ENVIRONMENTAL SETTING & SITE DESIGN REPORT

Environmental and sustainability solutions provided to
BRYN AGGREGATES LTD

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1.0 INTRODUCTION

Walker Resource Management Ltd (WRM) have been contracted by Bryn Aggregates Ltd (Bryn Aggregates) to produce an Environmental Setting and Site Design Report as part of their application for an environmental permit to recover 705,900m^3 of inert general fill waste, and soil waste material at the quarry at Gelliargwellt Farm, Hengoed. The wider farm site is home to an Anaerobic Digestion facility, a composting facility and a Materials Recovery Facility (MRF).

The waste material will be recovered to restore the areas of the quarry that are no longer in use in line with Condition 18 of Bryn Aggregate's planning permission (reference 12/0570/FULL) for the operation of the quarry. The waste will be recovered in line with the requirements of the environmental permit.

The planning permissions require Bryn Aggregates to restore the existing quarry at Bryn Quarry to its former agricultural use. Prior to quarrying the field was used for the grazing of the dairy herd. The land surrounding the site is used for grazing and silage for and by the dairy herd. The approved restoration of the quarry not only restores the land to its former agricultural use but establishes an aftercare scheme following cessation of all extraction and restoration activities.

2.0 PROPOSED ACTIVITY

Bryn Aggregates propose to recover approximately 705,900m^3 or 1,129,440 tonnes (using a conversion factor of 1.6 tonnes per m^3) of waste material for the restoration of the quarry at Gelliargwellt Farm. Approximately 620,000m^3 (992,000 tonnes) of inert waste material (general fill) will be recovered to achieve a formation layer below the approved restoration contours. Additionally, approximately 85,900m^3 (137,440 tonnes) of 1m thick waste soils will be recovered to achieve the approved restoration surface.

The waste will be recovered in line with the requirements set out in the environmental permit. Waste accepted onto site, following the strict protocols in the Waste Acceptance Procedure (EPR-OP02) which makes up part of the environmental management system, will be immediately deposited at its final location using a shovel loader and other agricultural and construction vehicles. If waste materials were not used, then non-waste materials would be used instead. The most likely source of an alternative would be to purchase virgin or recycled aggregates, clays and subsoil. These materials will likely come at a higher environmental cost.

The materials that will be used within this proposed development are wastes that have been brought to site directly by small local landscaping contractors or utility companies via the MRF. These wastes will not contain any hazardous materials. The recovery of discarded material is justifiable as it potentially diverts waste that would normally be going to landfill for disposal.

3.0 SITE DETAILS & CONDITION

3.1 Site Address

Bryn Aggregates Ltd
Gelliargwellt Farm,
Gelligaer Road,
Hengoed
CF82 8FY

3.2 Operational Location

Site Grid Reference: ST 12807 96263

3.3 Site Access

The primary vehicle access is from Gelligaer Road, which is located to the west of the site.

3.4 Current Site Description

The area in which the waste would be deposited for recovery is the area that makes up the quarry which is part of Gelliargwellt Uchaf Farm. Gelligaer Road connects neighbouring towns including Gelligaer and Penpedairheol which are located approximately 500m and 1,500m respectively, to the northeast of the site. Penybryn is located approximately 400m to the east, with the Penallta Industrial Estate located slightly further east. Caerphilly is located approximately 8.5km south of the site.

The site is bound to the south by agricultural land and Parc Penallta Country Park, which comprises an area of public open space and woodland. Nelson Bog Site of Special Scientific Interest (SSSI) is located 350m to the south of the site. Waun Rydd Site of Importance for Nature Conservation (SINC) is located immediately adjacent to the north of the site and Coed Gelliau'r – Gwellt SINC is located approximately 550m to the west of the site and comprises an ancient woodland.

As described in Section 2.0 above, the recovery of 705,900m^3 of inert general fill waste, and soil waste would enable Bryn Aggregates to restore the areas of the quarry that are no longer in use in line with Condition 18 of Bryn Aggregate's planning permission (reference 12/0570/FULL) for the operation of the quarry.

3.5 Historical Land Use Activity

Historical land use development of the site is captured through historical mapping, dating back to 1884. On the map from this year, the area covered by the site is undeveloped with a mixture of grassland and an area of furze and rough pasture named Waun Rydd. The map from 1901 shows the site as it was in 1884, although there is a label of Old Quarry over the southern portion of the existing quarry site. There are also signs of agricultural expansion of Gelliargwellt Farm to the west. The map from 1921 shows no change to the site but to the south, there is a label of New Gelligaer Colliery on the site of a previous colliery. Between 1921 and 1965, there is no change to the site and the immediate vicinity although increased residential areas do appear in Nelson and to the southwest of the site. An aerial photograph from 1945 shows the area of agricultural land within the site boundary containing a few lines of trees or bushes that act as field separators. An electricity transmission line crosses the western portion of the site in a general north-south direction in 1951.

During the 1960's and 1970's, it is known that the area between the quarry and Waun Rydd was all open cast mined. Parc Penalta was also the largest slag tip in the area. The map from 1974 shows that an area of the western portion of the site which was formally part of the furze and rough pasture named as Waun Rydd, no longer forms part of this designation. The designation of the land is unmarked. The residential areas of Penybryn and Nelson have also undergone significant residential expansion by 1974. In 1999, an area between the site and Gelliargwellt Uchaf Farm is labelled as refuse or slag heap. This takes up some of the area of land mentioned above which was formerly designated as Waun Rydd. In the map from 2006, that area of land is labelled as a sandstone quarry. Noting that planning permission for quarrying activities on this site was first granted in May 1993, it is likely that the area labelled as refuse or slag heap in 1999 was actually associated with the quarrying activity. In the latest map from 2022, the quarry is fully established and tracks leading into the quarry from the main farm are marked, as are small water lagoons within the quarry. Gelliargwellt Farm has expanded its operations with the inclusion of an Anaerobic Digestion facility and the MRF site adjacent to the quarry. Although not shown on the historical maps, it should also be made known that by 2022, the site of the original sandstone quarry, as labelled in 2006, is now the site of the green waste composting operation.

3.6 History of Incidents

There have been four recorded pollution incidents to controlled waters in the vicinity of the site location. Of the four recorded pollution incidents, three were recorded as Category 3 – Minor Incidents, with the remaining incident categorised as a Category 2 – Significant incident. The nearest Category 3 incident, which comprised the pollution of a freshwater stream at the rear of Oak Terrance with mud/clay/soil occurred in 1996 at approximately 1.4km away. The Category 2 incident took place in 1991 and involved the pollution of a bog, The Nelson, approximately 750m south of the site.

There have been 14 recorded incidents to air, land or water. The closest to the site was a Category 2 incident for water (Significant Incident), a Category 3 incident for land (Minor Incident) and a Category 4 incident for air (No Impact). This occurred in April 2018 and was located approximately 140m to the south of the site. The pollutant was identified as composted material.

3.7 Adaptation to Climate Change

Climate change has the potential to increase maximum summer daily temperatures by up to 7°C with extreme high temperatures above 40°C possible more frequently. This is unlikely to affect the waste being brought to site in any way other than it being drier, meaning that there is greater dust potential. Bryn Aggregates propose dust control measures for the site activities including dampening site roads, enforcing a speed limit to reduce dust entrainment in the air, sheeting of the vehicles carrying the waste and dampening of the waste. It is not expected that further control measures would be required due to an increase in maximum daytime summer temperatures, rather that these control measures would have to be carried out more frequently to control possible fugitive dust emissions. The source of the water for dampening is extraction from the quarry under licence. Therefore, even during summers in which rainfall quantities are below average, which is a possible impact of climate change, the continued use of the dampening system should be possible.

There is also the potential for extreme cold temperatures in the winter. Material will only be accepted onto site if it is safe to do so. This considers the condition of the site, vehicles to be used in the recovery of the material and the material itself. If the waste material is frozen and cannot be deposited and formed as required, it will not be accepted onto site.

More frequent storms are also widely considered to be a likely impact of climate change. This could impact the deposit for recovery activity in the form of strong winds or intense rainfall. Aside from the health and safety impact of storms, should the wind be too strong to deposit

the material without likely environmental impact in the way of dust, the material shall be rejected on arrival. The site has a Turnkey Osiris real-time dust monitor, located immediately west of the houses on Brynheulog Street, which assesses the concentrations of dust. This dust monitor has an alarm which goes off when the average concentration for PM10 or PM2.5 is above 40ug/m^3 for 5 minutes whilst the wind direction is between 180° to 270°. An alarm also goes off when the average concentration is above 200ug/m^3 over a 24-hour period whilst the wind direction is between 180° to 270°. The alarm is an email and text message for up to 5 different contacts which means that the site operator is informed in real time. When the continuous monitor alarm is raised or when dust is detected at the site boundary monitoring locations and the deposit for recovery activities are considered to be the source, the Site Manager will conduct an investigation to identify the cause of the dust emissions. If the dust emissions are attributed to an activity on the site and mitigation measures have failed, the activities that are the source of the emissions will cease until remedial measures have been implemented. Visual monitoring will be increased as necessary along the site boundary until the dust problem is resolved.

Daily rainfall levels and winter rainfall levels may also increase as a result of climate change. Should the waste material being delivered to site be identified as being too wet for deposit, it shall be rejected. Additionally, should the conditions at the recovery site be deemed unsuitable for waste to be deposited by the Site Manager, as a result of rainfall, no further waste shall be accepted onto site until conditions change and are deemed suitable by the Site Manager. Further discussion regarding surface water flows and surface water flooding can be found in Section 4.2 below.

4.0 SITE SETTING

4.1 Local and Regional Geology

The quarry is underlain with Upper Coal Measures strata assigned to the Grovesend Beds. The Mynyddislwyn Seam underlies part of the quarry but the Gelligaer Fault courses through the quarry so that the Big Rider Seam underlies the south-western part of the quarry at relatively shallow depth. A thick sequence of sandstones with subordinate mudstone bands overlies the Mynyddislwyn Seam.

The Grovesend Formation is bedrock composed of mudstone, siltstone and sandstone. It was formed approximately 318 to 319 million years ago in the Carboniferous Period.

There is one marked superficial deposit at the site which is Peat in the northern portion of the quarry. This Peat stretches out into Waun Rydd. Peat is a sedimentary superficial deposit formed between 2.8 million years ago and the present during the Quaternary period.

4.2 Hydrology

Current mapping suggests that there are several watercourses around the quarry site. There is one that tracks across Waun Rydd in an east to west direction to the north of the site. There are also two surface water features within the quarry itself. These are water storage lagoons. One of the lagoons feeds the dust washing plant. All of the surface water in the quarry is directed via natural falls to a quarry sump. This collects any surface water generated on the floor of the quarry following rain or the use of water as a dust mitigation technique. The water that collects in this sump is pumped across to a group of settlement lagoons located to the west of the quarry site. These settlement lagoons are regulated by Natural Resources Wales. The fine material that is in the water in the quarry sump settles out in the lagoons before the water is discharged into the clean water lagoon for on-site use or discharged into the adjacent un-named water course under environmental permit EPR/CB3391ZY. This watercourse appears to join up with others in the area and flow towards the Nelson Bog SSSI. The bog acts as a natural attenuation system long before run-off enters the main river system (River Rhymney) and its tributaries.

The southern portion of the quarry is located in an area which has limited potential for groundwater flooding to occur. There are certain locations within the proposed site that are designated as Flood Zones 2 and 3 for surface water as identified within the NRW Flood Map for Planning. Flood Zone 2 areas are those with 0.1% to 1% (1 in 1000 to 1 in 100) chance of flooding from surface water and/or small watercourses in a given year, including the effects of climate change. Flood Zone 3 areas are those with more than 1% (1 in 100) chance of flooding from surface water and/or small watercourses in a given year, including the effects of climate change.

However, the waste materials proposed to be used on site are inert general fill waste, and soil waste and so even in those locations where it is designed that surface water will run off site, it is anticipated that it will not cause a pollution incident. The site also operates under a Water Quality and Quantity Monitoring Scheme and Contingency Plan which helps to control surface water and reduces the likelihood of adverse environmental impacts.

4.3 Hydrogeology

The Site is underlain by the Grovesend Formation which is classified by Natural Resources Wales as a Secondary-A Aquifer. A secondary aquifer is described as permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers. The sandstone is likely to exist as a local aquifer, with groundwater flowing predominantly along fissures and fractures in the rock. The mudstone and siltstone layers in the Formation are likely to limit groundwater flow and recharge due to the low permeability of these layers. Mudstone will weather to clay in the upper part of the strata.

The majority of the site has no superficial aquifer designation. However, the northern portion of the site, where the Peat deposits are, is designated as Unproductive Strata which has no productive value.

The site is not situated within a Groundwater Source Protection Zone (SPZ). Additionally, there are no licenced groundwater abstractions identified within a 2km radius of the site. The groundwater vulnerability classification for the site is classified as a Secondary Aquifer – Medium Vulnerability. Medium vulnerability areas are of intermediate vulnerability between High Vulnerability and Low Vulnerability areas. For context, the definitions for High Vulnerability and Low Vulnerability areas are provided below:

- High Vulnerability areas – Areas that are able to easily transmit pollution to groundwater. They are likely to be characterised by high leaching soils and the absence of low permeability superficial deposits.
- Low Vulnerability areas – Areas that provide the greatest protection to groundwater from pollution. They are likely to be characterised by low leaching soils and/or the presence of superficial deposits with a low permeability.

It is believed that the groundwater recharge locally to the Site occurs at the topographical high (~300mAOD) approximately 1.8km to the northwest, where the Grovesend Formation sandstone is exposed. Additional recharge is also expected, albeit to a lesser extent, through the fault zones that strike northwest-southeast proximal to the south of the Site. The presence of several springs at a lower level to the south of the quarry void indicates that groundwater in the sandstone aquifer is discharging to ground surface at the interface between the sandstone and the underlying siltstone / mudstone layers of the Grovesend Formation.

A Water Quality and Quantity Monitoring Scheme and Contingency Plan has been produced which details the surface and groundwater monitoring to be carried out during the recovery of waste at the site and following completion of the proposed development. The risk of contamination of groundwater has also been covered in the Environmental Risk Assessment (EPR-B03) using the source-pathway-receptor conceptual site model. Finally, a Hydrogeological Risk Assessment has been produced for the restoration of the quarry via the recovery of waste. and as such it is considered that a specific hydrogeological risk assessment is not required for this site. The proposed restoration works is not believed to have the potential to give rise to significant discharges of hazardous and non-hazardous substances, and therefore the perceived risk to the water environment is considered Low. The Hydrogeological Risk Assessment accompanies this document.

4.4 Amenity Dust

The site has in place a Dust Management Plan (EPR-B01). This identifies the potential sources of fugitive dust emissions. The plan identifies the possible impacts associated with dust emissions, and thoroughly details the control measures which shall be taken to prevent and minimise dust emissions, including monitoring.

4.5 Noise and Vibration

The site also has in place a Noise and Vibration Management Plan (EPR-B05) which identifies the potential sources of noise and vibration and possible impacts. Mitigation measures proposed to minimise noise and vibration emissions are clearly identified in this document.

4.6 Ecology / Habitats

An Agricultural Benefit Statement was prepared in April 2019 by P. Roberts (BSc (Hons) Agric, OND Agric, FACTS R/F 02006). It is proposed that as the original use of the quarry area was agricultural use with dairy herd utilising the grazing pastures, the restoration would restore this original use. Suitable waste soils shall be identified for use as the 1m thick top layer. Prior to being recovered, these souls will be analysed to assess suitability in relation to potential contaminants, nutrient status and physical properties. The finished soil profiles will be cultivated, fertilised and sown with a suitable grass reseed mixture for grazing use by Gelliargwellt Farm. Subsequent grassland management will be based on standard agricultural practice with fertiliser inputs as RB209.

The Agricultural Benefit Statement considers that no harm to human health or risk of pollution will occur with the operation following the guidelines recommended. The Agricultural Benefit Statement Accompanies this document.

5.0 POLLUTION CONTROL MEASURES

5.1 General

The site is secured to reduce the risk of accidents and pollution incidents. The Gelliargwellt Farm site has a chain link fence surrounding it with a gate at the site entrance which is locked when the site is closed. The main Gelliargwellt Farm, on which the site office is located is secured with gates and fences to prevent access. The facility is also situated within a largely agricultural location.

All security measures will be subject to visual inspection by a trained operative. Any defects will be recorded in the site diary and rectified in the appropriate manner.

The boundary is checked on a regular basis for damage or signs of attempted entry. Such occurrences are entered in the site diary and any damage is repaired at the earliest opportunity.

All visitors will be required to sign in at the main farm Site Office on arrival and exiting the site.

5.2 Site Engineering

The proposal for the recovery operation has been designed by qualified personnel. The proposal was produced following an initial topographical survey carried out by JPCE Ltd. The same company also completed the pre and post development cross sections and levels calculations using the information gathered by the topographical survey. JPCE Ltd are a well-established consulting engineering company who provide technical advice services within the waste industry to waste management companies, such as MRF developments; foundations and drainage infrastructure; landfill cell designs. Surveying and ground modelling are also integral elements within their portfolio. The company Director, John Perkins, who carried out the surveys, calculations and design, as well as producing the maps, is a chartered civil engineer with nearly 40 years of experience. His previous roles have included, Section Engineer for Glamorgan County Council and Senior Engineer at George Crowder Associates.

The pre and post restoration cross sections that were produced were used to accurately calculate the volume of waste material required for the completion of the restoration scheme. The clear scope of the works i.e. restore the quarry to pre-quarried levels ensures that only the minimum volume of materials were calculated. The cross sections clearly show that no

additional waste material will be used above the minimum required amount. An attenuation layer will not be required as the waste material that will be recovered is largely inert and will not risk polluting the soil or water.

Given that the proposed development involves altering the gradient of the existing site to match those of the surroundings and the pre-quarried levels, a Slope Stability Risk Assessment has been carried out by JPCE Limited and it accompanies this document. A Construction Engineering Management Plan has also been produced.

The waste recovery works associated with the proposals will follow the detailed designs presented above. A dedicated Site Manager will be employed to oversee the waste recovery operations only.

5.3 Procedural

The materials that will be used within the development at Gelliargwellt Farm are wastes that have been brought to site via the Material Recycling Facility (MRF) located on the farm. The materials are wastes that have been brought to the MRF directly by small local landscaping contractors or utility companies. These wastes will not contain any hazardous materials. The waste will be transported onto the site over the course of approximately 2 years.

The operator will apply strict waste acceptance procedures as part of the implementation of the Environmental Management System (EMS) in accordance with the requirements of the Environmental Permit for these operations. This will ensure that only suitable waste materials are imported for use in the proposed restoration. A Waste Acceptance Procedure will be included in the EMS that will control how waste is accepted to ensure that only suitable waste is recovered in the development area.

No waste will be accepted at the site unless it has been subjected to an appropriate basic characterisation procedure. The minimum information to be collected includes:

- the full address where the waste was produced; and
- the identity of the producer; and
- all the reasonably identifiable previous uses of the producer site where the waste is excavation waste; and
- the process giving rise to the waste; and
- the physical appearance of the waste including colour and texture; and
- confirmation and evidence that the waste has been classified as non-hazardous; and

- where a weighbridge isn't used a metric conversion factor for volume (cubic metres) to weight (tonnes) for each waste stream; and
- the quantity of waste to be imported; and
- evidence of compliance with these procedures.

All waste producers are required to complete a Waste Questionnaire to ensure the materials suitability and quality. All Waste Questionnaires will be reviewed by the Technically Competent Manager (or otherwise appointed representative) to ensure the suitability of the material prior to acceptance at the site.

All waste types listed in Table 1 are included in NRW's *Prepare a management system for a deposit of waste for recovery activity guidance* as the types of waste a producer may not need to test. Consistent with the recovery guidance, where the waste is from a single waste stream (from only one source) and where there is no suspicion of contamination the waste will be accepted without testing. These materials will be recovered as general fill. The maximum quantity of this waste material to be accepted onto site is 620,000m^3 (992,000 tonnes).

Table 1 – Waste types that may be accepted as general fill

01 Waste resulting from exploration, mining, quarrying and physical and chemical treatment of minerals	
01 01	wastes from mineral excavation
01 01 02	Wastes from mineral non-metalliferous excavation
01 04	wastes from physical and chemical processing of non-metalliferous minerals
01 04 08	Waste gravel and crushed rocks other than those mentioned in 01 04 06
01 04 09	Waste sand and clays
17 Construction and demolition wastes	
17 01	concrete, bricks, tiles and ceramics
17 01 01	Concrete[1]
17 01 02	Bricks[1]
17 01 03	Tiles and ceramics[1]
17 01 07	Mixtures of concrete, bricks, tiles and ceramics[1]
17 05	soil stones and dredging spoil
17 05 04	Soil and stones other than those mentioned in 17 05 03[2]
19 Wastes from waste management facilities	

19 12	wastes from the mechanical treatment of waste (for example sorting, crushing, compacting, pelletising) not otherwise specified
19 12 09	Minerals (for example sand, stones) only[3]
20 MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS	
20 02	separately collected fractions (except 15 01)
20 02 02	Soil and stones[4]

Notes:

[1] As per the Council Decision, selected C&D waste can be accepted without testing: with low contents of other types of materials (like metals, plastic, soil, organics, wood, rubber, etc). The origin of the waste must be known. No C&D waste from constructions, polluted with inorganic or organic dangerous substances e.g. because of production processes in the construction, soil pollution, storage and use of pesticides or other dangerous substances etc. unless it is made clear that the demolished construction was not significantly polluted. No C&D waste from constructions, treated, covered or painted with materials, containing dangerous substances in significant amounts.

[2] As per the Council Decision, this can be accepted without testing excluding topsoil, peat; excluding soil and stones from contaminated site. Soil and stones will not be accepted directly from contaminated sites. They will be sampled and a site-specific risk assessment will be carried out.

[3] Residual fines from mechanical treatment of mixed wastes at transfer stations will not be accepted at the site.

[4] As per the Council Decision, can be accepted without testing if only from garden and park waste.

All waste types listed in Table 2 are waste codes that will be used in the top 1m soil formation layer as part of the restoration of the quarry, feature in NRW's Deposit for Recovery Guidance and may not need testing. Consistent with the recovery guidance, where the waste is from a single waste stream (from only one source) and where there is no suspicion of contamination the waste will be accepted without testing. The maximum quantity of combined waste types in Table 2 to be imported to site is approximately 85,900m^3 (137,440 tonnes).

Table 2 - Waste types that may be accepted as soil formation layer

01 Waste resulting from exploration, mining, quarrying and physical and chemical treatment of minerals	
01 01	wastes from mineral excavation
01 01 02	Wastes from mineral non-metalliferous excavation

17 Construction and demolition wastes	
17 05	soil stones and dredging spoil
17 05 04	Soil and stones other than those mentioned in 17 05 03[1]
19 Wastes from waste management facilities	
19 12	wastes from the mechanical treatment of waste (for example sorting, crushing, compacting, pelletising) not otherwise specified
19 12 09	Minerals (for example sand, stones) only[2]
20 MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS	
20 02	separately collected fractions (except 15 01)
20 02 02	Soil and stones[3]

[1] As per the Council Decision, this waste can be accepted without testing excluding topsoil, peat; excluding soil and stones from contaminated site. Soil and stones will not be accepted directly from contaminated sites. They will be sampled and a site-specific risk assessment will be carried out.

[2] Residual fines from mechanical treatment of mixed wastes at transfer stations will not be accepted at the site.

[3] As per the Council Decision, this waste can be accepted without testing if only from garden and park waste.

Level 2 compliance testing comprises testing periodically to determine whether the waste complies with the results of the basic characterisation testing and the site-specific conditions of the Permit.

Verification testing will comprise a visual inspection of the incoming waste and verification of the accompanying documentation. The basic characterisation information will be available prior to the acceptance of the waste at the site.

All incoming waste loads to the site will be checked. On arrival of each load of waste at the site the Duty of Care (DoC) documentation will be reviewed by the site personnel to confirm that it conforms with the basic characterisation. Once it is determined that the waste is potentially suitable for acceptance at the site a visual inspection where possible of the waste will be carried out at the site reception area to confirm that the waste conforms with the

description on the DoC documentation. If any waste does not conform with the description in the DoC documentation or if on the DoC documentation the waste described is unsuitable for acceptance for deposit at the site the waste will be rejected.

The site personnel and plant operative will be trained to recognise the types of waste that may be accepted at the site and to identify the details which should be presented on the DoC documentation. A record will be kept of the date and time of waste deliveries, the quantities and the nature of waste deposited at the site, the name of the company, the name of the representative delivering each load of waste and the vehicle registration number. DoC documentation for the waste received will be kept on record for the statutory period which comprises 6 years.

Given the strict adherence to the waste acceptance criteria that will be followed by Bryn Aggregates, the likelihood of pollution being caused by these proposals are extremely low.

5.4 Ground and Surface Water Management

An Environmental Risk Assessment (EPR-C03) has been produced as part of this permit application which shows the residual risk of the development to be low. This includes the risk of contamination of groundwater, which is also covered by the Hydrogeological Risk Assessment. The site is located outside any groundwater source protection zones.

The Site is underlain by the Grovesend Formation which is classified by Natural Resources Wales as a Secondary-A Aquifer. A secondary aquifer is described as permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers. The sandstone is likely to exist as a local aquifer, with groundwater flowing predominantly along fissures and fractures in the rock. The mudstone and siltstone layers in the Formation are likely to limit groundwater flow and recharge due to the low permeability of these layers. Mudstone will weather to clay in the upper part of the strata.

The majority of the site has no superficial aquifer designation. However, the northern portion of the site, where the Peat deposits are, is designated as Unproductive Strata which has no productive value.

The site is in location where there is limited potential for groundwater flooding to occur. There is also a low risk of surface water flooding to occur across the site, although there are a few

areas where the risk is higher. These are the areas classified as being located in Flood Zone 2 and 3. However, the proposed development will create surface water due to the increased surface area created by the restoration. As stated above, a Water Quality and Quantity Monitoring Scheme and Contingency Plan has been produced which details the surface and groundwater monitoring to be carried out during the recovery of waste at the site and following completion of the proposed development.

5.5 Amenity

The proposed activities outlined in Section 2 of this document will have a positive effect on amenity of the surrounding landscape. A screening bund is already located around the northern and eastern sides of the quarry which will help to visually screen the activities undertaken during the restoration of the quarry from the residential areas of Gelligaer to the north and Penybryn to the east. Post restoration, the site will be returned to the site's former agricultural use in the form of dairy herd grazing. As referenced in Section 3.7 above, the site has a Turnkey Osiris real-time dust monitor, located immediately west of the houses on Brynheulog Street, which assesses the concentrations of dust at this location. It is not considered that additional control measures will be required to protect the amenity of the site.

5.6 Post Closure Controls

Given the proposed activities, the proposed waste types (inert general fill waste, and soil waste) and the detailed design that has gone into the proposed development, post closure controls such as gas monitoring are not considered to be necessary. The proposed development has been designed to provide an agricultural benefit to the land post restoration. This design includes the return of the land for use as grazing for a dairy herd.

The results of the stability risk assessment show satisfactory factors of safety at all stages of the deposit for recovery site development. It is considered appropriate to undertake an annual topographical survey to identify areas of settlement or instability and a weekly visual inspection of the exposed subgrade, waste mass and capping materials for signs of settlement and instability during the stages of construction, waste placement and capping. Following completion of the restoration, a visual inspection for signs of settlement or instability will be undertaken during topographical survey visits. Should an area of concern be identified from the weekly visual inspections or during subsequent inspections Natural Resources Wales will be notified as soon as possible. Proposals to remediate instability will be included in the notification to NRW.

Ground water and surface water monitoring during the deposit for recovery process and post completion are presented in Section 6.2 below.

It is considered that restoration of the quarry will be considered complete when the topography levels meet those set out in the Waste Recovery Plan, which matches those of the restoration proposed in the planning permission. Should the annual topographical survey demonstrate that the levels remain constant from one year to the next, it shall be considered appropriate to apply to surrender the deposit for recovery environmental permit.

6.0 MONITORING

To ensure that Bryn Aggregates are not causing pollution and that the pollution control measures implemented are effective, Bryn Aggregates will follow a monitoring schedule. This schedule details the routine and periodic monitoring requirements required by Bryn Aggregates in line with their Environmental Permit.

6.1 Meteorological Monitoring

Weather conditions will be monitored routinely and recorded in line with the site's Dust Management Plan and Monitoring Schedule. The site has its own weather station which records temperatures, wind strength, wind direction and rainfall amounts, daily. The below section identifies the prevailing weather conditions on site, in terms of wind direction and rainfall amounts.

For the purpose of providing information on prevailing conditions at the site, information on the wind direction and rainfall amounts from over the last 30 years has been derived from a weather station in Caerphilly (ST 15542 86387), which is located approximately 10km southeast of Gelliargwellt Farm. This has been sourced from the Meteoblue website. The prevailing wind direction data is illustrated by the wind rose in Figure 1. Figure 1 demonstrates that the predominant wind direction in the region is from a south-westerly direction. The land to the southwest of the site, is used for agriculture. The nearest non-agricultural land use is the village of Gelligaer, approximately 750m to the east-northeast of the site. The nearest sensitive receptor to the northeast of site is the edge of the village of Gelligaer which is approximately 765m away. The nearest sensitive receptor to the site is Tophill Farm approximately 420m to the north-northwest. The Dust Management Plan and Fugitive Emissions Plan outline control measures to reduce the risk of potential emissions to sensitive receptors.

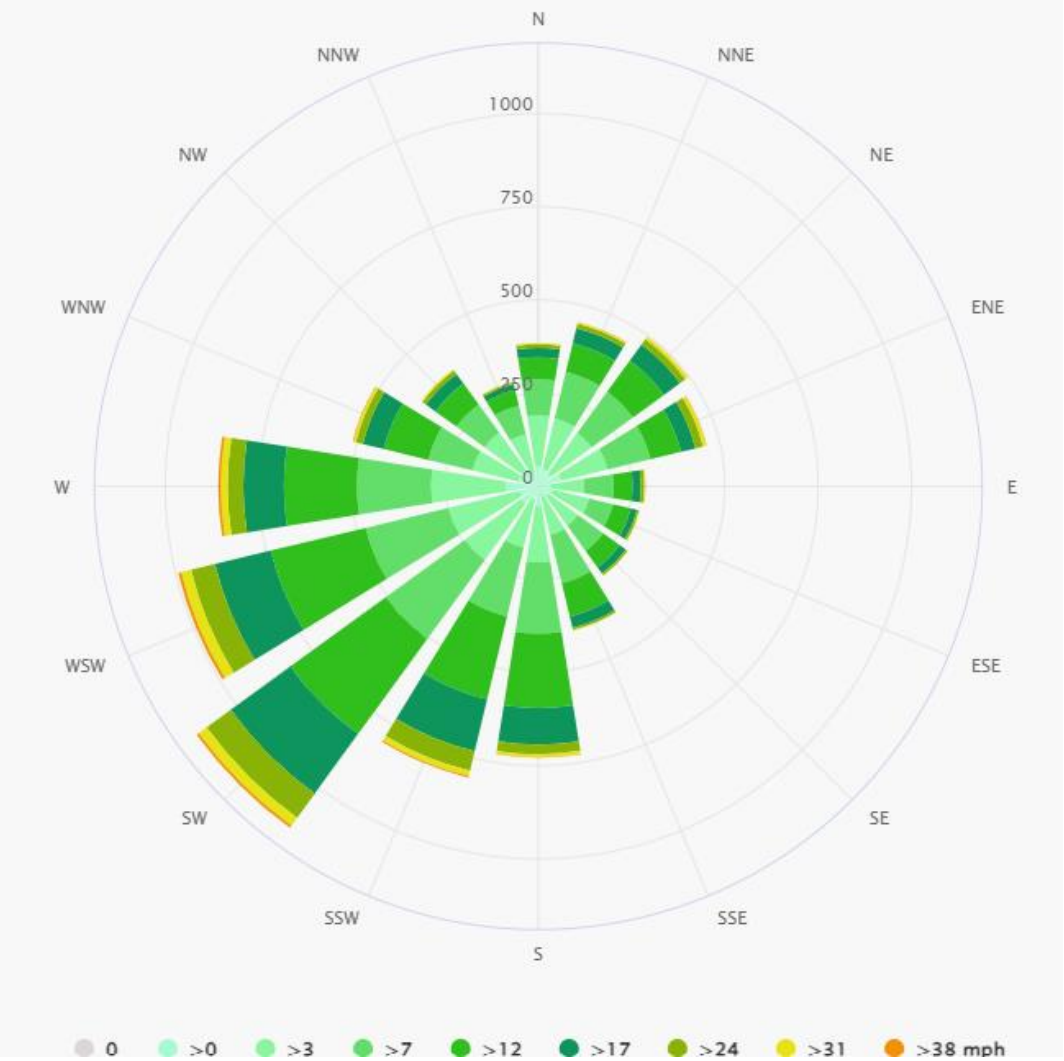


Figure 1 - Windrose showing the number of hours the wind has blown from each direction over the last 30 years at Caerphilly

Figure 2 shows average precipitation volumes over the last 30 years in Caerphilly. It shows that on average, April is the driest month with 65mm of rainfall whilst the wettest month on average is October with 112mm of rain.

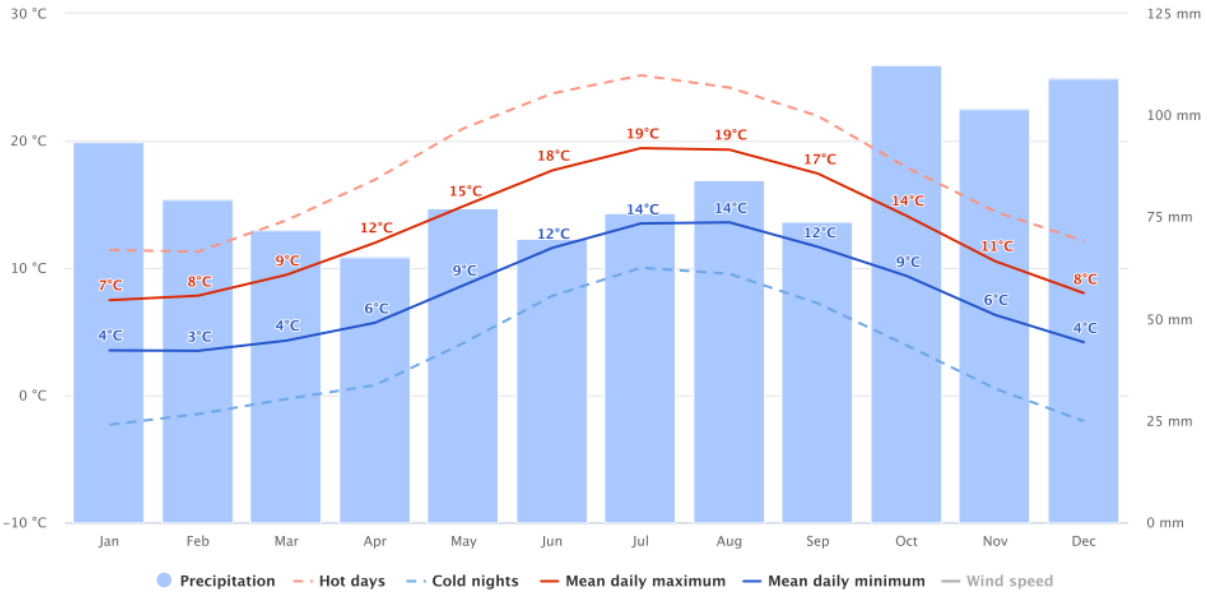


Figure 2 - Graph showing the average rainfall amounts on a monthly basis over the last 30 years in Caerphilly

6.2 Gas, Groundwater, Surface Water and Amenity Monitoring

The use of specific inert general fill waste, and soil waste and the adherence to the strict waste acceptance procedures negates the need for gas monitoring throughout the lifetime of the permit. The waste deposited for recovery on site has negligible potential to generate gas. A Water Quality and Quantity Monitoring Scheme and Contingency Plan has been produced which details the surface and groundwater monitoring to be carried out during the recovery of waste at the site and following completion of the proposed development.

Groundwater monitoring will be carried out every month with levels recorded and samples collected from 8 boreholes around the quarry. The following data shall be collected from each borehole:

- Depth to groundwater level measured by an electronic water level meter.
- Depth to base of monitoring borehole.
- Monitoring borehole defects.

Groundwater quality samples collected will be scheduled for the following suite of analysis:

- pH;
- Electrical Conductivity;

- Biological Oxygen Demand;
- Chemical Oxygen Demand;
- Dissolved Oxygen;
- Total Organic Carbon;
- Alkalinity;
- Ammonia;
- Chloride;
- Fluoride;
- Nitrate;
- Sulphate, sulphide and total sulphur;
- Metals: Al, As, B, Ca, Cd, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Zn;
- Total Petroleum Hydrocarbons by GC-FID;
- Speciated Polyaromatic Hydrocarbons (PAH) by GC-MS

Surface water monitoring will be carried out monthly with levels and flow rates manually measured and recorded. Samples shall also be collected where possible from the 8 monitoring locations around site. The following data shall be collected from each location:

- Depth of surface water measured by an electronic water level meter or hand tape as appropriate.
- Approximate channel shape.
- Channel top width (m).
- Channel base width (m).
- Flow rate (m/s).
- Silt level (m) at base of channel.

Additionally, date will be collected from 2No. permanently installed “Teledyne ISCO 2150” flow monitoring devices. These are sited within the channel of the watercourse being monitored and provide continuous data on the flow in that channel. (See further details below). These will be visited each month and the data collected in the intervening period collected for subsequent analysis.

Surface water quality samples collected will be scheduled for the following suite of analysis:

- pH;
- Electrical Conductivity;
- Biological Oxygen Demand;
- Chemical Oxygen Demand;

- Dissolved Oxygen;
- Total Organic Carbon;
- Alkalinity;
- Ammonia;
- Chloride;
- Fluoride;
- Nitrate;
- Sulphate, sulphide and total sulphur;
- Suspended solids;
- Metals: Al, As, B, Ca, Cd, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Zn;
- Total Petroleum Hydrocarbons by GC-FID;
- Speciated Polyaromatic Hydrocarbons (PAH) by GC-MS

Figure 3 below shows the locations of the groundwater and surface water monitoring points across the site.

The proposed development has been designed to provide an agricultural benefit to the land post restoration. This design includes the return of the land for use as grazing for a dairy herd. The restoration will positively impact the local area and therefore amenity monitoring is not considered necessary.

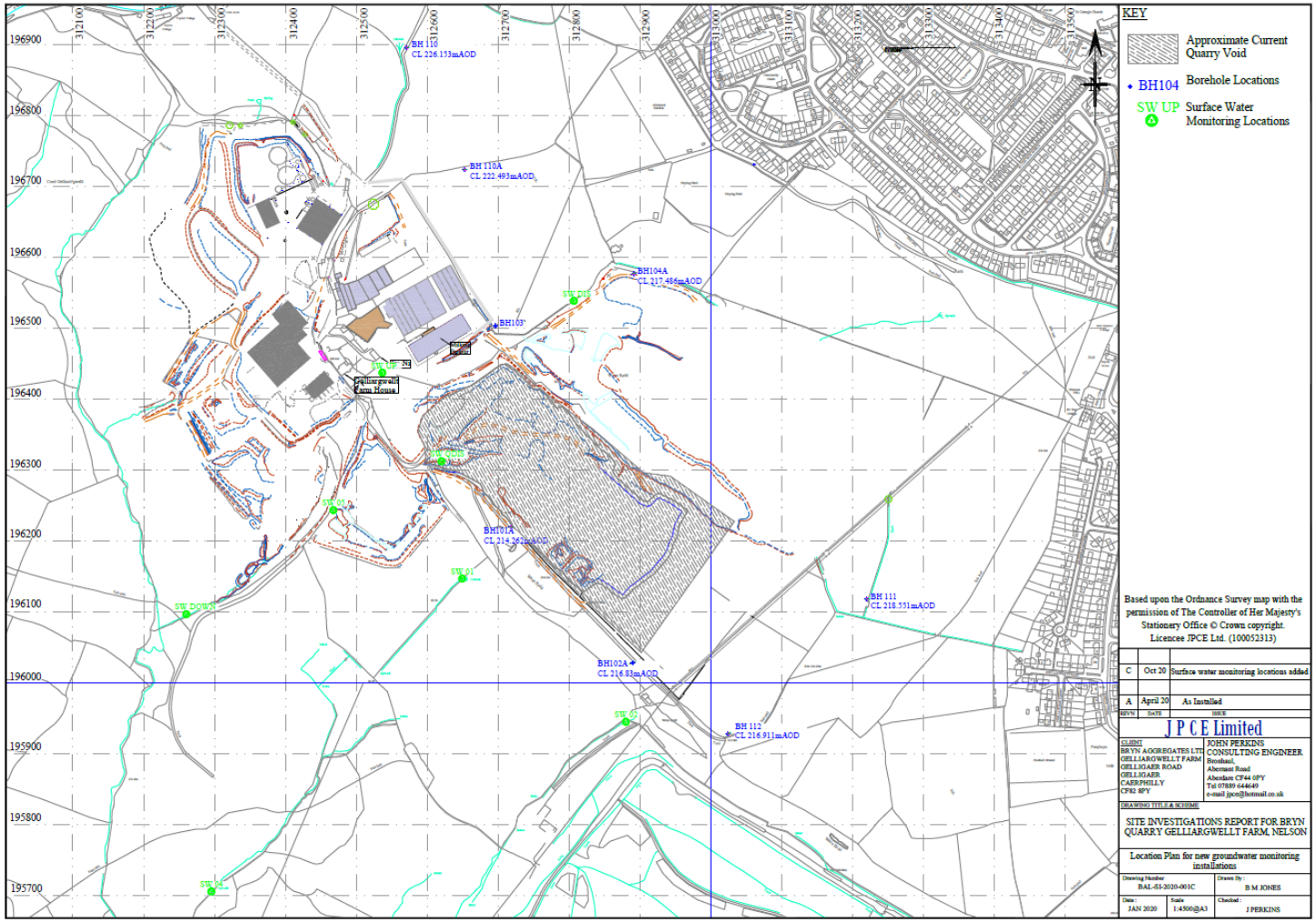


Figure 3 - Locations of ground and surface water monitoring points

7.0 RISK ASSESSMENTS

Table 3 - Environmental Risk Assessment

Pollutant Model			Judgement				Action	
Source	Pathway	Receptors	P	C	M	Justification of Magnitude	Risk Management	Residual Risk
Waste Materials	Airborne dust particulates and microorganisms during the movement, handling and deposition of waste.	Local residents located in Pen y Bryn (E, 460m) and Gelligaer (NE, 455m). The general public using nearby footpath to the immediate south and east of the site. Greenhill Primary school located 600m NE of the site. Tourist attractions such as Colliers Adventure Farm (S, 1km), Llancaiach Fawr Manor (W, 1.3km) and Parc Penalta.	Med	Med	Med	Med - Dusts and powders are not permitted waste types on this site, however, dust may arise from the movement of soils and inert waste. There is the potential for dust exposure for local residents and visitors near the site. The nearest sensitive receptors are approximately 500m away. Potential harm inflicted by airborne dust particulates and microorganisms include respiratory issues and allergic reactions in humans due to inhalation of dust and exposure to pathogenic microorganisms.	• The site has a Dust Management Plan (EPR_B03_Dust_Management_Plan) which details the preventative measures in place for reducing dust and the actions to be taken when there is a dust issue. • The site will be kept clean and dust suppression will be used when required. • Material will be assessed prior to receipt. • Materials will be handled carefully by trained operatives. • Daily site inspections. • Speed limit for vehicles on site. • The Site Manager will carry out a daily visual assessment of dust emission within the site and a continuous dust monitor is used to monitor dust emissions.	Low

Pollutant Model			Judgement				Action	
Source	Pathway	Receptors	P	C	M	Justification of Magnitude	Risk Management	Residual Risk
Waste Materials	Airborne dust particulates from the transport of waste materials	Local residents located in Pen y Bryn (E, 460m) and Gelligaer (NE, 455m). The general public using nearby footpath to the immediate south and east of the site. Greenhill Primary school located 600m NE of the site. Tourist attractions such as Colliers Adventure Farm (S, 1km), Llancaiach Fawr Manor (W, 1.3km) and Parc Penalta.	Med	Low	Low	Low - Limited potential for frequent and long-term exposure for residents close to the site due to location of facility. Potential harm inflicted by airborne dust particulates and microorganisms include respiratory issues and allergic reactions in humans due to inhalation of dust and exposure to pathogenic microorganisms.	• The site has a Dust Management Plan (EPR_B03_Dust_Management_Plan) which details the preventative measures in place for reducing dust and the actions to be taken when there is a dust issue. • Dust generation attributable to vehicle movements will be controlled by the use of water sprinklers on the site access roads. • During dry weather action will be taken to remove dust from the road. • The Site Manager will carry out a daily visual assessment of dust emission within the site and a continuous dust monitor is used to monitor dust emissions.	Low
Waste Materials	Fugitive releases of litter through aerial dispersion and spillage	Local wildlife in ecological receptors, such as, Waun Rydd SINC, Nelson Bog SSSI, the Ancient Semi Natural Woodland to the immediate south of the site, and Parc Penalta. Local residents located in Pen y Bryn (E, 460m)	Low	Med	Med	Med - Potential harm inflicted through fugitive releases of litter include nuisance, loss of amenity and danger to wildlife.	• Waste is inspected on delivery and rejected if the waste is not of the permitted EWC code or is contaminated, as detailed in the Waste Acceptance Procedure. • Daily site inspection and removal of litter.	Low

Pollutant Model			Judgement				Action	
Source	Pathway	Receptors	P	C	M	Justification of Magnitude	Risk Management	Residual Risk
		and Gelligaer (NE, 455m). The general public using nearby footpath to the immediate south and east of the site.. Greenhill Primary school located 600m NE of the site. Tourist attractions such as Colliers Adventure Farm (S, 1km), Llancaiach Fawr Manor (W, 1.3km) and Parc Penalta.						
Waste Materials	Waste, mud and litter on local roads caused by spillage from waste carrying vehicles	Local drivers and nearby roads.	Med	Med	Med	Med – potential to cause a hazard on the roads, risking the safety of drivers in the area.	• Daily site inspection and cleaning of access roads around the site as necessary. • Wheel wash used to clean wheels prior to departure from site. • Main road is swept if required.	Low
Waste Materials	Odour during the movement, handling and deposition of waste	Local residents located in Pen y Bryn (E, 460m) and Gelligaer (NE, 455m). The general public using nearby footpath to the	Low	Low	Low	Low – the majority of waste being delivered on site is inert so the odour will be low. The distance between the site and the nearest sensitive	• Daily site inspection. • A detailed Waste Acceptance Procedure (EPR-OP02 Waste Acceptance) will be followed to ensure that only appropriate waste materials are accepted onto site.	Low

Pollutant Model			Judgement				Action	
Source	Pathway	Receptors	P	C	M	Justification of Magnitude	Risk Management	Residual Risk
	through aerial dispersion.	immediate south and east of the site. Greenhill Primary school located 600m NE of the site. Tourist attractions such as Colliers Adventure Farm (S, 1km), Llancaiach Fawr Manor (W, 1.3km) and Parc Penalta.				receptors mitigate the potential consequence of creating a public nuisance for the local population.		
Vehicles and Plant On-Site	Noise and vibration from vehicle movements on and around site.	Local residents located in Pen y Bryn (E, 460m) and Gelligaer (NE, 455m). The general public using nearby footpath to the immediate south and east of the site. Greenhill Primary school located 600m NE of the site. Tourist attractions such as Colliers Adventure Farm (S, 1km), Llancaiach Fawr Manor (W, 1.3km) and Parc Penalta (SE).	Low	Low	Low	Low – the equipment required to transport and handle the waste generates low noise. The distance between the site and the nearest sensitive receptors mitigate the potential consequence of creating a public nuisance for the local population.	• Regular maintenance of plant and machinery. • Works will be carried out during operational hours, 07:00 – 18:00 Monday to Friday and on Saturday between 07:00 and 13:00.	Low

Pollutant Model			Judgement				Action	
Source	Pathway	Receptors	P	C	M	Justification of Magnitude	Risk Management	Residual Risk
Waste Materials	Scavenging animals and birds.	Staff that work on site. Local residents located in Pen y Bryn (E, 460m) and Gelligaer (NE, 455m). Tourist attractions such as Colliers Adventure Farm (S, 1km), Llancaiach Fawr Manor (W, 1.3km) and Parc Penalta (SE).	Low	Low	Low	Low – permitted waste types are unlikely to attract scavenging animals and birds. Potential harm inflicted by scavenging animals and birds include public nuisance and increased risk of zoonotic diseases transmission.	• Waste checks on delivery. • Daily site inspections. • As part of the whole site activities (farming, MRF and AD plant), pests are controlled.	Low
Waste Materials	Pests (e.g. flies)	Staff that work on site. Local residents located in Pen y Bryn (E, 460m) and Gelligaer (NE, 455m). Tourist attractions such as Colliers Adventure Farm (S, 1km), Llancaiach Fawr Manor (W, 1.3km) and Parc Penalta (SE).	Low	Low	Low	Low – insects are unlikely to increase as the waste permitted to be brought onto site is largely inert and so will not attract insects. Potential harm inflicted by pests like flies include public nuisance.	• Waste checks on delivery. • Daily site inspections.	Low
Waste Materials	Surface runoff during/following recovery of waste.	Local groundwater, local residents, visitors to the local area, and wildlife disruption in ecological receptors, such as, Nelson Bog SSSI.	Low	Med	Med	Low - during the restoration works, surface water run-off from the imported inert waste will be captured by the site drainage system and discharged to a stream, via the	• The site's waste acceptance procedure ensures that only inert general fill waste, and soil waste is accepted on site. • It is expected that following the completion of quarrying and restoration activities, in particular the cessation of pumping operations from the quarry void, a	Low

Pollutant Model			Judgement				Action	
Source	Pathway	Receptors	P	C	M	Justification of Magnitude	Risk Management	Residual Risk
						settlement lagoons under an environmental permit. These waters ultimately discharge across the western extent of the Nelson Bog SSSI. Potential harm from this pollutant includes contamination of local ecological receptors.	rebound in groundwater levels across the site would be anticipated resulting the reoccurrence and/or more frequent emergence of the spring lines directly down-gradient of the Site, such as SW1 and SW2, which are believed to represent the lithological boundary between the sandstones and mudstones of the Grovesend Formation. These spring lines flow down-gradient to the south and discharge into the Nelson Bog SSSI. This pathway considers the leachate to have already undergone the dilution and dispersion processes upon entering the groundwater aquifer. • See Hydrogeological Risk Assessment for further details.	
Waste Materials	Flooding of site	Neighbouring sites (Bryn Recycling, Bryn Power etc) and environmental receptors, such as, Nelson Bog SSSI.	Low	Low	Low	Low – the site is in a flood zone 1 so the risk of flooding is low. The site is also located on a hill so is unlikely to flood. The quarry void is designated as low to high risk of surface water flooding but the restoration plan will fill the void. The permitted waste is inert general fill waste, and soil waste so	• It is expected that following the completion of quarrying and restoration activities, in particular the cessation of pumping operations from the quarry void, a rebound in groundwater levels across the site would be anticipated resulting the reoccurrence and/or more frequent emergence of the spring lines directly down-gradient of the Site, such as SW1 and SW2, which are believed to represent the lithological boundary between the sandstones and mudstones of the Grovesend Formation. These spring lines flow down-gradient to the south and	Low

Pollutant Model			Judgement				Action	
Source	Pathway	Receptors	P	C	M	Justification of Magnitude	Risk Management	Residual Risk
						the potential for off-site pollution is much reduced. Potential harm from this pollutant includes disruption for neighbouring facilities and contamination of ecological receptors.	discharge into the Nelson Bog SSSI. This pathway considers the leachate to have already undergone the dilution and dispersion processes upon entering the groundwater aquifer. • See Hydrogeological Risk Assessment for further details.	
Waste On-Site, plant and vehicles used on and around Site	Fire on site	Staff, neighbouring sites (Bryn Recycling, Bryn Power etc) and local residents located in Pen y Bryn (E, 460m) and Gelligaer (NE, 455m).	Med	Med	Low	Med - Fires can be deliberate or accidental however the waste being deposited is largely inert and does not burn. Potential harm from fires on site include disruption for neighbouring facilities, damage to local infrastructure if the fire spreads, and threat of serious injury or death for any local human receptors.	• Follow manufacturer guidance and instructions on plant maintenance. • Manually controlled mains water dousing system • Site inspections to identify faulty equipment and other fire hazards.	Low
P = Possibility C = Consequence M = Magnitude								

Table 4 - Hydrological and Hydrogeological Risk Assessment

Pollutant Model			Pollutant Model		Pollutant Model	
Source	**Pathway**	**Receptors**	**Risk**	**Justification**	**Mitigation & Management**	**Risk**
Imported Inert General Fill Waste, And Soil Waste Restoration Materials	Vertical migration through the Grovesend Formation	Water Environment- Grovesend Formation Aquifer (Secondary A aquifer)	Moderate	Active dewatering operations are utilised within the quarry void throughout the majority of the year in order to keep the groundwater level below 205mAOD. Groundwater monitoring of the immediately up-gradient monitoring boreholes BH103A and BH104A indicate groundwater levels 204.62mAOD (BH104A – July 2022) – 215.93mAOD (BH103 – December 2022). Due to the proposed use of inert general fill waste, and soil waste as set out in the Waste Acceptance Procedure it is considered highly unlikely that water coming into contact with the material at the site will generate high concentrations of pollutants as part of any leachate generated. Any potential leachate generated will infiltrate into the Grovesend Formation sandstone that forms the quarry floor and will migrate vertically into the Secondary A aquifer, with no significant thickness of an unsaturated zone. Upon the leachate entering the Grovesend Formation groundwater body the potential leachate will be diluted and dispersed throughout the aquifer. There are no known groundwater abstractions within a 2km radius targeting the Grovesend Formation, and	• The restoration works will include a low permeability layer covering the inert restoration materials, to comprise soils waste (as per the site Wate Acceptance Procedure) thereby reducing the infiltration rate of surface waters into the waste mass. • Continuation of the current monthly groundwater and surface water monitoring plan will allow for the testing for potentially hazardous substances in the groundwater across the Site both up- and down- hydraulic gradient of the Site. Testing will highlight any potential exceedances of water quality parameters across the Site and allow for the potential identification of the origin.	Low

Pollutant Model			Pollutant Model		Pollutant Model	
Source	Pathway	Receptors	Risk	Justification	Mitigation & Management	Risk
				the site is not located within a Source Protection Zone. The Site is located within the South East Valleys Carboniferous Coal Measures (GB40902G201900) WFD Groundwater body which is listed with a “Poor” chemical and overall status.		

Pollutant Model			Pollutant Model		Pollutant Model	
Source	**Pathway**	**Receptors**	**Risk**	**Justification**	**Mitigation & Management**	**Risk**
Imported Inert General Fill Waste, And Soil Waste Restoration Materials	Groundwater migration through former coal workings	Nelson Bog SSSI	Low	Active dewatering operations are utilised within the quarry void throughout the majority of the year in order to keep the groundwater level below 205mAOD. Groundwater monitoring of the immediately up-gradient monitoring boreholes BH103A and BH104A indicate groundwater levels 204.62mAOD (BH104A – July 2022) – 215.93mAOD (BH103 – December 2022). It is therefore considered likely that any potential leachate generated from the inert waste mass will infiltrate into the Grovesend Formation sandstone that forms the quarry floor and will migrate vertically into the Secondary A aquifer, with an ~5m thickness seasonal unsaturated zone. However, due to the proposed inert nature of the material, it is considered highly unlikely that water coming into contact with the material at the site will generate high concentrations of pollutants as part of any leachate generated. Upon the leachate entering the Grovesend Formation groundwater body, it is considered likely that leachate will be highly diluted and dispersed throughout the aquifer. It is believed that the presence of former coal mine workings beneath the Site may act as minor pathway in the Grovesend Formation groundwater aquifer. The water features survey identified a mine adit located to the south of the quarry void where the groundwaters emerge and flow down-gradient to the south and ultimately discharge into the Nelson Bog SSSI. The	• Due to the low risk, no further mitigation measures have been identified.	Low

Pollutant Model			Pollutant Model		Pollutant Model	
Source	Pathway	Receptors	Risk	Justification	Mitigation & Management	Risk
				areas of the Nelson Bog SSSI down-gradient of the Site, that are fed by the Streams 2-4 (connected by a pathway), are Woodland and Willow scrub land that are not dependent on receiving base-rich waters.		

Pollutant Model			Pollutant Model		Pollutant Model	
Source	**Pathway**	**Receptors**	**Risk**	**Justification**	**Mitigation & Management**	**Risk**
Imported Inert General Fill Waste, And Soil Waste Restoration Materials	Surface water run-off from waste and discharge to nearby stream	Water Environment-Surface Waters	Moderate	This pollutant pathway is only considered complete during the restoration works, during which time the inert restoration materials will be exposed to precipitation and there is the potential for leachate generation as surface water runoff. Surface water run-off, together with intercepted groundwaters in the quarry void, are to be captured and collected via the quarry void drainage features, and transported down to the settlement lagoons, via the water management system, before discharge into Stream 2. There are no surface water abstractions from Stream 2 down-gradient of the Site. Any potential leachate present in the captured surface water run-off within the void is expected to undergo dilution and dispersion processed prior to discharge into the surface water feature. Additional treatment in the form of the settlement of suspended solids will also occur at the settlement lagoons prior to discharge. Waste acceptance procedures limit the imported materials to solely inert general fill waste, and soil waste (as defined within the Waste Acceptance Procedures) therefore minimising the potential presence of hazardous substances in any leachate generated.	• Following the completion of the restoration works, with the installation of a low permeability layer and drainagescheme, surface waters will be captured and collected in surface water lagoons with no interaction with the inert waste mass. • Regular checks and maintenance of the Water Management System will ensure that the drainage scheme is fully operational and working efficiently to attenuate potentially leached contaminants in the surface water run-off and allow any suspended solids to settle out of the waters prior to discharge into Stream 2. • Continuation of the current monthly groundwater and surface water monitoring plan will allow for the testing forpotentially hazardous substances in the surface waters prior to discharge into settlement lagoons; prior to discharge into Stream 2, and up- and down-gradient of discharge point into Stream 2. Testing will help highlight any potential exceedances of water quality parameters and allow the potential identification of the source.	Low

Pollutant Model			Pollutant Model		Pollutant Model	
Source	**Pathway**	**Receptors**	**Risk**	**Justification**	**Mitigation & Management**	**Risk**
Imported Inert General Fill Waste, And Soil Waste Restoration Materials	Surface water run-off from waste and discharge to nearby stream	Nelson Bog SSSI	Moderate	This pollutant pathway is only considered complete during the restoration works, during which time the inert restoration materials will be exposed to precipitation and there is the potential contaminated surface water runoff. Waste acceptance procedures limit the imported materials to solely inert general fill waste, and soil waste as set out in the Waste Acceptance Procedure therefore minimising the potential presence of hazardous substances in any leachate generated. Surface water run-off, together with intercepted groundwaters in the quarry void, are to be captured and collected via the quarry void drainage features, and transported down to the settlement lagoons, via the water management system, before discharge into Stream 2. Stream 2 flows into a larger stream (Stream 6) further to the south before discharging and spreading across the western extent of the Nelson Bog SSSI. It is considered likely that the any leachate discharged into Stream 2 will be significantly diluted prior to being discharged across Nelson Bog. The areas of the Nelson Bog SSSI down-gradient of the Site, that are fed by the Streams 2-4 (connected by a	• Following the completion of the restoration works, with the installation of a low permeability layer and drainage scheme, surface waters will be captured and collected in surface water lagoons with no interaction with the inert waste mass. • Regular checks and maintenance of the Water Management System will ensure that the drainage scheme is fully operational and working efficiently to attenuate potentially leached contaminants in the surface water run-off and allow any suspended solids to settle out of the waters prior to discharge into Stream 2. • Continuation of the current monthly groundwater and surface water monitoring plan will allow for the testing for potentially hazardous substances in the surface waters prior to discharge into settlement lagoons; prior to discharge into Stream 2, and up- and down-gradient of discharge point into Stream 2. Testing will help highlight any potential exceedances of water quality parameters and allow the potential identification of the origin.	Low

Pollutant Model			Pollutant Model		Pollutant Model	
Source	Pathway	Receptors	Risk	Justification	Mitigation & Management	Risk
				pathway), are Woodland and Willow scrub land that are not the raised bog area to the west that is dependent on receiving base-rich waters.		

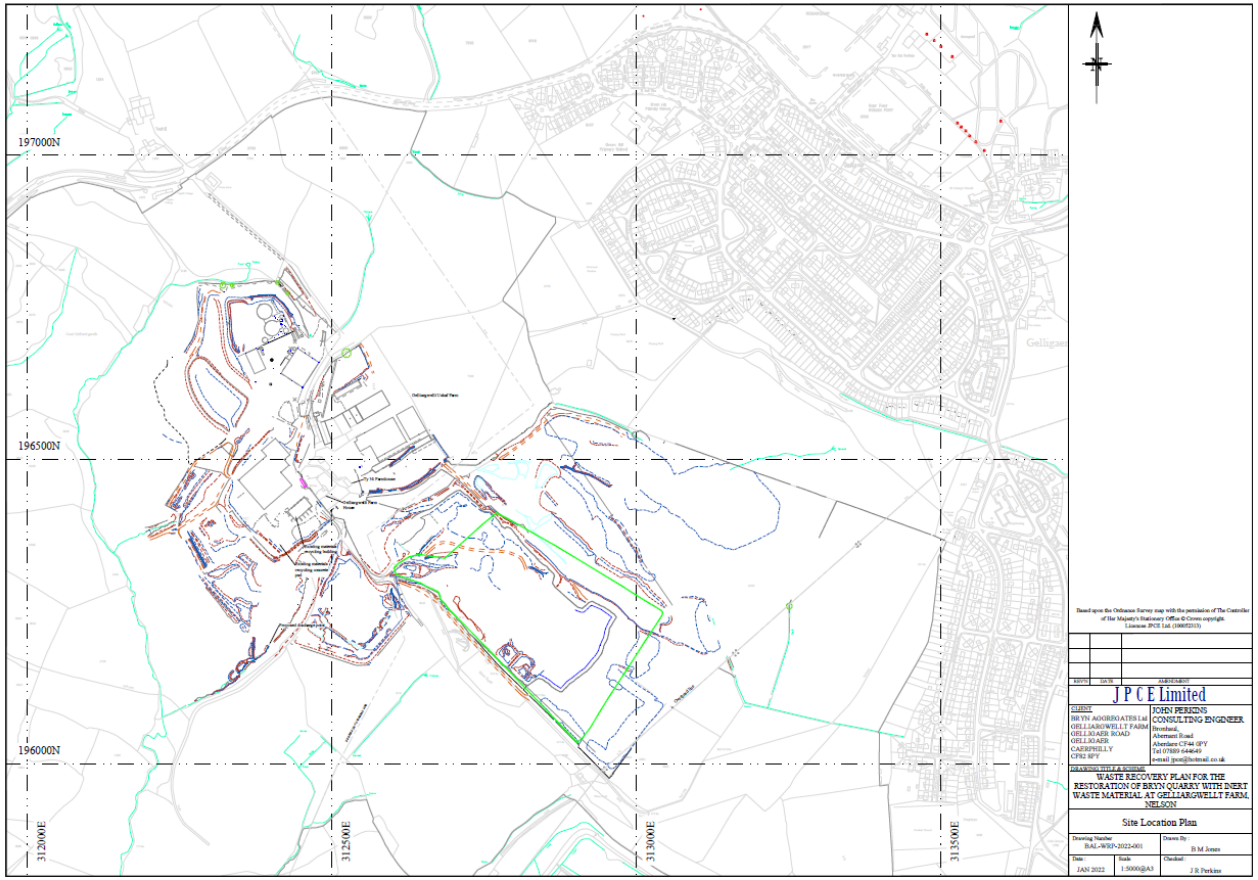
Pollutant Model			Pollutant Model		Pollutant Model	
Source	**Pathway**	**Receptors**	**Risk**	**Justification**	**Mitigation & Management**	**Risk**
Imported Inert General Fill Waste, And Soil Waste Restoration Materials	Reemergence of springs downgradient of Site	Water Environment-Surface Waters	Low	This pollutant pathway is only considered following the cessation of the dewatering activities within the quarry void, and the subsequent long-term re-bounding of groundwater levels across the Site. This normalising of groundwater levels may allow for the re-emergence of the down-gradient springs (SW01 & SW02), outside of the winter months. When present, these springs flow down-gradient, to the south, ultimately discharging into the upper portions of the Nelson Bog SSSI. It is expected that leachate, if present, in the groundwater emerging from these springs are likely to be diluted and have dispersed within the Grovesend Formation aquifer. There are no surface water abstractions from the springs down-gradient of the Site. Waste acceptance procedures limit the imported materials to general fill waste, and soil waste as set out in the Waste Acceptance Procedure therefore minimising the potential presence of hazardous substances in any leachate generated.	• Continuation of the current monthly groundwater and surface water monitoring plan will allow for the testing for potentially hazardous substances in the waters emerging at SW01 and SW02.Testing will help highlight any potential exceedances of water quality parameters and allow the potential identification of the origin.	Low

Pollutant Model			Pollutant Model		Pollutant Model	
Source	**Pathway**	**Receptors**	**Risk**	**Justification**	**Mitigation & Management**	**Risk**
Imported Inert General Fill Waste, And Soil Waste Restoration Materials	Reemergence of springs downgradient of Site	Nelson Bog SSSI	Moderate	This pollutant pathway is only considered following the cessation of the dewatering activities within the quarry void, and the subsequent re-bounding of groundwater levels across the Site. This normalising of groundwater levels may allow for the re-emergence of the down-gradient springs (SW01 & SW02), outside of the winter months. It is expected that When present, these springs flow down-gradient, to the south, ultimately discharging into the upper portions of the Nelson Bog SSSI. It is expected that leachate, if present, in the groundwaters emerging from these springs are likely to be diluted and have dispersed within the Grovesend Formation aquifer. The volume of water from the springs discharging into the Nelson Bog SSSI is expected to form a minor component to the overall waters feeding the SSSI. Waste acceptance procedures limit the imported materials to solely to inert general fill waste, and soil waste as set out in the Waste Acceptance Procedure therefore minimising the potential presence of hazardous substances in any leachate generated.	• Continuation of the current monthly groundwater and surface water monitoring plan will allow for the testing for potentially hazardous substances in the waters emerging at SW01 and SW02.Testing will help highlight any potential exceedances of water quality parameters and allow the potential identification of the origin.	Low

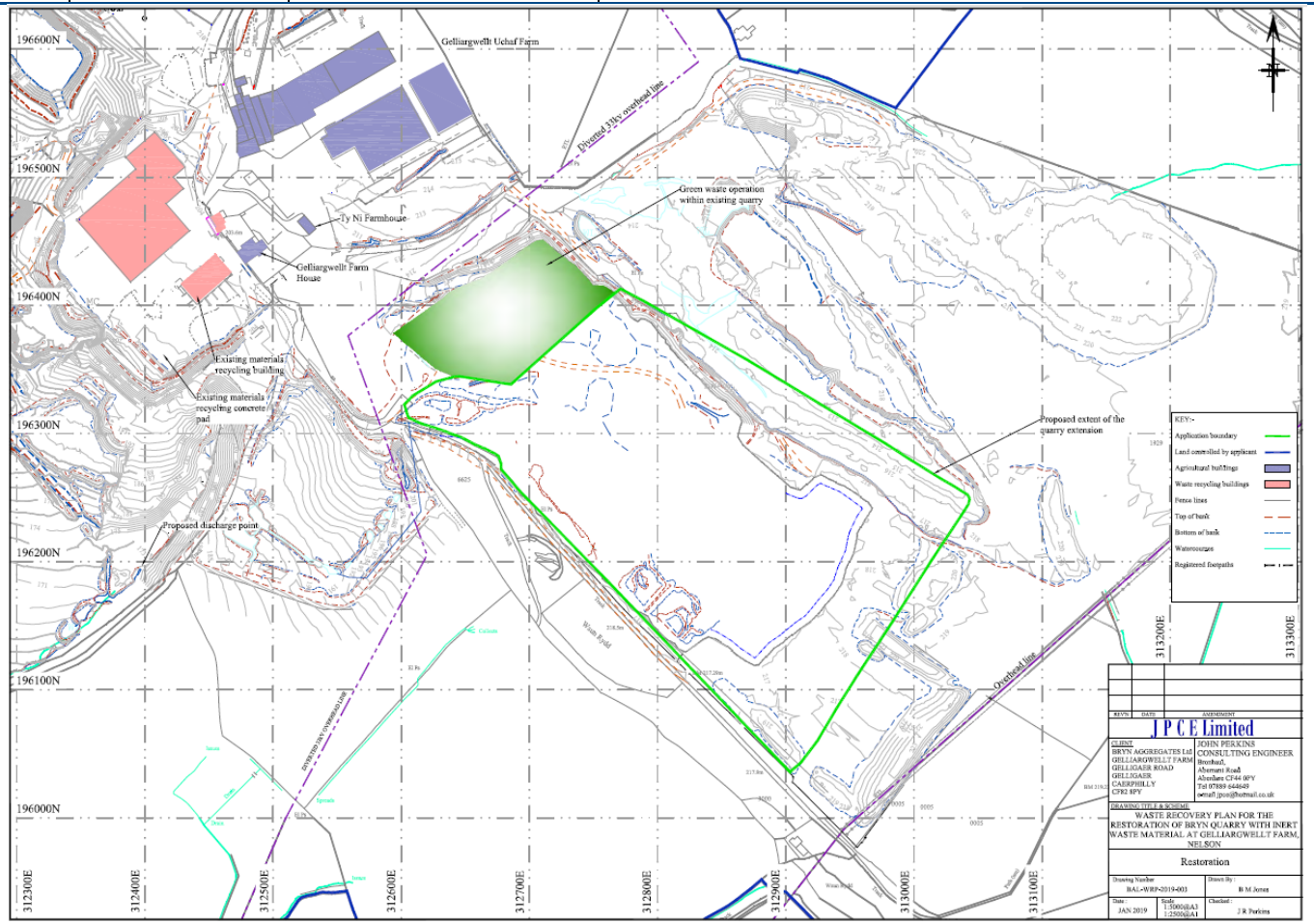
Pollutant Model			Pollutant Model		Pollutant Model	
Source	Pathway	Receptors	Risk	Justification	Mitigation & Management	Risk
				The areas of the Nelson Bog SSSI down-gradient of the Site, that are fed by the Streams 2-4 (connected by a pathway), are Woodland and Willow scrub land that are not dependent on receiving base-rich waters. Additionally, the relative contribution of SW1 and SW2 waters discharged into Nelson Bog SSSI is significantly lower than the combined Stream 2 & 6 discharge.		

8.0 SITE DRAWINGS

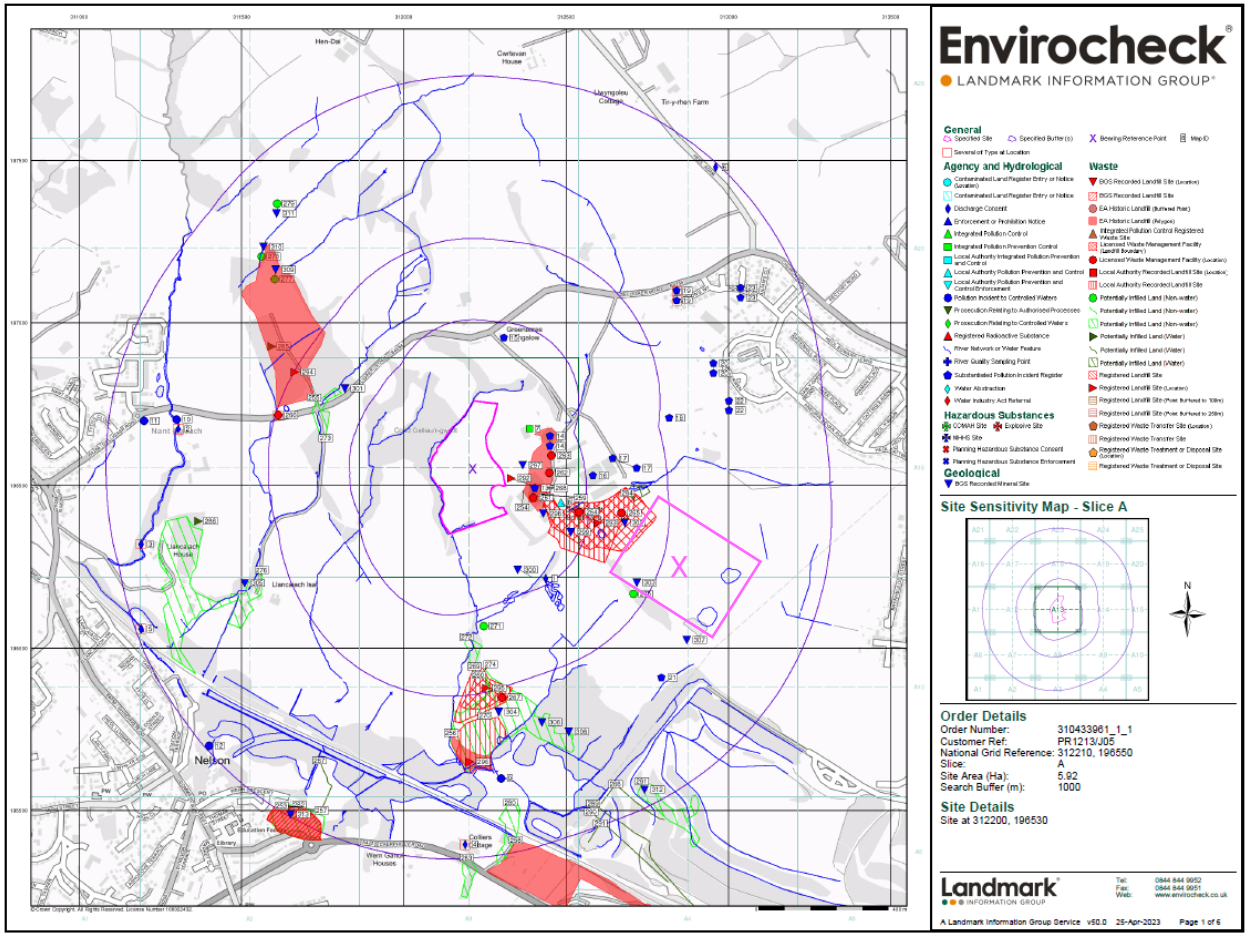
Drawing	Scale	Title	Site Name
ESSD-1	1:5,000 @ A3	Site Location Plan	Bryn Aggregates Ltd, Gelliargwellt Farm, Gelligaer Road, Hengoed, CF82 8FY



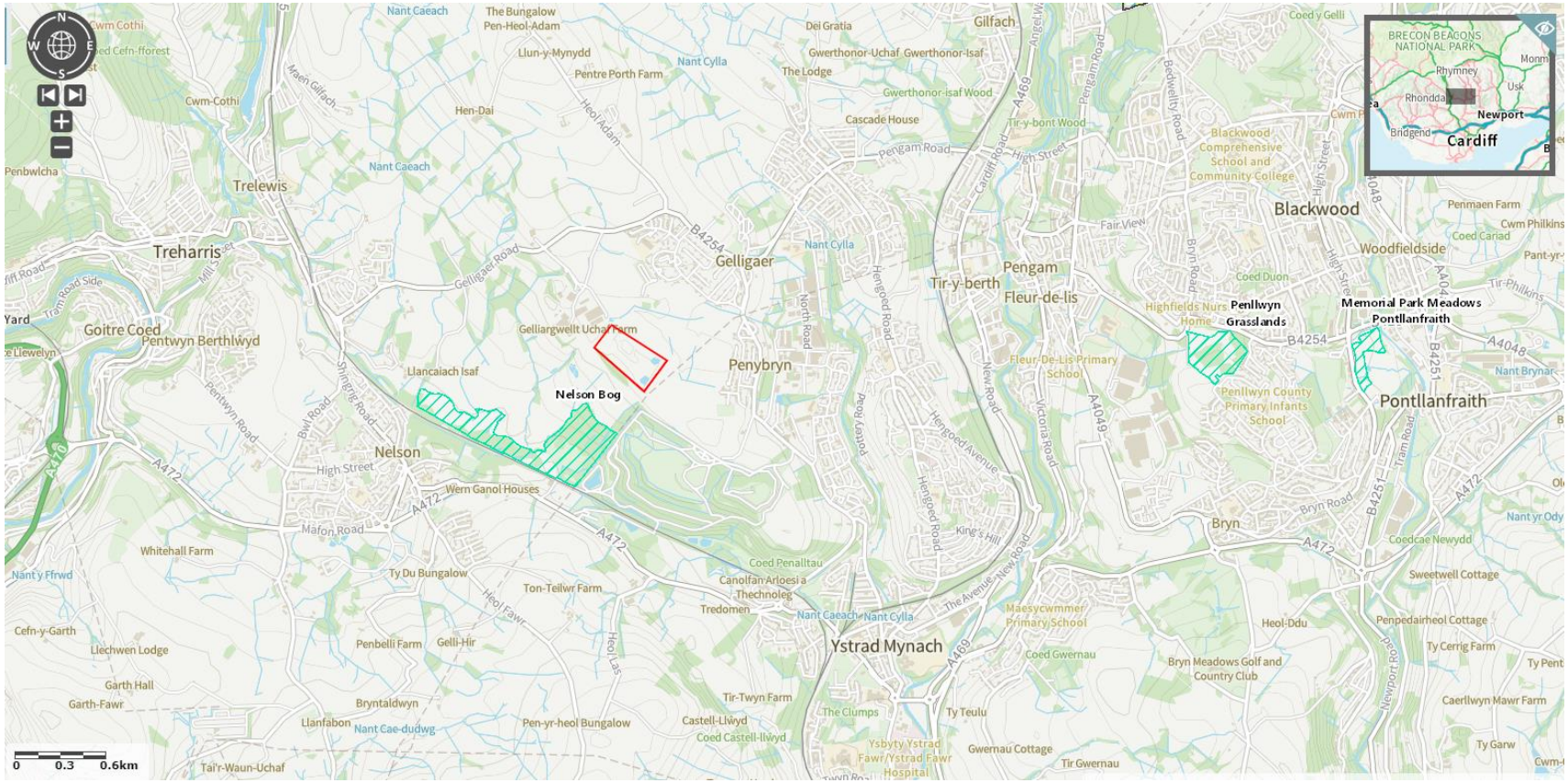
Drawing	Scale	Title	Site Name
ESSD-2	1:5,000 @ A3	Application Boundary	Bryn Aggregates Ltd, Gelliargwellt Farm, Gelligaer Road, Hengoed, CF82 8FY



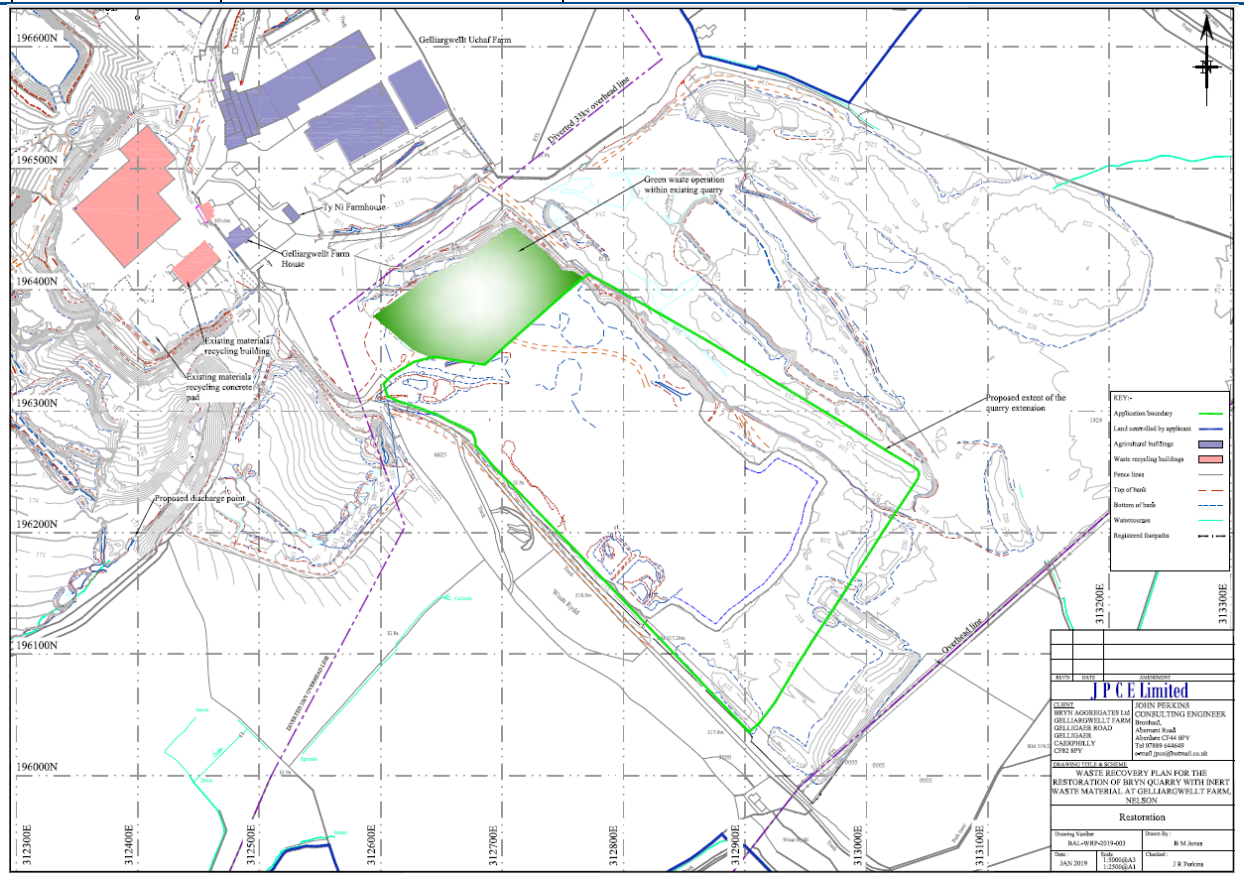
Drawing	Scale	Title	Site Name
ESSD-3	1:10,000	Environmental Site Setting	Bryn Aggregates Ltd, Gelliargwellt Farm, Gelligaer Road, Hengoed, CF82 8FY



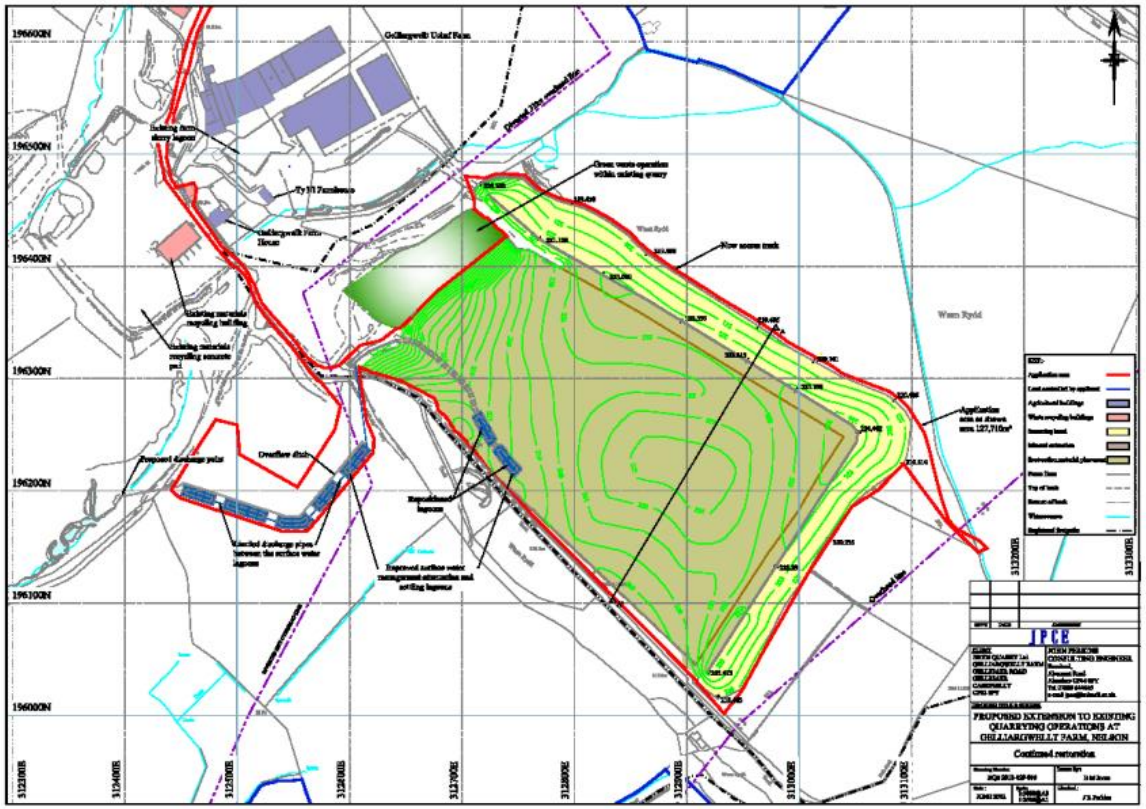
Drawing	Scale	Title	Site Name
ESSD-4	1:25,000	Ecological Receptors	Bryn Aggregates Ltd, Gelliargwellt Farm, Gelligaer Road, Hengoed, CF82 8FY



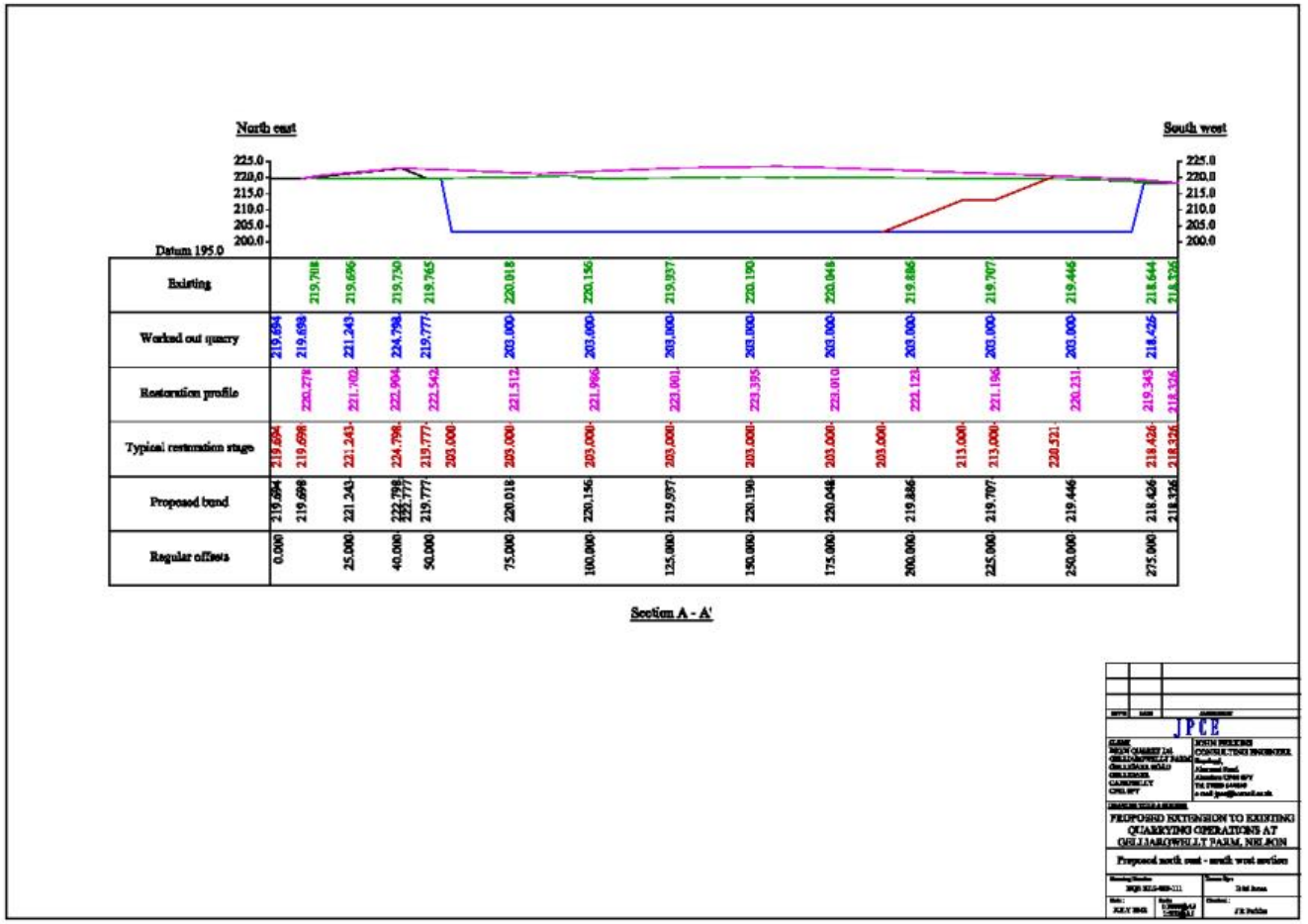
Drawing	Scale	Title	Site Name
ESSD-5	1:5,000 @ A3	Existing Topography	Bryn Aggregates Ltd, Gelliargwellt Farm, Gelligaer Road, Hengoed, CF82 8FY



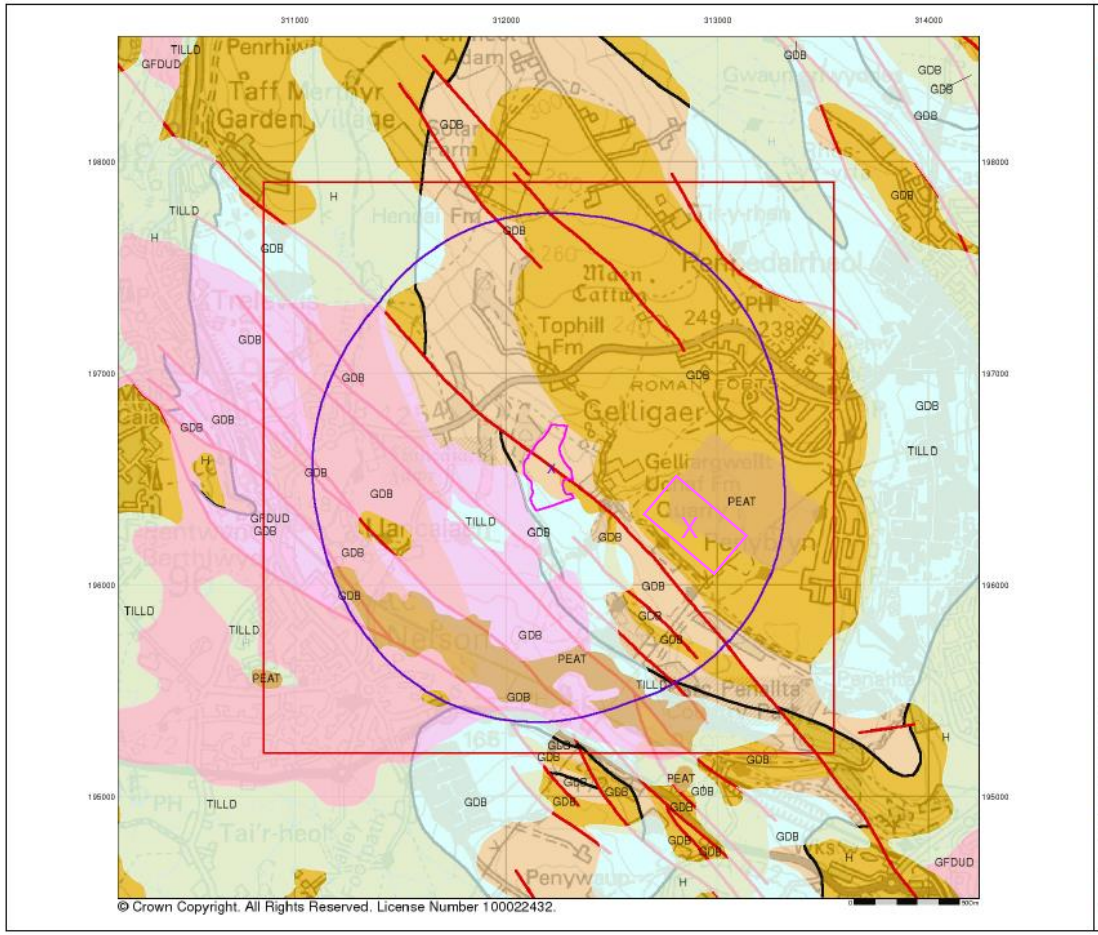
Drawing	Scale	Title	Site Name
ESSD-6	1:2,500 @ A3	Final Topography	Bryn Aggregates Ltd, Gelliargwellt Farm, Gelligaer Road, Hengoed, CF82 8FY



Drawing	Scale	Title	Site Name
ESSD-7	1:1,000 @ A3	Cross-Section 1-1	Bryn Aggregates Ltd, Gelliargwellt Farm, Gelligaer Road, Hengoed, CF82 8FY



Drawing	Scale	Title	Site Name
ESSD-8	1:50,000	Regional Geology	Bryn Aggregates Ltd, Gelliargwellt Farm, Gelligaer Road, Hengoed, CF82 8FY



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Combined Surface Geology

The Combined Surface Geology map combines all the previous maps into one combined geological overview of your site.

Please consult the legends to the previous maps to interpret the Combined "Surface Geology" map.

Additional Information

More information on 1:50,000 Geological mapping and explanations of rock classifications can be found on the BGS website. Using the LEX Codes in this report, further descriptions of rock types can be obtained by interrogating the 'BGS Lexicon of Named Rock Units'. This database can be accessed by following the 'Information and Data' link on the BGS website.

Contact

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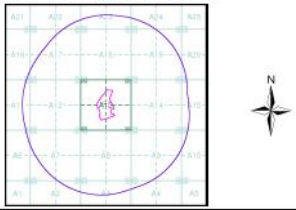
Fax: 0115 936 3276
email: enquiries@bgs.ac.uk
website: www.bgs.ac.uk

Combined Geology Map - Slice A



Order Details:

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National Grid Reference:	312210, 196550
Slice:	A
Site Area (Ha):	5.92
Search Buffer (m):	1000

Site Details:

Site at 312200, 196530

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Geology 1:50,000 Maps Legends

Superficial Geology

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	TILLD	Till, Devensian	Diamicton	Not Supplied - Devensian
	GFDUD	Glaciofluvial Deposits, Devensian	Sand and Gravel	Not Supplied - Devensian
	PEAT	Peat	Peat	Not Supplied - Quaternary

Bedrock and Faults

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	GDB	Grovesend Formation	Mudstone, Siltstone and Sandstone	Not Supplied - Westphalian
	GDB	Grovesend Formation	Sandstone	Not Supplied - Westphalian
	H	Hughes Member	Sandstone	Not Supplied - Westphalian
		Faults		
		Rock Segments		

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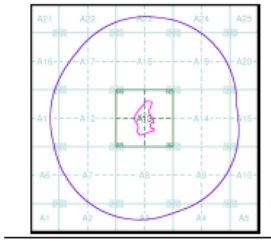
Geology 1:50,000 Maps

This report contains geological map extracts taken from the BGS Digital Geological map of Great Britain at 1:50,000 scale and is designed for users carrying out preliminary site assessments who require geological maps for the area around the site. This mapping may be more up to date than previously published paper maps.
The various geological layers - artificial and landslip deposits, superficial geology and solid (bedrock) geology are displayed in separate maps, but superimposed on the final 'Combined Surface Geology' map. All map legends feature on this page. Not all layers have complete nationwide coverage, so availability of data for relevant map sheets is indicated below.

Geology 1:50,000 Maps Coverage

Map ID:	1
Map Sheet No:	249
Map Name:	Newport
Map Date:	1969
Bedrock Geology:	Available
Superficial Geology:	Available
Artificial Geology:	Available
Faults:	Not Supplied
Landslip:	Available
Rock Segments:	Not Supplied

Geology 1:50,000 Maps - Slice A



Order Details:

Order Number:	31043396 1_1
Customer Reference:	PR1213/J05
National Grid Reference:	312210, 196550
Slice:	A
Site Area (Ha):	5.92
Search Buffer (m):	1000

Site Details:

Site at 312200, 196530

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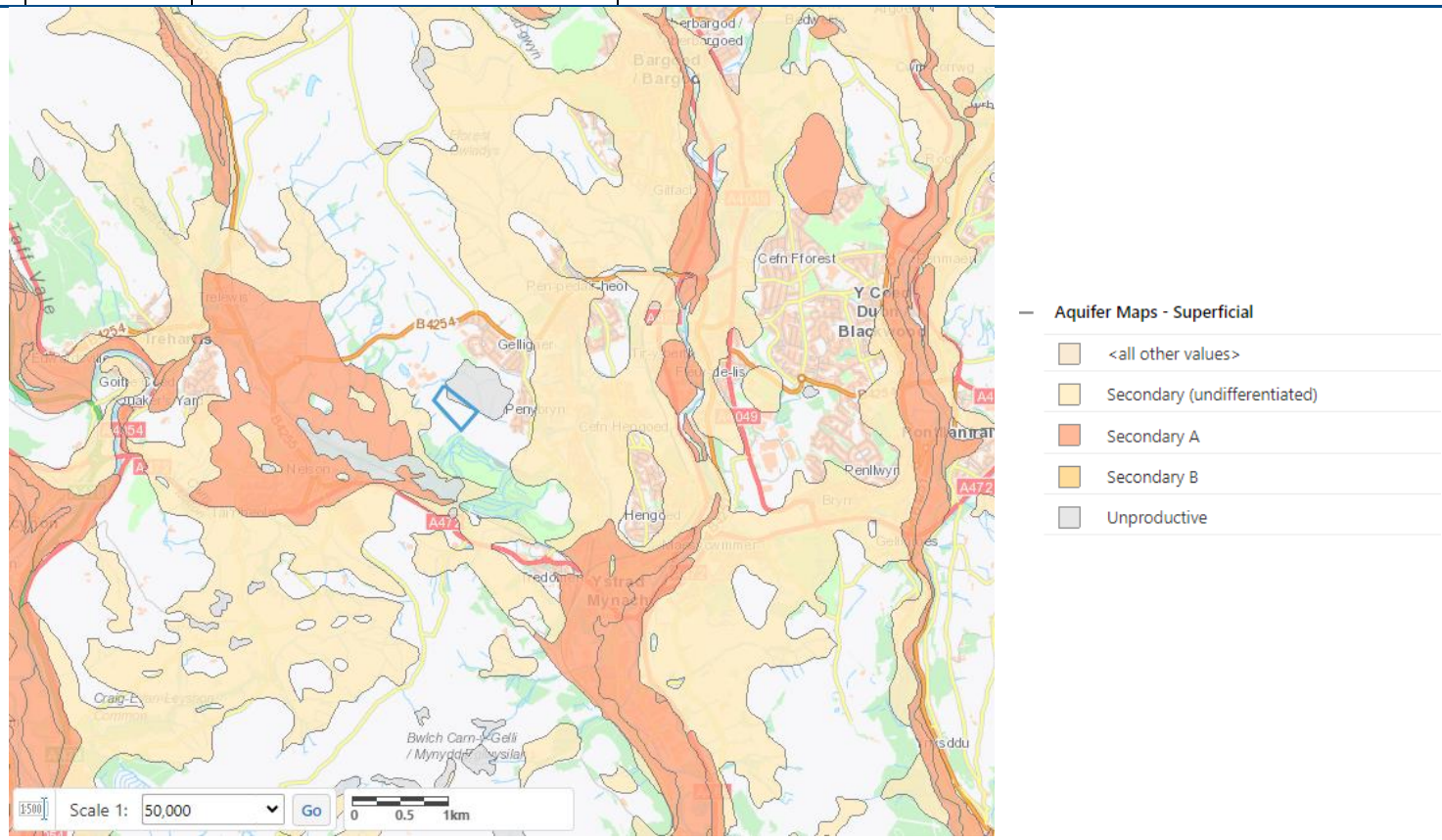
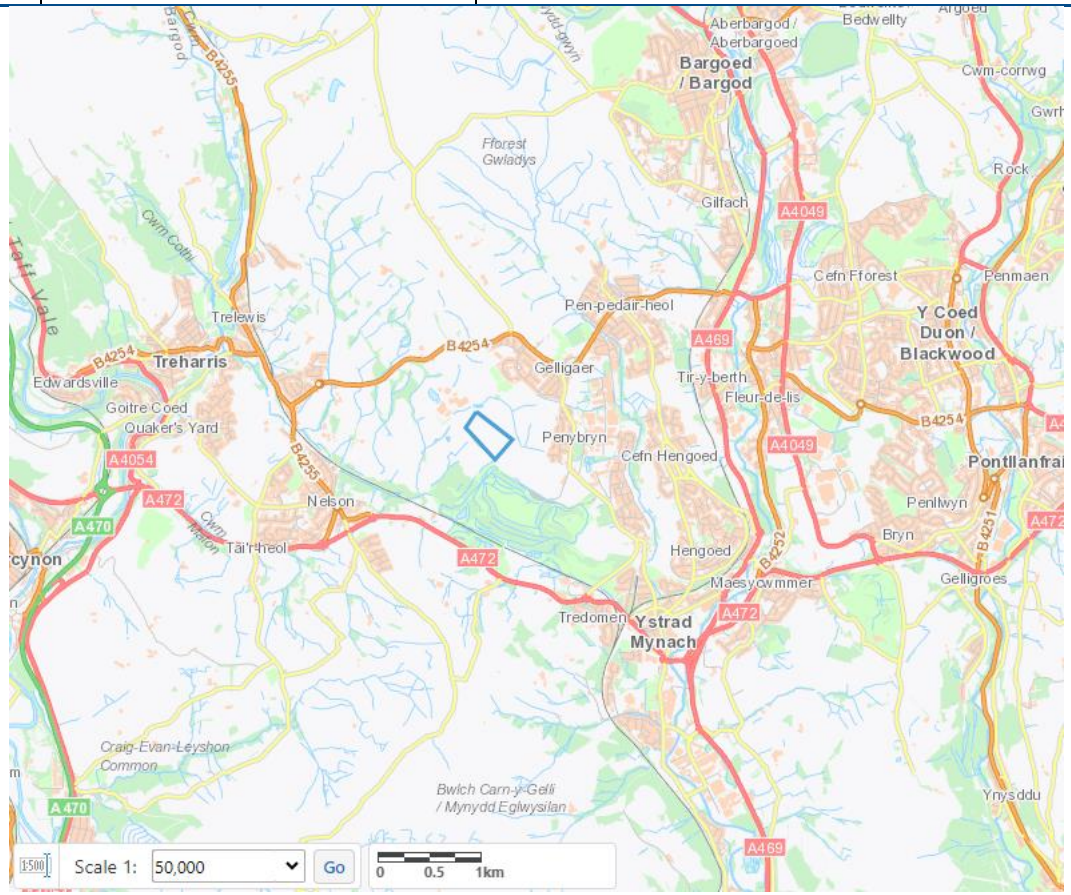
Drawing	Scale	Title	Site Name
ESSD-9	1:50,000	Bedrock Aquifer Designation	Bryn Aggregates Ltd, Gelliargwellt Farm, Gelligaer Road, Hengoed, CF82 8FY

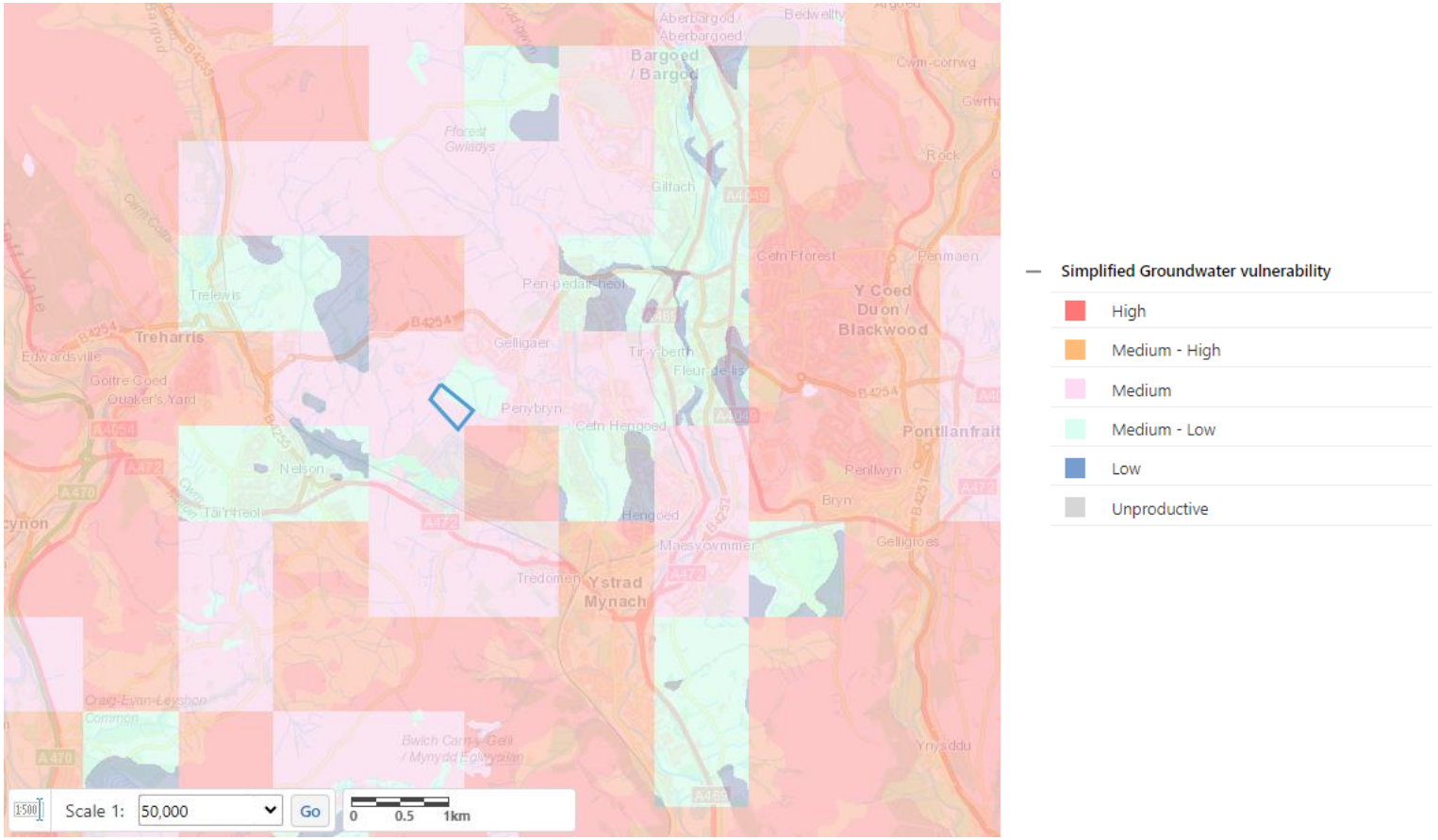
Drawing	Scale	Title	Site Name
ESSD-10	1:50,000	Superficial Aquifer Designation	Bryn Aggregates Ltd, Gelliargwellt Farm, Gelligaer Road, Hengoed, CF82 8FY



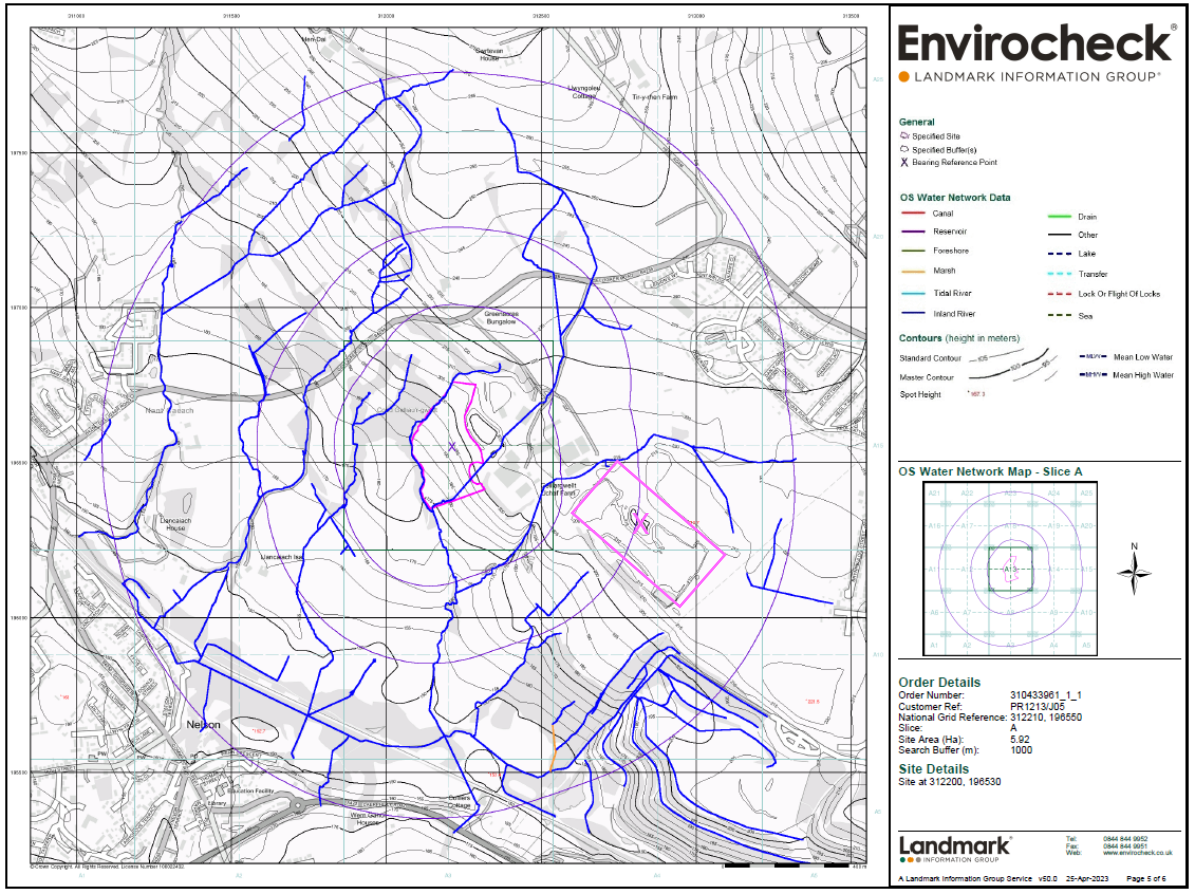
Drawing	Scale	Title	Site Name
ESSD-11	1:50,000	Source Protection Zones	Bryn Aggregates Ltd, Gelliargwellt Farm, Gelligaer Road, Hengoed, CF82 8FY



Drawing	Scale	Title	Site Name
ESSD-12	1:50,000	Groundwater Vulnerability	Bryn Aggregates Ltd, Gelliargwellt Farm, Gelligaer Road, Hengoed, CF82 8FY



Drawing	Scale	Title	Site Name
ESSD-13	1:10,000	Local Hydrology	Bryn Aggregates Ltd, Gelliargwellt Farm, Gelligaer Road, Hengoed, CF82 8FY



9.0 CONCLUSION

Bryn Aggregates propose to recover 705,900m^3 or 1,129,440 tonnes (using a conversion of 1.6 tonnes per m^3) of inert waste materials to restore the quarry in line with Condition 18 of Bryn Aggregates' planning permission (reference 12/0570/FULL) for the operation of the quarry. The area of development has been of agricultural or furze and rough pasture nature for as long as maps have been in existence for the area and any pollution incidents that have occurred in the area have been either some distance from the site or downslope of the site.

The geology of the area is Grovesend Formation which is classified by Natural Resources Wales as a Secondary-A Aquifer. The majority of the site has no superficial aquifer designation. However, the northern portion of the site, where the Peat deposits are, is designated as Unproductive Strata which has no productive value. The accompanying Hydrogeological Risk Assessment identifies the potential pollutant pathways for leachates generated from the proposed inert waste recovery. However, this assessment concludes that the proposed restoration works is not believed to have the potential to give rise to significant discharges of hazardous and non-hazardous substances, and therefore the perceived risk to water environment is considered Low.

The plans in the Section 9 above show the pre and post fill contours as well as the pre and post fill cross sections. Due to the volume of material is proposed to be recovered on site, a Slope Stability Risk Assessment has been carried out considering the basal subgrade, sideslope subgrade, waste mass and the capping system. This document accompanies this Environmental Setting and Site Design Report.

The use of specific inert general fill waste, and soil waste negates the need for gas monitoring to be carried out throughout the lifetime of the permit. However, in the Hydrogeological Risk Assessment it is proposed that the current ground and surface water monitoring is to be continued, with monthly visits to allow the collections of water samples for water quality testing and to record water level, and flow velocities where possible, at the monitoring points across the site. The results of the slope stability risk assessment show satisfactory factors of safety at all stages of the remaining development. However, it is considered appropriate to undertake an annual topographical survey to identify areas of settlement or instability and a weekly visual inspection of the exposed subgrade, lining system, waste mass and capping systems for signs of settlement and instability during stages of construction, waste placement and capping. Additionally, dust monitoring will be carried out daily given the potential for dust emissions during the recovery of waste materials on site.