An integrated approach for the effective management of water pollution risks from emerging contaminants

Perfluorinated compounds
HOlistic ENvironmental
Interinstitutional eXperience

Life Phoenix

Preventing, Ensuring, Promoting

LIFE PHOENIX Project

lifephoenix.eu

COORDINATOR

REGIONE DEL VENETO

PARTNERS

REGIONE DEL VENETO AZIENDA ZERO

arpav Agenzia Regionale per la Prevenzione e Protezione Ambientale del Veneto

IRSA CNR

Università degli Studi di Padova

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Environmental distribution and monitoring of new alternative PFAS in contaminated sites

new compounds – old problems

Sara Valsecchi (IRSA-CNR)
valsecchi@irsa.cnr.it

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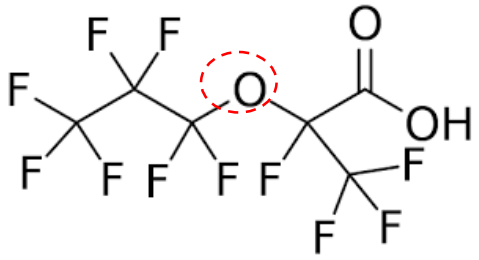
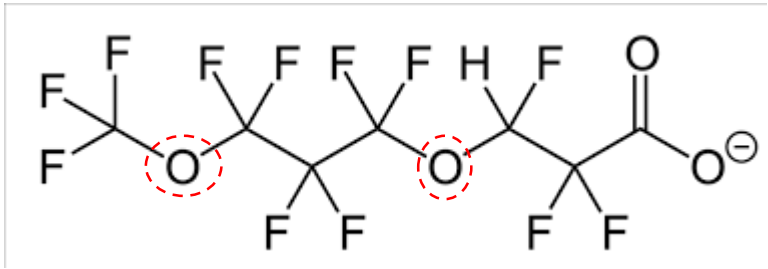
PFAS alternative in fluoropolymer manufacture



- ADONA from 3M/Dyneon
- GenX from (Chemours) DuPont
- cyclic or polymeric functionalized PFPEs from Solvay for its PTFE and PVDF manufacture
- EEA from Asahi
- APFHx from Daikin
- 6:2 FTCA from Chinese company



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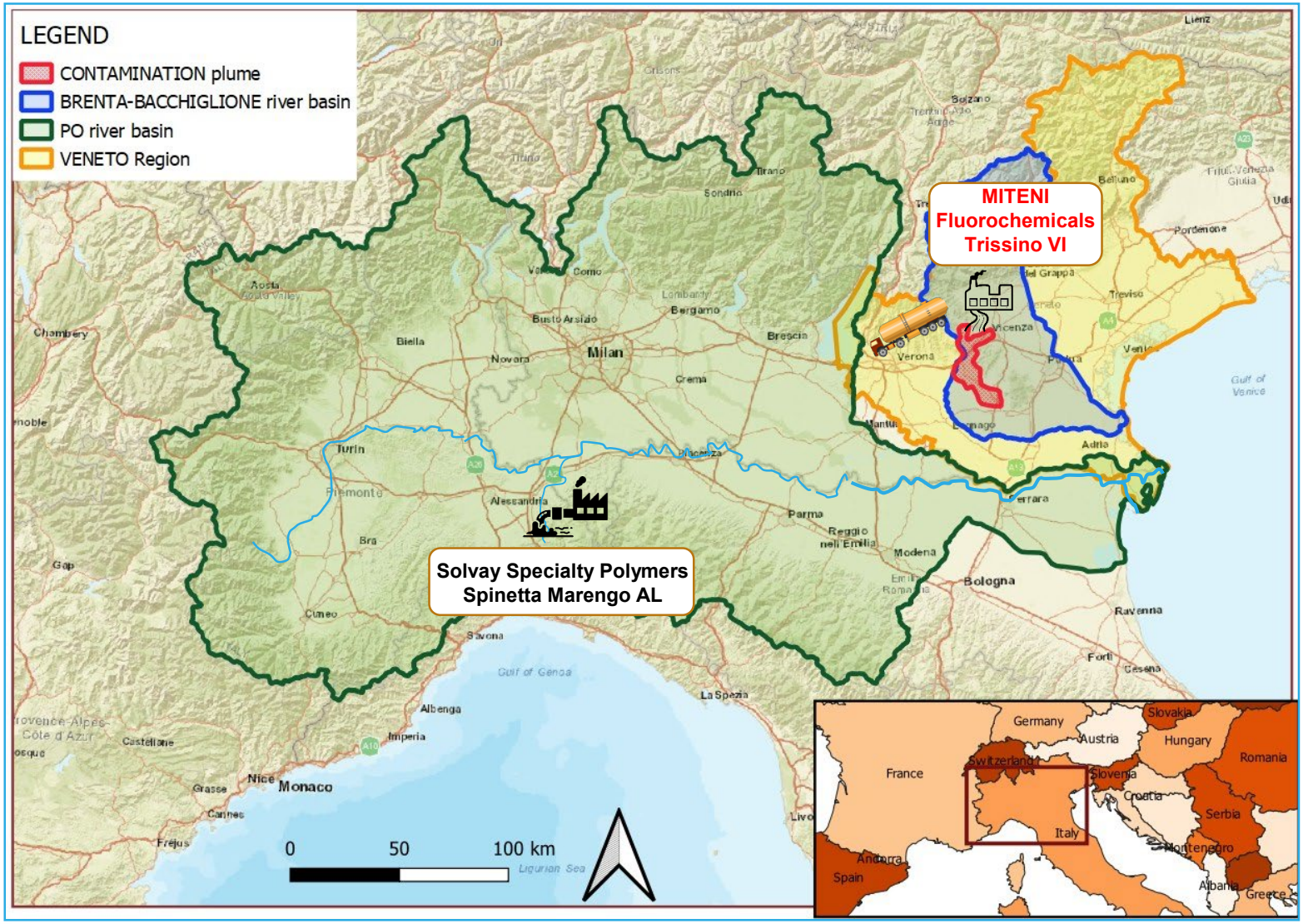
Monitoring of PFOA alternatives in Italy



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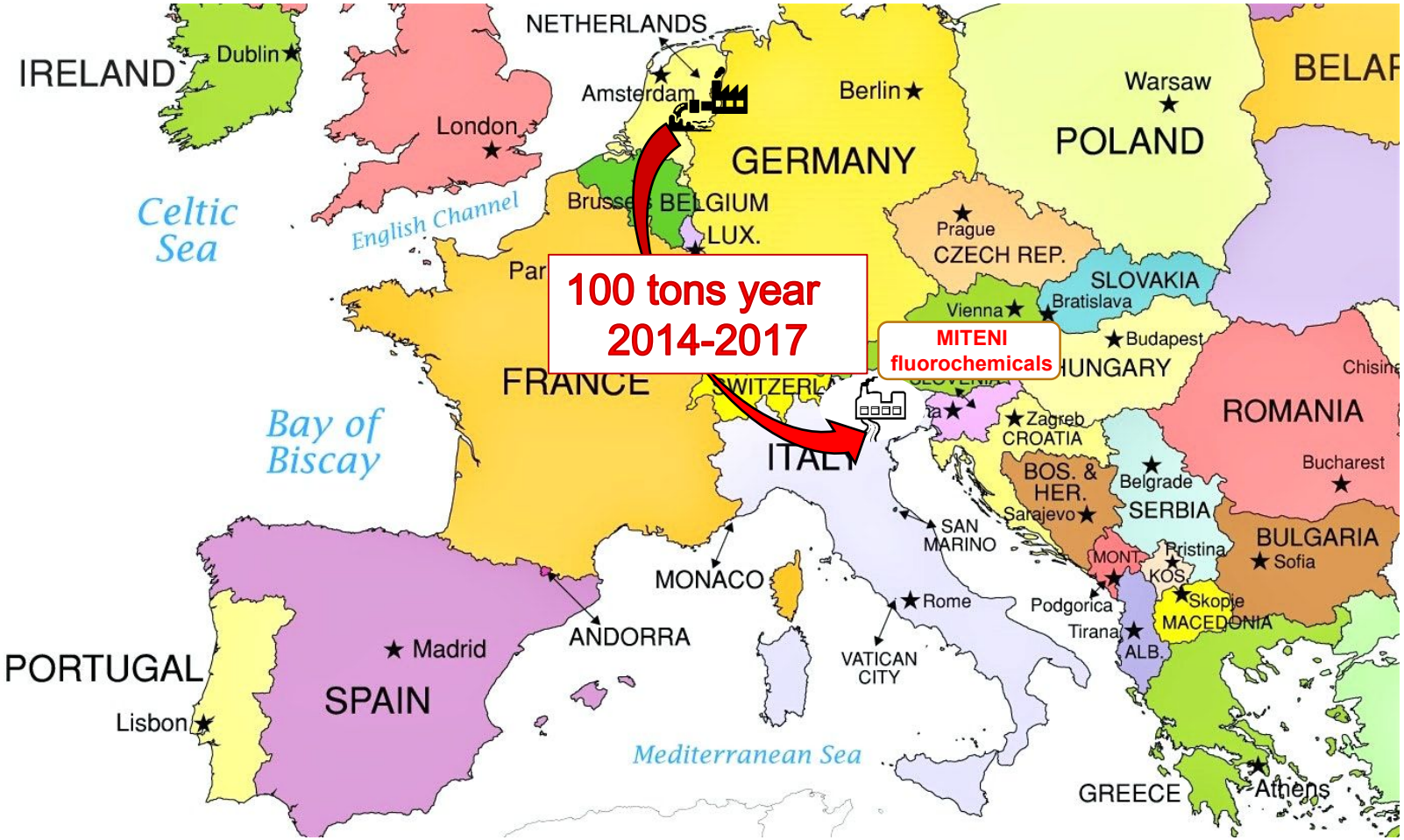
GenX
Chemours in Dordrecht (NL)



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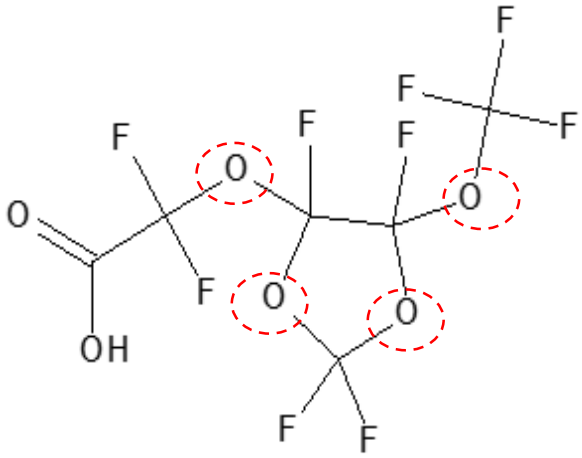
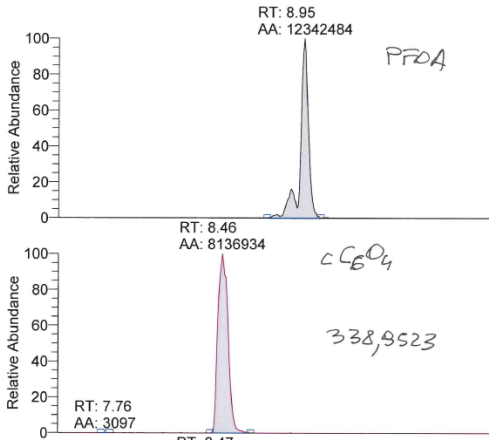
C6O4 (F-Dioxin)

P5MeODIOXOAc: Perfluoro([5-methoxy-1,3-dioxolan-4-yl]oxy)acetic acid

Solavy Miteni PPA
CAS # 1190931-41-9
name cC6O4



Molecular Formula: $C_6HF_9O_6$
Monoisotopic Mass: 339.962942 Da
[M-H]-: 338.955665 Da



efsa
European Food Safety Authority
EFSA J. 2014, 12(6):3718

"According to the applicant, the substance cC6O4, ammonium salt, is used as an emulsifier/dispersing agent during the polymerization process of fluoropolymers such as tetrafluoroethylene homopolymer and others."

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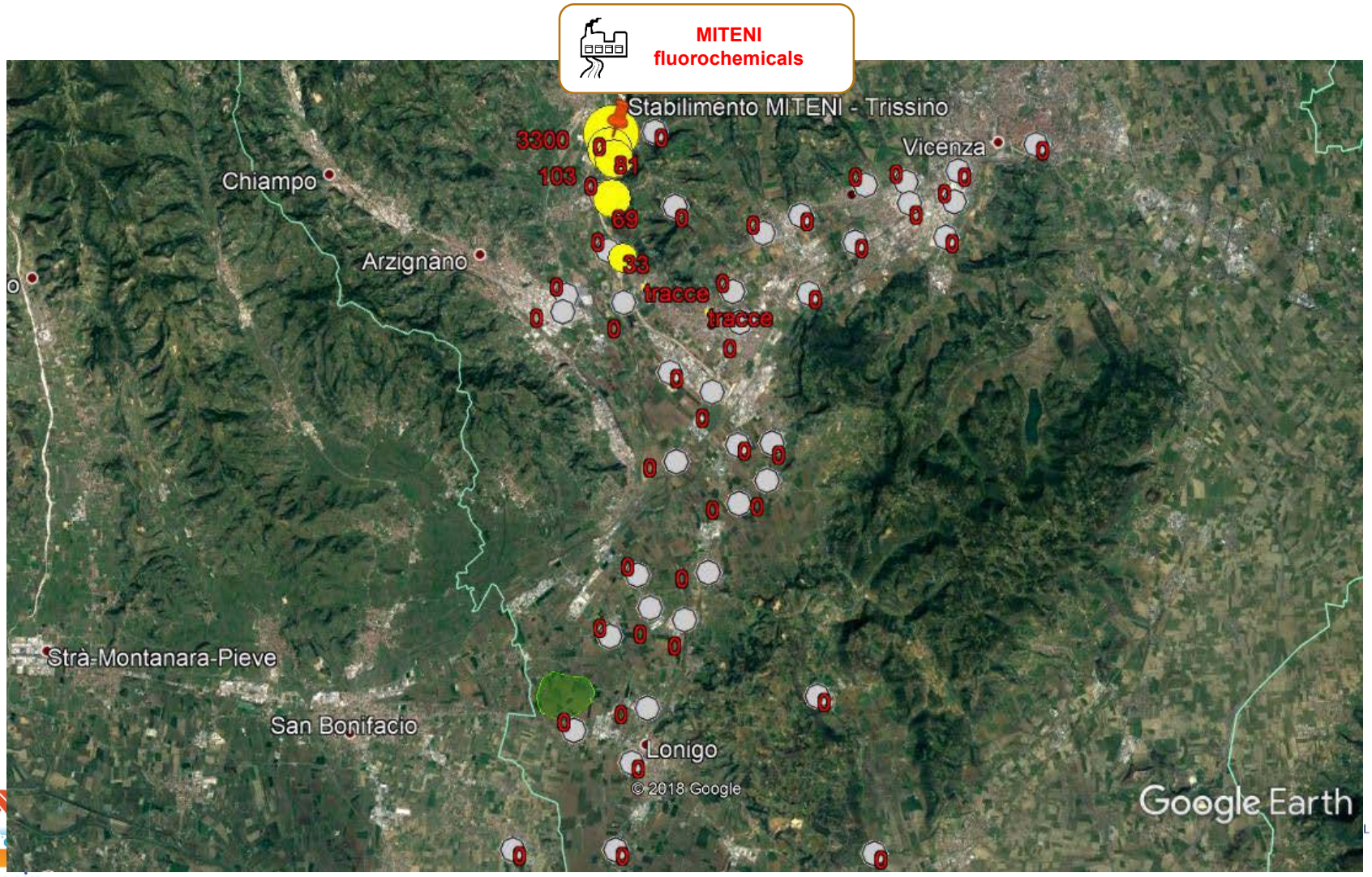
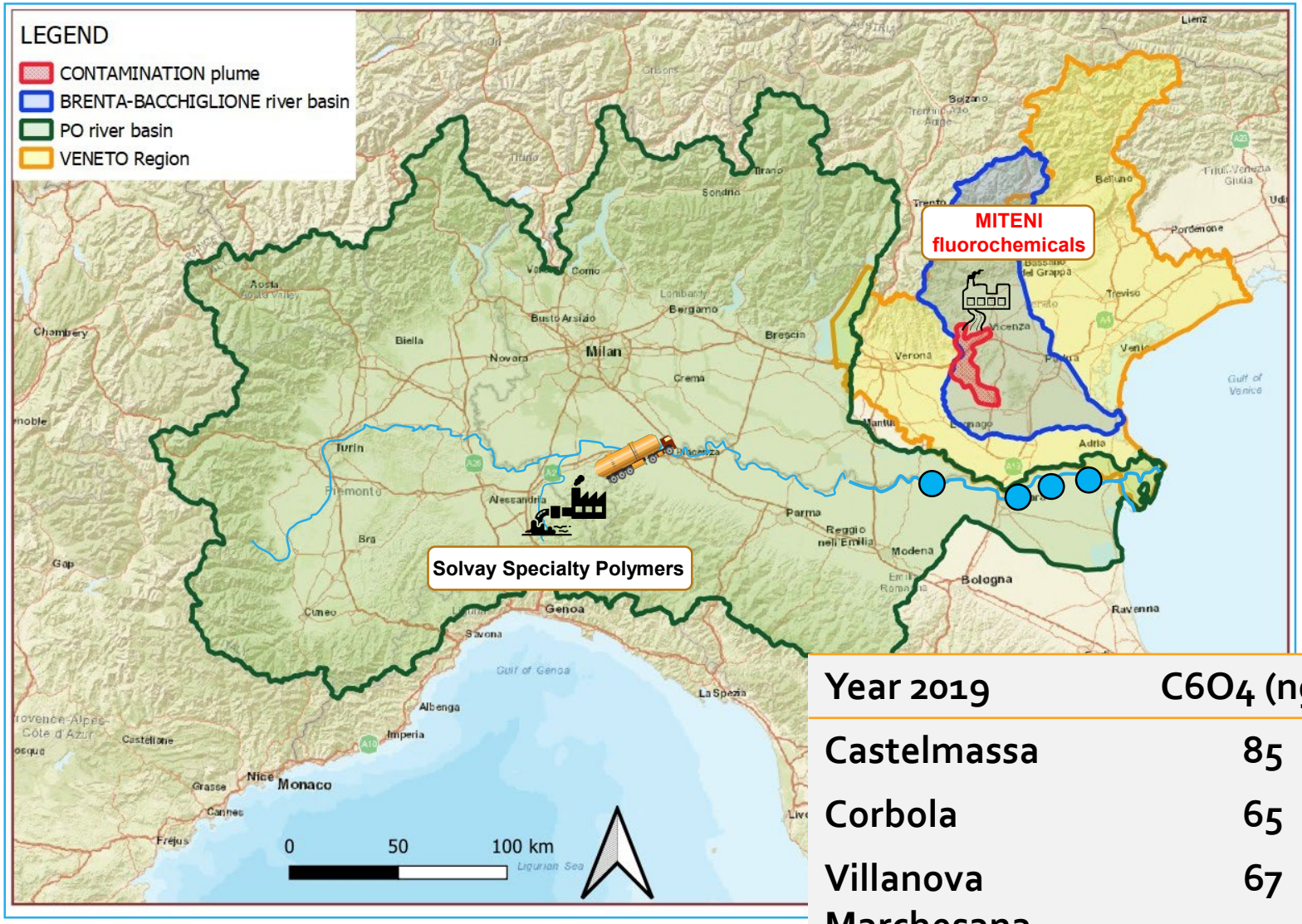
Monitoring of C6O4 in Miteni's polluted groundwater



Monitoring of C6O4



Year 2019	C6O4 (ng/L)
Castelmassa	85
Corbola	65
Villanova Marchesana	67
Taglio di Po	65

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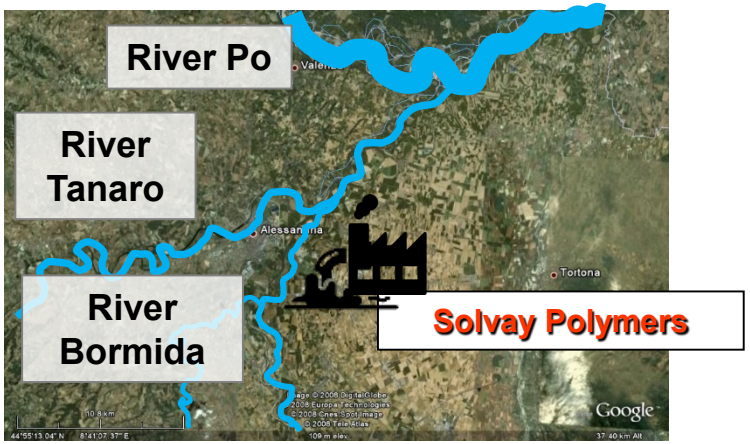
C6O4 source

Solvay discharge: 50-150 µg/L C6O4

C6O4 is the substitute of PFOA that Solvay has been using for PTFE production in Italy



Year 2020	C6O4 (ng/L)
Bormida	806
Tanaro	233
Po	88

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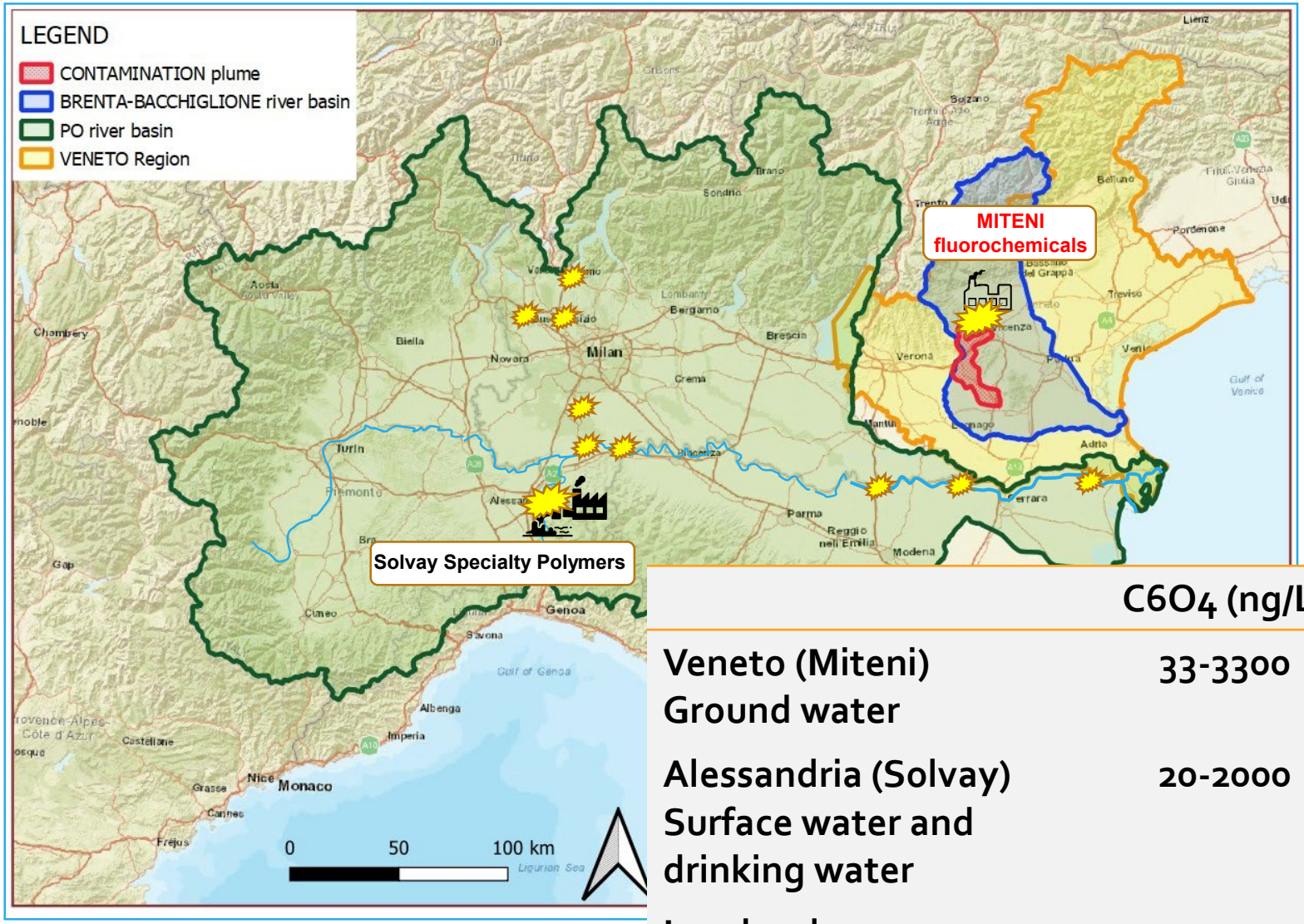
C6O4 environmental distribution



	C6O4 (ng/L)
Veneto (Miteni) Ground water	33-3300
Alessandria (Solvay) Surface water and drinking water	20-2000
Lombardy Surface water	40-321

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C6O4 bioaccumulation in clam (*Ruditapes philippinarum*)

Clam soft tissue	Water concentration µg/L	Bioaccumulation Factor (L/kg)	Bioaccumulation Factor (Log) (L/kg)
C6O4	1.01±0.07	**21**	**1.3**
PFOA	0.93±0.31	**119**	**2.1**

Bernardini *et al.*, The new PFAS C6O4 and its effects on marine invertebrate : first evidence of transcriptional and microbiota changes in the Manila clam *Ruditapes philippinarum* . *Environmental International*, accepted

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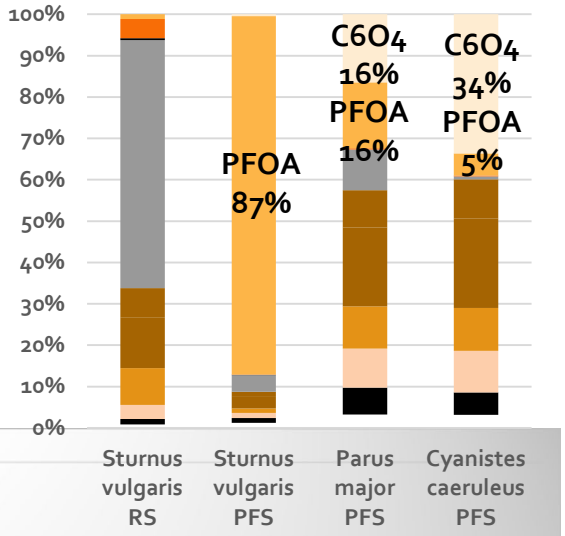
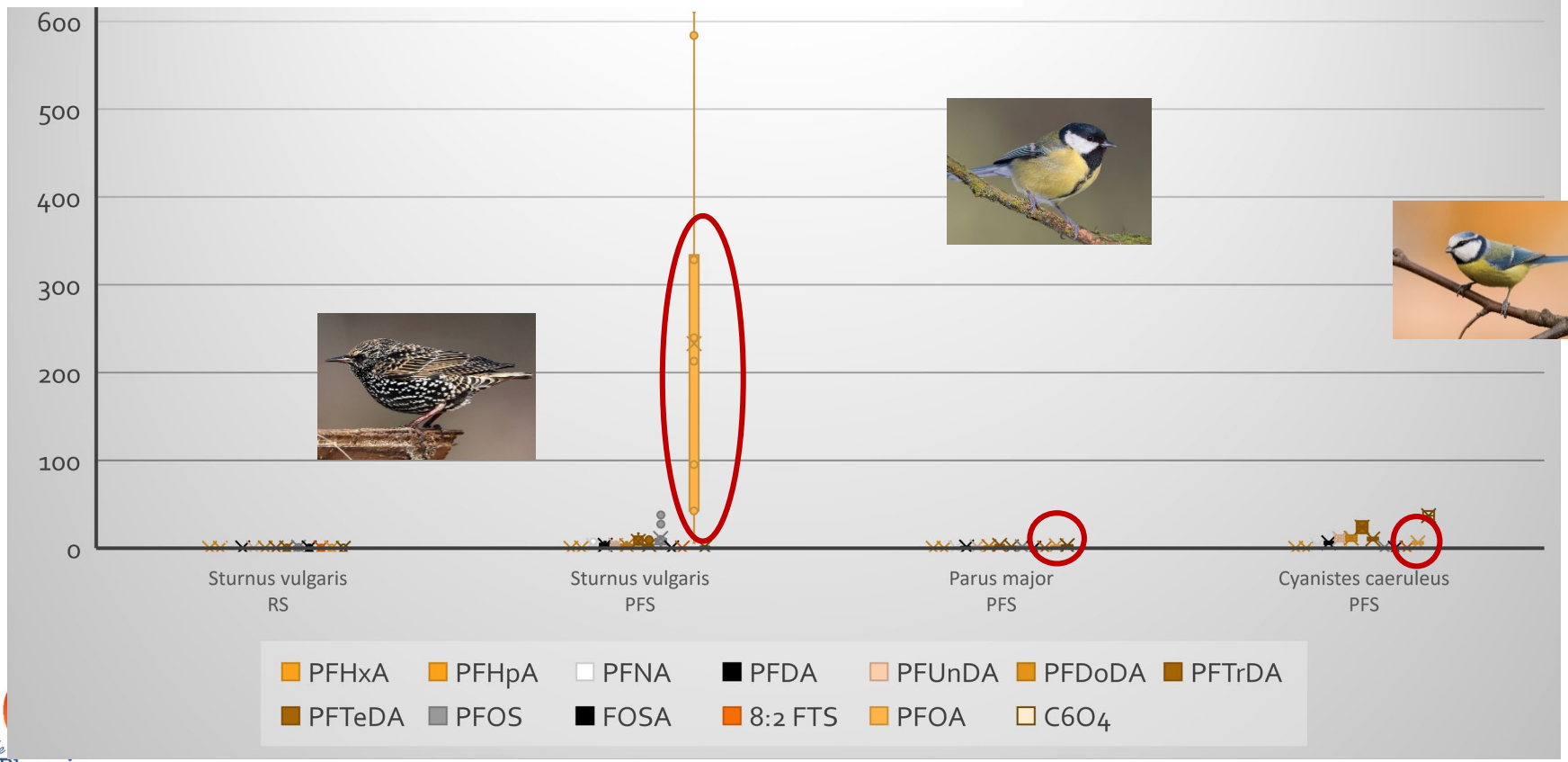
PFOA bioaccumulation in eggs of wild birds around Solvay site



***Morganti et al., Exposure assessment of PFAS-contaminated sites using avian eggs as a bio-monitoring tool: a frame of reference and a case study in the Po River valley (Northern Italy)*, submitted**



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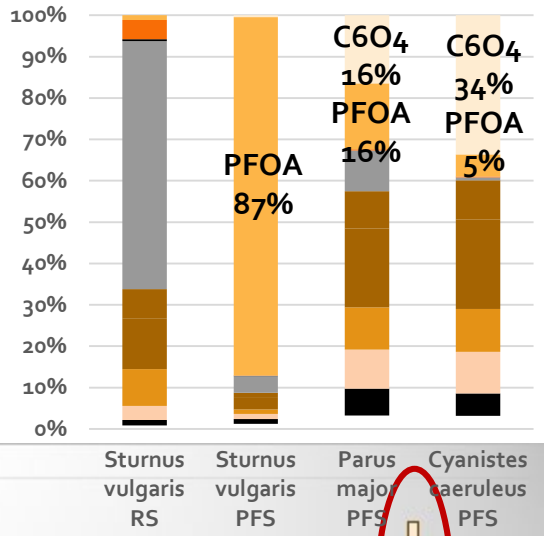
C6O4 bioaccumulation in eggs of wild birds around Solvay site



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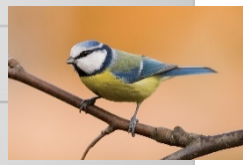
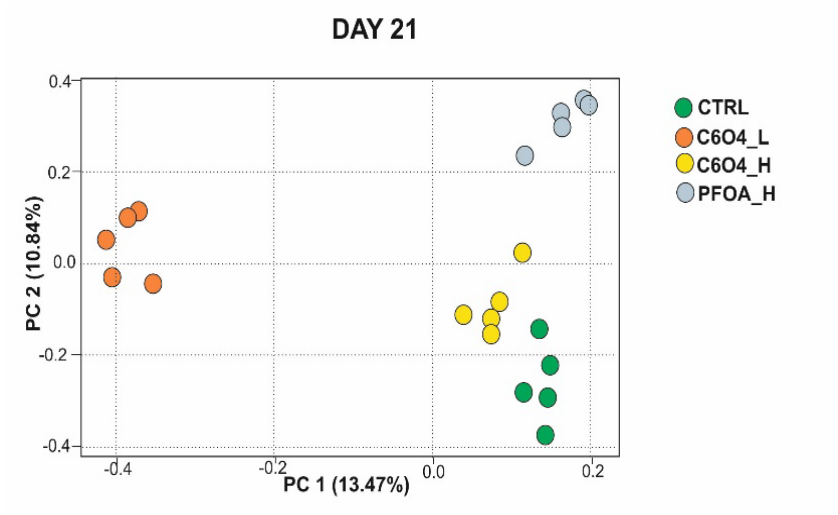


C6O4 effects in clam (*Ruditapes philippinarum*)



Bernardini *et al.*, The new PFAS C6O4 and its effects on marine invertebrate : first evidence of transcriptional and microbiota changes in the Manila clam *Ruditapes philippinarum* . *Environmental International*, accepted

- **significant perturbations** to the digestive gland microbiota likely determining the impairment of host physiological homeostasis
- **several alterations of the gene expression profiling**. A large part of the altered pathways, including immune response, apoptosis regulation, nervous system development, lipid metabolism and cell membrane metabolism are **the same in C6O4 and PFOA exposed clams**.
- dose-dependent responses as well as possible **narcotic or neurotoxic** effects and reduced activation of genes involved in **xenobiotic metabolism.**

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Product Discontinuation Announcement

WELLINGTON
LABORATORIES

345 Southgate Drive, Guelph ON, Canada N1G 3M5
Phone: (519) 822-2436 Fax: (519) 822-2849 Website: **www.well-labs.com**

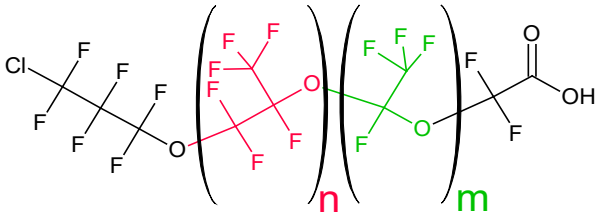
January 27, 2021

Dear Valued Customer,

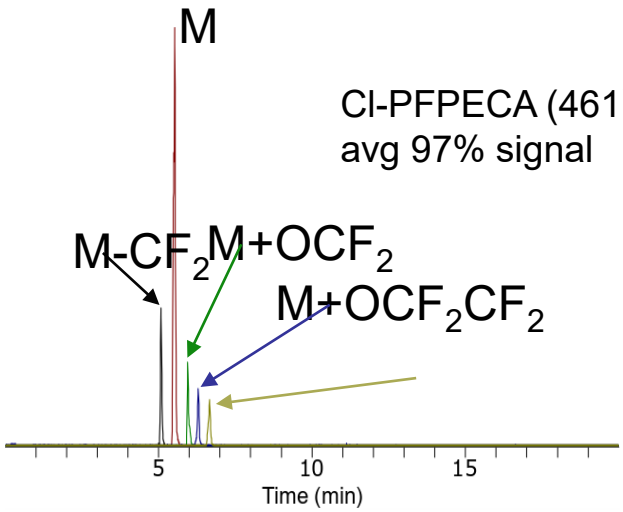
We apologize for the extended back-order that has been applied to our P5MeODIOXOAc product and regret to inform you that we are now discontinuing this product permanently. Wellington was notified in July of 2020 that the sale of our P5MeODIOXOAc standard for environmental testing and research (also known as C6O4, CAS 1190931-41-9) constituted an infringement of Solvay's patent rights. We were hoping to negotiate an

Chloro perfluoro polyether carboxylic acids Cl-PFPECAs(n,m)

Solvay
CAS 329238-24-6



propyl, ethyl



Cl-PFPECA (461)
avg 97% signal

Monoisotopic Mass (Da)

Solvay 1,1 — 577.9225

Solvay 1,0 — 461.9340

Solvay 0,1 — 411.9372

Solvay 2,0 — 627.9193

Solvay 0,2 — 527.9257

Wang, Z., et al. (2013). Environ. Int. **60: 242.**
EFSA J, 8 (2) (2010), p. 1519, 10.2903/j.efsa.2010.1519

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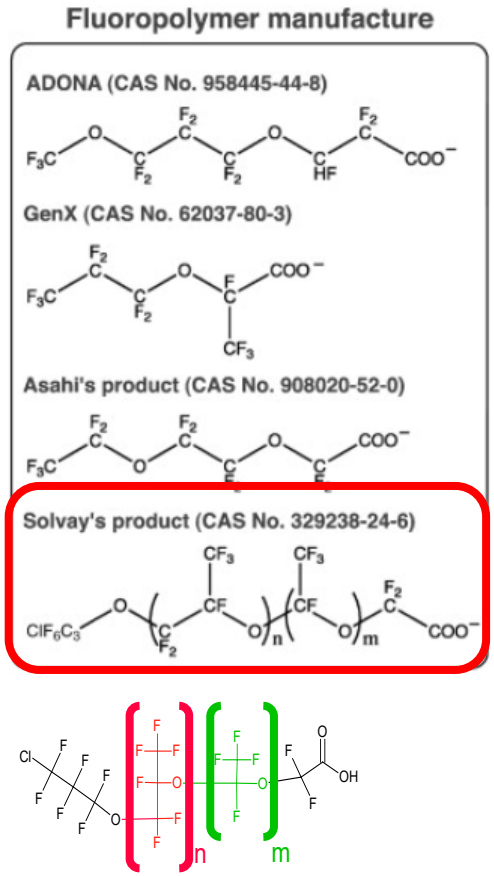
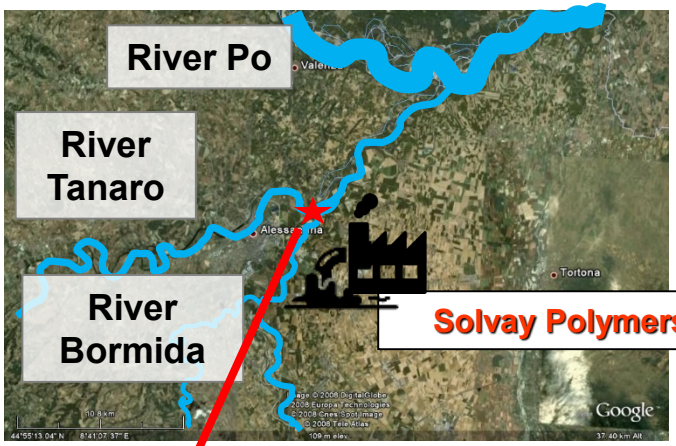
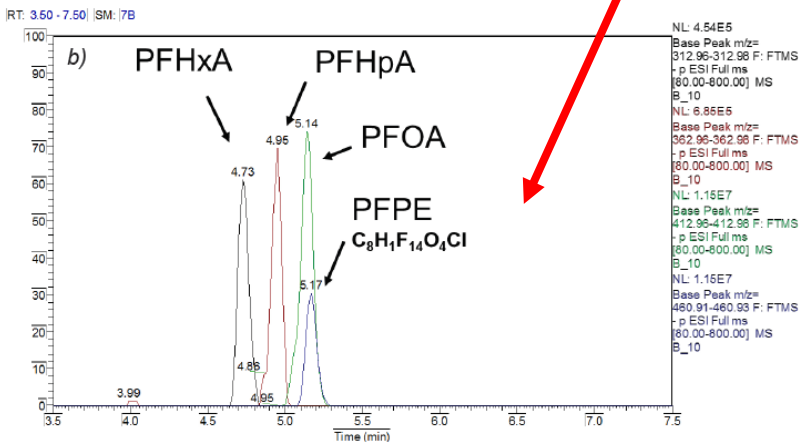
Cl-PFPECAs(n,m)







Wang, Z., et al. (2013). Environ. Int. **60: 242.**

Mazzoni et al. 2015. *Norman Bulletin Issue 4*

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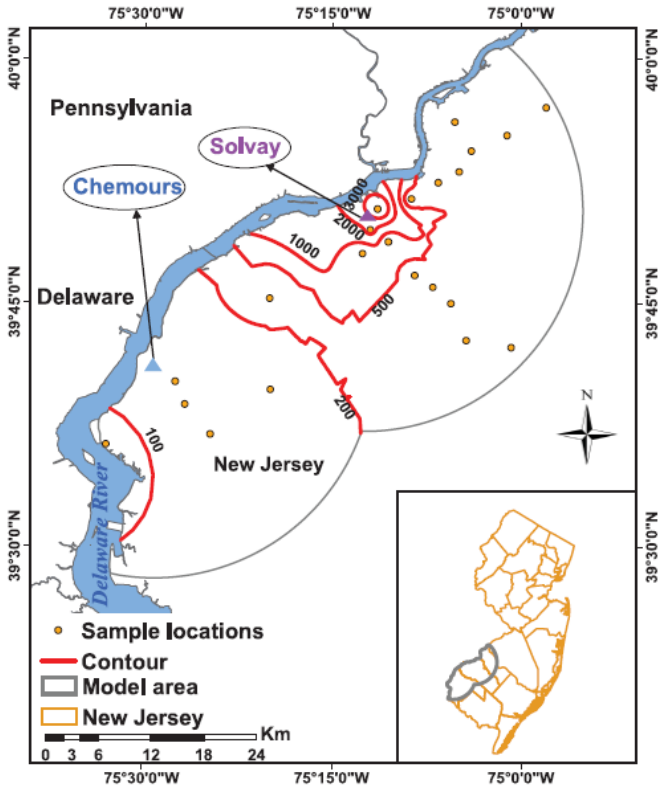
Cl-PFPECAs(n,m)

USA environmental monitoring

Surface and well samples collected prior any home treatment.
Congeners also detected in regional soil and plant samples



ENVIRONMENTAL Science & Technology LETTERS

pubs.acs.org/journal/estlcu Letter

Emerging Chlorinated Polyfluorinated Polyether Compounds Impacting the Waters of Southwestern New Jersey Identified by Use of Nontargeted Analysis

James P. McCord,* Mark J. Strynar, John W. Washington, Erica L. Bergman, and Sandra M. Goodrow

Science

RESEARCH

ANALYTICAL CHEMISTRY

Nontargeted mass-spectral detection of chloroperfluoropolyether carboxylates in New Jersey soils

John W. Washington[1]*, Charlita G. Rosal[1], James P. McCord[2], Mark J. Strynar[2], Andrew B. Lindstrom[2], Erica L. Bergman[3], Sandra M. Goodrow[4], Haile K. Tadesse[2], Andrew N. Pilant[2], Benjamin J. Washington[5], Mary J. Davis[1], Brittany G. Stuart[6], Thomas M. Jenkins[7]

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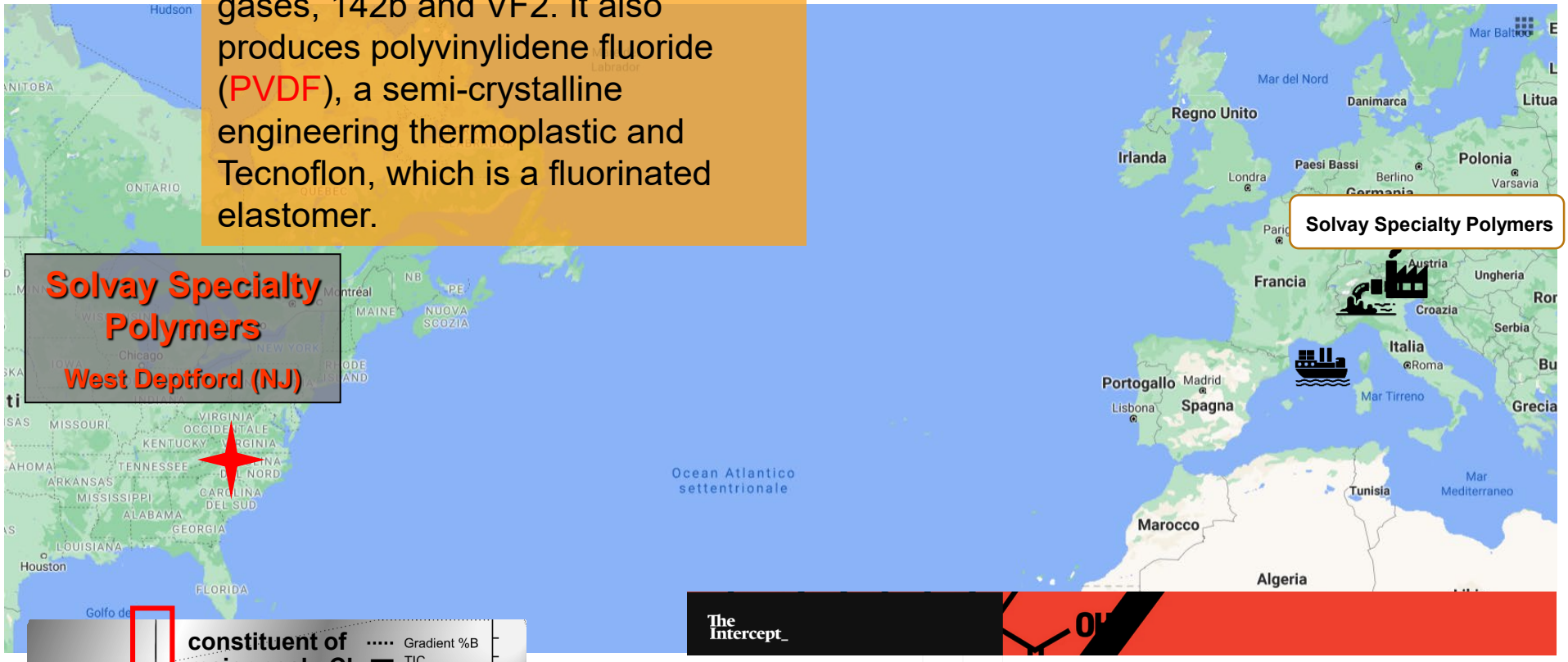
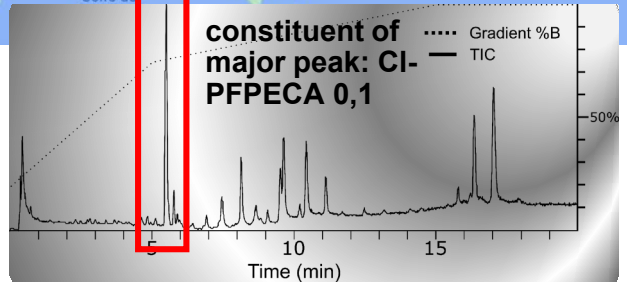
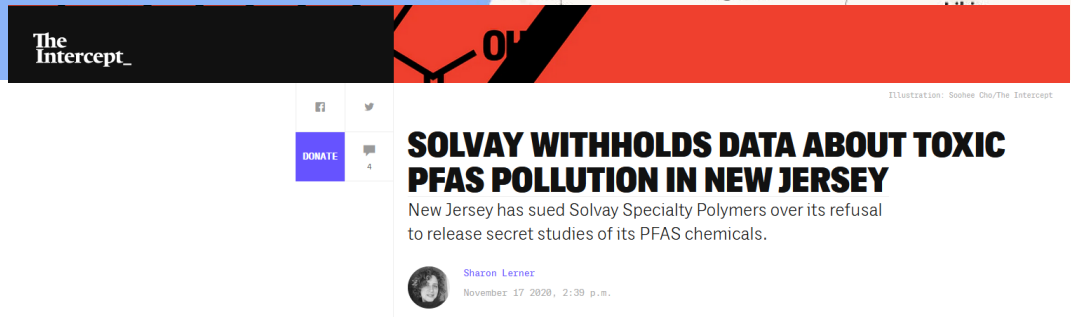
Cl-PFPECAs(n,m)

The site in NJ employs fluorinated gases, 142b and VF2. It also produces polyvinylidene fluoride (PVDF), a semi-crystalline engineering thermoplastic and Tecnoflon, which is a fluorinated elastomer.







Cl-PFPECAs(n,m)

Preliminary analyses 2020 LC-MS/MS

µg/L	year	PFOA	C6O4	Cl-PFPECA 1,0*	Cl-PFPECA 0,1*	Cl-PFPECA 2,0*	Cl-PFPECA 1,1*	Cl-PFPECA 0,2*
River Upstream	2020	nd	nd	nd	nd	nd	nd	nd
SOLVAY's discharge	2020	2.9	141	2.8	496	20	55	142
River Dowstream	2020	0.01	0.81	0.03	1.94	0.01	0.21	0.42

** Concentration estimated by cC6O4 calibration*

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Cl-PFPECAs(n,m)

Retrospective analysis of samples: GW

Groundwater below Solvay Site Plant (first layer) µg/L	year	PFOA	C6O4	Cl-PFPECA 1,0*	Cl-PFPECA 0,1*	Cl-PFPECA 2,0*	Cl-PFPECA 1,1*	Cl-PFPECA 0,2*
PZA-1	**2012**	**15**	**1**	***2-3***	***38-83***	***2-3***	***1-2***	***2-3***
PZB-1	**2012**	**14**	**1**	***2-3***	***40-87***	***1-2***	***1-2***	***2-3***
PZB-2	**2012**	**49**	**0**	***nd***	***25- 52***	***nd***	***nd***	***nd***

** Concentration estimated by C6O4 calibration*

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Conclusions

- Need to manage the circulation of waste
- $C6O4$ probably less bioaccumulative but not less toxic
- $C6O4$ reveals to be a non-safe alternative to PFOA
- Cl-PFPECA probably bioaccumulable