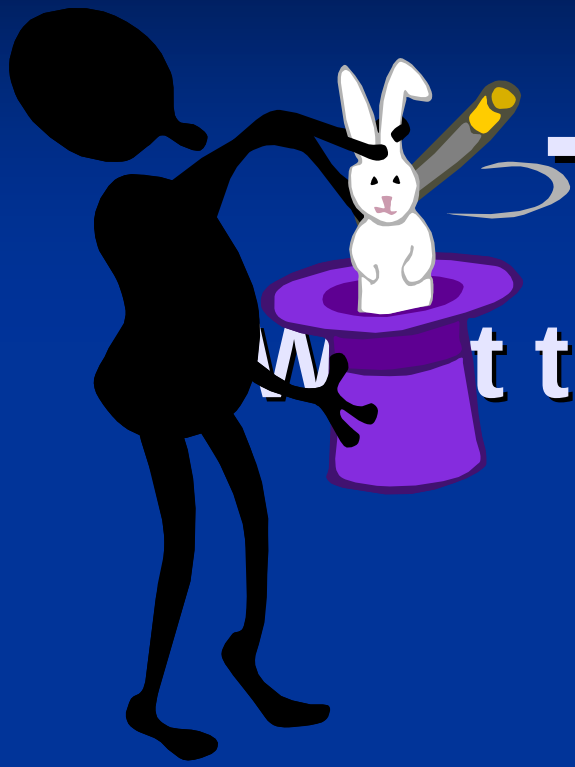


The Art of BOD

What the Checklists Don't Say . . .

Assessors Forum

The Forum - Denver, CO

January 2007

Silky S. Labie

CBOD

- Hydrocarbon Oxidation
- Inhibits Nitrifying Organisms

NOD

- Protein Degradation
- NH3, NO2, NO3

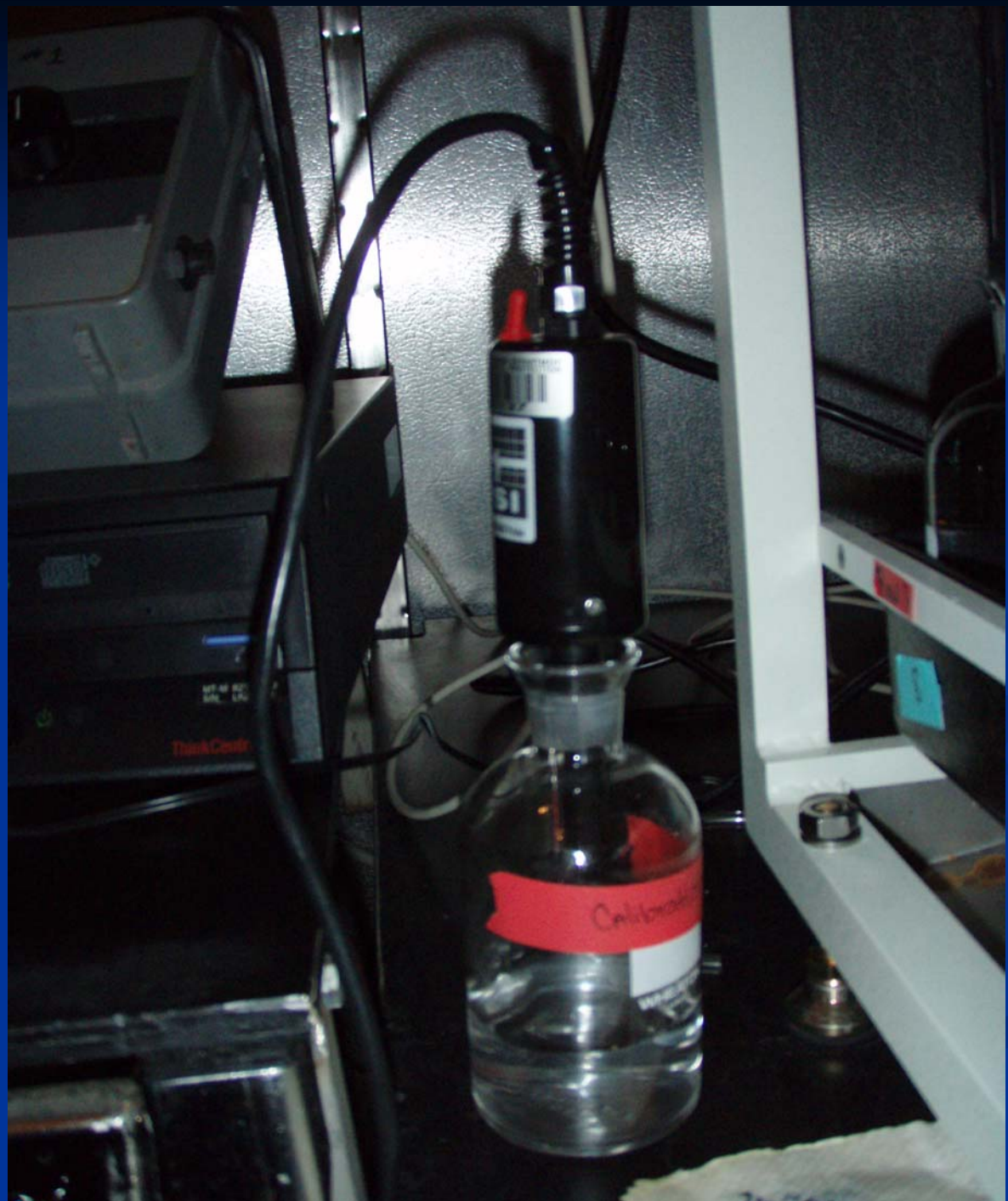
BOD

- The Amount of O_2 used to Decompose Organic Matter through Oxidation
- CBOD and NOD

- Empirical Test
- Method Defined Parameter

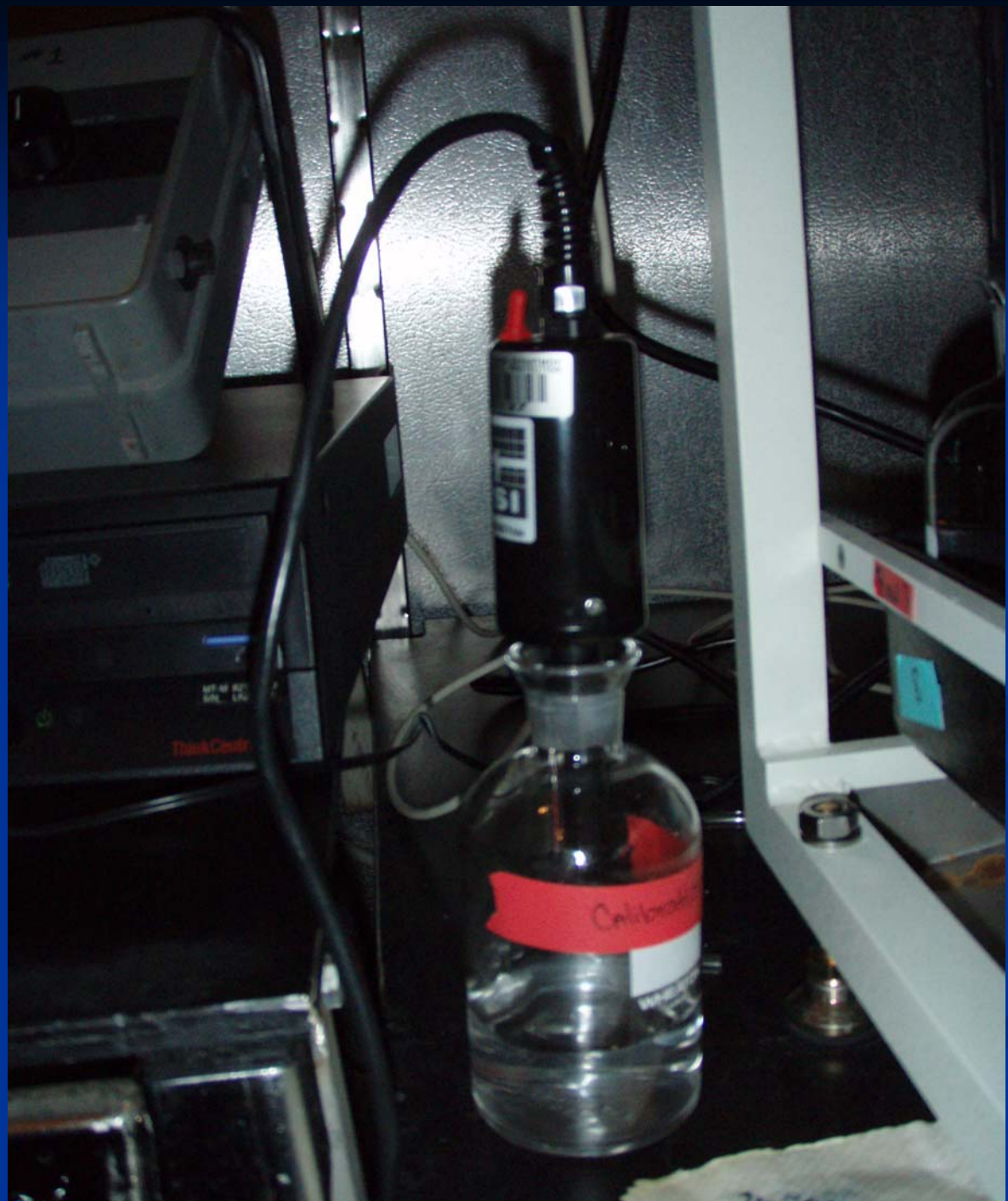
The Mechanics are Simple:


Measure a sample

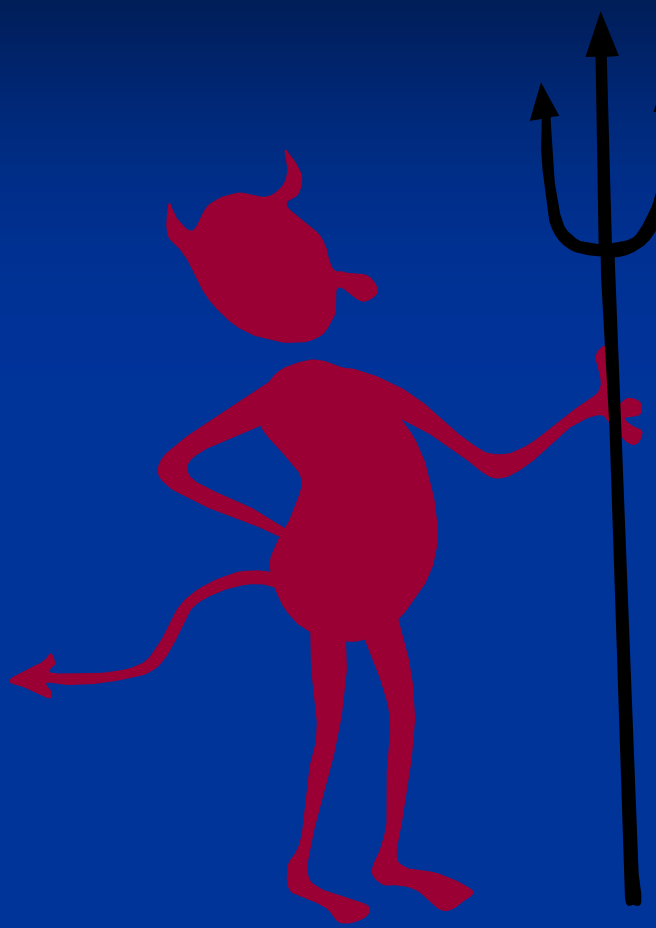


Measure Dissolved Oxygen

“Bake” @ 20°C for 5 days



Measure Dissolved Oxygen



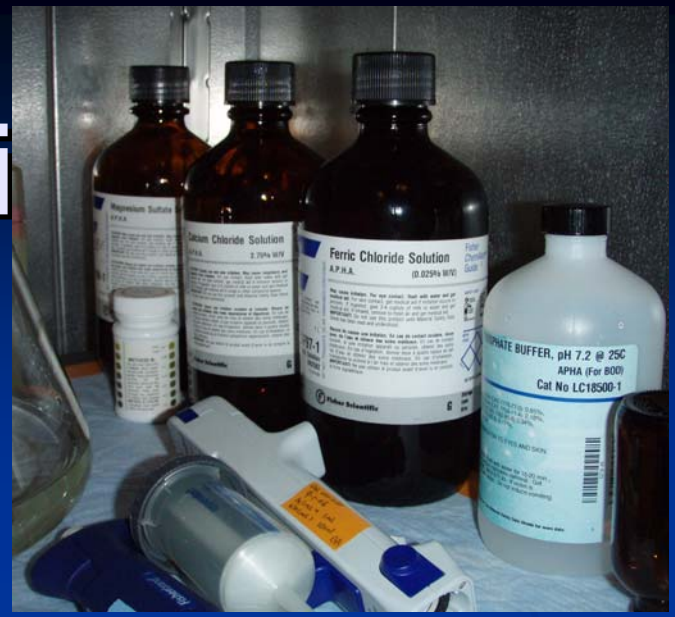
The Devil's in the Details

Sample Receipt & Assessment

- Received at ≤ 6° C
- 48 hour holding time
- pH range: 6.0 – 8.5
- No Residual Chlorine
  - Na_2SO_3 to remove
  - DO NOT ADD EXCESS!

Reagent Preparati

- Prepare per Method
- Dilution Water
  Temperature: 20 ± 3°C



- Saturate by shaking or aeration
- Use until DO depletion exceeds 0.2 mg/L
  - 24 hours recommended

Sample Preparation

- Temperature : 20±1°C
- How many dilutions?
  - "several" -
- Nutrient Requirement
  - >67% sample requires additional nutrients
- Aerate Sample

•More than a few
•A small number
•Consisting of a number more than two, but not very many
•Five recommended for unknowns

Sample Preparation

- Seeding
  - What is it?
  - Use when samples were known to be chlorinated
  - Add measured amount **to** BOD bottle
- Determine Initial DO
  - DO >9 mg/L - Supersaturation
- Stopper Container
  - No Air Bubbles
  - Water Seal

QC Criteria

- Blanks
  - Dilution - Uptake <0.2 mg/L (0.1 mg/L preferred
  - Seed Blank – Uptake 0.6 – 1 mg/L
- GGA – 198 ± 30.5 mg/L
  - CBOD have lower recoveries

Sample Results

- Samples
  - At least 2 mg/L depletion and
  - 1.0 mg/L residual
- Calculate all Dilution Results meeting criteria
- Report an average of all results that:
  - Meet the Depletion and Residual Criteria

  and
  - Dilution Series does not Exhibit Toxicity

Records to Review

- Transmittal Form from Field
  - Verify date and time of collection
- Sample Receipt Records
  - Verify Acceptable Receipt Temperature
- Reagent Records
  - Verify Dilution Water Preparation
  - Verify GGA Standard Receipt
  - Verify Reagent Receipt

Project Name: LCL0705
Project Location: Lcon Co.
Client: Lcon Co.
Data Set Id: LCL0705 SCT1
Sampler: SM, RM / AK, JS

Sample Information

Station	Date	Time	Matrix
MB6-S	7/12/05	10:30	SW
MB6-B		11:00	
MB3-S		11:30	
MB3-B		11:46	
MB1-S		12:00	
MB1-B		12:20	
LZ8-M		14:31	
LZ5-M		14:57	
LZ2-M		15:42	
LZ0-M		16:27	
L15-M		17:06	
LPZ1-M		17:35	
LPZ1-M(2)		17:37	
LW1-M		18:15	
Fld Blk		13:30	

Requested Analysis/Preservation/Bottle Type

TSS,TDS,BOD/ ice < 4°C/1/2 gal HDPE	Chlorophyll/ ice < 4°C/1L Amber Glass	Turbidity, Cl, Alk./ ice < 4°C/250ml HDPE	PO_4, NO_2, NO_3, Color/ ice < 4°C, field filtered 0.45u/ 50ml HDPE	Bacteria/ice < 4°C/100ml poly whirlpack	NH_3/3 drops H_2SO_4 < pH 2 /50ml HDPE	TKN/3 drops H_2SO_4 < pH 2 /50ml HDPE	TP/3 drops H_2SO_4 < pH 2 /50ml HDPE	Metals/3ml HNO_3 < pH2 /250ml HDPE	GC/MS Organics/ ice < 4°C/1L Amber Glass	Field Pres. Check	Rem
/	/	/	/	/	/	/	/	0	0	✓	
								1			
								0			

Storage Container Description: large cooler
Transportation to Lab Description: Toyota Forerunner
Relinquished By: [illegible] Date: 7/12/05 Time: 1855
Received By: [signature] Date: 7.12.05 Time: 1900

Notes:

Lab ID	Field ID	Field ID	Field ID				(<4°C)								
	Sample ID	Collection Date	Collection Time	Date Received	Time Rec'd	Preservation Method	Temp. @ Acceptance	Preservation Check	Holding Time Check	Requested Analysis	Container Type	Sample Volume	Matrix	Condition of Sample	Sample Location in Lab
G1477	FldBlk	07/12/05	13:30	07/12/05		Ice < 4oC		Acceptable	Acceptable	TSS, TDS	1/2 gal. HDPE	1/2 gal.	SW	Acceptable	Refridgerator 1A
G1478	MB6	07/12/05	10:30	07/12/05		Ice < 4oC		Acceptable	Acceptable	TSS, TDS	1/2 gal. HDPE	1/2 gal.	SW	Acceptable	Refridgerator 1A
G1479	MB6	07/12/05	11:00	07/12/05		Ice < 4oC		Acceptable	Acceptable	TSS, TDS	1/2 gal. HDPE	1/2 gal.	SW	Acceptable	Refridgerator 1A
G1480	MB3	07/12/05	11:30	07/12/05		Ice < 4oC		Acceptable	Acceptable	TSS, TDS	1/2 gal. HDPE	1/2 gal.	SW	Acceptable	Refridgerator 1A
G1481	MB3	07/12/05	11:46	07/12/05		Ice < 4oC		Acceptable	Acceptable	TSS, TDS	1/2 gal. HDPE	1/2 gal.	SW	Acceptable	Refridgerator 1A
G1482	MB1	07/12/05	12:00	07/12/05		Ice < 4oC		Acceptable	Acceptable	TSS, TDS	1/2 gal. HDPE	1/2 gal.	SW	Acceptable	Refridgerator 1A
G1483	MB1	07/12/05	12:20	07/12/05		Ice < 4oC		Acceptable	Acceptable	TSS, TDS	1/2 gal. HDPE	1/2 gal.	SW	Acceptable	Refridgerator 1A
G1484	L28	07/12/05	14:31	07/12/05		Ice < 4oC		Acceptable	Acceptable	TSS, TDS	1/2 gal. HDPE	1/2 gal.	SW	Acceptable	Refridgerator 1A
G1485	L25	07/12/05	14:57	07/12/05		Ice < 4oC		Acceptable	Acceptable	TSS, TDS	1/2 gal. HDPE	1/2 gal.	SW	Acceptable	Refridgerator 1A
G1486	L22	07/12/05	15:42	07/12/05		Ice < 4oC		Acceptable	Acceptable	TSS, TDS	1/2 gal. HDPE	1/2 gal.	SW	Acceptable	Refridgerator 1A
G1487	L20	07/12/05	16:27	07/12/05		Ice < 4oC		Acceptable	Acceptable	TSS, TDS	1/2 gal. HDPE	1/2 gal.	SW	Acceptable	Refridgerator 1A
G1488	L15	07/12/05	17:06	07/12/05		Ice < 4oC		Acceptable	Acceptable	TSS, TDS	1/2 gal. HDPE	1/2 gal.	SW	Acceptable	Refridgerator 1A
G1489	LPZ1	07/12/05	17:35	07/12/05		Ice < 4oC		Acceptable	Acceptable	TSS, TDS	1/2 gal. HDPE	1/2 gal.	SW	Acceptable	Refridgerator 1A
G1490	LPZ1	07/12/05	17:37	07/12/05		Ice < 4oC		Acceptable	Acceptable	TSS, TDS	1/2 gal. HDPE	1/2 gal.	SW	Acceptable	Refridgerator 1A
G1491	LW1	07/12/05	18:13	07/12/05		Ice < 4oC		Acceptable	Acceptable	TSS, TDS	1/2 gal. HDPE	1/2 gal.	SW	Acceptable	Refridgerator 1A

Task: 1
Client: 1
Data Set Id.: LCL0705
SET: 1 Page:13

Run on a YSI Model 57 Oxygen Meter, Ser# T10BC3
with a YSI 5905 BOD Probe, Ser# 059882,
incubated in Revco BOD Inc Ser# P01K-475749-PK

	Field Identification Information							5 Day BOD & 20 deg C					
			Collection		Depth Code	Repitition							
Lab ID #	Station	Date	Time			Container	Date received at Laboratory	Bottle Number	Volume Sample (ml)	Initial DO	Time of Analysis (HH:MM)	Final DO	Time of Analysis (HH:MM)
	glu/glu							3	6	7.89	1440	3.72	1440
	cal 1							DO read	8.80 @	21.6°C		DO read	8.92 @ 20.9°C
	Lab Blk							46.3	300	7.97		7.90	
1	G1477	FldBlk	07/12/05	13:30		1/2 gal HDPE	07/12/05	12		9.30		9.25	
2	G1478	MB6	07/12/05	10:30	S	1 1/2 gal HDPE	07/12/05	10.4		8.38		8.15	
3	G1479	MB6	07/12/05	11:00	B	1 1/2 gal HDPE	07/12/05	81		6.50		6.28	
4	G1480	MB3	07/12/05	11:30	S	1 1/2 gal HDPE	07/12/05	3.5		8.16		7.91	
5	G1481	MB3	07/12/05	11:46	B	1 1/2 gal HDPE	07/12/05	47.2		7.70		7.52	
6	G1482	MB1	07/12/05	12:00	S	1 1/2 gal HDPE	07/12/05	10.1		8.50		8.00	
7	G1483	MB1	07/12/05	12:20	B	1 1/2 gal HDPE	07/12/05	2.5		6.81		6.28	
8	G1484	L28	07/12/05	14:31	M	1 1/2 gal HDPE	07/12/05	100		7.15		5.10	
9	G1485	L25	07/12/05	14:57	M	1 1/2 gal HDPE	07/12/05	10.2		6.96		4.08	
10	G1486	L22	07/12/05	15:42	M	1 1/2 gal HDPE	07/12/05	11		7.50		5.48	
11	G1487	L20	07/12/05	16:27	M	1 1/2 gal HDPE	07/12/05	12.1		8.67		8.07	
		CC 2						DO read	8.38 @	24.2°C		DO read	9.17 @ 19.9°C
12	G1488	L15	07/12/05	17:06	M	1 1/2 gal HDPE	07/12/05	46.2		8.50		7.18	
13	G1489	LPZ1	07/12/05	17:35	M	1 1/2 gal HDPE	07/12/05	100		8.99		7.04	
14	G1490	LPZ1	07/12/05	17:37	M	F2 1/2 gal HDPE	07/12/05	11.6		9.11		7.21	
15	G1491	LW1	07/12/05	18:13	M	1 1/2 gal HDPE	07/12/05	43.6		8.38		7.97	1510

4	G1480	MB3		11:30	S	1	1/2 gal HDPE	07/12/05	3.5			8.16			7.91		
5	G1481	MB3	07/12/05	11:46	B	1	1/2 gal HDPE	07/12/05	47.2			7.70			7.52		
6	G1482	MB1	07/12/05	12:00	S	1	1/2 gal HDPE	07/12/05	10.1			8.50			8.00		
7	G1483	MB1	07/12/05	12:20	B	1	1/2 gal HDPE	07/12/05	2.5			6.81			6.28		
8	G1484	L28	07/12/05	14:31	M	1	1/2 gal HDPE	07/12/05	100			7.15			5.10		
9	G1485	L25	07/12/05	14:57	M	1	1/2 gal HDPE	07/12/05	10.2			6.96			4.08		
10	G1486	L22	07/12/05	15:42	M	1	1/2 gal HDPE	07/12/05	11			7.50			5.48		
11	G1487	L20	07/12/05	16:27	M	1	1/2 gal HDPE	07/12/05	12.1			8.67			8.07		
		CC 2							DO read	8.38	@	24.2°C			DO read	9.17	@ 19.9°C
12	G1488	L15	07/12/05	17:06	M	1	1/2 gal HDPE	07/12/05	46.2			8.50			7.18		
13	G1489	LPZ1	07/12/05	17:35	M	1	1/2 gal HDPE	07/12/05	100			8.99			7.04		
14	G1490	LPZ1	07/12/05	17:37	M	F2	1/2 gal HDPE	07/12/05	11.6			9.11			7.21		
15	G1491	LW1	07/12/05	18:13	M	1	1/2 gal HDPE	07/12/05	43.6			8.38			7.97	1510	
16																	
17																	
18																	
19																	
20																	
21																	
		cal 3							DO read	8.50	@	23.5°C	1500		DO read	9.10	@ 19.8 °C
								Analyst	AK	→	"	AK	→	"	AK	→	"
								Date	7/13/05	→	"	7/13/05	→	"	7/18/05	→	"
								Time	1245	→	"	1500	→	"	1510	→	"
								Notes									

Do not: burn. spindle or mutilate!

Records to Review

- Incubator Logs
  - 20±1°C on each test day (5 days!)
  - Calibrated Thermometer
- DO Calibration
  - Standard Type(s)
  - Initial and Continuing

Frequency: Daily when in use
Range: 20 +/- 1

Date	Temperature oC	Analyst	Manufacturer	Serial Number
6/16/2003	16.8	GM	REVCO BOD Incubator	P01K-475749-PK
6/16/2003	19.3	GM	REVCO BOD Incubator	P01K-475749-PK
6/17/2003	19.4	GM	REVCO BOD Incubator	P01K-475749-PK
6/18/2003	19.4	GM	REVCO BOD Incubator	P01K-475749-PK
6/21/2003	20.1	SM	REVCO BOD Incubator	P01K-475749-PK
7/2/2003	4.4	MTC	REVCO BOD Incubator	P01K-475749-PK
7/14/2003	18.4	GM	REVCO BOD Incubator	P01K-475749-PK
7/15/2003	20.4	GM	REVCO BOD Incubator	P01K-475749-PK
7/15/2003	20.0	SM	REVCO BOD Incubator	P01K-475749-PK
7/16/2003	20.5	GM	REVCO BOD Incubator	P01K-475749-PK
7/17/2003	20.4	AH	REVCO BOD Incubator	P01K-475749-PK
8/14/2003	20.1	GM	REVCO BOD Incubator	P01K-475749-PK
9/10/2003	20.0	SM	REVCO BOD Incubator	P01K-475749-PK
9/15/2003	20.0	SM	REVCO BOD Incubator	P01K-475749-PK
2/3/2004	19.8	AH	REVCO BOD Incubator	P01K-475749-PK
2/4/2004	19.6	AH	REVCO BOD Incubator	P01K-475749-PK
2/5/2004	19.9	AH	REVCO BOD Incubator	P01K-475749-PK
2/6/2004	19.9	SR	REVCO BOD Incubator	P01K-475749-PK
2/9/2004	19.9	SR	REVCO BOD Incubator	P01K-475749-PK
2/10/2004	19.8	AH	REVCO BOD Incubator	P01K-475749-PK
2/11/2004	19.9	AH	REVCO BOD Incubator	P01K-475749-PK
2/12/2004	19.8	AH	REVCO BOD Incubator	P01K-475749-PK
2/13/2004	19.9	AH	REVCO BOD Incubator	P01K-475749-PK
2/16/2004	19.9	AH	REVCO BOD Incubator	P01K-475749-PK
2/17/2004	19.7	AH	REVCO BOD Incubator	P01K-475749-PK
2/18/2004	20.0	AH	REVCO BOD Incubator	P01K-475749-PK
2/19/2004	19.9	AH	REVCO BOD Incubator	P01K-475749-PK
2/23/2004	19.9	AH	REVCO BOD Incubator	P01K-475749-PK
2/25/2004	20.1	AH	REVCO BOD Incubator	P01K-475749-PK
2/26/2004	20.0	AH	REVCO BOD Incubator	P01K-475749-PK
2/27/2004	20.2	AH	REVCO BOD Incubator	P01K-475749-PK
3/1/2004	19.8	AH	REVCO BOD Incubator	P01K-475749-PK
3/4/2004	20.0	AH	REVCO BOD Incubator	P01K-475749-PK
3/5/2004	20.4	AH	REVCO BOD Incubator	P01K-475749-PK
3/8/2004	20.0	AH	REVCO BOD Incubator	P01K-475749-PK
3/17/2004	20.3	AH	REVCO BOD Incubator	P01K-475749-PK
3/18/2004	20.2	AH	REVCO BOD Incubator	P01K-475749-PK
3/19/2004	20.1	AH	REVCO BOD Incubator	P01K-475749-PK
3/22/2004	19.9	AH	REVCO BOD Incubator	P01K-475749-PK
3/23/2004	20.0	AH	REVCO BOD Incubator	P01K-475749-PK

Temp not Monitored on all 5 days of incubation

Records to Review

- BOD Worksheets
  - Date and Time of Initial Set Up
  - Date and Time of Final Reading
  - Records of pH, residual Chlorine and Temperature Checks
  - Volumes of
    - GGA
    - Seed
    - Blank
    - Samples

Task: 1

No Seed Blank
Supersaturation? Temp problem
No standard or reagent links
pH check??
Residual Chlorine?

Run on a YSI Model 57 Oxygen Meter, Ser# T10BC3
with a YSI 5905 BOD Probe, Ser# 059882,
incubated in Revco BOD Inc Ser# P01K-475749-PK

									5 Day BOD & 20 deg C					
								Date received at Laboratory	Bottle Number	Volume Sample (ml)	Initial DO	Time of Analysis (HH:MM)	Final DO	Time of Analysis (HH:MM)
									3	6	7.89	1440	3.72	1440
									DO read	8.80 @	21.6°C		DO read 8.92 @ 20.9°C	
		Lab Blk							46.3	300	7.97		7.90	
1	G1477	FldBlk	07/12/05	13:30			1/2 gal HDPE	07/12/05	12		9.30		9.25	
2	G1478	MB6	07/12/05	10:30	S	1	1/2 gal HDPE	07/12/05	10.4		8.38		8.15	
3	G1479	MB6	07/12/05	11:00	B	1	1/2 gal HDPE	07/12/05	81		6.50		6.28	
4	G1480	MB3	07/12/05	11:30	S	1	1/2 gal HDPE	07/12/05	3.5		8.16		7.91	
5	G1481	MB3	07/12/05	11:46	B	1	1/2 gal HDPE	07/12/05	47.2		7.70		7.52	
6	G1482	MB1	07/12/05	12:00	S	1	1/2 gal HDPE	07/12/05	10.1		8.50		8.00	
7	G1483	MB1	07/12/05	12:20	B	1	1/2 gal HDPE	07/12/05	2.5		6.81		6.28	
8	G1484	L28	07/12/05	14:31	M	1	1/2 gal HDPE	07/12/05	100		7.15		5.10	
9	G1485	L25	07/12/05	14:57	M	1	1/2 gal HDPE	07/12/05	10.2		6.96		4.08	
10	G1486	L22	07/12/05	15:42	M	1	1/2 gal HDPE	07/12/05	11		7.50		5.48	
11	G1487	L20	07/12/05	16:27	M	1	1/2 gal HDPE	07/12/05	12.1		8.67		8.07	
		CC 2							DO read	8.38 @	24.2°C		DO read 9.17 @ 19.9°C	
12	G1488	L15	07/12/05	17:06	M	1	1/2 gal HDPE	07/12/05	46.2		8.50		7.18	
13	G1489	LPZ1	07/12/05	17:35	M	1	1/2 gal HDPE	07/12/05	100		8.99		7.04	
14	G1490	LPZ1	07/12/05	17:37	M	F2	1/2 gal HDPE	07/12/05	11.6		9.11		7.21	
15	G1491	LW1	07/12/05	18:13	M	1	1/2 gal HDPE	07/12/05	43.6		8.38		7.97	1510

Records to Review

- BOD Worksheets
  - Initial and Final DO Readings
  - Analysts' Initials
  - Links to reagents receipt/preparation

BOD

METHOD # SM 5210B (20th edition)

ANALYST INT. BJ

D.O. READING FIN. BJ

DATE IN: 12/09/06 @ 1300

METER CALIBRATION

DATE OUT: 12/14/06 @ 1100

SEED CORR. FACTOR (X/Y×Z)

	1st DAY	5th DAY
(1)	21.6°C 8.81 mg/L	22.2 °C 8.71 mg/L
(2)	21.0°C 8.90 mg/L	21.8 °C 8.69 mg/L

BOD/CBOD= Z-A/Y×100

ACCURACY: 87.4-85.8 % (84.6-115.4)

PRECISION: 1.2 % RSD

$(d_1-d_2)\times 200/(d_1+d_2)\times 1.4142$

Equipment: YSI 5OB

	BOD	CBOD
(1)	0.6457	(1)
(2)	0.6200	(2)
MEAN: A	0.6328	A

Matrix: Stu/wtu

Nutr. Pillow lot # 040922 exp.dt. 3/09

Seed Calculation:
(3.39÷21)*4=.6457 per 4 mL

LAB ID #	%SMPL	BOT. #	INT. D.O. mg/L	Lot# Exp.dt	FIN. D.O. mg/L	D L(					EMARK
DW		3	8.80		8.66	0.14				0	
Seed	7	55	8.80	50508/8/07	5.41	3.39	48.4			21	
Seed	10	57	8.79	20606R8/107	4.14	4.65	46.5			30	
GG std	2	58	8.80		4.71	4.09	173			4	
GG std	2	59	8.81		4.78	4.03	170			4	
62055 JC	1	60	8.78		7.78	1.00	36.7	-ve	6.62	4	
JC	2	61	8.76		7.92	0.84	10.4			4	
JC	5	62	8.72		7.57	1.15	10.3			4	
62056 JC	20	64	8.78		7.78	1.00	1.8	-ve	6.54	4	
JC	40	65	8.80		7.47	1.33	1.7			4	

	JC	5	62	8.72		7.57	1.15	10.3			4	
620156	JC	20	64	8.78		7.78	1.00	1.8	-ve	6.54	4	
	JC	40	65	8.80		7.47	1.33	1.7			4	
	JC	80	69	8.82		7.75	1.07	0.5			4	+ Nutrient
620157	JC	20	70	8.67		7.43	1.24	3.0	-ve	6.27	4	
	JC	40	71	8.48		6.01	2.47	4.6			4	
	JC	80	74	8.17		4.64	3.53	3.6			4	+ Nutrient
620158	JC	20	77	8.69		6.79	1.90	6.3	-ve	6.86	4	
	JC	40	78	8.54		6.26	2.28	4.1			4	
	JC	80	84	8.27		4.59	3.68	3.8			4	+ Nutrient
620156 dup	JC	80	88	8.82		7.65	1.17	0.7			4	+ Nutrient
DW			89	8.82		8.65	0.17				0	
620155	JC							10 J				
620156	JC							2 k J				
620157	JC							4.1				
620158	JC							4.0				

* ml Na_2SO_3 per 100 ml sample Duplicate precision ID # 69 dil (1) 7.3 mg/L (2) 7.0 mg/L (<20%)

Seed Calculation:
F=2÷5 =0.4
Avg depletion=(2.68+2.98) **÷2 =2.83**

BOD Run Log

					DO Calibration			
				nalyst			° C	mg/L
				RS	Set up	Before Readings	22	8.74
						After Readings	23.1	8.68
GGA ID:	6375							
Read:	4/15/07	1000	XYZ		Final	Before Readings	21	8.2
						After Readings	22	8.1

Result (mg/L BOD) = (100(D1 – D2) – (Y)f)/P
Where: Y = Average of B1, B2 and B3 and f = volume of seed in sample/volume of seed in seed control

Lab ID	Comments	pH(pH u)	Bottle #	Sample (ml)	P Sample (%)	Seed (mL)	D_1 Initial DO	D_2 Final DO	DO Dupletion	Calculated Value (mg/L)	Reported Value (mg/L)
Blank	☐Chlorine Check + ☐Chlorine Check - ☒Warmed to 20°C ☐Nitrification Inhibitor added		2	300			8.96	8.45	0.51		
Blank	☐Chlorine Check + ☐Chlorine Check - ☒Warmed to 20°C ☐Nitrification Inhibitor added		322	300			9.01	8.43	0.58		
Seed Control (B_1)	☐Chlorine Check + ☐Chlorine Check - ☒Warmed to 20°C ☐Nitrification Inhibitor added		3	5		5	8.90	6.22	2.68		
Seed Control (B_2)	☐Chlorine Check + ☐Chlorine Check - ☒Warmed to 20°C ☐Nitrification Inhibitor added		7	5		5	8.95	5.97	2.98		
Seed Control (B_3)	☐Chlorine Check + ☐Chlorine Check - ☒Warmed to 20°C ☐Nitrification Inhibitor added	100[(98.94-4.84)-(279*.4)]1.67									
GGA Standard	☐Chlorine Check + ☐Chlorine Check - ☒Warmed to 20°C ☐Nitrification Inhibitor added		18	5	1.67	2	8.99	4.84	4.15	181.00	175
GGA Standard	☐Chlorine Check + ☐Chlorine Check - ☒Warmed to 20°C ☐Nitrification Inhibitor added		203	5	1.67	2	8.97	5.02	3.95	169.00	

Lab ID	Comments	pH(pH u)	Bottle #	Sample (ml)	Sample (%)	Seed (mL)	Initial DO	Final DO	DO Dupletion	Calculated Value (mg/L)	Reported Value (mg/L)
968048	☒Chlorine Check + ☐Chlorine Check - ☒Warmed to 20°C ☐Nitrification Inhibitor added	6.80	27	3	1	2	8.92	7.00	1.92	78.80	
Influ 1			30	6	2	2	8.87	6.12	2.75	80.90	86.00
			25	9	3	2	8.94	4.82	4.12	99.60	90.2
968049	☒Chlorine Check + ☐Chlorine Check - ☒Warmed to 20°C ☐Nitrification Inhibitor added	6.70	35	75	25	2	8.99	4.94	4.05	11.70	
Effu 1			22	150	50	2	9.03	4.97	4.06	5.80	6.50
			40	285	95	2	8.85	5.73	3.12	2.10	11.7
968083	☒Chlorine Check + ☐Chlorine Check - ☒Warmed to 20°C ☐Nitrification Inhibitor added	6.60	106	3	1	2	8.89	6.53	2.36	1.23	
Influ 2			19	6	2	2	9.02	5.54	3.48	1.17	1.21
			108	9	3	2	9.10	4.27	4.83	1.23	
968083	☒Chlorine Check + Na_2SO_3 ☐Chlorine Check - ☒Warmed to 20°C ☐Nitrification Inhibitor added	6.30	121	75	25	2	9.20	6.65	2.55	5.67	
Effu 2			135	150	50	2	9.53	5.41	4.12	5.98	6.00
			156	285	95	2	9.98	2.88	7.10	6.28	
968085	☒Chlorine Check + ☐Chlorine Check - ☒Warmed to 20°C ☐Nitrification Inhibitor added	6.60	111	3	1	2	8.28	4.93	3.35	222.00	222
Influ 3			127	6	2	2	8.12	2.71	5.41	143.00	141.00
			136	9	3	2	8.08	0.56	7.52	58.00	
968086	☒Chlorine Check + ☐Chlorine Check - ☒Warmed to 20°C ☐Nitrification Inhibitor added	6.90	159	75	25	2	8.25	7.00	1.25	0.47	
Effu 4			171	150	50	2	8.11	6.90	1.21	0.16	0.28
			106	285	95	2	8.09	6.75	1.34	0.22	

Task:
Client:
Data Set Id.: LCL0705
SET: 1 Page:13

Run on a YSI Model 57 Oxygen Meter, Ser# T10BC3
with a YSI 5905 BOD Probe, Ser# 059882,
incubated in Revco BOD Inc Ser# P01K-475749-PK

5 Day BOD & 20 deg C

	Lab ID #	Field Identification Information: Station	Collection: Date	Collection: Time	Depth Code	Repitition	Container	Date received at Laboratory	Bottle Number	Volume Sample (ml)	Initial DO	Time of Analysis (HH:MM)	Final DO	Time of Analysis (HH:MM)
		glu/glu							3	6	7.89	1440	3.72	1440
		cal 1							DO read	8.80 @	21.6°C		DO read 8.92 @ 20.9°C	
		Lab Blk							46.3	300	7.97		7.90	
1	G1477	FldBlk	07/12/05	13:30			1/2 gal HDPE	07/12/05	12		9.30		9.25	
2	G1478	MB6	07/12/05	10:30	S	1	1/2 gal HDPE	07/12/05	10.4		8.38		8.15	
3	G1479	MB6	07/12/05	11:00	B	1	1/2 gal HDPE	07/12/05	81		6.50		6.28	
4	G1480	MB3	07/12/05	11:30	S	1	1/2 gal HDPE	07/12/05	3.5		8.16		7.91	
5	G1481	MB3	07/12/05	11:46	B	1	1/2 gal HDPE	07/12/05	47.2		7.70		7.52	
6	G1482	MB1	07/12/05	12:00	S	1	1/2 gal HDPE	07/12/05	10.1		8.50		8.00	
7	G1483	MB1	07/12/05	12:20	B	1	1/2 gal HDPE	07/12/05	2.5		6.81		6.28	
8	G1484	L28	07/12/05	14:31	M	1	1/2 gal HDPE	07/12/05	100		7.15		5.10	
9	G1485	L25	07/12/05	14:57	M	1	1/2 gal HDPE	07/12/05	10.2		6.96		4.08	
10	G1486	L22	07/12/05	15:42	M	1	1/2 gal HDPE	07/12/05	11		7.50		5.48	
11	G1487	L20	07/12/05	16:27	M	1	1/2 gal HDPE	07/12/05	12.1		8.67		8.07	
		CC 2							DO read	8.38 @	24.2°C		DO read 9.17 @ 19.9°C	
12	G1488	L15	07/12/05	17:06	M	1	1/2 gal HDPE	07/12/05	46.2		8.50		7.18	
13	G1489	LPZ1	07/12/05	17:35	M	1	1/2 gal HDPE	07/12/05	100		8.99		7.04	
14	G1490	LPZ1	07/12/05	17:37	M	F2	1/2 gal HDPE	07/12/05	11.6		9.11		7.21	
15	G1491	LW1	07/12/05	18:13	M	1	1/2 gal HDPE	07/12/05	43.6		8.38		7.97	1510
16														
17														

Lab ID	Vol (ml)	Initial DO	Final DO	Depletion	BOD mg/L
glu	6	7.89	3.72	4.17	208.5
lab blank	300	7.97	7.9	0.07	0.07
G1477	300	9.3	9.25	0.05	0.05
G1478	300	8.38	8.15	0.23	0.23
G1479	300	6.5	6.28	0.22	0.22
G1480	300	8.16	7.91	0.25	0.25
G1481	300	7.7	7.52	0.18	0.18
G1482	300	8.5	8	0.5	0.5
G1483	300	6.81	6.28	0.53	0.53
G1484	300	7.15	5.1	2.05	2.05
G1485	300	6.96	4.08	2.88	2.88
G1486	300	7.5	5.48	2.02	2.02
G1487	300	8.67	8.07	0.6	0.6
G1488	300	8.5	7.18	1.32	1.32
G1489	300	8.99	7.04	1.95	1.95
G1490	300	9.11	7.21	1.9	1.9
G1491	300	8.38	7.97	0.41	0.41

More Dilutions??

Tricks of the Trade

- Verify Adequate Documentation
- Verifying Method Compliance
  - Interview the Analyst(s)
    - Proper Sample Preparation?
      - Residual Chlorine Removal & pH
      - Aeration and Temperature
      - Appropriate Number of Dilutions
      - Dilution Technique and Seeding
      - Calibration

Tricks of the Trade

- Verifying Method Compliance
  - Interview the Data Reviewer
    - Acceptable QC
      - Blank acceptability
      - GGA acceptance
    - Proper Sample Assessment
    - Toxicity Assessment
    - Proper Data Reduction
    - Proper Reporting

T	F	Question
	✓	Samples must be analyzed within 36 48 urs of collection.
	✓	Sample pH isn't important. 6.0 – 8.5
✓		Samples must be free from residual chlorine.
	✓	Use Sodium sulfate to dechlorinate samples
	✓	You can prepare and store dilution water for 72 h 24rs
	✓	Samples must be warmed to room temperature 20 ±1°
≥3		How many dilutions must be prepared?
	✓	You can have a 100% dilution Nutrients & Seed
	✓	All samples must be seeded
<0.2		What is an acceptable residual in a laboratory blank?
✓		When analyzing CBOD, the GGA standard may be outside the ±30.5 mg/l criterion
	✓	The reported result must be the average of all dilutions