MOBUOY QUARTERLY MONITORING REPORT – Q2 2023

Abstract

Report summarizing the results and providing interpretation of the Environmental Monitoring Programme at the Mobuoy Road illegal waste site between 1st April and 30th June 2023.

Mobuoy Remediation Project Team

Mobuoy Remediation Project - Environmental Monitoring – Quarterly Report – Q2 2023

Contents

Executive Summary

Reporting Period:	01/04/2023 – 30/06/2023
Report Date:	11/09/2023
Monitoring Status:	Mobuoy EMP continues as per the agreed schedule.
Monitoring in Period:	Monitoring carried out at site – a. Q2 Groundwater Monitoring round complete – April 2023. b. Monthly Surface Water monitoring completed in April (23), May (23) & June (23) c. Bi-weekly Organics monitoring @ SW6 & SW8 continues as per schedule. d. 2 x rounds MNA monitoring complete - Round 5 (May 23) & Round 6 (June 23). e. The Technical Team continue to carry out weekly site inspections including field chemistry and visual inspection of surface water samples.
Mobuoy monitoring programme updates:	An updated groundwater monitoring schedule is in operation for 2023 - Targeted monitoring based on findings of the updated DQRA
Surface Water Quality Issues:	No surface water quality issues attributed to the Mobuoy Rd waste site have occurred in the reporting timeframe.
Mobuoy On-Call Officer:	No incidents at site within the reporting timeframe.
Surface Water Quality Monitoring	
Qualitative Organics Screen:	**No water quality issues** identified through the Organics Screening programme in the reporting timeframe. 4 x 'Large peaks' were detected which are classed as parameters "Routinely Monitored on the Mobuoy Site". 5 x 'Medium peaks' were detected for parameters which are classed as "Routinely Monitored on the Mobuoy Site" or "Identified in Screens of Surface Waters on the Mobuoy Site". Parameters identified have been isolated occurrences with the exception of 'Pentacosane' which has been detected as a 'Medium' peak on 2 occasions in the reporting timeframe – once at the 'Carmoney WTW Abstraction' and once at 'Carmoney WTW Final'. Detections occurred on separate dates and peak areas suggest that detections were not significant i.e., in exceedance of relevant environmental or drinking water standard.
Quantitative Organics monitoring of Surface Water:	**No water quality issues** identified through the Quantitative Organics monitoring in the reporting timeframe. All Organic parameters detected to date belong to the class of chemicals known as "PAHs" (Polycyclic Aromatic Hydrocarbons). Benzo(a)pyrene & Fluoranthene were detected in excess of the Environmental Quality Standard (EQS) but below the Drinking Water Standard (DWS) and World Health Organisation (WHO) guideline for drinking water quality at SW6 (u/s – upstream of the Mobuoy site) & SW8 (d/s – downstream of the Mobuoy site) in Q2 2023. The concentration of PAHs at SW8 (d/s) is comparable with SW6 (u/s), indicating a source upstream from the Mobuoy site.
Surface Water	**No water quality issues identified.** • Ammoniacal Nitrogen, Iron & Manganese are comparable

Monitoring – Metals and Inorganics Parameters:	between SW6 (u/s) & SW8 (d/s) monitoring locations. • Concentrations detected are below the relevant screening values (EQS & DWS), no increasing trends observed. • Water quality is comparable between SW6 (u/s) and SW8 (d/s), no adverse impacts on water quality in the River Faughan attributable to the Mobuoy site were observed.
Field Chemistry:	**No water quality issues identified in Q2 2023.** • 12 x site inspections were conducted by NIEA staff in Q2 2023. Site inspections involve a walkover of the River Faughan & tributaries that flow adjacent to the site where visual assessments are recorded and 'field chemistry' analysis carried out for a range of water quality parameters such as pH, Conductivity, Ammonia, Dissolved Oxygen & Turbidity. • Concentrations detected were comparable between SW6 (u/s) and SW8 (d/s).
Groundwater Quality Monitoring	
Groundwater Monitoring:	• **No increasing trends in groundwater** at the site are identified from comparison of spatial contaminant mapping 'heat maps' for Ammoniacal Nitrogen, Iron & Manganese from Q2 2023 with previous time periods. • Ammoniacal Nitrogen & Iron concentrations remain highest in Waste Zones 1, 2 & 3 on the City Industrial Waste site whilst Manganese concentrations are highest adjacent to the River Faughan in Waste Zone 8. • A review of groundwater monitoring data for locations located within Waste Zone 8 has identified a decreasing trend in Manganese concentrations at BH06. Historically, the highest manganese concentrations at site have been detected at BH06. Although a decreasing trend is observed in monitoring data, concentrations remain above the Environmental Quality Standard (EQS) - 123µg/l 'Bioavailable' (WFD Regulations (NI), 2015).

Groundwater Contaminants of Concern Summary – DQRA (Table 12.3)

Ammonia	Concentrations detected in exceedance of the EQS (0.3mg/l) at multiple locations within Waste Zones 1, 2, 3, 6 & 8.	**Monitoring data shows Ammonia concentrations are stable**. Increasing trends (BH107 & 201) & decreasing trends (BH119) are observable at select monitoring locations. Surface water (SW) monitoring data shows Ammonia concentrations are below the EQS (0.3mg/l) and comparable between SW6 (u/s) & SW8 (d/s).
Cyanide (Free)	Concentrations of Free Cyanide are found to be below the EQS (1ug/l) within Waste Zone 1, 2, 3, 6 & 9.	**Monitoring data shows concentrations are stable** with no increasing trends observed.
Cadmium	Concentrations detected in exceedance of the EQS (0.09ug/l) at multiple locations within Waste Zones 5, 6, 7 & 8	**Monitoring data shows Cadmium concentrations are stable** with no increasing trends observed. SW monitoring data shows Cadmium concentrations are comparable and below the EQS at SW6 & SW8.

Nickel	Concentrations detected in exceedance of the EQS (4ug/l 'Bioavailable') at multiple locations within Waste Zones 3 & 8.	**Monitoring data show concentrations are stable** with no increasing trends identified. SW monitoring data shows Nickel concentrations are comparable & below the EQS at SW6 & SW8.
Zinc	No concentrations detected in exceedance of the EQS (10.9ug/l 'Bioavailable' + ABC) within Waste Zones 3, 5, 7 & 8	Concentrations in groundwater appear **stable with a slight decreasing trend** observable at select locations. SW monitoring data shows Zinc concentrations are comparable & below the EQS at SW6 & SW8.
Naphthalene	Concentrations in exceedance of the EQS (2ug/l) detected within Waste Zones 1, 3, 5, 6 & 8**.**	**No increasing trends** identified in Waste Zones 3, 5 & 6. SW monitoring data shows Naphthalene concentrations are comparable & below the EQS at SW6 & SW8. A slight increasing trend is observable at BH404 (Waste Zone 8). BH404 is located directly down gradient of an identified source zone. Perimeter wells down gradient of BH404 are stable.
Fluoranthene	Concentrations in exceedance of the EQS (0.0063ug/l) detected within Waste Zones 3, 5 & 8.	**Concentrations are stable** with no increasing trends identified. In Q2 2023, SW monitoring data shows Fluoranthene detected above the EQS (0.0063ug/l) on 1 occasion at SW6 (u/s) with a concentration of 0.009ug/l detected. No detections above the EQS were observed at SW8 (d/s) in the reporting timeframe. Concentrations of Fluoranthene are comparable between SW6 & SW8, indicating a source upstream of the Mobuoy site.
Anthracene	Concentrations in exceedance of the EQS (0.1ug/l) detected within Waste Zones 3, 5 & 8.	**Concentrations are stable** with no increasing trends identified. SW monitoring data shows Anthracene concentrations are comparable & below the EQS at SW6 & SW8.
Benzene	Concentrations in exceedance of the EQS (10ug/l) detected in Waste Zones 3, 5 & 8.	**Concentrations are stable** with no increasing trends identified. SW monitoring data shows Benzene concentrations are comparable & below the EQS at SW6 & SW8.
Toluene	Concentrations in exceedance of the EQS (74ug/l) were detected within Waste Zone 3 & 8.	**Concentrations are stable** with no increasing trends identified in waste zones 3 & 8. SW monitoring data shows Toluene concentrations are comparable & below the EQS at SW6 & SW8.
Ethylbenzene	Q2 2023 GW monitoring found no detections in exceedance of the WHO guideline (300ug/l) within Waste Zones 3, 5 & 8	**Concentrations are stable** with no increasing trends identified. SW monitoring data shows Ethylbenzene concentrations are comparable & below the EQS at SW6 & SW8.

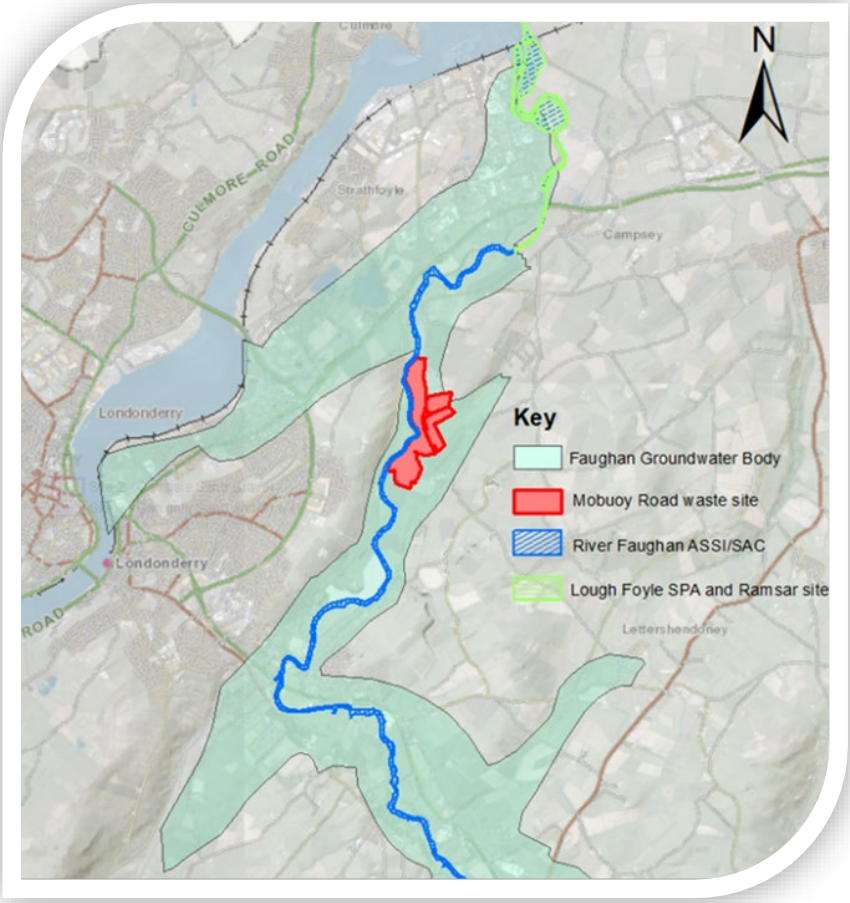
1.0 Introduction

The Mobuoy Road waste site contains deposits of uncontrolled waste that have impacted the groundwater beneath the site. The groundwater beneath the site flows towards the River Faughan and contributes to the flow in the River. The River Faughan flows to the north towards Lough Foyle and NI Water abstract water for public supply approximately 2km downstream of the site. The water abstracted by NI Water is then fully treated at the water treatment works, in line with the requirements of the Drinking Water Regulations, before going into the drinking water supply network.

The River Faughan is designated as an Area of Special Scientific Interest (ASSI) and as a Special Area of Conservation (SAC) due to its Atlantic salmon and otter populations.

Prior to remediation the environmental impacts of the waste deposits are closely monitored to assess any impact to the water environment through a comprehensive Environmental Monitoring Programme (EMP). Results are monitored and interpreted continuously by a dedicated project team. The purpose of this report is to provide a quarterly summary of the results, interpretations, and any resulting actions.

Figure 1 – Site Location and Setting



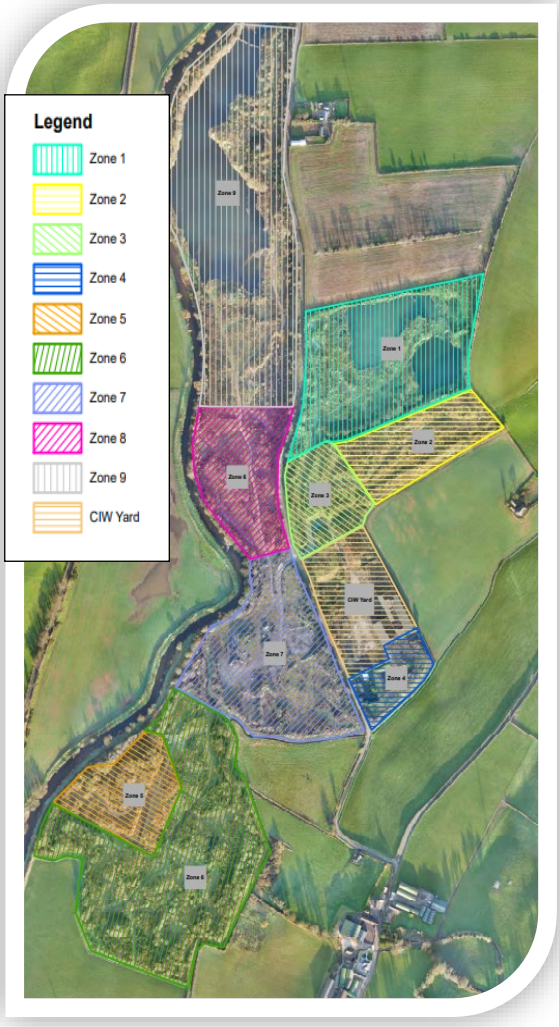
2.0 Our Current Understanding of the site – CSM

The risks of the waste on the environment have been thoroughly assessed in line with the Land Contamination Risk Management process (https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm).

An updated Detailed Quantitative Risk Assessment (DQRA) was completed in October 2022 (https://www.daera-ni.gov.uk/publications/mobuoy-remediation-project-industry-engagement-remediation-options). Important components of the DQRA are the Conceptual Site Model (CSM), identification of Potential Contaminants of Concern (PCOCs); and modelling of those PCOCs to assess the risk to the both the groundwater underlying the site and the River Faughan.

The CSM is constructed on the '**Source-Pathway-Receptor'** model. In the case of the Mobuoy site the CSM divides the site into discrete 'source zones' based on the different waste types and therefore different PCOCs in each zone.

Figure 2 - Source Zones (DQRA)



Source Zones have common pathways by which contamination could migrate to receptors.

Two **pathways** are identified for the Mobuoy site are:

1. Migration through the groundwater, and
2. Transport via a Tributary, which intersects part of the site, to the River Faughan.

The **receptors** sensitive to pollution from the site are the groundwater that underlies the site; the River Faughan and its ecology; and the drinking water abstraction at Cloghole.

Where the DQRA identifies a contaminant linkage, further detailed risk assessment has been undertaken using established modelling methodologies (Environment Agencies Remedial Targets Methodology using ConSim and Water Balance Modelling). This modelling has resulted in a risk rating for each contaminant in each source zone depending on the modelled concentrations at the receptor and the travel time to the receptor.

2.2 Review of Potential Contaminants of Concern

Potential contaminants of concern for the site per source zone are outlined in Figure 3 below. The Updated DQRA (Tetratech, October 2022) divides the site into ten 'source zones' as presented in Figure 2 above. PCOCs are assigned a risk rating from negligible to moderate depending on the degree to which modelling predicts these contaminants exceed their respective screening criteria at the site boundary and the predicated travel time to the receptor. The ratings within the table are based on established modelling methodologies.

Figure 3 - DQRA table 12.3 – Summary of DQRA Results – Risk to River Faughan

Mobuoy Road Waste Site **Updated DQRA**

Table 12-3 - Summary of DQRA Results – Risk to River Faughan

Contaminant of Concern	Source Area 1,2,3	Source Area 3,8	Source Area 5	Source Area 6	Source Area 7	Source Area 8	Source Area 9
Metals							
Arsenic	Low						
Boron	Low	Low					
Cadmium			Moderate	Moderate	Moderate	Moderate	
Copper	Negligible						
Zinc	Low	Moderate	Moderate	Low	Moderate	Low	Low
Nickel	Low	Moderate	Negligible	Low	Low	Moderate	Low
Mercury	Negligible	Low					
PAHs							
Naphthalene	Moderate	Moderate	Moderate	Moderate			
Fluoranthene		Moderate	Moderate				
Anthracene		Moderate	Moderate				
BTEX							
Benzene		Moderate	Moderate	Low			
Toluene	Negligible	Moderate	Low		Negligible		
Ethylbenzene		Moderate	Moderate				
TPH (aromatic)							
C5 to C7 Aromatic		Moderate	Moderate				
C8 to C10 Aromatic		Moderate					
C10 to C12 Aromatic	Moderate	Moderate	Moderate				
C12 to C16 Aromatic		Moderate	Moderate				
C16 to C21 Aromatic		Moderate	Low				
C21 to C35 Aromatic		Low					
Other							
Ammonia	Moderate	Negligible	Negligible	Moderate		Moderate	Low
Chloride	Low			Low		Moderate	
Free Cyanide	Moderate			Moderate	Moderate		Moderate

It is of note that this is the risk rating at the boundary condition of the site but when dilution from the River Faughan is taken into account the DQRA concludes that impact to the Faughan is not likely.

3.0 Aims of the Environmental Monitoring Programme

The purpose of the Environmental Monitoring Programme (EMP) is to:

1. Protect the raw water at Cloghole in the River Faughan that NI Water abstract to Carmoney Water Treatment Works for full treatment for public drinking water supply.
2. Protect water quality of the River Faughan;
3. Inform remediation design of the Mobuoy Road waste site.

This is done by:

1. Monitoring the water quality in the River Faughan to detect any immediate risk to the River and the Drinking Water.

2. Monitoring groundwater wells (or boreholes), installed into waste and natural ground on-site for any changes in chemical concentration within the groundwater. Monitoring the groundwater gives an early warning of changing risk to the receptors. The Potential Contaminants of Concern (PCOCs) identified for 'source zones' have travel times ranging from <1yr to >17000 yrs. These travel times feed into the modelled risk rating in the DQRA. If we observe an increasing trend in concentration or a change in spatial extent this could mean changes in the risk to the receptors.

3. Biological monitoring is undertaken in the River Faughan. Biological monitoring detects changes in the population structures of living organisms that occur when an ecosystem is subjected to pollution or other types of environmental stress. Biological monitoring gives the best indication of the River health in the Medium term.

In addition to monitoring undertaken for protection of public health and surface water receptors, monitoring for purposes of informing remediation design is undertaken in the form of 'Monitored Natural Attenuation' monitoring and 'Tarry Waste' monitoring (further explanation in section 5.0)

4.0 Collaborative Working

The EMP is implemented and developed at the site alongside a collaborative partnership with NI Water, Loughs Agency, and NIEA Water Management Unit. Additional support and oversight of the EMP is provided by the Drinking Water Inspectorate and from other project stakeholders through quarterly meetings of the Mobuoy Water Quality Technical Advisory Group (WQTAG). The WQTAG promotes a collaborative working platform for (a) Data Sharing; (b) Sharing expert advice on surface water and drinking water quality matters, and (c) Sharing working knowledge of other water quality pressures in the Faughan catchment.

5.0 Monitoring Programme Design

Current Monitoring Programme

The current monitoring programme consists of multiple complementary lines of monitoring:

1) **Mobuoy EMP** - The Environmental Monitoring Plan which is primarily aimed at risk management and the protection of sensitive receptors and encompasses:

   - Qualitative Screening for organic parameters in the River Faughan undertaken by NIEA and at the NI Water abstraction at Cloghole (raw water abstraction) and the treated water at Carmoney Water Treatment Works (WTW) by NIEA on behalf of NI Water.
   - Quantitative chemical analysis of site surface waters & the River Faughan.
   - Biological Monitoring of Surface Waters in the River Faughan
   - Quantitative chemical analysis of site Groundwater.

2) **MNA Monitoring** – Monitored Natural Attenuation Monitoring is for the purposes of remedial design to collect evidence of contamination attenuation processes in the site groundwater. MNA, where site conditions are suitable, has been shown to be effective in the remediation of Organics substances such as hydrocarbons. Subsequently, the MNA programme has been targeted towards areas where there is a greater concentration of organics impact. Serves a dual purpose for Tarry Waste monitoring.

3) **Tarry Waste Monitoring** - The greatest impact of organics on the site is associated with 'Tarry Waste' deposits. Additional 'Tarry Waste' specific parameters have been added to the MNA programme of monitoring rather than the EMP to maximise resource i.e. locations are already scheduled for MNA monitoring so some additional tarry waste parameters have been added.

Surface Water Monitoring Locations and Schedule

A summary of the surface water monitoring locations is presented in Figure 4 below with a summary schedule for surface water monitoring outlined in Table 1 below.

Figure 4 –Surface Water Monitoring Locations.

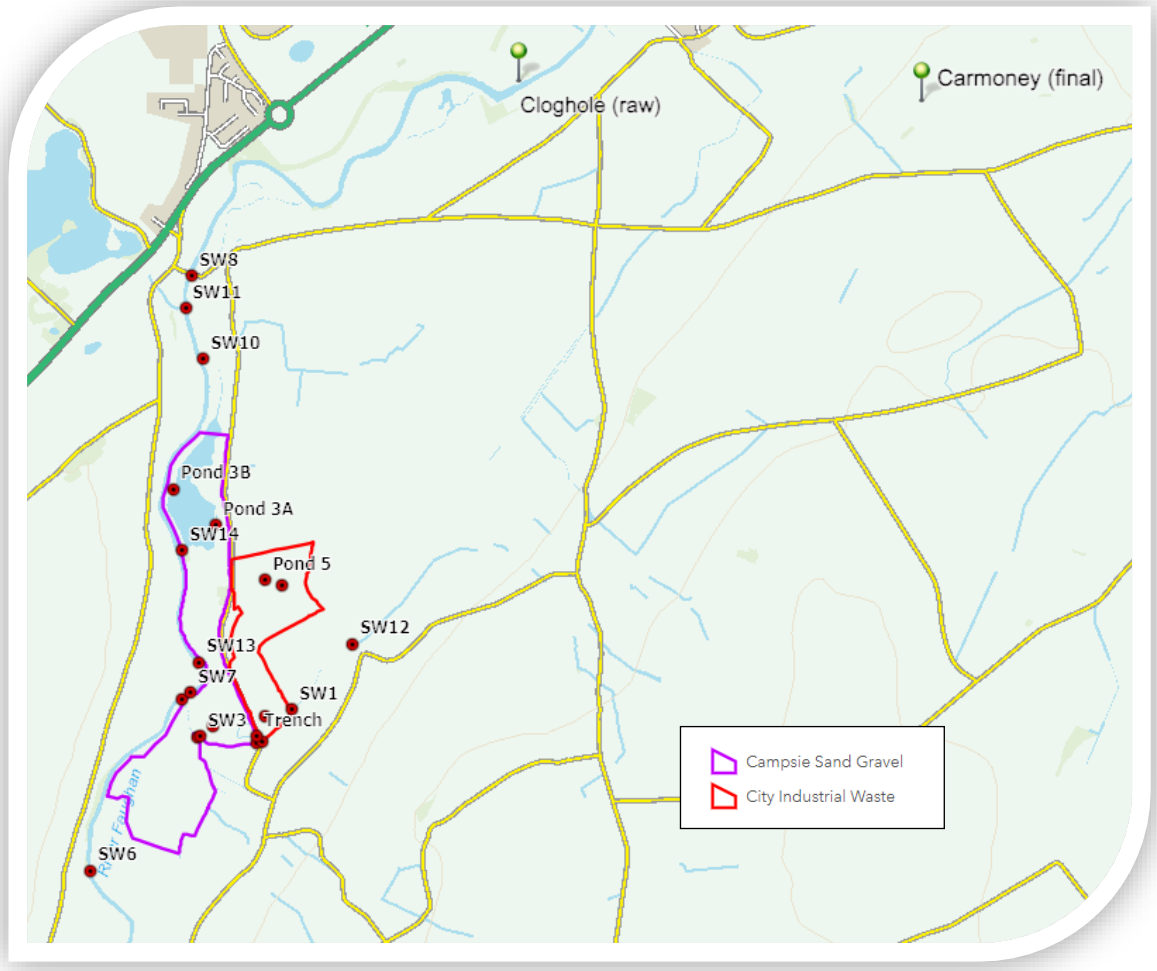


Table 1 - Summary of Surface Water Monitoring Schedule

Quantitative - Metals and Inorganics	
Surface Water	**Monthly – Tributary** (SW2, SW3, SW4, SW5, SW12); **and River Faughan** (SW6, SW7, SW8, SW10, SW11, SW14)**; and Site Standing Waters** (Lagoon, Trench, Pond 3a) **Quarterly - Tributary** (SW1, SW9) **and Site Standing Waters** (Pond 2, Pond 4 & Pond 5)
Quantitative - Organics	
Surface Water	**Monthly - River Faughan (SW6/ SW8)**
Raw Water and Treated Water at the Water Treatment Works	**Monthly – Raw (Cloghole abstraction) and Final Water (Carmoney Water Treatment Works).** ***Note this is addition to the sampling and analysis undertaken by NI Water.***
Biological Monitoring	
Macroinvertebrate Investigative Monitoring	**7 x monitoring locations (located upstream, adjacent to the site & downstream along the R.Faughan).**
Qualitative Organics Screen	
Surface Water	**Daily** – NIW Raw (River Faughan @ Cloghole) and Treated (Carmoney WTW) **Monthly** - SW6/ SW8 **Monthly** – SW5/SW12/SW10/Pond 3a **Bi Annual** – All site surface water ponds
Groundwater	**Frequency TBC -** Selected Groundwater/ Composite sample
Other catchment organics sources	As required – Annual

Groundwater Monitoring Locations and Schedule

A summary of the monitoring zones for groundwater are presented in Figure 2 in Section 2.0 of this report. The schedule by zone for the groundwater monitoring is outlined in Table 2 below.

The monitoring of site boreholes; both leachate (wells installed into waste) and groundwater wells (installed into natural ground) is split over two monitoring programmes; the Mobuoy EMP and the MNA monitoring programme. This is due to their slightly differing purposes. The EMP is primarily for the purposes of environmental protection, whereas the MNA programme is primarily for collection of evidence for remedial design.

Groundwater is sampled as per the monitoring schedule. Sampling frequency and suites of analysis are based on the risks identified in the detailed quantitative risk assessment (DQRA) for the site.

Table 2 – Monitoring Well locations in each Waste Zone

Source Zone	NIEA – Mobuoy EMP		MNA Monitoring		
	Quarterly	Annual	6 weekly	Quarterly	Annual
Zone 1	BH302; BH113; BH646	BH610D	BH302; BH407; BH408; BH610D; BH646	Additional analysis suites only	Additional analysis suites only
Zone 2	-	-	BH649B	Additional analysis suites only	-
Zone 3	BH659D; BH649B; BH666	-	BH405; BH406; BH659D; BH666	Additional analysis suites only	Additional analysis suites only
Zone 4	-	-	BH114; BH121; BH122; BH616 BH617	Additional analysis suites only	-
Zone 5	BH07; BH102; BH627; BH629; BH631	BH626; BH628; BH630	BH07; BH102; BH626; BH627 BH628; BH629 BH630; BH631	Additional analysis suites only	-
Zone 6	BH101; BH104; BH119; BH201; BH623D; BH624D; BH653; BH654D	-	-	BH101; BH119; BH201; BH623D; BH624D; BH653; BH654D	Additional analysis suites only
Zone 7	BH205	BH212	-	BH205; BH221; BH615D; BH618D	Additional analysis suites only
Zone 8	BH06; BH106; BH107; BH206; BH402; BH403; BH404; BH409; BH410; BH411; BH633; BH634; BH636D; BH651	BH401	BH06; BH106; BH107; BH206; BH402D; BH403; BH404; BH410; BH633; BH634; BH636D; BH651	Additional analysis suites only	-
Zone 9	BH220; BH635D BH637	BH111; BH638	BH111; BH635D; BH637	Additional analysis suites only	-
CIW Yard	-	-	BH613	BH210; BH614	-
Off Site	BH1 Drumahoe	BH612	-	-	-
Total	38 x Boreholes	9 x Boreholes	39 x Boreholes	13 x Boreholes	-

6.0 Surface Water Monitoring Results

6.1 Surface Water Monitoring Results Summary for Q2 2023.

Surface water quality results are screened against relevant Environmental Quality Standards (EQS) & Drinking Water Standards (DWS). The EQS are standards derived or set out by the 'Water Framework Directive (Priority Substances and Classification) Regulations (NI), 2015' designed to protect the water environment ecology and habitats. The DWS are standards derived or set out by the 'Water Supply (Water Quality) Regulations (NI) 2017'. For parameters where both an EQS & DWS are available, the most stringent value has been used for comparison. Long term trends in the data are monitored for any trends which may indicate an impact from the Mobuoy site. Trend analysis for key contaminants is presented in section 6.2 of this report.

Table 3 – Summary of Metallic Parameters (Trace Metals) in surface waters – Q2 2023 April - June

Parameter	Screening Value (EQS / DWS)	Tributary (SW1, SW2, SW3, SW4, SW5, SW9, SW12)		River Faughan (SW6, SW7, SW8, SW10, SW11, SW14)		Comments
	Units (µg/l)	No. Detections Above EQS	Trends observed	No. Detections Above EQS	Trends observed	
Arsenic	10 (**2**)	0	No	0	No	Monitoring data comparable between u/s and d/s.
Cadmium	0.09 (**1**)	0	No	0	No	Monitoring data comparable between u/s and d/s.
Calcium	-	0	No	0	No	Monitoring data comparable between u/s and d/s.
Chromium	50 (**2**)	0	No	0	No	Monitoring data comparable between u/s and d/s.
Chromium (III)	4.7 (**1**)	0	No	0	No	Monitoring data comparable between u/s and d/s.
Chromium (VI)	3.4 (**1**)	0	No	0	No	Monitoring data comparable between u/s and d/s.
Copper	1 (Bioavailable*) (**1**)	0	No	0	No	Monitoring data comparable between u/s and d/s.
Lead	1.2 (Bioavailable*)	0	No	0	No	Monitoring data

	(**1**)					comparable between u/s and d/s.
Nickel	4 (Bioavailable*) (**1**)	0	No	0	No	Monitoring data comparable between u/s and d/s.
Mercury	0.07 (**1**)	0	No	0	No	Monitoring data comparable between u/s and d/s.
Aluminium	0.2 (**2**)	0	No	0	No	Monitoring data comparable between u/s and d/s.
Iron	0.2 (**2**)	2@SW5	Seasonality observed in the data. No increasing trends. No increase between u/s and d/s.	2@SW6 2@SW7 2@SW8 1@SW10 1@SW14	Seasonality observed in the data. No increasing trends. No increase between u/s and d/s.	Iron concentrations are high in the catchment Further interpretation provided in section 6.2 below
Magnesium	-	0	No	-	No	Monitoring data comparable between u/s and d/s.
Manganese	0.05 (**2**)	2@SW2 3@SW3 3@SW4 3@SW5	No increasing trends. No increase between u/s and d/s	2@SW7 3@SW8 2@SW10 1@SW14	No increasing trends. No increase between u/s and d/s	Manganese concentrations are high in the catchment. Further interpretation provided in section 6.2 below
Potassium	-	0	No	0	No	Monitoring data comparable between u/s and d/s.
Vanadium	-	0	No	0	No	Monitoring data comparable between u/s and d/s.
Selenium	10 (**2**)	0	No	0	No	Monitoring data comparable between u/s and d/s.
Sodium	200,000 (**2**)	0	No	0	No	Monitoring data comparable

						between u/s and d/s.
Zinc	10.9AA+ABC (Bioavailable*)** (**1**)	0	No	0	No	Monitoring data comparable between u/s and d/s.
Sulphate	250 (**2**)	0	No	0	No	Monitoring data comparable between u/s and d/s.
Sulphur	-	0	No	0	No	Monitoring data comparable between u/s and d/s

(**1**) EQS (The Water Framework Directive (Priority Substances and Classification) Regulations (NI) 2015)

(**2**) DWS (The Water Supply (Water Quality) Regulations (NI) 2017)

*Bioavailable – The fraction of the dissolved concentration likely to result in toxic effects as determined using the 'Metals Bioavailability Assessment Tool'.

**AA- Annual average, ABC – Ambient Background Concentration. ABC is an estimate of background levels of Zinc based on a low percentile of monitoring data. A figure of 1µg/l has been estimated for freshwaters in NI.

Metals results from Q2 2023 for the monthly and quarterly scheduled surface water monitoring in the River Faughan and the tributary adjacent to the site (Table 3) indicate that Iron concentrations and Manganese concentrations are greater than the drinking water standard but below the environmental quality standard at a number of surface water monitoring locations, further interpretation provided in Section 6.2 below.

Table 4 – Summary of Inorganics Parameters in surface waters – Q2 2023 April – June

Parameter	EQS	Tributary (SW1, SW2, SW3, SW4, SW5, SW9, SW12)		River Faughan (SW6, SW7, SW8, SW10, SW11, SW14)		Comments
	Units (mg/l)	No. Detections Above EQS	Trends observed	No. Detections Above EQS	Trends observed	
Alkalinity	-	0	No	0	No	Monitoring data comparable between u/s and d/s.
Ammoniacal Nitrogen	0.3 (**1**)	0	No	0	No	Monitoring data comparable between u/s and d/s.
Biochemical Oxygen Demand	4 (**1**)	1 @ SW4	No increasing trends. No	0	No	BOD reading of 4.7mg/l detected at

			increase between u/s and d/s.			SW4. As per WFD Regulations 2015, water classed as 'Good' status.
Chloride	250 (**2**)	0	No	0	No	Monitoring data comparable between u/s and d/s.
Conductivity	2500µS/cm (**2**)	0	No	0	No	Monitoring data comparable between u/s and d/s.
Dissolved Organic Carbon	-	0	No	0	No	Monitoring data comparable between u/s and d/s.
Nitrate	50 (**2**)	0	No	0	No	Monitoring data comparable between u/s and d/s.
Nitrite	0.1 (**2**)	0	No	0	No	Monitoring data comparable between u/s and d/s.
pH	>6 <9 (**1**)	0	No	0	No	Monitoring data comparable between u/s and d/s.
Total Oxidised Nitrogen	-	0	No	0	No	Monitoring data comparable between u/s and d/s.
Total Phosphorus	-	0	No	0	No	Monitoring data comparable between u/s and d/s

(**1**) EQS (The Water Framework Directive (Priority Substances and Classification) Regulations (NI) 2015)

(**2**) DWS (The Water Supply (Water Quality) Regulations (NI) 2017)

Inorganics results for surface waters monitored in Q2 2023 indicate that Biochemical Oxygen Demand was detected above the 'Water Framework Directive' (WFD) classification for 'High Status' (4.0mg/l) on 1 occasion at SW4. However, the 'Good Status' classification was met at this location. SW4 is a monitoring location on a tributary that flows adjacent to the western boundary of the site and discharges to the River Faughan (see Figure 4). Samples collected at SW6 (u/s) & SW8 (d/s) on the same day show Biochemical Oxygen Demand is comparable between the upstream and downstream of the site and classified as 'High Status' (as per the WFD EQS). Overall, Biochemical Oxygen Demand is comparable between the upstream (SW6) and downstream (SW8) monitoring locations in the River Faughan in Q2 2023.

Table 5 – Summary of Organics Parameters exceeding a screening standard in Q2 2023 April - June

	Parameter	EQS Units (µg/l)	No. of detections	Average concentration (µg/l)	Max concentration (µg/l)	Min concentration (µg/l)
SW6	Benzo(a)pyrene	0.00017 (AA) (**1**)	0	0.0005	0.0005	0.0005
	Fluoranthene	0.0063 (AA) (**1**)	1	0.005	0.009	0.001
SW8	Benzo(a)pyrene	0.00017 (AA) (**1**)	2	0.00183	0.003	0.0005
	Fluoranthene	0.0063 (AA) (**1**)	0	0.00367	0.006	0.001

(**1**) EQS (The Water Framework Directive (Priority Substances and Classification) Regulations (NI) 2015)

(**2**) DWS (The Water Supply (Water Quality) Regulations (NI) 2017)

(AA) – Annual average.

Organics quantitative analysis of surface waters in Q2 2023 found low level detections of Benzo(a)pyrene & Fluoranthene which belong to the class of chemicals known as Polycyclic Aromatic Hydrocarbons (PAHs). Although multiple detections of Benzo(a)pyrene & Fluoranthene were found to be above the EQS (Environmental Quality Standard) at SW6 (upstream) & SW8 (downstream), concentrations detected were not in breach of their relevant "Maximum Allowable Concentration" (MAC). MAC is an environmental standard used to evaluate short term impacts. When compared with relevant Drinking Water Standards (DWS), detections of Benzo(a)pyrene in Q2 2023 were found to below the DWS (0.01ug/l) and the World Health Organisation (WHO) guideline for drinking water (0.7ug/l). For Fluoranthene, there is no screening value available in either 'The Water Supply Regulations (NI), 2017' or 'WHO guideline' with which to compare. An 'Operational' 'Standard No Adverse Response Level' (SNARL) of 10µg/l exists and no detections of Fluoranthene were found to be in breach of this standard.

Detections are low level and present in the upstream sample (SW6) as well as the downstream sample (SW8) indicating a source upstream of the Mobuoy site. Polycyclic aromatic hydrocarbons (PAHs) are ubiquitous environmental pollutants generated primarily during the incomplete combustion of organic materials. The EQS for PAHs is highly conservative compared to the drinking water standards for these substances. In Q2 2023, no increasing trends or increase in the number of parameters detected were observed at SW6 & SW8, water quality is comparable in the upstream and downstream sample.

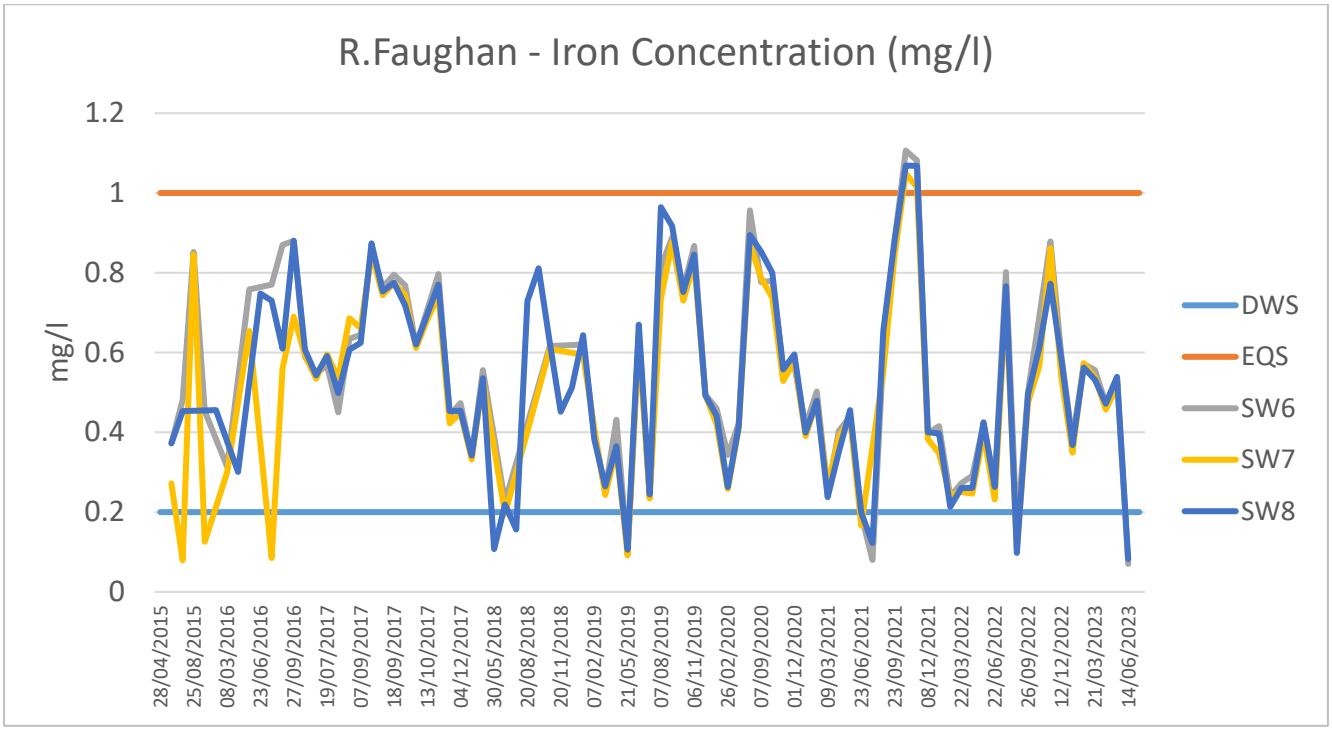
It should be noted that samples taken at SW6 and SW8 are reflective of the 'Raw' water quality in the river. Water abstracted by NI Water at Cloghole goes through a full treatment process at the Carmoney Treatment works, in line with the requirements of the Drinking Water Regulations, before going into the drinking water supply network.

6.2 Surface Water Monitoring Trends Analysis for Q2 2023.

6.2.1 Iron Trends in Surface Waters

Concentrations of Iron detected at SW6 (u/s - upstream of the site) & SW8 (d/s - downstream of the site) are above the DWS (0.2mg/l) but below the EQS (1.0mg/l) in April & May 2023. In June 2023, Iron concentrations are below both the DWS & EQS. Monitoring data does not indicate an increasing trend at SW8, and concentrations observed are comparable between the upstream and downstream monitoring locations. Iron is generally high in the catchment and a seasonal trend can be observed in the data.

Figure 5 – Iron concentrations in the River Faughan - SW6 & SW8

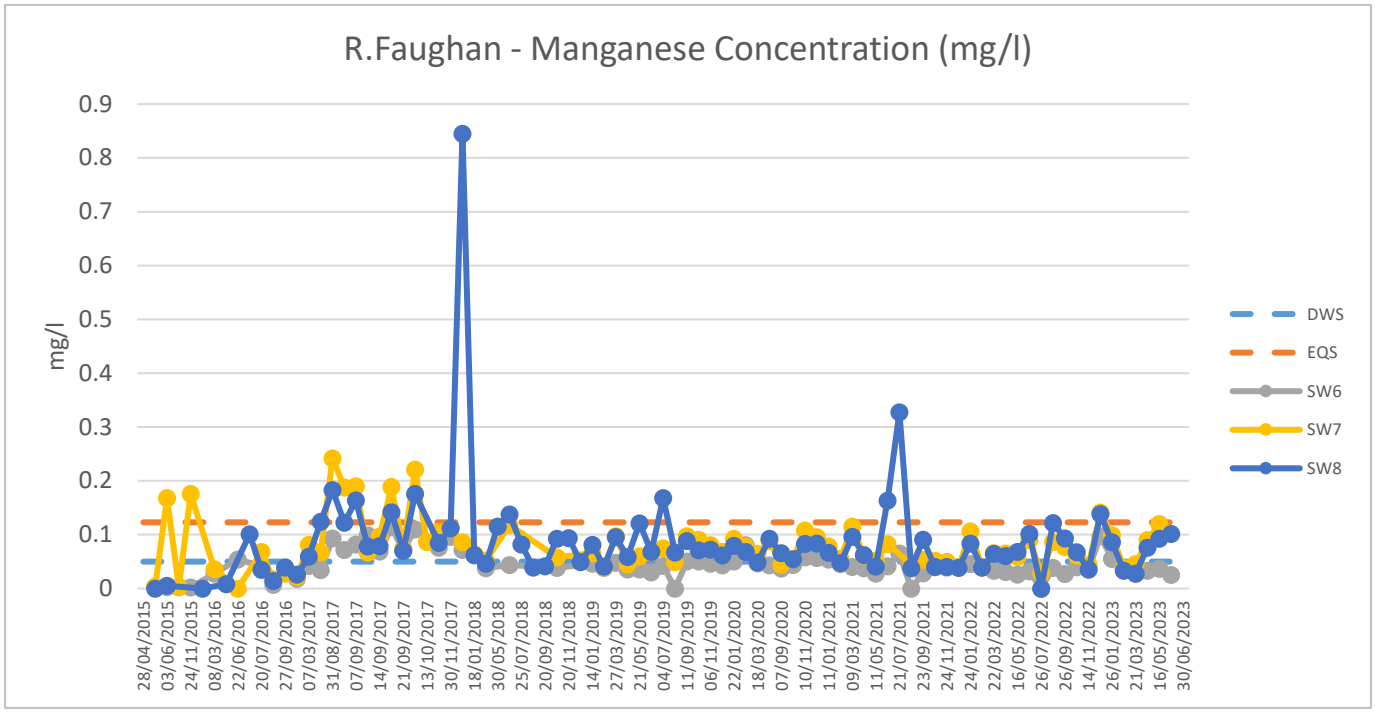


Notes: Screening values; DWS - 0.2mg/l (Water Supply Regs 2017); EQS – 1.0mg/l (WFD Regs 2015)

6.2.2 Manganese Trends in Surface Waters

In Q2 2023, concentrations of Manganese detected at SW6 (upstream of the site) are below both the DWS (0.05mg/l) and the EQS (0.123mg/l 'bioavailable'). Manganese concentrations detected at SW8 (downstream of the site) exceed the DWS (0.2mg/l) but are below the EQS (0.123mg/l 'bioavailable'). Monitoring data does not indicate an increasing trend at SW8, and concentrations observed are comparable between the upstream and downstream monitoring locations.

Figure 6 – Manganese concentrations in the River Faughan - SW6 & SW8

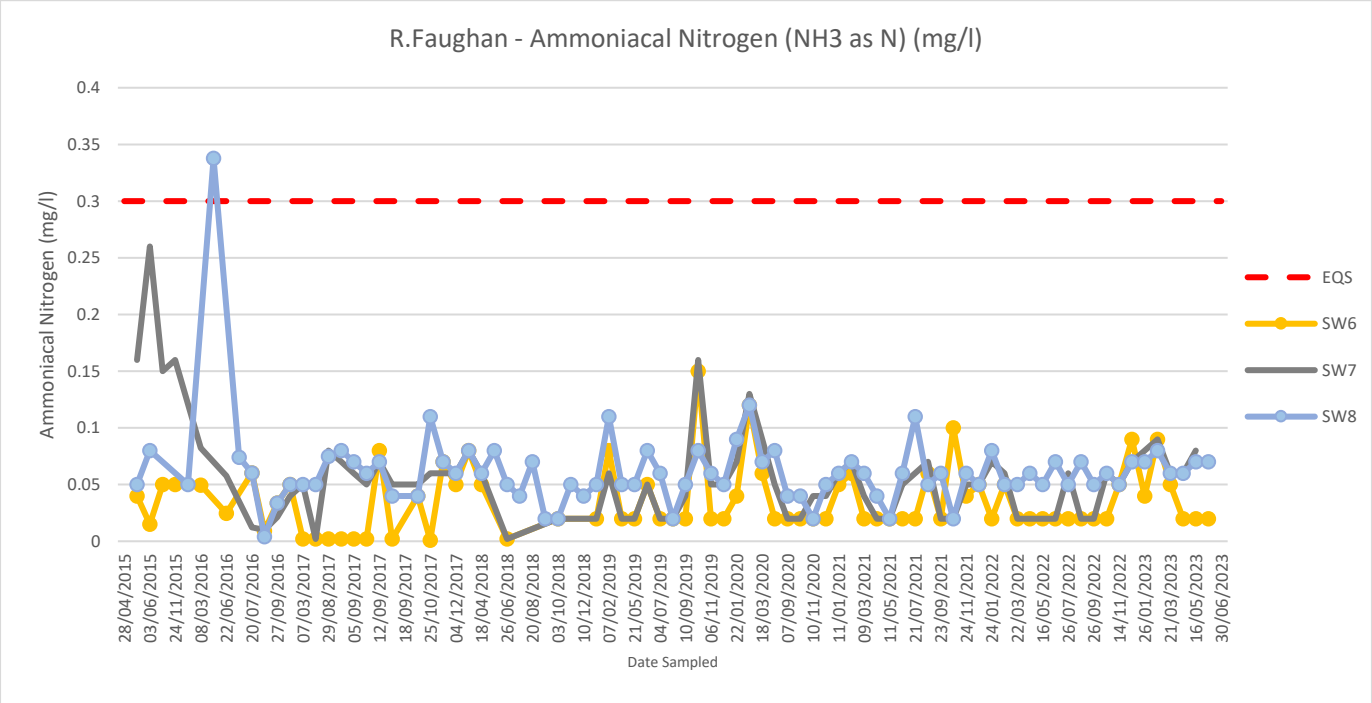


Notes: Screening values; DWS – 0.05mg/l (Water Supply Regs 2017); EQS – 0.123mg/l 'Bioavailable' (WFD Regs 2015)

6.2.3 Ammoniacal Nitrogen Trends in Surface Water

Ammoniacal Nitrogen results for Q2 2023 April – June indicate no detections above the EQS (0.3mg/l) at SW6 (upstream of the site) & SW8 (downstream of the site). Monitoring data does not indicate an increasing trend at SW8, and concentrations observed are comparable between the upstream and downstream monitoring locations.

Figure 7 – Ammoniacal Nitrogen concentrations in the River Faughan - SW6 & SW8



Notes: Screening values NH3 as N; EQS – 0.3mg/l (WFD Regulations, 2015); DWS – 1.0mg/l (Protection of Surface Waters Intended for the Abstraction of Drinking Water).

7.0 Qualitative Organics Screening Data

7.1 What is Organics Screening?

Organics screening is a rapid assessment tool designed by specialists in water quality for the protection of water quality. The screen provides an early warning of any changing risk from organics parameters to the raw water quality in the River Faughan at the point at which NI Water abstract to the works for treatment. The screen can detect if organic parameters are present at extremely low levels and provides rapid results compared to traditional analytical techniques.

7.2 Benefits of screening over Quantitative Analysis?

Organics Screening can return results within 48hrs, whereas traditional quantitative analysis results can take up to two weeks to return. The screen is referred to as 'non-targeted' analysis and can detect a very broad range of organics, whereas traditional quantitative analysis is tied to a specific suite of parameters. The screen will pick up parameters at very low concentrations, whereas traditional quantitative analysis will only pick up parameters that are higher than a 'limit of detection'. Therefore, **the screen is a sensitive, rapid, non-targeted technique** compared to traditional quantitative analysis.

7.3 Limitations of the screen

The screen cannot fully quantify the amount of an organic parameter but can provide a notional concentration which it categorises as a 'small', 'medium' or 'large' peak. It should be noted that a 'large' peak relates to a notional concentration >250ng/l which in most cases is well below any environmental or human health standards. If a large peak is detected then it is possible for expert geochemists to further infer a maximum notional concentration which can be compared to relevant human health or environmental standards.

7.4 How do we use the screen to manage risk from the Mobuoy site?

Groundwaters and surface waters on the Mobuoy site have been screened to provide a 'fingerprint' of parameters typical of the site. NIEA Geochemists provide expert interpretation in the form of a daily basis report which tells us if any organics parameters have been detected at significant concentrations which are likely to have originated from the Mobuoy Site.

Screening reports are returned on a daily basis for the abstraction point at Cloghole (Raw) and for the treated water at Carmoney Water Treatment Works (Final).

Criteria for significance of organics parameters are:

- Repeated detections of medium or large peaks that have been identified in screens of the Mobuoy site.
- Increasing numbers of parameters detected in screens of the Mobuoy site.

To date there have been no detections of significance.

Table 6 provides a summary of the small, medium and large peaks detected in Q2 – 2023 for substances that have potential to be related to the Mobuoy site.

Table 7 provides a summary of parameters detected as medium and large peaks.

Table 6 – Summary of Organics 'Peaks' in Q2 2023 – Cloghole Abstraction & Carmoney Water Treatment Works

Location Name	Large	Medium	Small	Total
Carmoney WTW (Final)	*4*	*4*	*111*	*119*
Cloghole Abstraction (Raw)	*0*	*1*	*206*	*207*

A summary of the parameters detected as medium and large peaks is provided in Table 7 below.

Table 7 Medium and Large Peaks – Q2 2023

Parameter	Carmoney WTW (Final)		Cloghole Abstraction (Raw)		Grand Total
	Large	Medium	Large	Medium	
Eicosane	-	1	-	-	1
Heneicosane	1	-	-	-	1
Heptacosane	1	-	-	-	1
Heptadecane	1	-	-	-	1
Hexadecane, 1-iodo	-	1	-	-	1
Pentacosane	-	1	-	1	2
Pentadecane	-	1	-	-	1
Tetracosane	1	-	-	-	1
Grand Total	**4**	**4**	**-**	**1**	**9**

Key

Substances Routinely Monitored on the Mobuoy Site
Substances Identified in Screens of Surface Waters on the Mobuoy Site

It should be noted that parameters detected do not necessarily relate to parameters picked up in screens of the Mobuoy surface waters but to substances that potentially may be present on a site of this type. Parameters identified in Q2 2023 have been isolated occurrences with the exception of Pentacosane which has been detected as a 'Medium' peak at both 'Carmoney WTW' and 'Cloghole Abstraction'.

Individual screening reports provide further interpretation on substances detected. Parameters listed in Table 7 are hydrocarbons that are produced from the combustion of carbonaceous material, particularly petroleum products therefore primary mode of entry into the aquatic environment is via aerial deposition. They can also originate from past pollution events; hydrocarbons are long lived in the aquatic environment. Peak areas suggest that the levels detected were not significant.

8.0 Groundwater Monitoring Results

The groundwater at the Mobuoy site is known to be impacted by leachate generated by waste deposited on the site. Section 8.1 summarises the groundwater monitoring results and exceedances over a screening standard in Q2 2023. Section 8.2 looks at trends, both spatially and over time within individual waste zones to assess changing risk.

8.1 Groundwater Monitoring Results Summary for Q2 2023

Groundwater monitoring results have been screened against relevant Environmental Quality Standards (EQS) and the number of detections above a standard are reported below. Where there is no available EQS then the Drinking Water Standard (DWS) or Suggested No Adverse Response Level (SNARL) have been used for comparison.

Table 8 - Summary of Dissolved Metallic Groundwater Parameters Exceeding a Standard in Q2 2023 April - June

Parameter	EQS Units (µg/l)	No. of detections above a standard	Average concentration (µg/l)	Max concentration (µg/l)	Min concentration (µg/l)
Arsenic	50 (**1**)	1	9.97	66.8	0.13
Cadmium	0.09 (**1**)	5	0.07	0.41	0.03
Chromium (III)	4.7 (**1**)	1	0.94	5.00	0.13
Iron	1000 (**1**)	14	18630	145640	10
Manganese	123 (Bioavailable) (**1**)	17	7497.11*	50740*	10*
Nickel	4 (Bioavailable) (**1**)	3	19.67*	144*	0.71*
Sodium	200,000 (**2**)	3	132,770	696,000	11,460

(**1**) EQS (The Water Framework Directive (Priority Substances and Classification) Regulations (NI) 2015)

(**2**) DWS (The Water Supply (Water Quality) Regulations (NI) 2017)

* Dissolved concentration.

Other metal parameters analysed such as Aluminium, Calcium, Chromium, Chromium (VI), Copper, Potassium, Magnesium, Mercury, Lead, Vanadium, Selenium, Sulphur, Sulphate and Zinc did not exceed the relevant screening values were applicable in Q2 2023.

Table 9 – Summary of Inorganic Groundwater Parameters Exceeding a Standard in Q2 2023 April - June

Parameter	EQS Units (mg/l)	No. of detections above a standard	Average concentration (mg/l)	Max concentration (mg/l)	Min concentration (mg/l)
Ammoniacal Nitrogen	0.3 (**1**)	20	52.78	435.85	0.06
Biochemical Oxygen Demand	4 (**1**)	11	8.03	57.0	1.5
Chloride	250 (**2**)	3	146.14	888.0	17.00
Conductivity	2500 (**2**)	5	1790.28	6123.0	381.7

(**1**) EQS (The Water Framework Directive (Priority Substances and Classificiation) Regulations (NI) 2015)

(**2**) DWS (The Water Supply (Water Quality) Regulations (NI) 2017)

Other inorganic parameters analysed such as Alkalinity, Chemical Oxygen Demand, Dissolved Organic Carbon, Nitrate, Nitrite, pH, Total Oxidised Nitrogen and Total Phosphorus did not exceed the relevant screening values were applicable.

Table 10 – Summary of Organic Groundwater Parameters Exceeding a Standard in Q2 2023 April - June

Substance Name	EQS Units (µg/l)	No. of detections above a standard	Average concentration (µg/l)	Max concentration (µg/l)	Min concentration (µg/l)
Benzene	10 (**1**)	7	439.06	4213.00	0.500
Toluene	74 (**1**)	2	37.92	455.00	0.500
Naphthalene	2 (**1**)	14	225.76	3867.54	0.026
Acenaphthylene	10 (**3**)	5	25.94	406.22	0.005
Fluorene	10 (**3**)	4	5.54	105.66	0.006
Phenanthrene	10 (**3**)	3	6.28	131.65	0.020
Anthracene	0.1 (**1**)	11	0.56	12.64	0.003
Fluoranthene	0.0063 (**1**)	30	2.33	51.90	0.005
Pyrene	10 (**3**)	2	3.09	69.11	0.006
Benzo(b)fluoranthene	0.017 (**1**)	14	0.37	6.07	0.005
Benzo(k)fluoranthene	0.017 (**1**)	13	0.20	3.32	0.001
Benzo(a)pyrene	0.00017 (**1**)	32	0.69	14.95	0.002
Indeno(1,2,3-cd)pyrene	0.1 (**2**)	10	0.66	14.38	0.001
Benzo(g,h,i)perylene	0.0082 (**1**)	15	1.00	24.05	0.001

(**1**) EQS (The Water Framework Directive (Priority Substances and Classification) Regulations (NI) 2015)

(**2**) DWS (The Water Supply (Water Quality) Regulations (NI) 2017)

(**3**) Operational SNARL (Suggested No Adverse Response Level)

8.2 Groundwater Monitoring Results Trends in Q2 2023

In order to assess any changing risk at the site, trends in the data are examined both spatially and over time. If an increasing trend or a change in spatial extent of a parameter is observed this would mean a potential changing risk at the site that would trigger further investigation.

The Updated DQRA (Tetratech, October 2022) divides the site into ten 'waste zones' as presented in Figure 2 of this report. The DQRA presents a summary of potential contaminants of concern (PCOCs) by waste zone (Figure 3) with an assigned risk rating ranging from negligible to moderate depending on the degree to which modelling predicts these contaminants exceed their respective screening criteria at the site boundary.

It is of note that this is the risk rating at the boundary condition of the site but when dilution from the River Faughan is taken into account the DQRA concludes that impact to the River Faughan is not likely. Parameters with a predicted moderate impact at the boundary conditions of the site are considered below (Table 11). Each Waste zone is taken in turn.

Table 11 – Groundwater Trends assessed by Source Zone and associated Contaminants of Potential Concern from DQRA

Source Zone	Parameters with Moderate Risk	Trends	Comments
1,2&3	Naphthalene	Concentrations of Naphthalene are found to exceed the EQS (2ug/l) at multiple locations (BH646, BH659D & BH666) with concentrations ranging from 10.3ug/l to 692.2ug/l in Q2 2023.	No change in spatial impact or concentration over time. **No change in risk.**
1,2&3	Ammonia	Concentrations of Ammonia are found to be above the EQS (0.3mg/l) at multiple locations with concentrations ranging from 0.46mg/l to 436mg/l in Q2 2023.	No change in spatial impact or concentration over time. **No change in risk**.
1,2&3	Free Cyanide	Concentrations of Free Cyanide are found to be below the EQS (1ug/l) within Waste Zones 1, 2 & 3 in Q2 2023.	No change in spatial impact or concentration over time. **No change in risk.**
3 & 8	Zinc	Monitoring in Q2 2023 has not identified Zinc in excess of the EQS (10.9ug/l 'Bioavailable' + ABC) at monitoring locations within Waste Zones 3 & 8. Zinc concentrations in groundwater appear stable with a decreasing trend	Decreasing trend observable at select locations. **No change in risk.**

		observable at select monitoring locations.	
3 & 8	Nickel	Concentrations of Nickel are found to exceed the EQS (4ug/l 'Bioavailable') at BH107 & BH410 with dissolved concentrations of 51.1ug/l & 48.3ug/l detected respectively in Q2 2023. Nickel concentrations appear to remain stable within these waste zones with no increasing trend observable at groundwater monitoring locations.	**No change in risk**
3 & 8	Naphthalene	Concentrations of Naphthalene are found to exceed the EQS (2ug/l) at multiple locations in Waste Zones 3 & 8 with concentrations ranging from 2.6ug/l to 3868ug/l. Concentrations appear to remain stable within these waste zones with the exception of BH404 were an increasing trend is observable. BH404 is directly down gradient of known source zone. Monitoring locations between BH404 and the River Faughan remain stable.	**No change in risk.**
3 & 8	Fluoranthene	Concentrations of Fluoranthene are found to exceed the EQS (0.0063ug/l) at multiple locations with concentrations ranging from 0.009ug/l to 31.5ug/l detected in Q2 2023. Decreasing trends are observable at select monitoring locations, no increasing trends identified within waste zones.	**No change in risk**.
3 & 8	Anthracene	Concentrations of Anthracene are found to exceed the EQS (0.1ug/l) at multiple locations with concentrations ranging from 0.109ug/l to 6.316ug/l	**No change risk.**

		detected in Q2 2023. No increasing trends observable at groundwater monitoring locations within Waste Zone 3 & 8.	
3 & 8	Benzene	Concentrations of Benzene were found to exceed the EQS (10ug/l) at multiple locations with concentrations ranging from 114.7ug/l to 4213ug/l detected in Q2 2023. No increasing trends observable at groundwater monitoring locations within Waste Zones 3 & 8.	**No change in risk.**
3 & 8	Toluene	Concentrations of Toluene were found to exceed the EQS (74ug/l) at BH402, BH404 & BH405 with concentrations of 352ug/l, 432ug/l & 200ug/l respectively, detected in Q2 2023. No increasing trends observable at groundwater monitoring locations within Waste Zones 3 & 8.	**No change in risk.**
3 & 8	Ethylbenzene	No detections of Ethylbenzene were found to exceed the WHO guideline (300ug/l) at groundwater monitoring locations sampled within Waste Zones 3 & 8 in Q2 2023. No increasing trends observable at groundwater monitoring locations.	**No change in risk.**
5	Cadmium	Concentrations of Cadmium are found to exceed the EQS (0.09ug/l) at BH102, with a concentration of 0.41ug/l detected in Q2 2023. Cadmium concentrations remain stable within the Waste Zone with no increasing trends observable.	**No change in risk**.
5	Zinc	Monitoring in Q2 2023 has not identified Zinc in excess of the EQS (10.9ug/l 'Bioavailable' + ABC) at	**No change in risk**.

		monitoring locations within Waste Zone 5. Zinc concentrations in groundwater appear stable.	
5	Naphthalene	Concentrations of Naphthalene are found to exceed the EQS (2ug/l) at BH07, BH626, BH629 & BH654D with concentrations of 22.9ug/l, 95.0ug/l, 642.5ug/l & 4.4ug/l respectively, detected in Q2 2023	**No change in risk**.
5	Fluoranthene	Concentrations of Fluoranthene are found to exceed the EQS (0.0063ug/l) at BH07, BH626, BH629 & BH654D with concentrations of 0.73ug/l, 0.84ug/l, 51.90ug/l & 0.47ug/l respectively, detected in Q2 2023.	**No change in risk**.
5	Anthracene	Concentrations of Anthracene are found to exceed the EQS (0.1ug/l) at BH07, BH626, BH629 & BH654D with concentrations of 0.35ug/l, 0.77ug/l, 12.64ug/l & 0.12ug/l respectively, detected in Q2 2023	**No change in risk**.
5	Benzene	Concentrations of Benzene are found to exceed the EQS (10ug/l) at BH626, BH629 & BH654D with concentrations of 50.7, 739ug/l & 13.6ug/l respectively, detected in Q2 2023	**No change in risk**.
5	Ethylbenzene	No detections of Ethylbenzene were found to exceed the WHO guideline (300ug/l) at groundwater monitoring locations sampled within Waste Zone 5 in Q2 2023.	**No change in risk**.
6	Cadmium	Concentrations of Cadmium are found to exceed the EQS (0.09ug/l) at BH101, with a concentration of 0.15ug/l detected in Q2 2023. Cadmium concentrations	**No change in risk.**

		remain stable within waste zones with no increasing trends observable.	
6	Naphthalene	Concentrations of Naphthalene are found to exceed the EQS (2ug/l) at BH624 with a concentration of 3.1ug/l detected in Q2 2023. Naphthalene concentrations remain stable with waste zone 6 with no increasing trends observable.	**No change in risk.**
6	Ammonia	Concentrations of Ammonia are found to be above the EQS (0.3mg/l) at multiple locations within Waste Zone 6 with concentrations ranging from 0.7mg/l to 129.5mg/l in Q2 2023. An increasing trend in Ammonia concentration is observable at BH201 with a decreasing trend also observable at BH119.	Increasing & decreasing trends observable at select monitoring locations. **No change in risk**.
6	Free Cyanide	Concentrations of Free Cyanide are found to be below the EQS (1ug/l) within Waste Zone 6 in Q2 2023.	**No change in risk.**
7	Cadmium	Concentrations of Cadmium are found to exceed the EQS (0.09ug/l) at BH104 with a concentration of 0.14ug/l detected respectively in Q2 2023. Cadmium concentrations remain stable within the waste zone with no increasing trends.	**No change in risk.**
7	Zinc	Recent groundwater monitoring has not identified Zinc in excess of the EQS (10.9ug/l 'Bioavailable' + ABC) at monitoring locations within waste zone 7. Zinc concentrations in groundwater are stable with a slight decreasing trend observable at select monitoring locations.	**No change in risk.**
8	Cadmium	Concentrations of Cadmium are found to exceed the EQS	**No change in risk.**

		(0.09ug/l) at BH409 & BH411 with a concentration of 0.14ug/l & 0.25ug/l detected respectively in Q2 2023. Cadmium concentrations remain stable within Waste Zone 8.	
8	Nickel	Concentrations of Nickel are found to exceed the EQS (4ug/l 'Bioavailable') at BH107 & BH410 with concentrations of 51.1ug/l & 48.3ug/l detected respectively in Q2 2023. Nickel concentrations appear to remain stable within Waste Zone 8 with no increasing trend observable.	**No change in risk**
8	Ammonia	Concentrations of Ammonia are found to exceed the EQS (0.3mg/l) at multiple locations in Waste Zone 8 with concentrations ranging from 2.9mg/l to 232.1mg/l. Ammonia concentrations remain stable within the waste zone with the exception of BH107 where an increasing trend is observable.	**No change in risk.**
8	Chloride	Concentrations of Chloride are found to exceed the DWS (200mg/l) at BH107 & BH206 with concentrations of 888mg/l & 534mg/l respectively, detected in Q2 2023. Chloride concentrations remain stable with no increasing trends observable.	**No change in risk**
9	Free Cyanide	Concentrations of Free Cyanide are found to be below the EQS (1ug/l) within Waste Zone 9 in Q2 2023.	**No change in risk.**
Surface Waters	Cadmium	No detections above the EQS (0.09ug/l) or the WHO guideline for drinking water quality (3ug/l) at SW6 (upstream) or SW8 (downstream) in Q2 2023. Cadmium concentrations are	**No impact.**

		comparable between SW6 & SW8.	
Surface Waters	Zinc	Monitoring data shows no detections above the EQS (10.9ug/l 'Bioavailable' + ABC) at SW6 & SW8 in Q2 2023. Zinc concentrations are comparable between SW6 & SW8	**No Impact**
Surface Waters	Nickel	Monitoring data shows no detections above the EQS (4ug/l 'Bioavailable') or the DWS (20ug/l) at SW6 & SW8 in Q2 2023. Nickel concentrations are comparable between SW6 & SW8.	**No impact**
Surface Waters	Naphthalene	Monitoring data shows no detections above the EQS (2ug/l) at SW6 & SW8 in Q2 2023. Naphthalene concentrations are comparable between SW6 & SW8.	**No impact**
Surface Waters	Fluoranthene	There was 1 detection above the EQS (0.0063ug/l) in Q2 2023 at SW6 with a concentration of 0.009ug/l detected. Given the detection above the EQS was detected at the upstream monitoring location, the source of the elevated reading is believed to be upstream of the site. Fluoranthene concentrations are comparable between SW6 & SW8.	**No impact**
Surface Waters	Anthracene	Monitoring data shows no detections above the EQS (0.1ug/l) at SW6 & SW8 in Q2 2023. Anthracene concentrations are comparable between SW6 & SW8.	**No Impact**
Surface Waters	Benzene	Monitoring data shows no detections above the laboratory 'Limit of Quantification' (LOQ) in Q2 2023. To date there have been no detections of	**No Impact**

		Benzene at SW6 or SW8 above the EQS (10ug/l).	
Surface Waters	Toluene	Monitoring data shows no detections above the laboratory 'Limit of Quantification' (LOQ) in Q2 2023. To date there have been no detections of Toluene at SW6 or SW8 above the EQS (74ug/l)	**No Impact**
Surface Waters	Ethylbenzene	Monitoring data shows no detections above the laboratory 'Limit of Quantification' (LOQ) in Q2 2023. To date there have been no detections of Ethylbenzene at SW6 or SW8 above the WHO guideline (300ug/l)	**No Impact**

9.1 Summary and Conclusions

Surface water monitoring was completed as per the monitoring schedule in Q2 2023. Iron concentrations were detected in excess of the Drinking Water Standard (DWS) but below the Environmental Quality Standard (EQS) at multiple locations in the River Faughan in Q2 2023. Manganese concentrations detected at SW6 (upstream of the site) were below the DWS and EQS while concentrations detected at SW8 (downstream of the site) exceeded the DWS but were below the EQS in Q2 2023. Iron and Manganese are known to be high in the Faughan catchment with elevated detections found historically upstream of the site at SW6. No increasing trends in Iron or Manganese were evident in results recorded from 2015 to date. Benzo(a)pyrene and Fluoranthene were detected in excess of the EQS but below the DWS and World Health Organisation (WHO) guideline for drinking water quality at SW6 (upstream) & SW8 (downstream) in Q2 2023. Detections are low level and present in the upstream sample (SW6) as well as the downstream sample (SW8) indicating a source upstream of the Mobuoy site. The Environmental Quality Standards for Polycyclic Aromatic Hydrocarbons, such as Benzo(a)pyrene and Fluoranthene, is highly conservative compared to the drinking water standards for these substances. All other surface water monitoring parameters were found to be below the relevant standards in Q2 2023.

Results from the daily organics screen at Cloghole abstraction point and Carmoney Water Treatment works final water found no detections of significance in Q2 2023. Substances detected as large and medium peaks are typically produced from the combustion of carbonaceous material or mobilisation of past pollution events. The notional concentration of any of these peaks would not exceed the relevant standards and therefore they have been classified as not significant.

Results from groundwater monitoring found multiple detections above the relevant standard (Environmental Quality Standards & Drinking Water Standards) in Q2 2023. These results have been broken down by waste zone as defined in the updated DQRA (October 2022). Groundwater is known to be impacted by leachate generated from waste on the site. In order to assess any changes in the risk, the data has been examined for trends both spatially and over time. No trends have been identified that would indicate that the risk to the surface water or the drinking water supply has increased.