Inquiry Reference - 2024/WHR01 and 2024/WHR02

Abstraction

AIL 2024/0008

AIL 2024/0009

Statement of Case Fermanagh and Omagh District Council

Fermanagh & Omagh
District Council
Comhairle Ceantair
Fhear Manach agus na hÓmai

Introduction

1.1. This is the statement of case of Fermanagh and Omagh District Council ('the Council') in objection to two applications made by Dalradian Gold Limited ('DGL') under the Water Abstraction and Impoundment (Licensing) Regulations (Northern Ireland) 2006 ('2006 Regulations') to abstract and impound water. The applications are made in connection with the related application for planning permission for an underground gold mine also made by DGL (LA10/2017/1249/F).

1.2. The first application seeks a licence to abstract mine ground water through dewatering of the underground mine and to store it within the west pond (AIL/2024/0008) (PAC Ref: 2024/WHR01). The second application seeks a licence to abstract and impound surface water associated with the proposed underground mine (AIL/2024/0009) (PAC Ref: 2024/WHR02).

1.3. In its main statement of case in connection with the application for planning permission (LA10/2017/1249/F), the Council explained that it obtained the views of expert consultants in order to assist it in these inquiries. Two of the statements of case are relevant to these discharge consent applications.

1.3.1. Ecology statement of case prepared by Mr Jon Davies BSc FCIEEM CEcol CEnv of RSK Wilding.

1.3.2. Hydrology, hydrogeology and peat statement of case prepared by Dr Catherine Isherwood PhD MSc CGeol FGS MIMMM of the Water Research Centre.

1.4. For the following reasons in summary, the Council invites the Planning Appeals Commission to recommend that the applications are refused based on the following draft reasons for refusal ('dRfR').

> dRfR 1: It has not been demonstrated that the proposal would not adversely affect the integrity of European designated sites and so consent to abstract must be refused under the Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995.
>
> dRfR 2: It has not been demonstrated that the proposal will not have an unacceptable adverse impact on ecological receptors.
>
> dRfR 3: It has not been demonstrated that granting the licences in the terms sought would be consistent with the duty to conserve biodiversity in section 1(1) of the Wildlife and Natural Environment Act (Northern Ireland) 2011.

2.0. Proposals and procedural history

(a) Application AIL/2024/0008

2.1. The following documents were submitted with the application.

2.1.1. Application form;

2.1.2. SRK Consulting report;

2.1.3. Kaya letter dated 17 December 2021;

2.1.4. Kaya letter dated 28 January 2022;

2.1.5. Gahan and Long letter dated 28 January 2022; and

2.1.6. DAERA spreadsheet of responses to the 2020 application.

2.2. In previous correspondence to the Planning Appeals Commission, the Council has observed that the representations made in connection with this application had not been made publicly available. These must be made available in advance of the hearing sessions as the purpose of the hearing sessions is to explore the representations that have been made.

2.3. The groundwater application seeks a licence for the abstraction of groundwater from the underground mine sump and its subsequent impoundment within the West Pond of the proposed mine site (which is, in fact, located towards the south west of the appeal site, as can be seen on drawing reference 2016021-P-CIV-003 (Rev FEI_2)). The abstraction results from the dewatering of the mine, which is necessary to create a safe working environment.

2.4. Water is proposed to be pumped from the underground mine to the mine portal via pipes. From the portal, it will be directed to the West Drainage Ditch, which is located to the west of the Dry Stack Facility, and thereafter stored in the West Pond. The West Pond has a proposed capacity of 38,855 m3. It will receive runoff from the western part of the Dry Stack Facility as well as mine water and runoff from the West Drainage Ditch.

(b) Application AIL/2024/0009

2.5. The following documents were submitted with the application.

2.5.1. Application form;

2.5.2. SRK Consulting report;

2.5.3. Kaya letter dated 17 December 2021;

2.5.4. Kaya letter dated 28 January 2022;

2.5.5. Gahan and Long letter dated 28 January 2022; and

2.5.6. DAERA spreadsheet of responses to the 2020 application.

2.6. In previous correspondence to the Planning Appeals Commission, the Council has observed that the representations made in connection with this application had not been made publicly available. These must be made available in advance of the hearing sessions as the purpose of the hearing sessions is to explore the representations that have been made.

2.7. Surface water run-off from the north of the proposed infrastructure site will be collected in the North Diversion Berm and directed to the Clean Water Pond (which, as can be seen from drawing reference 2016021-P-CIV-003 (Rev FEI_2), is located in the north-east of the application site). The primary use of water from the Clean Water Pond will be to provide a source of fresh water for the process plant. Overflow from the pond will also be used to maintain a minimum flow in the Pollanroe Burn (compensation flow) if necessary.

2.8. The pond will be excavated below ground level with a capacity of 40,260 m3.

3.0. Legal framework

(a) Water Abstraction and Impoundment (Licensing) Regulations (Northern Ireland) 2006

3.1. It is an offence to carry on any controlled activity except as it is authorised under the regulations and carried out in accordance with that authorisation (regulation 4(1)(a)–(b)). Controlled activity includes the abstraction of water from any underground strata or waterways and the construction, alteration or operation of any impounding works (regulation 2(1)). The Department may grant a licence on an application authorising a controlled activity (regulation 10). It may do so subject to such conditions as it thinks fit (regulation 10(3)).

3.2. A link between the Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995 and these regulations is secured through regulation 11.

(b) Water environment (Water Framework Directive) Regulations (Northern Ireland) 2017

3.3. The Department must exercise its relevant functions in a manner which secures compliance with the requirements of the Water Framework Directive and the Groundwater Directive (regulation 3(1)). This applies when granting licences under the 2006 Regulations (regulation 3(3)(f)). The Department is required to determine an authorisation so as to, in particular, *"prevent the deterioration of the […] groundwater status of a body of water"* (regulation 3(2)(a)) and to *"otherwise support the achievement of the environmental objectives set for a body of water under regulations 12 and 13"* (regulation 3(2)(b)).

3.4. So far as the regulation 3(2)(a) duty is concerned, in *Bund v Germany* (Case C-461/13) the Court explained that decision-makers are required — unless a derogation is granted — to refuse authorisation for an individual project where it may cause a deterioration of the status of a body of surface water. The phrase *"deterioration of the surface water status of a body of water"* was interpreted in this way.

> *"The concept of 'deterioration of the status' of a body of surface water […] must be interpreted as meaning that there is a deterioration as soon as the status of at least one of the quality elements [….] falls by one class, even if that fall does not result in a fall in classification of the body of surface water as a whole. However, if the quality element concerned […] is already in the lowest class, any deterioration of that element constitutes a 'deterioration of the status' of a body of surface water".*

3.5. The same reasoning would appear to apply to groundwater status.

3.6. So far as the regulation 3(2)(b) duty is concerned, regulation 12(1) requires the Department to bring forward proposals for environmental objectives for each river basin district in accordance with regulation 13 and a programme of measures to achieved those objectives under regulation 20. Regulation 13(5) sets out the objectives for groundwater bodies in the following terms.

> *"For groundwater bodies, the objectives are to —*
>
> *(a) prevent deterioration of the status of each body of groundwater;*
> *(b) prevent or limit the input of pollutants into groundwater;*
> *(c) protect, enhance and restore each body of groundwater, and ensure a balance between abstraction and recharge of groundwater, with the aim of achieving good groundwater quantitative status (if not already achieved) by 22nd December 2021;*
> *(d) reverse any significant and sustained upward trend in the concentration of any pollutant resulting from the impact of human activity in order to progressively reduce pollution of groundwater".*

(c) Wildlife and Natural Environment Act (Northern Ireland) 2011

3.7. Section 1(1) of the Wildlife and Natural Environment Act (Northern Ireland) 2011 places all public bodies under a duty to further the conservation of biodiversity so far as is consistent with the proper exercise of those functions. Both DfI and the Planning Appeals Commission are public bodies for section 1(1) purposes (section 1(5)(a) and (d)). Conserving biodiversity includes, in relation to any species of flora or fauna, restoring or enhancing a population of that species; and in relation to any type of habitat, restoring or enhancing the habitat (section 1(3)(a)–(b)). Decision-makers must not merely pay lip service to this duty (*R (Morge) v Hampshire County Council* [2009] EWHC 2940 (Admin), ¶179). The Department for Agriculture, Environment and Rural

Affairs ('DAERA') issued statutory guidance regarding the section 1(1) duty under section 1(4) WANE Act 2011 in May 2016.

3.8. Section 2(1) places the Department under a duty to publish a list of priority species and habitats. Public bodies, including DfI and the Planning Appeals Commission, are under a duty in section 2(3) to take such steps as appear to be reasonably practicable to further the conservation of the species of flora or fauna and types of habitats included in any published list or to promote the taking by others of such steps. The latest statutory list is dated March 2023.

(d) Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995

7.1. The Department will be subject to the duties contained in regulation 43 of the 1995 Regulations (regulation 49(1)(a)).

7.2. The legal principles governing appropriate assessments were summarised in *R (Wyatt) v Fareham Borough Council* [2022] EWCA Civ 983, ¶¶9(1)–(10).

4.0. Analysis

4.1. The Council relies principally on the evidence of Dr Catherine Isherwood and Mr Jon Davies on these matters as well as consultee comments and advice.

4.2. The main issues raised by Dr Isherwood can be summarised as follows.

4.2.1. The assessments undertaken to date have understated the risks to the Pollanroe Burn and the Curraghinalt Burn. These are considered to be of greater sensitivity than has been assessed by DGL in their assessments.

4.2.2. Development of an underground mine inevitably causes changes in groundwater flow paths, arising as a result of the underground mine workings.

4.2.3. The assessment indicates that a reduction in groundwater contribution to surface watercourses would be expected, with a reduction of 3-5% indicated for the Curraghinalt and Attagh Burns. The Unnamed Watercourse has not been assessed. The Pollanroe Burn has been assessed only on the basis of reduced groundwater flow resulting from underdrainage for the dry stack facility and for the surface water ponds at the above-ground infrastructure site.

4.2.4. The Unnamed Watercourse has been predicted to lose approximately 5% of its surface water contribution as a result of the catchment changes discussed above. A reduction in groundwater contribution in addition to this has potential to result in the Unnamed Burn drying up completely for parts of the year, and potentially for longer periods than historically in dry summers.

4.2.5. There has been no consideration of the potential for reduced groundwater contribution to the Pollanroe Burn as a result of the underground mine

workings. As a result it is not possible to assess whether there would be any anticipated impact to flow levels.

4.2.6. Modelling in the groundwater impact assessment indicates that approximately 81% of the mine water is expected to discharge through the current mine portal for treatment and discharge into the Curraghinalt Burn. The assessment of this is inadequate to rule out adverse effects.

4.2.7. The mine water volumes provided indicate that approximately 3% of the mine water is unaccounted for in all the calculations. It is of concern that this has not been modelled and that no potential flow or discharge pathways have been identified.

4.2.8. The loss of the natural upper catchment areas for the Pollanroe Burn and Unnamed Watercourse and replacement with artificial drainage channels will act to concreate flows. This has not been adequately considered.

4.2.9. It is not acceptable to dismiss significant increases in flow within the Pollanroe Burn as universally beneficial with inadequate data to support this claim.

4.2.10. Appendix C highlights specific concerns about groundwater quality.

4.3. The main issues raised by Mr Davies can be summarised as follows.

4.3.1. The classification of the Pollanroe Burn as being of limited ecological value is not accepted. The elevated level of chemicals and the impact of reverse osmosis has not been properly considered in the assessments.

4.3.2. It cannot be determined that the discharge of elevated nitrate and metal pollutants will not impact on the Owenkillew River Special Area of Conservation over time.

4.3.3. There is no justification as to why potential impacts on other designated sites downstream from the Owenkillew River Special Area of Conservation as a result of planned discharge of surface water from the site water treatment system to the Curraghinalt Burn has been screened out from further assessment in the shadow Habitats Regulations Assessment.

4.3.4. The toxicity risks associated with a number of the chemicals that could be released, means that the potential for significant indirect impacts some distance downstream of the discharge point cannot be discounted.

4.3.5. Several of the chemicals that would be released into the surface and groundwater, primarily through the reverse osmosis process, are known to be of moderate to high toxicity to fish and other species and could therefore have significant effects upon qualifying features of the SAC.

4.3.6. The discharge licence shadow Habitats Regulations Assessment considers potential for adverse effects on the Owenkillew River Special Area of Conservation as a result of discharge of surface water from the site water treatment system to the Curraghinalt Burn (a tributary of the Owenkillew River Special Area of Conservation). However, it does not include consideration of whether the burn itself is supporting habitat through its potential to support qualifying species of the Special Area of Conservation.

4.3.7. The shadow Habitats Regulations Assessment does not identify which qualifying features are relevant to the assessment of hydrological impacts. The assessment only mentions freshwater pearl mussel, but should also consider the potential for impacts on salmon, lampreys, otters and habitats (including floating water-crowfoot vegetation and bog woodland).

4.3.8. The assessment also does not consider the potential for impacts on other related ecological receptors which are important in supporting SAC species, and which are also sensitive to changes in water quality.

4.3.9. The suitability of the water for human consumption is quite different from its suitability for aquatic habitats and species and reverse osmosis treatment removes both beneficial and potentially harmful substances from the water. Trace elements such as calcium and magnesium that are essential for fish metabolism and growth will be removed, which could lead to adverse effects on fish, including salmonids.

4.3.10. There is clearly the potential for changes in water quality (both surface water and groundwater), including resulting from the discharge of water treated by reverse osmosis, to adversely affect the suitability of the watercourses (both the Owenkillew River and its tributaries) for SAC qualifying features.

4.3.11. The predicted changes in flow rates could also have significant effects.

4.3.12. The assessment of in-combination effects is insufficiently detailed.

4.4. Accordingly, based on the above, the Council has concerns about the impacts of changes to the groundwater environment could have on ecological receptors in particular, including but not limited to, the Owenkillew River Special Area of Conservation and its qualifying features. On the basis of the information which is currently before it, the Council does not consider that adverse effects can be ruled out from the abstractions which have been proposed.

4.5. As matters stand, therefore, the Council does not consider that the abstraction consents can be granted in the terms sought and offers the following dRfRs for consideration at the inquiry.

dRfR 1: It has not been demonstrated that the proposal would not adversely affect the integrity of European designated sites and so

consent to abstract must be refused under the Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995.

dRfR 2: It has not been demonstrated that the proposal will not have an unacceptable adverse impact on ecological receptors.

dRfR 3: It has not been demonstrated that granting the licences in the terms sought would be consistent with the duty to conserve biodiversity in section 1(1) of the Wildlife and Natural Environment Act (Northern Ireland) 2011.

5.0. Conclusion

5.1. For these reasons, the Planning Appeals Commission is invited to recommend to the Department that these applications be refused.

Curraghinalt Mine Project (Dalradian)

Ecology Statement of Case

Evidence of:

Jon Davies BSc MSc FCIEEM CEcol CEnv

Prepared for:

Fermanagh and Omagh District Council

2740409

SEPTEMBER 2024

Contents

EXECUTIVE SUMMARY

Having reviewed the ecological information provided by the applicant, I have identified a range of issues as outlined in Table 1 of my evidence below.

Table 1 Ecological Issues and concerns identified

Ecological issue	Concerns
Ecological surveys	
Aquatic habitat surveys (RHS and LCUS)	Undertaken during suboptimal conditions and surveys considered out of date
Fish surveys	Surveys not undertaken in smaller watercourses / burns. Surveys undertaken in larger watercourses could be considered out of date
Freshwater pearl mussel surveys	Surveys out of date, undertaken during sub-optimal conditions and not undertaken in smaller watercourses / burns
Crayfish surveys	No evidence of having been undertaken, or no obvious justification for them not being undertaken
Otter surveys	Undertaken during suboptimal conditions and not in all areas which may be impacted by the scheme
Environmental Statement	
Designated sites	Impacts on designated sites not given due consideration
Non-designated sites	Impacts on other habitats not given due consideration
Species	Impacts on Otter have not been adequately considered in the ES
Species	Mitigation for Badgers, Breeding birds, Bats and Marsh fritillary not sufficient to comply with local nature conservation policy
Monitoring	Monitoring of mitigation for habitats and species not of a sufficient timescale for a development of decades
Habitats Regulations Assessments	
Adequacy of HRAs (insufficient certainty in outcomes)	Lack of clarity in information presented
	Inadequacy of screening
	Lack of detail in identification of source-impact-pathway
	Lack of consideration of potential impacts on supporting habitats
	Inadequacy of ecological surveys underpinning the assessment
	Inadequacy of assessment of air quality impacts
	Inadequacy of assessment of disturbance from human activity (noise and visual disturbance)
	Inadequacy of assessment of hydrological implications
	Inadequacy of in-combination assessment (including lack of transboundary assessment)
Adequacy of BNG Assessment	
	Concerns with applicant's proposed habitat creation/enhancement

Ecological issue	Concerns
Adequacy of BNG Assessment	Applicant's BNG assessment significantly flawed and overstated
	Errors in applicant's metric calculations
	No BNG assessment for Power Line application

1 INTRODUCTION

1.1 Qualifications and experience

1.1.1 My name is Jon Davies. I am a Director at RSK Wilding and have more than 28 years of experience in ecological consultancy. I am a Chartered Ecologist, a Chartered Environmentalist and a Fellow of the Chartered Institute for Ecology and Environmental Management. I have a BSc (Hons) in Zoology from Bristol University and an MSc in Conservation from University College, London.

1.1.2 I have extensive experience in this field. For example, as Environmental Advisor to the Welsh Government, I previously gave evidence on ecological issues at the year-long Public Inquiry into the M4 Corridor around Newport project, and I have also previously been an Expert Witness at various other public inquiries and development consent order hearings into projects such as road schemes, gas pipelines and electricity transmission projects.

1.1.3 I also recently provided ecology affidavits on behalf of Derry and Strabane District Council for a Judicial Review in the matter of the grant by the Department of the Economy on 8 May 2019 of mineral prospecting licences to Flintridge Resources Ltd and Dalradian Gold Ltd under s11 of the mineral development act (Northern Ireland) 1969. The Judicial Review was held over four days in early April 2024.

1.1.4 The grounds of challenge in the Judicial Review included inadequate consultation, breach of the Habitats Directive and the Conservation (Natural Habitats etc) Regulations (Northern Ireland) 1995, and failing to comply, when deciding to grant the licences, with a number of statutory duties, including: to have regard to the need to conserve the natural beauty and amenity of the countryside (under Article 4 of the Nature Conservation and Amenity Lands (NI) Order 1985); to take reasonable steps to further the conservation and enhancement of the flora, fauna and other features of ASSIs (under Art 38 of the Environment (NI) Order 2002); and to further the conservation of biodiversity (under s1(1) of the Wildlife and Natural Environment Act (NI) 2011)).

1.1.5 My RSK Wilding, Biodiversity Net Gain (BNG) team is a specialist group of ecologists focuses on habitat surveys (using the UK Habitat Classification System), BNG calculations (using the Statutory Biodiversity Metric), habitat creation and restoration, Habitat Management and Monitoring Plans (HMMPs) and Biodiversity Gain Plans (BGPs). We also recently became a Responsible Body under the Environment Act 2021 and can thus oversee the work of other habitat banks and engage in Conservation Covenants with them to ensure successful delivery of BNG. We are thus recognised experts in the field of BNG.

1.1.6 I am familiar with the Code of Practice of the Chartered Institute for Ecology and Environmental Management (CIEEM). I believe that in addressing the ecology matters relating to this inquiry I have fulfilled my professional responsibilities in accordance with the Code of Practice.

1.1.7 I understand my duty to the inquiry and have complied with and will continue to comply with that duty. I believe that the facts stated within this proof of evidence

are correct and I confirm that the opinions expressed are my true and professional opinions.

1.1.8 I therefore confirm that this is my own professional opinion, provided in accordance with my professional qualifications. I have thus complied with my duties to the court, in particular that it is the duty of experts to help the court on matters within their expertise, and that this duty overrides any obligation to the person from whom experts have received instructions or by whom they are paid.

1.1.9 I am supported on the aquatic ecology aspects of this case by my colleague Dr Peter Walker

1.1.10 Dr Walker is a chartered environmentalist at RSK Biocensus where he is a technical director overseeing the aquatic ecology team and associated projects. Following on from a successful career in academia, resulting in multiple peer-reviewed publications, Dr Walker has been actively employed in aquatic ecological consultancy roles for more than 16 years. He is also an active member of the Institute of Fisheries Management (IFM), including holding the position of Chairman for the West Midlands branch, and sits on the advisory committee. He has also previously been an active member of fisheries consultatives and rivers trusts, including positions as a director and chair of the Cotswolds Rivers Trust.

1.1.11 Dr Walker has worked in every conceivable aquatic habitat throughout the UK, as well as undertaking surveys abroad in Azerbaijan, Albania, Greece and East Africa. He is familiar with various habitat assessment methods and standard survey methods for fish, macroinvertebrates, diatoms and macrophytes. He is experienced in surveys for riparian mammals and invasive non-native species, and holds several protected species survey licences, including for white-clawed crayfish, great crested newt and barn owl, and has an application pending for hazel dormouse.

2 BACKGROUND CONTEXT

2.1 Introduction

2.1.1 In November 2017, an application (LA10/2017/1249/F) was submitted by Dalradian Gold Ltd (DGL) to the Strategic Planning Division of the Department for Infrastructure (DfI) to construct an underground gold mine and associated infrastructure at a site located between the towns of Gortin and Greencastle in County Tyrone (the Curraghinalt Mine Project). The application was submitted with an accompanying Environmental Statement (ES).

2.1.2 There was also a planning application submitted by NIE Networks for a 33kV distribution line from the existing Strabane Main sub-station to the proposed mine site (Planning references: LA10/2019/1386/F and LA11/2019/1000/F). The proposed connection is 37.9 km in length comprising 26.9 km of overhead line and 11 km of underground cable.

2.1.3 The ES for the main application was accompanied by the following individual survey reports in Appendix C8: Phase 1 and 2 Habitats; Badger; Bats; Otter; Wintering Birds; Common lizards; Smooth newt; Fisheries and River Habitat Assessment; Freshwater pearl mussel; Marsh fritillary; Terrestrial and Freshwater invertebrates; and Breeding birds. All surveys were undertaken by SLR Consulting.

2.1.4 In August 2019, DGL submitted Further Environmental Information (FEI) in the form of an addendum to the ES. As part of this, the following additional reports of relevance were provided:

- Curraghinalt Gold Project Addendum to Environmental Statement (SRK Consulting, UK, Ltd);
- Information to inform Habitats Regulation Assessment Pursuant to Article 6(3): Curraghinalt Gold Project (James O'Neill Associates);
- C.8 Further Environmental Information – Addendum to Ecological Impact Assessment and Baseline Reports (SLR Consulting Ltd);
- Further Environmental Information – Addendum to Ecological Impact Assessment and Ecological Mitigation and Management Plan (SLR Consulting Ltd); and
- Proposed Infrastructure Site for the Gold Mine Badger Monitoring Report 2018 (SLR Consulting).

In October 2020, DGL again submitted Further Environmental Information (FEI) in the form of a further addendum to the ES: Curraghinalt Gold Project Addendum to Environmental Statement (SRK Consulting, UK, Ltd). There were no changes to impact descriptions and conclusions related to ecology in this second addendum, although the results of the EIA screening and the fisheries and aquatic ecology screening assessments related to the Power Line application are summarised. An updated shadow Habitats Regulations Assessment by Ecology Solutions was also submitted (C10).

3 PURPOSE AND SCOPE OF MY STATEMENT

3.1 Introduction

3.1.1 I was instructed by Fermanagh and Omagh District Council to provide expert ecology evidence in respect of the conjoined Public Inquiry for the Curraghinalt Project in County Tyrone, Northern Ireland.

3.1.2 The proposed Project would involve prospecting / exploration and mining for gold at the Curraghinalt deposit. My evidence deals with ecology, biodiversity and nature conservation matters in relation to the overall project site (including the Appeal Site and the associated NIE Networks power lines site), and is based upon my own professional opinion in line with my professional qualifications.

3.1.3 My evidence should be read in conjunction with the Statements of Case for Hydrology, Hydrogeology and Peat, Economics, Landscape & Visual and Carbon.

3.1.4 The principal purpose of my statement of case is to present evidence which demonstrates why, in my judgement, the effects of the Proposed Development in ecological terms are major and significant and should weigh heavily against approval of the applications in the overall planning balance.

3.1.5 The sections of my evidence are structured as follows:

1. Section 4 provides details of the legislation and planning policy background relevant to the scope of my evidence.
2. Section 5 sets out my assessment in relation to the adequacy of ecological surveys undertaken to inform the ecological assessments for the Project.
3. Section 6 sets out my assessment of the adequacy of the ecology elements of the Environmental Statement (ES), including any proposed mitigation and/or compensation.
4. Section 7 sets out my assessment of the adequacy of the Habitats Regulations Assessments (HRAs), including any proposed mitigation and/or compensation.
5. Section 8 sets out my assessment of the adequacy of the Biodiversity Net Gain (BNG) assessment (with the full report presented in Appendix 1 to this Statement).
6. Section 9 provides my summary conclusions.

3.1.6 I shall comment on the extent of harm to the ecology of the area in the context of relevant planning policy. It is not, however, the purpose of my statement to draw a conclusion on the overall acceptability of the proposed development. That is a matter of planning balance to be presented by the Council in its main statement of case.

4 LEGISLATION, PLANNING POLICY AND GUIDANCE

4.1 Overview

4.1.1 Planning policy is dealt with in detail by the Council in its main statement of case, but I have set out below a brief summary of the legislation and policy context relevant to the appeal proposals where it may have a bearing on a consideration of ecology matters.

4.2 Regional Development Strategy

4.2.1 With regards to this ecology statement of case, policy RG11: '*Conserve, protect and, where possible, enhance our built heritage and our natural environment*', is relevant. RG11 sets out to:

- *Sustain and enhance biodiversity;*
- *Identify, establish, protect and manage ecological networks;*
- *Protect, enhance and restore the quality of inland water bodies (this includes rivers); and*
- *Protect designated areas of countryside from inappropriate development (either directly or indirectly) and continue to assess areas for designation*.

4.2.2 I shall demonstrate through evidence that the proposed development would be in breach of this policy, specifically with regard to the enhancement of biodiversity and the protection of watercourses.

4.3 County Donegal Development Plan 2024-2030

4.3.1 The County Donegal Development Plan 2024-2030 (which is of relevance with regard to transboundary effects) was adopted on 16th May 2024 and came into effect on 26th June 2024. The plan has three aims related to biodiversity:

- *A requirement for all developments to comply with the Habitats and Birds Directive;*
- *To protect Ramsar Sites, Nature Reserves, Natural Heritage Areas and Species protected under the Wildlife Act; and*
- *To protect, where justified, features of local biodiversity value (e.g. hedgerows/field boundaries, trees, woodlands, and wetlands).*

4.3.2 In my opinion, and as demonstrated through the evidence I present, the proposals insufficiently address the potential impacts upon habitats protected under the Habitats and Birds Directive (specifically the Owenkillew SAC and its qualifying habitats and species), both within Fermanagh and Omagh District and indeed the neighbouring County Donegal.

4.4 Local Development Plan 2030 – Plan Strategy

4.4.1 The Fermanagh and Omagh District Council Local Development Plan 2030 – Plan Strategy was adopted in 2023. There is a statutory duty to take account of the local development plan in decision-making (section 45(1) Planning Act (Northern Ireland) 2011).

4.4.2 There are a number of policies which have relevance to the natural environment, and only those parts of the policies relevant to the Ecology Statement of Case are referenced below.

DE02 – Design Quality

4.4.3 Policy DE02 addresses development proposals in the countryside and states:

'The Council will support development proposals which…

> *f) protect and enhance features and assets of the natural and historic environment and landscape'*

4.4.4 I shall demonstrate through evidence that the proposed development would be in breach of this policy, specifically with regard to the Owenkillew SAC (and its constituent habitats and species), peatland habitats and protected species.

NE01 – Nature Conservation

4.4.5 Policy NE01 states that:

'The Council will only support development that, either individually or in combination with existing and/or proposed plans or projects, is not likely to have a significant effect on an existing or proposed SPA, existing or candidate SAC, Sites of Community Importance, or a listed or proposed RAMSAR. Development affecting Nationally important sites such as an ASSI, National Nature Reserve or Nature Reserve will only be permitted where it is not likely to adversely affect the integrity of the area, including the value of the site to the habitat network or the features for which it has been designated'.

4.4.6 I shall demonstrate through evidence that the proposed development would be in breach of this policy. Not only are in-combination effects insufficiently addressed, but also I will set out how there would be likely significant effects both on a SAC (the Owenkillew River) and an ASSI (the Owenreagh River).

NE02 – Protected Species and their Habitats

4.4.7 Policy NE02 states that:

'Development that is likely to harm a European Protected species will not be permitted unless it can be demonstrated that: (a) there is no satisfactory alternative; (b) the development is required in the interest of public health or public safety, or for other imperative reasons of over-riding public interest, including those of a social and economic nature and beneficial consequences of primary importance to the environment; (c) there is no detriment to the maintenance of the population of the species at a favourable conservation status; and (d) mitigation and compensatory measures are agreed and their delivery secured. The Council will only permit development that is not likely to harm any statutorily protected species and where any impact arising can be adequately mitigated or compensated against'.

4.4.8 I shall demonstrate through evidence that the proposed development would be in breach of this policy.

4.4.9 Furthermore, Policy clarification 5.39 states that:

'In addition, seasonal factors should be taken into account when assessing development proposals that could impact upon protected species for example nesting seasons. This is also important in determining when surveys should be carried out to establish the presence of a species on site'

4.4.10 In my opinion, where surveys have been carried out in the wrong season this aspect of the policy is also breached, and I discuss this further under Adequacy of Surveys in Section 5.

NE03 – Other Habitats, Species or Features of Natural Heritage Importance

4.4.11 Policy NE03 states that:

'The Council will only permit development likely to result in an unacceptable adverse impact on, or damage to, habitats, species or the features listed below, where the benefits of the development outweigh the value of the habitat, species or feature. In such cases, appropriate mitigation and/or compensatory measures will be required. These habitats and species include (but are not restricted to) – priority habitats and species; active peatland; ancient and long-established woodland; wetlands; rare and threatened species.

4.4.12 I shall demonstrate through evidence that the proposed development would be in breach of this policy, most significantly with regard to the peatland habitat restoration proposals and the impacts upon the Owenkillew SAC.

4.4.13 Policy NE03 goes on to state that:

'Where there is potential that a habitat, species or other feature of natural heritage importance exists on a site or is likely to be impacted by development, the developer will be required to carry out an appropriate survey of the site's interests and undertake a suitable ecological appraisal.'

4.4.14 In my opinion, the inadequacy of the surveys and assessments carried out for the Project (e.g. in relation to freshwater pearl mussel, salmonids, the Pollenroe Burn, etc.) mean that this policy has also been breached.

MIN01 - Minerals Development

4.4.15 Policy MIN01 states that:

'The Council will support proposals for minerals development where it is demonstrated that they do not have an unacceptable adverse impact upon:- a) the natural environment; and d) the water environment'

4.4.16 I shall demonstrate through evidence that the proposed development would be in breach of this policy, especially with regards to the impacts on peatland habitats and the Owenkillew SAC, and indeed to the overall biodiversity loss.

MIN02 - Restoration and Aftercare

4.4.17 Policy MIN02 states that:

'All applications for mineral development must be accompanied by satisfactory proposals for the final restoration scheme and proposed future land use; timescales for restoration; aftercare and site management restoration'

4.4.18 In my opinion the failings associated with the peatland restoration proposals means that the proposed development would be in breach of this policy.

4.5 Strategic Planning Policy Statement (SPPS) Northern Ireland

4.5.1 Before commenting on the Strategic Planning Policy Statement (SPPS), I note that the applicant refers to policy contained in the now superseded Planning Strategy for Rural Northern Ireland (1993) as well as Planning Policy Statement 2 Natural Heritage (PPS2) and Planning Policy Statement 21 Sustainable Development in the Countryside (PPS21). These policy statements ceased to have effect in Fermanagh and Omagh District when the Fermanagh and Omagh District Council Local Development Plan 2030: Plan Strategy was adopted on 16 March 2023.

4.5.2 Paragraph 4.40 states that:

"Plans and proposals should be rigorously assessed for their environmental impacts. There are a variety of assessments that are relevant to the planning process, some of which are required under European and domestic legislation. These include Sustainability Appraisal (SA) and Sustainable Environmental Assessment (SEA) for plans, Environmental Impact Assessment (EIA) for projects, and Habitats Regulations Assessment for plans and projects affecting Natura 2000 sites."

4.5.3 I shall consider the extent to which the proposals have been '*rigorously assessed for their environmental impacts*' through my evidence, especially with regard to the HRA process.

4.5.4 In addition, Paragraph 6.161 of the SPPS states that:

'Applications for the extraction of minerals must include satisfactory restoration proposals'.

4.5.5 Given the overlap between natural environment plan policies and natural environment policies within the SPPS, I do not propose to repeat all of the policies within the SPPS which relate to the natural environment. These are principally found between paragraphs 6.186 and 6.189 and are reflected in the core planning principle of preserving and improving the built and natural environment.

4.5.6 I shall demonstrate through my evidence that the restoration proposals are not satisfactory and would result in undue adverse effects on the important peatland habitats.

4.6 Wildlife and Natural Environment Act (WANE) in Northern Ireland

4.6.1 In 2011, the Wildlife and Natural Environment Act (WANE) in Northern Ireland came into force, amending the Wildlife Order (NI) 1985 and introducing new species to protected lists. The WANE Act includes a significant change for public bodies with the introduction of a new Biodiversity Duty for all public bodies:

"It is the duty of every public body, in exercising any functions, to further the conservation of biodiversity so far as is consistent with the proper exercise of those functions."

4.6.2 Guidance on the section 1(1) biodiversity duty was published in May 2016 under section 1(4).

4.6.3 As set out in Section 8, it is my assertion that the Project would not result in a net gain for biodiversity, as calculated by the applicant using the Defra Biodiversity Metric, but would in fact lead to a significant net loss.

4.7 Fermanagh and Omagh Biodiversity Strategy and Action Plan (2022-2027)

4.7.1 This document sets out Fermanagh and Omagh District Council's Biodiversity Strategy and Action Plan from 2022 - 2027. Through the delivery of seven thematic action plans based on evidenced needs, the intention is that the Council will contribute to the wider outcomes linked to principles contained within the legislation, which places a legal duty and responsibility on Council to act, namely:

- Protection of biodiversity;
- Maintenance of biodiversity;
- Enhancing biodiversity;
- Restoring biodiversity; and
- Promoting the understanding of biodiversity.

4.7.2 In my opinion, the above objectives for Fermanagh and Omagh District Council's biodiversity will be significantly compromised by the Project's activities, especially through the impacts upon aquatic species (and the Owenkillew River SAC) and through the loss of irreplaceable peatland habitats. This loss of biodiversity is specifically evidenced through our Defra Biodiversity Metric calculations (Section 8 of this statement), which demonstrate a significant net loss of biodiversity (rather than the net gain claimed by the applicant).

4.8 The Nature Conservation and Amenity Lands (Northern Ireland) Order 1985

4.8.1 This order sets out the former Department of the Environment for Northern Ireland's (DOENI), now the Department of Agriculture Environment and Rural Affairs (DAERA), rights and duties to protect and enhance sites of natural beauty or special scientific interest in Northern Ireland. It places particular emphasis on the establishment of a network of Areas of Special Scientific Interest (ASSI), National Nature Reserves (NNR) and Marine Nature Reserves (MNR).

4.8.2 As above, it is my opinion that these biodiversity duties are compromised by the Project.

4.9 The Conservation (Natural Habitats etc.) Regulations (NI) 1995, amended in 2012

4.9.1 The Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995 (as amended) transpose European Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (Habitats Directive) and Directive 2009/147/EC on the Conservation of Wild Birds (The Birds Directive) into national law, and provide for the classification/designation and protection of 'European sites' including Special Protection Areas (SPA) and Special Areas of Conservation (SAC), the protection of 'European protected species', and the adaptation of planning and other controls for the protection of European Sites.

4.9.2 I shall consider the extent to which these Regulations have been implemented, especially with regard to the HRA process, through my evidence.

4.10 The UK Peatland Strategy and the Northern Ireland draft Peatland Strategy

4.10.1 Approximately 80% of our peatlands are in a damaged and deteriorating state, and the UK Peatland Strategy (2018-2040) represents a collaborative and co-ordinated effort (developed by the IUCN UK Peatland Programme) to tackle the significant threats to these key habitats and to ensure that they are conserved, enhanced and restored.

4.10.2 Similarly, the draft NI Peatland Strategy (2021-2040) also identifies the ongoing threat to these habitats, especially in relation to the ecosystem services they provide, and again sets out a collaborative approach to their restoration across Northern Ireland through the delivery of specific Strategic Objectives and Actions.

4.10.3 It is my assertion that the peat restoration proposals would result in undue adverse effects on the important peatland habitats, and are thus contrary to the objectives of these strategies.

5 ADEQUACY OF ECOLOGICAL SURVEYS

5.1 Introduction

5.1.1 I have reviewed the various ecological survey reports with a view to determining whether the surveys undertaken were sufficient to accurately record notable ecological receptors (including both habitats and species) such that any potential impacts on such features could be adequately assessed.

5.1.2 This is especially relevant to the qualifying habitats and species of the Owenkillew River SAC, given that the burden of proof for HRA, and specifically the Appropriate Assessment stage of the process, involves using the 'best available scientific evidence' to determine 'beyond reasonable scientific doubt' that there will be no adverse effects on the integrity of the SAC.

5.1.3 A summary of this evaluation is provided for selected receptors in the following sections.

5.2 Aquatic Habitat Surveys

5.2.1 A combination of a desk-based study, River Habitat Survey (RHS) and Life Cycle Unit System (LCUS) study was undertaken for the aquatic habitat assessment. Whilst such an approach is appropriate for salmonids, it does not optimally consider or record habitat for other species, in particular lampreys, eels and freshwater pearl mussels. With regard to the latter, a separate, species-specific survey report is available, although this focuses on actual pearl mussel counts and does not discuss the habitat suitability in the larger or smaller watercourses.

5.2.2 Specifically, the habitat surveys did not seem to include any mention of the presence or frequency of occurrence of marginal fine sediment/silt deposits (which are important habitat for juvenile lamprey (ammocoetes)) nor of structural habitat such as undercut banks, boulders, submerged tree roots or woody debris, which might be used by a host of species, including the critically endangered European eel.

5.2.3 The tributaries of the Owenkillew and Owenreagh rivers (in particular the Pollanroe Burn, Curraghinalt Burn and Attagh Burn) do not appear to have been thoroughly assessed, and have largely been discounted as important habitat. As noted in the Hydrology, Hydrogeology and Peat SoC and raised by the Loughs Agency, these watercourses have been assessed as being of 'low sensitivity' but with little or no justification. No detailed descriptions of the habitat throughout the watercourses have been provided, despite their connectivity to the larger, 'high sensitivity' rivers.

5.2.4 However, based upon a site visit carried out by Dr Peter Walker (an aquatic ecologist colleague with 16 years aquatic ecology consultancy experience and 35 years as an angler), suitable habitat for multiple fish species (including juvenile salmonids, which could carry glochidia, the larval stage of freshwater pearl mussel) was clearly present. Given the importance of juvenile salmonids (including trout and salmon) in the life cycle of the critically endangered freshwater pearl mussel, we would have expected to see at least some exploratory fish surveys carried out

(e.g. using electrofishing gear) or a more detailed habitat description to justify screening the watercourse out.

5.2.5 It is, therefore, my opinion that the importance of this habitat has been overlooked, especially in light of plans to physically and chemically alter it, both via removal of c.975m of the upper Pollanroe Burn and through increasing the discharge of water, including with a high proportion of treated (via reverse osmosis) water. More recent surveys, undertaken in February 2021 by the Northern Ireland Environment Agency (NIEA) and the Loughs Agency, suggested that the habitat within the Curraghinalt Burn, and more so the Pollanroe Burn, included functional fish habitat such as refuge areas and potential spawning, nursery and holding habitat. Subsequent electrofishing surveys in June 2021 found fish in both the aforementioned burns, including juvenile salmonids (Atlantic salmon [*Salmo salar*] and brown trout [*Salmo trutta*]), thus confirming the value of these watercourses.

5.2.6 Furthermore, even those surveys that the applicant did carry out, undertaken in 2015, were completed in sub-optimal conditions due to unusually high / frequent rainfall creating more frequent spates and higher than normal river levels for the time of year. This is likely to have hindered the ability of surveyors to accurately assess substrate types in all areas of the watercourses, including the suitability of habitat for spawning, refuge etc.

5.2.7 Rivers, especially spate ones, can be very dynamic, with substrates frequently being scoured and redeposited. This can change the location of spawning areas, or other functional habitat, with the potential for some to disappear completely or become unsuitable, and new ones to be created. Given the spate nature of the assessed watercourses, I would consider the river habitat assessment to be out of date and unreliable for accurately determining the presence of potentially sensitive habitats, such as spawning areas or juvenile lamprey habitat. This is particularly pertinent given the records of significant storm events since 2015.

5.2.8 Whilst a small number of targeted lamprey surveys (targeting ammocoetes) were undertaken using electrofishing methods, there is no detail on the frequency and/or abundance of suitable habitat for juvenile lampreys, which would provide key evidence for the likely value of these watercourses. Furthermore, lamprey surveys were not undertaken in the smaller tributaries, and in the absence of detailed habitat maps or photographs it is not possible to determine whether or not suitable habitat was or is present for these species.

5.2.9 River and stream habitats are dynamic places which are constantly changing with changes in flow. Banks can be eroded and river bed material moved. As such, in-channel habitats are constantly changing, sometimes in relatively insignificant ways but, particularly following high flow / spate / flood events (e.g. during storms) the changes can be very significant, leaving the in-channel and riparian habitats quite different to what was present beforehand.

5.2.10 Whilst there is no specific guidance on the frequency with which habitat assessments should be undertaken, consideration of storm and flood events should be included when considering data which is not particularly recent. In this instance, there have been several notable (named) storm events which are likely to have caused spate or flood conditions in the watercourses concerned, and this in turn

can quite conceivably have resulted in the movement of substrates and changes in channel form. Spawning and refuge areas, for example, may now exist where they did not previously, and vice versa. In the case of pearl mussels, it may be that old beds have been displaced and new ones created. Current, or at least recent survey data is required to determine this.

5.2.11 In summary, the aquatic habitat surveys have been insufficient to properly assess the value of the watercourses present on site, specifically with regard to their suitability to support important species such as lamprey, pearl mussels and salmonids. This in turn means that the impact assessments, carried out both for the ES and HRA, are flawed, since the assessment of 'low sensitivity' for these watercourses, which are due to be both directly and indirectly affected by the proposals, likely understates their nature conservation value.

5.2.12 It is my opinion, therefore, that significant impacts upon these features, owing both to the nature of the impacts (see Section 7, below) and the value of the receptors, cannot be ruled out.

5.3 Fish Surveys

5.3.1 No fish surveys (e.g. using electrofishing equipment) were initially undertaken in the smaller watercourses, including the Curraghinalt Burn, Attagh Burn and Pollanroe Burn. During a site visit in March 2024, my colleague Dr Peter Walker observed a small section of the lower reaches of Pollanroe Burn from a road bridge. He concluded that the habitat was almost certainly capable of supporting various fishes, including juvenile salmonids, contrary to the habitat assessment undertaken by SLR. This opinion was based on observations of the physical features visible, including a diverse substrate and a mixture of flow types, including deeper, slower-flowing sections and faster run-and-riffle areas. He considered that together these combined to provide a diversity of habitats suitable for different fish species and life stages.

5.3.2 Following surveys undertaken in February 2021 by NIEA and the Loughs Agency to assess the habitat in selected burns, subsequent electrofishing surveys in June 2021 found fish in both the Curraghinalt Burn and Pollanroe Burn; this included juvenile salmonids (Atlantic salmon and brown trout). Given that such surveys only give a 'snap shot' of the fish present at the precise time of the survey, it may be that other fish species also use the burns at different times of the year.

5.3.3 Detailed habitat assessments (see above) are useful for determining whether the habitat is generally suitable for different species and if it contains habitat which fits the characteristics for, for example, salmonid spawning habitat, parr habitat or lamprey refuge habitat (which can then be surveyed). Lamprey ammocoetes and European eel (*Anguilla anguilla*) can be under-represented in standard electro-fishing surveys, so without targeted surveys for these species it cannot be concluded that they are likely to be absent (unless a formal habitat assessment has been undertaken which determined a lack of suitable habitat or other significant reasons which could prevent their presence, such as an impassable downstream barrier).

5.3.4 Lamprey are a selection feature of the Owenkillew SAC (though not technically a 'qualifying' feature, owing to the fact that the habitat present may not be of sufficient extent or quality to merit listing as SAC feature) and all three lamprey species (brook, river and sea) are present in the Owenreagh. All three species are listed in Annex II of the Habitats Directive. Lamprey spawning habitat is fairly specific as is juvenile (ammocoete) habitat, which is primarily silt accumulations in shallow slack water marginal areas (though there is some limited evidence that sea lamprey ammocoetes occur in deeper water mid-channel in some rivers).

5.3.5 Targeted surveys for lamprey should therefore be carried out in areas of likely habitat, formally referred to as optimal or sub-optimal. However, the habitat survey carried out for the site (which was salmon- and trout-focussed) does not report on such habitat, and it is therefore unclear whether or not it was looked for.

5.3.6 With regard to salmonids, the brief observation on-site by Dr Walker, supported by the views and data from NIEA and the Loughs Agency, suggests that the habitat was indeed suitable for supporting at least juvenile salmonids, and therefore warranted a more detailed assessment than that which was undertaken by the applicant.

5.3.7 Without a true understanding of the importance of these watercourses for key fish species (especially those associated with the nearby SAC rivers), it is not possible to properly assess the impacts of the proposals, such that both the ES and HRA will be flawed.

5.4 Freshwater Pearl Mussel Surveys

5.4.1 Freshwater pearl mussel (*Margaritifera margaritifera*) surveys completed in 2015 were re-surveys from those undertaken previously. However, both data sets should be considered out of date, particularly given the dynamic nature of the spate rivers within which surveys were carried out (as noted above). Since the surveys were undertaken, there have been multiple significant storm events (including storm Desmond in December 2015, followed by storm Frank) which will have resulted in high fluvial flows. Such conditions can cause mobilisation of riverbed substrates and associated biota, including freshwater pearl mussels.

5.4.2 The freshwater pearl mussel baseline survey report claims that it is 'highly unlikely that baseline conditions significantly alter year to year'. However, freshwater pearl mussels are benthic organisms sensitive to hydrological regime alterations and habitat degradation, including physical movement of substrate and excessive fine bed material deposits. Impacts from changes in flow (and in particular, increased flow) can include habitat loss, due to the formation of a new and unsuitable substrate, and a decrease in the potential dispersal among the residual habitats.

5.4.3 For example, during the 2015 high-flow events, the loss of freshwater pearl mussel beds was documented from the River Dee in Aberdeenshire. It is perfectly possible, therefore, that storm-related impacts on river flows in Northern Ireland since the surveys in 2015 might also have resulted in similar impacts, with loss or redistribution of mussel beds within the rivers during those events.

5.4.4 This dynamic nature of pearl mussel populations means that survey information can quickly become out of date. Given the importance and sensitivity of this receptor

(the Owenkillew population is the largest known population surviving in Northern Ireland), it is clearly very important to have a good and current understanding of where mussels associated with the SAC population (including outside of the Owenkillew River itself within its tributaries) are located and the extent of the population.

5.4.5 The freshwater pearl mussel baseline report also states that deep-water areas were not surveyed, and that there were no suitable gravels. Given that freshwater pearl mussels can be found in deep pools, these pools need to be surveyed using appropriate methods[1], unless the substrate can be confirmed as wholly unsuitable. Given the higher than usual flows reported for the year in which the surveys were undertaken, it is considered likely that the substrate in deeper pools will not have been wholly visible. Therefore, if they were discounted on the basis of habitat being unsuitable, evidence as to why it was unsuitable should have been provided.

5.4.6 NIEA and the Loughs Agency identified, in 2021, that the Curraghinalt and Pollanroe Burns were capable of sustaining juvenile salmonids. Surveys found juvenile trout and salmon in the Pollanroe Burn, with two trout also being caught in the Curraghinalt Burn. Surveys undertaken by SLR dismissed the ecological importance of these two smaller watercourses, but they are clearly important from a freshwater and migratory fisheries perspective. Furthermore, the presence of juvenile salmonids, the hosts for freshwater pearl mussel glochidia, would indicate that there is at least a possibility of freshwater pearl mussel being present. Surveys of these watercourses for this species should therefore have been undertaken.

5.4.7 Finally, with regard to other studies required, investigations into the impacts of different chemicals on freshwater pearl mussel are also lacking, largely due to difficulties in undertaking experiments with critically endangered species which have potential to harm them. However, it is known that pH, iron and aluminium can impact survival of early life stages[2]. Reverse osmosis (RO) reportedly lowers the pH of water, making it slightly acidic; this is because the process removes minerals in water that neutralise acid, which reduces the pH of water because of the high amount of carbonic acid in the water after it has been filtered. Water subjected to this RO process, and subsequently discharged into natural watercourses, therefore has the potential to impact freshwater pearl mussels, and other aquatic life, if present. I discuss the impacts of this in more detail in Section 7.8.

5.4.8 In the absence of suitable and recent survey data, particularly with regard to the watercourses due to be affected either by habitat loss or through adverse changes in water quality and/or quantity, it is not possible to rule out any likely significant impacts on this protected and critically endangered species.

[1] Cosgrove P, Hastie L, MacDougall K & Kelly A (2007) Development of a remote deep-water survey method for freshwater pearl mussels. Scottish Natural Heritage Commissioned Report No.263 (ROAME No. F06AC606).

[2] J. Taskinen, P. Berg, M. Saarinen-Valta, S. Välilä, E. Mäenpää, K. Myllynen, J. Pakkala (2011). Effect of pH, iron and aluminium on survival of early life history stages of the endangered freshwater pearl mussel, *Margaritifera margaritifera*. Toxicol. Environ. Chem., 93, pp. 1764-1777, 10.1080/02772248.2011.610798

5.5 White-clawed Crayfish Surveys

5.5.1 We have not seen any evidence of either a thorough desk-based or field-based survey to determine the presence or likely absence of white-clawed crayfish (*Austropotamobius pallipes*). From the limited habitat evidence provided, and the small sections of watercourses observed during my aquatic ecologist's site visit in March 2024, the habitat appears generally suitable for supporting the species, with abundant refuges, diverse substrate and varying flow characteristics[3].

5.5.2 White-clawed crayfish are certainly present in Northern Ireland, with reports from other watercourses and catchments within just a few kilometres of the site and associated watercourses. It is not unreasonable, therefore, to conclude that there is a possibility of this important species being present, and that detailed field surveys should have been undertaken to evaluate this further.

5.5.3 Such surveys do not appear to have been carried out to date, and without such surveys it is not possible to discount their likely presence or, therefore, to determine no likely significant effects on this protected species.

5.6 Otter Surveys

5.6.1 Otter (*Lutra lutra*) surveys carried out in 2012 yielded many more results (field sign observations) than those carried out in 2015/16. This may be due to water levels being higher than normal (and rising) on five out of 12 survey occasions in the latter survey period (as reported by SLR, and as noted in the sections above). Current NIEA guidance (2017) states that surveys should not be carried out after heavy rain; this is because signs may have been washed away and/or because higher water levels will make the identification of potential holts etc. more difficult or even not possible. The 2012 surveys noted several potential holt sites; however, these were not surveyed further (e.g. using camera traps) to confirm whether or not they were active.

5.6.2 The smaller tributaries on site were dismissed as being ecologically unimportant and unlikely to be of value to otters. This was apparently on the presumption that the streams did not contain prey for otters. However, surveys undertaken in 2021 have now shown notable numbers of fish in the Pollanroe Burn, and the ponds on site (and the peatland more generally) are likely to be good for amphibians. These are an important food source for otters, especially when present in large numbers during the breeding season in spring. The smaller tributaries may also be used by otters commuting across the landscape and between watercourses or catchments, and despite a lack of evidence found during 2015 (when surveys were undertaken in suboptimal conditions) there is no clear reason for assuming that they will not use these tributaries during other years. Therefore, these survey data should also be considered as inadequate and out-of-date.

5.6.3 There is little available guidance setting out the required frequency of survey for otters. However, the species is highly mobile and has extensive territories, so survey effort needs to be sufficient to understand the extent to which the site is being used. This is especially important where significant amounts of potentially important

[3] Peay S. (2003) Guidance on Habitat for White-clawed crayfish. R&D Technical Report W1-067/TR, Environment Agency, Bristol. 66 pp

habitat is due to be lost (in this case approximately two kilometres of suitable watercourse habitat – including 975m of the Pollanroe Burn - that could support holts or resting sites).

5.6.4 Although surveys on the Pollanroe Burn included a potential focal point (for sprainting), they only covered a very small section (c.100m). Given the not insignificant impacts predicted for this watercourse (e.g. removal of 975m of it), additional survey effort was clearly warranted (such as surveys in other years and more optimal conditions, and potentially the use of strategically-placed camera traps).

5.6.5 The surveyors were only able to access small areas within the development site, so other potentially useable habitat areas (e.g. for resting sites or holts) were not surveyed. Surveys relied on commuting otters leaving signs which could be detected by surveyors; however, this technique may have had limited success given the suboptimal weather and river conditions reported, and as discussed above.

5.6.6 It is therefore clear, given the lack of a good understanding of the importance of the area to otters, that any assessment of the impacts on otters, whether in the ES or HRA, will have been flawed, and that the potential for significant impacts on otters cannot be ruled out.

6 ADEQUACY OF ENVIRONMENTAL STATEMENT (ES)

6.1 Introduction

6.1.1 Having reviewed the ecological information provided by the applicants, I have identified a range of issues related to the adequacy of the impact assessments provided in the Environmental Statement (ES) documents.

6.1.2 Based upon the information provided within the documents listed below, my professional judgement is that there are elements of the assessment which have not been adequately addressed and/or sufficiently evidenced. As a result, I consider the ES to be deficient in its assessment of likely significant effects.

Documentation reviewed:

- Environmental Statement for the Curraghinalt Project, County Tyrone, Northern Ireland Volume 2 Chapter 8: Environmental and Social Impact Assessment (November 2017). (and associated Annexes). SRK Consulting (UK) Limited
- Curraghinalt Gold Project Addendum to Environmental Statement (July 2019; including the update to the Ecological Impact Assessment). SRK Consulting (UK) Limited.
- Curraghinalt Gold Project Second Addendum to Environmental Statement (November 2020). SRK Consulting (UK) Limited.
- Curraghinalt Gold Project Ecological Mitigation and Management Plan (2017) and the subsequent Addendum (2019). SLR.
- Individual 2017 survey reports in Appendix C8 of the ES (Phase 1 and 2 Habitat; Badger; Bats; Otter; Wintering Birds; Common lizards; Smooth newt; Fisheries and River Habitat Assessment; Freshwater pearl mussel; Marsh fritillary; Terrestrial and Freshwater invertebrates; and Breeding birds) and the subsequent EcIA and Baseline Reports Addendum (2019). SLR

6.2 Impacts on Designated Sites

6.2.1 Despite the proximity of the future mine workings to four sensitive designated sites (the Owenkillew River SAC, Owenkillew River ASSI, Drumlea and Mulan Woods ASSI and Owenreagh River ASSI), and even though smaller watercourses drain directly from the development site into these key rivers and bog woodlands, the impacts during construction, operation and closure are not assessed to be significant in the ES. I believe that the impact assessment has not properly considered the nature of the works and the sensitivities of the species and habitats for which they are designated, and I discuss this in more detail for the individual habitats and species below, especially in relation to the SAC river.

6.2.2 A key potential impact on designated sites is related to suspended solids in the Owenreagh River ASSI. Quantitative modelling predicts that "*the average concentration of suspended solids in the Owenreagh downstream of the Pollanroe Burn will be 5.7mg/L (95%ile) and the annual mean for the creation of suspended solids will not exceed 10mg/L*". It goes on to say that "*This is highly unlikely to have a significant adverse effect on the spawning habitat of the Owenreagh River, or on the ability of eggs and juvenile fish to develop*".

6.2.3 The accepted critical sediment preferences for salmon (collated as part of the Life in UK Rivers project, www.riverlife.org.uk) is 10 mg/L, and it is therefore expected that loading of sediment at this critical limit, over the full period of the mine operation, could impact on salmonids.

6.2.4 Also of note is the fact that the Owenreagh River is an ASSI based upon the presence of the freshwater pearl mussel; this species relies on "*no sedimentation in the few weeks after settlement of juveniles where these require clean sandy or gravelly substrates on the bed of a river in order to grow*". There is no reference in the ES to any potential impacts of sedimentation on this species.

6.2.5 Additionally, Impact ECO5 – 'Potential impact of dust emissions from construction and operational activities at the proposed infrastructure site on ecological receptors', fails to mention the Drumlea and Mulan Woods ASSI, which lies between 79m and 300m north of the Project Areas.

6.2.6 In both cases, insufficient consideration has been given to the potential for the qualifying features of the designated site to be adversely affected.

6.3 Impacts on Habitats

Pollanroe Burn

6.3.1 The ES notes that 975m of the Pollanroe Burn will be lost as part of the project and assesses this as a "*minor watercourse with limited ecological value*" and of Local (Higher) value.

6.3.2 As I have noted earlier, there is no evidence in the ES, nor in the Addendum to the ES (2019), that aquatic habitat and species surveys of the smaller watercourses, including the Pollanroe Burn, were undertaken. However, fish surveys undertaken in 2021 did record the presence of juvenile salmonids, thus indicating that the burn is likely to be of value to salmonids associated with both the Owenkillew and Owenreagh rivers (the former being an SAC). Furthermore, the presence of salmonids also means that the Burn could be of importance for freshwater pearl mussels, which use these fish species as hosts.

6.3.3 Therefore, I would question the classification of the Pollanroe Burn as being of limited ecological value, especially given that it flows directly into the designated Owenreagh River (and indirectly into the Owenkillew SAC) and is thus functionally-linked to both. I would thus suggest that the permanent loss of almost a kilometre of this watercourse should not be considered to be insignificant.

6.3.4 Furthermore, as noted in the Hydrology, Hydrogeology and Peat SoC, at closure of the mine, nitrate levels in the retained stretches of the Pollanroe Burn are predicted to be 12mg/L at low flows, which is above the national standards of 11.3mg/L.

Antimony, iron and manganese will also be elevated above standard levels at closure (iron and manganese already exceed national standards). The cumulative impacts on aquatic habitats and species exposed to elevated nitrate and metals are not considered in the ES, nor are sub-lethal impacts (e.g. impacts on reproductive rates and immune responses), and potential bioaccumulation of metals.

6.3.5 The ES also states that at closure of the mine, the average flow rates in the Pollanroe Burn will be "*50% higher than pre-development flows*" and that this will potentially flush pollutants (nitrates/metals) downstream into the Owenkillew River SAC/ASSI at a more rapid rate. This impact has been not considered significant: "*It is assessed that post-closure the mine is highly unlikely to have a significant effect on water quality in the Owenkillew River. No significant effects are predicted on habitat or species associated with the Owenkillew River from the proposed closure of the mine*."

6.3.6 There is no reference in the ES to any potential impacts from elevated nitrate and metal levels in the Pollanroe Burn, nor to changes in pH levels or the removal of key minerals from the water as a result of the reverse osmosis process. This is discussed in more detail in the Hydrology, Hydrogeology and Peat SoC, but again the potential certainly exists for significant long-term effects.

Owenkillew River SAC

6.3.7 One of the qualifying features of the Owenkillew River SAC is "*water courses of plain to montane levels with the* Ranunculion fluitantis *and* Callitricho-Batrachion". Water quality (particularly phosphorus and nitrates) strongly influences the species composition, extent and condition of riverine plant communities (Hatton-Ellis *et al*, 2003). Increasing nutrient supply will lead to an overall reduction in the number of species, with a loss of *Ranunculus* spp., and these communities are also sensitive to nitrates, metal pollution and sediment load.

6.3.8 It cannot be determined that the discharge of elevated nitrates and metal pollutants into the Pollanroe Burn will not impact on this qualifying feature in the Owenkillew River SAC over time.

Peatland habitats

6.3.9 Current plans show a loss of 30.25 hectares of five peatland habitats "*with affinities to Annex 1 Habitats and Northern Ireland Priority Habitats*" and the loss of 7.94 hectares of valley mire. These are highly important and sensitive habitats, and it is stated that is not possible to fully mitigate these habitat losses, that residual impacts will remain and that compensation is therefore required.

6.3.10 The Ecological Mitigation and Management Plan (EcMMP, 2017 and 2019) suggests that this loss can be successfully compensated through habitat creation, enhancement and restoration of retained areas. I would strongly suggest that creating new peatland habitat in Area A using peat overburden during construction works is highly unlikely to be successful. It will certainly not replicate the structure, diversity and complexity of the Annex 1 and NI Priority habitats being removed, since peatland habitats (of the value being lost) take hundreds of years to establish.

6.3.11 As suggested by John Ingham in his evidence, and on the basis of his extensive experience in minerals restoration projects, including upland moorland such as

this: '*. if the peat from site is mixed with topsoil and mineral to form the planting media, it is no longer functioning peat and the carbon stores are lost*'. He also notes how difficult it will be to establish heathland habitat as part of the restoration plans (see Section 8.3 of the Landscape and Visual Statement of Case). Further discussion into the flaws in the peat restoration proposals is also provided by Dr Catherine Isherwood in Section 7 of her Hydrology, Hydrogeology and Peat SoC.

6.3.12 I would also suggest that the proposed ratio of 2:1 for compensation area (relative to the area being lost) is wholly inadequate given the value of the habitat and the difficulty in its replacement/recreation. The Hydrology, Hydrogeology and Peat SoC suggests that a 10:1 ratio is likely to be more appropriate, whilst Section 8 of this SoC highlights that the loss of 'irreplaceable' habitat such as blanket bog requires a significant bespoke compensation package far greater than the proposed 2:1 replacement. I will discuss this key issue further in Section 7 and Section 8.

6.3.13 Finally with regard to habitats and the ES, it is important to note that the baseline provided in the impact assessment is fundamentally wrong. This is because the existing surface infrastructure site (Area C) was not reinstated to habitat as it was legally required to be as part of the consent for this activity, so instead the baseline comprised buildings and other lower-value habitats. Clearly an impact assessment based upon a lower-value baseline will understate the scale and importance of the impact.

6.3.14 Also, my understanding is that, given that this is thus unauthorised EIA development (at least on the existing infrastructure site), the applicant has to demonstrate an absence of unfair advantage. Given that the impact assessment will have benefitted from the lower baseline, I do not believe that an unfair advantage was absent. Similarly, there was also clearly an unfair advantage with regards to the BNG assessment (see Section 8, below), since the baseline for the Metric calculations (upon which the required net gain percentage is determined) would have been lower, meaning that less habitat creation and/or restoration would be required to achieve the necessary net gain.

6.3.15 Furthermore, had reinstated habitats been present in Area C, the applicant would also have had to undertake a much more substantial survey and assessment than simply saying making assumptions about the habitats (and indeed species) that might have been present in those circumstances. Again I consider this to be an unfair advantage.

6.4 Impacts on Species

Bats

6.4.1 Six species of bat will be impacted by the construction of the goldmine as "*development of the infrastructure will lead to fragmentation of flight lines and commuting routes for the species of bat using the cottage, and for Nathusius' pipistrelle, Leisler's bat and a Myotis species*". A total length of 1870m of new and supplementary hedgerow planting will "*connect the new bat house to the Pollanroe Burn, the other existing disused building and block of woodland on adjoining land to the south west*". The ES does not, however, mention the loss of nearly 1km of the

Pollanroe Burn and associated bankside vegetation, which will result in a discontinuous commuting route along this burn.

6.4.2 The EcMMP states that the new bat house being created will be monitored for a period of four years post the construction phase. Given the scale of the development and its long-life span, monitoring for such a short period of time does not seem sufficient to ensure that there are no significant residual adverse impacts on bat populations using the bat house.

6.4.3 Additional mitigation proposes that the semi-improved grasslands in the field where the new bat house will be built, and in the adjacent field to the south, will be "*enhanced through the sowing of a commercially available or bespoke wildflower seed-mix locally sourced in Northern Ireland",* presumably to encourage a diversity of invertebrate prey for bat populations. Given the sensitivity of the floral communities associated with the five peatland habitats "*with affinities to Annex 1 Habitats and Northern Ireland Priority Habitats*", I would suggest that this approach is not appropriate, as it could introduce species not typically associated with those communities, potentially causing changes to the plant communities and the ground conditions, and thus significant adverse effects on the sensitive peatland habitats.

Otter

6.4.4 The ES (2017) does not refer to any impacts on otters from the development. While otter signs were only found in a small number of locations in the accompanying surveys, it is my opinion that the survey work was inadequate, as stated above. Instead, I suggest that it is highly likely that otters are using minor watercourses, ponds and wetland/peatland habitats for both commuting and foraging, and therefore are likely to be moving across the catchment of the proposed mine.

6.4.5 The loss of three ponds supporting common frog (*Rana temporaria*), a common and accessible food source for otters during the breeding season, plus the loss of areas of marshy grassland, wet heathland, bog and fen habitat, could have impacts on otter populations in the catchment, but these were not considered.

6.4.6 Without additional survey effort along the Pollanroe Burn, the presence of otters along this watercourse cannot be ruled out, and the removal of 975m of this watercourse could present significant impacts for this species (both in terms of the loss of potential holt and foraging habitat and the fragmentation effect) as well as result in a breach of protected species legislation.

Breeding birds

6.4.7 The 2015 breeding bird surveys recorded a number of species within the survey area, including Golden Plover (*Pluvialis apricaria*), Skylark (*Alauda arvensis*), Cuckoo (*Cuculus canorus*), Red grouse (*Lagopus lagopus*) and Wheatear (*Oenanthe oenanthe*). These species will be impacted by the loss of peatland habitats from the development site. Enhancement of habitats in Area A was proposed by the applicant as mitigation for the impacts on these (and other) species, though only after this was queried by the RSPB (FEI, 2019).

6.4.8 My concern is that the EcMMP states that apart from checking bird boxes, which are not suitable for use by these species, there is "*No other specific monitoring programme*

for birds is proposed at the proposed infrastructure site during the operation of the gold mine". Given the very long operational period, and the potential impacts upon these key species, without regular breeding bird surveys there will be no way to monitor bird numbers and the success, or otherwise, of the proposed habitat enhancements.

6.4.9 The ES categorises the impact of disturbance on breeding bird communities as having significant residual impacts (impacts will remain significant after mitigation), so the lack of ongoing monitoring for the lifespan of the operational phase is surprising.

Badger

6.4.10 The most recent survey for badgers (2018) on the proposed development site recorded five badger setts in the south/southeast portion of Area A (the proposed infrastructure site). Two of these were classified as main setts, and while one of these was found to be inactive at the time of survey, the other was classified as having "*Very high*" levels of activity. The remaining three setts were classified as outliers with activity levels recorded as being "*Not present*", "*Low*" and "*Moderate*", respectively.

6.4.11 There is a proposed loss of "*64.8 ha of potential foraging habitat (mostly of poor value) for badgers, within possible territory of a single badger clan, and one active badger outlier sett will be affected by construction at the proposed infrastructure site*". The EcMMP states that "*the loss of potential foraging habitat within the proposed infrastructure site is considered highly unlikely to be critical to the maintenance of the local badger population*". However, given that the infrastructure site supports five setts, with one very active main sett, I would suggest that it is more likely that the badger population is highly reliant on the surrounding habitats, and that the loss of 64.8 ha could, therefore, be of significance.

6.4.12 The compensation to mitigate the loss of the main badger sett is the installation of an artificial sett. This does not compensate for the substantial loss of foraging habitat nor the loss of the other four setts in the area. The EcMMP states that monitoring of the artificial sett will take place for only two years post-construction. With decades of site operation, a two-year monitoring programme will not allow the residual impacts of the mine operation, and their potential significance, to be fully understood.

6.4.13 Effective mitigation is important as there is also the potential for a further main sett north of the existing surface infrastructure site (Area B) to be impacted by underground blasting. The suggested mitigation for this in the EcMMP is for blasting to occur under licence "*where this is deemed necessary by an EcOW*", but this does not tell us how the impacts would be mitigated, nor indeed if a disturbance licence could be obtained.

6.4.14 In summary, it does not seem that appropriate consideration has been given to the impacts of the mine development on resident badger populations, and I would dispute that the impacts regarding Surface Disturbance, Noise and Vibration (Table 8-62 ES, 2017) are classified as "*not significant after mitigation*". (N.B. This sett was not surveyed as part of the 2018 surveys).

Marsh fritillary

6.4.15 The marsh fritillary butterfly is afforded protection under Schedules 5 and 7 of the Wildlife (Northern Ireland) Order 1985 (as amended), which fully protects the species and its habitat. Marsh fritillaries are also afforded protection under Annex II of the

European Habitats Directive 92/43/EEC, which places a duty on the Northern Ireland Environment Agency (NIEA) to maintain the species at a favourable conservation status.

6.4.16 Surveys were undertaken in 2016 in two areas of the proposed infrastructure site (Area A) where there was presence of Devil'-bit scabious (*Succisa pratensis*), the only known food plant of this species. These surveys are referenced in the Addendum to Environmental Statement (2019). A historical population of marsh fritillary was known from one of these sites (SP2), and the sampling sites were assessed, respectively, as '*suitable (under-grazed) habitat*' (SP1) and '*good condition habitat*' (SP2) for marsh fritillary.

6.4.17 Whilst no individuals were recorded in these surveys, it was noted that populations of this species can fluctuate greatly in size from year to year, with small colonies prone to extinction where there is a small population in isolated areas of habitat. The habitat areas supporting Devil's-bit scabious within the study area were considered to be small, isolated areas within the context of the local landscape, and very poor weather conditions for all butterfly species in 2015 may have impacted upon the colony historically recorded at SP2.

6.4.18 Based on these considerations, it was stated that "*there is all reasonable likelihood of absence of Marsh fritillary within the proposed infrastructure site for the proposed gold mine development*". Given the results are from only a single year's survey effort, and that the previous year had been "*very poor weather conditions for all butterfly species*" it would not be right to assume the absence of this species from the proposed infrastructure site.

6.4.19 The survey report states that as "*Marsh fritillary populations function at a landscape scale and are able to colonise sites within a range of 10 km, then consideration must be given to ensure that any loss of potential habitat for this butterfly species through the gold mine development is adequately compensated for*". I note that the EcMMP states that annual monitoring of this species would occur from 2017 in one of the five retained units of peatland habitat in the infrastructure area (unit MU7), and that this unit would be enhanced for this species. The results of these surveys may provide more detail on the likelihood of absence of this species, but it is unsafe to assume the absence of marsh fritillaries on the basis of the current survey information. It is, therefore, also unsafe to assume that there will be no impacts upon this species.

7 ADEQUACY OF HABITATS REGULATIONS ASSESSMENT (HRA)

7.1 Introduction

7.1.1 The following HRA documents have been provided by the applicants as part of the application:

- Curraghinalt Project County Tyrone Northern Ireland. Update Shadow Habitats Regulations Assessment (November 2020) (referred to below as the sHRA), which supercedes two previous iterations:
- Curraghinalt Project County Tyrone. Prepared for Dalradian Gold Limited (November 2017). Environmental Statement - Volume 3. C10 Shadow Habitat Regulations Assessment.
- James O'Neill Associates. Information to inform Habitats Regulation Assessment Pursuant to Article 6(3): Curraghinalt Gold Project Prepared for: Dalradian Gold Limited (July 2019).
- Ecology Solutions. Discharge licence 068/12/3 Curraghinalt, Cortin County Tyrone. shadow Habitats Regulations Assessment (January 2020) (referred to below as the discharge licence sHRA).

7.1.2 Having reviewed the information provided within these documents, I have identified a range of issues relating to the adequacy of the HRA for the project, and these are summarised below.

7.1.3 The burden of proof for HRA, and specifically the Appropriate Assessment stage of the process, involves using the 'best available scientific evidence' to determine 'beyond reasonable scientific doubt' that there will be no adverse effects on the integrity of a European designated site.

7.1.4 As I will explain in the following sections, and based upon the information provided within the documents – and specifically the lack of robust survey information with regard to key qualifying species such as otter, salmonids and freshwater pearl mussel, and insufficient consideration of potential impact pathways - it is my professional judgement that this burden of proof has not been met.

7.2 Clarity of Information Presented

7.2.1 While the latest sHRA makes reference to previous iterations (2017 and 2019), it does not bring together all the necessary supporting information and evidence into one document. This makes the task of concluding the HRA difficult for the Competent Authority. In addition, it does not make reference to more recent, potentially relevant ecological information presented in the second addendum to the ES (October 2020). It should also be noted that not updating the sHRA further on the basis of other important evidence, such as the fish survey work undertaken in June 2021 by NIEA and the Loughs Agency (as discussed in Section 5.3, above), means that the assessment to be carried out by the Competent Authority is not based upon the 'best available scientific evidence'.

7.2.2 The sHRA also does not include a detailed map clearly identifying all of the tributaries which represent hydrological links from the site to the designated sites, nor indeed the areas of sensitive woodland and bog habitat within the SAC that could be affected by air quality impacts. This is unhelpful when trying to consider impact pathways between the development site and the designated sites, and thus makes it very difficult to properly assess impacts.

7.3 Adequacy of Screening

7.3.1 The sHRA identifies the need for detailed consideration of impacts on the following designated sites:

- Owenkillew River SAC;
- River Foyle and Tributaries SAC;
- Lough Foyle SPA (UK and ROI);
- Lough Foyle Ramsar site; and
- River Finn SAC.

7.3.2 The following potentially significant effects are identified:

- habitat loss, damage and fragmentation;
- disturbance from human activity (noise and visual disturbance);
- dust deposition;
- disturbance from vibration;
- changes in air quality (traffic emissions);
- changes in water quality (groundwater and surface water); and
- changes to the hydrogeological and hydrological regime.

7.3.3 The sHRA identifies all of the above impacts as relevant to the Owenkillew River SAC during at least one phase of the proposed project. For the other designated sites identified above, only changes in water quality and changes to the hydrogeological/ hydrological regime are screened in. Whilst these are indeed likely to be the main potential impact pathways to these additional designated sites, in my opinion a more thorough justification is required explaining why the other impacts have been screened out for these sites. This should include clear identification of the source-impact-pathway (as discussed below) and a clear explanation 'beyond reasonable scientific doubt' for the lack of impact, taking into account the precautionary principle.

7.3.4 For example, the discharge licence sHRA considers the potential for adverse effects on the Owenkillew River SAC as a result of the planned discharge of surface water from the site water treatment system to the Curraghinalt Burn (a tributary of the Owenkillew River SAC). However, there is no justification as to why potential impacts on the other designated sites downstream of the Owenkillew River SAC (i.e. the River Foyle and Tributaries SAC, Lough Foyle SPA, Lough Foyle Ramsar site and River Finn SAC) have been screened out.

7.3.5 Whilst these other designated sites are further away from the proposed development site, the nature of the impacts (see below), and specifically the toxicity risks associated with a number of the chemicals that could be released, means that the potential for significant indirect impacts some distance downstream of the discharge point cannot be discounted. The chemicals involved are potentially highly toxic, and the qualifying

habitats and species highly sensitive, such that even very small concentrations could accumulate within these watercourses.

7.3.6 Similarly, the potential air quality impacts on sensitive qualifying habitats associated with increased nitrogen deposition are also screened out without any clear justification. This includes the SAC designated features 'Bog Woodland' and 'Old Sessile Oak woods with *Ilex* and *Blechnum*'). As noted in the 2017 SRK report (p194), there will be an increase in nitrogen as a result of vehicular emissions. Given that many of the sensitive habitats within the vicinity of the site are currently exceeding critical loads for nitrogen, owing to intensive agricultural practices, there is a clear potential for increased emissions from this project to have cumulative and in-combination effects that could significantly harm these habitats (e.g. through changes in vegetation composition, with sensitive plant species being out-competed by grasses and other more dominant species). More detailed consideration of this potential needs to be provided before such impacts can be screened out.

7.4 Lack of Detail in Identification of Source-Impact-Pathway

7.4.1 The sHRA lacks clear identification of the ecological impacts that could potentially arise from the activities associated with the proposed project. Although the assessment includes reference to the source-impact-pathway methodology, it does not clearly describe or bring together the impact sources (i.e. the activities taking place during each phase of the project), the potential biophysical changes resulting from these activities, nor the ecological receptors which could be affected by the activities/ impacts identified and their sensitivities to the likely change.

7.4.2 For example, the impact assessments for changes in air quality (traffic emissions) and hydrological implications (changes in water quality, changes to the hydrogeological and hydrological regime, etc.) do not identify which of the qualifying features of the Owenkillew River SAC are relevant to each assessment. This is a significant failing, since it is the nature of each qualifying habitat and/or species, and its particular sensitivity to the biophysical changes brought about by specific impacts, that determines the likelihood (and potential significance) of an adverse effect.

7.4.3 Even where the qualifying features *are* discussed, the sHRA does not demonstrate an understanding of the sensitivities of the ecological receptors to the potential impacts being assessed, which in my opinion significantly reduces confidence in any conclusion of no adverse effects. For example, several of the chemicals that would be released into the surface and groundwater, primarily through the reverse osmosis process, are known to be of moderate to high toxicity to fish and other species (see Section 6 and Appendix C of the Hydrology, Hydrogeology and Peat SoC), and could therefore have significant effects upon qualifying features of the SAC (especially the freshwater pearl mussels and salmonids, but also the floating water-crowfoot habitat ('Water courses of plain to montane levels with the *Ranunculus fluitans* and *Callitricho-Batrachion* vegetation') and, more indirectly, the otters).

7.4.4 Further critique with regard to the hydrological impact pathways is provided in Section 7.8, below.

7.4.5 In addition, the sHRA does not clearly identify or justify which impacts are relevant to each stage of the development (construction, operation and closure). For example,

there is clearly the potential for disturbance from human activity (noise and visual disturbance) during the closure phase, which have not been considered. Similarly, there is a failure to fully consider the decommissioning/post-operational effects associated with water levels rising for 90 years after mine closure, with potential impacts on surface waters (see the Hydrology, Hydrogeology and Peat SoC for details). This piecemeal approach to the assessment reduces confidence, and raises doubts, in the overall conclusions of the sHRA.

7.4.6 Furthermore, the impact assessments do not assess each phase separately in order, which also makes the assessment confusing and difficult to determine whether the conclusions are acceptable. For impacts resulting from changes in air quality (traffic emissions), although the potential for impacts has been identified during the operational phase, the assessment only considers construction phase impacts.

7.4.7 Finally, as suggested in the section above, the potential impact pathways between the development (and specifically those activities likely to lead to nitrogen emissions) and the sensitive bog woodland that is a qualifying feature of the Owenkillew River SAC, have not been explored in any detail in the sHRA. In addition, it should be noted that the Black Bog SAC and Ramsar site, which was designated for its sensitive raised bog habitats, and which was screened out of the sHRA, is located less than 5km south-east of the development site (i.e. down-wind of the mine site in prevailing wind conditions).

7.4.8 Whilst previous DAERA/NIEA standing advice on air quality impacts (known as the Operational Protocol) suggested that anything less than a 1% increased 'process contribution' to critical levels of nitrogen deposition and nitrous oxides would not need further assessment in HRA, this has recently been replaced with 'case and site-specific advice (on a case-by-case basis)'. The reason for this is that 'urgent action is required to prevent rising ammonia concentrations and deposition at sensitive habitats to avoid further deterioration in their condition', since '98% of Special Areas of Conservation (SACs).. had nitrogen deposition rates exceeding their Critical Load' (DAERA, 2023).

7.4.9 Therefore, in my opinion bespoke assessment and detailed consideration of the potential air quality impacts upon both the bog woodland within the Owenkillew River SAC and the raised bog at the Black Bog SAC and Ramsar site are required in order to understand the implications of the proposals for these sensitive habitats (and in the light of the current serious situation regarding nitrogen deposition on SACs in Northern Ireland).

7.5 Lack of Consideration of Potential Impacts on Supporting Habitats

7.5.1 In my professional judgement, there is a lack of consideration of the potential for adverse impacts on supporting habitats; these are habitats outside the boundary of the designated sites, but which could support species which are part of the designated site populations, such as salmon, freshwater pearl mussels, floating water-crowfoot and otters.

7.5.2 Whilst the updated sHRA quotes the *Holohan Judgment* (which relates to the need to '*examine the implications for habitat types and species outside the boundaries of the protected site, insofar as those implications are liable to affect the site's Conservation Objectives*'), both the sHRA and discharge licence sHRA focus on direct impacts within

the boundary of the Owenkillew River SAC rather than considering functionally-linked habitats and features outside the SAC. Although the sHRA mentions discharges into three 'less sensitive' tributaries of the Owenkillew River SAC (the Pollanroe Burn, Curraghinalt Burn and Attagh Burn), the implication is that these watercourses are not part of the SAC and are therefore not important.

7.5.3 But as I will discuss below, not only are these features likely to be of importance for populations associated with the SAC (i.e. as 'supporting habitat'), but also the lack of robust survey data means that the presence and distribution of SAC qualifying species are currently not known. During his site visit, my colleague Dr Walker assessed the Pollanroe Burn as suitable for most if not all of the qualifying species of the SAC, on the basis that in places it was several metres wide and supported areas of riffle, sediment and gravel.

7.5.4 The sHRA also fails to identify potential supporting habitats, such as ponds, within the site boundary which could be a foraging resource for otters. Once supporting habitats are identified, the sHRA should assess the potential for impacts on them as a result of the Project.

7.5.5 Given that almost a kilometre of nearby supporting aquatic habitat, the Pollanroe Burn (known to supporting qualifying species, including salmon and otter, and potentially also freshwater pearl mussel), is due to be lost and not replaced, this could represent a significant impact upon the SAC populations of these species.

7.5.6 The discharge licence sHRA also considers potential for adverse effects on the Owenkillew River SAC as a result of discharge of surface water from the site water treatment system to the Curraghinalt Burn (a tributary of the Owenkillew River SAC). However, it does not include consideration of whether the burn itself is 'supporting habitat' through its potential to support qualifying species of the SAC.

7.5.7 It is my professional opinion that the omission of identification and proper assessment of supporting habitats renders the sHRAs for the project and discharge licence incomplete, and undermines the certainty of the conclusions of no adverse effects on the integrity of the designated sites.

7.6 Adequacy of Ecological Surveys

7.6.1 Section 5, above, identifies a number of issues regarding the adequacy of ecological surveys, including those for qualifying species of the Owenkillew SAC (salmon, fresh water pearl mussel and otter). It also notes the lack of baseline ecological surveys of potential supporting habitats, such as the Pollanroe Burn and Curraghinalt Burn, which would be required to inform the assessment of potential effects (as noted above).

7.6.2 Without reliable information regarding the presence, distribution and abundance of these species, it is not possible to properly quantify the effects, especially with regard to favourable conservation status. It is therefore my professional opinion that it cannot be demonstrated that the habitats regulation assessments have been based on 'the best available scientific evidence'.

7.6.3 This further undermines the certainty of the conclusions within the sHRAs for the project and discharge licence that there will be no adverse effects on the integrity of the designated sites.

7.7 Adequacy of Assessment of Disturbance from Human Activity (Noise and Visual Disturbance)

7.7.1 The sHRA assessment concludes that '*no adverse effect on the integrity of the Owenkillew River SAC or any other European / Ramsar site would arise in relation to human / visual disturbance*'. However, the evidence/justification provided in the assessment only considers noise, it does not assess visual disturbance.

7.7.2 Given the likely presence of otters within what is currently a tranquil environment with very few people, there is the potential for the otter population to be excluded from the area, and for many years, through a combination of noise, visual disturbance and general human activity over a large area.

7.7.3 It is, therefore, my professional opinion that conclusions of no adverse effects on the integrity of the otter component of the designated site have not been demonstrated.

7.8 Adequacy of Assessment of Hydrological Implications

7.8.1 As noted in Section 7.4 above, the sHRA does not identify which SAC qualifying features (habitats and/or species) are relevant to the assessment of hydrological impacts. The assessment only mentions freshwater pearl mussel, but should also consider the potential for impacts on salmon, lampreys, otters and habitats (including floating water-crowfoot vegetation and bog woodland), which are all also features of the Owenkillew River SAC.

7.8.2 In addition, the assessment also does not consider the potential for impacts on other related ecological receptors which are important in supporting SAC species, and which are also sensitive to changes in water quality. This includes brown trout (which can act as hosts for the larval glochidia of pearl mussels), and aquatic invertebrates, which are a food source for fish (including juvenile salmon and trout).

7.8.3 Lack of consideration of supporting habitats (as discussed in Section 7.5 above) is particularly relevant to hydrological impacts, given that there will be runoff and discharges directly into a number of tributaries that are hydrologically linked to the Owenkillew River SAC. In my opinion, these have not been adequately assessed to determine whether they represent supporting habitat for SAC qualifying species.

7.8.4 Whilst the impact assessment presents a lot of detail about the changes in water quality, it does not provide details of relevant sensitivities/vulnerabilities of the qualifying features of the Owenkillew SAC, and thus how the changes could impact them (for example, through sub-lethal levels and/or chemical bioaccumulation).

7.8.5 In my opinion, the assessment does not provide enough evidence to conclude, beyond reasonable scientific doubt, that there will be no adverse effect on the integrity of the SAC. Indeed the loss of 975m of the Pollanroe Burn, along with the discharge of water containing toxic chemicals and/or with important minerals removed by reverse osmosis (see Section 5 of the Hydrology, Hydrogeology and Peat SoC for further details), would strongly suggest that such a conclusion cannot be drawn. This opinion is shared by the Loughs Agency (see Section 2.2 of the Hydrology, Hydrogeology and Peat SoC).

7.8.6 The sHRA notes that '*the reverse osmosis plant would be expected to produce significantly higher quality effluent than is required by the site discharge consent,*

resulting in better water quality in the Owenkillew River than predicted in the Proposed Discharge Criteria document (Kaya 2020) and increases in baseline of less than 10% of the EQS.' The document goes on to state that '*Discharges to less sensitive watercourses (Pollanroe Burn, Curraghinalt Burn, Attagh Burn) will meet drinking water standards*'. However, the suitability of the water for human consumption is quite different from its suitability for aquatic habitats and species, and as noted above (and discussed in detail in the Hydrology, Hydrogeology and Peat SoC), reverse osmosis treatment removes both beneficial and potentially harmful substances from the water. Trace elements such as calcium and magnesium that are essential for fish metabolism and growth will be removed, which could lead to adverse effects on fish, including salmonids.

7.8.7 Reverse osmosis also lowers the pH of water, making it slightly acidic. The process removes minerals in water that neutralise acid, which reduces the pH of water because of the high amount of carbonic acid in the water after it has been filtered. Decreases in pH have the potential to adversely affect survival of freshwater pearl mussel (both the glochidia and juveniles).

7.8.8 In addition, Appendix C of the Hydrology, Hydrogeology and Peat SoC provides details of the potential toxicity and other effects of a number of chemicals (including ammonia, nitrates, chromium VI and arsenic) that may arise from the underground mine workings or mine water discharge. All of these are noted to have exceeded their respective environmental standards for groundwater and have known adverse effects on fish, invertebrates and/or aquatic habitats, with most having moderate to high chronic or acute toxicity to fish.

7.8.9 As such, there is clearly the potential for changes in water quality (both surface water and groundwater), including resulting from the discharge of water treated by reverse osmosis, to adversely affect the suitability of the watercourses (both the Owenkillew River and its tributaries) for SAC qualifying features. This has not been addressed in the sHRA.

7.8.10 Instead the focus seems to be on suggesting that there will be net benefits to water quality rather than adverse effects. The sHRA states that '*The exceedances in accepted standards or proposed ranges relating to discharges / water quality must be viewed in the light of the betterment arising from a reduction in agricultural practices in the catchments*'. It goes on to suggest that as diffuse pollution from agricultural sources is known to be a major contributor to degraded water quality, the proposed change to land use resulting from the project will effectively remove an element of agriculture from the relevant river catchments. It then concludes that '*it is considered that that no adverse effect on the integrity of the Owenkillew River SAC would arise in relation to effects from changes in surface water quality, and noting the improvements in the baseline situation which would arise from removal of land from agriculture (through delivery of the mine project), the discharges are not likely to retard any measures aimed at restoring or maintaining populations of qualifying species, such as Freshwater Pearl Mussel*'.

7.8.11 In my opinion, as the assessment does not quantify the stated 'betterment' of water quality resulting from agricultural change, it cannot, and does not, demonstrate that this is sufficient to offset the predicted '*exceedances in accepted standards or proposed ranges relating to discharges / water quality*' as a result of the proposed project, especially given that the toxic effects of many of the chemicals involved (as set

out in Appendix C of the Hydrology, Hydrogeology and Peat SoC) have not been considered. Furthermore, given the existing low intensity sheep-grazing in the area, and thus the relatively minor influence of the agricultural land management on water quality, it seems to me highly unlikely that this change in land use would be sufficient to offset the potentially significant, adverse changes in water quality resulting from the proposed project activities described above.

7.8.12 As noted in Sections 5.4 and 5.5 of the Hydrology, Hydrogeology and Peat SoC, in addition to the potential impacts to water quality, the predicted changes in flow rates could also have significant effects. The higher flow rates predicted in some watercourses could flush away silts used by lamprey ammocoetes and/or freshwater pearl mussel, whilst the low flow rates in others (caused by changes in catchment areas) could also make the watercourses unsuitable (and potentially even to dry out). Neither of these eventualities, nor their potential implications for the qualifying features of the SAC (including supporting habitat), have been properly assessed in the sHRA.

7.8.13 Most of the hydrological effects described above either relate to supporting habitats of the Owenkillew River SAC and/or would have indirect or distance effects on the river itself. However, as noted in the Hydrology, Hydrogeology and Peat SoC, ground water contributes approximately 16% of base flows in the Owenkillew River; therefore, any impacts on groundwater, either in relation to water quality or quantity, could clearly have a direct effect on the integrity of the SAC.

7.8.14 Finally, the sHRA notes that '*section 3.2 of the CEMP specifically considers those mitigation measures relevant to water pollution, vegetation clearance and soil conservation. The reader's attention is drawn to the CEMP for the relevant detail*'. In my opinion, it is wholly inadequate to address the mitigation measures in this way. In order to demonstrate 'beyond reasonable scientific doubt' that there will be no significant effect, it is necessary to set out clearly and precisely within the HRA what the mitigation measures are, to explain how they would reduce the specific effect on each qualifying feature (with reference to the specific impact pathways and biophysical changes that are being considered), and then provide a justification or explanation for why it is considered that the mitigation will ensure these impacts are not significant.

7.8.15 A full evidence-backed consideration of the detail is required to meet the high burden of proof. And given that each receptor-impact-mitigation interaction is different, this needs to be done for each of these interactions.

7.8.16 In my opinion, on the basis of the issues identified above, it cannot be concluded that there will be no adverse effect on the integrity of the Owenkillew River SAC (both directly and through its supporting habitat) arising in relation to effects from changes in the quality or quantity of both surface water and groundwater.

7.9 Adequacy of in-combination assessment

7.9.1 The sHRA includes an assessment of the potential for in-combination effects with '*the powerline project*' (which is related to the project, but subject to separate planning applications). It notes that '*No other plans or projects have been identified which must be considered in-combination with the project proposals'*. In my opinion, there is insufficient explanation as to why other plans and projects have not been considered, given the potential for in-combination and cumulative impacts with the mine project.

7.9.2 Futhermore, the list of ecological documents relating to the powerline project, which were reviewed to inform the in-combination assessment, does not include reference to a HRA. It is therefore not clear whether the conclusions of the powerline HRA were taken into consideration in the in-combination assessment.

7.9.3 Although the powerline HRA concluded no significant effects in its own right, given that the powerline will cross the Owenkillew River SAC as well as numerous tributaries of that SAC and the River Foyle and Tributaries SAC, and that both open-cut techniques and underground cabling will be carried out, the potential for in-combination effects on sensitive aquatic habitats and species clearly exists.

7.9.4 The impact conclusion statements within the discharge licence sHRA refer to '*alone and in-combination*' effects; however, the document does not include a section clearly setting out other plans and /or projects which have been considered as part of the in-combination assessment.

7.9.5 Given the issues identified here and above, in my opinion consideration of in-combination effects for both the sHRA and discharge licence sHRA need to be re-assessed, taking into account the likely impacts associated both with other plans (including the County Donegal Development Plan 2024-2030, the Fermanagh and Omagh District Council Local Development Plan 2030 – Plan Strategy and the Regional Development Strategy) and with concurrent projects, including review only the mineral prospecting licence application recently taken to judicial Review by Derry and Strabane District Council but also any other projects that could potentially impact upon the favourable conservation status of the Owenkillew River SAC and other designated sites in the area.

8 ADEQUACY OF BIODIVERSITY NET GAIN ASSESSMENT (BNG)

8.1 Introduction

8.1.1 In Northern Ireland, Biodiversity Net Gain (BNG) is not mandatory, as it now is in England. The Wildlife and Natural Environment Act 2011 does, however, include a statutory biodiversity duty for all government departments and public sector bodies (stating that "*it is the duty of every public body in exercising any functions to further the conservation of biodiversity so far as is consistent with the proper exercise of those functions*"). The applicant also relies on the concept of net biodiversity gain so it is relevant to consider.

8.1.2 In addition, 'Valuing Nature: A biodiversity strategy for Northern Ireland to 2020' notes that it is important to "*consider the outcomes of the consultation on Biodiversity Offsetting carried out by Defra and decide on the way forward in Northern Ireland*", whilst the Strategic Planning Policy Statement for Northern Ireland (SPPS) identify that "*planning policies of this statement….must have regard to any strategy designated for the conservation of biodiversity*".

8.1.3 Finally, Fermanagh and Omagh District Council's Biodiversity Strategy and Action Plan from 2022 – 2027 has three main aims that are relevant here: "*to protect, enhance and restore biodiversity on Council managed estate; to increase awareness and action for local biodiversity in the District; and to work in partnership with others to deliver biodiversity action in the District*".

8.1.4 Therefore, any development that leads to a net loss of biodiversity would clearly be contrary to prevailing planning policy, so the claims of net biodiversity gain must be robustly considered as part of this application.

8.2 Review of Applicant's BNG Assessment

8.2.1 There is an obvious direction of travel in policy terms, and it is this that the applicant was responding to in their consideration of the implications of their proposals on biodiversity. To do this they used a version of the Defra biodiversity metric ('Version 1') that was current at the time (2017), I and my BNG team reviewed how this was done and whether the methods and assumptions were appropriate. We then re-assessed the biodiversity implications of the proposals using the current version of the metric - the Statutory Biodiversity Metric (SBM) – to consider how using better-developed methodologies might influence the conclusions.

8.2.2 I recognise that the SBM was clearly not available at the time of the initial application. However, given the considerable ecological value of the habitats that would be affected, the large areas involved, and the importance of succeeding with the mitigation and compensation proposed, I consider that is important to understand as accurately as possible what the true biodiversity implications of the project will be.

8.2.3 My concern relates to whether the proposals would '*further the conservation of biodiversity*' and whether, when assessed using current standards, there might be a

net loss of biodiversity associated with construction of the gold mine rather than the net gain claimed. This is clearly a material consideration in the decision to grant or refuse planning permission for the project.

8.2.4 My detailed review of the BNG proposals is presented in Appendix 1. The conclusions of this assessment are summarised below.

Affected Habitats

8.2.5 The peat on the crest of the site supports a complex mosaic of blanket bog, wet heath, marshy grassland and acid grasslands, and forms a watershed for several small burns that flow into the Owenkillew River SAC/ASSI and Owenreagh River ASSI. The loss of almost 2km of this burn habitat (including 975m of Pollanroe Burn) is barely considered in the applicant's BNG assessment.

8.2.6 'Blanket bog' is treated as an 'irreplaceable habitat' within the current Statutory Biodiversity Metric (SBM), and any loss requires bespoke mitigation. The replacement ratio of 2:1 for peat habitat (as used in the applicant's assessment) is much lower than would be expected when compensating for the loss of irreplaceable habitat. The Hydrology, Hydrogeology and Peat SoC suggests that a 10:1 ratio would be more appropriate, and I would consider this to be much more realistic. Ultimately, this should be decided on a case-by-case basis with the local authority and statutory consultees.

8.2.7 Large areas of important, sensitive, and difficult-to-recreate habitats will be lost as part of the proposals and it is, therefore, surprising that a biodiversity net gain is predicted through the EcMMP proposals.

8.2.8 It is surprising that no mitigation is proposed for the loss of watercourse habitat. The SBM stipulates a requirement for a 10% uplift in each of the three habitat categories (habitat area units, watercourse units and hedgerow units), and even using the 2017 version of the metric, it should have been apparent that the loss of key aquatic linear habitats should have been mitigated and/or compensated.

Proposed Habitat Creation and Enhancement

8.2.9 As with Catherine Isherwood (in her Hydrology, Hydrogeology and Peat SoC) and John Ingham (in his Landscape and Visual SoC), I have considerable concerns about the likelihood of success of the peatland 'habitat creation' to replace the loss of valley mire or blanket bog that has developed over decades or even centuries. This clearly has implications for the accuracy of the BNG calculations, since the 'post-development' scenario which, alongside the baseline conditions, determines the net change in biodiversity, will not be realistic.

8.2.10 There is no detail in the EcMMP regarding water management in this peatland 'creation', and this is vital for ensuring that the peat remains wet enough to be 'active' (i.e. to generate *Sphagnum*). Furthermore, the 'bunded cells' into which the peat will be placed will be elevated on top of existing habitat, hydrologically disconnecting it.

8.2.11 Peatland takes hundreds of years to develop, so I dispute the claim in the applicant's assessment that new peatland habitat of "*good condition and high distinctiveness*" will be achieved. Indeed, this is supported in the EcMMP by the statement '*Whilst the aim is to restore the peatland communities so that they become active, it is acknowledged that in practice this may not always be possible*'.

8.2.12 The applicant has also not accounted for significant commitments in legal agreements (e.g. Covenants), nor for sufficient duration of ongoing monitoring and management of species and habitats, and potential remediation requirements. Uplift in biodiversity without these cannot be guaranteed.

Errors in the Applicant's Metric Calculations

8.2.13 A key error in the applicant's calculations (based upon Version 1 of the Defra Metric) is that they have subtracted the Habitat Impact Score (HIS) from the Habitat Mitigation Score (HMS) to provide the overall BNG figure - this is fundamentally wrong. The net change in units should be calculated with reference to the baseline habitat score across the whole site (Areas A, B and C combined), not just to the score associated with habitat loss. Therefore, to achieve a 10% net gain post-development (i.e. including all on-site and off-site mitigation and compensation), the baseline habitat score (which takes into account the value of all of the habitat within the site, including the lost, retained and enhanced habitats), should equal 1543.17 (i.e. 1402.88 x 1.1) and not 1402.88 as stated.

8.2.14 The calculation of net change presented in the 2019 Biodiversity Impact Statement is therefore incorrect. The figures should be calculated against the total baseline (1402.88) rather than against the value of only the areas directly affected (i.e. the HIS, 626.86). When calculated correctly, there will be a net loss of 868.28 units before compensation (i.e. 534.6 – 1402.88), and still a net loss of 647.65 units after compensation (i.e. 755.13 – 1402.88). This is clearly a very substantially different result from the claimed net gain.

8.2.15 Furthermore, in both of the applicant's Biodiversity Impact Assessments linear habitats have not been assessed correctly. A total of 8.14km of linear habitats would be lost as part of the proposals, including 1.71km of watercourse draining into a European designated river (the Owenkillew River SAC). Whilst some of the impacts on hedgerow habitat are to be mitigated - through the creation of 1.84km of species-rich hedgerow and the enhancement of 0.42km of currently defunct hedgerow - there is no mitigation or compensation proposed for the loss of stream habitat (including Pollanroe Burn).

8.2.16 I recognise that the inclusion of watercourse features in BNG metrics has developed since the applicant's assessment. However, as the watercourses are so close to the Owenkillew River SAC an Owenreagh ASSI, and the Pollanroe Burn is known to support otters and juvenile salmonids (2021 surveys), and potentially also freshwater pearl mussel, it is a significant failing that no mitigation or compensation has been proposed.

8.2.17 Finally, the existing infrastructure on the site (Area C) was classified as 'buildings and bare ground' in the applicant's baseline assessment. This classification is incorrect, as this area should have been reinstated to more natural habitats. The retained infrastructure is there without the benefit of planning permission, and has therefore been retained on-site unlawfully, since the applicant has a planning condition in place requiring this infrastructure to have been removed and restored to habitat.

8.2.18 So, for the BNG calculation, the baseline for Area C should have been assessed as the restored habitat that should be present (had the planning condition been properly discharged) rather than the buildings and hard-standings that remain at present. This retrospective EIA development, therefore, clearly has an unfair advantage (with regards both to the EIA assessment and the BNG calculations), since the baseline

situation has been understated, meaning that the ecological impacts (EIA) have also been underplayed whilst the net biodiversity change (BNG) has been overstated.

8.2.19 Indeed, there is an additional unfair advantage here; had the existing infrastructure been restored to more valuable habitat (as was legally required) the applicant would also have had to undertake a much more substantial survey and assessment than was actually carried out.

Statutory Biodiversity Metric (SBM)

8.2.20 Given the extensive flaws identified in the applicant's metric calculations (see above), we have prepared two versions of the SBM: the first re-runs the calculations using the same information, allowing a direct comparison between the two metrics; and, the second corrects the errors (giving a full justification for where and how we have changed the assessment), and provides a more accurate representation of the true BNG status of the project. In both cases a very different outcome is achieved compared with that claimed by the Applicant.

8.2.21 Using the same data inputs as for 2019, our results show that instead of a net gain of 128.27 habitat area units, using the most up-to-date calculator would actually indicate a net loss of 336.96 units (-24.58%), even with the 52.73 hectares of compensation within the three Compensation Areas. This calculation corrects the major flaw in the 2017 and 2019 calculations, described in the section above.

8.2.22 It should be noted that this figure does not include the significant loss of 9.25 ha of blanket bog, since this habitat is considered 'irreplaceable' in the SBM and requires its own bespoke compensation proportionate to the significance of the habitat (as detailed above). Furthermore, as noted above and in the evidence of Catherine Isherwood and John Ingham, the habitat restoration that is suggested as part of the DSF (and included in the BNG calculations) is extremely unlikely to work, so should be discounted.

8.2.23 With regard to linear habitats, instead of the net loss of 6.35 'linear units' concluded in the 2019 calculations (which conflated watercourse and hedgerow impacts, but only mitigated the impacts on hedgerows), running the data through the SBM indicates a net loss of 18.68 watercourse units (-39.13%) and a net gain of 8.14 hedgerow units (+49.24%).

8.2.24 Our second re-run of the calculations using the SBM (correcting the errors that were made in order to provide a more realistic calculation of the true BNG position of the project) indicates a net loss of 376.12 units (or -23.39%). For linear habitats, instead of the net loss of 6.35 'linear units' concluded in the 2019 calculations, this amended assessment indicates a net loss of 22.84 watercourse units (-40.90%) and a net gain of 9.37 hedgerow units (+49.24%).

8.2.25 In addition to the flaws in the BNG assessment for the gold mine (as detailed above), there are 7km of underground cabling and 30km of overhead line being installed to provide a power supply for the gold mine. This has not been accounted for in the BNG calculations for the project. This is a very significant omission, leading to a considerable understatement of the BNG impacts of the project as a whole.

9 CONCLUSIONS

9.1.1 There is much inter-relatedness between the various ecological features, impacts and assessments. Therefore, whilst I have attempted to avoid too much repetition in my evidence, this has in parts been unavoidable. However, this has largely served to emphasize the key arguments that I am making with regard to inadequacies of the ecological assessment of the project.

9.1.2 In my evidence I have set out how the inadequacy of the survey and assessment carried out for the EIA and HRA, combined with unrealistic mitigation and compensation proposals, have resulted in an assessment of the ecological implications of the project that is significantly flawed.

9.1.3 It should be noted that for three of the qualifying features of the Owenkillew River SAC (the Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation, the Old sessile oak woods with *Ilex* and *Blechnum,* and the Freshwater Pearl Mussel *population),* this SAC is considered to be one of the best in the United Kingdom. Therefore, ensuring there are no adverse effects due to water quality and other issues is of even greater importance.

9.1.4 Salmon, otter and freshwater pearl mussel are all qualifying features of the SAC. Each of these species has a reliance on the general ecology of the catchment within which they reside, and therefore any impacts within any part of the catchment have the potential to directly or indirectly affect these species.

9.1.5 In the case of salmon, their specific habitat requirements depend upon the life stage being considered and a variety of high-quality habitats are therefore required to ensure successful progression through all stages of the life cycle. Salmon is a species which requires very high-quality natural river water for spawning but also for growth, and this includes access to multiple invertebrate prey species throughout the time they reside in rivers after hatching.

9.1.6 Potential impacts on water quality, therefore, need to consider requirements for salmon specifically but also for the invertebrate prey upon which juvenile stages depend for food. The use of very pure (reverse osmosis) water may ensure that contaminants are not released into the watercourses, but they will also dilute the essential minerals which naturally occur and this could in turn have, at least localised, effects on fish and invertebrates.

9.1.7 The discounting of the Pollanroe Burn (and indeed the Curraghinalt and Attagh burns) as having little ecological importance is deeply flawed and has led to an unreliable assessment. This watercourse has been shown to contain juvenile salmonids and is also likely to contain a variety of other aquatic life which has not been surveyed or assessed. No surveys have been undertaken to confirm the presence or likely absence of freshwater pearl mussel. However, this species depends upon juvenile salmonids to transport glochidia, and thus if these fish are present there is at least potential for freshwater pearl mussel to be present, and surveys should have been undertaken to determine this.

9.1.8 Few experiments have been undertaken with freshwater pearl mussel due to their critically endangered status. Consequently, there is a paucity of information relating to

their tolerance to different pollutants / varying water quality or if exposure to pollutants may hinder reproductive success. A precautionary principle approach should, therefore, be adopted to ensure risks to this species are avoided, such that any meta-populations within the catchment, regardless of how many individual mussels these comprise, are not exposed to any substances or changes to habitat or water quality which has even a small chance of hindering their survival or ability to reproduce.

9.1.9 Otter is a highly mobile species with extensive home ranges often including many kilometres of watercourses and their associated tributaries and riparian habitats. Large areas of the proposed development site have not been surveyed for this qualifying species, and the assessment of the Pollanroe Burn as being of negligible importance for otter was based on surveys which were undertaken under sub-optimal conditions and on the assumption that fish were unlikely to be present.

9.1.10 This latter point has now been proven to be inaccurate; however, even in the absence of prey, such water courses can still be important for commuting. Therefore, the loss of c.975m of the Pollanroe Burn, along with the disturbance effects associated with a major long-term infrastructure project, could therefore have a significant fragmentation effect for the resident otters.

9.1.11 All of the above points lead to the obvious conclusion that both the Environmental Statement and, more importantly, the Habitats Regulations Assessments, have been based upon insufficient evidence, inadequate mitigation proposals and a lack of robust assessment of the likely ecological impacts of the proposals. Rather than the project having no, or limited, significant effect upon key ecological receptors, in my opinion the applicant has certainly not demonstrated 'beyond reasonable scientific doubt' that there will not be a significant effect upon the integrity of the Owenkillew SAC.

9.1.12 In addition to the legislative implications of these failings, it also means that the project is likely to be non-compliant with numerous local, regional and national policies aimed at protecting, restoring and/or enhancing biodiversity.

9.1.13 Finally, on the subject of biodiversity, I have shown the applicant's claim with regards to Biodiversity Net Gain (BNG) to be not just optimistic but highly inaccurate. Rather than the net gain of 128.27 habitat area units claimed, we have calculated (using more accurate and up-to-date version of the Biodiversity Metric) that in fact the project would result in a loss of 376.12 habitat area units (equivalent to a 23.39% net loss) as well as a loss of 22.84 watercourse units (equivalent to a 23.39% net loss).

9.1.14 It should also be noted that this figure does not include the significant loss of 9.25 ha of blanket bog, since this habitat is considered 'irreplaceable' in the SBM and requires its own bespoke compensation proportionate to the significance of the habitat (as detailed above). Furthermore, as noted above, the peatland restoration that is included in the BNG calculations is extremely unlikely to work, so should, in reality, be discounted. These figures also do not take into account the BNG implications of the power lines.

9.1.15 Whilst our assessment used a version of the Metric that was not available at the time of the application, it does allow us to understand more accurately the true implications of the project for biodiversity, and should therefore be a material consideration for the Inquiry.

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11 APPENDIX 1 – DETAILED BNG REPORT

Dalradian Biodiversity Net Gain review

Introduction

In Northern Ireland, Biodiversity Net Gain (BNG) is not mandatory, as it now is in England, but instead is required in accordance with policy. The Wildlife and Natural Environment Act 2011 does, however, include a statutory biodiversity duty for all government departments and public sector bodies (stating that "*it is the duty of every public body in exercising any functions to further the conservation of biodiversity so far as is consistent with the proper exercise of those functions*"). The applicant in this case has referred to net gain.

In addition, 'Valuing Nature: A biodiversity strategy for Northern Ireland to 2020' notes that it is important to "*consider the outcomes of the consultation on Biodiversity Offsetting carried out by Defra and decide on the way forward in Northern Ireland*", whilst the Strategic Planning Policy for Northern Ireland (SPPS) and Planning Policy Statement 2: Natural Heritage Wildlife identify that "*planning policies of this statement….must have regard to any strategy designated for the conservation of biodiversity*".

Finally, Fermanagh and Omagh District Council's Biodiversity Strategy and Action Plan from 2022 – 2027 has three main aims that are relevant here: to protect, enhance and restore biodiversity on Council managed estate; to increase awareness and action for local biodiversity in the District; and to work in partnership with others to deliver biodiversity action in the District.

So there is an obvious direction of travel in policy terms, and it is this that the Applicant was responding to in their consideration of the implications of their proposals on biodiversity. To do this they used a version of the Defra biodiversity metric that was current at the time (2017), and in this document we review how this was done and whether the methods and assumptions were appropriate. We then reassess the biodiversity implications of the proposals using the current version of the metric – the Statutory Biodiversity Metric – to consider how using better-developed methodologies might influence our conclusions.

We recognise that the SBM was clearly not available at the time of the initial application. However, given the considerable ecological value of the habitats that would be affected, the large areas involved, and the importance of succeeding with the mitigation and compensation proposed, it is important to understand as accurately as possible what the true biodiversity implications of the project will be.

Ultimately, our concerns relate to the extent to which the proposals would indeed '*further the conservation of biodiversity*' and whether, when assessed using current standards, there might in fact be a net *loss* associated with construction of the gold mine rather than the net *gain* claimed. This is clearly a material consideration in the decision to grant or refuse planning permission for the project.

Review of Applicant's BNG assessment

The 2017 Environmental Statement includes a document – the Ecological Mitigation and Management Plan (EcMMP) – that undertakes something similar to what would now be considered to be a Biodiversity Net Gain (BNG) assessment.

In this document, the baseline habitats within three areas due to be affected by the proposals (the 143.78ha of the proposed infrastructure site Area A, the 1.81ha of the existing surface infrastructure site Area C, and the 0.40 ha of the 'ventilation raises) are assessed, the loss of habitat from these areas is calculated, and mitigation is also set out in order to determine the net biodiversity situation post-development.

The mitigation comprises habitat creation and enhancement for peatland habitat within seven locations within Area C (the 'Management Units') and a further seven 'Habitat Enhancement (HE) areas (also within Area C) that are primarily proposed to mitigate species impacts (but which are included in the calculations). A further three 'Compensation Areas', totalling 52.73ha, within the proposed mineral extraction area (Area B), are also included in the calculations, with habitat enhancement here designed to achieve a net overall gain for biodiversity.

The calculations are carried out using a version of the Defra biodiversity metric dating from 2012[1]. Whilst this was a relevant methodology to use in the 2017 assessment, clearly BNG has moved on considerably since 2012, so the 'Biodiversity Impact Statement' included in the EcMMP is not to the standard that would be expected today.

However, notwithstanding how biodiversity assessment has improved in the intervening years, there are still a number of significant flaws in the assessment submitted with the application, and these are set out below. Furthermore, in order to provide a more realistic assessment of the actual biodiversity impacts of the project, we have also input the same baseline, habitat loss and habitat creation and enhancement data into the current metric (the Statutory Biodiversity Metric), in order to provide a better understanding of the true BNG status of the project.

Affected habitats

First of all, it is important to note that the area that would be affected by the proposals comprises a large area of valuable habitat (albeit that areas have been degraded over time through peat cutting, drainage and overgrazing). The peat on the crest of the site supports a complex mosaic of blanket bog, wet heath, marshy grassland and acid grasslands, whilst below the areas of peatland, there is a patchwork of fields bounded by earthbanks and hedgerows. The lower fields predominantly comprise improved and semi-improved grasslands, but pockets of peat remain which support a mosaic of mire and wet heath habitats.

The ridge also, significantly, forms a watershed for a number of small burns that flow into the Owenkillew and Owenreagh Rivers, the former of which is a European designated site. The loss of almost 2km of this burn habitat (including 975m of Pollanroe burn) is barely considered in the assessment, and this will be discussed further below.

It should not therefore be underestimated how important the baseline habitats are, and Table 2-1 in the EcMMP includes a long list of affected habitats, several of which are of some conservation importance (i.e. county or high local importance) even though the EcIA only recognised 'peatland habitats' as an important ecological feature (along with a number of species). As an example, blanket bog is of such importance that it is treated as an 'irreplaceable habitat' within the current Statutory Biodiversity Metric (SBM), and any loss requires bespoke mitigation. The replacement ratio of 2:1 for peat habitat (as used here) is

certainly much lower than would normally be expected now when compensating for the loss of such habitat.

Table 2-1 also sets out the areas of habitat due to be lost, and this includes very significant areas of some key habitat types, including 7.94 ha of valley mire, 10.61 ha of marshy grassland, 9.05 ha of modified/blanket bog and nearly 2km of running water. Table 2-3 relates these habitats to EU Habitats Directive Annex I Habitats and Northern Ireland Priority Habitats, indicating the predicted loss of 1.57 ha Northern Atlantic Wet Heath/Lowland Heathland, 9.05 ha of Blanket Bog, 5.25 ha of Purple Moor-grass and Rush Pastures and 3.49 ha Upland Flushes, Fens and Swamps. In contrast, Section 3.1 of the EcMMP states that '*the gold mine development is predicted to result in the direct and indirect loss of 9.05 ha of bog communities, 7.94 ha of fen valley mire communities, 2.62 ha of wet heath / acid grassland communities and 6.20 ha of marsh / marshy grassland communities*'.

So there is a degree of inconsistency around the exact area of each habitat to be lost, and how that habitat should be classified (which we attempt to address through our re-running of the calculations using the SBM). However, what is clear is that these are large areas of important, sensitive and difficult to recreate habitats, such that it is surprising that a net gain is predicted as a result of the EcMMP proposals, even with relatively large areas of creation and enhancement.

Whilst there is mitigation and compensation proposed for most of the bog and peat habitats (see below) as well as for the impacts on various species (through the Habitat Enhancement areas), and the landscaping proposals will also offset much of the impact on woodland and grassland habitat, it is surprising that no mitigation is proposed for the loss of watercourse habitat. The current Metric, which stipulates a requirement for a 10% uplift in each of the three habitat categories (habitat area units, watercourse units and hedgerow units) would not allow this. However, even back in 2017 it should have been apparent that the loss of key aquatic linear habitats should have been mitigated.

Proposed habitat creation and enhancement

As noted above, the 'Habitat mitigation, enhancement and compensation measures' section of the EcMMP (i.e. Part 1) identifies seven Management Units (MUs) within the proposed infrastructure site Area A (Figure 3.2) and three Compensation Areas (CAs) within Area B (Figure 3.3). A variety of habitat creation and enhancement measures are set out for the MUs whilst the focus of the CAs is enhancement. In the metric calculations (Appendix 02 of the EcMMP), therefore, the MUs appear in both the 'enhancement' and 'creation' parts of the metric whilst the CAs are only included under enhancement.

Sections 3.4 and 3.5 of the EcMMP set out the proposed approach to the creation and/or restoration of peatland habitat in the seven Management Units and three Compensation Areas**.** The proposed interventions include: the creation of peatland habitat on historically cut/modified bog or improved grassland through the re-use of peat stripped from the development site; blocking drains to re-wet the peat; the removal of conifer trees; scrub control; and reducing grazing pressure. [It should be noted at this point that two of the three MUs where habitat creation was proposed were removed from the scheme when the Peat Management Plan was updated, such that only the 1.43 ha of creation in MU2 remains.]

Whilst the majority of the enhancement measures would seem appropriate, we have particular concerns about the likelihood of the peatland 'habitat creation' succeeding. We

believe that it is unsound to suggest that valuable peatland habitat – to replace the loss of valley mire or blanket bog that has developed over decades or even centuries – can be effectively created in this way. Whilst some detail is provided regarding how 'peat overburden arising during the construction works' will be used to create new peatland habitat on top of degraded areas, the information provided in the EcMMP is insufficiently detailed to understand how the creation would work.

It is not clear, for example, what water management is proposed, and this will be key for ensuring that the peat remains wet enough to be 'active' (i.e. to generate *Sphagnum*). We are also concerned that the 'bunded cells' into which the peat will be placed will essentially be elevated (since they will be created on top of the existing habitat) and thus raised above the neighbouring peatland and thus hydrologically disconnected. It is also not clear what will happen to the habitat onto which the peat is being placed, other than any areas of rushes being stripped. Understanding the importance of the habitat being affected, and also its influence upon the peat being placed there, will be important.

Therefore the claim in the metric calculation that peatland habitat of 'good' condition and high distinctiveness will be achieved seems very optimistic. Not only is it unlikely that it will be possible to achieve this level of condition, but also the habitat created cannot realistically be claimed as a proper peatland habitat. These habitats take hundreds of years develop, and cannot be recreated simply by piling up excavated peat.

We note that the document accepts that 'Whilst the aim is to restore the peatland communities so that they become active, it is acknowledged that in practice this may not always be possible'. We believe that it is right to be wary of the likelihood of success, especially given the complexity and sensitivity of the habitats to be created.

Another key concern is that the duration of the proposed interventions is clearly inadequate. In BNG, habitat creation and/or enhancement measures are secured, managed and monitored for a minimum of 30 years in order to deliver the uplift in biodiversity required. Conservation covenants (i.e. legal land agreements) are then used as a mechanism for ensuring that delivery is successful, with enforcement possible where targets (i.e. expected increases in habitat condition) have not been met.

Without a similar commitment the uplift in biodiversity that is being claimed is invalid. The EcMMP requires, for example, the imposition of 'a cessation of grazing … for a period of up to five years', after which the area could readily be overgrazed again. This will hardly be guaranteeing that the habitat that has been restored through the removal of grazing pressure will remain in good condition. Perhaps more importantly, there is also no indication of long-term secured management of the peatland creation areas. This will be key if these areas are to deliver the habitat being committed to, since the complexity of the creation will need adaptive management over a long period to ensure success.

Similarly, whilst monitoring is proposed, there is no mention of the implementation of remedial measures in those circumstances where the monitoring demonstrates a lack of success, and also no means of enforcing the delivery of these measures. Without this, there is no means of guaranteeing that the required uplift will be delivered.

This uncertainty regarding the success of implementation is addressed in the Statutory Biodiversity Metric (SBM) by the negative multipliers of 'difficulty' (a measure which represents the uncertainty in the effectiveness of management techniques used to enhance

or create habitat) and 'Time to target condition' (the average time taken between starting creation or enhancement of habitats and that habitat reaching its target condition or distinctiveness). Although the Metric used in the 2017 and 2019 calculations does take into account 'difficulty of creation' and 'difficulty of restoration', the way in which these multipliers are used in the calculations in the SBM are more refined and evidence-based, and will likely have a more significant impact upon the final scores.

As an additional point, it should also be noted that detailed baseline mapping of the compensation areas has not been carried out; instead the assessment was informed simply by a walkover survey. This would need to be rectified if an accurate BNG calculation is to be provided.

Biodiversity Impact Statement and the Metric calculation

Taking the above habitat creation and enhancement measures into account, alongside the quantified loss of habitat, the Biodiversity Impact Statement (Section 4 of the 2017 EcMMP) used a biodiversity metric that was current at the time (the 2012 Defra metric) and calculated what the residual biodiversity impact would be.

First of all, the metric calculated the baseline biodiversity value of the habitats within the proposed infrastructure site (Area A), the existing surface infrastructure site (Area C) and the site of the proposed ventilation raises (in Area B). It then took into account the loss of habitat within Areas A, B and C, alongside the proposed creation and enhancement measures within the seven Management Units located in Area A, and calculated that there would be a net loss of 131.76 habitat area units *without* compensation, but a net gain of 88.77 *with* the compensation (i.e. including the enhancement of the 52.73 ha of degraded blanket bog within the three Compensation Areas).

The metric also assessed the impacts upon linear habitats, suggesting a net loss of 6.35 units both before and after compensation (since no improvements to linear features are proposed at the Compensation Areas). [It should be noted that aquatic and terrestrial linear features (primarily watercourses and hedgerows, respectively) were considered together, our concerns with this are addressed below].

In 2019, these calculations were updated in an addendum submitted as part of a Further Environmental Information (FEI) submission. The main difference for this submission was that two of the Management Units (MU4 and MU5) were no longer required, owing to reductions in the land take. This meant that the amount of habitat loss was reduced, as was the amount of habitat creation and enhancement needed.

This document therefore slightly amended the areas of habitat to be affected, such that net loss *without* compensation decreased from 131.76 habitat area units to 92.26, whilst the net gain *with* the compensation increased from 88.77 to 128.27 units. The linear unit calculations remained unchanged. So it is the updated data upon which these calculations were based (Appendix 01 of the 2019 FEI Addendum to the EcIA and EcMMP) that we have used in our re-running of the calculations using the Statutory Biodiversity Metric (SBM), see below.

A key error in the calculation of gains and losses is that the Applicant has subtracted the Habitat Impact Score from the Habitat Mitigation Score to provide the overall BNG figure, such that a gain is achieved simply by the HMS exceeding the HIS. This is fundamentally wrong. The net change in units should be calculated with reference to the baseline

biodiversity score across the whole site (Areas A, B and C combined), not just to the score associated with habitat loss. In other words, since the baseline habitat score (which takes into account the value of all of the habitat within the site, including the lost, retained and enhanced habitat) equals 1402.88, in order to achieve a 10% net gain the post-development scenario (i.e. including all on-site and off-site mitigation and compensation) should equal 1543.17 (i.e. 1402.88 x 1.1).

Therefore, the calculation of net change presented in the 2019 Biodiversity Impact Statement - which predicts a loss of 77.38 area units before compensation (i.e. without CA1-CA3 included)), and a gain of 128.27 units after compensation – is wrong. Instead, these figures should be calculated against the total baseline (1402.88) rather than against value only of the areas directly affected (i.e. the Habitat Impact Score, 626.86). When calculated this way, there will be a net loss of 868.28 units before compensation (i.e. 534.6 – 1402.88), and still a net loss of 647.65 units after compensation (i.e. 755.13 – 1402.88). This is clearly a substantially different result.

Another fundamental issue with the Biodiversity Impact Statements submitted by the Applicant (both in 2017 and 2019) is the way in which linear habitats are addressed. A total of 8.14km of linear habitats would be lost as part of the proposals, including 1.71km of watercourse draining directly into a European designated river (the Owenkillew SAC). Whilst some of the impacts on hedgerow habitat are to be mitigated, through the creation of 1.84km of species-rich hedgerow and the enhancement of 0.42km of currently defunct hedgerow, there is no mitigation or compensation proposed for the loss of stream habitat.

Although it is true that the inclusion of watercourse features in BNG metrics has developed significantly in recent years, the fact that these watercourses are so close to a SAC river, and are therefore likely to be of considerable nature conservation value (potentially containing spawning habitat for salmonids), makes it very surprising that no mitigation has been proposed.

Finally, it is also important to note that the calculations used within the Biodiversity Impact Statement counted the existing infrastructure on the site (Area C) as 'buildings and bare ground' in the baseline assessment. This infrastructure (including roads, stockpiles, bare ground, water treatment systems, areas of gravel, etc.) was put in place a few years ago as part of an exploration phase to assess the potential for the mine. However, it was a requirement of the consent that it should all be removed and the site restored at the end of that period.

Therefore, whilst 'buildings and bare ground' are clearly what is currently present, all of this is there without the benefit of planning permission. It has thus been retained on-site illegally, as the Applicant has a planning condition in place requiring this infrastructure to have been removed and restored to habitat. So for the BNG calculation, the baseline for Area C should have been assessed as the restored habitat that *should* be present (had the condition been properly discharged) rather than the buildings and hard-standings that *are* present.

Statutory Biodiversity Metric (SBM)

In order to determine the accuracy and appropriateness of the above calculations, and to challenge the assertion that there will be a significant net gain for biodiversity, we have carried out the following:

- An investigation into the data underpinning the metric calculations – the nature of the habitats, the condition assessment, etc.;
- An assessment of the pitfalls of the metric used (i.e. where there are limitations and whether or not these are addressed anywhere in the reporting);
- A consideration of the distinctiveness values used, whether they vary from the Statutory Biodiversity Metric (given that the SBM is England-specific) and if this is appropriate in an Irish context;
- An assessment of the potential requirement for re-classification of the value or condition of any created or enhanced habitats given what has been described in the proposals; and finally
- A re-run of the biodiversity calculations using the Statutory Biodiversity Metric.

Having carried out this work, we would summarise the errors within the 2017 and 2019 biodiversity calculations (further to the key issues described in the previous section) as follows (please note that a detailed list of our concerns is presented in Appendix 1):

- The wrong method for calculating the Habitat Impact Score (HIS) has led to a considerable understatement of the biodiversity implications of the project (as noted in the previous section);
- Errors and inconsistencies in the allocation of condition to habitats has affected the accuracy of the calculations;
- Errors, omissions and inconsistencies in the areas of different habitats to be affected (both positively and negatively) has affected the accuracy of the calculations, mostly leading to overestimates of the biodiversity benefits of the proposals;
- The way the enhancement section of the spreadsheet has been completed is wrong, leading to an overinflation of the Habitat Mitigation Score (HMS – i.e. the beneficial components of the project);
- Re-assessing the calculations (using the old Metric table but with the correct inputs, and assuming a baseline habitat area units score of 1388), demonstrates that achieving a 10% net gain for the project would require a further 383.61 habitat area units to be provided (i.e. in addition to the three Compensation Areas already secured). This rises to 399.98 if the alternative baseline figure of 1402.88 (see Appendix 1 for details) is used.
- As noted in the section above, hedgerows and watercourses are grouped together as 'linear habitats', with enhancement and creation measures only proposed for the hedgerow component. This serves to obscure the significant omission of any measures to offset the loss of important watercourse habitat. In more recent versions of the Metric, watercourse and hedgerow units are considered separately, along with habitat area units.

Given the wide-ranging flaws identified in the earlier metric calculations, we have prepared two versions of the Statutory Biodiversity Metric (SBM): the first re-runs the calculations using the same information, and thus allows a direct comparison between the two metrics (demonstrating how significantly the biodiversity impacts of the proposals have been understated in the 'old' format; see Appendix 2 and the separate SBM spreadsheet document in Excel (BNG Assessment 1); the second corrects the errors (giving a full justification for where and how we have changed the assessment), and thus provides a more accurate representation of the true BNG status of the project (see Appendix 3 and the separate SBM spreadsheet document in Excel (BNG Assessment 2). In both cases a very different outcome is achieved compared to that claimed by the Applicant.

SBM – using 2019 data

The full details of the SBM calculations are presented in the excel spreadsheet appended to this evidence (BNG Assessment 1), with an explanation of the differences and the considerations provided in Appendix 2.

In summary, our BNG assessment of the proposals (using the same data inputs as for 2019) indicates that instead of a net *gain* of 128.27 habitat area units, using the most up-to-date calculator would actually indicate a **net loss of 336.96 units** (or 24.58%), even with the 52.73 hectares of compensation within the three Compensation Areas.

This calculation corrects the major flaw in the 2017 and 2019 calculations, described in the section above,

It should also be emphasized that this is in the absence of the significant losses that would be associated with the loss of 9.25 ha of blanket bog, since this habitat is considered 'irreplaceable' in the SBM and requires its own bespoke compensation proportionate to the significance of the habitat. This would likely be replacement at a considerably higher multiplier than the 2:1 ratio (i.e. 2 ha of replacement habitat for every 1 ha lost) proposed for peatland habitats in the Applicant's assessments.

With regard to linear habitats, instead of the net loss of 6.35 'linear units' concluded in the 2019 calculations (which conflated watercourse and hedgerow impacts but only mitigated the impacts on hedgerows), running the data through the SBM indicates a **net loss of 18.68 watercourse units** (-39.13%) and a **net gain of 8.14 hedgerow units** (+49.24%).

SBM – using more appropriate data

The aim of this assessment was to amend the data input to the SBM to be more 'accurate' (based upon our review and assessment – see Appendix 1), correcting the errors that were made in order to provide a more realistic calculation of the true BNG position of the project.

As with the above assessment, the full details of the SBM calculations are presented in the excel spreadsheet appended to this evidence (BNG Assessment 2), with an explanation of the differences and the considerations provided in Appendix 3.

When using what we would consider to be more appropriate data inputs (as set out in Appendix 3), our second (more accurate and appropriate) re-run of the calculations using the SBM indicates a **net loss of 376.12 units** (or 23.39%).

With regard to linear habitats, instead of the net loss of 6.35 'linear units' concluded in the 2019 calculations, running the data through the SBM indicates a **net loss of 22.84 watercourse units** (-40.90%) and a **net gain of 9.37 hedgerow units** (+49.24%).

Notwithstanding the caveats associated with using a Metric that was not available at the time of Application (nor indeed for the update set out in the 2019 FEI addendum), the fact that the SBM was designed for use in England, and the difficulty in deriving an accurate figure without being able to calculate habitat areas ourselves in GIS, this is clearly a very different interpretation of the biodiversity implications of the proposals, but one that is much more appropriate.

It should also be emphasized that even these results significantly over-state the biodiversity performance of the project, since, as highlighted in Appendix 2 and 3, they do not account for the fact that the loss of 9.25 ha of blanket bog would actually require significant bespoke compensation. The requirements for this would likely entail creating and/or enhancing several times the area of this habitat that is due to be lost, and certainly considerably more than the 2:1 ratio described in the Applicant's proposals.

Power Line BNG

In addition to the flaws in the BNG assessment for the gold mine site as set out above, it would also seem that 7 km of underground cabling and 30 km of overhead line is being installed purely to provide a power supply for the gold mine, and that this has not been accounted for in the BNG calculations for the project. If this is correct, it is another very significant omission, leading to a considerable understatement of the BNG impacts of the project as a whole.

All that we have seen is the Ecological Appraisal and Ecological Impact Assessment (EcIA) for the power line. No BNG assessment or Biodiversity Impact Statement appears to have been produced.

As far as considering the biodiversity impacts of this component of the project are concerned, the mitigation table in the Ecological Appraisal simply says this for each habitat to be affected: '*The final power connection route will be carefully selected and in agreement with NIE Networks ecologist, following any future ecological surveys, to avoid the most sensitive areas of habitat. Site specific mitigation measures and working method statements will be developed where works are proposed, or access required through areas of [xx habitat] of high ecological value following any future ecological surveys and assessment to inform the consenting process for the power connection.*'

With regards to the EcIA, Section 8 of the document identifies the construction footprint within NI Priority Habitats as follows: 293m^2 of blanket bog, fens, flushes and swamps; 42m^2 of upland heath; and 0.84m^2 of wet woodland. These appear to be extremely small areas, given the length of the scheme and that 7km of undergrounding will take place. Also there is no indication of the loss of other habitats (which would also normally be taken into account in a BNG assessment), even though Section 4.3 of the document states that a total of seven priority habitats will be directly affected by the proposals, including (in addition to the above three) purple moor-grass & rush pasture, hedgerows and rivers & streams.

Notwithstanding how accurate and complete the above figures may or may not be, there seems to have been no biodiversity net gain calculation carried out. If this is as much as has been presented to the planning authority, this is clearly wholly inadequate, especially given the wide variety of important habitats present along the proposed route of the power line.

Conclusion

In conclusion, whilst the Applicant has applied a mitigation and compensation approach that essentially considers the net effect on biodiversity, we believe that they have very significantly overstated the situation by claiming a net gain.

Our recalculation of the BNG for the scheme - on the basis of similar habitat data to that used by the Applicant, but with justified changes - has demonstrated very different results to those presented in 2017 and 2019.

Furthermore, the apparent lack of a BNG assessment for the power line (as well as the issue around the wrongful use of the existing features at the Area C site rather than the habitats that should have been restored) would suggest that the adverse biodiversity effects of the scheme are even more significant.

Whilst it was clearly appropriate to use a metric that was current at the time of the initial application, the considerable progress in biodiversity assessment over the intervening years means that it is entirely appropriate to re-assess the BNG calculations, as we have done, as this provides a much more realistic assessment of the true biodiversity position for the project.

Although it is a positive move that the Applicant has managed to secure the compensation areas, and that 52.73 hectares is not an insignificant area, when compared with the scale of the impact (and specifically the considerable amount of high quality habitat being lost) it is wholly insufficient. In order to deliver an actual net gain for the project, much more thought will need to be given to delivering more extensive and meaningful restoration and enhancement, especially of peatland habitats, and at a landscape scale.

The quantum of restoration required to offset the impacts is significantly greater than the ratio of 2:1 currently being delivered by the proposals, especially given the difficulty with creating valuable bog habitat.

The whole ridge is essentially one connected blanket bog, and the opportunity exists to deliver an actual net gain for biodiversity (based upon the SBM calculations rather than inadequate and wrongly calculated figures presented in the Biodiversity Impact Statements) through landscape-scale habitat intervention. Engaging with the local authority would allow for a meaningful contribution to national and local targets (specifically Nature Recovery Aspirations for Northern Ireland) to be achieved.

Without considerable increases in the amount of compensation - especially with regard to peatland habitats – the proposed gold mine would have a significant adverse effect on biodiversity, in stark contrast to the 'net gain' claimed by the Applicant.

BNG Appendix 1 – Detailed review of the Biodiversity Metric calculations used in Applicant's Biodiversity Impact Statement

- The condition of the Woodland: Mixed plantation is given as 'Poor' but has scored '2' (which is the score assigned to Moderate condition). Which is correct?
- Area of habitat to be retained, enhanced and lost does not equal the total area for the main development site, but it does for the entire assessment (1.24 ha discrepancy):
    - The 2019 calculator omits 1.24 ha of marshy grassland in Columns C, E and G which it includes in the Habitat Area for this habitat (which totals 36.06) - This 1.24 ha of habitat would have a value of 14.88 using the distinctiveness and condition in the calculator.

- Table 1 of the FEI addendum uses 1402.88 as the Habitat Biodiversity Value which accounts for the omitted 1.24 ha of marshy grassland; however, this should also be captured within the calculations.

- The Habitat Impact Score (HIS) in the table clearly states that this should be calculated as the 'Site Habitat Biodiversity Value (Column J)' + Value of indirect impacts (Column M) (HIS = J+M). However, no indirect impacts have been identified, therefore the HIS should match the 'Site Habitat Biodiversity Value (J)':
  - This therefore should at least be 1388 (or 1402.88 as displayed in Table 1).
  - Instead, the assessor has used the total existing value of 'Habitats to be lost within the development' (Column H) which is 611.98 in the calculator.
  - This means that any following assessment, particularly the overall 'Habitat Biodiversity Impact Score', will be incorrect, as the approach does not align to the methodology of the calculator used and does not therefore represent the actual value of the baseline.
  - The 611.98 value is further contradicted by Table 1, which puts the Impact Score at 626.86. This presumably assumes that the 1.24 ha of marshy grassland unaccounted for is lost (611.98 + 14.88 (the value of 1.24 ha of marshy grassland) = 626.86).
- The area of post development habitats (creation + enhancement) does not equate to the area of habitat lost or enhanced in the baseline.
- The area of habitat enhanced in the baseline (47.68 ha) does not match the area of habitat enhanced in the post development calculations (53.41):
  - This means that 5.73 ha of enhancement identified in the post development sheet is not identified in the baseline.
  - The additional enhancement is 3.96 ha of acid grassland restoration to wet heath/acid grassland mosaic, plus 1.77 ha of fen and mire enhancement (which includes 0.78 ha of marshy grassland restoration to sphagnum bog).
  - By adding these areas into the enhancement section, and not counting them in the baseline, may inflate the value used in the post development calculations for this area.
- The areas of habitat loss in the baseline (67.09 ha) does not equal the area of habitat created in the post development table (16.96 ha). It is assumed that the 50.13 ha unaccounted for is built environment, but clarification should be given.
- The % net gain value is based upon the area of habitats lost and NOT the total site habitat biodiversity value (as discussed above); however, the Applicant has claimed the baseline value + the enhancement value of the enhancement areas in the post development calculations:
  - Enhancement value claimed should only be what is additional uplift from the baseline value.
  - The 2019 calculator tries to account for this in Column S (which advises the assessor to input the existing value of habitats to be enhanced (from Column F).
  - The formula then subtracts Column S from the value generated by the Area x Distinctiveness x Condition calculation for proposed habitats to remove the baseline value, before adding the multipliers - ((NxOxP)-S)/Q/R.
  - This has not been done, and it is difficult to understand where the values in Column S (which are all values from 1-3) have been derived from.
  - The use of the 1-3 values in Column S therefore does not subtract the actual baseline value of these areas of proposed enhancement to assess the actual uplift, only subtracting a small amount, meaning these values are overinflated.
  - This would reduce the value of the Habitat Mitigation Score (HMS – i.e. the beneficial components of the project) from 534.6 to a maximum of 293.78. [N.B. this is still slightly overinflated as the existing baseline value of the additional 5.73

ha (discussed above) is hard to calculate without knowing what the specific baseline of these areas are].

- The result of the Habitat Biodiversity Impact Score is -77.38 in the 2019 calculator, in the absence of enhancement in CA1-3.
- The use of different Figures in Table 1 suggest that this loss should instead be -92.26, when using 626.86 as the impact score:
    - The formula used in the calculator to get this figure is noted as the Habitat Mitigation Score – Habitat Impact Score (HMS – HIS). As mentioned above, the assessor has wrongly used the inflated value of enhancement and the value of created habitats to derive the HMS, and the value of habitats lost to derive the HIS.
    - Looking at the calculator formula, the HMS should either be 1388 (using the value in the calculator) or 1402.88 (using the value in Table 1), and the HIS should be 293.78 (assuming the approach above).
    - This would make the Habitat Biodiversity Impact Score:
        - -1094.22 when assuming a baseline value of 1388 (this is a 78.83% net loss in value).
        - -1109.1 when assuming a baseline value of 1402.88 (this is a 79.1% net loss in value).
- However, the formula set out in the calculator, and therefore this result, is inherently flawed as it does not account for the baseline value of the retained habitats nor for the baseline value of the enhanced habitats (before enhancement) in the Impact Score, which should be used in the final post development value:
    - Using the 1388 calculator baseline, and accounting for the habitats mentioned above (which amount to a value of 231.96 for retained habitats and 544.16 for the baseline of the habitats to be enhanced) would make the Habitat Biodiversity Impact Score equal -318.1. This is a 22.9% net loss.
    - Using the Table 1 figure of 1402.88 instead would make the Habitat Biodiversity Impact Score -332.98. This is a 23.74% net loss.
- Considering then the value of uplift that would be required to achieve 10% biodiversity net gain for the project:
    - If using the calculator scenario that values the Site Habitat Biodiversity Value as 1388:
        - This would need a post development value of 1526.8 units to achieve an overall 10% BNG (including retained, enhanced and created habitats);
        - With a net loss in value of 318.1 (as calculated above), this would mean that there is a 456.9 unit deficit to achieve 10%.
    - If using the Table 1 scenario, which values the Site Habitat Biodiversity Value as 1402.88:
        - This would need a post development value of 1543.17 units to achieve an overall 10% BNG (including retained, enhanced and created habitats)
        - With a net loss in value of 332.98 (as calculated above), this would mean that there is a 473.29 unit deficit to achieve 10%
- These figures are before the accounting of the offsite areas (CA1 - CA3).
- The calculations for offsite habitat enhancement in CA1 - CA3 are for some reason not included in the 2019 Addendum calculator. Table 2 suggests that these areas generate an additional value of 220.53 (755.13 - 534.6). This aligns with the figures provided in the 2017 calculator (138.6 habitat biodiversity value for CA1 + 62.05 for CA2 + 19.89 for CA3):
    - However, similar to other areas of enhancement described above, these figures assess the value of these enhanced areas without accounting for the value of the existing baseline. As such, the 220.53 value is not appropriate, meaning that it is overinflated.

- The baseline value of the 'Wetland: Sphagnum bog' areas in CA1-CA3 is not provided; however, assuming that it is consistent with similar habitat in the proposed infrastructure site (i.e. of High Distinctiveness and in Moderate Condition), the baseline value of the 52.73 ha of offsite habitat would be 632.76.
- When entering the baseline values into Column S on the 2017 calculator, this estimates the ACTUAL total uplift from offsite enhancement as 73.29 (rather than 220.53).
    - 52.73 ha x 6 (high distinctiveness) x 2 (moderate condition) = 949.14; 949.14-636.76 (offsite baseline) = 316.38; 316.38/time multiplier/ difficulty multiplier = 73.89.

- Adding this correct level of enhancement from the compensation areas to the net loss scenarios above (which left out CA1 – CA3) results in the following:
    - Calculator scenario baseline of 1388:
        - The overall net loss in Habitat Biodiversity Value reduces to 244.81. This is a 17.63% net loss, with a 383.61 unit uplift (offsite) needed to achieve 10% gain.
    - Table 1 scenario baseline of 1402.88:
        - The overall net loss in Habitat Biodiversity Value reduces to 259.69. This is an 18.51% net loss, with a 399.98 unit uplift (offsite) needed to achieve 10% gain.
- Finally, it is noted that in the 2019 Addendum, hedgerows were classified as 'high distinctiveness' habitats. Had this been applied to the other habitats that would have merited this assessment (valley mire, blanket bog, etc.) then the above performance would have been even worse.
- This review has been undertaken using the following assumptions/approach:
    - The review uses the suggested formula in the 2019 calculator to explore what the suggested result should be when using the data and formula set out in the 2019 calculator.
    - The document used for reference is Further Environmental Information – Addendum to Ecological Impact Assessment and Ecological Mitigation and Management Plan (SLR Ref: SLR Ref: 501.00241.00006).
    - The values for the offsite enhancement areas were taken from Appendix 01 - Quadrat Data for the Compensation Areas.
    - The baseline and proposed habitat distinctiveness and condition values used reflects those in the 2019 assessment, and the 2017 assessment for offsite areas. This was to explore the methodology used in this assessment, and is not an agreement that the values used are appropriate.
    - The 'time till target condition' and 'difficulty of creation' multiplier values reflect those used in the 2019 and 2017assessment. The appropriateness of these values is not reviewed here, particularly for the enhancement and creation of peatland habitats.

BNG Appendix 2 – Updated biodiversity assessment of the 2019 data using the Statutory Biodiversity Metric (SBM)

The aim of this Appendix (and the appended Metric excel spreadsheet; BNG Assessment 1) is to apply the same data that were used in the 2017/2019 assessment to the Statutory Biodiversity Metric (SBM) in order to provide as pure a comparison as possible between the two methodologies, thus demonstrating how the calculation of BNG has moved on over time.
However, where clear errors have been made in the previous interpretation of the data that would lead to incorrect application of the SBM – such as those regarding the distinctiveness of Annex 1 habitats – these have been corrected (as explained below).

Assumptions and caveats

- The Phase 1 habitat data from the Environmental Statement has been translated into the UK Habitat Classification (UK Hab) habitats required for the SBM by using the translation tool in the SBM along with the Phase 1 and ES reports. The original Phase 1 classification and description of the habitats are provided in the 'user comment' column of the SBM excel spreadsheet (appended to this submission; BNG Assessment 1) to be clear what habitat is being assessed.
- The areas of the baseline habitats have been copied over from the 2019 assessment and, as with the earlier assessment, come to a total 140.44 ha.
- Distinctiveness:
    - Distinctiveness is built into the SBM, and for this reason the distinctiveness level for some habitats vary from the 2019 assessment (where the latter were incorrect or outdated).
    - For example, the 2019 assessment does not consider assigning distinctiveness above 'High', nor does it address how to accurately assess irreplaceable habitats. Both of these are key features of the SBM, so are taken into account in this assessment.
    - Defra Metric version 1 was apparently used to inform the 2017/2019 assessment. The technical paper guidance (2012) states '*Some very valuable habitats are either very rare, difficult/impossible to recreate, or both. Whilst development on these habitats would be unlikely, if a local planning authority did decide that a development should go ahead on this type of habitat, any compensation would have to be bespoke, and managed on a case-by-case basis. It would be for the local planning authority to decide if the offsetting mechanism could be used*'. This guidance has not been applied to the 2017/2019 assessments.
    - The blanket bog and valley mire on site are described in the documentation as Annex 1 quality, i.e. of international importance. Such habitats are considered of very high distinctiveness in the SBM, which is considered more appropriate than the 'high' distinctiveness allocated to them in the 2019 assessment.
    - The rush-pasture is also considered of very high distinctiveness in the SBM, as it is considered a priority habitat that is highly threatened, internationally scarce and requires conservation action. The documentation notes that this habitat on site meets the priority habitat criteria for rush pasture in Northern Ireland, so the classification of this habitat as being of 'very high distinctiveness' in the SBM is considered appropriate.
    - Further to this, blanket bog is considered an irreplaceable habitat in the SBM, which is reflected in Appendix 2 of the Metric version 1 technical note, which puts the timescale to restoring peatland at 1000 - 5000 years.
    - Even though the SBM distinctiveness values are England-specific, the distinctiveness values provided are considered appropriate in a Northern Ireland context given the international importance of peatland habitats and the priority status of rush-pasture.
- In absence of detailed condition assessment information for non-bog habitats, we have kept the condition of each habitat the same as it was in the 2019 assessment.
- Strategic significance was not included in the 2017/2019 assessments, even though it is explained in the metric Version 1 technical paper (2012). In this assessment using the SBM, we have assigned each line with low strategic significance to keep it as close to the 2019 assessment as possible. There are certainly habitats on site which would be considered to be of high strategic significance; however, the effect of using this function is explored in the next steps (see Appendix 3, below).

- It is unknown, on the basis of the habitat documentation available, whether or not any individual standalone trees were present (since these are also a feature of the SBM). For the purposes of this review, it is assumed that these habitats are absent.
- Habitats within the 'Existing Infrastructure Site' have been kept consistent with those in the 2019 assessment; however, some of these are considered inappropriate due to proposed habitat creation which should have occurred in this area. Adjusting habitats in this area to reflect what should be there will not significantly impact the net change results either way.
- The feasibility of the proposals (in particular the likely success of the proposals to 'create' peatland habitat) are not considered at this stage. This is instead addressed Appendix 3, below.

Results: habitat area units

- The total number of baseline habitat units using the SBM is 1496.22.
- N.B. The baseline value of the 9.05 ha of blanket bog lost in the proposed infrastructure site, as well as the 0.2 ha lost in the ventilation raises (i.e. a total of 9.25 ha), are not included in this total. This is because blanket bog is an irreplaceable habitat and the SBM considers any loss unacceptable, meaning it will not provide a baseline value for these areas. The SBM guidance states that irreplaceable habitats require consideration *outside* of biodiversity net gain, and that bespoke compensation, proportionate to the significance of the habitat, must be agreed to address losses and deterioration of irreplaceable habitats. Therefore, the lost blanket bog has been taken out of the rest of the assessment.
- However, the proposed blanket bog to be enhanced *is* included in the calculations, as this is allowed in the SBM, and is treated separately to the blanket bog lost to development.
- Otherwise, the area of habitat retained, enhanced and lost is consistent to the figures in the 2019 assessment.
- There are 562.88 habitat units lost by the development (outside of the loss of blanket bog, which cannot be included within the calculation, as noted above)
- There are 1114.74 habitat units delivered post intervention (239.42 units retained + 766.36 habitat units from enhanced habitats (baseline and uplift) + 108.96 habitat units from created habitats).
- There was 5.73 ha of proposed enhancement identified in the post development calculation in the 2019 calculator which was not identified in the 2019 baseline calculations. These proposals have been captured within the Habitat Creation tab in the SBM version of the calculations.
- We have assumed a total of 46.04 ha of 'developed land, sealed surface' in the Habitat Creation tab to account for the development. This is not included in the 2019 calculations, but we have included it to satisfy the Area Check of the SBM. It has no impact on the overall calculations.
- Taking the above figures into account, the On-site net change in habitat units (i.e. excluding the offsite compensation areas) is -381.48 units, which equates to a 25.5% net loss. It should again be noted that this is the net loss *without* considering the loss of irreplaceable blanket bog (which cannot be calculated in the SBM).
- The proposed offsite enhancement (it the three compensation areas CA1 to CA3) generates 44.52 habitat units. This brings the overall net change (without considering lost blanket bog) to -336.96, which is a 24.58% net loss.
- The SBM suggests that 1645.84 units are needed overall to achieve 10% net gain (i.e. the total baseline figure of 1496.22 x 1.1) leaving a deficit of 486.58 units (though again with the lost blanket bog still requiring bespoke compensation outside of this).

Trading Rules

- The trading rules for habitat area units within the SBM are not satisfied, since not enough habitat types have been proposed to compensate for the loss of areas of very high distinctiveness habitats, which need like-for-like habitat to compensate for losses. The rules suggest that the following would be needed:
    - 186.47 units of Fen;
    - 123.2 units of Purple moor grass and rush pasture; and
    - 27.29 units of any habitat (to make up the shortfall to no net loss).
- This is still in the absence of the loss of 9.25 ha of blanket bog, which would require bespoke compensation.

Results: hedgerow unit results

- The SBM considers the hedgerows to be of lower distinctiveness than was assessed in the 2019 calculation.
- The baseline is considered to be 16.54 hedgerow units.
- 7.66 hedgerow units are due to be lost.
- The post intervention hedgerow units delivered through retention, enhancement and creation is 24.68.
- This gives a biodiversity net gain in hedgerow units of 8.14. This is a net gain of 49.24%

Results: watercourse unit results

- The watercourses were assessed alongside the hedgerows in the 2019 assessment.
- More information is needed to classify the watercourses. We have classified them as 'other rivers and streams' (high distinctiveness) rather than 'very high distinctiveness' priority habitat, since much of the burn network seems modified. The exception to this would potentially be the headwaters of these systems. UK Hab Version 2 considers priority river habitat to include headwaters, which have not been significantly altered from their natural state. However, it is difficult to define where the extent of this classification may be, if present, hence the use of the 'other rivers and streams' classification. Our assessment could therefore be understating the value of the watercourses.
- As a precautionary approach, we have considered watercourse and riparian encroachment to be minor in the absence of further information. It is likely that this will vary across the 3.33km of watercourse within the site, but this cannot be ascertained without further information.
- There is a baseline watercourse value of 47.74.
- The post intervention watercourse unit value is 29.06.
- This results in a net change of -18.68 watercourse units which is a 39.13% net loss. As noted above, this could be an underestimate of the loss, should further information indicate that priority headwater habitat is in fact present.
- The SBM suggests that 52.52 watercourse units are required for 10% net gain, which means there is currently a deficit of 23.46 watercourse units.

BNG Appendix 3 – Statutory Biodiversity Metric assessment of the Dalradian project using more accurate inputs (correcting the errors identified in Appendix 1)

The aim of this Appendix (and the appended Metric excel spreadsheet; BNG Assessment 2) is to amend the data input to the SBM to be more 'accurate' (based upon our review and

assessment – see Appendix 1), correcting the errors that were made in order to provide a much more realistic calculation of the true BNG position of the project.

Assumptions and caveats

This assessment has been carried out with a number of assumptions/considerations, the main one to note is as follows:

- The 9.25 ha of blanket bog lost is still entered into the calculator for this exercise but requires bespoke compensation (therefore has no baseline value). We have kept the blanket bog areas to be enhanced in the calculator to show the impact these would have on the overall assessment. As these enhancements are applied to offset the loss of non-blanket bog habitats, they could NOT form part of the bespoke compensation for the loss of blanket bog. Any bespoke compensation would have to be additional to what is proposed.
    - If blanket bog enhancement were considered as part of the bespoke compensation for blanket bog loss, these areas would need to be removed from the calculator and the rest of the development assessed separately from them.

Habitat area units

- It is assumed that baseline habitat extent and classification from the Applicant is correct
- It is assumed that baseline habitat condition is appropriate for non-peatland habitats
- The distinctiveness of habitats set in the metric largely applies to a Northern Irish context (although it is potentially the case that 'very high' for Rush Pasture may be too high a distinctiveness for Northern Ireland, and that 'high' would have been more appropriate)
- Peatland habitat baseline condition was reviewed in line with the EcMMP, and reassessed as follows (this differs slightly from the 2019 assessment, which considered condition of baseline blanket bog as all moderate):
    - MU1 - largely degraded but active - moderate condition
    - MU2 - largely degraded but largely active - moderate condition
    - MU3 - heavily degraded, inactive but capable of regeneration - poor condition.
    - MU6 - Largely degraded, inactive - poor to moderate condition.
    - MU7 - Mire habitat does not appear to be adversely affected, peat largely inactive - Good condition.
    - CA1 - Heavily modified but largely active - moderate condition.
    - CA2 - historically cutover but largely active - moderate condition
    - CA3 - Very degraded, inactive but capable of regeneration - poor condition.
- The blanket bog to be lost is considered an irreplaceable habitat and therefore needs bespoke compensation. The blanket bog to be enhanced should be considered as part of the mitigation package to compensate for the loss of non-blanket bog habitats and NOT form part of the bespoke compensation. This would have to be additional to the proposals outlined in the EMMP.
- It has been assumed that the proposals for blanket bog enhancement would work so long as water level management is addressed however:
    - Blanket bog enhancement would not reach good condition in the timescales of the project. It is accepted that the enhancements proposed for MU1-3 and CA1-3 will likely have a positive effect. However, given the time it takes to accumulate new peat, the 2019 assessment is considered to be over-promising a condition that it cannot achieve, particularly given the degraded nature of most of the blanket bog.
    - Mire enhancement in MU6 is considered to only achieve moderate condition due to baseline habitats being largely degraded. This is captured within the SBM in

the 'Habitat Creation' tab, as there is not sufficient information in the 2019 calculator to suggest an accurate classification and extent of baseline habitats to effectively capture it as 'restoration' within the enhancement tab.
    - Mire management in MU7 is considered to achieve good condition as it is already considered in good condition, and management would be to maintain the diversity of plants and the presence of Devil's-bit Scabious. This should not be captured within the SBM as its in good condition already so is not considered an enhancement (as there would be no uplift); instead, it should be captured as retention, with the management suggested simply maintaining its condition. However, we have kept this in the SBM in the 'Habitat Creation' tab as there is not sufficient information in the 2019 calculator to suggest an accurate classification and extent of baseline habitats to effectively capture it as 'retention' within the baseline tab.
- Blanket bog 'creation' in MU2 is described in the 2019 assessment as 'not designed to create blanket bog but rather a peatland habitat that is active'; however, blanket bog in good condition was selected in the 2019 Metric to represent this. This classification is considered inappropriate to effectively capture the result of these proposals (as you cannot 'create' blanket bog). Hydrological management seems to be absent from the proposals, and drainage is mentioned, raising the question as to whether this area would remain wet enough.
- It is likely that piling peat soils into an area would result in an acid-associated habitat; therefore, the medium distinctiveness 'upland acid grassland' has been selected in this version of the SBM. This results in a greater gain in habitat units (as the temporal and difficulty multipliers are lower) than if blanket bog were selected; however, it is considered a more appropriate habitat type to capture the nature of this intervention.
- The allocation of an appropriate level of Strategic Significance in the SBM has been informed by:
    - the Biodiversity Strategy and Action Plan - https://fodc.online/Biodiversity_Strategy_January_23/
        - It is the council's aim to assist in protecting, increasing and maintaining native woodland and tree cover in the district. Native woodlands have therefore been assigned High Strategic Significance.
    - Government Peatland Strategy - https://www.daera-ni.gov.uk/sites/default/files/consultations/daera/NI%20Peatland%20Strategy%20-%20Copy%20for%20EQIA%20Consultation.%20%208-8-2022.%20PDF_0.PDF
        - This has a goal that by 2040, Northern Ireland's peatland habitats are conserved and restored to optimise their Natural Capital value, so these habitats have also been assigned High Strategic Significance.
    - Fermanagh and Omagh Local Biodiversity Action Plan 2016- 2020 - https://www.fermanaghomagh.com/app/uploads/2016/07/Fermanagh-and-Omagh-Local-Biodiversity-Action-Plan.pdf
        - This includes actions for raising awareness of:
            - Rush pasture
            - Upland heath
            - Hedgerows
        - The updated 2023 strategy mentions this old plan, but it is assumed that these habitats are not a priority in the updated plan, so these have been selected for Moderate Strategic Significance.
    - See the calculator assessor's comments box for further assumptions.
- We have not changed the baseline habitats in Area C to reflect the proposals as we do not have information on the extent of these habitats. Doing so may marginally increase

the baseline value of the site; however, as this area is only 1.81 ha, it would not make a significant impact to the overall net loss shown by the assessment.

Hedgerow Units

- It is assumed that baseline habitat extent and classification is correct
- It is assumed that baseline habitat condition is appropriate
- It is considered that proposed habitat classification and condition is possible, under suitable management.
- All hedgerows are considered to be of High Strategic Significance due to the recent BAP aim in protecting, increasing and maintaining native tree cover in the district.

Watercourse Units

- More information is needed to classify the watercourses. However, for this version of the SBM we have classified them as 'very high distinctiveness' priority habitat, owing to their salmonid populations.
- As a precautionary approach, we have considered watercourse and riparian encroachment to be minor in the absence of further information. It is likely that this will vary across the 3.33km of watercourse within the site, but this cannot be ascertained without further information.
- The burns have been assigned Medium Strategic Significance, as they are not on a local plan but include headwaters in the catchment. The ditches have been classified as Low Strategic Significance.

Results

- Having re-run the SBM on the basis of the above assumptions and caveats, the results under the three habitat categories (habitat area units, watercourse units and hedgerow units) are as follows:

Unit Type	Baseline value	Post intervention value	Net unit change	Net % Change	Units required for overall 10% BNG	Unit deficit
Habitat onsite	1608	1199.19	-409.11	-25.44	1769.13	536.95
Habitat offsite	917.88	950.88	32.99	3.59		
Habitat combined	-	-	-376.12	-23.39		
Hedgerow	19.02	28.39	9.37	49.24	20.92	0
Watercourse	55.84	33.00	-22.84	-40.90	61.43	28.42

Trading rules

Assuming the distinctiveness level of rush pasture used in this assessment is appropriate (i.e. very high), the SBM indicates that the trading rules are not satisfied. Therefore, in order to achieve no net loss the following number of units of particular habitat types would need to be achieved as part of the overall units required:

- 215.34 units of Fen
- 135.52 units of Rush Pasture
- 25.26 units of any habitat type.

This would be needed alongside the existing EcMMP and bespoke compensation for the loss of peatland.

Curraghinalt Mine Project (Dalradian)

Dalradian Gold Ltd LA10/2017/1249/F (PAC Ref: C005)

Hydrology, Hydrogeology and Peat Statement of Case

Evidence of:
Catherine Isherwood PhD, MSc, CGeol, FGS, MIMMM

Prepared for:

Fermanagh and Omagh District Council

October 2024

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1 EXECUTIVE SUMMARY

1.1.1 This Statement of Case addresses three environmental receptors – hydrology, hydrogeology and peat.

1.1.2 I have reviewed the submitted documents concerning hydrology, hydrogeology and peat in the context of the Proposed Development and the legislation and policy context applicable to Northern Ireland and to Fermanagh and Omagh District. My review has identified a number of concerns relating to the assessment methods used in the Environmental Statement and supporting documents.

1.2 Hydrology

1.2.1 The surface hydrology is dominated by two major rivers – the Owenkillew and Owenreagh Rivers – and a series of smaller watercourses that form tributaries to these rivers. The Owenkillew and Owenreagh Rivers are both designated sites for all or part of their length. Both rivers have been assigned high sensitivity status, in line with their designation. The main tributaries – the Pollanroe Burn, Unnamed Watercourse, Curraghinalt Burn, Attagh Burn and Glenealy Burn – have been assigned low sensitivity status based on their small size and upland catchments. No supporting water quality, morphology or ecological data have been provided to support this sensitivity classification.

1.2.2 The uppermost 975 m of the Pollanroe Burn would be removed in its entirety, to be replaced with an artificial drainage channel in a different location. The wetland habitats, including an area of valley mire, would also be removed in their entirety.

1.2.3 The Pollanroe Burn and Unnamed Watercourse catchments would be modified, with part of the Unnamed Watercourse catchment being connected into the Pollanroe Burn catchment. The existing natural and partially modified drainage would all be replaced by a series of drains and ponds, which would change the existing flow regime entirely.

1.2.4 The development proposals include discharge of treated water into the Pollanroe Burn. This would increase the normal flow levels in the burn by up to 75% above normal flow levels. This is considered to be a positive effect, but no account is taken

of the increase in flow rates and the associated scour and geomorphological impacts these would have on the burn and its freshwater ecology.

1.2.5 In addition, the discharge water would be treated using reverse osmosis, which removes all impurities in the water including those naturally occurring in surface watercourses. There are significant concerns over the dilution effect of this volume of water on a natural system as it is recognised within the industry that reverse osmosis water will kill aquarium fish. No modelling has been presented where addition of large volumes of ultra-clean water to a natural system has been investigated.

1.2.6 All of these concerns have been considered to have Minor Adverse or Negligible impacts, or in the case of the additional flow a Positive impact, on the watercourses largely as a result of the Low sensitivity status.

1.2.7 This low sensitivity rating has allowed an assessment of Minor and Not Significant or Negligible and Not Significant for:

- Permanent loss of 975 m of natural watercourse channel and associated wetland habitats in the Pollanroe Burn catchment;
- Permanent loss of catchment and associated reduction in flow levels to the Unnamed Watercourse;
- Permanent increase in catchment area and associated increase in flow levels to the Pollanroe Burn;
- Permanent changes to catchment flow patterns for both the Pollanroe Burn and the Unnamed Watercourse;
- Permanent and large increases in annual average flows in the Pollanroe Burn;
- Potential impacts from discharge of large volumes of RO water into the natural environment.

1.2.8 In addition to the direct effects on hydrology, there are considerable indirect effects on habitats and freshwater ecology.

1.2.9 In my professional opinion, the under-valuing of the sensitivity of minor watercourses in the EIA process is the only reason why Major Adverse and Significant impacts have not been reported for surface water receptors.

1.2.10 It is my professional opinion that a re-assessment of significance using a High sensitivity status is required for surface water receptors. This re-assessment gives a more realistic picture of the hydrological impacts of the development and that Major Adverse and Significant impacts cannot be avoided by the development in its current form. This needs to be taken into consideration in the planning balance.

1.3 Hydrogeology

1.3.1 Development of an underground mine inevitably causes changes in groundwater flow paths, arising as a result of the underground mine workings. The Environmental Statement and accompanying documents include a groundwater impact assessment which covers modelling of changes to groundwater flow.

1.3.2 The assessment indicates that a reduction in groundwater contribution to surface watercourses would be expected, with a reduction of 3-5% indicated for the Curraghinalt and Attagh Burns. The Unnamed Watercourse has not been assessed. The Pollanroe Burn has been assessed only on the basis of reduced groundwater flow resulting from underdrainage for the dry stack facility and for the surface water ponds at the above-ground infrastructure site.

1.3.3 The Unnamed Watercourse has been predicted to lose approximately 5% of its surface water contribution as a result of the catchment changes discussed above. A reduction in groundwater contribution in addition to this has potential to result in the Unnamed Burn drying up completely for parts of the year, and potentially for longer periods than historically in dry summers.

1.3.4 There has been no consideration of the potential for reduced groundwater contribution to the Pollanroe Burn as a result of the underground mine workings. As a result it is not possible to assess whether there would be any anticipated impact to flow levels.

1.3.5 During mine operations, mine water would be pumped out and treated via the above-ground ponds and reverse osmosis system discussed above. Following closure, the mine water would gradually rise back to a stable level. Modelling in the groundwater impact assessment indicates that approximately 81% of the mine water is expected to discharge through the current mine portal for treatment and discharge into the Curraghinalt Burn. Discharge volumes are anticipated to be up to 20 m^3 per day for

the first 5-6 years after closure, and to rise to approximately 800 m^3 per day at around 15-20 years after mine closure.

1.3.6 Water treatment would be provided by a passive water treatment system downslope of the Curraghinalt mine entry. This system consists of a single pond with an outflow directly into the Curraghinalt Burn. I have been unable to identify any calculations relating to the sizing of this pond or to whether it is sufficient to hold and treat up to 800 m^3 of water per day in long term use.

1.3.7 The Curraghinalt Burn discharges directly into the Owenkillew River, which is designated for Atlantic Salmon and Freshwater Pearl Mussel. There is a considerable risk that, if the water treatment system is undersized either in terms of treatment ability or in terms of total capacity, untreated or under-treated water would be discharged directly into the Curraghinalt Burn and subsequently into the Owenkillew River. This could have a potentially very serious effect on the water quality in the Owenkillew River, undermining its designated status and causing damage to protected species.

1.3.8 An additional 16% of the mine water is anticipated to pass into the downgradient groundwater pathway and remain untreated. There is evidence provided that groundwater currently provides baseflow to the Owenkillew River and the potential for contamination arising from this 16% of untreated water has been given limited consideration, either in terms of treatment options or in terms of monitoring to identify if problems are arising.

1.3.9 The mine water volumes provided indicate that approximately 3% of the mine water is unaccounted for in all the calculations. It is of concern that this has not been modelled and that no potential flow or discharge pathways have been identified.

1.3.10 Although some general commitments to post-closure monitoring are included in the Environmental Statement, they are general statements and do not provide any detail as to the proposed type and frequency of monitoring that would be anticipated.

1.3.11 In my professional opinion, the Low sensitivity rating applied to the smaller surface watercourses has allowed a further assessment of Minor Adverse or Negligible impacts on the Curraghinalt, Attagh and Pollanroe Burns and overlooking of potential impacts to the Unnamed Watercourse as a result of reductions in groundwater contribution to the surface water flow in all these watercourses. Application of a High

sensitivity rating is likely to result in a Major Adverse and Significant impact in the Curraghinalt Burn and potentially also in the other watercourses discussed here.

1.3.12 Furthermore, there are concerns around the capacity and suitability of the proposed passive water treatment system at the Curraghinalt mine site, which leads to a potentially Significant risk to the Curraghinalt Burn and Owenkillew Rivers as a result.

1.3.13 Firmer commitments to post-closure monitoring are required, to cover the minimum length of time for which monitoring would be undertaken, the type and frequency of monitoring in order to ensure that pollution incidents are identified, and the remedial measures that would be implemented should the monitoring reveal any potentially damaging water chemistry.

1.4 Peat

1.4.1 It is accepted that areas of peat are present at the site and would need to be disturbed in order for the Proposed Development to proceed in its current form. Two main types of peat have been identified: blanket peat on the upper slopes, and valley mire fen peat in the headwaters area of the Pollanroe Burn.

1.4.2 Peat of considerable thickness has been encountered in several areas, notably in the valley mire area where peat up to 6.5 m has been recorded. Proposals within the Environmental Statement are to excavate all of the peat in areas where infrastructure is planned, partly to avoid the risk of peat slide and partly for engineering reasons relating to construction. Excavated peat would be used for habitat enhancement, for site reinstatement and for rehabilitation of the dry stack facility. There is proposed to be no surplus peat arising from the works.

1.4.3 While the Environmental Statement states that environmental considerations were given a high priority in site selection and evaluation, there is no meaningful consideration of peat as an environmental constraint except in terms of blanket bog habitat. There is no evidence that the site design has attempted to avoid areas of deeper peat (in this document, taken to be 1.0 m or deeper in line with Scottish guidance).

1.4.4 The sensitivity of peat as a carbon store, carbon sink and substrate for a range of protected habitats does not appear to have been considered. The peat survey and assessments have been based on guidance mainly from 2010-2012; recognition of

the importance of peat in terms of its carbon and habitat value has increased considerably over the intervening years and the current regulatory position in Northern Ireland, as in the other UK nations, is very different now. The emphasis is now on conserving peat and avoiding any development work on peat and in peatland habitat areas if at all possible, and minimising such works where it is not possible to avoid it completely. This position is not recognised within the Environmental Statement and the proposals are significantly out of step with the current legislative framework.

1.4.5 Of particular concern are the proposals for rehabilitation of the dry stack facility using a soil medium formed from a mix of varying types of peat, mineral subsoils and a soil improver. This practice runs counter to years of practical experience in handling excavated peat and using it for effective reinstatement and for peatland restoration. The proposed method would involve mixing of blanket peat, valley mire peat, mineral subsoils and a soil improver. Best practice specifies that different soils should be stored separately and reinstated in the order in which they were excavated.

1.4.6 Blanket peats are acidic, and valley mire fen peats can range from alkaline to slightly acidic. No evidence is presented about the pH of the valley mire peat and what impact mixing this material with an acidic blanket peat would have on either form of peat.

1.4.7 The process of mixing these highly different materials will destroy the remaining internal structure of the peats, and will make the peat materials much more susceptible to oxidation, drying and consequent loss of all stored carbon. The mixing together of the vegetated upper layers of both types of peat with the lower, more amorphous peat material will also result in complete loss of the vegetated ‘active’ layer which is essential for the peats to function as carbon sinks.

1.4.8 Using this blended material as a soil medium to rehabilitate the dry stack facility may allow the dry stack to become vegetated, but the vegetation will never be able to become active peat-forming habitat because the dry stack has been designed to shed water as part of its geotechnical stability. Peat formation requires waterlogged conditions as this inhibits the breakdown of dead vegetation and is the key element to developing the peat body over time.

1.4.9 In my professional opinion, peat has not been considered adequately during the Proposed Development design and siting process which has led to peat excavation

proposals that are incompatible with current regulatory and policy positions. Proposals for reuse of excavated peat are completely inappropriate and will result in loss of active peatland habitat, with its carbon sink attributes, as well as loss of stored carbon from the majority of the excavated peat.

1.5 Overall Conclusions

1.5.1 The Proposed Development in its current form is expected to have unacceptable impacts on surface water, groundwater, peat and peatland. In my professional opinion none of these receptors have been given due consideration within the design and siting process. The potential for Major Adverse and Significant impacts on all these receptors has been consistently under-assessed and requires appropriate consideration as part of the planning balance.

2 INTRODUCTION

2.1 Qualifications and Experience

2.1.1 My name is Catherine Elizabeth Isherwood. I hold Bachelor's and Master's degrees in Natural Sciences, an integrated Master's degree in Geological Sciences, and a Doctoral degree in Metamorphic Petrology and Modelling (all from the University of Cambridge), and a Master of Science degree in Applied Hydrogeology from Newcastle University. I was elected as a Fellow of the Geological Society of London in 2007 and as a Chartered Geologist in 2013. I was elected as a Member of the Institute of Materials, Minerals and Mining (IOM3) in 2021.

2.1.2 I am employed as the Technical Director of Environmental Geoscience and Hydrology at the Water Research Centre (WRc), a water and environment consultancy and centre of excellence which is part of the RSK Group of companies.

2.1.3 I have over eighteen years' experience subsequent to my PhD, gained primarily in the private sector. I joined RSKW, part of RSK Group, in 2015 as a Senior Hydrogeologist, progressing to Principal Hydrogeologist in 2019. After the acquisition of WRc in 2021, I was transferred to WRc in 2022 as part of a reorganisation of company structure.

2.1.4 I have been an assessor for chartership applications for the Geological Society of London (GSL) since 2016, and regularly tutor RSK colleagues who are working towards chartered status with the Geological Society and other professional institutions.

2.1.5 Relevant details of my career history and experience are provided in **Appendix A**.

2.2 Instruction

2.2.1 I am instructed to present evidence on behalf of Fermanagh and Omagh District Council (FODC) in respect of hydrology, hydrogeology and peat matters relating to the Curraghinalt Mine Project.

2.2.2 I wish to clarify at the outset that neither I nor my company have had any involvement with the Dalradian Project or any of the related applications prior to my instruction by FODC as outlined below.

2.2.3 The Curraghinalt Mine Project means the mine area encompassing the underground mine works to their maximum extent and all related above-ground infrastructure required for handling and processing the mineral produced, including the dry stack facility and water treatment infrastructure. This Statement does not refer to the associated overhead line at any point.

2.2.4 I was approached by FODC in February 2024 to review the submitted Curraghinalt Mine Project application and associated applications, and asked to confirm if I could support the Council's objection to the proposed development on grounds relating to hydrology, hydrogeology and peat.

2.2.5 Having first undertaken a desk-based exercise which involved reviewing all of the relevant documentation pertaining to the various applications, I undertook a one-day site visit on 12 March 2024. On this visit I was able to view the Site and the existing mine infrastructure site, their topographical settings and to view key hydrological elements of the area including the principal watercourses and drainage pathways, making reference to plans and visualisations of the proposed development while in the field.

2.2.6 I subsequently concluded that I could support FODC's position at the forthcoming inquiry. I was thereafter instructed by the Council to prepare a Hydrology, Hydrogeology and Peat Statement of Case in support of their objection to the proposed development.

2.2.7 I am familiar with the GSL's Codes of Conduct (2020). I believe that in addressing the hydrological, hydrogeological and peat matters relating to this inquiry I have fulfilled my professional responsibilities in accordance with the Codes of Conduct.

3 BACKGROUND CONTEXT

3.1 Introduction

3.1.1 A full planning history relating to the various applications is set out in the FODC Statement of Case. I do not seek to replicate this in my evidence. However, I provide below a summary of the various submissions with relevance to hydrology, hydrogeology and peat made by the respective applicants for the Curraghinalt Mine Project. At the same time, I summarise the relevant hydrological, hydrogeological and peat-related consultation responses of statutory consultees to the various submissions.

3.2 Curraghinalt Mine Application – LA10/2017/1249/F

Original 2017 application

3.2.1 In November 2017, an application (LA10/2017/1249/F) was submitted by Dalradian Gold Ltd (DGL) to the Strategic Planning Division of the Department for Infrastructure (DfI) to construct an underground gold mine and associated infrastructure at a site located between the towns of Gortin and Greencastle in County Tyrone (the Curraghinalt Mine Project). The application was submitted with an accompanying Environmental Statement (ES).

3.2.2 The following documents are of particular relevance to this statement, all from the ES Volume 3 and supported by figures, tables and in some cases further appendices or annexes:

- Section B2 – Outline Construction Environmental Management Plan (CEMP), prepared by SRK Consulting (UK) Ltd (SRK).
- Section B3 – Mine Waste Management Plan (MWMP) and its annexes, prepared by SRK.
- Section B7 – Peat Landslide Hazard and Risk Assessment, prepared by SLR Consulting Ltd (SLR).
- Section B8 – Peat Management Plan, prepared by SLR.

- Section B10 – Flood Risk and Drainage Assessment, prepared by Kaya Consulting Ltd (KCL).
- Section C1 – Soils and Geology Baseline Report, prepared by SLR.
- Section C3 – Surface Water Baseline Report, prepared by SRK.
- Section C4 – Surface Water Impact Assessment, prepared by SRK.
- Section C5 – Ground Water Baseline Report, prepared by SRK.
- Section C6 – Groundwater Impact Assessment, prepared by SRK.

3.2.3 I have not considered here the document at Section B6 – Draft Cyanide Management Plan, as later submissions confirm the intention of the Applicant not to make use of cyanide in any part of the process, and it is therefore no longer of relevance.

First ES Addendum (2019)

3.2.4 In August 2019, DGL submitted Further Environmental Information (FEI) in the form of an addendum to the ES. Updates to the following documents were provided as part of the FEI:

- Section B2 – Outline Construction Environmental Management Plan (CEMP), prepared by SRK Consulting (UK) Ltd (SRK).
- Section B3 – Mine Waste Management Plan (MWMP) and its annexes, prepared by SRK.
- Section B7 – Peat Landslide Hazard and Risk Assessment, prepared by SLR Consulting Ltd (SLR).
- Section B8 – Peat Management Plan, prepared by SLR.
- Section C3 – Surface Water Baseline Report, prepared by SRK.
- Section C5 – Ground Water Baseline Report, prepared by SRK.

Second ES Addendum (2020)

3.2.5 In October 2020, DGL again submitted FEI in the form of a further addendum to the ES. Additional updates to the following documents were provided as part of the FEI:

- Section B3 – Mine Waste Management Plan (MWMP) and its annexes, prepared by SRK.
- Section C3 – Surface Water Baseline Report, prepared by SRK.
- Section C4 – Surface Water Impact Assessment, prepared by SRK.
- Section C5 – Groundwater Monitoring Report, prepared by SRK (named as Ground Water Baseline Report in initial ES and first FEI submissions).
- Section C6 – Groundwater Impact Assessment, prepared by SRK.
- Appendix D2 – Draft Surface Water and Groundwater Environmental Monitoring and Action Plan, prepared by SRK.

Consultation responses

3.2.6 Summarised responses from key consultees are provided below.

3.2.7 **The Geological Survey of Northern Ireland (GSNI**) provided a response that they are satisfied that the geological characterisation of the Site is sufficient and that they are satisfied that the risks of peat landslide are low to negligible and that the design of the retention structures is satisfactory.

3.2.8 **DAERA Sea Fisheries Inspectorate** initially had concerns with the project from an aquaculture aspect, notably with reference to the potential for leaching or loss of contaminating materials from the proposed development into the watercourses. Following submission of the FEI in 2019, the Sea Fisheries Inspectorate state that they have no issues with the proposed development if all mitigation factors are in place as stated in the Waste Management Plan dated July 2019.

3.2.9 **Northern Ireland Water** have raised no concerns relating to the revised submissions.

3.2.10 **Loughs Agency** provided a consultation response to DfI on 5th March 2021 in response to submission of the FEI in 2020. They raised concerns over the low ecological significance status applied to the Pollanroe and Curraghinalt Burns, as below:

The Fisheries Assessment 2017 presents the findings of the fisheries and river habitat assessments on the Owenkillew & Owenreagh during August to September 2015 to inform the baseline ecological conditions. The report indicates that due to the wealth of information provided by Loughs Agency on the main stem rivers that baseline surveys of the tributaries within the study area were not considered necessary. The report states *"Minor tributaries of the Owenkillew and Owenreagh were initially screened out during the desk based review due to their general unsuitability for salmonids."* Inference appears to have been drawn from this report, in assigning the Pollanroe Burn and Curraghanilt Burn "low ecological significance" and in setting discharge consent criteria on this bases. Loughs Agency are of the opinion the bottom section of the Curraghanilt Burn is suitable habitat for salmon parr, and an area of approximately 1.2 kilometres on the bottom section of the Pollanroe Burn contains excellent spawning, nursery and holding habitats, suitable for Atlantic salmon and sea trout, as well as indigenous brown trout and possibly lamprey. A targeted and up to date Habitat & Fisheries assessment would be more appropriate in terms of fully assessing habitat suitability for salmonids and other designated species which may be utilising these tributaries within the study area.

The Atlantic salmon which are a key feature of the Owekillew River SAC are internationally in decline, and as such any development particularly adjacent to or hydrologically connected to the river must ensure the conservation of this species is considered.

3.2.11 Loughs Agency also raised concerns over the potential cumulative impact of the mine operations, including seepage and runoff, and surrounding land use on the Pollanroe Burn and the downstream surface water environment and whether this has been considered.

3.2.12 Loughs Agency requests assurance that the Mine Waste Facility is structurally sound, as failure of the structure could result in irreversible damage to the Owenreagh River and potentially to other parts of the Foyle system.

3.2.13 Loughs Agency also raises concerns over the volume of peat proposed to be removed and the impact this may have on the hydrological environment, including velocity of surface water runoff and the effect this may have on resident fish species. They state that any reduction in groundwater baseflow, no matter how limited, would be an issue of concern if considered in conjunction with potential loss of headwater streams. Together with consented discharges, this could lead to negative impacts on the hydrology and water chemistry of the river system and as such a potential negative effect on freshwater ecology. They state that there is limited consideration of the long-term impact of the development on the surface water environment post closure.

4 PURPOSE AND SCOPE OF MY STATEMENT

4.1.1 The principal purpose of my statement of case is to present evidence which demonstrates why, in my judgment, the effects of the Proposed Development on hydrology, hydrogeology and peat have been under-stated and should be considered to be major and significant adverse in Environmental Impact Assessment terms.

4.1.2 My statement will consider impacts to hydrology and surface water, impacts to hydrogeology and groundwater, and impacts to peat. I will demonstrate that the values associated with the water environment, including wetlands and peat, and specifically their sensitivity and susceptibility to change, are greater than reported in the submitted assessments.

4.1.3 I will review the submitted assessments that have relevance to the water environment, including groundwater, surface water and wetland areas including peat, before drawing my own conclusions about the effects which would arise as a result of the proposed development. I will demonstrate that the effects on the water environment, wetlands and peat would be significant and have been consistently under-reported in the submitted assessments.

4.1.4 In doing this, I will review and make observations about the Proposed Development in its current form, and will demonstrate how the proposed mitigation and restoration, even applied using best practice, cannot mitigate the impacts of the Proposed Development on hydrology, hydrogeology and peat such that the scheme can be made acceptable in environmental terms.

4.1.5 I will comment on the extent of harm to the environment, in terms of direct impacts on water quantity, water quality, water storage and retention, peat and peat soils, and will touch on indirect impacts to biodiversity including habitats and freshwater ecology and impacts to carbon and climate change including peat and peatland.

5 LEGISLATION, PLANNING POLICY AND GUIDANCE

5.1.1 Planning policy is dealt with in detail in the main statement of case of FODC. I have set out below a brief summary of the legislation and policy context relevant to the proposals where they may have a bearing on consideration of matters relating to hydrology, hydrogeology and peat.

5.2 Strategic Planning Policy Statement (SPPS) for Northern Ireland (2015)

5.2.1 Sections with relevance to hydrology, hydrogeology and peat are set out in various of the subsections within the SPPS. I have identified the main paragraphs below, but the list is not exhaustive.

Flood risk and hydrology

5.2.2 Policy relating to Flood Risk is set out in paragraphs 6.105-6.125 of the SPPS. The Regional Strategic Objectives also include important considerations relating to flood risk.

5.2.3 Paragraph 6.104 notes a number of regional strategic objectives of which the following is the most important in this context:

Promote sustainable development through the retention and restoration of natural flood plains and natural watercourses as a form of flood alleviation and an important environmental and social resource.

5.2.4 Within the Regional Strategic Policy section 'Artificial Modification of Watercourses' notes at paragraph 6.124:

While culverting may in some instances alleviate local flood risk, it cannot eliminate it and often increases the flood risk downstream by the accumulation of higher flows. The artificial modification of watercourses through culverting or canalisation is also widely considered to be environmentally unsustainable as such operations can adversely impact upon landscape quality, ecological integrity and biodiversity of watercourses.

5.2.5 Paragraph 6.125 notes that:

Planning authorities should only permit the artificial modification of a watercourse in the exceptional circumstances where culverting of a short length of watercourse (usually less than 10 m) is necessary to provide access to a development site (or part

thereof), or where such operations are necessary for engineering reasons unconnected with any development proposal.

Minerals

5.2.6 Policy relating to Minerals is set out in paragraphs 6.153-6.161 of the SPPS. Paragraph 6.154 notes that:

The policy approach for minerals development, including peat extraction from bog lands, must be to balance the need for mineral resources against the need to protect and conserve the environment.

5.2.7 Paragraph 6.158 notes that:

Minerals development within or in close proximity to an area that has been designated (or is proposed for designation) to protect its landscape, scientific or natural heritage significance will not normally be granted permission where this would prejudice the essential character of the area and the rationale for its designation.

Natural heritage

5.2.8 Policy relating to Natural Heritage is set out in paragraphs 6.173-6.193. The introductory section notes at paragraph 6.171 that:

Sustaining and enhancing biodiversity is fundamental to furthering sustainable development. The Northern Ireland Biodiversity Strategy and EU Biodiversity Strategy seek to halt the loss of biodiversity and ecosystems services by 2020. Furthermore, the Wildlife and Natural Environment Act (Northern Ireland) 2011 places a statutory duty on every public body to further the conservation of biodiversity.

5.2.9 Paragraph 6.174 notes that:

Planning authorities should apply the precautionary principle when considering the impacts of a proposed development on national or international significant landscape or natural heritage resources.

5.2.10 Paragraph 6.192 notes that:

Planning permission should only be granted for a development proposal which is not likely to result in the unacceptable adverse impact on, or damage to known:

- ***priority habitats;***
- ***priority species;***
- ***active peatland;***
- ***wetlands (including river corridors) …***

[list includes other points not directly relevant here].

5.3 Northern Ireland Biodiversity Strategy (2015)

5.3.1 The biodiversity strategy states on p2:

Northern Ireland's biodiversity is internationally important with some 20,000 species found on the land, in the soil, in the air and in the waters. This important biodiversity is a reflection of Northern Ireland's remarkable geological diversity. For its size, it is one of the most geologically diverse areas of the planet and this is an important factor in understanding our rich biodiversity. Our biological systems are maintained by and intrinsically linked to the earth, the rocks and soils on which vegetation grows, through which water percolates and in which a myriad of chemical processes take place. Conserving diversity – both biological and geological – is important in its own right, for the goods and services it provides and for the pleasure and fulfilment that can be derived from close engagement with nature.

5.3.2 The section entitled "Mountains, moors and heaths" on p11 states that:

Peaty soils cover almost 15% (206,400 hectares) of Northern Ireland's land, including most of the uplands. Of this total area, 165,000 hectares consists of either semi-natural blanket bog, lowland raised bog or fen vegetation each with a high biodiversity value. Overall, it is one of the most significant groups of habitats in a European context. The economic value of Northern Ireland's peatlands is viewed as increasingly significant in terms of their natural resources. Historically, peatlands have been valued primarily for use for grazing, fuel or horticultural peat. However, the highest values now recognised are for other ecosystem services such as clean water supply, carbon storage and recreation. Many current land management practices could compromise these services – for example, land drainage, over-grazing, intensive agriculture, forestry, peat-cutting and wind farm development.

The importance of peatlands is recognised through the International Union for Conservation of Nature (IUCN) UK Peatlands Programme set up in 2009 to promote peatland restoration in the UK. In Northern Ireland, the approach to peatlands is guided by the Department's Policy Statement, Conserving Peatland in Northern Ireland. And Government encourages the sustainable use of peatlands. Agri-environment schemes provide incentives to manage peatlands (around 38,000 hectares) and peat-cutting and wind farms are regulated by planning policies. While the restoration of peatlands is complex, expensive and time consuming, there may be opportunities through EU funding and local initiatives to encourage both protection and restoration of this valuable habitat. The value of peatland soils and vegetation as a carbon store is very high and their value in sequestering carbon may become a particularly economically advantageous characteristic as carbon accounting becomes more important. [my emphasis].

5.4 Northern Ireland Regional Development Strategy 2035 (2012)

5.4.1 Chapter 3 Strategic Guidance Section 3 Environment (p45) provides the most relevant information for this statement.

5.4.2 The introductory section at paragraph 3.22 states:

Improving the quality of the environment can make an important contribution towards achieving a better quality of life. Significant progress towards more sustainable settlements and the conservation and protection of our built and natural heritage cannot be achieved without a change in attitudes and lifestyles of individuals.

5.4.3 RG9: Reduce our carbon footprint and facilitate mitigation and adaptation to climate change whilst improving air quality includes various provisions relevant to hydrology, hydrogeology and peat. Specifically, paragraph 3.27 Adaptation (p47) states:

Protect soils. ***A fully functioning soil reduces the risk of flood and protects underground water supplies by neutralising and filtering out potential pollutants. Development leading to soil sealing, loss of biodiversity and deposition of processed materials represent significant threats to soils. Soil acts as a significant means of capturing and storing carbon thereby reducing the impact of climate change. Therefore, there is a need to manage soil, protect peat habitats, and safeguard soils in urban areas.***

Protect and extend the ecosystems and habitats that can reduce or buffer the effects of climate change. ***Many ecosystems and habitats (such as peat bogs) act as sinks or stores for carbon if undisturbed. … These areas should be protected and where possible extended.***

5.4.4 RG11: Conserve, protect and, where possible, enhance our built heritage and our natural heritage also includes various relevant provisions. Specifically, the Natural Environment section at paragraph 3.31 (p49) includes statements concerning sustaining and enhancing biodiversity; identification, establishment, protection and management of ecological networks; and protection, enhancement and restoration of the quality of inland water bodies.

5.5 Northern Ireland Peatland Strategy 2022-2040 (2022)

5.5.1 The Peatland Strategy sets out the importance of peatlands in a global context and in a Northern Irish context, stating (p6):

In Northern Ireland, our peatlands are of enormous importance to the stability and general well-being of our environment, conserving biodiversity, affecting river catchment hydrology and creating our distinctive upland and lowland landscapes. At both a global and local scale, peatlands can store and sequester carbon, with implications for the regulation of our climate.

5.5.2 The stated goals are (p6):

By 2040, Northern Ireland's peatland habitats are conserved and restored to optimise their Natural Capital value.

5.5.3 Within this section, on p7, the Peatland Strategy states:

Peatland restoration will be an important means of restoring our environment to a condition that is health and will meet our biodiversity targets and our Net Zero contribution. The goal of this Strategy is to ensure that peatlands in Northern Ireland are conserved or under restoration management to become health, functioning ecosystems before 2040 and that the ecosystem services that they provide are acknowledged and appreciated…

5.5.4 Strategic Objective 1 states (p17):

Peatlands in Northern Ireland are conserved, restored and appropriately managed, in accordance with the Climate Change Committee recommendations.

5.5.5 Strategic Objective 2 states (p18):

By 2025, policies and supporting delivery initiatives are in place to underpin appropriate management and restoration of peatlands in Northern Ireland.

Action 12: Publish a Position Statement on Upland Management, with accompanying new legislation if required.

Action 13: Develop Land Management schemes through new policies, which provide targeted support to underpin the appropriate management of peatlands long-term.

5.5.6 Strategic Objective 4 states (p21):

Peatlands are recognised for their unique biodiversity and ecosystem services provision and improved access to peatland sites is facilitated.

Action 26: Establish a long-term Peatland Communications campaign (in conjunction with other stakeholders) to boost awareness of peatlands, their role in ecosystem service provision and peatland heritage.

Action 29: Document the environmental history and cultural heritage value of peatlands to provide a context for conservation, restoration actions and communication activities.

5.6 Fermanagh and Omagh Local Development Plan 2030 (2023)

5.6.1 Peat is identified as a resource in the Minerals Development section of the FODC LDP (p122). The LDP states:

Peatland as a resource is of enormous importance to our environment, creating distinctive upland and lowland landscapes, conserving biodiversity and affecting river catchment hydrology. There are extensive areas of peat in the Council area and in some localities it is commercially extracted.

5.6.2 Policy MIN01 – Minerals Development states:

The Council will support proposals for minerals development where it is demonstrated that they do not have an unacceptable adverse impact upon:

a) the natural environment;

[b)-c) …]

d) the water environment […]

5.6.3 Policy NE03 – Other Habitats, Species or Features of Natural Heritage Importance (p148) states:

The Council will only permit development likely to result in an unacceptable adverse impact on, or damage to, habitats, species or the features listed below, where the benefits of the development outweigh the value of the habitat, species or feature. In such cases, appropriate mitigation and/or compensatory measures will be required.

5.6.4 'Active peatlands' are one of the features listed.

5.7 Fermanagh and Omagh Biodiversity Strategy and Action Plan 2022-2027 (2023)

5.7.1 Theme 6: Projects and Partnerships of the FODC Biodiversity Strategy and Action Plan contains a section entitled 'Protecting Peatlands'. This section states:

As recognised in this Strategy, peatlands are an important priority habitat in Fermanagh and Omagh and represent a significant portion of valuable peatlands for Northern Ireland. Through this Strategy and the Council's Climate Change and Sustainable Development Action Plan, the Council aims to protect and restore, where possible, peatlands and degraded soils on Council estate or in, partnership, across the District [sic].

5.7.2 The Appendices at Section 10.0 also include reference to bogs and heath (p47):

Bogs and heath continue to be one of the most characteristic features of the Council area. There are three distinctive types of peatland ecosystems, namely: lowland raised bog, blanket bog and fens, and two heathland types in our area: upland heathland and montane heath. They were historically viewed as vast desolate places that were used for afforestation (conifer plantations), sheep grazing and peat cutting. However, in recent years, the importance of bogs and heath for biodiversity, their value as carbon sinks, and their key feature in flood alleviation systems; has been widely recognised.

5.7.3 The Appendices also include reference to Wetlands, Lakes and Ponds, and Rivers and Streams, in all cases emphasising their value to biodiversity (p46).

6 HYDROLOGY

6.1 Introduction

6.1.1 Part of my instruction was to undertake a review of provided documentation relating to surface water and hydrological concerns. This section sets out the key elements relating to surface water and hydrology that I have identified as requiring further consideration.

6.2 Value assigned to surface waters

6.2.1 The principal surface waterbodies in the area have been assigned sensitivity ratings based on their characteristics. **Table 6.1** is extracted from the Surface Water Impact Assessment (SWIA, 2020).

Table 6.1. Copy of Table 7-3 showing the proposed sensitivity classification and basis for the classification for the assessed watercourses. Extract from FEI2 Appendix C4 Surface Water Impact Assessment, October 2020 (p71).

Watercourse	Sensitivity	Basis
Pollanroe Burn and minor tributaries	Low	Minor watercourse with limited ecological value. No flood alleviation benefits or important morphological diversity (i.e., is small upland watercourse)
Unnamed Watercourse and minor tributaries	Low	Minor watercourse with limited ecological value. No flood alleviation benefits or important morphological diversity (i.e., is small upland watercourse)
Owenreagh River, main channel	High	Important sensitive and protected ecosystem
Curraghinalt Burn and minor tributaries	Low	Minor watercourse with limited ecological value. No flood alleviation benefits or important morphological diversity (i.e., is small upland watercourse)
Attagh Burn and minor tributaries	Low	Minor watercourse with limited ecological value. No flood alleviation benefits or important morphological diversity (i.e., is small upland watercourse)
Glenealy Burn and minor tributaries	Low	Minor watercourse with limited ecological value. No flood alleviation benefits or important morphological diversity (i.e., is small upland watercourse)
Owenkillew River, main channel	High	Important sensitive and protected ecosystem

6.2.2 The Owenreagh and Owenkillew Rivers are both assigned ‘High’ sensitivity as a result of their designated status and high water quality.

6.2.3 The main watercourses providing drainage to the proposed overground infrastructure, the Pollanroe Burn and Unnamed Watercourse, and the Curraghinalt Burn which provides drainage to the existing aboveground infrastructure, are all assigned 'Low' sensitivity on the basis that they are minor watercourses with limited ecological value, no flood alleviation benefits or important morphological diversity.

6.2.4 I have not been able to identify any supporting evidence to underpin the 'Low' rating within any of the submitted ES documents in the form of water quality test results, water flow and flooding data, ecological sampling results or hydromorphological information.

Discussion

6.2.5 During the site visit undertaken in March 2024, I was able to ensure that the field survey group including myself visited a number of the key watercourses in the area. These included the Owenreagh River, Curraghinalt Burn, Pollanroe Burn and Unnamed Watercourse.

6.2.6 The Pollanroe Burn in its current form shows limited to no artificial modification. The areas of peat and wetland habitats in the headwaters and upper channel provide flood alleviation by means of water retention and slowing of flood peaks. Some artificial drainage channels have been excavated in the headwaters part of the catchment in an attempt to improve the drainage of the boggier areas.

6.2.7 Photographs provided below show the Pollanroe Burn during the site visit undertaken in March 2024, and give an idea of the range in morphology and channel type present within the catchment. **Photograph 6.1** and **Photograph 6.2** show a naturally variable-width channel with varied riparian vegetation, clear water and pool-and-riffle sequences. **Photograph 6.3** shows part of the bog and wetland habitat in the headwaters part of the catchment and some of the headwaters channels.

Photograph 6.1. View of the Pollanroe Burn main channel from bridge crossing on the B46 Crockanboy Road, looking downstream.

Photograph 6.2. View of the Pollanroe Burn main channel from bridge crossing on the B46 Crockanboy Road, looking upstream.

Photograph 6.3. View of headwaters area of the Pollanroe Burn catchment showing the areas of bog and wetland habitat.

6.2.8 The Unnamed Watercourse is a smaller watercourse than the Pollanroe Burn. While the main channel is difficult to access directly, the tributaries to the Unnamed Watercourse are easier to observe from publicly accessible land. These are a mixture of natural channels, straightened or modified channels and artificial channels providing drainage to moorland and pasture. The extensive area of boggy moorland in the headwaters area of the catchment provides flood alleviation by means of water retention and slowing of flood peaks to areas downstream.

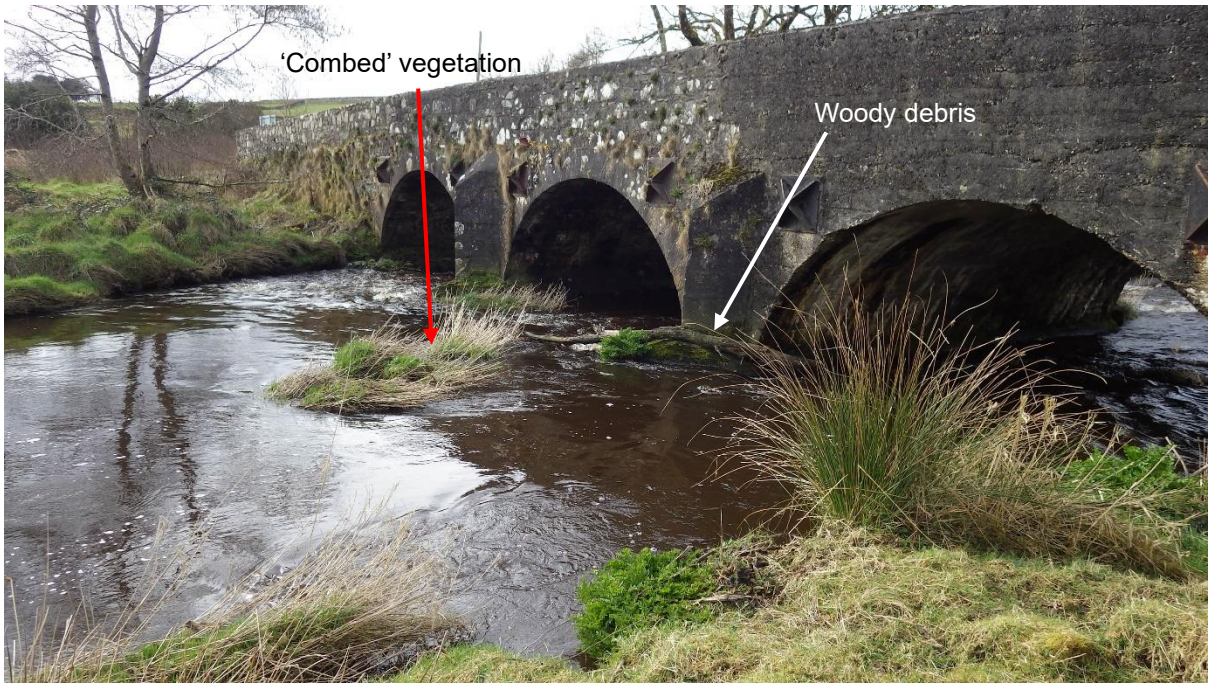
6.2.9 The Curraghinalt Burn is similar in character to the Pollanroe Burn, with a natural and naturally-varied channel morphology. The headwaters area of the burn consists of boggy moorland with some artificial drainage channels. The main channel has a steeper gradient than the Pollanroe Burn, but the riparian habitat appears to be varied and of good quality and the water was clear with no visible signs of suspended sediment.

6.2.10 The Owenreagh River forms a substantial watercourse within the region. Part of the Owenreagh River has been designated as an Area of Special Scientific Interest (ASSI) as a result of its riverine flora and fauna, and its importance for Freshwater Pearl Mussel (*Margaritifera margaritifera*) (DAERA, 2002). While the designation is not explicitly for hydrological characteristics, Freshwater Pearl Mussels are very

sensitive to water quality conditions and require high water quality in order to be viable. Further details of this species and its needs in terms of habitat are discussed by my colleague Mr Jon Davies in his Statement of Case.

6.2.11 The photographs provided below show the Owenreagh River during the site visit in March 2024, and give an idea of the size and flow of the river at this time. **Photograph 6.4** shows the river immediately upstream of the Greencastle Road bridge, with evidence of flood flows with woody debris trapped against the bridge pier. **Photograph 6.5** shows the river immediately downstream of the Greencastle Road bridge where the channel narrows through an extensive riffle sequence with shallower water.

6.2.12 The water was brown-coloured as a result of peat staining but was otherwise clear with no visible signs of suspended sediment. The section of river that was accessible showed a variety of riparian and channel conditions all of which were apparently in good condition. Evidence of high water flows under flood conditions was visible as woody debris caught against the bridge pier, other flood debris caught in bank vegetation and lower tree branches and the appearance of having been combed of grassy vegetation near the channel.



Photograph 6.4. View of the Owenreagh River at the Greencastle Road bridge, looking south across the river channel.

Photograph 6.5. View of the Owenreagh River from the Greencastle Road bridge, looking downstream.

6.2.13 As noted in **Section 3.2**, **paragraphs 3.2.10-3.2.13** above, the Loughs Agency consultation response dated 5th March 2021 identifies that the lower reaches of the Curraghinalt Burn are suitable for salmon parr and that a section of the Pollanroe Burn contains excellent habitat for Atlantic salmon, sea trout, brown trout and possibly lamprey species.

6.2.14 This assessment of habitat value from a key consultee, combined with my observations from the site visit and the undisputed high sensitivity of the receiving watercourses the Owenkillew and Owenreagh Rivers, raises a significant concern about the applied 'Low' sensitivity rating to all the minor watercourses.

6.2.15 The Precautionary Principle is an approach to risk management where, if it is possible that a given policy of action might cause harm to the public or to the environment, and if there is no scientific agreement on the issue, the policy or action in question should not be carried out. It is a well-established practice in Environmental Impact Assessment to apply the Precautionary Principle when there is a lack of environmental data or evidence relating to the baseline conditions of an environmental receptor. In the situation at hand, there is an apparent lack of data relating to the current condition of the minor watercourses in the Owenkillew and Owenreagh Rivers catchment areas. Both the Owenkillew and Owenreagh Rivers

have been accorded ‘High’ sensitivity as a result of their designated status for support of protected freshwater species. Application of the precautionary principle would indicate that the tributary watercourses should also be accorded ‘High’ sensitivity status in the absence of evidence to support a lower rating.

6.2.16 In my professional practice, I have never previously encountered a situation where, with limited supporting evidence, a minor watercourse or waterbody is assumed to be of ‘Low’ sensitivity where its receiving watercourse or waterbody has ‘High’ sensitivity, or where nearby watercourses that have been assessed by the environmental regulator have been accorded ‘High’ status. The accepted practice would be to assume that the unassessed watercourses are of similar status to the assessed watercourses.

6.2.17 In my professional opinion, the status of the Pollanroe Burn, Unnamed Watercourse and Curraghinalt Burn should all be accorded ‘High’ sensitivity status. Following the impact assessment method as set out in the SWIA (2020), this change in sensitivity would result in a Significant adverse and permanent impact on the Pollanroe Burn and Unnamed Watercourse, and a Significant negative and long-term impact on the Curraghinalt Burn.

6.2.18 In my professional opinion, therefore, the current Impact Assessment considerably understates the risk to the Pollanroe Burn, Unnamed Watercourse and Curraghinalt Burn The implication of this is that the damage to these watercourses that would be required in order to implement the Proposed Development would have a substantially greater impact on the water environment and on the associated wetlands and freshwater habitats than is stated in the ES. This needs to be carefully considered as part of the planning balance for the Proposed Development.

6.3 Uncompensated loss of Pollanroe Burn headwaters

6.3.1 The proposed design for the DSF and water treatment system would result in direct and permanent loss of the uppermost 975 m of the headwater tributaries to the Pollanroe Burn, as set out in this extract from the 2017 Non-Technical Summary (NTS; ES Volume 1, 2017, p25):

Disturbance of land at the proposed infrastructure site will affect the following important ecological features:

- 10.61 ha of marsh/marshy grassland habitat;
- 2.62 ha of wet heath/acid grassland mosaic habitat;
- 9.05 ha of bog habitat that, although is modified, conforms to blanket bog habitat;
- A small flush area of 0.03 ha;
- The fen habitats within the infrastructure site, which includes 7.94 ha of valley mire;
- Standing water, in the form of three ponds, with an area of 0.15 ha, within the infrastructure site;
- 975 m of the headwater tributaries of the Pollanroe Burn.

6.3.2 Although not stated explicitly in this list, accompanying maps of the proposed infrastructure indicate that most of the 975 m of channel lost would be from the Pollanroe Burn mainstem (e.g. **Figure 6.1**) as well as another short section of natural channel and various sections of artificial or modified channels. In addition, a number of bog and wetland habitats would also be lost, as specified in the list above. These habitats have relevance for both hydrological reasons and ecological reasons.

6.3.3 These sections of natural watercourse channel would be completely and permanently lost as they would lie under the eastern section of the DSF. The proposed replacement for these natural channels is a drainage ditch, the East Diversion Ditch, which would direct surface water from the Clean Water Pond around the eastern toe of the DSF and into the Pollanroe Burn downstream of the proposed Water Treatment Plant (**Figure 6.2**).

6.3.4 Based on the information provided, there are no proposals to create a natural-style channel to provide some compensation for the loss of the natural watercourse channels. There are also no proposals to attempt to compensate for or replace most of the bog or wetland habitat areas, with the exception of the areas of blanket bog.

6.3.5 There is very limited discussion over the impacts associated with the loss of the natural channels and their natural channel morphology.

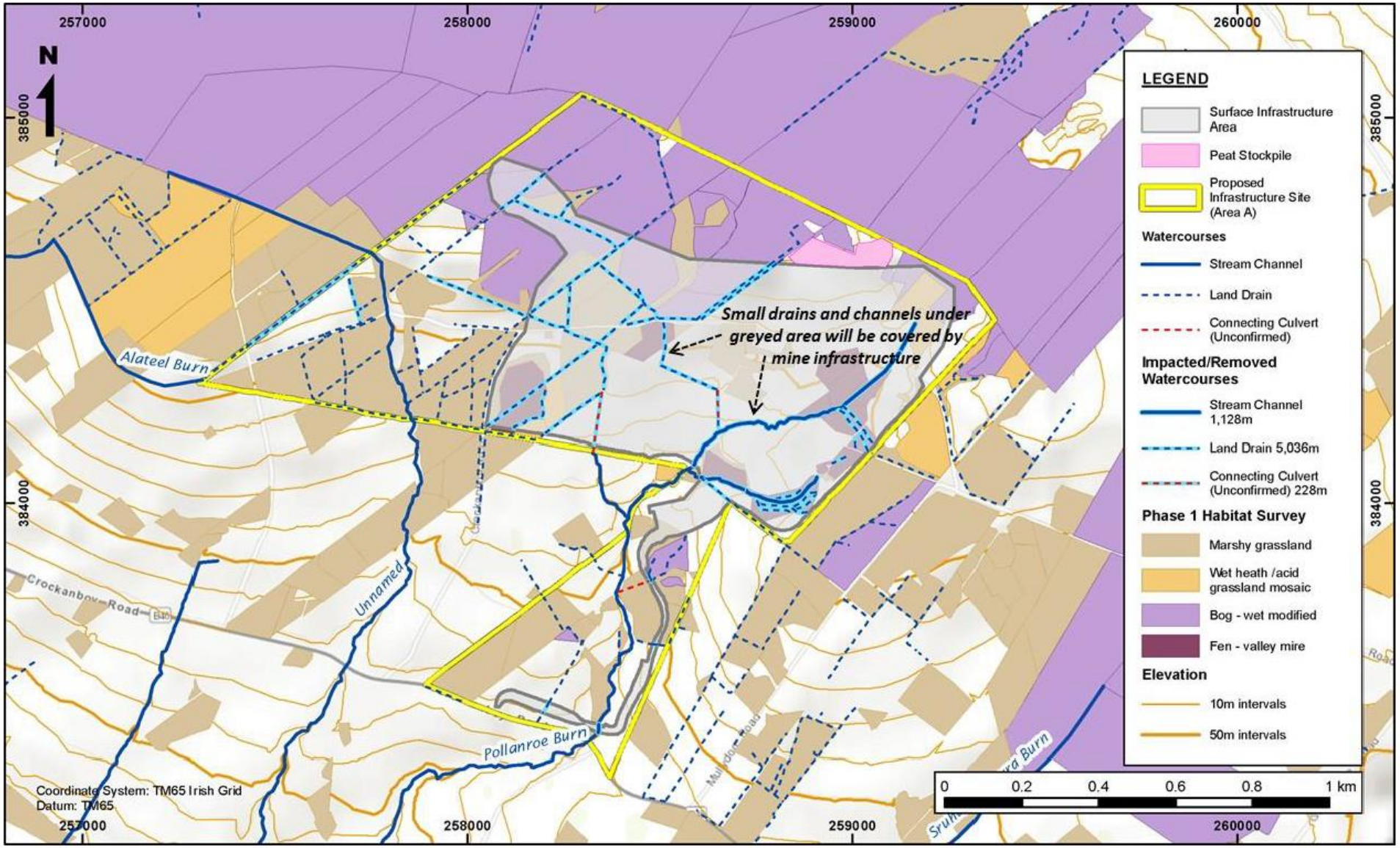


Figure 6.1. Copy of Figure 9-4 showing streams and drains within proposed infrastructure site area. Extract from FEI2 Appendix C4 Surface Water Impact Assessment, October 2020 (p93).

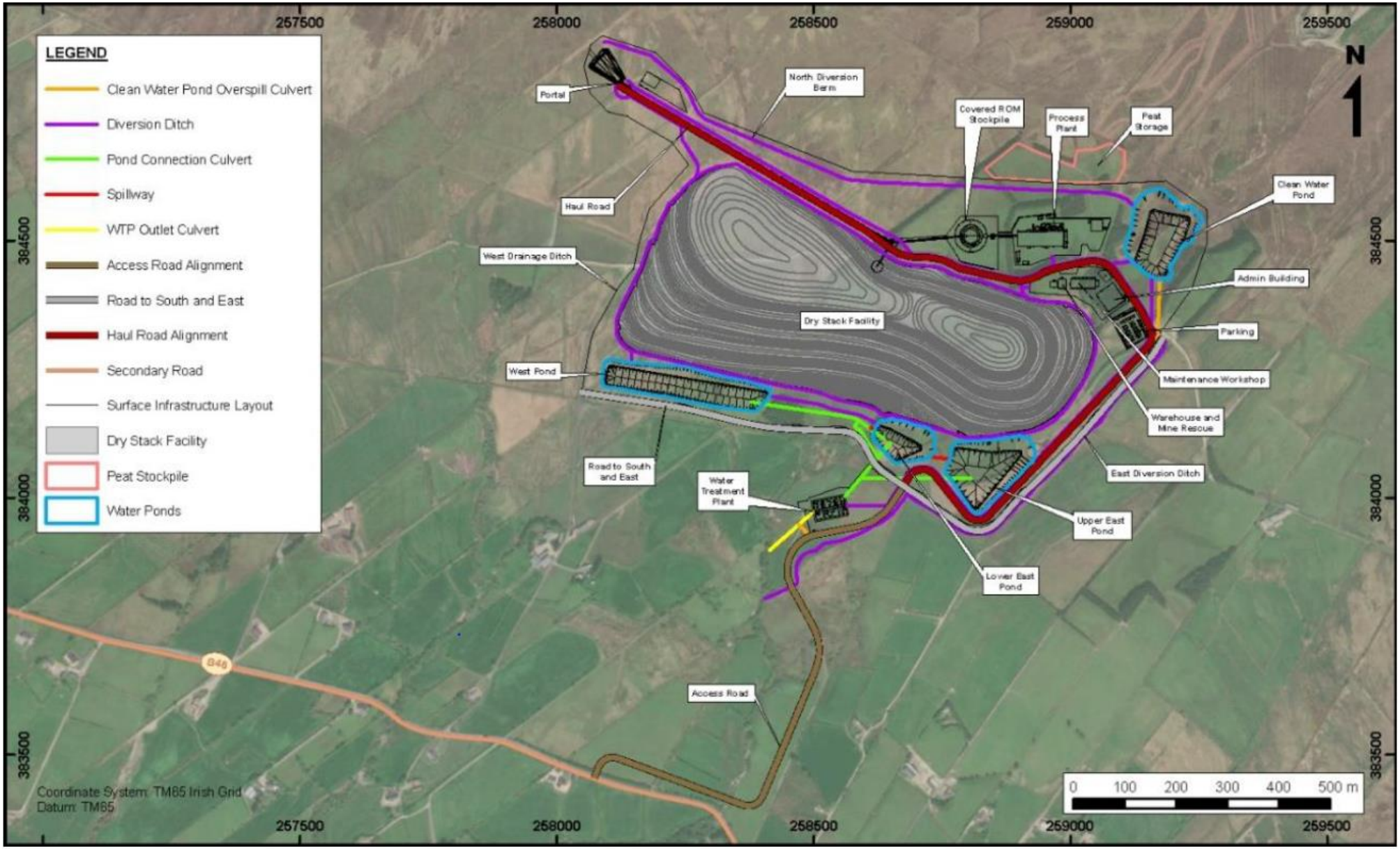


Figure 6.2: Copy of Figure 2-1 showing the proposed infrastructure site with DSF design. Extract from FEI2 Non-Technical Summary, October 2020 (p5).

Discussion

6.3.6 As far as I can identify, the loss of 975 m of natural watercourse channel and associated wetland habitats has been assessed as having Minor Significance on the basis that the Pollanroe Burn has been assigned Low sensitivity status. While the magnitude of impact is noted to be Major even with mitigation, the overall significance of impact has been assessed as Minor and Not Significant.

6.3.7 In light of the discussion under **Section 6.2**, application of the precautionary principle to the status of the Pollanroe Burn indicates that it should be considered to be of 'High' sensitivity. This would affect the overall significance of impact, based on a Major magnitude, to give a significance of Major and Significant.

6.3.8 It is my professional opinion that the status of the Pollanroe Burn should be accorded 'High' sensitivity status and that the impacts on the burn from loss of 975 m of natural channel and associated wetland habitats should therefore be considered to be a Major impact and Significant within the terms of Environmental Impact Assessment.

6.3.9 As stated in **paragraph 6.2.18**, in my professional opinion the current Impact Assessment considerably understates the risk to the Pollanroe Burn as a result of the 'Low' sensitivity status applied. The implication is that the damage to this watercourse that would be required in order to implement the Proposed Development would have a substantially greater impact on the water environment and on the associated wetlands and freshwater habitats than is stated in the ES. This needs to be carefully considered as part of the planning balance for the Proposed Development.

6.4 Concentration of flows and cross-catchment flows

6.4.1 The current proposed location of the DSF is mainly within the Pollanroe Burn catchment, with part of the western section crossing into the adjacent catchment of the Unnamed Watercourse. The water management proposals would require diversion of water from part of the Unnamed Watercourse catchment into the Pollanroe catchment to ensure that it is directed through the water treatment plant.

6.4.2 The SWIA (2020) states that approximately 0.07 km^2 of the natural catchment would be diverted to the Pollanroe Burn, resulting in a reduction of flows

"… by an amount proportional to the loss in catchment area."

6.4.3 The natural catchment area for the Unnamed Watercourse is indicated to be 1.39 km^2, with a loss of 0.07 km^2 resulting in a 5% reduction in catchment area. This has been classified as an impact of Minor magnitude for low flow conditions and Negligible magnitude for other flow conditions.

6.4.4 It is stated that this diversion would result in a 6% increase in catchment size for the Pollanroe Burn. This has been assessed as a positive impact on the Pollanroe Burn.

6.4.5 In addition, construction of the DSF would require diversion of natural overland flow around the DSF structure via constructed diversion ditches and ponds. These actions would disrupt the current overland flow paths as well as the existing flow channels, concentrating the flow into constructed channels and removing the water supply to remaining habitats downslope of the diversion channels.

Discussion

6.4.6 The loss of the natural upper catchment areas for the Pollanroe Burn and Unnamed Watercourse and replacement with artificial drainage channels will act to concentrate flows. Surface water flow within natural drainage channels and areas of waterlogged or boggy ground is naturally spread across a wide area, with some flow in channels but much of the flow through the soil horizon and surface vegetation. This is known as ‘through-flow’ and forms a key consideration for surface water and drainage management. Well-designed drainage systems should minimise disruption to through-flow as much as possible, as this flow is naturally slowed by its path through the soil and vegetation which lead to increased friction and a longer and more complex flow path.

6.4.7 Flow within constructed channels is less constrained as the channels are usually straight and have smooth margins. Vegetated channels may have grass along the channel margins, but this only serves to slow the flow in contact with the vegetation and the main flow would be faster than natural flow in a channel of equivalent size.

6.4.8 Capturing of diffuse surface flow into an artificial drainage network acts to concentrate the flow and speed up its transition through the drainage network in comparison with the previous natural flow rates. Cross-catchment flow also focuses the flow in one catchment rather than retaining its natural diffuse character. These lead to stronger flows and a higher erosive power within both the created artificial channel and, potentially, also within the natural channel downstream of the discharge location.

6.4.9 I have been able to find only very limited consideration of the potential impacts of a 5% flow reduction in the Unnamed Watercourse and what effect this might have on its integrity as a watercourse and on the habitats and species that it supports, particularly under low flow conditions with or without any changes resulting from climate change.

6.4.10 Consideration of increase in flow in the Pollanroe Burn is included in **Section 6.5**.

6.4.11 It is my professional opinion that the assessment of Minor and Negligible magnitude impacts on the Unnamed Watercourse do not take proper account of the reduced water level under low flow conditions and the anticipated impacts this would have on the habitats and species within the burn. Combined with the reconsideration of the Unnamed Watercourse's sensitivity, I consider that the assessment of impact has significantly understated the potential impacts.

6.5 Magnitude of flow changes and quality of reverse osmosis water in discharge

6.5.1 Operational flows within the Pollanroe Burn are predicted to increase by 75% in annual average flows at the discharge location. This increase is anticipated to reduce to approximately 50% higher than natural pre-development flow following closure and reinstatement of the project.

6.5.2 There is also a predicted reduction in flood flows within the Pollanroe Burn by approximately 15-35% as a result of the retention and storage of water within the pond system.

6.5.3 The SWIA (2020) assesses the change in flows as a Positive impact on the basis that an increase in flow during low flow periods, typically the drier summer months, is likely to result in the burn retaining flow year-round rather than drying up in drier periods, and that the retention and storage of water within the pond system will help to reduce flood flows.

6.5.4 Section 4.4 of the SWIA (2020) and Annex A (Water Balance) to the SWIA (2020) consider climate change and the impacts this will have on rainfall, evaporation and surface water runoff rates through the life of the mine and into the closure period. The assessment makes use of the UK Climate Change Predictions UKCP18 dataset (Met

Office, n.d.) which remains the latest official dataset for climate change predictions, although some analytical updates were provided in 2022.

6.5.5 Focus within the SWIA (2020) and its Annex A has mainly been on low flow rates, where the increase in flow in the Pollanroe Burn is assessed to have a positive impact through the lifetime of the mine.

6.5.6 No in-depth consideration is given to the reduction in flows in the Unnamed Watercourse, and the increased likelihood that the Unnamed Watercourse will dry up during the drier summer months following the reduction in catchment area.

6.5.7 The assessment also gives some consideration to the reduction in flood flows in the Pollanroe Burn, based on the UKCP18 dataset predictions. This is also considered to have a positive impact on the Pollanroe Burn.

6.5.8 No in-depth consideration is given to the increasing frequency and higher intensity of storm rainfall that has been observed in weather patterns over the last 20 years, and the effect that this is anticipated to have on flood flows and water levels within the Pollanroe Burn during the lifetime of the mine, when taking into account the predicted annual increase in flow within the burn.

6.5.9 In addition, the increased flows within the Pollanroe Burn would be achieved through discharge of ultra-clean water produced via reverse osmosis (RO). The RO process removes all impurities in water at an ionic level, including particles as small as 0.001-0.0001 micrometres (µm) in diameter. This process would remove all potentially polluting minerals, such as heavy metals, nitrates etc., but would also remove beneficial mineral salts that are naturally present in surface waters.

Discussion

6.5.10 Although some consideration of climate change has been included in the impact assessment, this has mainly been focused on low water conditions and the benefit to watercourses of controlled and compensation flow that could be provided from the proposed settlement ponds.

6.5.11 Flood risk has only been considered in relation to reduction of flood flows within the Pollanroe Burn, with no apparent consideration of the effects of high-intensity storms on flow rates, erosion and scour patterns within the burn channel.

6.5.12 Annex A (Water Balance) to Appendix C4 SWIA (2020) states in Section 3.6 (p30) that:

> Initial water balance runs considered the annual variations in rainfall by representing the annual totals as statistical distributions and then assigning the rainfall into monthly totals based on the average monthly rainfall distribution discussed in Table 8. This approach has advantages as it allows the modeller control on the statistics of the annual rainfall totals, but it does tend to smooth out natural variations in monthly rainfall, i.e., it uses an average monthly distribution of rainfall that does not pick up significant variation from that average.
>
> ***and***
>
> This approach allows for a more robust representation of observed variation in monthly rainfall totals but is limited by the available rainfall data series. As the proposed mine life is 20 years, the use of a 54-year time series data is considered robust to assess likely climatic variability during the mine life. The input time series contains one year with >1 in 200-year dry annual runoff totals and around three more with precipitation equivalent to a 1 in 10 dry year or less. In terms of wet years, the historical period contains four years with between 1 in 20 and 1 in 50 wet year precipitation and one with around a 1 in 80-year wet year, all based on fitting the annual totals to a normal distribution.

6.5.13 A shortcoming in the underpinning dataset is that there are no wet years represented with a more than 1 in 100 year return period, but these events are the ones most relevant to the current discussion. Although the flow modelling appears to be adequate for low flow conditions and for moderate flood flow conditions, this gap for high and extreme flood flow events is a concern given the increasing likelihood of experiencing these weather conditions as a result of climate change patterns.

6.5.14 High flows could have a significant impact on river channel morphology as a result of changes to erosion and sedimentation patterns arising from the increased water flow and increased turbulence that accompanies high flow conditions. This in turn would have a consequent effect on the freshwater habitats within the channel and along the channel banks and riparian corridor.

6.5.15 There may also be changes in erosion patterns that affect land holdings to either side of the burn and current infrastructure, such as roads and bridges, that are adjacent to or cross the channel. Changes in water flow patterns and erosive powers are known to undermine bridge structures and can lead to a requirement for engineering works and underpinning to resolve these issues (SFH, 2024). Erosion of river banks

alongside grazing land can lead to overhanging banks and unsafe conditions for livestock in fields adjacent to the river channel.

6.5.16 It is considered that the effects of a significant increase in flow on the fluvial geomorphology, erosion and sedimentation patterns within the river have not been duly considered from either a hydrological or freshwater ecology perspective. The ecological effects are considered in more detail in the Ecology Statement of Case.

6.5.17 Natural hydrological systems have not developed to use ultra-clean water such as that produced by the RO process, as they evolve to make use of rainwater, surface water runoff and varying levels of groundwater baseflow. There are potential consequences for invertebrates which rely on dissolved minerals (such as Calcium Carbonate) to build shells or cases as well as for freshwater fish which rely on water exchange through their gills to maintain their internal salt balance.

6.5.18 There is limited information available regarding the impacts of RO water discharge on the water quality of natural river systems. However, it is recognised within the fishkeeping and aquarium industry that RO water requires remineralisation prior to adding to the aquarium. Practical Fishkeeping (n.d.) states that

"neat RO water can be lethal for fish!

"Because it's nearly pure water, it has zero KH (carbonate hardness). This means that its lack of buffering capacity makes it prone to drastic pH swings.

"Its lack of minerals also plays havoc with fishes' osmoregulatory systems, as well as creating a poor environment for plant growth and development of the biological filter's microbial communities.

"Pure water is too sterile and potentially unstable for aquatic life […].

"RO water needs to be remineralised […]"

6.5.19 RO water is very different from the quality of water usually authorised for discharge from construction sites, as this usual discharge water would retain most of the natural mineral salts from the surface water and groundwater that formed the input into the water treatment system. The usual water treatment processes focus on removing sediment and chemicals such as oil and fuels from the water before it is discharged. In some situations, additional treatment to reduce the level of dissolved minerals may be necessary; these are usually provided by cascade or waterfall structures, settlement lagoons and reedbeds rather than use of RO (Coal Authority, 2017).

6.5.20 While pollutants including heavy metals, fertilisers, pesticides, hydrocarbons and sediment would have been removed, the natural mineral content of the water would remain largely unchanged. As RO water would not include these natural minerals, discharge of large volumes (up to 75% additional water volume) into the Pollanroe Burn would have a potentially significant dilution effect on the water. This in turn could result in widespread fish kills through disruption to their osmoregulatory system and widespread loss of invertebrates that rely on shell construction from Calcium Carbonate, as the RO water would not be able to provide the Calcium Carbonate mineral that they require to construct their shells.

6.5.21 I have been unable to find any water testing or modelling within the submitted documents that considers the water quality impacts of discharging large volumes of RO water into a natural watercourse and the changes this would have on the water chemistry within the watercourse, and as a result on the habitats and species supported by the watercourse. The ecological effects are considered in more detail in the Ecology Statement of Case.

6.5.22 In my professional opinion it is not acceptable to dismiss significant increases in flow within the Pollanroe Burn as universally beneficial with inadequate data to support this claim. The potential for significant negative impacts has not been adequately assessed.

6.5.23 In my professional opinion the absence of water quality testing or modelling for mixing of RO water and natural surface water to determine the likely range of effects on the natural water quality means that it is not possible to assess the impact of such discharge on the water environment. Understanding of the potential direct effects of RO water on water quality, and indirectly on fish and invertebrate species, indicates that a significant impact is possible and may be likely.

6.6 Conclusions

6.6.1 The conclusions of the SWIA as stated at Section 13.1 (p216) are that:

"During construction at the proposed infrastructure site… Calculations show a negligible impact on surface water flows in this area.

"During operations at the proposed infrastructure site… Calculations indicate that the water management at the site will be generally positive in terms of supporting low flows in the watercourses downstream of the mine and reducing flood peaks. Any other

impacts on flows are considered of Negligible overall significance. The only impacts that are considered of Minor significance are:

(i) Reduction in flows in Unnamed Watercourse that result from diversion of headwaters of the stream to the Pollanroe Burn; and

(ii) Removal of headwaters of minor tributaries of Pollanroe Burn, within the proposed infrastructure area."

6.6.2 The underpinning point at issue is the initial assessment of 'low' sensitivity of all the site watercourses except for the Owenkillew and Owenreagh Rivers.

6.6.3 This low sensitivity rating has allowed an assessment of Minor and Not Significant or Negligible and Not Significant for:

- Permanent loss of 975 m of natural watercourse channel and associated wetland habitats in the Pollanroe Burn catchment;
- Permanent loss of catchment and associated reduction in flow levels to the Unnamed Watercourse;
- Permanent increase in catchment area and associated increase in flow levels to the Pollanroe Burn;
- Permanent changes to catchment flow patterns for both the Pollanroe Burn and the Unnamed Watercourse;
- Permanent and large increases in annual average flows in the Pollanroe Burn;
- Potential impacts from discharge of large volumes of RO water into the natural environment.

6.6.4 In addition to the direct effects on hydrology, there are considerable indirect effects on habitats and freshwater ecology. These are considered in more detail in the Ecology Statement of Case.

6.6.5 The sensitivity of receptors has a very important role in the assessment of significance in environmental impact assessment. In this situation, the assumption of 'Low' sensitivity status has downgraded all of the anticipated impacts on the Pollanroe Burn and Unnamed Watercourse to Minor or Negligible and Not Significant.

6.6.6 In my professional opinion, the under-valuing of the sensitivity of minor watercourses in the EIA process is the only reason why Major Adverse and Significant impacts have not been reported for surface water receptors.

6.6.7 It is my considered opinion that impacts on the Pollanroe Burn, its associated wetland habitats and the Unnamed Watercourse should be considered to be Adverse, of Major magnitude and therefore Significant in terms of the EIA process.

6.6.8 The Proposed Development in its current form would lead to unacceptable impacts on surface water and wetland receptors. This needs to be carefully considered as part of the planning balance for the Proposed Development.

7 HYDROGEOLOGY

7.1 Introduction

7.1.1 Part of my instruction was to undertake a review of provided documentation relating to groundwater and hydrogeological concerns. This section sets out the key elements relating to groundwater and hydrogeology that I have identified as requiring further consideration.

7.2 Cross-catchment flows and changes to groundwater flow paths

7.2.1 Groundwater flow is understood largely to mirror the topography, with the Mullydoo, Crocknamoghil and Crockanboy ridge line forming a water divide. The proposed underground mine would cut across this water divide, providing a direct and permanent linkage between the two, currently separate, groundwater catchment areas.

7.2.2 Groundwater modelling undertaken for the Proposed Development indicates that there is potential vertical flow between geological units, consistent with groundwater discharge into the valleys of the Owenkillew and Owenreagh Rivers, indicating that it is likely that groundwater provides a level of baseflow to both rivers. Groundwater flow changes have already been identified as a result of exploratory drilling associated with the existing Curraghinalt mine (Groundwater Impact Assessment [GIA], 2020).

7.2.3 The groundwaters in this area form part of the Gortin Groundwater Body, defined as having a ‘good’ chemical and quantitative status in the North Western River Basin Management Plan Summary (NIEA, 2021).

7.2.4 The GIA (2020) indicates that baseflow to the Owenkillew River would have only minor, if any, changes in terms of water volume. There has been no equivalent modelling provided for the Owenreagh River, although part of the underground mine infrastructure would be located in the groundwater catchment of this river. As a result, it is impossible to state with any certainty whether any changes to the flow or chemistry of the Owenreagh River or its principal tributaries would be anticipated as a result of the underground mine workings.

7.2.5 Impacts on the Curraghinalt Burn have been assessed as Minor and Not Significant, largely as a result of the 'low' sensitivity rating applied to the Burn.

7.2.6 Impacts on the Pollanroe Burn have been considered to be fully compensated for by discharge of the DSF underdrainage into the Pollanroe Burn, and appear not to have been considered further.

7.2.7 Reductions in baseflow to the Curraghinalt and Attagh Burns are predicted to be between 3 and 5%, and reduction in baseflow to the Pollanroe Burn is predicted to be 2.3-2.5% (excluding the proposed groundwater baseflow arising from the pond and DSF underdrainage) (**Table 7.1**).

Table 7.1. Copy of Table 7-12 showing the modelled changes to baseflow in selected watercourses at the end of mining. Extract from FEI2 Appendix C6 Groundwater Impact Assessment (2020).

Watercourse	Average estimated baseflow within the modelled area at end of mine operation (m^3/d)*		Estimated Baseflow Reduction (m^3/d) *[sensitivity maximum]*	50th percentile summer flow (m^3/d)	Reduction in baseflow as a percentage of average summer flow (50th percentile)
	Without Mining	With Mining			
Owenkillew River#	3,946	3,937	9 *[36]*	100,397	0.01% *[0.4%]*
Owenreagh River#	2,398	2,399	-0.9 *[10]*	62,208	0% *[0.02%]*
Curraghinalt Burn	11.4	-9.9	21 *[27]*	622	3.4% *[4.3%]*
Attagh Burn	24.7	12.3	12 *[17]*	372	3.3% *[4.7%]*
Glenealy Burn	67.7	67.1	0.6 *[2]*	683	0.09% *[0.25%]*
Pollanroe Burn*	1,179	1,149	30 *[32]*	1,296	2.3%/ *[2.5%]* *-13%

Notes:

[ ] Italic values inside square brackets show maximum values from the sensitivity analysis range

* Changes in the Pollanroe Burn baseflow during operations are due to groundwater collected by pond and DSF underdrains. These underdrains report to the Pollanroe Burn, with an estimated 204m^3/d of flow for the base-case model. Therefore, the net change is an increase inflow relative to summer flows of approximately 13% based on the base case model

Baseflow values for the Owenkillew River and Owenreagh River are only for the stretch within the groundwater model area. The actual baseflow of the rivers will be considerably more, therefore fractional change in baseflow with mining would be much less. Values affected by this are underlined.

Discussion

7.2.8 The Water Environment (Water Framework Directive) Regulations (Northern Ireland) 2018 provide useful context when assessing proposals which may impact on a relevant type of water body or area.

7.2.9 As discussed in **Section 6.2**, there are significant reservations about the sensitivity ratings assigned to the minor tributaries within the Owenkillew and Owenreagh River catchments.

7.2.10 A reduction in baseflow of 3-5% is similar to the changes in surface water flow discussed in **Section 6.4** in relation to the reduction in flow in the Unnamed Watercourse as a result of the change in catchment area. If the Curraghinalt and Attagh Burns are considered to have 'High' sensitivity, it is more likely that this reduction in baseflow would be assessed as having a Significant effect.

7.2.11 Of particular relevance to groundwater baseflow, these effects would be more apparent in drier periods, as the baseflow proportion of river flows is usually higher in summer than in winter in UK conditions. This is because evaporation is higher in summer, which reduces overland flow, whereas groundwater is released to rivers as baseflow more consistently throughout the year and does not demonstrate such substantial seasonal changes (OU, n.d.).

7.2.12 This means that the reduction in baseflow is likely to have a more significant effect on total water flow than the numerically larger reduction in surface water flow. The combined effect of a 3-5% reduction in baseflow and a 5% reduction in surface water flow is therefore likely to mean that the Unnamed Watercourse would be dry for part of every year, and for longer periods each year, than has been the case to date. Reduction in baseflow to the Unnamed Watercourse appears to have been given no consideration at all in the assessments provided.

7.2.13 The changes in baseflow to the Pollanroe Burn do not appear to have taken account of the reduction in baseflow that would arise as a result of the underground mine workings, but only the changes arising from the underdrainage for the ponds and DSF.

7.2.14 It is my professional opinion that the assessment of Minor and Negligible magnitude impacts on the Curraghinalt Burn, Attagh Burn and Pollanroe Burn have been influenced by the 'Low' sensitivity status accorded to these waterbodies. I consider that the assessment of impact has significantly understated the potential impacts to these waterbodies and that a 'High' sensitivity status would be likely to give rise to a Significant impact.

7.2.15 In my opinion, ignoring potential impacts of reduction in baseflow to the Unnamed Watercourse is not acceptable and these impacts should be modelled in order to determine the level of impact anticipated.

7.2.16 In my professional opinion, the current Impact Assessment considerably understates the risk to the Curraghinalt Burn, Attagh Burn, Pollanroe Burn and Unnamed Watercourse as a result of the 'Low' sensitivity status applied. The implication is that the damage to these watercourses that would be required in order to implement the Proposed Development would have a substantially greater impact on the water environment and associated freshwater habitats than is stated in the ES. This needs to be carefully considered as part of the planning balance for the Proposed Development.

7.3 Groundwater rebound, mine water treatment and post-closure monitoring

7.3.1 Closure of the underground mine is indicated to involve:

"cessation of dewatering, backfill of tunnels and access drives, and recovery of the groundwater level surrounding the mine workings."

7.3.2 The existing adit mine portal at the Curraghinalt exploratory site is proposed to remain open, with a passive water treatment system in place to treat the mine drainage in the long term. Annex D to the GIA (Numerical Groundwater Model Report, 2020, p94) indicates that approximately 81% of the groundwater within the mine would discharge from the existing adit, and 16% will enter the downgradient groundwater pathway and flow away from the mine workings, potentially towards receptors. The remaining 3% is not accounted for.

7.3.3 In terms of water volume, the discharge is expected to remain below 20 m^3/d for the first 5-6 years after closure. Long-term discharge from the adit is estimated to rise to around 800 m^3/d, indicated to be approximately 15-20 years after closure.

7.3.4 The Curraghinalt Gold Mine Existing Infrastructure Site Restoration Plan (LUC drawing number LUC-6335-LP-PLN-004, dated 25th July 2019) identifies a passive water treatment system that will be constructed to treat water that emanates from the exploration adit, and that this will remain as a permanent feature of the Curraghinalt mine site.

7.3.5 A number of different chemicals and compounds (including ammonia, nitrates and heavy metals) that may arise from the underground mine workings or mine water discharge could impact upon the groundwater environment. Further discussion of these compounds, and their potential effects on groundwater chemistry, is provided in **Appendix C**.

Discussion

7.3.6 It has not been possible to identify any calculations to determine whether the sizing of the passive water treatment system identified in the Curraghinalt Gold Mine Existing Infrastructure Site Restoration Plan would be of sufficient size to hold and treat up to 800 m^3/d of discharging water.

7.3.7 While it is recognised that plans for a long-term passive water treatment system have been provided, the absence of any sizing calculations for the system is concerning. It is not possible to determine clearly the size of the pond indicated on the Curraghinalt Gold Mine Existing Infrastructure Site Restoration Plan.

7.3.8 Research and experience in mine water treatment indicate that a series of treatment systems is usually necessary to provide a sufficiently clean discharge into the water environment such that impacts are at an acceptable level. For example, the Coal Authority (2017) indicates that its practice for coal mine discharge is to use a cascade structure to allow mixing of air into the water, followed by a series of lagoons (to give time for suspended particles to settle out of the water), and finally a filtration stage in a series of reedbeds where finer particles are removed.

7.3.9 The restoration plan shows only a single settlement lagoon or pond to provide all stages of required mine water treatment. I have not been able to find any evidence to support the adequacy of a single settlement pond in treating the mine water to an acceptable level for discharge into the water environment.

7.3.10 It is clearly stated that the treated mine water will be discharged into the Curraghinalt Burn and subsequently into the Owenkillew River. The protected status of the Owenkillew River, and the sensitivity of the habitats and species within it to any decrease in water quality, mean that it is imperative that a full understanding of the nature of the discharge is provided, including provision of sufficient evidence that the proposed treatment system has capacity to hold and treat water of this volume for the long term.

7.3.11 I consider that it is a significant failing of the submitted documents not to provide any supporting calculations and sizing parameters for the proposed passive water treatment system. In the absence of these details, and combined with the proposed provision of a single pond rather than the more usual series of ponds and reedbed systems, there are significant concerns about the potential effects of the discharge on the Owenkillew River.

7.3.12 Although general commitments to post-closure monitoring are provided in Appendix K Surface Water and Groundwater Environmental Monitoring and Action Plan to the MWMP (SRK, October 2020), these are general statements and do not provide any detail as to the type and frequency of monitoring that would be anticipated.

7.3.13 It is stated that mine water rebound is expected to continue for between 10 and 20 years once the mine is closed. While it is acceptable that the exact details of post-closure monitoring would be agreed with the relevant regulatory authorities at a later date, as this would permit use of new equipment and technology that has not been developed at present, I would expect a minimum commitment to post-closure monitoring of groundwater and surface water to be undertaken for a period of at least 20 years, with some specification of the type and frequency of monitoring that is proposed.

7.3.14 In my professional opinion, there are insufficient details provided in relation to the sizing of the proposed passive water treatment system at the existing Curraghinalt Mine site to allow assessment of its suitability to hold and treat the predicted volume of mine water post-closure. I also have significant concerns over proposals for a single pond rather than a series of ponds and reedbeds, in line with best practice. These shortcomings provide a significant threat to the protected status of the Owenkillew River from potentially untreated discharge.

7.3.15 It is a matter of concern that 16% of the mine water would pass into the downgradient groundwater pathway and remain untreated. The potential for adverse impacts of this untreated mine water on downgradient receptors (notably the Owenkillew River) appears not to have been adequately considered and there are no proposals for long-term monitoring of the river to determine if any impacts have arisen and what mitigation and management would be required to control the discharge if it were found to be causing contamination of the river.

7.3.16 It is a further matter of concern that 3% of the mine water is unaccounted for, and there is no mention of its likely or potential discharge location or of any impacts that may arise from its discharge. 3% of total long-term discharge could reach around 30 m^3/d (based on 800 m^3/d as representing 81% of the total) and it would not apparently undergo any form of treatment, and must therefore be considered to present a contamination risk to the environment wherever it may discharge in the future. As a minimum, mitigation and management strategies for uncontrolled discharge would be required.

7.3.17 In my professional opinion, the general commitments to post-closure monitoring are inadequate given the high sensitivity nature of the Owenkillew and Owenreagh Rivers. Additional commitments are required to ensure that the potential threats to the Owenkillew and Owenreagh Rivers can be tracked and managed to an acceptable level.

7.4 Conclusions

7.4.1 As set out in **Section 6.6**, one of the underpinning points at issue here is the initial assessment of 'low' sensitivity of all the site watercourses except for the Owenkillew and Owenreagh Rivers.

7.4.2 This has allowed an assessment of Minor and Negligible magnitude impacts to be reported for the Curraghinalt, Attagh and Pollanroe Burns arising from changes in groundwater flow and baseflow to these watercourses. Furthermore, this has effectively justified the underestimation and overlooking of potential impacts to the Unnamed Watercourse.

7.4.3 There are also significant concerns about the sizing of the proposed passive water treatment system at the Curraghinalt mine site and whether one single pond would be sufficient to hold and treat the anticipated volumes of mine water post closure. Provision of an under-sized and potentially inadequate water treatment system poses a significant long-term risk to the water quality of the Curraghinalt Burn and to the Owenkillew River and, therefore, to the status of the Owenkillew SAC and its designated freshwater species and habitats.

7.4.4 Firmer commitments are required in relation to post-closure monitoring, relating to the length of time over which monitoring would be undertaken, the type and frequency of monitoring proposed, and the remedial measures that would be implemented should the monitoring reveal potentially-damaging water chemistry.

7.4.5 In my professional opinion, the under-valuing of the sensitivity of minor watercourses in the EIA process is the only reason why Major Adverse and Significant impacts have not been reported for surface water receptors as a result of changes to groundwater baseflow.

7.4.6 It is my considered opinion that sufficient concerns around the capacity and suitability of the proposed passive water treatment system at the Curraghinalt mine site remain and that there is a potentially Significant risk to the Curraghinalt Burn and Owenkillew River as a result.

8 PEAT

8.1 Introduction

8.1.1 Part of my instruction was to undertake a review of provided documentation relating to peat and peatland concerns. This section sets out the key elements relating to peat and peatland that I have identified as requiring further consideration.

8.1.2 For clarity, I use the following definitions for peat and peatland:

- Peat is *an accumulation of partially decomposed organic material, usually formed in waterlogged conditions. Peat soils have an organic layer more than 50 cm deep from the soil surface which has an organic matter content of more than 60% (Scotland's Soils, 2022).*
- Peatland is *the vegetation and habitat that forms on a peat substrate*.

8.2 Application of current guidance and best practice

8.2.1 The ES and the first FEI (2019) for the Proposed Development are accompanied by a Peat Landslide Hazard and Risk Assessment (FEI Appendix B7; PLHRA) and a Peat Management Plan (FEI Appendix B8; PMP).

8.2.2 In order to prepare these documents, peat depth surveys have been undertaken across the Proposed Development area to characterise the coverage of peat, the variation in peat depth and some estimation of peat condition within the area considered for development.

8.2.3 Much of the current guidance and best practice documentation relating to developments on peat have been produced by Scottish regulators and organisations. This is because Scotland contains the largest area of peat of any of the four UK nations and thus there has been interest in finding an appropriate balance between conserving peat and peatlands and allowing development of necessary infrastructure such as wind farms, most of which are in upland areas with extensive peat presence. Rather than preparing their own guidance and best practice documents, regulators in other parts of the UK have largely adopted the Scottish documentation, as it enables them to take advantage of the experience gained in Scottish development contexts.

8.2.4 The PMP and associated proposals for peat excavation and reuse thus rely mainly on Scottish guidance dating from 2010 to 2012, notably:

- SEPA Regulatory Position Statement – Developments on Peat (SEPA, February 2010);
- Guidance on the Assessment of Peat Volumes, Re-use of Excavated Peat and the Minimisation of Waste (Scottish Renewables and SEPA, January 2012);
- Floating Roads on Peat (Scottish Natural Heritage and Forestry Commission Scotland, August 2010);
- SEPA Restoration Techniques using Peat Spoil from Construction Works (SEPA, July 2011);
- Good Practice During Wind Farm Construction (Scottish Renewables, Scottish Natural Heritage, SEPA and Forestry Commission Scotland, 2010 – 1st Edition); and
- Northern Ireland Peatlands and Uplands Biodiversity Delivery Group (2019) web page 'Peatlands' (https://www.daera-ni.gov.uk/articles/peatlands).

8.2.5 The PLHRA states that it follows the Scottish Government's guidance for peat landslide hazard and risk assessment, although the revised second edition was only released following the fieldwork for the assessment. This guidance is:

- Peat Landslide Hazard and Risk Assessment – Best practice guide for proposed electricity generation development (1st Edition – Scottish Executive, 2006; 2nd Edition – Scottish Government, 2017).

8.2.6 No reference is made to the Scottish Government document "Guidance on Developments on Peatland: Peatland Survey (2017)" which has been the best practice guidance on survey coverage and data requirements since its publication, and sets out the requirements for peat survey for any developments in Scotland, and is also used in Wales as a guide to the level of survey required.

Discussion

8.2.7 The importance of peat as a naturally carbon-rich soil, active carbon sink and substrate for priority habitats has become more widely recognised and understood in recent years, and guidance and best practice in relation to developments on or affecting peat are changed and updated regularly as a result of this understanding. Most of the guidance documents quoted in the PMP are out-of-date in this context, which is a significant concern as the expectations and requirements on developers have changed since their publication.

8.2.8 The document "Good Practice During Wind Farm Construction" has undergone three revisions since its initial publication in 2010. The current version, the 4th Edition, is dated 2019. At the time the PMP was being prepared, the 3rd Edition would have been available as this was produced in 2015.

8.2.9 The understanding of the value and sensitivity of peat as a carbon store, carbon sink, water store and substrate underpinning several priority habitats has developed very considerably over the 12-14 years since most of the earlier guidance documents were produced. In parallel with this understanding, construction methods, peat handling and storage and peat reinstatement methods have also developed to form a body of material that underpins current guidance and best practice in relation to peat management in construction.

8.2.10 There is also very limited reference to policy and strategy specific to Northern Ireland, despite there being some relevant documents that should inform proposals where peat and peatland are likely to be affected. A selection of the key policy, strategy and legislation as in place at present is provided below.

8.2.11 The key elements of the SPPS, Biodiversity Strategy and Regional Development Strategy are set out in **Sections 5.2, 5.3 and 5.4**, above.

8.2.12 DAERA's Northern Ireland Peatland Strategy 2022-2040 (August 2022) states:

> ***"The percentage cover of peatland on the island of Ireland is only exceeded in global terms by three countries, Finland, Canada and Indonesia and as such, our peatland habitats are recognised as being important globally, nationally and locally."***

8.2.13 Peat and peatlands are considered to have an inherent value in terms of natural capital and ecosystem services, meaning that humans can derive a very wide range of benefits and services from ecosystems and their effective functioning (DAERA,

2022). Of particular relevance to peat are: climate regulation and adaptation (through carbon capture and storage); unique biodiversity and habitat for wildlife; drinking water filtration; flood attenuation and water storage; historical archive; areas for recreation and understanding of cultural heritage; and food production.

8.2.14 The Climate Change Act (Northern Ireland) 2022 (CCA) legislates for an ambitious target of net zero by 2050. The UK's Climate Change Committee (CCC) advises that land use change and nature-based solutions, including peatland restoration, should be a significant element of a holistic strategy to deliver this target (CCC, 2023).

8.2.15 Current best practice guidance for developments on peatland is provided by the Scottish Government's publication "Guidance on Developments on Peatland: peatland survey (2017)". This document remains the most recent guidance available in the sector, and is used as best practice in Scotland and Wales, with reference made to it also in England in some situations.

8.2.16 The following statement has been published on the Scottish Government's website in relation to the Scottish Renewables and SEPA (2012) document entitled "Guidance on the assessment of peat volumes, reuse of excavated peat, and the minimisation of waste":

Published: **16 July 2014**
Directorate: Environment and Forestry Directorate
Topic: Environment and climate change

Guidance on the assessment of peat volumes, reuse of excavated peat, and minimisation of waste.

This document, which dates from 2012, has not been reviewed or updated since. It does not reflect current legislation, good practice or controls. It continues to be used to provide some relevant advice, and has been retained for reference purposes.

8.2.17 As a result, while it is acceptable to consider this document for reference purposes, it is no longer appropriate to rely on it as guidance. As the initial ES was submitted in 2017, the Applicant should have been aware that this guidance document was out-of-date and therefore not suitable for use as guidance. This is especially important given the considerable impact upon peat and peatland that would result from the proposals.

8.2.18 The importance of peat and peat soils as long-term carbon stores and as a means of actively sequestering carbon has become much more widely recognised and appreciated within the last 5-10 years. Regulatory focus in much of the UK and internationally now places a very high value on peat in terms of its potential to help in achieving net zero by 2050. With this in mind, the focus now is very much on avoidance of groundworks in or affecting peat, with minimising works in peat as an option where avoidance is not possible.

8.2.19 This position is supported by the NIEA guidance document from 2021, which states:

"PPS18 has introduced a new policy for renewable energy whereby there shall be no development within active peatland unless there are imperative reasons of overriding public interest. The policy indicates that this includes blanket bog and raised bog. Active blanket bog and raised bog are European priority habitats listed under Annex 1 of the Habitats Directive 92/43/EEC. We therefore have an international obligation to conserve these habitats."

8.2.20 While it is accepted that the proposal does not relate to a renewable energy development, the imperative to protect active peatland should apply to all developments in areas with peat.

8.2.21 In addition, the FODC Biodiversity Strategy and Action Plan 2022-2027 (2023) contains specific reference to the loss and fragmentation of natural habitats, and makes reference to the duty on public bodies imposed by the Wildlife and Natural Environment Act (Northern Ireland) 2011 (WANE):

Public bodies, including councils, must consider the following five areas:

- ***Protection of biodiversity***
- ***Maintenance of biodiversity***
- ***Enhancing biodiversity***
- ***Restoring biodiversity***
- ***Promoting the understanding of biodiversity both within and outside the organisation.***

8.2.22 Within the FODC Biodiversity Strategy and Action Plan, at Theme 6: Projects and Partnerships, is a specific commitment to protecting peatlands:

Peatlands are an important priority habitat in Fermanagh and Omagh and represent a significant portion of valuable peatlands for Northern Ireland.

8.2.23 Furthermore, the FODC Local Development Plan (LDP) Strategy identifies peat as a resource in the Minerals Development section:

Peatland as a resource is of enormous importance to our environment, creating distinctive upland and lowland landscapes, conserving biodiversity and affecting river catchment hydrology. There are extensive areas of peat in the Council area and in some localities it is commercially extracted.

8.2.24 FODC LDP Strategy's Policy MIN01 – Minerals Development states:

The Council will support proposals for minerals development where it is demonstrated that they do not have an unacceptable adverse impact upon:

b) the natural environment;

[b)-c) …]

d) the water environment […]

8.2.25 FODC LDP Strategy's Policy NE03 – Other Habitats, Species or Features of Natural Heritage Importance states:

The Council will only permit development likely to result in an unacceptable adverse impact on, or damage to, habitats, species or the features listed below, where the benefits of the development outweigh the value of the habitat, species or feature. In such cases, appropriate mitigation and/or compensatory measures will be required.

8.2.26 'Active peatlands' are one of the features listed under this policy.

8.2.27 The waste hierarchy, used as a basis for the 2012 SR/SEPA guidance, has largely been abandoned in favour of a simpler hierarchy of actions which is intended to retain as much peat in good condition as possible.

8.2.28 The hierarchy in current usage is:

(a) **Avoid** – all areas of peat if at all possible.

(b) **Minimise** – incursion into areas of peat, particularly into larger areas and into deeper peat. 'Deeper peat' varies by UK nation, usually considered to be 0.4-0.5 m in Wales and England and 1.0 m in Scotland, although formal definitions are not established.

(c) **Reuse and compensate** – ties in with point 2, for any areas of peat that cannot be completely avoided there must be a plan for appropriate reuse of excavated peat and compensation for areas lost and/or disturbed.

8.2.29 The general principle is that peat should influence design and layout from conception of a project, and the ES should be able to demonstrate this clearly by showing the evolution of design and the influence of peat on the design as it developed. Where incursion into peat cannot be avoided by careful design, it has to be demonstrated

that development in peat has been kept to a practical minimum and the reasons why it is necessary have to be set out – whether it is to avoid another environmental constraint, such as development adjacent to a river, or because for engineering reasons complete avoidance is not possible, or other reasons as appropriate.

8.2.30 Where peat cannot be avoided and where possible from an engineering perspective, deeper peat should remain *in situ* with infrastructure 'floated' over it, such that it remains a carbon store even if it is unlikely to remain as an active carbon sink, although this depends on the engineering requirements of the infrastructure.

8.2.31 NIEA's Development Management Team Advice Note on Active Peatland and PPS18 (2012) is an internal reference document for NIEA staff, but is made available for reference to developers and their agents and consultants preparing applications for renewables on peatland sites. It sets out details of active and non-active peatland and how to distinguish these, and provides an outline of the surveys necessary within an EIA for developments on peatland. The surveys should include NVC-level surveys as habitats and peat are closely interlinked. The specification states:

> ***The habitat units on site with any peat depth measurement greater than 0.5 m should then be assessed in relation to active peatland. It would be useful for developers to apply the methodology below when identifying active peatland and provide the quadrat details within their ES.***

8.2.32 Survey requirements include details of plant species and percentage cover, areas of bare peat and algal mats, depth of peat, and whether the peat is intact or has evidence of any modifications.

8.2.33 Where the quality and/or extent indicates that the peatland unit is not active, the peatland area could be considered for compensatory or restoration measures. The document states:

> ***Where proposals are under consideration that include compensatory measures and/or allow appropriate rehabilitation management sufficient details should be provided to allow an assessment of the potential net effect of the overall development on peat habitats outside the active peatland area. In the event that such interventions produce a situation of no long term biodiversity loss, the NIEA consultation response will comment accordingly in the context of PPS18 policy RE1.***

8.2.34 The Mine Waste Management Plan Appendix E – Peat Management Plan (PMP) states (p15):

6.0 SITE MATERIALS BALANCE - PEAT RE-USE AND STORAGE

It is anticipated that all the peat excavated at site will either be re-used in landscape dressing following construction, for peat habitat enhancement purposes or stored for subsequent mixing with mineral subsoil to create a topsoil medium for restoration of the Dry Stack Facility and other areas where required on a phased basis.

A peat materials balance has been undertaken by the Project Engineers for the site to determine the volumes of peat arising at the development site which:

(i) can be re-used in the immediate short term (following excavation) for landscape dressing and habitat enhancement purposes (generally the acrotelmic and upper catotelmic (pseudo fibrous) peat) and;

(ii) will require longer term storage within the site (predominantly the catotelmic peat (pseudo fibrous to amorphous peat), behind fully engineered retention berms (or within engineered cells) after it has been mixed with minerals subsoil (also arising on-site) to create a topsoil medium suitable for restoration purposes.

8.2.35 Proposals for immediate and short-term reuse for landscape dressing and habitat enhancement include immediate repairs to small areas that have become damaged during construction, such as to track margins or areas affected inadvertently by vehicle movements, as well as planned reinstatement of track verges, cut slopes and low-rise berms where gradients are suitable for reinstatement with peat.

8.2.36 Material planned for reuse in landscape dressing and reinstatement would either be used immediately or would be stored on a temporary basis for reuse during construction, stated within the PMP as less than 6 months from excavation. These proposals are in line with best practice guidance for peat storage and reuse.

8.2.37 Landscape dressing has been estimated to be able to account for 33,000 m^3 of excavated peat. This option would include reuse of approximately 38% of the acrotelmic peat (the uppermost layer including the active vegetation) and upper catotelmic peat (fibrous to pseudo-fibrous peat from just below the active vegetation).

8.2.38 A small area has been identified for habitat enhancement, as shown on PMP Figure 2 (see **Figure 8.1** below), noted to be able to make use of 10,500 m^3 of excavated peat. This area would also include reuse of acrotelmic peat and upper catotelmic peat, to approximately 12% of the total of this type of peat.

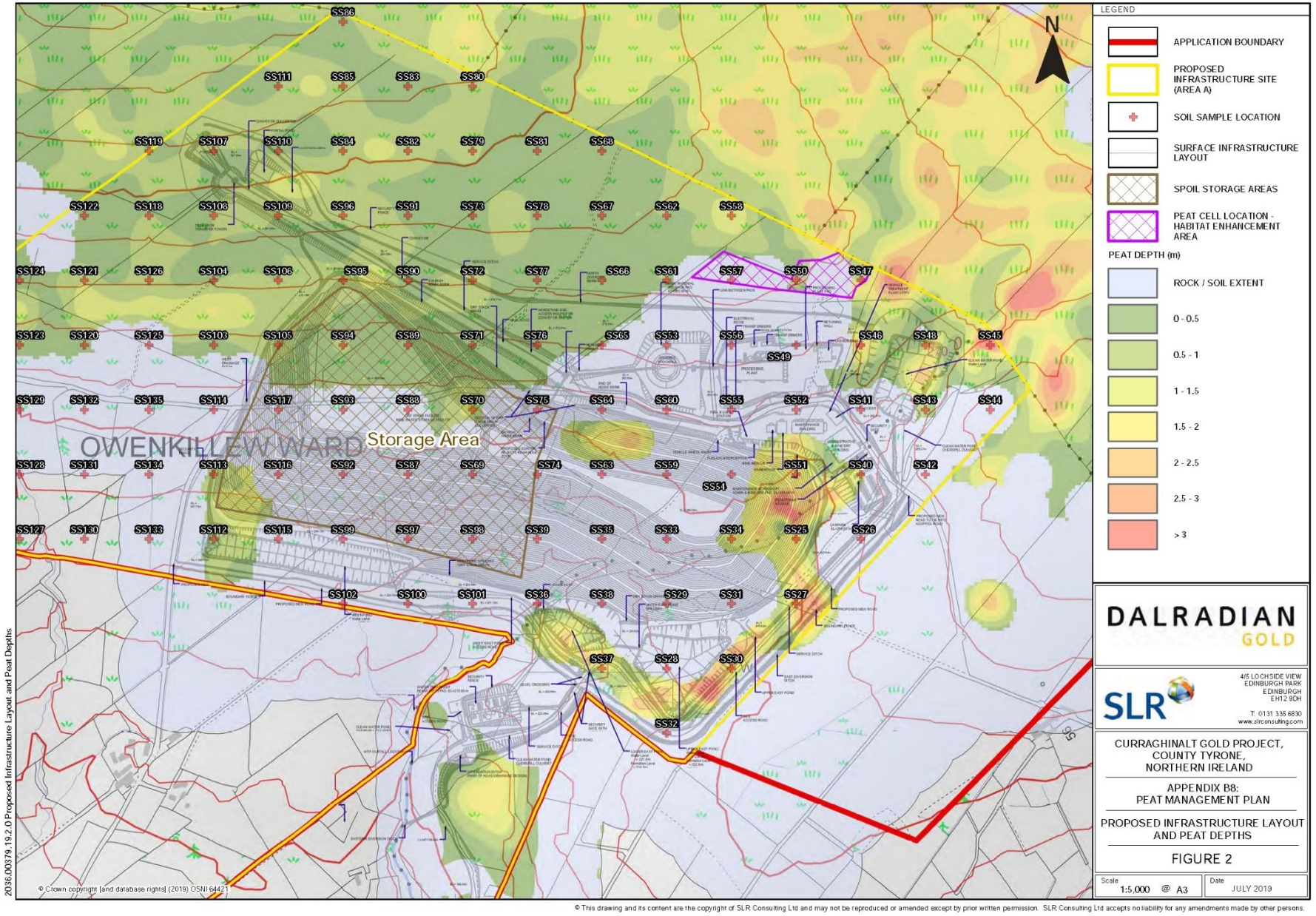


Figure 8.1: Copy of PMP Figure 2 showing the proposed habitat enhancement area (pink cross-hatching) and peat storage area within the DSF footprint (brown cross-hatching).

8.2.39 The remaining 50% of acrotelmic and upper catotelmic peat, plus all of the amorphous catotelmic peat, is proposed for longer-term storage in the storage area proposed within the DSF footprint. This will include all of the valley mire peat proposed for excavation from the Pollanroe Burn headwaters area, as this peat is not considered to be suitable for habitat enhancement or site reinstatement purposes.

8.2.40 The majority of the peat, which is not deemed to be suitable for landscape dressing and site reinstatement, is proposed to be set aside for reuse during progressive rehabilitation of the DSF. This process would involve mixing different types of peat and mineral subsoils together, adding a soil improver and laying it as a soil material on the DSF for seeding and colonising with vegetation.

8.2.41 The stated intention behind the use of peat in rehabilitation of the DSF is to establish peat moorland on the DSF such that it will blend better into the surrounding area. There are a number of problems with this approach.

8.2.42 A detailed description of peat, peat formation, the importance of the peat-forming vegetation layer and the requirement for waterlogging in peat are provided in **Appendix D**. Key elements are provided below.

8.2.43 In order for peat to form, there is a requirement for waterlogged conditions, as this stops the decomposition of dead plant material. This dead plant material collects, becomes compacted over time, and – because it is unable to decompose fully – retains its carbon and gradually builds to form the peat body.

8.2.44 If peat bodies begin to dry out – as a result of drainage, erosion, land use changes or weather and climatic change – the active peat-forming layer of vegetation changes, and the underlying peat material dries, cracks and erodes and the peat oxidises. Oxidation helps to re-start the decomposition process, leading to complete breakdown of the plant material and consequent loss of carbon to the atmosphere.

8.2.45 Key forms of erosion include wind removal of fine particles and water erosion. Water erosion of peat leads to very dark brown water with a high level of suspended sediment consisting mainly of peat particles. This drying and eroding process leads to permanent loss to the atmosphere of the carbon previously held within the peat.

8.2.46 The proposals for peat reuse set out in the ES include use of all of the excavated valley mire peat, some of the bog peat and some of the topsoils and mineral subsoils.

The process of mixing different types of peat together, and with various soils and a soil improver, will destroy the internal structure of the peat and make it more prone to drying-out. Blanket bog and moorland peats are naturally acidic and predominantly rainwater-fed, meaning that they have very low levels of nutrients and are classed as 'oligotrophic' (IPS, n.d.). However, valley mire and fen peats can vary from acidic to neutral or even alkaline, and are often fed by groundwater, some surface water and rainwater, meaning that they have much higher levels of nutrients and a very different mix of vegetation (IPS, n.d.). Both types of peat are valuable as carbon stores and sinks as well as substrates for a wide variety of sensitive habitats.

8.2.47 Mixing the excavated bog and valley mire peats with topsoil and mineral subsoils will speed up the drying-out process and will therefore also speed up the oxidation of peat and consequent loss of carbon. Best practice for storing excavated peat is to keep it in as large blocks as possible, to retain its internal structure, and reuse as quickly as possible to minimise drying out. Where peat has to be stored for any length of time, great care is required to keep it wet so that effective reinstatement is possible in the future.

8.2.48 The proposed process of mixing different types of soils is contrary to best practice. Construction industry best practice guidance specifies that different soils should be kept separate during the excavation process and stored in separate stockpiles, such that they can then be reinstated correctly and with minimal loss of structure, quality and fertility (Defra, 2009).

8.2.49 Mixing different types of peat with different types of soil and then adding soil improver will produce a homogenous substrate that has lost most or all of the value of the peats and the soils used in its production.

8.2.50 While the use of this mixed soil to rehabilitate the DSF would allow coverage with a vegetation mix, there would be no possibility of creating the conditions required for peat formation or development of a peatland habitat in a meaningful botanical sense on a constructed mound of this type.

8.2.51 As stated above, peat formation requires waterlogged conditions in order to develop. The DSF has been designed with:

- underdrainage, to remove groundwater and surface water seepage from the base of the structure;

- internal drainage, to remove any water held within the rock material during its construction; and
- an impermeable cap, to minimise the amount of rainwater that can enter the DSF once it has been completed.

8.2.52 While necessary to provide geotechnical stability of the DSF, these proposals to keep water out of the structure will inevitably lead to an environment that is too dry to support the formation of peat.

8.2.53 In addition, the designed shape of the DSF with a smooth, rounded top and side-slopes at angles of approximately 18-22° (1V:3H to 1V:2.5H; MWMP, Appendix B3, 2020) is intended to shed water rather than collect and hold it, further contributing to an environment that is unsuitable for peat formation.

8.2.54 Parts of the DSF, parts of all four of the proposed ponds, the site access and haul roads, and most of the conveyor, are located on areas with recorded peat. The PMP notes in Section 4.2 (p8) that:

Peat depths in excess of 5m were identified at the site in the Valley Mire, along the eastern edge of the proposed infrastructure area.

8.2.55 Similarly, the PLHRA notes in Section 2.8.1 (p11) that:

Peat thickness is generally between 0.1 to 1.0m, with thicker peats at the eastern edge of the area which are up to 6.5m in thickness at the valley mire.

8.2.56 This depth of 6.5 m is noted again in Section 2.8.2 of the PLHRA, on p13, as being present in the area through which the headwaters of the Pollanroe Burn flow.

8.2.57 The eastern end of the DSF, parts of the upper and lower East Ponds, the Clean Water Pond and much of the access road into the Site are all located on areas with peat depths greater than 3.0 m and where proposals are to excavate the peat in order to facilitate construction. Of particular note is the part of the DSF overlying the area of very deep peat in the valley mire, at depths of up to 6.5 m.

8.2.58 There appears to have been little or no attempt to design or relocate these elements of infrastructure to avoid the areas of deep peat, or in particular to redesign the DSF to avoid the area of very deep peat. The proposals in place amount to a ‘dig and dump’ strategy where the peat would be excavated in its entirety and set aside to be used in ‘rehabilitation’ of the DSF.

8.2.59 The PLHRA indicates at p37 that constructing the DSF and adjacent features over unexcavated peat of 3.0 m or deeper could lead to a risk of peat landslide, and sets out three mitigation options:

There are three potential mitigation options with regard to the risk to peat stability during and post construction:

i. **Option 1 -** Leave peat *in situ* and design appropriate protection to mitigate risk of a peat instability;
ii. **Option 2 -** Excavate and remove the peat;
iii. **Option 3 -** Avoid the areas of peat.

8.2.60 Option 3 (avoid) is dismissed as unviable due to site constraints. However, in the accepted hierarchies in place in other parts of the UK, 'avoid' forms the first step in the design process, not the last (e.g. PPW, 2024).

8.2.61 In all areas where potential peat slide risk has been identified, the only proposed mitigation is excavation of peat (PLHRA Table 6.9, p40). Current widely used guidance and best practice would advise avoidance of areas of peat in the first instance, which also avoids potential peat slide risk in these areas. Excavation of peat to avoid potential peat slide is not recognised as an acceptable management strategy in any UK jurisdiction because of the large volumes of peat material that would be generated and that would therefore require disposal.

8.2.62 I have been able to identify no evidence presented within the assessments to indicate that attempts to design the DSF and adjacent infrastructure have been considered in order to avoid these areas of very deep peat. Chapter 5 Consideration of Alternatives states that:

Environmental considerations had high priority in the evaluation of the sites.

8.2.63 However, it does not provide any meaningful consideration of peat except in respect of blanket bog habitat as part of the siting criteria. There is no evidence that peat itself was given due consideration during the site evaluation process, or that the DSF and other above-ground infrastructure were designed taking full and appropriate consideration of all kinds of peat deposits into account.

8.2.64 In my professional opinion, the assessment has not provided an overriding environmental or engineering reason to justify removal of peat up to 6.5 m in depth. These proposals are counter to the Strategic Planning Policy Statement for Northern Ireland (2015), the Northern Ireland Biodiversity Strategy 2015, the Northern Ireland

Regional Development Strategy 2035, notably policies RG9 and RG11, and FODC's Local Development Plan 2030 (2023).

8.2.65 In my professional opinion, the proposals for reuse of the excavated peat in rehabilitation of the DSF are counter to recognised best practice in place in the UK. Although proposals for use of some excavated peat in habitat enhancement and in site reinstatement appear to be in line with current guidance, **more than 73%** of the total estimated peat that would require excavation is proposed to be used in rehabilitation of the DSF (122,068 m^3 of a total 165,568 m^3; Table 4, p17 of MWMP Appendix E PMP). The proposed method of mixing different types of peat together and adding other soil materials including mineral subsoil, plus a soil improver, will destroy the peat completely. This 'mixed topsoil medium' may be suitable for growing vegetation cover on the DSF, but it will not meet any of the accepted definitions for peat or peatland owing to the unsuitable preparation of the mixed topsoil medium and its situation on the slopes of a constructed mound.

8.2.66 In my professional opinion and professional experience in peat reinstatement and peatland restoration, reuse of mixed peat and soils in rehabilitation of the DSF will not be successful as a method of peatland compensation. Both the peat soils and the peatland habitats will be completely destroyed in the process. Compensation proposals are completely inadequate to cover the scale of loss of peat and peatland that would be required to allow construction of the Proposed Development.

8.3 Survey coverage in relation to current guidance and best practice expectations

8.3.1 In lieu of published peat survey guidance for developments on peat in other parts of the UK, the Scottish Government guidance document "Guidance on Developments on Peatland: Peatland Survey (2017)" is used as best practice guidance in the rest of the UK as well as in Scotland.

8.3.2 The guidance document specifies that peat depth and condition surveys are usually conducted in two or more stages:

- Phase 1 surveys are intended to gather broad information covering the whole of the proposal area. These are conducted on a 100 m grid.

- Phase 2 surveys focus on areas of proposed infrastructure. For new tracks, the guidance requires peat depth records at 50 m spacings along the track centreline plus right-angled offsets to either side at 10-25 m from the centreline. This gives three survey points per 50 m length of track. Where existing track is proposed for upgrade, offset probing at 50 m intervals to either side of the existing track is required. Other infrastructure is expected to be surveyed on a 10 m grid.

8.3.3 The guidance was prepared for wind farm developments, so is open to a level of interpretation for non-wind farm developments. However, the principles remain the same and are widely applied to non-wind farm development proposals.

8.3.4 The PLHRA (FEI Appendix B7, 2020) states that:

> ***Peat depths have been determined by probing peatland at predetermined locations. In 2012, the probing was undertaken at 100 m intervals across the ridge. In 2015, the probing was undertaken at 50 m intervals and focused on the proposed infrastructure site which was not previously surveyed.***
>
> ***The proposed infrastructure site was covered by the Phase 1 Peat Survey, the Phase 2 focused on the proposed infrastructure area and the detailed probing as part of the PLHRA was focussed [sic] on the areas of thicker peat located where the proposed infrastructure area is to be located.***

8.3.5 Survey coverage for the Proposed Development appears to be acceptable for a Phase 1 survey, although the peat condition data are limited in detail.

8.3.6 The Phase 2 survey coverage is indicated to cover most of the proposed infrastructure area on an approximately 50 m grid, shown on Figure 6 of the PLHRA and Figures 2 to 4 of the PMP (FEI Appendix B8, 2020). Some small areas of irregular, close-spaced probing are indicated, notably adjacent to areas of deeper peat records; this would appear to correspond to the stated detailed probing as part of the PLHRA.

Discussion

8.3.7 There are some apparent gaps in the 50 m Phase 2 survey, notably in parts of the proposed DSF footprint and in the area around the proposed water treatment plant (see **Figure 8.2**, below). Data gaps can occur for a variety of reasons – usually inaccessibility or health and safety (for example, fallen trees or unstable ground) – but can pose problems within subsequent analysis. Subsequent use of peat depth survey data makes use of an interpolation, usually undertaken in a Geographical Information System (GIS) software package.

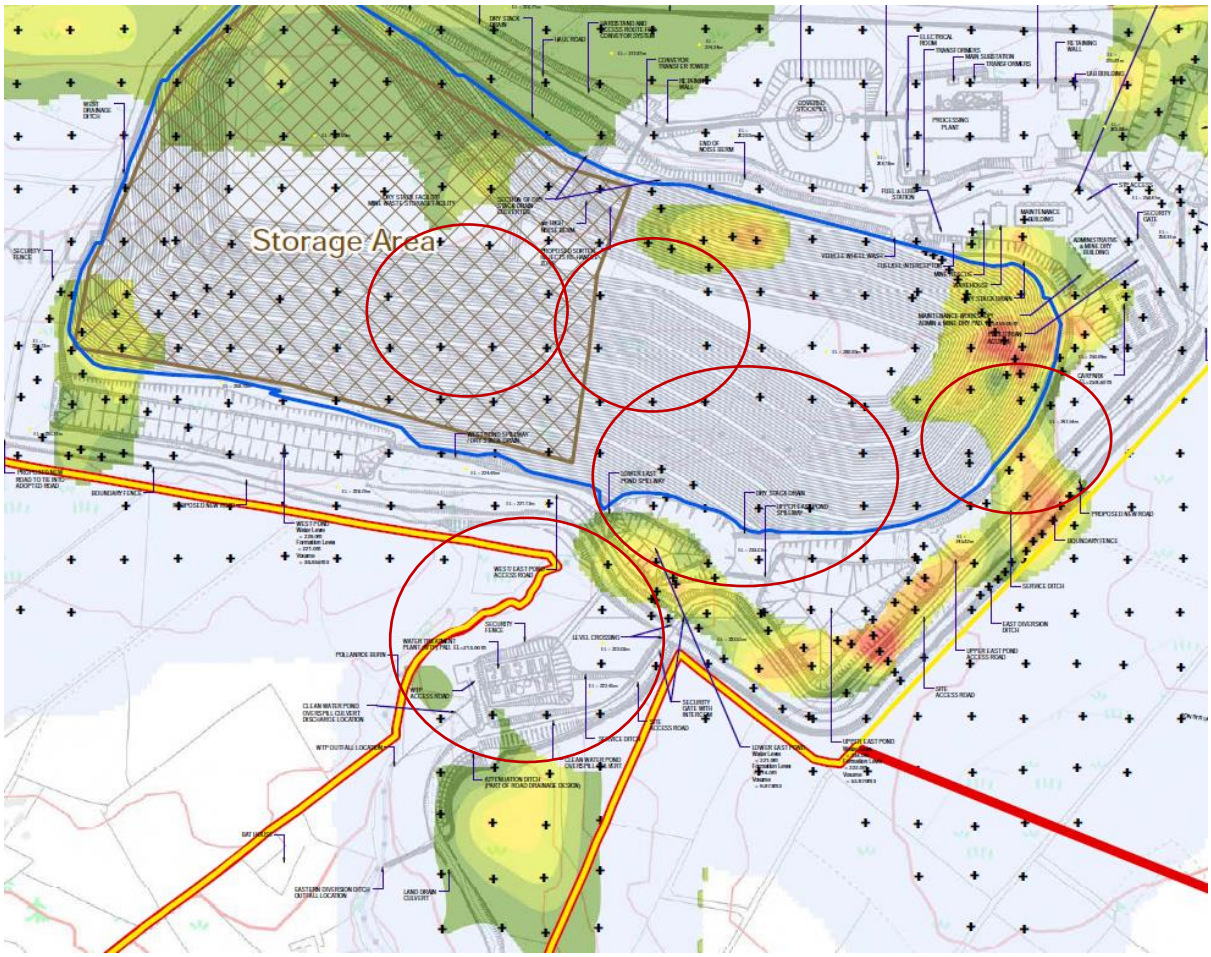


Figure 8.2. Extract from the PLHRA Figure 6 (FEI Appendix B7, 2020) showing data gaps in the peat depth survey marked with red ellipses (my mark-up).

8.3.8 As a form of model, these interpolations are only as good as the input data provided. Where gaps are present in the underlying data, the interpolation becomes questionable, and larger gaps mean greater uncertainty in the model. My personal experience in this area indicates that gaps of 150 m or more within the dataset make an interpolated model unreliable in these areas.

8.3.9 The absence of data from the three areas that coincide with the Pollanroe Burn (the two easternmost areas in the DSF footprint and the water treatment plant area) is of particular concern given the noted association between the Pollanroe Burn headwaters and the areas of valley mire, in which the deepest peat has been recorded. The data gap covers an area of approximately 300-400 m of the Pollanroe Burn headwaters area.

8.3.10 There is a very real possibility that areas of deep peat have been missed as a result of these data gaps. This would then lead to a potentially significant under-estimation of the volumes of peat that would need to be excavated and reused within the Proposed Development. This in turn would downplay the carbon emissions that would arise from peat excavation (please refer to the Carbon and greenhouse gas impact Statement of Case).

8.3.11 In addition, the Phase 2 and focused peat survey coverage do not provide the level of granularity expected for significant above-ground construction. While it is arguable that areas demonstrated to have no peat by the Phase 1 100 m grid and Phase 2 50 m grid could therefore be left with no further survey, additional coverage to define the areas where peat *has* been identified would be a minimum requirement (Scottish Government *et al.*, 2017). This has only been provided in a few small areas, and peat extent has not been defined sufficiently to ensure that the areas have been appropriately captured. Existing evidence from this Site demonstrates that peat depths vary substantially over very short distances (refer to PLHRA Figure 6), and my own experience of peat surveys indicates that depths can change by several metres across a surface distance of under 50 m.

8.3.12 This shortage of data in an important part of the Site raises concerns about the reliability of the PMP and its peat volume calculations, and also undermines the reliability of the PLHRA in an area where the stated risk of peat slide with no mitigation is classed as High (Table 6.7, PLHRA p37, FEI Appendix B7, 2020).

8.3.13 It is a widely recognised concept within the world of modelling that a model is only as good as the data and the assumptions from which it is built (e.g. Viscanti, 2022). In this case, the data gaps raise justified concerns over the reliability of the conclusions drawn from the model.

8.3.14 In my professional opinion, the gaps in peat survey coverage, and the lack of granularity in survey records in areas where deep peat has been identified, undermine the reliability of the PMP and PLHRA provided for the Proposed Development. The PLHRA provides only one method of mitigating peat slide risk – that of excavation of all peat in these areas. While this effectively removes the risk of peat slide, it provides different problems relating to peat handling and reinstatement and the proposals for this are contrary to best practice and current guidance relating to peat management. In addition, the shortage of peat depth data in key parts of the

site give rise to a concern that peat volumes may have been significantly under-estimated and that more peat may require to be excavated than previously thought.

8.4 Conclusions

8.4.1 Much of the consideration of peat appears to have been based on guidance documents from 2010 and 2012, with very limited acknowledgement that understanding of the value of peat has changed very substantially in the intervening years.

8.4.2 The proposals to excavate peat up to 6.5 m deep, with very little explanation of why this is unavoidable, are in conflict with current guidance and best practice as well as contrary to the policies set out in the Strategic Planning Policy Statement for Northern Ireland (2015), the Northern Ireland Biodiversity Strategy 2015, the Northern Ireland Regional Development Strategy 2035, notably policies RG9 and RG11, and FODC's Local Development Plan 2030.

8.4.3 The proposed mixing of different types of peat and soil to produce a substrate for use in rehabilitation of the DSF demonstrates a comprehensive lack of understanding of effective peat reuse in restoration and reinstatement, and of the devastating consequences for peat of being allowed to dry out.

8.4.4 While the peat depth survey has a fair coverage, there are significant gaps and a distinct lack of close-spaced survey points in key parts of the above-ground infrastructure area. This data shortage indicates that the findings of the PMP and PLHRA may be unreliable, particularly for the areas of greatest concern over the depth and coverage of the peat bodies present, and over the volumes of peat that would arise as a result of the proposed excavation to avoid peat slide risk.

8.4.5 In my professional opinion, the proposals for reuse of excavated peat are unacceptable because of the inevitable release of carbon from the peat through drying and oxidation, and the unsuitability of the DSF as a target for restoration of active peat and peat habitats as a result of its design for geotechnical stability.

8.4.6 In my professional opinion, the proposals are further undermined by the avoidable data gaps in the peat depth survey on which all peat assessment has been based. These gaps raise questions about the reliability of the results of both the PMP and PLHRA, particularly in the areas with wider peat cover and the areas of deepest peat.

9 DECLARATION

Statement of compliance

9.1.1 I understand that my duty as an expert witness is to the inquiry. I have complied with that duty and will continue to comply with it. This report includes all matters relevant to the issues on which my expert evidence is given. I have given details in this report of any matters which might affect the validity of this report. I have addressed this report to the inquiry. I further understand that my duty to the inquiry overrides any obligation to the party from whom I received instructions.

Statement of conflicts

9.1.2 I confirm that I have no conflict of interest of any kind, other than any which I have already set out in this report. I do not consider that any interest which I have disclosed affects my suitability to give expert evidence on any issue on which I have given evidence and I will advise the party by whom I am instructed if, between the date of this report and the trial, there is any change in circumstances which affects this statement.

Statement of truth

9.1.3 I confirm that I have made clear which facts and matters referred to in this report are within my own knowledge and which are not. Those that are within my own knowledge I confirm to be true. The opinions I have expressed represent my true and complete professional opinions on the matters to which they refer.

9.1.4 I understand that proceedings for contempt of court may be brought against anyone who makes, or causes to be made, a false statement in a document verified by a statement of truth without an honest belief in its truth.

Signed: 

Date:
14th October 2024

10 ACRONYMS, GLOSSARY AND REFERENCES

10.1 Acronyms

ASSI	Area of Special Scientific Interest
CANN	Collaboration Action Natura Network
CCA	Climate Change Act (Northern Ireland) 2022
CCC	UK Climate Change Committee
CEMP	Construction Environmental Management Plan
DAERA	Department of Agriculture, Environment and Rural Affairs, Northern Ireland Executive
Defra	Department for Environment, Food and Rural Affairs, UK Government
DGL	Dalradian Gold Limited
DfI	Department for Infrastructure
DSF	Dry Stack Facility
EIA	Environmental Impact Assessment
ES	Environmental Statement
FEI	Further Environmental Information
FODC	Fermanagh and Omagh District Council
GIA	Groundwater Impact Assessment, ES FEI2 Appendix C6
GIS	Geographical Information System, a form of computer software that creates, manages, analyses and maps all kinds of data
GSL	Geological Society of London
GSNI	Geological Survey of Northern Ireland
ha	hectare
IOM3	Institute of Materials, Minerals and Mining
IPS	International Peatland Society
IUCN	International Union for Conservation of Nature
µm	Micrometre, metric unit of length equivalent to 0.001 millimetres
MWMP	Mine Waste Management Plan
NIEA	Northern Ireland Environment Agency

NTS	Non-Technical Summary
PLHRA	Peat Landslide Hazard and Risk Assessment
PMP	Peat Management Plan
PPW	Planning Policy Wales
SPPS	Strategic Planning Policy Statement for Northern Ireland
SWIA	Surface Water Impact Assessment, ES FEI2 Appendix C4
RO	Reverse osmosis
UKCP18	UK Climate Change Predictions 2018.
WANE	Wildlife and Natural Environment Act (Northern Ireland) 2011
WRc	Water Research Centre Limited, part of RSK Group

10.2 Glossary

Acrotelm, acrotelmic	The uppermost vegetated layer of a peat body. The acrotelm has a distinct internal structure provided by the living vegetation, which becomes less distinct with depth.
Amorphous	Without a clearly defined shape or form. Used in peat descriptions for the more highly decomposed deeper parts of a peat body where all the plant structure has been lost.
Artificial	Made or produced by humans rather than occurring naturally.
Baseflow	The flow of water in a river or stream derived from groundwater and water stored in soils.
Buffering	The ability of water or a chemical solution to resist changes in pH.
Catchment	An area with a natural boundary where all surface water drains to a common channel to form a river.
Catotelm, catotelmic	The part of a peat body below the acrotelm or vegetated layer. The catotelm usually has a higher level of decomposition and, as a result, a weaker internal structure and can collapse upon excavation. It is described as fibrous or pseudo-fibrous when some of the plant fibres remain identifiable, or amorphous when plant material has all been decomposed.
Cross-catchment	The flow of water from one catchment area to another.
Compensation flow	Water released from a storage reservoir or pond to maintain flow levels in a river or stream, usually during low flow periods to ensure that the river retains a similar level of flow to conditions before the storage reservoir was constructed.
Diffuse flow	See Overland flow

Dilution	The action of making something weaker. For example, if water is too salty (for cooking), adding more water to make the water less salty would be a form of dilution.
Direct effect or impact	Effects or impacts that are caused directly by the activity.
Discharge	The volume of water that passes a given location within a given period of time. Often stated as metres cubed per day (m^3/d) or litres per second (l/s).
Drainage pathways	Overland routes where surface water flows, not necessarily forming watercourses.
Dry stack facility	Mine waste tip consisting of solid waste material formed into a structured mound.
Erosion	The process through which rocks and soils are broken down by natural forces such as wind and water. The breakdown can be physical, where particles are broken into smaller pieces, or chemical, where the chemical composition of the material is changed – for example, rust on iron tools.
Evaporation	Process by which an element or compound transitions from being a liquid to being a gas.
Fibrous (see also Pseudo-fibrous)	Consisting of or characterised by fibres. In peat, these fibres are derived from the peat-forming plant material.
Flood alleviation	Reducing runoff from the land following rainfall by holding or storing water.
Flood peak	The largest discharge reached during a flood event.
Flood debris	Material carried by flood water and left caught in vegetation, fences and against bridges or culverts. Very varied in composition, but may include twigs and grassy vegetation, plastic and other artificial debris.
Flush drainage	An area of more focused flow but not forming a channel. These occur in natural landforms and can form from surface water drainage or from low volumes of groundwater discharging at the ground surface.
Freshwater	Naturally occurring water with low concentrations of dissolved salts.
Groundwater	Water occurring below the ground in rocks, sediments and soils.
Headwaters	The small channels and boggy areas that combine to form a larger river.
High-intensity	In relation to rainfall, an event notable for particularly heavy rain in terms of mm/hour. High-intensity rainfall can lead to flash flooding because water storage and river channels can become overwhelmed and unable to hold all the water.
Homogenous	Also homogeneous. A substance that is uniform in composition or character.
Hydrocarbons	A chemical compound made from carbon and hydrogen. Includes oil, natural gas and petroleum products.
Hydrogeology	Study and science of groundwater.

Hydrology	Study and science of surface water; sometimes used more generically to include groundwater as well as surface water.
Hydromorphology	Study and science of the shape and character of river systems and channels. Also known as fluvial geomorphology.
Indirect effect or impact	Effects or impacts that affect the receptor via an intermediary. For example, effects on freshwater fish caused by a change in water quality that was caused by a pollution incident.
Integrated Master's	A Master's degree undertaken immediately following the final undergraduate year but prior to graduating.
Invertebrate	A collective term for animals that lack a backbone. Includes insects, spiders and worms.
Linkage	A pathway which connects two features.
Mineral salts	Inorganic salts which living organisms need to ingest or absorb to develop and maintain health.
Modified	A natural feature that has been changed by human intervention, e.g. a watercourse channel that has been straightened or dredged.
Morphology	Science of describing shape and structure, e.g. geomorphology describes the shape of the land and the processes that gave rise to that shape; hydromorphology describes the shape and character of a river channel.
n.d.	No date, used for references that are undated – typically web pages.
Osmoregulation	The maintenance of constant pressure in the fluids of an organism by the control of water and salt concentrations.
Overland flow	The diffuse flow of water across the ground surface when not within a channel.
Oxidation	The process of chemical change when exposed to oxygen, such as rusting of iron
pH	The 'potential of hydrogen' and used as an indication of acidity or alkalinity of a substance. A logarithmic scale which quantifies the concentration of positive hydrogen ions. The scale measures from 1 to 14, with 1 being most acidic, 7 being neutral and 14 being most alkaline.
Pool and riffle sequence	A channel form where there are alternating areas of shallow water and deeper water. Common in rivers with gravel beds and relatively gentle slopes.
Pseudo-fibrous (see also Fibrous)	Used to describe peats where the original plant structure is easily recognisable but the decomposition process has led to a reduction in strength.
Rebound	The process by which groundwater returns to its natural level following a period of dewatering.
Return period	An average time or estimated average time between events such as flood, storms, earthquakes or landslides.
Reverse osmosis	A water purification process that uses pressure to force water through a special membrane to separate it from contaminants.

	It is the reverse of normal osmosis where water moves through the membrane into the solution with a higher concentration of mineral salts in order to balance the water chemistry.
Riparian habitat	Habitat situated on the bank of a river.
Salmonids	A collective term used to cover salmon and trout species, plus other related types of fish such as char and grayling.
Salmon parr	A juvenile salmon of roughly 1-6 years in age, between the fry and smolt life stages. A parr lives in freshwater rivers and undergoes physical changes to allow it to swim to the salt-water sea/ocean as a smolt.
Scour	The removal of sediment or engineered materials from the bed or banks of a watercourse, via the movement of water.
Sedimentation	The deposition of particulate material.
Sensitivity	A term used in environmental impact assessment to describe a receptor. High sensitivity means that a receptor has very limited ability to absorb change of any kind. Low sensitivity means that a receptor can tolerate change with limited or no effect on the character of the receptor.
Substrate	An underlying surface or layer.
Suspended sediment	Usually fine particles of material which are carried by a liquid, typically water; it may include clay, silt and fine sand.
Through-flow	The horizontal flow of water through soil and the lower parts of vegetation including in the root zone.
Turbulence	The unsteady and chaotic flow of water.
Valley mire	An area of waterlogged peat in valley bottoms and natural basins with a characteristic set of plant communities, often with high biodiversity value.
Waterbody	A generic term used in the Water Framework Directive to mean a defined body of water. This may be surface water or groundwater and includes rivers and burns as well as loughs and defined areas of groundwater.
Water divide	A line which separates the direction in which water flows. Used in hydrogeology to mark the division between groundwater catchments.
Water environment	A term encompassing surface water, groundwater and wetland habitats (including peat) and the associated ecosystems, which are supported by them.
Waterlogged	Ground which is saturated with water to the point where there is no more capacity for water to be absorbed.
Water retention	Where the flow of water is slowed or stopped, to control the travel and speed of the water. Often forms part of flood management schemes but can also be used in pollution management.
Water treatment infrastructure	Any artificial drainage installed around a construction or operation area. Likely to include drainage ditches, barrier bunds to keep water out of excavations, settlement ponds, and any sustainable drainage systems.

Woody debris	A specific term used in fluvial geomorphology to describe large pieces of wood – tree branches or trunks, fence posts etc. – located within the river channel and that affect the high water flow patterns in the channel.

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11 APPENDIX A

CV for Dr Catherine Isherwood

12 APPENDIX B

CV for Dr Ehi Idahosa-Taylor

13 APPENDIX C

13.1 Groundwater quality

Introduction

13.1.1 This Appendix has been prepared by Dr Ehi Idahosa-Taylor to consider specific chemical impacts on the groundwater and surface water environments that may arise from the underground mine workings or mine water discharge. Dr Idahosa-Taylor is a Principal Toxicologist at WRc. Her CV is provided in **Appendix B**.

Consideration of groundwater chemistry

13.1.2 **Table 13.1** below provides an overview of chemicals that have been reported in the GIA (Annex F, addendum B). The table only shows chemicals that have been predicted to be at levels that will exceed the relevant environmental standards for groundwater.

13.1.3 The maximum predicted mine water concentration levels in the source zone concentration during the life of the Mine exceeds the environmental standards for groundwater for all chemicals presented in **Table 13.1**.

13.1.4 Emphasis has been placed on the chemicals that have exceeded their respective environmental standards for groundwater based on the maximum predicted Mine water concentration in the source zone during closure and also the maximum predicted leachate concentration inside the DSF.

Table 13.1. Chemicals that exceed environmental standards for groundwater

Parameter	Maximum predicted concentration in the source zone during the life of the Mine (mg/L)	Maximum predicted concentration in source zone during closure of Mine (mg/L)	Maximum predicted leachate concentration inside the DSF (mg/L)	Environmental standard for Groundwater or Draft discharge consent value*	Chemical classified as hazardous in groundwater	Naturally elevated	Exceeds background groundwater statistics in proposed mine area
NH_4N-N	59.7	2.8	2.59	0.39	Yes		Y (P50 & P95)
NO_3	911.3	42.9	39.6	11.3			Y (P50)
As	0.0161	0.0064	0.022	0.005	Yes	Yes	Y (P50, P75, P95)
Cr (VI)	0.007	0.0028	0.0071	0.0025	Yes		
Fe	1.03	1.0	0.093	0.2 0.71*		Yes	Y (P75, P95)
Mn	0.3738	0.2982	1.2×10^{-10}	0.05		Yes	
Sb	0.0112	0.0062	0.0097	0.005			Y (P50)

13.1.5 The sections below provide further information on the chemicals listed in **Table 13.1**. Where evidence is available, the emphasis has been placed on the likely behaviour of the chemical in water or soil and the chemical's potential to be toxic to organisms that may be present in the surrounding peatland area.

Ammonium (NH_4)

13.1.6 The maximum predicted concentration levels of ammonium during closure and inside the DSF based on current estimates would be 7-fold above the environmental standard for groundwater.

13.1.7 In aqueous solutions, ammonia assumes two chemical species: the un-ionised form (NH_3) and the ionised form (NH_4^+). Volatilisation occurs from surfaces, adsorption to organic matter and transformation via microbial nitrification, as well as significant plant uptake of ammonia will occur (PubChem, 2024). Ammonia is bound to soil via the positive charge of the ammonium ion to the negatively charged soil; therefore, ammonia is not mobile in soil and is unlikely to leach (Health Canada, 2001). Although it is noted that Ammonium is unlikely to leach from soils, any runoff contamination of local rivers (e.g. if the drainage system is overwhelmed) would be detrimental to surrounding freshwater species that are known to include salmon.

13.1.8 It is also important to note that the submitted surface water impact assessment for the project cites 0.39 mg/l (drinking water standards, Max concentration) as the value to which the maximum predicted concentrations are being compared. It is our assertion that the ammonia standards of 0.2 mg/L (90^{th} percentile) for rivers (UK Water Framework Directive, 2015) is a more appropriate value to be used when considering the potential risk to the local rivers.

13.1.9 The available toxicology data indicate that ammonia is of moderate to high acute and high chronic toxicity to fish. Using data available for the Owenreagh and Owenkillew Rivers (pH, size of catchment areas and flow rates, where available) it was possible to estimate the concentrations of ammonia in the rivers based on the provided predicted concentrations of ammonium of 2.8 mg/L and 2.59 mg/L during closure of the Mine and inside the DSF respectively. It is reassuring to note that at the current predicted concentration levels of ammonia, the total ammonia is unlikely to exceed the water framework directive standard of 0.2 mg/L (90th percentile) for rivers.

13.1.10 It is however imperative that additional work is undertaken to investigate the potential impact of ammonia to local freshwater species in the event of potential runoffs to surrounding rivers especially from the DSF.

Nitrate (NO_3)

13.1.11 The maximum predicted concentration levels of nitrate during closure and inside the DSF based on current estimates would be almost 4-fold above the environmental standard for groundwater.

13.1.12 In soil, inorganic nitrogen and wastes containing organic nitrogen are initially degraded to form ammonia, which is then oxidised to form nitrite and nitrate (WHO, 2016). Excess nitrate readily moves with groundwater (WHO, 2016). Under aerobic conditions, nitrate percolates into the aquifer, under anaerobic conditions, nitrate can undergo denitrification or can be degraded almost completely to form nitrogen (WHO, 2016).

13.1.13 Given the likelihood of migration of nitrate through groundwater, the current estimated levels of nitrate during closure and in the DSF may pose an unacceptable level of risk to ground water. Additional work and monitoring will have to be undertaken to investigate the potential impact of nitrate to rivers that contain freshwater species in the event of potential runoffs to surrounding rivers.

Arsenic (As)

13.1.14 The maximum predicted concentration levels of arsenic during closure and inside the DSF based on current estimates would be approximately 1-fold and almost 4-fold respectively, above the environmental standard for groundwater.

13.1.15 The distribution and transport of arsenic in sediment is dependent on the oxidation state of arsenic, as well as the water quality, native bacteria, and sediment type. It is reported that both adsorption of arsenic on iron-rich oxides on the surface of sediments and incorporation of arsenic into sediments by co-precipitation with hydrous iron oxides are factors controlling mobilisation of arsenic in sediment. Further, the degree of adsorption and remobilisation of arsenic compounds during water sediment interaction also varies with the oxidation state of arsenic, as well as the temperature, redox potential, and pH of the water (IPCS, 2001). Arsenic compounds are reported to be metabolised by soil bacteria to alkylarsines, MMA and

arsenate. These reduced forms of arsenic will volatilise from soil. The half-life of DMA in soil is reported to be approximately 20 days (IPCS, 2001).

13.1.16 The data available indicate that arsenic is of moderate acute toxicity to fish. Additional work will have to be undertaken to investigate the potential impact of arsenic to local freshwater species in the event of potential runoffs to surrounding rivers.

13.1.17 Given that there are naturally elevated levels of arsenic present in the surrounding soils, additional measures should be put in place to ensure that the estimated levels of arsenic remain below the regulatory limits.

Chromium VI (Cr 6+)

13.1.18 The maximum predicted concentration levels of Chromium (VI) during closure and inside the DSF based on current estimates would be approximately 1-fold and almost 3-fold respectively, above the environmental standard for groundwater.

13.1.19 In natural waters, chromium (VI) can be reduced to chromium (III) in the presence of reducing agents. The reduction of chromium (VI) to chromium (III) by ionic sulphate (S^{2-}) or iron (Fe^{2+}) under anaerobic conditions has been reported to occur rapidly, with half-lives ranging from instantaneous to a few days. However, reduction by organic sediment and soil is reported to be much slower and is dependent on the type and amount of organic material and the redox potential of water (ATSDR, 2012). Oxidation of chromium (III) to chromium (VI) is slow; dissolved oxygen in natural waters has been reported to oxidise chromium (III) with a half-life of 128 days (ATSDR, 2012). Chromium (VI) is reported to be reduced in soil to chromium (III), with half-lives ranging between 4-140 days (ATSDR, 2012).

13.1.20 The available data indicate that chromium is of high to moderate acute toxicity to algae, of moderate acute toxicity to annelids, molluscs, crustaceans, insects, and fish, of moderate chronic toxicity to fish and high chronic toxicity to amphibians.

Iron (Fe)

13.1.21 The maximum predicted concentration levels of Iron during closure based on current estimates would be 5-fold above the environmental standard for groundwater.

13.1.22 Elemental iron is insoluble in water (EC, 2000a). Iron salts are expected to hydrolyse or form complexes. Iron (II) salts are reported to be unstable and will precipitate out of solution in iron (III) hydroxide, which will settle as rust-coloured silt (WHO, 2003).

13.1.23 Additional work will have to be undertaken to investigate the fate of elemental iron in soil. Ionic iron compounds are expected to exist in their dissociated form in the environment and therefore volatilisation from dry or moist soil surfaces is not expected to be an important fate process. In general, metal cations are attracted to the negatively charged surfaces of soil particles, and iron II and III ions are reported to form strong complexes with fulvic acid soil fractions. Adsorption to soil will depend on the soil organic matter content and the pH (HSDB, 2024).

13.1.24 The available data indicate that iron is of low to moderate toxicity to bacteria and protozoa, of low to moderate acute and chronic toxicity to crustaceans, generally of moderate acute and of low chronic toxicity to insects, and of moderate to high acute and of variable chronic toxicity to fish, depending on the form of iron tested.

13.1.25 Given that there are naturally elevated levels of iron present in the surrounding soils, additional measures should be put in place to ensure that the estimated levels of iron during closure are not realised and do not result in any accidental runoffs to local rivers.

Manganese (Mn)

13.1.26 The maximum predicted concentration levels of manganese during closure of the Mine based on current estimates would be approximately 7-fold above the environmental standard for groundwater.

13.1.27 In surface waters, manganese occurs in both dissolved and suspended forms, depending on factors such as pH, anions present and oxidation-reduction potential (ATSDR, 2000 cited in WHO, 2011). The pH in the upland peatland groundwater is reported to be naturally acidic. It is therefore most likely that the divalent form (Mn^{2+}) will dominates in the areas around the Mine, since Mn2+ predominates in most water at pH 4-7, but more highly oxidised forms may occur at higher pHs or because of microbial oxidation (ATSDR, 2000 cited in WHO, 2011). A complex series of oxidation and adsorption reactions occur in aerobic waters, which eventually form manganese dioxide, a biologically unavailable, insoluble form of manganese. However, this reaction is slow in waters below pH 8.5 (Zaw and Chiswell, 1999 cited in WHO, 2005).

13.1.28 Manganese will sorb to soil, subject to the organic matter content and cation exchange capacity of the soil (ATSDR, 2000 cited in WHO, 2011).

13.1.29 The available data indicate that manganese is of low to moderate toxicity to bacteria, of moderate acute and chronic toxicity to algae and crustaceans, of moderate acute toxicity to fish and of moderate chronic toxicity to amphibians.

13.1.30 Given that there are naturally elevated levels of manganese present in the surrounding soils, additional measures should be put in place to ensure that the estimated levels of manganese during closure are not realised and do not result in any accidental runoffs to local rivers.

Antimony (Sb)

13.1.31 The maximum predicted concentration levels of antimony during closure of the Mine and in DSF based on current estimates would be approximately 2-fold above the environmental standard for groundwater.

13.1.32 The sorption and mobility of antimony in soil is dependent on the type of soil, the form of antimony and pH. In general, antimony strongly adsorbs to most soils (HSDB, 2024). After prolonged leaching, antimony is reported to be converted to a less mobile form, reducing the potential for future leaching (no further details available) (HSDB, 2024).

13.1.33 The leaching of antimony is significantly increased at high and low pHs (HSDB, 2024). In aerobic surface soils antimony is usually in its oxidised form (ATSDR, 1992).

13.1.34 The available data indicate that antimony metal is of low to moderate chronic toxicity to algae, of low to moderate acute and of moderate chronic toxicity to crustaceans, of moderate acute and of moderate to high chronic toxicity to fish.

13.1.35 The reported acidic nature of the upland peatland groundwater will render it particularly vulnerable if there is an increased risk of contamination from antimony.

13.2 References

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WHO (2011) Manganese in Drinking-water. Background document for the development of WHO Guidelines for Drinking-water Quality. WHO/SDE/03.04/104/Rev/1.

14 APPENDIX D

14.1 Peat formation

14.1.1 The International Peatland Society (IPS) notes the following about peat formation:

> ***Peat formation is the result of incomplete decomposition of the remains of plants growing in waterlogged conditions. This may happen in standing water (lakes or margins of slow-flowing rivers) or under consistently high rainfall (upland or mountain regions). As a result, partially decomposed plant remains accumulate and become compacted, forming peat that changes the substrate chemical and physical properties leading to a succession of plant communities.***

14.1.2 For peat to form it requires to be wet all the time and waterlogged for large parts of the year. Peat and peatland vegetation can tolerate limited periods of relative dryness but the main peat-forming Sphagnum mosses dry out under prolonged dry conditions and die off, leaving the peat 'inactive' or no longer growing. The prevalence of wet conditions in Ireland, Northern Ireland, Wales, Scotland and parts of England are the reason why these areas provide such a large proportion of the peatlands in an international context.

14.1.3 Waterlogged ground requires there to be a topography that collects and holds water – such as hollows and large flat areas – and an impermeable layer underneath that will stop the water from infiltrating into the ground. The western and northern parts of the British Isles are dominated by old, hard bedrock which can only hold very small amounts of groundwater. These are considered to be effectively impermeable, i.e. they form a barrier to water flow.

14.1.4 In addition to this impermeable bedrock, much of the region also has a layer of glacial till. Formerly called boulder clay, this material is deposited directly by and underneath active glaciers and is then left largely undisturbed. Glacial till is best described as a highly varied sediment with a very wide range of particle sizes from fine clay through to fist-sized or larger pieces of rock. While till can form water-bearing bodies in places where it contains more sand or gravel, it is mostly clay-dominated and very compacted, which means that in most of the British Isles it forms an impermeable barrier lying on top of the bedrock.

14.1.5 These conditions are ideal for the development of peat. Over the thousands of years since the glaciers disappeared from the UK and Ireland, areas with the right topography have collected water to form shallow ponds and lakes which slowly

colonise with vegetation. This vegetation dies and sinks, and more vegetation dies and sinks on top of it. After several thousand years, this wet vegetation matter becomes compressed and forms the material we know as peat.

14.1.6 For peat to be 'active', i.e. with a live surface vegetation layer that is continuing to grow and lay down peat-forming materials, it has to remain wet most of the time. In natural situations peat is rarely found on the tops of mountains or on steep slopes because the conditions for its formation are not present – it is too cold, or dry to support the right kinds of vegetation.

14.1.7 In some areas, such as the Flow Country in Caithness and Sutherland in the far north of Scotland, the small peaty hollows in the landscape have been filled in and have joined together to form a wide expanse of peat that stretches for tens of miles across the land. In most areas, the peat is more patchy and is mainly found in hollows and larger flatter areas.

14.1.8 Peat has been recorded to depths of more than 12 m in some places (e.g. Ford Moss, Northumberland/Tyne and Wear; JNCC, n.d.), with recorded depths in excess of 8 m regularly encountered in parts of Scotland [personal experience].

14.1.9 The process of accumulating vegetation in a waterlogged environment is the key to peat acting as a carbon store. The carbon in the vegetation is held in the peat and, because it is unable to decompose fully, is not released back into the environment. Where peat is actively forming, it will capture more carbon through every growing season and the peat body will gradually become thicker.

14.1.10 Where peat dries out, as a result of drainage, excavation, erosion, changes in weather or climatic conditions or for other reasons, the important vegetation layer changes and is no longer able to grow the necessary peat-forming plant species. For example, drier areas in blanket peat often have more heather and less Sphagnum moss. If this process continues, the peat will stop forming.

14.1.11 Where peat is eroded, or where land use changes convert peatland into agricultural land or development land, the carbon stored in the peat starts to be released into the atmosphere. Once it has started, this process is difficult to stop and reverse because restoring the all-important active peat-forming vegetation layer is very difficult, expensive and takes many years.

14.1.12 Peatland restoration can be undertaken successfully in areas where the changes have not been too extreme – such as damming drainage ditches and erosion channels or managing vegetation to remove the types of plants that speed up the drying-out process. Once the peat has been lost, it has gone permanently.

14.1.13 Peat is often considered to be ‘irreplaceable’. While not true in the strictest sense, it is effectively true because peat formation processes are very slow in human lifespan terms, requiring thousands of years to occur.

14.2 References

JNCC (n.d.). 7110 Active raised bogs. Joint Nature Conservation Committee. Available at: https://sac.jncc.gov.uk/habitat/H7110/