

Norlite Environmental Sampling

NEWMOA Presentation

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Norlite Environmental Sampling Report: Study Design

- Study designed to assess impacts from the receipt and combustion of AFFF and possible impacts from metals
- Soil samples collected from upwind, on-site, and downwind locations
- Surface water samples collected from on-site and near the site, as well as from two additional streams
- Soil samples analyzed for PFAS and metals
- Water samples analyzed for PFAS



Major Findings & Conclusions

Based on DEC's review of data, in consultation with DOH, this comprehensive study found:

- Soil concentrations do not show clear evidence of an increase in downwind PFAS concentrations;
- Soil concentrations do not show evidence of a substantial increase in downwind metals concentrations. Elevated concentration of metals in one sample may be associated with an adjacent facility;
- Concentrations of PFOA and PFOS in soils do not indicate a human health risk. Concentrations are below guidance values for the current land use and potential for human exposure;



Major Findings & Conclusions

- Analysis of stream water concentrations at high and low flows indicates possible influence from soils and precipitation runoff in areas of low surface water PFAS concentrations, but not in locations with higher surface water concentrations, such as those found in the Patroon Creek and in the Salt Kill downstream from Norlite; and
- Analysis of surface water samples in ponded water near Norlite property indicates that there are likely sources of PFAS compounds not associated with Norlite kiln emissions





Consumer Products Containing PFAS



Industrial Products/Processes Containing PFAS



Release, Transport, Exposure pathways (Oliaei et. al., 2013) Environmental Science Pollution Research





Norlite Environmental Sampling Report: Study Design

- Soil Samples
- Water Samples





Wind Rose Information





Study Design – Soil Sampling

- 22 soil samples collected and analyzed for 21 PFAS using EPA Method 537 (modified).
- Two soil samples were collected for a Total Oxidizable Precursor (TOP) assay. One downwind/one upwind.
- Two soil samples were collected in another urban area and analyzed for PFAS for comparison (Albany).



Study Design – Soil Sampling

- 20 soil samples collected and analyzed for 23 metals using approved EPA methods.
- Soil samples collected from 6 upwind locations and 10 locations downwind from the Norlite Facility.
- These 16 samples were collected at 0-6" depth.
- Four additional samples at Saratoga Sites collected at 0-2" depth.



Study Design – PFAS Water Sampling

- 21 water samples collected and analyzed for 21 PFAS using EPA Method 537 (modified).
- Four surface water samples (ponds) and eight flowing water samples (Salt Kill) collected around Norlite.
- One surface water and six flowing water samples (Patroon Creek) collected in an urban area (Albany) for comparison.
- Four flowing water samples (Schuyler Creek) collected in a rural/suburban area (Stillwater) for comparison.
- All flowing water samples collected at low and high flow conditions.



PFAS Guidance Values and Soil Sample Results

| Guidance Values for Anticipated Site Use | PFOA (ppb) | PFOS (ppb) |
|--|------------|------------|
| Unrestricted | 0.66 | 0.88 |
| Residential | 6.6 | 8.8 |
| Restricted Residential | 33 | 44 |
| Commercial | 500 | 440 |
| Industrial | 600 | 440 |
| Study Range | 0.19 – 1.1 | 0.26 – 9.8 |





PFAS in Soils

- Low concentrations found in all samples.
- Concentrations of PFOA and PFOS in soils do not indicate a human health risk.
- Soil sample results at Saratoga Sites are all below residential guidance values.
- One sampling location was greater than the residential value; this location is not a residential property.



Soil Concentrations Comparison

Sampling Result Comparison:

- PFAS concentrations are consistent with background studies performed at other locations in the Northeast.
- No clear evidence of contamination detected from the incineration of AFFF.

| Analyte | Vermont Range ¹ | Norlite Environmental Sampling Report Range | Catskills/Adirondack Range ³ |
|---------|----------------------------|---|---|
| PFBA | N/A | 0.1-0.9 | 5 |
| PFPeA | 0.14 - 1.3 | ND - 1.6 | 5 |
| PFHxA | 0.05 - 4.4 | 0.12 - 1.1 | ND - 0.32 |
| PFHpA | 0.044 – 0.9 | 0.063 - 1.0 | ND - 0.41 |
| PFOA | 0.052 - 4.9 | 0.19-1.1 | 0.26-1.1 |
| PFNA | 0.051 - 5.0 | 0.16 - 2.4 | ND - 0.45 |
| PFDA | 0.043 - 7.6 | 0.073 - 2.1 | 5 |
| PFUnDA | 0.038-2.6 | 0.12 - 1.8 | ND - 0.34 |
| PFDoDA | 0.10-0.69 | ND - 0.35 | ND |
| PFTrDA | N/A - 0.13 | ND - 0.264 | 5 |
| PFTeDA | N/A | ND | 5 |
| PFHxDA | N/A | 5 | 5 |
| PFODA | N/A | 5 | 5 |
| PFBS | 0.033 - 1.6 | ND | 5 |
| PFHxS | 0.076 - 0.88 | ND - 1.5 | |
| PFOS | 0.106 - 9.7 | 0.26 - 9.8 | ND – 1.4 |
| PFDS | 0.032 - 0.92 | ND - 5.7 | |

Soil Sample Results - Metals

- Detections of aluminum, arsenic, barium, beryllium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, vanadium, and zinc found in all samples.
- NYS soil cleanup objective concentrations for metals for property use in the same categories as displayed regarding PFAS.
- Exceedances of the unrestricted use concentrations detected in nine samples. This is not unexpected in developed areas
- One sample exceeded the residential value for mercury; this sample was collected from a non-residential setting.



Water Sample Results

Ranges of values

| Chemical | Range of Values Norlite Vicinity (ppt) | Guidance Values (ppt) |
|------------|---|-----------------------------|
| PFOA | 0.97 – 5.6 | 10 |
| PFOS | 1.6-12 | 10 |
| PFBS | 0.56 - 100 | 100 |
| Total PFAS | 8.64 - 171.8 | 500 |





Water Sample Locations – Norlite Vicinity

| Location WATER 1 WATER 1 Sample ID HFW1 LFW1 Flow High Flow Low Flow PFOS 2.9 1.6 J PFOA 1.8 1.7 J PFBS 2.6 2.2 Total PFAS 18.25 10.03 | |
|--|---|
| | Location WATER 2 WATER 2 Sample ID HFW2 LFW2 Flow High Flow Low Flow PFOS 1.8.3 <1.9 U PFOA 1.9 1.13 PFFBS 2.7 2 Total PFAS 18.91 8.64 |
| | Location WATER 6 Sample ID HFW3 LFW3 Sample ID LW65 Flow Heft M3 LFW3 Flow Low How Flow Heft M3 LFW3 Flow LW66 Flow Heft M3 LW37 Flow Low How Flow Low How Flow Flow LW765 2.2 2.2 2.4 Total FFAS 19.98 10.59 Location WATER 4 WATER 4 |
| end Surface Water Location | Sample ID HFW DUP HFW4 LPW4 Location WATER 5 Sample ID HFW DUP HFW4 LPW4 Sample ID LPW5 LOCATION Low Row PFOS 2 2.2 2.2 2.9 1.9 Fros 12 PFOA 0.971 PFES 2.9 2.5 2.4 PFOA 0.971 PFES 2.0.3 28.03 28.08 101.9 Total PFAS 27.19 Location WATER 7 WATER 7 WATER 7 |
| Units; inanograms per liter or parts per trillion U; Not Detected Bold Values Bold Values 10 PFOS 10 PFOA 10 Any individual PFAS 500 Total DFAS | Location WATER 8 Sample ID DUP LFM7 Sample ID UPW Flow Low How Fl |

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Notes:

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Water Concentrations Comparison

Sampling Result Comparison:

- **PFAS** concentrations are \bullet consistent with different studies performed at other locations in the Northeast.
- No clear evidence of \bullet contamination due to the incineration of AFFF.

| Analyte | Washington Lake | Norlite Range ² | New Jersey Surface |
|----------|--------------------|----------------------------|--------------------------|
| | Range ¹ | | Water Range ³ |
| PFBA | N/A | ND - 23 | ND - 5.2 |
| PFPeA | N/A | 2.3 - 13 | 1.0 - 10.0 |
| PFHxA | N/A | 2.4 - 11 | ND - 26.0 |
| PFHpA | 1.15 - 12.7 | 0.86 - 11.0 | 1.1 - 14.6 |
| PFOA | 3.27 - 15.8 | 0.97 - 5.6 | 1.9 - 33.9 |
| PFNA | ND - 3.51 | 0.41 - 1.8 | ND – 2.1 |
| PFDA | 0.25 - 3.58 | ND | ND |
| PFUnA | ND - 1.45 | 0.28 - 1.8 | ND |
| PFDoA | ND | ND | ND |
| PFTriA | N/A | ND | N/A |
| PFTeA | N/A | ND | N/A |
| NMeFOSSA | N/A | ND | N/A |
| NetFOSSA | N/A | ND | N/A |
| PFBS | N/A | 0.56 - 100 | ND - 6.6 |
| PFHxS | ND - 4.05 | 1.7 - 3.4 | ND - 95.9 |
| PFHpS | N/A | ND | N/A |
| PFOS | ND - 9.3 | 2.1 - 12 | ND - 102.0 |
| PFDS | ND – 3.4 | ND | N/A |
| PFOSA | ND - 0.47 | ND | ND |
| 6:2 FTS | ND - 1.46 | ND | N/A |
| 8:2 FTS | ND - 0.32 | ND | N/A |

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N/A - not applicable due to limited quantitative detection.

- Analysis performed for 12 PFAS

2 - Analysis performed for 21 PFAS

3 - Analysis performed for 12 PFAS

Study Area





Patroon Creek and Schuyler Creek



| Sample ID | PFOA (ppt) (High/Low) | PFOS (ppt) (High/Low) |
|------------------|--------------------------|--------------------------|
| Patroon Creek 1 | 6.6 (pond) | 4.7 (pond) |
| Patroon Creek 2 | 3.2/6.5 | 4.8/21 |
| Patroon Creek 3 | 4.0/4.4 | 4.5/6.7 |
| Patroon Creek 4 | 3.4/4.1 | 4.5/5.8 |
| Schuyler Creek 1 | 1.4/1.6 | 0.95/ND |
| Schuyler Creek 2 | 1.8/1.8 | 1.1/1.7 |



PFAS High Flow / Low Flow Results

| Sample ID | Low Flow (Total PFAS) (ppt) | High Flow (Total PFAS) (ppt) | Difference |
|------------------|-----------------------------------|------------------------------------|------------|
| Schuyler Creek 1 | 9.05 | 12.05 | + 3.00 |
| Schuyler Creek 2 | 4.34 | 9.44 | + 5.10 |
| Salt Kill 1 | 10.03 | 18.25 | +8.22 |
| Salt Kill 2 | 8.64 | 18.91 | +10.27 |
| Salt Kill 3 | 10.59 | 19.98 | +9.39 |
| Salt Kill 4 | 101.90 | 28.08 | - 73.82 |
| Patroon Creek 2 | 64.60 | 33.42 | - 31.18 |
| Patroon Creek 3 | 41.43 | 34.76 | -6.67 |
| Patroon Creek 4 | 36.90 | 31.84 | -5.06 |



Soil - PFAS Upwind / Downwind

Upwind and Downwind PFAS Concentration Geometric Means with Total PFAS (SUM)



Figure D1. – Geometric means of all quantitative and qualitative PFAS samples detected including total PFAS (sum).

Soil - PFAS Upwind/Downwind



Figure D2 – Geometric means of all quantitative and qualitative PFAS samples detected without the total PFAS (sum).



Figure D3 - Geometric means of all quantitative and qualitative metal samples (group 1).





Figure D4 - Geometric means of all quantitative and qualitative metal samples (group 2).





Figure D5 - Geometric means of all quantitative and qualitative metal samples (group 3).





Figure D6 - Geometric means of all quantitative and qualitative metal samples (group 4).



Total Oxidizable Precursor (TOP) Analysis

- Used to evaluate if there is a significant PFAS mass in soil and water samples not measured by conventional laboratory methods.
- Provides additional information on scale of PFAS contamination.
- **Overall:** Results of soil and water samples analyzed using TOP analysis indicate minimal perfluoroalkyl precursors in these samples.



Findings & Conclusions

- No clear evidence of an upwind/downwind gradient of PFAS contamination around Norlite based on an analysis of patterns.
- No evidence of a strong upwind/downwind gradient of metals.
- Concentrations of PFOA and PFOS in soils are below current guidance values to protect public health.



Findings & Conclusions

- PFOA and PFOS soil concentrations are consistent with background contamination reported in the literature.
- High flow sampling results indicate contributions from PFAS stormwater runoff of precipitation, but pattern was not consistent at all sampling sites and the contributions were not substantial.
- Analysis of surface water samples (ponds) near Norlite property indicate there are likely other sources of PFAS contributing to these findings that are unrelated to Norlite kiln emissions.



Questions or Comments?

Additional information and the final environmental sampling report are available on the NYSDEC's Norlite webpage at the link below:

https://www.dec.ny.gov/chemical/121118.html

