Chemcatcher®

Passive sampling for micropollutants

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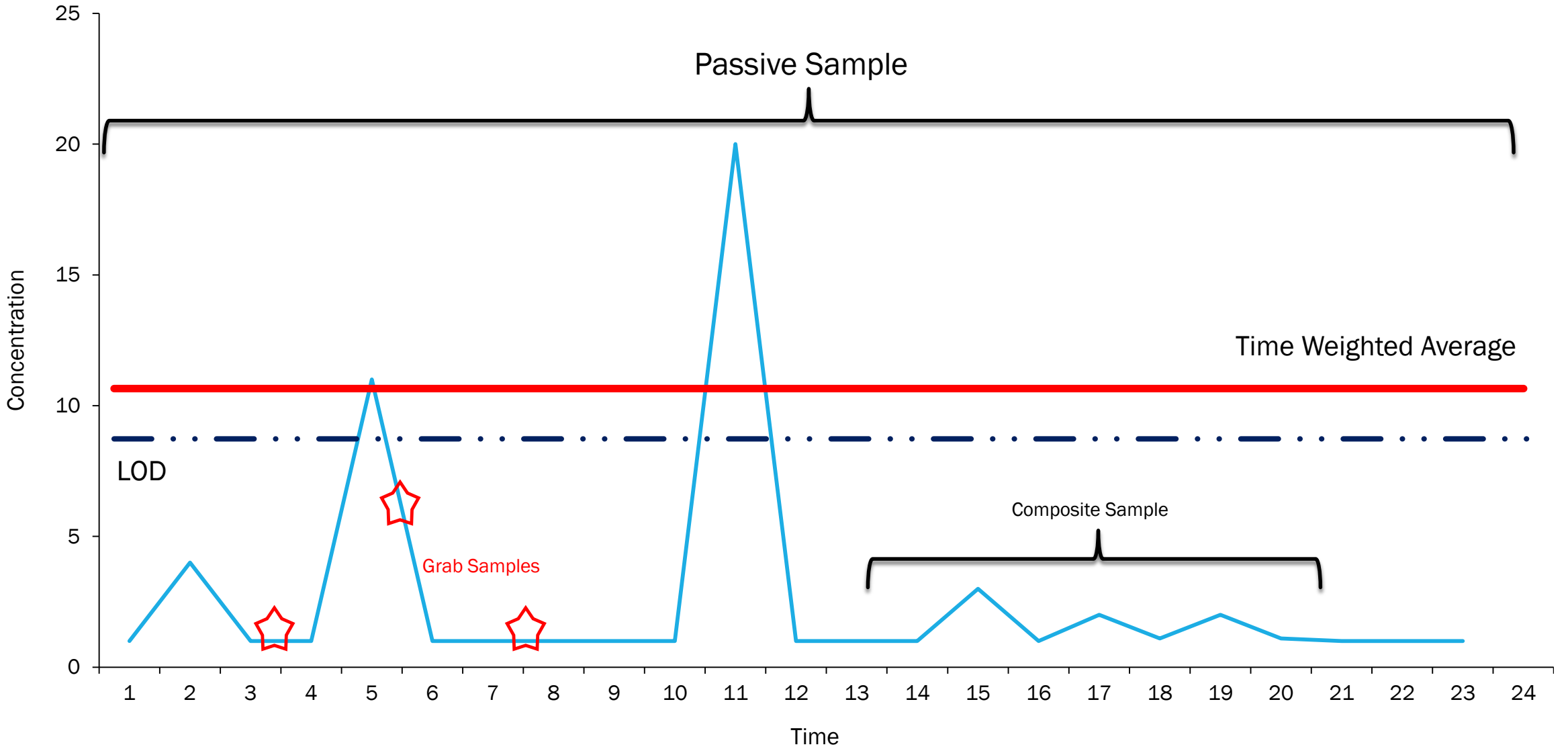
Passive Sample
Time Weighted Average
LOD
Grab Samples
Composite Sample
Concentration
Time
0
5
10
15
20
25
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
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24

PASSIVE SAMPLING TYPES

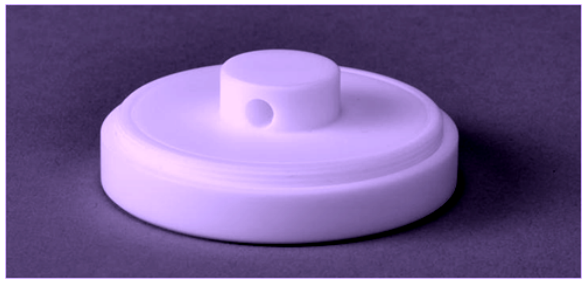
- Abiotic device used to monitor for chemical(s) in an environmental medium
- Has little to no moving parts
- Doesn’t require power to operate (remote deployments)
- Samples over a prolonged duration (14 days average)
- Reusable

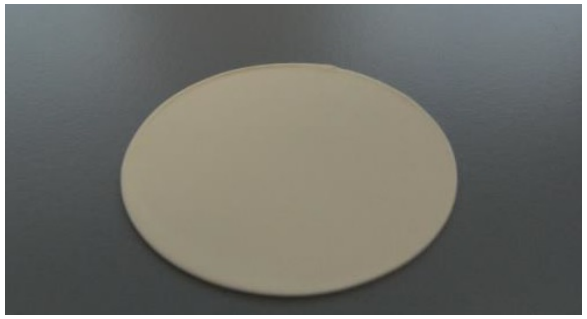
- Concentrate large volumes of water (1000 Ltrs) compared to a 1-2 Ltr sample
- Increased sensitivity & lower LoD
- Time-weighted average concentration
- Selectively samples residues from the dissolved phase
- Detect episodic events (spill or run-off)

COMMON CHEMICALS SAMPLED BY PASSIVE SAMPLERS

- Emerging Contaminants
  - Pharmaceuticals/Personal Care Products/ illicit Drugs
  - Mollusc Pesticides – Metaldehyde
  - Hormones
- Legacy / Related Contaminants
  - PAHs, PCBs,
  - Radionuclides
  - Metals,
  - Dioxins & Furans,
  - Acid Herbicides / Pesticides
  - PFOS/PFOA

CHEMCATCHER PASSIVE SAMPLERS





USING CHEMCATCHER® TO HELP SOLVE A PESTICIDE PUZZLE

TEAGASC (AGRICULTURAL AND FOOD DEVELOPMENT AUTHORITY)

teagasc
AGRICULTURE AND FOOD DEVELOPMENT AUTHORITY

MCPA STUDY BY TEAGASC

- Do we understand enough about the process of herbicide loss to water?
- Do current practices require modification to minimise this loss?
- Are there alternative tools to grab sampling for monitoring?

WHAT IS MCPA?

Specifically designed to kill weeds without harming crops and is a common active ingredient, widely available in both agricultural and domestic herbicide products.

Used widely to control the growth of weeds like the Common Soft Rush

MCPA POLLUTION

MCPA does not bind to soil particles and is prone to leaching, directly into watercourses or via land drains.

Field half-life of 14 days to one month depending on the type of crop being treated and the amount of MCPA being used.

ADVANTAGES OF CHEMCATCHERS FOR MCPA MONITORING

As MCPA is highly soluble it moves quickly in flashy conditions: grab sample can miss concentration spikes. Chemcatcher®, provides a time-weighted average, distributed over a 14-day period.

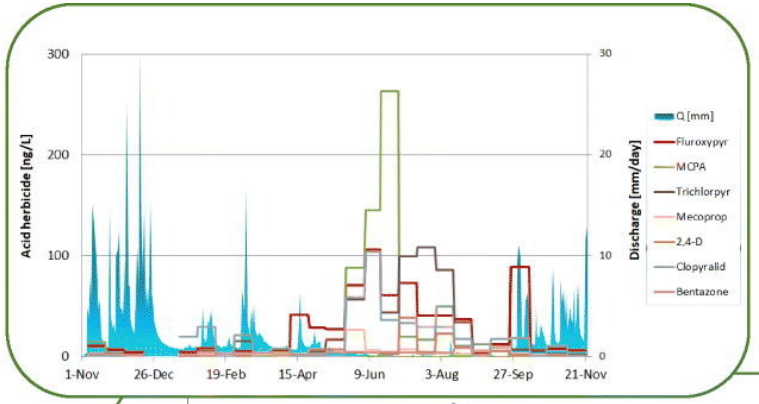
Chemcatcher® enables detection at lower levels than traditional sampling enabling monitoring of rivers that are representative areas as opposed to problem areas.

TEAGASC'S CATCHMENT AREAS

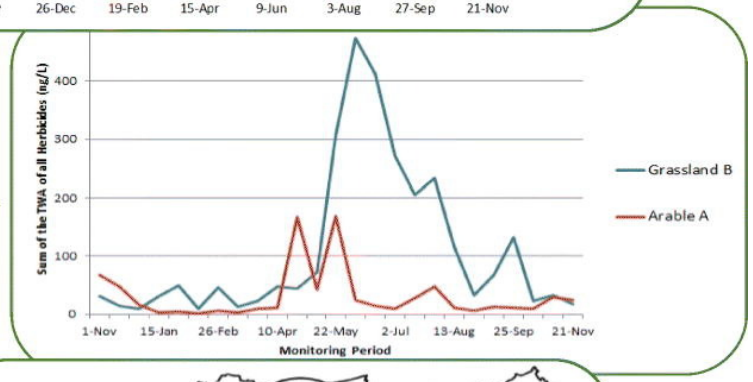
Grassland catchment

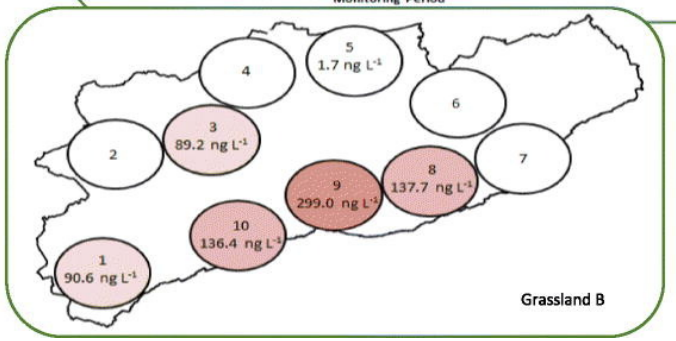
Arable catchment

Catchment river outlet

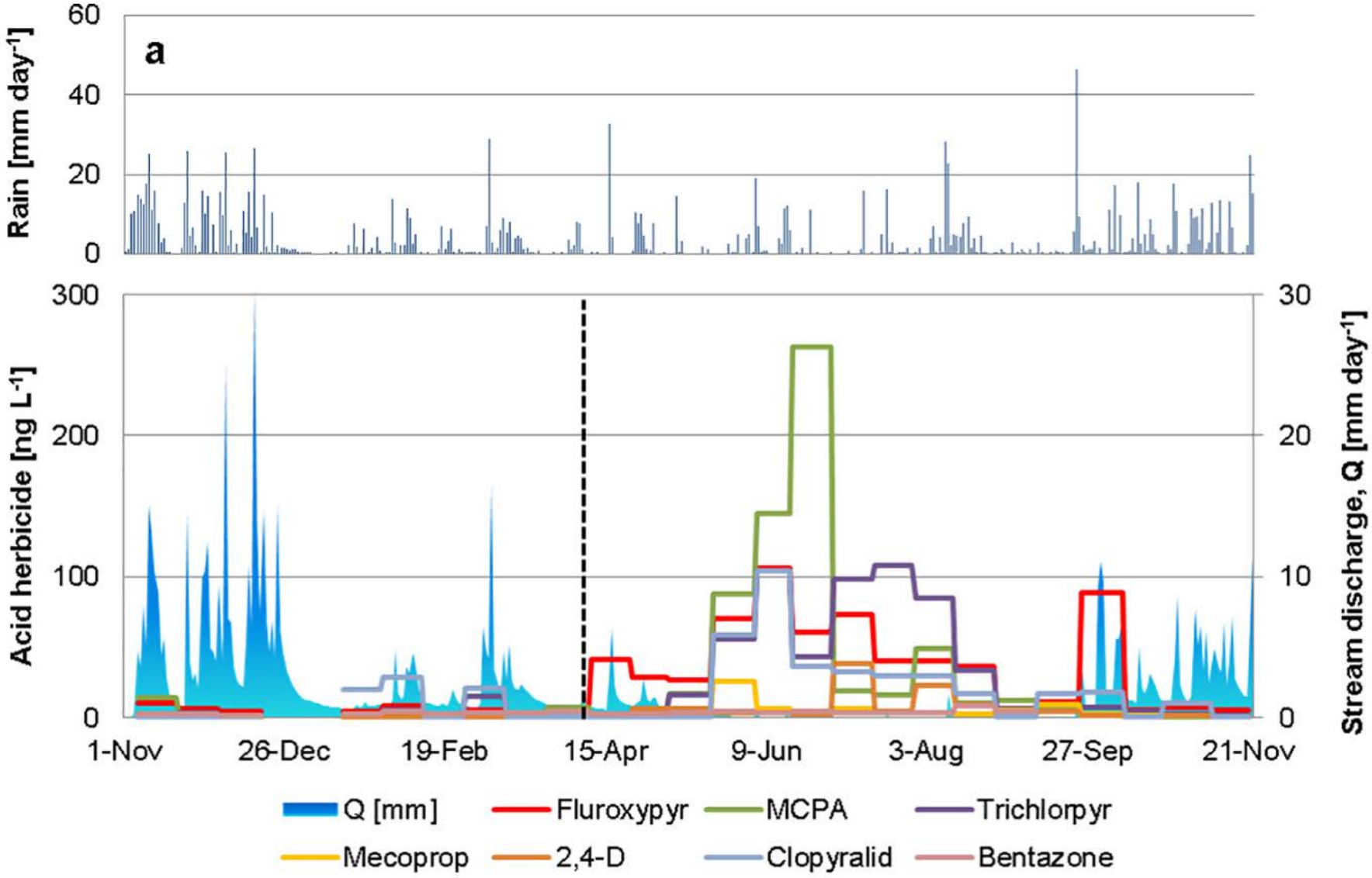


Private well

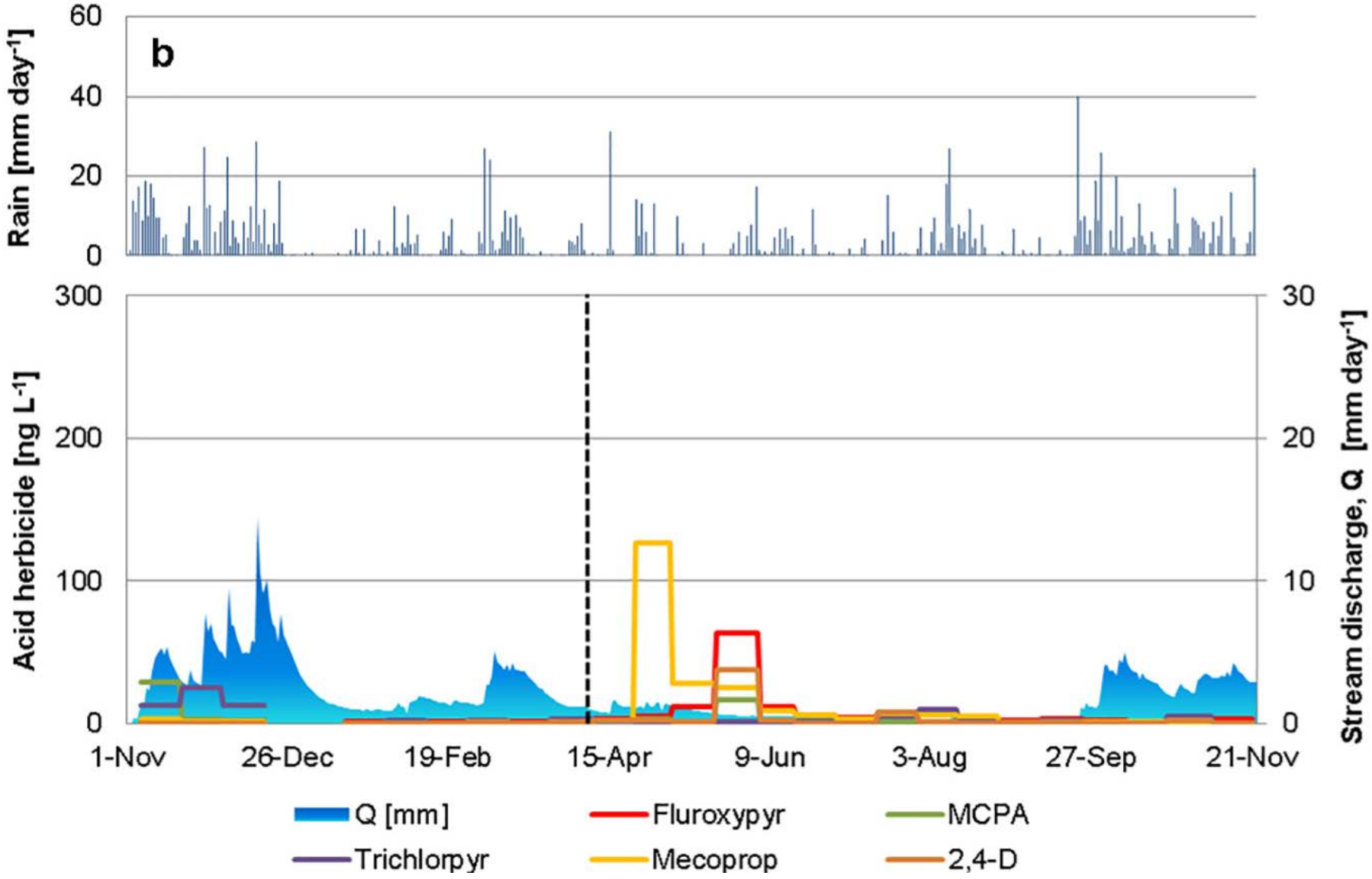




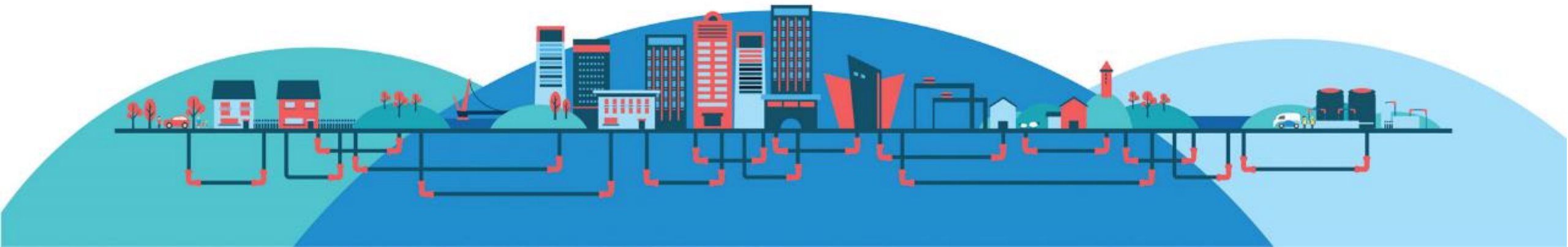
TEAGASC RESULTS – GRASSLAND



TEAGASC RESULTS – ARABLE LAND



How Northern Ireland Water is using Chemcatcher® to target raw water improvements
- Ballinrees Catchment



Northern Ireland Water

Assets include:

- 16765 miles of In Operation Water Mains
- 1,401 In Operation Waste Water Pumping Stations
- 1,077 In Operation Waste Water Treatment Works
- 23 In Operation Major Water Treatment Works

Drinking Water supply:

- 559 million litres per day

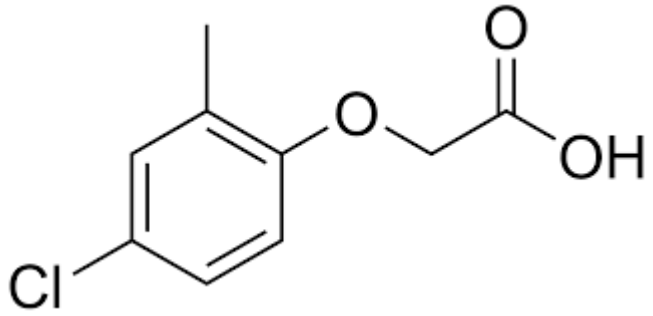
NI Water – issues with MCPA

- Water Inspectorate issued 3 enforcement notices to NI Water
- issues with MCPA s

Date of Significant Event	Area and Estimate of Population/ Properties Potentially Affected	Nature and Cause of Significant Event	Associated Council Area(s)
17/04/17 - 10/08/17	Ballinrees WTW (168,204 population)	Contraventions of the individual pesticide standard for MCPA occurred in the works final water due to insufficient treatment. A Consideration of Provisional Enforcement Order (CPEO) has been issued by the Inspectorate.	Causeway Coast & Glens Borough; and Derry City & Strabane District
06/06/17 - 07/09/17	Derg WTW (38,989 population)	Contraventions of the individual pesticide standard for MCPA occurred in the works final water due to insufficient treatment to effectively remove levels of MCPA in the raw water supply to the treatment works. MCPA use in the catchment area, to control weeds and rushes, caused elevated levels of MCPA in the raw water supply. A Consideration of Provisional Enforcement Order (CPEO) has been issued by the Inspectorate.	Derry City & Strabane District; and Fermanagh & Omagh District

Why did NI Water use Chemcatchers?

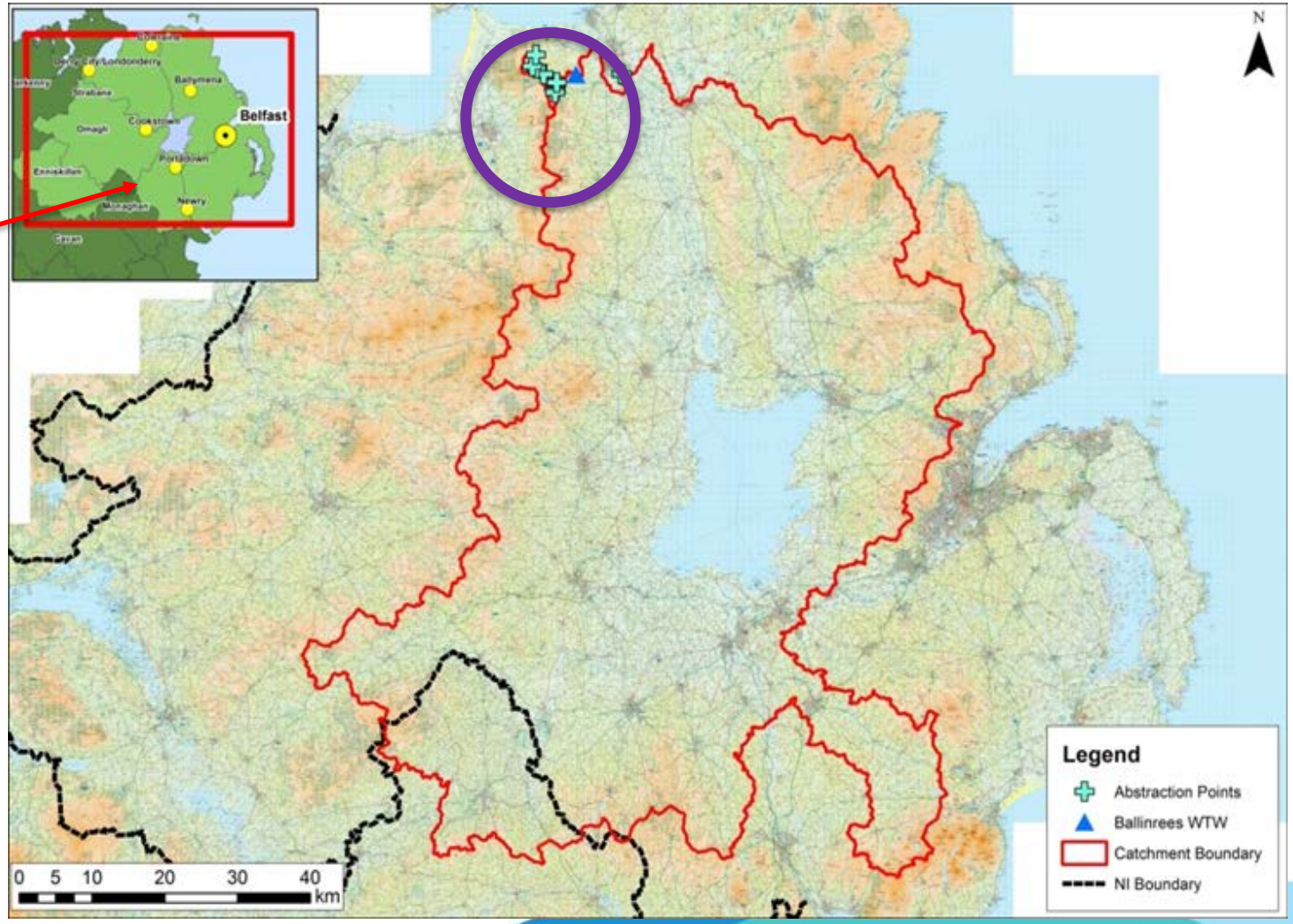
- To investigate **source** of grassland **MCPA**

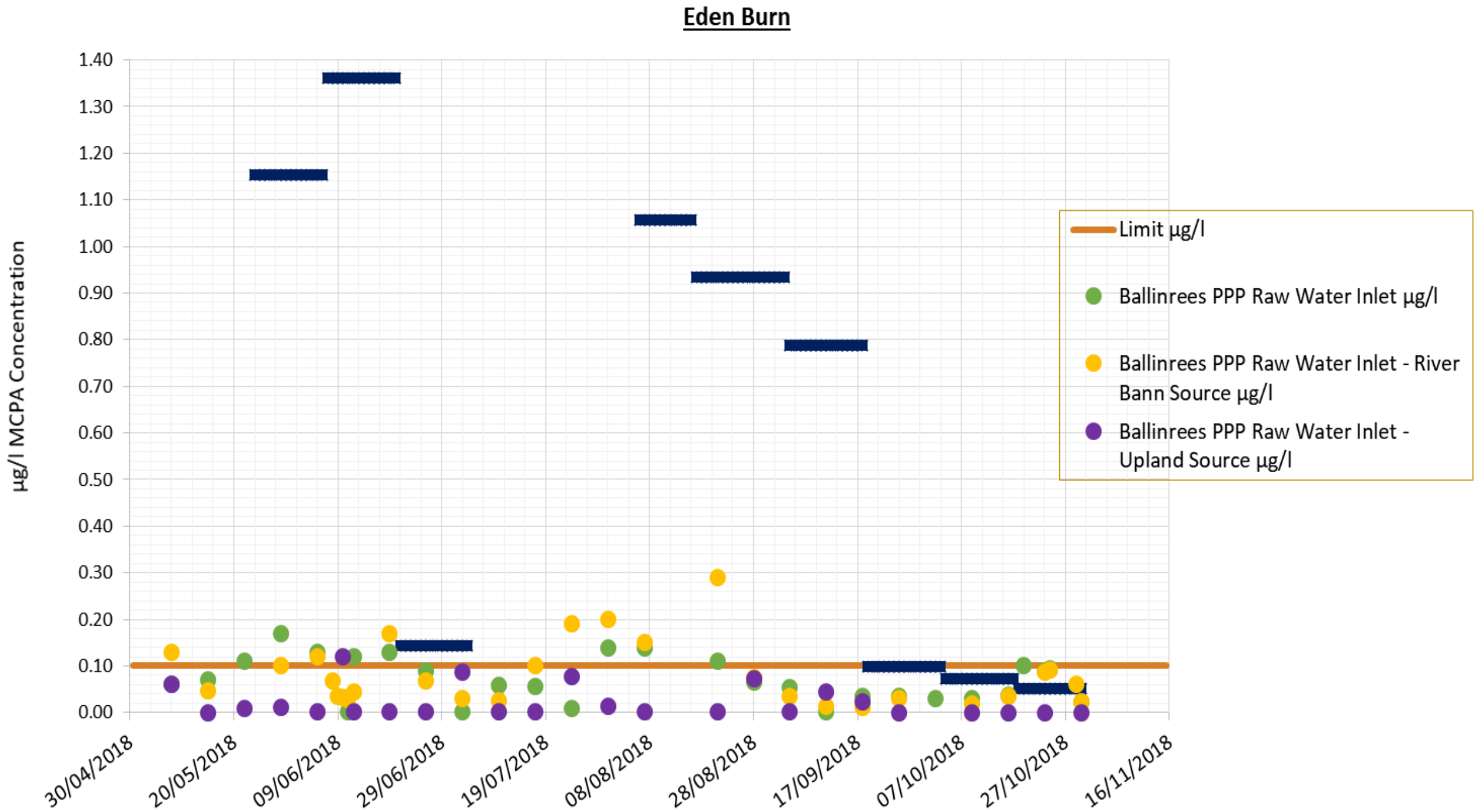


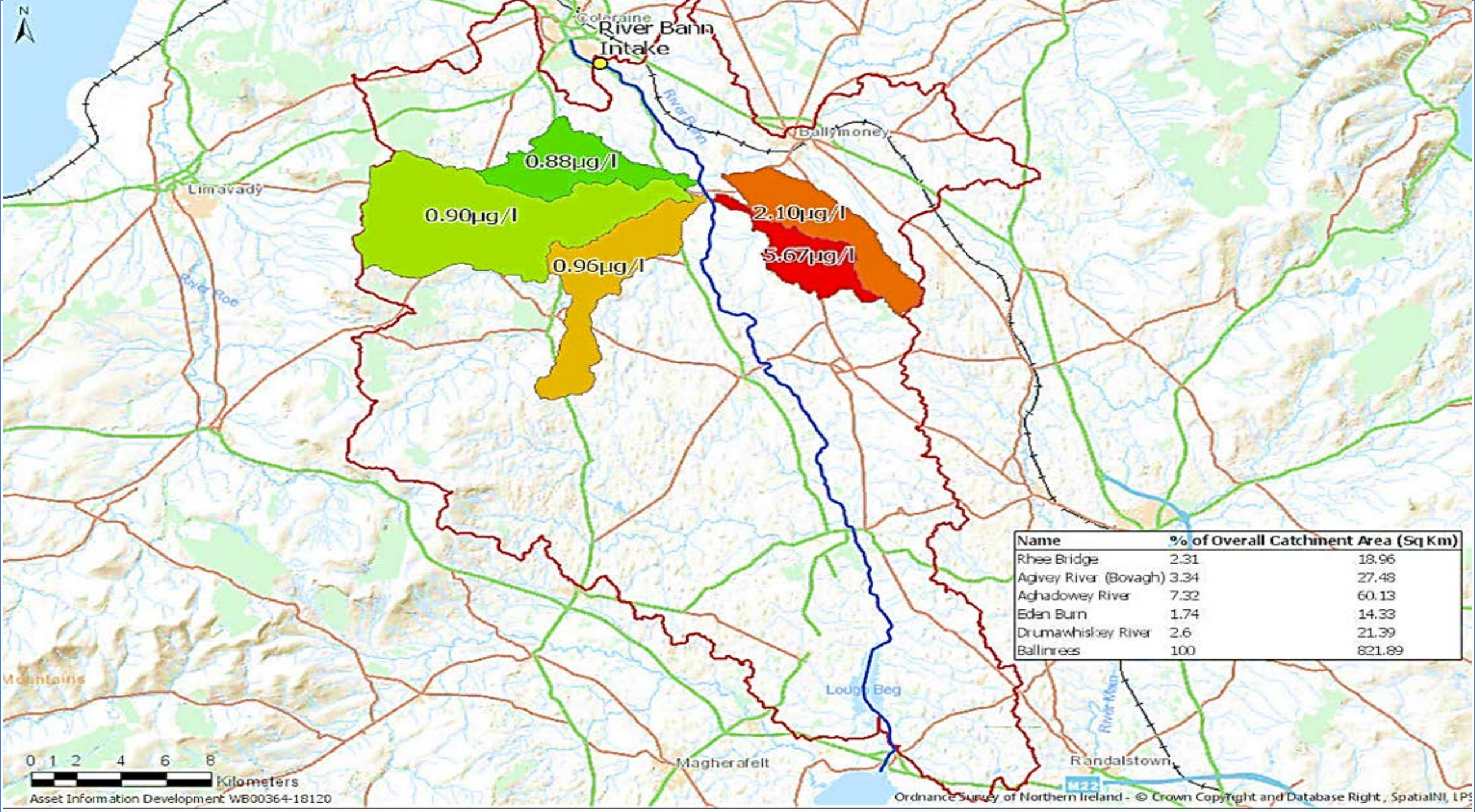
- Issues with exceedances of MCPA in drinking water

- Difficulties in removing MCPA - Granular activated carbon filters at treatment stage remove the chemical but are compromised with VOCs and humic acids so require capital investment for regeneration or replacement, especially after a significant MCPA ‘event’

Where is Ballinrees WTW?

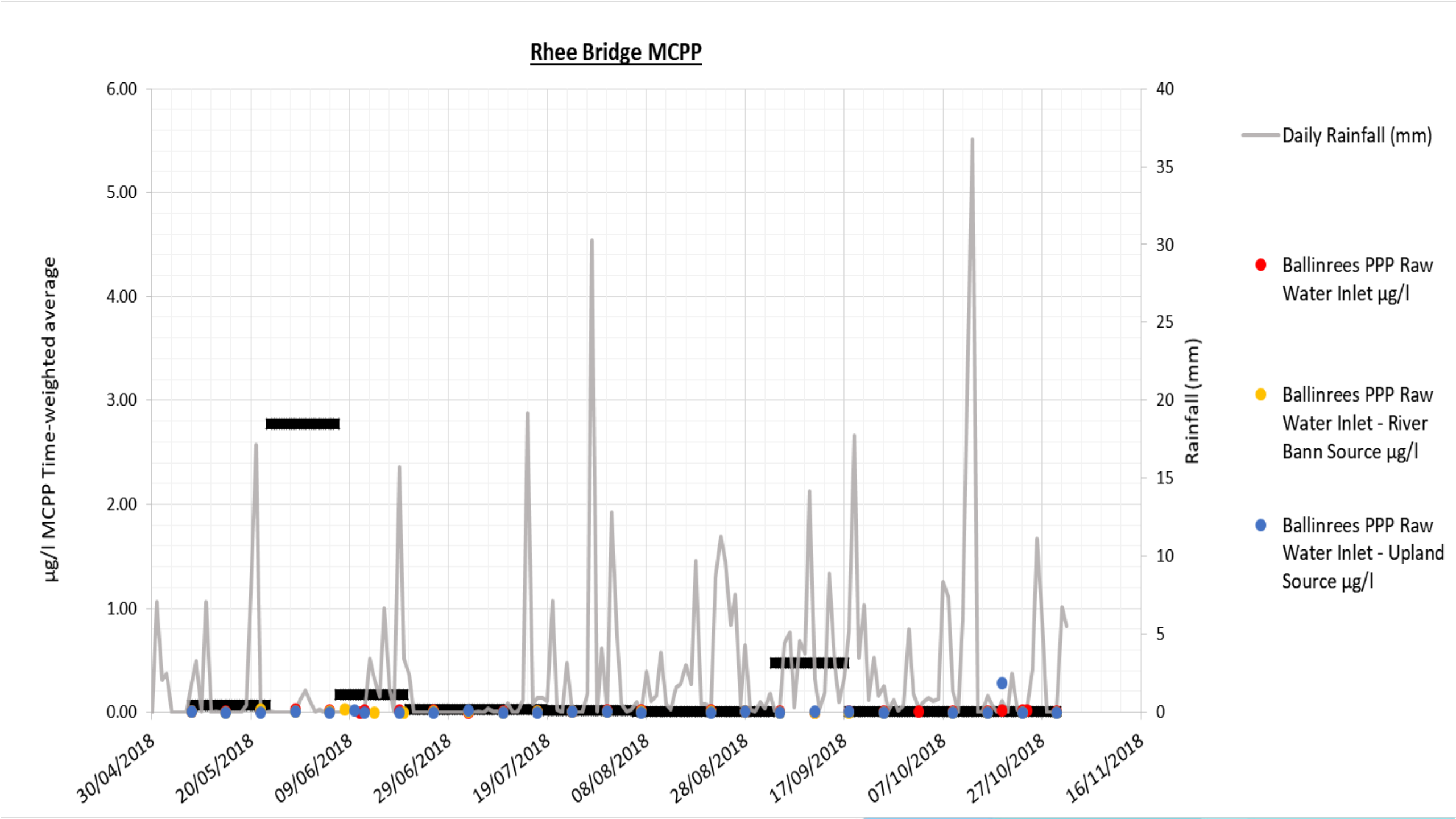



Eden Burn
µg/l MCPA Concentration
1.40
1.30
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
30/04/2018
20/05/2018
09/06/2018
29/06/2018
19/07/2018
08/08/2018
28/08/2018
17/09/2018
07/10/2018
27/10/2018
16/11/2018
Limit µg/l
Ballinrees PPP Raw Water Inlet µg/l
Ballinrees PPP Raw Water Inlet - River Bann Source µg/l
Ballinrees PPP Raw Water Inlet - Upland Source µg/l



Name	% of Overall Catchment	Area (Sq Km)
Rhee Bridge	2.31	18.96
Agivey River (Bovagh)	3.34	27.48
Aghadowey River	7.32	60.13
Eden Burn	1.74	14.33
Drumawhiskey River	2.6	21.39
Ballinrees	100	821.89

Crash near Rhee Bridge


Rhee Bridge MCPP
µg/l MCPP Time-weighted average
Rainfall (mm)
6.00
5.00
4.00
3.00
2.00
1.00
0.00
40
35
30
25
20
15
10
5
0
30/04/2018
20/05/2018
09/06/2018
29/06/2018
19/07/2018
08/08/2018
28/08/2018
17/09/2018
07/10/2018
27/10/2018
16/11/2018
Daily Rainfall (mm)
Ballinrees PPP Raw Water Inlet µg/l
Ballinrees PPP Raw Water Inlet - River Bann Source µg/l
Ballinrees PPP Raw Water Inlet - Upland Source µg/l

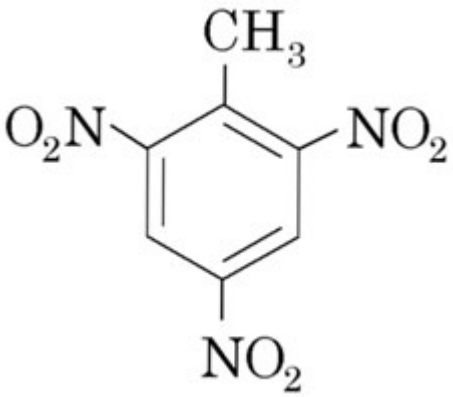
USING CHEMCATCHER AS PART OF AN INITIATIVE TO SAFELY REMOVE DUMPED WORLD WAR I AND II WEAPONS IN NORTH AND BALTIC SEAS

UDEMM

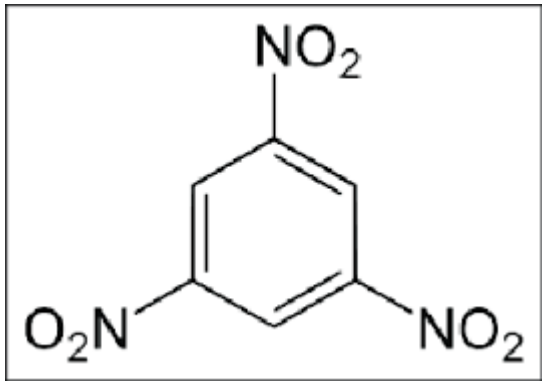
MUNITIONS IN THE BALTIC SEA

The most hazardous constituents found in conventional munitions

TNT



TNB



UDEMM

ECOLOGICAL EFFECT OF TNT AND ITS DEGRADATION PRODUCTS

- Toxic to aquatic organisms
- Bioaccumulation poses a threat to human health through the food chain as TNT has both acute and chronic toxic effects
- TNT is carcinogenic and mutagenic – while its major degradation products are also toxic and mutagenic

WHY USE CHEMCATCHERS TO MONITOR EXPLOSIVES

- The aims of the projects are to detect and identify ageing munitions and to safely remove them.
- Unlike biota, Chemcatcher will not metabolise the explosive compounds so a true concentration can be achieved.
- Easy to use in terms of preparation and analysis
- Were used in previous studies by this group where they detected explosives and pharmaceuticals, personal care products and illicit drugs in German rivers as well the North- and Baltic Sea

Thank You for Listening

Chemcatcher®

www.chemcatcher.ie

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