

**Study Number:** C08004-03  
**Test Type:** TOX  
**Route:** Dosing in Water  
**Species/Strain:** Rat/Harlan Sprague Dawley

**PA44: Urinalysis Data Summary**  
**Test Compound:** Vanadyl sulfate  
**CAS Number:** 27774-13-6

**Date Report Requested:** 12/18/2020  
**Time Report Requested:** 13:47:09  
**Lab:** Battelle

**Study Number:** C08004-03  
**Study Gender:** Both  
**PWG Approval Date:** See web page for date of PWG Approval  
**Version:** v1.1.4

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## F1 Male: F1 Biosample Animals

	Phase Day	Treatment Groups			
		0 mg/L	21 mg/L	41.9 mg/L	83.8 mg/L
Urine Clarity	PND 118	(5)	(5)	(5)	(3)
V Cloudy	PND 118	5	5	5	3
Urine Color	PND 118	(5)	(5)	(5)	(3)
yellow	PND 118	5	5	5	3
Specific Gravity	PND 118	1.049 ± 0.007 (5)	1.047 ± 0.004 (5)	1.038 ± 0.004 (5)	1.035 ± 0.007 (3)
<b>SEDIMENT EXAM</b>					
Urine White Blood Cells	PND 118	0.0 ± 0.0 (5)	0.0 ± 0.0 (5)	0.0 ± 0.0 (5)	0.0 ± 0.0 (3)
Urine Red Blood Cells	PND 118	1.4 ± 0.2 (5)	1.6 ± 0.2 (5)	1.2 ± 0.2 (5)	1.7 ± 0.3 (3)
Casts	PND 118	0.0 ± 0.0 (5)	0.0 ± 0.0 (5)	0.0 ± 0.0 (5)	0.0 ± 0.0 (3)
Epithelial Cells	PND 118	0.0 ± 0.0 (5)	0.0 ± 0.0 (5)	0.0 ± 0.0 (5)	0.0 ± 0.0 (3)
Mucus	PND 118	0.0 ± 0.0 (5)	0.0 ± 0.0 (5)	0.0 ± 0.0 (5)	0.0 ± 0.0 (3)
Sperm	PND 118	3.2 ± 0.4 (5)	2.6 ± 0.7 (5)	1.0 ± 0.0 (5)	2.7 ± 0.3 (3)
Bacteria	PND 118	0.2 ± 0.2 (5)	0.4 ± 0.2 (5)	0.8 ± 0.2 (5)	0.0 ± 0.0 (3)
Yeast	PND 118	1.2 ± 0.2 (5)	1.2 ± 0.2 (5)	1.6 ± 0.2 (5)	1.3 ± 0.3 (3)
Amorphous Sediment	PND 118	0.0 ± 0.0 (5)	0.0 ± 0.0 (5)	0.0 ± 0.0 (5)	0.0 ± 0.0 (3)
Crystals	PND 118	1.2 ± 0.2 (5)	1.4 ± 0.2 (5)	1.2 ± 0.2 (5)	1.7 ± 0.3 (3)
<b>URINE CHEMISTRIES</b>					
Total Protein (mg/dL)	PND 118	225.8 ± 56.5 (5)	288.0 ± 56.5 (5)	227.2 ± 56.4 (5)	241.3 ± 51.3 (3)
Percent of Control			127.5	100.6	106.9
Total Protein/Creatinine	PND 118	1.7 ± 0.4 (5)	2.0 ± 0.3 (5)	1.9 ± 0.2 (5)	2.3 ± 0.4 (3)
Percent of Control			119.5	113.9	140.6
Glucose (mg/dL)	PND 118	42.6 ± 6.7 (5)	44.0 ± 7.7 (5)	35.4 ± 5.1 (5)	27.7 ± 5.7 (3)
Percent of Control			103.3	83.1	64.9
Glucose/Creatinine	PND 118	0.30 ± 0.03 (5)	0.30 ± 0.04 (5)	0.31 ± 0.01 (5)	0.26 ± 0.00 (3)
Percent of Control			99.5	101.8	87.1
Calcium (mg/dL)	PND 118	28.2 ± 7.6 (5)	20.6 ± 2.9 (5)	21.1 ± 4.3 (5)	22.4 ± 8.9 (3)
Percent of Control			72.9	74.8	79.3
Calcium/Creatinine	PND 118	0.20 ± 0.04 (5)	0.15 ± 0.02 (5)	0.18 ± 0.03 (5)	0.20 ± 0.04 (3)
Percent of Control			74.0	92.0	100.4

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Lab: Battelle

F1 Male: F1 Biosample Animals

	Phase Day	Treatment Groups			
		0 mg/L	21 mg/L	41.9 mg/L	83.8 mg/L
Phosphorus (mg/dL)	PND 118	12.2 ± 2.6 (5)	17.8 ± 4.5 (5)	26.2 ± 12.3 (5)	16.5 ± 2.9 (3)
Percent of Control			145.6	214.4	134.8
Phosphorus/Creatinine	PND 118	0.09 ± 0.02 (5)	0.13 ± 0.03 (5)	0.20 ± 0.06 (5)	0.18 ± 0.05 (3)
Percent of Control			139.4	223.5	197.7
N-acetyl-beta-glucosaminidase (U/L)	PND 118	21.6 ± 3.3 (5)	22.4 ± 2.7 (5)	13.4 ± 2.2 (5)	17.7 ± 3.8 (3)
Percent of Control			103.7	62.0	81.8
N-acetyl-beta-glucosaminidase/Creatinine	PND 118	0.02 ± 0.00 (5)	0.02 ± 0.00 (5)	0.01 ± 0.00 (5)	0.02 ± 0.00 (3)
Percent of Control			96.1	72.9	101.7
Alkaline Phosphatase (U/L)	PND 118	126.2 ± 32.6 (5)	151.8 ± 20.8 (5)	120.2 ± 37.0 (5)	142.3 ± 12.1 (3)
Percent of Control			120.3	95.2	112.8
Alkaline Phosphatase/Creatinine (U/mg)	PND 118	0.09 ± 0.01 (5)	0.11 ± 0.01 (5)	0.10 ± 0.02 (5)	0.15 ± 0.03 (3)
Percent of Control			124.6	112.5	170.7
Aspartate Aminotransferase (U/L)	PND 118	11.0 ± 1.8 (5)	9.0 ± 0.9 (5)	6.8 ± 1.2 (5)	12.7 ± 1.8 (3)
Percent of Control			81.8	61.8	115.2
Aspartate Aminotransferase/Creatinine (U/mg)	PND 118	0.01 ± 0.00 (5)	0.01 ± 0.00 (5)	0.01 ± 0.00 (5)	0.01 ± 0.00 (3)
Percent of Control			82.4	77.2	172.2
Vanadium Concentration in Urine (ng/mL)	PND 118	0.5 ± 0.2 (5) **	26.0 ± 4.1 (5) **	50.3 ± 6.4 (5) **	104.5 ± 11.6 (3) **
Percent of Control			5084.1	9851.3	20456.6
Vanadium Concentration/Creatinine (ng/mg)	PND 118	0.3 ± 0.1 (5) **	18.0 ± 2.6 (5) **	45.8 ± 6.1 (5) **	104.0 ± 14.1 (3) **
Percent of Control			5707.2	14536.4	33023.0

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Lab: Battelle

F1 Male: F1 Biosample Animals

Treatment Groups

	Phase Day	168 mg/L		335 mg/L	
Urine Clarity	PND 118	(5)		(5)	
V Cloudy	PND 118	5		5	
Urine Color	PND 118	(5)		(5)	
yellow	PND 118	5		5	
Specific Gravity	PND 118	1.046 ± 0.005 (5)		1.055 ± 0.003 (5)	
<b>SEDIMENT EXAM</b>					
Urine White Blood Cells	PND 118	0.0 ± 0.0 (5)		0.0 ± 0.0 (5)	
Urine Red Blood Cells	PND 118	1.6 ± 0.2 (5)		1.8 ± 0.2 (5)	
Casts	PND 118	0.0 ± 0.0 (5)		0.0 ± 0.0 (5)	
Epithelial Cells	PND 118	0.0 ± 0.0 (5)		0.0 ± 0.0 (5)	
Mucus	PND 118	0.0 ± 0.0 (5)		0.0 ± 0.0 (5)	
Sperm	PND 118	1.8 ± 0.2 (5)		0.8 ± 0.2 (5)	
Bacteria	PND 118	0.2 ± 0.2 (5)		0.2 ± 0.2 (5)	
Yeast	PND 118	1.2 ± 0.2 (5)		1.2 ± 0.2 (5)	
Amorphous Sediment	PND 118	0.0 ± 0.0 (5)		0.0 ± 0.0 (5)	
Crystals	PND 118	1.4 ± 0.4 (5)		1.0 ± 0.3 (5)	
<b>URINE CHEMISTRIES</b>					
Total Protein (mg/dL)	PND 118	198.6 ± 40.9 (5)		300.4 ± 73.4 (5)	
Percent of Control		88.0		133.0	
Total Protein/Creatinine	PND 118	1.4 ± 0.1 (5)		1.9 ± 0.5 (5)	
Percent of Control		84.4		112.4	
Glucose (mg/dL)	PND 118	38.8 ± 7.5 (5)		55.8 ± 6.3 (5)	
Percent of Control		91.1		131.0	
Glucose/Creatinine	PND 118	0.27 ± 0.02 (5)		0.34 ± 0.04 (5)	
Percent of Control		90.7		113.9	
Calcium (mg/dL)	PND 118	38.9 ± 8.3 (5)		39.0 ± 14.1 (5)	
Percent of Control		137.9		138.4	
Calcium/Creatinine	PND 118	0.28 ± 0.06 (5)		0.24 ± 0.09 (5)	
Percent of Control		142.0		121.8	

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F1 Male: F1 Biosample Animals

Treatment Groups

	Phase Day	168 mg/L	335 mg/L
Phosphorus (mg/dL)	PND 118	12.8 ± 9.1 (5)	9.0 ± 5.9 (5)
Percent of Control		104.7	73.2
Phosphorus/Creatinine	PND 118	0.09 ± 0.07 (5)	0.05 ± 0.03 (5)
Percent of Control		101.8	59.1
N-acetyl-beta-glucosaminidase (U/L)	PND 118	21.6 ± 6.7 (5)	32.0 ± 8.0 (5)
Percent of Control		100.0	148.1
N-acetyl-beta-glucosaminidase/Creatinine	PND 118	0.01 ± 0.00 (5)	0.02 ± 0.01 (5)
Percent of Control		88.7	121.4
Alkaline Phosphatase (U/L)	PND 118	95.0 ± 19.8 (5)	119.0 ± 32.7 (5)
Percent of Control		75.3	94.3
Alkaline Phosphatase/Creatinine (U/mg)	PND 118	0.07 ± 0.01 (5)	0.07 ± 0.02 (5)
Percent of Control		79.4	83.8
Aspartate Aminotransferase (U/L)	PND 118	9.4 ± 2.3 (5)	12.6 ± 1.8 (5)
Percent of Control		85.5	114.5
Aspartate Aminotransferase/Creatinine (U/mg)	PND 118	0.01 ± 0.00 (5)	0.01 ± 0.00 (5)
Percent of Control		91.2	100.2
Vanadium Concentration in Urine (ng/mL)	PND 118	355.0 ± 53.6 (5) **	1364.0 ± 223.0 (5) **
Percent of Control		69471.6	266927.6
Vanadium Concentration/Creatinine (ng/mg)	PND 118	264.2 ± 44.9 (5) **	832.5 ± 130.5 (5) **
Percent of Control		83869.9	264232.5

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Lab: Battelle

## F1 Female: F1 Biosample Animals

	Phase Day	Treatment Groups			
		0 mg/L	21 mg/L	41.9 mg/L	83.8 mg/L
Urine Clarity	PND 117	(5)	(5)	(5)	(4)
V Cloudy	PND 117	5	5	5	4
sl. cloudy	PND 117	1			
Urine Color	PND 117	(5)	(5)	(5)	(4)
yellow	PND 117	5	5	5	4
Specific Gravity	PND 117	1.032 ± 0.002 (5)	1.040 ± 0.004 (5)	1.033 ± 0.004 (5)	1.027 ± 0.007 (4)
<b>SEDIMENT EXAM</b>					
Urine White Blood Cells	PND 117	0.0 ± 0.0 (5)	0.0 ± 0.0 (5)	0.0 ± 0.0 (5)	0.0 ± 0.0 (4)
Urine Red Blood Cells	PND 117	1.8 ± 0.5 (5)	2.0 ± 0.3 (5)	2.2 ± 0.2 (5)	2.3 ± 0.3 (4)
Casts	PND 117	0.0 ± 0.0 (5)	0.0 ± 0.0 (5)	0.0 ± 0.0 (5)	0.0 ± 0.0 (4)
Epithelial Cells	PND 117	0.0 ± 0.0 (5)	0.0 ± 0.0 (5)	0.0 ± 0.0 (5)	0.0 ± 0.0 (4)
Mucus	PND 117	0.0 ± 0.0 (5)	0.0 ± 0.0 (5)	0.0 ± 0.0 (5)	0.0 ± 0.0 (4)
Sperm	PND 117	0.0 ± 0.0 (5)	0.0 ± 0.0 (5)	0.0 ± 0.0 (5)	0.0 ± 0.0 (4)
Bacteria	PND 117	0.4 ± 0.2 (5)	0.6 ± 0.2 (5)	0.8 ± 0.2 (5)	0.0 ± 0.0 (4)
Yeast	PND 117	0.0 ± 0.0 (5)	0.4 ± 0.2 (5)	0.8 ± 0.4 (5)	0.5 ± 0.3 (4)
Amorphous Sediment	PND 117	0.0 ± 0.0 (5)	0.0 ± 0.0 (5)	0.0 ± 0.0 (5)	0.0 ± 0.0 (4)
Crystals	PND 117	1.8 ± 0.4 (5)	1.0 ± 0.0 (5)	1.2 ± 0.6 (5)	0.8 ± 0.3 (4)
<b>URINE CHEMISTRIES</b>					
Total Protein (mg/dL)	PND 117	147.2 ± 44.5 (5)	55.0 ± 6.2 (5)	44.2 ± 6.4 (5)	47.0 ± 16.7 (4)
Percent of Control			37.4	30.0	31.9
Total Protein/Creatinine	PND 117	1.9 ± 0.6 (5)	0.5 ± 0.0 (5)	0.5 ± 0.0 (5)	0.9 ± 0.4 (4)
Percent of Control			28.3	29.2	46.4
Glucose (mg/dL)	PND 117	25.6 ± 3.3 (5)	27.6 ± 3.6 (5)	21.4 ± 2.9 (5)	18.5 ± 4.6 (4)
Percent of Control			107.8	83.6	72.3
Glucose/Creatinine	PND 117	0.30 ± 0.03 (5)	0.26 ± 0.01 (5)	0.26 ± 0.01 (5)	0.30 ± 0.01 (4)
Percent of Control			87.9	87.8	101.3
Calcium (mg/dL)	PND 117	34.1 ± 4.1 (5) *	34.2 ± 4.9 (5)	37.3 ± 3.0 (5)	32.2 ± 6.7 (4)
Percent of Control			100.2	109.2	94.2
Calcium/Creatinine	PND 117	0.41 ± 0.06 (5) *	0.35 ± 0.08 (5)	0.50 ± 0.08 (5)	0.55 ± 0.05 (4)

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F1 Female: F1 Biosample Animals

	Phase Day	Treatment Groups			
		0 mg/L	21 mg/L	41.9 mg/L	83.8 mg/L
Percent of Control			86.1	121.3	133.8
Phosphorus (mg/dL)	PND 117	14.7 ± 1.9 (5) *	24.5 ± 6.2 (5)	18.9 ± 4.4 (5)	21.2 ± 5.7 (4)
Percent of Control			167.3	128.6	144.8
Phosphorus/Creatinine	PND 117	0.18 ± 0.04 (5)	0.23 ± 0.04 (5)	0.23 ± 0.05 (5)	0.39 ± 0.10 (4)
Percent of Control			127.4	126.8	210.5
N-acetyl-beta-glucosaminidase (U/L)	PND 117	11.0 ± 2.1 (5)	9.6 ± 0.9 (5)	7.2 ± 0.4 (5)	6.8 ± 1.8 (4)
Percent of Control			87.3	65.5	61.4
N-acetyl-beta-glucosaminidase/Creatinine	PND 117	0.01 ± 0.00 (5)	0.01 ± 0.00 (5)	0.01 ± 0.00 (5)	0.01 ± 0.00 (4)
Percent of Control			74.4	74.7	85.5
Alkaline Phosphatase (U/L)	PND 117	26.6 ± 6.0 (5)	14.8 ± 3.1 (5)	11.4 ± 7.5 (5)	5.5 ± 3.2 (4)
Percent of Control			55.6	42.9	20.7
Alkaline Phosphatase/Creatinine (U/mg)	PND 117	0.03 ± 0.01 (5)	0.01 ± 0.00 (5)	0.01 ± 0.01 (5)	0.01 ± 0.00 (4)
Percent of Control			44.2	34.1	20.0
Aspartate Aminotransferase (U/L)	PND 117	5.2 ± 1.2 (5)	2.4 ± 0.4 (5)	2.2 ± 0.4 (5)	2.3 ± 0.3 (4)
Percent of Control			46.2	42.3	43.3
Aspartate Aminotransferase/Creatinine (U/mg)	PND 117	0.01 ± 0.00 (5)	0.00 ± 0.00 (5)	0.00 ± 0.00 (5)	0.00 ± 0.00 (4)
Percent of Control			38.0	46.3	73.8
Vanadium Concentration in Urine (ng/mL)	PND 117	2.4 ± 0.8 (5) **	17.0 ± 2.8 (5) **	37.9 ± 8.5 (5) **	71.8 ± 14.0 (4) **
Percent of Control			720.3	1606.8	3043.4
Vanadium Concentration/Creatinine (ng/mg)	PND 117	2.6 ± 0.8 (5) **	15.9 ± 0.9 (5) **	46.8 ± 10.3 (5) **	126.6 ± 23.8 (4) **
Percent of Control			608.4	1788.2	4836.7

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Lab: Battelle

F1 Female: F1 Biosample Animals

Treatment Groups

	Phase Day	168 mg/L	335 mg/L
Urine Clarity	PND 117	(5)	(5)
V Cloudy	PND 117	5	5
sl. cloudy	PND 117		
Urine Color	PND 117	(5)	(5)
yellow	PND 117	5	5
Specific Gravity	PND 117	1.037 ± 0.006 (5)	1.039 ± 0.004 (5)
<b>SEDIMENT EXAM</b>			
Urine White Blood Cells	PND 117	0.0 ± 0.0 (5)	0.0 ± 0.0 (5)
Urine Red Blood Cells	PND 117	1.6 ± 0.2 (5)	2.6 ± 0.2 (5)
Casts	PND 117	0.0 ± 0.0 (5)	0.0 ± 0.0 (5)
Epithelial Cells	PND 117	0.0 ± 0.0 (5)	0.0 ± 0.0 (5)
Mucus	PND 117	0.0 ± 0.0 (5)	0.0 ± 0.0 (5)
Sperm	PND 117	0.0 ± 0.0 (5)	0.0 ± 0.0 (5)
Bacteria	PND 117	0.8 ± 0.4 (5)	0.2 ± 0.2 (5)
Yeast	PND 117	1.0 ± 0.0 (5)	1.0 ± 0.0 (5)
Amorphous Sediment	PND 117	0.4 ± 0.4 (5)	0.0 ± 0.0 (5)
Crystals	PND 117	0.2 ± 0.2 (5)	0.4 ± 0.2 (5)
<b>URINE CHEMISTRIES</b>			
Total Protein (mg/dL)	PND 117	70.4 ± 20.6 (5)	63.4 ± 8.8 (5)
Percent of Control		47.8	43.1
Total Protein/Creatinine	PND 117	0.8 ± 0.3 (5)	0.7 ± 0.0 (5)
Percent of Control		44.4	35.5
Glucose (mg/dL)	PND 117	27.4 ± 6.2 (5)	27.8 ± 3.8 (5)
Percent of Control		107.0	108.6
Glucose/Creatinine	PND 117	0.30 ± 0.03 (5)	0.29 ± 0.00 (5)
Percent of Control		100.7	96.6
Calcium (mg/dL)	PND 117	55.6 ± 11.5 (5)	47.7 ± 7.0 (5)
Percent of Control		162.9	139.8
Calcium/Creatinine	PND 117	0.68 ± 0.13 (5)	0.55 ± 0.11 (5)



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F1 Female: F1 Biosample Animals

Treatment Groups

	Phase Day	168 mg/L	335 mg/L
Percent of Control		164.6	134.6
Phosphorus (mg/dL)	PND 117	10.1 ± 3.6 (5)	14.0 ± 11.1 (5)
Percent of Control		68.9	95.4
Phosphorus/Creatinine	PND 117	0.10 ± 0.03 (5)	0.11 ± 0.08 (5)
Percent of Control		56.2	62.2
N-acetyl-beta-glucosaminidase (U/L)	PND 117	12.6 ± 2.0 (5)	12.4 ± 1.9 (5)
Percent of Control		114.5	112.7
N-acetyl-beta-glucosaminidase/Creatinine	PND 117	0.01 ± 0.00 (5)	0.01 ± 0.00 (5)
Percent of Control		113.5	104.0
Alkaline Phosphatase (U/L)	PND 117	16.8 ± 7.7 (5)	15.2 ± 9.6 (5)
Percent of Control		63.2	57.1
Alkaline Phosphatase/Creatinine (U/mg)	PND 117	0.02 ± 0.01 (5)	0.01 ± 0.01 (5)
Percent of Control		53.1	41.5
Aspartate Aminotransferase (U/L)	PND 117	4.2 ± 0.9 (5)	5.8 ± 0.7 (5)
Percent of Control		80.8	111.5
Aspartate Aminotransferase/Creatinine (U/mg)	PND 117	0.01 ± 0.00 (5)	0.01 ± 0.00 (5)
Percent of Control		84.5	99.0
Vanadium Concentration in Urine (ng/mL)	PND 117	149.4 ± 12.0 (5) **	613.6 ± 29.1 (5) **
Percent of Control		6330.5	26000.0
Vanadium Concentration/Creatinine (ng/mg)	PND 117	176.6 ± 15.1 (5) **	673.1 ± 70.6 (5) **
Percent of Control		6749.6	25722.1

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## LEGEND

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Values given as mean  $\pm$  SEM (N) with Percent of Control calculated by (dosed group mean / control group mean) x 100

PND - Postnatal Day

Urine Clarity and Color values are given as an incidence count with number examined in parentheses

Sediment Exam values are given as a mean grade and count

No statistical analyses were performed on graded or qualitative endpoints.

Values below the limit of detection (LOD) were substituted with 1/2 the LOD value.

If 80% or more of the values in a dose group were below the LOD, no statistical analysis was performed.

Statistical analysis for urine chemistry, volume, and specific gravity data was performed using Jonckheere (trend) and Shirley or Dunn (pairwise) tests.

Statistical significance for the control group indicates a significant trend test

Statistical significance for a treatment group indicates a significant pairwise test compared to the vehicle control group

\* Statistically significant at  $P \leq 0.05$

\*\* Statistically significant at  $P \leq 0.01$

Urine Sediment Grading Criteria:

Epithelial Cells 0=0-1, 1=2-5, 2=6-10, 3=11-20, 4=20+

Casts 0=0, 1=1-5, 2=6-10, 3=11-20, 4=20+

Crystals (Rabbits/Guinea Pigs-Calcium Carbonate) 0=0-20, 1=21-40, 2=41-60, 3=61-80, 4=81+

Red Blood Cells 0=0-5, 1=6-10, 2=11-25, 3=26-50, 4=50+

White Blood Cells 0=0-5, 1=5-10, 2=11-15, 3=16-25, 4=25+

Sperm 0=0, 1=1-5, 2=6-10, 3=11-20, 4=20+

Yeast 0=0, 1=1-10, 2=11-25, 3=26-50, 4=50+

Mucus 0=0, 1=10-25, 2=26-50, 3=51-75, 4=>75

Bacteria 0=0, 1=10-25, 2=26-50, 3=51-75, 4=>75

Amorphous Sediment 0=0, 1=10-25, 2=26-50, 3=51-75, 4=>75

**\*\* END OF REPORT \*\***