dashed line		in
Flow Velocity	0.26	ft/s	The area of the circular seg			sector minus the area	of the triangular po	rtion.		whose endp	oints equal the cho		m
			$A = \pi R^2 \cdot \frac{\theta}{a} -$	$\frac{R^2 \sin \theta}{\theta}$	$=\frac{R^2}{2}(\theta-\sin\theta)$					above the gr	reen area).		
60-SECOND REV	Velocity FT/S		2π	2	2 (
18	0.30												
Error	15.0%												
FLOW METER CALIBRA	TION												
DATE 08-14-2011													

Radius	2.00	Formulas [edit]
d+R (Wetted Depth)	2.88	Let R be the radius of the circle, θ is the central angle, c the chord length, s the arc length, h the height of the segment, and d the
Depth (h)	1.13	height of the triangular portion.
Angle	1.95	• The radius is $R=h+d=h/2+c^2/8h$
Area of Chord	2.03	\bullet The arc length is $s=R heta$
Wetted Area	10.53 sq in	
Wetted Area	0.07 sq ft	• The chord length is $c=2R\sin\frac{\theta}{2}=R\sqrt{2-2\cos\theta}$
Volume	5.00 gal	• The height is $h=R(1-\cos\frac{\theta}{2})=R-\sqrt{R^2-\frac{c^2}{4}}$
Volume in cf	0.67 cf	
Time	34.40 sec	• The angle is $\theta = 2 \arccos \frac{d}{R}$
Flow Rate	0.02 cfs	Area [edit] A circular segment (in green) is enclosed between
Flow Velocity	0.27 ft/s	The area of the circular segment is equal to the area of the circular sector minus the area of the triangular portion. a secant/chord (the dashed line) and the arc whose endpoints equal the chord's (the arc shown
180-SECOND REV	V elocity FT/S	$A = \pi R^2 \cdot \frac{\theta}{2\pi} - \frac{R^2 \sin \theta}{2} = \frac{R^2}{2} \left(\theta - \sin \theta\right)$
44	0.24	
Ептог	-8.7%	
FLOW METER CALIBRA	TION	
DATE 08-21-2011		

Radius	2.00	Formulas	[edit]
d+R (Wetted Depth)	2.88		
Depth (h)	1.13	Let R be the radius of the circle, θ is the central angle, c the chord length, s the arc length, h the height of the segment, and d the height of the triangular portion.	
Angle	1.95	• The radius is $R=h+d=h/2+c^2/8h$	
Area of Chord	2.03	$ D = \sqrt{2}$	
Wetted Area	10.53 sq in	• The arc length is $s=R heta$	- 3
Wetted Area	0.07 sq ft	$ullet$ The chord length is $c=2R\sinrac{ heta}{2}=R\sqrt{2-2\cos heta}$	
Volume	5.00 gal	• The height is $h=R(1-\cos\frac{\theta}{2})=R-\sqrt{R^2-\frac{c^2}{4}}$	^)
Volume in cf	0.67 cf		/
Time	34.00 sec	• The angle is $\theta = 2 \arccos \frac{d}{R}$	
Flow Rate	0.02 cfs	R	
		Area [edit] A circular segment (in green) is enclose	
Flow Velocity	0.27 ft/s	The area of the circular segment is equal to the area of the circular sector minus the area of the triangular portion. a secant/chord (the dashed line) and the whose endpoints equal the chord's (the	
		$A = \pi R^2 \cdot \frac{\theta}{2\pi} - \frac{R^2 \sin \theta}{2} = \frac{R^2}{2} (\theta - \sin \theta)$ above the green area).	
180-SECOND REV	V elocity FT/S	$\frac{1}{2\pi}$ $\frac{1}{2\pi}$ $\frac{1}{2}$ $$	
46	0.26		
Ептог	-5.2%		
FLOW METER CALIBRA	TION		
DATE 08-28-2011			

Radius	2.00	Formulas	[edit]
d+R (Wetted Depth)	275		1,000
Depth (h)	1.25	Let R be the radius of the circle, θ is the central angle, c the chord length, s the arc length, h the height of the segment, and d the height of the triangular portion.	
Angle	1.79	The state of the s	
Area of Chord	1.63	• The radius is $R=h+d=h/2+c^2/8h$	1
Wetted Area	10.94 sq in	• The arc length is $s=R heta$	7
Wetted Area	0.08 sq ft	• The chord length is $c=2R\sin{rac{ heta}{2}}=R\sqrt{2-2\cos{ heta}}$	
Volume	5.00 gal	• The height is $h=R(1-\cos\frac{\theta}{2})=R-\sqrt{R^2-\frac{c^2}{4}}$	
Volume in cf	0.67 cf		
Time	34.30 sec	• The angle is $\theta = 2 \arccos \frac{d}{R}$	
Flow Rate	0.02 cfs	R	
		Area [edit] A circular segment (in green) is enclosed by	
Flow Velocity	0.26 ft/s	The area of the circular segment is equal to the area of the circular sector minus the area of the triangular portion. a secant/chord (the dashed line) and the area of the triangular portion.	
		$A=\pi R^2\cdot rac{ heta}{2\pi}-rac{R^2\sin heta}{2}=rac{R^2}{2}\left(heta-\sin heta ight)$ above the green area).	
180-SECOND REV	V elocity FT/S	2π 2 2 2 2 3 3 3 3 3 4 3 3 4 3 3 4 3 4 3 4 3 4 4 4 4 4 4 4 4 4 4	
45	0.25		1
Егтог	-2.6%		
FLOW METER CALIBRA	TION		
DATE 09-05-2011			

Radius	2.00	Formulas
d+R (Wetted Depth)	263	Let R be the radius of the circle, θ is the central angle, c the chord length, s the arc length, h the height of the segment, and d the
Depth (h)	1.38	height of the triangular portion.
Angle	1.63	$ullet$ The radius is $R=h+d=h/2+c^2/8h$
Area of Chord	1.25	• The radius is $R=h+d=h/2+c^a/8h$ • The arc length is $S=R\theta$
Wetted Area	11.31 sq in	
Wetted Area	0.08 sq ft	• The chord length is $c=2R\sin{rac{ heta}{2}}=R\sqrt{2-2\cos{ heta}}$
	- 5250 5 50	$\frac{1}{\theta}$ $\frac{1}{c^2}$ R
Volume	5.00 gal	• The height is $h=R(1-\cos\frac{\theta}{2})=R-\sqrt{R^2-\frac{c^2}{4}}$
Volume in cf	0.67 cf	.7 '
Time	35.80 sec	$ullet$ The angle is $ heta=2rccosrac{d}{R}$
Flow Rate	0.02 cfs	n .
	ordered and their cost	Area [edit] A circular segment (in green) is enclosed between a secant/chord (the dashed line) and the arc
Flow Velocity	0.24 ft/s	The area of the circular segment is equal to the area of the circular sector minus the area of the triangular portion. whose endpoints equal the chord's (the arc sho
Anneal Anna Anna Anna Anna Anna Anna Anna An		$A = \pi R^2 \cdot \frac{\theta}{2\pi} - \frac{R^2 \sin \theta}{2} = \frac{R^2}{2} (\theta - \sin \theta)$
180-SECOND REV	V elocity FT/S	2π 2 2
43	0.24	
Error	0.5%	
FLOW METER CALIBRA	TION	
DATE 09-11-2011		

RP DO membrane changed? Y N Note: Wait 3 to 6 hours before calibrating for unattended RP DO membrane o-ring changed? Y N deployments; rum in Discrete mode for 10 minutes to accelerate brum in. (Rapital Pulse DO Only) Turbidity wiper changed? Y N Chlorophyll wiper changed? Y N BGA-PE wiper changed? Y N Rhodamine wiper changed? Y N R	Date of Calibration: The Second to S	Sonde ID: <u>05A 2409</u> AA								
RP DO membrane o-ring changed? Y N deployments; run in Discrete mode for 10 minutes to accelerate burn in. (Rapid Pulse DO Only) Turbidity wiper changed? Y N ROX DO wiper changed? Y N BGA-PE wiper changed? Y N BGA-PE wiper changed? Y N Rhodamine wiper changed? Y N Note: If parking problems occur with optical probes having a serial number 07L (Dec 07) or older, be sure the firmware is 3.06 or later. Parking issues with optical probes having a serial number of 10L may be related to a dirty wiper body or pad. Record sonde battery voltage: [if applicable] Record the following diagnostic numbers after calibration. 6560 Conductivity cell constant 1 Range 5.0 ± .45 Integrated conductivity cell constant 1 Range 5.0 ± .70 Range 0 ± 50 mv pH 7 Range 1.80 ± 50 mv pH 7 Range 1.80 ± 50 mv pH 7 Note: Millivolt span between pH 4 and 7 should be ≈ 165 to 180 mv Millivolt span between pH 7 and 10 should be ≈ 165 to 180 mv Millivolt span between pH 7 and 10 should be ≈ 165 to 180 mv DO charge (RP only) Range 0.7 to 1.4 Turbidity standard used in calibration DO gain Range 0.85 to 1.15 Chlorophyll DO (Chlorophyll DO (Charge (RP only) Range 0.85 to 1.15 Range 1.80 A PEPC A Chlorophyll DO (Charge (RP only) Range 0.7 to 1.4 Range 1.80 A PEPC A Range 1	rechnician: John Harring too Note:	New Aox Do, pH, consuct probes								
Turbidity wiper changed? Y N BGA-PE wiper changed? Y N ROX DO wiper changed? Y N Rhodamine wiper changed? Y N N BGA-PE wiper changed? Y N Rhodamine wiper changed? Y N N BGA-PE wiper babby or older, with optical probes having a serial number of the probable calibration constant: 0.0 psig ± 0.15	RP DO membrane o-ring changed? Y N deployments; run in Discrete mode for 10 minutes to accelerate									
3.06 or later. Parking issues with optical probes having a serial number prior to 07L may be related to a dirry wiper body or pad. Record sonde battery voltage:	Turbidity wiper changed? Y N Chlorophyll wiper changed? Y N ROX DO wiper changed? Y N BGA-PE wiper changed? Y N									
Record the following diagnostic numbers after calibration. Refect the following diagnostic numbers after calibration. Range 5.0 ± .45 Temperature 27.0 T	3.06 or later. Parking issues with optical probes having a serial number prior to 07L may be related to a dirty wiper body or									
Integrated conductivity cell constant Range 5.0 ± .70 Conductivity 11 43 //4/8 pH mv Buffer 7 Range 0 ± 50 mv pH 7 / 6.96 pH mv Buffer 4 Range +180 ± 50 mv* pH 10 /9.79 *Note: Millivolt span between pH 4 and 7 should be ≈ 165 to 180 mv ORP Millivolt span between pH 7 and 10 should be ≈ 165 to 180 mv Turbidity 514 / DO charge (RP only) Range 25 to 75 Turbidity 62.6 / DO gain Range 0.85 to 1.15 Clorophyll 49.5 / 96.3 Chlorophyll Y9.5 / 96.3 Chlorophyll Y9.5 / 96.3 Chlorophyll BGA PEPC / Barometric Pressure: mmHg BGA PEPC / Barometric Pressure: mmHg BGA PEPC / DO % Calculated − (BARO mmHg divided by 7.6) = % saturation Rhodamine / Example: 760 + 7.6 = 100.0% Depth Calibration - If zero was entered, record value meters/feet and pressure mmHg Depth Calibration (Vented) − Acceptable calibration constant: 0.0 psig ± 0.15	2	Standard Pre Cal / Post Cal								
pH mv Buffer 7 Range 0 ±50 mv pH 7 /6.96 pH mv Buffer 4 Range +180 ±50 mv* pH 10 /9.79 *Note: Millivolt span between pH 4 and 7 should be ≈ 165 to 180 mv ORP Millivolt span between pH 7 and 10 should be ≈ 165 to 180 mv Turbidity 514 / DO charge (RP only) Range 25 to 75 Turbidity 5.2.6 / DO gain Range 0.85 to 1.15 C1 Chlorophyll 49.5 / 96.3 Chlorophyll / Turbidity standard used in calibration DO RP / Manufacturer and part number DO ROX / BGA PE/PC / Barometric Pressure: mmHg BGA PE/PC / DO % Calculated - (BARO mmHg divided by 7.6) = % saturation Rhodamine / Example: 760 + 7.6 = 100.0% Depth Calibration - If zero was entered, record value meters/feet and pressure mmHg Depth Calibration (Vented) - Acceptable calibration constant: 0.0 psig ± 0.15	Record the following diagnostic numbers after calibration. 6560 Conductivity cell constant 47.81101 Range 5.0 ± .45	Temperature <u>Z9.0</u> 39.9 Sonde								
PH mv Buffer 4 Range +180 ± 50 mv* pH 10	Integrated conductivity cell constant Range 5.0 ± .70									
pH mv Buffer 10	pH mv Buffer 7 Range 0 ± 50 mv	pH 7								
*Note: Millivolt span between pH 4 and 7 should be ≈ 165 to 180 mv Millivolt span between pH 7 and 10 should be ≈ 165 to 180 mv Turbidity 514		p#== /								
Millivolt span between pH 7 and 10 should be ≈ 165 to 180 mv Turbidity 514 / DO charge (RP only) Range 25 to 75 Turbidity 62.6 / DO gain Range 0.7 to 1.4 ODO gain Range 0.85 to 1.15 Chlorophyll 495 / 96.3 Chlorophyll / Turbidity standard used in calibration DO RP / Manufacturer and part number DO ROX / BGA PE/PC / Barometric Pressure: mmHg BGA PE/PC / DO % Calculated - (BARO mmHg divided by 7.6) = % saturation Rhodamine / Example: 760 + 7.6 = 100.0% Depth Calibration - If zero was entered, record barometric pressure at time of calibration meters/feet and pressure mmHg Depth Calibration (Vented) - Acceptable calibration constant: 0.0 psig ± 0.15	pH mv Buffer 10 - 146.95 Range -180 ±50 mv *	pH 10								
DO charge (RP only) Range 25 to 75 Turbidity 52.6 DO gain Range 0.7 to 1.4 Turbidity 52.6 Range 0.85 to 1.15 Chlorophylt 495 Chlorophyll Chlorophyll Chlorophyll Chlorophyll Chlorophyll DO RP Manufacturer and part number DO ROX BGA PEPC DO % Calculated – (BARO mmHg divided by 7.6) = % saturation Example: 760 ÷ 7.6 = 100.0% Depth Calibration - If zero was entered, record barometric pressure at time of calibration mmHg Depth Calibration - If offset depth was entered, record value meters/feet and pressure mmHg Depth Calibration (Vented) — Acceptable calibration constant: 0.0 psig ± 0.15	*Note: Millivolt span between pH 4 and 7 should be \approx 165 to 180 mv	ORP/_								
DO gain Range 0.7 to 1.4 Turbidity \$\sigma\$ 5.2 / ODO gain Range 0.85 to 1.15 C1 Chierophylt 495 / 96.3 Chlorophyll / Turbidity standard used in calibration DO RP / Manufacturer and part number DO ROX / BGA PE/PC / Barometric Pressure: mmHg BGA PE/PC / DO % Calculated - (BARO mmHg divided by 7.6) = % saturation Rhodamine / Example: 760 ÷ 7.6 = 100.0% Depth Calibration - If zero was entered, record barometric pressure at time of calibration mmHg Depth Calibration - If offset depth was entered, record value meters/feet and pressure mmHg Depth Calibration (Vented) - Acceptable calibration constant: 0.0 psig ± 0.15	Millivolt span between pH 7 and 10 should be \approx 165 to 180 mv	Turbidity <u>514</u>								
DO gain Range 0.7 to 1.4 Turbidity \$\sigma\$ 5.2 / ODO gain Range 0.85 to 1.15 C1 Chierophylt 49.5 / 96.3 Chlorophyll / Turbidity standard used in calibration DO RP / Manufacturer and part number DO ROX / BGA PE/PC / Barometric Pressure: mmHg BGA PE/PC / DO % Calculated - (BARO mmHg divided by 7.6) = % saturation Rhodamine / Example: 760 ÷ 7.6 = 100.0% Depth Calibration - If zero was entered, record barometric pressure at time of calibration mmHg Depth Calibration - If offset depth was entered, record value meters/feet and pressure mmHg Depth Calibration (Vented) - Acceptable calibration constant: 0.0 psig ± 0.15	DO charge (RP only) Range 25 to 75									
ODO gain Range 0.85 to 1.15 Chlorophyll 49.5 / 96.3 Chlorophyll	DO gain Range 0.7 to 1.4	Turbidity 08 5.2 /								
Turbidity standard used in calibration DO RP / Manufacturer and part number DO ROX / BGA PE/PC / Barometric Pressure:mmHg BGA PE/PC / DO % Calculated - (BARO mmHg divided by 7.6) = % saturation Rhodamine / Example: 760 ÷ 7.6 = 100.0% Depth Calibration - If zero was entered, record barometric pressure at time of calibration mmHg Depth Calibration - If offset depth was entered, record valuemeters/feet and pressuremmHg Depth Calibration (Vented) - Acceptable calibration constant: 0.0 psig ± 0.15										
Manufacturer and part number DO ROX / BGA PE/PC / Barometric Pressure:mmHg BGA PE/PC / DO % Calculated - (BARO mmHg divided by 7.6) = % saturation Rhodamine / Example: 760 ÷ 7.6 = 100.0% Depth Calibration - If zero was entered, record barometric pressure at time of calibration mmHg Depth Calibration - If offset depth was entered, record value		Chlorophyll/_								
BGA PE/PC /_ Barometric Pressure:mmHg BGA PE/PC /_ DO % Calculated - (BARO mmHg divided by 7.6) = % saturation Rhodamine /_ Example: 760 ÷ 7.6 = 100.0% Depth Calibration - If zero was entered, record barometric pressure at time of calibrationmmHg Depth Calibration - If offset depth was entered, record valuemeters/feet and pressuremmHg Depth Calibration (Vented) - Acceptable calibration constant: 0.0 psig ± 0.15	Turbidity standard used in calibration	DO RP/								
Barometric Pressure:mmHg BGA PE/PC/_ DO % Calculated - (BARO mmHg divided by 7.6) = % saturation Rhodamine/ Example: 760 ÷ 7.6 = 100.0% Depth Calibration - If zero was entered, record barometric pressure at time of calibrationmmHg Depth Calibration - If offset depth was entered, record valuemeters/feet and pressuremmHg Depth Calibration (Vented) - Acceptable calibration constant: 0.0 psig ± 0.15	Manufacturer and part number	DO ROX/								
DO % Calculated – (BARO mmHg divided by 7.6) = % saturation Rhodamine / Example: 760 ÷ 7.6 = 100.0% Depth Calibration - If zero was entered, record barometric pressure at time of calibration mmHg Depth Calibration - If offset depth was entered, record value meters/feet and pressure mmHg Depth Calibration (Vented) - Acceptable calibration constant: 0.0 psig ± 0.15		BGA PE/PC/								
Example: 760 ÷ 7.6 = 100.0% Depth Calibration - If zero was entered, record barometric pressure at time of calibrationmmHg Depth Calibration - If offset depth was entered, record valuemeters/feet and pressuremmHg Depth Calibration (Vented) - Acceptable calibration constant: 0.0 psig ± 0.15	Barometric Pressure:mmHg	BGA PE/PC/								
Depth Calibration - If zero was entered, record barometric pressure at time of calibrationmmHg Depth Calibration - If offset depth was entered, record valuemeters/feet and pressuremmHg Depth Calibration (Vented) - Acceptable calibration constant: 0.0 psig ± 0.15		Rhodamine/								
Depth Calibration - If offset depth was entered, record value	•									
Depth Calibration (Vented) - Acceptable calibration constant: 0.0 psig ± 0.15										
	Deput Campration (vented) — Acceptable calibration constant: 0.0 psig ± 0	21.0								
Notes: CANNOT CATIBORAL NEW DO SENSOR- NEED TO ORDER NEW	Notes: CANNOT CATIBORE NEW DO SEASOR-	NEED TO ORDER WELL								
ADAPTER 6095 MS 8/ DB-9 from YSI										

Technician: Notes Harring from	le ID:
New DO ROX	
	rs before calibrating for unattended
burn in. (Rapid Pulse	Discrete mode for 10 minutes to accelerate DO Only)
Turbidity wiper changed? Y N Chlorophyll wiper change	ed? Y N
ROX DO wiper changed? Y N BGA-PE wiper changed	
BGA-PC wiper changed? Y N Rhodamine wiper change	d? Y N
Note: If parking problems occur with optical probes having a serial number 071 3.06 or later. Parking issues with optical probes having a serial number prior to pad.	L (Dec 07) or older, be sure the firmware is o 07L may be related to a dirty wiper body or
Record sonde battery voltage: (if applicable)	Record Calibration Values Standard Pre Cal / Post Cal
Record the following diagnostic numbers after calibration. 6560 Conductivity cell constant 438545 Range 5.0 ± .45	Temperature 28.8 27. Sonde
Integrated conductivity cell constant Range $5.0 \pm .70$	Conductivity 1363
pH mv Buffer 7	pH 7/_
pH mv Buffer 4 Range +180 ± 50 mv*	pH 4/_
pH mv Buffer 10 -40.1 Range -180 ±50 mv *	pH 10/_
*Note: Millivolt span between pH 4 and 7 should be \approx 165 to 180 mv	ORP/_
Millivolt span between pH 7 and 10 should be \approx 165 to 180 mv	Turbidity
DO charge (RP only) Range 25 to 75	Turbidity
DO gain Range 0.7 to 1.4	Turbidity 0.5/
ODO gain Range 0.85 to 1.15 C	Chierophyll 98 1/80
2	Chlorophyll/_
Turbidity standard used in calibration Hack 54alol Cel	DO RP/
Manufacturer and part number	DO ROX/_
	BGA PE/PC/
Barometric Pressure:mmHg	BGA PE/PC/
DO % Calculated (BARO mmHg divided by 7.6) = % saturation	Rhodamine/
Example: 760 ÷ 7.6 = 100.0%	
Depth Calibration - If zero was entered, record barometric pressure at time of ca	
Depth Calibration - If offset depth was entered, record value met	
Depth Calibration (Vented) – Acceptable calibration constant: $0.0 \text{ psig} \pm 0.15$	
Notes:	

Date of Calibration: 7/(7/2011 Sono	de ID:
	urs before calibrating for unattended Discrete mode for 10 minutes to accelerate DO Only)
Turbidity wiper changed? Y N Chlorophyll wiper change	
ROX DO wiper changed? Y N BGA-PE wiper changed	
BGA-PC wiper changed? Y N Rhodamine wiper change	ed? Y N
Note: If parking problems occur with optical probes having a serial number 07 3.06 or later. Parking issues with optical probes having a serial number prior topad.	L (Dec 07) or older, be sure the firmware is to 07L may be related to a dirty wiper body or
Record sonde battery voltage: (if applicable)	Record Calibration Values Standard Pre Cal / Post Cal
Record the following diagnostic numbers after calibration. 6560 Conductivity cell constant 4.78 565 Range 5.0 ± .45	TemperatureSonde
Integrated conductivity cell constant Range $5.0 \pm .70$	Conductivity 1417 1413
pH mv Buffer 7 -19.14 Range 0 ±50 mv	pH 7 6,56 17.14
pH mv Buffer 4 Range +180 ± 50 mv*	pH 4
pH mv Buffer 10 Range -180 ± 50 mv *	pH 10 12.5 110.01
*Note: Millivolt span between pH 4 and 7 should be \approx 165 to 180 mv	ORP /
Millivolt span between pH 7 and 10 should be ≈ 165 to 180 mv	Turbidity 5.2 4.0 15.0
DO charge (RP only) Range 25 to 75 -161.97	Turbidity 526 50. 150.
DO gain Range 0.7 to 1.4	Turbidity 0.5 514 496 / 494
ODO gain Range 0.85 to 1.15	Chlorophyll 44.51/01.2
	Chlorophyll/
Turbidity standard used in calibration	DO RP/
Manufacturer and part number	DO ROX/
	BGA PE/PC/
Barometric Pressure:mmHg	BGA PE/PC/
DO % Calculated - (BARO mmHg divided by 7.6) = % saturation	Rhodamine /
Example: $760 \div 7.6 = 100.0\%$	
Depth Calibration - If zero was entered, record barometric pressure at time of ca	alibrationmmHg
Depth Calibration - If offset depth was entered, record value me	ters/feet and pressuremmHg
Depth Calibration (Vented) – Acceptable calibration constant: $0.0 \text{ psig} \pm 0.15$	Where the rest in the contract of the contract
Notes:	

Date of Calibration: 7/24 11 Technician: JH	Sond	le ID:							
RP DO membrane changed? Y N Note: Wait 3 to 6 hours before calibrating for unattended RP DO membrane o-ring changed? Y N deployments; run in Discrete mode for 10 minutes to accelerate burn in. (Rapid Pulse DO Only)									
Turbidity wiper changed? Y N Chlore	ophyll wiper change								
ROX DO wiper changed? Y N BGA	-PE wiper changed								
BGA-PC wiper changed? Y N Rhoda	mine wiper change	d? Y N							
Note: If parking problems occur with optical probes having a 3.06 or later. Parking issues with optical probes having a pad.	ing a serial number 071 a serial number prior to	L (Dec 07) or oi o 07L may be re	lder, be sure the lated to a dirty	e firmware is wiper body or					
Record sonde battery voltage:		Record Standard	Calibration Pre C	Values al / Post Cal					
Record the following diagnostic numbers aft 6560 Conductivity cell constant Range	er calibration. 5.0 ± .45	Temperature	50016e K-1	BZ Sonde					
Integrated conductivity cell constant Range	$5.0 \pm .70$	Conductivity_	1380	11413					
pH mv Buffer 7 - 11.9 Range 0	± 50 mv			17.00					
pH mv Buffer 4 Range +180	± 50 mv*	pH 4	Annual Control of the						
pH mv Buffer 10 - 119.Z Range -180	± 50 mv *			/10.00					
*Note: Millivolt span between pH 4 and 7 should be ≈ 1	65 to 180 mv	ORP							
Millivolt span between pH 7 and 10 should be ≈	165 to 180 mv	CA	151	/ 100					
DO charge (RP only) Range 25	to 75			/					
DO gain Range 0.7 t	o 1.4	Turbidity 0.5_							
ODO gain Range 0.85		Chlorophyll _							
		Chlorophyll _							
Turbidity standard used in calibration		DORP							
Manufacturer and part number		DO ROX	84.2 %	19687					
-	Motororororororororororororororororororo	BGA PE/PC		1 94.5					
Barometric Pressure: 28-31 mmHg									
DO % Calculated – (BARO mmHg divided by 7.6) = %	saturation	Rhodamine		12					
Example: $760 \div 7.6 = 100.0\%$			28.31						
Depth Calibration - If zero was entered, record barometri	ic pressure at time of ca			ťg					
Depth Calibration - If offset depth was entered, record va				mmHg					
Depth Calibration (Vented) - Acceptable calibration cor									
,									
Notes: T. Levil F		Flouromoter							
Notes: Turbinity 5 5									
50 53	c	2.25 2.0	. 1 >69						
500 49	9		- (

Date of Calibration: 8171u	Sonde ID: Ys: 6820				
Technician: Y N Note: Wai	it 2 to 6 hour	s hafova aalihvativo	for weattanded		
9	3,				
	Rapid Pulse I		minutes to deceler die		
Turbidity wiper changed? Y N Chlorophyll wij	prophyll wiper changed? Y N				
	A-PE wiper changed? Y N				
BGA-PC wiper changed? Y N Rhodamine wip	er change	1? Y N			
Note: If parking problems occur with optical probes having a serial 3.06 or later. Parking issues with optical probes having a serial nunpad.					
Record sonde battery voltage: (if app		Record Ca Standard	libration Values Pre Cal / Post Cal		
Record the following diagnostic numbers <u>after</u> calibrates 6560 Conductivity cell constant Range $5.0 \pm .45$		Temperature 75	.5 75.18 Sonde		
$Integrated\ conductivity\ cell\ constant____ Range\ 5.0\ \pm .70$		Conductivity 144	13 1413/		
pH mv Buffer 7 Range $0 \pm 50 \text{ mv}$		pH 7 _7.1	3 7.00 /		
pH mv Buffer 4 Range $+180 \pm 50$ mv*	k	pH 4	2 /0.00		
pH mv Buffer 10 Range -180 ± 50 mv	*	pH 10	0.01 15.01		
*Note: Millivolt span between pH 4 and 7 should be ≈ 165 to 180 $\rm r$	mv	ORP 95			
Millivolt span between pH 7 and 10 should be ≈ 165 to 180	mv	Turbidity 500	500/533		
DO charge (RP only) Range 25 to 75		Turbidity 50	56 /		
DO gain Range 0.7 to 1.4		Turbidity 9:35			
ODO gain Range 0.85 to 1.15	61	Chlorophyll /0	0. 98.2/100,0		
	F)	Chlorophyll	5 73.21/12.95/70.74		
Turbidity standard used in calibration	Fl	DO RP. O.	25 -0.681/-0.716/-0.845		
Manufacturer and part number	_	DO ROX			
			/		
Barometric Pressure:mmHg		BGA PE/PC			
DO % Calculated – (BARO mmHg divided by 7.6) = % saturation Example: $760 \div 7.6 = 100.0\%$	1	Rhodamine	/		
Depth Calibration - If zero was entered, record barometric pressure	at time of ca	libration	mmHg		
Depth Calibration - If offset depth was entered, record value					
Depth Calibration (Vented) – Acceptable calibration constant: 0.0					
Notes:					

Date of Calibration: 7/31/11		Sond	e ID:		
Technician: VM H	-				
RP DO membrane changed? Y RP DO membrane o-ring changed? Y		run in D	s before calibro iscrete mode fo		
ROX DO wiper changed? Y BO	orophyll wiper A-PE wiper ch damine wiper	change nanged?	ed? Y		
Note: If parking problems occur with optical probes having a superior of the problems occur with optical probes having pad.					
Record sonde battery voltage:	(if applic	able)	Record Standard	Calibration Pre C	Values Cal / Post Cal
Record the following diagnostic numbers		on.		0.58	78.43
6560 Conductivity cell constant Range			Temperature		0000 000
Integrated conductivity cell constant Ran			Conductivity_		1/413
pH mv Buffer 7 Range				7.56 7.6	5 17.00
pH mv Buffer 4 Range +1	$\pm 50 \text{ mv}^*$		pH 4		
pH mv Buffer 10 Range -1	$\pm 50 \text{ mv} *$		pH 10 _	9.97	10.0
*Note: Millivolt span between pH 4 and 7 should be	≈ 165 to 180 mv		ORP _		/
Millivolt span between pH 7 and 10 should be	e ≈ 165 to 180 mv		Turbidity _	+5.0	515
DO charge (RP only) Range	25 to 75		Turbidity _	50.0	50/53
DO gain Range 0	.7 to 1.4		Turbidity 0.5_	500.0	496 1496
ODO gain Range 0.	85 to 1.15	CI	Chlorophyll.	129.0	1/00.00
			Chlorophyll _		/
Turbidity standard used in calibration			DO RP		/
Manufacturer and part number			DO ROX	95.0	
		F15	BGA PE/PC	224.8/213	1.8
Barometric Pressure: mmHg		F1.25	BGA PE/PC	15.50	/
DO % Calculated – (BARO mmHg divided by 7.6)	= % saturation		Rhodamine		1
Example: $760 \div 7.6 = 100.0\%$					
Depth Calibration - If zero was entered, record baron	etric pressure at t	ime of ca	alibration	mn	ıHg
Depth Calibration - If offset depth was entered, record					
Depth Calibration (Vented) – Acceptable calibration	-		370	00 0-00100-0	0
		9 - 0110	-		
Notes:					

Date of Calibration: 8-15-20.	1)	Soude ID; YS; 68	20		
Technician: JAH		1=1			
RP DO membrane changed?	Y N Note: Wait 3	to 6 hours before autibustics.	for an along to 3		
RP DO membrane o-ring chan	run in Discrete mode for 10 i	urs before cultivating for unattended Discrete mode for 10 minutes to accelerate			
Turbidity wiper changed? Y	burn in. (Rap	ld Pulse DO Only)			
ROX DO wiper changed? Y	and the second of the second o				
BGA-PC wiper changed? Y	The second secon				
Note: If parking problems occur with 5.06 or later. Parking issues with opped.	h optical probes having a serial ru stical probes having a serial numbe	mber 07L (Dec 07) or older, E r prior to 07L may be related	e sure the firmware is to a dirty wiper body or		
Record sonde battery voltage:		Standard	bration Values Pre Cal / Post Cal		
Record the following diagnos 6560 Conductivity cell constant	stic numbers <u>after</u> calibration	on. Temperature 79			
Integrated conductivity cell constant		Conductivity 141			
and the second s	Range 0 +56 my	pH 7 67.			
	Range +180 150 move	pH 4	0.10.6.10		
pH sav Buffer 10	Range -180 ±50 my*	pH 10 /0			
*Note: Millivolt span between pli 4	and 7 should be \$ 165 to 180 my	ORP	/		
	Fand 10 should be ≈ 165 to 180 my	Turbidity 500			
DO charge (RP only)	Range 25 to 75	Turbidity 50			
DO gain.	Range 0.7 to 1.4	Turbidity 0.5 5			
ODO gain	Range 0.85 to 1.15	Chlorophyll			
		Chlorophyll / hc	95% 96.2%		
Turbidity standard used in calibration	I)	DO RP	/		
Manufacturer and part number		DOROX	J		
		FI 5 BGAPERC 72.0	9/70.67/68.36		
Paromotric Prossure:	mmHg	F10.75 PCA PEAC -0.3	14.0-1095.0-180		
DO % Calculated - (BARO mod lg	divided by 7.6) = % saturation	Rhodamine			
Example: 760 + 7.6 = 100,0%					
Depth Calibration - If zero was enter	ed, record barometric pressure at ti	me of calibration	ramHg		
Depth Calibration - If office depth wi					
Depth Calibration (Vented) - Accep					
5 V					
Notes:					

Date of Calibration: 8 21 11 Sono	de ID: 451 6820				
RP DO membrane changed? Y N Note: Wait 3 to 6 hours before calibrating for unattended RP DO membrane o-ring changed? Y N deployments; run in Discrete mode for 10 minutes to accelerate burn in. (Rapid Pulse DO Only)					
Turbidity wiper changed? Y N Chlorophyll wiper change					
ROX DO wiper changed? Y N BGA-PE wiper changed					
BGA-PC wiper changed? Y N Rhodamine wiper change					
Note: If parking problems occur with optical probes having a serial number 07L (Dec 07) or older, be sure the firmware is 3.06 or later. Parking issues with optical probes having a serial number prior to 07L may be related to a dirty wiper body or pad.					
Record sonde battery voltage: (if applicable)	Record Calibration Values Standard Pre Cal / Post Cal				
Record the following diagnostic numbers <u>after</u> calibration. 6560 Conductivity cell constant Range 5.0 ± .45	Temperature				
Integrated conductivity cell constant Range $5.0 \pm .70$	Conductivity 1413 1424/1413				
pH mv Buffer 7 Range 0 ± 50 mv	pH 7 7.0 7.02/7.00				
pH mv Buffer 4 Range +180 ± 50 mv*	pH 4/_				
pH mv Buffer 10 Range -180 ± 50 mv *	pH 10 /0.0 /0.05/0.0				
*Note: Millivolt span between pH 4 and 7 should be \approx 165 to 180 mv	ORP C1 /60 98.6/200.0				
Millivolt span between pH 7 and 10 should be \approx 165 to 180 mv	Turbidity 5 6 /				
DO charge (RP only) Range 25 to 75	Turbidity 50 56 /				
DO gain Range 0.7 to 1.4	Turbidity 0 500 529/				
/	Chlorophyll 35 70.71				
FI	Chlorophyll 0.25 5.538				
Turbidity standard used in calibration	DORP 95.0 95.6/95.0				
Manufacturer and part number	DO ROX/_				
	BGA PE/PC/				
Barometric Pressure:mmHg	BGA PE/PC/				
DO % Calculated – (BARO mmHg divided by 7.6) = % saturation	Rhodamine/_				
Example: $760 \div 7.6 = 100.0\%$					
Depth Calibration - If zero was entered, record barometric pressure at time of calibrationmmHg					
Depth Calibration - If offset depth was entered, record value meters/feet and pressure mmHg					
Depth Calibration (Vented) - Acceptable calibration constant: 0.0 psig ± 0.15					
Notes: Order more consuct solutions (1)					

APPENDIX E PICTURES AND AERIALS









