

CASE NARRATIVE

Monthly Data Pall Life Sciences
Project: 1,4-Dioxane Remediation
Date: April, 2019

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Gelman Sciences, Inc. d/b/a Pall Life Sciences (PLS) attests to the validity of the laboratory data generated by PLS's Ann Arbor, Michigan Environmental Laboratory facilities reported herein. All analyses performed by PLS's Environmental Laboratory facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. PLS's Environmental group has reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

All of 1,4-dioxane and bromate samples were analyzed by Pall Corporation's Environmental Laboratory. The test results in this report meet all NELAP requirements for parameters for which accreditation are required or available. Any exceptions to NELAP requirements are noted in this report. All exceptions are noted per laboratory standard operating procedure based on EPA Method 1624c. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results. The odd even rule is used for rounding. Holding times were met for all samples analyzed. Proper preservation was observed on all samples unless otherwise detailed in the individual sections below.

RECEIPT/ STORAGE

The samples were received on the days noted in the report for the Month; the samples arrived in good condition, properly preserved and on ice when necessary. Samples that require 1,4-dioxane analysis are collected in hydrochloric HCl acid-preserved vials to a pH of ≤ 2 , with the exception of the Pall ozone treatment samples. These samples have chemicals that, when mixed with the HCl acid, cause interferences and trap damage. Every attempt is made to analyze these samples within 24 hours of receipt.

Samples that require Bromate analysis are collected and preserved in the laboratory with ethylene di-amine and refrigerated.

The barium sample was taken as a composite sample, preserved with nitric acid, and refrigerated before and after being sent to ATS for analysis. This sample is preserved with nitric acid and refrigeration.

Samples that are delivered to the laboratory the same day as they are collected are likely not to have reached a fully chilled temperature. This is acceptable as long as there is evidence that chilling has begun. All samples are iced or refrigerated at 4°C ($\pm 2^\circ\text{C}$) from the time of collection until sample preparation or analysis.

1,4-Dioxane (GC-MS)

All ground water and treated water samples were analyzed for 1,4-Dioxane (GC-MS) in accordance with EPA 1624C, which has been modified to enhance detection limits. Samples that were diluted to bring them within the calibrated range of the instrument are noted with a "D" under the Qualifier Code section of the data report. Reporting limits were adjusted based on each dilution.

Reporting limit for undiluted samples is 1ppb (part per billion, micrograms per liter, $\mu\text{g/L}$). All quality control parameters were within the acceptance limits.

Bromate (Ion Chromatography)

All surface water and treated samples were analyzed for Bromate (Ion Chromatography) in accordance with EPA 300.1. Surrogates are added to all samples. All quality control parameters were within the acceptance limits with the balance of sample analyzed.

The reporting limit for treated samples is 5.0ppb and for surface samples is 2.0ppb.

Barium

A composite Outfall001 sample was sent to Ann Arbor Technical Services (ATS) for total barium analysis in accordance with EPA200.7. Barium samples are analyzed quarterly in compliance with PLS NPDES permit. This sample is preserved with nitric acid and refrigeration. The results were less than the permitted level of 440µg/L at 190µg/L.

Qualifiers

1,4-Dioxane Qualifier Codes:

<u>Qualifier Code</u>	<u>Description</u>
nd:	The compound was analyzed for, but was not detected at or above the detection limit indicated.
D:	Analyte value quantified from a dilution, reporting limit is raised to reflect dilution.
E:	The compound result is greater than the upper quantitation limit in the associated calibration curve, reported as estimate.
B:	The sample vials contained air bubbles larger than 5mm, which may affect compound results.
J:	The compound was positively identified; the associated numerical value is the approximate concentration.
M:	Matrix effects, sample required dilution.
R:	The reported value is unusable and rejected due to variance from quality control criteria.
V:	The reported value is considered estimated due to variance from quality control criteria.
H:	Sample was analyzed past 14 day hold time, but within 28 days.
O:	Samples analyzed in outside laboratory.
S:	Samples split with DEQ.

Bromate Qualifier Codes:

<u>Qualifier Code</u>	<u>Description</u>
nd:	The compound was analyzed for, but was not detected at or above the detection limit indicated.
E:	The compound result is greater than the upper quantitation limit in the associated calibration curve.
J:	The compound was positively identified; the associated numerical value is the approximate concentration.
R:	The reported value is unusable and rejected due to variance from quality control criteria.
V:	The reported value is considered estimated due to variance from quality control criteria.
H:	Sample was analyzed past 28 day hold time

Analyst: Susan E.O. Peters Susan E.O. Peters Date: 5-10-19

Report Checked by: Laurel Beyer Laurel Beyer Date: 5/10/19

Sample Analysis Report

April, 2019

642 South Wagner Road
Ann Arbor, MI 48103-9019 US
734.436.4025 phone

Analyst Initials: SEOP
Date: 5-10-19

Sample Name - Date/Time Sampled	1,4-Dioxane Results (ppb)	R.L. (ppb)	Bromate Results (ppb)	R.L. (ppb)	Bromide Results (ppb)	R.L. (ppb)	Comments	Qualifier(s)
Residential Wells								
D0								
5005 Jackson Rd-04-23-19-14:07-1	12	1.0						
Extraction Wells								
C3								
DOLPH-04-03-19-10:45-1	120	1.0						
TW-20-04-03-19-09:29-1	940	10.0						D
D2								
LB-4-04-03-19-10:03-1	450	10.0						D
TW-21-04-03-19-09:56-1	230	5.0						D
E								
TW-18-04-03-19-09:40-1	250	5.0						D
TW-19-04-03-19-10:24-1	470	10.0						D
TW-23-04-03-19-10:09-1	490	10.0						D
Marshy								
PW-1-04-03-19-09:47-1	880	10.0						D
SW								
TW-22-04-03-19-09:20-1	490	10.0						D
TW-28-04-03-19-09:18-1	700	10.0						D
Monitoring Wells								

Sample Name - Date/Time Sampled	1,4-Dioxane Results (ppb)	R.L. (ppb)	Bromate Results (ppb)	R.L. (ppb)	Bromide Results (ppb)	R.L. (ppb)	Comments	Qualifier(s)
C3								
MW-1 Replacement-04-24-19-14:56-1	2400	100.0						D
MW-105s-04-23-19-15:40-1	450	10.0						D
MW-18d-04-22-19-15:40-1	54	1.0						
MW-32-04-22-19-15:15-1	21	1.0						
MW-34s-04-22-19-09:26-1	nd	1.0						
MW-35-04-22-19-11:57-1	2.4	1.0						
MW-38s-04-22-19-10:25-1	nd	1.0						
D0								
A2 Cleaning Supply-04-03-19-13:25-1	91	1.0						
MW-136i-04-11-19-09:47-1	nd	1.0						
MW-136s-04-11-19-10:10-1	nd	1.0						
MW-138i-04-11-19-15:23-1	6.5	1.0						
MW-138s-04-11-19-14:28-1	nd	1.0						
MW-140s-04-11-19-11:52-1	nd	1.0						
MW-53d-04-03-19-10:18-1	nd	1.0						
MW-53i-04-03-19-12:50-1	50	1.0						
MW-53s-04-03-19-11:36-1	nd	1.0						
D2								
175 Jackson Plaza-04-11-19-16:50-1	720	10.0						D
2819 Dexter Rd-04-05-19-11:50-1	170	10.0						D
373 Pinewood Shallow-04-08-19-10:56-1	240	10.0						D
MW-107-04-05-19-15:18-1	680	10.0						D
MW-113-04-15-19-15:13-1	76	1.0						
MW-117-04-05-19-10:27-1	nd	1.0						
MW-11d-04-22-19-14:09-1	340	10.0						D

Sample Name - Date/Time Sampled	1,4-Dioxane Results (ppb)	R.L. (ppb)	Bromate Results (ppb)	R.L. (ppb)	Bromide Results (ppb)	R.L. (ppb)	Comments	Qualifier(s)
MW-120s-04-12-19-15:38-1	nd	1.0						
MW-121s-04-08-19-16:02-1	nd	1.0						
MW-122s-04-16-19-13:15-1	210	5.0						D
MW-123s-04-15-19-10:47-1	nd	1.0						
MW-129i-04-12-19-11:44-1	nd	1.0						
MW-129s-04-12-19-10:25-1	nd	1.0						
MW-130i-04-16-19-11:10-1	4.5	1.0						
MW-130s-04-16-19-10:36-1	nd	1.0						
MW-133i-04-23-19-12:39-1	1.3	1.0						
MW-133s-04-23-19-11:55-1	1.1	1.0						
MW-134i-04-24-19-10:56-1	7.4	1.0						
MW-134s-04-24-19-10:25-1	7.8	1.0						
MW-17-04-08-19-12:51-1	300	10.0						D
MW-34d-04-22-19-09:45-1	nd	1.0						
MW-38d-04-22-19-11:07-1	35	1.0						
MW-92-04-25-19-11:11-1	41	1.0						
MW-BE-1d-04-16-19-14:35-1	560	10.0						D
MW-BE-1s-04-29-19-15:11-1	740	10.0						D
MW-KD-1d-04-30-19-11:48-1	260	5.0						D
MW-KD-1s-04-30-19-10:35-1	100	1.0						
E								
373 Pinewood Deep-04-08-19-10:21-1	nd	1.0						
IW-2-04-04-19-16:23-1	390	10.0						D
MW-100-04-15-19-16:37-1	2000	100.0						D
MW-101-04-05-19-09:29-1	110	1.0						
MW-103s-04-04-19-10:59-1	77	1.0						

Sample Name - Date/Time Sampled	1,4-Dioxane Results (ppb)	R.L. (ppb)	Bromate Results (ppb)	R.L. (ppb)	Bromide Results (ppb)	R.L. (ppb)	Comments	Qualifier(s)
MW-104-04-12-19-17:06-1	16	1.0						
MW-105d-04-23-19-15:55-1	190	5.0						D
MW-108d-04-24-19-13:55-1	804	100.0						D
MW-108s-04-24-19-12:39-1	280	10.0						D
MW-110-04-15-19-13:50-1	83	1.0						
MW-112i-04-03-19-15:11-1	9.7	1.0						
MW-112s-04-03-19-14:45-1	nd	1.0						
MW-115-04-24-19-12:39-1	540	10.0						D
MW-116-04-24-19-14:00-1	320	10.0						D
MW-119-04-15-19-12:15-1	48	1.0						
MW-120d-04-12-19-14:24-1	nd	1.0						
MW-121d-04-08-19-14:41-1	2.6	1.0						
MW-122d-04-16-19-12:09-1	nd	1.0						
MW-123d-04-15-19-09:28-1	nd	1.0						
MW-129d-04-12-19-13:01-1	1.4	1.0						
MW-130d-04-16-19-09:55-1	nd	1.0						
MW-133d-04-23-19-11:15-1	2.3	1.0						
MW-134d-04-24-19-09:39-1	2.1	1.0						
MW-135-04-26-19-12:13-1	nd	1.0						
MW-136d-04-11-19-11:01-1	nd	1.0						
MW-138d-04-11-19-14:06-1	nd	1.0						
MW-140d-04-11-19-12:27-1	nd	1.0						
MW-66-04-22-19-12:33-1	1.4	1.0						
MW-76i-04-04-19-12:20-1	92	1.0						
MW-76s-04-04-19-13:38-1	280	10.0						D
MW-81-04-30-19-13:11-1	200	5.0						D
MW-83s-04-30-19-14:37-1	420	10.0						D

Sample Name - Date/Time Sampled	1,4-Dioxane Results (ppb)	R.L. (ppb)	Bromate Results (ppb)	R.L. (ppb)	Bromide Results (ppb)	R.L. (ppb)	Comments	Qualifier(s)
MW-84s-04-04-19-15:00-1	23	1.0						
MW-85-04-29-19-13:44-1	520	10.0						D
MW-88-04-29-19-12:20-1	220	5.0						D
MW-90-04-26-19-14:05-1	12	1.0						
MW-91-04-29-19-10:55-1	190	5.0						D
MW-98d-04-29-19-09:23-1	16	1.0						
SH								
MW-5d-04-24-19-15:08-1	4600	100.0						D
Surface Water								
Not Applicable								
Allen Creek-Chapin-West Park-04-18-19-09:38-1	8.6	1.0						
Allen Creek-Eighth-Waterworks-04-18-19-10:45-1	nd	1.0						
Allen Creek-Maple Ridge-Arborview-04-18-19-10:00-1	nd	1.0						
Allen Creek-Maryfield-Wildwood Park-04-18-19-10:30-1	nd	1.0						
Allen Creek-Murray-Washington-04-18-19-10:55-1	nd	1.0						
Allen Creek-West Park SW-04-18-19-09:49-1	15	1.0						
Allen Creek-Wildwood-Arborview-04-18-19-10:20-1	nd	1.0						
HC/HR-04-01-19-08:40-1			nd	2.0				
HC/HR-04-02-19-08:06-1			nd	2.0				
HC/HR-04-03-19-08:06-1			nd	2.0				
HC/HR-04-04-19-08:24-1			nd	2.0				
HC/HR-04-05-19-07:59-1			nd	2.0				
HC/HR-04-08-19-07:41-1			nd	2.0				
HC/HR-04-09-19-07:51-1			nd	2.0				
HC/HR-04-10-19-07:46-1			nd	2.0				

Sample Name - Date/Time Sampled	1,4-Dioxane Results (ppb)	R.L. (ppb)	Bromate Results (ppb)	R.L. (ppb)	Bromide Results (ppb)	R.L. (ppb)	Comments	Qualifier(s)
HC/HR-04-11-19-07:54-1			nd	2.0				
HC/HR-04-12-19-07:49-1			nd	2.0				
HC/HR-04-15-19-07:46-1			nd	2.0				
HC/HR-04-16-19-07:47-1			nd	2.0				
HC/HR-04-17-19-07:41-1			nd	2.0				
HC/HR-04-18-19-07:49-1			nd	2.0				
HC/HR-04-19-19-07:58-1			nd	2.0				
HC/HR-04-22-19-07:49-1			nd	2.0				
HC/HR-04-23-19-08:11-1			nd	2.0				
HC/HR-04-24-19-07:55-1			nd	2.0				
HC/HR-04-25-19-07:43-1			nd	2.0				
HC/HR-04-26-19-07:49-1			nd	2.0				
HC/HR-04-29-19-07:48-1			nd	2.0				
HC/HR-04-30-19-07:43-1			nd	2.0				
Treatment System								
Green Pond-04-19-19-09:10-1	nd	1.0					Rainwater	
OUTFALL-04-01-19-1	6.5	1.0						
OUTFALL-04-01-19-2			7.5	5.0				
OUTFALL-04-02-19-1	6.7	1.0						
OUTFALL-04-02-19-2			5.5	5.0				
OUTFALL-04-03-19-1	6.9	1.0						
OUTFALL-04-03-19-2			nd	5.0				
OUTFALL-04-04-19-1	7.0	1.0						
OUTFALL-04-04-19-2			6.0	5.0				
OUTFALL-04-07-19-1	6.9	1.0						
OUTFALL-04-07-19-2			6.0	5.0				

Sample Name - Date/Time Sampled	1,4-Dioxane Results (ppb)	R.L. (ppb)	Bromate Results (ppb)	R.L. (ppb)	Bromide Results (ppb)	R.L. (ppb)	Comments	Qualifier(s)
OUTFALL-04-08-19-1	6.6	1.0						
OUTFALL-04-08-19-2			5.9	5.0				
OUTFALL-04-09-19-1	7.0	1.0						
OUTFALL-04-09-19-2			6.2	5.0				
OUTFALL-04-10-19-1	6.5	1.0						
OUTFALL-04-10-19-2			6.2	5.0				
OUTFALL-04-11-19-2			6.4	5.0				
OUTFALL-04-11-19-1	7.2	1.0						
OUTFALL-04-14-19-2			6.4	5.0				
OUTFALL-04-14-19-1	7.1	1.0						
OUTFALL-04-15-19-2			5.8	5.0				
OUTFALL-04-15-19-1	7.4	1.0						H
OUTFALL-04-16-19-2			5.9	5.0				
OUTFALL-04-16-19-1	6.6	1.0						H
OUTFALL-04-17-19-2			5.7	5.0				
OUTFALL-04-17-19-1	6.2	1.0						
OUTFALL-04-18-19-2			6.8	5.0				
OUTFALL-04-18-19-1	5.6	1.0						
OUTFALL-04-21-19-2			9.4	5.0				
OUTFALL-04-21-19-1	4.5	1.0						H
OUTFALL-04-22-19-2			9.0	5.0				
OUTFALL-04-22-19-1	5.2	1.0						H
OUTFALL-04-23-19-2			8.6	5.0				
OUTFALL-04-23-19-1	4.2	1.0						
OUTFALL-04-24-19-2			9.0	5.0				
OUTFALL-04-24-19-1	4.7	1.0						
OUTFALL-04-25-19-1	4.7	1.0						

Sample Name - Date/Time Sampled	1,4-Dioxane Results (ppb)	R.L. (ppb)	Bromate Results (ppb)	R.L. (ppb)	Bromide Results (ppb)	R.L. (ppb)	Comments	Qualifier(s)
OUTFALL-04-25-19-2			8.0	5.0				
OUTFALL-04-28-19-1	4.9	1.0						
OUTFALL-04-28-19-2			7.7	5.0				
OUTFALL-04-29-19-2			8.1	5.0				
OUTFALL-04-29-19-1	4.8	1.0						
OUTFALL-04-30-19-1	5.6	1.0						
OUTFALL-04-30-19-2			7.4	5.0				
Red Pond-04-01-19-08:16-1	370	10.0						D
Red Pond-04-08-19-07:11-1	380	10.0						D
Red Pond-04-15-19-07:14-1	390	10.0						D
Red Pond-04-22-19-08:20-1	370	10.0						D
Red Pond-04-29-19-07:20-1	380	10.0						D

PLS Qualifier Codes:

- nd: The compound was analyzed for, but was not detected at or above the detection limit indicated.
- D: Analyte value quantified from a dilution, reporting limit is raised to reflect dilution.
- H: Sample was analyzed past 14 day hold time, but within 28 days used by ATS for same method with EPA approval.
- O: Samples analyzed in outside laboratory, Ann Arbor Technical Services (ATS).



290 South Wagner Road
 Ann Arbor, Michigan 48103
 Tel. 734/995-0995 Fax. 734/995-3731
 Michigan Laboratory ID: 9604
 Wisconsin Laboratory ID: 998321720

Data Transmittal Cover Page

Project Name: Pall Corporation
ATS Project Number: G001-002
ATS Report Number(s): SRF_0423191

Project Description: This data report contains the results of one water sample, received by ATS on 4/23/19 to be analyzed for barium.

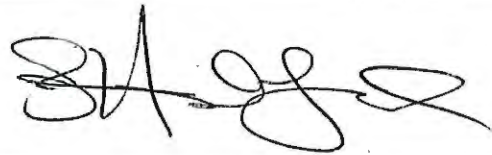
We certify that the sample analyses for this report have been conducted in accordance with guidelines provided in the referenced standard test method, and are consistent with detailed procedures described in a written Standard Operating Procedure specific to the ATS Laboratories, as required by USEPA. Laboratory data sheets, SOPs, and QA/QC information are available for inspection and audit at the laboratory upon request. Unless specifically noted on the data report, all applicable sample preservation and holding time requirements have been met.

Recipient: Ms. Sue Peters **Email:** Sue_Peters@Pall.com
FAX Number: _____

No. of Pages (including cover pg.): 3

From: Sarah Stubblefield **Email:** Sarah.Stubblefield@AnnArborTechnicalServices.com
 Senior Chemist / Lab Manager **FAX Number:** 734-995-3731

Additional Message: _____



Date: 5/2/19 **Signed:** _____

IF YOU DO NOT RECEIVE ALL PAGES OF THIS TRANSMITTAL, PLEASE CALL 734-995-0995.

This material is intended only for the use of the individual or entity to whom it is addressed, and may contain information that is privileged and confidential. If you are not the intended recipient or the agent responsible for delivering this material to the intended recipient, you are hereby notified that any dissemination, distribution or copying of this communication is strictly prohibited. If you have received this communication in error, please notify us immediately by telephone. Thank you.



290 South Wagner Road
Ann Arbor, Michigan 48103
Tel. 734/995-0995 Fax. 734/995-3731
Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Inorganic Analysis Data Summary Sheet

For: Ms. Sue Peters
Pall Corporation
642 South Wagner Road
Ann Arbor, MI 48103

ATS Project: Pall Corporation #G001-002
Report Date: 5/2/19
ATS SRF: 0423191

Sample Identification: Outfall 001

Sample Date: 4/8/19
Sample Time: na
Sampled By: Client
Laboratory Receipt Date: 4/23/19
Sample Matrix: Treated Water

<u>Parameter</u>	<u>Method</u>	<u>Units</u>	<u>Result</u>	<u>Reporting Limit</u>	<u>Analysis Date</u>	<u>Analysis Time</u>	<u>Analyzed By</u>
Metals Analysis							
Total Barium	EPA 200.7	mg/L	0.19	0.001	4/25/19	15:56	DMS

Comments

All methods reference USEPA methods unless otherwise noted.



250 South Wagner Road
Ann Arbor, Michigan 48103
Tel. 734/995-0995 Fax. 734/995-3731
Michigan Laboratory ID: 9504
Wisconsin Laboratory ID: 998321720

CHAIN OF CUSTODY RECORD

Page

PROJECT ID / NUMBER Total Barium Quarterly				LABORATORY INFORMATION				SHIPPING INFORMATION: SHIPPER (Check one) / TRACKING NUMBER(S) (if applicable)									
SAMPLE CUSTODIAN (Print & Signature) Susan Peters, Pall Corporation, 645 South Wagner Road, Ann Arbor, Mi. 48103				DATE / TIME 04-23-19 16:05				RECEIVED BY (Print & Signature) <i>E. Brier</i> 4/23/19				Date	Fed Ex	UPS	DHL	Courier	Tracking Number
RELINQUISHED BY (Print & Signature) Susan E.O. Peters <i>Susan E.O. Peters</i>				DATE / TIME 04-23-19 16:05				RECEIVED BY (Print & Signature) <i>E. Brier</i> 4/23/19				Date	Fed Ex	UPS	DHL	Courier	Tracking Number
RELINQUISHED BY (Print & Signature)				DATE / TIME				RECEIVED BY (Print & Signature)				Date	Fed Ex	UPS	DHL	Courier	Tracking Number
COMMENTS (Preservation, etc.) nitric acid												ANALYSIS				MATRIX Indicate Soil/Water/Air Sediment/Sludge Extract	
LINE NO.	BAR CODE	DATE	TIME	COMP.	GRAB	SAMPLE IDENTIFICATION	NO. OF CONTAINERS	PRIORITY NUMBER	Barium								
1.		04/08/2019	na	X		Outfall	1		X							about 200	
2.																	
3.																	
4.																	
5.																	
6.																	
7.																	
8.																	
9.																	
10.																	
11.																	
12.																	
13.																	
14.																	
15.																	
16.																	
17.																	
18.																	
19.																	
20.																	