

Analytical Report: Page 1 of 8 Project Name: Stormwater Project Number: Stormwater

Work Order Number: C1A3323 Received on Ice (Y/N): Yes

Temp: 4 °C

Report Date: 24-Feb-2021

Attached is the analytical report for the sample(s) received for your project. Below is a list of the individual sample descriptions with the corresponding laboratory number(s). Also, enclosed is a copy of the Chain of Custody document (if received with your sample(s)). Please note any unused portion of the sample(s) may be responsibly discarded after 30 days from the above report date, unless you have requested otherwise.

Thank you for the opportunity to serve your analytical needs. If you have any questions or concerns regarding this report please contact our client service department.

### **Sample Identification**

Lab Sample #	Client Sample ID	<u>Matrix</u>	Date Sampled	By	Date Submitted	<u>By</u>
C1A3323-01	S-03-012921ROUTINE	Liquid	01/29/21 3:30	Garth Engelhorn	01/29/21 11:31	Garth Engelhorn
C1A3323-02	S-03-012921-DUPROUTINE -	Liquid	01/29/21 3:30	Garth Engelhorn	01/29/21 11:31	Garth Engelhorn
C1A3323-03	S-03-012921-FBROUTINE	Liquid	01/29/21 3:50	Garth Engelhorn	01/29/21 11:31	Garth Engelhorn
C1A3323-04	S-04-012921ROUTINE	Liquid	01/29/21 5:30	Garth Engelhorn	01/29/21 11:31	Garth Engelhorn

location 6100 Quail Valley Court Riverside, CA 92507-0704 P 951 653 3351 F 951 653 1662 www.babcocklabs.com



Client Name:	Wood Environment&Infrastructure Solutions, In	Analy
Contact:	John Rudolph	Pr
Address:	9210 Sky Park Court #200	Proj
	San Diego, CA 92123	

tical Report: Page 2 of 8 roject Name: Stormwater ject Number: Stormwater

Report Date: 24-Feb-2021

Work Order Number: C1A3323 Yes

Received on Ice (Y/N):

Temp: 4 °C

Laboratory Reference Number C1A3323-01								
S-03-012921		MatrixSampled Date/TimeLiquid01/29/21 03:30			Received Date/Time 01/29/21 11:31			
Analyte(s)	Result	RDL	MDL	Units	Method	Analysis Date	Analys	t Flag
Aggregate Organic Compounds Biochemical Oxygen Demand	ND	10	10	mg/L	SM 5210B	01/29/21 21:12	DFL	N-BOD1,
Chemical Oxygen Demand	37	10	7.4	mg/L	SM5220D	02/05/21 14:50	SLL	N-BOD2

location 6100 Quail Valley Court Riverside, CA 92507-0704 P 951 653 3351 F 951 653 1662 www.babcocklabs.com



Client Name:	Wood Environment&Infrastructure Solutions, In	An
Contact:	John Rudolph	
Address:	9210 Sky Park Court #200	I
	San Diego, CA 92123	

nalytical Report: Page 3 of 8 Project Name: Stormwater Project Number: Stormwater

Report Date: 24-Feb-2021

Work Order Number: C1A3323 Yes

Received on Ice (Y/N):

Temp: 4 °C

Laboratory Reference Number C1A3323-02								
S-03-012921-DUP		<u>Matrix</u> Liquid		<u>San</u> 0	npled Date/Time 1/29/21 03:30	Received Date/Time 01/29/21 11:31		
Analyte(s)	Result	RDL	MDL	Units	Method	Analysis Date	Analyst	t Flag
Aggregate Organic Compounds Biochemical Oxygen Demand	ND	10	10	mg/L	SM 5210B	01/29/21 21:16	DFL	N-BOD1,
Chemical Oxygen Demand	44	10	7.4	mg/L	SM5220D	02/05/21 14:50	SLL	IN-BODZ

location 6100 Quail Valley Court Riverside, CA 92507-0704 P 951 653 3351 F 951 653 1662 www.babcocklabs.com



Client Name:	Wood Environment&Infrastructure Solutions, In	/
Contact:	John Rudolph	
Address:	9210 Sky Park Court #200	
	San Diego, CA 92123	

Analytical Report: Page 4 of 8 Project Name: Stormwater Project Number: Stormwater

Report Date: 24-Feb-2021

Work Order Number: C1A3323 Yes

Received on Ice (Y/N):

Temp: 4 °C

Laboratory Reference Number C1A3323-03								
S-03-012921-FB		<u>Matrix</u> Liquid		Sampled Date/Time 01/29/21 03:50		Received Date/Time 01/29/21 11:31		
Analyte(s)	Result	RDL	MDL	Units	Method	Analysis Date	Analys	t Flag
Aggregate Organic Compounds Biochemical Oxygen Demand	ND	5.0	5.0	mg/L	SM 5210B	01/29/21 21:19	DFL	N-BOD1,
Chemical Oxygen Demand	ND	10	7.4	mg/L	SM5220D	02/05/21 14:50	SLL	N-BOD2

location 6100 Quail Valley Court Riverside, CA 92507-0704 P 951 653 3351 F 951 653 1662 www.babcocklabs.com



Client Name:	Wood Environment&Infrastructure Solutions, In	An
Contact:	John Rudolph	
Address:	9210 Sky Park Court #200	F
	San Diego, CA 92123	

alytical Report: Page 5 of 8 Project Name: Stormwater Project Number: Stormwater

Report Date: 24-Feb-2021

Work Order Number: C1A3323 Yes

Received on Ice (Y/N):

Temp: 4 °C

Laboratory Reference Number C1A3323-04								
S-04-012921		MatrixSampled Date/TimeLiquid01/29/21 05:30			Received Date/Time 01/29/21 11:31			
Analyte(s)	Result	RDL	MDL	Units	Method	Analysis Date	Analyst	t Flag
Aggregate Organic Compounds Biochemical Oxygen Demand	ND	10	10	mg/L	SM 5210B	01/29/21 21:24	DFL	N-BOD1,
Chemical Oxygen Demand	160	10	7.4	mg/L	SM5220D	02/05/21 14:50	SLL	N-BOD2

location 6100 Quail Valley Court Riverside, CA 92507-0704 P 951 653 3351 F 951 653 1662 www.babcocklabs.com



Client Name:	Wood Environment&Infrastructure Solutions, In	Analytical Report:	Page 6 of 8
Contact:	John Rudolph	Project Name:	Stormwater
Address:	9210 Sky Park Court #200	Project Number:	Stormwater
	San Diego, CA 92123		

Report Date: 24-Feb-2021

Work Order Number:	C1A3323		
Received on Ice (Y/N):	Yes	Temp: 4	°C

## Aggregate Organic Compounds - Batch Quality Control

					Calles	Courses					
Analyte(s)	Result	RDI		Units	Level	Result	%REC	%REC	RPD	Limit	Flag
,,				•••••							- 0
Batch 1A29072 - Analyzed as re	ceived										
Blank (1A29072-BLK1)				F	Prepared	& Analyze	d: 01/29/2	1			
Biochemical Oxygen Demand	ND	1.0	1.0	mg/L							
LCS (1A29072-BS1)				F	Prepared	& Analyze	d: 01/29/2	1			
Biochemical Oxygen Demand	236	50	50	mg/L	198		119	85-115			Q-BOD2
Duplicate (1A29072-DUP1)		Source:	C1A3311-0	1 F	Prepared	& Analyze	d: 01/29/2	1			
Biochemical Oxygen Demand	ND	20	20	mg/L		ND				20	
Batch 1B05054 - Acid Digest											
Blank (1B05054-BLK1)				F	Prepared	& Analyze	d: 02/05/2	1			
Chemical Oxygen Demand	ND	10	6.3	mg/L							
LCS (1B05054-BS1)				F	Prepared	& Analyze	d: 02/05/2	1			
Chemical Oxygen Demand	509	10	6.3	mg/L	500		102	95-105			
Matrix Spike (1B05054-MS1)		Source:	C1B0396-0	1 F	Prepared	& Analyze	d: 02/05/2	1			
Chemical Oxygen Demand	502	13	8.4	mg/L	333	157	104	80-120			
Matrix Spike Dup (1B05054-MSD1)		Source:	C1B0396-0	1 F	Prepared	& Analyze	d: 02/05/2	1			
Chemical Oxygen Demand	487	13	8.4	mg/L	333	157	99	80-120	3	20	

location 6100 Quail Valley Court Riverside, CA 92507-0704 P 951 653 3351 F 951 653 1662 www.babcocklabs.com



Analytical Report: Page 7 of 8 Project Name: Stormwater Project Number: Stormwater

Report Date: 24-Feb-2021

Work Order Number:C1A3323Received on Ice (Y/N):Yes

Temp: 4 °C

#### Notes and Definitions

- N-BOD1 Dilution water blank exceeds 0.20 mg/L. As per method, data is reportable as qualified.
- N-BOD2 The LCS is outside method acceptance limits. As per method, data is reportable as qualified.
- Q-BOD2 This LCS is outside method acceptance limits. As per method, data is reportable as qualified.
- ND: Analyte NOT DETECTED at or above the Method Detection Limit (if MDL is reported), otherwise at or above the Reportable Detection Limit (RDL)
- NR: Not Reported
- RDL: Reportable Detection Limit
- MDL: Method Detection Limit
- \* / (Non-NELAP): NELAP does not offer accreditation for this analyte/method/matrix combination

#### Approval

Enclosed are the analytical results for the submitted sample(s). Babcock Laboratories certify the data presented as part of this report meet the minimum quality standards in the referenced analytical methods. Any exceptions have been noted.

lesso Hardd

Alexis Nicole Harold For Cindy A. Waddell

cc:

e-Standard No Alias.rpt

This report applies only to the sample(s) analyzed. As a mutual protection to clients, the public, and Babcock Laboratories, Inc., this report is submitted and accepted for the exclusive use of the Client to whom it is addressed. Interpretation and use of the information contained within this report are the sole responsibility of the Client. Babcock Laboratories, Inc. is not responsible for any misinformation or consequences that may result from misinterpretation or improper use of this report. This report is not to be modified or abbreviated in any way. Additionally, this report is not to be used, in whole or in part, in any advertising or publicity matter without written authorization from Babcock Laboratories, Inc. The liability of Babcock Laboratories, Inc. is limited to the actual cost of the requested analyses, unless otherwise agreed upon in writing. There is no other warranty expressed or implied.

*mailing* P.O Box 432 Riverside, CA 92502-0432 *location* 6100 Quail Valley Court Riverside, CA 92507-0704 P 951 653 3351 F 951 653 1662 www.babcocklabs.com



Analytical Report: Page 8 of 8 Project Name: Stormwater Project Number: Stormwater

Report Date: 24-Feb-2021

Work Order Number: C1A3323 Yes

Received on Ice (Y/N):

Temp: 4 °C

#### Babcock Laboratories, Inc. (951)653-3351 FAX (951) 653-1662 www.babcocklabs.com

#### Chain of Custody Sample Information Record

Client: Wood PLC	V	Contact:	Garth Engelhor	n				Phone No. (760) 64	4-0167
FAX No.		Email: ga	rth.engelhorn@	)altae	nviron	.com			Additional Reporting Requests
Project Name: Lake Elsinore Project		Turn Aro	und Time:	Ro	outine	*3-5 Day Rush	*48 Hour Rush	*24 Hour Rush	FAX Results:    Yes    N Email Results    Yes    N State EDT:    Yes    N
Project Location: Salt Creek/San Jacinto/Canyon	Lake	Lab TAT	Approval:	By			74	dditional Charges May Apply	(Include Source Number in Notes)
Sampler Information		# of	Containers		Sample	Analysis	Paguastad	Matrix	Notes
Name: Garth Engellow Employer: NVS	'n		ate	Containers		0 "		DW = Drinking Water GW = Groundwater WW = Wastewater	
Signature:	- Time	Unpreserved H2SO4 HCI HNO3	Na2S203 NaOH NaOH/ZnAcet NH4CI MCAA	Total # of 0	Routine Resample Special	COD SM52201 BOD SM52101		S = Source SG = Studge L = Liquid M = Miscellaneous	
5-03-012921 1/29/6	1 0330	1 1		2	X	xx		L	
5-03-012921-Dun 1/29/2	0330	11		2	x	202		L	
5-02-012921-FB 1/29/1	0350	11		2	20	20 50		L	
5-04-012921 1/2012	0030	11		2	E	20 20		L	
Delle suide at De (size)			Data / Tima			Consilved Dr	(Sign)	Prin	t Name / Company
Carth E	inge/40	44/ <i>NV</i> 5	<i>01/29/21   </i>	:31-	Ð	A	the second secon	B. Aocor	1
									9
(For Lab Use Only) Sample Integrity Upon R	Receipt/A	cceptance	Oriteria 7	G.	#-(	00			<u> </u>
Sample(s) Submitted on Ice? Yes No Custody Seal(s) Intact? Yes No Sample(s) Intact? Yes No		Sample Me Permissio Deviation/ Signature/	ets Laboratory A n to continue: Notes:	ccept	ance Cr	iteria? (	Yes No Yes No	C1A3 Rc'd: 01/29/ JLH	<b>323</b> 2021 11:31
eniperature Cooler Bi	ant i	eignaturei		2 with				<u> </u>	Page ( r

mailing P.O Box 432 Riverside, CA 92502-0432 location 6100 Quail Valley Court Riverside, CA 92507-0704 P 951 653 3351 F 951 653 1662 www.babcocklabs.com



Analytical Report: Page 1 of 5 Project Name: Stormwater Project Number: Stormwater

Report Date: 24-Feb-2021

Work Order Number:C1A3462Received on Ice (Y/N):YesYesTe

Temp: 2 °C

Attached is the analytical report for the sample(s) received for your project. Below is a list of the individual sample descriptions with the corresponding laboratory number(s). Also, enclosed is a copy of the Chain of Custody document (if received with your sample(s)). Please note any unused portion of the sample(s) may be responsibly discarded after 30 days from the above report date, unless you have requested otherwise.

Thank you for the opportunity to serve your analytical needs. If you have any questions or concerns regarding this report please contact our client service department.

#### **Sample Identification**

Lab Sample #	Client Sample ID	Matrix	Date Sampled	By	Date Submitted	By
C1A3462-01	CLS-013021ROUTINE	Liquid	01/30/21 12:20	Garth Engelhorn	01/30/21 13:50	Jake D.

location 6100 Quail Valley Court Riverside, CA 92507-0704 P 951 653 3351 F 951 653 1662 www.babcocklabs.com



Anal
P
Pro

ytical Report: Page 2 of 5 Project Name: Stormwater oject Number: Stormwater

Report Date: 24-Feb-2021

Work Order Number: C1A3462 Yes

Received on Ice (Y/N):

Temp: 2 °C

	La	boratory R <b>C1A</b>	teference N 3462-01	umber					
Sample Description CLS-013021		<u>Ma</u> Liq	<u>trix</u> uid	<u>San</u> 0	npled Date/Time 1/30/21 12:20	Received Date/Time 01/30/21 13:50			
Analyte(s)	Result	RDL	MDL	Units	Method	Analysis Date	Analys	t Flag	
Aggregate Organic Compounds Biochemical Oxygen Demand	ND	5.0	5.0	mg/L	SM 5210B	01/30/21 17:30	DSS	N-BOD1,	
Chemical Oxygen Demand	37	10	7.4	mg/L	SM5220D	02/06/21 14:40	SLL	N-BOD2	

P 951 653 3351 F 951 653 1662 www.babcocklabs.com



Client Name:	Wood Environment&Infrastructure Solutions, In	Analytical Report:	Page 3 of 5
Contact:	John Rudolph	Project Name:	Stormwater
Address:	9210 Sky Park Court #200	Project Number:	Stormwater
	San Diego, CA 92123		

Report Date: 24-Feb-2021

Work Order Number:	C1A3462				
Received on Ice (Y/N):	Yes	Temp:	2	°C	

## Aggregate Organic Compounds - Batch Quality Control

Analyto(c)	Posult	וחס		Unite	Spike	Source	%REC	%REC	RPD	RPD Limit	Flag
Analyte(S)	Result	RDL		Units	LCVCI	rtcouit	/iiteo	Linito	RID	Linin	Tidg
Batch 1A30021 - Analyzed as re	eceived										
Blank (1A30021-BLK1)					Prepared	& Analyze	ed: 01/30/2	1			
Biochemical Oxygen Demand	ND	1.0	1.0	mg/L							
LCS (1A30021-BS1)					Prepared	& Analyze	ed: 01/30/2	1			
Biochemical Oxygen Demand	251	50	50	mg/L	198		127	85-115			Q-BOD2
Duplicate (1A30021-DUP1)		Source:	C1A3408-0	05	Prepared	& Analyze	ed: 01/30/2	1			
Biochemical Oxygen Demand	13.9	5.0	5.0	mg/L		14.0			0.9	20	
Batch 1B06017 - Acid Digest											
Blank (1B06017-BLK1)					Prepared	& Analyze	d: 02/06/2	1			
Chemical Oxygen Demand	ND	10	7.4	mg/L							
LCS (1B06017-BS1)					Prepared	& Analyze	ed: 02/06/2	1			
Chemical Oxygen Demand	507	10	7.4	mg/L	500		101	95-105			
Matrix Spike (1B06017-MS1)		Source:	C1B0194-0	02	Prepared	& Analyze	d: 02/06/2	1			
Chemical Oxygen Demand	377	13	9.9	mg/L	333	36.9	102	80-120			
Matrix Spike Dup (1B06017-MSD1)		Source:	C1B0194-0	02	Prepared	& Analyze	ed: 02/06/2	1			
Chemical Oxygen Demand	368	13	9.9	mg/L	333	36.9	99	80-120	2	20	

location 6100 Quail Valley Court Riverside, CA 92507-0704 P 951 653 3351 F 951 653 1662 www.babcocklabs.com



Analytical Report: Page 4 of 5 Project Name: Stormwater Project Number: Stormwater

Report Date: 24-Feb-2021

Work Order Number:C1A3462Received on Ice (Y/N):Yes

Temp: 2 °C

#### Notes and Definitions

- N-BOD1 Dilution water blank exceeds 0.20 mg/L. As per method, data is reportable as qualified.
- N-BOD2 The LCS is outside method acceptance limits. As per method, data is reportable as qualified.
- Q-BOD2 This LCS is outside method acceptance limits. As per method, data is reportable as qualified.
- ND: Analyte NOT DETECTED at or above the Method Detection Limit (if MDL is reported), otherwise at or above the Reportable Detection Limit (RDL)
- NR: Not Reported
- RDL: Reportable Detection Limit
- MDL: Method Detection Limit
- \* / (Non-NELAP): NELAP does not offer accreditation for this analyte/method/matrix combination

#### Approval

Enclosed are the analytical results for the submitted sample(s). Babcock Laboratories certify the data presented as part of this report meet the minimum quality standards in the referenced analytical methods. Any exceptions have been noted.

lesso Hardd

Alexis Nicole Harold For Cindy A. Waddell

cc:

e-Standard No Alias.rpt

This report applies only to the sample(s) analyzed. As a mutual protection to clients, the public, and Babcock Laboratories, Inc., this report is submitted and accepted for the exclusive use of the Client to whom it is addressed. Interpretation and use of the information contained within this report are the sole responsibility of the Client. Babcock Laboratories, Inc. is not responsible for any misinformation or consequences that may result from misinterpretation or improper use of this report. This report is not to be modified or abbreviated in any way. Additionally, this report is not to be used, in whole or in part, in any advertising or publicity matter without written authorization from Babcock Laboratories, Inc. The liability of Babcock Laboratories, Inc. is limited to the actual cost of the requested analyses, unless otherwise agreed upon in writing. There is no other warranty expressed or implied.

*mailing* P.O Box 432 Riverside, CA 92502-0432 location 6100 Quail Valley Court Riverside, CA 92507-0704 P 951 653 3351 F 951 653 1662 www.babcocklabs.com



Analytical Report: Page 5 of 5 Project Name: Stormwater Project Number: Stormwater

Work Order Number: C1A3462 Yes

Received on Ice (Y/N):

Temp: 2 °C

Babcock Laboratories, Inc. (951)653-3351 FAX (951) 653-1662 www.babcocklabs.com

Report Date: 24-Feb-2021

**Chain of Custody Sample Information Record** 

Client: Wood PLC				Co	ntac	ct: (	Garl	h E	ing	elho	orn											Phone No. (760) 64	4-0167	
FAX No.				Em	ail:	gai	rth.e	eng	elh	orn	@a	altae	env	/iro	n.c	on	n						Additional Reporting Reques	ts No
Project Name: Lake Elsinore Pr	roject			Tui	m A	rou	Ind	Tim	ie:			R	outi	ine		*3.	-5 Da Rus	ay h	*4	8 Ha Ru	our sh	*24 Hour Rush	FAX Results: □ Yes Email Results: □ Yes State EDT: □ Yes	
Project Location: Salt Creek/San	Jacinto/C	Canyon	Lake	*La	b TA	AT A	ppr	oval				By:									*A	dditional Charges May Apply	(Include Source Number in Not	es)
Sampler Inform	nation				#	of Pr	Con	tain	ers				Sa	ampl	le	۸.	aalw	eie	Pog	iaet	od	Matrix	Notas	
Name: 6914	Engi	elhs	(n									ntainers						313			<u>Bu</u>	DW = Drinking Water GW = Groundwater	10103	
Employer: NOS			-	rved				Acetate				of Cor	0	ple	0000	5220U						WW = Wastewater S = Source		
Signature:			-	rese	5	03	E SZO	H/Zn	0	A		al #	utin	sam	ecial	MIS O						SG = Sludge L = Liquid		
Sample ID		Date	Time	Unp	HCI	UNH	Nac	NaO	NHA	MC		Tot	Ro	Re	Sp							M = Miscellaneous		
CLS-013021		1/30/21	12:20	1	1							2			)	x x	(					L		
		<i>p p</i>																						
		1	1					Π			Π				T	1	1							
				$\square$			1	Ħ		1			Π		1	1							· · · · · · · · · · · · · · · · · · ·	
					-					1	ĩ				t			1	-		+			
					-		1			-								1	-		-			
					-		÷						$\vdash$		+			-	-		+			
······································					-			$\vdash$		-				-	+	1		-		-	-	· · · · · · · · · · · · · · · · · · ·		_
					-	$\vdash$	-		-										-		-	· · · · · · · · · · · · · · · · · · ·		
				$\square$	-		_		_	_					-	-			-		-	I		
Relinquis/ied By (sign)	, Pr	int Nam	ne / Con	npan	у			Da	te /	Tim	ie			_	Re	cei	ved	By	(Sig	n)		Prin	t Name / Company	
- jul Mi	Vake	DAX	e fun	405			1/3	0/1	21	13	:5	0	(	Ľ	n	qi	et	5	Bl	N		Angie B.	WWN/EBB	
						-					7	_												
(For Lab Use Only) Sample	Integrity	Upon R	eceipt//	Acce	otan	ce (	Crite	ria	10															
Sample(s) Submitted on Ice?	Yes	No		San	iple	Mee	ets l	abo	orat	tory	Ace	cept	and	e C	rite	eria	?	6	les	i	Vo			_
Custody Seal(s) Intact?	Yes	No	NIA	Peri	miss	sion	to o	ont	inu	e:								1	es	1	Vo		462 <b>U</b> M	
Sample(s) Intact?	Yes	No		Dev	iatic	n/N	otes										de r						(0001 12:50	35
Temperature:	<u>°C</u>	Cooler Bla	ank	Sigr	natu	re/D	ate															EVS		į,

mailing P.O Box 432 Riverside, CA 92502-0432 location 6100 Quail Valley Court Riverside, CA 92507-0704 P 951 653 3351 F 951 653 1662 www.babcocklabs.com



Analytical Report: Page 1 of 17 Project Name: Stormwater Project Number: Lake Elsinore Project

Yes

Report Date: 02-Mar-2021

Work Order Number: C1B0159

Received on Ice (Y/N):

Temp: 3 °C

Attached is the analytical report for the sample(s) received for your project. Below is a list of the individual sample descriptions with the corresponding laboratory number(s). Also, enclosed is a copy of the Chain of Custody document (if received with your sample(s)). Please note any unused portion of the sample(s) may be responsibly discarded after 30 days from the above report date, unless you have requested otherwise.

Thank you for the opportunity to serve your analytical needs. If you have any questions or concerns regarding this report please contact our client service department.

#### **Sample Identification**

Lab Sample #	Client Sample ID	Matrix	Date Sampled	By	Date Submitted	<u>By</u>
C1B0159-01	S-03-013121	Liquid	01/31/21 16:50	Austin Kay	02/01/21 13:25	Jake D.
C1B0159-02	S-03-013121-DUP	Liquid	01/31/21 16:50	Austin Kay	02/01/21 13:25	Jake D.
C1B0159-03	S-03-020121-FB	Liquid	02/1/21 10:35	Austin Kay	02/01/21 13:25	Jake D.
C1B0159-04	S-04-013121	Liquid	01/31/21 15:49	Austin Kay	02/01/21 13:25	Jake D.
C1B0159-05	CLS-020121	Liquid	02/1/21 10:27	Austin Kay	02/01/21 13:25	Jake D.

location 6100 Quail Valley Court Riverside, CA 92507-0704 P 951 653 3351 F 951 653 1662 www.babcocklabs.com



Analytical Report: Page 2 of 17 Project Name: Stormwater Project Number: Lake Elsinore Project

Report Date: 02-Mar-2021

Work Order Number: C1B0159

Received on Ice (Y/N): Yes

Temp: 3 °C

#### Laboratory Reference Number

## C1B0159-01

S-03-013121	<u>Ma</u> Liq	<u>itrix</u> uid	<u>San</u> 0	Received Date/Time 02/01/21 13:25				
Analyte(s)	Result	RDL	MDL	Units	Method	Analysis Date	Analyst	Flag
Cations								
Total Hardness	170	3.0	3.0	mg/L	SM 2340B/EPA 200.7	02/09/21 19:23	AZP	
Calcium	43	1.0	0.40	mg/L	EPA 200.7	02/09/21 19:23	AZP	
Magnesium	15	1.0	0.40	mg/L	EPA 200.7	02/09/21 19:23	AZP	
Anions								
Nitrate as N	0.57	0.20	0.16	mg/L	EPA 300.0	02/01/21 23:27	KJN	
Nitrite as N	ND	0.1	0.09	mg/L	EPA 300.0	02/01/21 23:27	KJN	
Solids								
Total Dissolved Solids	440	10	10	mg/L	SM 2540C	02/03/21 09:22	YVD	
Total Suspended Solids	65	0.5	0.5	mg/L	SM 2540D	02/04/21 08:47	KJN	
Aggregate Organic Compounds								
Biochemical Oxygen Demand	ND	10	10	mg/L	SM 5210B	02/01/21 20:52	KL	
Chemical Oxygen Demand	51	10	7.4	mg/L	SM5220D	02/08/21 13:30	SLL	
Nutrients								
Ammonia-Nitrogen	0.2	0.1	0.04	mg/L	SM4500NH3H G	02/05/21 13:17	SLL	
Kjeldahl Nitrogen	1.8	0.1	0.09	mg/L	EPA 351.2	02/06/21 11:50	SLL	
Organic Nitrogen	1.6	0.10		mg/L	Calculation			
Total Nitrogen	2.4	0.40		mg/L	Calculation			
Ortho Phosphate Phosphorus	0.21	0.050	0.030	mg/L	EPA 300.0	02/01/21 23:27	KJN	
Total Phosphorus	0.53	0.05	0.02	mg/L	SM 4500P B E	02/08/21 18:30	DSS	

location 6100 Quail Valley Court Riverside, CA 92507-0704 P 951 653 3351 F 951 653 1662 www.babcocklabs.com



Report Date: 02-Mar-2021

Analytical Report: Page 3 of 17 Project Name: Stormwater Project Number: Lake Elsinore Project

Yes

Work Order Number: C1B0159

Work Order Numl Received on Ice (Y/N):

Temp: 3 °C

#### Laboratory Reference Number

### C1B0159-02

S-03-013121-DUP	<u>Ma</u> Liq	<u>itrix</u> juid	<u>San</u> 0	Receiv 02/01	Received Date/Time 02/01/21 13:25			
Analyte(s)	Result	RDL	MDL	Units	Method	Analysis Date	Analyst	Flag
Cations								
Total Hardness	170	3.0	3.0	mg/L	SM 2340B/EPA 200.7	02/09/21 19:29	AZP	
Calcium	41	1.0	0.40	mg/L	EPA 200.7	02/09/21 19:29	AZP	
Magnesium	15	1.0	0.40	mg/L	EPA 200.7	02/09/21 19:29	AZP	
Anions								
Nitrate as N	0.57	0.20	0.16	mg/L	EPA 300.0	02/01/21 23:39	KJN	
Nitrite as N	ND	0.1	0.09	mg/L	EPA 300.0	02/01/21 23:39	KJN	
Solids								
Total Dissolved Solids	440	10	10	mg/L	SM 2540C	02/03/21 09:22	YVD	
Total Suspended Solids	67	0.5	0.5	mg/L	SM 2540D	02/04/21 08:47	KJN	
Aggregate Organic Compounds								
Biochemical Oxygen Demand	ND	10	10	mg/L	SM 5210B	02/01/21 20:57	KL	
Chemical Oxygen Demand	51	10	7.4	mg/L	SM5220D	02/08/21 13:30	SLL	
Nutrients								
Ammonia-Nitrogen	0.2	0.1	0.04	mg/L	SM4500NH3H G	02/05/21 13:19	SLL	
Kjeldahl Nitrogen	2.1	0.1	0.09	mg/L	EPA 351.2	02/06/21 11:51	SLL	
Organic Nitrogen	1.9	0.10		mg/L	Calculation			
Total Nitrogen	2.6	0.40		mg/L	Calculation			
Ortho Phosphate Phosphorus	0.21	0.050	0.030	mg/L	EPA 300.0	02/01/21 23:39	KJN	
Total Phosphorus	0.46	0.05	0.02	mg/L	SM 4500P B E	02/04/21 19:25	DSS	

location 6100 Quail Valley Court Riverside, CA 92507-0704 P 951 653 3351 F 951 653 1662 www.babcocklabs.com



Analytical Report: Page 4 of 17 Project Name: Stormwater Project Number: Lake Elsinore Project

Yes

Report Date: 02-Mar-2021

Work Order Number: C1B0159

Received on Ice (Y/N):

Temp: 3 °C

#### Laboratory Reference Number

## C1B0159-03

S-03-020121-FB	<u>Ma</u> Liq	<u>ıtrix</u> juid	<u>San</u> 0	npled Date/Time 2/01/21 10:35	<u>Receiv</u> 02/01	Received Date/Time 02/01/21 13:25			
Analyte(s)	Result	RDL	MDL	Units	Method	Analysis Date	Analyst	Flag	
Cations									
Total Hardness	ND	3.0	3.0	mg/L	SM 2340B/EPA 200.7	02/09/21 19:31	AZP		
Calcium	ND	1.0	0.40	mg/L	EPA 200.7	02/09/21 19:31	AZP		
Magnesium	ND	1.0	0.40	mg/L	EPA 200.7	02/09/21 19:31	AZP		
Anions									
Nitrate as N	ND	0.20	0.16	mg/L	EPA 300.0	02/01/21 23:51	KJN		
Nitrite as N	ND	0.1	0.09	mg/L	EPA 300.0	02/01/21 23:51	KJN		
Solids									
Total Dissolved Solids	ND	10	10	mg/L	SM 2540C	02/04/21 14:09	AMB		
Total Suspended Solids	ND	2	2	mg/L	SM 2540D	02/04/21 11:52	KJN		
Aggregate Organic Compounds									
Biochemical Oxygen Demand	ND	5.0	5.0	mg/L	SM 5210B	02/01/21 21:00	KL		
Chemical Oxygen Demand	ND	10	7.4	mg/L	SM5220D	02/08/21 13:30	SLL		
Nutrients									
Ammonia-Nitrogen	ND	0.1	0.04	mg/L	SM4500NH3H G	02/05/21 13:20	SLL		
Kjeldahl Nitrogen	ND	0.1	0.09	mg/L	EPA 351.2	02/06/21 11:53	SLL		
Organic Nitrogen	ND	0.10		mg/L	Calculation				
Total Nitrogen	ND	0.40		mg/L	Calculation				
Ortho Phosphate Phosphorus	ND	0.050	0.030	mg/L	EPA 300.0	02/01/21 23:51	KJN		
Total Phosphorus	ND	0.05	0.02	mg/L	SM 4500P B E	02/04/21 19:25	DSS		

location 6100 Quail Valley Court Riverside, CA 92507-0704 P 951 653 3351 F 951 653 1662 www.babcocklabs.com



Analytical Report: Page 5 of 17 Project Name: Stormwater Project Number: Lake Elsinore Project

Report Date: 02-Mar-2021

Work Order Number: C1B0159

Received on Ice (Y/N): Yes

Temp: 3 °C

#### Laboratory Reference Number

### C1B0159-04

Sample Description S-04-013121	<u>Ma</u> Liq	<u>itrix</u> uid	<u>San</u> 0	npled Date/Time 1/31/21 15:49	Received Date/Time 02/01/21 13:25				
Analyte(s)	Result	RDL	MDL	Units	Method	Analysis Date	Analyst	Flag	
Cations									
Total Hardness	85	3.0	3.0	mg/L	SM 2340B/EPA 200 7	02/11/21 13:13	AZP		
Calcium	22	1.0	0.40	mg/L	EPA 200.7	02/11/21 13:13	AZP		
Magnesium	7.0	1.0	0.40	mg/L	EPA 200.7	02/11/21 13:13	AZP		
Anions									
Nitrate as N	0.60	0.20	0.16	mg/L	EPA 300.0	02/02/21 00:04	KJN		
Nitrite as N	ND	0.1	0.09	mg/L	EPA 300.0	02/02/21 00:04	KJN		
Solids									
Total Dissolved Solids	120	10	10	mg/L	SM 2540C	02/04/21 14:09	AMB		
Total Suspended Solids	170	0.5	0.5	mg/L	SM 2540D	02/04/21 08:47	KJN		
Aggregate Organic Compounds									
Biochemical Oxygen Demand	ND	10	10	mg/L	SM 5210B	02/01/21 21:06	KL		
Chemical Oxygen Demand	53	10	7.4	mg/L	SM5220D	02/06/21 14:40	SLL		
Nutrients									
Ammonia-Nitrogen	0.08	0.1	0.04	mg/L	SM4500NH3H G	02/05/21 13:26	SLL J	J	
Kjeldahl Nitrogen	1.4	0.1	0.09	mg/L	EPA 351.2	02/06/21 11:54	SLL		
Organic Nitrogen	1.3	0.10		mg/L	Calculation				
Total Nitrogen	2.0	0.40		mg/L	Calculation				
Ortho Phosphate Phosphorus	0.17	0.050	0.030	mg/L	EPA 300.0	02/02/21 00:04	KJN		
Total Phosphorus	0.56	0.05	0.02	ma/L	SM 4500P B E	02/04/21 19:25	DSS		

location 6100 Quail Valley Court Riverside, CA 92507-0704 P 951 653 3351 F 951 653 1662 www.babcocklabs.com



Analytical Report: Page 6 of 17 Project Name: Stormwater Project Number: Lake Elsinore Project

Yes

Report Date: 02-Mar-2021

Work Order Number: C1B0159

Received on Ice (Y/N):

Temp: 3 °C

#### Laboratory Reference Number

## C1B0159-05

Sample Description CLS-020121		<u>Ma</u> Lio	a <u>trix</u> juid	<u>San</u> 0	npled Date/Time 2/01/21 10:27	Received Date/Time 02/01/21 13:25			
Analyte(s)	Result	RDL	MDL	Units	Method	Analysis Date	Analyst	Flag	
Cations									
Total Hardness	230	3.0	3.0	mg/L	SM 2340B/EPA 200.7	02/09/21 19:35	AZP		
Calcium	62	1.0	0.40	mg/L	EPA 200.7	02/09/21 19:35	AZP		
Magnesium	18	1.0	0.40	mg/L	EPA 200.7	02/09/21 19:35	AZP		
Anions									
Nitrate as N	0.41	0.20	0.16	mg/L	EPA 300.0	02/02/21 00:16	KJN		
Nitrite as N	ND	0.1	0.09	mg/L	EPA 300.0	02/02/21 00:16	KJN		
Solids									
Total Dissolved Solids	430	10	10	mg/L	SM 2540C	02/04/21 14:09	AMB		
Total Suspended Solids	2	2	2	mg/L	SM 2540D	02/04/21 11:52	KJN		
Aggregate Organic Compounds									
Biochemical Oxygen Demand	ND	5.0	5.0	mg/L	SM 5210B	02/01/21 21:09	KL		
Chemical Oxygen Demand	21	10	7.4	mg/L	SM5220D	02/06/21 14:40	SLL		
Nutrients									
Ammonia-Nitrogen	0.5	0.1	0.04	mg/L	SM4500NH3H G	02/05/21 13:28	SLL		
Kjeldahl Nitrogen	1.7	0.1	0.09	mg/L	EPA 351.2	02/06/21 11:58	SLL		
Organic Nitrogen	1.2	0.10		mg/L	Calculation				
Total Nitrogen	2.1	0.40		mg/L	Calculation				
Ortho Phosphate Phosphorus	ND	0.050	0.030	mg/L	EPA 300.0	02/02/21 00:16	KJN		
Total Phosphorus	0.07	0.05	0.02	mg/L	SM 4500P B E	02/04/21 19:25	DSS		

location 6100 Quail Valley Court Riverside, CA 92507-0704 P 951 653 3351 F 951 653 1662 www.babcocklabs.com



Analytical Report: Page 7 of 17 Project Name: Stormwater Project Number: Lake Elsinore Project

Report Date: 02-Mar-2021

Work Order Number: C1B0159

	Received on Ice (Y/N):	Yes	Temp:	3	°C
--	------------------------	-----	-------	---	----

#### **Cations - Batch Quality Control**

					Spike	Source		%REC		RPD	
Analyte(s)	Result	RDL		Units	Level	Result	%REC	Limits	RPD	Limit	Flag
Batch 1B05066 - EPA 200.2											
Blank (1B05066-BLK1)				F	Prepared:	02/05/21	Analyzed	: 02/09/21			
Calcium	ND	1.0	0.20	mg/L							
Magnesium	ND	1.0	0.20	mg/L							
LCS (1B05066-BS1)				F	Prepared:	02/05/21	Analyzed	: 02/09/21			
Calcium	17.4	1.0	0.20	mg/L	17.0		102	85-115			
Magnesium	16.4	1.0	0.20	mg/L	17.0		96	85-115			
Matrix Spike (1B05066-MS1)		Source:	C1B0082-0	<b>2</b> F	Prepared:	02/05/21	Analyzed	: 02/09/21			
Calcium	23.8	1.0	0.40	mg/L	17.0	3.15	121	70-130			
Magnesium	17.1	1.0	0.40	mg/L	17.0	ND	101	70-130			
Matrix Spike Dup (1B05066-MSD1)		Source:	C1B0082-0	<b>2</b> F	Prepared:	02/05/21	Analyzed	: 02/09/21			
Calcium	23.8	1.0	0.40	mg/L	17.0	3.15	121	70-130	0.1	20	
Magnesium	17.2	1.0	0.40	mg/L	17.0	ND	101	70-130	0.8	20	
Batch 1B10111 - EPA 200.2											
Blank (1B10111-BLK1)				F	Prepared:	02/05/21	Analyzed	: 02/11/21			
Calcium	ND	1.0	0.20	mg/L							
Magnesium	ND	1.0	0.20	mg/L							
LCS (1B10111-BS1)				F	Prepared:	02/05/21	Analyzed	: 02/11/21			
Calcium	18.4	1.0	0.20	mg/L	17.0		109	85-115			
Magnesium	18.1	1.0	0.20	mg/L	17.0		106	85-115			

location 6100 Quail Valley Court Riverside, CA 92507-0704 P 951 653 3351 F 951 653 1662 www.babcocklabs.com



Analytical Report: Page 8 of 17 Project Name: Stormwater Project Number: Lake Elsinore Project

Report Date: 02-Mar-2021

Work	Order	Number:	C1B0159
------	-------	---------	---------

Received on Ice (Y/N):	Yes	Temp: 3
------------------------	-----	---------

°C

#### **Anions - Batch Quality Control**

Analyte(s)	Result	RDL		Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Flag
Batch 1B01137 - Analyzed as Re	ceived IC										
Blank (1B01137-BLK1)				P	repared	& Analyze	d: 02/01/2	1			
Nitrite as N	ND	0.1	0.09	mg/L							
Nitrate as N	ND	0.20	0.16	mg/L							
LCS (1B01137-BS1)				F	repared	& Analyze	d: 02/01/2 <sup>-</sup>	1			
Nitrite as N	2.48	0.1	0.09	mg/L	2.50		99	90-110			
Nitrate as N	5.43	0.20	0.16	mg/L	5.65		96	90-110			
Matrix Spike (1B01137-MS1)		Source:	C1B0032-02	2 P	repared	& Analyze	d: 02/01/2 <sup>-</sup>	1			
Nitrite as N	2.39	0.1	0.09	mg/L	2.50	ND	96	80-120			
Nitrate as N	6.60	0.20	0.16	mg/L	5.65	0.781	103	75-131			
Matrix Spike (1B01137-MS2)		Source:	C1B0042-01	I P	repared	& Analyze	d: 02/01/2 <sup>-</sup>	1			
Nitrite as N	2.55	0.1	0.09	mg/L	2.50	ND	102	80-120			
Nitrate as N	5.75	0.20	0.16	mg/L	5.65	0.191	98	75-131			
Matrix Spike Dup (1B01137-MSD1)		Source:	C1B0032-02	2 P	repared	& Analyze	d: 02/01/2 <sup>-</sup>	1			
Nitrite as N	2.42	0.1	0.09	mg/L	2.50	ND	97	80-120	1	20	
Nitrate as N	6.68	0.20	0.16	mg/L	5.65	0.781	104	75-131	1	20	

location 6100 Quail Valley Court Riverside, CA 92507-0704 P 951 653 3351 F 951 653 1662 www.babcocklabs.com



Analytical Report: Page 9 of 17 Project Name: Stormwater Project Number: Lake Elsinore Project

Report Date: 02-Mar-2021

Work Order Number: C1B0159

Received on Ice (Y/N): Yes Temp: 3 °C

#### **Solids - Batch Quality Control**

					Spike	Source		%REC		RPD	
Analyte(s)	Result	RDL		Units	Level	Result	%REC	Limits	RPD	Limit	Flag
Batch 1B03073 - Analyzed as	s received										
Blank (1B03073-BLK1)					Prepared	& Analyze	d: 02/03/2 <sup>2</sup>	1			
Total Dissolved Solids	ND	10	10	mg/L	_						
Duplicate (1B03073-DUP1)		Source:	C1A3408-07	7	Prepared	& Analyze	d: 02/03/2 <sup>,</sup>	1			
Total Dissolved Solids	126	10	10	mg/L	-	124			2	20	
Duplicate (1B03073-DUP2)		Source:	C1B0159-02	2	Prepared	& Analyze	d: 02/03/2 <sup>-</sup>	1			
Total Dissolved Solids	443	10	10	mg/L	_	441			0.5	20	
Batch 1B04069 - Analyzed as	s received										
Blank (1B04069-BLK1)					Prepared	& Analyze	d: 02/04/2 <sup>-</sup>	1			
Total Dissolved Solids	ND	10	10	mg/L	_						
Duplicate (1B04069-DUP1)		Source:	C1B0084-03	3	Prepared	& Analyze	d: 02/04/2 <sup>-</sup>	1			
Total Dissolved Solids	398	10	10	mg/L	_	418			5	20	
Duplicate (1B04069-DUP2)		Source:	C1B0104-0 <sup>4</sup>	1	Prepared	& Analyze	d: 02/04/2 <sup>-</sup>	1			
Total Dissolved Solids	619	10	10	mg/L	_	586			5	20	
Batch 1B04073 - Analyzed as	s received										
Blank (1B04073-BLK1)					Prepared	& Analyze	d: 02/04/2 <sup>.</sup>	1			
Total Suspended Solids	ND	0.5	0.5	mg/L	_						
Duplicate (1B04073-DUP1)		Source:	C1B0014-0 <sup>-</sup>	1	Prepared	& Analyze	d: 02/04/2 <sup>-</sup>	1			
Total Suspended Solids	164	0.5	0.5	mg/L	_	160			2	25	

*location* 6100 Quail Valley Court Riverside, CA 92507-0704 P 951 653 3351 F 951 653 1662 www.babcocklabs.com



Analytical Report: Page 10 of 17 Project Name: Stormwater Project Number: Lake Elsinore Project

Report Date: 02-Mar-2021

Work (	Order	Number:	C1B0159
--------	-------	---------	---------

Received on Ice (Y/N): Yes Temp: 3 °C

#### **Solids - Batch Quality Control**

Analyte(s)	Result	RDL		Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Flag
Batch 1B04073 - Analyzed as	received										
Duplicate (1B04073-DUP2)		Source:	C1B0036-	01	Prepared	& Analyze	d: 02/04/2	1			
Total Suspended Solids	228	0.5	0.5	mg/L		228			0	25	
Batch 1B04074 - Analyzed as	received										
Blank (1B04074-BLK1)					Prepared	& Analyze	d: 02/04/2	1			
Total Suspended Solids	ND	0.5	0.5	mg/L							
Duplicate (1B04074-DUP1)		Source:	C1B0049-	02	Prepared	& Analyze	d: 02/04/2	1			
Total Suspended Solids	420	20	20	mg/L		412			2	25	
Duplicate (1B04074-DUP2)		Source:	C1B0166-	01	Prepared	& Analyze	d: 02/04/2	1			
Total Suspended Solids	ND	5	5	mg/L		ND				25	

location 6100 Quail Valley Court Riverside, CA 92507-0704 P 951 653 3351 F 951 653 1662 www.babcocklabs.com



Analytical Report: Page 11 of 17 Project Name: Stormwater Project Number: Lake Elsinore Project

Report Date: 02-Mar-2021

Work	Order	Number:	C1B0159
------	-------	---------	---------

Received on Ice (Y/N): Yes Temp: 3 °C

#### Aggregate Organic Compounds - Batch Quality Control

					Spike	Source		%REC		RPD	
Analyte(s)	Result	RDL		Units	Level	Result	%REC	Limits	RPD	Limit	Flag
Batch 1B01147 - Analyzed as rec	ceived										
Blank (1B01147-BLK1)				F	Prepared	& Analyze	ed: 02/01/2	1			
Biochemical Oxygen Demand	ND	1.0	1.0	mg/L							
LCS (1B01147-BS1)				F	Prepared	& Analyze	ed: 02/01/2	1			
Biochemical Oxygen Demand	218	50	50	mg/L	198		110	85-115			
Duplicate (1B01147-DUP1)		Source:	C1B0159-0	1 F	Prepared	& Analyze	ed: 02/01/2	1			
Biochemical Oxygen Demand	ND	10	10	mg/L		ND				20	
Batch 1B06017 - Acid Digest											
Blank (1B06017-BLK1)				F	Prepared	& Analyze	ed: 02/06/2	1			
Chemical Oxygen Demand	ND	10	7.4	mg/L							
LCS (1B06017-BS1)				F	Prepared	& Analyze	ed: 02/06/2	1			
Chemical Oxygen Demand	507	10	7.4	mg/L	500		101	95-105			
Matrix Spike (1B06017-MS1)		Source:	C1B0194-0	2	Prepared	& Analyze	ed: 02/06/2	1			
Chemical Oxygen Demand	377	13	9.9	mg/L	333	36.9	102	80-120			
Matrix Spike Dup (1B06017-MSD1)		Source:	C1B0194-0	<b>2</b> [	Prepared	& Analyze	ed: 02/06/2	1			
Chemical Oxygen Demand	368	13	9.9	mg/L	333	36.9	99	80-120	2	20	
Batch 1B08111 - Acid Digest											
Blank (1B08111-BLK1)				F	Prepared	& Analyze	ed: 02/08/2	1			
Chemical Oxygen Demand	ND	10	7.4	mg/L							

location 6100 Quail Valley Court Riverside, CA 92507-0704 P 951 653 3351 F 951 653 1662 www.babcocklabs.com



Analytical Report: Page 12 of 17 Project Name: Stormwater Project Number: Lake Elsinore Project

Report Date: 02-Mar-2021

Work (	Order	Number:	C1B0159
--------	-------	---------	---------

Received on Ice (Y/N):	Yes	Temp:	3	°C
------------------------	-----	-------	---	----

#### Aggregate Organic Compounds - Batch Quality Control

					Spike	Source		%REC		RPD	
Analyte(s)	Result	RDL	ι	Jnits	Level	Result	%REC	Limits	RPD	Limit	Flag
Batch 1B08111 - Acid Digest											
LCS (1B08111-BS1)				F	repared	& Analyze	d: 02/08/2	1			
Chemical Oxygen Demand	500	10	7.4	mg/L	500		100	95-105			
Matrix Spike (1B08111-MS1)		Source:	C1B0159-03	F	repared	& Analyze	d: 02/08/2	1			
Chemical Oxygen Demand	325	13	9.9	mg/L	333	ND	97	80-120			
Matrix Spike Dup (1B08111-MSD1)		Source:	C1B0159-03	F	repared	& Analyze	d: 02/08/2	1			
Chemical Oxygen Demand	328	13	9.9	mg/L	333	ND	98	80-120	0.9	20	

location 6100 Quail Valley Court Riverside, CA 92507-0704 P 951 653 3351 F 951 653 1662 www.babcocklabs.com



Analytical Report: Page 13 of 17 Project Name: Stormwater Project Number: Lake Elsinore Project

Report Date: 02-Mar-2021

Received on Ice (Y/N): Yes Temp: 3 °C

### **Nutrients - Batch Quality Control**

					Spike	Source		%REC		RPD	
Analyte(s)	Result	RDL		Units	Level	Result	%REC	Limits	RPD	Limit	Flag
Batch 1B01137 - Analyzed as I	Received IC										
Blank (1B01137-BLK1)				I	Prepared	& Analyze	d: 02/01/2	1			
Ortho Phosphate Phosphorus	ND	0.050	0.030	mg/L							
LCS (1B01137-BS1)				I	Prepared	& Analyze	d: 02/01/2	1			
Ortho Phosphate Phosphorus	1.13	0.050	0.030	mg/L	1.25		91	90-110			
Matrix Spike (1B01137-MS1)		Source	: C1B0032-0	<b>2</b>	Prepared	& Analyze	d: 02/01/2	1			
Ortho Phosphate Phosphorus	3.03	0.050	0.030	mg/L	1.25	1.54	119	80-120			
Matrix Spike (1B01137-MS2)		Source	: C1B0042-0	1	Prepared	& Analyze	d: 02/01/2	1			
Ortho Phosphate Phosphorus	1.39	0.050	0.030	mg/L	1.25	0.219	94	80-120			
Matrix Spike Dup (1B01137-MSD1)	)	Source	: C1B0032-0	<b>2</b>	Prepared	& Analyze	d: 02/01/2	1			
Ortho Phosphate Phosphorus	3.05	0.050	0.030	mg/L	1.25	1.54	121	80-120	0.5	20	QMS(D)
Batch 1B04123 - Acid Digest											
LCS (1B04123-BS1)				I	Prepared	& Analyze	d: 02/04/2	1			
Total Phosphorus	0.548	0.05	0.02	mg/L	0.500		110	85-115			
Matrix Spike (1B04123-MS1)		Source	: C1A3318-0	2	Prepared	& Analyze	d: 02/04/2	1			
Total Phosphorus	0.582	0.05	0.02	mg/L	0.500	0.0948	98	80-120			
Matrix Spike Dup (1B04123-MSD1)	)	Source	: C1A3318-0	2	Prepared	& Analyze	d: 02/04/2	1			
Total Phosphorus	0.565	0.05	0.02	mg/L	0.500	0.0948	94	80-120	3	20	
Batch 1B05029 - Analyzed as r	received										
Blank (1B05029-BLK1)				I	Prepared	& Analyze	d: 02/05/2	1			
Ammonia-Nitrogen	ND	0.05	0.03	mg/L							

location 6100 Quail Valley Court Riverside, CA 92507-0704 P 951 653 3351 F 951 653 1662 www.babcocklabs.com



Analytical Report: Page 14 of 17 Project Name: Stormwater Project Number: Lake Elsinore Project

Report Date: 02-Mar-2021

Received on Ice (Y/N):	Yes	Temp:	3	°C
	- •••	· F.	-	-

#### **Nutrients - Batch Quality Control**

					Spike	Source		%REC		RPD	
Analyte(s)	Result	RDL		Units	Level	Result	%REC	Limits	RPD	Limit	Flag
Batch 1B05029 - Analyzed as rec	eived										
LCS (1B05029-BS1)				l	Prepared	& Analyze	d: 02/05/2	1			
Ammonia-Nitrogen	1.03	0.05	0.03	mg/L	1.00		103	90-110			
Matrix Spike (1B05029-MS1)		Source:	C1A3328-0	1	Prepared	& Analyze	d: 02/05/2	1			
Ammonia-Nitrogen	1.18	0.05	0.03	mg/L	1.00	0.167	102	80-120			
Matrix Spike Dup (1B05029-MSD1)		Source:	C1A3328-0	1	Prepared	& Analyze	d: 02/05/2	1			
Ammonia-Nitrogen	1.21	0.05	0.03	mg/L	1.00	0.167	104	80-120	2	20	
Batch 1B05081 - Acid Digest											
Blank (1B05081-BLK1)					Prepared	& Analyze	d: 02/06/2	1			
Kjeldahl Nitrogen	ND	0.1	0.09	mg/L							
LCS (1B05081-BS1)				I	Prepared	& Analyze	d: 02/06/2	1			
Kjeldahl Nitrogen	1.11	0.1	0.09	mg/L	1.00		111	80-120			
Matrix Spike (1B05081-MS1)		Source:	C1B0455-0	2	Prepared	& Analyze	d: 02/06/2	1			
Kjeldahl Nitrogen	7.86	0.4	0.4	mg/L	4.00	4.27	90	42-154			
Matrix Spike Dup (1B05081-MSD1)		Source:	C1B0455-0	2	Prepared	& Analyze	d: 02/06/2	1			
Kjeldahl Nitrogen	7.60	0.4	0.4	mg/L	4.00	4.27	83	42-154	3	25	
Batch 1B08130 - Acid Digest											
LCS (1B08130-BS1)					Prepared	& Analyze	d: 02/08/2	1			
Total Phosphorus	0.542	0.05	0.02	mg/L	0.500		108	85-115			

location 6100 Quail Valley Court Riverside, CA 92507-0704 P 951 653 3351 F 951 653 1662 www.babcocklabs.com



Analytical Report: Page 15 of 17 Project Name: Stormwater Project Number: Lake Elsinore Project

Report Date: 02-Mar-2021

Work (	Order	Number:	C1B0159
--------	-------	---------	---------

Received on Ice (Y/N):	Yes	Temp:	3	°C
		-		

#### **Nutrients - Batch Quality Control**

Analyte(s)	Result	RDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Flag
Batch 1B08130 - Acid Digest										
Matrix Spike (1B08130-MS1)		Source:	C1A3456-01	Prepared	& Analyze	d: 02/08/2	1			
Total Phosphorus	0.783	0.05	0.02 mg/	′L 0.500	0.224	112	80-120			
Matrix Spike Dup (1B08130-MSD1)		Source:	C1A3456-01	Prepared	& Analyze	d: 02/08/2	1			
Total Phosphorus	0.769	0.05	0.02 mg/	L 0.500	0.224	109	80-120	2	20	

location 6100 Quail Valley Court Riverside, CA 92507-0704 P 951 653 3351 F 951 653 1662 www.babcocklabs.com



Analytical Report: Page 16 of 17 Project Name: Stormwater Project Number: Lake Elsinore Project

Yes

Report Date: 02-Mar-2021

Work Order Number: C1B0159

Received on Ice (Y/N):

Temp: 3 °C

#### **Notes and Definitions**

J Estimated value

- QMS(D) Matrix spike recovery was out of acceptance criteria. Precision and accuracy demonstrated by remaining matrix spike results.
- ND: Analyte NOT DETECTED at or above the Method Detection Limit (if MDL is reported), otherwise at or above the Reportable Detection Limit (RDL)
- NR: Not Reported
- RDL: Reportable Detection Limit
- MDL: Method Detection Limit
- \* / (Non-NELAP): NELAP does not offer accreditation for this analyte/method/matrix combination

#### Approval

Enclosed are the analytical results for the submitted sample(s). Babcock Laboratories certify the data presented as part of this report meet the minimum quality standards in the referenced analytical methods. Any exceptions have been noted.

Cindy Caddlea Cindy A. Waddell

cc:

e-Standard No Alias.rpt

This report applies only to the sample(s) analyzed. As a mutual protection to clients, the public, and Babcock Laboratories, Inc., this report is submitted and accepted for the exclusive use of the Client to whom it is addressed. Interpretation and use of the information contained within this report are the sole responsibility of the Client. Babcock Laboratories, Inc. is not responsible for any misinformation or consequences that may result from misinterpretation or improper use of this report. This report is not to be modified or abbreviated in any way. Additionally, this report is not to be used, in whole or in part, in any advertising or publicity matter without written authorization from Babcock Laboratories, Inc. The liability of Babcock Laboratories, Inc. is limited to the actual cost of the requested analyses, unless otherwise agreed upon in writing. There is no other warranty expressed or implied.

*mailing* P.O Box 432 Riverside, CA 92502-0432 location 6100 Quail Valley Court Riverside, CA 92507-0704 P 951 653 3351 F 951 653 1662 www.babcocklabs.com



Analytical Report: Page 17 of 17 Project Name: Stormwater Project Number: Lake Elsinore Project

Yes

#### Work Order Number: C1B0159

Received on Ice (Y/N):

Temp: 3 °C

Babcock Laboratories, Inc. (951)653-3351 FAX (951) 653-1662 www.babcocklabs.com

Report Date: 02-Mar-2021

#### Chain of Custody Sample Information Record

Client: Wood PLC		Contact:	Garth E	ngelhorn	i					Phone No. (760) 64	4-0167
FAX No.		Email: g	arth.eng	elhorn@a	altae	nviro	n.com				Additional Reporting Requests
Project Name: Lake Elsinore Project		Turn Arc	ound Tim	e:	Ro	outine	*3-5 Da Rush	y *48 H R	lour ush	*24 Hour Rush	FAX Results: □ Yes □ No Email Results: □ Yes □ No State EDT: □ Yes □ No
Project Location: Salt Creek/San Jacinto/Canyon	Lake	"Lab TAT	Approval	enteri-	By:	100		82.31	*Ax	iditional Charges May Apply	(Include Source Number in Notes)
Sampler Information		# 0 & F	f Contain Preservati	ers ves		Samp Type	Analys	is Reque	sted	Matrix	Notes
Name: Alastia Kay Employer: NV.5 Signature:	-	Inpreserved 2504 ICI NO3	la2S203 la0H la0H/ZnAcetate	H4CI ICAA	fotal # of Container	Routine Resample	<i>Special</i> ae attached list			DW = Drinking Water GW = Groundwater WW = Wastewater S = Source SG = Sludge L = Liquid M = Miscialianeous	*BOD,COD,TN, Nitrogen- Organc, Hardness, Phos Ortho,Total Phos, TDS, TSS *analysis per PMA per dient JLH 2/1/2021
C 02 012101 (/al/	11.1	DITI	ZZZ	22	<b>F</b>	V	. 0			m = macchericoba	
5-07-015121 14/21	10.00	1 1 1		_	3	K .	×			L.	
2-03-013121-00p 1/3/11	16.30				2	X	۸			L	
5-03-020121-18 21/21	10:35	111			3	X	<u>)</u> 0	_		L	
5-04-013121 13121	15:49	111			3	Ķ	X			L	
CLS-020121 2/1/21	10:27	1 1			3	X	ĸ			L	
										5	
Pollnouiched By (sign) Print Nan	ne / Con	nanv	Da	te / Time			Received	3y (Siqn)		Prin	t Name / Company
A. this has	. / N	1/5	2/1/2	1 12:2	5	1	delle		,	0 11	
HUOTIN CM	6 Frees	JS/NYS	2/11	21 13:	25		-	M		1 open Herry	1/54
Jan Carlos Stree		11			L	-					
(For Lab Use Only) Sample Integrity Upon R	eceipt/A	Acceptance	e Criteria	िक्स्				#6	2		
Sample(s) Submitted on Ice? Yes No		Sample N	leets Labo	oratory Ac	cept	ance (	criteria?	Yes	No	C1R01	(50 思想)
Custody Seal(s) Intact? Yes No (	N/A	Permissio	on to cont	inue:				Yes	No		
Sample(s) intact?   Ves No		Deviation	/Notes:	5.14	34	182				Rc'd: 02/01/2	021 13:25
Temperature: Decolor Bl	ank	Signature	/Date:							JLH	
										b	Fage v ui

*mailing* P.O Box 432 Riverside, CA 92502-0432 location 6100 Quail Valley Court Riverside, CA 92507-0704 P 951 653 3351 F 951 653 1662 www.babcocklabs.com



FINAL REPORT

Work Orders:	1C11057	Report Date:	3/25/2021
		Received Date:	3/11/2021
Project:	Lake Elsinore and Canvon Lake Nutrient TMDL	Turnaround Time:	Normal
		Phones:	(858) 514-6465
		Fax:	(858) 278-5300
Attn:	John Rudolph	P.O. #:	C015101084
Client:	Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123	Billing Code:	

#### DoD-ISO ANAB # • ELAP-CA #1132 • EPA-UCMR #CA00211 • ISO17025 ANAB #L2457.01 • LACSD #10143 • NJ-DEP #CA015

This is a complete final report. The information in this report applies to the samples analyzed in accordance with the chain-of-custody document. Weck Laboratories certifies that the test results meet all requirements of TNI unless noted by qualifiers or written in the Case Narrative. This analytical report must be reproduced in its entirety.

Dear John Rudolph,

Enclosed are the results of analyses for samples received 3/11/21 with the Chain-of-Custody document. The samples were received in good condition, at 3.6 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

**Reviewed by:** 

1: State

Chris Samatmanakit Project Manager





FINAL REPORT

Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123 
 Project Number:
 Lake Elsinore and Canyon Lake Nutrient TMDL

 Project Manager:
 John Rudolph

Reported: 03/25/2021 08:38

## Sample Summary

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
S-03-031021	Austin Kay	1C11057-01	Water	03/10/21 17:00	
S-04-031121	Austin Kay	1C11057-02	Water	03/11/21 05:40	
CLS-031121	Austin Kay	1C11057-03	Water	03/11/21 10:07	



FINAL REPORT

Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123 Project Number: Lake Elsinore and Canyon Lake Nutrient TMDL Project Manager: John Rudolph

Reported: 03/25/2021 08:38

## Sample Results

Sample: S-03-03	1021					Sample	ed: 03/10/21 1	7:00 by Austin Kay
1C11057	7-01 (Water)							
Analyte		Resu	lt MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/	Physical Parameters by AF	PHA/EPA/ASTM Methods						
Method: EPA 410.4				Instr: UVVIS	504			
Batch ID: W1C0900		Preparation: _NONE (WETCHEM)		Prepared: 0	)3/15/21 11:07			Analyst: ssi
Chemical Oxygen De	mand		<b>5</b> 2.9	5.0	mg/l	1	03/16/21	
Method: SM 5210B				Instr: PH13				
Batch ID: W1C0737		Preparation: _NONE (WETCHEM)		Prepared: 0	)3/11/21 11:56			Analyst: SSI/LHN
Biochemical Oxygen	Demand	6.	<b>3</b> 2.0	2.0	mg/l	1	03/16/21	
Sample: S-04-03	1121					Sampl	ed: 03/11/21	5:40 by Austin Kay
1C11057	7-02 (Water)							
Analyte		Resu	lt MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/	Physical Parameters by AF	HA/EPA/ASTM Methods						
Method: EPA 410.4				Instr: UVVIS	504			
Batch ID: W1C0900		Preparation: _NONE (WETCHEM)		Prepared: 0	)3/15/21 11:07			Analyst: ssi
Chemical Oxygen De	mand		<b>0</b> 2.9	5.0	mg/l	1	03/16/21	
Method: SM 5210B				Instr: PH13				
Batch ID: W1C0737		Preparation: _NONE (WETCHEM)		Prepared: 0	)3/11/21 11:56			Analyst: SSI/LHN
Biochemical Oxygen	Demand	7.	<b>9</b> 2.0	2.0	mg/l	1	03/16/21	
Sample: CLS-031	121					Sample	ed: 03/11/21 1	0:07 by Austin Kay
1C11057	7-03 (Water)							
Analyte		Resu	lt MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/	Physical Parameters by AF	PHA/EPA/ASTM Methods						
Method: EPA 410.4				Instr: UVVIS	504			
Batch ID: W1C0900		Preparation: _NONE (WETCHEM)		Prepared: 0	03/15/21 11:07			Analyst: ssi
Chemical Oxygen De	mand		<b>9</b> 2.9	5.0	mg/l	1	03/16/21	
Method: SM 5210B				Instr: PH13				
Batch ID: W1C0737		Preparation: _NONE (WETCHEM)		Prepared: 0	)3/11/21 11:56			Analyst: SSI/LHN
Biochemical Oxygen	Demand	3.	<b>2</b> 2.0	2.0	mg/l	1	03/16/21	



FINAL REPORT

Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123 
 Project Number:
 Lake Elsinore and Canyon Lake Nutrient TMDL

 Project Manager:
 John Rudolph

**Reported:** 03/25/2021 08:38

## **Quality Control Results**

Conventional Chemistry/Physica	al Parameters by APHA/EPA/AS	STM Method	ds								
					Spike	Source		%REC		RPD	
Analyte	Result	MDL	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier
Batch: W1C0737 - SM 5210B											
Blank (W1C0737-BLK1)				Pre	epared: 03/11/21	Analyzed:	03/16/21				
Biochemical Oxygen Demand	ND	2.0	2.0	mg/l							
Blank (W1C0737-BLK2)				Pre	epared: 03/11/21	Analyzed:	03/16/21				
Biochemical Oxygen Demand	ND	2.0	2.0	mg/l							
LCS (W1C0737-BS1)				Pre	epared: 03/11/21	Analyzed:	03/16/21				
Biochemical Oxygen Demand		2.0	2.0	mg/l	198		86	85-115			
Duplicate (W1C0737-DUP1)	Source:	1C10130-02	2	Pre	epared: 03/11/21	Analyzed:	03/16/21				
Biochemical Oxygen Demand	3.40	2.0	2.0	mg/l		3.23			5	20	
Batch: W1C0900 - EPA 410.4											
Blank (W1C0900-BLK1)				Pre	epared: 03/15/21	Analyzed:	03/16/21				
Chemical Oxygen Demand	ND	2.9	5.0	mg/l							
LCS (W1C0900-BS1)				Pre	epared: 03/15/21	Analyzed:	03/16/21				
Chemical Oxygen Demand		2.9	5.0	mg/l	1000	-	94	90-110			
Duplicate (W1C0900-DUP1)	Source:	1C09008-01		Pre	epared: 03/15/21	Analyzed:	03/16/21				
Chemical Oxygen Demand		57	100	mg/l		9010			1	15	
Matrix Spike (W1C0900-MS1)	Source:	0104002-02		Pre	epared: 03/15/21	Analyzed:	03/16/21				
Chemical Oxygen Demand		11	20	mg/l	200	14.2	101	90-110			
Matrix Spike (W1C0900-MS2)	Source:	1C12047-01		Pre	epared: 03/15/21	Analyzed:	03/16/21				
Chemical Oxygen Demand	2310	11	20	mg/l	2000	246	103	90-110			
Matrix Spike Dup (W1C0900-MS	D1) Source:	0104002-02		Pre	epared: 03/15/21	Analyzed:	03/16/21				
Chemical Oxygen Demand		11	20	mg/l	200	14.2	100	90-110	1	15	
Matrix Spike Dup (W1C0900-MS	D2) Source:	1C12047-01		Pre	epared: 03/15/21	Analyzed:	03/16/21				
Chemical Oxygen Demand	2310	11	20	mg/l	2000	246	103	90-110	0	15	



Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123

# **Certificate of Analysis**

FINAL REPORT

Project Number: Lake Elsinore and Canyon Lake Nutrient TMDL

Reported: 03/25/2021 08:38

Project Manager: John Rudolph

## Notes and Definitions

ltem	Definition
%REC	Percent Recovery
Dil	Dilution
MDL	Method Detection Limit
MRL	The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ)
ND	NOT DETECTED at or above the Method Reporting Limit (MRL). If Method Detection Limit (MDL) is reported, then ND means not detected at or above the MDL.
RPD	Relative Percent Difference
Source	Sample that was matrix spiked or duplicated.

Any remaining sample(s) will be disposed of one month from the final report date unless other arrangements are made in advance.

All results are expressed on wet weight basis unless otherwise specified.

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.



FINAL REPORT

Work Orders:	1C12072	Report Date:	4/05/2021
		Received Date:	3/12/2021
Project:	Lake Elsinore and Canvon Lake Nutrient TMDI	Turnaround Time:	Normal
		Phones:	(858) 514-6465
		Fax:	(858) 278-5300
Attn:	John Rudolph	P.O. #:	C015101084
Client:	Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123	Billing Code:	

#### DoD-ISO ANAB # • ELAP-CA #1132 • EPA-UCMR #CA00211 • ISO17025 ANAB #L2457.01 • LACSD #10143 • NJ-DEP #CA015

This is a complete final report. The information in this report applies to the samples analyzed in accordance with the chain-of-custody document. Weck Laboratories certifies that the test results meet all requirements of TNI unless noted by qualifiers or written in the Case Narrative. This analytical report must be reproduced in its entirety.

Dear John Rudolph,

Enclosed are the results of analyses for samples received 3/12/21 with the Chain-of-Custody document. The samples were received in good condition, at 2.7 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

**Reviewed by:** 

1: State

Chris Samatmanakit Project Manager




FINAL REPORT

Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123 Project Number: Lake Elsinore and Canyon Lake Nutrient TMDL Project Manager: John Rudolph **Reported:** 04/05/2021 12:19

## Sample Summary

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
S-04-031221	Austin Kay	1C12072-01	Water	03/12/21 09:45	
S-03-031221	Austin Kay	1C12072-02	Water	03/12/21 10:45	



Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123

# **Certificate of Analysis**

FINAL REPORT

 Project Number:
 Lake Elsinore and Canyon Lake Nutrient TMDL

 Project Manager:
 John Rudolph

**Reported:** 04/05/2021 12:19

04/05/2021 12

## Sample Results

Sample:	S-04-031221						Sampl	ed: 03/12/21 9:45	by Austin Kay
	1C12072-01 (Water)								
Analyte			Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Anions by IC, I	EPA Method 300.0								
Method: EPA	300.0				Instr: LC12				
Batch ID: W	/1C0798	Preparation: _NONE (LC)			Prepared: 03/12/	21 11:01			Analyst: jan
Nitrate as I	Ν		900	8.3	110	ug/l	1	03/13/21 03:33	
Nitrite as N	l		39	12	150	ug/l	1	03/13/21 03:33	J
Conventional C	Chemistry/Physical Parameters b	y APHA/EPA/ASTM Methods							
Method: [CAI	_C]				Instr: [CALC]				
Batch ID: [0	CALC]	Preparation: [CALC]			Prepared: 03/23/	21 13:39			Analyst: YMT
Nitrogen, T	Total		1.8		0.20	mg/l	1	03/25/21	
Method: _Var	ious				Instr: [CALC]				
Batch ID: [0	CALC]	Preparation: [CALC]			Prepared: 03/25/	21 16:14			Analyst: YMT
Organic Ni	trogen, Total		0.72		0.10	mg/l	1	03/26/21	
Method: EPA	350.1				Instr: AA06				
Batch ID: W	/1C1624	Preparation: _NONE (WETCHEM)			Prepared: 03/25/	21 16:14			Analyst: YMT
Ammonia a	as N		0.20	0.047	0.10	mg/l	1	03/26/21	
Method: EPA	351.2				Instr: AA06				
Batch ID: W	/1C1455	Preparation: NONE (WETCHEM)			Prepared: 03/23/	21 13:39			Analyst: YMT
TKN		·····	0.93	0.13	0.20	mg/l	1	03/25/21	M-02
Mathad: EDA	252.2				Instr AA01				
Rotch ID: M	10000	Proposition NONE (METCHEM)			Bronored: 02/16/	21 00.56			Anobieti
NO2+NO3	as N		870	36	200	ua/l	1	03/17/21	Analyst: ymt
						5			
Method: EPA	365.3				Instr: UVVIS04				
Batch ID: W	/1C0856	Preparation: _NONE (WETCHEM)	0.00	0.0020	Prepared: 03/12/	21 17:21	1	02/12/21 17:20	Analyst: sbn
0-Phospha			0.22	0.0030	0.010	mg/i	1	03/12/21 17.20	
Method: EPA	365.3				Instr: UVVIS04				
Batch ID: W	/1C1212	Preparation: _NONE (WETCHEM)			Prepared: 03/18/	21 15:33			Analyst: sbn
Phosphoru	is as P, Total		0.40	0.0067	0.010	mg/l	1	03/23/21	
Method: SM	2540C				Instr: OVEN01				
Batch ID: W	/1C1182	Preparation: _NONE (WETCHEM)			Prepared: 03/18/	21 10:15			Analyst: blg
Total Disso	olved Solids		170	4.0	10	mg/l	1	03/19/21	
Method: SM	2540D				Instr: OVEN15				
Batch ID: W	/1C1115	Preparation: _NONE (WETCHEM)			Prepared: 03/17/	21 12:40			Analyst: ism
Total Susp	ended Solids		72		5	mg/l	1	03/17/21	
Metals by EPA	200 Series Methods								
Method: EPA	200.7				Instr: ICP03				
Batch ID: W	/1C1080	Preparation: EPA 200.2			Prepared: 03/17/	21 09:51			Analyst: kvm
Calcium, T	otal	-	20.6	0.160	0.500	mg/l	1	03/20/21	-
Magnesiun	n, Total		5.57	0.0390	0.500	mg/l	1	03/20/21	



FINAL REPORT

Wood - San D 9177 Sky Par San Diego, C	Diego k Court, Ste A A 92123	Project N Project Ma	umber: anager:	Lake Elsino TMDL John Rudol	re and Can <u>y</u> ph	yon Lake Nutrie	nt		<b>Reported:</b> 04/05/2021 12:19
Sa	mple Results								(Continued)
Sample:	S-04-031221						Sample	ed: 03/12/21	9:45 by Austin Kay
	1C12072-01 (Water)								(Continued)
Analyte			Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Metals by EPA	200 Series Methods (Continued)								
Method: SM 2	2340B				Instr: [CALC]				
Batch ID: [C	ALC]	Preparation: [CALC]			Prepared: 03,	/17/21 09:51			Analyst: kvm
Hardness a	as CaCO3, Total		74.3		3.31	mg/l	1	03/20/21	

W	
WECK LABORAT	ORIES, INC.

Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123

# **Certificate of Analysis**

FINAL REPORT

 Project Number:
 Lake Elsinore and Canyon Lake Nutrient

 TMDL

 Project Manager:
 John Rudolph

04/05/2021 12:19

**Reported:** 

(Continued)

## Sample Results

Sample:	S-03-031221						Sampl	ed: 03/12/21 10:45	by Austin Kay
	1C12072-02 (Water)								
Analyte			Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Anions by IC,	EPA Method 300.0								
Method: EPA	A 300.0				Instr: LC12				
Batch ID: \	W1C0798	Preparation: _NONE (LC)			Prepared: 03/12/	21 11:01			Analyst: jan
Nitrate as	Ν		500	8.3	110	ug/l	1	03/13/21 03:51	
Nitrite as	Ν		19	12	150	ug/l	1	03/13/21 03:51	J
Conventional	Chemistry/Physical Parameters	s by APHA/EPA/ASTM Methods							
Method: [CA	ALC]				Instr: [CALC]				
Batch ID:	[CALC]	Preparation: [CALC]			Prepared: 03/23/	21 13:39			Analyst: YMT
Nitrogen,	Total		1.4		0.10	mg/l	1	03/25/21	•
Method: Va	rious				Instr: [CALC]				
Batch ID: [		Proparation: [CALC]			Brenared: 03/25/	21 16.14			Analyst: VMT
Organic N	litrogen. Total		0.76		0.10	ma/l	1	03/26/21	Analyst. Hitt
						5			
Method: EPA	A 350.1				Instr: AA06				
Batch ID: \	W1C1624	Preparation: _NONE (WETCHEM)	0.47	0.047	Prepared: 03/25/	21 16:14	1	02/26/21	Analyst: YMT
Ammonia	as N		0.17	0.047	0.10	mg/i	'	03/20/21	
Method: EPA	A 351.2				Instr: AA06				
Batch ID: \	W1C1455	Preparation: _NONE (WETCHEM)			Prepared: 03/23/	21 13:39			Analyst: YMT
TKN			0.92	0.065	0.10	mg/l	1	03/25/21	
Method: EPA	A 353.2				Instr: AA01				
Batch ID: \	W1C0989	Preparation: _NONE (WETCHEM)			Prepared: 03/16/	21 09:56			Analyst: ymt
NO2+NO3	as N		500	36	200	ug/l	1	03/17/21	
Method: EPA	A 365.3				Instr: UVVIS04				
Batch ID: \	W1C0856	Preparation: _NONE (WETCHEM)			Prepared: 03/12/	21 17:21			Analyst: sbn
o-Phosph	ate as P		0.16	0.0030	0.010	mg/l	1	03/12/21 17:25	
Method: EPA	A 365.3				Instr: UVVIS04				
Batch ID: \	W1C1212	Preparation: NONF (WETCHEM)			Prepared: 03/18/	21 15.33			Analyst: sbn
Phosphor	us as P, Total		0.25	0.0067	0.010	mg/l	1	03/23/21	,, <b>,</b>
Mathad: SM	25400				Instr: OVEN01				
Ratch ID: \	N1C1192	Proparation: NONE (METCHEM)			Bronarod: 02/19/	21 10.15			Analyst bla
Total Diss	olved Solids		240	4.0	10	ma/l	1	03/19/21	Analyst. Dig
						5			
Method: SM	2540D				Instr: OVEN15				
Batch ID: \	W1C1115	<b>Preparation:</b> _NONE (WETCHEM)	20		Prepared: 03/17/	21 12:40	1	02/17/01	Analyst: ism
Total Sus	pendeu Sollus		- JZ		J	ng/i	I	03/17/21	
Metals by EPA	200 Series Methods								
Method: EPA	A 200.7				Instr: ICP03				
Batch ID: \	W1C1080	Preparation: EPA 200.2		0.455	Prepared: 03/17/2	21 09:51		00/05/5/	Analyst: kvm
Calcium,	Iotal		24.1	0.160	0.500	mg/l	1	03/20/21	
Magnesiu	m, Total		7.09	0.0390	0.500	mg/l	1	03/20/21	



FINAL REPORT

Wood - San 9177 Sky Pa San Diego, (	Diego ark Court, Ste A CA 92123	Projec	ct Number: t Manager:	Lake Elsino TMDL John Rudol	re and Can	yon Lake Nutrie	ent		<b>Reported:</b> 04/05/2021 12:19
Sa	ample Results								(Continued)
Sample:	S-03-031221						Sample	ed: 03/12/21 10	):45 by Austin Kay
	1C12072-02 (Water)								(Continued)
Analyte			Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Metals by EPA	200 Series Methods (Continued)								
Method: SM	2340B				Instr: [CALC]				
Batch ID: [	CALC]	Preparation: [CALC]			Prepared: 03,	/17/21 09:51			Analyst: kvm
Hardness	as CaCO3, Total		89.5		3.31	mg/l	1	03/20/21	



**FINAL REPORT** 

Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123

Project Number: Lake Elsinore and Canyon Lake Nutrient TMDL

Reported: 04/05/2021 12:19

Project Manager: John Rudolph

anador.	lohn	Rudolph

0	'			
(	)	ua	lity	Control Results

Anions by IC, EPA Method 300.0											
					Spike	Source		%REC		RPD	
Analyte	Result	MDL	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier
Batch: W1C0798 - EPA 300.0											
Blank (W1C0798-BLK1)					Prepared & A	nalyzed: 03/	12/21				
Nitrate as N		8.3	110	ug/l							
Nitrite as N		12	150	ug/l							
LCS (W1C0798-BS1)					Prepared & A	nalyzed: 03/	12/21				
Nitrate as N	2100	8.3	110	ug/l	2000		105	90-110			
Nitrite as N	2010	12	150	ug/l	2000		101	90-110			
Matrix Spike (W1C0798-MS1)	Source: 1	B05007-02		Prepared: 03/12/21 Analyzed: 03/13/21							
Nitrate as N	19700	83	1100	ug/l	20000	ND	98	84-115			
Nitrite as N	19200	120	1500	ug/l	20000	ND	96	87-108			
Matrix Spike (W1C0798-MS2)	Source: 1	C09102-01		Prepared: 03/12/21 Analyzed: 03/13/21				1			
Nitrate as N	20700	83	1100	ug/l	20000	470	101	84-115			
Nitrite as N	19600	120	1500	ug/l	20000	135	97	87-108			
Matrix Spike Dup (W1C0798-MSD1)	Source: 1	B05007-02		Pre	pared: 03/12/2	1 Analyzed:	03/13/21	1			
Nitrate as N	- 19600	83	1100	ug/l	20000	ND	98	84-115	0.3	20	
Nitrite as N	19200	120	1500	ug/l	20000	ND	96	87-108	0.05	20	
Matrix Spike Dup (W1C0798-MSD2)	Source: 1	C09102-01		Pre	pared: 03/12/2	1 Analyzed:	03/13/21	1			
Nitrate as N	20700	83	1100	ug/l	20000	470	101	84-115	0.1	20	
Nitrite as N	19600	120	1500	ug/l	20000	135	97	87-108	0.2	20	

WECK LABORAT	ORIES, INC.						

%REC

**FINAL REPORT** 

Wood - San Diego
9177 Sky Park Court, Ste A
San Diego, CA 92123

Project Number: Lake Elsinore and Canyon Lake Nutrient TMDL Project Manager: John Rudolph

Snike

Source

**Reported:** 04/05/2021 12:19

(Continued)

PDD

**Quality Control Results** 

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

					opine	Jourse		/011-0			
Analyte	Result	MDL	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier
Batch: W1C0856 - EPA 365.3											
Blank (W1C0856-BLK1)					Prepared & Ana	alyzed: 03/1	2/21				
o-Phosphate as P		0.0030	0.010	mg/l		-					
LCS (W1C0856-BS1)					Prepared & Ana	alvzed: 03/1	2/21				
o-Phosphate as P	0.209	0.0030	0.010	mg/l	0.200		104	88-111			
Matrix Calls (MICONFC MC1)	C	C12072 02			Duene and St. Am	h	2/21				
o-Phosphate as P		0.0030	0.010	ma/l	0.200	0.163	100	85-112			
				5							
Matrix Spike Dup (W1C0856-MSD1)	Source: 1	C12072-02	0.010	ma/l	Prepared & Ana	alyzed: 03/1	2/21 102	85 112	0.8	20	
	0.300	0.0030	0.010	шул	0.200	0.105	102	00-112	0.0	20	
Batch: W1C0989 - EPA 353.2											
Blank (W1C0989-BLK1)				Prep	ared: 03/16/21	Analyzed:	03/17/21	I			
NO2+NO3 as N		36	200	ug/l							
LCS (W1C0989-BS1)				Prep	ared: 03/16/21	Analyzed:	03/17/21	I			
NO2+NO3 as N	1010	36	200	ug/l	1000		101	90-110			
Matrix Spike (W1C0989-MS1)	Source: 1	C11003-01		Pron	arad: 03/16/21	Analyzad	02/17/21	I			
NO2+NO3 as N	2000	36	200	ug/l	2000	ND	100	90-110			
		~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~			1.02/16/24						
Matrix Spike (W1C0989-MS2) NO2+NO3 as N	Source: 1 3120	36	200	ug/l	ared: 03/16/21 2000	Analyzed: 1110	100	90-110			
	• • • • •										
Matrix Spike Dup (W1C0989-MSD1)	Source: 1	C11093-01	200	Prep	ared: 03/16/21	Analyzed:	03/17/21	00.110	0.5	20	
NO2+NO3 as N	1990	30	200	ug/i	2000	ND	100	90-110	0.5	20	
Matrix Spike Dup (W1C0989-MSD2)	Source: 1	C11093-02		Prep	ared: 03/16/21	Analyzed:	03/17/21	l			
NO2+NO3 as N	3120	36	200	ug/l	2000	1110	100	90-110	0	20	
Batch: W1C1115 - SM 2540D											
Blank (W1C1115-BLK1)					Prepared & Ana	alyzed: 03/1	7/21				
Total Suspended Solids	0.100		5	mg/l		-					J
LCS (W1C1115-BS1)					Prenared & An:	alvzed: 03/1	7/21				
Total Suspended Solids	54.5		5	mg/l	51.2		106	90-110			
	C	C12040 01			Duene and St. Am	h d. 02 /1	7/21				
Total Suspended Solids	<b>Source:</b> 1	C12040-01	5	mg/l	Prepared & Ana	12.0	//21		3	20	
				Ū							
Duplicate (W1C1115-DUP2) Total Suspended Solids	Source: 1	C12066-01	5	ma/l	Prepared & Ana	20.8	7/21		8	20	
	02.4		0	iiig/i		20.0			U	20	
Batch: W1C1182 - SM 2540C											
Blank (W1C1182-BLK1)				Prep	ared: 03/18/21	Analyzed:	03/19/21	l			
Total Dissolved Solids	ND	4.0	10	mg/l							
LCS (W1C1182-BS1)				Prep	ared: 03/18/21	Analyzed:	03/19/21	I			
Total Dissolved Solids	839	4.0	10	mg/l	824	-	102	96-102			
Duplicate (W1C1182-DUP1)	Source: 1	C15045-01		Pren	ared: 03/18/21	Analyzed:	03/19/21	1			
Total Dissolved Solids	494	4.0	10	mg/l		493			0.2	10	
Duplicate (MIC1192 DUP2)	Co	C10026 01		D	arad: 02/10/21	Analyzada	02/10/24	1			
Duplicate (WICI 182-D0P2)	Source: 1	C19026-01		Prep	area: 03/18/21	Analyzed:	03/19/21				
1C12072											Page 8 of 11



1C12072

# **Certificate of Analysis**

**FINAL REPORT** 

Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123			Number: Manager:	Lake E TMDL John F	Elsinore and Canyo Rudolph	<b>Reported:</b> 04/05/2021 12:19					
Quality Control Results		,	<b>g</b>							(C	ontinued)
Conventional Chemistry/Physical Parameters by APH	A/EPA/AST	M Methods	(Continue	d)							
					Spike	Source		%REC		RPD	
Analyte	Result	MDL	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier
Durlieste (M/161192 DUD2)	C	C10026 01			December 4: 02/10/21	6	07/10/21				
Total Dissolved Solids	<b>Source:</b> 1	4.0	10	mg/l	Prepared: 03/18/21	1120	03/19/21		2	10	
Batch: W1C1212 - EPA 365.3											
Blank (W1C1212-BLK1)					Prepared: 03/18/21	Analyzed:	03/23/21				
Phosphorus as P, Total		0.0067	0.010	mg/l	•	,					
LCS (W1C1212-BS1)					Prepared: 03/18/21	Analyzed:	03/23/21				
Phosphorus as P, Total	0.208	0.0067	0.010	mg/l	0.200	-	104	90-110			
Matrix Spike (W1C1212-MS1)	Source: 1	C16041-01			Prepared: 03/18/21	Analyzed:	03/23/21				
Phosphorus as P, Total	0.328	0.0067	0.010	mg/l	0.200	0.118	105	90-110			
Matrix Spike Dup (W1C1212-MSD1)	Source: 1	C16041-01			Prepared: 03/18/21	Analyzed:	03/23/21				
Phosphorus as P, Total	0.328	0.0067	0.010	mg/l	0.200	0.118	105	90-110	0	20	
Batch: W1C1455 - EPA 351.2											
Blank (W1C1455-BLK1)					Prepared: 03/23/21	Analyzed:	03/25/21				
TKN	ND	0.065	0.10	mg/l							
Blank (W1C1455-BLK2)		0.005	0.40		Prepared: 03/23/21	Analyzed:	03/25/21				
IKN	ND	0.065	0.10	mg/i							
LCS (W1C1455-BS1)	0 008	0.065	0.10	ma/l	Prepared: 03/23/21	Analyzed:	03/25/21	00 110			
INN	- 0.996	0.005	0.10	mg/i	1.00		100	90-110			
LCS (W1C1455-BS2)	0.946	0.065	0.10	ma/l	Prepared: 03/23/21	Analyzed:	<b>03/25/21</b> 95	90-110			
			0.10					00 110			
Matrix Spike (W1C1455-MS1) TKN	Source: 1	<b>C17064-01</b> 0.065	0.10	mg/l	Prepared: 03/23/21 1.00	Analyzed: 0.265	03/25/21 102	90-110			
Matein Seille (MICLASS MC2)	C	617064-02		0	December 1: 02/22/21	6	02/25/21				
TKN	<b>Source:</b> 1	0.065	0.10	mg/l	1.00	0.277	93	90-110			
Matrix Spile Dup (W1C1455-MSD1)	Source: 1	C17064-01			Propared: 03/23/21	Analyzadi	03/25/21				
TKN	1.25	0.065	0.10	mg/l	1.00	0.265	99	90-110	3	10	
Matrix Spike Dup (W1C1455-MSD2)	Source: 1	C17064-02			Prepared: 03/23/21	Analvzed:	03/25/21				
TKN	1.20	0.065	0.10	mg/l	1.00	0.277	92	90-110	0.6	10	
Batch: W1C1624 - EPA 350.1											
Blank (W1C1624-BLK1)					Prepared: 03/25/21	Analyzed:	03/26/21				
Ammonia as N		0.047	0.10	mg/l	-	-					
Blank (W1C1624-BLK2)					Prepared: 03/25/21	Analyzed:	03/26/21				
Ammonia as N	ND	0.047	0.10	mg/l							
LCS (W1C1624-BS1)					Prepared: 03/25/21	Analyzed:	03/26/21				
Ammonia as N	0.243	0.047	0.10	mg/l	0.250		97	90-110			
LCS (W1C1624-BS2)		0.047	0.40		Prepared: 03/25/21	Analyzed:	03/26/21	00.415			
Ammonia as N	0.242	0.047	0.10	mg/l	0.250		97	90-110			
Matrix Spike (W1C1624-MS1)	Source: 1	B05006-02			Prepared: 03/25/21	Analyzed:	03/26/21				



# **Certificate of Analysis**

**FINAL REPORT** 

Wood - San Diego 9177 Sky Park Court, Ste A		Project	Number:	Lake Elsir TMDL	nore and Cany	on Lake N	lutrient			Reported 04/05/2021 12:1		
San Diego, CA 92123		Project	Manager:	John Rude	olph							
Quality Control Results										(C	ontinued)	
Conventional Chemistry/Physical Parameters by APH	A/EPA/AST	M Methods	(Continue	d)								
Analyza	Pocult	MDI	MDI	Unite	Spike	Source	% PEC	%REC	PDD	RPD	Qualifier	
Batch: W1C1624 - EPA 350.1 (Continued)	Result	WIDE	WIKL	Units	Level	Result	/intee	LIIIIICS	KF D	Linit	Quaimer	
Matrix Spike (W1C1624-MS1)	Source: 1	B05006-02		Pre	nared: 03/25/21	Analyzed:	03/26/2	1				
Ammonia as N	2.66	0.047	0.10	mg/l	0.250	2.44	86	90-110			MS-02	
Matrix Spike (W1C1624-MS2)	Source: 1	B05006-03		Pre	pared: 03/25/21	Analyzed:	03/26/2	1				
Ammonia as N	2.52	0.047	0.10	mg/l	0.250	2.29	91	90-110				
Matrix Spike Dup (W1C1624-MSD1)	Source: 1	B05006-02		Pre	pared: 03/25/21	Analyzed:	03/26/2	1				
Ammonia as N	2.65	0.047	0.10	mg/l	0.250	2.44	82	90-110	0.4	15	MS-02	
Matrix Spike Dup (W1C1624-MSD2)	Source: 1	B05006-03		Pre	pared: 03/25/21	Analyzed:	03/26/2	1				
Ammonia as N	2.51	0.047	0.10	mg/l	0.250	2.29	84	90-110	0.7	15	MS-02	
Quality Control Results										(C	ontinued)	
Metals by EPA 200 Series Methods												
					Spike	Source		%REC		RPD		
Analyte	Result	MDL	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier	
Batch: W1C1080 - EPA 200.7												
Blank (W1C1080-BLK1)				Pre	pared: 03/17/21	Analyzed:	03/20/2	1				
Calcium, Total	ND	0.160	0.500	mg/l								
Magnesium, Total		0.0390	0.500	mg/l								
LCS (W1C1080-BS1)				Pre	pared: 03/17/21	Analyzed:	03/20/2	1				
Calcium, Total	48.9	0.160	0.500	mg/l	50.0		98	85-115				
Magnesium, Total	50.8	0.0390	0.500	mg/l	50.0		102	85-115				
Matrix Spike (W1C1080-MS1)	Source: 1	C12072-01		Pre	pared: 03/17/21	Analyzed:	03/20/2	1				
Calcium, Total	67.8	0.160	0.500	mg/l	50.0	20.6	94	70-130				
Magnesium, Total	55.8	0.0390	0.500	mg/l	50.0	5.57	100	70-130				
Matrix Spike Dup (W1C1080-MSD1)	Source: 1	C12072-01		Pre	pared: 03/17/21	Analyzed:	03/20/2	1				
Calcium, Total	69.6	0.160	0.500	mg/l	50.0	20.6	98	70-130	3	30		
Magnesium, Total	57.2	0.0390	0.500	mg/l	50.0	5.57	103	70-130	3	30		



Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123

# **Certificate of Analysis**

FINAL REPORT

Project Number: Lake Elsinore and Canyon Lake Nutrient TMDL Project Manager: John Rudolph

Reported: 04/05/2021 12:19

Notes and Definitions

ltem	Definition
J	Estimated conc. detected <mrl and="">MDL.</mrl>
M-02	Due to the nature of matrix interferences, sample was diluted prior to preparation. The MDL and MRL were raised due to the dilution.
MS-02	The RPD and/or percent recovery for this QC spike sample cannot be accurately calculated due to the high concentration of analyte inherent in the sample.
%REC	Percent Recovery
Dil	Dilution
MDL	Method Detection Limit
MRL	The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ)
ND	NOT DETECTED at or above the Method Reporting Limit (MRL). If Method Detection Limit (MDL) is reported, then ND means not detected at or above the MDL.
RPD	Relative Percent Difference
Source	Sample that was matrix spiked or duplicated.
Any rema	ining sample(s) will be disposed of one month from the final report date unless other arrangements are made in advance.

All results are expressed on wet weight basis unless otherwise specified.

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.



**FINAL REPORT** 

Work Orders:	1C15045	Report Date:	4/05/2021
		Received Date:	3/15/2021
Project	Lake Elsinore and Canyon Lake Nutrient TMDL	Turnaround Time:	Normal
i rojecu		Phones:	(858) 514-6465
		Fax:	(858) 278-5300
Attn:	John Rudolph	P.O. #:	
Client:	Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123	Billing Code:	

#### DoD-ISO ANAB # • ELAP-CA #1132 • EPA-UCMR #CA00211 • ISO17025 ANAB #L2457.01 • LACSD #10143 • NJ-DEP #CA015

This is a complete final report. The information in this report applies to the samples analyzed in accordance with the chain-of-custody document. Weck Laboratories certifies that the test results meet all requirements of TNI unless noted by qualifiers or written in the Case Narrative. This analytical report must be reproduced in its entirety.

Dear John Rudolph,

Enclosed are the results of analyses for samples received 3/15/21 with the Chain-of-Custody document. The samples were received in good condition, at 5.1 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

**Reviewed by:** 

1: State

Chris Samatmanakit **Project Manager** 





FINAL REPORT

Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123

Project Number:	Lake Elsinore and Canyon Lake Nutrient	Rep	orted:
	TMDL	04/05/2021	12:35
Project Manager:	John Rudolph		

## Sample Summary

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
CLS- 031521	Austin Kay	1C15045-01	Water	03/15/21 09:30	



Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123

# **Certificate of Analysis**

FINAL REPORT

 Project Number:
 Lake Elsinore and Canyon Lake Nutrient TMDL

 Project Manager:
 John Rudolph

**Reported:** 04/05/2021 12:35

## Sample Results

Sample:	CLS- 031521						Sampl	ed: 03/15/21 9:30	) by Austin Kay
	1C15045-01 (Water)								
Analyte			Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Anions by IC,	EPA Method 300.0								
Method: EPA	300.0				Instr: LC12				
Batch ID: \	W1C0910	Preparation: _NONE (LC)			Prepared: 03/15/2	1 11:41			Analyst: jan
Nitrate as	Ν		380	8.3	110	ug/l	1	03/15/21 20:19	
Nitrite as I	Ν		23	12	150	ug/l	1	03/15/21 20:19	J
Conventional	Chemistry/Physical Parameters by	APHA/EPA/ASTM Methods							
Method: [CA	LC]				Instr: [CALC]				
Batch ID: [	CALC]	Preparation: [CALC]			Prepared: 03/23/2	1 13:39			Analyst: YMT
Nitrogen,	Total		1.3		0.10	mg/l	1	03/25/21	
Method: _Va	rious				Instr: [CALC]				
Batch ID: [	CALC]	Preparation: [CALC]			Prepared: 03/23/2	1 13:39			Analyst: YMT
Organic N	itrogen, Total		0.62		0.10	mg/l	1	03/25/21	
Method: EPA	350.1				Instr: AA06				
Batch ID: \	N1C1352	Prenaration: NONE (WETCHEM)			Prenared: 03/22/2	1 11.34			Analyst: VMT
Ammonia	as N		0.28	0.047	0.10	mg/l	1	03/23/21	Analyse. Inth
						U			
Method: EPA	351.2				Instr: AA06				
Batch ID: \	W1C1455	Preparation: _NONE (WEICHEM)	0.90	0.065	Prepared: 03/23/2	1 13:39	1	03/25/21	Analyst: YMI
			0.50	0.005	0.10	ing/i	1	03/23/21	
Method: EPA	353.2				Instr: AA01				
Batch ID: \	W1C0989	Preparation: _NONE (WETCHEM)	)		Prepared: 03/16/2	1 09:56			Analyst: ymt
NO2+NO3	as N		400	36	200	ug/l	1	03/17/21	
Method: EPA	365.3				Instr: UVVIS04				
Batch ID: \	W1C1057	Preparation: _NONE (WETCHEM)	)		Prepared: 03/16/2	1 17:27		Α	nalyst: UVVIS04
o-Phospha	ate as P		0.018	0.0030	0.010	mg/l	1	03/16/21 18:01	
Method: EPA	365.3				Instr: UVVIS04				
Batch ID: \	W1C1212	Preparation: _NONE (WETCHEM)	)		Prepared: 03/18/2	1 15:33			Analyst: sbn
Phosphor	us as P, Total		0.036	0.0067	0.010	mg/l	1	03/23/21	
Method: SM	25400				Instr: OVEN01				
Batch ID: \	N1C1182	Preparation: NONE (WETCHEM)	1		Prepared: 03/18/2	1 10.15			Analyst: blg
Total Diss	olved Solids		490	4.0	10	mg/l	1	03/19/21	<b>Finalysia</b> sig
Mathad: SM	25400				Instra OVEN15				
Batch ID. )	2340D M1C1204	Properties NONE (METCHEM)			Dremaned: 02/10/2	1 17.00			Analyst
Total Susp	ended Solids		ND		5	ma/l	1	03/22/21	Analyst. Isin
						3			
Metals by EPA	200 Series Methods								
Method: EPA	200.7				Instr: ICP03				
Batch ID: \	W1C1080	Preparation: EPA 200.2		0.455	Prepared: 03/17/2	1 09:51		00/05/5/	Analyst: kvm
Calcium, 1	lotal		61.8	0.160	0.500	mg/l	1	03/20/21	
Magnesiu	m, Total		19.2	0.0390	0.500	mg/l	1	03/20/21	



FINAL REPORT

Wood - San D 9177 Sky Par San Diego, C	Diego k Court, Ste A A 92123	Pro	oject Number: ject Manager:	Lake Elsir TMDL John Rud	nore and Cany olph	von Lake Nutrie	nt		<b>Rep</b> 04/05/2021	orted: 12:35
Sa	mple Results								(Continu	ued)
Sample:	CLS- 031521						Sample	ed: 03/15/21	9:30 by Austir	n Kay
	1C15045-01 (Water)								(Continu	ued)
Analyte			Result	MDL	MRL	Units	Dil	Analyzed	Qu	alifier
Metals by EPA	200 Series Methods (Continued)									
Method: SM 2	2340B				Instr: [CALC]					
Batch ID: [C	ALC]	Preparation: [CALC]			Prepared: 03/	17/21 09:51			Analyst	: kvm
Hardness a	is CaCO3, Total		233		3.31	mg/l	1	03/20/21		



FINAL REPORT

Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123 Project Number: Lake Elsinore and Canyon Lake Nutrient TMDL

**Reported:** 04/05/2021 12:35

Project Manager: John Rudolph

## **Quality Control Results**

#### Anions by IC, EPA Method 300.0

					Spike	Source		%REC		RPD	
Analyte	Result	MDL	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier
Batch: W1C0910 - EPA 300.0											
Blank (W1C0910-BLK1)					Prepared & Ar	nalyzed: 03/	15/21				
Nitrate as N		8.3	110	ug/l							
Nitrite as N		12	150	ug/l							
LCS (W1C0910-BS1)					Prepared & Ar	nalyzed: 03/	15/21				
Nitrate as N	2080	8.3	110	ug/l	2000		104	90-110			
Nitrite as N	1960	12	150	ug/l	2000		98	90-110			
Matrix Spike (W1C0910-MS1)	Source: 0	L17007-01			Prepared & Ar	nalyzed: 03/	15/21				
Nitrate as N	19200	83	1100	ug/l	20000	ND	96	84-115			
Nitrite as N	19900	120	1500	ug/l	20000	ND	99	87-108			
Matrix Spike (W1C0910-MS2)	Source: 0	L17007-02			Prepared & Ar	nalyzed: 03/	15/21				
Nitrate as N	19700	83	1100	ug/l	20000	ND	98	84-115			
Nitrite as N	18600	120	1500	ug/l	20000	ND	93	87-108			
Matrix Spike Dup (W1C0910-MSD1)	Source: 0	L17007-01			Prepared & Ar	nalyzed: 03/	15/21				
Nitrate as N	19100	83	1100	ug/l	20000	ND	96	84-115	0.5	20	
Nitrite as N	19400	120	1500	ug/l	20000	ND	97	87-108	2	20	
Matrix Spike Dup (W1C0910-MSD2)	Source: 0	L17007-02			Prepared & Ar	nalyzed: 03/	15/21				
Nitrate as N	19700	83	1100	ug/l	20000	ND	98	84-115	0.05	20	
Nitrite as N	18600	120	1500	ug/l	20000	ND	93	87-108	0.05	20	

W	
WECK LABORAT	ORIES, INC.

**FINAL REPORT** 

Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123 Project Number: Lake Elsinore and Canyon Lake Nutrient TMDL

Reported: 04/05/2021 12:35

Project Manager: John Rudolph

(Continued)

## **Quality Control Results**

Conventional Chemistry/Physical Parameters by AP	HA/EPA/AS	TM Methods	5								
					Spike	Source		%REC		RPD	
Analyte	Result	MDL	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier
Batch: W1C0989 - EPA 353.2											
Blank (W1C0989-BLK1) NO2+NO3 as N		36	200	ug/l	Prepared: 03/16/21	Analyzed:	03/17/21				
LCS (W1C0989-BS1) NO2+NO3 as N	1010	36	200	ug/l	Prepared: 03/16/21 1000	Analyzed:	<b>03/17/21</b> 101	90-110			
Matrix Spike (W1C0989-MS1)	Source:	1C11093-01			Prepared: 03/16/21	Analvzed:	03/17/21				
NO2+NO3 as N	2000	36	200	ug/l	2000	ND	100	90-110			
Matrix Spike (W1C0989-MS2)	Source:	1C11093-02			Prepared: 03/16/21	Analyzed:	03/17/21				
NO2+NO3 as N	3120	36	200	ug/l	2000	1110	100	90-110			
Matrix Spike Dup (W1C0989-MSD1)	Source	1011093-01			Prenared: 03/16/21	Analyzed:	03/17/21				
NO2+NO3 as N	1990	36	200	ug/l	2000	ND	100	90-110	0.5	20	
Matrix Spike Dup (W1C0090 MSD2)	Sourcou	1011002 02			Proparad: 02/16/21	Analyzada	02/17/21				
NO2+NO3 as N	3120	36	200	ug/l	2000	1110	100	90-110	0	20	
Batch: WICIUS7 - EPA 365.5											
Blank (W1C1057-BLK1)	ND	0.0030	0.010	ma/l	Prepared & Ana	lyzed: 03/1	6/21				
	NB	0.0000	0.010	ing/i							
LCS (W1C1057-BS1)	0 203	0.0030	0.010	ma/l	Prepared & Ana	lyzed: 03/1	6/21 102	88 111			
0-r nospilate as r	0.205	0.0050	0.010	iiig/i	0.200		102	00-111			
Matrix Spike (W1C1057-MS1)	Source:	1C16041-01	0.010		Prepared & Ana	lyzed: 03/1	6/21	05 440			
o-Phosphale as P	0.275	0.0030	0.010	mg/i	0.200	0.0760	90	00-112			
Matrix Spike Dup (W1C1057-MSD1)	Source:	1C16041-01			Prepared & Ana	lyzed: 03/1	6/21				
o-Phosphate as P	0.275	0.0030	0.010	mg/l	0.200	0.0780	98	85-112	0	20	
Batch: W1C1182 - SM 2540C											
Blank (W1C1182-BLK1)					Prepared: 03/18/21	Analyzed:	03/19/21				
Total Dissolved Solids		4.0	10	mg/l		-					
LCS (W1C1182-BS1)					Prepared: 03/18/21	Analyzed:	03/19/21				
Total Dissolved Solids	839	4.0	10	mg/l	824	,	102	96-102			
Duplicate (W1C1182-DUP1)	Source:	1C15045-01			Prepared: 03/18/21	Analvzed:	03/19/21				
Total Dissolved Solids	494	4.0	10	mg/l		493			0.2	10	
Dunlicate (W1C1182-DUP2)	Source	1019026-01			Prenared: 03/18/21	Analyzed:	03/19/21				
Total Dissolved Solids	1140	4.0	10	mg/l	reparea: 00, 10, 21	1120	00,10,21		2	10	
Batch: W1C1212 - EPA 365.3											
Blank (W1C1212-BLK1)		0.0007	0.040		Prepared: 03/18/21	Analyzed:	03/23/21				
Priosphorus as P, Iotai	ND	0.0067	0.010	mg/l							
LCS (W1C1212-BS1)					Prepared: 03/18/21	Analyzed:	03/23/21				
Phosphorus as P, Total	0.208	0.0067	0.010	mg/l	0.200		104	90-110			
Matrix Spike (W1C1212-MS1)	Source:	1C16041-01			Prepared: 03/18/21	Analyzed:	03/23/21				
Phosphorus as P, Total	0.328	0.0067	0.010	mg/l	0.200	0.118	105	90-110			
Matrix Spike Dup (W1C1212-MSD1)	Source:	1C16041-01			Prepared: 03/18/21	Analyzed:	03/23/21				



FINAL REPORT

Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123		Project Project	Number: Manager:	Lake E TMDL John F	Isinore and Canyo Rudolph	on Lake N	utrient			04/05	Reported: /2021 12:35
Quality Control Results										(C	Continued)
Conventional Chemistry/Physical Parameters by APH	IA/EPA/AS	TM Methods	(Continue	d)							
Analyza	Pocult	MDI	MDI	Unite	Spike	Source	% DEC	%REC	PPD	RPD	Qualifier
Batch: W1C1212 - EPA 365.3 (Continued)	Result	WDL	MIKL	Units	Levei	Result	JUNEC	Linits	RF D	Linit	Quanner
Matrix Spike Dup (W1C1212-MSD1) Phosphorus as P, Total	<b>Source:</b> 0.328	<b>1C16041-01</b> 0.0067	0.010	mg/l	Prepared: 03/18/21 0.200	<b>Analyzed:</b> 0.118	<b>03/23/21</b> 105	90-110	0	20	
Batch: W1C1304 - SM 2540D											
Blank (W1C1304-BLK1) Total Suspended Solids	ND		5	mg/l	Prepared: 03/19/21	Analyzed:	03/22/21				
LCS (W1C1304-BS1) Total Suspended Solids	58.2		5	mg/l	Prepared: 03/19/21 62.2	Analyzed:	<b>03/22/21</b> 94	90-110			
Duplicate (W1C1304-DUP1) Total Suspended Solids	<b>Source:</b> 123	1C15021-02	5	mg/l	Prepared: 03/19/21	Analyzed: 120	03/22/21		3	20	
Duplicate (W1C1304-DUP2) Total Suspended Solids	<b>Source:</b> 112	1C19051-02	5	mg/l	Prepared: 03/19/21	Analyzed: 112	03/22/21		0	20	
Batch: W1C1352 - EPA 350.1											
Blank (W1C1352-BLK1) Ammonia as N	ND	0.047	0.10	mg/l	Prepared: 03/22/21	Analyzed:	03/23/21				
Blank (W1C1352-BLK2) Ammonia as N	ND	0.047	0.10	mg/l	Prepared: 03/22/21	Analyzed:	03/23/21				
LCS (W1C1352-BS1) Ammonia as N	0.242	0.047	0.10	mg/l	Prepared: 03/22/21 0.250	Analyzed:	<b>03/23/21</b> 97	90-110			
LCS (W1C1352-BS2) Ammonia as N	0.242	0.047	0.10	mg/l	Prepared: 03/22/21 0.250	Analyzed:	<b>03/23/21</b> 97	90-110			
Matrix Spike (W1C1352-MS1) Ammonia as N	<b>Source:</b> 0.247	<b>1C09002-02</b> 0.047	0.10	mg/l	Prepared: 03/22/21 0.250	Analyzed: ND	<b>03/23/21</b> 99	90-110			
Matrix Spike (W1C1352-MS2) Ammonia as N	<b>Source:</b> 0.521	<b>1C15045-01</b> 0.047	0.10	mg/l	Prepared: 03/22/21 0.250	<b>Analyzed:</b> 0.280	<b>03/23/21</b> 97	90-110			
Matrix Spike Dup (W1C1352-MSD1) Ammonia as N	<b>Source:</b> 0.246	<b>1C09002-02</b> 0.047	0.10	mg/l	Prepared: 03/22/21 0.250	Analyzed: ND	<b>03/23/21</b> 98	90-110	0.3	15	
Matrix Spike Dup (W1C1352-MSD2) Ammonia as N	<b>Source:</b> 0.522	<b>1C15045-01</b> 0.047	0.10	mg/l	Prepared: 03/22/21 0.250	<b>Analyzed:</b> 0.280	<b>03/23/21</b> 97	90-110	0.1	15	
Batch: W1C1455 - EPA 351.2											
Blank (W1C1455-BLK1) TKN	ND	0.065	0.10	mg/l	Prepared: 03/23/21	Analyzed:	03/25/21				
Blank (W1C1455-BLK2) TKN	ND	0.065	0.10	mg/l	Prepared: 03/23/21	Analyzed:	03/25/21				
LCS (W1C1455-BS1) TKN	0.998	0.065	0.10	mg/l	Prepared: 03/23/21 1.00	Analyzed:	<b>03/25/21</b> 100	90-110			
LCS (W1C1455-BS2) TKN	0.946	0.065	0.10	mg/l	Prepared: 03/23/21 1.00	Analyzed:	<b>03/25/21</b> 95	90-110			
Matrix Spike (W1C1455-MS1)	Source:	1C17064-01			Prepared: 03/23/21	Analyzed:	03/25/21				
1C15045											Page 7 of 9



**FINAL REPORT** 

Wood - San Diego 9177 Sky Park Court, Ste A		Project	Number:	r: Lake Elsinore and Canyon Lake Nutrient TMDL							Reported: 04/05/2021 12:35		
San Diego, CA 92123		Project	Manager:	John Rud	lolph								
Quality Control Results										(C	ontinued)		
Conventional Chemistry/Physical Parameters by APH	A/EPA/AST	M Methods	(Continue	(b									
					Spike	Source		%REC		RPD			
Analyte	Result	MDL	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier		
Batch: W1C1455 - EPA 351.2 (Continued)													
Matrix Spike (W1C1455-MS1)	Source: 1	C17064-01	0.40	Pre	epared: 03/23/21	Analyzed:	03/25/2	1					
IKN	1.28	0.065	0.10	mg/I	1.00	0.265	102	90-110					
Matrix Spike (W1C1455-MS2)	Source: 1	C17064-02		Pre	epared: 03/23/21	Analyzed:	03/25/2	1					
ΤΚΝ	1.20	0.065	0.10	mg/l	1.00	0.277	93	90-110					
Matrix Spike Dup (W1C1455-MSD1)	Source: 1	C17064-01		Pre	epared: 03/23/21	Analyzed	03/25/2 <sup>.</sup>	1					
TKN	1.25	0.065	0.10	mg/l	1.00	0.265	99	90-110	3	10			
Matrix Spike Dup (W1C1455-MSD2)	Source: 1	C17064-02		Pre	epared: 03/23/21	Analyzed	03/25/2	1					
TKN	1.20	0.065	0.10	mg/l	1.00	0.277	92	90-110	0.6	10			
Quality Control Results										(C	ontinued)		
Metals by EPA 200 Series Methods													
					Spike	Source		%REC		RPD			
Analyte	Result	MDL	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier		
Batch: W1C1080 - EPA 200.7													
Blank (W1C1080-BLK1)				Pre	epared: 03/17/21	Analyzed	03/20/2 <sup>.</sup>	1					
Calcium, Total	ND	0.160	0.500	mg/l									
Magnesium, Total		0.0390	0.500	mg/l									
LCS (W1C1080-BS1)				Pre	epared: 03/17/21	Analyzed	03/20/2	1					
Calcium, Total	48.9	0.160	0.500	mg/l	50.0		98	85-115					
Magnesium, Total	50.8	0.0390	0.500	mg/l	50.0		102	85-115					
Matrix Spike (W1C1080-MS1)	Source: 1	C12072-01		Pre	epared: 03/17/21	Analyzed	03/20/2	1					
Calcium, Total	67.8	0.160	0.500	mg/l	50.0	20.6	94	70-130					
Magnesium, Total	55.8	0.0390	0.500	mg/l	50.0	5.57	100	70-130					
Matrix Spike Dup (W1C1080-MSD1)	Source: 1	C12072-01		Pre	epared: 03/17/21	Analyzed	03/20/2	1					
Calcium, Total	69.6	0.160	0.500	mg/l	50.0	20.6	98	70-130	3	30			
Magnesium, Total	57.2	0.0390	0.500	mg/l	50.0	5.57	103	70-130	3	30			



Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123

# **Certificate of Analysis**

FINAL REPORT

 Project Number:
 Lake Elsinore and Canyon Lake Nutrient TMDL

 Project Manager:
 John Rudolph

**Reported:** 04/05/2021 12:35

Notes and Definitions

2010/02/00/	
ltem	Definition
J	Estimated conc. detected <mrl and="">MDL.</mrl>
%REC	Percent Recovery
Dil	Dilution
MDL	Method Detection Limit
MRL	The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ)
ND	NOT DETECTED at or above the Method Reporting Limit (MRL). If Method Detection Limit (MDL) is reported, then ND means not detected at or above the MDL.
RPD	Relative Percent Difference
Source	Sample that was matrix spiked or duplicated.

Any remaining sample(s) will be disposed of one month from the final report date unless other arrangements are made in advance.

All results are expressed on wet weight basis unless otherwise specified.

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.

### Lake Elsinore July 28, 2020 Water Column Profiles

Site	Time	Measure	Surface	1 m	2 m	3 m	4 m	5 m	6 m	7 m	8 m	Water Column Mean
		Temp (°C)	27.5	26.4	26.3	26.3	26.2	26.1	26.0	-		26.4
	11.12	Sp. Cond (µS/cm)	3143	3142	3142	3141	3142	3143	3143			3142
	11.12	рН	9.37	9.16	9.11	9.12	9.11	9.07	9.01			9.14
L F01		DO (mg/L)	13.0	4.5	3.3	3.7	3.7	2.0	0.9			4.4
LLUI		Temp (°C)	29.0	27.5	26.5	26.4	26.3	26.2	26.2			26.9
	13.38	Sp. Cond (µS/cm)	3147	3147	3143	3143	3143	3142	3143			3144
	10.00	pН	9.53	9.27	9.18	9.13	9.08	9.08	9.08			9.19
		DO (mg/L)	15.6	8.95	5.4	2.7	2.2	2.3	2.5			5.6
		Temp (°C)	26.6	26.6	26.6	26.5	26.4	26.3	26.3	26.3	26.2	26.4
	8.20	Sp. Cond (µS/cm)	3145	3146	3146	3146	3146	3145	3145	3145	3145	3145
	0.20	рН	9.32	9.26	9.24	9.21	9.20	9.17	9.17	9.15	9.14	9.21
		DO (mg/L)	6.8	5.4	4.6	4.0	3.9	3.4	3.2	2.8	2.7	4.1
LE02		Temp (°C)	28.8	26.7	26.6	26.5	26.4	26.4	26.3	26.3		26.8
13:30	12.20	Sp. Cond (µS/cm)	3157	3145	3143	3142	3143	3143	3143	3143		3145
	15.50	рН	9.58	9.20	9.11	9.09	9.09	9.08	9.08	9.06		9.16
		DO (mg/L)	16.4	4.6	3.1	3.2	3.2	2.6	2.3	2.4		4.7
		Temp (°C)	26.8	26.8	26.5	26.4	26.2	26.1	26.0			26.4
	07.38	Sp. Cond (µS/cm)	3136	3139	3147	3147	3148	3148	3148			3145
	07.50	рН	9.32	9.30	9.17	9.13	9.09	9.06	9.04			9.16
I Eosp		DO (mg/L)	6.5	5.7	2.1	1.5	0.6	0.2	0.1			2.4
LEUS		Temp (°C)	31.6	27.4	26.5	26.3	26.2	26.2	26.1			27.2
	12.20	Sp. Cond (µS/cm)	3152	3144	3145	3144	3144	3143	3145			3145
	13.20	pН	9.53	9.27	9.02	8.97	8.96	8.95	8.94			9.09
		DO (mg/L)	16.7	3.19	1.8	0.6	0.2	0.1	0.1	-	-	3.2
		Temp (°C)	28.6	26.9	26.6	26.4	26.3	26.3	26.3	26.3		26.7
Lakeshore	10.48	Sp. Cond (µS/cm)	3154	3144	3145	3144	3143	3144	3143	3142		3145
Sonde	10.40	pН	9.41	9.25	9.09	9.06	9.05	9.05	9.04	9.04		9.12
		DO (mg/L)	13.2	6.1	3.8	3.2	2.9	2.7	2.6	2.6		4.6
		Temp (°C)	27.4	26.9	26.8	26.5	26.4	26.3	26.3	25.7		26.5
Grand Ave	10.55	Sp. Cond (µS/cm)	3142	3141	3142	3142	3142	3142	3142	3144		3142
Sonde <sup>c</sup>	10.55	pН	9.3	9.25	9.18	9.08	9.06	9.06	9.07	8.96		9.12
		DO (mg/L)	10.2	8.6	3.9	2.7	2.5	2.8	2.7	0.1		4.2

a- Bottom measurement taken at 7.5 meters during morning profile readings.

b- Bottom measurement taken at 5.5 meters.

c- Bottom measurement taken at 6.5 meters.

### Lake Elsinore August 13, 2020 Water Column Profiles

Site	Time	Measure	Surface	1 m	2 m	3 m	4 m	5 m	6 m	7 m	8 m	Water Column Mean
		Temp (°C)	27.9	27.2	27.1	26.9	26.7	26.5	26.4			27.0
	10.45	Sp. Cond (µS/cm)	3198	3198	3198	3198	3196	3194	3193			3196
	10.45	pН	9.06	8.82	8.78	8.74	8.72	8.70	8.69			8.79
L E01		DO (mg/L)	7.8	2.4	1.5	0.5	0.1	0.1	0.1			1.8
LEUT		Temp (°C)	28.0	28.1	27.9	27.1	27.1	27.1	26.9			27.5
	15.05	Sp. Cond (µS/cm)	3199	3200	3198	3200	3197	3197	3197	-		3198
	15.05	pН	9.00	9.01	8.99	8.81	8.8	8.75	8.72	-		8.87
		DO (mg/L)	7.1	7.7	5.7	3.2	0.6	0.5	0.2			3.6
		Temp (°C)	27.3	27.3	27.3	27.2	26.9	26.5	26.4	26.2		26.9
	07.55	Sp. Cond (µS/cm)	3199	3199	3199	3199	3196	3193	3194	3193		3197
	07.55	pН	8.88	8.88	8.87	8.86	8.77	8.77	8.77	8.75		8.82
1 502		DO (mg/L)	2.6	2.6	2.5	2.3	0.1	0.0	0.0	0.0		1.3
LLUZ		Temp (°C)	28.8	28.7	27.3	27.2	27.0	27.1	27.0	26.7		27.5
	14.50	Sp. Cond (µS/cm)	3199	3201	3203	3199	3197	3196	3196	3193		3198
	14.50	pН	9.11	9.20	8.93	8.78	8.72	8.72	8.70	8.68		8.86
		DO (mg/L)	11.0	9.1	7.1	0.9	0.7	0.3	0.2	0.1		3.7
		Temp (°C)	27.2	27.2	27.2	26.8	26.5	26.4				26.9
	07.40	Sp. Cond (µS/cm)	3201	3201	3201	3198	3197	3196				3199
	07.40	pН	8.79	8.80	8.80	8.78	8.75	8.73				8.78
1 503		DO (mg/L)	0.9	0.9	0.9	0.1	0.1	0.1		-		0.5
LLUJ		Temp (°C)	29.4	29.0	28.1	27.4	27.0	26.4				27.9
	14.45	Sp. Cond (µS/cm)	3203	3201	3199	3197	3196	3193				3198
	14.45	pН	8.98	8.96	8.82	8.73	8.71	8.17	-	-		8.73
		DO (mg/L)	8.4	6.9	1.0	0.7	0.1	0.1				2.9
		Temp (°C)	27.5	27.4	27.3	27.2	26.7	26.4	26.4	26.2	26.2	26.8
Lakeshore	10.00	Sp. Cond (µS/cm)	3198	3199	3198	3198	3194	3192	3194	3191	3192	3195
Sonde	10.00	pН	8.93	8.88	8.80	8.77	8.73	8.71	8.71	8.69	8.68	8.77
		DO (mg/L)	7.0	2.6	1.84	1.25	0.19	0.0	0.0	0.0	0.0	1.4
		Temp (°C)	27.8	27.1	27.1	27.0	26.7	26.6	26.3	26.2		26.9
Grand Ave	00.20	Sp. Cond (µS/cm)	3197	3197	3197	3197	3195	3192	3192	3192		3195
Sonde <sup>a</sup>	09.50	рH	9.00	8.82	8.80	8.75	8.72	8.72	8.70	8.69		8.78
		DO (mg/L)	8.0	2.6	1.5	0.6	0.1	0.0	0.0	0.0		1.6

a- Bottom measurement taken at 6.5 meters.

Site	Time	Measure	Surface	1 m	2 m	3 m	4 m	5 m	6 m	7 m	8 m	Water Column Mean
		Temp (°C)	25.0	25.0	25.0	25.0	25.0	25.0	25.0			25.0
	07.30	Sp. Cond (µS/cm)	3315	3316	3315	3315	3315	3315	3315			3315
	07.55	pН	8.49	8.49	8.49	8.49	8.48	8.48	8.47		-	8.48
L E01		DO (mg/L)	0.6	0.5	0.4	0.3	0.4	0.4	0.3	-		0.4
LLUI		Temp (°C)	27.6	25.5	25.2	25.1	25.1	25.1	25.0			25.5
	12.40	Sp. Cond (µS/cm)	3320	3311	3314	3314	3315	3315	3316	-		3315
	13.40	pН	8.87	8.78	8.58	8.55	8.53	8.52	8.47			8.61
		DO (mg/L)	9.8	6.0	2.3	2.1	1.8	1.4	0.6			3.4
		Temp (°C)	25.4	25.4	25.4	25.3	25.3	25.2	25.2	25.1		25.3
	00.05	Sp. Cond (µS/cm)	3313	3313	3313	3314	3315	3314	3314	3314		3314
	00.05	pH	8.64	8.63	8.63	8.60	8.57	8.52	8.50	8.49		8.57
1 500		DO (mg/L)	3.6	3.4	3.3	2.8	1.7	0.8	0.3	0.1		2.0
LE02		Temp (°C)	27.2	25.6	25.3	25.2	25.2	25.2	25.1	25.1		25.5
	12.20	Sp. Cond (µS/cm)	3332	3311	3312	3314	3314	3315	3315	3315		3313
	13.30	pH	9.14	8.73	8.59	8.49	8.47	8.45	8.44	8.44		8.55
		DO (mg/L)	19.1	6.7	2.6	1.1	0.5	0.5	0.3	0.1		1.9
		Temp (°C)	25.3	25.3	25.3	25.3	25.3	25.3				25.3
	07.55	Sp. Cond (µS/cm)	3312	3313	3313	3313	3313	3313				3313
	07.55	pH	8.53	8.54	8.55	8.56	8.56	8.56				8.55
1 502		DO (mg/L)	2.3	2.1	2.0	2.0	2.0	1.0				1.9
LEUS		Temp (°C)	26.7	25.5	25.4	25.3	25.3	25.2				25.6
	12.15	Sp. Cond (µS/cm)	3314	3314	3313	3314	3314	3314				3314
	13.15	pH	8.97	8.76	8.53	8.51	8.49	8.46				8.62
		DO (mg/L)	15.5	5.0	2.6	2.0	1.3	1.0				4.6
		Temp (°C)	25.7	25.4	25.4	25.3	25.2	25.2	25.1	25.1	25.1	25.3
Lakeshore	10.15	Sp. Cond (µS/cm)	3312	3314	3314	3314	3314	3314	3314	3314	3314	3314
Sonde <sup>a</sup>	10.15	pН	8.74	8.63	8.61	8.58	8.55	8.53	8.52	8.51	8.51	8.58
		DO (mg/L)	7.3	3.1	2.4	1.9	1.4	0.9	0.8	0.6	0.6	2.1
		Temp (°C)	25.5	25.4	25.4	25.3	25.3	25.2	25.2	25.1		25.3
Grand Ave	00.50	Sp. Cond (µS/cm)	3311	3313	3312	3313	3314	3314	3313	3314		3313
Sonde <sup>b</sup>	09.50	pH	8.77	8.72	8.65	8.62	8.55	8.52	8.54	8.52		8.61
		DO (mg/L)	7.9	4.7	3.7	2.2	0.4	1.0	1.0	0.9		2.7

### Lake Elsinore September 14, 2020 Water Column Profiles

a- Bottom measurement taken at 7.5 meters.

b- Bottom measurement taken at 6.5 meters.

|--|

Site	Time	Measure	Surface	1 m	2 m	3 m	4 m	5 m	6 m	7 m	8 m	Water Column Mean
		Temp (°C)	24.5	24.4	24.4	24.4	24.4	24.4	24.4			24.4
	08.15	Sp. Cond (µS/cm)	3356	3357	3357	3357	3357	3357	3357			3357
	00.15	pН	8.76	8.76	8.76	8.75	8.75	8.75	8.75			8.75
L E01		DO (mg/L)	2.0	1.8	1.7	1.6	1.6	1.6	1.5			1.7
LLUI		Temp (°C)	26.4	26.4	25.3	25.0	24.6	24.5	24.5			25.2
	16.25	Sp. Cond (µS/cm)	3367	3364	3362	3360	3359	3359	3360			3362
	10.25	pН	9.08	9.07	8.98	8.87	8.79	8.72	8.73			8.89
		DO (mg/L)	11.6	9.6	6.0	3.9	1.3	1.1	1.5			5.0
		Temp (°C)	24.7	24.7	24.7	24.7	24.7	24.6	24.6	24.6		24.7
	00.20	Sp. Cond (µS/cm)	3356	3357	3357	3357	3357	3357	3357	3358		3357
	00.30	pН	8.82	8.80	8.80	8.78	8.77	8.75	8.74	8.73		8.77
1 502		DO (mg/L)	3.3	2.9	2.9	2.3	2.0	1.7	1.2	1.1	-	2.2
LEUZ		Temp (°C)	25.3	25.2	24.8	24.7	24.7	24.6	24.5	24.3		24.8
	15.40	Sp. Cond (µS/cm)	3358	3357	3359	3358	3358	3359	3359	3359		3358
	15.40	pН	8.90	8.90	8.75	8.71	8.70	8.68	8.66	8.65		8.74
		DO (mg/L)	7.3	7.0	2.1	1.4	1.3	0.7	0.3	0.2		2.5
		Temp (°C)	24.8	24.8	24.8	24.8	24.8	24.8				24.8
	00.00	Sp. Cond (µS/cm)	3356	3356	3357	3357	3357	3357				3357
	00.00	pН	8.77	8.77	8.76	8.76	8.77	8.76				8.77
1 502		DO (mg/L)	2.5	2.3	2.0	2.1	2.3	1.8		-	-	2.2
LEUS		Temp (°C)	27.0	25.3	24.9	24.8	24.8	24.7				25.3
	14.45	Sp. Cond (µS/cm)	3349	3359	3358	3358	3358	3359				3357
	14.45	pН	9.16	8.98	8.78	8.73	8.71	8.69				8.84
		DO (mg/L)	15.8	5.3	2.8	2.0	1.7	1.0				4.8
		Temp (°C)	26.0	26.0	25.0	24.7	24.7	24.7	24.6	24.5	24.3	24.9
Lakeshore	15.50	Sp. Cond (µS/cm)	3356	3356	3366	3360	3359	3358	3359	3359	3359	3359
Sonde <sup>a</sup>	13.30	pН	9.11	9.10	8.82	8.73	8.71	8.70	8.69	8.67	8.67	8.80
		DO (mg/L)	12.9	12.3	2.3	1.5	0.8	0.9	0.8	0.3	0.3	3.5
		Temp (°C)	26.3	25.6	24.8	24.7	24.7	24.7	24.5	24.4		25.0
Grand Ave	14.55	Sp. Cond (µS/cm)	3355	3362	3361	3359	3359	3359	3360	3359		3359
Grand Ave Sonde <sup>b</sup>	14:55	pH	9.17	9.06	8.79	8.72	8.70	8.70	8.67	8.67		8.81
		DO (mg/L)	13.7	9.9	2.1	1.3	1.1	1.2	0.2	0.1		3.7

a- Bottom measurement taken at 7.5 meters

b- Bottom measurement taken at 6.5 meters

Site	Time	Measure	Surface	1 m	2 m	3 m	4 m	5 m	6 m	7 m	8 m	Water Column Mean
		Temp (°C)	12.9	12.9	12.9	12.9	12.8	12.8	12.8			12.9
	07.30	Sp. Cond (µS/cm)	3374	3413	3443	3447	3450	3455	3456			3434
	07.50	pН	8.59	8.60	8.62	8.62	8.60	8.57	8.52			8.59
L E01		DO (mg/L)	6.0	5.8	5.8	5.7	5.6	4.4	3.5			5.2
LLUI		Temp (°C)	13.7	13.6	13.5	13.3	12.9	12.9	12.8			13.2
	15.30	Sp. Cond (µS/cm)	3489	3495	3498	3500	3502	3501	3502			3498
	15.50	рН	8.83	8.82	8.81	8.77	8.70	8.69	8.58			8.74
		DO (mg/L)	8.4	8.2	7.8	6.8	5.6	5.4	3.4			6.5
		Temp (°C)	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0		13.0
	08.25	Sp. Cond (µS/cm)	3459	3466	3469	3470	3471	3471	3471	3471		3469
	00.25	pН	8.71	8.70	8.70	8.69	8.69	8.69	8.68	8.68		8.69
1 502		DO (mg/L)	5.3	5.1	5.0	5.0	4.9	4.9	4.8	4.7		5.0
LLUZ		Temp (°C)	13.7	13.6	13.1	13.1	13.0	13.0	13.0	13.0		13.2
	15.18	Sp. Cond (µS/cm)	3494	3496	3502	3498	3499	3499	3500	3500		3499
	15.10	pН	8.81	8.78	8.70	8.66	8.65	8.65	8.65	8.65		8.69
		DO (mg/L)	7.8	7.3	5.8	5.0	4.8	4.6	4.6	4.5		5.5
		Temp (°C)	13.1	13.1	13.1	13.2	13.2	13.1				13.1
	08.05	Sp. Cond (µS/cm)	3448	3452	3457	3456	3457	3458				3455
	00.05	pН	8.72	8.72	8.73	8.73	8.74	8.73				8.73
1 503		DO (mg/L)	5.8	5.7	5.6	5.6	5.6	5.5				5.6
LLUJ		Temp (°C)	14.2	14.1	13.2	13.2	13.2	13.1				13.5
	15.00	Sp. Cond (µS/cm)	3492	3497	3484	3485	3485	3485				3488
	13.00	рН	8.87	8.86	8.71	8.70	8.69	8.69				8.75
		DO (mg/L)	9.3	8.6	5.6	5.4	5.3	5.2				6.6
		Temp (°C)	13.2	13.1	13.0	13.0	13.0	13.0	13.0	13.0	13.5	13.1
Lakeshore	11.20	Sp. Cond (µS/cm)	3486	3483	3485	3485	3485	3486	3486	3486	3404	3476
Sonde <sup>a</sup>	11.20	pН	8.70	8.68	8.65	8.65	8.65	8.65	8.65	8.65	7.09	8.49
		DO (mg/L)	5.4	5.3	4.8	4.7	4.6	4.6	4.5	4.5	0.2	4.3
		Temp (°C)	13.8	13.3	13.1	13.0	13.0	13.0	13.0	13.3		13.2
Grand Ave	10.55	Sp. Cond (µS/cm)	3494	3483	3483	3483	3484	3484	3484	3438		3479
Sonde <sup>b</sup>	10.55	pН	8.75	8.77	8.69	8.67	8.66	8.65	8.65	7.67		8.56
		DO (mg/L)	6.4	6.6	5.3	5.0	4.7	4.6	4.5	0.3		4.7

### Lake Elsinore December 9, 2020 Water Column Profiles

a- Bottom measurement taken at 7.5 meters

b- Bottom measurement taken at 6.5 meters

### Lake Elsinore February 17, 2021 Water Column Profiles

Site	Time	Measure	Surface	1 m	2 m	3 m	4 m	5 m	6 m	7 m	Water Column Mean
		Temp (°C)	13.4	13.4	13.3	13.2	13.1	13.1	13.1		13.2
1 E01	07:30	Sp. Cond (µS/cm)	3321	3318	3318	3318	3318	3318	3319		3319
LLUI	07.30	рН	8.81	8.79	8.73	8.62	8.66	8.65	8.64		8.70
		DO (mg/L)	9.6	9.6	9.4	9.0	8.7	8.6	8.3		9.0
		Temp (°C)	12.9	12.9	13.0	12.9	12.9	12.9	12.9	12.9	12.9
	07:50	Sp. Cond (µS/cm)	3317	3322	3322	3322	3322	3323	3324	3323	3322
LLUZ		рН	8.63	8.62	8.60	8.59	8.58	8.58	8.57	8.56	8.59
		DO (mg/L)	8.4	8.2	8.1	8.1	8.0	8.0	7.9	7.7	8.0
		Temp (°C)	13.5	13.3	13.1	13.0	13.0	13.0	13.0		13.1
LE03	10.15	Sp. Cond (µS/cm)	3321	3321	3322	3322	3323	3324	3324		3322
	10:15	рН	8.74	8.70	8.62	8.61	8.60	8.59	8.58		8.63
	-	DO (mg/L)	11.1	9.7	8.4	8.0	7.9	7.8	6.2		8.4

Notes:

Water column measurements were not recorded in the afternoon, or at the Lakeshore and Grand Avenue sonde locations, due to high winds and unsafe conditions on the lake (see text for details).

### Lake Elsinore April 8, 2021 Water Column Profiles

Site	Time	Measure	Surface	1 m	2 m	3 m	4 m	5 m	6 m	7 m	Water Column Mean
		Temp (°C)	18.7	18.7	18.7	18.7	18.7	18.0	16.1		18.2
1 E01	07.48	Sp. Cond (µS/cm)	3307	3307	3306	3306	3309	3308	3315		3308
LLUI	07.40	рН	9.02	9.01	9.00	9.00	8.98	8.89	8.64		8.93
		DO (mg/L)	9.8	9.7	9.5	9.5	8.6	6.5	0.4	-	7.7
		Temp (°C)	19.0	19.0	19.0	19.1	18.1	16.5	15.9	15.8	17.8
	08.20	Sp. Cond (µS/cm)	3297	3296	3297	3297	3317	3323	3300	3300	3303
LE02	08:20	рН	9.04	9.03	9.03	9.02	8.91	8.71	8.61	8.6	8.87
		DO (mg/L)	10.8	10.4	10.3	10.1	6.7	1.8	0.2	0.2	6.3
		Temp (°C)	19.1	19.1	19.0	18.0	17.4	16.3			18.2
LE03	09.10	Sp. Cond (µS/cm)	3301	3301	3301	3300	3303	3297			3301
	08:10	рН	9.03	9.03	9.00	8.85	8.78	8.62			8.89
	-	DO (mg/L)	10.5	10.3	9.7	5.2	3.2	0.4			6.6

Notes:

Water column measurements were not recorded in the afternoon, or at the Lakeshore and Grand Avenue sonde locations, due to high winds and unsafe conditions on the lake.

Lake Elsinore J	une 2, 1	2021 Wa	ater Column	Profiles
-----------------	----------	---------	-------------	----------

Site	Time	Measure	Surface	1 m	2 m	3 m	4 m	5 m	6 m	7 m	Water Column Mean
		Temp (°C)	23.0	23.5	23.5	23.5	23.4	23.0	22.9		23.3
	07.20	Sp. Cond (µS/cm)	3446	3466	3468	3470	3468	3469	3465		3465
	07.50	рН	8.97	8.97	8.97	8.96	8.93	8.86	8.82		8.93
		DO (mg/L)	10.1	9.3	9.2	8.7	7.6	5.7	4.3		7.8
LEUT		Temp (°C)	27.4	25	23.5	23.1	22.8	22.2	22		23.7
	14.40	Sp. Cond (µS/cm)	3469	3462	3455	3455	3457	3457	3456		3459
	14.40	рН	9.13	9.07	8.92	8.87	8.78	8.71	8.67		8.88
		DO (mg/L)	17.4	14.1	7.6	7.5	2.6	1.3	0.2		7.2
		Temp (°C)	23.9	23.8	23.7	23.5	22.8	22.4	22.1	22.0	23.0
	08.25	Sp. Cond (µS/cm)	3465	3464	3461	3464	3458	3457	3466	3461	3462
	00.25	рН	9.06	9.04	9.00	8.97	8.86	8.81	8.75	8.73	8.90
1 Eoop		DO (mg/L)	11.9	10.9	9.8	8.7	5.0	3.9	1.3	1.2	6.6
LE02		Temp (°C)	30.8	24.9	23.6	23.5	23.2	22.5	22.3	22.1	24.1
	14.50	Sp. Cond (µS/cm)	3488	3471	3456	3453	3457	3452	3451	3456	3461
	14.50	рН	9.17	9.05	8.94	8.91	8.86	8.78	8.75	8.71	8.90
		DO (mg/L)	19.9	10.1	8.9	7.8	6.0	4.0	2.8	1.0	7.5
		Temp (°C)	23.2	23.2	23.2	23.0	22.7	21.9			22.9
	08.10	Sp. Cond (µS/cm)	3459	3458	3460	3465	3460	3463			3461
	00.10	pН	8.98	8.99	8.96	8.91	8.87	8.72			8.91
		DO (mg/L)	9.5	10.0	7.4	6.9	4.4	0.2			6.4
LE03		Temp (°C)	30.3	24.4	23.0	22.7	22.6	22.1			24.2
	15.05	Sp. Cond (µS/cm)	3483	3445	3439	3453	3452	3455			3455
	15.05	рН	9.16	9.22	8.92	8.86	8.83	8.72			8.95
		DO (mg/L)	19.7	24.3	7.7	6.2	5.3	0.8			10.7
		Temp (°C)	27.2	24.3	23.7	23.4	23.1	22.7	22.2	21.7	23.5
Lakeshore	15.40	Sp. Cond (µS/cm)	3468	3472	3454	3452	3452	3454	3454	3457	3458
Sonde	13.40	рН	9.10	8.94	8.92	8.88	8.84	8.77	8.71	8.65	8.85
		DO (mg/L)	15.7	9.2	8.6	7.3	5.8	3.7	1.1	0.2	6.4
		Temp (°C)	28.2	24.8	23.6	23.2	23.1	22.8	22.0		24.0
Grand Ave	15.20	Sp. Cond (µS/cm)	3470	3479	3452	3451	3452	3456	3459		3460
Sonde	10.20	рН	9.22	9.1	8.95	8.89	8.85	8.78	8.68		8.92
		DO (mg/L)	22.0	14.5	9.2	7.7	5.9	4.0	0.3		9.1

a- Bottom measurement taken at 5.5 feet.

b- Bottom measurement taken at 6.5 feet.

c- Bottom measurement taken at 4.7 feet.

Canyon Lake August 13, 2020 Water Column Pro	files
--	-------

Site	Time	Measure	Surface	1 m	2 m	3 m	4 m	5 m	6 m	7 m	8 m	9 m	10 m	11 m	12 m	13 m	14 m	15 m	Water Column Mean - All	Water Column Mean - Epilimnion	Water Column Mean - Hypolimnion
Site         Tir $CL07^{a}$ 10: $CL07^{a}$ 15: $CL08^{b}$ 09: $CL08^{b}$ 14: $CL09$ 14: $0.9$ 14: $0.0$ 09: $0.0$ 14: $0.0$ 09: $0.0$ 09: $0.0$ 09: $0.0$ 09: $0.0$ 09: $0.0$ 09: $0.0$ 09: $0.0$ 09: $0.0$ 09: $0.0$ 09: $0.0$ 09: $0.0$ 09: $0.0$ 09: $0.0$ 09: $0.0$ 09: $0.0$ 09: $0.0$ 09:		Temp (°C)	28.6	28.2	28.0	27.9	27.6	26.5	21.8	18.8	16.6	15.5	15.0	14.8	14.7	14.6	14.5	14.5	20.5	28.1	14.7
	10.30	Sp. Cond (µS/cm)	653	654	655	655	659	667	679	680	683	683	688	689	694	702	716	742	681	655	705
	10.50	рН	9.16	9.20	9.17	9.15	8.97	7.90	7.16	7.10	7.11	7.11	7.06	7.05	7.02	6.98	6.90	6.81	7.74	9.13	6.97
CI 07 <sup>a</sup>		DO (mg/L)	8.7	8.8	8.6	8.4	6.9	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	8.3	0.0
CL07		Temp (°C)	29.7	29.1	28.3	28.0	27.9	26.2	21.8	18.8	17.1	15.5	15.1	14.9	14.7	14.6	14.6	14.5	20.7	28.6	14.7
	15.05	Sp. Cond (µS/cm)	660	656	658	657	657	667	680	681	680	682	684	691	697	704	710	718	680	658	701
	15.05	рН	9.24	9.32	9.25	9.24	9.14	8.00	7.27	7.13	7.10	7.09	7.08	7.02	6.99	6.95	6.91	6.87	7.79	9.24	6.97
		DO (mg/L)	9.6	9.9	9.4	9.2	8.1	0.5	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	3.0	9.2	0.0
		Temp (°C)	28.6	28.4	28.2	28.1	27.2	26.0	21.9	18.5	16.1	15.5	15.3		I	1	-	-	23.1	28.1	15.4
	00.45	Sp. Cond (µS/cm)	656	658	657	669	666	665	678	681	690	698	702		1		-		675	661	700
	09.45	рН	9.12	9.13	9.11	9.05	8.35	7.65	7.12	7.08	7.04	7.00	7.00		1		-		7.97	8.95	7.00
CL 00b		DO (mg/L)	8.4	8.5	8.4	7.4	4.1	0.2	0.1	0.1	0.0	0.0	0.0		I				3.4	7.3	0.0
CLU6		Temp (°C)	29.5	29.2	28.5	27.9	27.5	26.0	25.6	22.5	16.7	15.6	15.4		-				24.0	28.5	15.5
	14.50	Sp. Cond (µS/cm)	641	657	658	658	659	667	684	674	684	692	695		-				670	655	694
	14.50	рН	9.14	9.15	9.16	9.02	8.70	7.91	7.47	7.14	7.01	6.98	6.97		-				8.06	9.03	6.98
		DO (mg/L)	9.3	9.3	9.4	7.7	6.0	0.4	0.4	0.1	0.1	0.0	0.0						3.9	8.3	0.0
		Temp (°C)	27.9	27.9	27.8	27.8	27.3	22.1	17.7	15.9		-			1				24.3	27.9	15.9
	00.00	Sp. Cond (µS/cm)	738	740	739	739	763	901	984	1056									833	739	1056
	03.00	pН	9.25	9.25	9.23	9.18	8.44	7.05	6.97	6.88									8.28	9.23	6.88
CL 09		DO (mg/L)	9.2	9.2	8.6	8.1	2.4	0.2	0.1	0.1									4.7	8.8	0.1
OLUU		Temp (°C)	29.9	28.7	28.0	27.7	27.2	22.6	17.7	15.3		1			1				24.6	28.6	15.3
	14.30	Sp. Cond (µS/cm)	738	738	736	745	768	897	990	1054		1			1				833	739	1054
	14.00	рН	9.19	9.28	9.23	8.97	8.13	6.96	6.83	6.80		1			1				8.17	9.17	6.80
		DO (mg/L)	9.8	10.6	9.8	7.5	1.9	0.2	0.1	0.1		-			-				5.0	9.4	0.1
		Temp (°C)	27.9	27.9	27.9	27.8	27.6												27.8		
	08.00	Sp. Cond (µS/cm)	774	766	766	772	803												776		
	00.00	рН	9.18	9.19	9.17	8.88	8.42												8.97		
CI 10 <sup>0</sup>		DO (mg/L)	9.9	9.9	9.8	6.3	3.6												7.9		
CLIU		Temp (°C)	30.2	29.2	28.0	27.8	27.6												28.6		
	14.15	Sp. Cond (µS/cm)	759	756	759	794	803												774		
1	14.10	рН	9.15	9.28	9.09	8.69	8.11												8.86		
		DO (mg/L)	11.9	12.3	10.1	6.0	2.4					-			-				8.5		

Hypolimnion Epilimnion

Thermocline

No shading indicates no observed thermocline; lake well mixed

a- Bottom measurement taken at 14.5 meters.

b- Bottom measurement taken at 9.5 meters.

c- Bottom measurement taken at 3.5 meters.

### Canyon Lake October 5, 2020 Water Column Profiles

Site	Time	Measure	Surface	1 m	2 m	3 m	4 m	5 m	6 m	7 m	8 m	9 m	10 m	11 m	12 m	13 m	14 m	15 m	Water Column Mean - All	Water Column Mean - Epilimnion	Water Column Mean - Hypolimnion
		Temp (°C)	25.2	25.1	25.0	24.9	24.9	24.8	23.7	20.2	17.7	16.4	15.6	15.2	15.0	14.9	14.7	14.7	19.9	25.0	15.0
	10.27	Sp. Cond (µS/cm)	739	739	741	741	742	742	736	710	715	714	723	726	738	747	758	781	737	741	746
	10.27	pН	8.55	8.56	8.54	8.50	8.49	8.20	7.34	7.11	7.13	7.16	7.15	7.12	7.09	7.06	6.98	6.90	7.62	8.47	7.05
CL 07 <sup>a</sup>		DO (mg/L)	8.0	7.9	7.8	7.6	7.4	5.5	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.8	7.4	0.0
CL07		Temp (°C)	27.5	25.9	25.2	25.0	25.0	24.7	24.3	20.8	17.9	16.6	15.8	15.4	15.0	14.8	14.8	14.7	20.2	25.6	15.1
	15:05	Sp. Cond (µS/cm)	750	743	743	745	746	749	750	714	714	717	717	723	741	746	749	780	739	746	743
	10.00	рН	8.65	8.94	8.71	8.56	8.47	8.38	7.67	7.10	7.13	7.13	7.14	7.14	7.06	7.03	7.00	6.78	7.68	8.62	7.03
		DO (mg/L)	8.9	10.9	8.7	8.1	7.5	7.1	1.6	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	3.3	8.5	0.0
		Temp (°C)	25.3	25.2	25.1	25.0	25.0	24.8	23.7	20.9	17.9								23.7	25.1	17.9
	00.48	Sp. Cond (µS/cm)	742	741	742	742	743	746	736	715	725	-						-	737	743	725
	03.40	pН	8.52	8.51	8.49	8.45	8.42	7.85	7.22	7.05	7.07	1		1				-	7.95	8.37	7.07
CL 08		DO (mg/L)	7.8	7.7	7.6	7.4	7.2	2.8	0.1	0.1	0.0	1		1				-	4.5	6.8	0.0
OLUU		Temp (°C)	26.7	26.1	25.2	25.1	25.0	24.8	24.2	21.0	17.8						-		24.0	25.5	17.8
	14.50	Sp. Cond (µS/cm)	741	741	742	742	743	717	742	715	721						-		734	738	721
	14.50	pН	8.72	8.75	8.58	8.51	8.47	8.00	7.50	7.04	7.06	1		1				-	8.07	8.51	7.06
		DO (mg/L)	9.4	9.5	8.3	7.9	7.7	4.5	0.2	0.1	0.1	1		1				-	5.3	7.9	0.1
		Temp (°C)	25.0	25.0	24.9	24.9	24.9	23.8	19.1	17.1		-		-					23.1	24.9	17.1
	08.55	Sp. Cond (µS/cm)	864	865	864	863	864	883	1087	1113		1		1				-	925	864	1113
	00.55	pН	8.52	8.57	8.52	8.55	8.55	7.19	6.96	6.96		-							7.98	8.54	6.96
CL 00 <sup>b</sup>		DO (mg/L)	7.2	7.4	6.8	7.0	6.7	0.2	0.1	0.1		-		-					4.4	7.0	0.1
CLU9		Temp (°C)	27.7	25.6	25.1	25.0	24.9	24.0	18.9	18.4		1		-			-		23.7	25.7	18.4
	14:25	Sp. Cond (µS/cm)	867	862	858	859	862	881	1072	1084		-		-					918	862	1084
	14.23	pН	8.79	8.85	8.71	8.58	8.36	7.22	6.93	6.81		-		-					8.03	8.66	6.81
		DO (mg/L)	9.9	10.0	8.7	7.2	6.2	0.3	0.2	0.1									5.3	8.4	0.1
		Temp (°C)	25.0	25.0	25.0	25.0		1	1			1		1					25.0		
	08.08	Sp. Cond (µS/cm)	896	896	898	899		1	-			1		1					897		
	00.00	pН	8.53	8.54	8.59	8.63						-		-					8.57		
CI 10		DO (mg/L)	6.8	6.8	7.3	7.5		-	-			-		-					7.1		
OLIO		Temp (°C)	27.8	25.6	25.2	25.0		-	-		-	1		-	-	-	-	-	25.9		
	14.09	Sp. Cond (µS/cm)	901	896	897	898													898		
14	14.00	pН	8.87	8.83	8.53	8.45													8.67		
		DO (mg/L)	11.0	10.5	7.6	6.9													9.0		

Hypolimnion Epilimnion

Thermocline

No shading indicates no observed thermocline; lake well mixed

a- Bottom measurement taken at 14.5 meters.

b- Bottom measurement taken at 6.5 meters.

### Canyon Lake December 9, 2020 Water Column Profiles

Site	Time	Measure	Surface	1 m	2 m	3 m	4 m	5 m	6 m	7 m	8 m	9 m	10 m	11 m	12 m	13 m	14 m	Water Column Mean - All	Water Column Mean - Epilimnion	Water Column Mean - Hypolimnion
		Temp (°C)	14.0	13.9	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8		
	10.35	Sp. Cond (µS/cm)	725	724	724	724	724	725	725	725	725	725	725	726	732	744	747	728		
	10.55	pН	7.45	7.33	7.30	7.28	7.28	7.27	7.27	7.27	7.27	7.27	7.27	7.27	7.26	7.23	7.22	7.28		
CL 07		DO (mg/L)	3.0	2.6	2.4	2.4	2.4	2.4	2.3	2.4	2.3	2.4	2.6	2.6	2.1	1.6	1.4	2.3	Water Column Mean - Epilimnion         Water Column Mean - Epilimnion           3.8          28           28          28           28          29           2.3          29           3.1          29           2.5          37           3.7          22           2.3          37           2.2          23           3.7          22           3.7          23           3.6          38           2.3          3.3           3.6          3.6           2.8          3.6           3.3          3.3           3.0          3.3           3.0          3.2           2.6          3.2           3.2          3.2           3.2          3.2	
CL07		Temp (°C)	14.4	14.1	13.9	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.9		
	15.20	Sp. Cond (µS/cm)	725	725	724	724	725	725	725	725	725	726	726	729	737	742	746	729		-
	15.20	pН	7.55	7.42	7.35	7.31	7.30	7.28	7.28	7.29	7.29	7.29	7.29	7.28	7.27	7.25	7.22	7.31		
		DO (mg/L)	3.9	3.4	2.7	2.6	2.3	2.4	2.5	2.6	2.7	2.8	2.6	2.6	2.2	1.8	1.4	2.5		
		Temp (°C)	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	-	-				13.7		
	00.50	Sp. Cond (µS/cm)	722	722	722	722	722	722	722	722	722	722	-	-				722		
	09.00	pН	7.38	7.37	7.36	7.35	7.35	7.35	7.33	7.32	7.31	7.31				-		7.34		-
CI 008		DO (mg/L)	3.9	3.8	3.6	3.6	3.6	3.6	3.5	3.5	3.5	3.5			-			3.6		
CL08		Temp (°C)	14.4	14.2	13.8	13.7	13.7	13.7	13.7	13.7	13.7	13.7		-	-			13.8		
	15.05	Sp. Cond (µS/cm)	724	724	723	722	722	723	724	723	722	722				-		723	-	
	15.05	pН	7.50	7.47	7.42	7.37	7.36	7.32	7.30	7.30	7.31	7.31						7.37		
		DO (mg/L)	5.1	4.9	3.9	3.7	3.6	2.9	2.8	3.0	3.3	3.2						3.6		
		Temp (°C)	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	-	-	-	-	-			12.8		
	08.20	Sp. Cond (µS/cm)	843	843	843	843	846	851	861	862								849		
	00.00	рН	7.39	7.39	7.39	7.42	7.43	7.47	7.52	7.52								7.44		
CL 00b		DO (mg/L)	2.8	2.8	2.8	3.0	3.1	3.5	4.3	4.4								3.3		
CLU9		Temp (°C)	13.9	13.2	13.0	12.9	12.8	12.8	12.8	12.8								13.0		
	14.35	Sp. Cond (µS/cm)	840	838	837	839	843	849	855	855								845		
	14.00	pН	7.48	7.43	7.40	7.38	7.39	7.40	7.41	7.42								7.41		
		DO (mg/L)	3.7	3.0	2.8	2.8	3.0	3.3	3.4	3.4								3.2		
		Temp (°C)	12.6	12.6	12.6	12.6												12.6		
	07.55	Sp. Cond (µS/cm)	856	857	859	872												861		
	01.00	pН	7.67	7.63	7.61	7.64												7.64		
CI 10		DO (mg/L)	5.4	5.2	5.4	5.7												5.4		
0210		Temp (°C)	14.0	13.3	12.7	12.6												13.2		
	14.20	Sp. Cond (µS/cm)	850	848	847	861												852		
	14.20	pН	7.86	7.81	7.74	7.70												7.78		
		DO (mg/L)	7.0	7.0	6.3	6.4												6.7		



No shading indicates no observed thermocline; lake well mixed

a- Bottom measurement taken at 8.5 meters.

b- Bottom measurement taken at 6.5 meters.

Site	Time	Measure	Surface	1 m	2 m	3 m	4 m	5 m	6 m	7 m	8 m	9 m	10 m	11 m	12 m	13 m	14 m	Water Column Mean - All
		Temp (°C)	13.5	13.4	13.1	13.0	13.0	12.9	12.9	12.7	12.2	11.8	11.7	11.7	11.7	11.7	11.7	12.5
CL 07	10.40	Sp. Cond (µS/cm)	767	766	766	766	765	765	765	781	793	804	819	822	822	823	n 14 m 7 11.7 8 825 0 7.29 0.7           	790
CLUT	10.40	pН	7.68	7.67	7.66	7.65	7.65	7.64	7.63	7.52	7.43	7.39	7.35	7.33	7.32	7.30		7.50
CL08 <sup>a</sup>		DO (mg/L)	7.2	7.2	7.1	7.1	7.0	7.0	6.9	4.2	3.6	2.7	1.9	1.6	1.5	1.2	0.7	4.5
		Temp (°C)	13.6	13.5	13.4	13.3	13.2	12.6	12.2	12.0	11.9							12.9
	00:45	Sp. Cond (µS/cm)	756	757	759	759	760	765	780	778	785							767
CL08	09.45	pН	7.82	7.71	7.70	7.68	7.67	7.49	7.44	7.37	7.33			-				7.58
		DO (mg/L)	7.4	7.3	7.2	7.1	7.1	4.3	2.7	2.0	1.5							5.2
		Temp (°C)	13.2	13.3	13.2	13.2	12.9	12.4	11.8	11.7								12.7
	09.45	Sp. Cond (µS/cm)	847	847	845	868	911	964	989	1000								909
CL09	06.45	pН	8.89	8.87	8.83	8.63	8.07	7.66	7.49	7.47								8.24
		DO (mg/L)	14.8	14.8	14.1	11.5	6.2	0.6	0.2	0.1								7.8
		Temp (°C)	13.4	13.4	13.4	13.3	13.0											13.3
CI 10	07.50	Sp. Cond (µS/cm)	888	888	889	904	932											900
CL07 CL08ª CL09 <sup>b</sup> CL10	07.50	pН	8.84	8.86	8.84	8.56	7.95											8.61
		DO (mg/L)	13.9	13.9	13.7	11.8	6.3											11.9

### Canyon Lake February 17, 2021 Water Column Profiles

Notes:

Hypolimnion Epilimnion Thermocline

No shading indicates no observed thermocline; lake well mixed

Water column measurements were not recorded in the afternoon due to high winds and unsafe conditions on the lake (see text for details).

a- Bottom measurement taken at 7.5 meters.

b- Bottom measurement taken at 6.9 meters.

#### Canyon Lake April 8, 2021 Water Column Profiles

Site	Time	Measure	Surface	1 m	2 m	3 m	4 m	5 m	6 m	7 m	8 m	9 m	10 m	11 m	12 m	13 m	14 m	15 m	16 m	Water Column Mean - All	Water Column Mean - Epilimnion	Water Column Mean - Hypolimnion
CL07 <sup>a</sup>		Temp (°C)	19.9	19.7	19.6	19.5	17.9	16.1	15.1	14.3	13.9	13.6	13.4	13.3	13.3	13.2	13.2	13.1	13.1	15.4	19.7	13.4
	10.42	Sp. Cond (µS/cm)	778	778	778	778	791	784	782	792	797	799	801	802	803	802	803	807	808	793	778	801
	10.40	pН	8.19	8.17	8.15	8.14	7.90	7.70	7.58	7.46	7.39	7.35	7.30	7.28	7.26	7.25	7.24	7.21	7.17	7.57	8.16	7.29
CL 078		DO (mg/L)	10.0	10.0	9.9	9.8	8.3	6.6	4.8	2.8	1.9	1.1	0.2	0.1	0.1	0.1	0.0	0.0	0.0	3.8	9.9	0.6
CL07		Temp (°C)	21.6	20.2	19.9	19.5	17.0	15.3	14.7	14.4	13.8	13.6	13.5	13.4	13.3	13.3	13.2	13.2	13.1	15.5	20.3	13.5
	15.10	Sp. Cond (µS/cm)	781	779	778	778	783	783	789	794	798	798	801	802	802	802	802	804	808	793	779	801
	10.10	pН	8.23	8.23	8.22	8.17	7.97	7.62	7.56	7.53	7.44	7.40	7.36	7.32	7.31	7.30	7.29	7.27	7.23	7.61	8.21	7.35
		DO (mg/L)	10.0	10.2	10.1	9.8	8.2	4.9	3.8	2.3	1.4	1.1	0.4	0.2	0.1	0.1	0.1	0.1	0.1	3.7	10.0	0.6
		Temp (°C)	20.6	20.3	20.1	18.5	16.9	15.6	14.8	14.4	14.0	13.7					-		1	16.9	20.3	14.2
	10.00	Sp. Cond (µS/cm)	775	774	775	787	778	785	785	790	796	803					-		1	785	775	794
	10.00	pH	8.13	8.14	8.14	7.96	7.76	7.64	7.47	7.34	7.30	7.26					1		1	7.71	8.14	7.34
CL OB <sup>b</sup>		DO (mg/L)	9.8	9.9	10.0	8.4	7.2	5.3	3.0	1.4	0.2	0.1					-		-	5.5	9.9	1.2
CL08		Temp (°C)	21.7	21.1	20.1	19.8	17.6	15.8	15.1	14.6	14.2	14.2					1		-	17.4	21.0	14.5
	14.55	Sp. Cond (µS/cm)	776	776	775	780	782	781	783	788	793	794					-		1	783	776	790
	14.00	pH	8.24	8.22	8.21	8.13	7.82	7.68	7.53	7.45	7.39	7.35					-		-	7.80	8.22	7.43
		DO (mg/L)	10.1	10.3	10.2	9.5	7.7	5.8	4.0	2.5	1.0	0.5		-			-		-	6.2	10.2	2.0
		Temp (°C)	20.2	20.2	20.1	18.8	17.2	15.4	13.9	12.9	12.5	-	-	-		-	1		1	16.8	20.2	12.7
	0.05	Sp. Cond (µS/cm)	912	912	910	984	959	958	981	1020	1028	1					1		1	963	911	1024
	3.05	pН	8.35	8.36	8.30	7.63	7.51	7.38	7.23	7.05	7.02	1					-		1	7.65	8.34	7.04
CL 00°		DO (mg/L)	10.7	10.7	10.4	3.5	2.1	0.2	0.1	0.1	0.1	-					-		-	4.2	10.6	0.1
CLU9		Temp (°C)	22.1	20.8	20.4	19.4	17.1	15.7	13.9	13.8		I					-		1	17.9	21.1	13.9
	14.30	Sp. Cond (µS/cm)	911	905	910	960	950	957	972	980		1					-		1	943	909	976
	14.00	pН	8.50	8.50	8.44	7.74	7.50	7.42	7.29	7.23		1					-		1	7.83	8.48	7.26
		DO (mg/L)	11.5	12.0	11.1	5.8	1.9	0.5	0.2	0.1		1					1		1	5.4	11.5	0.2
		Temp (°C)	20.1	20.3	20.3	19.3	19.0	1	-	-		1	-	-		-	1		1	19.8		
	8.15	Sp. Cond (µS/cm)	974	971	968	1026	1031					-							-	994		
	0.15	pH	8.05	8.04	8.06	7.54	7.36									-				7.81		
CL 10 <sup>d</sup>		DO (mg/L)	9.6	9.6	9.7	2.3	1.5	-				-					-		-	6.5		
CL10		Temp (°C)	22.8	21.1	20.5	20.0														21.1		
	14.10	Sp. Cond (µS/cm)	959	958	959	1015														973		
	14.10	pН	8.37	8.35	8.28	7.81														8.20		
		DO (mg/L)	10.5	10.4	10.0	3.4											-			8.6		

Notes:

Hypolimnion

Epilimnion

Thermocline

No shading indicates no observed thermocline; lake well mixed

a- Bottom measurement taken at 15.3 meters in the morning and 15.5 meters in the afternoon.

b- Bottom measurement taken at 8.5 meters.

c- Bottom measurement taken at 7.5 meters.

d- Bottom measurement taken at 3.4 meters in the morning and 3 meters in the afternoon.

### Canyon Lake June 2, 2021 Water Column Profiles

Site	Time	Measure	Surface	1 m	2 m	3 m	4 m	5 m	6 m	7 m	8 m	9 m	10 m	11 m	12 m	13 m	14 m	15 m	Water Column Mean - All	Water Column Mean - Epilimnion	Water Column Mean - Hypolimnion
		Temp (°C)	26.1	25.4	25.1	24.7	24.3	22.4	20.6	18.6	16.5	15.2	14.5	14.1	14.0	13.9	13.8	13.8	18.9	25.3	14.2
	10.50	Sp. Cond (µS/cm)	876	876	875	874	875	875	872	863	860	859	861	860	865	865	865	868	868	875	863
	10.00	pH	8.57	8.59	8.59	8.56	8.44	7.96	7.60	7.40	7.31	7.25	7.20	7.20	7.17	7.17	7.16	7.11	Water Column Mean - All         Water Column Mean - Epilimnion           18.9         25.3           868         875           7.71         8.58           3.4         10.5           18.9         25.6           865         871           7.79         8.72           3.6         11.3           21.7         25.1           872         873           8.08         8.66           5.7         10.8           22.1         25.9           866         866           8.14         8.75           6.3         12.3           22.3         25.0           1047         1031           7.84         8.24           4.3         7.7           22.8         26.0           1043         1022           7.88         8.27           4.9         8.5           25.1            1063            8.14	7.18	
CI 07ª		DO (mg/L)	10.6	10.6	10.5	10.2	8.8	3.7	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.4	10.5	0.0
CL07		Temp (°C)	27.0	25.6	25.3	24.6	24.0	22.2	20.7	18.6	16.0	14.6	14.3	14.1	14.0	14.0	13.9	13.8	18.9	25.6	14.1
	15.25	Sp. Cond (µS/cm)	875	870	868	870	870	875	868	858	856	858	862	862	863	863	862	864	865	871	862
	10.20	pH	8.72	8.75	8.75	8.66	8.47	7.89	7.61	7.48	7.43	7.35	7.28	7.26	7.24	7.23	7.24	7.20	7.79	8.72	7.26
		DO (mg/L)	11.6	11.7	11.7	10.2	8.1	3.1	0.4	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	3.6	11.3	0.0
		Temp (°C)	26.0	25.1	25.0	24.4	24.0	22.7	20.4	18.3	16.0	15.3							21.7	25.1	15.3
	09.55	Sp. Cond (µS/cm)	873	870	871	876	880	876	874	866	866	867						-	872	873	867
	03.00	pН	8.57	8.74	8.72	8.60	8.44	8.18	7.60	7.40	7.29	7.25		-				-	8.08	8.66	7.25
CL 09b		DO (mg/L)	11.3	11.4	11.1	9.5	8.0	5.5	0.2	0.1	0.0	0.0							5.7	10.8	0.0
CLUO		Temp (°C)	27.5	26.0	25.2	24.7	24.2	22.8	20.7	17.8	16.5	15.9		1					22.1	25.9	15.9
	15:05	Sp. Cond (µS/cm)	865	864	867	869	870	872	868	860	859	861		-					866	866	861
	10.00	pН	8.69	8.80	8.78	8.73	8.42	8.15	7.62	7.50	7.40	7.30							8.14	8.75	7.30
		DO (mg/L)	12.5	13.3	12.6	10.9	8.3	5.0	0.3	0.2	0.1	0.1							6.3	12.3	0.1
		Temp (°C)	25.3	25.1	25.0	24.6	23.8	21.8	17.4	15.1									22.3	25.0	15.1
	00.00	Sp. Cond (µS/cm)	1031	1031	1030	1033	1077	1025	1057	1092									1047	1031	1092
	03.00	pН	8.25	8.27	8.26	8.16	7.81	7.63	7.23	7.13									7.84	8.24	7.13
CL 09		DO (mg/L)	8.0	8.1	7.9	7.0	2.9	0.2	0.1	0.0				-					4.3	7.7	0.0
OLUU		Temp (°C)	27.9	26.0	25.4	24.7	24.0	21.5	17.7	15.0		-						-	22.8	26.0	15.0
	14.40	Sp. Cond (µS/cm)	1006	1026	1029	1026	1072	1021	1054	1107		-						-	1043	1022	1107
	14.40	pН	8.27	8.28	8.30	8.22	8.00	7.67	7.24	7.06									7.88	8.27	7.06
		DO (mg/L)	8.6	8.8	8.9	7.9	4.6	0.4	0.2	0.1									4.9	8.5	0.1
		Temp (°C)	25.2	25.2	25.1	25.0	-		-			-		-					25.1		
	08.05	Sp. Cond (µS/cm)	1059	1060	1065	1067	-		-					-					1063		
	00.00	pН	8.14	8.14	8.14	8.14			-					-				-	8.14		
CI 10 <sup>6</sup>		DO (mg/L)	8.3	8.2	7.8	7.2	1	-	-		-	-		-			-	-	7.9		
CLIU		Temp (°C)	28.0	26.0	25.5	25.2	-		-	-	-	-	-	-	-			-	26.2		
	14.20	Sp. Cond (µS/cm)	1062	1052	1037	1055													1052		
	14.20	pH	8.36	8.39	8.36	8.30													8.35		
		DO (mg/L)	9.5	9.6	9.0	8.2													9.1		

Notes:

Hypolimnion

Epilimnion

Thermocline

No shading indicates no observed thermocline; lake well mixed

a- Bottom measurement taken at 14.5 feet in the afternoon.

b- Bottom measurement taken at 8.5 feet.

c- Bottom measurement taken at 2.5 feet.



**FINAL REPORT** 

Work Orders:	0G28110	Report Date:	8/31/2020
		Received Date:	7/28/2020
Project:	LE TMDL Monitoring	Turnaround Time:	Normal
	C C	Phones:	(858) 514-6465
		Fax:	(858) 300-4301
Attn:	John Rudolph	P.O. #:	
Client:	Wood - San Diego 2 9210 Sky Park Court, Suite 200 San Diego, CA 92123	Billing Code:	

#### DoD-ISO ANAB # • ELAP-CA #1132 • EPA-UCMR #CA00211 • HW-DOH # • ISO17025 ANAB #L2457.01 • LACSD #10143 • NELAP-OR #4047 • NJ-DEP #CA015 • SCAOMD #93LA1006

This is a complete final report. The information in this report applies to the samples analyzed in accordance with the chain-of-custody document. Weck Laboratories certifies that the test results meet all requirements of TNI unless noted by qualifiers or written in the Case Narrative. This analytical report must be reproduced in its entirety.

Dear John Rudolph,

Enclosed are the results of analyses for samples received 7/28/20 with the Chain-of-Custody document. The samples were received in good condition, at 4.1 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

**Reviewed by:** 

1: State

Chris Samatmanakit **Project Manager** 





### Wood - San Diego 2 9210 Sky Park Court, Suite 200 San Diego, CA 92123

# **Certificate of Analysis**

FINAL REPORT

Project Number: LE TMDL Monitoring

Reported: 08/31/2020 12:32

Project Manager: John Rudolph

### Sample Summary

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
LE02	John Rudolph	0G28110-01	Water	07/28/20 08:30	



Wood - San Diego 2 9210 Sky Park Court, Suite 200 San Diego, CA 92123

# **Certificate of Analysis**

FINAL REPORT

Project Number: LE TMDL Monitoring

Project Manager: John Rudolph

Reported: 08/31/2020 12:32

Sample Results

Sample:	LE02					Sampled	: 07/28/20 8:30 by	John Rudolph
	0G28110-01 (Water)							
Analyte		Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional C	Chemistry/Physical Parameters by	y APHA/EPA/ASTM Methods						
Method: EPA	350.1			Instr: AA06				
Batch ID: W	V0G1601	Preparation: _NONE (WETCHEM)		<b>Prepared:</b> 07/30	0/20 10:48			Analyst: YMT
Ammonia a	as N	ND	0.012	0.10	mg/l	1	08/03/20	
Method: EPA	353.2			Instr: AA01				
Batch ID: W	V0G1513	Preparation: _NONE (WETCHEM)		Prepared: 07/29	9/20 09:40			Analyst: sar
Nitrate as N	N	ND	0.040	0.20	mg/l	1	07/29/20 11:21	
Nitrite as N		ND	42	100	ug/l	1	07/29/20 11:21	
Method: EPA	365.3			Instr: UVVIS04				
Batch ID: W	V0G1523	Preparation: _NONE (WETCHEM)		<b>Prepared:</b> 07/29	9/20 10:29			Analyst: sbn
o-Phospha	ite as P	0.0030	0.0030	0.010	mg/l	1	07/29/20 16:01	J
Method: EPA	365.3			Instr: UVVIS04				
Batch ID: W	V0G1630	Preparation: _NONE (WETCHEM)		<b>Prepared:</b> 07/30	0/20 16:09			Analyst: sbn
Phosphoru	us as P, Total	0.13	0.00083	0.010	mg/l	1	08/04/20	
Method: SM	2540C			Instr: OVEN01				
Batch ID: W	V0G1659	Preparation: _NONE (WETCHEM)		Prepared: 07/3	1/20 11:31			Analyst: ism
Total Disso	olved Solids	1800	4.0	10	mg/l	1	07/31/20	
Method: SM	4500S2-D			Instr: _ANALYST	г			
Batch ID: W	V0G1623	Preparation: _NONE (WETCHEM)		<b>Prepared:</b> 07/30	0/20 15:10			Analyst: mfh
Sulfide, Tot	tal	ND	0.050	0.10	mg/l	1	07/30/20	
Sample:	LE02					Sampled	: 07/28/20 8:30 by	John Rudolph
	0G28110-01RE2 (Water)							
Analyte		Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional C	Chemistry/Physical Parameters by	y APHA/EPA/ASTM Methods						
Method: EPA	351.2			Instr: AA06				
Batch ID: W	V0G1676	Preparation: _NONE (WETCHEM)		Prepared: 07/3	1/20 16:03			Analyst: YMT
TKN		4.6	0.036	0.20	mg/l	2	08/04/20	


FINAL REPORT

Wood - San Diego 2 9210 Sky Park Court, Suite 200 San Diego, CA 92123 Project Number: LE TMDL Monitoring

Reported: 08/31/2020 12:32

Project Manager: John Rudolph

#### **Quality Control Results**

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

					Spike	Source		%REC		RPD	
Analyte	Result	MDL	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier
Batch: W0G1513 - EPA 353.2											
Blank (W0G1513-BLK1)					Prepared & Ana	lyzed: 07/2	9/20				
Nitrate as N	ND ND	0.040	0.20	mg/l		-					
Nitrite as N		42	100	ug/l							
LCS (W0G1513-BS1)					Prepared & Ana	lyzed: 07/2	9/20				
Nitrate as N	1.02	0.040	0.20	mg/l	1.00		102	90-110			
Nitrite as N	981	42	100	ug/l	1000		98	90-110			
Matrix Spike (W0G1513-MS1)	Source: 00	G23003-01			Prepared & Ana	lyzed: 07/2	9/20				
Nitrate as N	2.48	0.040	0.20	mg/l	2.00	0.399	104	90-110			
Nitrite as N	- 1030	42	100	ug/l	1000	ND	103	90-110			
Matrix Spike (W0G1513-MS2)	Source: 00	G23003-03			Prepared & Ana	lyzed: 07/2	9/20				
Nitrate as N	2.37	0.040	0.20	mg/l	2.00	0.319	103	90-110			
Nitrite as N	1000	42	100	ug/l	1000	ND	100	90-110			
Matrix Spike Dup (W0G1513-MSD1)	Source: 00	G23003-01			Prepared & Ana	lyzed: 07/2	9/20				
Nitrate as N	2.48	0.040	0.20	mg/l	2.00	0.399	104	90-110	0	20	
Nitrite as N	1030	42	100	ug/l	1000	ND	103	90-110	0	20	
Matrix Spike Dup (W0G1513-MSD2)	Source: 00	G23003-03			Prepared & Ana	lyzed: 07/2	9/20				
Nitrate as N	2.37	0.040	0.20	mg/l	2.00	0.319	103	90-110	0	20	
Nitrite as N	1000	42	100	ug/l	1000	ND	100	90-110	0	20	
Batch: W0G1523 - EPA 365.3											
Blank (W0G1523-BLK1)					Prepared & Ana	lyzed: 07/2	9/20				
o-Phosphate as P	ND	0.0030	0.010	mg/l							
LCS (W0G1523-BS1)					Prepared & Ana	lyzed: 07/2	9/20				
o-Phosphate as P	0.191	0.0030	0.010	mg/l	0.200		96	88-111			
Matrix Spike (W0G1523-MS1)	Source: 00	G28048-01			Prepared & Ana	lyzed: 07/2	9/20				
o-Phosphate as P	0.304	0.0030	0.010	mg/l	0.200	0.104	100	85-112			
Matrix Spike Dup (W0G1523-MSD1)	Source: 00	528048-01			Prepared & Ana	lvzed: 07/2	9/20				
o-Phosphate as P	0.302	0.0030	0.010	mg/l	0.200	0.104	99	85-112	0.7	20	
Batch: W0G1601 - EPA 350.1											
Plank (MOC1601 PLV1)					Proparad: 07/20/20	Applyzod	00/02/20				
Ammonia as N	ND	0.012	0.10	mg/l	repareu. 07/30/20	Analyzeu.	08/03/20				
Blank (W0G1601-BLK2)				6	Prepared: 07/30/20	Analyzed	08/03/20				
Ammonia as N	0.0402	0.012	0.10	mg/l	Tepareu. 07/30/20	Analyzeu.	00/03/20				J
LCS (W0G1601-BS1) Ammonia as N	0 245	0.012	0.10	F ma/l	0 250	Analyzed:	08/03/20 Q8	90-110			
	0.240	5.012	5.10	g/i	0.200		00	50 110			
LCS (W0G1601-BS2)	0.07.	0.046	0.40	F	Prepared: 07/30/20	Analyzed:	08/03/20	00.415			
Ammonia as N	0.254	0.012	0.10	mg/l	0.250		102	90-110			
Matrix Spike (W0G1601-MS1)	Source: 00	G27068-01RE	1	F	Prepared: 07/30/20	Analyzed:	08/03/20				
Ammonia as N	0.270	0.012	0.10	mg/l	0.250	0.0151	102	90-110			

0G28110



FINAL REPORT

#### Wood - San Diego 2 9210 Sky Park Court, Suite 200 San Diego, CA 92123

Project Number: LE TMDL Monitoring

Reported: 08/31/2020 12:32

Project Manager: John Rudolph

0/31/2020 12.32

(Continued)

#### **Quality Control Results**

Conventional Chemistry/Physical Parameters by A	APHA/EPA/AST	M Methods	s (Continued)								
	Bassili			11	Spike	Source	9/ DEC	%REC		RPD	0
Analyte Batch: W0G1601 - EPA 350 1 (Continued)	Kesuit	MDL	MKL	Units	Level	Kesult	%KEC	Limits	RPD	Limit	Qualifier
Matrix Spike (W0G1601-MS2)	Source: 0	627068-03			Prenared: 07/30/20	Analyzed.	08/03/20	1			
Ammonia as N	0.276	0.012	0.10	mg/l	0.250	ND	110	90-110			
Matrix Spike Dup (W0G1601-MSD1)	Source: 0	G27068-01F	RE1	F	Prepared: 07/30/20	Analyzed:	08/03/20	)			
Ammonia as N	0.269	0.012	0.10	mg/l	0.250	0.0151	102	90-110	0.5	15	
Matrix Spike Dup (W0G1601-MSD2)	Source: 0	G27068-03		F	Prepared: 07/30/20	Analyzed:	08/03/20	)			
Ammonia as N	0.276	0.012	0.10	mg/l	0.250	ND	111	90-110	0.3	15	MS-01
Batch: W0G1623 - SM 4500S2-D											
Blank (W0G1623-BLK1)					Prepared & Ana	lyzed: 07/3	30/20				
Sulfide, Total	ND	0.050	0.10	mg/l		-					
LCS (W0G1623-BS1)					Prepared & Ana	lyzed: 07/3	30/20				
Sulfide, Total	0.100	0.050	0.10	mg/l	0.100		100	95-105			
Duplicate (W0G1623-DUP1)	Source: 0	G29052-09			Prepared & Ana	lyzed: 07/3	30/20				
Sulfide, Total	1.20	0.10	0.20	mg/l		1.20			0	20	
Batch: W0G1630 - EPA 365.3											
Blank (W0G1630-BLK1)				F	Prepared: 07/30/20	Analyzed:	08/04/20	)			
Phosphorus as P, Total	ND	0.00083	0.010	mg/l							
LCS (W0G1630-BS1)				F	Prepared: 07/30/20	Analyzed:	08/04/20	)			
Phosphorus as P, Total	0.205	0.00083	0.010	mg/l	0.200		102	90-110			
Matrix Spike (W0G1630-MS1)	Source: 0	G28048-01		F	Prepared: 07/30/20	Analyzed:	08/04/20	)			
Phosphorus as P, Total	0.358	0.00083	0.010	mg/l	0.200	0.161	98	90-110			
Matrix Spike Dup (W0G1630-MSD1)	Source: 0	G28048-01		F	Prepared: 07/30/20	Analyzed:	08/04/20	)			
Phosphorus as P, Total	0.359	0.00083	0.010	mg/l	0.200	0.161	99	90-110	0.3	20	
Batch: W0G1659 - SM 2540C											
Blank (W0G1659-BLK1)					Prepared & Ana	lyzed: 07/3	31/20				
Iotal Dissolved Solids	ND	4.0	10	mg/l							
LCS (W0G1659-BS1)	00.4	10	10	···· ·· //	Prepared & Ana	lyzed: 07/	31/20	00 400			
Iotal Dissolved Solids	804	4.0	10	mg/i	824		98	96-102			
Duplicate (W0G1659-DUP1)	Source: 0	<b>G28101-05</b>	10	ma/l	Prepared & Ana	lyzed: 07/3	31/20		1	10	
	2190	4.0	10	iiig/i		2100			I	10	
Duplicate (W0G1659-DUP2) Total Dissolved Solids	Source: 0	<b>G28110-01</b>	10	ma/l	Prepared & Ana	1760	31/20		3	10	
	1710	4.0	10	iiig/i		1700			5	10	
Batch: W0G1676 - EPA 351.2											
Blank (W0G1676-BLK1)	ND	0.018	0.10	F ma/l	Prepared: 07/31/20	Analyzed:	08/04/20				
		0.070	0.10	ing/i							
Blank (W0G1676-BLK2) TKN	ND	0.018	0.10	F ma/l	Prepared: 07/31/20	Analyzed:	08/04/20				
	- 110	0.070	0.10	<u>g</u> /i							
LCS (W0G1676-BS1) TKN	0.926	0.018	0.10	F ma/l	Prepared: 07/31/20 1.00	Analyzed:	<b>08/04/20</b> 93	90-110			
				3							

0G28110



FINAL REPORT

#### Wood - San Diego 2 9210 Sky Park Court, Suite 200 San Diego, CA 92123

Project Number: LE TMDL Monitoring

Reported: 08/31/2020 12:32

Project Manager: John Rudolph

(Continued)

#### Quality Control Results

Conventional Chemistry/Physical Parameters by APH	A/EPA/AST	M Methods (	(Continued)								
					Spike	Source		%REC		RPD	
Analyte	Result	MDL	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier
Batch: W0G1676 - EPA 351.2 (Continued)											
LCS (W0G1676-BS2)				Prepar	ed: 07/31/20	Analyzed: 0	08/04/20				
TKN	0.911	0.018	0.10	mg/l	1.00		91	90-110			
Matrix Spike (W0G1676-MS1)	Source: 0	G27075-01		Prepar	ed: 07/31/20	Analyzed: 0	08/04/20				
TKN	1.24	0.018	0.10	mg/l	1.00	0.246	99	90-110			
Matrix Spike (W0G1676-MS2)	Source: 0	G27075-02		Prepar	ed: 07/31/20	Analyzed: 0	08/04/20				
TKN	1.26	0.018	0.10	mg/l	1.00	0.269	99	90-110			
Matrix Spike Dup (W0G1676-MSD1)	Source: 0	G27075-01		Prepar	ed: 07/31/20	Analyzed: 0	08/04/20				
TKN	1.24	0.018	0.10	mg/l	1.00	0.246	99	90-110	0.08	10	
Matrix Spike Dup (W0G1676-MSD2)	Source: 0	G27075-02		Prepar	ed: 07/31/20	Analyzed: 0	08/04/20				
TKN	1.33	0.018	0.10	mg/l	1.00	0.269	106	90-110	5	10	



# **Certificate of Analysis**

FINAL REPORT

Project Number: LE TMDL Monitoring

Reported: 08/31/2020 12:32

Project Manager: John Rudolph

#### Notes and Definitions

ltem	Definition
J	Estimated conc. detected <mrl and="">MDL.</mrl>
MS-01	The spike recovery for this QC sample is outside of established control limits possibly due to sample matrix interference.
%REC	Percent Recovery
Dil	Dilution
MDL	Method Detection Limit
MRL	The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ)
ND	NOT DETECTED at or above the Method Reporting Limit (MRL). If Method Detection Limit (MDL) is reported, then ND means not detected at or above the MDL.
RPD	Relative Percent Difference
Source	Sample that was matrix spiked or duplicated.

Any remaining sample(s) will be disposed of one month from the final report date unless other arrangements are made in advance.

All results are expressed on wet weight basis unless otherwise specified.

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.



FINAL REPORT

Work Orders:	0G28112	Report Date:	8/31/2020
		Received Date:	7/28/2020
Project:	1915100403 LECL TMLD Monitoring	Turnaround Time:	Normal
i loject.	<u> </u>	Phones:	(858) 514-6465
		Fax:	(858) 300-4301
Attn:	John Rudolph	P.O. #:	
Client:	Wood - San Diego 2 9210 Sky Park Court, Suite 200 San Diego, CA 92123	Billing Code:	

#### DoD-ISO ANAB # • ELAP-CA #1132 • EPA-UCMR #CA00211 • HW-DOH # • ISO17025 ANAB #L2457.01 • LACSD #10143 • NELAP-OR #4047 • NJ-DEP #CA015 • SCAQMD #93LA1006

This is a complete final report. The information in this report applies to the samples analyzed in accordance with the chain-of-custody document. Weck Laboratories certifies that the test results meet all requirements of TNI unless noted by qualifiers or written in the Case Narrative. This analytical report must be reproduced in its entirety.

Dear John Rudolph,

Enclosed are the results of analyses for samples received 7/28/20 with the Chain-of-Custody document. The samples were received in good condition, at 4.1 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

**Reviewed by:** 

1: State

Chris Samatmanakit Project Manager





## **Certificate of Analysis**

FINAL REPORT

Project Number: 1915100403 LECL TMLD Monitoring

#### Reported:

08/31/2020 12:39

Project Manager: John Rudolph

#### Sample Summary

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
LE02 - Int	John Rudolph	0G28112-01	Water	07/28/20 08:30	
LE02 - Surf	John Rudolph	0G28112-02	Water	07/28/20 09:45	



**FINAL REPORT** 

#### Wood - San Diego 2 9210 Sky Park Court, Suite 200 San Diego, CA 92123

Project Number: 1915100403 LECL TMLD Monitoring Reported:

Project Manager: John Rudolph

#### 08/31/2020 12:39

#### Sample Results ALS Truesdail

Sample:	LE02 - Int 0G28112-01 (Water)				Sampled:	: 07/28/20 8:30 b	y John Rudolph
Analyte		Result	MRL	Units	Dil	Analyzed	Qualifier
Microbiology							
Method: EPA	10200 H	Batch ID: 2007606	Prepared:	07/28/20 10:00			Analyst: GDG
Chlorophy	/ll a	252	1.00	ug/L	1	08/24/20	



Wood - San I 9210 Sky Pa	Diego 2 rk Court, Suite 200	Project Number:	1915100403 LE	ECL TMLD N	/lonitoring	]	08	Reported: 3/31/2020 12:39
San Diego, C	CA 92123	Project Manager:	John Rudolph					
Sa	mple Results ALS Truesdail							(Continued)
Sample:	LE02 - Surf 0G28112-02 (Water)					Sampled: (	)7/28/20 9:45 b	y John Rudolph
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier
Microbiology								
Method: EPA	10200 H	Batch ID: 2007606	Prep	oared: 07/28/2	0 10:00			Analyst: GDG
Chlorophy	ll a	188		1.00	ug/L	1	08/24/20	



FINAL REPORT

Wood - San Diego 2 9210 Sky Park Court, Suite 200 San Diego, CA 92123 Project Number: 1915100403 LECL TMLD Monitoring

Reported: 08/31/2020 12:39

Project Manager: John Rudolph

#### Quality Control Results

Microbiology											
				Spike	Source		%REC		RPD		
Analyte	Result	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier	
Batch: 2007606 - EPA 10200 H											
Blank (2007606-BLK1)			Prepar	ed: 07/31/20	Analyzed:	08/24/20					
Chlorophyll a	<1.00	1.00	ug/L								



### **Certificate of Analysis**

FINAL REPORT

Project Number: 1915100403 LECL TMLD Monitoring

Reported: 08/31/2020 12:39

Project Manager: John Rudolph

#### Notes and Definitions

finition
rcent Recovery
ution
e minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. e MRL is also known as Limit of Quantitation (LOQ)
lative Percent Difference
fii rc ut e la

Any remaining sample(s) will be disposed of one month from the final report date unless other arrangements are made in advance.

All results are expressed on wet weight basis unless otherwise specified.

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.

#### E.S. Babcock & Sons, Inc. Environmental Laboratories (951) 653-3351 FAX (951) 653-1662 www.babcocklabs.com

																			•								0628110
Client: Wood E&I Solutions, Inc.			Co	nta	ct:	Joh	n Ri	udo	lph														Phone	No.		8	358-243-8158 Additional Reporting Requests
FAX No.			En	nail:		joj	hn.r	udol	lph@	Dw0	podpl	lc.c	om	 1													Include QC Data Package: 🗌 Yes 📄 No
Project Name: LE TMDL Monitoring Project Number: 1915100403			Tu	rn A o TA	rou T Al	und ppro	Tim	ne:			R By:	out	tine	<u>e</u>	*	3-5   Ru	Day sh	,	*48	3 He Rus	our sh	*A	*24 Hour Rus ddillional Cha	sh rges Ma	Apply		FAX Results: Yes INO Email Results: Yes NO State EDT: Yes NO (Include Source Number in Notes)
Sempler Information				1	‡of	Con	tain wati	ers				Sa	amj Tyn	ple		۸na	lve	ie F	2eu		ted	1		Matrix	¢		Notes
Sampler Information Name: John Ruclop Employer: Wood E& Solutions, Signature: Sample ID	Inc.	Time	Unpreserved	HZSO4	HNO3	Na2S2O3	NaOH/ZnAcetate	NH4CI	MCAA Frozen		Total # of Containers	Routine	Resample	Special	TSS	Nitrate - Nitrite (EPA 353.2)	TKN (EPA 351.2	Ammonia (EPA 350.1)	Total Phosphorus (EPA 365.3)	SRP/Ortho-P (EPA 365.3)	Total Sulfide (SM4500S)	Total AL (EPA 200.7)	DW = Dri WW = Wa GW = Gro S = Soil SG = Slu L = Liqui M = Misc	nking W stewate bundwat dge d d ellaneou	ater r er s	۲ ۲ ۵	Vo lab filtration required for Ortho-P (field filtered). Total Phosphorus - Sub to Eurofins Calscience
L F02	7/28/20	0830									1					xlx	( x	x	x	x	x						
	1-1-			-			1								-												
			┼─┤								╏				- - -			1			-						
	-		┼┤			_		-	+		-	-			+					-			··				
	·						-		$\neg$		-	-		$\left  \right $			-			—ŀ							
			+	┢								┢				-	-			-†		+	·			-+	
Dalinguisting By (sign)	rint Non	le / Cor	.∟⊥ nna•	 W		<b>_</b>		∟ afe /	L. / Tir	ne ne		1		à.	Rec	_⊥_ eiv:	ed	- Bv	ىتىي (Sid	n)			-		F	Prin	t Name / Company
Xb. DG	La Rid	Talat	7		.7	1/:	28/	2	)	121	r'7	1	1	h		7	5	.,	<u>,                                     </u>	~	1 6	P	120 12	.57	7		· · · · · · · · · · · · · · · · · · ·
Lotu Thom The	UPE	i o in				-17		20	)	2,	14		<u></u>	$\frac{\pi}{2}$	<u>c r</u>	ulv	w	<u></u> /	<u>~  </u>		<u> </u>	10	ah	2/20	M	U	4.10
						. 0							-		-	-#**											

(For Lab Use Only) Sample Integrity	Upon R	eceipt			Lab Notes	
Sample(s) Submitted on Ice?	Yes	No		Temperature		Lab No
Custody Seal(s) Intact?	Yes	No	N/A	°C		
Sample(s) Intact?	Yes	No		🗆 Cooler Blank		Page of _/

#### E.S. Babcock & Sons, Inc. Environmental Laboratories

-2

#### **Chain of Custody & Sample Information Record**

(951) 653-3351 FAX (951) 653-1662

www.babcocklabs.com

0628112

Client: Wood E&I Solutions, In	IC.		Con	tac	t: J	ohn	Ru	dolp	oh												Phone No.	858-243-8158
FAX No.			Ema	ail:	j	ohn.	rud	lolp	h@\	wood	lplc	c.co	m									Additional Reporting Requests
Project Name: LECL TMDL M	onitoring		Tur *Lat	n Ar	our T Ap	nd T	ime val:	<del>9</del> :		<u> </u>	Rou	itine	θ	*3	3-5 Ru	Day sh	Ý	*4	8 Ho Rus	our sh *A	*24 Hour Rush dditional Charges May Apply	Email Results: ☐ Yes ☐ No Email Results: ☐ Yes ☐ No State EDT: ☐ Yes ☐ No (Include Source Number in Notes)
Sampler Informa	ation			of C Pre	Containers eservatives				S	Sample Type		Analysis Requested			iest	ted	Matrix	Notes				
Name: John R Employer: Wood E&I Solu Signature: Shot d	itions.Inc.		npreserved 2504	ō	NO3	aOH	BOH/ZnAcetate	CAA	uazo.	otal # of Containers	Contine	Resample	Special	otal Sulfide	itrate - Nitrite	KN KN	mmonia	otal Phosphorus	RP/Ortho-P	hiorophyli-a (SM10200 H)	DW = Drinking Water WW = Wastewater GW = Groundwater S = Soil SG = Sludge L = Liquid	Chi-a samples on 0.7 um GFF
Sample ID	Date 1	Time	DI	Ξ	I Z	Z	Z	zΣ	L.	+	+	-		1 3	ZH		- 4	H	0	0 V	M = Miscellaneous	Filter Volume: 2.80 /
LE02 - Int	124/20 0	sur			+	+		-			+				+	1	t	1		×	-	Filter Volume: 200 ml
LEUZ - SUIT		111						1		-	1			1	+	1	t	t		~		Filter Volume:
					-						+			T	1	T	Ť	1				Filter Volume:
					-						1							T				Filter Volume:
						T																Filter Volume:
Relinquished By (sign)	Print Name	/ Com	npaŋ	у			Da	te /	Tim	e			R	ece	ive	d E	Зу (	Sig	n)		, Р	rint Name / Company
hold	John Rudo	lah	1	Voa	1	7/2	8/	20	12	17		4	zh	0.10	2	E	w	5	-	26	1202.57	
Fernetroin "	Setur Eue	in	/		7	128	2/2	Э	2	.14	2	~	To	him	44	w	5				7/20/10 (4)4	4.16 102301
															0.010			•				

(For Lab Use Only) S	ample Integrity	Upon Re	eceipt	Lab Notes			
Sample(s) Sub	nitted on Ice?	Yes	No		Temperature		
Custody	Seal(s) Intact?	Yes	No	N/A	°C		
San	ple(s) Intact?	Yes	No		Cooler Blank		

.ab No			
	Page	of	/



FINAL REPORT

Work Orders:	0H07050	Report Date:	9/28/2020
		Received Date:	8/13/2020
Project:	1915100403 LECL TMDL Monitoring	Turnaround Time:	Normal
i roject.	5	Phones:	(858) 514-6465
		Fax:	(858) 300-4301
Attn:	John Rudolph	P.O. #:	
Client:	Wood - San Diego 2 9210 Sky Park Court, Suite 200 San Diego, CA 92123	Billing Code:	

#### DoD-ISO ANAB # • ELAP-CA #1132 • EPA-UCMR #CA00211 • HW-DOH # • ISO17025 ANAB #L2457.01 • LACSD #10143 • NELAP-OR #4047 • NJ-DEP #CA015 • SCAQMD #93LA1006

This is a complete final report. The information in this report applies to the samples analyzed in accordance with the chain-of-custody document. Weck Laboratories certifies that the test results meet all requirements of TNI unless noted by qualifiers or written in the Case Narrative. This analytical report must be reproduced in its entirety.

Dear John Rudolph,

Enclosed are the results of analyses for samples received 8/13/20 with the Chain-of-Custody document. The samples were received in good condition, at 5.0 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

**Reviewed by:** 

1: State

Chris Samatmanakit Project Manager





# **Certificate of Analysis**

FINAL REPORT

Project Number: 1915100403 LECL TMDL Monitoring

Reported: 09/28/2020 17:22

Project Manager: John Rudolph

#### Sample Summary

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
CL07	Kate Buckley	0H07050-01	Water	08/13/20 10:55	
CL08	Kate Buckley	0H07050-02	Water	08/13/20 10:05	
CL09	Kate Buckley	0H07050-03	Water	08/13/20 09:15	
CL10	Kate Buckley	0H07050-04	Water	08/13/20 08:15	
LE02	Kate Buckley	0H07050-05	Water	08/13/20 08:45	



# **Certificate of Analysis**

FINAL REPORT

Project Number: 1915100403 LECL TMDL Monitoring

Reported: 09/28/2020 17:22

Project Manager: John Rudolph

Sample:         CL07         Sample:         Private Research	Sample Results								
OHOTOSO-01 (Water)         Result         MDL         MRL         Units         Dil         Analysed         Concentional Chemistry/Physical Parameters by PPHA/EPA/ASTM Methods           Conventional Chemistry/Physical Parameters by PPHA/EPA/ASTM Methods         Instr. AA06         Instr. AA06         Analyse         Analyse           Batch Die: Woht0000         Preparation: _NONE (WETCHEM)         Preparet: 08/19/20 10.48         Analyse         Analyse           Ammonia as N         2.1         0.10         mgl         1         08/19/20           Batch Die: Woht1244         Preparation: _NONE (WETCHEM)         Preparet: 08/19/20 11:55         Analyse           Tr N         2.6         0.018         0.10         mgl         1         08/14/20 15:54           Method: EPA 353.2         Preparation: _NONE (WETCHEM)         Prepared: 08/12/20 16:59         Analyse           Nitrate as N         ND         0.40         0.20         mgl         1         08/14/20 15:54           Nitrate as N         ND         0.42         100         ugl         1         08/14/20 12:38           Orthod: EPA 365.3         Preparation: _NONE (WETCHEM)         Prepared: 08/14/20 11:32         Analyse           Batch ID: Woht036         Preparation: _NONE (WETCHEM)         Prepared: 08/17/20 11:32         Analyse </td <td>Sample: CL07</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Sampleo</td> <td>d: 08/13/20 10:55 b</td> <td>y Kate Buckley</td>	Sample: CL07						Sampleo	d: 08/13/20 10:55 b	y Kate Buckley
Analyte         Result         MDL         MRL         Units         DII         Analyzed         Que           Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods         Instr. AA06         Instr. AA06         Analyzed         Analyzed           Method: EPA 350.1         Preparetion:_NONE (WETCHEM)         Preparet: 08/19/20 10.48         Analyzet         Analyzet           Ammonia as N         2.1         0.012         0.10         mgl         1         08/19/20           Method: EPA 351.2         Instr. AA06         mstr. AA01         mstr. AA01         Manalyzet         Analyzet           TKN         2.6         0.018         0.10         mgl         1         08/14/20 15.54           Method: EPA 353.2         Instr. AA01         Preparet: 08/13/20 16.59         Analyzet           Nitrole as N         ND         0.40         0.20         mgl         1         08/14/20 15.54           Method: EPA 353.2         Instr. UVVIS04         Preparet: 08/13/20 16.59         Analyzet         Analyzet           Nitrole as N         ND         0.23         0.0030         0.010         mgl<1	0H07050-01 (Water)								
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods         Instr: A006         Instr: A006           Batch ID: W0H09090         Preparation: _NONE (WETCHEM)         Prepared: 08/19/20 10.48         Analysis           Ammonia as N         2.1         0.012         0.10         mgl         1         08/19/20           Method: EPA 351.2         Instr: A006         Prepared: 08/21/20 17.05         Analysis         Analysis           Method: EPA 351.2         Preparation: _NONE (WETCHEM)         Prepared: 08/13/20 16.59         Analysis           Method: EPA 353.2         Instr: A010         mgl         1         08/14/20 15.54           Method: EPA 353.2         Instr: NONE (WETCHEM)         ND         0.20         0.031         1         08/14/20 15.54           Mitrie as N         ND         0.20         0.030         0.010         mgl         1         08/14/20 15.54           Method: EPA 365.3         Preparation: _NONE (WETCHEM)         Prepared: 08/14/20 11.38         Analysis           Method: SM 2540C         Preparation: _NONE (WETCHEM)         Prepared: 08/14/20 11.38         Analysis           Method: SM 2540C         Preparation: _NONE (WETCHEM)         Prepared: 08/14/20 15.24         Analysis           Batch ID: W0H0962         Preparation: _NONE (W	Analyte		Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Method:         EPA 39.11         Instr: A066         Prepared:         08.179.20         10.48         Analysis           Armmonia as N         2.1         0.01         0.10         mgl         1         08/19/20           Method:         FPA 31.2         Batch ID: W0H1243         Preparation:_NONE (WETCHEM)         Instr: A06         mgr         1         08/19/20         Analysis           Method:         FPA 35.12         Batch ID: W0H1244         Preparation:_NONE (WETCHEM)         Instr: A06         mgr         1         08/14/20         Analysis           Method:         FPA 35.2         Instr: A06         mgr         1         08/14/20         Analysis           Method:         FPA 35.2         Instr: A006         mgr         1         08/14/20         Analysis           Method:         FPA 35.2         Instr: MONE (WETCHEM)         ND         0.40         0.20         mgl         1         08/14/20         Analysis           Method:         FPA 35.3         Preparation:_NONE (WETCHEM)         ND         0.23         0.000         0.010         mgl         1         08/14/20         1.36           Method:         FPA 35.3         Preparation:_NONE (WETCHEM)         O.000         0.010         mgl <t< td=""><td>Conventional Chemistry/Physical Parameters by</td><td>APHA/EPA/ASTM Methods</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	Conventional Chemistry/Physical Parameters by	APHA/EPA/ASTM Methods							
Batch ID: W0H0909         Preparation: NONE (WETCHEM)         Prepared: 08/19/20 10.48         Analyst           Ammonia as N         2.1         0.012         0.10         mg/l         1         08/19/20           Method: EPA 351.2         Instr: AA06         mg/l         1         08/24/20         Analyst           Method: EPA 351.2         Preparation: NONE (WETCHEM)         Prepared: 08/19/20 17/25         Analyst           Method: EPA 353.2         Instr: AA01         mg/l         1         08/24/20           Method: EPA 353.2         Preparation: NONE (WETCHEM)         Prepared: 08/19/20 16.59         Malyst           Nitrite as N         ND         0.040         0.20         mg/l         1         08/14/20 15.54           Method: EPA 365.3         Preparation: NONE (WETCHEM)         Prepared: 08/14/20 11.38         Malyst         Analyst           Method: EPA 365.3         Preparation: NONE (WETCHEM)         Prepared: 08/14/20 11.38         Malyst         Malyst           Phosphorus as P, Total         Preparation: NONE (WETCHEM)         Prepared: 08/14/20 15.32         Analyst           Method: SM 2540C         Prepared: 08/14/20 15.32         Malyst         Malyst           Batch ID: W0H0962         Preparation: NONE (WETCHEM)         Prepared: 08/14/20 11.57         Malyst     <	Method: EPA 350.1				Instr: AA06				
Ammonia as N       2.1       0.012       0.10       mg/l       1       08/19/20         Method: EPA 351.2       Instr: AA06       Preparation: NONE (WETCHEM)       Prepared: 08/21/20 17:05       Malyei         Method: EPA 353.2       Instr: AA01       Prepared: 08/13/20 16:59       Malyei         Method: EPA 353.2       Instr: AA01       Prepared: 08/13/20 16:59       Analyei         Method: EPA 353.2       Instr: AA01       Prepared: 08/13/20 16:59       Analyei         Niltifie as N       ND       0.040       0.20       mg/l       1       08/14/20 15:54         Niltifie as N       ND       0.040       0.20       mg/l       1       08/14/20 15:54         Method: EPA 365.3       Instr: UVVIS04       Prepared: 08/14/20 11:38       Analyei       Analyei         OxPhosphate as P       0.23       0.0030       0.010       mg/l       1       08/14/20 12:38         Prepared: 08/14/20 11:38       Prepared: 08/14/20 11:38       Instr: UVVIS04       Analyei       Analyei         Method: EPA 365.3       Instr: WOH031       mg/l       1       08/14/20 12:38       Analyei         Batch ID: WOH0361       Preparation: NONE (WETCHEM)       Instr: UVVIS04       Instr: WIN104       Analyei         Method: SM 2540C </td <td>Batch ID: W0H0909</td> <td>Preparation: _NONE (WETCHEM)</td> <td>)</td> <td></td> <td>Prepared: 08/</td> <td>19/20 10:48</td> <td></td> <td></td> <td>Analyst: YMT</td>	Batch ID: W0H0909	Preparation: _NONE (WETCHEM)	)		Prepared: 08/	19/20 10:48			Analyst: YMT
Method:         EPA 351.2         Instr: AA06         Prepared:         08/21/20         7/50         Analysi           Batch ID:         W0H1244         Preparation:         NONE (WETCHEM)         Prepared:         08/21/20         17.05         Analysi           Method:         EPA 353.2         Instr: AA01         Prepared:         08/21/20         16.55         Analysi           Method:         EPA 353.2         Instr: AA01         Prepared:         08/13/20         16.55         Analysi           Nitrate as N         ND         0.040         0.20         mg/l         1         08/14/20         15.54           Nitrate as N         ND         0.040         0.20         mg/l         1         08/14/20         15.54           Method:         EPA 365.3         Instr: UVVIS04         Prepared:         08/14/20         11.38         Analysi           Phosphorus as R, Total         0.27         0.0008         0.010         mg/l         1         08/26/20           Method:         SM 540C         Instr: UVVIS04         Prepared:         08/18/20         Instr: OVEN11         <	Ammonia as N		2.1	0.012	0.10	mg/l	1	08/19/20	
Batch ID: W0H1244         Preparation: NONE (WETCHEM)         Prepared: 08/21/20 17.05         Analysis           TKN         2.6         0.018         0.10         mg/l         1         08/24/20           Method: EPA 353.2         Instr: AA01         Prepared: 08/13/20 16:59         Fastr: AA01         Prepared: 08/13/20 16:59         Fastr: AA01           Batch ID: W0H0731         Preparation: NONE (WETCHEM)         ND         0.040         0.20         mg/l         1         08/14/20 15:54         Fastr: NONE (WETCHEM)         Frepared: 08/13/20 16:59         Fastr: NONE         Fastr: UVVIS04         Fastr: GR 702	Method: EPA 351.2				Instr: AA06				
TKN         2.6         0.018         0.10         mg/l         1         08/24/20           Method: EPA 353.2         Instr: AA01         Prepared: 08/13/20 16:59         Analys           NITITE as N         ND         0.040         0.20         mg/l         1         08/14/20 15:54           NITITE as N         ND         0.040         0.20         mg/l         1         08/14/20 15:54           Method: EPA 365.3         Instr: UV/IS04         Prepared: 08/14/20 11:38         Analys           O-Phosphate as P         0.23         0.0030         0.010         mg/l         1         08/14/20 12:38           Method: EPA 365.3         Instr: UV/IS04         Prepared: 08/21/20 15:22         Analys           Method: EPA 365.3         Instr: UV/IS04         Prepared: 08/21/20 15:22         Analys           Method: SM 2540C         Enstr: UV/IS04         Prepared: 08/21/20 15:30         Analys           Batch ID: W0H0952         Preparation: NONE (WETCHEM)         Prepared: 08/12/20 16:30         Analys           Total Dissolved Solids         390         4.0         10         mg/l         1         08/16/20           Method: SM 2540D         Instr: NONE (WETCHEM)         Prepared: 08/17/20 16:30         Analys         0         0.050	Batch ID: W0H1244	Preparation: _NONE (WETCHEM)	)		Prepared: 08/2	21/20 17:05			Analyst: ymt
Method:         EPR 353.2         Instr: A01         Preparation: _NONE (WETCHEM)         Prepared:         0.20         mg/l         1         0.8/14/20 15:54           Nitrate as N         ND         0.040         0.20         mg/l         1         0.8/14/20 15:54         Analys           Nitrate as N         ND         0.040         0.20         mg/l         1         0.8/14/20 15:54         Analys           Method:         EPA 365.3         Instr: UVVIS04         Prepared:         0.010         mg/l         1         0.8/14/20 12:38         Analys           o-Phosphate as P         0.23         0.0030         0.010         mg/l         1         0.8/14/20 12:38         Analys           Batch ID: W0H1238         Preparation: _NONE (WETCHEM)         Prepared:         0.010         mg/l         1         0.8/14/20 12:38           Phosphorus as P, Total         0.27         0.00083         0.010         mg/l         1         0.8/16/20           Method: SM 2540C         Instr: OVEN01         Instr: OVEN01         Analys         Analys           Total Dissolved Solids         390         4.0         10         mg/l         1         0.8/18/20           Method: SM 2540D         Preparation: _NONE (WETCHEM)         Prepare	ТКМ	• • • • • • • • • • • • • • • • • • • •	2.6	0.018	0.10	mg/l	1	08/24/20	• •
Batch Dr. W0H0731         Preparation: _NONE (WETCHEM)         Prepared: 08/13/20 16:59         Analys           Nitrate as N         ND         0.040         0.20         mg/l         1         08/14/20 15:54           Nitrate as N         ND         0.040         0.20         mg/l         1         08/14/20 15:54           Method: EPA 365.3         Instr: UVVIS04         Prepared: 08/13/20 16:59         Analys           0.4100 0016         Preparation: _NONE (WETCHEM)         Prepared: 08/14/20 11:38         Analys           0.423         0.030         0.010         mg/l         1         08/14/20 12:38           Method: EPA 365.3         Instr: UVVIS04         Frepared: 08/13/20 16:30         Analys           Phosphorus as P, Total         0.27         0.00083         0.010         mg/l         1         08/16/20           Method: SM 2540C         Instr: OVEN01         Frepared: 08/17/20 16:30         Analys         Analys           Total Dissolved Solids         390         4.0         10         mg/l         08/18/20           Method: SM 2540C         Instr: OVEN01         Frepared: 08/17/20 16:30         Analys         Analys           Total Dissolved Solids         4         5         mg/l         1         08/18/20	Method: EPA 353.2				Instr: AA01				
Nitrate as N       ND       0.040       0.20       mg/l       1       08/14/20 15:54         Nitrate as N       ND       42       100       ug/l       1       08/14/20 15:54         Method: EPA 365.3       Batch ID: W0H0816       Preparation: _NONE (WETCHEM)       Prepared: 08/14/20 11:38       Analys         o-Phosphate as P       0.23       0.0030       0.010       mg/l       1       08/14/20 12:38         Method: EPA 365.3       Batch ID: W0H0816       Preparation: _NONE (WETCHEM)       Prepared: 08/21/20 15:22       Analys         Phosphorus as P, Total       0.27       0.00083       0.010       mg/l       1       08/26/20         Method: SM 2540C       Instr: OVEN01       Instr: OVEN01       Analys         Batch ID: W0H0962       Preparation: _NONE (WETCHEM)       Prepared: 08/17/20 16:30       Analys         Method: SM 2540C       Instr: OVEN01       Instr: OVEN11       Analys         Batch ID: W0H1006       Preparation: _NONE (WETCHEM)       Prepared: 08/18/20 11:57       Analys         Method: SM 450022-D       Batch ID: W0H1006       Preparation: _NONE (WETCHEM)       Prepared: 08/18/20 11:57       Analys         Suffide, Total       ND       0.050       0.10       mg/l       1       08/16/20 <tr< td=""><td>Batch ID: W0H0781</td><td>Preparation: NONE (WETCHEM)</td><td>)</td><td></td><td>Prepared: 08/</td><td>13/20 16:59</td><td></td><td></td><td>Analvst: sar</td></tr<>	Batch ID: W0H0781	Preparation: NONE (WETCHEM)	)		Prepared: 08/	13/20 16:59			Analvst: sar
Nitrite as N       ND       42       100       ug/l       1       08/14/20 15:54         Method: EPA 365.3       Preparation:_NONE (WETCHEM)       Prepared: 08/14/20 11:38       Analys         Method: EPA 365.3       Instr: UVVIS04       Prepared: 08/14/20 11:38       Analys         Method: EPA 365.3       Preparation:_NONE (WETCHEM)       Prepared: 08/21/20 15:22       Analys         Phosphorus as P, Total       0.27       0.0003       0.010       mg/l       1       08/14/20 12:38         Method: SM 2540C       Preparation:_NONE (WETCHEM)       Prepared: 08/17/20 16:30       Analys       Analys         Method: SM 2540C       Preparation:_NONE (WETCHEM)       0.0003       0.010       mg/l       1       08/18/20         Method: SM 2540C       Preparation:_NONE (WETCHEM)       10       0.011/20 16:30       Analys         Method: SM 2540D       Preparation:_NONE (WETCHEM)       10       0.010       mg/l       1       0.014/20 12:57         Batch ID: W0H0962       Preparation:_NONE (WETCHEM)       10       0.011       0.014/20       1       0.014/20 12:57         Batch ID: W0H0962       Preparation:_NONE (WETCHEM)       Instr: OVEN11       T       Analys         Method: SM 450052-D       Preparation:_NONE (WETCHEM)       ND       <	Nitrate as N	· · · · · · · · · · · · · · · · · · ·	. ND	0.040	0.20	mg/l	1	08/14/20 15:54	, <b>,</b>
Method:         EPA 365.3 Batch ID:         Instr:         UVVIS04         Analysis           Batch ID:         W0H0816         Preparation:         NONE (WETCHEM)         Prepared:         08/14/20         11:38         Analysis           Method:         EPA 365.3         Instr:         UVVIS04         Prepared:         08/14/20         12:38           Method:         EPA 365.3         Instr:         UVVIS04         Prepared:         08/14/20         15:22         Analysis           Phosphorus as P, Total         0.27         0.00083         0.010         mg/l         1         08/26/20           Method:         SM 2540C         Instr:         Instr:         OVEN01         Analysis           Batch ID:         W0H0962         Preparation:<_NONE (WETCHEM)	Nitrite as N		- ND	42	100	ug/l	1	08/14/20 15:54	
Method:         LPrepared:         Batch ID:         WoH0816         Prepared:         Ref. V2/10         11:38         Analys           Batch ID:         W0H0816         Preparation:_NONE (WETCHEM)         Prepared:         08/14/20         11:38         Malys           Method:         EPA 365.3         Instr:         Instr:         UVVIS04         Analys           Phosphorus as P, Total         Preparation:_NONE (WETCHEM)         Prepared:         08/21/20         15:22         Analys           Method:         SM 2540C         Instr:         O.00083         0.010         mg/l         1         08/26/20           Method:         SM 2540C         Instr:         O.00083         0.010         mg/l         1         08/26/20           Method:         SM 2540C         Instr:         O.00083         0.010         mg/l         1         08/26/20           Method:         SM 2540D         Instr:         O.00083         0.010         mg/l         1         08/18/20           Method:         SM 2540D         Instr:         O.000         11:57         Analyst           Total         Suspended         Solids         4         5         mg/l         1         08/18/20           Method: <td>Mothod: EDA 265 2</td> <td></td> <td></td> <td></td> <td>Inctr: UNA/ISO/</td> <td></td> <td></td> <td></td> <td></td>	Mothod: EDA 265 2				Inctr: UNA/ISO/				
Initial Discription         Preparation:         CNOTIC (NEUCRED)         Preparet:         Name         Nam	Batch ID: W/0H0816	Proparation: NONE (WETCHEM)	<b>\</b>		Prepared: 08/	11/20 11.38			Analyst: shn
Method:         EPA 365.3         Instr:         UVVIS04         Instr:         UVVIS04         Analys           Batch ID:         W0H1238         Preparation:         NONE (WETCHEM)         Prepared:         08/21/20         15:22         Analys           Phosphorus as P, Total         0.27         0.00083         0.010         mg/l         1         08/26/20           Method:         SM 2540C         Instr:         OVEN01         Prepared:         08/17/20         16:30         Analys           Total         Dissolved Solids         390         4.0         10         mg/l         1         08/18/20           Method:         SM 2540C         Preparation:<_NONE (WETCHEM)	o-Phosphate as P		0.23	0.0030	0.010	mg/l	1	08/14/20 12:38	Analyst. son
Method:         EPA 303-3         Preparation:         NONE (WETCHEM)         Prepared:         08/21/20         15:22         Analys           Phosphorus as P, Total         0.27         0.00083         0.01         mg/l         1         08/26/20           Method:         SM 2540C         Instr:         OVEN01         Analys           Batch ID:         W0H0962         Preparation:         NONE (WETCHEM)         Prepared:         08/17/20         16:30         Analys           Total Dissolved Solids         390         4.0         10         mg/l         1         08/18/20           Method:         SM 2540D         Instr:         OVEN11         Analys         Analys           Batch ID:         W0H1006         Preparation:         NONE (WETCHEM)         Prepared:         08/18/20         11:57         Analys           Total Dissolved Solids         4         5         mg/l         1         08/18/20         11:57         Analys           Method:         SM 4500S2-D         Instr:         ANALYST         Mathys         Mathys         Mathys         1         08/15/20         08:13         Analys         1         08/15/20         1         1         08/15/20         1         1         1					In star UNA/ICO4				
Batch D: W0H1230       Preparation: _NONE (WETCHEM)       0.27       0.00083       0.010       mg/l       1       08/26/20         Method: SM 2540C       Instr: OVEN01       Prepared: 08/17/20 16:30       Analys         Batch ID: W0H0962       Preparation: _NONE (WETCHEM)       Prepared: 08/17/20 16:30       Analys         Method: SM 2540D       Instr: OVEN11       08/18/20       Analys         Method: SM 2540D       Instr: OVEN11       Marking (METCHEM)       Prepared: 08/18/20 11:57       Analyst         Method: SM 2540D       Instr: OVEN11       Instr: OVEN11       Marking (METCHEM)       Marking (METCHEM)       Marking (METCHEM)         Batch ID: W0H1006       Preparation: _NONE (WETCHEM)       Prepared: 08/18/20 11:57       Analyst         Method: SM 4500S2-D       Instr: _ANALYST       Marking (METCHEM)       Analyst         Batch ID: W0H0850       Preparation: _NONE (WETCHEM)       Prepared: 08/15/20 08:13       Analyst         Sulfide, Total       ND       0.050       0.10       mg/l       1       08/15/20         Method: EPA 200 Series Methods       ND       0.050       0.10       mg/l       1       08/26/20         Method: EPA 200.7       Instr: ICP03       Instr: ICP03       Instr: ICP03       Instr: ICP03       Instr: ICP03 <td< td=""><td>Retrod: EPA 305.3</td><td>Proparation: NONE (METCHEM)</td><td>\</td><td></td><td>Propared: 08/</td><td>21/20 15.22</td><td></td><td></td><td>Analyst: cha</td></td<>	Retrod: EPA 305.3	Proparation: NONE (METCHEM)	\		Propared: 08/	21/20 15.22			Analyst: cha
Method: SM 2540C       Instr: OVEN01       Instr: OVEN01       Analyse         Batch ID: W0H0962       Preparation: _NONE (WETCHEM)       Prepared: 08/17/20 16:30       Analyse         Total Dissolved Solids       390       4.0       10       mg/l       1       08/18/20         Method: SM 2540D       Instr: OVEN11       Instr: OVEN11       Analyse         Batch ID: W0H1006       Preparation: _NONE (WETCHEM)       Prepared: 08/18/20 11:57       Analyse         Method: SM 4500S2-D       Instr: _ANALYST       Analyse         Batch ID: W0H0850       Preparation: _NONE (WETCHEM)       Prepared: 08/15/20 08:13       Analyse         Sulfide, Total       ND       0.050       0.10       mg/l       1       08/15/20         Method: SPA 2000 Series Methods       Preparation: _NONE (WETCHEM)       Prepared: 08/15/20 08:13       Analyse         Method: EPA 200.7       Instr: ICP03       Instr: ICP03       Analyse         Method: EPA 200.7       Preparation: EPA 200.2       Prepared: 08/19/20 10:10       Analyse         Method: EPA 200.7       Instr: ICP03       Prepared: 08/19/20 10:10       Analyse         Method: EPA 200.7       Onegration: EPA 200.2       Prepared: 08/19/20 10:10       Analyse         Method: EPA 200.7       Onegration: EPA 200.2       P	Phosphorus as P, Total		0.27	0.00083	0.010	mg/l	1	08/26/20	Analyst. Son
Method:         SM 2540.C         Instr:         OVEN01           Batch ID:         W0H0962         Preparation:         NONE (WETCHEM)         Prepared:         08/17/20         16:30         Analyst           Total Dissolved Solids         390         4.0         10         mg/l         1         08/18/20           Method:         SM 2540D         Instr:         OVEN11         Frepared:         08/18/20         Instr:         OVEN11           Batch ID:         W0H1006         Preparation:         NONE (WETCHEM)         Prepared:         08/18/20         Instr:         Analyst           Method:         SM 4500S2-D         Instr:						Ū			
Batch 1D: WOH0952         Preparation: _NONE (WETCHEM)         Preparation: _NONE (WETCHEM)         Preparation: _NONE (WETCHEM)         Instr: OVEN11           Method: SM 2540D         Instr: .OVEN11         Analyst           Batch ID: WOH1006         Preparation: _NONE (WETCHEM)         Prepared: 08/18/20 11:57         Analyst           Method: SM 4500S2-D         Instr: _ANALYST         Analyst           Batch ID: WOH0850         Preparation: _NONE (WETCHEM)         Prepared: 08/15/20 08:13         Analyst           Sulfide, Total         ND         0.050         0.10         mg/l         1         08/15/20           Method: EPA 200.7         Instr: ICP03         Instr: ICP03         Analyst         Analyst           Aluminum, Dissolved         0.026         0.0014         0.020         mg/l         1         08/26/20	Retrod: SM 2540C				Dramanada 00/2	17/20 16:20			Analusti ism
Method:SMS	Total Dissolved Solids	Preparation: _NONE (WEICHEM)	- 390	4.0	10	ma/l	1	08/18/20	Analyst: Ism
Method:         SM 2540D         Instr:         OVEN11           Batch ID:         W0H1006         Preparation:         NONE (WETCHEM)         Prepared:         08/18/20         11:57         Analysis           Total Suspended Solids         4         5         mg/l         1         08/18/20           Method:         SM 4500S2-D         Instr:         Analysis         Analysis           Batch ID:         W0H00850         Preparation:         NONE (WETCHEM)         Prepared:         08/15/20         08:13         Analysis           Sulfide,         Total         OND         0.050         0.10         mg/l         1         08/15/20           Method:         SM 4500S2-D         Preparation:         NON (WETCHEM)         Prepared:         08/15/20         08:13         Analysis           Sulfide,         Total         ND         0.050         0.10         mg/l         1         08/15/20           Method:         EPA 200         Preparation:         PRO         D.050         0.10         mg/l         1         08/15/20           Method:         EPA 200.7         Instr:         Instr:         ICP03         Analyst           Aluminum, Dissolved         O.026         0.0014         0					-	5			
Batch ID: W0H1006         Preparation: _NONE (WEICHEM)         Prepared: 08/18/20 11::57         Analyst           Total Suspended Solids         4         5         mg/l         1         08/18/20           Method: SM 4500S2-D         Instr: _ANALYST         Instr: _ANALYST         Analyst           Batch ID: W0H0850         Preparation: _NONE (WETCHEM)         Prepared: 08/15/20         08:13         Analyst           Sulfide, Total         ND         0.050         0.10         mg/l         1         08/15/20           Method: EPA 200 Series Methods         ND         0.050         0.10         mg/l         1         08/15/20           Method: EPA 200.7         Instr: ICP03         Instr: ICP03         Analyst         Analyst           Aluminum, Dissolved         0.026         0.0014         0.020         mg/l         1         08/26/20           Aluminum, Total         0.035         0.0014         0.020         mg/l         1         08/26/20	Method: SM 2540D				Instr: OVEN11				
Method:         SM 450052-D         Instr: _ANALYST         Analyst           Batch ID:         W0H0850         Preparation: _NONE (WETCHEM)         Prepared:         08/15/20         08:13         Analyst           Sulfide,         Total         ND         0.050         0.10         mg/l         1         08/15/20           Method:         EPA 200 Series Methods         ND         0.050         0.10         mg/l         1         08/15/20           Method:         EPA 200 Series Methods         Instr: ICP03         Instr: ICP03         Analyst           Aluminum, Dissolved         0.026         0.0014         0.020         mg/l         1         08/26/20           Aluminum, Total         0.035         0.0014         0.020         mg/l         1         08/26/20	Batch ID: WUH1006	Preparation: _NONE (WEICHEM)	4		Prepared: 08/	18/20 11:57	1	08/18/20	Analyst: mfh
Method: SM 4500S2-D         Instr: _ANALYST           Batch ID: W0H0850         Preparation: _NONE (WETCHEM)         Prepared: 08/15/20 08:13         Analyst           Sulfide, Total         ND         0.050         0.10         mg/l         1         08/15/20           Method: EPA 200 Series Methods         Instr: ICP03         Analyst         Analyst         Analyst           Method: EPA 200.7         Preparation: EPA 200.2         Prepared: 08/19/20 10:10         Analyst           Aluminum, Dissolved         0.026         0.0014         0.020         mg/l         1         08/26/20           Aluminum, Total         0.035         0.0014         0.020         mg/l         1         08/26/20					Ū	nigh		00/10/20	Ŭ
Batch ID: W0H0850         Preparation: _NONE (WETCHEM)         Prepared: 08/15/20 08:13         Analyst           Sulfide, Total         ND         0.050         0.10         mg/l         1         08/15/20           Metals by EPA 200 Series Methods         Instr: ICP03         Instr: ICP03         Analyst           Batch ID: W0H1072         Preparation: EPA 200.2         Prepared: 08/19/20 10:10         Analyst           Aluminum, Dissolved         0.026         0.0014         0.020         mg/l         1         08/26/20	Method: SM 4500S2-D				Instr: _ANALYS	ST			
Metals by EPA 200 Series Methods         Instr: ICP03           Method: EPA 200.7         Instr: ICP03           Batch ID: W0H1072         Preparation: EPA 200.2           Aluminum, Dissolved         0.026           0.035         0.0014           0.020         mg/l           1         08/26/20	Batch ID: W0H0850	Preparation: _NONE (WETCHEM)		0.050	Prepared: 08/	15/20 08:13	1	08/15/20	Analyst: mfh
Metals by EPA 200 Series Methods         Instr: ICP03           Method: EPA 200.7         Instr: ICP03         Analyst           Batch ID: W0H1072         Preparation: EPA 200.2         Prepared: 08/19/20 10:10         Analyst           Aluminum, Dissolved         0.026         0.0014         0.020         mg/l         1         08/26/20           Aluminum, Total         0.035         0.0014         0.020         mg/l         1         08/26/20				0.000	0.10	iiig/i		00/13/20	
Method:         EPA 200.7         Instr:         ICP03           Batch ID:         W0H1072         Preparation:         EPA 200.2         Prepared:         08/19/20         10:10         Analyst           Aluminum, Dissolved         0.026         0.0014         0.020         mg/l         1         08/26/20	Metals by EPA 200 Series Methods								
Batch ID: W0H1072         Preparation: EPA 200.2         Prepared: 08/19/20 10:10         Analyst           Aluminum, Dissolved         0.026         0.0014         0.020         mg/l         1         08/26/20           Aluminum, Total         0.035         0.0014         0.020         mg/l         1         08/26/20	Method: EPA 200.7				Instr: ICP03				
Aluminum, Dissolved         0.026         0.0014         0.020         mg/l         1         08/26/20           Aluminum, Total         0.035         0.0014         0.020         mg/l         1         08/26/20	Batch ID: W0H1072	Preparation: EPA 200.2			Prepared: 08/	19/20 10:10			Analyst: kvm
Aluminum, Total 0.035 0.0014 0.020 mg/l 1 08/26/20	Aluminum, Dissolved		0.026	0.0014	0.020	mg/l	1	08/26/20	
	Aluminum, Total		0.035	0.0014	0.020	mg/l	1	08/26/20	



# **Certificate of Analysis**

**FINAL REPORT** 

Project Number: 1915100403 LECL TMDL Monitoring

Reported: 09/28/2020 17:22

Project Manager: John Rudolph

Sample Results								(Continued)
Sample: CL08						Sampleo	d: 08/13/20 10:05 b	y Kate Buckley
0H07050-02 (Water)								
Analyte	R	esult	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters	by APHA/EPA/ASTM Methods							
Method: EPA 350.1				Instr: AA06				
Batch ID: W0H0909	Preparation: _NONE (WETCHEM)			Prepared: 08/1	9/20 10:48			Analyst: YMT
Ammonia as N		0.95	0.012	0.10	mg/l	1	08/19/20	
Method: EPA 351.2				Instr: AA06				
Batch ID: W0H1244	Preparation: _NONE (WETCHEM)			Prepared: 08/2	1/20 17:05			Analyst: ymt
TKN		1.7	0.018	0.10	mg/l	1	08/24/20	
Method: EPA 353.2				Instr: AA01				
Batch ID: W0H0781	Preparation: NONE (WETCHEM)			Prepared: 08/1	3/20 16:59			Analyst: sar
Nitrate as N		ND	0.040	0.20	mg/l	1	08/14/20 15:55	
Nitrite as N		ND	42	100	ug/l	1	08/14/20 15:55	
Method: FPA 365 3				Instr: UVVIS04				
Batch ID: W0H0816	Preparation: NONE (WETCHEM)			Prepared: 08/1	4/20 11·38			Analyst: sbn
o-Phosphate as P	0.	.089	0.0030	0.010	mg/l	1	08/14/20 12:38	, <b></b>
Method: EDA 365 3				Instr: 11\0/IS0/				
Batch ID: W0H1238	Preparation: NONE (WETCHEM)			Prenared: 08/2	1/20 15:22			Analyst: shn
Phosphorus as P, Total		0.14	0.00083	0.010	mg/l	1	08/26/20	Analyst. som
					0			
				Dremene de 00/1	7/20 16:20			Amalusti ism
Total Dissolved Solids	Preparation: _NONE (WEICHEM)	390	4.0	10	//20 16:30 ma/l	1	08/18/20	Analyst: Ism
Method: SM 2540D				Instr: OVEN11				
Batch ID: W0H1006	Preparation: _NONE (WETCHEM)	4		Prepared: 08/1	8/20 11:57	1	09/19/20	Analyst: mfh
		- 4		5	тцул	I	06/18/20	J
Method: SM 4500S2-D				Instr: _ANALYS	Г			
Batch ID: W0H0850	Preparation: _NONE (WETCHEM)			Prepared: 08/1	5/20 08:13			Analyst: mfh
Sulfide, Iotal		ND	0.050	0.10	mg/l	1	08/15/20	
Metals by EPA 200 Series Methods								
Method: EPA 200.7				Instr: ICP03				
Batch ID: W0H1072	Preparation: EPA 200.2			Prepared: 08/1	9/20 10:10			Analyst: kvm
Aluminum, Dissolved	•••••••••••••••••••••••••••••••••••••••	.034	0.0014	0.020	mg/l	1	08/26/20	
Aluminum, Total	0.	.039	0.0014	0.020	mg/l	1	08/26/20	



# **Certificate of Analysis**

FINAL REPORT

Project Number: 1915100403 LECL TMDL Monitoring

Reported: 09/28/2020 17:22

Project Manager: John Rudolph

Sample Results								(Continued)
Sample: CL09						Sample	ed: 08/13/20 9:15 b	y Kate Buckley
0H07050-03 (Water)								
Analyte		Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters I	oy APHA/EPA/ASTM Methods							
Method: EPA 350.1				Instr: AA06				
Batch ID: W0H0909	Preparation: _NONE (WETCHEM)			Prepared: 08/1	9/20 10:48			Analyst: YMT
Ammonia as N		1.5	0.012	0.10	mg/l	1	08/19/20	
Method: EPA 351.2				Instr: AA06				
Batch ID: W0H1244	Preparation: _NONE (WETCHEM)			Prepared: 08/2	21/20 17:05			Analyst: ymt
ТКМ		2.4	0.018	0.10	mg/l	1	08/24/20	
Method: EPA 353.2				Instr: AA01				
Batch ID: W0H0781	Preparation: _NONE (WETCHEM)			Prepared: 08/1	3/20 16:59			Analyst: sar
Nitrate as N		ND	0.040	0.20	mg/l	1	08/14/20 15:56	
Nitrite as N		ND	42	100	ug/l	1	08/14/20 15:56	
Method: EPA 365.3				Instr: UVVIS04				
Batch ID: W0H0816	Preparation: _NONE (WETCHEM)			Prepared: 08/1	4/20 11:38			Analyst: sbn
o-Phosphate as P		0.012	0.0030	0.010	mg/l	1	08/14/20 12:39	
Method: EPA 365.3				Instr: UVVIS04				
Batch ID: W0H1238	Preparation: _NONE (WETCHEM)			Prepared: 08/2	21/20 15:22			Analyst: sbn
Phosphorus as P, Total		0.077	0.00083	0.010	mg/l	1	08/26/20	
Method: SM 2540C				Instr: OVEN01				
Batch ID: W0H0962	Preparation: _NONE (WETCHEM)			Prepared: 08/1	7/20 16:30			Analyst: ism
Total Dissolved Solids		460	4.0	10	mg/l	1	08/18/20	
Method: SM 2540D				Instr: OVEN11				
Batch ID: W0H1006	Preparation: _NONE (WETCHEM)			Prepared: 08/1	8/20 11:57			Analyst: mfh
Total Suspended Solids		6		5	mg/l	1	08/18/20	
Method: SM 4500S2-D				Instr: _ANALYS	т			
Batch ID: W0H0850	Preparation: _NONE (WETCHEM)			Prepared: 08/1	5/20 08:13			Analyst: mfh
Sulfide, Total		ND	0.050	0.10	mg/l	1	08/15/20	
Metals by EPA 200 Series Methods								
Method: EPA 200.7				Instr: ICP03				
Batch ID: W0H1072	Preparation: EPA 200.2			Prepared: 08/1	9/20 10:10			Analyst: kvm
Aluminum, Dissolved		0.071	0.0014	0.020	mg/l	1	08/26/20	
Aluminum, Total		0.10	0.0014	0.020	mg/l	1	08/26/20	



# **Certificate of Analysis**

**FINAL REPORT** 

Project Number: 1915100403 LECL TMDL Monitoring

Reported: 09/28/2020 17:22

Project Manager: John Rudolph

Sample Result	ts						(Continued)
Sample: CL10					Sample	ed: 08/13/20 8:15 b	y Kate Buckley
0H07050-04 (Water)							
Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Para	meters by APHA/EPA/ASTM Methods						
Method: EPA 350.1			Instr: AA06				
Batch ID: W0H0909	Preparation: _NONE (WETCHEM)		<b>Prepared:</b> 08/19	/20 10:48			Analyst: YMT
Ammonia as N	ND	0.012	0.10	mg/l	1	08/19/20	
Method: FPA 351 2			Instr: AA06				
Batch ID: W0H1244	Preparation: NONE (WETCHEM)		Prenared: 08/21	/20 17:05			Analyst: ymt
TKN	0.97	0.018	0.10	mg/l	1	08/24/20	rata yan
				0			
Method: EPA 353.2			Instr: AAU1	00 46 50			
Batch ID: W0H0781	Preparation: _NONE (WEICHEM)	0.040	Prepared: 08/13	/20 16:59	1	08/11/20 15:57	Analyst: sar
		40	0.20		4	00/14/20 15:57	
Nitrite as N	ND	42	100	ug/i	1	08/14/20 15:57	
Method: EPA 365.3			Instr: UVVIS04				
Batch ID: W0H0816	Preparation: _NONE (WETCHEM)		Prepared: 08/14	/20 11:38			Analyst: sbn
o-Phosphate as P	ND	0.0030	0.010	mg/l	1	08/14/20 12:40	
Method: EPA 365.3			Instr: UVVIS04				
Batch ID: W0H1238	Preparation: _NONE (WETCHEM)		Prepared: 08/21	/20 15:22			Analyst: sbn
Phosphorus as P, Total	0.046	0.00083	0.010	mg/l	1	08/26/20	
Method: SM 2540C			Instr: OVEN01				
Batch ID: W0H0962	Preparation: NONE (WETCHEM)		<b>Prepared:</b> 08/17	/20 16:30			Analvst: ism
Total Dissolved Solids	440	4.0	10	mg/l	1	08/18/20	
Method: SM 2540D			Instr: OVENI11				
Batch ID: W0H1006	Preparation: NONE (WETCHEM)		Prepared: 08/18	/20 11:57			Analyst: mfh
Total Suspended Solids	9		5	mg/l	1	08/18/20	Analyst.
				Ū			
Method: SM 4500S2-D			Instr: _ANALYS1				
Batch ID: W0H0850	Preparation: _NONE (WETCHEM)	0.050	Prepared: 08/15	/20 08:13	1	08/15/20	Analyst: mfh
		0.000	0.10	iiig/i		00/13/20	
Metals by EPA 200 Series Methods							
Method: EPA 200.7			Instr: ICP03				
Batch ID: W0H1072	Preparation: EPA 200.2		Prepared: 08/19	/20 10:10			Analyst: kvm
Aluminum, Dissolved	0.093	0.0014	0.020	mg/l	1	08/26/20	
Aluminum, Total	0.13	0.0014	0.020	mg/l	1	08/26/20	



# **Certificate of Analysis**

FINAL REPORT

Project Number: 1915100403 LECL TMDL Monitoring

Reported: 09/28/2020 17:22

Project Manager: John Rudolph

Sample Res	uits						(Continued)
Sample: LE02					Sample	d: 08/13/20 8:45 b	y Kate Buckley
0H07050-05 (Wa	ter)						
Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical I	Parameters by APHA/EPA/ASTM Methods						
Method: EPA 350.1			Instr: AA06				
Batch ID: W0H0909	Preparation: _NONE (WETCHEM)		Prepared: 08/	19/20 10:48			Analyst: YMT
Ammonia as N	0.40	0.012	0.10	mg/l	1	08/19/20	
Method: EPA 351.2			Instr: AA06				
Batch ID: W0H1244	Preparation: _NONE (WETCHEM)		Prepared: 08/2	21/20 17:05			Analyst: ymt
TKN	4.5	0.018	0.10	mg/l	1	08/24/20	
Method: EPA 353.2			Instr: AA01				
Batch ID: W0H0781	Preparation: _NONE (WETCHEM)		Prepared: 08/	13/20 16:59			Analyst: sar
Nitrate as N	ND	0.040	0.20	mg/l	1	08/14/20 16:05	
Nitrite as N	ND	42	100	ug/l	1	08/14/20 16:05	
Method: EPA 365.3			Instr: UVVIS04	Ļ			
Batch ID: W0H0816	Preparation: _NONE (WETCHEM)		Prepared: 08/	14/20 11:38			Analyst: sbn
o-Phosphate as P	0.0070	0.0030	0.010	mg/l	1	08/14/20 12:41	J
Method: EPA 365.3			Instr: UVVIS04	Ļ			
Batch ID: W0H1238	Preparation: _NONE (WETCHEM)		Prepared: 08/2	21/20 15:22			Analyst: sbn
Phosphorus as P, Total	0.25	0.00083	0.010	mg/l	1	08/26/20	
Method: SM 2540C			Instr: OVEN01				
Batch ID: W0H0962	Preparation: _NONE (WETCHEM)		Prepared: 08/	17/20 16:30			Analyst: ism
Total Dissolved Solids	1800	4.0	10	mg/l	1	08/18/20	
Method: SM 4500S2-D			Instr: _ANALYS	ST			
Batch ID: W0H0850	Preparation: _NONE (WETCHEM)		Prepared: 08/	15/20 08:13			Analyst: mfh
Sulfide, Total		0.050	0.10	mg/l	1	08/15/20	

#### Sample Results



FINAL REPORT

Wood - San Diego 2 9210 Sky Park Court, Suite 200 San Diego, CA 92123

#### Project Number: 1915100403 LECL TMDL Monitoring

Reported: 09/28/2020 17:22

Project Manager: John Rudolph

#### **Quality Control Results**

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

					Spike	Source		%REC		RPD	
Analyte	Result	MDL	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier
Batch: W0H0781 - EPA 353.2											
Blank (W0H0781-BLK1)				Р	Prepared: 08/13/20	Analyzed: 0	8/14/20				
Nitrate as N		0.040	0.20	mg/l							
Nitrite as N		42	100	ug/l							
LCS (W0H0781-BS1)				Р	Prepared: 08/13/20	Analyzed: 0	8/14/20				
Nitrate as N	0.992	0.040	0.20	mg/l	1.00		99	90-110			
Nitrite as N	- 1040	42	100	ug/l	1000		104	90-110			
Matrix Spike (W0H0781-MS1)	Source: Ol	103022-01		Р	Prepared: 08/13/20	Analyzed: 0	8/14/20				
Nitrate as N	4.61	0.040	0.20	mg/l	2.00	2.60	100	90-110			
Nitrite as N	- 1930	84	200	ug/l	2000	ND	97	90-110			
Matrix Spike (W0H0781-MS2)	Source: Ol	107049-05		Р	Prepared: 08/13/20	Analyzed: 0	8/14/20				
Nitrate as N	2.06	0.040	0.20	mg/l	2.00	ND	103	90-110			
Nitrite as N	1070	42	100	ug/l	1000	ND	107	90-110			
Matrix Spike Dup (W0H0781-MSD1)	Source: Ol	403022-01		Р	Prepared: 08/13/20	Analyzed: 0	8/14/20				
Nitrate as N	4.61	0.040	0.20	mg/l	2.00	2.60	100	90-110	0	20	
Nitrite as N	1930	84	200	ug/l	2000	ND	96	90-110	0.2	20	
Matrix Spike Dup (W0H0781-MSD2)	Source: Ol	107049-05		Р	Prepared: 08/13/20	Analyzed: 0	8/14/20				
Nitrate as N	2.06	0.040	0.20	mg/l	2.00	ND	103	90-110	0	20	
Nitrite as N	1070	42	100	ug/l	1000	ND	107	90-110	0	20	
Batch: W0H0816 - EPA 365.3											
Blank (W0H0816-BLK1)					Prepared & Ana	lyzed: 08/14	<b>i/20</b>				
o-Phosphate as P	ND	0.0030	0.010	mg/l							
LCS (WOH0916 BS1)					Propared & Anal	hrad: 08/1/	1/20				
o-Phosphate as P	0.204	0.0030	0.010	mg/l	0.200	iyzeu. 00/ 1-	102	88-111			
				U							
Matrix Spike (W0H0816-MS1) S	Source: 01	<b>107049-01</b>	0.010	ma/l	Prepared & Anal	lyzed: 08/14	100	85 112			
0-r nospilate as r	0.200	0.0030	0.010	iiig/i	0.200	0.00000	100	05-112			
Matrix Spike Dup (W0H0816-MSD1)	Source: Ol	107049-01			Prepared & Ana	lyzed: 08/14	4/20				
o-Phosphate as P	0.206	0.0030	0.010	mg/l	0.200	0.00600	100	85-112	0	20	
Batch: W0H0850 - SM 4500S2-D											
Blank (W0H0850-BLK1)					Prepared & Ana	lvzed: 08/15	5/20				
Sulfide, Total	ND	0.050	0.10	mg/l		. <u>j</u> _cu: co, :	,				
					<b>D</b>						
LCS (W0H0850-BS1) Sulfide Total	0 100	0.050	0.10	ma/l	Prepared & Anal	lyzed: 08/15	100	95-105			
	0.100	0.000	0.10	ing/i	0.100		100	30-100			
Duplicate (W0H0850-DUP1) S	Source: Ol	107050-01			Prepared & Ana	lyzed: 08/15	5/20				
Sulfide, Total	ND	0.050	0.10	mg/l		ND				20	
Batch: W0H0909 - EPA 350.1											
Blank (W0H0909-BLK1)					Prepared & Ana	lyzed: 08/19	9/20				
Ammonia as N	ND	0.012	0.10	mg/l							
Blank (W0H0909-BLK2)					Prepared & Ana	lyzed: 08/19	9/20				

0H07050



**FINAL REPORT** 

#### Wood - San Diego 2 9210 Sky Park Court, Suite 200 San Diego, CA 92123

#### Project Number: 1915100403 LECL TMDL Monitoring

**Reported:** 09/28/2020 17:22

Project Manager: John Rudolph

(Continued)

#### **Quality Control Results**

Conventional Chemistry/Phy	/sical Parameters by APHA	4/EPA/AST	M Methods	s (Continue	ed)							
						Spike	Source		%REC		RPD	
Analyte	(Continued)	Result	MDL	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier
Batch: W0H0909 - EPA 350.1	(Continued)											
Blank (W0H0909-BLK2) Ammonia as N		ND	0.012	0.10	ma/l	Prepared & An	alyzed: 08/	19/20				
		NB	0.012	0.10	ing/i							
LCS (W0H0909-BS1) Ammonia as N		0.256	0.012	0.10	mg/l	Prepared & Ana 0.250	alyzed: 08/	<b>19/20</b> 103	90-110			
LCC (MOLIODOD BC2)						Duamanad St Am	- h d- 00 /	10/20				
Ammonia as N		0.252	0.012	0.10	mg/l	0.250	alyzed: 08/	101	90-110			
Matrix Spike (W0H0909-MS1	)	Source: 0	H07008-01			Prepared & An	alyzed: 08/	19/20				
Ammonia as N		0.513	0.012	0.10	mg/l	0.250	0.255	103	90-110			
Matrix Spike (W0H0909-MS2	2)	Source: 0	H18097-03			Prenared & An	alvzed: 08/	19/20				
Ammonia as N		0.251	0.012	0.10	mg/l	0.250	ND	100	90-110			
Matrix Calles Due (MOLIODO	MCD1)	C	1107000 01			Duamana di St. A.u.	- h d- 00 /	10/20				
Ammonia as N		- 0.517	0.012	0.10	mg/l	0.250	0.255	105	90-110	0.9	15	
					5.							
Matrix Spike Dup (W0H0909	-MSD2)	Source: 0	H18097-03	0.10	mg/l	Prepared & Ana	alyzed: 08/	19/20 101	90-110	0.4	15	
		0.252	0.012	0.10	ing/i	0.200	ND	101	30-110	0.4	10	
Batch: W0H0962 - SM 2540C												
Blank (W0H0962-BLK1)					Prep	oared: 08/17/20	Analyzed:	08/18/20	)			
Total Dissolved Solids			4.0	10	mg/l							
LCS (W0H0962-BS1)					Prep	oared: 08/17/20	Analyzed:	08/18/20	)			
Total Dissolved Solids		831	4.0	10	mg/l	824	-	101	96-102			
Duplicate (W0H0962-DUP1)		Source: 0	H07050-03		Prec	oared: 08/17/20	Analyzed:	08/18/20	)			
Total Dissolved Solids		459	4.0	10	mg/l		462			0.7	10	
Duplicate (W/0H/0962-DUP2)		Source: 0	H07050-05		Pror	arad: 08/17/20	Analyzed	08/18/20	,			
Total Dissolved Solids		1810	4.0	10	mg/l	Jarea. 00/ 17/20	1820	00,10,20	,	0.2	10	
Batch: W0H1006 - SM 2540D												
Blank (W0H1006-BLK1)						Prepared & An	alvzed: 08/	18/20				
Total Suspended Solids				5	mg/l			,				
						Droparod & Ap	aluzadi 09/	10/20				
Total Suspended Solids		218		5	mg/l	242	aiyzeu. 00/	90	90-110			
						<b>n</b> 10.0		10/20				
Total Suspended Solids		Source: 0	H14041-01	5	mg/l	Prepared & An	60.0	18/20		7	20	
·····												
Duplicate (W0H1006-DUP2)		Source: 0	H17017-01	5	ma/l	Prepared & An	alyzed: 08/	18/20		2	20	
Iotal Suspended Solids		1090		5	ing/i		1070			2	20	
Batch: W0H1238 - EPA 365.3												
Blank (W0H1238-BLK1)					Prep	oared: 08/21/20	Analyzed:	08/26/20	)			
Phosphorus as P, Total		0.00100	0.00083	0.010	mg/l							J
LCS (W0H1238-BS1)					Prep	oared: 08/21/20	Analyzed:	08/26/20	,			
Phosphorus as P, Total		0.206	0.00083	0.010	mg/l	0.200		103	90-110			
Matrix Spike (W0H1238-MS1	1)	Source: 0	H07049-01		Prep	oared: 08/21/20	Analyzed:	08/26/20	)			
0H07050												Page 9 of 1



# **Certificate of Analysis**

FINAL REPORT

Project Number: 1915100403 LECL TMDL Monitoring

Reported: 09/28/2020 17:22

(Continued)

Project Manager: John Rudolph

/28/2020 17:22

#### **Quality Control Results**

Conventional Chemistry/Physical Parameters by APH	A/EPA/AST	M Methods	(Continued)	)							
					Spike	Source		%REC		RPD	
Analyte	Result	MDL	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier
Batch: W0H1238 - EPA 365.3 (Continued)											
Matrix Spike (W0H1238-MS1)	Source: 0	H07049-01		Prep	ared: 08/21/20	Analyzed:	08/26/20	1			
Phosphorus as P, Total	0.477	0.00083	0.010	mg/l	0.200	0.280	98	90-110			
Matrix Spike Dup (W0H1238-MSD1)	Source: 0	H07049-01		Prep	ared: 08/21/20	Analyzed:	08/26/20	)			
Phosphorus as P, Total	0.469	0.00083	0.010	mg/l	0.200	0.280	94	90-110	2	20	
Batch: W0H1244 - EPA 351.2											
Blank (W0H1244-BLK1)				Prep	ared: 08/21/20	Analyzed:	08/24/20	1			
TKN		0.018	0.10	mg/l							
Blank (W0H1244-BLK2)				Prep	ared: 08/21/20	Analyzed:	08/24/20	)			
TKN		0.018	0.10	mg/l							
LCS (W0H1244-BS1)				Prep	ared: 08/21/20	Analyzed:	08/24/20	)			
TKN	0.916	0.018	0.10	mg/l	1.00	-	92	90-110			
LCS (W0H1244-BS2)				Prep	ared: 08/21/20	Analyzed:	08/24/20	)			
TKN	0.926	0.018	0.10	mg/l	1.00		93	90-110			
Matrix Spike (W0H1244-MS1)	Source: 0	H17092-05		Prep	ared: 08/21/20	Analyzed:	08/24/20	)			
TKN	1.23	0.018	0.10	mg/l	1.00	0.198	103	90-110			
Matrix Spike (W0H1244-MS2)	Source: 0	H17092-06		Prep	ared: 08/21/20	Analyzed:	08/24/20	1			
TKN	1.14	0.018	0.10	mg/l	1.00	0.155	98	90-110			
Matrix Spike Dup (W0H1244-MSD1)	Source: 0	H17092-05		Prep	ared: 08/21/20	Analyzed:	08/24/20	)			
TKN	1.15	0.018	0.10	mg/l	1.00	0.198	96	90-110	6	10	
Matrix Spike Dup (W0H1244-MSD2)	Source: 0	H17092-06		Prep	ared: 08/21/20	Analyzed:	08/24/20	)			
TKN	1.22	0.018	0.10	mg/l	1.00	0.155	107	90-110	7	10	



# **Certificate of Analysis**

FINAL REPORT

Project Number: 1915100403 LECL TMDL Monitoring

Reported: 09/28/2020 17:22

Project Manager: John Rudolph

(Continued)

**Quality Control Results** 

Metals by EPA 200 Series Methods

					Spike	Source		%REC		RPD	
Analyte	Result	MDL	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier
Batch: W0H1072 - EPA 200.7											
Blank (W0H1072-BLK1)				Prepar	ed: 08/19/20	Analyzed: 0	8/26/20				
Aluminum, Dissolved		0.0014	0.020	mg/l							
Aluminum, Total		0.0014	0.020	mg/l							
LCS (W0H1072-BS1)				Prepar	ed: 08/19/20	Analyzed: 0	8/26/20				
Aluminum, Dissolved	0.208	0.0014	0.020	mg/l	0.200		104	85-115			
Aluminum, Total	0.208	0.0014	0.020	mg/l	0.200		104	85-115			
Matrix Spike (W0H1072-MS1)	Source: 0	H07049-01		Prepar	ed: 08/19/20	Analyzed: 0	8/26/20				
Aluminum, Total	0.250	0.0014	0.020	mg/l	0.200	0.0221	114	70-130			
Matrix Spike (W0H1072-MS2)	Source: 0	H07050-01		Prepar	ed: 08/19/20	Analyzed: 0	8/26/20				
Aluminum, Total	0.252	0.0014	0.020	mg/l	0.200	0.0351	109	70-130			
Matrix Spike Dup (W0H1072-MSD1)	Source: 0	H07049-01		Prepar	ed: 08/19/20	Analyzed: 0	8/26/20				
Aluminum, Total	0.251	0.0014	0.020	mg/l	0.200	0.0221	114	70-130	0.4	30	
Matrix Spike Dup (W0H1072-MSD2)	Source: 0	H07050-01		Prepar	ed: 08/19/20	Analyzed: 0	8/26/20				
Aluminum, Total	0.255	0.0014	0.020	mg/l	0.200	0.0351	110	70-130	1	30	



# **Certificate of Analysis**

FINAL REPORT

Project Number: 1915100403 LECL TMDL Monitoring

Reported: 09/28/2020 17:22

Project Manager: John Rudolph

#### Notes and Definitions

ltem	Definition
J	Estimated conc. detected <mrl and="">MDL.</mrl>
%REC	Percent Recovery
Dil	Dilution
MDL	Method Detection Limit
MRL	The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ)
ND	NOT DETECTED at or above the Method Reporting Limit (MRL). If Method Detection Limit (MDL) is reported, then ND means not detected at or above the MDL.
RPD	Relative Percent Difference
Source	Sample that was matrix spiked or duplicated.

Any remaining sample(s) will be disposed of one month from the final report date unless other arrangements are made in advance.

All results are expressed on wet weight basis unless otherwise specified.

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.



FINAL REPORT

Work Orders:	0H13067	Report Date:	10/14/2020
		Received Date:	8/13/2020
Project:	1915100403 LECL TMDL Monitoring	Turnaround Time:	Normal
	<u> </u>	Phones:	(858) 514-6465
		Fax:	(858) 300-4301
Attn:	John Rudolph	P.O. #:	
Client:	Wood - San Diego 2 9210 Sky Park Court, Suite 200 San Diego, CA 92123	Billing Code:	

#### DoD-ISO ANAB # • ELAP-CA #1132 • EPA-UCMR #CA00211 • HW-DOH # • ISO17025 ANAB #L2457.01 • LACSD #10143 • NELAP-OR #4047 • NJ-DEP #CA015 • SCAQMD #93LA1006

This is a complete final report. The information in this report applies to the samples analyzed in accordance with the chain-of-custody document. Weck Laboratories certifies that the test results meet all requirements of TNI unless noted by qualifiers or written in the Case Narrative. This analytical report must be reproduced in its entirety.

Dear John Rudolph,

Enclosed are the results of analyses for samples received 8/13/20 with the Chain-of-Custody document. The samples were received in good condition, at 5.0 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

**Reviewed by:** 

1: State

Chris Samatmanakit Project Manager





# **Certificate of Analysis**

FINAL REPORT

Project Number: 1915100403 LECL TMDL Monitoring

Reported: 10/14/2020 13:07

Project Manager: John Rudolph

#### Case Narrative

Samples CL10-Surf and LE02-Int were compromised during analysis. Sample filters were initially not analyzed properly and were contaminated before possible re-analysis.

#### Sample Summary

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
CL07-Int	Marisa Swiderski	0H13067-01	Water	08/13/20 10:55	
CL07-Surf	Marisa Swiderski	0H13067-02	Water	08/13/20 11:00	
CL08-Int	Marisa Swiderski	0H13067-03	Water	08/13/20 10:05	
CL08-Surf	Marisa Swiderski	0H13067-04	Water	08/13/20 10:10	
CL09-Int	Marisa Swiderski	0H13067-05	Water	08/13/20 09:15	
CL09-Surf	Marisa Swiderski	0H13067-06	Water	08/13/20 09:20	
CL10-Int	Marisa Swiderski	0H13067-07	Water	08/13/20 08:15	
LE02-Surf	Marisa Swiderski	0H13067-10	Water	08/13/20 09:00	
LE02-Surf (0.5m) TNTP	Marisa Swiderski	0H13067-11	Water	08/13/20 08:15	
LE02-Depth Integrated TNTP	Marisa Swiderski	0H13067-12	Water	08/13/20 08:30	
LE02-Surf (0.5m) TNTP DUP	Marisa Swiderski	0H13067-13	Water	08/13/20 08:55	



FINAL REPORT

#### Wood - San Diego 2 9210 Sky Park Court, Suite 200 San Diego, CA 92123

Project Number: 1915100403 LECL TMDL Monitoring

Project Manager: John Rudolph

Reported: 10/14/2020 13:07

Sample Results ALS Truesdail

	-						
Sample:	CL07-Int 0H13067-01 (Water)			Sa	mpled: 08/	13/20 10:55 by Ma	arisa Swiderski
Analyte		Result	MRL	Units	Dil	Analyzed	Qualifier
Microbiology							
Method: EPA	A 10200 H	Batch ID: 2008541	Prepared: 09/2	2/20 18:55			Analyst: AJF
Chlorophy	yll a	18.1	1.00	ug/L	1	09/22/20	O-04



Wood - San I 9210 Sky Par	Diego 2 rk Court, Suite 200	Project Number:	1915100403 LE	ECL TMDL Mo	onitoring	9	1	<b>Reported:</b> 0/14/2020 13:07
San Diego, C	A 92123	Project Manager:	John Rudolph					
Sa	mple Results ALS Truesdail							(Continued)
Sample:	CL07-Surf 0H13067-02 (Water)				5	Sampled: 08/1	3/20 11:00 by	Marisa Swiderski
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier
Microbiology								
Method: EPA	10200 H	Batch ID: 2008541	Prep	oared: 09/22/20	18:55			Analyst: AJF
Chlorophy	ll a	9.46		1.00	ug/L	1	09/22/20	O-04



Wood - San I 9210 Sky Pai	Diego 2 rk Court, Suite 200	Project Number:	1915100403 LE	CL TMDL Moni	toring	1	<b>Reported:</b> 0/14/2020 13:07
San Diego, C	CA 92123	Project Manager:	John Rudolph				
Sa	mple Results ALS Truesdail						(Continued)
Sample:	CL08-Int 0H13067-03 (Water)				Sampled: 08	8/13/20 10:05 by	Marisa Swiderski
Analyte		Result		MRL Un	its Dil	Analyzed	Qualifier
Microbiology							
Method: EPA	10200 H	Batch ID: 2008541	Prep	oared: 09/22/20 18	:55		Analyst: AJF
Chlorophy	ll a	27.8		1.00 ug	/L 1	09/22/20	O-04



Wood - San I 9210 Sky Pai	Diego 2 rk Court, Suite 200	Project Number:	1915100403 LE	ECL TMDL M	lonitorir	ng	1(	<b>Reported:</b> 0/14/2020 13:07
San Diego, C	CA 92123	Project Manager:	John Rudolph					
Sa	mple Results ALS Truesdail							(Continued)
Sample:	CL08-Surf 0H13067-04 (Water)					Sampled: 08/1	3/20 10:10 by N	Marisa Swiderski
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier
Microbiology								
Method: EPA	10200 H	Batch ID: 2008541	Pre	pared: 09/22/2	0 18:55			Analyst: AJF
Chlorophy	ll a	11.0		1.00	ug/L	1	09/22/20	O-04



Wood - San I 9210 Sky Pai	Diego 2 rk Court, Suite 200	Project Number:	1915100403 LECL T	MDL Monitori	ng	1(	<b>Reported:</b> 0/14/2020 13:07
San Diego, C	CA 92123	Project Manager:	John Rudolph				
Sa	mple Results ALS Truesdail						(Continued)
Sample:	CL09-Int 0H13067-05 (Water)				Sampled: 08,	/13/20 9:15 by M	Marisa Swiderski
Analyte		Result	MRL	Units	Dil	Analyzed	Qualifier
Microbiology							
Method: EPA	10200 H	Batch ID: 2008541	Prepared:	09/22/20 18:55			Analyst: AJF
Chlorophy	II a	67.5	1.00	ug/L	1	09/22/20	O-04



Wood - San I 9210 Sky Pa	Diego 2 rk Court, Suite 200	Project Number:	1915100403 LECL T	MDL Monitori	ng	10	<b>Reported:</b> 0/14/2020 13:07
San Diego, C	A 92123	Project Manager:	John Rudolph				
Sa	mple Results ALS Truesdail						(Continued)
Sample:	CL09-Surf 0H13067-06 (Water)				Sampled: 08	/13/20 9:20 by I	Marisa Swiderski
Analyte		Result	MRL	Units	Dil	Analyzed	Qualifier
Microbiology							
Method: EPA	10200 H	Batch ID: 2008541	Prepared:	09/22/20 18:55			Analyst: AJF
Chlorophy	II a	16.5	1.00	ug/L	1	09/22/20	O-04



Wood - San E 9210 Sky Par	Diego 2 rk Court, Suite 200	Project Number:	1915100403 LECL T	MDL Monitori	ng	10	Reported: 0/14/2020 13:07
San Diego, C	A 92123	Project Manager:	John Rudolph				
Sa	mple Results ALS Truesdail						(Continued)
Sample:	CL10-Int 0H13067-07 (Water)				Sampled: 08/	/13/20 8:15 by N	Aarisa Swiderski
Analyte		Result	MRL	Units	Dil	Analyzed	Qualifier
Microbiology							
Method: EPA	10200 H	Batch ID: 2008541	Prepared:	09/22/20 18:55			Analyst: AJF
Chlorophy	ll a	23.2	1.00	ug/L	1	09/22/20	O-04



Wood - San Diego 2 9210 Sky Park Court, Suite 200 San Diego, CA 92123		Project Number: Project Manager:	1915100403 LE John Rudolph	CL TMDL Mor	nitoring		1	<b>Reported:</b> 0/14/2020 13:07
Sa	mple Results ALS Truesdail							(Continued)
Sample:	LE02-Surf 0H13067-10 (Water)				Sar	mpled: 08/1	3/20 9:00 by	Marisa Swiderski
Analyte		Result		MRL U	Inits	Dil	Analyzed	Qualifier
Microbiology								
Method: EPA 10200 H		Batch ID: 2009467	Prep	oared: 09/24/20 1	5:06			Analyst: RRR
Chlorophy	ll a	200		1.00 u	ıg/L	1	09/25/20	O-04



Wood - San Diego 2		Project Number:	1915100403 LECL 1	MDL Monitor	ng		Reported:	
9210 Sky Park Court, Suite 200						10	0/14/2020 13:07	
San Diego, CA 92123		Project Manager:	John Rudolph					
Sa	mple Results ALS Truesdail						(Continued)	
Sample:	LE02-Surf (0.5m) TNTP 0H13067-11 (Water)				Sampled: 08	8/13/20 8:15 by M	Marisa Swiderski	
Analyte		Result	MRL	Units	Dil	Analyzed	Qualifier	
Microbiology								
Method: EPA 10200 H		Batch ID: 2009467	Prepared	09/24/20 15:06			Analyst: RRR	
Chlorophy	ll a	184	1.00	ug/L	1	09/25/20	O-04	



Wood - San Diego 2		Project Number:	1915100403 LE	CL TMDL Monitor	ing		Reported:
9210 Sky Park Court, Suite 200						10	0/14/2020 13:07
San Diego, CA 92123		Project Manager:	John Rudolph				
Sa	mple Results ALS Truesdail						(Continued)
Sample:	LE02-Depth Integrated TNTP 0H13067-12 (Water)				Sampled: 08	3/13/20 8:30 by I	Marisa Swiderski
Analyte		Result		MRL Units	Dil	Analyzed	Qualifier
Microbiology							
Method: EPA 10200 H		Batch ID: 2009467	Prep	ared: 09/24/20 15:06			Analyst: RRR
Chlorophyl	ll a	156		1.00 ug/L	1	09/25/20	O-04


Wood - San Diego 2		Project Number:	1915100403 LEC	CL TMDL Monitor	ing	g Reported				
San Diego, C	A 92123	Project Manager:	John Rudolph			1	0/14/2020 13:07			
Sa	mple Results ALS Truesdail						(Continued)			
Sample:	LE02-Surf (0.5m) TNTP DUP 0H13067-13 (Water)				Sampled: 0	8/13/20 8:55 by	Marisa Swiderski			
Analyte		Result	N	IRL Units	Dil	Analyzed	Qualifier			
Microbiology										
Method: EPA	10200 H	Batch ID: 2009467	Prepa	red: 09/24/20 15:06			Analyst: RRR			
Chlorophy	II a	166	1	.00 ug/L	1	09/25/20	O-04			



FINAL REPORT

Wood - San Diego 2 9210 Sky Park Court, Suite 200 San Diego, CA 92123 Project Number: 1915100403 LECL TMDL Monitoring

Reported: 10/14/2020 13:07

Project Manager: John Rudolph

#### Quality Control Results

Microbiology										
				Spike	Source		%REC		RPD	
Analyte	Result	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier
Batch: 2008541 - EPA 10200 H										
Blank (2008541-BLK1)			Prepar	ed: 08/27/20	Analyzed:	09/22/20				
Chlorophyll a	<1.00	1.00	ug/L							
Batch: 2009467 - EPA 10200 H										
Blank (2009467-BLK1)			Prepar	ed: 09/24/20	Analyzed:	09/25/20				
Chlorophyll a	<1.00	1.00	ug/L							

# WECK LABORATORIES, INC.

Wood - San Diego 2 9210 Sky Park Court, Suite 200 San Diego, CA 92123

### Certificate of Analysis

FINAL REPORT

Project Number: 1915100403 LECL TMDL Monitoring

Reported: 10/14/2020 13:07

Project Manager: John Rudolph

#### Notes and Definitions

A MARKING	
ltem	Definition
O-04	The sample was analyzed outside of the analyte's hold time.
%REC	Percent Recovery
Dil	Dilution
MRL	The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ)
RPD	Relative Percent Difference
Any rema	ining sample(s) will be disposed of one month from the final report date unless other arrangements are made in advance.

All results are expressed on wet weight basis unless otherwise specified.

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.

#### E.S. Babcock & Sons, Inc. Environmental Laboratories (951) 653-3351 FAX (951) 653-1662

#### Chain of Custody & Sample Information Record

www.babcocklabs.com

0467050

Client: Wood E&I Solutions, Inc.	Contact: Jo	ohn Rudolph			Phone No.	858-243-8158		
FAX No.	Email:	iohn.rudolph@wood	dplc.com		· · · · · · ·	Additional Reporting Requests		
Project Name: LECL TMDL Monitoring Project Number: 1915100403	Turn Aroun	nd Time: proval:	<u>Routine</u> *3-5 Da Rush <sub>by:</sub>	y *48 Hour Rush *Ac	*24 Hour Rush Iditional Charges May Apply	FAX Results: Yes - No Email Results: Yes No State EDT: Yes No (Include Source Number in Notes)		
Sampler Information	# of Co & Pres	ontainers servatives	Sample Type Analys	sis Requested	Matrix	Notes		
Name: Katc Buckley			ainers	365.3)	DW = Drinking Water	Ortho-P is field filtered (0.45 um)		
Employer: Wood E&I Solutions, Inc.		ta 1 4	PA 35	00.1) (EPA (365 1500S (7) EPA :	WW = Wastewater	Dissolved ATIS not-field-fillered- KB		
Signature: Katchneley	served 03	ZnAceta	# 01 C ne nple al Nitrite (E A 351.2	a (EPA 35 osphorus 10-P (EPA fifide (SM4 (EPA 200 (EPA 200 ed AL (I	S = Soll SG = Sludge	Dissilved Alis Field		
	npres 2S04 CI 2S2	aOH 14CI 02en 02en	Otal Outi S S S N (EP	P)Orti P/Orti tal Sul Ssolv	L = Liquid	1110100 (0,4 spanj.		
Sample ID Date Time			<u>- に に い に 差 日 天</u>	Dit 10 SR	M = Miscellaneous			
CL07 913/20 1055	┥┥╸╎╶┥╺┥			x x x x x x x	·····			
CL08 913120 1005				x x x x x x				
CL09 8/13/20 0915				xxxxxx				
CL10 0815			xxxx	xxxxxx	· · · · · · · · · · · · · · · · · · ·			
LEO2								
	<u>†                                    </u>							
	╋		╼╂┊┼┅╊╼┽╍┼┼╌					
			━┫╴╎╎╹┣╺┨╺╟			· · · · · · · · · · · · · · · · · · ·		
· · · ·			╶╊┈┊┼╎╋╋┥╋					
Relinguished By (sign) Print Name / Cor	npany	Date / Time	í Received I	By (Sian)	Prin	ut Name / Company		
4- BUILLIN Kate BUCKLA	unal B	lizion illim		Sall	- 11 - 60/	To los		
Br Dectar Sa	reh 9	12/20/1900	POI	\$13/2v	L- Abac	/ Threek 15:02		
				1				

	(For Lab Use Only) Sample Integrity Upon-Receipt	Lab Notes	
	Sample(s) Submitted on Ice? (Yes No Temperature		Lab No
	Custody Seal(s) Intact? Yes No N/A 5 °C		
j	Sample(s) Intact? (Yes) No 72-239 Cooler Blank		Page of

#### E.S. Babcock & Sons, Inc. Environmental Laboratories

## Chain of Custody & Sample Information Record

(951) 653-3351 FAX (951) 653-1662 www.babcocklabs.com

ſ

Client: Wood E&I Solutions, Inc.			Cor	ntact	: Jo	hn F	Rudo	plph											Phone No.	858-243-8158
FAX No.			Ema	ail:		john.	rudol	lph@	wood	plc.o	com									Additional Reporting Requests Include QC Data Package: Yes No
Project Name: <u>LE TNTP Offset</u> Project Location:			Turi *Lab	n Aro 5 TAT	oun Apr	d Tir prova	ne: al:		By	Roui	tine		*3-5 R	Da lush	ý I	*48	Hou Rush	ir 1 *Ac	*24 Hour Rush Iditional Charges May Apply	FAX Results: ☐ Yes ☐ No Email Results: ☐ Yes ☐ No State EDT: ☐ Yes ☐ No (Include Source Number in Notes)
Sampler Informat	tion			# c & l	of Co Pres	ontai erva	ners tives	;		S	ampl Type	e	Ana	alys	is R	equ	ester	d	Matrix	Notes
Name: KAHEBUC Employer: Wood E&I Solut Signature: KAHBU	Kley ions, Inc. Kly		Ipreserved SO4	21	25203	IOH IOH/ZnAcetate	14CI	ozen	otal # of Containers	outine	esample	peciar tal Sulfide	trate - Nitrite	S	nmonia	tal Phosphorus	tP/Ortho-P Norophyll-a (SM10200 H		DW = Drinking Water WW = Wastewater GW = Groundwater S = Soll SG = Sludge L = Liquid	Chi-a samples on 0.7 um GFF
Sample ID	Dat	e Time	5 9	Ĭ	Ň	N N		ĔĹ	<u> </u>	R R	<b>a</b> (	<u>م ر</u>	ž	<u> </u>	<u> </u>	۴	ភ្នំ ភ្នំ		M = Miscellaneous	
LE02 - Surf (0.5m) TNTP		1340815			+		┼╌┠			╉	<u> </u> .	_					<u>×</u>			Filter Volume: 300mt 270mL
LE02 - Depth Integrated TNTP	-+	0030	<u>/</u>		╇				_ _	+	┝	-		_	_	+	<u> </u>	-		Filter Volume: 300 mL
LE02 - Surf (0.5m) TNTP DUP	~	0855			-		$\left  \right $			-		+	$\left  - \right $				X			Filter Volume: 250ML
				_⊢								╞			_					Filter Volume:
				<u>    -</u>																Filter Volume:
			┨								.									Filter Volume:
									_											Filter Volume:
																				Filter Volume:
,																				Filter Volume:
																	·			Filter Volume:
Relinguished By (sign)	Print N	ame / Con	npany			D	ate /	Time	9		· · ·	Rec	eive	egel E	By (S	Sign	)		, Pri	nt Name / Company
Kate Buckley	Kate BU	xley	, we	pd	ų	b[i	3/1	ຄ (	1405	)		5	(e	þ	2	à	ah		Loche	Sarcha
Hector Sanch-	How	rfw	00	0	E	3-1	32	0	ISců	14	W)	-{	Ç	Č!	3	w			L. phar	
		1						*											-	· · · · · · · · · · · · · · · · · · ·

 (For Lab Use Only) Sample Integrity Upon Receipt	Lab Notes
Sample(s) Submitted on Ice? (Yes) No Urn Temperat	Lab No.
Custody Seal(s) Intact?	°C
Sample(s) Intact? Yes No Cooler Bla	ık Page of



**FINAL REPORT** 

Work Orders:	0114069	Report Date:	9/29/2020
		Received Date:	9/14/2020
Project <sup>.</sup>	LE TMDL Monitoring	Turnaround Time:	Normal
i loject.	C C	Phones:	(858) 514-6465
		Fax:	(858) 300-4301
Attn:	John Rudolph	P.O. #:	C015101084
Client:	Wood - San Diego 2 9210 Sky Park Court, Suite 200 San Diego, CA 92123	Billing Code:	

#### DoD-ISO ANAB # • ELAP-CA #1132 • EPA-UCMR #CA00211 • HW-DOH # • ISO17025 ANAB #L2457.01 • LACSD #10143 • NELAP-OR #4047 • NJ-DEP #CA015 • SCAQMD #93LA1006

This is a complete final report. The information in this report applies to the samples analyzed in accordance with the chain-of-custody document. Weck Laboratories certifies that the test results meet all requirements of TNI unless noted by qualifiers or written in the Case Narrative. This analytical report must be reproduced in its entirety.

Dear John Rudolph,

Enclosed are the results of analyses for samples received 9/14/20 with the Chain-of-Custody document. The samples were received in good condition, at 10.6 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

**Reviewed by:** 

1: State

Chris Samatmanakit Project Manager





### **Certificate of Analysis**

FINAL REPORT

Project Number: LE TMDL Monitoring

Reported: 09/29/2020 17:51

Project Manager: John Rudolph

#### Sample Summary

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
LE02	Kate Buckley	0114069-01	Water	09/14/20 08:45	



### **Certificate of Analysis**

FINAL REPORT

Project Number: LE TMDL Monitoring

Project Manager: John Rudolph

Reported: 09/29/2020 17:51

Sample Results

Sample: LE02	!				Sampleo	d: 09/14/20 8:45 b	y Kate Buckley
0114	069-01 (Water)						
Analyte		Resul	t MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemis	try/Physical Parameters by APHA/EPA	ASTM Methods					
Method: EPA 350.1			Instr: AA06				
Batch ID: W010659	Preparat	ion: _NONE (WETCHEM)	Prepared: 0	9/15/20 13:46			Analyst: YMT
Ammonia as N		0.6	9 0.10	mg/l	1	09/16/20	
Method: EPA 353.2			Instr: AA01				
Batch ID: W010779	Preparat	ion: _NONE (WETCHEM)	Prepared: 0	9/15/20 09:03			Analyst: SAR
Nitrate as N		NE	0.20	mg/l	1	09/15/20 12:04	
Nitrite as N		NE	D 100	ug/l	1	09/15/20 12:04	
Method: EPA 365.3			Instr: UVVIS	504			
Batch ID: W0I0788	Preparat	ion: _NONE (WETCHEM)	Prepared: 0	9/15/20 10:06			Analyst: sbn
o-Phosphate as P		NE	0.010	mg/l	1	09/15/20 11:27	
Method: EPA 365.3			Instr: UVVIS	504			
Batch ID: W010981	Preparat	ion: _NONE (WETCHEM)	Prepared: 0	9/17/20 15:55			Analyst: sbn
Phosphorus as P	, Total	0.2	<b>6</b> 0.010	mg/l	1	09/22/20	
Method: SM 2540C			Instr: OVEN	101			
Batch ID: W010887	Preparat	ion: _NONE (WETCHEM)	Prepared: 0	9/16/20 13:35			Analyst: ism
Total Dissolved S	olids		<b>0</b> 10	mg/l	1	09/16/20	
Method: SM 4500S2	-D		Instr: _ANA	LYST			
Batch ID: W0I1037	Preparat	ion: _NONE (WETCHEM)	Prepared: 0	9/19/20 10:15			Analyst: mfh
Sulfide, Total		NE	0.10	mg/l	1	09/19/20	
Sample: LE02	<u>!</u>				Sample	d: 09/14/20 8:45 b	y Kate Buckley
0114	069-01RE2 (Water)						
Analyte		Resul	t MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemis	try/Physical Parameters by APHA/EPA	ASTM Methods					
Method: EPA 351.2			Instr: AA06				
Batch ID: W0I1034	Preparat	ion: _NONE (WETCHEM)	Prepared: 0	9/18/20 17:33			Analyst: YMT
TKN		4.	<b>6</b> 0.40	mg/l	4	09/22/20	



#### **Certificate of Analysis**

FINAL REPORT

09/29/2020 17:51

Reported:

Project Number: LE TMDL Monitoring

Project Manager: John Rudolph

Quality	Control	Results
Guanty	Condor	ricourto

Conventional Chemistry/Physical Parameters	by APHA/EPA/ASTM Metho	ds								
				Spike	Source		%REC		RPD	
Analyte	Result	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier
Batch: W0I0659 - EPA 350.1										
Blank (W0l0659-BLK1)			Pre	pared: 09/15/20	) Analyzed	: 09/16/20	1			
Ammonia as N	• • • • • • • • • • • ND	0.10	mg/l							
Blank (W0I0659-BLK2)			Pre	pared: 09/15/20	) Analyzed	: 09/16/20				
Ammonia as N	ND	0.10	mg/l							
LCS (WOIDEED BS1)			Bro	narad: 00/15/20	) Analyzad	00/16/20				
Ammonia as N	0.255	0.10	mg/l	0.250	7 Analyzeu	102	, 90-110			
LCS (W010659-BS2)	0.256	0.10	Pre ma/l	0 250	) Analyzed	103	00_110			
	0.230	0.10	mg/i	0.230		105	90-110			
Duplicate (W0I0659-DUP1)	Source: 0I14115-01		Pre	pared: 09/15/20	) Analyzed	: 09/16/20	1			
Ammonia as N	· ND	0.10	mg/l		ND				15	
Matrix Spike (W0I0659-MS1)	Source: 0I10075-05		Pre	pared: 09/15/20	) Analyzed	: 09/16/20	)			
Ammonia as N	0.322	0.10	mg/l	0.250	0.0577	106	90-110			
Matrix Spike (W010659-MS2)	Source: 0110075-16		Pre	pared: 09/15/20	) Analyzed	09/16/20				
Ammonia as N	0.254	0.10	mg/l	0.250	ND	102	90-110			
Mathin Caller Daw (MOIOCEO MCD4)	C		P			00/16/20				
Ammonia as N	0.317	0.10	ma/l	0.250	0.0577	104	90-110	2	15	
Matrix Spike Dup (W010659-MSD2)	Source: 0110075-16	0.10	Pre ma//	pared: 09/15/20	) Analyzed	: 09/16/20	00 110	0.7	15	
Ammonia as N	0.250	0.10	mg/i	0.230	ND	102	90-110	0.7	10	
Batch: W0I0779 - EPA 353.2										
Blank (W0I0779-BLK1)				Prepared & An	alyzed: 09/	15/20				
Nitrate as N	ND	0.15	mg/l							
Nitrite as N	ND	100	ug/l							
LCS (W010779-BS1)				Prepared & An	alvzed: 09/	15/20				
Nitrate as N	1.02	0.15	mg/l	1.00		102	90-110			
Nitrite as N		100	ug/l	1000		108	90-110			
	C 014445 04					4 5 /00				
Duplicate (W010779-D0P1) Nitrate as N	0 921	0 15	ma/l	Prepared & An	alyzed: 09/ 0.933	15/20		1	20	
Nitrite as N	ND	100	ua/l		ND			-	20	
		100	ugn		ne -				20	
Matrix Spike (W010779-MS1)	Source: 0114055-01	0.45		Prepared & An	alyzed: 09/	15/20	00.440			
Nitrate as N	6.0	0.15	mg/i	2.00	5.54	106	90-110			
Nitrite as N	1050	100	ug/l	1000	ND	105	90-110			
Matrix Spike (W010779-MS2)	Source: 0I14104-05			Prepared & An	alyzed: 09/	15/20				
Nitrate as N	6.09	0.15	mg/l	2.00	3.95	107	90-110			
Nitrite as N	5050	500	ug/l	5000	ND	101	90-110			
Matrix Spike Dup (W010779-MSD1)	Source: 0I14055-01			Prepared & An	alyzed: 09/	15/20				
Nitrate as N	7.65	0.15	mg/l	2.00	5.54	106	90-110	0	20	
Nitrite as N	1070	100	ug/l	1000	ND	107	90-110	2	20	
Matrix Saika Dun (MO10770 MSD3)	Source: 0114104-05			Dropared 0. A.	aluzad- 00 (	15/20				
Nitrate as N	6.10	0.15	mg/l	2.00	3.95	108	90-110	0.2	20	
0114069			5							Doge 4 of 7
111003										Page 4 of 7

WECK LABORAT	ORIES. INC.

FINAL REPORT

#### Wood - San Diego 2 9210 Sky Park Court, Suite 200 San Diego, CA 92123

Project Number: LE TMDL Monitoring

**Reported:** 09/29/2020 17:51

Project Manager: John Rudolph

(Continued)	

**Quality Control Results** 

Conventional Chemistry/Physical Parameters	by APHA/EPA/ASTM Mathad	(Continue	ad)							
Conventional Chemistry/Physical Parameters	by APHA/EPA/ASTM Methods	s (Continue	eu)	Spike	Source		%REC		RPD	
Analyte	Result	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier
Batch: W0I0779 - EPA 353.2 (Continued)										
Matrix Spike Dup (W010779-MSD2)	Source: 0I14104-05			Prepared & Ar	nalyzed: 09/	15/20				
Nitrite as N	4830	500	ug/l	5000	ND	97	90-110	4	20	
Batch: W0I0788 - EPA 365.3										
Blank (W0I0788-BLK1)				Prepared & Ar	nalyzed: 09/	15/20				
o-Phosphate as P	ND	0.010	mg/l							
LCS (W0I0788-BS1)				Prepared & An	nalyzed: 09/	15/20				
o-Phosphate as P	0.206	0.010	mg/l	0.200		103	88-111			
Matrix Spike (W0I0788-MS1)	Source: 0103007-01			Prepared & Ar	nalyzed: 09/	15/20				
o-Phosphate as P	0.194	0.010	mg/l	0.200	ND	97	85-112			
Matrix Spike Dup (W0I0788-MSD1)	Source: 0103007-01			Prepared & Ar	nalyzed: 09/	15/20				
o-Phosphate as P	0.196	0.010	mg/l	0.200	ND	98	85-112	1	20	
Batch: W0I0887 - SM 2540C										
Blank (W0I0887-BLK1)				Prepared & Ar	nalyzed: 09/	16/20				
Total Dissolved Solids	ND	10	mg/l							
LCS (W010887-BS1)				Prepared & Ar	nalvzed: 09/	16/20				
Total Dissolved Solids		10	mg/l	824	,,	101	96-102			
Duplicate (W010887-DUP1)	Source: 0115077-04			Prenared & Ar	nalvzed: 09/	16/20				
Total Dissolved Solids	6230	10	mg/l	ricpurcu di A	6300	10/20		1	10	
Duplicate (WOI0887-DUD2)	Source: 0111045-01			Propared & A	nalvzod: 00/	16/20				
Total Dissolved Solids	62700	100	mg/l	ricpurcu di A	62800	10/20		0.2	10	
Batch: W0l0981 - EPA 365.3										
Blank (W010981-BI K1)			Pre	enared: 09/17/2	0 Analyzed	09/22/20	n			
Phosphorus as P, Total	ND	0.010	mg/l	cpurcu. 00/ 17/2	o manyica.					
LCS (W010981-BS1)			Dre	enared: 09/17/2	0 Analyzed	09/22/20	n			
Phosphorus as P, Total	0.202	0.010	mg/l	0.200	o Analyzeu	101	90-110			
Matrix Spike (WO10981-MS1)	Source: 0103007-01		Pro	enared: 09/17/2	0 Analyzed	09/22/20	n			
Phosphorus as P, Total	0.457	0.010	mg/l	0.200	0.253	102	90-110			
Matrix Spike Dup (W010981-MSD1)	Source: 0103007-01		Pre	enared: 09/17/2	0 Analyzed	09/22/20	n			
Phosphorus as P, Total	0.457	0.010	mg/l	0.200	0.253	102	90-110	0	20	
Batch: W0l1034 - EPA 351.2										
Blank (W011034-BI K1)			Pre	enared: 09/18/2	0 Analyzed	09/22/20	n			
TKN	ND	0.10	mg/l	cpurcu. 00/ 10/2	o raiaiyzea					
LCS (W0I1034-BS1)			Pro	enared: 09/18/2	0 Analyzed	09/22/20	n			
TKN	1.08	0.10	mg/l	1.00	o Analyzeu	108	90-110			
Matrix Saika (WOI1024 MS1)	Source: 0114114 04		Der	aparod: 00/19/2	0 Analumat	00/22/24	0			
TKN	1.17	0.10	mg/l	1.00	0.172	100	90-110			
Matrix Spike Dup (W0I1034-MSD1) TKN	Source: 0I14114-04	0.10	Pre ma/l	epared: 09/18/2 1.00	• Analyzed: 0.172	99/22/20 99	90-110	0.7	10	
			3		=				-	

0I14069



**FINAL REPORT** 

#### Wood - San Diego 2 9210 Sky Park Court, Suite 200 San Diego, CA 92123

Project Number: LE TMDL Monitoring

#### Reported:

Project Manager: John Rudolph

09/29/2020 17:51

Quality Control Results

Quality Control Re	esults								(C	ontinued)
Conventional Chemistry/Physical Paramet	ters by APHA/EPA/ASTM Metho	ds (Continued	d)							
				Spike	Source		%REC		RPD	
Analyte	Result	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier
atch: W0I1037 - SM 4500S2-D										
Blank (W0I1037-BLK1)				Prepared & A	nalyzed: 09/19	9/20				
Sulfide, Total	ND	0.10	mg/l							
LCS (W0I1037-BS1)				Prepared & A	nalyzed: 09/19	9/20				
Sulfide, Total	0.100	0.10	mg/l	0.100		100	95-105			
Duplicate (W0I1037-DUP1)	Source: 0I16119-03	8		Prepared & A	nalyzed: 09/19	9/20				
Sulfide, Total	0.400	0.10	mg/l		0.400			0	20	
Duplicate (W0I1037-DUP2)	Source: 0I17048-01			Prepared & A	nalyzed: 09/19	9/20				
Sulfide, Total	44.0	4.0	mg/l	-	44.0			0	20	



### **Certificate of Analysis**

FINAL REPORT

Project Number: LE TMDL Monitoring

Reported: 09/29/2020 17:51

Project Manager: John Rudolph

#### Notes and Definitions

ltem	Definition
%REC	Percent Recovery
Dil	Dilution
MRL ND	The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ) NOT DETECTED at or above the Method Reporting Limit (MRL). If Method Detection Limit (MDL) is reported, then ND means not detected at or
	above the MDL.
RPD	Relative Percent Difference
Source	Sample that was matrix spiked or duplicated.

Any remaining sample(s) will be disposed of one month from the final report date unless other arrangements are made in advance.

All results are expressed on wet weight basis unless otherwise specified.

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.

#### E.S. Babcock & Sons, Inc. Environmental Laboratories (951) 653-3351 FAX (951) 653-1662

#### Chain of Custody & Sample Information Record

www.babcocklabs.com

																								0.	I14069	
Client: Wood E&I Solutions,	Inc.		Co	nta	ict:	Joł	n F	ludo	olph														Phone No.	858-	243-8158	
FAX No.			En	nail	:	j	ohn.	rudo	lph	<u>D</u> wo	oodp	lc.c	om												Additional Reporting	Requests e: Yes No
Project Name: <u>LE TMDL Mon</u> Project Number: 1915100403	itoring		Tu Lat	rn / o TA	Aro AT A	und	Tir oval	ne: :			<u>R</u> By:	<u>out</u>	tine (		*3	3-5 [ Ru:	Day sh		*48 F	Ho Rusi	ur N	* *Ad	24 Hour Rush dilional Charges May Apply		FAX Result Email Result State ED Include Source Numbe	s:□ Yes No s:□ Yes No T:□ Yes No r in Notes)
Sampler Inform	ation				# of & P	f Co 'rese	ntaii erva	ners tive:	5 5			Sa T	amp Fype	le >	,	Ana	lysi	is R	lequ	iest	æd		Matrix		Notes	
Name: <u>Kate Bu</u> Employer: <u>Wood E&amp;I Soli</u> Signature: <u>Kate Bu</u> Sample ID	utions, Inc.	Timo	Inpreserved	12504 ICI	INO3	la2S2O3	aon laOH/ZnAcetate	IH4CI	ICAA Prozen		fotal # of Containers	Routine	Resample	Special	55 litrata - Nitrita (EDA 252 2)	DS (SM2540 C)	KN (EPA 351.2	ummonia (EPA 350.1)	otal Phosphorus (EPA 365.3)	otal Suffide (SM4500S)	otal AL (EPA 200.7)	otal AL (EPA 200.7)	DW = Drinking Water WW = Wastewater GW = Groundwater S = Soil SG = Sludge L = Liquid M = Miscellaneous	No lat filtere	› filtration required for ( এ).	⊃rtho-P (field
	Divila	AUS	<u> </u>	╵	· •					•				f		<u> </u>		4 V	<u>v</u> v							
									······································																	
Relinquished By (sign)	Print Name	/ Com	ipan	iy			D	ate .	/ Tin	ne				R	lec	eive	ed E	3y (	Sig	1)		_	Pri	nt Nan	ne / Company	
Kote bulley	Kate Buckle	<u>y/n</u>	1000 9/14/20 12.4 9/14/20 1-0			5 <b>06</b> 07	2 Dorin 7 Janghun 9/14/20 1307							1/2	01	.ગુંગ	}	Woets JAMEGOI	- ''f{	Jab. /wouldbs						
															•										ι -	

(For Lab Use Only) Sample Integrity	/ Upon_Receipt		Lab Notes	
Sample(s) Submitted on Ice?	Yes No	Temperature		Lab No.
Custody Seal(s) Intact?	Yes (No N/A	10.6° ℃		
Sample(s) Intact?	Yes No	Cooler Blank		Page of

#### E.S. Babcock & Sons, Inc. Environmental Laboratories

#### Chain of Custody & Sample Information Record

(951) 653-3351 FAX (951) 653-1662 www.babcocklabs.com

----

																							014071
Client: Wood E&I Solutions,	Inc.		Co	onta	act:	Jol	hn F	Rud	olpl	n												Phone No.	858-243-8158
FAX No.			En	nail	:	jol	<u>hn.r</u>	udc	lph	@v	/ood	plc	.con	<u>n</u>									Additional Reporting Requests
Project Name: LECL TMDL N Project Number: 1915100403	lonitoring		Tu *La	Turn Around Time: *Lab TAT Approval:				R By:	<u>Routine</u> *3-5 Day *48 l Rush R By:				*48 Hour *24 Hour Rush Rush *Additional Charges May Apply			*24 Hour Rush Illional Charges May Apply	FAX Results: Verson No Email Results: Verson No State EDT: Verson No (Include Source Number in Notes)						
Sampler Inform	ation				# of & P	f Co 'rese	ntai erva	ner tive	s •s			S	lampl Type	e	Ar	naly	sis	Rei	que	sted	,	Matrix	Notes
Name: <u>KAHEB</u> Employer: <u>Wood E&amp;I Sol</u> Signature: <u>Katu</u>	UCKUY utions, Inc. GUULY	-	served			03	ZnAcetate				# of Containers	ine	mple	lai	sultrice - Nitrite			nia Mean-trans	ritospriorus rtho-P	phyil-a (SM10200 H)		DW = Drinking Water WW = Wastewater GW = Groundwater S = Soll SG = Sludge	Chi-a samples on 0.7 um GFF
Samala ID	Dofo	Timo	lupre	12SQ4	NO3	la2S2		H4CI	ICAA	rozen	otai	Rout	Resa	Sec	otal » litrate	SO	¥	omm		hlorc		L ≍ Liquid M ≍ Missellanseus	
LE02 - Int	9/14/20	0845		<u> </u>				Z		<u>-</u>	╎╴						-		- 100	x	╡	M - Miscenalieous	Filter Volume: 350m
LE02 - Surf	4	0910																		x			Filter Volume: 350mC
																							Filter Volume:
																							Filter Volume:
																							Filter Volume:
																							Filter Volume:
Relinquished By (sign)	Print Nam	ne / Con	npar	ıy			D	ate	/ Ti	me				Re	cei	ved	Ву	(Si	gn)			Pri	nt Name / Company
Katebruhn	Kate Buck	ley/1	NO	od		9	14	12	0	1.5	୶ଜ	·											
Derline	Dec	~!'		- (		Å	14	12	۵	ţ,	· 67		T	WY	γw	$\gamma$						JAMEGOME 1	walobs
-																						1	··· · · · · · · · · · · · · · · · · ·

	Lab Notes		Jpon-Receipt	(For Lab Use Only) Sample Integrity
Lab No.		Temperature	Yes No	Sample(s) Submitted on Ice?
· · · · ·		(0.6 °C	Yes No N/A	Custody Seal(s) Intact?
		Cooler Blank	Yes No	Sample(s) Intact?

Page of \_\_\_\_



FINAL REPORT

Work Orders:	0125011	Report Date:	10/19/2020
		Received Date:	10/5/2020
Project:	<ecl 1915100403<="" monitoring="" th="" tmdl=""><th>Turnaround Time:</th><th>Normal</th></ecl>	Turnaround Time:	Normal
Troject.	<b>3 1 1 1</b>	Phones:	(858) 514-6465
		Fax:	(858) 300-4301
Attn:	John Rudolph	P.O. #:	C015101084
Client:	Wood - San Diego 2 9210 Sky Park Court, Suite 200 San Diego, CA 92123	Billing Code:	

#### DoD-ISO ANAB # • ELAP-CA #1132 • EPA-UCMR #CA00211 • HW-DOH # • ISO17025 ANAB #L2457.01 • LACSD #10143 • NELAP-OR #4047 • NJ-DEP #CA015 • SCAQMD #93LA1006

This is a complete final report. The information in this report applies to the samples analyzed in accordance with the chain-of-custody document. Weck Laboratories certifies that the test results meet all requirements of TNI unless noted by qualifiers or written in the Case Narrative. This analytical report must be reproduced in its entirety.

Dear John Rudolph,

Enclosed are the results of analyses for samples received 10/05/20 with the Chain-of-Custody document. The samples were received in good condition, at 4.3 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

**Reviewed by:** 

1: State

Chris Samatmanakit Project Manager





### **Certificate of Analysis**

FINAL REPORT

Project Number: <ECL TMDL Monitoring 1915100403

**Reported:** 10/19/2020 13:41

Project Manager: John Rudolph

#### Sample Summary

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
CL07	Kate Buckley	0I25011-01	Water	10/05/20 10:45	
CL08	Kate Buckley	0125011-02	Water	10/05/20 10:00	
CL09	Kate Buckley	0125011-03	Water	10/05/20 09:10	
CL10	Kate Buckley	0125011-04	Water	10/05/20 08:20	
LE02	Kate Buckley	0125011-05	Water	10/05/20 08:35	



\_

### **Certificate of Analysis**

**FINAL REPORT** 

Project Number: <ECL TMDL Monitoring 1915100403

Reported: 10/19/2020 13:41

Project Manager: John Rudolph

Sample Results							
Sample: CL07					Sampleo	d: 10/05/20 10:45 b	y Kate Buckley
0I25011-01 (Water)							
Analyte	Res	sult MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by	APHA/EPA/ASTM Methods						
Method: EPA 350.1			Instr: AA06				
Batch ID: W0J0391	Preparation: _NONE (WETCHEM)		Prepared: 1	0/09/20 09:44			Analyst: YMT
Ammonia as N		<b>1.9</b> 0.012	0.10	mg/l	1	10/09/20	
Method: EPA 351.2			Instr: AA06				
Batch ID: W0J0684	Preparation: _NONE (WETCHEM)		Prepared: 1	0/13/20 10:07			Analyst: YMT
TKN		<b>2.4</b> 0.018	0.10	mg/l	1	10/14/20	
Method: EPA 353.2			Instr: AA01				
Batch ID: W0J0241	Preparation: _NONE (WETCHEM)		Prepared: 1	0/06/20 09:05			Analyst: SAR
Nitrate as N		0.040	0.20	mg/l	1	10/06/20 12:48	J
Nitrite as N		ND 0.042	0.10	mg/l	1	10/06/20 12:48	
Method: EPA 365.3			Instr: UVVIS	04			
Batch ID: W0J0309	Preparation: _NONE (WETCHEM)		Prepared: 1	0/06/20 15:47			Analyst: sbn
o-Phosphate as P	0.	.16 0.0030	0.010	mg/l	1	10/06/20 16:36	
Method: EPA 365.3			Instr: UVVIS	04			
Batch ID: W0J0498	Preparation: _NONE (WETCHEM)		Prepared: 1	0/08/20 17:26			Analyst: sbn
Phosphorus as P, Total		<b>.20</b> 0.00083	0.010	mg/l	1	10/13/20	
Method: SM 2540C			Instr: OVEN	01			
Batch ID: W0J0322	Preparation: _NONE (WETCHEM)		Prepared: 1	0/06/20 17:23			Analyst: ism
Total Dissolved Solids		<b>4.0</b>	10	mg/l	1	10/07/20	
Method: SM 2540D			Instr: OVEN	11			
Batch ID: W0J0469	Preparation: _NONE (WETCHEM)		Prepared: 1	0/08/20 11:58			Analyst: mfh
Total Suspended Solids	· · · · · · · · · · · · · · · · · · ·	ND	5	mg/l	1	10/08/20	
Method: SM 4500S2-D			Instr: _ANAL	YST			
Batch ID: W0J0500	Preparation: _NONE (WETCHEM)		Prepared: 1	0/08/20 17:42			Analyst: mfh
Sulfide, Total		<b>8.0</b> 0.20	0.40	mg/l	4	10/09/20	
Metals by EPA 200 Series Methods							
Method: EPA 200.7			Instr: ICP03				
Batch ID: W0J0590	Preparation: EPA 200.2		Prepared: 1	0/11/20 15:03			Analyst: kvm
Aluminum, Dissolved	0.0	0.0014	0.020	mg/l	1	10/17/20	
Aluminum, Total	0.0	0.0014	0.020	mg/l	1	10/17/20	



### **Certificate of Analysis**

**FINAL REPORT** 

Project Number: <ECL TMDL Monitoring 1915100403

Reported: 10/19/2020 13:41

Project Manager: John Rudolph

Sample Results							(Continued)
Sample: CL08					Sampleo	d: 10/05/20 10:00 b	y Kate Buckley
0l25011-02 (Water)	Result	МDI	MRI	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Paramete	ers by APHA/EPA/ASTM Methods	MDL	iiiiii	onits	511	Analyzeu	Quanner
<b>Method:</b> EPA 350.1			Instr: AA06				
Batch ID: W0J0391	Preparation: _NONE (WETCHEM)		Prepared: 10/09	/20 09:44			Analyst: YMT
Ammonia as N	0.45	0.012	0.10	mg/l	1	10/09/20	
Method: EPA 351.2			Instr: AA06				
Batch ID: W0J0684	Preparation: _NONE (WETCHEM)		Prepared: 10/13,	/20 10:07			Analyst: YMT
TKN	1.1	0.018	0.10	mg/l	1	10/14/20	
Method: EPA 353.2			Instr: AA01				
Batch ID: W0J0241	Preparation: _NONE (WETCHEM)		Prepared: 10/06	/20 09:05			Analyst: SAR
Nitrate as N	ND	0.040	0.20	mg/l	1	10/06/20 12:49	
Nitrite as N	ND	0.042	0.10	mg/l	1	10/06/20 12:49	
Method: EPA 365.3			Instr: UVVIS04				
Batch ID: W0J0309	Preparation: _NONE (WETCHEM)		Prepared: 10/06	/20 15:47			Analyst: sbn
o-Phosphate as P	0.0070	0.0030	0.010	mg/l	1	10/06/20 16:39	J
Method: EPA 365.3			Instr: UVVIS04				
Batch ID: W0J0498	Preparation: _NONE (WETCHEM)		Prepared: 10/08	/20 17:26			Analyst: sbn
Phosphorus as P, Total	0.052	0.00083	0.010	mg/l	1	10/13/20	
Method: SM 2540C			Instr: OVEN01				
Batch ID: W0J0322	Preparation: _NONE (WETCHEM)		Prepared: 10/06	/20 17:23			Analyst: ism
Total Dissolved Solids		4.0	10	mg/l	1	10/07/20	
Method: SM 2540D			Instr: OVEN11				
Batch ID: W0J0469	Preparation: _NONE (WETCHEM)		Prepared: 10/08	/20 11:58			Analyst: mfh
Total Suspended Solids			5	mg/l	1	10/08/20	
Method: SM 4500S2-D			Instr: _ANALYST				
Batch ID: W0J0500	Preparation: _NONE (WETCHEM)		Prepared: 10/08	/20 17:42			Analyst: mfh
Sulfide, Total	4.8	0.20	0.40	mg/l	4	10/09/20	
Metals by EPA 200 Series Methods							
Method: EPA 200.7			Instr: ICP03				
Batch ID: W0J0590	Preparation: EPA 200.2		Prepared: 10/11,	/20 15:03			Analyst: kvm
Aluminum, Dissolved	0.032	0.0014	0.020	mg/l	1	10/17/20	
Aluminum, Total	0.040	0.0014	0.020	mg/l	1	10/17/20	



### **Certificate of Analysis**

**FINAL REPORT** 

Project Number: <ECL TMDL Monitoring 1915100403

Reported:

10/19/2020 13:41

Project Manager: John Rudolph

10	ntin	1004
	JHUH	ueu

Sample Results							(Continued)
Sample: CL09					Sample	d: 10/05/20 9:10 b	y Kate Buckley
0l25011-03 (Water)							
Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters	by APHA/EPA/ASTM Methods						
Method: EPA 350.1			Instr: AA06				
Batch ID: W0J0391	Preparation: _NONE (WETCHEM)		<b>Prepared:</b> 10/09	)/20 09:44			Analyst: YMT
Ammonia as N	2.3	0.012	0.10	mg/l	1	10/09/20	
Method: EPA 351.2			Instr: AA06				
Batch ID: W0J0684	Preparation: NONE (WETCHEM)		Prepared: 10/13	3/20 10:07			Analyst: YMT
ТКМ	3.1	0.018	0.10	mg/l	1	10/14/20	
Method: EPA 353.2			Instr: AA01				
Batch ID: W0J0241	Preparation: NONE (WETCHEM)		<b>Prepared:</b> 10/06	6/20 09:05			Analvst: SAR
Nitrate as N	0.056	0.040	0.20	mg/l	1	10/06/20 12:50	J
Nitrite as N	ND	0.042	0.10	mg/l	1	10/06/20 12:50	
Method: EPA 365.3			Instr: UVVIS04				
Batch ID: W0/0309	Preparation: NONF (WETCHEM)		Prepared: 10/06	5/20 15·47			Analyst: sbn
o-Phosphate as P	0.0070	0.0030	0.010	mg/l	1	10/06/20 16:40	J
Method: EPA 365.3			Instr: UVVIS04				
Batch ID: W0J0498	Preparation: NONE (WETCHEM)		Prepared: 10/08	3/20 17:26			Analyst: sbn
Phosphorus as P, Total	0.061	0.00083	0.010	mg/l	1	10/13/20	
Method: SM 2540C			Instr: OVENI01				
Batch ID: W010322	Preparation: NONE (WETCHEM)		Prepared: 10/06	5/20 17:23			Analyst: ism
Total Dissolved Solids	400	4.0	10	mg/l	1	10/07/20	,
Method: SM 2540D			Instr: OVENI11				
Batch ID: W0J0469	Preparation: NONE (WETCHEM)		<b>Prepared:</b> 10/08	3/20 11:58			Analyst: mfh
Total Suspended Solids	6		5	mg/l	1	10/08/20	
Method: SM 4500S2-D			Instr: ANALYST				
Batch ID: W0J0500	Preparation: NONE (WETCHEM)		Prepared: 10/08	3/20 17:42			Analyst: mfh
Sulfide, Total	8.8	0.20	0.40	mg/l	4	10/09/20	
Metals by EPA 200 Series Methods							
Method: FPA 200 7			Instr: ICP03				
Batch ID: W0J0590	Preparation: EPA 200.2		Prepared: 10/11	/20 15:03			Analvst: kvm
Aluminum, Dissolved	0.053	0.0014	0.020	mg/l	1	10/17/20	,
Aluminum, Total	0.070	0.0014	0.020	mg/l	1	10/17/20	



### **Certificate of Analysis**

**FINAL REPORT** 

Project Number: <ECL TMDL Monitoring 1915100403

Reported:

10/19/2020 13:41

Project Manager: John Rudolph

- 1	Continued)
	Continucu)

Sample Results							(Continued)
Sample: CL10					Sample	d: 10/05/20 8:20 b	y Kate Buckley
0l25011-04 (Water)							
Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by	APHA/EPA/ASTM Methods						
Method: EPA 350.1			Instr: AA06				
Batch ID: W0J0391	Preparation: _NONE (WETCHEM)		<b>Prepared:</b> 10/09	/20 09:44			Analyst: YMT
Ammonia as N	ND	0.012	0.10	mg/l	1	10/09/20	
Method: EPA 351.2			Instr: AA06				
Batch ID: W0J0684	Preparation: _NONE (WETCHEM)		<b>Prepared:</b> 10/13	/20 10:07			Analyst: YMT
TKN	0.98	0.018	0.10	mg/l	1	10/14/20	
Method: EPA 353.2			Instr: AA01				
Batch ID: W0J0241	Preparation: NONE (WETCHEM)		Prepared: 10/06	/20 09:05			Analyst: SAR
Nitrate as N	0.044	0.040	0.20	mg/l	1	10/06/20 12:51	J
Nitrite as N	ND	0.042	0.10	mg/l	1	10/06/20 12:51	
Method: EPA 365.3			Instr: UVVIS04				
Batch ID: W0J0309	Preparation: NONE (WETCHEM)		<b>Prepared:</b> 10/06	/20 15:47			Analvst: sbn
o-Phosphate as P	0.0050	0.0030	0.010	mg/l	1	10/06/20 16:41	J
Method: EPA 365.3			Instr: UVVIS04				
Batch ID: W0J0498	Preparation: _NONE (WETCHEM)		Prepared: 10/08	/20 17:26			Analyst: sbn
Phosphorus as P, Total	0.061	0.00083	0.010	mg/l	1	10/13/20	
Method: SM 2540C			Instr: OVEN01				
Batch ID: W0J0322	Preparation: _NONE (WETCHEM)		<b>Prepared:</b> 10/06	/20 17:23			Analyst: ism
Total Dissolved Solids	500	4.0	10	mg/l	1	10/07/20	
Method: SM 2540D			Instr: OVEN11				
Batch ID: W0J0469	Preparation: _NONE (WETCHEM)		Prepared: 10/08	/20 11:58			Analyst: mfh
Total Suspended Solids			5	mg/l	1	10/08/20	
Method: SM 4500S2-D			Instr: _ANALYST				
Batch ID: W0J0500	Preparation: _NONE (WETCHEM)		<b>Prepared:</b> 10/08	/20 17:42			Analyst: mfh
Sulfide, Total	ND	0.050	0.10	mg/l	1	10/09/20	
Metals by EPA 200 Series Methods							
Method: EPA 200.7			Instr: ICP03				
Batch ID: W0J0590	Preparation: EPA 200.2		Prepared: 10/11	/20 15:03			Analyst: kvm
Aluminum, Dissolved	0.069	0.0014	0.020	mg/l	1	10/17/20	
Aluminum, Total	0.16	0.0014	0.020	mg/l	1	10/17/20	



### **Certificate of Analysis**

**FINAL REPORT** 

Project Number: <ECL TMDL Monitoring 1915100403

Reported:

10/19/2020 13:41

Project Manager: John Rudolph

Sample Results							(Continued)
Sample: LE02					Sampleo	d: 10/05/20 8:35 b	y Kate Buckley
0l25011-05 (Water)							
Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters b	y APHA/EPA/ASTM Methods						
Method: EPA 350.1			Instr: AA06				
Batch ID: W0J0391	Preparation: NONE (WETCHEM)		Prepared: 10/0	)9/20 09:44			Analvst: YMT
Ammonia as N	0.31	0.012	0.10	mg/l	1	10/09/20	
Mathad EDA 251 2			Inches AAOG				
Retrict ID: W/010694	Properation: NONE (METCHENA)		Bronorod: 10/1	12/20 10:07			Analysti VMT
	Preparation: _NONE (WEICHEM)	0.018	0 10	ma/l	1	10/14/20	Analyst: MMI
		0.010	0.10	iiig/i	·	10/11/20	
Method: EPA 353.2			Instr: AA01				
Batch ID: W0J0241	Preparation: _NONE (WETCHEM)		Prepared: 10/0	06/20 09:05			Analyst: SAR
Nitrate as N	ND	0.040	0.20	mg/l	1	10/06/20 12:58	
Nitrite as N	0.11	0.042	0.10	mg/l	1	10/06/20 12:58	
Method: EPA 365.3			Instr: UVVIS04				
	Prenaration: NONE (WETCHEM)		Prepared: 10/0	16/20 15:47			Analyst: shn
o-Phosphate as P	0.0090	0.0030	0.010	mg/l	1	10/06/20 16:42	J
				5			
Method: EPA 365.3			Instr: UVVIS04				
Batch ID: W0J0498	Preparation: _NONE (WETCHEM)		<b>Prepared:</b> 10/0	08/20 17:26			Analyst: sbn
Phosphorus as P, Total	0.26	0.00083	0.010	mg/l	1	10/13/20	
Method: SM 2540C			Instr: OVEN01				
Batch ID: W0J0322	Preparation: _NONE (WETCHEM)		Prepared: 10/0	06/20 17:23			Analyst: ism
Total Dissolved Solids	2000	4.0	10	mg/l	1	10/07/20	
Method: SM 4500S2-D			Instr: ANALYS	т			
Batch ID: W010500	Preparation: NONE (WETCHEM)		Prepared: 10/0	)8/20 17·42			Analyst: mfh
Sulfide. Total	ND	0.050	0.10	mg/l	1	10/09/20	



FINAL REPORT

Wood - San Diego 2 9210 Sky Park Court, Suite 200 San Diego, CA 92123

0I25011

Project Number: <ECL TMDL Monitoring 1915100403

**Reported:** 10/19/2020 13:41

Project Manager: John Rudolph

#### **Quality Control Results**

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

					Spike	Source		%REC		RPD	
Analyte	Result	MDL	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier
Batch: W0J0241 - EPA 353.2											
Blank (W0J0241-BLK1)					Prepared & Analy	yzed: 10/06	/20				
Nitrate as N	n ND	0.040	0.20	mg/l							
Nitrite as N	n n ND	0.042	0.10	mg/l							
LCS (W0J0241-BS1)					Prepared & Analy	vzed: 10/06	/20				
Nitrate as N	1.01	0.040	0.20	mg/l	1.00		101	90-110			
Nitrite as N	1.05	0.042	0.10	mg/l	1.00		105	90-110			
Matrix Spike (W0J0241-MS1) Se	ource: 0J	05091-01			Prepared & Analy	yzed: 10/06	/20				
Nitrate as N	2.09	0.040	0.20	mg/l	2.00	ND	104	90-110			
Nitrite as N	1.10	0.042	0.10	mg/l	1.00	ND	110	90-110			
Matrix Spike (W0J0241-MS2) Se	ource: 0J	05091-02			Prepared & Analy	yzed: 10/06	/20				
Nitrate as N	2.12	0.040	0.20	mg/l	2.00	ND	106	90-110			
Nitrite as N	0.963	0.042	0.10	mg/l	1.00	ND	96	90-110			
Matrix Spike Dup (W0J0241-MSD1) So	ource: 0J	05091-01			Prepared & Analy	vzed: 10/06	/20				
Nitrate as N	2.10	0.040	0.20	mg/l	2.00	ND	105	90-110	0.5	20	
Nitrite as N	1.13	0.042	0.10	mg/l	1.00	ND	113	90-110	3	20	MS-01
Matrix Spike Dup (W0J0241-MSD2) So	ource: 0J	05091-02			Prepared & Analy	yzed: 10/06	/20				
Nitrate as N	2.12	0.040	0.20	mg/l	2.00	ND	106	90-110	0	20	
Nitrite as N	0.961	0.042	0.10	mg/l	1.00	ND	96	90-110	0.2	20	
Batch: W0J0309 - EPA 365.3											
Blank (W0J0309-BLK1)					Prepared & Analy	yzed: 10/06	/20				
o-Phosphate as P	ND	0.0030	0.010	mg/l							
LCS (W0J0309-BS1)					Prepared & Analy	yzed: 10/06	/20				
o-Phosphate as P	0.201	0.0030	0.010	mg/l	0.200		100	88-111			
Matrix Spike (W0J0309-MS1) So	ource: 0l	25011-01			Prepared & Analy	yzed: 10/06	/20				
o-Phosphate as P	0.361	0.0030	0.010	mg/l	0.200	0.162	100	85-112			
Matrix Spike Dup (W0J0309-MSD1) So	ource: 0l	25011-01			Prepared & Analy	yzed: 10/06	/20				
o-Phosphate as P	0.358	0.0030	0.010	mg/l	0.200	0.162	98	85-112	0.8	20	
Batch: W0J0322 - SM 2540C											
Blank (W0J0322-BLK1)				Pre	pared: 10/06/20 /	Analyzed: 1	0/07/20				
Total Dissolved Solids	ND	4.0	10	mg/l		-					
LCS (W0J0322-BS1)				Pre	pared: 10/06/20 /	Analyzed: 1	0/07/20				
Total Dissolved Solids	- 839	4.0	10	mg/l	824		102	96-102			
Duplicate (W0J0322-DUP1) So	ource: 0l	25011-05		Pre	pared: 10/06/20 /	Analyzed: 1	0/07/20				
Total Dissolved Solids	1970	4.0	10	mg/l		1960			0.5	10	
Batch: W0J0391 - EPA 350.1											
Blank (W0J0391-BLK1)					Prepared & Analy	yzed: 10/09	/20				
Ammonia as N	ND	0.012	0.10	mg/l							
Blank (W0J0391-BLK2)					Prepared & Analy	yzed: 10/09	/20				



**FINAL REPORT** 

#### Wood - San Diego 2 9210 Sky Park Court, Suite 200 San Diego, CA 92123

Project Number: <ECL TMDL Monitoring 1915100403

Reported: 10/19/2020 13:41

Project Manager: John Rudolph

(Continued)

#### **Quality Control Results**

Conventional Chemistry/Physical Parameters by AP	HA/EPA/AST	M Methods	s (Continue	ed)							
	D h	MDI		11-24-	Spike	Source	% <b>PFC</b>	%REC		RPD	0
Analyte	Kesuit	MDL	MKL	Units	Levei	Kesuit	%REC	Limits	KPD	Limit	Qualifier
					Durana d 9: Aug	h	0.00				
Ammonia as N	ND	0.012	0.10	mg/l	Prepared & Ana	iyzea: 10/0	J9/20				
LCS (W0J0391-BS1) Ammonia as N	0.246	0.012	0.10	mg/l	Prepared & Ana 0.250	lyzed: 10/0	<b>98</b>	90-110			
LCS (W0J0391-BS2)					Prepared & Ana	lvzed: 10/(	09/20				
Ammonia as N	0.242	0.012	0.10	mg/l	0.250	<b>,</b> ,	97	90-110			
Matrix Spike (W0J0391-MS1)	Source: 0.	J06086-01			Prepared & Ana	lyzed: 10/0	09/20				
Ammonia as N	0.239	0.012	0.10	mg/l	0.250	ND	95	90-110			
Matrix Spike (W0J0391-MS2)	Source: 0.	J06086-02			Prepared & Ana	lyzed: 10/0	)9/20				
Ammonia as N	0.235	0.012	0.10	mg/l	0.250	ND	94	90-110			
Matrix Spike Dup (W0J0391-MSD1)	Source: 0.	J06086-01			Prepared & Ana	lyzed: 10/0	09/20				
Ammonia as N	0.240	0.012	0.10	mg/l	0.250	ND	96	90-110	0.6	15	
Matrix Spike Dup (W0J0391-MSD2)	Source: 0.	J06086-02			Prepared & Ana	lyzed: 10/0	09/20				
Ammonia as N	0.234	0.012	0.10	mg/l	0.250	ND	94	90-110	0.2	15	
Batch: W0J0469 - SM 2540D											
Blank (W0J0469-BLK1)					Prepared & Ana	lyzed: 10/0	08/20				
Total Suspended Solids			5	mg/l							
LCS (W0J0469-BS1)					Prepared & Ana	lyzed: 10/0	08/20				
Total Suspended Solids	54.3		5	mg/l	50.5		108	90-110			
Duplicate (W0J0469-DUP1)	Source: 0.	J05091-02			Prepared & Ana	lyzed: 10/0	08/20				
Total Suspended Solids	62.0		5	mg/l		59.2			5	20	
Duplicate (W0J0469-DUP2)	Source: 0.	J05083-01			Prepared & Ana	lyzed: 10/0	08/20				
Total Suspended Solids	206		5	mg/l		214			4	20	
Batch: W0J0498 - EPA 365.3											
Blank (W0J0498-BLK1)				Pre	pared: 10/08/20	Analyzed:	10/13/20	1			
Phosphorus as P, Total		0.00083	0.010	mg/l							
LCS (W0J0498-BS1)				Pre	pared: 10/08/20	Analyzed:	10/13/20	1			
Phosphorus as P, Total	0.202	0.00083	0.010	mg/l	0.200		101	90-110			
Matrix Spike (W0J0498-MS1)	Source: 0	125011-01		Pre	pared: 10/08/20	Analyzed:	10/13/20	)			
Phosphorus as P, Total	0.404	0.00083	0.010	mg/l	0.200	0.203	100	90-110			
Matrix Spike Dup (W0J0498-MSD1)	Source: 0	125011-01		Pre	pared: 10/08/20	Analyzed:	10/13/20	)			
Phosphorus as P, Total	0.403	0.00083	0.010	mg/l	0.200	0.203	100	90-110	0.2	20	
Batch: W0J0500 - SM 4500S2-D											
Blank (W0J0500-BLK1)				Pre	pared: 10/08/20	Analyzed:	10/09/20	1			
Sulfide, Total	• • • • • • ND	0.050	0.10	mg/l							
LCS (W0J0500-BS1)				Pre	pared: 10/08/20	Analyzed:	10/09/20				
Sulfide, Total	0.100	0.050	0.10	mg/l	0.100		100	95-105			
Duplicate (W0J0500-DUP1)	Source: 0	125011-01		Pre	pared: 10/08/20	Analyzed:	10/09/20	)			
0I25011											Page 9 of 1



FINAL REPORT

Wood - San Diego 2 9210 Sky Park Court, Suite 200 San Diego, CA 92123 Project Number: <ECL TMDL Monitoring 1915100403

**Reported:** 10/19/2020 13:41

Project Manager: John Rudolph

#### (Continued)

#### **Quality Control Results**

Conventional Chemistry/Physical Parameters by APHA	A/EPA/ASTI	M Methods (	Continued)								
					Spike	Source		%REC		RPD	
Analyte	Result	MDL	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier
Batch: W0J0500 - SM 4500S2-D (Continued)											
Duplicate (W0J0500-DUP1)	Source: 0I	25011-01		Prepare	ed: 10/08/20	Analyzed: 1	0/09/20				
Sulfide, Total		0.20	0.40	mg/l		8.00			0	20	
Batch: W0J0684 - EPA 351.2											
Blank (W0J0684-BLK1)				Prepare	ed: 10/13/20	Analyzed: 1	0/14/20				
ТКМ		0.018	0.10	mg/l							
Blank (W0J0684-BLK2)				Prepare	ed: 10/13/20	Analyzed: 1	0/14/20				
ТКМ		0.018	0.10	mg/l							
LCS (W0J0684-BS1)				Prepare	ed: 10/13/20	Analyzed: 1	0/14/20				
ТКМ	0.953	0.018	0.10	mg/l	1.00		95	90-110			
LCS (W0J0684-BS2)				Prepare	ed: 10/13/20	Analyzed: 1	0/14/20				
TKN	0.933	0.018	0.10	mg/l	1.00		93	90-110			
Matrix Spike (W0J0684-MS1)	Source: 0J	06098-03		Prepare	ed: 10/13/20	Analyzed: 1	0/14/20				
ТКМ	1.20	0.018	0.10	mg/l	1.00	0.230	97	90-110			
Matrix Spike (W0J0684-MS2)	Source: 0J	06098-04		Prepare	ed: 10/13/20	Analyzed: 1	0/14/20				
ТКМ	1.34	0.018	0.10	mg/l	1.00	0.449	89	90-110			MS-01
Matrix Spike Dup (W0J0684-MSD1)	Source: 0J	06098-03		Prepare	ed: 10/13/20	Analyzed: 1	0/14/20				
TKN	1.13	0.018	0.10	mg/l	1.00	0.230	90	90-110	6	10	
Matrix Spike Dup (W0J0684-MSD2)	Source: 0J	06098-04		Prepare	d: 10/13/20	Analyzed: 1	0/14/20				
TKN	1.36	0.018	0.10	mg/l	1.00	0.449	91	90-110	2	10	



### Certificate of Analysis

FINAL REPORT

Project Number: <ECL TMDL Monitoring 1915100403

#### Reported:

10/19/2020 13:41

(Continued)

Project Manager: John Rudolph

Quality	Control	Results
---------	---------	---------

Metals by EPA 200 Series Methods

					Spike	Source		%REC		RPD	
Analyte	Result	MDL	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier
Batch: W0J0590 - EPA 200.7											
Blank (W0J0590-BLK1)				Prepar	ed: 10/11/20	Analyzed: 1	0/17/20				
Aluminum, Dissolved	0.00515	0.0014	0.020	mg/l							J
Aluminum, Total	0.00515	0.0014	0.020	mg/l							J
LCS (W0J0590-BS1)				Prepar	ed: 10/11/20	Analyzed: 1	0/17/20				
Aluminum, Dissolved	0.214	0.0014	0.020	mg/l	0.200		107	85-115			
Aluminum, Total	0.214	0.0014	0.020	mg/l	0.200		107	85-115			
Matrix Spike (W0J0590-MS1)	Source: 0	125011-01		Prepar	ed: 10/11/20	Analyzed: 1	0/17/20				
Aluminum, Dissolved	0.246	0.0014	0.020	mg/l	0.200	0.0267	110	70-130			
Aluminum, Total	0.246	0.0014	0.020	mg/l	0.200	0.0359	105	70-130			
Matrix Spike (W0J0590-MS2)	Source: 0	125012-01		Prepar	ed: 10/11/20	Analyzed: 1	0/17/20				
Aluminum, Dissolved	0.233	0.0014	0.020	mg/l	0.200	0.00865	112	70-130			
Aluminum, Total	0.233	0.0014	0.020	mg/l	0.200	0.0219	106	70-130			
Matrix Spike Dup (W0J0590-MSD1)	Source: 0	125011-01		Prepar	ed: 10/11/20	Analyzed: 1	0/17/20				
Aluminum, Dissolved	0.243	0.0014	0.020	mg/l	0.200	0.0267	108	70-130	1	30	
Aluminum, Total	0.243	0.0014	0.020	mg/l	0.200	0.0359	104	70-130	1	30	
Matrix Spike Dup (W0J0590-MSD2)	Source: 0	125012-01		Prepar	ed: 10/11/20	Analyzed: 1	0/17/20				
Aluminum, Dissolved	0.232	0.0014	0.020	mg/l	0.200	0.00865	112	70-130	0.5	30	
Aluminum, Total	0.232	0.0014	0.020	mg/l	0.200	0.0219	105	70-130	0.5	30	



### **Certificate of Analysis**

FINAL REPORT

Project Number: <ECL TMDL Monitoring 1915100403

**Reported:** 10/19/2020 13:41

Project Manager: John Rudolph

#### Notes and Definitions

ltem	Definition
J	Estimated conc. detected <mrl and="">MDL.</mrl>
MS-01	The spike recovery for this QC sample is outside of established control limits possibly due to sample matrix interference.
%REC	Percent Recovery
Dil	Dilution
MDL	Method Detection Limit
MRL	The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ)
ND	NOT DETECTED at or above the Method Reporting Limit (MRL). If Method Detection Limit (MDL) is reported, then ND means not detected at or above the MDL.
RPD	Relative Percent Difference
Source	Sample that was matrix spiked or duplicated.
Any romai	

Any remaining sample(s) will be disposed of one month from the final report date unless other arrangements are made in advance.

All results are expressed on wet weight basis unless otherwise specified.

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.



FINAL REPORT

Work Orders:	0J05079	Report Date:	11/13/2020
		Received Date:	10/5/2020
Project:	LECL TMDL Monitoring 1915100403	Turnaround Time:	Normal
i lojeca	<b>3 1 1 1</b>	Phones:	(858) 514-6465
		Fax:	(858) 300-4301
Attn:	John Rudolph	P.O. #:	
Client:	Wood - San Diego 2 9210 Sky Park Court, Suite 200 San Diego, CA 92123	Billing Code:	

#### DoD-ISO ANAB # • ELAP-CA #1132 • EPA-UCMR #CA00211 • HW-DOH # • ISO17025 ANAB #L2457.01 • LACSD #10143 • NELAP-OR #4047 • NJ-DEP #CA015

This is a complete final report. The information in this report applies to the samples analyzed in accordance with the chain-of-custody document. Weck Laboratories certifies that the test results meet all requirements of TNI unless noted by qualifiers or written in the Case Narrative. This analytical report must be reproduced in its entirety.

Dear John Rudolph,

Enclosed are the results of analyses for samples received 10/05/20 with the Chain-of-Custody document. The samples were received in good condition, at 4.3 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

**Reviewed by:** 

1: State

Chris Samatmanakit Project Manager





#### Sample Summary

### **Certificate of Analysis**

FINAL REPORT

Project Number: LECL TMDL Monitoring 1915100403

**Reported:** 11/13/2020 16:49

Project Manager: John Rudolph

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
CL07 - Int	Kate Buckley	0J05079-01	Water	10/05/20 10:45	
CL07 - Surf	Kate Buckley	0J05079-02	Water	10/05/20 10:55	
CL08 - Int	Kate Buckley	0J05079-03	Water	10/05/20 10:00	
CL08 - Surf	Kate Buckley	0J05079-04	Water	10/05/20 10:15	
CL09 - Int	Kate Buckley	0J05079-05	Water	10/05/20 09:10	
CL09 - Surf	Kate Buckley	0J05079-06	Water	10/05/20 09:25	
CL10 - Int	Kate Buckley	0J05079-07	Water	10/05/20 08:20	
CL10 - Surf	Kate Buckley	0J05079-08	Water	10/05/20 08:40	
LE02 - Int	Kate Buckley	0J05079-09	Water	10/05/20 08:35	
LE02 - Surf	Kate Buckley	0J05079-10	Water	10/05/20 08:50	



Wood - San Diego 2 9210 Sky Park Court, Suite 200	Project Number:	LECL TMDL Monitoring 1915100403	<b>Reported:</b> 11/13/2020 16:49
San Diego, CA 92123	Project Manager:	John Rudolph	
Sample Results Enthalpy Analytical			
Sampla: CL07 Int			Sampled: 10/05/20 10:45 by Kata Buckley

Sample:	CL07 - Int				Sampled:	10/05/20 10:45	by Kate Buckley			
	0J05079-01 (Water)									
Analyte		Result	MRL	Units	Dil	Analyzed	Qualifier			
Conventional	onventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods									
Method: SM	10200H	Batch ID: 254939	Prepared: 1	0/09/20 17:26			Analyst: _SUB			
Chlorophy	/II-a		1	mg/M3	1	10/22/20				



Wood - San E 9210 Sky Par	Diego 2 k Court, Suite 200	Project Number:	LECL TMDL M	onitoring 1	1915100403		11	Reported: /13/2020 16:49
San Diego, C	A 92123	Project Manager:	John Rudolph					
Sa	mple Results Enthalpy Analytical							(Continued)
Sample:	CL07 - Surf 0J05079-02 (Water)					Sampled:	10/05/20 10:55	by Kate Buckley
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods								
Method: SM 1	10200H	Batch ID: 254939	Pre	pared: 10/0	9/20 17:26			Analyst: _SUB
Chlorophyl	I-a	30		1	mg/M3	1	10/22/20	



Wood - San E 9210 Sky Par San Diego, C	Diego 2 rk Court, Suite 200 rA 92123	Project Number: Project Manager:	John Rudolph	onitoring 19	915100403		11	Reported: /13/2020 16:49
Sa	mple Results Enthalpy Analytical							(Continued)
Sample:	CL08 - Int 0J05079-03 (Water)					Sampled:	10/05/20 10:00	by Kate Buckley
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods								
Method: SM	10200H	Batch ID: 254939	Pre	pared: 10/09,	/20 17:26			Analyst: _SUB
Chlorophy	II-a	30		1	mg/M3	1	10/22/20	



Wood - San E 9210 Sky Par	Diego 2 k Court, Suite 200	Project Number:	LECL TMDL M	onitoring	1915100403		11	Reported: /13/2020 16:49
San Diego, C	A 92123	Project Manager:	John Rudolph					
Sa	mple Results Enthalpy Analytical							(Continued)
Sample:	CL08 - Surf 0J05079-04 (Water)					Sampled:	10/05/20 10:15	by Kate Buckley
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods								
Method: SM 1	10200H	Batch ID: 254939	Pre	pared: 10/0	9/20 17:26			Analyst: _SUB
Chlorophyl	I-a	30		1	mg/M3	1	10/22/20	



Wood - San D 9210 Sky Par	Diego 2 k Court, Suite 200	Project Number:	LECL TMDL M	onitoring 2	1915100403		11	Reported: /13/2020 16:49
San Diego, C	A 92123	Project Manager:	John Rudolph					
Sa	mple Results Enthalpy Analytical							(Continued)
Sample:	CL09 - Int 0J05079-05 (Water)					Sampled:	10/05/20 9:10	by Kate Buckley
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods								
Method: SM 1	10200H	Batch ID: 254939	Prej	pared: 10/0	9/20 17:26			Analyst: _SUB
Chlorophyl	I-a	26		1	mg/M3	1	10/22/20	



Wood - San [ 9210 Sky Pai	Diego 2 'k Court, Suite 200	Project Number:	LECL TMDL M	onitoring	1915100403		11	Reported: /13/2020 16:49	
San Diego, C	A 92123	Project Manager:	John Rudolph						
Sa	mple Results Enthalpy Analytical							(Continued)	
Sample:	CL09 - Surf 0J05079-06 (Water)					Sampled:	10/05/20 9:25	by Kate Buckley	
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier	
Conventional C	Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods								
Method: SM	10200H	Batch ID: 254939	Pre	pared: 10/0	09/20 17:26			Analyst: _SUB	
Chlorophy	II-a	24		1	mg/M3	1	10/22/20		



Wood - San E 9210 Sky Par	Diego 2 k Court, Suite 200	Project Number:	LECL TMDL M	onitoring	1915100403		11	Reported: /13/2020 16:49		
San Diego, C	A 92123	Project Manager:	John Rudolph							
Sa	mple Results Enthalpy Analytical							(Continued)		
Sample:	CL10 - Int 0J05079-07 (Water)					Sampled:	10/05/20 8:20	by Kate Buckley		
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier		
Conventional C	Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods									
Method: SM 1	10200H	Batch ID: 254939	Pre	pared: 10/0	9/20 17:26			Analyst: _SUB		
Chlorophyl	I-a			1	mg/M3	1	10/22/20			



Wood - San [ 9210 Sky Pai	Diego 2 rk Court, Suite 200	Project Number:	LECL TMDL M	onitoring	1915100403		11	Reported: /13/2020 16:49
San Diego, C	A 92123	Project Manager:	John Rudolph					
Sa	mple Results Enthalpy Analytical							(Continued)
Sample:	CL10 - Surf 0J05079-08 (Water)					Sampled:	10/05/20 8:40	by Kate Buckley
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods								
Method: SM	10200H	Batch ID: 254939	Pre	pared: 10/0	09/20 17:26			Analyst: _SUB
Chlorophy	II-a	25		1	mg/M3	1	10/22/20	


Wood - San I 9210 Sky Par	′ood - San Diego 2 210 Sky Park Court, Suite 200		LECL TMDL Mon	itoring 191510040	03	<b>Report</b> 11/13/2020 16		
San Diego, C	A 92123	Project Manager:	John Rudolph					
Sa	mple Results Enthalpy Analytic	cal					(Continued)	
Sample:	LE02 - Int 0J05079-09 (Water)				Sampled	: 10/05/20 8:35	by Kate Buckley	
Analyte		Result	M	RL Units	Dil	Analyzed	Qualifier	
Conventional C	hemistry/Physical Parameters by APHA/EPA/AS	STM Methods						
Method: SM	10200H	Batch ID: 254939	Prepa	red: 10/09/20 17:26			Analyst: _SUB	
Chlorophy	II-a			1 mg/M3	1	10/22/20		



Wood - San I 9210 Sky Par	Diego 2 rk Court, Suite 200	Project Number:	LECL TMDL M	onitoring	1915100403		11	Reported: /13/2020 16:49
San Diego, C	A 92123	Project Manager:	John Rudolph					
Sa	mple Results Enthalpy Analytical							(Continued)
Sample:	LE02 - Surf 0J05079-10 (Water)					Sampled:	10/05/20 8:50	by Kate Buckley
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier
Conventional C	Chemistry/Physical Parameters by APHA/EPA/ASTM N	<b>Methods</b>						
Method: SM	10200H	Batch ID: 254939	Pre	pared: 10/	09/20 17:26			Analyst: _SUB
Chlorophy	II-a	160		1	mg/M3	1	10/22/20	



### Certificate of Analysis

FINAL REPORT

Project Number: LECL TMDL Monitoring 1915100403

**Reported:** 11/13/2020 16:49

Project Manager: John Rudolph

### Notes and Definitions

ltem	Definition
%REC	Percent Recovery
Dil	Dilution
MRL	The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ)
Any remai	ning sample(s) will be disposed of one month from the final report date unless other arrangements are made in advance.

All results are expressed on wet weight basis unless otherwise specified.

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.

### E.S. Babcock & Sons, Inc. Environmental Laboratories

### Chain of Custody & Sample Information Record 012501)

#### (951) 653-3351 FAX (951) 653-1662 www.babcocklabs.com

Sample(s) Intact?

. 1

Client: Wood F&I Solutions Inc	Contact:	John Rudolph			Phone No.	858-243-8158
						Additional Reporting Requests
FAX No. Project Name: LECL TMDL Monitoring	Email: 	john.rudolph@w Ind Time:	Routine	) *3-5 Day *48 Ho Rush Rus	ur *24 Hour n Rush	FAX Results: FAX Results:
Project Number: 1915100403	Lab TAT A	oproval:	By:	······································	*Additional Charges May Apply	(Include Source Number In Notes)
Sampler Information	# of & Pr	Containers eservatives	Samp Type	Analysis Reques	ted Matrix	Notes
Name: <u>Bate Buckley</u> Employer: <u>Wood E&amp;I Solutions, Inc.</u> Signature: <u>Katchwally</u>	Ipreserved SSO4 C1 V03	22203 a0H a0H/ZnAcetate 44Cl CAA czen	otal # of Containers Routine Resample	Special SS trate - Nitrite (EPA 353.2) SS (SM2540 C) KN (EPA 351.2 mmonia (EPA 350.1) Tal Phosphorus (EPA 355.3) RP(Ortho-P (EPA 355.3) RP(Ortho-P (EPA 355.3)	$\begin{array}{c} \textbf{L} \\ \textbf{U} \\ $	Ortho-P is field filtered (0.45 um) Dissolved Al is not field filtered KB Diss Al is field fi (Herea
Sample ID Date Tim	e 5 꽃 또 도	<u></u>				
CL07 10/5/20 104	5					
CL08 015ho 00	<b>0</b>		┢╍╏┝┥	<u> </u>		
CL09 1015120 091	o				( x x	
CL10 10/5/20 082	0			x x x x x x x x x	< x x	
- • LE02 10/5/20 083	5					
						Print Name / Company
Relinquished By (sign) Print Name / C	ompany	Date / Time		Received by (Sigil)	11/20	,
Marisa Surdersh Marisa Swider	ski (Wood)	10/05/2020 13	540 A	Sometimes	JAIMEGO	meet were labe
What phi		1000100 103001				
(For Lab Use Only) Sample Integrity Upon Rece	ipt			Lab Notes	· · · · · · · · · · · · · · · · · · ·	
Sample(s) Submitted on Ice? Yes Custody Seal(s) Intact? Yes	No No N/A	Tempera 4,3	ture 10230		Lab	No Page of

## E.S. Babcock & Sons, Inc. Environmental Laboratories (951) 653-3351 FAX (951) 653-1662

Chain of Custody & Sample Information Record

-

www.babcocklabs.com								Phone No	858-243-8158
Client: Wood E&I Solutions, Ir	IC.	Contact:	John Rudolph			······			Additional Reporting Requests
FAX No		Email:	john.rudolph@w	oodplc	.com				Include QC Data Package: Yes No
		-		( Bou	tine	*3-5 Dav	*48 Hour	*24 Hour	FAX Results: ☐ Yes ☐ № Email Results: ☐ Yes ☐ №
Project Name: <u>LECL TMDL Mo</u>	onitoring	Turn Arol	ind lime:	C		Rush	Rush	Rush	State EDT: 🗌 Yes 🔲 No
Project Number: 1915100403		*Lab TAT A	pproval:	By:			*Ad	ditional Charges May Apply	(Include Source Number in Notes)
Sampler Informa	tion	# of & Pt	Containers reservatives	[S	ample Type	Analysis F	Requested	Matrix	Notes
Sampler morne				18				DW ≔ Drinking Water	
Name: Kate Bu	CRIEY			lain				WW = Wastewater	Chl-a samples on 0.7 um GFF
Employer: Wood E&I Solu	tions, Inc.		e l	l i i		0	sno	GW = Groundwater	
				12	e			S = Soll	
Signature: 1 R aff	Kully	2 2 2		# 9	ial no		Pho Pho Pho Pho	SG ≕ Sludge	
	$\overline{0}$			otal	pec	N S I trate	nlor Nor	L = Liquid	
Sample ID	Date Time	H H H H	S S S X X X	<b>╷</b> ≚╟╙	< ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~			M = Miscellaneous	Filter Volume: 5 apr 1
CL07 - Int	10/5/20 1045	•			┶╎╺╏		x		Filler Volume: Soom L
CL07 - Surf	10/5/20 1055						x		Filter Volume: SOOmL
CL08 - Int	10/5/20 1000						x		Filter Volume: 370mL
CL08 - Surf	10/5/20 1015						x		Filter Volume: 500mL
	0/5/20 0910						x		Filter Volume: 265mL
	10/5/20 0925	•					x		Filter Volume: 320 mL
	1015/200220						x		Filter Volume: 340 m L
	10/5/20 0820						x		Filter Volume: 285mL
	10/5/20 0010			+++					Filter Volume: 250mL
LE02 - Int	1013100 U853			+	╶╅╌┼╼				Filter Volume: 250mL
LE02 - Surf	10/5/10 005					<u></u>	<u>(0:)</u>	Dri	int Name / Company
Relinquished By (sign)	Print Name / Co	mpany	Date / Time		R	eceived By			
Marine Lunderin	Marisa Swiders	ki (Wood)	10/05/2020 1	340	Y	2	10/ >/ ·	TUMELA	A17 13 1914 1010
Dh			1015/20 15:24		<u> </u>	mahun	· ·		mell (ment hap)
							<u></u>		<u></u>

(For Lab Use Only) Sample Integrity	Upon Re	eceipt		·	Lab Notes			
Sample(s) Submitted on Ice?	Yes	No		Temperature		Lab No.		
Custody Seal(s) Intact?	Yes	No	N/A	4.3 °C				- 4
Sample(s) Intact?	Yes	No		Cooler Blank			Page	OT



**FINAL REPORT** 

Work Orders:	0K30022	Report Date:	1/12/2021
		Received Date:	12/9/2020
Project:	LECL TMDL Monitoring 1915100403	Turnaround Time:	Normal
rioject.		Phones:	(858) 514-6465
		Fax:	(858) 300-4301
Attn:	John Rudolph	P.O. #:	C015101084
Client:	Wood - San Diego 2 9210 Sky Park Court, Suite 200 San Diego, CA 92123	Billing Code:	

### DoD-ISO ANAB # • ELAP-CA #1132 • EPA-UCMR #CA00211 • HW-DOH # • ISO17025 ANAB #L2457.01 • LACSD #10143 • NELAP-OR #4047 • NJ-DEP #CA015

This is a complete final report. The information in this report applies to the samples analyzed in accordance with the chain-of-custody document. Weck Laboratories certifies that the test results meet all requirements of TNI unless noted by qualifiers or written in the Case Narrative. This analytical report must be reproduced in its entirety.

Dear John Rudolph,

Enclosed are the results of analyses for samples received 12/09/20 with the Chain-of-Custody document. The samples were received in good condition, at 3.3 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

**Reviewed by:** 

1: State

Chris Samatmanakit Project Manager

0K30022





## **Certificate of Analysis**

FINAL REPORT

Project Number: LECL TMDL Monitoring 1915100403

Reported: 01/12/2021 12:51

Project Manager: John Rudolph

### Sample Summary

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
CL07	Kate Buckley	0K30022-01	Water	12/09/20 11:00	
CL08	Kate Buckley	0K30022-02	Water	12/09/20 10:00	
CL09	Kate Buckley	0K30022-03	Water	12/09/20 09:00	
CL10	Kate Buckley	0K30022-04	Water	12/09/20 08:15	
LE02	Kate Buckley	0K30022-05	Water	12/09/20 09:30	



## **Certificate of Analysis**

FINAL REPORT

Project Number: LECL TMDL Monitoring 1915100403

### Reported:

01/12/2021 12:51

Project Manager: John Rudolph

Sample: CL07							Sampled	: 12/09/20 11:00 b	y Kate Buckley
0K30022	2-01 (Water)								
Analyte			Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/	Physical Parameters by APHA	/EPA/ASTM Methods							
Method: EPA 350.1					Instr: AA06				
Batch ID: W0L0951	Pre	paration: NONE (WETCHEM)			Prepared: 12/	17/20 12:33			Analyst: YMT
Ammonia as N			0.87	0.047	0.10	mg/l	1	12/18/20	,
Method: EPA 351.2					Instr: AA06				
Batch ID: W0L0765	Pre	paration: _NONE (WETCHEM)			Prepared: 12/	15/20 09:41			Analyst: YMT
TKN			1.4	0.065	0.10	mg/l	1	12/16/20	
Method: EPA 353.2					Instr: AA01				
Batch ID: W0L0549	Pre	paration: _NONE (WETCHEM)			Prepared: 12/	09/20 16:59			Analyst: sar
Nitrate as N			ND	0.040	0.20	mg/l	1	12/10/20 11:37	
Nitrite as N			ND	0.042	0.10	mg/l	1	12/10/20 11:37	
Method: EPA 365.3					Instr: UVVIS04	ļ			
Batch ID: W0L0593	Pre	paration: _NONE (WETCHEM)			Prepared: 12/	10/20 15:38			Analyst: sbn
o-Phosphate as P			0.022	0.0030	0.010	mg/l	1	12/10/20 17:10	
Method: EPA 365.3					Instr: UVVIS04	ļ			
Batch ID: W0L0997	Pre	paration: _NONE (WETCHEM)			Prepared: 12/	18/20 09:16			Analyst: sbn
Phosphorus as P, To	tal		0.039	0.00083	0.010	mg/l	1	12/23/20	
Method: SM 2540C					Instr: OVEN01				
Batch ID: W0L0739	Pre	paration: _NONE (WETCHEM)			Prepared: 12/	14/20 15:13			Analyst: blg
Total Dissolved Solid	ls		440	4.0	10	mg/l	1	12/14/20	
Method: SM 2540D					Instr: OVEN15				
Batch ID: W0L0633	Pre	paration: _NONE (WETCHEM)			Prepared: 12/	11/20 10:50			Analyst: mfh
Total Suspended Solid	ds		ND		5	mg/l	1	12/11/20	
Method: SM 4500S2-D					Instr: _ANALYS	ST			
Batch ID: W0L0583	Pre	paration: _NONE (WETCHEM)			Prepared: 12/	10/20 11:44			Analyst: mfh
Sulfide, Total			ND	0.050	0.10	mg/l	1	12/10/20	
Metals by EPA 200 Series	Methods								
Method: EPA 200.7					Instr: ICP03				
Batch ID: W0L0609	Pre	paration: EPA 200.2			Prepared: 12/	10/20 16:54			Analyst: kvm
Aluminum, Dissolved	k		0.013	0.0014	0.020	mg/l	1	12/29/20	J
Aluminum, Total			0.041	0.0014	0.020	mg/l	1	12/29/20	



## **Certificate of Analysis**

FINAL REPORT

Project Number: LECL TMDL Monitoring 1915100403

Reported: 01/12/2021 12:51

Project Manager: John Rudolph

(Continued)

Sample Results	

Sample:	CL08						Sampled	: 12/09/20 10:00 b	y Kate Buckley
	0K30022-02 (Water)								
Analyte			Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional	Chemistry/Physical Parameters by	APHA/EPA/ASTM Methods							
Method: EP/	A 350.1				Instr: AA06				
Batch ID:	W0L0951	Preparation: _NONE (WETCHEM	1)		Prepared: 12/	17/20 12:33			Analyst: YMT
Ammonia	as N		0.80	0.047	0.10	mg/l	1	12/18/20	
Method: EP/	A 351.2				Instr: AA06				
Batch ID:	W0L0765	Preparation: _NONE (WETCHEM	1)		Prepared: 12/	15/20 09:41			Analyst: YMT
<b>TKN</b>			1.3	0.065	0.10	mg/l	1	12/16/20	
Method: EP/	A 353.2				Instr: AA01				
Batch ID:	W0L0549	Preparation: NONE (WETCHEN	1)		Prepared: 12/	09/20 16:59			Analvst: sar
Nitrate as	N		, 	0.040	0.20	mg/l	1	12/10/20 11:38	
Nitrite as I	Ν		ND	0.042	0.10	mg/l	1	12/10/20 11:38	
Method: EP	A 365.3				Instr: UVVIS04	1			
Batch ID:	W0L0593	Preparation: NONE (WETCHEN	1)		Prepared: 12/	10/20 15:38			Analyst: sbn
o-Phosph	nate as P	· · · · · · · · · · · · · · · · · · ·	0.069	0.0030	0.010	mg/l	1	12/10/20 17:11	, <b>,</b>
Method: FP	A 365 3				Instr: UVVIS04	1			
Batch ID:	W0L0997	Preparation: NONE (WETCHEN	1)		Prepared: 12/	18/20 09:16			Analvst: sbn
Phosphor	rus as P, Total		0.036	0.00083	0.010	mg/l	1	12/23/20	, <b>,</b>
Method: SM	1 25400				Instr: OVEN01				
Batch ID:	W010739	Preparation: NONE (WETCHEM	1)		Prenared: 12/	14/20 15:13			Analyst: bla
Total Diss	solved Solids		440	4.0	10	mg/l	1	12/14/20	<b>Marysa</b> sig
Method: SM	1 2540D				Instr: OVEN15				
Batch ID:	W0L0633	Preparation: NONE (WETCHEN	1)		Prepared: 12/	11/20 10:50			Analyst: mfh
Total Susp	pended Solids		ND		5	mg/l	1	12/11/20	
Method: SM	1 4500S2-D				Instr: ANALY	ST			
Batch ID:	W0L0583	Preparation: NONE (WETCHEN	1)		Prepared: 12/	10/20 11:44			Analvst: mfh
Sulfide, To	otal		ND	0.050	0.10	mg/l	1	12/10/20	
Metals by EPA	A 200 Series Methods								
Method: FP	Δ 200 7				Instr. ICP03				
Batch ID.	W0L0609	Preparation: EPA 200.2			Prepared: 12/	10/20 16.54			Analyst: kvm
Aluminun	n, Dissolved		0.016	0.0014	0.020	mg/l	1	12/29/20	J
Aluminun	n, Total		0.064	0.0014	0.020	mg/l	1	12/29/20	
						-			



## **Certificate of Analysis**

FINAL REPORT

Project Number: LECL TMDL Monitoring 1915100403

Reported:

01/12/2021 12:51

(Continued)

Project Manager: John Rudolph

Sample Results
----------------

Sample:	CL09					Sample	d: 12/09/20 9:00 b	y Kate Buckley
	0K30022-03 (Water)							
Analyte		Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional	Chemistry/Physical Paramet	ters by APHA/EPA/ASTM Methods						
Method: EP	A 350.1			Instr: AA06				
Batch ID:	W0L0951	Preparation: _NONE (WETCHEM)		<b>Prepared:</b> 12/17,	/20 12:33			Analyst: YMT
Ammonia	a as N	0.95	0.047	0.10	mg/l	1	12/18/20	
Method: EP	A 351.2			Instr: AA06				
Batch ID:	W0L0765	Preparation: _NONE (WETCHEM)		Prepared: 12/15,	/20 09:41			Analyst: YMT
TKN		1.7	0.065	0.10	mg/l	1	12/16/20	
Method: EP	A 353.2			Instr: AA01				
Batch ID:	W0L0549	Preparation: _NONE (WETCHEM)		Prepared: 12/09,	/20 16:59			Analyst: sar
Nitrate as	5 N	0.052	0.040	0.20	mg/l	1	12/10/20 11:39	J
Nitrite as	Ν	ND	0.042	0.10	mg/l	1	12/10/20 11:39	
Method: EP	A 365.3			Instr: UVVIS04				
Batch ID:	W0L0593	Preparation: _NONE (WETCHEM)		Prepared: 12/10,	/20 15:38			Analyst: sbn
o-Phospl	nate as P	0.058	0.0030	0.010	mg/l	1	12/10/20 17:11	
Method: EP	A 365.3			Instr: UVVIS04				
Batch ID:	W0L0997	Preparation: NONE (WETCHEM)		<b>Prepared:</b> 12/18	/20 09:16			Analyst: sbn
Phospho	rus as P, Total	0.066	0.00083	0.010	mg/l	1	12/23/20	
Method: SN	A 2540C			Instr: OVEN01				
Batch ID:	W0L0739	Preparation: _NONE (WETCHEM)		Prepared: 12/14,	/20 15:13			Analyst: blg
Total Dis	solved Solids	520	4.0	10	mg/l	1	12/14/20	
Method: SN	A 2540D			Instr: OVEN15				
Batch ID:	W0L0633	Preparation: _NONE (WETCHEM)		Prepared: 12/11,	/20 10:50			Analyst: mfh
Total Sus	pended Solids			5	mg/l	1	12/11/20	
Method: SN	/ 4500S2-D			Instr: _ANALYST				
Batch ID:	W0L0583	Preparation: _NONE (WETCHEM)		Prepared: 12/10	/20 11:44			Analyst: mfh
Sulfide, T	otal	ND	0.050	0.10	mg/l	1	12/10/20	
Metals by EP	A 200 Series Methods							
Method: EP	A 200.7			Instr: ICP03				
Batch ID:	W0L0609	Preparation: EPA 200.2		Prepared: 12/10,	/20 16:54			Analyst: kvm
Aluminur	n, Dissolved	0.019	0.0014	0.020	mg/l	1	12/29/20	J
Aluminur	n, Total	0.14	0.0014	0.020	mg/l	1	12/29/20	



## **Certificate of Analysis**

FINAL REPORT

Project Number: LECL TMDL Monitoring 1915100403

Reported:

01/12/2021 12:51

(Continued)

Project Manager: John Rudolph

Sample:	CL10					Sample	d: 12/09/20 8:15 b	y Kate Buckley
	0K30022-04 (Water)							
Analyte		Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional	Chemistry/Physical Parameters	by APHA/EPA/ASTM Methods						
Method: EP/	A 350.1			Instr: AA06				
Batch ID:	W0L0951	Preparation: _NONE (WETCHEM)		Prepared: 12/17/	20 12:33			Analyst: YMT
Ammonia	as N	0.82	0.047	0.10	mg/l	1	12/18/20	
Method: EP/	A 351.2			Instr: AA06				
Batch ID:	W0L0765	Preparation: _NONE (WETCHEM)		Prepared: 12/15/	20 09:41			Analyst: YMT
TKN		1.6	0.065	0.10	mg/l	1	12/16/20	
Method: EP/	A 353.2			Instr: AA01				
Batch ID:	W0L0549	Preparation: _NONE (WETCHEM)		Prepared: 12/09/	20 16:59			Analyst: sar
Nitrate as	N	0.071	0.040	0.20	mg/l	1	12/10/20 11:45	J
Nitrite as I	Ν	ND	0.042	0.10	mg/l	1	12/10/20 11:45	
Method: EP/	A 365.3			Instr: UVVIS04				
Batch ID:	W0L0593	Preparation: _NONE (WETCHEM)		Prepared: 12/10/	20 15:38			Analyst: sbn
o-Phosph	ate as P	0.026	0.0030	0.010	mg/l	1	12/10/20 17:12	
Method: EP/	A 365.3			Instr: UVVIS04				
Batch ID:	W0L0997	Preparation: _NONE (WETCHEM)		Prepared: 12/18/	20 09:16			Analyst: sbn
Phosphor	rus as P, Total	0.072	0.00083	0.010	mg/l	1	12/23/20	
Method: SM	1 2540C			Instr: OVEN01				
Batch ID:	W0L0739	Preparation: _NONE (WETCHEM)		Prepared: 12/14/	20 15:13			Analyst: blg
Total Diss	solved Solids	530	4.0	10	mg/l	1	12/14/20	
Method: SM	1 2540D			Instr: OVEN15				
Batch ID:	W0L0633	Preparation: _NONE (WETCHEM)		Prepared: 12/11/	20 10:50			Analyst: mfh
Total Sus	pended Solids			5	mg/l	1	12/11/20	
Method: SM	1 4500S2-D			Instr: _ANALYST				
Batch ID:	W0L0583	Preparation: _NONE (WETCHEM)		Prepared: 12/10/	20 11:44			Analyst: mfh
Sulfide, To	otal	ND	0.050	0.10	mg/l	1	12/10/20	
Metals by EPA	A 200 Series Methods							
Method: EP/	A 200.7			Instr: ICP03				
Batch ID:	W0L0609	Preparation: EPA 200.2		Prepared: 12/10/	20 16:54			Analyst: kvm
Aluminun	n, Dissolved	0.021	0.0014	0.020	mg/l	1	12/29/20	
Aluminun	n, Total	0.27	0.0014	0.020	mg/l	1	12/29/20	



## **Certificate of Analysis**

FINAL REPORT

Project Number: LECL TMDL Monitoring 1915100403

### Reported:

01/12/2021 12:51

Project Manager: John Rudolph

(Continued)

Δ	Sample Results
	Campio i localito

Sample: LE02					Sample	d: 12/09/20 9:30 b	y Kate Buckley
0K30022-05 (Water)							
Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Para	meters by APHA/EPA/ASTM Methods						
Method: EPA 350.1			Instr: AA06				
Batch ID: W0L0951	Preparation: _NONE (WETCHEM)		Prepared: 12/	17/20 12:33			Analyst: YMT
Ammonia as N	0.61	0.047	0.10	mg/l	1	12/18/20	
Method: EPA 351.2			Instr: AA06				
Batch ID: W0L0765	Preparation: _NONE (WETCHEM)		Prepared: 12/	15/20 09:41			Analyst: YMT
ΤΚΝ	3.8	0.065	0.10	mg/l	1	12/16/20	
Method: EPA 353.2			Instr: AA01				
Batch ID: W0L0549	Preparation: _NONE (WETCHEM)		Prepared: 12/0	09/20 16:59			Analyst: sar
Nitrate as N	0.23	0.040	0.20	mg/l	1	12/10/20 11:46	
Nitrite as N	ND	0.042	0.10	mg/l	1	12/10/20 11:46	
Method: EPA 365.3			Instr: UVVIS04				
Batch ID: W0L0593	Preparation: _NONE (WETCHEM)		Prepared: 12/	10/20 15:38			Analyst: sbn
o-Phosphate as P	0.052	0.0030	0.010	mg/l	1	12/10/20 17:13	
Method: EPA 365.3			Instr: UVVIS04				
Batch ID: W0L0997	Preparation: _NONE (WETCHEM)		Prepared: 12/	18/20 09:16			Analyst: sbn
Phosphorus as P, Total	0.27	0.00083	0.010	mg/l	1	12/23/20	
Method: SM 2540C			Instr: OVEN01				
Batch ID: W0L0739	Preparation: _NONE (WETCHEM)		Prepared: 12/	14/20 15:13			Analyst: blg
Total Dissolved Solids	2000	4.0	10	mg/l	1	12/14/20	
Method: SM 4500S2-D			Instr: _ANALYS	ST			
Batch ID: W0L0583	Preparation: _NONE (WETCHEM)		Prepared: 12/	10/20 11:44			Analyst: mfh
Sulfide, Total	ND	0.050	0.10	mg/l	1	12/10/20	



FINAL REPORT

Wood - San Diego 2 9210 Sky Park Court, Suite 200 San Diego, CA 92123 Project Number: LECL TMDL Monitoring 1915100403

Reported: 01/12/2021 12:51

Project Manager: John Rudolph

### **Quality Control Results**

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

					Spike	Source		%REC		RPD	
Analyte	Result	MDL	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier
Batch: W0L0549 - EPA 353.2											
Blank (W0L0549-BLK1)				Prepa	red: 12/09/20	Analyzed: 1	2/10/20				
Nitrate as N		0.040	0.20	mg/l							
Nitrite as N		0.042	0.10	mg/l							
LCS (W0L0549-BS1)				Prepa	red: 12/09/20	Analyzed: 1	2/10/20				
Nitrate as N	0.999	0.040	0.20	mg/l	1.00		100	90-110			
Nitrite as N	1.06	0.042	0.10	mg/l	1.00		106	90-110			
Matrix Snike (WOL0549-MS1)	Source: 0	09067-01		Prena	red: 12/09/20	Analyzed: 1	2/10/20				
Nitrate as N	2.18	0.040	0.20	mg/l	2.00	0.165	101	90-110			
Nitrite as N	1.10	0.042	0.10	mg/l	1.00	ND	110	90-110			
Matrix Sailes (MOLOS 40, MS2)	Sources Of	00069 01		Dropor	ad. 12/00/20	Analyzadı 1	2/10/20				
Nitrate as N	2.78	0.040	0.20	ma/l	2.00	0.789	100	90-110			
Nitrite as N	1 07	0.042	0.10	ma/l	1.00	ND	107	90-110			
	1.07	0.042	0.10	iiig/i	1.00	NB	107	50-110			
Matrix Spike Dup (W0L0549-MSD1)	Source: 0	L09067-01		Prepa	red: 12/09/20	Analyzed: 1	2/10/20				
Nitrate as N	2.17	0.040	0.20	mg/l	2.00	0.165	100	90-110	0.5	20	
Nitrite as N	1.10	0.042	0.10	mg/l	1.00	ND	110	90-110	0	20	
Matrix Spike Dup (W0L0549-MSD2)	Source: 0	L09068-01		Prepa	red: 12/09/20	Analyzed: 1	2/10/20				
Nitrate as N	2.77	0.040	0.20	mg/l	2.00	0.789	99	90-110	0.4	20	
Nitrite as N	1.08	0.042	0.10	mg/l	1.00	ND	108	90-110	0.9	20	
Batch: W0L0583 - SM 4500S2-D											
Blank (W0L0583-BLK1)				Pr	epared & Ana	lyzed: 12/10	/20				
Sulfide, Total		0.050	0.10	mg/l		-					
LCS (W010583-BS1)				Pr	epared & Ana	lvzed: 12/10	/20				
Sulfide, Total	0.100	0.050	0.10	mg/l	0.100	. <b>,</b> , .	100	95-105			
Duplicate (WOL0583-DUP1)	Source: 0	K30022-01		Dr	enared & Ana	huzod: 12/1(	/20				
Sulfide, Total	ND	0.050	0.10	mg/l		ND	720			20	
Batch: 14/01 0502 504 265 2											
Balch: WULU595 - EPA 505.5											
Blank (W0L0593-BLK1)	ND	0.0030	0.010	Pr ma/l	epared & Ana	lyzed: 12/10	/20				
0-r nospilate as r	ND	0.0030	0.010	mg/i							
LCS (W0L0593-BS1)	0.000		0.040	Pr	epared & Ana	lyzed: 12/10	/20				
o-Phosphate as P	0.208	0.0030	0.010	mg/l	0.200		104	88-111			
Matrix Spike (W0L0593-MS1)	Source: 0	K30021-01		Pr	epared & Ana	lyzed: 12/10	/20				
o-Phosphate as P	0.272	0.0030	0.010	mg/l	0.200	0.0800	96	85-112			
Matrix Spike Dup (W0L0593-MSD1)	Source: 0	K30021-01		Pr	epared & Ana	lyzed: 12/10	/20				
o-Phosphate as P	0.268	0.0030	0.010	mg/l	0.200	0.0800	94	85-112	1	20	
Batch: W0L0633 - SM 2540D											
Blank (W0L0633-BLK1)				Pr	epared & Ana	lyzed: 12/11	/20				
Total Suspended Solids	ND		5	mg/l							
LCS (W0L0633-BS1)				Pr	epared & Ana	lyzed: 12/11	/20				



FINAL REPORT

#### Wood - San Diego 2 9210 Sky Park Court, Suite 200 San Diego, CA 92123

Project Number: LECL TMDL Monitoring 1915100403

Reported: 01/12/2021 12:51

Project Manager: John Rudolph

(Continued)

### **Quality Control Results**

Analyce         Name (	Conventional Chemistry/Phy	/sical Parameters by APHA/EP	PA/AST	TM Methods	(Continued	d)								
Analyse         Result         MAIL         Using         Level         Result         WAIL         Limit         R00         Limit         R00           LCS (WOL0633-5M 25400 (continued))         Prepared & Analysed: 12/11/20         5         mg1         0.0.8         10.2         00-110         10.2         00-110         10.2         00-110         10.2         00-110         10.2         00-110         10.2         00-110         10.2         00.1         10.2         00.1         10.2         00.1         10.2         00.1         10.2         00.1         10.2         00.1         10.2         00.1         10.2         00.1         10.2							Spike	Source		%REC		RPD		
Propared & Analyzed: 12/11/20         U         U           Total Surpernded Solids         61.9         5         mg1         60.8         102         90-110         V         V           Daglicate (W010633-00P1)         Source: 08.0002-01         Prepared & Analyzed: 12/11/20         V         10         20           Duglicate (W010633-00P2)         Source: 08.0002-01         Prepared & Analyzed: 12/11/20         V         0         20           Back: W010763-81X(1)         Source: 08.00012-01         mg1         824         100         96-10         V         10	Analyte	R	Result		MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier	
LS (200433-851)         Compared & Analyzect: 12/11/20         90-110           Duplicate (W000633-DUP1)         Source: 00/30022-01         5         mg1         3.20         13         20           Duplicate (W000633-DUP1)         Source: 00/30022-01         5         mg1         3.20         13         20           Duplicate (W000633-DUP2)         Source: 00/30022-01         6         mg1         Pepared & Analyzect: 12/14/20         0         20           Bark. (W000733-DUP2)         Source: 00/3002-01         mg1         Pepared & Analyzect: 12/14/20         0         9           Diplicate (W000733-DUP2)         Source: 00/10016-01         Pepared & Analyzect: 12/14/20         0	Batch: W0L0633 - SM 2540D	(Continued)												
Total Disponded Solids         61.9         5         mpl         60.8         102         90.410           Duplicate (W0L0833-DUP1)         Source 00.3002.01         5         mpl         3.20         13         20           Duplicate (W0L0833-DUP1)         Source 00.3002.01         5         mpl         48.0         0         0         20           Duplicate (W0L0833-DUP2)         Source 00.30012-01         5         mpl         48.0         0         0         20           Back: W0L0733-SM 2540C         Prepared & Analyzed: 12/14/20                 CS (W0L0733-SM 2540C         Prepared & Analyzed: 12/14/20	LCS (W0L0633-BS1)						Prepared & Ana	lyzed: 12/	11/20					
Duplicate (W010633-D0P2) Total Suspended Solids         Saurce 0130022-01 (Saurce 010810-C)         Prepared & Analyzed: 12/11/20 (Saurce 010810-C)         Perpared & Analyzed: 12/11/20 (Saurce 010810-C)         Saurce 010810-C)           Back: W010739-SM 2-540C         Frepared & Analyzed: 12/14/20 (Saurce 010810-C)         Saurce 010810-C)         Frepared & Analyzed: 12/14/20 (Saurce 010810-C)         Saurce 01081-C)         Frepared & Analyzed: 12/14/20 (Saurce 010810-C)         Saurce 01081-C)         Frepared & Analyzed: 12/14/20 (Saurce 010810-C)         Saurce 01081-C)         S	Total Suspended Solids		61.9		5	mg/l	60.8		102	90-110				
Total Suspanded Solids         2.80         5         mgt         3.20         13         20           Duglicate (W0.0333-DUP2)         Source 00.0812-01         6         mgt         4.8.0         0         20           Bask: W0.0739 - SM 2540C         F         mgt         4.8.0         0         20           Bask: W0.0739 - SM 2540C         F         mgt         4.8.0         0	Duplicate (W0L0633-DUP1)	So	urce: 0	K30022-01			Prepared & Ana	lyzed: 12/	11/20					
Duplicate (M0L0533-DUP2) Total Suspended Solids         Source: 0L08012-01 48.0         Prepared & Analyzed: 12/14/20 mog/         0         0         0         0           Batck: W0L0739 - SM 2540C         Prepared & Analyzed: 12/14/20 Total Dissolved Solids         ND         4.0         10         mog/         Responded & Analyzed: 12/14/20 mog/         ND         4.0         10         mog/         Responde & Analyzed: 12/14/20 mog/         ND         0.00         10         mog/         Responde & Analyzed: 12/14/20 mog/         ND         0.00         ND         0.00         ND         0.00         ND         0.00         ND         0.00         ND         0.00         ND         ND <t< td=""><td>Total Suspended Solids</td><td></td><td>2.80</td><td></td><td>5</td><td>mg/l</td><td></td><td>3.20</td><td></td><td></td><td>13</td><td>20</td><td></td></t<>	Total Suspended Solids		2.80		5	mg/l		3.20			13	20		
Deplete (w00.0739-00.07.)         Jack B. Clover (2017)         S         mpl         48.0         0         20           Batch: W01.0739-SM 2540C         Prepared & Analyzed: 12/14/20         Prepared & Analyzed: 12/14/20         Image: 100 000000000000000000000000000000000	Duplicate (W/010622 DUD2)	50		00012 01			Bronarod & Ana	hurad: 12/	11/20					
Barch: W0L0759 - SN 2540C         Prepared & Analyzed: 12/14/20         Prepared & Analyzed: 12/14/20           Blank (W0L0739 - SN 2540C         ND         4.0         10         mgl         Prepared & Analyzed: 12/14/20         0         96-102         10         10         10         96-102         10	Total Suspended Solids	30	48.0	100012-01	5	mg/l	Frepared & Alla	48.0	11/20		0	20		
Bark: W010739 - 5W 23AC           Prepared & Analyzed: 12/14/20           Bink: W010739-BS1)         Prepared & Analyzed: 12/14/20           Total Dissolved Solids         ND         4.0         no         Prepared & Analyzed: 12/14/20           Total Dissolved Solids         824         4.0         no         9           Dissolved Solids         824         4.0         9         Prepared & Analyzed: 12/14/20         0 <th co<="" td=""><td></td><td></td><td></td><td></td><td></td><td>Ū</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></th>	<td></td> <td></td> <td></td> <td></td> <td></td> <td>Ū</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>						Ū							
Bilank (W0L0739-BLK)         Prepared & Analyzed: 12/14/20         Second	Batch: W0L0739 - SM 2540C													
Total Dissolved Solids         ND         4.0         10         mg/l           LCS (W0L0793-B51)         Prepared & Analyzed: 12/14/20         98:102         99:102           Duplicate (W0L0739-DUP1)         Source: 01.10016-01         Prepared & Analyzed: 12/14/20         0.6         10           Duplicate (W0L0739-DUP2)         Source: 01.10016-01         Prepared & Analyzed: 12/14/20	Blank (W0L0739-BLK1)						Prepared & Ana	lyzed: 12/	14/20					
LCS (W0L0739-B51)         Source: 0L10016-01         Prepared & Analyzed: 12/14/20         Image: 0L10016-01         Prepared & Analyzed: 12/16/20         Image: 0L10016-01         Prepared: 12/15/20 Analyzed: 12/16/20         Image: 0L10016-01	Total Dissolved Solids		ND	4.0	10	mg/l								
Total Dissolved Solids       828       4.0       10       mgl       824       100       98-102         Duplicate (W0L0739-DUP)1       Source: 011001-01       Prepared & Analyzet: 12/14/20       27300       6.0       6.0         Duplicate (W0L0739-DUP)1       Source: 011010-01       Prepared & Analyzet: 12/14/20       3       10       mgl       27300       3       10         Batch: W0L0765 - 8EA 351.2       Source: 011010-01       Prepared: 12/15/20 Analyzet: 12/16/20       3       10       10       mgl       Prepared: 12/15/20 Analyzet: 12/16/20       1       1       10	LCS (W0L0739-BS1)						Prepared & Ana	lyzed: 12/	14/20					
Duplicate (W0L0739-DUP1)         Source: 0L10016-01         Prepared & Analyzed: 12/14/20         0.5         10           Total Dissolved Solids         .27400         4.0         10         mg/l         27300         0.5         10           Duplicate (W0L0739-DUP2)         Source: 0L11010-01         Prepared & Analyzed: 12/14/20         1<	Total Dissolved Solids		828	4.0	10	mg/l	824	-	100	96-102				
Duplication (voluo 765- MS1)         Source: 0L/00-01         mg/l         27300         0.6         10           Blank (voluo 765- BS1)         20200         4.0         10         mg/l         19500         3         10           Blank (voluo 765- EPA 351.2         Blank (voluo 765- BK1)         Prepared: 12/15/20         Analyzed: 12/16/20 <t< td=""><td>Duplicate (W010739-DUP1)</td><td>50</td><td>urco: 0</td><td>10016-01</td><td></td><td></td><td>Propared &amp; Ana</td><td>huzad: 12/</td><td>14/20</td><td></td><td></td><td></td><td></td></t<>	Duplicate (W010739-DUP1)	50	urco: 0	10016-01			Propared & Ana	huzad: 12/	14/20					
Duplicate (W0L0739-DUP2) Total Dissolved Solids         Source: 011010-01 20200         Prepared & Analyzed: 12/14/20 mg/l         3         10           Batch: W0L0765 - EPA 351.2         Prepared: 12/15/20         Analyzed: 12/16/20 mg/l         3         10           Blank (W0L0765 - EPA 351.2         Prepared: 12/15/20         Analyzed: 12/16/20 mg/l         5         5           Blank (W0L0765 - BLK2)         Prepared: 12/15/20         Analyzed: 12/16/20 mg/l         5         5           TKN         ND         0.065         0.10         mg/l         1.00         104         90-110         5           LCS (W0L0765 - BS1)         Prepared: 12/15/20         Analyzed: 12/16/20         104         90-110         5         5           TKN         .104         0.065         0.10         mg/l         1.00         104         90-110         5           LCS (W0L0765 - BS2)         mg/l         .104         0.065         0.10         mg/l         1.00         104         90-110         Metrix Spike (W0L0765 - MS2)         Source: 0L09061-01         Prepared: 12/15/20         Matrix Spike (W0L0765 - MS2)         Source: 0L09062-01         mg/l         1.00         ND         90-110         10         MS           Matrix Spike Dup (W0L0765 - MSD2)         Source: 0L09062-01	Total Dissolved Solids		7400	4.0	10	mg/l	Frepared & Alla	27300	14/20		0.6	10		
Duplicate (W0L0735-DUP2)         Source: 0L1010-01         mg/l         19500         3         10           Batch: W0L0765- EPA 351.2						-								
Batch:         Locol 4.0         I.O         Ingri         I.OO         I.O         I.O         Ingri         I.OO         I.O         I.O           Batch:         Prepared:         12/15/20         Analyzed:         12/15/20         Analyzed:         12/15/20         III         IIII         IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	Duplicate (W0L0739-DUP2)	Sol	urce: 0	4 0	10	ma/l	Prepared & Ana	19500	14/20		3	10		
Batch: W0L0765 - ELK1)         Prepared: 12/15/20         Analyzed: 12/16/20           Blank (W0L0765 - BLK2)         ND         0.065         0.10         mg/l         Prepared: 12/15/20         Analyzed: 12/16/20         Source: 0.000         Source: 0.000         MD         0.065         0.10         mg/l         Source: 12/15/20         Analyzed: 12/16/20         Source: 12/15/20         Analyzed: 12/16/20         Source: 12/15/20         Analyzed: 12/16/20         Source: 0.000         MD         0.065         0.10         mg/l         1.00         1.04         90-110         Source: 0.000         MD         1.00         1.00         1.00         90-110         Source: 0.000         MD         1.00         MD         90-110         MD         MD         MD         MD         0.065         0.10         mg/l         1.00         1.00         90-110         MD         MD <th< td=""><td></td><td>2</td><td>0200</td><td>4.0</td><td>10</td><td>шgл</td><td></td><td>19000</td><td></td><td></td><td>5</td><td>10</td><td></td></th<>		2	0200	4.0	10	шgл		19000			5	10		
Blank (W0L0765-BLK1)         ND         0.065         0.10         mg/l           Blank (W0L0765-BLK2)         Prepared: 12/15/20         Analyzed: 12/16/20         Image in the i	Batch: W0L0765 - EPA 351.2													
TKN       ND       0.065       0.10       mg/l         Blank (W0L0765-BLK2)       ND       0.065       0.10       mg/l         TKN       ND       0.065       0.10       mg/l         LCS (W0L0765-BS1)       Prepared: 12/15/20       Analyzed: 12/16/20       10/4       90-110         LCS (W0L0765-BS2)       TKN       1.04       0.065       0.10       mg/l       1.00       104       90-110         Matrix Spike (W0L0765-MS1)       Source: 0L09061-01       Prepared: 12/15/20       Analyzed: 12/16/20       Metrix         Matrix Spike (W0L0765-MS2)       Source: 0L09061-01       Prepared: 12/15/20       Analyzed: 12/16/20       Metrix         Matrix Spike (W0L0765-MS2)       Source: 0L09061-01       Prepared: 12/15/20       Analyzed: 12/16/20       Metrix         Matrix Spike (W0L0765-MSD1)       Source: 0L09061-01       Prepared: 12/15/20       Analyzed: 12/16/20       Metrix         Matrix Spike (W0L0765-MSD1)       Source: 0L09061-01       Prepared: 12/15/20       Analyzed: 12/16/20       Metrix         Matrix Spike Dup (W0L0765-MSD1)       Source: 0L09061-01       Prepared: 12/15/20       Analyzed: 12/16/20       Metrix         Matrix Spike Dup (W0L0765-MSD2)       Source: 0L09062-01       Prepared: 12/15/20       Analyzed: 12/16/20       Metrix	Blank (W0L0765-BLK1)						Prepared: 12/15/20	Analyzed:	12/16/20	)				
Blank (W0L0765-BLK2)         Prepared: 12/15/20         Analyzed: 12/16/20           TKN         ND         0.065         0.10         mg/l           LCS (W0L0765-BS1)         Prepared: 12/15/20         Analyzed: 12/16/20           TKN         1.04         0.065         0.10         mg/l         1.00         104         90-110           LCS (W0L0765-BS2)         Prepared: 12/15/20         Analyzed: 12/16/20         90-110         Matrix Spike (W0L0765-MS1)         Source: 0L09061-01         Prepared: 12/15/20         Analyzed: 12/16/20         Metrix Spike (W0L0765-MS2)         Source: 0L09061-01         Prepared: 12/15/20         Analyzed: 12/16/20         Metrix Spike (W0L0765-MS2)         Source: 0L09062-01         Prepared: 12/15/20         Analyzed: 12/16/20         Metrix Spike (W0L0765-MSD1)         Source: 0L09062-01         Prepared: 12/15/20         Analyzed: 12/16/20         Metrix Spike Dup (W0L0765-MSD1)         Source: 0L09062-01         Prepared: 12/15/20         Analyzed: 12/16/20         Metrix Spike Dup (W0L0765-MSD2)         Source: 0L09062-01         Prepared: 12/15/20         Analyzed: 12/16/20         Metrix Spike Dup (W0L0765-MSD2)         Source: 0L09062-01         Prepared: 12/15/20         Analyzed: 12/16/20         Metrix Spike Dup (W0L0765-MSD2)         Source: 0L09062-01         Prepared: 12/15/20         Metrix Spike Dup (W0L0765-MSD2)         Source: 0L09062-01         Prepared: 12/17/20	TKN		ND	0.065	0.10	mg/l								
TKN       ND       0.065       0.10       mg/l         LCS (W0L0765-BS1)       Prepared: 12/15/20       Analyzed: 12/16/20       Img/l         TKN       1.04       0.065       0.10       mg/l       1.00       104       90-110         LCS (W0L0765-BS2)       Prepared: 12/15/20       Analyzed: 12/16/20       Img/l       1.00       104       90-110         Matrix Spike (W0L0765-MS1)       Source: 0L09061-01       Prepared: 12/15/20       Analyzed: 12/16/20       Metrix         Matrix Spike (W0L0765-MS2)       Source: 0L09062-01       Prepared: 12/15/20       Analyzed: 12/16/20       Metrix         TKN       1.17       0.065       0.10       mg/l       1.00       ND       90-110       Metrix         Matrix Spike (W0L0765-MS2)       Source: 0L09061-01       Prepared: 12/15/20       Analyzed: 12/16/20       Metrix         TKN       1.17       0.065       0.10       mg/l       1.00       ND       90-110       Metrix         Matrix Spike Dup (W0L0765-MSD1)       Source: 0L09061-01       Prepared: 12/15/20       Analyzed: 12/16/20       Metrix         Matrix Spike Dup (W0L0765-MSD2)       Source: 0L09062-01       Prepared: 12/15/20       Analyzed: 12/16/20       Metrix         Matrix Spike Dup (W0L0765-MSD2)	Blank (W0L0765-BLK2)						Prepared: 12/15/20	Analyzed:	12/16/20					
LCS (W0L0765-BS1)         Prepared: 12/15/20         Analyzed: 12/16/20         Mailyzed: 12/16/20           TKN         1.04         0.065         0.10         mg/l         1.00         104         90-110           LCS (W0L0765-BS2)         Prepared: 12/15/20         Analyzed: 12/16/20         104         90-110         Maintain Spile (W0L0765-MS1)         Source: 0L09061-01         Prepared: 12/15/20         Analyzed: 12/16/20         Maintain Spile (W0L0765-MS2)         Source: 0L09062-01         Prepared: 12/15/20         Analyzed: 12/16/20         Maintain Spile (W0L0765-MS2)         Source: 0L09062-01         Prepared: 12/15/20         Analyzed: 12/16/20         Maintain Spile (W0L0765-MS2)         Source: 0L09061-01         Prepared: 12/15/20         Analyzed: 12/16/20         Maintain Spile (W0L0765-MSD1)         Source: 0L09061-01         Prepared: 12/15/20         Analyzed: 12/16/20         Maintain Spile Dup (W0L0765-MSD1)         Source: 0L09061-01         Prepared: 12/15/20         Analyzed: 12/16/20         Maintain Spile Dup (W0L0765-MSD2)         Source: 0L09062-01         Prepared: 12/15/20         Analyzed: 12/16/20         Maintain Spile Dup (W0L0765-MSD2)         Source: 0L09062-01         Prepared: 12/15/20         Analyzed: 12/16/20         Maintain Spile Dup (W0L0765-MSD2)         Source: 0L09062-01         Maintain Spile Dup (W0L0765-MSD2)         Source: 0L09062-01         Maintain Spile Dup (W0L0765-MSD2)         Maintain Spile Dup (W0L0765-MSD2)	TKN		ND	0.065	0.10	mg/l		,	,,					
TKN       1.04       0.065       0.10       mg/l       1.00       1.04       90-110         LCS (W0L0765-BS2)       Prepared: 12/15/20       Analyzed: 12/16/20       90-110       1.04       90-110         Matrix Spike (W0L0765-MS1)       Source: 0L09061-01       Prepared: 12/15/20       Analyzed: 12/16/20       90-110       Ms         Matrix Spike (W0L0765-MS1)       Source: 0L09061-01       Prepared: 12/15/20       90-110       Ms         Matrix Spike (W0L0765-MS2)       Source: 0L09062-01       Prepared: 12/15/20       90-110       Ms         Matrix Spike (W0L0765-MS2)       Source: 0L09061-01       Prepared: 12/15/20       Analyzed: 12/16/20       Ms         TKN        ND       0.065       0.10       mg/l       1.00       ND       90-110       Ms         Matrix Spike Dup (W0L0765-MSD1)       Source: 0L09061-01       Prepared: 12/15/20       Analyzed: 12/16/20       TKN         ND       0.065       0.10       mg/l       1.00       ND       90-110       Ms         Matrix Spike Dup (W0L0765-MSD2)       Source: 0L09062-01       Prepared: 12/15/20       Analyzed: 12/16/20       TKN							D	A	12/16/20					
LCS (W0L0765-BS2)       Prepared: 12/15/20       Analyzed: 12/16/20         TKN       1.04       0.065       0.10       mg/l       1.00       104       90-110         Matrix Spike (W0L0765-MS1)       Source: 0L09061-01       Prepared: 12/15/20       Analyzed: 12/16/20       Malyzed: 12/16/20         TKN       ND       0.065       0.10       mg/l       1.00       ND       90-110       Me         Matrix Spike (W0L0765-MS2)       Source: 0L09062-01       Prepared: 12/15/20       Analyzed: 12/16/20       Malyzed: 12/16/20       Me         Matrix Spike Dup (W0L0765-MS2)       Source: 0L09061-01       Prepared: 12/15/20       Analyzed: 12/16/20       Malyzed: 12/16/20         TKN       ND       0.065       0.10       mg/l       1.00       ND       90-110       Me         Matrix Spike Dup (W0L0765-MSD1)       Source: 0L09061-01       Prepared: 12/15/20       Analyzed: 12/16/20       Malyzed: 12/16/20       Me         TKN       ND       0.065       0.10       mg/l       1.00       ND       90-110       4       10         Matrix Spike Dup (W0L0765-MSD2)       Source: 0L09062-01       Prepared: 12/15/20       Analyzed: 12/16/20       Me       4       10       4       10       4       10       4	TKN		1.04	0.065	0.10	ma/l	1.00	Analyzed:	104	90-110				
LCS (W0L0765-BS2)         Prepared: 12/15/20         Analyzed: 12/16/20           TKN         1.04         0.065         0.10         mg/l         1.00         104         90-110           Matrix Spike (W0L0765-MS1)         Source: 0L09061-01         Prepared: 12/15/20         Analyzed: 12/16/20         MS           Matrix Spike (W0L0765-MS2)         Source: 0L09062-01         Prepared: 12/15/20         Analyzed: 12/16/20         MS           Matrix Spike (W0L0765-MS2)         Source: 0L09061-01         Prepared: 12/15/20         Analyzed: 12/16/20             TKN         1.17         0.065         0.10         mg/l         1.00         0.131         104         90-110         MS           Matrix Spike Dup (W0L0765-MSD1)         Source: 0L09061-01         Prepared: 12/15/20         Analyzed: 12/16/20              TKN         ND         0.065         0.10         mg/l         1.00         ND         90-110         10         MS           Matrix Spike Dup (W0L0765-MSD2)         Source: 0L09062-01         Prepared: 12/15/20         Analyzed: 12/16/20             TKN         1.22         0.065         0.10         mg/l         1.00         0.131         109         90-110 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>														
IKN       I.04       0.065       0.10       Ingit       I.00       I.04       90-110         Matrix Spike (W0L0765-MS1)       Source: 0L09061-01       Prepared: 12/15/20       Analyzed: 12/16/20       Ms         Matrix Spike (W0L0765-MS2)       Source: 0L09062-01       Prepared: 12/15/20       Analyzed: 12/16/20       Ms         Matrix Spike (W0L0765-MS2)       Source: 0L09062-01       Prepared: 12/15/20       Analyzed: 12/16/20       Ms         Matrix Spike Dup (W0L0765-MSD1)       Source: 0L09061-01       Prepared: 12/15/20       Analyzed: 12/16/20       Ms         Matrix Spike Dup (W0L0765-MSD2)       Source: 0L09062-01       Prepared: 12/15/20       Analyzed: 12/16/20       Ms         Matrix Spike Dup (W0L0765-MSD2)       Source: 0L09062-01       Prepared: 12/15/20       Analyzed: 12/16/20       Ms         Matrix Spike Dup (W0L0765-MSD2)       Source: 0L09062-01       Prepared: 12/17/20       Analyzed: 12/16/20       Ms         Matrix Spike Dup (W0L0765-MSD2)       Source: 0L09062-01       Prepared: 12/17/20       Analyzed: 12/18/20       Ms         Batch:       W0L0951 - EPA 350.1       Prepared: 12/17/20       Analyzed: 12/18/20       Ms       Ms         Blank (W0L0951-BLK2)       ND       0.047       0.10       mg/l       Prepared: 12/17/20       Analyzed: 12/18/20       <	LCS (W0L0765-BS2)		1.04	0.065	0.10	m a /l	Prepared: 12/15/20	Analyzed:	12/16/20	00.110				
Matrix Spike (W0L0765-MS1)         Source: 0L09061-01         Prepared: 12/15/20         Analyzed: 12/16/20           TKN        ND         0.065         0.10         mg/l         1.00         ND         90-110         MS           Matrix Spike (W0L0765-MS2)         Source: 0L09062-01         Prepared: 12/15/20         Analyzed: 12/16/20			1.04	0.005	0.10	mg/i	1.00		104	90-110				
TKN       ND       0.065       0.10       mg/l       1.00       ND       90-110       MS         Matrix Spike (W0L0765-MS2)       Source: 0L09062-01       Prepared: 12/15/20       Analyzed: 12/16/20       O.131       104       90-110       MS         Matrix Spike Dup (W0L0765-MSD1)       Source: 0L09061-01       Prepared: 12/15/20       Analyzed: 12/16/20       Volume       MS         Matrix Spike Dup (W0L0765-MSD1)       Source: 0L09061-01       Prepared: 12/15/20       Analyzed: 12/16/20       Volume       MS         Matrix Spike Dup (W0L0765-MSD2)       Source: 0L09062-01       Prepared: 12/15/20       Analyzed: 12/16/20       Volume       Volume       MS         Matrix Spike Dup (W0L0765-MSD2)       Source: 0L09062-01       Prepared: 12/15/20       Analyzed: 12/16/20       Volume       Volum	Matrix Spike (W0L0765-MS1	) Sor	urce: 0	L09061-01			Prepared: 12/15/20	Analyzed:	12/16/20	)				
Matrix Spike (W0L0765-MS2)         Source: 0L09062-01         Prepared: 12/15/20         Analyzed: 12/16/20           TKN         1.17         0.065         0.10         mg/l         1.00         0.131         104         90-110           Matrix Spike Dup (W0L0765-MSD1)         Source: 0L09061-01         Prepared: 12/15/20         Analyzed: 12/16/20         10         Ms           Matrix Spike Dup (W0L0765-MSD2)         Source: 0L09062-01         Prepared: 12/15/20         Analyzed: 12/16/20         10         Ms           Matrix Spike Dup (W0L0765-MSD2)         Source: 0L09062-01         Prepared: 12/15/20         Analyzed: 12/16/20         10         Ms           Matrix Spike Dup (W0L0765-MSD2)         Source: 0L09062-01         Prepared: 12/17/20         Analyzed: 12/16/20         10         Ms           Matrix Spike Dup (W0L0951 - EPA 350.1         Batch: W0L0951 - EPA 350.1         Prepared: 12/17/20         Analyzed: 12/18/20         10         4         10           Blank (W0L0951-BLK1)         ND         0.047         0.10         mg/l         1.21         0.10         10         10         10         10           Blank (W0L0951-BLK2)         ND         0.047         0.10         mg/l         12/17/20         Analyzed: 12/18/20         10         10         10         10 <td>TKN</td> <td></td> <td>ND</td> <td>0.065</td> <td>0.10</td> <td>mg/l</td> <td>1.00</td> <td>ND</td> <td></td> <td>90-110</td> <td></td> <td></td> <td>MS-01</td>	TKN		ND	0.065	0.10	mg/l	1.00	ND		90-110			MS-01	
TKN       1.17       0.065       0.10       mg/l       1.00       0.131       104       90-110         Matrix Spike Dup (W0L0765-MSD1)       Source: 0L09061-01       Prepared: 12/15/20       Analyzed: 12/16/20       90-110       10       Ms         Matrix Spike Dup (W0L0765-MSD2)       Source: 0L09062-01       Prepared: 12/15/20       Analyzed: 12/16/20       90-110       10       Ms         Matrix Spike Dup (W0L0765-MSD2)       Source: 0L09062-01       Prepared: 12/15/20       Analyzed: 12/16/20       90-110       4       10         Batch: W0L0951 - EPA 350.1       Blank (W0L0951 - BLK1)       ND       0.047       0.10       mg/l       mg/l       1.00       Analyzed: 12/18/20         Blank (W0L0951 - BLK2)       ND       0.047       0.10       mg/l       mg/l       mg/l       malyzed: 12/18/20         LCS (W0L0951-BLS1)       ND       0.047       0.10       mg/l       Prepared: 12/17/20       Analyzed: 12/18/20	Matrix Spike (W0L0765-MS2	) So	urce: 0	L09062-01			Prepared: 12/15/20	Analyzed:	12/16/20	1				
Matrix Spike Dup (W0L0765-MSD1)       Source: 0L09061-01 ND       Prepared: 12/15/20 0.065       Analyzed: 12/16/20 ND       90-110       10       MS         Matrix Spike Dup (W0L0765-MSD2)       Source: 0L09062-01 TKN       Prepared: 12/15/20 1.00       Analyzed: 12/16/20 0.131       90-110       4       10         Batch: W0L0951 - EPA 350.1       Prepared: 12/17/20       Analyzed: 12/18/20       4       10         Blank (W0L0951 - BLK1) Ammonia as N       ND       0.047       0.10       mg/l       12/17/20       Analyzed: 12/18/20       5         Blank (W0L0951 - BLK2)       ND       0.047       0.10       mg/l       5	TKN		1.17	0.065	0.10	mg/l	1.00	0.131	104	90-110				
TKN       ND       0.065       0.10       mg/l       1.00       ND       90-110       10       MS         Matrix Spike Dup (W0L0765-MSD2)       Source: 0L09062-01       Prepared: 12/15/20       Analyzed: 12/16/20       0.131       109       90-110       4       10         Batch:       W0L0951 - EPA 350.1       Prepared: 12/17/20       Analyzed: 12/18/20       4       10         Blank (W0L0951 - BLK1)       Prepared: 12/17/20       Analyzed: 12/18/20       4       10         Blank (W0L0951 - BLK2)       ND       0.047       0.10       mg/l       1.20       Analyzed: 12/18/20         LCS (W0L0951 - BS1)       Prepared: 12/17/20       Analyzed: 12/18/20       Prepared: 12/17/20       Analyzed: 12/18/20	Matrix Spike Dup (W0L0765-	-MSD1) So	urce: 0	L09061-01			Prepared: 12/15/20	Analyzed:	12/16/20					
Matrix Spike Dup (W0L0765-MSD2)       Source: 0L09062-01       Prepared: 12/15/20       Analyzed: 12/16/20       Vertical Science         TKN       1.22       0.065       0.10       mg/l       1.00       0.131       109       90-110       4       10         Batch: W0L0951 - EPA 350.1       Prepared: 12/17/20       Analyzed: 12/18/20       4       10         Blank (W0L0951-BLK1)       Prepared: 12/17/20       Analyzed: 12/18/20       5       5         Blank (W0L0951-BLK2)       ND       0.047       0.10       mg/l       5       <	TKN		ND	0.065	0.10	mg/l	1.00	ND	12, 10, 20	90-110		10	MS-01	
Matrix Spike Dup (W0L0765-MSD2)       Source: 0L09062-01       Prepared: 12/15/20       Analyzed: 12/16/20         TKN       1.22       0.065       0.10       mg/l       1.00       0.131       109       90-110       4       10         Batch: W0L0951 - EPA 350.1       Prepared: 12/17/20       Analyzed: 12/18/20         Blank (W0L0951 - EPA 350.1       Prepared: 12/17/20       Analyzed: 12/18/20         Blank (W0L0951 - BLK1)       Prepared: 12/17/20       Analyzed: 12/18/20         Ammonia as N       ND       0.047       O.10       mg/l         Elank (W0L0951 - BLK2)       Prepared: 12/17/20       Analyzed: 12/18/20         LCS (W0L0951 - BS1)       Prepared: 12/17/20       Analyzed: 12/18/20							D 1 40 45 60		40.46.00					
Batch: W0L0951 - EPA 350.1       Prepared: 12/17/20 Analyzed: 12/18/20         Blank (W0L0951-BLK1)       ND       0.047       0.10       mg/l         Blank (W0L0951-BLK2)       Prepared: 12/17/20 Analyzed: 12/18/20         Ammonia as N       ND       0.047       0.10       mg/l         LCS (W0L0951-BS1)       Prepared: 12/17/20 Analyzed: 12/18/20	Matrix Spike Dup (W0L0765- TKN	MSD2) Sol	urce: 0 1 22	0.065	0.10	ma/l	1 00	Analyzed: 0.131	12/16/20	90-110	4	10		
Batch: W0L0951 - EPA 350.1         Blank (W0L0951-BLK1)       Prepared: 12/17/20 Analyzed: 12/18/20         Ammonia as N       ND       0.047       0.10       mg/l         Blank (W0L0951-BLK2)       Prepared: 12/17/20 Analyzed: 12/18/20         Ammonia as N       ND       0.047       0.10       mg/l         LCS (W0L0951-BS1)       Prepared: 12/17/20 Analyzed: 12/18/20			1.22	0.000	0.10	iiig/i	1.00	0.101	100	00 110		10		
Blank (W0L0951-BLK1)         Prepared: 12/17/20 Analyzed: 12/18/20           Ammonia as N         ND         0.047         0.10         mg/l           Blank (W0L0951-BLK2)         Prepared: 12/17/20 Analyzed: 12/18/20           Ammonia as N         ND         0.047         0.10         mg/l           LCS (W0L0951-BS1)         Prepared: 12/17/20 Analyzed: 12/18/20	Batch: W0L0951 - EPA 350.1													
Ammonia as N       ND       0.047       0.10       mg/l         Blank (W0L0951-BLK2)       Prepared: 12/17/20 Analyzed: 12/18/20         Ammonia as N       ND       0.047       0.10       mg/l         LCS (W0L0951-BS1)       Prepared: 12/17/20 Analyzed: 12/18/20	Blank (W0L0951-BLK1)						Prepared: 12/17/20	Analyzed:	12/18/20	)				
Blank (W0L0951-BLK2)         Prepared: 12/17/20 Analyzed: 12/18/20           Ammonia as N         ND         0.047         0.10         mg/l           LCS (W0L0951-BS1)         Prepared: 12/17/20 Analyzed: 12/18/20	Ammonia as N		ND	0.047	0.10	mg/l								
Ammonia as N         ND         0.047         0.10         mg/l           LCS (W0L0951-BS1)         Prepared: 12/17/20 Analyzed: 12/18/20	Blank (W0L0951-BLK2)						Prepared: 12/17/20	Analyzed:	12/18/20	)				
LCS (W0L0951-BS1) Prepared: 12/17/20 Analyzed: 12/18/20	Ammonia as N		ND	0.047	0.10	mg/l		-						
	ICS (WOL0951-RS1)						Pronarod: 12/17/20	Analyzad	12/19/20					
	LC3 (WOL0351-D31)						1 iepaieu. 12/11/20	Analyzed:	12/ 10/20					



## **Certificate of Analysis**

FINAL REPORT

Project Number: LECL TMDL Monitoring 1915100403

Reported: 01/12/2021 12:51

Project Manager: John Rudolph

(Continued)

### **Quality Control Results**

Conventional Chemistry/Physical Parameters by APH	A/EPA/AST	M Methods	(Continued)								
					Spike	Source		%REC		RPD	
Analyte	Result	MDL	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier
Batch: W0L0951 - EPA 350.1 (Continued)											
LCS (W0L0951-BS1)				Prepa	red: 12/17/20	Analyzed:	12/18/20	1			
Ammonia as N	0.247	0.047	0.10	mg/l	0.250		99	90-110			
LCS (W0L0951-BS2)				Prepa	red: 12/17/20	Analyzed:	12/18/20	1			
Ammonia as N	0.252	0.047	0.10	mg/l	0.250		101	90-110			
Matrix Spike (W0L0951-MS1)	Source: 0	L14091-01		Prepa	red: 12/17/20	Analyzed:	12/18/20	1			
Ammonia as N	0.592	0.047	0.10	mg/l	0.250	0.342	100	90-110			
Matrix Spike (W0L0951-MS2)	Source: 0	L16050-01		Prepa	red: 12/17/20	Analyzed:	12/18/20	1			
Ammonia as N	0.268	0.047	0.10	mg/l	0.250	ND	107	90-110			
Matrix Spike Dup (W0L0951-MSD1)	Source: 0	L14091-01		Prepa	red: 12/17/20	Analyzed:	12/18/20	1			
Ammonia as N	0.590	0.047	0.10	mg/l	0.250	0.342	99	90-110	0.5	15	
Matrix Spike Dup (W0L0951-MSD2)	Source: 0	L16050-01		Prepa	red: 12/17/20	Analyzed:	12/18/20	1			
Ammonia as N	0.269	0.047	0.10	mg/l	0.250	ND	107	90-110	0.3	15	
Batch: W0L0997 - EPA 365.3											
Blank (W0L0997-BLK1)				Prepa	red: 12/18/20	Analyzed:	12/23/20	1			
Phosphorus as P, Total		0.00083	0.010	mg/l		-					
LCS (W0L0997-BS1)				Prepa	red: 12/18/20	Analyzed:	12/23/20	1			
Phosphorus as P, Total	0.207	0.00083	0.010	mg/l	0.200		104	90-110			
Matrix Spike (W0L0997-MS1)	Source: 0	K30021-01		Prepa	red: 12/18/20	Analyzed:	12/23/20	1			
Phosphorus as P, Total	0.472	0.00083	0.010	mg/l	0.200	0.268	102	90-110			
Matrix Spike Dup (W0L0997-MSD1)	Source: 0	K30021-01		Prepa	red: 12/18/20	Analyzed:	12/23/20	1			
Phosphorus as P, Total	0.472	0.00083	0.010	mg/l	0.200	0.268	102	90-110	0	20	



## **Certificate of Analysis**

FINAL REPORT

Project Number: LECL TMDL Monitoring 1915100403

### Reported:

01/12/2021 12:51

Project Manager: John Rudolph

(Continued)

**Quality Control Results** 

Metals by EPA 200 Series Methods

					Spike	Source		%REC		RPD	
Analyte	Result	MDL	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier
Batch: W0L0609 - EPA 200.7											
Blank (W0L0609-BLK1)				Prep	oared: 12/10/2	0 Analyzed:	12/29/20	)			
Aluminum, Dissolved	0.00600	0.0014	0.020	mg/l							J
Aluminum, Total	0.00600	0.0014	0.020	mg/l							J
LCS (W0L0609-BS1)				Prep	oared: 12/10/2	0 Analyzed:	12/29/20	)			
Aluminum, Dissolved	0.210	0.0014	0.020	mg/l	0.200		105	85-115			
Aluminum, Total	0.210	0.0014	0.020	mg/l	0.200		105	85-115			
Matrix Spike (W0L0609-MS1)	Source: 0	K30021-01		Prep	oared: 12/10/2	0 Analyzed:	12/29/20	)			
Aluminum, Total	0.302	0.0014	0.020	mg/l	0.200	0.0549	124	70-130			
Matrix Spike (W0L0609-MS2)	Source: 0	K30022-01		Prep	oared: 12/10/2	0 Analyzed:	12/29/20	)			
Aluminum, Total	0.270	0.0014	0.020	mg/l	0.200	0.0413	114	70-130			
Matrix Spike Dup (W0L0609-MSD1)	Source: 0	K30021-01		Prep	oared: 12/10/2	0 Analyzed:	12/29/20	)			
Aluminum, Total	0.304	0.0014	0.020	mg/l	0.200	0.0549	125	70-130	0.6	30	
Matrix Spike Dup (W0L0609-MSD2)	Source: 0	K30022-01		Prep	oared: 12/10/2	0 Analyzed:	12/29/20	)			
Aluminum, Total	0.275	0.0014	0.020	mg/l	0.200	0.0413	117	70-130	2	30	



## **Certificate of Analysis**

FINAL REPORT

Project Number: LECL TMDL Monitoring 1915100403

Reported: 01/12/2021 12:51

Project Manager: John Rudolph

### Notes and Definitions

ltem	Definition
J	Estimated conc. detected <mrl and="">MDL.</mrl>
MS-01	The spike recovery for this QC sample is outside of established control limits possibly due to sample matrix interference.
%REC	Percent Recovery
Dil	Dilution
MDL	Method Detection Limit
MRL	The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ)
ND	NOT DETECTED at or above the Method Reporting Limit (MRL). If Method Detection Limit (MDL) is reported, then ND means not detected at or above the MDL.
RPD	Relative Percent Difference
Source	Sample that was matrix spiked or duplicated.
Any remain	ning sample(s) will be disposed of one month from the final report date unless other arrangements are made in advance.

All results are expressed on wet weight basis unless otherwise specified.

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.



**FINAL REPORT** 

Work Orders:	0L09065	Report Date:	1/13/2021
		Received Date:	12/9/2020
Project	LECL TMDL Monitoring 1915100403	Turnaround Time:	Normal
roject.		Phones:	(858) 514-6465
		Fax:	(858) 300-4301
Attn:	John Rudolph	P.O. #:	C015101084
Client:	Wood - San Diego 2 9210 Sky Park Court, Suite 200 San Diego, CA 92123	Billing Code:	

### DoD-ISO ANAB # • ELAP-CA #1132 • EPA-UCMR #CA00211 • HW-DOH # • ISO17025 ANAB #L2457.01 • LACSD #10143 • NELAP-OR #4047 • NJ-DEP #CA015

This is a complete final report. The information in this report applies to the samples analyzed in accordance with the chain-of-custody document. Weck Laboratories certifies that the test results meet all requirements of TNI unless noted by qualifiers or written in the Case Narrative. This analytical report must be reproduced in its entirety.

Dear John Rudolph,

Enclosed are the results of analyses for samples received 12/09/20 with the Chain-of-Custody document. The samples were received in good condition, at 3.3 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

**Reviewed by:** 

1: State

Chris Samatmanakit Project Manager





### Sample Summary

### **Certificate of Analysis**

FINAL REPORT

#### Project Number: LECL TMDL Monitoring 1915100403

Reported: 01/13/2021 13:17

Project Manager: John Rudolph

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
CL07 - Int	Kate Buckley	0L09065-01	Water	12/09/20 11:00	
CL07 - Surf	Kate Buckley	0L09065-02	Water	12/09/20 11:00	
CL08 - Int	Kate Buckley	0L09065-03	Water	12/09/20 10:00	
CL08 - Surf	Kate Buckley	0L09065-04	Water	12/09/20 10:00	
CL09 - Int	Kate Buckley	0L09065-05	Water	12/09/20 09:00	
CL09 - Surf	Kate Buckley	0L09065-06	Water	12/09/20 09:00	
CL10 - Int	Kate Buckley	0L09065-07	Water	12/09/20 08:15	
CL10 - Surf	Kate Buckley	0L09065-08	Water	12/09/20 08:15	
LE02 - Int	Kate Buckley	0L09065-09	Water	12/09/20 09:30	
LE02 - Surf	Kate Buckley	0L09065-10	Water	12/09/20 10:00	



FINAL REPORT

Wood - San Diego 2Project Number:LECL TMDL Monitoring 19151004039210 Sky Park Court, Suite 200San Diego, CA 92123Project Manager:John Rudolph

Reported:

01/13/2021 13:17

### Sample Results Enthalpy Analytical

Sample:	CL07 - Int 0L09065-01 (Water)				Sample	d: 12/09/20 11:00	by Kate Buckley
Analyte		Result	MRL	Units	Dil	Analyzed	Qualifier
Conventional (	Chemistry/Physical Parameters by APHA	EPA/ASTM Methods					
Method: SM	10200H	Batch ID: 258613	Prepared:	: 12/09/20 11:00			Analyst: _SUB
Chlorophy	II-a	11	1	mg/M3	1	12/29/20	



Wood - San Diego 2 9210 Sky Park Court, Suite 200		Project Number:	LECL TMDL M	onitoring 19	915100403		01	Reported: /13/2021 13:17
San Diego, C	A 92123	Project Manager:	John Rudolph					
Sa	mple Results Enthalpy Analytical							(Continued)
Sample:	CL07 - Surf 0L09065-02 (Water)					Sampled: 7	12/09/20 11:00	by Kate Buckley
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier
Conventional C	hemistry/Physical Parameters by APHA/EPA/ASTM M	ethods						
Method: SM	10200H	Batch ID: 258613	Pre	oared: 12/09	/20 11:00			Analyst: _SUB
Chlorophy	II-a			1	mg/M3	1	12/29/20	



Wood - San E 9210 Sky Par	Wood - San Diego 2 9210 Sky Park Court, Suite 200		LECL TMDL M	onitoring 1	915100403		01	Reported: /13/2021 13:17
San Diego, C	A 92123	Project Manager:	John Rudolph					
Sa	mple Results Enthalpy Analytical							(Continued)
Sample:	CL08 - Int 0L09065-03 (Water)					Sampled:	12/09/20 10:00	by Kate Buckley
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier
Conventional C	hemistry/Physical Parameters by APHA/EPA/ASTM M	lethods						
Method: SM	10200H	Batch ID: 258613	Pre	pared: 12/09	9/20 10:00			Analyst: _SUB
Chlorophy	II-a			1	mg/M3	1	12/29/20	



Wood - San D	Diego 2	Project Number:	LECL TMDL M	onitoring 19	15100403			Reported:
9210 Sky Par	k Court, Suite 200					01	/13/2021 13:17	
San Diego, C	A 92123	Project Manager:	John Rudolph					
Sa	mple Results Enthalpy Analytical							(Continued)
Sample:	CL08 - Surf					Sampled: 1	2/09/20 10:00	by Kate Buckley
	0L09065-04 (Water)							
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier
Conventional C	hemistry/Physical Parameters by APHA/EPA/ASTM M	ethods						
Method: SM 1	10200H	Batch ID: 258613	Pre	oared: 12/09/	20 10:00			Analyst: _SUB
Chlorophyl	I-a			1	mg/M3	1	12/29/20	



Wood - San Diego 2 9210 Sky Park Court, Suite 200		Project Number:	LECL TMDL M	lonitoring <sup>2</sup>	1915100403		01	Reported: /13/2021 13:17
San Diego, C	A 92123	Project Manager:	John Rudolph					
Sa	mple Results Enthalpy Analytical							(Continued)
Sample:	CL09 - Int 0L09065-05 (Water)					Sampled:	12/09/20 9:00	by Kate Buckley
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier
Conventional C	hemistry/Physical Parameters by APHA/EPA/ASTM M	lethods						
Method: SM 1	10200H	Batch ID: 258613	Pre	pared: 12/0	9/20 09:00			Analyst: _SUB
Chlorophyl	I-a			1	mg/M3	1	12/29/20	



Wood - San E 9210 Sky Par	Wood - San Diego 2 9210 Sky Park Court, Suite 200		LECL TMDL N	Ionitoring	g 1915100403		01	Reported: /13/2021 13:17
San Diego, C	A 92123	Project Manager:	John Rudolph					
Sa	mple Results Enthalpy Analytical							(Continued)
Sample:	CL09 - Surf 0L09065-06 (Water)					Sampled:	12/09/20 9:00	by Kate Buckley
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier
Conventional C	hemistry/Physical Parameters by APHA/EPA/ASTM N	lethods						
Method: SM	10200H	Batch ID: 258613	Pre	epared: 12	/09/20 09:00			Analyst: _SUB
Chlorophyl	I-a			1	mg/M3	1	12/29/20	



Wood - San Diego 2 9210 Sky Park Court, Suite 200		Project Number:	LECL TMDL M	onitoring 1	915100403		01	Reported: /13/2021 13:17
San Diego, C	A 92123	Project Manager:	John Rudolph					
Sa	mple Results Enthalpy Analytical							(Continued)
Sample:	CL10 - Int 0L09065-07 (Water)					Sampled:	12/09/20 8:15	oy Kate Buckley
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier
Conventional C	hemistry/Physical Parameters by APHA/EPA/ASTM M	ethods						
Method: SM	10200H	Batch ID: 258613	Pre	pared: 12/09	9/20 08:15			Analyst: _SUB
Chlorophyl	II-a			1	mg/M3	1	12/29/20	



Wood - San Diego 2 9210 Sky Park Court, Suite 200		Project Number:	LECL TMDL M	onitoring 1	915100403		01	Reported: /13/2021 13:17
San Diego, C	A 92123	Project Manager:	John Rudolph					
Sa	mple Results Enthalpy Analytical							(Continued)
Sample:	CL10 - Surf 0L09065-08 (Water)					Sampled:	12/09/20 8:15	oy Kate Buckley
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier
Conventional C	hemistry/Physical Parameters by APHA/EPA/ASTM M	ethods						
Method: SM	10200H	Batch ID: 258613	Pre	pared: 12/09	)/20 08:15			Analyst: _SUB
Chlorophy	II-a	35		1	mg/M3	1	12/29/20	



Wood - San Diego 2 9210 Sky Park Court, Suite 200		Project Number:	LECL TMDL M	onitoring 19	15100403		01	Reported: /13/2021 13:17
San Diego, C	A 92123	Project Manager:	John Rudolph					
Sa	mple Results Enthalpy Analytical							(Continued)
Sample:	LE02 - Int 0L09065-09 (Water)					Sampled:	12/09/20 9:30	by Kate Buckley
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier
Conventional C	hemistry/Physical Parameters by APHA/EPA/ASTM M	ethods						
Method: SM	10200H	Batch ID: 258613	Pre	pared: 12/09/	20 09:30			Analyst: _SUB
Chlorophy	II-a	96		1	mg/M3	1	12/29/20	



Wood - San E 9210 Sky Par	Wood - San Diego 2 9210 Sky Park Court, Suite 200		LECL TMDL Mo	onitoring 19	15100403		01	Reported: /13/2021 13:17
San Diego, C	A 92123	Project Manager:	John Rudolph					
Sa	mple Results Enthalpy Analytical							(Continued)
Sample:	LE02 - Surf 0L09065-10 (Water)					Sampled: 1	2/09/20 10:00	oy Kate Buckley
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier
Conventional C	hemistry/Physical Parameters by APHA/EPA/ASTM M	lethods						
Method: SM	10200H	Batch ID: 258613	Prep	oared: 12/09/	20 10:00			Analyst: _SUB
Chlorophy	II-a	96		1	mg/M3	1	12/29/20	



FINAL REPORT

Wood - San Diego 2 9210 Sky Park Court, Suite 200 San Diego, CA 92123 Project Number: LECL TMDL Monitoring 1915100403

Reported: 01/13/2021 13:17

Project Manager: John Rudolph

### Quality Control Results

Conventional Chemistry/Physical Parameters by APH	A/EPA/ASTM Methods									
				Spike	Source		%REC		RPD	
Analyte	Result	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier
Batch: 258613 - SM 10200H										
BLK (BATCH-BLK1 (Water))	Source: TRUE			Prepared & An	alyzed: 12/2	29/20				
Chlorophyll-a	ND	1	mg/M3		TRUE		0-0		0	



## **Certificate of Analysis**

FINAL REPORT

Project Number: LECL TMDL Monitoring 1915100403

Reported: 01/13/2021 13:17

Project Manager: John Rudolph

### Notes and Definitions

ltem	Definition
%REC	Percent Recovery
Dil	Dilution
MRL	The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ)
ND	NOT DETECTED at or above the Method Reporting Limit (MRL). If Method Detection Limit (MDL) is reported, then ND means not detected at or above the MDL.
RPD	Relative Percent Difference
Source	Sample that was matrix spiked or duplicated.

Any remaining sample(s) will be disposed of one month from the final report date unless other arrangements are made in advance.

All results are expressed on wet weight basis unless otherwise specified.

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.

# Chain of Custody & Sample Information Record

of

[	······																				
Client: Wood E&I Solutions, In	IC.		Cor	ntact:	: Joł	n Ru	dolp	h												Phone No.	858-243-8158
EAX No			Ema			. <b>.</b>	at 1 1			I											Additional Reporting Requests
FAA NO,		·····	Ema		Jo	onn.ru	aoibi	n@w	loodb	IC.CO	om	·								· · · · · · · · · · · · · · · · · · ·	
Project Name: LECL TMDL Mo	onitoring		Tur	n Arc	ound	Time	e:		R	louti	ine		*3-	5 Da	ay	*,	48 H	Hour		*24 Hour	Email Results:  Yes No
Desta-4-Novel			]			<b>.</b>							F	Rusł	1		R	ush		Rush	State EDT: Yes 🔲 No
Project Number: 1915100403			Lab	TAT A	Appr f Co	oval:			By:		manal								*Ac	dditional Charges May Apply	(Include Source Number in Notes)
Sampler Informa	tion			8 F	rese	rvativ	/es			Ja T	ype Ype		À	naly	sis	Re	que	ester	1	Matrix	Notes
Name: Kate Buc	Kley								ners				5			65.3)			0.7)	DW = Drinking Water	Ortho-P is field filtered (0.45 um)
	} :								ntai				A 353.		.   =	EPA3	365.3)	(soo;	PA 20	WW = Wastewater	Dissolved AI is field filtered
Employer: VV000 E&I SOlut	ions, inc.					tate			ြပိ				EP	2	350	nec   sp	d	M45	Ξ	GW = Groundwater	
	. 1. 1		2ec			Ace			đ		8.		trite	5	361	E   ē		de (5	E F	S = Soli	
Signature:	miny				lõ.	- Ę,			#	ť'n	am		IZ	SM26	E PA		Ę	Ling 1	Į į	SG = Sludge	
			2SC	រប្រុ	a2S		S	2 2 2	of:	201	Ses	ရိုလ	itrate	SO (S			LD47	otal	isso	L = Liquid	
	Date	lime	티크			2 2 2	N N	<u></u>			<u>-</u>  -	<u>" </u>	Z	F	F	45	5	IF I		M = Miscellaneous	<u> </u>
CL07	12/9/20	11:00			┥╸╽┈					$\left  \right $		X	X	x	x >	<u> </u>	<u>x</u>	<b>x</b> :	<u>x x</u>		
CL08		10:00										x	x	x	x	( x	x	x	x x		
CL09		9:00										x	x	x	x	< x	x	x	x x		
CL10		8:15										x	x	x	x	k x	x	x	x x		
LE02		9:30										T	x	x	x		x	x			
· · · · ·		1										╈	<u> </u>			1					
						-[											-				
												Ť									
									-												
Relinquished By (sign)	Print Nam	e / Com	pany	,		Dat	e/T	ime	•			Re	ecei	ived	By	, (Si	ign)	)	_	, Pi	int Name / Company
Goutibrithi Kate Ariling 14			<i>NOO</i>	d	12	1912	ଯ	V	(D)	NAD								Headr	Sindertalecin		
- Om	Hacto	- Ea	no	h	12	i i	w	/17	s (X	00 1410. 12/2/20					0			Algabriel H hweek			
The symmetry and the sy		•			100		<b>u</b>	, , , , , , , , , , , , , , , , , , , ,		7	1.44	ı —				19	00	5		<u> </u>	

(For Lab Use Only) Sample Integrity	y Upon R	eceipt			Lab Notes	· ·
Sample(s) Submitted on Ice?	Yes	No		Temperature		Lab No
Custody Seal(s) Intact?	Yes	No	N/A	7,3 °C		
Sample(s) Intact?	Yes	No		Cooler Blank <sup>T-0734</sup>		Page



### Chain of Custody & Sample Information Record

$\mathcal{O}$	N	1065	
$\mathcal{O}\mathcal{V}$	V	$\left  \bigcirc \bigcirc \right $	

of

Client: Wood E&I Solutions, Inc.	Contact: Jo	hn Rudolph		858-243-8158		
FAX No.	Email: jo	hn.rudolph@wood		Additional Reporting Requests		
Project Name: LECL TMDL Monitoring Project Number: 1915100403	Turn Around	d Time: <u>R</u> proval: By:	<mark>Routine</mark> *3-5 Day *48 Hour Rush Rush : *A	*24 Hour Rush Iditional Charges May Apply	FAX Results:  Yes  No Email Results: Yes  No State EDT: Yes No (Include Source Number in Notes)	
Sampler Information	# of Co & Pres	ontainers ervatives	Sample Type Analysis Requested	Matrix	Notes	
Name: Kate Buckley		e ontainers		DW = Drinking Water WW = Wastewater	Chi-a samples on 0.7 um GFF	
Signature: Katebully	hpreserved 12504 12504 121 1003 122203	(aOH (aOH/ZnAcetat (H4C) ICAA Frozen Fotal # of Co	Routine Resample Special otal Sulfide otal Sulfide Ntrate - Nitrite DS Mononia TKN Otal Phosphor SRP/Ortho-P	S = Soil SG = Sludge L = Liquid		
CL07 - Int 12/9/20 11				M - MISCHIETAOUS	Filter Volume: 2,5DmL	
CL07 - Surf	5				Filter Volume:	
CL08 - Int			x		Filter Volume:	
CL08 - Surf	D		x	· · · · · · · · · · · · · · · · · · ·	Filter Volume:	
CL09 - Int 090	D		x		Filter Volume:	
CL09 - Surf 090	D		x		Filter Volume:	
CL10 - Int 081	5		x		Filter Volume:	
CL10 - Surf 081	5		x		Filter Volume:	
LE02 - Int 09:	io III		x		Filter Volume: 260mL	
LE02 - Surf 🗸 101	XD III				Filter Volume: 260mL	
Relinquished By (sign) Print Name / C	ompany	Date / Time	Received By (Sign)	Pri	nt Name / Company	
Katebuckieg KateBucking	/Wood 12	19/20 1400	Dalas	Hadr Sa	ush-/inpeckhar35	
tector Suph Hector S	andra 12	-9-22/1590	1500	Alganiti 11 V	)(()~	

(For Lab Use Only) Sample Integrity	Upon Re	eceipt			Lab Notes	
Sample(s) Submitted on Ice?	Ves	No		Temperature		Lab No.
Custody Seal(s) Intact?	Yes	No	N/A	3.3 00		
Sample(s) intact?	Yes	No		Cooler Blank		Page



FINAL REPORT

Work Orders:	1A21010	Report Date:	3/08/2021
		Received Date:	2/17/2021
Project <sup>.</sup>	LECL TMDL Monitoring	Turnaround Time:	Normal
i i ojecu	<u> </u>	Phones:	(858) 514-6465
		Fax:	(858) 300-4301
Attn:	John Rudolph	P.O. #:	C015101084
Client:	Wood - San Diego 2 9210 Sky Park Court, Suite 200 San Diego, CA 92123	Billing Code:	

#### DoD-ISO ANAB # • ELAP-CA #1132 • EPA-UCMR #CA00211 • ISO17025 ANAB #L2457.01 • LACSD #10143 • NJ-DEP #CA015

This is a complete final report. The information in this report applies to the samples analyzed in accordance with the chain-of-custody document. Weck Laboratories certifies that the test results meet all requirements of TNI unless noted by qualifiers or written in the Case Narrative. This analytical report must be reproduced in its entirety.

Dear John Rudolph,

Enclosed are the results of analyses for samples received 2/17/21 with the Chain-of-Custody document. The samples were received in good condition, at 6.6 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

**Reviewed by:** 

1: State

Chris Samatmanakit Project Manager





### **Certificate of Analysis**

FINAL REPORT

Project Number: LECL TMDL Monitoring

Reported: 03/08/2021 18:17

Project Manager: John Rudolph

### Case Narrative

Final Report: This is a complete final report. The information in this report applyies to the samples analyzed in accordance with the chain-of-custody document. Weck Laboratories certifies that the test results meet all requirements of NELAC unless noted by qualifiers or written in the Case Narrative. This analytical report must be reproduced in its entirety.

### Sample Summary

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
CL07	Kate Buckley	1A21010-01	Water	02/17/21 11:00	
CL08	Kate Buckley	1A21010-02	Water	02/17/21 10:05	
CL09	Kate Buckley	1A21010-03	Water	02/17/21 09:05	
CL10	Kate Buckley	1A21010-04	Water	02/17/21 08:00	
LE02	Kate Buckley	1A21010-05	Water	02/17/21 09:00	



### **Certificate of Analysis**

FINAL REPORT

Project Number: LECL TMDL Monitoring

Project Manager: John Rudolph

Reported: 03/08/2021 18:17

Sample Results								
Sample: CL07						Sampleo	1: 02/17/21 11:00 b	y Kate Buckley
1A21010-01 (Water)								
Analyte		Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by A	APHA/EPA/ASTM Methods							
Method: EPA 350.1				Instr: AA06				
Batch ID: W1B1130	Preparation: NONE (WETCHEM)			Prepared: 02/19	9/21 13:03			Analvst: SBN
Ammonia as N		0.58	0.047	0.10	mg/l	1	02/22/21	
Mothod: EDA 251 2				Instr: AAO6				
Batch ID: W1B1316	Prenaration: NONE (WETCHEM)			Prenared: 02/2	3/21 13:43			Analyst: VMT
TKN		1.5	0.065	0.10	mg/l	1	02/25/21	Analyst. HVH
					Ū			
Method: EPA 353.2	-			Instr: AA01				
Batch ID: W1B1049	Preparation: _NONE (WETCHEM)	0.29	0.040	Prepared: 02/18	8/21 11:08	1	02/18/21 17:46	Analyst: YMT
		0.30	0.040	0.20	ing/i	1	02/10/21 17.40	
Nitrite as N		ND	0.042	0.10	mg/i	1	02/18/21 17:46	
Method: EPA 365.3				Instr: UVVIS04				
Batch ID: W1B1074	Preparation: _NONE (WETCHEM)			<b>Prepared:</b> 02/18	8/21 15:28			Analyst: sbn
o-Phosphate as P		0.15	0.0030	0.010	mg/l	1	02/18/21 16:23	
Method: EPA 365.3				Instr: UVVIS04				
Batch ID: W1B1077	Preparation: _NONE (WETCHEM)			<b>Prepared:</b> 02/18	8/21 15:54			Analyst: sbn
Phosphorus as P, Total		0.051	0.0067	0.010	mg/l	1	02/22/21	
Method: SM 2540C				Instr: OVEN01				
Batch ID: W1B1189	Preparation: _NONE (WETCHEM)			Prepared: 02/22	2/21 13:16			Analyst: blg
Total Dissolved Solids		480	4.0	10	mg/l	1	02/24/21	
Method: SM 2540D				Instr: OVEN15				
Batch ID: W1B1119	Preparation: NONE (WETCHEM)			Prepared: 02/19	9/21 11·41			Analyst: ism
Total Suspended Solids		0.5		5	mg/l	1	02/19/21	J
					-			
				Instr: _ANALYST	0/21 12 11			A
Sulfide. Total		ND	0.050	0.10	ma/l	1	02/19/21	Analyst: yint
			01000	0.10			02, 10,21	
Metals by EPA 200 Series Methods								
Method: EPA 200.7				Instr: ICP03				
Batch ID: W1B1131	Preparation: EPA 200.2			Prepared: 02/19	9/21 13:06			Analyst: kvm
Aluminum, Dissolved		ND	0.0014	0.020	mg/l	1	02/20/21	
Aluminum, Total		0.053	0.041	0.050	mg/l	1	02/20/21	


## **Certificate of Analysis**

**FINAL REPORT** 

Project Number: LECL TMDL Monitoring

**Reported:** 03/08/2021 18:17

Analyst: kvm

J

02/20/21

02/20/21

Project Manager: John Rudolph

Sample Results							(Continued)
Sample: CL08					Sample	d: 02/17/21 10:05 b	y Kate Buckley
Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameter	rs by APHA/EPA/ASTM Methods						
Method: EPA 350.1			Instr: AA06				
Batch ID: W1B1130	Preparation: _NONE (WETCHEM)		Prepared: 02/19	/21 13:03			Analyst: SBN
Ammonia as N	0.51	0.047	0.10	mg/l	1	02/22/21	
Method: EPA 351.2			Instr: AA06				
Batch ID: W1B1316	Preparation: _NONE (WETCHEM)		Prepared: 02/23	/21 13:43			Analyst: YMT
ТКМ	1.3	0.065	0.10	mg/l	1	02/25/21	
Method: EPA 353.2			Instr: AA01				
Batch ID: W1B1049	Preparation: _NONE (WETCHEM)		Prepared: 02/18,	/21 11:08			Analyst: YMT
Nitrate as N	0.40	0.040	0.20	mg/l	1	02/18/21 17:48	
Nitrite as N	ND	0.042	0.10	mg/l	1	02/18/21 17:48	
Method: EPA 365.3			Instr: UVVIS04				
Batch ID: W1B1074	Preparation: _NONE (WETCHEM)		Prepared: 02/18,	/21 15:28			Analyst: sbn
o-Phosphate as P	0.032	0.0030	0.010	mg/l	1	02/18/21 16:24	
Method: EPA 365.3			Instr: UVVIS04				
Batch ID: W1B1077	Preparation: _NONE (WETCHEM)		Prepared: 02/18,	/21 15:54			Analyst: sbn
Phosphorus as P, Total	0.056	0.0067	0.010	mg/l	1	02/22/21	
Method: SM 2540C			Instr: OVEN01				
Batch ID: W1B1189	Preparation: _NONE (WETCHEM)		Prepared: 02/22	/21 13:16			Analyst: blg
Total Dissolved Solids	470	4.0	10	mg/l	1	02/24/21	
Method: SM 2540D			Instr: OVEN15				
Batch ID: W1B1119	Preparation: _NONE (WETCHEM)		Prepared: 02/19	/21 11:41			Analyst: ism
Total Suspended Solids	0.1		5	mg/l	1	02/19/21	J
Method: SM 4500S2-D			Instr: _ANALYST				
Batch ID: W1B1133	Preparation: _NONE (WETCHEM)		Prepared: 02/19	/21 13:11			Analyst: ymt
Sulfide, Total	ND	0.050	0.10	mg/l	1	02/19/21	
Metals by EPA 200 Series Methods							
Method: EPA 200.7			Instr: ICP03				
Batch ID: W1B1131	Preparation: EPA 200.2		Prenared: 02/19	/21 13.06			Analyst: kym

Aluminum, Dissolved

Aluminum, Total

1A21010

0.0028

0.052

0.0014

0.041

0.020

0.050

mg/l

mg/l

1

1



## **Certificate of Analysis**

**FINAL REPORT** 

Project Number: LECL TMDL Monitoring

Reported: 03/08/2021 18:17

Project Manager: John Rudolph

. -

Sample Results								(Continued)
Sample: CL09						Sample	d: 02/17/21 9:05 b	y Kate Buckley
1A21010-03 (Water)								
Analyte		Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters	s by APHA/EPA/ASTM Methods							
Method: EPA 350.1				Instr: AA06				
Batch ID: W1B1130	Preparation: _NONE (WETCHEM)	)		Prepared: 02/19	/21 13:03			Analyst: SBN
Ammonia as N		0.40	0.047	0.10	mg/l	1	02/22/21	
Method: EPA 351.2				Instr: AA06				
Batch ID: W1B1316	Preparation: _NONE (WETCHEM)	)		Prepared: 02/23	/21 13:43			Analyst: YMT
ΤΚΝ		1.6	0.065	0.10	mg/l	1	02/25/21	
Method: EPA 353.2				Instr: AA01				
Batch ID: W1B1049	Preparation: _NONE (WETCHEM)	)		Prepared: 02/18	/21 11:08			Analyst: YMT
Nitrate as N		0.12	0.040	0.20	mg/l	1	02/18/21 17:49	J
Nitrite as N		- ND	0.042	0.10	mg/l	1	02/18/21 17:49	
Method: EPA 365.3				Instr: UVVIS04				
Batch ID: W1B1074	Preparation: _NONE (WETCHEM)	)		Prepared: 02/18	/21 15:28			Analyst: sbr
o-Phosphate as P		0.034	0.0030	0.010	mg/l	1	02/18/21 16:24	
Method: EPA 365.3				Instr: UVVIS04				
Batch ID: W1B1077	Preparation: _NONE (WETCHEM)	)		Prepared: 02/18	/21 15:54			Analyst: sbr
Phosphorus as P, Total		0.12	0.0067	0.010	mg/l	1	02/22/21	
Method: SM 2540C				Instr: OVEN01				
Batch ID: W1B1189	Preparation: _NONE (WETCHEM)	)		Prepared: 02/22	/21 13:16			Analyst: blg
Total Dissolved Solids		580	4.0	10	mg/l	1	02/24/21	
Method: SM 2540D				Instr: OVEN15				
Batch ID: W1B1119	Preparation: _NONE (WETCHEM)	)		Prepared: 02/19	/21 11:41			Analyst: ism
Total Suspended Solids		10		5	mg/l	1	02/19/21	
Method: SM 4500S2-D				Instr: _ANALYST				
Batch ID: W1B1133	Preparation: _NONE (WETCHEM)	)		Prepared: 02/19	/21 13:11			Analyst: ymt
Sulfide, Total		ND	0.050	0.10	mg/l	1	02/19/21	
Metals by EPA 200 Series Methods								
Method: EPA 200.7				Instr: ICP03				
Batch ID: W1B1131	Preparation: EPA 200.2			Prepared: 02/19	/21 13:06			Analyst: kvm
Aluminum, Dissolved		ND	0.0014	0.020	mg/l	1	02/20/21	
Aluminum, Total		0.18	0.041	0.050	mg/l	1	02/20/21	



## **Certificate of Analysis**

**FINAL REPORT** 

Project Number: LECL TMDL Monitoring

Reported: 03/08/2021 18:17

Project Manager: John Rudolph

Sample Results							(Continued)
Sample: CL10					Sample	d: 02/17/21 8:00 b	y Kate Buckley
1A21010-04 (Water)							
Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parame	eters by APHA/EPA/ASTM Methods						
Method: EPA 350.1			Instr: AA06				
Batch ID: W1B1130	Preparation: _NONE (WETCHEM)		Prepared: 02/19,	/21 13:03			Analyst: SBN
Ammonia as N	0.11	0.047	0.10	mg/l	1	02/22/21	
Method: EPA 351.2			Instr: AA06				
Batch ID: W1B1316	Preparation: _NONE (WETCHEM)		Prepared: 02/23,	/21 13:43			Analyst: YMT
TKN	1.5	0.065	0.10	mg/l	1	02/25/21	
Method: EPA 353.2			Instr: AA01				
Batch ID: W1B1049	Preparation: NONE (WETCHEM)		Prepared: 02/18	/21 11:08			Analvst: YMT
Nitrate as N	0.088	0.040	0.20	mg/l	1	02/18/21 17:53	J
Nitrite as N	ND	0.042	0.10	mg/l	1	02/18/21 17:53	
Method: EPA 365.3			Instr: UVVIS04				
Batch ID: W1B1074	Preparation: _NONE (WETCHEM)		Prepared: 02/18,	/21 15:28			Analyst: sbn
o-Phosphate as P	0.0040	0.0030	0.010	mg/l	1	02/18/21 16:25	J
Method: EPA 365.3			Instr: UVVIS04				
Batch ID: W1B1077	Preparation: NONE (WETCHEM)		<b>Prepared:</b> 02/18	/21 15:54			Analyst: sbn
Phosphorus as P, Total	0.12	0.0067	0.010	mg/l	1	02/22/21	
Method: SM 2540C			Instr: OVEN01				
Batch ID: W1B1189	Preparation: NONE (WETCHEM)		Prepared: 02/22	/21 13.16			Analyst: blg
Total Dissolved Solids	560	4.0	10	mg/l	1	02/24/21	<b>,</b>
Method: SM 2540D			Instr: OVEN15				
Batch ID: W1B1119	Preparation: NONE (WETCHEM)		Prepared: 02/19	/21 11:41			Analyst: ism
Total Suspended Solids	14		5	mg/l	1	02/19/21	
Mathad SM 450052 D			Instru ANIALVET				
	Proposation: NONE (METCHENA)		Bronarod: 02/19	/21 12.11			Analyst
Sulfide, Total	ND	0.050	0.10	mg/l	1	02/19/21	Analyst. ymt
, 				3			
Metals by EPA 200 Series Methods							
<b>Method:</b> EPA 200.7			Instr: ICP03				
Batch ID: W1B1131	Preparation: EPA 200.2	0.0014	Prepared: 02/19	/21 13:06	1	02/20/24	Analyst: kvm
		0.0014	0.020	mg/i	1	02/20/21	J
Aluminum, Iotal	0.21	0.041	0.050	mg/I	1	02/20/21	

14859 Clark Avenue, City of Industry CA, 91745 | Phone: (626) 336-2139 | Fax: (626) 336-2634 www.wecklabs.com



## **Certificate of Analysis**

FINAL REPORT

Project Number: LECL TMDL Monitoring

Reported: 03/08/2021 18:17

Project Manager: John Rudolph

(Continued)

## Sample Results

Sample:	LE02					Sample	d: 02/17/21 9:00 b	y Kate Buckley
	1A21010-05 (Water)							
Analyte		Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional	Chemistry/Physical Parameters	s by APHA/EPA/ASTM Methods						
Method: EPA	A 350.1			Instr: AA06				
Batch ID: \	W1B1130	Preparation: _NONE (WETCHEM)		Prepared: 02/	19/21 13:03			Analyst: SBN
Ammonia	as N	0.18	0.047	0.10	mg/l	1	02/22/21	
Method: EPA	A 351.2			Instr: AA06				
Batch ID: \	W1B1316	Preparation: _NONE (WETCHEM)		Prepared: 02/2	23/21 13:43			Analyst: YMT
<b>TKN</b>		3.7	0.065	0.10	mg/l	1	02/25/21	
Method: EPA	A 353.2			Instr: AA01				
Batch ID: \	W1B1049	Preparation: _NONE (WETCHEM)		Prepared: 02/	18/21 11:08			Analyst: YMT
Nitrate as	Ν	0.085	0.040	0.20	mg/l	1	02/18/21 17:54	J
Nitrite as	Ν	0.11	0.042	0.10	mg/l	1	02/18/21 17:54	
Method: EPA	A 365.3			Instr: UVVIS04				
Batch ID: \	W1B1074	Preparation: _NONE (WETCHEM)		Prepared: 02/	18/21 15:28			Analyst: sbn
o-Phosph	ate as P	0.028	0.0030	0.010	mg/l	1	02/18/21 16:25	
Method: EPA	A 365.3			Instr: UVVIS04				
Batch ID: \	W1B1077	Preparation: _NONE (WETCHEM)		Prepared: 02/	18/21 15:54			Analyst: sbn
Phosphor	us as P, Total	0.26	0.0067	0.010	mg/l	1	02/22/21	
Method: SM	2540C			Instr: OVEN01				
Batch ID: \	W1B1189	Preparation: _NONE (WETCHEM)		Prepared: 02/2	22/21 13:16			Analyst: blg
Total Diss	olved Solids	2000	4.0	10	mg/l	1	02/24/21	
Method: SM	4500S2-D			Instr: _ANALYS	ST			
Batch ID:	W1B1133	Preparation: _NONE (WETCHEM)		Prepared: 02/	19/21 13:11			Analyst: ymt
Sulfide, To	otal		0.050	0.10	mg/l	1	02/19/21	



FINAL REPORT

Wood - San Diego 2 9210 Sky Park Court, Suite 200 San Diego, CA 92123 Project Number: LECL TMDL Monitoring

Reported: 03/08/2021 18:17

Project Manager: John Rudolph

#### **Quality Control Results**

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

				Spike	Source		%REC		RPD	
Analyte Result	MDL	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier
Batch: W1B1049 - EPA 353.2										
Blank (W1B1049-BLK1)				Prepared & A	nalyzed: 02/1	8/21				
Nitrate as N ND	0.040	0.20	mg/l							
Nitrite as N ND	0.042	0.10	mg/l							
LCS (W1B1049-BS1)				Prepared & A	nalyzed: 02/1	8/21				
Nitrate as N 1.04	0.040	0.20	mg/l	1.00		104	90-110			
Nitrite as N 1.02	0.042	0.10	mg/l	1.00		102	90-110			
Matrix Spike (W1B1049-MS1) Source:	1A29010-02			Prepared & A	nalyzed: 02/1	8/21				
Nitrate as N 10.6	0.040	0.20	mg/l	2.00	8.68	96	90-110			
Nitrite as N 1.01	0.042	0.10	mg/l	1.00	ND	101	90-110			
Matrix Spike (W1B1049-MS2) Source:	1A29010-03			Prepared & A	nalyzed: 02/1	8/21				
Nitrate as N 5.88	0.040	0.20	mg/l	2.00	3.79	104	90-110			
Nitrite as N 1.01	0.042	0.10	mg/l	1.00	ND	101	90-110			
Matrix Spike Dup (W1B1049-MSD1) Source:	1A29010-02			Prepared & A	nalyzed: 02/1	8/21				
Nitrate as N 10.6	0.040	0.20	mg/l	2.00	8.68	96	90-110	0	20	
Nitrite as N 0.991	0.042	0.10	mg/l	1.00	ND	99	90-110	2	20	
Matrix Spike Dup (W1B1049-MSD2) Source:	1A29010-03			Prepared & A	nalyzed: 02/1	8/21				
Nitrate as N 5.88	0.040	0.20	mg/l	2.00	3.79	104	90-110	0	20	
Nitrite as N 0.996	0.042	0.10	mg/l	1.00	ND	100	90-110	1	20	
Batch: W1B1074 - EPA 365.3										
Blank (W1B1074-BLK1)				Prepared & A	nalyzed: 02/1	8/21				
o-Phosphate as P ND	0.0030	0.010	mg/l		-					
LCS (W1B1074-BS1)				Prepared & A	nalyzed: 02/1	8/21				
o-Phosphate as P 0.196	0.0030	0.010	mg/l	0.200		98	88-111			
Matrix Spike (W1B1074-MS1) Source:	1A21009-01			Prepared & A	nalyzed: 02/1	8/21				
o-Phosphate as P 0.220	0.0030	0.010	mg/l	0.200	0.0270	96	85-112			
Matrix Spike Dup (W1B1074-MSD1) Source:	1A21009-01			Prepared & A	nalyzed: 02/1	8/21				
o-Phosphate as P 0.219	0.0030	0.010	mg/l	0.200	0.0270	96	85-112	0.5	20	
Batch: W1B1077 - EPA 365.3										
Blank (W1B1077-BLK1)			Prep	oared: 02/18/2	1 Analyzed:	02/22/21	I			
Phosphorus as P, Total ND	0.0067	0.010	mg/l							
LCS (W1B1077-BS1)			Prep	oared: 02/18/2	1 Analyzed:	02/22/21	I			
Phosphorus as P, Total 0.204	0.0067	0.010	mg/l	0.200		102	90-110			
Matrix Spike (W1B1077-MS1) Source:	1A21009-01		Prep	oared: 02/18/2	1 Analvzed:	02/22/21				
Phosphorus as P, Total 0.460	0.0067	0.010	mg/l	0.200	0.247	106	90-110			
Matrix Spike Dup (W1B1077-MSD1) Source	1A21009-01		Pron	oared: 02/18/2	1 Analyzed 1	02/22/21				
Phosphorus as P, Total 0.459	0.0067	0.010	mg/l	0.200	0.247	106	90-110	0.2	20	
Batch: W1B1119 - SM 2540D										
Blank (W1B1119-BLK1)				Prepared & A	nalyzed: 02/1	9/21				

1A21010



**FINAL REPORT** 

Wood - San Diego 2 9210 Sky Park Court, Suite 200 San Diego, CA 92123

Project Number: LECL TMDL Monitoring

Reported:

(Continued)

Project Manager: John Rudolph

03/08/2021 18:17

**Quality Control Results** 

Conventional Chemistry/Physical Parameters by	APHA/EPA/AST	M Method	s (Continue	d)							
					Spike	Source		%REC		RPD	
Analyte	Result	MDL	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier
Batch: W1B1119 - SM 2540D (Continued)											
Blank (W1B1119-BLK1)			_		Prepared & Ana	alyzed: 02/	19/21				
Total Suspended Solids	ND		5	mg/l							
LCS (W1B1119-BS1)					Prepared & Ana	alyzed: 02/	19/21				
Total Suspended Solids	63.9		5	mg/l	62.2		103	90-110			
Dunlicate (W1B1119-DUP1)	Source: 1	B17002-01			Prenared & An	alvzed: 02/	19/21				
Total Suspended Solids	38.0	517002 01	5	mg/l	rieparea a An	37.0	13/21		3	20	
·											
Duplicate (W1B1119-DUP2) Total Suspended Solids	Source: 11	B17060-01	5	ma/l	Prepared & Ana	182	19/21		1	20	
			5	iiig/i		102			-	20	
Batch: W1B1130 - EPA 350.1											
Blank (W1B1130-BLK1)				Pre	pared: 02/19/21	Analyzed:	02/22/21				
Ammonia as N		0.047	0.10	mg/l							
Blank (W1B1130-BLK2)				Pre	nared: 02/19/21	Analyzed	02/22/21				
Ammonia as N		0.047	0.10	mg/l	purcu: 02/15/21	/maryzea.	02/22/21				
				_							
LCS (W1B1130-BS1) Ammonia as N	0 254	0.047	0.10	Prej ma/l	0 250	Analyzed:	102/22/21	90-110			
	0.204	0.047	0.10	iiig/i	0.200		102	50-110			
LCS (W1B1130-BS2)				Pre	pared: 02/19/21	Analyzed:	02/22/21				
Ammonia as N	0.254	0.047	0.10	mg/l	0.250		101	90-110			
Matrix Spike (W1B1130-MS1)	Source: 1	A21009-01		Pre	pared: 02/19/21	Analyzed:	02/22/21				
Ammonia as N	0.423	0.047	0.10	mg/l	0.250	0.178	98	90-110			
Matrix Spike (W1B1130-MS2)	Source: 1/	A21010-01		Pre	pared: 02/19/21	Analyzed:	02/22/21				
Ammonia as N	0.861	0.047	0.10	mg/l	0.250	0.583	111	90-110			MS-02
				-	1 00 (40 (04						
Matrix Spike Dup (W1B1130-MSD1) Ammonia as N	Source: 1/	A21009-01	0.10	Prej ma/l	0 250	Analyzed: 0.178	98 98	90-110	0.1	15	
	0.122	0.011	0.10	iiig/i	0.200	0.170	00	00 110	0.1	10	
Matrix Spike Dup (W1B1130-MSD2)	Source: 1/	A21010-01		Prep	pared: 02/19/21	Analyzed:	02/22/21				
Ammonia as N	0.836	0.047	0.10	mg/l	0.250	0.583	101	90-110	3	15	
Batch: W1B1133 - SM 4500S2-D											
Blank (W1B1133-BLK1)					Prepared & Ana	alvzed: 02/	19/21				
Sulfide, Total		0.050	0.10	mg/l			,				
							40/04				
LCS (W1B1133-BS1) Sulfide Total	0 100	0.050	0.10	ma/l	0 0995	alyzed: 02/	19/21	95-105			
	0.100	0.000	0.10	iiig/i	0.0000		101	00 100			
Duplicate (W1B1133-DUP1)	Source: 1/	A21010-01			Prepared & Ana	alyzed: 02/	19/21				
Sulfide, lotal	ND	0.050	0.10	mg/l		ND				20	
Batch: W1B1189 - SM 2540C											
Blank (W1B1189-BLK1)				Prei	pared: 02/22/21	Analvzed:	02/24/21				
Total Dissolved Solids		4.0	10	mg/l							
LCC (M(101100 DC1)						Anal	02/24/25				
Total Dissolved Solids		4.0	10	ma/l	824 pareo: 02/22/21	Analyzed:	102/24/21	96-102			
	010										
Duplicate (W1B1189-DUP1)	Source: 1	A29010-04		Pre	pared: 02/22/21	Analyzed:	02/24/21				
1A21010											Page 9 of 1



FINAL REPORT

#### Wood - San Diego 2 9210 Sky Park Court, Suite 200 San Diego, CA 92123

Project Number: LECL TMDL Monitoring

Reported: 03/08/2021 18:17

Project Manager: John Rudolph

3/08/2021 18:17

(Continued)

## **Quality Control Results**

Conventional Chemistry/Physical Parameters by APHA	/EPA/AST	M Methods (	Continued)								
					Spike	Source		%REC		RPD	
Analyte	Result	MDL	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier
Batch: W1B1189 - SM 2540C (Continued)											
Duplicate (W1B1189-DUP1)	Source: 1/	29010-04		Prepare	ed: 02/22/21	Analyzed: 0	2/24/21				
Total Dissolved Solids	11000	4.0	10	mg/l		11000			0.5	10	
Duplicate (W1B1189-DUP2)	Source: 1	319092-02		Prepare	ed: 02/22/21	Analyzed: 0	2/24/21				
Total Dissolved Solids	1880	4.0	10	mg/l		1950			3	10	
Batch: W1B1316 - EPA 351.2											
Blank (W1B1316-BLK1)				Prepare	d: 02/23/21	Analyzed: 0	2/25/21				
TKN	ND	0.065	0.10	mg/l							
Blank (W1B1316-BLK2)				Prepare	ed: 02/23/21	Analyzed: 0	2/25/21				
TKN		0.065	0.10	mg/l							
LCS (W1B1316-BS1)				Prepare	d: 02/23/21	Analyzed: 0	2/25/21				
TKN	1.06	0.065	0.10	mg/l	1.00		106	90-110			
LCS (W1B1316-BS2)				Prepare	ed: 02/23/21	Analyzed: 0	2/25/21				
TKN	1.03	0.065	0.10	mg/l	1.00		103	90-110			
Matrix Spike (W1B1316-MS1)	Source: 1	309095-06		Prepare	d: 02/23/21	Analyzed: 0	2/25/21				
ТКМ	1.22	0.065	0.10	mg/l	1.00	0.204	101	90-110			
Matrix Spike (W1B1316-MS2)	Source: 1	309095-07		Prepare	ed: 02/23/21	Analyzed: 0	2/25/21				
TKN	1.27	0.065	0.10	mg/l	1.00	0.197	107	90-110			
Matrix Spike Dup (W1B1316-MSD1)	Source: 1	309095-06		Prepare	d: 02/23/21	Analyzed: 0	2/25/21				
TKN	1.23	0.065	0.10	mg/l	1.00	0.204	103	90-110	1	10	
Matrix Spike Dup (W1B1316-MSD2)	Source: 1	309095-07		Prepare	d: 02/23/21	Analyzed: 0	2/25/21				
ТК	1.20	0.065	0.10	mg/l	1.00	0.197	100	90-110	5	10	

## **Quality Control Results**

(Continued)

Metals by EPA 200 Series Methods											
					Spike	Source		%REC		RPD	
Analyte	Result	MDL	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier
Batch: W1B1131 - EPA 200.7											
Blank (W1B1131-BLK1)				Prepar	ed: 02/19/21	Analyzed: (	02/20/21				
Aluminum, Dissolved		0.0014	0.020	mg/l							
Aluminum, Total	ND	0.041	0.050	mg/l							
LCS (W1B1131-BS1)				Prepar	ed: 02/19/21	Analyzed: (	02/20/21				
Aluminum, Dissolved	0.210	0.0014	0.020	mg/l	0.200		105	85-115			
Aluminum, Total	0.210	0.041	0.050	mg/l	0.200		105	85-115			
Matrix Spike (W1B1131-MS1)	Source: 1	A21010-01		Prepar	ed: 02/19/21	Analyzed: (	02/20/21				
Aluminum, Total	0.279	0.041	0.050	mg/l	0.200	0.0529	113	70-130			
Matrix Spike Dup (W1B1131-MSD1)	Source: 1	A21010-01		Prepar	ed: 02/19/21	Analyzed: (	02/20/21				
Aluminum, Total	0.280	0.041	0.050	mg/l	0.200	0.0529	113	70-130	0.1	30	



## Certificate of Analysis

FINAL REPORT

Project Number: LECL TMDL Monitoring

Reported: 03/08/2021 18:17

Project Manager: John Rudolph

#### Notes and Definitions

ltem	Definition
J	Estimated conc. detected <mrl and="">MDL.</mrl>
MS-02	The RPD and/or percent recovery for this QC spike sample cannot be accurately calculated due to the high concentration of analyte inherent in the sample.
%REC	Percent Recovery
Dil	Dilution
MDL	Method Detection Limit
MRL	The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ)
ND	NOT DETECTED at or above the Method Reporting Limit (MRL). If Method Detection Limit (MDL) is reported, then ND means not detected at or above the MDL.
RPD	Relative Percent Difference
Source	Sample that was matrix spiked or duplicated.

Any remaining sample(s) will be disposed of one month from the final report date unless other arrangements are made in advance.

All results are expressed on wet weight basis unless otherwise specified.

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.



FINAL REPORT

Work Orders:	1B17088	Report Date:	3/15/2021
		Received Date:	2/17/2021
Project:	LECL TMDL Monitoring 1915100403	Turnaround Time:	Normal
	, i i i i i i i i i i i i i i i i i i i	Phones:	(858) 514-6465
		Fax:	(858) 300-4301
Attn:	John Rudolph	P.O. #:	C015101084
Client:	Wood - San Diego 2 9210 Sky Park Court, Suite 200 San Diego, CA 92123	Billing Code:	

#### DoD-ISO ANAB # • ELAP-CA #1132 • EPA-UCMR #CA00211 • ISO17025 ANAB #L2457.01 • LACSD #10143 • NJ-DEP #CA015

This is a complete final report. The information in this report applies to the samples analyzed in accordance with the chain-of-custody document. Weck Laboratories certifies that the test results meet all requirements of TNI unless noted by qualifiers or written in the Case Narrative. This analytical report must be reproduced in its entirety.

Dear John Rudolph,

Enclosed are the results of analyses for samples received 2/17/21 with the Chain-of-Custody document. The samples were received in good condition, at 6.6 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

**Reviewed by:** 

1: State

Chris Samatmanakit Project Manager





#### Sample Summary

# **Certificate of Analysis**

FINAL REPORT

Project Number: LECL TMDL Monitoring 1915100403

Reported: 03/15/2021 16:15

Project Manager: John Rudolph

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
CL07 - Int	Kate Buckley	1B17088-01	Water	02/17/21 11:00	
CL07 - Surf	Kate Buckley	1B17088-02	Water	02/17/21 11:05	
CL08 - Int	Kate Buckley	1B17088-03	Water	02/17/21 10:05	
CL08 - Surf	Kate Buckley	1B17088-04	Water	02/17/21 10:10	
CL09 - Int	Kate Buckley	1B17088-05	Water	02/17/21 09:05	
CL09 - Surf	Kate Buckley	1B17088-06	Water	02/17/21 09:10	
CL10 - Int	Kate Buckley	1B17088-07	Water	02/17/21 08:00	
CL10 - Surf	Kate Buckley	1B17088-08	Water	02/17/21 08:05	
LE02 - Int	Kate Buckley	1B17088-09	Water	02/17/21 09:00	
LE02 - Surf	Kate Buckley	1B17088-10	Water	02/17/21 09:20	



FINAL REPORT

Qualifier

Analyst: \_SUB

Wood - San Diego 2 9210 Sky Park Court, Suite 200	Project Number:	LECL TMDL Monitoring 1915100403	<b>Reported:</b> 03/15/2021 16:15
San Diego, CA 92123	Project Manager:	John Rudolph	
Sample Results Enthalpy Analytical			
Sample: CL07 - Int			Sampled: 02/17/21 11:00 by Kate Buckley

#### 1B17088-01 (Water) Analyte Result MRL Units Dil Analyzed Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods Method: SM 10200H Batch ID: 262124 Prepared: 02/17/21 11:00 Chlorophyll-a 1.6 1 mg/M3 1 02/25/21



Wood - San I 9210 Sky Par	Diego 2 rk Court, Suite 200	Project Number:	LECL TMDL Monitori	<b>Reported</b> 03/15/2021 16:1!			
San Diego, C	A 92123	Project Manager:	John Rudolph				
Sa	mple Results Enthalpy Analy	rtical					(Continued)
Sample:	CL07 - Surf 1B17088-02 (Water)				Sampled:	02/17/21 11:05 I	oy Kate Buckley
Analyte		Result	MRL	Units	Dil	Analyzed	Qualifier
Conventional C	Chemistry/Physical Parameters by APHA/EPA	ASTM Methods					
Method: SM	10200H	Batch ID: 262124	Prepared:	02/17/21 11:05			Analyst: _SUB
Chlorophy	II-a	3.2	1	mg/M3	1	02/25/21	



Wood - San E 9210 Sky Par	Diego 2 rk Court, Suite 200	Project Number:	LECL TMDL M	<b>Reported</b> 03/15/2021 16:1				
San Diego, C	A 92123	Project Manager:	John Rudolph					
Sa	mple Results Enthalpy Analytical							(Continued)
Sample:	CL08 - Int 1B17088-03 (Water)					Sampled:	02/17/21 10:05	by Kate Buckley
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier
Conventional C	hemistry/Physical Parameters by APHA/EPA/ASTM N	lethods						
Method: SM	10200H	Batch ID: 262124	Pre	<b>pared:</b> 02/1	7/21 10:05			Analyst: _SUB
Chlorophyl	II-a	3.2		1	mg/M3	1	02/25/21	



Wood - San I 9210 Sky Par	Diego 2 rk Court, Suite 200	Project Number:	LECL TMDL M		Reported: /15/2021 16:15			
San Diego, C	CA 92123	Project Manager:	John Rudolph					
Sa	mple Results Enthalpy Analytical							(Continued)
Sample:	CL08 - Surf 1B17088-04 (Water)					Sampled:	02/17/21 10:10	by Kate Buckley
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier
Conventional C	Chemistry/Physical Parameters by APHA/EPA/ASTM N	/lethods						
Method: SM	10200H	Batch ID: 262124	Pre	pared: 02/1	17/21 10:10			Analyst: _SUB
Chlorophy	II-a	3.7		1	mg/M3	1	02/25/21	



Wood - San E 9210 Sky Par	)iego 2 k Court, Suite 200	Project Number:	LECL TMDL M	onitoring 1	1915100403		03	Reported: /15/2021 16:15
San Diego, C	A 92123	Project Manager:	John Rudolph					
Sa	mple Results Enthalpy Analytical							(Continued)
Sample:	CL09 - Int 1B17088-05 (Water)					Sampled:	02/17/21 9:05	by Kate Buckley
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier
Conventional C	hemistry/Physical Parameters by APHA/EPA/ASTM M	ethods						
Method: SM 1	10200H	Batch ID: 262124	Pre	pared: 02/1	7/21 09:05			Analyst: _SUB
Chlorophyl	I-a	43		1	mg/M3	1	02/25/21	



Wood - San I 9210 Sky Par	Diego 2 rk Court, Suite 200	Project Number:	LECL TMDL M		03	Reported: /15/2021 16:15		
San Diego, C	A 92123	Project Manager:	John Rudolph					
Sa	mple Results Enthalpy Analytical							(Continued)
Sample:	CL09 - Surf 1B17088-06 (Water)					Sampled:	02/17/21 9:10	by Kate Buckley
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier
Conventional C	Chemistry/Physical Parameters by APHA/EPA/ASTM Mo	ethods						
Method: SM	10200H	Batch ID: 262124	Pre	pared: 02/17,	/21 09:10			Analyst: _SUB
Chlorophy	II-a	40		1	mg/M3	1	02/25/21	



Wood - San E 9210 Sky Par	Diego 2 'k Court, Suite 200	Project Number:	LECL TMDL M	onitoring 1	915100403		03	Reported: /15/2021 16:15
San Diego, C	A 92123	Project Manager:	John Rudolph					
Sa	mple Results Enthalpy Analytical							(Continued)
Sample:	CL10 - Int 1B17088-07 (Water)					Sampled:	02/17/21 8:00 1	oy Kate Buckley
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier
Conventional C	hemistry/Physical Parameters by APHA/EPA/ASTM M	ethods						
Method: SM 1	10200H	Batch ID: 262124	Pre	pared: 02/17	//21 08:00			Analyst: _SUB
Chlorophyl	II-a	67		1	mg/M3	1	02/25/21	



Wood - San Diego 2 9210 Sky Park Court, Suite 200		Project Number:	LECL TMDL M	<b>Reported</b> 03/15/2021 16:1				
San Diego, C	A 92123	Project Manager:	John Rudolph					
Sa	mple Results Enthalpy Analytical							(Continued)
Sample:	CL10 - Surf 1B17088-08 (Water)					Sampled:	02/17/21 8:05	oy Kate Buckley
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier
Conventional C	hemistry/Physical Parameters by APHA/EPA/ASTM M	ethods						
Method: SM 1	10200H	Batch ID: 262124	Pre	pared: 02/17	7/21 08:05			Analyst: _SUB
Chlorophyl	I-a			1	mg/M3	1	02/25/21	



Wood - San Diego 2 9210 Sky Park Court, Suite 200		Project Number:	LECL TMDL M	Report 03/15/2021 1€				
San Diego, C	A 92123	Project Manager:	John Rudolph					
Sa	mple Results Enthalpy Analytical							(Continued)
Sample:	LE02 - Int 1B17088-09 (Water)					Sampled:	02/17/21 9:00	by Kate Buckley
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier
Conventional C	hemistry/Physical Parameters by APHA/EPA/ASTM M	ethods						
Method: SM	10200H	Batch ID: 262124	Pre	pared: 02/17,	/21 09:00			Analyst: _SUB
Chlorophyl	II-a	70		1	mg/M3	1	02/25/21	



Wood - San E 9210 Sky Par	Diego 2 'k Court, Suite 200	Project Number:	LECL TMDL M	onitoring 1	915100403		03	Reported: /15/2021 16:15
San Diego, C	A 92123	Project Manager:	John Rudolph					
Sa	mple Results Enthalpy Analytical							(Continued)
Sample:	LE02 - Surf 1B17088-10 (Water)					Sampled:	02/17/21 9:20	by Kate Buckley
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier
Conventional C	hemistry/Physical Parameters by APHA/EPA/ASTM M	ethods						
Method: SM	10200H	Batch ID: 262124	Pre	pared: 02/17	7/21 09:20			Analyst: _SUB
Chlorophy	II-a	55		1	mg/M3	1	02/25/21	



## **Certificate of Analysis**

FINAL REPORT

Project Number: LECL TMDL Monitoring 1915100403

**Reported:** 03/15/2021 16:15

Project Manager: John Rudolph

#### Notes and Definitions

ltem	Definition						
%REC	Percent Recovery						
Dil	Dilution						
MRL	The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ)						
Any remaining sample(s) will be disposed of one month from the final report date unless other arrangements are made in advance.							

All results are expressed on wet weight basis unless otherwise specified.

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.

## Chain of Custody & Sample Information Record

# 1A21010

Client: Wood E&I Solutions, Inc.	Contact: John Rudolph		Phone No. 858-243-8158
FAX No.	Email: john rudoloh@w	odole com	Additional Reporting Requests
Project Name: LECL TMDL Monitoring Project Number: 1915100403	Turn Around Time:	<u>Routine</u> *3-5 Day *48 Hour * Rush Rush By: *Ad	24 Hour       FAX Results: Yes INO         Rush       State EDT: Yes No         State EDT: Yes No       No         Official Charges May Apply       (Include Source Number in Notes)
Sampler Information	# of Containers & Preservatives	Sample Type Analysis Requested	Matrix Notes
Name: KAKBUCKLEY		ntainers A 353.2) A 353.2) A 355.3) B 55.3) B 55.3) C 7 P A 200.7)	DW = Drinking Water     Ortho-P is field filtered (0.45 um)       WW = Wastewater     Dissolved AI is field filtered
Signature: Kat Boulutions, Inc.	oreserved 504 33 33 33 33 33 33 33 34 AA AA	tal # of Co utfine sample ectal tre - Nitrita (EP (SM2540 C) (EPA 350 monia (EPA 350 monia (EPA 350 (Ortho-P (EPA 350 I Phosphorus ( I Phosph	GW = Groundwater S = Soil SG = Sludge L = Liquid
Sample ID Date Time	HCI HCI Na2 NA2 NA2 Fro:	Tol Recent to the term Tota SRP Ammines SRP Ammines Tota Tota Dissection of the term Dissection of the term	M = Miscellaneous
CL07 2/17{21 11:00		x x x x x x x x x x x x	
CL08 2/17/21 10:05	j	x x x x x x x x x x x x	
CL09 2/17/21 09:05		x x x x x x x x x x x x	- · · ·
CL10 2/17/21 08:00		x x x x x x x x x x x x	
LE02 2/17/2/ 09:00			
· · ·			
		┝╼╼╊╼┥╾┥╸┥╸┥╸┥╸┥	
· · · · · · · · · · · · · · · · · · ·			
Relinquished By (sign) Print Name / Cor	ppany Date / Time	Received By (Sign)	Print Name / Company
Kasping Kuttevertey	Weed 2/17/21 13	5%	
John Shum	2-17-21 15	128 34 JOL	L-Aland
(For Lab Use Only) Sample Integrity Upon Receipt	t	Lab Notes	
Sample(s) Submitted on Ice? (Yes) No	Temperatu	ire	Lab No
Custody Seal(s) Intact?	N/A $(\varphi \cdot \varphi)$	°C	
Sample(s) Intact? ('Yes' No	Cooler Blan	Page of	

# Chain of Custody & Sample Information Record

Client: Wood E&I Solutions, Inc.		Cor	ntac	: <u>t:</u> .	Johr	ו Ru	ldo	lph											-	Phone No.	858-243-8158
FAX No.		Ema	ail:		johr	n.rug	dolp	oh@	<u>wooo</u>	lplo	<u>c.cc</u>	<u>om</u>									Include QC Data Package: Yes INo
Project Name: LECL TMDL Monitoring Project Number: 1915100403		Tur *Lak	n A o TA	rou T A	nd 1 ppro	Tim oval:	e:		F By:	<u> </u>	utin	<u>e</u>	**	3-5 <b>[</b> Rus	Day sh	J	'48 R	Hour tush	• Add	*24 Hour Rush ditional Charges May Apply	FAX Results: ☐ Yes ☐ No Email Results: ☐ Yes ☐ No State EDT: ☐ Yes ☐ No (Include Source Number in Notes)
Sampler Information			# 8	of ( Pro	Cont eser	taine vati	ers ves			Ĩ	Sam Typ	iple pe	A	naly	sis	Red	que	sted	·	Matrix	Notes
Name: <u>KatChrowing</u> Employer: <u>Wood E&amp;I Solutions, Inc.</u> Signature: <u>KatChrowing</u>		npreserved 2504	0	NO3	adh	aOH/ZnAcetate	H4CI	rozen	otal # of Containers	Dourino	Resample	Special	otal Sulfide	DS	KN	mmonia	otal Prospirorus P	hlorophyll-a		DW = Drinking Water WW = Wastewater GW = Groundwater S = Soll SG = Sludge L = Liquid	Chi-a samples on 0.7 um GFF
Sample ID Date	Time u · (v)	5 Ì	Ē	<u> </u>	žž	ž	z s	ΞŰ	┝╌┥┝╴	<u> </u>			<u>г</u> :	Z	F	<u> </u>	- 0			M = Miscellaneous	Filter Volume: 250
	<u>((</u> ∙00 u•0⊂		-				_			╎	+									<u></u>	Filter Volume: 250
	10:05		-				-			╁			-	-	-					· · · · ·	Filter Volume: 250
	10:10					╋╍┼		-		╈		+					-	x			Filter Volume: 250
	60.65									-											Filter Volume: 250
	AGUD		-							╈				+	ϯ		╈	x			Filter Volume: 250
	1800									t				╈	╞			x			Filter Volume: 250
CL 10 - Surf	0805				_		-+-			╋				-	$\uparrow$			x			Filter Volume: 250
	9000 900					╊┤				-					1			x			Filter Volume: 240
	1970									-					1			x			Filter Volume: 250
Polinguished By (eign) Print Name	a / Com		 v			Da	te /	Tim	<u>   </u>			R	ece	ived	, i Bı	/ (Si	ian'	)		Pri	nt Name / Company
Willbourger Vallar	0		<u>.</u> /າບ/	1	<u>əlr</u>	7h		12	343	T		t	2	Λ	S					· · · · · · · · · · · · · · · · · · ·	
- And Dung - Chief Chief	FA-			<u>л</u>	2	11-	7/2	71	1:2	ß		-r			-						
face here	~			(	J-	17.	2	/	15:3	ų		ţ	2	H	)					1 Abad	
/ (For Lab Use Only) Sample Integrity Upon R	leceipt													La	b N	otes	3				
Sample(s) Submitted on Ice? Yes	No					Т	'em 7	pera	ature											Lab No.	
Custody Seal(s) intact? (Yes) Sample(s) intact? (Yes)	No No		N/A				Q C00	*() Ier B	o °C Blank	;											Page of
																					035 2/18/21



**FINAL REPORT** 

Work Orders:	1C10006	Report Date:	4/29/2021
		Received Date:	4/8/2021
Project.	LECL TMDL Monitoring	Turnaround Time:	Normal
i lojeeu	Ĵ	Phones:	(858) 514-6465
		Fax:	(858) 278-5300
Attn:	John Rudolph	P.O. #:	C015101084
Client:	Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123	Billing Code:	

#### DoD-ISO ANAB # • ELAP-CA #1132 • EPA-UCMR #CA00211 • ISO17025 ANAB #L2457.01 • LACSD #10143 • NJ-DEP #CA015

This is a complete final report. The information in this report applies to the samples analyzed in accordance with the chain-of-custody document. Weck Laboratories certifies that the test results meet all requirements of TNI unless noted by qualifiers or written in the Case Narrative. This analytical report must be reproduced in its entirety.

Dear John Rudolph,

Enclosed are the results of analyses for samples received 4/08/21 with the Chain-of-Custody document. The samples were received in good condition, at 6.1 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

**Reviewed by:** 

1: State

Chris Samatmanakit Project Manager





## **Certificate of Analysis**

FINAL REPORT

Project Number: LECL TMDL Monitoring

**Reported:** 04/29/2021 12:58

Project Manager: John Rudolph

#### Case Narrative

Final Report: This is a complete final report. The information in this report applyies to the samples analyzed in accordance with the chain-of-custody document. Weck Laboratories certifies that the test results meet all requirements of NELAC unless noted by qualifiers or written in the Case Narrative. This analytical report must be reproduced in its entirety.

#### Sample Summary

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
CL07	Kate Buckley	1C10006-01	Water	04/08/21 11:00	
CL08	Kate Buckley	1C10006-02	Water	04/08/21 10:15	
CL10	Kate Buckley	1C10006-03	Water	04/08/21 08:25	
CL09	Kate Buckley	1C10006-04	Water	04/08/21 09:20	
LE02	Kate Buckley	1C10006-05	Water	04/08/21 09:45	



## **Certificate of Analysis**

FINAL REPORT

Project Number: LECL TMDL Monitoring

Project Manager: John Rudolph

**Reported:** 04/29/2021 12:58

Project Manag

Sample Results								
Sample: CL07						Sampleo	1: 04/08/21 11:00 b	y Kate Buckley
1C10006-01 (Water)								
Analyte	Re	sult	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters I	by APHA/EPA/ASTM Methods							
Method: EPA 350.1	-			Instr: AA06				
Batch ID: W1D0603	Preparation: NONE (WETCHEM)			Prepared: 04/12	2/21 17:22			Analyst: SBN
Ammonia as N	0	).76	0.047	0.10	mg/l	1	04/13/21	
Method: EDA 351 2				Instr: AA06				
Batch ID: W1D0516	Preparation: NONE (WETCHEM)			Prepared: 04/09	1/21 16.22			Analyct: SRN
TKN		1.2	0.065	0.10	mg/l	1	04/16/21	rilaryst. solv
					-			
Method: EPA 353.2				Instr: AAU1	15.20			
Nitrate as N	Preparation: _NONE (WEICHEM)	) 21	0.040	0 20	ma/l	1	04/08/21 18.14	
			0.042	0.10	mg/l	1	04/08/21 18:14	
			0.042	0.10	шул	'	04/00/21 10.14	
Method: EPA 365.3				Instr: UVVIS04				
Batch ID: W1D0491	Preparation: _NONE (WETCHEM)			Prepared: 04/09	)/21 11:10		04/00/04 44 44	Analyst: ssi
o-Phosphate as P	0.0	051	0.0030	0.010	mg/i	1	04/09/21 11:44	
Method: EPA 365.3				Instr: UVVIS04				
Batch ID: W1D0604	Preparation: _NONE (WETCHEM)			Prepared: 04/12	2/21 17:36			Analyst: sbn
Phosphorus as P, Total	0.0	072	0.0067	0.010	mg/l	1	04/14/21	
Method: SM 2540C				Instr: OVEN01				
Batch ID: W1D0585	Preparation: _NONE (WETCHEM)			Prepared: 04/12	2/21 14:49			Analyst: blg
Total Dissolved Solids		490	4.0	10	mg/l	1	04/12/21	
Method: SM 2540D				Instr: OVEN15				
Batch ID: W1D0670	Preparation: _NONE (WETCHEM)			Prepared: 04/13	8/21 13:39			Analyst: ism
Total Suspended Solids		ND		5	mg/l	1	04/14/21	
Method: SM 450052-D				Instr: ANALYST				
Batch ID: W1D0694	Preparation: NONF (WETCHEM)			Prepared: 04/13	3/21 16:42			Analyst: ssi
Sulfide, Total		ND	0.050	0.10	mg/l	1	04/13/21	, indigen so
Matala hu FDA 200 Casina Mathada								
Metals by EPA 200 Series Methods								
Method: EPA 200.7	Dressentions EDA 200.2			Instr: ICP03	101 10 11			Analyst
Aluminum Dissolved	Preparation: EPA 200.2	ND	0.041	Prepared: 04/09	mg/l	1	04/14/21	Analyst: kvm
	_		0.041	0.050	mg/i	1	04/14/21	
Aluminum, Total	0.0	050	0.041	0.050	mg/l	1	04/14/21	



Sample Results

## **Certificate of Analysis**

FINAL REPORT

Project Number: LECL TMDL Monitoring

Reported: 04/29/2021 12:58

Project Manager: John Rudolph

(Continued)

	1								, ,
Sample:	CL08						Sampleo	d: 04/08/21 10:15 b	y Kate Buckley
	1C10006-02 (Water)								
Analyte			Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional C	Chemistry/Physical Parameters by	/ APHA/EPA/ASTM Methods							
Method: EPA	350.1				Instr: AA06				
Batch ID: V	V1D0603	Preparation: _NONE (WETCHEM	)		Prepared: 04/	12/21 17:22			Analyst: SBN
Ammonia	as N		0.48	0.047	0.10	mg/l	1	04/13/21	
Method: EPA	351.2				Instr: AA06				
Batch ID: V	V1D0516	Preparation: _NONE (WETCHEM	)		Prepared: 04/0	09/21 16:22			Analyst: SBN
<b>TKN</b>			- 1.0	0.065	0.10	mg/l	1	04/16/21	
Method: EPA	353.2				Instr: AA01				
Batch ID: V	V1D0443	Preparation: _NONE (WETCHEM	)		Prepared: 04/0	08/21 15:28			Analyst: YMT
Nitrate as	Ν		0.24	0.040	0.20	mg/l	1	04/08/21 18:16	
Nitrite as N			- • ND	0.042	0.10	mg/l	1	04/08/21 18:16	
Method: EPA	365.3				Instr: UVVIS04				
Batch ID: V	V1D0491	Preparation: _NONE (WETCHEM	)		Prepared: 04/0	09/21 11:10			Analyst: ssi
o-Phospha	ite as P		0.039	0.0030	0.010	mg/l	1	04/09/21 11:46	
Method: EPA	365.3				Instr: UVVIS04				
Batch ID: V	V1D0604	Preparation: _NONE (WETCHEM	)		Prepared: 04/	12/21 17:36			Analyst: sbn
Phosphoru	us as P, Total		0.070	0.0067	0.010	mg/l	1	04/14/21	
Method: SM	2540C				Instr: OVEN01				
Batch ID: V	V1D0585	Preparation: _NONE (WETCHEM	)		Prepared: 04/	12/21 14:49			Analyst: blg
Total Disso	olved Solids		480	4.0	10	mg/l	1	04/12/21	
Method: SM	2540D				Instr: OVEN15				
Batch ID: V	V1D0670	Preparation: _NONE (WETCHEM	)		Prepared: 04/	13/21 13:39			Analyst: ism
Total Suspe	ended Solids		- · ND		5	mg/l	1	04/14/21	
Method: SM	4500S2-D				Instr: _ANALYS	т			
Batch ID: V	V1D0694	Preparation: _NONE (WETCHEM	)		Prepared: 04/	13/21 16:42			Analyst: ssi
Sulfide, Tot	tal		- ND	0.050	0.10	mg/l	1	04/13/21	
Metals by EPA	200 Series Methods								
Method: EPA	200.7				Instr: ICP03				
Batch ID: V	V1D0514	Preparation: EPA 200.2			Prepared: 04/0	09/21 16:11			Analyst: kvm
Aluminum,	Dissolved		- ND	0.041	0.050	mg/l	1	04/14/21	
Aluminum	, Total		0.052	0.041	0.050	mg/l	1	04/14/21	



## **Certificate of Analysis**

FINAL REPORT

Project Number: LECL TMDL Monitoring

Reported: 04/29/2021 12:58

Project Manager: John Rudolph

(Continued)

## Sample Results

Sample:	CL10					Sample	ed: 04/08/21 8:25 k	y Kate Buckley
	1C10006-03 (Water)							
Analyte		Re	sult MI	DL MRL	Units	Dil	Analyzed	Qualifier
Conventiona	I Chemistry/Physical Parameters	by APHA/EPA/ASTM Methods						
Method: El	PA 350.1			Instr: AA0	06			
Batch ID:	:W1D0603	Preparation: _NONE (WETCHEM)		Prepared	: 04/12/21 17:22			Analyst: SBN
Ammoni	a as N		. <b>27</b> 0.0	47 0.10	mg/l	1	04/13/21	
Method: El	PA 351.2			Instr: AA0	16			
Batch ID:	:W1D0516	Preparation: _NONE (WETCHEM)		Prepared	: 04/09/21 16:22			Analyst: SBN
<b>TKN</b>			<b>.91</b> 0.0	65 0.10	mg/l	1	04/16/21	
Method: El	PA 353.2			Instr: AA0	)1			
Batch ID:	:W1D0443	Preparation: _NONE (WETCHEM)		Prepared	: 04/08/21 15:28			Analyst: YMT
Nitrate a	s N	• • • • • • • • • • • • • • • • • • • •	. <b>20</b> 0.0	40 0.20	mg/l	1	04/08/21 18:17	
Nitrite as	s N		ND 0.0	42 0.10	mg/l	1	04/08/21 18:17	
Method: El	PA 365.3			Instr: UVV	/IS04			
Batch ID:	:W1D0491	Preparation: _NONE (WETCHEM)		Prepared:	: 04/09/21 11:10			Analyst: ssi
o-Phosp	hate as P	0.0	0.00	030 0.010	mg/l	1	04/09/21 11:46	
Method: El	PA 365.3			Instr: UVV	/IS04			
Batch ID:	:W1D0604	Preparation: _NONE (WETCHEM)		Prepared	: 04/12/21 17:36			Analyst: sbn
Phospho	orus as P, Total	0.0	0.00 0.00	067 0.010	mg/l	1	04/14/21	
Method: SI	M 2540C			Instr: OVE	N01			
Batch ID:	:W1D0585	Preparation: _NONE (WETCHEM)		Prepared	: 04/12/21 14:49			Analyst: blg
Total Dis	solved Solids		<b>600</b> 4.	0 10	mg/l	1	04/12/21	
Method: SI	M 2540D			Instr: OVE	N15			
Batch ID:	:W1D0670	Preparation: _NONE (WETCHEM)		Prepared	04/13/21 13:39			Analyst: ism
Total Sus	spended Solids		ND	5	mg/l	1	04/14/21	
Method: SI	M 4500S2-D			Instr: _AN	IALYST			
Batch ID:	:W1D0694	Preparation: _NONE (WETCHEM)		Prepared	: 04/13/21 16:42			Analyst: ssi
Sulfide, 1	Total		ND 0.0	50 0.10	mg/l	1	04/13/21	
Metals by EP	PA 200 Series Methods							
Method: El	PA 200.7			Instr: ICP0	)3			
Batch ID:	: W1D0514	Preparation: EPA 200.2		Prepared	: 04/09/21 16:11			Analyst: kvm
Aluminur	m, Dissolved		ND 0.0	41 0.050	mg/l	1	04/14/21	
Aluminu	m, Total	0.0	0.0	41 0.050	mg/l	1	04/14/21	



## **Certificate of Analysis**

**FINAL REPORT** 

Project Number: LECL TMDL Monitoring

Reported: 04/29/2021 12:58

Project Manager: John Rudolph

(Continued)

Sample Results								(Continued)
Sample: CL09						Sample	d: 04/08/21 9:20 b	y Kate Buckley
1C10006-04 (Water)								
Analyte		Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters b	y APHA/EPA/ASTM Methods							
Method: EPA 350.1				Instr: AA06				
Batch ID: W1D0603	Preparation: _NONE (WETCHEM	)		Prepared: 04/1	2/21 17:22			Analyst: SBN
Ammonia as N		- 1.4	0.047	0.10	mg/l	1	04/13/21	
Method: EPA 351.2				Instr: AA06				
Batch ID: W1D0516	Preparation: _NONE (WETCHEM	)		Prepared: 04/0	9/21 16:22			Analyst: SBN
TKN		- 2.0	0.065	0.10	mg/l	1	04/16/21	
Method: EPA 353.2				Instr: AA01				
Batch ID: W1D0443	Preparation: _NONE (WETCHEM	)		Prepared: 04/0	8/21 15:28			Analyst: YMT
Nitrate as N		0.12	0.040	0.20	mg/l	1	04/08/21 18:18	J
Nitrite as N		ND	0.042	0.10	mg/l	1	04/08/21 18:18	
Method: EPA 365.3				Instr: UVVIS04				
Batch ID: W1D0491	Preparation: _NONE (WETCHEM	)		Prepared: 04/0	9/21 11:10			Analyst: ssi
o-Phosphate as P		0.19	0.0030	0.010	mg/l	1	04/09/21 11:47	
Method: EPA 365.3				Instr: UVVIS04				
Batch ID: W1D0604	Preparation: NONE (WETCHEM	)		Prepared: 04/1	2/21 17:36			Analyst: sbn
Phosphorus as P, Total		0.24	0.0067	0.010	mg/l	1	04/14/21	
Method: SM 2540C				Instr: OVEN01				
Batch ID: W1D0585	Preparation: _NONE (WETCHEM	)		Prepared: 04/1	2/21 14:49			Analyst: blg
Total Dissolved Solids		600	4.0	10	mg/l	1	04/12/21	
Method: SM 2540D				Instr: OVEN15				
Batch ID: W1D0670	Preparation: _NONE (WETCHEM	)		Prepared: 04/1	3/21 13:39			Analyst: ism
Total Suspended Solids		- ND		5	mg/l	1	04/14/21	
Method: SM 4500S2-D				Instr: _ANALYS	г			
Batch ID: W1D0694	Preparation: _NONE (WETCHEM	)		Prepared: 04/1	3/21 16:42			Analyst: ssi
Sulfide, Total		- ND	0.050	0.10	mg/l	1	04/13/21	
Metals by EPA 200 Series Methods								
Method: EPA 200.7				Instr: ICP03				
Batch ID: W1D0514	Preparation: EPA 200.2			Prepared: 04/0	9/21 16:11			Analyst: kvm
Aluminum, Dissolved		- ND	0.041	0.050	mg/l	1	04/14/21	
Aluminum, Total		0.063	0.041	0.050	mg/l	1	04/14/21	



## **Certificate of Analysis**

FINAL REPORT

Project Number: LECL TMDL Monitoring

Reported: 04/29/2021 12:58

Project Manager: John Rudolph

(Continued)

## Sample Results

Sample: LE02							Sample	d· 04/08/21 9·45 h	v Kate Buckley
Sample. LLOZ							Sample	u. 04/00/21 3.43 b	y Rate Duckley
1C100	006-05 (Water)								
Analyte			Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistr	y/Physical Parameters by AP	HA/EPA/ASTM Methods							
Method: EPA 350.1					Instr: AA06				
Batch ID: W1D0603	I	Preparation: _NONE (WETCHEM)			Prepared: 04/	/12/21 17:22			Analyst: SBN
Ammonia as N			0.23	0.047	0.10	mg/l	1	04/13/21	
Method: EPA 351.2					Instr: AA06				
Batch ID: W1D0516	I	Preparation: _NONE (WETCHEM)			Prepared: 04/	/09/21 16:22			Analyst: SBN
TKN			2.6	0.065	0.10	mg/l	1	04/16/21	
Method: EPA 353.2					Instr: AA01				
Batch ID: W1D0443	1	Preparation: _NONE (WETCHEM)			Prepared: 04/	/08/21 15:28			Analyst: YMT
Nitrate as N			ND	0.040	0.20	mg/l	1	04/08/21 18:23	
Nitrite as N			ND	0.042	0.10	mg/l	1	04/08/21 18:23	
Method: EPA 365.3					Instr: UVVIS04	4			
Batch ID: W1D0491	1	Preparation: _NONE (WETCHEM)			Prepared: 04/	/09/21 11:10			Analyst: ssi
o-Phosphate as P			0.039	0.0030	0.010	mg/l	1	04/09/21 11:48	
Method: EPA 365.3					Instr: UVVIS04	4			
Batch ID: W1D0604	1	Preparation: _NONE (WETCHEM)			Prepared: 04/	/12/21 17:36			Analyst: sbn
Phosphorus as P, 1	Total		0.24	0.0067	0.010	mg/l	1	04/14/21	
Method: SM 2540C					Instr: OVEN01	1			
Batch ID: W1D0585	1	Preparation: _NONE (WETCHEM)			Prepared: 04/	/12/21 14:49			Analyst: blg
Total Dissolved So	lids		2000	4.0	10	mg/l	1	04/12/21	
Method: SM 4500S2-E	D				Instr: _ANALY	ST			
Batch ID: W1D0694		Preparation: _NONE (WETCHEM)			Prepared: 04/	/13/21 16:42			Analyst: ssi
Sulfide, Total			ND	0.050	0.10	ma/l	1	04/13/21	-



FINAL REPORT

Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123 Project Number: LECL TMDL Monitoring

**Reported:** 04/29/2021 12:58

Project Manager: John Rudolph

Quality	Control	Results
---------	---------	---------

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

					Spike	Source		%REC		RPD	
Analyte	Result	MDL	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier
Batch: W1D0443 - EPA 353.2											
Blank (W1D0443-BLK1)					Prepared & Ana	alyzed: 04/0	8/21				
Nitrate as N		0.040	0.20	mg/l							
Nitrite as N		0.042	0.10	mg/l							
LCS (W1D0443-BS1)					Prepared & Ana	alyzed: 04/0	8/21				
Nitrate as N	1.02	0.040	0.20	mg/l	1.00		102	90-110			
Nitrite as N	1.08	0.042	0.10	mg/l	1.00		108	90-110			
Matrix Spike (W1D0443-MS1)	Source: 1	D08057-02			Prepared & Ana	alyzed: 04/0	8/21				
Nitrate as N	2.26	0.040	0.20	mg/l	2.00	0.314	97	90-110			
Nitrite as N	1.03	0.042	0.10	mg/l	1.00	ND	103	90-110			
Matrix Spike (W1D0443-MS2)	Source: 1	D08059-02			Prepared & Ana	alyzed: 04/0	8/21				
Nitrate as N	2.24	0.040	0.20	mg/l	2.00	0.323	96	90-110			
Nitrite as N	1.03	0.042	0.10	mg/l	1.00	ND	103	90-110			
Matrix Spike Dup (W1D0443-MSD1)	Source: 1	D08057-02			Prepared & Ana	alyzed: 04/0	8/21				
Nitrate as N	2.26	0.040	0.20	mg/l	2.00	0.314	97	90-110	0	20	
Nitrite as N	1.03	0.042	0.10	mg/l	1.00	ND	103	90-110	0	20	
Matrix Spike Dup (W1D0443-MSD2)	Source: 1	D08059-02			Prepared & Ana	alyzed: 04/0	8/21				
Nitrate as N	1.71	0.040	0.20	mg/l	2.00	0.323	69	90-110	27	20	MS-01
Nitrite as N	1.03	0.042	0.10	mg/l	1.00	ND	103	90-110	0	20	
Batch: W1D0491 - EPA 365.3											
Blank (W1D0491-BLK1)					Prepared & Ana	alvzed: 04/0	9/21				
o-Phosphate as P		0.0030	0.010	mg/l		,					
					Drepared & An	bunda 04/0	0/21				
o-Phosphate as P	0.200	0.0030	0.010	ma/l	0.200	aiyzed: 04/0	100	88-111			
				5							
Matrix Spike (W1D0491-MS1)	Source: 1	C10006-01	0.010	ma/l	Prepared & Ana	alyzed: 04/0	9/21 104	85-112			
	0.200	0.0000	0.010	iiig/i	0.200	0.0010	104	00-112			
Matrix Spike Dup (W1D0491-MSD1)	Source: 1	C10006-01			Prepared & Ana	alyzed: 04/0	9/21				
o-Phosphate as P	0.252	0.0030	0.010	mg/l	0.200	0.0510	100	85-112	2	20	
Batch: W1D0516 - EPA 351.2											
Blank (W1D0516-BLK1)				Pre	epared: 04/09/21	Analyzed:	04/16/21	I			
TKN	ND	0.065	0.10	mg/l							
Blank (W1D0516-BLK2)				Pre	epared: 04/09/21	Analyzed:	<b>04/16/2</b> 1	I			
TKN		0.065	0.10	mg/l		-					
Blank (W1D0516-BLK3)				Pre	epared: 04/09/21	Analyzed:	04/21/21	I			
TKN	ND	0.065	0.10	mg/l		,					
LCS (W1D0516-BS1)				Pre	epared: 04/09/21	Analyzed:	04/16/21	I			
ΤΚΝ	1.02	0.065	0.10	mg/l	1.00		102	90-110			
LCS (W1D0516-BS2)				Pre	epared: 04/09/21	Analyzed:	04/16/21	I			
ТКМ	0.994	0.065	0.10	mg/l	1.00		99	90-110			

1C10006



## **Certificate of Analysis**

FINAL REPORT

Project Number: LECL TMDL Monitoring

Reported:

Project Manager: John Rudolph

04/29/2021 12:58

(Continued)

**Quality Control Results** 

Conventional Chemistry/Physical Parameters by AP	HA/EPA/AS	TM Methods	s (Continue	d)							
					Spike	Source		%REC		RPD	
Analyte	Result	MDL	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier
Batch: W1D0516 - EPA 351.2 (Continued)											
LCS (W1D0516-BS3)				Prepa	ared: 04/09/21	Analyzed:	04/21/21				
TKN	1.04	0.065	0.10	mg/l	1.00		104	90-110			
Matrix Spike (W1D0516-MS1)	Source:	1D06112-01		Prepa	ared: 04/09/21	Analyzed:	04/16/21				
TKN	1.15	0.065	0.10	mg/l	1.00	0.253	89	90-110			MS-01
Matrix Spike (W1D0516-MS2)	Source	1006112-02		Prena	arad: 04/09/21	Analyzod:	04/16/21				
TKN	1.24	0.065	0.10	mg/l	1.00	0.206	104	90-110			
	<b>c</b>	1006112 011		D		A	04/04/04				
TKN	<b>Source:</b> 1.15	0.065	0.10	mg/l	1.00	0.265	88	90-110			MS-03
Matrix Spike Dup (W1D0516-MSD1)	Source:	1D06112-01	0.10	Prepa	ared: 04/09/21	Analyzed:	04/16/21	00 110	4	10	MC 01
	1.13	0.065	0.10	mg/i	1.00	0.253	88	90-110	1	10	IVIS-01
Matrix Spike Dup (W1D0516-MSD2)	Source:	1D06112-02		Prepa	ared: 04/09/21	Analyzed:	04/16/21				
TKN	1.23	0.065	0.10	mg/l	1.00	0.206	103	90-110	0.7	10	
Matrix Spike Dup (W1D0516-MSD3)	Source:	1D06112-01F	RE1	Prepa	ared: 04/09/21	Analyzed:	04/21/21				
TKN	0.960	0.065	0.10	mg/l	1.00	0.265	70	90-110	18	10	MS-03
Batch: W1D0585 - SM 2540C											
Blank (W1D0585-BI K1)				F	Prepared & Ana	alvzed: 04/1	2/21				
Total Dissolved Solids	ND	4.0	10	mg/l							
LCS (W1D0585-BS1)				F	Prepared & Ana	alyzed: 04/1	2/21				
Total Dissolved Solids	836	4.0	10	mg/l	824		101	96-102			
Duplicate (W1D0585-DUP1)	Source:	1C10006-05		F	Prepared & Ana	alyzed: 04/1	2/21				
Total Dissolved Solids	1980	4.0	10	mg/l		1960			0.9	10	
Duplicate (W1D0585-DUP2)	Source	1007086-01		F	Prenared & An	alvzed: 04/1	12/21				
Total Dissolved Solids	39700	4.0	10	mg/l	repared & And	38900			2	10	
R-4-6- W/1R0(02 FRA 350 1											
Batch: W1D0603 - EPA 350.1											
Blank (W1D0603-BLK1)	ND	0.047	0.10	Prepa	ared: 04/12/21	Analyzed:	04/13/21				
Annonia as N	ND	0.047	0.10	ilig/i							
Blank (W1D0603-BLK2)		0.047	0.40	Prepa	ared: 04/12/21	Analyzed:	04/13/21				
Ammonia as N	ND	0.047	0.10	mg/l							
LCS (W1D0603-BS1)				Prepa	ared: 04/12/21	Analyzed:	04/13/21				
Ammonia as N	0.253	0.047	0.10	mg/l	0.250		101	90-110			
LCS (W1D0603-BS2)				Prepa	ared: 04/12/21	Analyzed:	04/13/21				
Ammonia as N	0.251	0.047	0.10	mg/l	0.250		101	90-110			
Matrix Spike (W1D0603-MS1)	Source:	1D12089-01		Prepa	ared: 04/12/21	Analvzed:	04/13/21				
Ammonia as N	0.253	0.047	0.10	mg/l	0.250	ND	101	90-110			
Matrix Snike (W1D0603-MS2)	Source	1012089-02		Drong	ared: 04/12/21	Analyzed	04/13/21				
Ammonia as N	0.254	0.047	0.10	mg/l	0.250	ND	101	90-110			
Mateix Seille Due (MIDOCO2 MCD1)	6	1012020 01		D	and 04/12/21	Anal	04/12/24				
Ammonia as N	0.254	0.047	0.10	mg/l	0.250	ND	101	90-110	0.2	15	
				<u> </u>							

1C10006



**FINAL REPORT** 

Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123

Project Number: LECL TMDL Monitoring

**Reported:** 04/29/2021 12:58

Project Manager: John Rudolph

(Continued)

## **Quality Control Results**

Conventional Chemistry/Physical Parameters b	Dy APHA/EPA/AST	M Method	ls (Continue	d)							
					Spike	Source		%REC		RPD	
Analyte	Result	MDL	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier
Batch: W1D0603 - EPA 350.1 (Continued)											
Matrix Spike Dup (W1D0603-MSD2)	Source: 1	D12089-02		Pre	pared: 04/12/21	Analyzed:	04/13/21	I			
Ammonia as N	0.254	0.047	0.10	mg/l	0.250	ND	102	90-110	0.02	15	
Batch: W1D0604 - EPA 365.3											
Blank (W1D0604-BLK1)				Pre	pared: 04/12/21	Analyzed:	04/14/21	I			
Phosphorus as P, Total	ND	0.0067	0.010	mg/l		,, <b>,</b>					
LCS (W1D0604-BS1)				Pre	pared: 04/12/21	Analvzed:	04/14/21	I			
Phosphorus as P, Total	0.208	0.0067	0.010	mg/l	0.200	,	104	90-110			
Matrix Spike (W1D0604-MS1)	Source: 1	C10006-01		Dro	mared: 01/12/21	Analyzad	04/14/21	ı			
Phosphorus as P. Total		0.0067	0.010	ma/l	0.200	0.0720	103	90-110			
				5							
Matrix Spike Dup (W1D0604-MSD1)	Source: 1	C10006-01	0.040	Pre	pared: 04/12/21	Analyzed:	04/14/21	00.440	0	20	
Phosphorus as P, Total	0.278	0.0067	0.010	mg/I	0.200	0.0720	103	90-110	0	20	
Batch: W1D0670 - SM 2540D											
Blank (W1D0670-BLK1)				Pre	pared: 04/13/21	Analyzed:	04/14/21	I			
Total Suspended Solids	ND		5	mg/l							
LCS (W1D0670-BS1)				Pre	pared: 04/13/21	Analyzed:	04/14/21	I			
Total Suspended Solids			5	mg/l	54.9		105	90-110			
Duplicate (W1D0670-DUP1)	Source: 1	D09060-01		Pre	pared: 04/13/21	Analyzed:	04/14/21	1			
Total Suspended Solids	66.0		5	mg/l	pa: ca: c :, : ;; = ;	70.0	• .,,		6	20	
Developer (MADOCTO DUDO)	<b>6</b>	D42052 04				<b>A</b>	04/14/20				
Total Suspended Solids	Source: 1	D12053-01	5	ma/l	pared: 04/13/21	Analyzed:	04/14/21		4	20	
	11.0		Ũ	iiig/i		10.0				20	
Batch: W1D0694 - SM 4500S2-D											
Blank (W1D0694-BLK1)					Prepared & Ana	alyzed: 04/	13/21				
Sulfide, Total	ND	0.050	0.10	mg/l							
LCS (W1D0694-BS1)					Prepared & Ana	alvzed: 04/	13/21				
Sulfide, Total	0.100	0.050	0.10	mg/l	0.101	<b>,</b> ,	99	95-105			
Durlingto (MIDOCOA DUDI)	C	D12020 02			Duene and St. Ann		12/21				
Sulfide Total	Source: 1	0 10	0.20	ma/l	Prepared & Ana	0 800	13/21		0	20	
,	0.000								÷	_,	
Duplicate (W1D0694-DUP2)	Source: 1	D13029-04			Prepared & Ana	alyzed: 04/	13/21		<u>,</u>		
	0.100	0.050	0.10	mg/I		0.100			U	20	
Duplicate (W1D0694-DUP3)	Source: 1	D13029-01			Prepared & Ana	alyzed: 04/	13/21				
Sulfide, Total	ND	0.10	0.20	mg/l		ND				20	
Duplicate (W1D0694-DUP4)	Source: 1	C10006-04			Prepared & Ana	alyzed: 04/	13/21				
Sulfide, Total	ND	0.10	0.20	mg/l		ND				20	



FINAL REPORT

Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123 Project Number: LECL TMDL Monitoring

**Reported:** 04/29/2021 12:58

Project Manager: John Rudolph

(Continued)

#### **Quality Control Results**

Metals by	/ EPA 200	Series I	Methods
-----------	-----------	----------	---------

					Spike	Source		%REC		RPD	
Analyte	Result	MDL	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier
Batch: W1D0514 - EPA 200.7											
Blank (W1D0514-BLK1)				Prepare	ed: 04/09/21	Analyzed: (	04/14/21				
Aluminum, Dissolved		0.041	0.050	mg/l							
Aluminum, Total		0.041	0.050	mg/l							
LCS (W1D0514-BS1)				Prepare	ed: 04/09/21	Analyzed: (	04/14/21				
Aluminum, Dissolved	0.217	0.041	0.050	mg/l	0.200		109	85-115			
Aluminum, Total	0.217	0.041	0.050	mg/l	0.200		109	85-115			
Matrix Spike (W1D0514-MS1)	Source: 1D08078-01 Pre		Prepare	red: 04/09/21 Analyzed: 04/14/21							
Aluminum, Total	0.290	0.041	0.050	mg/l	0.200	0.0659	112	70-130			
Matrix Spike Dup (W1D0514-MSD1)	Source: 1	D08078-01		Prepare	ed: 04/09/21	Analyzed: (	04/14/21				
Aluminum, Total	0.291	0.041	0.050	mg/l	0.200	0.0659	113	70-130	0.5	30	



## **Certificate of Analysis**

FINAL REPORT

Project Number: LECL TMDL Monitoring

**Reported:** 04/29/2021 12:58

Project Manager: John Rudolph

#### Notes and Definitions

ltem	Definition			
J	Estimated conc. detected <mrl and="">MDL.</mrl>			
MS-01	The spike recovery for this QC sample is outside of established control limits possibly due to sample matrix interference.			
MS-03	Multiple analyses indicate the percent recovery is out of acceptance limits due to a possible matrix effect.			
%REC	Percent Recovery			
Dil	Dilution			
MDL	Method Detection Limit			
MRL	The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ)			
ND	NOT DETECTED at or above the Method Reporting Limit (MRL). If Method Detection Limit (MDL) is reported, then ND means not detected at or above the MDL.			
RPD	Relative Percent Difference			
Source	Sample that was matrix spiked or duplicated.			
Any remaining sample(s) will be disposed of one month from the final report date unless other arrangements are made in advance.				
All results are expressed on wet weight basis unless otherwise specified.				

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.



**FINAL REPORT** 

Work Orders:	1D08088	Report Date:	4/26/2021
		Received Date:	4/8/2021
Project:	1915100403 LECL TMDL Monitoring	Turnaround Time:	Normal
	<u> </u>	Phones:	(858) 514-6465
		Fax:	(858) 278-5300
Attn:	John Rudolph	P.O. #:	C015101084
Client:	Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123	Billing Code:	

#### DoD-ISO ANAB # • ELAP-CA #1132 • EPA-UCMR #CA00211 • ISO17025 ANAB #L2457.01 • LACSD #10143 • NJ-DEP #CA015

This is a complete final report. The information in this report applies to the samples analyzed in accordance with the chain-of-custody document. Weck Laboratories certifies that the test results meet all requirements of TNI unless noted by qualifiers or written in the Case Narrative. This analytical report must be reproduced in its entirety.

Dear John Rudolph,

Enclosed are the results of analyses for samples received 4/08/21 with the Chain-of-Custody document. The samples were received in good condition, at 6.1 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

**Reviewed by:** 

1: State

Chris Samatmanakit **Project Manager** 




# Certificate of Analysis

FINAL REPORT

#### Project Number: 1915100403 LECL TMDL Monitoring

**Reported:** 04/26/2021 16:40

Project Manager: John Rudolph

Sample Summary					
Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
CL07- Int	Kate Buckley	1D08088-01	Water	04/08/21 11:00	
CL07- Surf	Kate Buckley	1D08088-02	Water	04/08/21 11:10	
CL08- Int	Kate Buckley	1D08088-03	Water	04/08/21 10:15	
CL08- Surf	Kate Buckley	1D08088-04	Water	04/08/21 10:25	
CL09- Int	Kate Buckley	1D08088-05	Water	04/08/21 09:20	
CL09- Surf	Kate Buckley	1D08088-06	Water	04/08/21 09:30	
CL10- Int	Kate Buckley	1D08088-07	Water	04/08/21 08:25	
CL10- Surf	Kate Buckley	1D08088-08	Water	04/08/21 08:40	
LE02- Int	Kate Buckley	1D08088-09	Water	04/08/21 09:45	
LE02- Surf	Kate Buckley	1D08088-10	Water	04/08/21 10:15	



Wood - San D 9177 Sky Par	Diego 'k Court. Ste A	Project Number:	1915100403 L	ECL TMDL	Monitoring		04/	<b>Reported:</b> 26/2021 16:40
San Diego, C	A 92123	Project Manager:	John Rudolph					
Sa	mple Results Enthalpy Analytical							
Sample:	CL07- Int 1D08088-01 (Water)					Sampled: 0	4/08/21 11:00 b	y Kate Buckley
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier
SM 10200-Н - (	Chlorophyll a							
Method: SM	10200-Н - Chlorophyll a	Batch ID: 265654	Pre	pared: 04/13/	21 00:00			Analyst: ATP
Chlorophy	ll a	3.2		1.0	mg/M3	1	04/13/21	



Wood - San I 9177 Sky Pa	Diego rk Court, Ste A	Project Number:	1915100403 L	ECL TME	DL Monitoring		04	Reported: /26/2021 16:40
San Diego, C	CA 92123	Project Manager:	John Rudolph					
Sa	mple Results Enthalpy Analytical							(Continued)
Sample:	CL07- Surf 1D08088-02 (Water)					Sampled:	04/08/21 11:10 I	oy Kate Buckley
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier
SM 10200-H -	Chlorophyll a							
Method: SM	10200-Н - Chlorophyll а	Batch ID: 265654	Pre	<b>pared:</b> 04/	13/21 00:00			Analyst: ATP
Chlorophy	/II a	4.3		1.0	mg/M3	1	04/13/21	



Wood - San I 9177 Sky Par	Diego rk Court, Ste A	Project Number:	1915100403 Ll	ECL TMD	L Monitoring		04/	Reported: /26/2021 16:40
San Diego, C	A 92123	Project Manager.	John Kudolph					
Sa	mple Results Enthalpy Analytical							(Continued)
Sample:	CL08- Int 1D08088-03 (Water)					Sampled:	04/08/21 10:15 k	by Kate Buckley
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier
SM 10200-H -	Chlorophyll a							
Method: SM	10200-Н - Chlorophyll а	Batch ID: 265654	Pre	pared: 04/1	3/21 00:00			Analyst: ATP
Chlorophy	II a	3.4		1.0	mg/M3	1	04/13/21	



Wood - San E 9177 Sky Par	Diego k Court, Ste A	Project Number:	1915100403 L	ECL TME	DL Monitoring		04	Reported: /26/2021 16:40
San Diego, C	A 92123	Project Manager:	John Rudolph					
Sa	mple Results Enthalpy Analytical							(Continued)
Sample:	CL08- Surf 1D08088-04 (Water)					Sampled:	04/08/21 10:25 k	by Kate Buckley
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier
SM 10200-H - (	Chlorophyll a							
Method: SM	10200-Н - Chlorophyll а	Batch ID: 265654	Pre	pared: 04/	13/21 00:00			Analyst: ATP
Chlorophyl	ll a	4.8		1.0	mg/M3	1	04/13/21	



Wood - San I 9177 Sky Par	Diego rk Court, Ste A	Project Number:	1915100403 LI	ECL TMDI	L Monitoring		04	Reported: /26/2021 16:40
San Diego, C	A 92123	Project Manager:	John Rudolph					
Sa	mple Results Enthalpy Analytical							(Continued)
Sample:	CL09- Int 1D08088-05 (Water)					Sampled:	04/08/21 9:20 k	by Kate Buckley
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier
SM 10200-H - (	Chlorophyll a							
Method: SM	10200-Н - Chlorophyll a	Batch ID: 265654	Pre	pared: 04/1	3/21 00:00			Analyst: ATP
Chlorophy	ll a	7.5		1.0	mg/M3	1	04/13/21	



Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123	Project Number: Project Manager:	1915100403 Ll John Rudolph	ECL TMDI	_ Monitoring		04	<b>Reported:</b> /26/2021 16:40
Sample Results Enthalpy Analytical							(Continued)
Sample: CL09- Surf 1D08088-06 (Water)					Sampled:	04/08/21 9:30 k	by Kate Buckley
Analyte	Result		MRL	Units	Dil	Analyzed	Qualifier
SM 10200-H - Chlorophyll a							
Method: SM 10200-H - Chlorophyll a	Batch ID: 265654	Pre	pared: 04/1	3/21 00:00	1	04/13/21	Analyst: ATP
Chlorophyll a	10		1.0	mg/M3	1	04/13/21	



Wood - San I 9177 Sky Par	Diego rk Court, Ste A	Project Number:	1915100403 L	ECL TMDI	_ Monitoring		04/	Reported: 26/2021 16:40
San Diego, C	A 92123	Project Manager:	John Rudolph					
Sa	mple Results Enthalpy Analytical							(Continued)
Sample:	CL10- Int 1D08088-07 (Water)					Sampled:	04/08/21 8:25 b	y Kate Buckley
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier
SM 10200-H -	Chlorophyll a							
Method: SM	10200-Н - Chlorophyll a	Batch ID: 265654	Pre	pared: 04/1	3/21 00:00			Analyst: ATP
Chlorophy	ll a	5.8		1.0	mg/M3	1	04/13/21	



Wood - San I 9177 Sky Par	Diego rk Court, Ste A	Project Number:	1915100403 Ll	ECL TME	DL Monitoring		04	Reported: /26/2021 16:40
San Diego, C	A 92123	Project Manager:	John Rudolph					
Sa	mple Results Enthalpy Analytical							(Continued)
Sample:	CL10- Surf 1D08088-08 (Water)					Sampled:	04/08/21 8:40 k	by Kate Buckley
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier
SM 10200-H - (	Chlorophyll a							
Method: SM	10200-Н - Chlorophyll a	Batch ID: 265654	Pre	<b>pared:</b> 04/	/13/21 00:00			Analyst: ATP
Chlorophy	ll a	5.9		1.0	mg/M3	1	04/13/21	



Wood - San I 9177 Sky Par	Diego rk Court, Ste A	Project Number:	1915100403 LI	ECL TMD	L Monitoring		04/	<b>Reported:</b> 26/2021 16:40
San Diego, C	CA 92123	Project Manager:	John Rudolph					
Sa	mple Results Enthalpy Analytical							(Continued)
Sample:	LE02- Int 1D08088-09 (Water)					Sampled:	04/08/21 9:45 k	y Kate Buckley
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier
SM 10200-H -	Chlorophyll a							
Method: SM	10200-Н - Chlorophyll a	Batch ID: 265654	Pre	<b>pared:</b> 04/ <sup>2</sup>	13/21 00:00			Analyst: ATP
Chlorophy	ll a	61		1.0	mg/M3	1	04/13/21	



Wood - San I 9177 Sky Pa San Diego (	Diego rk Court, Ste A CA 92123	Project Number:	1915100403 L	ECL TMDI	_ Monitoring		04.	Reported: /26/2021 16:40
Sa Sa	Imple Results Enthalpy Analytical	i Toject Manager.	John Rudolph					(Continued)
Sample:	LE02- Surf 1D08088-10 (Water)					Sampled:	04/08/21 10:15 k	oy Kate Buckley
Analyte		Result		MRL	Units	Dil	Analyzed	Qualifier
SM 10200-Н -	Chlorophyll a							
Method: SM Chlorophy	10200-Н - Chlorophyll a I <b>l a</b>	Batch ID: 265654 56	Pre	<b>pared:</b> 04/1 1.0	3/21 00:00 mg/M3	1	04/13/21	Analyst: ATP



## **Certificate of Analysis**

FINAL REPORT

Project Number: 1915100403 LECL TMDL Monitoring

**Reported:** 04/26/2021 16:40

Project Manager: John Rudolph

#### Notes and Definitions

ltem	Definition
%REC	Percent Recovery
Dil	Dilution
MRL	The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ)
Any remai	ning sample(s) will be disposed of one month from the final report date unless other arrangements are made in advance.

All results are expressed on wet weight basis unless otherwise specified.

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.

Chain of Custody & Sample Information Record

Client: Wood E&I Solutions, Inc	).		Cont	act:	Joh	n Ru	Idol	ph													Phone No.	858-243-8158
FAX No.			Emai	Email: john.rudo!ph@woodpic.com											Additional Reporting Requests							
Project Name: LECL TMDL Monitoring Project Number: 1915100403			Turn Lab T	Aroi AT A	und ppro	Tim val:	e:		_f	Rou	tine	<u>.</u>	*3. I	-5 D Rus	ay h	2	*48 F	Hoı lush	ur N	* *Ad	24 Hour Rush dillonal Charges May Apply	FAX Results: ⊡res □ № Email Results: ⊡res □ № State EDT: ⊡res □ № (Include Source Number in Notes)
Sampler Informati	ion			# of & Pi	Con reser	taine vati	ers ves			S	amp Type	ele e	A	nal	ysis	s Re	equ	est	ed		Matrix	Notes
Name: Katebi	relle	1							lers							í	2.3)			5	DW = Drinking Water	Ortho-P is field filtered (0.45 um)
Employer: Wood E&I Solution	ons, Inc.	J				ate			Contair				EPA 353.2		1	50.1) (***** 22	IS (EPA 36 04 265 21	(4500S)	(2-0	(EPA 20	WW = Wastewater GW ≂ Groundwater	Dissolved AI is field filtered
Signature: <u>Rad-ede</u>	ZUNG	g	served		_ ٥	UZnAcet		ç	ll # of (	tine	ample	cial	- Nitrite (I	M2540 C)	EPA 351.2	nia (EPA :	hosphoru	Sulfide (SN	AL (EPA 2(	Ived AL	S = Soll SG = Sludge	**ASAP on TP results for CL07, CL08, CL09, CL10 (5 day TAT)
Sample ID	Date	/ Time	Unpre H2SO		Na2S: NaOH	NaOH	MCA4	Froze	Tota	Rou	Res	Spe	Nitrate	TDS (S	TKN (E	Ammo	Cotal F	Total S	Total A	Disso	L = Liquid M = Miscellaneous	changed on CL09, CLID
CL07	4/8/21	IIDO										>	< x	x	x	x	x >		x	x	· · · · · · · · · · · · · · · · · · ·	
CL08	1	1015										>	< x	x	x	x	x>	x	x	х		
CL09		0920										>	( x	x	x	x	x>	x	x	x		
CL10		0825										· )	( x	x	x	x	x	x	x	x		
LE02	V	0945											x	x	<b>x</b> :	x	x	<u>( x</u>				
• .				• .																		-
·																						
Relinquished By (sign)	Print Na	ne / Com	pany			Dat	te /	l'ime				R	ece	ive	d By	y (S	Sigr	1)			i Pri	nt Name / Company
Main Dudern N	Manica S	nders	<i>kilu</i>	bal	4/	R/2	)	13	50		$\bigcap$	٨	ŀ	2							Hadres	Suncha / WG (RABS
@ Hector Sa			meh 4-321/1520			o Ath.										AlgabriaH	4/8/71 1520					
												-										

(For Lab Use Only) Sample Integrity	Upon Re	eceipt			Lab Notes		
Sample(s) Submitted on Ice?	Yes	No		Temperature		Lab No.	·
Custody Seal(s) Intact?	Yes	No	N/A	6. + - MC			
Sample(s) Intact?	Yes	No		Cooler Blank			Page of 2

#### Chain of Custody & Sample Information Record

Client: Wood E&I Solutions, Inc	<u>.</u>		Contact	John	Rudolph									Phone No.	858-243-8158
FAX No.			Email:	john.	rudolph@	)wood	plc.c	om							Additional Reporting Requests
Project Name: LECL TMDL Monitoring Project Number: 1915100403			Turn Arc	ound T Approv	ime: /al:	R By:	Routir	<u>1e</u>	*3-5 Day *48 Hour Rush Rush *Ac			'48 I Ri	Hour ush *A	*24 Hour Rush ddltional Charges May Apply	FAX Results: ☐ ves ☐ № Email Results: ☐ ves ☐ № State EDT: _ ves ☐ № (Include Source Number in Notes)
Sampler Informati	ion		# c & l	f Conta Preserv	iners atives		San Ty	nple pe	Ana	alysis	s Rec	ques	sted	Matrix	Notes
Name: <u>FAFE BUC</u> Employer: <u>Wood E&amp;I Soluti</u> Signature: <u>Market</u> B	NULLY ons, Inc.	-	pev		Acetate	of Containers	9		Nitrite		8	spiroids	ıyıl-a	DW = Drinking Water WW = Wastewater GW = Groundwater S = Soil	Chi-a samples on 0.7 um GFF
Signature:	Junio	¥	03 04 01	IS203	E A CI	tal #	utine	ecial	ate - I		nonis		oroph	SG = Sludge L = Liquid	
Sample ID	Date	Time	HZ28	NaC NaC	PIC NH	P	80	2 S	Nit	Ĩž	₩ V F	SRI 10	Ť	M = Miscellaneous	
CL07 - Int	4/8/21	11:00											x		Filter Volume: SDDmL
CL07 - Surf		11:10											x		Filter Volume: 500mL
CL08 - Int		1015											x		Filter Volume: 350ML
CL08 - Surf		10:25											x		Filter Volume: 500mL
CL09 - Int		0920											x		Filter Volume: 250mL
CL09 - Surf		0930											x		Filter Volume: 250mL
CL10 - Int		0925											x		Filter Volume: 7,52mL
CL10 - Surf		0340											x		Filter Volume: 255) ML
LE02 - Int		D945											x		Filter Volume: 250 mL
LE02 - Surf	$\checkmark$	1015											X		Filter Volume: 230 ml
Relinquished By (sign)	Print Nam	ne / Com	ipany		Date / Tim	e	1	Re	ceive	ed By	y (Sig	gn)	<u> </u>	, Frir	nt Name / Company,
Main drider W	lan'sa s	wide	skiluad	4/8	2/13	50			Ôð					Hector :	Sancha / WECKLADS
Ön	Ucctu	Su	ncher	4-	3-21/	1520	Ø	Hp.	2	•				Algaburd H.	U/8/71 1520
							· v	-							

(For Lab Use Only) Sample Integrity	Upon Re	eceipt			Lab Notes
Sample(s) Submitted on Ice?	Yes	No		Temperature	
Custody Seal(s) Intact?	Yes	No	N/A	6.1	
Sample(s) Intact?	Yes	No		⊖ Cooler Blank	

Lab No.

Page 2 of 2

\_\_\_\_\_

)8667



FINAL REPORT

Work Orders:	1F02086	Report Date:	6/22/2021
		Received Date:	6/2/2021
Proiect:	LECL TMDL Monitoring	Turnaround Time:	Normal
i loject.	5	Phones:	(858) 514-6465
		Fax:	(858) 278-5300
Attn:	John Rudolph	P.O. #:	C015101084
Client:	Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123	Billing Code:	

#### DoD-ELAP ANAB #L2457 • DoD-ISO ANAB # • ELAP-CA #1132 • EPA-UCMR #CA00211 • Guam-EPA #17-008R • HW-DOH # • ISO17025 ANAB #L2457.01 • LACSD #10143 • NELAP-OR #4047 • NJ-DEP #CA015 • NV-DEP #NAC 445A • SCAQMD #93LA1006

This is a complete final report. The information in this report applies to the samples analyzed in accordance with the chain-of-custody document. Weck Laboratories certifies that the test results meet all requirements of TNI unless noted by qualifiers or written in the Case Narrative. This analytical report must be reproduced in its entirety.

Dear John Rudolph,

Enclosed are the results of analyses for samples received 6/02/21 with the Chain-of-Custody document. The samples were received in good condition, at 9.1 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

Reviewed by:

1: State

Chris Samatmanakit Project Manager





### **Certificate of Analysis**

FINAL REPORT

Project Number: LECL TMDL Monitoring

Reported: 06/22/2021 12:43

Project Manager: John Rudolph

#### Sample Summary

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
CL07	Kate Buckley	1F02086-01	Water	06/02/21 11:05	
CL08	Kate Buckley	1F02086-02	Water	06/02/21 10:15	
CL09	Kate Buckley	1F02086-03	Water	06/02/21 09:15	
CL10	Kate Buckley	1F02086-04	Water	06/02/21 08:20	
LE02	Kate Buckley	1F02086-05	Water	06/02/21 09:25	



Sample Results

#### **Certificate of Analysis**

FINAL REPORT

Project Number: LECL TMDL Monitoring

Project Manager: John Rudolph

**Reported:** 06/22/2021 12:43

	•							
Sample:	CL07					Sampleo	d: 06/02/21 11:05 b	y Kate Buckley
	1F02086-01 (Water)							
Analyte		Resul	t MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional C	hemistry/Physical Parameters b	y APHA/EPA/ASTM Methods						
Method: EPA	350.1			Instr: AA06				
Batch ID: W	/1F0412	Preparation: NONE (WETCHEM)		Prepared: 06/0	7/21 14:49			Analyst: YMT
Ammonia a	as N	1.1	0.047	0.10	mg/l	1	06/08/21	
Method: EPA	351.2			Instr: AA06				
Batch ID: W	/1F0433	Preparation: _NONE (WETCHEM)		Prepared: 06/0	7/21 16:38			Analyst: ymt
TKN		1.8	3 0.065	0.10	mg/l	1	06/11/21	
Method: EPA	353.2			Instr: AA01				
Batch ID: W	/1F0193	Preparation: _NONE (WETCHEM)		Prepared: 06/0	3/21 08:25			Analyst: sar
Nitrate as N	•	ND	0.040	0.20	mg/l	1	06/03/21 11:15	
Nitrite as N		NC	0.042	0.10	mg/l	1	06/03/21 11:15	
Method: EPA	365.3			Instr: UVVIS04				
Batch ID: W	/1F0220	Preparation: NONE (WETCHEM)		Prepared: 06/0	3/21 11:49			Analyst: ssi
o-Phospha	te as P	0.075	<b>5</b> 0.0030	0.010	mg/l	1	06/03/21 12:36	
Method: EPA	365.3			Instr: UVVIS04				
Batch ID: W	/1F0255	Preparation: _NONE (WETCHEM)		Prepared: 06/0	3/21 16:50			Analyst: ssi
Phosphoru	is as P, Total	0.11	0.0067	0.010	mg/l	1	06/07/21	
Method: SM	2540C			Instr: OVEN01				
Batch ID: W	/1F0394	Preparation: _NONE (WETCHEM)		Prepared: 06/0	7/21 12:36			Analyst: blg
Total Disso	lved Solids	520	) 4.0	10	mg/l	1	06/08/21	
Method: SM	2540D			Instr: OVEN15				
Batch ID: W	/1F0410	Preparation: _NONE (WETCHEM)		Prepared: 06/0	7/21 14:32			Analyst: ism
Total Suspe	ended Solids	ND	)	5	mg/l	1	06/08/21	
Method: SM	4500S2-D			Instr: _ANALYS1	г			
Batch ID: W	/1F0381	Preparation: _NONE (WETCHEM)		Prepared: 06/0	7/21 11:04			Analyst: ymt
Sulfide, Tot	al	NE	) 0.050	0.10	mg/l	1	06/07/21	
Metals by EPA	200 Series Methods							
Method: EPA	200.7			Instr: ICP03				
Batch ID: W	/1F0528	Preparation: EPA 200.2		Prepared: 06/0	8/21 16:39			Analyst: kvm
Aluminum,	Dissolved		0.041	0.050	mg/l	1	06/10/21	
Aluminum,	Total	0.045	<b>i</b> 0.041	0.050	mg/l	1	06/10/21	J



#### Certificate of Analysis

06/10/21

**FINAL REPORT** 

Project Number: LECL TMDL Monitoring

**Reported:** 06/22/2021 12:43

Project Manager: John Rudolph

Sample Results							(Continued)
Sample: CL08					Sampled	: 06/02/21 10:15 b	y Kate Buckley
1F02086-02 (Water)							
Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameter	s by APHA/EPA/ASTM Methods						
Method: EPA 350.1			Instr: AA06				
Batch ID: W1F0412	Preparation: _NONE (WETCHEM)		Prepared: 06/07/	21 14:49			Analyst: YMT
Ammonia as N	1.1	0.047	0.10	mg/l	1	06/08/21	
Method: EPA 351.2			Instr: AA06				
Batch ID: W1F0433	Preparation: _NONE (WETCHEM)		<b>Prepared:</b> 06/07/	21 16:38			Analyst: ymt
ТКМ	1.2	0.065	0.10	mg/l	1	06/11/21	
Method: EPA 353.2			Instr: AA01				
Batch ID: W1F0193	Preparation: _NONE (WETCHEM)		Prepared: 06/03/	21 08:25			Analyst: sar
Nitrate as N		0.040	0.20	mg/l	1	06/03/21 11:16	
Nitrite as N		0.042	0.10	mg/l	1	06/03/21 11:16	
Method: EPA 365.3			Instr: UVVIS04				
Batch ID: W1F0220	Preparation: _NONE (WETCHEM)		Prepared: 06/03/	21 11:49			Analyst: ssi
o-Phosphate as P	0.019	0.0030	0.010	mg/l	1	06/03/21 12:37	
Method: EPA 365.3			Instr: UVVIS04				
Batch ID: W1F0255	Preparation: _NONE (WETCHEM)		Prepared: 06/03/	21 16:50			Analyst: ssi
Phosphorus as P, Total	0.056	0.0067	0.010	mg/l	1	06/07/21	
Method: SM 2540C			Instr: OVEN01				
Batch ID: W1F0394	Preparation: _NONE (WETCHEM)		Prepared: 06/07/	21 12:36			Analyst: blg
Total Dissolved Solids	520	4.0	10	mg/l	1	06/08/21	

Method: SM 2540D Instr: OVEN15 Batch ID: W1F0410 Preparation: \_NONE (WETCHEM) Prepared: 06/07/21 14:32 Analyst: ism Total Suspended Solids 5 06/08/21 ND mg/l 1 Method: SM 4500S2-D Instr: \_ANALYST Batch ID: W1F0381 Preparation: \_NONE (WETCHEM) Prepared: 06/07/21 11:04 Analyst: ymt Sulfide, Total ND 0.050 0.10 06/07/21 mg/l 1 Metals by EPA 200 Series Methods Method: EPA 200.7 Instr: ICP03 Batch ID: W1F0528 Analyst: kvm Prepared: 06/08/21 16:39 Preparation: EPA 200.2 Aluminum, Dissolved ND 0.041 06/10/21 0.050 mg/l 1

0.045

0.041

0.050

mg/l

1

Aluminum, Total

J



#### **Certificate of Analysis**

**FINAL REPORT** 

Project Number: LECL TMDL Monitoring

Reported: 06/22/2021 12:43

Project Manager: John Rudolph

Sample Results								(Continued)
Sample: CL09 1F02086-03 (Water)						Sample	d: 06/02/21 9:15 b	y Kate Buckley
Analyte		Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters b	y APHA/EPA/ASTM Methods							
Method: EPA 350.1				Instr: AA06				
Batch ID: W1F0412	Preparation: _NONE (WETCHEM	I)		Prepared: 06/0	7/21 14:49			Analyst: YMT
Ammonia as N		0.47	0.047	0.10	mg/l	1	06/08/21	
Method: EPA 351.2				Instr: AA06				
Batch ID: W1F0433	Preparation: _NONE (WETCHEM	)		Prepared: 06/0	7/21 16:38			Analyst: ymt
TKN		2.0	0.065	0.10	mg/l	1	06/11/21	
Method: EPA 353.2				Instr: AA01				
Batch ID: W1F0193	Preparation: _NONE (WETCHEM	)		Prepared: 06/0	3/21 08:25			Analyst: sar
Nitrate as N		n ND	0.040	0.20	mg/l	1	06/03/21 11:17	
Nitrite as N		- · ND	0.042	0.10	mg/l	1	06/03/21 11:45	
Method: EPA 365.3				Instr: UVVIS04				
Batch ID: W1F0220	Preparation: _NONE (WETCHEM	)		Prepared: 06/0	3/21 11:49			Analyst: ssi
o-Phosphate as P		0.10	0.0030	0.010	mg/l	1	06/03/21 12:37	
Method: EPA 365.3				Instr: UVVIS04				
Batch ID: W1F0255	Preparation: _NONE (WETCHEM	)		Prepared: 06/0	3/21 16:50			Analyst: ssi
Phosphorus as P, Total		0.17	0.0067	0.010	mg/l	1	06/07/21	
Method: SM 2540C				Instr: OVEN01				
Batch ID: W1F0394	Preparation: _NONE (WETCHEM	)		Prepared: 06/0	7/21 12:36			Analyst: blg
Total Dissolved Solids		620	4.0	10	mg/l	1	06/08/21	
Method: SM 2540D				Instr: OVEN15				
Batch ID: W1F0410	Preparation: _NONE (WETCHEM	)		Prepared: 06/0	7/21 14:32			Analyst: ism
Total Suspended Solids		- ND		5	mg/l	1	06/08/21	
Method: SM 4500S2-D				Instr: _ANALYS	г			
Batch ID: W1F0381	Preparation: _NONE (WETCHEM	)		<b>Prepared:</b> 06/0	7/21 11:04			Analyst: ymt
Sulfide, Total		ND	0.050	0.10	mg/l	1	06/07/21	
Metals by EPA 200 Series Methods								
Method: EPA 200.7				Instr: ICP03				
Batch ID: W1F0528	Preparation: EPA 200.2			Prepared: 06/0	8/21 16:39			Analyst: kvm
Aluminum, Dissolved		ND	0.041	0.050	mg/l	1	06/10/21	
Aluminum, Total		0.068	0.041	0.050	mg/l	1	06/10/21	



#### **Certificate of Analysis**

FINAL REPORT

Project Number: LECL TMDL Monitoring

Reported: 06/22/2021 12:43

Project Manager: John Rudolph

(Continued)

Sample Resul	lts
--------------	-----

Sample: CL	10						Sampled	d: 06/02/21 8:20 b	y Kate Buckley
1F	02086-04 (Water)								
Analyte			Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chem	istry/Physical Parameters by A	PHA/EPA/ASTM Methods							
Method: EPA 350.	1				Instr: AA06				
Batch ID: W1F04	112	Preparation: _NONE (WETCHEM)			Prepared: 06/07/2	21 14:49			Analyst: YMT
Ammonia as N			ND	0.047	0.10	mg/l	1	06/08/21	
Method: EPA 351.2	2				Instr: AA06				
Batch ID: W1F04	133	Preparation: _NONE (WETCHEM)			Prepared: 06/07/2	21 16:38			Analyst: ymt
TKN			0.77	0.065	0.10	mg/l	1	06/11/21	
Method: EPA 353.2	2				Instr: AA01				
Batch ID: W1F01	193	Preparation: _NONE (WETCHEM)			Prepared: 06/03/2	21 08:25			Analyst: sar
Nitrate as N			ND	0.040	0.20	mg/l	1	06/03/21 11:18	
Nitrite as N			ND	0.042	0.10	mg/l	1	06/03/21 11:18	
Method: EPA 365.3	3				Instr: UVVIS04				
Batch ID: W1F02	220	Preparation: _NONE (WETCHEM)			Prepared: 06/03/2	21 11:49			Analyst: ssi
o-Phosphate as	s P		.0030	0.0030	0.010	mg/l	1	06/03/21 12:38	J
Method: EPA 365.3	3				Instr: UVVIS04				
Batch ID: W1F02	255	Preparation: _NONE (WETCHEM)			Prepared: 06/03/2	21 16:50			Analyst: ssi
Phosphorus as	P, Total		0.054	0.0067	0.010	mg/l	1	06/07/21	
Method: SM 2540	с				Instr: OVEN01				
Batch ID: W1F03	394	Preparation: _NONE (WETCHEM)			Prepared: 06/07/2	21 12:36			Analyst: blg
Total Dissolved	I Solids		620	4.0	10	mg/l	1	06/08/21	
Method: SM 2540	D				Instr: OVEN15				
Batch ID: W1F04	\$10	Preparation: _NONE (WETCHEM)			Prepared: 06/07/2	21 14:32			Analyst: ism
Total Suspende	d Solids		ND		5	mg/l	1	06/08/21	
Method: SM 4500	S2-D				Instr: _ANALYST				
Batch ID: W1F03	381	Preparation: _NONE (WETCHEM)			Prepared: 06/07/2	21 11:04			Analyst: ymt
Sulfide, Total			ND	0.050	0.10	mg/l	1	06/07/21	
Metals by EPA 200	Series Methods								
Method: EPA 200.	7				Instr: ICP03				
Batch ID: W1F05	528	Preparation: EPA 200.2			Prepared: 06/08/2	21 16:39			Analyst: kvm
Aluminum, Diss	olved		ND	0.041	0.050	mg/l	1	06/10/21	
Aluminum, Tota	al		0.10	0.041	0.050	mg/l	1	06/10/21	



### **Certificate of Analysis**

FINAL REPORT

Project Number: LECL TMDL Monitoring

Reported: 06/22/2021 12:43

Project Manager: John Rudolph

(Continued)

#### Sample Results

Sample:	LE02					Sample	d: 06/02/21 9:25 b	y Kate Buckley
	1F02086-05 (Water)							
Analyte		Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional	Chemistry/Physical Paramete	ers by APHA/EPA/ASTM Methods						
Method: EPA	350.1			Instr: AA06				
Batch ID: \	W1F0412	Preparation: _NONE (WETCHEM)		Prepared: 06/	07/21 14:49			Analyst: YMT
Ammonia	as N	0.099	0.047	0.10	mg/l	1	06/08/21	J
Method: EPA	351.2			Instr: AA06				
Batch ID: \	W1F0433	Preparation: _NONE (WETCHEM)		Prepared: 06/	07/21 16:38			Analyst: ymt
<b>TKN</b>		4.1	0.065	0.10	mg/l	1	06/11/21	
Method: EPA	353.2			Instr: AA01				
Batch ID: \	W1F0193	Preparation: _NONE (WETCHEM)		Prepared: 06/	03/21 08:25			Analyst: sar
Nitrate as	Ν	ND	0.040	0.20	mg/l	1	06/03/21 11:19	
Nitrite as N	۱		0.042	0.10	mg/l	1	06/03/21 11:19	
Method: EPA	365.3			Instr: UVVIS04				
Batch ID: \	W1F0220	Preparation: _NONE (WETCHEM)		Prepared: 06/	03/21 11:49			Analyst: ssi
o-Phosph	ate as P	0.012	0.0030	0.010	mg/l	1	06/03/21 12:38	
Method: EPA	365.3			Instr: UVVIS04				
Batch ID: \	W1F0255	Preparation: _NONE (WETCHEM)		Prepared: 06/	03/21 16:50			Analyst: ssi
Phosphor	us as P, Total	0.28	0.0067	0.010	mg/l	1	06/07/21	
Method: SM	2540C			Instr: OVEN01				
Batch ID: \	W1F0394	Preparation: _NONE (WETCHEM)		Prepared: 06/	07/21 12:36			Analyst: blg
Total Diss	olved Solids	2100	4.0	10	mg/l	1	06/08/21	
Method: SM	4500S2-D			Instr: _ANALYS	ST			
Batch ID: \	W1F0381	Preparation: _NONE (WETCHEM)		Prepared: 06/	07/21 11:04			Analyst: ymt
Sulfide, To	tal		0.050	0.10	mg/l	1	06/07/21	



FINAL REPORT

Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123 Project Number: LECL TMDL Monitoring

**Reported:** 06/22/2021 12:43

Project Manager: John Rudolph

Quality	Control	Results
---------	---------	---------

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

					Spike	Source		%REC		RPD	
Analyte R	esult	MDL	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier
Batch: W1F0193 - EPA 353.2											
Blank (W1F0193-BLK1)					Prepared & A	nalyzed: 06/0	3/21				
Nitrate as N	ND	0.040	0.20	mg/l							
Nitrite as N	ND	0.042	0.10	mg/l							
LCS (W1F0193-BS1)					Prepared & A	nalyzed: 06/0	3/21				
Nitrate as N	1.04	0.040	0.20	mg/l	1.00		104	90-110			
Nitrite as N	1.04	0.042	0.10	mg/l	1.00		104	90-110			
Matrix Spike (W1F0193-MS1) Sou	urce: 1	C30068-01			Prepared & A	nalyzed: 06/0	3/21				
Nitrate as N	14.2	0.080	0.40	mg/l	4.00	9.93	107	90-110			
Nitrite as N	1.06	0.042	0.10	mg/l	1.00	ND	106	90-110			
Matrix Spike (W1F0193-MS2) Sou	urce: 1	E24014-05			Prepared & A	nalyzed: 06/0	3/21				
Nitrate as N	4.77	0.040	0.20	mg/l	2.00	2.65	106	90-110			
Nitrite as N	1.02	0.042	0.10	mg/l	1.00	ND	102	90-110			
Matrix Spike Dup (W1F0193-MSD1) Sou	urce: 1	C30068-01			Prepared & A	nalyzed: 06/0	3/21				
Nitrate as N	14.2	0.080	0.40	mg/l	4.00	9.93	106	90-110	0.1	20	
Nitrite as N	1.05	0.042	0.10	mg/l	1.00	ND	105	90-110	0.9	20	
Matrix Spike Dup (W1F0193-MSD2) Sou	urce: 1	E24014-05			Prepared & A	nalyzed: 06/0	3/21				
Nitrate as N	4.77	0.040	0.20	mg/l	2.00	2.65	106	90-110	0	20	
Nitrite as N	1.07	0.042	0.10	mg/l	1.00	ND	107	90-110	5	20	
Batch: W1F0220 - EPA 365.3											
Blank (W1F0220-BLK1)					Prepared & A	nalyzed: 06/0	3/21				
o-Phosphate as P	ND	0.0030	0.010	mg/l							
LCS (W1E0220_BS1)					Prenared & A	nalvzed: 06/0	3/21				
o-Phosphate as P 0	.206	0.0030	0.010	mg/l	0.200	lalyzeu. 00/0	103	88-111			
				0							
Matrix Spike (W1F0220-MS1) Sou	urce: 1 303	F02056-01	0.010	ma/l	0 200	nalyzed: 06/0 0 0990	3/21 102	85-112			
	.000	0.0000	0.010	mgn	0.200	0.0000	102	00 112			
Matrix Spike Dup (W1F0220-MSD1) Sou	urce: 1	F02056-01	0.040		Prepared & A	nalyzed: 06/0	3/21	05.440			
o-Phosphate as P	.304	0.0030	0.010	mg/l	0.200	0.0990	102	85-112	0.3	20	
Batch: W1F0255 - EPA 365.3											
Blank (W1F0255-BLK1)				Prep	oared: 06/03/2	1 Analyzed:	06/07/21				
Phosphorus as P, Total	ND	0.0067	0.010	mg/l		-					
LCS (W1F0255-BS1)				Prep	oared: 06/03/2	1 Analyzed:	06/07/21				
Phosphorus as P, Total 0	.207	0.0067	0.010	mg/l	0.200		104	90-110			
Matrix Spike (W1F0255-MS1) Sou	urce: 1	F02056-01		Prep	oared: 06/03/2	1 Analyzed:	06/07/21				
Phosphorus as P, Total 0	.371	0.0067	0.010	mg/l	0.200	0.170	100	90-110			
Matrix Spike Dup (W1F0255-MSD1) Sou	irce <sup>,</sup> 1	F02056-01		Pror	pared: 06/03/2	1 Analyzed	06/07/21				
Phosphorus as P, Total 0	.369	0.0067	0.010	mg/l	0.200	0.170	99	90-110	0.5	20	
Batch: W1F0381 - SM 4500S2-D				-							
					Deserve d O. A		7/21				
DIdlik (WIPUSÖI-BLKI)					rrepared & Al	naiyzed: 06/0	1/21				

1F02086



**FINAL REPORT** 

#### Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123

Project Number: LECL TMDL Monitoring

**Reported:** 06/22/2021 12:43

Project Manager: John Rudolph

(Continued)

**Quality Control Results** 

Conventional Chemistry/Physical Parameters by	APHA/EPA/AST	M Method	s (Continue	d)							
Analyte	Result	MDI	MRI	Units	Spike Level	Source Result	%RFC	%REC	RPD	RPD Limit	Qualifier
Batch: W1F0381 - SM 4500S2-D (Continued)	Nesun	MDL	WIKE	onits	Level	Result	JOREC	Linits	ND	Linit	Quanner
Blank (W1E0381-BLK1)					Prenared & Ana	lyzed: 06/	07/21				
Sulfide, Total	ND	0.050	0.10	mg/l	Frepared & Alla	iiyzeu. 00/0	57721				
LCS (W1F0381-BS1)					Prenared & Ana	lvzed: 06/(	07/21				
Sulfide, Total	0.100	0.050	0.10	mg/l	0.100		100	95-105			
Duplicate (W1F0381-DUP1)	Source: 1	C29078-01			Prepared & Ana	lyzed: 06/0	07/21				
Sulfide, Total	ND	0.050	0.10	mg/l		ND				20	
Batch: W1F0394 - SM 2540C											
Blank (W1F0394-BLK1)				Pr	repared: 06/07/21	Analyzed:	06/08/21				
Total Dissolved Solids	ND	4.0	10	mg/l							
LCS (W1F0394-BS1)				Pr	repared: 06/07/21	Analyzed:	06/08/21				
Total Dissolved Solids	828	4.0	10	mg/l	824	,,.	100	96-102			
Dumliante (M/150204 DUD1)	Courses 1	E02064 0E		De	unnarad: 06/07/21	Analyzadı	06/09/21				
Total Dissolved Solids	3780	4.0	10	mg/l	epared: 06/07/21	3760	00/00/21		0.6	10	
				0							
Duplicate (W1F0394-DUP2) Total Dissolved Solids	Source: 1	<b>F04022-01</b>	10	Pr ma/l	repared: 06/07/21	Analyzed: 61700	06/08/21		1	10	
	01000	4.0	10	ing/i		01700			1	10	
Batch: W1F0410 - SM 2540D											
Blank (W1F0410-BLK1)				Pr	repared: 06/07/21	Analyzed:	06/08/21				
Total Suspended Solids	ND		1	mg/l							
LCS (W1F0410-BS1)				Pr	epared: 06/07/21	Analyzed:	06/08/21				
Total Suspended Solids	65.2		1	mg/l	61.4	-	106	90-110			
Duplicate (W1F0410-DUP1)	Source: 1	F02051-01		Pr	repared: 06/07/21	Analyzed:	06/08/21				
Total Suspended Solids			1	mg/l		170	,		1	10	
Dumliante (M/150/10 DUD2)	Courses 1	E0402E 01		De	unnarad: 06/07/21	Analyzadı	06/09/21				
Total Suspended Solids	55.3	FU4U25-U1	1	mg/l	epared: 06/07/21	55.0	06/08/21		0.5	10	
				0							
Batch: W1F0412 - EPA 350.1											
Blank (W1F0412-BLK1)	ND	0.047	0.10	Pr ma/l	epared: 06/07/21	Analyzed:	06/08/21				
		0.047	0.10	iiig/i							
Blank (W1F0412-BLK2)		0.047	0.40	Pr	repared: 06/07/21	Analyzed:	06/08/21				
Ammonia as N	ND	0.047	0.10	mg/l							
LCS (W1F0412-BS1)				Pr	epared: 06/07/21	Analyzed:	06/08/21				
Ammonia as N	0.255	0.047	0.10	mg/l	0.250		102	90-110			
LCS (W1F0412-BS2)				Pr	epared: 06/07/21	Analyzed:	06/08/21				
Ammonia as N	0.262	0.047	0.10	mg/l	0.250	-	105	90-110			
Duplicate (W1F0412-DUP1)	Source: 1	F02010-01		Pr	repared: 06/07/21	Analyzed:	06/08/21				
Ammonia as N		0.047	0.10	mg/l		ND				15	
Matrix Sailes (MIE0412 MC1)	C	E02010 04			onered: 05 (07 (04	Analyzed	06/00/24				
Ammonia as N	Source: 1	0.047	0.10	ma/l	0.250	ND	100/08/21	90-110			
	_		-	5							
Matrix Spike (W1F0412-MS2)	Source: 1	F02062-01		Pr	epared: 06/07/21	Analyzed:	06/08/21				
1F02086											Page 9 of 12



FINAL REPORT

#### Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123

Project Number: LECL TMDL Monitoring

Reported: 06/22/2021 12:43

Project Manager: John Rudolph

.....

(Continued)

#### **Quality Control Results**

Conventional Chemistry/Physical Parameters by APH	HA/EPA/AST	M Methods	(Continue	ed)							
					Spike	Source		%REC		RPD	
Analyte	Result	MDL	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier
Batch: W1F0412 - EPA 350.1 (Continued)											
Matrix Spike (W1F0412-MS2)	Source: 1	F02062-01		Prep	oared: 06/07/21	Analyzed:	06/08/21				
Ammonia as N	0.498	0.047	0.10	mg/l	0.250	0.251	99	90-110			
Matrix Spike Dup (W1F0412-MSD1)	Source: 1	F02010-01		Prep	oared: 06/07/21	Analyzed:	06/08/21				
Ammonia as N	0.251	0.047	0.10	mg/l	0.250	ND	100	90-110	0.1	15	
Matrix Spike Dup (W1F0412-MSD2)	Source: 1	F02062-01		Prep	oared: 06/07/21	Analyzed:	06/08/21				
Ammonia as N	0.495	0.047	0.10	mg/l	0.250	0.251	98	90-110	0.5	15	
Batch: W1F0433 - EPA 351.2											
Blank (W1F0433-BLK1)				Prep	oared: 06/07/21	Analyzed:	06/11/21				
ТКМ		0.065	0.10	mg/l		-					
Blank (W1F0433-BLK2)				Prep	oared: 06/07/21	Analyzed:	06/11/21				
ТКМ		0.065	0.10	mg/l							
LCS (W1F0433-BS1)				Prep	oared: 06/07/21	Analyzed:	06/11/21				
ТКМ	0.968	0.065	0.10	mg/l	1.00		97	90-110			
LCS (W1F0433-BS2)				Prep	oared: 06/07/21	Analyzed:	06/11/21				
TKN	0.997	0.065	0.10	mg/l	1.00		100	90-110			
Duplicate (W1F0433-DUP1)	Source: 1	E28026-02		Prep	oared: 06/07/21	Analyzed:	06/11/21				
ТКМ	ND	0.065	0.10	mg/l		ND				10	
Matrix Spike (W1F0433-MS1)	Source: 1	E28026-01		Prep	oared: 06/07/21	Analyzed:	06/11/21				
ТКМ	1.23	0.065	0.10	mg/l	1.00	0.226	100	90-110			
Matrix Spike (W1F0433-MS2)	Source: 1	F02054-03		Prep	oared: 06/07/21	Analyzed:	06/11/21				
ТКМ	1.28	0.065	0.10	mg/l	1.00	0.288	99	90-110			
Matrix Spike Dup (W1F0433-MSD1)	Source: 1	E28026-01		Prep	oared: 06/07/21	Analyzed:	06/11/21				
TKN	1.23	0.065	0.10	mg/l	1.00	0.226	101	90-110	0.4	10	
Matrix Spike Dup (W1F0433-MSD2)	Source: 1	F02054-03		Prep	oared: 06/07/21	Analyzed:	06/11/21				
TKN	1.34	0.065	0.10	mg/l	1.00	0.288	105	90-110	4	10	



## **Certificate of Analysis**

FINAL REPORT

Project Number: LECL TMDL Monitoring

Reported: 06/22/2021 12:43

Project Manager: John Rudolph

(Continued)

**Quality Control Results** 

Metals by EPA 200 Series Methods

					Spike	Source		%REC		RPD	
Analyte	Result	MDL	MRL	Units	Level	Result	%REC	Limits	RPD	Limit	Qualifier
Batch: W1F0528 - EPA 200.7											
Blank (W1F0528-BLK1)				Prepare	ed: 06/08/21	Analyzed: 0	6/10/21				
Aluminum, Dissolved		0.041	0.050	mg/l							
Aluminum, Total		0.041	0.050	mg/l							
LCS (W1F0528-BS1)				Prepare	ed: 06/08/21	Analyzed: 0	6/10/21				
Aluminum, Dissolved	0.230	0.041	0.050	mg/l	0.200		115	85-115			
Aluminum, Total	0.230	0.041	0.050	mg/l	0.200		115	85-115			
Matrix Spike (W1F0528-MS1)	Source: 1	F02086-01		Prepare	ed: 06/08/21	Analyzed: 0	6/10/21				
Aluminum, Total	0.262	0.041	0.050	mg/l	0.200	0.0446	109	70-130			
Matrix Spike (W1F0528-MS2)	Source: 1	F02087-03		Prepare	ed: 06/08/21	Analyzed: 0	6/10/21				
Aluminum, Total	0.435	0.041	0.050	mg/l	0.200	0.179	128	70-130			
Matrix Spike Dup (W1F0528-MSD1)	Source: 1	02086-01		Prepare	ed: 06/08/21	Analyzed: 0	6/10/21				
Aluminum, Total	0.264	0.041	0.050	mg/l	0.200	0.0446	110	70-130	1	30	
Matrix Spike Dup (W1F0528-MSD2)	Source: 1	02087-03		Prepare	ed: 06/08/21	Analyzed: 0	6/10/21				
Aluminum, Total	0.430	0.041	0.050	mg/l	0.200	0.179	126	70-130	1	30	



## **Certificate of Analysis**

FINAL REPORT

Project Number: LECL TMDL Monitoring

Reported: 06/22/2021 12:43

Project Manager: John Rudolph

#### Notes and Definitions

Definition
Estimated conc. detected <mrl and="">MDL.</mrl>
Percent Recovery
Dilution
Method Detection Limit
The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ)
NOT DETECTED at or above the Method Reporting Limit (MRL). If Method Detection Limit (MDL) is reported, then ND means not detected at or above the MDL.
Relative Percent Difference
Sample that was matrix spiked or duplicated.

Any remaining sample(s) will be disposed of one month from the final report date unless other arrangements are made in advance.

All results are expressed on wet weight basis unless otherwise specified.

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.



FINAL REPORT

Work Orders:	1F02089	Report Date:	6/21/2021
		Received Date:	6/2/2021
Project:	1915100403 LECL TMDL Monitoring	Turnaround Time:	Normal
	, and the second s	Phones:	(858) 514-6465
		Fax:	(858) 278-5300
Attn:	John Rudolph	P.O. #:	C015101084
Client:	Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123	Billing Code:	

#### DoD-ELAP ANAB #L2457 • DoD-ISO ANAB # • ELAP-CA #1132 • EPA-UCMR #CA00211 • Guam-EPA #17-008R • HW-DOH # • ISO17025 ANAB #L2457.01 • LACSD #10143 • NELAP-OR #4047 • NJ-DEP #CA015 • NV-DEP #NAC 445A • SCAQMD #93LA1006

This is a complete final report. The information in this report applies to the samples analyzed in accordance with the chain-of-custody document. Weck Laboratories certifies that the test results meet all requirements of TNI unless noted by qualifiers or written in the Case Narrative. This analytical report must be reproduced in its entirety.

Dear John Rudolph,

Enclosed are the results of analyses for samples received 6/02/21 with the Chain-of-Custody document. The samples were received in good condition, at 9.1 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

**Reviewed by:** 

1: State

Chris Samatmanakit Project Manager





## **Certificate of Analysis**

FINAL REPORT

#### Project Number: 1915100403 LECL TMDL Monitoring

Reported: 06/21/2021 13:27

Project Manager: John Rudolph

Sample Summary					
Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
CL07- Int	Kate Buckley	1F02089-01	Water	06/02/21 11:05	
CL07- Surf	Kate Buckley	1F02089-02	Water	06/02/21 11:30	
CL08- Int	Kate Buckley	1F02089-03	Water	06/02/21 10:15	
CL08- Surf	Kate Buckley	1F02089-04	Water	06/02/21 10:30	
CL09- Int	Kate Buckley	1F02089-05	Water	06/02/21 09:15	
CL09- Surf	Kate Buckley	1F02089-06	Water	06/02/21 09:30	
CL10- Int	Kate Buckley	1F02089-07	Water	06/02/21 08:20	
CL10- Surf	Kate Buckley	1F02089-08	Water	06/02/21 08:30	
LE02- Int	Kate Buckley	1F02089-09	Water	06/02/21 09:25	
LE02- Surf	Kate Buckley	1F02089-10	Water	06/02/21 10:25	



Wood - San Diego	Project Number:	1915100403 LECL TMDL Monitoring	Reported:
9177 Sky Park Court, Ste A			06/21/2021 13:27
San Diego, CA 92123	Project Manager:	John Rudolph	
Sample Results Enthalpy Orange			

Sample:	CL07- Int 1F02089-01 (Water)					Sampled:	06/02/21 11:05	by Kate Buckley
Analyte		Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
SM 10200-H								
Method: Chlo	orophyll	Batch ID: 269011		Prepared: 06/0	02/21 00:00			Analyst: MMP
Chlorophyl	II a	26	1.0	1.0	mg/M3	1	06/17/21	



Wood - San 9177 Sky Pa	Diego ark Court, Ste A	Project Number:	19151004	403 LECL TMI	DL Monitoring		0	Reported: 6/21/2021 13:27
San Diego, (	CA 92123	Project Manager:	John Ruc	dolph				
Sa	ample Results Enthalpy Orange							(Continued)
Sample:	CL07- Surf 1F02089-02 (Water)					Sampled:	06/02/21 11:30	by Kate Buckley
Analyte		Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
SM 10200-H								
Method: Chl	orophyll	Batch ID: 269011		Prepared: 06/	/02/21 00:00			Analyst: MMP
Chlorophy	/II a	6.7	1.0	1.0	mg/M3	1	06/17/21	



Wood - San 9177 Sky Pa	Diego ark Court, Ste A	Project Number:	1915100	403 LECL TME	DL Monitoring		06	Reported: 6/21/2021 13:27
San Diego, (	CA 92123	Project Manager:	John Ruc	dolph				
Sa	ample Results Enthalpy Orange							(Continued)
Sample:	CL08- Int 1F02089-03 (Water)					Sampled:	06/02/21 10:15	by Kate Buckley
Analyte		Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
SM 10200-H								
Method: Ch	lorophyll	Batch ID: 269011		Prepared: 06/	02/21 00:00			Analyst: MMP
Chloroph	yll a	28	1.0	1.0	mg/M3	1	06/17/21	-



Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123		Project Number:	1915100	403 LECL TMI	DL Monitoring	Reported 06/21/2021 13:2		
		Project Manager:	John Ruc	dolph				
Sa	Imple Results Enthalpy Orange							(Continued)
Sample:	CL08- Surf 1F02089-04 (Water)					Sampled:	06/02/21 10:30	by Kate Buckley
Analyte		Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
SM 10200-H								
Method: Chlorophyll		Batch ID: 269011		Prepared: 06/	/02/21 00:00			Analyst: MMP
Chlorophy	/II a		1.0	1.0	mg/M3	1	06/17/21	



Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123		Project Number:	19151004	403 LECL TME	L Monitoring	<b>Reported</b> 06/21/2021 13:27		
		Project Manager:	John Ruc	dolph				
Sa	Imple Results Enthalpy Orange							(Continued)
Sample:	CL09- Int 1F02089-05 (Water)					Sampled:	06/02/21 9:15	by Kate Buckley
Analyte		Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
SM 10200-H								
Method: Chlorophyll		Batch ID: 269011		Prepared: 06/	02/21 00:00			Analyst: MMP
Chlorophy	/II a	54	1.0	1.0	mg/M3	1	06/17/21	



Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123		Project Number:	1915100	403 LECL TMD	L Monitoring	Reported: 06/21/2021 13:27		
		Project Manager:	John Ruo	dolph				
Sa	mple Results Enthalpy Orange							(Continued)
Sample:	CL09- Surf 1F02089-06 (Water)					Sampled:	06/02/21 9:30	by Kate Buckley
Analyte		Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
SM 10200-H								
Method: Chlorophyll		Batch ID: 269011		Prepared: 06/	02/21 00:00			Analyst: MMP
Chlorophy	ll a	6.9	1.0	1.0	mg/M3	1	06/17/21	



Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123		Project Number:	1915100	403 LECL TMI	DL Monitoring	Reported: 06/21/2021 13:27		
		Project Manager:	John Ruo	dolph				
Sa	mple Results Enthalpy Orange							(Continued)
Sample:	CL10- Int 1F02089-07 (Water)					Sampled:	: 06/02/21 8:20	by Kate Buckley
Analyte		Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
SM 10200-H								
Method: Chlorophyll		Batch ID: 269011		Prepared: 06	/02/21 00:00			Analyst: MMP
Chlorophy	/II a	9.9	1.0	1.0	mg/M3	1	06/17/21	-



Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123		Project Number:	1915100	403 LECL TME	DL Monitoring	Reported 06/21/2021 13:27		
		Project Manager:	John Ruc	dolph				
Sa	mple Results Enthalpy Orange							(Continued)
Sample:	CL10- Surf 1F02089-08 (Water)					Sampled:	06/02/21 8:30	by Kate Buckley
Analyte		Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
SM 10200-H								
Method: Chlorophyll		Batch ID: 269011		Prepared: 06/	02/21 00:00			Analyst: MMP
Chlorophy	/II a	9.6	1.0	1.0	mg/M3	1	06/17/21	


# **Certificate of Analysis**

FINAL REPORT

Wood - San I 9177 Sky Par	Diego rk Court, Ste A	Project Number:	1915100	403 LECL TM	DL Monitoring	Reported: 06/21/2021 13:27				
San Diego, C	A 92123	Project Manager:	John Ruo	dolph						
Sa	mple Results Enthalpy Orange							(Continued)		
Sample:	LE02- Int 1F02089-09 (Water)					Sampled:	: 06/02/21 9:25	by Kate Buckley		
Analyte		Result	MDL	MRL	Units	Dil	Analyzed	Qualifier		
SM 10200-H										
Method: Chlo	prophyll	Batch ID: 269011		Prepared: 06/	/02/21 00:00			Analyst: MMP		
Chlorophy	ll a	150	1.0	1.0	mg/M3	1	06/17/21			



# **Certificate of Analysis**

FINAL REPORT

Wood - San 9177 Sky Pa	Diego ark Court, Ste A	Project Number:	19151004	403 LECL TME	DL Monitoring	<b>Reported</b> 06/21/2021 13:27				
San Diego, (	CA 92123	Project Manager:	John Ruc	lolph						
Sa	ample Results Enthalpy Orange							(Continued)		
Sample:	LE02- Surf 1F02089-10 (Water)					Sampled:	06/02/21 10:25	by Kate Buckley		
Analyte		Result	MDL	MRL	Units	Dil	Analyzed	Qualifier		
SM 10200-H										
Method: Chl	orophyll	Batch ID: 269011		Prepared: 06/	/02/21 00:00			Analyst: MMP		
Chlorophy	/II a		1.0	1.0	mg/M3	1	06/17/21			



Wood - San Diego 9177 Sky Park Court, Ste A San Diego, CA 92123

# **Certificate of Analysis**

FINAL REPORT

Project Number: 1915100403 LECL TMDL Monitoring

Reported: 06/21/2021 13:27

Project Manager: John Rudolph

## Notes and Definitions

ltem	Definition
%REC	Percent Recovery
Dil	Dilution
MDL	Method Detection Limit
MRL	The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ)

Any remaining sample(s) will be disposed of one month from the final report date unless other arrangements are made in advance.

All results are expressed on wet weight basis unless otherwise specified.

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.

# Chain of Custody & Sample Information Record

- 4

Client: Wood E&I Solutions, Inc	c	Contact:	John Rudolph					Phone No.	858-243-8158
FAX No.		Email:	john.rudolph@v	oodplc.c	com				Additional Reporting Requests
Project Name: LECL TMDL Mo Project Number: 1915100403	nitoring	Turn Arc	Turn Around Time: <u>Routine</u>				*48 Hour Rush	FAX Results: No Email Results: No State EDT: No (Include Source Number in Notes)	
Sampler Informat	ion	# o & F	f Containers Preservatives	S	ample Type	Analyeis	Requested	Matrix	Notos
Name: KAYC BUC	Kley			tainers		223.2)	A 200.7)	DW = Drinking Water WW = Wastewater	Ortho-P is field filtered (0.45 um)
Employer: Wood E&I Solut	ions, Inc.		tate	Con		(EPA 3	350.1) US (EF PA 36 M4500 M4500 (EPA	GW = Groundwater	Dissolved Al is field filtered (0.45 um)
Signature: KAEB	pucklag	preserved SO4 D3	25203 DH DH/ZnAce 4CI AA Zen	tal # of outine	sample ecial	ate - Nitrite (SM2540 C I (EPA 351.2	nonia (EPA Il Phosphor /Ortho-P (E Il Sulfide (S Il AL (EPA 2 solved AL	S = Soil SG = Sludge L = Liquid	
Sample ID	Date Tim		NHU NAC	L R	Sp Re TSS	T TDS	Tota Tota Dis:	M = Miscellaneous	
CL07	6221 1100	5			x	xxx	x x x x x x x		
CL08	1 1019	5			x	xxx	x		
CL09	09	5			x	xxx	xxxxxx	. 1	
CL10	\ D8	10			x	xxx	××××××	i	
LE02	1/ 09:	\$				xxx	xxxx		· · · · · · · · · · · · · · · · · · ·
									·····
								1	1
								 I	
								· · · · · · · · · · · · · · · · · · ·	
Relinquished By (sign)	Print Name / Co	ompany	Date / Time		D 28	eceived By	(Sign)	Prin	t Name / Company
	Dorthavine Harn	in/wood	6/2/21 13:5	37	tetu	ia Ci	Euis	· .	
helding a Eren 1	in	6/02/21 3.0		Taril	was ed	olu 1500			
	<u>.</u>	- <b>- 1</b> 97				1			
· · · · · · · · · · · · · · · · · · ·			· · · · · · · · · · · · · · · · · · ·						
(For Lab Use Only) Sample In	ntegrity Upon Recei	ot				Lab No	tes		

or Lab Use Only)	Sample Integrity	Upon Re	ceipt			Lab Notes				
Sample(s) S	ubmitted on Ice?	Yes	No		Temperature		Lab No.			
Custo	dy Seal(s) Intact?	Yes	No	N/A	4, °C					
· · · · · · · · · · · · · · · · · · ·	Sample(s) Intact?	Yes	No		$\Box Cooler Blank$			Page	_ of	

17 p10 89	Phone No. 858-243-8158	Additional Reporting Requests Include QC Data Package: Tres I no	tour *24 Hour Email Results:e no	Ish Rush State EDT: ☐ ∞ No *Additional Charges May Apply (Include Source Number in Notes)	ted Matrix Notes	DW = Drinking Water	WW = Wastewater Chi-a samples on 0.7 um GFF GW = Groundwater	rophyll-a S = Soil S G = Sludge	C L - Liquid C M = Miscellaneous	Filter Volume:	Filter Volume:	Filter Volume: SNM	Filter Volume: SO MC	Filter Volume: 500 MC	Fitter Volume: SO M	Filter Volume: 500 M V	Filter Volume: SOML	Filter Volume: 249mC	Filter Volume: JSD MU	Print Name / Company		TCO.7			Lab No.	
		oodplc.com	Routine *3-5 Day *48 ⊢	By: By:	Sample Type Analysis Reques	iners	SUNC BJUOC	o fo fo fo all # of ( bo bo bo bo bo bo bo bo bo bo bo bo bo	Tot Ree Spaar Tota Trku Amn TRKU Spaar Spaar Trku Spaar Spaar Treas											C Received By (Sign)	3 Noticia CEm	00 FUNAJAWAN CORDE		Lab Notes	ure °C or3y	
	Contact: John Rudolph	Email: john.rudolph@w	Turn Around Time:	*Lab TAT Approval:	# of Containers & Preservatives	· · · · · · · · · · · · · · · · · · ·		eserved 04 5203 H/ZnAcet H ZnAcet F	Unp HCI Na2 Na0 Na0 Na0 Na0 Na0 Na0 Na0					-						npany Date / Time	in [was 6212] 135	in lebelar 3.			N/A Temperation N/A	
	s, Inc.		- Monitoring	03	rmation	BUCKLEY	Solutions, Inc.	4 Micklun	Date Time	10/2/11/05	1 1130		1035	Del	D-13C	1280	083	2260	A 1025	Print Name / Cor	Catherine Horn	Letrue En	- 5	ple Integrity Upon Receip	ed on Ice? Yes No (s) Intact? Yes No (s) Intact? Yes No	
	Client: Wood E&I Solution	FAX No.	Project Name: LECL TMDI	Project Number: 19151004	Sampler Info	Name: KQAR	Employer: Wood E&I S	Signature:	Sample ID	CL07 - Int	CL07 - Surf	CL08 - Int	CL08 - Surf	CL09 - Int	CL09 - Surf	CL10 - Int	CL10 - Surf	LE02 - Int	LE02 - Surf	Relinquished By (sign)	S	Letter a Guen		(For Lab Use Only) Sam	Sample(s) Submitt Custody Seal Sample	

Chain of Custody & Sample Information Record

•

**Delivery Report** 

# Water Quality Monitoring Lake Elsinore & Canyon Lake

Date: 2020-08-07

Client: Wood Plc

Delivery no.: 2370\_Delivery\_EOMAP2WoodPlc\_Vs1\_20200807

Authors:	Mail:	Telephone:
Philip Klinger	klinger@eomap.de	+49 8152 9986 115
Karin Schenk	schenk@eomap.de	+49 8152 9986 112



# CONTENT

1.	SERV	ICE PROVISION REPORT
LIST	OF AL	L DELIVERED SCENES
CON	TENT.	
LIST	OF DE	LIVERED FILES (ONE PRODUCT EXAMPLE)
FILE	NAMI	NG4
NOT	ES (E.C	G. TECHNICAL ISSUES, EXCEPTIONAL CONDITIONS, ETC.)4
2.	METH	HODOLOGY AND PRODUCTS
2.	1	Modular Inversion and Processing System (MIP)
2.	2	Products
2.	3	QUALITY CONTROL AND FLAGGING
2.	4	DATA FORMAT
2.	5	DATA SOURCES
CON	TACT.	

# 1. Service Provision Report

Contractor Details	Service Provider Details
Wood Environment & Infrastructure Solutions, Inc.	EOMAP GmbH & Co. KG
9210 Sky Park Court, Suite 200	Schlosshof 4, 82229 Seefeld, Germany
San Diego, CA 92123, USA	
Point of Contact	Point of Contact
John D. Rudolph	Philip Klinger
john.rudolph@woodplc.com	klinger@eomap.de, +49 (0)8152 9986115

Contractor PO / Reference number	
Contractor project title	
Service Provider reference number	2370
Date of delivery	2020-08-07
Version	1

#### List of all delivered scenes

Sensor	Time of record
Landsat-8	2020-07-28 18:22:29 UTC

#### Content

Product	Abbreviation	Yes/No
Total Absorption	ABS	
Aerosol Optical Thickness	AOT	
Yellow Substances	CDM	
Chlorophyll-a	CHL	$\square$
Ratio of Absorption and Scattering	DIV	
Harmful Algae Bloom Indicator	НАВ	$\square$
Diffuse Attenuation Coefficient	KDC	
Quality Coding	QUC	$\boxtimes$
Total Quality	QUT	$\square$
True Color/False Color Composite	RGB	$\square$
Remote Sensing Reflectance	RRS	
Secchi Disc Depth	SDD	
Sum of Inorganic Absorption	SIA	
Sum if Organic Absorption	SOA	
Surface Temperature	SST	
Turbidity	TUR	$\boxtimes$
Trophic State Index (Chlorophyll)	TSC	
Total Suspended Matter	TSM	
Light Penetration Depth	Z90	
Water Body Extent	WEX	

### List of delivered files (one product example)

File name	File format	Content
2370_Delivery_EOMAP2WoodPlc_Vs1_20200807.pdf	PDF	Delivery Report
CHL_us-california_040037_EOMAP_20200728_182229_LSAT8_m0030.tif	GeoTIFF	Product raster file, 8bit scaled and coloured
CHL_us-california_040037_EOMAP_20200728_182229_LSAT8_m0030_32bit.tif	GeoTIFF	Product raster file, 32bit real values
CHL_us-california_040037_EO-	ASCII	Product text file, real values
MAP_20200728_182229_LSAT8_m0030_wgs84_xyz.txt		
CHL_us-california_040037_EOMAP_20200728_182229_LSAT8_m0030.kmz	KMZ	GoogleEarth overlay
CHL_us-california_040037_EO-	XML	Metadata
MAP_20200728_182229_LSAT8_m0030_metadata.xml		
CHL us-california 040037 EOMAP 20200728 182229 LSAT8 m0030 overview.pdf	PDF	Overview PDF, metadata and guicklook



#### File naming

[Product abbreviation]\_[Country code]-[Area]\_EOMAP\_[Date of satellite image recording]\_[Time of satellite image recording]\_[sensor code]\_[spatial resolution]\_[optional]

see list of product abbreviations
Country ID following ISO 3166 ALPHA-2 standards
name of city/region or other relevant area characterization
Satellite image date used for the analysis in YYMMDD (YY= Year, MM = Month, DD = Date) in UTC
Satellite image date used for the analysis in HHMMSS (HH= Hours, MM = Minute, SS = Seconds) in UTC
time
Sensor in use
Spatial resolution/grid spacing in meters
is an optional parameter which can is used to support the intuitive use of the data, such as 'metadata' or 'XYZQ' for metadata files and ASCII XYZQ files.

#### Notes (e.g. technical issues, exceptional conditions, etc.)

Data Analyst Philip Uli-y

Philip Klinger

QA/QC

Karin Schenk



# 2. Methodology and Products

# 2.1 Modular Inversion and Processing System (MIP)

For the retrieval of satellite-derived water quality data, the physics-based Modular Inversion and Processing System (MIP), developed by EOMAP, has been applied to the satellite imagery. This sensor-independent approach includes all the relevant processing steps to guarantee a robust, standardised and operational retrieval of water quality parameters from various satellite data sources. The advantage of physics-based methods is that they do not require a priori information about the study area and can therefore be applied independently of satellite type and study area.

MIP imbeds sensor-independent algorithms and processing modules to derive consistent water quality parameters for multiple scales through a number of different satellite sensors. The algorithms take all relevant environmental impacts into account and do so for each individual measurement and pixel according to the current state-of-the-art, including:

- a. water, land, cloud identification
- b. estimation and correction of atmosphere and aerosol impacts<sup>1 2</sup>
- c. correction altitude level impacts<sup>3</sup>
- d. correction of adjacency impact (light scattering into the water signal from adjacent land surfaces)<sup>4</sup>
- e. correction<sup>5</sup> or flagging<sup>6</sup> of sunglitter impact
- f. retrieval of in-water absorption and scattering as physical measures<sup>7</sup>
- g. accounting for varying spectral slopes of specific inherent optical properties<sup>8</sup>
- h. provision of uncertainty measures and flagging procedures
- i. accounting for the full bidirectional effects in the atmosphere, at the water-atmosphere boundary layers and in-water, using a fully coupled radiative transfer model
- j. application of procedures to minimize errors, resulting from the coupled interaction of light between atmosphere, water surface and in-water on the signal, through coupled inversion procedures

The different workflow steps from satellite raw imagery import to value-added water quality retrieval are displayed in Figure 1.

<sup>&</sup>lt;sup>8</sup> Heege T., Schenk K., Klinger P., Broszeit A., Wenzel J., Kiselev V. (2015): Monitoring status and trends of water quality in inland waters using earth observation technologies. Proceedings "Water Quality in Europe: Challenges and Best Practice" UNESCO-IHP European Regional Consultation Workshop, Koblenz, Germany, Dec 2015, p. 1-4



<sup>&</sup>lt;sup>1</sup> Heege, T., Kiselev, V., Wettle, M., Hung N.N. (2014): Operational multi-sensor monitoring of turbidity for the entire Mekong Delta . Int. J. Remote Sensing, Special Issues Remote Sensing of the Mekong, Vol. 35 (8), pp. 2910-2926

<sup>&</sup>lt;sup>2</sup> Richter, R., Heege, T., Kiselev, V., Schläpfer, D. (2014): Correction of ozone influence on TOA radiance. Int. J. of Remote Sensing. Vol. 35(23), pp. 8044-8056, doi: 10.1080/01431161.2014.978041

<sup>&</sup>lt;sup>3</sup> Heege, T., Fischer, J. (2004): Mapping of water constituents in Lake Constance using multispectral airborne scanner data and a physically based processing scheme. Can. J. Remote Sensing, Vol. 30, No. 1, pp. 77-86

<sup>&</sup>lt;sup>4</sup> Kiselev, V., Bulgarelli, B. and Heege, T., (2015). Sensor independent adjacency correction algorithm for coastal and inland water systems. Remote Sensing of Environment, 157: 85-95. , ISSN 0034-4257, <u>http://dx.doi.org/10.1016/j.rse.2014.07.025</u>

 <sup>&</sup>lt;sup>5</sup> Heege, T. & Fischer, J. (2000): Sun glitter correction in remote sensing imaging spectrometry. SPIE Ocean Optics XV Conference, Monaco, Oct. 16-20.
 <sup>6</sup> EU FP7-Projekt GLASS: WP4 Validation report (29.2.2016): <u>www.glass-project.eu/assets/Deliverables/GLaSS-D4.2.pdf</u>

<sup>&</sup>lt;sup>7</sup> Bumberger J., Heege T., Klinger P., et al. (2017): Towards a Harmonized Validation Procedure for Inland Water Optical Remote Sensing Data using Inherent Optical Properties, Rem. Sens. 2017(9), 21p, submitted 28 Feb. 2017



Figure 1: EOMAP's physics-based workflow to derive satellite-based water quality

MIP is the most established, sensor-independent and operational aquatic remote sensing processing system for the full range of high, medium and low-resolution satellite sensors. Fully-automated water monitoring processors are installed in satellite ground segments worldwide (Europe, Australia, Asia and America), to ensure fast and efficient access to a wide range of satellite data. The data processing and orchestration software, the EOMAP Workflow System (EWS) allows for continuous, daily production.



# 2.2 Products

**Turbidity** (TUR) is a key parameter of water quality and is linearly related to the backward scattering of light of organic and inorganic particles in water. Turbidity is also linearly related to Total Suspended Matter (TSM) at low to moderate turbidity values. The measurement unit is Nephelometric Turbidity Unit (NTU). Satellite-derived turbidity is determined by the backward scattering of light between 450 to 800nm, which is physically retrieved using satellite data. The standard relation of EOMAP concentrations to inherent optical properties is defined as 1 NTU = 0.0118 1/m backward scattering at 550nm, or 1 NTU = 0.619 1/m total scattering at 550nm for an assumed ratio bb/b = 0.019. The linear relation between turbidity and suspended matter/solids in low to moderate concentrations is in most cases a regional constant, but can vary with particle size distribution. Note that the geometrical properties of an in-situ measurement device, and the wavelength in use, may differ in comparison to the satellite product. For example, the standard FTU determination, a measure of turbidity similar to NTU, is based on the measurement of light scattered within a 90° angle from a beam directed at the water sample. Alongside temporal differences in satellite and in situ measurements, different sampling depths and the measurement location, this needs to be considered when comparing and interpreting satellite derived vs. in situ measured turbidity values. The Turbidity product from 2020-07-28 is shown in Figure 2.





**Chlorophyll-a** (CHL) retrieval is based on the derived information of in-water organic absorption, in-water turbidity and spectral characteristics of each water body. Chlorophyll-a in [ $\mu$ g/l], is provided as a measure linearly related to the pigment-specific absorption at 440nm, with 1  $\mu$ g/l Chl equal to 0.035 1/m pigment absorption. Phaeophytin and further pigments cannot be discriminated methodologically with the spectral resolution provided by Landsat 8/Sentinel-2 and similar sensors and is therefore included in this product. The pigment-related absorption is always smaller than the absorption of organic components (SOA). For clear water condi-



tions (low chlorophyll/total suspended solids), the specific absorption chlorophyll increases significantly (Bricaud et al. 1995<sup>9</sup>). Chlorophyll values can vary over 4 magnitudes, for marine waters or clear lakes typical concentrations between 0.01 and 10  $\mu$ g/l, while for eutrophic lakes concentrations can reach 100  $\mu$ g/l and more. The chlorophyll products are typically reliable within a range of 10 – 50 % in comparison to in situ measures (Broszeit 2015<sup>10</sup>), which are typically based on one of three different methods, which include photometric, fluorescence and HPLC approaches and their subcategories. The Chlorophyll-a product from 2020-07-28 is shown in Figure 3.





The Harmful Algae Bloom Indicator (HAB) refers to the presence of cyanobacteria. It is sensitive to the appearance of cyanobacteria-related pigments, i.e. phycocyanin and phycoerythrin. Both pigments show absorption features in green wavelengths from 500 nm to approx. 640 nm; phycoerythrin shows its absorption maximum at 540-570 nm, phycocyanin at 610-620 (Colyer et al. 2005). Most satellite sensors support the identification of this feature with only two bands, i.e. one in the green wavelength region (e.g. L7 and L8 at 530 – 590 nm) and in the red wavelength region at approx. 640 – 670 nm. The used standard parameterisation of phytoplankton absorption in MIP as described above, however, does not account phycocyanin and phycoerythrin absorption in the retrieval process. The modelled phytoplankton absorption therefore lacks the absorption features of these pigments. Nonetheless, if these pigments are present in the water a slight spectral mismatch between modelled water leaving reflectance (R<sub>modelled</sub>) and satellite derived reflectance (R<sub>satellite</sub>) occurs. The algorithm then compares the slope of R<sub>modelled</sub> and R<sub>satellite</sub> between the green and red band ( $\delta R = R_{green} - R_{red}$ ) in order to classify pixels with regard to phycocyanin and phycoerythrin occurrence, i.e. harmful algae bloom probability. The HAB indicator from 2020-07-28 is shown in Figure 4.

<sup>&</sup>lt;sup>10</sup> Broszeit, A., 2015. Assessing long-term inland water quality using satellite imagery: A Feasibility and validation study of different lake types. MSc Thesis, Julius-Maximilian-University Würzburg, 96p



<sup>&</sup>lt;sup>9</sup> Bricaud, A., Babin, M., Morel, A., Claustre, H. (1995): Variability in the chlorophyll-specific absorption coefficients of natural phytoplankton: Analysis and parametrization. Journal of Geophysical Research Atmospheres, 100(C7):13,321-13,332

<section-header>

Figure 4: Harmful Algae Bloom Indicator product from 2020-07-28

**RGB** composite images represent the area of interest in true colour or false colour modes by combining predefined bands, depending on the sensor in use.



# 2.3 Quality Control and Flagging

As a standard output of the processing, an accuracy or quality indicator is calculated for each retrieved parameter and for each detected water pixel. This measure comprises a comprehensive range of factors that can impact the derived product quality, including:

- the geometry between sun, target, and sensor,
- the estimated sun glint probability,
- the retrieved aerosol optical depth,
- residuals of the measured and modelled sensor radiances and subsurface reflectances,
- the comparison of retrieved water species concentrations to extreme values as defined in the configuration files,
- pixels affected by cloud shadow and
- shallow water areas.

Threshold values define distinct values when a parameter is assumed to influence the quality. All parameters are integrated into one remaining quality parameter, allowing both an improved flagging and a quality weighting of pixels, that can later be merged into integrated 3rd level products.

The quality information is part of each standard geodata delivery and is visualized by two different 8bit Geo-TIFFs:

- QUT Total Quality, quantifying the overall quality of each pixel from low to high. Only valid water pixels excluding land, cloud or flagged pixels are represented in QUT indicator (Figure 5).
- QUC EOMAP Quality coding (Figure 6), revealing the processor's internal quality check, split into the defined indicators (e.g. sunglint, shallow water risk, etc.). These are classified into 'no quality concerns', 'quality risk and 'bad quality' (flag). Note that 'quality risk' pixels are marked as such but not flagged.



Figure 5: QUT product from 2020-07-28



EOMAP Quality Coding QUC 2020-07-28 18:22:29 UTC Landsat-8 Lake Elsinore & Canyon Lake



Figure 6: QUC product from 2020-07-28

The QUC file indicates the main quality influencing parameter using a specific EOMAP quality coding classification scheme with corresponding grey values (GV), shown in Figure 7.

Professional v	ersion allo	w combinatio	n of the two	most relevant flags:		1
First number =	most rele	vant flag				1
1-digit-numbe	er refer to	second releva	nt flag, e.g. 1	for sunglint risk, 2 for large solar zenith angle		
Examples:	2	5 Warning flag	g for large zer	nit solar angle and Whitecaps		1
	11	4 Critical flag	for sunglint,	olus warning for aerosol above limits		
	GV	GV range	Flag status	Flag description	Color code	Color
	0	0	Water	No risk identified	000	
	10	10 - 19	Warning	sunglint risk	148 138 84	
	20	20 - 29	Warning	large solar zenith angle	83 141 213	
	30	30 - 39	Warning	large spacecraft zenith angle	218 150 148	
	40	40 - 49	Warning	Aerosol above limit or Cirrus risk	196 215 155	
	50	50 - 59	Warning	Cloud Shadow	177 160 199	
	60	60 - 69	Warning	Shallow water risk	146 205 220	
	70	70 - 79	Warning	Mixed pixel risk	250 191 143	
	80	80 - 89	Warning	Retrieved concentration at configuration limit	190 190 190	
	90	90 - 99	Warning	Retrieval / processor warning	210 210 210	
	110	110 - 119	Critical	sunglint risk	73 69 41	
	120	120 - 129	Critical	large solar zenith angle	22 54 92	
	130	130 - 139	Critical	large spacecraft zenith angle	150 54 52	
	140	140 - 149	Critical	Aerosol above limit or Cirrus risk	118 147 60	
	150	150 - 159	Critical	Cloud Shadow	96 73 122	
	160	160 - 169	Critical	Shallow water risk	49 134 155	
	170	170 - 179	Critical	Mixed pixel risk	226 107 10	
	180	180 - 189	Critical	Retrieved concentration at configuration limit	120 120 120	
	190	190 - 199	Critical	Retrieval / processor warning	130 130 130	
	220	220	No value	Transition Zone	102 255 51	
	221	221	Unreliable	Shallow water automatically	146 205 220	
	222	222	Unreliable	Shallow water manually	60 159 186	
	223	223	Unreliable	Floating material	32 95 107	
	230	230	No water	Land	102 255 51	
	232	232	Unreliable	Invalid pixel manually	255 192 0	
	240	240	No water	Cloud	255 255 255	
	242	242	Unreliable	Cloud Shadow manually	96 73 122	
	244	244	Unreliable	Hill shadow	73 57 93	
	250	250	No retrieva	No retrieval / out of AOI or image extend	255 0 0	

Figure 7: EOMAP QUC quality coding



EOMAP's water quality products are accompanied by the processor's internal quality control mechanisms QUT and QUC, resulting in pixel flagging in case of unreliable values. Moreover, a manual quality check and - if required - additional masking is applied to each product.

As an example, cloud shadow effects typically occur in the vicinity of clouds, resulting in unrealistically low water parameter values. In order to detect and flag these areas, EOMAP has developed a specific algorithm based on geometric models, considering the sun angle and sensor viewing geometry, the retrieved aerosol properties, the height of the clouds, an analysis of the blue channel radiances and a statistical anomaly detection of the water species concentrations. When applying this cloud shadow detection algorithm, approx. 85% of the cloud shadows are detected and masked. Remaining cloud shadows are manually flagged and can be identified in the QUC file by GV 242.

Due to the spatial extent of single pixels (Sentinel-2: 10\*10m, Landsat 8: 30\*30m), it is likely that spectral mixing of signals from land and water can affect the pixels along the edge of the water body, leading to unreliable retrieval of water parameter values. Such pixels are labelled with the quality flag 'transition zone'. EO-MAP uses a high-resolution land-water-mask database to determine the land-water-boundary, which is then filtered to create a transition zone that is automatically flagged during processing. In the 8bit water constituent products the transition zone is marked by GV 251, whereas in the QUC product it is 220.

# 2.4 Data Format

The water quality data is delivered as 32bit real value GeoTIFF as well as 8bit scaled and colored GeoTIFF for easier visualization. The colours currently used are a suggestion/standard, but can be changed according to client specific request. In addition, metadata is stored in the .xml and the metadata .pdf files.

# 2.5 Data Sources

EOMAP uses the following data hubs to access and download satellite raw data from different sensors:

- Sentinel-3: PEPS https://peps.cnes.fr
- Landsat-8 Amazon Web Services, https://landsat-pds.s3.amazonaws.com
- Sentinel-2: ESA Sentinel HUB https://scihub.copernicus.eu/dhus/#/home
- MODIS Aqua and Terra: USGS https://earthexplorer.usgs.gov/



#### Contact

Head Office	EOMAP GmbH & Co. KG, Schlosshof 4, 82229 Seefeld, Germany
Postal Address	EOMAP GmbH & Co. KG, Schlosshof 4, 82229 Seefeld, Germany
Phone	+49 (0)8152 99861 10
Fax	+49 (0)8152 99861 29
Email	info@eomap.com
Website	www.eomap.com

© EOMAP GmbH & Co. KG August 2020

Disclaimer: This document contains confidential information that is intended only for the use by EOMAP's Client. It is not for public circulation or publication or to be used by any third party without the express permission of either the Client or EOMAP GmbH & Co. KG. The concepts and information contained in this document are the property of EOMAP GmbH & Co. KG. Use or copying of this document in whole or in part without the written permission of EOMAP GmbH & Co. KG constitutes an infringement of copyright.

While the findings presented in this report are based on information that EOMAP GmbH & Co. KG considers reliable unless stated otherwise, the accuracy and completeness of source information cannot be guaranteed. Furthermore, the information compiled in this report addresses the specific needs of the client, so may not address the needs of third parties using this report for their own purposes. Thus, EOMAP GmbH & Co. KG and its employees accept no liability for any losses or damage for any action taken or not taken on the basis of any part of the contents of this report. Those acting on information provided in this report do so entirely at their own risk.



**Delivery Report** 

# Water Quality Monitoring Lake Elsinore & Canyon Lake

Date: 2020-08-18

Client: Wood Plc

Delivery no.: 2370\_Delivery\_EOMAP2WoodPlc\_Vs2\_20200818

Authors:	Mail:	Telephone:
Philip Klinger	klinger@eomap.de	+49 8152 9986 115
Karin Schenk	schenk@eomap.de	+49 8152 9986 112



# CONTENT

1.	SERV	ICE PROVISION REPORT
LIST	OF AL	L DELIVERED SCENES
CON	TENT.	
LIST	OF DE	LIVERED FILES (ONE PRODUCT EXAMPLE)
FILE	NAMI	NG4
NOT	ES (E.0	G. TECHNICAL ISSUES, EXCEPTIONAL CONDITIONS, ETC.)4
2.	METI	HODOLOGY AND PRODUCTS
2.	1	MODULAR INVERSION AND PROCESSING SYSTEM (MIP)
2.	2	Products
2.	3	QUALITY CONTROL AND FLAGGING
2.	4	DATA FORMAT12
2.	5	DATA SOURCES
CON	TACT.	



# 1. Service Provision Report

Contractor Details	Service Provider Details
Wood Environment & Infrastructure Solutions, Inc.	EOMAP GmbH & Co. KG
9210 Sky Park Court, Suite 200	Schlosshof 4, 82229 Seefeld, Germany
San Diego, CA 92123, USA	
Point of Contact	Point of Contact
John D. Rudolph	Philip Klinger
john.rudolph@woodplc.com	klinger@eomap.de, +49 (0)8152 9986115

Contractor PO / Reference number	
Contractor project title	
Service Provider reference number	2370
Date of delivery	2020-08-18
Version	2

#### List of all delivered scenes

Sensor	Time of record
Sentinel-2B	2020-08-11 18:45:02 UTC

#### Content

Product	Abbreviation	Yes/No
Total Absorption	ABS	
Aerosol Optical Thickness	AOT	
Yellow Substances	CDM	
Chlorophyll-a	CHL	$\boxtimes$
Ratio of Absorption and Scattering	DIV	
Harmful Algae Bloom Indicator	НАВ	$\boxtimes$
Diffuse Attenuation Coefficient	KDC	
Quality Coding	QUC	$\boxtimes$
Total Quality	QUT	$\boxtimes$
True Color/False Color Composite	RGB	$\boxtimes$
Remote Sensing Reflectance	RRS	
Secchi Disc Depth	SDD	
Sum of Inorganic Absorption	SIA	
Sum if Organic Absorption	SOA	
Surface Temperature	SST	
Turbidity	TUR	$\boxtimes$
Trophic State Index (Chlorophyll)	TSC	
Total Suspended Matter	TSM	
Light Penetration Depth	Z90	
Water Body Extent	WEX	

### List of delivered files (one product example)

File name	File format	Content
2370_Delivery_EOMAP2WoodPlc_Vs2_20200818.pdf	PDF	Delivery Report
CHL_us-california_11smt_EOMAP_20200811_184502_SENT2_m0010.tif	GeoTIFF	Product raster file, 8bit scaled and coloured
CHL_us-california_11smt_EOMAP_20200811_184502_SENT2_m0010_32bit.tif	GeoTIFF	Product raster file, 32bit real values
CHL_us-california_11smt_EO-	ASCII	Product text file, real values
MAP_20200811_184502_SENT2_m0010_wgs84_xyz.txt		
CHL_us-california_11smt_EOMAP_20200811_184502_SENT2_m0010.kmz	KMZ	GoogleEarth overlay
CHL_us-california_11smt_EOMAP_20200811_184502_SENT2_m0010_metadata.xml	XML	Metadata
CHL_us-california_11smt_EOMAP_20200811_184502_SENT2_m0010_overview.pdf	PDF	Overview PDF, metadata and quicklook



#### File naming

[Product abbreviation]\_[Country code]-[Area]\_EOMAP\_[Date of satellite image recording]\_[Time of satellite image recording]\_[sensor code]\_[spatial resolution]\_[optional]

see list of product abbreviations
Country ID following ISO 3166 ALPHA-2 standards
name of city/region or other relevant area characterization
Satellite image date used for the analysis in YYMMDD (YY= Year, MM = Month, DD = Date) in UTC
Satellite image date used for the analysis in HHMMSS (HH= Hours, MM = Minute, SS = Seconds) in UTC
time
Sensor in use
Spatial resolution/grid spacing in meters
is an optional parameter which can is used to support the intuitive use of the data, such as 'metadata' or 'XYZQ' for metadata files and ASCII XYZQ files.

#### Notes (e.g. technical issues, exceptional conditions, etc.)

- Sunglint on both lakes was flagged locally and might have an impact on retrieved results

Data Analyst Philip Uli-y

Philip Klinger

QA/QC

Karin Schenk



# 2. Methodology and Products

# 2.1 Modular Inversion and Processing System (MIP)

For the retrieval of satellite-derived water quality data, the physics-based Modular Inversion and Processing System (MIP), developed by EOMAP, has been applied to the satellite imagery. This sensor-independent approach includes all the relevant processing steps to guarantee a robust, standardised and operational retrieval of water quality parameters from various satellite data sources. The advantage of physics-based methods is that they do not require a priori information about the study area and can therefore be applied independently of satellite type and study area.

MIP imbeds sensor-independent algorithms and processing modules to derive consistent water quality parameters for multiple scales through a number of different satellite sensors. The algorithms take all relevant environmental impacts into account and do so for each individual measurement and pixel according to the current state-of-the-art, including:

- a. water, land, cloud identification
- b. estimation and correction of atmosphere and aerosol impacts<sup>1 2</sup>
- c. correction altitude level impacts<sup>3</sup>
- d. correction of adjacency impact (light scattering into the water signal from adjacent land surfaces)<sup>4</sup>
- e. correction<sup>5</sup> or flagging<sup>6</sup> of sunglitter impact
- f. retrieval of in-water absorption and scattering as physical measures<sup>7</sup>
- g. accounting for varying spectral slopes of specific inherent optical properties<sup>8</sup>
- h. provision of uncertainty measures and flagging procedures
- i. accounting for the full bidirectional effects in the atmosphere, at the water-atmosphere boundary layers and in-water, using a fully coupled radiative transfer model
- j. application of procedures to minimize errors, resulting from the coupled interaction of light between atmosphere, water surface and in-water on the signal, through coupled inversion procedures

The different workflow steps from satellite raw imagery import to value-added water quality retrieval are displayed in Figure 1.

<sup>&</sup>lt;sup>8</sup> Heege T., Schenk K., Klinger P., Broszeit A., Wenzel J., Kiselev V. (2015): Monitoring status and trends of water quality in inland waters using earth observation technologies. Proceedings "Water Quality in Europe: Challenges and Best Practice" UNESCO-IHP European Regional Consultation Workshop, Koblenz, Germany, Dec 2015, p. 1-4



<sup>&</sup>lt;sup>1</sup> Heege, T., Kiselev, V., Wettle, M., Hung N.N. (2014): Operational multi-sensor monitoring of turbidity for the entire Mekong Delta . Int. J. Remote Sensing, Special Issues Remote Sensing of the Mekong, Vol. 35 (8), pp. 2910-2926

<sup>&</sup>lt;sup>2</sup> Richter, R., Heege, T., Kiselev, V., Schläpfer, D. (2014): Correction of ozone influence on TOA radiance. Int. J. of Remote Sensing. Vol. 35(23), pp. 8044-8056, doi: 10.1080/01431161.2014.978041

<sup>&</sup>lt;sup>3</sup> Heege, T., Fischer, J. (2004): Mapping of water constituents in Lake Constance using multispectral airborne scanner data and a physically based processing scheme. Can. J. Remote Sensing, Vol. 30, No. 1, pp. 77-86

<sup>&</sup>lt;sup>4</sup> Kiselev, V., Bulgarelli, B. and Heege, T., (2015). Sensor independent adjacency correction algorithm for coastal and inland water systems. Remote Sensing of Environment, 157: 85-95. , ISSN 0034-4257, <u>http://dx.doi.org/10.1016/j.rse.2014.07.025</u>

 <sup>&</sup>lt;sup>5</sup> Heege, T. & Fischer, J. (2000): Sun glitter correction in remote sensing imaging spectrometry. SPIE Ocean Optics XV Conference, Monaco, Oct. 16-20.
 <sup>6</sup> EU FP7-Projekt GLASS: WP4 Validation report (29.2.2016): <u>www.glass-project.eu/assets/Deliverables/GLaSS-D4.2.pdf</u>

<sup>&</sup>lt;sup>7</sup> Bumberger J., Heege T., Klinger P., et al. (2017): Towards a Harmonized Validation Procedure for Inland Water Optical Remote Sensing Data using Inherent Optical Properties, Rem. Sens. 2017(9), 21p, submitted 28 Feb. 2017



Figure 1: EOMAP's physics-based workflow to derive satellite-based water quality

MIP is the most established, sensor-independent and operational aquatic remote sensing processing system for the full range of high, medium and low-resolution satellite sensors. Fully-automated water monitoring processors are installed in satellite ground segments worldwide (Europe, Australia, Asia and America), to ensure fast and efficient access to a wide range of satellite data. The data processing and orchestration software, the EOMAP Workflow System (EWS) allows for continuous, daily production.



# 2.2 Products

**Turbidity** (TUR) is a key parameter of water quality and is linearly related to the backward scattering of light of organic and inorganic particles in water. Turbidity is also linearly related to Total Suspended Matter (TSM) at low to moderate turbidity values. The measurement unit is Nephelometric Turbidity Unit (NTU). Satellite-derived turbidity is determined by the backward scattering of light between 450 to 800nm, which is physically retrieved using satellite data. The standard relation of EOMAP concentrations to inherent optical properties is defined as 1 NTU = 0.0118 1/m backward scattering at 550nm, or 1 NTU = 0.619 1/m total scattering at 550nm for an assumed ratio bb/b = 0.019. The linear relation between turbidity and suspended matter/solids in low to moderate concentrations is in most cases a regional constant, but can vary with particle size distribution. Note that the geometrical properties of an in-situ measurement device, and the wavelength in use, may differ in comparison to the satellite product. For example, the standard FTU determination, a measure of turbidity similar to NTU, is based on the measurement of light scattered within a 90° angle from a beam directed at the water sample. Alongside temporal differences in satellite and in situ measurements, different sampling depths and the measurement location, this needs to be considered when comparing and interpreting satellite derived vs. in situ measured turbidity values. The Turbidity product from 2020-08-11 is shown in Figure 2.





**Chlorophyll-a** (CHL) retrieval is based on the derived information of in-water organic absorption, in-water turbidity and spectral characteristics of each water body. Chlorophyll-a in [ $\mu$ g/l], is provided as a measure linearly related to the pigment-specific absorption at 440nm, with 1  $\mu$ g/l Chl equal to 0.035 1/m pigment absorption. Phaeophytin and further pigments cannot be discriminated methodologically with the spectral resolution provided by Landsat 8/Sentinel-2 and similar sensors and is therefore included in this product. The pigment-related absorption is always smaller than the absorption of organic components (SOA). For clear water condi-



tions (low chlorophyll/total suspended solids), the specific absorption chlorophyll increases significantly (Bricaud et al. 1995<sup>9</sup>). Chlorophyll values can vary over 4 magnitudes, for marine waters or clear lakes typical concentrations between 0.01 and 10  $\mu$ g/l, while for eutrophic lakes concentrations can reach 100  $\mu$ g/l and more. The chlorophyll products are typically reliable within a range of 10 – 50 % in comparison to in situ measures (Broszeit 2015<sup>10</sup>), which are typically based on one of three different methods, which include photometric, fluorescence and HPLC approaches and their subcategories. The Chlorophyll-a product from 2020-08-11 is shown in Figure 3.



Figure 3: Chlorophyll-a product from 2020-08-11

The Harmful Algae Bloom Indicator (HAB) refers to the presence of cyanobacteria. It is sensitive to the appearance of cyanobacteria-related pigments, i.e. phycocyanin and phycoerythrin. Both pigments show absorption features in green wavelengths from 500 nm to approx. 640 nm; phycoerythrin shows its absorption maximum at 540-570 nm, phycocyanin at 610-620 (Colyer et al. 2005). Most satellite sensors support the identification of this feature with only two bands, i.e. one in the green wavelength region (e.g. L7 and L8 at 530 – 590 nm) and in the red wavelength region at approx. 640 – 670 nm. The used standard parameterisation of phytoplankton absorption in MIP as described above, however, does not account phycocyanin and phycoerythrin absorption in the retrieval process. The modelled phytoplankton absorption therefore lacks the absorption features of these pigments. Nonetheless, if these pigments are present in the water a slight spectral mismatch between modelled water leaving reflectance (R<sub>modelled</sub>) and satellite derived reflectance (R<sub>satellite</sub>) occurs. The algorithm then compares the slope of R<sub>modelled</sub> and R<sub>satellite</sub> between the green and red band ( $\delta R = R_{green} - R_{red}$ ) in order to classify pixels with regard to phycocyanin and phycoerythrin occurrence, i.e. harmful algae bloom probability. The HAB indicator from 2020-08-11 is shown in Figure 4.

<sup>&</sup>lt;sup>10</sup> Broszeit, A., 2015. Assessing long-term inland water quality using satellite imagery: A Feasibility and validation study of different lake types. MSc Thesis, Julius-Maximilian-University Würzburg, 96p



<sup>&</sup>lt;sup>9</sup> Bricaud, A., Babin, M., Morel, A., Claustre, H. (1995): Variability in the chlorophyll-specific absorption coefficients of natural phytoplankton: Analysis and parametrization. Journal of Geophysical Research Atmospheres, 100(C7):13,321-13,332

<section-header>

Figure 4: Harmful Algae Bloom Indicator product from 2020-08-11

**RGB** composite images represent the area of interest in true colour or false colour modes by combining predefined bands, depending on the sensor in use.



# 2.3 Quality Control and Flagging

As a standard output of the processing, an accuracy or quality indicator is calculated for each retrieved parameter and for each detected water pixel. This measure comprises a comprehensive range of factors that can impact the derived product quality, including:

- the geometry between sun, target, and sensor,
- the estimated sun glint probability,
- the retrieved aerosol optical depth,
- residuals of the measured and modelled sensor radiances and subsurface reflectances,
- the comparison of retrieved water species concentrations to extreme values as defined in the configuration files,
- pixels affected by cloud shadow and
- shallow water areas.

Threshold values define distinct values when a parameter is assumed to influence the quality. All parameters are integrated into one remaining quality parameter, allowing both an improved flagging and a quality weighting of pixels, that can later be merged into integrated 3rd level products.

The quality information is part of each standard geodata delivery and is visualized by two different 8bit Geo-TIFFs:

- QUT Total Quality, quantifying the overall quality of each pixel from low to high. Only valid water pixels excluding land, cloud or flagged pixels are represented in QUT indicator (Figure 5).
- QUC EOMAP Quality coding (Figure 6), revealing the processor's internal quality check, split into the defined indicators (e.g. sunglint, shallow water risk, etc.). These are classified into 'no quality concerns', 'quality risk and 'bad quality' (flag). Note that 'quality risk' pixels are marked as such but not flagged.



Figure 5: QUT product from 2020-08-11



EOMAP Quality Coding QUC 2020-08-11 18:45:02 UTC Sentinel-2B Lake Elsinore & Canyon Lake



Figure 6: QUC product from 2020-08-11

The QUC file indicates the main quality influencing parameter using a specific EOMAP quality coding classification scheme with corresponding grey values (GV), shown in Figure 7.

Professional v	ersion allo	w combinatio	on of the two	most relevant flags:		
First number =	most rele	vant flag	in or the thro	inost telefunctings:		
1-digit-numbe	r refer to	second releva	nt flag, e.g. 1	for sunglint risk, 2 for large solar zenith angle		
Examples:	2	5 Warning flag	g for large zer	nit solar angle and Whitecaps		1
	114	4 Critical flag	for sunglint, p	olus warning for aerosol above limits		
	GV	GV range	Flag status	Flag description	Color code	Color
	0	0	Water	No risk identified	000	
	10	10 - 19	Warning	sunglint risk	148 138 84	
	20	20 - 29	Warning	large solar zenith angle	83 141 213	
	30	30 - 39	Warning	large spacecraft zenith angle	218 150 148	
	40	40 - 49	Warning	Aerosol above limit or Cirrus risk	196 215 155	
	50	50 - 59	Warning	Cloud Shadow	177 160 199	
	60	60 - 69	Warning	Shallow water risk	146 205 220	
	70	70 - 79	Warning	Mixed pixel risk	250 191 143	
	80	80 - 89	Warning	Retrieved concentration at configuration limit	190 190 190	
	90	90 - 99	Warning	Retrieval / processor warning	210 210 210	
	110	110 - 119	Critical	sunglint risk	73 69 41	
	120	120 - 129	Critical	large solar zenith angle	22 54 92	
	130	130 - 139	Critical	large spacecraft zenith angle	150 54 52	
	140	140 - 149	Critical	Aerosol above limit or Cirrus risk	118 147 60	
	150	150 - 159	Critical	Cloud Shadow	96 73 122	
	160	160 - 169	Critical	Shallow water risk	49 134 155	
	170	170 - 179	Critical	Mixed pixel risk	226 107 10	
	180	180 - 189	Critical	Retrieved concentration at configuration limit	120 120 120	
	190	190 - 199	Critical	Retrieval / processor warning	130 130 130	
	220	220	No value	Transition Zone	102 255 51	
	221	221	Unreliable	Shallow water automatically	146 205 220	
	222	222	Unreliable	Shallow water manually	60 159 186	
	223	223	Unreliable	Floating material	32 95 107	
	230	230	No water	Land	102 255 51	
	232	232	Unreliable	Invalid pixel manually	255 192 0	
	240	240	No water	Cloud	255 255 255	
	242	242	Unreliable	Cloud Shadow manually	96 73 122	
	244	244	Unreliable	Hill shadow	73 57 93	
	250	250	No retrieva	No retrieval / out of AOI or image extend	255 0 0	

Figure 7: EOMAP QUC quality coding



EOMAP's water quality products are accompanied by the processor's internal quality control mechanisms QUT and QUC, resulting in pixel flagging in case of unreliable values. Moreover, a manual quality check and - if required - additional masking is applied to each product.

As an example, cloud shadow effects typically occur in the vicinity of clouds, resulting in unrealistically low water parameter values. In order to detect and flag these areas, EOMAP has developed a specific algorithm based on geometric models, considering the sun angle and sensor viewing geometry, the retrieved aerosol properties, the height of the clouds, an analysis of the blue channel radiances and a statistical anomaly detection of the water species concentrations. When applying this cloud shadow detection algorithm, approx. 85% of the cloud shadows are detected and masked. Remaining cloud shadows are manually flagged and can be identified in the QUC file by GV 242.

Due to the spatial extent of single pixels (Sentinel-2: 10\*10m, Landsat 8: 30\*30m), it is likely that spectral mixing of signals from land and water can affect the pixels along the edge of the water body, leading to unreliable retrieval of water parameter values. Such pixels are labelled with the quality flag 'transition zone'. EO-MAP uses a high-resolution land-water-mask database to determine the land-water-boundary, which is then filtered to create a transition zone that is automatically flagged during processing. In the 8bit water constituent products the transition zone is marked by GV 251, whereas in the QUC product it is 220.

# 2.4 Data Format

The water quality data is delivered as 32bit real value GeoTIFF as well as 8bit scaled and colored GeoTIFF for easier visualization. The colours currently used are a suggestion/standard, but can be changed according to client specific request. In addition, metadata is stored in the .xml and the metadata .pdf files.

# 2.5 Data Sources

EOMAP uses the following data hubs to access and download satellite raw data from different sensors:

- Sentinel-3: PEPS https://peps.cnes.fr
- Landsat-8 Amazon Web Services, https://landsat-pds.s3.amazonaws.com
- Sentinel-2: ESA Sentinel HUB https://scihub.copernicus.eu/dhus/#/home
- MODIS Aqua and Terra: USGS https://earthexplorer.usgs.gov/



#### Contact

Head Office	EOMAP GmbH & Co. KG, Schlosshof 4, 82229 Seefeld, Germany
Postal Address	EOMAP GmbH & Co. KG, Schlosshof 4, 82229 Seefeld, Germany
Phone	+49 (0)8152 99861 10
Fax	+49 (0)8152 99861 29
Email	info@eomap.com
Website	www.eomap.com

© EOMAP GmbH & Co. KG August 2020

Disclaimer: This document contains confidential information that is intended only for the use by EOMAP's Client. It is not for public circulation or publication or to be used by any third party without the express permission of either the Client or EOMAP GmbH & Co. KG. The concepts and information contained in this document are the property of EOMAP GmbH & Co. KG. Use or copying of this document in whole or in part without the written permission of EOMAP GmbH & Co. KG constitutes an infringement of copyright.

While the findings presented in this report are based on information that EOMAP GmbH & Co. KG considers reliable unless stated otherwise, the accuracy and completeness of source information cannot be guaranteed. Furthermore, the information compiled in this report addresses the specific needs of the client, so may not address the needs of third parties using this report for their own purposes. Thus, EOMAP GmbH & Co. KG and its employees accept no liability for any losses or damage for any action taken or not taken on the basis of any part of the contents of this report. Those acting on information provided in this report do so entirely at their own risk.



**Delivery Report** 

# Water Quality Monitoring Lake Elsinore & Canyon Lake

Date: 2020-09-22

Client: Wood Plc

Delivery no.: 2370\_Delivery\_EOMAP2WoodPlc\_Vs3\_20200922

Authors:	Mail:	Telephone:
Philip Klinger	klinger@eomap.de	+49 8152 9986 115
Karin Schenk	schenk@eomap.de	+49 8152 9986 112



# CONTENT

1.	SERV	ICE PROVISION REPORT
LIST	OF AL	L DELIVERED SCENES
CON	TENT.	
LIST	OF DE	LIVERED FILES (ONE PRODUCT EXAMPLE)
FILE	NAMI	NG4
NOTI	ES (E.0	G. TECHNICAL ISSUES, EXCEPTIONAL CONDITIONS, ETC.)4
2.	METI	HODOLOGY AND PRODUCTS
2.	1	MODULAR INVERSION AND PROCESSING SYSTEM (MIP)
2.	2	Products
2.	3	QUALITY CONTROL AND FLAGGING
2.	4	DATA FORMAT12
2.	5	DATA SOURCES
CON	TACT.	



# 1. Service Provision Report

Contractor Details	Service Provider Details		
Wood Environment & Infrastructure Solutions, Inc.	EOMAP GmbH & Co. KG		
9210 Sky Park Court, Suite 200	Schlosshof 4, 82229 Seefeld, Germany		
San Diego, CA 92123, USA			
Point of Contact	Point of Contact		
John D. Rudolph	Philip Klinger		
john.rudolph@woodplc.com	klinger@eomap.de, +49 (0)8152 9986115		

Contractor PO / Reference number	
Contractor project title	
Service Provider reference number	2370
Date of delivery	2020-09-22
Version	3

#### List of all delivered scenes

Sensor	Time of record
Sentinel-2B	2020-09-20 18:45:01 UTC

#### Content

Product	Abbreviation	Yes/No
Total Absorption	ABS	
Aerosol Optical Thickness	AOT	
Yellow Substances	CDM	
Chlorophyll-a	CHL	$\boxtimes$
Ratio of Absorption and Scattering	DIV	
Harmful Algae Bloom Indicator	НАВ	$\boxtimes$
Diffuse Attenuation Coefficient	KDC	
Quality Coding	QUC	$\boxtimes$
Total Quality	QUT	$\boxtimes$
True Color/False Color Composite	RGB	$\boxtimes$
Remote Sensing Reflectance	RRS	
Secchi Disc Depth	SDD	
Sum of Inorganic Absorption	SIA	
Sum if Organic Absorption	SOA	
Surface Temperature	SST	
Turbidity	TUR	$\boxtimes$
Trophic State Index (Chlorophyll)	TSC	
Total Suspended Matter	TSM	
Light Penetration Depth	Z90	
Water Body Extent	WEX	

### List of delivered files (one product example)

File name	File format	Content
2370_Delivery_EOMAP2WoodPlc_Vs3_20200922.pdf	PDF	Delivery Report
CHL_us-california_11smt_EOMAP_20200920_184501_SENT2_m0010.tif	GeoTIFF	Product raster file, 8bit scaled and coloured
CHL_us-california_11smt_EOMAP_20200920_184501_SENT2_m0010_32bit.tif	GeoTIFF	Product raster file, 32bit real values
CHL_us-california_11smt_EO-		Product text file, real values
MAP_20200920_184501_SENT2_m0010_wgs84_xyz.txt		
CHL_us-california_11smt_EOMAP_20200920_184501_SENT2_m0010.kmz	KMZ	GoogleEarth overlay
CHL_us-california_11smt_EOMAP_20200920_184501_SENT2_m0010_metadata.xml	XML	Metadata
CHL_us-california_11smt_EOMAP_20200920_184501_SENT2_m0010_overview.pdf	PDF	Overview PDF, metadata and quicklook



#### File naming

[Product abbreviation]\_[Country code]-[Area]\_EOMAP\_[Date of satellite image recording]\_[Time of satellite image recording]\_[sensor code]\_[spatial resolution]\_[optional]

W	ith	
[Pr	odı	ict

[Product abbreviation]	see list of product abbreviations
[Country code]	Country ID following ISO 3166 ALPHA-2 standards
[Area]	name of city/region or other relevant area characterization
[Date of satellite image rec.]	Satellite image date used for the analysis in YYMMDD (YY= Year, MM = Month, DD = Date) in UTC
[Time of satellite image rec.]	Satellite image date used for the analysis in HHMMSS (HH= Hours, MM = Minute, SS = Seconds) in UTC
	time
[sensor code]	Sensor in use
[spatial resolution]	Spatial resolution/grid spacing in meters
[optional]	is an optional parameter which can is used to support the intuitive use of the data, such as 'metadata' or 'XYZQ' for metadata files and ASCII XYZQ files.

#### Notes (e.g. technical issues, exceptional conditions, etc.)

Data Analyst

Philip Vili-y

Philip Klinger



Karin Schenk



# 2. Methodology and Products

# 2.1 Modular Inversion and Processing System (MIP)

For the retrieval of satellite-derived water quality data, the physics-based Modular Inversion and Processing System (MIP), developed by EOMAP, has been applied to the satellite imagery. This sensor-independent approach includes all the relevant processing steps to guarantee a robust, standardised and operational retrieval of water quality parameters from various satellite data sources. The advantage of physics-based methods is that they do not require a priori information about the study area and can therefore be applied independently of satellite type and study area.

MIP imbeds sensor-independent algorithms and processing modules to derive consistent water quality parameters for multiple scales through a number of different satellite sensors. The algorithms take all relevant environmental impacts into account and do so for each individual measurement and pixel according to the current state-of-the-art, including:

- a. water, land, cloud identification
- b. estimation and correction of atmosphere and aerosol impacts<sup>1 2</sup>
- c. correction altitude level impacts<sup>3</sup>
- d. correction of adjacency impact (light scattering into the water signal from adjacent land surfaces)<sup>4</sup>
- e. correction<sup>5</sup> or flagging<sup>6</sup> of sunglitter impact
- f. retrieval of in-water absorption and scattering as physical measures<sup>7</sup>
- g. accounting for varying spectral slopes of specific inherent optical properties<sup>8</sup>
- h. provision of uncertainty measures and flagging procedures
- i. accounting for the full bidirectional effects in the atmosphere, at the water-atmosphere boundary layers and in-water, using a fully coupled radiative transfer model
- j. application of procedures to minimize errors, resulting from the coupled interaction of light between atmosphere, water surface and in-water on the signal, through coupled inversion procedures

The different workflow steps from satellite raw imagery import to value-added water quality retrieval are displayed in Figure 1.

<sup>&</sup>lt;sup>8</sup> Heege T., Schenk K., Klinger P., Broszeit A., Wenzel J., Kiselev V. (2015): Monitoring status and trends of water quality in inland waters using earth observation technologies. Proceedings "Water Quality in Europe: Challenges and Best Practice" UNESCO-IHP European Regional Consultation Workshop, Koblenz, Germany, Dec 2015, p. 1-4



<sup>&</sup>lt;sup>1</sup> Heege, T., Kiselev, V., Wettle, M., Hung N.N. (2014): Operational multi-sensor monitoring of turbidity for the entire Mekong Delta . Int. J. Remote Sensing, Special Issues Remote Sensing of the Mekong, Vol. 35 (8), pp. 2910-2926

<sup>&</sup>lt;sup>2</sup> Richter, R., Heege, T., Kiselev, V., Schläpfer, D. (2014): Correction of ozone influence on TOA radiance. Int. J. of Remote Sensing. Vol. 35(23), pp. 8044-8056, doi: 10.1080/01431161.2014.978041

<sup>&</sup>lt;sup>3</sup> Heege, T., Fischer, J. (2004): Mapping of water constituents in Lake Constance using multispectral airborne scanner data and a physically based processing scheme. Can. J. Remote Sensing, Vol. 30, No. 1, pp. 77-86

<sup>&</sup>lt;sup>4</sup> Kiselev, V., Bulgarelli, B. and Heege, T., (2015). Sensor independent adjacency correction algorithm for coastal and inland water systems. Remote Sensing of Environment, 157: 85-95. , ISSN 0034-4257, <u>http://dx.doi.org/10.1016/j.rse.2014.07.025</u>

 <sup>&</sup>lt;sup>5</sup> Heege, T. & Fischer, J. (2000): Sun glitter correction in remote sensing imaging spectrometry. SPIE Ocean Optics XV Conference, Monaco, Oct. 16-20.
 <sup>6</sup> EU FP7-Projekt GLASS: WP4 Validation report (29.2.2016): <u>www.glass-project.eu/assets/Deliverables/GLaSS-D4.2.pdf</u>

<sup>&</sup>lt;sup>7</sup> Bumberger J., Heege T., Klinger P., et al. (2017): Towards a Harmonized Validation Procedure for Inland Water Optical Remote Sensing Data using Inherent Optical Properties, Rem. Sens. 2017(9), 21p, submitted 28 Feb. 2017


Figure 1: EOMAP's physics-based workflow to derive satellite-based water quality

MIP is the most established, sensor-independent and operational aquatic remote sensing processing system for the full range of high, medium and low-resolution satellite sensors. Fully-automated water monitoring processors are installed in satellite ground segments worldwide (Europe, Australia, Asia and America), to ensure fast and efficient access to a wide range of satellite data. The data processing and orchestration software, the EOMAP Workflow System (EWS) allows for continuous, daily production.



### 2.2 Products

**Turbidity** (TUR) is a key parameter of water quality and is linearly related to the backward scattering of light of organic and inorganic particles in water. Turbidity is also linearly related to Total Suspended Matter (TSM) at low to moderate turbidity values. The measurement unit is Nephelometric Turbidity Unit (NTU). Satellite-derived turbidity is determined by the backward scattering of light between 450 to 800nm, which is physically retrieved using satellite data. The standard relation of EOMAP concentrations to inherent optical properties is defined as 1 NTU = 0.0118 1/m backward scattering at 550nm, or 1 NTU = 0.619 1/m total scattering at 550nm for an assumed ratio bb/b = 0.019. The linear relation between turbidity and suspended matter/solids in low to moderate concentrations is in most cases a regional constant, but can vary with particle size distribution. Note that the geometrical properties of an in-situ measurement device, and the wavelength in use, may differ in comparison to the satellite product. For example, the standard FTU determination, a measure of turbidity similar to NTU, is based on the measurement of light scattered within a 90° angle from a beam directed at the water sample. Alongside temporal differences in satellite and in situ measurements, different sampling depths and the measurement location, this needs to be considered when comparing and interpreting satellite derived vs. in situ measured turbidity values. The Turbidity product from 2020-09-20 is shown in Figure 2.





**Chlorophyll-a** (CHL) retrieval is based on the derived information of in-water organic absorption, in-water turbidity and spectral characteristics of each water body. Chlorophyll-a in [ $\mu$ g/l], is provided as a measure linearly related to the pigment-specific absorption at 440nm, with 1  $\mu$ g/l Chl equal to 0.035 1/m pigment absorption. Phaeophytin and further pigments cannot be discriminated methodologically with the spectral resolution provided by Landsat 8/Sentinel-2 and similar sensors and is therefore included in this product. The pigment-related absorption is always smaller than the absorption of organic components (SOA). For clear water condi-



tions (low chlorophyll/total suspended solids), the specific absorption chlorophyll increases significantly (Bricaud et al. 1995<sup>9</sup>). Chlorophyll values can vary over 4 magnitudes, for marine waters or clear lakes typical concentrations between 0.01 and 10  $\mu$ g/l, while for eutrophic lakes concentrations can reach 100  $\mu$ g/l and more. The chlorophyll products are typically reliable within a range of 10 – 50 % in comparison to in situ measures (Broszeit 2015<sup>10</sup>), which are typically based on one of three different methods, which include photometric, fluorescence and HPLC approaches and their subcategories. The Chlorophyll-a product from 2020-09-20 is shown in Figure 3.



Figure 3: Chlorophyll-a product from 2020-09-20

The Harmful Algae Bloom Indicator (HAB) refers to the presence of cyanobacteria. It is sensitive to the appearance of cyanobacteria-related pigments, i.e. phycocyanin and phycoerythrin. Both pigments show absorption features in green wavelengths from 500 nm to approx. 640 nm; phycoerythrin shows its absorption maximum at 540-570 nm, phycocyanin at 610-620 (Colyer et al. 2005). Most satellite sensors support the identification of this feature with only two bands, i.e. one in the green wavelength region (e.g. L7 and L8 at 530 – 590 nm) and in the red wavelength region at approx. 640 – 670 nm. The used standard parameterisation of phytoplankton absorption in MIP as described above, however, does not account phycocyanin and phycoerythrin absorption in the retrieval process. The modelled phytoplankton absorption therefore lacks the absorption features of these pigments. Nonetheless, if these pigments are present in the water a slight spectral mismatch between modelled water leaving reflectance (R<sub>modelled</sub>) and satellite derived reflectance (R<sub>satellite</sub>) occurs. The algorithm then compares the slope of R<sub>modelled</sub> and R<sub>satellite</sub> between the green and red band ( $\delta R = R_{green} - R_{red}$ ) in order to classify pixels with regard to phycocyanin and phycoerythrin occurrence, i.e. harmful algae bloom probability. The HAB indicator from 2020-08-11 is shown in Figure 4.

<sup>&</sup>lt;sup>10</sup> Broszeit, A., 2015. Assessing long-term inland water quality using satellite imagery: A Feasibility and validation study of different lake types. MSc Thesis, Julius-Maximilian-University Würzburg, 96p



<sup>&</sup>lt;sup>9</sup> Bricaud, A., Babin, M., Morel, A., Claustre, H. (1995): Variability in the chlorophyll-specific absorption coefficients of natural phytoplankton: Analysis and parametrization. Journal of Geophysical Research Atmospheres, 100(C7):13,321-13,332

<section-header>

Figure 4: Harmful Algae Bloom Indicator product from 2020-09-20

**RGB** composite images represent the area of interest in true colour or false colour modes by combining predefined bands, depending on the sensor in use.



# 2.3 Quality Control and Flagging

As a standard output of the processing, an accuracy or quality indicator is calculated for each retrieved parameter and for each detected water pixel. This measure comprises a comprehensive range of factors that can impact the derived product quality, including:

- the geometry between sun, target, and sensor,
- the estimated sun glint probability,
- the retrieved aerosol optical depth,
- residuals of the measured and modelled sensor radiances and subsurface reflectances,
- the comparison of retrieved water species concentrations to extreme values as defined in the configuration files,
- pixels affected by cloud shadow and
- shallow water areas.

Threshold values define distinct values when a parameter is assumed to influence the quality. All parameters are integrated into one remaining quality parameter, allowing both an improved flagging and a quality weighting of pixels, that can later be merged into integrated 3rd level products.

The quality information is part of each standard geodata delivery and is visualized by two different 8bit Geo-TIFFs:

- QUT Total Quality, quantifying the overall quality of each pixel from low to high. Only valid water pixels excluding land, cloud or flagged pixels are represented in QUT indicator (Figure 5).
- QUC EOMAP Quality coding (Figure 6), revealing the processor's internal quality check, split into the defined indicators (e.g. sunglint, shallow water risk, etc.). These are classified into 'no quality concerns', 'quality risk and 'bad quality' (flag). Note that 'quality risk' pixels are marked as such but not flagged.



Figure 5: QUT product from 2020-09-20



EOMAP Quality Coding QUC 2020-09-20 18:45:01 UTC Sentinel-2B Lake Elsinore & Canyon Lake



Figure 6: QUC product from 2020-09-20

The QUC file indicates the main quality influencing parameter using a specific EOMAP quality coding classification scheme with corresponding grey values (GV), shown in Figure 7.

Professional v	ersion allo	ow combinatio	n of the two	most relevant flags:		
First number = most relevant flag					1	
1-digit-numbe	r refer to	second releva	nt flag, e.g. 1	for sunglint risk, 2 for large solar zenith angle		
Examples:	2	5 Warning flag	g for large zer	nit solar angle and Whitecaps		1
	11	4 Critical flag	for sunglint, p	olus warning for aerosol above limits		
	GV	GV range	Flag status	Flag description	Color code	Color
	0	0	Water	No risk identified	000	
	10	10 - 19	Warning	sunglint risk	148 138 84	
	20	20 - 29	Warning	large solar zenith angle	83 141 213	
	30	30 - 39	Warning	large spacecraft zenith angle	218 150 148	
	40	40 - 49	Warning	Aerosol above limit or Cirrus risk	196 215 155	
	50	50 - 59	Warning	Cloud Shadow	177 160 199	
	60	60 - 69	Warning	Shallow water risk	146 205 220	
	70	70 - 79	Warning	Mixed pixel risk	250 191 143	
	80	80 - 89	Warning	Retrieved concentration at configuration limit	190 190 190	
	90	90 - 99	Warning	Retrieval / processor warning	210 210 210	
	110	110 - 119	Critical	sunglint risk	73 69 41	
	120	120 - 129	Critical	large solar zenith angle	22 54 92	
	130	130 - 139	Critical	large spacecraft zenith angle	150 54 52	
	140	140 - 149	Critical	Aerosol above limit or Cirrus risk	118 147 60	
	150	150 - 159	Critical	Cloud Shadow	96 73 122	
	160	160 - 169	Critical	Shallow water risk	49 134 155	
	170	170 - 179	Critical	Mixed pixel risk	226 107 10	
	180	180 - 189	Critical	Retrieved concentration at configuration limit	120 120 120	
	190	190 - 199	Critical	Retrieval / processor warning	130 130 130	
	220	220	No value	Transition Zone	102 255 51	
	221	221	Unreliable	Shallow water automatically	146 205 220	
	222	222	Unreliable	Shallow water manually	60 159 186	
	223	223	Unreliable	Floating material	32 95 107	
	230	230	No water	Land	102 255 51	
	232	232	Unreliable	Invalid pixel manually	255 192 0	
	240	240	No water	Cloud	255 255 255	
	242	242	Unreliable	Cloud Shadow manually	96 73 122	
	244	244	Unreliable	Hill shadow	73 57 93	
	250	250	No retrieva	No retrieval / out of AOI or image extend	255 0 0	

Figure 7: EOMAP QUC quality coding



EOMAP's water quality products are accompanied by the processor's internal quality control mechanisms QUT and QUC, resulting in pixel flagging in case of unreliable values. Moreover, a manual quality check and - if required - additional masking is applied to each product.

As an example, cloud shadow effects typically occur in the vicinity of clouds, resulting in unrealistically low water parameter values. In order to detect and flag these areas, EOMAP has developed a specific algorithm based on geometric models, considering the sun angle and sensor viewing geometry, the retrieved aerosol properties, the height of the clouds, an analysis of the blue channel radiances and a statistical anomaly detection of the water species concentrations. When applying this cloud shadow detection algorithm, approx. 85% of the cloud shadows are detected and masked. Remaining cloud shadows are manually flagged and can be identified in the QUC file by GV 242.

Due to the spatial extent of single pixels (Sentinel-2: 10\*10m, Landsat 8: 30\*30m), it is likely that spectral mixing of signals from land and water can affect the pixels along the edge of the water body, leading to unreliable retrieval of water parameter values. Such pixels are labelled with the quality flag 'transition zone'. EO-MAP uses a high-resolution land-water-mask database to determine the land-water-boundary, which is then filtered to create a transition zone that is automatically flagged during processing. In the 8bit water constituent products the transition zone is marked by GV 251, whereas in the QUC product it is 220.

## 2.4 Data Format

The water quality data is delivered as 32bit real value GeoTIFF as well as 8bit scaled and colored GeoTIFF for easier visualization. The colours currently used are a suggestion/standard, but can be changed according to client specific request. In addition, metadata is stored in the .xml and the metadata .pdf files.

## 2.5 Data Sources

EOMAP uses the following data hubs to access and download satellite raw data from different sensors:

- Sentinel-3: PEPS https://peps.cnes.fr
- Landsat-8 Amazon Web Services, https://landsat-pds.s3.amazonaws.com
- Sentinel-2: ESA Sentinel HUB https://scihub.copernicus.eu/dhus/#/home
- MODIS Aqua and Terra: USGS https://earthexplorer.usgs.gov/



### Contact

Head Office	EOMAP GmbH & Co. KG, Schlosshof 4, 82229 Seefeld, Germany
Postal Address	EOMAP GmbH & Co. KG, Schlosshof 4, 82229 Seefeld, Germany
Phone	+49 (0)8152 99861 10
Fax	+49 (0)8152 99861 29
Email	info@eomap.com
Website	www.eomap.com

© EOMAP GmbH & Co. KG September 2020

Disclaimer: This document contains confidential information that is intended only for the use by EOMAP's Client. It is not for public circulation or publication or to be used by any third party without the express permission of either the Client or EOMAP GmbH & Co. KG. The concepts and information contained in this document are the property of EOMAP GmbH & Co. KG. Use or copying of this document in whole or in part without the written permission of EOMAP GmbH & Co. KG constitutes an infringement of copyright.

While the findings presented in this report are based on information that EOMAP GmbH & Co. KG considers reliable unless stated otherwise, the accuracy and completeness of source information cannot be guaranteed. Furthermore, the information compiled in this report addresses the specific needs of the client, so may not address the needs of third parties using this report for their own purposes. Thus, EOMAP GmbH & Co. KG and its employees accept no liability for any losses or damage for any action taken or not taken on the basis of any part of the contents of this report. Those acting on information provided in this report do so entirely at their own risk.



**Delivery Report** 

# Water Quality Monitoring Lake Elsinore & Canyon Lake

Date: 2020-11-0

Client: Wood Plc

Delivery no.: 2370\_Delivery\_EOMAP2WoodPlc\_Vs5\_20201105

Authors:	Mail:	Telephone:
Philip Klinger	klinger@eomap.de	+49 8152 9986 115
Karin Schenk	schenk@eomap.de	+49 8152 9986 112



### CONTENT

1.	SERV	RVICE PROVISION REPORT				
LIST	OF AL	L DELIVERED SCENES				
CON	TENT.					
LIST	OF DE	LIVERED FILES (ONE PRODUCT EXAMPLE)				
FILE	NAMI	NG4				
NOT	ES (E.0	G. TECHNICAL ISSUES, EXCEPTIONAL CONDITIONS, ETC.)4				
2.	METI	HODOLOGY AND PRODUCTS				
2.	1	MODULAR INVERSION AND PROCESSING SYSTEM (MIP)				
2.	2	Products				
2.	3	QUALITY CONTROL AND FLAGGING				
2.	4	DATA FORMAT12				
2.	5	DATA SOURCES				
CON	TACT.					



## 1. Service Provision Report

Contractor Details	Service Provider Details
Wood Environment & Infrastructure Solutions, Inc.	EOMAP GmbH & Co. KG
9210 Sky Park Court, Suite 200	Schlosshof 4, 82229 Seefeld, Germany
San Diego, CA 92123, USA	
Point of Contact	Point of Contact
John D. Rudolph	Philip Klinger
john.rudolph@woodplc.com	klinger@eomap.de, +49 (0)8152 9986115

Contractor PO / Reference number	
Contractor project title	
Service Provider reference number	2370
Date of delivery	2020-11-05
Version	4

### List of all delivered scenes

Sensor	Time of record
Sentinel-2B	2020-10-10 18:45:03 UTC

### Content

Product	Abbreviation	Yes/No
Total Absorption	ABS	
Aerosol Optical Thickness	AOT	
Yellow Substances	CDM	
Chlorophyll-a	CHL	$\boxtimes$
Ratio of Absorption and Scattering	DIV	
Harmful Algae Bloom Indicator	НАВ	$\boxtimes$
Diffuse Attenuation Coefficient	KDC	
Quality Coding	QUC	$\boxtimes$
Total Quality	QUT	$\boxtimes$
True Color/False Color Composite	RGB	$\boxtimes$
Remote Sensing Reflectance	RRS	
Secchi Disc Depth	SDD	
Sum of Inorganic Absorption	SIA	
Sum if Organic Absorption	SOA	
Surface Temperature	SST	
Turbidity	TUR	$\boxtimes$
Trophic State Index (Chlorophyll)	TSC	
Total Suspended Matter	TSM	
Light Penetration Depth	Z90	
Water Body Extent	WEX	

### List of delivered files (one product example)

File name	File format	Content
2370_Delivery_EOMAP2WoodPlc_Vs3_20200922.pdf	PDF	Delivery Report
CHL_us-california_11smt_EOMAP_20201010_184503_SENT2_m0010.tif	GeoTIFF	Product raster file, 8bit scaled and coloured
CHL_us-california_11smt_EOMAP_20201010_184503_SENT2_m0010_32bit.tif	GeoTIFF	Product raster file, 32bit real values
CHL_us-california_11smt_EO-	ASCII	Product text file, real values
MAP_20201010_184503_SENT2_m0010_wgs84_xyz.txt		
CHL_us-california_11smt_EOMAP_20201010_184503_SENT2_m0010.kmz	KMZ	GoogleEarth overlay
CHL_us-california_11smt_EOMAP_20201010_184503_SENT2_m0010_metadata.xml	XML	Metadata
CHL_us-california_11smt_EOMAP_20201010_184503_SENT2_m0010_overview.pdf	PDF	Overview PDF, metadata and quicklook



#### File naming

[Product abbreviation]\_[Country code]-[Area]\_EOMAP\_[Date of satellite image recording]\_[Time of satellite image recording]\_[sensor code]\_[spatial resolution]\_[optional]

With
[Product abbreviation]
[Country code]
[Area]
[Date of satellite image re
[Time of satellite image re

Country ID following ISO 3166 ALPHA-2 standards name of city/region or other relevant area characterization ec.] Satellite image date used for the analysis in YYMMDD (YY= Year, MM = Month, DD = Date) in UTC satellite image rec.] Satellite image date used for the analysis in HHMMSS (HH= Hours, MM = Minute, SS = Seconds) in UTC time [sensor code] Sensor in use [spatial resolution] Spatial resolution/grid spacing in meters is an optional parameter which can is used to support the intuitive use of the data, such as 'metadata' or 'XYZQ' for [optional] metadata files and ASCII XYZQ files.

### Notes (e.g. technical issues, exceptional conditions, etc.)

see list of product abbreviations

Data Analyst

Philip Vili-y

Philip Klinger



Karin Schenk



## 2. Methodology and Products

## 2.1 Modular Inversion and Processing System (MIP)

For the retrieval of satellite-derived water quality data, the physics-based Modular Inversion and Processing System (MIP), developed by EOMAP, has been applied to the satellite imagery. This sensor-independent approach includes all the relevant processing steps to guarantee a robust, standardised and operational retrieval of water quality parameters from various satellite data sources. The advantage of physics-based methods is that they do not require a priori information about the study area and can therefore be applied independently of satellite type and study area.

MIP imbeds sensor-independent algorithms and processing modules to derive consistent water quality parameters for multiple scales through a number of different satellite sensors. The algorithms take all relevant environmental impacts into account and do so for each individual measurement and pixel according to the current state-of-the-art, including:

- a. water, land, cloud identification
- b. estimation and correction of atmosphere and aerosol impacts<sup>1 2</sup>
- c. correction altitude level impacts<sup>3</sup>
- d. correction of adjacency impact (light scattering into the water signal from adjacent land surfaces)<sup>4</sup>
- e. correction<sup>5</sup> or flagging<sup>6</sup> of sunglitter impact
- f. retrieval of in-water absorption and scattering as physical measures<sup>7</sup>
- g. accounting for varying spectral slopes of specific inherent optical properties<sup>8</sup>
- h. provision of uncertainty measures and flagging procedures
- i. accounting for the full bidirectional effects in the atmosphere, at the water-atmosphere boundary layers and in-water, using a fully coupled radiative transfer model
- j. application of procedures to minimize errors, resulting from the coupled interaction of light between atmosphere, water surface and in-water on the signal, through coupled inversion procedures

The different workflow steps from satellite raw imagery import to value-added water quality retrieval are displayed in Figure 1.

<sup>&</sup>lt;sup>8</sup> Heege T., Schenk K., Klinger P., Broszeit A., Wenzel J., Kiselev V. (2015): Monitoring status and trends of water quality in inland waters using earth observation technologies. Proceedings "Water Quality in Europe: Challenges and Best Practice" UNESCO-IHP European Regional Consultation Workshop, Koblenz, Germany, Dec 2015, p. 1-4



<sup>&</sup>lt;sup>1</sup> Heege, T., Kiselev, V., Wettle, M., Hung N.N. (2014): Operational multi-sensor monitoring of turbidity for the entire Mekong Delta . Int. J. Remote Sensing, Special Issues Remote Sensing of the Mekong, Vol. 35 (8), pp. 2910-2926

<sup>&</sup>lt;sup>2</sup> Richter, R., Heege, T., Kiselev, V., Schläpfer, D. (2014): Correction of ozone influence on TOA radiance. Int. J. of Remote Sensing. Vol. 35(23), pp. 8044-8056, doi: 10.1080/01431161.2014.978041

<sup>&</sup>lt;sup>3</sup> Heege, T., Fischer, J. (2004): Mapping of water constituents in Lake Constance using multispectral airborne scanner data and a physically based processing scheme. Can. J. Remote Sensing, Vol. 30, No. 1, pp. 77-86

<sup>&</sup>lt;sup>4</sup> Kiselev, V., Bulgarelli, B. and Heege, T., (2015). Sensor independent adjacency correction algorithm for coastal and inland water systems. Remote Sensing of Environment, 157: 85-95. , ISSN 0034-4257, <u>http://dx.doi.org/10.1016/j.rse.2014.07.025</u>

 <sup>&</sup>lt;sup>5</sup> Heege, T. & Fischer, J. (2000): Sun glitter correction in remote sensing imaging spectrometry. SPIE Ocean Optics XV Conference, Monaco, Oct. 16-20.
<sup>6</sup> EU FP7-Projekt GLASS: WP4 Validation report (29.2.2016): <u>www.glass-project.eu/assets/Deliverables/GLaSS-D4.2.pdf</u>

<sup>&</sup>lt;sup>7</sup> Bumberger J., Heege T., Klinger P., et al. (2017): Towards a Harmonized Validation Procedure for Inland Water Optical Remote Sensing Data using Inherent Optical Properties, Rem. Sens. 2017(9), 21p, submitted 28 Feb. 2017



Figure 1: EOMAP's physics-based workflow to derive satellite-based water quality

MIP is the most established, sensor-independent and operational aquatic remote sensing processing system for the full range of high, medium and low-resolution satellite sensors. Fully-automated water monitoring processors are installed in satellite ground segments worldwide (Europe, Australia, Asia and America), to ensure fast and efficient access to a wide range of satellite data. The data processing and orchestration software, the EOMAP Workflow System (EWS) allows for continuous, daily production.



### 2.2 Products

**Turbidity** (TUR) is a key parameter of water quality and is linearly related to the backward scattering of light of organic and inorganic particles in water. Turbidity is also linearly related to Total Suspended Matter (TSM) at low to moderate turbidity values. The measurement unit is Nephelometric Turbidity Unit (NTU). Satellite-derived turbidity is determined by the backward scattering of light between 450 to 800nm, which is physically retrieved using satellite data. The standard relation of EOMAP concentrations to inherent optical properties is defined as 1 NTU = 0.0118 1/m backward scattering at 550nm, or 1 NTU = 0.619 1/m total scattering at 550nm for an assumed ratio bb/b = 0.019. The linear relation between turbidity and suspended matter/solids in low to moderate concentrations is in most cases a regional constant, but can vary with particle size distribution. Note that the geometrical properties of an in-situ measurement device, and the wavelength in use, may differ in comparison to the satellite product. For example, the standard FTU determination, a measure of turbidity similar to NTU, is based on the measurement of light scattered within a 90° angle from a beam directed at the water sample. Alongside temporal differences in satellite and in situ measurements, different sampling depths and the measurement location, this needs to be considered when comparing and interpreting satellite derived vs. in situ measured turbidity values. The Turbidity product from 2020-10-10 is shown in Figure 2.





**Chlorophyll-a** (CHL) retrieval is based on the derived information of in-water organic absorption, in-water turbidity and spectral characteristics of each water body. Chlorophyll-a in [ $\mu$ g/l], is provided as a measure linearly related to the pigment-specific absorption at 440nm, with 1  $\mu$ g/l Chl equal to 0.035 1/m pigment absorption. Phaeophytin and further pigments cannot be discriminated methodologically with the spectral resolution provided by Landsat 8/Sentinel-2 and similar sensors and is therefore included in this product. The pigment-related absorption is always smaller than the absorption of organic components (SOA). For clear water condi-



tions (low chlorophyll/total suspended solids), the specific absorption chlorophyll increases significantly (Bricaud et al. 1995<sup>9</sup>). Chlorophyll values can vary over 4 magnitudes, for marine waters or clear lakes typical concentrations between 0.01 and 10  $\mu$ g/l, while for eutrophic lakes concentrations can reach 100  $\mu$ g/l and more. The chlorophyll products are typically reliable within a range of 10 – 50 % in comparison to in situ measures (Broszeit 2015<sup>10</sup>), which are typically based on one of three different methods, which include photometric, fluorescence and HPLC approaches and their subcategories. The Chlorophyll-a product from 2020-10-10 is shown in Figure 3.



Figure 3: Chlorophyll-a product from 2020-10-10

The Harmful Algae Bloom Indicator (HAB) refers to the presence of cyanobacteria. It is sensitive to the appearance of cyanobacteria-related pigments, i.e. phycocyanin and phycoerythrin. Both pigments show absorption features in green wavelengths from 500 nm to approx. 640 nm; phycoerythrin shows its absorption maximum at 540-570 nm, phycocyanin at 610-620 (Colyer et al. 2005). Most satellite sensors support the identification of this feature with only two bands, i.e. one in the green wavelength region (e.g. L7 and L8 at 530 – 590 nm) and in the red wavelength region at approx. 640 – 670 nm. The used standard parameterisation of phytoplankton absorption in MIP as described above, however, does not account phycocyanin and phycoerythrin absorption in the retrieval process. The modelled phytoplankton absorption therefore lacks the absorption features of these pigments. Nonetheless, if these pigments are present in the water a slight spectral mismatch between modelled water leaving reflectance (R<sub>modelled</sub>) and satellite derived reflectance (R<sub>satellite</sub>) occurs. The algorithm then compares the slope of R<sub>modelled</sub> and R<sub>satellite</sub> between the green and red band ( $\delta R = R_{green} - R_{red}$ ) in order to classify pixels with regard to phycocyanin and phycoerythrin occurrence, i.e. harmful algae bloom probability. The HAB indicator from 2020-10-10 is shown in Figure 4.

<sup>&</sup>lt;sup>10</sup> Broszeit, A., 2015. Assessing long-term inland water quality using satellite imagery: A Feasibility and validation study of different lake types. MSc Thesis, Julius-Maximilian-University Würzburg, 96p



<sup>&</sup>lt;sup>9</sup> Bricaud, A., Babin, M., Morel, A., Claustre, H. (1995): Variability in the chlorophyll-specific absorption coefficients of natural phytoplankton: Analysis and parametrization. Journal of Geophysical Research Atmospheres, 100(C7):13,321-13,332

<section-header>

Figure 4: Harmful Algae Bloom Indicator product from 2020-10-10

**RGB** composite images represent the area of interest in true colour or false colour modes by combining predefined bands, depending on the sensor in use.



# 2.3 Quality Control and Flagging

As a standard output of the processing, an accuracy or quality indicator is calculated for each retrieved parameter and for each detected water pixel. This measure comprises a comprehensive range of factors that can impact the derived product quality, including:

- the geometry between sun, target, and sensor,
- the estimated sun glint probability,
- the retrieved aerosol optical depth,
- residuals of the measured and modelled sensor radiances and subsurface reflectances,
- the comparison of retrieved water species concentrations to extreme values as defined in the configuration files,
- pixels affected by cloud shadow and
- shallow water areas.

Threshold values define distinct values when a parameter is assumed to influence the quality. All parameters are integrated into one remaining quality parameter, allowing both an improved flagging and a quality weighting of pixels, that can later be merged into integrated 3rd level products.

The quality information is part of each standard geodata delivery and is visualized by two different 8bit Geo-TIFFs:

- QUT Total Quality, quantifying the overall quality of each pixel from low to high. Only valid water pixels excluding land, cloud or flagged pixels are represented in QUT indicator (Figure 5).
- QUC EOMAP Quality coding (Figure 6), revealing the processor's internal quality check, split into the defined indicators (e.g. sunglint, shallow water risk, etc.). These are classified into 'no quality concerns', 'quality risk and 'bad quality' (flag). Note that 'quality risk' pixels are marked as such but not flagged.



Figure 5: QUT product from 2020-10-10



EOMAP Quality Coding QUC 2020-10-10 18:45:03 UTC Sentinel-2B Lake Elsinore & Canyon Lake



Figure 6: QUC product from 2020-10-10

The QUC file indicates the main quality influencing parameter using a specific EOMAP quality coding classification scheme with corresponding grey values (GV), shown in Figure 7.

Professional v	ersion all	ow combinatio	n of the two	most relevant flags:		
First number = most relevant flag					1	
1-digit-numbe	er refer to	second releva	nt flag, e.g. 1	for sunglint risk, 2 for large solar zenith angle		
Examples:	2	5 Warning flag	g for large zer	nit solar angle and Whitecaps		1
	11	4 Critical flag	for sunglint, p	olus warning for aerosol above limits		
	GV	GV range	Flag status	Flag description	Color code	Color
	0	0	Water	No risk identified	000	
	10	10 - 19	Warning	sunglint risk	148 138 84	
	20	20 - 29	Warning	large solar zenith angle	83 141 213	
	30	30 - 39	Warning	large spacecraft zenith angle	218 150 148	
	40	40 - 49	Warning	Aerosol above limit or Cirrus risk	196 215 155	
	50	50 - 59	Warning	Cloud Shadow	177 160 199	
	60	60 - 69	Warning	Shallow water risk	146 205 220	
	70	70 - 79	Warning	Mixed pixel risk	250 191 143	
	80	80 - 89	Warning	Retrieved concentration at configuration limit	190 190 190	
	90	90 - 99	Warning	Retrieval / processor warning	210 210 210	
	110	110 - 119	Critical	sunglint risk	73 69 41	
	120	120 - 129	Critical	large solar zenith angle	22 54 92	
	130	130 - 139	Critical	large spacecraft zenith angle	150 54 52	
	140	140 - 149	Critical	Aerosol above limit or Cirrus risk	118 147 60	
	150	150 - 159	Critical	Cloud Shadow	96 73 122	
	160	160 - 169	Critical	Shallow water risk	49 134 155	
	170	170 - 179	Critical	Mixed pixel risk	226 107 10	
	180	180 - 189	Critical	Retrieved concentration at configuration limit	120 120 120	
	190	190 - 199	Critical	Retrieval / processor warning	130 130 130	
	220	220	No value	Transition Zone	102 255 51	
	221	221	Unreliable	Shallow water automatically	146 205 220	
	222	222	Unreliable	Shallow water manually	60 159 186	
	223	223	Unreliable	Floating material	32 95 107	
	230	230	No water	Land	102 255 51	
	232	232	Unreliable	Invalid pixel manually	255 192 0	
	240	240	No water	Cloud	255 255 255	
	242	242	Unreliable	Cloud Shadow manually	96 73 122	
	244	244	Unreliable	Hill shadow	73 57 93	
	250	250	No retrieval	No retrieval / out of AOI or image extend	255 0 0	

Figure 7: EOMAP QUC quality coding



EOMAP's water quality products are accompanied by the processor's internal quality control mechanisms QUT and QUC, resulting in pixel flagging in case of unreliable values. Moreover, a manual quality check and - if required - additional masking is applied to each product.

As an example, cloud shadow effects typically occur in the vicinity of clouds, resulting in unrealistically low water parameter values. In order to detect and flag these areas, EOMAP has developed a specific algorithm based on geometric models, considering the sun angle and sensor viewing geometry, the retrieved aerosol properties, the height of the clouds, an analysis of the blue channel radiances and a statistical anomaly detection of the water species concentrations. When applying this cloud shadow detection algorithm, approx. 85% of the cloud shadows are detected and masked. Remaining cloud shadows are manually flagged and can be identified in the QUC file by GV 242.

Due to the spatial extent of single pixels (Sentinel-2: 10\*10m, Landsat 8: 30\*30m), it is likely that spectral mixing of signals from land and water can affect the pixels along the edge of the water body, leading to unreliable retrieval of water parameter values. Such pixels are labelled with the quality flag 'transition zone'. EO-MAP uses a high-resolution land-water-mask database to determine the land-water-boundary, which is then filtered to create a transition zone that is automatically flagged during processing. In the 8bit water constituent products the transition zone is marked by GV 251, whereas in the QUC product it is 220.

## 2.4 Data Format

The water quality data is delivered as 32bit real value GeoTIFF as well as 8bit scaled and colored GeoTIFF for easier visualization. The colours currently used are a suggestion/standard, but can be changed according to client specific request. In addition, metadata is stored in the .xml and the metadata .pdf files.

## 2.5 Data Sources

EOMAP uses the following data hubs to access and download satellite raw data from different sensors:

- Sentinel-3: PEPS https://peps.cnes.fr
- Landsat-8 Amazon Web Services, https://landsat-pds.s3.amazonaws.com
- Sentinel-2: ESA Sentinel HUB https://scihub.copernicus.eu/dhus/#/home
- MODIS Aqua and Terra: USGS https://earthexplorer.usgs.gov/



### Contact

Head Office	EOMAP GmbH & Co. KG, Schlosshof 4, 82229 Seefeld, Germany
Postal Address	EOMAP GmbH & Co. KG, Schlosshof 4, 82229 Seefeld, Germany
Phone	+49 (0)8152 99861 10
Fax	+49 (0)8152 99861 29
Email	info@eomap.com
Website	www.eomap.com

© EOMAP GmbH & Co. KG November 2020

Disclaimer: This document contains confidential information that is intended only for the use by EOMAP's Client. It is not for public circulation or publication or to be used by any third party without the express permission of either the Client or EOMAP GmbH & Co. KG. The concepts and information contained in this document are the property of EOMAP GmbH & Co. KG. Use or copying of this document in whole or in part without the written permission of EOMAP GmbH & Co. KG constitutes an infringement of copyright.

While the findings presented in this report are based on information that EOMAP GmbH & Co. KG considers reliable unless stated otherwise, the accuracy and completeness of source information cannot be guaranteed. Furthermore, the information compiled in this report addresses the specific needs of the client, so may not address the needs of third parties using this report for their own purposes. Thus, EOMAP GmbH & Co. KG and its employees accept no liability for any losses or damage for any action taken or not taken on the basis of any part of the contents of this report. Those acting on information provided in this report do so entirely at their own risk.



**Delivery Report** 

# Water Quality Monitoring Lake Elsinore & Canyon Lake

Date: 2020-12-14

Client: Wood Plc

Delivery no.: 2370\_Delivery\_EOMAP2WoodPlc\_Vs5\_20201214

Authors:	Mail:	Telephone:
Philip Klinger	klinger@eomap.de	+49 8152 9986 115
Karin Schenk	schenk@eomap.de	+49 8152 9986 112



### CONTENT

1.	SERV	ICE PROVISION REPORT
LIST	OF AL	L DELIVERED SCENES
CON	TENT.	
LIST	OF DE	LIVERED FILES (ONE PRODUCT EXAMPLE)
FILE	NAMI	NG4
NOT	ES (E.C	G. TECHNICAL ISSUES, EXCEPTIONAL CONDITIONS, ETC.)4
2.	METI	HODOLOGY AND PRODUCTS
2.	1	MODULAR INVERSION AND PROCESSING SYSTEM (MIP)
2.	2	Products
2.	3	QUALITY CONTROL AND FLAGGING
2.	4	DATA FORMAT12
2.	5	DATA SOURCES
CON	TACT.	



## 1. Service Provision Report

Contractor Details	Service Provider Details
Wood Environment & Infrastructure Solutions, Inc.	EOMAP GmbH & Co. KG
9210 Sky Park Court, Suite 200	Schlosshof 4, 82229 Seefeld, Germany
San Diego, CA 92123, USA	
Point of Contact	Point of Contact
John D. Rudolph	Philip Klinger
john.rudolph@woodplc.com	klinger@eomap.de, +49 (0)8152 9986115

Contractor PO / Reference number	
Contractor project title	
Service Provider reference number	2370
Date of delivery	2020-12-14
Version	5

### List of all delivered scenes

Sensor	Time of record
Sentinel-2B	2020-12-09 18:44:57 UTC

### Content

Product	Abbreviation	Yes/No
Total Absorption	ABS	
Aerosol Optical Thickness	AOT	
Yellow Substances	CDM	
Chlorophyll-a	CHL	$\boxtimes$
Ratio of Absorption and Scattering	DIV	
Harmful Algae Bloom Indicator	НАВ	$\boxtimes$
Diffuse Attenuation Coefficient	KDC	
Quality Coding	QUC	$\boxtimes$
Total Quality	QUT	$\boxtimes$
True Color/False Color Composite	RGB	$\boxtimes$
Remote Sensing Reflectance	RRS	
Secchi Disc Depth	SDD	
Sum of Inorganic Absorption	SIA	
Sum if Organic Absorption	SOA	
Surface Temperature	SST	
Turbidity	TUR	$\boxtimes$
Trophic State Index (Chlorophyll)	TSC	
Total Suspended Matter	TSM	
Light Penetration Depth	Z90	
Water Body Extent	WEX	

### List of delivered files (one product example)

File name	File format	Content
2370_Delivery_EOMAP2WoodPlc_Vs5_20201214.pdf	PDF	Delivery Report
CHL_us-california_11smt_EOMAP_20201209_184457_SENT2_m0010.tif	GeoTIFF	Product raster file, 8bit scaled and coloured
CHL_us-california_11smt_EOMAP_20201209_184457_SENT2_m0010_32bit.tif	GeoTIFF	Product raster file, 32bit real values
CHL_us-california_11smt_EO-	ASCII	Product text file, real values
MAP_20201209_184457_SENT2_m0010_wgs84_xyz.txt		
CHL_us-california_11smt_EOMAP_20201209_184457_SENT2_m0010.kmz	KMZ	GoogleEarth overlay
CHL_us-california_11smt_EOMAP_20201209_184457_SENT2_m0010_metadata.xml	XML	Metadata
CHL_us-california_11smt_EOMAP_20201209_184457_SENT2_m0010_overview.pdf	PDF	Overview PDF, metadata and quicklook



#### File naming

[Product abbreviation]\_[Country code]-[Area]\_EOMAP\_[Date of satellite image recording]\_[Time of satellite image recording]\_[sensor code]\_[spatial resolution]\_[optional]

With
[Product abbreviation]
[Country code]
[Area]
[Date of satellite image re
[Time of satellite image re

Country ID following ISO 3166 ALPHA-2 standards name of city/region or other relevant area characterization ec.] Satellite image date used for the analysis in YYMMDD (YY= Year, MM = Month, DD = Date) in UTC satellite image rec.] Satellite image date used for the analysis in HHMMSS (HH= Hours, MM = Minute, SS = Seconds) in UTC time [sensor code] Sensor in use [spatial resolution] Spatial resolution/grid spacing in meters is an optional parameter which can is used to support the intuitive use of the data, such as 'metadata' or 'XYZQ' for [optional] metadata files and ASCII XYZQ files.

### Notes (e.g. technical issues, exceptional conditions, etc.)

see list of product abbreviations

Data Analyst

Philip Vili-y

Philip Klinger



Karin Schenk



## 2. Methodology and Products

## 2.1 Modular Inversion and Processing System (MIP)

For the retrieval of satellite-derived water quality data, the physics-based Modular Inversion and Processing System (MIP), developed by EOMAP, has been applied to the satellite imagery. This sensor-independent approach includes all the relevant processing steps to guarantee a robust, standardised and operational retrieval of water quality parameters from various satellite data sources. The advantage of physics-based methods is that they do not require a priori information about the study area and can therefore be applied independently of satellite type and study area.

MIP imbeds sensor-independent algorithms and processing modules to derive consistent water quality parameters for multiple scales through a number of different satellite sensors. The algorithms take all relevant environmental impacts into account and do so for each individual measurement and pixel according to the current state-of-the-art, including:

- a. water, land, cloud identification
- b. estimation and correction of atmosphere and aerosol impacts<sup>1 2</sup>
- c. correction altitude level impacts<sup>3</sup>
- d. correction of adjacency impact (light scattering into the water signal from adjacent land surfaces)<sup>4</sup>
- e. correction<sup>5</sup> or flagging<sup>6</sup> of sunglitter impact
- f. retrieval of in-water absorption and scattering as physical measures<sup>7</sup>
- g. accounting for varying spectral slopes of specific inherent optical properties<sup>8</sup>
- h. provision of uncertainty measures and flagging procedures
- i. accounting for the full bidirectional effects in the atmosphere, at the water-atmosphere boundary layers and in-water, using a fully coupled radiative transfer model
- j. application of procedures to minimize errors, resulting from the coupled interaction of light between atmosphere, water surface and in-water on the signal, through coupled inversion procedures

The different workflow steps from satellite raw imagery import to value-added water quality retrieval are displayed in Figure 1.

<sup>&</sup>lt;sup>8</sup> Heege T., Schenk K., Klinger P., Broszeit A., Wenzel J., Kiselev V. (2015): Monitoring status and trends of water quality in inland waters using earth observation technologies. Proceedings "Water Quality in Europe: Challenges and Best Practice" UNESCO-IHP European Regional Consultation Workshop, Koblenz, Germany, Dec 2015, p. 1-4



<sup>&</sup>lt;sup>1</sup> Heege, T., Kiselev, V., Wettle, M., Hung N.N. (2014): Operational multi-sensor monitoring of turbidity for the entire Mekong Delta . Int. J. Remote Sensing, Special Issues Remote Sensing of the Mekong, Vol. 35 (8), pp. 2910-2926

<sup>&</sup>lt;sup>2</sup> Richter, R., Heege, T., Kiselev, V., Schläpfer, D. (2014): Correction of ozone influence on TOA radiance. Int. J. of Remote Sensing. Vol. 35(23), pp. 8044-8056, doi: 10.1080/01431161.2014.978041

<sup>&</sup>lt;sup>3</sup> Heege, T., Fischer, J. (2004): Mapping of water constituents in Lake Constance using multispectral airborne scanner data and a physically based processing scheme. Can. J. Remote Sensing, Vol. 30, No. 1, pp. 77-86

<sup>&</sup>lt;sup>4</sup> Kiselev, V., Bulgarelli, B. and Heege, T., (2015). Sensor independent adjacency correction algorithm for coastal and inland water systems. Remote Sensing of Environment, 157: 85-95. , ISSN 0034-4257, <u>http://dx.doi.org/10.1016/j.rse.2014.07.025</u>

 <sup>&</sup>lt;sup>5</sup> Heege, T. & Fischer, J. (2000): Sun glitter correction in remote sensing imaging spectrometry. SPIE Ocean Optics XV Conference, Monaco, Oct. 16-20.
<sup>6</sup> EU FP7-Projekt GLASS: WP4 Validation report (29.2.2016): <u>www.glass-project.eu/assets/Deliverables/GLaSS-D4.2.pdf</u>

<sup>&</sup>lt;sup>7</sup> Bumberger J., Heege T., Klinger P., et al. (2017): Towards a Harmonized Validation Procedure for Inland Water Optical Remote Sensing Data using Inherent Optical Properties, Rem. Sens. 2017(9), 21p, submitted 28 Feb. 2017



Figure 1: EOMAP's physics-based workflow to derive satellite-based water quality

MIP is the most established, sensor-independent and operational aquatic remote sensing processing system for the full range of high, medium and low-resolution satellite sensors. Fully-automated water monitoring processors are installed in satellite ground segments worldwide (Europe, Australia, Asia and America), to ensure fast and efficient access to a wide range of satellite data. The data processing and orchestration software, the EOMAP Workflow System (EWS) allows for continuous, daily production.



### 2.2 Products

**Turbidity** (TUR) is a key parameter of water quality and is linearly related to the backward scattering of light of organic and inorganic particles in water. Turbidity is also linearly related to Total Suspended Matter (TSM) at low to moderate turbidity values. The measurement unit is Nephelometric Turbidity Unit (NTU). Satellite-derived turbidity is determined by the backward scattering of light between 450 to 800nm, which is physically retrieved using satellite data. The standard relation of EOMAP concentrations to inherent optical properties is defined as 1 NTU = 0.0118 1/m backward scattering at 550nm, or 1 NTU = 0.619 1/m total scattering at 550nm for an assumed ratio bb/b = 0.019. The linear relation between turbidity and suspended matter/solids in low to moderate concentrations is in most cases a regional constant, but can vary with particle size distribution. Note that the geometrical properties of an in-situ measurement device, and the wavelength in use, may differ in comparison to the satellite product. For example, the standard FTU determination, a measure of turbidity similar to NTU, is based on the measurement of light scattered within a 90° angle from a beam directed at the water sample. Alongside temporal differences in satellite and in situ measurements, different sampling depths and the measurement location, this needs to be considered when comparing and interpreting satellite derived vs. in situ measured turbidity values. The Turbidity product from 2020-12-09 is shown in Figure 2.





**Chlorophyll-a** (CHL) retrieval is based on the derived information of in-water organic absorption, in-water turbidity and spectral characteristics of each water body. Chlorophyll-a in [ $\mu$ g/l], is provided as a measure linearly related to the pigment-specific absorption at 440nm, with 1  $\mu$ g/l Chl equal to 0.035 1/m pigment absorption. Phaeophytin and further pigments cannot be discriminated methodologically with the spectral resolution provided by Landsat 8/Sentinel-2 and similar sensors and is therefore included in this product. The pigment-related absorption is always smaller than the absorption of organic components (SOA). For clear water condi-



tions (low chlorophyll/total suspended solids), the specific absorption chlorophyll increases significantly (Bricaud et al. 1995<sup>9</sup>). Chlorophyll values can vary over 4 magnitudes, for marine waters or clear lakes typical concentrations between 0.01 and 10  $\mu$ g/l, while for eutrophic lakes concentrations can reach 100  $\mu$ g/l and more. The chlorophyll products are typically reliable within a range of 10 – 50 % in comparison to in situ measures (Broszeit 2015<sup>10</sup>), which are typically based on one of three different methods, which include photometric, fluorescence and HPLC approaches and their subcategories. The Chlorophyll-a product from 2020-12-09 is shown in Figure 3.



Figure 3: Chlorophyll-a product from 2020-12-09

The Harmful Algae Bloom Indicator (HAB) refers to the presence of cyanobacteria. It is sensitive to the appearance of cyanobacteria-related pigments, i.e. phycocyanin and phycoerythrin. Both pigments show absorption features in green wavelengths from 500 nm to approx. 640 nm; phycoerythrin shows its absorption maximum at 540-570 nm, phycocyanin at 610-620 (Colyer et al. 2005). Most satellite sensors support the identification of this feature with only two bands, i.e. one in the green wavelength region (e.g. L7 and L8 at 530 – 590 nm) and in the red wavelength region at approx. 640 – 670 nm. The used standard parameterisation of phytoplankton absorption in MIP as described above, however, does not account phycocyanin and phycoerythrin absorption in the retrieval process. The modelled phytoplankton absorption therefore lacks the absorption features of these pigments. Nonetheless, if these pigments are present in the water a slight spectral mismatch between modelled water leaving reflectance (R<sub>modelled</sub>) and satellite derived reflectance (R<sub>satellite</sub>) occurs. The algorithm then compares the slope of R<sub>modelled</sub> and R<sub>satellite</sub> between the green and red band ( $\delta R = R_{green} - R_{red}$ ) in order to classify pixels with regard to phycocyanin and phycoerythrin occurrence, i.e. harmful algae bloom probability. The HAB indicator from 2020-12-09 is shown in Figure 4.

<sup>&</sup>lt;sup>10</sup> Broszeit, A., 2015. Assessing long-term inland water quality using satellite imagery: A Feasibility and validation study of different lake types. MSc Thesis, Julius-Maximilian-University Würzburg, 96p



<sup>&</sup>lt;sup>9</sup> Bricaud, A., Babin, M., Morel, A., Claustre, H. (1995): Variability in the chlorophyll-specific absorption coefficients of natural phytoplankton: Analysis and parametrization. Journal of Geophysical Research Atmospheres, 100(C7):13,321-13,332

<section-header>

Figure 4: Harmful Algae Bloom Indicator product from 2020-12-09

**RGB** composite images represent the area of interest in true colour or false colour modes by combining predefined bands, depending on the sensor in use.



# 2.3 Quality Control and Flagging

As a standard output of the processing, an accuracy or quality indicator is calculated for each retrieved parameter and for each detected water pixel. This measure comprises a comprehensive range of factors that can impact the derived product quality, including:

- the geometry between sun, target, and sensor,
- the estimated sun glint probability,
- the retrieved aerosol optical depth,
- residuals of the measured and modelled sensor radiances and subsurface reflectances,
- the comparison of retrieved water species concentrations to extreme values as defined in the configuration files,
- pixels affected by cloud shadow and
- shallow water areas.

Threshold values define distinct values when a parameter is assumed to influence the quality. All parameters are integrated into one remaining quality parameter, allowing both an improved flagging and a quality weighting of pixels, that can later be merged into integrated 3rd level products.

The quality information is part of each standard geodata delivery and is visualized by two different 8bit Geo-TIFFs:

- QUT Total Quality, quantifying the overall quality of each pixel from low to high. Only valid water pixels excluding land, cloud or flagged pixels are represented in QUT indicator (Figure 5).
- QUC EOMAP Quality coding (Figure 6), revealing the processor's internal quality check, split into the defined indicators (e.g. sunglint, shallow water risk, etc.). These are classified into 'no quality concerns', 'quality risk and 'bad quality' (flag). Note that 'quality risk' pixels are marked as such but not flagged.



Figure 5: QUT product from 2020-12-09



EOMAP Quality Coding QUC 2020-12-09 18:44:57 UTC Sentinel-2B Lake Elsinore & Canyon Lake



Figure 6: QUC product from 2020-12-09

The QUC file indicates the main quality influencing parameter using a specific EOMAP quality coding classification scheme with corresponding grey values (GV), shown in Figure 7.

Professional v	ersion allo	ow combinatio	n of the two	most relevant flags:		
First number =	most rele	evant flag				1
1-digit-numbe	r refer to	second releva	nt flag, e.g. 1	for sunglint risk, 2 for large solar zenith angle		
Examples:	2	5 Warning flag	g for large zer	nit solar angle and Whitecaps		1
	11	4 Critical flag	for sunglint, p	olus warning for aerosol above limits		
	GV	GV range	Flag status	Flag description	Color code	Color
	0	0	Water	No risk identified	000	
	10	10 - 19	Warning	sunglint risk	148 138 84	
	20	20 - 29	Warning	large solar zenith angle	83 141 213	
	30	30 - 39	Warning	large spacecraft zenith angle	218 150 148	
	40	40 - 49	Warning	Aerosol above limit or Cirrus risk	196 215 155	
	50	50 - 59	Warning	Cloud Shadow	177 160 199	
	60	60 - 69	Warning	Shallow water risk	146 205 220	
	70	70 - 79	Warning	Mixed pixel risk	250 191 143	
	80	80 - 89	Warning	Retrieved concentration at configuration limit	190 190 190	
	90	90 - 99	Warning	Retrieval / processor warning	210 210 210	
	110	110 - 119	Critical	sunglint risk	73 69 41	
	120	120 - 129	Critical	large solar zenith angle	22 54 92	
	130	130 - 139	Critical	large spacecraft zenith angle	150 54 52	
	140	140 - 149	Critical	Aerosol above limit or Cirrus risk	118 147 60	
	150	150 - 159	Critical	Cloud Shadow	96 73 122	
	160	160 - 169	Critical	Shallow water risk	49 134 155	
	170	170 - 179	Critical	Mixed pixel risk	226 107 10	
	180	180 - 189	Critical	Retrieved concentration at configuration limit	120 120 120	
	190	190 - 199	Critical	Retrieval / processor warning	130 130 130	
	220	220	No value	Transition Zone	102 255 51	
	221	221	Unreliable	Shallow water automatically	146 205 220	
	222	222	Unreliable	Shallow water manually	60 159 186	
	223	223	Unreliable	Floating material	32 95 107	
	230	230	No water	Land	102 255 51	
	232	232	Unreliable	Invalid pixel manually	255 192 0	
	240	240	No water	Cloud	255 255 255	
	242	242	Unreliable	Cloud Shadow manually	96 73 122	
	244	244	Unreliable	Hill shadow	73 57 93	
	250	250	No retrieva	No retrieval / out of AOI or image extend	255 0 0	

Figure 7: EOMAP QUC quality coding



EOMAP's water quality products are accompanied by the processor's internal quality control mechanisms QUT and QUC, resulting in pixel flagging in case of unreliable values. Moreover, a manual quality check and - if required - additional masking is applied to each product.

As an example, cloud shadow effects typically occur in the vicinity of clouds, resulting in unrealistically low water parameter values. In order to detect and flag these areas, EOMAP has developed a specific algorithm based on geometric models, considering the sun angle and sensor viewing geometry, the retrieved aerosol properties, the height of the clouds, an analysis of the blue channel radiances and a statistical anomaly detection of the water species concentrations. When applying this cloud shadow detection algorithm, approx. 85% of the cloud shadows are detected and masked. Remaining cloud shadows are manually flagged and can be identified in the QUC file by GV 242.

Due to the spatial extent of single pixels (Sentinel-2: 10\*10m, Landsat 8: 30\*30m), it is likely that spectral mixing of signals from land and water can affect the pixels along the edge of the water body, leading to unreliable retrieval of water parameter values. Such pixels are labelled with the quality flag 'transition zone'. EO-MAP uses a high-resolution land-water-mask database to determine the land-water-boundary, which is then filtered to create a transition zone that is automatically flagged during processing. In the 8bit water constituent products the transition zone is marked by GV 251, whereas in the QUC product it is 220.

## 2.4 Data Format

The water quality data is delivered as 32bit real value GeoTIFF as well as 8bit scaled and colored GeoTIFF for easier visualization. The colours currently used are a suggestion/standard, but can be changed according to client specific request. In addition, metadata is stored in the .xml and the metadata .pdf files.

## 2.5 Data Sources

EOMAP uses the following data hubs to access and download satellite raw data from different sensors:

- Sentinel-3: PEPS https://peps.cnes.fr
- Landsat-8 Amazon Web Services, https://landsat-pds.s3.amazonaws.com
- Sentinel-2: ESA Sentinel HUB https://scihub.copernicus.eu/dhus/#/home
- MODIS Aqua and Terra: USGS https://earthexplorer.usgs.gov/



### Contact

Head Office	EOMAP GmbH & Co. KG, Schlosshof 4, 82229 Seefeld, Germany
Postal Address	EOMAP GmbH & Co. KG, Schlosshof 4, 82229 Seefeld, Germany
Phone	+49 (0)8152 99861 10
Fax	+49 (0)8152 99861 29
Email	info@eomap.com
Website	www.eomap.com

© EOMAP GmbH & Co. KG December 2020

Disclaimer: This document contains confidential information that is intended only for the use by EOMAP's Client. It is not for public circulation or publication or to be used by any third party without the express permission of either the Client or EOMAP GmbH & Co. KG. The concepts and information contained in this document are the property of EOMAP GmbH & Co. KG. Use or copying of this document in whole or in part without the written permission of EOMAP GmbH & Co. KG constitutes an infringement of copyright.

While the findings presented in this report are based on information that EOMAP GmbH & Co. KG considers reliable unless stated otherwise, the accuracy and completeness of source information cannot be guaranteed. Furthermore, the information compiled in this report addresses the specific needs of the client, so may not address the needs of third parties using this report for their own purposes. Thus, EOMAP GmbH & Co. KG and its employees accept no liability for any losses or damage for any action taken or not taken on the basis of any part of the contents of this report. Those acting on information provided in this report do so entirely at their own risk.



**Delivery Report** 

# Water Quality Monitoring Lake Elsinore & Canyon Lake

Date: 2021-03-03

Client: Wood Plc

Delivery no.: 2370\_Delivery\_EOMAP2WoodPlc\_Vs6\_20210303

Authors:	Mail:	Telephone:
Philip Klinger	klinger@eomap.de	+49 8152 9986 115
Karin Schenk	schenk@eomap.de	+49 8152 9986 112



### CONTENT

1.	SERV	ICE PROVISION REPORT
LIST	OF AL	L DELIVERED SCENES
CON	TENT.	
LIST	OF DE	LIVERED FILES (ONE PRODUCT EXAMPLE)
FILE	NAMI	NG4
NOTI	ES (E.0	G. TECHNICAL ISSUES, EXCEPTIONAL CONDITIONS, ETC.)4
2.	METI	HODOLOGY AND PRODUCTS
2.	1	MODULAR INVERSION AND PROCESSING SYSTEM (MIP)
2.	2	Products
2.	3	QUALITY CONTROL AND FLAGGING
2.	4	DATA FORMAT12
2.	5	DATA SOURCES
CON	TACT.	


#### 1. Service Provision Report

Contractor Details	Service Provider Details
Wood Environment & Infrastructure Solutions, Inc.	EOMAP GmbH & Co. KG
9210 Sky Park Court, Suite 200	Schlosshof 4, 82229 Seefeld, Germany
San Diego, CA 92123, USA	
Point of Contact	Point of Contact
John D. Rudolph	Philip Klinger
john.rudolph@woodplc.com	klinger@eomap.de, +49 (0)8152 9986115

Contractor PO / Reference number	
Contractor project title	
Service Provider reference number	2370
Date of delivery	2021-03-03
Version	6

#### List of all delivered scenes

Sensor	Time of record
Sentinel-2B	2021-02-17 18:44:57 UTC

#### Content

Product	Abbreviation	Yes/No
Total Absorption	ABS	
Aerosol Optical Thickness	AOT	
Yellow Substances	CDM	
Chlorophyll-a	CHL	$\square$
Ratio of Absorption and Scattering	DIV	
Harmful Algae Bloom Indicator	НАВ	$\boxtimes$
Diffuse Attenuation Coefficient	KDC	
Quality Coding	QUC	$\boxtimes$
Total Quality	QUT	$\square$
True Color/False Color Composite	RGB	$\square$
Remote Sensing Reflectance	RRS	
Secchi Disc Depth	SDD	
Sum of Inorganic Absorption	SIA	
Sum if Organic Absorption	SOA	
Surface Temperature	SST	
Turbidity	TUR	$\boxtimes$
Trophic State Index (Chlorophyll)	TSC	
Total Suspended Matter	TSM	
Light Penetration Depth	Z90	
Water Body Extent	WEX	

#### List of delivered files (one product example)

File name	File format	Content
2370_Delivery_EOMAP2WoodPlc_Vs6_20210303.pdf	PDF	Delivery Report
CHL_us-california_11smt_EOMAP_20210217_184457_SENT2_m0010.tif	GeoTIFF	Product raster file, 8bit scaled and coloured
CHL_us-california_11smt_EOMAP_20210217_184457_SENT2_m0010_32bit.tif	GeoTIFF	Product raster file, 32bit real values
CHL_us-california_11smt_EO-	ASCII	Product text file, real values
MAP_20210217_184457_SENT2_m0010_wgs84_xyz.txt		
CHL_us-california_11smt_EOMAP_20210217_184457_SENT2_m0010.kmz	KMZ	GoogleEarth overlay
CHL_us-california_11smt_EOMAP_20210217_184457_SENT2_m0010_metadata.xml	XML	Metadata
CHL_us-california_11smt_EOMAP_20210217_184457_SENT2_m0010_overview.pdf	PDF	Overview PDF, metadata and quicklook



#### File naming

[Product abbreviation]\_[Country code]-[Area]\_EOMAP\_[Date of satellite image recording]\_[Time of satellite image recording]\_[sensor code]\_[spatial resolution]\_[optional]

\\/i+b	
VVILII	
[Product	

[Product abbreviation]	see list of product abbreviations
[Country code]	Country ID following ISO 3166 ALPHA-2 standards
[Area]	name of city/region or other relevant area characterization
[Date of satellite image rec.]	Satellite image date used for the analysis in YYMMDD (YY= Year, MM = Month, DD = Date) in UTC
[Time of satellite image rec.]	Satellite image date used for the analysis in HHMMSS (HH= Hours, MM = Minute, SS = Seconds) in UTC
	time
[sensor code]	Sensor in use
[spatial resolution]	Spatial resolution/grid spacing in meters
[optional]	is an optional parameter which can is used to support the intuitive use of the data, such as 'metadata' or 'XYZQ' for metadata files and ASCII XYZQ files.

#### Notes (e.g. technical issues, exceptional conditions, etc.)

Data Analyst

Philip Vili-y

Philip Klinger



Karin Schenk



#### 2. Methodology and Products

#### 2.1 Modular Inversion and Processing System (MIP)

For the retrieval of satellite-derived water quality data, the physics-based Modular Inversion and Processing System (MIP), developed by EOMAP, has been applied to the satellite imagery. This sensor-independent approach includes all the relevant processing steps to guarantee a robust, standardised and operational retrieval of water quality parameters from various satellite data sources. The advantage of physics-based methods is that they do not require a priori information about the study area and can therefore be applied independently of satellite type and study area.

MIP imbeds sensor-independent algorithms and processing modules to derive consistent water quality parameters for multiple scales through a number of different satellite sensors. The algorithms take all relevant environmental impacts into account and do so for each individual measurement and pixel according to the current state-of-the-art, including:

- a. water, land, cloud identification
- b. estimation and correction of atmosphere and aerosol impacts<sup>1 2</sup>
- c. correction altitude level impacts<sup>3</sup>
- d. correction of adjacency impact (light scattering into the water signal from adjacent land surfaces)<sup>4</sup>
- e. correction<sup>5</sup> or flagging<sup>6</sup> of sunglitter impact
- f. retrieval of in-water absorption and scattering as physical measures<sup>7</sup>
- g. accounting for varying spectral slopes of specific inherent optical properties<sup>8</sup>
- h. provision of uncertainty measures and flagging procedures
- i. accounting for the full bidirectional effects in the atmosphere, at the water-atmosphere boundary layers and in-water, using a fully coupled radiative transfer model
- j. application of procedures to minimize errors, resulting from the coupled interaction of light between atmosphere, water surface and in-water on the signal, through coupled inversion procedures

The different workflow steps from satellite raw imagery import to value-added water quality retrieval are displayed in Figure 1.

<sup>&</sup>lt;sup>8</sup> Heege T., Schenk K., Klinger P., Broszeit A., Wenzel J., Kiselev V. (2015): Monitoring status and trends of water quality in inland waters using earth observation technologies. Proceedings "Water Quality in Europe: Challenges and Best Practice" UNESCO-IHP European Regional Consultation Workshop, Koblenz, Germany, Dec 2015, p. 1-4



<sup>&</sup>lt;sup>1</sup> Heege, T., Kiselev, V., Wettle, M., Hung N.N. (2014): Operational multi-sensor monitoring of turbidity for the entire Mekong Delta . Int. J. Remote Sensing, Special Issues Remote Sensing of the Mekong, Vol. 35 (8), pp. 2910-2926

<sup>&</sup>lt;sup>2</sup> Richter, R., Heege, T., Kiselev, V., Schläpfer, D. (2014): Correction of ozone influence on TOA radiance. Int. J. of Remote Sensing. Vol. 35(23), pp. 8044-8056, doi: 10.1080/01431161.2014.978041

<sup>&</sup>lt;sup>3</sup> Heege, T., Fischer, J. (2004): Mapping of water constituents in Lake Constance using multispectral airborne scanner data and a physically based processing scheme. Can. J. Remote Sensing, Vol. 30, No. 1, pp. 77-86

<sup>&</sup>lt;sup>4</sup> Kiselev, V., Bulgarelli, B. and Heege, T., (2015). Sensor independent adjacency correction algorithm for coastal and inland water systems. Remote Sensing of Environment, 157: 85-95. , ISSN 0034-4257, <u>http://dx.doi.org/10.1016/j.rse.2014.07.025</u>

 <sup>&</sup>lt;sup>5</sup> Heege, T. & Fischer, J. (2000): Sun glitter correction in remote sensing imaging spectrometry. SPIE Ocean Optics XV Conference, Monaco, Oct. 16-20.
<sup>6</sup> EU FP7-Projekt GLASS: WP4 Validation report (29.2.2016): <u>www.glass-project.eu/assets/Deliverables/GLaSS-D4.2.pdf</u>

<sup>&</sup>lt;sup>7</sup> Bumberger J., Heege T., Klinger P., et al. (2017): Towards a Harmonized Validation Procedure for Inland Water Optical Remote Sensing Data using Inherent Optical Properties, Rem. Sens. 2017(9), 21p, submitted 28 Feb. 2017



Figure 1: EOMAP's physics-based workflow to derive satellite-based water quality

MIP is the most established, sensor-independent and operational aquatic remote sensing processing system for the full range of high, medium and low-resolution satellite sensors. Fully-automated water monitoring processors are installed in satellite ground segments worldwide (Europe, Australia, Asia and America), to ensure fast and efficient access to a wide range of satellite data. The data processing and orchestration software, the EOMAP Workflow System (EWS) allows for continuous, daily production.



#### 2.2 Products

**Turbidity** (TUR) is a key parameter of water quality and is linearly related to the backward scattering of light of organic and inorganic particles in water. Turbidity is also linearly related to Total Suspended Matter (TSM) at low to moderate turbidity values. The measurement unit is Nephelometric Turbidity Unit (NTU). Satellite-derived turbidity is determined by the backward scattering of light between 450 to 800nm, which is physically retrieved using satellite data. The standard relation of EOMAP concentrations to inherent optical properties is defined as 1 NTU = 0.0118 1/m backward scattering at 550nm, or 1 NTU = 0.619 1/m total scattering at 550nm for an assumed ratio bb/b = 0.019. The linear relation between turbidity and suspended matter/solids in low to moderate concentrations is in most cases a regional constant, but can vary with particle size distribution. Note that the geometrical properties of an in-situ measurement device, and the wavelength in use, may differ in comparison to the satellite product. For example, the standard FTU determination, a measure of turbidity similar to NTU, is based on the measurement of light scattered within a 90° angle from a beam directed at the water sample. Alongside temporal differences in satellite and in situ measurements, different sampling depths and the measurement location, this needs to be considered when comparing and interpreting satellite derived vs. in situ measured turbidity values. The Turbidity product from 2021-02-17 is shown in Figure 2.





**Chlorophyll-a** (CHL) retrieval is based on the derived information of in-water organic absorption, in-water turbidity and spectral characteristics of each water body. Chlorophyll-a in [ $\mu$ g/l], is provided as a measure linearly related to the pigment-specific absorption at 440nm, with 1  $\mu$ g/l Chl equal to 0.035 1/m pigment absorption. Phaeophytin and further pigments cannot be discriminated methodologically with the spectral resolution provided by Landsat 8/Sentinel-2 and similar sensors and is therefore included in this product. The pigment-related absorption is always smaller than the absorption of organic components (SOA). For clear water condi-



tions (low chlorophyll/total suspended solids), the specific absorption chlorophyll increases significantly (Bricaud et al. 1995<sup>9</sup>). Chlorophyll values can vary over 4 magnitudes, for marine waters or clear lakes typical concentrations between 0.01 and 10  $\mu$ g/l, while for eutrophic lakes concentrations can reach 100  $\mu$ g/l and more. The chlorophyll products are typically reliable within a range of 10 – 50 % in comparison to in situ measures (Broszeit 2015<sup>10</sup>), which are typically based on one of three different methods, which include photometric, fluorescence and HPLC approaches and their subcategories. The Chlorophyll-a product from 2021-02-17 is shown in Figure 3.



Figure 3: Chlorophyll-a product from 2021-02-17

The Harmful Algae Bloom Indicator (HAB) refers to the presence of cyanobacteria. It is sensitive to the appearance of cyanobacteria-related pigments, i.e. phycocyanin and phycoerythrin. Both pigments show absorption features in green wavelengths from 500 nm to approx. 640 nm; phycoerythrin shows its absorption maximum at 540-570 nm, phycocyanin at 610-620 (Colyer et al. 2005). Most satellite sensors support the identification of this feature with only two bands, i.e. one in the green wavelength region (e.g. L7 and L8 at 530 – 590 nm) and in the red wavelength region at approx. 640 – 670 nm. The used standard parameterisation of phytoplankton absorption in MIP as described above, however, does not account phycocyanin and phycoerythrin absorption in the retrieval process. The modelled phytoplankton absorption therefore lacks the absorption features of these pigments. Nonetheless, if these pigments are present in the water a slight spectral mismatch between modelled water leaving reflectance (R<sub>modelled</sub>) and satellite derived reflectance (R<sub>satellite</sub>) occurs. The algorithm then compares the slope of R<sub>modelled</sub> and R<sub>satellite</sub> between the green and red band ( $\delta R = R_{green} - R_{red}$ ) in order to classify pixels with regard to phycocyanin and phycoerythrin occurrence, i.e. harmful algae bloom probability. The HAB indicator from 2021-02-17 is shown in Figure 4.

<sup>&</sup>lt;sup>10</sup> Broszeit, A., 2015. Assessing long-term inland water quality using satellite imagery: A Feasibility and validation study of different lake types. MSc Thesis, Julius-Maximilian-University Würzburg, 96p



<sup>&</sup>lt;sup>9</sup> Bricaud, A., Babin, M., Morel, A., Claustre, H. (1995): Variability in the chlorophyll-specific absorption coefficients of natural phytoplankton: Analysis and parametrization. Journal of Geophysical Research Atmospheres, 100(C7):13,321-13,332

<section-header>

Figure 4: Harmful Algae Bloom Indicator product from 2021-02-17

**RGB** composite images represent the area of interest in true colour or false colour modes by combining predefined bands, depending on the sensor in use.



### 2.3 Quality Control and Flagging

As a standard output of the processing, an accuracy or quality indicator is calculated for each retrieved parameter and for each detected water pixel. This measure comprises a comprehensive range of factors that can impact the derived product quality, including:

- the geometry between sun, target, and sensor,
- the estimated sun glint probability,
- the retrieved aerosol optical depth,
- residuals of the measured and modelled sensor radiances and subsurface reflectances,
- the comparison of retrieved water species concentrations to extreme values as defined in the configuration files,
- pixels affected by cloud shadow and
- shallow water areas.

Threshold values define distinct values when a parameter is assumed to influence the quality. All parameters are integrated into one remaining quality parameter, allowing both an improved flagging and a quality weighting of pixels, that can later be merged into integrated 3rd level products.

The quality information is part of each standard geodata delivery and is visualized by two different 8bit Geo-TIFFs:

- QUT Total Quality, quantifying the overall quality of each pixel from low to high. Only valid water pixels excluding land, cloud or flagged pixels are represented in QUT indicator (Figure 5).
- QUC EOMAP Quality coding (Figure 6), revealing the processor's internal quality check, split into the defined indicators (e.g. sunglint, shallow water risk, etc.). These are classified into 'no quality concerns', 'quality risk and 'bad quality' (flag). Note that 'quality risk' pixels are marked as such but not flagged.



Figure 5: QUT product from 2021-02-17



EOMAP Quality Coding QUC 2021-02-17 18:44:57 UTC Sentinel-2B Lake Elsinore & Canyon Lake



Figure 6: QUC product from 2021-02-17

The QUC file indicates the main quality influencing parameter using a specific EOMAP quality coding classification scheme with corresponding grey values (GV), shown in Figure 7.

Professional version allow combination of the two most relevant flags:						
First number = most relevant flag					1	
1-digit-number	r refer to	second releva	nt flag, e.g. 1	for sunglint risk, 2 for large solar zenith angle		
Examples:	2	25 Warning flag	g for large zer	nit solar angle and Whitecaps		1
	11	4 Critical flag	for sunglint, p	olus warning for aerosol above limits		
	GV	GV range	Flag status	Flag description	Color code	Color
	0	0	Water	No risk identified	000	
	10	10 - 19	Warning	sunglint risk	148 138 84	
	20	20 - 29	Warning	large solar zenith angle	83 141 213	
	30	30 - 39	Warning	large spacecraft zenith angle	218 150 148	
	40	40 - 49	Warning	Aerosol above limit or Cirrus risk	196 215 155	
	50	50 - 59	Warning	Cloud Shadow	177 160 199	
	60	60 - 69	Warning	Shallow water risk	146 205 220	
	70	70 - 79	Warning	Mixed pixel risk	250 191 143	
	80	80 - 89	Warning	Retrieved concentration at configuration limit	190 190 190	
	90	90 - 99	Warning	Retrieval / processor warning	210 210 210	
	110	110 - 119	Critical	sunglint risk	73 69 41	
	120	120 - 129	Critical	large solar zenith angle	22 54 92	
	130	130 - 139	Critical	large spacecraft zenith angle	150 54 52	
	140	140 - 149	Critical	Aerosol above limit or Cirrus risk	118 147 60	
	150	150 - 159	Critical	Cloud Shadow	96 73 122	
	160	160 - 169	Critical	Shallow water risk	49 134 155	
	170	170 - 179	Critical	Mixed pixel risk	226 107 10	
	180	180 - 189	Critical	Retrieved concentration at configuration limit	120 120 120	
	190	190 - 199	Critical	Retrieval / processor warning	130 130 130	
	220	220	No value	Transition Zone	102 255 51	
	221	221	Unreliable	Shallow water automatically	146 205 220	
	222	222	Unreliable	Shallow water manually	60 159 186	
	223	223	Unreliable	Floating material	32 95 107	
	230	230	No water	Land	102 255 51	
	232	232	Unreliable	Invalid pixel manually	255 192 0	
	240	240	No water	Cloud	255 255 255	
	242	242	Unreliable	Cloud Shadow manually	96 73 122	
	244	244	Unreliable	Hill shadow	73 57 93	
	250	250	No retrieval	No retrieval / out of AOI or image extend	255 0 0	

Figure 7: EOMAP QUC quality coding



EOMAP's water quality products are accompanied by the processor's internal quality control mechanisms QUT and QUC, resulting in pixel flagging in case of unreliable values. Moreover, a manual quality check and - if required - additional masking is applied to each product.

As an example, cloud shadow effects typically occur in the vicinity of clouds, resulting in unrealistically low water parameter values. In order to detect and flag these areas, EOMAP has developed a specific algorithm based on geometric models, considering the sun angle and sensor viewing geometry, the retrieved aerosol properties, the height of the clouds, an analysis of the blue channel radiances and a statistical anomaly detection of the water species concentrations. When applying this cloud shadow detection algorithm, approx. 85% of the cloud shadows are detected and masked. Remaining cloud shadows are manually flagged and can be identified in the QUC file by GV 242.

Due to the spatial extent of single pixels (Sentinel-2: 10\*10m, Landsat 8: 30\*30m), it is likely that spectral mixing of signals from land and water can affect the pixels along the edge of the water body, leading to unreliable retrieval of water parameter values. Such pixels are labelled with the quality flag 'transition zone'. EO-MAP uses a high-resolution land-water-mask database to determine the land-water-boundary, which is then filtered to create a transition zone that is automatically flagged during processing. In the 8bit water constituent products the transition zone is marked by GV 251, whereas in the QUC product it is 220.

#### 2.4 Data Format

The water quality data is delivered as 32bit real value GeoTIFF as well as 8bit scaled and colored GeoTIFF for easier visualization. The colours currently used are a suggestion/standard, but can be changed according to client specific request. In addition, metadata is stored in the .xml and the metadata .pdf files.

#### 2.5 Data Sources

EOMAP uses the following data hubs to access and download satellite raw data from different sensors:

- Sentinel-3: PEPS https://peps.cnes.fr
- Landsat-8 Amazon Web Services, https://landsat-pds.s3.amazonaws.com
- Sentinel-2: ESA Sentinel HUB https://scihub.copernicus.eu/dhus/#/home
- MODIS Aqua and Terra: USGS https://earthexplorer.usgs.gov/



#### Contact

Head Office	EOMAP GmbH & Co. KG, Schlosshof 4, 82229 Seefeld, Germany
Postal Address	EOMAP GmbH & Co. KG, Schlosshof 4, 82229 Seefeld, Germany
Phone	+49 (0)8152 99861 10
Fax	+49 (0)8152 99861 29
Email	info@eomap.com
Website	www.eomap.com

© EOMAP GmbH & Co. KG March 2021

Disclaimer: This document contains confidential information that is intended only for the use by EOMAP's Client. It is not for public circulation or publication or to be used by any third party without the express permission of either the Client or EOMAP GmbH & Co. KG. The concepts and information contained in this document are the property of EOMAP GmbH & Co. KG. Use or copying of this document in whole or in part without the written permission of EOMAP GmbH & Co. KG constitutes an infringement of copyright.

While the findings presented in this report are based on information that EOMAP GmbH & Co. KG considers reliable unless stated otherwise, the accuracy and completeness of source information cannot be guaranteed. Furthermore, the information compiled in this report addresses the specific needs of the client, so may not address the needs of third parties using this report for their own purposes. Thus, EOMAP GmbH & Co. KG and its employees accept no liability for any losses or damage for any action taken or not taken on the basis of any part of the contents of this report. Those acting on information provided in this report do so entirely at their own risk.



**Delivery report** 

# Water Quality Monitoring: Lake Elsinore & Canyon Lake

Date: 2021-04-14 Version: 7

Clients: Wood Plc. Reference: 2370\_Delivery\_EOMAP2WoodPlc

#### EOMAP GmbH & Co.KG, Schlosshof 4, 82229 Seefeld Germany

Authors:	e-mail	Phone
Philip Klinger	klinger@eomap.de	+49 8152 99861 13
Karin Schenk	schenk@eomap.de	+49 8152 99861 12



## CONTENT

1.	SER	VICE PROVISION REPORT	3
1. 1. 1. 1. 1.	.1 .2 .3 .4	LIST OF ALL DELIVERED SCENES CONTENT LIST OF DELIVERED FILES (ONE PRODUCT EXAMPLE) FILE NAMING NOTES (E.G. TECHNICAL ISSUES, EXCEPTIONAL CONDITIONS, ETC.)	3 3 4 4
2.	MET	HODOLOGY: MODULAR INVERSION AND PROCESSING SYSTEM (MIP)	5
3.	PRO	DUCTS	7
4 4 4 4	.1 .2 .3 .4	Turbidity (TUR) Chlorophyll-a (CHL) Harmful Algae Bloom Indicator (HAB) True color composite (RGB)	7 8 9
4.	QUA	ALITY CONTROL AND FLAGGING1	0
5.	DAT	A FORMAT1	3
6.	DAT	A SOURCES1	3



# 1. Service Provision Report

Contractor Details	Service Provider Details
Wood Environment & Infrastructure Solutions, Inc.	EOMAP GmbH & Co. KG
9210 Sky Park Court, Suite 200	Schlosshof 4, 82229 Seefeld, Germany
San Diego, CA 92123, USA	
Point of Contact	Point of Contact
John D. Rudolph	Philip Klinger
john.rudolph@woodplc.com	klinger@eomap.de, +49 (0)8152 9986115

Contractor PO / Reference number	
Contractor project title	
Service Provider reference number	2370
Date of delivery	2021-04-14
Version	7

## 1.1 List of all delivered scenes

Sensor	Time of record
Sentinel-2B	2021-04-08 18:44:56 UTC

#### 1.2 Content

Product	Abbreviation	Yes/No
Total Absorption	ABS	
Aerosol Optical Thickness	АОТ	
Yellow Substances	CDM	
Chlorophyll-a	CHL	$\boxtimes$
Ratio of Absorption and Scattering	DIV	
Harmful Algae Bloom Indicator	НАВ	$\boxtimes$
Diffuse Attenuation Coefficient	KDC	
Quality Coding	QUC	$\boxtimes$
Total Quality	QUT	$\boxtimes$
True Color/False Color Composite	RGB	$\boxtimes$
Remote Sensing Reflectance	RRS	
Secchi Disc Depth	SDD	
Sum of Inorganic Absorption	SIA	
Sum if Organic Absorption	SOA	
Surface Temperature	SST	
Turbidity	TUR	$\boxtimes$
Trophic State Index (Chlorophyll)	TSC	
Total Suspended Matter	TSM	
Light Penetration Depth	Z90	
Water Body Extent	WEX	

## 1.3 List of delivered files (one product example)

File name	File format	Content
2370_Delivery_EOMAP2WoodPlc_Vs7_20210414.pdf	PDF	Delivery Report
CHL_us-california_11smt_EOMAP_20210408_184456_SENT2_m0010.tif	GeoTIFF	Product raster file, 8bit scaled and coloured
CHL_us-california_11smt_EOMAP_20210408_184456_SENT2_m0010_32bit.tif	GeoTIFF	Product raster file, 32bit real values
CHL_us-	ASCII	Product text file, real values
california_11smt_EOMAP_20210408_184456_SENT2_m0010_wgs84_xyz.txt		
CHL_us-california_11smt_EOMAP_20210408_184456_SENT2_m0010.kmz	KMZ	GoogleEarth overlay
CHL_us-california_11smt_EOMAP_20210408_184456_SENT2_m0010_metadata.xml	XML	Metadata
CHL_us-california_11smt_EOMAP_20210408_184456_SENT2_m0010_overview.pdf	PDF	Overview PDF, metadata and quicklook



#### 1.4 File naming

[Product abbreviation]\_[Country code]-[Area]\_EOMAP\_[Date of satellite image recording]\_[Time of satellite image recording]\_[sensor code]\_[spatial resolution]\_[optional]

W	ith

[Product abbreviation]	see list of product abbreviations
[Country code]	Country ID following ISO 3166 ALPHA-2 standards
[Area]	name of city/region or other relevant area characterization
[Date of satellite image rec.]	Satellite image date used for the analysis in YYMMDD (YY= Year, MM = Month, DD = Date) in UTC
[Time of satellite image rec.]	Satellite image date used for the analysis in HHMMSS (HH= Hours, MM = Minute, SS = Seconds) in UTC
	time
[sensor code]	Sensor in use
[spatial resolution]	Spatial resolution/grid spacing in meters
[optional]	is an optional parameter which can is used to support the intuitive use of the data, such as 'metadata' or
'XYZQ' for	metadata files and ASCII XYZQ files.

#### 1.5 Notes (e.g. technical issues, exceptional conditions, etc.)

Data Analyst Philip Uli-J

Philip Klinger

QA/QC

Karin Schenk



# 2. Methodology: Modular Inversion and Processing System (MIP)

For the retrieval of satellite-derived water quality data, the physics-based Modular Inversion and Processing System (MIP), developed by EOMAP, has been applied to the satellite imagery. This sensor-independent approach includes all the relevant processing steps to guarantee a robust, standardised and operational retrieval of water quality parameters from various satellite data sources. The advantage of physics-based methods is that they do not require a priori information about the study area and can therefore be applied independently of satellite type and study area.

MIP imbeds sensor-independent algorithms and processing modules to derive consistent water quality parameters for multiple scales through a number of different satellite sensors. The algorithms take all relevant environmental impacts into account and do so for each individual measurement and pixel according to the current state-of-the-art, including:

- a. water, land, cloud identification
- b. estimation and correction of atmosphere and aerosol impacts<sup>1 2</sup>
- c. correction altitude level impacts<sup>3</sup>
- d. correction of adjacency impact (light scattering into the water signal from adjacent land surfaces)  $^{\!\!\!4}$
- e. correction<sup>5</sup> or flagging<sup>6</sup> of sunglitter impact
- f. retrieval of in-water absorption and scattering as physical measures<sup>7</sup>
- g. accounting for varying spectral slopes of specific inherent optical properties<sup>8</sup>
- h. provision of uncertainty measures and flagging procedures
- i. accounting for the full bidirectional effects in the atmosphere, at the water-atmosphere boundary layers and in-water, using a fully coupled radiative transfer model
- j. application of procedures to minimize errors, resulting from the coupled interaction of light between atmosphere, water surface and in-water on the signal, through coupled inversion procedures

The different workflow steps from satellite raw imagery import to value-added water quality retrieval are displayed in Figure 1.

<sup>&</sup>lt;sup>8</sup> Heege T., Schenk K., Klinger P., Broszeit A., Wenzel J., Kiselev V. (2015): Monitoring status and trends of water quality in inland waters using earth observation technologies. Proceedings "Water Quality in Europe: Challenges and Best Practice" UNESCO-IHP European Regional Consultation Workshop, Koblenz, Germany, Dec 2015, p. 1-4



<sup>&</sup>lt;sup>1</sup> Heege, T., Kiselev, V., Wettle, M., Hung N.N. (2014): Operational multi-sensor monitoring of turbidity for the entire Mekong Delta . Int. J. Remote Sensing, Special Issues Remote Sensing of the Mekong, Vol. 35 (8), pp. 2910-2926

<sup>&</sup>lt;sup>2</sup> Richter, R., Heege, T., Kiselev, V., Schläpfer, D. (2014): Correction of ozone influence on TOA radiance. Int. J. of Remote Sensing. Vol. 35(23), pp. 8044-8056, doi: 10.1080/01431161.2014.978041

<sup>&</sup>lt;sup>3</sup> Heege, T., Fischer, J. (2004): Mapping of water constituents in Lake Constance using multispectral airborne scanner data and a physically based processing scheme. Can. J. Remote Sensing, Vol. 30, No. 1, pp. 77-86

<sup>&</sup>lt;sup>4</sup> Kiselev, V., Bulgarelli, B. and Heege, T., (2015). Sensor independent adjacency correction algorithm for coastal and inland water systems. Remote Sensing of Environment, 157: 85-95. , ISSN 0034-4257, <u>http://dx.doi.org/10.1016/j.rse.2014.07.025</u>

<sup>&</sup>lt;sup>5</sup> Heege, T. & Fischer, J. (2000): Sun glitter correction in remote sensing imaging spectrometry. SPIE Ocean Optics XV Conference, Monaco, Oct. 16-20.

<sup>&</sup>lt;sup>6</sup> EU FP7-Projekt GLASS: WP4 Validation report (29.2.2016): <u>www.glass-project.eu/assets/Deliverables/GLaSS-D4.2.pdf</u>

<sup>&</sup>lt;sup>7</sup> Bumberger J., Heege T., Klinger P., et al. (2017): Towards a Harmonized Validation Procedure for Inland Water Optical Remote Sensing Data using Inherent Optical Properties, Rem. Sens. 2017(9), 21p, submitted 28 Feb. 2017



Figure 1: EOMAP's physics-based workflow to derive satellite-based water quality

MIP is the most established, sensor-independent and operational aquatic remote sensing processing system for the full range of high, medium and low-resolution satellite sensors. Fully-automated water monitoring processors are installed in satellite ground segments worldwide (Europe, Australia, Asia and America), to ensure fast and efficient access to a wide range of satellite data. The data processing and orchestration software, the EOMAP Workflow System (EWS) allows for continuous, daily production.



## 3. Products

## 4.1 Turbidity (TUR)

**Turbidity** (TUR) is a key parameter of water quality and is linearly related to the backward scattering of light of organic and inorganic particles in water. Turbidity is also linearly related to Total Suspended Matter (TSM) at low to moderate turbidity values. The measurement unit is Nephelometric Turbidity Unit (NTU). Satellite-derived turbidity is determined by the backward scattering of light between 450 to 800nm, which is physically retrieved using satellite data. The standard relation of EOMAP concentrations to inherent optical properties is defined as 1 NTU = 0.0118 1/m backward scattering at 550nm, or 1 NTU = 0.619 1/m total scattering at 550nm for an assumed ratio bb/b = 0.019. The linear relation between turbidity and suspended matter/solids in low to moderate concentrations is in most cases a regional constant, but can vary with particle size distribution. Note that the geometrical properties of an in-situ measurement device, and the wavelength in use, may differ in comparison to the satellite product. For example, the standard FTU determination, a measure of turbidity similar to NTU, is based on the measurement of light scattered within a 90° angle from a beam directed at the water sample. Alongside temporal differences in satellite and in situ measurements, different sampling depths and the measurement location, this needs to be considered when comparing and interpreting satellite derived vs. in situ measured turbidity values. The Turbidity product from 2021-04-08 is shown in Figure 2.



Figure 2: Turbidity product from 2021-04-08



## 4.2 Chlorophyll-a (CHL)

**Chlorophyll-a** (CHL) retrieval is based on the derived information of in-water organic absorption, in-water turbidity and spectral characteristics of each water body. Chlorophyll-a in [ $\mu$ g/l], is provided as a measure linearly related to the pigment-specific absorption at 440nm, with 1  $\mu$ g/l Chl equal to 0.035 1/m pigment absorption. Phaeophytin and further pigments cannot be discriminated methodologically with the spectral resolution provided by Landsat 8/Sentinel-2 and similar sensors and is therefore included in this product. The pigment-related absorption is always smaller than the absorption of organic components (SOA). For clear water conditions (low chlorophyll/total suspended solids), the specific absorption chlorophyll increases significantly (Bricaud et al. 1995<sup>9</sup>). Chlorophyll values can vary over 4 magnitudes, for marine waters or clear lakes typical concentrations between 0.01 and 10  $\mu$ g/l, while for eutrophic lakes concentrations can reach 100  $\mu$ g/l and more. The chlorophyll products are typically reliable within a range of 10 – 50 % in comparison to in situ measures (Broszeit 2015<sup>10</sup>), which are typically based on one of three different methods, which include photometric, fluorescence and HPLC approaches and their subcategories. The Chlorophyll-a product from 2021-04-08 is shown in Figure 3.



Figure 3: Chlorophyll-a product from 2021-04-08

<sup>&</sup>lt;sup>10</sup> Broszeit, A., 2015. Assessing long-term inland water quality using satellite imagery: A Feasibility and validation study of different lake types. MSc Thesis, Julius-Maximilian-University Würzburg, 96p



<sup>&</sup>lt;sup>9</sup> Bricaud, A., Babin, M., Morel, A., Claustre, H. (1995): Variability in the chlorophyll-specific absorption coefficients of natural phytoplankton: Analysis and parametrization. Journal of Geophysical Research Atmospheres, 100(C7):13,321-13,332

# 4.3 Harmful Algae Bloom Indicator (HAB)

The Harmful Algae Bloom Indicator (HAB) refers to the presence of cyanobacteria. It is sensitive to the appearance of cyanobacteria-related pigments, i.e. phycocyanin and phycoerythrin. Both pigments show absorption features in green wavelengths from 500 nm to approx. 640 nm; phycoerythrin shows its absorption maximum at 540-570 nm, phycocyanin at 610-620 (Colyer et al. 2005). Most satellite sensors support the identification of this feature with only two bands, i.e. one in the green wavelength region (e.g. L7 and L8 at 530 – 590 nm) and in the red wavelength region at approx. 640 – 670 nm. The used standard parameterisation of phytoplankton absorption in MIP as described above, however, does not account phycocyanin and phycoerythrin absorption features of these pigments. Nonetheless, if these pigments are present in the water a slight spectral mismatch between modelled water leaving reflectance (R<sub>modelled</sub>) and satellite derived reflectance (R<sub>satellite</sub>) occurs. The algorithm then compares the slope of R<sub>modelled</sub> and R<sub>satellite</sub> between the green and red band ( $\delta R = R_{green} - R_{red}$ ) in order to classify pixels with regard to phycocyanin and phycoerythrin occurrence, i.e. harmful algae bloom probability. The HAB indicator from 2021-04-08 is shown in Figure 4.



Figure 4: Harmful Algae Bloom Indicator product from 2021-04-08

## 4.4 True color composite (RGB)

**RGB** composite images represent the area of interest in true colour or false colour modes by combining predefined bands, depending on the sensor in use.



# 4. Quality Control and Flagging

As a standard output of the processing, an accuracy or quality indicator is calculated for each retrieved parameter and for each detected water pixel. This measure comprises a comprehensive range of factors that can impact the derived product quality, including:

- the geometry between sun, target, and sensor,
- the estimated sun glint probability,
- the retrieved aerosol optical depth,
- residuals of the measured and modelled sensor radiance and subsurface reflectance,
- the comparison of retrieved water species concentrations to extreme values as defined in the configuration files,
- pixels affected by cloud shadow and
- shallow water areas.

Threshold values define distinct values when a parameter is assumed to influence the quality. All parameters are integrated into one remaining quality parameter, allowing both an improved flagging and a quality weighting of pixels, that can later be merged into integrated 3rd level products.

- The quality information is part of each standard geodata delivery and is visualized by two different 8bit GeoTIFFs:
  - QUT Total Quality, quantifying the overall quality of each pixel from low to high. Only valid water pixels excluding land, cloud or flagged pixels are represented in QUT indicator (Figure 5).
  - QUC EOMAP Quality coding (Figure 6), revealing the processor's internal quality check, split into the defined indicators (e.g. sunglint, shallow water risk, etc.). These are classified into 'no quality concerns', 'quality risk and 'bad quality' (flag). Note that 'quality risk' pixels are marked as such but not flagged.





Figure 5: QUT product from 2021-04-08



Figure 6: QUC product from 2021-04-08



The QUC file indicates the main quality influencing parameter using a specific EOMAP quality coding classification scheme with corresponding grey values (GV), shown in

Figure 7.

Professional ve	ersion all	ow combinatio	on of the two	most relevant flags:		
First number =	most rel	evant flag				1
1-digit-number	r refer to	second releva	nt flag, e.g. 1	for sunglint risk, 2 for large solar zenith angle		
Examples:	:	25 Warning flag	g for large zer	iit solar angle and Whitecaps		1
	1	14 Critical flag	for sunglint, p	olus warning for aerosol above limits		
	GV	GV range	Flag status	Flag description	Color code	Color
	0	0	Water	No risk identified	000	
	10	10 - 19	Warning	sunglint risk	148 138 84	
	20	20 - 29	Warning	large solar zenith angle	83 141 213	
	30	30 - 39	Warning	large spacecraft zenith angle	218 150 148	
	40	40 - 49	Warning	Aerosol above limit or Cirrus risk	196 215 155	
	50	50 - 59	Warning	Cloud Shadow	177 160 199	
	60	60 - 69	Warning	Shallow water risk	146 205 220	
	70	70 - 79	Warning	Mixed pixel risk	250 191 143	
	80	80 - 89	Warning	Retrieved concentration at configuration limit	190 190 190	
	90	90 - 99	Warning	Retrieval / processor warning	210 210 210	
	110	110 - 119	Critical	sunglint risk	73 69 41	
	120	120 - 129	Critical	large solar zenith angle	22 54 92	
	130	130 - 139	Critical	large spacecraft zenith angle	150 54 52	
	140	140 - 149	Critical	Aerosol above limit or Cirrus risk	118 147 60	
	150	150 - 159	Critical	Cloud Shadow	96 73 122	
	160	160 - 169	Critical	Shallow water risk	49 134 155	
	170	170 - 179	Critical	Mixed pixel risk	226 107 10	
	180	180 - 189	Critical	Retrieved concentration at configuration limit	120 120 120	
	190	190 - 199	Critical	Retrieval / processor warning	130 130 130	
	220	220	No value	Transition Zone	102 255 51	
	221	221	Unreliable	Shallow water automatically	146 205 220	
	222	222	Unreliable	Shallow water manually	60 159 186	
	223	223	Unreliable	Floating material	32 95 107	
	230	230	No water	Land	102 255 51	
	232	232	Unreliable	Invalid pixel manually	255 192 0	
	240	240	No water	Cloud	255 255 255	
	242	242	Unreliable	Cloud Shadow manually	96 73 122	
	244	244	Unreliable	Hill shadow	73 57 93	
	250	250	No retrieval	No retrieval / out of AOI or image extend	255 0 0	

Figure 7: EOMAP QUC quality coding

EOMAP's water quality products are accompanied by the processor's internal quality control mechanisms QUT and QUC, resulting in pixel flagging in case of unreliable values. Moreover, a manual quality check and - if required - additional masking is applied to each product. As an example, cloud shadow effects typically occur in the vicinity of clouds, resulting in unrealistically low water parameter values. In order to detect and flag these areas, EOMAP has developed a specific algorithm based on geometric models, considering the sun angle and sensor viewing geometry, the retrieved aerosol properties, the height of the clouds, an analysis of the blue channel radiances and a statistical anomaly detection of the water species concentrations. When applying this cloud shadow detection algorithm, approx. 85% of the cloud shadows are detected and masked. Remaining cloud shadows are manually flagged and can be identified in the QUC file by GV 242.

Due to the spatial extent of single pixels (Sentinel-2: 10\*10m, Landsat 8: 30\*30m), it is likely that spectral mixing of signals from land and water can affect the pixels along the edge of the water body, leading to unreliable retrieval of water parameter values. Such pixels are labelled with the quality flag 'transition zone'. EOMAP uses a high-resolution land-water-mask database to determine the land-water-boundary, which is then filtered to create a transition zone that is automatically flagged during processing. In the 8bit water constituent products the transition zone is marked by GV 251, whereas in the QUC product it is 220.



## 5. Data Format

The water quality data is delivered as 32bit real value GeoTIFF as well as 8bit scaled and colored GeoTIFF for easier visualization. The colours currently used are a suggestion/standard, but can be changed according to client specific request. In addition, 2.5

# 6. Data Sources

EOMAP uses the following data hubs to access and download satellite raw data from different sensors:

- Sentinel-3: PEPS https://peps.cnes.fr
- Landsat-8 Amazon Web Services, https://landsat-pds.s3.amazonaws.com
- Sentinel-2: ESA Sentinel HUB https://scihub.copernicus.eu/dhus/#/home
- MODIS Aqua and Terra: USGS https://earthexplorer.usgs.gov/



#### © EOMAP GmbH & Co. KG April 2021

Disclaimer: This document contains confidential information that is intended only for the use by EOMAP's Client. It is not for public circulation or publication or to be used by any third party without the express permission of either the Client or EOMAP GmbH & Co. KG. The concepts and information contained in this document are the property of EOMAP GmbH & Co. KG. Use or copying of this document in whole or in part without the written permission of EOMAP GmbH & Co. KG constitutes an infringement of copyright.

While the findings presented in this report are based on information that EOMAP GmbH & Co. KG considers reliable un-less stated otherwise, the accuracy and completeness of source information cannot be guaranteed. Furthermore, the information compiled in this report addresses the specific needs of the client, so may not address the needs of third par-ties using this report for their own purposes. Thus, EOMAP GmbH & Co. KG and its employees accept no liability for any losses or damage for any action taken or not taken on the basis of any part of the contents of this report. Those acting on information provided in this report do so entirely at their own risk.

#### EOMAP

Schlosshof 4 82229 Seefeld Germany +49 (0)8152 99861 10 info@eomap.com www.eomap.com



**Delivery report** 

# Water Quality Monitoring: Lake Elsinore & Canyon Lake

Date: 2021-06-11 Version: 8

Clients: Wood Plc. Reference: 2370\_Delivery\_EOMAP2WoodPlc

#### EOMAP GmbH & Co.KG, Schlosshof 4, 82229 Seefeld Germany

Authors:	e-mail	Phone
Philip Klinger	klinger@eomap.de	+49 8152 99861 13
Karin Schenk	bernert@eomap.de	+49 8152 99861 16



## CONTENT

1. S	ERVICE PROVISION REPORT	3
1.1 1.2	List of all delivered scenes	3 3
1.3	List of delivered files (one product example)	3
1.4	FILE NAMING	4
1.5	NOTES (E.G. TECHNICAL ISSUES, EXCEPTIONAL CONDITIONS, ETC.)	4
2. N	METHODOLOGY: MODULAR INVERSION AND PROCESSING SYSTEM (MIP)	5
3. P	PRODUCTS	7
4.1	Turbidity (TUR)	7
4.2	Chlorophyll-a (CHL)	8
4.3	Harmful Algae Bloom Indicator (HAB)	9
4.4	True color composite (RGB)	9
4. C	QUALITY CONTROL AND FLAGGING	10
5. D	DATA FORMAT	13
6. D	DATA SOURCES	13



## 1. Service Provision Report

Contractor Details	Service Provider Details
Wood Environment & Infrastructure Solutions, Inc.	EOMAP GmbH & Co. KG
9210 Sky Park Court, Suite 200	Schlosshof 4, 82229 Seefeld, Germany
San Diego, CA 92123, USA	
Point of Contact	Point of Contact
John D. Rudolph	Philip Klinger
john.rudolph@woodplc.com	klinger@eomap.de, +49 (0)8152 9986115

Contractor PO / Reference number	
Contractor project title	
Service Provider reference number	2370
Date of delivery	2021-06-11
Version	8

## 1.1 List of all delivered scenes

Sensor	Time of record
Landsat-8	2021-05-28 18:22:16 UTC

#### 1.2 Content

Product	Abbreviation	Yes/No
Total Absorption	ABS	
Aerosol Optical Thickness	АОТ	
Yellow Substances	CDM	
Chlorophyll-a	CHL	$\boxtimes$
Ratio of Absorption and Scattering	DIV	
Harmful Algae Bloom Indicator	НАВ	$\boxtimes$
Diffuse Attenuation Coefficient	KDC	
Quality Coding	QUC	$\boxtimes$
Total Quality	QUT	$\boxtimes$
True Color/False Color Composite	RGB	$\boxtimes$
Remote Sensing Reflectance	RRS	
Secchi Disc Depth	SDD	
Sum of Inorganic Absorption	SIA	
Sum if Organic Absorption	SOA	
Surface Temperature	SST	
Turbidity	TUR	$\boxtimes$
Trophic State Index (Chlorophyll)	TSC	
Total Suspended Matter	TSM	
Light Penetration Depth	Z90	
Water Body Extent	WEX	

## 1.3 List of delivered files (one product example)

File name	File format	Content
2370_Delivery_EOMAP2WoodPlc_Vs8_20210611.pdf	PDF	Delivery Report
CHL_us-california_040037_EOMAP_20210528_182216_LSAT8_m0030.tif	GeoTIFF	Product raster file, 8bit scaled and coloured
CHL_us-california_040037_EOMAP_20210528_182216_LSAT8_m0030_32bit.tif	GeoTIFF	Product raster file, 32bit real values
CHL_us-	ASCII	Product text file, real values
california_040037_EOMAP_20210528_182216_LSAT8_m0030_wgs84_xyz.txt		
CHL_us-california_040037_EOMAP_20210528_182216_LSAT8_m0030.kmz	KMZ	GoogleEarth overlay
CHL_us-	XML	Metadata
california_040037_EOMAP_20210528_182216_LSAT8_m0030_metadata.xml		
CHL_us-california_040037_EOMAP_20210528_182216_LSAT8_m0030_overview.pdf	PDF	Overview PDF, metadata and quicklook



#### 1.4 File naming

[Product abbreviation]\_[Country code]-[Area]\_EOMAP\_[Date of satellite image recording]\_[Time of satellite image recording]\_[sensor code]\_[spatial resolution]\_[optional]

With	
[Product abbreviation]	see list of product abbreviations
[Country code]	Country ID following ISO 3166 ALPHA-2 standards
[Area]	name of city/region or other relevant area characterization
[Date of satellite image rec.]	Satellite image date used for the analysis in YYMMDD (YY= Year, MM = Month, DD = Date) in UTC
[Time of satellite image rec.]	Satellite image date used for the analysis in HHMMSS (HH= Hours, MM = Minute, SS = Seconds) in UTC
	time
[sensor code]	Sensor in use
[spatial resolution]	Spatial resolution/grid spacing in meters
[optional]	is an optional parameter which can is used to support the intuitive use of the data, such as 'metadata' or
'XYZQ' for	metadata files and ASCII XYZQ files.

#### 1.5 Notes (e.g. technical issues, exceptional conditions, etc.)

• Sunglint on parts of Lake Elsinore (especially southeastern part) which was corrected for, however values might still be slightly biased.

Data Analyst Philip Vili-y

Philip Klinger

arlac Hendrik Berneit

Hendrik Bernert



# 2. Methodology: Modular Inversion and Processing System (MIP)

For the retrieval of satellite-derived water quality data, the physics-based Modular Inversion and Processing System (MIP), developed by EOMAP, has been applied to the satellite imagery. This sensor-independent approach includes all the relevant processing steps to guarantee a robust, standardised and operational retrieval of water quality parameters from various satellite data sources. The advantage of physics-based methods is that they do not require a priori information about the study area and can therefore be applied independently of satellite type and study area.

MIP imbeds sensor-independent algorithms and processing modules to derive consistent water quality parameters for multiple scales through a number of different satellite sensors. The algorithms take all relevant environmental impacts into account and do so for each individual measurement and pixel according to the current state-of-the-art, including:

- a. water, land, cloud identification
- b. estimation and correction of atmosphere and aerosol impacts<sup>1 2</sup>
- c. correction altitude level impacts<sup>3</sup>
- d. correction of adjacency impact (light scattering into the water signal from adjacent land surfaces)  $^{\!\!\!4}$
- e. correction<sup>5</sup> or flagging<sup>6</sup> of sunglitter impact
- f. retrieval of in-water absorption and scattering as physical measures<sup>7</sup>
- g. accounting for varying spectral slopes of specific inherent optical properties<sup>8</sup>
- h. provision of uncertainty measures and flagging procedures
- i. accounting for the full bidirectional effects in the atmosphere, at the water-atmosphere boundary layers and in-water, using a fully coupled radiative transfer model
- j. application of procedures to minimize errors, resulting from the coupled interaction of light between atmosphere, water surface and in-water on the signal, through coupled inversion procedures

The different workflow steps from satellite raw imagery import to value-added water quality retrieval are displayed in Figure 1.

<sup>&</sup>lt;sup>8</sup> Heege T., Schenk K., Klinger P., Broszeit A., Wenzel J., Kiselev V. (2015): Monitoring status and trends of water quality in inland waters using earth observation technologies. Proceedings "Water Quality in Europe: Challenges and Best Practice" UNESCO-IHP European Regional Consultation Workshop, Koblenz, Germany, Dec 2015, p. 1-4



<sup>&</sup>lt;sup>1</sup> Heege, T., Kiselev, V., Wettle, M., Hung N.N. (2014): Operational multi-sensor monitoring of turbidity for the entire Mekong Delta . Int. J. Remote Sensing, Special Issues Remote Sensing of the Mekong, Vol. 35 (8), pp. 2910-2926

<sup>&</sup>lt;sup>2</sup> Richter, R., Heege, T., Kiselev, V., Schläpfer, D. (2014): Correction of ozone influence on TOA radiance. Int. J. of Remote Sensing. Vol. 35(23), pp. 8044-8056, doi: 10.1080/01431161.2014.978041

<sup>&</sup>lt;sup>3</sup> Heege, T., Fischer, J. (2004): Mapping of water constituents in Lake Constance using multispectral airborne scanner data and a physically based processing scheme. Can. J. Remote Sensing, Vol. 30, No. 1, pp. 77-86

<sup>&</sup>lt;sup>4</sup> Kiselev, V., Bulgarelli, B. and Heege, T., (2015). Sensor independent adjacency correction algorithm for coastal and inland water systems. Remote Sensing of Environment, 157: 85-95. , ISSN 0034-4257, <u>http://dx.doi.org/10.1016/j.rse.2014.07.025</u>

<sup>&</sup>lt;sup>5</sup> Heege, T. & Fischer, J. (2000): Sun glitter correction in remote sensing imaging spectrometry. SPIE Ocean Optics XV Conference, Monaco, Oct. 16-20.

<sup>&</sup>lt;sup>6</sup> EU FP7-Projekt GLASS: WP4 Validation report (29.2.2016): <u>www.glass-project.eu/assets/Deliverables/GLaSS-D4.2.pdf</u>

<sup>&</sup>lt;sup>7</sup> Bumberger J., Heege T., Klinger P., et al. (2017): Towards a Harmonized Validation Procedure for Inland Water Optical Remote Sensing Data using Inherent Optical Properties, Rem. Sens. 2017(9), 21p, submitted 28 Feb. 2017



Figure 1: EOMAP's physics-based workflow to derive satellite-based water quality

MIP is the most established, sensor-independent and operational aquatic remote sensing processing system for the full range of high, medium and low-resolution satellite sensors. Fully-automated water monitoring processors are installed in satellite ground segments worldwide (Europe, Australia, Asia and America), to ensure fast and efficient access to a wide range of satellite data. The data processing and orchestration software, the EOMAP Workflow System (EWS) allows for continuous, daily production.



## 3. Products

# 4.1 Turbidity (TUR)

**Turbidity** (TUR) is a key parameter of water quality and is linearly related to the backward scattering of light of organic and inorganic particles in water. Turbidity is also linearly related to Total Suspended Matter (TSM) at low to moderate turbidity values. The measurement unit is Nephelometric Turbidity Unit (NTU). Satellite-derived turbidity is determined by the backward scattering of light between 450 to 800nm, which is physically retrieved using satellite data. The standard relation of EOMAP concentrations to inherent optical properties is defined as 1 NTU = 0.0118 1/m backward scattering at 550nm, or 1 NTU = 0.619 1/m total scattering at 550nm for an assumed ratio bb/b = 0.019. The linear relation between turbidity and suspended matter/solids in low to moderate concentrations is in most cases a regional constant, but can vary with particle size distribution. Note that the geometrical properties of an in-situ measurement device, and the wavelength in use, may differ in comparison to the satellite product. For example, the standard FTU determination, a measure of turbidity similar to NTU, is based on the measurement of light scattered within a 90° angle from a beam directed at the water sample. Alongside temporal differences in satellite and in situ measurements, different sampling depths and the measurement location, this needs to be considered when comparing and interpreting satellite derived vs. in situ measured turbidity values. The Turbidity product from 2021-05-28 is shown in Figure 2.



Figure 2: Turbidity product from 2021-05-28



## 4.2 Chlorophyll-a (CHL)

**Chlorophyll-a** (CHL) retrieval is based on the derived information of in-water organic absorption, in-water turbidity and spectral characteristics of each water body. Chlorophyll-a in [ $\mu$ g/l], is provided as a measure linearly related to the pigment-specific absorption at 440nm, with 1  $\mu$ g/l Chl equal to 0.035 1/m pigment absorption. Phaeophytin and further pigments cannot be discriminated methodologically with the spectral resolution provided by Landsat 8/Sentinel-2 and similar sensors and is therefore included in this product. The pigment-related absorption is always smaller than the absorption of organic components (SOA). For clear water conditions (low chlorophyll/total suspended solids), the specific absorption chlorophyll increases significantly (Bricaud et al. 1995<sup>9</sup>). Chlorophyll values can vary over 4 magnitudes, for marine waters or clear lakes typical concentrations between 0.01 and 10  $\mu$ g/l, while for eutrophic lakes concentrations can reach 100  $\mu$ g/l and more. The chlorophyll products are typically reliable within a range of 10 – 50 % in comparison to in situ measures (Broszeit 2015<sup>10</sup>), which are typically based on one of three different methods, which include photometric, fluorescence and HPLC approaches and their subcategories. The Chlorophyll-a product from 2021-05-28 is shown in Figure 3.



Figure 3: Chlorophyll-a product from 2021-05-28

<sup>&</sup>lt;sup>10</sup> Broszeit, A., 2015. Assessing long-term inland water quality using satellite imagery: A Feasibility and validation study of different lake types. MSc Thesis, Julius-Maximilian-University Würzburg, 96p



<sup>&</sup>lt;sup>9</sup> Bricaud, A., Babin, M., Morel, A., Claustre, H. (1995): Variability in the chlorophyll-specific absorption coefficients of natural phytoplankton: Analysis and parametrization. Journal of Geophysical Research Atmospheres, 100(C7):13,321-13,332

# 4.3 Harmful Algae Bloom Indicator (HAB)

The Harmful Algae Bloom Indicator (HAB) refers to the presence of cyanobacteria. It is sensitive to the appearance of cyanobacteria-related pigments, i.e. phycocyanin and phycoerythrin. Both pigments show absorption features in green wavelengths from 500 nm to approx. 640 nm; phycoerythrin shows its absorption maximum at 540-570 nm, phycocyanin at 610-620 (Colyer et al. 2005). Most satellite sensors support the identification of this feature with only two bands, i.e. one in the green wavelength region (e.g. L7 and L8 at 530 – 590 nm) and in the red wavelength region at approx. 640 – 670 nm. The used standard parameterisation of phytoplankton absorption in MIP as described above, however, does not account phycocyanin and phycoerythrin absorption features of these pigments. Nonetheless, if these pigments are present in the water a slight spectral mismatch between modelled water leaving reflectance (R<sub>modelled</sub>) and satellite derived reflectance (R<sub>satellite</sub>) occurs. The algorithm then compares the slope of R<sub>modelled</sub> and R<sub>satellite</sub> between the green and red band ( $\delta R = R_{green} - R_{red}$ ) in order to classify pixels with regard to phycocyanin and phycoerythrin occurrence, i.e. harmful algae bloom probability. The HAB indicator from 2021-05-28 is shown in Figure 4.



Figure 4: Harmful Algae Bloom Indicator product from 2021-05-28

## 4.4 True color composite (RGB)

**RGB** composite images represent the area of interest in true colour or false colour modes by combining predefined bands, depending on the sensor in use.



# 4. Quality Control and Flagging

As a standard output of the processing, an accuracy or quality indicator is calculated for each retrieved parameter and for each detected water pixel. This measure comprises a comprehensive range of factors that can impact the derived product quality, including:

- the geometry between sun, target, and sensor,
- the estimated sun glint probability,
- the retrieved aerosol optical depth,
- residuals of the measured and modelled sensor radiance and subsurface reflectance,
- the comparison of retrieved water species concentrations to extreme values as defined in the configuration files,
- pixels affected by cloud shadow and
- shallow water areas.

Threshold values define distinct values when a parameter is assumed to influence the quality. All parameters are integrated into one remaining quality parameter, allowing both an improved flagging and a quality weighting of pixels, that can later be merged into integrated 3rd level products.

- The quality information is part of each standard geodata delivery and is visualized by two different 8bit GeoTIFFs:
  - QUT Total Quality, quantifying the overall quality of each pixel from low to high. Only valid water pixels excluding land, cloud or flagged pixels are represented in QUT indicator (Figure 5).
  - QUC EOMAP Quality coding (Figure 6), revealing the processor's internal quality check, split into the defined indicators (e.g. sunglint, shallow water risk, etc.). These are classified into 'no quality concerns', 'quality risk and 'bad quality' (flag). Note that 'quality risk' pixels are marked as such but not flagged.





Figure 5: QUT product from 2021-05-28



Figure 6: QUC product from 2021-05-28


The QUC file indicates the main quality influencing parameter using a specific EOMAP quality coding classification scheme with corresponding grey values (GV), shown in Figure 7 .

Professional ve	ersion al	low combinatio	n of the two	most relevant flags:		
First number = most relevant flag						1
1-digit-number refer to second relevant flag, e.g. 1 for sunglint risk, 2 for large solar zenith angle						
Examples: 25 Warning flag for large zenit solar angle and Whitecaps						1
114 Critical flag for sunglint, plus warning for aerosol above limits						
	GV	GV range	Flag status	Flag description	Color code	Color
	0	0	Water	No risk identified	000	
	10	10 - 19	Warning	sunglint risk	148 138 84	
	20	20 - 29	Warning	large solar zenith angle	83 141 213	
	30	30 - 39	Warning	large spacecraft zenith angle	218 150 148	
	40	40 - 49	Warning	Aerosol above limit or Cirrus risk	196 215 155	
	50	50 - 59	Warning	Cloud Shadow	177 160 199	
	60	60 - 69	Warning	Shallow water risk	146 205 220	
	70	70 - 79	Warning	Mixed pixel risk	250 191 143	
	80	80 - 89	Warning	Retrieved concentration at configuration limit	190 190 190	
	90	90 - 99	Warning	Retrieval / processor warning	210 210 210	
	110	110 - 119	Critical	sunglint risk	73 69 41	
	120	120 - 129	Critical	large solar zenith angle	22 54 92	
	130	130 - 139	Critical	large spacecraft zenith angle	150 54 52	
	140	140 - 149	Critical	Aerosol above limit or Cirrus risk	118 147 60	
	150	150 - 159	Critical	Cloud Shadow	96 73 122	
	160	160 - 169	Critical	Shallow water risk	49 134 155	
	170	170 - 179	Critical	Mixed pixel risk	226 107 10	
	180	180 - 189	Critical	Retrieved concentration at configuration limit	120 120 120	
	190	190 - 199	Critical	Retrieval / processor warning	130 130 130	
	220	220	No value	Transition Zone	102 255 51	
	221	221	Unreliable	Shallow water automatically	146 205 220	
	222	222	Unreliable	Shallow water manually	60 159 186	
	223	223	Unreliable	Floating material	32 95 107	
	230	230	No water	Land	102 255 51	
	232	232	Unreliable	Invalid pixel manually	255 192 0	
	240	240	No water	Cloud	255 255 255	
	242	242	Unreliable	Cloud Shadow manually	96 73 122	
	244	244	Unreliable	Hill shadow	73 57 93	
	250	250	No retrieval	No retrieval / out of AOI or image extend	255 0 0	

Figure 7: EOMAP QUC quality coding

EOMAP's water quality products are accompanied by the processor's internal quality control mechanisms QUT and QUC, resulting in pixel flagging in case of unreliable values. Moreover, a manual quality check and - if required - additional masking is applied to each product. As an example, cloud shadow effects typically occur in the vicinity of clouds, resulting in unrealistically low water parameter values. In order to detect and flag these areas, EOMAP has developed a specific algorithm based on geometric models, considering the sun angle and sensor viewing geometry, the retrieved aerosol properties, the height of the clouds, an analysis of the blue channel radiances and a statistical anomaly detection of the water species concentrations. When applying this cloud shadow detection algorithm, approx. 85% of the cloud shadows are detected and masked. Remaining cloud shadows are manually flagged and can be identified in the QUC file by GV 242.

Due to the spatial extent of single pixels (Sentinel-2: 10\*10m, Landsat 8: 30\*30m), it is likely that spectral mixing of signals from land and water can affect the pixels along the edge of the water body, leading to unreliable retrieval of water parameter values. Such pixels are labelled with the quality flag 'transition zone'. EOMAP uses a high-resolution land-water-mask database to determine the land-water-boundary, which is then filtered to create a transition zone that is automatically flagged during processing. In the 8bit water constituent products the transition zone is marked by GV 251, whereas in the QUC product it is 220.



#### 5. Data Format

The water quality data is delivered as 32bit real value GeoTIFF as well as 8bit scaled and colored GeoTIFF for easier visualization. The colours currently used are a suggestion/standard, but can be changed according to client specific request. In addition, 2.5

### 6. Data Sources

EOMAP uses the following data hubs to access and download satellite raw data from different sensors:

- Sentinel-3: PEPS https://peps.cnes.fr
- Landsat-8 Amazon Web Services, https://landsat-pds.s3.amazonaws.com
- Sentinel-2: ESA Sentinel HUB https://scihub.copernicus.eu/dhus/#/home
- MODIS Aqua and Terra: USGS https://earthexplorer.usgs.gov/



#### © EOMAP GmbH & Co. KG June 2021

Disclaimer: This document contains confidential information that is intended only for the use by EOMAP's Client. It is not for public circulation or publication or to be used by any third party without the express permission of either the Client or EOMAP GmbH & Co. KG. The concepts and information contained in this document are the property of EOMAP GmbH & Co. KG. Use or copying of this document in whole or in part without the written permission of EOMAP GmbH & Co. KG constitutes an infringement of copyright.

While the findings presented in this report are based on information that EOMAP GmbH & Co. KG considers reliable un-less stated otherwise, the accuracy and completeness of source information cannot be guaranteed. Furthermore, the information compiled in this report addresses the specific needs of the client, so may not address the needs of third par-ties using this report for their own purposes. Thus, EOMAP GmbH & Co. KG and its employees accept no liability for any losses or damage for any action taken or not taken on the basis of any part of the contents of this report. Those acting on information provided in this report do so entirely at their own risk.

#### EOMAP

Schlosshof 4 82229 Seefeld Germany +49 (0)8152 99861 10 info@eomap.com www.eomap.com





## Lake Elsinore- Historical Monitoring Results

No data available from June 2012-July2015 TMDL target of 0.75 mg/L is annual average to be attained by 2020 Bold represents current monitoring year July 2020-June 2021

# Lake Elsinore- Historical Monitoring Results (continued)



No data available from June 2012-July2015 TMDL target of 0.1 mg/L is annual average to be attained by 2020 Bold represents current monitoring year July 2020-June 2021

# Lake Elsinore- Historical Monitoring Results (continued)



No data available from June 2012-July2015 TMDL target of 25 μg/L is summer average to be attained by 2020 Bold represents current monitoring year July 2020-June 2021 \*Not measured due to laboratory error. See report for details.



# Lake Elsinore- Historical Monitoring Results (continued)

No data available from June 2012-July 2015 Bold represents current monitoring year July 2020-June 2021



### **Canyon Lake- Historical Monitoring Results**

No data available from May 2005-July 2007; June 2012-July2015 TMDL target of 0.75 mg/L is annual average to be attained by 2020 Bold represents current monitoring year July 2020-June 2021



# **Canyon Lake- Historical Monitoring Results (continued)**

No data available from May 2005-July 2007; June 2012-Sept 2013 TMDL target of 0.1 mg/L is annual average to be attained by 2020 Bold represents current monitoring year July 2020-June 2021



## **Canyon Lake- Historical Monitoring Results (continued)**

No data available from June 2012-July2015 2020 TMDL target of 25 μg/L is annual average to be attained by 2020 Bold represents current monitoring year July 2020-June 2021





No data available from May 2005-July 2007; June 2012-July2015 Bold represents current monitoring year July 2020-June 2021