Unit 15
Melbourne Business Park
Model Farm Road
Cork T12 WR89

T: 021 434 5366
E: admin@ocallaghanmoran.com
www.ocallaghanmoran.com

GROUNDWATER MONITORING PROGRAMME

Q4 2024

BARCLAY CHEMICALS Ltd
(IE Licence No. P0522-1)

Prepared For: -

Barclay Chemicals
Damastown Way,
Damastown Industrial Park,
Mulhuddart
Co. Dublin

Prepared By: -

O'Callaghan Moran & Associates
Unit 15 Melbourne Business Park
Model Farm Road
Cork

December 2024

	Name	Date	Position
Prepared by (consultant)	Marzena Nowakowska	12/12/2024	Senior Hydrogeologist M.Sc. P.Geo
Approved by (consultant)	Sean Moran	17/12/2024	Director M.Sc. P.Geo, Eur. Geo

LIMITATION

The conclusions and recommendations contained in this report are based in part upon information provided by others and the assumption that all relevant information has been provided by those bodies from whom it has been requested. Information obtained from third parties has not been independently verified by OCM, unless otherwise stated in the Report.

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1. INTRODUCTION

1.1. PROJECT CONTRACTUAL BASIS & PARTIES INVOLVED

O' Callaghan Moran & Associates (OCM) Ltd were requested to undertake the Groundwater Monitoring Programme at the Barclay Chemicals Environmental Protection Agency (EPA) licensed facility in Damastown Industrial Estate commencing in October 2023.

This report documents the findings of the Quarterly Monitoring Programme completed at the facility in November 2024. It also includes for the monitoring of new up hydraulic gradient monitoring wells BH-06 and RC-06 located in the northeast corner of the site and for monitoring in replacement wells GW-2A and BH-03A as well as the existing monitoring well network. Monitoring wells GW-1, GW-2 and GW-3 and BH-3 have all been decommissioned as requested by the EPA.

1.2. SITE LOCATION AND SURROUNDING LAND USE

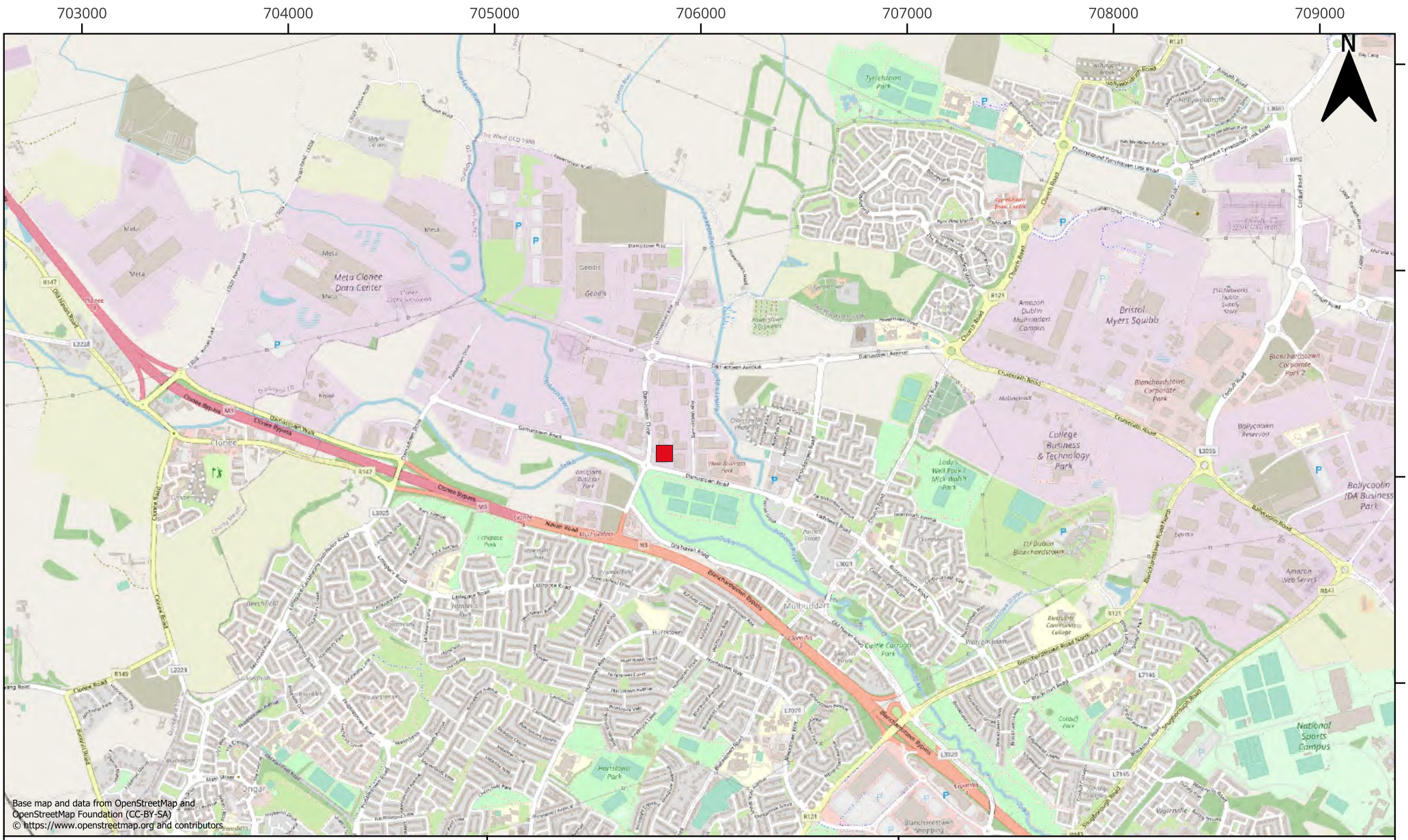
Barclay Chemicals Manufacturing Ltd is located on, Damastown Way, Mulhuddart, Dublin 15 (Figure 1.1). The site is situated in the Damastown Industrial Park and is surrounded by industrial/commercial developments. A communications company is located immediately northwest of the plant, and a gourmet grocery store to the west of the site. A packaging company and food products supplier is located along the east of the site separated by the Damastown Way industrial estate road. A logistics company is located south of Barclay Chemicals site and a data management company is to the southwest (Figure 1.2).

Avondale Park residential area is 380 m to the east of the site and Bramblefield View is the closest residential area c 650 m south of the site and south of N3 Navan Road. Tolka Valley Park and the Clonee United FC playing pitches are approximately 300 m to the south of the site.

The River Tolka flows west-east about 270 m southwest of the site at the closest point and the Pinkeen River flow north-south 260 m east of the site.

The nearest proposed Natural Heritage Area (the Royal Canal [Site Code 002103]) is 3.26 km from the site. Baldoyle Special Protection Area (SPA) is within 19 Km to the west of the site.

The site operates under an IE Licence issued by the EPA Licence No. P0522-01 under Class 5.15 'The production of plant health products and biocides (production means the production on an industrial scale by chemical or biological processing).



O'Callaghan Moran & Associates

Unit 15 Melbourne Business Park,
Model Farm Road, Cork.
Tel. (021) 4345366
email: info@ocallaghanmoran.com

CLIENT

Barclay Chemicals

TITLE

Site Location

DETAILS

Site Location

0 500 m

FIGURE 1.1

O'Callaghan Moran & Associates

Unit 15 Melbourne Business Park,
Model Farm Road, Cork.
Tel. (021) 4345366
email: info@ocallaghanmoran.com

CLIENT

Barclay Chemicals

TITLE

Site Layout

DETAILS

Site Boundary

0 50 m

FIGURE 1.2

2. ENVIRONMENTAL SETTING

2.1 SOILS AND GEOLOGY

The subsoils beneath the site comprise limestone tills (Figure 2.1). The composition of the till varies being more gravelly in some areas but the tills are generally quite dense. Site investigations completed at the site and documented in the Detailed Quantitative Risk Assessment (DQRA) completed for the site in 2023 indicate that the tills are approximately 8m thick beneath the site. A c2m thick layer of rounded gravels was encountered at c7m below ground level in the lands to the south of the site. The gravels are present at a depth of c9m below ground level (bgl) in RC-05 further to the southwest of the site closer to the Tolka River and extend to 16m bgl and increases in thickness to 7m where they overlie limestone bedrock. The site investigation data indicates that the gravels mapped by Teagasc along the Tolka River may extend further to the northeast along the river than previously indicated. Based on the logs for the wells beneath the site the gravels do not extend beneath the site but may not be too far from the southern site boundary. The gravels are overlain by c9m of boulder clay in RC05 the bedrock well closest to the Tolka River indicating they are not in direct hydraulic contact with the river. The bedrock beneath the site comprises dark limestone and shale from the Lucan formation (Figure 2.2).

2.2 HYDROGEOLOGY AND HYDROLOGY

The subsoils beneath the site are not classified as an aquifer. The underlying bedrock is classified as a Locally Important Aquifer (Ll) that is productive only in local zones (Figure 2.3). This type of aquifer typically has short flow paths (10s to 100s of metres) with discharge to surface water features. Fracture and fissure permeability is low due to the impure/argillaceous nature of the bedrock.

The aquifer vulnerability rating beneath the site is Low (Figure 2.4) and this is consistent with the site investigation findings completed at the site as documented in the DQRA.

The GSI indicate that groundwater recharge through the soils and subsoils in the vicinity of the site is low (<50mm/year). There are no large-scale public water supplies in the vicinity of the site though an industrial use well is identified c340m up hydraulic gradient of the site in Tyrellstown (Figure 2.5). The well has a potential yield of 115 m^3 /d. Based on the topography and the indicated well location it is likely that the zone of contribution (ZoC) for this well extends to the northeast away from the site. Given the nature of the bedrock (Ll) it is unlikely that the ZoC extends down hydraulic gradient over 300m to the southwest.

The site is located in the Dublin Groundwater Body (GWB) (IE_EA_G_008). The 2016-2021 Groundwater Status assessment undertaken under Water Framework Directive 2000 for this GWB is Good.

The site straddles the Tolka River and Pinkeen River catchments. The western site boundary is c200m northeast of the Tolka River while the eastern boundary is c200m west of the Pinkeen River. Both rivers flow from northwest to south east with the Pinkeen discharging into the Tolka River c945m to the south of the site (Figure 2.6).

Both rivers are part of the Tolka Surface Water Body (SWB) (IE_EA_09T010800). The 2016-2021 Status Assessment for the Tolka SWB is Poor.

2.3 SCOPE OF WORKS

The works completed comprise the following elements;

- Collection of Groundwater Samples from the onsite and offsite groundwater monitoring wells on November 26th and 27th including monitoring of field hydrochemistry

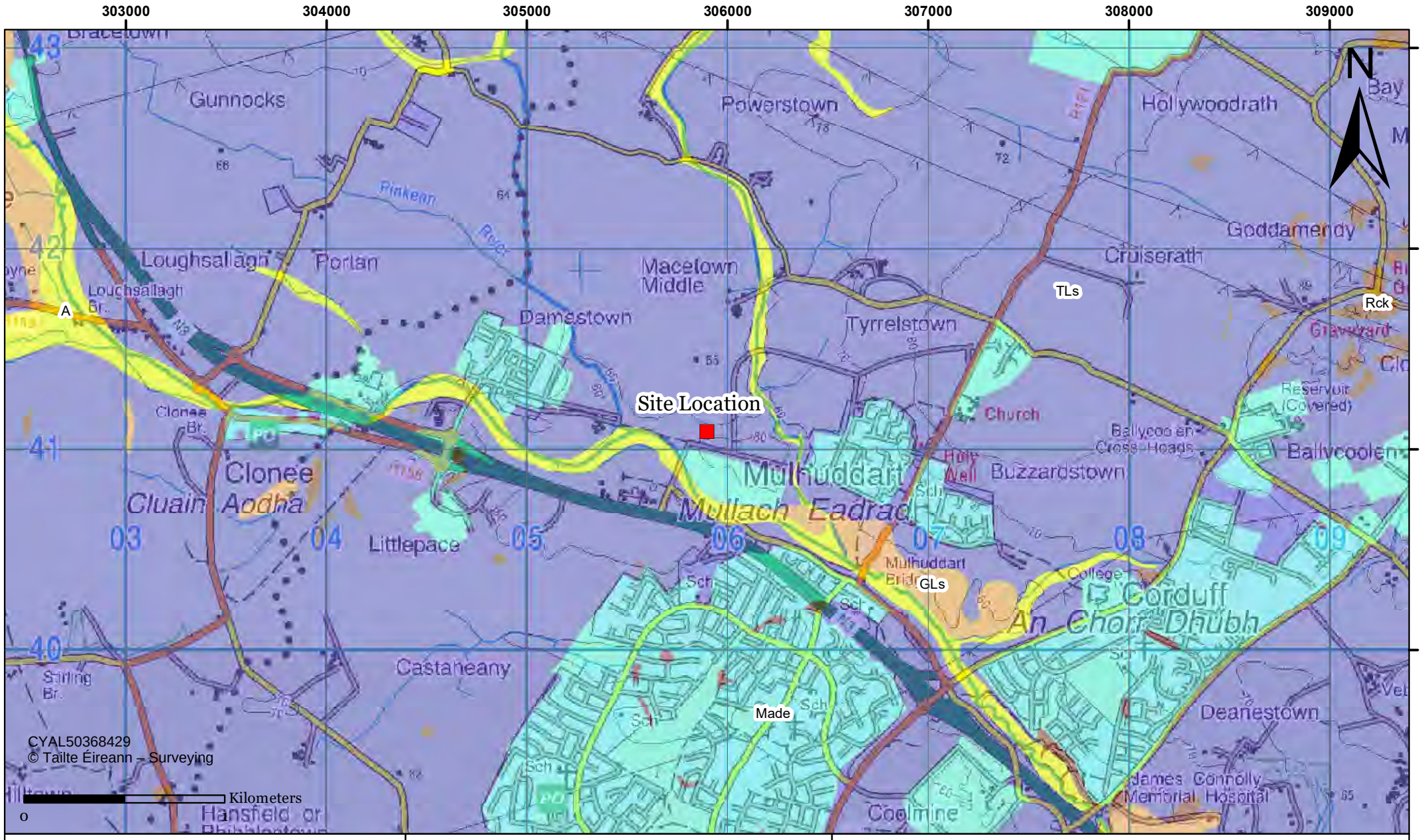
  Subsoil Wells: BH-01, BH-02, BH-03A, BH-04, BH-05 and BH-06

  Bedrock Wells: RC-01, RC-02, RC-04, RC-05, RC-06 and GW2A.

- Laboratory analysis for the following parameters which includes parameters to assess Natural Attenuation of the contaminant plume beneath and down hydraulic gradient of the facility.

  (Glyphosate, AMPA, Iron III (ferric), Iron II (ferrous) , Manganese (IV), Manganese (II) Carbon dioxide (dissolved),Dissolved methane, Formaldehyde, Nitrate as NO3, Nitrite as NO2, pH, Sulphide, Sulphate, VOC and sVOC suite, TOC and TIOC, Orthophosphate)

- Preparation of this interpretive monitoring report.



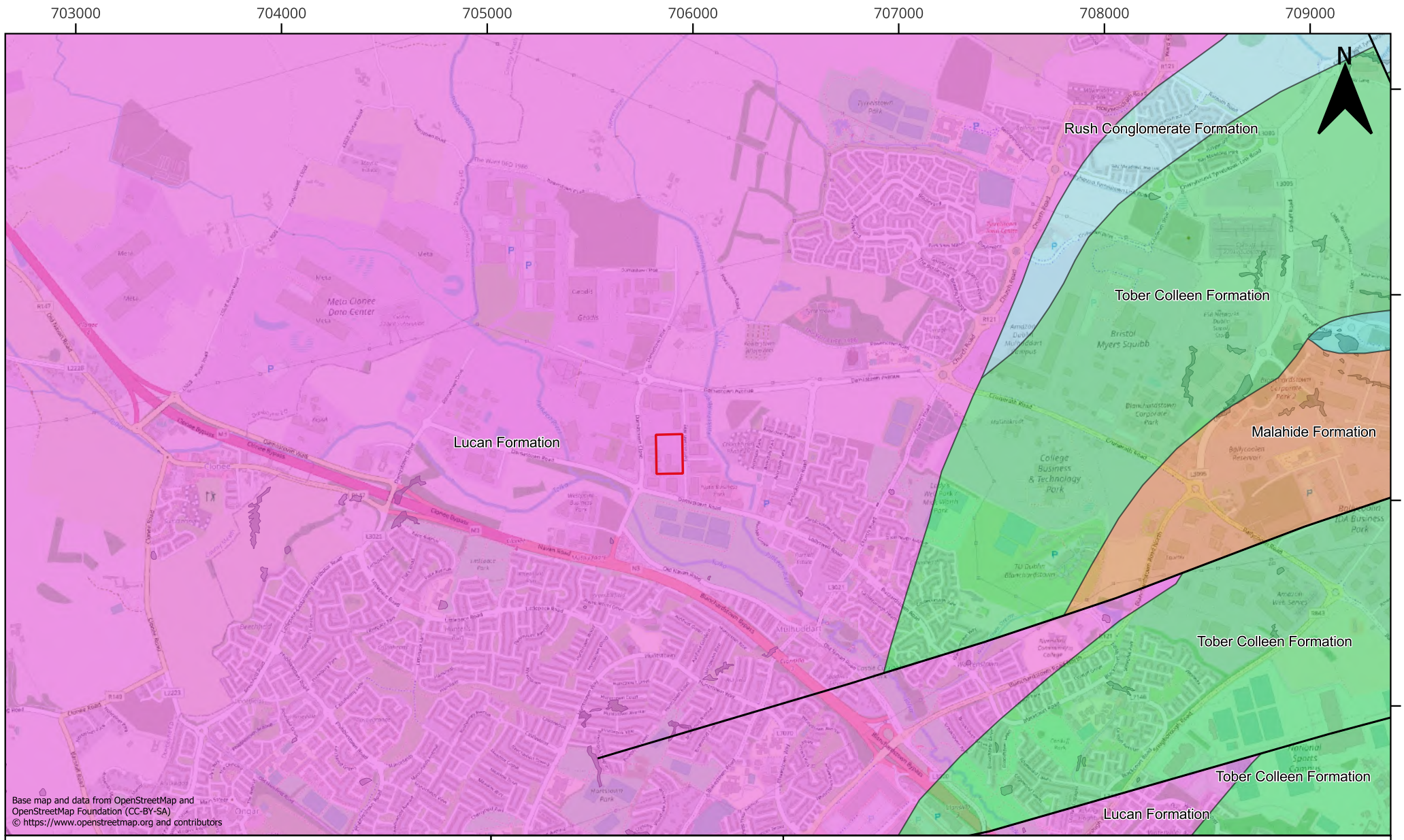
O'Callaghan Moran & Associates,
Unit 15 Melbourne Business Park,
Model Farm Road, Cork.
Tel. (021) 4345366
email: info@ocallaghanmoran.com

CLIENT
Barclay Chemicals

TITLE
Subsoils

Details:
- Site Location
- A - Alluvium undifferentiated
- GLs - Limestone sands and gravels (Carboniferous)
- Made - Made Ground
- Rck - Bedrock at surface
- TLs - Limestone till (Carboniferous)

Figure 2.1



O'Callaghan Moran & Associates

Unit 15 Melbourne Business Park
Model Farm Road, Cork
Tel. (021) 4345366
email: info@ocallaghanmoran.com

CLIENT
Barclay Chemicals

TITLE
Bedrock Geology

DETAILS

Dublin_Geological_Linework
Fault
Dublin_Stratigraphy
Lucan Formation
Malahide Formation
Rush Conglomerate Formation
Tober Colleen Formation
Waulsortian Limestones
Site Boundary

0 500 m

FIGURE 2.2

O'Callaghan Moran & Associates,
Unit 15 Melbourne Business Park,
Model Farm Road, Cork.
Tel. (021) 4345366
email: info@ocallaghanmoran.com

CLIENT

Barclay Chemicals

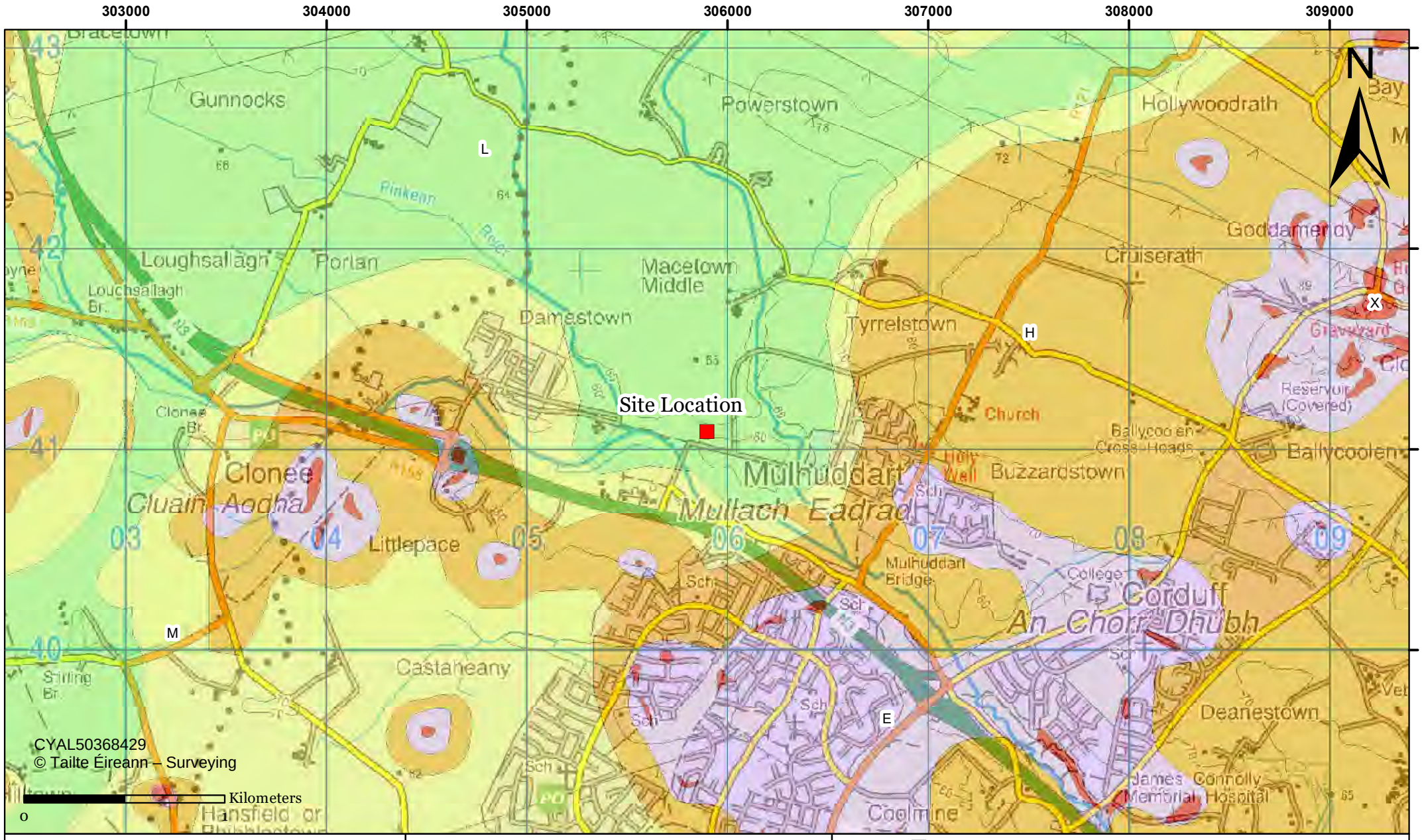
TITLE

Aquifer Classification

Details:

- Site Location
- LI - Locally Important Aquifer. Mod. Productive only in Local Zones
- PI - Poor Aquifer. Unproductive except for Local Zones

Figure 2.3



O'Callaghan Moran & Associates,
Unit 15 Melbourne Business Park,
Model Farm Road, Cork.
Tel. (021) 4345366
email: info@ocallaghanmoran.com

CLIENT
Barclay Chemicals

TITLE
Groundwater Vulnerability

Details:
- Site Location
- X - Bedrock near Surface
- E - Extreme
- H - High
- M - Moderate
- L - Low

Figure 2.4

O'Callaghan Moran & Associates,
Unit 15 Melbourne Business Park,
Model Farm Road, Cork.
Tel. (021) 4345366
email: info@ocallaghanmoran.com

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TITLE

GSI Well Location Data

Details:

Unfortunately many of the borehole logs in the GSI database do not contain accurate location information. The size of the circles shown above is inversely proportional to the accuracy of the well location (i.e. small circles represent high accuracy, where relatively larger circles represent lower accuracy).

- Site Location
- Well Accuracy 10m to 50m
- Well Accuracy 50m to 100m
- Well Accuracy 100m to 200m
- Well Accuracy 250m to 500m
- Wells Accuracy 500m to 1km

Figure 2.5

O'Callaghan Moran & Associates,
Unit 15 Melbourne Business Park,
Model Farm Road, Cork.
Tel. (021) 4345366
email: info@ocallaghanmoran.com

CLIENT
Barclay Chemicals

TITLE
Hydrology

Details:

- Site Location
- Rivers

Figure 2.6

3. GROUNDWATER MONITORING PROGRAMME

3.1 GROUNDWATER SAMPLING & MONITORING

The Quarter Four monitoring programme was completed on November 26th – 27th 2024. The monitoring programme involves field measurements of pH, temperature, electrical, conductivity, redox, and groundwater levels. Groundwater samples were obtained from monitoring wells BH-01, BH-02, BH-3A, GW-2A, BH-04, BH-05 BH-06, RC-01, RC-02, RC-04, RC-05 and RC-06. Monitoring wells GW-1, GW-2 and GW-3 have all been decommissioned. The groundwater samples were sent for laboratory analysis for Glyphosate, AMPA, Iron III (ferric), Iron II (ferrous) , Manganese (IV), Manganese (II) Carbon dioxide (dissolved),Dissolved methane, Formaldehyde, Nitrate as NO3, Nitrite as NO2, pH, Sulphide, Sulphate, VOC and sVOC suite, TOC and TIOC, Orthophosphate.

Wells GW-1, GW-2, GW-3 and BH-3 were decommissioned between August and October 2023 due to concerns over their potential to introduce surface based contaminants to the aquifer beneath the site.

Monitoring well locations are shown on Figure 3.1. Groundwater levels were measured in all of the wells. The wells were then purged to ensure that the groundwater samples obtained were representative of the formation and not the stagnant water in the well. The purging and sampling was undertaken using a peristaltic pump and dedicated tubing in order to reduce the risk of cross contamination. OCM's groundwater sampling protocols are attached in Appendix A.

3.1.1 IN-SITU MONITORING

During purging, pH, temperature, redox and electrical conductivity were monitored in-situ, and the groundwater samples were only obtained when these parameters had stabilised. Field parameter monitoring results for Q4 2024 are summarised in Table 3.1 below.

Previous groundwater monitoring data collected by OCM indicates that the groundwater flow direction is predominantly from the north to the south and southeast toward the confluence between the Pinkeen and Tolka River channels. The groundwater level and flow direction from Q4 2024 is shown on Figure 3.2 and confirmed that the groundwater flow direction is from the north to the south and southeast and is generally consistent with previous monitoring programmes.

Table 3.1 In-Situ Monitoring in Q4 2024

Monitoring Well No	Date	Temperature	Dissolved Oxygen		Conductivity	pH	ORP
	Unit	°C	%	mg/l	µS/cm	unit	mV
BH-01	27/11/2024	11.0	24.7	2.69	520	7.40	33.1
BH-02	27/11/2024	10.9	83.9	9.07	606	7.48	44.3
BH-03A	27/11/2024	11.9	80.1	8.62	403	7.27	70.3
BH-04	26/11/2024	11.0	55.0	6.05	718	6.94	79.5
BH-05	26/11/2024	10.2	82.8	9.25	932	6.62	83.1
BH-06	26/11/2024	11.5	54.0	5.88	782	6.83	103.3
GW-2A	27/11/2024	12.2	44.0	4.69	768	6.84	46.9
RC-01	27/11/2024	11.0	2.4	0.26	752	6.76	29.5
RC-02	27/11/2024	10.7	81.7	9.06	469	7.42	61.4
RC-04	26/11/2024	11.1	83.4	9.16	562	7.16	72.6
RC-05	26/11/2024	10.3	35.2	3.94	846	6.83	81.2
RC-06	26/11/2024	11.4	56.0	6.10	797	6.93	76.5

The observed temperature range from 10.2°C to 14.6°C influences microbial activity and chemical reaction rates, with higher temperatures generally enhancing degradation rates. Most wells fall within this range, supporting potential microbial degradation.

Dissolved oxygen (DO) values range from 0.27 mg/L to 9.82 mg/L, highlighting variability in aerobic conditions. Higher DO values, such as those observed in BH-02 (9.07 mg/L) and RC-04 (9.16 mg/L), indicate aerobic environments favourable for microbial activity. Well RC-01 (0.26 mg/L) exhibit low DO levels, suggesting potential limitations in aerobic degradation pathways.

Conductivity values range from 406 µS/cm to 932 µS/cm, reflecting varying levels of dissolved ions. Higher conductivity may indicate the presence of dissolved contaminants or ions, potentially affecting glyphosate transport and fate.

The pH values range from 6.62 to 7.64, generally near-neutral, which is favourable to glyphosate degradation. For instance, BH-02 (pH 7.48) and RC-02 (pH 7.42) demonstrate optimal conditions for microbial activity.

Oxidation-reduction potential (ORP) values range from -175.3 mV to 131.0 mV. Positive ORP values, as seen in BH-06 (103.3 mV) and BH-05 (83.1 mV), reflect oxidising conditions that favour aerobic microbial degradation. In contrast, negative ORP values in RC-01 (-175.3 mV), suggest reducing environments that may slow degradation or shift pathways to anaerobic processes.

Overall, the data supports the premise that microbial degradation is influenced by the interaction of temperature, DO, conductivity, pH, and ORP, with optimal conditions observed in several wells for effective glyphosate breakdown.

3.2 LABORATORY ANALYSIS

During the Q4 2024 sampling programme, the collected samples were stored in ice-cooled containers prior to shipment via courier within 24 hours of sampling. Glyphosate and AMPA analysis was conducted by Fitz Scientific in Drogheda, co. Louth with the remaining parameters analysed by Chemtest Laboratory in the UK. The samples were analysed for the parameters listed in Section 3.1. The based in Ireland. Both laboratories are accredited for the range of parameters analysed.

O'Callaghan Moran & Associates

Unit 15 Melbourne Business Park
Model Farm Road, Cork
Tel. (021) 4345366
email: info@ocallaghanmoran.com

CLIENT

Barclay Chemicals

TITLE

Monitoring Wells location

DETAILS

0 50 m

Monitoring Well No

Site Boundary

FIGURE 3.1

O'Callaghan Moran & Associates

Unit 15 Melbourne Business Park
Model Farm Road, Cork
Tel. (021) 4345366
email: info@ocallaghanmoran.com

CLIENT

Barclay Chemicals

TITLE

Groundwater level Q4 2024

DETAILS

GW flow direction

Monitoring Well No / GW [mOD]

GW level contours [mOD]

Rivers

Site Boundary

0 50 m

Figure 3.2

4. RESULTS & DISCUSSION OF MONITORING PROGRAMME

4.1 GROUNDWATER MONITORING RESULTS

The results of the laboratory analysis are presented in Table 4.1 and 4.2, and the groundwater quality trend assessment is in Section 4.2. In the tables the results have been compared with the Groundwater Threshold Values (GTVs) adopted in 2010 under the Groundwater Regulations (SI 09 of 2010) and subsequent amendments 2016 and 2019. The EPA Interim Guideline Values (IGVs) developed to assist in the characterisation of groundwater bodies as part of the implementation of the Water Framework Directive 2000 are also used for comparison purposes. Full laboratory results are presented in Appendix B.

The EPA IGV limits are proposed water quality standards and are set out in the EPA publication "Towards Setting Guideline Values for the Protection of Groundwater in Ireland" - Interim Report, 1993. The groundwater regulations limits known as Groundwater Threshold values (TVs) derive in part from the IGVs, were. Not all of the parameters on the IGV list are included under the groundwater regulations therefore both are included for comparative purposes.

In Q4 2024 the glyphosate levels decreased in subsoil monitoring wells: BH-01 (7.55 µg/l) and BH-03A (0.0846 µg/l) compared to Q3 2024, but remained above GTV values. In the bedrock well RC-01 (0.0881 µg/l) the glyphosate concentration slightly increased compared to the previous round. In remaining monitoring wells glyphosate concentration was below the limit of detection (<0.0017ug/l). Overall in Q4 2024 the trends of glyphosate concentrations continued declining in all monitoring wells (Appendix 3).

AMPA was detected in monitoring wells: BH-01, BH-3A and RC-01. The highest concentration was in BH-03A in Q4 2024 at 428.25 µg/l, which is an increase compared to previous round, but remaining overall on a downward trend.

VOCs, sVOCs, MTBEs and PAHs were not detected. Orthophosphate exceeded the threshold values for IGV in all monitoring wells except RC-06. Dissolved CO_2 ranges from 1.7 mg/l in BH03A to 13.0 mg/l in BH-05. Methanal (Formaldehyde) was below levels of detection.

Manganese (II) concentrations range from <1.0 µg/l to 130.0 µg/l, while Manganese (IV) concentrations vary widely from < 1.0 µg/l to 770.0 µg/l. Manganese (II) is the reduced form and is typically found under anaerobic conditions, while manganese (IV) is the oxidised form, prevalent under aerobic conditions. The presence of both forms indicates a dynamic redox environment, possibly influenced by varying oxygen levels.

Iron (II) concentrations range were 20 µg/l or below levels of detection (< 20 µg/l) suggesting reducing conditions. Iron (III) concentrations are consistently below 20 µg/l, indicating limited oxidizing conditions.

The Formaldehyde concentrations were below levels of detection (< 0.005 µg/l).

The 2023 DQRA set a site specific target level (SSTL) for glyphosate at 2,780 ug/l. The glyphosate levels recorded in November 2024 are all orders of magnitude below the SSTL indicating that the groundwater impact beneath the site is not significant.

Although the modelled compliance point limit modelled in DQRA in 2023 is 18 ug/l glyphosate, it is not being detected in the offsite monitoring wells.

Table 4.1 Results of laboratory analysis in subsoil monitoring wells – BH01, BH02, BH03A, BH04, BH05, BH06 (Q4 2024) .

Parameter	Units	LOD	Monitoring Well						GTV	EPA IGV
			BH-01	BH-02	BH-03A	BH-04	BH-05	BH-06		
		Date	27/11/2024	27/11/2024	27/11/2024	26/11/2024	26/11/2024	26/11/2024		
Dissolved CO2	mg/l	0.60	3.6	2.1	1.7	5.7	13.0	10.0	NE	NE
Nitrite as NO2	mg/l	0.020	0.028	< 0.020	0.020	0.020	< 0.020	< 0.020	0.375	0.100
Nitrate as NO3	mg/l	0.50	< 0.50	2.70	8.90	< 0.50	29.0	< 0.50	37.5	25.0
Orthophosphate as PO4	mg/l	0.050	0.078	0.058	2.700	0.069	0.051	0.058	NE	0.030
Sulphate	mg/l	1.0	51.0	160.0	69.0	69.0	89.0	120.0	187.5	200.0
Sulphide	mg/l	0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	NE	NE
Iron (Dissolved)	µg/l	5.0	< 5.0	< 5.0	< 5.0	12.0	< 5.0	< 5.0	NE	200.000
Manganese [II]	µg/l	1.0	23.0	< 1.0	< 1.0	120.0	< 1.0	52.0	NE	NE
Manganese [IV]	µg/l	1.0	120.0	< 1.0	< 1.0	770.0	< 1.0	310.0	NE	NE
Iron [II]	µg/l	20	20.0	20.0	< 20	< 20	< 20	< 20	NE	NE
Iron [III]	µg/l	20	< 20	< 20	< 20	< 20	< 20	< 20	NE	NE
Total Inorganic Carbon	mg/l	2.5	94.0	43.0	38.0	110.0	120.0	110.0	NE	NE
Total Organic Carbon	mg/l	2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	NE	NE
Dissolved Methane	mg/l	0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	NE	NE
Methanal (Formaldehyde)	mg/l	0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	NE	NE
Glyphosate	µg/l	<0.0017	7.55	<0.0017	0.085	<0.0017	<0.0017	<0.0017	0.075	NE
AMPA	µg/l	<0.002	78.92	<0.002	428.25	<0.002	<0.002	<0.002	NE	NE

LOD – limit of detection
GTV – Groundwater Threshold Values
EPA IGV – Environmental Protection Agency Interim Guideline Values
NA – not available (see section 3.2)

Table 4.2 Results of laboratory analysis in bedrock monitoring wells – RC01, RC02, RC04, RC05, RC06, GW2A (Q4 2024).

Parameter	Units	LOD	Monitoring Well							
			RC-01	RC-02	RC-04	RC-05	RC-06	GW-02A	GTV	EPA IGV
		Date	27/11/2024	27/11/2024	26/11/2024	26/11/2024	26/11/2024	27/11/2024		
Dissolved CO2	mg/l	0.60	6.8	2.2	4.3	5.7	7.2	12.0	NE	NE
Nitrite as NO2	mg/l	0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	0.021	0.375	0.100
Nitrate as NO3	mg/l	0.50	0.94	2.20	6.70	3.90	< 0.50	< 0.50	37.5	25.0
Orthophosphate as PO4	mg/l	0.050	0.053	0.056	0.050	0.052	< 0.050	0.052	NE	0.030
Sulphate	mg/l	1.0	87.0	100.0	100.0	110.0	130.0	130.0	187.5	200.0
Sulphide	mg/l	0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	NE	NE
Iron (Dissolved)	µg/l	5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	NE	200.0
Manganese [II]	µg/l	1.0	130.0	< 1.0	< 1.0	120.0	2.6	120.0	NE	NE
Manganese [IV]	µg/l	1.0	680.0	< 1.0	< 1.0	< 1.0	< 1.0	570.0	NE	NE
Iron [II]	µg/l	20	< 20	< 20	< 20	20.0	< 20	< 20	NE	NE
Iron [III]	µg/l	20	< 20	< 20	< 20	< 20	< 20	< 20	NE	NE
Total Inorganic Carbon	mg/l	2.5	84.0	43.0	58.0	89.0	100.0	100.0	NE	NE
Total Organic Carbon	mg/l	2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	NE	NE
Dissolved Methane	mg/l	0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	NE	NE
Methanal (Formaldehyde)	mg/l	0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	NE	NE
Glyphosate	µg/l	<0.0017	0.088	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	0.075	NE
AMPA	µg/l	<0.002	0.086	<0.002	<0.002	<0.002	<0.002	<0.002	NE	NE

LOD – limit of detection
GTV – Groundwater Threshold Values
EPA IGV – Environmental Protection Agency Interim Guideline Values
NA – not available (see section 3.2)

4.2 TREND ASSESSMENT

Appendix C illustrate the trend assessments for the contaminants of concern Glyphosate and AMPA detected during the monitoring period Q4 2020 – Q4 2024 in the individual wells: BH01, RC01, BH02, RC02, BH04, RC04, BH05, RC05. Monitoring results for recently installed wells (BH03A, GW2A, BH06, RC06) are only available since Q2 2023. Trends for all wells are shown on Figure 4.1 and Figure 4.2

The trend assessment also includes the results of monitoring conducted by the Agency in November 2023 in BH03A, BH06 and GW2A.

The monitoring data highlights a steady decline in glyphosate concentrations across all wells from their peak values. BH-01 recorded the highest glyphosate concentration, peaking at 101 µg/L in Q2 2024 before dropping significantly to 7.55 µg/L by Q4 of 2024. Similarly, BH-03A exhibited persistently elevated levels, starting at 0.438 µg/L in January 2024, rising to a peak of 1.39 µg/L in June, and then decreasing markedly to 0.0846 µg/L by the Q4 of 2024. In contrast, BH-04, RC-01, RC-02, and RC-06 maintained glyphosate levels close to or below the detection limits, a pattern mirrored in the remaining wells. Seasonal trends reveal higher concentrations during the spring and summer months.

The concentration of AMPA, a by-product of glyphosate degradation, follow a similar pattern, with notable peaks in BH-01 and BH-03A. BH-01 reached its maximum AMPA concentration of 185.5 µg/L in January 2024, while BH-03A peaked at 1,510 µg/L in May. Both wells experienced significant reductions over time, with BH-03A declining to 85 µg/L and BH-01 dropping to 16 µg/L by Q3 2024. Compared to glyphosate, AMPA levels decreased more gradually, reflecting its persistence in the environment. This slower decline is due to the intermediate stability of AMPA during glyphosate breakdown, which occurs primarily through microbial activity under aerobic conditions. The continued presence of AMPA highlights the extended timeframe required for its full degradation into carbon dioxide, water, and other benign by-products. Notably, the observed increases in AMPA concentrations in Q4 2024 suggest ongoing glyphosate transformation processes, possibly driven by renewed inputs of glyphosate or shifts in environmental factors such as temperature or microbial activity that influence degradation rates. This reinforces the importance of monitoring both glyphosate and its degradation products to fully assess environmental impacts.

The findings suggest the presence of a localised and diminishing contamination plume, confined primarily to the production area. Glyphosate concentrations remain below detection limits in all offsite monitoring wells.

4.3 ASSESSMENT OF MONITORED NATURAL ATTENUATION

Field geochemical parameter values measured in groundwater under low flow sampling techniques during past monitoring works and geochemical parameters measured in the laboratory are summarised in Table 4.3 below. All parameters were monitored by OCM between 18/10/2023 and 27/11/2024.

Table 4.3 Degradation Parameter Summary

Parameter	Units	Range (Average)	Comments
Field Measured Dissolved Oxygen (DO) Note 1	mg/l	0.11 – 10.16 (3.93)	Minimum DO is 0.11 mg/l with an average of 3.63mg/l suggesting aerobic conditions prevail.
Temperature Note 4	°C	7.9 – 16.2 (11.78)	Temperature within optimum range for microbial degradation.
pH in field Note 5	pH units	6.62 – 7.96 (7.20)	Minimum, maximum, and average pH within the optimum range for microbial degradation.
Oxidation Reduction Potential (ORP) Note 6+3	mV	-253.7 – 193.7 (61.05)	Slightly low average ORP levels along with slightly low DO levels suggest mildly reducing conditions with suboptimal conditions for microbial degradation of glyphosate. It should be noted however that glyphosate also readily degrades under anaerobic conditions but marginally slower.
Conductivity note 9	µS/cm	337.7 – 1006 (688.72)	The recorded conductivity range is typical of an aquifer of this nature.
Chemical Oxygen Demand (COD)	mgO_2/l	<10 – 15 (10.69)	Very low COD levels across the site in correlation with elevated DO levels suggesting aerobic conditions.
Dissolved CO_2	mg/l	<0.6 – 68 (7.28)	Elevated levels of dissolved CO_2 correlate with low methanogenic bacterial activity.
Nitrite	mg/l	<0.02 – 0.07 (0.02)	Nitrite levels generally low, suggesting denitrification processes are exhausted.
Nitrate	mg/l	<0.5 – 69 (6.10)	Absence of nitrate indicates denitrifying bacteria may have consumed all available nitrate in the absence of oxygen except for Bh02, BH03A, BH05, RC02,RC04 and RC05. Whilst degradation of glyphosate occurs under both aerobic and anaerobic conditions, aerobic degradation would be expected to dominate where conditions are favourable.
Orthophosphate as PO_4	mg/l	0.05 – 3.1 (0.31)	Elevated Orthophosphate levels were recorded in all wells suggesting high microbial activity.
Phosphorus (Dissolved)	mg/l	<0.02 – 2.1 (0.15)	Elevated dissolved phosphorus levels were recorded in all wells except for BH02 on 05/12/23 suggesting high microbial activity across the site.
Sulphate	mg/l	<35 – 200 (98.59)	Presence across the site suggests sulphate reduction not yet taking place

Parameter	Units	Range (Average)	Comments
Sulphide	mg/l	<0.05 – 0.16 (0.06)	Generally low levels, consistent with high sulphate levels, suggesting sulphate reduction not yet taking place.
Manganese II	ug/l	<1 – 830 (99.47)	Generally high levels across the site, correlating with elevated levels of Mn II, indicating manganese reducing processes are not taking place.
Manganese IV	ug/l	<1 – 840 (191.14)	Generally high levels across the site, alongside with elevated levels of Mn IV, indicating manganese reducing processes are not taking place.
Iron II	ug/l	<20 – 650 (32.03)	Generally low levels across the site except for BH01 where 650ug/L reported in December 2023. All other wells indicate some degree of iron reduction processes may be taking place indicating mildly reducing conditions.
Iron III	ug/l	<20 – 62 (20.70)	Generally low levels across the site, indicating iron reduction processes are taking place.
Total Organic Carbon (TOC)	mg/l	<2 – 4.5 (2.47)	Low TOC levels are indicative that decaying vegetation and organic matter are present, which may act as a substrate for microbial activity.
Dissolved Methane	mg/l	<0.5 – 1.2 (0.08)	Low levels suggest little methanogenic bacterial activity with prevailing aerobic/mildly reducing conditions prevailing across the site.
Glyphosate[Note 10 & 11]	ug/l	<0.005 – 126 (5.97)	Elevated levels indicate herbicide contamination is present in the groundwater beneath the site, however trends indicate that the levels are decreasing to low levels.
AMPA [Note 10 & 11]	ug/l	<0.01 – 1305 (54.29)	Elevated levels of AMPA contamination has been detected beneath the site, however this trend is noted to be decreasing to low levels with the exception of BH03A and BH01 where it has increased which would indicate high levels of glyphosate degradation has occurred at this locations

Table Notes:
Comments are based on the following information presented in Environment Agency R & D Report 95 (Carey et al, 2000), Water Quality Monitoring Report on Nitrogen and Phosphorus Concentrations in Irish waters (EPA 2020) & Glyphosate: Its Environmental Persistence and Impact on Crop Health and Nutrition (Kanissery, Gairhe, Kadyampakeni, Batuman, Alvarez 2019 PMID 31766148):

1. A dissolved oxygen content of less than 1mg/l indicates that aerobic degradation of hydrocarbons is unlikely.
2. Corrected to standard hydrogen electrode (SHE) potential value. Aerobic degradation of contaminants generally occurs above a redox potential of greater than +150mV.
3. Mildly reducing conditions occur between +50 to -150mV and are normally associated with manganese and nitrate reduction.
4. Biological and biochemical processes are accelerated at temperatures in excess of 20°C and may be inhibited at temperatures below 5°C.
5. Optimal range for microbial degradation between pH of 6 and 8.5.
6. General water quality parameter used as a marker to verify that site samples are obtained from the same aquifer system.

7. The Irish Threshold for phosphorus in water is 0.035mg/l.
8. A measure of the total concentration of organic material (natural and anthropogenic) in water that may act as a primary substrate for biological degradation (reductive dehalogenation)
9. General water quality parameter used as a marker to verify that site samples are obtained from the same aquifer system
10. Glyphosate degradation by microbial activity has been broadly studied, and bacterial species involved in the degradation have been isolated and characterised. Bacteria are considered to be the main drivers behind its degradation in soil,
11. Both aerobic and anaerobic conditions favour the degradation of glyphosate, even though anaerobic degradation is generally slower than aerobic degradation is generally slower than aerobic degradation.

The data suggest favourable conditions for MNA at the site, with a mix of aerobic and mildly reducing environments. Dissolved oxygen levels (0.11 – 10.16 mg/l) indicate predominant aerobic conditions, while low oxidation-reduction potential values support anaerobic processes, essential for glyphosate degradation. The temperature (7.9 – 16.2°C) and pH (6.62 – 7.96) are within optimal ranges for microbial activity. Elevated levels of nutrients, including orthophosphate and dissolved phosphorus, further indicate high microbial activity.

Mildly reducing conditions are reflected in high sulphate and low sulphide concentrations, while manganese and iron reduction processes are also observed. Nitrate levels suggest active denitrification in certain wells, promoting aerobic degradation of glyphosate.

AMPA, a glyphosate by-product, is present at elevated levels (up to 428.25 µg/l), particularly at BH03A and BH01, indicating ongoing degradation. Glyphosate concentrations are declining, further supporting MNA.

Overall, the site is undergoing successful MNA, with natural processes effectively breaking down glyphosate and AMPA, aided by favourable geochemical and microbial conditions. Monitoring is essential to track the continued decline of AMPA.

Figure 4.1 Glyphosate concentration trends in Monitoring Wells in years 2020-2024.

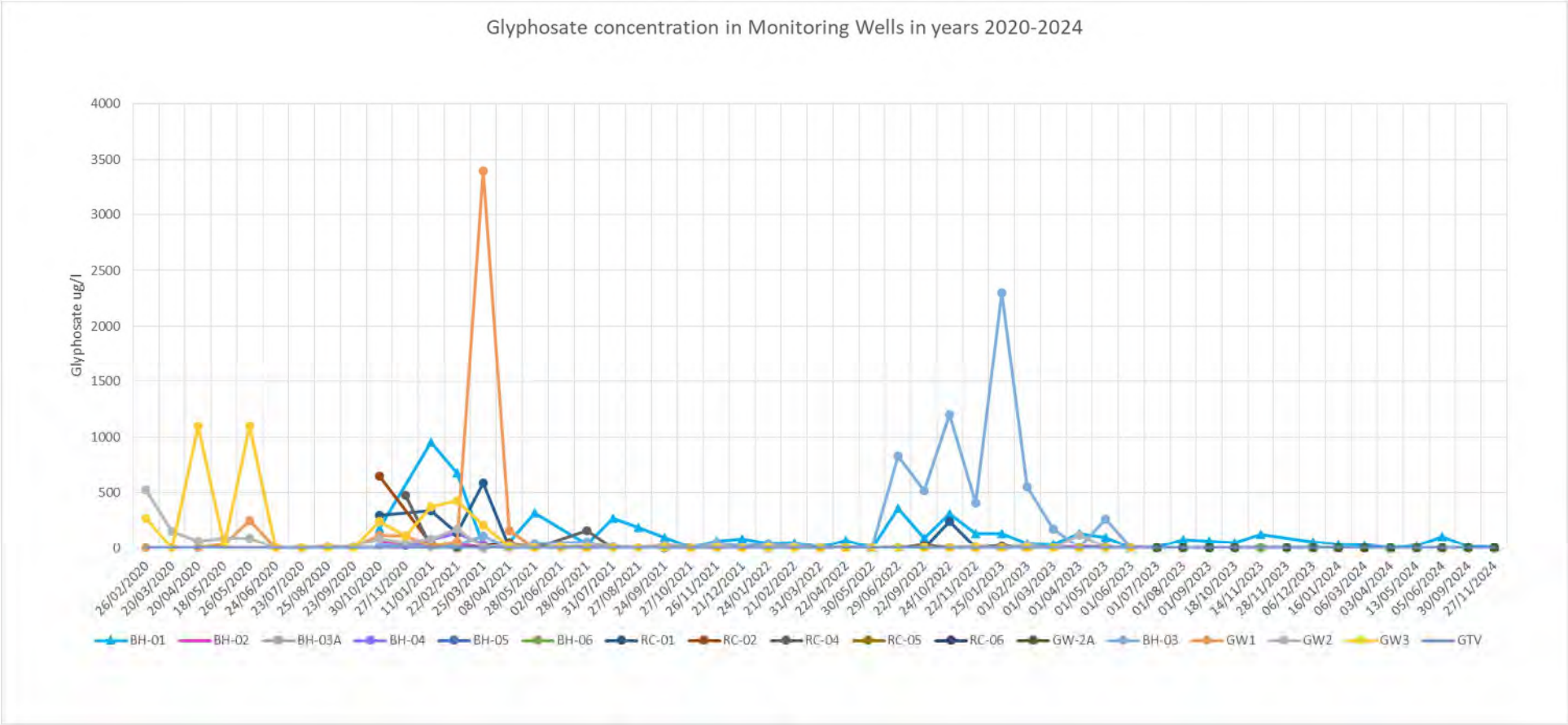
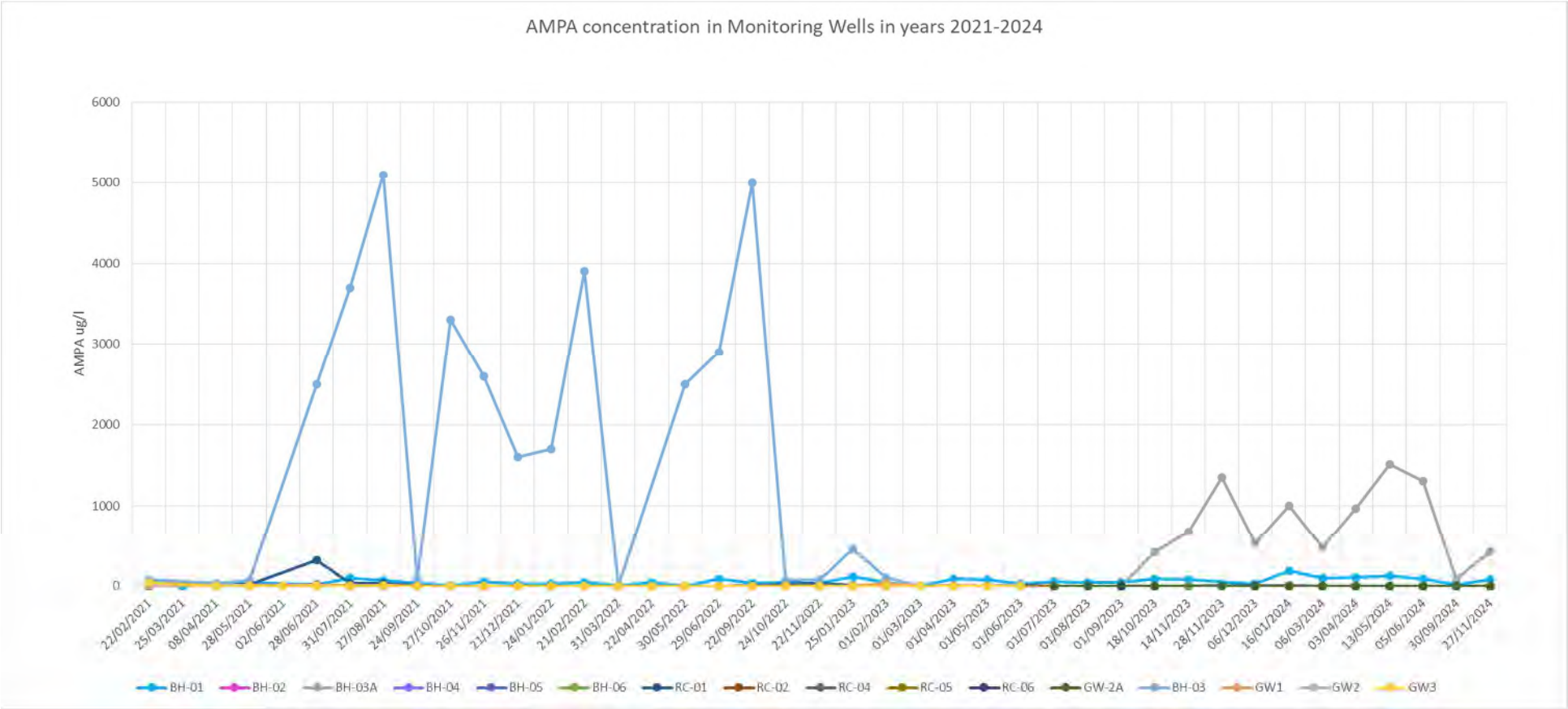


Figure 4.2 AMPA concentration trends in Monitoring Wells in years 2021-2024.



5. CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

The Q4 2024 results for glyphosate are in all wells below the SSTLs and meet the compliance point limits and are below the laboratory limit of detection in the offsite wells.

Groundwater monitoring data from Q4 2024 show that pollution mitigation efforts continue to be effective at reducing glyphosate levels where present in the groundwater beneath the site in the vicinity of wells BH-01 and BH-03A. The presence of AMPA, glyphosate's breakdown product, across various wells indicates active natural degradation processes. Overall, declining glyphosate levels and residual AMPA confirm that MNA is contributing to site remediation.

5.2 RECOMMENDATIONS

Due to the ongoing detection of glyphosate in groundwater above the GTV, groundwater monitoring should be continued to confirm the declining trend in groundwater concentrations observed in both the superficial deposits and bedrock aquifers.

APPENDIX A – OCM SAMPLING PROTOCOL

STANDARD OPERATING PROCEDURE

SOIL SAMPLING

The soil sampling technique described below will be followed to ensure that soil samples are representative of the environment which they are intended to characterise.

1.0 SAMPLING

(A) Locate the soil sampling station in accordance with the workplan which will specify the number and type of samples to be taken. Place a wooden stake into the ground one metre from the sample location and record sample location on the stake.

(B) Record the location in the field logbook and, if possible, photograph the location.

(C) Collect soil samples from the depth specified in the workplan and record the depth in the field notebook. Describe the colour and texture of each sample and record in notebook.

(D) Wear appropriate level of protection when taking samples (gloves, safety glasses, hard hat etc.) as specified in the workplan. Collect soil samples as specified in the workplan using decontaminated stainless steel trowel, soil corer, or similar device. Collect discrete soil samples from each station.

(E) If required by the workplan, composite discreet soil samples by placing equal volumes of soil into the container and mixing thoroughly to a homogenous mixture. Samples may be hand picked, if necessary, to remove larger materials, such as leaves, sticks, gravel, rocks etc., if specified in the workplan. Record in notebook the nature of any materials removed from soil samples.

(F) Deposit each soil sampled into a (clean, pre-washed) container. At the time of collection, the sample bottle will be filled to the top with soil sample.

(G) Fill out labels with waterproof ink and attach to the sample container. The following information will be recorded on each sample label: -

- Client/Site Name
- Date Collected
- Time Collected
- Analysis
- Preservative
- Sample Identification Number

(H) Decontaminate sampling equipment as described below unless otherwise specified in the site workplan. When using stainless steel sampling equipment: -

- wash with non-phosphate detergent in potable water,
- rinse sequentially in potable water, methanol, acetone, methanol and D1 water and;
- allow to air dry in a containment free area.

(I) Wrap the decontaminated sampling equipment in aluminium foil which has been decontaminated in accordance with Section H.

2.0 FIELD DOCUMENTATION

Record sample information in the field notebook. Provide a complete description of the sample location, and a photograph, if necessary. Describe the soil appearance, especially if the presence of oil or an odour is noted. Document the sample bottle lot numbers in the field notebook. Record weather conditions at the time of sampling. The Field Team Leader will initial the logbook entries for correctness.

3.0 FIELD QA/QC SAMPLES

See the separate SOP on Field QA/QC samples for appropriateness and preparation of D1 Water Field Blanks, Cross-contamination Field Blanks, Trip Blanks and Field Duplicate Samples.

4.0 PACKAGING AND TRANSPORT

Check to be sure that all necessary information is on the sample container label. Complete the chain-of custody form. Package, label and transport the samples to the testing laboratory in accordance with requirements for packing, shipping and labelling environmental samples.

END.

STANDARD OPERATING PROCEDURE

GROUNDWATER SAMPLING

The primary objective of groundwater sampling is to establish groundwater quality and evaluate whether the potential contaminant sources at a site have impacted the groundwater in the underlying aquifer. The additional objective is to measure hydraulic gradient, or slope, of the water table to evaluate the direction of groundwater flow.

The purpose of this procedure is to ensure that representative samples of groundwater are collected and documented using consistent methods to ensure sample integrity.

1.0 SAMPLING PROCEDURES

1.1 Well Operating and Purging Procedures

All groundwater sampling will be conducted after the installed and developed wells have been allowed to equilibrate for at least 2 to 3 days. A Field Data Sheet for Well Sampling will be completed for each well.

Groundwater sampling teams will use to following procedure for approaching, opening, purging and sampling all wells, unless directed otherwise by a site specific workplan.

1) Prior to placing any equipment into the well, decontaminate the sampling equipment according to standard decontamination protocol.

2) Ensure you have a working FID/PID, a well key, and a depth-to-water meter.

3) Unlock and open the well cap just enough to insert the probe of the PID/FID. Take and record a reading. A decision to upgrade PPE may be necessary based on the FID/PID readings in the breathing zone.

4) Where practical, the surface water column will be visually examined for the presence of hydrocarbons, if present or suspected, the thickness of the hydrocarbon layer will be measured using an oil/water interface probe prior to taking the depth-to-water measurement.

5) Insert the water level probe into the well and measure and record the static water level to the nearest 0.01 m with respect to the established survey point on top of the well casing.

6) Decontaminate the water level probe with DDI water (Do not rinse with any solvents unless product was encountered).

7) Calculate and record the minimum volume of water to be purged according to the following conversion factors: -

1 well volume	=	water column in metres x litres/linear metre
50mm casing	=	2.0 LPM
100mm casing	=	8.1 LPM
150mm casing	=	18.2 LPM
200mm casing	=	32.4 LPM

8) Purge the well of at least 3 casing volumes by pumping or bailing with a decontaminated submersible pump or PVC bailer equipped with a bottom filling check valve (if the purge volume is low, generally less than 100 litres, the sampling team might find it more efficient to purge with a bailer than a pump). Use a graduated bucket to track the amount of water removed from the well. Periodically determine the pH, temperature and specific conductance of the purged water. Continue purging until the well has been completely evacuated or until the pH and specific conductance measurements have stabilised for at least one well volume. Wells that become dewatered before producing three casing volumes will be sampled as soon as practical once they recover sufficiently.

9) Dispose of purge water collected in the graduated bucket by pouring onto the ground at a distance of 50 to 60 metres from the vicinity of the well. If the water is known or suspected to be significantly contaminated, it may be necessary to store the purge water in a secure container, such as a drum, pending proper disposal.

10) Be aware and record any unusual occurrence during purging such as cascading (a shallow water entry zone that trickles into the borehole).

1.2 Field Parameter Measurement

Measurements of field parameters of pH, temperature and electrical conductivity are collected and organic vapour screening is conducted while the well is purged. To facilitate the collection of basic field parameters, the field team needs to: -

- Purge three well volumes of water from the well and measure field parameters for each well volume removed.

- Collection of water samples should take place after stabilisation of the following parameters: -

  - Temperature $^{+}$/- 1^{o}C
  - pH (meter or paper) $^{+}$/- 0.2 units
  - Specific conductivity $^{+}$/- 5%

- If the aforementioned parameters do not stabilise within three purge volumes, the well will be purged up to a maximum of six borehole volumes unless two consecutive sets of stabilised parameters are obtained.

- Note any observations in the field logbook.

1.3 Collection of Water Samples

All samples or chemical analysis will be placed in laboratory prepared bottles. The types of sample containers and preservative required for each type of analysis are described in the workplan. If required, preservatives will be placed in the sample containers prior to collecting the samples.

The following procedure will be used to sample a well: -

1) After the well has been purged and allowed to recover, sample the well using a properly decontaminated or dedicated disposable bailer. Gently lower the bailer into the water column. Allow the bailer to sink and fill with a minimum of surface disturbance.

2) Slowly raise the bailer out of the well. Do not allow the bailer line to contact the ground, either by coiling it on a clean plastic sheet or by looping it from arm to arm as the line is extracted from the well.

3) Samples will be collected for VOCs analysis immediately after purging is complete and before other samples are collected. Pour the samples slowly into the laboratory prepared 40 ml glass vial. Overfill each vial slightly to eliminate air bubbles, a convex meniscus should be present at the top of the vial. Ensure that the Teflon liner of the septum cap is facing inward and that no bubbles are entrapped. After capping securely, turn bottle upside-down, tap it against your other hand, and observe sample water for bubbles. If bubbles are observed, remove the cap, overfill the vial and reseal. Repeat this step for each vial until the samples with no bubbles are obtained.

4) Place a label on the container and enter the following information: -

   Client/Site Name
   Date Collected
   Time Collected
   Analysis
   Preservative
   Sample Identification Number

5) Record pertinent information in the field logbook and on the Field Data Sheet for Well Sampling. Complete chain-of-custody form.

6) Place custody seals on the container caps. As soon as possible, place sample containers in a cooler with ice packs and maintain at $4^{o}C$ until extraction. Surround the bottles with appropriate packaging.

7) Obtain the semi-volatile compound/pesticides/PCBs sample(s) by transferring the water to a laboratory prepared 1000 ml amber glass bottle with Teflon-lined cap. Fill the bottle to the bottom of the neck and follow steps 4, 5 and 6 above.

8) Dissolved metals (if necessary) requires the team to filter the sample water through a .45 micron filter. The water is collected in a 1 litre, unpreserved, plastic or glass bottle with HNO_3 preservative. Filtering must be done within 15 minutes of sample collection.

9) Obtain the total metals sample by directly transferring the water from the bailer into a laboratory prepared 1000 ml plastic or glass bottle with HNO_3 preservative.

10) Be sure the pH of the metals sampled is less than 2 by pouring off an aliquot in a clean jar and testing for pH using litmus paper. Dispose of this water and rinse the jar.

11) Collect and prepare Field QA/QC samples in accordance with separate SOP.

12) Be sure to record all data required on the Field Data Sheet or Well Sampling and appropriate entries into the field logbook.

13) Secure the well cap and replace the locking cover.

14) Decontaminate all sampling equipment according to procedure.

15) Decontaminate submersible pumps as follows: -

Scrub pump and cord in a tub of appropriate detergent and potable water
Pump at least 80 litres of soapy water through pump
Rinse with potable water
Pump at least 80 litres of rinse water through the pump
Rinse with DI water before lowering pump into the next well.

END.

APPENDIX B - LABORATORY RESULTS

eurofins | Chemtest
Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	24-39068-1
Initial Date of Issue:	06-Dec-2024
Re-Issue Details:	
Client	O Callaghan Moran & Associates
Client Address:	15 Melbourne Business Park Model Farm Road Co. Cork IRELAND
Contact(s):	Marzena Nowakowska Sean Moran
Project	24-260-01 Barclay Chemicals

Quotation No.:	Q23-33411	**Date Received:**	06-Jun-2024
Order No.:	24-260-01	**Date Instructed:**	28-Nov-2024
No. of Samples:	12		
Turnaround (Wkdays):	5	**Results Due:**	04-Dec-2024
Date Approved:	06-Dec-2024		

Approved By:

Details: David Smith, Technical Director

For details about application of accreditation to specific matrix types, please refer to the Table at the back of this report

Results - Water

Project: 24-260-01 Barclay Chemicals

Client: O Callaghan Moran & Associates				**Chemtest Job No.:**		24-39068	24-39068	24-39068	24-39068	24-39068	24-39068	24-39068
Quotation No.: Q23-33411				**Chemtest Sample ID.:**		1902335	1902336	1902337	1902338	1902339	1902340	1902341
Order No.: 24-260-01				Client Sample Ref.:		RC01	RC02	RC04	RC05	RC06	GW02A	BH01
				Sample Type:		WATER	WATER	WATER	WATER	WATER	WATER	WATER
				Sample Sub Type:		Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
				Date Sampled:		27-Nov-2024	27-Nov-2024	26-Nov-2024	26-Nov-2024	26-Nov-2024	27-Nov-2024	27-Nov-2024
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**							
Dissolved CO2		N	1160	mg/l	0.60	6.8	2.2	4.3	5.7	7.2	12	3.6
Nitrite as NO2		U	1220	mg/l	0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	0.021	0.028
Nitrate as NO3		U	1220	mg/l	0.50	0.94	2.2	6.7	3.9	< 0.50	< 0.50	< 0.50
Orthophosphate as PO4		U	1220	mg/l	0.050	0.053	0.056	0.050	0.052	< 0.050	0.052	0.078
Sulphate		U	1220	mg/l	1.0	87	100	100	110	130	130	51
Sulphide		U	1325	mg/l	0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Iron (Dissolved)		N	1455	µg/l	5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Manganese [II]		N	1470	µg/l	1.0	130	< 1.0	< 1.0	120	2.6	120	23
Manganese [IV]		N	1470	µg/l	1.0	680	< 1.0	< 1.0	< 1.0	< 1.0	570	120
Iron [II]		N	1455	µg/l	20	< 20	< 20	< 20	20	< 20	< 20	20
Iron [III]		N	1455	µg/l	20	< 20	< 20	< 20	< 20	< 20	< 20	< 20
Total Inorganic Carbon		N	1220	mg/l	2.5	84	43	58	89	100	100	94
Total Organic Carbon		U	1610	mg/l	2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Dissolved Methane		N	1630	mg/l	0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Methanal (Formaldehyde)		N		mg/l	0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Dichlorodifluoromethane		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloromethane		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vinyl Chloride		N	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane		U	1760	µg/l	5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Chloroethane		U	1760	µg/l	2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Trichlorofluoromethane		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trans 1,2-Dichloroethene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
cis 1,2-Dichloroethene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromochloromethane		U	1760	µg/l	5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Trichloromethane		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloromethane		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloropropene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Benzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane		U	1760	µg/l	2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Trichloroethene		N	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibromomethane		U	1760	µg/l	10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Bromodichloromethane		U	1760	µg/l	5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
cis-1,3-Dichloropropene		N	1760	µg/l	10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Toluene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trans-1,3-Dichloropropene		N	1760	µg/l	10	< 10	< 10	< 10	< 10	< 10	< 10	< 10

Results - Water

Project: 24-260-01 Barclay Chemicals

Client: O Callaghan Moran & Associates				**Chemtest Job No.:**		24-39068	24-39068	24-39068	24-39068	24-39068	24-39068	24-39068
Quotation No.: Q23-33411				**Chemtest Sample ID.:**		1902335	1902336	1902337	1902338	1902339	1902340	1902341
Order No.: 24-260-01				Client Sample Ref.:		RC01	RC02	RC04	RC05	RC06	GW02A	BH01
				Sample Type:		WATER	WATER	WATER	WATER	WATER	WATER	WATER
				Sample Sub Type:		Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
				Date Sampled:		27-Nov-2024	27-Nov-2024	26-Nov-2024	26-Nov-2024	26-Nov-2024	27-Nov-2024	27-Nov-2024
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**							
1,1,2-Trichloroethane		U	1760	µg/l	10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Tetrachloroethene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichloropropane		U	1760	µg/l	2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Dibromochloromethane		U	1760	µg/l	10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
1,2-Dibromoethane		U	1760	µg/l	5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Chlorobenzene		N	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane		U	1760	µg/l	2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Ethylbenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Styrene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tribromomethane		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Isopropylbenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromobenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,3-Trichloropropane		N	1760	µg/l	50	< 50	< 50	< 50	< 50	< 50	< 50	< 50
N-Propylbenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2-Chlorotoluene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3,5-Trimethylbenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
4-Chlorotoluene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tert-Butylbenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trimethylbenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Sec-Butylbenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichlorobenzene		N	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
4-Isopropyltoluene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,4-Dichlorobenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
N-Butylbenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichlorobenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromo-3-Chloropropane		U	1760	µg/l	50	< 50	< 50	< 50	< 50	< 50	< 50	< 50
1,2,4-Trichlorobenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Hexachlorobutadiene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,3-Trichlorobenzene		U	1760	µg/l	2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Methyl Tert-Butyl Ether		N	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
N-Nitrosodimethylamine		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Phenol		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
2-Chlorophenol		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Bis-(2-Chloroethyl)Ether		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,3-Dichlorobenzene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,4-Dichlorobenzene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,2-Dichlorobenzene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50

Results - Water

Project: 24-260-01 Barclay Chemicals

Client: O Callaghan Moran & Associates						**Chemtest Job No.:**	24-39068	24-39068	24-39068	24-39068	24-39068	24-39068
Quotation No.: Q23-33411						**Chemtest Sample ID.:**	1902335	1902336	1902337	1902338	1902339	1902340	1902341
Order No.: 24-260-01						Client Sample Ref.:	RC01	RC02	RC04	RC05	RC06	GW02A	BH01
						Sample Type:	WATER	WATER	WATER	WATER	WATER	WATER	WATER
						Sample Sub Type:	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
						Date Sampled:	27-Nov-2024	27-Nov-2024	26-Nov-2024	26-Nov-2024	26-Nov-2024	27-Nov-2024	27-Nov-2024
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**								
2-Methylphenol (o-Cresol)		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Bis(2-Chloroisopropyl)Ether		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Hexachloroethane		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
N-Nitrosodi-n-propylamine		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
4-Methylphenol		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Nitrobenzene		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Isophorone		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
2-Nitrophenol		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
2,4-Dimethylphenol		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Bis(2-Chloroethoxy)Methane		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
2,4-Dichlorophenol		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,2,4-Trichlorobenzene		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Naphthalene		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
4-Chloroaniline		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Hexachlorobutadiene		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
4-Chloro-3-Methylphenol		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
2-Methylnaphthalene		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Hexachlorocyclopentadiene		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
2,4,6-Trichlorophenol		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
2,4,5-Trichlorophenol		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
2-Chloronaphthalene		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
2-Nitroaniline		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Acenaphthylene		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Dimethylphthalate		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
2,6-Dinitrotoluene		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Acenaphthene		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
3-Nitroaniline		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Dibenzofuran		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
4-Chlorophenylphenylether		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
2,4-Dinitrotoluene		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Fluorene		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Diethyl Phthalate		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
4-Nitroaniline		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
2-Methyl-4,6-Dinitrophenol		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Azobenzene		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
4-Bromophenylphenyl Ether		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Hexachlorobenzene		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Phenanthrene		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Anthracene		N	1790	µg/l	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50

Results - Water

Project: 24-260-01 Barclay Chemicals

Client: O Callaghan Moran & Associates				**Chemtest Job No.:**		24-39068	24-39068	24-39068	24-39068	24-39068	24-39068	24-39068
Quotation No.: Q23-33411				**Chemtest Sample ID.:**		1902335	1902336	1902337	1902338	1902339	1902340	1902341
Order No.: 24-260-01				Client Sample Ref.:		RC01	RC02	RC04	RC05	RC06	GW02A	BH01
				Sample Type:		WATER	WATER	WATER	WATER	WATER	WATER	WATER
				Sample Sub Type:		Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
				Date Sampled:		27-Nov-2024	27-Nov-2024	26-Nov-2024	26-Nov-2024	26-Nov-2024	27-Nov-2024	27-Nov-2024
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**							
Carbazole		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Di-N-Butyl Phthalate		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Fluoranthene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Pyrene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Butylbenzyl Phthalate		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Benzo[a]anthracene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Chrysene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Bis(2-Ethylhexyl)Phthalate		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Di-N-Octyl Phthalate		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Benzo[b]fluoranthene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Benzo[k]fluoranthene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Benzo[a]pyrene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Indeno(1,2,3-c,d)Pyrene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Dibenz(a,h)Anthracene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Benzo[g,h,i]perylene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
4-Nitrophenol		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50

Results - Water

Project: 24-260-01 Barclay Chemicals

Client: O Callaghan Moran & Associates				**Chemtest Job No.:**		24-39068	24-39068	24-39068	24-39068	24-39068
Quotation No.: Q23-33411				**Chemtest Sample ID.:**		1902342	1902343	1902344	1902345	1902346
Order No.: 24-260-01				Client Sample Ref.:		BH02	BH03A	BH04	BH05	BH06
				Sample Type:		WATER	WATER	WATER	WATER	WATER
				Sample Sub Type:		Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
				Date Sampled:		27-Nov-2024	27-Nov-2024	26-Nov-2024	26-Nov-2024	26-Nov-2024
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**					
Dissolved CO2		N	1160	mg/l	0.60	2.1	1.7	5.7	13	10
Nitrite as NO2		U	1220	mg/l	0.020	< 0.020	0.020	0.020	< 0.020	< 0.020
Nitrate as NO3		U	1220	mg/l	0.50	2.7	8.9	< 0.50	29	< 0.50
Orthophosphate as PO4		U	1220	mg/l	0.050	0.058	2.7	0.069	0.051	0.058
Sulphate		U	1220	mg/l	1.0	160	69	69	89	120
Sulphide		U	1325	mg/l	0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Iron (Dissolved)		N	1455	µg/l	5.0	< 5.0	< 5.0	12	< 5.0	< 5.0
Manganese [II]		N	1470	µg/l	1.0	< 1.0	< 1.0	120	< 1.0	52
Manganese [IV]		N	1470	µg/l	1.0	< 1.0	< 1.0	770	< 1.0	310
Iron [II]		N	1455	µg/l	20	20	< 20	< 20	< 20	< 20
Iron [III]		N	1455	µg/l	20	< 20	< 20	< 20	< 20	< 20
Total Inorganic Carbon		N	1220	mg/l	2.5	43	38	110	120	110
Total Organic Carbon		U	1610	mg/l	2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Dissolved Methane		N	1630	mg/l	0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Methanal (Formaldehyde)		N		mg/l	0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Dichlorodifluoromethane		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloromethane		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vinyl Chloride		N	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane		U	1760	µg/l	5	< 5	< 5	< 5	< 5	< 5
Chloroethane		U	1760	µg/l	2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Trichlorofluoromethane		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trans 1,2-Dichloroethene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
cis 1,2-Dichloroethene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromochloromethane		U	1760	µg/l	5	< 5	< 5	< 5	< 5	< 5
Trichloromethane		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloromethane		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloropropene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Benzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane		U	1760	µg/l	2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Trichloroethene		N	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibromomethane		U	1760	µg/l	10	< 10	< 10	< 10	< 10	< 10
Bromodichloromethane		U	1760	µg/l	5	< 5	< 5	< 5	< 5	< 5
cis-1,3-Dichloropropene		N	1760	µg/l	10	< 10	< 10	< 10	< 10	< 10
Toluene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trans-1,3-Dichloropropene		N	1760	µg/l	10	< 10	< 10	< 10	< 10	< 10

Results - Water

Project: 24-260-01 Barclay Chemicals

Client: O Callaghan Moran & Associates				**Chemtest Job No.:**		24-39068	24-39068	24-39068	24-39068	24-39068
Quotation No.: Q23-33411				**Chemtest Sample ID.:**		1902342	1902343	1902344	1902345	1902346
Order No.: 24-260-01				Client Sample Ref.:		BH02	BH03A	BH04	BH05	BH06
				Sample Type:		WATER	WATER	WATER	WATER	WATER
				Sample Sub Type:		Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
				Date Sampled:		27-Nov-2024	27-Nov-2024	26-Nov-2024	26-Nov-2024	26-Nov-2024
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**					
1,1,2-Trichloroethane		U	1760	µg/l	10	< 10	< 10	< 10	< 10	< 10
Tetrachloroethene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichloropropane		U	1760	µg/l	2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Dibromochloromethane		U	1760	µg/l	10	< 10	< 10	< 10	< 10	< 10
1,2-Dibromoethane		U	1760	µg/l	5	< 5	< 5	< 5	< 5	< 5
Chlorobenzene		N	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane		U	1760	µg/l	2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Ethylbenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Styrene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tribromomethane		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Isopropylbenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromobenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,3-Trichloropropane		N	1760	µg/l	50	< 50	< 50	< 50	< 50	< 50
N-Propylbenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2-Chlorotoluene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3,5-Trimethylbenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
4-Chlorotoluene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tert-Butylbenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trimethylbenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Sec-Butylbenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichlorobenzene		N	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
4-Isopropyltoluene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,4-Dichlorobenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
N-Butylbenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichlorobenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromo-3-Chloropropane		U	1760	µg/l	50	< 50	< 50	< 50	< 50	< 50
1,2,4-Trichlorobenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Hexachlorobutadiene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,3-Trichlorobenzene		U	1760	µg/l	2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Methyl Tert-Butyl Ether		N	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
N-Nitrosodimethylamine		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Phenol		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
2-Chlorophenol		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Bis-(2-Chloroethyl)Ether		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,3-Dichlorobenzene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,4-Dichlorobenzene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,2-Dichlorobenzene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50

Results - Water

Project: 24-260-01 Barclay Chemicals

Client: O Callaghan Moran & Associates		**Chemtest Job No.:**				24-39068	24-39068	24-39068	24-39068	24-39068
Quotation No.: Q23-33411		**Chemtest Sample ID.:**				1902342	1902343	1902344	1902345	1902346
Order No.: 24-260-01		Client Sample Ref.:				BH02	BH03A	BH04	BH05	BH06
		Sample Type:				WATER	WATER	WATER	WATER	WATER
		Sample Sub Type:				Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
		Date Sampled:				27-Nov-2024	27-Nov-2024	26-Nov-2024	26-Nov-2024	26-Nov-2024
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**					
2-Methylphenol (o-Cresol)		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Bis(2-Chloroisopropyl)Ether		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Hexachloroethane		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
N-Nitrosodi-n-propylamine		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
4-Methylphenol		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Nitrobenzene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Isophorone		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
2-Nitrophenol		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
2,4-Dimethylphenol		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Bis(2-Chloroethoxy)Methane		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
2,4-Dichlorophenol		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,2,4-Trichlorobenzene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Naphthalene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
4-Chloroaniline		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Hexachlorobutadiene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
4-Chloro-3-Methylphenol		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
2-Methylnaphthalene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Hexachlorocyclopentadiene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
2,4,6-Trichlorophenol		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
2,4,5-Trichlorophenol		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
2-Chloronaphthalene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
2-Nitroaniline		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Acenaphthylene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Dimethylphthalate		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
2,6-Dinitrotoluene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Acenaphthene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
3-Nitroaniline		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Dibenzofuran		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
4-Chlorophenylphenylether		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
2,4-Dinitrotoluene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Fluorene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Diethyl Phthalate		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
4-Nitroaniline		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
2-Methyl-4,6-Dinitrophenol		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Azobenzene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
4-Bromophenylphenyl Ether		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Hexachlorobenzene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Phenanthrene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Anthracene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50

Results - Water

Project: 24-260-01 Barclay Chemicals

Client: O Callaghan Moran & Associates				**Chemtest Job No.:**		24-39068	24-39068	24-39068	24-39068	24-39068
Quotation No.: Q23-33411				**Chemtest Sample ID.:**		1902342	1902343	1902344	1902345	1902346
Order No.: 24-260-01				Client Sample Ref.:		BH02	BH03A	BH04	BH05	BH06
				Sample Type:		WATER	WATER	WATER	WATER	WATER
				Sample Sub Type:		Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
				Date Sampled:		27-Nov-2024	27-Nov-2024	26-Nov-2024	26-Nov-2024	26-Nov-2024
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**					
Carbazole		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Di-N-Butyl Phthalate		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Fluoranthene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Pyrene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Butylbenzyl Phthalate		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Benzo[a]anthracene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Chrysene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Bis(2-Ethylhexyl)Phthalate		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Di-N-Octyl Phthalate		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Benzo[b]fluoranthene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Benzo[k]fluoranthene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Benzo[a]pyrene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Indeno(1,2,3-c,d)Pyrene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Dibenz(a,h)Anthracene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Benzo[g,h,i]perylene		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
4-Nitrophenol		N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50

Test Methods

SOP	Title	Parameters included	Method summary	Water Accred.
1010	pH Value of Waters	pH at 20°C	pH Meter	
1160	Aggressive Dissolved CO2	Aggressive Dissolved CO2	Titration	PL LE GW
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.	RE PW PL LE DW GW
1325	Sulphide in Waters	Sulphides	Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using N,N–dimethyl-pphenylenediamine.	PL LE GW
1455	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).	RE PW PL SW DW GW
1470	MnII and MnIV in Waters	MnII and MnIV	Mn(II): Filtration of samples followed by the colorimetric determination of Mn(II). Mn(IV): Calculation from total Manganese, determined by ICP-MS, and Manganese(II), determined colorimetrically; Mn(IV) = Tot Mn – Mn(II).	
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation	PL SW GW
1760	Volatile Organic Compounds (VOCs) in Waters by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics. (cf. USEPA Method 8260)	Automated headspace gas chromatographic (GC) analysis of water samples with mass spectrometric (MS) detection of volatile organic compounds.	PL GW
1790	Semi-Volatile Organic Compounds (SVOCs) in Waters by GC-MS	Semi-volatile organic compounds	Solvent extraction / GCMS detection	

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

This report shall not be reproduced except in full, and only with the prior approval of the laboratory.
Any comments or interpretations are outside the scope of UKAS accreditation.
The Laboratory is not accredited for any sampling activities and reported results relate to the samples 'as received' at the laboratory.
Uncertainty of measurement for the determinands tested are available upon request .
None of the results in this report have been recovery corrected.
All results are expressed on a dry weight basis.

The following tests were analysed on samples 'as received' and the results subsequently corrected to a dry weight basis EPH, VPH, TPH, BTEX, VOCs, SVOCs, PCBs, Phenols.

For all other tests the samples were dried at ≤ 30°C prior to analysis.
All Asbestos testing is performed at the indicated laboratory .
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1.

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt.
All water samples will be retained for 14 days from the date of receipt.
Charges may apply to extended sample storage.

Water Sample Category Key for Accreditation

DW - Drinking Water
GW - Ground Water
LE - Land Leachate
NA - Not Applicable

Report Information

PL - Prepared Leachate
PW - Processed Water
RE - Recreational Water
SA - Saline Water
SW - Surface Water
TE - Treated Effluent
TS - Treated Sewage
UL - Unspecified Liquid

Clean Up Codes

NC - No Clean Up
MC - Mathematical Clean Up
FC - Florisil Clean Up

HWOL Acronym System

HS - Headspace analysis
EH - Extractable hydrocarbons – i.e. everything extracted by the solvent
CU - Clean-up – e.g. by Florisil, silica gel
1D - GC – Single coil gas chromatography
Total - Aliphatics & Aromatics
AL - Aliphatics only
AR - Aromatic only
2D - GC-GC – Double coil gas chromatography
#1 - EH_2D_Total but with humics mathematically subtracted
#2 - EH_2D_Total but with fatty acids mathematically subtracted
+ - Operator to indicate cumulative e.g. EH+EH_Total or EH_CU+HS_Total

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

FITZ SCIENTIFIC
MONITORING & TESTING

Unit 35,
Boyne Business Park,
Drogheda,
Co. Louth,
Ireland
Tel: +353 41 9845440
Fax: +353 41 9846171
Web: www.fitzsci.ie
Email: info@fitzsci.ie

A copy of this certificate is available on www.fitzsci.ie.

Customer supplied information appear in italics.

Customer	*Marzena Nowakowska* *O'Callaghan Moran & Associates* *Unit 15 Melbourne Business Park* *Model Farm Road* *Cork*	Lab Report Ref. No.	2874/2411010/01
		Date of Receipt	27/11/2024
		Sampled On	*26/11/2024*
		Date Testing Commenced	27/11/2024
		Received or Collected	Courier DX
		Condition on Receipt	Acceptable
Customer PO	*24-260-01*	Date of Report	11/12/2024
Customer Ref	*RC06*	*Sample Type*	*Ground Water*
Ref 2			
Ref 3			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
AMPA (Ground)	579	LCMS/MS With Derivitisation	<0.002	ug/L	INAB
Glyphosate (Ground)	579	LCMS/MS With Derivitisation	<0.0017	ug/L	INAB

Signed: Katherine ni Quillen **Date: 11/12/2024**

Katherine McQuillan - Technical Manager

Acc. : Accredited Parameters by ISO/IEC 17025:2017

For bacterial analysis a result of 0 means none detected in volume examined
All organic results are analysed as received and all results are corrected for dry weight at 104 C
Results shall not be reproduced, except in full, without the approval of Fitz Scientific
Results contained in this report relate only to the samples tested (P) : Presumptive Results

** : The test result for this parameter may be invalid as it has exceeded the recommended holding time (BS EN ISO 5667-3:2024)

Final results will be issued without any estimated uncertainty of measurement being applied. This can be supplied on request.
Fitz Scientific maintain all customer information in the strictest confidence which is legally enforceable.

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MONITORING & TESTING

Unit 35,
Boyne Business Park,
Drogheda,
Co. Louth,
Ireland
Tel: +353 41 9845440
Fax: +353 41 9846171
Web: www.fitzsci.ie
Email: info@fitzsci.ie

A copy of this certificate is available on www.fitzsci.ie.

Customer supplied information appear in italics.

Customer	*Marzena Nowakowska* *O'Callaghan Moran & Associates* *Unit 15 Melbourne Business Park* *Model Farm Road* *Cork*	Lab Report Ref. No.	2874/2411010/02
		Date of Receipt	27/11/2024
		Sampled On	*26/11/2024*
		Date Testing Commenced	27/11/2024
		Received or Collected	Courier DX
		Condition on Receipt	Acceptable
Customer PO	*24-260-01*	Date of Report	11/12/2024
Customer Ref	*BH06*	*Sample Type*	*Ground Water*
Ref 2			
Ref 3			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
AMPA (Ground)	579	LCMS/MS With Derivitisation	<0.002	ug/L	INAB
Glyphosate (Ground)	579	LCMS/MS With Derivitisation	<0.0017	ug/L	INAB

Signed: Katherine ni Quillen **Date: 11/12/2024**

Katherine McQuillan - Technical Manager

Acc. : Accredited Parameters by ISO/IEC 17025:2017

For bacterial analysis a result of 0 means none detected in volume examined
All organic results are analysed as received and all results are corrected for dry weight at 104 C
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Results contained in this report relate only to the samples tested (P) : Presumptive Results

** : The test result for this parameter may be invalid as it has exceeded the recommended holding time (BS EN ISO 5667-3:2024)

Final results will be issued without any estimated uncertainty of measurement being applied. This can be supplied on request.
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Ireland
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Fax: +353 41 9846171
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Email: info@fitzsci.ie

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Customer supplied information appear in italics.

Customer	*Marzena Nowakowska* *O'Callaghan Moran & Associates* *Unit 15 Melbourne Business Park* *Model Farm Road* *Cork*	Lab Report Ref. No.	2874/2411010/03
		Date of Receipt	27/11/2024
		Sampled On	*26/11/2024*
		Date Testing Commenced	27/11/2024
		Received or Collected	Courier DX
		Condition on Receipt	Acceptable
Customer PO	*24-260-01*	Date of Report	11/12/2024
Customer Ref	*RC04*	*Sample Type*	*Ground Water*
Ref 2			
Ref 3			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
AMPA (Ground)	579	LCMS/MS With Derivitisation	<0.002	ug/L	INAB
Glyphosate (Ground)	579	LCMS/MS With Derivitisation	<0.0017	ug/L	INAB

Signed: Katherine Mc Quillen **Date: 11/12/2024**

Katherine McQuillan - Technical Manager

Acc. : Accredited Parameters by ISO/IEC 17025:2017

For bacterial analysis a result of 0 means none detected in volume examined
All organic results are analysed as received and all results are corrected for dry weight at 104 C
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Customer supplied information appear in italics.

Customer	*Marzena Nowakowska* *O'Callaghan Moran & Associates* *Unit 15 Melbourne Business Park* *Model Farm Road* *Cork*	Lab Report Ref. No.	2874/2411010/04
		Date of Receipt	27/11/2024
		Sampled On	*26/11/2024*
		Date Testing Commenced	27/11/2024
		Received or Collected	Courier DX
		Condition on Receipt	Acceptable
Customer PO	*24-260-01*	Date of Report	11/12/2024
Customer Ref	*BH04*	*Sample Type*	*Ground Water*
Ref 2			
Ref 3			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
AMPA (Ground)	579	LCMS/MS With Derivitisation	<0.002	ug/L	INAB
Glyphosate (Ground)	579	LCMS/MS With Derivitisation	<0.0017	ug/L	INAB

Signed: Katherine ni Quillen **Date: 11/12/2024**

Katherine McQuillan - Technical Manager

Acc. : Accredited Parameters by ISO/IEC 17025:2017

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Customer	*Marzena Nowakowska* *O'Callaghan Moran & Associates* *Unit 15 Melbourne Business Park* *Model Farm Road* *Cork*	Lab Report Ref. No.	2874/2411010/05
		Date of Receipt	27/11/2024
		Sampled On	*26/11/2024*
		Date Testing Commenced	27/11/2024
		Received or Collected	Courier DX
		Condition on Receipt	Acceptable
Customer PO	*24-260-01*	Date of Report	11/12/2024
Customer Ref	*BH05*	*Sample Type*	*Ground Water*
Ref 2			
Ref 3			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
AMPA (Ground)	579	LCMS/MS With Derivitisation	<0.002	ug/L	INAB
Glyphosate (Ground)	579	LCMS/MS With Derivitisation	<0.0017	ug/L	INAB

Signed: Katherine ní Quillen **Date: 11/12/2024**

Katherine McQuillan - Technical Manager

Acc. : Accredited Parameters by ISO/IEC 17025:2017

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Customer	*Marzena Nowakowska* *O'Callaghan Moran & Associates* *Unit 15 Melbourne Business Park* *Model Farm Road* *Cork*	Lab Report Ref. No.	2874/2411010/06
		Date of Receipt	27/11/2024
		Sampled On	*26/11/2024*
		Date Testing Commenced	27/11/2024
		Received or Collected	Courier DX
		Condition on Receipt	Acceptable
Customer PO	*24-260-01*	Date of Report	11/12/2024
Customer Ref	*RC05*	*Sample Type*	*Ground Water*
Ref 2			
Ref 3			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
AMPA (Ground)	579	LCMS/MS With Derivitisation	<0.002	ug/L	INAB
Glyphosate (Ground)	579	LCMS/MS With Derivitisation	<0.0017	ug/L	INAB

Signed: Katherine McQuillan **Date: 11/12/2024**

Katherine McQuillan - Technical Manager

Acc. : Accredited Parameters by ISO/IEC 17025:2017

For bacterial analysis a result of 0 means none detected in volume examined
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Customer	*Marzena Nowakowska* *O'Callaghan Moran & Associates* *Unit 15 Melbourne Business Park* *Model Farm Road* *Cork*	Lab Report Ref. No.	2874/2411010/07
		Date of Receipt	27/11/2024
		Sampled On	*27/11/2024*
		Date Testing Commenced	27/11/2024
		Received or Collected	Courier DX
		Condition on Receipt	Acceptable
Customer PO	*24-260-01*	Date of Report	11/12/2024
Customer Ref	*RC02*	*Sample Type*	*Ground Water*
Ref 2			
Ref 3			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
AMPA (Ground)	579	LCMS/MS With Derivitisation	<0.002	ug/L	INAB
Glyphosate (Ground)	579	LCMS/MS With Derivitisation	<0.0017	ug/L	INAB

Signed: Katherine Mc Quillen **Date: 11/12/2024**

Katherine McQuillan - Technical Manager

Acc. : Accredited Parameters by ISO/IEC 17025:2017

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** : The test result for this parameter may be invalid as it has exceeded the recommended holding time (BS EN ISO 5667-3:2024)

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Customer	*Marzena Nowakowska* *O'Callaghan Moran & Associates* *Unit 15 Melbourne Business Park* *Model Farm Road* *Cork*	Lab Report Ref. No.	2874/2411010/08
		Date of Receipt	27/11/2024
		Sampled On	*27/11/2024*
		Date Testing Commenced	27/11/2024
		Received or Collected	Courier DX
		Condition on Receipt	Acceptable
Customer PO	*24-260-01*	Date of Report	11/12/2024
Customer Ref	*BH02*	*Sample Type*	*Ground Water*
Ref 2			
Ref 3			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
AMPA (Ground)	579	LCMS/MS With Derivitisation	<0.002	ug/L	INAB
Glyphosate (Ground)	579	LCMS/MS With Derivitisation	<0.0017	ug/L	INAB

Signed: Katherine ní Quillen **Date: 11/12/2024**

Katherine McQuillan - Technical Manager

Acc. : Accredited Parameters by ISO/IEC 17025:2017

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Customer	*Marzena Nowakowska* *O'Callaghan Moran & Associates* *Unit 15 Melbourne Business Park* *Model Farm Road* *Cork*	Lab Report Ref. No.	2874/2411010/09
		Date of Receipt	27/11/2024
		Sampled On	*27/11/2024*
		Date Testing Commenced	27/11/2024
		Received or Collected	Courier DX
		Condition on Receipt	Acceptable
Customer PO	*24-260-01*	Date of Report	11/12/2024
Customer Ref	*GW2A*	*Sample Type*	*Ground Water*
Ref 2			
Ref 3			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
AMPA (Ground)	579	LCMS/MS With Derivitisation	<0.002	ug/L	INAB
Glyphosate (Ground)	579	LCMS/MS With Derivitisation	<0.0017	ug/L	INAB

Signed: Katherine ní Quillen **Date: 11/12/2024**

Katherine McQuillan - Technical Manager

Acc. : Accredited Parameters by ISO/IEC 17025:2017

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Customer	*Marzena Nowakowska* *O'Callaghan Moran & Associates* *Unit 15 Melbourne Business Park* *Model Farm Road* *Cork*	Lab Report Ref. No.	2874/2411010/10
		Date of Receipt	27/11/2024
		Sampled On	*27/11/2024*
		Date Testing Commenced	27/11/2024
		Received or Collected	Courier DX
		Condition on Receipt	Acceptable
Customer PO	*24-260-01*	Date of Report	16/12/2024
Customer Ref	*BH3A*	*Sample Type*	*Ground Water*
Ref 2			
Ref 3			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
AMPA (Ground)	579	LCMS/MS With Derivitisation	428.250	ug/L	
Glyphosate (Ground)	579	LCMS/MS With Derivitisation	0.0846	ug/L	INAB

Signed: A Harmon **Date: 16/12/2024**

Aoife Harmon - Laboratory Supervisor

Acc. : Accredited Parameters by ISO/IEC 17025:2017

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Customer	*Marzena Nowakowska* *O'Callaghan Moran & Associates* *Unit 15 Melbourne Business Park* *Model Farm Road* *Cork*	Lab Report Ref. No.	2874/2411010/11
		Date of Receipt	27/11/2024
		Sampled On	*27/11/2024*
		Date Testing Commenced	27/11/2024
		Received or Collected	Courier DX
		Condition on Receipt	Acceptable
Customer PO	*24-260-01*	Date of Report	13/12/2024
Customer Ref	*BH01*	*Sample Type*	*Ground Water*
Ref 2			
Ref 3			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
AMPA (Ground)	579	LCMS/MS With Derivitisation	78.920	ug/L	
Glyphosate (Ground)	579	LCMS/MS With Derivitisation	7.5500	ug/L	

Signed: Katherine McQuillan **Date: 13/12/2024**

Katherine McQuillan - Technical Manager

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Customer	*Marzena Nowakowska* *O'Callaghan Moran & Associates* *Unit 15 Melbourne Business Park* *Model Farm Road* *Cork*	Lab Report Ref. No.	2874/2411010/12
		Date of Receipt	27/11/2024
		Sampled On	*27/11/2024*
		Date Testing Commenced	27/11/2024
		Received or Collected	Courier DX
		Condition on Receipt	Acceptable
Customer PO	*24-260-01*	Date of Report	11/12/2024
Customer Ref	*RC01*	*Sample Type*	*Ground Water*
Ref 2			
Ref 3			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
AMPA (Ground)	579	LCMS/MS With Derivitisation	0.086	ug/L	INAB
Glyphosate (Ground)	579	LCMS/MS With Derivitisation	0.0881	ug/L	INAB

Signed: Katherine ni Quillan **Date: 11/12/2024**

Katherine McQuillan - Technical Manager

Acc. : Accredited Parameters by ISO/IEC 17025:2017

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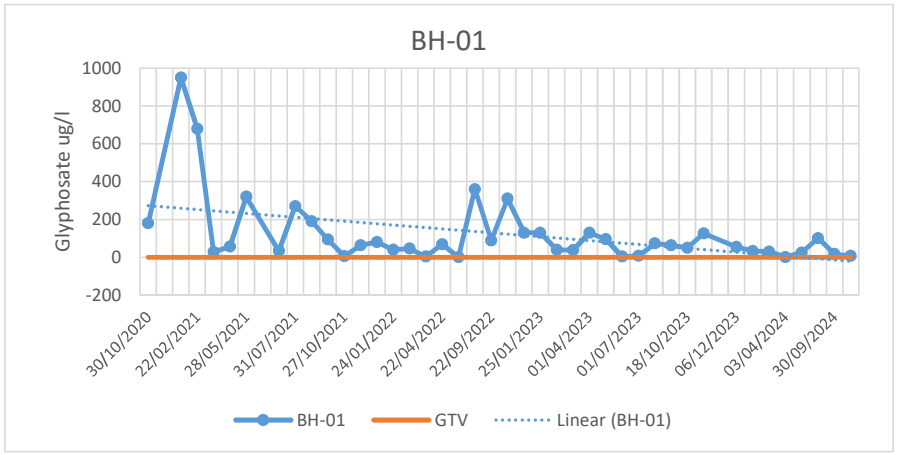
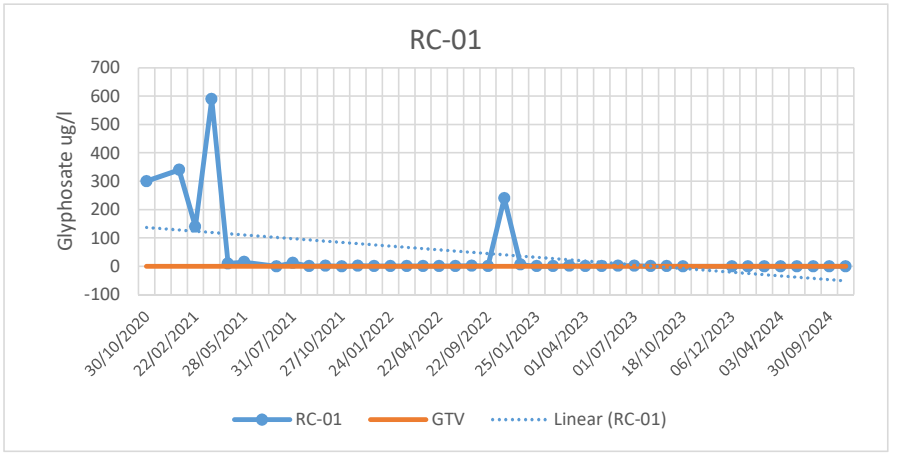
APPENDIX C – GLYPHOSATE AND AMPA CONCENTRATION TRENDS


BH-01
Glyphosate ug/l
1000
800
600
400
200
0
-200
30/10/2020
22/02/2021
28/05/2021
31/07/2021
27/10/2021
24/01/2022
22/04/2022
22/09/2022
25/01/2023
01/04/2023
01/07/2023
18/10/2023
06/12/2023
03/04/2024
30/09/2024
BH-01
GTV
Linear (BH-01)


RC-01
Glyphosate ug/l
700
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500
400
300
200
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-100
30/10/2020
22/02/2021
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31/07/2021
27/10/2021
24/01/2022
22/04/2022
22/09/2022
25/01/2023
01/04/2023
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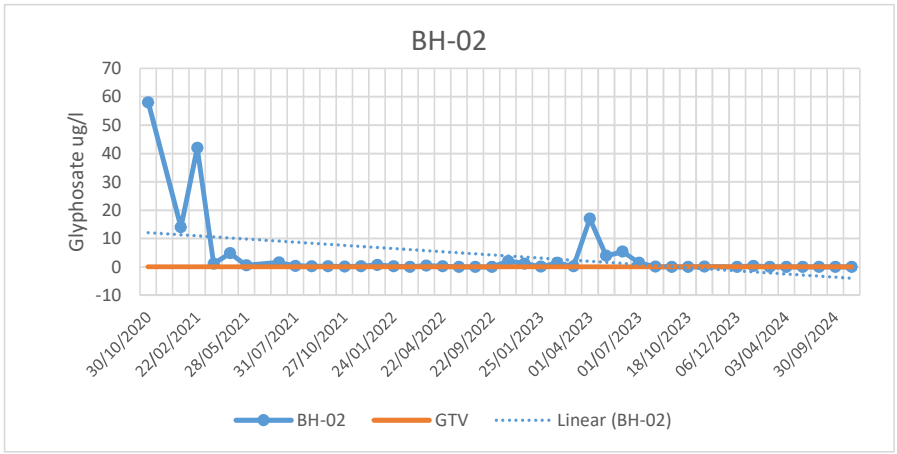
30/09/2024
RC-01
GTV
Linear (RC-01)


BH-02
Glyphosate ug/l
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60
50
40
30
20
10
0
-10
30/10/2020
22/02/2021
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31/07/2021
27/10/2021
24/01/2022
22/04/2022
22/09/2022
25/01/2023
01/04/2023
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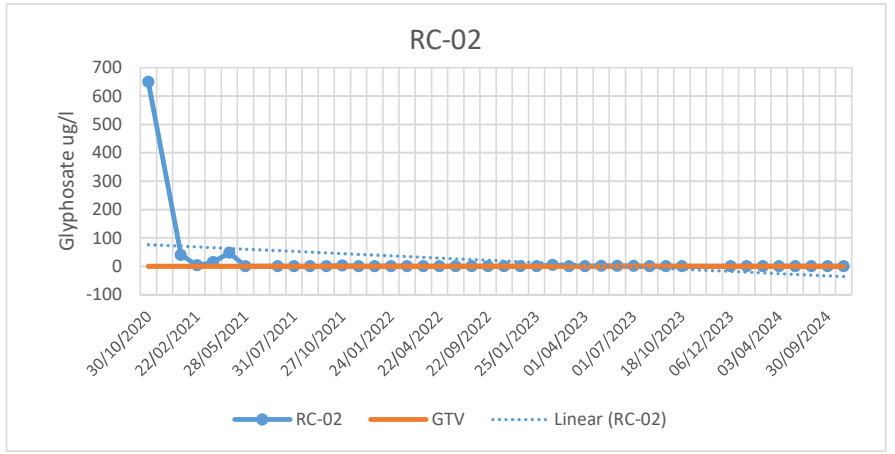
30/09/2024
BH-02
GTV
Linear (BH-02)


RC-02
Glyphosate ug/l
700
600
500
400
300
200
100
0
-100
30/10/2020
22/02/2021
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31/07/2021
27/10/2021
24/01/2022
22/04/2022
22/09/2022
25/01/2023
01/04/2023
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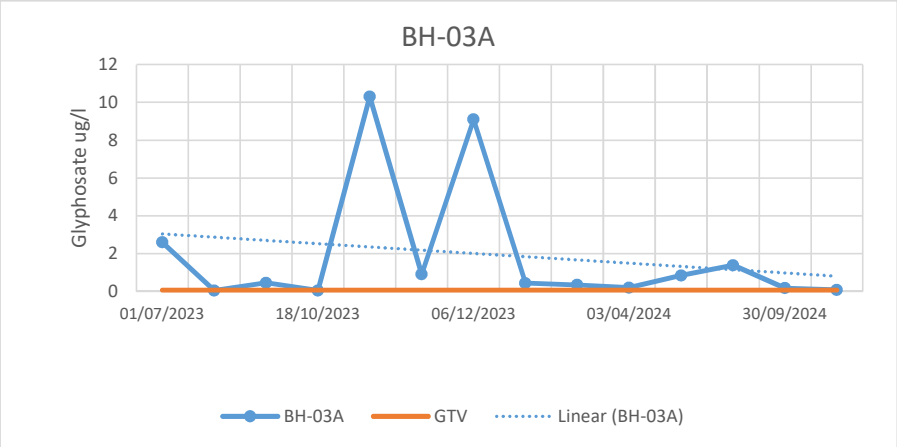
30/09/2024
RC-02
GTV
Linear (RC-02)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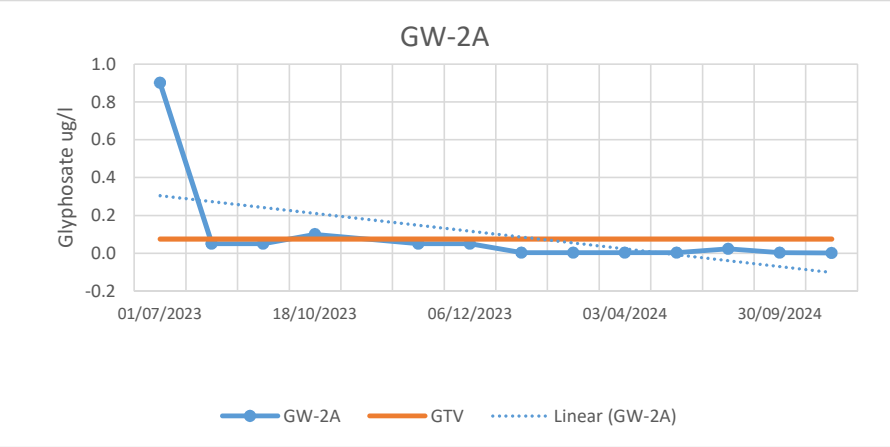
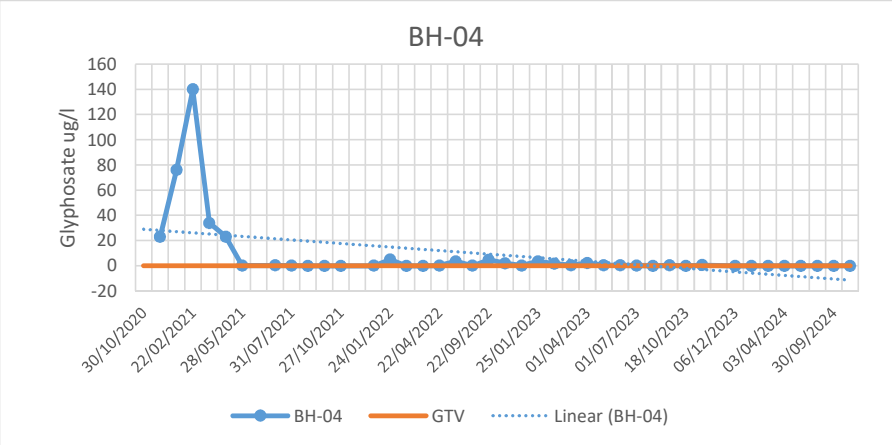
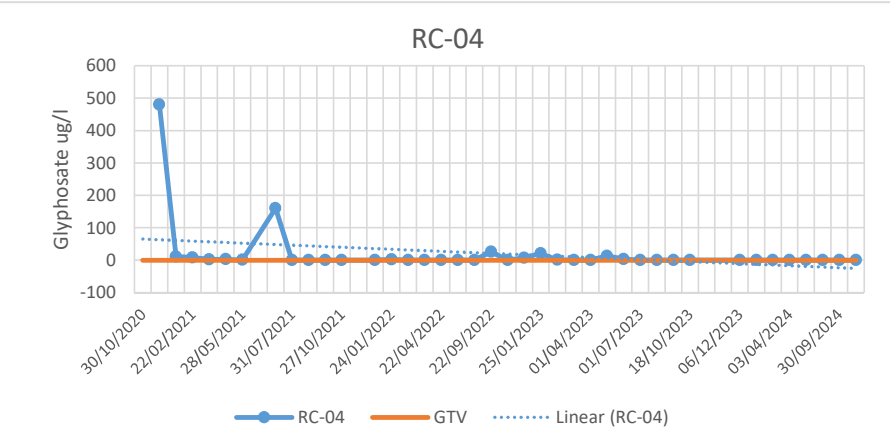
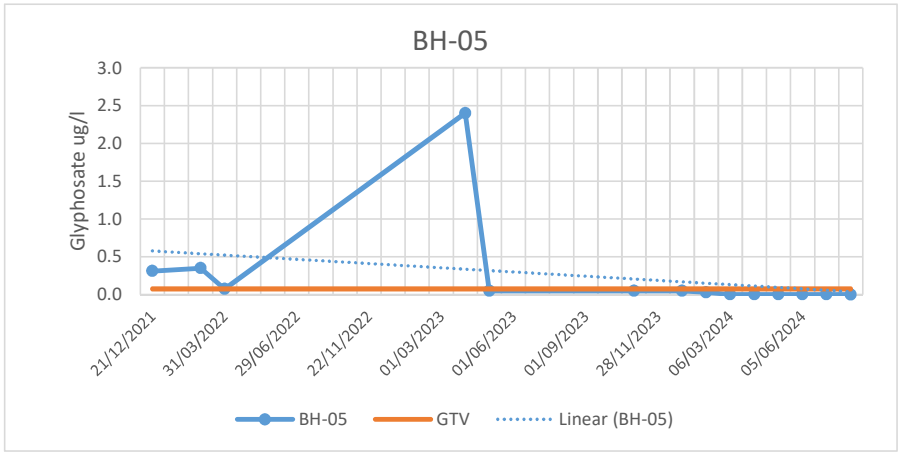
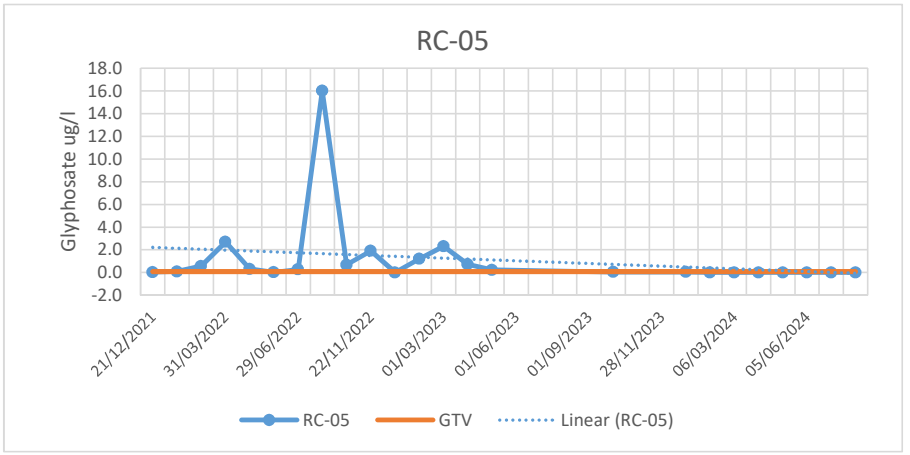
Glyphosate ug/l
12
10
8
6
4
2
0
01/07/2023
18/10/2023
06/12/2023
03/04/2024
30/09/2024
BH-03A
GTV
Linear (BH-03A)

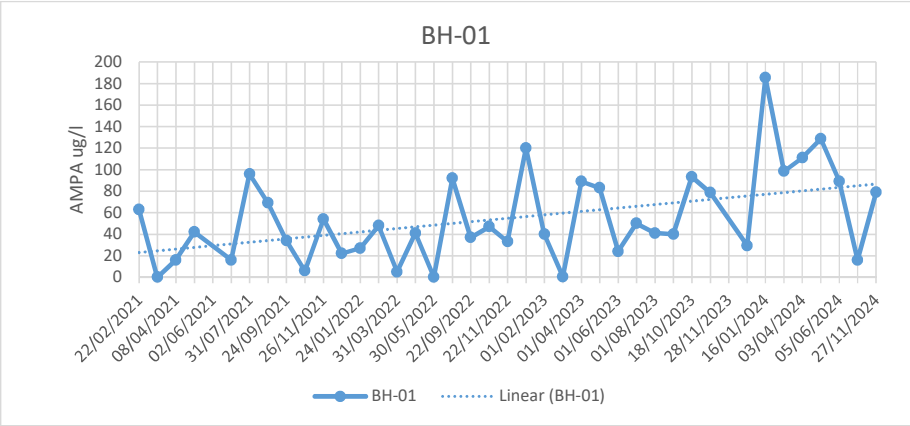

GW-2A
Glyphosate ug/l
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
01/07/2023
18/10/2023
06/12/2023
03/04/2024
30/09/2024
GW-2A
GTV
Linear (GW-2A)

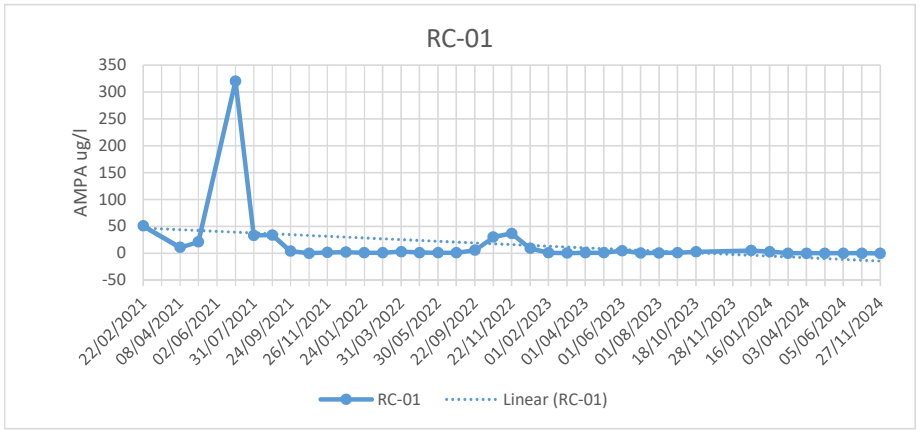

BH-04
Glyphosate ug/l
160
140
120
100
80
60
40
20
0
-20
30/10/2020
22/02/2021
28/05/2021
31/07/2021
27/10/2021
24/01/2022
22/04/2022
22/09/2022
25/01/2023
01/04/2023
01/07/2023
18/10/2023
06/12/2023
03/04/2024
30/09/2024
BH-04
GTV
Linear (BH-04)

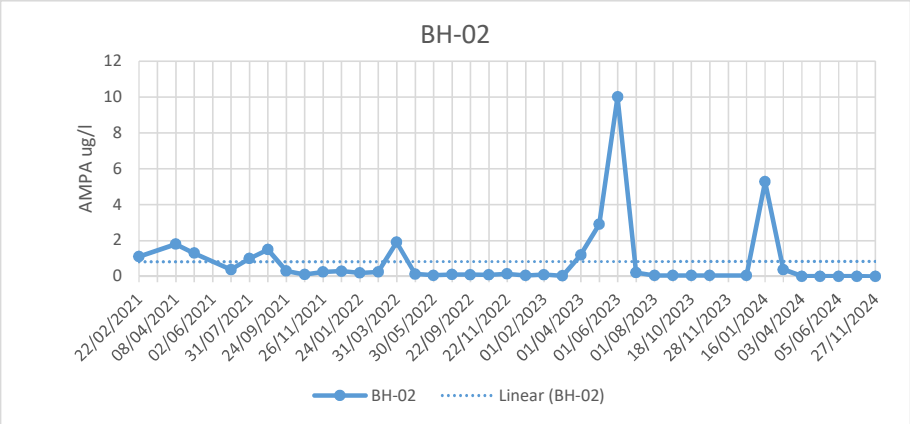

RC-04
Glyphosate ug/l
600
500
400
300
200
100
0
-100
30/10/2020
22/02/2021
28/05/2021
31/07/2021
27/10/2021
24/01/2022
22/04/2022
22/09/2022
25/01/2023
01/04/2023
01/07/2023
18/10/2023
06/12/2023
03/04/2024
30/09/2024
RC-04
GTV
Linear (RC-04)

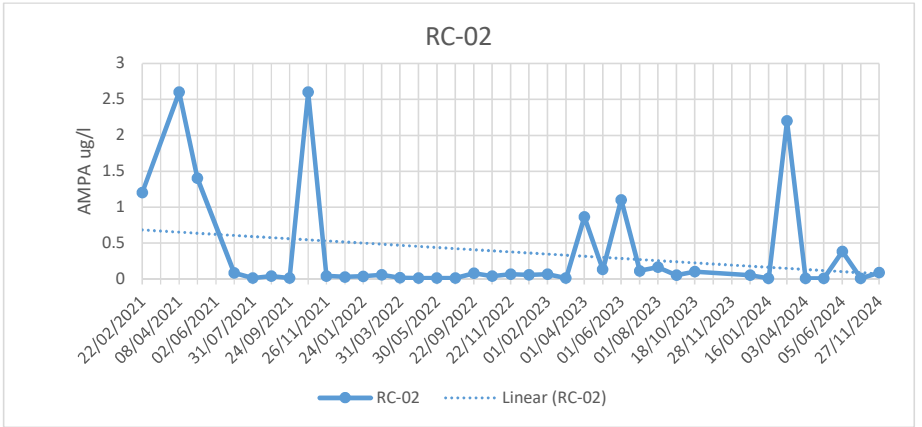

BH-05
Glyphosate ug/l
3.0
2.5
2.0
1.5
1.0
0.5
0.0
21/12/2021
31/03/2022
29/06/2022
22/11/2022
01/03/2023
01/06/2023
01/09/2023
28/11/2023
06/03/2024
05/06/2024
BH-05
GTV
Linear (BH-05)


RC-05
Glyphosate ug/l
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
-2.0
21/12/2021
31/03/2022
29/06/2022
22/11/2022
01/03/2023
01/06/2023
01/09/2023
28/11/2023
06/03/2024
05/06/2024
RC-05
GTV
Linear (RC-05)


BH-01
AMPA ug/l
200
180
160
140
120
100
80
60
40
20
0
22/02/2021
08/04/2021
02/06/2021
31/07/2021
24/09/2021
26/11/2021
24/01/2022
31/03/2022
30/05/2022
22/09/2022
22/11/2022
01/02/2023
01/04/2023
01/06/2023
01/08/2023
18/10/2023
28/11/2023
16/01/2024
03/04/2024
05/06/2024
27/11/2024
BH-01
Linear (BH-01)


RC-01
AMPA ug/l
350
300
250
200
150
100
50
0
-50
22/02/2021
08/04/2021
02/06/2021
31/07/2021
24/09/2021
26/11/2021
24/01/2022
31/03/2022
30/05/2022
22/09/2022
22/11/2022
01/02/2023
01/04/2023
01/06/2023
01/08/2023
18/10/2023
28/11/2023
16/01/2024
03/04/2024
05/06/2024
27/11/2024
RC-01
Linear (RC-01)


BH-02
AMPA ug/l
12
10
8
6
4
2
0
22/02/2021
08/04/2021
02/06/2021
31/07/2021
24/09/2021
26/11/2021
24/01/2022
31/03/2022
30/05/2022
22/09/2022
22/11/2022
01/02/2023
01/04/2023
01/06/2023
01/08/2023
18/10/2023
28/11/2023
16/01/2024
03/04/2024
05/06/2024
27/11/2024
BH-02
Linear (BH-02)


RC-02
AMPA ug/l
3
2.5
2
1.5
1
0.5
0
22/02/2021
08/04/2021
02/06/2021
31/07/2021
24/09/2021
26/11/2021
24/01/2022
31/03/2022
30/05/2022
22/09/2022
22/11/2022
01/02/2023
01/04/2023
01/06/2023
01/08/2023
18/10/2023
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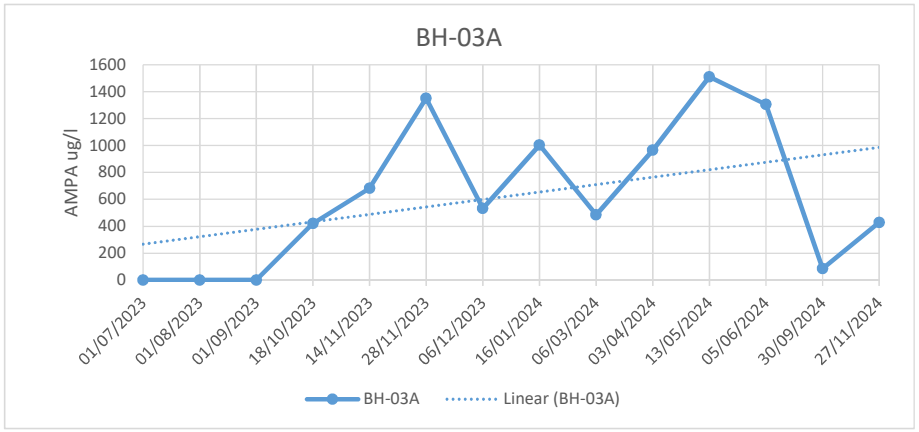
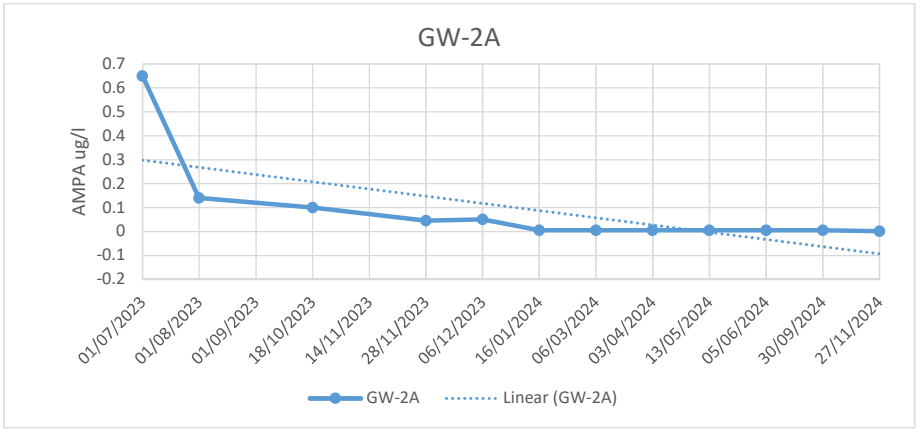
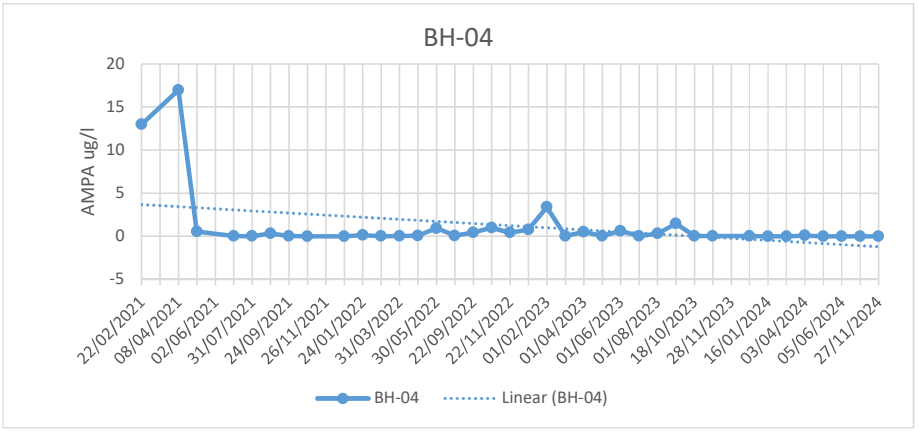
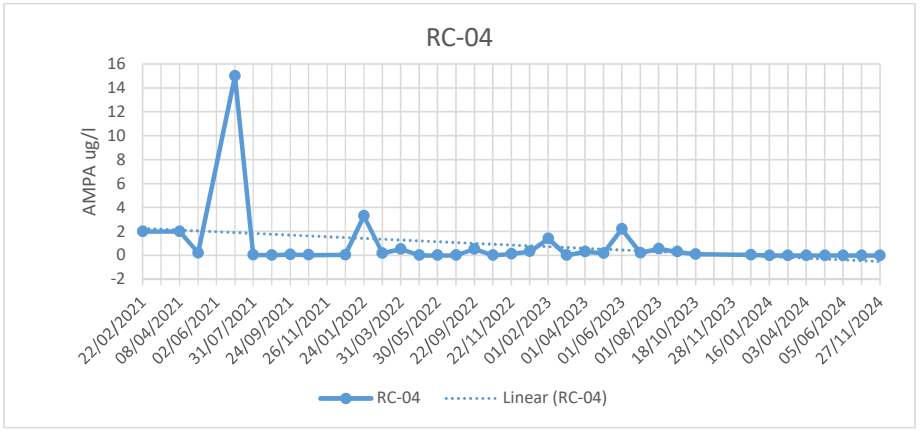
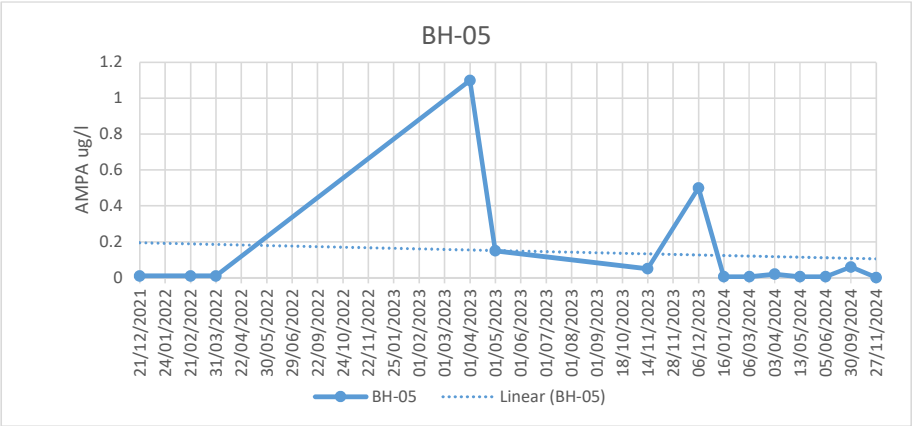
16/01/2024
03/04/2024
05/06/2024
27/11/2024
RC-02
Linear (RC-02)


BH-03A
AMPA ug/l
1600
1400
1200
1000
800
600
400
200
0
01/07/2023
01/08/2023
01/09/2023
18/10/2023
14/11/2023
28/11/2023
06/12/2023
16/01/2024
06/03/2024
03/04/2024
13/05/2024
05/06/2024
30/09/2024
27/11/2024
BH-03A
Linear (BH-03A)


GW-2A
AMPA ug/l
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
01/07/2023
01/08/2023
01/09/2023
18/10/2023
14/11/2023
28/11/2023
06/12/2023
16/01/2024
06/03/2024
03/04/2024
13/05/2024
05/06/2024
30/09/2024
27/11/2024
GW-2A
Linear (GW-2A)


BH-04
AMPA ug/l
20
15
10
5
0
-5
22/02/2021
08/04/2021
02/06/2021
31/07/2021
24/09/2021
26/11/2021
24/01/2022
31/03/2022
30/05/2022
22/09/2022
22/11/2022
01/02/2023
01/04/2023
01/06/2023
01/08/2023
18/10/2023
28/11/2023
16/01/2024
03/04/2024
05/06/2024
27/11/2024
BH-04
Linear (BH-04)


RC-04
AMPA ug/l
16
14
12
10
8
6
4
2
0
-2
22/02/2021
08/04/2021
02/06/2021
31/07/2021
24/09/2021
26/11/2021
24/01/2022
31/03/2022
30/05/2022
22/09/2022
22/11/2022
01/02/2023
01/04/2023
01/06/2023
01/08/2023
18/10/2023
28/11/2023
16/01/2024
03/04/2024
05/06/2024
27/11/2024
RC-04
Linear (RC-04)


BH-05
AMPA ug/l
1.2
1
0.8
0.6
0.4
0.2
0
21/12/2021
24/01/2022
21/02/2022
31/03/2022
22/04/2022
30/05/2022
29/06/2022
22/09/2022
24/10/2022
22/11/2022
25/01/2023
01/02/2023
01/03/2023
01/04/2023
01/05/2023
01/06/2023
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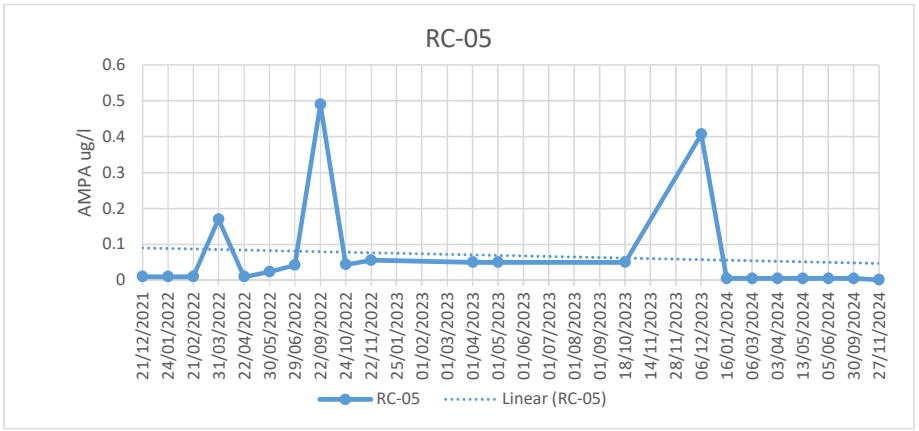
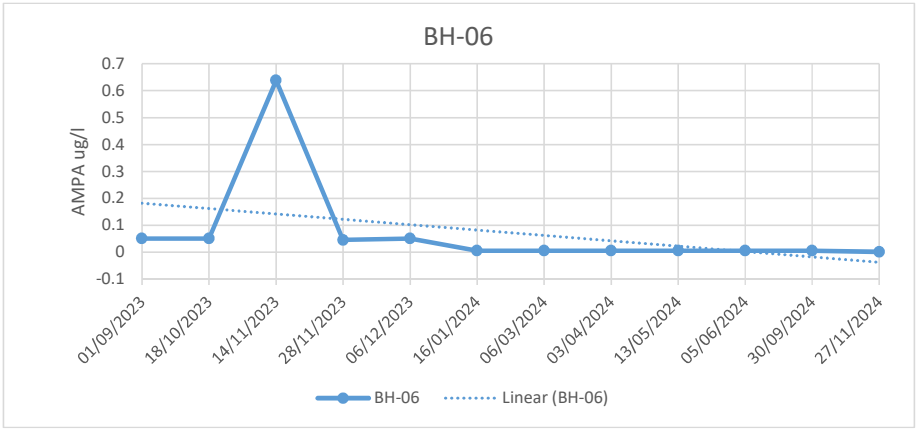
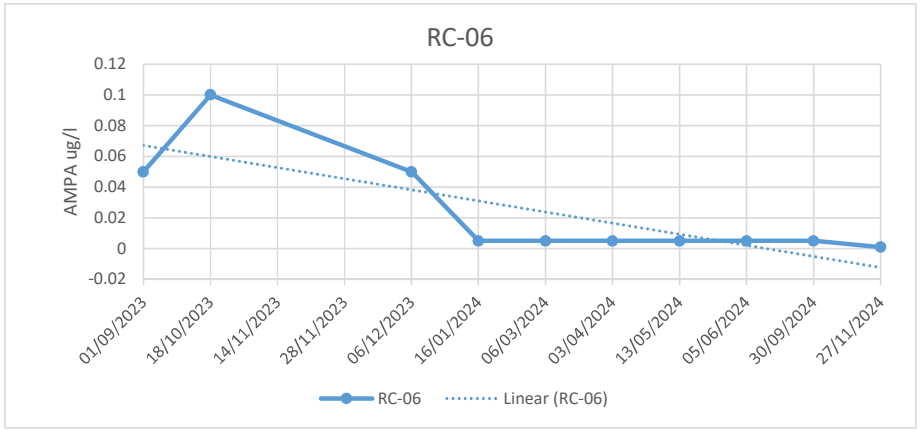
01/08/2023
01/09/2023
18/10/2023
14/11/2023
28/11/2023
06/12/2023
16/01/2024
06/03/2024
03/04/2024
13/05/2024
05/06/2024
30/09/2024
27/11/2024
BH-05
Linear (BH-05)


RC-05
AMPA ug/l
0.6
0.5
0.4
0.3
0.2
0.1
0
21/12/2021
24/01/2022
21/02/2022
31/03/2022
22/04/2022
30/05/2022
29/06/2022
22/09/2022
24/10/2022
22/11/2022
25/01/2023
01/02/2023
01/03/2023
01/04/2023
01/05/2023
01/06/2023
01/07/2023
01/08/2023
01/09/2023
18/10/2023
14/11/2023
28/11/2023
06/12/2023
16/01/2024
06/03/2024
03/04/2024
13/05/2024
05/06/2024
30/09/2024
27/11/2024
RC-05
Linear (RC-05)


BH-06
AMPA ug/l
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
01/09/2023
18/10/2023
14/11/2023
28/11/2023
06/12/2023
16/01/2024
06/03/2024
03/04/2024
13/05/2024
05/06/2024
30/09/2024
27/11/2024
BH-06
Linear (BH-06)


RC-06
AMPA ug/l
0.12
0.1
0.08
0.06
0.04
0.02
0
-0.02
01/09/2023
18/10/2023
14/11/2023
28/11/2023
06/12/2023
16/01/2024
06/03/2024
03/04/2024
13/05/2024
05/06/2024
30/09/2024
27/11/2024
RC-06
Linear (RC-06)