Agriment Services, Inc.

Appendix 1. Lagoon Sludge Survey Form **Revised August 2008**

A. Farm Permitor DWQ Identification Number: → **67-77 (H & K Farm)**

B. Lagoon Identification: → **Chris Casteen 1**

C. Person(s) taking Measurements: → **Jonathan Miller**

D. Date of Measurements: → **3/10/2020**

E. Methods/Devices Used for Measurement of:

a. Distance from the lagoon liquid surface to the top of the sludge layer: → **Sonar Boat**

b. Distance form the lagoon liquid surface to the bottom soil of lagoon: → **Range Pole**

c. Thickness of the sludge layer if making a direct measurement with "core sampler": **n/a**

F. Lagoon Surface Area (using dimensions at inside to of bank): → **0.58**
(Draw a sketch of the lagoon on separate sheet, list dimensions and calculate surface area. **The lagoon may have been built different than designed, so measurements should be made.)**

G. Estimate number of sampling points:

a. Less than 1.33 acre, use 8 points: → **8**

b. If more than 1.33 acre, surface area acres x 6 = sampling points, with a maxium of 24: →

(Using sketch and dimensions, develop a uniform grid that has the same number of intersection as the estimated number of sampling points needed. Number the intersection points on the lagoon grid so that data recorded at each can be easily matched.)

H. Conduct sludge survey and record data on "Sludge Survey Data Sheet" (Appendix 2). **Also, at the location of the pump intake, take measurement of distance from liquid surface to top of sludge layer and record it on the Data Sheet (last row); this must be at least 2.5 ft. when irrigating.**

I. At time of sludge survey, also measure the distance from the Maximum Liquid Level to the Present Liquid Level (measure at the lagoon gage pole): → **0.15**

J. Determine distance from top of bank to the Maximum Liquid Level (use lagoon management plan or other lagoon records): → **1.60**

K. Determine distance from Maximum Liquid Level to Minimum Liquid Level (use lagoon management plan or other lagoon records): → **2.40**

L. Calculate distance from present liquid surface level to Minimum Liquid Level (**Item K - Item I**, assuming present liquid level is below Max. Liq. Level): → **2.25**

M. Record from sludge survey data sheet the distance from the present liquid surface level to the lagoon bottom (average for all the measurement points): → **7.78**

N. Record from sludge survey data sheet the distance from the present liquid surface level to the top of the sludge layer (average for all the measurement points): → **4.61**

O. Record from sludge survey data sheet the average thickness of the Sludge Layer: → **3.17**

P. Calculate the thickness of the existing Liquid Treatment Zone (**Item N - Item L**): → **2.36**

Q. **If Item O is greater than Item P, proceed to the Worksheet for Sludge Volume and Treatment Volume. If Item O is equal to or less than Item P, you do not have to determine volumes.**

Completed by: **Ronnie G. Kennedy** (Print Name) _____ (Signature)

Agriment Services, Inc.

Appendix 2. Sludge Survey Data Sheet **Revised August 2008**

Lagoon Identification: **Chris Casteen 1** Date: **3/10/2020**

Completed by: **Ronnie G. Kennedy** (Print Name) (Signature)

(A) Grid Point No.	(B) Distance from liquid surface to top of sludge	(C) Distance from liquid surface to lagoon bottom (soil)	(C) - (B) Thickness of sludge layer
	Feet (tenths)	Feet (tenths)	Feet (tenths)
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
# of points with readings	**1267**	**x**	**x**
Average of points	**4.61**	**7.78**	**3.17**
At pump intake	**3.00**	**x**	**x**

*All Grid Points and corresponding sludge layer thickness must be show on a sketch attached to this Sludge Survey Data Sheet.

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Appendix 3. Worksheet for sludge volume and treatment volume **Revised August 2008**

The average thickness of the sludge layer and the thickness of the existing liquid (sludge-free) treatment zone (are determined from information on the Lagoon Sludge Survey Form (Item O and P, respectively). **If the lagoon has a designed sludge storage volume, see notes at end of the worksheet.** The dimensions of the lagoon as measured and the side slope are needed for calculations of sludge volume and of total treatment volume. If the lagoon is a standard geometric shape, the sludge volume and treatment volume in the lagoon can be estimated by using standard equations. For approximate volumes of rectangular lagoons with constant side slope, calculate length and width at the midpoint of the layer, and multily by layer thickness to calculate layer volume. For irregular shapes, convert the total surface area to a square or rectangular shape. For exact volumes for lagoons with constant side slope, the "Prismoidal Equations" may be used.

		Lagoon
1	Average Sludge Layer Thickness *(T)* :	**3.17 ft.**
2	Depth of lagoon from top of bank to bottom soil surface *(D)* :	**10.00 ft.**
3	Slope = horizontal/vertical side slope *(S)* :	**3.00**
4	Length at top inside bank *(L)* :	**220.00 ft.**
5	Width at top inside bank *(W)* :	**115.00 ft.**
6	Length at midpoint of sludge layer (*Lm) = L - 2 S (D - (T/2))* :	**169.51 ft.**
7	Width at midpoint of sludge layer (*Wm) = W - 2 S (D - (T/2))* :	**64.51 ft.**
8	Volume of sludge *(Vs) = Lm Wm T* :	**34,664.24 ft³**
9	Volume in gallons *Vsg = V (7.5 gal./ft³)* :	**259,981.77 gal.**
10	Thickness of existing liquid tmt. zone (Y)	**2.36 ft.**
11	Thickness of total treatment zone (Z) = T + Y	**5.53 ft.**
12	Length at midpoint of total tmt. zone Lz = L - 2(S)(D-(Z/2)	**176.59 ft.**
13	Width at midpoint of total tmt. Zone Wz = W - 2(S) (D -(Z/2)	**71.59 ft.**
14	Volume of total treatment zone (Vz) = Lz Wz Z	**69,910.69 ft³**
15	Ratio (R) of sludge layer volume to total Treatment volume R = Vs/Vz	**0.50**

If the ratio exceeds 50%, than a sludge Plan of Action may be required. Check with DWQ for information on filing the Plan of Action.

Note: If the lagoon has a designed sludge storage volume (DSSV), subtract that volume from both the volume of sludge (Vs) (Item 8) and from the volume of total treatment zone (Vz) (Item 14), and take the ratio:

16	Design sludge storage volume (DSSV)	**ft³**
17	Ratio (R) of sludge layer volume to treatment volume adjusted for (DSSV).	**0.50**

Lagoon Identification: **Chris Casteen 1** Date: **3/10/2020**

Completed by: **Ronnie G. Kennedy** (Print Name) (Signature)