Technical Report – Water Quality and Discharge

Prepared by Kaya Consulting
Instructed by Dalradian Gold Limited

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Contents

1. Introduction

1.1 Numerous consultees to the Transboundary Consultation for the Curraghinalt mine raised issues related to the impact of discharges from the mine on river flows and water quality. Particularly the comments related to the impact of the discharges to flows and water quality in the River Foyle and River Finn.

1.2 Key consultation points raised are outlined in Table 1-1, but there were other generic comments on water quality and flows made by other consultees.

1.3 This technical report addresses these comments providing further information on the impact of the mine on flows and water quality in the River Foyle and River Finn. The report also provides further information on the discharge consent values proposed by DGL with direct reference to the Loughs Agency (LA) Point 5.1, presented in Table 1-1.

Table 1-1: Summary of Key Transboundary Consultations Highlighting Flow and Water Quality Concerns related to Site Discharge

Key Consultations
Loughs Agency Point 5.1 *Loughs Agency have reviewed RR 6 Surface Water and welcome concessions made by the applicant to meet discharge standards which would have a negligible impact on salmonids. There are however still a number of outstanding parameters which when viewed cumulatively, pose a risk of negative impacts on aquatic species, for example the applicant has classified watercourses into which discharges will be made as rivers instead of headwaters, which gives them an incorrect, higher discharge threshold. 21 of the 31 parameters are outside relevant thresholds and standards, including suspended solids, nitrates and phosphorous. Loughs Agency supports NIEA's position in relation to impacts from the proposed discharge parameters.*
Letter from Joy Baird *The mine will generate toxic tailings containing arsenic, lead, and cadmium, as identified in studies of similar mining operations. The World Health Organization (WHO) recognises these substances as severe health hazards, linked to cancer, kidney disease, and developmental issues in children.* *The Environmental Protection Agency (EPA) confirms that even low levels of heavy metals in drinking water can have cumulative toxic effects, particularly on vulnerable populations.* *The North Western International River Basin District (IRBD) has identified the River Foyle as already under pressure from diffuse pollution. The addition of mining contaminants risks irreversible damage.*
An Taisce *Section 4.1 contains comments on the impact of heavy metals in mine discharge on water quality in the River Finn and River Foyle* *Section 4.2 contains comments related to water quality at closure* *Section 4.3 seeks additional information on the impact on water quality in the River Finn and River Foyle. It also comments on the choice of standards used in the assessment.*
EPA *Comments on potential impact of mine on River Foyle*

2. Discharge Consent Parameters

2.1 Updated discharge consent values were presented in the DGL Water Discharge SoC. The key update to the discharge consent values (from 2020 ES) was the lowering of many of the proposed criteria to be consistent with EQS, in response to the identified presence of fish in the Pollanroe and Curraghinalt Burns. For the Pollanroe Burn average EQS and maximum EQS values were proposed as there were juvenile fish in this burn. For Curraghinalt Burn maximum EQS values were proposed as adult fish only were proposed in these burns.

2.2 In response to further fish data (outlined in Annexes 2 and 3 of sHRA submitted with Bennu Environmental's Transboundary Response ('Fish Survey Report')), DGL propose the following additional changes, which again decreases some of the proposed discharge values

2.2.1 Addition of application of mean EQS values for Curraghinalt Burn due to Fish Survey Report suggesting potential for juvenile trout in the burn

2.2.2 Average TSS concentrations reduced from 25mg/L to 10mg/L to be consistent with values requested by LA

2.2.3 Average phosphorus concentration reduced from 0.02mg/L to 0.016mg/L to be consistent with EQS and original value proposed by NIEA

2.3 A comparison between the standards used by DGL and proposed by NIEA is provided in Tables appended to this response;

2.3.1 Standards Non-Metals, table summarising Non-Metals – Annex 2

2.3.2 Standards Metals, table summarising Metals – Annex 3

2.4 It is clear that there is general agreement between the two parties for parameters where there is a Northern Ireland EQS. The key disagreement is where DGL propose the use of International Standards or Drinking Water standard where there are no Northern Ireland values, and where NIEA propose the use of average baseline conditions. We already highlighted the issues with the use of average baseline conditions as standards in our RR9 Surface Water Rebuttal statement (e.g., Section 7.8).

2.5 Additional tables appended to this response compare the discharge consent values proposed by DGL and those proposed by NIEA, highlighting where there is agreement and where there is disagreement;

2.5.1 Discharge Consent Discussion Non-Metals, table summarising Non-Metals – Annex 4

2.5.2 Discharge Consent Discussion Metals, table summarising Metals – Annex 5

2.6 It is clear that most of the disagreements originate from the NIEA's inappropriate use of 'Monte Carlo' model calculations. We would continue to highlight that most of the DGL discharge consent values are set to EQS values, which are themselves (with no downstream dilution) protective of fish and aquatic life.

2.7 In terms of the transboundary responses LA suggest (their Point 5.1) that there is disagreement over 21 of the 31 parameters in the proposed discharge consent. The tables within this report put these disagreements in context and show a simple path for resolution.

2.8 In terms of other responses highlighting concerns with water quality, the information presented here (and in the following section) highlights that discharges from the mine will be regulated by a discharge consent with DGL proposing consent values that are protective of fish at the point of discharge, and therefore of greater protection where fish are located and in the River Finn or River Foyle.

2.9 We have not identified any other discharge consent within the Foyle catchment, or within Northern Ireland, which sets discharge consent values as target water quality standards at end of pipe, reflecting the stringency of the approach being taken.

2.10 In addition, water discharged from the mine will be treated by a Reverse Osmosis (RO) water treatment plant, the performance of which is outlined in technical memo provided by ASDR (November 2025) and considered in Section 3. The RO plant will discharge water at concentrations lower than the discharge consent values.

3. Impacts on River Foyle and River Finn

3.1 Transboundary consultation responses have asked for more information on the impact of discharges from the mine on River Foyle and River Finn.

3.2 Within the 2nd Addendum to ES Volume 3, Appendix C4, Surface Water Impact Assessment (SWIA), Section 4.3 described the setting of the mine site within the wider Foyle catchment, with Table 4-2 highlighting the scale of the development within the wider catchment. Section 6 of the SWIA outlined the scoping of project impacts and Section 7 of the SWIA outlined the study area considered in the assessment. Given the negligible impact predicted at the confluence of the Owenreagh and Owenkillew Rivers (see Sections 9.2.3 and 10.2.3), impacts further downstream were considered to be negligible and there was no requirement to extend the study area.

3.3 However, more clarity is provided in this report.

Impact on Flows

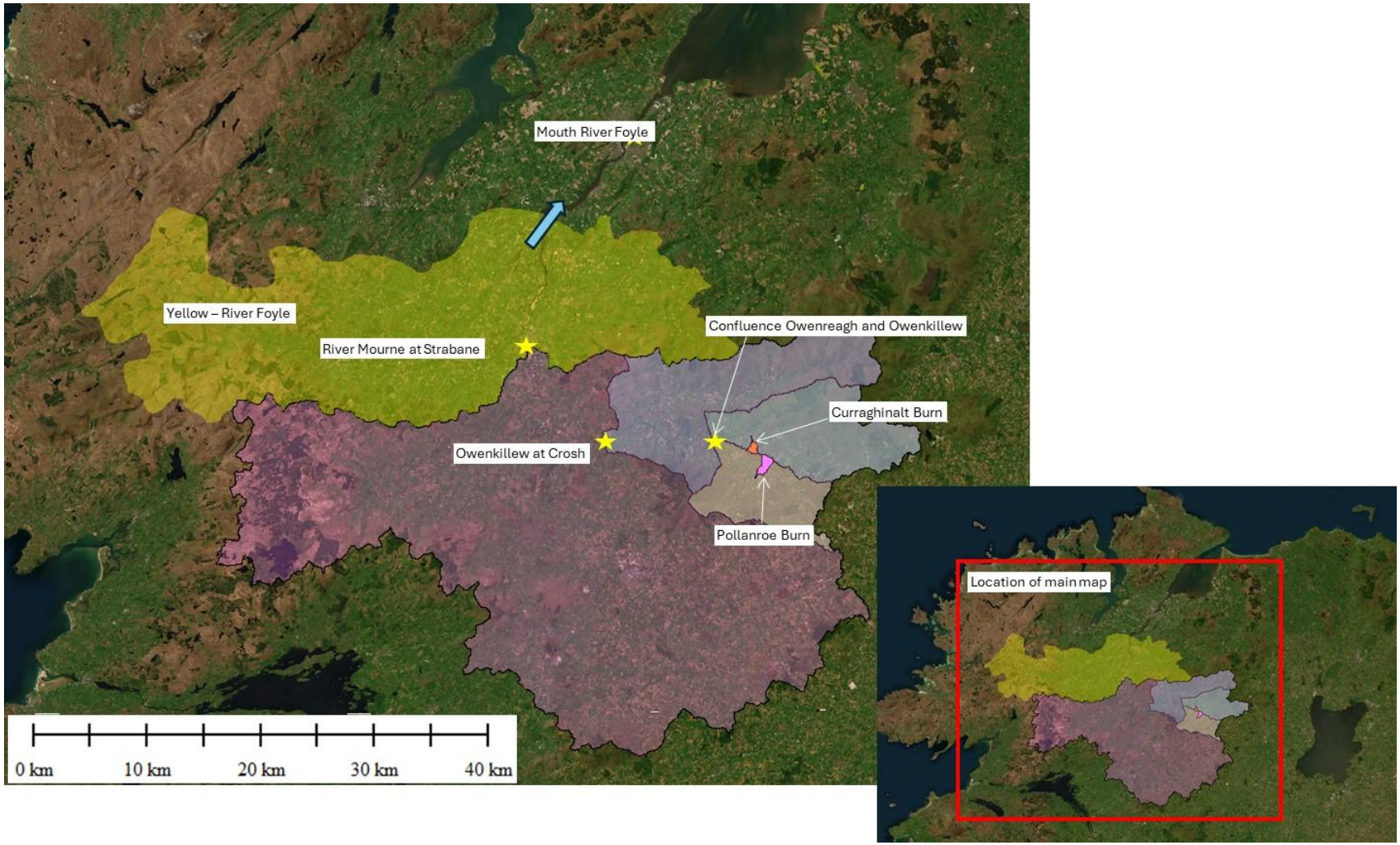
3.4 Figure 3-1 shows the Pollanroe and Curraghinalt Burn catchments in the context of the wider River Foyle catchment, with Table 3-1 comparing the Pollanroe Burn catchment and the change in average flows resulting from discharge to the burn, with natural flows in the wider catchment. The Proposed Infrastructure site (<0.5km^2) is around 0.02% of the Foyle River catchment (2,925km^2), so a miniscule part of the wider catchment area.

3.5 It is clear that in terms of flow the impact of the mine is negligible (0.36% of natural average flows) in the Owenkillew River downstream of the Owenreagh River, never mind in the River Foyle, where the change in flow in the Pollanroe Burn due to the discharge (15L/s or 0.015 m^3/s) is 0.03% of the total average flow in the River Foyle.

Table 3-1: Comparison of Pollanroe Burn Catchment and Discharge to Flows in Wider Foyle River Catchment

Location	Catchment Area (km^2)	Average Annual Flow (m^3/s)	DGL Discharge as Percent (%)
Average Discharge to Pollanroe	n/a	0.0245	
Change in Flow in Pollanroe from Baseline	n/a	0.015	
Proposed Infrastructure Area	<0.5	n/a	
Pollanroe Burn Baseline	2	0.06	41
Owenreagh River at Owenkillew	85.5	2.5	1.0
Owenkillew downstream of Owenreagh	222.5	6.9	0.36
Owenkillew River At Dfl Gauge at Crosh	440	16.3	0.15
River Mourne at Dfl Gauge at Strabane	1844	59.9	0.04
Foyle at Mouth	2925	95	0.03

Figure 3-1: Pollanroe Burn and Curraghinalt Burn Catchments in Context of Foyle River Catchment



Water Quality

3.6 The project Surface Water Impact Assessment (SWIA, 2nd Addendum to ES Volume 3, Appendix C4) predicted the impact of the mine on water quality in the Owenreagh and Owenkillew Rivers. As the impacts were very small and considered insignificant to the ecology and fish in these rivers, the assessment stopped at the confluence of these rivers.

3.7 Water quality impacts were updated in the October 2024 Water Discharge Statement of Case (Annex 1 TR Discharge Consents) in response to changes in proposed discharge criteria for the mine. The calculations were based on the impact of discharges at either (i) maximum predicted pre-treatment mine water quality or (ii) proposed discharge limit values, whichever was lower. Calculations were provided for Owenkillew River and Owenreagh Rivers. In this memo the predictions are extended for discharges from the proposed infrastructure area further downstream to the Mourne and Foyle, based on data in **Table 3-2**. These results are provided in **Table 3-3** for the parameters for which DGL propose discharge consent values.

3.8 The results clearly show negligible impact on water quality, even for the assumption that water discharged from the mine is at the maximum allowed limit (discharge consent level) or at the maximum mine water concentration (where this is less than discharge consent). However, in reality water discharged from the mine will be treated through a Reverse Osmosis (RO) water treatment plant and concentrations of water discharged from the mine will be less than the discharge consent values.

3.9 ASDR memo provided a description of the RO treatment plant and provides tables of predicted discharge quality from the RO plant based on predictions of water quality within the mine site.

3.10 The predicted RO discharge concentrations compared to the proposed discharge consent values and baseline concentrations are provided in **Table 3-4**. A maximum and mean RO discharge is calculated. Details of the baseline water quality are provided in **Annex 1**.

3.11 The impact of the mine discharge, assuming discharge at the mean RO treatment plant concentration, is provided in **Table 3-5**. The mean value is the appropriate value to use when comparing to average baseline concentrations, average discharge rates and mean EQS values.

3.12 The results show that for most parameters the treated water quality is less than baseline conditions, so downstream water quality would not be increased. The impacts would not be measurable in the River Foyle.

3.13 It is noted that these results do not consider any remineralization to maintain TDS concentrations in the discharge water, as outlined in ADSR's technical note Section 2.4.

3.14 Based on these results, consultees can have confidence that discharges from the mine will have no impact on water quality in the River Finn or River Foyle.

Table 3-2: Input data to Water Quality Calculations

Key Inputs to Water Quality Calculations
Flows
Flow in Owenreagh River, upstream of Pollanroe Burn: 1,480 L/s average, 280 L/s 95%ile flow
Flow in Owenreagh River, upstream of Owenkillew River: 2,490 L/s average, 380 L/s 95%ile flow
Discharge to Pollanroe Burn 24.5 L/s Average, with 8.2 L/s standard deviation
Flow in Owenkillew River downstream of Owenreagh River: 7,490 L/s average, 1140 L/s 95%ile flow
Flow in River Mourne at Strabane: 59,900 L/s average
Flow in Foyle River close to mouth: 95,000 L/s average
Water Quality
Station used for water quality for Owenreagh upstream of Pollanroe Burn: SW11
Station used for water quality for Owenreagh upstream of Owenkillew River: SW09
Station used for water quality for Owenkillew upstream of Owenreagh River: SW08
Station used for water quality for Owenkillew downstream of Owenreagh River: SW12
Impact on Mourne and Foyle Rivers calculated based on additional dilution under average flow conditions from Owenkillew to these sites

Table 3-3: Predicted concentrations in Owenkillew downstream, Strabane River and River Foyle

Parameter	Unit	Baseline Owenkillew River ds of Owenreagh (SW12)	Detection Limit	Impact of Mine on Owenkillew River	Estimated Impact of Mine on Strabane River	Estimated Impact of Mine on Foyle River
Non-Metals						
BOD	mg/L	0.90	1	-0.00035	-0.000029	-0.000017
Total Ammonia	mg/L N	0.048	0.01	+0.00046	+0.000038	+0.000022
Nitrate	mg/L N	0.30	0.05	0	0	0
Sulphate	mg/L	1.42	0.5	+0.80	+0.067	+0.038
Metals						
Antimony	µg/L	1.37	2	+0.013	+0.0011	+0.00061
Arsenic	µg/L	0.90	0.9	+0.030	+0.0025	+0.0015
Barium	µg/L	12.0	1.9	+0.88	+0.073	+0.042
Cadmium	µg/L	0.020	0.03	+0.00019	+0.000015	+0.000009
Total Chromium	µg/L	0.27	0.2	+0.025	+0.0021	+0.0012
Cobalt	µg/L	0.11	0.1	+0.0094	+0.00078	+0.00045
Copper	µg/L	1.13	1	+0.022	+0.0019	+0.0011
Iron	mg/L	0.67	0.005	+0.00004	+0.000004	+0.000002
Lead	µg/L	0.40	0.4	+0.0034	+0.00028	+0.00016
Manganese	µg/L	72	1.5	+0.33	+0.028	+0.016
Mercury	µg/L	0.0065	0.01	-0.00012	-0.00001	-0.000006
Molybdenum	µg/L	0.12	0.2	+0.22	+0.018	+0.011
Nickel	µg/L	0.64	0.2	+0.038	+0.0032	+0.0018
Uranium	µg/L	2.5	5	+0.040	+0.0034	+0.0019
Zinc	µg/L	4.95	1.5	+0.043	+0.0036	+0.0021

Table 3-4: RO Discharge Concentrations compared to Proposed Discharge Consent Values

Parameter	*Unit*	*Proposed Discharge Consent*		*Calculated Discharge from RO Plant (double pass RO)*		**Baseline**		
		Max	***Mean***	***Max***	***Mean***	**Pollanroe (SW25)**	**Owenreagh (SW11)**	**Owenkillew (SW08)**
TSS	mg/L	50	10	0.00047	0.00046	4.31	6.19	6.3
BOD	mg/L	3 (90%ile)	1	0.16	0.072	0.7	1.11	0.72
Ammonia	mg/L N	0.25 (90%ile)	0.2 (90%ile)	0.16	0.072	0.074	0.057	0.05
Nitrate	mg/L N	11.3	0.42	0.55	0.24	0.22	0.27 (0.42 for 2021-2023 data)	0.24
Nitrite	mg/L N	None		0.000011	0.000011	0.003	0.003	0.003
Chloride	mg/L	None		0.046	0.045	9.59	13.54	9.97
Fluoride	mg/L	None		0.0018	0.0017	0.15	0.19	0.15
Sulphate	mg/L	250	-	0.029	0.028	2.06	2.2	1.35
Phosphorus (as SRP_	mg/L	-	0.016	0.0014	0.0014	0.02	0.02	0.02
Aluminium	µg/L	None		0.041	0.040	55.5	48.4	67.3
Antimony	µg/L	5	-	0.01	0.01	1.13	1.05	1.16
Arsenic	µg/L	10	-	0.01	0.01	0.7	0.63	1.05
Barium	µg/L	1100	620	2.48	2.46	19.6	7.4	9.4
Boron	µg/L	None		10.8	10.6	6.08	5.16	5.16
Cadmium	µg/L	0.26	0.08	0.00031	0.00030	0.015	0.022	0.016
Cr III	µg/L	None		0.087	0.08	2.92	2.53	2.48
CrVI	µg/L	None		0.14	0.14	2.92	2.47	2.48
Chromium	µg/L	30	8.1	0.25	0.24	0.28	0.31	0.22
Cobalt	µg/L	11.5	3	0.27	0.26	0.24	0.088	0.134
Copper	µg/L	54	14	0.01	0.01	1.06	1.05	1.03
Iron	mg/L	0.61	-	0.0015	0.0015	0.61	0.6	0.81
Lead	µg/L	10	7.2	0.0026	0.0026	0.24	0.25	0.35
Manganese	µg/L	187	-	0.47	0.47	187	84	58
Mercury	µg/L	0.07	-	0.00029	0.00029	0.217	0.106	0.112
Molybdenum	µg/L	68	-	0.16	0.14	0.13	0.19	0.15
Nickel	µg/L	20	12.2	0.0051	0.0051	0.52	0.42	0.57
Selenium	µg/L	None		0.0052	0.0066	0.68	0.69	0.62
Silver	µg/L	None		0.0066	0.0066	2.5	2.5	2.5
Sodium	mg/L	None		0.048	0.047	6.15	8.92	6.48
Uranium	µg/L	30	15	0.039	0.04	2.5	2.5	2.6
Zinc	µg/L	73.3	20.7	0.16	0.16	8.7	7.45	6.24

Table 3-5: Predicted concentrations in Owenkillew downstream, Strabane River and River Foyle based on RO Plant Discharges

Parameter	Unit	Baseline Owenkillew River ds of Owenreagh (SW12)	Detection Limit	Impact of Mine on Owenkillew River	Estimated Impact of Mine on Strabane River	Estimated Impact of Mine on Foyle River
Non-Metals						
BOD	mg/L	0.90	1	-0.0033	-0.00028	-0.00016
Total Ammonia	mg/L N	0.048	0.01	+0.00005	+0.000004	+0.000002
Nitrate	mg/L N	0.30	0.05	-0.00058	-0.000048	-0.000028
Nitrite	mg/L N	0.003	0.006	-0.00001	-0.000001	-0.000005
Chloride	mg/L	11.25	0.3	-0.043	-0.0036	-0.0021
Fluoride	mg/L	0.15	0.3	-0.00048	-0.000040	-0.000023
Sulphate	mg/L	1.42	0.5	-0.0070	-0.00058	-0.00034
Metals						
Aluminium	µg/L	60.0	1.5	-0.096	-0.013	-0.0076
Antimony	µg/L	1.37	2	-0.0034	-0.00028	-0.00016
Arsenic	µg/L	0.90	0.9	-0.0020	-0.00017	-0.000096
Barium	µg/L	12.0	1.9	-0.016	-0.0013	-0.00076
Boron	µg/L	5.20	12	+0.018	+0.0015	+0.00084
Cadmium	µg/L	0.020	0.03	-0.00007	-0.000006	-0.000003
Chromium (III)	µg/L	2.47	6	-0.0079	-0.00066	-0.00038
Chromium (VI)	µg/L	2.47	6	-0.0075	-0.00062	-0.00036
Total Chromium	µg/L	0.27	0.2	-0.00021	-0.000018	-0.000010
Cobalt	µg/L	0.11	0.1	+0.00055	+0.000046	+0.000027
Copper	µg/L	1.13	1	-0.0034	-0.00028	-0.00016
Iron	mg/L	0.67	0.005	-0.0019	-0.00016	-0.000092
Lead	µg/L	0.40	0.4	-0.00079	-0.000066	-0.000038
Manganese	µg/L	72	1.5	-0.27	-0.022	-0.013
Mercury	µg/L	0.006	0.01	-0.00034	-0.000028	-0.000016
Molybdenum	µg/L	0.12	0.2	-0.00016	-0.000013	-0.000008
Nickel	µg/L	0.64	0.2	-0.0013	-0.00011	-0.000064
Selenium	µg/L	0.66	1.2	-0.00022	-0.00018	-0.00011
Silver	µg/L	2.5	5	-0.0080	-0.00067	-0.00039
Sodium	mg/L	7.08	0.1	-0.029	-0.0024	-0.0014
Uranium	µg/L	2.5	5	-0.0079	-0.00066	-0.00038
Zinc	µg/L	4.95	1.5	-0.023	-0.0020	-0.0011

4. Annex 1: Baseline Water Quality

4.1 A review of baseline conditions has been undertaken to take account of the additional sampling between the 2020 EIA update (considered data up to end of 2019) and January 2024. Within the EIA an approach was taken where individual sampling sites were grouped together to provide average conditions for key river reaches (e.g., concentrations for Owenreagh River at its mouth combined data for sites SW09, SW10, SW11 and SWN06/SW26).

4.2 With additional samples taken since the submission of the Second Addendum, the baseline data is presented here for individual sites which provides more information on spatial changes across the catchments. A comparison is made between these results and those presented in the Second Addendum 2020 update, with a discussion of any differences.

Sampling Sites

4.3 A summary of the sampling sites considered in this note is provided in **Table 4-1**, with locations shown on **Figure 4-1**. The number of samples for each site is shown in **Table 4-1**. This illustrates the increase in number of samples for many sites since 2019.

4.4 The available data sets are comprehensive in terms of the total number of samples and the number of sites. The data covers watercourses upstream and downstream of potential discharge locations at the mine site, watercourses of a range of scales and sampling covers potential seasonal variations in concentrations.

4.5 It is noted that there were discharges from exploration works at the existing adit into the Curraghinalt Burn which will impact on water quality local to the discharge point. However, in terms of its impact on the baseline:

4.5.1 The discharges will not impact on any sites in the Owenreagh River catchment or the Owenkillew River upstream of the Curraghinalt Burn

4.5.2 There is a sampling site on the Curraghinalt Burn upstream of the discharge point, which will be unaffected by the discharge

4.5.3 Key calculations in the EIA and discharge consent applications use data from sites unaffected by the exploration discharge (i.e., Curraghinalt Burn upstream of discharge, Owenkillew River upstream of Curraghinalt and Owenreagh catchment)

4.6 Moreover, the discharge from the exploration works was small (mean of 3.6 L/s and daily maximum of 9.4 L/s) compared to the flow in the Owenkillew River at the Curraghinalt Burn, with averages of 4,430 L/s, or 1,230 times larger than the average discharge flow.

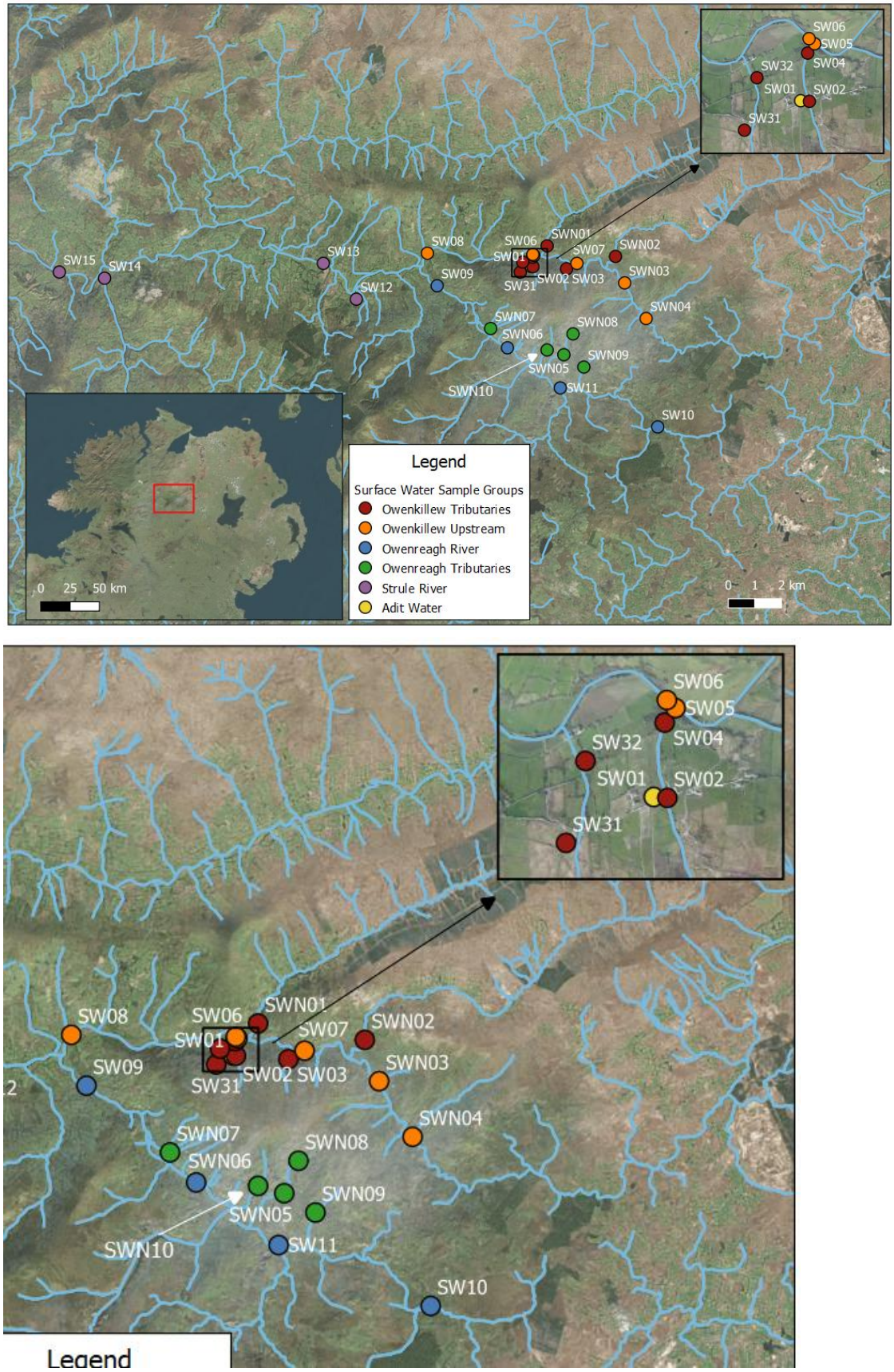
Table 4-1: Water quality sampling sites considered in this assessment

Location ID	Description	Number of Samples for 2020 EIA	Number of Samples at Jan 2024
Owenkillew River (Upstream of Confluence with Owenreagh)			
SW23	Glenhull Bridge	21	30
SW24	Near confluence with Camanransy Burn	20	29
SW05	U/S of Curraghinalt Burn confluence	45	93
SW06	D/S of Curraghinalt Burn confluence	45	94
SW07	D/S of Greenan Bridge	20	62
SW08	U/S of Drumlea Road Bridge	20	37
Owenkillew Tributaries (including Curraghinalt Burn)			
SW02	Curraghinalt Burn U/S of Attys Bridge	45	94
SW03	Glenealy Burn U/S of Glenealy Bridge	18	35
SW21	Glenark River at Glenark Bridge	8	12
SW22	Coneyglen Burn at Coneyglen Burn	8	12
SW31	Attagh Burn U/S of Attagh Bridge	6	20
SW32	Attagh Burn D/S Attagh Bridge	5	23
Curraghinalt Burn – downstream existing infrastructure site discharge			
SW04	Curraghinalt Burn D/S of discharge point from existing infrastructure site (not included in 2020 EIA Owenkillew Tributaries grouping as con	45	92
Adit			
Adit – SW01	[a]Adit flow in Curraghinalt Burn	14	14
Owenreagh River			
SW09	U/S of Drumlea Bridge	20	36
SW10	Formil Bridge	14	30
SW11	Cashel Bridge	21	37
SW26	Aghanamirigan Bridge	20	64
Owenreagh Tributaries (including Pollanroe Burn)			
SW25	Pollanroe Burn at Pollanroe Bridge	41	90
SW27	Unnamed Tributary	15	19
SW28	[b]Pollanroe Burn u/s of Bridge	2	2
SW29	Sruhanalticarra Burn at bridge on B46	21	37
SW30	Unnamed Burn on B46 west of SWN8 at Fashioners Bridge	14	31
Owenkillew/Strule River (Downstream of Confluence with Owenreagh)			
SW12	Owenkillew River U/S of Gortin	20	30
SW13	Owenkillew River D/S of Gortin	21	30
SW14	River Strule U/S of Moyle Bridge	4	6
SW15	River Strule U/S of A5 Bridge	4	6

a Adit flow is routed to treatment so no additional samples after 2016

b Samples only taken for radon assessment and not continued

Figure 4-1: Water quality sampling site locations



Results

Comparison of Averages

4.7 Average concentrations for key parameters are provided in **Tables 4-2 to 4-7**. Values for specific monitoring stations are compared to groupings used in the 2020 EIA. The groups are:

- **Table 4-2**: Data for Curraghinalt and Pollanroe Burns (SW25, SW02, SW04);
- **Table 4-3**: Data for Owenreagh Tributaries, including Pollanroe Burn (SW25, SW27, SW29, SW30);
- **Table 4-4**: Data for Owenreagh River Upstream Sampling Points (SW09, SW10, SW11, SW26);
- **Table 4-5**: Data for Owenkillew River Sampling Points (SW05, SW06, SW07, SW08, SW23, SW24);
- **Table 4-6**: Data for Owenkillew River Tributaries, including Curraghinalt Burn (SW02, SW03, SW21, SW22, SW31, SW32);
- **Table 4-7**: Data for Strule River Group (SW12, SW13, SW14, SW15).

4.8 Overall, the updated baseline concentrations are consistent with the results reported in 2020, with more discussion provided in the following sections below. There are three parameters that show markedly different concentrations set out immediately below:

4.8.1 In the 2020 EIA the 'Total Chromium' concentrations were obtained as the sum of the CrIII and CrVI anions. Following a review of the data, it is clear that the detection limit for CrIII and CrVI was higher than the EQS and higher than the detection limit for Dissolved Chromium (un-speciated) in the laboratory data, such that the sum of CrIII and CrVI is strongly impacted by the detection limit. It is suggested that due to high detection limits that discharge criteria for CrIII and CrVI should be removed, with one 'Total Dissolved Chromium' limit retained. As a result, the baseline chromium data in discharge consent and impact assessment calculations should be based on Dissolved Chromium measurements, which are lower than the values previously used and are a more accurate reflection of concentrations in the watercourses.

4.8.2 There are differences in detection limits for Mercury between certain sampling sites and over time, with higher detection limits recorded for data at a number of sites and post 2020. As the measured Mercury concentrations are very strongly influenced by detection limit, this has resulted in changes to average baseline concentrations. However, these changes do not reflect any measured change in actual water quality in the watercourses; it just reflects the detection limit.

4.8.3 Average Zinc concentrations are generally higher using the updated data compared to the data for the Second Addendum in 2020. This is discussed in more detail in Section 3.2.15, but it is due to there being a few samples post-2020 that record higher concentrations than were observed up to 2020 and which raise the long-term average. Most samples are consistent with data collected for the Second Addendum in 2020, so it appears that the presence of the higher values reflects natural variability in the watercourses, which has been revealed through the longer time series obtained since 2020.

Table 4-2: Baseline water quality – Pollanroe Burn and Curraghinalt Burn

Parameter	Unit	Pollanroe Burn		Curraghinalt Burn SW02		Curraghinalt Burn SW04	
		2020 EIA – SW25 Mean	Updated – SW25 Mean	2020 EIA – SW02 Mean	Updated – SW02 Mean	2020 EIA – SW04 Mean	Updated – SW04 Mean
TSS	mg/L	6.11	4.31	6.21	5.34	6.02	4.88
BOD	mg/L	0.89	0.70	0.99	0.83	1.09	0.81
Total Ammonia	mg/L N	0.073	0.074	0.038	0.046	0.101	0.066
Nitrate	mg/L N	0.23	0.22	0.12	0.16	0.423	0.22
Nitrite	mg/L N	0.003	0.003	0.017	0.010	0.016	0.009
Chloride	mg/L	9.60	9.59	8.28	8.19	10.75	10.49
Fluoride	mg/L	0.15	0.15	0.15	0.15	0.164	0.16
Sulphate	mg/L	2.13	2.06	0.44	0.46	6.34	5.71
Aluminium	µg/L	59.0	55.5	82.2	87.6	58.6	53.8
Antimony	µg/L	1.22	1.13	1.18	1.13	1.27	1.16
Arsenic	µg/L	0.92	0.70	1.24	1.73	1.23	1.19
Barium	µg/L	20.14	19.6	15.1	14.7	58.9	65.8
Boron	ug/L	5.95	6.08	5.40	5.80	5.18	5.79
Cadmium	µg/L	0.015	0.015	0.021	0.022	0.024	0.022
Chromium (III)	µg/L	2.85	2.92	2.60	2.80	2.60	2.80
Chromium (VI)	µg/L	2.85	2.80	2.60	2.80	2.60	2.80
Chromium (dis)	µg/L	-	0.28	-	0.23	-	0.25
Cobalt	µg/L	0.21	0.24	0.34	0.42	0.45	0.51
Copper	µg/L	1.20	1.06	1.89	2.06	1.88	2.20
Copper (bio)	µg/L	0.069	0.050	0.09	0.080	0.11	0.11
Iron	mg/L	0.68	0.61	1.98	2.38	1.05	1.08
Lead	µg/L	0.28	0.24	0.28	0.24	0.31	0.27
Manganese	µg/L	219	187	72	72	202	190
Manganese (bio)	µg/L	63.22	52.8	59.4	64.29	78.94	80.53
Mercury	µg/L	0.0061	0.171	0.0061	0.187	0.019	0.217
Molybdenum	µg/L	0.105	0.13	0.17	0.15	0.96	0.60
Nickel	µg/L	0.43	0.52	0.36	0.46	1.01	1.03
Nickel (bio)	µg/L	0.09	0.10	0.07	0.07	0.30	0.29
Selenium	µg/L	0.73	0.68	0.63	0.65	0.60	0.60
Silver	µg/L	2.5	2.5	2.5	2.5	2.5	2.5
Sodium	mg/L	6.08	6.15	5.18	5.11	7.29	7.33
Uranium	µg/L	2.5	2.5	2.5	2.5	2.5	2.5
Zinc	µg/L	4.60	8.70	14.45	13.19	7.02	10.19
Zinc (bio)	µg/L	1.50	2.93	3.22	2.68	2.24	3.40

Table 4-3: Baseline water quality – Owenreagh Tributaries including Pollanroe Burn

Parameter	Unit	Owenreagh Tributaries Grouping	Owenreagh Tributaries			
		2020 EIA - Mean	Updated SW25 - Mean	Updated SW27 - Mean	Updated SW29 - Mean	Updated SW30 - Mean
TSS	mg/L	9.93	4.31	6.84	15.81	7.32
BOD	mg/L	1.10	0.70	1.05	1.01	0.87
Total Ammonia	mg/L N	0.083	0.074	0.059	0.077	0.102
Nitrate	mg/L N	0.22	0.22	0.26	0.19	0.29
Nitrite	mg/L N	0.003	0.003	0.003	0.004	0.003
Chloride	mg/L	10.72	9.59	11.67	11.85	11.05
Fluoride	mg/L	0.15	0.15	0.16	0.16	0.15
Sulphate	mg/L	2.12	2.06	4.67	1.95	2.46
Aluminium	µg/L	73.42	55.5	52.1	70.6	77.6
Antimony	µg/L	1.12	1.13	1.16	1.05	1.03
Arsenic	µg/L	0.82	0.70	0.72	0.57	1.19
Barium	µg/L	18.39	19.6	33.6	10.3	16.6
Boron	ug/L	5.90	6.08	4.68	6.84	6.39
Cadmium	µg/L	0.03	0.015	0.033	0.024	0.027
Chromium (III)	µg/L	2.57	2.92	2.32	2.63	3.04
Chromium (VI)	µg/L	2.57	2.92	2.31	2.63	3.04
Chromium (dis)	µg/L	0.29	0.28	0.22	0.33	0.28
Cobalt	µg/L	0.25	0.24	0.25	0.20	0.54
Copper	µg/L	1.51	1.06	1.82	1.73	1.86
Copper (bio)	µg/L	0.084	0.050	0.070	0.050	0.12
Iron	mg/L	0.72	0.61	0.44	0.57	0.99
Lead	µg/L	0.33	0.24	0.35	0.32	0.26
Manganese	µg/L	185	187	62	232	181
Manganese (bio)	µg/L	54.18	52.8	15.65	75.39	55.01
Mercury	µg/L	0.0074	0.217	0.005	0.158	0.219
Molybdenum	µg/L	0.10	0.13	0.12	0.14	0.11
Nickel	µg/L	0.50	0.52	0.59	0.57	0.67
Nickel (bio)	µg/L	0.095	0.10	0.12	0.10	0.110
Selenium	µg/L	0.60	0.68	0.63	0.71	0.62
Silver	µg/L	2.5	2.5	2.6	2.6	2.6
Sodium	mg/L	6.68	6.15	7.45	7.75	7.19
Uranium	µg/L	2.5	2.5	2.6	2.6	2.6
Zinc	µg/L	5.65	8.70	6.39	9.07	12.85
Zinc (bio)	µg/L	1.65	2.93	2.27	2.47	4.05

Table 4-4: Baseline water quality – Owenreagh River Upstream

Parameter	Unit	Owenreagh River Upstream Grouping	Owenreagh River			
		2020 EIA - Mean	Updated – SW09 - Mean	Updated – SW10 - Mean	Updated – SW11 - Mean	Updated – SW26 - Mean
TSS	mg/L	6.63	7.53	6.13	6.19	4.98
BOD	mg/L	1.15	0.86	0.97	1.11	0.71
Total Ammonia	mg/L N	0.068	0.051	0.075	0.057	0.064
Nitrate	mg/L N	0.26	0.31	0.35	0.27	0.28
Nitrite	mg/L N	0.003	0.003	0.003	0.003	0.003
Chloride	mg/L	13.36	12.57	13.91	13.54	12.30
Fluoride	mg/L	0.20	0.19	0.20	0.19	0.15
Sulphate	mg/L	1.48	2.35	1.30	2.20	2.17
Aluminium	µg/L	54.85	45.4	49.2	48.4	55.5
Antimony	µg/L	1.20	1.25	1.13	1.05	1.30
Arsenic	µg/L	0.53	0.59	0.57	0.63	0.54
Barium	µg/L	9.32	11.0	10.9	7.4	9.7
Boron	ug/L	4.83	5.47	6.03	5.16	5.72
Cadmium	µg/L	0.026	0.019	0.019	0.022	0.020
Chromium (III)	µg/L	2.36	2.57	2.91	2.53	2.68
Chromium (VI)	µg/L	2.33	2.57	2.91	2.47	2.68
Chromium (dis)	µg/L	0.28	0.31	0.24	0.31	0.35
Cobalt	µg/L	0.093	0.111	0.095	0.088	0.110
Copper	µg/L	1.22	1.15	0.83	1.05	1.02
Copper (bio)	µg/L	0.042	0.05	0.03	0.04	0.04
Iron	mg/L	0.66	0.53	0.83	0.60	0.57
Lead	µg/L	0.37	0.36	0.26	0.25	0.26
Manganese	µg/L	78	70	101	84	83
Manganese (bio)	µg/L	23.83	19.41	36.86	24.49	24.82
Mercury	µg/L	0.005	0.116	0.196	0.106	0.166
Molybdenum	µg/L	0.16	0.17	0.15	0.19	0.15
Nickel	µg/L	0.30	0.41	0.27	0.42	0.40
Nickel (bio)	µg/L	0.049	0.08	0.05	0.10	0.08
Selenium	µg/L	0.60	0.62	0.60	0.69	0.66
Silver	µg/L	2.5	2.6	2.5	2.5	2.5
Sodium	mg/L	8.59	8.34	9.15	8.92	8.20
Uranium	µg/L	2.50	2.57	2.50	2.50	2.50
Zinc	µg/L	4.74	5.85	5.69	7.45	6.84
Zinc (bio)	µg/L	1.16	2.18	1.56	2.26	2.40

Table 4-5: Baseline water quality – Owenkillew River Upstream

Parameter	Unit	Owenkillew River Upstream Grouping	Owenkillew River					
		2020 EIA - Mean	Updated – SW05 - Mean	Updated – SW06 - Mean	Updated – SW07 - Mean	Updated – SW08 - Mean	Updated – SW23 - Mean	Updated – SW24 - Mean
TSS	mg/L	6.60	5.10	4.99	4.71	6.30	7.00	4.55
BOD	mg/L	1.00	0.79	0.82	0.87	0.72	0.93	1.02
Total Ammonia	mg/L N	0.065	0.170	0.072	0.075	0.050	0.085	0.049
Nitrate	mg/L N	0.16	0.15	0.14	0.17	0.24	0.22	0.16
Nitrite	mg/L N	0.003	0.003	0.003	0.003	0.003	0.003	0.003
Chloride	mg/L	9.96	9.85	9.50	9.55	9.97	10.74	10.31
Fluoride	mg/L	0.15	0.15	0.16	0.17	0.15	0.15	0.15
Sulphate	mg/L	1.05	1.21	1.31	1.28	1.35	1.01	0.93
Aluminium	µg/L	73.04	65.9	67.5	66.3	67.3	67.2	67.5
Antimony	µg/L	0.13	1.14	1.16	1.07	1.16	1.30	1.21
Arsenic	µg/L	0.81	0.86	0.84	0.78	1.05	0.81	0.95
Barium	µg/L	9.75	12.1	12.9	8.9	9.4	9.1	9.0
Boron	ug/L	4.99	5.81	5.68	5.61	5.16	5.37	5.03
Cadmium	µg/L	0.020	0.021	0.017	0.019	0.016	0.026	0.027
Chromium (III)	µg/L	2.45	2.80	2.80	2.71	2.48	2.47	2.45
Chromium (VI)	µg/L	2.63	2.80	2.80	2.71	2.48	2.47	3.48
Chromium (dis)	µg/L	0.19	0.19	0.21	0.25	0.22	0.25	0.21
Cobalt	µg/L	0.16	0.183	0.212	0.184	0.134	0.172	0.172
Copper	µg/L	1.31	1.06	1.13	1.11	1.03	1.18	1.07
Copper (bio)	µg/L	0.065	0.040	0.050	0.040	0.040	0.070	0.080
Iron	mg/L	0.96	0.90	0.93	0.92	0.81	0.98	0.93
Lead	µg/L	0.31	0.23	0.24	0.29	0.35	0.28	0.22
Manganese	µg/L	96	94	96	91	58	119	112
Manganese (bio)	µg/L	44.8	45.84	44.30	37.99	26.69	46.33	41.38
Mercury	µg/L	0.005	0.168	0.177	0.184	0.112	0.006	0.008
Molybdenum	µg/L	0.13	0.20	0.16	0.14	0.15	0.11	0.14
Nickel	µg/L	0.56	0.64	0.66	0.57	0.57	0.48	0.49
Nickel (bio)	µg/L	0.090	0.120	0.110	0.090	0.100	0.080	0.080
Selenium	µg/L	0.60	0.62	0.62	0.60	0.62	0.60	0.60
Silver	µg/L	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Sodium	mg/L	6.28	6.16	6.26	6.28	6.48	6.79	6.53
Uranium	µg/L	2.5	2.5	2.5	2.8	2.6	2.7	2.5
Zinc	µg/L	4.95	6.79	7.06	9.00	6.24	7.76	6.34
Zinc (bio)	µg/L	1.29	1.80	1.92	2.45	1.69	2.13	1.90

Table 4-6: Baseline water quality – Owenkillew River Tributaries, including Curraghinalt Burn

Parameter	Unit	Owenkillew River Tributaries Grouping	Owenkillew River Tributaries					
		2020 EIA - Mean	Updated – SW02 - Mean	Updated – SW03 - Mean	Updated – SW21 - Mean	Updated – SW22 - Mean	Updated – SW31 - Mean	Updated – SW32 - Mean
TSS	mg/L	7.70	5.34	8.43	5.08	7.00	4.00	7.00
BOD	mg/L	0.90	0.83	1.13	0.58	1.04	0.50	0.50
Total Ammonia	mg/L N	0.045	0.047	0.055	0.107	0.043	0.034	0.047
Nitrate	mg/L N	0.080	0.16	0.23	0.06	0.05	0.17	0.30
Nitrite	mg/L N	0.003	0.010	0.003	0.003	0.003	0.003	0.003
Chloride	mg/L	8.25	8.19	9.09	9.48	7.52	7.13	8.43
Fluoride	mg/L	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Sulphate	mg/L	0.45	0.46	0.38	0.82	0.45	1.66	2.32
Aluminium	µg/L	90.86	87.6	90.2	75.1	73.0	112.3	63.9
Antimony	µg/L	1.00	1.13	1.00	1.00	1.00	1.00	1.09
Arsenic	µg/L	1.79	1.73	5.53	1.34	1.31	0.72	1.07
Barium	µg/L	14.12	14.7	11.6	11.5	9.9	4.2	63.9
Boron	ug/L	5.34	5.80	5.09	5.58	5.83	6.00	6.00
Cadmium	µg/L	0.015	0.022	0.019	0.015	0.015	0.015	0.015
Chromium (III)	µg/L	2.64	2.80	2.52	2.83	2.83	3.00	3.00
Chromium (VI)	µg/L	2.64	2.80	2.52	2.83	2.83	3.00	3.00
Chromium (dis)	µg/L	0.20	0.23	0.20	0.23	0.29	0.34	0.21
Cobalt	µg/L	0.51	0.42	0.78	0.48	0.37	1.02	0.26
Copper	µg/L	1.72	2.06	1.53	1.08	0.83	2.10	1.59
Copper (bio)	µg/L	0.088	0.09	0.06	0.10	0.10	0.11	0.07
Iron	mg/L	1.76	1.98	2.52	0.76	0.94	1.00	0.54
Lead	µg/L	0.20	0.28	0.32	0.20	0.20	0.20	0.20
Manganese	µg/L	134	72	172	134	136	332	120
Manganese (bio)	µg/L	101.6	59.4	131.04	101.42	89.20	314.87	56.48
Mercury	µg/L	0.010	0.0061	0.179	0.005	0.005	0.189	0.219
Molybdenum	µg/L	0.15	0.17	0.16	0.10	0.10	0.14	0.16
Nickel	µg/L	0.55	0.36	0.64	1.28	0.93	0.48	0.54
Nickel (bio)	µg/L	0.11	0.07	0.10	0.33	0.20	0.08	0.13
Selenium	µg/L	0.60	0.63	0.64	0.60	0.72	0.75	0.60
Silver	µg/L	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Sodium	mg/L	5.27	5.18	5.68	5.99	5.12	4.99	6.06
Uranium	µg/L	2.5	2.5	2.7	2.5	3.6	2.5	2.5
Zinc	µg/L	9.97	14.45	10.68	9.27	8.88	8.44	6.05
Zinc (bio)	µg/L	2.44	3.22	2.78	4.32	3.36	2.59	2.20

Table 4-7: Baseline water quality – Strule River Group

Parameter	Unit	Strule Group Grouping	Strule River			
		2020 EIA - Mean	Updated – SW12 - Mean	Updated – SW13 - Mean	Updated – SW14 - Mean	Updated – SW15 - Mean
TSS	mg/L	6.90	8.53	5.40	5.33	4.83
BOD	mg/L	0.98	0.90	0.78	1.25	1.25
Total Ammonia	mg/L N	0.066	0.048	0.110	0.106	0.080
Nitrate	mg/L N	0.40	0.30	0.26	1.09	0.89
Nitrite	mg/L N	0.0058	0.003	0.003	0.022	0.012
Chloride	mg/L	14.09	11.25	15.04	17.62	13.77
Fluoride	mg/L	0.15	0.15	0.15	0.24	0.29
Sulphate	mg/L	2.84	1.42	2.38	11.60	6.48
Aluminium	µg/L	64.05	60.0	61.0	37.6	44.6
Antimony	µg/L	1.20	1.37	1.10	1.00	1.00
Arsenic	µg/L	0.74	0.90	1.01	0.74	0.53
Barium	µg/L	21.29	12.0	12.9	94.3	61.2
Boron	ug/L	4.86	5.20	5.60	7.83	5.33
Cadmium	µg/L	0.020	0.020	0.023	0.015	0.015
Chromium (III)	µg/L	2.27	2.47	2.47	2.67	2.67
Chromium (VI)	µg/L	2.27	2.47	2.47	2.67	2.67
Chromium (dis)	µg/L	0.33	0.27	0.27	0.72	0.27
Cobalt	µg/L	0.11	0.11	0.14	0.05	0.05
Copper	µg/L	1.46	1.13	1.15	1.67	1.50
Copper (bio)	µg/L	0.056	0.048	0.048	0.051	0.05
Iron	mg/L	0.69	0.67	0.64	0.34	0.39
Lead	µg/L	0.48	0.40	0.45	0.20	0.20
Manganese	µg/L	55	72	48	34	52
Manganese (bio)	µg/L	23.35	32.13	18.56	14.96	11.09
Mercury	µg/L	0.006	0.006	0.006	0.005	0.020
Molybdenum	µg/L	0.12	0.12	0.13	0.10	0.12
Nickel	µg/L	0.56	0.64	0.61	0.83	0.45
Nickel (bio)	µg/L	0.088	0.12	0.12	0.16	0.08
Selenium	µg/L	0.60	0.66	0.63	0.60	0.60
Silver	µg/L	2.5	2.5	2.5	2.5	2.5
Sodium	mg/L	7.68	7.08	7.27	12.1	11.6
Uranium	µg/L	2.5	2.5	2.5	2.5	2.5
Zinc	µg/L	4.28	4.95	5.15	4.30	5.02
Zinc (bio)	µg/L	1.17	1.48	1.58	1.03	1.55

Table 4-8: Baseline water quality – average numbers of samples below detection limit and above EQS (values over 75% are shaded orange)

Parameter	Average % of samples below detection limit	Average % of samples above EQS	Comment
TSS	66	2	
BOD	67	1	
Total Ammonia	3	0	
Nitrate	18	0	
Nitrite	98	0	
Chloride	0	0	
Fluoride	99.6	0	
Sulphate	56	0	
Aluminium	0.2	0.4	
Antimony	91	0	
Arsenic	78	0	
Barium	2	0	
Boron	93	0	
Cadmium	95	3	
Chromium (III)	99.5	0.2	
Chromium (VI)	99.5	1	
Chromium (CrIII + CrVI)	69	0	
Cobalt	61	0	
Copper	63	0	
Iron	0.1	31	
Lead	95	0	
Manganese	0.4	14	
Mercury	94	46	Exceedances due to detection limit lower than EQS
Molybdenum	84	0	
Nickel	43	0	
Selenium	98	0	
Silver	99.8	100	Exceedances due to detection limit lower than EQS
Sodium	0	0	
Uranium	99	0	
Zinc	7	4	

Based on sampling locations SW02, SW04, SW05, SW06, SW07, SW08, SW09, SW10, SW11, SW12, SW13, SW23, SW24 and SW25

Time Series Data for Key Parameters

Ammonia

4.9 Data for Total Ammonia (as N) for key locations are shown in **Figure 4-2**. On the Owenreagh River average concentrations are between 0.05 to 0.075 mg/L N, with the Owenkillew River having a similar range, albeit the average at SW05 is impacted by a single high sample (10.0 mg/L N) in July 2021, which raises its value. If this high value is excluded (due to it being an outlier) the average would be consistent with other sites on the Owenkillew River. There is no clear trend in the data in terms of changes over time or changes between catchments.

4.10 The Northern Ireland EQS for Ammonia is 0.2mg/L (90%ile), and within the baseline dataset very few samples are recorded above this limit. Ammonia is not identified as being a parameter of concern for FWPM in JNCC (2015) but guidelines are presented in British Standard BS EN 16859:2017 (related to FWPM), with a range of 0.01 to 0.05 mg/L (average), with almost all sites in the study area having averages above this range. It is noted that unlike the earlier JNCC 2015 document, BS EN 16859:2017 clarifies that listed water quality criteria 'specific levels should not be interpreted as water quality targets but are presented to provide assistance in target-setting'. The Northern Ireland Drinking Water Standard for Ammonia is 0.39mg/L.

Nitrate

4.11 Data for Nitrate for key locations are shown in **Figure 4-3**. There appear to be rising trends in nitrate at a number of locations (with linear trendlines plotted in **Figure 4-3**). **Figure 4-4** shows key sites replotted with different y-axes to focus on trends. The trend is clearest for SW10 and SW11, upstream sampling stations on the Owenreagh River, suggesting rising concentrations in the headwaters of the Owenreagh River, upstream of the Pollanroe Burn. A rising trend is also noted in the Owenkillew River upstream of the confluence with the Owenreagh River (SW05 and SW08), as well as in the Curraghinalt Burn upstream of the exploration site (SW02).

4.12 Nitrate is a parameter considered in JNCC (2015) as being important for FWPM. The JNCC (2015) guideline for nitrate is 0.125 mg/L N. BS EN 16859:2017 gives a guideline range of 0.125 to 0.5 mg/L N (median concentration) for Nitrate. Northern Ireland (SR351) does not have an EQS for nitrate, but the Canadian Council of Ministers of the Environment (CCME) has an average value of 3 mg/L N (long term exposure) and the Northern Ireland Drinking Water Standard is 11.3 mg/L N.

4.13 The main Owenkillew River is part of the SAC, with the following baseline conditions for key sites on the Owenkillew presented below, with data from the Owenreagh River provided for comparison;

- Owenkillew River
  - Upstream of Curraghinalt Burn SW24: 0.16mg/L (average)
  - Upstream of Curraghinalt Burn SW07: 0.17mg/L (average)
  - Upstream of Curraghinalt Burn SW05: 0.15mg/L (average)
  - Upstream of confluence with Owenreagh River SW08: 0.24mg/L (average)
  - Downstream of confluence with Owenreagh River SW12: 0.30mg/L (average)
- Owenreagh River upstream of Pollanroe Burn
  - Upstream of Pollanroe Burn SW10: 0.35mg/L (average)

- Upstream of Pollanroe Burn SW11: 0.27mg/L (average)
- At mouth SW09: 0.31mg/L (average)

4.14 It is clear that baseline conditions across the catchment exceed the JNCC (2015) guideline value, but they are within the range of values provided in BS EN 16859:2017 for FWPM. Owenreagh River concentrations are higher than those in the Owenkillew River, but all sites on the main watercourses exceed the JNCC value, with larger watercourses impacted by upstream farming, sewage and forestry runoff. But it is also the case for small tributaries such as the Pollanroe Burn and Curraghinalt Burn where the catchment is more natural with peatland, open ground and some farming. This suggests that background nitrate concentrations in the catchment are above the JNCC (2015) guideline.

4.15 Baseline averages are needed for the Owenreagh and Owenkillew Rivers for discharge consent calculations, which are presented in the Discharge Consent SoC Annex 1 TR. Analyses were undertaken looking at sites upstream of the Curraghinalt Burn and Pollanroe Burn (i.e., directly upstream of discharge points) and considering changes in average concentrations over time in order to take into account the observed increasing trends in the water quality data;

- Owenreagh River upstream of Pollanroe Burn (combined data for SW10 and SW11)
  - Average for 2015 to end 2019: 0.28 mg/L N
  - Average for 2019 – 2023: 0.34 mg/L N
  - Average for 2020 – 2023: 0.37 mg/L N
  - Average for 2021 – 2023: 0.42 mg/L N
  - Given the rising trend it is proposed to use the most recent average (**0.42 mg/L N**) as an indication of current nitrate concentrations in the Owenreagh River upstream of the Pollanroe Burn.
- Owenkillew River upstream of Curraghinalt Burn (combined data for SW5, SW7, SW23 and SW24)
  - Average for 2015 to end 2019: 0.16 mg/L N
  - Average for 2019 – 2023: 0.17 mg/L N
  - Average for 2020 – 2023: 0.18 mg/L N
  - Average for 2021 – 2023: 0.20 mg/L N
  - Given the rising trend it is proposed to use the most recent average (**0.20 mg/L N**) as an indication of current nitrate concentrations in the Owenkillew River upstream of the Curraghinalt Burn

TSS

4.16 Data for TSS for key locations are shown in **Figure 4-5**. TSS concentrations will vary with flow in the channel, with higher flows associated with higher flow conditions, and with availability of sediment, such as soil washed off fields during fallow periods. Under normal conditions TSS concentrations are relatively low, around 5 – 10 mg/L, but there are numerous samples with elevated concentrations >20mg/L. A lower detection limit in samples post-2020 recorded lower concentrations during periods of low TSS, with similar distribution of higher concentrations in the post-2020 period, with no significant change in baseline conditions for TSS.

Figure 4-2: Total Ammonia as N Concentrations at Key Sites: Owenkillew River upstream of confluence with Owenreagh River (SW05, SW06, SW08); Owenkillew tributaries (SW02, SW03); Curraghinalt Burn (SW04); Owenreagh River (SW09, SW10, SW11, SW26); Owenreagh tributary (SW25); Owenkillew River downstream of confluence with Owenreagh River (SW12).

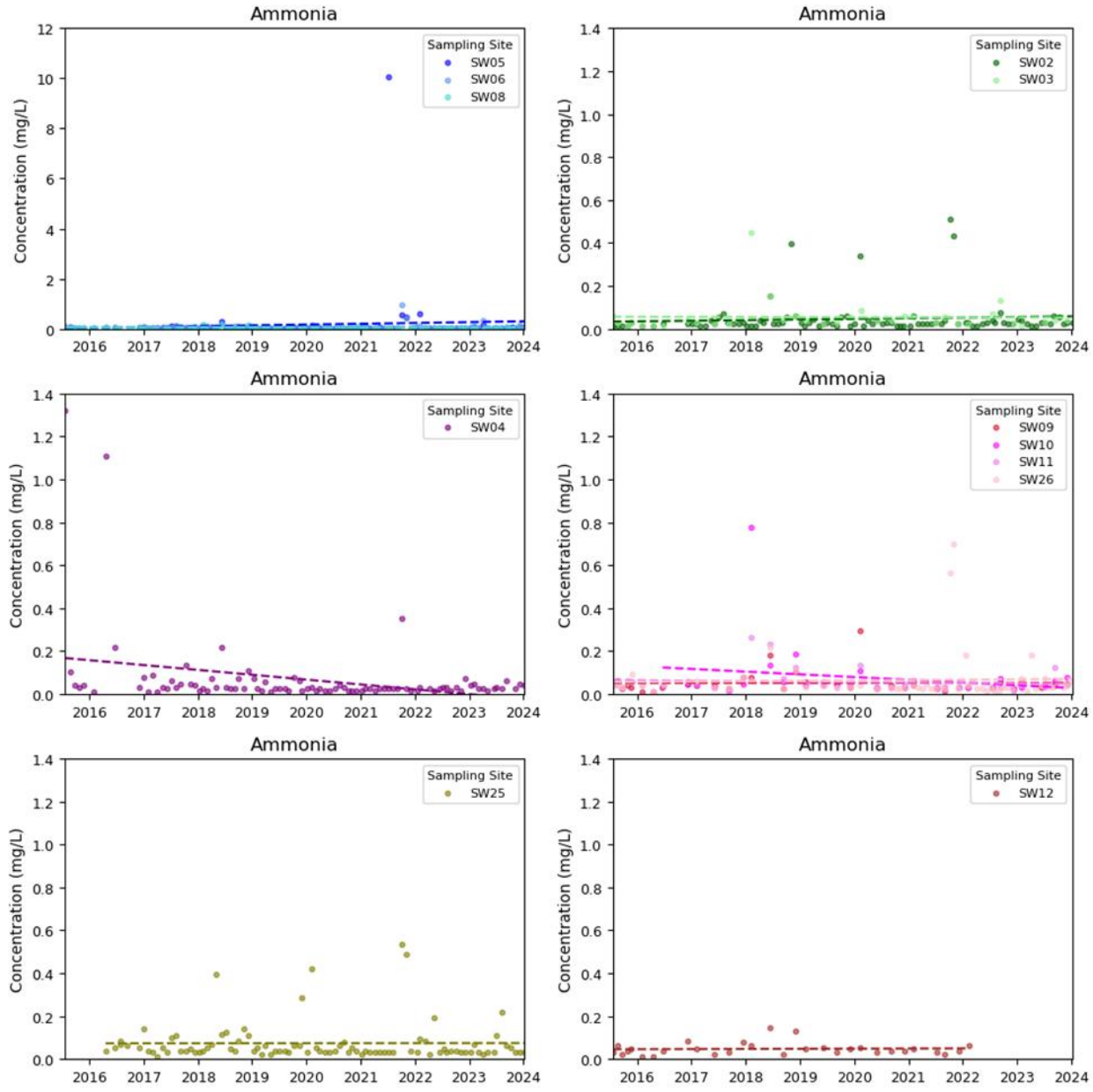


Figure 4-3: Nitrate Concentrations at Key Sites: Owenkillew River upstream of confluence with Owenreagh River (SW05, SW06, SW08); Owenkillew tributaries (SW02, SW03); Curraghinalt Burn (SW04); Owenreagh River (SW09, SW10, SW11, SW26); Owenreagh tributary (SW25); Owenkillew River downstream of confluence with Owenreagh River (SW12).

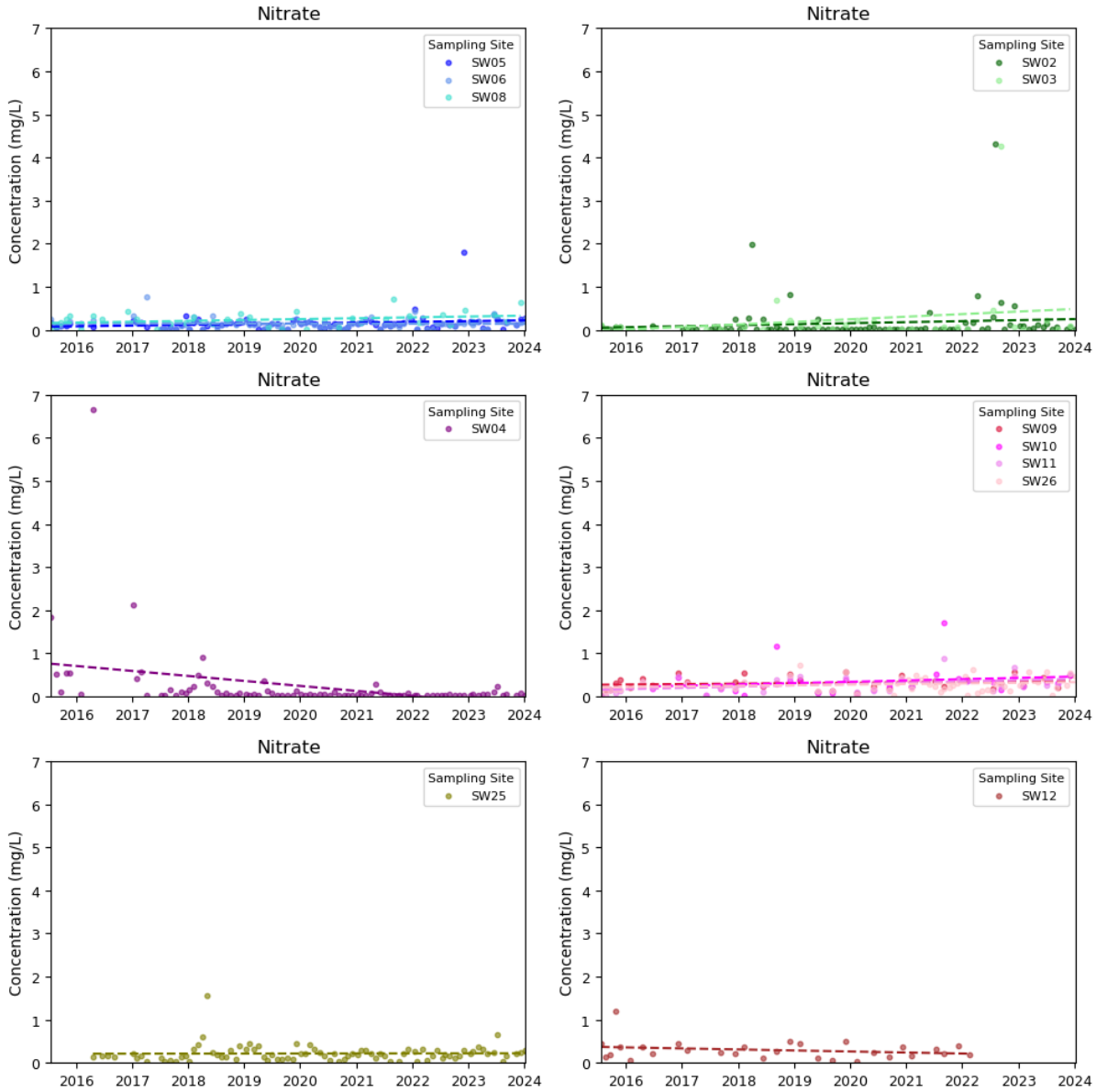


Figure 4-4: Nitrate Concentrations at Key Sites: Owenkillew River upstream of confluence with Owenreagh River (SW05, SW06, SW08); Owenkillew tributary (SW02); Owenreagh River (SW10, SW11, SW26).

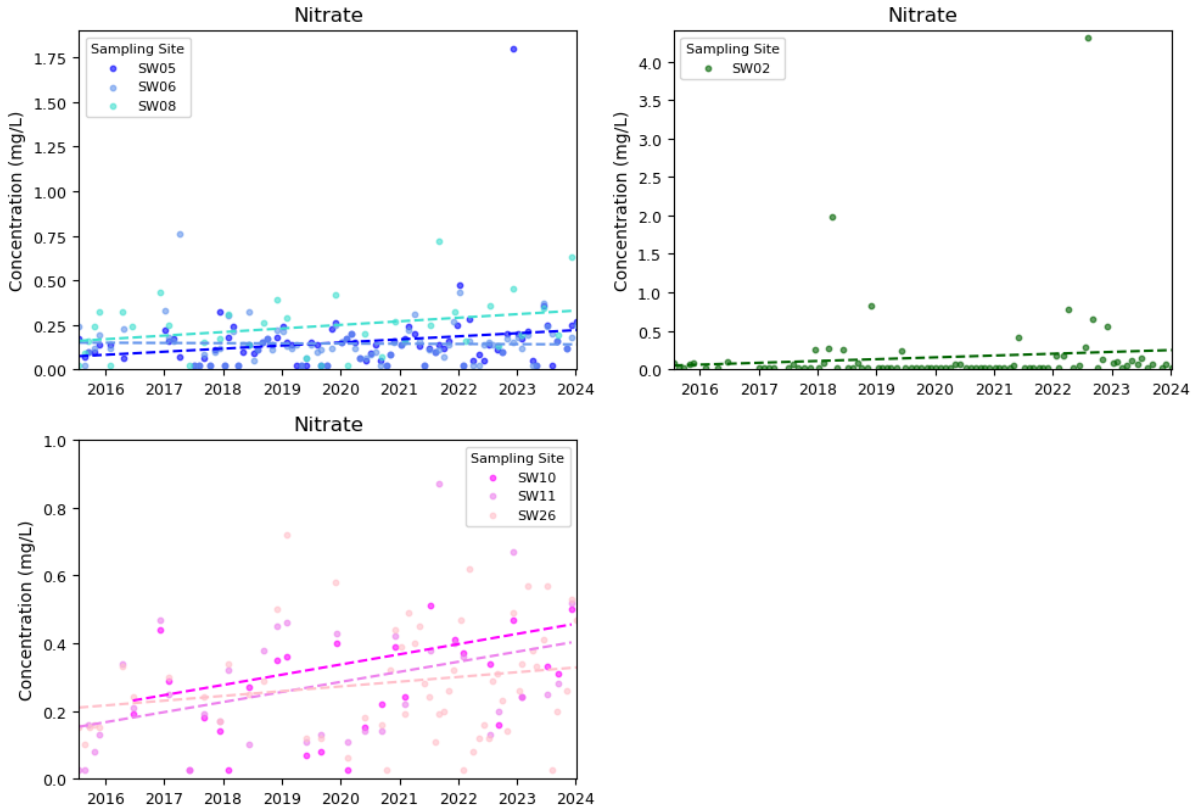
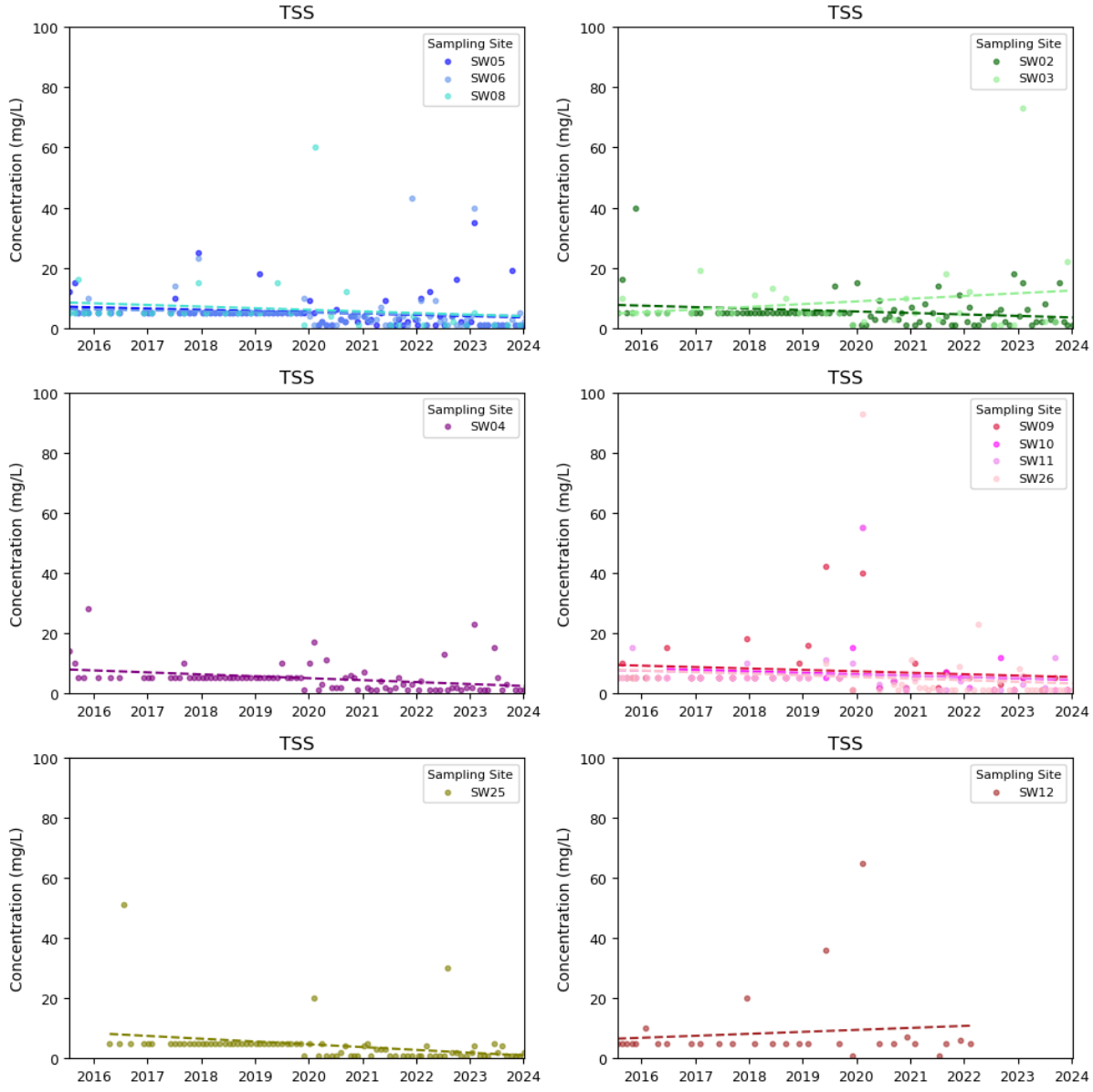


Figure 4-5: TSS Concentrations at Key Sites: Owenkillew River upstream of confluence with Owenreagh River (SW05, SW06, SW08); Owenkillew tributaries (SW02, SW03); Curraghinalt Burn (SW04); Owenreagh River (SW09, SW10, SW11, SW26); Owenreagh tributary (SW25); Owenkillew River downstream of confluence with Owenreagh River (SW12).



Phosphorus

4.17 Phosphorus was not identified as a parameter of interest in the Second Addendum, as no source was identified within mine water. However, NIEA has requested that phosphorus is included within the Discharge Consent for the mine given that JNCC (2015) identifies phosphorus as a parameter of concern for FPWM. Phosphorus parameters that have been sampled are;

- Ortho Phosphate as PO4 (LOD 0.06 mg/L or 0.03 mg/L unaccredited). Colorimetric test. Filtered through 0.45 µm prior to analysis. This analysis is considered to be equivalent to Soluble Reactive Phosphorus (SRP as referenced in JNCC and other guidance), albeit there is a requirement to convert from phosphate to phosphorus (x0.326). The detection limit is relatively high for this parameter given the analysis method.
- MRP Ortho Phosphate as P (LOD 0.03 mg/L (since 2022) or 0.01 mg/L unaccredited). Same colorimetric test as Ortho Phosphate. Filtered through ~8 µm prior to analysis and therefore includes some suspended material.
- Total phosphorus (LoD 0.7 µg/L) ICP-OES. Includes all forms of phosphorus in an unfiltered sample.
- Dissolved phosphorus (LoD 0.7 µg/L) ICP-OES. Measures all types of dissolved phosphorus present in the sample. However, most soluble phosphorus is likely to be orthophosphate (SRP). Note, dissolved phosphorus concentrations should not exceed SRP.

4.18 Only the ICP dissolved phosphorus analysis is readily capable of delivering detection limits that are directly comparable to JNCC (2015 and 2016) guideline values for SRP (0.005 to 0.02 mg/L) and the ICP has limitations as it may overestimate SRP as the dissolved phosphorus measurement includes 'non-reactive' phosphorus.

4.19 Considering orthophosphate as PO4 data (between 2011 and 2024) at upstream monitoring locations in the Owenkillew (SW05, SW07, SW23 and SW24) and Owenreagh (SW10 and SW11), it is evident that the bulk of all data are less than detection limit, which is itself above the JNCC (2015 and 2016) values. The number of results for each location during the monitoring period range between 29 (SW24) and 113 (SW05). A number of values are above the detection limit. The highest concentration of orthophosphate as PO4 recorded at any location between 2011 and 2024 is 3.07 mg/L This number equates to 1 mg/L orthophosphate as P. SW11 is at Cashel Bridge and is the closest downstream to Greencastle sewage treatment works.

4.20 Although JNCC guidance refers to reactive phosphorus, the project orthophosphate as PO4 analysis does not offer sufficient resolution to meet the targets. MRP orthophosphate analysis has similar outcomes and limitations. This means that the JNCC guidance is not appropriate for setting practical discharge consents.

4.21 In late 2023 dissolved phosphorus analysis was commenced using ICP, and there are currently up to three results for monitoring locations. Data from upstream locations in the Owenreagh (6 results) range from 0.0121 mg/L to 0.0225 mg/L (average 0.018 mg/L). Five results from upstream in the Owenkillew range from 0.0103 mg/L to 0.0228 mg/L (average 0.015 mg/L). These averages are at or above the JNCC (2015) target of 0.005 mg/L, and there is a likelihood that both rivers are above JNCC (2016) average value of 0.01 mg/L for upland low alkalinity rivers.

4.22 Data for dissolved phosphorus are available for 14 groundwater wells at the project. Groundwater concentrations range from <0.0007 mg/L to 0.0314 mg/L (median 0.0026 mg/L). The suggestion here is that bulk groundwater phosphorus concentrations entering the mine will be lower than surface water even before treatment. This likely reflects the phosphorus sources in the catchment which can be expected to reflect surface agricultural activity and sewage treatment/septic tank distribution. Two recent high resolution samples from the adit entrance both have a dissolved phosphorus concentration of <0.0007 mg/L.

4.23 Long term NIEA monitoring data (January 2011 to December 2016) was published in Horton, M., Bell, D., Keys, A. & Mitchell, F. (2018) Freshwater pearl mussel survey of Northern Ireland 2017. Report prepared by Ballinderry Rivers Trust for the Northern Ireland Environment Agency. Northern Ireland Environment Agency Research and Development supports an average phosphorus value of 0.02 mg/L in the Owenkillew SAC (range 0.01 to 0.09 mg/L). This value is considered consistent with the recent high resolution site data discussed above and also with the maximum phosphorus concentrations for SAC rivers in favourable condition (high altitude and low alkalinity category) in JNCC (2016), i.e., 20 ug/L. Regarding phosphorus, long term data (and therefore averages) come with the benefit of being able to account for the growing season when nutrients are typically consumed and/or returned to the water environment.

Bioavailable Concentrations Update

4.24 Environmental Quality Standards (EQSs) for some metals are expressed in terms of bioavailable metal concentration. This criterion currently applies to copper, zinc, manganese and nickel. The EQS for such metals is referenced as $EQS_{bioavailable}$. The bioavailable concentration gives an estimate of the amount of metal that is biologically active (i.e. as toxicity) and of ecological relevance.

4.25 An EQS is the concentration of a chemical in the environment below which there is not expected to be an adverse effect on the specific endpoint being considered e.g. the protection of aquatic life. However, it is recognised “that measures of total metal in waters have limited relevance to potential environmental risk” (UKTAG, 2014). This is based on the knowledge that the amount of metal that is actually bioavailable is influenced by a range of water quality parameters, most significantly pH, dissolved organic carbon (DOC) and calcium.

4.26 The Water Framework Directive - United Kingdom Technical Advisory Group (WFD-UKTAG) has developed a river and lake assessment method for specific metals (UKTAG, 2014). This document introduces, and is accompanied by M-BAT, a Metal Bioavailability Assessment Tool. M-BAT currently predicts metal bioavailability for copper, zinc, manganese and nickel.

4.27 M-BAT operates in MS Excel and is a simple-to-use tool that produces output results similar to more complex Biotic Ligand Models (albeit slightly precautionary). M-BAT determines metal bioavailability at specific locations using local pH, DOC and Ca water chemistry data to calculate the Predicted No Effect Concentration (PNEC). The output of the PNEC calculation is used to derive a site-specific EQS.

4.28 DOC is available for the period July 2021 onwards. Prior to the measurement of DOC there was only Total Organic Carbon (TOC) measured across the study area. Organic carbon reduces metal bioavailability, so the TOC measure is less conservative than DOC. A comparison between the DOC and TOC values measured since July 2021 was undertaken to establish a relationship between the two parameters. The analysis established that the measured DOC totals were, on

average, 96% of the measured TOC totals. Therefore, a scaling factor of 0.96 was applied to TOC values for samples collected between January 2015 and January 2024 to convert to DOC. This allowed the PNEC calculations to be undertaken for a larger data set than relying on the post-2021 data when DOC was measured. Given there is an almost one-to-one relationship between TOC and DOC it would make no sense to exclude the pre-2021 data.

Site Specific EQS (Dissolved) from the PNEC Calculation

4.29 The M-BAT tool calculates a site-specific PNEC (for the dissolved metal) based on the pH, DOC and Ca inputs that can be used to derive a site-specific EQS.

4.30 The PNEC calculation was undertaken for all sampling rounds for SW05 on the Owenkillew River and SW26 on the Owenreagh River. These are sampling locations which have the largest number of samples and are close to the Pollanroe Burn and Curraghinalt Burn respectively.

4.31 Within the UKTAG guidance the calculation can be undertaken for individual samples or the average of available data. Therefore, when selecting the site-specific EQS the guidance suggests that an average value would be appropriate. However, in this assessment, to be conservative, the 10th percentile PNEC value (i.e. the PNEC value exceeded by 90% of the sampling rounds) was selected. The selection of the 10th percentile value allows for a conservative site-specific EQS value to be applied for both the Owenreagh River and Owenkillew River whilst accounting for the impact of isolated low values.

4.32 The 10th percentile PNEC value (site-specific EQS value) for each of the four metals is shown, along with the mean PNEC value for reference, in **Table 4-9**. The 10th percentile PNEC value, and corresponding site-specific EQS, is visually compared to the PNEC ensemble for each of the four metals in **Figures 4-6** to **Figure 4-9**.

Table 4-9: The 10th percentile and mean PNEC value for the Owenreagh River and Owenkillew River. The site-specific EQS is taken from the 10th percentile value.

Parameter	Owenkillew SW05 (ug/L)		Owenreagh SW26 (ug/L)	
	Mean	10%ile	Mean	10%ile
Copper	33.0	14.5	28.7	14.0
Zinc	18.5	21.7	37.9	20.7
Manganese	313	136	479	276
Nickel	24.4	13.2	21.3	12.2

Figure 4-6: The calculated PNEC value ensembles for Copper in the Owenreagh River (left) and Owenkillew River (right). The 10th percentile PNEC value, the site-specific EQS, is shown as the dashed lines.

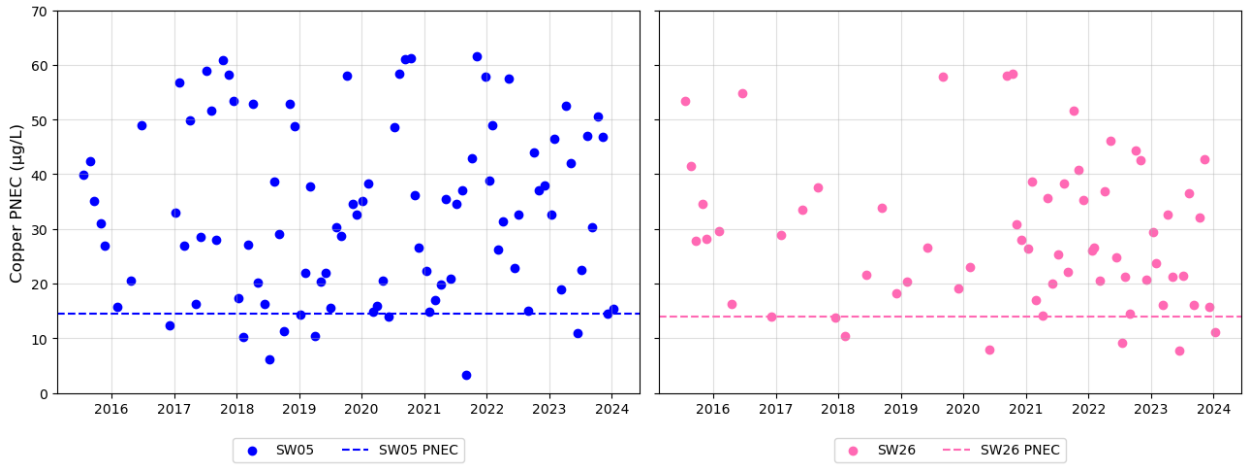


Figure 4-7: The calculated PNEC value ensembles for Zinc in the Owenreagh River (left) and Owenkillew River (right). The 10th percentile PNEC value, the site-specific EQS, is shown as the dashed lines.

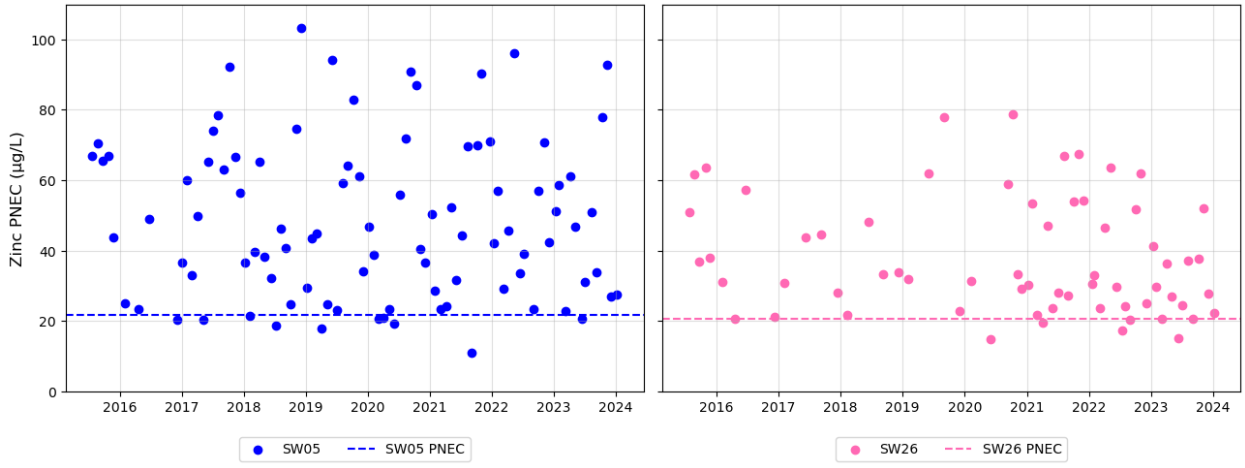


Figure 4-8: The calculated PNEC value ensembles for Manganese in the Owenreagh River (left) and Owenkillew River (right). The 10th percentile PNEC value, the site-specific EQS, is shown as the dashed lines.

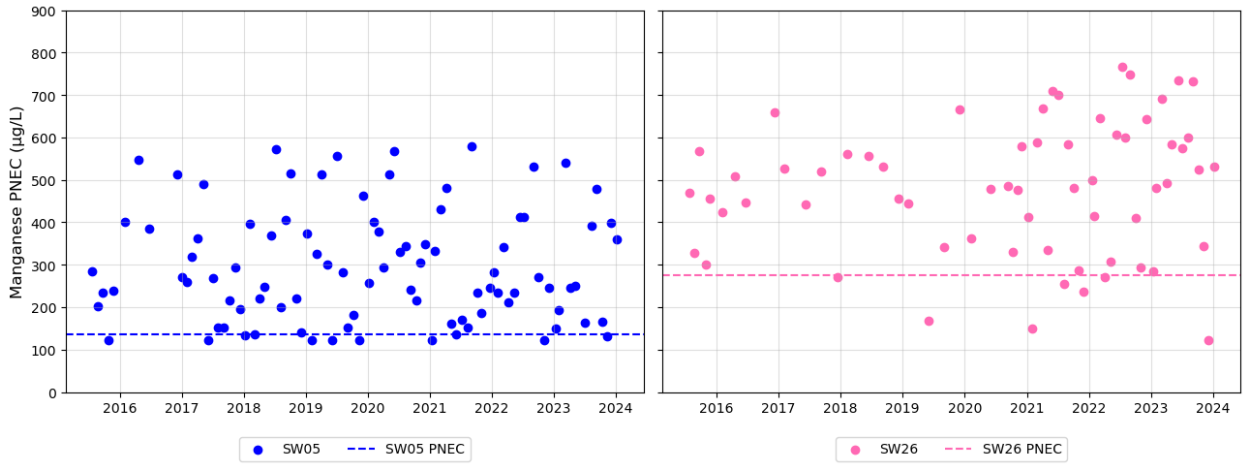
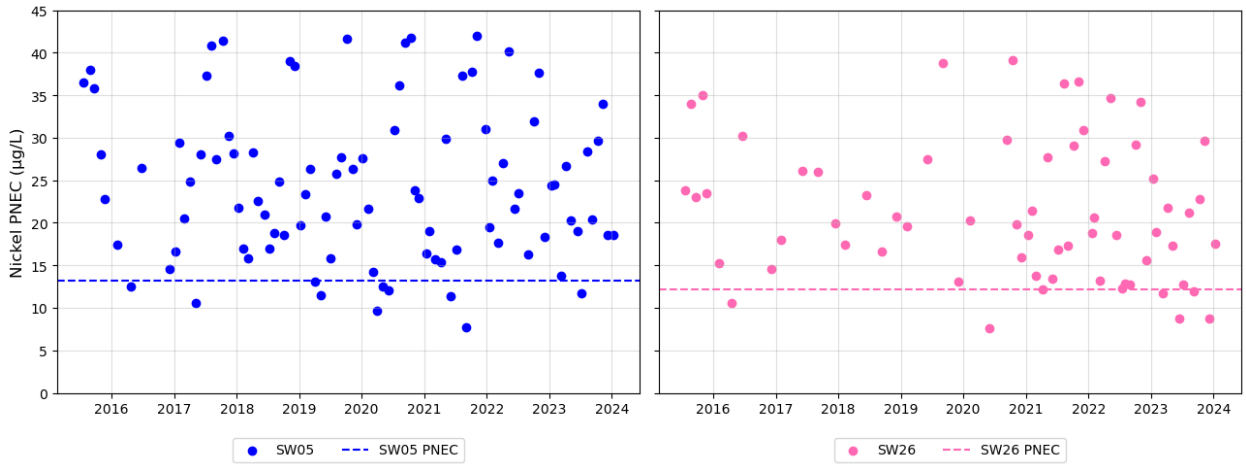


Figure 4-9: The calculated PNEC value ensembles for Nickel in the Owenreagh River (left) and Owenkillew River (right). The 10th percentile PNEC value, the site-specific EQS, is shown as the dashed lines.



5. Annex 2: Discussion of Standards for Non-Metals

Parameter	***NIEA Approach to Standards from September 2023 letter and later evidence***	***DGL Standards From Section 4 of SoC Annex 1 TR Discharge Consents, with changes reflecting September 2024 Conservation Objectives***	***Summary of Approaches to Standards***
pH	NI EQS	NI EQS	Both parties propose the use of NI EQS
Temperature	JNCC (2015)	NI EQS	As there is NI EQS then this should be applied. But DGL can accept JNCC (2015) as this is less conservative than EQS
TSS	JNCC (2005)	Sept 2024 Conservation Objectives	Although there is no EQS or (current) JNCC value. Both parties agree that 10mg/L annual average standard is applicable to spawning salmon. DGL propose an annual average standard of 10mg/L from the Sept 2024 Conservation Objectives, which is consistent with the value in the old (removed) JNCC (2005). NIEA propose the annual average value as a maximum. DGL propose a maximum value of 50mg/L in addition to an annual average.
BOD	JNCC (FWPM)	Sept 2024 Conservation Objectives incorporating JNCC values and NI EQS	Both parties agree in application of JNCC values DGL proposing JNCC as annual average and NI EQS as maximum value. NIEA proposing JNCC annual average value as maximum value, with no annual average value
Ammonia	JNCC (Rivers)	Sept 2024 Conservation Objectives incorporating JNCC values and NI EQS	Both parties agree in application of JNCC values DGL proposing JNCC as annual average and NI EQS as maximum value. NIEA proposing JNCC annual average value as maximum value, with no annual average value
Nitrate	JNCC (FWPM)	Sept 2024 Conservation Objectives incorporating JNCC values, Drinking Water Standards and CCME EQS	Both parties agree in application of JNCC values DGL proposing JNCC as appropriate as a standard for annual average concentrations, with Drinking Water Standard as maximum value (as lower than maximum limit for CCME EQS). NIEA proposing JNCC annual average value as maximum value, with no annual average value
Nitrite	Background	Drinking Water Standard (no EQS)	There is no EQS or JNCC value. DGL propose Drinking Water Standard as maximum value. NIEA propose average baseline concentration as maximum limit. Neither party proposes an average standard. It should be noted that DGL propose this parameter is removed from Discharge Consent as there is no significant mobilised source at the mine (see Section 5.1.1 of DGL SoC for Discharge Consent), no EQS and Nitrogen can be regulated through nitrate and ammonia. NIEA also propose removal of nitrite for discharge consent for Curraghinalt Burn.

Parameter	*NIEA Approach to Standards from September 2023 letter and later evidence*	*DGL Standards From Section 4 of SoC Annex 1 TR Discharge Consents, with changes reflecting September 2024 Conservation Objectives*	*Summary of Approaches to Standards*
Chloride	Background	SEPA EQS, Drinking Water Standard	There is no NI EQS or JNCC value. DGL propose SEPA EQS as annual average and Drinking Water standard as a maximum; noting these are the same value (250mg/L). NIEA propose average baseline concentration as maximum limit.
			It should be noted that DGL propose this parameter is removed from Discharge Consent as there is no significant mobilised source at the mine (see Section 5.1.1 of DGL SoC for Discharge Consent).
Fluoride	Background	SEPA EQS, Drinking Water Standard	There is no NI EQS or JNCC value. DGL propose SEPA EQS as an average standard, with Drinking Water Standard as a maximum limit (this is lower than maximum SEPA EQS). NIEA propose average baseline concentration as maximum limit.
			It should be noted that DGL propose this parameter is removed from Discharge Consent as there is no significant mobilised source at the mine (see Section 5.1.1 of DGL SoC for Discharge Consent). NIEA also propose removal of fluoride for discharge consent for Curraghinalt Burn.
Sulphate	Background	SEPA EQS, Drinking Water Standard	There is no NI EQS or JNCC value. The Drinking Water Standard (250mg/L) is lower than the SEPA EQS (400mg/L), so setting the Drinking Water Standard as a maximum limit would mean the average limit is also met. NIEA propose average baseline concentration as maximum limit. Neither party proposes an average standard.
Phosphorus	JNCC (FWPM/Rivers)	NI EQS and Sept 2024 Conservation Objectives incorporating JNCC values	Both parties agree that JNCC has application to the site.
			There is disagreement over which JNCC value to use (value for rivers or burns) and relative importance of NI EQS. In their SoC NIEA proposed NI EQS of 0.016mg/L but appear to change their approach at Rebuttal to be consistent with Loughs Agency who suggested a value of 0.01mg/L (JNCC for burns). It should be noted that NIEA propose annual average standards as maxima. DGL proposed use of NI EQS with consideration of JNCC value for Owenkillew River SAC (0.02mg/L).

COLOUR KEY

	Full Agreement
	Minor Disagreement, easily resolved
	Standard Agreed, but form of measurement (average e or maximum is in dispute)
	Disagreement over NIEA use of baseline as standard
	Other

6. Annex 3: Discussion of Standards for Metals

Parameter	*NIEA Approach to Standards from September 2023 letter and later evidence*	*DGL Standards From Section 4 of SoC Annex 1 TR Discharge Consents, with changes reflecting September 2024 Conservation Objectives*	*Summary of Approaches to Standards*
Aluminium	Background	No EQS, Drinking Water Standard	There is no NI EQS or JNCC value. DGL propose Drinking Water standard as a maximum. NIEA propose average baseline concentration as maximum limit. It should be noted that DGL propose this parameter is removed from Discharge Consent as there is no significant mobilised source at the mine (see Section 5.1.1 of DGL SoC for Discharge Consent). NIEA also propose removal of aluminium for discharge consent for Curraghinalt Burn.
Antimony	Background	No EQS, Drinking Water Standard	There is no NI EQS or JNCC value. DGL propose Drinking Water standard as a maximum. NIEA propose average baseline concentration as maximum limit.
Arsenic	NI EQS	NI EQS	Both parties accept the relevance of NI EQS DGL proposing Drinking Water Standard as maximum value as it is less than NI EQS. No average value is proposed as maximum is already protective of average EQS. NIEA proposing NI EQS annual average value as maximum value.
Barium	Background	EU EQS	There is no NI EQS or JNCC value. DGL propose EU EQS as average and maximum standards. NIEA propose average baseline concentration as maximum limit. Both parties propose removing parameter from discharge consent
Boron	Background	CCME EQS	There is no NI EQS or JNCC value. DGL propose CCME EQS as average and maximum standards. NIEA propose average baseline concentration as maximum limit. Both parties propose removing parameter from discharge consent
Cadmium	NI EQS	NI EQS	Both parties accept the relevance of NI EQS DGL propose average EQS as average limit and maximum EQS and maximum limit. NIEA propose average EQS as maximum limit.
Cr III	NI EQS	NI EQS	Both parties accept the relevance of NI EQS It should be noted that DGL propose this parameter is removed from Discharge Consent as it can be regulated through Total Chromium. NIEA also propose removal of CrIII for discharge consent for Curraghinalt Burn.
CrVI	NI EQS	NI EQS	Both parties accept the relevance of NI EQS It should be noted that DGL propose this parameter is removed from Discharge Consent as it can be regulated through Total Chromium. NIEA also propose removal of CrVI for discharge consent for Curraghinalt Burn.
Chromium	NI EQS	NI EQS	Both parties accept the relevance of NI EQS DGL propose average EQS as average limit. NIEA propose average EQS as maximum limit.
Cobalt	None	SEPA EQS	NIEA propose International EQS as standard, with NIEA proposing no standard.

Parameter	*NIEA Approach to Standards from September 2023 letter and later evidence*	*DGL Standards From Section 4 of SoC Annex 1 TR Discharge Consents, with changes reflecting September 2024 Conservation Objectives*	*Summary of Approaches to Standards*
			Both parties propose removing parameter from discharge consent
Copper	NI EQS	NI EQS	Both parties accept the relevance of NI EQS DGL propose average EQS as average limit. NIEA propose average EQS as maximum limit.
Iron	NI EQS	NI EQS and Drinking Water Standards	Both parties accept the relevance of NI EQS DGL propose Drinking Water Standard as a maximum limit (as this is lower than average NI EQS), so setting the Drinking Water Standard as a maximum limit would mean the average limit is also met. NIEA propose average NI EQS as maximum limit. It is noted that baseline concentrations are above EQS and Drinking Water Standard.
Lead	NI EQS	NI EQS and Drinking Water Standards	Both parties accept the relevance of NI EQS DGL propose Drinking Water Standard as a maximum limit (as this is lower than max NI EQS), and average EQS as average standard. NIEA propose average NI EQS as maximum limit.
Manganese	NI EQS	NI EQS and Drinking Water Standards	Both parties accept the relevance of NI EQS Drinking Water Standard is lower than average NI EQS. NIEA propose average NI EQS as maximum limit. It is noted that baseline concentrations are above Drinking Water Standard, but below EQS.
Mercury	NI EQS	NI EQS	Both parties accept the relevance of NI EQS. Both parties propose use of maximum EQS and maximum standard. No average standard is proposed by either party.
Molybdenum	Background	CCME EQS	There is no NI EQS or JNCC value. DGL propose CCME EQS as an average standard. NIEA propose average baseline concentration as maximum limit.
Nickel	NI EQS	NI EQS and Drinking Water Standards	Both parties accept the relevance of NI EQS DGL propose Drinking Water Standard as a maximum limit (as this is lower than max NI EQS), and average EQS as average standard. NIEA propose average NI EQS as maximum limit.
Selenium	Background	USEPA (EQS)	There is no NI EQS or JNCC value. DGL propose CCME EQS as an average standard. NIEA propose average baseline concentration as maximum limit. It should be noted that DGL propose this parameter is removed from Discharge Consent as there is no significant mobilised source at the mine (see Section 5.1.1 of DGL SoC for Discharge Consent).
Silver	Background	NI EQS	DGL propose average EQS as average limit. NIEA propose average baseline concentration as maximum limit.

Parameter	*NIEA Approach to Standards from September 2023 letter and later evidence*	*DGL Standards From Section 4 of SoC Annex 1 TR Discharge Consents, with changes reflecting September 2024 Conservation Objectives*	*Summary of Approaches to Standards*
			It should be noted that DGL propose this parameter is removed from Discharge Consent as there is no significant mobilised source at the mine (see Section 5.1.1 of DGL SoC for Discharge Consent).
Sodium	Background	No EQS, Drinking Water Standard	There is no NI EQS or JNCC value. DGL propose Drinking Water Standard as an average standard. NIEA propose average baseline concentration as maximum limit.
			It should be noted that DGL propose this parameter is removed from Discharge Consent as there no significant mobilised source at the mine (see Section 5.1.1 of DGL SoC for Discharge Consent). NIEA also propose removal of sodium for discharge consent for Curraghinalt Burn.
Uranium	Background	CCME EQS, Drinking Water Standard	There is no NI EQS or JNCC value. DGL propose Drinking Water Standard as a maximum standard, as it is lower than maximum CCME EQS. NIEA propose average baseline concentration as maximum limit.
Zinc	NI EQS	NI EQS	Both parties accept the relevance of NI EQS
			DGL propose average EQS as average limit. NIEA propose average EQS as maximum limit.

COLOUR KEY

- Full Agreement
- Minor Disagreement, easily resolved
- Standard Agreed, but form of measurement (average e or maximum is in dispute)
- Disagreement over NIEA use of baseline as standard
- Other

7. Annex 4: Discussion of Discharge Consent Proposals – Non-Metals

Parameter	*Unit*	*NIEA and Loughs Agency Proposed Discharge Criteria for Pollanroe Burn- All Max. All from NIEA SoC unless otherwise noted*	*DGL Pollanroe (any changes from DGL SoC highlighted in red text)*		*NIEA and Loughs Agency Proposed Discharge Criteria for Curraghinalt Burn- All Max. All from NIEA SoC unless otherwise noted*	*DGL Curraghinalt (any changes from DGL SoC highlighted in red text)*		*Agreement/Disagreement*	*Changes from DGL SoC*
			Max	*Mean*		*Max*	*Mean*		
pH	-	6.5-9	6.2-9.0		6.5-9	6.2-9.0		DGL propose pH range consistent with NI EQS, with NIEA proposing a narrower range. DGL would be content with either range but propose use of NI EQS.	No change
Temperature	°C	18 (Loughs Agency) or 20 (NIEA)	20	None	18 (Loughs Agency) or 20 (NIEA)	20	None	There is agreement with the values proposed by NIEA in their SoC. However, Loughs Agency requested value <background temperature seen in rivers in summer (18°C) which is not reasonable as RO treatment process does not impact on water temperature.	No change
TSS	mg/L	10	50	**10**	10	50	**10**	DGL has reviewed consent values and is content to reduce the average annual consent value to 10mg/L. DGL propose to retain the maximum value of 50mg/L. NIEA propose the JNCC (2005) and Sept 2024 Conservation Objectives annual average value as a maximum	DGL propose change to annual average concentrations to 10mg/L consistent with NIEA suggestion
BOD	mg/L	0.89	3	1	0	3	1	There is consistent approach to the use of JNCC, but NIEA propose discharge values that are erroneous due to use of Monte Carlo method (Issues 1 and 3). DGL propose an annual average consent value that is consistent with Conservation Objectives and a maximum that is consistent with EQS. NIEA values cannot be sensibly applied as a Discharge Consent	No change

Parameter	*Unit*	*NIEA and Loughs Agency Proposed Discharge Criteria for Pollanroe Burn- All Max. All from NIEA SoC unless otherwise noted*	*DGL Pollanroe (any changes from DGL SoC highlighted in red text)*		*NIEA and Loughs Agency Proposed Discharge Criteria for Curraghinalt Burn- All Max. All from NIEA SoC unless otherwise noted*	*DGL Curraghinalt (any changes from DGL SoC highlighted in red text)*		*Agreement/Disagreement*	*Changes from DGL SoC*
			Max	*Mean*		*Max*	*Mean*		
Ammonia	mg/L N	2	0.25	0.2	1.71	0.25	0.2	DGL propose values that are lower than those proposed by NIEA. It is unclear how NIEA have come to their values are as they are above the JNCC and NI EQS values.	No change
Nitrate	mg/L N	0	11.3	0.42	0.17	11.3	0.2	NIEA propose discharge values that are erroneous due to use of Monte Carlo method (Issues 1 and 3). DGL propose average baseline concentrations as average consent value, with Betterment Plan to provide equivalent to JNCC at end of pipe. NIEA values cannot be sensibly applied to Discharge Consents.	No change
Nitrite	mg/L N	0	None	None	None	None	None	NIEA propose no value for Curraghinalt and zero concentration for Pollanroe due to erroneous use of Monte Carlo method (Issue 1). DGL propose removal of parameter from discharge consent. NIEA value for Pollanroe cannot be sensibly applied as a Discharge Consent. NIEA already propose removing the parameter from discharge consent for Curraghinalt, so propose that parameter is removed for both burns.	No change

Parameter	*Unit*	*NIEA and Loughs Agency Proposed Discharge Criteria for Pollanroe Burn- All Max. All from NIEA SoC unless otherwise noted*	*DGL Pollanroe (any changes from DGL SoC highlighted in red text)*		*NIEA and Loughs Agency Proposed Discharge Criteria for Curraghinalt Burn- All Max. All from NIEA SoC unless otherwise noted*	*DGL Curraghinalt (any changes from DGL SoC highlighted in red text)*		*Agreement/Disagreement*	*Changes from DGL SoC*
			Max	*Mean*		*Max*	*Mean*		
Chloride	mg/L	9.41	None	None	6.21	None	None	NIEA propose maximum consent value is less than baseline due to erroneous use of Monte Carlo method (Issue 3). Using average baseline value as a maximum limit (standard) is not appropriate way to set discharge consent value. DGL propose removal of the parameter from the discharge consent.	No change
Fluoride	mg/L	0.15	None	None	None	None	None	NIEA propose no value for Curraghinalt and value that is less than detection limit for Pollanroe due to erroneous use of Monte Carlo method (Issue 2). DGL propose removal of the parameter from the discharge consent due to no predicted impact from mine and no EQS	No change
Sulphate	mg/L	1.99	250	None	None	250	None	NIEA propose no value for Curraghinalt and value for Pollanroe that is less than average baseline due to erroneous use of Monte Carlo method (Issue 3). DGL propose SEPA EQS in absence of NI EQS	No change

8. Annex 5 Discussion of Discharge Consent Proposals – Metals

Parameter	*Unit*	*NIEA and Loughs Agency Proposed Discharge Criteria for Pollanroe Burn- All Max. All from NIEA SoC unless otherwise noted*	*DGL Pollanroe (any changes from DGL SoC highlighted in red text)*		*NIEA and Loughs Agency Proposed Discharge Criteria for Curraghinalt Burn- All Max. All from NIEA SoC unless otherwise noted*	*DGL Curraghinalt (any changes from DGL SoC highlighted in red text)*		*Agreement/Disagreement*	*Changes from DGL SoC*
			Max	*Mean*		*Max*	*Mean*		
Aluminium	µg/L	53.77	None		None	None		NIEA propose no value for Curraghinalt and maximum consent value for Pollanroe that is less than average baseline due to erroneous use of Monte Carlo method (Issue 3). Using average baseline value as a maximum limit (standard) is not appropriate way to set discharge consent value. DGL propose removal of the parameter from the discharge consent.	No change
Antimony	µg/L	1.16	5		0.07	5		NIEA propose value for Curraghinalt that is less than average baseline due to erroneous use of Monte Carlo method (Issue 3); value for Pollanroe is above average baseline. Using average baseline value as a maximum limit (standard) is not appropriate way to set discharge consent value. DGL propose Drinking Water Standard as there is no EQS.	No change

Parameter	*Unit*	*NIEA and Loughs Agency Proposed Discharge Criteria for Pollanroe Burn- All Max. All from NIEA SoC unless otherwise noted*	*DGL Pollanroe (any changes from DGL SoC highlighted in red text)*		*NIEA and Loughs Agency Proposed Discharge Criteria for Curraghinalt Burn- All Max. All from NIEA SoC unless otherwise noted*	*DGL Curraghinalt (any changes from DGL SoC highlighted in red text)*		*Agreement/Disagreement*	*Changes from DGL SoC*
			Max	*Mean*		*Max*	*Mean*		
Arsenic	µg/L	0	10		0	10		NIEA propose discharge values that are erroneous (zero) due to use of Monte Carlo method (Issues 1, 2, 3 and 4). A zero value cannot be sensibly applied as a Discharge Consent. DGL propose Drinking Water Standard as a maximum value as it is lower and protective of the average EQS value (50 µg/L)	No change
Barium	µg/L	None	None	None	None	None	None	Both parties propose removing parameter from discharge consent	No change
Boron	µg/L	None	None	None	None	None	None	Both parties propose removing parameter from discharge consent	No change
Cadmium	µg/L	0.46	0.26	0.08	0.69	0.45	**0.08**	NIEA are not consistent in proposing a value >EQS for Curraghinalt and <EQS for Pollanroe, due to erroneous use of Monte Carlo method (Issue 4). DGL propose average consent value based on mean EQS and maximum consent value for Pollanroe based on Monte Carlo calculation for Owenreagh River, with maximum for Curraghinalt set to Max EQS.	DGL content to include annual average consent value for Curraghinalt to be consistent with Pollanroe

Parameter	*Unit*	*NIEA and Loughs Agency Proposed Discharge Criteria for Pollanroe Burn- All Max. All from NIEA SoC unless otherwise noted*	*DGL Pollanroe (any changes from DGL SoC highlighted in red text)*		*NIEA and Loughs Agency Proposed Discharge Criteria for Curraghinalt Burn- All Max. All from NIEA SoC unless otherwise noted*	*DGL Curraghinalt (any changes from DGL SoC highlighted in red text)*		*Agreement/Disagreement*	*Changes from DGL SoC*
			Max	*Mean*		*Max*	*Mean*		
Cr III	µg/L	0	None		None	None		NIEA propose no value for Curraghinalt and proposed discharge value for Pollanroe is erroneous (zero) due to use of Monte Carlo method (Issues 1, 2, 3 and 4). A zero value cannot be sensibly applied as a Discharge Consent. DGL propose removal of the parameter from the discharge consent.	No change
CrVI	µg/L	0	None		None	None		NIEA propose no value for Curraghinalt and proposed discharge value for Pollanroe is erroneous (zero) due to use of Monte Carlo method (Issues 1, 2, 3 and 4). A zero value cannot be sensibly applied as a Discharge Consent. DGL propose removal of the parameter from the discharge consent.	No change
Chromium	µg/L	0	30	8.1	0	50	**8.1**	NIEA propose discharge values that are erroneous (zero) due to use of Monte Carlo method (Issues 1, 2, 3 and 4). A zero value cannot be sensibly applied as a Discharge Consent. DGL propose average EQS as annual average consent	DGL content to include annual average consent value for Curraghinalt to be consistent with Pollanroe

Parameter	*Unit*	*NIEA and Loughs Agency Proposed Discharge Criteria for Pollanroe Burn- All Max. All from NIEA SoC unless otherwise noted*	*DGL Pollanroe (any changes from DGL SoC highlighted in red text)*		*NIEA and Loughs Agency Proposed Discharge Criteria for Curraghinalt Burn- All Max. All from NIEA SoC unless otherwise noted*	*DGL Curraghinalt (any changes from DGL SoC highlighted in red text)*		*Agreement/Disagreement*	*Changes from DGL SoC*
			Max	*Mean*		*Max*	*Mean*		
								value and maximum consent value for Pollanroe based on Monte Carlo calculation for Owenreagh River, with maximum for Curraghinalt set to Drinking Water Standard.	
Cobalt	µg/L	None	None	None	None	None	None	Both parties propose removing parameter from discharge consent	No change
Copper	µg/L	0.02	54	14	0	239	**14.5**	Due to erroneous use of Monte Carlo method (Issues 1,2,3 and 4) NIEA calculate consent values that are inappropriate. A zero value cannot be sensibly applied as a Discharge Consent, nor such a low value (compared to EQS and baseline) that it is effectively close to zero. DGL propose average EQS as annual average consent value and maximum consent values based on Monte Carlo calculations for Owenreagh and Owenkillew Rivers.	DGL content to include annual average consent value for Curraghinalt to be consistent with Pollanroe. Note value are slightly different as they are adjusted bio-available concentrations as outlined in the DGL SoC for Discharge Consent
Iron	mg/L	0.66	0.61		0	2.38		NIEA propose zero consent value for Curraghinalt due to erroneous use of Monte Carlo method (Issues 1, 2,3 and 4). DGL propose maximum discharge consent for Pollanroe	No change

Parameter	*Unit*	*NIEA and Loughs Agency Proposed Discharge Criteria for Pollanroe Burn- All Max. All from NIEA SoC unless otherwise noted*	*DGL Pollanroe (any changes from DGL SoC highlighted in red text)*		*NIEA and Loughs Agency Proposed Discharge Criteria for Curraghinalt Burn- All Max. All from NIEA SoC unless otherwise noted*	*DGL Curraghinalt (any changes from DGL SoC highlighted in red text)*		*Agreement/Disagreement*	*Changes from DGL SoC*
			Max	*Mean*		*Max*	*Mean*		
								and Curraghinalt based on average baseline, which is above Drinking Water Standard and EQS (1mg/L).	
Lead	µg/L	7.78	10	7.2	11.17	10	7.2	Due to erroneous use of Monte Carlo method, NIEA are not consistent in proposing a value >EQS for Curraghinalt and <EQS for Pollanroe. DGL propose average EQS as annual average consent value and maximum consent values based on Drinking Water Standard which is lower than maximum EQS.	DGL content to include annual average consent value for Curraghinalt to be consistent with Pollanroe
Manganese	µg/L	91.46	187		2.88	72		NIEA propose very low and below baseline consent values due to erroneous use of Monte Carlo method (Issues 2,3 and 4). DGL propose maximum discharge consent for Pollanroe and Curraghinalt based on average baseline, which is above Drinking Water Standard, but less than EQS.	No change
Mercury	µg/L	0.08	0.07		0.11	0.07		DGL propose maximum discharge consent value that is lower than that proposed by NIEA, so acceptable	NIEA's proposal accepted

Parameter	*Unit*	*NIEA and Loughs Agency Proposed Discharge Criteria for Pollanroe Burn- All Max. All from NIEA SoC unless otherwise noted*	*DGL Pollanroe (any changes from DGL SoC highlighted in red text)*		*NIEA and Loughs Agency Proposed Discharge Criteria for Curraghinalt Burn- All Max. All from NIEA SoC unless otherwise noted*	*DGL Curraghinalt (any changes from DGL SoC highlighted in red text)*		*Agreement/Disagreement*	*Changes from DGL SoC*
			Max	*Mean*		*Max*	*Mean*		
Molybdenum	µg/L	0.1	68		0.04	70		Due to erroneous use of Monte Carlo method (Issues 1,2,3 and 4) NIEA calculate consent values that are so low as to be effectively zero. DGL proposes maximum consent limit based on Drinking Water Standards which are lower than (and protective of) International EQS values. There is small (non-material) lowering of consent value for Pollanroe Burn as discussed in discharge consent application	No change
Nickel	µg/L	21.68	20	12.2	0	20	13.2	NIEA calculate inconsistent consent values. For Pollanroe value is higher than those proposed by DGL. For Curraghinalt NIEA propose zero concentration due to erroneous use of Monte Carlo method (Issues 1,2,3 and 4). A zero value cannot be sensibly applied as a Discharge Consent. DGL propose average EQS as annual average consent value and maximum consent values based on Drinking Water Standards.	DGL content to accept NIEA's proposal for the PB and include annual average consent value for Curraghinalt to be consistent with Pollanroe. Note values are slightly different as they are adjusted bio-available concentrations as outlined in the DGL SoC for Discharge Consent

Parameter	*Unit*	*NIEA and Loughs Agency Proposed Discharge Criteria for Pollanroe Burn- All Max. All from NIEA SoC unless otherwise noted*	*DGL Pollanroe (any changes from DGL SoC highlighted in red text)*		*NIEA and Loughs Agency Proposed Discharge Criteria for Curraghinalt Burn- All Max. All from NIEA SoC unless otherwise noted*	*DGL Curraghinalt (any changes from DGL SoC highlighted in red text)*		*Agreement/Disagreement*	*Changes from DGL SoC*
			Max	*Mean*		*Max*	*Mean*		
Selenium	µg/L	0.7	None		0	None		NIEA calculate a zero concentration for Curraghinalt and near zero value for Pollanroe due to erroneous use of Monte Carlo method (Issues 1,2,3 and 4). A zero value cannot be sensibly applied as a Discharge Consent. DGL propose removal of the parameter from the discharge consent.	No change
Silver	µg/L	2.5	None		0.02	None		NIEA calculate consent values that are below the laboratory detection limit due to erroneous use of Monte Carlo method (Issues 2,3 and 4). Very low values (compared to EQS and baseline) which are effectively close to zero are not sensible to be used as Discharge Consent value. DGL propose removal of the parameter from the discharge consent.	No change
Sodium	mg/L	5.96	None		None	None		NIEA propose no value for Curraghinalt and value that is less than baseline for Pollanroe due to erroneous use of Monte Carlo method (Issue 3). DGL propose removal of the	No change

Parameter	*Unit*	*NIEA and Loughs Agency Proposed Discharge Criteria for Pollanroe Burn- All Max. All from NIEA SoC unless otherwise noted*	*DGL Pollanroe (any changes from DGL SoC highlighted in red text)*		*NIEA and Loughs Agency Proposed Discharge Criteria for Curraghinalt Burn- All Max. All from NIEA SoC unless otherwise noted*	*DGL Curraghinalt (any changes from DGL SoC highlighted in red text)*		*Agreement/Disagreement*	*Changes from DGL SoC*
			Max	*Mean*		*Max*	*Mean*		
								parameter from the discharge consent.	
Uranium	µg/L	2.5	30	15	0	30	**15**	NIEA propose a zero consent value for Curraghinalt and value that is less than detection limit for Pollanroe due to erroneous use of Monte Carlo method (Issues 1,2,3 and 4) A zero value cannot be sensibly applied as a Discharge Consent. DGL propose average EQS as annual average consent value and maximum consent values based on Drinking Water Standard which is lower than the maximum EQS.	DGL content to include annual average consent value for Curraghinalt to be consistent with Pollanroe

Parameter	*Unit*	*NIEA and Loughs Agency Proposed Discharge Criteria for Pollanroe Burn- All Max. All from NIEA SoC unless otherwise noted*	*DGL Pollanroe (any changes from DGL SoC highlighted in red text)*		*NIEA and Loughs Agency Proposed Discharge Criteria for Curraghinalt Burn- All Max. All from NIEA SoC unless otherwise noted*	*DGL Curraghinalt (any changes from DGL SoC highlighted in red text)*		*Agreement/Disagreement*	*Changes from DGL SoC*
			Max	*Mean*		*Max*	*Mean*		
Zinc	µg/L	0.21	73.3	20.7	1.14	204	**21.7**	NIEA propose very low consent values due to erroneous use of Monte Carlo method (Issues 2,3 and 4). NIEA calculate consent values that are inappropriate. DGL propose average EQS as annual average consent value and maximum consent values based on Monte Carlo calculations for Owenreagh and Owenkillew Rivers.	DGL content to include annual average consent value for Curraghinalt to be consistent with Pollanroe. Note values are slightly different as they are adjusted bio-available concentrations as outlined in the DGL SoC for Discharge Consent. It is noted that in Table 6 of the DGL SoC text suggests that maximum consent value for Pollanroe is based on Drinking Water standard, which is wrong. The maximum is based on Monte Carlo calculations for Owenreagh River.

ISSUES WITH NIEA APPROACH TO MONTE CARLO MODELLING

Issue 1	Discharge Consent Value is set to zero, which is not a practical value for consent setting, see DGL Rebuttal Statement for Discharges, e.g., Executive Summary Para 17 to 22 and Main report Section 7.7
Issue 2	Discharge Consent Value is <laboratory detection limit, so cannot be used as a consent value as non-compliance cannot be measured
Issue 3	Discharge Consent Value is <baseline, which is not a practical value for consent setting as it would mean discharge of natural waters would be non-compliant
Issue 4	Discharge Consent Value is set <<EQS, which is not an appropriate value for consent setting as these concentrations are well below values which are considered protective to aquatic life through research and toxicity analysis
Issue 5	Other issue outlined in DGL Rebuttal Statement for Discharges

COLOUR KEY

	Full Agreement
	Issue due to NIEA application of Monte Carlo model