From:
Sent: 05 April 2016 11:26
To:
Subject: eting 05 April
Attachments: NIEA Water Meeting.pdf

ry, please see attached agenda for this afternoon.
anks

Meeting Notes 5 April 2016

t talked about SW issues and the design of treatment systems.
Still working through information
He asked about the Owenkillew Sub Basin Management Strategy EQS and WFD
Diulution Zones also mentioned and discharge active standards how can they be achieved in relation.
RC explained that WMU uses WFD (Classification ,Priority,Substances and Shellfish Waters)Regulations NI.
MS asked about the Owenreagh would it be similar to Owenkillew
RC explained we need to know what is going to be discharged and where to we need flows and discharge information for the construction and process site drainage from the mining operation.
Dilution Zones are not specified but the standards have to be met. Modelling was provided for the previous consent similar modelling should/could be used.
MS explained that some of the previous parameters were already in excess of the EQS values. The same catchment modelling to be used with dilution modelling using high and low flow water balance modelling.
MS asked about Nitrates
RC explained that may not be an issue from previous application made TBC.
Discussion about a WFD Assessment
RC asked what was WFD assessment was not aware if it? but would find out TBC

From: e
Sent: 05 April 2016 10:58
To: ning)
Cc: Acheson, Stephen
Subject: FW: Dalradian Meeting 05 April

All

In advance of our meeting this afternoon, please find agenda provided by Turleys.

Regards,

[redacted]

Department of the Environment

From: [mailt[redacted]
Sent: 04 April 2016 21:11
To: Walker, Graeme
Subject: RE: Dalradian Meeting 05 April

Evening

Some minor changes.

Latest version attached.
See you tomorrow.
Kind regards [illegible]

Sheila Murphy
[redacted]
turley.co.uk

Bi . d

From: Coey, Richard
Sent: 05 April 2016 11:26
To:
Subject: FW: Dairadian Meeting 05 April
Attachments: NIEA Water Meeting.pdf

Gerry, please see attached agenda for this afternoon.
Thanks

From: Walker, Graeme
Sent: 05 April 2016 10:58
To: Hartmann, Silke; Coey, Richard; Finegan, Keith; Findlay, Deirdre; Lynch, Eamon (Planning)
Cc: Acheson, Stephen
Subject: FW: Dairadian Meeting 05 April

All

In advance of our meeting this afternoon, please find agenda provided by Turleys.

Regards,

[redacted]

Department of the Environment
www.doeni.gov.uk

From: [redacted]
Sent: 04 April 2016 21:11
To: Walker, Graeme
Subject: RE: Dairadian Meeting 05 April

Evening

Some minor changes.

Latest version attached.
See you tomorrow.
Kind regards,

[redacted]

Turley
[redacted]
turley.co.uk

Agenda

Project:	Curraghinalt Gold Mine		
Venue:	Turley, Hamilton House, 3 Joy Street, Belfast	Date:	05 April 2016
Attending:	, DOE er, DOE son, DOE NIEA IPRI , NIEA WMU , NIEA NED an, NIEA WMU y, Dalradian Resources . Dalradian Gold Ltd s, Dalradian Gold Ltd , Turley , Turley nald, JDS JDS in, SRK y, SRK SRK d, SRK · Kaya Consulting (via teleconference)		
Objective:	NIEA Water Meeting		

1. Introductions

2. Scoping responses

3. Surface water

   (a) Interpretation of the water quality objectives for the catchment

   (b) Applicability of the Owenkillew Sub-Basin Management Strategy (implementation of freshwater pearl mussel measures) in relation to the water quality objectives for the catchment.

   (c) Background water quality relative to the water quality objectives.

   (d) Sizing of dilution zones/ approach to calculating end-of-pipe discharge criteria.

4. Groundwater

   (a) Methodology for selection of assessment points for hazardous and non-hazardous substances (and how this could vary throughout the mine life cycle)

   (b) Methodology for selection of target concentrations (e.g. background concentrations, detection limits, river/water standards etc).

   (c) Overview of planned groundwater impact assessment methodology (groundwater modelling, reactive hydrochemical modelling, software used and attenuations mechanism proposed to be assessed)

5. WFD Assessment

6. Timing of the discharge consent(s)

7. AOB

Contact

[redacted]

TC 40/12

ard

From:
Sent: 30 June 2016 15:58
To:
Subject: FW: Curraghinalt: NIEA Water
Attachments: Draft EQS Talk v2.pptx

please see below and attached- I had a teleconference this afternoon wit .n ian i (Kaya Consulting) and y (SRK) to discuss the attached presentation. I agreed the list of parameters to be modelled, the methodology for modelling (same as previous application) and the current EQS's. There was some discussion over which nitrate limit to apply- the priority subs has a 50mg/l target, but the Owenkillew Sub Basin Management Strategy suggests 0.125mg/l (which it looks like the Owenreagh is already in excess of).
Company intend to undertake some modelling over the next few weeks with a view to consulting with us on likely consent conditions by the end of July. I'll get a chat with you when back in the office.
Thanks

From: rphy [redacted]
Sent: 30 June 2016 14:01
To: Coey, Richard
Subject: FW: Curraghinalt: NIEA Water

H

Dial in details below.

[redacted]

PIN: [redacted]

Kind regards

[redacted]

Turley

[redacted]

in

From: [redacted]
Sent: 30 June 2016 12:50
To: [redacted] hard.Coe[redacted]
Cc: [redacted] (Planning)
([redacted]Eamon.Cyn[redacted]
Subject: Curraghinalt: NIEA Water

Please see attached.

Speak at 2pm.

Kind regards

Curraghinalt Water Quality Discharge Limits

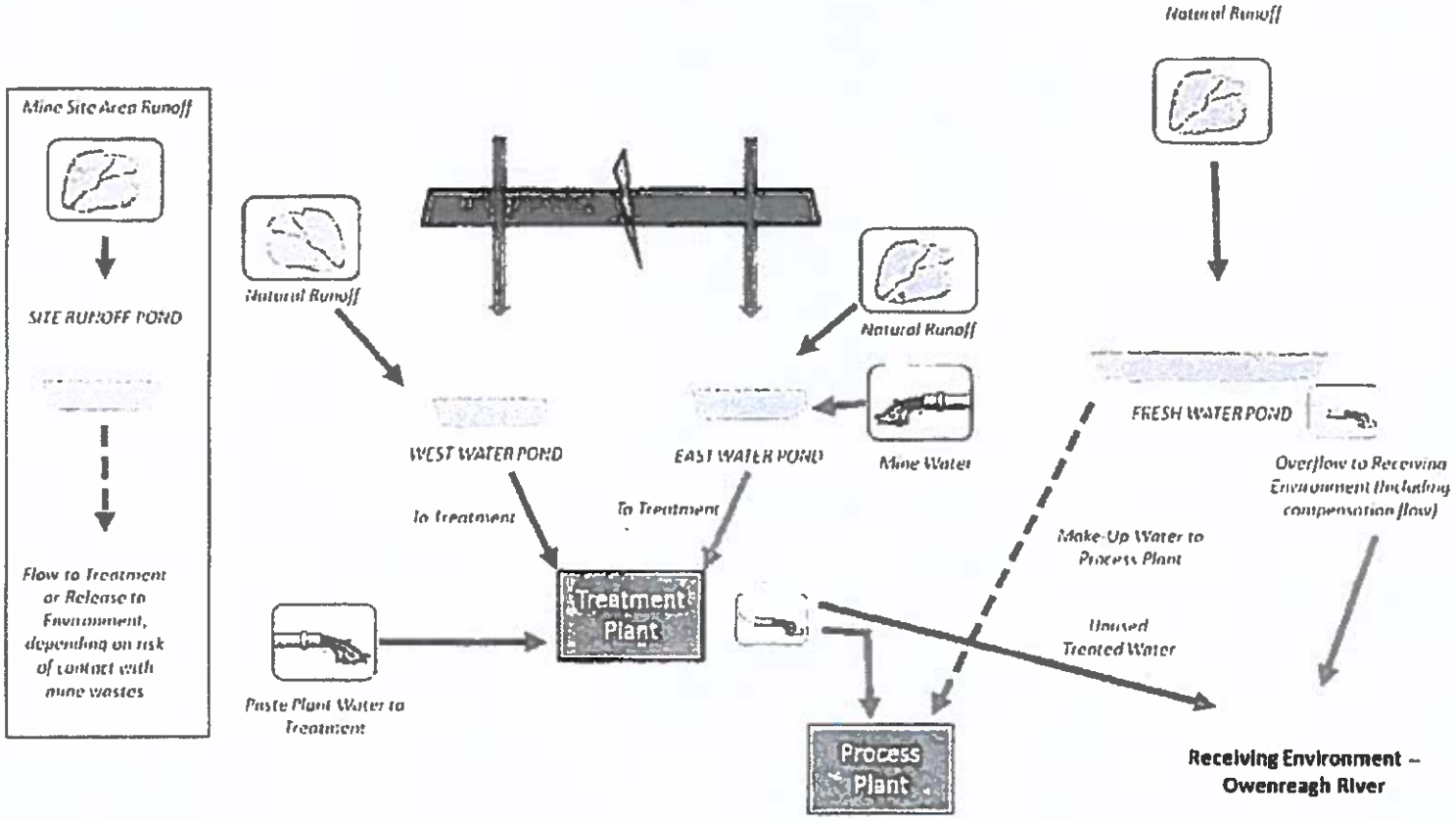
- Purpose of discussion is to provide update on progress of water balance and water quality assessment
- Review of available water quality standards and current water license for tunnel extension
- Discussion of methodology for water quality impact assessment
- Two consented discharges will be required
  - Extension of current consent for existing infrastructure area, including mine water contribution during construction phase
  - New consent for mine site area; including construction work and treated discharges from mine site
- Presentation focusses on new consent. However, methodology for both consents will follow same approach taken for Tunnel Extension Water License Application

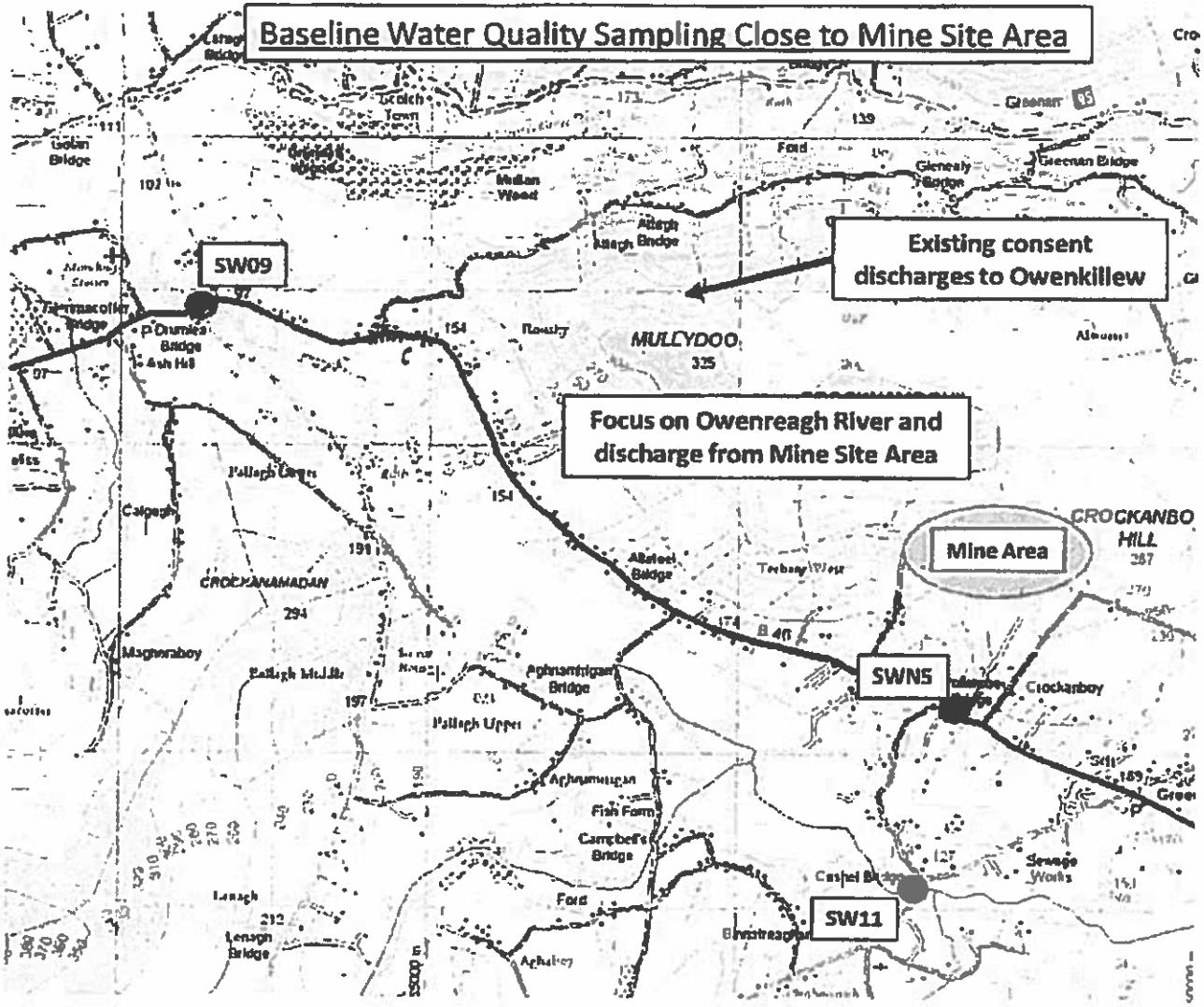
Water Balance Update

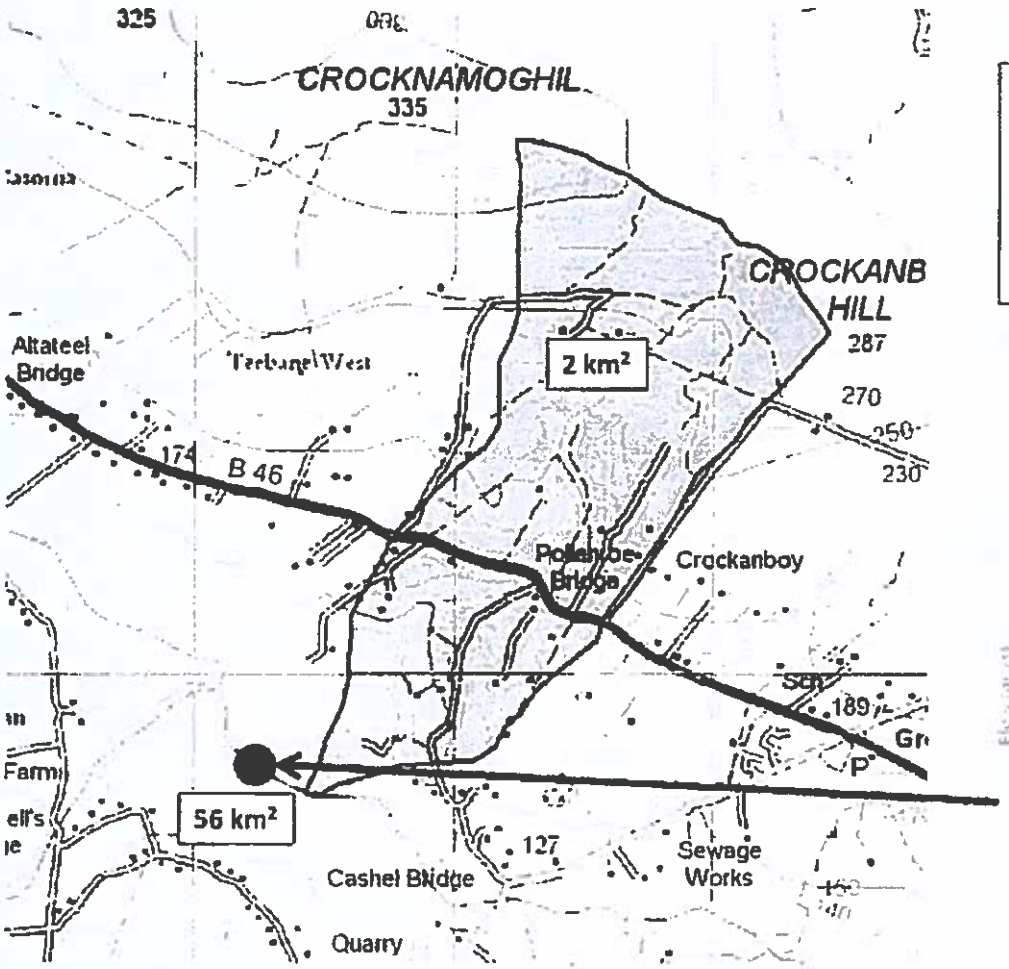
Water Balance model of site and water management infrastructure has been created and used to develop initial site water balance

- Monthly time step
- Includes all mine site components

Currently being used to refine site water management plan, optimise sizing of water storage ponds and water treatment plant




Baseline Water Quality Sampling Close to Mine Site Area
Existing consent discharges to Owenkillew
SW09
Focus on Owenreagh River and discharge from Mine Site Area
MULLYDOO
CROCKANBO HILL
Mine Area
SWN5
SW11
CROCKANAMADAN
Crockanboy
Sewage Works
Fish Farm
Campbell's Bridge
Aghnamuiggan Bridge
Pallegh Upper
Pallegh Middle
Magherahoy
Lenagh Bridge
Ford
Greenan Bridge
Glenealy Bridge
Median Wood
Aileagh Bridge
Alakeel Bridge
Torbay West
Cashel Bridge
Aghalney

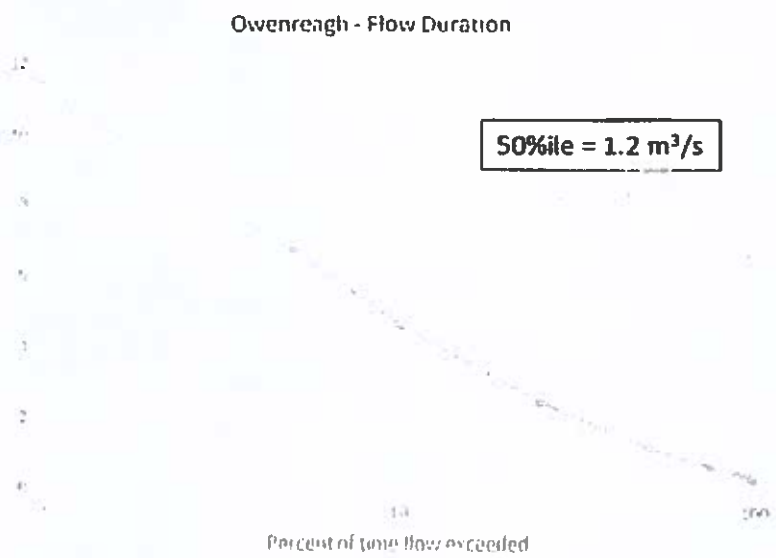


Hydrological Catchments for Receiving Environment

Owenreagh River – 56 km² downstream of mine site

Unnamed Watercourse draining mine site – 2 km²

Proposed receiving environment is Owenreagh River



Dilution Calculations to be Undertaken to Assess Post-development Concentrations in Receiving Environment

Same methods as for Tunnel Extension Water License - Assumption of total mixing across river width

Calculations to be Undertaken for Average Flow Conditions for Owenreagh River

Assessment requires initial predictions of water treatment plant effluent

$$\frac{\left(Conc.River\left(\frac{mg}{L}\right)\cdot River\ Flow\left(\frac{m^3}{s}\right)\right)+\left(Conc.Outfall\left(\frac{mg}{L}\right)\cdot Discharge\ Rate\left(\frac{m^3}{s}\right)\right)}{River\ Flow\left(\frac{m^3}{s}\right)+Discharge\ Rate\left(\frac{m^3}{s}\right)}$$

Example Calculation for Tunnel Extension

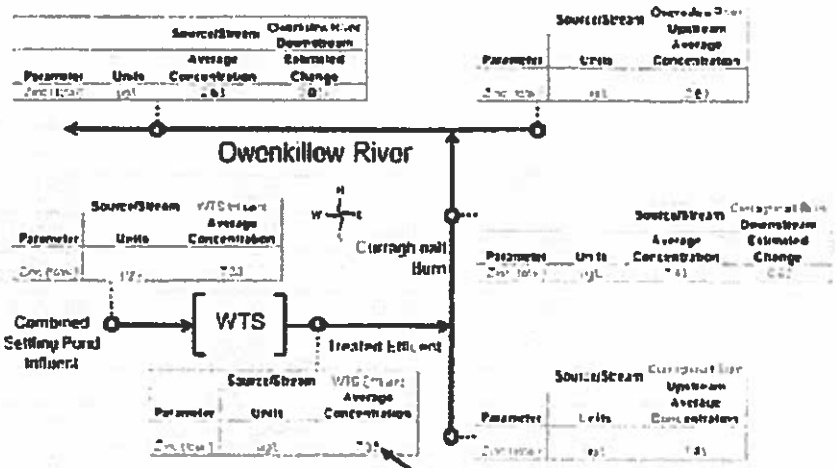


Figure 45 Owenkillow River average flow mass balance on total zinc

Predicted concentration in treated effluent

<u>Discharge to Receiving Environment from Treatment Plan</u>

Average in Year 6 = 20.5 m^3/hour = 6 L/s
Maximum in Year 6 ~ 150 m^3/hour = 42 L/s

Median River Flow = 1.2 m^3/s (1,200 L/s)
Max. Treatment Plant = 3.5% of river flow; Average Treatment Plant = 0.5% river flow

Potential Parameter of Concern	Tunnel Extension Discharge Consent (mg/L)	Possible EQS (SR 2015/351 unless otherwise stated) (mg/L)	SW09		SW11	
			Median (mg/L)	Maximum (mg/L)	Median (mg/L)	Maximum (mg/L)
Ammonia as NH4		0 2	0 045	0 08	0 05	0 08
Nitrate as N	-	50 (Nitrates Directive)	0 3	3 19	0 11	1 6
BOD	10	3	1.1	11	1 5	4
Hardness	for reference	-				
Cyanide		0 001	0 0015	0 003	0 001	0 003
Arsenic	0 05	0 05	0 00064	0 00302	0 00045	0 0021
Cadmium	0 0007	0 00008	0 00005	0.00015	0 000015	0.00016
Chomium (III + VI)	0 0081		0 00075	0 0029	0 0001	0 0025
Chromium III	-	0 0047	0 001	0 001	0 001	0.0075
Chromium VI	-	0 0034	0 0025	0 02	0 001	0.01
Copper	0 0162	0 001	0.0015	0.00178	0.0015	0.0075
Iron	3.9	1	0 49	1.1	0.76	1
Lead	0 0072	0 0072	0 0002	0 0029	0 0002	0 0005
Mercury	0 0017	0 00007	0 000005	0.0005	0 000005	0 00001
Manganese	-	0 123	0 036	0 11	0 059	0 11
Nickel	0 02	0 02	0 00067	0 0021	0 0001	0 0006
Silver	-	0 0005	0 0025	0 0025	0 0025	0 0025
Zinc (Total)	0 0338	0 0109 + Ablent background	0 0021	0 024	0 0031	0 0072
TSS	50	10 (Sub-basin management plan)	5	17	5	15

Other Potential Parameters of Concern
Chloride, sulphate, uranium, vanadium
No agreed standards

Way Forward

- Site Water Balance to be finalised in next few weeks
- Once Water Treatment Plant effluent concentrations are obtained, dilution calculations based on water balance and baseline hydrology will be undertaken
- Initial set of Discharge Criteria will be provided for discussion
- Prior to this we would look for;
  - Confirmation of list of Parameters of Concern
  - Confirmation of EQS values for receiving environment
  - Conformation of methodology for calculations supporting application

Presentation for teleconference 30/6/16

[redacted] 30/6/16

Curraghinalt Water Quality Discharge Limits

- Purpose of discussion is to provide update on progress of water balance and water quality assessment
- Review of available water quality standards and current water license for tunnel extension
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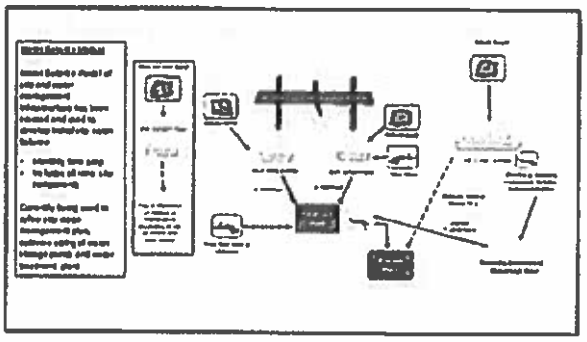

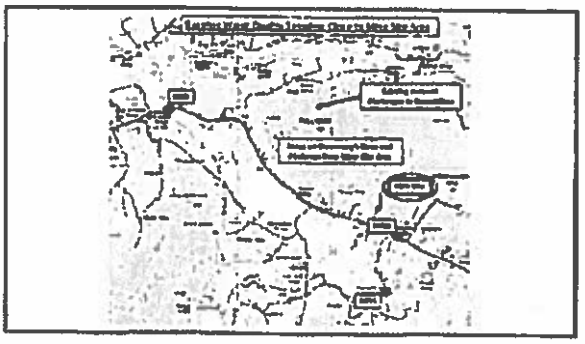

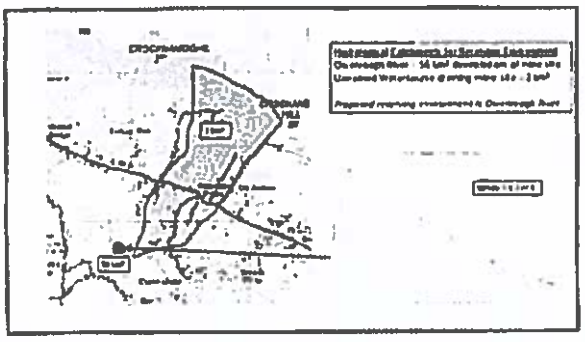

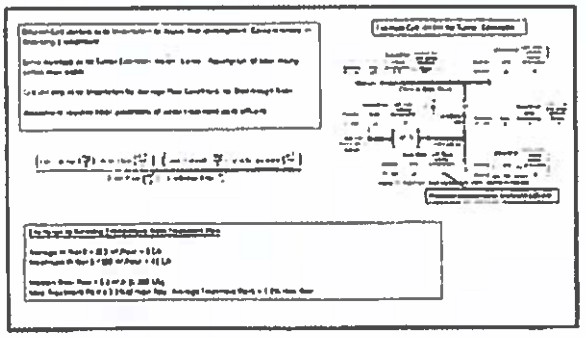

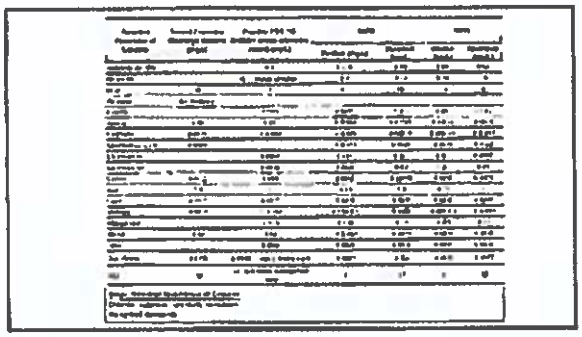

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  - Confirmation of EQS values for receiving environment
  - Confirmation of methodology for calculations supporting application

..eslin, Gerard

From: [redacted]
Sent: 21 June 2016 16:50
To:
Cc:
Subject: Re: Dalradian

Thanks for coming back. Sorry it hasn't worked out.

I will check to seeing there is anything. Are there any slots next week that might suit you as an alternative?

Sent from my iPhone

[redacted]

On 21 Jun 2016, at 16:30 [redacted] wrote:

Good afternoo.. ... orry unfortunately I have another meeting here in Lisburn this Thursday afternoon- is there any information that could be sent electronically at this stage?
Best Regards

Richard

Industrial and Domestic Consents
Regulation Unit
Northern Ireland Environment Agency
17 Antrim Road
Tonagh
Lisburn
BT28 3AL

Direct Line [redacted]
email: [redacted]

From: [redacted]
Sent: 21 June 2016 15:40
To:
Cc: [redacted]
Subject: Dalradian

Good afternoon

I appreciate it is short notice but the Dalradian water consultant, is available on Thursday to give you some more information about his work on the project. We have a PAD meeting with the Planners at 2pm here. Would you be available at 2pm or 3pm for a half hour slot for a water focus?

Kind regards
<image001.jpg>

[redacted]

From:
Sent: 30 November 2016 13:52
To:
Cc: [redacted]
Subject: HPRM: RE: Curraghinalt sewage treatment permitting

Record Number: AE1/16/503340

the objectives for BOD and ammonia for this particular catchment are as follows:

BOD	3 mg/l
Ammonia	0.2 mg/l

However these signify the class boundaries between Good and Moderate status under WFD, so cannot be exceeded. For this reason, when undertaking modelling we assume that the concentration in the river is 50% that of the maximum permitted (mid class concentration (in this case 1.5 mg/l for BOD and 0.1 mg/l for ammonia)), and allow a certain amount of deterioration as a result of the proposed discharge. In the case of sewage effluent, we normally permit a deterioration from the mid class of 13% for BOD and 28% for ammonia.
I hope this is useful, however again any queries please come back to me.
Regards

From [redacted]
Sent: 29 November 2016 17:00
To [redacted]
Cc: [redacted] rard
Subject: RE: Curraghinalt sewage treatment permitting

We are using a Monte Carlo method for our water balance modelling, which appears consistent with the EA method. I will contact them so our input distributions are similar to those used in the EA method and hopefully our model will be able to be set up consistent with their approach.

Can you clarify the receiving water targets for typical sewage effluent in NI?

Regards,

From: [redacted]
Sent: 29 November 2016 16:34
To [redacted]
Cc: [redacted]
Subject: RE: Curraghinalt sewage treatment permitting

ael, we normally calculate required consent conditions for specific discharges by using mass balance calculations- using "Monte Carlo" modelling software- this software is owned by the Environment Agency for England and as such we are unable to share it- you could try approaching the Agency directly to ascertain if it would be possible to obtain a copy (enquiries@environment-agency.gov.uk).

The mass balance software uses various permutations of the following equation to calculate downstream contaminant concentrations following discharge input:

$T = (FC + fc) / (F + f)$

Where:
T = concentration of pollutant in river after mixing
F = upstream river flow
f = discharge flow
C = concentration of pollutant in upstream river
c = concentration of pollutant in discharge

In the Monte Carlo simulation, a value for each of the variables F, C, f and c is plucked randomly from the full range of possible values. Values will be determined by the input parameters in the model, using data which describes the distributions of each of the variables, which are:
Mean and Q95 upstream river flows.
Mean and standard deviation of discharge flow.
Mean and standard deviation of pollutant concentration in river.
Mean and standard deviation of pollutant concentration in discharge.

A value for T is created for each set of values of F, C, f and c using the equation above. The sequence of random selection and mass balance is repeated until enough values of T have been created to define its distribution (Typically about 500 such calculations will be carried out).
To calculate the discharge standard needed to achieve a 90 percentile river quality objective downstream, the Monte Carlo model compares the river quality target with the 90 percentile value of the calculated distribution of T. Using this model, the discharge standard required is expressed as a 95 percentile. Consent conditions are therefore set on a 95 percentile basis, and compliance assessed as such.

I hope that this provides some explanation of the calculations used to formulate consent conditions- please let me know if you want to discuss further.
Best Regards

Industrial and Domestic Consents
Regulation Unit
Northern Ireland Environment Agency
17 Antrim Road
Tonagh
Lisburn
BT28 3AL

Direct Line [redacted]
email [redacted]

From: [redacted]
Sent: 29 November 2016 14:10
To

Cc: [redacted]
Subject: [redacted]urraghinalt sewage treatment permitting

I the meeting of the 9th November, we briefly discussed requirements related to sewage discharges from the Curraghinalt mine site. You noted that if the discharge rate from the propose treatment plant was <10 m^3/day then this would be considered within guideline limits for small (<2km^2) catchments.

At the time of the meeting we presented discharge rates that were significantly higher than 10 m^3/day, but they were based on conservative flow rates used for costing purposes. The engineers have gone back to the proposals and refined the treatment rates based on the staffing numbers on site and the British Water guidance. They have managed to decrease the flow rates very close to 10m^3/day, but at still a little (1 to 3 m^3/day) above this rate.

During the meeting you noted that if the rates were higher than 10 m^3/day it would be possible to calculate dilution rates based on observed low flow conditions and/or standard values used by NIEA.

Would you be able to forward us details of the calculations that you will be undertaking at the site so we can undertake some work to review the discharge rates and discharge quality required at the treatment plant. We have flow data for small streams in the site area that can be used to calculate median and 95%ile low flows. In addition, there is some flexibility within the mine water management to provide a compensation flow to the receiving waters. We would want to undertake some iterations to assess what would be required to meet your requirements.

Please get back to me if you have any questions, but we look forward to hearing from you.

Regards,

[redacted]

Kaya Consulting Limited [redacted]

T. [redacted]
M. [redacted]
[redacted]

TC 40/12

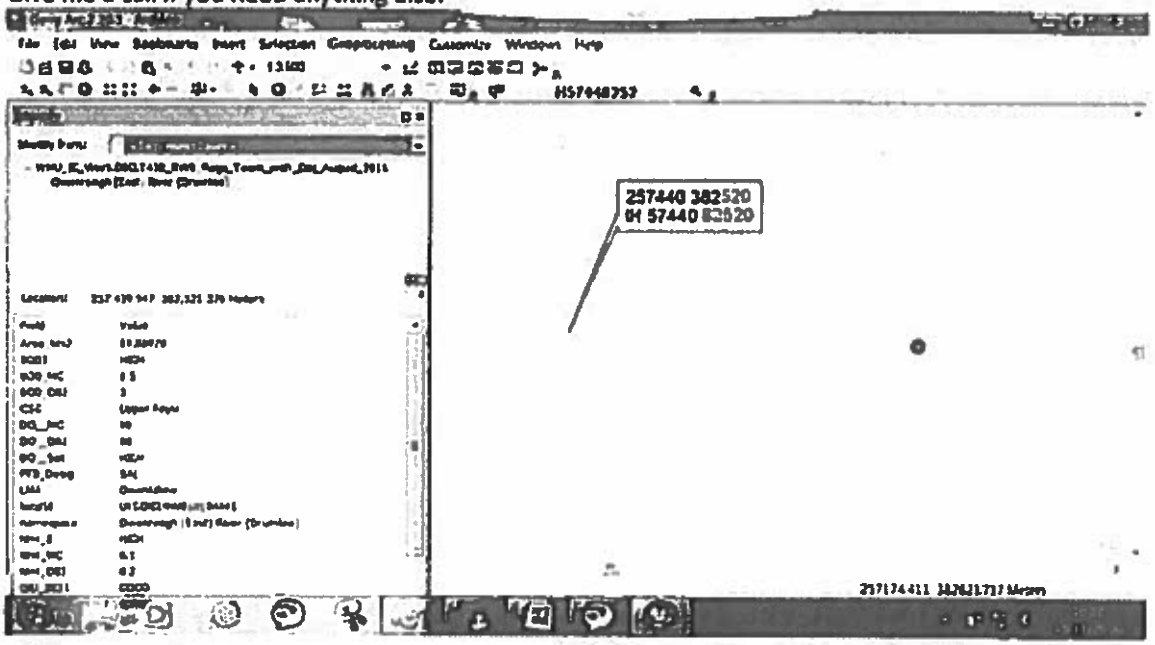
From:
Sent: 30 November 2016 10:45
To:
Subject: HPRM: RE: Curraghinalt sewage treatment permitting

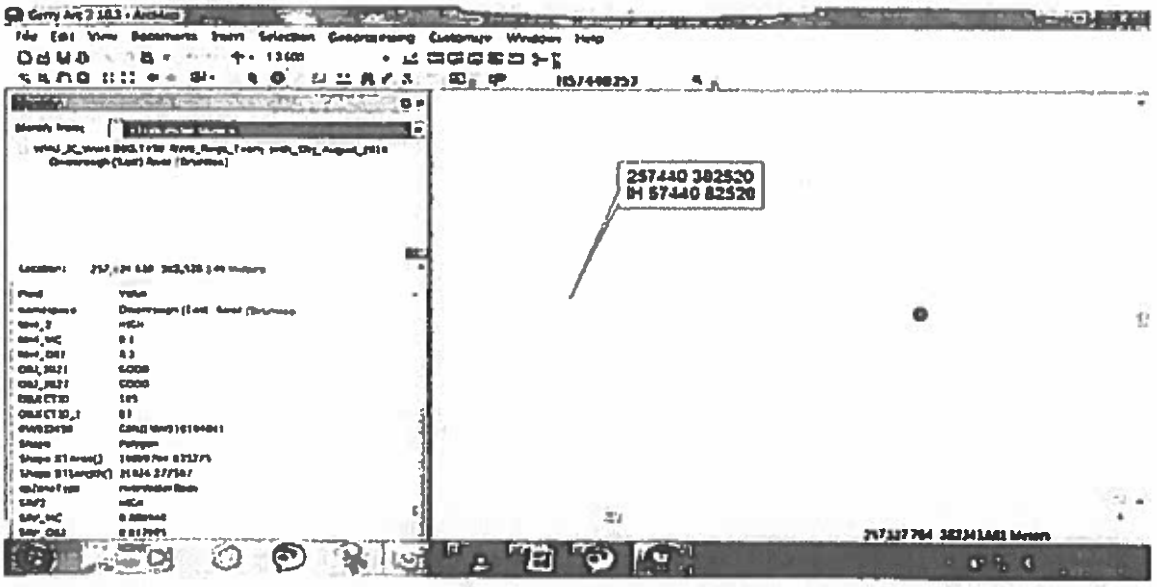
Record Number: AE1/16/501539

PI see the information as shown. I had to send you to screen shots to include all of the information on the layer.

BOD MC= 1.5
BOD OBJ=3
NH4 MC= 0.1
NH4 OBJ= 0.2

Give me a call if you need anything else.





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Regards,

[redacted]

Kaya Consulting Limited

[redacted]

T.
M.
www.kayaconsulting.co.uk

From:
Sent: 29 November 2016 17:04
To:
Subject: HPRM: FW: Curraghinalt sewage treatment permitting

Record Number: AE1/16/501525

please see below- could you please let me know what the receiving water targets for BOD and ammonia are for the Pollanroe catchment?
Thanks

From [redacted]
Sent: 29 November 2016 17:00
To:
Cc. [redacted]
Subject: RE: Curraghinalt sewage treatment permitting

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Can you clarify the receiving water targets for typical sewage effluent in NI?

Regards,

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Sent: 29 November 2016 [redacted]
To [redacted]

Subject: RE: Curraghinalt sewage treatment permitting

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Direct Line: [redacted]
email [redacted]

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To: [redacted]
Cc:
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Subject: Meeting 9 Novemeber:2016.

Meeting Monday 9 Novemeber:2016.

Dalradian Gold
Curraghinalt Gold Mine Project

Meeting at Turley Offices Belfast

explained the to the representatives from Dalradian Gold, the consenting information required related to the

- Site drainage effluent discharge.
- Sewage effluent discharge.

Agenda

Project:	Curraghinalt Gold Mine		
Venue:	Turley Offices, Belfast	Date:	09 November 2016

Attending:

IIEA Water Management Unit

NIEA Water Management Unit

NIEA Conservation Designation and Protection

Dfl

Dfl

, Dalradian Gold Ltd

s, Dalradian Gold Ltd

ir, CFR

on, Turley

y, Turley

Dialling in

, Kaya Consulting

es, SRK

, SRK

SRK

Objective: Surface Water / Discharge Criteria

1. Review of previous discussions
2. Treatment options
3. Review of parameter list to be considered with existing EQS values
4. Detection limit issues and water license
5. Owenreagh River and Pollanroe Burn – compliance point for discharges
6. AOB

Contact

[redacted]

Turley