CONTENTS

INTRODUCTION

Chapters 6 to 12 of this ES have set out the findings of the EIA for a range of environmental topics, and in particular, ascertain the potential significance of identified effects. The topics considered as part of the EIA have been determined through a process of scoping (refer to Chapter 4 of this Volume). It is possible for a number of the environmental topics to impact upon nearby receptors; whilst individually, the impacts may be within accepted limits, collectively, the impacts may be more significant. These are referred to as "*inter-relationships between impacts*". At the same time, potential impacts associated with the proposed development may be acceptable in isolation, but when considered in the context of other developments in the immediate vicinity, may become more significant. These are referred to as "*Cumulative Effects*".

14.1 The previous chapters in this volume set out the cumulative effects that may arise. This Chapter of the ES therefore draws together the potential cumulative impacts arising through the proposed amendment of the restoration scheme. It also summarises the main interactions between the environmental topics that form part of the EIA.

LEGAL BACKGROUND

EIA Regulations

14.2 Within Chapter 4 of this Volume, the statutory requirements regarding the content of an ES have been set out. Paragraph 5(e) to Schedule 4 of the EIA Regulations provides that an ES may contain a description of the likely significant effects of the development on the environment resulting from "*the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources*".

14.3 This is not a mandatory requirement of an ES (being the items listed in Regulation 5(a) to (e)), but one which is required where "*relevant to the specific characteristics of the development and to the environmental features likely to be affected*".

Planning Practice Guidance

14.4 Whilst applying the interpretation of the EIA Regulations in England, in the absence of recent similar guidance on the EIA Regulations in Wales it provides useful context. Paragraph 017 (Reference ID: 27-017-20140306) to the web based PPG comments that:

> *"Some parts of a mineral planning authority area may have been subjected to successive mineral development (such as aggregate extraction or surface coal mining) over a number*

of years. Mineral planning authorities should include appropriate policies in their minerals local plan, where appropriate, to ensure that the cumulative impact of a proposed mineral development on the community and the environment will be acceptable. The cumulative impact of mineral development is also capable of being a material consideration when determining individual planning applications."

CUMULATIVE EFFECTS

14.5 There is a broad range of opinion on the definition of cumulative impacts[1]. The widely accepted definition is that provided by the United States Council on Environmental Quality in 1978:

'the impacts on the environment which result from incremental impacts of the action when added to other past, present and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time".

14.6 IEMA goes on to comment that cumulative impacts may occur:

• Physical-chemical transport	A physical or chemical emission is transported away from a proposed project where it then interacts with another pollutant (e.g., air emissions, waste water effluent, sediment). Several entirely separate developments can therefore have a cumulative impact at a location some distance away from the project location
• Nibbling loss	Occurring as a result of the gradual disturbance and loss of land and habitat (e.g., clearing of land for new housing and roads.)
• Spatial and temporal crowding	Cumulative effects can occur when too much is happening within too small an area and in too brief a period of time. Spatial crowding results in an overlap of effects (e.g., noise from a road adjacent to an industrial site, confluence of stack emission plumes). Temporal crowding may occur if effects from different actions overlap or occur before the receptor has had time to recover.
• Growth-inducing potential	A project can induce further projects to occur. (e.g., bypass for a town creating new development opportunities)
• Combined effects	These occur when different types of effects all affect the same receptor. Assessed individually they may be considered to be insignificant, but when combined result in a significant effect on the receptor (e.g. perceived change in the quality of life of a household or

[1] Page 11/4. Guidelines for Environmental Impact Assessment. IEMA

community)

14.7 Cumulative impacts have also been described[2] as being those impacts caused by the sum of the projects impacts on the environment component, and/or the projects impacts when added to those of other past, present or future projects. Cumulative impacts can be:

- additive, aggregative or "nibbling", namely the simple sum of all of the impacts;
- synergistic, where impacts interact to produce an impact greater than the sum of the individual impact; and
- neutralising or antagonistic impact, where the impacts counteract each other, reducing the overall impact.

14.8 Cumulative impacts may therefore result from a number of situations:

- the interaction or proximity of two or more current mineral operations (not necessarily for the same type of mineral) or developments of a similar nature;
- the continuation of a particular working over a period of time through successive extensions;
- the interaction or accumulation of different impacts at one site, affecting a range of sensitive receptors; and
- a combination of the above scenarios.

14.9 In considering the potential cumulative impacts, it is important to keep in mind the extant planning permissions for Penrhyn Quarry.

LAND USE

Other Mineral Sites

14.10 Apart from the existing quarry workings to the north and east of the extension area there are no other active mineral operations within the vicinity of Penrhyn Quarry. To the south are the former large scale quarry workings at Dinorwig, within the Llanberis valley. These workings are physically separated by intervening mountainous topography (Elidir Fawr) which inhibit the potential for any significant cumulative effects.

14.11 A former quarry (Marchlyn) lies to the south-west of the existing quarry workings with intervisibility between the two; however, this quarry has been abandoned and has assimilated into the local landscape. With the exception of potential visual effects, no other potential cumulative effects arise. Similarly, some 3km to the north of Penrhyn Quarry is another abandoned quarry, located approximately 1km north-east of Rachub.

14.12 In relation to the potential cumulative effects with the existing operations, these have been addressed in the previous chapters and none have been identified. In this context, based on the

[2] Methods of Environmental Impact Assessment. P Morris and R Therivel. UCL Press 2000

mitigation measures that have been put forward (including those designed into the scheme) no significant residual effects have been identified as a result of developing the proposed extension.

Other Developments with Similar Characteristics

14.13 Other types of development that would potentially have similar characteristics to the quarrying operations would be the construction phase of large housing developments, retail of industrial parks, especially in the context of noise, air quality (dust), movement of plant and machinery and disturbance of the ground (removal of vegetation and soils for example). Given the rural nature of the locality very few opportunities exist for such development in the vicinity of the proposed extension and certainly no large scale schemes.

ENVIRONMENTAL QUALITY

Landscape and Visual

14.14 As noted above, there apart from the existing quarry workings to the north and east of the extension area there are no other active mineral operations within the vicinity of Penrhyn Quarry. This limits the potential for any cumulative landscape or visual effects with other mineral developments.

14.15 Consideration has been given to the potential for cumulative landscape and visual effects of the development proposal with regard to mineral development. The existing Penrhyn Quarry and other historic quarries within the area form part of the established baseline, against which the proposed developments within Penrhyn Quarry and the proposed quarry extension are judged. The restricted nature of the resultant landscape and visual effects are thus considered to be unlikely to lead to further additional or combined cumulative landscape and visual effects as change will be viewed within the baseline of the existing permitted works.

14.16 The proposed extension is a relatively limited increase in the extent of quarrying, proposed due to an increase in geological knowledge and development of optimal extraction methods. The extension area is contained wholly within the Llanberis – Bethesda Landscape Character Area , the description of which reflects the heavy influence of the quarry industry.

14.17 In the case of the proposed development adverse landscape and visual effects would occur from the proposed mineral extension, although this is a very limited area within the context of the large -scale landscape of the study area, and outside the Snowdonia National Park. Any changes resulting from this extension would also be in the context of the existing quarry and no significant effects are predicted to occur. The importance of the Fronllwydd and Elidir Fach ridges are identified in the LVIA and these limit the effects of the existing quarry, as well as the extension area within the wider Snowdonia National Park.

14.18 In view of this, no significant cumulative effects have been identified.

Ecology

14.19 An ecological impact assessment has been carried out and is presented in Chapter 7 of this volume. The assessment has considered the potential effects upon designates sites in the area, the habitats that would be lost as well as the potential effects on important species identified through survey work.

14.20 Within the ecological assessment cumulative effects are assessed in terms of residual effects only (whether significant or not) and on the basis that proposed mitigation measures are implemented. Where no effects or unappreciable effects on an ecological feature are predicted when considering the project alone then there is no pathway for cumulative effects to occur.

14.21 No plans or projects have been identified in the vicinity of the site that could potentially give rise to cumulative impacts. Based on the above, no significant effects are likely during operation or restoration in-combination with other plans or projects.

14.22 In view of this, no significant cumulative effects have been identified.

Cultural Heritage

14.23 An assessment has been undertaken in relation to Cultural Heritage and is presented in Chapter 8 of this volume. It is development within the proposed extension area that has the potential to affect heritage assets and their significance both directly and indirectly, and which is thus of relevance.

14.24 Although the proposed extension is an industrial feature, it is part of an existing substantial complex and would largely be absorbed into the profile and massing of the current quarry. There are no other planned major developments within the vicinity of the quarry that in combination could affect the setting of designated heritage assets.

14.25 The assessment concludes that, having regard to the baseline conditions, the nature of the proposed development and the proposed measures that would be effective in mitigating the impacts of the scheme, there would be no significant residual effects (direct, indirect, cumulative or combined) upon known cultural heritage assets. The proposed development therefore fully accords with both local and national cultural heritage policy. It is supported by Objective 7 of the World Heritage Site Management Plan that promotes a sustainable slate industry.

14.26 In view of this no cumulative effects have been identified in respect of cultural heritage.

Water Environment

14.27 The assessment undertaken in relation to the water environment has considered the potential cumulative hydrological effect of the proposed development taking into account the wider development around the quarry. It is noted that there are no other quarries within the study area.

14.28 It has been shown that the proposed development at the application site would have no significant effect on ground or surface water resources or flood risk. It is concluded, therefore, that the proposed development would not result in any cumulative effect on groundwater, surface water or flood risk, locally or regionally.

Noise

14.29 For noise, cumulative impacts can occur if noise from the proposed development would add significantly to background noise levels at nearby receptors.

14.30 Chapter 10 of this Volume sets out a detailed noise assessment, based on worst case predictions on noise propagation. The assessment, which is based on recognised standards, compares predicted noise levels against measured background noise levels to assess the likely degree of impact. In so doing, the assessment considers the likelihood for cumulative impacts to occur.

14.31 The existing quarry workings would continue to operate in the same manner, i.e. materials would be extracted from the working face and transported to the production site for processing. The noise predictions represent a worst-case scenario in terms of plant and equipment locations where mobile equipment is operating at its closest approach to the nearby receptors or in locations where attenuation provided by the screening bunds is at a minimum.

14.32 The assessment shows that the worst-case predicted noise levels generated by the existing daytime operations would be below the conditioned noise limits at all of the receptor locations considered.

14.33 In view of this, no significant cumulative effects have been identified.

Air Quality

14.34 The vast majority of emissions of dust from the operations (extraction, tipping and associated haulage) would be deposited within 100m of the source[3], although particles of between >10µm and <30µm may travel 250m to 500m. As such the potential for cumulative dust impacts to occur are limited given the lack of other potential sources and limited number of receptors. The assessment has determined that there will not be any significant air quality effects as a result of the proposals.

Vibration

14.35 The absence of any other quarries and the large separation distance between the quarry workings (as extended) and vibration sensitive receptors means that the likelihood of any significant cumulative effects is near zero. In this respect, vibration levels have been predicted at less than

[3] Based upon research document - DETR, The Environmental Effects of Dust from Surface Mineral Workings (Dec 1995)

1mm/s at the nearest receptor, which is well below the limits imposed in the current planning permission or indeed Welsh Government guidance.

14.36 In view of this, no significant cumulative effects have been identified.

CONCLUSION

14.37 Cumulative effects may result from a number of situations:

- the interaction or proximity of two or more current mineral operations (not necessarily for the same type of mineral) or developments of a similar nature;
- the continuation of a particular working over a period of time through successive extensions;
- the interaction or accumulation of different impacts at one site, affecting a range of sensitive receptors; and
- a combination of the above scenarios.

14.38 In considering the potential cumulative impacts, it is important to keep in mind the extant planning permissions for the quarry.

14.39 Consideration has been given to the potential cumulative effects with existing operations and no cumulative effects have been identified. There are no other mineral operations within the immediate vicinity of the proposed extension that could give rise to cumulative effects. In addition, there are no other forms of developments in the area that would give rise to any significant cumulative effects.