
From: South East Planning <southeastplanning@cyfoethnaturiolcymru.gov.uk>
Sent: 25 January 2024 14:25
To: Thomas Boothroyd; Planning DC
Subject: P/22/0206 - Vaynor Quarry (Major) V2 - NRW Response NRW:01140459
Attachments: P.22.0206 - Methry vaynor quarry v2.pdf; Abstraction licence response letter.pdf

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Dear Tom / Merthyr

Please accept our apologies for the delayed response. As you'll see, discussions within NRW were needed before we could respond. Attached is our latest advice as well as a letter NRW permitting have sent the applicant in relation to their abstraction licence application. If you have any queries please do not hesitate to contact me.

Kind Regards
James Davies

Tîm Cynllunio Datblygu / Development Planning Team
Cyfoeth Naturiol Cymru / Natural Resources Wales

Ffôn / Tel: 03000 653033
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Yn falch o arwain y ffordd at ddyfodol gwell i Gymru trwy reoli'r amgylchedd ac adnoddau naturiol yn gynaliadwy / Proud to be leading the way to a better future for Wales by managing the environment and natural resources sustainably.

Croesewir gohebiaeth yn Gymraeg a byddwn yn ymateb yn Gymraeg, heb i hynny arwain at oedi / Correspondence in Welsh is welcomed, and we will respond in Welsh without it leading to a delay.

Ein cyf/Our ref: CAS-237371-G4F4
Eich cyf/Your ref: P/22/0206

Merthyr Tydfil County Borough Council
Unit 5 Triangle Business Park
Pentrebach
CF48 4TQ

Dyddiad/Date: 25 January 2024

Annwyl Syr/Madam/Dear Sir/Madam,

BWRIAD / PROPOSAL: FIRST PERIODIC REVIEW OF OLD MINERALS PERMISSION (ROMP) AT VAYNOR QUARRY (PURSUANT TO ENVIRONMENT ACT 1995).

LLEOLIAD/LOCATION: VAYNOR QUARRY, UPPER VAYNOR ROAD, CEFN COED, MERTHYR TYDFIL, CF48 2LA.

Thank you for consulting Cyfoeth Naturiol Cymru (CNC)/Natural Resources Wales (NRW) about the above. We apologise for the delay in responding to this consultation.

We continue to have concerns with this ROMP application as submitted. We advise inadequate information has been provided to allow us to assess the likely environmental impacts from quarrying at this dormant quarry site. **To overcome these concerns, further information from the applicant regarding hydrological and hydrogeological impacts on protected sites and clarification on bats is necessary prior to determining this application.** Further details are provided below.

Notwithstanding the above advice for further environmental information, we also advise that based on the information submitted to date, new conditions regarding European protected species and lighting should be attached to the planning permission through this first periodic review. Further details are provided below.

Hydrological and Hydrogeological Impacts on Protected Sites (SSSI)

We have reviewed the SLR Consulting Limited letter to your Authority dated 19 July 2023 (reference: 407.00027.00430). This has not altered our position on the potential likely significant effects on the Sites of Special Scientific Interest (SSSI) from the quarrying restarting and changing the current hydrological and/or hydrogeological regime in the area.

We advise inadequate information has been provided to allow us to assess the likely environmental impacts from the quarrying restarting at this dormant site. We therefore continue to have concerns over the lack of evidence in the submission.

As such, we cannot agree with the EIA findings which conclude no impact on the Nant y Glais watercourses or a negligible effect on the Taf Fechan watercourses, which are associated with the SSSIs of the same name. Furthermore, the ES concludes significant effects on springs NG01 and NG02 are likely, with the potential for the two springs to be lost completely as a result of the quarrying. No mitigation has been proposed. We do not consider this acceptable and although these springs are located outside the SSSI designations, they contain Annex 1 (Habitats Directive) habitat.

For information, the applicant has also applied to NRW to vary their existing abstraction licence at the quarry site. The applicant has submitted the same environmental information provided in this ROMP application to support the variation of abstraction licence. NRW's Permitting Service have yet to determine the licence and are seeking further environmental information to understand and assess hydrological and hydrogeological impacts. They have also concluded that potential effects on the local environment (notably the Cwm Taf Fechan SSSI, including springs and associated flora) from the quarrying operations is uncertain. These uncertainties are consistent with our previous statutory consultee advice.

Internal discussions have taken place to ensure NRW's planning response to this ROMP consultation and NRW's Permitting Service's determination of the abstraction licence is co-ordinated.

There is potential for some regulatory overlap between the ROMP process and abstraction licensing regarding the likely hydrological and hydrogeological effects. It is likely that if the applicant can secure a variation to their abstraction licence, our concerns as statutory consultee on these effects will be addressed.

NRW's Permitting Service's letter to the applicant's agent is appended. This explains the licensing position and provides details of the information NRW are seeking. It is important to note that if this information is submitted, it may not demonstrate that the impacts are acceptable.

At this stage, and unless or until the Applicant provides further information as set out in the appended letter, NRW are unable to advise the mineral planning authority whether the applicant has demonstrated the likely hydrological and hydrogeological effects on the local environment (specifically the SSSI interest) can be avoided or, if not, mitigated appropriately (and secured/controlled through either regulatory regime). Your authority may consider it necessary for this information to also be submitted with the ROMP application.

Protected Species

Bats

In our response dated 03/02/2023 we sought clarification over the location of caves associated with Vaynor quarry where lesser horseshoe bats have been found. This would allow us to understand whether this species could be impacted by future operations.

The letter from SLR Consulting Limited referenced above states that the quarry owners (Hanson) are not aware of any caves within the site and asks for clarification regarding the records we hold. SLR Consulting Limited state that no visible caves within the site have been noted during ecological survey visits.

We are aware of a report which indicates that three caves were surveyed for evidence of bat presence in July 2016 by Smith Ecology Limited. The caves are named Vaynor Quarry North Rift, Vaynor Quarry South Rift, and Vaynor Quarry Cave 2. Evidence of lesser horseshoe bat presence was found in all three caves. In addition, the surveyors looked for Vaynor Quarry Cave, a cave numbered 723 in Cambrian Caving Registry, but this feature could not be found at the time.

Therefore, this matter requires concluding before we can advise whether bats are material to the consideration of this ROMP application.

Great Crested Newts (GCN)

We have reviewed the updated survey information and the detail in the above letter by SLR Consulting Limited. As previously stated, and as indicated by the 2023 survey information, the site supports a large breeding population of GCN.

We are satisfied that the amended GCN mitigation, compensation and enhancement detail as outlined in the above letter address our previous concerns regarding the sufficiency of the habitat creation proposals. We advise that remaining concerns over the implementation and monitoring of this mitigation, compensation and enhancement should be addressed by conditions attached to the periodic review.

Detailed conservation plan for great crested newts

We advise that a GCN conservation plan is prepared, building on the measures outlined in the SLR Consulting Letter (19 July 2023) and the drawings GCN1-5. The conservation plan should include the following:

- An assessment of impacts during operational and post- mineral extraction phases of the scheme. This to include an evaluation of the nature, extent and duration of the likely direct and indirect impacts of the works. This assessment should include:
 - review of the extent, distribution and quality of GCN habitat to be removed, retained, enhanced and created, supported by drawings as appropriate;
 - Risks of incidental injury or killing; and
 - Consideration of habitat functionality and connectivity during and post operation.
- Submission of details and associated plans concerning principles of GCN avoidance and mitigation measures including, but not limited to: fence specifications and proposed locations, consideration of access issues across fence lines, fence monitoring and maintenance requirements, and supervised removal of barrier fences. Submission to include proposed timescales and reporting requirements.
- Submission of further details concerning dedicated GCN compensation area(s), including location plans, extent, access, and current and proposed tenure. Details shall identify areas of terrestrial and aquatic habitat to be retained, enhanced and created for each proposed phase of mineral extraction. In respect of aquatic habitats, this should include pond design and fish management requirements.
- Details of timing, phasing and duration of construction activities and conservation measures; the timetable shall demonstrate that mitigation/ compensation works are aligned with the proposed development.

- Long-term financial considerations.

The requirement for conservation plan could be absorbed into the proposed Ecological Management Plan (EMP) condition (condition number 29 on the MTCBC planning condition schedule document).

We would anticipate that the plan be updated as successive phases and review periods come forward.

We envisage that the conservation plan will materially inform the provisions of any subsequent application for a derogation licence issued by NRW under Regulation 55 of the Conservation of Habitats and Species Regulations 2017 (as amended).

Long-term surveillance and monitoring strategy

We consider a planning condition is required for monitoring results to inform targeted management of GCN to ensure their maintenance or restoration to their Favourable Conservation Status of the local population can be demonstrated or achieved.

As such we seek the following planning condition, or if appropriate, the objectives of this condition can be absorbed into the proposed EMP condition:

Condition: Within 12 months of the completed review date of the mineral planning permission(s) 52/78/0718, 1/5066, 1/4120 and 1/1466 a long-term monitoring and strategy shall be submitted to the written satisfaction of the Mineral Planning Authority. The scheme shall include:

1. Defined ecological features and associated monitoring key performance indicators.
2. Monitoring and surveillance methodologies.
3. Persons responsible for commissioning and undertaking.
4. Reporting and results dissemination, including submission of data to appropriate recognised recording schemes.
5. Contingency prescriptions that are capable of being implemented in the event of required surveillance not being carried out.

Implementation shall be carried out in accordance with the approved plan.

Justification: To demonstrate that mining operation is not causing a long-term detrimental impact on great crested newt.

Long-term post-mining

We note the proposed condition for an aftercare scheme which includes provision of an aftercare habitat management plan. We would seek the following objectives to be included in such a condition:

1. Tenure; and proposed changes to tenure of ecology areas
2. Management and surveillance plan for ecology areas
3. Protected species licensing requirements;
4. Financial resource provision; and

5. Timescales for implementing the plan.

Justification: To ensure implementation of targeted conservation management post mineral extraction.

Updated survey

Given the lifetime of the scheme, we ask that you consider whether it is necessary to secure updated ecological surveys prior to the commencement of each phase of the scheme. If so, we advise the following condition:

Condition: No phase shall commence until updated pre-extraction ecological surveys including for bats have been carried out. If the survey confirms the presence of bats or other protected species, the results of the survey together with proposed mitigation measures shall be submitted to and approved in writing by the Mineral Planning Authority. The measures shall be carried out in accordance with the approved details.

Justification: To ensure the potential presence of further protected species is confirmed prior to construction and where necessary remedial measures are implemented for their protection.

Landscape

Our previous landscape advice in our letter dated 3 February 2023 (referenced CAS-196279-Q0N3) confirmed that the restoration proposals and related conditions were acceptable to us. However, we had concerns regarding a lack of information relating to lighting and therefore the potential impacts of lighting on tranquillity and dark skies.

We agree with the SLR Consulting letter dated 19 July 2023, that a condition on lighting could address this concern. We suggest the following condition is included:

Condition: Details of lighting to be installed or operated after the Date of Final Determination shall be submitted to and agreed in writing by the Local Planning Authority. The Lighting Plan should include:

- Details of the siting and type of external lighting to be used.
- Measures to reduce light spillage.
- Measures to monitor light spillage.
- The operation of the Scheme will be in accordance with the approved Lighting Plan.

Justification: A lighting plan should be submitted to ensure lighting details are agreed to minimise the impacts of lighting in the interest of dark skies and night-time tranquillity of Bannau Brycheiniog National Park.

Assuming the additional lighting condition is included, we are satisfied with the schedule of conditions insofar as they relate to landscape and visual matters, and we have no further comments to make.

Previous Advice and Other Matters

Our advice on Ornithology and Air Quality remains unchanged from our letter dated 3 February 2023 (referenced CAS-196279-Q0N3).

Our comments on this application only relate specifically to matters included on our checklist, *Development Planning Advisory Service: Consultation Topics* (September 2018), which is published on our [website](#). We have not considered potential effects on other matters and do not rule out the potential for the proposed development to affect other interests.

We advise the applicant that, in addition to planning permission, it is their responsibility to ensure they secure all other permits/consents/licences relevant to their development. Please refer to our [website](#) for further details.

If you have any queries on the above, please do not hesitate to contact us.

Yn gywir / Yours faithfully

James Davies

Cynghorydd - Cynllunio Datblygu/Advisor - Development Planning
Cyfoeth Naturiol Cymru/Natural Resources Wales

E-bost/E-mail: southeastplanning@cyfoethnaturiolcymru.gov.uk

Ffôn/Phone: 03000 65 3033

Croesewir gohebiaeth yn Gymraeg a byddwn yn ymateb yn Gymraeg, heb i hynny arwain at oedi./Correspondence in Welsh is welcomed, and we will respond in Welsh without it leading to a delay.

Richard Holtham
Stantec

By email only:
Richard.Holtham@stantec.com

Dear Richard

Application to vary abstraction licence WA/057/0021/0014 Vaynor Quarry

NRW has reviewed the information relevant to the topic of groundwater licencing for the Vaynor Quarry site. Particular reports that have been focused upon include:

- VAYNOR QUARRY Environment Act 1995 First Periodic ROMP **ES** Volume 1, August 2022
- The Vaynor Quarry ROMP: Supporting **Groundwater Flow Modelling Report**, July 2022
- Vaynor Quarry: Flood Consequence Assessment (**FCA**) and Drainage Strategy, August 2022

A key focus for groundwater licensing is assessing the degree to which the proposed water management for the site which is effectively discharging from a pond system over the coming decades will sufficiently mimic the current hydrodynamics that support the Taf Fechan ecosystem which includes springs and associated bryophytes located to the south of the quarry. NRW considers that the potential effects and their nature on the local environment, notably the Taf Fechan ecosystem including springs and associated flora from quarry operations are uncertain. In addition, the tools, notably a numeric groundwater model that have been used to predict future hydrodynamic behaviours, have revealed a number of key shortcomings. Please see the attached annex which consists of sections and figures from the various reports that are used to support NRW's current view and position. Please note that this is not a definitive list but rather the information presented serves as a means to illustrate some of the key concerns.

Taking into consideration the reports referred to above and particular aspects of those reports, the following key uncertainties arise:

- The numeric modelling that has been performed is based on an inter-granular flow model when there are numerous references in the numeric modelling report to the groundwater regime as being a fracture-flow system with *'the majority of the flow is likely to be concentrated within a small volume of high hydraulic conductivity fissures.'*

- The hydraulic conductivity values of 0.15m/d and 0.25m/d are not considered representative of fractured limestone. Hydraulic conductivity values representative of limestone fracture systems are generally significantly greater than the values used in the model.
- There are dry cells and flooding cells that have manifested during the numeric modelling exercise which indicate that the model is not a good representation of reality. These manifestations will interfere with model convergence. The model has a central 10 m grid and 5 layers and it does not appear to be representing site conditions very well. This is not surprising given the difficulty of modelling a fractured bedrock system with multiple sinks (springs / rivers) and topography and using inter-granular flow as the flow mechanism.
- The model is not considered to be 'calibrated' and appears to be an exercise in matching observed heads by adjusting variables such as the hydraulic conductivity.
- The numeric model has simulated the SE pond as constant heads. Changes in the spatial characteristics of the pond over time have not been considered.

NRW therefore does not believe that the groundwater numeric modelling that has been performed to date in support of groundwater management at Vaynor Quarry is representative of current and future predicted hydrodynamic conditions. Further, NRW believes that the numeric groundwater modelling and particular conceptual aspects presented within the FCA such as head changes that occur in the pond system located within the southern portion of the site arising from changes in stormwater and groundwater contributions over time together with associated recharge dynamics, should have been integrated within the numeric groundwater modelling exercise.

Based upon the information submitted to date NRW's view is that there are too many uncertainties to be able to reach the conclusion that the proposed pond will maintain the future hydrodynamics that support the Taf Fechan ecosystem. The nature of the fracturing at the site has not been investigated including for example fracture density, orientation and dip and the use of survey lines that intersect fractures, stereo nets and rose diagrams, the latter to assess fracture populations and trends. These types of field data would help to inform upon preferred groundwater flow directions. Given the distance between the pond and the Taf Fechan ecosystem, it is uncertain whether the fractures that the pond water will intersect are also connected to the Taf Fechan and associated springs.

In light of the uncertainties highlighted above and the need to rely on predicted future flow regimes and passive management of groundwater at the site, exploration of the following actions and activities could be undertaken.

- Assess the nature of the fracture system at the site including fracture density, orientation, dip and the types of fractures such as whether or not they are smooth or infilled with secondary materials such as fine sediments. This could be done through field work.

- Revisit the nature of the numeric modelling that has been performed to date with an emphasis on assessing future flows and groundwater dynamics using a simulator that can model fracture-flow. This can only be considered successful if a meaningfully calibrated model for current conditions can be developed so that there is more confidence in predicted conditions and hydrodynamics. Calibration should utilise spring, river flow and pond level data. Explore integrating aspects of the FCA such as pond recharge and changes in the pond footprint that are proposed over the coming decades into the numeric groundwater model. Explore whether the pond groundwater system is best simulated using variable recharge or constant heads.
- Numeric groundwater modelling simulations should mimic the proposed quarry phases and the use of transient modelling rather than steady-state modelling should be explored.
- Simulate the pond in the SE corner of the site so that the simulations reflect changes in the spatial characteristics of the pond over time as the current model relies on one pond footprint. Explore calibration to pond levels.
- Use the numeric modelling to explore the proposed pond configuration and potentially amend and enhance its design so that there is a greater probability that transmissive fractures that are intersected by the pond and that groundwater flowing in those fractures intersected by the pond have a greater potential to connect to the Taf Fechan spring line, the Taf Fechan stream and associated ecosystems including the floral communities such as bryophytes. Explore if a pond that is located closer to the Taf Fechan ecosystem and consisting for example of a curvilinear 'infiltration trench' would be a more useful design or as an additional feature to the current pond so that there is greater probability that water within the particular fractures that feed the Taf Fechan ecosystem and associated springs are connected to the water from the 'infiltration trench' or pond/infiltration trench combination.
- Explore the use of mass-balance estimations/calculations to assess the current groundwater flows that support the Taf Fechan.
- Develop a Monitoring Strategy and Plan (with contingencies) to verify that no negative changes to the Taf Fechan system are occurring and develop contingencies for dealing with any that may arise. This could include the construction of additional infiltration structures closer to the Taf Fechan.

Please note however even if the proposals suggested above are undertaken and further information is submitted to support your application, this does not guarantee that the proposal will be acceptable. Additionally we may request further information. Once you have reviewed the above information, please let me know if you would like to discuss any of the points and how you intend to proceed with this application.

As previously discussed, I would be grateful if you could confirm that you agree to a proposed extension to determination of your application by 31 March 2024; or intend on withdrawing your application.



**Cyfoeth
Naturiol**
Cymru
**Natural
Resources**
Wales

Yours sincerely
Liz Cole

Direct dial: 03000 65 4240

Annex: Vaynor quarry response letter

Reports reviewed :

- VAYNOR QUARRY Environment Act 1995 First Periodic ROMP **ES** Volume 1, August 2022
- The Vaynor Quarry ROMP: Supporting **Groundwater Flow Modelling Report**, July 2022
- Vaynor Quarry: Flood Consequence Assessment (**FCA**) and Drainage Strategy, August 2022

Page 143 of the **ES** states the following:

Cwm Taf Fechan SSSI is located to the south of the Quarry. It is expected that water draining from the south-east pond currently contributes to flows in the Cwm Taf Fechan SSSI springs and baseflow in the Taf Fechan. The pond will be retained and enlarged through quarrying. This will allow the hydraulic gradient south of the Quarry to remain unchanged. Indeed, as the pond is expanded, the hydraulic gradient may steepen through time meaning and in either case there will be no decrease in flows at the springs within the SSSI as a result of the development. Therefore, there will be no loss of flow to the Cwm Taf Fechan SSSI springs and the degrees of effect and impact are expected to be Negligible.

And page 16 of the **Groundwater Flow Modelling report** states

It should be noted that these hydraulic conductivity values represent the weighted average of the limestone fissures and matrix. In reality, the majority of the flow is likely to be concentrated within a small volume of high hydraulic conductivity fissures.

Page 40

It is also noted that there is insufficient data available on the fissure frequency, orientation and transmissivity to justify an alternative modelling approach that would be more suited to modelling a fissure flow system.

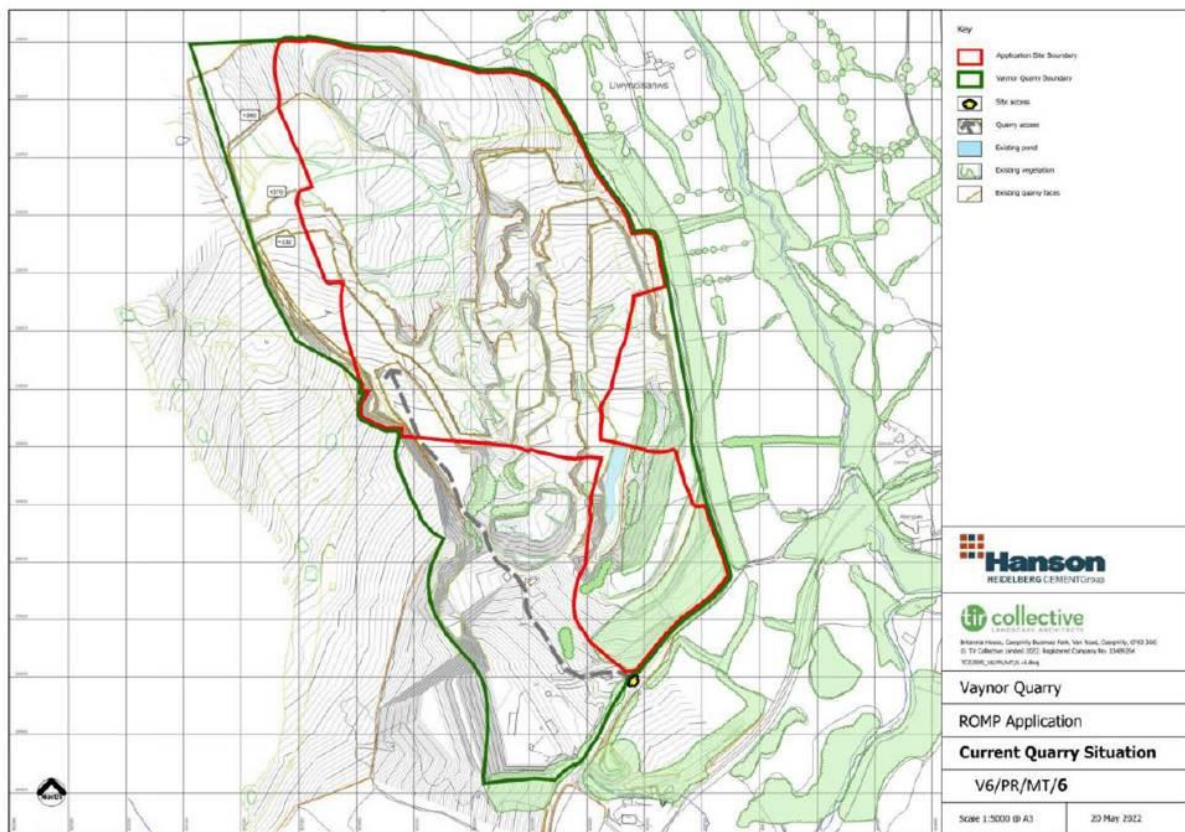
Page 41

In reality, the groundwater flow direction and magnitude following recharge at the proposed infiltration pond will depend on the fissures that the pond intersects. On the assumption that some fissures are intersected and recharge to groundwater is possible, it is likely that groundwater flow will be towards the south and the rivers. Overall, it is considered that the net impact of groundwater discharge to the rivers and springs will not be significantly different from under the current situation.

A review of the proposed phased quarrying excavation is presented in the **ES** as Figures 3-1 to 3-7 inclusive. These Figures show the current pond (light blue feature) within the SE portion of the site generally oriented North-South. After 15 years the pond is depicted as being slightly larger on the northern end of the pond

and then after 30 years a West-East oriented limb to the pond is shown as added which is then widened as part of the restoration phase.

Figure 3-1: Current Quarry Situation



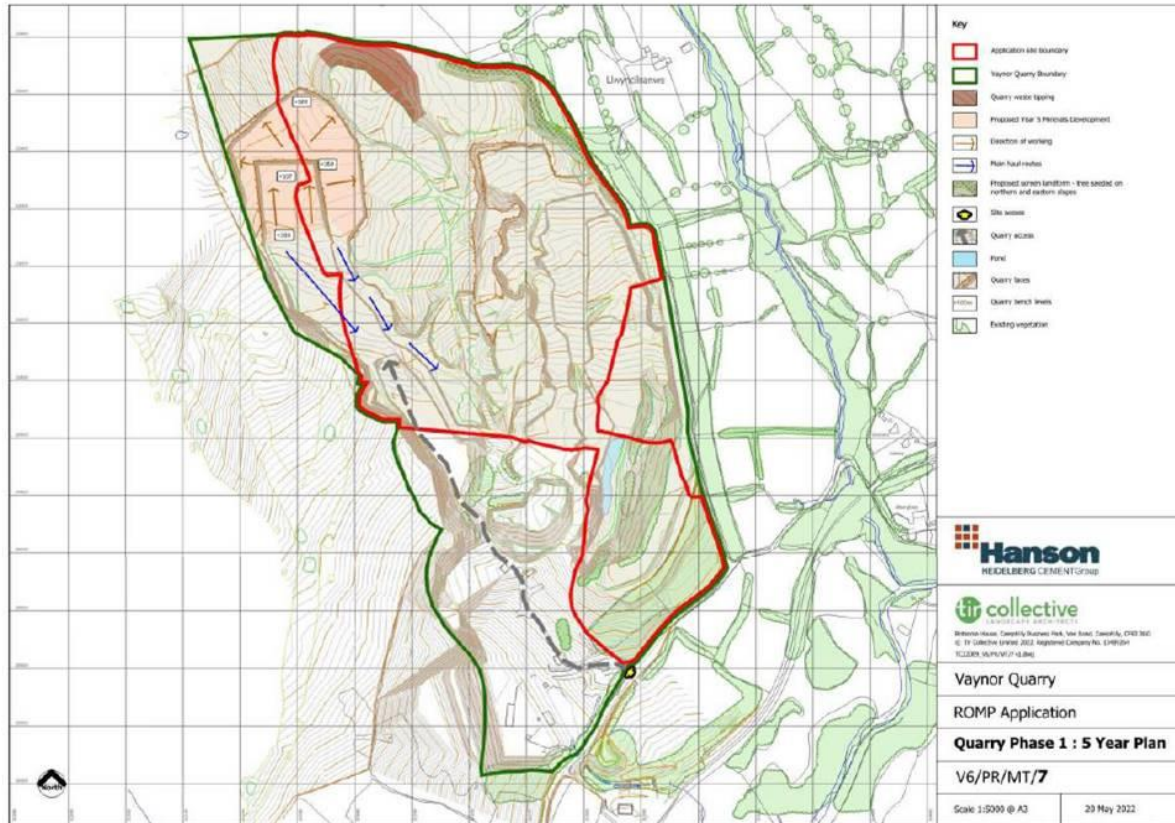


Figure 3-3: Phase 2 After 10 years

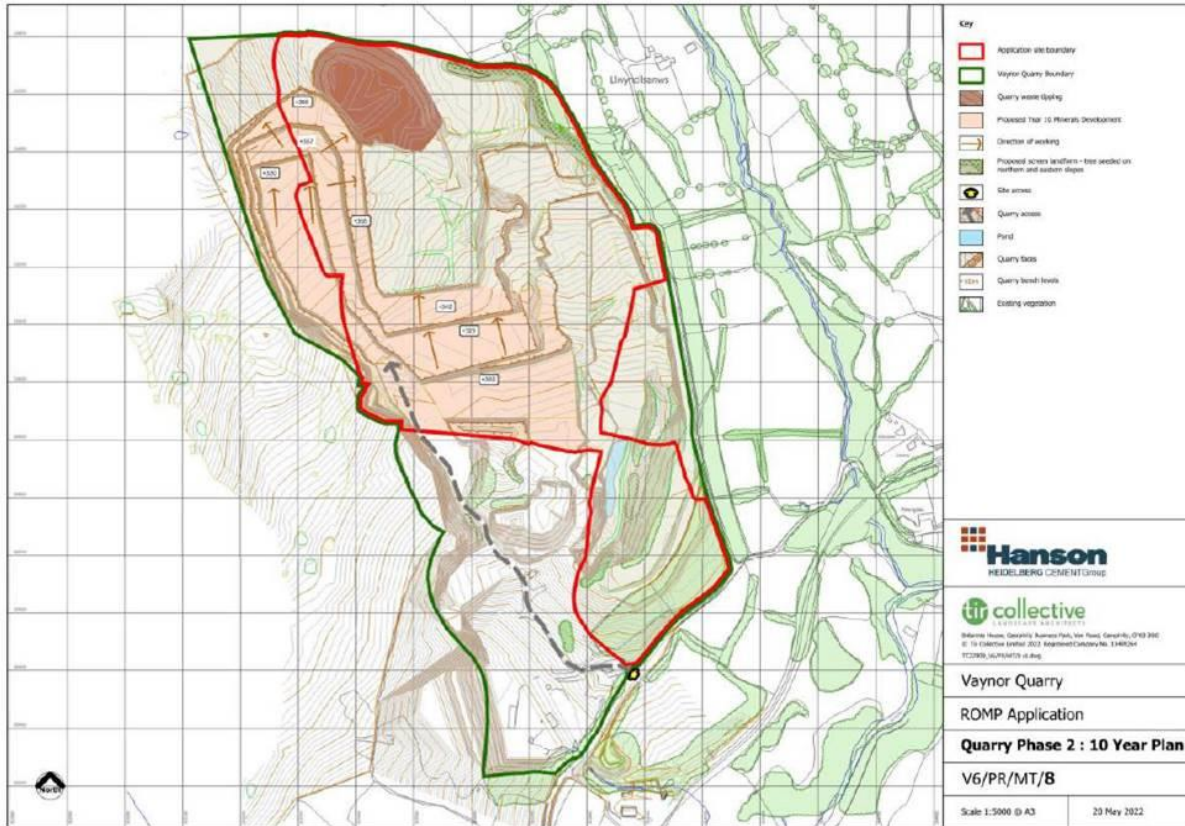
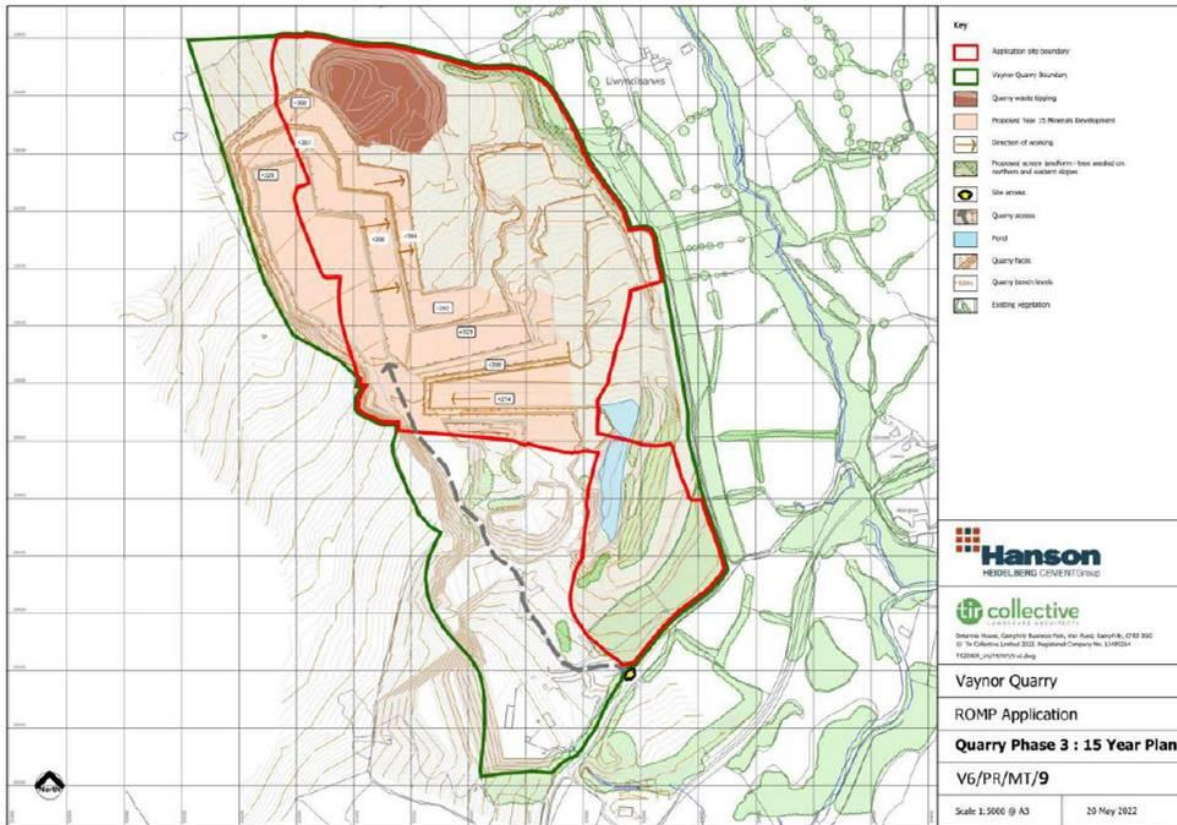


Figure 3-4: Phase 3 After 15 years



Key

- Application site boundary
- Vaynor Quarry Boundary
- Quarry waste disposal
- Proposed Year 30 Physical Development
- Direction of existing
- Proposed screen landfill re-bank needed on northern and eastern slopes
- Site access
- Quarry access
- FINC
- Quarry face
- Quarry bench levels
- Existing vegetation

Hanson
HEIDELBERG CEMENT GROUP

the collective
LANDSCAPE ARCHITECTS

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Vaynor Quarry
ROMP Application
Quarry Phase 4 : 30 Year Plan
V6/PR/MT/10
Scale 1:5000 @ A3
20 May 2022



Figure 3-6: Phase 5 after 60 years

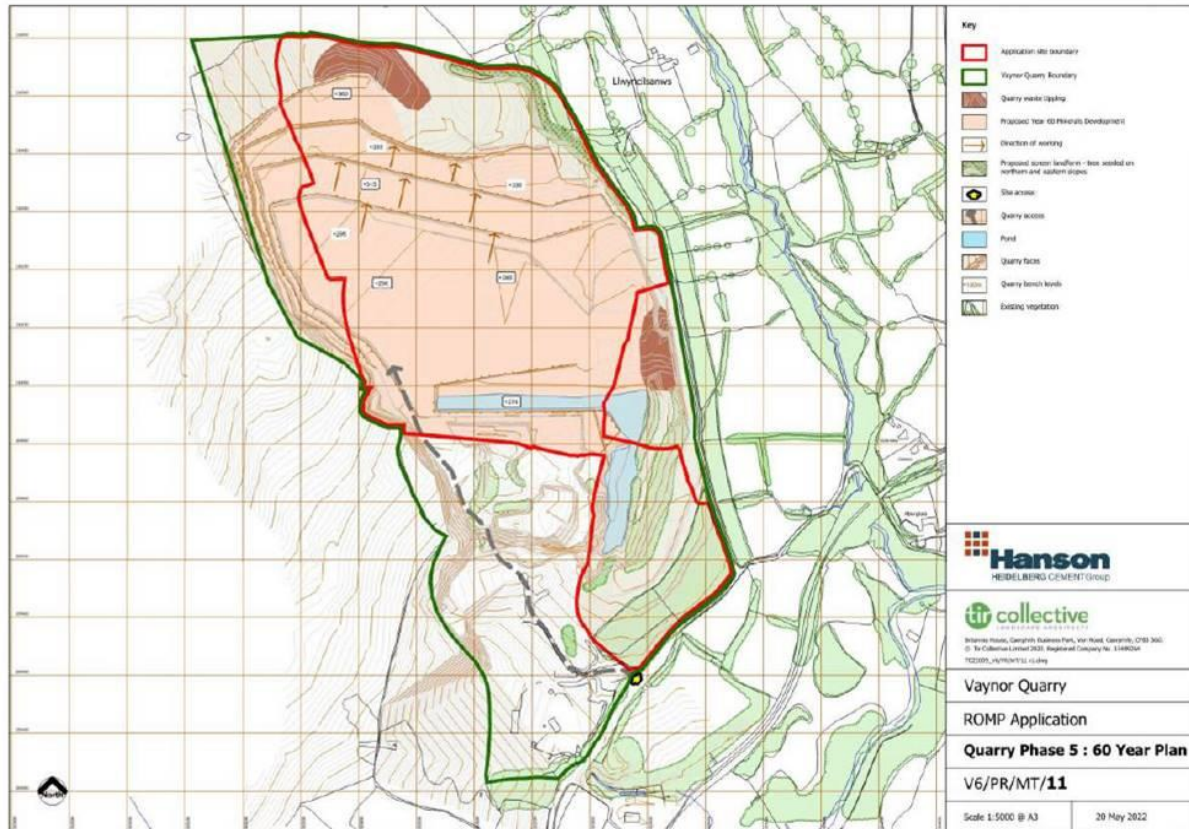
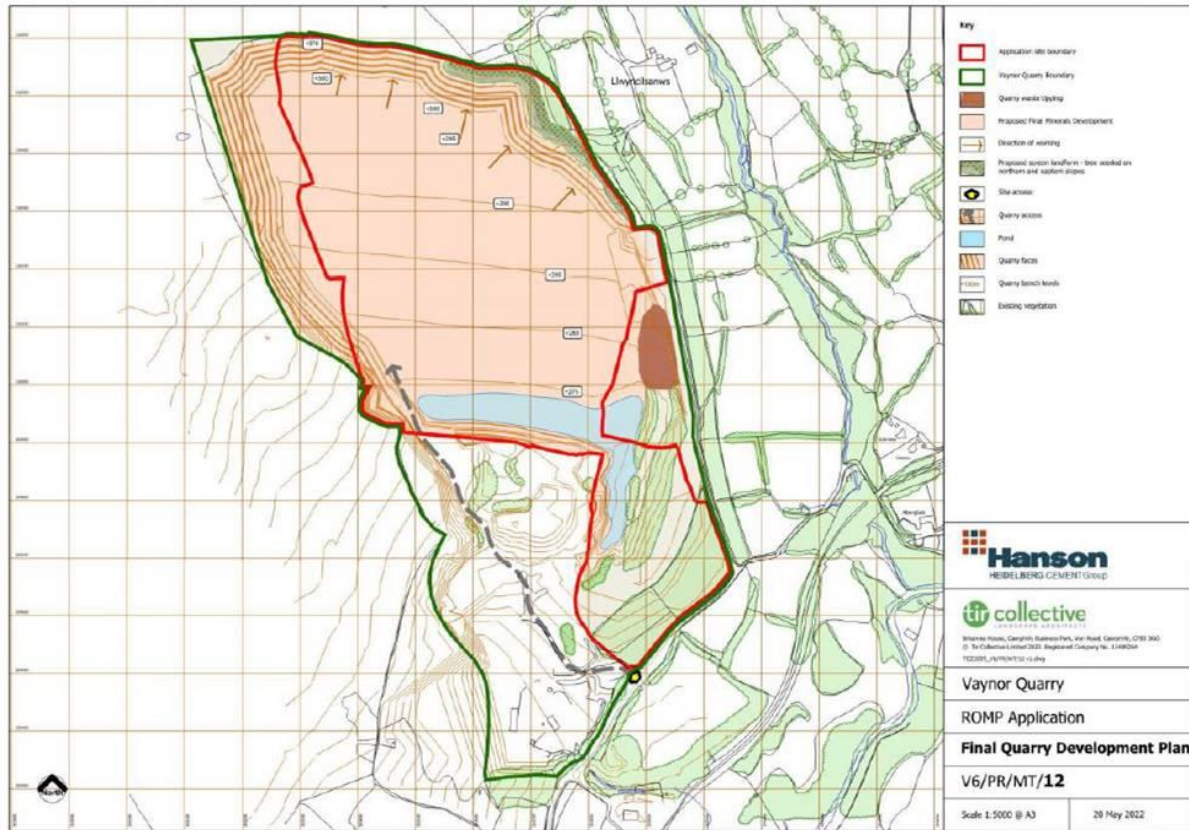
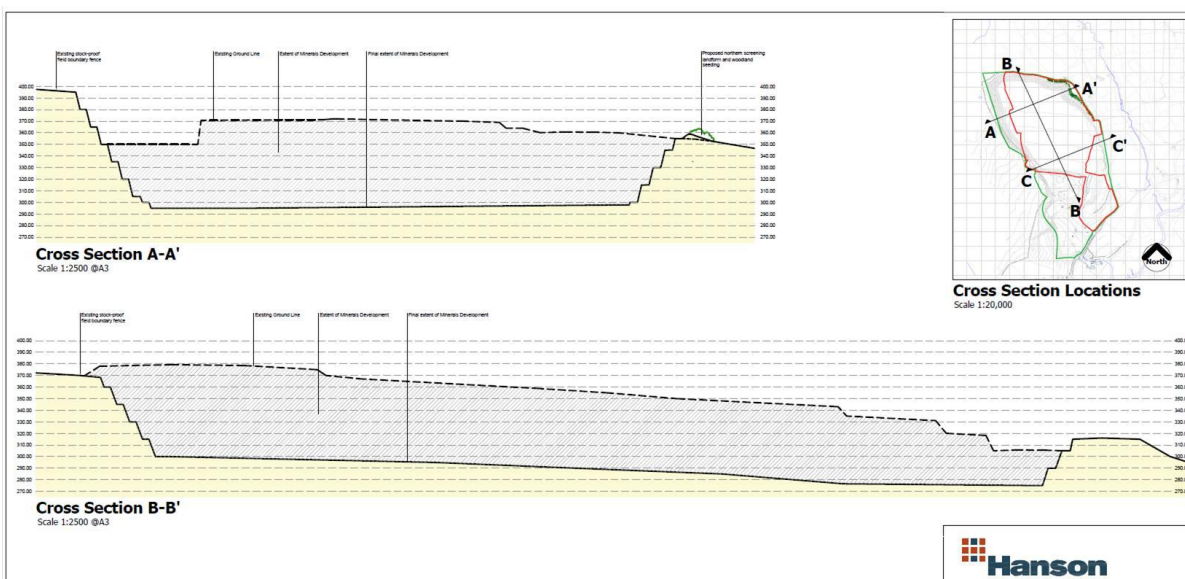


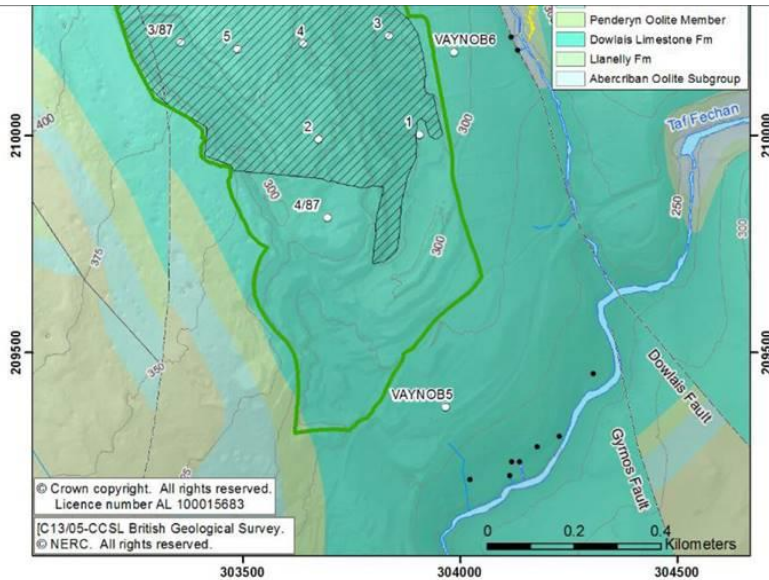
Figure 3-7: Final Quarry Development



The following are cross-sections show the extent and depth of the proposed quarrying across the Vaynor quarry site.



The following is a Figure that shows the spring Line along the Taf Fechan. The spring line is located to the south of the site and to the south of the pond area.



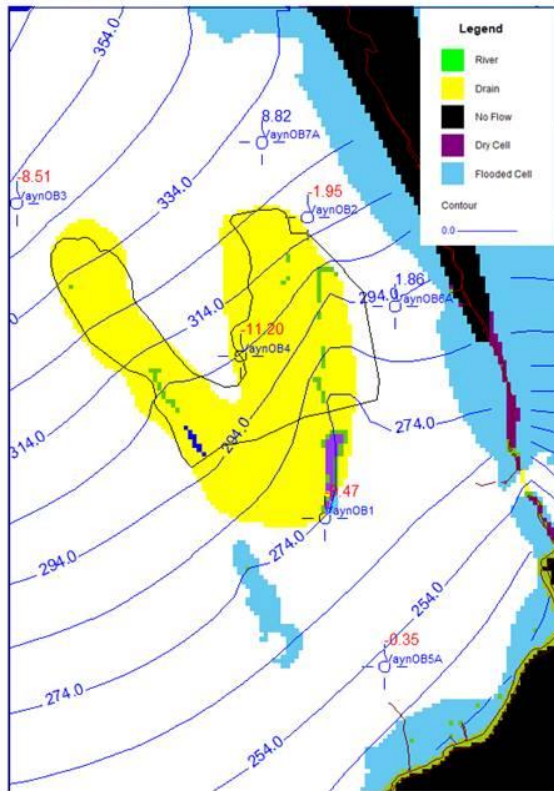
The following excerpts are Text and Figures from the The **Vaynor Quarry ROMP: Supporting Groundwater Flow Modelling Report, July 2022**

Pages 21-22

Obtaining an improved calibration would necessitate introducing additional hydraulic conductivity and / or recharge zones into the model and there is limited field evidence to support this. Given the difficulties in using heads measured within fissured strata to calibrate a porous medium flow model, it is not considered worthwhile to attempt this.

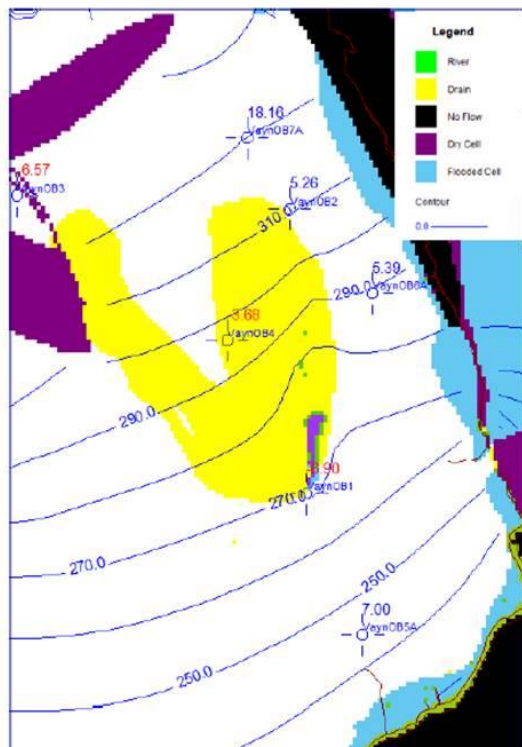
The following two figures shows the predicted heads using a hydraulic conductivity of 0.15m/d and 0.25m/d respectively. Calibration values to measured groundwater levels at particular wells, for example VaynOB3 to the west, are shown as either a simulated head increase in red or a head decrease in blue. For example, VaynOB5a located to the south shows a simulated head increase of - 8.35m using a hydraulic conductivity of 0.15m/day with a head decrease of +7.00m using a hydraulic conductivity of 0.25m/day. This shows that a simple change to the mass hydraulic conductivity value results in a significant difference in the simulated head values at VaynOB5a compared to actual values. Calibration has therefore not been achieved. Note that groundwater monitoring well VaynOB5a is the closest to the Taf Fechan ecosystem and springs.

2.13 Predicted heads in vicinity of Site in Layer 2: hydraulic conductivity 0.15 m



it within the excavation area, small blocks of green cells are flooded cells and purple cells are

Figure 2.12 Predicted heads in vicinity of Site in Layer 2: hydraulic conductivity 0.25 m/d



Page 22 of the numeric modelling report states:

Assuming that the bulk groundwater flow is within fissures, the majority of the flux from the infiltration ponds will be to where fissures connecting these ponds discharge

Page 28 **Section 2.3.3.3 Taf Fechan springs** states that

There are no quantitative flow data for these springs against which to compare the modelled discharges, although qualitative observations of spring flows have been made.

The following two figures shows the additional drawdown using a hydraulic conductivity of 0.15m/d and 0.25m/d respectively. There is a significant difference in the magnitude of the estimated drawdown to the east and northeast. The large blue area within the southern area is the pond and this has been simulated as a constant head which therefore controls the nature of the simulated groundwater drawdown contours around it and within the southern area of the site. Contouring within fractured rock systems must be treated with caution as such contouring are representative of equipotential lines which may not be representative of fractured rock systems.

Figure 3.6 Additional drawdown imposed by proposed quarry extension in Layer 2:
hydraulic conductivity 0.15 m/d

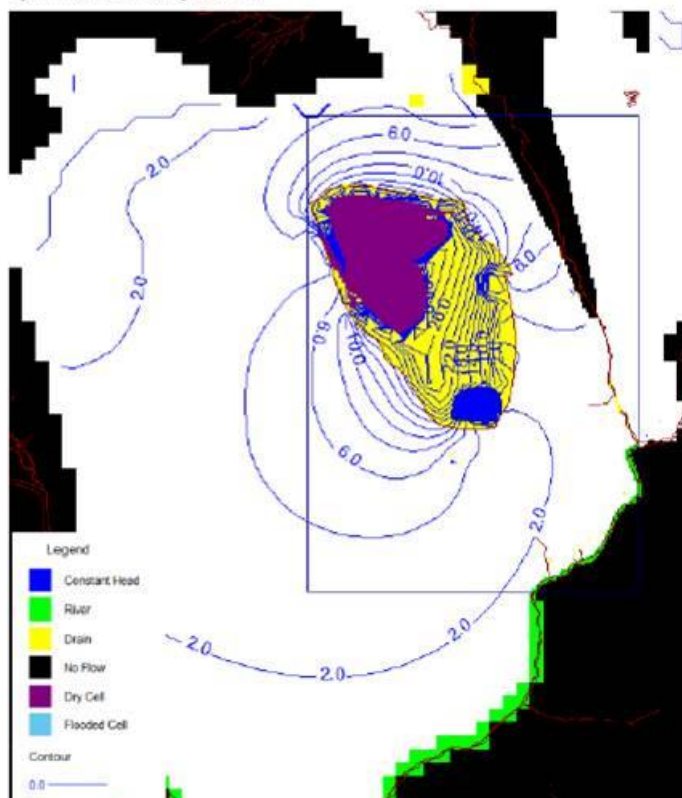
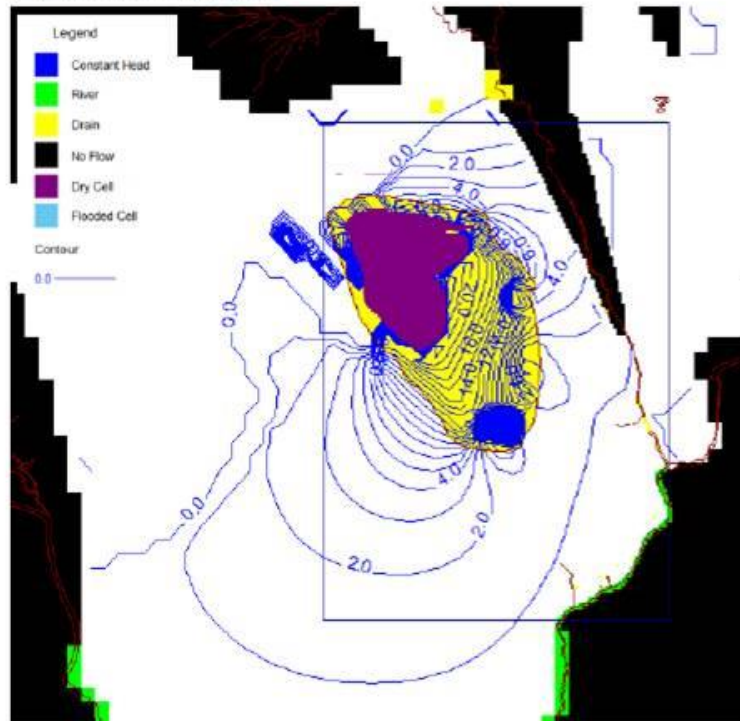


Figure 3.5 Additional drawdown imposed by proposed quarry extension in Layer 2: hydraulic conductivity 0.25 m/d



Page 37 of the **Vaynor Quarry: Flood Consequence Assessment (FCA) and Drainage Strategy, August 2022** depicts the current runoff catchments at the site. It is unclear if or how these were considered as part of the numeric groundwater modelling exercise.

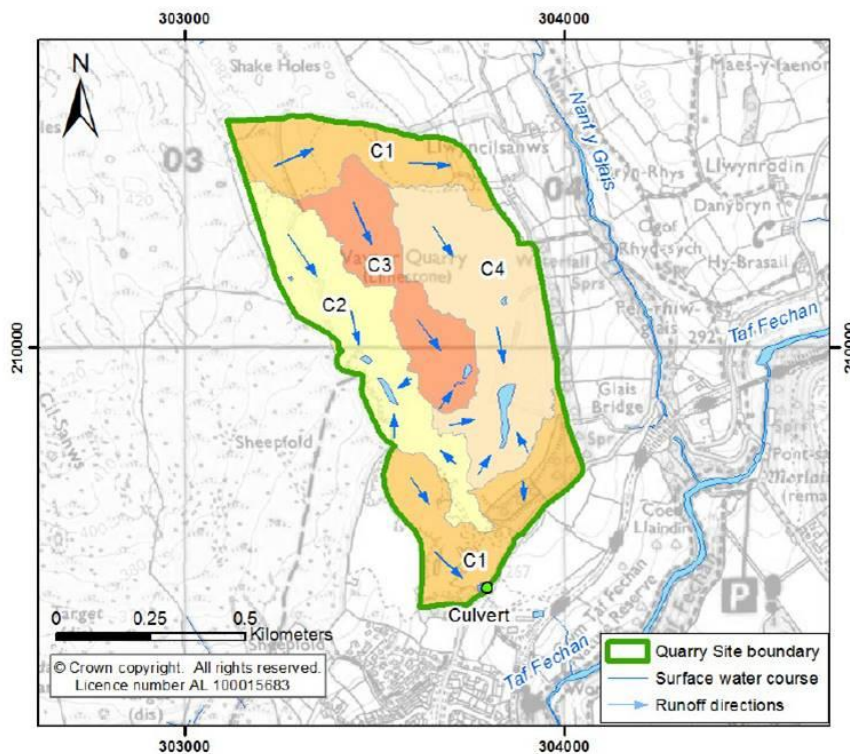


Figure 6.2 Runoff catchments – current

Page 47 of the FCA uses an infiltration rate (recharge rate) of 0.48m/day as stated in the text below. The text also states that...*this methodology does not account for seasonal changes or long-term variation in the hydraulic heads of the pond and local groundwater table.*:

Outflows were computed by multiplying an assumed infiltration rate of 0.48 m/day (as calculated in Section 2.3.4) by the “wetted” surface area of the infiltration pond (i.e. the area below the water surface for a given water level). As the infiltration pond is expected to be connected to the groundwater table, only the “wetted” area above the observed rest water level of 270.7 m AOD is assumed to be available for infiltration. This area was calculated for each theoretical water level (at 0.05 m increments) from a stage vs surface area relationship for the pond, again calculated using Surfer 22 (Golden Software, 2021). Though this methodology simplifies the real system and does not account for seasonal or long-term variation in the hydraulic heads of the pond and local groundwater table, it is deemed to provide a reasonable approximation.