

Breedon Trading Limited
Denbigh Quarry
Denbigh, Denbighshire

Technical Note

Environmental Permit, Water Discharge
Discharge Rate / Volume Estimation

03rd Feb 2022



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1 INTRODUCTION

- 1.1 Breedon Trading Limited (BTL) are currently undertaking the extraction, processing and sale of aggregate (limestone) at Denbigh Quarry, Denbigh, Denbighshire, North Wales (The Site).
- 1.2 Discharge from the Site was historically made under consenting Environmental Permit (EP), Water Discharge Activity, CG0333601 (*appendix 1*). This consent is understood to have been held by a previous Site operator, having lapsed at some point between the end of their ownership of the Site, and its eventual ownership by BTL (the Site being in ownership of a third operating company during the intervening period).
- 1.3 BTL have recently undertaken a review of water management at the Site, and have identified need for a replacement EP, this both allowing for updated and improved water management practices, and allowing for planned future quarry development, thus bringing the Site into full regulatory compliance.
- 1.4 BCL Consultant Hydrogeologists Limited have therefore been instructed by BTL to make application (The Application) to Natural Resources Wales (NRW) for a new EP, Water Discharge, for the Site.
- 1.5 NRW require submission within the Application of supporting detail evidencing derivation of discharge rates / volumes. Such information is provided below, together with necessary supporting context.

2 BACKGROUND

2.1 Summary Site Setting

- 2.1.1 The Site forms an active quarry on the northern outskirts of the town of Denbigh (*figure 1*), being located upon the outcrop of the Carboniferous Limestones of the Clwyd Limestone Group (CLG), which form its economic mineral.
- 2.1.2 To the immediate east of the Site, the CLG become overlain by Triassic strata characteristic of the Vale of Clwyd, which are in turn overlain by Glacial Till, upon which the River Clwyd is based. Drainage across the area is made to the River Clwyd, locally via a minor unnamed tributary of the Hennlan Brook (termed here the 'Hennlan Ditch').
- 2.1.3 The CLG form a karstic aquifer, groundwaters within which flow towards the Vale of Clwyd (eastwards).

2.2 Site Water Management

- 2.2.1 As at *figure 1*, the drainage of the Site is split into two areas, the Quarry Area, and the Plant Area.
- 2.2.2 As at *figure 2*, The Plant Area is provided at its lowest point with a 160m² concrete lined lagoon (The Plant Lagoon), featuring 2.3m of available freeboard, within which treatment via settlement is provided. Rainfall / runoff from across the Plant Area is intercepted by this feature. Waters are lifted from the lagoon into a discharge pipeline by electro-submersible pump (maintaining attenuation freeboard within the lagoon itself), then being discharged off-Site to the Hennlan Ditch.

- 2.2.3 The dimensions of the Plant Lagoon are however insufficient for providing settlement treatment in extreme rainfall events. It is thus equipped with a second electro-submersible pump which, when necessary, pumps to a secondary 2 cell lagoon (The Top Lagoon) where additional settlement area and attenuation volume is provided.
- 2.2.4 Cell 1 of the Top Lagoon provides a settlement area of some 569m² and 1.1m of attenuation freeboard. Cell 1 discharges by pipeline under gravity to Cell 2. Cell 2 provides a further 680m² of settlement area and 1.4m of attenuation freeboard. Cell 2 discharges by pipeline under gravity to a bunded ditch which conveys treated waters to the discharge pipeline.
- 2.2.5 The Plant Lagoon is equipped with gravity exceedance overflow to the Hennlan Ditch in contingency for occurrence of rainfall events exceeding design parameters. This operates as a safety control feature and is not in routine use.
- 2.2.6 The Quarry Area drains diffusely to a basal sump (in groundwater continuity) within which all incident waters are able to dissipate to ground. Future quarry development however requires sub-water table mineral extraction. At this point, the sump will attenuate rainfall / runoff and provide settlement treatment, prior to these waters being removed from the Site via dewatering abstraction, along with groundwater ingress (via the discharge route from the Top Lagoon).
- 2.2.7 Discharge arrangements at the Site are presented as a schematic for ease of interpretation at *figure 3*.

3 DERIVATION OF APPLICATION RATES / VOLUMES

3.1 Plant Area Drainage Element

- 3.1.1 Operation of the Plant Lagoon and both cells of the Top Lagoon have been designed to provide effective settlement treatment prior to discharge of waters from the Site through application of Stokes Law, allowing removal of particles to 4µm diameter through maintenance of a through flow rate of 1e10⁻⁵ m/s¹.
- 3.1.2 Application of this concept to the lagoon dimensions detailed at *Section 2* indicates acceptable discharge rates, as at *table 1* (where rainfall / runoff rates exceed these discharge rates, excess waters will be attenuated within the lagoons, the same volume of water being discharged over a longer time period at a lower rate).

Table 1 Discharge Rates from Lagoons			
Feature	A, Area (m ²)	Q, Discharge Rate (l/s)	Derivation
Plant Lagoon	160	1.6	Q = ((1*10 ⁻⁵)*A)*1,000
Top Lagoon (Cell 1)	569	5.69	
Top Lagoon (Cell 2)	680	6.8	

- 3.1.3 Combined discharge rates from the lagoon system will comprise that made from both the Plant Lagoon directly, and from Cell 2 of the Top Lagoon, to total 8.4l/s.

¹ National Coal Board, 'Technical Management of Water in the Coal Mining Industry', 1982

3.2 Dewatering Element

- 3.2.1 Previous hydrogeological assessment of the Site² applied historic data sources together with Site development proposals to estimate expected dewatering rates, indicating peak groundwater ingress rates to the Site requiring dewatering of some 108l/s.
- 3.2.2 Dewatering abstraction must however also remove rainfall / runoff incident upon the Quarry Area. Applying average effective rainfall rates of 314mm/a (as also derived from previous assessment of the Site) to the estimated 16.9ha catchment of the Quarry Area, indicates average rainfall / runoff rates of some 1.7l/s (excess rates from episodic rainfall events being attenuated within the sump).
- 3.2.3 This indicates combined groundwater ingress and incident rainfall rates requiring dewatering of some 109.7l/s.

3.3 Application Rates / Volumes

- 3.3.1 Though the discharge from the Site will be rainfall dependent and will vary throughout its lifespan, it must be permitted for maximum discharge rates, thus combined maximum rates estimated for both the drainage of the Plant Area and dewatering of the Quarry Area, operating concurrently.
- 3.3.2 As discharge is rainfall dependent, it is considered prudent that climate change allowance also be incorporated into application rates / volumes, ensuring sufficient discharge rates are permitted throughout the lifespan of the Site (10% allowance, set to upper end rainfall intensity correction for the '2020s', in line with Environment Agency Guidance³ 'Flood Risk Assessments, Climate Change Allowances', February 2022).

Table 2 Application Rates and Volumes		
Units	Discharge Rate	Derivation
m ³ /a	4,097,052	m ³ /d * 365 (year round discharge)
m ³ /d	11,224.8	m ³ /hr * 24 (24 hr per day discharge)
m ³ /hr	467.7	l/s / 1,000 * 60 * 60
l/s	130	Plant Area rate (section 3.1) + Quarry Area rate (section 3.2) * 1.1 (climate allowance)

- 3.3.3 As at *appendix 1*, in November 2019, the Environment Agency (which at the time administered discharge permits at the Site location) confirmed that rates of similar magnitude were acceptable, though it is not known if a permit confirming this was ultimately issued.

4 CLOSURE

- 4.1 Assessment has been undertaken to estimate and thus confirm necessary rates of discharge from Denbigh Quarry, Denbigh, North Wales, in support for a consenting Environmental Permit, as issued by NRW.

² BCL Consultant Hydrogeologists Limited 'Denbigh Quarry, Hydrological and Hydrogeological Impact Assessment', January 2020.

³ Natural Resources Wales guidance provides peak river flow and sea level correction factors, not rainfall intensity factors, which have been sourced from Environment Agency guidance as an alternative source.

4.2 Should any further detail in this regard be necessary, this can be provided upon request.



Peter Simpson, BSc, MSc, FGS
Principal Hydrogeologist

BCL Consultant Hydrogeologists Limited
03rd Feb 2022



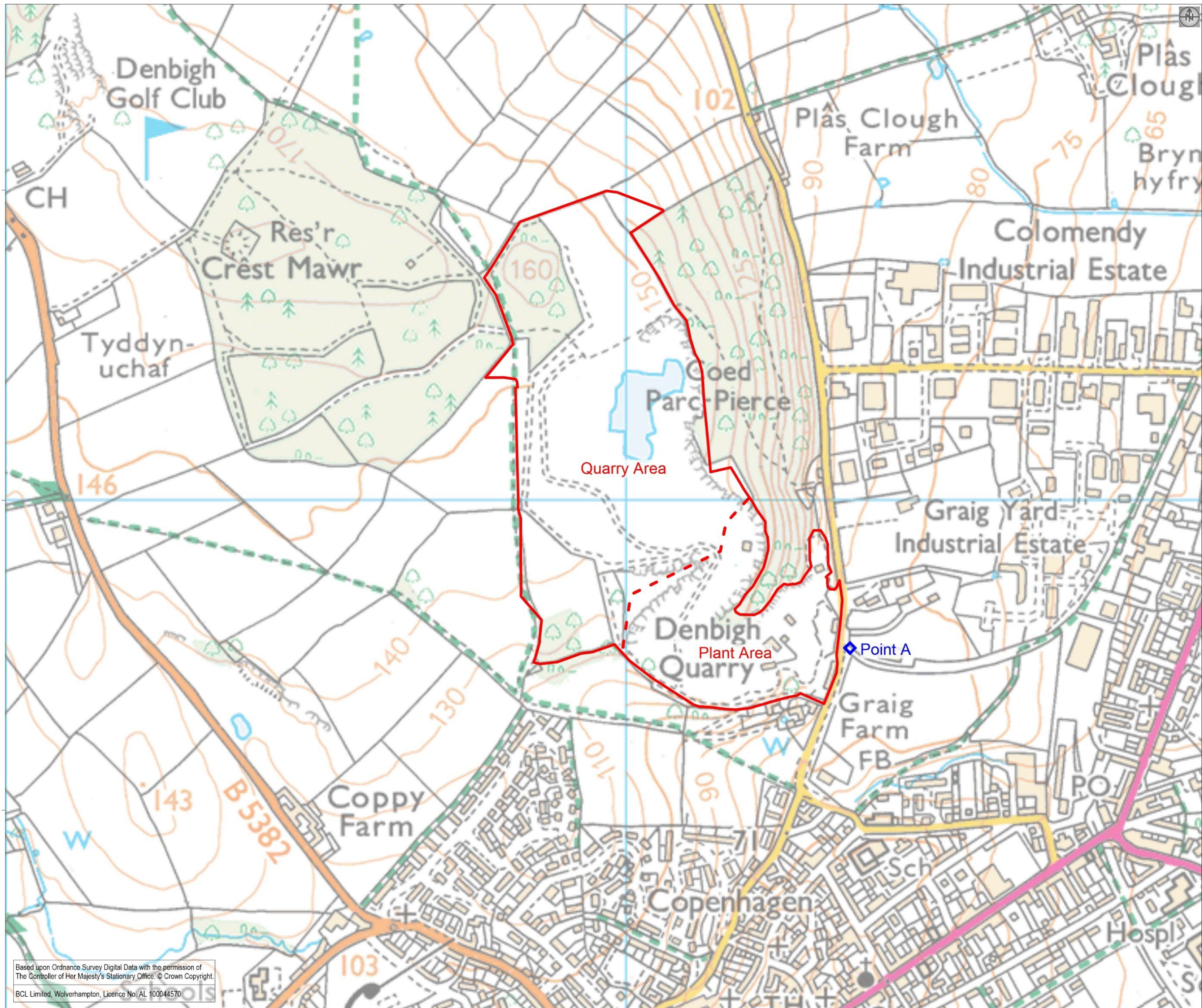
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Denbigh Quarry
Denbigh, Denbighshire

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Figures



Site Boundary



Discharge and
Sample Point

SBTL/DQ/EPWD21_VOLUMES_001



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Denbigh Quarry, Denbigh, Denbighshire

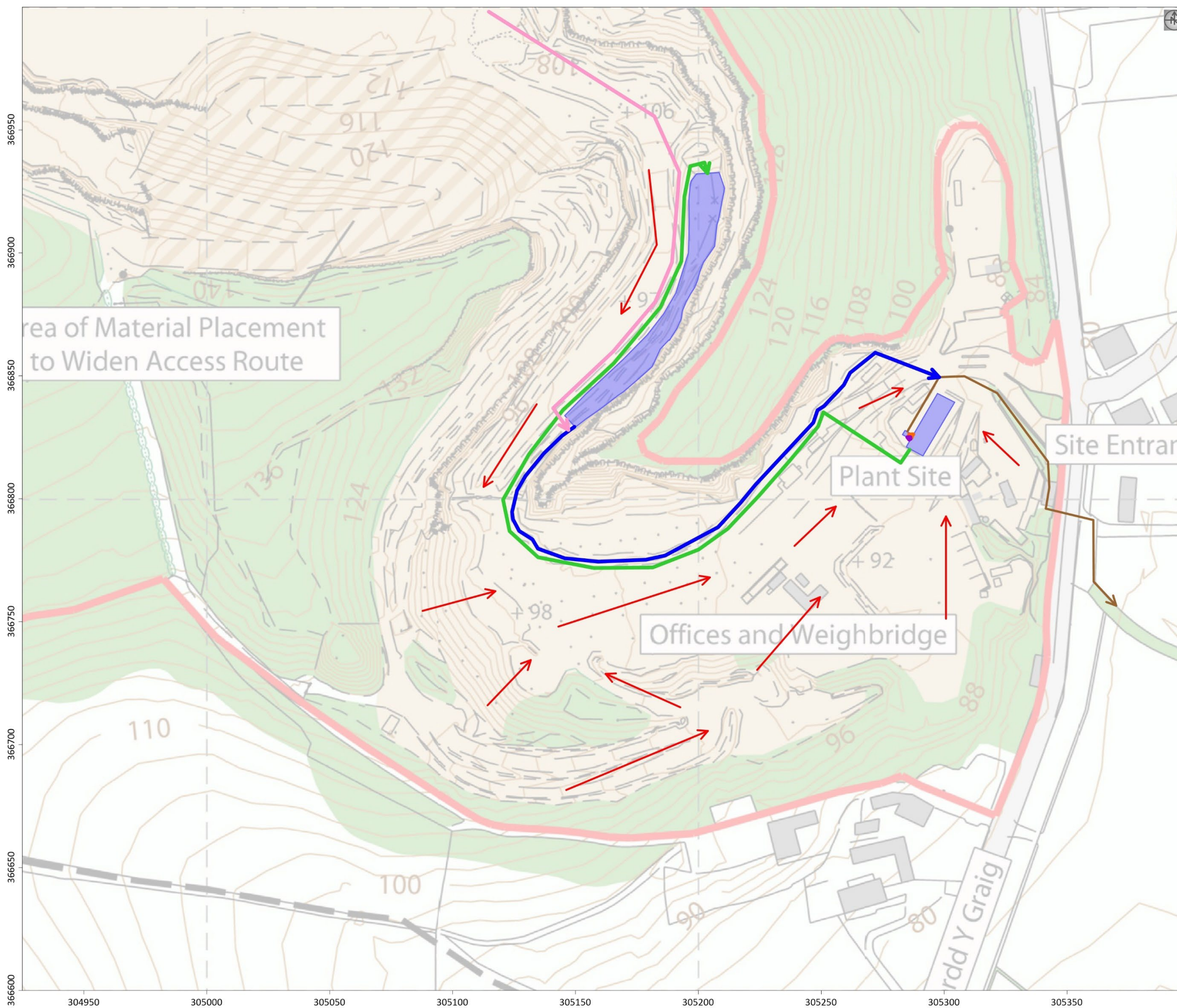
Environmental Permit, Water Discharge

Figure 1 Site Location

Drawn By: PS
Date: 18/03/2021

Scale: 1:6,000
Format: A3L

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The Controller of Her Majesty's Stationary Office. © Crown Copyright.
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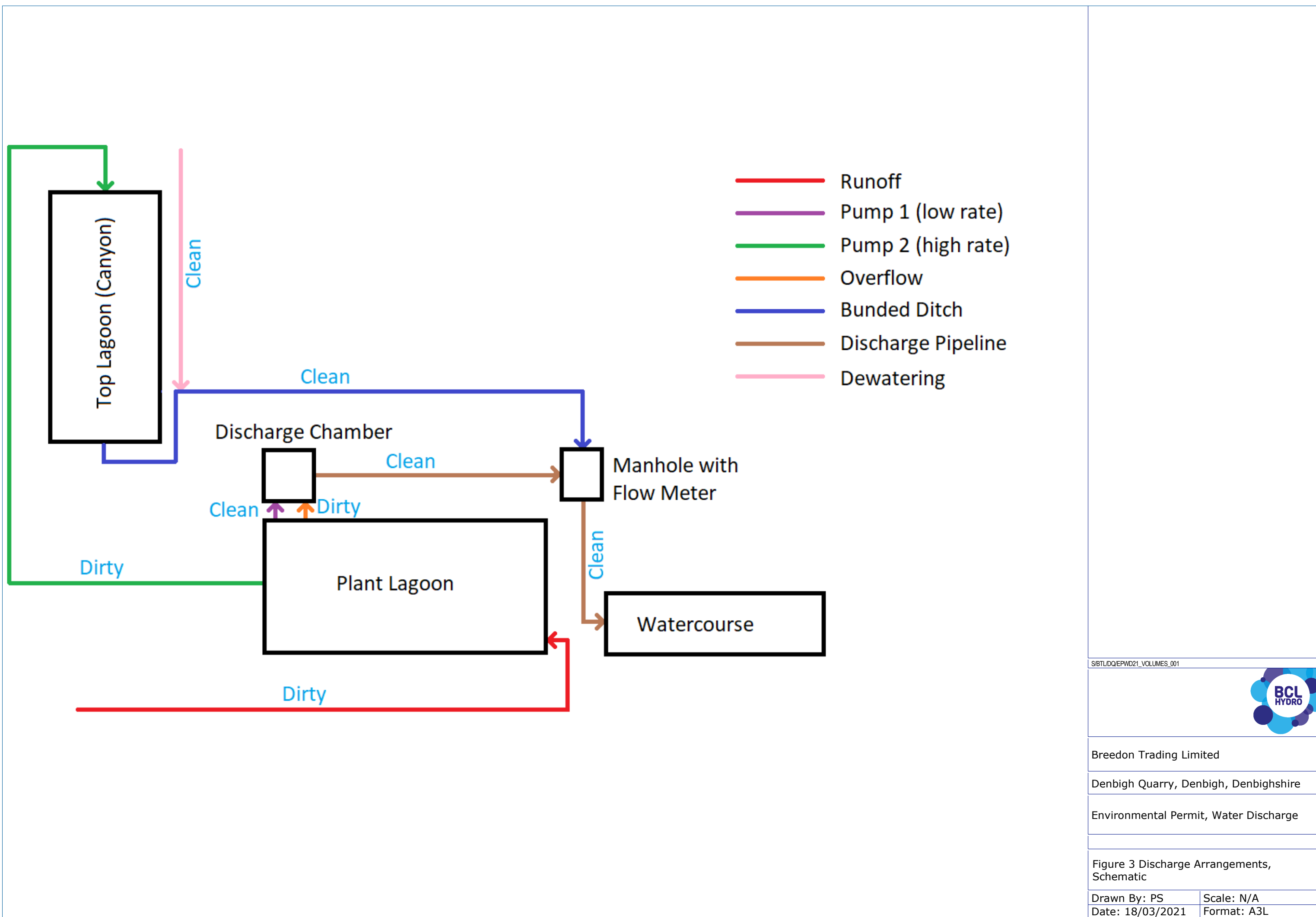
- Runoff
- Pump 1 (low rate)
- Pump 2 (high rate)
- Overflow
- Bunded Ditch
- Discharge Pipeline
- Dewatering

SBTL/DQ/EPWD21_VOLUMES_001



Breedon Trading Limited
Denbigh Quarry, Denbigh, Denbighshire
Environmental Permit, Water Discharge

Figure 2 Discharge Arrangements, Plant Area



SBTL/DQ/EPWD21_VOLUMES_001



Breedon Trading Limited

Denbigh Quarry, Denbigh, Denbighshire

Environmental Permit, Water Discharge

Figure 3 Discharge Arrangements, Schematic

Drawn By: PS	Scale: N/A
Date: 18/03/2021	Format: A3L



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Denbigh Quarry
Denbigh, Denbighshire

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[Appendix 1: Historic Discharge Permit Details](#)

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ych cyf/Your ref.

ych cyf/Our ref.

CG0333601

Dyddiad/Date:

18th June 1998

Mr S. Treacy
Senior Estate Surveyor
Tarmac Quarry Products
1 Lismore Road
Buxton
Derbyshire
SK17 9AP

Dear Mr Treacy

RE: WATER RESOURCES ACT 1991, SCHEDULE 10 (AS AMENDED BY THE ENVIRONMENT ACT 1995) APPLICATION FOR VARIATION OF CONSENT TO DISCHARGE NO CG0333601.

Further to your application for variation of consent of the Agency to discharge under the provisions of Section 88 of the Water Resources Act 1991, I enclose the Agency's formal notice of the variations made to the conditions of the consent to discharge Trade Effluent from Graig Quarry, Denbigh.

Under the present Scheme of Charges for Discharges to Controlled Waters an annual charge will be made for all consents to discharge, except where the discharge is of sewage effluent of five cubic metres or less per day. This charge is based on information derived from the conditions attached to the consent to discharge, as outlined in the enclosed leaflet. A change in conditions may therefore result in a change in annual charge, you may therefore receive a revised bill in due course.

If you are not satisfied with the new conditions of the consent you may appeal against the decision to the Secretary of State for Wales at the Welsh Office, Cathays Park, Cardiff CF1 3NQ.

Please take careful note that if the holder of the consent changes, you must inform the Agency **IN WRITING** as soon as possible of the name of the new holder. This to ensure that the rights and charges associated with the Consent are transferred to the new holder. A certificate of Holder notice will be sent to you shortly which is designed for this purpose, and should be kept safely with the Consent until required.

Asiantaeth yr Amgylchedd
Llwyn Brian, Ffordd Penlan, Parc Menai, Bangor LL57 4DE.
Ffon 01248 670770, Ffacs 01248 670561, GTN 7-26 X 4000

Environment Agency
Llwyn Brian, Ffordd Penlan, Parc Menai, Bangor LL57 4DE.
Tel 01248 670770, Fax 01248 670561, GTN 7-26 X 4000



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AGENCY

If you have any questions regarding the enforcement of this consent please contact Mr Dave Andrew, Team Leader Environment Protection, Environment Agency, Chester Road, Buckley. CH7 3AJ. Tel 01244 550124.

Yours sincerely,

BRIAN BOOTH
Team Leader Customer Contact

Enc.

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CONSENT NO. CG0333601



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Environment
Agency

WATER RESOURCES ACT 1991

SECTION 88 - SCHEDULE 10

(AS AMENDED BY THE ENVIRONMENT ACT 1995)

NOTICE OF MODIFICATION OF CONSENT TO DISCHARGE

TO: Tarmac Heavy Building Materials (UK) Ltd
PO Box 8
Millfields Road
Ettingshall
Wolverhampton WV4 6JP

Following a review of the conditions of its consent, the **ENVIRONMENT AGENCY** ("The Agency") in pursuance of its powers under the Water Resources Act 1991 **HEREBY MODIFIES ITS CONSENT** to the making of a discharge **OF TRADE EFFLUENT** as follows:

Trade Effluent
with respect to Consent No. CG0333601 issued on the 21st September 1992

FROM: Tarmac Quarry Products Ltd

AT: Graig Quarry, Graig Road, Denbigh

TO: Tributary of Henllan Brook

HEREAFTER SUBJECT TO the conditions set out in the following schedule(s):

Trade Effluent

Schedule No. CG0333601 01

Subject to the provisions of Paragraphs 7 and 8 of Schedule 10 of the Water Resources Act 1991, no notice shall be served by the Agency, which alters the effect of modifications made by this notice, without the agreement in writing of the consent holder, during a period of 4 years from the date this notice is served.

Dated this 18th day of June 1998

Signed
Team Leader Water Quality Consents

Asiantaeth yr Amgylchedd

Ffordd Caer, Bwcle, Sir Fflint CH7 3AJ Ffon 01244 550124 Ffacs 01244 550144

Environment Agency

Heol y Castell, Buckley, Flintshire CH7 3AJ Tel 01244 550124 Fax 01244 550144

CONSENT NO.	CG0333601
SCHEDULE NO.	CG0333601 01
DATED	18th June 1998



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CONDITIONS OF CONSENT TO DISCHARGE

Trade Effluent ("the Discharge")

FROM: Tarmac Quarry Products Ltd., Graig Quarry, Graig Road, Denbigh.

1. (a) The Discharge shall not contain any poisonous, noxious or polluting matter or solid waste matter.
- (b) Provided that the Discharge hereby consented is made in accordance with the following conditions of this consent, such discharge shall not be taken to be in breach of condition (a) above by reason of containing substances or having properties identified in and controlled by these conditions.

NATURE

2. The Discharge shall consist solely of trade effluent from Tarmac Quarry Products Ltd., Graig Quarry, Graig Road, Denbigh.

LOCATION

3. The Discharge shall be made in the manner and at the place specified as:
 - (a) discharging via a pipe;
 - (b) discharging to tributary of Henllan Brook;
 - (c) at National Grid Reference SJ 0532 6684;
 - (d) shown marked 'Discharge & Sampling Point' on Plan CG0333601 attached as Annex 1.

SAMPLING POINTS

4. The outlet from the inteceptor shall be constructed, maintained and appropriately labelled so that a representative sample of the Discharge may be obtained at National Grid Reference SJ 0532 6684 as shown marked "Discharge & Sampling Point" on Plan CG0333601.

CONSENT NO.	CG0333601
SCHEDULE NO.	CG0333601 01



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VOLUME

5. The volume of the Discharge shall not exceed 260 cubic metres per day.
6. The rate of discharge shall not exceed 6 litres per second.

FLOW MEASUREMENT

7. Flow measurement structure(s) shall be provided and maintained to enable the instantaneous flow rate and daily volume of the Discharge to be measured or determined as required.

COMPOSITION

8. The discharge shall not contain more than 60 milligrammes per litre of suspended solids (dried at 105 degrees Celsius)
9. The pH of the discharge shall remain at all times between 5 and 9 pH units.

OPERATION

10. As far as is reasonably practicable, the works shall be operated so as to prevent:
 - (a) any matter being present in the Discharge, other than matter specifically covered by numerical conditions in this consent, to such an extent as to cause the receiving waters, or any waters of which the receiving waters are a tributary, to be poisonous or injurious to fish in those waters, or to the spawning grounds, spawn or food of fish in those waters, or otherwise cause damage to the ecology of those waters; and
 - (b) the Discharge from having any other adverse environmental impact.

MAINTENANCE

11. The plant shall be operated and maintained in accordance with good operational practice such that :
 - i). It remains fully operational except at times of unavoidable mechanical breakdown which shall be attended to, and the Agency informed of the failure as soon as practicable after the failure.

CONSENT NO.	CG0333601
SCHEDULE NO.	CG0333601 01



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- ii). Following the failure all equipment shall be returned to normal operation as soon as practicable,
- iii). The interceptor shall be cleaned and desludged at sufficient frequency and in such a manner to prevent carryover of solids in breach of this consent.

CONSENT NO.	CG033360101
SCHEDULE NO.	CG0333601 01



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ANNEX 1

Plan CG0333601

GRAIG QUARRY, DENBIGH



Eich cyf/Your ref.

Ein cyf/Our ref:

Ymholiadau/Enquiries.

Dyddiad/Date

EP3/QU/Denbigh Quarry

Joanne Evans

Ext 4507

29th November 1999



ASiantaeth Yr
Amgylchedd Cymru
ENVIRONMENT
AGENCY WALES

Paul Burfitt,
Tarmac Quarry Products Limited,
Headquarters,
Millfields Road,
Ettinghall,
Wolverhampton,
West Midlands,
WV4 6JP

Dear Paul,

RE: DENBIGH QUARRY, DENBIGHSHIRE, NORTH WALES.

I refer to your letter dated 27th November 1999 and our subsequent telephone conversation regarding your requesting for a modification to the current discharge consent (CG0333601) held by Tarmac for the Denbigh Quarry site.

I have forward a copy of your letter to our consents department who will implement the necessary modifications to Consent Number CG0333601, so as to reflect the change in situation at site i.e. addition of water from the upper quarry and increase in maximum daily flow to 117 litres/second. Once the modification has been completed the Agency will reissue the consent

However, until you receive a copy of the modified consent the Agency has no objections to the discharge of water from the upper quarry, providing that the discharge at all times complies with the quality conditions imposed on the site's existing consent and passes through the existing site sample point. If you have any queries with regard to the above or require further assistance or information, please do not hesitate to contact me.

Yours sincerely

Joanne Evans

JOANNE EVANS

Environment Protection Officer

(EP310308/APH)

Asiantaeth yr Amgylchedd Cymru
Ffordd Caer, Bwcle, Sir y Fflint CH7 3AJ
Ffon 01244 550124 Ffacs 01244 550144

Environment Agency Wales
Chester Road, Buckley, Flintshire CH7 3AJ
Tel 01244 550124 Fax 01244 550144