February 08, 2022

Vista Work Order No. 2201160

Mr. Steve Dyke
Holland Board of Public Works
42 S. River Ave
Holland, MI 49423

Dear Mr. Dyke,

Enclosed are the results for the sample set received at Vista Analytical Laboratory on January 18, 2022 under your Project Name 'Holland Biosolids PFAS'.

Vista Analytical Laboratory is committed to serving you effectively. If you require additional information, please contact me at 916-673-1520 or by email at jfox@vista-analytical.com.

Thank you for choosing Vista as part of your analytical support team.

Sincerely,

Jamie Fox
Laboratory Director

Vista Analytical Laboratory certifies that the report herein meets all the requirements set forth by NELAP for those applicable test methods. Results relate only to the samples as received by the laboratory. This report should not be reproduced except in full without the written approval of Vista.

Vista Work Order No. 2201160
Case Narrative

Sample Condition on Receipt:

One sludge sample was received and stored securely in accordance with Vista standard operating procedures and EPA methodology. The sample was received in good condition and within the recommended temperature requirements.

Analytical Notes:

PFAS Isotope Dilution Method

The sample was extracted and analyzed for a selected list of PFAS using Vista's Isotope Dilution Method. The results for PFHxS, PFOA, PFOS, MeFOSAA and EtFOSAA include both linear and branched isomers. Results for all other analytes include the linear isomers only.

Holding Times

The sample was extracted and analyzed within the hold times.

Quality Control

The Initial Calibration and Continuing Calibration Verifications met the method acceptance criteria.

A Method Blank and Ongoing Precision and Recovery (OPR) sample were extracted and analyzed with the preparation batch. No analytes were detected in the Method Blank above the Reporting Limit (RL). The OPR recoveries were within the method acceptance criteria.

The labeled standard recoveries outside the acceptance criteria are listed in the table below.

QC Anomalies

LabNumber	SampleName	Analysis	Analyte	Flag	%Rec
2201160-01	Biosolids PFAS	PFAS Isotope Dilution Method	13C3-PFBA	H	20.4
2201160-01	Biosolids PFAS	PFAS Isotope Dilution Method	13C2-PFDA	H	21.4
2201160-01	Biosolids PFAS	PFAS Isotope Dilution Method	13C2-8:2 FTS	H	24.2
2201160-01	Biosolids PFAS	PFAS Isotope Dilution Method	d3-MeFOSAA	H	13.3
2201160-01	Biosolids PFAS	PFAS Isotope Dilution Method	13C2-PFUnA	H	15.6
2201160-01	Biosolids PFAS	PFAS Isotope Dilution Method	d5-EtFOSAA	H	14.1
2201160-01	Biosolids PFAS	PFAS Isotope Dilution Method	13C2-PFDoA	H	10.8
2201160-01	Biosolids PFAS	PFAS Isotope Dilution Method	13C2-PFTeDA	H	13.1

H = Recovery was outside laboratory acceptance criteria.

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Sample Inventory Report

Vista Sample ID	Client Sample ID	Sampled	Received	Components/Containers
2201160-01	Biosolids PFAS	17-Jan-22 10:00	18-Jan-22 09:44	HDPE Jar, 6 oz

Vista Project: 2201160

Client Project: Holland Biosolids PFAS

ANALYTICAL RESULTS

Sample ID: Method Blank

PFAS Isotope Dilution Method

Client Data

Name: Holland Board of Public Works
Project: Holland Biosolids PFAS
Matrix: Solid

Laboratory Data

Lab Sample: B22A111-BLK1
Column: BEH C18

Analyte	CAS Number	Conc. (ng/g)	RL	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFBA	375-22-4	ND	1.00		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
PFPeA	2706-90-3	ND	1.00		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
PFBS	375-73-5	ND	1.00		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
4:2 FTS	757124-72-4	ND	2.00		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
PFHxA	307-24-4	ND	1.00		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
PFPeS	2706-91-4	ND	1.00		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
HFPO-DA	13252-13-6	ND	2.00		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
PFHpA	375-85-9	ND	1.00		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
ADONA	919005-14-4	ND	1.00		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
PFHxS	355-46-4	ND	1.00		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
6:2 FTS	27619-97-2	ND	2.00		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
PFOA	335-67-1	ND	1.00		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
PFHpS	375-92-8	ND	2.00		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
PFNA	375-95-1	ND	1.00		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
PFOSA	754-91-6	ND	2.00		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
PFOS	1763-23-1	ND	2.00		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
9Cl-PF3ONS	756426-58-1	ND	1.00		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
PFDA	335-76-2	ND	1.00		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
8:2 FTS	39108-34-4	ND	2.00		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
PFNS	68259-12-1	ND	2.00		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
MeFOSAA	2355-31-9	ND	1.00		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
EtFOSAA	2991-50-6	ND	1.00		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
PFUnA	2058-94-8	ND	2.00		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
PFDS	335-77-3	ND	1.00		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
11Cl-PF3OUdS	763051-92-9	ND	2.00		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
PFDoA	307-55-1	ND	1.00		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
PFTrDA	72629-94-8	ND	1.00		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
PFTeDA	376-06-7	ND	1.00		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C3-PFBA	IS	86.8	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
13C3-PFPeA	IS	91.1	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
13C3-PFBS	IS	93.3	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
13C3-HFPO-DA	IS	88.3	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
13C2-4:2 FTS	IS	99.8	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
13C2-PFHxA	IS	87.7	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
13C4-PFHpA	IS	87.8	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
13C3-PFHxS	IS	99.0	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
13C2-6:2 FTS	IS	88.2	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1

Sample ID: Method Blank — **PFAS Isotope Dilution Method**

Client Data

Name: Holland Board of Public Works
Project: Holland Biosolids PFAS
Matrix: Solid

Laboratory Data

Lab Sample: B22A111-BLK1
Column: BEH C18

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C5-PFNA	IS	77.8	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
13C8-PFOSA	IS	22.2	10 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
13C2-PFOA	IS	84.4	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
13C8-PFOS	IS	90.2	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
13C2-PFDA	IS	65.4	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
13C2-8:2 FTS	IS	73.2	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
d3-MeFOSAA	IS	52.7	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
13C2-PFUnA	IS	50.9	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
d5-EtFOSAA	IS	52.5	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
13C2-PFDoA	IS	52.5	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1
13C2-PFTeDA	IS	64.4	20 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 14:58	1

RL - Reporting limit

The results are reported in dry weight.
The sample size is reported in wet weight.
Results reported to RL.

When reported, PFHxS, PFOA, PFOS, MeFOSAA and EtFOSAA include both linear and branched isomers. Only the linear isomer is reported for all other analytes.

Sample ID: OPR **PFAS Isotope Dilution Method**

Client Data

Name: Holland Board of Public Works
Project: Holland Biosolids PFAS
Matrix: Solid

Laboratory Data

Lab Sample: B22A111-BS1
Column: BEH C18

Analyte	CAS Number	Amt Found (ng/g)	Spike Amt	% Rec	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFBA	375-22-4	19.1	20.0	95.7	65 - 135		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
PFPeA	2706-90-3	19.6	20.0	98.2	65 - 135		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
PFBS	375-73-5	20.8	20.0	104	65 - 135		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
4:2 FTS	757124-72-4	19.4	20.0	96.9	60 - 145		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
PFHxA	307-24-4	19.8	20.0	99.1	65 - 135		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
PFPeS	2706-91-4	20.1	20.0	101	65 - 135		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
HFPO-DA	13252-13-6	22.5	20.0	112	65 - 135		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
PFHpA	375-85-9	18.6	20.0	92.9	65 - 135		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
ADONA	919005-14-4	18.6	20.0	93.2	65 - 135		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
PFHxS	355-46-4	19.6	20.0	97.8	65 - 135		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
6:2 FTS	27619-97-2	19.4	20.0	97.2	60 - 140		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
PFOA	335-67-1	18.4	20.0	91.9	65 - 135		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
PFHpS	375-92-8	20.8	20.0	104	65 - 135		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
PFNA	375-95-1	20.6	20.0	103	65 - 135		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
PFOSA	754-91-6	17.8	20.0	89.1	65 - 140		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
PFOS	1763-23-1	21.2	20.0	106	65 - 140		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
9Cl-PF3ONS	756426-58-1	18.5	20.0	92.7	65 - 135		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
PFDA	335-76-2	19.4	20.0	97.0	65 - 135		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
8:2 FTS	39108-34-4	20.3	20.0	101	65 - 135		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
PFNS	68259-12-1	18.3	20.0	91.5	65 - 135		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
MeFOSAA	2355-31-9	19.1	20.0	95.7	65 - 135		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
EtFOSAA	2991-50-6	18.7	20.0	93.7	65 - 135		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
PFUnA	2058-94-8	20.3	20.0	102	65 - 140		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
PFDS	335-77-3	16.7	20.0	83.5	50 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
11Cl-PF3OUdS	763051-92-9	24.9	20.0	125	65 - 135		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
PFDoA	307-55-1	20.6	20.0	103	65 - 135		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
PFTrDA	72629-94-8	21.6	20.0	108	60 - 140		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
PFTeDA	376-06-7	19.5	20.0	97.4	65 - 135		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1

Labeled Standards	Type	% Rec	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C3-PFBA	IS	87.6	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
13C3-PFPeA	IS	91.6	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
13C3-PFBS	IS	88.1	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
13C3-HFPO-DA	IS	88.4	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
13C2-4:2 FTS	IS	89.5	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
13C2-PFHxA	IS	87.6	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1

Sample ID: OPR

PFAS Isotope Dilution Method

Client Data

Name: Holland Board of Public Works
Project: Holland Biosolids PFAS
Matrix: Solid

Laboratory Data

Lab Sample: B22A111-BS1
Column: BEH C18

Labeled Standards	Type	% Rec	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C4-PFHpA	IS	88.7	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
13C3-PFHxS	IS	92.9	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
13C2-6:2 FTS	IS	83.1	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
13C5-PFNA	IS	80.0	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
13C8-PFOSA	IS	19.8	10 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
13C2-PFOA	IS	86.4	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
13C8-PFOS	IS	90.3	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
13C2-PFDA	IS	68.9	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
13C2-8:2 FTS	IS	76.4	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
d3-MeFOSAA	IS	56.3	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
13C2-PFUnA	IS	56.5	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
d5-EtFOSAA	IS	54.4	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
13C2-PFDoA	IS	56.2	25 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1
13C2-PFTeDA	IS	65.5	20 - 150		B22A111	31-Jan-22	0.500 g	04-Feb-22 15:08	1

Sample ID: Biosolids PFAS

PFAS Isotope Dilution Method

Client Data

Name: Holland Board of Public Works
Project: Holland Biosolids PFAS
Location: Holland Biosolids PFAS
Matrix: Sludge
Date Collected: 17-Jan-22 10:00

Laboratory Data

Lab Sample: 2201160-01
Date Received: 18-Jan-22 09:44
% Solids: 4.07
Column: BEH C18

Analyte	CAS Number	Conc. (ng/g)	RL	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFBA	375-22-4	ND	1.00		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
PFPeA	2706-90-3	ND	1.00		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
PFBS	375-73-5	ND	1.00		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
4:2 FTS	757124-72-4	ND	2.01		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
PFHxA	307-24-4	3.15	1.00		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
PFPeS	2706-91-4	ND	1.00		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
HFPO-DA	13252-13-6	ND	2.01		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
PFHpA	375-85-9	ND	1.00		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
ADONA	919005-14-4	ND	1.00		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
PFHxS	355-46-4	ND	1.00		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
6:2 FTS	27619-97-2	ND	2.01		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
PFOA	335-67-1	ND	1.00		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
PFHpS	375-92-8	ND	2.01		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
PFNA	375-95-1	ND	1.00		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
PFOSA	754-91-6	ND	2.01		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
PFOS	1763-23-1	ND	2.01		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
9Cl-PF3ONS	756426-58-1	ND	1.00		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
PFDA	335-76-2	ND	1.00		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
8:2 FTS	39108-34-4	ND	2.01		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
PFNS	68259-12-1	ND	2.01		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
MeFOSAA	2355-31-9	1.88	1.00		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
EtFOSAA	2991-50-6	1.62	1.00		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
PFUnA	2058-94-8	ND	2.01		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
PFDS	335-77-3	ND	1.00		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
11Cl-PF3OUdS	763051-92-9	ND	2.01		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
PFDoA	307-55-1	ND	1.00		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
PFTrDA	72629-94-8	ND	1.00		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
PFTeDA	376-06-7	ND	1.00		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C3-PFBA	IS	20.4	25 - 150	H	B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
13C3-PFPeA	IS	29.7	25 - 150		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
13C3-PFBS	IS	34.8	25 - 150		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
13C3-HFPO-DA	IS	30.8	25 - 150		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
13C2-4:2 FTS	IS	33.3	25 - 150		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
13C2-PFHxA	IS	31.9	25 - 150		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
13C4-PFHpA	IS	35.4	25 - 150		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
13C3-PFHxS	IS	34.3	25 - 150		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1

Sample ID: Biosolids PFAS — **PFAS Isotope Dilution Method**

Client Data

Name:	Holland Board of Public Works	Matrix:	Sludge
Project:	Holland Biosolids PFAS	Date Collected:	17-Jan-22 10:00
Location:	Holland Biosolids PFAS		

Laboratory Data

Lab Sample:	2201160-01	Column:	BEH C18
Date Received:	18-Jan-22 09:44		
% Solids:	4.07		

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C2-6:2 FTS	IS	40.0	25 - 150		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
13C5-PFNA	IS	25.4	25 - 150		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
13C8-PFOSA	IS	13.1	10 - 150		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
13C2-PFOA	IS	31.0	25 - 150		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
13C8-PFOS	IS	25.5	25 - 150		B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
13C2-PFDA	IS	21.4	25 - 150	H	B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
13C2-8:2 FTS	IS	24.2	25 - 150	H	B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
d3-MeFOSAA	IS	13.3	25 - 150	H	B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
13C2-PFUnA	IS	15.6	25 - 150	H	B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
d5-EtFOSAA	IS	14.1	25 - 150	H	B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
13C2-PFDoA	IS	10.8	25 - 150	H	B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1
13C2-PFTeDA	IS	13.1	20 - 150	H	B22A111	31-Jan-22	12.2 g	04-Feb-22 15:18	1

RL - Reporting limit

The results are reported in dry weight.
The sample size is reported in wet weight.
Results reported to RL.

When reported, PFHxS, PFOA, PFOS, MeFOSAA and EtFOSAA include both linear and branched isomers. Only the linear isomer is reported for all other analytes.

DATA QUALIFIERS & ABBREVIATIONS

B	This compound was also detected in the method blank
Conc.	Concentration
CRS	Cleanup Recovery Standard
D	Dilution
DL	Detection Limit
E	The associated compound concentration exceeded the calibration range of the instrument
H	Recovery and/or RPD was outside laboratory acceptance limits
I	Chemical Interference
IS	Internal Standard
J	The amount detected is below the Reporting Limit/LOQ
LOD	Limit of Detection
LOQ	Limit of Quantitation
M	Estimated Maximum Possible Concentration (CA Region 2 projects only)
MDL	Method Detection Limit
NA	Not applicable
ND	Not Detected
OPR	Ongoing Precision and Recovery sample
P	The reported concentration may include contribution from chlorinated diphenyl ether(s).
Q	The ion transition ratio is outside of the acceptance criteria.
RL	Reporting Limit
RL	For 537.1, the reported RLs are the MRLs.
TEQ	Toxic Equivalency, sum of the toxic equivalency factors (TEF) multiplied by the sample concentrations.
TEQMax	TEQ calculation that uses the detection limit as the concentration for non-detects
TEQMin	TEQ calculation that uses zero as the concentration for non-detects
TEQRisk	TEQ calculation that uses ½ the detection limit as the concentration for non-detects
U	Not Detected (specific projects only)
*	See Cover Letter

Unless otherwise noted, solid sample results are reported in dry weight. Tissue samples are reported in wet weight.

Vista Analytical Laboratory Certifications

Accrediting Authority	Certificate Number
Alaska Department of Environmental Conservation	17-013
Arkansas Department of Environmental Quality	21-023-0
California Department of Health – ELAP	2892
DoD ELAP - A2LA Accredited - ISO/IEC 17025:2005	3091.01
Florida Department of Health	E87777-26
Hawaii Department of Health	N/A
Louisiana Department of Environmental Quality	01977
Maine Department of Health	2020018
Massachusetts Department of Environmental Protection	M-CA413
Michigan Department of Environmental Quality	9932
Minnesota Department of Health	1980678
New Hampshire Environmental Accreditation Program	207720
New Jersey Department of Environmental Protection	CA003
New York Department of Health	11411
Ohio Environmental Protection Agency	87778
Oregon Laboratory Accreditation Program	4042-016
Pennsylvania Department of Environmental Protection	017
Texas Commission on Environmental Quality	T104704189-21-12
Vermont Department of Health	VT-4042
Virginia Department of General Services	10769
Washington Department of Ecology	C584
Wisconsin Department of Natural Resources	998036160

Current certificates and lists of licensed parameters are located in the Quality Assurance office and are available upon request.

NELAP Accredited Test Methods

MATRIX: Air	
Description of Test	**Method**
Determination of Polychlorinated p- Dioxins & Polychlorinated Dibenzofurans	EPA 23
Polychlorinated Dibenzodioxins in Ambient Air by GC/HRMS	EPA TO-9A

MATRIX: Biological Tissue	
Description of Test	**Method**
Tetra- through Octa-Chlorinated Dioxins and Furans by Isotope Dilution GC/HRMS	EPA 1613B
Brominated Diphenyl Ethers by HRGC/HRMS	EPA 1614A
Chlorinated Biphenyl Congeners in Water, Soil, Sediment, and Tissue by GC/HRMS	EPA 1668A/C
Pesticides in Water, Soil, Sediment, Biosolids, and Tissue by HRGC/HRMS	EPA 1699
Perfluorinated Alkyl Acids in Drinking Water by SPE and LC/MS/MS	EPA 537
Polychlorinated Dibenzo-p-Dioxins and Polychlorinated Dibenzofurans by GC/HRMS	EPA 8280A/B
Polychlorinated Dibenzodioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) by GC/HRMS	EPA 8290/8290A

MATRIX: Drinking Water	
Description of Test	**Method**
Tetra- through Octa-Chlorinated Dioxins and Furans by Isotope Dilution GC/HRMS	EPA 1613/1613B
Perfluorinated Alkyl Acids in Drinking Water by SPE and LC/MS/MS	EPA 537
Perfluorinated Alkyl Acids in Drinking Water by SPE and LC/MS/MS	EPA 537.1
Determination of Per- and Polyfluoroalkyl Substances in Drinking Water by Isotope Dilution Anion Exchange Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry	EPA 533
Perfluorooctanesulonate (PFOS) and Perfluorooctanoate (PFOA) - Method for Unfiltered Samples Using Solid Phase Extraction and Liquid Chromatography/Mass Spectrometry	ISO 25101 2009

MATRIX: Non-Potable Water	
Description of Test	**Method**
Tetra- through Octa-Chlorinated Dioxins and Furans by Isotope Dilution GC/HRMS	EPA 1613B
Brominated Diphenyl Ethers by HRGC/HRMS	EPA 1614A
Chlorinated Biphenyl Congeners in Water, Soil, Sediment, and Tissue by GC/HRMS	EPA 1668A/C
Pesticides in Water, Soil, Sediment, Biosolids, and Tissue by HRGC/HRMS	EPA 1699
Perfluorinated Alkyl Acids in Drinking Water by SPE and LC/MS/MS	EPA 537
Dioxin by GC/HRMS	EPA 613
Polychlorinated Dibenzo-p-Dioxins and Polychlorinated Dibenzofurans by GC/HRMS	EPA 8280A/B
Polychlorinated Dibenzodioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) by GC/HRMS	EPA 8290/8290A

MATRIX: Solids	
Description of Test	**Method**
Tetra-Octa Chlorinated Dioxins and Furans by Isotope Dilution GC/HRMS	EPA 1613
Tetra- through Octa-Chlorinated Dioxins and Furans by Isotope Dilution GC/HRMS	EPA 1613B
Brominated Diphenyl Ethers by HRGC/HRMS	EPA 1614A
Chlorinated Biphenyl Congeners in Water, Soil, Sediment, and Tissue by GC/HRMS	EPA 1668A/C
Pesticides in Water, Soil, Sediment, Biosolids, and Tissue by HRGC/HRMS	EPA 1699
Perfluorinated Alkyl Acids in Drinking Water by SPE and LC/MS/MS	EPA 537
Polychlorinated Dibenzo-p-Dioxins and Polychlorinated Dibenzofurans by GC/HRMS	EPA 8280A/B
Polychlorinated Dibenzodioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) by GC/HRMS	EPA 8290/8290A

Vista Analytical Laboratory

CHAIN OF CUSTODY

For Laboratory Use Only
Work Order #: 2201160 Temp: 5.8 °C
Storage ID: WR-2 Storage Secured: Yes ☑ No ☐

Project ID: Holland Biosolids PFAS PO#: Sampler: Steve Dyke (name)

TAT (check one): Standard: x 21 days; Rush (surcharge may apply): ☐ 14 days ☐ 7 days Specify:

Relinquished by (printed name and signature)	Date	Time	Received by (printed name and signature)	Date	Time
Steve Dyke Steve Dyke	1-17-22	10Am	Justin Briseño Justin Brise	01/18/22	0944

SHIP TO: Vista Analytical Laboratory
1104 Windfield Way
El Dorado Hills, CA 95762
(916) 673-1520 * Fax (916) 673-0106

ATTN: Lab

Method of Shipment: Air
Tracking No.: 1z4xx1332210010823

Add Analysis(es) Requested

Sample ID	Date	Time	Location/ Sample Description	Container(s) Quantity	Type	Matrix	PFOA/ PFOS	UCMR3 PFAS List:6	537.1 List: 14 or 18 (Circle One)	EPA Draft List of 24	OTHER: Please attach analyte list	PFAS by Isotope Dilution: PFOA/ PFOS	PFAS by Isotope Dilution: UCMR3 PFAS List:6	PFAS by Isotope Dilution: 537.1 List of 14	PFAS by Isotope Dilution: 537.1 List of 18	EPA Method 537 (DW only)	Comments
Biosolids PFAS	1-17-22	10am	Holland Biosolids PFAS	1	PJ	SL					x						See attached list.

Special Instructions/Comment
Please see attached list of the 28 analytes. We would also like a percent solids.
Note: pH of sample is approximately 12.

SEND DOCUMENTATION AND RESULTS TO:

Name: Steve Dyke
Company: Holland BPW
Address: 42 South River Ave
City: Holland State: MI Zip: 49424
Phone: (616)355-1255
Email: sdyke@hollandbpw.com

Container Types: P = HDPE, PJ = HDPE Jar
PY = Polypropylene, O= Other

Bottle Preservation Type:
TZ= Trizma:

Matrix Types: AQ = Aqueous, DW = Drinking Water, EF = Effluent, PP = Pulp/Paper, SD = Sediment, SL = Sludge, SO = Soil, WW = Wastewater, B = Blood/Serum, O = Other

EGLE PERFLUOROALKYL AND POLYFLUOROALKYL SUBSTANCES (PFAS) MINIMUM LABORATORY ANALYTE LIST

Below is the minimum laboratory PFAS analyte list for analysis of deer, drinking water, groundwater, surface water, soil, wastewater effluent, and landfill leachate samples collected by Michigan's Departments of Environment, Great Lakes, and Energy, Health and Human Services, Agriculture and Rural Development, and Natural Resources.

This minimum analyte list was developed based on the potential for these chemicals to be found in Michigan, the availability of the chemical standards used for testing, and the ability of available laboratories to test for these PFAS. This list includes PFAS that can be tested for in drinking water using United States Environmental Protection Agency (USEPA) Methods 537 Rev.1.1 or 537.1, which are the only methods that should be used when analyzing drinking water samples. Other testing methodology may be used to test for PFAS in other media (not drinking water). This list is not exhaustive of PFAS in Michigan's environment.

A fish icon (🐟) precedes those compounds that are also currently being tested for in fish tissue.

Analyte Name	Acronym	Fluorinated Carbon Chain Length	Molecular Formula	CAS Number	USEPA Method 537 Rev. 1.1	USEPA Method 537.1
🐟 Perfluorotetradecanoic acid	PFTeA	C_{14}	$C_{13}F_{27}COOH$	376-06-7	X	
🐟 Perfluorotridecanoic acid	PFTriA	C_{13}	$C_{12}F_{25}COOH$	72629-94-8	X	
🐟 Perfluorododecanoic acid	PFDoA	C_{12}	$C_{11}F_{23}COOH$	307-55-1	X	
🐟 Perfluoroundecanoic acid	PFUnA	C_{11}	$C_{10}F_{21}COOH$	2058-94-8	X	
🐟 Perfluorodecanoic acid	PFDA	C_{10}	$C_9F_{19}COOH$	335-76-2	X	
🐟 Perfluorononanoic acid	PFNA	C_9	$C_8F_{17}COOH$	375-95-1	X	
🐟 Perfluorooctanoic acid	PFOA	C_8	$C_7F_{15}COOH$	335-67-1	X	
🐟 Perfluoroheptanoic acid	PFHpA	C_7	$C_6F_{13}COOH$	375-85-9	X	
🐟 Perfluorohexanoic acid	PFHxA	C_6	$C_5F_{11}COOH$	307-24-4	X	
🐟 Perfluoropentanoic acid	PFPeA	C_5	C_4F_9COOH	2706-90-3		
🐟 Perfluorobutanoic acid	PFBA	C_4	C_3F_7COOH	375-22-4		
🐟 Perfluorodecanesulfonic acid	PFDS	C_{10}	$C_{10}F_{21}SO_3H$	335-77-3		
Perfluorononanesulfonic acid	PFNS	C_9	$C_9F_{19}SO_3H$	68259-12-1		
🐟 Perfluorooctanesulfonic acid	PFOS	C_8	$C_8F_{17}SO_3H$	1763-23-1	X	
Perfluoroheptanesulfonic acid	PFHpS	C_7	$C_7F_{15}SO_3H$	375-92-8		
🐟 Perfluorohexanesulfonic acid	PFHxS	C_6	$C_6F_{13}SO_3H$	355-46-4	X	
Perfluoropentanesulfonic acid	PFPeS	C_5	$C_5F_{11}SO_3H$	2706-91-4		
🐟 Perfluorobutanesulfonic acid	PFBS	C_4	$C_4F_9SO_3H$	375-73-5	X	

Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS)
Minimum Laboratory Analyte List

2201160 5.8°C

Analyte Name	Acronym	Fluorinated Carbon Chain Length	Molecular Formula	CAS Number	USEPA Method 537 Rev. 1.1	USEPA Method 537.1
Perfluorooctanesulfonamide	PFOSA	C_8	$C_8F_{17}SO_2NH_2$	754-91-6		
Fluorotelomer sulfonic acid 8:2	FtS 8:2	C_8	$C_8F_{17}CH_2CH_2SO_3$	39108-34-4		
Fluorotelomer sulfonic acid 6:2	FtS 6:2	C_6	$C_6F_{13}CH_2CH_2SO_3$	27619-97-2		
Fluorotelomer sulfonic acid 4:2	FtS 4:2	C_4	$C_4F_9CH_2CH_2SO_3$	757124-72-4		
2-(N-Ethylperfluorooctanesulfonamido) acetic acid	N-EtFOSAA	C_8	$C_8F_{17}SO_2N(C_2H_5)CH_2COOH$	2991-50-6	X	
2-(N-Methylperfluorooctanesulfonamido) acetic acid	N-MeFOSAA	C_8	$C_8F_{17}SO_2N(CH_3)CHCOOH$	2355-31-9	X	
Hexafluoropropylene oxide dimer acid	HFPO-DA	C6	$C_6HF_{11}O_3$	13252-13-6		X
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	11Cl-PF3OUdS	C10	$C_{10}HF_{20}ClSO_4$	763051-92-9		X
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid	9Cl-PF3ONS	C8	$C_8HF_{16}ClSO_4$	756426-58-1		X
4,8-dioxa-3H-perfluorononanoic acid	ADONA	C7	$C_7H_2F_{12}O_4$	919005-14-4		X

Laboratories Providing PFAS Analytical Services

(The list that turns up in the search results from the following links does not constitute an endorsement of those firms on the list, nor is it a statement against any firm not on the list. Additionally, the capacity of the labs to provide services consistent with EGLE's recommendations above has not been verified and these details should be addressed prior to contracting with the laboratories below.)

The **United States Environmental Protection Agency (US EPA)** has a list of laboratories approved under the UCMR3 program using US EPA Method 537 Rev. 1.1 for PFAS in drinking water:
https://www.epa.gov/dwucmr/third-unregulated-contaminant-monitoring-rule

The **United States Department of Defense, Environmental Laboratory Accreditation Program (US DoD ELAP)** maintains a list of labs for the determination of PFAS in various environmental media other than drinking water on the Defense Environmental Network Information Exchange (DENIX) server:
http://www.denix.osd.mil/edqw/accreditation/accreditedlabs/

Contact Information

Questions regarding PFAS in general, contact:

- **MDHHS General Information**
  (517) 373-3740
- **EGLE Environmental Assistance Center**
  (800) 662-9278

Questions regarding laboratory information, contact:

- **MDHHS Chemistry & Toxicology Division**
  (517) 335-9490
- **EGLE Drinking Water Analysis Laboratory**
  (517) 335-8184

Vista Analytical Laboratory

Sample Log-In Checklist

Page # 1 of 1

Vista Work Order #: 2201160 TAT STD

Samples Arrival:	**Date/Time** 01/18/22 0944		**Initials:**		**Location:** WR-2 **Shelf/Rack:** N/A		
Delivered By:	FedEx	UPS	On Trac	GLS	DHL	Hand Delivered	Other
Preservation:	Ice		Blue Ice		Techni Ice	Dry Ice	None
Temp °C: 5.8 (uncorrected)		**Probe used:** Y / N			**Thermometer ID:** DT-5		
Temp °C: 5.8 (corrected)							

	YES	NO	NA
Shipping Container(s) Intact?	✓		
Shipping Custody Seals Intact?		✓	✓
Airbill — Trk # 1Z4XX1332210010823	✓		
Shipping Documentation Present?	✓		
Shipping Container: Vista / Client / Retain / Return		Dispose	
Chain of Custody / Sample Documentation Present?	✓		
Chain of Custody / Sample Documentation Complete?	✓		
Holding Time Acceptable?	✓		

Logged In:	**Date/Time** 01/18/22 1422	**Initials:**	**Location:** WR-2 **Shelf/Rack:** A-3	
COC Anomaly/Sample Acceptance Form completed?			✓	✓

Comments:

CoC/Label Reconciliation Report WO# 2201160

LabNumber	CoC Sample ID		SampleAlias	Sample Date/Time		Container	BaseMatrix	Sample Comments
2201160-01	A Biosolids PFAS	☑	Holland Biosolids PFAS	17-Jan-22 10:00	☑	HDPE Jar, 6 oz	Solid	

Checkmarks indicate that information on the COC reconciled with the sample label.
Any discrepancies are noted in the following columns.

	Yes	No	NA
Sample Container Intact?	✓		
Sample Custody Seals Intact?	✓		
Adequate Sample Volume?	✓		
Container Type Appropriate for Analysis(es)	✓		

Comments:

Preservation Documented: Na2S2O3 Trizma NH4CH3CO2 None All Other

Verifed by/Date: JB 01/18/22