PFAS BRIEFING FOR THE COMMITTEE ON ENVIRONMENT AND NATURAL RESOURCES

FEBRUARY 8, 2021

DAVID BURNS, P.E., DIRECTOR
BUREAU OF REMEDIATION & WASTE MANAGEMENT

Overview of Presentation

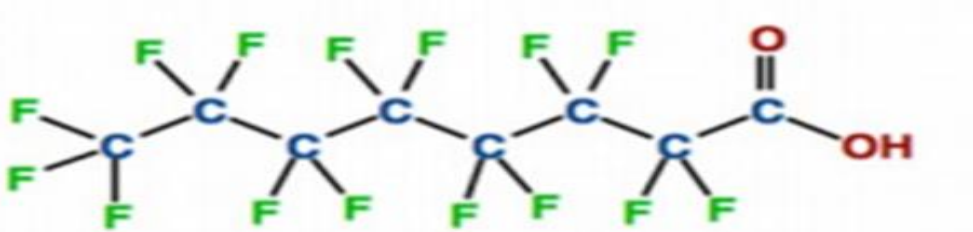
- PFAS basics
- Regulatory levels
- Current work
- Site Examples
- Federal and State actions

PFAS – What Are They?

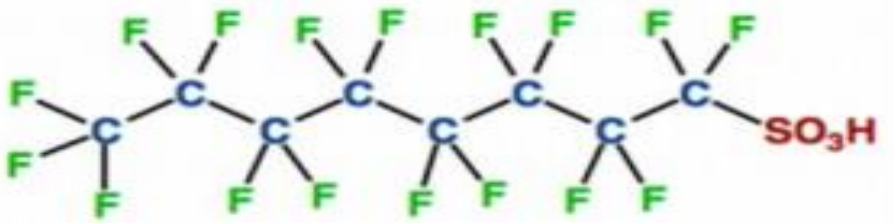
- Stable, C-F bond strength
  Low volatility
  High molecular weight

- Thermally stable
  Hydrophobic
  Lipophobic
  Surfactant properties

- Focus on small percentage of the total number of PFAS compounds (4,000+)



PFOA - perfluorooctanoic acid



PFOS - perfluorooctanesulfonic acid

Where Used?

Previous and Current Uses: Industrial and Consumer Products

PFOA

- Cooking surfaces (Teflon)
- Fire fighting foams
- Toothpaste, Shampoos, cosmetics
- Polishes and waxes
- Electronics
- Lubricants/surfactants/emulsifiers
- Pesticide
- Plumbing Tape
- Food containers and contact paper
- Textiles (Gore-Tex) and Leather
- Paints, varnishes, sealants
- Cleaning products
- And more…

PFOS

- Metal plating and finishing
- Fire fighting foams
- Photograph Development
- Semiconductor industry
- Aviation Fluids
- Flame repellants
- Packaging Papers
- Oil and Mining
- Stain repellants on carpets and upholstery (e.g. Stainmaster, ScotchGard)
- Cleaning products
- Paints, varnishes, sealants
- Leathers, textiles
- And more…

ASWDA (2016)

Where Are PFAS Found in the Environment?

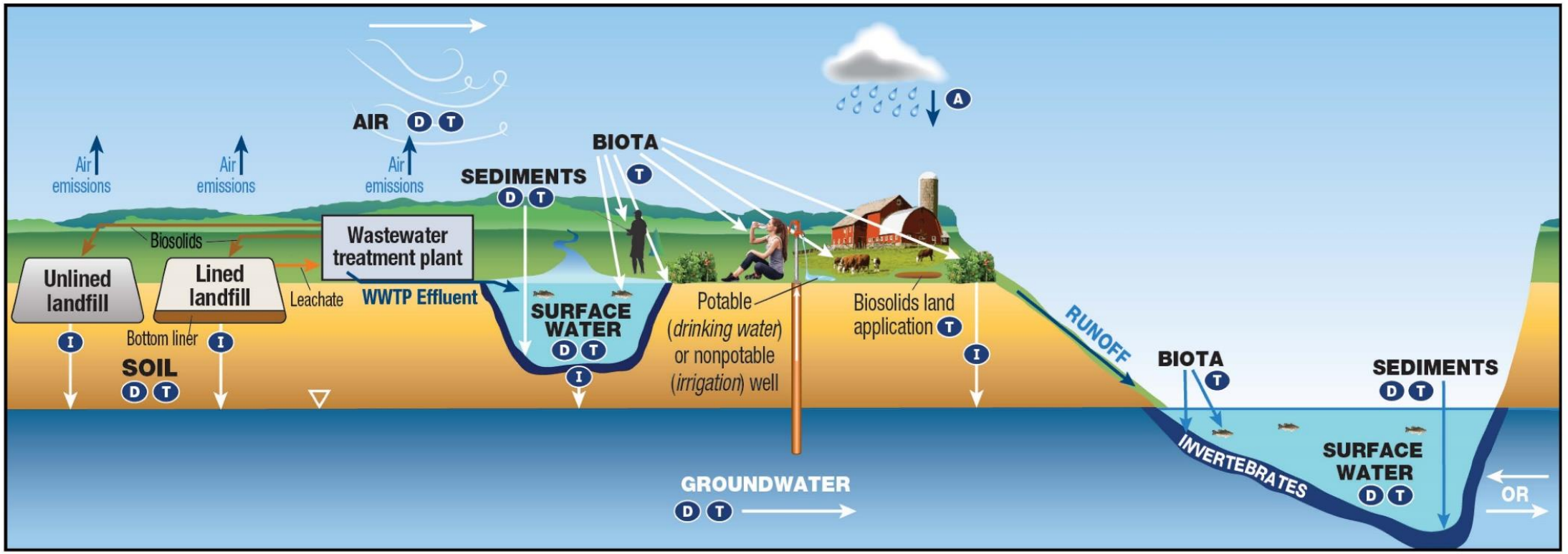


Figure 3. Conceptual site model for landfills and WWTPs.

(Source: Adapted from figure by L. Trozzolo, TRC, used with permission)

Regulatory Levels

- Biosolids/compost screening levels for PFOA, PFOS, & PFBS
- EPA drinking water Health Advisory (PFOA, PFOS, or PFOA + PFOS) – 70 ppt
- Governor's Task Force recommendation for sum of 5 PFAS in drinking water (PFOA, PFOS, PFNA, PFHpA, & PFHxS) – 70 ppt
- Other screening or action levels (fish tissue, milk, beef, crop-specific soil screening levels) developed by ME CDC as requested

MAINE PFAS SCREENING LEVELS

November 2020

Soil Remedial Action Guidelines[1] (mg/kg)						
Compound	Leaching to Groundwater	Residential	Commercial Worker	Park User	Recreator Sediment	Construction Worker
PFBS	7.1	1,700	22,000	4,900	5,700	51,000
PFOS	0.021	1.7	22	4.9	5.7	5.1
PFOA	0.0095	1.7	22	4.9	5.7	5.1

Soil Beneficial Use[2] (ng/g, dry weight)	
Compound	Beneficial Use
PFBS	1,900
PFOS	5.2
PFOA	2.5

Recreational Angler RAGs[3] (mg/kg wet weight)	
Compound	Fish Tissue
PFBS	52
PFOS	0.052
PFOA	0.052

Drinking Water[4] (ng/l or ppt)	
Compound	Residential
PFOS	70
PFOA	70

Milk[5] (ng/l or ppt)	
Compound	Action Level
PFOS	210

Beef[6] (ng/g)	
Compound	Action Level
PFOS	3.4

Dairy[7] - PFOS Crop-Specific Soil Screening Levels (ng/g dry weight)			
	Soil to Hay to Milk Screening Level	Soil to Corn-Silage to Milk Screening Level	Soil to Hay and Corn-Silage to Milk Screening Level
Grass-Based Farm	6.8	120	6.4
Average Maine Farm	13.8	54.8	11.0

Helpful Conversions: 0.000001 ppm = 0.001 ppb = 1 ppt

Parts Per Million (ppm)	Parts Per Billion (ppb)	Parts Per Trillion (ppt)
1 milligram/kilogram (mg/kg) = 1 ppm	1 microgram/kilogram (µg/kg) = 1 ppb	1 nanogram/kilogram (ng/kg) = 1 ppt
1 milligram/liter (mg/l) = 1 ppm	1 microgram/liter (µg/l) = 1 ppb	1 nanogram/liter (ng/l) = 1 ppt
1 microgram/gram (µg/g) = 1 ppm	1 nanogram/gram (ng/g) = 1 ppb	1 picogram/gram (pg/g) = 1 ppt

[1] Maine Department of Environmental Protection (Maine DEP), *Maine Remedial Action Guidelines (RAGs) for Sites Contaminated with Hazardous Substances*, effective October 19, 2018.

[2] Maine DEP, *Maine Solid Waste Management Rules: Beneficial Use of Solid Wastes*, 06-096 C.M.R. ch. 418, Appendix A, last amended July 8, 2018.

[3] Maine DEP, *RAGs for Sites Contaminated with Hazardous Substances*, effective October 19, 2018.

[4] EPA, https://www.epa.gov/ground-water-and-drinking-water/drinking-water-health-advisories-pfoa-and-pfos, November 2016.

[5] Maine Center for Disease Control and Prevention (CDC), *Action levels for PFOS in cow's milk*, Memorandum to Rachael Fiske, Maine Department of Agriculture, Conservation and Forestry (DACF), from Andrew Smith, SM, ScD and Thomas Simones, PhD, Maine CDC, March 28, 2017.

[6] Maine CDC, Action levels for PFOS in beef for use in determining whether beef at a farm is adulterated, Memorandum to Nancy McBrady, Maine DACF, from Andrew Smith, SM, ScD and Thomas Simones, PhD, Maine CDC, August 4, 2020.

[7] Maine CDC, Derivation of PFOS soil screening levels for a soil-to-fodder-to-cow's milk agronomic pathway, September 16, 2020.

Current Work

- DoD, Superfund, & Uncontrolled sites
- Closed, unlined landfills
- Biosolids – on-going testing
- Biosolids land application sites
- Model Calibration & Plant Uptake
- Coordination internal and with DACF, DWP & MECDC
  - Screening Guidelines
  - Public Water Systems
  - Retail Milk
  - Bureau of Land Resources
  - Bureau of Water Quality
  - Bureau of Air Quality

Overview of Results

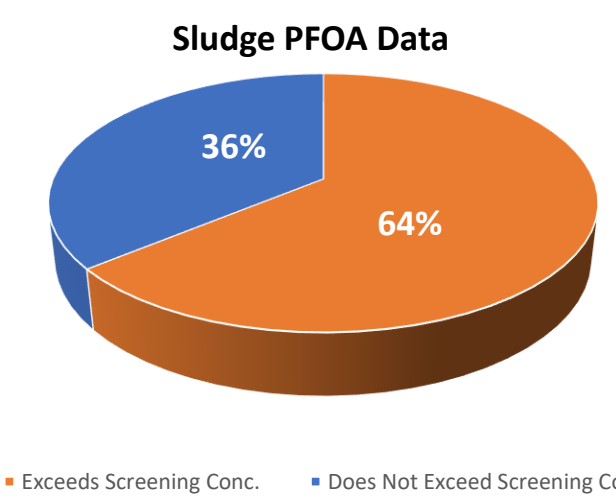
- Environmental & Geographic Analysis Database (EGAD)
- All data subject to data validation prior to EGAD input
- Over 52,000 PFAS records in EGAD representing 346 sites

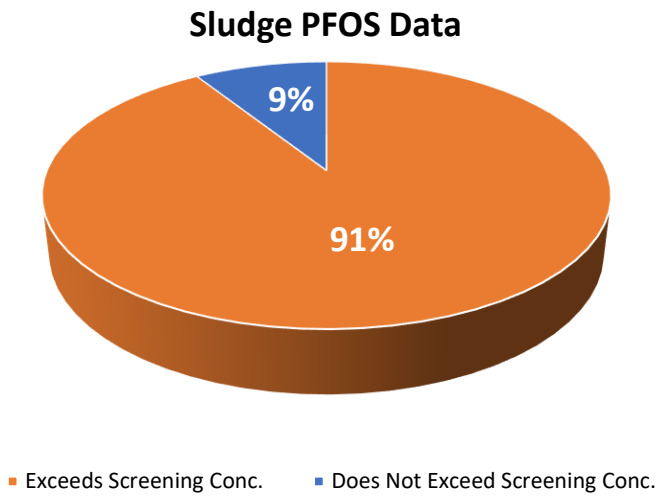
Overview of Results – Cont'd

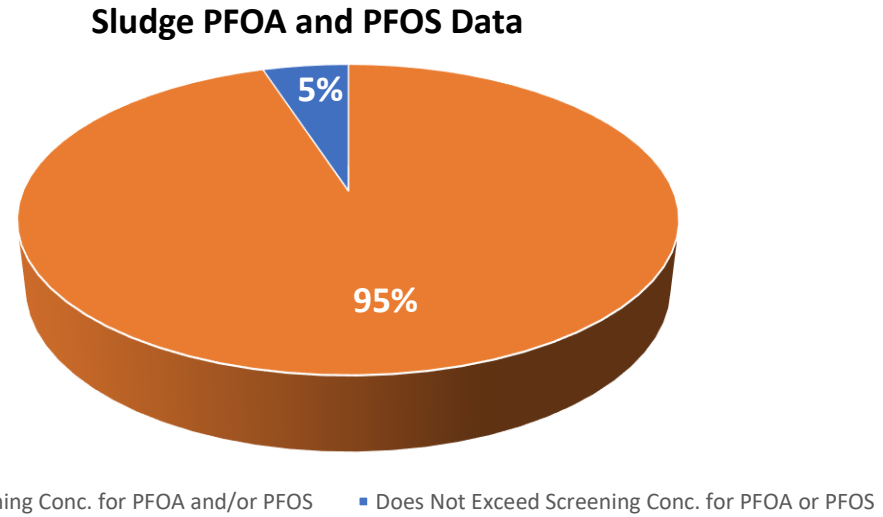
Significant findings to date include:

- PFAS found around DoD sites, likely associated with AFFF releases from use or training sites
- Closed, unlined municipal landfills are sources, levels dependent upon industrial/commercial inputs
- Biosolids from treatment plants contain PFAS at varying levels
- Elevated levels of PFAS found in private wells nearby to some licensed biosolids land application sites

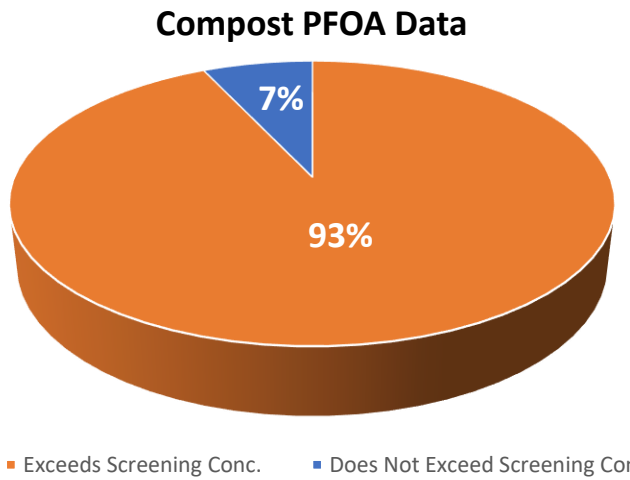
Sludge PFAS Data

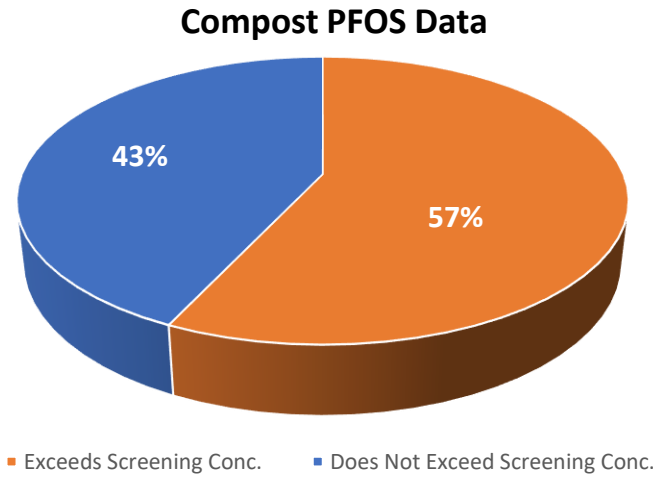


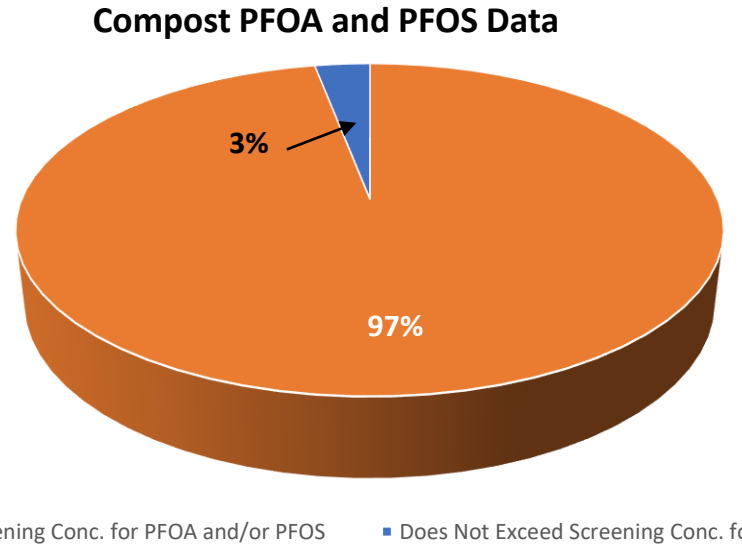




Biosolids Compost PFAS Data



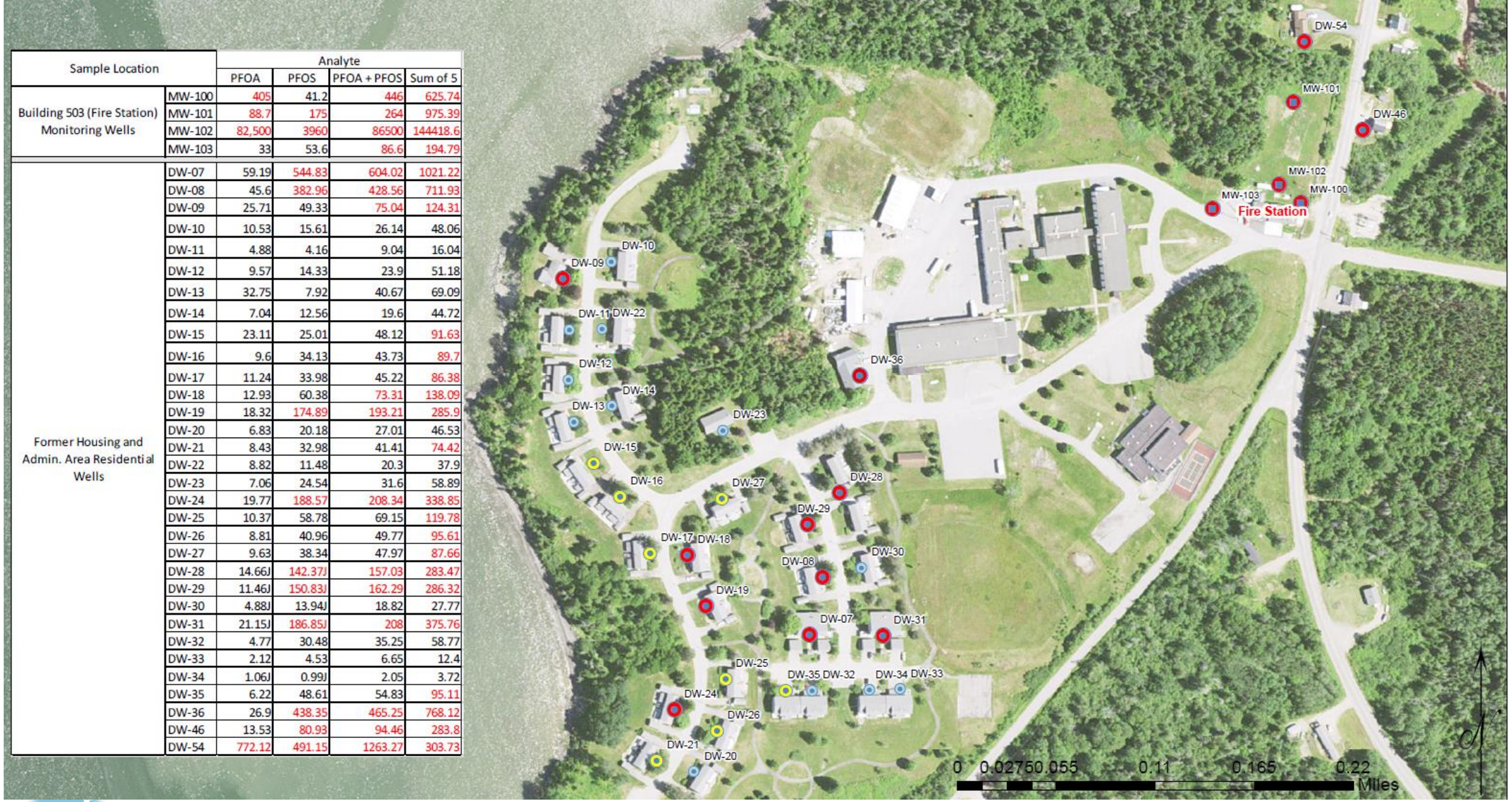




Site Example

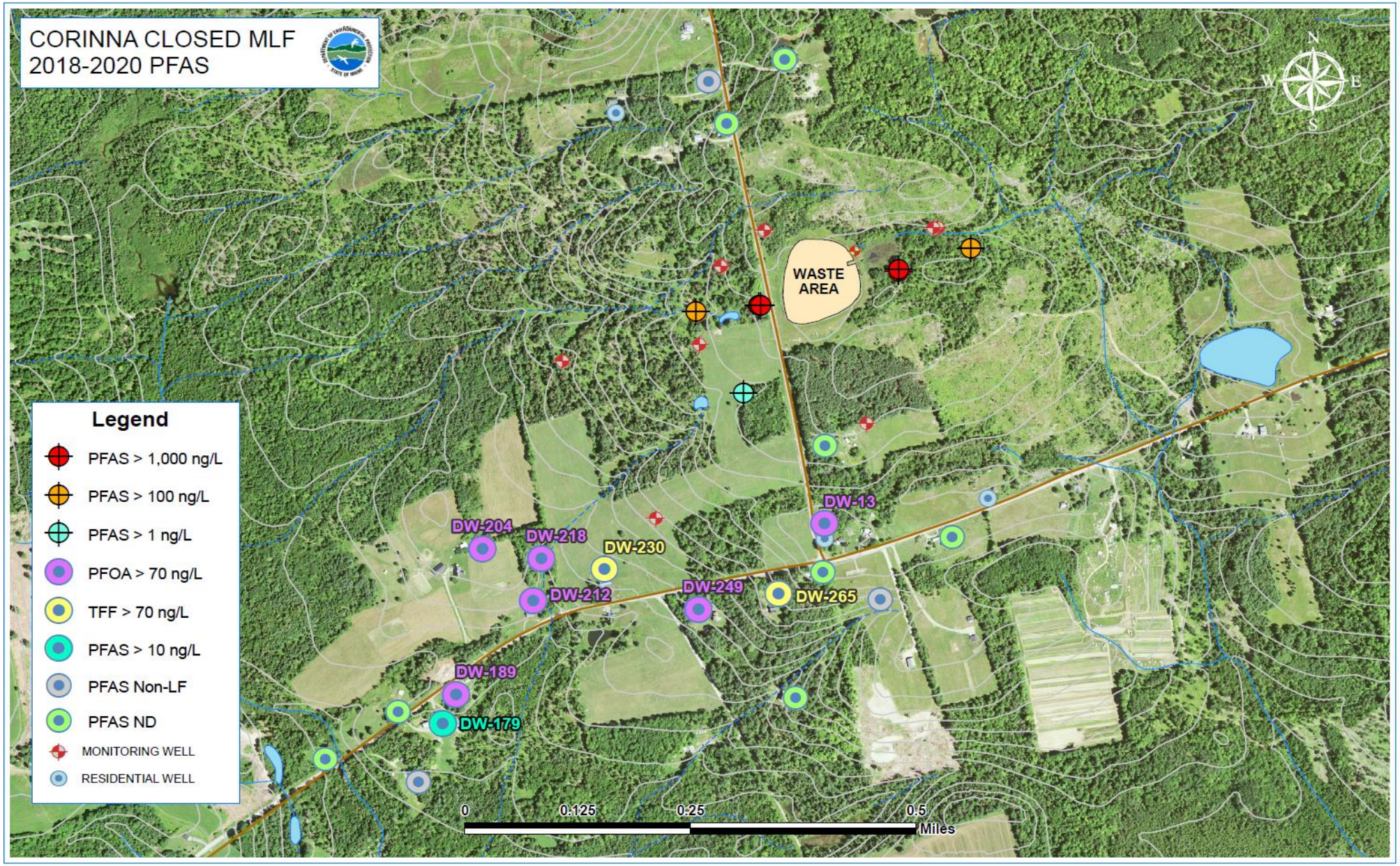
Department of Defense Site (DoD)

Sample Location		Analyte			
		PFOA	PFOS	PFOA + PFOS	Sum of 5
Building 503 (Fire Station) Monitoring Wells	MW-100	405	41.2	446	625.74
	MW-101	88.7	175	264	975.39
	MW-102	82,500	3960	86500	144418.6
	MW-103	33	53.6	86.6	194.79
Former Housing and Admin. Area Residential Wells	DW-07	59.19	544.83	604.02	1021.22
	DW-08	45.6	382.96	428.56	711.93
	DW-09	25.71	49.33	75.04	124.31
	DW-10	10.53	15.61	26.14	48.06
	DW-11	4.88	4.16	9.04	16.04
	DW-12	9.57	14.33	23.9	51.18
	DW-13	32.75	7.92	40.67	69.09
	DW-14	7.04	12.56	19.6	44.72
	DW-15	23.11	25.01	48.12	91.63
	DW-16	9.6	34.13	43.73	89.7
	DW-17	11.24	33.98	45.22	86.38
	DW-18	12.93	60.38	73.31	138.09
	DW-19	18.32	174.89	193.21	285.9
	DW-20	6.83	20.18	27.01	46.53
	DW-21	8.43	32.98	41.41	74.42
	DW-22	8.82	11.48	20.3	37.9
	DW-23	7.06	24.54	31.6	58.89
	DW-24	19.77	188.57	208.34	338.85
	DW-25	10.37	58.78	69.15	119.78
	DW-26	8.81	40.96	49.77	95.61
	DW-27	9.63	38.34	47.97	87.66
	DW-28	14.66J	142.37J	157.03	283.47
	DW-29	11.46J	150.83J	162.29	286.32
	DW-30	4.88J	13.94J	18.82	27.77
	DW-31	21.15J	186.85J	208	375.76
	DW-32	4.77	30.48	35.25	58.77
	DW-33	2.12	4.53	6.65	12.4
	DW-34	1.06J	0.99J	2.05	3.72
	DW-35	6.22	48.61	54.83	95.11
	DW-36	26.9	438.35	465.25	768.12
	DW-46	13.53	80.93	94.46	283.8
	DW-54	772.12	491.15	1263.27	303.73



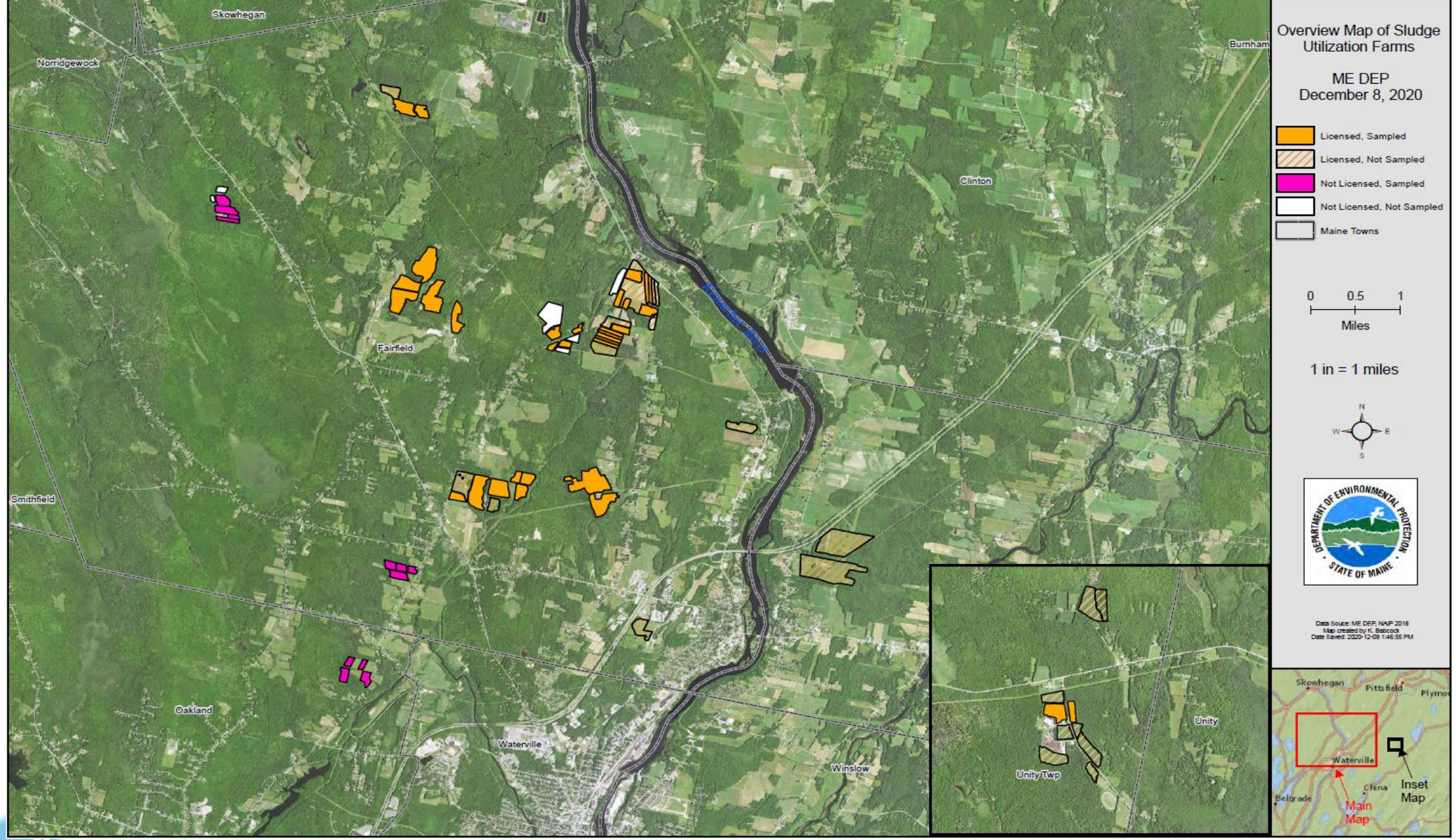
Site Example

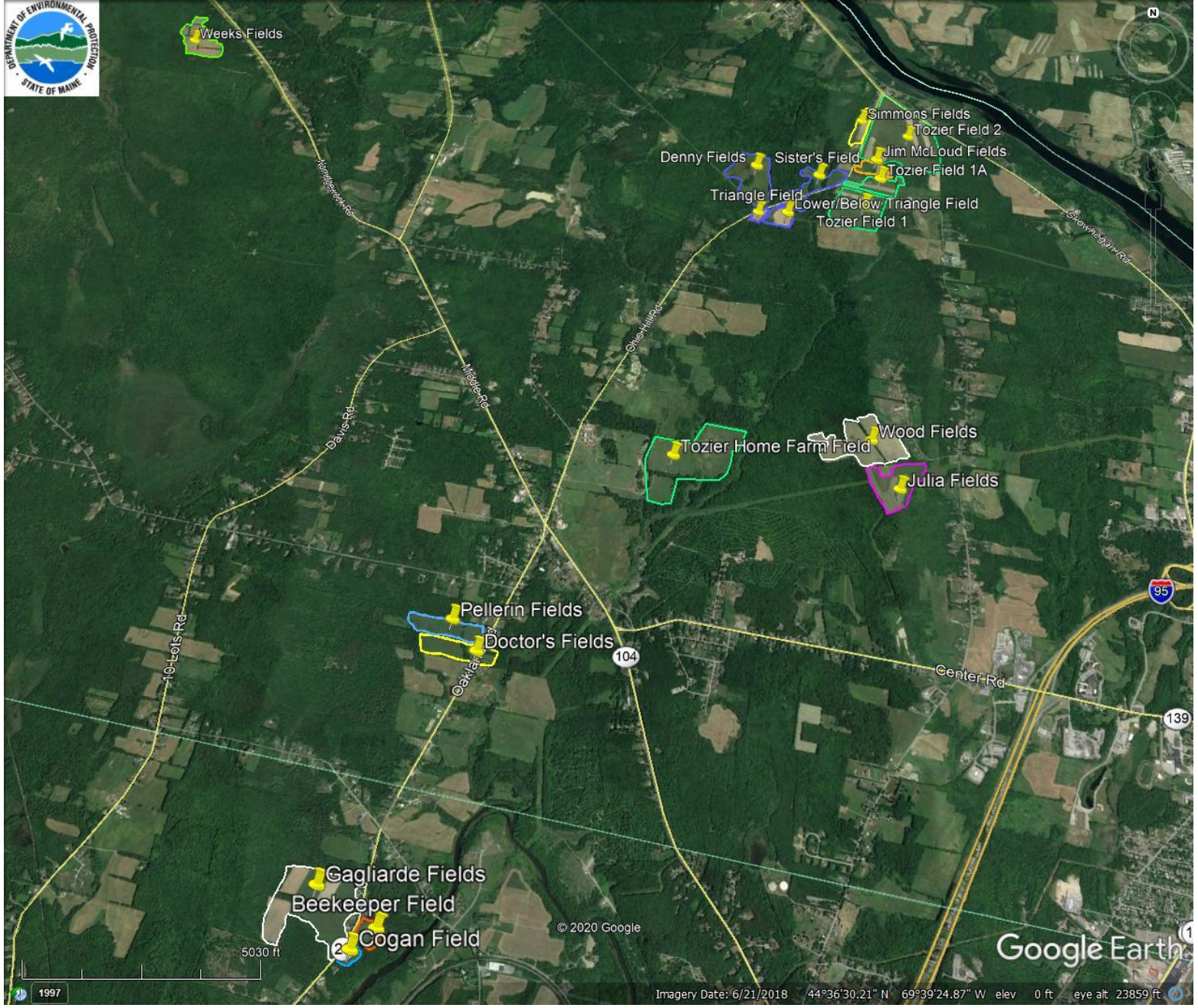
Closed, Unlined Municipal Solid Waste Landfill

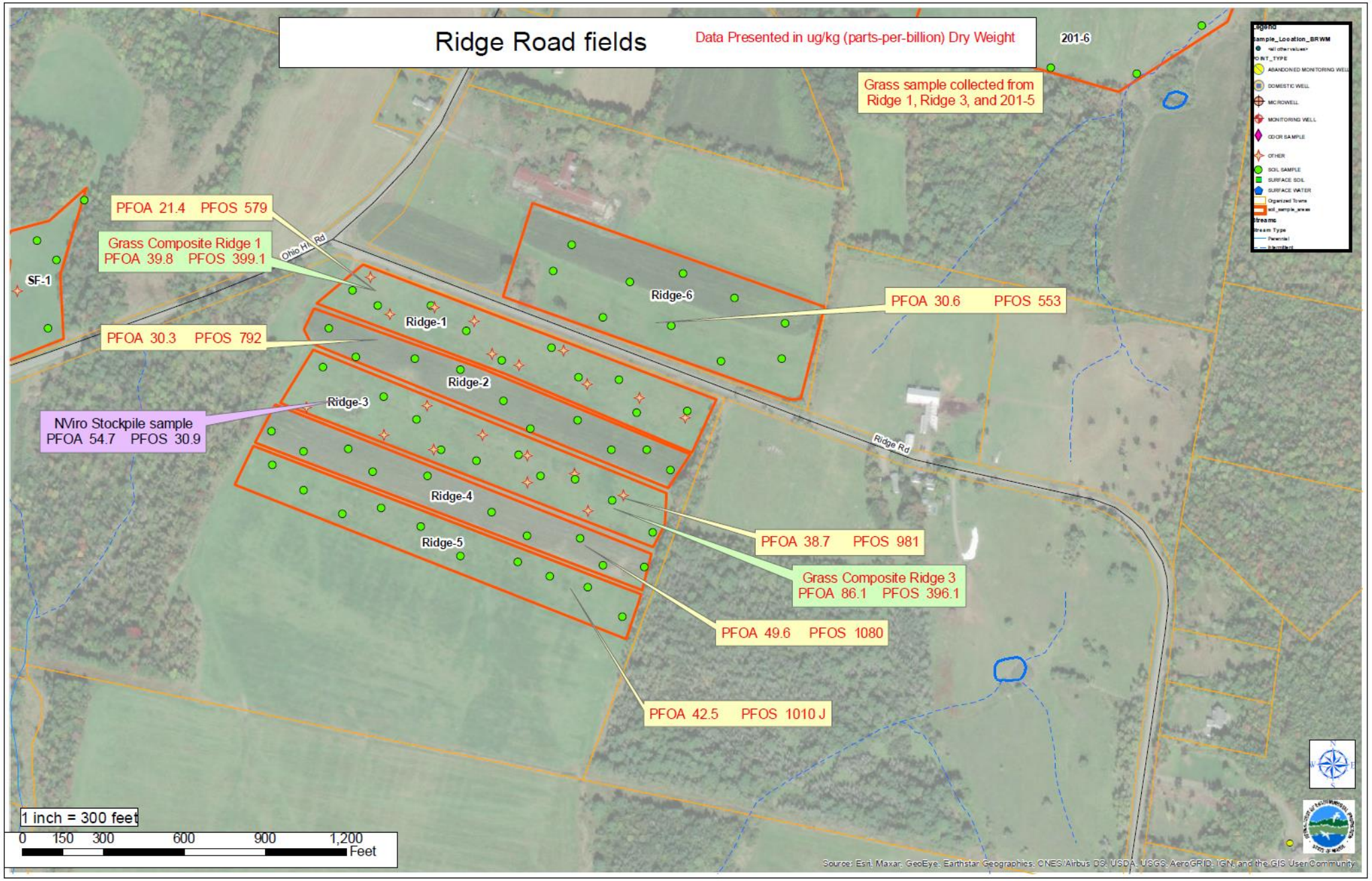

CORINNA CLOSED MLF
2018-2020 PFAS
N
W
E
S
WASTE AREA
DW-13
DW-204
DW-218
DW-230
DW-212
DW-249
DW-265
DW-189
DW-179
Legend
PFAS > 1,000 ng/L
PFAS > 100 ng/L
PFAS > 1 ng/L
PFOA > 70 ng/L
TFF > 70 ng/L
PFAS > 10 ng/L
PFAS Non-LF
PFAS ND
MONITORING WELL
RESIDENTIAL WELL
0
0.125
0.25
0.5
Miles

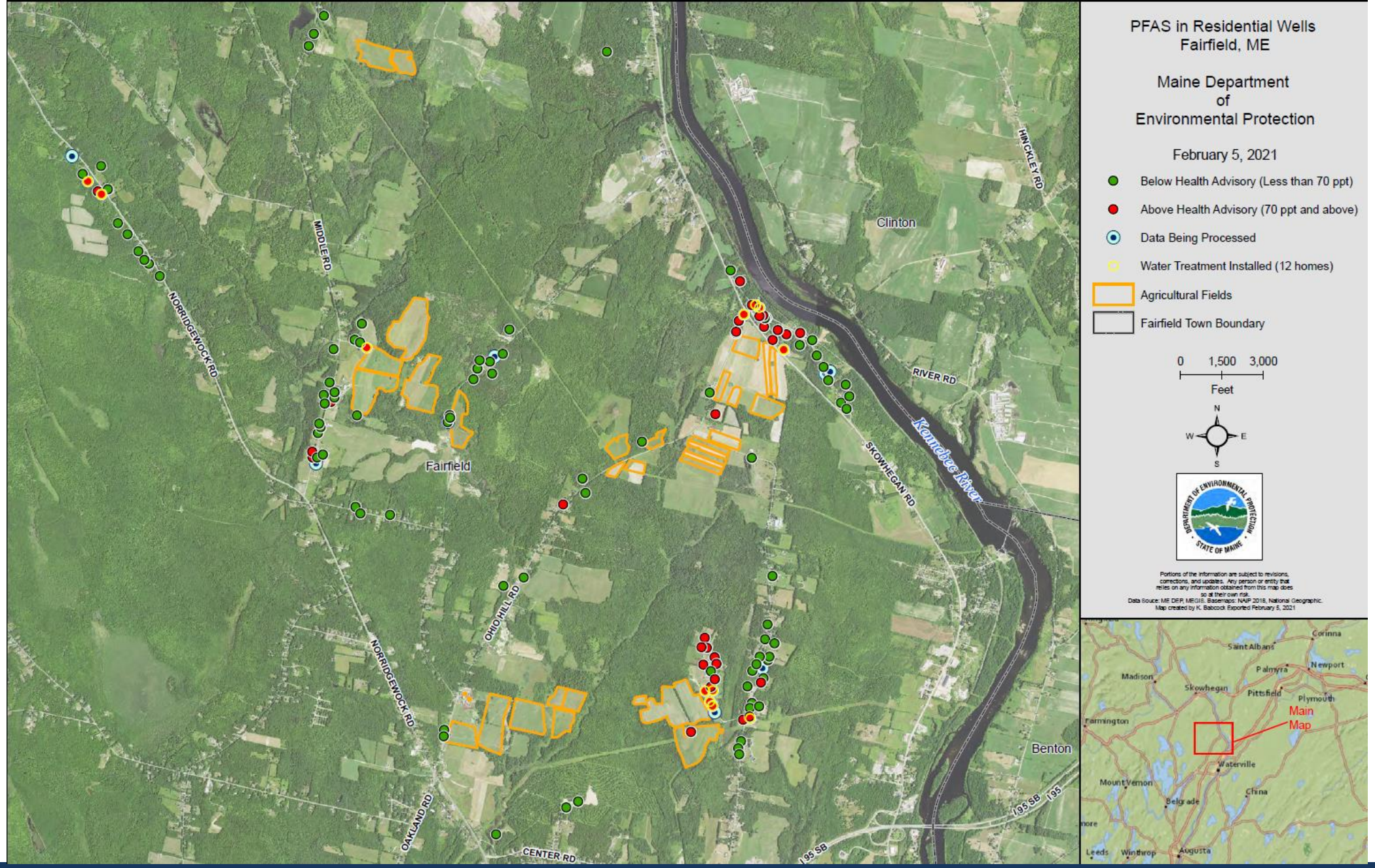
Site Example

Biosolids Land Application Site


Skowhegan
Norridgewock
Burnham
Clinton
Fairfield
Smithfield
Oakland
Waterville
Winslow
Unity
Unity Twp
Overview Map of Sludge Utilization Farms
ME DEP
December 8, 2020
Licensed, Sampled
Licensed, Not Sampled
Not Licensed, Sampled
Not Licensed, Not Sampled
Maine Towns
0 0.5 1
Miles
1 in = 1 miles
N
W
E
S
DEPARTMENT OF ENVIRONMENTAL PROTECTION
STATE OF MAINE
Data Souce: ME DEP, NAIP 2018
Map created by K. Babcock
Date Saved: 2020-12-08 1:46:55 PM
Skowhegan
Pittsfield
Waterville
China
Belgrade
Inset Map
Main Map


Weeks Fields
Simmons Fields
Tozier Field 2
Jim McLoud Fields
Tozier Field 1A
Denny Fields
Sister's Field
Triangle Field
Lower/Below Triangle Field
Tozier Field 1
Wood Fields
Tozier Home Farm Field
Julia Fields
Pellerin Fields
Doctor's Fields
Gagliarde Fields
Beekeeper Field
Cogan Field
Davis Rd
Middle Rd
Ohio Hill Rd
10-Lots Rd
Center Rd
104
95
139
5030 ft
© 2020 Google
Google Earth
Imagery Date: 6/21/2018 44°36'30.21" N 69°39'24.87" W elev 0 ft eye alt 23859 ft


Ridge Road fields
Data Presented in ug/kg (parts-per-billion) Dry Weight
201-6
Grass sample collected from Ridge 1, Ridge 3, and 201-5
PFOA 21.4 PFOS 579
Grass Composite Ridge 1
PFOA 39.8 PFOS 399.1
Ohio Hill Rd
SF-1
Ridge-1
Ridge-2
Ridge-3
Ridge-4
Ridge-5
Ridge-6
PFOA 30.6 PFOS 553
PFOA 30.3 PFOS 792
NViro Stockpile sample
PFOA 54.7 PFOS 30.9
Ridge Rd
PFOA 38.7 PFOS 981
Grass Composite Ridge 3
PFOA 86.1 PFOS 396.1
PFOA 49.6 PFOS 1080
PFOA 42.5 PFOS 1010 J
1 inch = 300 feet
0 150 300 600 900 1,200
Feet
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community


PFAS in Residential Wells
Fairfield, ME
Maine Department
of
Environmental Protection
February 5, 2021
Below Health Advisory (Less than 70 ppt)
Above Health Advisory (70 ppt and above)
Data Being Processed
Water Treatment Installed (12 homes)
Agricultural Fields
Fairfield Town Boundary
0 1,500 3,000
Feet
N
W
E
S
Portions of the information are subject to revisions, corrections, and updates. Any person or entity that relies on any information obtained from this map does so at their own risk.
Data Source: ME DEP, MEGIS. Basemaps: NAIP 2018, National Geographic.
Map created by K. Babcock Exported February 5, 2021
Clinton
Fairfield
Benton
Kennebec River
MIDDLE RD
NORRIDGEWOCK RD
HINCKLEY RD
RIVER RD
SKOWHEGAN RD
OHIO HILL RD
OAKLAND RD
CENTER RD
I95 SB
I95
Corinna
Saint Albans
Newport
Palmyra
Madison
Skowhegan
Pittsfield
Plymouth
Farmington
Main
Map
Waterville
Mount Vernon
China
Belgrade
Leeds
Winthrop
Augusta

Private well water test results for PFAS – Fairfield, Maine

Total PFOA PFOS >= null (all values)

Basemap
- Streets
- Satellite

Note: map extent may change

Analyte to map
Total PFOA PFOS

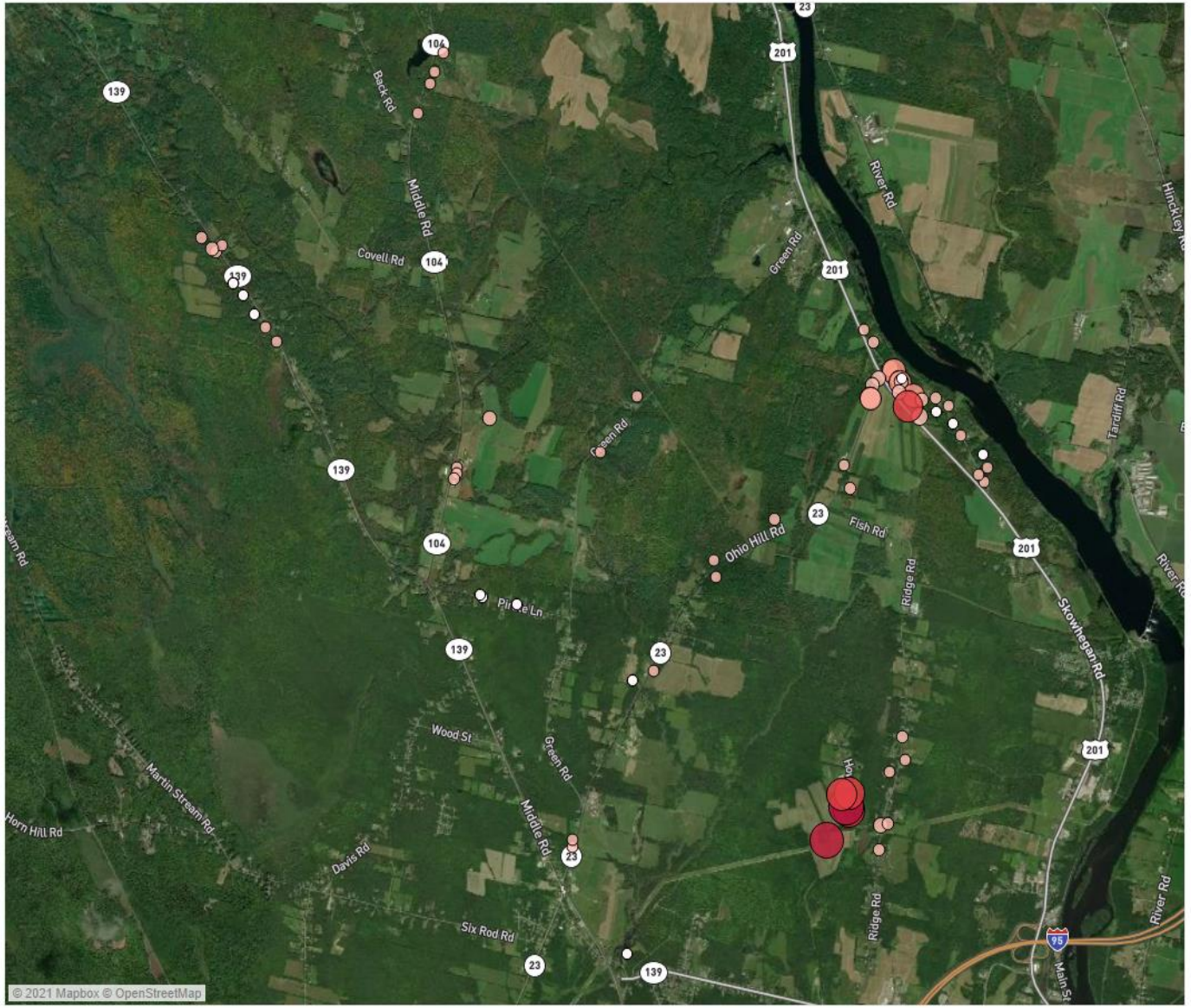
Show values ≥
null (all values)

Value labels
- Show
- Hide

Color legend
0 — 25,980

Non-detects are white

Size legend
- 0
- 5,000
- 10,000
- 15,000
- 20,000
- 25,980



Quick Stats

of sample points: 71
# of samples: 87
(and percent) of sample points >= null (all values): 71 (100.0%)
Maximum: 25,980
Minimum (detect): 0.22

List (hover to highlight on map)

Filter by Address: All

Filter by Site Name: All

Max. Sample Id	Site Name	Max. Val..	
[redacted]	JULIA 2	25,980	...
	JULIA 2	22,870	...
	JULIA 2	18,880	...
	JULIA 2	17,970	...
	JULIA 2	16,960	...
	OHIO HILL R..	15,800	...
	OHIO HILL R..	7,700	...
	OHIO HILL R..	6,490	...
	OHIO HILL R..	6,280	...
	OHIO HILL R..	5,110	...
	OHIO HILL R..	4,570	...
	OHIO HILL R..	2,637	...
	OHIO HILL R..	1,838.4	...
	OHIO HILL R..	1,783	...
	OHIO HILL R..	1,419	...
	OHIO HILL R..	996	...
	JULIA 2	746.1	...
	OHIO HILL R..	613	...
	OHIO HILL R..	606	...
	MIDDLE ROA..	574	...
	OHIO HILL R..	463	...
	WEEKS FIELDS	370	...
	OHIO HILL R..	347.7	...
	OHIO HILL R..	133.4	...
	OHIO HILL R..	122.1	...
	OHIO HILL R..	110.38	...

Federal and State Actions

- Federal drinking water MCL
- RCRA hazardous substance
- Federal grant funding
- Treatment and destruction research
- AFFF alternatives
- Source reduction
- State Legislation
  - Hazardous substance bill
  - FAME waste oil $ transfer
  - Uncontrolled Sites bond
  - PFAS reporting/AFFF reporting

Further Information

- PFOA and PFOS, Maine Department of Environmental Protection
- Managing PFAS in Maine, Final Report from the Maine PFAS Task Force
- DACF, Agriculture, Food and Rural Resources PFAS
- Maine CDC Fact Sheet
- US EPA Fact Sheet
- PFAS Screening Levels

Contact:

David Burns, P.E., Director BRWM

dave.e.burns@maine.gov

www.maine.gov/dep