

## CONSERVATION INNOVATION GRANTS Final Report

<b>Agreement Number:</b>	NRCS 68-3A75-4-196
<b>Grantee Name:</b>	KLA Environmental Services, Inc.
<b>Project Title:</b>	Maintaining and protecting groundwater quality from nutrients and pathogens found in livestock waste lagoons by utilizing a water balance method of testing the integrity of the lagoons.
<b>Project Director:</b>	Richard A. McKee
<b>Contact Information:</b>	<b>Phone Number:</b> 785-273-5115 <b>E-Mail:</b> rich@kla.org
<b>Period Covered by Report:</b>	October 1, 2004 to October 1, 2009
<b>Project End Date:</b>	<b>October 1, 2009 (extension granted)</b>

**Summarize the work performed during the project period covered by this report:**

The project period covered by this report extends from October 1, 2004 to October 1, 2009. KLA Environmental Services, Inc. (KLAES) conducted 97 water balance studies that were eligible for Conservation Innovation Grants (CIGs). These studies measured the whole-pond seepage rates from livestock waste storage ponds at 32 cattle feeding operations located in Kansas. Eighty-one of the 97 CIG-eligible ponds tested met the applicable regulations set by the Kansas Department of Health and Environment (KDHE). This regulation limits seepage rates for earthen waste storage ponds serving confined animal feeding operations to 0.25 in./d or 6.35 mm/d. Table 1 describes the seepage tests completed since October 1, 2004.

**Table 1. TESTING RESULTS FROM OCTOBER 1, 2004 TO OCTOBER 1, 2009**

	SEEPAGE RATE		
	IN./D	FRACTION (IN./D)	MM/D
MAXIMUM	0.8932	1	22.6870
AVERAGE	0.1093	1/9	2.7770
MINIMUM	0.0016	1/635	0.0400
STANDARD DEVIATION	0.1546	1/6	3.9265

Assuming that variation in seepage rates from pond to pond can be described by a log normal distribution; a log normal distribution was developed for the dataset derived from the water balance studies. Figure 1 shows this log normal distribution for the dataset created from the 97 CIG-eligible seepage tests conducted since October 1, 2004. The distribution in Figure 1 shows that the probability of a waste storage pond having a seepage rate greater than 6 mm/d is less than 10%. Therefore, assuming that the waste storage ponds tested are representative of the entire population of livestock waste storage ponds in Kansas, it could be inferred that 90% of the ponds have a seepage rate less than the Kansas regulatory limit of 0.25 inch/day.

**Figure 1. CUMULATIVE PROBABILITY FOR WASTE STORAGE PONDS SEEPAGE RATES**

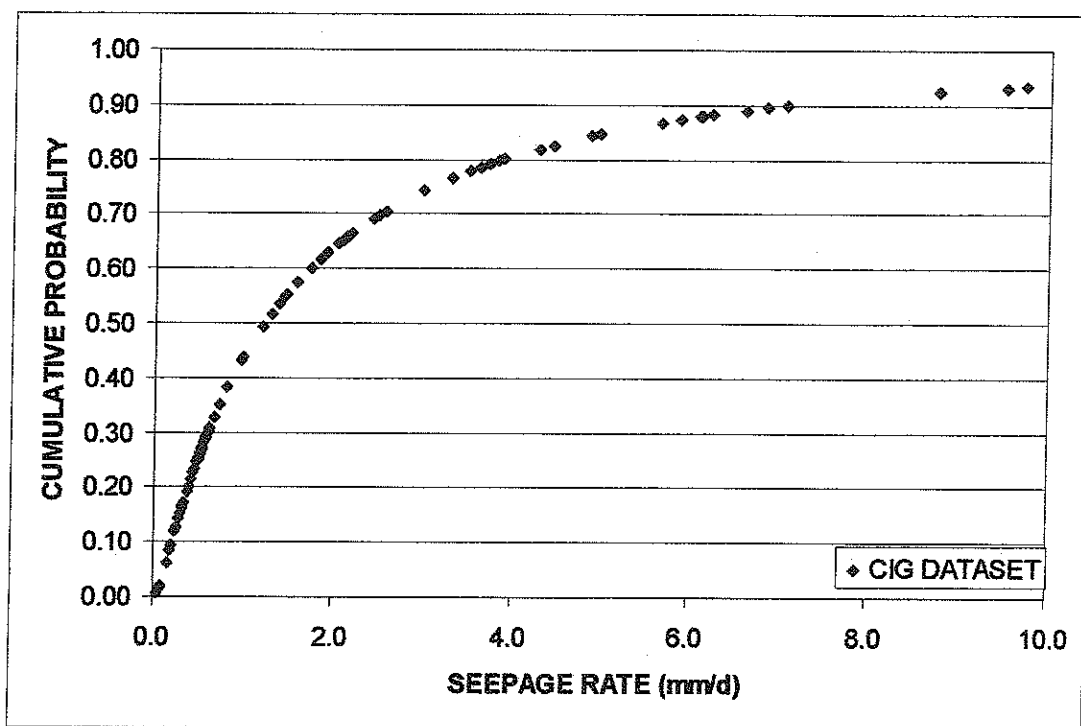


Table 2. FACILITY AND POND INFORMATION, OCTOBER 1, 2004 TO OCTOBER 1, 2009

FACILITY	POND	FACILITY TYPE	COUNTY	STATE	LINER TYPE	SEEPAGE RATE MM/D	*LINER THICKNESS		POND AGE YEARS	SOIL TYPE	TEST COMPLETION DATE
							M	YARDS			
1	A	SWINE	GEARY	KS	SOIL	8.785	-	-	10+	Tully silty clay loam	5/19/2005
1	A	SWINE	GEARY	KS	SOIL	0.730	-	-	10+	Tully silty clay loam	2/13/2008
1	B	SWINE	GEARY	KS	SOIL	0.188	-	-	10+	Tully silty clay loam	4/16/2005
1	C	SWINE	GEARY	KS	SOIL	0.870	-	-	10+	Tully silty clay loam	4/21/2005
1	D	SWINE	GEARY	KS	SOIL	0.975	-	-	10+	Tully silty clay loam	3/30/2008
2	A	TRUCK	SALINE	KS	SOIL	3.635	-	-	5+	McCook silt loam	3/30/2005
2	B	TRUCK	SALINE	KS	SOIL	4.952	-	-	5+	McCook silt loam	3/30/2005
2	C	TRUCK	SALINE	KS	SOIL	0.970	-	-	-	McCook silt loam	3/13/2005
3	A	BEEF	RICE	KS	SOIL	0.150	0.15	-	1	Geary silt loam	4/28/2005
4	A	SWINE	YUMA	CO	SOIL	2.045	0	-	10	Julesburg	4/17/2005
4	B	SWINE	YUMA	CO	SOIL	9.500	0	-	10	Julesburg	4/17/2005
5	A	BEEF	PRATT	KS	SOIL	0.247	-	-	-	Farmum loam	12/18/2004
5	B	BEEF	PRATT	KS	SOIL	3.738	-	-	-	Farmum loam	12/27/2004
5	C	BEEF	PRATT	KS	SOIL	0.372	-	-	-	Farmum loam	12/13/2004
5	D	BEEF	PRATT	KS	SOIL	0.061	-	-	-	Farmum loam	1/28/2005
5	E	BEEF	PRATT	KS	SOIL	0.325	-	-	-	Farmum loam	3/2/2005
5	F	BEEF	PRATT	KS	SOIL	3.319	-	-	-	Farmum loam	1/28/2005
6	A	BEEF	PAWNEE	KS	SOIL	1.204	-	-	-	Pratt loam fine sand	11/1/2004
6	B	BEEF	PAWNEE	KS	SOIL	0.256	-	-	-	Pratt loam fine sand	10/21/2004
6	C	BEEF	PAWNEE	KS	SOIL	2.444	-	-	-	Pratt loam fine sand	10/21/2004
6	D	BEEF	PAWNEE	KS	SOIL	0.303	-	-	-	Pratt loam fine sand	4/13/2006
7	A	BEEF	HASKELL	KS	SOIL	0.046	-	-	-	Richfield silt loam	12/16/2004
7	B	BEEF	HASKELL	KS	SOIL	0.606	-	-	-	Richfield silt loam	11/8/2004
7	C	BEEF	HASKELL	KS	SOIL	0.606	-	-	-	Richfield silt loam	11/8/2004
8	A	BEEF	HASKELL	KS	SOIL	2.995	0.15	-	1	Richfield silt loam	4/3/2006

**Table 2. FACILITY AND POND INFORMATION, OCTOBER 1, 2004 TO OCTOBER 1, 2009 (CONTINUED)**

FACILITY	POND	FACILITY TYPE	COUNTY	STATE	LINER TYPE	SEEPAGE RATE	*LINER THICKNESS	POND AGE	SOIL TYPE	TEST COMPLETION DATE
9	A	BEEF	SCOTT	KS	SOIL	9.723	0	20+	Randal clay	11/19/2005
10	A	BEEF	BARTON	KS	SOIL	0.481			Pratt loamy fine sand	12/16/2005
11	A	BEEF	ROOKS	KS	SOIL	6.792	-	10+	Hamey-Mento silt loam	1/11/2006
11	B	BEEF	ROOKS	KS	SOIL	3.830	-	10+	Hamey-Mento silt loam	1/11/2006
11	C	BEEF	ROOKS	KS	SOIL	0.816	-	10+	Hamey-Mento silt loam	1/11/2006
11	D	BEEF	ROOKS	KS	SOIL	2.198	-	10+	Hamey-Mento silt loam	12/31/2005
11	E	BEEF	ROOKS	KS	SOIL	0.284	-	10+	Hamey-Mento silt loam	1/25/2006
13	A	BEEF	RENO	KS	SOIL	0.579	-	10+	Pratt loamy fine sand	2/23/2006
13	C	BEEF	RENO	KS	SOIL	0.070	-	10+	Pratt loamy fine sand	3/15/2006
13	D	BEEF	RENO	KS	SOIL	0.999	-		Pratt loamy fine sand	1/15/2008
13	F	BEEF	RENO	KS	SOIL	0.497	-	10+	Pratt loamy fine sand	2/4/2006
13	G	BEEF	RENO	KS	SOIL	***0.580	-	10+	Pratt loamy fine sand	5/22/2006
13	H	BEEF	RENO	KS	SOIL	***0.580	-	10+	Pratt loamy fine sand	5/22/2006
14	L	BEEF	BUTLER	KS	SOIL	0.521	-		Rosehill silty clay	4/28/2006
15	A	BEEF	OTTAWA	KS	SOIL	0.303	-		Hobbs silt loam	5/18/2006
15	B	BEEF	OTTAWA	KS	SOIL	2.099	-		Hobbs silt loam	10/29/2007
16	A	BEEF	FINNEY	KS	SOIL	0.392	-		Valent fine sand	11/25/2006
16	B	BEEF	FINNEY	KS	SOIL	0.040	-		Valent fine sand	12/19/2006
16	C	BEEF	FINNEY	KS	SOIL	0.076	-		Valent fine sand	11/25/2006
16	D	BEEF	FINNEY	KS	SOIL	0.188	-		Valent fine sand	4/27/2007
16	E	BEEF	FINNEY	KS	SOIL	0.541	-		Valent fine sand	12/11/2006
17	A	BEEF	DECATUR	KS	SOIL	1.586	-		Coly silt loam	3/11/2007
18	A	BEEF	BARTON	KS	SOIL	2.211	-		Bridgeport silt loam	11/22/2006
18	B	BEEF	BARTON	KS	SOIL	1.446	-		Hord silt loam	2/15/2007
18	C	BEEF	BARTON	KS	SOIL	18.637	-		Bridgeport silt loam	12/7/2006
18	D	BEEF	BARTON	KS	SOIL	3.322	-		Hord silt loam	11/14/2006

Table 2. FACILITY AND POND INFORMATION, OCTOBER 1, 2004 TO OCTOBER 1, 2009 (CONTINUED)

FACILITY	POND	FACILITY TYPE	COUNTY	STATE	LINER TYPE	SEEPAGE RATE		*LINER THICKNESS	POND AGE	SOIL TYPE	TEST COMPLETION DATE
						MM/D	YEARS				
19	A	BEEF	HASKELL	KS	SOIL	0.970	-	-		Otero-Schamber	3/7/2007
19	B	BEEF	HASKELL	KS	SOIL	2.164	-	-		Otero-Schamber	3/19/2007
19	C	BEEF	HASKELL	KS	SOIL	0.457	-	-		Otero-Schamber	3/27/2007
19	D	BEEF	HASKELL	KS	SOIL	4.859	-	-		Otero-Schamber	3/19/2007
19	E	BEEF	HASKELL	KS	SOIL	0.204	-	-		Otero-Schamber	3/27/2007
20	A	BEEF	RICE	KS	SOIL	1.470	0.3048	-		Detroit silt loam	11/14/2006
20	B	BEEF	RICE	KS	SOIL	0.480	0.3048	-		Detroit silt loam	11/15/2006
20	C	BEEF	RICE	KS	SOIL	0.323	0.3048	-		Detroit silt loam	11/16/2006
20	D	BEEF	RICE	KS	SOIL	0.667	0.3048	-		Detroit silt loam	4/6/2007
21	A	BEEF	STEVENS	KS	SOIL	0.415	-	-		Atchinson loam	5/16/2007
22	A	BEEF	LYON	KS	SOIL	1.924	-	-		Ladysmith silt clay loam	10/28/2007
22	B	BEEF	LYON	KS	SOIL	0.532	-	-		Ladysmith silt clay loam	10/30/2007
23	A	BEEF	HARVEY	KS	SOIL	1.850	-	-		Naron fine sandy loam	11/6/2007
24	A	BEEF	GRAY	KS	SOIL	1.745	-	-		Valent fine sand	12/4/2007
25	A	SWINE	NEMAHA	KS	SOIL	5.882	-	-		Wyimore silty clay loam	2/23/2008
25	B	SWINE	NEMAHA	KS	SOIL	0.376	-	-		Wyimore silty clay loam	3/28/2008
25	C	SWINE	NEMAHA	KS	SOIL	0.511	-	-		Wyimore silty clay loam	3/10/2008
26	A	BEEF	THOMAS	KS	SOIL	0.336	-	-		Keith silt loam	4/8/2008
26	B	BEEF	THOMAS	KS	SOIL	2.103	-	-		Keith silt loam	4/8/2008
27	A	BEEF	SEWARD	KS	SOIL	0.975	-	-		Otero-Schamber	9/24/2008
27	B	BEEF	SEWARD	KS	SOIL	0.619	-	-		Otero-Schamber	9/24/2008

Table 2. FACILITY AND POND INFORMATION, OCTOBER 1, 2004 TO OCTOBER 1, 2009 (CONTINUED)

FACILITY	POND	FACILITY TYPE	COUNTY	STATE	LINER TYPE	SEEPAGE RATE		*LINER THICKNESS		POND AGE YEARS	SOIL TYPE	TEST COMPLETION DATE
						MM/D		M				
30	A	BEEF	RILEY	KS	SOIL	6.838		-			Smolan silty clay loam	12/09/08
31	A	BEEF	BUTLER	KS	SOIL	1.209		-			Rosehill silty clay	02/25/09
31	B	BEEF	BUTLER	KS	SOIL	0.976		-			Rosehill silty clay	02/25/09
31	C	BEEF	BUTLER	KS	SOIL	6.240		-			Rosehill silty clay	02/25/09
31	D	BEEF	BUTLER	KS	SOIL	1.741		-			Rosehill silty clay	02/26/09
31	E	BEEF	BUTLER	KS	SOIL	12.705		-			Rosehill silty clay	02/26/09
32	A	BEEF	HASKELL	KS	SOIL	0.488		-			Ritchfield silt loam	03/24/09
32	B	BEEF	HASKELL	KS	SOIL	3.520		-			Ritchfield silt loam	03/18/09
32	C	BEEF	HASKELL	KS	SOIL	2.141		-			Ritchfield silt loam	03/24/09
32	D	BEEF	HASKELL	KS	SOIL	4.288		-			Ritchfield silt loam	04/26/09
32	E	BEEF	HASKELL	KS	SOIL	4.436		-			Ritchfield silt loam	10/03/09
32	F	BEEF	HASKELL	KS	SOIL	7.064		-			Ritchfield silt loam	05/17/09

NOTE: \* NOTE: LINER THICKNESS REPRESENTS THICKNESS OF A DESIGNED COMPACTED SOIL LINER FOR WASTE STORAGE PONDS SERVING THESE TYPES OF FACILITIES.

\*\* POND C AT FACILITY 8 HAS BEEN CHANGED FROM POND A, AS IDENTIFIED IN PREVIOUS REPORTS.

\*\*\* PONDS G AND H AT FACILITY 13 ARE HYDRAULICALLY CONNECTED BY A CUT IN THE BERM SEPARATING THE PONDS.

KLAES determines whole-pond seepage rates using the methods developed by Ham (1999) and Ham and DeSutter (1999 and 2003). Seepage rates are calculated as the difference between the change in depth and evaporation during a 5- to 10-day period when precipitation is less than 2 mm and less than 5% of the total depth change. During the test period, the evaporation rate must be less than 6 mm/d, with a wind speed of less than 2 m/s at the start of the test period, and less than 3 m/s at the end of the test period.

Changes in the liquid level of the ponds are measured with float-based liquid level recorders and pressure-based depth recorders, as described by Ham and DeSutter (1999 and 2003). Evaporation is determined using the bulk-transfer meteorological method (Ham, 1999, Eq. 3). This technique uses short-time-interval meteorological data and measurements of the pond surface temperature to calculate evaporation every 60 minutes. Meteorological conditions are measured with instruments contained in a portable weather station positioned on-site and on a floating platform located near the middle of the waste storage pond. All instruments are sampled every 10 seconds using data acquisition equipment. The data are stored as hourly averages and subsequently transferred to KLAES on a daily basis via cellular telephone.

Since October 1, 2004, the testing equipment has been deployed at 132 ponds resulting in 111 valid tests, 97 of which were CIG-eligible (Table 4). Of the CIG-eligible ponds, 9 had seepage rates which exceeded applicable seepage rate requirements for livestock waste storage ponds. Twenty deployments did not yield valid tests as a result of uncontrolled inflows or outflows, or facility operational issues requiring the tests to be stopped.

**Table 4. TESTS CONDUCTED AND DEPLOYMENTS BY SEASON AND GRANT ELIGIBILITY**

<b>Testing Season</b>	<b>CIG-Eligible Tests Completed</b>	<b>Non-CIG Eligible Tests Completed</b>	<b>Incomplete and Invalid Test (CIG and Non-CIG)*</b>	<b>Total Deployments</b>
<b>2004-2005</b>	22	3	5	30
<b>2005-2006</b>	17	4	11	32
<b>2006-2007**</b>	20	2	0	22
<b>2007-2008***</b>	14	0	0	14
<b>2008-2009****</b>	24	5	5	34
<b>TOTAL</b>	<b>97</b>	<b>14</b>	<b>20</b>	<b>132</b>

\* A 120-hour dataset meeting the required criteria for whole-pond seepage rate measurement could not be collected.

\*\* October 2, 2006 to October 1, 2007

\*\*\* October 2, 2007 to April 1, 2008

\*\*\*\* April 2, 2008 to October 1, 2009

## REFERENCES

- Ham, J.M. 1999. Measuring evaporation and seepage losses from lagoons used to contain animal waste. *Trans. of ASAE*. 42(5):1303-1312.
- Ham, J. M. 2002. Seepage losses from animal waste lagoons: A summary of a four-year investigation in Kansas. *Trans. of ASAE*. 45(4):983-992.
- Ham, J.M. and DeSutter, T.M. 1999. Seepage losses and nitrogen export from swine waste lagoons: A water balance study. *J. Environ. Qual.* 31:1370-1379
- Ham, J.M. and DeSutter, TM. 2003. Standards for measuring seepage from anaerobic lagoons and manures storages. ASAE paper number: 034130.



**Describe significant results, accomplishments and lessons learned. Compare actual accomplishments to the project goals in your proposal:**

One project goal is the completion of 30 tests during each testing season. Between October 1, 2004 and October 1, 2009, the testing equipment was deployed at 132 waste storage ponds. Valid tests were conducted at 111 of those 132 ponds. Valid tests averaged 22.2 tests per testing season

During this project, it was estimated that a total of 50 CIG-eligible producers would participate in this project. The ability to meet this goal was outside the control of KLAES. It was based solely upon the response of CIG-eligible producers to request this service. As of April 2009, 32 CIG-eligible producers had participated in the project, resulting in the completion of 97 valid tests. Outreach has been performed to inform producers of the availability of the program.

**In the space below, provide the following in accordance with the Environmental Quality Incentives Program (EQIP) and CIG grant agreement provisions:**

- 1. A listing of EQIP-eligible producers involved in the project, identified by name and social security number or taxpayer identification number:**

<b>Grant Period</b>	<b>October 1, 2004 – April 1, 2005</b>
<b>Facility Name</b>	<b>Taxpayer Identification Number</b>
Cattle Empire, LLC	48-1185257
Pratt Feeders, L.L.C.	48-0909271
Ward Feed Yard, Inc.	48-0704759
N & R Land and Cattle Enterprises, Inc.	48-0864672

<b>Grant Period</b>	<b>April 2, 2005 – October 1, 2005</b>
<b>Facility Name</b>	<b>Taxpayer Identification Number</b>
Sellers Farms, Inc.	48-0789510
Brett Rutledge (Triple "R" Farms, Inc.)	522-02-6537
F & R Swine, Inc.	48-1243952
N & R Land and Cattle Enterprises, Inc.	48-0864672

<b>Grant Period</b>	<b>October 2, 2005 – April 1, 2006</b>
<b>Facility Name</b>	<b>Taxpayer Identification Number</b>
Cattle Empire, LLC	48-1185257
Wiechman Feedyard, L.P.	48-1192805
Barton County Feeders, Inc.	48-1102363
Rooks County Feeders, LLC	48-1238666
Haw Ranch Feedlot, L.L.C.	47-0885026

<b>Grant Period</b>	<b>April 2, 2006 – October 1, 2006</b>
<b>Facility Name</b>	<b>Taxpayer Identification Number</b>
Cattle Empire, LLC	48-1185257
Haw Ranch Feedlot, L.L.C.	47-0885026
Haw Ranch Feedlot II, L.L.C.	81-0620220
Ottawa County Feeders, Inc.	48-1280979
Ward Feed Yard, Inc.	48-0704759

<b>Grant Period</b>	<b>October 2, 2006 – April 1, 2007</b>
<b>Facility Name</b>	<b>Taxpayer Identification Number</b>
Brookover Ranch Feed Yard	48-0628754
Sellers Farms, Inc	48-0789510
Great Bend Feeding, Inc.	48-0778304
Miller Feed Yard, Inc.	48-0723731
Decatur County Feed Yard, LLC	91-1870059

<b>Grant Period</b>	<b>April 2, 2006 – October 1, 2007</b>
<b>Facility Name</b>	<b>Taxpayer Identification Number</b>
Brookover Ranch Feed Yard	48-0628754
Sellers Farms, Inc	48-0789510
River Bend Feed Yard, Inc.	48-0792395

<b>Grant Period</b>	<b>October 2, 2007 – April 1, 2008</b>
<b>Facility Name</b>	<b>Taxpayer Identification Number</b>
Darbyshire Farms, L.L.C.	48-1211148
Cattle Empire, LLC	48-1185257
F & R Swine, Inc.	48-1243952
Haw Ranch Feedlot, L.L.C.	47-0885026
Stephens Farms, Inc.	48-0767681
Ottawa County Feeders, Inc.	48-1280979
Wendling Farms, LLC	515-48-3171
Haverkamp Brothers, LLP	48-1053909
DM&M Farms, Inc.	48-1082022

<b>Grant Period</b>	<b>April 2, 2008 – October 1, 2008</b>
<b>Facility Name</b>	<b>Taxpayer Identification Number</b>
Supreme Cattle Feeders, LLC	91-1917297

<b>Grant Period</b>	<b>October 2, 2008 – April 1, 2009</b>
<b>Facility Name</b>	<b>Taxpayer Identification Number</b>
Supreme Cattle Feeders, LLC	91-1917297
Bartlett Cattle Company, L.P.	75-2625373
Ward Feed Yard, Inc.	48-0704759
Shaw Feedyard, Inc.	48-1151674
Larson Farms, Inc.	48-0964114

Haw Ranch Feedlot II, L.L.C.	81-0620220
Sublette Feeders	48-1023793

<b>Grant Period</b>	<b>April 2, 2009 – October 1, 2009</b>
<b>Facility Name</b>	<b>Taxpayer Identification Number</b>
Bartlett Cattle Company, L.P.	75-2625373
Shaw Feedyard, Inc.	48-1151674
Haw Ranch Feedlot, L.L.C.	47-0885026
Sublette Feeders	48-1023793

2. **The dollar amount of any direct or indirect payment made to each individual producer or entity for any structural, vegetative or management practices. Both semiannual and cumulative payment amounts must be submitted.**

The producer makes a cash contribution to offset the cost of whole-pond seepage testing. No funding is used to pay the producer or entity for structural, vegetative, or management practice implementation.

3. **A self-certification statement indicating that each individual or entity receiving a direct or indirect payment for any structural, vegetative or management practices through this grant is in compliance with the Adjusted Gross Income (AGI) and Highly-Erodible Lands and Wetlands Conservation (HEL/WC) compliance provisions of the Farm Bill.**

Paragraph 9.01.C.1 of the Consulting Agreement between KLA Environmental Services, Inc. and the producer (Owner) states as follows:

“Owner certifies that the facility, where the services set forth in this Agreement are provided, is eligible for the United States Department of Agriculture – Natural Resources Conservation Service Environmental Quality Incentives Program.”



December 22, 2009

Mr. Gregorio Cruz  
Natural Resources Conservation Service  
Conservation Innovation Grants  
P.O. Box 2890  
Washington, D.C. 20013-2890

Dear Mr. Cruz:

KLA Environmental Services, Inc. is a 2004 recipient of a Conservation Innovation Grant as indicated below.

**Project Title:**

Maintaining and protecting groundwater quality from nutrients and pathogens found in livestock waste lagoons by utilizing a water balance method of testing the integrity of the lagoons.

**Project Director:**

Rich McKee, 6031 SW 37<sup>th</sup> Street, Topeka, KS 66614  
Phone: 785-273-5115  
Fax: 785-273-3399  
E-mail: rich@kla.org

Enclosed is the Final Progress Report for the period October 1, 2004 through October 1, 2009. Should you have any questions or need additional information, please contact Derek Belton, at KLA Environmental Services, Inc., 785-823-0097.

Sincerely,

A handwritten signature in cursive script that reads 'Rich'.

Rich McKee  
Board Chairman  
Grantee Authorizing Agent  
KLA Environmental Services, Inc.

Enclosure