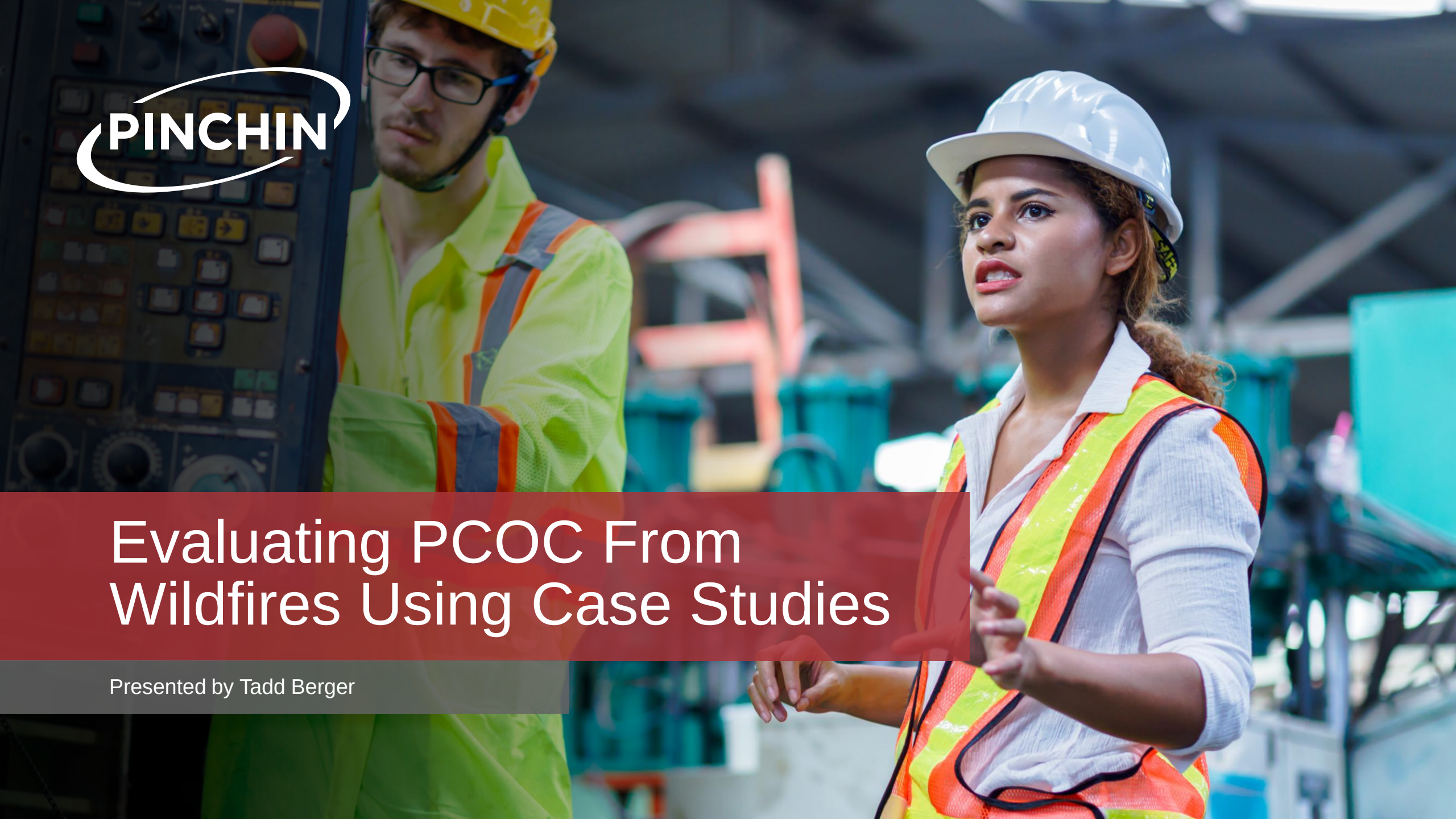

Evaluating PCOC From Wildfires Using Case Studies

Presented by Tadd Berger

Today's Presenter

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Conceptual Site Model

Shallow soils are most likely to be impacted from a recent fire event

Chemicals in soil after wildfire can be attributed to 1 of 4 source categories

- Chemicals present **before** the fire
- Chemicals release **because of** the fire
- Chemicals **created by** the fire
- Chemicals **used to fight** the fire

Case Study Approach

- Select data from 5 fire events [116 Location Data Points Used]
  - Major wildfire in BC (63 data points used)
  - Major wildfire in Alberta (28 data points used)
  - Total Loss Fire of Ontario Industrial Facility (10 data points used)
  - Large Property Fire on Ontario Commercial and Vacant Property (3 data points used)
  - Major wildfire in BC (12 data points used)
- Filter data to only use surficial soils and ash
- Evaluate data set to remove “uninteresting data”
- Considered Conceptual Site Model to further evaluate data

A Fire Event Example

Contamination Pre-Dating the Fire

- Tanks, industrial activities, historical spills, etc.
  - Do not expect Pyro-remediation to have eliminated these issues
- Naturally Occurring Concentrations
  - Arsenic, iron, other metals

Contamination As an Indirect Result of the Fire

1. Containment breaches
    - Hoses or totes melting, or ASTs being dropped. Especially if materials are not easily combusted
2. Asbestos, lead paint chips, falling from structures as they burn
3. PFAS present in construction materials
4. Chemicals used during fire fighting

Asbestos

Per- and Polyfluoroalkyl Substances (PFAS)

Fire Fighting Chemicals

Phos-Chek – ammonia sulphate (fertilizer) and red dye

Class A Foams

(non PFAS containing)

Water

Clay Slurry

Contamination as a Direct Effect of the Fire

Chemical reactions that occur during combustion that create toxins

- PAHs
- Dioxins

Chemicals with no detections

Chloronaphthalene, 2-
Bromodichloromethane
Bromoform
Bromomethane
Butadiene, 1,3-
Carbon Tetrachloride
Chlorobenzene
Chloroform
Dichlorobenzene, 1,2-
Dichloroethane, 1,2-
Dichloropropane, 1,2-
Dichlorobenzene, 1,3-
Dichlorobenzene, 1,4-
Dichloroethane, 1,1-
Dichloroethylene, 1,1-
Dichloroethylene, 1,2-cis-
Dichloroethylene, 1,2-trans-
Dibromochloromethane [DBCM]
Dichloromethane
Nonane
Trichloroethylene
Trichlorofluoromethane
Vinyl chloride
Tetrachloroethane, 1,1,1,2-
Trichloroethane, 1,1,1-
Tetrachloroethane, 1,1,2,2-
Trichloroethane, 1,1,2-
Trichlorobenzene, 1,2,4-
Methyl ethyl ketone [MEK]
Methyl Isobutyl Ketone [MIBK]
Ethylene Dibromide
Dichlorodifluoromethane
Dibromoethane, 1,2-
1,3-Dichloropropene (Total)
Cis-1,3-Dichloropropylene
Trans-1,3-Dichloropropylene
Hexane
Methylene Chloride
Bis(2-chloroisopropyl)ether
p-Chloroaniline
3,3'Dichlorobenzidine
Diethyl phthalate
Dimethyl phthalate
2-4-Dinitrotoluene
1,2,4-Trichlorobenzene
2,6-Dinitrotoluene
2,4- & 2,6-Dinitrotoluene
2-Chlorophenol
2,4-Dichlorophenol
2,4-Dimethylphenol
2,4-Dinitrophenol
Pentachlorophenol
Phenol
2,4,5-Trichlorophenol
2,4,6-Trichlorophenol

Chemicals with no exceedances of lowest CSR standards

Methylnaphthalene, 1-

Methylnaphthalene, 2-

Acenaphthene

Chrysene

Fluorene

Acetone

Methyl tert-butyl ether [MTBE]

Tetrachloroethylene

Aluminum

Boron

Lithium

Mercury

Manganese

Molybdenum

Selenium

Silver

Strontium

Thallium

Tungsten

Uranium

Aroclor 1016

Aroclor 1221

Aroclor 1232

Aroclor 1242

Aroclor 1248

Aroclor 1254

Aroclor 1260

Aroclor 1262

Aroclor 1268

polychlorinated biphenyls [PCBs], total

Biphenyl

Bis(2-ethylehexyl)phthalate

Methylnaphthalene, 2-(1-)

Quinoline

Total PCDDs and PCDFs (TEQ)

Too few exceedances

Less than 2 exceedances in large datasets

VPHs /F1

Anthracene

Benzo(a)pyrene

Fluoranthene

Ethylbenzene

Toluene

Xylenes, Total

Antimony

Cobalt

Nickel

Chemicals Evaluated

LEPH/HEPH (F2, F3, F4)

Several PAHs

Benzene

Styrene

Arsenic

Barium

Beryllium

Cadmium

Chromium

Copper

Iron

Lead

Tin

Vanadium

Zinc

A Reminder of the 5 Fires

- Select data from 5 fire events [116 Location Data Points Used]
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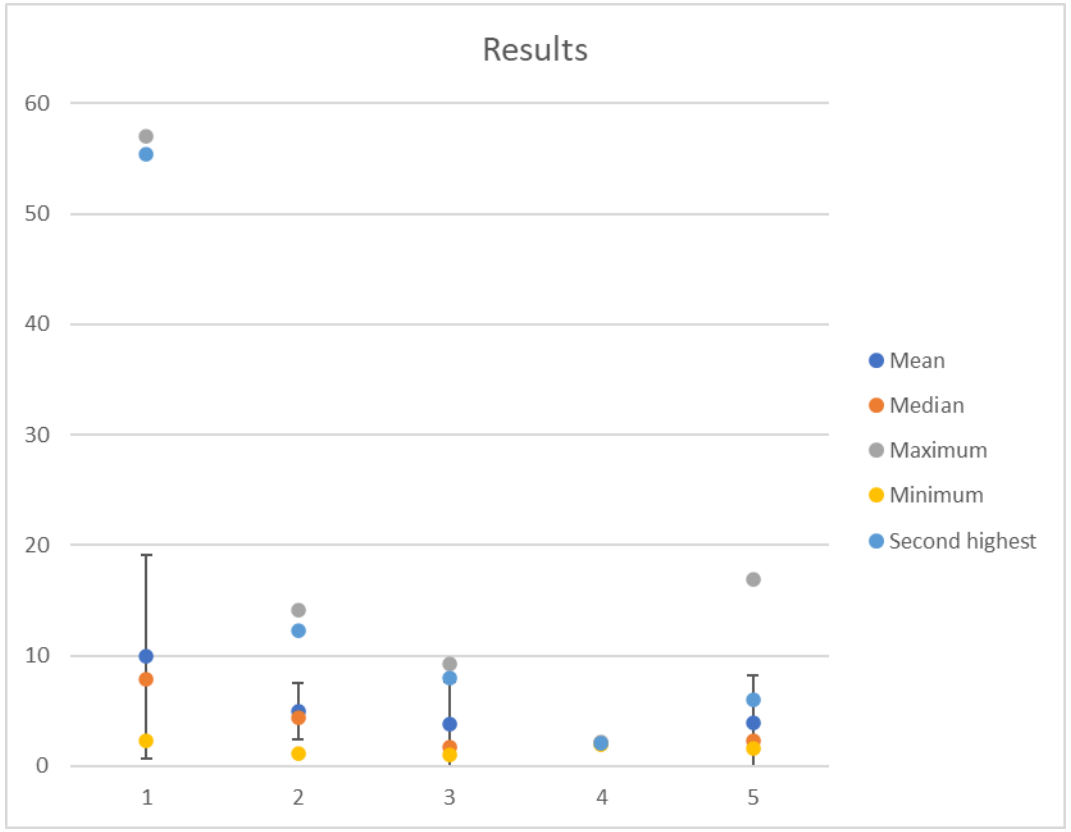
  5. Major wildfire in BC (12 data points used)

Arsenic



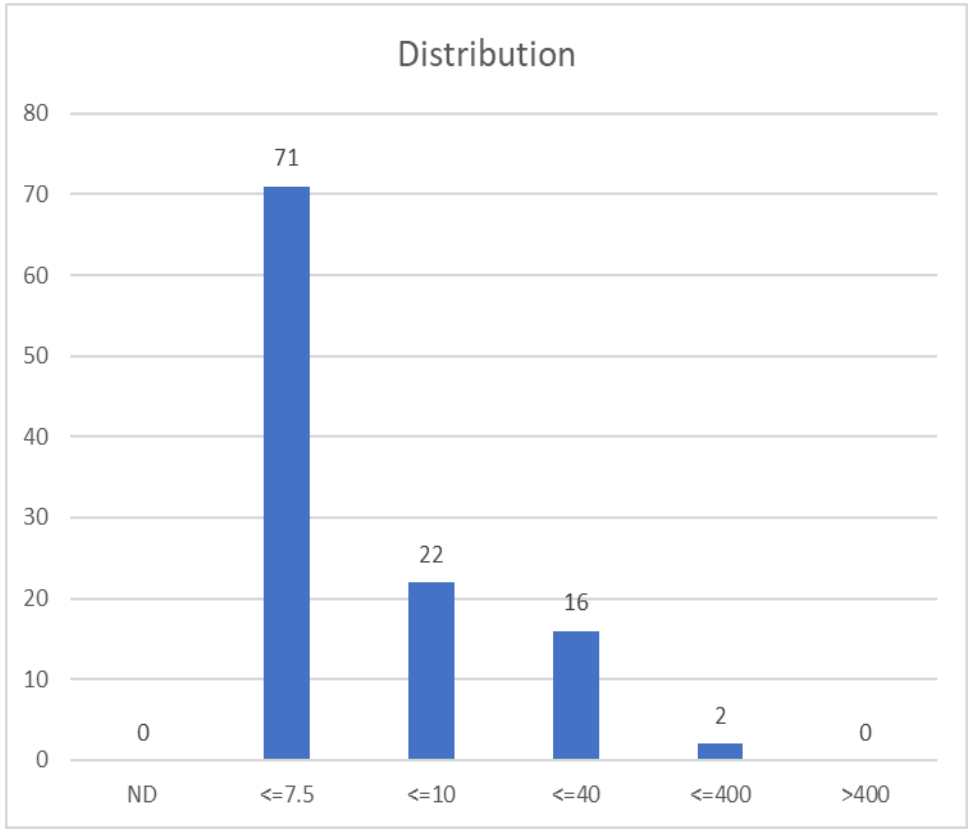
111 Samples

111 Detections

18 Exceedances

Exceedances only present at 3 fires.

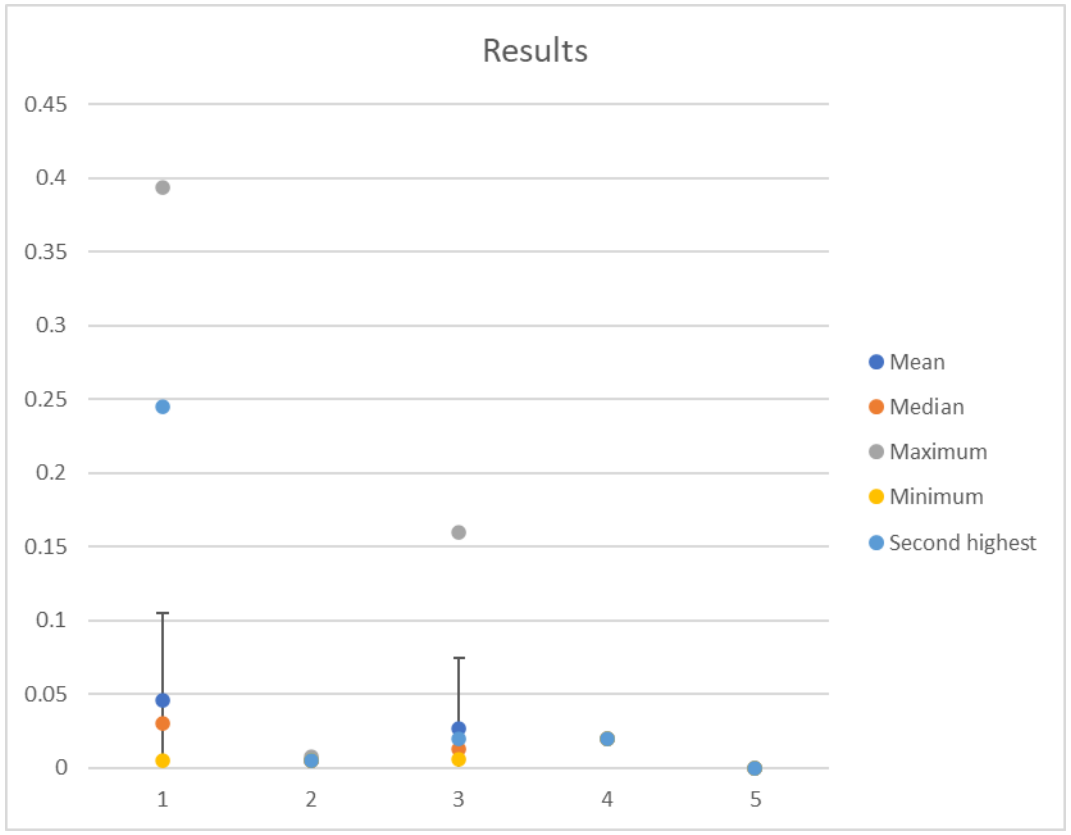
Likely natural background



CSR DW protection = 10

CSR IL Direct Contact = 400

Benzene



78 Samples

24 Detections

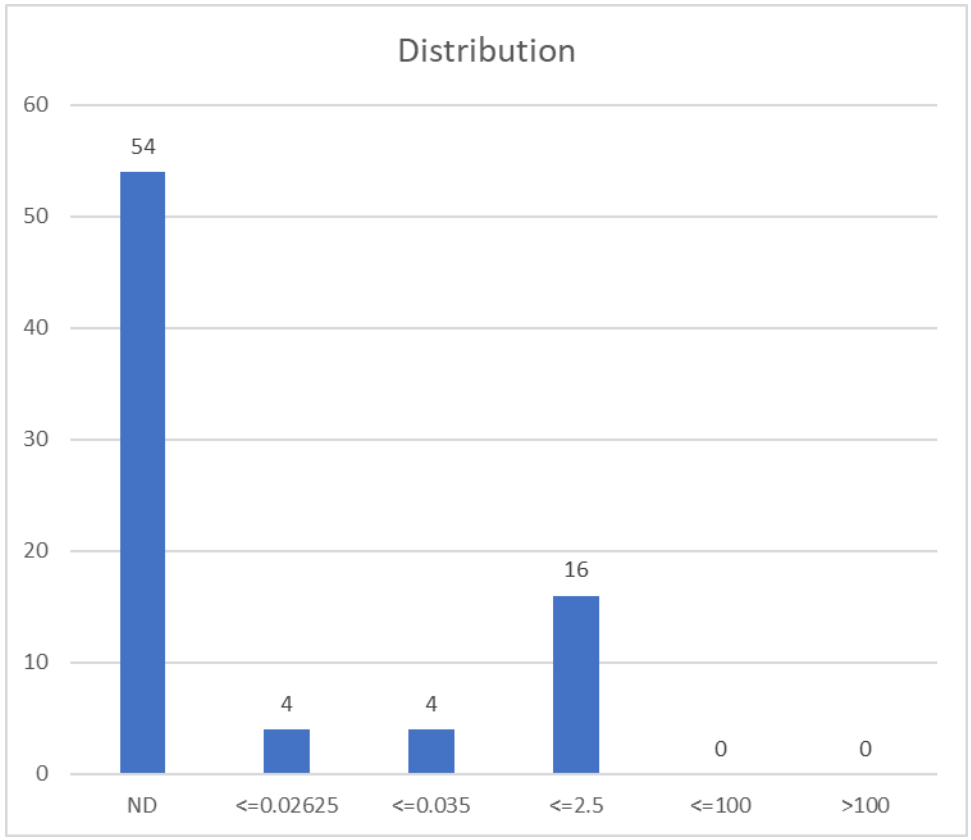
16 Exceedances

No samples for Fire 5

22 Detections from Fire 1

15 Exceedances from Fire 1

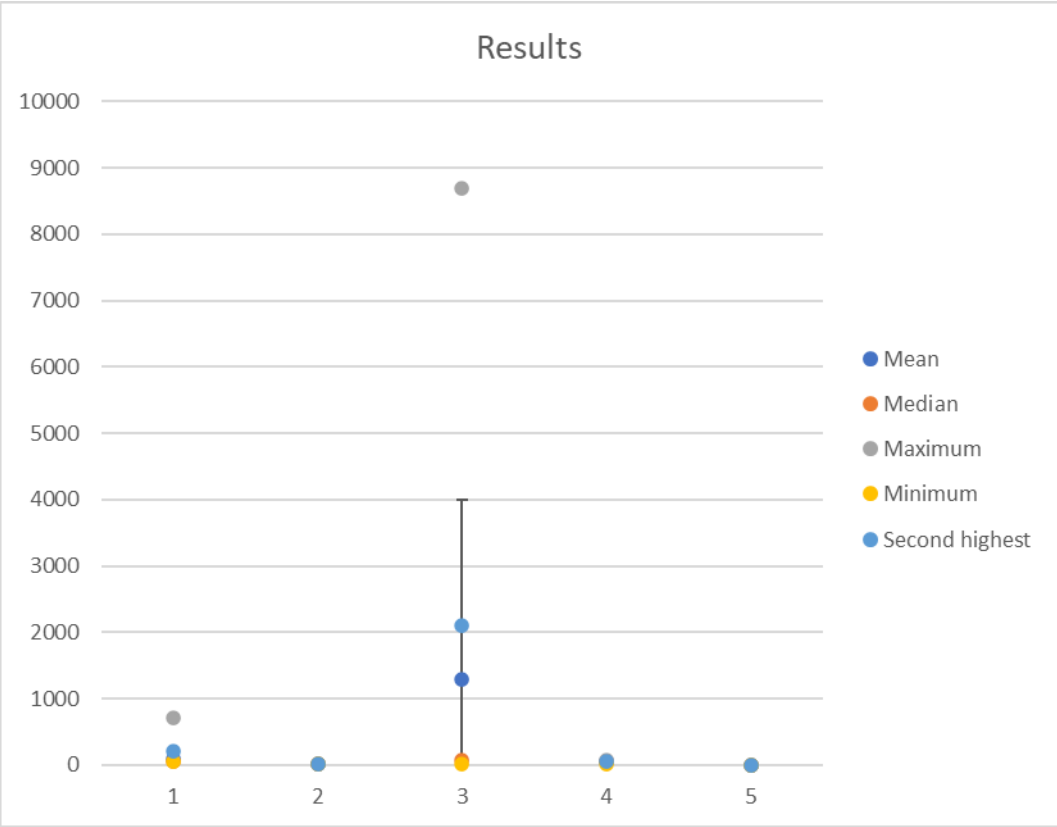
Not sure why Fire 1 had benzene issues



CSR DW protection = 0.035

CSR AW protection = 2.5

EPHs10-19 / F2



82 Samples

9 Detections

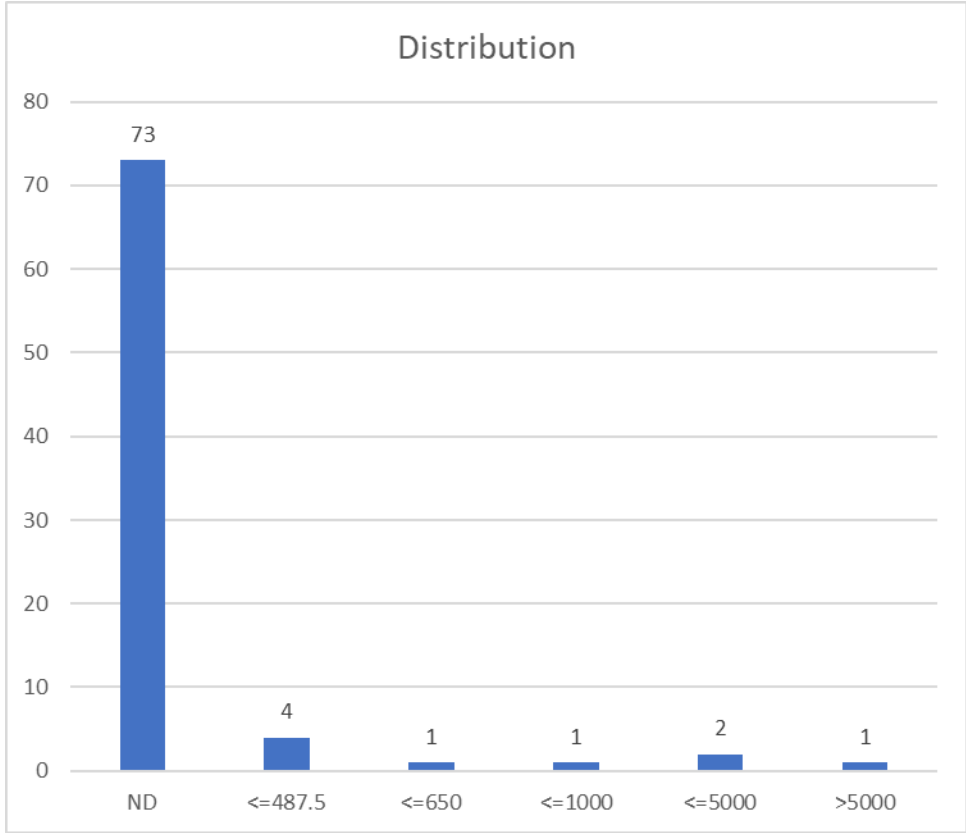
4 Exceedances

3 Above Residential

No samples for Fire 5

Residential exceedances all from Fire 3

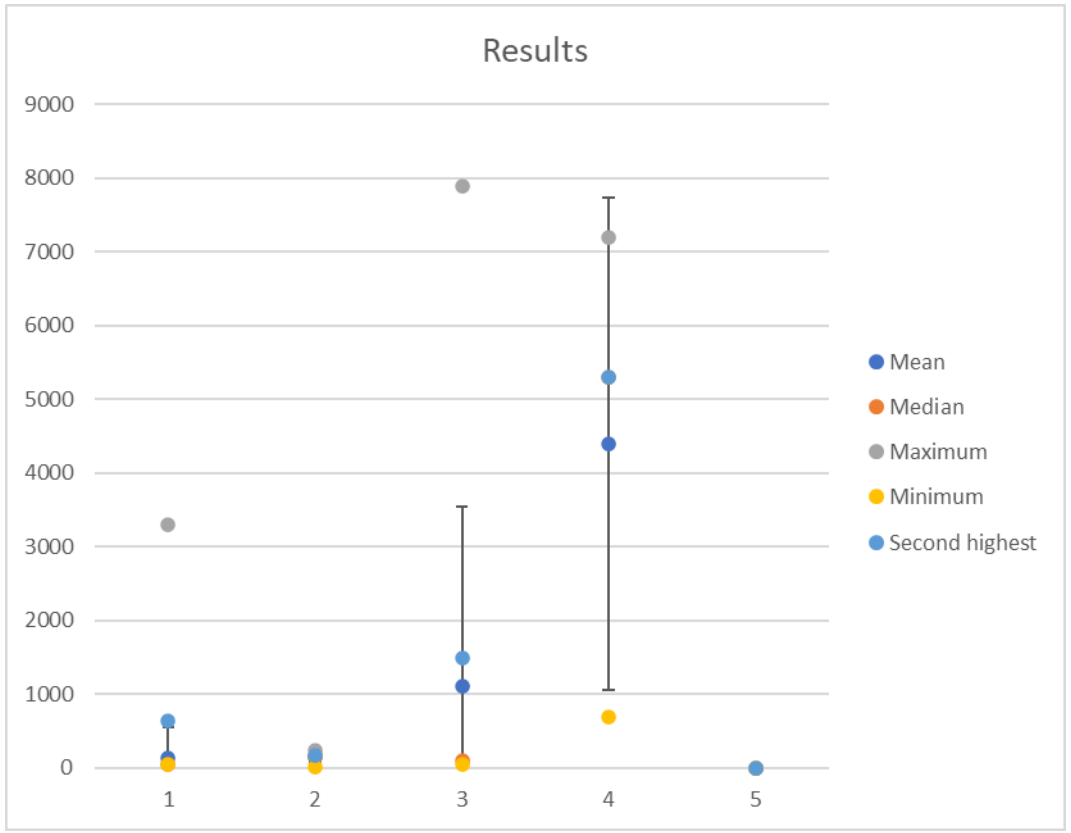
EPH concentrations likely from pre-existing conditions



CSR LEPH Wildlands = 650

CSR LEPH Residential = 1000

EPHs19-32 / F3



82 Samples

27 Detections

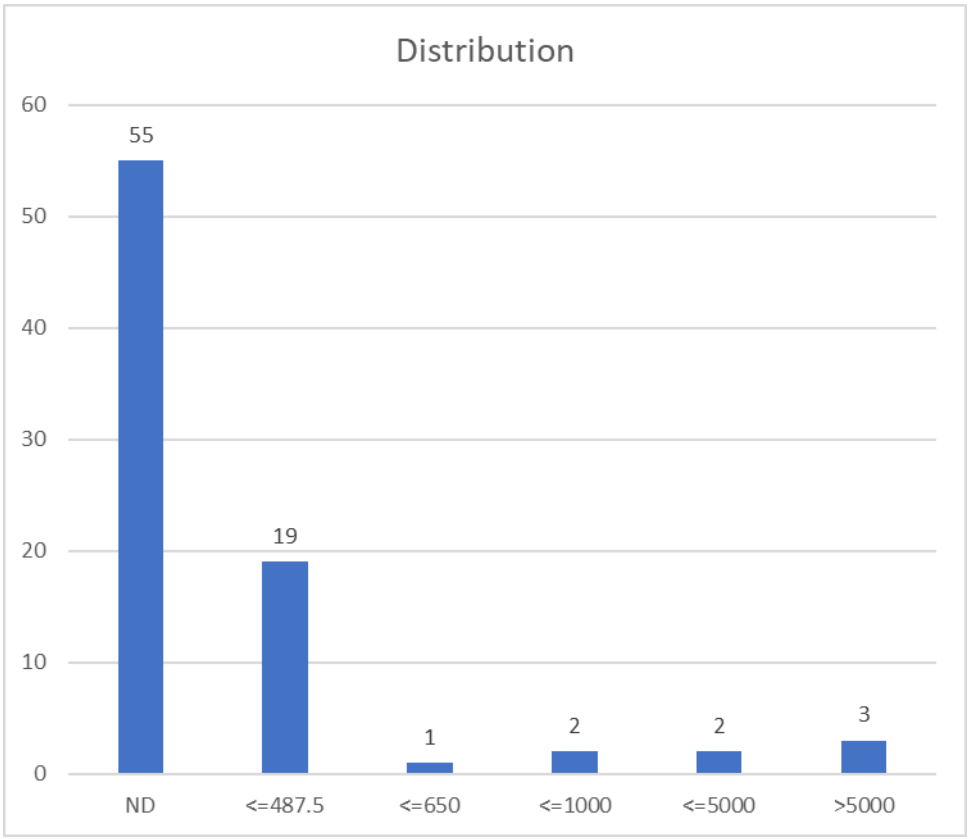
7 Exceedances

5 Above Residential

No samples for Fire 5

Residential exceedances mostly from Fire 3 & 4

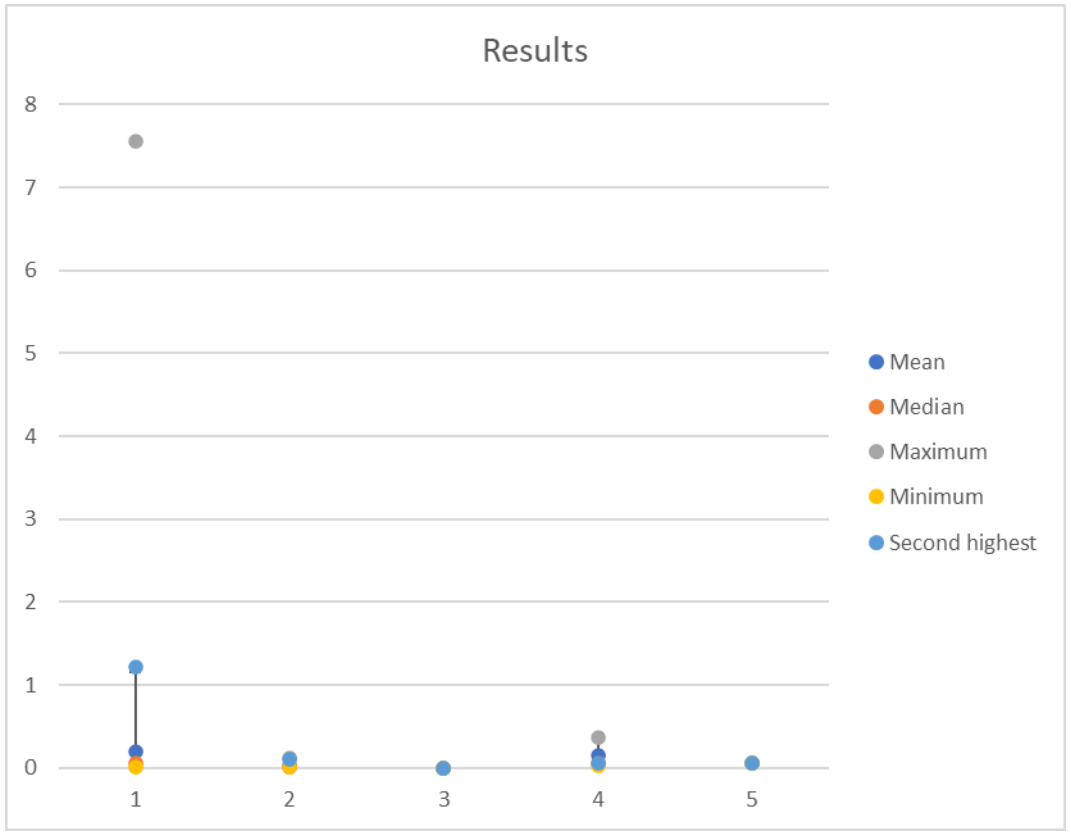
EPH concentrations likely from pre-existing conditions



CSR HEPH Wildlands = 650

CSR HEPH Residential = 1000

Naphthalene



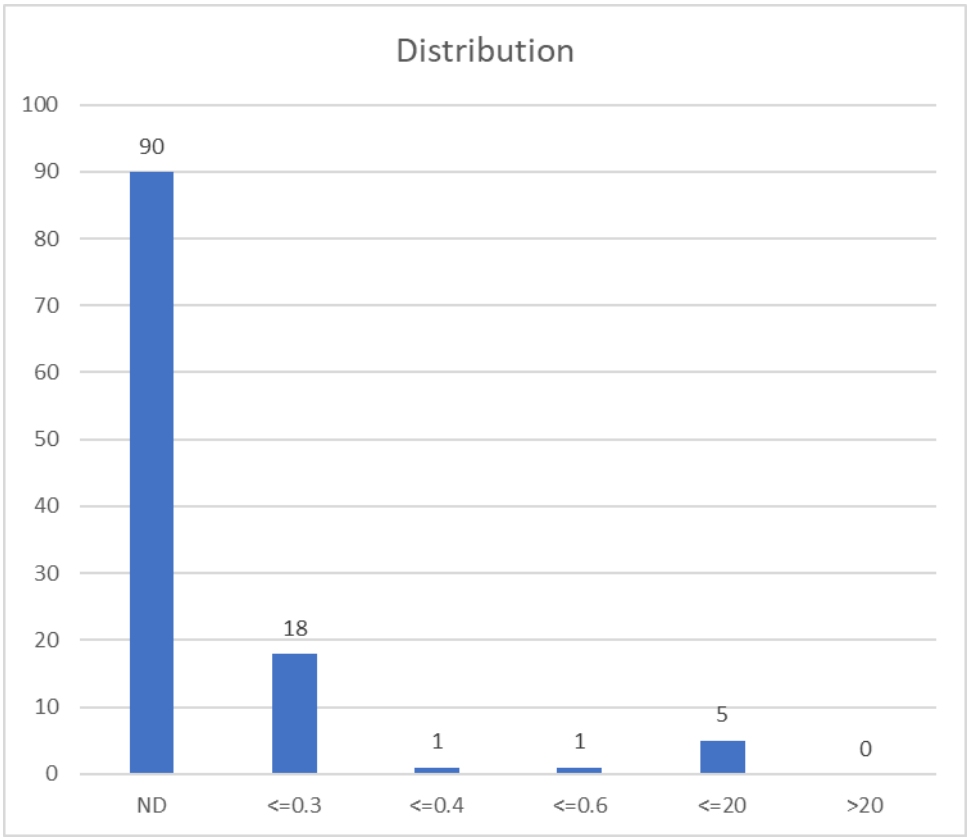
106 Samples

20 Detections

6 Exceedances

All exceedances are from Fire 1.

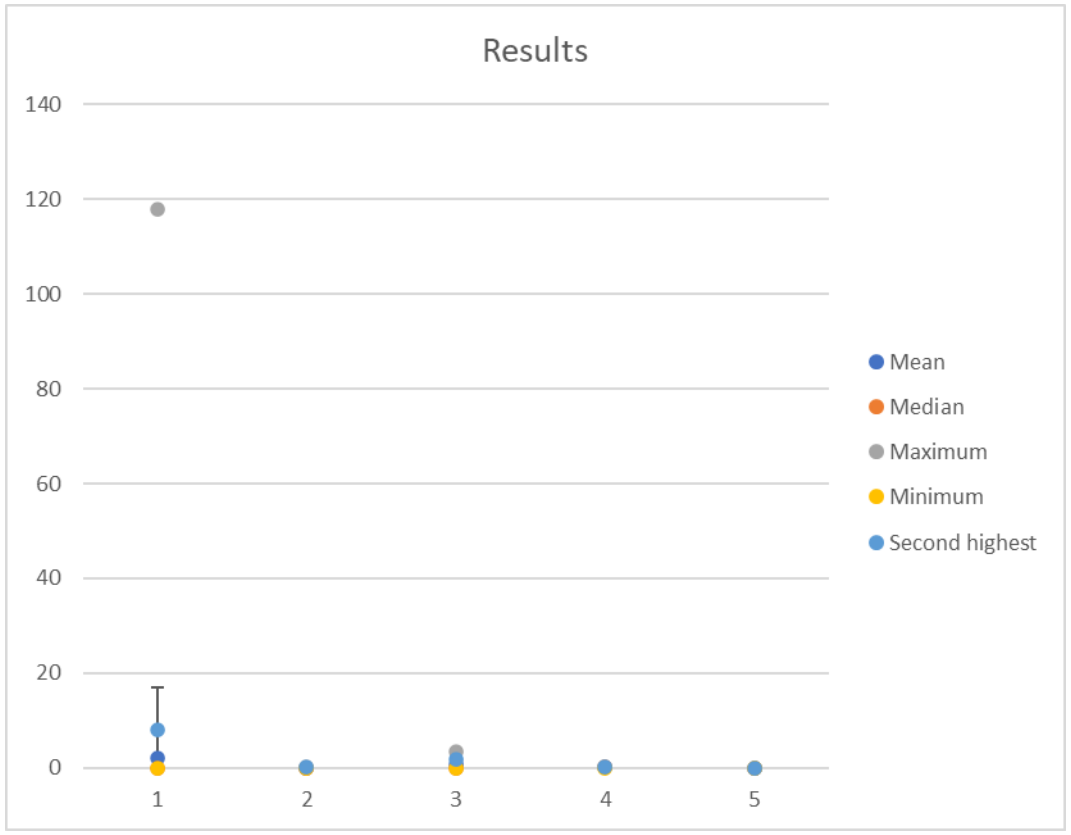
Likely from pre-existing conditions



CSR Wildlands = 0.4

CSR Commercial = 20

Phenanthrene



115 Samples

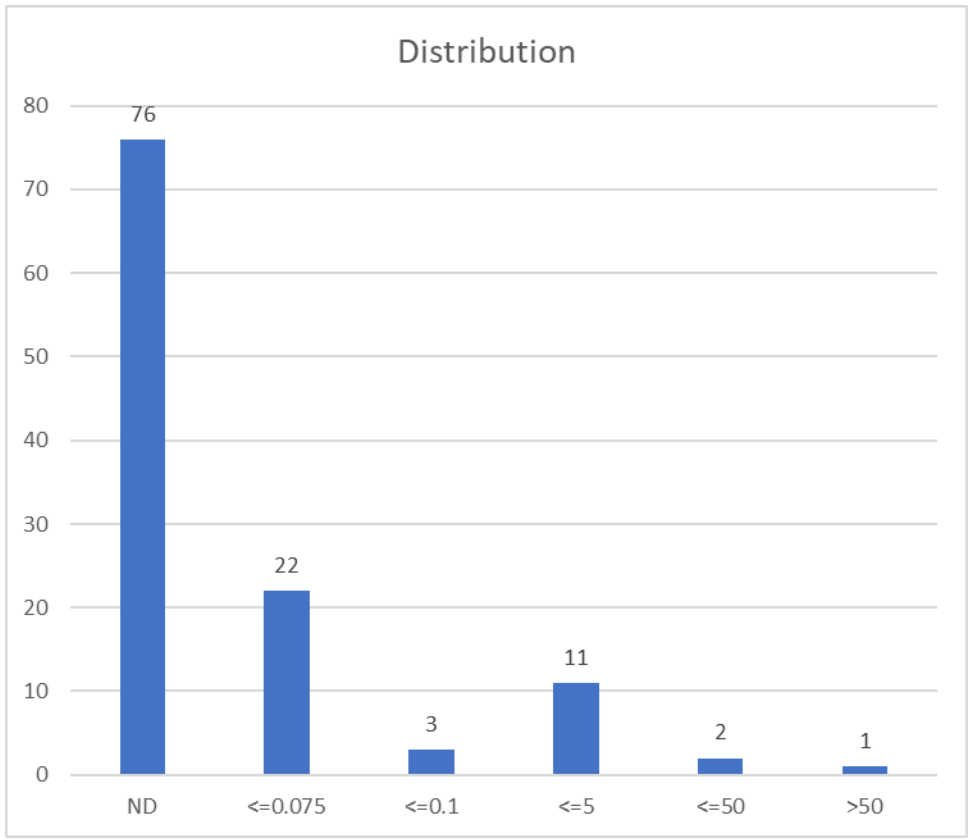
38 Detections

14 Exceedances

Only 3 above Residential

All residential exceedances are from Fire 1.

Likely from pre-existing conditions



CSR AG = 0.1

CSR Residential = 5

Conclusions

Benzene – Maybe?

Dioxins – Probably not

PAHs – Uncertain, but not overly likely

But do not forget pre-existing conditions!!!


QUESTIONS?