Environmental Statement Volume I:

Technical Assessments Part 2

Nant Llesg Surface Mine

Incorporating Land Remediation

miller argent

Environmental Statement: Volume I: Technical Assessments

Table of Contents

Nant Llesg Surface Mine

Incorporating Land Remediation

Chapter 11

Hydrology and Drainage

Nant Llesg Surface Mine

Incorporating Land Remediation

Environmental Statement

Chapter 11 - Hydrology and Drainage

miller argent

Table of Contents

Tables

11 Hydrology and Drainage

Chapter Summary

11.1 Various watercourses rise on the Nant Llesg site (the 'Site') and drain towards the River Rhymney, but these comprise a small proportion of the upper River Rhymney's overall catchment area. A series of manmade drainage ditches and ponds are present on and adjacent to the Site, comprising the surface elements of the Dowlais Free Drainage System (DFDS). The largest component of these surface water features is Rhaslas Pond, which is an artificial water body with water levels raised above local ground levels by manmade embankments.

11.2 The only nearby user of water adjacent to the Site is the existing Ffos-y-fran Land Reclamation Scheme (FLRS). Information provided by the Environment Agency Wales (EAW) - now Natural Resources Wales (NRW) - and local authorities (Caerphilly and Merthyr Tydfil County Borough Councils) indicate that there are very few abstractions from the ground or watercourses and discharges to watercourses in the vicinity of the proposed development. Overall surface water utilisation in the area is minimal.

11.3 Monitoring data indicate that, whilst a variety of broader water quality indicators are generally good around the Site, the water quality is impacted by the area's historic mining/industrial legacy, with elevated levels of iron and other metals being recorded. A key influence on water quality is the discharge of untreated minewater, which is particularly high in iron and manganese, into the River Rhymney from the Bute Level (a minewater drainage system). This discharge occurs towards the southern end of the Rhymney culvert at Pontlottyn, and is responsible for the current severe orange ochre staining of the river bed in this area.

11.4 In addition to chemical pollution, severe erosion problems are present along the Nant Bargod Rhymni above Fochriw. It is considered that the erosion of colliery spoil (alongside other sediment sources along the watercourse) is the source of the fine material transported downstream to Parc Cwm Darran Country Park, where this material is being deposited at the head of the lake and which has to be cleared from time to time. The soft unconsolidated material deposited underwater is considered a health and safety issue, and warning signs have been erected alongside the lake inlet.

11.5 The potential effects from the proposed '*Nant Llesg Surface Mine, Incorporating Land Remediation'* scheme have been identified, and suitable mitigation measures capable of reducing adverse effects identified.

11.6 The potential for effects during the various stages of the scheme has been assessed in detail, including the initial site preparation works, through the operational stage to the completion of coal extraction, the subsequent backfilling of the final void, and restoration of the surface landform, water bodies, soils and vegetation. At all stages the main potential effects identified were the potential for a reduction in the water quality of receptor watercourses, and the potential for increased rates of surface runoff from disturbed areas to have an impact on the magnitude and frequency of high flows and downstream flood risk.

11.7 The key mitigation measure identified was the need to manage water draining from the Site to ensure that water quality was not adversely impacted and additional runoff is captured, stored and released slowly at a rate matching the existing overall runoff rate. A Surface Water Management Plan (SWMP) has been prepared to demonstrate this (see Appendix MA/NL/ES/A11/001). The SWMP details how drainage from the Site would be managed, and explains how a series of water treatment areas (WTAs) would be incorporated to provide the water quality treatment and attenuate runoff. Downstream

water quality would therefore be protected, and there would be no increase in flood risk due to the installation of attenuation lagoons as part of the WTAs. In fact, flood risk would be slightly reduced for regular storm events (between the 1 in 1 year and 1 in 100 year + climate change), since the outflow from these attenuation facilities would actually be less than the baseline greenfield rates. This low rate is required for operational reasons to ensure appropriate settlement and treatment of the runoff to meet agreed water quality standards. In addition, during the operational period of the site, the routing of overflow from Rhaslas Pond during the largest flood events into the mine void would result in a reduction in flood risk posed to receptors along the Nant Carno compared to the current baseline.

11.8 A series of Method Statements would be followed to ensure works that could have adverse effects on the water environment follow current best environmental practice. These describe a means of undertaking the required site operations in a way that minimises or avoids actions that could have negative water environment effects.

11.9 Based on the proposed scheme with incorporated operational mitigation measures, the remaining effects are associated with the reduction in size of Rhaslas Pond and the incorporation of the pond into the Site's surface water management system during the operational phase. During this phase the upper reaches of several watercourses would be removed, although all of these watercourses would be reinstated during the restoration phase.

11.10 The scheme has two key and important positive effects on the surface water environment, which are as follows:

- Minor Significant Positive - Some of the underground manmade minewater drainage network would be interrupted by the void during the operational phase of the scheme; this would result in reduced minewater discharges entering the Bute Level. Subsurface drainage pathways would be reinstated during backfill to prevent unintended new flow-paths being created. However, since a large proportion of the remaining coal would have been removed (including the sulphur within it), it is considered that the acidity of groundwater would be reduced. Overall it is expected that the works would contribute to an improvement in downstream water quality in the River Rhymney, an important surface water receptor. The discharge is currently considered the second worst in unmitigated discharge in Wales by the Coal Authority. This is discussed in detail in the hydrogeology section (Chapter 10); and

- Moderate Significant Positive - Works to stabilise, retain and revegetate the eroding colliery spoil along the Nant Bargod Rhymni would result in reduced siltation of the lake at Parc Cwm Darran Country Park. These works would be carried out in the early stages of the scheme providing a rapid improvement in this area.

11.11 Overall, the predicted adverse effects are considered to be either minor or *'Not Significant'* in EIA terms. The key potential effects on surface water receptors have been identified as the potential to increase runoff rates into the watercourses draining the site, and reductions in the quality of water within these watercourses. However, these effects would be effectively mitigated through the use of appropriately designed WTAs, which would ensure that runoff rates and water quality are managed on-site. As runoff rates are being managed, the identified flood risk receptors would not be affected.

11.12 The remaining notable effects of the development on the water environment, such as the removal of small water bodies within the main operation site, and the alterations to Rhaslas Pond, are also considered to be minor *'not significant'* on account of the low sensitivity of these receptors. As mitigation, replacement features and a restored Rhaslas Pond would be constructed during the final restoration phase of the scheme.

11.13 An extensive surface water and groundwater monitoring scheme would be agreed with NRW, which is anticipated to incorporate existing stream monitoring locations. Appropriate consents for the discharge of treated water would be obtained, together with abstraction licences for dewatering of the excavation and dust suppression operations.

Introduction

11.14 This assessment has been prepared by AMEC Environment and Infrastructure UK Ltd ('AMEC'). The scope of this assessment covers the potential effects of the proposed development on hydrology i.e. surface water features in and around the Nant Llesg Surface Mine Incorporating Land Remediation site (the 'Site'). Surface water is assessed in terms of the water quality, water quantity, flood risk, and hydromorphology of the water bodies present in and around the Site i.e. watercourses, ponds, wetlands and reservoirs. The existing baseline is established, potential surface water receptors are identified, and the potential effects of the proposed development are then assessed. Where required, suitable mitigation measures are identified and outlined in this chapter. This chapter should be read in conjunction with the Surface Water Management Plan (SWMP), included in Appendix MA/NL/ES/A11/001. It should be noted that this hydrology chapter focuses on surface water; the Hydrogeology chapter (Chapter 10) covers potential effects on groundwater.

Technical Context

11.15 Surface coal mining by its nature requires the excavation of a void and the construction of an overburden mound. The creation of a void and interception of groundwater may entail the need for dewatering, and the treatment of this water to ensure it is of sufficient quality to be suitable for release into local watercourses.

11.16 The excavation of a void and the creation of an overburden mound, alongside general site operations, may alter runoff rates. This is due to the removal of natural vegetation, and the presence of bare soils/excavated rock, and steeper slopes on the edges of the overburden mound. Drainage pathways may be disrupted where the void or overburden storage areas interrupt natural flow-paths. Runoff from the Site therefore needs to be managed in terms of quantity to ensure that local water bodies are not impacted and flood risk is not increased, and in terms of quality to ensure that local water bodies are not polluted.

11.17 There remains a legacy of abandoned mine shafts, adits and spoil heaps around Nant Llesg, due to the long history of coal mining in the area. As part of the development it is proposed to seal the shafts and adits on site, and undertake some surface stabilisation works on the unstable spoil located to the north of Fochriw.

11.18 A broad range of hydrological effects can be associated with developments such as that proposed at Nant Llesg. The following potential effects are included within the scope of this assessment:

- Disruption of natural drainage routes;
- Increases in runoff rates;
- Increased sediment loadings in runoff;

- Alterations to the Site's runoff regime causing flooding, pollution or contamination of surface water or groundwater resources; and

- Potential for accidental spillages of fuels, lubricants and other chemicals.

11.19 The surface water features within the Site are perched above the groundwater level within the hillside, and are fed by direct precipitation and the slow release of water stored in the soil. Groundwater monitoring data indicates that the groundwater level is over a hundred metres below the surface. For example, Rhaslas Pond is situated at 405m AOD, and the groundwater level below this pond varies between 260 to 300m AOD. Fine surface sediment acts as an aquitard limiting the rate of infiltration into the bedrock. Dewatering of the void would not therefore influence these features. In terms of the potential for effects associated with dewatering of groundwater on larger watercourses (i.e. the River Rhymney), these are considered within the Hydrogeology Chapter 10.

11.20 The effects on hydrology can potentially extend beyond any surface mine site to also affect the surface water bodies at the local and regional scale (.e. streams, rivers, ponds, lakes and wetlands. Where historical mining has taken place, there is also the potential for surface waters to already be contaminated with elevated concentrations of certain metals, such as iron and manganese, via groundwater issuing from old workings or runoff from old areas of spoil. The disturbance of the rock strata by mining operations, and its temporary storage in overburden mounds, also has the potential to increase the contamination risk from metals. Therefore, dewatered groundwater and runoff from the Site would need to be treated before it can be discharged to surface water bodies.

11.21 A glossary of terms is provided at the end of this chapter.

Methodology

Study Area

11.22 The red line boundary on Drawing MA/NL/ES/11/001 shows the extent of the Nant Llesg Surface Mine Incorporating Land Remediation planning application boundary. The baseline assessment covers the area itself and the potential surface water receptors in the surrounding adjacent area.

11.23 This section sets out how the existing surface water environment has been assessed, and how the final surface water receptors have been selected. The assessment has focussed on existing watercourses and water bodies (Tables 11.5 and 11.6 respectively) on and adjacent to the site, and these have been appraised in terms of water quantity (Table 11.7), quality, existing users of the water resource (Table 11.8), and hydromorphology (Table 11.9). Adjacent areas of existing development that could be affected by increased runoff rates (water quantity) are identified separately as potential flood risk receptors. The identified surface water receptors are listed in Table 11.10.

11.24 The Site occupies high ground approximately 1.5 km to the west-south-west of Rhymney Town Centre, and mainly comprises common land forming part of the Gelligaer and Merthyr Common (CL38) at levels between 300 m and 450 m above Ordnance Datum (mAOD). It is bounded to the north by Nant Carno and the A465 'Heads of the Valleys' Road, to the east by the A469 and the Heads of the Valleys Industrial Estate, to the south by common land, and then the settlements of Pontlottyn and Fochriw, and to the west by the Blaencarno to Cwmbargoed Road.

11.25 The general area of land within and to the east and south of the Site is exposed land above the tree line. It is crossed by power lines, and the course of a disused railway. No public roads are present within the main operational Site, although several roads are present around the Site's southern boundary. A few track-ways are present on Site, mostly around Rhaslas Pond. Other evidence of previous mineral working and industrial activity exists in the form of a number of surface colliery spoil and iron foundry slag tips, and areas of existing partial reclamation.

11.26 The majority of the Site is currently Open Upland in character, with an easterly aspect i.e. overlooking Rhymney. The landscape is typical of the higher hills around the Heads of the Valleys coalfield area, being both treeless and exposed. The land to the north of the Site has a northerly aspect, overlooking the Nant Carno and down to the Nant Carno valley bottom, and consists of enclosed fields and improved grassland pasture over previously restored areas.

11.27 Most of the central part of the Site consists of a relatively flat plateau, with land dropping relatively sharply to the Site boundary: to the north down to the Nant Carno; to the east down to the Rhymney; in the south sharply towards Fochriw; and to the southwest sharply into the Nant Gyrawd catchment. Areas of particularly marshy ground are present to the south and east of Rhaslas Pond, and around the small headwater streams. To the west of the Site, the hilltop continues within the existing Ffos-y-fran Land Reclamation Scheme (FLRS) and Trecatti sites.

Data Gathering and Survey Work

11.28 Extensive knowledge of the Site has been gained from the considerable investigation work undertaken in the area by Miller Argent, and from the development of the existing surface coal and land remediation site to the west at FLRS. The investigations at Nant Llesg have included the acquisition and review of hydrogeological and hydrological data via site investigation, site walkover, and consultation with relevant organisations (such as Environment Agency Wales (EAW) (now Natural Resources Wales (NRW)) and Caerphilly County Borough Council, CCBC); and the subsequent factual and interpretative reporting of these findings is summarised in this ES chapter.

11.29 The other publicly available data and sources of information that have been collated and used in the assessment of hydrological effects are listed in Table 11.1. These complement the other sources of data that have been obtained for the hydrogeological assessment, details of which are given in Chapter 10.

Table 11.1 Hydrology – Public and Other Sources of Information

Topic	Source of Information
Climate	
Precipitation	Flood Estimation Handbook CD-Rom (Version 3) Miller-Argent rain gauge at the Cwmbargoed Disposal Point (CDP)
Evapotransipration	Evapotransipration – Met. Office MORECS data
Mapping	Ordnance Survey 1:25,000, Ordnance Survey 1:10,000, and OS Mastermap Data
Topography	Contour data (derived from site LIDAR survey commissioned by Miller-Argent)
Surface water Resources	OS Mapping Site walkover River Basin Management Plan – Severn River Basin District (EA, 2009)
Surface water Quality	River Basin Management Plan – Severn River Basin District (Environment Agency (EA), 2009) NRW – local water quality monitoring Miller Argent – surface water quality monitoring data
Surface water Abstractions and Discharge Consents	CCBC - properties with private water supply Merthyr Tydfil County Borough Council, MTCBC – properties with private water supply. NRW – abstraction licence and discharge consent records
Other Environmental Information	N/A

11.30 In support of this assessment, the following baseline surveys were undertaken:

- Water quality monitoring: Miller-Argent has ongoing monitoring associated with the FLRS operation (between April 2004 and present). The two sampling points on the River Rhymney (upstream of Rhymney and at Pontlottyn), and the sampling point below the CDP on the Nant Gyrawd monitoring, are relevant to the Nant Llesg baseline. These locations are shown on Drawing MA/NL/ES/11/001;

- New monitoring has been carried out monthly since November 2011 at Rhaslas Pond, and on the following streams: the Nant Carno, Nant Llesg, Capital Valley and Nant Bargod Rhymni. These locations are shown on Drawing MA/NL/ES/11/001;

- AMEC site walkover of 6 November 2011. This covered the Nant Llesg planning application site, including all watercourses, Rhaslas Pond, and the partially infilled (with inert landfill) railway cutting. Outside the site, Blaen Carno and various locations along the River Rhymney between Llechryd and Pontlottyn were viewed. The Nant Bargod Rhymni at Fochriw, and the Nant Bargod Rhymni and lake at Cwm Darran Country Park, were also viewed. Photographs are provided in Appendix MA/NL/ES/A11/002 (see Plates 1 to 25 and 37);

- AMEC site walkover of 2 May 2012. The Nant Bargod Rhymni was walked between Tunnel Road and Fochriw, including the areas of eroding spoil within the site between Fochriw and Gelli-Gaer pond. Photographs are provided in Appendix MA/NL/ES/A11/002 (see Plates 26 to 36);

- AMEC site visit of 14 September 2011. The existing FLRS operations and CDP were viewed. Photographs are provided in Appendix MA/NL/ES/A11/002 (see Plates 38 to 41); and

- Locations of photos are shown on Drawing MA/NL/ES/11/010.

Technical Methodologies and Standards Used

11.31 The assessment has taken the approach of collating baseline information from the sources outlined in the Data Gathering section and Table 11.1 to identify potential hydrological receptors to the development. A Scoping Request and two Scoping Reports ('*Nant Llesg Surface Mine, Including Land Remediation'*, Miller Argent, 2011 and 2012) were produced to detail the proposed scheme, the second document providing updated information based on the evolution of the development proposals. The documents were submitted to CCBC as requests for formal scoping opinions at key points during the design process, and were forwarded on by CCBC for consultation with statutory consultees. The responses of consultees, as appended to the formal scoping opinions, have been used to tailor the scope of the assessment. Where required, further technical consultations have been undertaken with individual technical specialisms in the EAW and CCBC to identify required supporting information.

11.32 This assessment has been undertaken in accordance with the flood risk guidance provided in the Welsh Assembly Government (WG) Technical Advice Note 15 (TAN15) 'Development and Flood Risk' document. The EAW document 'Guidance on Surface Water Run-off (Wales only)' (EAW, 2011) has been used to inform the SWMP.

11.33 In preparing the SWMP (Appendix MA/NL/ES/A11/001), standard runoff estimation techniques have been used based on hydrological/meteorological data contained on the Flood Estimation Handbook (FEH) CD-ROM (Centre for Ecology and Hydrology (CEH), 2007). These are set out in the SWMP document.

11.34 The assessment has adhered to the requirements set out in various planning policies and environmental regulations. Details of these are provided in the 'Baseline Environment' section (para 11.42 - 11.118).

Consultations Undertaken and Agreed Methodology

11.35 Technical consultation on hydrology has been conducted with the EAW (now NRW) and CCBC and, additionally MTCBC. Meetings were held with the EAW to discuss the

hydrological issues associated with the proposed development on the 4 November 2011 and 3 July 2012. Hydrological data requests were also made to these organisations.

11.36 Furthermore, scoping reports were submitted to CCBC in June 2011 and January 2012, which included details of the proposed approach to be taken with respect to hydrology. The CCBC consultation responses dated 26 August 2011, 9 March 2012 and 23 August 2012 largely confirmed the proposed scope.

11.37 In its consultation responses, EAW made comment on a number of issues; these are detailed in Table 11.2.

Table 11.2 Summary of Key Points identified in Scoping Opinion

Matter Raised	Comment
The assessment should give consideration to all known abstractions within or near to the site boundary of the proposed development; EAW provided details of existing licensed abstractions (surface water) in the vicinity and advised that unlicensed (e.g. private water) abstractions may also exist in the area that would need to be considered.	Data obtained from EAW on all licenced abstractions. Data requested and obtained from MTCBC and CCBC for private water abstractions. The potential for impacts has been assessed.
A SWMP would be required to demonstrate how runoff would be managed. This should include details of Water Treatment Areas (WTAs) required to attenuate flows and provide the required water quality treatment. The effects on receiving surface watercourses should be considered.	A SWMP has been prepared. See Appendix MA/NL/ES/A11/001
The management of Rhaslas Pond should be considered in the ES.	Implications for Rhaslas Pond during the development, and subsequent restoration of the pond, have been considered.
The foul water disposal methods for the associated offices should be detailed.	Foul water disposal provision has been considered.
Details of watercourse diversions should be included. Where possible, 'soft' engineering methods should be used in preference to hard engineering.	No diversions are proposed. Some sections of the upper headwaters would be lost for the duration of the development. Details of the reinstatement of these headwater streams are provided.
Flood Risk – the Site is in WG TAN15 Flood Zone A, defined as: "little or no risk of flooding".	Agreed with the EAW that a Flood Consequence Assessment (FCA) is not required. A SWMP has been prepared (see Appendix MA/NL/ES/A11/001).

Matter Raised	Comment
There are no Main River (MR) watercourses on or adjacent to the Site, although there are multiple Ordinary Watercourses (OW). Flood Defence Consents (FDCs) would be required for the erection of any culvert, dam, weir or obstruction on or across these watercourses.	The necessary FDCs would be obtained for new structures on or in the watercourses.
The impact of the development alongside existing operations at FLRS and CDP should be considered in the assessment.	A cumulative impact assessment is included in this chapter
The development would need to comply with Environmental Permitting Regulations, such as discharges from the WTAs. Consideration of permitting requirements for the scheme should be included in the ES.	Permitting requirements have been considered. Appropriate discharge consents would be obtained for the four WTAs.

11.38 A subsequent meeting was held with the EAW on 3 November 2011 to discuss hydrology issues at the Nant Llesg site. The EAW confirmed that a Flood Consequence Assessment (FCA) was not required on account of the Site's location in TAN15 Flood Zone A. During this meeting the final scope of the SWMP and hydrological assessment was confirmed.

11.39 Based on the consultations undertaken and the feedback received, the methodology outlined in the Technical Methodologies section is considered suitable for this assessment.

Potential Significant Effects

11.40 Whether an effect resulting from the development is significant or not is primarily determined by the sensitivity (or value) of a given receptor and the magnitude of the change acting upon it. In terms of hydrology, the key areas in which changes could occur are water resources (quantity and quality), flood risk and hydromorphology.

11.41 The sensitivity of hydrological receptors is normally related to the relative importance of the surface water-related feature that might be at risk from effects. For example, a mountainside stream with a small catchment area, and poor habitat due to past mining activities, may be considered to be of local 'Low' importance, whereas a larger river which is used for water supply may be considered of regional 'Medium' importance. More detail on the assessment methodology is provided later in the 'Environmental Assessment: Assessment of Effects' section of this chapter.

Baseline Environment

Planning Context

National Policy

11.42 Minerals Planning Policy Wales (MPPW) sets out the broad strategy for mineral extraction in Wales, but it contains limited guidance with regards to the potential impacts on hydrology.

11.43 More detailed WG guidance on coal extraction is set out in Minerals Technical Advice Note 2 (MTAN2): 'Coal', which was issued in January 2009 (the overall principles of this guidance are discussed in Chapter 19). Paragraphs 201 to 223 set out the key issues with regards to the water environment. The relevant aspects with regards to hydrology (surface water) are as follows:

- *The Water Framework Directive (WFD) is the key legislation for the protection of inland surface water bodies. The relevant River Basin Management Plan (RBMP) is the principal mechanism through which the WFD is implemented for any particular River Basin District (RBD);*

- *Under the Water Act (2003), abstraction licences will be required for dewatering and the transfer of water between sources;*

- *Potential impacts are a planning issue and need to be assessed to identify any required monitoring and mitigation;*

- *With regards to hydrology, the following impacts may occur:*

    1. *Alteration to the surface topography over which water flows;*

    2. *Change to the surface water flow pattern;*

    3. *Alteration to the quantity and quality of water flows;*

    4. *Change in water infiltration recharging the aquifer, either by quality or rate of recharge;*

    5. *De-watering of existing workings or diversion of watercourses which may reduce groundwater levels, change the supply of water to abstraction points or springs, or cause subsidence of ground surfaces;*

    6. *Alterations to discharges from workings causing flooding, pollution or contamination of surface or groundwater sources;*

    7. *Discharges from slurry lagoons or other treatments at coal preparation plants.*

- *The need to assess flood risk is reiterated. Surface water should be prevented from entering the excavation;*

- *With regards to the ES, the environmental baseline should consider the immediate area around the Site, and in neighbouring surface water catchments where impacts may occur. The baseline studies should assess: surface water quality, vulnerable surface water receptors, and rainfall/evaporation/transpiration. Confidence limits*

should be established. A cohesive, robust conceptual understanding of the Site and immediate area's hydrology should be produced;

- *The Site should be assessed before development, during operations and following restoration. In particular, modelling and assessment should predict changes to baseline levels, flows and qualities of surface water. The potential area of influence of operation and vulnerable features should be identified;*

- *Risks should be evaluated taking into account confidence in the data, sensitivity to specific factors, and the robustness of the assessment approach. The surface water monitoring undertaken at, and in the vicinity of the Site, should be appropriate to the risks identified, particularly in terms of water quality and quantity sensitive features of the surface water environment. Key trigger values should be included in the monitoring; and*

- *The ES will need to demonstrate proposals to control polluted drainage at source and to treat, manage and monitor emissions at the surface during operations and post closure. Lagoons are typically required to meet the conditions required within discharge consents. Such treatment will enable full settlement of the mine water and allow precipitation of pollutants, for example metals, which are bound to particulate material. The areas, which must be of sufficient size, the locations, and potential impacts of lagoons and their sediments, are a land-use consideration. Lagoons will also be regulated to meet the Mining Waste Directive.*

11.44 The key document with regards to flood risk is the WG TAN15 'Development and Flood Risk'. This sets out the WG's approach to managing the potential impacts of development on flood risk across Wales. The key components of TAN15 are as follows:

- Development advice maps are provided indicating the level of flood risk across Wales, with land being designated as flood zone A, B or C1 and C2 (see terminology section for definitions);

- Ensuring the type of development or land use is appropriate to the level of flood risk within each flood zone;

- Justifying the location of built development – ensuring that only appropriate development occurs within a flood zone; and

- Guidance is also given on assessing flooding consequences, on managing surface water run-off from new development and climate change. For sites where Flood Consequence Assessments (FCAs) are required, detailed guidance is provided.

Local Policy

11.45 With regards to hydrology, the Policy CW5 (Protection of the Water Environment) of the CCBC Local Development Plan (LDP) is the key local policy relevant to the Nant Llesg scheme. This policy states the following:

- *"Development proposals will only be permitted where:*

  - *they do not have an unacceptable adverse impact upon the water environment; and*

  - *Where they would not pose an unacceptable risk to the quality of controlled waters (including groundwater and surface water)."*

11.46 The policy details the need to assess the impacts of climate change, and the impacts on water resources (quantity/quality) and the associated impacts on the wider environment. Avoiding impacts on the River Rhymney is noted as a particular issue.

Regulatory and Policy Context

The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003

11.47 The EU Water Framework Directive (WFD, Directive 2000/60/EC) came into force on 22 December 2000 and established a comprehensive legal framework for the protection, improvement and sustainable use of all water bodies across Europe. The remit of the WFD extends to all rivers, canals, estuaries, wetlands, coastal waters and groundwater.

11.48 The WFD was transposed into English and Welsh Law through the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003, the River Basin Districts Surface Water and Groundwater Classification (Water Framework Directive) (England and Wales) Direction 2010 and The River Basins Typology, Standards and Groundwater Threshold Values (Water Framework Directive) (England and Wales) Directions 2009. The core objectives include preventing deterioration in the status of water bodies and, where possible, restoring surface waters and groundwater damaged by pollution, water abstraction, dams and engineering activities to 'Good Status' by 2015. However, the regulations recognise that, in some cases, achievement of Good Status by 2015 would be technically infeasible or disproportionately costly, so later deadlines can be justified where appropriate.

11.49 In order to meet these objectives, the WFD and subsequent Regulations introduced a process known as 'River Basin Management Planning' to protect, monitor and improve the water environment in a sustainable way. The Regulations now name NRW as the competent authority for managing both the planning and regulatory frameworks.

River Basin Management Planning

11.50 A central principle of the WFD is that comprehensive RBMPs are prepared for each member state to set out how the water environment within each RBD would be managed over a succession of planning cycles. The first RBMPs would cover the period from 2009 to 2015, and subsequent plans will be published every six years thereafter.

11.51 The catchments of the Rivers Rhymney and Taff fall within the Severn RBD. The EA produced a RBMP for the Severn in December 2009, which contains an assessment of the current condition of all water bodies within the district, sets out the environmental objectives for the current river basin planning cycle and beyond, and specifies the programme of measures required to meet these objectives. The Severn RBMP is sub-divided into smaller catchment groups, the Site being situated in the South East Valleys sub-district.

Environmental Permitting (England and Wales) Regulations 2010

11.52 The Environmental Permitting (England and Wales) Regulations 2010 provide the framework for the consenting of all activities that have the potential to impact the water environment, including the following:

- Discharges to all controlled waters (replacing the parts of the Water Resources Act 1991 that relate to the regulation of discharges to controlled waters);

- Disposal to land (replacing the Groundwater Regulations 1998); and
- The Regulations may also in due course be extended to cover abstractions and impoundments. Consultation on this is ongoing (EA, 2012a).

Flood and Water Management Act (2010)

11.53 The Flood and Water Management Act (2010) *"aims to provide better, more sustainable management of flood risk for people, homes and businesses"* across England and Wales. The Act details the specific flood risk management roles of organisations, and includes requirements for increased co-operation between relevant authorities.

Reservoirs Act (1975)

11.54 The Reservoirs Act (1975) places particular obligations on the owners of reservoirs to ensure they are maintained in good order. In particular, a panel engineer (a specialist in reservoir engineering) must be appointed to supervise and inspect the reservoir, with inspections required every ten years or sooner if supervision identifies the need for an inspection. Changes to the original 1975 Act have recently been consulted on, as a result of recommendations contained in the Flood and Water Management Act (2010), to take a more risk based-approach. Depending on the final form of these changes, the existing regulations applicable to Rhaslas Pond (already a designated Reservoir) may be enhanced. However, Rhaslas Pond is already above the current threshold (25,000m^3) that defines a reservoir, and it is likely that designation will remain even if the lower threshold in the Flood and Water Management Act 2010 is brought into force. There is no other water body on site that could be designated a reservoir, even if the threshold was to be lowered.

Best Practice Guidance

11.55 A range of best practice guidance is of relevance to this assessment. The EAW produce Pollution Prevention Guidelines (PPGs) for a range of activities which outline measures that should be taken by those managing the environmental effects of those activities. The PPGs provide a basis for the assessment of effects on surface water, and include information relating to the design of surface water treatment systems. The key documents relevant to the water aspects of the proposed development include the following:

- PPG1: 'General Guide to the Prevention of Water Pollution';
- PPG2: 'Above Ground Oil Storage Tanks';
- PPG3: 'Use and design of oil separators in surface water drainage systems';
- PPG4: 'Treatment and disposal of sewage where no foul sewer is available';
- PPG5: 'Works In, Near or Liable to Affect Watercourses';
- PPG6: 'Working at Construction and Demolition Sites';
- PPG7: 'Refuelling Facilities';
- PPG8: 'Safe Storage and Disposal';
- PPG13: Vehicle washing and cleaning';
- PPG21: 'Pollution Incident Planning Response';

- PPG22: 'Incident Response - dealing with spills'; and
- PPG 26: 'Drums and intermediate bulk containers'.

WFD Setting

11.56 The Nant Llesg site falls within the RBMP surface water body known as: "Rhymney R - source to confluence with Nant Bargod Rhymni" (GB109057033130), and a summary of the WFD status designation is given in Table 11.3. This water body currently has moderate ecological status due to the reduced health of the River Rhymney's fish stocks, although the confidence of this classification was stated as uncertain (on the basis of data available in 2009 when the RMBP was produced). Additional monitoring has been collected between 2009 and the present (as reported in Appendix MA/NL/ES/A11/003). The water body is designated as both a Freshwater Fish Directive protected area and a Drinking Water Protected Area. The WFD Ecological Objective is for this water body to achieve good ecological status by 2015.

Table 11.3 Summary Information from the River Basin Management Plan

WFD Criteria	Information Relevant to Nant Llesg Site
Water Body ID	GB109057033130
Water Body Name	Rhymney R - source to conf Nant Bargod Rhymni
River Basin District Name	Severn
Catchment Name	South East Valleys
Current Overall Status	Moderate
Ecological Status	Moderate
Ecological Certainty	Uncertain
Chemical Status	Not required
Chemical Status Certainty	Not required
Overall Objective	Good Status by 2015
Ecological Objective	Good Ecological Status by 2015
Chemical Objective	Not required
Site of Special Scientific Interest (SSSI) (Non-Natura 2000)	No
Hydromorphological Designation	Not Designated A/HMWB

WFD Criteria	Information Relevant to Nant Llesg Site
Protected Area	Yes
Drinking Water Protected Area	Yes
Freshwater Fish Directive	Yes
Biological Elements - Fish- Current	Moderate
Biological Elements - Fish- 2015	Good
Supporting Conditions - Hydrology- Current	Not High
Supporting Conditions - Hydrology- 2015	Not High

11.57 Under the WFD, Environmental Quality Standards have been set for the concentrations of specific chemicals in surface waters. These standards are generally set by the individual member states (in the UK by UKTAG[1]), with the European Commission setting values for Hazardous Substances. For other substances where the WFD sets no value, this ES has used EQS values are based on the scientific literature. Some EQSs are hardness-dependent, and therefore different values apply to different water bodies. The EQS values relevant to this assessment, and their basis, are set out alongside monitored values in Appendix MA/NL/ES/A11/003.

[1] United Kingdom Technical Advisory Group for the WFD (see: http://www.wfduk.org/)

Existing Surface Water Baseline

Receptors

11.58 In order to set out the relevant surface water receptors at the site, this section (paragraphs 11.58 to 11.118) initially details the baseline meteorology and hydrology at Nant Llesg. Potential receptors are set out, and the assessment details whether or not the proposed development could impact on each potential receptor. For a receptor to be affected by the development there needs to be a pathway between actions at the site and the receptor. Selected receptors, i.e. those for which there is potential for site operations to cause changes in the properties of the receptor, are taken forward for further assessment (paragraphs 11.119 and 11.120 and Table 11.10).

Climate

11.59 Precipitation data have been collected at the CDP and Twynyrodyn between 2005 and 2011, and the recorded annual totals are shown in Table 11.4. The data indicate that total daily precipitation of 40 to 70mm is typical for the periods of heaviest rainfall, although on two occasions daily totals have exceeded this, reaching 150mm on 08/01/05 and 250mm on 18/07/07. Analysis of Met Office records confirms that the UK experienced severe flooding on both of these dates, with daily totals of approximately 100mm being recorded even at more central/eastern lowland UK locations. These daily totals are therefore considered correct.

11.60 In terms of annual totals, there is a good match between the data at the two gauges for the years 2005 to 2007 and 2010 to 2011, although less so in 2009. The difference is considered to relate to two factors. Rainfall at Twynyrodyn is greater due to its situation 3.5km to the west of the CDP, with Twynyrodyn receiving more rainfall due to the orographic effect of the steep eastern valley side rising above Merthyr Tydfil up to the CDP. Conversely, the CDP rainfall data are affected by the strong wind speeds experienced on the top of the hill.

11.61 The FEH CD-Rom was checked to determine key meteorological catchment characteristics for the upper Nant Llesg watercourse, which covers the centre of the Nant Llesg site. The average rainfall is given as 1507mm for the period 1961 to 1990, which is in line with measured totals at the CDP and Twynyrodyn. The median annual maximum one-day rainfall total (a measure of heavy rainfall) is given as 53mm, which is also in line with the wettest daily rainfall totals recorded at the CDP.

Table 11.4 Annual Rainfall Totals at the CDP and Twynyrodyn

Year	Total Annual Precipitation (mm)	
	CDP (	**Twynyrodyn**
2005	1340	**
2006	1560	1865
2007	1620	1774
2008	*	1920
2009	1210	1784
2010	990	1024
2011	1010	1189
	** only 410mm recorded due to fault with raingauge for several months* *** data collection started in mid-April 2005, 1051mm recorded for rest of year*	

11.62 Examination of Met Office Rainfall and Evaporation Calculation System (MORECS) summary data in CEH's annual hydrological review reports (CEH, 2009) indicates typical potential/actual evapotranspiration for the area of around 550 to 600mm. Based on a comparison of rainfall and MORECS data, this indicates that typically just over a third of total annual precipitation is lost as evapotranspiration.

Geology, Soils and Runoff

11.63 The geology of the Site consists of the Lower and Middle Coal Measures strata that comprise alternating mudstones, siltstones and sandstones, with intermittent coal seams and ironstone units. A superficial covering of various materials, such as gravels, clays, sand and made ground, as well as areas of opencast backfill in areas worked for coal in the past, is present. Further details are provided in the Geology and Hydrogeology Chapters.

11.64 The Soil Survey of England and Wales 1:250 000 South West England - Sheet 5 (1983) indicates that soils at the Site are either 'cambic stagnohumic gley soils' (Wilcocks 1 association) or disturbed ground (i.e. former mine workings). The Wilcocks 1 soils are described as *"slowly permeable seasonally waterlogged loamy upland soils with a peaty surface horizon. Coarse loamy soils affected by groundwater in places"*. The soils at Nant Llesg are therefore regarded as being poorly draining, and prone to waterlogging. Further details on soils are given in the Agricultural Land Use and Soils section (Chapter 9).

11.65 The FEH CD-Rom was checked to determine key hydrological catchment characteristics for the upper Nant Llesg watercourse, which covers the centre of the Nant Llesg site. The Standard Percentage Runoff (SPR) value was found to be 0.45 i.e. on average around 45% of rainfall runs straight into watercourses. The Baseflow Index value was found to be 0.30 i.e. typically 70% of the total flow results from rapid flow generation processes such as surface runoff and transmission through the soil zone, with the remaining 30% occurring as 'baseflow' derived from slow and gradual groundwater seepage into the watercourse.

The proportion of time that soils are wet (PROPWET) value is given as 0.54, indicating that for over half the year soil moisture deficits (SMD) are limited, meaning that soils readily generate runoff. Water removed from the void by dewatering operations would be discharged to a receiving watercourse in the Rhymney catchment after passing through a WTA. Dewatering would therefore result in no loss of water from the Rhymney catchment.

11.66 Overall these indicators indicate shallow, easily waterlogged soils, prone to producing rapid surface water runoff.

Surface Water Receptors: Watercourses

11.67 The main Nant Llesg Site lies within the River Rhymney catchment, although the CDP drains to the Nant Gyrawd catchment, a tributary of the River Taff (see Drawing MA/NL/ES/11/002). The Nant Llesg site does not drain directly to the River Rhymney, but via several tributaries, namely the Nant Carno, Nant Llesg, and Pontlottyn tributaries, and also the Nant Bargod Rhymni. The Rivers Rhymney and Taff discharge to the Bristol Channel to the east and in the centre of Cardiff respectively. All of these watercourses are potential receptors that could be affected by operations associated with the Scheme.

11.68 Historically, a large proportion of surface water has been collected and routed via a system of ponds and leats as part of the manmade Dowlais Free Drainage System (DFDS). Currently the leats are largely non-functioning (blocked by road and track crossings, vegetation and dumped material), and surface water largely follows the natural topography towards the headwaters of various tributaries.

11.69 The natural hydrology of the Site is generally that of an upland catchment. Various watercourses rise on the edges of the upper plateau, and radiate outwards into the adjacent valleys to the north, east and south. In areas of former mining activity or subsequent restoration, and in developed areas along the valley bottoms, the watercourses have generally been modified in recent centuries.

11.70 Detailed descriptions of the potential receptors (watercourses and catchments) associated with the site are detailed in Table 11.5 and on Drawings MA/NL/ES/11/002 and MA/NL/ES/11/003.

11.71 Photographs of the receptor watercourses are provided in Appendix MA/NL/ES/A11/002, to give an indication of their typical characteristics.

11.72 Overall, the receptor watercourses are typical upland streams as found across the South Wales Valleys, although at Nant Llesg the majority of the watercourses have been impacted by past mining and industrial activity. In places, some relatively natural headwaters in boggy hilltop areas and/or sections running on top of bedrock remain (Appendix MA/NL/ES/A11/002 Plates 3, 6, 7 and 11). However, in other areas such as the watercourse draining Rhaslas Pond to the Nant Carno, the channel is heavily modified and reinforced with gabions (Appendix MA/NL/ES/A11/002 Plates 2 and 9). The Nant Bargod Rhymni between Tunnel Road and Fochriw has eroded large quantities of the adjacent mining spoil, causing downstream sedimentation problems (Appendix MA/NL/ES/A11/002 Plates 26 to 35). Whilst none of these watercourses are identified as key biodiversity features (in terms of nature designations), they would nonetheless support the existing local biodiversity.

11.73 No historic flow data are available for the watercourses detailed in Table 11.5. However, the Table sets out estimated flows based on site visit observations and estimates made using the Revitalised Flood Hydrograph (ReFH) and FEH flood estimation software.

11.74 The receptor watercourses draining the hill top area of the site are likely to be extremely responsive to rainfall, on account of the shallow, boggy soils, and steep slopes to the valley bottom. During drier periods, due to the limited baseflow from the shallow mountaintop soils and the small catchments, these streams are likely to reduce to a trickle or dry up entirely.

11.75 In comparison, the Rivers Rhymney and Taff exhibit a less extreme variation between highest and lowest flows, on account of their larger catchment areas and higher baseflows from groundwater inputs, and in the case of the Taff, regulated releases from the multiple reservoirs in the headwaters. Particularly in the case of the River Rhymney, a flashy response to rainfall events would still be expected on top of these baseflows, associated with the steep valley sides and limited flow attenuation by reservoirs.

Table 11.5 Descriptions of Existing Receptor Watercourses at the Site

Catchment	Sub-catchment	Description	Catchment Area	Observed Discharge During Site Visit (Q)	Peak Discharge During the 1% AEP (1 in 100 year) Flood Event (Q)
River Rhymney Receptor Ref: SWC1 Ref on Drawing MA/NL/ES/ 11/003: A	N/A	Rises on the south slopes of Cefn yr Ystrad (617m AOD), at an elevation of 500m AOD, 4km north of the A465, before flowing southwards through Rhymni. The river drops to 300m AOD at the B4257 north, before dropping to around ~270mAOD downstream of Rhymney. The watercourse is culverted in two places adjacent to CVIE[1]. The Nant Carno, Nant Llesg and Pontlottyn tributaries (detailed below) join this watercourse. Iron-rich mine water from the lower levels of the DFDS beneath the Nant Llesg site enter the longer downstream culvert, causing the orange iron ochre staining within the river to the south of the culvert outlet.	Upstream of B4257 bridge: 10.7km^2. Downstream of Rhymney culvert: 21.8km^2.	Site visit 06/10/11, Q downstream of Rhymney culvert estimated as: ~ 2.5m^3/s.	Downstream of Rhymney culvert ReFH peak flows: Upstream: 50% AEP: 20 m^3/s 1% AEP: 54 m^3/s Downstream: 50% AEP: 24 m^3/s 1% AEP: 67 m^3/s

Catchment	Sub-catchment	Description	Catchment Area	Observed Discharge During Site Visit (Q)	Peak Discharge During the 1% AEP (1 in 100 year) Flood Event (Q)
Nant Carno Receptor Ref: SWC2 Ref on Drawing MA/NL/ES/ 11/003: B	Nant Carno North	Catchment primarily located to the north of the A465 (various culverts convey flows under this road). Significant historical water management features in this area. Watercourses are otherwise relatively natural (banks/bed), with the addition of some leats. Some streams impacted by historical tipping. Majority of flows routed via the Bute Town Pond. The stream flows eastwards, and is culverted under the A469 before joining the River Rhymney, just upstream of the B4257 above Rhymni.	4.64km^2	Site visit 06/10/11, Q at the Rhaslas/Trecatti watercourse confluence with the Nant Carno estimated as: ~ 0.5m^3/s.	Rhaslas/Trecatti watercourse confluence with the Nant Carno ReFH peak flows: 50% AEP: 3 m^3/s 1% AEP: 9 m^3/s

Catchment	Sub-catchment	Description	Catchment Area	Observed Discharge During Site Visit (Q)	Peak Discharge During the 1% AEP (1 in 100 year) Flood Event (Q)
	Rhaslas and Trecatti *Fig 1.3 ref: C*	System of largely artificial watercourses on recently restored areas of formerly derelict mine/iron works (some un-restored tips remain in the far north). Typically concrete or gabion lined channels, with various hard engineering erosion measures (check dams etc). Two culverts convey flows from the Trecatti area under the minor road. In the south of the sub-catchment any overflow from Rhaslas Pond flows northwards through a length of natural channel/marshy area before entering the engineered channel. Some leats that formerly fed Rhaslas Pond are present to the west of the pond, although these are now truncated by the adjacent road at Twn y Waun and/or partially infilled by tipping/track crossings.	1.64km^2		
	Nant Carno South	No major surface watercourses (some minor field boundary ditches). Area of formerly derelict mine workings, recently restored. Surface water flows downslope into the main Nant Carno Stream.	0.32km^2		

Catchment	Sub-catchment	Description	Catchment Area	Observed Discharge During Site Visit (Q)	Peak Discharge During the 1% AEP (1 in 100 year) Flood Event (Q)
	North of HVIE[2]	Small area of land including some industrial units. CCBC records show a culvert draining this area, which joins the main Nant Carno outlet to the River Rhymney.	0.04km^2		
Nant Llesg/Capital Valley Receptor Ref: SWC3	West of HVIE	Small area of land. Served by culvert taking flows east to the River Rhymney.	0.03km^2	Site Visit 06/10/11, Q on the Nant Llesg at confluence with the River Rhymney estimated as: ~ 0.25m^3/s.	Nant Llesg at confluence with the River Rhymney ReFH peak flows: 50% AEP: 2 m^3/s 1% AEP: 6 m^3/s
	HVIE North	Industrial estate piped drainage. Drainage system routing unclear, presumed to the Nant Llesg stream immediately to the south.	0.13km^2		

Catchment	Sub-catchment	Description	Catchment Area	Observed Discharge During Site Visit (Q)	Peak Discharge During the 1% AEP (1 in 100 year) Flood Event (Q)
	Nant Llesg *Fig 1.3 ref: D*	Several minor tributaries rising within marshy areas on the hill top. Large sections incised into historical mine spoil (significant quantities of loose material mobilised). To the eastern edge various artificial catch drains are present, intercepting all flows before they reach the Heads of Valleys Industrial Estate. Culverts convey these channels under the HVIE access road before discharging into a small watercourse located in a ravine. This watercourse is then culverted under the A469 before discharging into the River Rhymney.	1.34km^2		
	HVIE South	Industrial Estate piped drainage. Drainage system routing unclear, presumed to the Nant Llesg stream immediately to the north.	0.12km^2		
	West of CVIE	Small hillside springs, with some leats capturing flows. Artificial catch drain along western edge of HVIE/A469 captures these flows; a culvert then conveys this east under the A469, before discharging into the River Rhymney just downstream of the main Rhymni culvert outlet.	0.61km^2	Site Visit 06/10/11, Q above culvert to the River Rhymney estimated as: ~ 0.25m^3/s.	

Catchment	Sub-catchment	Description	Catchment Area	Observed Discharge During Site Visit (Q)	Peak Discharge During the 1% AEP (1 in 100 year) Flood Event (Q)
Pontlottyn tributaries Receptor Ref: SWC4 Ref on Drawing MA/NL/ES/ 11/003: E	N/A	Small hillside springs, with some leats capturing flows. Captured into a culvert which runs down to discharge into the River Rhymney near the B4257 bridge.	0.53km^2	Site Visit 06/10/11 –a trickle in upper catchment, lower sections not viewable (culverts /development).	

Catchment	Sub-catchment	Description	Catchment Area	Observed Discharge During Site Visit (Q)	Peak Discharge During the 1% AEP (1 in 100 year) Flood Event (Q)
Nant Bargod Rhymni Receptor Ref: SWC5 Ref on Drawing MA/NL/ES/ 11/003: G	N/A	Stream rising within the boggy area to the south of Rhaslas Pond. Culverted beneath Tunnel Road before flowing south and passing through a culvert under the former railway embankment. The channel then passes through a large area of historic mine tipping, before flowing through Fochriw village (culvert under main road here). The main channel then flows southwards towards Parc Cwm Darran. In the upper catchment, some isolated leats are present, which no longer convey flow elsewhere. In the southwest portion of the catchment there is a significant area of partially restored mine workings, with multiple channels eroding into the loose tipped material. These are transporting a large load of sediment into the main watercourse, which is conveyed and deposited 3km downstream within the lake at Parc Cwm Darran.	1.76km^2	Site Visit 06/10/11, Q above culvert at Tunnel Road estimated as: ~ 0.1m^3/s. At Fochriw: ~0.5m^3/s.	ReFH peak flows at Fochriw: 50% AEP: 3 m^3/s 1% AEP: 9 m^3/s

Catchment	Sub-catchment	Description	Catchment Area	Observed Discharge During Site Visit (Q)	Peak Discharge During the 1% AEP (1 in 100 year) Flood Event (Q)
Nant Gyrawd Receptor Ref: SWC6 Ref on Drawing MA/NL/ES/ 11/003: I	N/A	Tributary of the River Taff. North of the Bogey road this hillside area is drained southwards by several ditches which collect flows and route them southwest-wards. There is a dense network of leats and several ponds (part of the DFDS[3]) present here, although these are now largely truncated by the road to the east, and the FLRS overburden mound to the west. The watercourse then passes through a culvert under the Bogey Road, and the existing FLRS overburden mound access track and the railway line before entering the natural (bed/bank) Nant Gyrawd. Surface water within the existing CDP (coal processing/loading) area passes through a series of treatment ponds before draining via culverts under the rail line into the Nant Gyrawd.	0.84km^2	Not viewed during site visit.	At confluence with Bargod Taf. ReFH peak flows: 50% AEP: 2 m^3/s 1% AEP: 6 m^3/s
[1] CVIE - Capital Valley Industrial Estate; [2] HVIE – Head of Valleys Industrial Estate; [3] DFDS – Dowlais Free Drainage System					

Surface Water Receptors - Reservoirs, Ponds and Pools

11.76 In addition to watercourse receptors there are various ponds, pools and a reservoir on and adjacent to the Site which are potential receptors. These are detailed in Table 11.6 and shown on Drawing MA/NL/ES/11/003.

11.77 Seventeen potential receptor features have been identified, including the following:

- One reservoir – Rhaslas Pond - (defined as a water body that is impounded by raised embankments, 'J' on Drawing MA/NL/ES/11/003);
- Multiple medium sized ponds, also mostly formed by embankments, although too small to be classified as reservoirs, also exist e.g. Q, R, S, V and W on Drawing MA/NL/ES/11/003;
- Multiple pools, defined as shallow features which may dry up during summer months, are also present e.g. K, L, M, N, O and P on Drawing MA/NL/ES/11/003; and
- There are also existing treatment ponds for the CDP (T on Drawing MA/NL/ES/11/003), and a pond near Trecatti (U on Drawing MA/NL/ES/11/003).

11.78 Within the main Site, the key receptor water body is Rhaslas Pond on account of its large size and designation under the Reservoirs Act 1975. Although located off-site, the pond above Pontlottyn (R on Drawing MA/NL/ES/11/003), Bute Town pond (W on Drawing MA/NL/ES/11/003) and the four ponds north of the CDP (V on Drawing MA/NL/ES/11/003) are included on account of their proximity to the Site. The pond above Fochriw (Q on Drawing MA/NL/ES/11/003) is outside of, but immediately adjacent to, the Site boundary (adjacent to land included for restoration), and its outflows pass through the proposed remediation area.

11.79 Detailed descriptions of these water body receptors associated with the Nant Llesg Surface Mine Site are provided in Table 11.6 and on Drawing MA/NL/ES/11/002 and MA/NL/ES/11/003.

11.80 Photographs of some of the water bodies are provided in Appendix MA/NL/ES/A11/002, to give an indication of their typical characteristics.

11.81 The majority of the water bodies at or adjacent to the Site are artificial, having been constructed historically (as part of historic mining activities), by means of impoundment to support past mining and industrial activities. Rhaslas Pond is particularly notable on account of it being a designated reservoir due to the volume of the impoundment. Of the remaining water bodies, the majority appear to be ponds associated with voids left by small scale mining or in areas of historical spoil mounds. Only Gelligaer Pond (P on Drawing MA/NL/ES/11/003) and a small ephemeral pond (O on Drawing MA/NL/ES/11/003) appear as natural features which are common on poorly drained upland areas across the hilltops of the South Wales Valleys. Whilst none of these water bodies have specific nature conservation designations, they form part of the available habitats within the local area. More detail is provided in the Ecology and Nature Conservation section (Chapter 8).

Table 11.6 Existing Water bodies at the Nant Llesg Surface Mine Site

Water body Name	Description		Size (Ha)
On site water bodies			
Rhaslas Pond Receptor Ref: SWB1 Ref on Drawing MA/NL/ES/11/003: J	Large reservoir (capacity 210,000m^3) in the centre of the Site, formed by two east-west running earth-fill embankments on the north and south side (both around 450m long). Maximum water depth of around 4m, embankments rising around 4.1m above the natural ground level (2m above the water level). Small catchment area limited to around 0.1km^2 to the east, and 0.3km^2 to the west. Larger historic catchment area (~1km^2) via the leat system to west now mostly cut off. Former storage reservoir for the DFDS (around 150 years old). Outlets (spillway and valve house) to the north. Designated reservoir under the Reservoirs Act (1975) as a 'Category C' – *"Negligible risk to life and limited property damage"*. Some amenity use (fishing, general amenity). Some dumping of tyres/rubble observed during site visit in October 2011.		11.51
Small ponds near Rhaslas Pond Receptor Ref: SWB2 Ref on Drawing MA/NL/ES/11/003: K, L, M, N, O	Small pool west of Rhaslas	Small pool in rocky alcove – surface water accumulation in small mining excavation. Likely ephemeral.	0.02
	Two small pools to southwest of Rhaslas	Surface water accumulation west of trackway/relict of historic mining. Likely ephemeral.	0.05 (each)
	Two small pools northwest of Rhaslas	Surface water accumulations in hollows within spoil tipping. Likely ephemeral.	
	Small pool east of Rhaslas	Surface water filled void from past mining. Likely ephemeral.	0.01
	Hill top pool	Small shallow pool in marshy area (natural). Likely ephemeral.	0.01
Gelli-Gaer Pond Receptor Ref: SWB3 Ref on Drawing MA/NL/ES/11/003: P	Shallow pond within marshy area on the summit plateau (natural).		0.10
Pond above Fochriw Receptor Ref: SWB Ref on Drawing MA/NL/ES/11/003: Q	Catch pond/water storage for historic mining.		1.40

Water body Name	Description		Size (Ha)
Pond above Pontlottyn Receptor Ref: SWB5 Ref on Drawing MA/NL/ES/11/003: R	Catch pond/water storage for historic mining.		0.34
Pond west of HVIE Receptor Ref: SWB6 Ref on Drawing MA/NL/ES/11/003: S	Catch pond/water storage for historic mining.		0.04
Cwmbargoed Disposal Point (CDP) Receptor Ref: SWB7 Ref on Drawing MA/NL/ES/11/003: T	Various surface water management pits – for water quality treatment and flow attenuation.		Total: 0.42
Off-Site, Adjacent Water bodies			
Small pond northeast of Trecatti Receptor Ref: SWB8 Ref on Drawing MA/NL/ES/11/003: U	Part of the drainage system serving the restored slopes of Trecatti.		0.16
Ponds north of the CDP Receptor Ref: SWB9 Ref on Drawing MA/NL/ES/11/003: V	CBD1	Now dry. Evidence of historic mining water storage pond. Ephemeral.	0.25
	CBD2	Evidence of historic mining water storage pond.	0.43
	CBD3	Evidence of historic mining water storage pond.	0.07
	CBD4	Evidence of historic mining water storage pond.	0.15
Bute Town Pond Receptor Ref: SWB10 Ref on Drawing MA/NL/ES/11/003: W	Large catch pond/water storage for historic mining activities. Designated reservoir. Environment Agency breach modelling considers Bute Town Pond as well as Rhaslas Pond. Discharges to Nant Carno (River Rhymney).		6.05

Surface Water Quality

11.82 Water quality sampling points are shown on Drawing MA/NL/ES/11/001. Water Quality data are tabulated in Appendix MA/NL/ES/A11/003, referenced to the surface water receptor to which the data relate. The Table references preceded with 'A11' are located in Appendix A11.

11.83 Various water quality monitoring datasets are available for the water bodies detailed above. The EAW carries out monitoring along the River Rhymney, Nant Bargod Rhymni, and the Nant Gyrawd (surface water receptors SWC1, SWC5 and SWC6 respectively); the available data are detailed in Tables A11/003.1 and A11/003.2 (see Appendix A11/003). Table A11/003.1 sets out chemistry (dissolved oxygen, BOD and ammonia), biology (macro-invertebrate diversity), nitrates and phosphate GQA classification data, whilst Table A11/003.2 sets out the results of detailed analysis of various metals, chloride and pH. WFD status data are also available for these three watercourses, and are detailed in Table A11/003.3 (see Appendix MA/NL/ES/A11/003).

11.84 Miller Argent currently carries out water quality monitoring in connection with the existing FLRS. The water quality data relevant to the proposed development of the Site are set out in Table A11/003.4 (see Appendix MA/NL/ES/A11/003), covering receptors SWC1 and SWC6. Data are available between 2004 and present. This table sets out the recorded levels of various metals, anions (chloride and sulphate), PAHs, BOD, COD, TOC and pH.

11.85 Miller Argent has been undertaking water quality monitoring in support of the Nant Llesg surface mine since November 2011. Data for Rhaslas Pond (receptor ref: SWB1) are shown in Table A11/003.5 (see Appendix MA/NL/ES/A11/003). Data for various watercourses draining Nant Llesg (SWC2, SWC3, SWC4 and SWC5) are shown in Table A11/003.6 (see Appendix MA/NL/ES/A11/003). Data are set out in two separate tables since Rhaslas Pond, being predominantly rainwater fed, has significantly lower hardness levels compared to the watercourses; hardness levels influence the Maximum Allowable Concentration (MAC) of certain determinands (chromium, copper, lead, nickel and zinc). These tables set out the recorded levels of various metals, anions (chloride and sulphate), PAHs, BOD, COD, TOC and pH.

11.86 Data collection by Miller Argent is ongoing and would continue throughout the lifetime of the Nant Llesg site.

11.87 The EAW GQA data (Table A11/003.1) indicates that upstream of Rhymney, receptor SWC1 (the River Rhymney), the Nant Bargod Rhymni (SWC5) and the Nant Bargod Taf (as measured just upstream of the confluence with SWC6) downstream of the Site are relatively high-quality watercourses in terms of biology, chemistry, nitrates and phosphates, with all these water bodies being in either the top or second to top band for these four parameters. Downstream of Rhymney, the classification for the River Rhymney (SWC1) drops in terms of biology and chemistry (typically by one grade), whilst scores remain very low for nitrates, and actually improve, from 'low' to 'very low' for phosphates. Based on known influences on water quality in the settlement of Rhymney, this is interpreted as largely being the result of minewater discharges from the Bute Level which conveys flows from the DFDS into the River Rhymney.

11.88 The EAW WFD classifications (Table A11/003.3) indicate that for the River Rhymney (SWC1), Nant Bargod Rhymni (SWC5) and Nant Bargod Taf (which includes SWC6), classifications for all but one parameter are all relatively high, indicating good quality watercourses. Macrophytes, invertebrates, phosphate, DO, pH, ammonia, WFD Annex 8 substances, morphology and hydrology are all consistently classified as 'Good' or 'High' (although this classification is for the whole watercourse length, hiding the effects of the severe physical modification to the watercourse associated with the Rhymney culvert). The only low scoring parameter for all three watercourses is Fish, which is indicated as 'Poor', this suggests that the fish present in these watercourses compare poorly with what would be expected in a typical un-impacted reference reach. Poor channel structure, siltation from sediment inputs from adjacent

land use, in-channel obstructions (i.e. weirs) and poor water quality are the most common reasons for poor fish scores.

11.89 pH values are within normal ranges for all watercourses/bodies monitored (Tables A11/003.2, A11/003.4, A11/003.5 and A11/003.6), average values typically being between 7.6 and 7.9 for most sites. The average pH in the lower River Rhymney (SWC1) is pH 7.4 at Pontlottyn – this is notably lower than in the upper River Rhymney and the other watercourses monitored. This is interpreted as being an impact of the minewater discharge from the Bute Level/DFDS. In addition, the average pH in Rhaslas Pond (SWB1) is notably lower (pH ~7.4), on account of it being mainly rainwater-fed.

11.90 The detailed water quality data for metals and anions (Tables A11/003.2, A11/003.4, A11/003.5 and A11/003.6) are not considered untypical for an upland catchment, especially one with a history of iron and coal mining. Typically, recorded levels of most determinands for SWC1 to SWC6 and SWB1 are relatively low, with the detected levels being below the Maximum Allowable Concentration (MAC) (whether this is based on the 95 percentile value or the annual average (AA)). This is the case for arsenic, cadmium, chromium and nickel, and also for chloride and sulphates. Detected levels of aluminium, copper, lead and zinc occasionally exceed the MAC. Detected levels of iron and manganese frequently exceed the MAC value.

11.91 Whilst detected copper levels are below the appropriate MAC for all monitored watercourses (SWC1 to SWC6), the MAC for Rhaslas Pond (SWB1) is lower on account of the pond's lower hardness. This means that despite copper concentrations still being relatively low; the appropriate copper MAC for Rhaslas Pond (Table A11/003.5) is exceeded.

11.92 The water quality data presented in these tables for metals/anions clearly show the impact of historic mining activities, with elevated levels of iron, manganese and sulphate in particular. There is a particularly marked increase in concentrations on the River Rhymney (SWC1) at Pontlottyn, downstream of the Bute Level/DFDS discharge. This corresponds to the Bute Level discharge being ranked as the second worst unmitigated minewater outflow in Wales by the Coal Authority.

11.93 The detailed water quality data for Biological Oxygen Demand, Chemical Oxygen Demand, Total Organic Carbon (BOD, COD and TOC respectively) in Tables A11/003.2, A11/003.4, A11/003.5 and A11/003.6) are considered generally typical for an upland catchment (i.e. receptors SWC1 to SWC6 and SWB1), with levels generally being low. Recorded BOD and COD levels (i.e. oxygen demand) are particularly low. Occasional spikes in TOC levels exceed 8mg/l in some of the monitored watercourses.

11.94 TOC levels are notably higher in the River Rhymney (SWC1), and on the Nant Gyrawd (SWC6). Inspection of the raw data indicates that the highest levels were found between 2004 and 2009, with a declining trend between 2009 and present. Since FLRS the groundwork started in June 2007, and high levels of some determinands occurred before this time - this strongly suggests that these measured values represent the natural background variation for this location. In addition, whilst some drainage from FLRS and all drainage from the CDP drain to the Nant Gyrawd, no drainage is currently directed to the River Rhymney. The levels are therefore interpreted as largely representing background levels on account of geology and historical industrial/mining activities.

11.95 Detected levels of PAHs follow a similar pattern to TOC trends. Overall, detected levels (Tables A11/003.4, A11/003.5 and A11/003.6) for SWC1 to SWC6 and SWB1 are low. Occasional spikes have occurred intermittently since monitoring started in 2004, both before and after works started (June 2007) at FLRS, with no apparent trends. Again of note are spikes in concentration detected in the two River Rhymney (SWC1) monitoring points (both up and downstream of the Rhymney culvert). Given the high levels at the upstream monitoring point (upstream of the Bute Level/DFDS outflow), these are not associated specifically with the Bute Level. Surface drainage from the CDP and FLRS does not drain towards the River Rhymney,

and the below ground components of the DFDS drain to the west (rather than east to the Bute Level). The levels do not appear to be associated with the FLRS and CDP, and are therefore interpreted as largely representing background levels on account of geology and historical industrial/mining activities.

11.96 Overall, the available water quality monitoring provides a substantial baseline dataset, including for a period of time before the FLRS, and now before the proposed Nant Llesg scheme. Baseline data indicates that for a large range of determinands, the watercourses are of relatively high quality (i.e. pH, DO, Ammonia, BOD, COD, key heavy metals). Some notable elevated levels of iron, manganese and also PAHs are noted, but appear to be related to the area's overall background geology and history of mining and industry (since levels are similarly high across all sampling points). Whilst the WFD classifications for most biological elements are good, fish are notable for being classified as 'Poor', this again appears to be related to in-channel barriers and degradation of the physical habitat. Table 11.7 summarises the water quality data by receptor.

Table 11.7 Water Quality Summary by Receptor

Receptor Reference	Name	Details
SWC1	River Rhymney	Low WFD score for Fish. Pollution impacts from Bute Level discharge D/S of the Rhymney culvert outlet. Concentrations of all tested metals (except Al, Mn), anions, and pH acceptable. PAH concentrations exceed EQS. Occasional spikes in Cu, Fe, BOD, COD, and TOC values, but AA EQS not exceeded.
SWC2	Nant Carno	Concentrations of all tested metals, anions, BOD, TOC and pH acceptable. PAHs concentrations exceed EQS. Occasional spikes in Cu, COD values occasionally exceed EQS.
SWC3	Nant Llesg	Concentrations of all tested metals, anions, BOD, COD, TOC, pH and PAHs acceptable. Occasional spikes in Cu values, but AA EQS not exceeded.
SWC4	Pontlottyn	Concentrations of all tested metals (except Mn), anions, TOC and pH acceptable. Occasional spikes in Al, Fe, Pb, BOD and COD, values and PAHs concentrations, but AA EQS not exceeded.
SWC5	Nant Bargod Rhymni	Concentrations of all tested metals (except Mn), anions, BOD, COD, TOC, pH and PAHs acceptable. Occasional spikes in Cu, Pb, and COD values, but AA EQS not exceeded.
SWC6	Nant Gyrawd	Concentrations of all tested metals (except Mn), anions, BOD, COD, and pH acceptable. Occasional spikes in Al, Cu, Fe, COD, and TOC values and PAHs concentrations, but AA EQS not exceeded.
SWB1	Rhaslas Pond	Data indicates very low levels of tested substances. Concentrations of Cu, Pb and Zn whilst being low are considered to be high with reference to cyprinid fish due to

Receptor Reference	Name	Details
		the low hardness/pH of the water body. Cu exceeds EQS.
SWB2	Small ponds nr Rhaslas	No data, SWB1 considered representative.
SWB3	Gelli-Gaer Pond	No data, SWB1 considered representative.
SWB4	Historic mining water storage pond, nr Fochriw	No data, SWB1 considered representative.
SWB5	Historic mining water storage pond, nr Pontlottyn	No data, SWB1 considered representative.
SWB6	Historic mining water storage pond, nr HVIE	No data, SWB1 considered representative.
SWB7	CDP water treatment ponds	Treatment pond.
SWB8	Small pond nr Trecatti	No data.

Existing Abstraction and Discharge Licences

11.97 Details of existing abstractions and discharge consents were requested from the EAW and CCBC. The recorded consents within 2.5 km of the Site are shown in Table 11.8. For ease of receptor referencing, the seven abstractions and 17 discharges have been grouped into four sets of abstractions (AB1 to AB4) and five sets of discharges (DC1 to DC5), since commonly several licences occur at the same locations. Individual licence references are listed under these receptor references where available. The locations of these are shown on Drawing MA/NL/ES/11/004.

11.98 There are seven current licensed abstractions, three of which relate to existing operations at the FLRS (dust suppression, vehicle washing and coal washing), which Miller Argent operate and would continue to manage appropriately. The other four abstractions are located in Blaen Carno, further from the proposed Site, to the northeast on the opposite side of the Rhymney valley to the Site, upstream of where the current tributaries draining the Site join the River Rhymney. Two of these are private water supplies (PWS), and two are abstractions by Welsh Water for public water supply from reservoirs. All of these sources are located well upstream of the point where any tributary draining Nant Llesg joins with the River Rhymney, and there is therefore no pathway from the Site to these four abstractions. They are not therefore considered to be receptors for the purposes of this assessment.

11.99 For the reasons outlined above, the potential for effects on existing abstractions has been scoped out. Rhaslas Pond would be managed to provide sufficient water to allow the abstraction to continue, whilst the two existing abstraction licences within the FLRS would not be influenced by the proposed scheme as they are located in a separate catchment.

11.100 There are 17 consented discharges present. Six of these relate to operations at the FLRS, whilst a further three relate to existing drainage from the CDP. These drain to the Nant Gyrawd. Seven consents are associated with Welsh Water's Combined Sewer Overflow (CSO) discharges from sewers to the River Rhymney. The remaining discharge relates to a historic land reclamation scheme to a tributary of the River Taff.

11.101 In addition, data from the Coal Authority have indicated that the Bute Level typically discharges flows of between 0.05 m^3/s to 0.1 m^3/s into the River Rhymney, although peak flows may reach up to 0.9m^3/s. The discharge point is within the main Rhymney culvert.

11.102 In terms of discharge consents, the existing demands (in terms of dilution) placed on local watercourses appear limited, since the FLRS/CDP consents relate to the discharge of treated water to the Nant Gyrawd. Intermittent CSO discharges (due to storm events) occur from the public sewers in Rhymney to the River Rhymney, so this discharge is in a different catchment to the FLRS/CDP discharges. Although occasional, the CSO discharges would have a considerable impact on water quality when they occur, the effects of which are likely to last longer than the discharge event itself. Due to the fact that untreated sewage is temporarily discharged into the river, impacts from CSO discharges are likely to much more severe than those arising from the discharge of treated water from the FLRS/CDP.

11.103 The Nant Llesg operation would only discharge to tributaries of the River Rhymney, the FLRS only discharges to tributaries of the River Taff. Discharges from the CDP would continue to discharge to a tributary of the River Taff as at present. The area of the CDP site would not be increased, so a greater volume of runoff from rainfall would not result. The coal washing operation is intended to collect and recycle as much of the process water as feasible. Water draining out of washed coal would be directed towards the existing WTA. This water may be re-abstracted for re-use, or be treated and discharged off site. The operation would need to comply with the existing discharge consent, which would ensure that the WTA is operated in such a way that the quality of the treated discharge is not reduced. For this reason, no significant effects on the River Taff are expected, since the Nant Llesg site drains to the River Rhymney.

11.104 For the reasons outlined in paragraph 11.102, it is considered that there would not be an in-combination impact from the discharge of the future treated site runoff on the ability of the River Rhymney to accept the existing CSO discharges. For these reasons, the potential for effects on existing Discharge Consents has been scoped out from the assessment.

Table 11.8 Existing Abstraction and Discharge Consents

Location		Details
Abstractions		
Ref: ABS1	Rhaslas Pond (0.5km S of the proposed void centre)	1 x Miller-Argent water abstraction for existing operations at FLRS EA licence ref: WA/057/0022/002. Dust suppression.
Ref: ABS2	Existing FLRS site (2.8km WSW of the proposed void centre)	2 x Miller-Argent water abstractions for existing operations at FLRS EA licence ref: 21/57/22/0009. Mineral Washing.
Ref: ABS3	Blean Rhymney (2.3km NE of the proposed void centre)	Two abstraction points. Two small reservoirs in the headwaters of the River Rhymney upstream of the A465. Welsh Water abstractions for public water supply EA licence ref: 21/57/11/0001.
Ref: ABS4	Princetown / Llechryd (approx 2.2km NE of the proposed void centre)	Two PWSs serving isolated properties are recorded on CCBC's register.
Discharge Consents		
Ref: DC1	FLRS attenuation and treatment lagoons. Discharge to Nant Gyrawd. (2.5km SW of the proposed void centre)	6 discharge consents (EA refs: AN0264603, AN0274601, AN0265001, AN0265002, AN0264601, AN0264602, NPSWQD000674). Existing Miller-Argent consents for discharge of treated/attenuated runoff/dewatering from FLRS surface mine.
Ref: DC2	CDP. Discharge to Nant Gyrawd. (2.3km SSW of the proposed void centre)	3 discharge consents (EA refs: AN0054001, AE2013403, AE2013404). Existing Miller-Argent consents for discharge of treated/attenuated runoff from the CDP.

Location		Details
Ref: DC3	Rhymney and Pontlottyn. Discharges to River Rhymney. (various, between 1km E and 3km SE of the proposed void centre)	7 discharge consents (EA refs: AN0093901, AN0094201, AN0094101, AN0315701, AF3001301, AF3001302, AN0094001). CSO discharges from sewers to River Rhymney
Ref: DC4	Pengarnddu, Methyr Tydfil. Discharge to tributary of River Taff (2.3km WNW of the proposed void centre)	1 discharge consent (EA ref: AF4027901) Drainage from historic land restoration scheme.
Ref: DC5	Trecatti landfill site (1.4km west of the proposed void centre)	Discharge to tributary of River Taff. Treated leachate discharge to the foul sewer.

Flood Risk

11.105 Table 11.5 details the watercourses present on and around the Nant Llesg site, with Drawings MA/NL/ES/11/002 and MA/NL/ES/11/003 showing the various catchments. Appendix MA/NL/ES/A11/004 shows the following three figures:

- Figure A11/004.1 – an extract from the WG TAN15 Flood Map;
- Figure A11/004.2 - the EA online Flood Map (Rivers and Sea); and
- Figure A11/004.3 - the EA online Flood Map (Reservoirs).

11.106 The mapping in Figure A11/004.1 and Figure A11/004.2 indicates that the entire Nant Llesg site is located in the lowest flood risk zone i.e. TAN15 Flood Zone A “minimal risk of flooding”.

11.107 The mapping in Figure A11/004.3 indicates the areas that would be flooded in the unlikely event of reservoir impoundments being breached. Around Nant Llesg, the EA has assessed the potential inundation area in the exceptional circumstances that any one of the five impounded reservoirs in the upper River Rhymney were to fail or be overtopped: namely, the two Blaen Rhymney reservoirs, Rhaslas Pond, Jepson’s Pond or Bute Town Pond. These impoundments are subject to rigorous supervision inspections and enforcement of remedial action under the Reservoirs Act, 1975 to minimise the risk of such failure.

11.108 Downstream/downslope of the proposed Nant Llesg site are areas of existing development that may be at risk of flooding. This includes areas along the main River Rhymney, and shown as being within Flood Zone C (greater than 0.1% annual risk of fluvial flooding) in Figure A11/004.1, but also areas adjacent to small tributaries too small to have had their associated flood zones mapped, and direct surface water runoff running overland downslope towards existing development. Examination of local topography indicates three key areas that could be regarded as potential flood risk receptors from the proposed Nant Llesg development.

11.109 The following potential receptors have been identified:

- FR1a - Existing development within Blaen Carno/Rhymney/Pontlottyn;
- FR1b - Tunnel Road, and existing development in Fochriw; and
- FR1c - Isolated properties in the Nant Gyrawd/Nant Bargod Taf valley.

11.110 In summary, the mapping indicates that flood risk to the Site is minimal. Flood Mapping and examination of watercourse and topography mapping indicates that some areas of development downstream of the Site are currently at risk of flooding, and three potential flood risk receptors from the proposed development have been identified.

Hydromorphology

11.111 Table 11.5 details the watercourses present on and around the Nant Llesg site, with Drawing MA/NL/ES/11/003 showing the type of channel. Photographs of key watercourses can be found in Appendix MA/NL/ES/A11/002.

11.112 Under the WFD, hydromorphology is considered to be a supporting element for ecological status. Hydromorphology concerns the physical integrity of a watercourse and adjacent land, with reference to what would naturally be expected for a particular type of watercourse. For example, natural watercourses in the Welsh Valleys would typically be expected to have a channel bed comprised of either solid bedrock or partially mobile coarse material (boulders, cobbles and pebbles), with generally low river banks and narrow floodplain areas. Natural vegetation such as bog and woodland would be present next to the channel, and the planform would be expected to meander.

11.113 Within Appendix MA/NL/ES/A11/002, it can be seen that there has been significant modification to many of the watercourses considered in this assessment (this is well shown in Plates: 2 and 9). Plates 25 to 36 illustrate the severe instability, channel incision, erosion and sediment transport currently taking place in the area of historic mining spoil along the Nant Bargod Rhymni in the area located between South Tunnel Road and Fochriw. These plates clearly show the need for remediation to stabilise the slopes and watercourses in this area.

11.114 Plate 37 in Appendix MA/NL/ES/A11/002 shows some of the current impacts in Parc Cwm Darran Country Park, with sediment accumulating around the inlet to the lake, which has had to be removed from time to time. Warning signs are present detailing the health and safety issues associated with wading into the waters here, due to the soft sediment deposited on the bed. Communications (Pers Comms., 2012) with CCBC have confirmed that the local authority has historically undertaken and paid for dredging operations to remove and dispose of this sediment onto adjacent land. These works cost £120,000 in 2007, and further works are now required due to the build up of sediment at the lake inlet over the last 5 years.

11.115 Plates 9 to 12 show some of the watercourses within the eastern remediation area, where again erosion and instability issues can be seen.

11.116 Based on the site visit observations of watercourses (Appendix MA/NL/ES/A11/002), it can be seen that there has been considerable historical modifications to the majority of the watercourses present on and adjacent to the Nant Llesg site. These are summarised in Table 11.9, and supported by the photographic record presented in Appendix MA/NL/ES/A11/002.

Table 11.9 Nant Llesg Watercourse Hydromorphology

Watercourse Reference	Hydromorphology Summary	Level of Historical Hydro-morphological Impact*
River Rhymney Receptor ref: SWC1	Large lengths culverted through Rhymney, with hard engineered walls and historic mine spoil confining the river to a deep channel elsewhere in Rhymney. More natural sections up and downstream of the settlement of Rhymney.	Considerable
Nant Carno Receptor ref: SWC2	The watercourse draining Rhaslas Pond to the Nant Carno is highly modified, and has been reinforced and fixed along the majority of its length with gabions.	Considerable
Nant Llesg Receptor ref: SWC3	Some relatively natural headwater reaches on the main Nant Llesg site. In other places the watercourse is eroding into historic spoil material. Re-sectioned, concrete lined channels above Rhymney, and then culverted until its confluence with the River Rhymney.	Considerable
Pontlottyn tributaries Receptor ref: SWC4	Limited short upper natural headwater reaches on the main Nant Llesg site, with significant diversions through areas of past mining activity above Pontlottyn. Culverted from the outskirts of Pontlottyn until its confluence with the River Rhymney.	Considerable
Nant Bargod Rhymni Receptor ref: SWC5	Natural headwater reaches between Rhaslas and Tunnel Road. Between Tunnel Road and Fochriw, the watercourse and its tributaries pass through an extensive area of historic mining spoil, with significant erosion and entrainment of material occurring. Downstream of Fochriw at Parc Cwm Darran Country Park significant sedimentation results.	Considerable

Watercourse Reference	Hydromorphology Summary	Level of Historical Hydro-morphological Impact*
Nant Gyrawd Receptor ref: SWC6	Upper headwaters currently covered by a spoil mound associated with FLRS. Main channel appears relatively undisturbed within a narrow wooded valley.	Moderate
* Classification based on observations during the site walkover, as summarised in this table, and documented by the photographs in Appendix MA/NL/ES/A11/002.		

Nature Conservation Designations

11.117 With regards to the water environment, according to the Countryside Council for Wales, there are no statutory designated sites such as Sites of Special Interest (SSSI) or Special Areas of Conservation (SAC) within the proposed scheme boundary, or in the immediate vicinity, that would be directly affected. It is considered that there would not be any adverse indirect effects as there are no downstream designated sites associated with the inland water environment of the Taff and Rhymney. Reference should be made to Chapter 10 (Hydrogeology) for further information regarding groundwater dependent habitats, and to Chapter 8 (Ecology and Nature Conservation) for impact on terrestrial habitats.

11.118 The potential for adverse effects on the surface water elements of designated nature sites has therefore been considered and scoped out of this hydrology assessment. The impacts on terrestrial (and other) habitats is covered in the ecology section (Chapter 8).

Proposed Scope of Assessment

11.119 Key water features and potential hydrological receptors have been identified at the proposed Site and for a distance beyond the proposed site boundary as shown on Drawings MA/NL/ES/11/002 to MA/NL/ES/11/005. Based on the information identified, the different types of receptor can be summarised as follows (for definition of terms, refer back to earlier text):

- Local watercourses and water bodies, as defined in Tables 11.5 and 11.6 respectively – receptors in terms of water quantity, water quality and hydromorphology; and
- Existing development nearby – receptor in terms of flood risk.

11.120 The identified surface water receptors are listed in Table 11.10 below and presented on Drawing MA/NL/ES/11/005.

Table 11.10 Potential Hydrological Receptors

Receptor Reference	Type	Name	Approximate Location
SWC1	Surface Watercourse	River Rhymney	Adjacent to the site
SWC2	Surface Watercourse	Nant Carno	On/adjacent to the site
SWC3	Surface Watercourse	Nant Llesg/Capital Valley	On/adjacent to the site
SWC4	Surface Watercourse	Pontlottyn	On/adjacent to the site
SWC5	Surface Watercourse	Nant Bargod Rhymni	On/adjacent to the site
SWC6	Surface Watercourse	Nant Gyrawd	On/adjacent to the site
SWB1	Surface Water Body	Rhaslas Pond	On site
SWB2	Surface Water Body	Small ponds near Rhaslas	On site
SWB3	Surface Water Body	Gelli-Gaer Pond	On site
SWB4	Surface Water Body	Historic mining water storage pond, nr Fochriw	On site
SWB5	Surface Water Body	Historic mining water storage pond, nr Pontlottyn	On site
SWB6	Surface Water Body	Historic mining water storage pond, nr HVIE	On site
SWB7	Surface Water Body	CDP water treatment ponds	On site

Receptor Reference	Type	Name	Approximate Location
SWB8	Surface Water Body	Small pond near Trecatti	Adjacent to the site
FR1	Flood Risk	Flood risk on site and to downstream people and property	Adjacent to site

11.121 The MIS Landfill lies beneath the area proposed for overburden storage. This was a landfill site which was only permitted to receive inert wastes (inert waste being waste that would not undergo any significant biological, chemical or physical transformation). Sampling has indicated that the tipped wastes are not entirely inert, and includes some non-permitted wastes.

11.122 Sampling commissioned by Miller Argent has indicated some asbestos inclusions and particularly elevated levels of PAHs, copper, mercury, lead and sulphates. Notably alkaline and acidic samples were found, with pHs of 4.6 and 11.2 being identified (outside of the typical range of 6 to 9 for soils). Owing to the age of the older tipping area, some of the non inert elements of the waste appear to have degraded already. Further information can be found in Chapter 17 (Waste).

11.123 Given the nature of the material here, it is likely that some impact may have occurred on water quality historically, particularly when the un-degraded contaminated waste had been freshly placed in the landfill area. However, data do not exist to determine if this was the case, but the landfill certainly would have been a source of contamination, and the drainage of direct rainfall through the landfill means that a route exists to local water bodies. It is likely that some contamination continues to leave the landfill area, but, given the size of the landfill in comparison to the surface water catchment (upper Nant Bargoed Rhymni) and the groundwater body beneath, rapid dilution occurs. With regards to the future removal of the landfilled waste, with appropriate planning for waste removal activities, and a methodology (including pollution prevention measures) agreed with NRW, there is considered to be limited potential for contamination of local water resources by the landfilled wastes during removal. Waste excavation and sorting would take place within the existing MIS landfill area. The removal and appropriate disposal of the waste would be of long term benefit since a pollution source would have been removed.

Identified Data Deficiencies

11.124 Overall, the available data are considered to be suitable for a robust assessment to be carried out.

11.125 No historical flow data are available for the River Rhymney at Rhymney, or indeed the small hillside tributaries that rise on Site. The Site is set away from the River Rhymney, and flow data for this watercourse is not considered essential. The effect of future site runoff rates on the small watercourses on site is dealt with in the SWMP (see Appendix MA/NL/ES/A11/001).

11.126 Historical flow data for surface watercourses would improve the ability to determine if particular pollutants were linked to particular flow events i.e. high-flows, or prolonged dry periods. In

addition, at some water quality monitoring points (i.e. the River Rhymney locations) it is difficult to determine the source of all of the elevated pollutant levels, on account of the infrequent point measurements and the large and diverse upstream catchment. Increases in the concentrations of Al, Mn, Fe and PAHs are clearly associated with the inflow of the Bute Level to the River Rhymney culvert. However it is notable that concentrations of PAHs are already elevated upstream of the Bute Level, suggesting other upstream sources for this determinand in the upper Rhymney catchment.

Seasonal Temporal Change

11.127 Surface water discharges in watercourses and levels in water bodies as well as water quality conditions would vary, subject principally to changing weather conditions. Seasonally, watercourse discharges and water levels can be expected to be higher in the winter and lower in the summer, on the basis that effective precipitation (precipitation that causes runoff into watercourses/water bodies) would generally be far greater during the winter period.

11.128 Consequently, during the project lifetime, variations in surface water discharges and levels can be expected. The key issue would be the management of runoff and dewatering from the operational site. The WTAs would need to be designed to effectively treat and attenuate the required volumes of water at all times of the year, to the required return period. Further details are provided in the SWMP (see Appendix MA/NL/ES/A11/001).

Medium and Long-term Temporal Change

11.129 Current climate change predictions indicate that as a result of climate change, more extremes of weather are likely to be experienced, with floods and droughts becoming more frequent (Defra, 2012). Defra (2006) guidance requires a 10% allowance for increased rainfall intensity to be included in surface water runoff calculations for developments with a lifetime up to 2055. This is to ensure that more intense future rainfall is appropriately managed.

11.130 Without remediation works, the colliery spoil above Fochriw would continue to erode, and become increasingly unstable as the slopes are undercut, increasing sediment delivery rates to Cwm Darran.

Assessment Criteria and Assignment of Significance

Receptor Sensitivity or Value

11.131 The assessment methodology employed to evaluate the significance of potential effects of the proposed development on surface water takes into account the sensitivity (or importance) of potential receptors and the magnitude of change on the surface water receptors. Table 11.11 provides a summary of how the sensitivity or value of the various types of surface water receptors are assessed in terms of its size, its current quality, whether it is used for water supply, and whether it is subject to any statutory conservation designations.

Table 11.11: Summary of Sensitivity (or Value) of Surface Water Receptors

Sensitivity/ Value	Criteria	Examples
Very High	Receptor with a high quality and rarity at a regional or national scale, with a limited potential for substitution.	SSSI, SAC, Special Protection Area (SPA), Ramsar sites, where designation is based specifically on aquatic features
High	Receptor with a high quality at a sub-regional scale, with a limited potential for substitution.	Local-scale surface water bodies at High Status*, or those used for public water supply. Regional-scale surface water bodies at Good or High Status*, or those used for public water supply.
Medium	Receptor with a medium/poor quality at a sub-regional scale, with a limited potential for substitution.	Local-scale surface watercourses at Good Status* (and not used for public water supply, but may be used for PWS). Regional-scale surface watercourses at Moderate Status* or below (and not used for public water supply, but may be used for PWS).
Low	Receptor with a variable quality at a local scale, with potential for substitution	Local-scale water bodies at Moderate Status* or below (and not used for public or PWS)
*status refers to the water bodies WFD classification		

Magnitude of Change

11.132 The magnitude of change on surface water receptors is mainly determined by a qualitative evaluation based on professional judgement, and is independent of the sensitivity of the feature. Table 11.12 details the classification for magnitude of change used in this assessment, and provides examples of what sort of changes would be associated with each tier (graded from high through medium and low to negligible).

11.133 With respect to surface water quantity, the magnitude of any loss of surface water is primarily based on assessed changes to catchment areas as a result of changes in topography associated with preliminary works, void excavation, overburden and screening mound creation, restoration and aftercare. Changes in catchment characteristics (for example, steeper slopes associated with overburden mounds, disturbed/de-vegetated/compacted soils etc) would result in changes to runoff rates, and cause sediment to be entrained in runoff from the site. These changes need to be quantified and appropriate surface water management arrangements put in place.

11.134 In terms of surface water quality, the magnitude of change can be related to the water quality criteria relevant to each receptor, which would be the quality standards specified for use in RBMP water body status assessments (The River Basin Districts Typology, Standards and Groundwater threshold values (Water Framework Directive) (England and Wales) Directions, 2010), or any other relevant EQSs, such as those specified for the Freshwater Fisheries Directive.

Table 11.12: Examples of Hydrological Magnitude of Change

Magnitude	Criteria	Examples
High	Results in major change to a feature, i.e. of sufficient magnitude to affect its use/ integrity.	Major decline in surface water levels, discharge or quality, severely limiting use and lowering water body or wetland status.
Medium	Results in noticeable change to feature, i.e. of sufficient magnitude to affect its use/ integrity in some circumstances.	Moderate decline in surface water levels, discharge or quality, limiting use and lowering water body or wetland status in some circumstances.
Low	Results in minor change to feature, with insufficient magnitude to affect its use/ integrity in most circumstances.	Measurable decline in surface water levels, discharge or quality, but with limited consequences in terms of use and water body or wetland status.
Negligible	Results in little or no change to feature, with insufficient magnitude to affect its use/ integrity.	No measurable decline in surface water levels, discharge or quality, and no consequence in terms of use and water body or wetland status.

11.135 Impact magnitude should also take into account the impact duration, for which the following definitions are relevant in relation to surface water issues:

1. **Temporary - Short Term**: A period of months, up to one year;
2. **Temporary - Medium Term**: A period of more than one year, up to five years; and
3. **Temporary - Long Term**: A period of greater than five years.
4. **Permanent -** Extending beyond the life of the project.

Determination of Significance

11.136 The significance of potential effects (either *'significant' or 'not significant'*) is derived by considering both the sensitivity of the feature and the magnitude of change acting upon it, as summarised in Table 11.13.

Table 11.13: Significance Assessment Matrix

Sensitivity of Receptor	Magnitude of Change			
	High	**Medium**	**Low**	**Negligible**
Very High	Major Significant	Major Significant	Moderate Significant	Minor Significant
High	Major Significant	Moderate Significant	Moderate Significant	Minor Significant
Medium	Moderate Significant	Moderate Significant	Minor Significant	Not Significant
Low	Minor Significant	Minor Significant	Not Significant	Not Significant

11.137 There is no absolute guidance on the definitions of what degrees of change fall into each class of magnitude of change. A large range of classifications are used, but typical hydrological examples of the broad definitions of the terms used are as follows (note that effects can be adverse or beneficial):

1. **Significant**: Adverse major or moderate effects may include derogation of public water supplies in terms of quantity or quality, pollution of surface water bodies, irreversible damage or long term damage to surface water supported important ecological sites, derogation of private water supplies. Beneficial effects might include improvement of water quality in larger watercourses, or a reduction in flood risk; and

2. **Not Significant**: Adverse minor or not significant effects might include minor derogation of private water supplies (where an alternative is available), minor deterioration in local stream water quality, but remaining within requisite standards. Beneficial effects may include improvement in local water quality or watercourse morphology.

Mitigation Measures Adopted as Part of the Project

Overall Approach to Hydrological Mitigation

11.138 Surface water management during the main site operations would seek to minimise the effects on the surface and groundwater regime on the Site and within the vicinity of the Site. In practice, this means minimising the amount of surface water entering the void, and keeping existing surface water bodies separate from surface drainage systems associated with the operations on the Site. Water within the void can then be pumped out for appropriate treatment during dry periods, and runoff from spoil mounds and operational areas routed to settlement/treatment facilities. Water from these sources would then be released at attenuated rates following treatment, in accordance with a discharge consent, into surrounding surface watercourses. This approach would allow the potential for adverse effects on receptors to be minimised and for beneficial effects to be maximised.

11.139 During exceptional rainfall events which elevate local flood risk, the potential would remain to divert some of the flows from the future overburden mound and Rhaslas Pond into the operational void for temporary storage, since a large portion of the overburden mound would drain to Rhaslas, and the Rhaslas overspill weir provides a flow route into the void. This would provide some additional flood protection to adjacent developed areas. Miller Argent has previously undertaken similar operations at FLRS on the request of the EAW. The four proposed WTAs are situated at lower elevations compared to Rhaslas and the top edge of the void, and therefore at these points water cannot be diverted into the void.

11.140 Site operations would involve the use of heavy plant and machinery, and this would result in the need to store oils and diesel with the consequential risks of accidental spillages. The Site would therefore adopt best working practices and measures to protect the water environment against such spillages.

Development Phases and Incorporated Mitigation

11.141 This section assesses in detail the various phases associated with the Nant Llesg scheme in order to present the associated mitigation incorporated to manage potential effects. Details of each component of the scheme are provided in Table 11.14, alongside an explanation of the measures that would be incorporated to prevent or minimise any effect. Signposts are provided to the sections where proposed measures (beyond what is industry Good Practice) are detailed further. The following scheme components are considered:

a. Preliminary Site Establishment Operations;

b. Land Remediation Works;

c. Waste Tipping;

d. Surface Mining Operations - Dispositions (phases) 1 to 5, namely the following:

i. Initial Box cut (in site establishment) – Year 1 to 4;

ii. Up to Maximum Void – Year 4 to 6;

iii. Maximum Void to start of backfilling from overburden mound – Year 6 to 9.5;

iv. End of coaling – Year 9.5 to 11; and

v. Backfilling and Restoration – Year 11 to 14;

e. Operations at CDP;

f. Restoration of the land;

g. Decommissioning of CDP

h. Aftercare.

Table 11.14 Nant Llesg Scenarios Assessment

Scheme Component	Site Operation	Key Hydrological Implications	Additional Measures Required?	See Further (para ref)
A	1. Boundary fencing	None	No	-
	2. Construction of water treatment facilities	Limited. To be constructed to manage the quantities of water estimated in the SWMP. Method statements to be agreed with EAW. WTAs and catch drains constructed at the same time. Good construction practice to be followed. Permits required (discharge consents).	Yes	11.143 and 11.154

Scheme Component	Site Operation	Key Hydrological Implications	Additional Measures Required?	See Further (para ref)
	3. Reduction of Rhaslas Pond	Approximately half of the pond area would be infilled for the duration of the scheme. As the remaining pond would be used as a surface water management facility in support of site operations (attenuation of runoff, some settling and use of water for abstractions), the reservoir would be more intensively used than at present. Discharge from the pond would be partially re-routed, with a fixed flow southwards introduced to the Nant Bargod Rhymni rather than Nant Carno (both watercourses still drain to the River Rhymney), due to the excavation of the mine void at the location of the current northern drainage route. All flood flows in excess of the pond's attenuation capacity would, however, be routed north into the void. Further details are provided in the SWMP. Rhaslas Pond design arrangements would be undertaken and certified by a Reservoir Panel Engineer; a Panel Engineer would oversee all stages of operation.	Yes	11.156 to 11.159
	4. Construction of accommodation area	Surface water runoff to be routed to WTAs for treatment and attenuation. Foul water treatment arrangements to be provided. Good construction practice to be followed.	No	11.143, 11.145 and 11.160

Scheme Component	Site Operation	Key Hydrological Implications	Additional Measures Required?	See Further (para ref)
	5. Erection of on-site coal processing plants	Surface water runoff to be routed to WTAs for treatment and attenuation. Initial treatment of water from the barrel wash within the Nant Llesg site would occur adjacent to the wash, via a local settlement/treatment lagoon, with the partially treated water then being routed to WTA2 for final treatment. At the CDP, water from the product wash would be treated at the existing WTAs. Good construction practice to be followed.	No	11.145 to 11.153. 11.154 and SWMP (Appendix MA/NL/ES/ A11/001)
	6. Construction of internal roads, wash bays and weighbridge	Surface water runoff to be routed to WTAs for treatment and attenuation. Good construction practice to be followed.	No	11.145 to 11.154
	7. Preliminary soil stripping	Works to follow construction of WTAs and catch drains, silty runoff would be captured and treated before discharge off-site. Good construction practice to be followed.	No	11.145 and 11.154
	8. Construction of soil mounds/baffle embankments	Works to follow construction of WTAs and catch drains, silty runoff would be captured and treated (settlement in the WTAs) before discharge off-site. Suitable grading of slope material, and prompt seeding of slopes would facilitate rapid protection of slope surfaces. Good construction practice to be followed.	No (see B1,B 2 and B3 below)	11.142 and 11.154 11.143 SW MP (Appendix MA/NL/ES/ A11/001)

Scheme Component	Site Operation	Key Hydrological Implications	Additional Measures Required?	See Further (para ref)
B	1. Surface treatment of land adjoining the site to address instability associated with old mine shafts and adits	Potential for disturbance of soils/vegetation, and potentially production of silty runoff. Some works near watercourses.	Yes	11.145 and 11.154
	2. Surface treatment of land adjoining the site to address the scouring of old colliery tip material into watercourse feeding Cwm Darran Park Lake	Potential for disturbance of soils/vegetation, and potentially production of silty runoff. Works would be adjacent to the Nant Bargod Rhymni.	Yes	11.145 and 11.154
	3. General tidying up and surface treatment of areas closest to settlements	Limited potential for disturbance of soils/vegetation, and potentially production of silty runoff. Some works near watercourses. Works would though be small-scale and localised to key existing areas of erosion.	Yes	11.145 and 11.154
C	1. Assessment of MIS Landfill during the initial phase of site operations until such time as the land is required for overburden storage	MIS site would cease to operate; no further tipping is currently expected. Handling of materials as detailed in the waste chapter. This represents no change to baseline.	No	See Waste section (Chapter 17)

Scheme Component	Site Operation	Key Hydrological Implications	Additional Measures Required?	See Further (para ref)
	2. Investigation, sorting, treatment and removal of waste material in the northernmost section of the MIS Landfill	Potential for discovery of non-inert waste (with the potential to pollute watercourses). If such waste is discovered, procedures would be put in place to manage contamination at source i.e. construction of bunded area to contain any contaminated water within the landfill area. In addition, by the time that this phase of works is undertaken, the MIS site would be within the catchment of a WTA, and any contaminated runoff leaving the cutting area would therefore be captured and treated before release.	Yes	11.145 to 11.154, and see Waste section (Chapter 17)
	3. Investigation and removal of non-inert waste from the MIS Landfill as necessary	As above. For removal from site, sealed trucks should be used that would not allowed contaminated water to be released from in-transit non-inert waste. Waste to be taken to an appropriately licensed waste-disposal facility.	No	11.145 and 11.154
D	1. The phased process of excavation and storage of overburden to expose the coal	Surface water effects as per A.7 and A.8. Mitigated by the construction of WTAs and catch drains before excavation works commence.	No	11.143 and SWMP (Appendix MA/NL/ES/ A11/001)

Scheme Component	Site Operation	Key Hydrological Implications	Additional Measures Required?	See Further (para ref)
	2. The progressive extraction and processing of the coal for dispatch to market via the CDP	Extraction activities contained within void, limiting potential for effects on surface water. Controlled dewatering of void (when required) to WTA2 for treatment and release to Nant Llesg watercourse. Transport of coal from coal-stocking area adjacent to the void to CDP within covered, road wagons. Processing areas on the Nant Llesg site and at the CDP would be/are served by drainage systems that would route any runoff to WTAs. On the Nant Llesg site a barrel wash would wash the coal, re-using as much of the process water as possible. Used process water would be initially treated (settlement, pH balancing) adjacent to the barrel wash, before being routed to WTA2 for final treatment. Future coal from Nant Llesg would be blended on the Nant Llesg site to minimise problems with high sulphur content coal causing acidic runoff at the CDP. Runoff from the blending area would be pre-treated and then routed to WTA2 for further treatment, before discharge. Abstraction license(s) required for dust suppression water (from Rhaslas).	No	11.143 and SWMP (Appendix MA/NL/ES/ A11/001)
	3. The progressive backfilling of the void behind the advancing coaling operations	Activities contained within the void. Controlled dewatering of void (when required) to WTA for treatment and release to Nant Bargod Rhymni.	No	11.143
	4. The return of stored overburden to backfill the final void	Surface water effects as per A.7 and A.8. Mitigated by the WTAs and catch drains which would capture and treat any runoff.	No	11.143 and SWMP (Appendix

Scheme Component	Site Operation	Key Hydrological Implications	Additional Measures Required?	See Further (para ref)
	5. The preparation of the final landform	Surface water effects as per A.7 and A.8. Mitigated by the WTAs and catch drains which would capture and treat any runoff.	No	MA/NL/ES/ A11/001)
E	1. Transport of coal to the disposal point from the Nant Llesg and FLRS surface mines	Transport of coal from coal-stocking area adjacent to the mine void(s) to CDP within covered, road wagons. Processing areas on the Nant Llesg site and at the CDP would be/are served by drainage systems that would route any runoff to WTAs.	No	11.143 and 11.144
	2. Coal stocking; coal washing, processing and preparation for market	Coal washing would be split between the Nant Llesg site, and the CDP, with the bulk of the washing occurring on the CDP site. Runoff from the CDP is routed through existing WTAs (attenuation, settlement and pH balancing) before discharge to the Nant Gyrawd (tributary of the Nant Bargod Taf). Runoff from the Nant Llesg site would be routed through appropriate treatment facilities, discharging via WTA2. Coal washing operation is a discrete operation, with process water recycled where possible. Required process top-up water is abstracted from WTA ponds, some return of water via runoff/drainage passes back to the WTA for treatment. Abstraction license(s) required for coal wash water.	No	11.144

Scheme Component	Site Operation	Key Hydrological Implications	Additional Measures Required?	See Further (para ref)
	3. Water treatment facilities	A new water recycling lagoon is proposed at the CDP. This would be an 8,000m^3 lagoon, connected to the existing WTA lagoons. The lagoon would be filled with water pumped from the existing WTAs to form an offline storage area, and would not itself discharge to local watercourses. The existing WTAs would continue to capture and treat water draining from the site. There would be no increase in site operational surface area, which would mean no increase in runoff rates – the existing WTA would remain fully suitable to treat the site's drainage. Following completion of the FLRS and expiry of the MTCBC CDP planning application in December 2024, all of the operational, water storage and WTA requirements would be located on land within CCBC. Areas of the CDP within MTCBC would no longer be required for the Nant Llesg operations and would be restored. This would not alter the hydrological functioning of the CDP or surface water management/water quality.	No	11.143 and 11.144
	4. Use of railway sidings	Runoff from siding/associated loading area drains to existing WTA.	No	11.144
	5. Coal lorry maintenance workshop	Maintenance workshop is within a covered building to exclude rainfall. Apron drainage routed to an oil interceptor and then to WTA. Emergency spill kits kept on hand.	No	11.144

Scheme Component	Site Operation	Key Hydrological Implications	Additional Measures Required?	See Further (para ref)
	6. Coal analysis laboratory, visitor/education centre, staff and operative accommodation/welfare facilities and car parking	Surface water runoff routed to WTA for treatment and attenuation. Foul water treatment arrangements to be provided. Used laboratory chemicals to be disposed of via specialist waste contractor (as at present). Good construction practice to be followed.	No	11.144, 11.145 and 11.161
F	1. Spreading of soils and soil-forming materials	Surface water effects as per A.7 and A.8. Mitigated by the WTAs and catch drains which would capture and treat any runoff.	No	11.145 and 11.154
	2. Formation of micro-topographical features	Surface water effects as per A.7 and A.8. Mitigated by the WTAs and catch drains which would capture and treat any runoff.	No	11.145 and 11.154
	3. Establishment of water features	Offline construction of features. Features constructed as early as possible before re-watering to allow vegetation to re-establish, and rain to wash fines down into bed material to minimise sediment ingress once flows re-established. Use of straw bales and geotextiles temporarily during works. Works to be undertaken to Method Statement agreed with NRW. Good construction practice for works near water to be followed. The design of the reinstated Rhaslas Pond would be undertaken by Reservoir Panel Engineer.	Yes	11.154 and 11.161

Scheme Component	Site Operation	Key Hydrological Implications	Additional Measures Required?	See Further (para ref)
	4. Preparation of areas for ecological interest, preparation of landscape features, preparation of public rights of way and urban common/access land	Good construction practice to be followed. Limited potential for impact. Measures taken to minimise sediment laden runoff. If works near water required, special measures to be agreed with EAW.	No	11.145 and 11.154
G	1. Removal of all plant, machinery and buildings and the restoration of the land	Existing WTA effectively manages runoff from the current site. WTA either to be managed until new use is identified and underway, or appropriately decommissioned. Building/plant demolition to follow good practice, potentially contaminated materials to be removed using appropriate methods and as early as possible in the demolition process. Works to be informed by a risk assessment and method statement.	No	11.145 and 11.154
H	1. Predominantly agricultural operations to rehabilitate the surface of the land and render it fit for the proposed after-use.	Limited potential for effects – works focussed on sowing/planting of remaining vegetation, and the initial maintenance. Works largely similar to normal farming operations. Procedures to minimise sediment runoff followed. Works near water to be undertaken following specific Method Statement.	No	11.145 and 11.154

11.144 Summarising from Table 11.14, the key mitigation to protect the surface water environment are as follows:

1. Surface water management arrangements (quantity and quality) for the main Nant Llesg site, including dewatering from the surface mine void. This is addressed in the SWMP (see Appendix MA/NL/ES/A11/001);

2. Confirmation that the existing surface water management operations (quantity and quality) at the CDP are sufficient for the increased coal throughput;

3. Statements of Good Site Construction/Operation Practice;

4. Method Statements to be produced for the following operations:

   i. WTA and catch drain construction;

   ii. General works liable to produce silty runoff;

   iii. General works near water;

   iv. Remediation works in area of old mine shafts/adits;

   v. Remediation works on coal spoil areas adjacent to the Nant Bargod Rhymni above Fochriw; and

   vi. MIS landfill – procedure to follow to assess/identify non-inert waste, and if non-inert waste identified.

5. Environmental permitting requirements;

6. Detailed design for mitigation of hydrological effects arising from modifications to Rhaslas Pond and loss of some headwater streams;

7. Statement of foul water treatment arrangements for the main Nant Llesg site and the CDP;

8. Re-establishment of water features – agreement would be reached with NRW on the principles for reinstatement of water features (Rhaslas Pond and headwaters).

Mitigation of Identified Effects

1. Surface Water Management Plan

11.145 The key provisions of the SWMP (see Appendix MA/NL/ES/A11/001) are as follows:

- Attenuation of runoff in WTA1, WTA2, WTA3 and WTA4 up to the 1% AEP event, plus an allowance for a 10% increase in rainfall intensity due to climate change. Rhaslas Pond would be configured with a hydrobrake (a discharge limiting device) to provide some additional attenuation to support WTA4. Excess flows from events in excess of the 1 in 5 year event would be routed to the void for temporary storage. These flows, direct precipitation and any dewatering of the DFDS would be pumped to WTA2 for treatment, outside of wet periods when the WTA is attenuating and treating flows draining directly to it;

- Discharge rates from the WTAs would be set so as not to increase runoff above existing greenfield rates for each sub-catchment. In reality, the outflow rates would be lower than the existing greenfield rates, since the rates must be limited to ensure appropriate settlement of suspended fines suspended within the runoff from the site. This requires an outflow rate below what the natural greenfield rate would be; and

- Settlement ponds would designed to take the volume of flow passing through them. Flocculants would be used to enhance settlement rates. This would allow settlement of suspended particles and the precipitation of metals such as iron and manganese by oxidation. Additional treatment would be provided to intercept hydrocarbons (oil, fuel, diesel and hydraulic fluids) that could potentially enter watercourses. This would occur at source (hydrocarbon interceptors installed in designated key areas and placement of spill kits), and also at the WTAs themselves (use of adsorbent booms at the WTAs). The booms and spill kits provide a means of providing protection against the potential for accidental spillages. pH balancing would be implemented if required.

2. CDP - Surface Water Management

11.146 The existing surface water management infrastructure (attenuation ponds and settlement ponds), plus water quality treatment, would continue to serve the CDP and ensure that discharges comply with the standards set out in the discharge consents. The key issue with the current infrastructure is the balancing of pH in response to acidic runoff from coal with a high sulphur content. Since the coal from Nant Llesg would be exported via the CDP, the total coal throughput would be higher. Only coarse washing of coal cleanings and gleanings would occur on the Nant Llesg site. It is proposed to construct a new coal washing plant at the CDP with a throughput of up to 400t/hr, and this would be served by a new water storage/recycling lagoon, located to the west of the railway. The new lagoon would be an offline facility, filled by pumping. The coal washing facility would provide the final 'polishing' to wash the coal and reduce the rock content, making it suitable for alternative markets, prior to export from the CDP. The existing water management infrastructure (WTA) and discharge consents would ensure runoff from the CDP continues to meet requirements. Following completion of the FLRS and expiry of the MTCBC CDP planning application in December 2024, all of the operational, water storage and WTA requirements would be located on land within CCBC. Areas of the CDP within MTCBC would no longer be required for the Nant Llesg operations and would be restored. This would not alter the hydrological functioning of the CDP or surface water management/water quality.

3. Good Site Construction/Operation Practice

11.147 The EAW has produced a range of PPGs. These identify the key steps to be taken to minimise the potential for construction/operation to impact on the water environment, and would be followed. The EA (2012) and Business Wales (2011) provide detailed guidance on the prevention of potential water pollution effects from coal extraction. The recommendations of these documents would be followed during all stages of the development.

11.148 As with all similar construction or mining operations, there would be heavy plant and machinery on site. With refuelling and maintenance operations there is the potential for accidental spillages. In order to minimise this potential, these operations would adopt best working practices and measures to protect the water environment.

11.149 In accordance with PPG2 all fuel tanks on site would have bunded containment of at least 110% of the volume of the largest tank or 25% of the total volume of all tanks within the store, whichever is greater. There would also be no drainage point from the bunded containment area, with incident rainfall being removed as required. Tamper proof taps and valves would be installed, and all empty fuel containers or drums would be stored within a containment area, prior to their removal or disposal from the Site.

11.150 Designated re-fuelling points would be used for the majority of the mobile machinery, and these would be located within the hard-standing areas. Where fuelling of large plant (i.e. excavators) needs to occur for practical reasons within an operational location, drip trays and absorbent mats and pellets would be used to contain or absorb accidental spillages. Any plant maintenance would also be undertaken in a designated area and would adopt similar contamination prevention measures. In addition, oil interceptors would be incorporated in the drainage from key operational areas (vehicle maintenance areas, parking areas etc), to prevent contaminated water reaching the WTAs. The WTAs would be fitted with absorbent booms to collect residual hydrocarbons in the site run-off.

11.151 All deliveries of potentially polluting substances would be supervised.

11.152 Vehicles would be regularly washed in a designated washdown area fitted with a sump/hydrocarbon interceptor. A facility is currently located at the entrance/exit to the CDP, and an additional vehicle wash would be installed at the entrance/exit from the Nant Llesg mine.

11.153 All collected hydrocarbons removed from the interceptors would be tankered off site, along with used oil booms. All items would be appropriately disposed of via a licensed waste contractor.

11.154 Vegetation would be kept in place as long as possible, only being removed when necessary to start excavations and site works. Exposed soils/spoil would be re-seeded as soon as practicable.

11.155 The remediation of land in the south of the Site would be undertaken during the periods of the year when ground conditions are suitable, so that sediment laden runoff is minimised, and also to facilitate rapid re-establishment of vegetation. To minimise effects, these works would be supported by individual Method Statements tailored to the chosen restoration option and agreed with NRW and CCBC. Typical measures for temporary earthwork operations like these include silt fences, which divert silty runoff to flow through silt traps and settlement areas before reaching the watercourse. Where works take place on one side of a shallow hillside stream channel, operations would only be undertaken during periods of either no flow or low flow, when sandbags can be used to retain flows alongside the opposite bank and minimise the water reaching the remediation area.

4. Method Statements

11.156 Method statements would be produced and agreed with the NRW and CCBC for the various identified site operations during the final detailed design and construction stage. With regards to the water environment, the statements would include the following points:

- Reference to the identified PPGs and how they would be followed/implemented;
- In particular, requirements of PPG5 would be adhered to when working adjacent to existing watercourses in order to minimise disturbance to the watercourse and the amount of silt produced;
- A minimum stand-off distance of 5m would be maintained between disturbed areas and watercourses, with the exception of watercourse crossings and works to watercourses themselves;
- It would be ensured that all permanent and temporary consents have been submitted to NRW and all other relevant Statutory Authorities for the proposed works;

- Construction personnel should be in receipt of and familiar with a services search prior to commencement of the Works. Public Utilities record drawings must be obtained to identify the location of underground and above ground apparatus; and

- Excavated materials to be stored within designated storage areas i.e. soil storage mounds or overburden mound.

5. Environmental Permitting Requirements

11.157 With regards to the surface water environment, operations within the Site would require the following environmental consents:

- The Reservoirs Act 1975 – this act (as subsequently amended) requires that a Panel Engineer is appointed to supervise the design and modification of an existing reservoir. As Rhaslas Pond is a designated reservoir under the Act, the design of the proposed modifications to Rhaslas Pond would need to be undertaken, approved, and the subsequent works supervised, by an appropriate Panel Engineer;

- Discharge consents – discharges from the four WTAs. Flow rates would be monitored to ensure that the agreed rates are not exceeded. Water quality monitoring points would be incorporated within the design to enable regular sampling. Water quality monitoring would be undertaken to specifications agreed between NRW and Miller Argent. These would be set out in the individual discharge consents (frequency and determinands);

- Abstraction licences – may be required in support of dewatering of a quarry void, abstraction of water from the WTA ponds/Rhaslas Pond for use for dust suppression, and coal washing; and

- Flood defence consents (FDCs) – these are required for works involving watercourses. Consents would be required for any culverts crossing existing watercourses (i.e. to enable road crossings), and also the removal of sections of watercourse during the operational phase. The consents ensure that these operations do not increase flood risk. Following the implementation of the Floods and Water Management Act 2010, the consenting process for Ordinary Watercourses would be undertaken by the Lead Local Flood Authority (LLFA), in this case CCBC (NRW retain responsibility for Main Rivers, but all of the watercourses on site are Ordinary Watercourses). .

6. Hydrological Effects – Rhaslas Pond Reduction and Headwater Watercourses Removal

11.158 The proposals would mean that flows currently draining from Rhaslas Pond northwards to the Nant Carno would instead drain southwards to the Nant Bargod Rhymni (at a maximum rate of 200l/s), and once the attenuation available within Rhaslas Pond is full, inflows above 200l/s would pass into the mine void. The reduction in flows to the Nant Carno is considered to be limited, as the area of diverted catchment (100 ha) amounts to 18% of the total Nant Carno catchment (which is currently 553 ha in extent). This would contribute to a reduction in flood risk along the Nant Carno. Due to the fact that Rhaslas Pond is a reservoir with an overspill weir forming the outlet, Rhaslas Pond does not currently provide any support to baseflows in the Nant Carno. At present, flows only enter the Nant Carno when the outlet weir is being overtopped i.e. when during and immediately after a rainfall event when the reservoir is full to capacity.

11.159 In future, the main drainage route from Rhaslas Pond would be to the south, via a hydrobrake which would provide attenuation to prevent any increase in flow rates, and thus avoiding increasing flood risk in the Nant Bargod Rhymni receiving watercourse. Overall with these sub-catchment changes in place, proportionally more water draining from the Site would drain to the Nant Bargod Rhymni, and the catchment area would increase from 126ha to 182.5ha. Given

that the Nant Bargod Rhymni currently has a catchment area of 16.5km^2, this results in the catchment increasing to 17.1km^2, a 3.6 % increase. As both the Nant Carno and the Nant Bargod Rhymni drain to the River Rhymney, there would be no overall change in the catchment area of the River Rhymney as a result of these flow diversions i.e. the water drains via a different sub-catchment, and is not diverted entirely out of the catchment. Further details are provided in the SWMP (see Appendix MA/NL/ES/A11/001).

11.160 Rhaslas Pond would be decreased in area by approximately 50% during the operational phase. Following completion of the operational phase, it is proposed to restore the pond to an area/volume approaching its original pre-development size, with such work to be certified by a Panel Engineer under the Reservoirs Act 1975. Water levels would be re-established at a level that would protect the southern embankment and prevent degradation of the stone work. Rhaslas Pond would continue to be classified as a reservoir under the Reservoirs Act 1975 throughout, and Miller Argent would be required to have it supervised and inspected and would be responsible for maintenance. Figure A11/004.3 in Appendix MA/NL/A11/004 shows the current extent of flood risk associated with potential reservoir failure in and around the Site. It can be seen that four of the reservoirs and the associated areas that would be inundated in the extremely unlikely event of an impoundment failure or overtopping are located outside of the Site boundary. Only Rhaslas is within the boundary, and has potential flood flow pathways through the site. Once the site is operational, the pathway from Rhaslas's northern impounding embankment (towards Blaen Carno and also Rhymney) would be removed, since this water would instead enter the quarry void. With regards to Rhaslas's southern impounding embankment, the main pathway towards Fochriw would remain as at present. The smaller pathway towards Rhymney would, however, be cut off by the future presence of the overburden mound. Examination of these pathways on a detailed topographic survey of the Site indicates that land levels are such that the flow pathway south along the railway cutting would be preferential compared to the route towards Rhymney. Given the unlikely nature of failure/overtopping of the embankment, and the fact that the majority of resulting flooding would at present drain southwards, the future presence of the overburden mound blocking the pathway to the east can be considered to have negligible impact on risk. Upon restoration, the pre-existing situation would be reinstated.

11.161 The physical presence of the Site and its operations would not have a cumulative impact alongside climate change on flood risk over the medium term (during the period of site operation), since a climate change allowance has been included in the attenuation volumes associated with the WTAs. In terms of drought, the Nant Llesg Site represents a small proportion of the overall Rhymney catchment (4.1km^2, compared to 52km^2 at the confluence of the Nant Bargoed Rhymni and River Rhymney). The deepest depth of the void would (at 250m AOD) be at approximately the same level as the groundwater level during summer months, thereby limiting impacts on groundwater available under the site to supplement low summer drought flows.

7. Foul water treatment arrangements for Nant Llesg and the CDP

11.162 A rotating biological contactor ('Biodisc') packet sewer treatment system would be used at the surface mine, with the treated effluent being routed to an adjacent soakaway. This treatment method has been agreed with the EAW for existing foul water disposal at the CDP, and has performed well to date. There would therefore be no requirement for any regular road tankering to take large quantities of untreated foul water off site, just periodic (typically one or two times per year) removal of accumulated sludge by tanker.

8. Re-establishment of watercourses – Rhaslas Pond and headwater watercourses

11.163 Rhaslas Pond and the headwater watercourses would be restored following the completion of the operational phase. Appropriate restoration of watercourses would be required to ensure the features are stable and not at risk of erosion, and are consistent with the expected hydromorphology. Detailed plans would be produced and submitted for agreement with NRW

and CCBC. Proposals regarding Rhaslas Pond would be approved by the Reservoir's Panel Engineer during the development of the restoration design concept for Rhaslas Pond. Habitat and amenity enhancements would be included to reinstate the pond to a better than current standard.

Summary of Key Mitigations during Site Operations

11.164 Surface water management measures would be incorporated in the site operations from the start of development. WTAs are proposed to intercept, treat and then slowly release runoff from the various site operations. WTAs would be constructed as site operations develop, so that a WTA is present ready to treat the runoff that subsequently occurs during site operations. Cut-off ditches would be constructed around spoil mounds and operational areas to collect contaminated runoff and direct it to the WTAs. These features would effectively keep this site runoff separate from natural runoff from undisturbed areas of the site, which would continue to drain from the site as before development. A Surface Water Management Plan (SWMP) has been prepared and details how flows from the developed site would be balanced to ensure that runoff is not increased as a result of the development, therefore insuring that flood risk is not increased. Further details can be found in the SWMP in Appendix MA/NL/ES/A11/001.

11.165 The SWMP has calculated existing runoff rates as 13.7 l/s/ha for the mean annual peak runoff, and for the 1% AEP (1 in 100 year) event 29.8 l/s/ha respectively. Flows would be attenuated and treated up to the 1% AEP event with a 10% climate change allowance (the 'Design Event') for increased rainfall intensity as required by NRW SWMP guidance. Whilst the storage volumes would be sized to handle flows produced by this Design Event, actual discharge rates would be notably lower than the corresponding greenfield discharge rates for the Design Event due to the need to discharge flows at a regular controlled rate to facilitate sufficient water quality treatment.

11.166 The WTAs would incorporate an overflow weir for runoff events caused by extreme rainfall in excess of the design event. This flow would pass off site into the receiving watercourses. It is important to note that for flows of this extreme magnitude (above the 1 in 100 year with 10% climate change allowance), the presence of the Operational Site would not increase flood risk (and indeed some benefit is provided by the flows captured by the open void). Excess flows from Rhaslas Pond above the design event would pass into the mine void, for subsequent dewatering outside of the storm event. Only Rhaslas Pond and part of the overburden mound are situated at an elevation where excess flows can be routed into the void. Therefore, during extreme events, runoff in excess of the design event of the WTAs (which are situated at a lower elevation such that flows cannot be diverted to the void), would pass through the WTAs and into the receiving watercourses.

11.167 When void dewatering is required, water would be pumped out of the void to an initial treatment area on the southern edge of the void. At this location, initial pH dosing would be undertaken and the flow routed to WTA2 for further settlement and treatment. From WTA2 treated flows drain to the Nant Llesg stream. Since appropriate treatment facilities (e.g. the use of aeration, settlement and chemical dosing) would be constructed to promote the precipitation and removal of metals (notably iron) prior to discharge, this would ensure that the surface water quality discharge standards are met.

11.168 Dewatering would not take place during periods of high flows in the receiving watercourses so as to ensure that dewatering does not increase flood risk.

11.169 In addition, some remediation of former mine workings is proposed away from the main operational site and WTAs; this would take place during the early stages of the main Nant Llesg operational phase. The key areas being the eroding partially restored spoil north of Fochriw,

which is currently being eroded by the Nant Bargod Rhymni, and former mine workings within land to the east of the operational area of the mine (to the west of the Heads of the Valleys Industrial Estate). These works are anticipated to be of short duration, and would incorporate the use of smaller machinery than the main mining operations. Paragraphs 11.145 to 11.153 detail how impacts on the water environment would be prevented during these works.

11.170 Under the Discharge Consent process, a monitoring and testing procedure would be agreed with NRW for the WTA discharges.

Summary of Key Mitigations during Site Restoration

11.171 By this stage the remediation areas north of Fochriw and to the west of the Heads of the Valleys Industrial Estate would have already been restored as those works, and their aftercare, take place during the main operational phase, as described above. This section therefore focuses on the restoration of the operational areas of the Site.

11.172 The WTAs would remain in place until all mining activities and significant restoration works within the catchment of each WTA are completed. This would ensure that all runoff continues to be fully treated and attenuated.

11.173 Appropriate backfilling and re-creation of the agreed landform would then be undertaken before stored soils are replaced and vegetation re-established. During this phase runoff would continue to be collected and treated by the WTAs. Good practice would be followed in undertaking these works and Method Statements agreed with NRW.

11.174 Replacement headwater watercourses, to replace those removed for the operational phase would be constructed. These would follow the restored landform, and reinstate the existing drainage pattern and overall catchments. Rhaslas Pond would also be restored from the reduced form constructed during the operation phase to an area/volume approaching that of its current size. These works would be agreed with NRW and certified by a Panel Engineer under the Reservoirs Act 1975. For works to watercourses, Flood Defence Consents would be required; these would need to be agreed with CCBC in consultation with NRW. Good practice would be followed in undertaking these works and Method Statements agreed with. NRW.

11.175 General pollution control and prevention measures would be followed, with appropriate measures taken for incident response and the storage of fuel and oil. Further details are provided in the ‘Good Site Construction/Operation Practice’ section (paras 11.145 to 11.153).

Summary of Proposed Mitigation

11.176 Table 11.15 lists the types of receptors that could be affected by the proposed development in relation to potential hydrological effects. It also summarises the environmental measures that have been incorporated into the development proposals in order to avoid, reduce or compensate for potential adverse effects and identifies the type of mitigation proposed and its aim, together with the likely effectiveness, i.e. would the effects be fully, substantially or only partially effective. The operational phase is that detailed in phases ‘a’ to ‘e’ in para 11.141. The restoration and aftercare phase corresponds to phases ‘f’ to ‘h’.

Table 11.15 Summary of Proposed Mitigation Measures

Receptor/ Issue	Change(s) and Potential Effects	Incorporated Mitigation	Likely Effectiveness
Surface Water Features (Table 11.10 Receptor Refs: SWC and SWB)			
Water Quantity during site operations (phases a to g in para 11.141)	Existing volumes of water would still drain to the River Rhymney (from the Nant Llesg site) and the River Taff (from the CDP). Rhaslas Pond reduced in area and used for mining operations. Temporary loss of some hilltop ponds.	WTAs to attenuate runoff and ensure runoff rates are not increased. No changes to catchments. Therefore no impact expected to off-site watercourses and no mitigation required. Temporary use of Rhaslas Pond during the site operation and loss of hilltop pond accepted, mitigation to be reinstatement at restoration phase.	Substantially Effective
Water Quantity following site restoration	Existing volumes of water would still drain to the River Rhymney (from the Nant Llesg site) and the River Taff (from the CDP). Rhaslas Pond restored. Minor hilltop ponds recreated.	WTAs to remain in place until restoration completed. Appropriately restore all water bodies.	Substantially Effective
Water Quality during site operations	Site operations could potentially introduce contaminants to surface water bodies. Reduction in water quality of receptor watercourses either from site runoff (mainly sediment) or from accidental spillage of fuels, lubricants or other pollutants.	Provision of WTAs to collect and treat runoff water from the site to the standards set by Discharge Consents, before it is discharged off-site. Adoption of best practice guidance regarding storage and handling of fuels and lubricants, plant refuelling and maintenance during site operations would minimise this risk.	Substantially Effective

Receptor/ Issue	Change(s) and Potential Effects	Incorporated Mitigation	Likely Effectiveness
Water Quality following site restoration	Continued introduction of contaminants to surface water bodies following restoration.	Restoration of site to agreed specifications. WTAs would remain in place until full restoration has been undertaken. Agreed period of aftercare and rectification of defects.	Substantially Effective
Flood Risk (Table 11.10 Receptor Ref: FR)			
During Site Operation	Increase in flood risk to downslope/ downstream development.	WTAs are proposed which for flows up to the 1% AEP + climate change allowance event would attenuate flows to existing greenfield (natural) runoff rates. The WTAs would be designed to safely pass more extreme flows from more extreme natural rainfall events.	Substantially Effective
Following Restoration	Continued higher level of flood risk.	WTAs to remain in place until restoration complete.	Substantially Effective
Hydromorphology (11.10)			
During Site Operation	Removal or damage to watercourses.	Some upper headwater watercourses removed during operational phase. Mitigation: reinstatement at restoration phase.	Fully Effective (short term removal, but later fully reinstated)
Following Restoration	Continuation of operational phase effects.	Watercourses reinstated. Existing issues with erosion of historic mining spoil would have been addressed.	Fully Effective

Implementation of Mitigation Measures

11.177 Table 11.16 sets out the mitigation measures and proposals that have been incorporated into the scheme to mitigate the hydrological effects on receptors. It also includes details of who

would be responsible for the implementation of the measures, and the suggested mechanism of compliance to ensure that the proposals would be carried out as envisaged.

Table 11.16 Implementation of Incorporated Mitigation and Monitoring Proposals

Mitigation Measure/ Monitoring Proposal	Actioned By	Compliance Mechanism
Appropriate design of watercourse crossings (it is anticipated that some minor short culverts would be required to cross some site drainage ditches); adoption of best practice in construction.	Miller Argent	Planning Condition, Flood Defence Consent (FDC), Regular Inspection
Watercourse restoration	Miller Argent	Planning Condition
Maintain standoff between watercourses and site activities	Miller Argent	Regular inspection
Regulate discharges from site so as not to increase downstream flood risk	Miller Argent	Discharge Consent
Compliance with Mine Waste Directive and appropriate disposal of silts recovered from WTAs	Miller Argent	Planning Condition + Environmental Permit required from NRW
Provide appropriate treatment of minewater and surface runoff to prevent pollution in downstream watercourses	Miller Argent	Discharge Consent
Adopt best practice in storage of fuel, oils and chemicals, and in plant refuelling and maintenance	Miller Argent	Planning condition and regular inspection

Environmental Assessment: Assessment of Effects

11.178 In assessing the potential effects of the proposals, the scoping responses, local and National policy/guidance/advice, consultation with stakeholders, the findings of the baseline assessment and the identified mitigations have been taken into account.

11.179 This section sets out the assessed environmental effects of the scheme as described in Chapter 3. The application includes the operational area of the surface mine and the area of the existing operational CDP within the County Borough of Caerphilly within the Site. The CDP would receive coal from both Nant Llesg and FLRS. Where relevant the in-combination effects/cumulative impacts of the Nant Llesg Scheme operating alongside the current FLRS are assessed.

11.180 The surface water environment baseline has been investigated, and it can be seen that due to local topography the Nant Llesg and FLRS schemes drain to different catchments (Drawings

MA/NL/ES/11/002, MA/NL/ES/11/003 and MA/NL/ES/11/005). Drainage from the operational area of the Site would be to the River Rhymney catchment, whilst the CDP and FLRS, would as at present, continue to drain to the River Taff catchment.

11.181 Table 11.17 sets out the assessed effects on the identified surface water receptors during the Operational Phase (phases 'a' to 'e' as indicated in para 11.141 - from initial site works, through to the final backfilling of the void), based on the receptor sensitivity,the predicted magnitude of change acting on the receptor, and duration, in order to determine the significance of these effects.

11.182 Table 11.18 sets out the assessed effects on the identified surface water receptors during the site restoration and aftercare phase (phases 'f' to 'h' in para 11.141), and then into the future following completion of aftercare, based on the receptor sensitivity, the predicted magnitude of change acting on the receptor, and duration, in order to determine the significance of these effects.

Table 11.17 Assessment of Effects on Identified Hydrological Receptors – Initial Site Preparation through to End of Operational Phase

Receptor Reference	Feature	Summary of Identified Impacts	Component	Sensitivity of Receptor	Magnitude of Change	Duration	Significance
SWC1	River Rhymney	WTAs draining to tributaries of the River Rhymney would treat/attenuate water appropriately to requirements of Discharge Consent to manage effects on water quality. Further dilution of treated flows by flow within the receiving watercourses. Flows to the Bute Level would be reduced slightly by the development, since some of the adits would be intercepted, and the water captured and treated. No changes to overall catchment area, limiting effects on water quantity.	Water Quantity and Water Quality and Hydromorphology	Medium	Negligible	Temporary (Long Term)	Not Significant
SWC2	Nant Carno	Loss of headwater channel (tributary to Nant Carno) between Rhaslas Pond and northern edge of Nant Llesg site & reduction in catchment area (-18%) would reduce water quantity slightly. WTA1 would manage effects on water quality.	Water Quantity and Hydromorphology	Low	Medium (-)	Temporary (Long Term)	Minor Significant (adverse).
			Water Quality	Low	Low (-)	Temporary (Long Term)	Not Significant
SWC3	Nant Llesg/Capital	Loss of headwater channel from source to eastern edge of Nant Llesg site. Limited	Water Quantity and Water	Low	Low (-)	Temporary	Not

Receptor Reference	Feature	Summary of Identified Impacts	Component	Sensitivity of Receptor	Magnitude of Change	Duration	Significance
	Valley	changes to catchment area would not lead to impacts on water quantity. Attenuation/treatment of site water via WTAs would manage effects on water quality (WTA2, which discharges to Nant Llesg tributary, and WTA3a*, which discharges to Capital Valley tributary).	Quality			(Long Term)	Significant
			Hydromorphology	Low	Medium (-)	Temporary (Long Term)	Minor Significant (adverse).
SWC4	Pontlottyn	Loss of short length of headwater channel. Limited changes to catchment area would mean no impacts on water quantity*.	Water Quantity and Hydromorphology	Low	Medium (-)	Temporary (Long Term)	Minor Significant (adverse).
			Water Quality	Low	Low (-)	Temporary (Long Term)	Not Significant
SWC5	Nant Bargod Rhymni	Loss of short length of headwater channel between Rhaslas and proposed WTAs. Construction of new channel to drain Rhaslas Pond via WTA4 to the Nant Bargod Rhymni. Overall catchment area increased by 3.6 %, which would result in limited changes to water quantity, especially with	Water Quantity	Medium	Low (-)	Temporary (Long Term)	Not Significant
			Water Quality	Medium	Low (-)	Temporary (Long Term)	Not Significant

Receptor Reference	Feature	Summary of Identified Impacts	Component	Sensitivity of Receptor	Magnitude of Change	Duration	Significance
		attenuation measures in place. WTA3b* and WTA4 (attenuation/treatment of site water) would manage effects on water quality.	Hydromorphology	Medium	Low (-)	Temporary (Long Term)	Not Significant
		Major reductions to sediment input to this watercourses (and thus reductions in siltation at Parc Cwm Darran Country Park) due to the proposed remediation works to stabilise and re-vegetate the unstable eroding spoil along this watercourse (these works would be undertaken at an early stage during the development's lifetime)	Sediment (water quality / morphology of wider catchment)	Medium	High (+)	Permanent	Moderate Significant (positive)
SWC6	Nant Gyrawd	No change in terms of water quantity/quality. Existing discharge from the CDP via WTAs and existing Discharge Consents to continue to provide attenuation and manage effects on water quality.	Water Quantity and Water Quality and Hydromorphology	Low	Negligible	Temporary (Long Term)	Not Significant
SWB1	Rhaslas Pond	Reduced in size during operational phase, and used for managing site runoff. Impacts on water quantity and quality would occur.	Water Quantity and Water Quality and	Low	High (-)	Temporary (Long Term)	Minor Significant (adverse).

Receptor Reference	Feature	Summary of Identified Impacts	Component	Sensitivity of Receptor	Magnitude of Change	Duration	Significance
			Hydromorphology				
SWB2	Small ponds nr Rhaslas	Relict of past mining would be within the operational boundary, but remain intact.	Water Quantity and Water Quality and Hydromorphology	Low	Negligible	Temporary (Long Term)	Not Significant
SWB3	Gelli-Gaer Pond	Would remain present and undisturbed throughout site operations. No impact on water quantity/quality.	Water Quantity and Water Quality and Hydromorphology	Low	Negligible	N/A (Unaffected)	Not Significant
SWB4	Historic mining water storage pond, nr Fochriw	Unaffected – water body and supporting watercourses outside of areas affected by proposals. No impact on water quantity/quality.	Water Quantity and Water Quality and Hydromorphology	Low	Negligible	N/A (Unaffected)	Not Significant

Receptor Reference	Feature	Summary of Identified Impacts	Component	Sensitivity of Receptor	Magnitude of Change	Duration	Significance
SWB5	Historic mining water storage pond, nr Pontlottyn	No direct effect – water body outside of operational area. Small portion of upper catchment captured by WTA3, and would drain towards Capital Valley and Fochriw, limited impacts on water quantity. No impacts on water quality.	Water Quantity Water Quality and Hydromorphology	Low	Negligible	N/A (Unaffected)	Not Significant.
SWB6	Historic mining water storage pond, nr HVIE	Unaffected – small isolated pond.	Water Quantity and Water Quality and Hydromorphology	Low	Negligible	N/A (Unaffected)	Not Significant
SWB7	CDP water treatment ponds	Existing WTA designed to serve the whole of the CDP. WTA would continue to appropriately treat runoff from the CDP site.	Water Quantity and Water Quality and Hydromorphology	Low	Negligible	Temporary (Long Term)	Not Significant
SWB8	Small pond nr Trecatti	Unaffected – water body and supporting watercourses outside of areas affected by proposals	Water Quantity and Water Quality and	Low	Negligible	N/A (Unaffected)	Not Significant

Receptor Reference	Feature	Summary of Identified Impacts	Component	Sensitivity of Receptor	Magnitude of Change	Duration	Significance
			Hydromorphology				
FR1	Flood risk on site and to downstream people and property	No effects predicted. Site runoff captured by catch drains and WTAs designed to handle flows up to the 1% AEP + 10% climate change allowance, released to downstream watercourses at attenuated rates equivalent to pre-development greenfield (natural) runoff rates.	Flood Risk	Medium	Negligible	Temporary (Long Term)	Not Significant
	* Due to the location of WTA3 at a location where three different tributaries rise (the Capital Valley stream, Pontlottyn stream and a tributary of the Nant Bargod Rhymni), flow from WTA3 has been split (denoted by 'a' and 'b', to drain to the Capital Valley stream and Nant Bargod Rhymni tributary respectively). The majority of flows in this area currently drain to these two catchments. No flow is to be passed to the Pontlottyn tributary, as flows pass through a limited capacity culvert through a dense urban area before reaching the River Rhymney. In addition, flows would be attenuated to below pre-development greenfield rates. Flood risk would therefore not be increased. Further details are provided in the SWMP.					

Table 11.18 Assessment of Effects on Identified Hydrological Receptors – Restoration and Aftercare Phase

Receptor Reference	Feature	Summary of Identified Impacts	Component	Sensitivity of Receptor	Magnitude of Change	Duration	Significance
SWC1	River Rhymney	The upper headwaters of tributaries draining to the River Rhymney, which were temporarily removed during operations, would be reinstated. Whilst flows to the Bute Level would increase to pre-development levels following reinstatement of flow pathways, the quality of the water is predicted to improve since a significant proportion of the coal (and the sulphur within) would have been removed. WTA would then be decommissioned.	Water Quantity and Hydromorphology	Medium	Negligible	Permanent	Not Significant
			Water Quality	Medium	Low (+)	Permanent	Minor Significant (positive)
SWC2	Nant Carno	Removed headwater channel would be reinstated during restoration stage to a good morphological standard (compared to the existing engineered channel), and Rhaslas Pond reconnected to reinstate the pre-development catchment area. Water quantity/quality would match pre-development values. WTA would then be decommissioned.	Water Quantity	Low	Negligible	Permanent	Not Significant
			Water Quality	Low	Negligible	Permanent	Not Significant
			Hydromorphology	Low	Low (+)	Permanent	Not Significant
SWC3	Nant Llesg/Capital	Removed headwater channels would be reinstated during restoration stage to a good	Water Quantity	Low	Negligible	Permanent	Not

Receptor Reference	Feature	Summary of Identified Impacts	Component	Sensitivity of Receptor	Magnitude of Change	Duration	Significance
	Valley	hydromorphological standard; existing areas of erosion would have been remediated. Water quantity/quality would match pre-development values. WTA would then be decommissioned.					Significant
			Water Quality	Low	Negligible	Permanent	Not Significant
			Hydromorphology	Low	Medium (+)	Permanent	Minor Significant (positive).
SWC4	Pontlottyn	Removed headwater channel would be reinstated during restoration stage to a good hydromorphological standard. Water quantity/quality would match pre-development values.	Water Quantity and Water Quality and Hydromorphology	Low	Low (+)	Permanent	Not Significant
SWC5	Nant Bargod Rhymni	Removed headwater channels would be reinstated during restoration stage to a good hydromorphological standard; existing areas of erosion would have been remediated. Flows from Rhaslas Pond would be diverted back to the Nant Carno (the pre-development arrangement). Water quantity/quality would match pre-development values. WTA would then be decommissioned.	Water Quantity	Medium	Negligible	Permanent	Not Significant
			Water Quality	Medium	Negligible	Permanent	Not Significant
			Hydromorphology	Medium	High (+)	Permanent	Moderate Significant

Receptor Reference	Feature	Summary of Identified Impacts	Component	Sensitivity of Receptor	Magnitude of Change	Duration	Significance
		Major reductions to sediment input to this watercourse (and thus reductions in siltation at Parc Cwm Darran Country Park) due to the remediation works to stabilise and re-vegetate the unstable eroding spoil along this watercourse.					(positive).
SWC6	Nant Gyrawd	Removed headwater channels would be reinstated during restoration stage to a good hydromorphological standard. Water quantity/quality would match pre-development values. WTAs would then be decommissioned.	Water Quantity and Water Quality and Hydromorphology	Low	Negligible	Permanent	Not Significant
SWB1	Rhaslas Pond	Rhaslas would be reinstated during the restoration phase. The restored Rhaslas Pond would be designed to provide improved habitats and amenity value	Water Quantity and Water Quality and Hydromorphology	Low	Medium (+)	Permanent	Minor Significant (positive)
SWB2	Small ponds nr Rhaslas	Would be within the operational boundary, but remain intact.	Water Quantity and Water Quality and Hydromorphology	Low	Negligible	Permanent	Not Significant

Receptor Reference	Feature	Summary of Identified Impacts	Component	Sensitivity of Receptor	Magnitude of Change	Duration	Significance
SWB3	Gelli-Gaer Pond	Pond would have remained present and undisturbed during the operational phase, nevertheless, minor improvements to setting/habitats as part of general final site restoration	Water Quantity and Water Quality and Hydromorphology	Low	Low (+)	Permanent	Not Significant
SWB4	Historic mining water storage pond, nr Fochriw	Pond would have remained present and undisturbed during the operational phase, nevertheless, minor improvements to setting/habitats as part of general final site restoration. Restoration of the eroding spoil in areas adjacent to the pond would have been completed.	Water Quantity and Water Quality and Hydromorphology	Low	Low (+)	Permanent	Not Significant
SWB5	Historic mining water storage pond, nr Pontlottyn	Pond would have remained present and undisturbed during the operational phase, nevertheless, minor improvements to setting/habitats as part of general final site restoration.	Water Quantity and Water Quality and Hydromorphology	Low	Low (+)	Permanent	Not Significant
SWB6	Historic mining water storage pond, nr HVIE	Pond would have remained present and undisturbed during the operational phase, nevertheless, minor improvements to setting/habitats as part of general final site restoration.	Water Quantity and Water Quality	Low	Low (+)	Permanent	Not Significant

Receptor Reference	Feature	Summary of Identified Impacts	Component	Sensitivity of Receptor	Magnitude of Change	Duration	Significance
SWB7	CDP water treatment ponds	Ponds would be decommissioned as the CDP is decommissioned. Potential for restoration of the site and reinstatement of typical hilltop hydrological features.	Water Quantity and Water Quality and Hydromorphology	Low	Low (+)	Permanent	Not Significant
SWB8	Small pond nr Trecatti	Unaffected – water body and supporting watercourses outside of areas affected by proposals	Water Quantity and Water Quality and Hydromorphology	Low	Negligible	N/A (Unaffected)	Not Significant
FR1	Flood risk on site and to downstream people and property	Once the site is restored, the impacts of surface mine operations on runoff rates would cease, and once site is re-vegetated the WTAs would be decommissioned. Sediment sources into local watercourses (i.e. Nant Bargod Rhymni and Nant Llesg) would have been reduced, preventing the reduction in channel capacity due to sediment.	Flood Risk	Medium	Negligible	Permanent	Not Significant

Predicted Effects and their Significance

11.183 Based on the Environmental Assessment detailed above, the expected effects on the receptors identified in Table 11.10 have been detailed in Tables 11.17 and 11.18 for the site preparation/operational and restoration/aftercare phases respectively. Hydrologically, the phases 'a' to 'h' listed in para 11.141 split well into these two overall groupings. Phases 'a' to 'e' represent intervention into the baseline hydrological environment and implementation of measures to mitigate impacts during the operational works; whilst phases 'f' to 'h' represent withdrawing from the site and ensuring the Site is restored and left in a suitable condition. The receptors sensitivity is assessed based on the collated information in the baseline assessment; the magnitude of change is then assessed for both the operation phase of the proposals and the post-restoration phase. Where the magnitude of change is greater than 'Negligible', whether the change is adverse or beneficial (positive or negative), the effect has been assessed.

11.184 Tables 11.17 and 11.18 indicate that the assessed hydrological receptors are of generally 'Low' sensitivity on the grounds of their status as assessed against Table 11.11. Flood Risk is though ranked as 'Medium' on account of there being several notable areas of existing development alongside several of the tributaries draining the site.

11.185 In terms of magnitude of change during the operational phase, the predicted magnitude is 'Negligible' for ten of the 15 receptors, three are ranked as 'Medium (-)' one as 'High (-)', and one as 'High (+)' on account of the proposals having a greater magnitude of change on the receptor, in the operational phase this is due to the loss of certain headwater streams and water bodies. The 'High (+)' magnitude of change relates to remediation of eroding spoil on the Nant Bargod Rhymni above Fochriw.

11.186 In terms of duration of change during the operational phase, the duration is considered to be 'N/A (Unaffected)' for four receptors, on account of the receptor being located on or adjacent to the Site, but not effected by the development. For ten of the receptors, duration has been ranked as 'Temporary (Long Term)', on account of the effects lasting for the duration of the operational phase. The impact on one receptor is classified as 'Permanent', on account of the effects lasting beyond the lifetime of the development. This permanent change relates to remediation of eroding spoil on the Nant Bargod Rhymni above Fochriw.

11.187 The overall significance of potential effects on receptors during the Site Preparation/Operational Phase has been assessed as 'Minor Significant (adverse)' for 4 receptors, 'Not Significant' for 10 receptors, with one notable 'Moderate Significant (positive)' being associated with the remediation of the eroding spoil on the Nant Bargod Rhymni.

11.188 In terms of magnitude of change during and following the restoration/aftercare phase, the predicted magnitude is 'Negligible' for four of the 15 receptors, whilst 8 are ranked as 'Low (+)', two are ranked as 'Medium (+)' and one as 'High (+)'. The 'High (+)' magnitude of change relates to remediation of eroding spoil on the Nant Bargod Rhymni above Fochriw, and the 'Medium' to improvements to the reinstated watercourses.

11.189 In terms of duration of change during and following the restoration/aftercare phase, the duration is considered to be 'N/A (Unaffected)' for one of the receptors on account of the receptor being located on or adjacent to the Site, but not affected by the development. For fourteen of the receptors, duration has been ranked as 'Permanent', on account of the effects lasting beyond the lifetime of the development. These permanent changes, are, however, positive changes, and relate to the reinstatement of watercourses and water bodies following the development, as well as the remediation of eroding spoil on the Nant Bargod Rhymni above Fochriw.

11.190 In one case the significance of potential effects on receptors following the Restoration Phase has been assessed as: 'Moderate Significant (positive)'. This is the Nant Bargod Rhymni, on

account of the restoration works to stabilise eroding spoil north of Fochriw. In two other cases the significance of potential effects on receptors following the Restoration Phase has been assessed as: 'Minor Significant (positive)'. The remainder (twelve) are assessed as 'Not Significant'.

Cumulative Effects

11.191 Based on the assessment of effects on the hydrological environment, the potential for cumulative effects to occur is considered to be low. Potential cumulative effects could occur due to the inter-relation of the following developments:

The Development Proposals:

1. Nant Llesg Surface Mine, incorporating Land Remediation; and

2. the Cwmbargoed Disposal Point (CDP)

Existing nearby operations:

3. Ffos-y-fran Land Reclamation Scheme (FLRS);

4. Merthyr Industrial Services Waste Tipping Operations; and

5. Trecatti Landfill Site.

11.192 Only developments (1), (4) and (5) are situated within the River Rhymney catchment. Developments (2) and (3) are in the catchment of the River Taff. The hydrological effects of development (1) are to be managed on-site, so that the only off-site effects would be minor and localised. Similarly, measures have been identified to manage any hydrology effects from development (4) as part of development (1), resulting in no off-site effects. The existing measures incorporated within developments (2) and (3) are considered to appropriately manage existing and future hydrological effects from both of these developments, resulting in no off-site effects. Whilst development (2) would in future handle coal from development (1) in addition to the current coal handled from development (3) all coal in future would undergo initial preparation within development (2) within a new coal washing facility with water recycled. Some final processing would occur within development (2), here the existing WTA processes would fully treat runoff from coal processing and ensure that the existing discharge consents continue to be met. All coal would be dispatched through (2). Also, the existing measures to prevent hydrological effects are considered suitable to prevent any off-site effects.

11.193 Experience at FLRS indicates that the WTAs proposed form an effective means of reducing the impact on downstream watercourses (in terms of water quality and quantity). To date the WTAs have achieved a very high level of performance such that there is confidence that any discharge consent specifications can be complied with.

11.194 In terms of water quantity, the methodology applied in the SWMP, which uses the best current hydrological techniques to estimate flows would fully provide for the normal operational management of runoff from the site up to the design event (the 1% AEP event with a 10% increase in rainfall intensity to account for potential climate change impacts). The WTAs would be engineered to safely pass on flows in excess of this event. This is considered acceptable, since for extreme events such as these, the Scheme's impact on runoff rates (if any) would be minimal in comparison with the amount of runoff that such an extreme event naturally produces due to the magnitude of rainfall intensity and runoff associated with such an event.

11.195 In terms of water quality, the WTAs would function appropriately, by design and appropriate maintenance, to treat the substances to the extent required by any discharge consents. During a high flow event the concentration of most contaminants would be reduced owing to the levels of dilution achieved due to the high runoff rates. In contrast, during the peak of a high flow event, turbidity would be elevated due to the entrainment of fine particles from rapid runoff, and the lower settling time associated with the high through-put of water during the peak of the event; however turbidity would be similarly elevated elsewhere in other parts of the catchment associated with turbid runoff from other catchment surfaces. Further dilution of any remaining contaminants would occur as the treated water becomes progressively diluted in the downstream receiving watercourses.

11.196 Development (5) is already in operation, and therefore forms part of the existing baseline. Discharges from (5) are to a tributary of the River Taff, and to the foul sewer. Developments (2) and (3) also drain to the tributaries of the River Taff, but are also existing operations considered part of the baseline. Development (4) currently, and development (1) in future, drain to the River Rhymney (a different catchment). The fact that (5) is pre-existing, and (1) would drain to a different catchment prevents there being any potential for in-combination effect.

11.197 Two small areas of the existing CDP (2) are located beyond the planning application site boundary. Area one (2.0 ha in area), the northwest corner of the CDP site, includes the Bogey Road crossing for coal haul vehicles crossing from Development (3) to (2), an area of hardstanding, a short length of railway siding used by all coal haul trains entering/leaving the CDP, and some minor trackways. Around one third of this area is undisturbed and retains natural upland vegetation. A small stream (a tributary of the Nant Gyrawd) passes from the north through this section of the site, and out to the south. No changes from the existing are proposed in this area. Area two (3.2ha in area), the southern-most portion of the CDP currently contains part of a coal stocking area, some components of the CDP's WTA, and part of the CDP screening bund. No physical changes (i.e. new constructions) are proposed in this area, as a result of coal import from Development (1). This area is only used for stocking coal from development (3), it is not proposed to stock coal from Development (1) in this area, and while the treatment (in terms of dosing for pH and flocculation) at the WTA may need to be adjusted, no changes to it are proposed and the existing Discharge Consent conditions would still be met. For these reasons it is not considered that there would be any significant cumulative effects as a result of the proposed development (1) and the parts of the CDP (2) not within the planning application boundary.

11.198 Planning permission has recently been granted for a new 'Wood Pellet Facility' at the Capital Valley Industrial Estate. Whilst this development would also drain to the River Rhymney, no cumulative impacts are expected, as the development would need to incorporate appropriate measures to manage the quantity/quality of runoff draining from the site. These measures would mean that runoff matches pre-development rates and that only clean runoff (from roofs and non-operational areas) would be able to drain to the River Rhymney.

Inter-relationships and in-combination effects

11.199 The key inter-relationships between hydrology and other topics are the following areas:

1. Hydrogeology – changes to quantity/quality of surface water infiltrating to become groundwater; and

2. Biodiversity – loss of certain habitat areas during the operational phase of the proposed development (i.e. Rhaslas Pond, headwater watercourse channels and the boggy source areas of the watercourses).

11.200 In terms of hydrogeology, the effects are expected to be negligible. Appropriate measures have been incorporated to manage and treat surface water within the overall Site boundary. Surface runoff would be managed so as to avoid drainage into the void, complying with the EAW SWMP guidance (Environment Agency Wales, 2011), and also because most of the site does not drain towards the void. This approach would minimise the volume of contaminated void water that needs to be removed from the void and subsequently treated. In addition, the hydrology baseline assessment indicated that on average around 1/3 of the precipitation falling on the Site is lost through evapo-transpiration, and that around 2/3 of the remaining amount would typically drain as rapid runoff. Allowing for the fact that some of the remaining rainfall would flow as baseflow within the soils to watercourses, the amount of surface water passing to groundwater is a limited proportion of the overall rainfall falling on the Site. The operational phase of the Scheme would also reduce some of the flows entering the Bute Level due to the interception of parts of the DFDS, assisting with ameliorating what the Coal Authority currently consider to be the second worst unmitigated minewater discharge in Wales. This is discussed further in the Hydrogeology chapter, but overall this water would be treated to a higher standard via the Site's WTAs in comparison to the existing raw discharge to the River Rhymney. These flow paths would be reinstated as the void is backfilled to ensure that unintended new flow-pathways are not created. However, owing to the fact that a large proportion of the remaining coal would have been removed, it is expected that on reinstatement of flow paths to the Bute Level the acidity and hence levels of iron and manganese would be reduced. This would result in a permanent reduction in the concentration of these metals passing into the Bute Level, and on into the River Rhymney.

11.201 In terms of ecology, the value of the habitats lost during the operational phase, and resulting effects are assessed within the ecology chapter (chapter 8). The key impacts are expected to be the loss of some water bodies within the site (headwater streams and ponds) during operation as well as the reduction in size of Rhaslas Pond and its use as part of the surface water management scheme. The restoration scheme would reinstate features, and provide opportunities for habitat creation and removal of the existing historic mining influences.

Summary and Conclusions

Key Findings

11.202 The proposed surface mine development at Nant Llesg lies in a hydrologically low sensitivity area where there is minimal surface water utilisation. One of the key features is the multiple watercourses that originate from boggy areas on the Nant Llesg site, and drain towards the River Rhymney. The existing FLRS and CDP sites lie within the catchment of the River Taff, minimising the potential for cumulative effects.

11.203 The assessment carried out has compiled the available hydrological information for the Site and surrounding areas in order to establish the current baseline conditions. Both the current condition and the current utilisation of surface water resources have been assessed. This has indicated a generally low sensitivity surface water environment.

11.204 Existing water quality monitoring associated with the nearby FLRS site and recently initiated water quality monitoring in support of the Nant Llesg application have allowed assessment of local surface water quality. This has indicated generally good water quality, but with elevated concentrations of several metals, including iron, manganese and zinc.

11.205 Other water quality data have highlighted the current impact on the quality of the River Rhymney from elevated metals in the discharge from the DFDS and Bute Level, although monitoring data collected by the EAW (now NRW) indicate that only zinc concentrations have exceeded the EQS on occasions.

11.206 A surface water and groundwater sampling network has been established at the Site such that effects from the proposed development on local water resources (levels and quality) could be monitored.

11.207 The key impact during the operational phase would be the reduction in size of Rhaslas Pond, and its use as part of the Site's surface water management system. However, this impact would be limited to the operational phase, with the water body being reinstated to an area/volume approaching the existing pre-development Rhaslas Pond upon completion of operations.

11.208 The proposed development would result in a significant improvement along the Nant Bargod Rhymni watercourse, since the existing areas of unstable and eroding colliery spoil would be remediated as part of the scheme. This would substantially reduce the current fine sediment inputs that have been causing siltation in the lake at Parc Cwm Darran Country Park.

11.209 During the restoration phase, the surface watercourses removed during the operational phase would be reinstated. Since short reaches of these watercourses are at present affected by spoil or hard-engineering associated with historic mining activities; this would represent an opportunity to reinstate them in a more natural form. This would remediate any existing water quality problems associated with the eroding spoil and dumped material.

11.210 It is anticipated that improvements would be made to the minewater currently discharging into the River Rhymney from the Bute Level as a result of the Nant Llesg scheme (see Hydrogeology Chapter 10). This would result in improvements to downstream water quality along the River Rhymney.

11.211 In relation to the scoping guidance provided by the EAW (para 11.37), the proposed site design and associated avoidance and mitigation measures detailed in this chapter address the points raised. The key points that have been covered are as follows:

- Abstractions have been assessed;
- a SWMP (see Appendix MA/NL/ES/A11/001) has been prepared with details of the WTAs and their attenuation and water quality functions, and assessing the potential for effects on receiving watercourses;
- the management of Rhaslas Pond through the development has been covered;
- arrangements for foul water disposal addressed;
- no watercourse diversions are proposed, although details of the sections of headwater watercourses to be long term but temporarily removed have been detailed;
- the TAN15 flood risk classification has been confirmed;
- FDCs would be obtained for crossings of minor watercourses;
- a cumulative assessment of the Nant Llesg proposals, in combination with the existing operations at the CDP and FLRS and other developments, has been undertaken; and
- permitting regulations for discharges from the WTAs have been detailed.

11.212 With regards to the guidance set out in the WG MTAN2 (as detailed in para 11.43), the assessment has covered the following:

- the requirements of the WFD and Water Act;

- the potential for hydrological impacts has been considered, and mitigations (collection, attenuation and water quality treatment at WTAs) have been put into place to prevent negative effects;
- the impacts of dewatering and minewater discharge changes have been considered;
- a SWMP has been prepared to manage flood risk;
- the baseline study has covered the water environment both on Site, and around the Site; and
- the sensitivity of local water quality and vulnerable receptors has been assessed.

11.213 Furthermore, the assessment provides an understanding of the balance between rainfall/evapo-transpiration/runoff at the site, as part of a broader conceptual understanding of the surface water system of the local area.

11.214 The potential areas of influence and receptors have been identified, and control measures proposed and assessed. Based on the assessment of receptor sensitivity and the available data and the resulting conceptual model, the assessment is considered robust. In particular, modelling has been carried out (the SWMP) to assess the quantities of runoff that require management due to changes caused by the development.

11.215 Operational procedures and WTAs have been detailed that would allow water quality and quantity to be appropriately managed within the site, including arrangements for the settling of suspended material and metal precipitation.

11.216 Water quality monitoring has been started to gather baseline information for the proposed receiving watercourses, and this would enable any changes over the period of operation to be identified and mitigated. The future discharge consents associated with the new WTAs would provide a means of ensuring the level of suspended solids and the pH of the discharged surface water is suitable

11.217 Overall, no adverse Significant Effects ('Major Significant' or 'Moderate Significant') on the identified hydrology receptors are predicted. One key positive Significant effect is identified, associated with the stabilisation and remediation of areas of eroding spoil along the Nant Bargod Rhymni.

11.218 During the Operational Phase, identified effects are considered to be 'Temporary (Long Term)', associated with the removal of upper sections of watercourses and changes to Rhaslas Pond. The effects of the works undertaken during the Restoration phase would be permanent, on account of these works being the reinstate of hydrological features and site restoration (i.e. a positive permanent).

Mitigation Measures

11.219 The key mitigation feature incorporated within the proposals is the routing of all site drainage (runoff from operational areas/overburden mounds and dewatering flows) through a series of WTAs. The WTAs have been designed to ensure water is appropriately treated to an acceptable quality before discharge, and that flows are attenuated so as to be released at the same rates as those prevailing prior to the development of the Nant Llesg site into the receiving watercourses. A SWMP has been produced to detail the proposed arrangements (see Appendix MA/NL/ES/A11/001).

11.220 Para 11.114 details the key proposed mitigations measures. As well as the use of WTAs, mitigation involves following good site construction/oOperation practice. This would be

informed by detailed Method Statements (agreed with NRW where appropriate). A series of PPGs have also been developed (by the former EA, now NRW), and cover subjects such as PPG5: Works and maintenance in or near water.

11.221 During the Operational Phase, Rhaslas Pond would be reduced in size and used as part of the operational site's surface water management system. Upper sections of watercourses would also be temporarily removed to allow excavation of the void/construction of the overburden mounds. The proposed mitigation would be the reinstatement of these features following completion of the Operational Phase.

Residual Effects

11.222 Following the proposed mitigation measures, the residual effects would be limited and relate to the 'temporary (long term)' (i.e. during the operational phase) reduction in size and extent of various watercourses and waterbodies. These effects would though only extend to the end of the operation phase, when the site and water features would be restored. The residual effects would not be permanent.

Cumulative Effects

11.223 No cumulative effects (in-combination with other developments) have been identified (see paragraph 11.191 for discussion). This is because the potential for hydrological effects is contained and managed within the site.

Conclusions

11.224 This assessment of the hydrological baseline sensitivity has identified that the surface water environment on and in the vicinity of Nant Llesg is generally of low sensitivity. In terms of water quantity, the water draining from the Nant Llesg site represents a small proportion of flows draining to the upper River Rhymney catchment. In terms of quality, the existing monitoring data have indicated that water quality is impacted by high levels of iron, manganese, zinc and also PAHs. This appears to be associated with the broader geology/mining and industrial legacy of the wider area.

11.225 The potential effects from the Nant Llesg Surface Mine, Incorporating Land Remediation scheme have then been identified, and suitable mitigation measures capable of preventing adverse effects identified. The key impact identified is the need to manage water draining from the Site to ensure that water quality would not be impacted, and also flows would be attenuated to existing rates so as to replicate current flows and so as not to increase flood risk. A Surface Water Management Plan (SWMP) has been prepared (see Appendix MA/NL/ES/A11/001) detailing how this would be undertaken, and a series of WTAs would be incorporated to provide this treatment and attenuation.

11.226 Based on the proposed scheme with incorporated operational mitigations, the remaining effects are associated with the reduction in size of Rhaslas Pond and incorporation of the pond in the Site's surface water management system during the operational phase. Also, some short lengths of headwater watercourses would also be lost during the operational phase. However, all of these watercourses would be reinstated during the restoration phase.

11.227 The scheme has two important positive effects on the surface water environment, namely the following:

- The reduction in minewater flows to the Bute Level (which discharges into the River Rhymney) during the operational phase. This water would be intercepted, treated in WTA2 and then discharged to the Nant Llesg tributary. On backfilling, replacement flow pathways would be created to prevent the creation of unintended flow pathways. Owing to

the removal of a large proportion of the remaining coal and its sulphur content, it is expected that this water would be less acidic and therefore contain less iron and manganese, which would result in a significant improvement in downstream water quality (helping to ameliorate what the Coal Authority currently consider to be the second worst unmitigated minewater discharge in Wales); and

- The stabilisation of eroding colliery spoil along the Nant Bargod Rhymni, north of Fochriw and subsequent significant reduction of elevated siltation of the lake at Cwm Darran Country Park due to this material.

Relevant Terminology

11.228 Some of the more common hydrological terminology that has been used in this chapter has been defined as follows:

11.229 AA – Annual Average – a long-term chemical standard: averaged concentrations over a year should not exceed this level.

11.230 Annual Exceedance Probability (AEP) - The probability of flooding has traditionally been considered in terms of the statistical return period of a flood. For instance, the 100 year flood is one that that occurs on average once every one hundred years. An alternative method of expressing the probability of flooding is in terms of the likelihood of a flood happening in a given year. In this case, the 100 year flood is equivalent to the 1 in 100 or 1% Annual Exceedance Probability (AEP) flood, i.e. where there is a 1 in 100 or 1% chance of the flood occurring in any year.

11.231 BFI – BaseFlow Index – the proportion of the total average annual flow that is derived from baseflow i.e. the proportion of precipitation that leaves the catchment more slowly than direct runoff. This water is stored and transferred via the ground (soil, subsoil and the deeper bedrock) and may take days, weeks or more to reach a watercourse.

11.232 BOD – Biological Oxygen Demand – the amount of dissolved oxygen required by aerobic micro-organisms to metabolise (oxidise) the compounds which they can metabolise within a water sample.

11.233 Catchment - In terms of surface water, a catchment is the area of land from which water drains to a given watercourse. It is important to note that surface water catchments may differ from groundwater catchments, since surface water catchments are primarily driven by surface topography, whereas groundwater catchments may be defined at least partly on the basis of geological structure.

11.234 COD – Chemical Oxygen Demand – the amount of oxygen required to chemically oxidise all easily oxidisable compounds in water through the use of a chemical oxidant.

11.235 Controlled waters - Controlled waters are water bodies that require consent from either EAW or the relevant local authority for an abstraction from, discharge to or impoundment of that water body. Controlled waters include all watercourses, lakes, canals and water contained in underground strata.

11.236 EQS – Environmental Quality Standard – the concentration of a specific chemical below which harmful effects are not expected to occur. EQS are set depending on the specific chemical and the type of water body.

11.237 Evapotranspiration - this term refers to the process by which water moves from the land to the atmosphere as part of the hydrological cycle by evaporation from surfaces, or via plants transpiring. Potential evapotranspiration refers to the maximum possible rate of evapotranspiration, however in reality the rate is often limited (actual evapotranspiration) due to water availability and plant physiology.

11.238 FEH - This handbook sets out generalised procedures for extreme rainfall and flood frequency estimation in the UK. FEH sets out the standard approaches used to assess flood flows in rivers for a given return period or AEP.

11.239 Flood Zones – Flood Zones are areas of land that would flood under a flood event of a specified magnitude, and are mapped consistently across the whole of Wales. For example, within TAN15 the WG defines Flood Zone C as the area of land that would flood due to a fluvial or tidal flood event with a probability (AEP) of 0.1%. This is further sub-divided into Zones C1 (developed and served by significant flood defence infrastructure) and C2 (areas of floodplain without significant flood defence infrastructure). Flood Zone B is defined as areas where there are geological deposits indicative of possible past flooding. Flood Zone A represents areas with a risk of fluvial and/or tidal flooding of less than 0.1% AEP.

11.240 GQA – General Quality Assessment - These are a series of methodologies for classifying river and estuary water quality into UK consistent grades. The classification covers biology, chemistry, nitrates and phosphates.

11.241 Hydromorphology – the physical form of the water environment, for example the shape of the channel banks and bed and the materials that these consist of.

11.242 MAC – Maximum Allowable Concentration – a short-term chemical standard: concentrations should be below this value for at least 95% of the time.

11.243 Main River – A statutory designation that refers to watercourses for which the EA has flood defence powers. Generally these are larger streams and rivers, although some smaller watercourses are also included, particularly those with locally significant flood risk issues. In Wales, Main Rivers are designated by the Welsh Assembly Government (WG).

11.244 MORECS - Meteorological Office Rainfall and Evaporation Calculation System – provides gridded information for the UK on monthly potential and actual evapotranspiration. This data provides an indication of the proportion of rainfall that leaves a catchment via evapotranspiration.

11.245 Ordinary Watercourse – all watercourses that are not designated as Main Rivers. The EA states these as every “river, stream, ditch, drain, cut, dyke, sluice, sewer (other than a public sewer) and passage”.

11.246 PAH – Polyaromatic Hydrocarbons – carbon compounds derived from fossil fuels and/or the incomplete combustion of organic matter.

11.247 RBD – River Basin District – refers to an area covered by a specific RBMP, which may be one catchment, or multiple adjacent catchments. For example, the entire River Rhymney catchment is situated within the Severn River Basin District.

11.248 RBMP – River Basin Management Plan – the document that details the current status of water bodies within a River Basin, and the key pressures affecting them. The plan also identifies the measures required to maintain improve the current status of constituent water bodies. Preparation of RMBPs is a key requirement of the WFD.

11.249 ReFH – Revitalised Flood Hydrograph – a software package used to calculate flood hydrographs across the UK based on catchment descriptors.

11.250 Runoff - Runoff is the water that runs off of a site (as opposed to water which is intercepted, stored in the soil or depressions, or infiltrates to ground). During and immediately after a rainfall event, this water typically flows directly and quickly to watercourses, and is usually the major contribution to the peak discharge in a watercourse during a flood event. The lower the Baseflow Index (BFI, defined above in paragraph 11.212) of a watercourse, the higher the contribution from surface water runoff to the total flow.

11.251 SMD – Soil Moisture Deficit – this term refers to the amount of available water storage capacity available within the soil.

11.252 SPR – Standard Percentage Runoff – a hydrological term referring to the typical percentage of rainfall that forms the direct runoff element of the water leaving a catchment i.e. water that rapidly enters a watercourse during and immediately after precipitation, resulting in a pronounced peak in flows. The SPR value given by the FEH is an estimate based on soil type.

11.253 Surface water quality - the physio-chemical properties of water, in terms of the levels of specified dissolved and suspended substances, as compared to the levels that would naturally be expected for a water body of a given typology.

11.254 Surface water resource - The surface water resource is the total quantity of surface water available within a catchment. This can be subdivided into that which is required for the natural functioning of the water body, and the water available for abstraction without significant impact on the water body.

11.255 TAN15 – Technical Advice Note 15 – Defined by WG as providing " technical guidance which supplements the policy set out in Planning Policy Wales in relation to development and flooding".

11.256 TOC – Total Organic Carbon – the total amount of organic carbon in a water sample. Unlike BOD and COD, TOC therefore solely relates to the levels of dissolved organic carbon.

11.257 WFD Annex 8 substances – an indicative list of the main pollutants as set out in the WFD implementation documents, including: *2,4-D (ester and non-ester); 2,4-dichlorophenol; ammonia; arsenic; chlorine; copper; chromium; cyanide; cypermethrin; diazinon; dimethoate; iron; linuron; mecoprop; permethrin; phenol; toluene; and zinc.*

11.258 WFD Annex 10 substances – specific *pollutants* termed "Priority Substances" as set out in the WFD implementation documents, including: *alachlor, anthracene, brominated diphenylether (only pentabromobiphenylether), benzene, atrazine, cadmium and its compounds, chlorfenvinphos, chlorpyrifos, C10-13-chloroalkanes, 1,2-dichloroethane, Di(2-ethylhexyl)phthalate (DEHP), hexachlorobenzene, dichloromethane, diuron, hexachlorobutadiene, fluoroanthene, endosulfan, hexachlorocyclohexane, nickel and its compounds, isoproturon, mercury and its compounds, trichloromethane, lead and its compounds, nonylphenols, naphthalene, pentachlorobenzene, octylphenols, polyaromatic hydrocarbons (PAHs), pentachlorophenol, tributyltin compounds, simazine, trichlorobenzenes, and trifluralin.*

11.259 WFD – Water Framework Directive – an European Commission directive aimed at protecting and managing water resources in order to maintain or restore them (where possible) to 'good' status. Good status is defined in terms of how closely various parameters of a given water body matches what would be expected in a fully natural water body of that typology. The directive considers water bodies at the River Basin District level, rather than as subdivided by administrative boundaries.

References, Footnotes, Bibliography

Business Wales (2011) Practical ways you can prevent water pollution [online] http://business.wales.gov.uk/preventing-water-pollution [accessed 12/02/2013]

Centre for Ecology and Hydrology (2007) Flood Estimation Handbook

Centre for Ecology and Hydrology (2009) UK Hydrological Review 2009 [online] http://www.ceh.ac.uk/data/nrfa/nhmp/annual_review/pdf/Hydrological_Review_2009.pdf [accessed 03/08/2012]

Defra (2006) Flood and Coastal Defence Appraisal Guidance FCDPAG3 Economic Appraisal - Supplementary Note to Operating Authorities – Climate Change Impacts http://archive.defra.gov.uk/environment/flooding/documents/policy/guidance/fcdpag/fcd3climate.pdf [accessed 09/05/2013]

Defra (2012) UK Climate Change Risk Assessment: Government Report [online] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69487/pb13698-climate-risk-assessment.pdf [accessed 09/05/2013]

Environment Agency Wales (2011) Guidance on Surface Water Run-off' (Wales only)

Environment Agency (2012a) Environmental permitting amendment regulations - civil sanctions, carbon capture and storage, anaerobic digestion and administrative changes [online] http://www.defra.gov.uk/environment/quality/permitting/ [accessed 12/02/2013]

Environment Agency (2012b) Mining and quarrying guidance [online] https://brand.environment-agency.gov.uk/mb/EbMaJa [accessed 12/02/2013]

Environment Agency (2012c) Reservoirs - Panel engineers [online] http://www.environment-agency.gov.uk/business/sectors/64253.aspx [accessed 03/08/2012]

Environment Agency (2012d) Regulation of activities on ordinary watercourses [online] http://www.environment-agency.gov.uk/research/planning/136423.aspx [accessed 03/08/2012]

Miller Argent (2011) Nant Llesg Surface Mine, Including Land Remediation

Miller Argent (2012) Nant Llesg Surface Mine, Including Land Remediation

Per. Comms. (2012) – phone discussion with Kevin Kinsey of CCBC 23/11/11

Welsh Assembly Government (2009) Minerals Technical Advice Note 2 (MTAN2): 'Coal'.

Welsh Assembly Government (2004) Technical Advice Note 15 (TAN15) Development and Flood Risk.

Nant Llesg Surface Mine

Incorporating Land Remediation

Chapter 12

Air Quality and Dust

Nant Llesg Surface Mine

Incorporating Land Remediation

Environmental Statement

Chapter 12 - Air Quality and Dust

miller argent

Table of Contents

Tables

Figures

12 Air Quality and Dust

Chapter Overview

12.1 This chapter assesses the air quality impacts of the project, being the 'Nant Llesg Surface Mine, Incorporating Land Remediation', and includes the operation of the Cwmbargoed Disposal Point (CDP), the proposed remediation works and the export of coal from the site. The impact on nitrogen dioxide (NO_2), airborne particulate matter and dust deposition was modelled using the Atmospheric Dispersion Modelling System (ADMS) version 5 dispersion model. Additional modelling was undertaken using ADMS-Roads (version 3.1) to assess the impact of road and rail traffic from the scheme. These models are well-recognised as suitable for assessing the impacts on air quality.

12.2 Air quality in the area surrounding Nant Llesg is currently good with the national air quality objectives being achieved by a wide margin. There have been very occasional dust complaints from members of the public living in Rhymney and Fochriw. The baseline dust data, collected over six years, support the view that there have been very occasional dust events in Fochriw. In Rhymney, where monitoring has been undertaken for more than one year, there have been occasional dust events at the Heads of the Valley Industry Estate, but not at the two Primary Schools, suggesting a local source, most likely from within Rhymney, affecting the industrial estate.

12.3 The assessment of the impacts of the project has assumed that there will be best practice dust mitigation at all stages of the development. Key to this is proactive management of the site including forecasting when dust generating conditions may occur and putting appropriate mitigation in place before complaints are received. The main method of suppressing dust emissions is through the application of water using water bowsers on the unpaved haul routes, Fog Cannons® which spray a fine mist over a large area and are very effective at grounding dust particles, and mist sprays on coal handling equipment and at coal stocking areas. An integral part of the management of dust emissions is monitoring in the local community, and a monitoring programme will be agreed with Caerphilly County Borough Council and implemented.

12.4 It is predicted that the air quality objectives would be achieved during all phases of the project. Using the Institute of Air Quality Management criteria, the magnitude of the change in concentrations at residential receptors as a result of the proposed mine is generally small to medium, but due to the good baseline air quality in the area, the significance of the impact at most residential receptors is negligible. However, for a small number of receptors, notably in Rhymney and Fochriw, a minor adverse air quality impact is predicted.

12.5 The most significant impact predicted is dust deposition. During phases 1 – 4 of the project there is predicted to be a minor adverse impact at most receptors. Residential receptors in Fochriw are predicted to see a small improvement in dust deposition during phases 4 and 5 as a result of the end of coaling at Ffos-y-fran Land Reclamation Scheme, and an associated reduction in operations at the CDP. The cumulative impact of the removal of the Ffos-y-fran Land Reclamation Scheme overburden mounds during phase 3 of the project is predicted to result in a minor adverse impact at most receptors, with a moderate adverse impact at one residential receptor. During phase 4 the cumulative impact at this and several other receptors is predicted to be negligible due to the reduction in operations at the CDP.

12.6 Taking account of the duration of the operation of the surface mine (approximately 14 years) the overall impact is predicted to be of minor adverse significance using the Institute of Air Quality Management's significance criteria.

12.7 The decommissioning of the CDP may result in dust emissions. The modelling suggests that after decommissioning there will be a reduction in dust deposition, and that this will be a minor

benefit to the local community. However, the directional dust measurements and complaints records suggest that dust deposition will very rarely be an issue in Fochriw.

Introduction

12.8 ENVIRON UK Ltd. undertook the air quality assessment, and wrote this Chapter. The baseline dust monitoring and analysis was undertaken by DustScan Ltd.

12.9 Surface coal mining has the potential to impact on local air quality. Dust generated during site preparation, excavation, stockpiling, loading, transportation, tipping and processing operations can be dispersed and deposited within local communities. In addition, the exhaust emissions from site plant and vehicles, can affect local air quality

12.10 The air quality assessment addressed the following potential impacts of the operations at Nant Llesg:

- Fugitive dust due to the mining operations;
- Exhaust emissions of particulate matter (PM) and nitrogen oxides (NOx) from on-site plant and vehicles;
- Exhaust emissions from off-site vehicles and diesel trains; and
- Fugitive emissions of coal dust from the train wagons.

12.11 The term ‘dust’ is used largely in the context of effects on the amenity of the local community, although there are other impacts as discussed later in this chapter. Dust is defined by the British Standards Institution as particles below 75 µm in diameter which settle out under their own weight but which remain suspended for some time (British Standards Institution, 1994).

12.12 Dust is generated during many human activities including minerals extraction and surface mining, heavy industry, waste management, construction and demolition, agriculture (especially arable farming) and road transport.

12.13 It is generally produced by mechanical action on materials and is carried by moving air when there is sufficient energy in the airstream. More energy is required for dust to become airborne than for it to remain suspended. Dust is removed through gravitational settling (sedimentation), washout (for example during rainfall or by wetting) and by impaction on surfaces (e.g. on vegetative screening). Dust, for example from bare ground, can be resuspended by the wind or vehicle movement during dry weather.

12.14 Dust propagation, transport in the air, and subsequent deposition, depend on particle size, wind energy and disturbance activities. Whilst not entirely size-related, smaller particles tend to travel further than larger ones. Dispersal of dust is determined by how long the dust remains airborne and is highly weather-dependent, making it difficult to predict.

12.15 Dust from surface coal mines is mainly coarse; gravitational settling is appreciable so dust concentrations decrease rapidly away from the source. Large particles (over 30µm) return to the surface quite quickly; medium-size particles (10-30µm) will generally travel 100-250m from the source under normal conditions. In adverse weather conditions coarse dust can travel 500m from the source. Residents can potentially be affected by dust up to 1km from the source, but continual or severe concerns about dust are most likely to be experienced near to dust sources (generally within 100m) (MTAN2, 2009).

12.16 In this study, in addition to dust, the particulate matter fractions considered were PM_{10} and $PM_{2.5}$, defined as PM which passes through a size-selective inlet with a 50% efficiency cut-off at 10 and 2.5 microns (µm) respectively.

12.17 PM_{10} is generally considered to be inhalable particles and $PM_{2.5}$ respirable particles. Inhalable particles are those that enter the body through the nose and mouth and are typically deposited in the trachea and bronchia section of the lung. Respirable particles are deposited deeper in the lung, in the alveolar region.

12.18 To aid understanding regarding the size of these particles it can be useful to compare them with familiar objects. The diameter of a typical human hair is about 50µm. Generally people can differentiate objects in the size range 20-40µm. Particles that fall within the PM_{10} range are generally invisible to the naked eye and five spherical 10 µm particles would fit across a single hair.

12.19 Research into the health effects of particles on children, undertaken in communities within 750m of the boundary of surface coal mines in north east England, concluded that, for planning applications, PM_{10} should be considered up to 1km from the site (Department of Heath, 1999).

12.20 A glossary of terms is included in Appendix MA/NL/ES/A12/001.

Methodology

Consultation

12.21 The Environmental Health Department of Caerphilly County Borough Council (CCBC) was consulted on the monitoring and assessment methodology by email on 7th June 2012 and agreed the approach in an email dated 23rd October 2012.

12.22 Both the Countryside Council for Wales (CCW) and the Environment Agency Wales (EAW) (now Natural Resources Wales (NRW)) requested in their responses to the initial scoping report that the impacts of dust deposition on special areas of conservation (SACs) sites be considered.

Study Area

12.23 The main focus of the assessment was on the potential impacts to the local communities in Fochriw, Rhymney, Pontlottyn, Bute Town and, Llechryd, as these are most likely to be adversely affected by the site activities. All potential dust sources within the planning application boundary and within 1 km of a human receptor were included in the assessment.

12.24 The potential air quality and dust impacts on the Tair Carreg Moor SINC were also considered. The scheme includes much of the Cefn Gelligaer SINC, and therefore the impact of dust deposition on this part of the SINC has not been included in this assessment. The exception is the impact to this SINC south of South Tunnel Road, close to the CDP, which is not within the scheme.

12.25 The impact of emissions from the coal trains at residential properties closest to the railway between the Cwmbargoed Disposal Point (DP) and Ystrad Mynach, in Bedlinog, was assessed.

12.26 In response to CCW and EAW, the potential for dust deposition on Aberbargoed Grasslands SAC, Usk Bat Sites SAC, Cwm Cadlan SAC and Blaen Cynon SAC was included in the assessment.

Cumulative Impacts

12.27 The assessment has considered the cumulative impacts of the scheme, the Ffos-y-fran Land Reclamation Scheme (FLRS), the Trecatti landfill site, and the proposed NET Wood Pellet Plant in Rhymney.

Baseline Environment

12.28 The baseline assessment used data from Miller Argent, CCBC, Merthyr Tydfil County Borough Council (MTCBC) and Defra, as well as model output as described below.

12.29 The following monitoring data collected by Miller Argent was used. The locations of the monitoring sites are shown on Drawing MA/NL/ES/12/001.

- PM_{10} and $PM_{2.5}$ concentrations measured using Tapered Element Oscillating Monitors (TEOMs) at Twynyrodyn School in Merthyr Tydfil.
- Directional dust flux and dust deposition (see definition below) measured using DustScan and DustDisc samplers around FLRS. This includes the measurement of dust flux at Fochriw Primary School since January 2006.
- PM_{10} and $PM_{2.5}$ concentrations measured at Upper Rhymney Primary School from November 2011 using a Beta Attenuation Monitor (BAM).

12.30 Dust flux is the horizontal passage of dust past a point, usually driven in the wind and is the rate of passage of dust on the pathway from sources to a receptor. Dust deposition is the vertical passage of dust to a surface, or the ground driven by its deposition velocity (Hall et al, 1994).

12.31 Table 12.1 shows the location of the dust flux and deposition samplers and when monitoring commenced.

Table 12.1: Nant Llesg Dust Flux and Deposition Monitoring Locations

Site	Site ID (See Drawing MA/NL/ES/12/001)	Date Commenced
Upper Rhymney Primary School	1A	4th November 2011
Heads of the Valley Industrial Estate	2A	4th November 2011
Bryn Awel Primary School	3A	9th December 2011
Nant Llesg (within site, close to the	4A	20th January 2012

Site	Site ID (See Drawing MA/NL/ES/12/001)	Date Commenced
eastern boundary)		
Trecatti (within site, opposite the Landfill access road)	5A	27th January 2012
Fochriw School	-	12th January 2006 (flux) 6th January 2012 (deposition)
Fochriw Road (near South Tunnel Road junction)	6A	20th January 2012)
Railway – eastern side	7A	5th April 2012
Railway – west side	8A	5th April 2012
Bryn Caerau	-	12th January 2006

12.32 The raw dust flux measurements were summarised as Absolute Area Coverage (AAC) and Effective Area Coverage (EAC) for each sample period. The latter is divided into 15^{o} sectors. AAC is a measure of the total dust coverage of the sticky pad over the sampling period, and the EAC is a measure of the dust soiling per day, taking account of the colour of the dust. The data is expressed as the percentage AAC or EAC.

12.33 A dust complaints matrix for assessing the dust flux measurements (Table 12.2) has been developed over a number of years, originally by Geoffrey Walton Practice and more recently by DustScan Ltd. It is incorporated into the Institute of Air Quality Management and Institution of Environmental Sciences guidance on construction dust monitoring (IAQM and IES, 2012). This matrix updates the criteria in MTAN2 (MTAN2 paragraph 155) and is based on the analysis of a large number of dust flux measurements, from mineral extraction and other dust sources. This matrix defines the risk of dust complaints in five categories from very low to very high. It is considered unlikely that there will be justifiable dust complaints when dust flux data is in the low or very low category, however when it is in the high and particularly the very high category, it is likely that there will be justifiable complaints. This dust matrix has been used to assess the baseline dust flux measurements in this assessment.

Table 12.2: Dust Complaints Risk Matrix

	AAC: Dust coverage (for a 15° sector)				
EAC: dust soiling	**Level 0 <80%/ interval**	**Level 1 80-95%/ interval**	**Level 2 <95-99%/ interval**	**Level 3 <99-100%/ interval**	**Level 4 >100%/over a 45° sector/ interval**
Level 0 <0.5%/day	Very low	Very low	Very low	Low	Medium
Level 1 0.5-0.7%/day	Low	Low	Low	Medium	High
Level 2 0.7-2.0%/day	Medium	Medium	Medium	High	High
Level 3 2.0-5.0%/day	High	High	High	High	Very High
Level 4 >5%/day	Very High	Very High	Very High	Very High	Very High

12.34 At the beginning of 2012 DustScan changed the adhesive used on the sticky pads to enable the measurement of the mass of dust deposited on the DustDisc sampler. The vast majority of the DustDisc samples contain too little dust to measure the mass. A local relationship between %EAC and mass (mg/m^2) has been developed from the data collected at two sample locations where there is higher mass deposition. There is some evidence that the DustDisc sampler has approximately 75% of the collection efficiency compared of a Frisbee deposition gauge. The MTAN2 monitoring guide value of 80 mg/m^2/day (MTAN2 paragraph 155) is likely to be based on data collected using a Frisbee Gauge, although MTAN2 does not provide advice on the type of sampler to use. The results have been adjusted for the lower DustDisc collection efficiency. It should be noted that the collection efficiency is dependent on wind speed, and that the collection efficiency of a Frisbee Gauge is approximately 50%.

12.35 Other baseline data used in the assessment included the background air quality maps provided as part of Local Air Quality Management (LAQM) by Defra (Defra, 2012) and CCBC and MTCBC nitrogen dioxide (NO_2) diffusion tube data (CCBC, 2012 and MTCBC, 2012). Locations of the diffusion tubes are shown in Drawing MA/NL/ES/12/002.

12.36 The impact of the current operations at the CDP was modelled using the same methodology as for the operational impact of Nant Llesg (described later in this Chapter and in Appendix MA/NL/ES/A12/002) to provide baseline information on dust deposition and air quality in the study area. The baseline model included emission sources within the CDP but outside the Nant Llesg planning application boundary.

12.37 To provide some confidence in the model results the predicted maximum dust deposition, expressed as a daily value averaged over a week, was compared with the DustDisc mass deposition data measured at Fochriw School and Upper Rhymney School since January

2012. This comparison is discussed in the description of the baseline conditions later in this chapter.

12.38 The impacts of emissions from the FLRS site itself (i.e. excluding the FLRS activities at the CDP) have not been included in the baseline model due to the distance of active operations from the local communities that may be impacted by the proposed mine. MTAN2 (paragraph 142) states "The potential health impacts of particulate matter from opencast sites are often raised as a health concern by local communities. Endorsed by the Committee of Medical Effects on Air Pollutants, the University of Newcastle-upon Tyne's report "Do particulates from opencast mining impair children's respiratory health?" (DoH,1999) concluded that it is relevant to consider the contribution of opencast coal sites to PM_{10} levels in communities up to 1000m from a site."

12.39 The FLRS southern overburden mound (known as OB3) is approximately 1.5 km from the nearest dwelling that might be impacted upon by the Nant Llesg scheme while the northern overburden mound (OB1) is slightly further from the nearest dwelling that might be affected by Nant Llesg (ca. 1.4 km). The third overburden mound (OB2) is even further from any receptors that might be affected by Nant Llesg. The Newcastle Study ((Department of Health 1999) is the most comprehensive UK study of the air quality impact of surface coal mines undertaken to date. It developed an assessment framework for new surface mines which stated that if a site is within 1km of a sensitive receptor and the PM_{10} air quality objective is likely to be exceeded then an assessment is required.

12.40 The placing of overburden at OB2 has ceased and will cease at OB1 and OB3 prior to the project commencing, which, at its earliest, will be 2014, and therefore there will be minimal emissions from the nearest part of the FLRS site to any dwelling or other sensitive receptor, which in any case are at more than 1km distance. It is not therefore included within the baseline for the Nant Llesg scheme. The dust emissions during the removal of the FLRS overburden mounds are assessed as cumulative impacts and are discussed latter in this chapter.

12.41 The measured and modelled PM_{10}, $PM_{2.5}$ and NO_2 concentrations were compared to the air quality objectives and EU limit values. The modelled dust deposition was compared to the guide value in MTAN2 for protection of public amenity (MTAN2 paragraph 155), and the Highway's Agency's assessment level for ecological receptors. The modelled NOx concentrations and nitrogen and acid deposition were compared with the Centre for Ecology and Hydrology criteria for the protection of ecological receptors.

12.42 The assessment criteria are described in more detail in the section below on Assessment Criteria and Assignment of Significance.

Preliminary Operations, Land Remediation Works, Waste Tipping, Water Treatment Facility, and Aftercare

12.43 These works were assessed qualitatively, using the Institute of Air Quality Management screening and assessment methodology for construction impacts (IAQM, 1212) taking into account the proposed activities and the location of the nearest human and ecological receptors.

Operation of the Surface Mine

12.44 The impacts of the operation of the surface mine on the local community were modelled using the Atmospheric Dispersion Modelling System (ADMS) and ADMS-Roads dispersion models to predict future concentrations of PM_{10}, $PM_{2.5}$, and NO_2, and dust deposition. ADMS 5 was used to estimate the impact of the emissions from the operation of the mine and the CDP for each of the five stages of development of the mine. ADMS-Roads 3.1 was used to estimate the impact of the emissions from the railway and local roads.

12.45 The five phases of the operation of the surface mine are illustrated in Disposition Plans (MA/NL/PA/004-008) which provide information on the plant to be used in different working areas and the approximate location of the haul routes. Each of these phases was modelled. Three additional scenarios were also modelled. These were as follows:

- The beginning of Disposition 1 when the Visual and Acoustic Screening Bund will be constructed;
- The cumulative impact of Disposition 3 and the removal of the FLRS overburden mounds; and
- The cumulative impact of Disposition 4 and the removal of the FLRS overburden mounds.

12.46 Activities not included in the Disposition Plans, or of short duration have been assessed qualitatively, using the Institute of Air Quality Management methodology for the assessment of construction impacts (IAQM, 2012).

Modelling the Operational Impacts of the Mine

12.47 In compliance with the requirements of Mineral Technical Advice Note 2: Coal (MTAN2) (Welsh Assembly Government, 2009) (paragraphs 143 to145 and Appendix K)) the impact of the operation of the open cast mine on ambient PM_{10} concentrations and dust deposition has been modelled, in this case, using the ADMS dispersion model (version 5). The same methodology has been used to estimate $PM_{2.5}$, NO_x, and NO_2 concentrations. This section provides an overview of the modelling methodologies used as part of the assessment. Details of the dispersion modelling are provided in Appendix MA/NL/ES/A12/002.

12.48 The fugitive dust emissions were derived from the US Environmental Protection Agency's (USEPA) "*Compilation of Air Pollution Emission Factors*' known as AP42 (USEPA, 2012) as the UK National Atmospheric Emission Inventory does not include UK derived emission factors for these sources. This is the recommended approach in MTAN2 in paragraph 144.

12.49 Samples of the surface dust on FLRS haul routes and overburden mounds were collected in accordance with USEPA requirements (USEPA, 2012) and analysed for silt and moisture content using a UKAS certified laboratory. It was assumed that Nant Llesg surface dust will have similar properties as FLRS which shares the same geological sequence of coals and overburden.

12.50 Exhaust emissions of NOx and PM from the on-site plant were assumed to be at the emission limits applicable in early 2014, when the new plant is anticipated to be delivered to the site. The limits are expressed in g/kWh, and by combining information on the power of individual plant and hours of operation the emission rate (in g/s) was derived. It was assumed that 5% of the plant was from FLRS and meets the emission limits applicable in 2007. The exception was the plant at the CDP. Here it was assumed that all vehicles and plant associated with FLRS meet the 2007 limits.

12.51 Emissions were modelled for the five phases of the operation of the mine (known as dispositions). For each stage the Disposition Plans (see Drawings MA/NL/PA/004 to 008) were reproduced within ADMS. These plans provide a snapshot of working activities for each phase of the operation of the mine.

12.52 The model used hourly sequential meteorological data from the Met Office weather station at St Athan for five years (2007 to 2011). MTAN2 requires the use of data from a Met Office station (MTAN2 Appendix K), and this station was chosen as it is the closest weather station with all the data required for the dispersion model. However, it is not ideal as it is located close to the Bristol Channel and wind direction and speed will be influenced by the channel, and therefore will not be fully representative of the wind conditions at Nant Llesg. Certain metrological parameters are also measured at the CDP, again consistent with the advice in MTAN2 Appendix K regarding the installation of an on-site weather station. To provide a more realistic meteorological data set for the modelling the St Athan wind data (speed and direction) was supplemented by the CDP data. Both sets of data have been used in the modelling. The number of 'wet days' is similar between St Athan and CDP and therefore the rain data was not replaced. The highest predicted concentrations and dust deposition for each modelled receptor were used in the assessment. Depending on the location of the receptor with respect to site operations, the 'worst meteorological' year differed. The CDP data for 2008 was incomplete and therefore only four years of data from this site were used. The wind roses for the St Athan and CDP are shown in Drawing MA/NL/ES/12/004.

12.53 The model incorporated the changing topography of the site as the phases of the project progress including the void and overburden mounds for each of the five key stages of the project.

12.54 For predicting the PM_{10} and NO_2 concentrations hourly data from Twynyrodyn (PM_{10}) and the Cwmbran AURN (NOx and ozone) monitoring stations were used. These are the nearest urban background monitoring sites with the relevant data. The chemistry module within ADMS 5 was used to estimate the NO_2 concentrations. This was done to enable the 1-hour (NO_2) and 24-hour (PM_{10}) concentrations to be modelled. For $PM_{2.5}$ the 2012 annual mean concentration from Upper Rhymney School was added to the model output to provide the total concentrations. Data from this monitoring station was used because it is closer to Defra's predicted background concentration and is higher than the annual mean $PM_{2.5}$ concentrations measured atTwynyrodyn School.

12.55 There is little measured baseline mass based dust deposition data available, and therefore it was not possible to include the contribution from other sources in the area.

12.56 The dispersion modelling incorporated assumptions regarding the efficacy of water suppression in mitigating dust, PM_{10} and $PM_{2.5}$ emissions. Quantification of the impact of all dust suppression techniques used by Miller Argent is not available, although there is evidence of their effectiveness both from visual observations of operations and from the minimal number of complaints at FLRS. For the purposes of the modelling it was assumed that mitigation measures will result in a 50% reduction in the emissions from the following sources.

- Loading and unloading of coal trucks
- Active coal stockpiles
- Loading of coal onto train wagons
- Drilling
- Coal Processing

12.57 Miller Argent use ECOLOGY Srl Fog Cannons® to suppress dust. These machines emit a powerful jet of fine water droplets. They rotate up to 330°, and can cover a very large area. The water drops capture the solid dust particles in the air and bring them down to the ground by gravity. It also wets the surface of the ground providing a protective layer.

12.58 The Fog Cannons® power supply and water feeder tank are mounted on a mobile unit enabling access across the site. Miller Argent was the first UK mining company to use Fog Cannons® in this manner.

12.59 Tests undertaken at the coal stockpiles of an ENEL power station in Brindisi, Italy, suggest that a single Fog Cannon® can reduce emissions by 66%. During the test the Fog Cannon® was not ideally located for dust suppression due to operational constraints. The Fog Cannon® operates best when upwind and above dust sources. The suppliers believe that with careful design and use the dust mitigation could be greater than 90%. In the modelling it was assumed that they reduce PM emissions from bulldozing and overburden loading and unloading by 75%.

12.60 Measured moisture content of the dust collected from FLRS unpaved roads was used to determine the efficacy of the water dust suppression to reduce fugitive dust emissions from the haul routes at the Nant Llesg Surface Mine, using data provided in AP42 (USEPA, 2012). This showed that dust emissions would be reduced by 95%, and therefore this mitigation factor was used in the model.

12.61 No mitigation was assumed for the windblown emissions from the overburden mound due to activity on the mound during most dispositions. There is a period of several years in Disposition 3 after all the overburden has been deposited and before its removal to restore the mine when the mound will be seeded to suppress windblown dust emissions. However, it was assumed that wind erosion will occur in all Dispositions including Disposition 3. However, due to the long period that the visual and acoustic screening bund will remain seeded and undisturbed, no wind erosion from the bund was assumed until it is removed in Disposition 5. Wind erosion was taken into account in the model that included the construction of the mitigation bund but by the end of Disposition 1, the mitigation bund will be well vegetated and there will be minimal windblown dust emissions from the mitigation bund. Therefore the models of the end of Disposition 1 onwards exclude wind erosion from the mitigation bund.

12.62 PM_{10}, $PM_{2.5}$, and NO_2, concentrations and dust deposition were predicted at the receptors shown in Drawing MA/NL/ES/12/003 and listed below. The receptors are mainly dwellings, but also include commercial receptors in Rhymney and ecological receptors on Tair Carreg Moor SINC.

12.63 Residential receptors modelled (see Drawing MA/NL/ES/12/003):

- Cwm Nant (1)
- Lower Row, Bute Town (2)
- The Rhymney House, Llechryd (3)
- Sand Crest Lodge, Rhymney (4)
- 26 Glan Yr Afon, Rhymney (5)
- 3, Old Brewery Lane, Rhymney (6)
- Valletta Lodge, Hill Road, Pontlottyn (7)
- Bali Hai, Bryhyfryd, Pontlottyn (8)

- 72 Pontlottyn Road, Fochriw (9)
- Cae Glas, Fochriw (10)
- Ty Nazareth, Guest Street, Fochriw (11)
- Blaen-Carno Farmhouse (12)
- Gypsy Castle (13)

12.64 Commercial receptors modelled (see Drawing MA/NL/ES/12/003):

- Head of the Valleys Industrial Estate A (north) (14)
- Head of the Valleys Industrial Estate B (south) (15)
- Capital Valley Eco Park (16)

12.65 Ecological receptors modelled (see Drawing MA/NL/ES/12/003):

- Tair Carreg Moor SINC (north) (17)
- Tair Carreg Moor SINC (south) (18)

12.66 The northern SINC receptor was chosen because of its proximity to the excavation area. The southern SINC receptor was chosen to take account of the contribution of emissions from the coal trucks travelling between the CDP and Nant Llesg to NOx concentrations and nitrogen and acid deposition close to the junction of Fochriw Road and the Bogey Road. This is the worst case location with respect to these pollutants due to it being adjacent to the roads. The nitrogen and acid deposition was estimated using the methodology in the Design Manual for Roads and Bridges (DMRB) (Highways Agency, 2007) as described in the Appendix MA/NL/ES/A12/002.

12.67 The dust deposition at the southern SINC receptor is also likely to be broadly representative of the dust deposition experienced close to the CDP on Cefn Gelligaer SINC.

12.68 The potential impacts of dust deposition on the four SACs located approximately 10 km from the site, (to inform the Habitats Regulation Assessment), were assessed qualitatively drawing on the results of the dust deposition modelling.

Impact of the Cwmbargoed Disposal Point

12.69 A number of potential dust generating activities are currently undertaken at the CDP associated with the handling and processing of coal being delivered from the nearby FLRS. Only the southern part of the CDP is within 1 km of a residential property, the recommended assessment distance (Department of Health, 1999). Within this area the main sources of dust are loading of the trains, use of front end loaders, crushing and screening of coal and wind erosion of the coal stockpiles. These sources, as well as the exhaust emissions from the machinery and the trucks bringing the coal to the CDP were included in the baseline dispersion model.

12.70 A standalone planning application has been submitted to CCBC for the new coal washing plant. As that application is yet to be determined, proposals for the installation of the same plant have been included in this application. Proposals are also included for its use to process coals from both the Nant Llesg and Ffos-y-fran mines, together with the provision of a new water recycling

facility to support the increase in coal processing. The existing CDP operations would continue, although it is envisaged that as a result of introducing the new plant there is likely to be a reduction in the tonnage of coal that would need to be crushed and screened through the existing plant. The quantities are difficult to predict, so for the purpose of the assessment the worst case scenario has been modelled, that is assuming that the existing plant continues to operate at its current level of production in conjunction with the new plant.

12.71 There is some uncertainty regarding the emissions from the existing crushing and screening plant. No emission factors for these processes at surface coal mines is available within AP42, the UK or EU equivalents (National Atmospheric Emission Inventory and EMEP/CORINAIR Atmospheric Emission Inventory Guidebook). In the absence of directly applicable emission factors it was considered more appropriate to use emission factors for processing coal in other industries, than to ignore these emissions or to use emission factors for other minerals. The total suspended particles (TSP) emission factor for coal processing in the coke industry was used. There are no separate factors for PM_{10} and $PM_{2.5.}$ The TSP emission factor used is likely to overestimate the emissions of PM_{10} and $PM_{2.5}$ as the coke industry uses smaller sized coal particles (0.15 to 3.2mm) than that produced at the CDP (up to 50mm). Further information is provided in Appendix MA/NL/ES/A12/00.

12.72 The new coal processing plant, which would include the crushing and screening of coal, will be located within a building at the CDP. All external conveyors will be covered; and transfer chutes enclosed and fitted with dust suppression sprays. This plant is not considered to be a significant source of dust. The only potential source of dust emission is the loading of the crushing plant. The building housing the feed hopper will be closed on three sides, but left open on one side to allow the front end loaders access to input coal to the plant. Water sprays will be mounted above the coal loading area to supress dust emissions. Water spraying is recognised as an effective means to suppress dust and therefore there will be little fugitive dust emissions, and minimal escape of dust from the feed hopper building. Therefore it was not included in the model. All other sources were included in the model.

12.73 The final decommissioning and restoration of the CDP was assessed qualitatively.

ADMS Model Verification

12.74 To provide some confidence in the ADMS model the predicted baseline annual mean concentrations of PM_{10} and $PM_{2.5,}$ and the mass of dust deposited were compared with monitored data. Although this does not allow the robustness of the model to predict ambient air quality due to emissions from a deep surface mine to be assessed, it does provide information on the ability of the model to predict concentrations and dust deposition due to the operations at the CDP, which is an important source of airborne particulate matter, particularly for receptors in Fochriw. The available PM_{10} monitoring data is for 2012, which was compared with the worst case modelled data using meteorological data from 2007 to 2011, and therefore the comparison can only be indicative. The PM_{10} data from Fochriw is from May – December 2012 and it may underestimate the number of days with concentrations greater than 50µg/m^3 during the calendar year, because there is less than one year's data. The monitoring station is approximately 50m from the closest receptor modelled (72 Pontlottyn Road). The dust deposition data was collected at Fochriw School.

12.75 No comparison is provided for the annual mean $PM_{2.5}$ data because the predicted concentrations are dominated by the background concentration used, which comes from Upper Rhymney School.

12.76 The comparison is presented in Table 12.3. It should be noted that it is not expected that the modelled and measured data will be exactly the same, but it gives an indication as to whether or not the data are similar, and whether the model significantly over or under predicts.

Table 12.3 Comparison of Baseline Modelled and Measured Data

Monitoring Site		Maximum Annual Mean PM_{10} ($\mu g/m^3$)	Maximum N° days PM_{10} > 50 $\mu g/m^3$	Maximum Dust Deposition ($mg/m^{2/}day$)
Fochriw*	Monitored	11	0	56/37**
	Modelled	17	5	50
Upper Rhymney School	Monitored	16	1	26
	Modelled	19	2	6/8**

Notes: *The dust deposition monitored data is from Fochriw School; the PM_{10} data is from the CCBC monitoring station located outside 37 Pontlottyn Road. The modelled data is from Fochriw School and 72 Pontlottyn Road (approximately 50m from the PM_{10} monitoring station). Further information on the monitoring is provided in the text. ** St Athan/CDP data.

12.77 At Upper Rhymney School the maximum modelled baseline annual mean PM_{10} concentration was approximately 20% higher than the 2012 measured data, while at Fochriw it was about 55% higher. There is year to year variation in monitoring data due to the weather, as illustrated by the PM_{10} data from Twynyrodyn School in Table 12.4 (see Baseline Environment section of this chapter). 2012 generally had lower than average concentrations. The Fochriw concentration was lower than at Rhymney which is to be expected as Fochriw is a small village while Rhymney is a small town with more traffic and other emissions.

12.78 Modelling the number of days with PM_{10} concentrations greater than 50$\mu g/m^3$ is more difficult than modelling the annual mean concentration, because it is very dependent on the weather during a relatively small number of days. The maximum modelled number of days is greater than measured at both locations. Again this may be due to comparing the worst case model results with the 2012 monitored data. However, it seems unlikely that Fochriw would have as many as 5 days with concentrations above 50$\mu g/m^3$ when there were only 2 measured at Twynyrodyn School and one at Upper Rhymney School. High concentrations often occur at the same time at many monitoring stations in an area due to the regional influence on ambient PM_{10} concentrations.

12.79 In summary, the model appears to slightly overestimate the impact of the emissions from the CDP on the baseline concentrations of PM_{10} and $PM_{2.5}$ in Fochriw and Rhymney. The impact appears greater at Fochriw where emissions from the CDP activities will have a greater impact than at Rhymney, due to its closer location to the CDP.

12.80 For dust deposition it is more difficult to directly compare the modelled and measured data, as the amount of dust collected on the DustDisc is too small to measure for the vast majority of samples. Using a locally derived relationship between %EAC per sampling interval and mg/m^2 per sampling interval suggests that the maximum daily dust deposition since sampling commenced at Upper Rhymney School was 26 mg/m^2/day compared with predicted values of 8 and 6 mg/m^2/day This suggests firstly that the CDP operations contribute little to the dust deposition in Rhymney and secondly that there is likely to be another source of dust. The six weeks with the highest dust deposition occurred during consecutive weeks. This is very unusual as the weather conditions in Wales are highly variable and very unlikely to have remained stable for six weeks. This strongly suggests a short term local source such as demolition or construction activity taking place near the sampler. The next highest dust deposition was 9 mg/m^2/day which occurred some months later. This is similar to the modelled data and there is confidence that the model does not under predict dust deposition, notwithstanding the results of the comparison as a result.

12.81 At Fochriw School the highest estimated dust deposition from the DustDisc data was 56 mg/m^2/day compared to the highest predicted values of 50mg/m^2/day. The measured data is similar to that modelled using the St Athan meteorological data, again suggesting confidence in the model. However, using the CDP meteorological dataset, which is considered to be more realistic than the St Athan meteorological dataset, the highest predicted value during the baseline was 37 mg/m^2/day. This is significantly lower than that measured. Analysis of when the highest concentrations occurred showed no pattern. Unlike the Upper Rhymney School data the highest dust deposition samples from Fochriw School did not occur during consecutive sampling periods. At Fochriw School the three highest dust deposition measurements were 56, 50 and 24 mg/m^2/day. The modelled dust deposition lies between the second and third highest measured dust deposition. The directional dust flux measurements from Fochriw School shows that during the week with the highest dust deposited over half the dust flux collected (measured as %EAC) came from the south east, i.e. a source other than the CDP. For the second highest measured dust deposition sample nearly half the dust came from between north west and north, again not from the CDP. For the third highest dust deposition the dust flux data shows that two thirds came from the approximate direction of the CDP. As the baseline model only includes emission sources within the CDP, this suggests that the model is over predicting dust deposition. This over prediction is greater when using the St Athan meteorological dataset, but also occurs with the CDP meteorological dataset.

12.82 The average dust deposition measured at Fochriw was 5 mg/m^2/day compared to the 12 to 14 mg/m^2/day modelled suggesting that the model typically over estimates the dust deposition.

12.83 In summary, the dust deposition data suggests that the model fairly well represents the worst case baseline conditions in Rhymney where the current contribution to dust deposition is small, but that there can be periods of high dust deposition due to local sources such as demolition and construction, which cannot be account for in the model. In Fochriw, there also seem to be other sources of dust deposition. However the model appears to over-estimate the contribution of the CDP to dust deposition at Fochriw School.

Impact of traffic and railway

12.84 Even though there are low levels of traffic associated with the mine, its impact on the Tair Carreg Moor SINC was modelled using the ADMS-Roads dispersion model (version 3.1) due to the SINC's sensitivity with respect to nitrogen (N) and acid deposition. Defra's emission factor toolkit (version 5.2), for estimating road transport emissions in England, Scotland, Wales and Northern Ireland, was used to calculate NO_x emissions for input into the ADMS-Roads model to estimate concentrations of NO_2 and nitrogen and acid deposition at the roadside, i.e. the point of maximum impact.

12.85 The ADMS-Roads dispersion model was also used to estimate the impact of the NOx exhaust emissions from the coal train locomotives on local NO_2 concentrations at several residential receptors. The emission factor for the type 666 locomotive typically deployed on this rail route, was used (Department for Transport, 2012). Concentrations of NO_2 were predicted for the following receptors in Bedlinog which are the closest to the railway line from CDP towards Ystrad Mynach (see Drawing MA/NL/ES/12/003):

- 28 Bedw Road, Bedlinog (A)
- 13 Moriah Street, Bedlinog (B)
- 18 Edwards Terrace, Bedlinog (C)
- 11 Station Terrace, Bedlinog (D)
- High Street (where it crosses railway), Bedlinog (E)

12.86 To assess the impact of any dust being released from the train wagons the dust flux was measured using a DustScan sampler on either side of the railway line.

Technical Limitations

12.87 MTAN2 (Appendix K) requires the applicant to "use computer-modelling techniques to assess how nuisance dust could disperse from a site", and therefore this approach has been used for this assessment. However, there are important limitations of the use of dispersion models for deep surface mines. In a comparison of modelled and measured dust deposition it was estimated that a dispersion model can predict annual mean deposition within $\pm$ 40% for 70% to 80% of the deposition gauges, but are much poorer at predicting short term averages (Environment Australia, 1998). Commonly used dispersion models have difficulty reproducing the complex wind patterns within and out of a mine. There is some evidence that dispersion models tend to over-estimate the concentrations of dust from surface mines (Mineral Industry Research Organisation, 2011).

12.88 MTAN2 (paragraph 145) also strongly recommends the use of fugitive emission factors developed for surface coal mines in the Western part of the USA where the climate is very different from South Wales, being typically drier, and therefore dustier. This limitation is acknowledged in MTAN2 (paragraph 146).

12.89 The section on ADMS model verification earlier in this chapter suggests that using the US EPA emission factors within ADMS 5 results in an over-estimate of PM_{10} and $PM_{2.5}$ concentrations at Fochriw and Upper Rhymney School.

12.90 Dust measurements are dependent on the sampler used, in particular its collection efficiency for the size of particle of interest. The dust deposition modelling results have been assessed against the MTAN2 criteria of 80mg/m^2/day as a weekly average (MTAN2 paragraph 155). This is a custom and practice threshold used to assess darker dust, such as coal, developed from data collected using a dust deposition gauge. The majority of the dust generated from a surface mine is overburden (Department of Health, 1999) and therefore will be a lighter colour than coal. The model does not differentiate between dark and light coloured dust.

12.91 The modelled dust deposition uses total suspended particle (TSP) emission factors developed from ambient air measurements at 12 surface coal mines in Western USA, measured using very different sampling equipment (i.e. a high volume air sampler not a deposition gauge). The samplers measure the mass of dust in a defined volume of air, not the mass of dust deposited

on a horizontal surface. The modelling estimates the concentration of particles in the air and then calculates the deposition to estimate the mass of dust deposited at different locations. The collection efficiency of deposition gauges are likely to be different and potentially significantly lower than high volume air samplers. The dispersion modelling methodology recommended by MTAN2 means that a modelled dust deposition of 80 mg/m^2/day (averaged over a week) is likely to be more stringent than the same dust deposition measured using a deposition gauge. That is the predicted dust deposition is likely to over-estimate what is likely to be actually measured by a deposition gauge.

12.92 Defra model the background concentrations over a 1 km by 1 km grid covering the whole of Wales. Data is provided of annual mean background concentrations from 2010 to 2030, and shows that air quality is predicted to improve over time. The Nant Llesg modelling uses hourly monitoring data for 2011 to define the background concentrations of PM_{10} and NOx, and annual mean monitoring data for 2012 for $PM_{2.5}$. No improvement in the background concentrations in the future years was assumed. As work on the project will commence in 2014, at the earliest, and the operational phase will continue for 14 years the predicted concentrations from the Nant Llesg Surface Mine are likely to be over-estimated.

12.93 The dust deposition modelling of the impacts of the scheme do not take account of dust emissions from sources other than those associated with Miller Argent (South Wales) Ltd's operations at the CDP. There will be other sources of dust such as due to demolition, construction, and agricultural activities in or near to local communities but these are very difficult to include in the modelling because they are often short term activities which could occur close to any of the receptors.

Baseline Environment

Air Quality Monitoring

12.94 The PM_{10} and $PM_{2.5}$ concentrations at Twynyrodyn Community School in Merthyr Tydfil, approximately 3km to the west of the Nant Llesg site, are shown in Table 12.4.

Table 12.4: Monitored PM_{10} and $PM_{2.5}$ Concentrations at Twynyrodyn Primary School

Monitoring Site	Pollutant	Objective	Year					
			2007	2008	2009	2010	2011	2012
Twynyrodyn Community School (Suburban)	PM_{10}	Annual Mean (µg/m^3)	16	13	14	14	16	13
		No. Days > 50 µg/m^3	2	2	5	5	8	2
	$PM_{2.5}$	Annual Mean (µg/m^3)	8	7	6	6	6	6

Monitoring Site	Pollutant	Objective	Year					
			2007	2008	2009	2010	2011	2012

Notes:

PM_{10} measurements adjusted using the volatile correction method

The Air Quality Objectives and the EU indicative limit value are discussed later in this chapter under 'Assessment Criteria and Assignment of Significance'.

Air Quality Objectives:

PM_{10} annual mean 40 $\mu g/m^3$; up to 35 days with concentrations greater than 50 $\mu g/m^3$; permitted.

$PM_{2.5}$ annual mean 25 $\mu g/m^3$

EU indicative limit value:

$PM_{2.5}$ annual mean 20 $\mu g/m^3$ to be achieved by 2020

12.95 The Twynyrodyn Community School monitoring shows PM_{10} and $PM_{2.5}$ concentrations are significantly lower than the air quality objectives (see Table 12.15 in Assessment Criteria and Assignment of Significance section of this chapter) and the indicative EU limit value for $PM_{2.5}$.

12.96 PM_{10} and $PM_{2.5}$ concentrations have been measured at Upper Rhymney Primary School since November 2011, using a Beta Attenuation Monitor (BAM). The monitoring results are shown in Table 12.5. The data capture over this period was 72% for PM_{10} and 70% for $PM_{2.5}$. These values are below Defra's data capture requirements, and therefore there is some uncertainty regarding this data. However, as it is similar to the annual mean concentrations measured at Twynyrodyn School in Merthyr Tydfil it is not considered likely that the baseline annual mean concentrations will be significantly different to that reported. However, the number of days greater than 50 $\mu g/m^3$ may be higher as there could have been pollution events when the instruments were off-line.

Table 12.5: Monitored PM_{10} and $PM_{2.5}$ Concentrations (µg/m^3) at Rhymney and Fochriw

Monitoring Site	Pollutant	Objective	2012
Upper Rhymney School (Suburban)	PM_{10}	Annual Mean (µg/m^3)	16
		No. Days > 50 µg/m^3	1
	$PM_{2.5}$	Annual Mean (µg/m^3)	9
Pontlottyn Road Fochriw*	PM_{10}	Annual Mean (µg/m^3)	11
		No. Days > 50 µg/m^3	0
	$PM_{2.5}$	Annual Mean (µg/m^3)	9

Note: * Data from CCBC's Fochriw monitoring station for 4th May to 31st December 2012.

Air Quality Objectives:

PM_{10} annual mean 40 µg/m^3; up to 35 days with concentrations greater than 50 µg/m^3; permitted.

$PM_{2.5}$ annual mean 25 µg/m^3

EU indicative limit value:

$PM_{2.5}$ annual mean 20 µg/m^3 to be achieved by 2020

12.97 Table 12.5 also show the PM data from CCBC's PM_{10} and $PM_{2.5}$ monitoring site outside 37 Pontlottyn Road, Fochriw. Ratified data was provided by CCBC for the period from 4th May to 31st December 2012. Local Air Quality Management Technical Guidance (Defra et al, 2009) shows that six months PM_{10} monitoring, that commences in May is likely to under-estimate the annual mean concentrations by only a few per cent. Data collected over eight months is likely to be very similar to the annual mean concentrations. These data were unusually low, probably because of the poor weather, and have therefore not been used in the baseline model and do not affect the conclusions of the assessment.

12.98 MTCBC and CCBC monitor annual mean NO_2 concentrations using passive diffusion tubes. A summary of the monitoring results from tubes located within approximately 3.5 km of the site are provided in Table 12.6. The location of the diffusion tubes are shown in Drawing MA/NL/ES/12/002.

12.99 CCBC measured NO_2 concentrations in the High Street, Rhymney until 2009, when monitoring ceased due to the very low concentrations measured (18 µg/m^3 in 2009). In June and July 2011 NO_2 diffusion tube monitoring by CCBC commenced in 34 Pontlottyn Road, Fochriw and Ger-y-Nant, Llechryd respectively.

Table 12.6: Diffusion Tube Annual Mean NO_2 Concentrations (µg/m^3)

Site ID	Site Name	Classification	Distance From Site (km)	Year			
				2009	2010	2011	2012
CCBC 62	Ger-y-Nant, Llechryd	Background	0.7	-	-	14*	15
CCBC 63	Pontlottyn Road, Fochriw	Background	0.4	-	-	10*	10
CCBC 28	Parc Cwm Darren, Deri	Background	2.2	11	12	12	11
MTCBC - 25	Upper Dowlais	Roadside	3.3	21	27	25	-
MTCBC – 29F	Mardy Street, Mount View	Roadside	2.5	-	26	23	-
MTCBC - 32	46 Victoria St, Dowlais	Kerbside	2.5	-	29	26	-

Notes: CCBC data not bias adjusted. * 6 months data.

Air Quality Objective: Annual mean 40 µg/m^3

See Drawing MA/NL/ES/12/002 for monitoring locations

12.100 The diffusion tube monitoring results show that current annual mean NO_2 concentrations in the vicinity of the site are well below the air quality objective. There is no automatic monitoring in the locality for comparison against the short term NO_2 objective. However, it is considered unlikely that this objective will be exceeded where the annual mean is less than approximately 60 µg/m^3 (Defra et al, 2009).

12.101 Defra's estimated average background concentrations for NO_x, NO_2, PM_{10} and $PM_{2.5}$ for the grid squares covering the Site are provided in Table 12.7.

Table 12.7: 2010 Annual Mean Background Concentrations (µg/m^3)

Grid Reference	NO_x	NO_2	PM_{10}	$PM_{2.5}$
310500, 208500	11.7	15.8	12.4	8.9
309500, 208500	11.6	15.5	12.5	9.1
310500, 207500	13.2	18.1	12.8	9.3
309500, 207500	10.2	13.6	12	8.6
Average	11.7	15.8	12.4	9.0
Source: Defra (2012)				

12.102 All the available data indicate that background concentrations of NO_2, PM_{10} and $PM_{2.5}$ are well below the Environmental Assessment Levels (EALs) used in this assessment and presented in the section on Assessment Criteria and Assignment of Significance.

Dust Flux Measurements

12.103 Table 12.8 shows the baseline dust flux data from when sampling commenced (see Table 12.1) until the middle of April 2013. The data are obtained over 15 degree sectors at each sampling location, thus there are 24 sectors per sample. The table summarises the dust flux data by setting out the frequency of occurrence of the risk categories shown in Table 12.2.

Table 12.8: Baseline Dust flux Measurements

Sampling Site	Percentage in Each Dust Complaint Risk Category				
	Very Low	Low	Medium	High	Very High
Upper Rhymney Primary School	>99%	<1%	<1%	0%	0%
Heads of the Valley Industrial Estate	98%	<1%	<1%	1%	0%
Bryn Awel Primary School	100%	0%	0%	0%	0%
Nant Llesg (within site, close to the eastern boundary)	>99%	<1%	0%	0%	0%
Trecatti (within Nant Llesg site, opposite the Landfill access road)	>86%	4%	3%	6%	<1%
Fochriw School	>99	<1%	<1%	0%	0%
Fochriw Road (close to junction with South Tunnel Road)	>86%	4%	4%	5%	1%
Railway – eastern side	100%	0%	0%	0%	0%
Railway – western side	100%	0%	0%	0%	0%
Bryn Caerau	>99%	<1%	<1%	<1%	0%

Notes: See Table 12.2 for definition of risk categories

Each sample is divided into 24 x 15^{o} sectors to measure the direction of travel of the dust. The percentage in the table refers to the number of 15^{o} sectors in each risk category compared to the total number of 15^{o} sectors sampled.

12.104 This data suggests that the existing CDP operations have not resulted in significant dust impacts at the sampling location at Fochriw School. More than 99% of the DustScan data were in 'Very Low' category.

12.105 The dust flux data shows that the highest risk of dust complaints occurs on Fochriw Road and opposite to the Trecatti Landfill site access, suggesting that both the landfill and CDP could be sources of dust locally. However, there are no residential receptors nearby, and therefore it is unlikely there will be complaints.

12.106 Some of the dust measured at the Fochriw Road sampler is likely to have come from cars using the unsurfaced track leading to Rhas Las Pond, which is about 60m distance. The DustScan data indicates that some of the high and very high risk of dust complaints samples came from the north, through east to south. Any mud on vehicle wheels from the unsurfaced track would be deposited on Fochriw Road and be re-suspended by other vehicles when dry, adding to the dust at this sampler, and therefore some of the dust from other directions may be indirectly due to the use to this track.

12.107 There are dwellings within Fochriw closer to the CDP than the School where the sampler is located and it has been considered whether there could have been significantly more dust deposited at these dwellings. On balance, it is not considered that this is the case since Miller Argent's complaints data does not support it. There have been only 3 verified dust complaints (i.e. from named individuals) from Fochriw residents from 2007 to the end of October 2012.

12.108 The DustScan samples from either side of the railway line collected over approximately one year (April 2012 to April 2013) show a very low potential for dust annoyance, suggesting that little coal dust escapes from the coal wagons. This is also supported by the lack of complaints over dust emission from the coal trains.

12.109 Both primary schools in Rhymney experienced very low levels of dust during the sampling period of approximately 17 months.

12.110 The Heads of the Valley Industrial Estate has experienced periods with high dust levels on occasions when, if this was a residential area, complaints might be expected. During these periods the dust came from the east through to the south and therefore most likely from a source within Rhymney.

12.111 To the south of the CDP, close to Bryn Caerau farmhouse, there were very occasional dust events resulting in a medium or risk of dust complaints. However no complaints were made to Miller Argent during these periods.

Modelled Baseline

12.112 The results of the baseline modelling of the current emissions from the CDP are shown in Tables 12.9 to 12.12.Table 12.9 shows that all the air quality objectives and the indicative EU limit value for PM2.5 are achieved by a wide margin in the baseline. The data presented is the highest concentration predicted using either the St Athan or the CDP meteorological dataset. It should be noted that the annual mean and 24-hour objectives do not apply at workplaces. The 1-hour objective only applies where the public can reasonably be expected to be exposed to ambient air above the objective value for more than 18 hours in a calendar year, which is not the case here. Table 12.10 shows the predicted dust deposition. Predicted dust deposition for the two sets of meteorological data are presented:

- St Athan Met Office weather station data from 2007 to 2011 (St Athan data); and

- The St Athan data with the wind speed and direction replaced by the wind data from the CDP weather station (2007, 2009-2011) (CDP data)

12.113 The number of wet days measured at St Athan is similar to that measured at the CDP and Twynyrodyn School in Merthyr Tydfil, and therefore it was decided not to replace the rainfall data.

12.114 The St Athan data are presented because MTAN2 requires the use of data from a Met Office weather station. However given its location it is unlikely to be representative of the weather conditions in the area around the CDP, and the CDP data is considered to be more representative of the conditions in the area.

12.115 Where the mass of dust deposited is measured, MTAN2 requires mineral planning authorities to set a planning condition for a maximum 80mg/m^2/day as a weekly average. Compliance with such a planning condition would be assessed by monitoring and is not directly comparable with the modelled results (the dust collection efficiency varies with wind speed and type of sampler). However, to ensure that if such a planning condition were to be applied it could be complied with, the model results have been assessed against the MTAN2 criteria of 80mg/m^2/day. It should be noted that Miller Argent currently use samplers that measure dust soiling, not dust mass, which may be regarded as a better indicator of dust annoyance. MTAN2 also provides a criterion for a planning condition if directional dust soiling samplers (such as DustScan) are used (MTAN2 paragraph 154).

12.116 It should be noted that the MTAN2 limits appear to have been set for the protection of public amenity (MTNA2 paragraph 155) and therefore do not apply to commercial facilities, and that it applies to coal dust which is darker than the dust from overburden. The modelling does not distinguish between the coal and overburden dust.

12.117 The modelled dust deposition is the maximum daily deposition rate averaged over a week. Therefore it represents the worst week over several years. It is very dependent on the weather conditions during that week, and is not representative of the conditions that may be experienced the vast majority of the time. Therefore Table 12.10 also provides the predicted average weekly dust deposition over the five years for the St Athan data and four years for the CDP data, which will be the more typical deposition for the human receptors. The predicted dust deposition at most receptors is higher using the CDP data than the St Athan data. This is due to the differences in wind speed and direction as shown in the wind roses in Drawing MA.NL/ES/12/004

Table 12.9: Baseline - Predicted PM_{10}, $PM_{2.5}$ and NO_2 Concentrations

Receptor (number on) Drawing MA/NL/ES/12/003	PM_{10} Annual Average ($\mu g/m^3$)	PM_{10} N° days > 50 $\mu g/m^3$	$PM_{2.5}$ Annual Average ($\mu g/m^3$)	NO_2 Annual Average ($\mu g/m^3$)	NO_2 N° hours > 200 $\mu g/m^{3**}$
Residential Receptors					
Cwm Nant (1)	16.4	2	9.2	13.1	0
Lower Row, Bute Town (2)	16.3	2	9.1	13.1	0
The Rhymney House, Llechryd (3)	16.3	2	9.1	13.1	0
Sand Crest Lodge, Rhymney (4)	16.5	2	9.2	13.2	0
26 Glan Yr Afon, Rhymney (5)	16.6	2	9.3	13.2	0
3 Old Brewery Lane, Rhymney (6)	16.8	2	9.4	13.3	0
Valletta Lodge, Hill Road, Pontlottyn (7)	17.4	3	9.7	13.6	0
Bali Hai, Bryhyfryd (8)	17.5	3	9.7	13.6	0
72 Pontlottyn Road, Fochriw (9)	18.3	4	10.1	13.8	0
Cae Glas Fochriw (10)	19.2	6	10.6	13.9	0
Ty Nazareth, Guest Street Fochriw (11)	19.0	6	10.5	13.8	0
Blaen Carno Farmhouse (12)	16.2	2.	9.1	13.0	0
Gypsy Castle (13)	16.2	2.	9.1	13.0	0

Commercials Receptors					
Heads of Valley Industrial Estate (14)	16.8	2	9.4	13.3	0
Heads of Valley Industrial Estate (15)	17.1	3	9.5	13.4	0
Capital Valley Eco Park (16)	17.3	3	9.6	13.5	0

EALs as follows:

PM_{10} - annual mean 40 µg/m^3; 35 days per year permitted with PM_{10} greater than 50 µg/m^3

$PM_{2.5}$ - annual mean 20 µg/m^3

NO_2 - annual mean 40 µg/m^3, 18 hours per year permitted with NO_2 greater than 200 µg/m^3

These EALs apply to locations where the public may be exposed over the relevant averaging period. Therefore at the Heads of the Valley Industrial Estate and the Capital Valley Eco Park only the hourly NO_2 EAL applies where the public might reasonably be expected to be present.

Table 12.10: Baseline - Predicted Dust Deposition at Residential and Commercial Receptors

Receptor (number on Drawing MA/NL/ES/12/003)	Maximum daily dust deposition averaged over one week mg/m^2/day		Average daily dust deposition averaged over one week mg/m^2/day	
	St Athan	CDP	St Athan	CDP
Residential Receptors				
Cwm Nant (1)	4.3	7.3	0.7	1.4
Lower Row, Bute Town (2)	3.5	5.6	0.5	1.2
The Rhymney House, Llechryd (3)	3.5	5.8	0.5	1.2
Sand Crest Lodge, Rhymney (4)	5.9	9.4	0.9	2.0
26 Glan Yr Afon, Rhymney (5)	6.7	9.3	1.0	2.3
3 Old Brewery Lane, Rhymney (6)	8.7	11.3	1.3	2.9
Valletta Lodge, Hill Road, Pontlottyn (7)	23.4	22.5	7.6	5.6
Bali Hai, Bryhyfryd (8)	22.2	28.3	8.2	5.8
72 Pontlottyn Road, Fochriw (9)	32.4	40.6	11.6	8.5
Cae Glas Fochriw (10)	54.0	40.9	12.4	11.0
Ty Nazareth, Guest Street Fochriw (11)	46.3	35.5	10.8	9.8
Blaen Carno Farmhouse (12)	2.1	3.0	0.4	0.4
Gypsy Castle (13)	2.5	2.9	0.7	1.4

Receptor (number on Drawing MA/NL/ES/12/003)	Maximum daily dust deposition averaged over one week mg/m^2/day		Average daily dust deposition averaged over one week mg/m^2/day	
	St Athan	CDP	St Athan	CDP
Residential Receptors				
Commercial Receptors				
Heads of Valley Industrial Estate (14)	8.9	15.4	0.3	0.4
Heads of Valley Industrial Estate (15)	13.2	17.3	1.4	3.2
Capital Valley Eco Park (16)	19.6	24.0	2.0	4.4
EAL for protection of public amenity: 80 mg/m^2/day averaged over a week. St Athan data for 2007=2011; CDP data for 2007, 2009-2011				

12.118 Table 12.11 shows that the baseline daily NOx critical level and nitrogen deposition critical load were predicted to be exceeded at both ecological receptors. It should be noted that this is the worst case, as these receptors are on the boundary of the SINC and the road. Receptor 18 is at the junction between the Bogey Road and Fochriw Road, where higher concentrations are to be expected due to emissions from traffic on both roads, and at this receptor the annual mean NOx EAL is also predicted to be exceeded. As concentrations decline rapidly with distance from a road, only a small area of the SINC is likely to exceed the EALs. The acid deposition EAL is predicted to be achieved.

Table 12.11: Baseline - Predicted NOx Concentrations, Nitrogen and Acid Deposition on the Tair Carreg SINC

Receptor (Number on Drawing MA/NL/ES/12/003)	Annual mean NOx ($\mu g/m^3$)	Maximum Daily NO_x ($\mu g/m^3$)	N deposition (kgN//Ha/yr)	Acid deposition (K_{eq}/Ha/yr)
Tair Carreg Moor SINC (north) (17)	19.2	108	22.8	0.16
Tair Carreg Moor SINC (south) (18)	38.9	183	23.7	0.22
EALs: NOx annual mean 30 $\mu g/m^3$; daily NOx 75 $\mu g/m^3$ N deposition 5 kgN/Ha/yr (for acid grasslands) Acid Deposition critical load 1.42 K_{eq}/Ha/yr				

12.119 The predicted NOx concentrations and nitrogen and acid deposition are based on the monitored NO_2 concentration at the Cwmbran monitoring station in 2011. These concentrations are likely to be slightly higher than on the SINC and are anticipated to decline in the future. In reality, the annual mean NOx is unlikely to be exceeded throughout the life of the mine.

12.120 The baseline daily NOx and nitrogen deposition both exceed the EAL by a wide margin..

12.121 There are a number of different types of habitats in the SINCs. In this assessment the most sensitive habitat, acid grassland, has been used to assess the nitrogen deposition.

12.122 Whilst exceedence of a critical load or level is undesirable, exceedence it not generally the only or main reason a designated site may be in a poor condition. Other factors are often important. This is discussed further in the Ecology Chapter (Chapter 8) of this ES.

12.123 Table 12.12 shows the dust deposition on the ecological receptors. There is no accepted environmental assessment level (EAL) for dust deposition. The value used comes from the Highways Agency's Design Manual for Roads and Bridges (DMRB) for assessing the impact of dust during construction and is based on a literature review by Farmer (1993). There is insufficient evidence on the effect of overburden and coal deposition on local habitats, and therefore this EAL is considered to be indicative.

Table 12.12: Baseline - Dust Deposition on the Tair Carreg Moor SINC

Receptor (Number on Drawing MA/NL/ES/12/003)	Maximum daily dust deposition averaged over one week mg/m^2/day		Average daily dust deposition averaged over one week mg/m^2/day	
	St Athan	CDP	St Athan	CDP
Tair Carreg Moor SINC (north) (17)	19	15	3	2
Tair Carreg Moor SINC (south) (18)	1555	1809	467	782
Indicative EAL: 1,000 mg/m^2/day				

12.124 The indicative dust EAL is also exceeded in the baseline at the ecological receptor close to CDP (receptor 18). This high level of dust deposition close to the CDP is also seen in the DustScan data with some samples reaching the high and very high risk of dust complaints categories (see Fochriw Road data in Table 12.8). However, it should be noted that these high levels are very localised and occur infrequently. Sources other than the CDP are likely to contribute to the measured data.

12.124 According to the Highways Agency (2007) most species are affected by dust deposition at levels considerably higher than 1000 mg/m^2/day. Dust can have two types of effect on vegetation: physical and chemical. Any adverse effect due to physical processes, such as reduced photosynthesis or respiration and transpiration due to the deposition of dust, is naturally countered by the high level of rainfall experienced in this area. In this location any dust depositing on the leaves would be readily washed away by the frequent rain. Typically around 50% of days are wet days, as recorded by the rain gauge at the CDP. Furthermore, coal processing, storage and transport have been undertaken at the CDP for more than 50 years, well before the site was locally designated as a SINC. The vegetation is therefore more likely to reflect the chemical and physical regime over that period. It is therefore considered unlikely that these levels of dust deposition have had or will have a significant impact on the SINC.

12.125 The dust deposition on the Cefn Gelligaer SINC south of South Tunnel Road, close to the CDP, is likely to be similar to that at the southern Tair Carreg SINC receptor (18), with the dust deposition falling with distance from the CDP.

12.126 Further information on the impact of the baseline conditions on the SINCs is provided in the Ecology Chapter (Chapter 8) of this ES.

Data Limitations

12.127 There is relatively little data on local NO_2 concentrations in the study area, however the available data does show low concentrations at background locations in the area. No continuous NO_2 monitoring data is available, and therefore the assessment has had to draw on

the hourly data from the background monitoring station at Cwmbran. Concentrations are likely to be higher there than on the Tair Carreg SINC, but may be slightly lower than in parts of Rhymney very close to the main roads through the town (High Street/ Church Street/Upper High Street/Coronation Terrace, Queens Crescent /B4257).

12.128 Miller Argent has used DustScan to measure dust flux since 2006. This method offers a number of advantages over mass based deposition measurement techniques. Directional dust flux (the horizontal passage of dust past a point) measurement methods such as DustScan, have the advantage of being able to identify the direction of the source of the dust. This is because it directly measures the dust in the air from different directions between dust sources and receptors. Recently published research shows that it is more accurate than the British Standard (BS 1747:5) directional sampler (Datson et al, 2012). There are limitations to the use of wind data to infer the source of deposited dust, especially in areas of complex topography. In addition, DustScan samples are stored and can be re-examined and the dust characteristics analysed. This method is well recognised and accepted (e.g. in MTAN2). The DustScan samplers do not measure dust deposition or the mass of dust for comparison with the modelled data. The Nant Llesg DustScan samplers have been fitted with DustDisc which use horizontal sticky pads to measure dust soiling. Since the beginning of 2012 a soluble adhesive has been used to enable the mass of dust to be measured. However, most samples collected around Nant Llesg have insufficient dust to measure the mass. A locally derived correlation between %EAC and mass has been developed to enable the mass of dust deposited to be calculated from the %EAC on the DustDisc samples. At Fochriw and Upper Rhymney the modelled maximum dust deposition has been compared with the maximum sampled dust deposition ($mg/m^2/day$).

12.129 The amount of dust collected depends on the sampler and wind speed. The collection efficiency of DustDisc in comparison to the British Standard 1747: Part 1 deposit gauge is not known, however, it is thought to be about 75% of the efficiency of Frisbee gauges which are commonly used to measure the mass of dust deposited.

12.130 The modelled dust deposition may underestimate the baseline conditions if there are other significant sources occurring at the same time, such as local construction sites. Most dust sources will be short lived and localised. Therefore, it is considered likely that the most significant long term sources that impact on dust deposition at the modelled receptors have been included in the baseline assessment.

Seasonal Temporal Change

12.131 Monthly average PM_{10} and $PM_{2.5}$ data does not show any clear seasonal trends. However rainfall over the period 2007, 2009-2011, at the CDP was lowest in spring, followed by summer and autumn, with the highest rainfall in winter. This is broadly reflected in the peak 24-hour concentrations measured, with the highest PM_{10} concentrations occurring more frequently in drier seasons. For example, high 24-hour PM_{10} concentrations (i.e. above 50 $\mu g/m^3$) were measured on 10 occasions at Twynyrodyn Primary School over the five years 2007 to 2011, the frequency was greatest in spring (4 days), followed by summer (3 days) autumn (2 days) and winter (1 day). It should be noted that while rainfall is important for suppressing dust emissions (e.g. the re-suspension of dust deposited on roads), many other factors influence ambient PM_{10} and $PM_{2.5}$ concentrations including the changes in source strength, wind speed and direction, solar radiation, mixing depth. There is also a significant regional contribution to measured concentrations.

12.132 For NO_2 the seasonal trends are different with the highest monthly average concentrations tending to occur in winter when there are typically higher NOx emissions and less dispersion of pollution due to more frequent stable atmospheric conditions.

Medium and Long-term Temporal Change

12.133 The long term PM_{10} monitoring data from Twynyrodyn School suggests that there has been little change in annual mean concentrations since 2007 (0.2 µg/m^3 per year increase on average), despite FLRS commencing coal extraction during this period. It is therefore considered that FLRS does not make a significant impact on measured concentrations at this location, and that the year-to-year variability is mainly due to the weather conditions. Over the same period the annual mean $PM_{2.5}$ concentrations have declined by an average 0.4 µg/m^3 per year. Small improvements in $PM_{2.5}$ concentrations are expected as a result of the implementation of national and international policies to reduce direct emissions of particulate matter and the emissions of gases which form particles in the atmosphere.

12.134 There is insufficient local data to determine any trends in the NO_2 concentrations. In the past there have been significant reductions in NO_2 concentrations at most monitoring locations in the UK, largely due to the reduction in road traffic emissions. In recent years the forecast improvements in NO_2 concentrations have not been observed in monitoring data. Since around 2003 concentrations have remained more or less constant or have only declined slightly at many monitoring stations. However, rural stations saw, on average, a decline of ca. 1.4% per year in NO_2 concentrations between 2004 and 2009 (Carslaw et al, 2011). There is no reason to suspect that Fochriw and Rhymney have not followed this trend.

12.135 Improvements in background NO_2, PM_{10} and $PM_{2.5}$ are reflected in the background annual mean modelling undertaken by Defra, but have not been taken into account in this assessment, as measured background data for 2011 and 2012 was used.

12.136 The dust flux measurements do not show any clear medium or long-term trends.

Assessment Criteria and Assignment of Significance

Site Establishment Impacts

12.137 The significance of the impact of the Site Establishment and construction of the CDP water treatment facility was assessed using the Institute of Air Quality Management's (IAQM) '*Guidance on the Assessment of the Impacts of Construction on Air Quality and the Determination of their Significance'* S (IAQM, 2012). This defines the dust emission class based primarily on the size of the area being worked. This and the distance to the nearest human and ecological receptors are used to define the risk category as shown in Table 12.13.

Table 12.13: IAQM Dust Risk Categories for Site Establishment Activities

Distance to Nearest Receptor (m)*		Dust Emission Class		
Human	**Ecological**	**Large**	**Medium**	**Small**
<20	-	High Risk Site	High Risk Site	Medium Risk Site
20 - 50	-	High Risk Site	Medium Risk Site	Low Risk Site
50 - 100	<20	Medium Risk Site	Medium Risk Site	Low Risk Site
100 - 200	20 - 40	Medium Risk Site	Low Risk Site	Negligible
200 - 350	40 - 100	Low Risk Site	Low Risk Site	Negligible

* These distances are from the dust emission source. Where this is not known then the distance should be from the site boundary. The risk is based on the distance to the nearest receptor.

12.138 The dust risk category is used to define the level of mitigation required to minimise the dust impacts. Following the IAQM guidance, assuming appropriate mitigation is applied, the residual impact should be either minor adverse or negligible as shown in Table 12.14.

Table 12.14: Significance of Impacts for Each Activity with Mitigation

Sensitivity of Surrounding Area	Risk of Site Giving Rise to Dust Impacts		
	High	Medium	Low
Very High	Minor adverse	Minor adverse	Negligible
High	Minor adverse	Negligible	Negligible
Medium	Negligible	Negligible	Negligible
Low	Negligible	Negligible	Negligible

Operational impacts

12.139 The operational impacts on people were assessed against the air quality objectives for PM_{10} and NO_2 (see Table 12.15), the indicative EU limit value for $PM_{2.5}$ and the MTAN2 dust criteria using the Institute of Air Quality Management's (IAQM) significance criteria for operational impacts (IAQM, 2009) as described below.

12.140 The impacts on ecology were assessed against the Highways Agency indicative dust deposition criteria and the Centre for Ecology and Hydrology criteria for the protection of ecological receptors. The significance of these impacts was assessed by the project ecologists and is discussed in the Ecology Chapter (Chapter 8) of the ES.

12.141 Table 12.15 presents the national air quality objectives (AQOs) in the Air Quality Regulations (Wales) 2000.

Table 12.15: NO_2 and PM Objectives

Pollutant	Concentration	Measured As	Date to be achieved and maintained thereafter by
Nitrogen Dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times per year	1 hour mean	31 December 2005
	40 µg/m^3	Annual mean	31 December 2005
PM_{10}	50 µg/m^3 not to be exceeded more than 35 times per year	24 hour mean	31 December 2004
	40 µg/m^3	Annual mean	31 December 2004
$PM_{2.5}$	25 µg/m^3	Annual mean	2020
Source: The Air Quality Regulations (Wales) 2000			

12.142 The Air Quality Strategy (Defra et al, 2007) includes an annual mean air quality objective for $PM_{2.5}$ of 25 µg/m^3 to be achieved by 2020, and a target of 15% reduction in annual mean background concentrations between 2010 and 2020. The latter apply to urban background sites. These objectives are not included in the Air Quality (Wales) Regulations. EU Directive 2008/50/EC has a target value of 25 µg/m^3 to be achieved by 2010; a limit value of 25 µg/m^3 to be achieved by 2015; an indicative limit value of 20 µg/m^3 by 2020, and a similar exposure reduction target. In this assessment the value of 20 µg/m^3 as an annual mean has been used to assess the predicted $PM_{2.5}$ concentrations, as the operation of the mine will continue beyond 2020..

12.143 EU Directive 2008/50/EC also includes limit values for PM_{10} and NO_2. These are implemented in Wales by the Air Quality Standards (Wales) Regulations 2010. The limit values are the same as the air quality objectives, set out in Table 12.15, but the date the NO_2 objectives must be achieved is 2010. The UK Government applied for a time extension for the South Wales zone but this was rejected by the European Commission.

12.144 Where the mass of dust deposited is measured, MTAN2 requires mineral planning authorities to set a planning condition for a maximum 80mg/m^2/day as a weekly average (MTAN2 paragraph 155). This value has been used to assess the results of the modelling. It should be noted that this value was set for the protection of public amenity and therefore does not apply to commercial facilities and that it applies to coal dust which is darker than the dust from the overburden. The modelling does not distinguish between the coal and overburden dust.

12.145 The only assessment criteria for the deposition of dust on ecological sites currently available is that provided by the Highways Agency (2007). According to the Highways Agency, most species appear to be unaffected until dust deposition rates are at levels considerably higher

than 1000mg/m^2/day, and therefore this is regarded as an indicative EAL. As explained above local factors such as type of dust, rainfall and management practices should also be considered. Effects may first occur at much higher dust deposition, well in excess of 1000mg/m^2/day.

12.146 The impacts of vehicle exhaust emissions on the Tair Carreg Moor SINC were assessed against the NO_x critical levels, the nitrogen critical load and the acid critical load function for the site, available from the Centre for Ecology and Hydrology (see www.apis.ac.uk). For the acid critical load function the maximum nitrogen (CLmaxN) and sulphur (CLmaxS) and minimum nitrogen (CLminN) critical loads are taken into account. The Cefn Gelligaer SINC to the south of the application site boundary is unlikely to be affected by the vehicle exhaust emissions due to the distance for the main coal truck vehicle route.

12.147 The critical levels and loads for the site are:

- Annual mean NOx: 30 µg/m^3
- 24-hour NOx : 75 µg/m^3
- Nitrogen (N) deposition critical load (for acid grasslands): 5-10 kg/Ha/yr. In line with good practice 5 kg/Ha/yr was used
- CLmaxS: 0.56 k_{eq}S/Ha/yr; CLminN: 0.58 k_{eq}N/Ha/yr; CLmaxN: 1.14 (k_{eq}/ha/yr)

12.148 The air quality objectives, critical levels, critical loads and dust deposition assessment criteria have collectively been referred to as the environmental assessment levels (EALs) in this chapter.

12.149 The IAQM significance criteria are derived from the magnitude of the impact, i.e. the change in air quality or dust deposition (shown in Table 12.16) combined with the sensitivity of the receptor. This is defined as the absolute ambient concentration or dust deposition in relation to the environmental assessment level (EAL) (see Table 12.17).

Table 12.16: Descriptors for Magnitude of Changes for Human Receptors

Magnitude of Change	Percentage of EAL	Annual Mean PM_{10}/NO_2 (µm/m^3)	No of days PM_{10} > 50 µm/m^3	Annual mean $PM_{2.5}$ (µm/m^3)	Dust deposition (mg/m^2/ day)
Large	> 10%	> 4	> 4days	> 2.5	>8
Medium	5-10%	2-4	Increase 2-4	1.25-2.5	4-8
Small	1-5%	0.4-2	Increase 1-2	0.25-1.25	0.8-4
Imperceptible	<1%	>0.4	Increase <1	<0.25	<0.8

12.150 Where the change in ambient concentration or deposition is imperceptible, this is designated as no significant change.

Table 12.17: Air Quality Impact Descriptors

Absolute concentration in relation to EAL*	Magnitude of change		
	Large	Medium	Small
Above EAL with scheme	Major	Moderate	Minor
Just below EAL with scheme (i.e. within 90% of EAL)	Moderate	Moderate	Minor
Below EAL with scheme (i.e. 75-90% of EAL	Minor	Minor	Negligible
Well below EAL with scheme (i.e. <75% of EAL)	Minor	Negligible	Negligible
* Concentration/deposition with scheme where there is an adverse impact, and without scheme where there is a beneficial impact			

12.151 The matrix in Table 12.17 is used to determine the impacts at individual receptors.

12.152 The next step is to assess the overall significance of the air quality impacts. The assessment should take full account of the specific characteristics of the proposed development. The factors that are considered to be particularly important for the project include:

- Whether or not an exceedence of an objective or limit value is predicted to arise in the study area where none existed before or an exceedence area is substantially increased.
- The extent to which an objective or limit value is exceeded, e.g. an annual mean NO_2 of 41µg/m^3 should attract less significance than an annual mean of 51 µg/m^3.
- The duration, frequency and probability of any dust events. For example, if dust annoyance is likely to occur a few times a year over a period of a decade, this is likely to be a more significant impact than if dust annoyance occurs the same number of times per year, but only for one year.

12.153 No significance criteria have been assigned for the ecological receptors during the operation of the mine as this is discussed in the Ecology chapter.

12.154 The IAQM methodology determines the significance of impacts by considering the annual mean concentrations. It does not provide significance criteria for short term concentrations. As the annual mean NO_2 objective is in general more stringent than the 1-hour objective, this is not

considered to be an issue for assessment of NO_2. However, typically the 24-hour PM_{10} objective is more likely to be exceeded than the annual mean. Given the importance of this criterion Environmental Protection UK in their guidance on 'Development Control: Planning for Air Quality' (EPUK, 2010) has adapted the IAQM approach to define its significance, and the adapted approach has been used in this assessment. It should be noted that this results in a more stringent significance criterion than that used by the Environment Agency in its guidance for large industrial processes. That is, process contributions can be considered insignificant if the long term process contribution is less than 1% of the long term EAL and the short term process contribution is less than10% of the short term EAL (Environment Agency, 2012).

12.155 The adapted IAQM approach was used to define the significance of the dust deposition, which is also a short term criteria, and therefore the assessment is also more stringent than the Environment Agency's approach.

Decommissioning of the Cwmbargoed Disposal Point

12.156 The significance of the decommissioning of the CDP has been assessed using the same criteria as for the operational impacts. The IAQM '*Guidance on the Assessment of the Impacts of Construction on Air Quality and the Determination of their Significance*' provides assessment methodologies for both demolition and construction impacts.

Policy Context

12.157 This section provides a brief review of the relevant international, national and local legislation and policy.

International Legislation and Policy

12.158 EU Directive 2008/50/EC on ambient air quality and cleaner air for Europe sets out the ambient air quality limit values NO_2, PM_{10} and $PM_{2.5}$ and a critical level for NO_x. The Air Quality Standards (Wales) Regulations 2010 implements these requirements into Welsh legislation.

12.159 The Habitats Directive (92/43/EEC) requires any significant impacts of new developments, including the impacts of air pollution, on Natura 2000 sites to be assessed by the competent authority. This is implemented into Welsh legislation by the Conservation of Habitats and Species Regulations 2010.

Local Air Quality Management

12.160 Part IV of the Environment Act 1995 places a statutory duty on all local authorities to review existing air quality in their area. This process is known as Local Air Quality Management (LAQM). Where air quality objectives are not likely to be met the local authority must declare an Air Quality Management Area (AQMA) and develop an action plan in pursuit of the objectives. It also requires the Secretary of State to issue an Air Quality Strategy, which should be periodically reviewed.

12.161 The 2007 Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Defra et al, 2007) establishes the policy for ambient air quality in the UK. It includes the national Air Quality Objectives (AQOs) for the protection of human health and vegetation for 11 pollutants. Those AQOs included as part of Local Air Quality Management are prescribed in the Air Quality (Wales) Regulations 2000. Table 12.15 presents the AQOs for NO_2, PM_{10} and $PM_{2.5,}$ the key pollutants emitted from vehicles and mining plant. The AQO values for NO_2 and PM_{10} are the

same as the EU limit values although the compliance dates differs. The AQO values for $PM_{2.5}$ are different to the EU target and indicative limit values as described in the section on Assessment Criteria and Assignment of Significance

12.162 The AQOs apply to external air where there is relevant exposure to the public over the relevant averaging periods. The objectives do not apply in workplaces, inside buildings or where people are unlikely to be regularly exposed.

12.163 In 2008, CCBC declared an AQMA in Caerphilly Town Centre due to predicted exceedences of the NO_2 objective. However, Caerphilly Town Centre is approximately 20km from the Site.

12.164 Merthyr Tydfil County Borough Council (MTCBC) concluded that air quality within the borough complies with the AQOs, with the exception of an area located within Merthyr Tydfil Town Centre (approximately 4km from the site), where exceedences of the NO_2 objective have also been identified.

Planning Policies

12.165 The main planning guidance for the assessment of the air quality and dust impacts from surface coal mines is MTAN2. This sets out the methodology to be used and provides dust flux and dust deposition criteria for when the site is operational. It also provides 'best practice' advice for dust assessment and mitigation (MTAN2 Appendix K).

12.166 CCBC's Local Development Plan up to 2021 (adopted in 2010) contains policy SP6 which states: "Development proposals should contribute to creating sustainable places by having full regard to the context of the local, natural, historic and built environment and its special features through… inter alia…The incorporation of mitigation measures that improve and maintain air quality".

Key Parameters for Assessment

12.167 The assessment was largely based on the five Disposition Plans prepared by Miller Argent for the Nant Llesg Surface Mine. The development will be a continuous process and the works will progress from west to east, gradually moving towards Rhymney. Therefore each Disposition Plan represents the end of a stage in the development when the works is the furthest east and therefore closest to the main residential area.

12.168 The dispersion model predicts concentrations and dust deposition on a calendar year basis using meteorological data from 2007 and 2011. This is because the EALs are generally defined on an annual basis either as an annual mean concentration or a number of days or hours above a predetermined concentration permitted over a year.

12.169 The following have been modelled:

- Disposition 1 - Box Cut
- Disposition 2 - Maximum Void
- Disposition 3 - Interim Void
- Disposition 4 - End of Coaling

- Disposition 5 - Backfilling and Restoration

12.170 The Disposition Plans provide details of the site plant and vehicles that will be deployed in each working area and approximate positions of haul routes. These have been included in the modelling with the exception of 4 wheeled drive vehicles used by professional teams management, and visitors, and personnel carriers used to transport staff around the site, as these vehicles will contribute little to the overall emissions.

12.171 In the modelling of emissions from the CDP it was assumed that both FLRS (baseline) and the Nant Llesg Surface Mine operate at maximum capacity, i.e. produce 1 million and 0.75 million tonnes per year respectively. This is a worst case assumption.

12.172 Activities included in the Disposition Plans that last for significantly less than a year, or are not scheduled to occur in the modelled years, have not been included in the model, with the exception of the construction of the visual and acoustic screening bund, which is scheduled to take approximately four months in Disposition 1. This is because the assessment uses predicted concentrations and dust deposition over a calendar year.

12.173 The impact of the construction of the visual and acoustic screening bund was modelled separately from the rest of Disposition 1. This is because it will take place at the beginning of Disposition 1 when the coal extraction working area will be furthest from Rhymney, whereas Disposition 1 is modelled at the end when the works are closest to Rhymney. .

12.174 The results are presented for the worse case meteorological year. For some receptors and pollutants this is for the 'pure' St Athan data (i.e. without the inclusion of CDP wind data), which is likely to be less representative of the conditions over the Nant Llesg Surface Mine than the 'hybrid' data which includes the wind speed and direction data from the CDP.

12.175 The assumptions used in the modelling are described in more detail in Appendix MA/NL/ES/A12/002.

Mitigation Measures Adopted as Part of the Project

12.176 To protect the amenity of the local community the limit of the coal excavation area will be a minimum of 500m from the settlement boundary. Within this separation zone some land restoration works, and the construction and eventual removal of environmental features such as the visual and acoustic screening bund, soil baffle embankments and water treatment facilities will take place, but the scale and intensity of these works, and the associated emissions, will be substantially less than in the coal working excavation area, on the haul routes and overburden mounds, and within the CDP and will in any event be short term in duration. Dust suppression in the form of mist sprays will be used in these areas when required.

12.177 Good dust management of a surface mine requires a combination of proactive identification of the conditions likely to give rise to dust off-site, good practices such as the training of site operatives to understand the importance of minimising dust emissions, regular and frequent monitoring, and a culture where it is acceptable to request plant shut down due to the conditions.

12.178 To forward plan site activities the weather forecast is currently reviewed at least once a day to identify possible dust-generating conditions. These are particularly dry weather with winds blowing towards residential areas. This will continue when the Nant Llesg Surface Mine is operational.

12.179 The dust mitigation on Nant Llesg will include:

- For the work within the coal working excavation area including the loading of coal and overburden trucks, the use of dust suppression will depend on the observations of the operatives. Some strata are very dusty and others are not. Experience has shown that Fog Cannons® which atomise water particles are very effective at grounding dust close at the source, and these will be used as required during adverse weather conditions, i.e. when it is dry and windy. Fog Cannons®, fitted to a trailer, are mobile, and can be used where needed.

- A dust collection system on the drill for the blast holes will be used and the area wetted prior to the blast.

- During the construction of the visual and acoustic screening bund and the overburden mound water bowsers and Fog Cannons® will be used to suppress dust as required.

- The active coal stockpiles located near the barrel wash on the Nant Llesg site and at the CDP will be fitted with mist sprays to suppress the dust. These will be used during adverse weather conditions.

- Mist sprays will be fitted to the loading hoppers used to load the rail and road wagons.

- At the southern overburden mound Fog Cannons® will be used to suppress the dust during truck unloading and loading, as required.

- The unpaved haul routes will be regularly re-graded and sprayed with water using bowsers. During dry weather the water bowsers will continuously travel along the haul roads spraying water.

- In total it is anticipated that there will be up to 4 Fog Cannons® and up to 7 water bowsers operating on the site at the same time.

- Automated vehicle washing facilities will be used to wash the wheels, underside and sides of vehicles to minimise the mud from the site getting onto the public highway; where site mud inadvertently gets onto the public highway the road will be cleaned.

- Areas of hardstand and paved roads within the site will be regularly cleaned to minimise the risk of dust leaving the site.

12.180 Further dust mitigation measures are provided in Miller Argent's Mining Management System, which includes an Environmental Management Plan. This is briefly described below.

Environmental Management Plan

12.181 Miller Argent has an integrated management system covering their commercial activities and operations which will be applied to the project. This includes a Quality Management System, Mining Management System and an Environmental Management System. The latter is accredited to the international standard ISO 14001. The scope of the management system includes all Miller Argent operations. Community and environmental issues are covered in controlled procedures (CPs) including the following to manage dust emissions:

- CP14: Community Issues and Corrective Action Procedure

- CP64: Noise, Dust and Vibration

12.182 These are 'live' documents in that they are frequently reviewed and updated as necessary. The management system aims to be proactive rather than solely reactive. That means that when new issues arise, solutions are identified, often before complaints are received. For example, during adverse weather conditions for dust propagation the potentially affected residential areas are visited to assess the conditions and if required additional mitigation implemented, e.g. repositioning a Fog Cannon® within a working area (they need to be positioned upwind and above the dust source to be most effective) or bringing an additional Fog Cannon® into an area working a particularly dusty strata.

12.183 As part of the management of air quality and dust in the local community, monitoring of PM_{10}, $PM_{2.5}$ and dust flux and deposition will continue.

Dust complaints

12.184 Any dust complaints from the Nant Llesg Surface Mine will be taken seriously. Staff will visit the complainant and investigate the causes. They will visit the complainant again to inform them of the results of the investigation. Complaints are recorded together with the results of the investigation into the causes, the rectification action and timescale within which action was taken. Management actions are required to prevent a recurrence. Miller Argent maintains a complaints register to enable any patterns to be identified.

Mining Management System

12.185 When designing the site, including the temporary haul routes, Miller Argent aim to achieve a balance between minimising dust and optimising recovery of coal. Controlled Procedure 64 (CP64) (see Appendix MA/NL/ES /A12/003) provides a list of the mitigation measures.

12.186 Briefly these mitigation measures are:

- All vehicles will remain on designated roads and traffic routes within the site.
- All surfaced site roadways, will be kept clean or damp by means of a water bowser and/or road sweeper where necessary.
- All vehicles leaving the site, having travelled on areas where potential dust raising material lies, will pass through the automated vehicle washing facility before leaving site. All loaded lorries will pass through the vehicle washing facility and be sheeted before leaving site. Equipment leaving site that is too large to pass through the washing facility will be cleaned to a satisfactory standard before leaving site onto the public highway.
- All mobile plant will have exhausts directed above the horizontal, wherever possible.
- The drop height of coal taken from stockpiles to the screen hopper, rail wagons or road vehicles by a front end loading shovel will be minimised.
- Vehicles unloading will not encroach onto stocks of coal.
- Coal stocks will be delineated with clearly defined transport routes allowing adequate room for vehicular access for stocking and de-stocking operations.

- Stockpiles will be located in dedicated areas.
- Active stockpiles will be wetted periodically if there is potential for dust emissions (e.g. during dry weather).
- Dust suppression sprays will be fitted to mobile screen transfer points (if not enclosed) and used during periods when risk of dust emissions exist.
- Dust suppression sprays will be used during excavation of overburden and coal during conditions when the risk of dust is high to control the dust emissions.
- Crushers, when used, will have dust suppression sprays fitted or be totally enclosed.
- Conveyor belt scrapers, where fitted, will be maintained in an effective working condition to prevent material build-up on return rollers and a risk of dust emissions.
- All vehicles on site will adhere to the maximum speed limits, as indicated by speed limit signs.
- A high standard of housekeeping will be maintained throughout the site at all times.

12.187 CP64 also includes procedures for monitoring dust and includes:

- Thrice daily visual dust monitoring at the CDP and twice daily on site by Miller Argent. The date, time and results of this monitoring shall be recorded including any remedial action taken.
- In the event of airborne dust from the site being deposited off site, then remedial action shall be taken immediately. If the remedial action fails to rectify the problem, then cessation of the site operation or part of the site operation causing the dust will be initiated by the operations manager or the CDP manager. If these actions fail to rectify the problem the operations manager or the CDP manager will contact the Director/Project Manager prior to informing the relevant Local Authority.
- If there is evidence of airborne dust being deposited off site repeatedly then formal monitoring will be undertaken to identify the source and resolution.
- All fixed plant operating on site shall be subject to a fully documented comprehensive maintenance scheme to ensure that highest standards of performance, efficiency and environmental compliance are maintained.
- Mobile plant and vehicles on site shall be regularly maintained and records kept of any breakdowns or malfunctions.
- A programme of air quality and dust monitoring shall be agreed with the local authority. This will include dust flux and dust deposition using DustScan and DustDisc samplers and ambient PM concentrations. Data from the continuous PM monitoring station will be downloaded to the Cwmbargoed office on a daily basis.
- Rainfall, wind speed and direction and air temperature will be measured at the CDP and be downloaded daily to the Nant Llesg Site Office and records kept electronically with a hard copy of the summary data retained for the duration of the site.
- Staff shall, when there is a risk of potentially dusty conditions off-site, visit the community areas likely to be affected, preferably prior to receiving any complaints,

assess the dust levels and if the dust levels are excessive liaise with the site to vary operations and plant complements to reduce to acceptable levels. If sufficient reduction in dust is not achieved, request that the site be shut down.

Environmental Assessment

12.188 The main potential effects of the Nant Llesg Surface Mine are:

- Dust deposition giving rise to visible soiling of surfaces, such as cars and window ledges, resulting in annoyance due to the need for more frequent cleaning.

- Visible dust clouds causing reduced visibility. This is typically only an issue in the immediate vicinity of a source, but visibility is one of the main ways by which people tend to judge air quality. Given the distance from the nearest residential property, i.e. approximately 350m from the coal working excavation area, reduced visibility due to dust is not considered to be a significant issue.

- Excessive dust emissions can impact on personal comfort, as the skin, eyes and mouth are coated with dust. This is unlikely to occur outside the site boundaries, and therefore this has also not been considered further.

- Emissions of PM and NOx can give rise to human health effects The most important air pollutant in terms of health effects is PM, particularly particles emitted from vehicle exhausts and industry. For people with lung and heart conditions, increases in PM pollution can worsen their symptoms. The other important pollutant is nitrogen dioxide (NO_2). Its short term health effects are also well established, and it can cause irritation of the lungs and exacerbate existing lung conditions including asthma. However, it is unlikely that such high levels of NO_2 will be reached in the UK (Defra et al, 2009).

- High concentrations of NOx and the deposition of nitrogen can effect biodiversity and water quality. Air pollutants are removed from the atmosphere through wet deposition, by rain, and other forms of precipitation, and by dry deposition onto surfaces. This can result in the pollution of water-bodies, and the acidification and eutrophication of important habitats. Dry nitrogen deposition has been explicitly modelled for the Tair Carreg Moor SINC, and has been considered qualitatively for the four SACs located approximately 10 km from the mine. Significant wet deposition occurs over longer distance and therefore has not been considered.

Site Establishment

12.189 The dust generating potential of the site establishment operations is generally limited due to their scale, the type of plant that will be used, and their location away from receptors. The works includes fencing, site clearance, preliminary soil stripping, construction of water treatment areas, workshops and offices, junction improvements and construction of a new site access road.

12.190 Most of these activities are similar to those on other major land development projects, and the impact of those works within 350m of a human receptor or within 100m of an ecological receptor have been assessed qualitatively using the IAQM's '*Guidance on the Assessment of the Impacts of Construction on Air Quality and the Determination of their Significance*' (IAQM, 2012). IAQM screens out the need for an assessment of impacts where there is no receptor within these distances.

12.191 The activities that would be within 350m of human receptors are:

- Construction activities within the early reclamation area (W12, on Drawing MA/NL/PA/004);
- The construction of water treatment area 1; and
- The construction of water treatment area 3

12.192 The activities that would be within 100m of ecological receptors, i.e. either the Tair Carreg Moor SINC or the Cefn Gelligaer SINC south of South Tunnel Road are:

- Junction improvements and the construction of the new access road
- Construction activities within the early reclamation area (W12, on Drawing MA/NL/PA/004)
- The construction of the water treatment area 4

12.193 The air quality and dust impact of site establishment on the Cefn Gelligaer SINC within the Nant Llesg operational boundary has not been considered because the operation of the mine will have a much more significant impact than the minor site establishment works.

12.194 The risk categories (see Table 12.13) and significance of residual impscts (i.e. after mitigation) associated with each of the activities (see Table 12.14) are shown in Tables 12.18 to 12.22.

Table 12.18: Risk and Significance (Residual Impacts) Associated with the Early Reclamation Area (W12)

Early Reclamation Area					
Activity	**Dust Emission Class**	**Distance to Receptor**	**Risk Category**	**Sensitivity of Surrounding Area**	**Significance**
Earthworks	Large	Human receptor – 80 m	Medium	Low	Negligible
Construction	Small		Low		Negligible
Trackout	Small		Negligible		Negligible
Earthworks	Large	Ecological receptor – >20m	Medium	Medium	Negligible
Construction	Small		Low		Negligible
Trackout	Small		Low		Negligible

Early Reclamation Area					
Activity	**Dust Emission Class**	**Distance to Receptor**	**Risk Category**	**Sensitivity of Surrounding Area**	**Significance**
Combined Significance			-	-	Negligible

Table 12.19: Risk and Significance (Residual Impacts) Associated with the Water Treatment Area 1

Water Treatment Area 1					
Activity	**Dust Emission Class**	**Distance to Nearest Receptor**	**Risk Category**	**Sensitivity of Surrounding Area**	**Significance**
Earthworks	Large	Human- 90 m	Medium	Low	Negligible
Construction	Small		Low		Negligible
Trackout	Small		Negligible		Negligible
Combined Significance			-	-	Negligible

Table 12.20: Risk and Significance (Residual Impacts) Associated with the Water Treatment Area 3

Water Treatment Area 3					
Activity	**Dust Emission Class**	**Distance to Nearest Receptor**	**Risk Category**	**Sensitivity of Surrounding Area**	**Significance**
Earthworks	Large	Human – 250 m	Low	Low	Negligible
Construction	Small		Negligible		Negligible
Trackout	Small		Negligible		Negligible
Combined Significance			-	-	Negligible

Table 12.21: Risk and Significance (Residual Impacts) Associated with the Water Treatment Area 4

Water Treatment Area 4					
Activity	**Dust Emission Class**	**Distance to Nearest Receptor**	**Risk Category**	**Sensitivity of Surrounding Area**	**Significance**
Earthworks	Large	Ecological – <20 m	Medium	Medium	Negligible
Construction	Small		Low		Negligible
Trackout	Small		Low		Negligible
Combined Risk and Significance			-	-	Negligible

Table 12.22: Risk and Significance (Residual Impacts) Associated with the Junction Improvements and Construction of the New Access Road

Junction Improvements and New Access Road					
Activity	**Dust Emission Class**	**Distance to Nearest Receptor**	**Risk Category**	**Sensitivity of Surrounding Area**	**Significance**
Earthworks	Medium	Ecological - < 20 m	Medium	High	Negligible
Construction	Medium		Medium		Negligible
Trackout	Medium		Medium		Negligible
Combined Significance			-	-	Negligible

12.195 The residual impact of the works in the early reclamation and water treatment areas on human and ecological receptors was assessed to be negligible.

Land Remediation Works

12.196 Remediation work is planned for areas of former mineral waste tipping or mining dereliction that lie between Rhymney and the operational area of the Nant Llesg Surface Mine. This work will take place in years 1 and 2 of the scheme. The scale and type of work, that is, the removal of soils, capping of shafts or sealing and filling the adits with granular fill material, and capping, is not considered likely to result in significant dust generation. At any one time the area being worked will be very small. As some of this work will be within 350m of residential receptors these impacts were also assessed qualitatively using the IAQM methodology, and found to be negligible. The risk categories and significance of impacts (with mitigation) associated with the land remediation works is shown in Table 12.23.

Table 12.23: Risk and Significance (Residual Impact) Associated with the Land Remediation Works

Land Remediation Works					
Activity	**Dust Emission Class**	**Distance to Nearest Receptor**	**Risk Category**	**Sensitivity of Surrounding Area**	**Significance**
Earthworks	Small	>340 m	Negligible	Low	Negligible
Construction	Small		Negligible		Negligible
Trackout	Small		Negligible		Negligible
Combined Risk and Significance			Negligible	Low	Negligible

12.197 Surface remediation work is planned for the area between Fochriw and the CDP, which would principally involve improvements to the surface water drainage of the area incorporating minor earthworks and dressing of channels with suitable hard wearing materials and grass-seeded geo-textiles and similar treatment of eroded stream embankments. The impact of this work, with mitigation, is also predicted to be negligible.

Waste Tipping

12.198 No tipping operations have taken place for a considerable period of time at the Merthyr Industrial Services (MIS) site, and Miller Argent do not intend to deposit any further waste. No waste has been deposited on the southernmost section of the MIS

12.199 The removal and recycling of the deposited waste in the excavation area and its transport for disposal of any non-inert material off-site is considered unlikely to be a significant additional source of dust. The covering of the un-excavated landfill may generate some local dust during the construction of the overburden mound.

12.200 These works will be more than 350m from any residential receptors and more than 100m from parts of the Cefn Gelligaer SINC outside the operational boundary of Nant Llesg. Therefore these impacts have not been considered further.

CDP Water Treatment Facility

12.201 Included within the Nant Llesg planning application is a new water treatment facility at the CDP. The new facility will require the construction of two new lagoons and a new water treatment building, which would house the automated dosing facilities and provide storage for water

treatment products. This facility is likely to be constructed towards the end of the operation of the Mine.

12.202 The impact of the construction of the CDP water treatment facility was assessed using the IAQM '*Guidance on the Assessment of the Impacts of Construction on Air Quality and the Determination of their Significance*' (IAQM, 2012). That is, the same method as for the site establishment works.

12.203 There are no human receptors within 350m of the CDP and therefore only the ecological impacts have been considered. Table 12.24 shows the risk and significance associated with the construction of the Water Treatment Facility after mitigation. The residual impacts of these works are also considered to be negligible.

Table 12.24: Risk and Significance (Residual Impacts) Associated with the Water Treatment Facility

Waste Treatment Facility					
Activity	**Dust Emission Class**	**Distance to Nearest Receptor**	**Risk Category**	**Sensitivity of Surrounding Area**	**Significance**
Earthworks	Large	Ecological – <20 m	Medium	Medium	Negligible
Construction	Small		Low		Negligible
Trackout	Small		Low		Negligible
Combined Risk and Significance			-	-	Negligible

Coal Washing Plant, CDP

12.204 A standalone planning application has been submitted to CCBC for a new coal washing plant. As that application is yet to be determined, proposals for the installation of the same plant have been included in this application. The plant will be located within the CDP.

12.205 Using the IAQM 'Guidance on the Assessment of the Impacts of Construction on Air Quality and the Determination of their Significance' (IAQM, 2012) the construction impacts were determined qualitatively.

12.206 There are no human receptors within 350m of the CDP and therefore only the ecological impacts have been considered. Table 12.25 shows the risk and significance associated with the construction of the Coal Washing Facility after mitigation. The residual impact of these works are also considered to be negligible.

Table 12.25: Risk and Significance (Residual Impacts) Associated with the Coal Washing Plant

Coal Washing Plant					
Activity	**Dust Emission Class**	**Distance to Nearest Receptor**	**Risk Category**	**Sensitivity of Surrounding Area**	**Significance**
Earthworks	Small	Ecological – >50 m	Low	Low	Negligible
Construction	Small		Low		Negligible
Trackout	Small		Low		Negligible
Combined Risk and Significance			-	-	Negligible

Operational Impacts

12.207 In the following sections the impacts on the residential and commercial receptors are considered for each of the five Dispositions during the development of the surface mine. The impacts on the ecological receptors, i.e. the SINCs adjacent to the operational boundary of the mine and the impacts of the railway line have been considered separately later in this chapter.

12.208 The modelling results are presented in a series of tables for each Disposition as follows:

- Predicted PM_{10}, $PM_{2.5}$, and NO_2 concentrations.
- Significance of the Predicted Air Quality Impacts. These tables present the magnitude of the change in air quality (either in $\mu g/m^3$ or for PM_{10}, the number of days with concentrations greater than 50 $\mu g/m^3$), and the significance, as defined in Table 12.17. The magnitude of change is the difference between the predicted concentrations in the baseline (Table 12.9) and with the project (e.g. for Disposition 1, Table 12.25). However, due to the rounding of the data the impact presented in the significance tables may be slightly different to the difference in the data presented in the tables. The tables present the worst case data; i.e. the highest concentration predicted using either the St Athan or CDP meteorological dataset.
- Predicted Dust Deposition. These tables present the predicted maximum and average daily dust deposition averaged over one week, separately for the St Athan and the CDP meteorological datasets.
- Significance of Predicted Dust Deposition. These tables show the magnitude of the impact of the project (see Table 12.16) and the significance of the predicted impact (see table 12.17), predicted using both the St Athan and CDP meteorological datasets.

Disposition 1 - Development of Box Cut

12.209 Figure MA/NL/PA/004 shows the locations of the works including the plant during the first phase of the surface mine; the development of the box cut, used in the modelling. It is a snapshot of the activities that will take place during this phase. Work will start in the west and move eastward. Year 4 was modelled to represent Disposition 1, as in this year the working area will be closest to Rhymney, and therefore represents a worst case.

12.210 Construction of the visual and acoustic screening bund to the east and north of the coal working excavation area is planned to take place over four months during year one. By the end of Disposition 1 dust generated by wind erosion will be minimal as the bund will have been seeded and vegetated over several growing seasons. However, the bund is closer to Rhymney than the coal working excavation area, and therefore the impact of the construction of this bund has also been modelled. This modelling focused on the impact in Rhymney and used only the more representative CPD weather data.

12.211 Several activities will take place at the beginning of the box cut that was not included in the dispersion modelling. These are:

- Soil and soil material stripping from the coal working excavation area, which will be minor sources of dust emissions. The emissions due to wind erosion of the soil stockpiles are included in the model

- Cleaning and gleanings from coaling operations that would be recovered and stockpiled on site during the development of the Box Cut prior to the barrel wash being commissioned

12.212 The predicted PM_{10}, $PM_{2.5}$, and NO_2, concentrations at the residential and commercial receptors during Disposition 1 are presented in Table 12.26.

Table 12.26: Disposition 1: Predicted PM_{10}, $PM_{2.5}$ and NO_2 Concentrations

Receptor (number on Drawing MA/NL/ES/12/003)	PM_{10} Annual Average ($\mu g/m^3$)	PM_{10} N° days > 50 $\mu g/m^3$	$PM_{2.5}$ Annual Average ($\mu g/m^3$)	NO_2 Annual Average ($\mu g/m^3$)	NO_2 N° hours > 200 $\mu g/m^3$**
Residential receptors					
Cwm Nant (1)	18.3	4	9.8	15.7	0
Lower Row, Bute Town (2)	17.5	4	9.6	14.7	0
The Rhymney House, Llechryd (3)	17.4	3	9.5	14.7	0
Sand Crest Lodge, Rhymney (4)	18.7	4	10.0	16.0	0
26 Glan Yr Afon, Rymney (5)	19.2	5	10.2	16.4	0
3 Old Brewery Lane, Rhymney (6)	19.9	6	10.5	16.8	0
Valletta Lodge, Hill Road, Pontlottyn (7)	19.6	6	10.7	15.0	0
Bali Hai, Bryhyfryd (8)	20.3	6	11.2	14.6	0
72 Pontlottyn Road, Fochriw (9)	20.5	7	11.3	14.6	0
Cae Glas Fochriw (10)	20.8	9	11.8	14.3	0
Ty Nazareth, Guest Street Fochriw (11)	20.5	8	11.5	14.3	0
Blaen Carno Farmhouse (12)	18.2	4	9.8	16.2	0
Gypsy Castle (13)	18.9	4	10.0	16.5	0

Commercial receptors					
Heads of Valley Industrial Estate (14)	20.9	7	10.7	18.3	0
Heads of Valley Industrial Estate (15)	22.0	8	11.0	18.2	0
Capital Valley Eco Park (16)	20.7	6	10.7	16.0	0

EALs as follows:

PM_{10} - annual mean 40 µg/m^3; 35 days per year permitted with PM_{10} greater than 50 µg/m^3

$PM_{2.5}$ - annual mean 20 µg/m^3

NO_2 - annual mean 40 µg/m^3, 18 hours per year permitted with NO_2 greater than 200 µg/m^3

These EALs apply to locations where the public may be exposed over the relevant averaging period. Therefore at the Heads of the Valley Industrial Estate and the Capital Valley Eco Park the hourly NO_2 EAL only applies where the public might reasonably be expected to be present.

Table 12.27: Disposition 1: Significance of the Predicted Air Quality Impacts

Receptor (number on Drawing MA/NL/ES/12/003)	PM_{10} Annual Mean		PM_{10} N° days > 50 µg/m^3		$PM_{2.5}$ Annual Average (µg/m		NO_2 Annual mean	
	Impact (µg/m^3)	Significance	Impact (N° days)	Significance	Impact (µg/m^3)	Significance	Impact (µg/m^3)	Significance
Residential Receptors								
Cwm Nant (1)	2.0	Negligible	2	Negligible	0.7	Negligible	2.5	Negligible
Lower Row, Bute Town (2)	1.2	Negligible	2	Negligible	0.4	Negligible	1.6	Negligible
The Rhymney House, Llechryd (3)	1.1	Negligible	1	Negligible	0.4	Negligible	1.6	Negligible
Sand Crest Lodge, Rhymney (4)	2.2	Negligible	2	Negligible	0.8	Negligible	2.8	Negligible
26 Glan Yr Afon, Rymney (5)	2.6	Negligible	3	Negligible	0.9	Negligible	3.1	Negligible
3 Old Brewery Lane, Rhymney (6)	3.1	Negligible	4	Negligible	1.0	Negligible	3.5	Negligible
Valletta Lodge, Hill Road, Pontlottyn (7)	2.2	Negligible	3	Negligible	1.0	Negligible	1.4	Negligible
Bali Hai, Bryhyfryd (8)	2.8	Negligible	3	Negligible	1.4	Negligible	1.0	Negligible
72 Pontlottyn Road, Fochriw (9)	2.2	Negligible	3	Negligible	1.2	Negligible	0.8	Negligible
Cae Glas Fochriw (10)	1.6	Negligible	3	Negligible	1.1	Negligible	0.5	Negligible
Ty Nazareth, Guest Street Fochriw (11)	1.5	Negligible	2	Negligible	1.0	Negligible	0.5	Negligible

Receptor (number on Drawing MA/NL/ES/12/003)	PM_{10} Annual Mean		PM_{10} N° days > 50 µg/m^3		$PM_{2.5}$ Annual Average (µg/m		NO_2 Annual mean	
	Impact (µg/m^3)	Significance	Impact (N° days)	Significance	Impact (µg/m^3)	Significance	Impact (µg/m^3)	Significance
Blaen Carno Farmhouse (12)	1.9	Negligible	2	Negligible	0.7	Negligible	3.2	Negligible
Gypsy Castle (13)	2.7	Negligible	2	Negligible	0.9	Negligible	3.5	Negligible
Commercial Receptors								
Heads of Valley Industrial Estate (14)	4.1	n/a	5	n/a	1.3	n/a	5.0	n/a
Heads of Valley Industrial Estate (15)	4.8	n/a	5	n/a	1.5	n/a	4.8	n/a
Capital Valley Eco Park (16)	3.4	n/a	3	n/a	1.1	n/a	2.5	n/a

Notes: The impacts presented are the difference between the data in Tables 12.9 and 12.25 (but estimated before the data was rounded).

EPUK/IAQM does not give significance criteria for the NO_2 one hour EAL. The annual mean NO_2 EAL is more stringent than the short term EAL, i.e. is generally more difficult to achieve.

12.213 Table 12.27 shows the magnitude of the change in air quality from the baseline conditions and the significance of these changes for Disposition 1. It should be noted that in Table 12.26 the predicted impact on the number of days with PM_{10} concentrations greater than 50µg/m^3 has been rounded to whole days.

12.214 All the PM_{10}, $PM_{2.5}$ and NO_2 EALs were predicted to be achieved by a wide margin at all receptors. The predicted impact of Disposition 1 on air quality at all receptors was negligible

12.215 The dust deposition during Disposition 1 is shown in Table 12.28. As noted earlier the MTAN2 dust guideline value, 80mg/m^2/day, is recommended for use by the mineral planning authority for a monitoring planning condition for the protection of public amenity (MTAN2 paragraph 155), and not explicitly for assessing modelled predictions.

Table 12.28: Disposition 1: Predicted Dust Deposition

Receptor (number on Drawing MA/NL/ES/12/003)	Maximum daily dust deposition averaged over one week mg/m^2/day		Average daily dust deposition averaged over one week mg/m^2/day	
	St Athan	CDP	St Athan	CDP
Residential Receptors				
Cwm Nant (1)	21.9	32.1	3.6	7.6
Lower Row, Bute Town (2)	13.6	20.3	2.0	4.5
The Rhymney House, Llechryd (3)	12.2	17.9	2.0	4.4
Sand Crest Lodge, Rhymney (4)	25.1	30.6	4.6	9.0
26 Glan Yr Afon, Rymney (5)	25.9	30.0	5.5	9.8
3 Old Brewery Lane, Rhymney (6)	29.1	33.4	8.5	12.1
Valletta Lodge, Hill Road, Pontlottyn (7)	47.2	52.5	18.3	12.9
Bali Hai, Bryhyfryd (8)	39.2	42.6	15.2	10.8
72 Pontlottyn Road, Fochriw (9)	40.7	48.5	16.6	11.7
Cae Glas Fochriw (10)	63.1	47.7	15.5	13.3
Ty Nazareth, Guest Street Fochriw (11)	53.6	40.6	13.2	11.8
Blaen Carno Farmhouse (12)	14.6	12.5	2.5	1.8
Gypsy Castle (13)	8.9	11.2	1.6	1.9
Commercial Receptors				
Heads of Valley Industrial Estate (14)	43.5	53.9	14.5	19.5

Receptor (number on Drawing MA/NL/ES/12/003)	Maximum daily dust deposition averaged over one week mg/m^2/day		Average daily dust deposition averaged over one week mg/m^2/day	
	St Athan	CDP	St Athan	CDP
Heads of Valley Industrial Estate (15)	53.5	59.3	20.5	23.9
Capital Valley Eco Park (16)	50.3	46.7	20.3	17.3
Note: EAL for protection of public amenity = maximum 80 mg/m^2/day averaged over a week.				

12.216 The table presents the data for the St Athan and CDP meteorological datasets, and both the maximum and average dust deposition. The highest dust deposition was predicted to occur in Fochriw and the Heads of the Valley Industrial Estate. The maximum dust deposition at all modelled receptors was well below the MTAN2 guideline value of 80 mg/m^2/day. The table also shows that the average dust deposition, which represents the more typical dust deposition, is much lower than the maximum. This average is likely to be more representative of the day to day dust deposition, whereas the maximum is the worst case over the four (CDP) or five (St Athan) years of meteorological conditions modelled.

12.217 Table 12.29 shows the significance of the dust impacts. Based on the highest predicted change in dust deposition (i.e. either the St Athan or CDP data) with the proposed surface mine a minor adverse dust impact was predicted for all residential receptors except Ty Nazareth in Fochriw and Gypsy Castle, where the impacts were predicted to be negligible. This is because, at most receptors while there was predicted to be a large change in dust deposition (i.e. more than 8 mg/m^2/day as defined in Table 12.16) the dust deposition was less than 75% of the EAL (see table 12.17). At Cae Glas a medium change was predicted (i.e. between 4 and 8 mg/m^2/day) using the CDP meteorological dataset, but because the predicted dust deposition was between 75% and 90% of the EAL the overall impact was also minor adverse.

12.218 The MTAN2 guideline value is aimed at the protection of public amenity and may not be applicable to commercial receptors. Dust sensitive commercial receptors filter their ambient air intake, and typically are less concerned regarding the colour of the dust.

Table 12.29: Disposition 1: Significance of Predicted Dust Deposition

Receptor (number on Drawing MA/NL/ES/12/003)	Impact* Maximum daily dust deposition averaged over one week mg/m^2/day		Significance	
	St Athan	CDP	St Athan	CDP
Residential Receptors				
Cwm Nant (1)	17.6	24.8	Minor Adverse	Minor Adverse
Lower Row, Bute Town (2)	10.2	14.6	Minor Adverse	Minor Adverse
The Rhymney House, Llechryd (3)	8.7	12.1	Minor Adverse	Negligible
Sand Crest Lodge, Rhymney (4)	19.1	21.2	Minor Adverse	Minor Adverse
26 Glan Yr Afon, Rymney (5)	19.2	20.7	Minor Adverse	Minor Adverse
3 Old Brewery Lane, Rhymney (6)	20.4	22.1	Minor Adverse	Minor Adverse
Valletta Lodge, Hill Road, Pontlottyn (7)	23.8	30.1	Minor Adverse	Minor Adverse
Bali Hai, Bryhyfryd (8)	17.0	14.3	Minor Adverse	Minor Adverse
72 Pontlottyn Road, Fochriw (9)	8.3	7.9	Minor Adverse	Negligible
Cae Glas Fochriw (10)	9.1	6.8	Minor Adverse	Minor Adverse
Ty Nazareth, Guest Street Fochriw (11)	7.3	5.1	Negligible	Negligible
Blaen Carno Farmhouse (12)	12.5	9.5	Minor Adverse	Minor Adverse
Gypsy Castle (13)	6.4	8.3	Negligible	Minor Adverse
Commercial Receptors				
Heads of Valley Industrial Estate (14)	34.5	38.5	Minor Adverse	Minor Adverse
Heads of Valley Industrial Estate (15)	40.3	42.0	Minor Adverse	Minor Adverse
Capital Valley Eco Park (16)	30.7	22.7	Minor Adverse	Minor Adverse

Notes: EAL for protection of public amenity = maximum 80 mg/m^2/day averaged over a week.

* Compared to the baseline (tables 12.9 and 12.27)

12.219 Table 12.30 presents the results of the modelling of the dust emissions during the construction of the visual and acoustic screening bund in year one of Disposition 1. The modelling also includes the impact of the early reclamation works in Working Area 12 (see Drawing MA/NL/PA/004).

12.220 Despite modelling the works for a whole year instead of the four months that the construction of the screening bund is likely to take, the predicted dust deposition at receptors closest to the works are also well below the EAL.

Table 12.30: Disposition 1 During Construction of Visual and Acoustic Screening Bund: Predicted Dust Deposition

Receptor (number on Drawing MA/NL/ES/12/003)	Maximum daily dust deposition averaged over one week mg/m^2/day		Average daily dust deposition averaged over one week mg/m^2/day	
	St Athan	CDP	St Athan	CDP
Residential Receptors				
Cwm Nant (1)	24.7	33.5	4.3	7.9
Lower Row, Bute Town (2)	10.6	14.7	1.5	3.0
The Rhymney House, Llechryd (3)	9.1	12.4	1.5	2.8
Sand Crest Lodge, Rhymney (4)	20.1	21.4	4.8	7.1
26 Glan Yr Afon, Rymney (5)	16.5	19.7	5.7	7.3
3 Old Brewery Lane, Rhymney (6)	14.8	16.4	7.1	7.5
Valletta Lodge, Hill Road, Pontlottyn (7)	25.3	27.3	9.5	7.2
Bali Hai, Bryhyfryd (8)	23.8	30.4	9.6	7.3
72 Pontlottyn Road, Fochriw (9)	34.2	42.1	13.3	10.6
Cae Glas Fochriw (10)	60.5	47.3	16.4	15.0
Ty Nazareth, Guest Street Fochriw (11)	49.3	36.8	13.3	12.3
Blaen Carno Farmhouse (12)	9.0	7.4	1.9	1.2
Gypsy Castle (13)	6.3	6.7	1.3	1.2
Commercial Receptors				
Heads of Valley Industrial Estate (14)	43.4	46.2	20.9	19.8
Heads of Valley Industrial Estate (15)	30.3	25.2	11.0	10.9
Capital Valley Eco Park (16)	23.3	26.5	7.5	7.3
Note: EAL for protection of public amenity = maximum 80 mg/m^2/day averaged over a week.				

12.221 Table 12.31 presents the significance of the impact of the construction of the Visual and Acoustic Screening Bund on dust deposition

Table 12.31: Disposition 1 During Construction of Visual and Acoustic Screening Bund: Significance of Predicted Dust Deposition

Receptor (number on Drawing MA/NL/ES/12/003)	Impact* Maximum daily dust deposition averaged over one week mg/m^2/day		Significance	
	St Athan	CDP	St Athan	CDP
Residential Receptors				
Cwm Nant (1)	26.2	20.4	Minor Adverse	Minor Adverse
Lower Row, Bute Town (2)	9.1	7.1	Minor Adverse	Negligible
The Rhymney House, Llechryd (3)	6.5	5.6	Negligible	Negligible
Sand Crest Lodge, Rhymney (4)	12.0	14.2	Minor Adverse	Minor Adverse
26 Glan Yr Afon, Rymney (5)	10.4	9.9	Minor Adverse	Minor Adverse
3 Old Brewery Lane, Rhymney (6)	5.1	6.1	Negligible	Negligible
Valletta Lodge, Hill Road, Pontlottyn (7)	4.9	1.9	Negligible	Negligible
Bali Hai, Bryhyfryd (8)	2.1	1.6	Negligible	Negligible
72 Pontlottyn Road, Fochriw (9)	1.5	1.8	Negligible	Negligible
Cae Glas Fochriw (10)	6.4	6.5	Negligible	Negligible
Ty Nazareth, Guest Street Fochriw (11)	1.4	3.0	Negligible	Negligible
Blaen Carno Farmhouse (12)	4.5	6.9	Negligible	Negligible
Gypsy Castle (13)	3.8	3.8	Negligible	Negligible
Commercial Receptors				
Heads of Valley Industrial Estate (14)	30.8	30.8	Minor Adverse	Minor Adverse
Heads of Valley Industrial Estate (15)	8.0	8.0	Negligible	Minor Adverse
Capital Valley Eco Park (16)	2.5	2.5	Negligible	Negligible

Notes: EAL for protection of public amenity = maximum 80 mg/m^2/day averaged over a week.

***** Compared to the baseline (Tables 12.8 and 12.29)

12.222 This table shows that the construction of the Visual and Acoustic Screening Bund will result in a negligible impact at the majority of the receptors, with a few receptors having a minor adverse impact.

12.223 Overall Disposition 1 was considered to have a minor adverse impact.

Disposition 2 - Development to Maximum Void

12.224 The location of the works and plant during Disposition 2 are shown in Drawing MA/NL/PA/005.This stage will take two years to complete, and in the last year (year 6) the coal working excavation area will be closest to Rhymney. By the end of this stage the southern overburden mound would have been completed and seeded, significantly reducing the risk of dust emissions due to wind erosion.

12.225 The predicted PM_{10}, $PM_{2.5}$, and NO_2, concentrations at the residential and commercial receptors for Disposition 2 are presented in Table 12.32.

Table 12.32: Disposition 2 -Predicted PM_{10}, $PM_{2.5}$ and NO_2 Concentrations

Receptor (number on Drawing MA/NL/ES/12/003)	PM_{10} Annual Average ($\mu g/m^3$)	PM_{10} N° days > 50 $\mu g/m^3$	$PM_{2.5}$ Annual Average ($\mu g/m^3$)	NO_2 Annual Average ($\mu g/m^3$)	NO_2 N° hours > 200 $\mu g/m^{3**}$
Residential Receptors					
Cwm Nant (1)	18.9	6	10.0	16.0	0
Lower Row, Bute Town (2)	17.8	4	9.6	14.9	0
The Rhymney House, Llechryd (3)	17.7	3	9.6	14.8	0
Sand Crest Lodge, Rhymney (4)	19.3	6	10.1	16.3	0
26 Glan Yr Afon, Rymney (5)	19.8	7	10.3	16.6	0
3 Old Brewery Lane, Rhymney (6)	20.6	6	10.6	17.0	0
Valletta Lodge, Hill Road, Pontlottyn (7)	19.7	6	10.7	14.8	0
Bali Hai, Bryhyfryd (8)	20.3	6	11.2	14.5	0
72 Pontlottyn Road, Fochriw (9)	20.6	7	11.3	14.5	0
Cae Glas Fochriw (10)	20.8	9	11.7	14.3	0
Ty Nazareth, Guest Street Fochriw (11)	20.5	8	11.4	14.3	0

Receptor (number on Drawing MA/NL/ES/12/003)	PM_{10} Annual Average ($\mu g/m^3$)	PM_{10} N° days > 50 $\mu g/m^3$	$PM_{2.5}$ Annual Average ($\mu g/m^3$)	NO_2 Annual Average ($\mu g/m^3$)	NO_2 N° hours > 200 $\mu g/m^{3**}$
Residential Receptors					
Blaen Carno Farmhouse (12)	19.0	5	10.0	16.9	0
Gypsy Castle (13)	19.6	6	10.1	16.7	0
Commercial Receptors					
Heads of Valley Industrial Estate (14)	22.2	7	11.1	19.0	0
Heads of Valley Industrial Estate (15)	22.9	8	11.3	18.1	0
Capital Valley Eco Park (16)	20.9	6	10.7	15.7	0

EALs as follows:

PM_{10} - annual mean 40 $\mu g/m^3$; 35 days per year permitted with PM_{10} greater than 50 $\mu g/m^3$

$PM_{2.5}$ - annual mean 20 $\mu g/m^3$

NO_2 - annual mean 40 $\mu g/m^3$, 18 hours per year permitted with NO_2 greater than 200 $\mu g/m^3$

These EALs apply to locations where the public may be exposed over the relevant averaging period. Therefore at the Heads of the Valley Industrial Estate and the Capital Valley Eco Park the hourly NO_2 EAL only applies where the public might reasonably be expected to be present.

Table 12.33: Disposition 2 - Significance of the Predicted Air Quality Impacts

Receptor (number on Drawing MA/NL/ES/12/003)	PM_{10} Annual Mean		PM_{10} N° days > 50 µg/m^3		$PM_{2.5}$ Annual Average (µg/m		NO_2 Annual mean	
	Impact (µg/m^3)	Significance	Impact (N° days)	Significance	Impact (µg/m^3)	Significance	Impact (µg/m^3)	Significance
Residential Receptors								
Cwm Nant (1)	2.6	Negligible	4	Minor Adverse	0.8	Negligible	2.8	Negligible
Lower Row, Bute Town (2)	1.5	Negligible	2	Negligible	0.5	Negligible	1.8	Negligible
The Rhymney House, Llechryd (3)	1.4	Negligible	1	Negligible	0.5	Negligible	1.7	Negligible
Sand Crest Lodge, Rhymney (4)	2.8	Negligible	4	Negligible	0.9	Negligible	3.1	Negligible
26 Glan Yr Afon, Rymney (5)	3.2	Negligible	5	Minor Adverse	1.0	Negligible	3.4	Negligible
3 Old Brewery Lane, Rhymney (6)	3.8	Negligible	4	Negligible	1.2	Negligible	3.7	Negligible
Valletta Lodge, Hill Road, Pontlottyn (7)	2.3	Negligible	3	Negligible	1.0	Negligible	1.3	Negligible
Bali Hai, Bryhyfryd (8))	2.8	Negligible	3	Negligible	1.4	Negligible	0.9	Negligible
72 Pontlottyn Road, Fochriw (9)	2.3	Negligible	3	Negligible	1.2	Negligible	0.7	Negligible
Cae Glas Fochriw (10)	1.6	Negligible	3	Negligible	1.1	Negligible	0.4	Negligible

Receptor (number on Drawing MA/NL/ES/12/003)	PM_{10} Annual Mean		PM_{10} N° days > 50 µg/m^3		$PM_{2.5}$ Annual Average (µg/m		NO_2 Annual mean	
	Impact (µg/m^3)	Significance	Impact (N° days)	Significance	Impact (µg/m^3)	Significance	Impact (µg/m^3)	Significance
Ty Nazareth, Guest Street Fochriw (11)	1.5	Negligible	2	Negligible	1.0	Negligible	0.4	Negligible
Blaen Carno Farmhouse (12)	2.8	Negligible	3	Negligible	0.9	Negligible	3.9	Negligible
Gypsy Castle (13)	3.4	Negligible	4	Minor Adverse	1.1	Negligible	3.7	Negligible
Commercial Receptors								
Heads of Valley Industrial Estate (14)	5.5	n/a	5	n/a	1.7	n/a	5.7	n/a
Heads of Valley Industrial Estate (15)	5.8	n/a	5	n/a	1.7	n/a	4.7	n/a
Capital Valley Eco Park (16)	3.6	n/a	3	n/a	1.1	n/a	2.2	n/a

Notes: The impacts presented are the difference between the data in Tables 12.9 and 12.31 (but estimated before the data was rounded.

EPUK/IAQM does not give significance criteria for the NO_2 one hour EAL. The annual mean NO_2 EAL is more stringent than the short term EAL, i.e. is generally more difficult to achieve.

The number of days PM10 concentrations were greater than 50 µg/m^3 was rounded.

12.226 The EALs were predicted to continue to be achieved at all these receptors.

12.227 The magnitude and significance of these impacts are presented in Table 12.33.

12.228 The $PM_{2.5}$, NO_2 and annual PM_{10} impacts at all receptors were negligible A minor adverse impact was predicted with respect to the short term PM_{10} concentrations at three receptors. This is because there was predicted to be a large change, i.e. more than 4, in the number of days with concentrations greater than 50 $\mu g/m^3$. For Cwm Nant and Gypsy Castle there were slightly above 4 days, while for Sand Crest Lodge there were slightly less than 4days before rounding. At the other receptors a negligible impact was predicted because the change in concentration was predicted to be smaller.

12.229 Table 12.34 shows the impact of Disposition 2 on maximum and average dust deposition, for the two meteorological datasets. The MTAN2 guideline value was predicted to be achieved at all receptors.

Table 12.34: Disposition 2 - Predicted Dust Deposition

Receptor (number on Drawing MA/NL/ES/12/003)	Maximum daily dust deposition averaged over one week $mg/m^2/day$		Average daily dust deposition averaged over one week $mg/m^2/day$	
	St Athan	CDP	St Athan	CDP
Residential Receptors				
Cwm Nant (1)	26.1	36.6	4.2	9.1
Lower Row, Bute Town (2)	15.2	21.9	2.2	4.9
The Rhymney House, Llechryd (3)	13.3	19.9	2.2	4.9
Sand Crest Lodge, Rhymney (4)	27.8	34.0	5.5	10.5
26 Glan Yr Afon, Rymney (5)	28.2	32.6	6.8	11.4
3 Old Brewery Lane, Rhymney (6)	30.9	36.0	10.6	14.0
Valletta Lodge, Hill Road, Pontlottyn (7)	49.1	55.2	19.0	13.3
Bali Hai, Bryhyfryd (8)	40.6	43.8	15.5	11.0
72 Pontlottyn Road, Fochriw (9)	40.9	48.6	16.7	11.7
Cae Glas Fochriw (10)	63.0	47.5	15.5	13.3
Ty Nazareth, Guest Street Fochriw (11)	53.6	40.5	13.3	11.8
Blaen Carno Farmhouse (12)	16.6	13.8	3.0	2.2
Gypsy Castle (13)	9.6	12.8	1.9	2.2

Commercial Receptors				
Heads of Valley Industrial Estate (14)	50.9	60.4	20.9	24.9
Heads of Valley Industrial Estate (15)	59.6	64.3	24.5	27.1
Capital Valley Eco Park (16)	51.3	48.2	21.1	17.8
Note: EAL for protection of public amenity = maximum 80 mg/m^2/day averaged over a week.				

12.230 Table 12.35 shows the magnitude of the change in dust deposition from the proposed surface mine during Disposition 2, and the significance of the impact for residential receptors. The greatest impact was again predicted to be dust deposition with a minor adverse impact predicted at all receptors except Gypsy Castle and Ty Nazareth with the St Athan meteorological dataset. With the more realistic CDP meteorological dataset there was predicted to be an minor adverse impact at all receptors except 72 Pontlottyn Road, Cae Glas and Ty Nazareth. This was because of the large change in predicted dust deposition (see Table 12.16), and the dust deposition remaining less than 75% of the EAL.

Table 12.35: Disposition 2 - Significance of Predicted Dust Deposition

Receptor (number on Drawing MA/NL/ES/12/003)	Impact* Maximum daily dust deposition averaged over one week mg/m^2/day		Significance	
	St Athan	CDP	St Athan	CDP
Residential Receptors				
Cwm Nant (1)	21.8	29.3	Minor Adverse	Minor Adverse
Lower Row, Bute Town (2)	11.7	16.3	Minor Adverse	Minor Adverse
The Rhymney House, Llechryd (3)	9.8	14.0	Minor Adverse	Minor Adverse
Sand Crest Lodge, Rhymney (4)	21.9	24.6	Minor Adverse	Minor Adverse
26 Glan Yr Afon, Rymney (5)	21.5	23.3	Minor Adverse	Minor Adverse
3 Old Brewery Lane, Rhymney (6)	22.2	24.7	Minor Adverse	Minor Adverse
Valletta Lodge, Hill Road, Pontlottyn (7)	25.8	32.7	Minor Adverse	Minor Adverse
Bali Hai, Bryhyfryd (8)	18.4	15.5	Minor Adverse	Minor Adverse
72 Pontlottyn Road, Fochriw (9)	8.6	8.0	Minor Adverse	Negligible
Cae Glas Fochriw (10)	9.0	6.6	Minor Adverse	Negligible
Ty Nazareth, Guest Street Fochriw (11)	7.3	5.1	Negligible	Negligible

Receptor (number on Drawing MA/NL/ES/12/003)	Impact* Maximum daily dust deposition averaged over one week mg/m^2/day		Significance	
	St Athan	CDP	St Athan	CDP
Blaen Carno Farmhouse (12)	14.5	10.8	Minor Adverse	Minor Adverse
Gypsy Castle (13)	7.1	10.0	Negligible	Minor Adverse
Commercial Receptors				
Heads of Valley Industrial Estate (14)	42.0	45.0	Minor Adverse	Minor Adverse
Heads of Valley Industrial Estate (15)	46.4	47.1	Minor Adverse	Minor Adverse
Capital Valley Eco Park (16)	31.7	24.2	Minor Adverse	Minor Adverse
Note: EAL for protection of public amenity = maximum 80 mg/m^2/day averaged over a week. * Compared to the baseline (Tables 12.10 and 12.33)				

12.231 Overall the impact of Disposition 2 is considered to be a minor adverse impact

Disposition 3 - Maximum Void to Interim Void

12.232 The location of the works and plant during Disposition 3 are shown in Drawing MA/NL/PA/006. This stage will take approximately three and a half years to complete, and in the last full year (year 9) the coal working excavation area will be closest to Rhymney. The predicted PM_{10}, $PM_{2.5}$, and NO_2, concentrations at the residential and commercial receptors for Disposition 3 are presented in Table 12.36, and the magnitude and significance of these impacts is presented in Table 12.37.

12.233 During Disposition 3 the EALs were predicted to continue to be achieved at all residential receptors, and at all receptors except one a negligible air quality impact was predicted. A minor adverse impact was predicted at 26 Glan Yr Afon, Rymney with respect to the short term PM_{10} concentrations. This is due to the predicted increase being more than 4 days with PM_{10} concentrations above 50 µg/m^3

.

Table 12.36: Disposition 3 - Predicted PM_{10}, $PM_{2.5}$ and NO_2 Concentrations

Receptor (number on Drawing MA/NL/ES/12/003)	PM_{10} Annual Average ($\mu g/m^3$)	PM_{10} N° days > 50 $\mu g/m^3$	$PM_{2.5}$ Annual Average ($\mu g/m^3$)	NO_2 Annual Average ($\mu g/m^3$)	NO_2 N° hours > 200 $\mu g/m^{3**}$
Residential receptors					
Cwm Nant (1)	18.5	4	9.9	15.2	0
Lower Row, Bute Town (2)	17.5	4	9.6	14.3	0
The Rhymney House, Llechryd (3)	17.5	3	9.5	14.3	0
Sand Crest Lodge, Rhymney (4)	19.0	6	10.1	15.7	0
26 Glan Yr Afon, Rymney (5)	19.4	7	10.3	16.0	0
3 Old Brewery Lane, Rhymney (6)	20.2	6	10.6	16.2	0
Valletta Lodge, Hill Road, Pontlottyn (7)	19.5	6	10.6	14.3	0
Bali Hai, Bryhyfryd (8)	20.2	6	11.1	14.2	0
72 Pontlottyn Road, Fochriw (9)	20.4	7	11.3	14.2	0
Cae Glas Fochriw (10)	20.7	8	11.7	14.2	0
Ty Nazareth, Guest Street Fochriw (11)	20.5	8	11.4	14.1	0
Blaen Carno Farmhouse (12)	18.7	4	10.1	16.2	0

Receptor (number on Drawing MA/NL/ES/12/003)	PM_{10} Annual Average ($\mu g/m^3$)	PM_{10} N° days > 50 $\mu g/m^3$	$PM_{2.5}$ Annual Average ($\mu g/m^3$)	NO_2 Annual Average ($\mu g/m^3$)	NO_2 N° hours > 200 $\mu g/m^{3**}$
Residential receptors					
Gypsy Castle (13)	19.2	3	10.1	15.9	0
Commercial receptors					
Heads of Valley Industrial Estate (14)	21.7	7	11.2	18.2	0
Heads of Valley Industrial Estate (15)	22.2	8	11.2	16.9	0
Capital Valley Eco Park (16)	20.5	6	10.6	14.9	0

EALs as follows:

PM_{10} - annual mean 40 $\mu g/m^3$; 35 days per year permitted with PM_{10} greater than 50 $\mu g/m^3$

$PM_{2.5}$ - annual mean 20 $\mu g/m^3$

NO_2 - annual mean 40 $\mu g/m^3$, 18 hours per year permitted with NO_2 greater than 200 $\mu g/m^3$

These EALs apply to locations where the public may be exposed over the relevant averaging period. Therefore at the Heads of the Valley Industrial Estate and the Capital Valley Eco Park the hourly NO_2 EAL only applies where the public might reasonably be expected to be present.

Table 12.37: Disposition 3 - Significance of the Predicted Air Quality Impacts

Receptor (number on Drawing MA/NL/ES/12/003)	PM_{10} Annual Mean		PM_{10} N° days > 50 µg/m^3		$PM_{2.5}$ Annual Average (µg/m		NO_2 Annual mean	
	Impact (µg/m^3)	Significance	Impact (N° days)	Significance	Impact (µg/m^3)	Significance	Impact (µg/m^3)	Significance
Residential Receptors								
Cwm Nant (1)	2.1	Negligible	2	Negligible	0.7	Negligible	2.1	Negligible
Lower Row, Bute Town (2)	1.2	Negligible	2	Negligible	0.4	Negligible	1.2	Negligible
The Rhymney House, Llechryd (3)	1.2	Negligible	1	Negligible	0.4	Negligible	1.2	Negligible
Sand Crest Lodge, Rhymney (4)	2.5	Negligible	4	Negligible	0.9	Negligible	2.4	Negligible
26 Glan Yr Afon, Rymney (5)	2.8	Negligible	5	Minor Adverse	1.0	Negligible	2.7	Negligible
3 Old Brewery Lane, Rhymney (6)	3.4	Negligible	4	Negligible	1.2	Negligible	2.9	Negligible
Valletta Lodge, Hill Road, Pontlottyn (7)	2.1	Negligible	3	Negligible	1.0	Negligible	0.7	Negligible
Bali Hai, Bryhyfryd (8)	2.6	Negligible	3	Negligible	1.4	Negligible	0.6	Negligible
72 Pontlottyn Road, Fochriw (9)	2.1	Negligible	3	Negligible	1.2	Negligible	0.4	Negligible
Cae Glas Fochriw (10)	1.5	Negligible	2	Negligible	1.0	Negligible	0.3	Negligible

Receptor (number on Drawing MA/NL/ES/12/003)	PM_{10} Annual Mean		PM_{10} N° days > 50 µg/m^3		$PM_{2.5}$ Annual Average (µg/m		NO_2 Annual mean	
	Impact (µg/m^3)	Significance	Impact (N° days)	Significance	Impact (µg/m^3)	Significance	Impact (µg/m^3)	Significance
Ty Nazareth, Guest Street Fochriw (11)	1.4	Negligible	2	Negligible	1.0	Negligible	0.3	Negligible
Blaen Carno Farmhouse (12)	2.5	Negligible	2	Negligible	1.0	Negligible	3.2	Negligible
Gypsy Castle (13)	3.0	Negligible	1	Negligible	1.1	Negligible	2.9	Negligible
Commercial Receptors								
Heads of Valley Industrial Estate (14)	4.9	n/a	5	n/a	1.8	n/a	4.9	n/a
Heads of Valley Industrial Estate (15)	5.1	n/a	5	n/a	1.7	n/a	3.5	n/a
Capital Valley Eco Park (16)	3.2	n/a	3	n/a	1.0	n/a	1.4	n/a

Notes: The impacts presented are the difference between the data in Tables 12.9 and 12.35 (but estimated before the data was rounded.

EPUK/IAQM does not give significance criteria for the NO_2 one hour EAL. The annual mean NO_2 EAL is more stringent than the short term EAL, i.e. is generally more difficult to achieve.

Table 12.38: Disposition 3 - Predicted Dust Deposition

Receptor (number on Drawing MA/NL/ES/12/003)	Maximum daily dust deposition averaged over one week mg/m^2/day		Average daily dust deposition averaged over one week mg/m^2/day	
	St Athan	CDP	St Athan	CDP
Residential Receptors				
Cwm Nant (1)	21.1	31.8	3.4	7.3
Lower Row, Bute Town (2)	12.7	18.2	1.8	4.1
The Rhymney House, Llechryd (3)	11.7	17.3	1.9	4.2
Sand Crest Lodge, Rhymney (4)	23.6	29.7	4.5	9.0
26 Glan Yr Afon, Rymney (5)	24.4	29.3	5.7	10.0
3 Old Brewery Lane, Rhymney (6)	27.4	32.0	8.8	12.3
Valletta Lodge, Hill Road, Pontlottyn (7)	45.5	51.9	17.9	12.5
Bali Hai, Bryhyfryd (8)	37.6	44.1	15.1	10.7
72 Pontlottyn Road, Fochriw (9)	40.0	48.1	16.4	11.5
Cae Glas Fochriw (10)	62.2	44.2	15.0	12.8
Ty Nazareth, Guest Street Fochriw (11)	52.5	38.9	12.9	11.5
Blaen Carno Farmhouse (12)	11.8	11.0	2.2	1.8
Gypsy Castle (13)	7.4	10.0	1.5	1.7
Commercial Receptors				
Heads of Valley Industrial Estate (14)	45.4	56.2	17.6	22.0
Heads of Valley Industrial Estate (15)	50.8	54.7	20.6	23.2
Capital Valley Eco Park (16)	47.0	45.1	18.7	16.1
Note: EAL for protection of public amenity = maximum 80 mg/m^2/day averaged over a week.				

12.234 Table 12.39 shows the impact of Disposition 3 on maximum and average dust deposition, for the two meteorological datasets. The MTAN2 guideline value, 80 mg/m^2/day, was predicted to be achieved at all receptors

12.235 Table 12.38 shows the magnitude of the change in dust deposition from the proposed surface mine during Disposition 4, and the significance of the impact for residential receptors. The greatest impact was again predicted to be dust deposition with a minor adverse impact predicted at all receptors except at 72 Pontlottyn Road, Ty Nazareth and Gypsy Castle with the St Athan meteorological dataset. With the more realistic CDP meteorological dataset a negligible impact was also predicted at Cae Glas. Most receptors were predicted to have a large change in dust deposition (greater than 8 mg/m^2/day) and the dust deposition was predicted to be less than 75% of the EAL.

12.236 Overall Disposition 3 is also considered to have a minor adverse impact.

Table 12.39: Disposition 3 - Significance of Predicted Dust Deposition

Receptor (number on Drawing MA/NL/ES/12/003)	Impact* Maximum daily dust deposition averaged over one week $mg/m^2/day$		Significance	
	St Athan	CDP	St Athan	CDP
Residential Receptors				
Cwm Nant (1)	16.8	24.5	Minor Adverse	Minor Adverse
Lower Row, Bute Town (2)	9.3	12.6	Minor Adverse	Minor Adverse
The Rhymney House, Llechryd (3)	8.2	11.5	Minor Adverse	Minor Adverse
Sand Crest Lodge, Rhymney (4)	17.7	20.3	Minor Adverse	Minor Adverse
26 Glan Yr Afon, Rymney (5)	17.8	20.0	Minor Adverse	Minor Adverse
3 Old Brewery Lane, Rhymney (6)	18.7	20.7	Minor Adverse	Minor Adverse
Valletta Lodge, Hill Road, Pontlottyn (7)	22.2	29.4	Minor Adverse	Minor Adverse
Bali Hai, Bryhyfryd (8)	15.4	15.8	Minor Adverse	Minor Adverse
72 Pontlottyn Road, Fochriw (9)	7.7	7.5	Negligible	Negligible
Cae Glas Fochriw (10)	8.2	3.2	Minor Adverse	Negligible
Ty Nazareth, Guest Street Fochriw (11)	6.2	3.4	Negligible	Negligible
Blaen Carno Farmhouse (12)	9.7	8.1	Minor Adverse	Minor Adverse
Gypsy Castle (13)	4.9	7.1	Negligible	Negligible
Commercial Receptors				
Heads of Valley Industrial Estate (14)	36.5	40.8	Minor Adverse	Minor Adverse
Heads of Valley Industrial Estate (15)	37.6	37.4	Minor Adverse	Minor Adverse
Capital Valley Eco Park (16)	27.4	21.1	Minor Adverse	Minor Adverse
Note:. * Compared to the baseline (Tables 12.10 and 12.37				

Disposition 4 – To End of Coaling

12.237 The location of the works and plant during Disposition 4 are shown in Drawing MA/NL/PA/007. The duration of this phase is anticipated to be approximately 2 years, finishing in year 11. At the end of this stage of the development the coal working excavation area will be the closest to Rhymney, and therefore is considered to be the period of maximum impact in the area where there are most human receptors. However, by this time coaling at FLRS will have been completed and therefore there will be less activity, and associated emissions, at the CDP.

12.238 The predicted PM_{10}, $PM_{2.5}$, and NO_2, concentrations at the residential and commercial receptors for Disposition 4 are presented in Table 12.40, and the magnitude and significance of these impacts are presented in Table 12.50.

12.239 During Disposition 4 the air quality EALs were predicted to continue to be achieved at all receptors. At all residential receptors a negligible impact was predicted for all air pollutants. An imperceptible reduction in annual mean $PM_{2.5}$ concentrations compared to the baseline was predicted due to the reduced activity at the CDP, as a result of the completion of coaling at FLRS.

Table 12.40: Disposition 4 - Predicted PM_{10}, $PM_{2.5}$ and NO_2 Concentrations

Receptor (number on Drawing MA/NL/ES/12/003)	PM_{10} Annual Average ($\mu g/m^3$)	PM_{10} N° days > 50 $\mu g/m^3$	$PM_{2.5}$ Annual Average ($\mu g/m^3$)	NO_2 Annual Average ($\mu g/m^3$)	NO_2 N° hours > 200 $\mu g/m^{3**}$
Residential receptors					
Cwm Nant (1)	18.6	5	9.8	14.9	0
Lower Row, Bute Town (2)	17.4	4	9.4	14.1	0
The Rhymney House, Llechryd (3)	17.4	3	9.4	14.2	0
Sand Crest Lodge, Rhymney (4)	19.2	6	9.9	15.5	0
26 Glan Yr Afon, Rymney (5)	19.7	6	10.1	15.9	0
3 Old Brewery Lane, Rhymney (6)	20.4	6	10.3	16.4	0
Valletta Lodge, Hill Road, Pontlottyn (7)	18.9	5	9.9	14.7	0
Bali Hai, Bryhyfryd (8)	19.2	6	10.1	14.4	0
72 Pontlottyn Road, Fochriw (9)	19.4	6	10.2	14.0	0
Cae Glas Fochriw (10)	19.4	7	10.3	13.7	0
Ty Nazareth, Guest Street Fochriw (11)	19.3	5	10.2	13.8	0
Blaen Carno Farmhouse (12)	19.3	4	10.0	15.7	0

Receptor (number on Drawing MA/NL/ES/12/003)	PM_{10} Annual Average ($\mu g/m^3$)	PM_{10} N° days > 50 $\mu g/m^3$	$PM_{2.5}$ Annual Average ($\mu g/m^3$)	NO_2 Annual Average ($\mu g/m^3$)	NO_2 N° hours > 200 $\mu g/m^{3**}$
Residential receptors					
Gypsy Castle (13)	19.4	3	10.0	15.7	0
Commercial receptors					
Heads of Valley Industrial Estate (14)	22.2	8	11.0	17.6	0
Heads of Valley Industrial Estate (15)	22.3	7	10.8	17.5	0
Capital Valley Eco Park (16)	20.1	6	10.1	15.8	0

EALs as follows:

PM_{10} - annual mean 40 $\mu g/m^3$; 35 days per year permitted with PM_{10} greater than 50 $\mu g/m^3$

$PM_{2.5}$ - annual mean 20 $\mu g/m^3$

NO_2 - annual mean 40 $\mu g/m^3$, 18 hours per year permitted with NO_2 greater than 200 $\mu g/m^3$

These EALs apply to locations where the public may be exposed over the relevant averaging period. Therefore at the Heads of the Valley Industrial Estate and the Capital Valley Eco Park the hourly NO_2 EAL only applies where the public might reasonably be expected to be present.

Table 12.41: Disposition 4 - Significance of the Predicted Air Quality Impacts

Receptor (number on Drawing MA/NL/ES/12/003)	PM_{10} Annual Mean		PM_{10} N° days > 50 µg/m³		$PM_{2.5}$ Annual Average		NO_2 Annual mean	
	Impact (µg/m³)	Significance	Impact (N° days)	Significance	Impact (µg/m³)	Significance	Impact (µg/m³)	Significance
Residential Receptors								
Cwm Nant (1)	2.3	Negligible	3	Negligible	0.6	Negligible	1.7	Negligible
Lower Row, Bute Town (2)	1.1	Negligible	2	Negligible	0.3	Negligible	1.0	Negligible
The Rhymney House, Llechryd (3)	1.1	Negligible	1	Negligible	0.3	Negligible	1.1	Negligible
Sand Crest Lodge, Rhymney (4)	2.7	Negligible	4	Negligible	0.7	Negligible	2.3	Negligible
26 Glan Yr Afon, Rymney (5)	3.0	Negligible	4	Negligible	0.8	Negligible	2.6	Negligible
3 Old Brewery Lane, Rhymney (6)	3.5	Negligible	4	Negligible	0.9	Negligible	3.0	Negligible

Receptor (number on Drawing MA/NL/ES/12/003)	PM_{10} Annual Mean		PM_{10} N° days > 50 µg/m^3		$PM_{2.5}$ Annual Average		NO_2 Annual mean	
	Impact (µg/m^3)	Significance	Impact (N° days)	Significance	Impact (µg/m^3)	Significance	Impact (µg/m^3)	Significance
Valletta Lodge, Hill Road, Pontlottyn (7)	1.5	Negligible	2	Negligible	0.2	Negligible	1.2	Negligible
Bali Hai, Bryhyfryd (8)	1.7	Negligible	3	Negligible	0.4	Negligible	0.8	Negligible
72 Pontlottyn Road, Fochriw (9)	1.1	Negligible	2	Negligible	.0.1	Negligible	0.2	Negligible
Cae Glas Fochriw (10)	0.2	Negligible	1	Negligible	-0.3	Negligible	-0.1	Negligible
Ty Nazareth, Guest Street Fochriw (11)	0.3	Negligible	-1	Negligible	-0.2	Negligible	0.0	Negligible
Blaen Carno Farmhouse (12)	3.1	Negligible	2	Negligible	1.0	Negligible	2.7	Negligible
Gypsy Castle (13)	3.2	Negligible	1	Negligible	1.0	Negligible	2.7	Negligible

Receptor (number on Drawing MA/NL/ES/12/003)	PM_{10} Annual Mean		PM_{10} N° days > 50 µg/m^3		$PM_{2.5}$ Annual Average		NO_2 Annual mean	
	Impact (µg/m^3)	Significance	Impact (N° days)	Significance	Impact (µg/m^3)	Significance	Impact (µg/m^3)	Significance
Commercial Receptors								
Heads of Valley Industrial Estate (14)	5.5	n/a	6	n/a	1.6	n/a	4.3	n/a
Heads of Valley Industrial Estate (15)	5.2	n/a	4	n/a	1.3	n/a	4.1	n/a
Capital Valley Eco Park (16)	2.8	n/a	3	n/a	0.5	n/a	2.3	n/a

Notes: The impacts presented are the difference between the data in Tables 12.9 and 12.39 (but estimated before the data was rounded.

EPUK/IAQM does not give significance criteria for the NO_2 one hour EAL. The annual mean NO_2 EAL is more stringent than the short term EAL, i.e. is generally more difficult to achieve.

12.240 Table 12.42 shows the predicted dust deposition with the St Athan and CDP meteorological datasets.

Table 12.42: Disposition 4 - Predicted Dust Deposition

Receptor (number on Drawing MA/NL/ES/12/003)	Maximum daily dust deposition averaged over one week mg/m^2/day		Average daily dust deposition averaged over one week mg/m^2/day	
	St Athan	CDP	St Athan	CDP
Residential Receptors				
Cwm Nant (1)	23.8	34.3	3.5	7.0
Lower Row, Bute Town (2)	12.7	17.2	1.7	3.4
The Rhymney House, Llechryd (3)	12.0	16.7	1.9	3.7
Sand Crest Lodge, Rhymney (4)	27.0	32.4	5.6	9.2
26 Glan Yr Afon, Rymney (5)	26.9	32.1	7.5	10.6
3 Old Brewery Lane, Rhymney (6)	29.6	35.0	11.7	13.9
Valletta Lodge, Hill Road, Pontlottyn (7)	41.2	44.9	16.1	12.4
Bali Hai, Bryhyfryd (8)	36.3	34.3	13.1	10.2
72 Pontlottyn Road, Fochriw (9)	32.6	36.3	13.5	10.3
Cae Glas Fochriw (10)	49.1	35.0	12.4	11.2
Ty Nazareth, Guest Street Fochriw (11)	42.2	31.4	10.8	10.0
Blaen Carno Farmhouse (12)	12.6	11.4	2.4	1.9
Gypsy Castle (13)	9.2	10.7	1.7	1.7
Commercial Receptors				
Heads of Valley Industrial Estate (14)	51.2	56.0	23.6	26.2
Heads of Valley Industrial Estate (15)	53.6	57.6	22.9	25.4
Capital Valley Eco Park (16)	43.1	41.4	17.9	15.2
Note: EAL for protection of public amenity = maximum 80 mg/m^2/day averaged over a week.				

12.241 Table 12.43 shows the impact on dust deposition and the significance at the residential receptors.

Table 12.43: Disposition 4 - Significance of Predicted Dust Deposition

Receptor (number on Drawing MA/NL/ES/12/003)	Impact Maximum daily dust deposition averaged over one week		Significance	
	St Athan	CDP	St Athan	CDP
Residential Receptors				
Cwm Nant (1)Cwm Nant (1)	19.5	27.0	Minor Adverse	Minor Adverse
Lower Row, Bute Town (2)	9.2	11.5	Minor Adverse	Minor Adverse
The Rhymney House, Llechryd (3)	8.5	10.8	Minor Adverse	Minor Adverse
Sand Crest Lodge, Rhymney (4)	21.0	23.0	Minor Adverse	Minor Adverse
26 Glan Yr Afon, Rymney (5)	20.2	22.8	Minor Adverse	Minor Adverse
3 Old Brewery Lane, Rhymney (6)	20.9	23.7	Minor Adverse	Minor Adverse
Valletta Lodge, Hill Road, Pontlottyn (7)	17.9	22.4	Minor Adverse	Minor Adverse
Bali Hai, Bryhyfryd (8)	14.1	5.9	Minor Adverse	Negligible
72 Pontlottyn Road, Fochriw (9)	0.2	-4.3	Negligible	Negligible
Cae Glas Fochriw (10)	-4.9	-6.0	Negligible	Negligible
Ty Nazareth, Guest Street Fochriw (11)	-4.1	-4.1	Negligible	Negligible

Receptor (number on Drawing MA/NL/ES/12/003)	Impact Maximum daily dust deposition averaged over one week		Significance	
	St Athan	CDP	St Athan	CDP
Residential Receptors				
Blaen Carno Farmhouse (12)	10.5	8.4	Minor Adverse	Minor Adverse
Gypsy Castle (13)	6.8	7.8	Negligible	Negligible
Commercial Receptors				
Heads of Valley Industrial Estate (14)	42.3	40.5	Minor Adverse	Minor Adverse
Heads of Valley Industrial Estate (15)	40.5	40.3	Minor Adverse	Minor Adverse
Capital Valley Eco Park (16)	23.5	17.4	Minor Adverse	Minor Adverse
Note: Compared to the baseline (Tables 12.10 and 12.41				

12.242 With the St Athan meteorological dataset there is predicted to be a negligible impact at the three receptor sin Fochriw and at Gypsy Castle. At the other receptors there is predicted to be a minor adverse impact. With the CDP meteorological dataset there is also predicted to be a negligible impact at Bali Hai in Bryhyfryd.

12.243 At several receptors there is predicted to be a reduction in dust deposition. This is due to coaling at FLRS being completed. While we have not included activity at FLRS in the model, activity at the CDP will be affected by the completion of coaling and the consequential reduction of activity is included in the model

12.244 Despite the improvement at some receptors in Fochriw, overall Disposition 4 is also considered to have a minor adverse impact due to the minor adverse impact in Rhymney where there are more dwellings.

Disposition 5 – Backfilling and Restoration

12.245 The location of the works and plant during Disposition 5 are shown in Drawing MA/NL/PA/008. This stage will take approximately three years, up to year 14, to complete. During this stage of the development of the mine the coaling has stopped and the overburden mound is removed to fill the remaining void in the excavation area. At the end of this Disposition the visual and acoustic screening bund will be removed. The last year of backfilling and restoration has been modelled as the backfilling will take place from east to west and the last year is therefore likely to be representative of the worst case, given that operations will be closest to Rhymney.

Table 12.44: Disposition 5 - Predicted PM_{10}, $PM_{2.5}$ and NO_2 Concentrations

Receptor (number on Drawing MA/NL/ES/12/003)	PM_{10} Annual Average ($\mu g/m^3$)	PM_{10} N° days > 50 $\mu g/m^3$	$PM_{2.5}$ Annual Average ($\mu g/m^3$)	NO_2 Annual Average ($\mu g/m^3$)	NO_2 N° hours > 200 $\mu g/m^{3**}$
Residential receptors					
Cwm Nant (1)	17.9	3	9.3	14.3	0
Lower Row, Bute Town (2)	16.8	3	9.1	13.8	0
The Rhymney House, Llechryd (3)	16.8	2	9.1	13.9	0
Sand Crest Lodge, Rhymney (4)	18.0	4	9.3	14.8	0
26 Glan Yr Afon, Rymney (5)	18.3	5	9.3	15.1	0
3 Old Brewery Lane, Rhymney (6)	18.5	5	9.4	15.5	0
Valletta Lodge, Hill Road, Pontlottyn (7)	17.3	4	9.2	14.6	0
Bali Hai, Bryhyfryd (8)	17.0	3	9.1	14.2	0
72 Pontlottyn Road, Fochriw (9)	16.6	3	9.1	13.8	0
Cae Glas Fochriw (10)	16.6	2	9.0	13.5	0
Ty Nazareth, Guest Street Fochriw (11)	16.6	2	9.0	13.6	0
Blaen Carno Farm (12)	18.4	3	9.4	14.8	0

Receptor (number on Drawing MA/NL/ES/12/003)	PM_{10} Annual Average ($\mu g/m^3$)	PM_{10} N° days > 50 $\mu g/m^3$	$PM_{2.5}$ Annual Average ($\mu g/m^3$)	NO_2 Annual Average ($\mu g/m^3$)	NO_2 N° hours > 200 $\mu g/m^{3**}$
Residential receptors					
Gypsy Castle (13)	18.3	3	9.4	15.2	0
Commercial receptors					
Heads of Valley Industrial Estate (14)	20.4	6	9.7	16.5	0
Heads of Valley Industrial Estate (15)	19.9	5	9.7	16.9	0
Capital Valley Eco Park (16)	18.2	4	9.3	15.6	0

EALs as follows:

PM_{10} - annual mean 40 $\mu g/m^3$; 35 days per year permitted with PM_{10} greater than 50 $\mu g/m^3$

$PM_{2.5}$ - annual mean 20 $\mu g/m^3$

NO_2 - annual mean 40 $\mu g/m^3$, 18 hours per year permitted with NO_2 greater than 200 $\mu g/m^3$

These EALs apply to locations where the public may be exposed over the relevant averaging period. Therefore at the Heads of the Valley Industrial Estate and the Capital Valley Eco Park the hourly NO_2 EAL only applies where the public might reasonably be expected to be present.

Table 12.45: Disposition 5 - Significance of the Predicted Air Quality Impacts

Receptor (number on Drawing MA/NL/ES/12/003)	PM_{10} Annual Mean		PM_{10} N° days > 50 µg/m^3		$PM_{2.5}$ Annual Average (µg/m		NO_2 Annual mean	
	Impact (µg/m^3)	Significance	Impact (N° days)	Significance	Impact (µg/m^3)	Significance	Impact (µg/m^3)	Significance
Residential Receptors								
Cwm Nant (1)	1.5	Negligible	1	Negligible	0.1	Negligible	1.1	Negligible
Lower Row, Bute Town (2)	0.5	Negligible	1	Negligible	-0.1	Negligible	0.7	Negligible
The Rhymney House, Llechryd (3)	0.5	Negligible	0	Negligible	0.0	Negligible	0.7	Negligible
Sand Crest Lodge, Rhymney (4)	1.5	Negligible	2	Negligible	0.1	Negligible	1.6	Negligible
26 Glan Yr Afon, Rymney (5)	1.7	Negligible	3	Negligible	0.1	Negligible	1.8	Negligible
3 Old Brewery Lane, Rhymney (6)	1.7	Negligible	3	Negligible	0.0	Negligible	2.2	Negligible
Valletta Lodge, Hill Road, Pontlottyn (7)	-0.1	Negligible	1	Negligible	-0.5	Negligible	1.0	Negligible
Bali Hai, Bryhyfryd (8)	-0.5	Negligible	0	Negligible	-0.6	Negligible	0.6	Negligible

72 Pontlottyn Road, Fochriw (9)	-1.7	Negligible	-1	Negligible	-1.1	Negligible	0.0	Negligible
Cae Glas Fochriw (10)	-2.6	Negligible	-4	Minor Beneficial	-1.6	Negligible	-0.3	Negligible
Ty Nazareth, Guest Street Fochriw (11)	-2.4	Negligible	-4	Minor Beneficial	-1.4	Negligible	-0.2	Negligible
Blaen Carno Farmhouse (12)	2.1	Negligible	1	Negligible	0.3	Negligible	1.7	Negligible
Gypsy Castle (13)	2.1	Negligible	1	Negligible	0.3	Negligible	2.2	Negligible
Commercials Receptors								
Heads of Valley Industrial Estate (14)	3.6	n/a	4	n/a	0.3	n/a	3.2	n/a
Heads of Valley Industrial Estate (15)	2.8	n/a	2	n/a	0.1	n/a	3.5	n/a
Capital Valley Eco Park (16)	0.9	n/a	1	n/a	-0.3	n/a	2.1	n/a
Notes: The impacts presented are the difference between the data in Tables 12.9 and 12.43 (but estimated before the data was rounded. EPUK/IAQM does not give significance criteria for the NO_2 one hour EAL. The annual mean NO_2 EAL is more stringent than the short term EAL, i.e. is generally more difficult to achieve.								

12.246 The predicted PM_{10}, $PM_{2.5}$, and NO_2, concentrations at the residential and commercial receptors for Disposition 5 are presented in Table 12.44, and the magnitude and significance of these impacts are presented in Table 12.45.

12.247 The air quality EALs were predicted to continue to be achieved at all residential receptors and the impact on annual PM_{10}, $PM_{2.5}$ and NO_2 concentrations was predicted to be negligible or a minor benefit compared to the baseline at all the modelled residential receptors. The benefit is due the reduced level of activity at the CDP due to the completion of coaling at FLRS compared to the baseline.

12.248 Table 12.46 shows the predicted maximum and average dust deposition with the St Athan and CDP meteorological datasets. The MTAN2 guideline value of 80 mg/m^2/day was predicted to be achieved at all receptors.

Table 12.46: Disposition 5 - Predicted Dust Deposition

Receptor (number on Drawing MA/NL/ES/12/003)	Maximum daily dust deposition averaged over one week mg/m^2/day		Average daily dust deposition averaged over one week mg/m^2/day	
	St Athan	CDP	St Athan	CDP
Residential Receptors				
Cwm Nant (1)	13.6	18.4	2.2	4.8
Lower Row, Bute Town (2)	6.7	8.8	0.9	2.1
The Rhymney House, Llechryd (3)	6.4	8.6	1.0	2.1
Sand Crest Lodge, Rhymney (4)	14.7	16.8	3.2	5.4
26 Glan Yr Afon, Rymney (5)	13.8	16.1	3.8	5.6
3 Old Brewery Lane, Rhymney (6)	13.0	13.8	5.4	6.0
Valletta Lodge, Hill Road, Pontlottyn (7)	21.2	16.7	5.7	3.9
Bali Hai, Bryhyfryd (8)	15.3	9.3	3.1	2.4
72 Pontlottyn Road, Fochriw (9)	6.4	9.8	1.5	1.0
Cae Glas Fochriw (10)	4.1	2.8	0.6	0.4
Ty Nazareth, Guest Street Fochriw (11)	3.2	2.9	0.6	0.4

Receptor (number on Drawing MA/NL/ES/12/003)	Maximum daily dust deposition averaged over one week mg/m^2/day		Average daily dust deposition averaged over one week mg/m^2/day	
	St Athan	CDP	St Athan	CDP
Blaen Carno Farmhouse (12)	5.4	3.2	1.1	0.6
Gypsy Castle (13)	3.8	3.4	0.7	0.5
Commercial Receptors				
Heads of Valley Industrial Estate (14)	30.5	32.7	14.3	15.1
Heads of Valley Industrial Estate (15)	28.7	29.8	13.6	13.3
Capital Valley Eco Park (16)	21.8	21.0	9.2	6.7
Note: EAL for protection of public amenity = maximum 80 mg/m^2/day averaged over a week.				

12.249 Table 12.47 shows the impact on dust deposition of Disposition 5 and its significance at the residential receptors. There was predicted to be a minor benefit in Fochriw as a result of reduced emissions as activity at the CDP reduces due to the end of coaling. Using the CDP meteorological dataset there was also predicted to be a minor benefit at Bryhyfryd.

12.250 At eight residential receptors there was predicted to be a negligible and at one or two residential receptors (depending on the meteorological dataset used) a minor adverse impact. The minor adverse impacts were predicted to occur at Cwm Nant, and Sand Crest Lodge because while there is a large (i.e. greater than 8 mg/m^2/day) change in dust deposition and the dust deposition will be less than 75% of the EAL. No adverse impacts were predicted at residential receptors using the CDP meteorological dataset. other than at Cwm Nant where a minor adverse impact was predicted.

12.251 A minor adverse impact was also predicted at the Heads of the Valley industrial estate.

Table 12.47: Disposition 5 - Significance of Predicted Dust Deposition

Receptor (number on Drawing MA/NL/ES/12/003)	Impact Maximum daily dust deposition averaged over one week mg/m^2/day		Significance	
	St Athan	CDP	St Athan	CDP
Residential Receptors				
Cwm Nant (1)	9.4	11.1	Minor Adverse	Minor Adverse
Lower Row, Bute Town (2)	3.2	3.1	Negligible	Negligible
The Rhymney House, Llechryd (3)	2.8	2.8	Negligible	Negligible
Sand Crest Lodge, Rhymney (4)	8.8	7.4	Minor Adverse	Negligible
26 Glan Yr Afon, Rymney (5)	7.1	6.8	Negligible	Negligible
3 Old Brewery Lane, Rhymney (6)	4.3	2.5	Negligible	Negligible
Valletta Lodge, Hill Road, Pontlottyn (7)	-2.2	-5.7	Negligible	Negligible
Bali Hai, Bryhyfryd (8)	-6.9	-19.1	Negligible	Minor Beneficial
72 Pontlottyn Road, Fochriw (9)	-26.0	-30.8	Minor Beneficial	Minor Beneficial
Cae Glas Fochriw (10)	-49.9	-38.2	Minor Beneficial	Minor Beneficial
Ty Nazareth, Guest Street Fochriw (11)	-43.1	-32.5	Minor Beneficial	Minor Beneficial
Blaen Carno Farmhouse (12)	3.3	0.3	Negligible	Negligible
Gypsy Castle (13)	1.4	0.6	Negligible	Negligible
Commercial Receptors				
Heads of Valley Industrial Estate (14)	21.6	17.3	Minor Adverse	Minor Adverse
Heads of Valley Industrial Estate (15)	15.5	12.6	Minor Adverse	Minor Adverse
Capital Valley Eco Park (16)	2.2	-3.0	Negligible	Negligible
Note: * Compared to the baseline (Tables 12.10 and 12.45)				

12.252 At the end of Disposition 5 the Visual and Acoustic Screening Bund will be removed. This impact was not been explicitly modelled because the impacts are likely to be similar to those during its construction (see Table 12.31). In summary, using both meteorological

datasets, the impact on dust deposition at the majority of the receptors was predicted to be negligible.

12.253 Overall Disposition 5 is considered to have negligible impact taking account of the beneficial impact in Fochriw and that the impact at the majority of the residential receptors is negligible.

Ecological Receptors

12.254 The impact of the exhaust emissions from the coal trucks, Nant Llesg traffic, the Mine works and the CDP on the Tair Carreg SINC was modelled using ADMS and ADMS-Roads. In addition the dust emissions from the project including the CDP were modelled using ADMS. The predicted NOx concentrations and nitrogen and acid deposition are showed in Table 12.48.

12.255 The data is presented for the Disposition resulting in the highest concentration or deposition, i.e. the worst case during the operation of the Mine.

Table 12.48: Predicted NOx Concentrations and Nitrogen and Acid Deposition with the Nant Llesg Surface Mine on the Tair Carreg SINC

Receptor (number on Drawing MA/NL/ES/12/003)	Annual mean NOx **(µg/m^3)**	**Maximum Daily NO_x (µg/m^3)**	**Nitrogen deposition (kgN/Ha/yr)**	**Acid deposition (K_{eq}/Ha/yr)**
Tair Carreg Moor SINC (north) (17)	39.6	235	23.6	0.22
Tair Carreg Moor SINC (south) (18)	63.4	278	24.0	0.25
EALs as follows: NOx annual mean 30 µg/m^3; daily 75 µg/m^3 Nitrogen deposition 5 kgN/Ha/yr (acid grasslands) Acid deposition 1.42 K_{eq}/Ha/yr				

12.256 The NOx and the nitrogen deposition EALs are predicted to be exceeded with Nant Llesg, mainly due to high baseline levels. The acid deposition EAL is achieved by a wide margin.

12.257 The impacts of the operation of the Nant Llesg Surface Mine on NOx concentrations and nitrogen and acid deposition are shown in Table 12.49. That is the difference between the data shown in Table 12.48 (with Nant Llesg operating) and Table 12.11 (baseline).

Table 12.49: Predicted Impact of Nant Llesg Surface Mine on NOx Concentrations and Nitrogen and Acid Deposition on the Tair Carreg SINC

Receptor (number on Drawing MA/NL/ES/12/003)	Annual mean NOx ($\mu g/m^3$)	Maximum Daily NO_x ($\mu g/m^3$)	Nitrogen deposition (kgN/Ha/yr)	Acid deposition (K_{eq}/Ha/yr)
Tair Carreg Moor SINC (north) (17)	20.4	127	0.7	0.05
Tair Carreg Moor SINC (south) (18)	24.5	95	0.4	0.03
For the significance of the ecological impacts see the Ecology Chapter (Chapter 8) Table shows the difference between Table 12.11 (baseline) and Table 12.46.				

12.258 Comparison of the data in Tables 12.48 and 12.49 shows that the baseline conditions contribute significantly to the predicted concentrations and deposition, particularly at the southern SINC receptor. The significance of this is discussed in the Ecology Chapter (Chapter 8).

12.259 The predicted dust deposition is presented in Table 12.50. The dust deposition indicative EAL is predicted to be exceeded at the ecological receptor closest to the CDP (receptor 18). This is due to the high baseline dust deposition which already exceeds the EAL (1,555 and 1,803 $mg/m^{2/}$day for the St Athan and CDP data respectively) (see Table 12.12); the proposed mine is predicted to increase the baseline dust deposition at this receptor by less than 10%.

12.260 Dust can have two types of effect on vegetation: physical and chemical. Any adverse effect due to physical processes, such as reduced photosynthesis or respiration and transpiration due to the deposition of dust, is naturally countered by the high level of rainfall experienced in this area. In this location any dust depositing on the leaves would be readily washed away by the frequent rain. More than 50% of days are wet days, as recorded by the rain gauge at the CDP. Furthermore, coal processing, storage and transport have been undertaken at the CDP for more than 50 years, well before the site was locally designated as a SINC. The vegetation is therefore more likely to reflect the chemical and physical regime over that period. It is therefore considered unlikely that these levels of dust deposition have had or will have a significant impact on the SINC. This is discussed further in the ecology chapter (Chapter 8) of this Environmental Statement.

Table 12.50: Predicted Dust Deposition during Operation of the Nant Llesg Surface Mine on the Tair Carreg SINC

Receptor (Number on Drawing MA/NL/ES/12/003)	Maximum daily dust deposition averaged over one week mg/m^2/day		Average daily dust deposition averaged over one week mg/m^2/day	
	St Athan	CDP	St Athan	CDP
Tair Carreg Moor SINC (north) (17)	85	65	21	17
Tair Carreg Moor SINC (south) (18)	1890	2181	493	816
Indicative EAL: 1,000 mg/m^2/day				

12.261 Table 12.51 shows the impact of the operation of the proposed surface mine on the maximum and average dust deposition, (i.e. the difference between the dust deposition in tables 12.46 and 12.12).

Table 12.51: Predicted Impact of the Operation of the Nant Llesg Surface Mine on the Tair Carreg SINC

Receptor (Number on Drawing MA/NL/ES/12/003)	Maximum daily dust deposition averaged over one week mg/m^2/day		Average daily dust deposition averaged over one week mg/m^2/day	
	St Athan	CDP	St Athan	CDP
Tair Carreg Moor SINC (north) (17)	67	51	17	15
Tair Carreg Moor SINC (south) (18)	335	372	26	34
Note: The table shows the difference between Table 12.12. and Table 12.48				

12.262 The impact of the operation of the Nant Llesg Surface Mine on the Cefn Gelligaer SINC to the south of South Tunnel Road has not been modelled. However, the NOx concentrations

and nitrogen and acid deposition close to the Fochriw Road are likely to be within the range of those at the two receptors modelled on the Tair Carreg Moor SINC.

12.263 The dust deposition on the Cefn Gelligaer SINC close to the boundary of the CDP is likely to be similar to that at the southern Tair Carreg receptor (receptor 18), but less with distance from the CDP.

12.264 The implications of these increases in dust and NOx concentrations are discussed in the Ecology Chapter.

12.265 In response to CCW and EAW (both now NRW) the impact of the Nant Llesg Surface Mine on dust deposition on Aberbargoed Grasslands SAC, Usk Bat Sites SAC, Cwm Cadlan SAC and Blaen Cynon SAC has been considered qualitatively.

12.266 The Tair Carreg Moor SINC receptors modelled are 310m (receptor 17) and 1,150m (receptor 18) from the coal working excavation area of the Nant Llesg Mine. The highest dust deposition occurs close to the CDP (at receptor 18). At the closest modelled receptor to the coal working excavation area (Tair Carreg SINC receptor 17), and all the receptors away from the CDP the dust deposition is well below the indicative EAL for protection of vegetation of 1000mg/m^2/day (see Tables 12.28, 12.34, 12,38, 12,42 and 12.46). Therefore the SACs, which are significantly further from Nant Llesg than these receptors, will not experience significant dust deposition as a result of the operation of the Mine. The potential for ecological effects on the SACs are considered further in the Ecology chapter

12.267 Other locally designated sites within approximately 2 km of the site include:

- Butetown, Llechryd and Rhymney Grasslands
- Cefn y Brithdir, South of Pontlottyn
- Cwm-Llydrew Wood, South of Fochriw
- Mile End Pond, Abertysswg
- Nant Bargod Flush, South of Fochriw
- Nant Bargod Rhymni
- Pan March and Traed y Milwyr, Llechryd
- River Rhymney
- Troed-Rhiw'r-Fuwch, north west of New Tredegar
- Y Graig Mire, south of Abertysswg

12.268 These sites also are very unlikely to experience dust deposition in excess of the indicative dust deposition EAL.

Railway

12.269 The impact of the NOx emissions from the train locomotives on annual mean NO_2 concentrations close to the railway in Bedlinog are shown in Table 12.52. The impact is predicted to be imperceptible, and the impact is of negligible significance. At other receptors further from the railway the impact will be even less.

Table 12.52: Predicted NO_2 Concentrations near Railway

Receptor (number on Drawing MA/NL/ES/12/003)	NO_2 annual mean*			
	Baseline Concentration ($\mu g/m^3$)	With Nant Llesg Concentration ($\mu g/m^3$)	Impact ($\mu g/m^3$)	Significance
28 Bedw Road (A)	13.6	13.7	0.1	Negligible
13 Moriah Street (B)	13.7	13.9	0.2	Negligible
18 Edward Terrace (C)	13.7	13.9	0.2	Negligible
11 Station Terrace (D)	13.7	13.8	0.1	Negligible
High Street (E)	13.9	14.2	0.3	Negligible
EAL: NO_2 annual mean 40 $\mu g/m^3$				

12.270 There is potential for the coal dust to escape from the coal wagons. However, the wagons are designed with the top of the sides sloping inwards to prevent dust emissions. These are cleaned before the train leaves the CDP. Figure 12.1 shows photographs of the wagons and their cleaning.

12.271 The six months of baseline dust flux data adjacent to the railway line shows that there is little dust coming from the coal wagons. Therefore it is not considered that dust emissions from the coal wagons are currently significant. It is considered unlikely that the increase in the number of trains due to the disposal of the coal form the proposed mine will change this.

Figure 12.1 Photographs of the Coal Wagons and Cleaning the Wagons

Overall significance of the operational impacts

12.272 The magnitude of the change in PM_{10}, $PM_{2.5}$ and NO_2 concentrations at residential receptors as a result of the operation of the proposed mine is generally small, and due to the good baseline air quality in the area, all the air quality EALS are achieved by a wide margin and therefore the significance of the impact at most residential receptors is negligible. However, for a small number of receptors, a minor adverse impact is predicted with respect to PM_{10} concentrations.

12.273 The most significant impact is dust deposition. During Dispositions 1 to 4 there is predicted to be a minor adverse impact at most modelled receptors, with the highest dust deposition predicted at the Heads of Valley Industrial Estate during Dispositions 3 and 4. It should be noted that the baseline DustScan data suggests that there is an existing source of dust in this area. It is an industrial estate where dust emissions might be expected to be higher than in residential areas.

12.274 The modelling suggests that the mass dust deposition criterion in MTAN2 of 80 mg/m^2/day will be achieved at all the receptors modelled. However, there may be periods of dust deposition in the local community but if they do occur are likely to be rare occurrences during certain weather conditions, such as dry weather with high wind speeds that could disperse the dust from the surface mine operations long distances towards receptors.

12.275 In determining the overall significance of an impact the IAQM guidance recommends the use of professional judgement. A number of factors need to be taken into account.

12.276 The modelling suggests that there should be no adverse impacts to the health of the local communities because the air quality assessment levels set to protect human health, are all predicted to be achieved, by a wide margin. In general the impact on air quality at individual receptors is negligible.

12.277 The assessment level for dust annoyance is less well defined. The origins and evidence base for the MTAN2 criterion of 80 mg/m^2/day is unclear, and MTAN2 does not provide information on the type or specification of sampler to be used to measure dust deposition. The mass of dust measured is very dependent on the collection efficiency of the sampler.

12.278 Public expectations over acceptable dust levels are likely to have changed over recent decades, but there has been little, if any, work over this period investigating the acceptability of the mass of dust deposited around surface coal mines. The use of directional dust soiling data (i.e. using %AAC and %EAC), is a better method of measuring the potential for dust annoyance, given the recent work undertaken by DustScan Ltd in

developing a dust complaints risk matrix (Table 12.2). However, it is not possible to model the soiling using a dispersion model.

12.279 The prediction of maximum concentrations (and dust deposition) using dispersion models is difficult. These model are much better at predicting long term average concentrations, and it is considered likely that the model used over-estimates the annual mean concentrations and, is a useful tool for predicting whether the short term PM_{10} objective is achieved or not. However of all the matrices used in this assessment it is least good at predicting the maximum daily dust deposition.

12.280 The modelling suggests that the MTAN2 criterion will be met, and for the vast majority of the time the dust deposition will be much lower than the maximum MTAN2 limit (80mg/m^2/day as a weekly average). In reality, adverse weather conditions (dry weather and high wind speeds) that result in dust emissions will occur.

12.281 Proactive dust management will reduce the potential for dust emissions to disperse from the site. These include anticipation of adverse weather conditions, monitoring dust both on site and in the community, the use of best practice dust suppression and, if necessary, the ability to shut down operations until weather conditions change. However there may be occasions, albeit likely to be rare, when dust will deposit in the local community. These dust events may occur over only one or two days, i.e. less than the MTAN2 weekly averaging period. Nevertheless they may cause annoyance.

12.282 Miller Argent's management procedures are proactive, and ultimately if there are abnormal dust emissions that cannot be controlled thorough the use of water suppression, operations will cease until weather conditions improve. Nevertheless, there may be occasional dust events that are difficult to control.

12.283 The operation of the mine will continue for 14 years. This is considered to be a long period for members of the local community to experience periodic dust events.

12.284 Therefore, although the impacts at individual receptors, based on the model results, were generally negligible with respect to air quality and minor adverse with respect to dust deposition, taken as a whole, over the 14 years of the mine operation, the long term impact in terms of air quality and dust deposition is considered to be a moderate adverse impact.

Decommissioning of Cwmbargoed Disposal Point

12.285 The future decommissioning of the CDP is likely to result in a reduction in dust deposition in Fochriw as its operations will no longer be a source of dust. However, during its decommissioning, if it involves the removal of plant and clearing of the site, there may be short term dust emissions.

Aftercare

12.286 The aftercare of the site is not considered to have any significant impacts on air quality or dust deposition.

Cumulative Impacts

12.287 Other potentially significant sources of dust, airborne particulate matter, and NO_X in or close to the study area are the Trecatti Landfill operated by Biffa, FLRS operated by Miller Argent and the proposed NET Wood Pellet Plant in Capital Valley Eco Park.

12.288 The processing and disposal of the coal from FLRS is included in the baseline assessment and assessment of the operations of the CDP during the scheme. The other important

source of dust during some Dispositions is the removal of the southern overburden mound of FLRS. The mound will shortly be completed and seeded and is unlikely to be a significant source of dust during the early phases of the mine. However, its removal as part of the backfilling of the FLRS excavation area has the potential to give rise to dust emissions which will occur during Dispositions 3 and 4. The cumulative impact of the removal of the FLRS overburden mounds and Dispersions 3 and 4 have been modelled and the results are shown in the following tables (Tables 12.53 to 12.56).

Table 12.53: Cumulative Impact of Disposition 3 and the Removal of the FLRS Overburden Mounds: Predicted Air Quality

Receptor (number on Drawing MA/NL/ES/12/003)	PM_{10} Annual Average ($\mu g/m^3$)	PM_{10} N° days > 50 $\mu g/m^3$	$PM_{2.5}$ Annual Average ($\mu g/m^3$)	NO_2 Annual Average ($\mu g/m^3$)	NO_2 N° hours > 200 $\mu g/m^{3**}$
Residential Receptors					
Cwm Nant (1)	19.2	7	10.1	16.9	0
Lower Row, Bute Town (2)	18.1	4	9.7	15.9	0
The Rhymney House, Llechryd (3)	18.1	3	9.7	15.8	0
Sand Crest Lodge, Rhymney (4)	19.8	8	10.4	17.2	0
26 Glan Yr Afon, Rymney (5)	20.2	8	10.5	17.5	0
3 Old Brewery Lane, Rhymney (6)	21.0	7	10.8	17.9	0
Valletta Lodge, Hill Road, Pontlottyn (7)	20.4	6	10.9	16.5	0
Bali Hai, Bryhyfryd (8)	21.1	10	11.4	16.3	0
72 Pontlottyn Road, Fochriw (9)	21.4	8	11.6	16.5	0
Cae Glas Fochriw (10)	21.9	12	12.0	16.4	0
Ty Nazareth, Guest Street Fochriw (11)	21.7	12	11.8	16.4	0
Blaen Carno Farm (12)	19.1	4	10.2	17.1	0

Receptor (number on Drawing MA/NL/ES/12/003)	PM_{10} Annual Average ($\mu g/m^3$)	PM_{10} N° days > 50 $\mu g/m^3$	$PM_{2.5}$ Annual Average ($\mu g/m^3$)	NO_2 Annual Average ($\mu g/m^3$)	NO_2 N° hours > 200 $\mu g/m^{3**}$
Residential Receptors					
Gypsy Castle (13)	19.6	4	10.3	17.2	0
Commercial Receptors					
Heads of Valley Industrial Estate (14)	22.6	10	11.5	19.9	0
Heads of Valley Industrial Estate (15)	23.2	12	11.5	19.1	0
Capital Valley Eco Park (16)	21.4	6	10.9	17.1	0

EALs as follows:

PM_{10} - annual mean 40 $\mu g/m^3$; 35 days per year permitted with PM_{10} greater than 50 $\mu g/m^3$

$PM_{2.5}$ - annual mean 20 $\mu g/m^3$

NO_2 - annual mean 40 $\mu g/m^3$, 18 hours per year permitted with NO_2 greater than 200 $\mu g/m^3$

These EALs apply to locations where the public may be exposed over the relevant averaging period. Therefore at the Heads of the Valley Industrial Estate and the Capital Valley Eco Park the hourly NO_2 EAL only applies where the public might reasonably be expected to be present.

Table 12.54. Cumulative Impact of Disposition 3 and the Removal of the FLRS Overburden Mounds: Significance of the Predicted Air Quality Impacts

Receptor (number on Drawing MA/NL/ES/12/003)	PM_{10} Annual Mean		PM_{10} N° days > 50 µg/m^3		$PM_{2.5}$ Annual Average (µg/m		NO_2 Annual mean	
	Impact (µg/m^3)	Significance	Impact (N° days)	Significance	Impact (µg/m^3)	Significance	Impact (µg/m^3)	Significance
Residential Receptors								
Cwm Nant (1)	2.8	Negligible	5	Minor Adverse	1.0	Negligible	3.7	Negligible
Lower Row, Bute Town (2)	1.8	Negligible	2	Negligible	0.6	Negligible	2.8	Negligible
The Rhymney House, Llechryd (3)	1.8	Negligible	1	Negligible	0.6	Negligible	2.6	Negligible
Sand Crest Lodge, Rhymney (4)	3.3	Negligible	6	Minor Adverse	1.1	Negligible	4.0	Negligible
26 Glan Yr Afon, Rymney (5)	3.6	Negligible	6	Minor Adverse	1.3	Negligible	4.3	Minor Adverse
3 Old Brewery Lane, Rhymney (6)	4.2	Minor adverse	5	Minor Adverse	1.4	Negligible	4.6	Minor Adverse
Valletta Lodge, Hill Road, Pontlottyn (7)	3.0	Negligible	3	Negligible	1.2	Negligible	2.9	Negligible
Bali Hai, Bryhyfryd (8)	3.5	Negligible	7	Minor Adverse	1.6	Negligible	2.7	Negligible
72 Pontlottyn Road, Fochriw (9)	3.1	Negligible	4	Minor Adverse	1.4	Negligible	2.7	Negligible

Cae Glas Fochriw (10)	2.6	Negligible	6	Minor Adverse	1.4	Negligible	2.5	Negligible
Ty Nazareth, Guest Street Fochriw (11)	2.6	Negligible	6	Minor Adverse	1.3	Negligible	2.6	Negligible
Blaen Carno Farmhouse (12)	2.8	Negligible	2	Negligible	1.1	Negligible	4.1	Minor Adverse
Gypsy Castle (13)	3.4	Negligible	2	Negligible	1.2	Negligible	4.1	Minor Adverse
Commercial Receptors								
Heads of Valley Industrial Estate (14)	5.8	n/a	8	n/a	2.1	n/a	6.6	n/a
Heads of Valley Industrial Estate (15)	6.0	n/a	9	n/a	2.0	n/a	5.7	n/a
Capital Valley Eco Park (16)	4.1	n/a	3	n/a	1.3	n/a	3.6	n/a
Notes: The impacts presented are the difference between the data in Tables 12.8 and 12.52 (but estimated before the data was rounded. EPUK/IAQM does not give significance criteria for the NO_2 one hour EAL. The annual mean NO_2 EAL is more stringent than the short term EAL, i.e. is generally more difficult to achieve.								

Table 12.55: Cumulative Impact of Disposition 4 and the Removal of the FLRS Overburden Mounds: Predicted Air Quality

Receptor (number on Drawing MA/NL/ES/12/003)	PM_{10} Annual Average ($\mu g/m^3$)	PM_{10} N° days > 50 $\mu g/m^3$	$PM_{2.5}$ Annual Average ($\mu g/m^3$)	NO_2 Annual Average ($\mu g/m^3$)	NO_2 N° hours > 200 $\mu g/m^{3**}$
Residential Receptors					
Cwm Nant (1)	19.5	9	10.0	16.9	0
Lower Row, Bute Town (2)	18.1	4	9.6	16.0	0
The Rhymney House, Llechryd (3)	18.1	3	9.6	15.9	0
Sand Crest Lodge, Rhymney (4)	20.1	8	10.2	17.2	0
26 Glan Yr Afon, Rymney (5)	20.6	8	10.4	17.6	0
3 Old Brewery Lane, Rhymney (6)	21.3	6	10.6	18.3	0
Valletta Lodge, Hill Road, Pontlottyn (7)	19.8	6	10.1	16.9	0
Bali Hai, Bryhyfryd (8)	20.0	6	10.3	16.6	0
72 Pontlottyn Road, Fochriw (9)	20.2	7	10.4	16.3	0
Cae Glas Fochriw (10)	20.3	7	10.6	16.0	0
Ty Nazareth, Guest Street Fochriw (11)	20.2	7	10.5	15.9	0
Blaen Carno Farm (12)	19.8.	4	10.2	16.9	0

Receptor (number on Drawing MA/NL/ES/12/003)	PM_{10} Annual Average ($\mu g/m^3$)	PM_{10} N° days > 50 $\mu g/m^3$	$PM_{2.5}$ Annual Average ($\mu g/m^3$)	NO_2 Annual Average ($\mu g/m^3$)	NO_2 N° hours > 200 $\mu g/m^{3**}$
Residential Receptors					
Gypsy Castle (13)	20.1	5	10.2	17.4	0
Commercial Receptors					
Heads of Valley Industrial Estate (14)	23.3	10	11.3	19.7	0
Heads of Valley Industrial Estate (15)	23.4	8	11.2	19.8	0
Capital Valley Eco Park (16)	21.1	6	10.4	17.7	0

EALs as follows:

PM_{10} - annual mean 40 $\mu g/m^3$; 35 days per year permitted with PM_{10} greater than 50 $\mu g/m^3$

$PM_{2.5}$ - annual mean 20 $\mu g/m^3$

NO_2 - annual mean 40 $\mu g/m^3$, 18 hours per year permitted with NO_2 greater than 200 $\mu g/m^3$

These EALs apply to locations where the public may be exposed over the relevant averaging period. Therefore at the Heads of the Valley Industrial Estate and the Capital Valley Eco Park the hourly NO_2 EAL only applies where the public might reasonably be expected to be present.

Table 12.56. Cumulative Impact of Disposition 4 and the Removal of the FLRS Overburden Mounds: Significance of the Predicted Air Quality Impacts

Receptor (number on Drawing MA/NL/ES/12/003)	PM_{10} Annual Mean		PM_{10} N° days > 50 µg/m^3		$PM_{2.5}$ Annual Average (µg/m		NO_2 Annual mean	
	Impact (µg/m^3)	Significance	Impact (N° days)	Significance	Impact (µg/m^3)	Significance	Impact (µg/m^3)	Significance
Residential Receptors								
Cwm Nant (1)	3.1	Negligible	7	Minor Adverse	0.9	Negligible	3.8	Negligible
Lower Row, Bute Town (2)	1.9	Negligible	2	Negligible	0.5	Negligible	2.9	Negligible
The Rhymney House, Llechryd (3)	1.8	Negligible	1	Negligible	0.5	Negligible	2.8	Negligible
Sand Crest Lodge, Rhymney (4)	3.6	Negligible	6	Minor Adverse	1.0	Negligible	4.0	Minor Adverse
26 Glan Yr Afon, Rymney (5)	3.9	Negligible	6	Minor Adverse	1.1	Negligible	4.4	Minor adverse
3 Old Brewery Lane, Rhymney (6)	4.5	Minor adverse	4	Negligible	1.2	Negligible	4.9	Minor adverse
Valletta Lodge, Hill Road, Pontlottyn (7)	2.4	Negligible	3	Negligible	0.4	Negligible	3.3	Negligible

Bali Hai, Bryhyfryd (8)	2.4	Negligible	3	Negligible	0.6	Negligible	3.0	Negligible
72 Pontlottyn Road, Fochriw (9)	1.9	Negligible	3	Negligible	0.3	Negligible	2.5	Negligible
Cae Glas Fochriw (10)	1.1	Negligible	1	Negligible	0.0	Negligible	2.1	Negligible
Ty Nazareth, Guest Street Fochriw (11)	1.1	Negligible	1	Negligible	0.0	Negligible	2.1	Negligible
Blaen Carno Farmhouse (12)	3.5	Negligible	2	Negligible	1.1	Negligible	3.9	Negligible
Gypsy Castle (13)	3.9	Negligible	3	Negligible	1.2	Negligible	4.3	Minor Adverse
Commercial Receptors								
Heads of Valley Industrial Estate (14)	6.5	n/a	8	n/a	1.9	n/a	6.3	n/a
Heads of Valley Industrial Estate (15)	6.3	n/a	5	n/a	1.6	n/a	6.3	n/a
Capital Valley Eco Park (16)	3.8	n/a	3	n/a	0.8	n/a	4.2	n/a

Notes: The impacts presented are the difference between the data in Tables 12.8 and 12.54 (but estimated before the data was rounded.

EPUK/IAQM does not give significance criteria for the NO_2 one hour EAL. The annual mean NO_2 EAL is more stringent than the short term EAL, i.e. is generally more difficult to achieve.

12.289 Tables 12.53 and 12.55 show that all the EALs continue to be achieved by a good margin when the FLRS overburden mounds are removed during Dispositions 3 and 4. Tables 12.54 and 12.56 show that there is a minor cumulative adverse impact on the number of days when PM_{10} concentrations are greater than 50 µg/m^3 at several of the residential receptors. There is also a minor adverse impact with respect to the annual mean concentrations of PM_{10} and NO_2 at one or two receptors.

12.290 Tables 12.57 to 12.60 show the cumulative impacts on dust deposition during Dispositions 3 and 4.

Table 12.57: Cumulative Impact of Disposition 3 and the Removal of the FLRS Overburden Mounds: Dust Deposition

Receptor (number on Drawing MA/NL/ES/12/003)	Maximum daily dust deposition averaged over one week mg/m^2/day		Average daily dust deposition averaged over one week mg/m^2/day	
	St Athan	CDP	St Athan	CDP
Residential Receptors				
Cwm Nant (1)	25.6	37.1	4.1	7.3
Lower Row, Bute Town (2)	16.4	22.4	2.3	4.1
The Rhymney House, Llechryd (3)	14.7	20.8	2.3	4.1
Sand Crest Lodge, Rhymney (4)	28.8	36.1	5.4	8.6
26 Glan Yr Afon, Rymney (5)	29.7	35.1	6.6	9.4
3 Old Brewery Lane, Rhymney (6)	33.2	38.0	10.0	11.3
Valletta Lodge, Hill Road, Pontlottyn (7)	55.3	63.0	21.5	9.2
Bali Hai, Bryhyfryd (8)	47.0	54.6	18.4	7.0
72 Pontlottyn Road, Fochriw (9)	48.4	57.2	19.6	5.4
Cae Glas Fochriw (10)	72.7	50.8	17.7	4.0
Ty Nazareth, Guest Street Fochriw (11)	61.6	45.3	15.5	3.8
Blaen Carno Farmhouse (12)	12.7	13.3	2.7	2.4
Gypsy Castle (13)	8.3	12.3	1.8	2.1
Commercial Receptors				
Heads of Valley Industrial Estate (14)	52.6	64.0	19.0	21.1
Heads of Valley Industrial Estate (15)	60.2	64.1	22.8	21.5
Capital Valley Eco Park (16)	55.5	51.5	22.0	18.4
Note: EAL for protection of public amenity = maximum 80 mg/m^2/day averaged over a week.				

Table 12.58: Cumulative Impact of Disposition 3 and the Removal of the FLRS Overburden Mounds: Significance of the Predicted Dust Deposition Impacts

Receptor (number on Drawing MA/NL/ES/12/003)	Impact Maximum daily dust deposition averaged over one week $mg/m^2/day$		Significance	
	St Athan	CDP	St Athan	CDP
Residential Receptors				
Cwm Nant (1)	21.3	29.8	Minor Adverse	Minor Adverse
Lower Row, Bute Town (2)	12.9	16.8	Minor Adverse	Minor Adverse
The Rhymney House, Llechryd (3)	11.1	15.0	Minor Adverse	Minor Adverse
Sand Crest Lodge, Rhymney (4)	22.8	26.8	Minor Adverse	Minor Adverse
26 Glan Yr Afon, Rymney (5)	23.0	25.8	Minor Adverse	Minor Adverse
3 Old Brewery Lane, Rhymney (6)	24.5	26.7	Minor Adverse	Minor Adverse
Valletta Lodge, Hill Road, Pontlottyn (7)	31.9	40.5	Minor Adverse	Minor Adverse
Bali Hai, Bryhyfryd (8)	24.8	26.3	Minor Adverse	Minor Adverse
72 Pontlottyn Road, Fochriw (9)	16.0	16.6	Minor Adverse	Minor Adverse
Cae Glas Fochriw (10)	18.7	9.8	Moderate Adverse	Minor Adverse
Ty Nazareth, Guest Street Fochriw (11)	15.3	9.8	Minor Adverse	Minor Adverse
Blaen Carno Farmhouse (12)	10.6	10.4	Minor Adverse	Minor Adverse
Gypsy Castle (13)	5.9	9.5	Negligible	Minor Adverse
Commercial Receptors				
Heads of Valley Industrial Estate (14)	43.6	48.6	Minor Adverse	Minor Adverse
Heads of Valley Industrial Estate (15)	47.0	46.8	Minor Adverse	Minor Adverse
Capital Valley Eco Park (16)	35.9	27.5	Minor Adverse	Minor Adverse
Note: EAL for protection of public amenity = maximum 80 $mg/m^2/day$ averaged over a week.				

Table 12.59: Cumulative Impact of Disposition 4 and the Removal of the FLRS Overburden Mounds: Dust Deposition

Receptor (number on Drawing MA/NL/ES/12/003)	Maximum daily dust deposition averaged over one week mg/m^2/day		Average daily dust deposition averaged over one week mg/m^2/day	
	St Athan	CDP	St Athan	CDP
Residential Receptors				
Cwm Nant (1)	28.9	40.5	9.9	4.3
Lower Row, Bute Town (2)	17.0	22.2	5.4	2.4
The Rhymney House, Llechryd (3)	15.5	22.1	5.5	2.5
Sand Crest Lodge, Rhymney (4)	33.2	39.5	12.1	6.6
26 Glan Yr Afon, Rymney (5)	33.3	38.3	13.5	8.8
3 Old Brewery Lane, Rhymney (6)	36.6	42.8	17.0	13.6
Valletta Lodge, Hill Road, Pontlottyn (7)	51.4	56.6	13.6	19.7
Bali Hai, Bryhyfryd (8)	47.7	43.8	11.4	16.1
72 Pontlottyn Road, Fochriw (9)	38.7	41.9	11.3	15.9
Cae Glas Fochriw (10)	56.5	40.2	11.9	14.1
Ty Nazareth, Guest Street Fochriw (11)	48.5	35.9	10.7	12.3
Blaen Carno Farmhouse (12)	13.8	15.5	3.4	3.1
Gypsy Castle (13)	9.9	13.6	2.9	2.2
Commercial Receptors				
Heads of Valley Industrial Estate (14)	59.6	64.9	29.3	25.8
Heads of Valley Industrial Estate (15)	65.9	69.6	29.0	26.6
Capital Valley Eco Park (16)	50.3	50.7	17.5	21.7
Note: EAL for protection of public amenity = maximum 80 mg/m^2/day averaged over a week.				

Table 12.60: Cumulative Impact of Disposition 4 and the Removal of the FLRS Overburden Mounds: Significance of the Predicted Dust Deposition Impacts

Receptor (number on Drawing MA/NL/ES/12/003)	Impact: Maximum daily dust deposition averaged over one week mg/m^2/day		Significance	
	St Athan	CDP	St Athan	CDP
Residential Receptors				
Cwm Nant (1)	24.6	33.2	Minor Adverse	Minor Adverse
Lower Row, Bute Town (2)	13.5	16.6	Minor Adverse	Minor Adverse
The Rhymney House, Llechryd (3)	12.0	16.2	Minor Adverse	Minor Adverse
Sand Crest Lodge, Rhymney (4)	27.3	30.1	Minor Adverse	Minor Adverse
26 Glan Yr Afon, Rymney (5)	26.6	28.9	Minor Adverse	Minor Adverse
3 Old Brewery Lane, Rhymney (6)	27.9	31.5	Minor Adverse	Minor Adverse
Valletta Lodge, Hill Road, Pontlottyn (7)	28.0	34.1	Minor Adverse	Minor Adverse
Bali Hai, Bryhyfryd (8)	25.5	15.4	Minor Adverse	Minor Adverse
72 Pontlottyn Road, Fochriw (9)	6.3	1.2	Negligible	Negligible
Cae Glas Fochriw (10)	2.5	-0.7	Negligible	Negligible
Ty Nazareth, Guest Street Fochriw (11)	2.2	0.4	Negligible	Negligible
Blaen Carno Farmhouse (12)	11.7	12.5	Minor Adverse	Minor Adverse
Gypsy Castle (13)	7.5	10.8	Negligible	Minor Adverse
Commercial Receptors				
Heads of Valley Industrial Estate (14)	50.7	49.5	Minor Adverse	Minor Adverse
Heads of Valley Industrial Estate (15)	52.8	52.4	Minor Adverse	Minor Adverse
Capital Valley Eco Park (16)	30.7	26.7	Minor Adverse	Minor Adverse
Note: EAL for protection of public amenity = maximum 80 mg/m^2/day averaged over a week.				

12.291 Tables 12.57 and 12.59 show that the MTAN2 guideline value of 80 mg/m^2/day will be achieved at all the receptors. The cumulative impact of the removal of the FLRS overburden mounds and the Mine was predicted be minor adverse at most of the receptors modelled.

12.292 The additional impact of the removal of the FLRS overburden mounds on dust deposition on the ecological receptors is very small, and therefore the impact is essentially as in Table 12.51.

12.293 The proposed NET Wood Pellet Plant located at the Capital Valley Eco Park will emit NOx, PM_{10} and $PM_{2.5}$ from the stacks. No detailed air quality impact assessment was submitted with the planning application, although a screening assessment was undertaken by CCBC, which showed that the impact of the plant on local air quality would be small. The combined impacts of this plant and the Nant Llesg Surface Mine are not considered likely to result in an exceedance of any air quality objective or EU limit value set for the protection of human health, given the good baseline air quality at sensitive receptors in the area.

12.294 There is some evidence from the baseline DustScan measurements that the Trecatti Landfill site is a source of dust in the area, but it is further from the sensitive receptors than the proposed Nant Llesg Surface Mine, and therefore its impact within the study area is considered to be minimal. Those receptors closest to both Trecatti Landfill and the proposed Nant Llesg Surface Mine are unlikely to be exposed to PM_{10} and $PM_{2.5}$ concentrations exceeding the health based air quality objectives or EU limit values or dust deposition exceeding the environmental assessment level (EAL). This is because the wind does not frequently blow towards these receptors, which are to the north of Nant Llesg, (see Drawing MA/NL/ES/12/004), and are downwind of Trecatti Landfill and Nant Llesg when the wind comes from different directions.

12.295 The DustScan data also provides some evidence that there is an existing source of dust close to or within the Heads of the Valley Industrial Estate. This is reflected in the baseline data. The predicted Nant Llesg dust deposition will be additional to that from local sources. The 80mg/m^2/day dust EAL relates to coal deposition, and is more stringent than that commonly applied to less dark dust. Most of the dust from the operation of the surface mine will be overburden, not coal, and is likely to be a lighter colour than coal. A custom and practice level of 200 mg/m^2/day is typically used for sources other than coal. Most dust sensitive industries are not concerned regarding the colour of the dust, and it is considered unlikely that this value will ever be exceeded.

12.296 It is not possible to predict the impact of demolition and construction works in the local communities over the time scale of the Nant Llesg Surface Mine. Any works will be much closer to receptors than Nant Llesg, and the impacts of these sources may be more significant.

Summary and Conclusions

12.297 The air quality and dust impacts of the proposed Nant Llesg surface mine were considered for all phases of the development. A snapshot in time for each of the five major phases, or Dispositions, of the operation of the mine was modelled using a well-recognised dispersion model. In addition, the emissions from the rail and road traffic associated with the proposed development were modelled. During Dispositions 3 and 4 the FLRS overburden mounds will be removed to backfill its excavation area. The cumulative impact of this with the proposed mine was also modelled.

12.298 Air quality in the area surrounding the mine is currently good with only very occasional dust events occurring in Fochriw and parts of Rhymney.

12.299 Proactive dust management will reduce the potential for dust emissions during the operation of the Nant Llesg Mine. This includes the appropriate use of water suppression techniques, and the monitoring of air quality and dust within the community. In the modelling it has been assumed that dust mitigation measures will reduce emissions, by 95% on the haul roads and by 50 to 75% elsewhere. During the operation of the mine, if dust becomes an issue dust generating operations will cease until emission are controlled.

12.300 The preliminary works are expected to have a negligible impact on air quality and dust deposition.

12.301 There is predicted to be either an imperceptible or small increase in $PM_{2.5}$ concentrations and a small or medium increase in NO_2 concentrations at all residential receptors in the local community during the operation of the Mine. For annual mean PM_{10} a medium increase in concentration is predicted at one or two receptors during some of the Dispositions. For the short term PM_{10} concentrations a large change in the number of days with concentrations greater than 50µgm^3 is predicted Air quality will continue to be good with all the air quality objectives and the indicative EU limit value for $PM_{2.5}$ being achieved. Using the Institute of Air Quality Management significance criteria these impacts are mostly negligible.

12.302 The main impact during the operation of the mine is dust deposition. Using the Institute of Air Quality Management criteria, adapted for short term impact assessment, the impact is generally minor adverse at individual receptors. During Disposition 4 there was predicted to be a small reduction in dust deposition at some receptors due to the end of coaling at FLRS, resulting in a negligible impact at many receptors. During Disposition 5 there is predicted to be a minor beneficial impact in Fochriw and Bryhyfryd when dust emissions from the CDP reduce further as a result of the end of coaling at Nant Llesg.

12.303 The modelling suggests that the mass dust deposition criteria in MTAN2 of 80 mg/m^2/day will be achieved at all the receptors modelled, generally by a good margin. The results presented are for the highest predicted dust deposition in each Disposition, using the five (St Athan) or four (CDP) years of meteorological data. In simple terms, if a Disposition were to occur over five/four years the the maximum dust deposition presented would occur once. Typical dust deposition would be much lower.

12.304 The modelling of the cumulative impact of the removal of the FLRS overburnde mounds and the proposed Nant Llesg mine shows that the air quality objectives for PM_{10} and NOx, the indicative EU limit value for $PM_{2.5}$, and the MTAN 2 dust deposition guide value are all achieved.

12.305 The cumulative impacts of Trecatti Landfill and the NET plant in Capital Valley Eco Park are not considered likely to change the overall significance of the predicted impacts of the Nant Llesg Surface Mine Incorporating Land Reclamation on dust and air quality.

12.306 There are indications that the model over-predicts the dust deposition therefore the results are considered to be conservative.

12.307 Proactive dust management will reduce the potential for dust emissions to disperse from the site. These include anticipation of adverse weather conditions, monitoring dust both on site and in the community, the use of best practice dust suppression measures, and the ability, if necessary, to shut down operations until weather conditions change. However, there may be periods of dust deposition in the local community but if they do occur are likely to be rare occurrences during certain weather conditions, such as dry weather with high wind speeds that could disperse the dust from the surface mine operations long distances towards receptors.

12.308 Following the end of mine operations and the decommissioning of the CDP dust emissions will decline.

Key Findings

12.309 Air quality in the vicinity of the proposed Nant Llesg Surface Mine Incorporating Land Remediation is currently good with the air quality objectives for PM_{10} and NO_2 and the indicative EU limit for $PM_{2.5}$, set for the protection of human health, achieved by a wide margin. Very occasional dust events occur at some receptors, when amenity may be adversely affected, occur due to demolition and construction activities and other local sources.

12.310 The critical levels and loads set for the protection of the vegetation are currently exceeded at some locations within the Tair Carreg Moor SINC. In particular, the daily NOx critical level, the indicative dust deposition level, and the nitrogen critical load are exceeded by a wide margin close to the Fochriw and Bogey Roads. The implications of this are discussed in the ecology chapter.

12.311 A qualitative assessment of the impacts of the site establishment, land remediation works, removal and covering of landfilled materials, and the construction of the CDP water treatment facility was undertaken using the Institute of Air Quality Management guidance for assessing construction impacts

12.312 The operation of the proposed mine was assessed quantitatively by modelling the change in ambient concentrations of PM_{10}, $PM_{2.5}$ and NO_2 and dust deposition at 13 residential receptors and three commercial receptors. The Institute of Air Quality Management criterion for assessing operational impacts was used in this assessment, adapted to take account of the impact on short term PM_{10} concentrations and dust deposition.

12.313 The air quality objectives and the indicative EU limit value are predicted to be achieved by a wide margin during all phases of the proposed mine. This includes the impact of emissions from the trains and trucks exporting the coal from the CDP. In addition, the maximum daily dust deposition averaged over one week, recommended in MTAN2 as a planning condition for the measurement of the mass of dust deposited, was also predicted to be achieved at all receptors.

12.314 The critical levels and loads set for the protection of the vegetation continue to be exceeded during the operation of the proposed mine at some locations within the Tair Carreg Moor SINC close to the roads. This is mainly due to the high baseline levels. The implications of this are discussed in the ecology chapter.

12.315 The impact of the proposed mine on the Special Areas of Conservation (SACs) within approximately 10km of the site was considered. However, taking account of their distance and that modelled dust deposition at much closer receptors were more than an order of magnitude lower than the indicative dust deposition assessment level, it is not considered likely that there will be a significant effect on these habitats.

Mitigation Measures

12.316 There will be proactive dust management on the site which will reduce the dispersion of dust. This includes the proactive identification of the conditions likely to give rise to dust off-site, good practices such as the training of site operatives to understand the importance of minimising dust emissions, regular and frequent monitoring in the community,and good on-site housekeeping; and a culture where it is acceptable to request plant shut down due to the conditions.

12.317 The main method of dust suppression is the spraying of water on dusty areas of the site. This will include the use of Fog Cannons® which are very effective at grounding dust close at the source over large areas, water bowers which spray water onto the haul routes and spray mists which apply water droplets to the coal loading hoppers and stockpiles. The haul routes will also be regularly re-graded.

12.318 Automated vehicle washing facilities will be used to minimise the mud from the site getting onto the public highway; where site mud inadvertently gets onto the public highway the road will be cleaned. Areas of hardstand and paved roads within the site will be regularly cleaned to minimise the risk of dust leaving the site.

12.319 Any dust complaints will be investigated and staff will visit the complainant. Complaints are recorded together with the results of the investigation into the causes, the rectification action and timescale within which action was taken.

Residual Impacts

12.320 The mitigation measures will be incorporated into the Miller Argent Mine Management System, which includes the Environmental Management System. These measures were built into the quantitative and qualitative assessments of the air quality and dust deposition impacts.

12.321 The residual impacts of the site establishment, land remediation works, removal and covering of landfilled materials, and the construction of the CDP water treatment facility will be negligible,

12.322 The main impact of the operation of the proposed mine is dust deposition, and to a lesser extent, daily PM_{10} concentrations. The impacts were predicted to be either negligible or minor adverse on the local communities during phases one to four. During the fifth phase, when backfilling and land restoration will take place, a minor beneficial impact was predicted at a few receptors due to end of coaling at FRLS and the associated reduction in operations at the CDP. At the other receptors the impacts were predicted to be either negligible or minor adverse.

12.323 There may be very rate dust events

12.324 Using professional judgement and taking account of the uncertainties regarding the modelling, and the duration of the operation of the proposed mine, the impact on the local community of the air emissions during the operation of the mine is considered to be minor adverse.

12.325 This impact will be temporary, albeit long term, and will continue until backfilling and restoration is complete.

Cumulative Impacts

12.326 The cumulative impact of the removal of the FLRS overburden mounds, Trecatti Landfill and the proposed NET Wood Pellet Plant at the Capital Valley Eco Park in Rhymney have been considered.

12.327 The FLRS overburden mounds will be completed and seeded prior to the operation of the proposed mine commencing and therefore will not be a significant dust source. However, their removal as part of the backfilling of the FLRS excavation area has the potential to give rise to dust emissions during phases 3 and 4. The air quality objectives for PM_{10} and NO_2, and the indicative EU limit value for $PM_{2.5}$ are predicted to continue to be achieved by a good margin when this cumulative impact is taken into account.

12.328 The MTAN2 guideline value of 80 mg/m^2/day is also predicted to be achieved at all receptors, generally by a wide margin, during the removal of the FLRS overburden mounds. Using the more representative CDP meteorological dataset the predicted dust deposition was at least 20% below the indicative guideline value at all receptors.

12.329 The cumulative impact of the removal of the FLRS overburden mounds is considered to be a minor adverse impact at most receptors with respect to dust deposition, and at a few receptors with respect to the PM_{10} and NO_2 concentrations. The additional impact of the removal of the FLRS overburden mounds on dust deposition on the ecological receptors is small.

12.330 There is some evidence that the Trecatti Landfill site is a source of dust in the area, but it is further from the sensitive receptors in Rhymney and Fochriw than the proposed mine, and therefore its impact within the study area is considered to be minimal.

12.331 The combined emissions of the proposed NET Wood Pellet Plant at the Capital Valley Eco Park and the proposed mine are not considered likely to result in an exceedance of any air quality objective or the indicative EU limit value set for the protection of human health, given the good baseline air quality at sensitive receptors in the area.

12.332 Therefore, consideration of the cumulative impacts of other major air pollution sources in the area does not change the assessment of the overall impact of the proposed mine on air quality and dust deposition.

Conclusions

12.333 The main air quality and dust impact of the proposed mine is predicted to be dust deposition within the local communities. Miller Argent has a good proactive dust management system, which under most weather conditions will be effective at controlling dust. However, during dry windy weather the dust can become suspended in the air and travel long distances. If these events do occur they could cause annoyance in the local community, but given the distances to the receptors they are likely to be rare occurrences.

12.334 Using professional judgement, consideration of the proposed development and taking account of the probability of an adverse impact, the uncertainties regarding the modelling, and the duration of the operation of the project, the overall impact of the air emissions from the mine is considered to be minor adverse.

12.335 Taking account of other pollution sources in the area does not change the conclusions of this assessment.

12.336 The impacts will be temporary albeit long term.

References

Arup Environmental and Ove Arup Partnership,1995, the Environmental Impacts of Dust from Surface Mineral Workings, Volume Two, Technical Report,

Caerphilly County Borough Council, 2012, Air Quality Progress Report 2011 and personal communication, email form Maria Godfrey dated 5th November 2012.

Carslaw, D.C., Beevers, S.D. Westmoreland, E. Williams, M.L. Tate, J.E., Murrells, T.

Stedman, J. Li, Y., Grice, S., Kent, A. and I. Tsagatakis (2011). Trends in NOx and NO_2, prepared for Defra, Crown Copyright

Datson H, Hall D., and Birch B., Validation of a new method for directional dust monitoring. Atmospheric Environment 50 (2012) 1-8.

Defra, Scottish Government, Welsh Assembly Government, and the Department of the Environment Northern Ireland, 2009, Local Air quality Management, Technical Guidance LAQM, TG.09, Defra, London.

Defra, 2012, http://uk-air.defra.gov.uk/data

Defra in partnership with the Scottish Executive, Welsh Assembly Government and Department of the Environment Northern Ireland, 2007, Air Quality Strategy for England, Scotland, Wales and Northern Ireland, HMSO, London

Department For Heath and Department for Environment, Transport and Regions, 1999, “Do Particulates from Opencast Mining Impair Children’s Respiratory Health?”, The Stationery Office, London.

Department for Transport , 2012 Transport Analysis Guidance (TAG) Unit 3.3.3, The Air Quality Sub-Objective, http://www.dft.gov.uk/webtag/documents/expert/unit3.3.3.php

Environment Agency, 2012, Environment Agency (2011), Horizon Guidance H1 Annex F Air Emissions, Bristol.

Environment Australia, 1998, Dust Control, Best Practice Environmental Management in Mining

Environment Protection UK, 2010, Development Control: Planning for Air Quality (2010 Update), Brighton

Hall, D.J., Upton, S.L., Marsland, G.W., 1994. Designs for a deposition gauge and a flux gauge for monitoring ambient dust. Atmospheric Environment 28 (18) 2963-2979.

Highways Agency. 2007. Design Manual for Roads and Bridges, Volume 11, Section 3, Part ! Air Quality (HA207/07)

Institute of Air Quality Management, 2009, Position on the Description of Air Quality Impacts and the Assessment of their Significance.

Institute of Air Quality Management, 2012, Guidance in the Assessment of the Impacts of Construction on Air Quality and the Determination of their Significance.

Institute of Air Quality Management and Institution of Environmental Sciences, 2012, Guidance on Construction Dust Monitoring.

Mineral Industries Research Organisation (MIRO), 2011, Management, Mitigation and Monitoring of Nuisance Dust and PM_{10} Emissions Arising from the Extractive Industries: An Overview, Report prepared by AEA Technology, Reference AEAT/ENV/R3141.

Merthyr Tydfil County Borough Council, 2012, 2012 Air Quality Updating and Screening Assessment.

Welsh Assembly Government, 2009, Mineral Technical Advice Note 2 Coal

United States Environmental Protection Agency (2012), Technology Transfer Network, Clearing House for Inventories and Emission Factors, Emission Factors and AP42, Compilation of Air Pollutant Emission Factors, www.epa.gov.ttnchie1/ap42, accessed 7th June 2012. Sections used: 11.9 Western Surface Coal Mining; 13.2.2 Unpaved Roads; 13.2.4 Aggregate Handling And Storage Piles; 13.2.5 Industrial Wind Erosion; APP-C1 Method for sampling surface bulk dust loading

Nant Llesg Surface Mine

Incorporating Land Remediation

Chapter 13

Noise

Nant Llesg Surface Mine

Incorporating Land Remediation

Environmental Statement

Chapter 13 - Noise

miller argent

Table of Contents

Tables

13 Noise and Vibration

Chapter Overview

13.1 The mobile plant required to operate the proposed surface mine and land remediation scheme can cause noise in the surrounding communities. The plant to be used on the site will be manufactured and bought to the strictest noise specifications and this will allow the mine to be operated within the limits recommended by the Welsh Government in MTAN2. Noise will be audible in the surrounding communities of Rhymney and Fochriw and the significance of this noise depends upon the change in noise compared with the existing noise. Surveys have been carried out to establish the existing noise conditions and the noise from the proposed development has been predicted for all surrounding areas. Comparison of these two sets of data has allowed the significance of the increases in noise to be assessed. The increases in noise are generally negligible or minor, but are judged to be moderate in quieter and more exposed locations.

13.2 Prior to the commencement of the surface mine working there will be land remediation work carried out on an area of land immediately north of Fochriw and south of the land required for the mine. The noise from this work has been calculated and assessed against the guidance in the relevant British Standard, BS 5228, and shown to meet this guidance.

13.3 The dispatch of coal by rail could potentially cause up to a 70% increase in the number of coal trains using the route from the Cwmbargoed Disposal Point (CDP). These trains will be permitted to use only the train paths already available for coal trains. The worst-case noise impact for a daytime or night-time period will be no worse than currently experienced as there are days and nights when the maximum permitted number of train movements are already used.

13.4 Coal will be moved by road from the surface mine to the CDP. This route is approximately 700 metres long, but is remote from any housing and consequently will not increase noise at any residential property.

Introduction

13.5 This chapter presents an acoustic assessment of noise from the proposed Nant Llesg Surface Mine incorporating Land Reclamation Scheme. Surface mining and land remediation necessarily involves the use of large diesel-powered plant operating in the open and is therefore a noise generating operation. The main noise producing activities associated with the proposed surface mine are: soil stripping, removal of overburden and creation of the overburden mound, coaling and haulage within the site, backfilling the void, returning overburden to the void, and site restoration. Noise may also be experienced in surrounding areas by the export of coal from the site and by road traffic generated by the working of the site. The assessment methodology used to examine noise at and around Nant Llesg is presented together with the appropriate guidelines on noise.

13.6 A description of the assessment methodology is given and the predictions of the noise from the above aspects of the scheme are presented. The results of a baseline survey carried out in the area are provided and a prediction of the noise generated at the site is presented. A comparison with the baseline survey and the noise predictions is used as the basis of the assessment of the impact of noise from the scheme. Based on these predictions, noise mitigation measures have been developed and incorporated in the scheme to achieve a noise climate at residential properties which would be in accordance with guidance in relevant policy documents.

Methodology

13.7 Discussions were held with the Environmental Health Department of the local planning authority, Caerphilly County Borough Council on 9 August 2011 and agreement was reached on the methodologies to be used for the environmental noise assessment. This was confirmed in a letter from Curload Consultants to the Council dated 31 August 2011

13.8 This section describes the methodologies adopted for the prediction and assessment of the noise generation from the scheme and the road and rail traffic associated with the scheme during its lifetime. Different noise indices and standards are used for these three activities and they are therefore assessed separately. In each case the assessment requires knowledge of the existing noise levels and forecasts of future noise levels and these are described below.

The Surface Mine Including Remediation

13.9 The impact of noise from any industrial and commercial development on surrounding areas is assessed in terms of its level relative to a baseline or in terms of absolute noise levels. In the case of minerals working at the site the noise impact is assessed using both of these approaches. The predicted noise level is considered relative to the existing noise level and an overall cap on the absolute noise level. To carry out this assessment the pre-existing noise levels at surrounding areas have been established and the noise from the proposed activity has been predicted.

13.10 A baseline noise survey has been carried out at the surrounding communities and some isolated houses over an extended period to establish the existing noise levels under conditions when noise from the surface mine would likely be most significant. Four monitoring locations representative of the communities which could potentially be affected by noise were agreed with the local planning authority and several isolated properties were subsequently added. These additional locations were discussed and agreed with the Council at a meeting on 25 October 2012. The monitoring locations are described in Table 13.1 and shown at Drawing MA/NL/ES/013/001. The survey times were selected to ensure that measurements were obtained under dry conditions with light or no winds. A full description of the survey procedure and detailed results are presented in Appendix MA/NL/PA/A13/001.

Table 13.1: Noise monitoring locations

Location	Description
1	East Rhymney (Ty Coch)
2	West Rhymney (Coronation Terrace)
3	North Fochriw (North end of Pontlottyn Road)
4	Fochriw Road (north of site opposite Halfway House)
5	West Fochriw (near allotments)
6	Gypsy Castle (near Heads of the Valleys Road)
7	Upper Rasbrynoer Farm, Rhymney

13.11 The noise from the scheme has been predicted following the calculation method given in British Standard 5228 part 1[i]. This has been implemented using a proprietary software programme (IMMI). A three dimensional topographical model of the site and the surrounding area was used to calculate noise propagation from the site for a series of plant dispositions representative of the sequence of phases of extraction and restoration of the site. The sound power levels for each significant item of plant are included in the model and the plant is distributed across the site to be representative of the working of each disposition. Plant is modelled as either static plant or mobile plant on haul roads. The program has been used to calculate noise contours across the surrounding residential communities. These contours are presented at Drawings MA/NL/ES/013/002 - MA/NL/ES/013/010. The sound power levels for the plant items used in the calculations are shown in Table 13.2.

Table 13.2: Sound power levels for proposed plant

Proposed Plant	Size	Sound Power Level dB(A)
Excavators		
Hydraulic Excavator	7 m^3	108
Hydraulic Excavator	15 m^3	111
Coal cleaner/excavators	25 t	108
Coal cleaner/excavators	24 t	108
Coal Excavators	35 t	108
Excavator	12 t	104
Excavator	25 t	108
Pumps		
High-lift pumps	6"	103
Dump Trucks		
Dump truck	90 t	109
Articulated dump trucks	40 t	109
Dump truck	60 t	109
Coal trucks	25 t	109
Dozers		
Dozer	50 t	114
Rubber- tyred Dozers	28 t	111
Coal Washing Plant		
Dense medium washing plant	400 t/hr	118
On-site barrel washing plant	200 t/hr	112
Small Plant		
Water bowsers		108
Graders		108
Tractor bowser		110

Proposed Plant	Size	Sound Power Level dB(A)
Drill rig		115
Articulated fuel bowser	25 t	111
Personnel carriers		98
Land Rover		95

Note: The proposed plant is based on types of plant used at the Miller Argent surface mine at Ffos-y-fran Land Reclamation Scheme (FLRS). Alternative plant from different manufacturers may be used but would be procured to meet the above sound power levels. In some cases the noise levels used for the plant are lower than the equivalent plant in use at FLRS. These noise levels are used where it is known that attenuation measures have been successfully fitted after delivery by other plant operators. Further details are given at paragraph 13.31.

Dispatch of Coal by Train

13.12 The bulk of the coal from the Nant Llesg site will be dispatched from the CDP by train. The trains are loaded using a wheeled loader and the existing loading siding will be used for loading the additional trains. This means that only one train could be loaded at any time. Any noise from loading therefore will not increase in level due to the additional trains, but will occur for longer periods of the day and night. The noise from loading is included in the baseline survey results obtained during the daytime and evenings, but was not found to be audible at any of the survey locations. The nearest houses to the loading siding are 1250 m away in Fochriw and the land also provides significant screening of sound between the CDP and this area. The calculated external noise level for loading at the nearest house at night is less than 20 dB(A) and because this would be inaudible inside the houses no further assessment of this activity has been undertaken.

13.13 The trains will use the existing freight line which is located to the south of the site and joins a passenger line at Ystrad Mynach. The trains will be identical to those currently using the line to export coal from FLRS and therefore the noise caused by any new train movement will be similar to the noise of the existing trains. The noise caused by coal trains at houses near the railway line will be equal to the noise from the existing trains leaving the disposal point and therefore a noise survey was carried out at locations close to the line. Data logging sound level meters were installed for several days at houses in Trelewis and Ystrad Mynach to record the level and duration of several coal trains. Attended monitoring was also carried out at other locations in Bedlinog and Ystrad Mynach. The noise due to additional trains was then added to the measured existing noise and the increase was assessed against appropriate standards. The assessment of the absolute noise levels was made by comparison with advice given in BS 8233 and also by the World Health Organization.

13.14 CCBC requested that additional measurements be taken along the route of the passenger line and these measurements were taken at a house in Ystrad Mynach.

Road traffic

13.15 The scheme will generate additional traffic on the surrounding roads. During site establishment and clearance it is forecast that approximately 10 deliveries per month of plant by heavy vehicles will occur and these will be routed via the northern section of Fochriw Road. Staff cars and light goods vehicles servicing the site will approach from any of the surrounding roads, during all phases of the development.

13.16 The access to the site will be located on the eastern side of Fochriw Road approximately 130 metres north of South Tunnel Road. This access point will also be used by coal lorries moving coal from the mine to the CDP on the south side of Bogey Road, a distance of approximately 700 metres. There are no houses or other sensitive properties along these sections of Fochriw Road and Bogey Road that the coal lorries will use to take coal from Nant Llesg to the disposal point. The change in road traffic noise from this additional traffic will not therefore cause a significant change in noise at any sensitive receptor and is not assessed separately. These movements are, however, included in the overall modelling used to predict the total noise generation of the development and the impact on the surrounding communities.

13.17 The additional road traffic generated by deliveries of large plant during site establishment and clearance would pass a house on Fochriw Road when moving between the mine and the Heads of the Valleys Road. These movements are expected to occur at a rate of two or three a week and would be within the daily variation of vehicle movements: consequently the impact of these delivery vehicles is not considered significant and is not assessed further.

13.18 Staff cars and light goods vehicles servicing the site may use any of the roads leading to the site, but would cause a negligible change in the overall traffic flows on these roads and is not assessed further.

13.19 There is an existing permission for up to 50 thousand tons of coal to be dispatched from the CDP by road and this will remain the case with the proposed development. Therefore some coal from the mine may be dispatched by road under this permission. If this occurred it would not cause any additional vehicle movements by road. The impact of these movements is therefore not considered significant and is not assessed further.

Baseline Environment

13.20 The noise sensitive locations around the surface mine site are generally several hundred meters from the mine working areas. Over this distance noise propagation is significantly affected by wind direction and in particular the noise levels may be reduced by 8 to 10 dB when the wind is from the receptor towards the noise source. At some baseline survey locations local noise sources caused a range of noise levels to occur under varying wind directions; in these cases the measurements obtained with winds from the receptor towards the scheme have been excluded from the calculated average background noise levels to ensure that the baseline is representative of the levels that would obtain when noise form the scheme is not reduced by upwind conditions.

13.21 The baseline noise survey was carried out at seven locations around the proposed surface mine, with additional locations used for monitoring the noise of the coal trains. The recorded data have been analysed to identify the measurements that were taken under calm or light downwind conditions and these have been averaged to derive representative background and ambient noise levels for each receptor. The representative ambient and background noise levels recorded at the survey locations are summarised below in Table 13.3.

Table 13.3: Summary of ambient and background noise levels around main site

Location		Measured Noise levels	
		Ambient (dB L_{Aeq})	Background (dB L_{A90})
1	East Rhymney (Ty Coch)	49	43
2	West Rhymney (Coronation Terrace)	51	45
3	North Fochriw (North end of Pontlottyn Road)	55	39
4	Fochriw Road (north of site opposite Halfway House)	50	41
5	West Fochriw (near allotments)	44	37
6	Gypsy Castle (near Heads of the Valleys Road)	48	45
7	Upper Rasbrynoer Farm, Rhymney	44	41

13.22 The baseline noise surveys were conducted during dry conditions under calm or light wind conditions in order to describe the noise climate in the area. Opportunities to collect noise data under these conditions were limited due to the prevalence of high wind speeds, rain or fog.

13.23 At present Network Rail permits up to six train movements in a 24 hour day on the main line, where one train is defined as the combined outgoing and return journeys. These trains are divided equally between daytime and night-time. This theoretically allows for three trains (6 one-way movements) at night, but the time required to manoeuvre and load a train means that the maximum practical one-way movements in and out of the CDP at night is limited to five. While the maximum number of trains allowed on the main line in any daytime period is also 3 (6 one-way movements), up to two additional one-way movements may be permitted and the maximum number of daytime one-way train movements could be up to eight.

13.24 Noise measurements were taken at 12 metres from the branch line at three locations and typically the noise of the trains was 75 dB L_{Aeq} over a one minute period. Additional noise measurements taken over several days at a location close to the main line showed that the noise of coal train pass-bys was similar to the noise of passenger trains, but the duration of the passenger train pass-bys was shorter. The noise survey results are presented in Appendix MA/NL/PA/A13/001.

13.25 The assessment of changes in road traffic noise on the public highway network is assessed in terms of change rather than absolute noise level. Consequently a baseline noise survey of road traffic noise on the existing road network was not requested by the local authority and no survey was carried out.

Assessment Criteria and Assignment of Significance

Guidance and Assessment Criteria

Noise Generated at the Site

13.26 The main guidance on planning and noise in Wales is given in Technical Advice Note (Wales): Noise (TAN 11)[ii], however no specific guidance is given in TAN 11 relating to the noise from the surface mining of coal or land remediation. Detailed advice on all aspects of planning relating to coal, including noise, is given in Minerals Technical Advice Note 2: Coal (MTAN2)[iii]. For construction noise TAN 11 recommends that the advice given in BS 5228 *Noise and vibration control on construction and open sites* should be followed. This standard is considered appropriate for the land remediation work that will be undertaken on land outside of the land required for the surface mine.

13.27 Paragraph 29 of MTAN2 states that coal working will generally not be acceptable within 500 metres (m) of settlements, however, settlements are not defined in MTAN2, with paragraph 30 of MTAN2 placing the onus on the MPA to define settlements or a "settlement boundary". It is noted at paragraph 30 that research undertaken by BGS used a grouping of ten properties as the baseline for a settlement. This advice has been followed by Caerphilly County Borough Council in defining a settlement boundary for Rhymney (and other settlements in the locality of the Nant Llesg site).

13.28 As advised by MTAN2 the scheme has been designed to ensure that there would be no coal working within 500 m of the defined settlement boundary at Rhymney, Pontlottyn or Fochriw, to the east of the site. Paragraphs 49 to 51 give a range of exceptional circumstances where working closer within 500 m of settlements may be considered appropriate, and this is discussed in detail in Chapter 17 of the Planning Statement. However, of relevance to the assessment of noise impacts is the proposal to create a screen mound along the eastern boundary of the coal extraction area, which would also act as a noise attenuation barrier. The screening mound would be positioned within 500 m of the settlement boundary, would not involve coal working as part of the creation of the screening mound. This element of the development is considered to fall within the range of "exceptional circumstances" listed in paragraphs 49 and 50 of MTAN2.

13.29 The emphasis of the scheme design is on minimising the impact of coal extraction. At Paragraph 97 of MTAN2 the use of best available techniques is recommended and it is stated: 'operators should adopt the Best Available Technology (BAT). The essence of BAT is that the techniques selected to protect the environment should achieve an appropriate balance between environmental benefits and the costs incurred by operators.'

13.30 MTAN 2 gives specific advice on noise at paragraphs 167 – 177. When considering planning conditions it states at paragraph 173:

- *'MPAs should establish a noise limit at sensitive locations of background plus 10 dB L_{Aeq} 1hr or 55 dB L_{Aeq} 1hr (free field), or whichever is the lesser, during normal working hours (0700 -1900, Monday to Friday excluding Public Holidays).*
- *In some noise sensitive locations, 0800 - 1800 hours may be more appropriate, with reduced levels defined for the dawn and evening one-hour periods*
- *When working is agreed between 0800 and 1200 on Saturdays, MPAs may consider it appropriate to establish a reduced noise level*

- *At all other times, limits should not exceed 42 dB L_{Aeq} 1hr (free field) at sensitive locations*
- *Where tonal noise contributes significantly it may be appropriate to set specific limits for this element.*
- *Peak or impulsive noise, which may include some reversing bleepers, may also require separate limits that are independent of background noise and should only exceptionally be permitted at night.'*

13.31 Exceptions are made for short term working and paragraph 174 states*: 'Short-term operations that cannot easily meet these noise limits might include soil stripping, the construction and removal of baffle mounds and soil storage mounds, construction of new permanent landforms and aspects of site road construction and maintenance. These activities can bring longer-term environmental benefits. Minerals advice in Wales has been that increased noise limits between 1000 and 1600 hours on Monday to Friday excluding Public Holidays of up to 67 dB L_{Aeq} 1hr (free field) should be considered for periods of up to 8 weeks in a year, monitored at the noise-sensitive properties nearest to the source. However, this is approaching levels identified by the WHO[iv] as having the critical health effect of hearing impairment – 70dB for 24 hours. (WHO Guidelines p. XVIII). The MPA should assess the predicted noise for such operations, consider proposed and potential mitigation, and have evidence of the long-term benefits before agreeing the level, duration and frequency of such exceptions, and not to exceed 67 dB L_{Aeq} 1hr (free field) for the hours identified above'.*

13.32 British Standard 5228 provides guidance applicable to construction and open sites which is considered suitable to apply to land remediation. This standard gives recommendations for methods of noise and vibration control relating to construction and open sites where work activities or operations generate significant noise and/or vibration levels. It places an emphasis on the use of best practical means to minimise noise. At Annex E (Informative) useful guidance is provided for the setting of limits for work on open sites. Alternative methods are given which set noise limits in terms of absolute levels or levels relative to existing ambient noise levels. At section E2 an absolute daytime noise limit of 70 dB $L_{Aeq,\ 12\ hr}$ is given for rural areas. At section E3 a limit of 65 dB $L_{Aeq,\ 12\ hr}$ is indicated based on the relatively low existing ambient noise in the vicinity of the land remediation works. The lower limit has been adopted as applicable for this remediation work.

Defining Significance

Surface Mine

13.33 The significance of the noise impact from the site is a function of the particular sensitivity of the receptor and the magnitude of the noise. The scales used for these factors in the assessment of the main coal mining and processing site are given in Tables 13.4 and 13.5. The significance of the noise from the railway and road traffic movements is assessed separately.

13.34 When developing these scales it is recognised that the impacts will vary over the life of the mine, but the impact at any location is likely to be temporary, but of a medium to long-term duration. MTAN2 provides in the glossary the following definition of sensitive development: *'Sensitive development is any building occupied by people on a regular basis and includes housing areas, hostels, meeting places, schools and hospitals where an acceptable standard of amenity should be expected. Sensitive development could also include specialised high technology industrial development. Authorities may also wish to include other developments or uses (such as places of recreation) within this definition, depending on local circumstances and priorities. This should be explained in the development plan'.*

13.35 A further reference to sensitive development is made in MPPW when commenting on the use of buffer zones around minerals developments. It states: '*Buffer zones have been used by mineral planning authorities for some time to provide areas of protection around permitted and proposed mineral workings where new development which would be sensitive to adverse impact, including residential areas, hospitals, schools, should be resisted.'*

13.36 The official advice given in MTAN 2 and MPPW[v] refers to sensitive development, but does not give advice on the degree of sensitivity of particular categories of receptors. The World Health Organisation notes in its guidelines on noise[vi] that for hospitals *patients have less ability to cope with stress* and therefore healthcare facilities should be treated as the most sensitive locations. Commercial and industrial buildings generally contain varying sources of noise producing equipment and are considered to be least sensitive. Examples of particular sensitivity used in this assessment are given in Table 13.4.

Table 13.4: Example Definitions of Sensitivity or Value

Sensitivity	Typical Descriptors
High	Hospitals and similar buildings housing people with particular need for quiet conditions for rest and recovery.
Medium	Residential buildings, schools
Low	Offices, commercial and light industrial buildings
Negligible	Industrial buildings containing noisy processes.

13.37 The scale of magnitude of noise impacts is based on the human response to noise and is shown in Table 13.5. An increase in noise of 10 dB is generally considered to correspond to a doubling of loudness, while a change of 3 dB in fluctuating noise is considered to be just perceptible. Changes in steady noise of 1 dB may just be perceptible in laboratory conditions.

Table 13.5: Definitions of Magnitude

Magnitude	Typical Descriptors
High	>10 dB above background noise
Medium	>5 to 10 dB above background noise
Low	3 to 5 dB above background noise
Negligible	-10 dB below to <3 dB above background noise
No Change	>10 dB below background noise

Table 13.6: Significance Assessment Matrix

Sensitivity	Magnitude of Impact			
	High	**Medium**	**Low**	**Negligible**
High	Major	Moderate/Major*	Minor	Negligible
Medium	Moderate/Major*	Moderate	Minor	Negligible
Low	Minor/moderate*	Minor	Negligible/Minor*	Negligible
Negligible	Negligible/Minor*	Negligible	Negligible	Negligible

* significance dependant on duration of the impact.

13.38 The changes in noise levels are also subject to the recommendations given in MTAN 2 and presented at paragraph13.22. This guidance recommends that noise from the site should not be more than 10 dB higher than the background noise at a sensitive property or limited to 55 dB $L_{Aeq,\ 1hr}$. whichever is the lower. Situations where noise from the mine exceeds background by more than 10 dB are included in the significance matrix in Table 13.6. If the noise from the mine were to exceed the recommended overall noise limit of 55 dB $L_{Aeq,\ 1hr}$ it would be considered major adverse.

Land remediation

13.39 The lower limit recommended in BS 5228 has been adopted for assessment of significance of noise from land remediation work and therefore a significant effect would occur if daytime noise at noise sensitive receptors exceeds 65 dB $L_{Aeq,\ 12\ hr}$. No attempt is made to define the significance of impacts that do not exceed this lower limit.

Railway assessment

13.40 There is no official guidance on the assessment of noise from existing railways or the intensification of the use of existing railways. Train noise is normally assessed by considering the average continuous noise levels (L_{Aeq}) caused by trains over the daytime or night-time periods. During the daytime the noise from coal trains on the branch line is below the level of 55 dB $L_{Aeq,\ 16\ hr}$ recommended by the WHO and BS 8233[vii] for daytime noise exposure and are therefore excluded from this assessment. The number of additional coal trains that would use the main line during the day is small compared with the existing number of passenger trains. The additional trains would make no noticeable change to the daytime average noise levels and are therefore excluded from this assessment.

13.41 At night the levels of noise during train movements have the potential to be more noticeable due to the lower levels of ambient noise and are therefore included within this assessment.

13.42 The World Health Organization in its Guidelines on Community Noise noted at section 3.4 that *'For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{Amax} more than 10–15 times per night'.* It also noted at section 4.3.2 that '*At night, sound pressure levels at the outside façades of the living spaces should not exceed 45 dB L_{Aeq} and 60 dB L_{Amax}, so that people may sleep with bedroom windows open. These values have been obtained by assuming that the noise reduction from outside to inside with the window*

partly open is 15 dB'. This guidance informed the recommendation given in BS 8233 (1999) that '*For a reasonable standard in bedrooms at night, individual noise events (measured with the F time-weighting) should not normally exceed 45 dB* L_{Amax}*'*.

Road traffic assessment

13.43 There is no official guidance on the assessment of noise from existing roads or the intensification of the use of existing roads. Road traffic noise is generally evaluated following the methodology given in The Calculation of Road Traffic Noise[viii] which provides a method for calculating or measuring road traffic noise in terms of the 18 hour L_{A10} index. This index is the average value that is exceeded for 10% of the time between 06:00 and 00:00 hours. It is considered that attention should be paid to how noticeable the change in noise would be for occupants of affected houses. In this regard a 3 dB change in noise is normally considered to be just perceptible and a 10 dB change represents a doubling in loudness. It should also be noted that a 25% increase in traffic is required to cause a 1 dB increase in traffic noise and a doubling of traffic results in a 3 dB increase in noise. It is forecast that an additional 10 lorry movements per month will for delivery of large plant during site establishment and a similar number for plant removal during site clearance. These would make a negligible change to the existing road traffic noise and are therefore excluded from this assessment.

Mitigation Measures Adopted as Part of the Project

13.44 Throughout the development of the surface mine proposals noise has been recognised as a major design consideration. Mitigation includes (i) control on hours of working, (ii) site design and (iii) quiet plant selection.

13.45 Working hours for the surface mine will be restricted to 07.00 – 19.00 Mondays to Fridays and 08:00 to 12:00 on Saturday morning.

13.46 It is not possible to significantly change the location of the main features of the surface mine because these are largely dependent on geological, physical and topographical factors. The limits of the operational areas of the site, however, have been designed to be at least 500 metres from the settlement boundary with the coal working area being in excess of 650 metres from any of the surrounding communities. As noted above, a visual and acoustic screening bund is to be placed between the working void and properties in Rhymney to the north and east. The construction of the screening bund will be planned in a manner that will minimise the short term effects during construction of the mound by constructing the outer edge of the mound first and then back-filling to complete the screen mound behind the outer face. The screening bund will be constructed during the first 4 months of excavation works. The acoustic screening provided by this bund would leave the proposed noise limits marginally exceeded (by 1 dB) at the nearest house on Fochriw Road during the working of dispositions 1 and 2. It is proposed to provide a 3 m acoustic barrier along the south eastern boundary of this property to ensure that the noise limits are met during all stages of the working of the site.

13.47 The larger and more numerous items of plant would be the principal noise sources, but all plant will be procured to ensure compliance with appropriate noise limits. Early calculations showed that the overburden dump trucks, large excavators and large dozers will dominate the noise emission and that standard plant would not be sufficiently quiet to ensure that the requirements of MTAN 2 would be met. Some manufacturers of these plant items do provide versions of their plant fitted with noise control packages, but again it was found that these did not adequately attenuate the noise.

13.48 Opportunities are however available to fit additional noise control measures to the plant that they operate to further reduce noise levels. Miller Argent has done this effectively with the large

excavators and trucks which it operates at its FLRS site. In general, it is preferable for any noise control measures to be built into the equipment by the manufacturer rather than fitted at a later date by the operator. Detailed discussions have been held with plant suppliers to investigate noise control developments that will be available for the plant to be used at the mine. The discussions have confirmed that additional mitigation measures are capable of being introduced comprising:

- Dump trucks would be fitted with acoustic louvres on the cooling radiators, cladding and enclosures around the engine and transmission and the exhaust will be ducted through the body and additional attenuators will be fitted.

- Excavators would be fitted with acoustic louvres on the water and oil radiators fans, enclosure of the underside of the engine enclosure and damping or stiffening of the engine enclosure panels.

- Dozers would be fitted with engine enclosures, sound absorption will be fitted inside these enclosures and noise suppression will be included in the undercarriage.

13.49 The sound power levels for the plant included in Table 13.1 were derived from these discussions and the results of post-delivery modifications made by plant operators. An example of the attenuation that will be achieved is that the standard Cat 777F off road truck has a sound power level of 118 dB(A) and the currently available noise control package reduces this to 112 dB(A). Further noise control measures have been identified and agreed with the manufacturer that will reduce the sound power level to 109 dB(A).

Environmental Assessment

Main Site

13.50 The noise levels for representative dispositions of plant during the life of the surface mine have been calculated and the resulting noise contours are presented in Drawings MA/NL/ES/013/002 - 010. The work activities included in each disposition are listed in table 13.7.

Table 13.7 Description of works included in each disposition calculation

Disposition	Description of working
0*	Remediation and drainage works to south of surface mine site
1A	Box cut and construction of north and east screen mound
1B	Box cut and disposal to southern overburden mound
2 HR1	Maximum void and disposal to overburden mound
2 HR2	Maximum void and back filling of void
3	Intermediate void
4	End if coaling and filling of void
5A	Restoration – removal of overburden mound to void
5B	Restoration – removal of north and east screen mounds

* Disposition 0 covers the remediation and drainage works to an area of land to the south of the site and north of Fochriw. This area of land is shown as area W12 on the Disposition 1 Development of the Box Cut: Drawing MA/NL/PA/004.

13.51 The noise predicted at each agreed receptor location during the remediation work in disposition 0 is shown in Table 13.8. The threshold of significance taken from BS5228 is 65 dB $L_{Aeq,\ 12\ hr}$ and it can be seen that this is met at all locations. The impact of this remediation work is therefore not significant. The work is expected to take approximately three months and therefore this will be a short term temporary effect.

Table 13.8 Predicted land remediation noise (dB $L_{Aeq,\ 1\ hr}$)

Predicted noise levels during Disposition 0							
Location	1	2	3	4	5	6	7
Noise level	24.9	26.5	44.5	25.9	49.5	25.1	24.1

13.52 The noise levels for Dispositions 1 to 5 calculated at the agreed background noise monitoring locations are shown in Table 13.9 together with the appropriate background noise derived from the baseline noise survey and the noise limit for each location. The calculated noise levels have been compared with the noise limits recommended in MTAN2 of background plus 10 dB and the excesses relative to the noise limits are presented in Table 13.10.

Table 13.9 Predicted surface mine operational noise (dB LAeq, 1 hr)

Loc'n	B/g	Noise Limit	Disposition							
			1A	1B	2HR1	2hr2	3	4	5A	5B
1	43	53	41.8	44.4	43.8	43.5	45.8	47.1	45.1	48.3
2	45	55	45.1	44.1	45.5	45.4	48.3	48.1	44.9	49.8
3	39	49	40.0	47.4	46.1	44.2	44.7	47.8	46.0	39.0
4	41	51	47.4	46.9	46.2	48.9	49.4	48.7	45.9	44.2
5	37	47	39.2	44.5	44.3	42.3	43.7	46.9	45.8	37.9
6	45	55	46.5	48.5	47.5	48.7	49.1	48.8	45.0	50.6
7	41	51	39.7	45.3	42.7	42.8	44.3	46.9	44.4	46.0

Table 13.10 Calculated excess relative to noise limit (dB $L_{Aeq, 1\ hr}$)

Loc'n	B/g	Noise Limit	Disposition							
			1A	1B	2HR1	2hr2	3	4	5A	5B
1	43	53	-11.2	-8.6	-9.2	-9.5	-7.2	-5.9	-7.9	-4.7
2	45	55	-9.9	-10.9	-9.5	-9.6	-6.7	-6.9	-10.1	-5.2
3	39	49	-9.0	-1.6	-2.9	-4.8	-4.3	-1.2	-3.0	-10.0
4	41	51	-3.6	-4.1	-4.8	-2.1	-1.6	-2.3	-5.1	-6.8
5	37	47	-7.8	-2.5	-2.7	-4.7	-3.3	-0.1	-1.2	-9.1
6	45	55	-8.5	-6.5	-7.5	-6.3	-5.9	-6.2	-10.0	-4.4
7	41	51	-11.3	-5.7	-8.3	-8.2	-6.7	-4.1	-6.6	-5.0

13.53 The increases in noise at each location have been compared with the existing background noise levels and the significance of these increases has been established by reference to Table 13.5. In each case the locations are at residential properties and therefore the significance for medium sensitivity receptors is used. The derived significance for each impact is shown in Table 13.11. The table shows that noise generated from the surface mine may be audible or just audible during most phases of the work and therefore the noise would be a long term temporary effect at each location.

Table 13.11 Significance of calculated impacts

Loc'n	Disposition							
	1A	1B	2HR1	2hr2	3	4	5A	5B
1	Negligible	Negligible	Negligible	Negligible	Negligible	Minor	Negligible	Moderate
2	Negligible	Negligible	Negligible	Negligible	Minor	Minor	Negligible	Minor
3	Negligible	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Negligible
4	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Minor	Minor
5	Minor	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Negligible
6	Negligible	Minor	Negligible	Minor	Minor	Minor	Negligible	Negligible
7	Negligible	Minor	Negligible	Negligible	Minor	Moderate	Minor	Minor

13.54 Inspection of Table 13.11 shows that the noise impact of the proposed development at receptors which are considered to be representative of the worst effected parts of Rhymney would generally be negligible, but would increase to minor as the void progresses eastwards towards the town. The impact during the final restoration phase would increase to moderate at receptors considered to be representative of the north of Rhymney, where there are houses at elevated locations with a line of sight to the screen mound. Minor impacts are shown at the isolated houses (see Upper Rasbrynoer Farm) to the east of Rhymney during some phases of the work due to the low levels of background noise in this area. In all cases the increase in noise would be below the limit recommended in MTAN2.

13.55 To the south of the surface site mine minor and moderate impacts are generally forecast for the village of Fochriw, particularly during periods of activity at the overburden mound. The two receptor locations are considered to be representative of the worst affected parts of the village. The village is built on land that falls towards the south and therefore much of the southern part of the village will benefit from topographical screening and reduced noise impact. Again, in all cases noise would be below the limit recommended in MTAN 2

13.56 There are isolated residential receptors to the north of the site and south of the Heads of the Valleys Road. The impact at the nearest house (Halfway House) and the houses at Gypsy Castle is assessed as moderate for much of the development. However the increase in noise will be below the limits recommended in MTAN2

13.57 The assessment of significance is based on the change in noise levels that will occur, however, it is noted that the guidance given in MTAN2 regarding limits on noise from surface mining is met at all relevant locations.

Railway

13.58 An analysis of the train movements to and from the CDP throughout 2011 has been carried out. This analysis shows that the number of movements varied between none and the practical maximum during the night-time (i.e. 5 movements between 23:00 and 07:00) while during the daytime (07:00 to 23:00) movements varied from none to a maximum 8 movements. The movements are summarised in Tables 13.12 and 13.13. It can be seen that about one third of days had no train movements, although it is noted that no trains are dispatched on Sundays. A larger proportion of nights had no train movements, again with no movements on Sundays, and the maximum permitted movements occurred on two occasions.

Table 13.12 Daytime train movements in 2011.

Movements per Day	Number of Days	Train Movements
0	92	0
1	51	51
2	45	90
3	40	120
4	63	252
5	39	195
6	27	162
7	6	42
8	2	16
Total	365	928

Table 13.13 Night-time train movements in 2011

Movements per Night	Number of Nights	Train Movements
0	165	0
1	68	68
2	49	98
3	67	201
4	14	56
5	2	10
Total	365	433

13.59 The average number of train movements in the day was 3 and at night the average was 1.4 movements. These averages are for Monday to Saturday and exclude Sundays when no movements take place. Assuming that the split between day and night for the additional trains that will be required when development proceeds is similar to the current split; the average movements would increase to 5 trains during the daytime and 2.4 trains at night. It is not possible to predict the numbers of train movements on a daily basis as this is determined by customer demand and track availability which is controlled by Network Rail. It is however considered likely that the distribution of additional train movements throughout the year will be similar to the current distribution and therefore there will be a small increase in the number of nights when the maximum number of movements will take place.

13.60 The maximum combined production from the existing FLRS and the Nant Llesg surface mine will be 1.75 M tonnes per year. There is permission for 0.05 M tonnes to be dispatched by road and this means that the theoretical maximum increase in train movements from the CDP is 70%. It is considered that the likely increase will be approximately 50%, but a 70% increase has been considered as a worst case scenario so as to consider the impacts of any change in noise.

13.61 This increase would result in approximately a 2 dB increase in the daytime (LAeq 16 hr) and night-time (LAeq, 8 hr) noise levels. Changes of less than 3 dB are not normally perceptible; however, the numbers of train movements per day, both during the day and night, are small and the noise would be perceived as individual events by those living near to the line. The duration of a single train pass-by is just over 1 minute and therefore it is not considered meaningful to consider the average the noise of trains over the day or night-time. The impact of an individual train movement at any receptor will not change from the current impact, but approximately 70% more movements will occur on an annual basis. The overall impacts during the daytime and night-time periods can be no worse that the impact that occurs when the maximum permitted movements are used and consequently the greatest impact will be the same as the greatest impact that is currently experienced. The impacts of increased train movements are therefore considered to be either negligible or of low significance. The increased number of trains would be required while the mine is operating alongside Ffos-y-Fran and therefore should be considered as a long term temporary effect.

13.62 The dispatched trains are often required to stop at Ystrad Mynach prior to the junction with the main line. The stopping causes brake noise, the character of which is potentially more attention drawing than the noise of an uninterrupted train pass-by. It has to be noted that the operation of the trains is outside the control of Miller Argent.

13.63 The noise survey along the main line showed that the noise from a coal train was similar to the noise levels caused by passenger trains, although the pass-by times were of longer duration for coal trains. A coal train pass-by lasted approximately 70 seconds, whereas the passenger train pass-bys typically lasted between 20 and 30 seconds. During the daytime there were up to 10 passenger train movements an hour and at night there were a further 10 passenger train movements. There will be an average of 2 additional coal train movements during the daytime. This results in an increase in total daytime train movements from 10 to 11 in two hours in any day and these changes are not considered to be significant. At night there would be an average increase of 1 train movement per night. The WHO recommends that maximum noise levels at night should not exceed 45 dB L_{Amax} for more than 10 – 15 times a night and this equates to a level of 60 dB L_{Amax} outside the building. Train pass-by noise for both passenger and coal trains are typically in the range 60 to 65 dB L_{Aeq} and therefore the recommended internal noise level is just exceeded by both the existing and proposed train movements however, the total number of night-time movements including the additional coal trains is within the range given by the WHO. These changes in noise due to the additional coal train movements are considered to be either negligible or of low significance.

Road Traffic

13.64 The forecast road traffic generated by the operation of the surface mine has been compared with the measured existing flows on the road network surrounding the surface mine. The main element of generated road traffic is the transport of coal from the mine to the Cwmbargoed Disposal Point. This route is approximately 700 metres and comprises sections of Fochriw Road and Bogey Road which do not pass any noise sensitive properties and consequently these vehicle movements are not considered to give rise to a significant impact in the vicinity of the route.

13.65 Up to 10 deliveries per week of plant by heavy vehicles would occur during site establishment and a similar number would occur during site clearance. These movements are insignificant compared with the existing vehicle movements and have not been assessed.

Cumulative Effects

13.66 In general the proposed scheme is sufficiently remote from the FLRS and the Trecatti landfill site that there are no significant cumulative impacts at receptor locations. Other sources of noise, such as the industrial estate in Rhymney, are included in the baseline noise survey; although no industrial activity was found to significantly contribute to overall noise levels at survey locations.

13.67 The baseline noise survey was conducted at times when there was work being carried out on the FLRS overburden mounds, which are the closest working areas to the survey locations. The survey therefore is representative of the worst case noise levels from the FLRS and higher levels at FLRS will not occur when the Nant Llesg surface mine is operating, resulting in a higher total noise level than that predicted for the surface mine.

13.68 The Trecatti landfill site was operating normally during the baseline noise surveys and was not observed to contribute noticeably to the measured noise levels at the survey locations and was generally found to be imperceptible. There will be no cumulative noise impact due to the operation of the surface mine and the Trecatti landfill site.

13.69 The coal washing plant proposed to be included within the CDP, which is also the subject of a separate application, is included in the calculations of noise contours for the site dispositions. The rate of production through the plant would however intensify, if the Nant Llesg scheme proceeds. It has been assessed as part of the scheme on that basis so as to assess the environmental effects associated with the higher intensity of production.

13.70 If the production of coal extends beyond 2024 some of the water treatment facilities at the CDP will be relocated as shown on drawing MA/NL/PA/044. This will not involve any additional noise producing equipment. The distance that these facilities will be moved is small compared with the distance to the nearest community locations and this change in layout will not affect the overall noise at these community locations.

13.71 Planning permission was granted on 6 December 2012 for a woodchip plant to be built in the industrial estate on the western boundary of Rhymney. An environmental statement submitted with the application provided an ambient noise survey in the vicinity of the plant and predictions of the operational noise from the plant. Daytime noise levels of 45 dB L_{Aeq} were predicted at approximately 350 m from the plant but a barrier was included in the design to reduce this distance to about 160 m to the north of the plant. The highest noise levels in the area around the woodchip plant due to the surface mine will occur during disposition 4. The calculated noise levels for disposition 4 are shown in table 13.14 together with the measured ambient and predicted noise for the woodchip plant (taken from the environmental statement for the plant). It can be seen that at locations close to the woodchip plant (Locations 1 and 3) the overall noise will increase by approximately 2 dB compared with the noise from the woodchip plant alone. The noise from the woodchip plant falls significantly with distance and at locations 2 and 4 the combined noise from the surface mine and the woodchip plant is only marginally higher (<1 dB) than for the mine alone. It is noted that at all locations the combined noise from the two developments is below or only marginally above the existing ambient noise. In addition, the noise from the surface mine taken together with the woodchip plant will be within the limits recommended in MTAN2. The noise from the land remediation works (disposition 0) is calculated to be approximately 30 dB L_{Aeq} or lower in the vicinity of the woodchip plant. This is below the background and ambient noise levels in the area affected by noise from the woodchip plant and also 5 to 15 dB below the levels of noise predicted for the woodchip plant. Consequently there is no significant cumulative noise impact due to the land remediation and the woodchip plant.

Table 13.14 Calculated cumulative impact of surface mine and the permitted woodchip plant

Receptor Locations in Woodchip Plant ES		Daytime Noise Level, dB L_{Aeq}			
No.	Location	Existing Ambient	Woodchip Plant	Surface Mine	Woodchip and Mine
1	Drewery Lane	48 – 55	44.5	47.0	48.7
2	Thomas Fields	45.5	36.0	45.0	45.5
3	Forge Crescent	45.5	42.3	44.0	46.3
4	Plantation Terrace	45.5	35.0	42.0	42.8

Inter-relationships and in-combination effects

13.72 The acoustic screen bund to be constructed along the northern and eastern perimeter of the void would also provide significant visual screening of the excavation area and vehicles on the haul roads within the void.

Summary

13.73 The operation of the surface mine can lead to noise impacts in the surrounding communities from the mine itself and also the associated road and railway traffic. Different criteria and assessment techniques should be used for these different aspects of noise and these have been discussed. The importance of any noise impact depends to some degree on the levels of pre-existing noise and therefore a baseline noise survey has been carried out to establish existing levels of background and ambient noise at receptors considered to be representative of the surrounding communities that would be potentially affected.

13.74 The noise from the surface mine has been calculated over a wide area and noise contour plans have been provided for a variety of dispositions in the development that show the effects at all areas where there is potential for a significant effect to occur. More detailed results are presented in the assessment for the representative community locations that were agreed with Caerphilly County Borough Council. The assessment shows that noise levels will be increased at surrounding community locations, but that levels will be within recommended criteria.

13.75 After preparation the coal will be dispatched from the site by the existing railway from the CDP. The potential impacts due to the additional train movements have been assessed separately for the branch line from CDP to the main line and for the main line used by the coal trains. The noise of coal trains has been monitored and found to be similar in level to the passenger trains using the main line. The noise from additional trains on the branch line during the daytime is within

recommended guidance, but the additional trains at night have the potential to be more noticeable, but again would be within recommended limits.

Conclusions

13.76 The surface mine proposals include significant mitigation measures that will allow the mine to be worked within the recommended limits given by the Welsh Government in MTAN2.

13.77 Noise from the mine will be audible in surrounding areas and this has been assessed and generally found to be of negligible or minor significance in the Rhymney area. The increases in noise at Fochriw and some isolated properties to the north of the site are of minor or moderate significance.

13.78 The noise from coal dispatch trains movements will be similar to the noise from the existing coal trains. There are days and nights when the maximum allowable train movement times are utilised and therefore the noise impacts can be no worse than on these days and nights, but such conditions may occur slightly more frequently.

References, Footnotes, Bibliography

i British Standards Institution, (2009) *BS 5228: Part 1: 2009, Noise and vibration control on construction and open sites: Code of practice for basic information and procedures for noise and vibration control*, British Standards Institution, London.

ii The National Assembly for Wales (1997) Technical Advice Note (TAN) 11, Noise, The Stationery Office, Cardiff

iii Welsh Government (2009) Minerals Technical Advice Note 2: Coal

iv World Health Organization, (1999) Guidelines for Community Noise, WHO, Geneva

v Welsh Government (2000) *Minerals Planning Policy Wales,* The National Assembly for Wales

vi British Standards Institution, (1999) BS 8233: 1999, Sound insulation and noise reduction for buildings – Code of practice, British Standards Institution, London

vii Department of Transport and Welsh Office. (1988) Calculation of Road Traffic Noise, HMSO, London

Chapter 14
Blasting and Vibration

Nant Llesg Surface Mine

Incorporating Land Remediation

Environmental Statement

Chapter 14 - Blasting and Vibration

miller argent

Table of Contents

Tables

Figures

14 Blasting and vibration

Chapter Overview

14.1 A blasting impact assessment was undertaken for the proposed Nant Llesg site to determine any potential impact of vibration and air overpressure produced from blasting operations at the site on buildings and structures close to the proposed site. This assessment was carried out by determining the potential receptors in the immediate vicinity of the proposed site and assessing the underlying and surrounding geology and historic workings.

14.2 Sixteen receptors were identified. The types of buildings and structures included five residential properties, two un-occupied properties, six industrial buildings and three structures. Cwm Nant, a residential property to the north-east of the proposed site, was determined as the nearest sensitive property to proposed blasting operations at a distance of 433m from the limit of blasting. Although blasting operations will be carried out closer than 500m to the nearest structure, no blasting will be carried out within 500m of the settlement boundary.

14.3 No historic vibration results were available from the Nant Llesg site and so test blast and historic blasting data collected from the nearby Ffos-y-fran Land Reclamation Scheme (FLRS) was used instead. The use of this data was based on the logical expectation that the vibration and air overpressure levels produced will be similar, given that both sites' have common geology and that blasting practices employed on the Nant Llesg site will be the same as those currently employed on the FLRS. A series of vibration and air overpressure predictions were calculated for each receptor using specifically designed blast monitoring exercises at the FLRS, and corroborated by the comprehensive blast monitoring data available at that site.

14.4 The magnitude of the vibration predictions generated for the nearest residential and industrial buildings to the site were very low. Predicted vibration levels, to a 50% confidence level, were near to the human perception threshold of 0.50 millimetres per second but well below the MTAN2 maximum vibration limit guide of 6 millimetres per second. Based on a 95% confidence, the highest calculated vibration prediction is 5.47 millimetres per second at the closest building which is an unoccupied property, also below the MTAN2 maximum vibration limit guide.

14.5 Air overpressure levels are also predicted to be very low, with the nearest sensitive property, Cwm Nant predicted to receive levels of 7.38 Pascals (111 decibels linear) to a 50% confidence. All predicted levels for the various properties identified were below the MTAN2 maximum level guidance of 120 decibels linear (18.90 Pascals), with 95% confidence..

14.6 Given that the current blast design, execution and monitoring regime employed at FLRS will be adopted at Nant Llesg and based on the vibration and air overpressure predictions generated for the Nant Llesg site, the potential impact from blast induced vibration and air overpressure on all of the identified potential receptors is considered to be of low to negligible significance. Thus no additional mitigation measures are considered necessary over and above good blasting design, practice, monitoring and management.

Introduction

14.7 Blast Log Ltd were engaged by Miller Argent to undertake and report on a blast and vibration impact assessment for the proposed Nant Llesg surface mine incorporating land reclamation, to be included in the Environmental Impact Assessment (EIA) submission. The assessment focuses ensuring that the MTAN (Mineral Technical Advice Note) 2: Coal (2009) guidance

regarding blasting best practice, the Quarries Regulations 1999 and superseding legislation are adhered to.

14.8 Miller Argent propose extracting coal from the site using surface mining methods. This requires extraction of the coal measure sequence between the Black Pins or Gorllwyn Seams to the Little Vein seam, a c.150m sequence of the Carboniferous Middle (and some Lower) Coal Measures. Whilst the coal and less hard interburden units, such as mudstones and thin siltstones, which separate the coal partings would be extracted by mechanical methods, hard interburden partings such as sandstone, thicker than 5m will need to be broken up using drill and blast techniques, before being removed from the extraction area to expose the coals beneath. Blasting of specific geological units will therefore be required at various depths within the site.

14.9 In assessing the potential blasting and vibration impacts resulting from the proposals of the Nant Llesg site, the following documents have been reviewed:

Planning documents:

- Minerals Technical Advice Note 2: Coal (MTAN 2) (dated January 2009).
- Minerals Planning Policy: Wales, December 2000.

Proposal related documents:

- Nant Llesg Surface Mine Including Land Reclamation - Request for Revised Scoping Opinion, dated 30 December 2011.

Site documents:

- 2D and 3D Models provided by Miller Argent of planning boundaries, mine designs and geological information.
- Proposed site layout Drawing No. MA/NL/PA/003 Revision L, dated 14 March 2013

Other Documents

- BGS geological maps
- Specification for safe working in the vicinity of Wales & West Utilities high pressure gas pipelines and associated installation - requirements for third parties (T/SP/SSW/22) revision 08/04.

14.10 An appraisal of the area surrounding the proposed surface mine and the underlying geology has been undertaken in determining potential impacts of the blasting operations on potential receptors.

14.11 No historic blasting data from the Nant Llesg site was available and so to understand what vibration and air overpressure levels might be generated from the site, two test blasts were carried out at the Ffos-y-fran Land Reclamation Scheme (FLRS). As shown on Drawing No. MA/NL/ES/14/001, the FLRS is located immediately to the south west of the proposed Nant Llesg site and works strata from the same horizons as will be encountered in Nant Llesg. Test blast data together with historic blasting data from FLRS has been analysed and used to predict vibration levels likely to be generated by the Nant Llesg site and received at the identified potential receptors. This has enabled the level of any impact on the potential receptors to be determined and mitigation measures, if required, to be designed.

Impact Assessment on the Site Surroundings, Local Geology and Planning Documentation

Baseline

14.12 At present there is no mining activity of the Nant Llesq site and thus no blast induced vibrations are being experience by the occupants of structures adjacent to the proposed development. Such structures are too far away from the FLRS for the blast vibration to be above the threshold of perception.

Potential receptors in the immediate vicinity of the site

14.13 Drawing No. MA/NL/ES/14/001 shows the proposed Nant Llesg site and its immediate surroundings, including the eastern extent of the FLRS site. The proposed site is located to the north of the village of Fochriw, north west of the village of Pontlottyn and to the west of Rhymney. To the north of the site is the A465 Heads of the Valleys Road which is a dual carriageway structure, to the west is Dowlais and the Trecatti Landfill site and to south west is the FLRS.

14.14 A number of villages, structures and industrial sites lie in the vicinity of the proposed Nant Llesg site. Representative worst case residential properties, industrial units or structures, in all directions around the site were chosen for assessment based on their relative distance from the rock head which will be the limit of blasting. These are listed below and are shown on Drawing No. MA/NL/ES/14/001. The distance to these nearest locations has been calculated using the rock head boundary, determined by Miller Argent as the limit of any potential blasting. The distances stated are therefore the shortest possible distances between blasting and the identified location:

Residential properties:

1. Half Way House is located 478m to the north west of the site.

2. Blaen-carno Farm is located 556m to the north west of the site.

3. Gypsy Castle which is a residential property is located 643m to the north of the site.

4. Cwm Nant is located 433m to the north east of the site and it is the nearest residential property to the proposed site.

5. At a distance of 813m is 48 Glan-yr-afon which is the closest residential property to the east of the site within the settlement of Rhymney. (It should be noted that although the settlement boundary of Rhymney, defined in the Caerphilly Local Development Plan 2010, lies at a distance of 500m from the proposed extraction boundary (at the closest point), the nearest residential property within the settlement lies at a distance of 813m from the extraction boundary).

6 & 7. Two unoccupied farm outbuildings are located 360m and 368m, respectively from the blasting limit, to the north of the site. As the outbuildings are unoccupied they are not regarded as sensitive structures but they have been included due to their proximity to the proposed Nant Llesg site and the potential for occupation, although occupation by anyone other than site personnel is unlikely as these properties are in the ownership of Miller Argent.

Industrial units:

8. Covantec, light industrial units, located 583m to the east of the site.

9. Advance Moulds Furniture, light industrial units, located 527m to the east of the site.

10. An unoccupied industrial unit in the Heads of the Valleys Industrial Estate located 552m to the east of the site.

11. At a distance c.1.1km to the south east are K&J's light industrial units and grounds

Industrial structures or infrastructure:

12. At a distance of c.1.3km to the south is the Cwmbargoed Disposal Point.

13. Biffa water treatment works, is located at the Trecatty landfill site, 522m to the west of the site.

14. Located to the west of the proposed excavation area and within the proposed operational site boundary is a high pressure gas pipeline operated by Wales and West Utilities. As shown on MA/NL/ES/14/001, the pipeline approaches to a minimum distance of 74m from the rockhead boundary.

15. Located to the north of the proposed excavation area is a water pumping station operated by Welsh Water. The pumping station approaches to a minimum distance of 113m from the rockhead boundary as shown on Drawing No. MA/NL/ES/14/001.

16. Overhead power lines are shown currently to pass over the extraction area and to the west of the site. It is understood that the power line which passes over the extraction area will be re-routed on pylons along the western operational site boundary and will then pass at a minimum distance of 96m from the limit of excavation.

14.15 The locations which are the closest to the site comprise mainly industrial units, infrastructure, two unoccupied outbuildings and five individual isolated residential buildings. With the exception of the overhead power line which will be diverted, the nearest structure to the limit of blasting is the high pressure gas main, which passes at a minimum distance of 74m from the excavation area. During a meeting on 6th August 2012 between Miller Argent, Blast Log and West & Wales Utilities (the pipeline operator), it was determined that the gas main construction is welded steel with an external diameter 48 inches (1.22 metres) with a wall thickness of 12.7mm. The pipe is buried at a minimum depth of 1.5m from the ground surface. The gas pressure within the pipeline flows at 48 bar (696 psi or 4,800 kPa).

14.16 The closest five residential properties to the west, north and east of the site have been identified as representative of the potential worst case impact receptors. Cwm Nant is the nearest property, being 433m to the north-east of the site. To the south of the site the nearest residential property is in the village of Fochriw at a distance of 1.6km from the nearest possible blasting approach. This is considered to be too distant to require consideration under this assessment and so is not identified as a potential impact receptor.

14.17 Location numbers 11 and 12, shown on Drawing No. MA/NL/ES/14/001, are the nearest structures or buildings to the south east and south of the site and are at distances of 1.1km and 1.3km respectively. They are considered to be too distant to require assessment. Further, both are buildings related to industrial processes and are not considered to be sensitive, but for completeness, because they are the nearest buildings in a southerly direction, vibration and air overpressure predictions have been calculated for these locations. In summary then for the purpose of this assessment all of the locations numbered 1-16 inclusive will be considered in this impact assessment as potential receptors, based on proximity to the extraction area and structure type.

14.18 In summary, for the purpose of the blast vibration assessment, all of the locations numbered 1-16 inclusive will be considered as potential receptors, based on their relative proximity to the extraction area and structure type.

Geology

14.19 Drawing No. MA/NL/ES/14/002 shows the local geological setting around Nant Llesg and Drawing No. MA/NL/ES/14/003 shows three generalised vertical sections of strata at the Nant Llesg site, the FLRS and as shown on the British Geological Survey (BGS) 1:10,000 geological map, reference SO 10 NW. Drawing No. MA/NL/ES/14/003 also shows the correlation of coal seams between the sections as the names of coal seams can differ between the different sources. As shown on Drawing No. MA/NL/ES/14/003, the Nant Llesg site would facilitate the extraction of multiple coal seams predominantly from the Middle Coal Measures Formation which comprises coal seams and interburden units of mudstone, siltstone and sandstone (site boreholes indicate a general interburden composition of 64-99% mudstone and 0-30% sandstone/siltstone with 0-3% of ironstone), as well as some coals from the top of the underlying Lower Coal Measures which also comprises coal seams with mudstone, siltstone and sandstone interburden units.

14.20 The local geological setting at the FLRS shown on Drawing No. MA/NL/ES/14/002 confirms that the coal seams are common with the seams present in the proposed Nant Llesg area.

14.21 Drawing No. MA/NL/ES/14/002 shows the Middle Coal Measures to be exposed over most of the proposed extraction area, with a small area of the underlying Lower Coal Measures exposed at ground surface to the northern limit of the extraction area. The strata dip generally to the south south east at c.3-9 degrees. The potential receptors numbered 1, 6 and 7 are therefore up-dip of the site, and locations 5, 9, 10, 13, 14 and 16 are positioned along strike or slightly down dip of the site. In the Nant Llesg area only one fault is reported on BGS geological maps. This fault is aligned c. northwest to southeast and is located to the east of the proposed site, between it and the village of Rhymney. This fault, which downthrows to the west, is in a similar position to the proposed eastern operational site boundary. Vibration from the Nant Llesg site would travel across this fault (rather than along it) and in that process it is possible that the vibration level may reduce slightly from that assessed. Other fault positions are shown on the Drawing No. MA/NL/ES/14/002 and are taken from a plan of the Lower Four Feet seam where faults were intercepted. Whilst these faults were mapped at depth, they may not have surface expressions. The faults are shown either in a similar alignment to the fault reported on BGS geological maps, or are aligned c. south west to north east, approximately parallel to with the strike of the units.

Old workings and features of interest

14.22 Drawing nos. MA/NL/ES/14/002 and MA/NL/ES/14/004 show the location of historic surface mining sites in the vicinity of the Nant Llesg site. Dowlais Top and Pant-y-waun are partially or completely located within the proposed extraction area at Nant Llesg. The Royal Arms site is almost entirely located within the proposed site boundary and the Cae Harris site is located outside the proposed site boundary to the north west. Neither the Royal Arms site nor the Cae Harris site have properties or buildings on them, and the Royal Arms site separates the potential receptors no. 6 and 7 (Drawing MA/NL/ES/14/001) from the Nant Llesg site. Drawing MA/NL/ES/14/002 indicates that the Cae Harris and Royal Arms sites extracted the seams from the Nine Feet (equivalent of the Rhaslas seam) down to the Gellideg seam (equivalent of the Lower Four Feet seam). The Nine Feet to the Little Vein are included in the Nant Llesg site, the Lower Four Feet (equivalent to the Gellideg seam) is below the floor of the proposed Nant Llesg workings. The presence of a backfilled void related to previous open cast mining activity in the vicinity should dampen vibration transmission between the Nant Llesg site and potential receptors 3 and 4 which are directly up dip of the site and receptor 2.

14.23 Deep, old mine workings for both ironstone and coal are extensive in the area. Most seams are understood to have been subjected to some degree of underground mining, with particularly extensive workings in the Two Feet Nine, Upper Four Feet, Black, Big, Rhaslas, Little Vein and Lower Four Feet seams. All are planned to be worked at the Nant Llesg site, with the exception of the Lower Four Feet seam which is about 20-30m beneath the proposed basal working seam at Nant Llesg. Deep workings were accessed by shafts and adits and all reported shafts and adits in the vicinity of the site are shown on Drawing MA/NL/ES/14/004. Some of the shafts and adits shown will relate to old workings in the immediate Nant Llesg area, but many of them will relate to deep workings in nearby areas. Drawing MA/NL/ES/14/004 shows the area of old workings in the Lower Four Feet seam. As shown, the workings extend beneath the site area and east toward the village of Rhymney. Adit direction arrows on Drawing MA/NL/ES/14/004 indicate that some access to these workings may have been from the east, between the site and Rhymney. The presence of any open, old workings and associated roadways, shafts and adits, located toward Rhymney which may have flooded will provide pathways for preferential transmission of blast induced vibration. Old workings which are collapsed or backfilled may reduce the transmission of vibration. The condition of old mine workings in the area is not known but there is the potential therefore for properties in the Rhymney area close to the location of shafts, adits and old workings to be subject to blast vibration transmission.

Planning and development related documents

14.24 After reviewing the planning documents, proposal related documents and the site documents listed in Paragraph 14.9, the following information has been highlighted as being relevant to the environmental impact assessment.

14.25 The scoping report for the site highlights vibration as an issue common to all surface mining sites, and states in paragraph 18.4 that “the process at surface mine sites can give rise to low levels of ground vibration and air overpressure, which although well below the threshold for causing physical damage at buildings or structures beyond the site boundary, remain perceptible.”

14.26 MTAN 2 provides the following recommendations and limits for ground vibration and air overpressure:

> “A detailed scheme for approval should be included in the Environmental Statement so that it can be assessed as mitigation, to include:….a maximum level of ground vibration at vibration-sensitive buildings; ground vibration levels should not exceed a PPV (Peak Particle Velocity) of 6 mms^{-1} resultant value in 95% of blasts measured over a rolling three-month period as reviewed on a weekly basis” (ref para 164).

14.27 The MTAN 2 document also states that “air overpressure should not exceed 120 dB linear (21 Pa), in 95% of blasts measured over any twelve-month period, and no individual blast should exceed 125db (34 Pa), measured at the nearest noise sensitive property.” (ref para 164)

14.28 These criteria have been used as the basis of determining the impact on the potential receptors identified in the vicinity of the Nant Llesg site.

14.29 The gas main is under the management of Wales and West Utilities and as such has separate requirements for working in its vicinity. Section 8.5 of their Specification for safe working in the vicinity of gas pipelines (document T/SP/SSW/22) states

> “No blasting should be allowed within 250 metres of a pipeline without an assessment of the vibration levels at the pipeline. The peak particle velocity at the pipeline must be limited to a maximum level of 75 mms^{-1}. Where the peak particle velocity is predicted to exceed 50 mms^{-1}, the ground vibration must be monitored by the contractor and the results available to Wales & West Utilities responsible person at their request.”

14.30 As shown on Drawing MA/NL/ES/14/001, the pipeline passes at a minimum distance of 74m from the nearest potential point of blasting and as such an assessment of vibration levels on the pipeline is included within this assessment.

Summary

14.31 The location of the nearest properties, buildings and structures surrounding the site have been identified and are considered to be potential blast and vibration impact receptors for the purpose of this assessment. These sixteen locations are set out in Paragraph 14.13 and are shown on Drawing MA/NL/ES/14/001. The geological setting and the presence of old workings (deep and surface mine) have been considered. The presence of backfilled surface mine workings to the north of the Nant Llesg site are expected to dampen the transmission of any blast vibration from the site to receptor numbers 2 to 4, 6 and 7, and potentially to location 1. Deep workings and access shafts and adits are present in multiple seams proposed to be worked at Nant Llesg and one deep mining plan indicates that works and potentially access ways to the deep workings extended toward Rhymney. These may act as preferential pathways for transmitting any blast vibration and as such the impacts on the general area of Rhymney and specifically properties in the vicinity of shafts and adits should be considered.

14.32 Vibration and air overpressure limits to be adopted in this impact assessment have been provided by MTAN2 and vibration levels required by Wales and West Utilities, when blasting within 250m of the gas pipeline have been used.

Historic Vibration Data and Test Blasts

14.33 To carry out a vibration and air overpressure impact assessment, vibration predictions from blasts at the Nant Llesg site need to be calculated. No active surface mining sites are currently operating within the Nant Llesg site area and therefore no site specific vibration results are available.

14.34 Other relevant blast data was therefore required and so blast data from the adjacent FLRS which comprised of 1463 results was reviewed. This site, as shown on Drawing MA/NL/ES/14/002 and MA/NL/ES/14/004 is located to the west and south west of the proposed Nant Llesg site and includes the same geological units that the Nant Llesg site is intending to extract. The Nant Llesg site would employ the same buffer blasting technique as employed at FLRS to fracture and loosen hard interburden units. Although the hardness and thickness of the interburden units may vary slightly between sites causing some blast parameters to change (notably hole depth and consequently the explosive charge), the fundamentals of the blast design and initiation design will remain the same as at FLRS. This similarity in geological units, a similar blasting technique and the close proximity of the sites to each other provide a high confidence that data from the FLRS will accurately replicate the vibration and air overpressure levels expected at the proposed Nant Llesg site.

14.35 In addition to analysing the available historic vibration and air overpressure data, it was decided that two test buffer blasts should be carried out. The test blasts were designed to replicate a proposed full scale production blast but be on a smaller scale, with fewer holes being initiated than would likely to be employed during a production blast. Undertaking such test blasts allowed a high level of monitoring close into the blast sites, compared to monitoring locations of historic blasts. Two test blasts were carried out rather than one to increase the number of recordings per monitoring location and to allow a larger data set to be collected.

14.36 Before the test blasts were carried out, vibration predictions using the existing historical site data were calculated for the proposed monitoring locations. This was done because if the test blast produced actual vibration levels similar to the predicted levels, then the high quality of the

FLRS data and the accuracy of the well established prediction technique, described further below, would be demonstrated. These two factors are very important as vibration predictions are provided later in this assessment for the identified potential receptors around the Nant Llesg site, which are calculated from the FLRS data set.

Test blast design and vibration prediction

14.37 The two test blasts were undertaken on the LA1-K interburden (sandstone/siltstone) unit at the FLRS on 26th June 2012. The coal directly above the interburden is the Big seam and the coal directly below is the Red seam. The interburden unit and the coals are shown on MA/NL/ES/14/003, and as highlighted in purple on the drawing this correlates with units within the planned Nant Llesg excavation.

14.38 The calculation used to predict the vibration levels which are called Peak Particle Velocities (PPV's) at any given monitoring locations is shown in Equation 1 below. This can be re-arranged to derive an estimated Maximum Instantaneous Charge weight (MIC), and that is shown in Equation 2. In Equation 2, the distance value is the distance from the blast to the nearest residential or sensitive property or monitoring location and the PPV value is the site's permitted vibration limit.

$$PPV = A*\left(\frac{\text{distance}}{\sqrt{MIC}}\right)\frac{B}{}$$

Equation 1. A and B are known as the site factors which are obtained through monitoring and regression analysis

$$MIC = \left(\frac{\text{distance}}{\left(\frac{\text{PPV}}{A}\right)^{\frac{1}{B}}}\right)^2$$

Equation 2. A and B are known as the site factors which are obtained through monitoring and regression analysis

14.39 These equations are used by Miller Argent to calculate the MIC for all blasts at the FLRS and were used for the two test blasts. Using this information and after consultation between Miller Argent and the drill and blast contractor, the test blasts were designed such that the MIC weight would be that most likely to be employed in production blasts at Nant Llesg, for the thickness of interburden at the test blast location (thicker interburden would require a larger charge weight). Therefore the vibration and air overpressure results produced would be similar to that expected from a blast at Nant Llesg. The agreed maximum charge weight to be used was 19kg of ammonium nitrate (ANFO) for a dry hole or 24kg for emulsion for a hole with the presence of water.

14.40 Blast Log Ltd holds a substantial database of blast and vibration results from the FLRS. All available data on the database was interrogated and using the Scaled Distance and PPV data on the database and the determined test blast MIC, predictions of PPV levels likely to be recorded at each monitoring location were calculated at 50% and 95% probabilities. As with all statistical techniques, there is an error range associated with the estimate. Thus for any value of scaled distance, the predicted PPV using a 50% confidence is the mean estimate of the value such that there is a 50% chance that the actual vibration level will be above the prediction and a 50% chance it will be below this value. Whilst, for any one blast, the actual PPV at a single point cannot be precisely predicted, standard statistical techniques allow the range in

which it will lie to be assessed. In practice, the upper bound 95% confidence value is normally taken for design purposes as this indicates a confidence that the actual PPV recorded from a blasting event will, 19 out of 20 times, be below the predicted PPV.

14.41 Two sets of predictions were generated for each test blast. The first set was a general prediction based on vibration results collected from all interburden horizons at the FLRS, which comprised of 1463 results obtained between 18/06/09 and 27/04/12. The second was horizon specific to the interburden to be blasted which was based on 20 results from the LA1-K interburden. Tables 14.1 and 14.2 show these vibration predictions for each monitoring location.

Table 14.1 Test blast 1 predicted vibration levels using 50% and 95% weightings

Seismograph No.	Distance to nearest shothole (m)	Predicted vibration (PPV) values using all historic vibration data		Predicted vibration (PPV) values using horizon specific vibration data	
		50% (mm/s^{-1})	95% (mm/s^{-1})	50% (mm/s^{-1})	95% (mm/s^{-1})
Mon 1	160.60	2.80	10.43	2.36	8.53
Mon 2	126.94	3.68	13.73	3.33	12.03
Mon 3	125.17	3.74	13.96	3.40	12.28
Mon 4	85.35	5.86	21.85	5.95	21.47
Mon 5	57.13	9.37	34.95	10.69	38.59
Mon 6	47.97	11.50	42.88	13.80	49.81
Mon 7	33.23	17.67	65.89	23.59	85.12

Table 14.2 Test blast 2 predicted vibration levels using 50% and 95% weightings

Seismograph No.	Distance to nearest shothole (m)	Predicted vibration (PPV) values using all historic vibration data		Predicted vibration (PPV) values using horizon specific vibration data	
		50% (mm/s^{-1})	95% (mm/s^{-1})	50% (mm/s^{-1})	95% (mm/s^{-1})
Mon 1	82.60	6.09	22.71	6.24	22.53
Mon 2	48.93	11.23	41.90	13.41	48.38
Mon 3	91.86	5.38	20.05	5.35	19.29
Mon 4	68.54	7.57	28.25	8.20	29.58
Mon 5	47.97	11.50	42.88	13.80	49.81
Mon 6	46.45	11.94	44.53	14.47	52.20
Mon 7	32.84	17.91	66.81	24.00	86.60

14.42 Prior to blasting, it was decided that all monitoring would be carried out on-site and at a range of distances close to the blast (i.e. less than 150m to the nearest shot hole) in order to ensure that all seismographs triggered and data recorded for each blast.

Test blast descriptions

Test blast 1

14.43 The location of test blast 1 is shown on Drawing MA/NL/ES/14/005 and comprised of 48 holes in 6 rows with a designed burden and spacing of 4.5m. All holes in this blast were drilled to a depth of 4.7m.

14.44 All shot holes were loaded with a 1.7m depth of ANFO load to the base of the holes and each hole was primed and initiated with 1 x 500g primer and 2 x Non-electric detonators at the base of the hole. The holes were then stemmed from surface to a depth of 3m. The MIC for the blast was 19.5kg (19kg of ANFO and 1 primer of 500g). Surface connector timings were 17ms along the six rows and 42ms between the rows. The blast was initiated from the south-western end of the shot.

Test blast 2

14.45 As shown on Drawing MA/NL/ES/14/005, test blast 2 was located adjacent to and just south of test blast 1. The blast comprised of 60 holes in 4 rows with a designed burden and spacing of 4.5m. Holes in this blast were drilled to a depth of 4.7m.

14.46 48 holes were loaded using 24kg of Blendex80 emulsion and the remaining 12 holes were loaded with 19kg ANFO, loaded in the base 1.7m of the hole. Each hole was primed and initiated with 1 x 500g primer and 2 x Non-electric detonators at the base of the hole. The holes were then stemmed from surface to a depth of 3m. The MIC for the blast was 24.5kg (24kg of Blendex80 and 1 primer of 500g). Surface connector timings were 17ms along the six rows and 42ms between the rows. The blast was initiated from the north-eastern end of the shot.

Monitoring of the test blasts

14.47 The exact distances between both test blasts and monitoring locations were recorded and both blasts were monitored at multiple locations and at varying distances from the blast.

14.48 Seven commercially available digital seismographs (Whites and Instantel Minimates) were used to monitor ground vibration and air overpressure levels for both test blasts. The locations of the seismographs, called MON 1 - MON 7 are shown on Drawing MA/NL/ES/14/005. MON 1 and 2 were located on the blasting bench at distances of between 49-161m from the blasts, and MON 3-7 were located on the bench above the blast, at distances of between 33-125m from the blasts.

14.49 All vibration and air overpressure results recorded for test blasts 1 and 2 are shown in Tables 14.3 and 14.4; all seismograph units triggered.

Table 14.3 Test blast 1 recorded vibration and air overpressure levels

Seismograph No.	Recorded PPV (mm/s^{-1})	Difference between the recorded PPV and 50% prediction value (mm/s^{-1})		Recorded air overpressure	
		All data	Horizon specific	(Pa)	(dB(lin))
Mon 1	1.82	-0.98	-0.54	17.42	119
Mon 2	3.27	-0.41	-0.06	29.58	123
Mon 3	3.65	-0.09	0.25	15.89	118
Mon 4	5.91	0.05	-0.04	28.25	123
Mon 5	8.26	-1.11	-2.43	53.37	129
Mon 6	14.35	2.85	0.55	56.37	129
Mon 7	23.62	5.95	0.03	79.62	132

Table 14.4 Test blast 2 recorded vibration and air overpressure levels

Seismograph No.	Recorded PPV (mm/s^{-1})	Difference between the recorded PPV and 50% prediction value (mm/s^{-1})		Recorded air overpressure	
		All data	Horizon specific	(Pa)	(dB(lin))
Mon 1	4.83	-1.26	-1.41	26.37	122
Mon 2	25.80	14.57	12.39	37.24	125
Mon 3	4.22	-1.16	-1.13	15.89	118
Mon 4	5.97	-1.60	-2.23	25.18	122
Mon 5	7.50	-4.00	-6.30	44.77	127
Mon 6	7.79	-4.15	-6.68	39.91	126
Mon 7	11.4	-6.51	-12.60	70.96	131

Review of the test blast vibration and air overpressure level

14.50 The vibration results from test blast 1 ranged between 23.62 mms^{-1} to 1.82 mms^{-1} at distances between 33m and 161m from the blast respectively. The results from the second test blast ranged between 25.80 $mms^{-1}$to 4.22 mms^{-1} at locations 49m and 92m from the blast respectively.

14.51 The air overpressure results from test blast 1 ranged between 80 Pa (132 dB(lin)) to 17 Pa (119 dB(lin)), 33m and 161m from the blast respectively. The results from the second test blast ranged between 71 Pa (131 dB(lin)) to 16 Pa (118 dB(lin)) at 49m and 92m from the blast respectively.

14.52 A comparison between the vibration results and the predictions made using all vibration data from test blast 1 (shown in Table 14.1 and 14.3) show that all the results correlate well with the predictions made using a 50% i.e. even chance confidence with no single result being close to the 95% prediction value. The horizon specific LA1-K based predictions for test blast 1 again show that the 50% weighting predictions correlated well with the actual results and for most monitoring locations the horizon specific 50% prediction was slightly closer to the actual result than the prediction using all data, with the predictions and actual results differing by a maximum of 2.43 mms^{-1}at a scaled distance of 13.6 $m/kg^{0.5}$ and a minimum of just 0.03 mms^{-1} at a scaled distance of 8.5$m/kg^{0.5}$ The average difference between average of all the predicted values and average of all the actual values was 0.56 mms^{-1}. This figure is specific to the short scale distances involved in the trial blast and would be significantly less at the distances involved between the vibration sensitive structures and the proposed blast sites.

14.53 Table 14.4 shows the actual results for test blast 2. The difference between the recorded and predicted values for test blast 2 was higher than seen with test blast 1, with the difference varying between a minimum of 1.13 mms^{-1} at a scaled distance of 25.1 $m/kg^{0.5}$ and a maximum of 12.60 mms^{-1} at a scaled distance of 10.0 $m/kg^{0.5}$, although almost all results were still less than the 50% predicted value. Six of the seven recorded results were lower than their 50%

prediction values with the exception of the Mon 2 result of 25.90 mms^{-1} recorded 49m from the blast which is higher than the 50% horizon specific prediction of 13.41 mms^{-1}, but significantly less than the 95% or 1 in 20 chance of 48.38 mms^{-1}. That one result of the fourteen recorded should be significantly higher than the mean prediction is to be expected, due to the statistical probabilities associated with the methodology. Although this result was higher than the 50% prediction it still lies within the predictive range between 50% and 95% probability. The average difference between all predicted and actual values was 6.11 mms^{-1}. Again, this figure is specific to the short scale distances involved in the trial blast and would be significantly less at the distances involved between the vibration sensitive structures and the proposed blast sites. The predictions for both test blasts were calculated in the same way and this reflects the natural variability in blasting operations and vibration transmission. As all results lie within the acceptable predictive range of 50% and 95% with 13 of the 14 results obtained from the two test blasts being close to or less than their 50% predicted value and with no result near to or above the 95% prediction this demonstrates that the predictability of vibrations produced from blasting at FLRS is very good to excellent, using either all FLRS vibration results or the horizon specific results.

14.54 This gives a very high degree of confidence with respect to using the FLRS vibration data to generate vibration predictions for future blasting operations proposed at Nant Llesg, given that blasting operations for both sites would take place to facilitate the excavation of interburden from the same geological sequence.

Data Analysis

14.55 Although comparisons have been made between the predicted and recorded values for each monitoring location for both test blasts in Paragraph 14.50 and 14.51, the test blast results have also been analysed to determine how the results correlate in order to assess the overall performance of the two test blasts.

14.56 The vibration results from the two test blasts were combined to produce a single scaled distance regression graph, shown on Figure 14.1. The 50% and 95% confidence lines as shown in Figure 14.1 were calculated using the test blast results and not the overall FLRS data to aid in assessing the performance of the test blasts, hence they differ from those relating to all the FLRS data, used for the calculations in Tables 14.1 to 14.4. The overall performance will depend on the scatter of the points used to produce the best fit line. The “measure of the degree of best fit” relates both to the correlation coefficient (CC) and the Standard Error (SE). It is clear from the graph in Figure 14.1 that the spread of data or ‘scatter’ is small and this is confirmed by the SE which reports a value of 0.28 which is very good. The results show little variability between the individual data points within each blast as most of the results lie around the 50% prediction line. This suggests that vibrations produced from these blasts attenuated proportionally with increasing distances. In addition, the reported correlation co-efficient is 0.92 is also excellent. Based on the standard error and correlation co-efficient, it can be said that the test blasts performed optimally regarding the vibration recorded at each location.

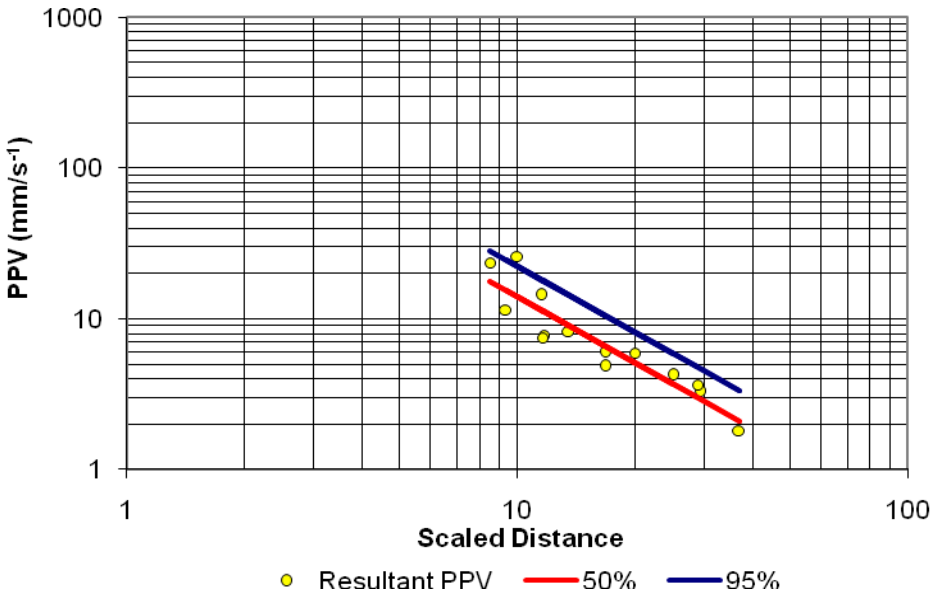


Figure 14.1 Vibration scaled distance regression model for test blast 1 and 2

14.57 The air overpressure results from the two test blasts were also combined to produce a single scaled distance regression graph which is shown on Figure 14.2. It is clear from the graph that the spread of data or 'scatter' is small and this is confirmed by the SE which reports a value of 0.24 which is excellent. Similar to the vibration results, Figure 14.2 show little variability between the individual data points within each blast with most of the results lie around the 50% predicted line. The reported correlation co-efficient is 0.88 which is very good. Overall, based on the standard error and correlation co-efficient, it can be said that the test blasts performed optimally regarding the air overpressure produced.

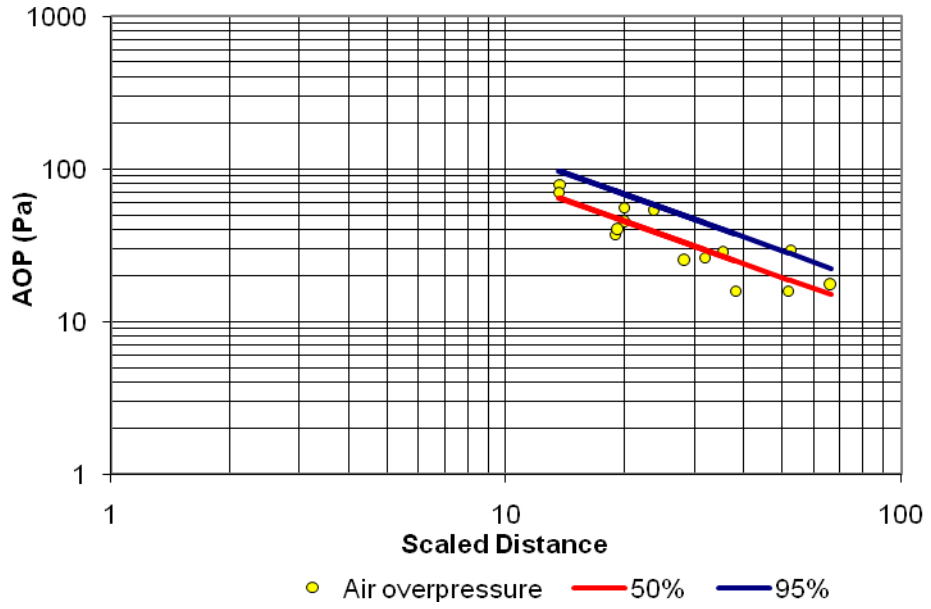


Figure 14.2 Air overpressure scaled distance regression model for test blast 1 and 2

Vibration Predictions

14.58 As discussed historic vibration results were required to allow vibration predictions to be generated for each potential receptor in the vicinity of the Nant Llesg site for the vibration impact assessment. Due to Nant Llesg being a green field site, no such data set was available and it was decided to use data from the near by FLRS. The vibration produced from blasting operations carried out at FLRS and their subsequent attenuation is expected to be similar to that produced by Nant Llesg operations, because the type of blasting employed will be the same and because of the similar geological situation. The two test blasts undertaken demonstrated that the predictability of vibration produced from blasting at FLRS is very good and that vibration results collected from FLRS can be used to generate reliable predictions for Nant Llesg.

14.59 As such, vibration predictions for each of the potential receptors described in Paragraph 14.13 have been calculated using all of the vibration results recorded at the FLRS, up to and including April 2012 and including the test blast results. Table 14.5 shows a table of these vibration predictions for each potential receptor based on the nearest point of blasting and a charge weight of 40kg. The test blasts at FLRS used 19.5kg for test blast 1 and 24kg for test blast 2 charge weights because of the thickness of interburden intercepted at FLRS. The 40kg charge weight has been used after taking an average of interburden thicknesses at Nant Llesg and hence likely charge weights that will be required. The results are summarised below.

Table 14.5 Predicted vibration levels at the potential receptors surrounding the Nant Llesg site using 50% and 95% weightings

Location Number	Location description	Distance between the receptor and the nearest point of blasting (m)	Predicted vibration values	
			50% (mm/s^{-1})	95% (mm/s^{-1})
1	Half Way House	478	1.05	3.93
2	Blaen-carno Farm	556	0.88	3.29
3	Gypsy Castle	643	0.74	2.77
4	Cwm Nant	433	1.18	4.41
5	48 Glan-Yr-Afon, Rhymney	813	0.57	2.11
6	Farm outbuilding	360	1.47	5.47
7	Farm outbuilding	368	1.43	5.33
8	Covantec	583	0.83	3.11
9	Advanced Moulds Furniture (Unit 12-16)	527	0.94	3.50
10	Unoccupied unit at the Heads of the Valleys Industrial Estate	552	0.89	3.32
11	K&J's light industrial units and grounds	1107	0.39	1.47
12	Cwmbargoed Disposal Point	1373	0.31	1.14
13	Biffa water treatment plant	522	0.95	3.54
14	Gas pipeline	74	9.34	34.82
15	Water pumping station	113	5.69	21.22
16	Diverted overhead power lines	96	6.88	25.68

14.60 Of the five residential properties (locations 1 to 5) which are regarded as vibration sensitive buildings the nearest, Cwm Nant (433m) has predicted vibration levels of just 1.18 mms^{-1} and 4.41 mms^{-1} based on a 50% and 95% probability respectively. The others are lower.

14.61 Locations 6 and 7, un-occupied farm outbuildings, which are not regarded as sensitive structures are located 360m and 368m from the site and have maximum predicted vibration levels of 1.47 mms^{-1} using a 50% confidence and 5.47 mms^{-1} based on a 95% confidence.

14.62 Locations 8 to 13 are industrial properties which are not regarded as vibration sensitive buildings and because of their build structure have a higher vibration tolerance. Of these five locations, the maximum predicted vibration levels of 0.95 mms^{-1} and 3.54 mms^{-1} based on a 50% and 95% confidence respectively, were calculated at the Biffa water treatment plant.

14.63 The last three receptors are the gas pipeline, water pumping station and overhead power line. As the nearest receptors to the proposed blasting area the predicted vibration levels are higher than at all other receptors with maximum predicted levels of 9.34 mms^{-1} and 34.82 mms^{-1} based on 50% and 95% confidence respectively, were calculated at the gas pipeline.

14.64 The calculated predictions indicate that the Nant Llesg site would be able to comply with the with the requirement in MTAN2 guidance that 'no blasting operation should exceed a PPV of 6 mms^{-1} resultant value in 95% of blasts measured over a rolling three-month period at any vibration sensitive building' as all residential and industrial buildings (locations 1-13) have calculated vibration predictions (both 50% and 95% weighting) at less than 6mms^{-1}. The highest calculated vibration prediction at these locations is location 6, an unoccupied farm outbuilding that is not a vibration sensitive building where 1.47 mms^{-1} and 5.47 mms^{-1} were predicted based on 50% and 95% weighting respectively. The vibration predictions for the residential and commercial building receptors are very low and in particular the 50% predictions are near to but below the human perception threshold of 0.50 mms^{-1}. Therefore it can be said that the potential impact of vibration on the identified, closest residential and industrial buildings should be low to negligible.

14.65 Vibration predictions for locations 11 and 12 were calculated at a 50% confidence at a maximum of 0.39 mms^{-1}, which is below the human perception level of c.0.5 mms^{-1}. As such, it is highly unlikely that vibrations from blasting would be experienced at these two locations or at distances of greater than 900m from the site.

14.66 The vibration predictions for the nearest structures of the gas pipeline and diverted overhead power line exceed 6 mms^{-1} (although neither are regarded as vibration sensitive buildings), with the closest point of the gas pipeline to blasting predicted to receive 9.34 mms^{-1} to 34.82 mms^{-1} based on a 50% and 95% confidence respectively. Both predicted values are significantly lower than the maximum vibration limit of 75 mms^{-1}, stated in Section 8.5 of the Wales and West Utilities Specification for safe working in the vicinity of high pressure gas pipelines (reference T/SP/SSW/22). As such the possible impact of blasting on the gas main is considered to be negligible and the limit of 75 mms^{-1} is unlikely to be exceeded based on the predictions made.

14.67 The point of blasting closest to the gas main and diverted overhead power lines will take place during the creation of the box-cut at the start of the coaling operation, to the west of the site. The working direction after development of the box cut would be from west to east across the site and as such blasting operations would move further away from the gas main as the site progresses thus reducing further the level of vibration received at the gas main and the diverted overhead power line from that predicted in this assessment.

14.68 The diverted overhead power line and the water pumping station are further away from the blasting area than the pipeline and consequently have lower predicted vibration levels than the gas main, of 6.88 mms^{-1} and 25.68 mms^{-1} for the overhead power line and 5.69 mms^{-1} and 21.22 mms^{-1} for the water pumping station based on 50% and 95% confidences respectively. There is understood to be no guidance from the operating companies relating to maximum vibration levels, but the foundation structures are of substantial concrete and steel construction and a similar vibration limit to the pipeline of 75 mms^{-1} is inferred. British standard BS7385-2 provides a guide level on cosmetic damage of 50 mms^{-1} for re-enforced and heavy industrial buildings. However, power line foundations are considered to be more substantial than those

buildings and therefore more able to withstand vibration. The British Standard is therefore considered too onerous and the pipeline limit is considered more appropriate, using professional judgement. On that basis, the potential impact of vibration on the power lines and water pumping station is therefore considered to be negligible.

14.69 Old working plans indicate that access to workings beneath the Nant Llesg site were from the Rhymney area. The presence of old workings, roadways, shafts and adits will affect the transmission of vibration and therefore may cause vibration levels in the area between the site and Rhymney to differ slightly from the values predicted in this assessment, although it is not expected that levels would vary significantly, as the FLRS vibration results are generated from ground where old workings are also present. A scheme of vibration monitoring should however take this into account and monitoring should be undertaken in this area, around the identified potential receptors, numbers 5, 6 and 11 which are the closest industrial and residential structures to the site and are located over or close to old workings and in close proximity to shafts and adits. If an issue arises where routine mitigation measures may not be sufficient then the advanced blasting techniques to control PPV as defined in Minerals Industry Research Organisation report "Full scale quarry blasting project into the use of electronic detonators to control vibration from blasting" (2006) will be considered. ".

14.70 FLRS has two vibration limits which are defined in the current planning permission to operate the site. These are 6 mms^{-1} resultant value in 95% of blasts and no blast shall exceed 8 mms^{-1}. To date, by using good blast design and execution, no result has been equal to or exceeded 6 mms^{-1} at the nearest vibration sensitive property, thus demonstrating the site management's ability to manage and control blasting operations. To date, as a result of careful design and execution, the highest recorded vibration was 2.03 mms^{-1} at the nearest sensitive property.

14.71 Blast induced ground borne vibrations are true transients of extremely short duration. Although they are expected arise every operational day, at the magnitudes predicted they will not produce any significant impact. The duration of the effect will be temporary long term as blasting operations will be carried out over a many years but each event will be of extremely short duration. Overall, the significance of the effect will be negligible to no impact for the majority of receptors. For Half Way House, the impact will be very minor.

Air Overpressure Predictions

14.72 Table 14.6 also shows the predicted air overpressure values for each of the potential receptor locations in Pascals (Pa) measured on a linear scale and Decibel Linear (dB(lin)) measured on a logarithmic scale using 50% and 95% confidences. Using the Decibel Linear scale, an increase in 6 dB(lin) is the equivalent of doubling the amount of air overpressure. Air overpressure predictions have not been calculated for the gas main as it is a buried structure and is not susceptible to air overpressure or for the diverted overhead power line which does not form a solid barrier to air overpressure.

Table 14.6 Predicted air overpressure levels at the potential receptors surrounding the Nant Llesg site using 50% and 95% weightings

Location Number	Location description	Predicted Air Overpressure values			
		50% (Pa)	95% (Pa)	50% (dB(lin))	95% (dB(lin))
1	Half Way House	6.73	10.09	111	114
2	Blaen-carno Farm	5.86	8.78	109	113
3	Gypsy Castle	5.12	7.67	108	112

4	Cwm Nant	7.38	11.06	111	115
5	48 Glan-Yr-Afon, Rhymney	4.12	6.18	106	110
6	Farm outbuilding	8.75	13.12	113	116
7	Farm outbuilding	8.58	12.85	113	116
8	Convatec	5.61	8.40	109	112
9	Advanced Moulds Furniture (Unit 12-16)	6.15	9.22	110	113
10	Unoccupied unit at the Heads of the Valleys Industrial Estate	5.90	8.83	109	113
11	K&J's light industrial units and grounds	3.10	4.64	104	107
12	Cwmbargoed Disposal Point	2.54	3.80	102	106
13	Biffa water treatment plant	6.21	9.30	110	113
14	Gas pipeline	N/A	N/A	N/A	N/A
15	Water pumping station	25.55	38.29	122.13	125.64
16	Overhead power lines	N/A	N/A	N/A	N/A

14.73 Table 14.6 shows that the water pumping station at a distance of 113m from the closest point of blasting is predicted to receive the highest air overpressure level of all potential receptors of 25.55 Pa (122 dB(lin)) based on a 50% prediction and i38.29 Pa (126 dB(lin)) based on a 95% prediction. As the pumping station is infrastructure, this location is not a noise sensitive property and therefore the MANT2 compliance level of '120 dB linear, in 95% of blasts measured over any twelve-month period, and no individual blast should exceed 125dB' does not apply to this location. Notwithstanding this, the MTAN 2 guidance which only applies to noise sensitive properties is complied with. The nearest sensitive property, Cwm Nant is predicted to receive 7.38 Pa (111 dB(lin)) and 11.06 Pa (115 dB(lin)) based on a 50% and 95% weighting respectively. These are low levels of air overpressure. Damage in the form of broken windows due to air overpressure is considered only to be possible at levels in excess of 140dB (188.90 Pa) and perception of air overpressure induced building vibration, (often confused with ground vibration) is considered to commence at 120dB (18.90 Pa).The predictions are well below levels at which damage could occur and well below levels at which air pressure can be perceived.

14.74 At locations in excess of 1km from the site (K&J's units and grounds and the CDP), the air overpressure is predicted to attenuate below that of human perception i.e. 3.80 Pa (106 dB(lin)) and therefore it is highly unlikely that air overpressure from blasting will be experienced at these two locations.

14.75 Due to the low levels of air overpressure predicted for each location, the impact of air overpressure is assessed as negligible. Based on the predictions made and the low level of air overpressure expected at each location, it is expected that Nant Llesg will be able to comply with the limit in the MTAN2 document of 120 dB linear (18.90 Pa), in 95% of blasts measured

over any twelve-month period, and no individual blast should exceed 125db (33.60 Pa), measured at the nearest noise sensitive property. To date, by using good blast design and execution, no blast at FLRS has produced greater than 7.50 Pa (112 dB (lin)) at the nearest sensitive property.

14.76 Similar to blast induced ground borne vibrations, blast induced air overpressure is a true transient of extremely short duration. Although they are expected arise every operational day, at the magnitudes predicted they will not produce any significant impact. The duration of the effect will be temporary long term as blasting operations will be carried out over a many years but each event will be of extremely short duration. Overall, the significance of the effect will be negligible to no impact for all receptors.

14.77 Prediction calculations indicate that the impact of vibration on the identified potential receptors will be low to negligible and the impact of air overpressure on the identified potential receptors will be negligible. No additional mitigation measures over and above good blasting design and practice are considered necessary as outlined and described in Appendix L: Best practice of blasting in the MTAN2: Coal document and Appendix MA/NL/ES/A14/001. This document provides more information on best practice based on a literature review of key research papers in this field and current best practices with respect to reducing the environmental impact of both ground vibration and air overpressure that arises as a result of surface blasting operations. The regulation and enforcement of vibration and air overpressure levels received at buildings and structures beyond an operations' site boundary is standard practise in surface mining operations through the use of stringent limits. These limits are set as part of a mineral operations planning condition by the Mineral Planning Authority, as evidenced by the current planning permission with respect to FLRS.

Other blast and vibration impacts

14.78 In the sections above the potential impact of vibration and air overpressure on local residents, buildings and structures have been considered. Other than blast induced vibration and air overpressure, the only other potential impact from blasting on the surrounding environment is considered to be flyrock. Flyrock is rock from the blast site which is projected beyond the danger zone surrounding the blast. The key to minimising the risk of flyrock is implementing best practice in all aspects of the blast design, execution and monitoring. This includes, for example with blast design and execution, surveying the blast position, pre-profiling free faces and optimising the burdens and spacings to prevent the risk of gas venting from the explosion (which causes flyrock) and stemming to the correct depth and with the correct materials. These procedures are implemented at FLRS and as a result there has been no incidence of flyrock to date at that site. For Nant Llesg, no blasting will be designed or executed that does not adhere to best practice guidelines as outlined in Appendix L: Best practice of blasting in the MTAN2: Coal document or does not comply with the Quarries Regulations 1999 or any superseding legislation. Following best practice will, as well as minimising the risk of flyrock, also assist in the control of air overpressure and vibration levels. As such the risk of flyrock is considered to be negligible.

14.79 The use of both electronic initiation and shock tube initiation systems to detonate blasts on FLRS has not given rise to any noise complaints from residents in the vicinity of the site. Both initiation methods use down the hole detonators which are significantly lower noise sources than conventional surface detonators. The distance from the nearest properties to the blasting operations on FLRS have always been sufficient such that no noise complaints due to blasting have ever been received. Given that the distance from the nearest properties on Nant Llseq to potential blasting operations is not less than that experieced at FLRS, it is anticipated that the use of such initiation system for Blasts on Nant Llesq will not give rise to complaints regarding noise from blasting

Cumulative and in-combination effects

14.80 The only envisaged cumulative or in-combination effects are that blasting operations at the FLRS site will be on going whilst blasting operations are carried out at the Nant Llesg site. It should therefore be considered whether this in-combination effect will have a vibration or amenity impact upon the nearest sensitive locations to the site. A less likely in-combination and cumulative effect would be the impact on those locations if blasts at the two sites were undertaken simultaneously.

14.81 The distances between each of the 16 locations identified in this assessment and the FLRS rockhead boundary have been measured to determine the closest point of blasting at FLRS to each location. All 16 locations are in excess of 1km from closest point of blasting at FLRS, with the nearest locations being Location 1: Half Way House at a distance of 1085m; Location 13: Biffa water treatment plant at a distance of 1107m; and Location 14: Gas pipeline at a distance of 1085m. The next nearest location is Location 15: the water pumping station at distance of 2045m from the limit of blasting. Due to the large distances involved and the maximum charge weights of explosives likely to be used at both sites given the burden characteristics, sensitive receptors adjacent to FLRS to the south are unlikely to be affected by blasting at the Nant Llesg site (there are no sensitive receptors to the north or east of the FLRS) and in turn the majority of sensitive receptors adjacent to blasting on the Nant Llesg site are unlikely to be affected by blasting at FLRS.

14.82 The potential vibration impact on the nearest three locations (1: Half Way House, 13: the Biffa water treatment plant and 14: the gas pipeline) to FLRS, which are the only receptors that could be impacted upon by blasting at both FLRS and Nant Llesg is considered here. Table 14.7 shows the predicted vibration levels for Locations 1, 13 and 14 from blasting at Nant Llesg and Ffos-y-fran.

Table 14.7 Predicted vibration levels at the closest potential receptors surrounding the Nant Llesg site and Ffos-y-fran land reclamation scheme using 50% and 95% weightings

Location Number	Location description	Nant Llesg			Ffos-y-fran land reclamation scheme		
		Distance between the receptor and the nearest point of blasting (m)	Predicted vibration values		Distance between the receptor and the nearest point of blasting (m)	Predicted vibration values	
			50% (mm/s^{-1})	95% (mm/s^{-1})		50% (mm/s^{-1})	95% (mm/s^{-1})
1	Half Way House	478	1.05	3.93	1085	0.40	1.50
13	Biffa water treatment plant	522	0.95	3.54	1107	0.39	1.47
14	Gas pipeline	74	9.34	34.82	1085	0.40	1.50

14.83 The vibration predictions from blasts at FLRS for these receptor locations are very low and in particular the 50% predictions at Half Way House and the Biffa Water Treatment Plant are well below the human perception threshold of 0.50 mms^{-1}. Both predicted values are significantly lower than the maximum vibration limit of 75 mms^{-1}, stated in Section 8.5 of the Wales and West Utilities Specification for safe working in the vicinity of high pressure gas pipelines (reference T/SP/SSW/22).Therefore the likely effect of the blasts at the FLRS on sensitive structures close to Nant Llesg will be minimal. The other sensitive receptors have not been included in Table 14.7 as the predicted vibration levels to those locations are significantly below the human perception threshold of 0.5 mms^{-1}, being over 2km from the site. The potential in-combination effect of vibration from blasts at both sites on these nearest identified locations is assessed as negligible.

14.84 Although the potential effect of vibration on the identified properties/structures is negligible, as blasts at FLRS may be perceptible to residents at Half Way House the amenity effect of blasting may increase as people may be aware of an increased number of blasts. This is only applicable to the residential Location 1 identified in Table 14.7 as locations 13 and 14 are an industrial structure and infrastructure respectively. In order to ensure low vibration levels at both sites and therefore to reduce the potential amenity effect on residents at Location 1, continued monitoring of blast results and best practise and the use of best available techniques in blast design and execution would be employed at the Nant Llesg site and should continue to be employed at the FLRS.

14.85 All sensitive receptors relating to Nant Llesg are in excess of 1km from FLRS and the air overpressure is predicted to attenuate below that of human perception i.e. 3.80 Pa (106 dB(lin)).Therefore it is highly unlikely that the effect of air overpressure from blasting at FLRS will be experienced at any of the indentified locations.

14.86 A further potential in-combination and cumulative effect would be if both FLRS and Nant Llesg fired a blast on each site simultaneously. Miller Argent has confirmed that site management would ensure blasts were not fired simultaneously and therefore this effect is not considered further.

Summary and Conclusions

Key Findings

14.87 The main potential impact associated with blasting at the proposed Nant Llesg site is considered to be blast induced vibration and air overpressure at local buildings and is the focus of this assessment. Historic vibration data from the nearby FLRS and test blast data have been used to predict the likely levels that would be received at nearby buildings so that the level of any impact can be determined.

14.88 Vibration predictions for the nearest residential or industrial buildings to the site were very low and with a 50% confidence were near to the human perception threshold of 0.50 mms^{-1} and well below the MTAN2 maximum vibration limit guide of 6 mms^{-1} resultant value in 95% of blasts. The vibration predictions for the gas main were 9.34 mms^{-1} and 34.82 mms^{-1} based on a 50% and 95% confidence respectively which is significantly lower than the maximum limit of 75 $mms^{-1}$for this structure given in Section 8.5 of the Wales and West Utilities document, reference T/SP/SSW/22 and this limit should not be exceeded. FLRS has two vibration limits which are defined in the current planning permission to operate the site. These are 6 mms^{-1} resultant value in 95% of blasts and no blast shall exceed 8 mms^{-1}. To date, by using good blast design and execution, no result has been equal to or exceeded 6 mms^{-1} at the nearest vibration sensitive property, thus demonstrating the site management's ability to control and execute blasting operations. To date, as a result of careful design and execution, the highest

recorded vibration was 2.03 mms^{-1} at the nearest sensitive property. It is concluded that the same limits as apply at FLRS should be applied at Nant Llesg and they are achievable.

14.89 A series of air overpressure predictions were calculated for each of the receptors. Similar to the vibration levels, the level of air overpressure is expected to be very low with the nearest sensitive property, Cwm Nant at a distance of 433m from the closest point of blasting predicted to receive levels of 7.38 Pa (111 dB(lin)) and 11.06 Pa (115 dB(lin)), based on a 50% and 95% weighting respectively. All predicted levels are below the MTAN2 maximum level guidance of 120 dB linear (18.90 Pa), in 95% of blasts. To date, no blast at FLRS has produced greater than 7.50 Pa (112 dB (lin)) at the nearest sensitive property.

14.90 Flyrock is considered to be the only other potential impact associated with blasting activities at the proposed site.

14.91 Noise from Blasting on Nant Llesq is not considered to be a potential impact given the use of modern blast initiation systems. No noise complaints from local residents relating to blasting on FLRS have been received.

Mitigation Measures

14.92 As the potential impact from blast induced vibration and air overpressure on all of the identified potential receptors and buildings and structures beyond those distances is considered to be negligible and no special mitigation measures (over and above good blasting design and practice) are considered necessary. A vibration monitoring scheme should be implemented to ensure adherence to the proposed limits.

14.93 Minimising the risk of flyrock would be achieved by implementing best practise and using best available techniques in blast design and execution as employed at FLRS where no flyrock incidents have been recorded.

Residual Effects

14.94 Blast induced air overpressure effects and ground borne vibrations are true transients of extremely short duration. Although they are expected arise every operational day, at the magnitudes predicted they will not produce any significant impact.

14.95 The duration of the effect blast induced air overpressure effects and ground borne vibrations will be temporary long term as blasting operations will be carried out over many years but each event will be of extremely short duration.

14.96 The significance of the effect is considered to be negligible to no impact for many of the receptors. For Half Way House the impact will be very minor.

Cumulative Effects

14.97 The only cumulative or in combination effects that can be foreseen is that blasting operations on FLRS site will be carried out while blasting operations are carried out at Nant Llesg. Vibration predictions show that vibration from FLRS may be perceptible at three locations only; Half Way House, the gas main and the water pumping station. Such low vibration levels indicate no impact from vibration on those structures. It is considered though, that residents at Half Way House (the only residential structure) may be aware of an increased number of blasts. To minimise any potential effect good blasting design and best practice will be employed. No blasting would take place simultaneously on both sites.

Conclusions

14.98 In summary, it is considered that blasting operations at the proposed Nant Llesg site will be able to meet the vibration and air overpressure limits advised required by MTAN 2 when employing best practice in blast design and execution, in combination with blast monitoring and regression analysis and then using the results of the analysis to plan all future blasts.

Additional Documents

14.99 In fulfilling the requirements of the Nant Llesg scoping opinion and the proposals set out in the scoping opinion, several additional documents are appended to this report.

14.100 Appendix MA/NL/ES/A14/001 provides more information on best practice and as referred to by the Nant Llesg scoping opinion provides a literature review of key research papers in this field and current best practices with respect to reducing the environmental impact of both ground vibration and air overpressure that arises as a result of surface blasting operations.

14.101 Appendix MA/NL/ES/A14/002 provides a scheme of vibration monitoring, as required in Section 18.15 of the scoping report. Section 8.5 of the Wales and West specification for safe working states that 'No blasting should be allowed within 250m of a pipeline without an assessment of vibration levels on the pipeline.' This assessment is provided earlier in this chapter, but provisions for vibration monitoring in relation to the pipeline are also provided in Appendix MA/NL/PA/A14/002.

14.102 Appendix MA/NL/ES/A14/003 provides a scheme of air overpressure management and mitigation.

14.103 Appendix MA/NL/ES/A14/004 provides the most recent vibration analysis and scaled distance regression models for each of the blasted interburden horizons at FLRS, up to and including July 2012, as referred to in Section 18.9 of the scoping report.

Nant Llesg Surface Mine

Incorporating Land Remediation

Chapter 15

Cultural Heritage

Nant Llesg Surface Mine

Incorporating Land Remediation

Environmental Statement

Chapter 15 – Cultural Heritage

miller argent

Table of Contents

Tables

15 Cultural Heritage

Chapter Overview

15.1 The Nant Llesg site, with land to the south included for land remediation and land further to the south included as alternative land for access or access and grazing, generally lies between Rhymney and Merthyr Tydfil. This is a landscape of hills with a distinctive historic character. The area around the site evidences human activities from prehistoric to recent times. Today, the surrounding landscape mostly bears testament to mediaeval and post-mediaeval rural farming, including some farmhouse sites and of associated fields, and of open animal husbandry on Gelli-Gaer and Merthyr Common. Superimposed on this are visible and buried features of 17th to 20th century industry. The substantial numbers of archaeological features (assets) spread throughout the site and setting are remains of the once vast South Wales mining industry, of ironstone then coal.

15.2 Thus throughout the site are remains of coal mines, including locations of pit heads with shafts, adits, arrangements of buildings and complex infrastructure. Associated with these are former quarries, coal spoil tips, rail networks, and surface drains. Notable elements of the landscape today are the leats and ponds of the Dowlais Free Drainage System (DFDS). This was a complex mechanism for collecting together surface rain runoff and underground mine waters, delivering it to the Dowlais Iron Works. Rhaslas Pond is the largest of the reservoirs and one of the oldest elements of the DFDS. Some leats of the DFDS still support drainage of the landscape.

15.3 The scheme will involve making safe a large number of the known and encountered mine shafts and adits, found over a substantial area west of Rhymney. This will be followed by surface mining of coal to a considerable depth in the north part of the site. A peripheral noise and visual bund will be formed to the east and north of the excavation isolating it from urban Rhymney to the east. Generally, to the south of the excavation there would be a large temporary overburden mound, which will be returned to the excavated void once coal extraction is complete. A large area of the site is Common land and, to compensate for this, several landholdings to the south of Nant Llesg are being promoted for either access or access and grazing uses for the duration of the scheme.

15.4 All of the activities within the Nant Llesg main site will firstly involve surface soil removal. The topsoil, some sub-soils and industrial disturbed ground contain the large numbers of archaeological sites, the remains of the former land uses and of habitation. Archaeological remains also are to be found within the old coal workings.

15.5 Given the important prehistoric and historic cultural heritage remains on the site and within the surrounding area, the scheme has addressed cultural heritage concerns within the Environmental Statement, in accordance with the scoping opinion of Caerphilly County Borough Council (CCBC) as to what should be addressed in the Environmental Impact Assessment (EIA). Glamorgan Gwent Archaeological Trust (GGAT) has been appointed the archaeological contractor to the scheme and has undertaken four commissions to establish the archaeological interest that exists on the site today. Their findings are set out in four reports (GGAT 2012a, 2012b, 2012c, 2013).

15.6 The archaeological reports were based on exhaustive desk study research, field walking and some site evaluation, undertaken to the standards of the Institute for Archaeologists.

15.7 The reports show the scheme is indeed rich in archaeological remains, especially from the industrial period, many of which have a surface expression that help to create the distinctive landscape. The archeological remains have been assessed to determine their function, character, age, cultural value and likely condition.

15.8 The EIA has progressively defined and assessed the impacts of the scheme and the effects it will have on the known and on predicted archaeological remains. Where the nature and value of the assets are still uncertain further archaeological evaluation would occur, likely comprising standard archaeological excavation trenching.

15.9 No cumulative effects are identified, those that could occur to cultural heritage remains found on other nearby significant developments.

15.10 From the assessment of effects, an archaeological programme has been defined, which would be suitable to mitigate adverse impacts of the scheme. The scope and contents of the archaeological programme is proposed to be controlled by planning condition(s). GGAT would provide a 'Scheme of Works' to be approved in writing which would address the site-based activities and post-site assessment and analysis. It is anticipated that this would be a requirement of the planning condition(s) which would be discharged upon publication of the findings.

15.11 Where possible, the scheme would support in situ preservation of significant archaeological remains (i.e. preserved where they lie). There would be 'added value' opportunities, principally related to the areas outside topsoil stripping, mostly to the east and west of the central area for mining excavation and spoil mounding.

15.12 Where in situ preservation cannot be achieved then there would be a programme of archaeological field work carried out by GGAT as follows:

1. Excavations and recording at times when mine shafts and adits are being made safe.

2. Major and minor archaeological excavations prior to and integrated with top soil and subsoil stripping.

3. Watching brief during the scheme, carried out to definitions of the Institute for Archaeologists.

15.13 This programme of field archaeology would be highly similar to that which has been undertaken on the Ffos-y-fran Land Reclamation Scheme (FLRS), where many excavations occurred with nationally significant results. The quality of the GGAT undertakings resulted in Miller Argent being the runner-up in the British Archaeological Awards for 2012, for best archaeological project. Similar undertakings and results would be anticipated on the Nant Llesg scheme.

15.14 Given this programme of mitigation there would be no significant residual adverse environmental effects.

15.15 Furthermore, the scheme would support activities that would have beneficial effects to cultural heritage concerns:

1. Use of Miller Argent facilities for school education, continuing the programme operating for FLRS including:

- School classes at the educational centre at Cwmbargoed Disposal Point, generally looking at archaeology and the type of things that would be found on site. This would be linked to museum visits;

- Field excursions; and

- Local history talks and class learning exercises in schools.

2. Undertaking one of more community-based archaeological excavations. At the Nant Llesg main site, before the mining operations commence, and under safe working conditions, there are opportunities for community training on small excavations run by Miller Argent and GGAT where:

- A range of archaeological of sites would be investigated, potentially including those of prehistoric, medieval and industrial ages.

- There are opportunities for Further Education in archaeological methodology and in local history.

3. Running with two or more schools an experimental project addressing preservation of archaeological artefacts – by burying new objects in controlled environments and later carrying out archaeological excavation recovery for scientifically assessing their condition. This assessment would likely involve a local college with laboratory facilities as follows:

- The experiments would be for children of all ages and noting that several years would pass before the artefacts would be recovered.

- The experiments would relate to school education in several science subjects.

- There would be sets of artefacts buried in different locations to test survival in differing ground conditions.

- The artefacts would be 'everyday things' that could be brought in from homes (at no cost or paid for by the scheme). The objects would range from bits of metal to bits of meat!

- The experiment would incorporate time-capsules being prepared by the children and buried along with the artefacts.

4. Incorporating in situ remains and reconstructions within the restored landscape, supporting 'Place Making'. The restoration would support:

- Creating five cultural heritage cluster areas where there are concentrations of archaeological sites. Some of these would be preserved because they would be avoided by the scheme and other locations would have been investigated by the mitigation programme of archaeology.

- Preserving or replicating features of mine shafts and adit entrances, in the areas bordering the site to the east.

- Replicating or showing in the restored landscape the outline of features removed on Rhaslas Pond, specifically the northern embankment. This would support heritage interpretation.

- Illustrating and replicating features of mediaeval house platforms overlooking Rhymney.

- Conserving the south embankment of Rhaslas Pond and using this with DFDS leats found to the east as part of east west cultural heritage trails – traversing over to Sarn Howell Pond and the Ffos-y-fran Mining Village Scheduled Monuments.

- Reconstruction of a section of a DFDS underground water drain (known from documents to have been constructed in dressed masonry and brick) as a feature on the surface within the restored landscape – a functional use is also proposed for this as a bridge and culvert on the Rhymney Valley Ridgeway long distance footpath.

- Creating a set-aside area north of Rhaslas Pond for cultural venues.
- Recreating field wall and hedges in traditional forms and promoting the training of local craft skills.
- Route marking the former alignment of the Great Western Railway's Brecon and Merthyr Railway in the restored landscape.

Introduction

15.16 The Nant Llesg site proposed for surface mining and including remediation (the 'Scheme') is a rich and diverse component of the highly distinctive historic landscape west of Rhymney. The location of the Nant Llesg site is shown in the planning application drawing MA/NL/PA/002. The landscape principally illustrates with clarity the lives, struggles and achievements of the industrial age. At the moment it has a limited social function due to the risks associated with ground instability resulting from old coal mining activities. The scheme aims to use the historic environment in delivering tangible social, economic and environmental benefits to the Welsh community, a driver being promoted by the Minister for Housing, Regeneration and Heritage (Cadw 2012). The Nant Llesg scheme is shown in the 'Proposed Site Layout', planning application drawing MA/NL/PA/003. The scheme is described in Chapter 3 of the Environmental Statement. Details of the scheme's methodology are set out in the planning statement and variously shown in the planning application drawings.

15.17 This chapter follows policy and guidance advice in 'Minerals Technical Advice Note 2: Coal, January 2002' (MTAN2). Paragraphs 90-92 address the 'Historic Environment'. Appendices provide guidance on good practice in undertaking an Environmental Impact Assessment.

15.18 Supporting the design and planning process for the scheme, the Miller Argent team has over the last two years promoted the integration of archaeologists within the design; Richard Hughes being the Archaeological Consultant and Elizabeth Dunning providing full-time in-house archaeological roles. The cultural heritage inputs for the scheme continue from those in the Ffos-y-fran Land Reclamation Scheme (FLRS), a similar undertaking presently being implemented to the west, where archaeology has had a significant and highly successful agenda.

15.19 Glamorgan Gwent Archaeological Trust Ltd (GGAT) has been fully involved in the planning stages of the scheme, carrying on from undertaking extensive and small archaeological excavations on FLRS. Here the GGAT undertakings were outstanding, thus the Trust was runner up in the Best British Archaeological Project award for 2012. Miller Argent is now aiming to provide matching undertakings for the Nant Llesg scheme.

15.20 In summary at FLRS, GGAT conducted 8km of archaeological trenching. Topsoil was stripped over some 300ha, most of this being with a 2m grading bucket. This method was best suited to the finding of artefacts such as the only piece of Bronze Age pottery (food vessel urn) ever found on Merthyr Common and exposing archaeological sites such as an animal kraal (small stakes setting out a huge enclosure), a cairn and a 'cremation'. This latter site in the end turned out to be the remains of a Bronze Age dinner, mostly remains of a crow (which most interestingly is the meaning of Ffos-y-fran – brâin/crow being mutated softly to frân). In total GGAT undertook some 21 archaeological excavations, which under any other circumstance would be considered significant (in size) individually. Countless building surveys were undertaken on upstanding remains (bridges, culverts, air shafts, shafts etc). The Dowlais Free Drainage System (DFDS) was extensively investigated and mapped. The finds are now illuminating historical industrial processes and everyday life on the Common. The results are

soon to be published. Some research objectives for the Nant Llesg scheme have been taken forward from the GGAT findings made at FLRS.

15.21 The results of the more than 5 years of archaeology at FLRS have now been used to support the production of 4 documents that address the archaeological heritage within the main site, the land proposed to be remediated and in the areas proposed as access land or access and grazing land to the south (GGAT 1012a, GGAT 2012b, GGAT2012c, and GGAT2013). These documents are reproduced as ES technical appendices MA/NL/ES/A15/001 to MA/NL/ES/A15/004.

15.22 Together, the 'cultural heritage team' have been able to satisfy practical needs of the scheme, responding to typical planning concerns in identifying, understanding the archaeological tangible and intangible resources and honing the scheme objectives. This takes into account the development impacts and the effects that would be likely caused to known and potential cultural heritage remains (assets). From this work mitigation measures have been derived and assessed. The following heritage objectives illustrate key themes addressed in the design of the Nant Llesg scheme:

- identification of risks and safety problem solving where there would be adverse effects on heritage assets; regarding those assets found below ground and within the historic landscape, those that would be removed and those that will be retained;
- improving the scheme by integration of cultural heritage objectives with those prescribed for other development topics, supporting Welsh Government heritage-informed regeneration objectives and principles (Cadw 2012);
- making use of the opportunity for undertaking archaeological research, related to known and potential assets generally at ground level and found deeply preserved in the old mining levels;
- taking advantage of the scheme to better protect and enhance the heritage resources, as presently know and as further found, in the site and immediately around it; those resources that can be avoided and others which are to be retained and celebrated within the landscape;
- promoting local community interest groups in the study of local history and in undertaking local archaeological mitigation and research investigations. Furthermore, information, in various forms, will be shared for aiding with long-term heritage management and promoting the cultural heritage of Rhymney Valley and Gelli-Gaer and Merthyr Commons;
- developing projects on the history of the Rhymney Valley and the Common lands that would make a significant contribution to local school and other educational curricula; and,
- ensuring that cultural heritage objectives are included in the landscape restoration programme of works, specifically related to 'place-making' and the making a 'cultural heritage destination'.

15.23 Key actions achieved in the scheme design, where there is potential for significant adverse effects, have focused on prescribing a suite of mitigation measures for implementation before and during the scheme. Cultural heritage measures during the scheme include:

- providing protection mechanisms for key 'areas' of cultural heritage assets within and bordering Nant Llesg. The assets variously comprise the nearby designated prehistoric landscapes, areas of medieval and post medieval farming and settlement, areas of 'old men's workings', the vast landscapes of varied activities related to industrial scale mining;

- avoidance, when possible, of specific key features (buried and upstanding), by adopting modified/alternative designs and specifically related to the design for topsoil stripping and new temporary infrastructure. This encompasses: house platforms, leats, property boundary stones, enclosures, cairns and mining pit head structures;

- designing archaeological undertakings to satisfy the likely planning conditions, for mitigation interventions where archaeological remains could not be avoided and would be partially or completely removed by the scheme;

- documenting of old mine workings which are exposed, including for artefact recovery and emergency conservation. The work would be linked to seam mapping prior to extraction of the surviving coal deposits.
- contributing to master planning then the recreation of the landscape utilising cultural heritage assets;
- having a scientific research programme related to the short term behaviour of archaeological structures and artefacts buried below spoil mounds and in deep backfill;
- engaging with the local community and amenity societies, involving them in appreciating and celebrating their heritage;
- conserving and replicating structural remains (including tops of mine shafts, adit entrances, pit head structures, and features of the DFDS) that will positively contribute to the landscape restoration programme; and,
- designing of post-scheme heritage promotion and the use of retained assets, as cultural and educational resources for the community and visitors.

General Description of the Site Including Topography, Geology and Land Use

The Nant Llesg Site

15.24 The Nant Llesg scheme lies within the County Borough of Caerphilly, but with 3 out of 5 areas proposed for Common land exchange for various access and grazing lying within the County Borough of Merthyr Tydfil. Chapter 4 of the Environmental Statement (ES) addresses the site selection and alternatives. The proposed development area is irregular and extends approximately 1.8km east–west, by approximately 3.0km north–south. It lies immediately west of Rhymney, centered on NGR SO 10063 07120. Historically, the site is an area of hillside and flattened sub-summit, with an east-west trending saddle at Cwm Bargoed. It is currently rough, often poorly drained, mountain grazing grassland with extensive areas of semi buried derelict industrial land. Generally to the northwest is a reclaimed landscape resulting from previous surface coal mining and landscape restoration.

15.25 The proposed surface mining and land remediation site is located on the generally east facing slopes of Gelli-Gaer Common and comprises the upper reaches of the Rhymney Valley. The River Rhymney, located to the east, trends north-north-west to south-south-east with small tributaries descending east and southeast across the site and southwards at the site's southwest end. The trend of the topography is a gentle to moderate slope from roughly 420m above Ordnance Datum (AOD) in the north-west to 300m AOD in the east and south-east. Towards the base of the Rhymney Valley, on the edge of the site, are local cliffs resulting from tributary erosion, stone quarrying and mining.

15.26 The geology of the study area comprises deposits of the Upper (Pennant), Lower and Middle Coal Measures, which include shales, sandstones and reserves of coal and ironstone; partially overlain in places by deposits of Boulder Clay. Overlying the solid geology are superficial soils generally poor and shallow, with distinctive areas where disturbed surface soils reflect on 19th and 20th century industrial processes in and around the mines. In the main the more natural soil are acidic "gley soils" and blanket peats, creating poorly drained moorland conditions. Further

details regarding geology are found at Chapter 3 of this Environmental Statement and details regarding ecology, agriculture, soils and hydrology/drainage are found in Chapters, 9 and 11 respectively of this Environmental Statement.

15.27 Within the more natural landscape of Nant Llesg are small areas, with a surface expression remarkably surviving the 19th - 20th century mining activities, illustrating human activities from prehistoric to post-medieval times.

15.28 However, most of the site comprises substantial areas of made-ground comprising shale debris, resulting from the many mining industries that have historically taken place in the area. Mixed in with the shales are surface remains of colliery sites, mine shafts, tips, tramways, railways, and leats. One large reservoir survives, Rhaslas Pond, an important reservoir of the Dowlais Free Drainage System, this still having a function for landscape drainage. Some surface coal mining and surface restoration has occurred in the northern part of the site. The site also contains some modern refuse tipping.

Proposed Parcels of Temporary Grazing and Public Access Lands

15.29 While the Nant Llesg scheme is being implemented Miller Argent propose the adoption of several nearby land holdings for temporary public access or agricultural grazing and public access. The aim would be to mitigate temporary loss of Common land through the implementation period of the scheme. These lands are generally located to the south of Nant Llesg and are shown on the 'Common Land – Land Assessment Areas' Drawing, MA/NL/PA/028. Overall, a large number of areas have been studied in respect of the historic character and cultural heritage assets. Some of those areas studied for Common land mitigation have been identified within the Environmental Statement as suitable for the proposed temporary objectives and are addressed within a separate application for consent to interfere with Common land to be made under section 38 of the Commons Act 2006.

15.30 Areas within the Nant Llesg scheme main site are defined as follow:

- Area 1 Main site for surface mining and land remediation, including areas set aside for temporary spoil mounding and siting temporary facilities.
- Area 2 A trapezoidal area of marshy and rough pasture land crossed with well-defined natural drainage routes and bordering the Great Western and Rhymney, Taff Bargoed Branch, Joint Railway.
- Area 3 A linear zone of rough pasture bordering main north-south road to the west, formed over a highly disturbed industrial landscape with Rhaslas Pond to the east centrally placed.
- Area 4 A roughly triangular piece of grassland on the lower west flank of the Rhymney valley, containing semi natural and improved drainage routes, quarry floors, cliffs and exposed features of industrial heritage.
- Area 5 A sub rectangular area mostly of exposed and reworked colliery spoil north west of Fochriw, with older grass covered tips to the east and with the cutting of the Great Western and Rhymney Joint Railway line at the southern end.
- Area 6 A roughly rectangular piece of Common land with improved grassland on the lower west flank of the valley at Rhymney, containing semi natural and improved drainage routes at the north and south ends, quarry floors, distinctive cliffs and exposed and shallow buried features of industrial age and of older medieval heritage.

- Area 13 A roughly lozenge piece of Common land improved grassland on the west mid flank of the Rhymney valley, containing semi natural and improved drainage routes, floors, quarry cliffs and exposed and shallow buried features of industrial heritage.

- Area 14 The precisely delineated old linear route of the Brecon and Merthyr Railway, variously set on embankment and in shallow cutting. Presently the route is partially in-filled with imported landfill.

15.31 Defined areas beyond the Nant Llesg site, generally to the south and south-west:

- Area 7 A sub rectangular piece of improved grassland on the lower west flank of Rhymney Valley bordering new urban development to the east. With improved drainage and evidencing extensive shallow linear quarrying and pitting at the south end.

- Area 8 Two linked sub rectangular pieces of improved grassland on the lower west flank of Rhymney Valley with semi natural and improved drainage. North bordered to the west with denuded old quarry face and the south bordered to the east with major quarry faces and working floors.

- Area 9 A long thin 'lens' shaped parcel of improved semi-improved neutral and marshy grassland bordering Bargod Taf stream.

- Area 10 (sub divided into 10a, 10b,10c)

10a In the north, a cluster of large fields of improved grassland over a complex landform, reflecting on prehistoric and/or early historic habitation sites and some quarrying.

10b In the west, a series of large fields of improved grassland radiating off Merthyr and Gelli-Gaer Common.

10c Comprising most of the area, a complex medieval and post medieval agricultural landscape astride a substantial length of the slightly meandering Bargod Taf stream with the ridge of Merthyr and Gelli-Gaer Common to the west and the ridge of Gelli-Gaer Common to the east. The area contains farm building complexes in the north (active) and south (ruinous) and complex land types ranging from broad-leaved semi-natural woodland and shrub, tree/hedge/fence and ditched bordered unimproved neutral grassland, and improved grassland.

- Area 11 A series of fields on the west flank Merthyr and Gelli-Gaer Common immediately south of a set of well-preserved coal mine lobe fan spoil tips. The fields, defined by ditch and bank and remnant trees and hedges, are of improved grassland to the east and semi-improved acid grassland to the west.

- Area 12 A set of improved rectangular stone walled and hedge fenced fields supporting improved grassland set on a saddle across Merthyr and Gelli-Gaer Common, with steep scarp slopes to the west and gently descending eastwards to Bargod Taf river. There are only farm buildings in the area, the farm house being ruinous.

Overview of Study Methodology

Introduction to the Methodology

15.32 The characterization of the archaeological resource and historic landscape, and the assessment of the effect of the scheme on them, has involved a series of research

commissions, undertaken during 2010-2013. This has included a desk-based archaeological assessment of the main site and an assessment of the historic landscape. Miller Argent recognised the cultural value of the southern embankment of Rhaslas Pond and thus commissioned more detailed historical research of the whole reservoir. An assessment of the would be temporary grazing and/or public access lands generally located to the south has also been undertaken. The full baseline data derived from these commissions are presented in four key specialist reports prepared by Glamorgan Gwent Archaeological Trust Ltd (GGAT 2012a, GGAT 2012b, GGAT 2012c, GGAT 2013), these are presented in the technical appendices to this chapter (Appendices MA/NL/ES/A15/001 to MA/NL/ES/A15/004.

15.33 For clarity, this chapter has then focused on the significant issues and the assessment of effects. Mitigation objectives are then derived and assessed aiming to ensure adverse residual effects are nominal and acceptable in the planning process. Table 15.1 illustrates the cultural heritage working process adopted in this chapter.

Table 15.1 Environmental Impact Assessment Study Methodology

Desk-based archaeological assessment and consultation, addressing surface and buried cultural heritage resources, of the main Nant Llesg surface mine and land remediation areas. Desk based assessment of parcels of land to the south, to compensate for the temporary occupation of common land within the site (being considered for taking forward into Common Land Application as temporary grazing or public access under the Commons Act 2006). This process takes into account findings from the Ffos-y-fran Land Reclamation Scheme.

↓

Historic Landscape Characterization

↓

Field inspection and, as necessary, first phase site evaluation

↓

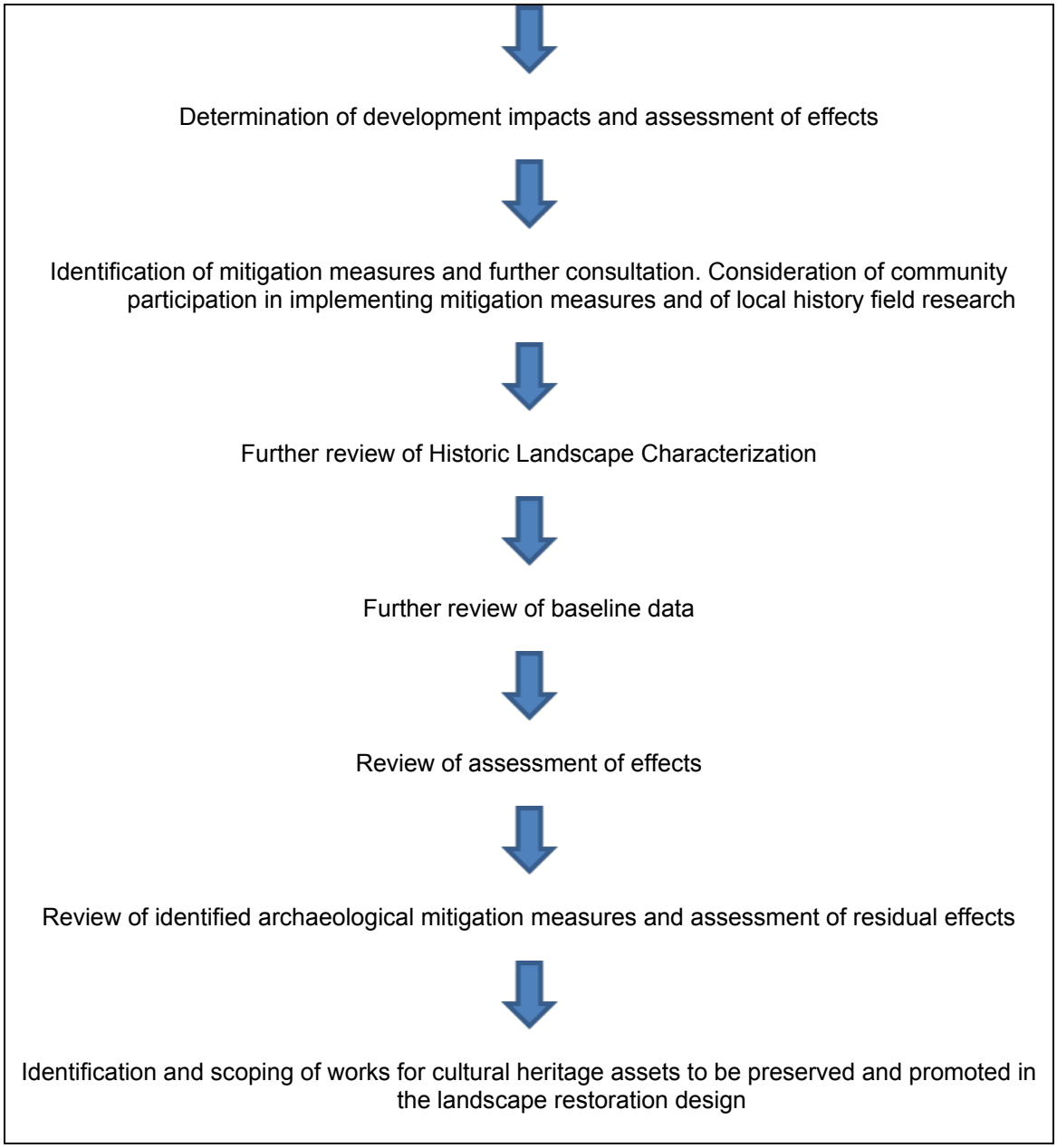
Review of Historic Landscape Characterization

↓

Further research into the history of the Dowlais Free Drainage System and Rhaslas Pond

↓

Review of baseline data and consultation with stakeholders



15.34 Alongside the archaeological work, there have been regular discussions with both the design team and external interested stakeholders. These have resulted in the protection of key cultural heritage assets, through alterations to proposed site layout and of scheme's working methods. Notably, this strategy has been taken forward for the protection of the southern half the culturally important Rhaslas Pond. Here, Miller Argent has effectively supported Cadw in the scheduling assessment process for the southern embankment dam, ensuring its long term future as a national monument. Furthermore, the process has resulted in some changes to topsoil storage and overburden areas, to avoid some other key assets.

Consultation

15.35 To support data collection and interpretation, guiding bespoke mitigation objectives, consultation has been ongoing through the design of the scheme and preparation of the

Environmental Statement. Specifically for cultural heritage concerns, pre-application consultation has been with:

- CCBC – consultation on several occasions: during scoping of the Environmental Impact Assessment; as the scheme has developed and with GGAT (curatorial); and, during the design of the application for consent to interrupt Common land. Related to cultural heritage, the only topic discussed has been regarding Rhaslas Pond;
- Cadw - related to the potential scheduling of Rhaslas Pond and to the temporary land proposed for grazing and access/grazing which are set against Merthyr and Gelli-Gaer Common, within designated historic landscapes and near to Scheduled Monuments;
- NRW (formerly CCW) – generally related to natural heritage but drawing attention to the scheme taking into account the effects on cultural heritage assets. The consultation noted meetings with Cadw, CCBC and MTCBC, where cultural heritage topics have been addressed;
- MTCBC - during the design for the proposed temporary land for access or access and grazing.
- GGAT (Curatorial) – related to: all aspects of assessment methods; the use of areas for access and grazing/access to mitigate impacts on Common land; the assessment results; design of a mitigation agenda; and, the design of landscape restoration. The major topic of consideration related to Rhaslas Pond;
- Commoners – generally noting that the scheme has assessed the effects to cultural heritage assets and should the scheme be consented then a mitigation programme of archaeological works would be implemented;
- Local Communities - generally living to the east and south of Nant Llesg - during the presentation of the scheme to the public and stakeholders – and referencing that cultural heritage topics were being addressed in the design of the scheme; and,
- Caerphilly Local Access Forum – generally referencing what would be an acceptable typology of local access facilities and the need to consider land maintenance, both topics having a cultural heritage interest.

Introduction to the Archaeological Desk-Based Assessment Methodology

15.36 The desk based assessments, forming part of the baseline description, resulted from reviewing existing information about the archaeological assets within the defined study areas, centered on NGR SO 10063 07120. The assessments were undertaken in accordance with specifications drawn up by Miller Argent and clarified in detail in the Written Schemes of Investigation provided by GGAT (Contracts)**.** The methodology of the studies conformed to the Institute for Archaeologists' *Standards & Guidance for Archaeological Desk-based Assessments*. Full details of the methods and findings are presented in Glamorgan Gwent Archaeological Trust's reports (GGAT 2012a, GGAT 2012b, GGAT 2012c for the main site and areas proposed for remediation, and GGAT 2013 for the proposed parcels of land being considered for temporary grazing and grazing and public access during the implementation of the scheme). These can be found at Appendices MA/NL/ES/A15/001 to MA/NL/ES/A15/004 respectively.

15.37 Information recorded on the regional Historic Environmental Record (HER), formerly the Sites and Monuments Record (SMR), and National Monuments Record (NMR) were tabulated and assessed. Cartographic and documentary sources were viewed including relevant published

information: primarily the collections of the National Library, Aberystwyth and the Glamorgan Record Office, Cardiff. Collections of aerial photographs held by the Central Register of Air Photography for Wales, Cardiff, were also examined. Lidar scan images and ground investigation data provided by Miller Argent were also utilized. Old mine plans (working plans and abandonment mine plans) were provided by the Coal Authority via Miller Argent.

15.38 Fieldwork entailed walkover survey of the Nant Llesg site and land proposed for temporary access or grazing and access while the Common land is affected by the scheme. Each known significant site was visited and its extent and condition recorded. During the fieldwork further archaeological sites were discovered and logged.

15.39 The desk-based research and field walking took account of the extensive programme of archaeological research and excavations undertaken for the FLRS located some distance to the west. The results of other field work organized by GGAT on Gelli-Gaer Common were also utilized.

15.40 The desk-based assessment and field walking were supplemented with some first phase site evaluation. This comprised the excavation of a limited number of exploratory trenches, where it was considered important to better know the likely age and character of the assets identified on the ground surface.

15.41 The archaeological assets within the study area are categorized in accordance with the only available criteria that are nationally agreed; these are based on the Department of Transport/Welsh Office /Scottish Office *Design Manual for Roads and Bridges* Vol. 11 Section 3 Part 2, to which an additional category (Unknown) has been added.

15.42 Definitions of cultural heritage values used in the assessment are presented in Table 15.2.

Table 15.2 Asset Value System

Category	Value
A	National importance
B	Regional importance.
C	Local importance
D	Low importance
U	Unknown

15.43 The assessment of the importance of individual sites is essentially a subjective exercise based upon the skills and experience of the project team and consultant. The importance of certain sites will be implied by their status within the statutory framework. Scheduled Monuments will always be of national importance; Listed Buildings will be of at least regional importance. Values assigned to other sites are given both in relation to their individual importance and to their context within the wider landscape.

15.44 The assignment of values to identified interests requires consideration of the reliability and accuracy of the source data, ranging from fully-recorded features seen in open excavation to antiquarian comments on finds of note from a poorly-defined location. Confidence/Reliability estimates are assigned, using the criteria defined in Table 15.3.

Table 15.3 Confidence in Defining Assets

Status	Definition
Very high	Existing information is derived from excavation to modern standards with full supporting detail
High	Existing information is reliable and detailed
Medium	Existing information is apparently reliable but limited in detail
Low	Existing information is too limited to allow its reliability to be assessed

Introduction to the Historic Landscape Characterization Methodology

15.45 The Welsh landscape is steeped in history and displays the influence of man from later prehistoric times through to the industrial era. The man-made features left behind may be slight to highly distinct and damaged, masked or well preserved. Some landscapes are of especial historic significance, and in recent years this fact has been recognised by the identification of 58 areas as being key Historic Landscapes. These are described within the *Register of Landscapes of Outstanding Historic Interest in Wales* (Cadw, CCW & ICOMOS UK 1998) and the *Register of Landscapes of Special Historic Interest in Wales* (Cadw, CCW & ICOMOS UK 2001).

15.46 Relevant to Nant Llesg application site, Gelli-Gaer Common and Merthyr Common are designated landscapes (Historic Landscape Character Areas HLW (MG1)4 and HLW (MG1)2 respectively).

15.47 The southern dam of Rhaslas Pond is regarded within the assessment as if it were a Scheduled Monument, given that Cadw have indicated that they will consider it for designation during the determination period of the planning application.

15.48 Other landscapes often have a ‘distinctiveness’, giving a strong local ‘sense of place’, with an important recreational use. Relevant to Nant Llesg, CCBC has within its Local Development Plan (LDP) Strategic Policy SP10 and Countywide Policy CW4 (though principally relating to the natural environment) (CCBC 2010).

15.49 CCBC also has within its LDP non statutory policies regarding landscapes, but drawing attention to their value, protection and celebration, related to development objectives (CCBC 2010) (see Paragraph 0.94 - points 3, 7, 11, 12, and 13). Thus ‘Gelli-Gaer Common’ is identified as a Special Landscape Area (SLA) (see NH1. 2, Paragraphs 3.19, 3.20 and 3.2).

15.50 CCBC has also identified Visually Important Local Landscapes (VILLS), though these are also non-statutory. One VILL is identified as relevant to Nant Llesg is NH2.1 – Northern Rhymney Valley (see paragraphs 3.22 and 3.23 of the Caerphilly LDP Written Statement).

15.51 An assessment of the cultural heritage historic landscapes has been undertaken as a specialist study by GGAT(Contracts) (GGAT2012c). This has used a method referred to as ASIDOHL –

'Assessing the Significance of the Impact of Development On Historic Landscape areas'. The assessment covered for designated Historic Landscape Character Areas (HLCA) which are generally found to the west and south of the scheme. The landscape and a visual appreciation of the site and setting are also addressed in Chapter 16 of the Environmental Statement.

15.52 The ASIDOHL2 methodology has also be used to evaluate the landscape within Nant Llesg site via an agreed division of the landscape into a set of assessment zones called Nant Llesg Local Historic Landscape Character Areas (NLLHCA) (GGAT 2012c – Appendix MA/NL/ES/A15/003).

15.53 The ASIDOHL methodology has not been used within the Common land being considered for temporary access and grazing and access exchange areas, as the proposed uses are considered to have no significant visual temporary or permanent effects on the landscapes, in a short- or long-term scenario.

15.54 The objectives of the undertaken ASIDOHL assessments relate to:

- Consistency with the EIA approach, and applying the same good practice (ASIDOLH2 methodology), undertaken for the FLRS. The aim has also been to satisfy the cultural heritage objectives of Cadw, Welsh Historic Monuments, Natural Resources Wales (formerly CCW), and ICOMOS (UK). These organizations all take a special interest in protection, improving and promoting of the Welsh landscape and where the landscape can be a key topic of concern in the planning process. Cadw for the Welsh National Government has established principle for the good governance of the historic environment (Cadw 2011)

- The Nant Llesg application site nearly bordering important elements of the registered Gelli-Gaer Landscape of Outstanding Historic Interest [HLW (MGL) 4].While it is apparent that the CCBC LDP ascribes no protection to the Nant Llesg application site landscape, as it is not on the register of identified landscapes of national importance, it is somewhat indirectly addressed in the inspectors report on the CCBC LDP (Nixon 2010 NH1.1 Upper Rhymney Valley SLA and NH2.1 Northern Rhymney Valley VILL).

- Nant Llesg application site nearly bordering important element of the registered Merthyr Tydfil Landscape of Outstanding Historic Interest [HLW (MGL) 2]. A detailed characterisation report on the Merthyr Tydfil Historic Landscape has been completed for Cadw: Welsh Historic Monuments, *Historic landscape characterisation: Merthyr Tydfil/Merthyr Tudful Part 1 and 2: landscape characterisation and management, January 2003*.

15.55 Development effects to the landscape are of two potential types:

1. those resulting from the physical impacts to the ground surface over large areas; and,

2. those resulting from changes to general and specific views, to and from the area.

15.56 The landscape characterization study has taken note of Merthyr Tydfil having been designated as a landscape of 'Outstanding Historical Interest' for (principally) three out of five potential criteria that are defined (Cadw/ICOMOS-UK/CCW 1998):

1. Intensively developed or extensively remodeled Surface: A landscape in which development or change as a result of human activity (land use) has been so intense, resulting in substantial alterations to the natural (landform) and semi-natural (land cover) elements; large towns, cities, conurbations, industrial areas, large-scale civil engineering projects, landscapes showing endeavour on a grand scale.

2. Period: Landscapes in which development or change as a result of human activity has been arrested at one or more stages and subsequent material alteration restricted: relict (or fossil) landscapes showing human activity within one or more periods, perhaps abandoned or essentially unchanged after the principal activity ceased.

3. Cultural merit: Landscapes with historic (events, traditions, legends, folklore), artistic, literary, architectural, technological, religious or other important cultural association, either singly or in combination.

15.57 Furthermore, the *Merthyr Tydfil Borough Local Plan* (deposited 1996; adopted for planning purposes 25th May 2011) notes the inclusion of Merthyr Tydfil as a Grade 1 landscape in the then-draft *Register of Landscapes Parks and Gardens of Special Historic Interest in Wales* vol. 2 i (para 5.4), but no specific policy relates to the historic landscape.

15.58 In respect of the Miller Argent application site:

1. Nant Llesg site is close by the registered Historic Landscapes of Gelli-Gaer [HLW (MG1) 4] and Merthyr Tydfil [HLW (MG1) 2]. Both are Landscapes of Outstanding Historic Interest and contain a wealth surface and buried archaeological remains, of all ages, including Scheduled Monuments and Listed Buildings.

2. In its overall nature, the present landscape of the west flank of Rhymney Valley has a recognised distinctiveness. This recognition is not that the landscape is especially ancient or has evolved over a long period, but that which survives here is a compelling and very clearly seen physical expression of important historical processes, contained within the present-day landscape. The cultural value of this landscape is increasing due to the southern dam of Rhaslas Pond being identified as being of possible national value.

3. Guidelines setting out a suggested methodology for historic landscape assessment have been produced by Cadw and the former CCW in conjunction with the Welsh Archaeological Trusts (Cadw, CCW & The Welsh Archaeological Trusts 2003).

15.59 The published guidance outlines a methodology for assessing the indirect and visual effects of proposals on the historic landscape (ASIDOHL). The present study of the effects of the Nant Llesg development was undertaken according to this methodology. A summary of the ASIDOHL process guidance is provided later on in this chapter; the full details appear as a Technical Annex within the *Guide to good practice on using the Register of Landscapes of Historic Interest in Wales in the planning and development processes* (Cadw, CCW & The Welsh Archaeological Trusts 2003).

15.60 Each project involves detailed examination of the landscape, on the basis of which analysis the Historic Landscape is divided into a number of Historic Landscape Character Areas (HLCAs). Each HLCA is a discrete entity, defined according to historic attributes or cultural associations that distinguish it from adjacent areas.

15.61 The character areas within the Nant Llesg site (NLLHLCA) were established by expert judgment, taking into account location aspect, topography, geomorphology/geology, past and present land uses, and the location/type/age of cultural heritage resources documented in the archaeological desk based assessment.

ASIDOHL Stage 4 Value Parameters

15.62 A score system has been used; see Tables 15.4 and 15.5, to assess the components of the HLCAs.

Table 15.4 ASIDOHL Stage4: Cultural Heritage Evaluation Scores

Criterion	Score
Very High	4
High	3
Moderate	2
Low	1
None	0

Table 15.5 ASIDOHL Stage 4 Grades of Overall Value of a Character Area

Score (%)	Value
80-100	Very High
60-79	High
40-59	Considerable
20-39	Moderate
5-19	Low
0-4	None-Very Low

15.63 The HLCAs form the basic unit assessed within ASIDOHL. As outlined below in the methodology, each HLCA directly or indirectly affected by the proposed development is assessed individually within Stages 2-4 of ASIDOHL. In Stage 5 the results of Stages 2-4 are combined to produce an assessment of the overall effect on the Historic Landscape described by the *Register*.

15.64 For the purpose of the Nant Llesg site, the GGAT ASIDOHL study identifies 8 distinctive character areas, these wholly or partially within the site (called Nant Llesg Historic Landscape Character Areas [NLLHLCA - 001 to 008]). The ASIDOHL assessment methodology has then assessed impacts and effects within them, but without utilizing the complex scoring system given they are not designated.

Field Evaluation Methodology for the Nant Llesg Site

15.65 As previously described, supporting the desk-based assessments, a programme of field walking has been undertaken over the Nant Llesg site and the parcels of land proposed for mitigation of impacts on Common land. For Nant Llesg the programme also supported the intrusive field evaluation objectives.

15.66 The field evaluation was achieved through a test pit survey, conducted by GGAT (Contracts) as additional works to the desk-based archaeological assessment and initial historic landscape character study (GGAT 2012b - Appendix MA/NL/ES/A15/002). The work was undertaken in

accordance with guidance in the Institute of Field Archaeologist's *Standard and Guidance for Archaeological Field Evaluations.*

15.67 The evaluation aimed to clarify the nature of earthworks, so far interpreted as man-made features but of unknown function, age and value, with intrusive investigation and recording. The undertaking aimed to not disturb significant remains and to fully restore *in situ* preservation conditions.

15.68 The evaluation comprised test pits, of varying sizes, excavated to a c.1m depth, sufficient for exploration purposes. The findings are reported in the desk based assessment (GGAT2012b - Appendix MA/NL/ES/A15/002).

15.69 The results of the evaluation were fed into the micro-zonation of the historic landscape and assessment of the NLLHLCAs (GGAT2012c - Appendix MA/NL/ES/A15/003).

Additional Research Methodology Used for the Rhaslas Pond Study

15.70 Throughout the archaeological agenda for the FLRS the documentation and understanding of the Dowlais Free Drainage System (DFDS) has been of importance. The site abutted a Scheduled Ancient Monument, a semi-functioning small reservoir of the DFDS (Sarn Howell Pond) and contained a listed aqueduct, once delivering water to the reservoir. Elsewhere, were other reservoirs and a complex network of water leats (at ground level and within several of the worked coal seams).

15.71 The FLRS mitigation programme of works undertook several phases of research and archaeological excavations. Prior to these excavations, twenty-two leats, five ponds, and three pit sites, with water management features, were recorded during field survey. Mitigation works were then integrated with the early stages of FLRS engineering ground works which enabled the structure of the leats and ponds to be further investigated.

15.72 As a result of the programme, an excellent understanding of the DFDS has been gained and this has been used to inform the desk based assessment of the Nant Llesg scheme (GGAT2012a, GGAT2012b, and GGAT2012c - Appendix MA/NL/ES/A15/001 to Appendix MA/NL/ES/A15/003).

15.73 Following the recognition that Rhaslas Pond was a reservoir of the DFDS additional documentary research was undertaken, in order to establish as far as possible its history and significance. Information was sought in the Dowlais Iron Company records held by the Glamorgan Record Office, Cardiff, and were searched for specific material relating age, construction and function (GGAT2012a - Appendix MA/NL/ES/A15/001). The private historic archive of Hugh Crawshay has as yet not been inspected but would be as part of detailed mitigation design and later to support the interpretation of mitigation findings. Field walking has aimed to identify and assess leats into and out of Rhaslas Pond.

15.74 Independent of the Miller Argent commission to GGAT, Cadw has also undertaken some recent historical research on Rhaslas Pond, this also involved two inspections of the site. The research, with the support of Miller Argent, related to assessing it, or part of it, for potential scheduling as a monument of national importance.

Study methodology for the Proposed Areas of Temporary Access or Grazing and/or Access

15.75 As a separate study, GGAT (Contracts) have assessed additional parcels of lands being considered for supporting grazing and access and access only, while the scheme is undertaken. These parcels of land are shown on planning application drawing MA/NL/PA/030. GGAT has adopted a consistent methodology to that used for the main Nant Llesg site. This has comprised the undertaking of an archaeological desk-based assessment and field inspection. The former has researched the known cultural heritage assets from archaeological databases and other documentary sources of information, these sources being those used to study the main Nant Llesg site. The fieldwork has aimed to confirm the finding of the desk-based assessment and to discover new assets, those with a surface expression. This research has provided the information needed in the EIA for understanding and evaluating the historic landscape and prescribing mitigation measure would the scheme proposals be implemented.

Methods Used to Define the Nant Llesg Scheme Impacts and Effects

15.76 The implementation of the Nant Llesg surface mining and land reclamation scheme would involve a large number of 'site-engineering' processes, for archaeology and the historic landscape called here development 'impacts'. These would affect the ground surface and landscape appearance where there are known and predictable cultural heritage assets and others that could be discovered by chance. For Nant Llesg, the 'impacts' are those that are typically occurred on the FLRS site, thus are well understood and which would be efficiently managed in relationship to cultural heritage concerns. From the assessment of the impact characteristics the 'effects' on archaeological assets can then be determined. In the following account of the many impact processes Table 15.6 prescribes the scale of impact severity. The same approach has been adopted for defining and assessing impacts of the parcels of Common land variously studied in context of temporary and permanent grazing and access uses.

Table 15.6 Scale and definition of Adverse Impacts

Criteria	Grazing and Access Impacts
Total and Very Severe	Complete (75-100%) destruction or disturbance of the area from ground level down into natural soil formations from intensive uses. It can include removal of surface and deeper soil formations within the immediate context.
Considerable and Major	Very extensive (30-74%) surface soil destruction and disturbance, at ground level and into natural formations. With some very localized/limited ground surface survival where the scheme works will not occur.
Moderate	Partial destruction and damage (15-29%) of surface and shallow soil formations within the site, with a significant amount of the landscape not being affected by the scheme

Criteria	Grazing and Access Impacts
Minor-Slight	Localised removal (5-14%) of shallow soil formations, retaining most of the as-found landscape.
Very Slight-None	No destruction and disturbance (0-4%) of the ground surface

15.77 This chapter also examines alternative scheme impacts, both constructional and operational, assessing the potential to beneficially modify scheme adverse effects. The reduction on the effects the scheme would have would reduce the need for mitigation undertakings.

Effects within Nant Llesg site and the Common lands

15.78 The assessment of effects takes into account the likely set of impacts the development would have, as defined above, and others that could occur from time to time. The assessment takes into consideration alternative development proposals that may be derived during the planning processes.

15.79 In addition to any direct effects of the proposal on specific known archaeological sites and those still to be found, the development would affect the overall historic landscape west of Rhymney, including the settings of the registered historic landscapes of Merthyr and Gelli-Gaer Commons.

15.80 Three environmental archaeological domains are recognized where there would be effects from implementing the scheme:

- Surface and near surface archaeological features (in and just below top soils) – of all ages and commonly related to modifying the surface for habitation, agricultural activities, siting of industrial buildings and processes, burials and ritual activities and routing of water and vehicles. These normally have slight to distinct surface expressions and thus are also elements of the historic landscape.

- Deep surface excavation normally related to quarrying, shallow early mining, forming major reservoirs. These normally have a very marked surface expression and thus are also elements of the historic landscape.

- Deep mining in coal seams accessed via shafts and adits. These may or may no longer have obvious surface expressions.

Method Used to Assess Construction Effects on Archaeology

15.81 Within the chapter direct effects on cultural heritage assets are defined in Table 15.7. These effects may relate to one of more phases of implementing the scheme.

Table 15.7 Definition of Beneficial and Adverse Effects on Archaeological Assets

Criteria	Definition
Moderate Beneficial	Moderate changes of land use or management to enhance, by a sliding scale, the preservation of identified archaeological deposits and historic buildings. Foundation deigns for reuse so no impacts and effects of preserved resources when the site is redeveloped in future. Important for understanding and appreciating the resources and promoting the scheme within the context of local heritage objectives.
Minor Beneficial	Small changes of land use or management to enhance the preservation of identified archaeological deposits and historic buildings. Significant gain of knowledge for minor losses of resource. Helpful for the appreciating resources and promoting the scheme within the context of local heritage objectives.
Negligible	No perceivable effects on known or predicted archaeological resource historic buildings and their settings. Mitigation protects the resources from accidental adverse effects. Of such low importance that they are considered not to be material to the decision making process.
Minor Adverse	Minor adverse effects are to small areas of known or potential resources and features of historic buildings at a local level or where the archaeological resource is very truncated or fragmented and the building elements have been significantly altered. The removal of the archaeological resource or a building feature would not affect future investigations. Effects that may be raised as local issues but are of low importance in the decision making process.
Moderate Adverse	The adverse effects would be to archaeological resources at a local and regional level by engineering impacts that would remove large areas of the resource or significantly change the character and appearance of a building. Effects of the development that may be judged to be important at a local scale (i.e. in the local planning context) are not likely to be key decision making issues.
Major Adverse	Adverse effects caused to sites of high archaeological potential or to Archaeological Priority Areas, Scheduled Ancient Monuments including their settings and to other archaeological sites of regional/national value. Loss of most or all of the historic fabric of listed Buildings. The severity of the effects would require the impacts to be redesigned, to allow for in-situ preservation and retention of historic buildings. Effects of the development of greater than local scale and if adverse are potential concerns to the project depending upon the relative importance attached to the issue during decision making.

Criteria	Definition
Extreme	Effects representing key factors in the decision making process. They are generally, but not exclusively, associated with sites and features of national importance and resources/features which are unique and which if lost cannot be replaced or relocated.

15.82 Furthermore, effects to the general surrounding soil burial environment can have short, moderate or long term effects, generally these being detrimental.

15.83 Effects on archaeological remains can be significantly affected by their composition, resilience to degradation and as-found state of preservation (the degree of 'robustness').

15.84 Effects to archaeological assets normally occur immediately, usually related to loss of burial/protection and to removal and accidental damage of artefacts. However, effects can also take a long time to occur, this relates to changes in burial preservation conditions and to induced asset degradation. Table 15.8 defines sensitivity of typical archaeological resources to be expected with Nant Llesg and the Common lands to the south.

Table 15.8 Damage and Decay Potential

Resource Condition	Definition
Highly Sensitive.	Resource effectively that would be destroyed by contractor's plant including by vibrations and removal and also destroying the context that would be essential for understanding the resource. Would principally relate to soft and decayed organic and corroded metal artefacts and weak normally consolidated alluvial soils. Highly decayed buildings, buildings classed as in a dangerous condition, where there are complex, where there lightly attached finishes.
Sensitive	Resources that would be significantly damaged by the extraction process and where resource loss would be detrimental to an understanding and off site preservation of the resource. Organic artefacts and structures usually have damageable surfaces if not removed in a protective soil mantle. Decayed buildings with visible evidence of structural deformation that would require wide scale stabilisation and remediation.
Moderately sensitive	Where some decay and damage is caused to the resource but allowing for a certainty of interpretation and still permitting preservation, conservation and display. Buildings requiring local repair of structural distress and treatment of some fabric decay affecting weather tightness.
Moderately Robust	Some physical minor damage would be caused generally to large strong artefacts and structural features but acceptable as still allowing for complete study and

Resource Condition	Definition
	archiving. Buildings requiring a general programme of maintenance. Slight damage may result from the development works.
Robust	Generally strong and durable resources - enough to withstand most extraction methods and usually related to metal, pottery and other inorganic materials and building structural elements including foundations and buried infrastructure. Buildings in a sound condition but needing a little maintenance for weather tightness and with some engineering performance reserve capacity.
Highly Robust	Strong and durable artefacts, typically pottery sherds and stone materials, those that generally survive rough extraction and engineering contractor site works processes. Buildings requiring no maintenance and repair and with a considerable engineering performance reserve capacity. Would not be adversely affected by the proposed development scheme

Methods Used to Assess the Resulting Long Term Effects on Archaeology

15.85 The same sliding scale of definitions used in Table 15.8 for assessing construction effects are applied when considering potential effects when the land is restored to its original or modified-foreseeable uses. The effects relate to retained (*in situ*) archaeological assets within the site, and bordering it, which would have been avoided or protected during the construction and landscape restoration phases.

Assessment Methodology of Effects the Impacts will Have on the Historic Landscape

15.86 Recent guidance (Cadw/CCW/WATs 2003) has emphasized the interaction between different aspects of impact, including landscape and the archaeological heritage, requiring an Environmental Statement to include a description of *"the likely significant effects of the development on the environment, which should cover the direct effects and any indirect, secondary, cumulative, short medium and long-term, permanent and temporary effects … and the description by the applicant of the forecasting methods used to assess the effects on the environment"*.

15.87 Guidance is also given on the approach to fulfilling this requirement in relation to historic landscapes where effects to be assessed include *'the effect of the development on the overall historic integrity and coherence of the area on the Register"* (Cadw/ICOMOS-UK/CCW 1998).

15.88 Furthermore, Planning Policy Wales (Issue 5, Nov. 2012) states that "Information on the landscapes on the second part of the Register should be taken into account in considering the implications of developments which are of such a scale that they would have a more than local impact on an area on the Register". (Chapter 6, para 6.5.25).

15.89 While the application site and exchanges lands are not designated on the register, only nearly bordered by the Gelli-Gaer and Merthyr Common, the good practice promoted by the above documents has been followed for the scheme's own landscape.

15.90 Within the GGAT ASIDOHL Stage 2 process assessment 'direct' impacts to the landscape have been defined. This takes account of quantification based on considering 'absolute' impact on a resource type, 'relative' impact on a resource type and impact holistically on the landscape. It applies to physical and visual concerns.

15.91 The impacts are defined in Table 15.9 according to a scale of severity.

Table 15.9 Scale of Impact Severity on the Historic Landscape

Term	Permanent Loss/Removed (%)
Very Severe	75-100
Severe	50-74
Considerable	30-49
Moderate	15-29
Slight	5-14
Very Slight	1-4

15.92 The effects are also defined in Table 15.10 according to a scale of magnitude, applied to the importance of the resource.

Table 15.10 Magnitude of Effects to Historic Landscape

Value to the Character Area	Effect to the landscape
Very High	Lost
High	Substantially reduced
Considerable	Reduced
Moderate	Moderately reduced
Low	Slightly reduced
Very Low	Very slightly reduced

15.93 For the purpose of the GGAT study, in conformity to the ASIDOHL2 process, the magnitude of the impacts and effects use scoring systems, as defined in Table 15.11.

Table 15.11 ASIDOHL2 Effects Scoring System

Impact and element sensitivity	Scores
Direct physical impact – absolute:	
Very severe	6
Severe	5
Considerable	4
Moderate	3
Slight	2
Very Slight	1
Direct physical impact – relative:	
Very severe	6
Severe	5
Considerable	4
Moderate	3
Slight	2
Very Slight	1
Site Category	
A National Importance	4
B regional importance	3
C Local importance	2
D low importance	1
U unknown	1
Direct physical impact – landscape value	
Very High	6
High	5
Considerable	4
Medium	3
Low	2
Very Low	1
Landscape value Effect	
Lost	6
Substantially reduced	5
Considerably reduced	4
Moderately reduced	3
Slightly reduced	2
Very slightly reduced	1

Methodology Used to Assess the Effects on the Landscape Following the Completion of the Surface Mining and Land Remediation Works

15.94 Cultural heritage works would be phased to occur before and during the implementation of the scheme; mitigation generally coming 'early' within the scheme, given that archaeological assets are generally found in or just below the ground surface that would be affected first. Potential impacts and effects are assessed by methods previously defined. . Where assets are retained the cultural heritage programme provides supportive methods for retaining them in the medium and long-term, by physical protection and management. In areas where mines shafts and adits are made safe and are handed back for public use in the restoration scheme this would support there being positive effects.

Assumptions

15.95 The following assumptions are made within this chapter:

- Archaeological sites would be discovered during the implementation of the Nant Llesg scheme. Their character and importance would be similar to those known and thus the archeological principles, objectives and mitigation methods, based on excavation and documentation, would not change;
- landscape values would not significantly change, related to seasonal visual effects, new archaeological discoveries and restoration/aftercare works;
- Miller Argent would continue to employ a fulltime archaeologist, to manage the programme of archaeological works;
- GGAT Contracts would provide archaeological contracting roles, providing continuity for undertaking expert mitigation works, following on from the achievements on the FLRS;
- the character of the landscape restoration would further develop as more discoveries are made and can be taken into account in design and implementation; and,
- the scheme will offer opportunities for community and school participation in archaeological research and monitoring.

The 'Baseline' Condition

Introduction: Baseline for Archaeological Sites

15.96 The known archaeology of the Nant Llesg site is based on the GGAT desk-based assessment, a programme of fieldwork (generally field-walking), intrusive investigation of some asset locations and a special additional study of Rhaslas Pond. These are fully reported in the appendices (GGAT 2012b and GGAT 2012a respectively – Appendices MA/NL/ES/A15/002 and MA/NL/ES/A15/001).

15.97 The known archaeology of the Common land exchange is based on a GGAT desk-based assessment and accompanied fieldwork. This study is fully reported on in the technical appendices (GGAT 2013 – Appendix MA/NL/ES/A15/004).

15.98 Large study areas have been used, to support the 'inward' extrapolation of site resources, giving an increased confidence of capturing the true character of archaeological conditions.

15.99 The GGAT studies fully catalogues the data, giving locations to each known and predicted asset, prescribing values to each, of assets found in clusters, also defined by type and period.

Introduction: Baseline of the Nant Llesg Historic Landscape

15.100 The evaluation of the Nant Llesg historic landscape is based on the GGAT desk based assessment derived from the following undertakings supplemented by field work and some evaluation. The landscape assessment is reported in the technical appendices (GGAT 2012c - Appendix MA/NL/ES/A15/003):

Identified Archaeological Interests related to the Nant Llesg site

15.101 The Environmental Statement provides a summary of the GGAT findings.

15.102 One feature is present within the survey area of the main Nant Llesg site that is regarded of possible national importance. This is the south embankment of Rhaslas Pond. Cadw is in the process of assessing Rhaslas Pond.

15.103 Beyond the Nant Llesg site to the west, the Sarn Howell Pond and Watercourses (SAM Gm494(MER)) and two further Scheduled Ancient Monuments - Deserted Iron Mining Village, Ffos-y-fran (SAM Gm496(MER) and Merthyr Common Round Cairns (SAM Gm222(MER).

15.104 The site contains no listed buildings. A timber aqueduct over the former Taff-Bargoed Railway, Cwmbargoed (PRN 02471m; NPRN85995) is a listed building (Grade II) now fully conserved but repositioned west to be part of the redefined Sarn Howell Scheduled Monument and cultural heritage area.

15.105 Prior to the current assessment works, 142 sites were recorded on the regional HER within the proposed development area; an additional 156 sites were identified as a result of the current desk-top study, including 56 sites identified from the field visits and additional aerial photographic work. These sites all form a material interest in the planning and mitigation processes. The identification of the category of the sites set out below is adopted from table 15.2 of the methodology section. Further details of value coding and of the individual sites are given in the gazetteer presented in the GGAT desk based assessment (GGAT2012b – Appendix MA/NL/ES/A15/002).

Category A, A/B and A/D sites

15.106 There is 1 category A site (i.e. of National importance) and 5 category A/B sites (of high regional value, including the general PRN for the Dowlais Free Drainage System) within the area of interest. These sites are listed in the Table 15.12.

Table 15.12 Category A, A/B and A/D Archaeological.

ID	NGR	Type	Condition	Status	Confidence
02987m/ 85521	SO09500718	Reservoir (Rhaslas Pond)	Near Intact	None	High
02287.0m	SO0978008023	Leat	Near Intact	None	High
02424m	SO09700798	Round Barrow	Damaged	None	High
02910m	SO09970800	Linear feature	Near Intact	None	High
03013.0m/ 85591	SO09090745	Leat	Near Intact	None	High
03014m/ 85581	SO09050748	Reservoir	Near Intact	None	High
02942	SO10000790	Extractive Area	Damaged	None	High
80455	SO104078	Mining Feature	Damaged	None	High

Category B and B/C sites

15.107 There are 17 category B sites (i.e. sites of Regional importance), 8 B/C sites within the area of interest and 1 B/D site. These are listed in Table 15.13.

Table 15.13 Category B and B/C Archaeological

ID	NGR	Type	Condition	Status	Confidence
02947m/ 85603	SO09520751	Drainage Ditch	Near Intact	None	High
03017m/ 85594	SO09380736	Reservoir Inspection Chamber	Restored	None	High
03018m/ 85593	SO09370739	Filter House	Near Intact	None	High
03019m/ 85592	SO09380742	Valve Tower	Restored	None	High
03020m/ 85595	SO09370739	Leat	Near Intact	None	High
03022m/ 85596	SO09250736	Dam	Near Intact	None	High

ID	NGR	Type	Condition	Status	Confidence
03023m/ 85605	SO09610734	Leat	Restored	None	High
NLL028	SO0937607381	Sluice	Near Intact	None	High
NLL071	SO0961807341	Leat	Near Intact	None	High
NLL080	SO0997107962	Area of Pits	Damaged	None	High
NLL138	SO10270730	Hut Platform	Damaged	None	High
NLL142	SO1028207906	Trackway	Near Intact	None	High
02990m/ 85576	SO09410694	Leat	Near Intact	None	High
02993m/ 88017	SO09310681	Leat	Near Intact	None	High
02997m/ 85575	SO09310682	Leat	Near Intact	None	High
03008.0m /85588	SO08920737	Leat	Near Intact	None	High
04209m/ 85572	SO09270687	Leat	Near Intact	None	High
02918.0m	SO10040791	Leat	Near Intact	None	High
NLL144	SO1001208008	Ridge and Furrow	Damaged	None	High
NLL172	SO1023908013	Mineral Extraction Site	Damaged	None	High
NLL120	SO0992306443	Leat	Intact	None	High
80456	SO098063	Mining Feature	Damaged	None	High

Category C and C/D sites

15.108 There are 88 category C sites (i.e. sites of Local importance) and 24 category C/D sites within the area of interest.

Category D sites.

15.109 There are 151 category D sites (i.e. sites of Low importance) within the area of interest.

Category U sites

15.110 There are no category U sites (i.e. sites of unknown importance) within the area of interest. Subsequent field evaluation demonstrated that four possible features were natural features of no archaeological interest.

Discussion

15.111 The only category A site within the Nant Llesg site is Rhaslas Pond (02987m/85521), located on the west side of the proposed scheme. The southern bank of Rhaslas Pond is in the process of being assessed for scheduling by Cadw. Cadw regards the northern embankment as of lesser value given its degraded condition. There are 2 category A/B sites, 13 category B sites and 2 category B/C sites surrounding Rhaslas Pond. These sites are all associated with the Dowlais Free Drainage System and Rhaslas Pond, either as leats and smaller ponds or parts of Rhaslas Pond itself such as the valve house (03019m/85592) or the northern bank (03022m/85596). North-east of the development area is a cluster of 3 category A/B sites, 1 category A/D site, 2 category B sites and 3 category B/C sites. One of these sites is a damaged prehistoric burial cairn, the only prehistoric feature within the Nant Llesg site; the others are post-medieval features to do with mineral extraction and farming in the form of ridge and furrow. To the south east of the development area are 1 category B site and 4 category B/C sites. The category B site is a possible cluster of medieval hut platforms, their exact date currently unknown. The other features in this area range from post-medieval field systems and building platforms to leats used for water drainage. Together the archaeological assets are typical of a well-used very old historic landscape and this has been significantly changed as a result of industrial exploitation, mostly during the 19th and first half of the 20th centuries for obtaining stone, ironstone and coal.

Identified Archaeological Interests Related to the Parcels of Land for Temporary Access and Grazing and Access

15.112 The same identification and assessment methods have been used to identify and evaluate cultural heritage assets in parcels of land considered for Common land exchange, see Drawing MA/NL/PA/030. Cadw has been consulted as to their own evaluation of assets values. Further details of individual sites are given in the gazetteer presented in the GGAT desk based assessment (GGAT2013).

Category A and A/B sites

15.113 There is 1 category A site (i.e. of National importance) and no category A/B sites (including the general PRN for the Dowlais Free Drainage System) within the defined areas. The A site is listed in Table 15.14.

Table 15.14 Category A and A/B site in the Common land areas

Area	ID	NGR	Type	Condition	Status	Confidence
Area 8	NLCL156	SO1270603903	Cairn	Damaged	None	Medium

Category B and B/C sites

15.114 There are 7 category B sites (i.e. sites of Regional importance) and no B/C sites within the defined Areas. These category sites are listed in Table 15.15.

Table 15.15 B and B/C Archaeological Sites in the Common land Areas

Area	ID	NGR	Type	Condition	Status	Confidence
Area 10	01493m/ 18007	SO08200335	House	Near Destroyed	None	High
Area 9	04315m	SO08800501	Enclosure	Damaged	None	High
Area 9	04347m	SO08890501	Crop mark	Not Known	None	High
Area 10	37465	SO08200335	Pigsty	Near Destroyed	None	High
Area 11	NLCL090	SO0731503453	Dwelling	Damaged	None	Medium
Area 10	NLCL165	SO0950904194	Boundary	Damaged	None	Medium
Area 10	NLCL176	SO091290 4089	Leat	Not Known	None	Medium

Category C and C/D sites

15.115 There are 19 category C sites (i.e. sites of Local importance) and no category C/D sites within the defined Areas.

Category D sites

15.116 There are 2 category D sites.

Category U sites.

15.117 There are no category U sites (i.e. sites of unknown importance) within the areas of interest.

Conclusion on Archeological Interests Related to the Nant Llesg Site

15.118 The archaeological study has included the identification of assets in zones surrounding each defined Area. Sites of all category values have been identified and logged and used to support the extrapolation of potential conditions, then used for supporting mitigation objectives.

15.119 The location of assets have been compared with a mapping plan showing soil conditions (MA/NL/ES/09/003), these commonly being formed by human activities, including those of agricultural and industrial origin. The soils can themselves have heritage significance, being the burial environment. They also contain archaeological remains and 'ecofacts' (ecological remains), both normally having a cultural heritage value. The soil map confirms the heavy industrial age origin over the north half of Nant Llesg, down the east and west sides of the site and in the extended limb in the south. North east of Rhaslas Pond are areas of natural soils surrounded by a surface restored after the industrial activities. This marries well with historic Ordnance Survey mapping illustrating them being left relatively untouched. South of Rhaslas Pond and to the south east are areas of three types of more natural soils ('Clays-peat at top', 'Loamy-shallow' and 'Loamy over Clayey'). In these areas there are far less numbers of known archaeological assets. In these areas, the archaeological potential for there being older remains is better, given that elsewhere the ground surface has been highly disturbed by quarrying and mining related activities. However, it is to be noted that poorly drained areas, giving rise to peat, would not have been conducive to habitation.

Historic Landscape Characterisation

15.120 The GGAT landscape study for the Nant Llesg application site, based on the ASIDOHL methodology previously described.

15.121 An ASIDOHL assessment has not been undertaken for the parcels of land for temporary use for grazing and/or public access, given that access and grazing or access alone will have no significant impact or effect on the landscapes within and around each, whether considered for temporary or permanent altered uses.

Summary of Nant Llesg Application Site Character Areas (ASIDOHL Stage 1)

15.122 Eight local historic landscape character areas comprise the Nant Llesg application site. These are defined, described and illustrated in the ASIDOHL assessment report (GGAT 2012c – Appendix MA/NL/ES/A15/003).

NLLHLCA 001 – Rhaslas

15.123 This area takes its name from Rhaslas Pond, a reservoir of the Dowlais Iron Company's water management facility called the Dowlais Free Drainage System, and with other components within this character area and to the west in HLCA 031. The area contains elements of the natural/man-made common land, used for mountain grazing, and areas of coal and ironstone crop and mine workings. Associated with this are remains of industrial housing (and public house), railways, and a World War II army facilities. The landscape along the ridge may contain Prehistoric and Roman remains. The south dam of Rhaslas Pond is now regarded as being of national importance, given the interest expressed by Cadw in the latter months of 2012 in assessing it for scheduling as a Scheduled Ancient Monument.

NLLHLCA 002 – Pant-y-waun, Brin DDu, Pen-y-Fedw/Brin Pyllog

15.124 This is an extensive area of reclaimed industrial land with surface mine coal extraction in the 1950's and 60's followed by surface landscaping. The extraction and spoil storage removed all surface remains of known 17th to 19th century very crude shallow then sophisticated deeper ironstone and coal workings and the related surface public and private buildings and infrastructure/transport networks.

NLLHLCA 003 – Nant Llesg, Pen y Cwm, Cwm Wen, Gwaun-y-Mynydd

15.125 This is surviving Common land on the western flanks of Rhymney Valley. With Rhaslas Pond to the west and reclaimed industrial land generally to the north and east. The area contains probable prehistoric and medieval remains including funerary and settlement sites and remains of medieval and post-medieval upland agricultural activities. Superimposed on this are large numbers of surface and sub-surface features, the remains of stone, ironstone and coal exploitation. The greatest concentration of archeological sites lies along the eastern side of this character area and where the landscape has not been affected within NLLHLCA004 immediately to the east.

NLLHLCA 004 – Lower Cwm Wen and New Duffryn Pit

15.126 Formerly this was a complex area of mining with early working chasing stone beds, ironstone and coal seam outcrops back into the hillside and then with deeper mining via a number of collieries. Beneath modern surface landscaping, aiming to make the surface stable and safe, remains of pits and rail/tram way infrastructure may survive.

NLLHLCA 005 – Tunnel Pit and Fochriw Colliery

15.127 This is a large area of reclaimed industrial land with buried features of the former Tunnel Pits and Fochriw Colliery. The area retains the rote and cutting morphology of the disused Brecon and Merthyr Railway, this is, in part, obliterated with modern tipping. This route may reflect on a former Roman and post-medieval road.

NLLHLCA 006 – Cwm Bargoed Washery Depot

15.128 This area essentially comprises the site of a washery established during the latter half of the 20th century with its extensive tips and lagoons. The washery has removed or buried most of the mining and transport remains, which previously stood in the area. As it appears today the area is characterized by a few surviving features associated with the washery and the former Cwm Bargoed Colliery and the adjacent Great Western and Rhymney Joint Railway Taff Bargoed Branch, re-used as a mineral railway. Most other features in the area have been largely removed by continued industrial use and substantial development works for the FLRS, including the addition of new buildings and substantial areas of hard standing and infrastructure.

15.129 West of the 'Mineral Railway' an area of land included in the Nant Llesg planning application boundary, outside the present operational area, is required for a new water recycling facility. This would be a water holding tank set into the ground and fed by temporary pipes to be set on the ground surface. This area has been archaeologically researched and no assets have been identified. Its boggy and natural drainage character indicates that it has a very low or no archaeological potential.

NLLHLCA 007 – Fochriw Pit Pond

15.130 A surviving area of industrial altered Common, this also associated with Gelli-Gaer historic landscape (HLCA006) to the south. The area, named from the key feature a reservoir associated with Fochriw Pit, probably provided water for the water balancing system used in the shaft. The pond is a likely feature of the DFDS. Through the area is a tarmac road and which may reflect on the alignment of a Roman Road and medieval or post-medieval track.

NLLHLCA 008 – Cwm Carno

15.131 This is an area bordered to the north by the Heads of Valley duel carriageway road (on the alignment of a former railway) and to the south by Nant Carno Brook. It is principally enclosed upland pasture altered with 19th century occupation superseding a complex arrangement of medieval and post-medieval stone wall and earth bank enclosures and associated cottages and farm buildings/yards. The area contains many industrial remains, giving a key character to the altered landscape. Features include Rhymney reservoir, complex colliery spoil tips of Blaen Carno Pit and World War II allotments and a possible decoy-bombing site.

Registered Historic Landscape Character Areas (ASIDOHL Stage 1)

Generally to the west and southwest of the Nant Llesg application site, within CCBC and MTCBC, is a set of Historic Landscape Character Areas (HLCA). The HLCAs form part of Gelli-Gaer Common [HLW (MG1) 4] and Merthyr Tydfil Common [HLW (MG1) 2] respectively, areas that are part of two registered landscapes of Outstanding Historic Interest in Wales. **HLCAs in the County Borough of Caerphilly**

HLCA004 – Eastern Enclosed Common

15.132 New enclosed pasture land with small post medieval farms loosely connected by lanes. With place name evidence suggestive of mediaeval occupation. In the northeast, along the valley

bottom, contains elements of modern urban settlement. Not within the registered landscape but with common boundaries to the west and northwest.

HLCA006 – Pen open Garnbugail/Mynydd Fochrew Common

15.133 This is an area of open upland common containing surface and buried features. Particularly important for a Bronze Age cairn on the highest point of Gelli-Gaer Common and for medieval house platforms and Roman road, known to contain other prehistoric funerary and ritual sites of national value.

HLCAs in the County Borough of Merthyr Tydfil

HLCA031 - Merthyr Common

15.134 This is a nationally important industrial landscape with many features and structures related to the DFDS. Also containing remnants of traditional upland agrarian occupation and post mediaeval pre-industrial outcrop seam workings and related village, and later transport networks. Contains Scheduled Monuments and listed (relocated) building (viaduct). The northern part of Merthyr Common now comprises the FLRS containing a large excavation and spoil mounds.

HLCA032 - Cwm Bargoed Washery

15.135 This is an extensive area of major spoil mounds generated by FLRS, retaining an upgraded element of the former Great Western and Rhymney Joint Railway/Mineral Railway, still operating to serve the CDP, and with some older industrial aged features and elements of Cwm Barged Pits.

HLCA041 - Merthyr Common North

15.136 This is open Common land with extensive features of the DFDS and other ponds and leats.

HLCA075 – Garth Fawr Improved Common

15.137 This is an area of recently improved and enclosed land, illustrating field clearance and other agricultural improvements affecting shallow ground conditions. The area contains an extensive habitation site likely to be of a prehistoric age.

HLCA076 – Bargoed Taff (Bargod Taf)

15.138 This is a medieval and post-medieval enclosed landscape with phased patterns of walling and farms and superimposed on a potentially rich prehistoric landscape associated with the Gelli-Gaer Common historic landscape to the south.

HLCA077 – Merthyr Common South

15.139 This an upland mountain grazing landscape containing a rich assemblage of prehistoric funerary and ritual monuments several of which are Scheduled Monuments. The landscape also contain elements of medieval seasonal upland farming including a mediaeval long house and boundary walls

HLCA078 – Dowlais Great Tip

15.140 This is an extensive area of recently reclaimed industrial landscape, once containing industrial and mediaeval aged remains variously associated with mining and before that with upland settlements and a seasonal fair/market.

Assessment of the Nant Llesg Site's Historic Landscape 'Character Areas'

15.141 The following section of this chapter assesses heritage values of the individual and combined character areas, drawing upon the work of GGAT. The assessment allows for the direct and indirect impacts and effects on the historic landscape to be established.

Evaluation of relative importance of the Character Areas (ASIDOHL Stage 4)

15.142 The relative importance, or value of the historic character areas affected by development are set out below.

15.143 It should be noted that Stage 4(c) has not been undertaken during the study and the evaluation of importance has been limited to stages 4(a) and 4(b) instead. Firstly, it was felt that the Nant Llesg site is not a Registered Landscape thus is not of a recognised national value. It was also felt that insufficient comparable data sets were available for meaningful comparisons to be made. The nearest non related landscapes on the Register are the ironworking landscape of Blaenavon, a World Heritage Site, and the industrial landscape of Clydach Gorge, neither of which have been the subject of detailed characterisation study to date. In addition it is considered that the World Heritage Site status designation renders Blaenavon, a recognised landscape of international significance, unsuitable as a measure against which character areas in the Nant Llesg historic landscape should be evaluated. The World Heritage status would place undue bias on any comparison and would thus be unsafe. A comparison with evaluation elsewhere of nearby potentially relevant local historic character areas, beyond the application site has also not been undertaken due to unrelated significant differences.

Gelli-Gaer HLCA Value Assessment

15.144 Table 15.16 shows the overall assessment of the assessment of the landscape areas within the Gelli-Gaer HLCA.

Table 15.16 Gelli-Gaer HLCA Value Assessment

HLCA	Total	Score in relationship to whole of the character area	Score in relation to whole of the registered landscape	Average Score	% Score
004 East Enclosed Common	55	30	34	32	58% Considerable

006 Pen open Garnbgail	55	52	52	52	94% Very High
Overall Value					**76%** High

Merthyr Tydfil HLCA Value Assessment

Table 15.17 shows the overall assessment of the landscape areas within the Gelli-Gaer HLCAs.

Table 15.17 Merthyr HLCA Value Assessment

HLCA	Total score availabl e	Score in relationship to whole of the character areas	Score in relation to whole of the registered landscape	Average Score	% score
031 Merthyr Common	55	37	34	35.5	64% High
032 Cwm Bargoed Washery	55	19	19	19	34% Moderate
041 Merthyr Common North	55	44	41	43	78% High
075 Garth Fawr	55	23	22	22.5	41% Considerable
076 Bargoed Taff	55	34	34	34	62% High
077 Merthyr Common South	55	50	45	47.5	86% Considerable
078 Dowlais Great Tip	55	21	21	21	38% Moderate

Overall value					**57%** Considerable

NLLHLCAs

15.145 Table 15.18 assesses the value of the NLLHLCAs found within the site would they in part or as a whole ever be part of the two registered historic landscapes, now noting the increased value of Rhaslas Pond (GGAT 2012a – Appendix MA/NL/ES/A15/001). This table is based on a general qualitative assessment of the descriptive accounts (GGAT 2012c – Appendix MA/NL/ES/A15/003); the assessment does not use the ASIDOHL scoring methodology as they are not within the designated historic landscapes (HLCAs).

Table 15.18 The value contribution of NLLHLCA to the overall landscape should the designated historic landscape be extended to cover the site

NLLHLCA	Single Value	Group Value and also combined with values of the adjacent HLCAs	Comment
001 Rhaslas	Very High	Very High	The area contains Rhaslas Pond and DFDS leats within the SINC located to the west of the site
002 Pant-y-waun	Moderate	Moderate	A landscape retaining a strong traditional farm land character and with useful views towards Gelli-Gaer Common, containing modern and historic landscape surfaces. Some locations with significant landscape views seen from local hill crests in all directions
003 Nant Llesg	Moderate	High	A substantial part of Gelli-Gaer Common with significant views in all directions. With significant clusters of archaeological sites on the lower flanks of the hillside and with a distinctive visual industrial heritage character.
004 Lower Cwm Wen	Moderate	Moderate	Usefully contributes to uphill views of Gelli-Gaer Common and forming the setting areas containing clusters of archaeological sites with a surface expression.
005 Tunnel Pit	Moderate	Moderate	Usefully contributes to general views of Gelli-Gaer and Merthyr Common and route-marking of the former GWR branch line

NLLHLCA	Single Value	Group Value and also combined with values of the adjacent HLCAs	Comment
006 Cwm Bargoed Washery Depot	Low	Low	There are no distinctive historic attributes and contributions within the existing operational area of the CDP. The additional land required for the water recycling facility is found within the present operational boundary and within the Nant Llesg planning application site area. It is an active modern industrial landscape where no significant cultural heritage assets are identified.
007 Fockriw Pit Pond	-	-	Outside the scheme and not evaluated
008 Cwm Carno	-	-	Outside the scheme and not evaluated

Character and Size of the Impacts

15.146 Within the Nant Llesg site top soil and sub soil stripping within the footprints of the overburden mound and coal working excavation area would be two of the major processes throughout. Moderate processes would be those principally related to the surface remediation and landscape restoration/aftercare works. Given the proposed scale of the Nant Llesg scheme minor-localised impacts are identified, including the construction of infrastructure, access roads and inserted buried pipes. These are common activities for the industry and alternative methods of surface mining and land remediation are not identified.

15.147 Within the parcels of land identified for temporary grazing and/or public access, the impacts would be common style grazing and/or public access to roam the land, potentially being short and long term altered uses. These are defined as being minor impacts in respect of buried archaeological assets. The impacts are potentially moderate in respect of upstanding assets and any increased grazing is regarded as a potential major impact. The proposals envisage no farm improvements impacts (soil improvement, ploughing, removal of walls and fences and new construction). No alternative impacts in the more distant future are identified, given on-going stable agricultural land uses of the region.

15.148 Visual changes are regarded as minor impacts as they are temporary. The key impacts would be the excavation for coal and the overburden mounds.

Effects of the Development - Impacts on the Nant Llesg Site

15.149 The scheme works have been defined in Chapter 3 of the Environmental Statement and these will variously affect cultural heritage assets – buried archaeological remains and surface/above ground features, together comprising the historic landscape. Assessment of Effects on Buried Archaeological Resources

15.150 The effects on buried archaeological sites, artefacts and soil formations would come about by their removal out of context, and damage/destruction. Here the effects are considered should there be no mitigation.

15.151 The effects on the individually significant identified archaeological assets (A, A/B, and B) are shown in Table 15.19.

Table 15.19 Effects of development on A, A/B and B value archaeological sites

ID	Type	Value	Effect
O2987m85521	Reservoir (north	A	Severe
02987m/85521	Reservoir (south)	A	None
02287.0m	Leat	A/B	Severe
02424m	Round Barrow	A/B	Severe
02910m	Linear Feature	A/B	Severe
03013.0m	Leat	A/B	Severe
03014m/ 85581	Reservoir	A/B	Severe
02942m	Mineral Extraction Site	A/D	Severe
80455	Mining Feature	A/D	Minor
02947m/ 85603	Drainage Ditch	B	Severe
03017m/ 85594	Reservoir Inspection Chamber	B	Severe
03018m/ 85593	Filter House	B	Severe
03019m/ 85592	Valve Tower	B	Severe
03020m/ 85595	Leat	B	Severe
03022m/85596	Dam	B	Severe

ID	Type	Value	Effect
03023m/85605	Leat	B	Severe
NLL028	Sluice	B	Severe
NLL071	Leat	B	Severe
NLL080	Pit	B	Severe
NLL138	Platform	B	Severe
NLL142	Trackway	B	Severe
02990m/ 85576	Leat	B	Major
02993m/ 88017	Leat	B	Major
02997m/ 85575	Leat	B	Major
03008.0m/ 85588	Leat	B	Major
02409m/ 85572	Leat	B	Major

15.152 Scheme-wide effects related to the defined set of impacts are illustrated in Table 15.20, these not taking into account mitigation.

Table 15.20 Scheme-wide combined effects

Impact element of the scheme	Effect Assessment	Comment
Ecological protection ground works prior to scheme implementation	Minor adverse to minor, permanent beneficial	Where assets are in appropriate areas there is an opportunity to better protect and preserve them than as found presently
Top soil (and sub soil) stripping	Severe, permanent adverse	Total removal of archaeological assets
Spoil Mounding	None to minor temporary adverse and minor beneficial	There is an opportunity for asset retention in protected burial environments
Creation of haulage and other roads	Moderate, permanent adverse	Effect where occurring outside zones of top soil and sub soil stripping

Impact element of the scheme	Effect Assessment	Comment
Creation of hard standing large areas	Moderate permanent adverse	Effect where occurring outside zones of top soil and sub soil stripping
Excavation of siltation and water storage lagoons	Minor to moderate, permanent adverse	Effect where occurring outside zones of top soil and sub soil stripping
Linear trenching	Minor to moderate. permanent adverse	Effect where occurring outside zones of top soil and sub soil stripping
Making safe old mine shafts and adits	Minor adverse to minor beneficial	There is an opportunity to recreate some shaft tops and adit entrances of the assets during the engineering works to make them safe
Excavation to base of cut	Major permanent adverse	Full removal of evidence of workings
Landscape restoration	Moderate adverse to minor beneficial	The process would allow for improved protection and celebration of cultural heritage but with significant damage risks if uncontrolled
Grazing and access to additional lands	None to moderate adverse	Generally cultural heritage assets are robust and new land uses are likely to be no more severe than as-found excepting grazing which potentially could be more intensive in confined land holdings
Access to additional lands	None to minor	Roaming considered to cause accidental slight damage only

Effects to the Historic Landscape from Works on the Site

Assessment of overall significance of direct and indirect effects on the historic landscape (ASIDOHL Stage 5)

15.153 This section assesses the overall significance of the effect of development and the effects that altering the historic character areas would have on the whole of the historic landscape area on the Register. The definitions of effects are defined in Table 15.10. This final stage combines the results of Stages 2 to 4 to produce an assessment of the overall significance of impact of development and the effects that altering the historic character area(s) concerned has on the whole of the historic landscape area on the Register and those locally prescribed for the Nant Llesg application site. This is determined by setting out and scoring the value of the character area(s) affected in relation to the effect caused by development and the consequent reduction in value of the historic landscape area on the Register. The results of the assessment are set out below.

Assessment of the overall significance of direct effects of development on the HLCAs

Gelli-Gaer

15.154 No physical direct effects are identified to the two identified and evaluated character areas with MTCBC.

15.155 There are no identified physical direct effects to the seven identified and evaluated character areas.

Assessment of the overall significance of indirect effects of development on the HLCA

15.156 Overall resultant effects to the HLCAs, short and long term holistically considered, are defined in Tables 15.21 and 15.22.

Table 15.21 Significance of indirect effects in Gelli-Gaer HLCAs

Character Area (HLCA)	Value (score resulting from ASIDOHL stage 4)	Effect	Reduction of value	Overall significance of effect
004 Eastern Enclosed Common	5	1	1	7 Slight
006 Pen open Garnbgail	9	1	1	11 Moderate
Summary	7	1	1	9 Slight

Table 15.22 Significance of indirect effects in Merthyr Tydfil HLCAs

Character Area	Value (score resulting from ASIDOHL stage 4)	Effect	Reduction of value	Overall significance of effect
031 Merthyr Common	7	1	1	9 Slight
032 Cwm Bargoed Washery	3	1	1	5 Slight
041 Merthyr Common North	7	1	1	5 Slight
075 Garth Fawr	3	1	1	5 Slight
076 Bargoed Taff	3	1	1	5 Slight
077 Merthyr Common South	8	2	1	11 Moderate
078 Dowlais Great Tip	3	1	1	5 Slight
Summary	5	1	1	6.4 Slight

15.157 There would be no permanent adverse visual effects given a programme of restoration, aftercare and reuse as temporary grazing land with enhanced public use and environmentally sensitive management. Generally, temporary indirect visual impacts have been assessed as Slight, though Moderate effects are identified in HLCA006 and HLCA077.

15.158 Assessments of significant direct effects the scheme would have on the NLLHLCAs are shown in Table 15.23. As the areas are not part of designated historic landscapes the assessments have not used the sophisticated ASIDOHL2 assessment scoring system used for the HLCAs. Assessments and comments are provided, which are related to the magnitude of effects, given the landscape restoration.

Table 15.23 Overall effects of development on the NLLHLCAs

Character Area (GGAT 2012a, pp. 56-91)	Effects caused by the scheme	Reduction of asset value	Overall significance of effect taking into account mitigation and landscape restoration	Comment
001 Rhaslas	Very Severe	Very High down to Moderate	Moderate adverse	The south half of Rhaslas Pond is retained locally reducing the effect of the scheme
002 Pant-y-waun	High	High down to Low	Minor adverse	Most of the area lies within the surface mine excavation area and within the restored Trecatti surface coal mine landscape
003 Nant LLesg	High	High down to Low	Minor adverse	Most of the area lies within the surface mine, areas of spoil mounding and in areas for mine shaft remediation within the first two years of implementing the scheme
004 Lower Cwm Wen	High	High down to Low	Minor adverse	The landscape to be made safe within the first two years of implementing the scheme including restoration for access uses
005 Tunnel Pit	None	Minor (beneficial)	Minor beneficial	Only the route of the Great Western Railway's, Merthyr-Brecon Railway, lies within the scheme. Treatment of ground contamination and putting back to Common will be a positive gain for the restoration proposals

Character Area (GGAT 2012a, pp. 56-91)	Effects caused by the scheme	Reduction of asset value	Overall significance of effect taking into account mitigation and landscape restoration	Comment
006 Cwm Bargoed Washery Depot	None	Minor	Minor beneficial	Continued use with an additional water lagoon, followed by restoration and putting back to Common will be a positive gain for the restoration proposals
007 Fochriw Pit Pond	-	-	-	Outside the scheme
008 Cwm Carno.	-	-	-	Outside the scheme

15.159 Table 15.23 has shown the long-term direct effects on the six NLLHCAs within the scheme as being moderately significant, with considerable loss of cultural heritage value. Adverse effects would be offset by a programme of mitigation and landscape restoration. NLLHLCAs 007 and 008 are located beyond the scheme, thus are not affected.

Assessment of the overall significance of indirect effects of development on the NLLHLCA

15.160 Views into and across the Nant Llesg site are considered in Table 15.24. This takes into account the duration of the scheme, when views to the site's local landscape character areas would be temporarily – albeit long term - affected. This would be at times when there would be no public access to the site from which there would be outward looking views. Thus the outward looking view effects are considered only for the scheme following landscape restoration. The views are then assumed to be from within the scheme areas and from afar, at 'moderate' viewing distances, where historic landscape panoramas and surface cultural heritage features are identifiable and interpretable.

Table 15.24 Significance of indirect (visual) long-term effects on the NLLHLCAs

Character Area	Effect	Reduction of value	Overall significance of effect	Comment
001 Rhaslas	Moderate	Minor	Moderate to Minor	A significant amount of the authentic landscape is retained
002 Pant-y-waun	Moderate	Moderate	Moderate	Some authentic elements of the historic landscape will be retained
003 Nant Llesg	Moderate	Moderate	Moderate	Some authentic elements of the historic landscape will be retained
004 Lower Cwm Wen	Minor	Minor	Minor	Following extensive mine shaft and adit stabilisation the landscape will be a principle element of the restored landscape
005 Tunnel Pit	Minor beneficial	Minor beneficial	Minor beneficial	Historic railway route will be a feature within the landscape restoration and part of the Common
006 Cwm Bargoed Washery Depot	Minor beneficial	Minor beneficial	Minor beneficial	The landscape will be returned to Common
007 Fochriw Pit Pond	-	-	-	No change, located beyond the scheme
008 Cwm Carno	-	-	-	No changes, located beyond the scheme

15.161 Table 15.24 shows that the scheme will generally reduce the value of views of the NLLHCAs, given that the as-found complex industrial surfaces and features will be removed, not fully replaceable by the landscape restoration proposals.

Summary of direct effects on the designated historic landscapes

15.162 No direct effects would be caused to the registered HLCAs

Summary of Indirect effects on the designated historic landscapes

15.163 Within the immediate area to the west and south of the proposed Nant Llesg scheme, only two HLCAs are considered to be subject to indirect visual effects, which are more than of a slight or negligible magnitude: Gelli-Gaer (HLCA006) and Merthyr Tydfil (HLCA077).

15.164 In respect of where there would be slight effects these are considered to be occurring in the short term only. Following landscape restoration, part of an archaeological/landscape mitigation programme of works, there would be no residual effects. Positive direct effects would result from the better public uses to which the Nant Llesg landscape will be put.

Conclusion of historic landscape loss through development effects

15.165 The overall significance of the impact of the Nant Llesg scheme on the designated historic landscape is considered to be low.

Effects to Parcels of Land Identified for Additional Grazing and/or Access

15.166 The follow definitions of potential effects on potential use of land to mitigate impacts on Common land are identified in Table 15.25.

Table 15.25 Definition of adverse effects for areas for temporary grazing and/or public access

Scale of adverse effect to cultural heritage assets, also noting suitability for the altered uses	Definition of adverse effects
No significant effects - High suitability	Areas with no buried archaeological assets determined by desk based assessment and site evaluation. Areas with deeply buried archaeological remains and where new uses will not disturb the ground surface and where assets are highly robust. Locations where unforeseen effects can be managed by standard archaeological mitigation and where this would make a significant positive contribution to cultural heritage objectives.
Slight adverse effects – Moderate suitability	Areas with some evidence of there being buried archaeological assets as determined by archaeological research. Areas where access would result in some local top soil and sub soil erosion but where archaeological assets are moderately robust. Locations where adverse effects on archaeological assets can be managed by standard archaeological mitigation undertakings resulting in useful contributions to cultural heritage objectives.
Moderate adverse effects – Low suitability	Areas with significant known and predicted slightly to moderately robust archaeological assets. Assets which would be sensitive to increased short and long term public access. Areas where metal detection, making safe of mine shafts and adits could lead to vandalism

Scale of adverse effect to cultural heritage assets, also noting suitability for the altered uses	Definition of adverse effects
	and damage of buried archaeological assets. Areas where mitigation would only partly offset asset destruction.
Major adverse effects – No suitability	Areas with highly important archaeological assets, including extensive sites and well preserved historic landscapes. Shallow made ground locations where there are highly sensitive archaeological assets that would be damaged by immediate access. Locations where there are exposed archaeological sites and upstanding monuments and structures and where not protected and maintained from increased access. Locations where mitigation would not offset losses of important assets.

15.167 Table 15.26 summarizes the identified effects in each of the proposed areas for temporary grazing and/or public access, thus assessing suitability for modified grazing and access uses associated with implementation of the Nant Llesg scheme.

Table 15.26 Effects and land suitability for temporary grazing and/or public access

Area Reference Number (MA/NL/CLA/LAND	Suitability during the period of the Nant Llesg scheme Key a) Access and Grazing b) Access only	Explanation notes regarding significant effects Key Numbers contained within brackets refer to site references presented in the archaeological desk based assessment (GGAT 2013 – Appendix MA/NL/ES/A15/004).
Areas within the Application Site		
1	a) Not relevant as within the Application Site Area b) Not relevant as within the Application Site Area	a) Not an available area in the short term, during the implementation of the scheme – the land is needed for operation of surface mining and land remediation. All assets would be removed with some exceptions where preserved *in situ* (including the south dam of Rhaslas Pond). No long term adverse effects following restoration. b) Not an available area in the short term, during the implementation of the scheme – the land is needed for operation of surface mining and land remediation. All assets would be removed, with some exceptions where preserved *in situ* (including the south dam of Rhaslas Pond). No long term adverse effects

Area Reference Number (MA/NL/CLA/LAND	Suitability during the period of the Nant Llesg scheme Key a) Access and Grazing b) Access only	Explanation notes regarding significant effects Key Numbers contained within brackets refer to site references presented in the archaeological desk based assessment (GGAT 2013 – Appendix MA/NL/ES/A15/004).
		following restoration.
2	a) Not relevant as within the Application Site Area b) Not relevant as within the Application Site Area	a) No significant known and likely archaeological assets as determined by the archaeological desk based assessment. There would be a positive gain by returning the area to a historic Common of high cultural heritage value. b) No significant known and likely archaeological assets as determined by the archaeological desk based assessment. Access already suspended so there would be a positive long term benefit by returning the area to Common after scheme completion.
3	a) Not relevant as within the Application Site Area b) Not relevant as within the Application Site Area	a) Not an available area in the short term, during the implementation of the scheme – the land is needed for operation of surface mining and land remediation. Would the area be available there generally would be no change from the as-found status. The area contains a rich assemblage of assets (GGAT 2012b – Appendix MA/NL/ES/A15/002), which are shallow and could be prone to adverse effects, should access and grazing be more intensive during the period of the scheme and in a long term scenario. There are opportunities to promote cultural heritage within the restoration scheme. b) Not an available area in the short term, during the implementation of the scheme – the land is needed for operation of surface mining and land remediation. Would the area be available there generally would be no change from the as-found status. The use is not likely to impact on buried assets (GGAT 2012b – Appendix MA/NL/ES/A15/002) and surface topography in the short or in a long term scenario. There are opportunities to promote cultural heritage within the restoration scheme.
4	a) Not relevant as within the Application Site Area	a) Not an available area in the short term, during the implementation of the scheme – the land is needed for operation of surface mining and land remediation. Would the area be

Area Reference Number (MA/NL/CLA/LAND	Suitability during the period of the Nant Llesg scheme Key a) Access and Grazing b) Access only	Explanation notes regarding significant effects Key Numbers contained within brackets refer to site references presented in the archaeological desk based assessment (GGAT 2013 – Appendix MA/NL/ES/A15/004).
	b) Not relevant as within the Application Site Area	available there generally would be no change from the as-found status (GGAT 2012b – Appendix MA/NL/ES/A15/002). There could be potentially additional adverse effects by increased grazing and public roaming in a confined landscape following localized land remediation processes. Moderate effects may occur in a long term scenario, and once the land parcel has been re-associated with the overall Common. There are opportunities to promote cultural heritage within the restoration scheme. b) Not an available area in the short term, during the implementation of the scheme – the land is needed for operation of surface mining and land remediation. Would the area be available there generally would be no change from the as-found status (GGAT 2012b – Appendix MA/NL/ES/A15/002). There could be potentially some damage if there were to be increased uncontrolled roaming and poor landscape management in the short term and in a long term scenario. There are opportunities to promote cultural heritage within the restoration scheme.
5	a) Not relevant as within the Application Site Area b) Not relevant as within the Application Site Area	a) Not an available area in the short term, during the implementation of the scheme – the land is needed for operation of surface mining and land remediation. Would the area be available there generally would be no change from the as-found status. The area contains a moderately rich assemblage of assets, which are buried at varying depths (GGAT 2012b – Appendix MA/NL/ES/A15/002) and which could be prone to adverse effects should land remediation more expose the assets and should access and grazing then be more intensive in a long term scenario. b) Not an available area in the short term, during the implementation of the scheme – the land is needed for operation of surface mining and land remediation. Would the area be available there generally would be no change from the as-found status. Not likely to impact on buried assets and original surface

Area Reference Number (MA/NL/CLA/LAND	Suitability during the period of the Nant Llesg scheme Key a) Access and Grazing b) Access only	Explanation notes regarding significant effects Key Numbers contained within brackets refer to site references presented in the archaeological desk based assessment (GGAT 2013 – Appendix MA/NL/ES/A15/004).
		topography (GGAT 2012b – Appendix MA/NL/ES/A15/002) in the short term or in a long term scenario.
14	a) Not relevant as within the Application Site Area b) Not relevant as within the Application Site Area	a) An area not available during duration of the scheme. Later it would positively contribute to cultural heritage objectives, through ground contamination having been treated and which is presently likely to be protecting buried old ground surfaces. New uses would be related to the historic railway route. No significant archaeological sites are identified within the railway cutting. b) An area positively contributing to cultural heritage objectives through treatment of ground contamination, protecting buried old ground surfaces and providing new uses related to the historic railway route that the area delineates. No significant archaeological sites identified within the railway cutting.
Areas beyond the Application site		
6	a) Low b) Moderate	a) Land proposed as grazing already under separate agreement. There would be potentially significant effects to *in situ* assets and to heritage related work in the restoration site works. However, there are opportunities to promote cultural heritage within the restoration scheme. b) There would be some potential adverse effects if there were to be uncontrolled roaming after remediation and during scheme operation prior to full site restoration. There are opportunities to promote cultural heritage within the restoration scheme.
7	a) Not available to the scheme but High if this was to change b) High	a) No known or predicted assets within boundary and with any unforeseen assets protected below top soils in the short and a long term scenario and also not prone to vandalism. Surrounding assets are of a robust character. b) No known or predicted assets are identified within boundary and with no

Area Reference Number (MA/NL/CLA/LAND	Suitability during the period of the Nant Llesg scheme Key a) Access and Grazing b) Access only	Explanation notes regarding significant effects Key Numbers contained within brackets refer to site references presented in the archaeological desk based assessment (GGAT 2013 – Appendix MA/NL/ES/A15/004).
		predicted/unforeseen assets are likely below top soils. No protection is identified for short and a long term scenarios. Surrounding assets are of a robust character. No assets appear prone to vandalism.
8	a) Not available to the scheme but High if this was to change b) High	a) Robust known or predicted assets within boundary and with any unforeseen assets protected below top soils in the short and a long term scenario and also not prone to vandalism. Surrounding assets are of a robust character. b) Robust known or predicted assets within boundary and with any unforeseen assets protected below top soils in the short and a long term scenario and also not prone to vandalism. Surrounding assets are of a robust character. One site is identified for mitigation, located on the western boundary – a prehistoric cairn (NLCL156).
9	a) High b) High	a) Potentially 'Moderate' suitability related to Pen-y-Darren coal mine within area, but remains likely to be robust and not affected by grazing and roaming access. No other remains predictable within the area, with robust assets within the setting. b) Potentially 'Moderate' suitability related to Pen-y-Darren coal mine within area, but remains likely to be robust and not affected by potential roaming public access in the short term or a long term scenario. No other remains predictable within the area. A nationally important prehistoric settlement is located to the north (04313m) and would be sensitive if there were roaming access; otherwise robust assets are located within the setting.
10	a) Whole area = Moderate 10a = Moderate 10b = Moderate 10c = Low	a) Damage to historic structures related to historic landscape character of post medieval and medieval farming and earlier settlements. A significant risk of damage identified within area 10b and 10c. Less effects likely within the more open and improved landscape of 10a. A significant risk of decay and vandalism

Area Reference Number (MA/NL/CLA/LAND	Suitability during the period of the Nant Llesg scheme Key a) Access and Grazing b) Access only	Explanation notes regarding significant effects Key Numbers contained within brackets refer to site references presented in the archaeological desk based assessment (GGAT 2013 – Appendix MA/NL/ES/A15/004).
	b) Whole area = High 10a = High 10b) High 10c = Low	to significant assets identified in a long term scenario. b) Controlled access would have no predictable significant adverse effects to known robust buried archaeological assets, historical structures and unforeseen older monuments during the period of the scheme. Area 10c has complex historic land uses that could be sensitive to roaming. A significant risk of decay and vandalism is identified to significant assets in a long term altered use scenario (NLCL032, 02291/19396, 01493m/18007/37463)
11	a) Moderate b) Moderate	a) Robust industrial aged assets within and to west of the land parcel and reported to be substantially destroyed. Field systems and farmsteads are registered as being of historic value and would be moderately sensitive to degradation. Prehistoric cairn(s) identified at one specific location on the east boundary of the area and vulnerable to access damage. No other known or predictable older buried assets that would be sensitive to public access and changes of agricultural land uses in the short term or in a long term scenario. b) Robust industrial aged assets within and to the west of the site and reported to be substantially damaged. General field systems and the farmstead (NCL087) are registered as being of historic value and would be moderately sensitive to degradation. Prehistoric cairn(s) identified at one specific location on the east boundary of the area and would vulnerable to roaming access damage (NCL168). No other known or predictable older buried assets that would be sensitive to roaming public access in the short term or in a long term scenario.
12	a) High locally low to moderate	a) Highly limited known assets within the area. It comprises a landscape with mostly robust assets within the setting. Bronze Age pillow mounds at Penddeugae Fach, to the north of Area 12, would suggest a locally surviving old landscape (likely extending within Aras 12) of

Area Reference Number (MA/NL/CLA/LAND	Suitability during the period of the Nant Llesg scheme Key a) Access and Grazing b) Access only	Explanation notes regarding significant effects Key Numbers contained within brackets refer to site references presented in the archaeological desk based assessment (GGAT 2013 – Appendix MA/NL/ES/A15/004).
	b) High locally low to moderate	human activity which could be sensitive to surface erosion (00525m/24491/91958). b) Highly limited known assets within the area. It comprises a landscape with mostly robust assets within the setting. Bronze Age pillow mounds at Penddeugae Fach would suggest a locally surviving landscape of human activity which should not be too sensitive to just roaming access in the short term but possibly vulnerable within a long term altered use scenario (00525m/24491/91958).
13	a) Low b) Moderate	a) An area not available during the short term duration of the scheme. If available, then there would be potentially significant adverse damaging effects to *in situ* assets and caused by any remediation related work occurring before and during the restoration programme. An area with high suitability in a long term managed landscape scenario. There are opportunities to promote cultural heritage within the restoration scheme. b) An area not available during the short term duration of the scheme. If available, there could be some potential adverse damaging effects if there were to be uncontrolled roaming public access, before and during remediation and short term restoration. An area with high suitability in a long term managed landscape scenario. There are opportunities to promote cultural heritage within the restoration scheme.

15.168 Generally, most parcels of land offer opportunities for temporary altered uses permitting access and for grazing uses, or access only. In many respects the identified parcels of land would continue the as-found agricultural uses. Top soils and sub-soils would generally continue to protect archaeological assets. Areas 3, 4, 6, 10, 12, and 13 all contain clusters of shallowly buried assets and upstanding remains. These could be locally vulnerable to damage at times of grazing and public access. The known assets in Areas 5, 8, 9, 11, and 12 would not be vulnerable at times of grazing and public access. Willful vandalism to archaeological assets and to upstanding structural remains/monuments is considered to be a low risk during the short period of the Nant Llesg scheme, and also would likely be a low risk in a long-term modified land use scenario. Asset identification and landscape management would allow for implementing appropriate on-going planned and ad hoc mitigation.

Strategic Effects

15.169 Cultural Heritage (archaeology and historic landscape) and Natural Heritage (ecology and historic landscape) Chapters of the Environmental Statement both address some cultural commonalities, Nant Llesg being the host of a significant number of unique, related and interrelated assets of many types. The higher cultural heritage value assets and greater densities of asset locations appear to be where the topography, soils and ground cover types are slightly to moderately more complex (RPS2012 and Drawing: Phase 1 from NCV. Drawing MA/NL/ES/09/003). These locations are pretty well the five defined cultural heritage cluster areas, especially CA2, CA3, and CA4. These cluster areas are addressed in the cultural heritage restoration strategy of this chapter. Least assets are located in the extensive areas of wet dwarf shrub heath and semi-improved acid grassland, much of this being 'Clays-(Peat top)', 'Loamy-shallow' and 'Loamy over Clayey' soils. The ecological ground surface cover types do not seem to reflect on human roles in their creation, excepting, those areas related to improved and semi-improved grassland (assumed to be modern). Such surface formational activities may account for loss of topographic expressions of assets, especially those related to the industrial age mining operations. The 'improved' ground conditions will likely have damaged shallow buried archaeological sites.

15.170 The suite of impacts of the scheme share common effects to man-made and natural heritage assets:

- major and moderate adverse effects by the removal of surface and subsurface soils within the footprint of the scheme (the areas of land remediation and of surface mining)
- neutral or minor beneficial effects by mitigation protection and engineered preservation of some archaeological assets within the site and bordering it and by environmental improvements to minimize long term detrimental changes.

15.171 The landscape, from a cultural heritage and natural heritage point of view, would share some common minor beneficial effects, resulting from mitigation, restoration and community studies/educational undertakings.

15.172 Temporary adverse effects on man-made historic and related natural heritage, landscape views would result from principally seeing the surface mine deep excavation and adjacent spoil mounding. Key heritage views affected would be those generally looking west from the distant east side of Rhymney, up to Gelli-Gaer and Merthyr Common ridges. Some temporary local viewing effects are identified for HLCA 004 and 006.

Cumulative Effects

15.173 Four developments have been assessed cumulatively with the Nant Llesg proposal:

- Ffos-y-fran Land Reclamation Scheme;
- Trecatti Landfill Site;
- The areas of Cwmbargoed Disposal Point outside the Nant Llesg planning application site area; and

- A Wood Pellet Facility at Capital Valley Eco-Park in Rhymney.

15.174 The relative location of the developments is shown on Drawing MA/NL/ES/02/001.

Ffos-y-fran Land Reclamation Scheme

15.175 The FLRS is mostly set beyond a substantial area of retained historic and important natural landscape. The restoration of the FLRS landscape, where there have been overburden mounds, surface mining and engineering temporary works, includes topographic features reflecting on past uses and conservation of archaeological assets. Here, Sarn Howell Pond Scheduled Monument has been extended, supported by the findings of the archaeological mitigation works carried out as a part of the scheme. A restored aqueduct across the Great Western Railway cutting, systems of DFDS leats, features of a brick kiln and tramway altogether create a heritage 'park' within the completed restoration scheme.

15.176 The same strategy of retaining, investigating, conserving and celebrating archaeological assets would occur within Nant Llesg site, as a result of implementing the restoration strategy. The Nant Llesg restoration strategy would forge cultural heritage links between the two schemes via heritage promotion objectives in Cluster Area 5 (see plan: MA/NL/ES/16/014). Thus, in respect of the FLRS, minor to moderate beneficial cumulative effects are identified.

Trecatti Landfill Site

15.177 Trecatti represents a substantial area of former surface coal mining, presently being used for licensed landfill. Eventually the restored topography will be roughly the same form as the original natural one. For that site, no archaeological assets remain. Nant Llesg would similarly reinstate the natural topography but with many retained buried and surface restored cultural heritage assets. Thus, in respect of the Trecatti site, no cumulative adverse effects are identified.

Areas of Cwmbargoed Disposal Point Outside the Nant Llesg Site Area

15.178 There are two areas of the CDP outside the Nant Llesg planning application site area that lie within MTCBC. In the northwest is an area of undisturbed land. This to be fenced out of the operational area of the CDP thus providing protection to potential cultural heritage assets and providing a more extensive buffer to a Scheduled Monument located further to the west. Immediately east of the undisturbed land and within the operational area of the CDP is an area which is mainly traversed by site traffic passing between the CDP and the FLRS. There is also a short length of railway siding crossing the southern extremity of the same area, along which coal trains pass while entering and leaving the CDP. Such activites have considerably disturbed the previous landscape. In the south of the CDP is an area of industrial landscape of the present CDP. It is used for water treatment, coal stocking and the siting of a baffle embankment and these activities have also considerably disturbed the previous landscape.

Wood Pellet Facility at Capital Valley Eco-Park

15.179 Planning Consent has been granted for the Net Wood Pellet Facility, a Combined Heat and Power generating facility making and burning wood pellets from imported timber. The plant is located in Capital Eco-Park Rhymney, a short distance east of Nant Llesg. The application documents do not address archaeology or historic landscape topics. The planning application did not require an Environmental Statement, where cultural heritage concerns could have been addressed and the scheme has been consented (CCBC. Application 12/0510/FULL): Permission for Development dated 6/12/2012). No archaeological planning 'Condition' has been imposed on the development related to cultural heritage topics. It is therefore assumed that no significant archaeological remains exist on the site. Given this assumption, this chapter

of the EIA has scoped out there being any cumulative impacts and effects. No linked mitigation requirements are thus identified.

15.180 Given the works occurring, and to occur, within the identified four developments, no cumulative significant adverse effects are identified in relation to known and potential cultural heritage assets within NL.

Summary of the Scheme's Adverse Effects (without Mitigation Interventions) to Archaeological Assets

15.181 Based on the HER and GGAT databases covering the site and setting, and taking account of the development proposals Plan (see MA/NL/PA/003), in summary, the anticipated zones of effects are shown in Table 15.27.

Table 15.27 Summary of effects

Summary of Effects without Mitigation Interventions
Total Adverse Effect – within the full foot print zone of the coal extraction and excavation area. There is one exception, Rhaslas Pond where the effect would be partial for the whole reservoir, since the southern half is to be retained, as the dam has been regarded as a Scheduled Monument for the purposes of this assessment and provides positive support to the objectives of the restoration plan.
Total Adverse Effect – within all areas of top soil stripping and overburden mounding. The removal of the Rhaslas Pond northern embankment and of the retained water body is classed as a total adverse effect.
Total Adverse Effect - in areas of lagoons and haulage routes where not diverted for archaeological mitigation requirements.
Total to Moderate Adverse Effects - where there would be areas of engineered hard standing surrounding the surface mining and land remediation areas.
Minor to Total Adverse Effects - where linear excavations would occur, typical for buried infrastructure routing – the scale of effect is dependent on the size of archaeological site or feature and where routing cannot be adjusted.
None to Minor Adverse and Minor Beneficial Effects - where archaeological sites are located within the bounding landscape not included in scheme works.
None to Minor Adverse and Minor Beneficial Effects - where archaeological sites are located within areas where ecological resources are to be retained and preserved during the period of the scheme.
None to Minor Adverse and Minor Beneficial Effects – in all parcels of land to be used for temporary access and grazing and for access only.

Residual Effects, Given a Programme of Mitigation

15.182 The basis of mitigation on Nant Llesg is to minimize adverse effects that would otherwise occur, satisfying cultural heritage preservation objectives. Where *in situ* preservation cannot be achieved or is not desirable as mitigation then research, investigations and site-based documentation will occur, as addressed within this chapter. With implementation of a programme of archaeology, adverse effects are minimized.

15.183 The residual adverse effects, left following mitigation, as a whole, are considered to be none or very minor. With one exception, no residual adverse effects are identified related to known high and moderate valued assets, since the desk based assessments, early site evaluation, and archaeological works during the initial stages of implementing the scheme would address these. Mitigation would result in new archaeological data and publications. A moderate adverse effect would remain as a result of the loss of the northern half of Rhaslas Pond.

15.184 Given the chance of there always being an accidentally found high or moderate valued asset archaeological watching briefs would aim to deal with this risk, by implementing a programme of archaeology – by forward planning of site activities integrated with the active engineering works.

15.185 Residual minor effects would result from some engineering works having to be undertaken for safety reasons and where complete archaeological mitigation work is not feasible. Also, some engineering works, involving extremely large machinery, means some accidentally revealed archaeological remains are not seen, but generally this would apply to small and low value assets.

Mitigation

Introduction

15.186 The Nant Llesg scheme offers a rare opportunity to integrate commercial and economic activity with cultural, social, and archaeological objectives, in a landscape of unstable old mine workings. Thus mitigation proposals principally relate to industrial period cultural heritage remains, but generally the landscape contains remains of all historic and some prehistoric periods.

15.187 Miller Argent identifies that there would be some losses of heritage remains as a result of implementing the proposed Nant Llesg scheme. The scheme would however comprehensively mitigate the losses with archaeological objectives that have developed forward from highly innovative and exemplar mitigation achieved at FLRS. The implementation of the mitigation proposals would significantly contribute to understanding and celebrating the history of the South Wales valleys.

15.188 Mitigation options relate to adverse effects at ground level sub surface level and underground in seams where coal and overburden extraction is to occur.

15.189 Compared with the original concept for the scheme, significant scheme improvements related to cultural heritage objectives have already been achieved, and can be regarded as supporting the minimizing of required site-based mitigation. Over two years the scheme design development has achieved the following:

- retention of the southern half of Rhaslas Pond, a major early reservoir of the Dowlais Free Drainage System. Here, Miller Argent has supported Cadw's assessment of the south dam as a possible Scheduled Monument. During the implementation of the scheme the

southern embankment would be protected from accidental damage and on-going decay. The embankment will be fenced off from access and there would be a programme of archaeological and engineering monitoring. A Hydro-Brake will be constructed at the west end of the embankment;

- withdrawal of surface mining operations from the basal slopes of Rhymney Valley, where archaeological assets are identified and where sites will continue to be preserved *in situ*;

- protection then enhancement in the scheme restoration programme of the mediaeval occupation platforms, quarrying and mining landscape within the eastern boundary of the site;

- recovery of structural elements and display of the DFDS where discovered underground; and

- choosing only those areas of land for temporary grazing and access while the scheme goes ahead that have no or robust buried archaeological and upstanding monument assets.

15.190 The development of the FLRS scheme has also already brought about what is probably the most in-depth study of the DFDS. This study continues in the design and implementation stages of the Nant Llesg scheme.

15.191 Some archaeological site evaluation works have already occurred. More evaluation will aim to better define and understand the physical heritage assets prior to the implementation of the scheme, better prescribing and enabling agreement of mitigation solutions. The on-going programme of archaeological evaluation would be developed in consultation with CCBC and approved by them.

15.192 The mitigation addresses site-based requirements in three distinct phases:

- pre the start of site works – from now and through the scheme procurement period;

- during the site works comprising preparation of the site, the box cut and creation of overburden mound, surface mining and backfilling; and

- during the reinstatement of the land surface to its new modelled form and subsequent aftercare

15.193 Some mitigation can be developed during the scheme, as a response to unforeseen discoveries and new and evolving research objectives, this noting the long period of the scheme's programme.

15.194 All mitigation designs would be developed in consultation with CCBC and approved by them to satisfy planning conditions and an archaeological planning brief. The Written Scheme of Investigation would incorporate bespoke research objectives for one or more programmes of archaeology.

Mitigation Objectives Related to Archaeology

15.195 Mitigation of the adverse effects of the current scheme will be achieved through on-going development design. This would aim to reduce the development impacts and effects on predictable assets worthy of high value where they are known to exist. In view of current

advancements made in understanding the heritage of FLRS it is proposed that the mitigation objectives would be:

- preservation of resources *in situ* wherever possible, unless inappropriate, primarily achieved by scheme design development, where ground works will be engineered to avoid archaeological sites and leave the as-found ground conditions undisturbed;

- further survey, documentation and evaluation of all known archaeological features within development areas, generally before they are disturbed by engineering ground works. This may be based on surface inspections, remote sensing and intrusive investigation. Evaluation may be the mitigation undertaking, if no further investigation is then required;

- survey and documentation of known features bordering the development areas, where access is gained and where information would support mitigation and research objectives within the site. This would potentially be based on surface inspections, remote sensing and intrusive investigation;

- archaeological investigation and recording of principal archaeological assets, generally before being disturbed by engineering ground works. The scale of excavation would be commensurate with the extent and value of the site and character of the resources;

- completion of DFDS survey and study within the site and local setting;

- undertaking of one or more phases of archaeological watching briefs, on topsoil stripping at the start of development. This would likely discover archaeological sites of all heritage value, and may result in major to minor archaeological mitigation excavations. Watching briefs would conform to methods and objectives defined by the Institute for Archaeologists and of any others supported by CCBC;

- recording of old mine workings when possible. A specific undertaking would be for investigating and documenting an element of the underground DFDS main drainage route – with a second phase of work as a section of the masonry and brick structure is dismantled related to later reconstruction within the landscape restoration programme;

- implementing a full programme of analysis, to include development of site 3D model, showing the patterns and methods of underground mining and mine drainage;

- reporting and publication of the site based archaeological findings and linked to outputs being progressed for FLRS; and

- support to restoration of the landscape following the completion of the surface mining and land remediation scheme, to reflect on its historic structure and visible features.

15.196 Presently, no mitigation objectives are identified for buried archaeological assets in the parcels of land offered as public access and/or access and grazing land to mitigate impacts on Common land. Some mitigation works may be required to protect upstanding structural remains from accidental damage. The need for mitigation would be reviewed from time to time based on observing the impacts of farm animal husbandry and public access.

Mitigation proposals for Nant Llesg

15.197 Mitigation proposals for each identified archaeological site would be subject to on-going development, responding to further research and consultation, and to the developing methods proposed for the surface mining and land reclamation. The scheme will identify planning

milestones for key stages in the development, to ensure an integration of the archaeological objectives with the refinement of the engineering designs and proposed site based activities.

15.198 The following mitigation principles would broadly apply:

- There would be no mitigation requirements for the following, with one exception, since none are present within the site or within the immediate setting: World Heritage Sites; Scheduled (ancient) Monuments; Listed Buildings; and, Conservation Areas.

- One site is identified for special consideration, Rhaslas Pond. This is a core element of the early DFDS. Mitigation has been a priority within the scheme design, as originally to achieve the scheme it was envisaged the whole of the rather dilapidated reservoir would have to be removed. The scheme was changed allowing for the southern dam to be fully retained supporting Cadw in its consideration of making the south dam a Scheduled Monument. In the short term the south dam will be protected and then later conserved on gaining Scheduled Monument Consent. The northern half of Rhaslas Pond would be removed as part of the coal extraction works and to locate the barrel wash plant and associated stocks. Archaeological investigation and documentation would occur here. Following the completion of the scheme landscape restoration would utilize the retained southern half of the reservoir as a key feature and the footprint of northern half would be shown, marked out as a slightly raised landscape feature. During the period of the scheme some repair and maintenance would possibly be required to the southern embankment of Rhaslas Pond. The mitigation and protection designs would take into account long-term management requirements.

- A full programme of archaeological investigation would be implemented, related to assets that the scheme would remove within the areas of surface mining and land remediation and to assets planned for *in situ* preservation. The scope of the investigation would respond to asset value. All works would be to standards of the Institute for Archaeologists.

- Within and generally bordering the site, where there would be no direct adverse effects to individual and group-wide assets, of prescribed value, there would be no archaeological mitigation requirements. Such sites are identified as being in the landscape to the north, south, east and west of the coal extraction area and overburden mounds, mostly bordering urban Rhymney. Here, some research and investigation would be required supporting early stages of the scheme where there would be making safe of mine shafts and adits and of the associated landscape restoration.

- During the period of the scheme areas designated to preservation would be protected from accidental damage and vandalism. Where archaeological investigations result in the need for preservation of the remains the areas would also be protected. To support mitigation designs there may be as-found condition surveys/evaluations. The investigations would be used to measure site preservation conditions, noting that changes can accidentally result from engineering site works, or, from non-related activities as a result of implementing the scheme. Generally, the surveys would include comprehensive archaeological documentation.

- There would be focused archaeological works where an asset is in the bordering zone to the Nant Llesg site and is related to one or more sites affected within the scheme. The works would be likely to focus on identification and documentation and would likely not involve any intrusive archaeological and surface geophysical forensic investigations. The aim of the condition surveys would be to better define and understand the character and extent of each archaeological site and to allow for short-term and long-term asset condition monitoring and resource management.

- Within various parcels of land to be used as temporary land for grazing and access there would be protection measures to exposed sensitive archaeological and upstanding assets. The assets to be protected would be agreed with CCBC and MTCBC.

15.199 The following mitigation options would be prescribed singly or in combination, where there would be major effects, typically the full removal of assets of high to moderate value within the surface mining area and in the landscape to be used for mitigation bunding and soil and overburden storage:

- survey and recording, to provide surface topographic and feature mapping;
- as necessary, local evaluation and sampling with archaeological pits and trenches; and
- archaeological excavation, carried out by standard archaeological processes to satisfy well-honed research objectives. Given the character of known assets small and moderate scale archaeological excavations are envisaged and these will occur before implementation of the scheme.

(The sites would be identified as a requirement of the consented scheme, prescribed within written schemes of archaeological investigation prepared by the archaeological contractor and approved by CCBC prior to implementation.)

15.200 Where there would be slight or moderate adverse effects to high and moderate valued assets, and where these resources cannot be preserved totally or partially *in situ,* then the mitigation would include:

- survey and recording, comprising site topographic mapping and drawing of exposed features;
- condition determination;
- local site evaluation, variously comprising sampling of the Nant Llesg site with pits and trenches to satisfy precisely determined research objectives. Where no further archaeological work is required this will be regarded as a mitigation process; and
- local excavations and general watching briefs, as part of an overall mitigation package, undertaken before and during the engineering site works.

  (The sites would be identified as a requirement of the consented scheme, prescribed within written schemes of archaeological investigation prepared by the archaeological contractor and approved by CCBC prior to implementation.)

15.201 Where there would be slight or moderate adverse effects to high and moderate valued assets, and where these resources can be retained *in situ*, the mitigation would include:

- survey and recording comprising site topographic mapping and drawing of exposed features;
- determination of condition;
- local evaluation, comprising sampling of the site with pits and trenches to satisfy precisely determined research objectives. Where no further archaeological work is required this would be regarded as a mitigation process; and
- local archaeological excavation, as part of an overall mitigation package during the engineering site works.

(All of these sites would be identified as a requirement of the consented scheme, prescribed within written schemes of archaeological investigation prepared by the archaeological contractor and approved by CCBC prior to implementation.)

15.202 Where the types of assets have a low heritage value and would be totally removed by the scheme the mitigation would be, at maximum, a programme of as-found documentation and the undertaking of watching briefs.

15.203 Where the assets have a low heritage value and would be totally or partially preserved *in situ* the mitigation would be, at a maximum, documentation of features as-found at ground level and condition determination. *(The sites would be identified as a requirement of the consented scheme, prescribed within written schemes of archaeological investigation prepared by the archaeological contractor and approved for implementation by CCBC.)*

15.204 In respect of the 'leat' elements of the DFDS there would be developed an overall mitigation design. The many components would be treated individually and group-wide, this aiming to answer predetermined 'global' research objectives and for an efficient and cost effective integration of archaeological works with the surface mining and land reclamation works. The mitigation programme would consider long term management requirements.

15.205 Where the resources are related to early historic mining, and where there would be major effects to adits, shafts, crop and underground workings, and artefacts located underground the mitigation has to take account of high levels of safety required during the coaling and archaeological operations. All heritage mitigation objectives would be carried out by specially trained professionals. Here mitigation would be:

- survey and recording, of the workings and working methods;
- artefact recovery, documentation and emergency conservation works; and,
- documentation and specialist dismantling of an underground length of the DFDS drain tunnel identified of old mining plans, for later reconstruction within the scope of the landscape restoration scheme. This would occur if the tunnel were to be found in a reasonable and safe condition.

Mitigation in Respect of the Historic Landscape

Introduction

15.206 Table 15.29 draws together the significant landscape effects that would occur to the landscape character areas within the site, in the immediate surroundings and within the land used for access and grazing and access to mitigate impacts on Common land. The areas are shown within the GGAT study of the landscape (GGAT2012c. Figures 11 to 18).

15.207 The development of the scheme has taken the adverse and beneficial effects into account for mitigation prior to, during, and following the completion of the works. Factors taken into account include the scale and distribution of impacts and effects and the cultural value of the buried archaeological and surface landscape assets. For each character area mitigation is then proposed.

Historic Landscape Mitigation Objectives

15.208 The objectives have been to:

- change the impacts and so minimise adverse effects;
- avoid assets of high value, and protect these from accidental damage and vandalism;
- document and study assets *in situ* that cannot be avoided followed by removal under controlled professional archaeological conditions; and
- utilize recovered assets and memories of them in the restored landscape.

15.209 Mitigation within the landscape character areas is shown below:

Table 15.28 Mitigation within the local historic landscape character areas

Character Area	Significance of the Effect	Proposed Mitigation
Within Nant Llesg Site (NLLHLCAs)		
001 Rhaslas	Major -Permanent	Achieved: Redesign of the scheme layout, part preserving of Rhaslas Pond. No effects to the areas outside the site to the west (also a SINC) Future: A programme of archaeology. Incorporation of cultural heritage features within the restored landscape
002 Pant-y-waun	Minor - Temporary	Future: A programme of archaeology related to residual features not affected by the previous surface mine coal extraction and landscape restoration.
003 Nant Llesg.	Major Temporary	Achieved: Redesign of the scheme layout. Future: Preservation and protection of the landscape along the eastern and southern areas of the site, beyond the coal excavation area and overburden mounding. A programme of archaeology. Incorporation of cultural heritage features within the restored landscape.
004 Lower Cwm Wen	Minor to Moderate - Temporary	Achieved: Modification of the scheme layout. Future: Preservation and protection of the landscape along the eastern and southern areas of the site, beyond the coal excavation area and overburden mounding. A programme of archaeology. Incorporation of cultural heritage features within the restored landscape.
005 Tunnel Pit.	Major - Temporary	Future: Preservation and protection of the landscape in the southern areas of the site, beyond the coal excavation area and overburden mounding, and surface remediation. A programme of archaeology.

Character Area	Significance of the Effect	Proposed Mitigation
		Incorporation of cultural heritage features within the restored landscape.
006 Cwm Bargoed Washery Depot	Minor - Permanent	Future: A programme of archaeology where there has been no modern redevelopment associated with Ffos-y-fran scheme. Incorporation of modern industrial structures within the old industrial landscape
007 Fochriw Pit Pond	Moderate - Temporary	Achieved: removed from the scheme.
008 Cwm Carno	Major	Achieved: removed from the scheme. Future: Cultural heritage opportunities with objectives shared with the restoration of the Nant Llesg site.
Outside the Nant Llesg Site (HLCAs)		
031 Merthyr Common	Minor	No mitigation proposed, related to there being only short-term adverse visual effects
032 Cwm Bargoed Washery	Minor	No mitigation proposed, related to there being only short-term adverse visual effects
041 Merthyr Common North	Minor	No mitigation proposed, related to there being only short-term adverse visual effects
075 Garth Fawr	Minor	No mitigation proposed, related to there being only short-term adverse visual effects
076 Bargoed Taff	Minor	No mitigation proposed, related to there being only short-term adverse visual effects
077 Merthyr Common South	Moderate	No mitigation proposed, related to there being only short-term adverse visual effects
078 Dowlais	Minor	No mitigation proposed, related to there being only short-term adverse visual effects

Character Area	Significance of the Effect	Proposed Mitigation
Great Tip		
Parcels of land for temporary grazing and/or public access	None	Securing of significant upstanding remains from accidental damage. Some local research excavation related to community based archaeological activities No mitigation required in respect of visual concerns

Mitigation of Effects Following the Completion of the Scheme, Within the Period of Restoration and Aftercare

15.210 In addition to the site-specific and general archaeological pre-scheme implementation mitigation works, the effects of the development on the historic landscape and its associated features would be further minimized, during the restoration and aftercare phase through:

- re-use and maintenance of water features as part of site drainage where possible;
- retention wherever possible of current landform, cover and land boundaries; and
- improved protection and on-going monitoring and management of the area as a whole where possible.

15.211 To part compensate for loss of heritage remains forming the historic landscape Miller Argent propose to retain various structural features of their scheme. Some of these will become elements in the restored land and other will be buried, effectively becoming future archaeological resources. Further information is presented in the restoration strategy report (Chapter 11 of the Planning Statement, *Restoration Strategy*).

Residual Effects to Archaeological Resources Following Mitigation

15.212 Given a programme of archaeological mitigation, before, during and after the implementation of the Nant Llesg scheme it is necessary to consider residual adverse effects. Such effects would be evident in the long term. The degree to which there are such effects (those that cannot be successfully mitigated), is the measure to which the cultural heritage related objectives are not fully successful.

15.213 Table 15.29 presents a summary of the archaeological undertakings to specific key archaeological resources and illustrating the magnitude of residual effects.

Table 15.29 Residual effects following key mitigation undertakings on archaeological sites

Location/Ref	Description of Effect	Scale of Residual Effect
Rhaslas Pond	Loss of fabric and visual aspects of the removed northern embankment and impounded water. Investigation, documentation and showing the outlines within the restored landscape only partially a mitigation of impact adverse effects.	**Moderate adverse**
Rhaslas Pond	Conservation and on-going maintenance of southern embankment to retain authenticity and integrity	**Moderate beneficial**
DFDS	Investigation, documentation and showing the outlines within the restored landscape only partially mitigation of impact effects. Presentation of preserved leats within the restored landscape and along external heritage trails	**Minor beneficial**
Mine shafts and adits on east side of site	Making safe, protection and enhancement – adverse effects off set by recreation of features of shafts and adits at the ground surface	**Minor beneficial**
Medieval house platforms	Making safe and, protection and use as an educational resource	**Minor beneficial**
Post medieval quarry faces and working platforms	Making safe and, protection and use as an educational resource	**Minor beneficial**
Industrial aged colliery spoil tips	Making safe, protection and enhancement	**Minor beneficial**

Direct and Indirect Long-Term Residual Effects to the Historic Landscape

15.214 The completed scheme would be followed by restoration and long term aftercare. This would include provision for the monitoring and enhancement of the character area landscapes.

15.215 The magnitude and significance of the determined residual effects to the overall historic landscape are illustrated in Table 15.30.

Table 15.30 Residual effects to the historic landscape

Nant Llesg Local Historic Landscape Character Area	Significance of the residual adverse Effects following Mitigation	Comments
Within Nant Llesg Site		
001	Very Slight	There would be a requirement to carry out active management and maintenance of the reservoir stone armoured banks of the south dam. Minor loss of authenticity may occur as a result of complying with the Reservoir Act of 1975
002	None	Slight beneficial effects may result from enhanced landscape protection and management
003	Very Slight	There would be a requirement to carryout active management and maintenance of retained features of the DFDS. Minor loss of authenticity may occur
004	None	Slight beneficial effects may result from enhanced landscape protection and management
005	None	Slight beneficial effects may result from enhanced landscape protection and management
006	None	Minor to moderate beneficial effects would result from the facilities being retained as cultural 'industrial' heritage resources
007	None	Slight beneficial effects may result from enhanced landscape protection and management
008	None	Slight beneficial effects may result from enhanced landscape protection and management
Outside the Nant Llesg Site		
031	None	Views to and from the character areas are re-established. Slight beneficial effects would result from enhanced understanding of the character area and its better on-going protection and management
032	None	Views to and from the character areas are re-established. Slight beneficial effects would result from enhanced understanding of the character area and its better on-going protection and management
041	None	Views to and from the character areas are re-established. Slight beneficial effects would result from enhanced understanding of the character area

Nant Llesg Local Historic Landscape Character Area	Significance of the residual adverse Effects following Mitigation	Comments
		and its better on-going protection and management
075	None	Views to and from the character areas are re-established. Slight beneficial effects would result from enhanced understanding of the character area and its better on-going protection and management
076	None	Views to and from the character areas are re-established. Slight beneficial effects would result from enhanced understanding of the character area and its better on-going protection and management
077	None	Views to and from the character areas are re-established. Slight beneficial effects would result from enhanced understanding of the character area and its better on-going protection and management
078	None	Views to and from the character areas are re-established. Slight beneficial effects would result from enhanced understanding of the character area and its better on-going protection and management

15.216 The minor to moderate beneficial effects would be in respect of:

- the final form of the site drainage, designed in order to retain the character of elements of the DFDS. Discussions concerning the desirability and feasibility of replicating key affected features at this stage would be held with CCBC and Cadw, and other interested parties. The proposals would support longer term monitoring and management;

- conservation of the embankment, forming the Rhaslas Pond reservoir dam in the south and outlining the northern one as a surface feature, taking account of the previous investigations and documentation. The proposals would support longer term monitoring and management;

- conserving and displaying cultural heritage features not effected by the scheme, those generally lying around perimeter of the Nant Llesg site, within five defined archaeological site cluster areas. The proposals would support longer term monitoring and management; and,

- reinstatement, in the restored landscape, of structural components of archaeologically excavated sites, these investigated as part of mitigation requirements. Discussions concerning the desirability and feasibility of replicating key affected features at this stage would be held with CCBC and Cadw, and other interested stakeholders. Such objectives would be developed with ecological and other restoration objectives. The proposals would support longer term monitoring and management.

15.217 The results of all cultural heritage activities occurring on site would be complemented by a programme of activities giving ‘added value’ – regarded as indirect beneficial effects:

- on- going historical research;
- publication of findings; and
- increasing public awareness and participation, in local history and archaeology in this area of the South Wales valleys, and supporting of school education objectives.

Cultural Heritage Restoration Strategy

15.218 The Scheme offers an opportunity to promote cultural heritage in the landscape restoration proposals, giving long term added value, following the achieving of mitigation requirements. The strategy offers the potential to variously preserve archaeological sites and present them for long term community benefits.

15.219 In the landscapes surrounding the two main site areas, the creation of mitigation bunds, excavation cut and overburden mounding, there are opportunities to retain and 'use' the archaeological assets – with a focus on those with greater heritage value. The local landscapes, where there are opportunities, are found to the east and west of the two core areas. Here the proposals would be:

- early land remediation, effectively minimizing the risk of mine shaft and adit collapses. This land will be made safe in the first two years of the scheme and then locally restored and handed back for various uses. The shafts and adits mainly occur to the east and west of the surface mining excavation and overburden mound; and,
- providing visual and acoustic bunding, related to commercial and residential occupation in Rhymney. This land will be restored following the completion of surface mining.

Both types of areas will require a minimum 5 years of aftercare and this will ensure cultural heritage objectives are secure and sustainable.

15.220 The strategy would include using the cultural heritage assets to:

- tell and illustrate 'stories', mostly related to local history of Common land agricultural uses and mineral exploitation by quarrying and mining - allowing tangible and intangible heritage to be integrated with landscape restoration and onward uses;
- linking up the stories to other themes, mainly those related to the natural environment. Key component for cultural heritage is the DFDS which still has a functional landscape drainage use today;
- giving a character to the landscape, with modern and historic elements - which otherwise would all be a new creation;
- forging heritage trails with key themes, traversing Gelli-Gaer and Merthyr Common and including those established for the restoration objectives in the FLRS;
- allow for future research and celebration; and
- whenever possible, incorporating the few known older archaeological assets, those of prehistoric to mediaeval age.

15.221 Five significant cultural heritage character areas are defined within the restoration plan (Cluster Areas or 'CA'). The cluster areas are shown on MA/NL/ES/16/012-1 and MA/NL/ES/16/012-2 and are described within the Restoration Study (Chapter 11 of the Planning Statement).

CA1

- Key Story: General mining history
- Priority: Low
- Location: South end of Area 4
- Scheme Activities: Most of CA1 is an undisturbed area within and beyond the MA scheme and for inclusion within the MA restoration design. Some of CA1 is within land for remediation and restoration in approximately two years into the MA scheme.

CA2

- Key Story: Quarrying, shafts/adits, tips and spoil, and medieval housing platforms
- Priority: High
- Location: South end of Area 6
- Scheme Activities: CA1 is within land for remediation and restoration in approximately two years into the MA scheme. The area is adjacent to a water treatment lagoon (a rectangular pond). Part of the area would be left as-found but in a safe condition.

CA3

- Key Story: Complex mining with features strewn along drainage route
- Priority: Low to Moderate
- Location: North end of Area 6
- Scheme Activities: CA3 is within land for remediation and restoration in approximately two years into the Miller Argent scheme. The area is within the zone scheduled for a visual and acoustic bund. Part of CA3 is within coal working excavation area, where there will be archaeological mitigation.

CA4

- Key Story: Complex surface features of mining landscape
- Priority: High
- Location: Off the north-west end of Rhaslas Pond
- Scheme Activities: Area 3 would be scheduled for remediation and return to Common land in approximately two years into the MA scheme. CA4 is part within and part outside the coal working excavation area. The northern embankment of Rhaslas Pond would be removed and illustrated later in the restored landscape. The area is outside and just within the toe of the overburden mound.

CA5

- Key Story: Rhaslas Pond and DFDS
- Priority: Very High
- Location: Off the south-west end of Rhaslas Pond and on the east end
- Scheme Activities: Reinstated Common land and a natural landscape west of Fochriw Road. CA5 includes part of Area 3 for remediation and return to Common land approximately two years into the scheme. The area will include the main office and access road (and haulage road?)

15.222 Engineering works in the landscape areas east and west of the main area of the scheme would not totally impact on the as-found ground surface. Here there would be opportunities, while undertaking the engineering works to make shafts and adits safe, for having pre-designed and integrated cultural heritage objectives. The process for making a shaft safe would likely involve all or most of the following tasks:

Phase I

- re-evaluation of location based on OS maps, mine plans of various sorts, Coal Authority databases, other documents, use of air photos/Lidar. The aim is to get a new best fit for shaft location;*
- site inspection, talking to local people (*);
- geophysical prospecting (techniques potentially including: GPR, Thermography, Gravimetrical, Resistivity, Magnetrometry, Gas emission) (*);
- trenching/area stripping, responding to findings of the prospecting (*);
- inspection of found features and void from ground surface – followed by recording (mostly by photography to ensure a high level of safety) (*); and,
- re-evaluation of what is found with the as-found documentation (part of risk assessment).(*)

Phase 2

- design of remedial work and methods of working (in accordance with Coal Authority best practice) (*);
- tipping down void of shaft, if required (Possible drilling to find depth of shaft staging where void appears to be filled?), all undertaken to high levels of safety;
- cleaning away of local overburden to create a working area at rock-head – in the area of old pithead structures and infrastructure(*);
- further void filling as necessary;
- construction of capping (likely to be an extensive RC slab, set into the rock-head, where possible,)
- back-filling above slab nearly to ground level; and,

- completion of backfilling with top soil to ground surface.

The activities marked "(*)" above illustrate where archaeological skills can be useful and where collected information can be ploughed back into heritage mitigation undertakings and reporting.

15.223 Additional to the above activities, specifically aimed at landscape restoration, there would be:

- local excavation and recording of pit head structures – much the same as undertaken at FLRS . This would be followed by some consolidation of remains for display within the restoration plan; and,

- reconstruction of shaft linings at ground level, likely to be brick or stone, set on the concrete capping slab and brought up to slightly above restoration ground surface. The form and style of construction work to match the construction detailing of the encountered shaft. The internal area would have an ecology or architectural treatment. The creation of the 5 Cluster Areas would be classed as a moderate effect, a positive beneficial mitigation undertaking giving added value to the landscape restoration. The design would be part of the landscape restoration design and would be agreed with CCBC and the land owners.

15.224 The focus of reconstruction would be in the restoration landscape along the east side of the Nant Llesg site and at the east end of the Rhaslas Pond south embankment (in CA2 and CA3, and possibly CA5). Reconstruction would only occur a few times where the mine was one of the more interesting/important ones, based on heritage research and mitigation undertakings – and where it could be part of a story in the restoration proposals, providing an educational tool, probably along a heritage trail. This reconstruction strategy would be classed as a moderately beneficial effect, a positive mitigation undertaking giving added value to the landscape restoration.

15.225 The same sort of objective would be developed for illustrating the location and construction of a few mine adit entrances.

15.226 The reconstructions would be considered for a possible community project – perhaps involving retired old miners with building skills.

15.227 It is proposed not to reinstate the north embankment of Rhaslas Pond to make it functional for holding reservoir water. The scheme proposes that during the restoration, and taking account of archaeological mitigation results, the recovered and stored armouring stone would be used to recreate the alignment and form of the removed embankment. The northern part of Rhaslas Pond would peter out to a wetland marsh and remain related to the retained water body to the south.

15.228 The scheme also would offer an opportunity to retain elements of the scheme's Water Treatment Areas. These are important elements of water management and mirror water reservoirs of the DFDS, including Rhaslas Pond. Thus, from a cultural point of view, some retention, by adaptation, of the lagoons provides 'continuity' of the landscape having had an important industrial land use. The retention following completion of the scheme would support ecological and landscape restoration proposals that would be implemented, and 'handed back' earlier, within the first two years of the scheme. This proposal would be classed as a minor beneficial effect, a positive mitigation undertaking giving added value to the landscape restoration.

15.229 The scheme proposes, that if found and if in a good condition within the surface mine excavation, the DFDS underground drainage tunnel is identified and documented. Old mining plans are suggestive of it being constructed in stone or brick masonry. A short length would then be dismantled, further documented and later rebuilt within the restored landscape. This takes note that the DFDS was a 3-dimensional facility of water management providing it to

Merthyr's Dowlais Ironworks (GGAT 2012a – Appendix MA/NL/ES/A15/001). This would support 'added value' to the restoration, as the scheme is required to retain the south embankment of Rhaslas Pond and nearby many leats will be left in the retained natural landscape. Many elements of the DFDS are also preserved within FLRS. The restoration proposes the rebuilt element would be sited in cultural heritage Cluster Area 3 where it could functionally serve as a foot bridge across a small stream. This function would help with its maintenance and management requirements, more difficult if left as an isolated feature elsewhere. This reconstruction strategy would be classed as a moderately beneficial scheme effect, a positive mitigation undertaking giving further character to the landscape restoration.

Community Engagement

15.230 Previous sections of this chapter have drawn attention the scheme getting local interest groups involved with research and mitigation undertakings, as part of education outreach objectives, part of Welsh Government historic environment strategy (Cadw2012). This would follow on from the outreach activities occurring on FLRS. Opportunities relate to fieldwork for locating and assessing archaeological sites - for example in the landholdings proposed for mitigation of impacts upon Common land and in mitigation excavations that would be occurring before engineering works start. The scheme proposes some reconstruction that could involve retired miners. Involving the community would require special designs to ensure a high level of site safety and welfare.

Research of *in situ* Preservation of Artefacts

15.231 The aim of this research theme would be to see how artefacts of various types of material survive in the buried environment at identified archaeological sites. The research would be undertaken by one or two local schools directed by GGAT and supported by Miller Argent staff and consultants, and possibly involving a university. Involving schools and a college would require special designs to ensure a high level of site safety and welfare.

15.232 The aim would be to bury 'grids' of new artefacts (of many types) in the local natural ground, under top soil mounding, and under excavation spoil mounding. One set of artefacts would be at 0.5m depth and another at 1m. A grid of artefacts would be uncovered half way through the scheme and another during the site restoration period. The excavation would look at distortion and decay changes to the artefacts and this would support a consideration of how well old archaeological artefacts have been preserved, or not! Other sets of artefacts could be left in the local natural ground for a further period of time, for longer term monitoring. The study of artefact preservation could also be useful for environmentally assessing soils.

15.233 Some of the tasks would include: documentary research; soil testing; assessing and describing sites in the field; collecting and describing artefacts for the experiments; modeling anticipated performance, relating artefacts to matching ones found in FLRS; locating and constructing the test facilities; short-, medium- and long-term monitoring; and, assessing artefacts after excavation. For schools, this would involve education in several science subjects. The proposal would give added value to the archaeological mitigation agenda and be innovative for Welsh archaeological sciences.

Education Centre

15.234 The Education Centre at the CDP would be continued and further developed to provide a facility for local schools and visitors. It would aim to accommodate:

- arranged visits by parties or individuals who have an interest in activities at Nant Llesg;
- community based archaeological activities that would be developed for the scheme;
- information about cultural heritage and ecological finds and activities on Nant Llesg for the information of visitors;
- further details derived from Nant Llesg about the Dowlais Free Drainage System and historic mining, the Tair Carreg Moor Site of Importance for Nature Conservation, the Cefn Gelligaer West of Deri Site of Importance for Nature Conservation;
- ecological management of land south of Bryn Caerau Farmstead; and
- information on the progress and on-going proposals for the Nant Llesg scheme.

15.235 The Education Centre, originally established for FLRS, would help in interpreting the five cultural heritage Cluster Areas on Nant Llesg.

Alternative Proposals

15.236 The Environmental Statement has addressed alternative proposals for implementing the scheme. As these were considered the effects of them on known cultural heritage assets were assessed. The aim was to identify opportunities to minimize the adverse effects and supporting mitigation objectives.

15.237 The alternative scheme options would have required the same programme of archaeological works, given the scheme cannot avoid the objective of making the landscape safe, the deep excavation to recover coals and the need for having a large area for spoil storage.

15.238 Modifications to the scheme design have resulted in preserving archaeological remains in situ, that originally would have been removed, these generally located along the east and west sides of Nant Llesg.

Summary and Conclusions

15.239 In respect of cultural heritage, the EIA methodology for the Nant Llesg scheme has mirrored that used for the Ffos-y-fran Land Restoration Scheme. Here, the resulting mitigation undertakings have proved highly successful, significantly contributing to archaeological research findings celebrating the history and culture of the area.

Key Findings

15.240 As a result of a desk based assessment supported by some site investigations, all carried out by Glamorgan Gwent Archaeological Trust (GGAT [Contracts]), there is a thorough

understanding of cultural heritage assets to be found in the Nant Llesg scheme and within the immediate context.

15.241 Assets are found throughout the landscape, singly and in clusters, and support giving the landscape a strong historic character. Many support the identification and valuing of natural ecological landscape elements.

15.242 Rhaslas Pond and related leats are regarded as of high value, components of the once extensive Dowlais Free Drainage System, a water management facility for providing water to Dowlais iron works. Although not yet a scheduled monument, the south embankment of the reservoir is being regarded as scheduled following discussions with Cadw.

15.243 No other scheduled monument lies within Nant Llesg site and it does not include Conservation Areas and Listed buildings. The site is not part of a designated historic landscape, these deemed to be of national value. Merthyr and Gelligaer Common, generally to the west and south of Nant Llesg, are designated and form a site context. The Common forms a series of Local Historic Landscape Areas (LHCAs) and these have been identified and assessed. The scheme has been found only to have temporary long term effects to these – for the duration of the scheme prior to final landscape restoration.

15.244 Given the growing value of the south embankment of Rhaslas Pond a series of Nant Llesg Local Historic Landscape Character Areas (NLLHLCAs) have been identified on site and assessed, these also supporting the interpretation of the assets where found singly and in clusters. The scheme will have permanent effects to these.

15.245 Most assets stem from the industrial period, related to the mining industry – features representing all aspects of quarrying mining and coal/ironstone processing – and also to the resultant vast amount of ground disturbance, mostly related to spoil disposal. Notably, there are a large number of mine shafts and related pit head buildings and structures, many still to be seen in the landscape. Rhaslas Pond and the water leats are notable features of the historic landscape.

15.246 Surviving within this highly disturbed landscape are older features, notably medieval house platforms where farm building and animal pens were sited. The desk-based assessment would suggest there is a chance of there being older sites – of Prehistoric and Roman age.

15.247 The proposed Common land exchange areas contain just a few archaeological assets and some of these relate to the archaeologically rich sites on Merthyr-Gelligaer Commons.

Mitigation Measures

15.248 In areas where archaeological assets would be removed by the implementation of the scheme a programme of archaeology would occur, comprising excavation and watching briefs. This would be based on planning briefs provided by CCBC and MTCBC, supported by advice from Cadw and the Miller Argent in house and archaeological staff, and the appointed archaeological contractor (GGAT[Contracts]). All undertaking would be carried out to standards of the Institute for Archaeologists.

15.249 The programme of archaeology will apply to known and predicted archaeological sites and to those that would be discovered during the early stages of implementing the Nant Llesg scheme. Most archaeological excavation will be to assets found slightly to moderately buried within top soils and sub soils. The mitigation undertakings would occur progressively ahead of each area of proposed works on the land, including that identified for early remediation and over the operational area of the mine.

15.250 The archaeology would apply to assets of all ages and extent. The duration of each excavation would be related to the value and extent of the buried resources. Where assets are identified as of local/minor interest the mitigation would support local investigations, documentation and recovery of the associated artefacts.

15.251 Mitigation would also occur when assets are identified within old coal workings and need documentation and recovery.

15.252 Positive effects would result from a range of cultural heritage activities related to the proposals for landscape restoration. This would include: community based cultural heritage projects; education programmes for schools; forward looking archaeological scientific research; and, preservation/restoration/reconstruction of archaeological features in the restored historic landscape.

15.253 Given the significance of Rhaslas Pond to the Dowlais Free Drainage System, the southern half of the reservoir would be retained in situ, protected and conserved following the completion of the scheme. This would be related to the status of Rhaslas Pond if taken forward for scheduling. The northern half of the reservoir would be thoroughly investigated and documented prior to its removal. The form and character of the northern embankment and water body would be later reflected in the restoration design for the historic landscape.

Residual Effects

15.254 Given the intent to undertake a through programme of archaeology no significant residual adverse effects are identified. Either assets would have been preserved as-found in situ, thus would not be adversely affected, or, would have been removed through archaeological process. Permanent minor adverse effects to local value resources could occur if safety concerns would not allow for safe access for full mitigation undertakings. Permanent minor positive effects would result from conservation and stabilisation of exposed industrial structures during the programme of making-safe abandoned mine shafts. Permanent minor to moderate positive residual effects would result from the ‘added value’ research, data accumulation, the publication of findings and educational uses of the programme of archaeology results. This would also support cultural heritage objectives in the landscape restoration programme.

Cumulative Effects

15.255 The cultural heritage assessment has taken account of four significant developments within the context of the Nant Llesg site. Given the works presently occurring, and to further occur, within the identified developments, no cumulative significant adverse effects are identified in relation to known and potential cultural heritage assets.

Conclusion

15.256 In respect of cultural heritage, the Environmental Impact Assessment (EIA) methodology for the Nant Llesg Scheme has mirrored that used for the Ffos-y-fran Land Restoration Scheme. Here, the resulting mitigation undertakings have proved highly successful, significantly contributing to archaeological research findings, celebrating the history of the area.

15.257 Miller Argent (South Wales) Limited has employed GGAT to study the Nant Llesg site and the areas of land that would be temporarily used for grazing and public access or just access. To

inform the EIA there has been comprehensive desk-based research and field investigation studies, defining and interpreting previously found and newly discovered archaeological assets. Throughout the area are extensive industrial aged sites and remains. Surprisingly, given the impact of mining on the landscape, there are locally surviving older remains, spanning prehistoric to post-medieval times, witnessing habitation and agricultural activities, albeit on the edges of the operational area.

15.258 The EIA study has examined the assets in terms of the scheme impacts and the significant adverse and positive effects that would result. Within the mitigation bunding, excavation and overburden mound areas all archaeological remains would be removed. Elsewhere, remains would be variously retained where possible and appropriate or removed, in relation to localised activities associated with implementing the scheme.

15.259 A comprehensive mitigation agenda has been defined for the Nant Llesg Scheme that would off-set the adverse effects the scheme would have on significant cultural heritage assets. This would comprise a programme of extensive and small-scale archaeological excavations and watching briefs – all conforming to well-honed research objectives agreed with CCBC. MTBC would be consulted as to research objective associated with the parcels of land within the county borough proposed for temporary public access or grazing and access uses. The mitigation undertakings would occur progressively ahead of each area of proposed works on the land including that identified for early remediation and over the operational area of the mine.

15.260 Positive effects would result from a range of cultural heritage activities related to the proposals for landscape restoration. This would include: community based cultural heritage projects; education programmes for schools; forward looking archaeological scientific research; and, preservation/restoration/reconstruction of archaeological features in the restored historic landscape.

15.261 Given the significance of the Rhaslas Pond to the DFDS, the southern half of the reservoir would be retained in situ, protected and conserved following the completion of the scheme, related to its status if taken forward for scheduling. The northern half of the reservoir would be thoroughly investigated and documented prior to its removal. The form and character of the northern embankment and water body would be later reflected in the restoration design for the historic landscape.

15.262 Overall, the scheme, following the mitigation and added value agendas, would result in minor acceptable residual adverse effects.

References & Appendices

Cadw/ICOMOS-UK/CCW Joint Initiative 1998. Register of Landscapes of Historic Interest in Wales. Part 2 of the Register of Landscapes, Parks and Gardens of Special Historic Interest in Wales. Part 2.1 Landscapes of Outstanding Historic Interest.

Cadw/CCW/WATs,2003, Guide to Good Practice on Using the Register of Landscapes of Historic Interest in Wales in the Planning and Development Processes. Version 1, February 2003.

Cadw (for the Welsh Assembly Government), 2011. Conservation Principles for the sustainable management of the historic environment in Wales. March 2011.

Cadw (for Welsh Government), 2012. Historic Environment Strategy for Wales.

Department for Culture, Media and Sport, and Welsh Assembly Government, 2007. Heritage protection for the 21st Century. March 2007.

Caerphilly County Borough Council, 2008. Local Development Plan Up to 2021. Background Paper 3, Historic Environment. October 2008.

Caerphilly County Borough Council, 2010. Local Development Plan up to 2021. Written Statement. November 2010.

Caerphilly County Borough Council, 2012a. Request for Scoping Opinion, dated 9th March 2012. Appendix 1, Page two, response review by Glamorgan Gwent Archaeological Trust.

Caerphilly County Borough Council, 2012b. Revised Scoping Opinion, addressed in letter to the applicant dated 23rd August 2012.

Glamorgan Gwent Archaeological Trust Ltd. (GGAT 2012a). Rhaslas Pond Nant Llesg Surface Mine incorporating land remediation, Caerphilly. September 2012.

Glamorgan Gwent Archaeological Trust Ltd. (GGAT 2012b). Nant Llesg Surface Mine incorporating land remediation, Caerphilly. Archaeological desk-based assessment. December 2012.

Glamorgan Gwent Archaeological Trust Ltd. (GGAT 2012c). Nant Llesg Surface Mine incorporating land remediation, Caerphilly. Historic Landscape Assessment (ASIDOHL2). Archaeological desk-based assessment. December 2012.

Glamorgan Gwent Archaeological Trust Ltd. (GGAT 2013). Nant Llesg common land exchange, Merthyr Tydfil and Caerphilly. Archaeological desk-based assessment. January 2013.

Miller Argent (South Wales) Ltd. Nant Llesg Surface Mine including Land reclamation. Request for Revised Scoping Opinion. December 2011. Section 22, Archaeology and Cultural Heritage, pp93-104.

Nixon. A. Report on the Examination into the Caerphilly County Borough Council's Local Development Plan up to 2021. Inspector's Report to Caerphilly County Borough Council, 2010.

Welsh Government. Planning Policy for Wales. Chapter 6, Conserving the Historic Environment. November 2012.

Nant Llesg Surface Mine

Incorporating Land Remediation

Chapter 16

Landscape and Visual

Nant Llesg Surface Mine

Incorporating Land Remediation

Chapter 16 – Landscape and Visual Impact Assessment

miller argent

Table of Contents

Tables

16 Landscape and Visual Impact Assessment

Introduction

16.1 The Scoping Opinion issued by CCB Council (CCBC) seeks an assessment of visual impact and landscape issues to be included as a topic to be covered by the ES.

16.2 The LVIA is illustrated with plans, photographs and visualisations, as follows:

Table 16- 1 LVIA Drawings

Drawing number	Title
MA/NL/ES/016/001-1	Landscape and visual context 1:50,000
MA/NL/ES/016/001-2	Landscape and visual context 1:25,000
MA/NL/ES/016/002 -	Topography context
MA/NL/ES/016/003-1	Landscape designations 1:50,000
MA/NL/ES/016/003-2	Landscape designations 1:25,000
MA-NL-ES-16-003-3	LDP policies 50k
MA-NL-ES-16-003-4	LDP policies 25k
MA/NL/ES/016/004	LANDMAP: Level 3 classification
MA/NL/ES/016/005	LANDMAP: Overall Evaluation
MA/NL/ES/016/006	Public Access
MA/NL/ES/016/007	Landscape of the site
MA/NL/ES/016/008	Site photographs
MA/NL/ES/016/009	Zone of theoretical visibility Phase 1,3,4

Drawing number	Title
MA/NL/ES/016/010	Viewpoint locations
MA/NL/ES/016/011	Viewpoint photographs
MA/NL/ES/016/012-1	Restoration concept
MA/NL/ES/016/012-2	Restoration strategy
MA/NL/ES/016/013-1, 2	Viewpoint Photograph 1A - Photomontage Views
MA/NL/ES/016/014-1, 2	Viewpoint Photograph 2 - Photomontage Views
MA/NL/ES/016/015-1, 2	Viewpoint Photograph 3A - Photomontage Views
MA/NL/ES/016/016-1, 2	Viewpoint Photograph 3B - Photomontage Views
MA/NL/ES/16/017-1, 2	Viewpoint Photograph 10 - Photomontage Views
MA/NL/ES/16/018-1, 2	Viewpoint Photograph 14 - Photomontage Views
MA/NL/ES/16/019-1, 2	Viewpoint Photograph 18 - Photomontage Views
MA/NL/ES/16/020-1	Viewpoint Photograph 23 - Photomontage Views
MA/NL/ES/16/021-1	Cumulative LVIA Other Developments
MA/NL/ES/16/021-2	Cumulative LVIA Timeline with other developments
MA/NL/ES/16/021-3	Cumulative Zone of Theoretical Visibility Phase 3

16.3 Detailed data are set out in Appendices, as follows:

MA/NL/ES/A16/001	LANDMAP
MA/NL/ES/A16/002	Viewpoint Details
MA/NL/ES/A16/003	Planning Policies for the Landscape & Landscape Designations

Methodology

16.4 The methodology for assessing the landscape and visual effects is based on the recommendations in the Guidelines for Landscape and Visual Impact Assessment (GLVIA)[1].

16.5 The Landscape and Visual Impact assessment (LVIA) for the proposed Nant Llesg development was largely prepared between November 2011 and June 2013, using the 2nd Edition of the Guidelines for Landscape and Visual Impact Assessment as the basis for the assessment methodology.

16.6 The 3rd Edition of the Guidelines was published on 17th April 2013. In response to queries from members, the LI's Technical Committee produced a statement on the transition from the 2nd to the 3rd edition, which was published on the LI's website, http://www.landscapeinstitute.org/knowledge/GLVIA.php.

16.7 This is the Statement from the LI on the "transition":

16.8 GLVIA3 replaces the second edition GLVIA2. In general terms the approach and methodologies in the new edition are the same. The main difference is that GLVIA3 places greater emphasis on professional judgement and less emphasis on a formulaic approach. Members have asked for clarification on the status of projects developed under GLVIA2, but reviewed or implemented after publication of the third edition.

16.9 *An assessment started using GLVIA2 should be completed using that edition. However, if in the view of the professional a comparison should be undertaken with GLVIA3, and subsequently if necessary a re-assessment undertaken according to GLVIA3, then this should be discussed and agreed with the client in the first instance. Obviously, assessments started after the publication of GLVIA3 should use it, rather than GLVIA2*

16.10 In principle, then, the LVIA for Nant Llesg should be completed using GLVIA 2nd Edition guidance, even though it will be submitted with a planning application more than 2 months after publication of the 3rd Edition.

16.11 Although the approach and methodologies in the 3rd Edition are the same in principle, the new Guidelines set out a step-wise approach to assessing sensitivity of receptor, magnitude of change and significance of effect. The terminology in the LVIA for Nant Llesg may not accord with that of GLVIA3, but a clear chain of reasoning is set out, from description of the baseline, through consideration of the changes likely to arise from the development proposals, the sensitivity of landscape and visual receptors to those changes, the magnitude of the changes and, hence, the level significance of the effect

16.12 The objectives of the LVIA are to:

- Establish the baseline conditions for the landscape context and visual amenity
- Identify potential effects on features and aspects of the landscape and on views of the site
- Propose measures to prevent, reduce or offset adverse effects
- Assess the nature, degree and significance of effects with mitigation measures in place.

[1] Guidelines on Landscape and Visual Impact Assessment, 2nd Edition, Landscape Institute and Institute of Environmental Management and Assessment, Spon 2002

Study areas

16.13 Extents of study areas for the landscape, visual and cumulative impact assessments, (**Drawing MA/NL/ES/16/001**), are:

- Landscape assessment study area: the extent of the application site and the landscape context up to 5 kilometres of the site. The 5km area is modified in fact by topographic features, and the ridges to west, south and east and the rising land to the north (**Drawing MA/NL/ES/16/002**) restrict the zone of influence or landscape context of the site.
- Visual impact assessment study area extends to a distance of 5 kilometres
- The study area for the cumulative landscape and visual impact assessment also extends to a distance of 5 kilometres.

Darkness and lighting

16.14 The broad lighting characteristics of the site and its surroundings were identified as well as isolated point sources of light in dark areas, to enable the effect of the lighting associated with the proposed scheme on the night-time landscape and visual amenity to be assessed.

16.15 The assessment methodology for effects of lighting of the development is based on the recommendations and guidance published by the Institute of Lighting Engineers (ILE)[2] and the former Department of Communities and Local Government[3] and the definitions and terms in the Institute of Lighting Engineers guidance:

- *Environmental Zones*, categories used to identify and map the levels of lighting within the study area:
  - E1: Intrinsically Dark, the level of darkness found in remote countryside
  - E2: Low Distinct Brightness, the level of light found in a rural or small village location
  - E3: Medium Distinct Brightness, as found in small towns or urban locations
  - E4: High Distinct Brightness, associated with larger town centres with a high level of night time activity.
- *Lighting characteristics*, terms used to describe the extent to which lighting affects the wider landscape:
  - Light Pollution: obtrusive light, or impeding view of night sky, etc.

---

2 Institute of Lighting Engineers, Guidance Notes for the Reduction of Light Pollution, 2011, available on ILE website: https://www.theilp.org.uk/documents/obtrusive-light/

3 Lighting in the Countryside: Towards Good Practice, July 1997, available on the Government archive website: http://webarchive.nationalarchives.gov.uk/20120919132719/http://www.communities.gov.uk/documents/planningandbuilding/pdf/158352.pdf

- Sky Glow: "when upward stray light is reflected back to earth"; the brightening of the sky above towns and cities
- Glare: "the uncomfortable brightness of a light source when viewed against a dark background"
- Light Trespass: "the spillage of light beyond the property on which the light source is located".

Baseline studies and surveys carried out

Technical deficiencies or limitations in available data

16.16 There are some errors and some omissions in the LANDMAP data, which are noted in Appendix **MA/NL/ES/A16/001** and which are explained further below**.**

Consultations

16.17 An EIA scoping request was sent to Caerphilly County Borough Council (CCBC) in June 2011 and their Scoping Opinion was issued on 26th August 2011. Appended to the Scoping Opinion were responses from consultees including the Countryside Council for Wales (CCW – now Natural Resources Wales, NRW). In summary, the scoping opinion and attached consultee responses included, in relation to landscape and visual matters:

- The topics covered by the environmental statement should include landscape and visual impact
- The assessments should "set out the significance of the impacts, including any cumulative impacts, and should pay particular regard to the impacts on sensitive receptors nearby", i.e. residential or other sensitive buildings within 500m of the site boundary.
- Issues raised by the consultation bodies and other consultees in their responses should be taken into account
- CCBC's Landscape Architect sought cumulative impacts assessment with the wind turbines near the site for which planning permission had been granted. That permission has since expired without being implemented. In addition the area of land on which the turbines were proposed has been included in the project. Accordingly a cumulative assessment of the project with the wind turbines has not been carried out.

16.18 A Revised Scoping Opinion was issued by CCBC in September 2012, in response to changes made to the proposal, which did not alter the requirements in relation to landscape and visual matters.

16.19 A round-table meeting was held with officers of CCBC on 20th October 2011 to discuss a range of matters associated with the proposed development. CCBC emphasised that the restoration scheme for the site should be ecology and landscape led and were keen that it should provide for low key recreation.

16.20 The views of local communities were canvassed during public exhibitions where initial proposals for the scheme and for the options for restoration were presented. These events are in the Statement of Community Consultation. Issues arising of relevance to consideration of landscape and visual matters were:

- Concern about effects on features such as Rhaslas Pond and the Bent Iron (a landmark art work sculpture on the site)
- Concern about visual intrusion especially of proposed overburden mounds, the duration of the operations, and proximity of the site boundary to local communities.

16.21 In addition, a separate consultation exercise was carried out in relation to the scope of the visual impact assessment and the selection of representative viewpoints to illustrate the range and nature of views available of the site and, potentially, of the proposed development. The viewpoints used in the assessment are those agreed with CCBC, MTBC, BBNPA and NRW.

Baseline Environment: Landscape

16.22 The site is located on a broad ridge between the Fochriw Road to the west and the upper slopes of the Rhymney Valley to the east. The ridge falls gently north, to enclosed agricultural land, then falling more steeply towards the A465 heads of the Valleys Road. To the south, the land rises to Mynydd Fochriw. The site is largely on open land, with enclosed fields bordering its northern and eastern edges. The majority of the site is urban common and CROW[4] access land, and is crossed by several public rights of way, as well as the Rhymney Valley Ridgeway Footpath which runs on a north-south alignment in the eastern part of the site. Further details of public rights of way are given in chapter 6 (Recreation and Tourism).

The landscape context: LANDMAP

16.23 The wider landscape context is described by reference to the LANDMAP[5] assessment, "the national information system, devised by the Countryside Council for Wales[6], for taking landscape into account in decision-making". The information database contains "both relatively objective information - such as rock type and historical information - and more subjective information, such as sensory responses and cultural interpretation". The information comprises studies of five aspects of the landscape: Geological Landscape (GL), Landscape Habitats (LH), Historic Landscape (HL), Cultural Landscape (CL), and Visual and Sensory Aspect (VS). The classification and evaluation of the aspect areas relevant to the site, its landscape context and the visual and sensory aspects of the visual study area are set out in **Appendix MA/NL/ES/A16/001** and shown on **Drawings MA/NL/ES/16/004-1 to 004-5** Level 3 Classification and **MA/NL/ES/16/005-1 to 005-5** Level 3 Evaluation.

16.24 All five LANDMAP Aspects are addressed, as relevant to the site and its landscape context in relation to the impacts of the proposals, and are summarised in the following paragraphs. The following is a summary of the LANDMAP Level 3 classification and evaluation, in regard, first, to the site and then the wider landscape context study area:

- The LANDMAP Geological Landscape Level 3 classification of the whole site is Glacial Mountain Valley. The evaluation of the northern half of the site is Outstanding and of the southern areas of the site is Moderate

- The LANDMAP Landscape Habitats Level 3 classification of the upland areas of the site is Mosaic, evaluated High, and of the northern third of the site, Improved Grassland, evaluated Low.

- The LANDMAP Historic Landscape Level 3 classification and corresponding evaluation of the northern third of the site is incorrect (Woodland). The other two-thirds of the site is classified as Marginal Land and evaluated Outstanding.

---

4 Countryside and Rights of Way Act, 2000: the maps of access land and "open country" are under review; consultations closed in November 2012, publication of the provisional maps is expected in August 2013 and of the finalised maps in August 2014

5 Countryside Council for Wales (now Natural Resources Wales), http://landmap.ccw.gov.uk/ and http://landmap.ccw.gov.uk/methodology/

6 Now Natural Resources Wales

- The whole site falls within a large Cultural Landscape area classified at Level 3 as Institutions and evaluated High.

- The LANDMAP Visual and Sensory Level 3 classification of most of the site is Upland Grazing, and the north-eastern and eastern side slopes are Hillside and Scarp Slopes Mosaic. The whole site is evaluated Moderate, although with high scenic quality. The principal management recommendation is restoration to a natural landscape, maximising natural regeneration.

16.25 In the wider context, most of the study area is classified in the **Geological Landscape** aspect as Glacial Mountain Valley and evaluated Moderate, except for aspect area CynonGL007 which covers the northern half of the site and is evaluated Outstanding. Glacial Mountain Valley areas to the south-west, on the valley sides either side of Troedyrhiw are evaluated High. To the north-west, the east and south-east facing slopes to the north-west of Merthyr Tydfil are classified as Upland Valley Slope and evaluated High. Further to the north-west and to the north within the Brecon Beacons National Park, are areas classified as Doline or Sink Field, Pavements, Dry Valleys, Etc., evaluated Outstanding. The part of the Taff Valley within the study area to the west is classified as Active Upland River or Stream Channel System, and is evaluated Low.

16.26 In the **Landscape Habitats** aspect, the Mosaic classification extends from the site along the ridges of Cefn y Brithdir and Cefn Gelligaer, evaluated High. An area of Mixed Woodland between them and the valley bottom are evaluated Moderate. Most of the Merthyr Common area within MTCBC is classified as Acid Grassland, with areas of Improved Grassland in the Bargod-Taf valley to the south west, all evaluated High. An area of Improved Grassland in the Taff Valley south of Merthyr Tydfil is evaluated Moderate. An area classified as Broadleaf Woodland to the north and south-west of Morlais Hill (to the north of Merthyr Tydfil) is evaluated Outstanding. The urban area of Merthyr Tydfil is classified as Residential/Green Space and evaluated Low.

16.27 Areas of Acid Grassland are identified around Bute Town and Princetown to the north of the site, on the ridge between Rhymney and Tredegar and along Mynydd Bedwellte, those within CCBC evaluated High and those within Blaenau Gwent evaluated Moderate. Most of the area north of the A465 and within CCBC and Blaenau Gwent, together with an area to the west in the national park, is classified Marsh/Marshy Grassland, and evaluated High. Further north within the Brecon Beacons National Park is an area classified as Dwarf Shrub Heath, also evaluated High.

16.28 Other Landscape Habitat areas to the east classified as Residential/Green Space or River Corridors are evaluated Low and areas of Improved Grassland, Mixed or Coniferous Woodland, or Bracken, are evaluated Moderate.

16.29 In the **Historic Landscape** aspect, the Marginal Land classification within the site extends south-east along the ridges of Cefn y Brithdir and Cefn Gelligaer, evaluated Outstanding. Other areas of Marginal Land occur on the ridge between Rhymney and Tredegar and on Mynydd Bedwellte; along the ridge extending from the FLRS and along Cilfach yr Encil, and on much of the uplands north of the A465 and into the Brecon Beacons National Park. The boundaries of these HL aspect areas generally correspond with those of the Landscape Habitats aspect areas. The areas south-east and south-west of the site and within the Brecon Beacons National Park are evaluated Moderate; the areas between the Brecon Beacons National Park and the A465 are evaluated High within MTCBC and Moderate within CCBC.

16.30 Areas of Irregular Fieldscapes occur in the Nant Gyrawd-Taf Bargod valley and around Bedlinog and within the Nant Bargod Rhymni valley, to the south of the study area; on the slopes of Mynydd Bedwellte in the east of the study area; on the slopes north-west of Cilfach yr Encil to the west and north of Pant in the north-west, and around Bute Town and north of Princetown in the north of the study area. The areas in the south, north-west and east are generally evaluated High and the other areas, Moderate.

16.31 Merthyr Tydfil, the settlements to its south, and Tredegar are classified as Nucleated Settlement, and those in the Rhymney Valley as Other Settlement. Merthyr Tydfil is evaluated Outstanding and the other settlement areas High. The areas of Parc Bryn Bach and Waun y Pound in the north-east of the study area are classified as Reclaimed Land, evaluated Low.

16.32 Most of the study area east of the MTCBC boundary is classified as Institutions in the **Cultural Landscape** aspect and most of the area west of this boundary as Rural, and most evaluated High. The area of Institutions within Blaenau Gwent is evaluated Outstanding and an area on the south-western edge of the study area, Moderate. Settlements in the Rhymney Valley extending to include Pontlottyn and Fochriw; in Merthyr Tydfil and in the Taff Valley, and industrial areas north of Tredegar, are classified as Urban. The

evaluations of these areas varies: the Rhymney Valley settlements are evaluated High; parts of Merthyr Tydfil and Taff Valley settlements are evaluated Outstanding, other parts High and parts Moderate; those north of Tredegar, Outstanding.

16.33 An area around Pant, to the north of Merthyr Tydfil, and Parc Bryn Bach are classified as Infrastructure and evaluated Outstanding and High, respectively. Areas in the Brecon Beacons National Park to the north-west, extending south-east to the Urban area north of Tredegar and at the north-eastern edge of the study area, as well as the area around Cyfarthfa Castle in the west of Merthyr Tydfil, are classified as Places and evaluated Outstanding.

16.34 In the **Visual and Sensory aspect,** smaller aspect areas are defined than for the other LANDMAP aspects. The site and the ridges extending to the south and the land rising to the north are classified Upland Grazing, evaluated Moderate. The higher parts of other ridges are classified as Upland Moorland or Hillside and Scarp Slopes Mosaic, as is the north-eastern part of the site, or Mosaic Upland and Plateaux, at Parc Bryn Bach and around Pant to the north of Merthyr Tydfil. Valley sides in the south-west, south and south-east of the study area are classified Open/Wooded Mosaic Upland Valleys, with areas in the west of Open Upland Valleys and small areas in the east of Wooded Upland Valleys The A4060 corridor to the west of FLRS and land extending into FLRS and Trecatti Landfill Site is classified as Derelict/Waste Ground. The main valley settlements are classified either as Urban (Merthyr Tydfil and south to Troedyrhiw and Tredegar and surroundings) or Village, Rhymney, New Tredegar). Cyfarthfa Park in Merthyr Tydfil is classified Amenity Land.

16.35 Most of the Visual and Sensory aspect areas are evaluated Moderate and the settlements and Derelict/Waste Ground, Low. A substantial part of Merthyr Common is also evaluated Low, the ridgeline and slopes to the west. Uplands to the north in the Brecon Beacons National Park and in Blaenau Gwent are evaluated High, as are parts of the ridges of Cefn Gelligaer, Cefn y Brithdir and Mynydd Bedwellte.

The landscape of the site

16.36 The landscape of the site consists of 8 main parts, shown on **Drawing MA/NL/ES/16/007** with photographs on **Drawing MA/NL/ES/16/008-1 to 3**:

1. Open upland

16.37 The majority of the site is open upland, much of it common grazing land and urban common, where the public have a right to access for fresh air and exercise. It is also designated open access land under the CROW Act and is crossed by a number of public rights of way and the Rhymney Valley Ridgeway Footpath on its eastern side. The key characteristics of this area are:

- Open, elevated, broad ridge with level or undulating landform and strong sense of openness or exposure and wildness. The large water body of Rhaslas Pond in the west of the area is a notable feature, in scale with the landscape and of historic interest; remains of former settlement and mine or iron workings are also apparent. The ridge is bisected by the raised embankment of the former Brecon and Merthyr Railway that connected Dowlais with Fochriw, which continues south through Fochriw to Darran Valley. A 400kV overhead powerline along north-western boundary a prominent feature, in scale with the landscape

- Absence of settlement, except: Fochriw to the south, overlooking the common; Rhymney within the valley to the east, and Cwmbargoed Disposal Point, a distinctive industrial land use associated with historic and present coal workings a source of localised intrusion from sounds of processes and visibility of industrial elements and lighting. The western site boundary is defined by Fochriw Road, a minor but busy road connecting settlements to the south with A465 to north, resulting in moderate traffic intrusion on the otherwise tranquil landscape; other detractors are results of fly-tipping and casual waste disposal.

- Uninterrupted, wide ranging views, especially north to the Brecon Beacons National Park and east over the ridges between the South-Wales valleys; views to the west are interrupted by the FLRS overburden mounds

2. Northern slopes, Bryn Pyllog

16.38 From the ridge top, the land falls in distinct slopes, scarp-like in places, curving around to the north, north-west and north-east. Part of the area is open/common land but the majority is enclosed, although, being subdivided mainly by fences, it has an open appearance. The area is characterised by:

- Transition between the open ridge top and agricultural fields on the lower slopes; large fenced enclosures of pastureland; partly previously opencast-mined and restored with improved grass, characteristically a brighter green contrasting with the adjacent open upland
- Roads beyond the area, Fochriw Road to the west, A465 further to the north and A469 to east, are sources of busyness, lighting and traffic intrusion
- Scale is medium with a sense of openness to exposure and elevation; sharp contrast with nearby urban areas to the east.
- Views over Rhymney valley and town to the east, to the uplands of Brecon Beacons National Park to the north, beyond the busy A465 corridor, to the industrial developments at Dowlais Top and Pengarnddu to the north-west and Trecatti Landfill Site to the west; from higher elevations, distant views over ridges and hills to east as well.

3. Northern enclosed fields

16.39 This is the land falling from the northern slopes of the ridge to the Cwm Carno valley, south of A465, characterised by:

- Fields of pasture surrounded by struggling hedges on banks with occasional trees (also not thriving); A made landscape, restored from previous opencast workings; mature trees along the stream valley defining the northern boundary of the site; Bute Town Pond a short distance to the north-east; regular landscape pattern; some discordant elements: the clearly struggling hedges and trees, and the intrusion of the A645; moderate scale; sense of openness, as the sloping land allows views out over the field hedges.
- Industrial estates on the western edge of Rhymney to the east, scattered farm dwellings along the slopes outside of the site boundary; A465 apparent by traffic movement, noise and lights as well as lampposts in pale colour making them more prominent; north-west corner crossed by 400kV overhead power line dominating in scale
- Attractive views to the north towards the land rising to the Brecon Beacons National Park and unexceptional mid-distance views to west, and east. The rising land to the south confines views.

4. South-eastern slopes

16.40 Although site investigations show there are frequent remains of shafts and old mine workings (known Shafts and Adits are shown on the Site Layout Plan MA/NL/PA/003), most of this area has the appearance of undisturbed natural ground, and is characterised by:

- Transition slopes between the upland of the ridge to the west and the steeper valley side to the east
- Rounded, smooth, rolling landform; mostly open common grazing crossed by small streams; some enclosed fields in the north of the area; landscape condition mixed, disrupted by tipping and historic industrial land uses on its southern margins
- Sense of wildness but not remoteness, due to proximity of valley settlement; strong contrast with these areas; moderate to high intrusion of industrial and built up areas and traffic on busy roads in the valley.

5. North-eastern valleys and tips

16.41 This is the area following the sloping curve of the north-eastern part of the site between the enclosed fields and the open upland to the south-west, characterised by:

- Diversity of features within the site, including tips and associated diverse vegetation, eroded water courses, diverse landforms, small and large; separated from the upland by a distinct scarp forming the southern side of a distinct valley in which are remains of former mine workings of historic interest; divided by fences and so has sense of openness; sharp boundary to built up area to the east: Heads of Valleys Industrial Estate and residential areas beyond; to A469 to the north-east linking to A465 to north; many tracks of scrambling motor-bikes especially on the tips.

- A random landscape pattern from the variety of landform features associated with tipping and former mine working; medium scale and moderate sense of openness; moderately tranquil with moderate sound and visual intrusion from industrial estate, traffic, erosion of tips, etc

- Near views of built up area and industrial estates, softened by tree cover within and bordering the settlement; fine, distant views north and south along valley and to the mid-distance over Rhymney Hill to east.

6. South-eastern valley side

16.42 This small area lies to the east of area 4 South-eastern slopes, where the slopes steepen and fall to the A469 in the valley floor:

- In contrast with other parts of the site, there is a small old stone quarry at the northern end of this area, which has revegetated, leaving an enclosed valley with visually interesting rock outcrops or low cliffs; the sense of small scale and enclosure heightened by relatively recent woodland plantings on the lower slopes which are well established. To its south and east, the land falls steeply in smooth slopes of grassland and blocks of woodland planting, to a stone wall boundary with the A469.

- Visually enclosed by valley sides and confined within quarry; attractive with some intrusion of traffic on A469, sheltered within quarry.

7. Southern tips

16.43 To the west of the disused railway line and stream valley north of Fochriw is an area of old tips, merging with the “open upland” extending south from South Tunnel Road:

- The landform is formed into the characteristic local ridges and valleys of tips. Side slopes are steep, especially to the east, which are eroded by drainage run-off and motor-bike scrambling into gullies and bare areas.

- On a high part of the ridge extending northwards into the site, but oriented towards the upland settlement of Fochriw, forming part of its landscape setting

- The tip landform and poor vegetation cover gives a sense of randomness and discordance, interrupting the main ridge landscape.

8. Cwmbargoed Disposal Point

16.44 The Disposal Point (CDP) is an industrial use associated with the extraction of coal, historically and currently. The site of the CDP is bounded by the Fochriw Road on the east and the Bogey Road on the north. Its western boundary is defined by the mineral railway that serves it and continues south through Cwm Bargod. The site of the CDP has been enclosed on its southern, northern and eastern sides with earth mounding on which mixed shelter-belt type planting has been established, including non-native conifers which are easily identifiable in views of the CDP and the entire site is enclosed within security fences.

16.45 Within, are offices, visitor and educational facilities, car parking for staff and visitors, plant and large industrial buildings for coal processing and loading onto trains, water treatment areas, and large areas of hard standing on which coal stocks are stored while awaiting processing and dispatching. It is busy with activity: of the plant and of vehicles bringing coal to the CDP and crossing Bogey Road at regular intervals and, occasionally, of movements of the long freight trains coming to and transporting the coal away from the CDP. The activity and associated industrial sounds are apparent only from within a short distance of the CDP. It is lit in hours of darkness, with relatively low-key security and building lighting, but with prominent spot and flood lighting at the railway sidings.

16.46 The CDP provides a sharp contrast with the adjacent open moorland to the east and south and the enclosed farmland of Cwm Golau and Cwm Bargod, but is in context and closely related spatially with the large scale industrial features and activity of the coal surface mine at FLRS .

Baseline Environment: Visual Amenity

16.47 Zones of Theoretic Visibility (ZTV) have been generated by computer to identify the geographic extents within which views may be available of the features of the proposed development. **Drawings MA/NL/ES/16/009-1 to 9-3** show both the predicted extent of the ZTV of the proposed extraction void and of the overburden and screening mounds for each of three key phases of the development. The ZTVs illustrated are based upon “bare ground scenario”, i.e. no allowance has been made for potential screening by minor variations in topography, existing vegetation, buildings within settlement, etc.

16.48 The ZTVs show a pattern of visibility reflecting the topography of the area: the main areas from which the overburden mounds would be visible extend in a broad band along the Rhymney Valley and onto the uplands immediately to the north, with smaller areas on the ridges rising to the south and the more distant ridges to the east and north-east of Tredegar and more distant uplands to east and north-east. The overburden mounds would themselves screen visibility of the operational voids from the south and south-west, and the existing mounds at FLRS would screen views from further west. The initial studies showed that the void at its succeeding phases would be visible from the west facing slopes of the Rhymney valley and the rising land to the north and further to the north-east and, as the void progressed eastwards, it would become visible from areas further to the south-east. Therefore, the design of the overburden storage was amended to include a long visual and acoustic screening mound along the eastern and northern edges of the area of extraction, to provide screening of the void when viewed from settlements, especially Rhymney[7]. From some locations, views of features of the proposed development would become visible once the overburden mounds at the FLRS site would be removed, as can be seen in the ZTV for Final Void (**Drawing MA/NL/ES/16/009-3**)

16.49 The principal viewpoints for description and assessment were identified from the views identified in the ZTVs as available to people within the nearby communities, at locations in areas of landscape importance, such as, the Brecon Beacons National Park, when using public access areas and routes, within the ZTV. The principle viewpoints were agreed in writing with CCBC. **Drawings MA/NL/ES/16/003-1 to 4** show areas with landscape designation or subject to protective landscape policies, public rights of way, long distance routes and cycle routes, county parks and areas of cultural heritage importance.

16.50 **Drawing MA/NL/ES/16/010** shows the locations of the selected viewpoints. Details of the viewpoints, their location, distance from the site boundary, and the potential receptors or locations which are the reasons for selection are set out in tables in **Appendix MA/NL/ES/A16/002** and summarised in the following Table:

[7] It is intended that this will be erected early in the scheme and removed last, in order to mitigate adverse effects on views of the void and the activity within it for as long as possible. The evolution of the scheme design is described more fully in Chapter 4

Table 16- 2 Viewpoint locations and selection criteria

VP Ref	Title	Distance from site boundary (km)	Receptors represented/Reasons for selection
1	Fochriw	0.1 to 0.8	Settlement: residents
2	Rhymney, Bryn Carno area	0.5 to 1.0	Settlement: residents
3	Rhymney Conservation Area, 2no. locations within town centre	0.4 to 0.8	Settlement: residents Conservation area and listed buildings
4	Abertysswg	0.8 to 1.7	Settlement: residents
5	Pontlottyn	0.9 to 1.4	Settlement: residents
6	Rhymney Valley Ridgeway Footpath (Cefn Brithdir)	0.8 to 2.0	Users of long distance footpath Users of common land, access land Visually Important Local Landscape LANDMAP VS evaluation: High
7	Pentwyn, south of Fochriw	0 to 0.25	Settlement: residents Requested by CCBC
8	Fochriw Road between Disposal Point and A465	0	Travellers on road Requested by CCBC
9	National Cycle Route 468, Abertysswg	2.5 to 3.0	Users of NCR Visually Important Local Landscape
10	Bridleway, Mynydd Fochriw	1.0 to 3.2	Users of long distance footpath Users of common land, access land Landscape of Special Historic Interest Visually Important Local Landscape LANDMAP VS evaluation: High
11	Rhymney to Tredegar Road	1.25 to 1.75	Ridgeline within Special Landscape Area Travellers between Rhymney and Tredegar Requested by CCBC
12	National Cycle Route 46, Parc Bryn Bach	1.5 to 2.2	Users of NCR Visitors to country park Special Landscape Area
13	Bute Town Pond National Cycle Route 46	0.2 to 0.6	Visitors to pond area Users of NCR

VP Ref	Title	Distance from site boundary (km)	Receptors represented/Reasons for selection
14	South of Ras Bryn Oer	1.0 to 2.2	Moved from bridleway, Rhymney Hill On access road to elevated residential properties LANDMAP VS evaluation: High to Moderate
15	Waundeg	2.8 to 3.2	Settlement: residents Industrial estate
16	Merthyr Common	2.0 to 5.0	Users of access land Landscape of Outstanding Historic Interest Scheduled Monument
17	Bryniau/Morlais Castle Golf Club	3.7	Users of access land Next to golf course Landscape of Outstanding Historic Interest
18	Twynau Gwynion, BBNP	3.4 to 4.0	Users of access land Brecon Beacons National Park LANDMAP VS evaluation: High
19	Sirhowy Valley Walk	5.0	Users of long distance footpath LANDMAP VS evaluation: High
20	Garn Fawr, Chartist Cave	7.5	Users of access land Brecon Beacons National Park LANDMAP VS evaluation: High Requested by CCW (now NRW)
21	Garn Ddu	7.5 to 8.5	Users of access land Brecon Beacons National Park LANDMAP VS evaluation: High Requested by CCW (now NRW)
22	Princetown		Settlement: residents Identified in course of baseline studies
23	Heads of Valleys Industrial Estate	0.6	Viewers from the Industrial Estate

16.51 Seven viewpoints were selected from these, and agreed with CCBC, for which photomontages have been prepared at the three selected stages of the development and after restoration:

VP1 Fochriw, near the bus-stop on Pontlottyn Road

VP2 Rhymney, from the public open space in Bryn Carno

VP3 Rhymney Conservation Area, 2no. locations within town centre

VP10 Bridleway on Mynydd Fochriw

VP14 Minor road south of Ras Bryn Oer

VP18 Twynau Gwynion, BBNP.

16.52 In addition, photomontages have been prepared at the three selected stages of the development and after restoration for VP23.

Baseline Environment: Darkness and Lighting

16.53 The site lies within an area of undeveloped open upland which is Intrinsically Dark. To the west, the landscape is currently occupied by FLRS, where the overburden mounds screen and enclose the active areas of the development, and represent an Intrinsically Dark area, but interrupted by vehicle lights along Fochriw Road and South Tunnel Road.

16.54 To the south, Fochriw is a small settlement of Low Distinct Brightness, set within the otherwise Intrinsically Dark upland, with a distinctive row of point lights from the street light along the road south towards Pentwyn.

16.55 In contrast, the proposed operational areas of the site, to the east of the FLRS overburden mounds, are a mix of localised areas of Low Distinct Brightness, and static point lights, associated with workshops and other built facilities, or bright point lights associated with lighting of operational areas, and moving point light associated with vehicles. An important light source in the study area is the CDP, with localised point lights on buildings and plant, moving vehicle lights, intermittent vehicle warning lights, and bright flood lights at the rail sidings where coal product is loaded onto trains, which cause localised Light Spillage.

16.56 To the east, the Rhymney Valley settlements and the roads along the valley are a distinct area of High to Medium Distinct Brightness, visible from the eastern side of the site and presenting a distinct contrast with the Intrinsic Darkness of the enclosing ridges. This urban area and that of Merthyr Tydfil to the west of FLRS also give rise to Sky Glow above the valleys.

16.57 To the north, the corridor of the A465 is a source of High Distinct Brightness from the street lights at the roundabout junctions and nearby urban development, giving rise to a zone of Light Spillage around the junctions, and moving vehicle lights, set against the Intrinsically Dark landscape extending further to the north into the Brecon Beacons National Park.

Summary of relevant planning policy

16.58 The designations and planning policies relevant to the landscape and visual aspects of the development proposals were reviewed and the main relevant policies are set out in Appendix MA/NL/ES/A16/001 and summarised below. Landscape designations are shown on **Drawings MA/NL/ES/16/003-1, 2** and landscape related policies on **Drawings MA/NL/ES/16/003-3, 4**.

16.59 The site is not subject of any protective landscape designation but the adopted CCBC Local Development Plan shows that:

- The land to the north of the A465 is a Special Landscape Area (SLA), rising towards the Brecon Beacons National Park, about 2.5km to the north of the site at its nearest point.
- The land to the south of the site and rising towards Mynydd Fochriw is a Visually Important Local Landscape (VILL).

- The land to the west within Merthyr Tydfil is a Landscape of Outstanding Historic Interest and Mynydd Fochriw to the south is a Landscape of Special Historic Interest.

- A large part of the site is a Site of Interest for Nature Conservation (SINC)

- A large part of the site is common land and open access land[8].

16.60 The site lies entirely within Caerphilly CBC, but the visual study area extends over neighbouring authority areas and relevant policies from those authorities are considered in addition to those for Caerphilly.

Minerals Planning Policy Wales 2000 (MPPW)

16.61 MPPW provides for working of mineral resources while protecting areas of importance to the natural and built heritage. In particular, its seeks that minerals development "adjacent or close to a National Park … that might affect the setting of these areas should be assessed carefully to determine whether the environmental and amenity impact is acceptable". Effects on historic buildings, landscapes, parks and gardens, conservation areas, and ancient monuments and their settings must also be considered.

16.62 New mineral extraction must "provide satisfactory and suitable restoration" which should "at least maintain, and preferably enhance, the long-term quality of land and landscapes taken for mineral extraction … to the benefit of local communities".

Minerals Technical Advice Note 2: Coal 2009 (MTAN2)

16.63 Further detail on assessing the effects of proposals for coal extraction are provided in MTAN2, providing guidance on best practice in carrying out landscape and visual impact assessment in Appendix N and on assessing cumulative impact within the EIA in Appendix G.

N Best practice for landscape and visual impact assessment

16.64 Section N1 recommends reference to GLVIA[9] and advises that visual impact assessment should be undertaken from various viewpoints including main settlements, major traffic routes, bridleways and footpaths, both close to the site and from greater distances, to reflect its landscape setting, and viewing corridors and visual characters should be identified. Study area extents are recommended:

- for the landscape impact assessment, normally all areas within 500m of the site boundary

- for visual impact assessment, up to the visual envelope, based on intervisibility studies which must be shown on a scaled plan.

16.65 Material advised to support the LVIA includes annotated illustrative materials such as computer-generated photomontages, oblique aerial photographs and other photographs. The assessment should identify potential sources of impact on landscape and visual amenity, taking into account the magnitude and degree of effect, and descriptive text should provide a concise and reasoned argument. MTAN2 also suggests computer based techniques to support the assessment process.

---

8 See §1.99 below

9 Guidelines on Landscape and Visual Impact Assessment, 2nd Edition, Landscape Institute and Institute of Environmental Management and Assessment, Spon 2002

16.66 Section N2 advises that approaches to mitigation should aim to avoid or reduce adverse effects or remedy unavoidable effects, whether on landscape or on views. Approaches may be based on "Primary Measures" built into the design of the development or "Secondary Measures" to address residual effects, so that the proposal would be integrated into the local surroundings.

G Best Practice for assessing cumulative impact within the EIA

16.67 Section G1 advises that the appropriate spatial boundaries for the study area should be defined in relation to the distance the environmental effects travel (G3). The assessment of cumulative impacts should be based on available data (and further survey work if needed) and should focus on the most important environmental aspects (G4, G5). Having established the baseline, the assessment should identify past and future projects and their environmental effects and assess interactions between them and the project (G5). The assessment should consider, of relevance to LVIA (G6):

- the source of environmental change, the type and magnitude of effect
- additive and non-additive effects, whether beneficial or adverse, duration, reversibility, indication of uncertainty;
- historic and projected trends
- effects which would not be significant for each scheme individually but would be significant in combination and effects which would be significant for each scheme individually but would not be significant in combination.

Caerphilly County Borough Local Development Plan up to 2021 (adopted November 2010)

16.68 The Key Objectives of the LDP, relevant to the development proposals, include:

- 2. Ensure that the County Borough is well served by accessible public open space and accessible natural green space.
- 4. Ensure that the environmental impact of all new development is minimised.
- 11. Identify, protect and, where appropriate, enhance valuable landscapes and landscape features and protect them from unacceptable development.
- 13. Create appropriate new landscape and ecological features and habitats as an integral part of new development wherever appropriate.
- 24. Protect and enhance the overall quality of the historic natural and built environment of the County Borough.

Section A: The Development Strategy

16.69 The LDP proposes a Development Strategy based on three broad geographic areas. The site is located within the Heads of the Valleys Regeneration Area. It is stated that "a large part of the area has been shown to be highly valued and sensitive environmentally". The Development Strategy seeks to reduce the impact of development upon the countryside and to "take into account the impact of proposals for the extraction of minerals on the amenity of residents and its implications for the safeguarding or enhancement of the natural environment".

16.70 The LDP seeks to "develop opportunities for the County Borough to contribute to the Valleys Regional Park – a network of countryside recreation areas linked by strategic footpaths and cycleways". Policy SP10 Conservation of Natural Heritage seeks to "protect, conserve, enhance and manage the natural heritage of the County Borough in the consideration of all development proposals within both the rural and built

environment". Natural Heritage includes the "landscape and amenity value of the County Borough". Policy SP18 Protection of Strategic Leisure Network seeks to "protect important networks of public open space, natural green space and recreational facilities from inappropriate development".

Section B: Countywide Policies

16.71 Policy CW4 Natural Heritage Protection states that development proposals "that affect locally designated natural heritage features, will only be permitted (A) where they conserve and, where appropriate, enhance the distinctive or characteristic features of the Special Landscape Area (SLA) or Visually Important Local Landscape (VILL)". Policy CW6 Trees, Woodland and Hedgerow Protection would only permit development with appropriate tree surveys, mitigation, management and protection schemes, or, "where trees, woodlands or hedgerows are removed, suitable replacements are provided where appropriate".

Section C: Area Specific Policies

16.72 Section C includes policies specific to Strategy Area 1 Heads of the Valleys Regeneration Area within which the majority of the site is located. The LDP recognises that the Upper Rhymney Valley offers the greatest potential in terms of energy production due in part to the coal resources at the site and "seeks to balance the safeguarding and potential development of minerals in this area against the objective of safeguarding the landscape from further degradation and, where possible, securing landscape enhancement". Development proposals should "secure effective landscape rehabilitation and enhancement as an integral part of the scheme" and be consistent with the wider regeneration strategy and enhanced recreational and tourism role envisaged for the area.

16.73 Policy NH1 identifies Special Landscape Areas (SLAs) which "seek to protect areas that exhibit distinctive landscape, historical, cultural, biodiversity and geological features and characteristics within the County Borough". Applicants will "need to demonstrate that any development proposal will not have an unacceptable impact on the specific distinctive features or characteristics associated with the SLA". The SLAs have been identified using NRW LANDMAP datasets and SLA designation methodology. Special Landscape Areas are identified at

- Upper Rhymney Valley (NH1.1), "one of the most open upland areas within the County Borough" and "forms the Northern edge of the coalfield", includes the area to the north of Rhymney east of the A469 and, at its nearest, the site is located c.60m from the SLA boundary. Land within the County Borough, north of the A465 is also within the SLA, approximately 500m north of the site.

- Gelligaer Common (NH1.2), an "important and increasingly rare upland landscape within South East Wales exhibiting continuity of land use over many centuries", is located beyond Pentwyn to the south of the site, c.325m from the site boundary.

16.74 The site is not within either Special Landscape Area.

16.75 Policy NH2 identifies Visually Important Local Landscapes (VILLs) which "seek to protect the distinctive features or characteristics of the visual and sensory landscape of the County Borough and how we perceive and respond to the landscape around us". VILLs were identified using the Visual and Sensory Aspect layer of LANDMAP. Development "will only be permitted where it conserves and, where appropriate, enhances the distinctive visual and sensory landscape features or characteristics of the VILL" and "should demonstrate that these features of the visual and sensory LANDMAP aspect layer are conserved and, where appropriate enhanced for the benefit of the visual landscape." Visually Important Local Landscapes are identified at:

- Northern Rhymney Valley (NH2.1), a "predominantly upland and open area". Long term aims include managing development at settlement edges to prevent further loss of visual quality and character, retaining the open feel of the area. Medium term objectives include reclamation of post-industrial and mining sites. In the short term, stone walls are to be promoted as the primary boundary treatment in the area with stockproof fencing where appropriate. It includes the area of the site to the south of South Tunnel Road, excluding the CDP area, but not the area of the site to the north of South Tunnel Road.

- Manmoel (NH2.2), "predominantly an upland landscape with a strong sense of openness", with a distinctive field pattern, beech hedging and stonewalls, is located some 4.8km to the east of the site.

16.76 Policy NH3 identifies Sites of Importance for Nature Conservation (SINCs). Development proposals will "normally be permitted where it would not cause unacceptable harm to the particular features of the SINC" and if harm is unavoidable effective mitigation measures should be employed. Approximately two-thirds of the site is designated as a SINC, excluding the northern slopes, the CDP and a small area to the west of Fochriw.

16.77 Policy LE3 seeks to protect Country Parks from inappropriate development. Country Parks are designated at Parc Bryn Bach (500m north-east of the site) and Parc Cwm Darran (1km south of the site).

16.78 Policy TR1 seeks to safeguard land to facilitate improvements to the cycle route network, including:

- TR1.1 Rhymney Valley Linear Cycle Route - Heads of the Valleys to Bedwas / Caerphilly, HOV. The indicative route alignment shown on the Proposals Map. TR1.1 passes within 60m of the site boundary at its nearest point.
- TR1.2 Completion and Extension of Cycle Route NCN46
- TR1.6 Link from Fochriw to NCN 46 via Rhaslas Pond, the indicative route of which follows the Fochriw Road north with a detour along the alignment of the disused railway within the site to Rhaslas Pond before rejoining Fochriw Road[10].

Merthyr Tydfil County Borough Council, Local Development Plan 2006-21, (adopted 25 May 2011)

16.79 The application site lies entirely outside Merthyr Tydfil County Borough, but the CDP is immediately adjacent to its eastern boundary. Some MTCBC policies may be relevant to consideration of the landscape and/or visual effects of the Nant Llesg proposal.

Borough-Wide Strategic Policy

16.80 Policy BW5 Natural Heritage seeks to "protect and support the enhancement of the County Borough's distinctive natural heritage" and that proposals will only be permitted where "they maintain, enhance or do not cause harm to:

- The landscape character of the countryside
- Trees, woodlands and hedgerows that have natural heritage value or contribute to the character and amenity of an area"

16.81 Policy BW7 Sustainable design and place making requires development proposals to:

- Not result in unacceptable impact on local amenity in terms of visual impact
- Incorporate a good standard of landscape design
- Take account of natural heritage and the historic environment on site and in terms of potential impact on neighbouring areas of importance
- Contribute to the provision of usable open space, ensuring its accessibility and connectivity to other green infrastructure, footpaths and cycleways

[10] Although the LDP provides this indicative route for a cycle way, it would be over common land, which would have to be taken out of common in order to allow the proposal to proceed.

16.82 Policy BW16 Protecting / enhancing the network of leisure facilities seeks to "protect and support the enhancement of leisure facilities including … public rights of way in order to ensure their continued use for recreation and amenity".

Area Specific Policies

16.83 Policy AS4 Historic Landscape states "there will be a presumption in favour of the protection, conservation and enhancement of Gelligaer Common and the main settlement of Merthyr Tydfil in accord with their status of Landscapes of Historic Interest in Wales". The Merthyr Tydfil LDP does not identify any other local landscape designations.

Topic Based Policies

16.84 Policy TB8 is concerned with proposals for Mineral extraction and associated development which "will only be allowed where

- they would not result in unacceptable environmental impacts
- they would not conflict with transportation considerations including access, … and enjoyment of public rights of way
- they include acceptable proposals for progressive and final restoration, aftercare and beneficial after-use".

Brecon Beacons National Park

16.85 No part of the application site lies within the National Park, but the landscape context and visual study areas extend into its southern margins. Some Brecon Beacons National Park policies may therefore be relevant to consideration of the landscape and/or visual effects of the Nant Llesg proposal.

Brecon Beacons National Park Unitary Development Plan (approved March 2007)

16.86 The UDP provides policies to enable the special qualities of the National Park to be protected and for "careful control" of development that "straddles the Park boundary or is conspicuous from within the Park". Part 1 Policy 1: The Special Qualities of the National Park states that: "In considering all proposals for development the NPA will give great weight to conserving and enhancing the Park's special qualities and its natural beauty, wildlife and cultural heritage which the designation is intended to protect".

Brecon Beacons National Park Deposit Local Development Plan (November 2010)[11]

16.87 Policy SP1 of the Deposit LDP is to be used by the NPA when commenting on proposals that impact the National Park, which seeks to enable:

- "Development that conserves or enhances the natural beauty, wildlife and cultural heritage of the National Park
- Development that provides for, or supports, the understanding and enjoyment of the special qualities of the National Park in a way that does not harm those qualities

[11] The Brecon Beacons Deposit LDP was published in November 2010 and a composite plan including Proposed Focussed Changes was published in October 2011. The LDP will supersede the UDP on adoption.

- Development which fulfils the two purposes above and that assists the economic and social well-being of local communities".

Blaenau Gwent County Borough Council Unitary Development Plan (adopted July 2006)

16.88 No part of the application site lies within Blaenau Gwent, but the landscape context and visual study areas extend into County Borough, and some policies may therefore be relevant to consideration of the landscape and/or visual effects of the Nant Llesg proposal.

General Policies

16.89 Policy G2 states that "development proposals will be considered against … the impact of development on landscape quality". Policy EN1 The Natural Environment states that "development proposals should safeguard the natural beauty of land". Policy EN2 The Built Environment seeks to protect "the natural setting and important existing built form in the vicinity of the proposal".

Environment Policies

16.90 Policy EN18 concerns Special Landscape Areas and states that "proposals detrimental to the features or qualities of SLAs will not be permitted". SLAs within Blaenau Gwent include the area north of the A465 excluding the settlement and industrial estates; the area from Rhymney Hill south to Mynydd Bedwellte; and the uplands between Tredegar and Ebbw Vale.

Mineral Policies

16.91 Policy M5 is concerned with the visual impact of minerals development. It states that "All plant, buildings and stockpile areas will:

- where practicable, be grouped together to prevent the creation of an unsightly sprawl of development and to facilitate their screening;
- be kept as low as practicable to minimise visual intrusions;
- be of appropriate colour, cladding or suitably treated to reduce their visual impact;
- be satisfactorily maintained to preserve their external appearance;
- be removed upon cessation of extraction and the site restored".

Designations

National Landscape Designations

National Park

16.92 The Brecon Beacons National Park is located to the north of the site, approximately 2.7km from the site boundary at the closest point. The two statutory purposes of the Brecon Beacons National Park Authority, as defined in the 1995 UK Environment Act, are to:

- conserve and enhance the natural beauty, wildlife and cultural heritage of the National Park
- promote opportunities for the enjoyment and understanding of its special qualities.

16.93 The Brecon Beacons National Park Authority has defined 11 "special qualities", of relevance to the proposal:

- A National Park offering peace and tranquillity with opportunities for quiet enjoyment, inspiration, relaxation and spiritual renewal
- A feeling of vitality and healthfulness that comes from enjoying the Park's fresh air, clean water, rural setting, open land …
- A sense of place and cultural identity …
- The National Park's sweeping grandeur and outstanding natural beauty observed across a variety of harmoniously connected landscapes … with extensive views in all directions.
- A working, living "patchwork" of contrasting patterns, colours, and textures …
- In the context of the UK, geographically rugged, remote and challenging landscapes
- Enjoyable and accessible countryside with extensive, widespread and varied opportunities to pursue … sustainable recreation or relaxation.

16.94 The Brecon Beacons National Park Authority is in the process of establishing a Dark Sky Reserve and, based upon the guidance of the International Dark Skies Association[12], have defined three zones: "a Core Zone with no, or very few, external light sources, a Buffer Zone with strict stray light control to protect the Core, and lastly an External Zone with slightly relaxed stray light control" for which it is intended to produce Supplementary Planning Guidance[13]. The site lies entirely outside these Zones. The landscape context and visual study area extend into part of the southern margin of the National Park, which is part of the Core Zone.

Registered Historic Landscapes

16.95 The Merthyr Tydfil Landscape of Outstanding Historic Interest passes close to the western boundary of the CDP. The area is described as "a natural basin situated at the head of the Taff valley, containing an internationally renowned iron and coal industrial landscape of the 18th and 19th centuries. The area includes large ironworks, associated coal mining industry, waste tips, power and transportation systems, terraced industrial housing, Cyfarthfa Castle Ironmasters' house and gardens, and important related, historical religious, literary and political associations".

16.96 The southern margin of the site is included within the Gelli-Gaer Common Landscape of Special Historic Interest. The area "represents a rich and increasingly rare upland landscape in South East Wales, having numerous distinct foci of settlement representing continuity of land use and activity from the prehistoric period to the recent past. The area includes: Bronze Age funerary and ritual monuments; Iron Age hut settlements; a Roman fort and associated features including a Roman road and military practice camps; a medieval earthwork castle and a significant concentration of medieval platform houses which include some of the first examples of the type to be archaeologically excavated in Wales".

16.97 There are two Registered Historic Parks and Gardens within 5km of the site. Bedwellty Park, Tredegar, located 3.5km to the east of the site, is a Grade II early nineteenth-century urban landscape park, with interesting contemporary features. Cyfarthfa Castle is a Grade II* "Victorian park, which was converted from

12 http://www.darksky.org/: "The mission of the International Dark-Sky Association (IDA) is to preserve and protect the night-time environment and our heritage of dark skies through environmentally responsible outdoor lighting".

13 Brecon Beacons National Park LDP Composite Plan, published 26 October 2011, proposed Policy 6 Light Pollution

a private to a public park with formal gardens", and is located 4km to the west of the site. A significant view is identified from the castle but in a south-westerly direction away from the site.

Scheduled Monuments

16.98 There are a total of 36 Scheduled Monuments located within 5km of the site boundary, of which one is within a distance of 500m: Sarn Howell Pond and Watercourses (GM94), part of the Dowlais Free Drainage System, located immediately to the west of the CDP boundary.

16.99 In addition, the southern embankment of Rhaslas Pond, within the site, is of cultural heritage interest and is being considered for scheduling by Cadw. It is treated for the purposes of the LVIA as if it is scheduled.

Listed Buildings

16.100 There are a total of 244 Listed Buildings within 5km of the site, those within 500m of the site are Grade II and all within the community of Rhymney to the east of the site.

Conservation Areas

16.101 The two closest conservation areas to the site are Rhymney Town Conservation Area, 400m east of the site which includes 16 Listed Buildings, and Bute Town Conservation Area, 350m north-east of the site, a planned village built in 1825-30 containing 3 rows of listed terraces (Middle Row, Collins Row and Lower Row) to provide quality housing for workers in the local ironworks.

Country Parks

16.102 Country Parks within the vicinity of the site are Parc Bryn Bach (within Caerphilly County Borough and Blaenau Gwent County Borough) and Parc Cwm Darran (within Caerphilly County Borough). The boundary of Parc Bryn Bach is located 550m to the north-east of the site. Parc Cwm Darran is located 900m south of the site.

Valleys Regional Park

16.103 The site is located within the Valleys Regional Park (VRP). The aim of the VRP is to create a high quality, sustainable network of green space and complements the activities and programmes of the Heads of the Valleys and Western Valleys Regeneration Areas[14]. Current VRP projects within the vicinity of the site include enhancements to Parc Cwm Darran and improvements to access trails in the Sirhowy Valley.

Nature Conservation Designations

16.104 There are no areas of Ancient and Semi-natural Woodland or Plantation on Ancient Woodland Site within the site boundary or adjacent to it.

16.105 There are no Special Areas of Conservation (SAC) within the landscape context study area and no Sites of Special Scientific Interest within 500m of the site, the nearest being at Cefn y Brithdir (2.7km south-east of the site).

16.106 There are no areas designated as Local Nature Reserves within 500m of the site, the nearest is Cwmllwydrew Meadows (1km south of the site).

14 Valleys Regional Park website http://www.thevalleys.org.uk/

Routes and areas designated for public access

16.107 Public access and rights of way are dealt with in detail in ES Chapter 6 Recreation and Tourism. Public rights of way (PRoW) and open access land designated under the CROW Act[15] are shown on **Drawing MA/NL/ES/16/006**.

Access Land

16.108 The site includes large areas of Registered Common Land (approximately 70% of the site area) and a small area designated as Open Country adjacent to the A469 by the Capital Valley Industrial Park, which are both designated open access land. There are large areas of open access land within the 5km study area, which include:

- Gelligaer Common and Cefn y Brithdir to the south of the site
- Merthyr Common to the west and north of the site
- Land north of the A465 extending into the national park
- Rhymney Hill and Mynydd Bedwellte to the east.

Bridleways

16.109 Four bridleways cross the site:

- Bridleway 89 commences along the A469 near the football ground north of Pontlottyn then heads north crossing into the site before following the Heads of the Valleys Industrial Estate access road as far north as the Nant Llesg watercourse.
- From this point Bridleway 92 runs north along the Heads of the Valleys Industrial Estate access road to a junction with Footpath 91, crossing back into the site to a junction with Bridleway 93 at the north-east corner of the site, just south of the Nant Carno.
- Bridleway 93 runs east-west along the northern boundary of the site to the south of the Nant Carno to a junction with Footpath 96 then continues westward, exiting the site before heading south to a junction with Footpath 95.
- From this point Bridleway 99 heads eastward back into the site for a distance of 100m.

Public footpaths

16.110 The site is crossed by 11 public footpaths:

- In the south-east of the site Footpaths 85 and 86 run east-west from the A469/Bridleway 89 to the crossing point of the disused railway and South Tunnel Road
- The north of the site is served by a network of Footpaths 90, 91, 95, 96, 97, 98 and 100 with Bridleways 92, 93 and 99.
- Footpath 151 connects Gelligaer Common with Merthyr Common, heading north from the Lapwing area and skirting the west shore of Rhaslas Pond, before heading westward to a junction with Footpath 150. From here both footpaths head west out of the site crossing Fochriw Road.

15 Countryside and Rights Way Act, 2000, which defined areas of open land for public access, see Endnote 4

Long Distance paths

16.111 The east of the site is crossed by the Rhymney Valley Ridgeway Footpath which, although it does not follow a public right of way, crosses the common to form a part of a long distance footpath. Within the context study area, the long distance footpath heads northwards along the ridgeline of Cefn y Brithdir to Fochriw. The route crosses into the site from a point within Gelligaer Common to the north of Fochriw, heading northwards across the common to disused mine workings and tips, then heads north out of the common along the lower slopes to the west of the Heads of the Valleys Industrial Estate. The route exits the site at the north-eastern corner to follow the A469 north to the end of the route at Bute Town.

16.112 The Taff Trail long distance footpath follows the Afon Taf north from Cardiff to Brecon. Within the 5km study area the Taff Trail follows the Taff River from Troedyrhiw to Merthyr Tydfil and then north to Pontsticill; it is 3.6km from the site at its closest point. The Coed Morgannwg Way links to the Taff Trail near Abercanaid, some 4.5km from the site.

16.113 The Rhymney Riverside Walk is a walking route promoted by the Valleys Regional Park which commences at either Bute Town or Parc Bryn Bach then follows the Afon Rhymni south through Rhymney, Pontlottyn, New Tredegar and southwards to Caerphilly and Cardiff. The route passes within 250m of the eastern boundary of the site where the Afon Rhymni is crossed by the B4257 Carno Street road bridge, and is immediately adjacent to the site where it passes the Capital Valley Industrial Park.

Cycle routes

16.114 There are a number of interconnected cycle routes within the study area. National Cycle Route (NCR) 468 connects Bargoed with the NCR46 to the north, passing through Abertysswg and Rhymney. It follows the A469 northward from the roundabout with the B4257 passing within 100m of the site and connects to NCR46 near the junction of the A469 and A465. NCR46 Merthyr Tydfil to Brynmawr follows approximately the line of the A465, passing within 450m of the northern site boundary, to Dowlais and connects with NCR8 The Taff Trail north of Merthyr Tydfil. NCR8 largely follows the route of the Taff Trail long distance footpath and is 3.7km from the site at its closest point. NCR477 Taith Trevithick Trail links to NCR8 at Merthyr Tydfil and runs southward on the opposite side of the valley to NCR8; it is 3.2km from the site at its closest point. 800m south of the site, NCR469 follows a dismantled railway line from Parc Cwm Darran south to Bargoed. NCR467 Ebbw Vale to Tredegar follows the Sirhowy River and connects to NCR46 at Parc Bryn Bach 2.4km from the site.

Other factors affecting the assessment

Seasonal Temporal Change: Weather

16.115 The weather is a factor affecting the assessment of, especially, visual impacts and the Met Office[16] average statistics for weather patterns for the region show that for the area in which the site is located, there are:

- 170-190 days in the year when rainfall exceeds 1mm, 46-52% of the year (above the Wales average: 165.5 days)
- 1250-1350 hours of sunshine (below the Wales average: 1388.7 hours)
- 50-70 days of the year when air frost occurs, which can create hazy conditions limiting visibility, 13.7-19% of the year (above the Wales average: 49.1 days).

16 The Met Office website: http://www.metoffice.gov.uk/climate/uk/averages/

Assessment Criteria and Assignment of Significance

16.116 The degree of the likely landscape and visual effects of the proposed development are determined by relating the sensitivity of the receptors, or ability of the landscape to accommodate the changes arising from the development proposals, and the magnitude of changes in the landscape or view to which the receptors will be subjected. The nature of the landscape and visual effects will be described and may be positive/beneficial or negative/adverse; short, medium or long term; temporary or permanent or reversible. Indicative criteria for sensitivity and magnitude are set out in the following tables:

Table 16- 3 Sensitivity of Receptors

Sensitivity	Indicative criteria for landscape receptors	Indicative criteria for visual receptors
High	Areas with a strong landscape structure with valued features resulting in a distinct and valued character A landscape of international or national importance A landscape or many landscape elements vulnerable to disturbance No or little potential for substitution or replacement	Views experienced by many viewers where the site is an important component in the view Daily, prolonged or sustained views available over a long period, or where the view of the landscape is an important attractant A view from a highly valued landscape, or a nationally important recreation facility Views from residential properties (main living area), public rights of way or passive recreational activities, where the view of the landscape is an important attractant
Moderate	A landscape of moderately valued characteristics, perhaps of local significance Reasonably tolerant of changes, or a formerly highly sensitive landscape whose sensitivity has been reduced by the presence of intrusive features A landscape of regional importance Potential for substitution or replacement	Views from secondary living areas of residential properties Frequent to occasional open views available Viewers are pursuing activities such as sports or outdoor work A view from a landscape of moderate importance, or a locally important recreation facility, where the view of the landscape is part of its attraction
Low	A relatively low value or degraded landscape Tolerant of substantial change without adverse impact on character A landscape of local importance Good potential for substitution or replacement	Views available to people in industrial settings Glimpsed views or passing views available to travellers in vehicles A view of low importance, or where the view of the landscape is not the reason for visiting

Table 16- 4 Magnitude of Change

Magnitude	Criteria for assessing landscape change	Criteria for assessing visual change
Large	Great change in or loss of landscape characteristics over a wide area or very intense change over a smaller area Great damage to key characteristics, features or elements (adverse) Large scale or major improvement in the integrity of the landscape character Extensive restoration or enhancement; major improvement of features, attributes or character (beneficial)	The general visual amenity or majority of viewers affected Great change in view or loss of the view or its key characteristics (adverse) Large scale or major improvement in the visual amenity or character of the landscape within the view (beneficial)
Medium	Considerable changes or loss in landscape characteristics, but not adversely affecting the integrity (adverse) Benefit to, or addition of, key characteristics, features or elements; localised improvement in landscape character (beneficial).	Many viewers affected Noticeable change in view or partial loss of the view or its key characteristics (adverse) Partial improvement in the visual amenity or character of the landscape within the view (beneficial)
Small	Discernible change in, or minor loss of, some components or key characteristics of the landscape (adverse) Minor benefit to landscape character, or addition of some key characteristics, features or elements (beneficial)	Few viewers affected Small or minor change in view or wider visual amenity Minor change or partial loss of key characteristics of the view (adverse) Minor improvement in the visual amenity or character of the landscape within the view (beneficial)
Negligible	Little or no change to landscape characteristics Very minor loss or detrimental alteration to one or more characteristics, features or elements (adverse) Very minor benefit to or positive addition of one or more characteristics, features or elements (beneficial)	No or barely perceptible change

16.117 Assessment of magnitude of change also takes into account the impact duration, for which the following definitions are used:

Temporary - Short term: A period of months, up to one year;

Temporary - Medium term: A period of more than one year, up to five years;

Temporary - Long term: A period of greater than five years but not beyond the lifetime of the Project

Permanent - A period beyond the lifetime of the Project

16.118 Guidance on assessing the significance of landscape and visual effects is found in GLVIA, which advises that the significance of effect, whether adverse or beneficial, is assessed by relating the sensitivity of the receptor and the scale or magnitude and nature of change to which it is subject. In this assessment, the relative significance of landscape and visual effects is graded from major to negligible, according to the following criteria:

Table 16- 5 Criteria for Assessing Levels of Effect

Degree of effect	Indicative criteria for landscape effects	Indicative criteria for visual effects
Major	Large adverse change to the features, elements, character, or value of in a highly sensitive landscape Highly sensitive landscape completely degraded Little or no scope for mitigation Great improvement to the landscape over a wide area, sufficient to upgrade overall landscape character, or localised intense improvement to landscape features or characteristics resulting in upgrading their value or importance	Large visual intrusion experienced from highly sensitive viewpoints The proposals would cause a great deterioration in the existing view or general visual amenity Little or no scope for mitigation Great improvement in the view, sufficient to upgrade overall visual amenity
Moderate	Medium change to landscape character, features, or elements of moderate to high sensitivity landscape Smaller change to more highly sensitive landscape or greater change to less sensitive landscape Some scope for mitigation Discernible improvements to landscape character	Noticeable visual intrusion on moderately sensitive views The development would cause a noticeable deterioration in the existing view Some scope for mitigation Noticeable reduction in visual intrusion, or improvement in the view
Minor	Localised or limited change to the existing landscape character of low to moderate sensitivity or a small change to landscape of high sensitivity Considerable scope for mitigation Localised improvement to the existing landscape	Localised visual intrusion in a view of low to moderate or high sensitivity Good scope for mitigation Localised reduction in visual intrusion, or improvement in the view
Negligible or None	Little or no perceived change to the existing landscape character The change is difficult to discern	The change in the view is imperceptible or difficult to discern

16.119 In addition to these criteria, in some instances the effect may be discernible or greater, but offset by other considerations, for example, through mitigation proposals, and the resulting effect is neither beneficial nor adverse. In such cases, the effect is assessed as neutral.

16.120 The following matrix provides a general guide to relating assessments of sensitivity of receptors and the changes resulting from the proposals and the terms used in the assessment of relative significance of effects. For landscape and visual effects, the matrix may not be directly applicable, as the significance of effects can be influenced by complex inter-relationships between components and characteristics of the landscape and the visual qualities experienced by people in different settings. The factors leading to the assessment conclusions are explained in the relevant assessment sections below.

Table 16- 6 Significance Assessment Matrix

Sensitivity	Magnitude of change			
	Large	**Medium**	**Small**	**Negligible**
High	Major	Moderate or Major	Minor or Moderate	Minor
Medium	Moderate or Major	Moderate	Minor	Negligible or Minor
Low	Minor or moderate	Minor	Negligible or Minor	Negligible or Minor
Negligible	Minor	Negligible or Minor	Negligible or Minor	Negligible

Key Parameters for Assessment

16.121 This section describes the assumptions used in assessing the landscape and visual effects of the proposal.

Mitigation Measures Adopted as Part of the Project

16.122 The potential effects of the proposals were considered from an early stage in the design of the development and mitigation measures have been incorporated with a view to avoiding adverse effects or reducing them or with a view to offsetting them through compensatory measures where they are unavoidable. The assessment was made on the basis of those mitigation measures that are an integral part of the proposals.

Site layout

16.123 The layout of the major elements of the operational site is largely dictated by the location and accessibility of the coal reserve: the excavation area in the north and area for overburden storage in the south, but:

- Soil storage mounds would be located on the perimeters of the site, where they would also provide a degree of screening, or on the edges of the overburden mound.
- The potential for visual intrusion from the excavation activities and the void was recognised, leading to the introduction of a screening mound on the north-eastern and eastern edge (see below).
- The built and operational support facilities would be located close to an existing busy road and away from the nearby communities.
- The screening, overburden, and soil storage mounds would provide a degree of screening, so that they would be visible only from particular viewpoints where the elevation and angle of view would allow.

Lighting

16.124 Through choice of lighting, the spread of light can be limited and light focused on the working areas to reduce the potential intrusion on Dark areas.

Screen mound

- A proposed screening mound along the eastern and north-eastern edges of the extraction area would greatly reduce the extent of the zone of visibility of the proposed excavation void.
- The design of the screening mound along the eastern and northern edges of the area of extraction would provide screening of the void in views, especially from Rhymney.
- The scale and form of the screening mound was partly determined by balancing the potential for it to become an intrusive feature in its own right against the benefit of the screening it would provide.

CDP

16.125 The new building proposed to house the new wash plant would be the largest single built element on the site, with the potential to be prominent in views, especially as the roof level would also be higher than the planting on the eastern and northern boundaries that currently screens the CDP in many views. The mitigation proposed is the architectural treatment of the cladding of the main building, using a pattern of brown and olive colours to give the impression that it is a cluster of smaller built forms and to break up its appearance in views to a similar visual texture to the rest of the CDP (illustrated in the "artist's impressions" on **Drawing MA/NL/PA/022**.

Overburden and screen mound construction

16.126 The overburden and screen mounds would screen visibility of the operational voids from the east, south and south-west, and the existing mounds at FLRS would screen views from further west. Mitigation to reduce adverse effects of mound construction on receptors to the north east, east, south east, south and south west is possible through the method of constructing the mound:

- First an outer bund to each layer is built up towards the outside of the site, with backfilling continuing behind. This will screen the operations from views from outside the site. The procedure would be reversed during removal.
- The overburden mound would remain in place for 3.5 years and the outer slopes would be grass-seeded as work proceeds as well as the finished top surface. As the grass became established, the degree of potential intrusion would reduce.
- The screening and soil storage mounds would be built early in the project, over a period of 4 months, and would be removed last during the final part of the restoration process, over a similar time period.
- After formation of the overburden mound, soil storage mounds and screening mounds, they would remain in place for the medium term, as elements in the landscape, but would screen other operational areas of the site from view.

Common Land

16.127 While the common land within the site would not be available during operations, other areas of land are included in the proposals for stock grazing by the Commoners, and/or for public access:

- The loss of the open areas of the site would be offset by provision of additional lands as temporary common land[17].

- At the end of operations, the common land of the site, and access to it, would be restored and some additional areas dedicated.

16.128 There is potential to upgrade the landscape of the additional areas of land included in the proposals, through:

- Boundary hedge management and planting up gaps

- Repairing stone walls in poor condition

- To benefit to the community in the long term with increased or easier public access to the countryside.

16.129 Adverse effects on landscape character from the proposed use for common grazing, such as loss of field boundary vegetation or walls, would be prevented by appropriate land management and fencing.

Remediation proposals

16.130 Surface treatment and remediation of land adjoining the site would be carried out in the first two years to:

- Address instability associated with old mine shafts and adits;

- Address the scouring of old colliery tip material into the water course feeding Parc Darran lake;

- Manage the southern open upland area for lapwing habitat;

- Generally tidy up and treat areas closest to settlements;

- Remediate hazards remaining from former mine working especially on the eastern slopes;

- Identify and conserve those cultural heritage features that can be made safe;

- Enhance ecological features;

- Improve public access, initially on the eastern and north-eastern slopes, with information about the natural and man-made features of the landscape;

- Enhance landscape features, pattern and character, and the setting the eastern and north-eastern ridge side provides to Rhymney.

16.131 The remediation areas would be outside the operational area of the surface mine, but are included within the site boundary to allow remedial works and landscape enhancement measures. The proposal for remediation of this land includes:

- Small scale “soft engineering” works would reduce run-off of silt to Parc Cwm Darran Lake.

---

17 Potential effects on the access land and rights of way as a recreational resource are considered in Chapter 16 Recreation and Tourism. The LVIA assesses effects on the landscape character and amenity of the areas and routes.

- New routes for public access would be established, with signage, gates or stiles in field boundaries, and bridges over water courses, to connect with the surrounding network.

- Although public rights of way across the land would be stopped up for the duration of the development, there would be permissive access to most routes, where they would not be in conflict with the remedial operations, or via variations on the routes. Alternative routes would also be provided over common land or as permissive routes to enable management of access while remediation activities were in progress, but would be more formally created once remediation activities are complete.

- Old mine hazards would be remediated, landscape features and character, and the ecological and heritage aspects of the landscape enhanced, with long term benefits.

16.132 In the views from the east in which the remedial and landscape enhancement works would be visible, the landscape enhancement would be apparent, for both landscape and visual amenity, for viewers from the Rhymney conservation area and more distant elevated views, from Bryn Carno and Ras Bryn Oer.

16.133 Early treatment of the eastern, southern and western margins of the site, would provide additional access and information to improve people's connection with landscape, wildlife, and heritage early in the development timeframe

Ecological mitigation and enhancement proposals

16.134 Proposals for ecological mitigation and enhancement at Bryn Caerau Farm would also result in upgrading (above their baseline condition) the features and patterns of the historic landscape of Irregular Fieldscapes, within the Open/Wooded Mosaic Upland Valleys and Open Upland Valleys landscape (VS aspect areas), and these upgraded features and patterns would be managed and maintained in the long term.

Rhymney Valley Ridgeway Footpath

16.135 The part of the Rhymney Valley Ridgeway Footpath route through the site would be temporarily re-routed, along the eastern slopes of the site, through the area to be remediated, and would resume its route at South Tunnel Road. Adverse effects resulting from this temporary albeit long term re-routing would be offset by the upgraded landscape context that would result from the remediation works. As noted in Chapter 6 Recreation and Tourism, the temporary route would be along a new bridleway to be established in advance of mining operations along the lower slopes of the Rhymney valley side. It would link with existing public rights of way and would remain in place as a permanent additional public right of way following restoration of the site.

Restoration strategy

16.136 The proposals for remediation and restoration of operational areas aim to mitigate and/or offset adverse landscape effects and achieve benefits to the landscape character and amenity for local communities in the long term:

- Re-establishing the open upland character of the main operational areas of the site after completion of coaling and backfilling to restore the landform;

- Establishing a variety of habitat types;

- Integrating features of historic interest or marking their locations with new features;

- Restoring and enhancing public access to the area;

- Reinstating the Bent Iron as a landmark and adding other landmark or way-marking features;

- Provision of information signs, seats etc.

16.137 The comprehensive restoration strategy for the whole site aims to integrate considerations of land use, public access and amenity for local communities, nature conservation and cultural heritage, with a landscape character appropriate to the location and context. The restoration strategy would be implemented progressively as operations proceeded.

Environmental Assessment

16.138 The development proposals are described in detail in Chapters 3 and 4, and associated Appendices and Drawings illustrate the components and phasing of the mining project. In addition, areas of land adjoining the operational surface mine are to be subjected to land remediation works over the initial two years of the project.

16.139 The CDP forms part of the planning application site area and is assessed as part of the scheme. The CDP also receives coal from the FLRS. The impact of the proposed scheme together with the existing CDP and the FLRS is assessed cumulatively.

16.140 The LVIA considers the following aspects of the proposals:

a. **Preliminary Operations**: The first operations would be to set up the site before excavation or extraction operations can take place. These operations would include boundary fencing, construction of water treatment facilities, reduction of Rhaslas Pond to accommodate workshops, coal processing and storage requirements; construction of accommodation area, car parking and office facilities including an improvement to the vertical alignment of Fochriw Road and sight-lines to the junction with Bogey Road; erection of on-site coal processing plants, internal roads, wash bays and weighbridge facilities; preliminary soil stripping and construction of soil storage mounds and the screening mound.

b. **Land Remediation Works**: Surface treatment of land within the site to address instability associated with old mine shafts and adits; address the scouring of old colliery tip material into water course feeding Darran Park Lake, and management of the area for lapwing habitat; general tidying up and surface treatment of areas closest to settlements.

The opportunity will be taken to remediate hazards remaining from former mine working especially on the southern and eastern area of the site included to allow (a) remediation of these hazards, (b) identification and conservation where appropriate of those cultural heritage features that can be made safe, (c) ecological enhancement, (d) improved public access with information about the natural and man-made features of the landscape, (e) enhancement of landscape features, pattern and character, and the setting it provides to Rhymney.

c. **Waste Tipping**: Merthyr Industrial Services landfill operation along the disused railway cutting in the southern sector of the operational site. Investigation, sorting, treatment and removal of waste material in the northernmost section of the cutting; investigation and removal of non-inert waste from the site as necessary; capping of waste in the southernmost section; over-tipping treated/processed area of waste with overburden. The landfilling of this area would cease upon commencement of the scheme.

d. **Dispositions 1 to 4**: The process of excavation to expose the coal and storage of overburden material above ground during the progressive extraction and processing of the coal would take place in phases, known as dispositions, shown on **Drawings MA/NL/PA/004-007**, over a period of 11 years. The coal would be transported to and dispatched to market from the CDP, which is separated from the operational site by Fochriw Road. The phased operations include progressive backfilling of the void behind the advancing coaling operations and progressive preparation of the final land form, with the stored overburden used to backfill the final void during Disposition 5 shown on **Drawing MA/NL/PA/008**. As set out previously, stored soils and overburden from the screening mound would be the last to be removed so as to ensure the maximum screening of operations from Rhymney.

e. **Operations at the CDP:** Transport of coal to the CDP from the scheme and from FLRS; coal stocking; coal washing, processing and preparation for market; import of coal by road from other locations; dispatch of coal by road and rail to market; water treatment facilities; use of railway sidings, coal lorry maintenance workshop, coal analysis laboratory, visitor/education centre, staff and operative accommodation/welfare facilities and car parking. A new coal wash facility is to be constructed, within a building, which would be the largest single built element at the CDP. There would be other associated smaller buildings housing other functions and structures, such as covered conveyors, and new water recycling/treatment facilities. The use of the CDP to process coal from the scheme may require extension of the lifetime of the CDP for up to two years beyond its current permitted limit of December 2024.

f. **Ecological mitigation and enhancement proposals** at Bryn Caerau Farm to enhance the ecological value of the main habitats of interest, which are also features of the pattern and character of the "irregular fieldscapes" landscape.

g. **Common Land:** alternative lands are put forward from the outset of development, some areas of which would be used for stock grazing by the commoners and for public access and other areas which would be used for public access only, while the common land within the site would be unavailable.

h. **Restoration of the land**: The restoration strategy is described in detail in the Planning Statement and illustrated on **Drawings MA/NL/ES/16/012-1, 2**. It includes: the spreading of the stored soils and soil-forming materials; formation of micro-topographical features and localised variations in the general restored topography to allow variations to develop in the restored vegetation as it establishes; establishment of water features, water courses and wetland areas; establishment of grassland, heathland, wetland, hedgerow, woodland and other vegetation; preparation of areas for ecological and cultural heritage interests and access to them where appropriate; preparation of landscape features; preparation of public rights of way and urban common/access land, including fencing, gates and stiles, sign-posting.

i. **Decommissioning of the CDP**: At the end of its current permitted time, the areas of the CDP outside the application boundary for this scheme would be restored in accordance with that permission. After end of coaling at this scheme, all plant, machinery and buildings would be removed and the land restored to upland agricultural use.

j. **Aftercare**: Predominantly agricultural operations to rehabilitate the surface of the land and render it fit for the proposed after-use; management of access and facilities for public enjoyment of the ecological, cultural heritage features and the restored landscape.

16.141 The following features are relevant to the assessment of potential landscape and visual effects:

- As part of the preliminary site setup works, the site offices and support facilities would be established in the west of the site, on the northern part of Rhaslas Pond which would be infilled,

- A haul route would be constructed between the site access to Fochriw Road via Bogey Road to the existing CDP. The improvement to Fochriw Road would require engineering works to the road and a temporary diversion over land to its east while the works were going on.

- During Disposition 1 (years 1-4), the initial "box cut" would be excavated in the north-west of the site, generating a need to store overburden above ground

- The majority of the overburden would be stored in a mound in the south of the site, north of the South Tunnel Road and the rest would be used in the initial phase to establish a screening bund on the eastern and north-eastern sides of the proposed excavation area

- The excavation would reach its maximum extent during Disposition 2 (years 5-6), during part of which the initial cut would be backfilled with overburden and surplus overburden would be added to the southern storage mound

- Excavation would proceed in two further Dispositions, progressing towards the east side of the ridge

- During Disposition 3 (years 6-9.5), overburden would be used to backfill the previous void
- During Disposition 4 (years 9.5-11), material from the southern overburden mound would be used to backfill the previous void.

16.142 On completion of the Disposition 4 excavation, the remaining material in the southern overburden mound and then lastly the material from the screening mound would be used to backfill the final void (years12-14) with a minimum of five years' aftercare to ensure its successful establishment (years 15-19),

Assessment of Landscape Effects

16.143 The assessment of landscape effects on the site is set out first so that these can be understood in relation to the wider context.

The landscape of the site

16.144 The assessment of effects on the landscape of the site is by reference to the landscape character areas described above. Table 16-7 below provides a summary description of each landscape area, an assessment of its sensitivity to the proposal, an analysis of the changes likely to arise from the proposal and an assessment of the magnitude of those changes.

16.145 The sensitivity of the landscape depends in part on the nature of the changes likely to be produced by the proposals and the degree to which the landscape (its features, qualities or character) can accommodate them. Parts of the site lie within the main operational area, where large scale changes are likely, and parts outside, where smaller scale operations are proposed.

16.146 Table 16- 8 then sets out the assessment of the levels of landscape effects for each of the operational phases.

Table 16-7 Sensitivity of Landscape Character Areas & Magnitude of Change

Landscape character area	Sensitivity	Scheme proposals in the area	Magnitude of change, Mitigation measures
1. Open upland			
The majority of the site; common land and urban common, designated open access land, crossed by public rights of way, including part of the Rhymney Valley Ridgway Walk. Landscape character: Open, elevated, broad ridge; strong sense of openness or exposure and wildness; tranquil; uninterrupted, wide ranging views (views to the west interrupted by Ffos y Fran overburden mounds) Landscape features: Rhaslas Pond and associated drainage features; features of historic interest: remains of former settlement and mine workings, cutting of a former railway; 400kV overhead powerline prominent to north-west Detractors: intrusion of use of railway cutting for waste disposal & results of fly-tipping and casual waste disposal; moderate traffic intrusion; low intrusion of present coal workings at Ffos y Fran and industrial land use at Cwmbargoed Disposal Point	LANDMAP Evaluations: GL High LH High (most of the area) HL Outstanding CL High VS Moderate Potentially highly sensitive but sensitivity reduced by presence of intrusive features: Moderate to High; Rhaslas Pond: High as a notable landscape/historic landscape feature	A margin along Fochriw Road would be outside the main operational area of the site, where the diverted route of the 33kV power line would run and localised remedial works would take place in the first 2 years, following which public access would be restored. The operational area would be fenced. Part of Rhaslas Pond would be infilled. Its surroundings would be changed to construct the offices, accommodation and facilities to support the mining operations, and vehicle access routes to/from Fochriw Road and the CDP. Parts of the area would be affected by the construction of the water treatment areas and associated infrastructure. The soils on these areas and on the extent of the phase 1 excavation would be stripped and stored in mounds on the perimeter of the site. The western, southern and eastern boundaries of the area would be enclosed by fencing. A road link would be formed in year 1, between the haul road within the site and the Disposal Point via Fochriw Road and Bogey Road. The vertical alignment of a short length of Fochriw Road is to be altered to improve the sight-lines to the road junction, which will require formation of a cutting, reconstruction of the road, and a temporary diversion on the land to the east, while the works are carried out. The temporary road area would be restored to upland grassland and the road edges would be married into the adjacent landform	This area would be affected by the proposals throughout all the operational phases. Initially, the effects would be concentrated in the areas of offices/workshops/other facilities, haulage and access routes water treatment areas, the area of the Disposition 1 excavation and soil storage: localised but locally large changes, adverse and short term Fencing the site would result in long term loss of public access, to both public rights of way, access land and the long distance footpath, and would alter currently open land to enclosed land. The 4 months of construction of the screening bund and 6 years of overburden mound construction would be a period of activity, vehicle movements and earth-moving, intruding on the sense of openness, wildness and tranquillity. Mitigation to reduce adverse effects is possible through the method of constructing the mound: first building up an outer bund to each layer and continuing backfilling behind, followed by grassing the outer slopes as work proceeds and the finished top surface. The changes in the landscape would be large, adverse and medium-long term. The overburden mound would remain in place for a further 3.5 years. The screening bund would remain in place until year 19. As the grass became established, the degree of potential intrusion would reduce, but the overburden mound

Landscape character area	Sensitivity	Scheme proposals in the area	Magnitude of change, Mitigation measures
		and grassed. The excavations for coal extraction would extend into the northern margin of the area during In phases 3-4. The overburden material from phases 1-2 would be stored over much of the area. During part of Disposition 4, the stored overburden would be gradually removed to fill the void. Restoration of excavated areas would proceed progressively through phases 2-4. Final restoration, with removal of stored overburden, offices, hardstandings workshops and other structures; establishment of restoration levels, removal of soil storage mounds as soils are respread and of water treatment areas, would be followed by aftercare operations to establish the vegetation, access routes and landscape features. That would take place over a five-year period. This area would be restored to open upland grazing, with a large area in the south where saved peat would be spread over clay, with a view to re-establishing dwarf wet scrub heath. Public access would be reinstated and a new route established along the alignment of the disused railway, marked by a low bank. The southern part of Rhaslas Pond would be retained and the northern part reinstated as wetland with a new footpath on a low stone-faced bank marking its northern embankment which would have been removed during the excavations. Other new routes would be established to link with those to the west, forming a “heritage trail” between this area and the restored FLRS. In the east, the Rhymney Valley Ridgeway Footpath would be reinstated on a modified alignment, to take advantage of views and to pass by restoration and	and screening mound would remain a new feature in the landscape of the open ridge, with the overburden mound interrupting views from the south, especially, and the screening mound screening views into the void, especially from the east and north east. After coaling, there would be a period of activity and change again, as the overburden and lastly the screening mound was returned to the final void for restoration of the landform, followed by gradual changes as the landscape restoration features were established. During the period of removal of the screening mound views into the void would be available, albeit for the short term during final backfilling operations. The changes in the initial phase would be localised, as site facilities were established. For the Fochriw Road improvement there would be short term changes during the engineering works, and the road improvement would be a permanent localised small change. During mining operations, changes in the landscape would be large, long term and adverse initially whilst the screening and the overburden mounds are constructed, reducing to large to medium adverse once the overburden mound was completed; becoming large adverse again during restoration backfilling, and reducing to small during restoration aftercare. The character of the upland landscape would be reinstated, a neutral and permanent effect, but public access would be enhanced, especially to the landscape habitats and heritage features of the restored landscape and in connectivity with the surrounding landscape, a permanent large amenity benefit.

Landscape character area	Sensitivity	Scheme proposals in the area	Magnitude of change, Mitigation measures
		cultural heritage features. The "Bent Iron" would be reinstated just beyond the eastern edge of the area, as a landmark on the route and in the wider landscape. In the south-east, the water treatment area would be the basis for a wetland, with the possibility of retaining some of the lagoons in reduced form, as remnants of this industrial use of the site and future cultural heritage.	
2. Northern slopes, Bryn Pyllog			
Landscape character: Transition between the open ridge top and agricultural fields on the lower slopes; medium scale, sense of openness to exposure and elevation; sharp contrast with nearby urban areas; views over Rhymney valley and town, to the national park uplands, to the industrial developments at Dowlais Top and Trecatti Landfill Site. Landscape features: Distinct slopes, scarp-like in places; large fenced enclosures of pastureland, partly brighter green improved grass contrasting with the open upland Detractors: Trecatti Landfill Site and roads beyond the area are sources of busyness, lighting and traffic intrusion.	LANDMAP Evaluations: GL Outstanding LH Low HL Low CL High VS Moderate Restored former opencast land tolerant of change without adverse impacts on the landscape character and good potential for upgrading through the restoration proposals: Low	Much of this area lies within the proposed extent of the excavation void. During the preliminary phase, soils would be removed from operational areas and stored in bunds on the site perimeter. The western and northern boundaries of the area would be enclosed by fencing. In phases 1 – 4, the area would be progressively excavated and backfilled. Part of the northern screening mound would be located on the eastern margin of the area. During phase 4, the screening mound would be gradually removed to fill the void. As excavation proceeded the previous Disposition void would be progressively backfilled to restoration land levels, and the process of landscape restoration commenced. A small part of the area in the east is within a remediation area, where localised operations would be carried out to make relict mine features safe, and the area restored within the first 2 years, including reinstatement of public access. Restoration proposals in the area include: field boundaries of hedgerow or stone wall; bands of woodland across the slope marking the transition from lower level hedge-bound fields to stone wall-	There would be small improvements from the addition of planting in the remediation area to the east, in the short term, but most of the area would be subject to large changes throughout the operational phases, with excavation progressing from west to east and establishment of the screening mound on the eastern edge in phase 1 and later removal during year 14. That would be followed by a period of gradual change, during landscape restoration and aftercare, as the restoration features became apparent and the new landscape character established. Restoration proposals in the area would upgrade the landscape features and characteristics – large permanent improvements in landscape features and amenity, sufficient to alter perception of landscape character.

Landscape character area	Sensitivity	Scheme proposals in the area	Magnitude of change, Mitigation measures
		bound fields on the higher land; local features recalling historic elements of the landscape, and enhanced public access.	
3. Northern enclosed fields			
The land falling from the northern slopes of the ridge to the Cwm Carno valley, south of A465. Landscape character: A made landscape, restored from previous opencast workings; moderate scale; sense of openness; views out over field hedges; regular landscape pattern; some discordant elements; attractive views to the north, views to the south confined by rising land. Landscape features: Fields of pasture surrounded by trimmed hedges on banks with occasional (struggling) trees; mature trees along the stream valley on northern boundary of the site. Detractors: Industrial estates on the western edge of Rhymney to the east; A465 apparent by traffic movement, noise and lights as well as lampposts in pale colour; north-west corner crossed by 400kV overhead power line dominating in scale	LANDMAP Evaluations: GL Moderate LH High HL Outstanding CL High VS Moderate Restored former opencast land tolerant of change without adverse impacts on the landscape character and good potential for upgrading through the restoration proposals: Low	The eastern-most part of this area would be outside the operational area of the surface mine, but is included within the site boundary to allow remedial works and landscape enhancement measures. The hedgerows and pastureland in this area would be removed during initial operations, to allow a water treatment area to be constructed in the north-east and to accommodate soils stripped from the operational areas. Site boundary vegetation would be retained. The western, northern and eastern edges would be enclosed by fencing. During the first 4 months of Disposition 1 the screen mound to be formed from overburden material would be constructed on the fields in the south of the area. This would be remain in place to screen operations within the void from views from the north and north-east and would then be removed towards the end of the scheme. Restoration proposals in this area would include upgrading the soil condition and drainage appropriate to the reinstated agricultural use of the land. The field pattern would be restored, with hedgerow boundaries and additional woodland planting along the northern and eastern boundaries. Long term management would take place by the farmer.	Large changes would take place in this area from initial operations through Disposition 1. The features would remain in place through to about year 14, when the screen mound would be removed for backfilling the excavation, soils from the storage mounds respread, the water treatment area removed, a period of activity and further large change over 1 year. That would be followed by the landscape restoration and aftercare, when gradually the restoration features would become apparent and the landscape character re-established. The landscape features and character would be reinstated here, and there would be small improvements arising from additional woodland planting and management.

Landscape character area	Sensitivity	Scheme proposals in the area	Magnitude of change, Mitigation measures
4. South-eastern slopes,			
Transition slopes between the upland of the ridge to the west and the steeper valley side to the east Landscape character: Rounded, smooth, rolling landform; landscape condition mixed, disrupted by tipping and historic industrial land uses on its southern margins; sense of wildness but not remoteness, due to proximity of valley settlement; strong contrast with these areas. Landscape features: Mostly open common grazing; some enclosed fields in the north of the area; crossed by small streams. Detractors: Moderate to high intrusion of industrial and built up areas and traffic on busy roads in the valley.	LANDMAP Evaluations: GL Moderate LH High HL Outstanding CL High VS Moderate Strong landscape structure with valued features of historic landscape; potential for upgrading through remediation and restoration proposals: Moderate - High	All of this area would be outside the operational area of the surface mine, but is included within the site boundary to allow remedial works and landscape enhancement measures. Operations to remediate hazards from old workings would be carried out within the first 24 months. New routes for public access would be established, with signage, gates or stiles in field boundaries, and bridges over water courses, to connect with the surrounding network.	Changes in the landscape during operations would be small in this area. Although large changes would be occurring in the neighbouring area to the west, this area would be separated from them by change in landform between the two areas. There would be small short-term landscape changes during remediation works, and small long term or permanent beneficial changes as a result of the remediation and the improved public access.
5. North-eastern valleys and tips			
The sloping north-eastern part of the site between the enclosed fields and the open upland. Landscape character: A distinct scarp and valley with remains of former mine workings of historic interest; sense of openness; random landscape pattern; medium scale and moderate sense of openness; moderately tranquil; near views of built up area softened by tree	LANDMAP Evaluations: GL Outstanding LH High HL Outstanding CL High VS Moderate Strong landscape structure but degraded; good potential for	The western part of this area would be within the area of the Disposition 3-4 excavation and part of the eastern screening mound. During initial operations, that part of the area would be fenced and soils stripped from the footprint of the screening mound, which would be constructed in Disposition 1. The eastern part of the area would be within the area where remedial works and landscape enhancement measures are to be carried out, as	The changes in the western part of the area would be large adverse and medium term during operations. The screening mound would be established in the earliest phases and grassed, remaining in place until year 14 providing containment to the operational area and screening from the eastern part of the area. It would be a large new feature in the landscape, but formed to merge with the valley side landform and grass-seeded, which would be a medium change over the medium to long term. Its removal for

Landscape character area	Sensitivity	Scheme proposals in the area	Magnitude of change, Mitigation measures
cover; fine, distant views north and south along valley. Landscape features: Diversity of features within the site: tips and associated diverse vegetation, eroded water courses, diverse landforms; divided by fences; sharp boundary to built up area to the east; Detractors: Many tracks of scrambling motor-bikes especially on the tips; moderate sound and visual intrusion from industrial estate, road traffic, erosion of tips, etc	upgrading: Moderate	described for area 4. Landscape enhancements such as planting to lower level field boundaries, stone walling to those on higher land, woodland and other planting, would be carried out and new ponds established. The "Bent Iron" would be reinstated on the edge of the area, within a stone faced terrace feature to give it greater prominence, and integrated with the edge of the common land. As noted, it would be a landmark in the wider landscape. Public access would be reinstated and new routes made, that would enhance connection with the surrounding area and through the enclosed fields to the open upland. Adits and levels in the southern part of the area are of cultural heritage interest. The proposed new footpath with information signage, would allow them to be appreciated.	backfilling the void would be a short period of large change. The remediation works and landscape enhancements in the eastern part of the area would be carried out in the first 2 years, with large long term to permanent benefit to the landscape character and amenity from improved access and opportunities to appreciate the landscape heritage. The restoration proposals in the western part of the area would re-establish landscape features characteristic of the transition from lowland to upland in this area and public access would be reinstated with improved signage and gates. That would be a medium improvement over current landscape condition, and a long term to permanent benefit.
<u>6. South-eastern valley side</u>			
A small area in the east, where the slopes steepen and fall to the A469 in the valley floor Landscape character and features: An enclosed valley with visually interesting rock outcrops or low cliffs, the remains of a small old stone quarry; small scale and enclosure increased by relatively recent woodland plantings on the lower slopes; land beyond falls steeply in smooth slopes of grassland and blocks of woodland planting, to a stone wall boundary with the A469; views confined within quarry; Detractors: Some intrusion of traffic on	LANDMAP Evaluations: GL Moderate LH High HL Outstanding CL High VS Moderate Distinctive features and landscape character: High	Most of this area would be outside the operational area of the surface mine, but is included within the site boundary to allow remedial works and landscape enhancement measures. Operations to remediate hazards from old workings would be carried out within the first 2 years. Part of the area would be the site of a water treatment area during operations, where the slopes would be engineered to accommodate the lagoons which would be enclosed by fencing. New routes for public access through the area would be established, with signage, gates or stiles in field boundaries and bridges over water courses, to connect with the surrounding network.	Changes in the landscape during operations would be small in this area. Although large changes would be occurring in the neighbouring area to the west, this area would be separated from them by change in landform between the two areas. There would be small short-term landscape changes during remediation works, and small long term to permanent beneficial changes as a result of the remediation and the improved public access.

Landscape character area	Sensitivity	Scheme proposals in the area	Magnitude of change, Mitigation measures
A469.			
7. Southern tips			
Area of old tips to the west of the disused railway line and stream valley north of Fochriw. Landscape character and features: On a high part of the ridge extending northwards into the site; landform of characteristic local ridges and valleys of tips; eroded into gullies and bare areas by drainage run-off and motor-bike scrambling; forming part of landscape setting of Fochriw; wide ranging views. Detractors: The tip landform and poor vegetation cover gives a sense of randomness and discordance, interrupting the main ridge landscape; moderate intrusion of Cwmbargoed Disposal Point and Ffos-y-Fran site.	LANDMAP Evaluations: GL Moderate LH High HL Outstanding CL High VS Moderate A degraded landscape tolerant of substantial change; the features that detract from the landscape aesthetics are valued as cultural heritage: Low to Moderate	Engineering works would be carried within to the first 2 years to minimise the scouring of old colliery tip material into water course feeding Cwm Darran Park Lake. Some small scale regrading would be carried out to the tips and drainage off them, and the bank to the stream reformed to a more natural form. Surface treatments to “tidy up” and improve the appearance of the areas closest to Fochriw would be carried out, and connections to Fochriw and other public rights of way in the area improved.	These would be small changes in the short term, with long term benefits to amenity and landscape character.
8. Cwmbargoed Disposal Point.			
Landscape character: An industrial use associated with the extraction of coal, its western boundary defined by the mineral railway; sharp contrast with the adjacent open moorland and enclosed farmland, but in context and closely related to the large scale industrial features and activity of FLRS. Landscape features: Offices, visitor and educational facilities, car parking, plant	LANDMAP Evaluations: GL Moderate LH High HL Outstanding CL High VS Moderate The area is in industrial use and is a relatively low value or degraded	The proposal will add an industrial building within the existing complex of buildings and structures, of similar character to the existing large industrial facility of the CDP, to house a new coal wash facility. The architectural design of the exterior cladding of the new building would give it the appearance of a series or cluster of buildings within the landscape. A new water recycling area would be formed to the west of the railway as a series of lagoons. The area would be enclosed by a fence and soils stripped in the initial operations	The magnitude of change in the site is likely to be small to moderate during construction and during operation, and it is not likely to affect landscape character, features or qualities of its immediate context to more than a small degree. During decommissioning, the dismantling of the proposed development is unlikely to be distinguishable from the process of decommission the whole CDP, and will result in no added landscape change.

Landscape character area	Sensitivity	Scheme proposals in the area	Magnitude of change, Mitigation measures
and large industrial buildings, large areas of hard standing, coal stocks; enclosed within security fences with earth mounding and screen planting on the southern and eastern sides. Detractors: Lit in hours of darkness, with prominent spot and flood lighting at the railway sidings; activity of plant and of vehicles and, occasionally, of movements of long freight trains and associated industrial sounds, apparent from within a short distance of the DP.	landscape, tolerant of substantial change without adverse impact on character: Low	and stored in mounds on the periphery of the site. The area would be excavated to allow the water lagoons to be formed, which would remain in place for the rest of the operational period. During construction, the activities and changes would merge with those of the rest of the site operations, becoming more apparent as the main building is nearing completion. During coaling operations, the CDP would be a place of industrial activity and vehicle movements associated with transport of the coal to the CDP, processing it in the plant already existing in the site, storing it in stock piles and loading it onto trains, all as at present. Although larger in scale, the new built facility would be of similar form and colour to the existing, and the apparent greater “mass” of the building would be reduced by the proposed use of colour patterning. At the end of the operational phase, it would be removed along with the other elements of the CDP during the decommissioning phase. The areas of the CDP outside the application boundary would be restored in accordance with its present planning permission at the end of its current permission. Further small changes would be needed within the remaining CDP to accommodate water treatment facility, if coaling at the Nant Llesg scheme continues beyond this point. The remainder of the CDP would then be restored in accordance with the restoration strategy for this scheme.	

Table 16- 8 Assessment of Landscape Effects

	Assessment: Preliminary operations	Assessment: Phases 1-2 Box Cut to Maximum Void	Assessment: Phases 3-4 Maximum Void to End of Coaling including progressive restoration of Phases 1-3	Assessment: Phases 4-5 Restoration Backfilling & progressive restoration of Phases 3-4	Assessment: Aftercare
Landscape character area & Sensitivity	**Year 1**	**Years 1-6**	**Years 6-11**	**Years 12-14**	**Year 15-19**
1. Open upland Moderate - High (Rhaslas Pond: High)	Minor, adverse, short term	Major, adverse, medium term	Major to moderate, adverse, medium term	Major, adverse, medium term	Minor, neutral, long term to permanent[18] for landscape character Major, beneficial, long term to permanent, for public amenity
2. Northern slopes, Bryn Pyllog Low	Negligible, beneficial, long term, in the remediation area	No additional change	No additional change	No additional change	No additional change
	Minor, adverse, short term	Moderate to major,	Moderate to major,	Moderate to major,	Major to moderate, beneficial, long term to

[18] Remediation and restoration aftercare would be undertaken over the medium term, but the effects would become permanent

	Assessment: Preliminary operations	Assessment: Phases 1-2 Box Cut to Maximum Void	Assessment: Phases 3-4 Maximum Void to End of Coaling including progressive restoration of Phases 1-3	Assessment: Phases 4-5 Restoration Backfilling & progressive restoration of Phases 3-4	Assessment: Aftercare
Landscape character area & Sensitivity	**Year 1**	**Years 1-6**	**Years 6-11**	**Years 12-14**	**Year 15-19**
	in the operational area	adverse, medium term	adverse, medium term	adverse, medium term	permanent
3. Northern enclosed fields Low	Moderate, adverse, short term	Moderate, adverse, medium term	Moderate, adverse, medium term	Moderate, adverse, medium term	Minor, beneficial, long term to permanent
4. South-eastern slopes Moderate to High	Minor, neutral, short term	Minor, beneficial, long term to permanent	No additional change	No additional change	No additional change
5. North-eastern valleys and tips Moderate	Minor, adverse, short term, in the remediation area	Major, beneficial, long term to permanent, in the remediation area	No additional change	No additional change	No additional change in the remediation area
	Major, adverse, short term, in the operational area	Major, adverse, long term, in the operational area	No additional change	No additional change	Moderate, beneficial, long term to permanent, in the operational area

	Assessment: Preliminary operations	Assessment: Phases 1-2 Box Cut to Maximum Void	Assessment: Phases 3-4 Maximum Void to End of Coaling including progressive restoration of Phases 1-3	Assessment: Phases 4-5 Restoration Backfilling & progressive restoration of Phases 3-4	Assessment: Aftercare
Landscape character area & Sensitivity	**Year 1**	**Years 1-6**	**Years 6-11**	**Years 12-14**	**Year 15-19**
6. South-eastern valley side High	Minor, adverse, short-term	Minor, beneficial, long term to permanent	No additional change	No additional change	No additional change
7. Southern tips	Minor, adverse, short-term	Moderate, beneficial, long term	No additional change	No additional change	No additional change
8. Cwmbargoed Disposal Point.	Negligible, short-term	Negligible, long term	No additional change	No additional change	Negligible, neutral, long term to permanent

The wider landscape context

16.147 The LANDMAP classifications and evaluations are used as the basis for assessing the effects of the development proposals on the landscape of the wider context. **Appendix MA/NL/ES/A16/001** contains the descriptions of the LANDMAP aspect areas in the five aspects, which are summarised in section 1.16-1.28 above. Below, the sensitivity of the landscape is derived from the evaluations of the LANDMAP aspects and the changes in the landscape as a result of the development, and hence, the effect on the wider landscape is assessed in Table 16- 10.

Table 16- 9 Landscape sensitivity of the wider context

Receptor & analysis	Sensitivity
Geological Landscape: Part of the site and the landscape context to the north is evaluated Outstanding, and otherwise the evaluation is Moderate generally with some small areas evaluated in the more distant context.	Very High to the north, Moderate elsewhere
Landscape Habitats: The immediate context to the north and east are evaluated Low, and areas of settlement generally are evaluated low in the wider context, but the majority of the study area is evaluated High to the west, south and north, Moderate to the east and south east.	High to north, west and south, Moderate or Low elsewhere
Historic Landscape: a large proportion of the wider context to the west and south, and an area to the far north, is evaluated Outstanding, with areas of High evaluation to the south-east and east of the site and in the far south-west and east of the study area, with some areas of Moderate or Low evaluation to the north-east and east.	Generally Very High or High; Moderate or Low in areas to the north-east and east
Cultural Landscape: The majority of the study area is evaluated High with extensive areas evaluated Outstanding to the north-west, north- and north-east and a smaller area in the south.	High within Very High wider context
Visual & Sensory aspect: The majority of the landscape context is evaluated Moderate or Low (the urban areas in the valleys and the western side of Merthyr Common). Ridges and uplands to the north south-east and east are evaluated High.	Generally Moderate or Low, occasionally High

Table 16- 10 Assessment of landscape effects on the wider context

Receptor & Sensitivity	Changes due to the development	Assessment
Geological Landscape: Very High to the north, Moderate elsewhere	Large topographic features would be formed for a long term period during operations and removed during restoration. That would be a small change in the Geological Landscape context, and there would be little perceptible change after restoration.	Minor, adverse, long term during operations Negligible after restoration
Landscape Habitats: High to north, west and south, Moderate or Low elsewhere	The Landscape Habitats areas extending over the wider context would be affected directly by the loss of parts of the areas within the site during operations. The restoration would aim to restore a range of ground conditions and habitats appropriate to the location. The aspect area covering the north of the site is currently evaluated Low, and the restoration proposals would aim to raise that evaluation in the long term. These would be relatively small changes in the Landscape Habitats represented in the wider context, offset by the restored habitats and the creation of new habitats at Bryn Caerau Farm in the longer term. Ecological mitigation and enhancement proposals in Cwm Golau/Bryn Caerau Farm area would upgrade the grassland, hedgerow and woodland habitats (see Chapter 15).	Generally: Minor adverse effect in the long term as a result of the lost habitats, offset by restored habitats and creation of new habitats at Bryn Caerau Minor beneficial or Negligible effect in the long term to permanently. Bryn Caerau Farm area: Major beneficial in the short term through to permanently.
Historic Landscape: Generally Very High or High; Moderate or Low in areas to the north-east and east	The development would not affect the Historic Landscape of the wider area generally, but the site is covered by an aspect area that extends to the wider area to the south-east which is evaluated Outstanding for “an exceptionally rich and diverse archaeological heritage”. The development proposals include retention of identified historic landscape features within the site and investigation and recording of archaeological assets discovered during operations. The restoration strategy includes providing new routes to visit the identified cultural heritage elements within the site, retaining some features, for example, part of a water treatment area, expressing the locations of former features, and linking them to the historic landscape around the site. While there would be short to long term disruption of the highly sensitive historic landscape, there is the potential for this to be offset by the investigation and recording process and the restoration proposals. Appreciation of other highly or very highly sensitive Historic Landscape areas could be upgraded by these proposals. Ecological mitigation and enhancement proposals in Bryn Caerau Farm area would upgrade and maintain the landscape features and pattern that distinguish the irregular fieldscapes classification (see Chapter 15).	Generally: Moderate, adverse long term during operations; Moderate beneficial in the long term to permanently after restoration. Bryn Caerau Farm area: Major beneficial in the short term to permanently.

Receptor & Sensitivity	Changes due to the development	Assessment
Cultural Landscape: High to Moderate; Very High within the Brecon Beacons National Park	The operations and features of the operational site would be visible or partially visible from parts of the Cultural Landscape area to the north, south-east and east, valued for the policies and designations to protect natural and visual attributes. Most of the CL areas within the ZTV are within 2km and Highly sensitive, while only small and more distant parts of Very Highly sensitive areas would fall within the ZTV. The operations would be a medium change in the Highly sensitive Cultural Landscape context and a small change in the Very Highly sensitive Cultural Landscape context. The visual assessment[19] found for High sensitivity viewers within 1km of the site with direct open views, the development would cause Major, adverse effects during periods of greatest change, reducing to Minor for Very Highly sensitive viewers from the more distant areas within the Brecon Beacons National Park to the north. Ecological mitigation and enhancement proposals in Cwm Golau/Bryn Caerau Farm area would maintain a relatively small part of the "Rural" cultural landscape.	Generally: Major, adverse long term during operations for CL areas within 1km, reducing to Minor those over 2km; Minor or not noticeably different from the present after restoration. Bryn Caerau Farm area: Moderate beneficial in the long term to permanently.
Visual & Sensory aspect: Generally Moderate or Low, occasionally High	The visual assessment found for Moderate to Low sensitivity viewers within 1km of the site with direct open views, the development would cause Moderate to Minor, adverse effects during periods of greatest change, rising to Major for Highly sensitive viewers, and Minor for Highly sensitive viewers in more distant areas within the Brecon Beacons National Park to the north. Ecological mitigation and enhancement proposals would upgrade and maintain the features and patterns of the Open/Wooded Mosaic Upland Valleys and Open Upland Valleys landscape of the Bryn Caerau Farm area.	Generally: Moderate to Minor adverse long term during operations for VS areas within 1 or 2km, reducing to Minor over 2km; Minor or not noticeably different from the present after restoration. Bryn Caerau Farm area: Moderate beneficial in the short term to permanently.

Lighting effects on landscape character and visual amenity

16.148 The changes in the darkness and lighting characteristics resulting from the development are described in the table below, for each of the areas described in paragraphs 1.45 to 1.49 above. The effects of the proposals on visual amenity are set out below (para 1.180 onwards).

[19] See 1.180 and the following section for the visual impact assessment

Table 16- 11 Assessment of lighting effects

	Assessment: Preliminary operations	Assessment: Phases 1-2 Box Cut to Maximum Void	Assessment: Phases 3-4 Maximum Void to End of Coaling including progressive restoration of Phases 1-3	Assessment: Phases 4-5 Restoration Backfilling & progressive restoration of Phases 3-4	Assessment: Aftercare
	Year 1	**Years 1-6**	**Years 6-11**	**Years 12-14**	**Year 15-19**
Light sources of the development **Areas of darkness and lighting**	Moving vehicle lights and point lights at areas of construction of built facilities and support facilities such as water treatments areas on the periphery of the operational site; lighting at the CDP	Concentration of point lights at the built and support facilities in the west of the site; moving vehicle lights and local flood lights at excavation and overburden mound areas; moving vehicle lights along haul route to CDP; lighting at the CDP	Point lights at the built and support facilities in the west of the site; moving vehicle lights and local flood lights at excavation area; moving vehicle lights along haul route to CDP; overburden mound would be dark; lighting at the CDP	Point lights at the built and support facilities in the west of the site; moving vehicle lights and local flood lights at excavation and overburden mound areas as over burden is removed to backfill the void; moving vehicle lights along haul route to CDP lighting at the CDP	Occasional localised vehicle lights during the agricultural operations associated with establishing landscape features
The site and immediate environs, Intrinsically Dark, except for vehicle lights along Fochriw and South Tunnel Roads	The moving vehicle lights and scattered point lights would change the darkness level of this area to Low Distinct Brightness; the effect would be localised: Minor, adverse, short term effect	The moving vehicle lights and scattered point lights would change the darkness level of this area to Low Distinct Brightness interspersed with bright point lights, with a concentration of Low to Medium Distinct Brightness at the built and support facilities in the west, causing localised Light Spillage: Minor to Moderate, adverse, medium term effect.	The moving vehicle lights and scattered point lights would change the darkness level in the north of this area to Low Distinct Brightness interspersed with bright point lights, with a concentration of Low to Medium Distinct Brightness at the built support facilities in the west, causing localised Light Spillage: Minor, adverse, medium term effect.	The moving vehicle lights and scattered point lights would change the darkness level of this area to Low Distinct Brightness interspersed with bright point lights, with a concentration of Low to Medium Distinct Brightness at the built support facilities in the west, causing localised Light Spillage: Minor to Moderate, adverse, medium term effect.	The Intrinsically Dark character of the area would be restored.

	Assessment: Preliminary operations	Assessment: Phases 1-2 Box Cut to Maximum Void	Assessment: Phases 3-4 Maximum Void to End of Coaling including progressive restoration of Phases 1-3	Assessment: Phases 4-5 Restoration Backfilling & progressive restoration of Phases 3-4	Assessment: Aftercare
	Year 1	**Years 1-6**	**Years 6-11**	**Years 12-14**	**Year 15-19**
Fochriw, Low Distinct Brightness, set within Intrinsically Dark upland	The darkness and light character of this area would not itself be changed, but the view from it of the Intrinsically Dark upland of the site would change to include moving vehicle lights and scattered point lights: Minor, adverse, short term effect.	During formation of the overburden mound, moving vehicle lights and point lights at locations of operations would be apparent in views to the north: Moderate, adverse, medium term effect.	The overburden mound would screen views of lit areas of the site and the site would largely appear Intrinsically Dark: Negligible, medium term effect.	Moving vehicle lights and point lights at locations of operations would be apparent in views to the north during removal of the overburden mound to backfill the void: Moderate, adverse, medium term effect.	The darkness and light character of this area would be restored.
The operational areas of FLRS, localised areas of Low Distinct Brightness, and static and moving point lights	No change	No change	No change until removal of the northern overburden mound at FLRS was complete, when the lighting at the built facilities in the west of the site, moving vehicle lights between operational areas of the site and point lights at locations of operations would be apparent in views available from FLRS. As an industrial area, the effect on landscape character and visual amenity is assessed as None.	Moving vehicle lights and point lights at locations of operations would be apparent in views to the east during removal of the overburden mound to backfill the void. Towards the end of this period, the FLRS site would be restored and available for public access, when the effects of the lighting at Nant Llesg would be moderately intrusive on the Intrinsically Dark character in the eastern parts of the restored	The previous Intrinsically Dark character of the area would be restored.

	Assessment: Preliminary operations	Assessment: Phases 1-2 Box Cut to Maximum Void	Assessment: Phases 3-4 Maximum Void to End of Coaling including progressive restoration of Phases 1-3	Assessment: Phases 4-5 Restoration Backfilling & progressive restoration of Phases 3-4	Assessment: Aftercare
	Year 1	**Years 1-6**	**Years 6-11**	**Years 12-14**	**Year 15-19**
				landscape, resulting in Minor to Moderate, adverse, short term effect	
Cwmbargoed Disposal Point, with localised point lights on buildings and plant, moving vehicle lights, intermittent vehicle warning lights, and bright flood lights at the rail sidings	No change	No change	No change	No change	With restoration of the CDP as well as the site, the previous Intrinsically Dark character of the area would be restored.
Rhymney Valley settlements and roads, High to Medium Distinct Brightness	The darkness and light character of this area would not itself be changed, but the view from it of the Intrinsically Dark upland of the site would change to include moving vehicle lights and scattered point lights: Minor, adverse, short term effect.	The view of the Intrinsically Dark upland of the site from some locations would continue to include moving vehicle lights and scattered point lights, but once the screening mound was completed, the site would appear Intrinsically dark from most of the area: Minor, adverse, medium term effect.	Once the overburden mound was formed, no moving vehicles could be seen and the site would appear Intrinsically Dark: Negligible or No effect, medium term.	Moving vehicle lights and point lights at locations of operations would be apparent in views to the site during removal of the overburden mounds, increasing as the screening bund is removed: Minor, adverse, medium term effect.	The view of the Intrinsically Dark upland of the site would be restored.
Sky Glow above the valley urban areas	No change	No change	No change	No change	No change
The corridor of the A465, High	No change	No change	No change	No change	No change

	Assessment: Preliminary operations	Assessment: Phases 1-2 Box Cut to Maximum Void	Assessment: Phases 3-4 Maximum Void to End of Coaling including progressive restoration of Phases 1-3	Assessment: Phases 4-5 Restoration Backfilling & progressive restoration of Phases 3-4	Assessment: Aftercare
	Year 1	**Years 1-6**	**Years 6-11**	**Years 12-14**	**Year 15-19**
Distinct Brightness at the roundabout junctions and moving vehicle lights					
The Intrinsically Dark landscape extending into the Brecon Beacons National Park	The darkness and light character of the area would not itself be changed, but the view from it of the Intrinsically Dark upland of the site would change to include moving vehicle lights and scattered point lights in the distance: Negligible effect, short term.	The view of the Intrinsically Dark upland of the site would continue to include moving vehicle lights and scattered point lights in the distance: Negligible effect, medium term.	The view of the Intrinsically Dark upland of the site would continue to include moving vehicle lights and scattered point lights in the distance: Negligible effect, medium term.	The view of the Intrinsically Dark upland of the site would continue to include moving vehicle lights and scattered point lights in the distance: Negligible effect, medium term.	The view of the Intrinsically Dark upland of the site would be restored.

16.149 In summary, the Intrinsically Dark character of the operational areas of the site itself would be changed during the operational period to one of Low Distinct Brightness with moving vehicle lights and point light sources at locations of operations, which would vary in correspondence with the phases of the operations. There would be a concentration of Low to Medium Distinct Brightness at the built and support facilities in the west of the site, causing localised Light Spillage. For other areas, the lighting of the site and operations would be visible to varying degrees and varying with the phases of operations. Moving vehicle lights and point lighting of locations of operations during formation of the screening and then the overburden mound would be visible, but the screening bund would reduce or prevent adverse effects on many views from Rhymney in particular.

16.150 In views from the south and east, the mounds, once formed, would screen most other lighting within the site for much of the operational period. Lighting of the site, along with lights from moving vehicles, would however become visible again during removal of the overburden mounds and screening bund. It is unlikely that the Intrinsically Dark upland landscape of the part of the Brecon Beacons National Park within the study area would be accessed at night, and moving vehicle lights and scattered point lights would be distant elements in night-time views from the area.

16.151 The Intrinsically Dark character of the site and its appearance in views from surrounding areas would be restored with completion of landscape restoration.

Potential Temporary Common Land

16.152 Some 314ha of common land lies within the site (areas 1-5), including parts of the Gelligaer and Merthyr Commons. It is anticipated about 201ha would be required to be fenced off for the development and would not be available for common uses for the period of the development, including the restoration and aftercare period. About 113ha would be unavailable, in various parts and at varying times, for up to 2 years while remediation and landscape improvement works were undertaken. The scheme proposals include the provision of alternative land which could be used for stock grazing by the commoners and for public access, and other areas which could be used for public access only in order to offset the adverse effects of the loss of the common land within the site during operations. These are identified as Areas 6-14 on **Drawing MA/NL/PA/035**.

16.153 In the following sections is a summary of the current landscape character of each area, its intended use or management as replacement common land, and the effects of the use on the landscape character.

Area 6 – Land adjacent to Heads of the Valleys Industrial Estate

Baseline description

16.154 The majority of the area comprises the lower slopes of site landscape character area 5 North-eastern valleys and tips and partly includes the northern part of area 4 South-eastern slopes. A distinct scarp slopes down to the industrial estate in the valley, with fields divided by fences and remains of former mine workings (which are of historic interest). Scale is medium and there is a moderate sense of openness, the landscape pattern is random. Many tracks of scrambling motor-bikes are evident especially on the tips, and there is moderate sound and visual intrusion from industrial estate, road traffic, erosion of tips, etc. Near views of built up area are softened by tree cover. In the south, it forms part of the transition slopes between the upland of the ridge to the west and the steeper valley side to the east.

16.155 This area is included in the remediation scheme for the project which would establish small-medium scale fieldscapes, the fields divided by stone walls in keeping with the traditional valley-side landscape pattern. Footpaths are proposed, providing "managed" public access, connection between the valley side and upland landscapes, and access to the historic landscape features.

Intended use

16.156 This land would be made available after and, where possible, during remediation for common grazing and public access.

Landscape effects

16.157 The area could accommodate "managed" public access without significant adverse effect on the remediated landscape. Common grazing with open access would be likely to result in damage or degradation to the restoration landscape features to be established, with major adverse effect for the objectives of the restoration strategy.

Area 7 – Land west of Pontlottyn

Baseline description

16.158 Land sloping down north-east towards Pontlottyn and to the north-west of Pontlottyn, on either side of Fochriw Road near Brynhyfryd and Brynglas. It borders higher, open common land to the west, south and east, which is also access land. The rising land and the vegetation features give a sense of enclosure, in contrast with the open land beyond. Public footpaths follow the eastern and southern boundaries of the southern area, giving access from Fochriw Road. The Rhymney Valley Ridgeway Footpath and other rights of way cross the open land to the south and west.

16.159 The southern area is bounded by gappy hedges, including along the road between South Tunnel Road and Pontlottyn (Fochriw Road), and a conifer shelter belt on its south-western side. The boundary to the common is marked by stone walling in poor condition. The northern area is bounded by a trimmed hedge along Fochriw Road and fencing with gappy vegetation along other boundaries. Both areas are currently in use for grazing.

Intended use

16.160 The land is currently in use for grazing and not available for replacement grazing land. However, it would be made available for public access. That would mean that the public could "roam" within the fields and would not be confined to the existing public rights of way.

Landscape effects

16.161 The land is immediately adjacent to both existing open access land and to the community of Pontlottyn. There would be long term moderate benefit to the community from the easier access to access land[20] and adverse effects on the landscape character are unlikely.

Area 8 – Land South of Rhymney

Baseline description

16.162 This parcel of land is located on the higher land of the ridge and including part of the steep scarp slope to the Rhymney Valley to the east. The scarp slope is craggy with grassy ledges and scrub in places, characteristic of the setting of the A469 and Pontlottyn above the Rhymney River. The higher land in the area is fenced, improved pasture, contrasting with the open common grazing land adjacent to it. Its elevation provides fine distant views, including to the national park to the north and over the valley settlements. There is a communications mast on the high point of the scarp, a landmark in many views.

16.163 Two public footpaths cross the southern part of the area, one apparently along the scarp slope, one connecting with the A469 at Craig Rhymney and one connecting with access land to the west of the area. The adjacent land is open access land and the Rhymney Valley Ridgeway Footpath follows a stone track along the western boundary of the area. The land is currently used for grazing.

Intended use

16.164 The land would be made available for public access. As with Area 7, this would mean that the public could "roam" within the fields and would not be confined to the existing public rights of way.

Landscape effects

16.165 The land is immediately adjacent to existing open access land and the long distance footpath. There would be long term moderate benefit to the community from the additional access to this elevated land with its wide-ranging views. Adverse effects on the landscape character from public access are unlikely.

[20] As noted previously, potential effects on the access land and rights of way as a recreational resource are considered in Chapter 16 Recreation.

Area 9 - Area of land south of the Ffos-y-Fran Land Reclamation Scheme between the minor road and the Bargod Taf

Baseline description

16.166 This is a narrow strip of land, sloping steeply to the stream and separating the existing open common and access land from the road. It is rushy grassland with scattered scrub and trees along the stream. There is a strong sense of enclosure within the valley and views are confined to the near landscape. To the north, the features of FLRS dominate the landscape but to the south and east, the open common rising to Mynydd Gilfach yr Encil and the enclosed valley landscape of irregular hedge-bound fields provide the context. There is a layby alongside the road a short distance to the west.

Intended use

16.167 This land would be made available for both common grazing land and for public access.

Landscape effects

16.168 Although a small parcel of land, its use for grazing additional to the adjacent common land and use by people for public access would not result in changes to its landscape character and would be a minor benefit in potentially easier access between the road and the open land to the south[21].

Area 10 Land to the south of the Ffos-y-fran Land Reclamation Scheme - part of the Bryn Caerau Farm: 10a improved grazing west, 10b - improved fields to north

Baseline description

16.169 This land is at the head of and along the Taf-Bargod valley, on the slopes rising to the north and west from the enclosed irregular fieldscape of the valley bottom. To the north, the features of FLRS dominate. The area is characterised by rolling valley-side landform, larger fields enclosed variously by fences, hedges with some trees, and walls in poor condition. There is a strong sense of containment within the valley, but on the rising land with views over the attractive traditional farmland on the lower land. This area provides a transition to the open common and access land rising to Mynydd Gilfach yr Encil, which adjoins it to the west. There are no public rights of way over this land.

Intended use

16.170 This land would be made available for both common grazing land and for public access.

Landscape effects

16.171 There would be no adverse effects on landscape character from the proposed use for common grazing and public access. There would be minor long term benefit to the public from increased access to the countryside.

[21] Potential effects on the access land and rights of way as a recreational resource are considered in Chapter 16 Recreation.

Area 11 - Land at Gilfach yr Encil & Glinmil

Baseline description

16.172 This area is located on the steep west facing Taff Valley side, on gentler upper slopes below the prominent ridge of Mynydd Gilfach yr Encil. It is an area of enclosed fields of improved pasture surrounded by open access land and adjoining the common land of Merthyr Common. The fields are enclosed by low banks, fences and stone walls in poor condition and there are occasional trees. In the south of the area are the remains of the former farmstead of Gilfach-yr-Encil. To the north of the area are former coal tips and mine remains.

16.173 This area lies a short distance from the residential areas on the east of Troedyrhiw, and the land between them is access land.

16.174 Because of its elevation on the valley side there is a strong sense of openness with wide ranging views over the Taff Valley and north to the Brecon Beacons.

Intended use

16.175 This land would be made available for common grazing and public access.

Landscape effects

16.176 There would be no adverse effects on landscape character from the proposed use for common grazing and public access. There would be minor long term benefit to the public from increased access to the countryside and the visual amenity of the views available from the area.

Area 12 - Land at Pendducae Fawr Farm

Baseline description

16.177 This area is partly on the ridge top to the north of Mynydd y Capel and south of Mynydd Gilfach yr Encil, with views over the Taff Valley, and partly on the north-east facing valley side overlooking the Bargod-Taf Valley and the village of Bedlinog.

16.178 It is an area of medium sized fields forming a regular pattern on the gentler upper slope above the steep lower slopes of the valley side, where fields are smaller and irregular. Field boundaries are variously dry stone walls or hedges, with some mature trees, more frequent on the lower slopes to the east.

16.179 There are a number of farmsteads (Penddeugae-Fawr, Penddeugae-fach, and Bryn-rhedyn). Penddeugae-Fach, which would be excluded from the area, is accessed from a minor road from the Taff Valley and a community route from Troedyrhiw. Otherwise there is no public access to this area. It adjoins the common and open access land along the ridge to north and south-west and is bounded on the south-west by conifer plantation on the Taff Valley side.

Intended use

16.180 This land would be made available for common grazing and public access.

Landscape effects

16.181 Adverse effects on landscape character from the proposed use for common grazing could arise from loss of field boundary vegetation or walls, which could be prevented by appropriate land management and fencing. There would be minor long term benefit to the public from increased access to the countryside and the visual amenity of the views available from the area.

Area 13 - Land adjacent to Heads of The Valleys Industrial Estate

Baseline description

16.182 Part of the upper slopes of site landscape character area 5 North-eastern valleys and tips, a distinct scarp and valley with remains of former mine workings of historic interest between the enclosed fields on the lower valley side and the open upland to the west. The elevation gives a sense of openness and there are fine, distant views north and south along valley. Fields are currently divided by fences. Many tracks of scrambling motor-bikes are evident especially on the tips, and there is moderate sound and visual intrusion from industrial estate, road traffic, erosion of tips, etc.

16.183 This is part of the land to be remediated as part of the scheme which would establish small-medium scale fieldscapes, the fields divided by stone walls in keeping with the traditional valley-side landscape pattern. Footpaths are proposed, providing "managed" public access, connection between the valley side and upland landscapes, and access to the historic landscape features.

Intended use

16.184 This land would be made available during, where possible, and after remediation for common grazing and public access.

Landscape effects

16.185 The area could accommodate "managed" public access without significant adverse effect on the restoration landscape. Common grazing with open access would be likely to result in damage or degradation to the restoration landscape features to be established, with major adverse effect for the objectives of the restoration strategy.

Area 14 - Land currently part of inert waste landfill facility running in old railway cutting and not common land

Baseline description

16.186 This waste tipping operation has been using the cutting of the disused railway line through the site as a repository with unattractive entrance gates and signage on South Tunnel Road where the line of the disused railway crosses the road. It is an operational waste site, with mounds of waste that intrude on the landscape character. It would cease operation on commencement of the scheme, when the associated fencing and signage would also be removed. It is within the footprint of the proposed overburden mound. The restoration landform would be formed so that the waste store was not uncovered or disturbed and restoration of the land would be to upland grassland/wet heath with a character appropriate to the landscape context. The line of the disused railway would be marked in the restoration design by a low earth bank on which a bridleway would be established, so the route would be marked in the landscape for the future.

Intended use

16.187 This land would be made available after the end of operations and restoration aftercare for common grazing and public access.

Landscape effects

16.188 Its dedication after restoration as urban common would remove an interruption of the common and access land within the site, a permanent landscape benefit.

Assessment of Visual Effects

16.189 The visual effects of the proposed development are assessed by reference to the receptors and the viewpoints identified above in Table 16- 2 Viewpoint locations and selection criteria. From these, viewpoints were selected for which photomontages were prepared to illustrate the view at selected stages of the development, which are described in **Appendix MA/NL/ES/A16/003**. Photographs of the views are on **Drawings MA/NL/ES/16/011-1 to 9** with photomontages for seven viewpoints illustrated on **Drawings MA/NL/ES/16/013 to 19** at three key stages of the development and after restoration.

Visual sensitivity

16.190 Based upon the criteria in Table 16- 3 Sensitivity of Receptors, the sensitivity of viewers ("visual receptors") at these locations has generally been classified as follows:

Table 16- 12 Sensitivity of viewers

Receptor/groups of viewers	Nature of the view or visual amenity	Sensitivity	Representative viewpoints
Residents	Indirect or oblique views	High to Moderate	1, 2, 3, 4, 5, 14
Residents	Direct, open views	High	1, 2, 3, 4, 5, 15, 19, 22
Residents	Oblique views from residence but open views when travelling to and from the residence	High to Moderate	14, 22
Users of a promoted footpath or cycle route	The view of the landscape is an important attractant	High	6, 9, 13, 19
Users of public rights of way	The landscape and views are the attractant	High generally, Moderate where views are interrupted or intermittent	1, 10, 12, 14, 15, 21
Users of access land	An important recreation resource	High	1, 10, 11, 16, 17, 18, 19, 20, 21
Users of a recreational amenity	The setting contributes to the amenity but is not the focus of the view	Moderate to Low	9, 11, 12

Receptor/groups of viewers	Nature of the view or visual amenity	Sensitivity	Representative viewpoints
Users of local community facilities, golf course and clubhouse, etc	The attention is likely to be more focussed on the recreational use than on the landscape	Moderate to Low	7, 11, 17
Users of sitting area, public open space	A local community facility or amenity, visual amenity is part of the attraction	Moderate	2, 4, 9
Visitors to a Country Park	A promoted recreation facility where the landscape is an important attraction	High	12
Views from valued landscapes	BBNP, conservation area, VILL, LOHI, LSHI, SLA, LANDMAP VS evaluation is High.	High	1, 3, 6, 9, 10, 11, 12, 14, 16, 18, 19, 20, 21
Town centre visitors	Rhymney, frequent framed views	Moderate	3
View from an industrial estate	The focus is not on the landscape	Low	15, 23
Travellers along the road	Direct but passing views View is not focussed on the landscape but with open views over the open upland	Low to Moderate	1, 4, 8, 11, 22

Findings of the visual impact assessment from the viewpoint study

16.191 **Appendix MA/NL/ES/A16/003** sets out the detailed assessment of effects at the twenty-two viewpoints selected as representative of the views available to various groups of viewers. The findings are summarised below for each group. The findings should be read in conjunction with **Appendix MA/NL/ES/A16/003** and **Drawings MA/NL/ES/A16/011-1 to 9**, Viewpoint Photographs and **MA/NL/ES/A16/013 to 19,** Photomontages.

Visual effect for residents

16.192 For residents within 2km of the site with direct open views, the development would cause Major, adverse medium term effects, especially at times during years 1-6 and 12-14, when the overburden and screening

mounds were being formed during the early phases of excavations, and later removed to fill the final void. The effects in these phases would be reduced to Moderate for residents with oblique or indirect views and for more distant residents. The effect would be intermittent, as the proposal to form the outer face of each layer first and remove it last would provide screening of operations behind. The screening mound on the eastern and north-eastern sides of the excavation area, to be formed early in the development over a 4-month period, would screen views of the excavation area from most of Rhymney, and partial screening from more elevated points on the east of Rhymney to Princetown area.

16.193 During the initial operations, visual effects would be Moderate, adverse short term for residents at relatively elevated locations with open views from the east or north-east. For other residents, the visual effects would be Negligible or none in this phase.

16.194 After formation of the screening and overburden mounds, they would remain in place for the medium to long term as elements in the landscape, with varying visual effect depending on the relative elevation, distance and angle of view. This was assessed as Moderate, adverse generally, but Minor for more distant viewers. For the very near residents in Fochriw, once formed, the overburden mound would screen other operational areas of the site from view and the visual effect would arise from the interruption of the open view north currently available.

Views from Rhymney Town Centre and Conservation Area

16.195 The view from Rhymney Town centre was considered in its own right as it is the nearest town and a conservation area. Because of the relatively low elevation and the buildings and mature trees within the town centre, the views available are generally framed glimpses where streets or junctions or the playing field open views towards the site. For visitors to the town centre, the visual effect was assessed as Moderate adverse medium term during overburden mound construction and removal and Minor adverse medium term during other phases. There would be no views of the excavation area, potential visibility screened by the proposed screen mound. The Remedial and landscape enhancement works on the eastern valley side would be visible in some of these views, assessed as Minor to Moderately beneficial in the long term to permanently.

Travellers along Roads

16.196 Travellers along the roads in the visual study area are generally assessed as having Low sensitivity to changes in their view, but Fochriw Road and South Tunnel Road are just beyond the site boundaries and there would be direct open views of the site available from them, raising their sensitivity to Moderate. Generally the visual effects were assessed as Minor or Moderate, adverse medium to long term during the main operational phases, and Minor or Negligible during initial operations and restoration aftercare.

16.197 From the north-west of the site on Fochriw Road, however, the view would include the built facilities and coal processing facility to be located between the excavation and overburden mound areas, raising the visual effect to Moderate to Major during the main operations and Moderate to Minor during initial operations or Negligible during restoration aftercare.

Viewers from Common/Access Land

16.198 The site is located on an elevated ridge and surrounded by other ridges and uplands, much of which is common and/or open access land.

16.199 For people using access land on the more distant uplands of the Brecon Beacons National Park to the north, the visual effects would be reduced by the distance from the site and the greater elevation, which affords wide ranging panoramic views, in which the site and the features of the development would be relatively small elements. In views from access land more than 5km from the site, the visual effects would be no more than Minor, adverse, medium term, during the phases of greatest change, i.e. during initial excavations and overburden mound construction and later removal for backfilling the final void and restoring the site.

1.1 For people using access land near the site, within 1km, the effects during these phases would be Major, adverse and medium term, reducing to Moderate medium term due to the presence of the overburden mound, and Minor short term during initial site enabling operations and aftercare operations to establish the restored landscape. In views from nearby access land, the changes in the CDP would result in

Moderate, short term adverse visual effect, during construction, and Moderate, long term, during operation.

16.200 At intermediate distances, the effects would be reduced to Moderate during the phases of greatest change and Negligible during initial operations and restoration aftercare.

Users of public rights of way generally and promoted routes

16.201 This pattern is repeated for the public rights of way from which views of the site are available. There are frequent public footpaths and bridleways, and several promoted long distance footpaths and cycle routes.

16.202 Because of the low level routes followed by the promoted cycle routes near the site, the features of the development would have varying visual effects: from None to Moderate, medium to long term adverse for the route through Abertysswg and route 46 to the north of the site.

16.203 From the distant, although elevated, Sirhowy Valley Walk, about 5km to the east of the site, the visual effects would be no more than Minor, adverse medium term, during the main excavation phases of the development, Negligible during the phases of least change in initial site enabling operations and aftercare operations.

16.204 The nearest promoted route is the Rhymney Valley Ridgeway Footpath, following the ridge of Cefn y Brithdir south-eastwards from the site. From the higher elevations of the ridge, the visual effects of the development would be Moderate to Major adverse medium term, during the phases of greatest change, reducing to Moderate after the overburden mound is established. Visual effects would be Minor, adverse short term, to Negligible during the initial site enabling operations and aftercare operations.

Users of public open spaces and local amenity spaces and recreational facilities

16.205 Within the visual study area, views are available from several public open spaces, local recreational facilities and golf courses. The assessment identified no more than Moderate, adverse medium term, visual effects during the phases of greatest changes, for the Parc Bryn Bach Country Park and users of the ridges of Mynydd Fochriw and Mynydd Cilfach yr Encil for paragliding. For local amenity open spaces and golf courses, the effects assessed in the phases of greatest change were Minor to Moderate, adverse.

Views of Remediated Areas

16.206 In the views from the east in which the remedial and landscape enhancement works would be visible, their visual effect was assessed as Moderate, beneficial, over the baseline condition in the long term to permanently for viewers from the Rhymney conservation area, and Minor, beneficial, for the more elevated views represented by viewpoints at Bryn Carno and Ras Bryn Oer.

Assessment of Cumulative Effects

Baseline

16.207 The cumulative landscape and visual effects assessed are of this proposal with the following other developments, which are taking place within 5 kilometres of site, or are likely to take place during or extending beyond the lifetime of the development, whose locations are shown on **Drawing MA/NL/ES/16/020-1**:

- The operational Ffos-y-fran Land Reclamation scheme (FLRS), which commenced operation in 2007 and whose site boundary is about 20m to the west of the site boundary at its nearest point. This development would continue in operation until 2022, with progressive restoration by backfilling, including removal of the overburden mounds and restoration of the site, continuing until 2024, which would be followed by an aftercare period.

- Cwmbargoed Disposal Point (CDP), located in the south-west of the Nant Llesg site. It is included in the cumulative impact assessment as a past development that has been operational intermittently, and continues in operation to process coal. It is also included in this development proposal because a new coal wash facility is proposed and use of the CDP for this scheme would require changes to the water treatment facilities and is likely to require an extension to its existence beyond its currently permitted limit. At the end of the current permission the areas outside this scheme's application boundary would be restored.

- Merthyr Industrial Services landfill operations (MIS), which has been in existence for some time and occupies a narrow band of land within the site boundary, and which will cease operation on commencement of the proposed development.

- Trecatti Landfill Site, which has been in operation since the late 1980's. The main part of the Trecatti site is located just over 300m to the west of the site and immediately north of FLRS. Its vehicular access is from Fochriw Road, immediately west of the site. This is a long term development, which is expected to continue in operation beyond the lifetime of either the FLRS or the proposed development.

- NET Wood Pellet Plant, Rhymney, a recently consented development, which is to be located in the Capital Valleys Ecopark within the existing Capital Valleys Industrial Estate on the western edge of Rhymney. It is scheduled to be under construction during 2013 and is assumed to be in operation indefinitely from 2014.

16.208 The information concerning the developments, and their ZTVs, where available, was obtained from their respective planning applications or other documents in the public domain. Where such information was not available, the developments are described from site observation.

16.209 The timescales of the developments considered in relation to that of the proposed development have been estimated from the information available and are outlined on **Drawing MA/NL/ES/16/020-2,** and related to the proposed timeline of the proposed development.

16.210 The cumulative effects of the proposal with these other developments are assessed as follows:

- Additive effects: landscape and/or visual effects combined with or in addition to the effects of the other developments

- Sequential: experience of first one effect, and later another at different places as one moves through the landscape

- Temporal: effects accumulating over a period of time on the landscape or visual amenity, from this proposal and the other developments.

16.211 The changes in the FLRS during the life of the development were included in the computer modelling for the ZTVs and photomontages of the proposed development.

<u>Merthyr Industrial Services Landfill Operations (MIS)</u>

16.212 This landfill operation uses the cutting of the disused railway line through the site as a repository. It will cease operation on commencement of the proposed development. It is apparent from beyond the site from the intrusive entrance gates and signage on South Tunnel Road where the line of the disused railway crosses the road. Initial operations and restoration of the site have been influenced by the need to treat and/or remove waste from the northern part and encapsulate the deposited waste in the southern part of the landfill. That would occur during initial operations before deposition of the overburden mound, when the associated fencing and signage would also be removed. The restoration landform would be formed so that the waste store was not able to be uncovered or disturbed. The line of the disused railway would be marked in the restoration design by a low earth bank on which a bridleway would be established, so the route would be marked in the landscape for the future.

16.213 Temporally, as noted, the MIS operations and its visible features would be removed from the landscape when the development commenced, and would be replaced by the overburden mound and fencing in the

south of the site. In the long term, that would in turn be replaced by the restoration landscape, in which the MIS site would be indiscernible. The restored landscape would be a beneficial change from the baseline position.

Ffos-y-fran Land Reclamation scheme (FLRS)

16.214 Coal extraction at FLRS would continue until 2022. Maximum void, when both the extraction void and the overburden storage mounds would be at their maximum sizes, would occur approximately between 2014 and 2016. During this time, operations would commence at Nant Llesg, with initial operations in 2014 and excavation of the initial Box Cut commencing in 2015. Maximum void would be achieved at Nant Llesg during the final coaling phase at FLRS, in 2019-20.

16.215 By 2022, removal of the overburden mounds at FLRS to backfill the final void would have commenced, continuing for a further 2 years, with progressive restoration of the land surface and features. As backfilling was near completion at FLRS, removal of the overburden mounds to backfill the final void at Nant Llesg would commence and continue for a further three years, to 2027 to complete restoration of the site. Aftercare would continue after that until 2029 at FLRS and until 2032 at Nant Llesg.

16.216 **Drawing MA/NL/ES/16/020-3** shows the cumulative ZTVs (CZTV) of FLRS and Nant Llesg when Nant Llesg would have achieved maximum void and, correspondingly, maximum height and extent of overburden storage. At that point, FLRS would have passed maximum void stage and be part way towards final void and three years from end of coaling. This is probably the point of maximum combined effects between the two schemes. A feature of the CZTV is that the overburden mounds of each scheme provide a degree of screening for the other scheme, reflected in the pattern of visibility of the excavation voids of the two developments: to the east, there are few locations where FLRS void would be visible and, to the west, few areas where Nant Llesg void would be visible.

16.217 The main zone where the voids and overburden mounds of both developments would be visible is to the north-west of Nant Llesg, at between 1 and 2km distance, as the land rises to the north from the A456 as far as the Brecon Beacons National Park boundary where the long ridge of Cefn Ystrad provides a visual boundary. A smaller zone of combined visibility would occur along the south-west facing flank of Cefn Twynau-duon further to the north and east, between 2 and 5km distance. Elsewhere, such combined visibility would only occur on the tops of higher ridges in small areas in the south and south-east of the CZTV, such as at Mynydd Bedwellte.

16.218 The pattern of combined visibility of the overburden mounds without combined visibility of the voids is similar. The overburden mounds and void of FLRS would be seen in views from the west, but they would in turn screen views of the proposed development.

16.219 As can be seen in the timeline on **Drawing MA/NL/ES/16/020-2**, there would be a period of about eight years when the most prominent features at both FLRS and at Nant Llesg would be extant together: the overburden mounds and the excavation voids. The overburden mounds would provide containment of and separation between the active operations in the two sites, so that it is likely that the combined effects of the two sites would be related to the effects of the overburden mounds, while the effects of the excavation voids would be apparent sequentially, that is, from different locations in the landscape, both on landscape character and on views.

16.220 Temporally, FLRS is a feature of the upland landscape currently. After commencement of the Nant Llesg development, the periods of greatest change would occur, first, at Nant Llesg when there would be little apparent change in the FLRS site and, later, during removal of the FLRS overburden mounds at a period of little apparent change in the Nant Llesg site, followed by activity and change during removal of the Nant Llesg overburden mounds, while aftercare was underway at FLRS. The restoration landscape at FLRS would be becoming established while the aftercare operations were getting under way at Nant Llesg, so that after a further three years the restoration landscapes of both sites would be sufficiently well established to be absorbed back into their context.

Cwmbargoed Disposal Point (CDP)

16.221 The CDP is a temporary development, which would cease to be required once the proposed development is complete. Consent is also being sought for a new wash plant within a large building and a new water treatment facility within the CDP site, and changes to existing water treatment facilities after the currently permitted operations cease. The CDP is an industrial site on the margin of the existing FLRS site, with

activity arising from the transport of coal from FLRS, crossing Bogey Road to the west of its junction with Fochriw Road. For the Nant Llesg development, a second coal haulage route would be formed, emerging from the site north of the Fochriw Road junction, travelling along Fochriw Road to turn into Bogey Road and entering the CDP via an existing lorry access. There would be additional activity associated with the vehicles carrying coal from the Nant Llesg site, with local effects on the neighbouring roads.

Trecatti Landfill

16.222 The Trecatti Landfill development is also a temporary development, but likely to continue in operation for longer than FLRS and/or Nant Llesg, with little noticeable change from its present character and appearance. It receives waste by road vehicle to fill a historic excavation void. As the main part of the site is located on the north-facing slopes of Merthyr Common, enclosed by the higher land of Merthyr Common to the south and the Nant Llesg site to the east, it is apparent in the landscape only from the north and north-west.

16.223 In currently available views, the near view from Fochriw Road and more distant views from the uplands to the north and north-west, it is seen in context with FLRS, but its location on the northern slopes makes it seem more prominent in the view than FLRS behind it. Cumulatively, it would be seen with similar features of Nant Llesg in addition.

NET Wood Pellet Plant, Rhymney

16.224 Capital Valley Ecopark is within an established industrial area in the Rhymney Valley on the western edge of the urban area. As noted in the planning application documents for the proposed Plant, the area has been in industrial use since the beginning of the 19th Century. The proposed Plant would receive and process fresh wood from plantations in the Brecon Beacons National Park to make pellets for export to biomass generating facilities elsewhere. Some of the material would be used to generate electricity on site, for use in the Plant processes. The elements of the development would be large industrial buildings, the largest being two buildings with a ridge height of 20m from ground level and a 30m high stack. The OS map shows a spot level on the road to the north of the Plan site of 266m so the approximate level of the top of the stack would be just under 300m AOD and of the largest buildings, under 290m AOD. The operational area boundary of the Nant Llesg development is generally above 350m AOD, the eastern side slopes of the overall site intervening and providing separation between the valley and the main operations of the site.

16.225 There is potential for combined visibility from Rhymney, but the visual assessment studies for both developments show that where the Nant Llesg site would be visible, the Wood Pellet Plant either would not be visible or would be seen in the valley lowland and viewed against the backdrop of the eastern side slopes of the Nant Llesg site[22]. The overburden mound and screening mound of the Nant Llesg development would be seen as prominent landform features on the hill above the western valley-side. As noted in the DAS, the Plant would sit well within its industrial context, and it would be a small addition to the views available.

Analysis and assessment

Additive effects

16.226 Cumulatively with Trecatti, CDP and FLRS, the Nant Llesg proposal would extend the area of landscape where industrial and minerals related development was taking place. The Nant Llesg development would add similar features to those of the current FLRS, adding activity to the landscape and the local roads. This would be a Major cumulative medium to long term additive landscape effect, while the main coaling operations were progressing in both FLRS and Nant Llesg.

[22] As illustrated in photomontages presented in the NET Energy Group Ltd. Wood Pellet Plant (Capital Valley Ecopark, Rhymney), Design & Access Statement, July 2012 (DAS)

16.227 Considering the MIS landfill operation, the effects of the Nant Llesg development would be to bring this incongruous land use to an end and effect restoration of the land to a character appropriate to the landscape context. However, that restoration would be delayed until the restoration of the Nant Llesg site and in the interim the landscape and visual effects would arise from the Nant Llesg development in its own right, with the current Minor adverse landscape effects of the MIS development giving way to the Major adverse medium term effects of the Nant Llesg development. The cessation of the land use and ultimate restoration to open upland is assessed as a Minor permanent landscape benefit compared to the baseline situation.

16.228 The principal cumulative effect the Nant Llesg development with the CDP would be temporal, through extension of the lifetime of the part of the CDP included within the Nant Llesg planning application boundary for a further two years, assessed as a Minor, adverse, short term effect.

16.229 There would be little landscape character or visual interaction between the Nant Llesg development and the consented Wood Pellet Plant in Rhymney, which would be well contained within its industrial and urban setting, and thus there would be no landscape or visual cumulative effect.

16.230 As noted above, the Trecatti Landfill site, where visible, is generally seen in context with FLRS, its location on the northern slopes making it seem more prominent in the view than FLRS behind it. Cumulatively, it would be seen with similar features of Nant Llesg in addition. The likely effect is a reduction in the relative importance of the landfill void in the landscape, with these larger features providing a larger scale context. After end of coaling at FLRS, and the gradual removal of the overburden mounds and backfilling and restoration of the final void, Trecatti would be seen with the changing features of Nant Llesg to the east for a further three years, as the overburden mounds there were removed to backfill and restore the final void. Trecatti would then become the only such feature in this landscape. The cumulative effect would be on the local landscape, increasing the extent of such development in the landscape, which would be temporary although long term, and in combination with Trecatti, would be a Moderate, adverse effect.

16.231 However, the main sources of cumulative landscape and/or visual effects are likely to be from the Nant Llesg development with the FLRS development, being similar in scale, with similar characteristics, and in close proximity. Additively, the features of the Nant Llesg and FLRS developments would occupy a large area of contiguous upland landscape for a period of about ten years, from box cut at Nant Llesg to end of coaling at FLRS, a medium to long term, Major landscape effect.

16.232 Combined additive visual effects would occur for viewers in the uplands to the north-west between 1 and 3km distant, extending to the Brecon Beacons National Park boundary, where the voids and overburdens mounds of both developments would be theoretically visible. In the views from the uplands to the north, Trecatti Landfill and FLRS sites were noted as visible and contributing together to Moderate visual intrusion. Cumulative visual impact resulting from the addition of the Nant Llesg development is not likely to be more than Minor to Moderate and medium to long term, for the ten years when the features of the two surface mine operations would be in existence together.

16.233 In more distant views to the east, north-east and south-east, where the Nant Llesg void and overburden mound and the FLRS overburden mounds (but not the void) would be theoretically visible, the visual effect of the Nant Llesg development in its own right was assessed as Minor at worst and otherwise Negligible (VP19, VP20). The cumulative effect of Nant Llesg with FLRS would be Negligible also.

16.234 In the near views from the higher elevation viewpoint in the Rhymney-Princetown-Ras Bryn Oer area, the CZTV indicates that the FLRS overburden mounds would be visible with those of Nant Llesg and the Nant Llesg void. The visual effects in this area of the Nant Llesg development in its own right, represented by VPs 2, 12, 14 and 22, were assessed as Major to Moderate, adverse, medium to long term, during the ten year period when the features of the two surface mine operations would be in existence together. The effects of the remediation and restoration proposals in these views were assessed as Moderate, beneficial, long term to permanent for residents with direct open views, to Minor for less sensitive or more distant viewers, and None for viewers in Bryn Bach Country Park. The overall additive effect of Nant Llesg in these areas would be with FLRS and would vary with the relative importance of the two developments in the view, likely to be Moderate or less, as the FLRS is generally a background element and the Nant Llesg development unlikely to be seen as adding significantly to its effects.

Sequential effects

16.235 The CZTV indicates the potential for sequential and additive visual effects for some routes through the landscape: the A465 and A4060 corridors, Bogey Road, Fochriw Road and South Tunnel Road; the Rhymney Valley Ridgeway Footpath and Bridleway 151 along the western flank of Mynydd Fochriw; National Cycle Route 46 along the A465 corridor and between Bute Town and Parc Bryn Bach.

16.236 The A465 traverses the CZTV of FLRS to the north-east as far as the roundabout junctions with A4060 at Dowlais Top and Pengarnddu. Between this junction and Tafarnaubach Industrial Estate to the north-east, the CZTV shows combined visibility of FLRS and Nant Llesg, and where such views are available to the north they would include Trecatti Landfill as well. North of Tredegar, the CZTV indicates there would be no views of either scheme, or possibly distant glimpses of FLRS overburden mounds. However, observation on site showed that the road is frequently in cutting, or banks have been formed along the southern edge of the highway, which screen views towards the Nant Llesg site from vehicles, except taller goods or commercial vehicles. If views are available, they are likely to be glimpsed views, which would limit the importance of the site features in the view.

16.237 The A4060 skirts the western boundary of the FLRS site and the north-western boundary of the Trecatti Landfill site, before meeting the A465 at Dowlais Top. Both Trecatti and FLRS, but not Nant Llesg, are apparent in the views from the road north of the Mountain Hare roundabout, from where access is gained to Bogey Road. The contribution of Nant Llesg to the additive effects with these developments would Negligible or None.

16.238 Bogey Road passes through the FLRS site, the excavation area to the north separated from the road by mounding, workshop areas and water treatment areas, and overburden mounds to south and north at its eastern end. It crosses the coal haulage route from FLRS to the CDP and passes along the northern boundary of the CDP, before meeting the junction with Fochriw Road. Approaching this junction, the features of the Nant Llesg site would come into view: the overburden mound to the east and north-east, the coal haulage route from Nant Llesg, the road improvement south of the road junction and the built facilities to the north on the western edge of the Nant Llesg site. The visual experience from the Bogey Road is of an intensively industrial/extractive mineral landscape. The road's name indicates that its original use was for serving former mineral extraction in the area so the present experience is not incongruous. In addition, it is possible to avoid using Bogey Road by using the A-roads to the north. The Nant Llesg development would add to the industrial landscape experienced from the eastern end of the road, and would be a Major long term additive effect at this close range, but neutral in nature.

16.239 The northern end of Fochriw Road passes through part of the CZTV which indicates visibility of both FLRS and Nant Llesg overburden mounds and Nant Llesg void, and Trecatti Landfill would also be visible. However, the road is in cutting for part of this section and visibility of the site is limited until near or south of the road entrance to the Trecatti site.

16.240 Travelling south from here, the road would pass between the overburden mounds of FLRS, set back from the road on the west and the built facilities and coal processing and haul route of Nant Llesg, set back but closer to the road on the east. They would be seen with the Nant Llesg overburden mound as the backdrop. Further south, the road would pass along the eastern boundary of the CDP, via the road improvement to be carried out as part of the Nant Llesg development, and through the short section of the coal haulage route between the Nant Llesg site and the CDP via the Bogey Road junction. Further south, the view of the developments would be lost.

16.241 Travelling north from Pen-y-banc/Pentwyn, the road descends northwards. Mynydd Fochriw would screen views of the CDP and of the FLRS overburden mounds to the west and north-west, but partial views of the Nant Llesg overburden mound would be available to the north. West of the southern extent of Fochriw, the road turns north-west and passes the northern end of Mynydd Fochriw, when the CDP and FLRS overburden mounds would come into view and there would be an open view of the Nant Llesg overburden mound. The road passes along the eastern boundary of the CDP, screened by its boundary vegetation, via the road improvement referred to above. North of this, the FLRS overburden mounds would be on the west and the built facilities, coal haulage route and processing areas of Nant Llesg would come into view on the east and, beyond these, the view would extend to the wider landscape to the north. The landform of the site would screen the excavation area from view, although the movement of vehicles from the void to the overburden mound and coal processing area would be seen.

16.242 There would be large changes to the context of and views from Fochriw Road as a result of the Nant Llesg development, for a distance of about 3 to 4km, the additive effect of the Nant Llesg development being to emphasise the influence of industrial activities and landscape features in the upland landscape. They would result in Major, adverse, medium to long term additive effects for the ten year period when the main features of both surface mines would be in existence together, reducing to Moderate and then Negligible as first FLRS and then Nant Llesg reached the end of backfilling and restoration, the openness of the landscape was restored and restoration features become established through the aftercare periods.

16.243 From South Tunnel Road, travelling west, the overburden mounds of FLRS are currently prominent landforms in the view along the road, with open views north and south over the upland common. With development of Nant Llesg, the road would be enclosed to the north by the proposed overburden mound, which would interrupt the view north and be a prominent additional landform in the landscape. The south-eastern water treatment area would be a noticeable feature from the eastern section of the road and the re-routed overhead power line on timber poles alongside the northern side of the road. The changes to the context of the view from the road would largely derive from the Nant Llesg development, adding to the Moderate effects of the FLRS development and Minor effects of the CDP, assessed as Major, adverse, medium term, while the features of all three developments were in existence together.

16.244 The route of the Rhymney Valley Ridgeway Footpath passes along the eastern edge of the uplands of the site and, after crossing South Tunnel Road to pass between Fochriw and Pontlottyn, along the ridgeline of Rhiw Cantorion and Cefn y Brithdir. The part of the route through the site would be temporarily re-routed along the eastern slopes of the site, through the area to be remediated and would resume its route at South Tunnel Road. This would be a moderately large change, with loss of the upland context and views, but offset by the upgraded landscape context that would be achieved by the remediation works. In addition, its temporary route would be along a new bridleway to be established along the lower slopes of the Rhymney valley side, which would remain in place as a permanent additional public right of way. The cumulative effect on this part of the route would be Moderate, neutral (neither adverse nor beneficial), long term during operations.

16.245 Views would be available of elements of both Nant Llesg and FLRS, as well as of the CDP from parts of the route. Where views are available, the overburden mounds of both surface mines and the screening mound at Nant Llesg, but not the operational excavation areas, would generally be visible (VP6). From the high point of Rhiw Cantorion, the CZTV indicates potential views of the excavation void as well, but from very short lengths of the path, which at points is likely to be screened by conifer plantation on the ridge-side. South of the high point of Y Darran, no view of any of the sites would be available. After backfilling and restoration of FLRS, only the overburden mound and screening mound of Nant Llesg and the CDP would be visible from these parts of the route. After restoration of Nant Llesg, the route would be restored along the upland of the site, with addition of signage and marker cairns and improved connectivity with the new paths proposed.

16.246 The Rhymney Valley Ridgeway Footpath route would be affected during operations for short lengths over a distance of about 3km, assessed as Moderate, adverse, medium term. After restoration, its reinstatement and the improvements would be a Moderate permanent benefit.

16.247 The Sirhowy Valley Walk LDFP (long distance footpath) passes through the CZTV of both Nant Llesg and FLRS for a short distance, less than 3km, at a distance of just under 5km from the site. As the route rises southwards onto the Domen Fawr-Cefn Manmoel ridge, the overburden mounds of the two surface mines would be just noticeable and the CDP could be identified. Further south, the CZTV indicates visibility of the Nant Llesg void as well. The view from this area is represented by VP19, for which the visual effects of the Nant Llesg Scheme were assessed as Minor during operations. The overall additive or sequential effects would not be greater than Minor medium to long term, and for a short length of the route, where the sites would be viewed within a wide panorama, the overall cumulative effect on the visual amenity of the route as a whole would be Negligible.

16.248 Because of the low level routes followed by the promoted cycle routes near the site, the features of the development would have varying sequential visual effects: from None to Moderate adverse locations and at different times.

16.249 Views towards Nant Llesg, Trecatti and FLRS are available from parts of Route 46 to the north of the site along the A465, passing through Bute Town and Parc Bryn Bach. The CZTV indicates visibility of the overburden mounds of both surface mine schemes and of the Nant Llesg void along this section of the route. From the western end of this part of the route, Trecatti Landfill would be visible; from immediately

north of the site, the soil storage mounds and northern water treatment area would also be visible. From east of Bute Town, the view of Trecatti would be lost and vegetation would screen the northern water treatment area and other features in the northern fields of the site, and from Parc Bryn Bach vegetation would also screen the Nant Llesg void. To the north of the site the additive effects of Nant Llesg with the other developments would be Major adverse, due to proximity, but localised. The effects would reduce to Moderate further east, where the importance of the elements in the view is reduced by distance and increased screening by vegetation. A relatively short section of the route would be affected, and may be seen as part of the varied landscape and visual experience of the overall route.

Temporal effects

16.250 As Nant Llesg and the principal other developments of FLRS, CDP and Trecatti Landfill, are temporary albeit long term developments, and Nant Llesg and FLRS are characterised by change through time, as excavation progresses across the sites, overburden and soils are stored in mounds and removed later to backfill final voids, the cumulative effects of the sites change correspondingly through time.

16.251 The timeline on **Drawing MA/NL/ES/16/020-2** shows that the features of Nant Llesg and FLRS would overlap for a ten year period, at the end of which FLRS site would be transformed as the overburden mounds were removed and the final void backfilled. The openness of the landscape occupied by FLRS would be restored, leaving the Nant Llesg development the main development features in the landscape. Cumulatively, the lifetime of part of the CDP would be extended for a further two years, a short term effect. As restoration backfilling at FLRS concluded and the landscape features were being restored, coaling would cease at Nant Llesg, the CDP would be dismantled, and restoration backfilling would have commenced at Nant Llesg, continuing the transformational change in the landscape for a further three years.

16.252 At this point the openness of the upland of Merthyr and Gelligaer Common would be restored and restoration of the land cover and landscape features would be under way across the area. Then Trecatti Landfill would be the only such development in the landscape, its effects localised by its location on the northern slopes of Merthyr Common.

Review of the landscape and visual impact assessments with reference to relevant elements of planning policy and guidance

Minerals Planning Policy Wales 2000 (MPPW)

16.253 As required by **Minerals Planning Policy Wales 2000 (MPPW)**, the effects on the landscape and visual amenity, on the Brecon Beacons National Park, on historic buildings, landscapes, parks and gardens, conservation areas, have been considered in the LVIA (and the cultural heritage and nature conservation aspects dealt with in ES chapters 8 and 15). A comprehensive restoration strategy is put forward, which aims to integrate considerations of land use, public access and amenity for local communities, nature conservation and cultural heritage, with a landscape character appropriate to the location and context.

Minerals Technical Advice Note 2: Coal 2009 (MTAN2)

16.254 The LVIA has been carried out in accordance with GLVIA, as advised by Minerals Technical Advice Note 2: Coal (MTAN2). The study area extents and assessment viewpoints were agreed with the relevant consultees.

16.255 The assessment is supported by plans and illustrations, including photomontages from eight viewpoints at three stages of the development.

16.256 The scheme design has evolved through consideration of the range of potential environmental effects and the opportunities for mitigation or off-setting of adverse effects. An example is the design of the proposed screening mound along the eastern and north-eastern edges of the extraction area, greatly reducing the extent of the zone of visibility of the proposed excavation void.

16.257 The assessment of cumulative landscape and visual effects has taken into account relevant other developments, and assessed the contribution of the Nant Llesg proposal to additive, sequential and temporal cumulative effects.

Caerphilly County Borough Local Development Plan

16.258 The early remediation works and accompanying landscape upgrading proposals on the areas of the site outside the main operational boundary would contribute to the Caerphilly County Borough Local Development Plan (LDP) Development Strategy objectives with regard to developing the network of countryside recreation areas and routes, re-establishing the traditional valley-side landscape features and new public access routes linking with surrounding communities, as well as exploiting opportunities for engagement with the nature conservation and cultural heritage interests of the site.

16.259 The landscape proposals in the remediation areas and the ultimate restoration proposals would establish a pattern of hedgerows, woodlands, watercourses and water features (Policy CW4, CW6). They also seek to enhance the landscape over its baseline condition in the remediation areas and restore an appropriate character in the main operational areas.

16.260 The site is not within either Special Landscape Area designated under Policy NH1 nor in the VILL designated under Policy NH2, but would be visible from them and the likely visual effects of the development have been assessed. An assessment of effects on the LANDMAP aspects was also carried out.

16.261 The site's location within a SINC has been taken into account in the mitigation proposals for adverse effects on nature conservation interests (see Chapter 8) and in the restoration and remediation proposals (Policy NH3).

16.262 No landscape effects were identified on County Parks, and visual effects identified were limited to a small area in the west of Parc Bryn Bach (Policy LE3).

16.263 Adverse effects on the visual amenity of the cycle route network were also limited to parts of route 46 and 468 to the north and south-east of the site (Policy TR1[23]). The restoration strategy seeks to provide linkages with the surrounding cycle network and provides bridleways through the site, which are available to cyclists. (The recreation aspects of the development are dealt with in detail in Chapter 6.)

Merthyr Tydfil County Borough Council, Local Development Plan

16.264 The LVIA acknowledges there would be temporary albeit medium to long term adverse effects on the landscape and visual context of the site, although the site is not within Merthyr Tydfil and no trees or woodland or other landscape features within Merthyr Tydfil would be affected (Policy BW5).

16.265 The LVIA found Major adverse visual effects would be very localised within Merthyr Tydfil and would be temporary but medium to long term. The proposals include restoration to a landscape character appropriate to the upland context, taking account of landscape, natural and cultural heritage interests of importance, improving accessibility to the countryside, and connectivity with surrounding communities, and proposes information signage about the area (Policy BW7, BW16).

16.266 Ecological mitigation and enhancement proposals in the Bryn Caerau Farm area aim to offset habitat loss within the operational areas. They would also result in upgrading and maintaining the features and

[23] As much of the site is common land, the aspiration for a cycle route through the upland, as set out in Policy TR1.6, is unlikely to be achievable as it would require land to be taken out of common.

patterns of the historic landscape of Irregular Fieldscapes, within the Open/Wooded Mosaic Upland Valleys and Open Upland Valleys landscape. The proposals to provide additional lands as temporary common land would offset the loss of the open areas of the site during operations. The common land of the site would be restored and some additional areas dedicated. (Policy AS4)

16.267 While there would be temporary and localised Major adverse visual effects within Merthyr Tydfil, they would be medium to long term. There would be some benefit in the long term from the restoration proposals, as described above, which would be progressively implemented from remediation of peripheral areas in the first two years, through progressive restoration of the extraction void through the operational period to final restoration and aftercare (Policy TB8).

Brecon Beacons National Park Unitary Development Plan

16.268 As noted the Brecon Beacons National Park is about 2.5km to the north of the site at its nearest point. The potential for impacts on its special qualities has been taken into account and the LVIA included the range of views available, finding, at most, Minor adverse visual effects for near views immediately to the north (represented by VP18) and Negligible or No effect for more distant locations (UDP Part 1 Policy 1).

Blaenau Gwent County Borough Council Unitary Development Plan

16.269 The boundary of Blaenau Gwent is 1.5km to the east of the site at its nearest point, but is generally more than 2km distant. The ridges that are followed by the boundary act as visual barriers in the ZTV of the proposed development, so that visual impacts are limited to areas where the elevation of the land allows views to the site, represented by VPs 11 and 19. The greatest visual effect assessed was for the nearer VP11, Moderate to Minor, medium term, and Minor for more distant views. (VP11 also represents views from a SLA, Policy EN18.)

16.270 The design of the development would comply with Policy M5, in the siting, form and colour of the built facilities on the western margin of the site where they would be enclosed by the screening mound to the east, which would screen any potential visibility from Blaenau Gwent, and they would be removed as part of the proposed restoration of the site.

National Landscape Designations

National Park

16.271 As noted above, the only likely effects on the Brecon Beacons National Park might be on visual amenity, but the LVIA found, at most, Minor adverse visual effect for viewers in the national park.

Registered Historic Landscapes

16.272 The Merthyr Tydfil Landscape of Outstanding Historic Interest is separated from the site, although the westernmost edge of the CDP abuts its boundary for a very short length and FLRS occupies a substantial area within the historic landscape area. A small area on the southern margin of the site, providing access for the proposed remediation works in the south of the site, is included within the Gelli-Gaer Common Landscape of Special Historic Interest.

16.273 As noted above, the development would not directly affect the historic landscape of the wider area generally, but the proposed development would be visible from the higher elevations within both the Merthyr Tydfil and Gelli-Gaer areas, to the south-west and south respectively. The restoration strategy includes providing new routes to linking features within the site to the historic landscape around the site. While there would be short to long term disruption of the site close to the very highly and highly sensitive historic landscape areas, there is the potential for this to be offset by the restoration proposals.

16.274 There would be no direct change to or effect on the registered historic landscapes. Indirectly, a relatively small part of their context would be changed with, Minor, adverse long term effect during operations and Minor to Negligible beneficial effect in the long term to permanently after restoration. The effect on the visual amenity of visitors to the historic landscapes was assessed by reference to viewpoints VP16 from Merthyr Common and VP10 Mynydd Fochriw, assessed as Moderate to Major, adverse long term during operations. However, the effects would be localised to the limited areas of the historic landscapes with views of the site and the development.

Registered Historic Parks and Gardens

16.275 There would be no landscape or visual effect on Registered Historic Parks and Gardens.

Scheduled Monuments

16.276 Effects on the historic and cultural heritage assets are considered in Chapter 15 Cultural Heritage Assessment. It found that there would be not effects requiring mitigation on any World Heritage Sites, Scheduled Monuments, Listed Buildings or Conservation Areas, including the scheduled monument of Sarn Howell Pond and Watercourses (GM94 to the west of the CDP.

16.277 The southern embankment of Rhaslas Pond, which is being considered for scheduling by Cadw, would be within the operational area of the site. Measures to protect its cultural heritage interest are set out in Chapter 15. The features of the southern part of the pond and its southern embankment would be retained and protected during operations. The northern part would be reinstated as wetland with a new footpath on a low stone-faced bank marking its northern embankment, which would have been removed during the excavations. New routes would be established to form a “heritage trail” between this area and the restored FLRS. It is a feature of High landscape sensitivity, which would be subject to large long term changes during operations, assessed as a Major adverse long term landscape effect. However, the retention of the part of particular historic landscape interest and the design proposals for the overall feature and its context in the restoration strategy would be beneficial in the long term to permanently, upgrading the character of its landscape setting and access to it, with provision of information and connection with the surrounding features of the historic industrial landscape.

Conservation Areas and Listed Buildings

16.278 Rhymney Town Conservation Area is 400m east of the site and includes 16 Listed Buildings. The potential for visual intrusion on the area and the setting of the conservation area and listed buildings was recognised in the design of the proposal, which introduced a screening mound to ensure no views of the excavation area would be available. The remedial and landscape works on the ridge side would improve the visual quality of this part of the area’s landscape setting and context, from the medium term. Visual effects were assessed as Moderate, beneficial, over the baseline condition in the long term.

16.279 Bute Town Conservation Area is 350m north-east of the site and contains 3 rows of listed terrace houses. .

16.280 Another cultural heritage feature in the landscape is the local landmark on the ridgetop, the “Bent Iron”. While not listed or otherwise protected by any designation, its role in the cultural landscape has been acknowledged. It would be removed during the operational period and reinstated during restoration. The design proposals include a stone faced terrace feature and alignment of the Rhymney valley Ridgeway Footpath to pass by it, as a landmark on the route and in the wider landscape.

Summary

16.281 Summaries of the findings of the assessments of effects on landscape and visual amenity, on darkness and lighting characteristics of the area, on additional areas of common land under consideration, and of cumulative effects, are set out in the Tables on pages 72- 72.

Summary review with reference to planning policy and guidance

16.282 As required by Minerals Planning Policy Wales 2000 (MPPW), the effects on the landscape and visual amenity, on the Brecon Beacons National Park, on historic buildings, landscapes, parks and gardens, conservation areas, have been considered in the LVIA (and the cultural heritage and nature conservation aspects dealt with in ES chapters 8 and 15). A comprehensive restoration strategy is put forward, which aims to integrate considerations of land use, public access and amenity for local communities, nature conservation and cultural heritage, with a landscape character appropriate to the location and context.

16.283 The recommendations of Minerals Technical Advice Note 2: Coal 2009 (MTAN2) have been taken into account in the LVIA. An assessment of effects on the LANDMAP aspects was carried out.

16.284 The policies of the Local Development Plans covering the site and its landscape context have also been taken into account in the LVIA, in the design of the development and in the remediation and restoration strategy: off-setting temporary loss of public access, integrating the site with the network of countryside recreation areas and routes, re-establishing the traditional valley-side landscape features, provision of new public access routes linking with surrounding communities, and exploiting opportunities for engagement with the nature conservation and cultural heritage interests of the site. The proposals also seek to enhance the landscape over its baseline condition in the remediation areas.

16.285 The site is not within a Special Landscape Area.

16.286 The site's location within a SINC has been taken into account in the restoration and remediation proposals.

16.287 No landscape effects were identified on County Parks, and visual effects identified were limited to a small area in the west of Parc Bryn Bach.

16.288 Adverse effects on the visual amenity of the cycle route network were also limited to parts of route 46 and 468 to the north and south-east of the site.

16.289 The Brecon Beacons National Park is about 2.5km to the north of the site at its nearest point. The potential for impacts on its special qualities has been taken into account and the visual studies included the range of views available, finding, at most, Minor adverse visual effects for near views immediately to the north and Negligible or No effect for more distant locations.

16.290 The development would not directly affect the historic landscape of the wider area generally, but the proposed development would be visible from the higher elevations within both the Merthyr Tydfil and Gelli-Gaer areas, to the south-west and south respectively. While there would be short to long term disruption of the site close to the very highly and highly sensitive historic landscape areas, there is the potential for this to be offset by the restoration proposals, which include new routes to link features within the site to the historic landscape around the site. A relatively small part of the context of the registered historic landscapes would be changed. However, the effects would be localised to the limited areas of the historic landscapes from where views of the site and the development would be available.

16.291 There would be no landscape or visual effect on Registered Historic Parks and Gardens.

Conclusions

16.292 In the parts of the site that lie within the main operational area where large scale changes are likely, the landscape effects were assessed as Major or Major to Moderate, medium to long term and adverse during operations. Smaller scale operations are proposed in parts of the site outside the main operational area to the east, south and west to remediate old mine hazards and enhance landscape features and character, and the ecological and heritage aspects of the landscape, with long term benefits.

16.293 A comprehensive restoration strategy for the whole site is put forward, which aims to integrate considerations of land use, public access and amenity for local communities, nature conservation and cultural heritage, with a landscape character appropriate to the location and context. The restoration

strategy would be implemented progressively as operations proceeded. It is anticipated that the details of the restoration design would be submitted for approval in advance of each stage of progressive restoration, as a requirement of a planning permission.

16.294 Effects on the wider landscape context, assessed by reference to the five LANDMAP aspects, would be medium to long term during operations and: Minor adverse for the Geological Landscape and Landscape Habitats, Moderate adverse for the Historic Landscape, Major, adverse for the view from the Cultural landscape within 1km reducing to Minor at over 2km, and Moderate to Minor adverse long term for Visual & Sensory areas within 1 or 2km, reducing to Minor over 2km. The effects of the remediation and restoration proposals on the wider landscape would be Minor to Moderate beneficial in the long term, or not noticeably different from the present.

16.295 Additional areas of land are included in the proposals that could be used for stock grazing by the Commoners, while the common land within Nant Llesg would not be available, and for public access. Other areas are included for use for public access only. In general, there would be no adverse effects on landscape character from the proposed uses and potential adverse landscape or visual effects, e.g. from loss of field boundary vegetation or walls, could be prevented by appropriate land management and fencing. There is potential to upgrade the landscape through boundary hedge management and planting up gaps, repairing stone walls in poor condition and for benefit to the community in the long term from increased or easier public access to the countryside.

16.296 The Intrinsically Dark character of the operational areas of the site itself would be changed during the operational period to one of Low Distinct Brightness. For other areas, the lighting of the site and operations would be visible to varying degrees and varying with the phases of operations. The Intrinsically Dark character of the site and its appearance in views from surrounding areas would be restored with completion of landscape restoration.

16.297 ZTVs of the development proposals show a pattern of visibility reflecting the topography of the area:

- The main areas from which the soil storage areas, screening and overburden mound would be visible extend in a broad band along the Rhymney Valley and onto the uplands immediately to the north, with smaller areas on the ridges rising to the south, the more distant ridges to the east and north-east of Tredegar, and more distant uplands to east and north-east.

- The overburden mound would screen visibility of the operational voids from the south and south-west, and the existing mounds at Ffos-y-Fran would screen views from further west.

- The design of the screening mound along the eastern and north-eastern edges of the area of extraction would provide screening of the void when viewed from settlements, especially Rhymney. It will be constructed early (taking approximately four months) and removed late in the development process in order to maximise its screening effects.

- From some locations, views of features of the proposed development would become visible once the storage mounds at the Ffos-y-Fran site would be removed.

16.298 The assessment found:

- For **residents** within 2km of the site with direct open views, the development would cause Major, adverse effects, especially during years 1-6 and 9.5-14, when the overburden and screening mound were being formed during the early phases of excavations, and later removed to fill the final void. The effects in these phases are reduced to Moderate for residents with oblique or indirect views and for more distant residents.

- After formation of the overburden and screening mounds, they would remain in place for the medium term, as elements in the landscape, with varying visual effect, depending on the relative elevation, distance and angle of view. This was assessed as Moderate, adverse generally, but Minor for more distant viewers. For the very near residents in Fochriw, once formed, the overburden mound would screen other operational areas of the site from view and the visual effect would arise from the interruption of the open view north currently available.

- The nearest **promoted route** is the Rhymney Valley Ridgeway Footpath, from where there would be Moderate to Major visual effects, adverse, during the phases of greatest change while the overburden mound is created and removed, reducing to Moderate after the overburden mound is established; Minor to Negligible during the initial operations and aftercare. From the distant Sirhowy Valley Walk, the visual effects would be no more than Minor, adverse, during the main excavation phases.

- Because of the low level routes followed by the **promoted cycle routes** near the site, the features of the development would have varying visual effects: from None to Moderate adverse for the route through Abertysswg and route 46 to the north of the site.

- For people using **rights of way and access land** near the site, the effects during the phases of greatest change while the overburden mound is created and removed would be Major, adverse and medium term, reducing to Moderate due to the presence of the overburden mound, and Minor during initial operations and restoration aftercare. In views from more than 5km from the site, the visual effects would be no more than Minor, adverse, medium term, during these phase and Moderate at intermediate distances.

- Where views are available from **public open spaces, local recreational facilities and golf courses**, the assessment identified no more than Moderate, adverse, visual effects during the phases of greatest changes, for and the Parc Bryn Bach Country Park and users of the ridges of Mynydd Fochriw and Mynydd Cilfach yr Encil for paragliding. For local amenity open spaces and golf courses, the effects assessed in the phases of greatest change were Minor to Moderate, adverse, and Minor to Moderate for local amenity open spaces and golf courses.

- The views available from **Rhymney Town centre, a conservation area**, are generally framed glimpses where streets or junctions or the playing field open views towards the site. The visual effect was assessed as Moderate adverse during overburden mound construction and removal and Minor adverse during other phases. The remedial and landscape enhancement works on the eastern valley side would be visible in some of these views, assessed as Minor to Moderately beneficial in the long term.

- **Travellers along the roads** in the visual study area are generally assessed as of low sensitivity to changes in their view, but Fochriw Road and South Tunnel Road are just beyond the site boundaries and there would be direct open views of the site available from them, raising their sensitivity to Moderate. Generally the visual effects were assessed as Minor or Moderate, adverse during the main operational phases, and Minor or Negligible during initial operations and restoration aftercare. From the north-west of the site on Fochriw Road, however, the view would include the built facilities and coal processing facility to be located between the excavation and overburden mound areas, raising the visual effect to Moderate to Major during the main operations and Moderate to Minor during initial operations or Negligible during restoration aftercare.

- In the views from the east in which the **remedial and landscape enhancement works** would be visible, their visual effect was assessed as Moderate, beneficial, over the baseline condition in the long term, for viewers from the Rhymney conservation area, and Minor beneficial in more distant elevated views, represented by viewpoints at Bryn Carno and Ras Bryn Oer.

16.299 Cumulatively, with Trecatti, CDP and FLRS, Nant Llesg would extend the area of landscape where industrial and minerals related activities were taking place, although the MIS activities would cease. The additive visual effect would vary with the relative importance of the two sites in views, the angle of view and distance from Nant Llesg. Sequential views would be available from some routes through the landscape. Nant Llesg, FLRS, CDP and Trecatti Landfill, are temporary albeit long term developments. Nant Llesg and FLRS are characterised by change through time and the cumulative effects would change correspondingly through time. The features of Nant Llesg and FLRS would be in existence at the same time for a period of eight years, the contribution of Nant Llesg to additive effects assessed as Minor to Moderate, adverse and medium term, generally, locally Major adverse and medium term, e.g. in views from local roads and from cycle route 46 where it passes a short distance to the north of the site.

16.300 Remediation and restoration of the site would aim to mitigate and/or offset adverse landscape effects and achieved benefits to the landscape character and amenity for local communities in the long term through:

- Early treatment of the eastern, southern and western margins of the site, providing additional access and information to improve people's connection with landscape, wildlife, and heritage early in the development timeframe

- Re-establishing the open upland and the character of the main operational area of the site after completion of coaling and backfilling to restore the landform, establish a variety of habitat types, integrate features of historic interest or mark their locations with new features, restore and enhance public access to the area, reinstate the Bent Iron as a landmark and add other landmark or way-marking features, provision of information signs, seats etc.

Summary of Landscape Effects Assessment

Table 16- 13 Effects on the landscape of the site

Landscape Area/Receptor	Baseline summary	Proposals affecting the Area	Landscape Sensitivity	Magnitude of Change	Assessment: During Operations	Assessment: After Restoration
Area 1 Open Upland	The majority of the site; common land and urban common, open access land, crossed by public rights of way; open, elevated, broad ridge; strong sense of openness or exposure and wildness; tranquil; uninterrupted, wide ranging views; crossed by Rhymney Valley Ridgway Footpath Detractors: use of railway cutting for waste disposal; fly-tipping and casual waste disposal; moderate traffic intrusion; low intrusion of present operations at FLRS and CDP.	Affected by the proposals through all operational phases: excavations in the north, site facilities and coal haul route in the west and overburden mound and water treatment area in the south	Potentially highly sensitive but sensitivity reduced by presence of intrusive features: Moderate to High; Rhaslas Pond: High as a notable landscape/historic landscape feature	Initial operations: localised changes, as site facilities were established. During mining operations: large, long term and adverse initially reducing to large to medium adverse once the overburden mound was established and grassed. Long term loss of public access including to the long distance footpath. After restoration, the character of the upland landscape would be reinstated, and public access and connectivity enhanced, a large amenity benefit in the long term.	Minor, short term during preliminary operations Major or Major to Moderate during the main operational phases, medium to long term	Moderate long term benefit over the whole area, Moderate to Major benefit for public amenity
Area 2 Northern Slopes, Bryn y Pyllog	Transition between open ridge top and agricultural fields on the lower slopes; medium scale, sense of openness to exposure and elevation; sharp contrast with nearby urban areas; views over valleys with	Lies within the proposed excavation area and would be subject to large changes throughout the operational phases, being progressively excavated and backfilled from west to east.	Restored former opencast land tolerant of change without adverse impacts on the landscape character and good potential for upgrading through the restoration proposals:	Small improvements from the addition of planting in the remediation area, in the short term; large changes over most of the area throughout the operational phases. Gradual change medium	Minor adverse, short term during preliminary operations Moderate to Major, medium to long term, during the main operational phases	Negligible, beneficial, long term, in the remediation area Major to moderate, beneficial, long term in the operational area

Landscape Area/Receptor	Baseline summary	Proposals affecting the Area	Landscape Sensitivity	Magnitude of Change	Assessment: During Operations	Assessment: After Restoration
	settlements, industrial areas, to the national park uplands. Detractors: Roads beyond the area are sources of busyness, lighting and traffic intrusion.		Low	term, as restoration became apparent, upgrading landscape features and characteristics; large long term improvements, sufficient to alter perception of landscape character.		
Area 3 Northern Enclosed Fields	A made landscape, restored from previous opencast workings; moderate scale; sense of openness; views out over field hedges; regular landscape pattern; some discordant elements; attractive views to the north. Detractors: Industrial estates to the east; traffic intrusion from and street lights on A465; 400kV overhead power line dominates to north-west	The eastern-most part of Area 3 would be outside the operational area, but included for remediation works, but the rest of the areas would accommodate soil storage mounds and a water treatment area, as well as the screen mound in the south of the area.	Restored former opencast land tolerant of change without adverse impacts on the landscape character and good potential for upgrading through the restoration proposals: Low	Large changes from initial operations through phase 1. The features would remain in place through to about year 14, when the screen mound would be removed, soils from the storage mounds respread, the water treatment area removed, a period of activity and further large change over 1 year. Gradual medium term change as restoration features became apparent and landscape character re-established; small improvements in additional woodland planting and public access.	Moderate adverse throughout the operational period, adverse and medium to long term	Minor, beneficial, long term Moderate, beneficial, long term, in the operational area
Area 4 South-eastern Slopes	Transition between upland and valley side; rounded, smooth, rolling landform; landscape condition disrupted by tipping and historic industrial land uses on southern margins; sense	Included to allow remediation of old mine hazards and landscape enhancement, with relatively small changes in this area.	Strong landscape structure with valued features of historic landscape; potential for upgrading through remediation and restoration proposals:	Small changes in this area, although large changes occurring in the neighbouring area to the west. Small short-term landscape changes	Minor beneficial in the long term	Minor beneficial in the long term

Landscape Area/Receptor	Baseline summary	Proposals affecting the Area	Landscape Sensitivity	Magnitude of Change	Assessment: During Operations	Assessment: After Restoration
	of wildness but not remoteness; strong contrast with valley settlement. Detractors: Moderate to high intrusion of industrial and built up areas; traffic on busy valley roads.		Moderate - High	during remediation works, and small long term beneficial changes as a result of the remediation and the improved public access.		
Area 5 North-eastern Valleys & Tips	A distinct scarp and valley with remains of former mine workings of historic interest; sense of openness; random landscape pattern; medium scale and moderate sense of openness; moderately tranquil; near views of built up area softened by tree cover; fine, distant views along valley. Detractors: Moderate sound and visual intrusion from industrial estate, road traffic, scrambling motor-bikes, erosion of tips, etc	The western part of Area 5 would be affected by the latter phases of excavation and part of the screen mound, while the eastern part is within the area of remediation and landscape enhancement works.	Strong landscape structure but degraded; good potential for upgrading: Moderate	Large adverse and medium term during operations In the west of the area. The screen mound a large new feature in the landscape and a medium change over the medium term; removal for backfilling the void, a short period of large change. Remediation works and landscape enhancements in the eastern part: large long term benefit to the landscape character and amenity. Restoration proposals in the west of the area would re-establish characteristic landscape features and improved public access: a medium improvement over current landscape condition, and a long term benefit.	Major adverse, medium to long term throughout the operational phases in the operational area Major beneficial and long term in the remediation area	Moderate, beneficial, long term, in the operational area Major beneficial and long term in the remediation area
Area 6 South-eastern Valleyside	Enclosed valley with visually remains of old stone quarry; small scale and enclosure increased	Part of Area 6 would be the site of a water treatment area by most of the area is included for	Distinctive features and landscape character:	Small changes during operations, although large changes occurring in the neighbouring area	Minor adverse long term and localised at the water treatment area	Minor, beneficial, long term

Landscape Area/Receptor	Baseline summary	Proposals affecting the Area	Landscape Sensitivity	Magnitude of Change	Assessment: During Operations	Assessment: After Restoration
	by relatively recent woodland plantings on lower slopes; land beyond falls steeply in smooth slopes of grassland and blocks of woodland planting to stone wall boundary with the A469; views confined within quarry; Detractors: Some intrusion of traffic on A469.	remediation of mine hazards and landscape enhancement.	High	to the west. Small short-term landscape changes during remediation works, and small long term beneficial changes as a result of the remediation and the improved public access.	Minor beneficial long term from the landscape enhancements	
Area 7 Southern Tips	On a high part of the ridge extending northwards from Fochriw to Nant Llesg; characteristic local ridges and valleys of tips, eroded into gullies and bare areas by drainage run-off and motor-bike scrambling; forming part of landscape setting of Fochriw; wide ranging views. Detractors: The tip landform and poor vegetation cover gives a sense of randomness and discordance; moderate intrusion of Cwmbargoed Disposal Point and Ffos-y-Fran site.	Included for the purposes of remediation and management for ecological enhancement, with small scale "soft engineering to reduce run-off of silt to Parc Cwm Darran lake; improvement to vertical alignment of Fochriw Road between Areas 7 & 8	A degraded landscape tolerant of substantial change; the features that detract from the landscape aesthetics are valued as cultural heritage: Low to Moderate	Small changes in the short term, with long term benefits to amenity and landscape character.	Minor adverse short term during the engineering works	Moderate long term benefit to the landscape character
Area 8 Cwmbargoed Disposal Point	An industrial use associated with the extraction of coal; sharp	Would continue in operation as at present but with the construction	The area is in industrial use and is a relatively low value or degraded	The only change in the landscape at the CDP would be the construction	Minor adverse short term during construction and long term during	Negligible, neutral, long term

Landscape Area/Receptor	Baseline summary	Proposals affecting the Area	Landscape Sensitivity	Magnitude of Change	Assessment: During Operations	Assessment: After Restoration
	contrast with the adjacent open moorland and enclosed farmland; in context and scale with FLRS. Detractors: Lit in hours of darkness, with prominent spot and flood lighting at the railway sidings; activity of plant, vehicles and, occasionally, long freight trains; associated industrial sounds apparent from within a short distance of the DP.	of the wash plant building and the addition of a new water recycling facility to the west of the railway line, affecting a small area of upland grassland, which would be restored ultimately.	landscape, tolerant of substantial change without adverse impact on character: Low	of the wash plant building and formation of the water recycling area, localised relatively small to moderate but long term change, ultimately restored to its present landscape character.	operation of the water recycling facility	
Area 4 South-eastern Slopes, parts of Area 3 Northern Enclosed Fields, Area 5 North-eastern Valleys & tips, most of Area 6 South-eastern valleyside and all of Area 7	As described above for each Area.	These areas would be affected by short term operations to remediate mine hazards, improve surface water drainage, restore vegetation on old tips, enhance landscape, ecological and cultural heritage features, as well as public access,	As described above for each Area.	As described above for each Area.	Long term benefits to landscape and amenity	Long term benefits to landscape and amenity

Table 16- 14 Effects on the landscape of the site wider context: LANDMAP

Landscape Area/Receptor	Baseline summary	Proposals affecting the Area	Landscape Sensitivity	Magnitude of Change	Assessment: During Operations	Assessment: After Restoration
Geological Landscape	Most of the study area is classified as Glacial Mountain Valley. To the north-west, the east and south-east facing slopes to the north-west of Merthyr Tydfil are classified as Upland Valley Slope. Further to the north-west and to the north within the national park, are areas classified as Doline or Sink Field, Pavements, Dry Valleys, Etc. The part of the Taff Valley within the study area to the west is classified as Active Upland River or Stream Channel System	Large topographic features would be formed for a long term period during operations and removed during restoration	Part of the site and the landscape context to the north is evaluated Outstanding, and otherwise the evaluation is Moderate generally with some small areas evaluated in the more distant context: Very High to the north, Moderate elsewhere	Large topographic features would be formed during operations and removed during restoration: A small change during operations and little perceptible change after restoration	Minor, adverse, long term	Negligible
Landscape Habitats	The upland areas of the site and along the ridges of Cefn y Brithdir and Cefn Gelligaer are classified as Mosaic. Between the ridges and the valley bottom is an area of Mixed Woodland. Most of the Merthyr Common is classified as Acid Grassland, with areas of Improved Grassland in the Bargod-Taf valley to the south	Landscape Habitats extending over the wider context would be affected directly by the loss of parts of the areas within the site during operations. The restoration would aim to restore a range of ground conditions and habitats appropriate to the location, and to raise the current Low evaluation of the aspect area covering the north of the site in the	The immediate context to the north and east are evaluated Low; areas of settlement generally are evaluated low, but the majority of the study area is evaluated High to the west, south and north, Moderate to the east and south east: High to north, west and south, Moderate or Low elsewhere	The loss of habitats within the site would be a relatively small change in the related aspect area. The enhancement of habitats in the north of the site would be a small change in this aspect area. The change to other aspect areas would be negligible.	Minor adverse as a result of the lost habitats, offset by restored habitats	Minor beneficial in the north of the site in the long term; Negligible elsewhere

Landscape Area/Receptor	Baseline summary	Proposals affecting the Area	Landscape Sensitivity	Magnitude of Change	Assessment: During Operations	Assessment: After Restoration
	west; The Taff Valley south of Merthyr Tydfil is Improved Grassland; to the north of Merthyr Tydfil is an area of Broadleaf Woodland to the north and south-west of Morlais Hill. The urban area of Merthyr Tydfil is classified as Residential/Green Space. Areas of Acid Grassland are identified to the north of the site, on the ridge between Rhymney and Tredegar and along Mynydd Bedwellte. Most of the area north of the A465 and within CCBC and Blaenau Gwent, together with an area to the west in the national park, is Marsh/Marshy Grassland.	long term.				
Historic Landscape	The Marginal Land classification within the site extends south-east along the ridges of Cefn y Brithdir and Cefn Gelligaer, on the ridge to the between Rhymney and Tredegar and on Mynydd Bedwellte, along the ridge extending from the FLRS and along Cilfach yr Encil, and on much of the uplands	The Historic Landscape would not be affected generally, but the site is within a large aspect area, which is evaluated Outstanding for "an exceptionally rich and diverse archaeological heritage". While there would be short to long term disruption of the highly sensitive historic landscape, there is the	A large proportion of the wider context to the west and south, and an area to the far north, is evaluated Outstanding, with areas of High evaluation to the south-east and east of the site and in the far south-west and east of the study area, with some areas of Moderate or Low evaluation to the north-	Short to long term Medium change in the highly sensitive historic landscape, with potential to be offset by the restoration proposals, including improving public appreciation of the resource.	Moderate, adverse long term	Moderate beneficial in the long term

Landscape Area/Receptor	Baseline summary	Proposals affecting the Area	Landscape Sensitivity	Magnitude of Change	Assessment: During Operations	Assessment: After Restoration
	north of the A465 and into the national park. Areas of Irregular Fieldscapes occur in the Nant Gyrawd-Taf Bargod valley and around Bedlinog and within the Nant Bargod Rhymni valley, on the slopes of Mynydd Bedwellte in the east of the study area, on the slopes north-west of Cilfach yr Encil to the west and north of Pant in the north-west, and in the north of the study area. Merthyr Tydfil, the settlements to its south, and Tredegar are classified as Nucleated Settlement, and those in the Rhymney Valley as Other Settlement. The areas of Parc Bryn Bach and Waun y Pound in the north-east of the study area are classified as Reclaimed Land.	potential for this to be offset by the restoration proposals. Appreciation of other highly or very highly sensitive Historic Landscape areas could be upgraded by these proposals.	east and east: Generally Very High or High; Moderate or Low in areas to the north-east and east			
Cultural Landscape	Most of the study area east of the MTCBC boundary is classified as Institutions and most of the area west of this boundary as Rural. Settlements in the Rhymney Valley and in the Taff Valley, and industrial areas north of Tredegar, are classified	The operations and features of the operational site would be visible or partially visible from some areas valued for the policies and designations to protect natural and visual attributes.	The majority of the study area is evaluated High with extensive areas evaluated Outstanding to the north-west, north- and north-east and a smaller area in the south: High within Very High wider context	Medium change in the Highly sensitive Cultural Landscape context within 1km and a small change in the Very Highly sensitive Cultural Landscape context	Major, adverse long term CL areas within 1km (affecting for the view from them), reducing to Minor for those over 2km	Minor or not noticeably different from the present

Landscape Area/Receptor	Baseline summary	Proposals affecting the Area	Landscape Sensitivity	Magnitude of Change	Assessment: During Operations	Assessment: After Restoration
	as Urban. An area around Pant and Parc Bryn Bach are classified as Infrastructure. Areas in the national park to the north-west, the urban area north of Tredegar, at the north-eastern edge of the study area, and the area around Cyfarthfa Castle in, are classified as Places.					
Visual & Sensory aspect	The aspect areas are defined on a finer grain than other aspects. The site and the ridges extending to the south and the land rising to the north are classified Upland Grazing. The higher parts of other ridges are classified as Upland Moorland or Hillside and Scarp Slopes Mosaic, as is the north-eastern part of the site, or Mosaic Upland and Plateaux, at Parc Bryn Bach and around Pant to the north of Merthyr Tydfil. Valley sides in the south-west, south and south-east of the study area are classified Open/Wooded Mosaic Upland Valleys, with areas in the west of Open	The assessment is based upon the visual impact assessment and viewpoint study	The majority of the landscape context is evaluated Moderate or Low Ridges and uplands to the north south-east and east are evaluated High: Generally Moderate or Low, occasionally High	The assessment is based upon the Visual Impact assessment: Moderate to Minor, adverse effects during periods of greatest change, rising to Major for Highly sensitive viewers, and Minor for Highly sensitive viewers in more distant areas within the national park to the north	Moderate to Minor adverse long term for VS areas within 1 or 2km, reducing to Minor over 2km	Minor or not noticeably different from the present

Landscape Area/Receptor	Baseline summary	Proposals affecting the Area	Landscape Sensitivity	Magnitude of Change	Assessment: During Operations	Assessment: After Restoration
	Upland Valleys and small areas in the east of Wooded Upland Valleys The A4060 corridor to the west of FLRS and land extending into FLRS and Trecatti Landfill Site is classified as Derelict/Waste Ground. The main valley settlements are classified either as Urban (Merthyr Tydfil and south to Troedyrhiw and Tredegar and surroundings) or Village (Rhymney, New Tredegar). Cyfarthfa Park in Merthyr Tydfil is classified Amenity Land.					

Table 16- 15 Effects on the landscape of Additional Lands to Mitigate Effects on the Common

Common Land Area	Baseline summary	Proposals affecting the Area	Assessment
Area 7 Land west of Pontlottyn	Land north-east and north-west of Pontlottyn, on either side of Fochriw Road, bordering higher, open common land, also access land. Currently in use for grazing. Sense of enclosure, in contrast with the open land beyond. Public footpaths give access from Fochriw Road. Rhymney Valley Ridgeway Footpath and other rights of way cross the open land to the south and west. The southern area bounded by gappy hedges; conifer shelter belt on south-western side; stone walling on boundary to the common in poor condition. The northern area bounded by trimmed hedge along Fochriw Road and fencing with gappy vegetation along other boundaries.	Available for public access where the public could "roam" within the fields and would not be confined to the existing public rights of way.	The land is immediately adjacent to both existing open access land and to the community of Pontlottyn. There would be long term moderate benefit to the community from the easier access to access land and adverse effects on the landscape character are unlikely. There is potential for upgrading the landscape components through boundary hedge management and planting up gaps.
Area 8 Land South of Rhymney	On the higher land of the ridge including part of the steep scarp slope to the Rhymney Valley to the east, which is craggy with grassy ledges and scrub in places, characteristic of the setting of the A469 and Pontlottyn. The higher land in the area is fenced, improved pasture, contrasting with the open common grazing land adjacent to it; elevated with fine distant views; a communications mast on the high point of the scarp, a landmark in many views. Two public footpaths cross the southern part of the area. The adjacent land is open access land and the Rhymney Valley Ridgeway Footpath follows the western boundary of the area.	The land is currently in use for grazing and not available for replacement grazing land. However, it would be made available for public access. As with Area 7, this would mean that the public could "roam" within the fields and would not be confined to the existing public rights of way.	The land is immediately adjacent to existing open access land and the long distance footpath. There would be long term moderate benefit to the community from the additional access to this elevated land with its wide-ranging views. Adverse effects on the landscape character are unlikely.
Area 9 Area of land south of the Ffos-y-Fran Land Reclamation Scheme between the minor road and the Bargod Taf	A narrow strip of land, sloping steeply to the stream and separating the existing open common and access land from the road; rushy grassland with scattered scrub and trees along the stream; strong sense of enclosure within the valley; views are confined to the near landscape. To the north, the features of FLRS dominate; to the south and east, the open common rising to Mynydd Cilfach yr Encil and the enclosed	This land would be made available for both common grazing land and for public access.	Although a small parcel of land, its use for grazing additional to the adjacent common land and use by people for public access would not result in changes to its landscape character and would be a minor benefit in potentially easier access between the road and the open land to the south.

Common Land Area	Baseline summary	Proposals affecting the Area	Assessment
	valley landscape of irregular hedge-bound fields provide the context. There is a layby alongside the road a short distance to the west.		
Area 10 Land to the south of the Ffos-y-fran Land Reclamation Scheme - part of the Bryn Caerau Farm: 10a improved grazing west, 10b - improved fields to north	At the head of and along the Taf-Bargod valley, on the slopes rising to the north and west from the enclosed irregular fieldscape of the valley bottom. To the north, the features of FLRS dominate. Rolling valley-side landform, larger fields enclosed variously by fences, hedges with some trees, and walls in poor condition; strong sense of containment within the valley, with views from the rising land over the attractive traditional farmland on the lower land; transition to the open common and access land rising to Mynydd Cilfach yr Encil, adjoining to the west. There are no public rights of way over this land.	This land would be made available for both common grazing land and for public access.	There would be no adverse effects on landscape character from the proposed use for common grazing and public access. There would be minor long term benefit to the public from increased access to the countryside.
Area 11 Land at Gilfach yr Encil & Glinmil	On the steep west facing Taff Valley side, on gentler upper slopes below the prominent ridge of Mynydd Cilfach yr Encil. An area of enclosed fields of improved pasture surrounded by open access land and adjoining Merthyr Common. The fields are enclosed by low banks, fences and stone walls in poor condition; occasional trees; former coal tips and mine remains to the north; a short distance from the residential areas on the east of Troedyrhiw, and the land between them is access land. Elevated on the valley side; strong sense of openness with wide ranging views over the Taff Valley and north to the Brecon Beacons.	This land would be made available for common grazing and public access.	There would be no adverse effects on landscape character from the proposed use for common grazing and public access. There would be minor long term benefit to the public from increased access to the countryside and the visual amenity of the views available from the area.
Area 12 Land at Pendducae Fawr Farm	Partly on the ridge top to the north of Mynydd y Capel and south of Mynydd Cilfach yr Encil, with views over the Taff Valley, and partly on the north-east facing valley side overlooking the Bargod-Taf Valley and the village of Bedlinog. Regular medium sized fields on the gentler upper slope; smaller irregular fields on the steep lower valley side. Field boundaries variously dry stone walls or hedges, with some mature trees, more	This land would be made available for common grazing and public access.	Adverse effects on landscape character from the proposed use for common grazing could arise from loss of field boundary vegetation or walls, which could be prevented by appropriate land management and fencing. There would be minor long term benefit to the public from increased access to the countryside and the visual amenity of the views available from the area.

Common Land Area	Baseline summary	Proposals affecting the Area	Assessment
	frequent on the lower slopes to the east. There are a number of farmsteads, a minor road from the Taff Valley and a community route from Troedyrhiw. Otherwise no public access. It adjoins the common and open access land along the ridge.		

Darkness and Lighting

16.301 Summary of the proposals affecting Darkness and Lighting: all areas

- During preliminary operations: moving vehicle lights and point lights at areas of construction of built facilities and support facilities such as water treatments areas on the periphery of the operational site
- During the main operational phases: Concentration of point lights at the built and support facilities in the west of the site; moving vehicle lights and local flood lights at excavation and overburden mound areas; moving vehicle lights along haul route to CDP; the overburden mound, once formed, would be dark; moving vehicle lights and local flood lights during formation and later removal to backfill the void
- During restoration: occasional localised vehicle lights during the agricultural operations associated with establishing landscape features.

Table 16- 16 Effects on Darkness and Lighting

Darkness/Lighting Area	Baseline summary	Assessment: During Operations	Assessment: After Restoration
The site and immediate environs	Intrinsically Dark, except for vehicle lights along Fochriw and South Tunnel Roads	The darkness level would change to Low Distinct Brightness locally, interspersed with bright point lights, and with a concentration of Low to Medium Distinct Brightness at the built and support facilities in the west, causing localised Light Spillage.	The Intrinsically Dark character of the area would be restored.
Fochriw	Low Distinct Brightness, set within Intrinsically Dark upland	The darkness and light character of this area would not itself be changed, but the view from it of the Intrinsically Dark upland of the site would change to include moving vehicle lights and scattered point lights. Once formed, the overburden mound would screen views of lit areas of the site and the site would largely appear Intrinsically Dark.	The darkness and light character of this area would be restored.
The operational areas of FLRS	Localised areas of Low Distinct Brightness, and static and moving point lights	No change until backfilling at FLRS was complete, when the lighting at the built facilities in the west of Nant Llesg, moving vehicle lights between operational areas of the site and during removal of the overburden mound to backfill the void, and point lights at locations of operations would be apparent in views available from the restored FLRS.	The previous Intrinsically Dark character of the area would be restored.
Rhymney Valley settlements and roads	High to Medium Distinct Brightness	The darkness and light character of this area would not itself be changed, but the view from it of the Intrinsically Dark upland of the site would change to include moving vehicle lights and scattered point lights. Once formed, the overburden and screen mounds would screen the operational areas and the site would appear Intrinsically Dark.	The view of the Intrinsically Dark upland of the site would be restored.
The landscape extending into the national park	Intrinsically Dark	The darkness and light character of the area would not itself be changed, but the view from it of the Intrinsically Dark upland of the site would change to include moving vehicle lights and scattered point lights.	The view of the Intrinsically Dark upland of the site would be restored.
Cwmbargoed Disposal	Localised point lights on buildings and plant, moving vehicle lights, intermittent vehicle warning lights, and	No change	With restoration of the CDP as well as of Nant Llesg, the previous Intrinsically Dark character of the area

Darkness/Lighting Area	Baseline summary	Assessment: During Operations	Assessment: After Restoration
Point	bright flood lights at the rail sidings		would be restored.
Valley urban areas	Sky Glow	No change	No change
The corridor of the A465	High Distinct Brightness at the roundabout junctions and moving vehicle lights	No change	No change

Table 16- 17 Summary of Visual Effects Assessment

Viewer or Visual Receptor	Sensitivity	Representative viewpoints	Summary assessment
Residents	Direct, open views High	1, 2, 3, 4, 5, 15, 19, 22	For residents within 2km of the site with direct open views, the development would cause Major, adverse effects, especially during years 1-6 and 9.5-14, when the overburden mounds were being formed during the early phases of excavations, and later removed to fill the final void. The effects in these phases are reduced to Moderate for residents with oblique or indirect views and for more distant residents. Although originally predicted to be visible from VP15, subsequent modifications of the development design now mean that no part of the development would be visible from this location. During the initial operations, visual effects would be Moderate, adverse for residents at relatively elevated locations with open views from the east or north-east. For other residents, the visual effects would be negligible or none in this phase. After formation of the overburden mound and screening mound, they would remain in place for the medium term, as elements in the landscape, with varying visual effect, depending on the relative elevation, distance and angle of view. This was assessed as Moderate, adverse generally, but Minor for more distant viewers. For the very near residents in Fochriw, once formed, the overburden mound would screen other operational areas of the site from view and the visual effect would arise from the interruption of the open view north currently available.
Residents	Indirect or oblique views High to Moderate	1, 2, 3, 4, 5, 14	
Residents	Oblique views from residence but open views when travelling to and from the residence High to Moderate	14, 22	

Viewer or Visual Receptor	Sensitivity	Representative viewpoints	Summary assessment
Users of a promoted footpath or cycle route	The view of the landscape is an important attractant High	6, 9, 13, 19	The nearest promoted route is the Rhymney Valley Ridgeway Footpath, following the ridge of Cefn y Brithdir south-eastwards from the site. From the higher elevations of the ridge, the visual effects of the development would be Moderate to Major, adverse, during the phases of greatest change, reducing to Moderate after the overburden mound is established. Visual effects would be Minor, adverse, to Negligible during the initial operations and restoration aftercare. Because of the low level routes followed by the promoted cycle routes near the site, the features of the development would have varying visual effects: from None to Moderate adverse for the route through Abertysswg and route 46 to the north of the site. From the distant, although elevated, Sirhowy Valley Walk, about 5km to the east of the site, the visual effects would be no more than Minor, adverse, during the main excavation phases of the development, Negligible during the phases of least change in initial operations and restoration aftercare.
Users of public rights of way	The landscape and views are the attractant High generally, Moderate where views are interrupted or intermittent	1, 10, 12, 14, 15, 21, 23	In views from rights of way more than 5km from the site, the visual effects would be no more than Minor, adverse, medium term, during the phases of greatest change during initial excavations and overburden mound construction and later removal for backfilling the final void. Although originally predicted to be visible from the cycle route at Waundeg (VP15), subsequent modifications of the development design now mean that no part of the development would be visible from this location. For people using rights of way near the site, within 1km, the effects during these phases would be Major, adverse and medium term, reducing to Moderate due to the presence of the overburden mound, and Minor during initial operations and restoration aftercare. There would be partial or interrupted views of formation and removal of the screen mound from the bridleways in Heads of the Valleys Industrial Estate, which would then effectively screen views of operations. The woodland planting along the ridge side would be a Moderate, beneficial, long term effect on the view. At intermediate distances, the effects are reduced to Moderate during the phases of greatest change and Negligible during initial operations and restoration aftercare.

Viewer or Visual Receptor	Sensitivity	Representative viewpoints	Summary assessment
Users of access land	An important recreation resource High	1, 10, 11, 16, 17, 18, 19, 20, 21	The site is located on an elevated ridge and surrounded by other ridges and uplands, much of which is open access land. For people using the access land on the more distant uplands of the national park to the north, the visual effects would be reduced by the distance from the site and the greater elevation, which affords wide ranging panoramic views, in which the site and the features of the development would be relatively small elements. In views from access land more than 5km from the site, the visual effects would be no more than Minor, adverse, medium term, during the phases of greatest change during initial excavations and overburden mound construction and later removal for backfilling the final void. For people using the access land near the site, within 1km, the effects during these phases would be Major, adverse and medium term, reducing to Moderate due to the presence of the overburden mound, and Minor during initial operations and restoration aftercare. At intermediate distances, the effects are reduced to Moderate during the phases of greatest change and Negligible during initial operations and restoration aftercare.
Users of a recreational amenity	The setting contributes to the amenity but is not the focus of the view Moderate to Low	9, 11, 12	Within the visual study area, views are available from several public open spaces, local recreational facilities and golf courses. The assessment identified no more than Moderate, adverse, visual effects during the phases of greatest changes, for and the Parc Bryn Bach Country Park and users of the ridges of Mynydd Fochriw and Mynydd Gilfach yr Encil for paragliding. For local amenity open spaces and golf courses, the effects assessed in the phases of greatest change were Minor to Moderate, adverse.
Users of local community facilities, golf course and clubhouse, etc	The attention is likely to be more focussed on the recreational use than on the landscape Moderate to Low	7, 11, 17	For local amenity open spaces and golf courses, the effects assessed in the phases of greatest change were Minor to Moderate, adverse.
Users of sitting area, public open space	A local community facility or amenity, visual amenity is part of the attraction Moderate	2, 4, 9	For local amenity open spaces, the effects assessed in the phases of greatest change were Moderate to Minor, adverse.
Visitors to a Country Park	A promoted recreation facility where the landscape is an important attraction	12	In the views from the east in which the remedial and landscape enhancement works would be visible, their visual effect was assessed as Moderate, beneficial,

Viewer or Visual Receptor	Sensitivity	Representative viewpoints	Summary assessment
	High		over the baseline condition in the long term for viewers from the Rhymney conservation area, and Minor, beneficial, for the more elevated views represented by viewpoints at Bryn Carno and Ras Bryn Oer.
Views from valued landscapes	BBNP, conservation area, VILL, LOHI, LSHI, SLA, LANDMAP VS evaluation is High. High	1, 3, 6, 9, 10, 11, 12, 14, 16, 18, 19, 20, 21	In the views from the east in which the remedial and landscape enhancement works would be visible, their visual effect was assessed as Moderate, beneficial, over the baseline condition in the long term for viewers from the Rhymney conservation area, and Minor, beneficial, for the more elevated views in valued landscapes, represented by viewpoints at Bryn Carno and Ras Bryn Oer.
Town centre visitors	Rhymney, frequent framed views Moderate	3	The view from Rhymney Town centre was considered in its own right as the nearest town and a conservation area. Because of the relatively low elevation and the buildings and mature trees within the town centre, the views available are generally framed glimpses where streets or junctions or the playing field open views towards the site. For visitors to the town centre, the visual effect was assessed as Moderate adverse during overburden mound construction and removal and Minor adverse during other phases. The Remedial and landscape enhancement works on the eastern valley side would be visible in some of these views, assessed as Minor to Moderately beneficial in the long term.
View from an industrial estate	The focus is not on the landscape Low	15, 23	Although originally predicted to be visible from the industrial estate here, subsequent modification of the development design now mean that no part of the development would be visible from viewpoint 15. No effect at any stage of the development. The photomontage illustrations from viewpoint 23 shows that the proposed screen mound would be effective in screening views of operations from the nearby Heads of the Valleys Industrial Estate, and that the proposed landscape enhancements would be a noticeable improvement in the view in the long term.

Viewer or Visual Receptor	Sensitivity	Representative viewpoints	Summary assessment
Travellers along the road	Direct but passing views View is not focussed on the landscape but with open views over the open upland Low to Moderate	1, 4, 8, 11, 22	Travellers along the roads in the visual study area are generally assessed as of low sensitivity to changes in their view, but Fochriw Road and South Tunnel Road are just beyond the site boundaries and there would be direct open views of the site available from them, raising their sensitivity to Moderate. Generally the visual effects were assessed as Minor or Moderate, adverse during the main operational phases, and Minor or Negligible during initial operations and restoration aftercare. From the north-west of the site on Fochriw Road, however, the view would include the built facilities and coal processing facility to be located between the excavation and overburden mound areas, raising the visual effect to Moderate to Major during the main operations and Moderate to Minor during initial operations or Negligible during restoration aftercare.

Summary of Cumulative Effects Assessment

16.302 Other developments taking place within 5km or likely to take place during the life of the Nant Llesg development are: FLRS, Cwmbargoed Disposal Point (CDP), Merthyr Industrial Services Waste Tipping Operations (MIS), Trecatti Landfill, and NET Wood Pellet Plant, Rhymney. Timescales vary between the developments, e.g. Trecatti Landfill commenced in 1999 and is likely to continue beyond the life of Nant Llesg, while FLRS commenced in 2007, and would be complete three years before Nant Llesg; NET is likely to commence operation in 2014 and to continue indefinitely and MIS would cease when Nant Llesg commenced.

Additive effects

16.303 With Trecatti and FLRS, Nant Llesg would extend the area of landscape where industrial and minerals related activities were taking place, although the MIS activities would cease. It is likely that, in views where Trecatti is visible, the apparent importance of the Trecatti features would be reduced because of the relative scale of those of Nant Llesg, affecting local landscape character and views from the north. The features and activities of Nant Llesg would be similar in scale and character to those of FLRS, assessed as Minor to Moderate, adverse and medium term for the ten years while the features of both sites would be in existence at the same time, and for viewers within 3km of the site. The overall effect would vary with the relative importance of the two sites in the view, the angle of view and distance from Nant Llesg.

Sequential effects

16.304 Sequential views would potentially be available from some routes through the landscape: the A465 and A4060 corridors, Bogey Road, Fochriw Road and South Tunnel Road; the Rhymney Valley Ridgeway Footpath and Bridleway 151 along the western flank of Mynydd Fochriw; National Cycle Route 46 along the A465 corridor and between Bute Town and Parc Bryn Bach, for the eight years while the features of both sites would be in existence at the same time:

- Because of the nature of views from A465, the contribution of Nant Llesg to effects with other developments would be Negligible or None
- Bogey Road passes through FLRS site. Nant Llesg would add to the industrial landscape experience from the eastern end of the road, a Major long term effect, but neutral in nature during operations
- There would be large changes in the context of and view from Fochriw Road as a result of the Nant Llesg development in addition to FLRS and Trecatti, a Major adverse long term effect during operations, for a short distance along the road of 3-4km
- South Tunnel road passes along the southern boundary of the operational area of the site and FLRS and CDP are visible in the view west. Nant Llesg features in addition assessed as Major adverse medium term effect during the period with all three would be in operation together
- The Rhymney Valley Ridgeway Footpath route would be affected for short lengths over a distance of about 3km, assessed as Moderate, adverse, medium term
- For the Sirhowy Valley Walk LDFP (long distance footpath), the overall additive or sequential effects would not be greater than Minor, and for a short length of the route, where the sites would be viewed within a wide panorama, the overall cumulative effect on the route would be Negligible
- Because of the low level routes followed by the promoted cycle routes near the site, the features of the development would have varying visual effects: from None to Moderate adverse for route 468 through Abertysswg
- Views towards Nant Llesg, Trecatti and FLRS would be available to varying degrees from different parts of Route 46. The effects of Nant Llesg with the other developments would be Major adverse immediately to the north of the site, due to proximity, and localised, reducing to Moderate further east, where the importance of the elements in the view would be reduced by

distance and with increased screening by vegetation. A relatively short section of the route would be affected, and it may be seen as part of the varied landscape and visual experience of the overall route.

16.305 At the end of operations, the openness and character of the landscape would be restored.

Temporal effects

16.306 Nant Llesg, FLRS, CDP and Trecatti Landfill, are temporary albeit long term developments. Nant Llesg and FLRS are characterised by change through time as excavation progresses across the sites, overburden and soils are stored in mounds and removed later to backfill final voids. The cumulative effects of the sites change correspondingly through time.

16.307 There would be a period of about ten years when the most prominent features at FLRS and at Nant Llesg would be extant together: the overburden mounds and the excavation voids. Before that point in time, the cumulative effects would be those of FLRS and the CDP together and after that point, the effects would be those of Nant Llesg alone.

Nant Llesg Surface Mine

Incorporating Land Remediation

Chapter 17

Waste

Nant Llesg Surface Mine

Incorporating Land Remediation

Environmental Statement

Chapter 17 - Waste

miller argent

Table of Contents

Tables

17 Waste

Chapter Overview

17.1 International legislation affecting the handling of waste during the scheme includes the European Waste Framework Directive 2008/98/EC, implemented by the Waste (England and Wales) Regulations 2011, and the European Mining Waste Directive 2006/21/EC. The proposals for reuse of materials on site and the instigation of a Material Management plan mean the scheme will comply with the objectives set by these directives.

17.2 Waste is defined in Section 75 of the Environmental Protection Act 1990 by reference to Article 3.1 of the Waste Framework Directive 2008, namely “any substance or object which the holder discards or intends or is required to discard”.

17.3 On a national level the Welsh Government’s policy towards waste management (Planning Policy Wales / Technical Advice Note 21) requires the responsible handling of waste and is based upon a hierarchy of reduction, re-use, recovery and where necessary the safe disposal of waste. The project aims to focus on the on site recovery of waste. Where waste is to be removed offsite for disposal to landfill, Waste Acceptable Criteria (WAC) testing is to be undertaken in order to correctly determine the appropriate waste treatement facility.

17.4 The Nant Llesg Surface Mine including Land Reclamation scheme is expected to generate various waste streams during the different stages of works; with key waste streams produced during enabling works and during dispositions one to five.

17.5 Ground investigations on site have identified contamination within an inert landfill to the east of Rhaslas Pond. This landfill is owned by Merthyr Industrial Services (MIS) and comprises two segregated areas; pre and post dating implementation of the 1999 Landfill Directive. An area outside of the permitted landfill boundary is also believed to contain landfilled materials. Through liasion with the NRW and necessary remedial works, it is intended to surrender the landfill permit prior to the commencement of works on site.

17.6 Some of the landfilled materials in the MIS landfill will require excavation and removal, following surrender of the existing landfill permit. Consultation with the NRW shall be undertaken to ensure suitable waste removal and stabilisation of residual wastes is undertaken to facilitate surrender of the permit. Materials identified during ground investigation at the MIS landfill include asbestos and biodegrabale material, which will require careful handling by appropriately qualified personnel.

17.7 Preliminary operations and subsequent land remediation works are expected to generate minimal waste streams, which will mainly consist of the removal of apparatus associated with the existing land uses across the site (e.g. agriculture and former mine adits).

17.8 Coaling works through dispositions one to four will generate the key waste streams of the scheme; predominantly from plant maintenance (at the workshop area) and process water treatment effluent (at the barrel wash, Cwmbargoed Disposal Point product wash and water treatment areas).

17.9 The final restoration and aftercare stages are not anticipated to produce any significant waste streams as major works comprise redistribution of overburden material and topsoils across the voids created by the preceding surface mining operations. Opportunities for recycling, e.g. offices, fencing and site accessories, are to be utilised where possible during this stage. Temporary concrete hardstanding on site is to be broken up, crushed and sent off site for reuse. This will aid the minimisation of waste during this stage of the scheme.

17.10 The Cwmbargoed Disposal Point is to be removed and restored as part of the works. This is likely to generate a large waste stream in the form of plant, machinery and demolition materials.

17.11 Key receptors identified as being suseptible to waste impacts are controlled waters, construction workers and businesses and residents along any waste haulage routes.

17.12 Ongoing consultation with the Environment Agency will determine the necessary materials and volumes to be removed from the MIS landfill as part of the landfill permit surrender process.

17.13 The removal of material from the MIS landfill and the proposed reduction in the size of Rhaslas pond will reduce the potential for horizontal / vertical migration of leachable contaminants from the MIS landfill; the significance of the risk to proximal controlled waters from the MIS landfill is therefore considered as **minor** with any risks experienced considered to have a duration of ***Temporary – Short Term.*** Risks posed to controlled waters from waste streams generated during dispositions one to five (e.g. sediment) will be mitigated by the production of a surface water management plan as detailed in the Hydrology Chapter. The residual risk is therefore considered to be **minor** with the duration of any effects deemed ***Temporary – Short Term*****.**

17.14 Human health risks to construction workers from potentially harmfull landfilled materials within the MIS landfill can be mitigated through the correct use of PPE and best practice working methods. It should also be noted that exposure of construction workers to these materials will be temporary, thus the human health risk posed by these materials is considerd to be **negligible** with the duration of any effects deemed ***Temporary – Short Term***. Similarly, risks to human health from management of waste streams during dispositions one to five shall be minimised through best practice operational procedures and these risks are also considered to be **negligible** with the duration of any effects deemed ***Temporary – Short Term*****.**

17.15 The bulk of exported waste from the scheme will be delivered to the adjacent Trecatti site and will therefore not pass any businesses or residents within the site vicinity. A small quantity of hazardous waste (e.g. generated from the MIS landfill) will be delivered to the appropriate disposal point in Swindon, passing one residential property before accessing the A465 Heads of the Valleys Road and subsequently travelling along major trunk roads and motorways. Best working practices will reduce the risk of odours and spillages. As a result the potential for an increase in traffic volume associated with waste haulage is deemed **negligible** however any effects as a result are considered to have a duration of ***Temporary – Short Term***. Alongside best practice working methods, the implementation of a Material Management Plan for the scheme will specify the appropriate waste storage, disposal, haulage and handling measures to be undertaken on site. The scheme will thus be compliant with relevant planning policies and legislation.

Introduction

17.16 This chapter considers the waste aspects of the Nant Llesg Surface Mine including Land Remediation scheme and provides an assessment of the waste effects as a result of the proposed development of the site.

17.17 The principle objectives of this chapter are to consider the constraints relating to waste for the scheme by developing a baseline, identifying potential waste streams, and including an assessment of the proposed scheme to identify any significant waste impacts within the area. Details of mitigation measures are outlined where considered necessary and residual effects are identified.

17.18 The scheme has the potential to impact on a number of receptors within the boundary of the site including construction workers and controlled waters, in addition to offsite waste disposal

sites, surrounding businesses and residents associated with the transport and processing of exported waste materials. The risks to controlled waters on site are covered in detail within the Hydrogeological Chapter (Chapter 10) and the Hydrology and Drainage chapter (Chapter 11).

17.19 The primary impacts will originate from the generation of waste streams during coaling works (e.g. sediment from the lagoon), in addition to the disturbance and removal of other wastes (e.g. MIS landfilled materials) associated with site clearance and enabling works. Overburden material and topsoil excavated as part of disposition one shall be stockpiled onsite for reuse as part of restoration works, and are therefore not classed as waste.

17.20 The scheme also has potential to impact on the landfill/treatment sites accepting waste streams generated by the scheme (e.g. hazardous and non hazardous waste from the MIS landfill.) Impacts associated with HGV movements along the proposed waste haulage route to offsite waste facilities are covered in detail within the Transport Assessment (Chapter 7). For the purposes of this assessment only direct impacts to residents and businesses associated with waste haulage are considered.

17.21 This waste impact assessment considers potential waste effects over the following phases of works, with key waste streams associated with each phase distinguished below:

a. Preliminary Operations – *wastes associated with removal of apparatus from existing land use*

b. Land Remediation Works – *wastes associated with former mine shafts and adits*

c. Removal of Waste Tipping – *wastes associated with MIS landfill (volume of materials to be removed from site will be dependent on ongoing consultation with Natural Resources Wales (NRW) regarding the permit surrender)*

d. Dispositions 1 to 5 – *inert wastes as classified under Mine Waste Directive (2006/21/EC). These are wastes generated by extractive industries which meet the definition of 'inert waste' as set out in Article 3 of Directive 2006/21/EC.*

e. Restoration of land – *no significant waste streams anticipated due to reuse of stockpiled overburden and topsoil material. Offices, site accessories, fences, etc, to be recycled and reused where possible to minimise the generation of waste.*

f. Decommissioning of Cwmbargoed Disposal Point – *wastes associated with demolition of buildings and removal of plant/machinery from the CDP.*

17.22 The Aftercare Period is not anticipated to generate any notable waste streams and therefore has been scoped out of this assessment.

Methodology

Study Area

17.23 For the purposes of this waste assessment, the study area is defined as the areas within the Nant Llesg site boundary; no significant waste streams are anticipated to be generated outside of this area as a result of the scheme. Consideration has also been given to potential waste disposal and treatment sites and waste haulage routes outside the site boundary.

Baseline Studies and Surveys

17.24 In order to establish the nature of landfilled materials within the MIS landfill, a number of investigations have been undertaken as follows:

- Terradat – Geophysical survey to identify the potential presence of landfill leachate at MIS landfill (July 2011);
- Initial ground investigation around perimeter of MIS landfill to establish likely consistency of waste materials (September 2011); and
- Quantum Ltd ground investigation across the MIS landfill to classify waste materials and identify potential issues for landfill permit surrender (2012).

17.25 The factual report and chemical testing data from the 2012 Quantum ground Investigation is included as Appendix MA/NL/ES/A17/001.

Policy and Legislative Context

17.26 Waste is a wide ranging term encompassing most unwanted materials and is defined by the Environmental Protection Act 1990 (Section 75) as including:

a) any substance which constitutes a scrap material or an effluent or other unwanted surplus substance arising from the application of any process; and

b) any substance or article which requires to be disposed of as being broken, worn out, contaminated or otherwise spoiled.

European Level

17.27 The revised EU Waste Framework Directive 2008/98/EC (implemented in Wales under the Waste (England and Wales) Regulations 2011) is the primary legislation for the management of waste. The key objective of the Waste Framework Directive is to provide *"measures to protect the environment and human health by preventing or reducing the adverse impacts of the generation and management of waste and by reducing overall impacts of resource use and improving the efficiency of such use".*

17.28 Under the Waste Regulations any waste transferred off site will require a waste transfer note or consignment note that includes a declaration stating the waste management hierarchy has been applied as part of the waste management process. The Waste Hierarchy aims to reduce the production and harmfulness of waste, and to maximise waste recovery through a preferential hierarchy of prevention, re-use, recycling, recovery and disposal.

17.29 The European Commission Directive 2006/21/EC (Mining Waste Directive) covers the management of waste from the extracting and processing of mineral resources. The Directive came into force in England and Wales on 7 July 2009 and aims to reduce the negative effects of mining and the waste produced by mining industries. This waste includes:

- Materials that must be removed to reach the mineral resource, such as topsoil and waste rock and;
- The remains after minerals have been extracted from ore.

17.30 The Directive states that *"Waste placed back into the excavation voids either for their rehabilitation or for construction purposes related to the mineral extraction process, such as the building or maintenance within voids of means of access for machinery, haulage ramps, bulkheads, safety barricades or berms, needs also to be subject to certain requirements in order to protect surface water and/or groundwater, secure the stability of such waste, and ensure appropriate monitoring upon cessation of such activities. Accordingly, such waste should not be subject to the requirements of this Directive which relate exclusively to 'waste facilities', except for the requirements mentioned in the specific provision on excavation voids."*

17.31 As such any material that is excavated, stored and re-used for reclamation with regards to this scheme ceases to be classed as waste following appropriate treatment, secured stability and monitoring (if required).

National Level: PPW and Associated TAN 21

17.32 The Welsh Government's general policy towards waste management is based on a hierarchy of reduction, re-use, recovery (including recycling and composting) and where necessary safe disposal of waste.

17.33 Local planning authorities are required, in conjunction with Natural Resources Wales(NRW), to ensure that waste is recovered or disposed without harming the environment, without endangering human health, without risk to water, air, soil plants or animals, without causing a nuisance through noise or odours, and without adversely affecting countryside or places of special interest.

17.34 Waste should be managed (or disposed of) in accordance with the Proximity Principle which states that waste should be treated and or disposed of as near to the source of origin as possible because transporting waste itself has an environmental impact.

Minerals Technical Advice Note for Coal

17.35 The Minerals Technical Advice Note 2: Coal (MTAN2) for Wales sets out detailed advice on the mechanisms for delivering the policy for coal extraction through surface and underground working for planning authorities and the coal mining industry.

17.36 It states that *"In considering an application for coal working by underground mining, the MPA will need to be satisfied, in addition to other relevant considerations for coal working, that the arrangements for the disposal of waste materials arising from the development are acceptable".*

17.37 Colliery spoil is defined as the material above, below and interspersed with the coal seams that are extracted in the process of mining coal. The MTAN gives potential options for colliery spoil use as aggregate, stowing underground, backfilling and states that *"Full account should be taken of the environmental consequences and the need for any environmental permits before a particular option is selected".*

17.38 Any spoil heaps and lagoons which contain material from a mine or quarry will be classed as tips and will be subject to the Health and Safety at Quarries Regulations 1999 (the Quarries Regs.) Where material is defined as waste, it will also need to comply with the Mining Waste Directive discussed above.

17.39 Using spoil to backfill excavation voids is encouraged in the MTAN, but consideration must be given to whether the voids have a particular ecological, scientific or historical importance.

Local Level

17.40 Strategy Policy 9 (SP9) of the Caerphilly County Borough Council Local Development Plan (LDP) states that "The Council will implement a sustainable, integrated approach to waste management, which minimises the production of waste and its impact on the environment, and maximises the use of unavoidable waste as a resource….. In line with the National Waste Strategy and the Regional Waste Plan (RWP), the Council will seek to promote the reduction, re-use and recycling of materials in order to reduce land take-up for waste facilities."

17.41 The Caerphilly County (LDP) area specific policy states that *"a railhead site is identified as suitable for minerals handling and related waste management facilities, as follows: Cwmbargoed Disposal Point, north west of Fochriw. The Cwmbargoed Disposal Point complex straddles the boundary of Caerphilly and Merthyr Tydfil County Boroughs. The majority of the site lying within Caerphilly County Borough is used for the preparation and despatch of coal."*

17.42 In accordance with local policy, the Nant Llesg scheme shall maximise the reuse of excavated materials wherever practicable, primarily by stockpiling overburden material and soils onsite for the progressive backfilling and restoration of voids during and on completion of coaling operations and for aftercare purposes.

Technical Appendices

17.43 The technical Appendix relevant to this waste chapter comprises the Quantum Ltd factual report on ground investigation at MIS landfill (Report No. G132/FGI) – Appendix MA/NL/ES/A17/001.

Consultation

17.44 The principal waste issue requiring detailed consultation is associated with the MIS landfill present on site within the boundary of the proposed overburden storage mound. A meeting was held on Tuesday 3rd July at the NRW (then Environment Agency Wales (EAW)) St Mellons office with representatives from the EAW groundwater and Contaminated Land team and the EAW Pollution Prevention and control Compliance Officer, in addition to the client and technical specialists from Mott MacDonald (waste) and AMEC (hydrogeology). The primary aim of the meeting was to inform the design of a ground investigation (GI) at the MIS landfill to address the following objectives:

- Obtain detailed information on the type and quantity of waste materials present within the landfill, and undertake chemical testing on soil samples to facilitate analysis of the waste material

- Obtain sufficient data on the waste type and gassing potential to enable the existing MIS landfill permit to be surrendered.

17.45 Following this meeting, a detailed schedule of works for GI at the MIS landfill was produced and approved by the current permit holders of the landfill. A ground investigation was subsequently undertaken and chemical testing results analysed. Results are to be issued to NRW as part of the forthcoming licence surrender application.

Assumptions and Limitations

17.46 The findings and opinions of this Chapter are based on information obtained from a variety of sources as detailed, and are believed to be reliable. Nevertheless the authors do rely upon information obtained from third parties.

17.47 To the extent that this Chapter is based on information obtained fromthe GI, it should be recognise that any such investigation can examine only a fraction of the subsurface conditions and there may be the potential for chemical or physical conditions to locally differ from those reported. This is of particular note for the MIS landfill, where material is likely to be very heterogeneous in nature.

17.48 Historical maps may omit potentially contaminative land uses which may have existed between the map publication dates. Additionally, historic mapping is known to not always be accurate both in terms of exact land use and location of features.

17.49 Quantitative data regarding generation of waste streams from dispositions will be dependent on the ground conditions encountered and process treatments implemented.

Sensitive Receptors to Potential Waste Effects

17.50 The principle receptors which may be impacted by waste are detailed in Table 17.1 below. Where there is a significant overlap in the potential impacts with other technical impact assessments, the relevant technical chapters have been identified and the scope of waste impacts outlined.

Table 17.1 Principal Receptors Subject to Waste Effects

Receptor	Details	Overlap	Scope of Waste Impacts
Construction and maintenance workers involved in handling and disposal of waste materials	Excavation of wastes from MIS landfill. Handling of operational wastes.	Land Contamination	Human health impacts directly associated with handling of waste. Gassing potential from wastes in MIS landfill.
Controlled waters	Residual waste materials in MIS landfill.	Land Contamination Hydrology Hydrogeology	Impacts on Rhaslas pond and perched groundwaters from leachable wastes in landfill.
Residents and businesses along waste haulage routes	Offsite disposal of hazardous and non-hazardous wastes.	Transport	Impacts directly associated with waste transport (i.e. hazardous material storage during transport etc).

Receptor	Details	Overlap	Scope of Waste Impacts
Landfill and treatment sites for waste materials	Use of available landfill resource for waste disposal.	N/A	Impacts on landfill capacity.

Baseline

Site Location and Description

17.51 The Nant Llesg Surface Mine Incorporating Land Remediation scheme is situated across a 479.1 hectare area of open moorland to the north of Fochriw and west of Rhymney in south Wales; approximately 4km east of Merthyr Tydfil. The site boundaries are formed by single lane roads and tracks. To the north, the A465 runs parallel to the northern site boundary while the town of Rhymney lies beyond the eastern site boundary. The Ffos-y-fran Land Reclamation Scheme (FLRS) and Trecatti Landfill lie to the west of the site. Topography across the site ranges from a maximum of approximately 430mAOD at the l western edge down to around 300mAOD at the south-eastern perimeter.

17.52 A reservoir, Rhaslas Pond (11.5 ha), is located in the western-central section of the site, to the west of a dismantled railway cutting which runs in a southerly direction towards Fochriw. This cutting includes the MIS landfill which has been utilised since the 1970s, further details of which are provided in paragraphs 1.60.

Geology and Made Ground

17.53 Geological information in this section is based on the footprint of the main excavation void and the MIS landfill, as these areas will form the principal sources of any waste streams associated with the scheme.

Made Ground

17.54 The British Geological Society (BGS) OpenGeoScience interactive mapping tool indicates that the majority of the site as having either been 'worked out' by opencast coal seam operations, or to be covered by 'made ground (mainly from coal and ironstone workings), particularly in the northern section (known to have been utilised for surface mining in the past). According to historic maps extensive quarrying and surface mining has been undertaken since the 1870s, with a numerous shafts and adits located across the area. Consequently there is potential for made ground and reworked material (associated with old air shafts etc) to be present across the site; however the amount of material consisting of made ground that will be generated is considered negligible in comparison to the overall scale of the works and will be disposed of as part of the backfill.

17.55 Ballast, building foundations and other made ground associated the former railway lines across the site may be present in localised areas. Made ground and waste materials associated with the MIS landfill in the former railway cutting near Rhaslas Pond are present in thicknesses of approximately 3.5m. This material was recovered from boreholes as a dark greyish brown silty sandy gravel. The strata also contained some fragments of brick, concrete, wood, glass, tile,

metal and plastic with occasional pockets of black ash. Further details of this area are provided in paragraphs 1.60 and 1.61.

Superficial Deposits

17.56 Where undisturbed, superficial deposits on the site are generally less than 10m thick, and have been shown to comprise Boulder Clay typically overlain by thin clay and peat deposits, the exception is along the lower reaches of the Nant Llesg site where gravel and boulder deposits occur above rockhead..

Solid Geology

17.57 Within the excavation area the strata that will be encountered belong to the Lower and Middle Coal Measures of the Westphalian Stage of the Carboniferous Period and consist chiefly of mudstones and silty mudstones with subordinate sandstones, coals, seatearths and ironstones. The strata outcropping over the Overburden Storage Area belong to the upper part of the Middle Coal Measures and to the lower part of the Upper Coal Measures, and while comprising similar lithologies to those that will be encountered in the excavation, there is an increased proportion of sandstone within this sequence..

17.58 The MIS landfill site located within the south-running railway cutting to the east of Rhaslas Pond has been the subject of a permit for the deposition of 'inert' waste at the site since the 1970s. The landfill comprises two sections; hereafter referred to as Phase 1 and Phase 2/3, separated by a clay bund. There is evidence to suggest that the area north of the Phase 1 site was used for unlicensed tipping in the 1970s. The positions of the various landfill areas and features are provided in Drawing MA/NL/ES/017/001.

Controlled waters

17.59 Proximal controlled waters to the Nant Llesg site which may currently be at risk from waste effects from the scheme comprise the following:

- The Rhaslas Pond reservoir immediately west of the MIS landfill is to be partly infilled and is therefore considered a receptor. However, the reservoir is to be utilised as a water supply for the barrel wash and dust suppression and is to be included within the Site Surface Water Management Plan; as such it is unlikely to be affected by waste impacts on site.

- Streams which bisect the site in an easterly direction towards Rhymney and additional streams which pass across the site to the north and south. The scheme will necessitate diversion and infill of these watercourses consequently these are also not considered to be at risk from future aspects of the scheme.

- Groundwaters underlying the site. The groundwater table is at approximately 100m bgl in the vicinity of the site and is therefore unlikely to be directly impacted by vertical migration of contamination directly associated with wastes (e.g. leachate from landfilled materials in MIS landfill). It should also be noted that groundwaters associated with coal bearing strata are generally of poor quality, details of groundwater quality are detailed in the Hydrogeological Chapter.

Areas of MIS Landfill

17.60 The Phase 1 area of the MIS landfill site is now closed to waste tipping. It pre-dates the implementation of the 1999 Landfill Directive; consequently this area has been segregated from the latter Phase 2/3 area via a vertical clay bund. The active Phase 2/3 landfill site is approximately 720m long and 50m wide at its greatest width. The installation is licensed to accept up to 12,000 tonnes per annum of inert waste. The permit allows inert soils and stones, excluding topsoil, peat, and soil and stones from contaminated sites.

17.61 An inspection of this landfill was carried out on the 22nd of July 2011 by the EAW (now NRW) who observed that non-inert material had been deposited including soil fines, plastic, paper, small electrical components, metal and wood. Evidence of burning of waste was also noted.

Ground Investigation at MIS Landfill

17.62 A GI where the specification was given prior approval by the EAW (now NRW) was undertaken across the MIS landfill site between the 20th and 24th July 2012 by Quantum Geotechnical Ltd, with chemical testing undertaken on soil samples by Scientific Analysis Laboratories (SAL) Ltd. The ground investigation comprised 3 No. rotary open-hole boreholes in addition to 14 No. mechanically excavated trial pits. Groundwater and gas monitoring installations were placed in each of the three boreholes to facilitate a programme of post fieldwork monitoring.

17.63 Soil samples were taken from all exploratory holes, with the exception of BH02. Chemical testing was subsequently undertaken on 28 No. samples from a range of depths across the site for the following suite of contaminants:

- Soil suite: As, B, Ba, Be, Cd, Cr, Cu, Fe, Pb, Hg, Mo, Ni, Sb, Se, Zi, pH, total sulphur, sulphide (water soluble), cyanide, TPH with aliphatic/aromatic split, PAH (speciated), VOCs, phenols and asbestos screen;

- Leachate suite: As, B, Ba, Be, Cd, Cr, Cu, Fe, Hg, Mo, Ni, Pb, Sb, Se, V, Zn, ammonical nitrogen, chloride, sulphur, sulphide, cyanide, pH, PAH (speciated), PCB (speciated) organic carbon, TPH (total).

17.64 WAC testing (total and leachate suite) was also undertaken on 14 No. samples for waste classification purposes.

Analysis of Ground Chemical Testing Results

Analysis Methodology

17.65 Chemical testing was undertaken by SAL Ltd, an MCERTS and United Kingdom Accreditation Service (UKAS) accredited laboratory. MCERTS is the Environment Agency's Monitoring Certification Scheme that provides a framework for businesses to meet certain quality requirements with regards to the monitoring of emissions into the environment. UKAS is the United Kingdom Accreditation Service where accreditiation demonstrates the competence, impartiality and performance capability of the accredited company.

17.66 Soil testing results were compared against the EA Soil Guideline Values (SGVs) for a commercial land use. These are scientifically based generic assessment criteria used as a screening tool for the quantative assessment of land contamination under the Contaminated Land Exposure Assessment (CLEA).

17.67 Where EA SGVs were not available, Land Quality Management (LQM) / Chartered Institute of Environmental Health (CIEH) Generic Assessment Critera (GAC) have been used. Where neither SGVs nor GACs are available (e.g. for polychlorinated biphenyls) the Serious Risk

Concentrations (SRC) from RIVM Report 711701023 were used although it should be noted that these are considered to be very conservative trehsholds for the MIS landfill site as they relate to residential land uses.

17.68 Leachate testing was undertaken in order to establish the risk posed by contaminants on controlled waters. Results were compared against the current EA Environmental Quality Standards (EQS) for fresh waters and UK Drinking Water Standards (UK DWS) where EQSs were not available. Groundwater Threshold Values (sourced from the Severn District River Basin Management Plan) have not been used as principal assessment criteria due to the significant depth to groundwater and the conservative nature of these values.

17.69 SAL Ltd also undertook WAC testing in order to establish the required disposal route of any waste generated on site. WAC testing identifies the concentrations of specific contaminants within the site and depending on this specific concentration, defines it as either “inert”, “stable non-reactive hazardous waste” or “hazardous”.

17.70 HazwasteOnline™ is a tool that analyses the concentrations of various contaminants within a sample to provide a generic waste classification of a site in terms of either “non-hazardous” or “hazardous”.

17.71 The HazwasteOnline™ website states that *“HazWasteOnline™ provides waste producers, consultants, carriers and waste receivers with a simple, accurate and auditable tool for the classification of potentially hazardous and hazardous waste materials…”.*

17.72 According to the HazwasteOnline website, *“HazWasteOnline™ allows users to code and classify waste as defined in the EWC (European Waste Catalogue 2002) based on the regulatory framework for the EC's Hazardous Waste directive (Council Directive 91/689/EC) and latest Environment Agency guidance (Technical Guidance WM2). The system comprises an analysis and reporting web front-end, a calculation engine to model the regulations and a database to save the contaminants inputted and reports generated. The system is fully auditable and is maintained by us to reflect the latest changes in EC regulations and Environment Agency guidance.”*

Soil Samples that Have Potential to Impact on Human Health

17.73 Asbestos fibres were detected in 13 of the 25 trial pit soil samples analysed by SAL Ltd. Eleven samples were found to contain only chrysotile fibres, one sample purely amosite fibres and one further sample contained both chrysotile and amosite fibres. The two samples taken from BH01 and the sample from BH03 were also found to contain chrysotile fibres.

17.74 A sample of the suspected asbestos material (SP01 0.1) was taken and confirmed as amosite fibres.

17.75 Asbestos is an absolute entry in the EWC and therefore should be classed as hazardous where any is removed from site for disposal.

17.76 Five trial pit samples were found to contain levels of lead in excess of the (now withdrawn) 750mg/kg EA commericlal land use SGV. A concentration of 870mg/kg was recorded in TP01 3.0; levels of 820mg/kg and 4,400mg/kg were recorded in TP02 0.1 and TP02 2.0 respectively; 840mg/kg was recorded in TP04 0.1 and 1,000mg/kg was found in TP05 2.0.

17.77 Whilst not considered to pose a significant human health risk, two trial pit samples were recorded as having alklaine pHs outside the normal range for soils of pH6 to pH9. TP03 2.0 recorded a pH of 9.5 and TP04 3.0 a pH of 9.0. Two samples from BH1 also exceeded the upper threshold with results of 9.8 and 9.2. One sample (TP11 2.0) was recorded as having an acidic pH below the lower threshold of pH 6 with a value of 4.6.

Soil Leachate Samples With Potential to Impact on Controlled Waters

17.78 Table 17.2 summarises the leachable contaminants found in each trial pit and borehole in exceedance of relevant thresholds, which would have potential to impact on controlled waters where allowed to migrate into proximal surface waters or groundwaters. It is worth noting that all trial pit samples had concentrations of free cyanide and sulphide <0.05mg/l. This is equal to the detection limit but greater than the threshold established under the EQSs. As a result it is possible that all samples may contain levels of cyanide and sulphide in excess of the EQSs.

Table 17.2 Leachate Exceedances.

Trial Pit / Borehole	Exceedances	Concentration	Threshold	Source
TP01	Ammoniacal nitrogen	0.14mg/l	0.015mg/l	EQS
	Total Cyanide	0.05mg/l	0.05mg/l	EQS
	Mercury	0.61µg/l	0.05µg/l	EQS
TP02	Ammoniacal nitrogen	0.06mg/l	0.015mg/l	EQS
	Cadmium	0.36µg/l	0.25µg/l	EQS
	Mercury	0.49µg/l	0.05µg/l	EQS
	pH	9.3	6<pH<9	EQS
TP03	Mercury	0.27µg/l	0.05µg/l	EQS
	pH	10.4	6<pH<9	EQS
	PAH Sum 4	0.12µg/l	0.1µg/l	EQS
TP04	Ammoniacal nitrogen	1.9mg/l	0.015mg/l	EQS
	Cyanide Total	0.08mg/l	0.05mg/l	EQS
	Mercury	0.52µg/l	0.05µg/l	EQS
	pH	9.4	6<pH<9	
	Sulphate	490mg/l	400mg/l	EQS
	Anthracene	0.31µg/l	0.1µg/l	EQS
	Fluoranthene	0.89µg/l	0.1µg/l	EQS
	PAH Sum 4	1.72µg/l	0.1µg/l	EQS
TP05	Mercury	0.42µg/l	0.05µg/l	EQS
	PAH Sum 4	0.15µg/l	0.1µg/l	EQS

Trial Pit / Borehole	Exceedances	Concentration	Threshold	Source
TP06	Mercury	0.2µg/l	0.05µg/l	EQS
	Fluoranthene	0.14µg/l	0.1µg/l	EQS
	PAH Sum 4	0.3µg/l	0.1µg/l	EQS
TP07	Barium	130µg/l	100µg/l	EQS
	Mercury	0.11µg/l	0.05µg/l	EQS
	Sulphate	470mg/l	400mg/l	EQS
	Anthracene	0.11µg/l	0.1µg/l	EQS
	Fluoranthene	0.44µg/l	0.1µg/l	EQS
	PAH Sum 4	1.13µg/l	0.1µg/l	EQS
TP08	Mercury	0.09µg/l	0.05µg/l	EQS
	PAH Sum 4	0.12µg/l	0.1µg/l	EQS
TP09	Mercury	0.06µg/l	0.05µg/l	EQS
	Fluoranthene	0.14µg/l	0.1µg/l	EQS
	PAH Sum 4	0.35µg/l	0.1µg/l	EQS
TP10	Mercury	0.05µg/l	0.05µg/l	EQS
	Nickel	26µg/l	20µg/l	EQS
	Sulphate	1400mg/l	400mg/l	EQS
TP11	Ammoniacal nitrogen	0.86mg/l	0.015mg/l	EQS
	pH	5.1	6<pH<9	EQS
	Fluoranthene	0.18µg/l	0.1µg/l	EQS
	PAH Sum 4	0.35µg/l	0.1µg/l	EQS
BH01	Ammoniacal nitrogen	0.96mg/l	0.015mg/l	EQS
	Cadmium	0.26µg/l	0.25µg/l	EQS
	Copper	99µg/l	28µg/l	EQS
	Mercury	0.39µg/l	0.05µg/l	EQS

Trial Pit / Borehole	Exceedances	Concentration	Threshold	Source
	Nickel	30µg/l	20µg/l	EQS
	pH	11.2	6<pH<9	EQS
	Sulphate	1500mg/l	400mg/l	EQS
BH03	Ammoniacal nitrogen	0.91mg/l	0.015mg/l	EQS
	Mercury	0.31µg/l	0.05µg/l	EQS

17.79 Primary leachable contaminants from the MIS waste materials include ammoniacal nitrogen, heavy metals and PAH compounds.

17.80 It should be noted that EQSs are highly conservative thresholds designed to ensure protection of controlled waters, and that laboratory leaching tests are aggressive and represent a worst case scenario of natural ground conditions.

Ground Gas Risks

17.81 During the ground investigation, evidence of timber and other biodegradable material was identified in all but two exploratory holes, giving rise to potential for elevated concentrations of gases such as methane to build up within the landfilled waste.

17.82 Quantum Geotechnical were instructed to complete six months of ground gas monitoring to include one monitoring visit per month. The first round of monitoring was undertaken on the 26th September 2012; data was to be taken from all eight boreholes on site, including the historical monitoring points.

17.83 Due to access issues during the first round of monitoring only one historic BH was accessible in addition to the three BHs installed during the recent GI.

17.84 Methane (CH_4) was not encountered in any borehole; however BHs 01, 02 and 03 recorded relatively low concentrations of carbon dioxide (CO_2). The historic BH01E was recorded to have a relatively high level of CO_2 at 6.2%, thought to result from biodegradation of organic materials in the landfill over time. Depleted oxygen levels were noted in three of the boreholes with concentrations of 16.3% in BH01, 15.9% in BH03 and 8.7% in historic BH01E.

17.85 Overall the gas monitoring results indicate a low gassing potential across the site, however this is based upon the analysis of one round of monitoring only and will only be confirmed with more confidence when all six rounds of monitoring are complete.

Waste Categorisation

17.86 The HazWasteOnline™ analysis indicated that (should materials be excavated from the landfill as waste) material from seven of the trial pit samples and one sample from borehole 3 would be classified as “hazardous” waste.

Table 17.3 Hazardous Trial Pit Contaminants.

Trial Pit / Borehole	Hazardous Contaminant	Hazardous Property
TP01	PAH	H14: Ecotoxic
TP02	Zinc	H14: Ecotoxic
TP03	Lead	H10: Toxic for Reproduction
TP04	PAH	H14: Ecotoxic
TP05	PAH	H14: Ecotoxic
TP12	PAH	H14: Ecotoxic
BH03	PAH	H14: Ecotoxic

17.87 The proposed main excavation area of the Nant Llesg surface mine overlies the unlicensed tip to the immediate north of the MIS landfill beyond the Phase 1 licensed area. Four of the fourteen trial pits excavated during the GI are contained within this area (TP01-TP04); all four of which contain samples which would be classified as hazardous waste if removed from site for disposal (according to the HazWasteOnline™ analysis).

17.88 WAC testing on the six samples taken from these four trial pits confirmed they contain levels of certain contaminants in excess of that acceptable in hazardous landfills. Consequently, should material from these locations be excavated for disposal, pre-treatment would be necessary to reduce the hazardous properties of the materials to levels acceptable to the hazardous waste landfill facility.

Table 17.4 Summary of WAC Testing for TP01 to TP04.

Trial Pit / Borehole	Contaminant	Concentration	WAC Threshold Breached
TP01	Loss on ignition TOC TPH (C10-C40)	17% 7.6% 510mg/kg	Hazardous (10%) Hazardous (6%) Hazardous (500mg/kg)
TP02	Loss on ignition TOC Fluoride	11% 6.8% 10mg/kg	Hazardous (10%) Hazardous (6%) Inert (10mg/kg)
TP03	Loss on ignition TOC Antimony Sulphate	13% 8.1% 0.33mg/kg 2600mg/kg	Hazardous (10%) Hazardous (6%) Inert (0.06mg/kg) Inert (1000mg/kg)
TP04	Loss on ignition TOC TPH Antimony Fluoride Sulphate	13% 10% 700mg/kg 0.29mg/kg 15mg/kg 2500mg/kg	Hazardous (10%) Hazardous (6%) Hazardous (500mg/kg) Inert (0.06mg/kg) Inert (10mg/kg) Inert (1000mg/kg)

Summary of Waste Materials from MIS Landfill

17.89 Soil samples taken from the MIS landfill identified the presence of amosite and chrysotile asbestos which may pose a human health risk to construction workers handling wastes.A licenced asbestos contractor should provide suitable migitation and management advice relating to asbestos. Risks posed to construction workers from other contaminants are short term in nature and can be mitigated through the use of best practice working methods and PPE.

17.90 Soil leachate results (representing a worst case scenario) indicate that ammoniacal nitrogen, some heavy metal compounds and PAHs have potential to impact on controlled waters where leachates generated as rainwater percolates through the MIS waste materials migrate into proximal surface and groundwaters. Removal of the MIS waste materials from site will eliminate this risk.

17.91 Chemical testing results determined the presence of non-inert materials within the MIS landfill including elevated levels of biodegradable matter. During decomposition these materials have the potential to produce hazardous gases and construction workers will be required to undertake best working practices in order to minimise the risks posed by an accumulation of gas to human health.

17.92 Ongoing consultation with NRW regarding the MIS landfill permit surrender will confirm volumes of material to be removed from the MIS landfill.

Available Waste Disposal and Treatment Facilities

17.93 There is potential for some materials which are unsuitable to remain on site (e.g. waste from the MIS landfill) to be removed and treated offsite at licensed facilities, a list of which are provided below.

17.94 The nearest non hazardous and inert waste disposal/treatment facilities to the site include the following:

- Adrian Lewis Waste Paper Collections Ltd, Ebbw Vale;
- Biffa Waste Services Ltd, Merthyr Tydfil; and
- Thomas Waste Management Ltd, Brynmawr.

17.95 Suitable hazardous waste disposal facilities closest to the site include:

- Hills Waste Solutions Ltd, Swindon.

Data Limitations

17.96 Environmental monitoring of the MIS landfill and detailed waste records have not been undertaken by the permit holder for several years, consequently up-to-date information on the gassing and leaching potential of the waste is limited at the time of completing this waste assessment. Further gas monitoring is to be undertaken as part of the post fieldwork monitoring for the 2012 GI which shall facilitate a more robust assessment of the waste and whether it is suitable to remain in situ following closure of the landfill.

17.97 Whilst the 2012 Quantum GI aimed to classify the wastes within the MIS landfill as far as practicable, the heterogeneous nature of landfilled materials may result in significant variations of waste components over short distances. Consequently there is potential for waste materials not encountered during the ground investigation to be encountered during excavation works.

17.98 Exact volumes and areas of waste material to be excavated from the MIS landfill and removed from site for treatment and/or disposal will be dependent on discussions with NRW regarding surrender of the landfill permit, in addition to the materials encountered during excavation works. Consultation and liaison with NRW will be ongoing as part of the landfill permit surrender process.

Assessment criteria and Assignment of Significance

Potential receptors

17.99 For the purposes of the waste chapter, potential receptors suceptable to waste impacts (prior to any mitigation) are as follows:

- Construction workers and site personnel who may come into contact with landfilled waste materials from the MIS landfill and waste arisings during coaling works (e.g. during maintenance of barrel wash and new product wash facilities, water treatment facilities and plant maintenace);

- Residents and businesses along waste haulage routes who may be sensitive to potential odour and waste leakage from transport vehicles removing waste materials from site; and

- Controlled waters (Rhaslas Pond and underlying perched groundwaters) which may be impacted by leachable PAH and heavy metal contamination within MIS landfill, in addition to proximal watercourses which have potential to be impacted by operational wastes such as lagoon sediment prior to mitigation.

Forecast Waste Streams

17.100 Wastes streams generated during each stage of the works (with potential to imapct on receptors) are based on a maximum annual rate of coal production of 750,000 tonnes, as this represents the worst case scenario from a waste perspective. Table 17.5 illustrates the types of waste that will be generated during each stage of the proposed works.

Table 17.5 Forecast waste streams

Wastes Generated	Preliminary Operations	Land Remediation Works	Wastes associated with MIS landfill	Dispositions 1 - 5	Operations at CDP	Restoration period	Decommissioning of CDP
Generic Waste	✓	✓	✓	✓	✓	✓	✓
Site Construction Waste	✓						✓
Hazardous Excavation Waste		✓	✓				
Coal Excavation Waste		✓	✓	✓			
Vehicular Waste		✓	✓	✓	✓		
Wash Plant material				✓	✓		

17.101 It should be noted that arisings from the site and CDP coal washing facilities will comprise rock, shale and coaly material which will be suitable for reuse as backfilling materials. This material is inert and has a distinct use, it is therefore not a waste following processing and is not considered further in this chapter. Any wood and steel found in the barrel wash feed will be separated and recycled off site. Oils and grease produced from the maintenance of machinery is to be collected and disposed of with all other oil based waste collected on site.

17.102 The volume of waste generated during each phase of works is largely dependent on the ground conditions encountered, the onsite treatment processes used for e.g. desedimentation of

process waters, and the outcomes from ongoing consultation with the NRW regarding the MIS landfill permit surrender. However, it is anticipated (as a worst case scenario) that approximately 5,600 tonnes of waste will need to be removed from the unlincensed tipping area to the immediate north of MIS landfill as part of the works.

17.103 Following segregation and sorting of the wastes from the unlicensed tip, it is expected that approximately 560 tonnes of the material will be classified as hazardous for the purposes of onwards disposal, and 3920 tonnes would be classed as non-hazardous, with the remining 1120 tonnes classed as inert.

17.104 The above figures assumes the segregation of waste is straightforward and that soils are typically granular sands and gravels. Where clay and other cohesive materials are encountered during excavation, the quantity of hazardous materials is likely to increase due to the difficulties in segregating cohesive material.

17.105 Maintenance of the water treatment lagoons during the operational phase is likely to generate a waste stream comprising silt and sediment. This material will subsequently be utilised as backfill for the main void and consequently will cease to be a waste. Consequently this material stream is not considered further in this chapter.

Defining Significance

Receptor sensitivity

17.106 The sensitivity of receptors to waste impacts as been assigned using the following methodology:

- **High:** Sensitive and designated controlled waters (e.g. Principal Aquifer, Source Protection Zone), sensitive human receptors (e.g. long term residential use of land with homegrown produce)

- **Medium:** Locally important controlled waters (e.g. Secondary A/B aquifers, lcoally important surface waters) human receptors with temporary exposure (e.g. construction workers)

- **Low:** Non sensitive controlled waters (e.g. watercourses with poor to moderate ecological quality)

Impact Magnitude

17.107 The magnitude of waste impacts has been assigned using the following methodology:

- **High:** Short term risk of pollution/consumption to sensitive resource (e.g. widespread pollution of Principal Aquifer from landfill leachate, significant quantities of waste for landfill), short term (acute) human health risk, significance and widespread disturbance of human receptors;

- **Medium:** Medium/long term risk of pollution/consumption of sensitive resource (e.g. localised pollution of secondary A/Principal aquifer, generation of wastes for landfill), medium/long term (chronic) human health risk, localised distrubance of human receptors;

- **Low:** Easily preventable permanent health effects on humans, pollution of non-sensitive water recources or low risk of pollution of locally important water resource; and

- **Negligible:** No discernable effects

Key Parameters for Assessment

17.108 The magnitude of waste impacts has been assigned using the following methodology:

Significance of Impacts

17.109 The significance of potential waste impacts has been determined using the following matrix:

Table 17.6 Significance Assessment Matrix

	MAGNITUDE OF IMPACT			
SENSITIVITY	**High**	**Medium**	**Low**	**Negligible**
High	Major	Moderate/Major	Minor/moderate	Minor
Medium	Moderate/Major	Moderate	Minor	Negligible/Minor
Low	Minor/Moderate	Minor	Negligible/Minor	Negligible/Minor

Mitigation Measures Adopted as Part of the Project

Procedure for Screening Site Won Materials

17.110 A Material Management Plan/Site Waste Management Plan (MMP/SWMP) is to be established on site to ensure appropriate materials and waste handling procedures and associated disposal of waste where necessary. The MMP/SWMP shall maintain records of the quantities of waste streams which are disposed of offsite and reused on site. Many of the waste streams generated onsite will cease to be classified as waste due to their inert properties and reuse as backfill (e.g. barrel wash arisings and new product wash).

17.111 The MMP/SWMP will contain details relating to the segregation of materials on site. According to the CL:AIRE definition of waste, material arisings classed as hazardous can remain in situ when their engineering properties are acceptable and they do not pose a significant human health or environmental risk. Such material will be sebregated and remain in situ.

17.112 Arisings from the excavation of the MIS landfill are to be stockpiled on site for visual screening in order to segregate areas of biodegradable materials (unsuitable for re use due to gassing potential) and areas of suspected inert material that may be acceptable for re use on site (e.g. stones and inert rubble). Large items of plastics/metals/asbestos excavated from the MIS landfill are to be segregated from other arisings for removal from site.

17.113 WAC testing is to be undertaken on any potentially hazardous material travelling off site in order to classify the correct disposal procedures.

17.114 An accredited asbestos contractor should be appointed for the management of these materials.

Correct Disposal and Waste Classification of MIS Landfill Wastes

17.115 Chemical testing on the samples taken from the MIS landfill confirmed the presence of non-inert materials on site, particularly in the unlicensed tipping area to the north of the Phase 1 boundary. Ongoing consultation with NRW will establish the materials and volumes of waste to be excavated from the MIS landfill area that will require disposal off site. Wherever practicable, landfilled materials within the licensed landfill boundary will not be disturbed and are likely to be capped using overburden material.

17.116 The landfill type used for the disposal of unsuitable may require further WAC testing due to legislative reasons. If large volumes of waste are to be disposed of, WAC testing will be required on one sample per 500m^3 of material, subject to the landfill operator requirements.

17.117 MIS material deemed suitable for reuse on site will be used to backfill the MIS landfill void. This material will then be contained by an engineered capping layer prior to construction of the overburden mound. The engineered capping layer shall be designed in consultation with NRWand shall ensure that generation of leachate is minimised.

MIS Landfill Permit Surrender

17.118 Miller Argent have entered into a call option agreement with the current owners of the MIS landfill.

17.119 On obtaining a successful planning permission for the Nant Llesg site Miller Argent can call on this option which transfers the land title to Miller Argent.

17.120 Miller Argent will then work towards surrendering the current waste permit for the MIS landfill (gas and water monitoring are currently ongoing to facilitate this).

17.121 All works will be carried out with full aproval of the NRW Wales.

Environmental Assessment

Controlled Waters

17.122 Controlled waters which may be at risk from waste impacts include the Rhymney and Nant Bargod Rhymi rivers (classified as receptors of **low** sensitivity given their respectively moderate and poor ecological potential). Underlying groundwaters associated with the Secondary A aquifer are classifed as receptor of **medium** sensitivity due to their status as locally important controlled waters. Rhaslas pond (adjacent to the MIS landfill) is to be partly infilled as part of the works and is a potential **low** sensitivity receptor due its connectivity to a watercourse with poor ecological quality (the Nant Bargod Rhymi river), in addition to the lack of any sensitive uses of Rhaslas pond (e.g. discharge consent, abstraction licence). The Surface Water

Management Plan will set out mitigation measures for all controlled waters on site and as such there is assumed to be no residual risk to controlled waters posed by waste streams on site.

17.123 Key project stages where controlled waters have the potential to be impacted include the land remediation works, waste tipping, dispositions 1 to 5 and operations at Cwmbargoed Disposal Point.

17.124 There is potential for leachable contamination within the landfilled materials at the MIS landfill to migrate into underlying groundwaters. However, ground investigation data from MIS landfill indicates that leachable contamination in landfilled wastes is low. Additionally, the depth to groundwater is significant (~100m bgl) and the groundwater quality associated with coal bearing strata is typically low. As part of the landfill permit surrender process, it will be necessary to excavate and remove any wastes which are considered to pose a risk to controlled waters due to leachable levels of contamination. Consequently the magnitude of impact to underlying groundwater is considered to be **low** and thus the impact significance is classed as **minor.** Depending on the significance of a contamination event the duration of any effects to groundwater are considered to be ***Temporary – Short Term*.**

17.125 The reuse of a large proportion of the process effluent arisings as backfill signfiicantly minimises the quantity of process wastes. The proposals for several water treatment facilities on site further minimises the risk of wastes from process effluents (e.g. lagoon silt) reaching proximal surface watercourses (particularly during storm events where the working void will be allowed to flood rather than discharge non-compliant effluent to watercourse). Consequently the magnitude of impact to Rhymney and Nant Bargod Rhymi rivers is considered **low**, resulting in an impact significance of **negligible/minor.** Depending on the significance of a contamination event the duration of any effects to proximal surface waters are considered to be ***negligible*/*Temporary – Short Term*.**

Site Workers

17.126 Key project stages with the potential to impact on site workers from a waste perspective include the preliminary operations, land remediation works, waste tipping and operations at Cwmbargoed Disposal Point.

17.127 The most notable human health issues relating to the proposed works is the removal of wastes from the MIS landfill by construction workers (considered as receptors with **medium** sensitivity).

17.128 Asbestos fibres and other harmful materials were recorded in the majority of trial pit and borehole samples which prior to mitigation could cause a permanent human health risk. Construction workers may also be temporarily exposed to materials, dust and fluids produced during the excavation and processing of coal on site. Accumulation of ground gas from the MIS landfill poses a temporary risk to human health where workers are in confined spaces (e.g. during excavation of waste materials). The magnitude of impact to construction workers is considered as **medium** ***prior to mitigation*** (due to presence of asbestos and potential concentrations of ground gas). This results in a impact significance of **moderate.** Prior to mitigation the potential effects exposure to asbestos and the presence of ground gas may have on human health could cause a ***permanent*** effect.

17.129 With reference to the above, implementation of standard best practice working methodologies such as restricting access to confined spaces, onsite gas monitoring during excavation works at MIS landfill, safe operational maintenance procedures for sediment removal and appropriate PPE shall mitigate human health impacts through isolation of receptors from potentially harmful waste materials. With the use of such measures the magnitude of risk will reduce to **negligible**

and the overall significance will also reduce to **minor/negligible** with a durational effect considered to be ***negligible/Temporary – Short Term*.**

Nuisance

17.130 The proposed works have the potential to cause a nuisance to businesses and residents in the vicinity of the site (considered to be receptors of **medium** sensitivity) due to odours and noise related to the haulage of waste material. These impacts are likely to occur during the disposal of hazardous and non hazardous wastes excavated from the MIS landfill.

17.131 The volumes of waste anticipated for export from the site are likely to be negligible in comparison to the volumes of coal exported from the site. For example, a worst case scenario will involve approximately 560 tonnes of hazardous waste and 3,920 tonnes of non-hazardous waste from the MIS landfill requiring removal from site for disposal. No significant quantities of hazardous waste are anticipated from any other part of the scheme.

17.132 The use of best practice methods (e.g. covered vans) decreases the risk of causing a nuisance, and in comparison to the rest of the scheme, the potential for nuisance from an increase in the volume of traffic means the magnitude of risk is **negligble**, giving an overall significance of **negligible or minor**. Any nuisance effects experienced are considered to have a ***Temporary – Short Term*** duration.

17.133 The expected traffic impacts caused by the haulage of waste from site are analysed in detail in the Traffic section of this Environmental Statement (Chapter 7).

Sustainability and Resource Use

17.134 The management of waste is an important aspect of sustainable management of the scheme. Waste arisings from the MIS landfill may require off site disposal at a suitably licensed landfill facility, potentially consuming valuable landfill capacity. Suitable waste management procedures should therefore be adopted throughout all project stages.

17.135 The incorrect classification of waste on site may contribute to an increase in volume requiring off site disposal. Increases in the volume of waste will impact upon costs relating to the treatment and haulage of the waste. To minimise the quantity of waste exported from site associated with the MIS landfill facility, onsite sorting and segregation of waste arisings shall be undertaken to segregate unsuitable waste materials from those that are suitable to remain in the MIS landfill under an engineered capping layer.

17.136 The sensitivity of the receiving waste treatment facilities is **medium** due to the regional importance of saving valuable landfill space. The magnitude of the impact is **low**, giving an overall significance of **minor**. The effects of material disposal at landfill are ***permanent*** so alternative methods of reuse or recycling must be utilised where feasible.

Significant Residual Effects (Following Mitigation)

17.137 The use of Personal Protective Equipment (PPE) alongside best practice working methods and temporary nature of works will result in a minor to negligible human health impact for construction workers on site. **There are therefore no signficiant residual risks to human health.**

17.138 The residual risks to controlled waters are also **negligible** due to the considerably distance of the site from any notable receptors and typically low sensitivity of the receptors identified. The removal of hazardous waste from the MIS landfill and the low leachate potential of remaining waste will also reduce the risks posed to controlled waters. The implementation of a Surface Water Management Plan incorporaing mitigation measures for the protection of the partially infilled Rhaslas pond will ensure there are no residual risks to this low sensitivity receptor..

17.139 Best practice working methods will also eliminate the risk of causing a nuisance to residents; any increases in traffic volumes are deemed negligible in comparison with the scale of the scheme as a whole.

Compliance with Planning Policy and Legislation

17.140 The following table identifies relevant legislation and how this scheme complies.

Table 17.7 Scheme Compliance with Relevant Legislation and Policies.

Planning Policy	Policy Level	Project Compliance
EU Waste Framework Directive 2006/21/EC Waste (England and Wales) Regulations 2011	European Directive	Consideration of waste management hierarchy. Instigation of a Material Management Plan with a focus on material reuse. Reuse of arisings on site Sorting of MIS waste to minimise off site removal
EU Mining Waste Framework Directive 2006/21/EC	European Directive	Reuse of excavated spoil to backfill the main void. Instigation of a Material Management Plan with a focus on material re use.
Environmental Protection Act 1990	United Kingdom	Consideration of materials for reuse on site. WAC testing to correctly classify waste.
PPW / TAN 21	National	Consideration of the waste hierarchy. WAC testing used to correctly classify

Planning Policy	Policy Level	Project Compliance
		wastes. On site recovery of waste.
Minerals Technical Advice Note (MTAN) for Wales	National	Instigation of a Material Management Plan with a focus on material re use. Re use of spoil to backfill main void.
Strategy Policy 9 (SP9) of the Caerphilly County Borough Council	Local	Use of existing CDP.

Summary and Conclusions

Key Findings

17.141 The site clearance and enabling works are expected to generate a small volume of waste (fences and generic waste items) that has the potential for re use elsewhere.

17.142 Waste from the Merthyr Industrial Services (MIS) landfill contained within the site boundary has the potential to form a hazardous waste stream as chemical testing has indicated the presence of non inert materials with methane gas emission potential within this landfill. Ongoing consultation with the NRW will determine the requirement for capping or removal of waste from this area for off site disposal.

17.143 The coaling works in dispositions 1-4 will generate sediment from maintenance of the lagoons which would be managed in accordance with details set out in the Surface Water Management Plan. Arisings from the site and CDP coal washing plants are to be reused as backfill and are therefore not classified as waste. Waste from vehicle washing facilities will be treated within the on site water treatment works and excavation of the main void will generate arisings to be stockpiled on site for re use onsite during the restoration phase.

17.144 The final restoration stage of the scheme is not expected to generate any notable waste streams due to the reuse of all spoil as backfill in the main excavation void.

17.145 The potential for waste generated as part of the scheme causing a nuisance to surrounding residents is considered negligible as best working practice methods will reduce the risk of odours and spills. The potential for increased traffic volumes is deemed as a negligible impact in comparison to the overall scale of the scheme.

Cumulative Effects

17.146 There is potential for cumulative impacts to arise from the development scheme and MIS waste tipping operations for the period when MIS continue to utilise the landfill site for disposal of inert wastes. However, consultation is ongoing with the EA regarding permit surrender for the MIS landfill site and it is not anticipated that any further material will be desposited at the site.

17.147 Excavation and removal of waste materials from site from the MIS landfill has a cumulative impact in relation to the export of coal from the site due to the increased number of lorry movements. However, this impact would be negligible.

17.148 There is potential for cumulative impacts to arise from the stockpiling of overburden on site. The pressure exerted by the piles may affect the structural integirty of surrounding buildings and structures (e.g. roads). However due to the minor nature of the surrounding roads and the lack of surrounding buildings and residential properties, this impact is considered to be minimal.

Conclusions

17.149 The production of key waste streams will be generated during the coaling excavation in Dispositions 1 to 4. These will include waste from the CDP and alternative processing works on site.

17.150 The first key receptor group identified in this study is construction workers exposed to waste materials within the MIS landfill and coal processing facilities.

17.151 Proximal surface waters are considered to be a sensitive receptor however onsite water treatment works and other mitigation measures shall minimise any potential risks to these receptors. Any effects caused by the production of waste on site to proximal surface waters would be ***Temporary – Medium Term***, depending on the severity of the effect.

17.152 The final receptor is considered to be the surrounding residents due to the potential for a marginal increase in traffic volumes associated with export of waste from site. Although this is deemed negligible, any effects experienced during coaling works would be ***Temporary – Short Term***.

17.153 Ongoing discussions with the EAW will determine the materials and volumes to be removed from the MIS landfill, reducing the risks posed by contaminants to controlled waters. The proximity of the site reduces the likelihood of contamination reaching controlled waters. If controlled waters were effected by the production of waste on site, the duration of the effects would be ***Temporary – Medium Term***, depending on the severity of the effect.

17.154 The use of appropriate PPE and best practice working methods throughout the scheme will reduce the risks posed by potentially harmful materials to construction workers.

17.155 The use of best working practice methods and the instigation of a MMP/SWMP on site will allow for the appropriate storage, disposal, haulage and handling of waste to be undertaken. Any effects caused by these mitgation measures would be deemed ***Temporary – Short Term***.

Nant Llesg
Surface Mine
Incorporating Land Remediation

Chapter 18
Health and Wellbeing

Nant Llesg Surface Mine

Incorporating Land Remediation

Environmental Statement

Chapter 18 - Health and Welfare

miller argent

Table of Contents

18 Health Impact Assessment

Background

18.1 In keeping with best practice, a Health Impact Assessment (HIA) has been commissioned by Miller Argent to investigate and address the potential impact of the proposed Nant Llesg Surface Mine, including land remediation (referred to as the proposed Project).

18.2 The scope and focus of the HIA has been defined and iteratively refined through engagement with key stakeholders: initially through the formal EIA scoping exercise with statutory consultees; and subsequently through a separate HIA scoping exercise with key health stakeholders and local communities via an integrated engagement strategy. It has further benefited from iterative input from the Welsh HIA Support Unit in the discussion and implementation of appropriate assessment protocols and influence on the development of the final Health Action Plan (HAP).

18.3 The assessment scope focuses on the key health issues raised during formal consultation and informal engagement, and implements an integrated approach with the Environmental Statement, to ensure that the HIA is based upon realistic changes in environmental and socio-economic conditions that are directly attributable to the proposed Project.

18.4 The overarching process comprised the following stages:

- HIA Scoping Exercise;
- Project Profile;
- Community Profile;
- Integrated Engagement Strategy;
- Assessment; and
- Health Action Plan.

18.5 This section of the ES provides a summary of the HIA. For a full account of the approach, methods and key stages including the Health Action Plan, please refer to the Health Impact Assessment.

Community Profile

18.6 The community profile for the four wards of Twyn Carno, Darran Valley, Pontlottyn and Moriah indicates an ageing population, with slow growth and a net outward migration of the 20-24 year old age bracket (largely due to seeking education and employment opportunities). Although health is improving in the area, there are localised areas of health deprivation that strongly correlate with high levels of socio-economic deprivation and low educational attainment. Specific health challenges noted within the Caerphilly Borough Council Health Needs Assessment (Ref. 10) include the need to tackle poor lifestyle choices and risk taking behaviour to address the core health issues in the area, and the need to address antisocial behaviour.

18.7 Given the burden of existing poor health, local communities are sensitive to environmental impacts that might compound existing circumstance and health burdens, but, equally, are likely to respond positively to improvements in socio-economic circumstance (through improved education, employment and income) and lifestyle (such as improved diet and physical activity), which would alleviate the predominant causes of patterns of existing poor health in Caerphilly and neighbouring boroughs.

18.8 The HIA has considered such factors in its assessment, and also through the mitigation and community support initiatives within the HAP.

Assessment

18.9 The assessment investigates each of the potential health pathways associated with the mining, remediation and final restoration stages of the proposed Project, including:

Mining and remediation activities

- the potential impact from changes in emissions to air (including changes in exposure to PM_{10}, $PM_{2.5}$, NO_2 and dust) to residential and commercial receptors (including any consequent impact upon existing employment);
- the potential risk of accident and injury due to additional road traffic movements;
- the potential community disruption and annoyance from noise and vibration;
- the potential impact on access and accessibility (social connectivity, recreation and physical activity);
- the potential socio-economic health benefit from increased training, education, employment and income opportunities (direct, indirect and induced);
- the removal of existing environmental hazards on areas of public land surrounding the proposed surface mine, and addressing legacy mining activity sediment runoff into local river tributaries;
- the potential environmental amenity benefit from rapid reinstatement of remediated areas, drawing on local input to final landform and use;

Final reclamation scheme

- increased access and accessibility (improved social connectivity and recreation areas);
- enhanced areas of public space, recreational amenities and facilities free from environmental hazards (supporting physical activity and social cohesion through shared amenities); and
- provision of a gateway to the Brecon Beacons, including strategic green transport networks supporting local visitors, tourism and local spending.

Conclusion

18.10 The principal community health concern raised during public engagement is the potential risk from changes in air quality. However, following a review of the available scientific evidence base and a detailed exposure response assessment of worst case hypothetical scenarios, it is concluded that changes in PM_{10}, $PM_{2.5}$ and NO_2 will be minor. The environmental concentration of these pollutants would remain within air quality standards set to protect health and would not be of a level to allow any adverse health outcome during the mining and remediation stage of the project to be quantified.

18.11 Prior to mitigation, and during specific meteorological conditions, there is the potential for dust emission and deposition beyond the site boundary that could result in local community

annoyance. However, an operational management plan is proposed to minimise such occurrences by reducing or halting operations where appropriate. This will be further supported by a comprehensive dust management plan with provision for dust monitoring, to track emissions directly attributable to the proposed project and support iterative refinement and enhancement of dust management. With this mitigation in place, the potential residual impact on local air quality has been assessed as negligible within the ES.

18.12 Following the extraction of coal, the proposed remediation work would help to address existing environmental hazards including making safe disused mine shafts, remediating old coal tips, inspecting and treating the Merthyr Industrial Services inert landfill site and removing old underground workings to reduce the mine water pollution that presently discharges into the River Rhymney. This work would benefit the surrounding area with a final reclamation scheme that makes positive changes and helps to meet the needs of the local community.

18.13 A comprehensive education, training, employment and procurement is proposed, alongside on-going community support initiatives and community benefit fund to address local circumstance, barriers to benefit uptake, and to support local health improvement objectives.

Nant Llesg Surface Mine

Incorporating Land Remediation

Chapter 19

Sustainability and Climate Change

Nant Llesg Surface Mine

Incorporating Land Remediation

Environmental Statement

Chapter 19 – Sustainability and Climate Change

miller argent

Table of Contents

Tables

19 Sustainability and Climate Change

Introduction

19.1 Sustainability is an important element of Miller Argent's proposal for the Nant Llesg scheme, and the proposed design and operations have been developed to ensure that the three pillars of sustainability: social, economic and environmental outcomes, are promoted. Climate change is widely regarded as the most pressing challenge for sustainable development, and the proposals have been developed to minimise both the impact on climate change, and how climate change could impact the project.

19.2 This chapter, with Appendix MA/NL/ES/A19/001 Nant Llesg Sustainability and Carbon Statement, sets out how sustainable development has been integral to the planning of this project, and how it would be delivered during the construction, operation and eventual decommissioning of the proposed facilities. It is also sets out how climate change has been considered as part of the development of the proposals, both in terms of mitigation and adaptation.

Approach

19.3 Sustainability is recognised as *"a central organising principle"* of the Welsh Assembly Government, with sustainable development identified as the *"process by which we reach the goal of sustainability".* MTAN2 recognises this and provides practical advice on the approach to sustainable coal working. MTAN2 also specifically requires applications for coal working to *"demonstrate that actions to reduce carbon emissions from the extraction and transport of coal are included in the proposals".*

19.4 The original scoping opinion for the proposed Nant Llesg scheme, provided by Caerphilly County Borough Council (26 August 2011), did not include any specific reference to the need for a sustainability statement, although it did request that the ES outline actions relating to the reduction of carbon emissions.

19.5 Miller Argent submitted a scoping report and further request for a scoping opinion to Caerphilly on 31st December 2011. This recommended that sustainability and carbon statements would be prepared for the proposed Nant Llesg scheme, as standalone reports. The response from Caerphilly County Borough Council (9 March 2012) confirmed this would be required, stating that "*the Environmental Statement should take account of the following potential impacts on the environment: … Sustainability and Climate Change Assessment*". To address this response, the sustainability and carbon statement has been included as an appendix to the Environmental Statement, with this short chapter explaining how sustainability and climate change has been addressed within the project proposals.

Sustainability

19.6 Whilst recognising the importance of sustainability in the context of development proposals, it is acknowledged that the Town & Country Planning (Environmental Assessment) (England and Wales) Regulations 1999 (as amended) ("the EIA Regulations") does not require sustainability to be addressed as part of the EIA. It is generally recognised that sustainability encompasses the issues addressed by the EIA, but also incorporates wider issues across the

broad spectrum of environmental, economic and social considerations. This section of the chapter therefore responds specifically to the request in the Caerphilly County Borough Council scoping opinion to take account of sustainability in the Environmental Statement.

19.7 The table below signposts to relevant chapters of the Environmental Statement which set out relevant design proposals, environmental assessments and mitigation measures which have been drawn upon when undertaking the sustainability appraisal. Reference is also made to Miller Argent's management system, including its Quality Management System (QMS), Mining Management System (MMS) and an Environmental Management System (EMS) which will be adopted during the lifetime of the Nant Llesg scheme.

Table 19.1: Relevant Chapters of the Environmental Statement and Other Documents Drawn Upon to Undertake the Sustainability Appraisal.

Sustainability Framework			Environmental Statement Chapter / Other Relevant Documents
Theme	Sustainability Objective	Key Considerations for Nant Llesg	
Economy and Skills	To promote a resilient and stable economy	• Employment opportunities • Educational development of employees • Indirect stimulation of the local economy	Chapter 5 – Social Assessment Miller Argent Outline Training Strategy
Social Well Being	To provide mineral resources to meet society's needs	• Supply for energy generation • Supply for manufacturing	Chapter 15 of the Planning Statement (Needs Case)
	To minimise the impact on health and wellbeing	• Health impact • Access to recreational opportunities	Chapter 6 – Recreation and Tourism Chapter 7 – Traffic and Transport Chapter 10 – Hydrogeology Chapter 11 – Hydrology and Drainage Chapter 12 – Air Quality and Dust Chapter 13 – Noise Chapter 14 – Blasting and Vibration Chapter 17 - Waste Chapter 18 – Health and Welfare Health Impact Assessment (HIA) Surface Water Management Plan

Sustainability Framework			Environmental Statement Chapter / Other Relevant Documents
Theme	Sustainability Objective	Key Considerations for Nant Llesg	
			(SWMP)
Climate Change	To reduce carbon emissions from the extraction and transportation of coal	• Carbon emissions arising from extraction methods and associated operations • Transport related carbon emissions	Chapter 7 – Traffic and Transport Chapter 9 – Agricultural Land Use and Soil Miller Argent's Environmental Management System Miller Argent's Mining Management System Restoration Strategy
	To minimise vulnerability and adapt to a changing climate	• Flood risk • Adaptation to a changing climate	Chapter 11 – Hydrology and Drainage Surface Water Management Plan (SWMP) Miller Argent's Environmental Management System
Natural and Cultural Heritage	To protect areas of importance to natural or cultural heritage	• Protection and enhancement of ecological resources • Protection and enhancement of the landscape • Protection and enhancement of cultural heritage	Chapter 8 – Ecology and Nature Conservation Chapter 11 – Hydrology and Drainage Chapter 15 – Cultural Heritage Chapter 16 – Landscape and Visual Impact Restoration Strategy Miller Argent's Environmental Management System
Pollution	To minimise the environmental impact of mineral extraction and related operations	• Traffic • Noise and Vibration • Air Quality and Dust • Light • Water Quality	Chapter 10 – Hydrogeology Chapter 11 – Hydrology and Drainage Chapter 12 – Air Quality and Dust Chapter 13 – Noise Chapter 14 – Blasting and Vibration Chapter 16 – Landscape and Visual Impact Chapter 17 – Waste Miller Argent's Environmental

Sustainability Framework			Environmental Statement Chapter / Other Relevant Documents
Theme	Sustainability Objective	Key Considerations for Nant Llesg	
			Management System Air Quality, Noise and Vibration (AQNV) Strategy Surface Water Management Plan (SWMP)
Resources and Waste	To encourage the efficient use of resources and minimise the production of waste	• Use of resources within mining operations • Waste and Recycling • Soil management and remediation	Chapter 9 – Agricultural Land Use and Soil Chapter 17 – Waste Miller Argent's Environmental Management System

19.8 Appendix MA/NL/ES/A19/001 Nant Llesg Sustainability and Carbon Statement sets out in detail how the development proposals for Nant Llesg have had regard to a series of sustainability objectives, termed the sustainability framework, to ensure that social, economic and environmental outcomes, the three pillars of sustainability, are promoted. The sustainability and carbon statement demonstrates how the proposed Nant Llesg scheme will be delivered within this sustainability framework, and in particular, demonstrates that the scheme complies with relevant policies for sustainability, promoted at relevant national, regional and local levels of Government.

Climate Change

19.9 As stated above, climate change is widely acknowledged as the most pressing challenge for sustainable development. Recent developments in EIA best practice, including "Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment" (European Commission, 2013) and "IEMA Principles Series: Climate Change Mitigation & EIA" (IEMA, 2010), have indicated that it may be appropriate for climate change to be addressed within the EIA. However, there is still a wide range of opinions on whether this is appropriate, given the global nature of climate change which conflicts with the "Environmental Impact Assessment: A guide to good practice and procedures" (DCLG, 2006) which refers to *"the surrounding environmental features"* when introducing the approach to assessing environmental impacts (Chapter 4, Paragraph 106). There is no guidance currently available on an appropriate assessment methodology for climate change, or how to select an appropriate baseline or significance criteria. Climate change is a global issue and therefore does not easily fit into project level assessments used in standard EIA methodology.

19.10 In considering what is important to decision makers, both the EU and IEMA guidance confirm that the focus should be on consideration from the earliest stage of minimising carbon and other greenhouse gas emissions, to minimise the impact of the proposed development on climate change. In addition, appropriate consideration should be given to the consequences of a changing climate. The Nant Llesg project has adopted this approach and chapter 6 of Appendix MA/NL/ES/A19/001 Nant Llesg Sustainability and Carbon Statement sets out in detail how the proposed scheme has minimised carbon emissions arising from both the

extraction and transportation of coal, and how the project has been designed to minimise vulnerability and adapt to a changing climate.

19.11 The appraisal of GHG emissions associated with this project has been undertaken within the context that this project is consistent with the Energy White Paper (DTI, 2007) which confirms, in section 5.4, that *"coal will continue to play a significant role in global electricity generation for the foreseeable future, partly because it is the most abundant global fossil fuel but also because it brings security of supply benefits"*. The reduction of GHG emissions associated with the use of coal in both the energy and manufacturing industries is addressed more widely in the Climate Change Act 2008 and the EU ETS (Emissions Trading Scheme Directive), and is not within the scope of this project.

19.12 As referred to the Table 19.1 above, this has drawn upon the other topics within the Environmental Impact Assessment, which have addressed climate change in respect to either climate change mitigation or adaptation as appropriate.

19.13 In terms of climate change mitigation, to minimise the impact of the project on climate change, Chapter 7 (Traffic and Transport) sets out the proposals to minimise the carbon emissions associated with both transportation of the coal, and also use of transport by employees working at the site, and Chapter 9 (Agricultural Land Use and Soil) sets out the soil handling methodologies which will be followed to ensure the soil is appropriately management in order to reduce the potential for carbon emissions release. Chapter 8 (Ecology and Nature Conservation) and Chapter 16 (Landscape and Visual Impact) both set out the tree planting proposals that form part of the ecological enhancement at Bryn Caerau and that are included in the restoration strategy, which offsets the methane emissions associated with the extraction of coal (further details explained in paragraphs 6.25 and 6.26 of Appendix MA/NL/ES/A19/001.

19.14 Adaptation to a changing climate is important for this scheme. Chapter 8 (Ecology and Nature Conservation) has considered the need to include the potential for changes in the baseline conditions as a result of climate change. Chapter 11 (Hydrology and Drainage) sets out the proposed Surface Water Management Strategy, and how this will include appropriate allowance for the potential increases in rainfall or severe storm events due to climate change. (The proposed SWMP, including the proposed water treatment areas, has been designed to attenuate and treat water volumes from a 1 in 100 year + 10% climate change allowance storm event.) Chapter 12 (Air Quality and Dust) also confirms that local weather conditions will be closely monitored and proposes a range of dust mitigation measures which will be adopted in the event of a drought.

Conclusion

19.15 Appendix MA/NL/ES/A19/001 Nant Llesg Sustainability and Carbon Statement sets out in detail how Miller Argent's existing policies and procedures and the evolved design of the proposed Nant Llesg scheme responds to each of the themes, sustainability objectives and key considerations of the sustainability framework, and thus demonstrates how the project meets the objectives of sustainable development throughout its lifetime.

Nant Llesg Surface Mine

Incorporating Land Remediation

Chapter 20

Summary and Overview

Nant Llesg Surface Mine

Incorporating Land Remediation

Environmental Statement

Chapter 20 – Summary and Overview

miller argent

Contents

20 Summary and Overview

Introduction

20.1 This chapter provides a summary of the likely environmental impacts that have been assessed and reported in the preceding chapters, together with a brief overview of the key environmental issues which have emerged from the assessment. It provides a summary and resume of the principal findings, mitigation measures, residual effects, cumulative effects (where relevant) and conclusions of the respective assessments. It then provides an overview of what are perceived to be the main issues which enter the balance of the need for the development and the socio economic benefits it will bring, against the environmental effects which would be associated with the development. The references made in the cumulative assessment relate to developments in the vicinity of the site at Ffos-y-fran Land Reclamation Scheme; Trecatti Landfill Site; the areas of Cwmbargoed Disposal Point outside the Nant Llesg planning application site area; and a Wood Pellet Facility at Capital Valley Eco-Park in Rhymney.

20.2 The Chapter is structured to firstly provide a summary of the principal findings of the respective studies (as reported in the preceding chapters), and then an overview of the key issues. A brief summary of the development is provided as a context and for ease of reference.

Development Proposals

20.3 A description of the Nant Llesg scheme is set out at Chapter 3 of this environmental statement with site selection and alternatives to working the scheme being considered at Chapter 4. These should be read in their entirety to fully understand the complexity of the project that has been assessed. In brief, the project includes the following development proposals:

- Mineral workings at the Nant Llesg Surface Mine to recover approximately 6 million tonnes of coal by surface mining methods;
- Remediation of old shafts, adits and mining dereliction associated with former iron ore and coal mining, including improvements to the quality of mine water discharge into the River Rhymney;
- Land remediation to address silting of Darran Valley Country Park Lake, involving drainage works on the site of a former colliery tip and tip washing scheme north of Fochriw;
- Road improvement works at the junction of Fochriw Road and Bogey Road with improvements to the access points to Cwmbargoed Disposal Point off the Bogey Road and the formation of a new vehicular access to the surface mine;
- Works associated with Rhaslas Pond involving the archaeological examination and recording of the northern embankment before its removal and the protection of and minor drainage works to the southern embankment;
- Investigate, treat, remove and/or cap waste materials at a licenced inert landfill site within the area of the proposed scheme;
- The provision of an additional coal washing plant and ancillary water recycling facility at Cwmbargoed Disposal Point;

- Continued use of facilities at Cwmbargoed Disposal Point for the duration of mining operations at the Nant Llesg and Ffos-y-fran surface mines and the provision of a new layout for the water treatment facilities for the period 31st December 2024 until the cessation of mining operations at the Nant Llesg Surface Mine;

- Restoration and aftercare of the land.

20.4 To facilitate these works, it is also necessary that separate applications be submitted and planning obligations undertaken to close up all public rights of way that cross the site; to create a replacement network of rights of way as part of an approved restoration strategy; and to carry out proposed works on the Gelligaer and Merthyr Urban Common (CL38) with the provision of temporary grazing and public access land for the duration of mining operations.

Summary of Environmental Impact Assessment

20.5 The conclusions of the environmental impact assessment for each of the topic headings are set out below:

Social Impact Assessment (Chapter 5)

20.6 From a social and economic perspective the Nant Llesg Surface Mine, Incorporating Land Remediation, presents positive beneficial impacts of major significance in relation to job creation in the local area and moderate significant positive impacts with regards to the training opportunities and effects on the economic activity and unemployment of local residents.

20.7 The project is estimated to support a total of between 287 to 382 jobs with a net gain of 173 to 249 net new local jobs (within 10 miles) after allowing for potential deadweight, displacement and leakage effects. The project will substantially increase the workspace to resident ratio of the study area, where at present there are only 2,000 jobs but some 14,000 working age residents. In addition, there will likely be social benefits through opportunities for local unemployed residents, in addition to the health and mental wellbeing benefits associated with gaining permanent employment. The extent of the impacts will be supported by the emerging training and recruitment strategy, which will help to minimise leakage effects.

20.8 Overall, the assessment has identified the following socio-economic benefits of the Nant Llesg scheme:

- Direct employment: between 144 and 239 jobs (dependent on shift pattern);

- Indirect employment: 118 jobs;

- Induced employment (through employee spending): 25 jobs;

- Average annual supplier expenditure on goods and services: £32.7m;

- Average annual wages at Nant Llesg: c.£5m;

- Total project wage bill: £70m;

- Estimated total employee spending per annum: £2.38m;

- Total project employee spend: £33.3m;

- Miller Argent would work with local schools, colleges and training providers to raise awareness of job opportunities

- Local unemployed residents would be sought to be part of the workforce where they have the skills to work efficiently and safely on site

- Substantial and continuous training and professional development will be offered to staff through a planned increase in the number of in-house trainers and assessors

- Local businesses will be made aware of contract opportunities from the project so that they can bid effectively for them.

Cumulative Impacts

20.9 Caerphilly County Borough Council has granted planning consent for the NET Energy Group to build a new biomass power plant at Capital Valley Eco Park near Rhymney. According to a news report, the construction phase will employ about 30 people on site, with a further 30 being directly employed to produce wood pellets for sale once the plant is operational. The company have also claimed that a further 150 indirect jobs will be supported. It is estimated to be on-site in 2014, which is similar to the start of the Nant Llesg scheme (subject to planning).

20.10 The cumulative impact of these additional jobs with the Nant Llesg scheme jobs are not considered significant to the positive impacts that would be created by the Nant Llesg scheme. This is because there is substantial capacity within the existing local labour market to absorb the cumulative jobs benefits without the need to look outside the local area except for specialist skills. Consequently there are unlikely to be any additional requirements for in-migration of workers to fill these jobs and therefore no pressure on the housing supply and community facilities from an in-migration of workers. However, the accumulation of these two schemes should help to strengthen the competitiveness of the local labour market, for the betterment of residents and the wider economy.

Recreation and Tourism (Chapter 6)

20.11 The proposed Nant Llesg Surface Mine including Land Remediation is partly located on the Gelligaer and Merthyr Urban Common (CL38) over which the public have a right of access over for air and exercise on foot and on horseback. In addition, public access is available along a number of public rights of way which cross the site and to locations such as Rhaslas Pond and beyond the site recreational and tourist facilities include those within the Brecon Beacons National Park, Parc Cwm Darran, Parc Bryn Bach and at Bute Town Reservoir. These resources have been identified through desk studies and surveys and discussed with consultees including Caerphilly County Borough Council (CCBC).

20.12 The assessment of environmental effects on recreational and tourist resources during the lifetime of the Project takes into account the following key stages:

- Site establishment i.e. the preliminary operations required prior to the commencement of the mining operations, including the stopping up of public rights of way and the receipt of consent to carry out works on the urban common;

- Land remediation works to the south, west and east of the site to address, amongst other things, instability associated with old mine shafts and adits;

- The five operational phases for the progressive extraction and processing of the coal;

- Operations at the existing Cwmbargoed Disposal Point and its decommissioning; and

- The restoration of the land in accordance with the agreed restoration strategy, which has been developed following consultation with CCBC.

Mitigation Measures Adopted as Part of the Project

20.13 Mitigation measures that have been included within the project have been taken into account in the assessment of potential effects on recreational and tourist resources arising during the key stages of the proposed Nant Llesg Surface Mine project. These include:

- Land remediation areas outside the area of the operational surface mine where works would include the making safe of shafts and adits in the first two years of the Project, together with the establishment of new permissive recreational routes. These routes would link with existing bridleways and cycle ways or minor roads, to mitigate for the temporary loss of rights of way stopped up for the duration of the Project and would, *inter alia*, maintain north-south public access.

- Temporary areas for public access to the south of the Nant Llesg site and to the east and west of the railway which would provide a total of around 153 hectares of land for public access for the duration of the Project.

- Permanent areas for public access comprising one area that would be put forward for registration as permanent common land at the commencement of the Project and one following completion of the mining operations.

- An area for ecological compensation at Bryn Caerau in Cwm Golau to the south west of Nant Llesg, where managed permissive public would be incorporated with the ecological management proposals.

Key Findings

Common Land

20.14 During the site establishment operations the operational boundary within which the coal extraction area, overburden storage area, peat storage areas, workshops, offices and barrel wash facilities are located, would be fenced and access to these parts of the common, totalling 201 hectares, would thus be prevented. No further areas of common land would be affected during the five phases of coaling undertaken within the operational boundary. The area of common land within the fenced operational boundary represents approximately 6.5% of the total area of the Gelligaer and Merthyr urban common (3090 hectares) and to take account of the temporary suspension of access rights to the urban common, additional areas totalling around 153 hectares would be made available for public access as described above. It has therefore been assessed that the temporary, long-term effect arising from the 19 year suspension of access rights to approximately 201 hectares of the urban common as a result of the Project would be **Minor Adverse**. The impacts on common land arising from the land remediation works is assessed as **Minor Adverse**.

20.15 Following completion of the mining operations the site would be restored in accordance with the agreed restoration strategy, including the re-establishment of the rights of public access to the common land. Additional areas would be put forward for registration as common land and the permanent long-term effect of the restoration of the land is therefore assessed as **Minor Beneficial**. The eventual restoration of the CDP as part of the Nant Llesg scheme, together with the smaller areas outside the application boundary, would see approximately 23 hectares of land being brought back into the urban common. This would result in a permanent long-term **Minor Beneficial** effect.

Public Rights of Way

20.16 The operational boundary would be fenced during the preliminary operations and the public rights of way affected would be stopped up. Within 24 months from the commencement of

coaling new linear recreational routes would be put in place as part of the land remediation works described above. These together with areas of common land would provide north-south and east-west pedestrian and equestrian access around the site and the significance of temporary, long-term effect on the public rights of way network during the lifetime of the Nant Llesg Project is therefore assessed as **Minor Adverse**.

20.17 The land remediation works would require the stopping up of some public rights of way until the works have been completed but permissive access to areas of the common would remain, subject to minor deviations to avoid works. In addition, new permissive pedestrian and bridleway routes would be created within 2 years of the commencement of coaling which would be legally created on permanent alignments during restoration and aftercare of the land. The significance of the permanent, long-term effect of the land remediation works on public rights of way is therefore assessed as **Minor Beneficial.** The restoration of the site would include the creation of public rights of way in accordance with the restoration strategy for the site and providing an improvement in the quantity and quality of the local network. This is assessed to have a permanent long-term effect of **Minor to Moderate Beneficial** significance.

Recreational Facilities

20.18 During the preliminary works for the Project the size of Rhaslas Pond would be reduced and the site fenced and therefore there would be no public access to this area for approximately 19 years, which is assessed to be of **Moderate Adverse** significance. There would be no direct effects on recreational facilities outside the site but there would be **Minor Beneficial** effects on some water-based recreational activities arising from improvements to water quality as a result of the water management measures put in place as part of the Project. Following the cessation of coaling the final void would be filled and, in accordance with the restoration strategy, Rhaslas Pond would be re-established and there would be long-term minor benefits to water quality. These are assessed to be of permanent, long-term **Negligible** significance.

Tourist Resources

20.19 No tourist resources are located within the Nant Llesg operational area and there would be no direct effects on those resources located outside the site. The Bent Iron, a well-known landmark, would be taken down and either stored or temporarily re-located. As part of the restoration strategy there would therefore be improved public access to existing recreational resources, the Rhymney Valley Ridgeway Walk would be created along a new public bridleway and ecological and cultural heritage enhancements would be put in place, and the Bent Iron would be reinstated on the edge of the urban common. The temporary and permanent effects on tourist resources during the operational mining phase and the restoration of the site of the Project is therefore assessed as **Negligible**.

Additional Mitigation and Residual Effects

20.20 No additional recreational or tourist mitigation measures have been put in place in addition to those measures that have been included as part of the Project. The residual effects are the same as those described above as described above.

Cumulative Effects

20.21 The potential for cumulative effects has been assessed with the Ffos y Fran Land Reclamation Scheme, the Trecatti Landfill Site, the Cwmbargoed Disposal Point outside the Application Area and the Net Wood Pellet Facility. The assessment of cumulative effects on common land as a result of the Nant Llesg project, together with the FLRS and the Trecatti Landfill Site, takes into account the temporary suspension of access rights to a combined maximum area of nearly 487 hectares together with the provision of around 153 hectares of temporary access land to which there would be public access for the lifetime of the Project. The combined loss of the urban common would be temporary but over a long duration and is therefore assessed to be of **Minor/Moderate Adverse** significance**.** There would also be a

temporary but long term cumulative effect of **Minor Adverse** significance on public rights of way.

Conclusions

20.22 Following the completion of the Nant Llesg project the site would be restored in accordance with the agreed restoration strategy resulting in beneficial effects on the recreational and tourist resources within and proximate to the site. The rights of public access to urban common would be re-instated and two new areas put forward for registration as urban common. A new network of public rights of way would be created, including those new routes provided within the first 2 years of the project within the land remediation areas. In addition, there would be managed public access within the Bryn Caerau biodiversity compensation area. Rhaslas Pond would be restored accessed from the common and new public footpaths and the Bent Iron would be reinstated on the edge of the urban common.

Traffic and Transport (Chapter 7)

Key Findings

20.23 Annual Average Daily Traffic (AADT) flows have been obtained for sites on the public road network in the vicinity of the Nant Llesg site using traffic data collected during 2010 and 2011. The data show that traffic flows are significantly lower than design capacities on all roads. This means that local roads could continue to operate satisfactorily even with substantial increases in traffic volumes. The increases would be greatest on the route between the Nant Llesg site and Cwmbargoed Disposal Point (CDP), a distance of approximately 800m, as well as the main route to the trunk road network, i.e. via Fochriw Road and Rhymney Common Road. An increase in traffic flows of 48% on Bogey Road (from the CDP entrance to its junction with Fochriw Road – movements west of the CDP entrance will be restricted to LGVs and so will be of a lesser magnitude) and 27% on Fochriw Road (north of its junction with South Tunnel Road) is forecast as a result of the project, during site operation.

20.24 The cumulative assessment has identified that there are no significant impacts on sensitive parts of the highway network associated with other committed developments.

20.25 Analysis of accident data indicates very few clusters of injury accidents on the local highway network and none can be considered statistically significant. It is clear that HGVs have not been instrumental in the cause of the accidents recorded, although it is also clear that a significant number of HGVs use the local highway network.

20.26 The impact of the project upon the operation of the rail network will be negligible, as it will remain well within capacity.

Mitigation Measures

20.27 If the Nant Llesg Surface Mine, Incorporating Land Remediation project was implemented, there would be an increase in traffic movements on the local highway network during the site enabling works and site operation in particular. Measures to mitigate these impacts would be:

- Site Environmental Management Plan (SEMP);
- Off-site highway improvements;
- CDP access improvements; and
- Site Travel Plan.

20.28 Continuing the environmental best practice implemented for FLRS, to ensure the impact of the traffic related to the project is minimised, a number of proposals would be implemented through a Site Environmental Management Plan (SEMP).

20.29 The applicant is volunteering off-site highway improvements at the Fochriw Road/Bogey Road priority T-junction. The proposed works would include:

- carriageway re-profiling on Fochriw Road, to the south of the junction, to improve visibility to the south for vehicles entering/exiting Bogey Road from the current 70m 'y' distance to approximately 160m;
- carriageway resurfacing on the other approaches to the junction, i.e. Bogey Road and Fochriw Road (North); and
- the installation of directional and junction warning signs.

20.30 CDP access improvements would be carried out that would allow coal lorries from the surface mine to enter the CDP via the existing HGV entrance from Bogey Road at Access Point 'B' and return to the coal extraction area via a separate exit onto Bogey Road approximately 150m further west at Access Point 'C'. These minor improvements will maximise highway visibility for exiting HGVs and for oncoming vehicles.

20.31 To further manage the impacts of traffic generated by the project on the local highway network, the applicant will introduce a Site Travel Plan to encourage the use of sustainable modes of travel by staff, operatives and visitors as well as improving access to the site for potential new employees.

Residual Effects

20.32 The residual impacts of the Development in each of the assessment periods can be summarised as follows:

- Site enabling works – the transport impacts are anticipated to be **minor adverse** temporary (medium term) with respect to highway safety due to the small number of sensitive receptors along local road links, **negligible adverse** temporary (medium term) in respect of highway operation as Fochriw Road and Bogey Road are single carriageway roads with adequate geometries and a low number of access points, **minor adverse** temporary (medium term) in respect of non-motorised users as the number of pedestrians and cyclists is low, and **neutral** with respect to physical fitness as there are very few people living adjacent to the site or the main HGV routes to it who would be discouraged from walking or cycling;
- Site operation – the transport impacts are anticipated to be **minor adverse** temporary (long term) with respect to highway safety due to the small number of sensitive receptors along local road links, **minor adverse** temporary (long term) in respect of highway operation as Fochriw Road and Bogey Road are single carriageway roads with adequate geometries and a low number of access points, **minor adverse** temporary (long term) in respect of non-motorised users as the number of pedestrians and cyclists is low, and **neutral** with respect to physical fitness as there are very few people living adjacent to the site or the main HGV routes to it who would be discouraged from walking or cycling; and
- Site aftercare – the transport impacts are anticipated to be negligible **adverse** permanent with respect to highway safety and operation due to the negligible or slight change in traffic flow on local road links, and **minor beneficial** permanent in respect of non-motorised users and physical fitness as there may be an increased number of pedestrians and cyclists (and therefore an increase in physical activity) with the creation of new links through the site.

Cumulative Effects

20.33 A cumulative impact assessment has been undertaken to review the potential traffic impact of the Development and the recently permitted Wood Pellet Facility located at Capital Valley Eco-Park, Rhymney. The assessment has been undertaken to determine whether any significant impacts could be caused by cumulative traffic generation which may not be considered within the individual site assessments for each of the sites.

20.34 The assessment determined that it is not anticipated that the capacity of the local highway network will be exceeded because the geometry of local roads and the low number of junctions and private access points allows significantly greater volumes of traffic to be accommodated than those which are predicted during the operational phase. If any major development comes forward at a future date, it will be appropriate for that developer to consider the potential cumulative impacts at that time.

20.35 The cumulative assessment has identified that the impacts are limited and do not affect sensitive parts of the highway network included within the study area. In summary, these results do not alter the findings presented in the assessment scenarios.

Conclusions

20.36 In accordance with the defined significance criteria, only impacts of major or moderate magnitude are considered significant in terms of the EIA regulations, therefore the transport impacts of the project are assessed as not significant, following mitigation.

20.37 The cumulative assessment has identified that there are no significant impacts on sensitive parts of the highway network associated with other committed developments.

20.38 With respect to the impacts of the project upon the operation of the rail network, these are considered to be neutral as it will remain well within capacity.

Ecology and Nature Conservation (Chapter 8)

20.39 Sites of importance for nature conservation, habitats, species populations, and species assemblages present within and in the vicinity of the site have been identified through desk study and surveys. The effects of the Nant Llesg proposals on ecology and nature conservation have been assessed taking into account measures to avoid or reduce the effects which are integral to the design of the project and which will be secured as part of the proposal.

20.40 For the purposes of the assessment, the land take of the scheme as a result of site clearance and the working of the site are considered first. In practice a high proportion of this land take would take place in the early stages of working as a result of clearing and stripping the land required for the soil and overburden stores, and the initial box cut, as well as the areas for the site offices, workshops and other facilities. The remaining land take would take place in small increments as the scheme progressed. Since most of the land take occurs in the early stages of the scheme there is little to be gained from assessment of the effects of the land take for individual stages of the scheme separately, and thus the effects of the overall land take are assessed together.

20.41 The operational effects of the mining operation are assessed next. These are the additional effects, over and above the effects of the land take, and include effects arising from the activity on site such as noise generated by site activities, disturbance of wildlife as a result of vehicle and pedestrian movements, risk of spills or leaks of fuel, oil, and chemicals, pollution as a result of site drainage; and dust deposition on vegetation. These effects would occur throughout the scheme. They are assessed against the impact of land take, rather than against the baseline situation prior to commencement of the Nant Llesg development and are

intended to show the additional effects of activity, in addition to the effects of land take. This is the logical approach to assessment of these effects since they would only occur if the land take for the scheme took place, so it is not reasonable or practical to assess them against the existing baseline.

20.42 The Restoration Strategy forms the basis for the assessment of the effects of the restoration of the site. This is a comparison of the ecological characteristics of the restored landform and vegetation against the baseline situation before the commencement of the scheme.

Key Findings

20.43 As a result of the land take of the project there would be an impact of major significance on breeding birds (in particular the loss of the nesting area for two pairs of little ringed plover, suitable habitat for which would be reinstated on restoration). There would be impacts of moderate significance on non-statutory designated sites (loss of much of the Cefn Gelligaer SINC, although this would be restored on completion of the scheme), habitat loss (particularly wet heath, unimproved acid grassland and marshy grassland), wintering/passage birds (especially those associated with Rhaslas Pond), terrestrial invertebrates (including grayling and small heath butterflies and broom moth), and dragonflies and damselflies (including the scarce blue-tailed damselfly). Suitable habitat for species which currently occur on the site would be reinstated on restoration. Other than for these instances, the remainder of the ecological effects would be of negligible or minor significance.

20.44 During operation of the site no additional adverse effects would be of greater than minor significance. There would potentially be beneficial effects on amphibians and bats as a result of habitat creation (and for amphibians, through provision of road crossings), and to otter and fish as a result of improvements to downstream water quality.

20.45 Comparing the restored site with the baseline, the majority of effects would be of negligible or minor significance. There would be potential moderate adverse effects on non-statutory sites and habitats, breeding and wintering/passage birds (taking account of the long timescales required for full recovery of the restored areas). There are likely to be beneficial effects on amphibians, reptiles, bats and otter as a result of habitat creation (and for amphibians, provision of road crossings), and on fish as a result of improvements to downstream water quality.

Mitigation

20.46 The restoration and aftercare proposals for the site take account of the habitats and species currently present within the site, and seek to re-establish topographical, soil and drainage conditions and management practices which would support these habitats and species. In particular habitats and species included in the Caerphilly Biodiversity Action Plan (BAP) have been taken into account. Local BAPs are intended to focus resources to conserve and enhance biodiversity by taking account of national and local priorities. Thus the restoration and after care proposals include specific measures to reinstate wet dwarf shrub heath in the area south of Rhaslas Pond. New ponds would be created by modifying the water treatment areas used for the development, and elsewhere, and watercourses would be established as part of the drainage of the restored site. A network of hedgerows would be established within the farmland area in the north of site, with new woodland areas here and in the east of the site. The restored site would provide habitat for Caerphilly BAP species such as great crested newt and other amphibians, common lizard, bats, otter, lapwing and a range of other breeding and wintering birds.

20.47 The land at the north of the Nant Llesg site which would be restored to enclosed agricultural grazing land would, at the end of the aftercare period, return to the current landowner who would continue to farm the land.

20.48 Management of the land at the south of the Nant Llesg site, following the aftercare period, would be the responsibility of the commoners as is currently the case. This would include the area of restored wet heathland as well as extensive areas of restored grassland to the north

and east. These grasslands on mineral soils would provide better quality grazing than the wet heathland areas restored on peat, and it is likely that stock would tend to avoid these areas in favour of the better quality grasslands. Thus in all likelihood, overgrazing of the wet heath would not occur as sheep would tend to use the nearby areas of better grazing on mineral soils which would be comparatively more attractive, as is currently the case. However, as is also currently the case, there can be no guarantee that a favourable grazing regime would continue.

Residual Effects

20.49 The effects referred to under key findings above are the residual effects of the project taking into account the proposed mitigation. The nature of the proposed development means that it is not possible to fully mitigate the ecological effects of the proposals within the Nant Llesg Site. In order to off-set these effects it is proposed to implement ecological enhancements and management in an area to the south west of Nant Llesg.

20.50 The land at Bryn Caerau already contains a variety of habitats of value and supports protected and notable flora and fauna. However, there are a number of opportunities available to enhance the overall ecological value of the area by creating new habitats and by managing both the existing habitats and new habitats created. The land is part of the holding known as Bryn Caerau Farm which is owned by Miller Argent (South Wales) Limited and farmed by tenants. Management of the land at Bryn Caerau would be secured by means of a S106 agreement.

Cumulative Effects

20.51 The potential for cumulative effects has been assessed with the Ffos y Fran Land Reclamation Scheme, the Cwmbargoed Disposal Point outside the Application Area, the Trecatti Landfill Site, and the Net Wood Pellet Facility. No potential significant cumulative effects of the Nant Llesg project with these projects on ecology and nature conservation have been identified.

Conclusions

20.52 Following completion of the Nant Llesg project, the site itself would have been restored and would be managed by the landowner in the north and the commoners in the south. In addition, the Bryn Caerau offsetting area would have had some 20 years of habitat improvement and management, and an agreement would be in place to ensure that the key habitats would continue to be managed in an appropriate manner. While the wet heath habitats within the Nant Llesg site would take a long time to recover, the likelihood is they would recover in the long term, given the alternative grazing available. It must be acknowledged that there are current threats to the wet heath if grazing pressure is increased and this would also be the case when the site is recovering.

20.53 Taking into account the likelihood of the wet heath recovering, the existing and continued threats from overgrazing, and the habitat improvement and management of Bryn Caerau, then the overall balance of biodiversity of the area would be maintained.

Agricultural Land Use and Soils (Chapter 9)

20.54 The agricultural and soil resources present within and in the vicinity of the site have been identified through desk study and surveys. The effects of the Nant Llesg proposals on agricultural land quality, soils, farm holdings and the agricultural use of Merthyr and Gelligaer Common have been assessed taking into account measures to avoid or reduce the effects which are integral to the design of the project and which will be secured as part of the proposal.

20.55 For the purposes of the assessment, the land take of the scheme as a result of site clearance and the working of the site are considered first. In practice, all of the land required for the surface mine would be taken out of agricultural use and a high proportion of soil disturbance would take place in the early stages of working as a result of clearing and stripping the land required for the soil and overburden stores, and the initial box cut, as well as the areas for the site offices, workshops and other facilities. Since most of the land take occurs in the early stages of the scheme there is little to be gained from assessment of the effects of the land take for individual stages of the scheme separately, and thus the effects of the overall land take are assessed together.

20.56 During the operational phase of the mining operation there are not anticipated to be any additional effects on agricultural land use or soil resources. Following the completion of mining operations on site, the Restoration Strategy forms the basis for the assessment of the effects of the restoration of the site. This strategy includes and identification of soil resources to be used in the restoration of the site and the identification for the appropriate methods of soil handling to be implemented for the different soil types that exist within the site.

Key Findings

Soils and Agricultural Land Quality

20.57 The detailed soil and agricultural land classification survey of the land likely to be disturbed by the implementation of the project has found that approximately 41% of the land to have been previously disturbed by firstly iron scouring and subsequently by surface mining and tipping operations. The remaining land which would be stripped of soils as part of the operation comprises natural soil profiles. Approximately 64.9ha of this land contains soils with peaty topsoils.

20.58 The quality of the agricultural land is limited to grade 4 due to a severe climatic limitation, or grade 5 due to a severe soil wetness limitation. No areas of the “best and most versatile” grade 1, 2 or 3a agricultural land are therefore affected by this proposal. It is therefore assessed that there would be a long term temporary negligible effect on agricultural land quality, based on the agricultural land classification of the project area and the comprehensive soil management and restoration proposals submitted as part of the project.

20.59 For the non-peaty mineral soil resources stripped as part of the project, the implementation of the proposed soil handling methods and the effective implementation of the aftercare period would enable these materials to be maintained and used for the distribution of end uses identified within the restoration strategy (MA/NL/PA/009). The best practice techniques for the restoration of these types of soil resources has been widely and successfully applied across surface mining sites in Wales and England.

20.60 It is therefore assessed that for the non-peaty mineral soils, on the completion of the aftercare period there would be a low magnitude of impact on soil resources, based on limited losses of materials during the process of soil stripping, storage and handling, on soils that are considered to be of low sensitivity due their susceptibility to wetness. Overall, the effect on non-peaty soil resources at the end of the aftercare period is therefore assessed to be of **permanent minor adverse significance**.

20.61 With regard to the clayey soils with a peaty surface, the draft soil handling methodology for peaty soils has been developed taking into account best practice guidance available, examples of other development sites in Wales and Scotland where peaty soils are being stored and handled and consultation advice. However, it is recognised that these peaty soils are sensitive materials and are susceptible to damage and losses when disturbed.

20.62 Therefore, whilst the successful implementation of the soil handling methods and the ecological restoration and aftercare strategy for these areas should lead to the effective redevelopment of the soil profiles and habitats in this area, it is assessed that a loss of a proportion of these sensitive materials may result from operations taking place on the main site. It is therefore assessed that following aftercare there would be a medium magnitude of

impact on the shallow peat resource, which is considered to be of moderate sensitivity. The overall effect on these clayey soils with a peaty surface is therefore considered to be of **permanent moderate adverse significance.**

Farm Holdings

20.63 The operational area of the project would affect two farm holdings outside the boundary of the Merthyr and Gelligaer Common. One farm is using land on the eastern side of the project area, predominantly as grazing land on the basis of a short term agreement with Miller Argent, with a small area also owned as part of the holding. The land is located at some distance to the main holding and the loss of this grazing land, mainly used on a short term basis, would not be likely to affect the day to day management of the overall farming enterprise.

20.64 The second farm is situated at Cwm Carno, to the north of the Nant Llesg project. Approximately 99ha of land (owned and tenanted) is affected by the project. This would render this holding unworkable in its current form. However the farmer affected is in agreement with Miller Argent over the use of the land and has indicated the intention to continue to operate the holding, on a reduced basis, during the lifetime of the project.

20.65 The effects on these holdings during the operational period would therefore have a medium magnitude of effect, with a single farm holding potentially rendered unworkable for the duration of the project. The sensitivity of the holdings is assessed to be low, based on the nature of the operations and the quality of the agricultural land affected. The significance of the operations on the farming framework would therefore be at a local level and is assessed to be of **minor adverse long term temporary significance.**

Agricultural Use of the Common

20.66 A total of approximately 201 hectares of the land affected by the site establishment and operational stages of the mine forms part of the Gelligaer and Merthyr Urban Common (CL38). Of this area approximately 188.7 ha is available for agricultural grazing, excluding the area of Rhaslas Pond. The total area of 201 ha represents approximately 6.5% of the total area of the Gelligaer and Merthyr urban common (3090 hectares).

20.67 Also, there would be limited short terms works to areas of common surrounding the operational area during the first 2 years from commencement of coaling. These would include firstly an area of urban common land to the west of the area of the main operation would be temporarily affected during the preliminary operations, as the existing overhead power lines across the main operational site would be diverted within this area prior to the commencement of mining. Once these initial works have been completed the right to graze this area, totalling approximately 25ha would be available and would continue through the lifetime of the Project.

20.68 There would also be beneficial remediation works carried out in targeted areas of common land to the east (3.4ha) and south of the operational area to the south of South Tunnel Road (54ha). The overall effects of these targeted works, which would be limited in area, **are assessed to be of negligible medium short term temporary significance**

20.69 The project proposals include the provision of areas of temporary grazing land that would be available for use by those commoners with grazing rights throughout the life of the project. These areas include approximately 6ha of land west of Bryn Caerau, approximately 25ha of land east of Pentrebach and approximately 50ha of land at Pendducae. In total, therefore, approximately 81ha of temporary grazing land would be made available.

20.70 Whilst the quality of the land is poor or very poor within the areas of common land affected, the effects on the agricultural use of the land are assessed to be of medium sensitivity, based on the numbers and types of enterprises who not only actively use the common but also those who have grazing rights on the common.

20.71 The provision of alternative grazing areas comprising a total of approximately 81 ha of land during the operation would provide areas of good quality improved grassland to the

commoners. The inherent quality of the agricultural land within the additional areas is generally of better quality than the areas of grazing lost on the Nant Llesg site, where there are limited natural soil resources due to the extent of previous mining disturbance and areas of low capacity grazing land where clayey soils with peaty topsoils are located. Without the provision of these additional grazing areas it is assessed that the overall magnitude of impact on the grazing capacity of the common would be medium and based on a medium sensitivity of this land, the effect would be of moderate adverse significance. However, the addition of the additional areas of predominantly good quality improved grassland to the common would reduce the magnitude of impact on the common to low and therefore the significance of effect of the loss of grazing capacity within the common as a whole from moderate to **long term temporary minor adverse.**

20.72 There are however a number of individual commoners who are more specifically affected by the temporary loss of the common within the project. Whilst the common is unstinted and commoners have rights to graze all areas of the common, it is recognised that there are at least seven commoners in the vicinity of the Nant Llesg project who use this area of land on a regular basis for grazing livestock. Although the additional areas provided (Areas 9, 11 and 12) would be available to these commoners, they are located at some distance from the existing areas of the Nant Llesg project and are separated from the current grazing area by the railway line that runs north-south to the west of the CDP. It is therefore assessed that, even taking into account the additional temporary areas, for those individual commoners who use the area of land at Nant Llesg on a regular basis , the loss of the common at Nant Llesg could affect the day to day operation of these individual enterprises.

20.73 It is therefore assessed that the effect of site establishment and operational stages of the Nant Llesg project on the local structure of farm holdings which use the Nant Llesg area on a regular basis would be of **long term temporary minor to moderate adverse significance**.

20.74 The restoration of the land in accordance with the restoration strategy and the effective implementation of the aftercare period would enable the land to be effectively re-integrated into the common. Based on the successful restoration, the residual effect on the agricultural use of the common following the aftercare period is assessed to be of **negligible permanent significance.**

Mitigation

20.75 No further mitigation measures are proposed beyond the measures that have been adopted as part of the project, including the restoration and aftercare strategy and provision of additional grazing land for the lifetime of the project.

Residual Effects

20.76 The effects described under the key findings above are the residual effects taking into account the measures that have been adopted as part of the project.

Cumulative Effects

20.77 The cumulative effect on land use and soils arising from the implementation of the project is the loss of common land grazing in addition to those areas of the Merthyr and Gelligaer common already affected by the FLRS and Trecatti schemes.

20.78 The three schemes in total affect a maximum of approximately 435 ha of urban common, mostly located within the northern area of the Gelligaer and Merthyr Urban Common, where grazing rights are suspended. The implementation of suitable voluntary agreements with individual commoners to control stocking ratios on the remaining areas of the common together with the provision of 81ha of temporary grazing land during the operational period would enable the potential cumulative effect of the Nant Llesg project on the grazing capacity on the common to be reduced as far as possible. However, the temporary loss of common due to FLRS, Nant Llesg and Trecatti would be likely to result in adjustments in the day to day management of individual farm holdings and potential changes to the structure of farming in

the wider local area. It is therefore assessed that the magnitude of the cumulative impact on farm holdings would be likely to be low to medium, depending on the nature of the individual enterprises that are affected by the three schemes. Based on the medium sensitivity of the common land the cumulative effect on the agricultural use of the common is assessed to be of **long term temporary minor to moderate adverse significance.**

Conclusions

20.79 The implementation of the proposed restoration and aftercare scheme would enable the agricultural land to be successfully reintegrated into the Merthyr and Gelligaer Common and the individual farm holdings that lie outside the boundary of the common.

20.80 The mineral soil resources identified within the project would be stripped stored and restored in accordance with recognised best practice methods and following the aftercare period the effect on these resources would be negligible. Techniques for the handling and restoration of the peaty soils have also been developed as part of the project. However, it is recognised that these are sensitive soils, where there may be a residual loss of a small proportion of the peat resource and where the proposed wet heath habitats would take a long time to recover.

Hydrogeology (Chapter 10)

Key Findings

20.81 The proposed surface mine development at Nant Llesg lies in a hydrogeologically low sensitivity area where there is minimal groundwater utilisation. The DFDS provides pathways for groundwater and minewaters to contribute to flows in the nearby River Rhymney to the east. The Coal Authority currently consider that at the present time remediation of what is regarded as the second worst unmitigated discharge in Wales is otherwise "*probably infeasible mainly due to health and safety concerns of entering the river culvert to capture and transfer the water*" (Coal Authority, pers.comm).

20.82 The assessment carried out has compiled the available hydrogeological information for the site and surrounding area in order to establish the current baseline conditions. Groundwater monitoring data have indicated that water levels are at great depth below the ground surface, at elevations in the range 255–300 m AOD, with a general eastward groundwater flow towards the River Rhymney, and with eastern sections of the DFDS influencing the water levels and the flow pattern.

20.83 Samples from recently installed piezometers at Nant Llesg, and existing piezometers at the nearby Ffos-y-fran site, have allowed assessment of local groundwater quality. This has indicated elevated concentrations of several metals, including iron, manganese and zinc. Other water quality data have highlighted the current impact on the quality of the River Rhymney from elevated metals in the discharge from the Bute Watercourse, although monitoring data collected by the NRW indicate that only zinc concentrations have exceeded the EQS for this metal on occasions.

20.84 Since the deepest, southern part of the excavation is planned to reach an elevation of 248 m AOD, in order to work the site safely and in dry conditions, it can be anticipated that some dewatering to remove groundwater would be required during mineral production. Though limited in extent and duration, such dewatering would lower groundwater levels in the area and reduce flows in the associated DFDS. Indeed, theoretical calculations suggest that the dewatering would lower groundwater levels by 7 – 30 m over a radius of up to 3 km, and would capture the majority of the water that would otherwise reach the Bute Watercourse by way of the DFDS, and in particular the Rhaslas Drain. The intercepting of the DFDS water in this way would mean that the downstream DFDS would experience a marked fall in flow during site operations. Although there is no flow data for the River Rhymney in this area, groundwater at Nant Llesg provides baseflow to the river, including the discharge from the

Bute Watercourse. Consequently, the interference with the Rhaslas Drain and dewatering at Nant Llesg has the potential to also reduce the baseflow to the river.

20.85 Dewatering during site operations, in particular associated with control of the drainage from the intercepted Rhaslas Drain, would reduce the contaminant load discharging to the river. In addition, the decoaling would remove a proportion (~20%) of the coal seams and old workings which are contributing to elevated metals and sulphate concentrations, and the quality of the groundwater body and within the DFDS and the receiving River Rhymney could be expected to improve over the baseline in the longer term.

20.86 With respect to the two PWSs, at 1.5 km and 2 km northeast of the proposed excavation area, they sit within the theoretical radius of drawdown of up to 3 km. However, they do not lie in the baseline groundwater catchment of Nant Llesg, and are positioned on higher ground on the opposite side of the River Rhymney. This, together with the limited additional drawdown associated with the proposed excavations, means that there would be no impact on both PWS in terms of water level, yield, and quality.

Mitigation Measures

20.87 Groundwater management during the main site operations would seek to minimise the effects on the surface and groundwater regime within the vicinity of the site. Where possible, this means targeting any dewatering and attempting to keep surface and groundwater sources of water within the void separate as far as is practicable. In addition, where highly permeable deposits within superficial deposits (e.g. sand and gravel lenses) are intercepted in the upper sidewalls of the excavations, then these could be sealed with engineered low hydraulic conductivity materials to prevent inflows.

20.88 Site operations would involve the use of heavy plant and machinery, and this would result in the need to store oils and diesel with the consequential risks of accidental spillages. The site would therefore adopt best working practices and measures to protect the water environment, including the bunding of fuel storage tanks, control of runoff from metalled surfaces and measures to deal with any fuel spillages.

20.89 Investigations are on-going in order to characterise the on-site MIS Landfill wastes and their pollution potential. Subject to these, appropriate works would be undertaken to engineer and prepare the site to a condition appropriate to be covered by the overburden mound.

20.90 It is not anticipated that large volumes of groundwater would be encountered during the early stages of excavation at Nant Llesg. Shallow perched aquifers in superficial deposits and within the bedrock would drain into the excavation, and the water would be allowed to drain from the base of the excavation or be pumped out to WTAs and managed as part of the surface water management scheme.

20.91 It is anticipated that the Rhaslas Drain would be intercepted near to the base and southern edge of the excavation. The water would be collected and pumped from the excavation, initially to WTA 2, from where it would be discharged (following any required flow balancing and treatment) under consent into the River Rhymney via the Nant Llesg watercourse. Appropriate treatment facilities (e.g. the use of aeration, settlement and chemical dosing) would be constructed to promote the precipitation and removal of metals (notably iron) prior to discharge, in accordance with limits to be agreed with NRW, and would assist in improving water quality in the receiving river, as well as compensating for flow losses.

20.92 The disruption of the Rhaslas Drain introduced during the site operations would be rectified on restoration by the installation of a replacement adit or some similar construction. This feature would reconnect the upstream and downstream undisturbed elements of the Rhaslas Drain and so would restore DFDS discharges into the Bute Watercourse.

20.93 With respect to water quality, the development proposals for Nant Llesg involve the excavation of the overlying rock strata to expose the coal seams. Initially, when excavating the box cut, the overburden would be stored above ground, but subsequently it would be

progressively backfilled into the decoaled areas. The stored overburden would then be replaced within the final void following the cessation of coaling operations, as part of the final restoration phase.

20.94 The excavation works would remove some of the source of the current groundwater contamination. However, the disturbed overburden would still have the potential to oxidise and leach metals as it becomes saturated, and this could lead to adverse effects on water quality if the appropriate mitigation measures are not put in place. The proposed limited duration of its exposure, especially in terms of progressively restored overburden, means that the effects would be more limited than those from overburden that has been kept in above ground storage for a protracted period. However, it is still important to identify the level of risk to groundwater and implement an appropriate strategy during site operations. A backfill strategy would be required for the site, developed and implemented by means of a planning condition and consultation with NRW, and would be designed to optimise the use of carbonate buffering rock present at the site to minimise the generation of leachate from the backfilled material.

Residual Effects

20.95 During site operations, dewatering would result in the lowering of groundwater levels in the vicinity of the excavations. The local groundwater body (GW1) is considered to be of "*low*" sensitivity, based on its secondary status, limited use, and variable and sometimes poor quality. The likely magnitude of change is considered to be "*medium"* and *"temporary – short term",* since active dewatering is principally only likely to be required when the excavations are at considerable depth, and even then would be largely intercepting DFDS water. Consequently, dewatering and the associated effect on the local groundwater resource are considered to be "*minor*" in environmental impact assessment terms.

20.96 Interception and removal of part of the Rhaslas Drain (GW2) during the excavations would result in a "*high*" magnitude and *"temporary – long term"* loss of flow in the down-gradient Rhaslas Drain east of the application site. The DFDS is considered of "*low*" sensitivity on account of its poor quality and the absence of any water users. Therefore, any loss of flow is considered to be "*minor*".

20.97 During site operations, and with the appropriate mitigation in place, it is not anticipated that groundwater quality within the Coal Measures strata or the DFDS would change. With its *"low"* sensitivity and likely *"low"* magnitude, *"temporary – short term"* change, the effect on local groundwater and DFDS quality is considered to be *"not significant"*.

20.98 Following backfilling and restoration, groundwater levels would recover to approximate pre-excavation levels. The change with respect to the groundwater resource (GW1) would be of "*low*" magnitude and *"temporary – short-term"*, in conjunction with a "*low*" sensitivity, and therefore "*not significant*".

20.99 The cessation of dewatering, together with reinstatement of the Rhaslas Drain, would also allow flows to be re-established in the DFDS. The change with respect to baseline DFDS flows would be of "*low*" magnitude and *"temporary – short-term"*, in conjunction with a "*low*" sensitivity, and therefore "*not significant*".

20.100 An appropriate backfill strategy would be developed and agreed with NRW such that any adverse effects on the groundwater body (GW1) quality and on the quality of the DFDS and the Rhaslas Drain (GW2) would be avoided. The change with respect to both groundwater quality and DFDS quality is considered likely to be of "*low*" magnitude within a "*low*" sensitivity, hence the effect on these receptors would be "*not significant*". However the change would be positive and *"permanent"* as a consequence of the removal of the coal seams and old workings from the excavations.

20.101 The River Rhymney (R1) is classed as of "*medium*" sensitivity near Nant Llesg because of its moderate water quality, and because of the return of the abstracted water by way of the WTAs the likely magnitude of change of flow is classed as "*low*" and *"temporary – short term"*.

Consequently, dewatering and the associated effect on the volume of baseflow contribution to the river is considered to be "*minor".*

20.102 In terms of water quality, the water returned to the "*medium*" sensitivity watercourse would be of considerably better quality than the original groundwater and DFDS water, and therefore the magnitude of change would be "*high*" and a "*moderate*", *"temporary – long term"* benefit. It is important to note that the Coal Authority currently consider that at the present time remediation of the DFDS discharge is otherwise "*probably infeasible mainly due to health and safety concerns of entering the river culvert to capture and transfer the water*" (Coal Authority, pers.comm.).

20.103 The two PWSs (PWS1 and PWS2) are at distance from the proposed excavations and beyond the River Rhymney, and therefore the magnitude of change for water level/yield and water quality would be "*negligible*" and *"temporary – short term"*. Given the "*low*" sensitivity of the PWS, this results in "*not significant*" change at both locations.

20.104 Following backfilling and restoration, groundwater levels would recover to approximate pre-excavation levels, and consequently the baseflow contribution to the river would also return to baseline. The change with respect to baseflow volumes would be of "*low*" magnitude and *"temporary – short-term"*, and in conjunction with a "*medium*" classification for the sensitivity of the river in terms of flow, the overall effect is therefore assessed as minor.

20.105 With respect to baseflow quality, the excavation would remove a source of some of the current contamination issues. Furthermore, an appropriate backfill strategy would be developed and agreed with NRW such that any adverse effects on the quality of water discharging to the River Rhymney would be avoided. The change with respect to river quality compared to the baseline is therefore considered to be "*positive*" with a magnitude of change assessed as "*medium*" and *"permanent"*. With the river of "*medium*" sensitivity in terms of water quality, the overall positive effect is considered to be "*moderate"*.

20.106 The two PWSs would remain unchanged with respect to both water level/yield and water quality following backfill and restoration, again resulting in *"temporary – short-term",* "*not significant*" change at both locations.

Cumulative Effects

20.107 The key potential cumulative impact would be associated with the works that would be undertaken at the MIS landfill site within the proposed scheme to cap the landfill prior to the use. This would be dispatched through the CDP, where the existing measures to prevent hydrological effects are considered suitable to prevent any off-site effects.

Conclusions

20.108 The hydrogeological impact assessment has established that the proposed site operations and restoration would have no significant negative impacts on the limited number of water features identified in the Nant Llesg area. A *"temporary – long term",* "*moderate*", benefit would be achieved during the operational phase of the site by intercepting and treating DFDS waters before they are returned to the River Rhymney, and a *"permanent",* "*moderate"* benefit to water quality would be obtained in the longer term by the removal of contaminating coal seams and by the implementation of a suitable, and NRW-approved, backfill strategy. It is important to note that the Coal Authority currently consider that at the present time remediation of what is regarded as the second worst unmitigated discharge in Wales is otherwise "*probably infeasible mainly due to health and safety concerns of entering the river culvert to capture and transfer the water*" (Coal Authority, pers.comm.).

20.109 An extensive surface water and groundwater monitoring scheme would be agreed with NRW which is anticipated would incorporate existing borehole and stream monitoring locations. This would serve to monitor the effects of the development and site restoration on local groundwater levels and surface water and groundwater quality and inform mitigation actions.

Appropriate consents and licences would be obtained from NRW for water management at the site.

Hydrology and Drainage (Chapter 11)

Key Findings

20.110 The proposed surface mine development at Nant Llesg lies in a hydrologically low sensitivity area where there is minimal surface water utilisation. One of the key features is the multiple watercourses that originate from boggy areas on the Nant Llesg site, and drain towards the River Rhymney. The existing FLRS and CDP sites lie within the catchment of the River Taff, minimising the potential for cumulative effects.

20.111 The assessment carried out has compiled the available hydrological information for the Site and surrounding areas in order to establish the current baseline conditions. Both the current condition and the current utilisation of surface water resources have been assessed. This has indicated a generally low sensitivity surface water environment.

20.112 Existing water quality monitoring associated with the nearby FLRS site and recently initiated water quality monitoring in support of the Nant Llesg application have allowed assessment of local surface water quality. This has indicated generally good water quality, but with elevated concentrations of several metals, including iron, manganese and zinc.

20.113 Other water quality data have highlighted the current impact on the quality of the River Rhymney from elevated metals in the discharge from the DFDS and Bute Level, although monitoring data collected by the EAW (now NRW) indicate that only zinc concentrations have exceeded the EQS on occasions.

20.114 A surface water and groundwater sampling network has been established at the Site such that effects from the proposed development on local water resources (levels and quality) could be monitored.

20.115 The key impact during the operational phase would be the reduction in size of Rhaslas Pond, and its use as part of the Site's surface water management system. However, this impact would be limited to the operational phase, with the water body being reinstated to an area/volume approaching the existing pre-development Rhaslas Pond upon completion of operations.

20.116 The proposed development would result in a significant improvement along the Nant Bargod Rhymni watercourse, since the existing areas of unstable and eroding colliery spoil would be remediated as part of the scheme. This would substantially reduce the current fine sediment inputs that have been causing siltation in the lake at Parc Cwm Darran Country Park.

20.117 During the restoration phase, the surface watercourses removed during the operational phase would be reinstated. Since short reaches of these watercourses are at present affected by spoil or hard-engineering associated with historic mining activities; this would represent an opportunity to reinstate them in a more natural form. This would remediate any existing water quality problems associated with the eroding spoil and dumped material.

20.118 It is anticipated that improvements would be made to the minewater currently discharging into the River Rhymney from the Bute Level as a result of the Nant Llesg scheme (see Hydrogeology Chapter 10). This would result in improvements to downstream water quality along the River Rhymney.

20.119 In relation to the scoping guidance provided by the EAW, the proposed site design and associated avoidance and mitigation measures detailed in this chapter address the points raised. The key points that have been covered are as follows:

- Abstractions have been assessed;
- a SWMP (see Appendix MA/NL/ES/A11/001) has been prepared with details of the WTAs and their attenuation and water quality functions, and assessing the potential for effects on receiving watercourses;
- the management of Rhaslas Pond through the development has been covered;
- arrangements for foul water disposal addressed;
- no watercourse diversions are proposed, although details of the sections of headwater watercourses to be long term but temporarily removed have been detailed;
- the TAN15 flood risk classification has been confirmed;
- FDCs would be obtained for crossings of minor watercourses;
- a cumulative assessment of the Nant Llesg proposals, in combination with the existing operations at the CDP and FLRS and other developments, has been undertaken; and
- permitting regulations for discharges from the WTAs have been detailed.

20.120 With regards to the guidance set out in the WG MTAN2, the assessment has covered the following:

- the requirements of the WFD and Water Act;
- the potential for hydrological impacts has been considered, and mitigations (collection, attenuation and water quality treatment at WTAs) have been put into place to prevent negative effects;
- the impacts of dewatering and minewater discharge changes have been considered;
- a SWMP has been prepared to manage flood risk;
- the baseline study has covered the water environment both on Site, and around the Site; and
- the sensitivity of local water quality and vulnerable receptors has been assessed.

20.121 Furthermore, the assessment provides an understanding of the balance between rainfall/evapo-transpiration/runoff at the site, as part of a broader conceptual understanding of the surface water system of the local area.

20.122 The potential areas of influence and receptors have been identified, and control measures proposed and assessed. Based on the assessment of receptor sensitivity and the available data and the resulting conceptual model, the assessment is considered robust. In particular, modelling has been carried out (the SWMP) to assess the quantities of runoff that require management due to changes caused by the development.

20.123 Operational procedures and WTAs have been detailed that would allow water quality and quantity to be appropriately managed within the site, including arrangements for the settling of suspended material and metal precipitation.

20.124 Water quality monitoring has been started to gather baseline information for the proposed receiving watercourses, and this would enable any changes over the period of operation to be identified and mitigated. The future discharge consents associated with the new WTAs would

provide a means of ensuring the level of suspended solids and the pH of the discharged surface water is suitable

20.125 Overall, no adverse Significant Effects ('Major Significant' or 'Moderate Significant') on the identified hydrology receptors are predicted. One key positive Significant effect is identified, associated with the stabilisation and remediation of areas of eroding spoil along the Nant Bargod Rhymni.

20.126 During the Operational Phase, identified effects are considered to be 'Temporary (Long Term)', associated with the removal of upper sections of watercourses and changes to Rhaslas Pond. The effects of the works undertaken during the Restoration phase would be permanent, on account of these works being the reinstate of hydrological features and site restoration (i.e. a positive permanent).

Mitigation Measures

20.127 The key mitigation feature incorporated within the proposals is the routing of all site drainage (runoff from operational areas/overburden mounds and dewatering flows) through a series of WTAs. The WTAs have been designed to ensure water is appropriately treated to an acceptable quality before discharge, and that flows are attenuated so as to be released at the same rates as those prevailing prior to the development of the Nant Llesg site into the receiving watercourses. A SWMP has been produced to detail the proposed arrangements (see Appendix MA/NL/ES/A11/001).

20.128 The key proposed mitigations measures have been detailed in the Key Findings section above. As well as the use of WTAs, mitigation involves following good site construction/operation practice. This would be informed by detailed Method Statements (agreed with NRW where appropriate). A series of PPGs have also been developed (by the former EA, now NRW), and cover subjects such as PPG5: Works and maintenance in or near water.

20.129 During the Operational Phase, Rhaslas Pond would be reduced in size and used as part of the operational site's surface water management system. Upper sections of watercourses would also be temporarily removed to allow excavation of the void/construction of the overburden mounds. The proposed mitigation would be the reinstatement of these features following completion of the Operational Phase.

Residual Effects

20.130 Following the proposed mitigation measures, the residual effects would be limited and relate to the 'temporary (long term)' (i.e. during the operational phase) reduction in size and extent of various watercourses and waterbodies. These effects would though only extend to the end of the operation phase, when the site and water features would be restored. The residual effects would not be permanent.

Cumulative Effects

20.131 No cumulative effects (in-combination with other developments) have been identified. This is because the potential for hydrological effects is contained and managed within the site.

Conclusions

20.132 This assessment of the hydrological baseline sensitivity has identified that the surface water environment on and in the vicinity of Nant Llesg is generally of low sensitivity. In terms of water quantity, the water draining from the Nant Llesg site represents a small proportion of flows draining to the upper River Rhymney catchment. In terms of quality, the existing monitoring data have indicated that water quality is impacted by high levels of iron, manganese, zinc and also PAHs. This appears to be associated with the broader geology/mining and industrial legacy of the wider area.

20.133 The potential effects from the Nant Llesg Surface Mine, Incorporating Land Remediation scheme have then been identified, and suitable mitigation measures capable of preventing adverse effects identified. The key impact identified is the need to manage water draining from the Site to ensure that water quality would not be impacted, and also flows would be attenuated to existing rates so as to replicate current flows and so as not to increase flood risk. A Surface Water Management Plan (SWMP) has been prepared (see Appendix MA/NL/ES/A11/001) detailing how this would be undertaken, and a series of WTAs would be incorporated to provide this treatment and attenuation.

20.134 Based on the proposed scheme with incorporated operational mitigations, the remaining effects are associated with the reduction in size of Rhaslas Pond and incorporation of the pond in the Site's surface water management system during the operational phase. Also, some short lengths of headwater watercourses would also be lost during the operational phase. However, all of these watercourses would be reinstated during the restoration phase.

20.135 The scheme has two important positive effects on the surface water environment, namely the following:

- The reduction in minewater flows to the Bute Level (which discharges into the River Rhymney) during the operational phase. This water would be intercepted, treated in WTA2 and then discharged to the Nant Llesg tributary. On backfilling, replacement flow pathways would be created to prevent the creation of unintended flow pathways. Owing to the removal of a large proportion of the remaining coal and its sulphur content, it is expected that this water would be less acidic and therefore contain less iron and manganese, which would result in a significant improvement in downstream water quality (helping to ameliorate what the Coal Authority currently consider to be the second worst unmitigated minewater discharge in Wales); and

- The stabilisation of eroding colliery spoil along the Nant Bargod Rhymni, north of Fochriw and subsequent significant reduction of elevated siltation of the lake at Cwm Darran Country Park due to this material.

Air Quality and Dust (Chapter 12)

Key Findings

20.136 Air quality in the vicinity of the proposed Nant Llesg Surface Mine Incorporating Land Remediation is currently good with the air quality objectives for PM_{10} and NO_2 and the indicative EU limit for $PM_{2.5}$, set for the protection of human health, achieved by a wide margin. Very occasional dust events occur at some receptors, when amenity may be adversely affected, occur due to demolition and construction activities and other local sources.

20.137 The critical levels and loads set for the protection of the vegetation are currently exceeded at some locations within the Tair Carreg Moor SINC. In particular, the daily NOx critical level, the indicative dust deposition level, and the nitrogen critical load are exceeded by a wide margin close to the Fochriw and Bogey Roads. The implications of this are discussed in the ecology chapter, but in brief there do not appear to be significant adverse effects on the SINC.

20.138 A qualitative assessment of the impacts of the site establishment, land remediation works, removal and covering of landfilled materials, and the construction of the CDP coal wash and water treatment facility was undertaken using the Institute of Air Quality Management guidance for assessing construction impacts.

20.139 The operation of the proposed mine was assessed quantitatively by modelling the change in ambient concentrations of PM10, PM2.5 and NO2 and dust deposition at 13 residential receptors and three commercial receptors. The Institute of Air Quality Management criterion

for assessing operational impacts was used in this assessment, adapted to take account of the impact on short term PM10 concentrations and dust deposition.

20.140 The air quality objectives and the indicative EU limit value are predicted to be achieved by a wide margin during all phases of the proposed mine. This includes the impact of emissions from the trains and trucks exporting the coal from the CDP. In addition, the maximum daily dust deposition averaged over one week, recommended in MTAN2 as a planning condition for the measurement of the mass of dust deposited, was also predicted to be achieved at all receptors.

20.141 The critical levels and loads set for the protection of the vegetation continue to be exceeded during the operation of the proposed mine at some locations within the Tair Carreg Moor SINC close to the roads. This is mainly due to the high baseline levels. The implications of this are discussed in the ecology chapter, but in brief significant adverse effects on the SINC are not anticipated.

20.142 The impact of the proposed mine on the Special Areas of Conservation (SACs) within approximately 10km of the site was considered. However, taking account of their distance and that modelled dust deposition at much closer receptors were more than an order of magnitude lower than the indicative dust deposition assessment level, it is not considered likely that there will be a significant effect on these habitats and there is no possibility of adverse impacts on the integrity of the SACs.

Mitigation Measures

20.143 There will be proactive dust management on the site which will reduce the dispersion of dust. This includes the proactive identification of the conditions likely to give rise to dust off-site, good practices such as the training of site operatives to understand the importance of minimising dust emissions, regular and frequent monitoring in the community, and good on-site housekeeping; and a culture where it is acceptable to request plant shut down due to the conditions.

20.144 The main method of dust suppression is the spraying of water on dusty areas of the site. This will include the use of Fog Cannons® which are very effective at grounding dust close at the source over large areas, water bowers which spray water onto the haul routes and spray mists which apply water droplets to the coal loading hoppers and stockpiles. The haul routes will also be regularly re-graded.

20.145 Automated vehicle washing facilities will be used to minimise the mud from the site getting onto the public highway; where site mud inadvertently gets onto the public highway the road will be cleaned. Areas of hardstand and paved roads within the site will be regularly cleaned to minimise the risk of dust leaving the site.

20.146 Any dust complaints will be investigated and staff will visit the complainant. Complaints are recorded together with the results of the investigation into the causes, the rectification action and timescale within which action was taken. Plant shut down will occur where necessary due to conditions.

Residual Impacts

20.147 The mitigation measures will be incorporated into the Miller Argent Mine Management System, which includes the Environmental Management System. These measures were built into the quantitative and qualitative assessments of the air quality and dust deposition impacts.

20.148 The residual impacts of the site establishment, land remediation works, removal and covering of landfilled materials, and the construction of the coal washing plant and CDP water treatment facility will be negligible,

20.149 The main impact of the operation of the proposed mine is dust deposition, and to a lesser extent, daily PM10 concentrations. The impacts were predicted to be either negligible or minor adverse on the local communities during phases one to four. During the fifth phase, when backfilling and land restoration will take place, a minor beneficial impact was predicted at a few receptors due to end of coaling at FRLS and the associated reduction in operations at the CDP. At the other receptors the impacts were predicted to be either negligible or minor adverse.

20.150 There may be very rare dust events

20.151 Using professional judgement and taking account of the uncertainties regarding the modelling, and the duration of the operation of the proposed mine, the impact on the local community of the air emissions during the operation of the mine is considered to be minor adverse.

20.152 This impact will be temporary, albeit long term, and will continue until backfilling and restoration is complete.

Cumulative Impacts

20.153 The cumulative impact of the removal of the FLRS overburden mounds, Trecatti Landfill and the proposed NET Wood Pellet Plant at the Capital Valley Eco Park in Rhymney have been considered.

20.154 The FLRS overburden mounds will be completed and seeded prior to the operation of the proposed mine commencing and therefore will not be a significant dust source. However, their removal as part of the backfilling of the FLRS excavation area has the potential to give rise to dust emissions during phases 3 and 4. The air quality objectives for PM_{10} and NO_2, and the indicative EU limit value for $PM_{2.5}$ are predicted to continue to be achieved by a good margin when this cumulative impact is taken into account.

20.155 The MTAN2 guideline value of 80 mg/m^2/day is also predicted to be achieved at all receptors, generally by a wide margin, during the removal of the FLRS overburden mounds. Using the more representative CDP meteorological dataset the predicted dust deposition was at least 20% below the indicative guideline value at all receptors.

20.156 The cumulative impact of the removal of the FLRS overburden mounds is considered to be a minor adverse impact at most receptors with respect to dust deposition, and at a few receptors with respect to the PM_{10} and NO_2 concentrations. The additional impact of the removal of the FLRS overburden mounds on dust deposition on the ecological receptors is small.

20.157 There is some evidence that the Trecatti Landfill site is a source of dust in the area, but it is further from the sensitive receptors in Rhymney and Fochriw than the proposed mine, and therefore its impact within the study area is considered to be minimal.

20.158 The combined emissions of the proposed NET Wood Pellet Plant at the Capital Valley Eco Park and the proposed mine are not considered likely to result in an exceedance of any air quality objective or the indicative EU limit value set for the protection of human health, given the good baseline air quality at sensitive receptors in the area.

20.159 Therefore, consideration of the cumulative impacts of other major air pollution sources in the area does not change the assessment of the overall impact of the proposed mine on air quality and dust deposition.

Conclusions

20.160 The main air quality and dust impact of the proposed mine is predicted to be dust deposition within the local communities. Miller Argent has a good proactive dust management system, which under most weather conditions will be effective at controlling dust. However, during dry windy weather the dust can become suspended in the air and travel long distances. If these

events do occur they could cause annoyance in the local community, but given the distances to the receptors they are likely to be rare occurrences.

20.161 Using professional judgement, consideration of the proposed development and taking account of the probability of an adverse impact, the uncertainties regarding the modelling, and the duration of the operation of the project, the overall impact of the air emissions from the mine is considered to be minor adverse.

20.162 Taking account of other pollution sources in the area does not change the conclusions of this assessment.

20.163 The impacts will be temporary albeit long term.

Noise (Chapter 13)

Key Findings

20.164 The operation of the surface mine can lead to noise impacts in the surrounding communities from the mine itself, and also the associated road and railway traffic. Different criteria and assessment techniques should be used for these different aspects of noise, and these have been discussed. The importance of any noise impact depends to some degree on the levels of pre-existing noise, and therefore a baseline noise survey has been carried out to establish existing levels of background and ambient noise at receptors that were agreed with Caerphilly County Borough Council to be representative of the surrounding communities that would be potentially affected.

20.165 The noise from the surface mine has been calculated over a wide area and noise contour plans have been provided for a variety of dispositions in the development to show the effects within areas where there is potential for a significant effect to occur. More detailed results are presented in the assessment for the representative receptors. The assessment shows that noise levels will be increased at surrounding community locations, but that levels will be within recommended criteria.

20.166 After preparation the coal will be dispatched from the site by the existing railway from the Cwmbargoed Coal Disposal Point (CDP). The potential impacts due to the additional train movements have been assessed separately for the branch line from the CDP to the main line and for the main line used by the coal trains. The noise of coal trains has been monitored and found to be similar in level to the passenger trains using the main line. The noise from additional trains on the branch line during the daytime is within recommended guidance, but the additional trains at night have the potential to be more noticeable, but again would be within recommended limits.

Mitigation Measures

20.167 The surface mine proposals include significant mitigation measures that will allow the mine to be worked within the recommended limits given by the Welsh Government in MTAN2. These measures include the selection of very quiet plant, limiting working hours and site design to maximise acoustic screening via the erection of the visual and acoustic screening bund along the northern and eastern perimeter of the void.

Residual Effects

20.168 Noise from the mine will be audible in surrounding areas throughout the life of the mine and is therefore a long term temporary effect. This has been assessed and generally found to be of negligible or minor significance in the Rhymney area. The increases in noise at Fochriw and some isolated properties to the north of the site are of minor or moderate significance.

20.169 The noise from coal dispatch trains movements will be similar to the noise from the existing coal trains. There are days and nights when the maximum allowable train movement times are utilised and therefore the noise impacts can be no worse than on these days and nights, but such conditions may occur more frequently. This will occur throughout the life of the mine until output from the Ffos-y-fran mine ceases and is therefore a long term temporary effect.

Cumulative Effects

20.170 In general the proposed scheme is sufficiently remote from the FLRS and the Trecatti landfill site that there are no significant cumulative impacts at receptor locations.

20.171 The coal washing plant proposed to be included within the CDP, which is also the subject of a separate application, is included in the calculations of noise contours for the site dispositions. The rate of production through the plant would however intensify if the Nant Llesg scheme proceeds. It has been assessed as part of the scheme on that basis, so as to assess the environmental effects associated with the higher intensity of production.

20.172 Planning permission was granted on 6 December 2012 for a woodchip plant to be built in the industrial estate on the western boundary of Rhymney. A calculation of the cumulative impact of the plant and the Nant Llesg scheme has been carried out and no significant cumulative noise impact due to the land remediation and the woodchip plant.

20.173 If the production of coal extends beyond 2024 some of the water treatment facilities at the CDP will be relocated as shown on drawing MA/NL/PA/044. This will not involve any additional noise producing equipment. The distance that these facilities will be moved is small compared with the distance to the nearest community locations and this change in layout will not affect the overall noise at these community locations.

20.174 Other sources of noise, such as the industrial estate in Rhymney, are included in the baseline noise survey; although no industrial activity was found to significantly contribute to overall noise levels at survey locations.

Blasting and Vibration (Chapter 14)

Key Findings

20.175 The main potential impact associated with blasting at the proposed Nant Llesg site is considered to be blast induced vibration and air overpressure at local buildings and is the focus of this assessment. Historic vibration data from the nearby FLRS and test blast data have been used to predict the likely levels that would be received at nearby buildings so that the level of any impact can be determined.

20.176 Vibration predictions for the nearest residential or industrial buildings to the site were very low and with a 50% confidence were near to the human perception threshold of 0.50 mms^{-1} and well below the MTAN2 maximum vibration limit guide of 6 mms^{-1} resultant value in 95% of blasts. The vibration predictions for the gas main were 9.34 mms^{-1} and 34.82 mms^{-1} based on a 50% and 95% confidence respectively which is significantly lower than the maximum limit of 75 $mms^{-1}$for this structure given in Section 8.5 of the Wales and West Utilities document, reference T/SP/SSW/22 and this limit should not be exceeded. FLRS has two vibration limits which are defined in the current planning permission to operate the site. These are 6 mms^{-1} resultant value in 95% of blasts and no blast shall exceed 8 mms^{-1}. To date, by using good blast design and execution, no result has been equal to or exceeded 6 mms^{-1} at the nearest vibration sensitive property, thus demonstrating the site management's ability to control and execute blasting operations. To date, as a result of careful design and execution, the highest recorded vibration was 2.03 mms^{-1} at the nearest sensitive property. It is concluded that the same limits as apply at FLRS should be applied at Nant Llesg and they are achievable.

20.177 A series of air overpressure predictions were calculated for each of the receptors. Similar to the vibration levels, the level of air overpressure is expected to be very low with the nearest sensitive property, Cwm Nant at a distance of 433m from the closest point of blasting predicted to receive levels of 7.38 Pa (111 dB(lin)) and 11.06 Pa (115 dB(lin)), based on a 50% and 95% weighting respectively. All predicted levels are below the MTAN2 maximum level guidance of 120 dB linear (18.90 Pa), in 95% of blasts. To date, no blast at FLRS has produced greater than 7.50 Pa (112 dB (lin)) at the nearest sensitive property.

20.178 Flyrock is considered to be the only other potential impact associated with blasting activities at the proposed site.

20.179 Noise from Blasting on Nant Llesg is not considered to be a potential significant impact given the use of modern blast initiation systems. No noise complaints from local residents relating to blasting on FLRS have been received.

Mitigation Measures

20.180 As the potential impact from blast induced vibration and air overpressure on all of the identified potential receptors and buildings and structures beyond those distances is considered to be negligible and no special mitigation measures (over and above good blasting design and practice) are considered necessary. A vibration monitoring scheme should be implemented to ensure adherence to the proposed limits.

20.181 Minimising the risk of flyrock would be achieved by implementing best practise and using best available techniques in blast design and execution as employed at FLRS where no flyrock incidents have been recorded.

Residual Effects

20.182 Blast induced air overpressure effects and ground borne vibrations are true transients of extremely short duration. Although they are expected arise every operational day, at the magnitudes predicted they will not produce any significant impact.

20.183 The duration of the effect blast induced air overpressure effects and ground borne vibrations will be temporary long term as blasting operations will be carried out over many years but each event will be of extremely short duration.

20.184 The significance of the effect is considered to be negligible to no impact for many of the receptors. For Half Way House the impact will be minor.

Cumulative Effects

20.185 The only cumulative or in combination effects that can be foreseen is that blasting operations on FLRS site will be carried out while blasting operations are carried out at Nant Llesg. Vibration predictions show that vibration from FLRS may be perceptible at three locations only; Half Way House, the gas main and the water pumping station. Such low vibration levels indicate no impact from vibration on those structures. It is considered though, that residents at Half Way House (the only residential structure) may be aware of an increased number of blasts. To minimise any potential effect good blasting design and best practice will be employed. No blasting would take place simultaneously on both sites.

Conclusions

20.186 In summary, it is considered that blasting operations at the proposed Nant Llesg site will be able to meet the vibration and air overpressure limits advised required by MTAN 2 when employing best practice in blast design and execution, in combination with blast monitoring and regression analysis and then using the results of the analysis to plan all future blasts.

Cultural Heritage (Chapter 15)

20.187 In respect of cultural heritage, the EIA methodology for the Nant Llesg scheme has mirrored that used for the Ffos-y-fran Land Restoration Scheme. Here, the resulting mitigation undertakings have proved highly successful, significantly contributing to archaeological research findings celebrating the history and culture of the area.

Key Findings

20.188 As a result of a desk based assessment supported by some site investigations, all carried out by Glamorgan Gwent Archaeological Trust (GGAT [Contracts]), there is a thorough understanding of cultural heritage assets to be found in the Nant Llesg scheme and within the immediate context.

20.189 Assets are found throughout the landscape, singly and in clusters, and support giving the landscape a strong historic character. Many support the identification and valuing of natural ecological landscape elements.

20.190 Rhaslas Pond and related leats are regarded as of high value, components of the once extensive Dowlais Free Drainage System, a water management facility for providing water to Dowlais iron works. Although not yet a scheduled monument, the south embankment of the reservoir is being regarded as scheduled following discussions with Cadw.

20.191 No other scheduled monument lies within Nant Llesg site and it does not include Conservation Areas and Listed buildings. The site is not part of a designated historic landscape, these deemed to be of national value. Merthyr and Gelligaer Common, generally to the west and south of Nant Llesg, are designated and form a site context. The Common forms a series of Local Historic Landscape Areas (LHCAs) and these have been identified and assessed. The scheme has been found only to have temporary long term effects to these – for the duration of the scheme prior to final landscape restoration.

20.192 Given the growing value of the south embankment of Rhaslas Pond a series of Nant Llesg Local Historic Landscape Character Areas (NLLHLCAs) have been identified on site and assessed, these also supporting the interpretation of the assets where found singly and in clusters. The scheme will have permanent effects to these.

20.193 Most assets stem from the industrial period, related to the mining industry – features representing all aspects of quarrying mining and coal/ironstone processing – and also to the resultant vast amount of ground disturbance, mostly related to spoil disposal. Notably, there are a large number of mine shafts and related pit head buildings and structures, many still to be seen in the landscape. Rhaslas Pond and the water leats are notable features of the historic landscape.

20.194 Surviving within this highly disturbed landscape are older features, notably medieval house platforms where farm building and animal pens were sited. The desk-based assessment would suggest there is a chance of there being older sites – of Prehistoric and Roman age.

20.195 The proposed Common land exchange areas contain just a few archaeological assets and some of these relate to the archaeologically rich sites on Merthyr-Gelligaer Commons.

Mitigation Measures

20.196 In areas where archaeological assets would be removed by the implementation of the scheme a programme of archaeology would occur, comprising excavation and watching briefs. This would be based on planning briefs provided by CCBC and MTCBC, supported by advice from Cadw and the Miller Argent in house and archaeological staff, and the appointed

archaeological contractor (GGAT [Contracts]). All undertaking would be carried out to standards of the Institute for Archaeologists.

20.197 The programme of archaeology will apply to known and predicted archaeological sites and to those that would be discovered during the early stages of implementing the Nant Llesg scheme. Most archaeological excavation will be to assets found slightly to moderately buried within top soils and sub soils. The mitigation undertakings would occur progressively ahead of each area of proposed works on the land, including that identified for early remediation and over the operational area of the mine.

20.198 The archaeology would apply to assets of all ages and extent. The duration of each excavation would be related to the value and extent of the buried resources. Where assets are identified as of local/minor interest the mitigation would support local investigations, documentation and recovery of the associated artefacts.

20.199 Mitigation would also occur when assets are identified within old coal workings and need documentation and recovery.

20.200 Positive effects would result from a range of cultural heritage activities related to the proposals for landscape restoration. This would include: community based cultural heritage projects; education programmes for schools; forward looking archaeological scientific research; and, preservation/restoration/reconstruction of archaeological features in the restored historic landscape.

20.201 Given the potential for CADW to schedule the southern embankment of the Rhas Las Pond and its significance as a part of the Dowlais Free Drainage System, the southern half of the reservoir would be retained in situ, protected and conserved following the completion of the scheme. The northern half of the reservoir would be thoroughly investigated and documented prior to its removal. The form and character of the northern embankment and water body would be later reflected in the restoration design for the historic landscape.

Residual Effects

20.202 Given the intent to undertake a through programme of archaeology no significant residual adverse effects are identified. Either assets would have been preserved as-found in situ, thus would not be adversely affected, or, would have been removed through archaeological process. Permanent minor adverse effects to local value resources could occur if safety concerns would not allow for safe access for full mitigation undertakings. Permanent minor positive effects would result from conservation and stabilisation of exposed industrial structures during the programme of making-safe abandoned mine shafts. Permanent minor to moderate positive residual effects would result from the 'added value' research, data accumulation, the publication of findings, and educational uses of the programme of archaeology results. This would also support cultural heritage objectives in the landscape restoration programme.

Cumulative Effects

20.203 The cultural heritage assessment has taken account of four significant developments within the context of the Nant Llesg site. Given the works presently occurring, and to further occur, within the identified developments, no cumulative significant adverse effects are identified in relation to known and potential cultural heritage assets.

Conclusions

20.204 A comprehensive study has been made of the cultural heritage assets on and immediately around the Nant Llesg site. The findings are based on a desk-based assessment and site investigations. Further assets would be discovered before and during implementation of the scheme.

20.205 The implementation of the Nant Llesg scheme would offer continued opportunities to preserve some assets where they are found in the ground. Especially to the east and west of the surface mine excavation and associated spoil mounding, the scheme's landscape restoration can be further adjusted to achieve this. In areas of no significant adverse effects, the assets would be preserved for the foreseeable future.

20.206 Where assets cannot be preserved in situ, principally within the footprint of the surface mine and where top soil stripping would occur, then all assets would be immediately and permanently adversely affected. Here a programme of mitigation would occur, comprising a programme of archaeological investigations and recording and archaeological watching briefs.

20.207 Within land holding proposed for alternative Common land grazing and public roaming access no significant permanent adverse effects are identified. Potential temporary minor adverse effects could occur as a result of induced ground surface erosion and accidental damage. Where this would be identified at the time a programme of protection and investigation would then occur.

20.208 The archaeological works, for the main Nant Llesg site and proposed temporary exchange common lands would be implemented by Glamorgan Gwent Archaeological Trust under the direction of the Miller Argent in-house archaeologist. Given the mitigation undertakings no significant residual short- or long-term adverse effects are identified. Positive long-term residual effects would result from analysis and publication of the archaeological findings. This effectively would advance the understanding of the cultural heritage of this part of the Caerphilly and Merthyr Tydfil county boroughs. The results would positively add to those from Ffos-y-fran Land Reclamation Scheme, which have been nationally recognised for their excellence.

20.209 Furthermore, the implementation of Nant Llesg scheme offers the opportunity for cultural heritage innovatively adding value to the scheme and national cultural heritage objectives, by engaging with the local community, scientific research, and conservation - effectively resulting in minor to major positive permanent residual effects.

Landscape and Visual Impact (Chapter 16)

Key Findings

20.210 The site is located on a broad ridge between the Fochriw Road to the west and the upper slopes of the Rhymney Valley to the east. The ridge falls gently north, to enclosed agricultural land, then falling more steeply towards the A465 heads of the Valleys Road. To the south, the land rises to Mynydd Fochriw. The majority of the site is urban common and CROW access land, and is crossed by several public rights of way including the Rhymney Valley Ridgeway Footpath in the east of the site. The landscape of the site consists of eight main areas of different landscape character:

Area 1: Open Upland, the majority of the site.

Area 2. Northern slopes, Bryn Pyllog, the land falling from the ridge to the north-west, north and north-east.

Area 3. Northern enclosed fields, the land falling from the northern slopes to Cwm Carno.

Area 4. South-eastern slopes, the transition slopes between the upland and the lower valley side, overlooking the southern part of Rhymney

Area 5, North-eastern Valleys & Tips, the area between the enclosed fields and the open upland to the south-west.

Area 6 South-eastern Valleyside, a small area to the east of Area 4, where the slopes steepen and fall to the A469 in the valley floor.

Area 7 Southern Tips, an area of old tips to the west of the disused railway line and stream valley north of Fochriw, merging with the "open upland" extending south from South Tunnel Road

Area 8 Cwmbargoed Disposal Point, an industrial use for the processing of coal, bounded by the Fochriw Road on the east and the Bogey Road on the north.

20.211 The LANDMAP assessments describe five aspects of the landscape of the wider context of the site:

- The LANDMAP Geological Landscape Level 3 classification of the whole site is Glacial Mountain Valley, the northern half of the site evaluated Outstanding and the southern areas Moderate.

- The LANDMAP Landscape Habitats Level 3 classification of the upland areas of the site is Mosaic, evaluated High, and of the northern third of the site, Improved Grassland, evaluated Low.

- The LANDMAP Historic Landscape Level 3 classification (Woodland) and corresponding evaluation of the northern third of the site is incorrect in the LANDMAP database. The other two-thirds of the site is classified as Marginal Land and evaluated Outstanding.

- The whole site falls within a large Cultural Landscape area classified at Level 3 as Institutions and evaluated High.

- The LANDMAP Visual and Sensory Level 3 classification of most of the site is Upland Grazing, and the north-eastern and eastern side slopes are Hillside and Scarp Slopes Mosaic. The whole site is evaluated Moderate, although with high scenic quality. The principal management recommendation is restoration to a natural landscape, maximising natural regeneration.

20.212 The Zones of Theoretic Visibility (ZTV) generated by computer, which identified the geographic extents within which views may be available of the proposed development, show:

- The main areas from which the overburden and screening mounds would be visible extend in a broad band along the Rhymney Valley and onto the uplands immediately to the north.

- The overburden and screening mounds would themselves screen visibility of the operational voids from the east south and south-west.

- From some locations, views of features of the proposed development would become visible once the storage mounds at the Ffos-y-Fran site would be removed.

20.213 The principal viewpoints described represent the views available to people within the nearby communities, at locations in areas of landscape importance, such as, the Brecon Beacons National Park, when using public access areas and rights of way, long distance footpaths and cycle routes, and visiting county parks and areas of cultural heritage importance. The viewpoints used in the assessment were agreed with CCBC, MTBC, BBNPA and NRW.

20.214 The darkness and lighting characteristics of the area were considered. The site lies within an area of undeveloped open upland which is 'Intrinsically Dark'. At Cwmbargoed Disposal Point, localised point lights and bright flood lights at the rail sidings cause localised Light Spillage. To the south, Fochriw is a small settlement of Low Distinct Brightness set within the otherwise Intrinsically Dark upland. To the east, the Rhymney Valley settlements are a distinct area of High to Medium Distinct Brightness and, with Merthyr Tydfil, gives rise to Sky

Glow above the valleys. To the north, the corridor of the A465 is a source of High Distinct Brightness from the street lights and moving vehicles light, set against the Intrinsically Dark landscape of the national park.

Mitigation Measures

20.215 The potential effects of the proposals on the landscape and on visual amenity were considered from an early stage in the design of the development and mitigation measures have been incorporated with a view to avoiding adverse effects or reducing them or with a view to offsetting them through compensatory measures where they are unavoidable, including:

Site layout:

- Soil storage mounds located on the perimeters of the site, where they would also provide a degree of screening; a visual and acoustic screening mound on the north-eastern and eastern edge of the excavation area;

- Locating the built and operational support facilities close to an existing busy road and away from the nearby communities and choice of lighting to limit the spread of light and reduce the potential intrusion on Dark areas.

- Architectural treatment of the new wash plant building in the CDP to break up its appearance in views.

- Temporarily re-routing the part of the Rhymney Valley Ridgeway Footpath route through the site along the eastern slopes of the site.

Overburden and screen mound construction

- First constructing an outer bund to each layer with backfilling continuing behind (reversed during removal), grass-seeding as work proceeds as well as the finished top surface

Common Land

- Areas of land are included in the proposals for stock grazing by the Commoners, and/or for public access, while the common land within the site would not be available during operations.

Remediation and enhancement proposals

- Surface treatment and remediation of land adjoining the site would be carried out within two years of commencement of coaling to: address hazards associated with old mine shafts and adits, conserving those cultural heritage features that can be made safe; prevent silting up Parc Cwm Darren lake; enhance ecological features; generally tidy up areas closest to settlements; improve public access, initially on the eastern and north-eastern slopes; enhance landscape features, pattern and character, and the setting the eastern and north-eastern ridge side provides to Rhymney.

- Ecological mitigation and enhancement at Bryn Caerau Farm would also result in upgrading the features, patterns and, thus, the character of the historic landscape.

Restoration strategy

- The proposals for remediation and restoration of operational areas aim to mitigate and/or offset adverse landscape effects and achieve benefits to the landscape character and amenity for local communities in the long term: re-establishing the open upland character of the main part of the site; establishing a variety of habitat types and

integrating features of historic interest or marking their locations with new features; restoring and enhancing public access to the area, with the Bent Iron reinstated as a landmark, and provision of information signs, seats etc.

Residual Landscape Effects

20.216 Effects on the wider landscape context, assessed by reference to the five LANDMAP aspects, would be medium to long term during operations and: Minor adverse for the Geological Landscape and Landscape Habitats, Moderate adverse for the Historic Landscape, Major, adverse for the view from the Cultural landscape within 1km reducing to Minor at over 2km, and Moderate to Minor adverse long term for Visual & Sensory areas within 1 or 2km, reducing to Minor over 2km. The effects of the remediation and restoration proposals on the wider landscape would be Minor to Moderate beneficial in the long term, or not noticeably different from the present.

20.217 In additional areas of land for stock grazing by the Commoners and for public access, there would be no adverse effects on landscape character from the proposed uses and potential adverse landscape or visual effects, e.g. from loss of field boundary vegetation or walls, could be prevented by appropriate land management and fencing, which would also upgrade the landscape and benefit the community in the long term from increased or easier public access to the countryside.

20.218 The Intrinsically Dark character of the operational areas of the site itself would be changed during the operational period to one of Low Distinct Brightness. For other areas, the lighting of the site and operations would be visible to varying degrees and varying with the phases of operations. The Intrinsically Dark character of the site and its appearance in views from surrounding areas would be restored with completion of landscape restoration.

Residual Visual Effects

20.219 ZTVs of the development proposals show a pattern of visibility reflecting the topography of the area. The assessment found:

- For **residents** within 2km of the site with direct open views, the development would cause Major, adverse effects when the overburden and screening mound were being formed during the early phases of excavations and later removed to fill the final void. The effects in these phases would be Moderate for residents with oblique or indirect views and for more distant residents.

- After formation, the overburden and screening mounds would remain in place for the medium term as elements in the landscape, assessed as Moderate, adverse generally, but Minor for more distant viewers. For the very near residents in Fochriw, the overburden mound would screen other operational areas of the site from view. The visual and acoustic screening mound would screen views of site operations for near residents in Rhymney.

- For users of the **promoted route,** Rhymney Valley Ridgeway Footpath, there would be Moderate to Major visual effects, adverse, during the phases when the overburden mound is created and removed, reducing to Moderate after it is established, and Minor to Negligible during the initial operations and aftercare. From the distant Sirhowy Valley Walk, the visual effects would be no more than Minor, adverse, during the main excavation phases.

- Because of the low level routes followed by the **promoted cycle routes** near the site, the visual effects would vary from None to Moderate adverse.

- For people using **rights of way and access land** near the site, the effects during the phases of greatest change would be Major, adverse and medium term, reducing to Moderate due to the presence of the overburden mound, and Minor during initial

operations and restoration aftercare. In views from more than 5km from the site, the visual effects would be no more than Minor, adverse, medium term, during these phases, and Moderate at intermediate distances.

- There would be no more than Moderate, adverse, visual effects during the phases of greatest changes, for visitors to Parc Bryn Bach **Country Park** and users of the ridges for **paragliding**. For **local amenity open spaces and golf courses**, the effects assessed in the phases of greatest change were Minor to Moderate, adverse.

- The views available from **Rhymney Town centre, a conservation area**, are generally framed glimpses where streets or junctions or the playing field open views towards the site. The visual effect was assessed as Moderate adverse during screening and overburden mound construction and removal and Minor adverse during other phases. The remedial and landscape enhancement works on the eastern valley side would be visible in some of these views, assessed as Minor to Moderately beneficial in the long term.

- For **travellers along the roads**, the visual effects were assessed as Minor or Moderate generally, adverse during the main operational phases, and Minor or Negligible during initial operations and restoration aftercare. From the north-west of the site on Fochriw Road, however, the view would include the built facilities and coal processing facility, raising the visual effect to Moderate to Major during the main operations and Moderate to Minor during initial operations or Negligible during restoration aftercare.

- In the views from the east in which the **remedial and landscape enhancement works** would be visible, their visual effect was assessed as Moderate, beneficial, over the baseline condition in the long term, for viewers from the Rhymney conservation area, and Minor beneficial in more distant elevated views, represented by viewpoints at Bryn Carno and Ras Bryn Oer.

Cumulative Effects

20.220 Cumulatively, Nant Llesg would extend the area of landscape where industrial and minerals related activities were taking place. The additive visual effect would vary with the relative importance in views, the angle of view and distance from Nant Llesg. Sequential views would be available from some routes through the landscape. Nant Llesg and FLRS are characterised by change through time and the cumulative effects would change correspondingly through time. The features of Nant Llesg and FLRS would be in existence at the same time for a period of eight years, the contribution of Nant Llesg to additive effects assessed as Minor to Moderate, adverse and medium term, generally, locally Major adverse and medium term.

Conclusions

20.221 In the parts of the site that lie within the main operational area where large scale changes are likely, the landscape effects were assessed as Major or Major to Moderate, medium to long term and adverse during operations. The smaller scale operations to remediate old mine hazards would enhance landscape features and character, and the ecological and heritage aspects of the landscape, with long term benefits.

20.222 The site is not within a Special Landscape Area. The site's location within a SINC has been taken into account in the restoration and remediation proposals. There would be no landscape or visual effect on Registered Historic Parks and Gardens. For viewers from the Brecon Beacons National Park, the assessment found, at most, Minor adverse visual effects for near views immediately to the north and Negligible or No effect for more distant locations.

20.223 The development would not directly affect the historic landscape of the wider area generally, but the proposed development would be visible from the higher elevations within both the Merthyr Tydfil and Gelli-Gaer areas. A relatively small part of the context of the registered historic landscapes would be changed. However, the effects would be localised to the limited

areas of the historic landscapes from where views of the site and the development would be available.

20.224 No landscape effects were identified on County Parks, and visual effects identified were limited to a small area in the west of Parc Bryn Bach. Adverse effects on the visual amenity of the cycle route network would be limited to parts of route 46 and 468 to the north and south-east of the site.

20.225 The mitigation and restoration strategies also aim to achieve benefits to the landscape character and amenity for local communities in the long term. The comprehensive restoration strategy for the whole site, which would be implemented progressively as operations proceeded, aims to integrate land use, public access and amenity for local communities, nature conservation and cultural heritage, with a landscape character appropriate to the location and context.

Waste (Chapter 17)

Key Findings

20.226 The site clearance and enabling works are expected to generate a small volume of waste (fences and generic waste items) that has the potential for re use elsewhere.

20.227 Waste from the Merthyr Industrial Services (MIS) landfill contained within the site boundary has the potential to form a hazardous waste stream as chemical testing has indicated the presence of non inert materials with methane gas emission potential. The Phase 1 area of the MIS landfill site is now closed to waste tipping and pre-dates the implementation of the 1999 Landfill Directive; consequently this area has been segregated from the latter Phase 2/3 area via a vertical clay bund. An additional area immediately to the north of the MIS landfill contains unlicensed tipped waste; as a worst case scenario, approximately 5,600 tonnes of waste will need to be removed from the unlicensed tipping area. On-going consultation with the NRW will determine the requirement for capping of the licensed landfill.

20.228 The coaling works in dispositions 1-4 will generate sediment from maintenance of the lagoons which would be managed in accordance with details set out in the Surface Water Management Plan. Arisings from the barrel wash plant are to be reused of as backfill and thus cease to be classified as waste. Waste from vehicle washing facilities will be treated within the on-site water treatment works and excavation of the main void will generate arisings to be stockpiled on site for re use onsite during the restoration phase.

20.229 The final restoration stage of the scheme is not expected to generate any notable waste streams due to the reuse of all spoil as backfill in the main excavation void.

20.230 The potential for waste generated as part of the scheme causing a nuisance to surrounding residents is considered negligible as best working practice methods will reduce the risk of odours and spills. The potential for increased traffic volumes is deemed as a negligible impact in comparison to the overall scale of the scheme.

Cumulative Effects

20.231 There is potential for cumulative impacts to arise from the development scheme and MIS waste tipping operations for the period when MIS continue to utilise the landfill site for disposal of inert wastes. However, consultation is ongoing with NRW regarding permit surrender for the MIS landfill site and it is not anticipated that any further material will be desposited at the site.

20.232 Excavation and removal of waste materials from site from the MIS landfill has a cumulative impact in relation to the export of coal from the site due to the increased number of lorry movements. However, this impact would be negligible.

20.233 There is potential for cumulative impacts to arise from the stockpiling of overburden on site. The pressure exerted by the piles may affect the structural integirty of surrounding buildings and structures (e.g. roads). However due to the minor nature of the surrounding roads and the lack of surrounding buildings and residential properties, this impact is considered to be minimal.

Conclusions

20.234 The production of key waste streams will be generated during the coaling excavation in Dispositions 1 to 4. These will include waste from the CDP and alternative processing works on site.

20.235 The first key receptor group identified in this study is construction workers exposed to waste materials within the MIS landfill and coal processing facilities.

20.236 Proximal surface waters are considered to be a sensitive receptor however onsite water treatment works and other mitigation measures shall minimise any potential risks to these receptors. Any effects caused by the production of waste on site to proximal surface waters would be ***Temporary – Medium Term***, depending on the severity of the effect.

20.237 The final receptor is considered to be the surrounding residents due to the potential for a marginal increase in traffic volumes associated with export of waste from site. Although this is deemed negligible, any effects experienced during coaling works would be ***Temporary – Short Term***.

20.238 Ongoing discussions with the EAW will determine the materials and volumes to be removed from the MIS landfill, reducing the risks posed by contaminants to controlled waters. The proximity of the site reduces the likelihood of contamination reaching controlled waters. If controlled waters were effected by the production of waste on site, the duration of the effects would be ***Temporary – Medium Term***, depending on the severity of the effect.

20.239 The use of appropriate PPE and best practice working methods throughout the scheme will reduce the risks posed by potentially harmful materials to construction workers.

20.240 The use of best working practice methods and the instigation of a Material Management Plan and Site Waste Management Plan on site will allow for the appropriate storage, disposal, haulage and handling of waste to be undertaken. Any effects caused by these mitgation measures would be deemed ***Temporary – Short Term***.

Health and Welfare: Health Impact Assessment (HIA) (Chapter 18)

20.241 A Health Impact Assessment was carried out to investigate and address the potential impact of the Nant Llesg scheme. The scope and focus of the HIA built upon experience at Ffos-Y-Fran and was defined and iteratively refined through engagement with key stakeholders and local communities through an integrated engagement strategy.

20.242 The assessment drew from and built upon the technical outputs of the ES to investigate each of the potential health pathways directly associated with the mining, remediation and final restoration stages of the proposed Project.

20.243 The principal community health concern raised during public engagement was the potential risk from changes in air quality. Following a review of the available scientific evidence base and based on an exposure response assessment of worst case hypothetical scenarios

applying the highest burdens of poor health in the area, it is concluded that changes in concentrations of PM10, PM2.5 and NO2 air pollutants would remain within air quality standards set to protect health and would not be of a magnitude sufficient to quantify any significant adverse health outcome. Such a conclusion is consistent with the findings from FLRS, where monitoring data has remained within all air quality standards set to protect health since the start of operations.

20.244 Concerns of dust impacts were also voiced. The proposed project seeks to draw from and build upon the experience and dust management best practice established at FLRS (categorised as a Low Dust Risk within its permit to operate from Caerphilly Borough Council (2012) and Merthyr Tydfil Borough Council (2013). Following mitigation, and the provision of additional dust monitoring stations, potential dust impacts are predicted to also be minor, and not of a level to result in any measurable adverse health outcome.

20.245 Concerns of visual impact were also voiced, and primarily addressed through design by pulling the mining area away from the settlement boundary and through the inclusion of a visual and acoustic bund at a cost to the mining area.

20.246 Following the extraction of coal, the proposed remediation work would help to address existing environmental hazards including making safe disused mine shafts, remediating old coal tips, inspecting and treating the Merthyr Industrial Services inert landfill site and removing old underground workings to reduce the mine water pollution that presently discharges into the River Rhymney. This work would benefit the surrounding area with a final reclamation scheme that makes positive changes and helps to meet the needs of the local community.

20.247 A comprehensive education, training, employment and procurement strategy is proposed, alongside on-going community support initiatives and community benefit fund to address local circumstance, barriers to benefit uptake, and to support local health improvement.

20.248 On the basis that all regulatory environmental standards set to protect health have been achieved at FLRS, and are predicted to be achieved at Nant Llesg; that the assessment from relative changes in air quality, noise and transport upon existing burdens of health are not sufficient to quantify any adverse health outcome; and when considering the approach proposed to address community concerns, perceptions and priorities; operational procedures; and the commitment for on-going community engagement, the proposed project does not constitute a significant risk to local community health.

20.249 When further considering the significant underlying factors defining local burdens of poor health in the area (largely socio-economic and lifestyle related), and the direct, indirect and induced socio-economic benefits from the proposed project, the immediate and final land reclamation (removing existing environmental hazards and supporting regeneration) and the catalogue of committed community support initiatives (summarised within the HAP) to optimise local health benefit uptake, the proposed project is considered to constitute a net health benefit.

Sustainability and Climate Change (Chapter 19)

Sustainability

20.250 Sustainable development has been integral to the planning of the project, and the way in which it would be delivered during the construction, operation and eventual decommissioning of the proposed facilities. The study also sets out how climate change has been considered as part of the development of the proposals, both in terms of mitigation and adaptation.

20.251 The sustainability and carbon statement demonstrates that the scheme complies with relevant policies for sustainability, promoted at relevant national, regional and local levels of Government.

Climate Change

20.252 Climate change is widely acknowledged as the most pressing challenge for sustainable development. Recent developments in EIA best practice, including "Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment" (European Commission, 2013) and the Institute of Environmental Management and Assessment Principles Series: "Climate Change Mitigation & EIA" (IEMA, 2010), have indicated that it may be appropriate for climate change to be addressed within the EIA. However, there is still a wide range of opinions on whether this is appropriate, given the global nature of climate change and the conflict with the "Environmental Impact Assessment: A guide to good practice and procedures" (DCLG, 2006) which refers to "the surrounding environmental features" when introducing the approach to assessing environmental impacts (Chapter 4, Paragraph 106) – emphasis added. There is no guidance currently available on an appropriate assessment methodology for climate change, or how to select an appropriate baseline or significance criteria. Climate change is a global issue and therefore does not easily follow the standard EIA methodology.

20.253 For decision makers, both the EU and IEMA guidance confirm that the focus should be on considering from the earliest stage, opportunities for minimising carbon and other greenhouse gas emissions, so as to minimise the impact of the proposed development on climate change. In addition, appropriate consideration should be given to the consequences of a changing climate. In this context, the proposed scheme has minimised carbon emissions arising from both the extraction and transportation of coal, and the project has been designed to minimise vulnerability and adapt to a changing climate.

20.254 The appraisal of GHG emissions associated with this project has been undertaken within the context that this project is consistent with the Energy White Paper (DTI, 2007) which confirms, in section 5.4, that *"coal will continue to play a significant role in global electricity generation for the foreseeable future, partly because it is the most abundant global fossil fuel but also because it brings security of supply benefits"*. The reduction of GHG emissions associated with the use of coal in both the energy and manufacturing industries is addressed more widely in the Climate Change Act 2008 and the EU ETS (Emissions Trading Scheme Directive), and is not within the scope of this project.

20.255 Chapter 7 (Traffic and Transport) sets out the proposals to minimise the carbon emissions associated with both transportation of the coal, and also use of transport by employees working at the site. Chapter 9 (Land Use and Soil) sets out the soil handling methodologies which will be followed to ensure the soil is appropriately management in order to reduce the potential for carbon emissions release. Chapter 8 (Ecology and Nature Conservation) and Chapter 16 (Landscape and Visual) both set out the tree planting proposals that form part of the ecological enhancement at Bryn Caerau and that are included in the restoration strategy, which offsets the methane emissions associated with the extraction of coal (further details explained in paragraphs 6.25 and 6.26 of Appendix MA/NL/ES/A19/001).

20.256 Adaptation to a changing climate is important for this scheme. Chapter 8 (Ecology and Nature Conservation) has considered the need to include the potential for changes in the baseline conditions as a result of climate change. Chapter 11 (Hydrology and Drainage) sets out the proposed Surface Water Management Strategy, and how this will include appropriate allowance for the potential increases in rainfall or severe storm events due to climate change. (The proposed Surface Water Management Plan, including the proposed water treatment areas, has been designed to attenuate and treat water volumes from a 1 in 100 year + 10% climate change allowance storm event). Chapter 12 (Air Quality and Dust) also confirms that local weather conditions will be closely monitored and proposes a range of dust mitigation measures which will be adopted in the event of a drought.

20.257 Appendix MA/NL/ES/A19/001 Nant Llesg Sustainability and Carbon Statement sets out in detail how Miller Argent's existing policies and procedures and the evolved design of the proposed Nant Llesg scheme responds to each of the themes, sustainability objectives and key considerations of the sustainability framework, and thus demonstrates how the project meets the objectives of sustainable development throughout its lifetime.

Residual Impacts / Effects and Significance

20.258 The significance of the residual impacts of the overall project are summarised below. Justification for how the level of significance has been derived is discussed fully within the relevant assessment chapters:

Description of residual impact / effect	Duration of impact / effect	Significance of impact / effect
Social Impact Assessment		
Job creation in the local economy	Long term	Major beneficial
Increased training opportunities, more economic activity and reduced unemployment of local residents		Moderate
Cumulative job creation with NET Wood Chip Facility	Long term	Major Beneficial
Cumulative pressure for local housing and services resulting from jobs being created through NET Wood Chip Factory	Permanent	Not significant
Recreation and Tourism		
Common Land:		
Preliminary Operations & Mining	Long term, temporary	Minor Adverse
Land Remediation	Medium term, temporary	Minor Adverse
Restoration of the land	Long term, permanent	Minor Beneficial
Decommissioning of the CDP	Long term, permanent	Minor Beneficial
Public Rights of Way:		
Preliminary Operations & Mining	Long term, temporary	Minor Adverse
Land Remediation	Medium term, temporary	Minor Beneficial
Restoration of the land	Long term, permanent	Minor to Moderate Beneficial
Recreational Facilities:		
Preliminary Operations & Mining	Long term, temporary	Moderate Adverse
Water management	Long term, permanent	Minor Beneficial
Land Remediation & Restoration of the land	Long term, permanent	Negligible
Tourist Resources:		
Preliminary Operations & Mining	Long term, temporary	Negligible

Description of residual impact / effect	Duration of impact / effect	Significance of impact / effect
Restoration of the land	Long term, permanent	Negligible
Traffic and Transport		
Impact on highway safety (i.e. changes in traffic flow on routes with sensitive receptors present)	Temporary long term	Minor adverse
Impact on highway operation (i.e. the impact of changes in traffic flow on highway capacity)	Temporary long term	Minor adverse
Non-motorised users (i.e. the impact of changes in traffic flow on pedestrians, cyclists and equestrians)	Temporary long term	Minor adverse
Physical fitness (i.e. the impact of changes in traffic flow on levels of physical activity)	Temporary long term	Neutral

Ecology and Nature Conservation		
Statutory Designated Sites		
Effects of land take.	N/A	Negligible
Operational Effects	N/A	Negligible
Restoration	N/A	Negligible
Non-statutory designated sites		
Effects of land take.	Temporary – long term	Moderate adverse
Operational Effects	Temporary – long term	Minor adverse
Restoration	Permanent	Moderate adverse (potentially Negligible)

Description of residual impact / effect	Duration of impact / effect	Significance of impact / effect
Habitats		
Effects of land take	Temporary – long term	Moderate adverse
Operational Effects	N/A	Negligible
Restoration	Permanent	Minor/Moderate adverse
Amphibians		
Effects of land take.	Temporary – long term	Minor adverse
Operational Effects	Temporary - long term	Negligible/potentially beneficial
Restoration	Permanent	Minor beneficial
Reptiles		
Effects of land take.	Temporary – long term	Minor adverse
Operational Effects	N/A	Negligible
Restoration	Permanent	Negligible/potentially beneficial
Bats		
Effects of land take.	Temporary – long term	Minor adverse
Operational Effects	Temporary – long term	Negligible/potentially beneficial
Restoration	Permanent	Negligible/potentially beneficial
Otter		
Effects of land take.	Temporary – long term	Minor adverse
Operational Effects	Temporary – long term	Negligible/potentially beneficial
Restoration	Permanent	Negligible/potentially beneficial
Breeding Birds		
Effects of land take.	Temporary – long term	Major adverse
Operational Effects	Temporary – long term	Minor adverse
Restoration	Permanent	Moderate adverse
Wintering/passage birds		
Effects of land take.	Temporary – long term	Moderate adverse
Operational Effects	Temporary – long term	Minor adverse
Restoration	Permanent	Moderate adverse

Description of residual impact / effect	Duration of impact / effect	Significance of impact / effect
Terrestrial invertebrates		
Effects of land take.	Temporary – long term	Moderate adverse
Operational Effects	Temporary – long term	Negligible
Restoration	Permanent	Minor adverse
Dragonflies and damselflies		
Effects of land take.	Temporary – long term	Moderate adverse
Operational Effects	Temporary – long term	Negligible
Restoration	Permanent	Minor adverse
Aquatic invertebrates		
Effects of land take.	Temporary – long term	Minor adverse
Operational Effects	Temporary – long term	Negligible
Restoration	Permanent	Negligible
Fish		
Effects of land take.	Temporary – long term	Minor adverse
Operational Effects	Temporary – long term	Minor beneficial
Restoration	Permanent	Minor beneficial
Agricultural Land Use and Soils		
Agricultural Land Quality		
Site Establishment and Operations	Temporary – Long Term	Negligible
Restoration	Permanent	Negligible
Soils – Mineral		
Site Establishment and Operations	Temporary – Long Term	Minor Adverse
Restoration	Permanent	Minor Adverse
Soils – Peaty Topsoil		
Site Establishment and Operations	Temporary - Long Term	Moderate Adverse
Restoration	Permanent	Moderate Adverse
Farm Holdings		
Site Establishment and Operations	Temporary – Long Term	Minor Adverse
Restoration	Permanent	Negligible

Description of residual impact / effect	Duration of impact / effect	Significance of impact / effect
Agricultural Use of Merthyr Common		
Site Establishment and Operations	Temporary – Long Term	Minor to Moderate Adverse
Restoration	Permanent	Negligible
Hydrogeology		
During Site Operations		
Groundwater Body (GW1)		
Resource	Temporary – Short Term	Minor adverse
Quality	Temporary – Short Term	Not Significant
Rhaslas Drain (GW2)		
Resource	Temporary – Long Term	Minor adverse
Quality	Temporary – Short Term	Not Significant
River Rhymney Baseflow (R1)		
Flow	Temporary – Short Term	Minor adverse
Quality	Temporary – Long Term	Minor positive
Llechryd PWS (PWS1)		
Resource	Temporary – Short Term	Not Significant
Quality	Temporary – Short Term	Not Significant
Princetown PWS (PWS1)		
Resource	Temporary – Short Term	Not Significant
Quality	Temporary – Short Term	Not Significant
After Restoration		
Groundwater Body (GW1)		
Resource	Temporary – Short Term	Not Significant

Description of residual impact / effect	Duration of impact / effect	Significance of impact / effect
Quality	Permanent	Not Significant
Rhaslas Drain (GW2)		
Resource	Temporary – Short Term	Not Significant
Quality	Permanent	Not Significant
River Rhymney Baseflow (R1)		
Flow	Temporary – Short Term	Minor adverse
Quality	Permanent	Moderate positive
Llechryd PWS (PWS1)		
Resource	Temporary – Short Term	Not Significant
Quality	Temporary – Short Term	Not Significant
Princetown PWS (PWS1)		
Resource	Temporary – Short Term	Not Significant
Quality	Temporary – Short Term	Not Significant
Hydrology and Drainage		
Reduction in the size of Rhaslas Pond and incorporation within the Operational Site's surface water management system. This would be a residual effect during the Operational Phase only (the feature would be reinstated during the Restoration phase).	Temporary (Long Term)	Not Significant (negative)
Removal of upper sections of minor watercourses within the site boundary to enable void excavation and overburden mound construction. Site runoff would be captured and treated within the designated WTAs. This is a residual effect during the Operational Phase only (the features would be reinstated during the Restoration phase).	Temporary (Long Term)	Not Significant (negative)

Description of residual impact / effect	Duration of impact / effect	Significance of impact / effect
Following completion of coaling and restoration of the site, flows to the Bute Level would increase to pre-development levels following reestablishment of flow pathways. However, the quality of the water is predicted to improve since a significant proportion of the coal (and the sulphur within) would have been removed.	Permanent	Minor Significant (positive)
Stabilisation and remediation of eroding spoil above Fochriw would result in a reduction in the sediment being carried by the Nant Bargod Rhymni and causing siltation of the lake at Cwm Darran Country Park.	Permanent	Moderate Significant (positive)
Air Quality and Dust		
Enabling works Including site establishment, land remediation, removal and covering of landfilled materials and construction of facilities	Temporary short term	Negligible
Operation of Mine Dust Deposition in the local community PM_{10} concentrations $PM_{2.5}$ concentrations NO_2 concentrations	Temporary long term	 Minor adverse Minor adverse Negligible Negligible
Transport of Coal Dust Deposition PM_{10} concentrations $PM_{2.5}$ concentrations NO_2 concentrations	Temporary long term	 Negligible Negligible Negligible Negligible
Noise		
Noise from mining operations will be audible at communities around the site	Long term temporary effect (duration of mining)	Minor to moderate
Additional trains used for dispatch of coal from Cwmbargoed Disposal Point will be audible at houses along the train route.	Long term temporary effect (duration of mining)	Negligible or low significance

Description of residual impact / effect	Duration of impact / effect	Significance of impact / effect
Blasting and Vibration		
Blast induced air overpressure effects and ground borne vibrations	Long term, but each event will be of extremely short duration	Negligible to no impact except for Half Way House where the impact will be minor
Cultural Heritage		
Conservation and stabilisation of exposed industrial structures during the programme of making-safe abandoned mine shafts and other ground instability	Permanent	Minor positive
'Added value' research, data accumulation, publication of findings and educational uses of the programme of archaeology results.	Permanent	Minor to moderate positive
Effects to local value resources if safety concerns would not allow for safe archaeological access.	Permanent	Minor adverse
Conservation and management of the southern embankment of Rhaslas Pond	Permanent	Major positive
Landscape and Visual Impact: Landscape Effects		
Landscape context: effects on the five LANDMAP aspects:	Medium to long term	Minor adverse for the Geological Landscape and Landscape Habitats Moderate adverse for the Historic Landscape Major, adverse for the view from the Cultural landscape within 1km reducing to Minor at over 2km Moderate to Minor adverse for Visual & Sensory areas within 1 or 2km, reducing to Minor over 2km.

Description of residual impact / effect	Duration of impact / effect	Significance of impact / effect
The effects of the remediation and restoration proposals on the wider landscape	Long term	Minor to Moderate beneficial, or not noticeably different from the present.
Area 1 Open Upland Initial operations: localised changes, as site facilities were established.	Short term	Minor, adverse
Area 1 Open Upland During mining operations through all operational phases: excavations in the north, site facilities and coal haul route in the west and overburden mound and water treatment area in the south. Long term loss of public access including to the long distance footpath.	Medium to long term during the main operational phases	Major or Major to Moderate
Area 1 Open Upland After restoration, the character of the upland landscape would be reinstated, and public access and connectivity enhanced, a large amenity benefit in the long term.	Long term	Moderate benefit over the whole area, Moderate to Major benefit for public amenity
Area 2 Northern Slopes, Bryn y Pyllog Large changes over most of the area throughout the operational phases.	Medium to long term, during the main operational phases	Moderate to Major
Area 2 Northern Slopes, Bryn y Pyllog Small improvements from the addition of planting in the remediation area during preliminary operations	Short term	Minor, adverse
Area 2 Northern Slopes, Bryn y Pyllog Gradual change as restoration becomes apparent, upgrading landscape features and characteristics; large long term improvements, sufficient to alter perception of landscape character.	Long term, in the remediation area Long term in the operational area	Negligible, beneficial, in the remediation area Major to moderate, beneficial, in the operational area

Description of residual impact / effect	Duration of impact / effect	Significance of impact / effect
Area 3 Northern Enclosed Fields Large changes from initial operations through phase 1. The features would remain in place through to about year 14, when the screen mound would be removed, soils from the storage mounds re-spread, the water treatment area removed, a period of activity and further large change over 1 year.	Medium to long term	Moderate, adverse throughout the operational period
Area 3 Northern Enclosed Fields Gradual medium term change as restoration features became apparent and landscape character re-established; small improvements in additional woodland planting and public access.	Long term	Moderate, beneficial Minor, beneficial, outside the operational area
Area 4 South-eastern Slopes Small changes in this area, although large changes occurring in the neighbouring area to the west. Small short-term landscape changes during remediation works, and small long term beneficial changes as a result of the remediation and the improved public access.	Long term	Minor, beneficial
Area 5 North-eastern Valleys & Tips Large changes during operations In the west of the area. The screen mound a large new feature in the landscape and a medium change over the medium term; removal for backfilling the void, a short period of large change.	Medium to long term	Major, adverse
Area 5 North-eastern Valleys & Tips Restoration proposals in the west of the area would re-establish characteristic landscape features and improved public access: a medium improvement over current landscape condition, and a long term benefit.	Long term	Moderate, beneficial, in the operational area

Description of residual impact / effect	Duration of impact / effect	Significance of impact / effect
Area 5 North-eastern Valleys & Tips Remediation works and landscape enhancements in the eastern part: large long term benefit to the landscape character and amenity.	Long term	Major, beneficial in the remediation area
Area 6 South-eastern Valleyside Small changes during operations, although large changes occurring in the neighbouring area to the west.	Long term	Minor ,adverse and localised at the water treatment area
Area 6 South-eastern Valleyside Small short-term landscape changes during remediation works, and small long term beneficial changes as a result of the remediation and the improved public access.	Long term	Minor, beneficial
Area 7 Southern Tips Small changes in the short term, with long term benefits to amenity and landscape character.	Short term during the engineering works; Long term benefit to the landscape character	Minor adverse Moderate, beneficial
Area 8 Cwmbargoed Disposal Point The only changes in the landscape at the CDP would be the construction of the wash plant building and formation of the water recycling area.	Short term during construction and long term during operation	Minor, adverse
Area 8 Cwmbargoed Disposal Point Restoration to its present landscape character.	Long term	Negligible, neutral
Effects on additional areas of **land used temporarily for stock grazing** by the Commoners and for public access.	Long term	No adverse effects on landscape character

Description of residual impact / effect	Duration of impact / effect	Significance of impact / effect
Effects on additional areas of land used temporarily for public access	Long term	Benefit to the community from increased or easier public access to the countryside.
The Intrinsically Dark character of the operational areas of the site itself would be changed during the operational period to one of Low Distinct Brightness. For other areas, the lighting of the site and operations would be visible to varying degrees and varying with the phases of operations. The Intrinsically Dark character of the site and its appearance in views from surrounding areas would be restored with completion of landscape restoration.	Medium to long term during operations Permanent	Minor to Moderate, adverse No effect
Landscape and Visual Impact: Visual Effects		
Residents within 2km of the site with direct open views, when the overburden and screening mound were being formed during the early phases of excavations and later removed to fill the final void.	Intermittent, short to medium term	Major, adverse
Residents with oblique or indirect views and more distant residents.	Intermittent, short to medium term	Moderate, adverse
Residents within 2km of the site with direct open views, while the overburden and screening mounds remain in place as elements in the landscape. For the very near residents in Fochriw, the overburden mound would screen other operational areas of the site from view.	Medium term	Moderate, adverse generally Minor for more distant viewers
Users of the Rhymney Valley Ridgeway Footpath, when the overburden mound is created and removed	Intermittent, short to medium term	Moderate to Major, adverse
Users of the Rhymney Valley Ridgeway Footpath, after the overburden mound is established	Medium to long term	Moderate, adverse
Users of the Rhymney Valley Ridgeway Footpath, during the initial operations and aftercare.	Short term	Minor to Negligible

Description of residual impact / effect	Duration of impact / effect	Significance of impact / effect
Users of the Sirhowy Valley Walk, during the main excavation phases.	Medium to long term	Minor, adverse
Because of the low level routes followed by the **promoted cycle routes** near the site, the visual effects would vary.	Intermittent, short to medium term	Varying from None to Moderate adverse
Users of rights of way and access land near the site, the phases of greatest change would be when the overburden and screening mound were being formed and later removed	Medium term	Major
Users of rights of way and access land near the site, effects due to the presence of the overburden mound	Long term	Moderate
Users of rights of way and access land near the site, during initial operations and restoration aftercare	Short term	Minor, adverse
Users of rights of way and access land more than 5km from the site, during these phases,	Medium term	No more than Minor, adverse Moderate, adverse at intermediate distances.
Visual effects during the phases of greatest changes for visitors to Parc Bryn Bach **Country Park** and users of the ridges for **paragliding**.	Medium term	No more than Moderate, adverse
Users of local amenity open spaces and golf courses, in the phases of greatest change.	Medium term	Minor to Moderate, adverse
Views available from **Rhymney Town centre and conservation area** are generally framed glimpses where streets or junctions or the playing field open views towards the site, during overburden mound construction and removal		Moderate adverse Minor adverse during other phases
Travellers along the roads, during the main operational phases	Medium to long term	Minor or Moderate, adverse
Travellers along the roads, during initial operations and restoration aftercare	Short term	Minor or Negligible

Description of residual impact / effect	Duration of impact / effect	Significance of impact / effect
From the north-west of the site on **Fochriw Road**, during the main operations the view would include the built facilities and coal processing facility	Medium to long term	Moderate to Major
From the north-west of the site on **Fochriw Road**, during initial operations and restoration aftercare	Short term	Moderate to Minor; Negligible.
Views from **Rhymney conservation area** in which the **remedial and landscape enhancement works** would be visible, their visual effect over the baseline condition	Long term	Moderate, beneficial
More distant elevated views from the east in which the **remedial and landscape enhancement works** would be visible, represented by viewpoints at Bryn Carno and Ras Bryn Oer.	Long term	Minor beneficial
Waste		
Leachable levels of contamination remaining in MIS landfill impacting upon underlying groundwater.	Temporary – Short Term	Minor
Process wastes reaching proximal surface watercourses (particularly during storm events where the working void will be allowed to flood rather than discharge non-compliant effluent to watercourse)	Temporary – Medium Term	Negligible / Minor
Increase in volume of traffic.	Temporary – Short Term	Negligible / Minor

Conclusions: The balance of effects

20.259 The most significant of the above environmental effects relate to ecology, notably the land take within the SINC and the effect on breeding birds, and landscape and visual impact, notably the physical landscape changes associated with the surface mine and overburden mound, and the visual effects of the development, particularly during the short term construction of the eastern screening mound, and the construction and eventual removal of the main overburden mound.

20.260 Notwithstanding these key issues, it is apparent from the assessments in Chapters 5 to 19 of this ES that the mitigation measures incorporated within the project design have achieved residual environmental impacts that fall within the environmental limits and objectives set out in MPPW and MTAN2, particularly in relation to noise, blast vibration, and dust controls. It is noteworthy that, with the exceptions identified above, no other major adverse effects are predicted for any of the remaining environmental and amenity topics which have been

assessed. Moreover, and despite the conclusions reached regarding the adverse ecological and landscape / visual effects, the effects would be temporary and fully mitigated via the restoration scheme. These temporary negative effects can be contrasted with significant positive permanent environmental effects in terms of the remediation of mine hazards, improvements in mine water quality, and improvements to discharge in the water course feeding the lake at Parc Cwm Darran. Overall, the project can be rendered environmentally acceptable by the imposition of suitable planning conditions and/or planning obligations that reflect Government advice and guidance, and local planning policy.

20.261 The written statement of the adopted Caerphilly County Borough Local Development Plan states that:

"Caerphilly County Borough Council is the Mineral Planning Authority with responsibility for planning control over minerals exploration and working within the County Borough. There is no companion guide to MPPW. However, the Council considers that, on minerals issues, national policy and guidance is sufficiently clear and therefore will be relied upon in the determination of planning applications in relation to mineral extraction and related development, in conjunction with any relevant countywide policies and site-specific policies contained within the LDP" (see paragraph 0.44)

20.262 The Nant Llesg proposal is considered to be in accordance with relevant countywide and site specific LDP policies, and with the development plan as a whole.

20.263 Paragraph 62 of Minerals Planning Policy Wales (MPPW) states:

"62. Proposals for opencast or deep-mine development or colliery spoil disposal will be expected to meet the following requirements otherwise they should not be approved:

- *The proposal should be environmentally acceptable or can be made so by planning conditions or obligations, and there must be no lasting environmental damage;*

- *If this cannot be achieved, it should provide local or community benefits which clearly outweigh the disbenefits of likely impacts to justify the grant of planning permission;"*

20.264 The above requirements are commonly referred to as the 'first and second tests of MPPW' and form a central theme of current minerals planning policy.

20.265 In relation to the 'first test', it is concluded from the findings of the EIA that:

(a) the development could proceed in an "*environmentally acceptable*" way;

(b) there would be "no lasting environmental damage"; and

(c) the various environmental commitments and mitigation measures can be controlled by "*planning conditions"* and a legal agreement.

20.266 The development is considered to be in accordance with relevant LDP policies and with the development plan as a whole and it is therefore further concluded that the development could proceed in accordance with the development plan.

20.267 Notwithstanding the above conclusions, the development would also satisfy the 'second test', set out above, in bringing substantial local community benefits, including:

(i) the remediation of historic mining dereliction associated with the treatment of mining shafts and adits which will improve public amenity and create safe conditions for public access to extensive areas of land;

(ii) restoration of land to open mountain grassland, interspersed with woodland belts and a substantial package of new paths as a public amenity;

(iii) the improvement in the second worst mine water discharge in Wales which is unlikely to be rectified with public funds absent the scheme;

(iv) the improvement in the run off of siltation to the lake in Darren Country Park;

(v) the improvement of visibility along the southern approach to the junction of Bogey Road and Fochriw Road to improve highway safety;

(vi) remediation and/or removal of waste from the MIS landfill;

(vii) a superior restoration of an area previously subjected to former and somewhat pioneering 'opencast' mining;

(viii) the creation of areas of nature conservation (and geo diversity conservation) as part of the restoration scheme, together with substantial off site biodiversity benefits at the Bryn Caerau area; and

(ix) demonstrable employment and economic benefits associated with direct and indirect employment and the overall contribution to the local economy.

20.268 It follows from the above that the overall balance of need and benefits against environmental effects weighs heavily in favour of planning permission being granted.

Contact Us

If you would like any further information on the proposals then please get in touch:

Call: Freephone 0800 169 6507

Email:
ma.enquiries@millerargent.co.uk

Visit: www.nantllesg.co.uk

These details will put you in touch with PPS Group which coordinates our Nant Llesg public consultation activity.