



Carew Quarry ROMP Review



Environmental Statement Volume 1

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1.0 INTRODUCTION

1.1 Background

This Environmental Statement (ES) sets out the results of an Environmental Impact Assessment (EIA) of the effects of quarrying and related activities at Carew Quarry, Carew Cheriton in Pembrokeshire. The location of Carew Quarry is illustrated on Figure 1.01.

The exercise is part of a mandatory review of planning conditions at quarries, which is a requirement of the Environment Act 1995. The provisions of the Act require that the planning conditions regulating operations at all active quarries should be the subject of reviews at 15 year intervals. These requirements are explained in more detail in section 1.2 below. In this context, the primary purpose of the EIA has been to consider the environmental effects of the permitted operations at Carew Quarry, and to use the environmental information as a basis for drafting updated planning conditions to control the ongoing operation.

Quarrying at Carew commenced in 1919, initially as a source of lime for various lime kilns situated in the general locality. Operations have continued since then, with the focus now on the supply of high quality crushed limestone as an aggregate for the construction industry. The first planning permission was granted in 1947 under the provisions of an Interim Development Order (IDO) (reference PR/92). Since that time there have been a series of planning permissions for extensions to the original quarry, comprising a south eastern extension in 1961 (reference PR/1123); a further south eastern extension in 1970 (reference PR/1123/1); a southern extension in 1972 (reference PR/2676); a further southern extension in 1987 (NP/40/87); and a western extension in 1992 (reference NP/113/89).

In August 1997, a planning application was submitted to 'consolidate' all the above planning permissions into one single permission. The application was approved on 17th December 1997 (reference

NP/319/97), and it is this permission which now forms the subject of the 15 year review (to be submitted by 17th December 2012).

There have been a series of subsequent planning permissions which have granted approval for a concrete blockworks and for inert waste recycling. There have also been a number of permissions which have amended conditions imposed on the 1997 permission relating to, inter alia, hours of working and imports of material for use in the concrete blockworks. However, the dominant permission which is the subject of the review remains the 1997 permission (reference NP/319/97).

The 1997 planning permission includes a comprehensive set of 83 planning conditions covering hours of working; control of noise, dust and blast vibration; safeguarding of ground and surface water; removal of plant upon completion quarrying; and the implementation of a restoration scheme. The conditions form the basis of the current Review which considers the extent to which the conditions need to be updated to reflect the results of the EIA, current circumstances at the quarry, and up to date regulatory guidance which has emerged since the planning permission was issued in 1997. The consideration of updated conditions is also informed by a more recent planning permission granted in March 2011 as a renewal of permission for an inert waste recycling operation at the quarry (reference NP/10/482). That permission was granted for a temporary period to coincide with the current review (December 2012) but it imposes a comprehensive and updated schedule of conditions which provides a helpful starting position for the consideration of updated conditions as part of the formal Review.

1.2 Legislative Context

The Environment Act 1995 sets out a process whereby the planning conditions imposed on mineral planning permissions are reviewed on a 15 year cycle. This is to ensure that conditions do not become outdated with the passage of time. Guidance on the procedures to be followed, and the approach which Mineral Planning Authorities (MPA's)

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need to follow as part of a Review are set out in Mineral Planning Guidance Note 14 (MPG14) issued in September 1995. The exercise of a 'Review of Old Mining Permissions' is commonly referred to by the acronym 'ROMP Review'.

Since the introduction of the Environment Act 1995, new EIA Regulations have been introduced (in 2000) to apply the EIA requirements to ROMP applications submitted after the Regulations came into force in November 2000 (reference Regulation 26A inserted into the 1999 EIA Regulations). The EIA Regulations 1999 set out a series of thresholds which are to be used to assess whether applications (or in this case ROMP Reviews) need to be supported by an EIA. Further guidance is set out in Welsh Office Circular 11/99, which indicates that EIA is likely to be required in 'sensitive areas' (Regulation 2- which includes land in a National Park), and for quarries which cover more than 15 hectares or involve the extraction of more than 30,000 tonnes of mineral per annum (reference Circular 11/99 paragraph A7). The Carew Quarry ROMP Review qualifies for EIA under the location and output criteria, and the Applicants have thus agreed at the outset that the application will be accompanied by an EIA.

1.3 Environmental Impact Assessment and Environmental Statement

1.3.1 Context

It is apparent from the nature of a Review of planning conditions that planning permission for quarrying at Carew already exists. The principle of quarrying is therefore not an issue for reconsideration as part of the Review, unless the environmental effects are deemed to be of such significance that the existing planning permission should be formally modified or revoked. If that were to occur then compensation would be payable to the Applicants for the loss of the mineral asset.

1.3.2 Purpose of the ES

In practical terms, an EIA is a constructive means of assisting the drafting of updated planning conditions in that allows environmental effects to be identified through the EIA process; mitigation measures to minimise environmental effects can be defined; and these in turn can be translated into updating planning conditions. The EIA can thus be an effective means of informing the matters which should appropriately be covered by updating planning conditions, and in highlighting up to date environmental standards and criteria which should be applied. Thus, whilst an EIA needs to assess the environmental effects of the ongoing development, it's focus is rather different to studies which accompany planning applications for e.g. extensions to quarries. With planning applications, the EIA is testing the principle of whether a new development is acceptable in environmental terms: with a ROMP Review application the principle of environmental acceptability has already been established, and the purpose now is simply for the EIA to inform the drafting of updated conditions to regulate the ongoing, already permitted, development. The scope of the technical EIA studies has been defined accordingly.

1.3.3 Technical Studies

The content of the EIA and respective technical studies has been informed by informal discussions held with the Pembrokeshire Coast National Park Authority (NPA), by the Applicants experience of operating the quarry, and by the external consultancy services employed by Thomas Scourfield & Sons, many of whom have longstanding background knowledge of the quarry.

Specific technical studies have been undertaken to deal with:

- Hydrology and Hydrogeology – Parsons Brinckerhoff Limited
- Landscape and Visual Effects: SLR Consulting Limited
- Ecology: SLR Consulting Limited
- Noise: SLR Consulting Limited

Inputs on other technical issues have been prepared by other specialists within SLR, supplemented by technical inputs on the phased quarry development, working practices, quarry blast design, and operational mitigation measures provided by in-house expertise available to the Applicant.

The EIA and preparation of the ES has been coordinated by SLR Consulting Limited. SLR are members of the Institute of Environmental Assessment and Management, with specialist capability in minerals planning.

1.3.4 Format of the ES

The ES has been prepared to fulfil the requirements set out in the Town and Country Planning (Environmental Impact Assessment (England and Wales) Regulations 1999 regarding the content of environmental statements (Schedule 4), and to follow the further advice set out in the Welsh Government booklet; Environmental Assessment – ‘A Guide to the Procedures’.

The ES is accordingly sub divided in to a number of sections, namely:

1.0 Introduction which sets out the background the preparation of the ES and the underlying purpose of the ROMP Review;

2.0 The Site and its Surroundings which provides a summary baseline description of the site, as an introduction to the more detailed baseline descriptions set out in the impact assessment chapters;

3.0 The Ongoing Development, which describes the details of the quarry development scheme and conceptual restoration strategy;

4.0-12.0 Environmental Effects and Mitigation Measures which describes, in detail, the potential effects of the development under the chapter headings of landscape and visual effects (5.0); Ecology (6.0);

Hydrology and Hydrogeology (7.0); Noise (8.0); Blast Vibration (9.0); Dust (10.0); Traffic (11.0); and Cultural Heritage (12.0)

13.0 Planning Policy Considerations, which analyses the planning policy issues against which the ongoing development can be considered, and which provides a further context for the drafting of planning conditions;

14.0 Summary of Environmental Issues; which draws upon the content of preceding chapters in identifying issues which require control via planning conditions, and which cross refers to an updated schedule of conditions prepared by the Applicant;

15.0 Conclusions and Planning Conditions; which provides a general overview of the EIA, and the schedule of updated planning conditions produced as an Annex to the ES.

1.4 Submitted Documents

The ES seeks to provide an objective account of the environmental effects of the overall proposed development. The aims of the statement are to:

- (a) Describe the baseline conditions at the site against which changes and effects can be assessed.
- (b) Describe the details of the respective elements of the overall scheme.
- (c) Consider the potential environmental effects of the development.
- (d) Describe the measures which are available to mitigate those effects.
- (e) Assess the likely effectiveness of the mitigation measures.

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- (f) Draw conclusions which will assist in the drafting of up-to-date planning conditions controlling the ongoing operations at the quarry.

The ES (Volume 1) draws together the inputs from the specialist technical consultants who have undertaken the EIA, and is intended to be a self-contained document which covers all relevant topics. It does however cross-refer to a number of background documents and technical appendices prepared by the consultant team, which have been bound into Volume 2.

The ES reproduces a series of figures which have been prepared by the EIA project team as part of their inputs into the ES. These are reproduced within Volume 3 of the overall submission. Volume 3 also includes the quarry development and restoration plans which have formed the context for the EIA.

A Non-Technical Summary of the ES has been prepared as a separate document (Volume 4) as a means of enabling the findings and conclusions of the ES to be more readily understood.

1.5 Planning Conditions

The purpose of the Review is to formulate a schedule of updated planning conditions which reflect modern standards and controls, and which provide (i) detailed controls over on-going operations for the 15 year Review period; and (ii) a context for subsequent Reviews by confirming the longer term intentions for the development of the Quarry, and the final restoration strategy.

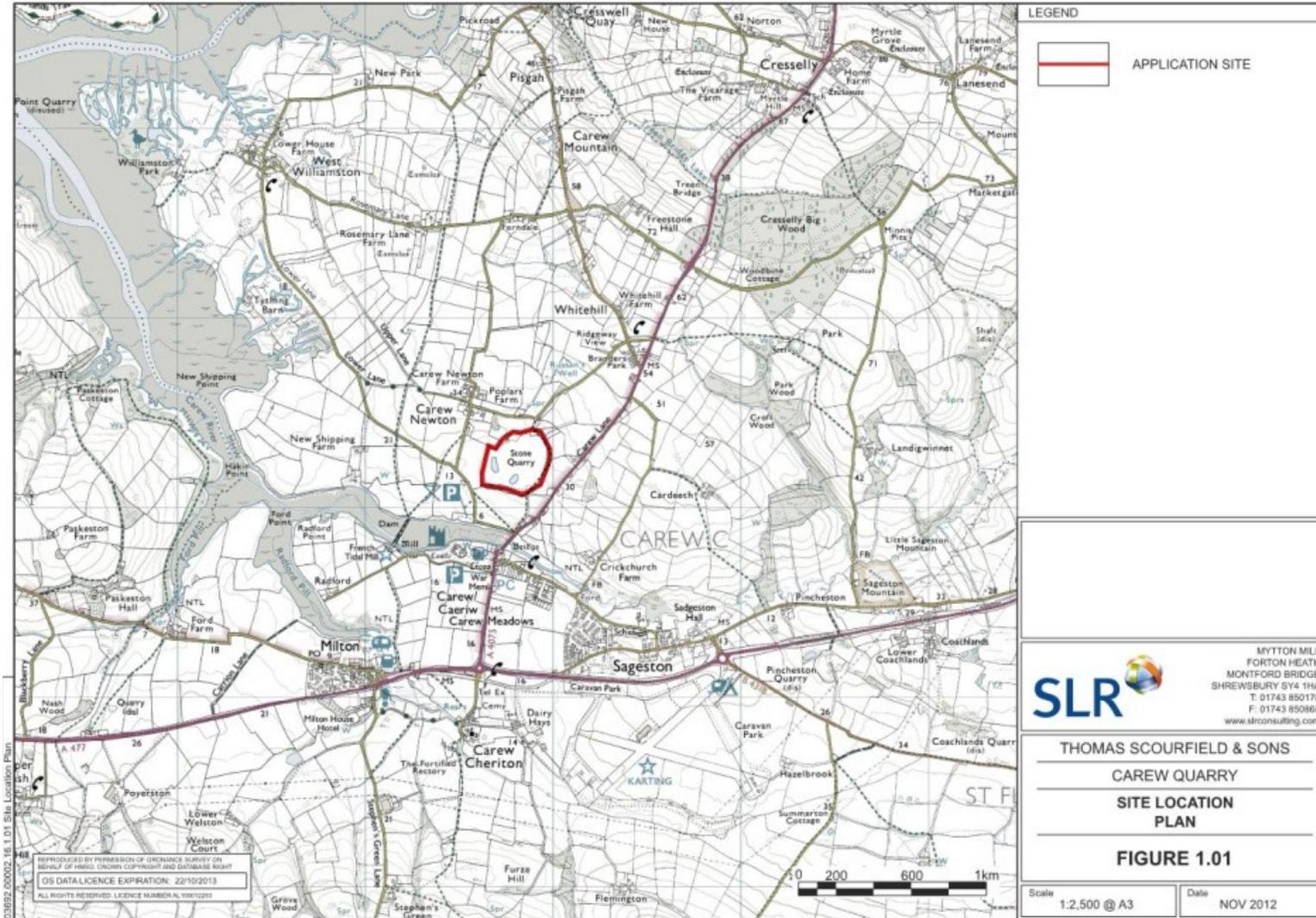
The initial onus is on the Applicant to propose an updated schedule of planning conditions. The purpose of the EIA and this ES is to facilitate that exercise by providing an environmental context for the development scheme and environmental and amenity conditions which should logically be associated with the scheme. The ES also includes a review of planning policy guidance which recommends specific criteria

levels for e.g. blast vibration which are more stringent than the limits prescribed in the current planning conditions.

Pembrokeshire Coast Natural Park Authority (NPA) is not obliged to accept the planning conditions proposed by the Applicant, and they are entitled to impose different conditions or additional conditions. However, where a Mineral Planning Authority (MPA) determines conditions different from those submitted by the Applicant and the effect of the new conditions, other than restoration or aftercare, as compared with the effect of the existing conditions is to impose a restriction on working rights, then Applicants whose interests have been adversely affected by the restrictions will be entitled to claim compensation (ref. Schedule 14, paragraph 13 of the Environment Act 1995).

The conditions proposed by the Applicant are produced as Annex 1 to the ES, and the rationale behind the conditions is summarised in Chapter 14.0 of the ES. The updated quarry development scheme and the proposed updated conditions are considered to represent a positive and constructive approach to devising an environmentally sensitive operation, and to regulating the development by modern, up to date planning controls. In those terms, the exercise associated with the EIA has been of positive value in preparing specific conditions which reflect the conclusions and recommendations of the EIA.

Figure 1.01
Site location Plan



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2.0 CAREW QUARRY APPLICATION SITE

2.1 Location and Topography

Carew Quarry is a long established quarry which extracts Carboniferous Limestone from the north eastern limit of a north westerly trending anti-cline, within limestones of the Pembrokeshire Limestone Series.

The quarry is centred on National Grid Reference SN048043, within south westerly facing ground on the northern side of the Carew River, south east of the village of Carew Newton in Pembrokeshire.

Ground elevations around the quarry perimeter vary between 20-30 metres AOD, rising to 57 metres AOD at Whitehill, approximately 1 kilometre to the north east.

2.2 The Quarry Site

The site extends to some 9.48 hectares, and comprises an operational quarry void with quarry faces and benches; areas of historic quarry tips; existing and redundant internal quarry haul roads; areas of standing water at the base of the void; a fixed crushing and screening plant; ancillary mobile plant; aggregate stock piles; a concrete blockworks and associated ready mix concrete plant; site offices and workshop buildings; a car park and HGV lorry park; and associated access road and circulation space.

The quarry has been worked to its lateral limits, and its operations are now focused on developing the quarry faces and benches and deferring the quarry floor

2.3 Landscape Context

The quarry has been developed within a gentle ridgeline, with the site boundaries defined to retain the outer edges of the ridgeline. As a result, the quarry is very well contained and screened in the landscape. The visual impact assessment discussed in chapter 5.0 of the ES highlights the limited viewpoints of the quarry which are available, and the very limited visual effects associated with the quarrying operations.

2.4 Ecology

The site is not subject to any statutory or non statutory nature conservation designations. There are however, a number of statutory designations in the vicinity of the site, comprising the Millford Haven Waterway SSSI and Carew Castle SSSI to the south of the site, and components of the Pembrokeshire Marine SAC and the Pembrokeshire Bat Sites and Bosherton Lakes SAC, also situated to the south of the site.

A detailed Phase 1 Habitat Survey has not identified any important habitat, flora or fauna at the site. Peregrine falcons have successfully nested at the site, apparently undisturbed by the operations continuing in other parts of the quarry.

2.5 Hydrology and Hydrogeology

The main water features in the area are the Carew River and Mill Pond to the south, with surface water drainage in the form of small streams in the vicinity of the quarry.

The site lies outside the boundary of a Groundwater Source Protection Zone for Milton Springs, and is separated from the defined zone by the Carew River. There are no ground or surface water abstraction sites in the immediate vicinity of the quarry.

APPLICATION SITE 2

Water collects in the base of the quarry in a sump, where the main component is surface water. Water is pumped out of the quarry to a catch pit/soakaway located in the field immediately to the south of the quarry. The water from the soakaway infiltrates back into the ground, or partly enters the Mill Pond. The pumping of water is regulated by a Discharge Consent Licence issued by the Environment Agency.

2.6 Cultural Heritage

The site is not affected by any cultural heritage designations, and any buried archaeology which may have been present at the site has been destroyed by historic quarrying operations.

There are 3 Scheduled Ancient Monuments, 14 Listed Buildings and a Conservation Area at Carew village, and the indirect effects on these features are considered as part of the impact assessment set out in Chapter 12.0 of the ES.

3.0 QUARRY DEVELOPMENT

3.1 Introduction

The quarry development scheme which accompanied the 1997 planning application anticipated the progressive deepening of the quarry, with a series of benches, served by haul roads initially along the western side of the quarry, and then focused along the eastern side. The base of the central and western areas of the quarry were planned to be progressively widened and deepened, with haul roads removed when no longer required for operational purposes, with the faces then worked back to their final positions. The quarry has been developed over the 15 year period consistent with these principles.

The quarry requires de-watering to maintain access to reserves below the water table, and groundwater is discharged off-site via a series of settlement pits located to the south west of the quarry. These de-watering operations are regulated by a Discharge Consent Licence issued by the Environment Agency in 2005.

In order to provide a context for the EIA, the quarry development plans have been updated to reflect current circumstances and the anticipated progress of quarrying for the duration of the 15 year period, together with the final quarry development layout. The exercise has been further informed by an updated topographic survey (produced as Plan ref CQ/2), which has provided the basis for the quarry development plans.

3.2 Phased Quarry Development Scheme

The updated quarry development scheme is illustrated on Plans CQ/3 – CQ/6 produced within ES Volume 4. The plans have been based upon the exploitation of a total remaining reserve of some 3.7m tonnes of limestone, at an extraction rate of some 150,000 tonnes per annum, over a period of some 25 years. The rate of quarry output has fluctuated in recent years as a reflection of economic circumstances within a range of over 250,000

tonnes to some 125,000 tonnes. In order to provide a reference for the impact assessment, and for the purpose of a quarry design, future quarrying has been assumed to average some 150,000 tonnes per annum. At such an output level, the quarry would have a life of some 25 years, giving a time horizon to 2037. In order to introduce some flexibility associated with fluctuations in demand, the schedule of updated conditions proposes the standard Minerals Act 1982 end date of February 2042 for the completion of quarrying. In the event of quarrying being completed earlier, then the requirements of separate conditions relating to restoration would become relevant and enforceable.

3.2.1 Phase 1: Circa Year 5 (Plan CQ/3)

Current operations are focused on the development of quarry faces and benches in the extreme south eastern area of the site, together with the extraction of rock from a historic quarry tip in the south eastern area.

Operations will be developed by constructing a new internal haul road ramp in the southern area of the site down to the base of the quarry, currently shown on the topographic survey plan reference CQ/2 at -16 metres AOD. The alignment of the new haul road is shown on figure 3.01, and will enclose an area of the former quarry tip on its western side. Operations will then continue with the excavation of rock from the quarry tip, and the exposure of rock face and benches beneath the tip. These faces will then be worked in an easterly direction towards the haul road ramp. In addition, de-watering of the quarry void would continue to allow access to reserves below the current -16 metre AOD level.

3.2.2 Phase 2: Circa Year 15 (Plan CQ/4)

Operations would then progress within the south eastern area of the site, with similar activities associated with the recovery of rock from the historic quarry tip, and the exposure of faces and benches which would be worked in an easterly and south easterly direction to their final positions. The central haul road ramp would be retained during this period, with access off the ramp to the new benches at respective levels along the ramp.

Water management would be assisted by the temporary retention of the central ramp/bund, which will allow the south eastern void to be de-watered into the south western void.

3.2.3 Final Quarry Development (Plans CQ/5 – CQ/6)

The final quarry operations would necessitate the removal of the concrete blockworks to allow access to the reserves currently situated beneath the blocks storage building. The exposed faces at the northern edge of Phase 2 would then be progressively worked in a northerly direction towards the processing plant site. Ultimately, the fixed processing plant would be removed, and the residual reserves beneath the fixed plant site would be excavated and processed using mobile plant. All faces would then be worked back to their final positions, as part of a 'retreat' out of the quarry which will exploit remaining accessible reserves.

In summary, the quarry development scheme is straightforward in developing the quarry within its existing footprint to the approved lateral limits, with 5 main elements of;

- (i) The creation of a new central haul road ramp;
- (ii) Recovery of rock from the historic south east quarry tip;
- (iii) Development of quarry faces and benches in a south easterly direction to the site boundary;
- (iv) Deepening of the quarry floor;
- (v) The ultimate retreat from the quarry void via the extraction of reserves from beneath the blockworks and processing plant site and development of the quarry faces to the lateral limits.

3.3 Processing Plant

The processing plant comprises a conventional arrangement of a primary crusher, with a secondary crusher and screens which produce the required stone products and sizes. Ancillary plant includes a concrete batching plant which provides ready mixed concrete to an onsite blockworks, but

which has the flexibility to also provide material for a ready mix concrete truck mix operation.

The quarrying process involves the blasting of limestone from the quarry face, which creates a rock stock pile. The material is then lifted by loading shovel and placed in dump trucks for transportation via dedicated haul roads to the primary crusher plant. The material is fed into the primary crusher hopper where the crusher reduces the rock in size. The resulting rock is fed by conveyor to a surge pile. Material is drawn from the surge pile and fed on to a conveyor for transfer to a fully enclosed secondary crusher and screen house. The material is fed, and where appropriate re-circulated, through the crusher and screens to reduce the stone to the desired sizes. The stone is then fed via a series of conveyors to ground stock piles.

Land to the immediate south east of the plant site, at the circa 30m AOD level, is used for the manufacture of concrete blocks. The operation involves the use of a concrete batching plant, which is a conventional arrangement allowing stone to be stored in above ground storage bins and mixed with cement to create ready mixed concrete. The material is then transferred to an enclosed unit where it is fed into concrete block moulds and stockpiled ready for off-site distribution.

The operation of the processing plant and ready mix concrete plant is regulated by a Permit, issued by Pembrokeshire County Council under the provisions of the Pollution Prevention and Control Act 1999. These controls are considered further in Chapter 10.0 of the ES (Dust).

3.4 Inert Waste Recycling

There have been a series of planning permissions granted at Carew Quarry for the importation of inert construction and demolition waste for recycling and production of secondary aggregate. These permissions have been associated with a relaxation of conditions 30 and 31 of planning permission reference NP/319/97 which originally prohibited the importation and processing of material at the quarry. The most recent planning

permission for a relaxation of these restrictions was granted in March 2011 (reference NP/10/482) for a temporary period to 14th December 2012. This time period was defined to coincide with the date of the ROMP Review and the opportunity this presents to address the future of inert recycling as part of the ROMP Review submission.

The recycling operation comprises the importation of inert material (brick rubble, concrete, soils, etc.), which is screened and processed via existing mobile and fixed plant at the quarry. The raw material and processed stockpiles are located within the quarry area on the level ground situated to the west of the blockworks. The area is not visible from external vantage points.

The throughput of recycling has not exceeded 10,000 tonnes per annum, but subject to availability of recyclable material, the aspiration is that throughput could rise to circa 25,000 tonnes per annum.. This is a small proportion of primary aggregate output at the quarry, and within the parameters of normal primary aggregate annual output fluctuations.

3.5 Hours of Operation

The hours of working imposed on the most recent planning permission (NP/04/469) are:

“accept in emergencies to maintain safe quarry working (which shall be notified to the National Park Authority as soon as practicable) or with the prior written approval of the National Park Authority; -

- (a) No extraction, backfilling or use of plant and machinery (including pre-planned servicing) associated with the extraction and processing of minerals, and no loading of lorries with aggregate should be carried out except between the hours of 0730 and 1730 hour on Mondays to Fridays, and 0730 and 1600 hours on Saturdays;*

- (b) No loading of lorries with concrete blocks shall take place on the site except between the hours of 0700 and 1900 hours on Mondays to Fridays and 0730 and 1600 hours on Saturdays;*
- (c) No servicing, or maintenance and testing of plant shall be carried out between the hours of 2100 and 0700 hours Monday to Saturday;*
- (d) No operations on the periphery of the site or at high levels, or in unscreened locations, such as the formation, removal or alteration of spoil tips, baffle mounds, screening and storage embankments, formation or maintenance of drainage works, and the stripping and replacement of soils shall be carried except between 0900 and 1700 hours Monday to Friday and 0900 and 1200 hours on Saturdays;*
- (e) No operations, other than environmental monitoring and water pumping at the site shall take place on Sundays or Bank holidays.*

Other than some minor flexibility for maintenance work, no changes to these approved hours are proposed as part of this submission.

3.6 Output and Traffic Movements

There are no output restrictions on the permitted activities at Carew Quarry. Historical production has been in excess of 250,000 tonnes per annum, which based upon a notional average load of 18 tonnes, and a 275 day working year, equates to some 50 loads per day, or 100 movements.

Permission also exists for the importation of up to 40,000 tonnes per annum of aggregate for use in the concrete blockworks, together with the importation of some 5,000 tonnes per annum of cement and pumice (reference permission NP/04/469, condition 8). Based upon similar assumptions regarding load sizes and working days, these activities generate some 8 loads of aggregate per day (16 movements), and some 2-3 loads of cement/pumice per week.

The recycling operation has historically been a relatively low key activity, attracting some 6,000 tonnes per annum, and a maximum of some 10,000 tonnes per annum. This equates to an average of 1-2 loads per day (2-4 movements). If volumes increased to circa 25,000 tonnes per annum, this would generate some 5 loads per day (10 movements). The export of recycled secondary aggregate would generate similar movements per day. In practice, the opportunity to use 'back hauls' for the importation of material reduces the movements associated with importation. In addition, some of the material will not be capable for producing a marketable recycled product (i.e. soils and clay), and thus not all of the imported material leaves the quarry as a recycled product (where the residue will be retained for restoration purposes within the quarry).

The overall operation is therefore capable of generating up to some 120 movements per day. More recently, as a result of depressed economic conditions, output at the quarry has reduced. For the purposes of the ROMP Review, it has been assumed that the quarry will operate at an average of some 150,000 tonnes per annum. Based upon the same assumptions regarding load sizes etc., this will generate an average of some 30 loads per day (60 movements), plus the small additional movements associated with imports.

3.7 Alternatives

It is conventional practice in undertaking an EIA to consider the principal alternatives to a development, although the EIA Regulations confirm that such an exercise is not mandatory. In addition, the circumstances of a ROMP Review are different in that planning permission for the development has already been granted. As noted in Chapter 1.0, the underlying purpose of the EIA is to provide a context to assist the drafting of an updated schedule of planning conditions designed to minimise the environmental effects of the development, and to ensure that the ongoing development proceeds in accordance with up to date environmental standards and controls.

In view of the planning status of Carew Quarry, and its extant planning permissions for quarrying, the consideration of alternatives has not related to alternatives to the quarry itself in terms of supply etc, but rather whether there are alternatives to the quarry development scheme, related operational issues and associated mitigation measures. This has formed part of the overall EIA exercise aimed at minimising the environmental and amenity effects of the development, and providing a development scheme which can be controlled by planning conditions.

In practical terms, there are no material alternatives to the quarry development scheme which is proposed. The historically deposited quarry waste in the south eastern area of the quarry needs to be processed and where possible marketed in order to provide access to the underlying reserves of stone. Once removed, the eastern and central areas of the quarry can be deepened within the existing quarry footprint. The remaining reserves beneath the blockworks and processing plant can only be worked as a final phase using mobile plant as a 'retreat' out of the quarry. The parameters for the development of the quarry are thus largely fixed by the physical configuration of the quarry and the operational constraints which this imposes. There are thus no material changes to the principles of the scheme which accompanied the 1997 planning permission.

3.8 Restoration Strategy

3.8.1 Introduction

The restoration strategy is reflective of the fact that the final quarry layout will create a deep void, where water levels within the void are anticipated to recover to approximately 10 metres AOD. The result will be that the majority of the site will become a lake, with limited terrestrial areas around its margins, and limited exposures of rock faces/benches above the equilibrium water level within the lake.

The restoration strategy is thus focused upon the areas of the site above the water table and outside the rim of the quarry, where landscaping and

other restoration/habitat works could be implemented. The strategy is illustrated on plan reference CQL-1

In summary, the restoration scheme proposes:

- (i) Tree and shrub planting blocks within the restored northern area of the site, in the vicinity of the current site offices and workshop buildings (which would be removed);
- (ii) Tree planting around the western and eastern sides of the site to provide landscape and ecological linkages to established features beyond the site boundary; and
- (iii) Under-storey planting to reinforce the linear woodland belt along the southern side of the quarry.

In addition, there will be natural re-colonisation of exposed quarry faces, particularly in the upper levels of the quarry which will remain undisturbed. This is evident from the re-colonisation which has already taken place, notably on faces to the north east of the processing plant site (ref photo1).

Photograph 1: Natural re-colonisation on north east quarry face



The final restoration strategy will thus be refined to reflect circumstances towards the end of the quarry development scheme, when opportunities to retain attractive rock features and re-colonisation can be identified, and other areas requiring interventionist treatment can be agreed.

The implementation of the final restoration scheme is thus a long term prospect. This is reflected in the current planning permission which requires the submission of a detailed restoration scheme within 30 years of the date of the (1997) planning permission, or within 6 months of the termination of quarrying, whichever is the sooner (reference condition 59 of planning permission reference NP 319/97). The restoration strategy which has been produced to accompany the ROMP Review thus remains a conceptual scheme, which will be produced in detail at the appropriate time towards the end of the quarry development operations.

However, in order to inform the nature of such a detailed scheme, the following principles have been prepared, which, as appropriate, would be incorporated into a subsequently submitted detailed restoration scheme.

3.8.2 Tree and Shrub Planting

Planting Pattern

The woodland and scrub planting would be carried out as described in 'Creating New Native Woodlands'¹. Species would be planted in single species groups of 5-12 number, at 1-1.5m intervals with gaps between the groups. This would be consistent with an average spacing of 2m, but allows the development of an irregular planting matrix.

In addition wider gaps would be left to create glades and clearings amounting to a maximum total of 20% of the total woodland area. Thus, 80% of the indicated woodland areas would be planted at a density of 1 plant per 4² or 2,500 plants per hectare.

¹ Forestry Commission Bulletin 112, 1994.

Tree and Shrub Planting Mixes

The mixes used are designed to allow the formation of transitional woodland communities with mixes based on National Vegetation Classification (NVC) W16 on the higher ground, NVC W7 on the side slopes and NVC W5 on the lower ground around the lake margins and where wet conditions may exist.

Table 3-1 Woodland Mix 1

Damp Conditions and Lake Margins

(Based on NVC type W5 – Alder carr woodland)

<i>Species</i>	<i>Common Name</i>	<i>%</i>
<i>Alnus glutinosa</i>	Alder	45
<i>Fraxinus excelsior</i>	Ash *	20
<i>Betula pubescens</i>	Downy Birch	15
<i>Salix cinerea</i>	Grey Willow	15
<i>Quercus robur</i>	Oak	5

Table 3-2 Woodland Mix 2

Drier Conditions, upper slopes

(Based on NVC type W8 – Ash Field Maple woodland)

<i>Species</i>	<i>Common Name</i>	<i>%</i>
<i>Fraxinus excelsior</i>	Ash *	15
<i>Acer Campestre</i>	Field Maple	15
<i>Betula pubescens</i>	Downy Birch	10
<i>Quercus petraea</i>	Oak	10
<i>Corylus avellana</i>	Hazel	10
<i>Crataegus monogyna</i>	Hawthorn	10
<i>Ilex aquifolium</i>	Holly	25
<i>Sorbus aucuparia</i>	Rowan	5

(* Decisions on the use of Ash would be taken at the time of implementation and would reflect the outcome of the current ash die back 'Chalar fraxinea' disease).

These mixes have been defined in consultation with the ecologist involved in preparing Chapter 6 of the Environmental Statement.

Planting Methods

Stock would be sourced from local provenance wherever possible. All trees and shrubs would be planted as bare rooted 1+1 transplants.

Planting Techniques

All stock would be pit planted between the end of November and the start of March with compost and slow release fertiliser added to the backfilled soil.

All planting areas would be fenced to protect from grazing stock, where more economic, rabbit proof fencing would be used in place of individual plant protection. In the areas of individual tree protection transparent rabbit spirals or shrub shelters, supported by 450mm stout bamboo canes would be used.

3.8.3 Grass Seed Mixes and Rates

Seeding for the proposed grassland areas would be carried out in late summer/early autumn (August-early September). If seeding at that time proves not to be possible, then a spring seeding would be carried out (March-May).

Ground Cultivation/Surface Treatment

The majority of ground cultivation would be based upon a loose tipped a 'soil' surface formed by the regrading and earthmoving operations. Preparation would only take place when the 'soil' was in a dry and friable condition.

The ground would be stone picked, lightly firmed and cultivated to produce a fine tilth suitable for seeding.

Seeding Method

The seed would be broadcast by hand over most areas, due to the nature of the site. The rate of sowing would be 3-5 g/m² for the grassland area.

Where access is not possible, such as the upper levels of the rock faces down to 10 m AOD (water level) the seed mix would be applied by hydroseeding.

The following tables include the proposed seeding mixes for the restored grassland areas. However, on-site assessment of pH and nutrient levels (prior to seeding) would be undertaken, and amendments or changes to the mix made as required.

The mix shown in Table 3.3 below has been designed to be used across the entire restoration area. The purpose of the mix is to establish a good cover across the restoration while enabling the resultant grassland to be diversified through subsequent management.

Table 3-3 Basic Grassland Mix and Nurse Sward

<i>Species</i>	<i>Common Name</i>	<i>%</i>
<i>Agrostis capillaris</i>	Common bent	25
<i>Agrostis stolonifera</i>	Creeping bent	25
<i>Holcus lanatus</i>	Yorkshire fog	20
<i>Festuca rubra</i>	Red fescue	15
<i>Festuca ovina</i>	Sheep's fescue	15

3.8.4 Ephemeral Water Bodies / Scrapes

The ephemeral water bodies / scrapes within the former plant site area would be allowed to naturally colonise with vegetation resulting a range of emergent vegetation types characteristic of the area.

3.8.5 Aftercare Details

A full aftercare plan would be devised for the restoration of the proposed site containing the following information and additional details for specific habitats as required.

a) Proposed Planting

All new planting on the site would be subject to a 5 year aftercare plan, which would ensure that a one metre wide diameter around the base of trees would be kept weed-free by applying an appropriate herbicide twice every year. All ties, stakes and tree protection would be checked at the same time and records kept of failures. A winter visit would be undertaken as required to replace any failed plants within the aftercare period. The location and species of the replacements would be agreed with the NPA, thus allowing potential diversification and improvements in the planting blocks, rather than straight like for like replacements.

b) Proposed Grassland

The initial grassland management is partly dependent upon the time of sowing, and thus detailed management proposals would be developed at that time. Management would also reflect the extent of established grassland within the narrow corridor available outside the quarry rim.

c) Ephemeral Water Bodies / Scrapes

These features would be monitored and managed in order to avoid any particular species becoming predominant. Management works would be sensitive to the nature of aquatic habitats and only carried out in consultation with the appointed ecologist.

3.8.6 Restoration Management

The restored site would be closely monitored throughout the 5 year aftercare period so that the most suitable management regime could be defined on an area-by-area basis. An aftercare management plan would be formulated in accordance with the recommendations of MTAN1 (or other applicable guidance at the time).

The management plan would consist of both an outline scheme, submitted at the outset that would provide the overall objectives for the management of the site and the main management operations, and an annual, detailed scheme that would be submitted to the NPA in the autumn of each aftercare year. It is also proposed that an aftercare meeting would be held on an annual basis to discuss the condition of the site and to agree the aftercare requirements for the following growing season.

All planting/seeding failures would be replaced on an annual basis, during the first two years of aftercare, to ensure 100% maintenance to the agreed densities/land cover. All replacements would use plants of the same species or other such species as may be agreed with the planning authority. If abnormal plant or tree failure persists then investigations and proposals for the remedying of site conditions would be prepared and agreed with the planning authority.

Fertiliser requirements would also be assessed on an annual basis throughout the aftercare period. Tree and shrub planting would receive slow-release fertiliser, applied to the base of each plant, according to manufacturer's instructions, at the end of the second growing season.

The purpose of the aftercare plan would be to establish the proposed vegetation types upon the restored landform.

It is acknowledged that under the provisions of the Weeds Act 1959, it is the responsibility of all occupiers of land, whether used for agriculture or not, to control injurious weeds so that they do not spread. For all areas, weeds would be controlled by the appropriate application of herbicides by a certified competent person, according to manufacturer's instructions or, in areas of grass, by cutting or grazing.

4.0 ENVIRONMENTAL IMPACT ASSESSMENT

4.1 Introduction

The scope of the EIA has been informed by discussions with representatives NPA, and by the Applicant's experience of operating the quarry and the environmental issues which they have encountered.

The topics which have been addressed as part of the EIA cover the full spectrum of potential environmental effects. The results set out in the ES will hopefully assist the NPA in making an informed decision on the environmental effects which would be associated with the ongoing development, the opportunities which are available to mitigate the identified effects, and the nature of the planning conditions which should reasonably be imposed.

Informal discussions with the NPA indicated that it would be appropriate to commission specific technical studies relating to landscape and visual effects, ecology, hydrology and hydrogeology, and noise. It was further concluded that other conventional environmental effects such as dust, blast vibration, traffic etc. need to be addressed in the EIA, but in the context of operations at Carew Quarry, these activities are already well established and properly regulated and thus the EIA could deal with the matters in a straightforward and proportionate way.

The subsequent chapters of the ES consider the respective environmental topics in this context.

4.2 EIA and ES

The ES describes in detail the potential environmental effects of the ongoing development, with reference to:

- Landscape and visual impact (Chapter 5.0)

- Ecology (Chapter 6.0)
- Hydrology & Hydrogeology (Chapter 7.0)
- Noise (Chapter 8.0)
- Blast Vibration (Chapter 9.0)
- Dust (Chapter 10.0)
- Traffic (Chapter 11.0)
- Cultural Heritage (Chapter 12.0)

Chapter 13.0 consider planning policy issues, with particular reference to environmental controls and standards which could be imposed as planning conditions.

An overall summary of the environmental effects is set out in chapter 14.0, which draws upon the main environmental issues set out preceding chapters. This in turn has served as a focus for identifying measures which could reduce any environmental and amenity effects which have been identified, and which could be regulated by planning conditions.

5.0 LANDSCAPE AND VISUAL EFFECTS.

5.1 Introduction

The assessment concerns the ongoing operation of Carew Quarry, and issues which need to be reflected as part of the ROMP Review.

The assessment addresses the landscape and visual effects associated with the ongoing development. Full details of the development are contained within Chapter 3.0. Figure CQX-1 illustrates the position of Carew Quarry, north of Carew village and river.

The nature of landscape and visual impact is outlined below:

“Landscape and Visual assessments are separate, although linked procedures”

“Landscape effects derive from changes in the physical landscape, which may give rise to changes in its character and how it is experienced.”

“Visual effects relate to the changes that arise in the composition of available views as a result of changes to the landscape, to people’s responses to the changes, and to the overall effects with respect to visual amenity.”²

This section is split into five main sub-sections as follows:

² Guidelines for Landscape and Visual Impact Assessment (Second Edition) Paragraph 2.13, 2.14 and 2.15

- an introduction, which includes the methodology; identification of landscape and visual receptors; and landscape policy (5.1 and 5.2);
- a baseline assessment of the existing landscape and visual amenity (5.3 and 5.4);
- a review of the potential landscape and visual effect sources within the development proposals; (5.6)
- an examination of the likely residual impacts for both landscape and visual (5.7); and
- a conclusion on the likely landscape and visual impact of the ongoing development (5.8).

Outline details of the methodology are set out below with additional details included in [Appendix 1A](#) within ES Volume 2.

5.2 Methodology

A site visit to assess the baseline conditions and take photographs from the majority of the viewpoints was carried out on 27th October 2012. The weather was clear with good visibility, but low sun.

5.2.1 Potential Landscape and Visual Receptors

The initial study area for the landscape and visual assessment was selected on the basis of a desktop study, and the area chosen is shown on figure CQX-1 – Landscape Designations. This area has been chosen to reflect the nature of the proposed development and has been defined with the benefit of professional experience of similar projects.

Table 5.1 below includes a list of receptors, and their approximate direction and distance from the nearest application boundary.

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Table 5-1 Potential Receptors

Potential Landscape and Visual Receptor	Location	Distance (km)	Comment
National Landscape Designations			
Pembrokeshire COAST National Park			Carew Quarry is located within the south eastern edge of one section of the National Park
Local Landscape and Landscape Related Designations			
Landscape of Outstanding Historic Interest	n/A	n/a	Milford haven waterway includes Carew Quarry
Carew Conservation area	S	0.3	Includes Carew village
Regional Character Assessment (CCW)			
Area 48 – Milford Haven	n/a	n/a	Includes Carew Quarry
Area 44 – Taf and Cleddau Vales	SE	0.1	Area 44 directly west of A4075
LANDMAP			
PMBRKVS052 – Sageston	n/a	n/a	Carew Quarry is entirely contained within this LANDMAP area, which has a Moderate overall evaluation
PMBRKVS051 – Daugleddau	SW	0.1	Extends across Carew River and valley to southwest, and has an Outstanding overall evaluation
Register of Parks and Gardens of Historic Interest			
Cresselly – Ornamental landscape park approximately 3 km to the north east			
Upton Castle – Ornamental garden and mansion house approximately 3 km to west			

Potential Landscape and Visual Receptor	Location	Distance (km)	Comment
Scheduled Ancient Monuments (Potential visibility identified by ZTV study)			
Carew Castle	S	0.3	Elevated views towards Carew Quarry from upper lands of the castle only
Carew Bridge	S	0.2	No views from this receptor are considered likely due to low lying position
Carew Cross	S	0.3	Partly screened by intervening vegetation
Recreational Facilities			
Pembrokeshire Coast National Trail	S	6.0	No views from this receptor would occur
Landsker Borderlands Trail	N	2.2	No views from this receptor would occur
Various local rights of way	n/a	n/a	Most relevant is footpath that passes along eastern edge of quarry from near Carew Bridge to quarry entrance
Parking and Picnic area	SW	0.2	Located on northern shore of Carew River off Butts Lane

A number of representative viewpoints were used to assess the significance of existing landscape and visual effects caused by the existing Quarry. These viewpoints are listed below in Table 5.2. These 5 viewpoints were chosen from a total of 14 viewpoints identified by field work on 27th October 2012. The position of these viewpoints is illustrated on each of the relevant viewpoint sheets (i.e. Figures CQX3-CQX7).

Table 5-2 Viewpoints

Viewpoint		Grid Reference		Description
		Easting	Northing	
A	Carew Lane/A4075	205174	204280	View from east illustrating existing screening
B	Footpath east of Quarry	204860	204085	View from boundary of quarry into quarry void
C	Carew Castle	204519	203753	View from upper level of Castle ramparts
D	Carew Newton House	204698	204503	View from Carew Newton village directly to west of quarry
E	Brooklyn, property west of Quarry Entrance	204799	204482	View from property looking towards quarry entrance

5.2.2 Landscape Designations and Policies

Minerals Planning Policy Wales (MPPW), March 2004

MPPW includes the following references to Mineral Reviews.

“6. Because of the long term nature of most minerals developments, authorities have a duty to undertake periodic reviews of planning permissions to ensure that they are kept up to date. This guidance (MPPW) should be taken into account in that review of conditions.”

Minerals Planning Policy Wales sets out clear statements of national development control policy on minerals in National Parks.

Relevant policy content includes the following:

“C. To reduce the impact of mineral extraction and related operations during the period of working by, for example, ensuring sensitive working practices and improved operating standards.”

“34. Environmental issues that must be addressed include:

- *visual intrusion and general landscaping;*
- *impact on sites of nature conservation, historic and cultural importance;*
- *restoration, aftercare and after-use.”*

MPPW states in Paragraph 52;

“The guiding principles determining the potential after-use of a site should form part of the application submission for proposed mineral extraction or the review of mineral planning permissions, although flexibility and review will often be necessary during the life of the mineral operations. Using the guiding principles as a framework, and even for long term working sites, there must be a defined and acceptable minimum standard of restoration outlined at the application stage.”

Pembrokeshire Coast National Park Local Development Plan, December 2001

The LDP identifies the special qualities of the National Park as follows;

- coastal splendour;
- diverse geology;
- diversity of landscape;
- distinctive settlement character;
- rich historic environment
- cultural heritage;
- richness of habitats and biodiversity;

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- islands
- accessibility;
- space to breath;
- remoteness, tranquillity and wildness; and
- diversity of experiences and combination of individual qualities.

The value of these special qualities is stated in paragraphs 4.56 and 4.57 as;

“The special qualities of the National Park are those characteristics and features of the National Park which individually or in combination contribute to making this National Park unique. Work has been undertaken to refresh the Authority’s understanding of those special qualities for the Management Plan.”

“The strategy is to ensure that development in the Park conserves and enhances those special qualities. Even seemingly minor changes in the landscape can have an adverse effect and therefore attention to detail and the cumulative effects of change are important considerations. To support this strategy a Landscape Character Assessment and a Settlement Study have been prepared.”

Policy 15 – Conservation of the Pembrokeshire Coast National Park states

“Development will not be permitted where this would adversely affect the qualities and special character of the Pembrokeshire Coast National Park by:

- a. causing significant visual intrusion; and/or,*
- b. being insensitively and unsympathetically sited within the landscape;
and/or*
- c. introducing or intensifying a use which is incompatible with its location;
and/or*
- d. failing to harmonise with, or enhance the landform and landscape*
- e. character of the National Park; and/or*
- f. losing or failing to incorporate important traditional features.”*

Whilst this policy relates to new development, the underlying principles may be regarded as being appropriate to a ROMP Review.

5.2.3 Landscape Designations

Landscape designations and the value attached to particular landscapes are two of a number of criteria considered in identifying the relative sensitivity of the landscape within which a development is situated. The location and areas covered by the key designations identified are shown on figure CQX1 – Landscape Designations

5.3 LANDSCAPE BASELINE

5.3.1 Introduction

The landscape baseline represents a study of the existing and developing landscape, against which changes development can be assessed.

Current landscape assessment practice utilises landscape character assessment for analysing and assessing the potential impacts of any development upon the local landscape.

The former Countryside Agency (now Natural England) guidelines make a clear distinction between the characterisation process (in which the attributes of the landscape are described) and the judgement making process. This section of the assessment examines existing character studies and undertakes a characterisation process, and forms the

landscape baseline. Later sections make judgements about the potential effects of the proposed development based upon the landscape.

5.3.2 Existing Landscape Appraisals of the Application Site and its Surroundings

The Countryside Agency guidelines identify three main levels of Landscape Character Assessment:

- National and regional scale;
- County, district and unitary authority scale; and
- Local, parish and site scale.

The Landscape Character Map of Wales identifies Carew Quarry as being located within the Hafan Millffwrdd/Milford Haven Landscape Character Area (LCA). The boundary between this character area and the Dyffrynnoedd Taf A'R Cleddau/Taf and Cleddau Vales LCA lies 800m to the east of the quarry. Full details of both of these LCAs are reproduced as [Appendix 1B](#) to the ES.

The key characteristics of the Milford Haven LCA include the following which are evident in the landscape around Carew Quarry.

- The Milford Haven ria which extends from the Daugleddau Estuary into the River Carew which passes approximately 200m to the south of the quarry (a ria is a drowned river valley) ;
- Internationally important intertidal habitats;
- Scenic quality of 'rias';
- Dispersed villages and hamlets; and
- Agricultural mosaic of mixed fields bounded by hedgerow.

Pembrokeshire Coast National Park Landscape Character Assessment SPG June 2011³ identifies Carew Quarry as being located within the

³ <http://www.pembrokeshirecoast.org.uk/default.asp?pid=249>

Daugleddau LCA. Full details of the LCA are included in [Appendix 1B](#). This character assessment is based upon LANDMAP and has been used to assess the effects of the existing quarry and its proposed development upon the local landscape.

The special qualities of the Daugleddau LCA that are relevant to the local landscape of Carew Quarry are as follows:

- No sense of being near sea except for tidal water movements and smell of salt;
- Framed views, tranquil, sense of sheltered well cared for farmland; and
- Outstanding historical significance, in particular the Carew tide-mill;

The LANDMAP data for the quarry site and adjacent area of Carew River is reproduced in [Appendix 1C](#) and has been referenced in the following assessment of the local character.

5.3.3 Landscape Appraisal of the Application Site and its Surroundings

The Countryside Agency guidance on landscape appraisal recommends that landscapes are initially characterised, and that judgements about the nature and sensitivity of these landscapes are then based on this characterisation process. The Agency's guidance recommends that the characterisation process should be based on an assessment of natural factors, cultural social factors and aesthetic and perceptual factors.

5.3.4 Natural and Semi-natural Characteristics

The topography of the local landscape is defined by the Daugleddau ria. Such features were formed by a past rise in sea level which flooded inland valleys, to create wide inland tidal rivers.

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The River Carew flows east to west directly south of Carew Quarry before it turns northwest to join with the Cresswell River which forms a tributary to the main Daugleddau ria. The landform rises from the Carew River (which lies at sea level) up to a high point of approximately 80m AOD near Cresselly.

Carew Quarry is located at an elevation of approximately 30m AOD, with the rim of the quarry varying between 18-35m AOD. The quarry is approximately 50m deep with levels of circa -16m AOD on the quarry survey.

The boundary of the quarry area is well vegetated with hedgerows and mature trees.

5.3.5 Cultural and Social Factors

The area of Carew village is very important from a historic perspective, due to the castle, bridge, tidal mill, village cross and village conservation area. A car park and toilets are provided near to the Cross. These features have created a 'honey pot' location for tourism adding to the cultural value of the local area.

An additional car park and picnic area have been created on the northern bank of the Carew River, near to the tidal mill.

A walk from the village to the tidal mill, across the mill tidal dam, along the northern river bank and across Carew Bridge and back to the village was noted during field work as being very popular.

5.3.6 Aesthetic and Perceptual Aspects

The aesthetic qualities of the background landscape of the local area are summarised in Table 5.3, divided into the main categories identified within the guidance⁴

Table 5-3 Aesthetic Attributes of the General Landscape and Application Site.

Aesthetic Factors	
Enclosure	This is a landscape of enclosed and small scale character with a large amount of hedgerow and tree cover within the agricultural landscape. Contrasting with the more open tidal river to the south. The quarry creates its own localised enclosure.
Balance	The landscape is generally balanced, with the exception of the quarry which forms a discordant feature where visible.
Pattern	The agricultural landscape defines a generally regular rectilinear field pattern which the quarry is generally in character with.
Diversity	This is a simple agricultural landscape, made diverse by its historic features. The quarry adds another level of diversity to this landscape.
Scale	The agricultural landscape defines a medium scale, with landscape of the Carew River creating a larger scale focus.
Form and Line	The landscape is generally curving and rolling, with the sharp angles and rock faces of the quarry in contrast with this.

⁴ Landscape Character Assessment – Countryside Agency and Scottish Natural Heritage (2002) – Paragraph 5.12 and Box 5.1

Colour	A landscape of muted agricultural greens, browns and reflective water. When illuminated by sunlight the pale orange faces of the quarry contrast with the natural landscape colours.
Movement	Movement is generally restricted to cars travelling along roads within the landscape. The quarry site in comparison can appear very busy at times.

5.3.7 Landscape Dynamics and Potential for Landscape Enhancement

Additional development is likely to be highly restricted due to planning restrictions linked to the National Park designation and contained historic nature of the existing settlements within the local area.

The ongoing development of Carew Quarry is detailed in the phasing plans submitted as part of the ROMP scheme (ref ES Chapter 3.0).

5.3.8 Landscape Character, Classification and Evaluation

The detailed landscape appraisal has identified the main components of the landscape in the locality of the site, and how these have been accurately identified and described in the Daugleddau LCA description. This LCA has therefore been used to assess the effect of the existing quarry and potential effects of the ongoing development.

5.4 VISUAL BASELINE

5.4.1 Introduction

Visual Impact Assessment relates to “*changes that arise in the composition of the available views as a result of changes to the landscape, to peoples’ responses to the changes and to the overall effects with respect to visual amenity*”, (“Guidelines for Landscape and Visual Impact

Assessment”, Second Edition, *op.cit*). Initially, it is necessary to define the extent of visibility both within and outside the site.

5.4.2 Field Work

Analysis of the Ordnance Survey 1:25,000 maps were made to identify potential viewpoints and areas for field investigation based on the following criteria:

- Identified as potential receptors in the baseline;
- Proximity to the site;
- High concentrations of viewers, such as settlements, local recreational facilities etc;
- Views from designated areas, private properties, footpaths and other receptors;
- Views illustrating the visual character of the surrounding area; and
- Views illustrating the range and type of views present.

The location of the selected viewpoints is based on the above factors with a photograph of each existing view and the viewpoint location included on the individual viewpoint figures CQX/3-CQX/7. Table 5.2 lists the viewpoints and their grid reference.

5.4.3 Viewpoint Photographs

The viewpoint photographs have been scaled to match the actual view on the ground. To achieve this effect the viewer should hold the photograph at a distance of 300mm from his/her eye.

5.4.4 Viewpoints

Viewpoint A – Carew Lane / A4075. This viewpoint is located on the main ‘A’ road directly east of the quarry near to the properties of Glen Ross and Mayfield Cottage. The viewpoint looks west towards the quarry area with properties on the west side of the ‘A’ road visible (Lynwood/Clifton House)

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within the view. The viewpoint represents effects for uses of the road and residents in the adjacent properties.

Carew Quarry is screened from view by intervening vegetation and the fact that most operations are located below intervening ground level. Small quarry plant components are just visible above the vegetation and are located near the northeast rim of the quarry site. Although visible these form a minor component of the view. Views from the rear of Lynwood and Clifton House are likely to be screened by intervening mature tree vegetation present to the west of the built properties.

Viewpoint B – Footpath east of Quarry. This viewpoint is located on the public footpath which starts from the east end of Butts Lane and north end of Carew Bridge and extends north, rising up with the landform, and skirting the eastern side of Carew Quarry. The viewpoint represents effects for general users of the public footpath and/or users following the Carew Short Walk and West Williamstone/Carew Half Day Walk, and any other local walks that make use of this right of way.

When walking north along this footpath, Carew Quarry is screened from view until the quarry boundary is reached. At this point a security fence has been erected to create a safe barrier to the steep rock faces that descend into the quarry void. A wide open view exists looking across the quarry void. Further north along the footpath views are curtailed by a screen mound, although one section of this is currently breached for access purposes. A number of pipes and tyres are present along the eastern side of the footpath adjacent to this breach.

Viewpoint C – Carew Castle. This viewpoint is from the Mock-Medieval Gatehouse within the grounds of Carew Castle, and looks north towards Carew Quarry. This position was chosen as it represents the most open view from within the castle. Although slightly more elevated views exist from the North-West Tower and Chapel Tower, these views are more restricted in terms of the width of view and direction of view; Carew Quarry is no more visible from these alternative positions. This viewpoint thus represents the worst case effects on visitors to this Scheduled Ancient Monument and tourist attraction.

Views of Carew Quarry are screened by a line of boundary trees that run along the southern edge of the quarry. Views through and beneath the tree canopies are possible, particularly in the winter period, when sunlight illuminates the existing northeast quarry faces, illustrated in the photography taken for this viewpoint.

Viewpoint D – Carew Newton. This viewpoint is from the entrance to Carew Newton House, looking east along the initial line of the drive towards Carew Quarry. This viewpoint represents effects on local residents in this village.

A small section of the west facing rock face of the quarry is visible, and this viewpoint represents the most open view identified from the west. No other views from this area were identified, although views may exist from local properties where no intervening vegetation is present.

Viewpoint E – Brooklyn. This viewpoint is located directly west of the quarry entrance close to the property called Brooklyn. This viewpoint represents views for residents and users of the local road which passes the quarry entrance and links to the village of Whitehill to the north.

Parked HGVs are visible above the hedgerow indicating the parking area of the quarry and some of the quarry plant buildings are visible through the intervening vegetation to the south. Oblique views from the upstairs windows at Brooklyn are likely to be effected to a larger extent.

5.4.5 Conclusions of the Visual Assessment of the Existing Site

The existing visual impact of Carew Quarry is largely contained by the natural landform, vegetation and layout to the immediate boundary and internal area of the quarry. Very few views of the quarry exist and those that do are restricted to glimpses of small areas of quarry faces and/or plant structures amongst the mature vegetation which surrounds the quarry. The one exception is at Viewpoint B, where the full scale and nature of the quarry is revealed due to the proximity of the public footpath on the eastern rim of the quarry void.

5.5 DEVELOPMENT PROPOSALS

5.5.1 Landscape and Visual Elements of the Existing Development

The proposed phased quarry development and restoration is illustrated on Plans CQ1-CQ6 and CQL/1, discussed in Chapter 3.0

The existing quarry occupies the majority of the permitted site boundary. With the exception of face alignment changes within the disturbed area and a deepening of the mineral void, no additional physical landscape changes would occur. Given the very restricted visibility of the existing quarry development no additional indirect effects are anticipated on the aesthetics and perception of the quarry within the local landscape.

The main elements of note for the visual and landscape assessment would therefore be any changes in the visual components currently visible including the quarry workings, plant site components and ancillary operations/land uses.

5.5.2 Sources of Potential Visual Effects

The quarry workings are generally screened from view and due to this do not affect the general landscape character of the local landscape. The proposed working of the quarry is in line with the previously submitted phasing plans, and involves the development of the quarry at depth, screened from general view by the rim of the quarry and intervening landform. The proposed working scheme would potentially cause some visual change when the northern and eastern faces will be worked towards the boundary, and when the plant site platform is removed during this process. This change is likely to be partly visible in the limited views identified to the south and west.

Some of the plant site buildings are visible in a limited area within the adjacent landscape to the northwest through a screen of vegetation. Their

potential removal at the end of the quarry development period would be a beneficial change.

The existing lorry parking near to the quarry entrance is also visible in a similar area. In addition, other ancillary equipment is present around the edge of the quarry. The removal of these elements would also be a beneficial change in the long term.

Having noted the above it should be emphasised how minimum these changes would be within the local landscape as a whole.

5.5.3 Nature of Effects

The sources identified above can have a variety of effects as follows.⁵

“Effects can be negative (adverse) or positive (beneficial); direct, indirect, secondary or cumulative and can be permanent or temporary (short, medium or long term). They can also arise at different scales (local, regional or national) and have different levels of significance (local, regional or national).”

5.5.4 Type of Effect

The type of effect caused by changes to the landscape can be described as beneficial, neutral or adverse.

In the case of the ongoing development, the anticipated changes caused by the continued working of the quarry are considered to be neutral as the elements currently visible would remain visible, although potentially in a slightly different configuration.

The potential removal of plant buildings at the end of quarrying is considered beneficial.

⁵ Guidelines for Landscape and Visual Impact Assessment (Second Edition) Paragraph 7.6

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5.5.5 Direct and Indirect Effects

Most effects are direct effects, but the development may lead to some indirect effects on the surrounding landscape. Direct and indirect effects are defined as⁶;

“A direct (or primary) effect may be defined as an effect that is directly attributable to a defined element or characteristic of the proposed development, for example the loss or removal of an element or feature, “such as a hedgerow or a prominent group of trees”

“An indirect (or secondary) effect is an effect that is not a direct result of the proposed development but is often produced away from the site of the development or as a result of a complex pathway or secondary association.”

The effects caused by the continued quarry development are likely to be limited direct visual effects, and the indirect effects of current quarry traffic on the local roads.

5.5.6 Timescales of Effect

For this assessment effects caused to the landscape can be short term medium term, or long term.

The extraction operations are considered to be medium term operations and part of the ongoing development. Any removal of the large scale plant buildings at the end of the quarrying would be a permanent change.

⁶ Guidelines for Landscape and Visual Impact Assessment (Second Edition) Paragraph 7.7-7.8

5.5.7 Scale and Level of Impact

Landscape and visual effects can also be caused at different scales and may have different significance at different scales. The main scales likely to require consideration are local, regional and national.

As demonstrated in the baseline assessment, the extent of landscape and visual effects are restricted to the local scale.

5.5.8 Proposed Mitigation

Mitigation measures have the potential to address the following aspects:

- visual impact of rock faces currently visible from the south and west;
- ancillary equipment around the periphery;
- views of the existing plant buildings and HGV parking; and
- vegetation management.

The phased working scheme identifies the potential for hydroseeding the tops of the existing rock faces. The key potential for this work would be the beneficial improvement of the visual effects of the northeast quarry faces as seen from Carew Castle. This would involve facilitating the nature recolonisation which has taken place on other areas of upper faces which remain undisturbed, and where experience ?????? recolonisation produce attractive landscape results (ref photograph 1 in Section 3.8)

There would be benefit in removing ancillary equipment from its current location around the periphery of the quarry but it is recognised that at present, there are space limitations within the quarry to accommodate such equipment.

The potential for additional planting along the northwest edge of the quarry should be investigated to bulk up existing vegetation and look towards improving the existing vegetation screening.

Planting proposals could be implemented to increase the ground level screening along the southern edge of the quarry. Management of the existing tree screen should be carried out to ensure its healthy development, including additional tree planting to ensure the medium to long term continuation of the existing screen belt of trees.

The above mitigation measures have been adopted into the restoration strategy plan ref CQL-1

5.6 Predicted Residual Landscape Impacts

Having assessed the landscape baseline and identified the potential elements of the development likely to cause change to that baseline, a detailed assessment of the potential changes can be made to identify any significant effects.

5.6.1 Landscape Sensitivity

Landscape sensitivity is defined by a number of factors and it does not necessarily follow that a highly valued landscape or landscape feature, such as a National Park or long distance right of way, will always be defined by a high sensitivity.

“Landscape designation (as a reflection of value to society) is thus only one of a number of criteria that are considered in identifying the relative ‘sensitivity’ of the landscape to a proposed development. It should not be used in isolation.”⁷

The overall sensitivity of the existing landscape resource is based on the following criteria, which are taken from the stated guidance⁸:

⁷ Guidelines for Landscape and Visual Impact Assessment (Second Edition) Paragraph 2.32

⁸ Guidelines for Landscape and Visual Impact Assessment (Second Edition) Paragraph

.7.16 & 7.17

- the value placed on the landscape;
- the compatibility of the proposed development with the existing land-uses and landscape character;
- the condition of the landscape;
- the contribution of the landscape within the site to the overall landscape character;
- the scope for mitigation of the proposed development; and
- the degree to which landscape elements and characteristics can be replaced or substituted.

The overall sensitivity of a landscape is categorised as high, medium, low or negligible for the purposes of an assessment.

Table 5.4 compares the various criteria effecting landscape sensitivity to identify a final overall level of sensitivity for the local landscape.

Table 5-4 Sensitivity of Carew Quarry and the Adjacent Landscape to the ongoing development.

Landscape Element	Description
Value	Carew quarry is located within an area designated as a national park and has a high level of historic value directly south and centred on Carew village.
Incompatibility	The existing quarry forms part of the baseline landscape and the general nature of the quarry and its perceived relationship to the local landscape would not change.
Condition	The condition of the quarry is poor in landscape terms, but the adjacent areas are in good condition.
Contribution to Character	The quarry area contributes little to the existing character of the local area due to its limited visibility.
Inability to Mitigate	The existing quarry has a very restricted effect

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	on the adjacent landscape which could be reduced further by mitigation
Difficulty of replication or substitution	The only way to replicate the original landscape would be to infill the quarry with inert waste.
Overall Landscape sensitivity	LOW

The sensitivity of the site itself and the adjacent landscape (periphery areas) to the proposed development is considered to be low as the continued working of the quarry is consistent with the existing character and condition of the landscape as created by the existing quarry workings.

The sensitivity of the remainder of the study area and individual Landscape Character Areas, as identified in the baseline section of this chapter, are assessed in Table 5.5 below. These reflect the sensitivity of the landscape away from the immediate vicinity of Carew Quarry, and across the remainder of the study area.

Table 5-5 Sensitivity of the Local Landscape Character to the Proposed Development

Pembrokeshire Coast National Park SPG			
Character Area	Details of Area	Key Receptors	Sensitivity
Daugleddau	Includes quarry and ria landscape to south and west	National Park, Carew historic value, landform of Carew River and rural baseline	High

5.6.2 Magnitude of Landscape Change

The magnitude of landscape impacts depends upon the following factors⁹:

- The scale or degree of change to the existing landscape resource;
- the nature of the change caused by the proposed development (for example, beneficial or adverse); and
- the timescale, or phasing, of the proposed development

The magnitude of change is categorised as substantial, moderate, slight or negligible.

Changes in Natural Characteristics

The existing development proposals would reduce the floor of the quarry creating a deeper void in the short to medium term. In the long term this void would flood to approximately 10m AOD resulting in a lake forming in the base of the workings and filling the majority of the void.

Changes in Cultural and Social Factors

No perceivable effects would occur to cultural and social factors identified within the baseline study.

Changes in Aesthetic and Perceptual Aspects

The proposed mitigation planting and management to the southern quarry boundary would improve the nature of the visible quarry elements resulting in a beneficial although limited landscape effect.

Landscape Character, Classification and Evaluation

⁹ Guidelines for Landscape and Visual Impact Assessment (Second Edition) Paragraphs 7.19

The continued development of the quarry would not affect any of the key characteristics of the identified LCAs, and the perception of the change would be greatly limited in extent.

Summary of Magnitude of Landscape Change

Consideration of above factors has resulted in the identification of a **Negligible** magnitude of change as a result of the continued working of the quarry.

5.7 Predicted Residual Visual Impacts

5.7.1 Introduction

The potential visual effects of the proposed development on the surrounding landscape, and in particular the views from the identified viewpoints, have been assessed with the aid of plans and computer models, and are described in detail below.

5.7.2 Sensitivity of Viewpoints

The list of the identified viewpoints set out below also includes a brief assessment of their sensitivity. Sensitivity depends on the following factors¹⁰:

- The location and context of the viewpoint, for example, viewpoints which are perceived to be closer to the site are generally more sensitive;
- The number of viewers who commonly use the viewpoint; some viewpoints are commonly used by the public, such as formal viewing

¹⁰ Guidelines for Landscape and Visual Impact Assessment (Second Edition) Paragraphs 7.31 and 7.32

platforms, picnic areas or recreational rights of way'; other viewpoints may be difficult to gain access to;

- The nature of the viewpoint. Residential properties are sensitive to visual impacts as the residents experience the impacts on a regular and prolonged basis. Public footpaths can also be sensitive, since the users' attention is often focused on the landscape. By contrast, views from outdoor sport facilities, transport routes or places of work are less sensitive;
- Movement of viewers at the viewpoint. More transitory views, for example from a road, are generally less sensitive than views experienced from residential properties and footpaths; and
- The cultural significance of the viewpoint, including its appearance in guidebooks and tourist maps, or cultural and historical associations.

The sensitivity of viewpoints is categorised as high, medium, low or negligible.

5.7.3 Magnitude of Visual Impacts

For each of the viewpoints the potential magnitude of the residual visual impacts, taking into account the proposed mitigation, is assessed. The magnitude of visual impacts is mainly dependent upon the following factors¹¹:

- What proportion of the existing view would change as a result of the development proposals?;
- How many characteristic features or elements within the view would be changed?;
- How appropriate is the proposed development in the context of the existing views?;
- How many viewers would be affected by the changes in the view;

¹¹ Guidelines for Landscape and Visual Impact Assessment (Second Edition) Paragraph 7.36

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- What is the timescale of the proposed development? Also, is it continuous or intermittent?; and
- What is the angle of the view in relation the main activity of the receptor?

The magnitude of change is categorised as substantial, moderate, slight or negligible.

5.7.4 Viewpoints

Viewpoint A – Carew Lane / A4075. This viewpoint is located on the main 'A' road directly east of the quarry near to the properties of Glen Ross and Mayfield Cottage. Road users travelling along this road would have a **Medium** sensitivity to visual change, while residents would have a **High** sensitivity.

Carew Quarry is well screened from view by intervening vegetation and no change would occur as the quarry phased development continued. The removal of ancillary equipment from view would result in a **Negligible** magnitude of change.

Viewpoint B – Footpath east of Quarry. This viewpoint is located on the public footpath and viewers from public footpaths are generally considered to have a high sensitivity. However it is considered that the obvious disturbance in existing views of the quarry reduces the level of sensitivity to **Medium**.

The existing development of the quarry results in continual visual change at this viewpoint. It is considered that this would be perceived as **Moderate** magnitude of change in the worst case scenario. This change is likely to be at the final restoration stage when the void would flood to form a lake and the existing plant site will have been removed. Although some views of the quarry are prevented by a screen bank insufficient space exists to extend this screen bank further south. The existing breach in the screen bank could be in filled.

Viewpoint C – Carew Castle. This viewpoint is from the Mock-Medieval Gatehouse within the grounds of Carew Castle. Viewers at this viewpoint would have a **High** sensitivity (tourists, visitors etc).

Views of Carew Quarry are screened by a line of boundary trees that run along the southern edge of the quarry, reducing the effects of the existing quarry. Although the existing rock faces are visible, the tree screen reduces their impact and the continued development of the quarry would not alter the components which are visible. The magnitude of change is therefore assessed as **Negligible**. The successful implementation of the proposed mitigation measures to increase planting and management of the existing screen belt; and re-colonisation of the visible faces, would increase the magnitude of change to **Slight**, as this change would be more noticeable than the simple continuation of the current workings. This would however be a beneficial change.

Viewpoint D – Carew Newton. This viewpoint is from the entrance to Carew Newton House, looking east along the initial line of the drive towards Carew Quarry. This viewpoint represents effects on local residents in this village who would have a **High** sensitivity.

The small section of the west facing rock face visible would be allowed to re-colonise and thus its appearance would be softened and improved, although the proximity of the view would not disguise its rock surface nature. The magnitude of change caused is considered to be **Negligible**.

Viewpoint E – Brooklyn. This viewpoint is located directly west of the quarry entrance close to the property called Brooklyn. Users of the local road would have a **Medium** sensitivity to the quarry, while residents would have a **High** sensitivity.

Removal of parked HGVs from the view and the partly screened quarry plant buildings would create a **Slight** long term magnitude of change which would be beneficial. This benefit would accrue earlier if additional screen planting is successful.

5.7.5 General Visibility of the Proposed Development

The assessment of the above viewpoints illustrates how screened the existing quarry is and its limited visual impact. The ongoing development of the quarry would not alter this situation.

5.8 Potential Significance of Landscape and Visual Impacts

5.8.1 Assessment of the Significance of Impacts

The potential significance of landscape and visual impacts is determined by a combination of the magnitude of the potential impact and the sensitivity of the landscape setting to change. These two variables can be correlated as illustrated in Table 5.6, below. Thus, a landscape impact of low magnitude may nevertheless be assessed to have a moderate impact in a highly sensitive landscape.

Table 5-6 Principles of Assessing Landscape and Visual Impacts

Magnitude	Sensitivity			
	Negligible	Low	Medium	High
Negligible	Negligible	Negligible/Minor	Minor	Minor/Moderate
Slight	Negligible/Minor	Minor	Minor/Moderate	Moderate
Moderate	Minor	Minor/Moderate	Moderate	Major/Moderate
Substantial	Minor/Moderate	Moderate	Major/Moderate	Major

The above consideration of the sensitivity of the receptors with the magnitude of the potential impacts provides an overall assessment of the potential significance of impacts. However, this process is not a quantitative process; there is not an absolute scoring system. Instead, the correlation of the two factors, although reflecting recognised features and methods of working outlined in this chapter, is in the end a matter of professional judgement.

Impacts of **Major/Moderate and Major** are considered significant for the purposes of this assessment.

Table 5.7, below, provides a brief definition of the full range of significance criteria. It must be emphasised that both landscape and visual impacts can be either adverse or beneficial in nature.

Table 5-7 Significance Criteria for Landscape and Visual Impact

Negligible	The proposed scheme is appropriate in its context. It may be difficult to differentiate from its surroundings and would affect very few or no receptors
Minor	The proposed scheme would cause a barely perceptible impact, and would affect few receptors.
Moderate	The proposed scheme would cause a noticeable difference to the landscape, and would affect several receptors.
Major	The proposed scheme would completely change the character and/or appearance of the landscape for a long period of time or permanently. It would affect many receptors

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5.8.2 Potential Significance of Landscape Impacts

Having identified the landscape sensitivity of the site and adjacent landscape, and the landscape character area within the local landscape, an assessment can be made of potential landscape effects by use of the previously measured sensitivity and magnitude of change. This assessment is recorded in Table 5.8 below.

Table 5-8 Significance of Landscape Effects

Sensitivity	Magnitude of Change	Significance of Impact	Description
SITE AND ADJACENT LANDSCAPE – QUARRY AND PERIPHERIES			
Low	Negligible	Negligible/ Minor	The main effect would arise from the removal of the existing plant site buildings and is beneficial in nature.
LOCAL LANDSCAPE CHARACTER – DAUGLEDDAU LCA			
High	Negligible	Minor/ Moderate	Possible beneficial effects could occur through additional planting and hydroseeding

Landscape effects would be minimal and potentially beneficial in the long term, and localised around the quarry. No significant effects would occur in the continued development of the quarry as outlined

5.8.3 Potential Significance of Visual Impacts of the Proposed Development

The significance of the visual impacts in respect of each viewpoint is summarized in Table 5.9 below.

Table 5-9 Potential Significance of Visual Impact on Viewpoints

A	Medium (Road users) High (Residents)	Negligible	Minor to Minor / moderate	Glimpses of existing ancillary equipment on edge of quarry, removal considered beneficial
B	Medium	Moderate	Moderate	Open view of existing quarry
C	High	Negligible	Minor/ moderate	
D	High	Negligible	Minor/ moderate	
E	Medium (Road users) High (Residents)	Slight	Minor/ moderate to Moderate	

Table 5.9 illustrates the limited effects on visual amenity which would be caused by the continued working of the quarry. None of these effects are considered significant.

5.8.4 Effects on Landscape Receptors

Having identified the significance of the landscape and visual impacts, a judgement can be made on the likely impacts on other landscape receptors as identified in Table 5.1.

Pembrokeshire Coast National Park

Although the quarry is located within the National Park, its screened nature minimise any existing effects, and the ongoing development would not change this situation.

It is considered that the National Park has a High sensitivity and that the existing quarry has less than a negligible localised effect on the special qualities and character of the National Park. The potential mitigation proposals could create a negligible effect in themselves, which is considered beneficial as it could reduce the existing low level of visual effect yet further. Thus the potential effect on the National Park would be Minor/moderate in the worst case, and beneficial in nature particularly in the long term.

Milford Haven Landscape of Outstanding Historic Nature

The same points made for National Park are relevant for this designated area in terms of effects on its landscape character. Effects on its historic value are not addressed in this chapter, but given the very limited landscape and visual effects identified, it is considered that historic value is unlikely to be effected.

Carew Conservation Area / Ancient Monuments

Field work was undertaken in Carew Village, including assessment work at Carew Bridge and Carew Cross. No potential views of the existing quarry were identified, and no additional views would be created in connection with the ongoing development. It is therefore concluded that no effects on the visual amenity of visitors to these areas would occur.

Visual effects on the amenity of visitors to Carew Castle are recorded under Viewpoint C, and are not considered significant.

Historic Parks and Gardens

The limited visibility of Carew Quarry would not extend to the area of Cressley or Upton Castle

Recreational Facilities

Viewpoint B identifies a public right of way with close views of the quarry void, but this is the exception. It is considered that no effects are likely to occur to any long distance trails.

Views from the parking/picnic area north of Carew River look up the slope towards the quarry and the intervening landform screens any views as identified in the description for Viewpoint B. The angle of view from the Tidal Mill are is such that the tree screen along the southern edge of the quarry is seen at an angle which increases its screening ability and the quarry faces are effectively hidden even in winter.

5.9 SUMMARY

5.9.1 Introduction

A landscape and visual assessment of the proposed development has been completed in accordance with accepted guidance. A study of the landscape and visual components of the site and the local area was undertaken through desktop study and fieldwork. This study identified the main landscape and visual receptors and resulted in a baseline appraisal against which the existing and proposed landscape and visual impacts could be assessed. The main landscape and visual implications of the development and their potential impacts were identified, and mitigation was developed to further reduce these impacts.

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5.9.2 Landscape Impact

The landscape effect caused by the existing quarry and its ongoing development are minimal due to the enclosed nature of the quarry and the peripheral screen vegetation. The proposed mitigation features would create negligible beneficial changes. No significant landscape effects would occur.

5.9.3 Visual Impact

The existing quarry development has a restricted visual effect on the local landscape as illustrated by the viewpoints. Although some views do exist they are generally restricted to glimpses of one or two of the quarry components. The only exception is Viewpoint B which may be improved by landscape improvement works and removal of stored materials. No significant effects on visual amenity would occur.

6.0 ECOLOGY

6.1 Introduction

This Chapter of the ES provides an Ecological Impact Assessment (EclA) in respect of the continuation of quarrying activities at Carew Quarry and phased restoration.

The application boundary is shown on Figure 1.01, produced in Chapter 1.0. The majority of this area comprises a currently operational quarry site.

Around the margins of the site are small areas of plantation and secondary woodland and scrub which have either been planted to provide screening or have developed on parts of the site which have been previously worked.

Collectively the above areas are hereafter referred to as ‘the site’.

The development is described in full in Chapter 3.0 of the ES, although in summary it will essentially comprise:

- the continuation of quarrying activities including de-watering by working the quarry downwards within the current footprint of development; and
- phased restoration in accordance with a conceptual design which has been informed by landscape/visual amenity considerations and the opportunities presented to create new wildlife habitats, allied to local circumstances and Local Biodiversity Action Plan (LBAP) priorities.

The purpose of this EclA is to provide decision-makers with information about the likely significant ecological effects associated with the continuation of quarrying activities and phased restoration, in particular the potential impacts on designated and undesignated habitats and protected species.

It is the role of all ecologists involved in ecological assessment to:

- provide an objective and transparent assessment of the ecological effects of a proposed development or activity;
- facilitate objective and transparent determination of the consequences of the proposals in terms of national, regional and local policies relevant to nature conservation and biodiversity; and
- set out what steps will be taken to ensure that legal requirements relating to habitats and protected or controlled species are met.

In assessing the effects of any such proposal, it is necessary to define the spatial and temporal area of study and to focus the assessment upon those features or resources that are of ecological value in the context of that proposal. The scope of this assessment has been determined through the consideration of the possible direct and indirect impacts associated with the development and the ecological receptors that may be affected.

6.2 Guidance and Industry Good Practice

The scope of this EclA, collection of baseline data, evaluation of ecological resources, description and assessment of the significance of impacts follows guidelines set out by the Institute of Ecology and Environmental Management (IEEM) and references therein.

6.3 Approach to Assessment

The ES relates to the continuation of quarrying activities at the existing Carew Quarry. The site will be restored to an agreed restoration design.

The EclA study area covers the entire application site as shown on Figure 14/1 (produced within ES Volume 2, Appendix 2B), and adjacent areas where there is continuity.

Also relevant to this EclA, are Chapter 3.0 of the ES, which sets out the restoration strategy, and Chapter 7.0 of the ES, which considers potential

hydro-geological impacts in respect of dewatering activities and discharge into the Milford Haven Waterway SSSI/Pembrokeshire Marine SAC.

6.4 Previous Assessments

No pre-existing ecological information was available in respect of the site other than records held by WWBIC.

In March 2004, a hydrological assessment was undertaken by Parsons Brinckerhoff in consultation with the Countryside Council for Wales (CCW) and the Environment Agency (EA).

The assessment related to the effect of varying (increasing) the existing surface water discharge consent which permits water extracted from the sump in the quarry void to be released after interception by a pond feature into the Mill Pond which is situated some 200m to the south.

The tidal Mill Pond forms part of the Milford Haven Waterway SSSI/Pembrokeshire Marine SAC and supports associated species, most notably the Tentacled Lagoon Worm *Alkmaria romijni* – an SSSI feature.

Due to the potential for changes to occur to the water environment in the Mill Pond which could affect associated species, it was considered necessary to complete a detailed assessment of potential effects.

The assessment considered the potential for increased discharges to affect the Mill Pond and concluded that allowing more freshwater would lead to improvements in the quality of water of the impounded water which would benefit associated species.

Further assessment in respect of the quarry development activities which are the subject of the ROMP application and potential impacts on the Milford Haven Waterway SSSI/ Pembrokeshire Marine SAC are provided in the Hydro-geology Chapter 7.0 of the ES.

6.5 Collation of Baseline Data – Background Data and Biological Records

To inform the current study, the following organisations or on-line resources have provided data which has been used to prepare this EclA:

- West Wales Biodiversity Information Centre (WWBIC);
- The Countryside Council for Wales (CCW) website¹²;
- UK Biodiversity Action Plan (UKBAP) website¹³;
- Joint Nature Conservation Committee website¹⁴; and
- Pembrokeshire National Park Local Biodiversity Action Plan (LBAP) website¹⁵.

A summary of background information received for the purposes of this EclA is included within this Chapter and Appendix 2A. Copies of site designations have been included within Appendix 2A.

6.6 Collation of Baseline Data – Habitats and Flora

To inform the current study, a habitat survey of the site has been undertaken following the standard methodology for Phase 1 habitat survey; this approach was developed by the Joint Nature Conservation Committee (JNCC) in the mid 1980's and has, as its core, the utilisation of a standardised series of colour, symbols and descriptive categories to record habitats, species and other physical features.

¹² <http://www.ccw.gov.uk>

¹³ <http://www.defra.gov.uk>

¹⁴ <http://www.jncc.defra.gov.uk>

¹⁵ <http://www.pembrokeshirecoast.org.uk>

The methodology was developed in order to allow a quick, universal, means of mapping semi-natural and other habitats at up to a county scale. A Phase 1 survey therefore provides a consistent approach to habitat recording and evaluation, and a means of identifying features which may be of value for protected species through the use of target notes.

The Phase 1 survey was undertaken on the 23rd October 2012 and focused on the main operational area as this encompasses the majority of the site, as shown on Figure 6.01. Habitats and features outside of the site were surveyed where access was possible and they were relevant to the assessment.

The Phase 1 habitat map shown as Figure 6.01 is based upon the JNCC methodology, although due to the anthropogenic nature of habitats and features present, some variations were required to present the results of the survey appropriately.

The Phase 1 survey was 'extended' to include an assessment of the potential for protected species to occur within or adjacent to the site.

The Phase 1 survey did not record the presence of semi-natural habitats which were extensive and/or particularly noteworthy. As such, no more detailed botanical surveys (Phase 2) have been recommended.

6.7 Collation of Baseline Data – Protected and Notable Fauna

The Extended Phase 1 survey and desk study found that there was an absence of semi-natural habitats or other features which could support protected or notable fauna due to the currently operational status of the majority of the site.

The following species/groups were identified as being in need of further comment in this EclA:

- bats; and
- breeding birds

No other protected species were considered likely to be present within the site or have the potential to be affected by the quarry development proposals.

6.8 Collation of Baseline Data – Constraints

No specific constraints have been identified that would prevent the EclA from being completed.

It is considered that the level of detail gathered during this EclA study has been sufficient to assess the value of those habitats and species present and the impacts upon them and to advise an appropriate scheme of mitigation to ensure that the proposed extension can be undertaken without adversely affecting sensitive ecological receptors.

The ecological surveys undertaken to inform this EclA have been undertaken following industry guidance and best practice.

6.9 Approach to Evaluation

The baseline information obtained has been used to undertake an assessment of the value of ecological features within the study area.

Ecological features are defined as:

- statutorily protected (Natura 2000 sites, National Nature Reserve, Sites of Special Scientific Interest and Local Nature Reserves) or locally designated (e.g. Sites of Importance for Nature Conservation/County Wildlife Sites) sites and features;
- sites and features of biodiversity value not designated in this way, e.g. areas listed on published inventories of priority biodiversity habitats (e.g. ancient woodland inventory, lowland grassland inventory) or areas of habitats subject to UK or Local Biodiversity Action Plan targets; and
- species of biodiversity value or other significance, including those protected and controlled by law.

An evaluation of the above ecological features has been based upon the relevant IEEM guidelines.

6.10 Impact Assessment

The assessment of ecological impacts follows the process described by the IEEM, which can be summarised as:-

- determine the value of ecological features and resources affected through survey and/or research and assess impacts affecting important features and resources (quantifying the proportion affected and reversibility/recoverability of those resources);
- identify significant impacts in the absence of any mitigation;
- identify measures to avoid or reduce adverse impacts (and in particular likely significant impacts);
- demonstrate the likely success of mitigation measures;
- identify opportunities for enhancement; and
- produce a clear summary of the significant residual impacts of the proposal incorporating all mitigation and enhancement measures.

6.10.1 Evaluation Criteria

All species and populations of species, including those with statutory protection, are evaluated on the same basis. It should be noted that even when a species is protected under European and UK statute, the presence of a small population on a site within a region where this species is widespread is unlikely to be assessed at a value of greater than district-level importance. Equally, a particular feature on a site may attract large numbers of an unprotected species that has limited distribution and this may represent a feature of county or even regional importance.

The criteria used to determine the biodiversity value of a species or features that may support a species include the following general considerations:

- rarity at a geographical level (international, national or local);

- endemism and locally distinct varieties or sub-species;
- species on the edge of geographic range;
- size of populations in the local geographical context;
- species-rich assemblages of a larger taxonomic grouping, e.g. herpetofauna or wintering birds;
- plant communities, ecosystems or habitat mosaics/associations that provide habitat for any of the above species or assemblages; and
- populations of species considered as significant under locally published guidelines or Red Data Books (RDB).

IEEM guidelines (2006) suggest that to ensure a consistency of approach, ecological features are valued in accordance with their geographical frame of reference as follows:

- International;
- UK;
- National (Wales);
- Region (South West Wales);
- County/Borough (Pembrokeshire National Park);
- District (South West Pembrokeshire)
- Parish/Ward (Carew Community Council); and
- Site Level Only (Carew Quarry).

Sites and features that are valued as being important within the immediate zone of influence (i.e., site level) may still have ecological value, for either flora or fauna, but this value is considered to be no greater than what is typical for those habitats or species in that locality and they do not have any special nature conservation interest. These categories have been applied to the features identified in baseline survey described previously.

Separate valuations are provided for designated sites, non-designated sites, features and species where appropriate.

These categories are then applied to the features identified in baseline surveys and desk-top studies. Some features can already be recognised as having ecological value and as such they may be designated as a

statutory or non statutory wildlife site, other features may require an evaluation based upon their previously un-assessed biodiversity value.

Impacts are assessed as significant if they affect the favourable conservation status of a receptor at a specified geographic scale. The conservation status of a species means the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its populations. Conservation status of a habitat means the sum of influences acting upon it and its typical species that may affect its long-term natural distribution, structure and functions as well as the long-term survival of its typical species.

6.10.2 Impact Criteria

Table 6.1 below identifies the key considerations when characterising impacts on ecological receptors once the above values have been established. The table characterises the valued ecological receptors affected and identifies the range of potential impacts, the magnitude and significance of the effect.

Table 6-1 Key Considerations When Characterising Impacts

Descriptor	Definition ¹⁶
Direction of impact	Positive or negative impact.
Probability of occurring	Broadly defined on 3 levels: Certain (> 95% of occurring), Probable (above 50% but below 95%) or Unlikely (above 5% but below 50%).
Complexity	Direct, Indirect or Cumulative.

¹⁶ Definitions for these terms and further information relating the methods of assessment are given in Guidelines for Ecological Impact Assessment (IEEM, 2006).

Descriptor	Definition ¹⁶
Extent and Context	Area/number affected and % of total.
Magnitude	Describes the severity of effect in words.
Timing and Frequency	Seasonality and resilience to repeated impacts (e.g., noise).
Duration	Permanent or Temporary in ecological terms (e.g. within the lifetime of the species effected).
Reversibility	Whether or not the effect can be reversed in an appropriate ecological timescale.

To fully evaluate the effects of a predicted impact upon those valued ecological receptors it is necessary to assess the magnitude of the impact upon that feature (identified in Table 6.2). The predicted impacts of the proposed development, following mitigation, i.e. the residual impacts are assessed using the following criterion which is based upon guidance provided by the IEEM.

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Table 6-2 Criteria for Assessing the Magnitude of Impacts

Magnitude of Impact	Criteria
Major Negative	A change likely to cause a permanent adverse effect upon the integrity and/or conservation status of the ecological receptor.
Negative	A change adversely affects the valued ecological receptor but not to the extent that a permanent effect on integrity and/or conservation status occurs.
Neutral	No effect.
Positive	A change is likely to benefit the receptor in terms of its conservation status, but not so far as to achieve favourable conservation status.
Major Positive	A change is likely to restore an ecological receptor to favourable conservation status, or to create a feature of recognisable value.

Table 6.3 provides a guide to aid the assessment of the significance of impacts according to the value of the ecological receptor. For example, negative impact on a site of national importance will be of minor through to major significance whereas a major negative impact upon a site of parish importance will be of minor to moderate.

The matrix, in many cases, provides a range of levels of significance that may occur; these can only be refined by the careful consideration of those factors at the site such as existing baseline, predicted trends, background level of impacts and the likely effectiveness of the proposed mitigation measures. Areas or features assessed as being of negligible value are excluded from this assessment.

Table 6-3 Impact Significance Matrix

Magnitude of Impact	Value of Ecological Receptor					
	International	National	Regional	County	District	Parish
Major Negative	Critical	Critical	Critical - Moderate	Major - Moderate	Moderate - Minor	Minor - Moderate
Negative	Major - Minor	Major - Minor	Major - Minor	Moderate - Minor	Moderate - Minor	Minor
Neutral	Not Significant					
Positive	Major - Minor	Major - Minor	Major - Minor	Moderate - Minor	Moderate - Minor	Minor
Major Positive	Critical	Critical	Critical - Moderate	Major - Moderate	Moderate - Minor	Minor - Moderate

6.10.3 Residual Impacts

The significance of residual impacts is assessed on three separate levels. These can be summarised as:

- impacts upon biodiversity resources;
- consequences in terms of national and local nature conservation planning policy; and
- legal requirements relating to species and habitats.

6.10.4 Legal and Policy Considerations

A brief overview of planning policies that are potentially relevant to this EclA is provided below.

National Policy (Planning Policy Wales)

Chapter 5 of Planning Policy Wales (PPW) contains important policy statements in respect of biodiversity and, more specifically, the mechanisms for protecting and enhancing biodiversity through development controlled by the planning process. This includes assessment of ecologically designated sites and protected species to be undertaken for proposed developments.

The PPW guidance is supplemented by Technical Advice Notes (TAN), with TAN 5 relating to nature conservation and planning, which further explains the requirement to consider ecological impacts in development proposals.

International Sites

The most important sites for biodiversity are those identified through international conventions and European Directives. Local planning authorities should identify these sites on proposals maps and may need to cross-refer to the statutory protection given to these sites in the explanatory texts in local development documents.

National Sites

Many SSSI's are also designated as sites of international importance and will be protected accordingly. Those that are not, or those features of SSSI's not covered by an international designation, should be given a high degree of protection under the planning system.

Planning permission should not normally be granted where a proposed development on land within or outside a SSSI is likely to have an adverse effect on an SSSI (either individually or in combination with other developments). Where an adverse effect on the site's notified special

interest features is likely, an exception should only be made where the benefits of the development, at this site, clearly outweigh both the impacts that it is likely to have on the features of the site that make it of special scientific interest and any broader impacts on the national network of SSSI's. Local authorities should use conditions and/or planning obligations to mitigate the harmful aspects of the development and where possible, to ensure the conservation and enhancement of the site's biodiversity or geological interest.

Local and Regional Sites

Sites of regional and local biodiversity and geological interest, which include Regionally Important Geological Sites, Local Nature Reserves and Local Sites, have a fundamental role to play in meeting overall national biodiversity targets; contributing to the quality of life and the well-being of the community; and in supporting research and education. Criteria-based policies should be established in local development documents against which proposals for any development on, or affecting, such sites will be judged. These policies should be distinguished from those applied to nationally important sites.

Biodiversity within Developments

Development proposals provide many opportunities for building-in beneficial biodiversity or geological features as part of good design. When considering proposals, local planning authorities should maximise such opportunities in and around developments, using planning obligations where appropriate.

Species Protection

Many individual wildlife species receive statutory protection under a range of legislative provisions.

Other species have been identified as requiring conservation action as species of principal importance for the conservation of biodiversity in Wales.

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Local authorities should take measures to protect the habitats of these species from further decline through policies in local development documents. Planning authorities should ensure that these species are protected from the adverse effects of development, where appropriate, by using planning conditions or obligations. Planning authorities should refuse permission where harm to the species or their habitats will result unless the need for, and benefits of, the development clearly outweigh that harm.

National Legislation

Local Authorities have a statutory obligation to conserve and enhance biodiversity under the Natural Environment and Rural Communities Act (NERC) 2006. This Act extends the biodiversity duty set out in the Countryside and Rights of Way (CROW) Act to public bodies and statutory undertakers to ensure due regard to the conservation of biodiversity:

"Every public authority must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity" Section 40, NERC Act, 2006.

Local Development Plan Policy – Pembrokeshire Coast National Park

The Pembrokeshire Coast National Park (PCNP) Local Development Plan (LDP) was adopted in September 2010, with Supplementary Planning Guidance (SPG), providing further detail and explanation of the LDP policies, subsequently being released for consultation in 2011.

The PCNP LDP contains cross-referenced text to PPW (4.62) in respect of statutorily protected sites and Policy 10 (Local Sites of Nature Conservation Interest) and Policy 11 (Protection of Biodiversity) that are potentially relevant to this EclA.

Policy 2 relates to Local Wildlife Sites and states that *"development that would be liable to significantly harm the nature conservation value of a Local Nature Reserve, or the main interest within a Regionally Important Geological Site (RIGS), will only be permitted if the importance of the*

development outweighs the local value of the site and mitigation, minimisation and offsetting has been investigated.

Policy 11 is titled Protection of Biodiversity and states that *"development that would disturb or otherwise harm protected species or their habitats or the integrity of other habitats, sites or features of importance to wildlife and individual species including Local Biodiversity Action Plan species and habitats will only be permitted where the effects will be acceptably minimised or mitigated through careful design, work scheduling or other measures"*.

6.11 Ecological Baseline

6.11.1 Contextual Information – Ecologically Designated Sites

A summary of the statutorily designated sites identified within the desk study search area is provided in Table 6.4 below.

Citations and site information received or sourced during the desk-top study have been provided within [Appendix 2A](#).

Table 6-4 Summary of Ecologically Designated Sites within the 2km Search Area

Site Name and Importance	Proximity to site boundary	Reason for Importance
Milford Haven Waterway SSSI	220m S	Milford Haven Waterway is of special interest for its geology, ancient woodland, marine biology, saltmarsh, swamp, saline lagoons, rare and scarce plants and invertebrates, nationally important numbers of migratory waterfowl, greater and lesser horseshoe bats <i>Rhinolophus ferrumequinum</i> and <i>R. hipposideros</i> ,

Site Name and Importance	Proximity to site boundary	Reason for Importance
		and otter <i>Lutra lutra</i> . The former millpond at Carew Castle forms a lagoon habitat which is an unusual and rare habitat both in the UK and elsewhere supporting a number of characteristic species that are rarely found in other habitats. Species found include the nationally scarce tentacled lagoon worm <i>Alkmaria romijni</i> and the crustacean <i>Gammarus chevreuxi</i> , along with lagoon cockle <i>Cerastoderma glaucum</i> .
Pembrokeshire Marine SAC	220m S	Annex 1 habitats which are a primary reason for selection:- Estuaries, large shallow inlets and bays, reefs Annex 1 habitats which are present as a qualifying feature but which are not a primary reason for selection of this site:- Sandbanks, mudflats and sand flats, coastal lagoons, Atlantic salt meadows and submerged or partially submerged sea caves. Annex II species that are a primary reason for selection of this site:- Grey seal Shore dock Annex II species that are present as qualifying features, but are not a primary reason for site selection:- Sea lamprey, River lamprey, Allis

Site Name and Importance	Proximity to site boundary	Reason for Importance
		shad, Twaite shad, Otter.
Carew Castle SSSI	380m S	Carew Castle and surrounds lie at the head of the Carew River estuary and provide important transitory roosting and feeding sites for greater horseshoe bats <i>Rhinolophus ferrumequinum</i> and other bat species.
Pembrokeshire Bat Sites and Bosherton Lakes SAC	380m S	Annex I habitats that are a primary reason for selection of this site:- Hard oligo-mesotrophic waters with benthic vegetation of Chara spp. Annex II species that are a primary reason for selection of this site:- Greater horseshoe bat <i>Rhinolophus ferrumequinum</i> . Annex II species present as a qualifying feature, but not a primary reason for site selection:- Lesser Horseshoe Bat <i>Rhinolophus hipposideros</i> Annex II species present as a qualifying feature, but not a primary reason for site selection:- Otter <i>Lutra lutra</i>

The WWBIC did not identify any non-statutory ecological designations within a 2km radius.

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6.11.2 Contextual Information – Pre-existing Records of Protected and Notable Species

A background search for records of protected and notable species was undertaken as part of the study. The search extended for a 2km radius from the site.

A number of records of legally protected and ecologically notable species within the 2 km desk study search area were returned during the desk study. Due to the high number of biological records returned, only a summary of the internationally and nationally protected and priority species records identified within the search area is provided in Table 6/5 below.

Table 6-5 Summary of Internationally and Nationally Protected and Notable Species Records within the 2km Search Area

Group	Species (scientific name)
Birds	Common greenshank (<i>Tringa nebularia</i>), Great northern diver (<i>Gavia immer</i>), Starling (<i>Sturnus vulgaris</i>), Northern Goshawk (<i>Accipiter gentilis</i>), Common linnet (<i>Carduelis cannabina</i>), Curlew (<i>Numenius arquata</i>), Northern pintail (<i>Anas acuta</i>), Red Kite (<i>Milvus milvus</i>), Northern lapwing (<i>Vanellus vanellus</i>), skylark (<i>Alauda arvensis</i>), Little tern (<i>Sturnus alibrons</i>), Golden plover (<i>Pluvialis apricaria</i>), Fieldfare (<i>Turdus pilaris</i>), Bullfinch (<i>Pyrrhula pyrrhula</i>), Kingfisher (<i>Alcedo atthis</i>), Redwing (<i>Turdus iliacus</i>), Song thrush (<i>Turdus philomelos</i>), Herring gull (<i>Larus argentatus</i>), Black-tailed godwit (<i>Limosa limosa</i>), Black-headed gull (<i>Larus ridibundus</i>), Greater scaup (<i>Aythya marila</i>), Kestrel (<i>Falco tinnunculus</i>), House sparrow (<i>Passer domesticus</i>), Firecrest (<i>Regulus ignicapilla</i>), dunnock (<i>Prunella modularis</i>) Little egret (<i>Egretta</i>

Group	Species (scientific name)
	garzetta), Greylag goose (<i>Anser anser</i>) Northern Shoveler (<i>Anas clypeata</i>). Meadow pipit (<i>Anthus pratensis</i>), Mute swan (<i>Cygnus olor</i>), Shelduck (<i>Tadorna tadorna</i>), Great black-backed gull (<i>Larus marinus</i>), Swallow (<i>Hirundo rustica</i>), Grey wagtail (<i>Motacilla cinerea</i>), Stonechat (<i>Saxicola torquata</i>), Swift (<i>Apus apus</i>) and Mallard (<i>Anas platyrhynchos</i>).
Mammals	Greater horseshoe bat (<i>Rhinolophus ferrumequinum</i>), lesser horseshoe bat (<i>Rhinolophus hipposideros</i>), pipistrelle (<i>Pipistrellus</i>), common pipistrelle (<i>P. pipistrellus</i>), soprano pipistrelle (<i>P.pygmaeus</i>), Natterer's bat (<i>Myotis nattereri</i>), noctule bat (<i>Nyctalus noctula</i>), serotine (<i>Eptesicus serotinus</i>), Daubenton's bat (<i>Myotis daubentonii</i>) and brown long-eared bat (<i>Plecotus auritus</i>). Hedgehog (<i>Erinaceus europaeus</i>), otter (<i>Lutra lutra</i>), badger (<i>Meles meles</i>) and polecat (<i>Mustela putorius</i>).
Amphibians and Reptiles	Common toad (<i>Bufo bufo</i>), Slow worm (<i>Anguis fragilis</i>), Grass snake (<i>Natrix natrix</i>), Common frog (<i>Rana temporaria</i>), palmate newt (<i>Lissotriton helveticus</i>), adder (<i>Vipera berus</i>) and common lizard (<i>Zootoca vivipara</i>).
Invertebrates	Dingy skipper (<i>Erynnis tages</i>), Wall (<i>Lasiommata megera</i>), Brown hairstreak (<i>Thecla betulae</i>), Small heath (<i>Coenonympha pamphilus</i>), Marsh Fritillary (<i>Euphydryas aurinia</i>) and Grayling (<i>Hipparchia semele</i>). Moths.

6.11.3 Habitat Baseline

The results of the Phase 1 habitat surveys are shown on Drawing 14/1 produced as [Appendix 2B](#). Full descriptions of habitats against the target note references shown on Figure 14/1 are provided as [Appendix 2B](#).

The site largely comprises of an operational quarry void with significant areas of bare rock, vertical faces, benches and processing equipment. Two areas of standing water also occur within the base of the void which are un-vegetated and form in response to rainfall and quarrying activities.

Peripheral areas comprise of small areas of retained scrub, plantation and secondary woodland around a narrow rim of the quarry or adjacent to roads, buildings and stockpiles/storage areas in the north east part of the site.

Small areas of developing calcareous grassland and taller ruderal grassland are present along bunds or un-used ground. The swards were found to be disturbed and weedy in character.

6.11.4 Protected and Notable Flora

No species of legally protected or notable flora were recorded during the Phase 1 habitat surveys. Due to the timing of the Phase 1 survey some species may have been under-recorded, however, due to the absence of semi-natural habitats and disturbed nature of the majority of the site it is considered unlikely that plant species of conservation value would occur.

6.11.5 Invasive Flora

A locally dominant patch of Montbretia (*Crocsmia x crocosmiiflora*) was noted within a slope bordering a storage yard (Target Note 6). This species was recently added to Schedule 9 of the Wildlife and Countryside Act 1981 (Variation of Schedule 9) (England and Wales) Order 2010. Schedule 9 makes it an offence to plant or otherwise cause the spread of the species listed in the wild.

No other invasive plant species listed on Schedule 9 were recorded during the Extended Phase 1 survey or were highlighted during discussions with quarry staff or as part of the background WWBIC data search.

6.12 Protected and Notable Species Baseline

6.12.1 Otter and Water Vole

The site provides no habitat opportunities in the form of running water or well-vegetated standing water for these two species.

6.12.2 Badger

No badger setts were recorded within the site or within 30m of where development activities currently take place or could do so as part of planned development in the future.

Evidence of badger foraging was noted during the Extended Phase 1 survey visit in Target Note 13, a plantation screening bund.

The peripheral areas of woodland are therefore likely to form part of the home ranges of the local badger clan(s) with areas of improved pastureland outside of the site providing the highest value foraging habitats.

6.12.3 Bats

The desk top study identified the presence of nine species of bat within the 2km search area: lesser horseshoe, greater horseshoe, Natterer's, Daubenton's, common pipistrelle, soprano pipistrelle, serotine, noctule and brown long-eared bat, although none of the records related to the site itself.

Carew Castle to the south of the site (approximately 380m) is notified as an SSSI and SAC because of the presence of important transitory roosts

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of bats in particular greater and lesser horseshoe bats which both maintain internationally important populations in Pembrokeshire.

The Phase 1 habitat survey was extended to record the presence of features which may be used by bats for roosting and/or provide secure foraging or commuting routes.

Roosting Value

The quarry buildings and other structures were subject to an external inspection during the Phase 1 survey and were considered to have negligible potential to support bat roosts. The site office is a portacabin and the other buildings are steel-framed and metal-sheeted and all are subject to noise and disturbance arising through operational activities.

No mature trees occur within the site which were considered to have the potential to support bat roosts.

The Phase 1 habitat survey recorded the presence of solution holes (x4) which occur at elevation within vertical rock faces (>20m from the quarry floor) within the operational void (Target Note 1 aggregated). The localised collapse in bedding planes or drop-out of blocks has resulted in small holes up to 2m wide which are of un-determined depth. The holes are largely un-vegetated except for localised buddleia scrub in places.

Bats will use holes and crevices in rock faces to roost, however, they require undisturbed conditions. During hibernation, they typically need extensive chambers and passages as these are required to provide the necessary stable temperatures and levels of humidity and darkness. Proximity to good quality foraging habitats is also important when bats emerge to feed during milder weather.

The quarry void is frequently subject to considerable noise, vibration, dust and movement of personnel and vehicles as rock is blasted, moved and processed.

Due to the operational nature of the site and the high levels of disturbance which these features are subject to it is considered unlikely that they would

be used by bats in preference to un-disturbed sites which are better linked to foraging habitats.

Future quarrying activities will involve working the site downwards rather than laterally and as such the solution hole features will be retained and others exposed as rock faces are created.

The majority of the site provides negligible foraging opportunities for bats due to the absence of structured semi-natural habitats. Retained scrub and secondary/plantation woodland around the periphery of the site may form part of the wider foraging resource for local populations of bats, although this is small in extent.

6.12.4 Reptiles

Records for all of the commoner species of reptile were returned within the 2km data search area.

The majority of the site comprises of bare rock, sparse pioneer vegetation or disturbed crushed aggregate of negligible value to this group as a supporting habitat.

Habitat mosaics which are favoured by reptiles such as short and tall grassland and scrub with sunny aspects were found to be absent from the majority of the site. Where locally present (i.e. TN 6 and 7) they have developed recently and are small, isolated and disturbed in nature.

6.12.5 Amphibians

Records of common toad, common frog and palmate newt were returned during the desk study. Great crested newts are to be absent from Pembrokeshire.

The two waterbodies (TN 2 and 3) within the quarry void are un-vegetated and vary in their extent. Due to their poor quality as potential breeding sites for amphibians and location in the base of the operational quarry they

are considered to have negligible potential to support breeding amphibians.

The balancing pond at TN 14 was found to be poorly vegetated and turbid and also considered unlikely to provide significant opportunities for breeding by amphibians.

6.12.6 Birds

Records of a number of bird species were returned from within the 2km data search area.

The SSSI citation for Carew Castle mentions the presence of peregrine falcon and barn owl (*Tyto alba*).

Quarry staff confirmed that a pair of peregrine falcon has bred in the quarry on rock ledges for a considerable number of years (including 2012). Peregrine falcon is listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended). This part of the Act provides special protection against killing or disturbance.

Habitats with the potential to support breeding populations of a range of common bird species were identified during the Phase 1 survey, in particular those associated with scrub/woodland habitats.

6.12.7 Ecological Processes and Trends

In the absence of any intervention or the proposed development, the upper edges of the quarry would be subject to natural ecological succession and show a gradual transition from bare rock to grassland and scrub communities and ultimately a climax community of woodland. Upon cessation of de-watering, a lake would naturally form in the quarry floor which would eventually occupy most of the void.

6.13 Nature Conservation Evaluation

6.13.1 Designated Nature Conservation Sites

Four statutorily designated sites occur within the 2km search area.

Milford Haven Waterway SSSI and Carew Castle SSSI are present approximately to the south of the site at c. 220m and c.385m respectively. See Table 6.4 for further details.

Components of the Pembrokeshire Marine SAC and the Pembrokeshire Bat Sites and Bosherton Lakes SAC are situated to the south of the site at c.220 and 385m respectively, with their boundaries coincident with the underpinning SSSI's referred to above. See Table 6.4 for further details. No non-statutory sites of nature conservation importance were identified within a 2km radius.

The site itself is not the subject of any statutory or non-statutory ecological site designations (i.e. as SSSI, County Wildlife Site or Local Nature Reserve).

6.13.2 Undesignated Features of Biodiversity Importance – Habitats and Flora

The majority of the application site comprises of bare rock, crushed aggregate and pioneer grassland habitat that are present due to the operational nature of the site. These habitats are of negligible ecological value.

Peripheral areas comprising retained scrub, plantation and secondary woodland and patches and linear strips of developing calcareous and tall ruderal grassland are small in extent, anthropogenic in origin and disturbed in character and are therefore evaluated as being of site level ecological value only.

6.13.3 Undesignated Features of Biodiversity Importance – Fauna

The site is not considered to provide any significant opportunities for roosting by bats.

The retained vegetated upper margins are likely to form part of a wider foraging resource for local populations of bats, however, the small extent of the areas which are present and their relatively recent origin will limit their value as sources of insect prey.

6.13.4 Reptiles

The site is not considered to have the potential to support significant populations of reptiles due to the absence of suitable habitats.

6.13.5 Breeding Birds

The presence of a nesting pair of peregrine falcon is considered to be of ecological importance at a district level. This species is relatively widely distributed in Pembrokeshire particularly along the coast but continues to suffer from persecution.

6.13.6 Other Fauna

The site is not considered to have any potential to support any further protected species or any critical assemblages of other species above densities found in comparable habitats that occur relatively frequently in the surrounding landscape.

6.13.7 Social, Community or Economic Value

Some areas of habitat/species may not be particularly rare or of high ecological value in their own right but they may be of social or community value for a neighbourhood/community that has the use of such an area for recreational or educational use (nature trails for example). In addition to

this, some wild populations of animals may also be of economic value such as red grouse on heather moors that can be shot or trout in rivers that are fished, or even significant populations of birds that may attract bird watchers to a region.

Such an assessment is, however, centred upon those populations and areas that are considered to be natural or semi-natural.

No species of particular socio-economic value were recorded, or considered likely to be present within the site.

6.14 Potential Impacts

To assess the effects of a proposed development it is essential that the impacts that could arise are identified and characterised. The range of impacts that require consideration in the ecological impact assessment are based upon knowledge of the proposed development and knowledge of the receptors (features of ecological significance). This can only be undertaken with a thorough understanding of ecological processes and how flora and fauna react to the range of impacts that could occur.

Potential impacts are characterised in terms of their direction, permanence, certainty and reversibility. An assessment is also made of the likely significance of the impact prior to mitigation, and the significance of the residual impact, i.e. after all agreed mitigation is implemented. The degree of confidence in the likely success of mitigation, based upon published studies and the experience of the assessor, is also made and any uncertainties are clearly expressed.

6.14.1 Ecological Receptors

Through the process of scoping, consultation and ecological survey, ecological receptors have been identified as having the potential to be affected by the continuation in quarrying activities at Carew Quarry. It is important to note that only those receptors with the potential to be affected, i.e. requiring further consideration in this EclA, are included below:

Full details regarding the phasing of limestone extraction and restoration activities are provided in Chapter 3.0.

6.14.2 Potential Impacts to Habitats

No habitats of ecological value have been identified as being present within the site where quarry development activities would take place.

The continuation of quarrying activities would take place within the footprint of current operational activities and involve the downward working of the quarry floor. Such activities in the locations proposed would not lead to impacts on any habitats of ecological value.

The areas of scrub and plantation/secondary woodland around the perimeter of the site would be retained, strengthened, diversified and extended as part of the proposed restoration scheme.

The following construction/operation impacts have been identified and are discussed in the following section:

- Habitat loss, fragmentation and isolation through land-take;
- Alterations to ground water;
- Alterations to surface water flow and quality;
- Pollution;
- Dust deposition; and
- Post construction (restoration) impacts.

6.14.3 Habitat Loss, Fragmentation and Isolation through Land-take

Habitat loss involves the direct destruction or physical take-up of vegetation. Habitat loss may also occur as a result of a change in land or water management, for instance the drying-up of watercourses or events leading to a change in habitat type.

Habitat loss can result in the direct loss of individuals or populations of plant or animal species. It may also cause other populations to become

demographically unstable or unsustainable, due to loss of prey species or habitat niches.

Fragmented and isolated habitats are likely to be more vulnerable to external factors that may have a negative effect upon them; e.g. disturbance, and may be less resilient to change, including climate and management change; than connected habitats because colonising species may be unable to reach the habitat.

The continuation of quarrying activities would not lead to the loss, fragmentation or isolation of any habitats of ecological value.

The proposed restoration places an emphasis on re-establishing habitat linkages around peripheral areas through the creation of woodland corridors and more open habitat mosaics (i.e. grassland and scrub mosaics). As such, no habitat fragmentation that could be considered ecologically significant is likely to occur.

Alterations to Groundwater and Surface Water Flow and Quality

Full details of the hydrological impacts arising from a continuation of quarrying activities are provided in Chapter 7.0 of the ES.

The hydro-geological assessments have concluded that subject to adherence to the requirements of the existing discharge consent licence, there will be no impact on the Mill Pond or other features.

Pollution

During operational phase, the potential exists that stored materials, stationary plant and vehicles could lead to an increased risk of accidental pollution events.

Due to the absence of sensitive habitats and species within the operational site or immediate surroundings there would be no impacts if such events were to occur.

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The site operator already operates to environmental standards under a series of planning conditions imposed on current operations, and it has in place high standards for pollution prevention through the adoption of best practice working methods and monitoring. Even if such incidents occur control measures are in place to ensure that they are dealt with quickly and effectively and that they are contained.

Dust

The current limestone extraction, processing and storage operations at the site are controlled and regulated by detailed planning conditions as set out in the current planning permission and the processing plant permit.

The permission and permit include conditions relating to dust control and suppression methods that are implemented as part of the day to day running of the site.

It is proposed in this ES that the continuation of site operations will be undertaken in accordance with current practices. As such, and in the context of the existing site workings, it is unlikely that there would be a significant increase in existing levels of dust generation.

The continued implementation of measures to minimise dust creation and control dust that will be generated will minimise the risk of dust causing any significant ecological impacts to ecological receptors.

Chapter 10.0 provides full details relating to air quality, although in summary, no impacts to ecological receptors are predicted.

6.15 Potential Impacts to Species

6.15.1 Breeding Birds

The removal of pioneer vegetation to facilitate quarrying could potentially affect breeding birds if undertaken within the breeding season (March to August inclusive). However, the quarry void where quarrying operations would take place is largely un-vegetated except for small amounts of

buddleia scrub and therefore provides few opportunities for nesting by birds.

In respect of nesting peregrine falcon, the site has supported a pair for many years thus indicating that quarrying operations can be compatible with the retention of a breeding site for this species provided that the situation is monitored. Staff at the Quarry keep a watching brief in respect of ensuring that quarrying operations do not affect ledges where active nesting is taking place.

The site contains a number of potential ledge sites where this species can nest and as most of the future quarrying activities will involve working the site downwards rather than laterally these will be retained.

6.16 Proposed Mitigation

Opportunities to deliver habitat creation linked to local circumstances and LBAP initiatives will be taken during the restoration of the site. Further details are provided in Chapter 3.0 of the ES and are summarised below.

6.16.1 Restoration Strategy

The restoration of the site will provide a diversity of habitat types with an emphasis on strengthening and extending existing scrub and woodland cover so that the quarry continues to be screened, particularly from views from the south.

Opportunities to create mosaics of grassland (calcareous and neutral), scrub and ephemeral waterbodies will also be taken along the northern side of the Quarry which is currently occupied by the plant site.

The habitats to be created will provide direct contributions to existing BAP frameworks and would provide new or enhanced habitats for a range of BAP fauna, such as bats, birds and invertebrates.

6.16.2 Mitigation for Impacts to Species : Breeding Birds

The nests of wild birds, regardless of how common the species are, are protected under the Wildlife and Countryside Act 1981 (as amended) whilst they are occupied or being built.

Vegetation removal should place outside of the bird breeding season, which typically runs from March to the end of August, unless subject to a breeding bird survey beforehand by an appropriately experienced ecologist.

A watching brief should be maintained in respect of the presence of breeding peregrine falcon involving visual inspections using binoculars or telescopes early in the nesting season and then after fledging to determine breeding success.

In the medium-long term, opportunities for nesting by a wider range of birds will be enhanced through the establishment of new habitats as part of the site restoration.

6.16.3 Residual Ecological Impacts

Table 6.6 provides a summary of the potential impacts on ecological receptors that have the potential to be affected by the continuation of quarrying at Carew Quarry and assesses the type, magnitude and duration of residual impacts following mitigation, where proposed and appropriate.

Table 6-6 Summary of Potential Impacts, Mitigation and Residual Impacts

Important Ecological Feature	Description of Potential Impact	Characterisation of Impact	Ecological Significance of Impact if unmitigated	Mitigation and Enhancement Proposals	Significance of Residual Impact following Mitigation and level of Confidence.
Operational Phase.					
Peregrine falcon Specially protected under Schedule 1 of the Wildlife and Countryside Act 1981) against killing, injury and disturbance when nesting.	Killing, Injury, Disturbance and/or loss of nesting ledges.	Negative Unlikely (note: mainly vertical working of the quarry floor is proposed which would leave faces intact) Direct Temporary (over a season)	Unlikely to result in the vacation of the site by this species but would be significant for a given year if breeding activity failed. A probable offence under the relevant legislation as the presence of this species is known at the site.	Watching brief in respect of the location of nesting activities.	Not significant. High level of confidence as this species has co-existed with active quarrying over many years.
Breeding Birds Schedule 1 of the Wildlife and Countryside Act 1981 (as amended)	Removal of vegetation during the nesting season.	Negative Unlikely Direct Temporary (over a season)	A probable offence under the relevant legislation.	Timing of works to avoid vegetation removal during nesting season, provision of suitable nesting habitats as part of a nature-conservation-led restoration.	Not significant.
Restoration Phase.					
Habitat Creation	Provision of a habitat mosaic of greater diversity.	Positive Certain Direct Permanent	n/a	Detailed habitat creation described in Chapter 3.0 of the ES.	Significant at a Parish level.

6.17 Summary and Conclusions

An assessment of the significance of predicted ecological impacts that will result from this has been undertaken following IEEM guidance.

The scope of this EclA has been informed through a review of background information available from a range of sources.

An Extended Phase 1 habitat survey was undertaken in October 2012 by an experienced terrestrial ecologist.

The desk study and habitat survey has provided a current ecological assessment of the study area, which includes the potential for legally protected, rare or notable species of flora and fauna to occur.

No additional species surveys or habitat evaluations were undertaken due to the absence of semi-natural habitats and other features of ecological significance with the potential to be impacted upon by a continuation in quarrying activities.

No direct or indirect impacts upon statutory or non-statutory ecologically designated sites have been predicted.

Provided that a watching brief is maintained in respect of nesting activity by peregrine falcon then a continuation of quarrying operations are unlikely to affect this species.

Recommendations have been provided in respect of the timing of any vegetation removal to ensure the protection of breeding birds. No impacts on any other protected species have been predicted.

Opportunities exist and will be taken to create habitats of ecological value during the restoration phase and aftercare.

Overall, the continuation of quarrying at Carew Quarry is not predicted to have any significant or long term adverse ecological effects.

7.0 HYDROLOGY AND HYDROGEOLOGY

7.1 Introduction

Carew Quarry extracts Carboniferous limestone, producing a range of crushed aggregate and associated products for the local construction market. This chapter assesses the impacts of on-going operations on the water environment in terms of quantity and quality. These are all controlled by the underlying geology.

7.2 Baseline Conditions

Location and Topography

Carew Quarry is centred on approximate National Grid Reference (NGR) SN 048 043 within south-westerly facing ground on the northern side of the Carew River, south east of the village of Carew Newton in Pembrokeshire. Ground elevations around the quarry perimeter vary between 30-40m above Ordnance Datum (AOD), rising to 57m AOD at Whitehill, approximately 1km to the north-east. The quarry location is shown in Figure 7.1 (produced within ES Volume 2, Appendix 3).

Geology

The geology of the quarry is shown in Figure 7.2 (ES Appendix 3), which is based on information published by the British Geological Survey (BGS)¹⁷. This indicates that the quarry is located on the north-eastern limb of a north-westerly trending anticline within limestones of the Pembrokeshire Limestone Series. The Pembrokeshire Limestone Series is underlain by limestones of the Black Rock Subgroup and Gullely Oolite and overlain by interbedded mudstones, siltstones and sandstones of the Bishopston Mudstone Group, which outcrops on the higher ground, to the north-east.

The quarry extracts mostly from the Pembrokeshire Limestone Series, although the contact with the more carbonaceous limestones of the Black Rock Subgroup is visible in the south-western corner. The strata dip to the north-east at an approximately 40°.

Surface Drainage

The quarry lies within the surface catchment of the tidal Carew River and, in particular of the Mill Pond, which is created by the impoundment of the river at the French tidal mill, approximately 0.6km to the west and downstream of the tidal limit. The Mill Pond traps seawater by flap valves (sluices) on its upstream side, as well as freshwater flowing down the Carew River, to create a brackish lake of about 7 ha in area. The Mill Pond forms part of the Pembrokeshire Coast Special Area for Conservation (SAC), which is designated because of the reported presence of the Tentacled Lagoon Worm *Alkmaria romijni* within its bottom sediments.

Drainage within the surface catchment is controlled by the local topography and the distribution of the underlying geology. Rainfall incident on the Bishopston Mudstone Group to the south of Whitehill is hindered from infiltrating by the lower permeability of these strata and shed off the surface as overland flow, or supported as standing water on the clay soils, several of which are shown published Ordnance Survey (OS) topographic maps, as shown in Figure 7.1.

A detailed consideration of the local drainage features is provided in the water features survey, which is included as [Appendix 3A](#). This shows the main features on the annotated 1:2500 scale OS topographic map, presented as Figure 2 in that report. In summary, however, there are two main drainage systems in proximity to the quarry, which are shown as permanent surface water features on either side of the road between the quarry and Whitehill.

To the west, a small stream rises at Russan's Well, a small pond located in an area of poorly drained land with clay soils, approximately 500m to the north of the quarry (NGR 0508 0480). The outflow flows along a field

¹⁷ 1:50,000 scale information available at the BGS website <http://www.bgs.ac.uk>

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boundaries to the south-south-west into an overgrown area to the north of Brooklyn, which is shown as “sinks” on the published maps (NGR 048-045). This location coincides with the mapped boundary between the Bishopston Mudstone Group and the Pembrokeshire Limestone Series (Figure 7.2) and is a sink hole or swallet.

Drainage on the eastern side of the road between Whitehill and the quarry is controlled by field drainage that outflows into a boundary ditch, which flows to the east of the quarry and ‘daylights’ on the western side of the A4075 Carew Lane. The quarry owners report that this ditch was originally routed to a shallow depression, situated between Hillgate and the quarry car park on its north-eastern margin (NGR 0495 0440). The flows witnessed by the quarry caused the owners to plug the inflow ditch with clay, to divert water away from the quarry towards Carew Lane. This feature also coincides with the mapped boundary between the Bishopston Mudstone Group and the Pembrokeshire Limestone Series (Figure 7.2) and is a second sink hole, which appears also to take the flow from a stream that emerges within the garden of Hillgate, immediately to the north-east of the quarry, at times of high rainfall.

Geomorphological Features

In addition to the two sink holes to the north of the quarry, mentioned above, there is evidence of limestone dissolution within the quarry in the presence of two small caves high up within the western quarry face, at the western edge and immediately above the contact with the underlying Black Rock Limestone in the south-western corner. No further quarry will take place in the locations of the identified caves

Other potential limestone dissolution features include the presence of a shallow dry valley in the field immediately to the south of Brooklyn, immediately to the west of the western quarry margin, which has an elevation of between 10-15m AOD (Figure 7.1), and a spring within the base of the Mill Pond, that is apparent at low water, emerging from the Black Rock Limestone (NGR 047 039)

Hydrogeology

The Carboniferous Limestone is classified by the Environment Agency Wales (EAW) as a Principal Aquifer, often capable of supporting large volumes of good quality water. The principal mechanism of water movement is turbulent flow through joints and fissures, the capacity of which has been enhanced by carbonate dissolution. This renders the aquifer susceptible to pollution, particularly where it is present at outcrop, as the rapid infiltration and transport mechanisms provided by the fissured systems limit the potential for attenuation of contaminants. Large spring sources emerge from the Carboniferous Limestone at Milton, on the southern side of the Carew River, which have historically been used for the Public Water Supply but had to be withdrawn because of such problems. The best estimate of the limestone catchment contributing to the Milton source, as demonstrated by its groundwater source protection zone, is shown on Figure 7.1.

The quarry lies within a block of Carboniferous Limestone that is separated from that contributing to the Milton Springs by the presence of the Carew River, which appears to represent a hydraulic boundary. As such, the quarry is situated within a relatively small block of limestone aquifer, the main outflow from which, prior to quarrying, may well have been the spring that emerges in the Mill Pond, noted above. The contributory catchment of this block is undelineated but appears to include a proportion of the Carboniferous Limestone that extends to the north-west, as well as the area of topographically higher Bishopston Mudstone Group that drains to it.

Water Use

The Carew area is classified by the EA as a groundwater exempt area and therefore there are no licensed groundwater abstractions. The largest groundwater source is the Milton Springs, to the south of the Carew River. The published groundwater source protection zone associated with this source (Inner Protection Zone - Zone 1) is shown on Figure 7.1.

The Public Register of licensed abstractions held by the Environment Agency Wales (EAW) indicates that there is one licensed surface water abstraction within 2km of the quarry, Licence No. 22/61/6/0090, located at NGR 0556 0341, 1 km to the south-east, shown on Figure 7.1. The water is taken from the Carew River for the purpose of providing through flow to a fish farm.

The Environment Health Department of Pembrokeshire County Council has records of one unlicensed supply at Tything Barn utilised by a caravan site. The supply is located at NGR 034 052, 1.6 km to the west-north-west of the quarry, within the Pembrokeshire Limestone Series. The location is shown on Figure 7.1.

Quarry Water Management

Water collecting in the base of the quarry workings collects in the sump in the south-western corner, from where it is pumped to a series of catch pits / soakaways located in the field immediately to the south of the quarry. The high level overflow from the catch pits enters the local highway drain from where it discharges directly to the Mill Pond at the bottom of Butts Lane. As a consequence, water pumped from the sump has three potential routes:

- Infiltration into the Carboniferous Limestone (Black Rock Limestone) and seepage back into the quarry via the high wall (a proportion of recirculation is known to occur);
- Infiltration into the Carboniferous Limestone and then lateral groundwater flow away from the quarry, presumably to discharge into the Carew River; and, at times of high discharge,
- Direct discharge to the Mill Pond via the highway drains.

Operational experience at the quarry indicates that it is the management of surface water inflows that is the single greatest constraint to working, however. At times of high rainfall, surface flows into the quarry are significant: the drains either side of the road to Whitehill overtop, follow the course of the road southwards and cascade over the northern quarry

face. During certain periods in 2012 such flows were significant and necessitated cessation of operations. As an indication of the rate of inflow that can be experienced, sump water levels have been known to rise from an operational level of about -16m AOD by the order of 15-20m over the course of a weekend.

Routine measurement of the quarry discharge between 1 May 2000 and 1 March 2004, summarised in [Appendix 3B](#), indicated a range of daily pumped volumes between 2,800 – 5,700 m³/day, with a mean daily flow of 4,250 m³/day; the range in flows caused by the problem of surface run-in. These were greater than the then permitted maximum discharge of 3600 m³/day and necessitated variation of the quarry discharge consent, which was subsequently increased to a maximum daily discharge of 10,000 m³/day, to allow for control of the surface water inflows at times of peak rainfall intensity. The discharge consent variation was subsequently granted by the EAW on 27 July 2005 (Consent No. BP0236901).

Water Quality

As part of the process of applying to vary the discharge consent for the quarry, an Appropriate Assessment was required to be produced in accordance with the Habitats Regulations 1994, to demonstrate that the variation would not be harmful to the habitat of the Tentacled Lagoon Worm; it being understood that *Alkmaria romijni* could tolerate salinity of between 5 - 20 mS/cm. The assessment was produced in consultation with Countryside Council for Wales (CCW) and EAW and concluded, based on the underlying assumptions, that the variation would be marginally beneficial. The assessment showed that the water quality within the impounded Mill Pond was a function of three main variables:

- The state of the tide;
- Freshwater flows within the Carew River; and
- Discharge from the quarry.

The hydrological report that formed the basis of the Appropriate Assessment is included in [Appendix 3B](#).

The assessment included in [Appendix 3B](#) includes the routine monitoring data of the quarry discharge that was undertaken between 1998 and 2001. This showed the conductivity of the sump water in this period to have varied between 0.5 mS/cm and about 3.5-4 mS/cm, with a mean value of 1.83 mS/cm. Monitoring undertaken between August and October 2012 is consistent with the earlier monitoring, the variation demonstrating the effect of surface water inflows but also suggesting a degree of stratification within the limestone adjacent to the coast.

Summary: Assessment of Historic Operations

Historic extraction operations at Carew have affected the local water environment, particularly the local drainage regime, which has been altered by the creation of a large void and the procedures implemented to facilitate and maintain dry working conditions. The changes have been slight and limited to the area in the immediate vicinity of the quarry, however. The overall water balance to the Mill Pond, which was the ultimate and most sensitive receptor for water entering that part of the Carboniferous Limestone now occupied by the quarry, has been unaffected by operations, as all intercepted water has been returned to it (see [Appendix 3B](#)).

7.3 Summary of Proposals

It is proposed that extraction operations will continue in line with the current planning consent. Limestone will be extracted within the existing quarry footprint, maintaining the quarry sump in the south-western corner, with discharge of intercepted water to the catch pits to the south, as currently. Extraction will predominantly be of the unworked limestones of the Pembrokeshire Limestone Series that are above the water table, to the east and north of the existing sump location.

7.4 Assessment of Effects

The majority of this section deals with the assessment of potential effects arising from on-going operations and the mitigation required, with consideration also given to post-closure effects.

Future Extraction Operations

Future operations are considered in terms of the effects to the identified surface water and groundwater receptors, each of which is considered in terms of quantity and quality.

Surface Water Receptors

The surface water receptors identified are:

- The Mill Pond and the Pembrokeshire Coast SAC;
- The licensed surface water abstraction No. 22/61/6/0090, located 1 km to the south-east of the quarry, shown on Figure 7.1; and
- Riparian ownership outside the quarry.

As noted in Section 7.2, current operations do not affect the water balance to the tidal Mill Pond. Provided that water pumped from the quarry sump continues to be discharged in accordance with the requirements of the existing discharge consent, the Mill Pond and Pembrokeshire Coast SAC will be unaffected by on-going operations. The potential is present for the discharged water quality to be affected by accidental spills of fuel or chemicals, which is discussed below in relation to the water quality within the Carboniferous Limestone aquifer.

The licensed surface water abstraction shown on Figure 7.1, is above the tidal limit and therefore up-gradient of the quarry and so will be unaffected.

Most of the riparian ownership in the vicinity of the quarry is located up-gradient of the quarry and so will be unaffected by operations. That which is arguably down-gradient, such as the surface water drainage system to

the east of the quarry has already been affected by the historic diversion works described in Section 7.2. No additional effects will take place as the quarry outflow is concentrated to the south.

Groundwater Receptors

The groundwater receptors identified are:

- The Milton Springs source;
- The unlicensed supply at the Tything Barn caravan site, located 1.6 km to the west-north-west of the quarry; and
- The Carboniferous Limestone aquifer.

The quarry lies outside the catchment to the Milton Springs source, shown in Figure 7.1 and is hydraulically isolated from it. The Milton Springs will therefore be unaffected by continued operations.

The source at Tything Barn is located within the same aquifer block as the quarry but is outside its topographic catchment, which approximates to the search envelope shown on Figure 7.1 within the water features survey in [Appendix 3A](#). This source has reported no deleterious effects to the local Environmental Health Department and is assumed to be unaffected by current operations. As such, no future impacts are anticipated.

Dewatering operations have lowered natural groundwater levels within the Carboniferous Limestone within the quarry, probably of the order of between 20-30m at the sump. This effect can be expected to have extended beyond the quarry footprint but is likely to be asymmetric because of the geological structure and the effect of the karst features controlling groundwater movement, noted in Section 7.2, and the turbulent flow processes in operation. The cone of depression associated with the dewatering can be assumed to be in a *quasi* steady-state because of historic operations. Some expansion of the dewatering 'cone' is likely to occur as the footprint of the existing sump enlarges, however this is likely to be only incremental outside that which has already taken place; significant expansion of the cone of depression will not occur.

Water quality within the aquifer can potentially be affected by the following:

- Accidental spillages of fuels, oil, grease and other chemicals that may be stored and used within the quarry premises; and
- Saline intrusion as a result of excessive pumping.

The fractured nature of the limestone makes it susceptible to contamination, as shown by the historic reduction in quality experienced at the Milton Springs source. Furthermore, the exposure of the water table at the quarry sump means there is the potential for direct contamination of the groundwater resource, with little or no scope for attenuation by natural processes once a spillage had occurred. In addition, once it had reached the quarry sump, such contamination would have the potential to enter the Mill Pond and Pembrokeshire Coast SAC. Such risks, whilst they may be small can only be mitigated by good operational procedures, associated with refuelling operations and chemical storage.

As noted in Section 7.2, historic operations detected a variation in observed salinity within the quarry discharge, which was attributed to variations in surface inflow and some stratification of water quality within the limestone. Such variations were transient over an annual cycle (see [Appendix 3B](#)). Regular monitoring has recommenced but shows very similar conditions within the quarry sump water. As a result, deterioration of the groundwater quality outside the variation observed historically is not envisaged, however this should be confirmed by ongoing monitoring.

Cessation of Operations

On cessation of operations and dewatering, water levels within the quarry will recover and rise to create a freshwater lake within the void. This is likely to have some stratification caused by an increased proportion of salinity near its base, owing to the proximity to the coast and the Mill Pond, which it is assumed will continue to be impounded by the French tidal mill. Final lake top water levels will be controlled by the permeability of the quarry walls on completion, and the drainage capacity of the dry valley adjacent to the western margin but are estimated to be between 10-15m AOD. Notwithstanding the above, provision should be made for

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monitoring the rate of water level increase, with the include measures to control water levels, should these be required.

7.5 Mitigation and Recommendations

The following recommendations are made:

- (i) Inclusion of a condition requiring best practice for refuelling operations and the storage and use of chemicals within the quarry.
Reason: for the protection of groundwater quality and the Pembrokeshire Coast SAC.
- (ii) Regular (weekly) monitoring of the quarry discharge should be reinstated (following cessation resulting from the failure of the flowmeter and reconfiguration of the discharge arrangement).
Reason: for compliance with the site discharge consent and protection of the SAC.
- (iii) Regular monitoring of water quality in the sump, should also be reinstated. Reason: To manage salinity levels.

7.6 Summary

Historic extraction operations at Carew have affected the water environment, however the associated impacts have either been negligible or only of limited duration and extent. Continued working should witness similar impacts, however this should be confirmed by appropriate monitoring. A freshwater lake will occupy the void on the cessation of operations.

8.0 NOISE

8.1 Introduction

A ROMP assessment of noise has been carried out with reference to British Standards and other government guidance. Noise issues relating to the operation of the development have been considered in relation to the nearest noise-sensitive property to the north west of the site (Carew Newton House).

Technical terms or references are occasionally used in this section. To assist the reader, a glossary of terminology, including a table of example noise levels that may be found in general life, are included in [Appendix 4A](#).

8.2 Government Advice, Standards and Good Practice

8.2.1 Planning Conditions Relating to Noise

The planning permission granted by Pembrokeshire Coast National Park Authority dated 17th December 1997, under application number NP/319/97, outlines permitted noise levels for operations at Carew Quarry.

Condition 32 relates to normal operations within the quarry and states:

“Except during construction of the “bund/baffle mound” required by Condition 34 and during the period described in Condition 33 operations at the quarry shall be so managed that during the working day, the level of noise under neutral weather and “free field” conditions at the south eastern facade of Carew Newton House (Grid Reference SN0463 0448) shall not exceed 50 dBLAeq(1hr), as measured in accordance with BS5228:1984 “Code of Practice for Noise Control on Construction and Demolition Sites”.”

Conditions 33 and 34 were subject to time limits for a 5 year period from the date of the planning permission relating to operations at high levels within the quarry. These operators have been completed and the time limited conditions have expired such that only Condition 32 is relevant at this time.

Condition 38 required the submission of a scheme of noise monitoring. Such a scheme was submitted, and approved by the NPA in June 1998.

BS5228:1984 Code of Practice for Noise Control on Construction and Demolition Sites has been superseded several times since the 1997 conditions were imposed. The current version of BS5228, BS5228:2009 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise, outlines the guidance for noise monitoring in Annex G of the Code.

Subsequent to the permission reference NP/319/97, a further temporary permission was granted by Pembrokeshire Coast National Park Authority dated 12th February 2010, under application number NP/04/469 for a variation to the hours for importing materials. Conditions 22 to 27 refer to noise. This permission was due to expire on 30th September 2012 when operations would revert to the original conditions.

Condition 22 re-iterates the limits set out in Condition 32 of the 1997 permission. Condition 22 states:

“Between the hours of 0730 and 1730 Monday to Friday and between 0730 and 1600 hours on Saturdays, the noise level attributable to operations at the site, measured at any noise-sensitive property not owned by the quarry owner or operator, shall not exceed 50 dB LAeq (1 hour) (free field) other than for activities covered by Condition 23[sic] below. Outside these hours the noise level attributable to operations at the site shall not exceed 42 dB LAeq (1 hour) (free field). ‘Noise sensitive property’ means occupied residential property or public buildings.”

However, Condition 23 states:

“The noise level attributable to operations on the periphery of the site or at high levels, or in unscreened locations, such as the formation, removal or alteration of spoil tips, baffle mounds, screening and storage embankments at the site, measured at any noise sensitive property not owned by the quarry owner or operator, shall not exceed 53 dB LAeq (1 hour) (free field). These noise limits shall only apply for a maximum of 8 weeks in any calendar year unless otherwise agreed in writing with the National Park Authority.”

Conditions 24 and 25 refer to mitigation measures for plant, Condition 26 refers to the removal and/or addition of acoustic screening and Condition 27 refers to noise monitoring in accordance with the agreed scheme.

More recently a, planning permission was granted in March 2011 to renew a temporary planning permission which allows the importation of inert waste material for treatment and processing as a recycling operation (permission reference NP/10/482). The planning permission is time limited to 14th December 2012, to coincide with the date of the Environment Act ROMP Review. The planning permission reproduces the majority of the planning conditions imposed on the original permission reference NP/319/97, where the noise conditions state that:

“Between the hours of 07.30 and 17.30 Monday to Friday and between 07.30 and 16.00 on Saturday, the noise level attributable to operations at the site, measured at any noise sensitive property not owned by the quarry owner or operator, shall not exceed 50 dblaeq (1 hour) (free field) other than for activities covered by condition 18 below (sec 23 below). Outside these hours the noise level attributable to operations at the site shall not exceed 42 dblaeq (1 hour) (3 field)”. Noise sensitive property means occupied residential property or public buildings. (Condition 22) and

“The noise level attributable to operations on the periphery of the site or at high levels, or in unscreened location, such as the formation, removal or alteration of spoil tips, baffle mounds, screening or storage

embankments at the site, measured at any noise sensitive property not owned by the quarry owner or operator, shall not exceed 53 dblaeq (1 hour) (3 field). These noise limits shall only apply for a maximum of 8 weeks in any calendar year unless otherwise agreed in writing by the National Park Authority” (reference Condition 23)”.

8.2.2 Sources of Information

Information regarding the ongoing development, including the fixed and mobile plant to be employed, operational hours and proposed vehicle movements to and from the site has been provided by the client and/or their sub-consultants.

8.3 Approach to the assessment

This assessment considers the suitability of the extant planning condition for noise generated by site activities at Carew Newton House for continued activities at Carew Quarry.

Noise levels generated by current operations at Carew Quarry were measured at Carew Newton House in line with the requirements of Condition 32 of the extant planning permission (ref NP/319/97 to determine whether existing operations are in compliance with the condition.

A qualitative assessment has been made as to the suitability of the noise limit detailed in Condition 32 for future operations at Carew Quarry.

8.4 Baseline Conditions

An environmental noise survey was carried out on 4th October 2012 to determine the current operational noise levels at Carew Newton House.

The weather conditions during the survey periods were acceptable for noise monitoring, being dry and cloudy with little wind. The microphone

was placed 1.5m above the ground in free-field conditions, *i.e.* at least 3.5m from the nearest vertical, reflecting surface.

The results of the noise survey are presented in Table 8-1 below.

Table 8-1 Summary of Measure Noise Levels – Weekday, free-Field dB

Location	L _{Aeq,T}	L _{A90}	L _{A10}	L _{Amax}
Carew Newton House	44.8	41.8	46.2	61.3

The noise climate in the area comprised distant and local road traffic, quarrying activities and natural sounds such as birdsong, horses and wind in nearby trees.

8.5 Environmental Design Measures

The future development of the site has been designed to offer maximum protection to the amenity of local residents with operations taking place deeper within the void, and with internal haulage routed behind existing screening mounds or worked faces where possible.

8.6 Potential Impact

Since planning permission was granted, site operations have been periodically monitored to ensure compliance with the conditioned noise limits and no excessive noise levels have been reported. It should be noted that, during the life of the quarry to date, replacement and additional plant have been installed without the conditioned limits being breached.

Future operations at the quarry would be undertaken deeper within the quarry void and at distances no closer to the nearby noise-sensitive properties than previous operations.

Table 8-2 shows the comparison of existing operational noise levels without corrections, *i.e.* those including extraneous, non-site related noise sources, against the Conditioned noise limits specified in the planning permission.

Table 8-2 Derived Criteria for Normal Operations, Free-field dB

Location	Measured Noise Level, L _{Aeq,1hr}	Conditioned Noise Limit, L _{Aeq,1hr}
Carew Newton House	44.8	50.0

Table 8-2 shows that existing operations at the quarry meet the noise limit detailed in Condition 32 of the extant planning permission.

Based on the above, it is considered that the noise limit in Condition 32 remains appropriate for future activities at Carew Quarry.

8.6.1 Operational Assessment

Future operations at Carew Quarry would generally be undertaken deeper within the quarry void and at distances no closer to the nearby noise-sensitive properties than previous operations.

It is assumed that all future operations would be undertaken using the existing plant compliment with any additional or new plant items bought onto to site would only be to replace existing plant due to breakdown or permanent replacement.

During the proposed future operations, towards the end of the life of the site, the ‘block plant’ would be removed completely leading to a reduction of the overall amount of plant on site.

Based on the above, it is considered that noise levels generated by future operations at Carew Quarry would continue to meet the noise limit outlined

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in Condition 32 of the extant planning permission, and that the noise monitoring outlined in Condition 32 of the permission should continue to show continued compliance with the limits.

8.7 Mitigation Measures

The proposed future operations progress plant would work at lower elevations, deeper in the void, giving more screening/attenuation of noise to nearby noise-sensitive locations with the removal of plant towards the end of the life of the quarry. No specific mitigation measures are considered necessary to reduce the potential impacts from noise; however the following *Good Site Practice* measures, as a minimum, would be adhered to.

8.7.1 Good Site Practice

The site design incorporates several features that provide mitigation against potential noise nuisance; these features include, but are not necessarily limited to:

- the construction of screening mounds between operations and noise-sensitive receptors where necessary; and
- the use of low frequency broadband reverse warning systems on all mobile plant.

In addition to the noise mitigation measures incorporated into the site design, good site management practices and other specific measures would also provide additional noise mitigation. These measures would include:

- activities within the proposed development would be undertaken in locations where noise attenuation from existing natural landforms would maximise the benefit to the noise-sensitive properties;
- internal haul routes would, wherever possible, be routed such that separation distances to the noise sensitive properties are maximised;

- all haul roads would be kept clean and maintained in a good state of repair to avoid unwanted rattle and “body slap” from vehicles;
- all mobile plant used at the proposed extension would have noise emission levels that comply with the limiting levels defined in EC Directive 86/662/EEC and any subsequent amendments;
- all mobile plant and heavy goods vehicles entering the site will move in a circular pattern to minimise, as far as is practical and safe, noise from reverse warning systems;
- plant would be operated in a proper manner with respect to minimising noise emissions, for example, minimisation of drop heights and no un-necessary engine revving;
- plant would be subject to regular maintenance. All plant at the site would be fitted with effective exhaust silencers and would be maintained in good working order to meet manufacturers’ noise rating levels. Defective silencers would be replaced immediately;
- plant that is used intermittently, would be shut down when not in use; and
- pumps, generators and compressors would be located behind existing screening mounds, would be either electrically powered and would be fitted with an acoustic covers where necessary. Diesel powered pumps, generators and compressors will be installed within acoustic enclosures.

8.8 Conclusions

The noise assessment considers the suitability of the extant planning condition for noise generated by continued activities at Carew Quarry. Noise levels generated by current operations at Carew Quarry were measured at Carew Newton House in line with the requirements of Condition 32 of the extant planning permission to determine whether existing operations are still in compliance with the condition.

A qualitative assessment has been made as to the suitability of the noise limit detailed in Condition 32 for future operations at Carew Quarry. It is noted that as future operations would generally be undertaken deeper within the void and at distance no closer than previous operations the

potential noise levels generated by future operation would continue to meet the noise limits detailed in Condition 32.

Based on the results of the assessment, it is considered that all practical means have been employed in the design of the site to protect the amenity of the nearby noise-sensitive properties.

It is concluded that noise should not pose a material constraint to the ongoing development at the quarry.

9.0 BLAST VIBRATION

9.1 Introduction

Carew Quarry contains Carboniferous Limestone and, consistent with other similar quarries working such limestone, the rock is extracted by a succession of controlled blasts from quarry faces which breaks up the rock allowing it to be excavated and transported to a crushing and screening plant for processing.

Each blast is individually designed with boreholes charged with explosives and detonated in a way which loosen and breaks up the rock, which can then be excavated from a rock pile. When an explosive detonates within a borehole, stress waves are generated causing very localised distortion. However, outside this immediate vicinity, permanent deformation does not occur. Instead, the rapidly decaying stress waves cause the ground to exhibit elastic properties whereby the rock particulars are returned to their original position following the passage of the stress waves. Such vibration is always generated even by the most well designed and executed of blasts, and will radiate away from the blast attenuating as distance increases. With experience and knowledge of the factors which influence ground vibration, such as blast type and design, site geology and receiving structures, the magnitude and significance of these waves can be accurately predicted at any location.

Ground vibration is calculated in terms of 'peak particle velocity' (PPV), and is measured in millimetres per second (mms). Detailed research has determined that vibration levels well in excess of 50 mms are necessary to produce structural damage to residential type properties. For human perception, government advice is that levels should be set in the range of 6-12 mms as discussed further below.

Vibration is also generated within the atmosphere where the term 'air over pressure' is used to encompass both its audible and sub audible frequency components. Again, experience and knowledge and blast type and design enables prediction of levels and an assessment of their significance.

However, unlike with ground vibration, predictions of air overpressure can be made less certain by the fact that air over pressure levels may be significantly influenced by atmospheric conditions. Hence, the most effective method of control is its minimisation at source.

It is important to realise that for any given blast it is very much in the operators interest to always reduce vibration, both ground and air borne to the minimum possible in that this substantially increases the efficiency and hence the economy of blasting operations.

9.2 Current Planning Conditions

Planning permission reference NP/319/97, which is the subject of this Review, imposes conditions that;

"Ground vibration as a result of blasting operations will not exceed a peak particle velocity of 8.5 mm/second in 95% of all blasts measured over any period of 6 months and no individual blasts shall exceed a peak particle velocity of 12 mm/sec as measured at vibration sensitive buildings. The measurement to the be maximum of 3 mutually perpendicular directions taken at the ground surface' (condition 50).

'The maximum excess pressure (peak over pressure) resulting from any blast event shall not exceed 120 dB (linear) at any vibration sensitive building, as measured using a precision sound level metre, calibrated and set to extended linear frequency and 'peak' time response (condition 51).'

Condition 52 requires that vibration and air over pressure levels shall be monitored in accordance with a scheme to be submitted to the National Park Authority. Such a scheme was submitted to and approved by the National Park Authority in June 1998 which, in summary, requires all blasts to be monitored at Cross Cottage in Carew Newton.

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The same limits on ground vibration and air over pressure from blasting are imposed on permission reference NP/04/469 (reference condition 18 and 21), and permission NP/10/482 (reference conditions 18 and 21).

9.3 Planning Policy and Advice Standards

Minerals Planning Guidance Note 14 (MPG 14) provides advice on planning conditions which might be imposed as part of ROMP Reviews to regulate ground vibration from blasting, and to minimise air overpressure. MPG 14 also advises that planning conditions might appropriately be imposed relating to the times of blasting, and the need for audible warnings to be issued prior to the commencement of any blasting operations.

In terms of vibration limits, MPG 14 suggests that:

'ground vibration as a result of blasting operations shall not exceed a peak particular velocity of [6 mm/sec] [10mm/sec] in 95% of all blasts measured over any period of [6 months] and no individual blast shall exceed a peak particle velocity of [12 mm/sec] as measured at vibration sensitive buildings. The measurement to be a maximum of 3 mutually perpendicular directions taken at the ground surface' (reference Annex M:Environmental Protection)'.

It will be noted that the current Carew Quarry 95% limit of 8.5 mm/sec is mid way between the suggested limits of 6 and 10 mm/sec, and that the upper limit of 12 mm/sec is consistent with the MPG 14 guidance.

More recently, Minerals Technical Advice Note 1: Aggregates (MTAN1) published by the Welsh Assembly Government in March 2014, sets out detailed advice on the mechanisms for delivery the policy for aggregates extraction. Section C describes the methodologies to be employed to reduce the environmental impact of aggregates production, and covers such topics as buffer zones, dust, blasting, noise and visual impact.

In terms of blasting, MTAN1 gives advice on suitable planning conditions to control the environmental impact of blasting operations at quarries. Paragraph 83 states that:

'planning conditions relating to the control of blasting should only relate to those aspects of environmental management that are under the control of the operator; should be directly relevant to environmental issues; and should not be in conflict with existing health and safety legislation. Consequently planning conditions should provide for:

- *Acceptable days for blasting operations; unless there are exceptional circumstances such as safety, emergency, blasting should take place at regular times within the working week i.e. Mondays to Fridays. Blasting on Saturday mornings should be a matter for negotiation between the operator and the MPA taking into account of the views of any nearby residents. No blasting should take place at any other time that is Saturday afternoons, Sundays or Bank or National holidays;*
- *Acceptable times of blasting operations: blasting should only take place between the hours of 10am and 1600 hours, except where there is an emergency in the interests of safety;*
- *Maximum level of ground vibration at sensitive locations: ground vibration as a result of blasting operations should not exceed a peak particle velocity of 6 mms^{-1} PPV in 95% of all blasts measured over any 6 month period, and no individual blast should exceed a peak particle velocity of 10 mms^{-1} PPV;*
- *Approval of the scheme which air over pressure is managed and mitigated through careful design of blasting operations;*
- *Approval of the scheme of vibration monitoring so that compliance with set limits can be adequately demonstrated by the operator at any time'.*

9.4 Blast Monitoring

All blasts are monitored at Carew Quarry, and detailed records are maintained of the location and design of the blast, the maximum instantaneous charge (MIC) – i.e. the explosives weight in kilograms, and the recorded ground vibration and air over pressure. Records for the 12 month period from October 2011 to October 2012 are produced as Table 9.1

Table 9-1 Carew Quarry Blasting Records

Date	MIC	PPL	AOP
12/10/12	78	DT *	DT
17/09/12	78	DT	DT
02/07/12	50	4.39	106
24/05/12	78	0.37	112
02/05/12	72	DT	DT
13/01/12	55	5.20	106
05/12/11	50	5.37	100
18/11/11	65	DT	DT
03/11/11	35	6.41	100
03/10/11	26	9.14	100

* DT = vibrograph did not trigger, meaning that vibration levels were too low to trigger the sensor.

It will be noted that with 2 exceptions, all ground vibration levels were below 6mm/sec, with just one above (6.41mm/sec), and an isolated example at 9.14 mm/sec. The highest level was recorded when blasting was taking place at a relatively elevated position in the north western area of the quarry, in closest proximity to the monitoring location. All quarrying in this location has now been completed.

It is apparent from the above records that the current limits of 8.5 mm/sec for 95% of blasts, and an upper limit of 12mm/sec are being complied with.

It is also apparent that the operations seem appear to be capable of meeting the more stringent limits suggested in MTAN1 of 6mm/sec for 95% of blasts and an upper limit of 10 mm/sec.

9.5 Mitigation Measures

In view of adherence to the current blast vibration limits, no specific additional mitigation measures are considered to be necessary. It is also important to recognise that blasting at Carew Quarry is undertaken by qualified and experienced personnel where, in addition to planning controls, the operations are regulated by the Mines and Quarries Inspectorate. In view of these wider controls, it is an established principle that specific aspects of blast design such as the number of boreholes or the amount of explosives used should not be included in the blasting conditions. Blasting design criteria must always be the direct responsibility of the site operator as defined by the Quarries Regulations 1999. Thus, conditions should state the desired objectives rather than the methods by which the objectives are to be achieved. In this case therefore the key issue is to set a limit on ground vibration, which will then require the Operators to design blasts to ensure adherence to the limits.

In the above context, the advice set out in the DETR publication on the Environmental Effects of Production Blasting from Surface Mineral Workings is that planning conditions should focus on days and times for blasting operations; allowable ground vibration limits; a scheme for air over pressure control in preference to limit values, and a scheme of monitoring. The updated planning conditions have been drafted to reflect this advice.

9.6 Suggested Planning Conditions

In the context of the underling objective of a ROMP Review to improve environmental performance, and to update planning conditions to accord with current standards, it is considered appropriate to revise the blasting conditions at Carew Quarry to introduce a more stringent blast vibration criteria. This would reduce the 95% limit from 8.5 mm/sec to 6mm/sec, and the upper limit from 12 mm/sec to 10 mm/sec.

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Planning conditions are thus included in the schedule of updated conditions, which reflects the advice in MTAN and which reflect the following principles:

Unless there are exceptional circumstances such as a safety emergency, blasting shall only be carried out between 09:00 am and 16:00 pm Mondays to Fridays, and under exceptional circumstances on Saturday mornings. No blasting should take place at any other time, that is, Saturday afternoons, Sundays or Bank or National Holidays;

Blasting times shall be clearly advertised at the quarry and an audible warning shall be sounded before each blast to alert personnel, residents and visitors to the area;

A record of each blast at the quarry extension area shall be maintained showing the Maximum Instantaneous Charge, the number of holes and total charge and detonation technique, together with the detailed location of the blast. The record shall also show the minimum distance to the nearest noise vibration sensitive premises.

All blasts shall be designed to ensure that ground vibration as a result of blasting operations does not exceed 6mm/sec in 95% of all blasts measured over a 6 month period, and no individual blast shall exceed 10mm/sec, as measured at Carew Cross, Carew Newton. Evidence that each blast has been designed and implemented to meet the above criteria shall be applied to the NPA upon request.

All blasts shall be designed and detonated in a way which minimises air overpressure.

10.0 DUST

10.1 Introduction

This Chapter presents an overview of potential sources of dust emissions at Carew Quarry, and highlights the dust controls and mitigation measures which are implemented as part of the ongoing development.

The assessment cross-refers to the environmental permitting regime under the Pollution Prevention and Control Act, which regulates the operation of the quarry processing plant and related activities, and which imposes strict controls on emissions and the monitoring of emissions from the plant, stockpiles, haul roads and aggregate handling operations.

The Permit (reference PPC/10/3.5) issued by Pembrokeshire County Council, imposes requirements relating to:

- i. Control, monitoring, sampling and measurement of emissions, to include visual assessment, monitoring, inspection and remedial access;
- ii. Material handling, including restrictions on storage of material in the open; use of water sprays; use of storage bays; restrictions on the height of stockpiles; enclosure of conveyors; enclosure of transfer points; enclosure of screen houses and transfer houses; fitting of dust extraction and dust suppression on the crushing plant; and minimisation of drop heights of stone;
- iii. Materials handling associated with mobile crushing and screening plant, which include similar requirements to those relating to fixed plant;
- iv. Transfer and loading, including minimising wind borne dust at the loading points; use of dust collection systems on the cement silo (with additional specific dust controls relating to the use of cement in the ready mix/block plant operations); dampening down of dust

on internal haul roads; sheeting of outgoing and incoming vehicles carrying material less than 75mm in size; and using plant with upwards facing exhausts; and

- v. General operations, including requirements for staff training, maintenance of dust control equipment, and general housekeeping requirements to prevent dust accumulations.

The advice in MTAN1 is that controls imposed on a Permit should not be duplicated as part of the planning regime (ref para 76). However, as part of an EIA and the updating of planning conditions, it is appropriate to identify the main sources of dust at the quarry, and to draft conditions relating to ameliorative measures to mitigate impacts where such measures are not specifically dealt with as part of a Permit. Such conditions could include road cleansing and on-site speed restrictions etc, together with general site design which should include in-built mitigation measures to locate dust emission sources away from sensitive development; protection of loading activities and materials storage areas; and control of soil handling and overburden stripping, including timing to suit weather conditions (ref MTAN1 para 77).

In considering the potential for dust impact, reference has been made to Minerals Policy Statement 2: “*Controlling and Mitigating the Environmental Effects of Minerals Extraction in England Annex 1: Dust*”. As noted in the title, the guidance relates to England only, but it draws extensively upon the results of a DoE research project undertaken for the ODPM by Arup Environmental/ Ove Arup & Partners on ‘*The Environmental Effects of Dust from Surface Mineral Workings*’ (HMSO 1995) – hereafter referred to as the Arup Report 1995. The research study is applicable to quarries in Wales (and is referenced in MTAN1, para 72), and it is thus appropriate to draw upon the good practice guidance set out in MPS2, which itself draws upon the Arup Report 1995.

The assessment of dust air quality impacts has also been undertaken in the context of advice in MPS2 relating to the potential for dust emissions from typical activities within mineral workings (Annex 1A); the good practice for reducing and controlling dust (Annex 1B); and the form and

nature of planning conditions which can control dust emissions, and which can be complementary to the Permit controls (para 77).

10.2 Assessment of Impacts

Dust emissions can arise from mineral sites as a result of operational activities, and wind erosion of exposed surfaces. The amount of dust raised is dependent upon a number of interrelated factors, which include:

- The nature of the material;
- The prevailing meteorological conditions;
- The activities being undertaken;
- The influence of any on-site mitigation measures.

The potential for dust generation at mineral sites is largely related to the hardness of the minerals being handled; the extent of handling and processing necessary; and the size of the mineral products being produced. For dust to become airborne, energy is required to overcome the gravitation and cohesive forces binding dust particles to the surface. At Carew Quarry, with a relatively hard limestone resource, the most significant dust emission potential is associated with;

- Soil and overburden stripping;
- Blast hole drilling and blasting;
- Loading at the quarry face and haulage to the mobile processing plant;
- Processing the excavated rock;
- Storage of products; and
- Loading and haulage off-site of finished products.

The extent of dust dispersal depends on a range of factors including particle size; wind speed; dry weather conditions; and surface roughness e.g. the extent of tree cover. The greatest proportion of dust, comprising large dust particles (greater than 30 µm) will largely deposit within 100m of the source. Larger sized mineral particles in excess of 75 µm are not readily transported the air and, if disturbed, normally fall under gravity

within several metres of the source, except in very severe dry weather conditions. Intermediate sized particles (10-30 µm) are likely to travel further afield although, as a result of dilution effects, the extent of dust deposition at distances of over 250 m from the source is likely to be low. Smaller particles (less than 10 µm) make up a small proportion of the dust emitted from most mineral workings, and are only deposited slowly, but may travel 1,000 m or more. These particles, referred to as PM10, are not included in this assessment of potential nuisance dust.

10.3 Mitigation Measures

Detailed guidance on conventional good practice is set out in the 'Best Practice Guide: Dust and Mineral Operations' appended to the Arup Report 1995, and in summary form in MPS2 Annex 1, Appendix 1B. The essence of the guidance is that dust emissions can be controlled by effective site management. Based upon the principal sources of dust generation identified in section 10.2 above, the following key mitigation measures would be adopted, as a continuation of established practice.

10.3.1 Soil and overburden handling

Soil stripping and restoration are generally a short term seasonal activity, and there is considerable flexibility as to timing. Moreover, the majority of the permitted Carew Quarry already forms part of the quarry footprint, with only very limited areas to the north east requiring soil stripping as part of the phased quarry development scheme.

In accordance with conventional practices of soil and overburden handling, the soils would not be moved in extreme wet or dry conditions. During very dry conditions, consideration would be given to suspension of soil handling operations if wind speeds give rise to dust generation that could cause a nuisance to dust sensitive locations in the vicinity of the site, particularly during dry and windy conditions. These principles would be followed for both initial soil and overburden stripping and handling, and during operations associated with restoration.

10.3.2 Shot Hole Drilling and Blasting

In order to produce rock fragmentation, it is necessary to drill a series of holes (shot holes) into the rock. These holes are subsequently charged with explosives and detonated. This drilling process has the potential to generate dust which, if not controlled, can give rise to nuisance.

The drilling of shot holes for blasting would follow established practice. This ensures that drilling is undertaken by an air flushed drilling rig which is fitted with a fabric filter bag which removes dust from the air venting from the drilling rig. All filtered dust is then removed from the area prior to blasting, which serves to reduce dust emissions to negligible proportions.

As discussed in chapter 9.0 of this ES, the design of each blast is undertaken on a case-by-case basis to minimise impact, including dust emissions. The careful design and control of blasts can therefore substantially limit dust emissions and enable any minor emissions to be rapidly diluted and dispersed into the atmosphere. It is also relevant to note that each blast is a single incident of very short duration.

10.3.3 Mineral Extraction and Transportation

The operation will continue to utilise the existing fixed and a mobile crushing and screening plant which is located within the quarry. This serves to minimise haulage distances to the plant, and provides the opportunity to locate processed stockpiles within the quarry void.

Dust emissions from mineral extraction will benefit from the location of the development within an increasingly deep void. However, additional good practice measures will include minimising the drop height of as dug material onto the ground and during loading, and the continued use of dust sprays on the quarry access road, and internal roads.

The main dust mitigation measures for the internal haul route will continue to rely upon:

- Dust suppression by regular spraying with fixed sprays/water bowser;
- Regular compaction, grading and maintenance of the haul road;
- Maintaining a speed limit of 10 mph;
- Fitting all site vehicles and plant with upswept exhausts and radiator fan shields;
- Evenly loading vehicles to avoid spillages;
- Dampening down the internal quarry haul road to a mobile plant location using the on-site water bowser; and
- Ensuring that all site traffic keeps to the designated haul routes to reduce the potential for dust emissions.

10.3.4 Processing, storage and off-site distribution

The operation of the crushing and screening plant is regulated by a Permit which imposes strict controls on emissions from the plant; requirements and operational measures designed to minimise dust emissions from the crusher, screen and conveyors; and continuous monitoring to ensure the effectiveness of the control measures.

The requirements of the Permit are adhered to, operate effectively, and are regularly and routinely monitored by Pembrokeshire County Council.

10.3.5 Residual Effects and Conclusions

The standard 'good practice' measures outlined above reflect the advice on methods for controlling dust set out in MPS2, and are accepted by regulators and the mineral industry as providing effective control against the impact of airborne dust.

The location of the quarry in relation to sensitive receptors, provide circumstances where the inherent risk of adverse effects from dust range are low. When the effects of mitigation measures are included, the residual effects are considered to be low to negligible at all receptors.

With the effective deployment of mitigation measures at the site, it is concluded that Carew Quarry will continue in a way which does not give rise to significant adverse dust effects on sensitive receptors.

10.4 Planning Conditions

The management and mitigation measures set out in section 10.3 above could appropriately form the basis of a dust control protocol to be included within a suitably worded planning condition. These issues are reflected in the schedule of planning conditions produced as Annex 1.

The conditions are consistent with the advice in MTAN1 regarding the matters which can appropriately be controlled by planning conditions (ref para 77), and the more detailed advice set out in MPS2 relating to dust mitigation through watering (para 1.30); conditions relating to haul roads and traffic (para 1.32); soil stripping and overburden handling in appropriate weather and ground conditions (para 1.33); the cessation of activities during adverse weather conditions (para 1.34) and the need for monitoring of dust to review the effectiveness of the control mechanisms and to allow action to be taken if the mitigation practices need to be modified (para 1.35).

11.0 TRAFFIC

11.1 Introduction

The pattern of traffic movements at Carew Quarry is well established, with vehicles utilising the unclassified highway from the site entrance at Hillgate to travel in a north westerly direction to the crossroads at Whitehill, from where vehicles utilise the short lengths of highway to join the A4045 at Whitehill. Vehicles then travel either north or south bound along the A4045 primary road to their respective market destinations. The unclassified highway serving the quarry is well maintained, and quarry vehicles are accustomed to using the highway with no highway safety difficulties.

Planning permission reference NP/319/97 imposed a series of requirements relating to improvements to the site access, including the surfacing of the access bellmouth and internal access road (condition 20), and the erection of 'stop' / 'give way' signs and white lines at the junction of the quarry entrance with the public highway (condition 27) – ref photograph 2.

These works have been implemented, and have been supplemented by additional signage and the installation of dust suppression sprays on the internal access road (ref photograph 3). The site access is thus well established, and functions well.

Photograph 2: Site Entrance



Photography 3: Dust Suppression



11.2 Traffic Movements

Output levels over the 15 year period since the granting of the 1997 planning permission have fluctuated in response to market demand, with peak outputs in excess of 250,000 tonnes per annum during large scale construction projects at Pembroke Dock which were served by Carew Quarry. More recently, as a result of depressed economic conditions, output has declined, and this is common to all quarries in Pembrokeshire and elsewhere.

In February 2010, planning permission was granted for the importation of material for use in the manufacture of concrete blocks at the established on-site concrete blockworks. The underlining purpose of this venture this to provide flexibility in the nature of aggregate used in concrete blocks, and where practicable, to conserve high quality limestone resources at Carew Quarry for high quality and high specification uses. The planning permission for the imports (reference NP/04/469) imposes a limit on imported aggregate of 40,000 tonnes per annum or 50% of the aggregate used in the manufacture of concrete products, whichever is the greater, together with a maximum of 5,000 tonnes per annum of cement/pumice. These imports result in additional vehicle movements, which were deemed at the time to be acceptable to the Highway Authority, and they are in part offset by 'back haulage'. Overall, the imports are within normal fluctuations in output, particularly compared to historical high levels of output.

Planning permission also exists for the recycling of inert construction and demolition waste imported to the site which is processed to create secondary aggregate. This is a relatively low key activity, which historically has generated a throughput of some 6,000 tonnes per annum but which it is protected could increase to up to some 25,000 tPA.

For the purposes of the ROMP Review EIA, it has been assumed that:

- (i) Quarry operations and output will be maintained at an average of some 150,000 tonnes per annum;
- (ii) Imports of aggregate will continue up to the maximum specified limits;
- (iii) Recycling will continue at relatively low levels (maximum 25,000 tonnes per annum)

Based upon a 275 day working year, and an average load size of 18 tonnes, the above volumes will generate ongoing movements of some 30 aggregate loads per day (60 movements); 8 aggregate imports per day (16 movements); 2-3 loads of cement/ pumice per week; and some 5 loads of recycled material per day (10 movements).

11.3 Planning Conditions

There are no restrictions on output or vehicle movements from the Quarry. MPG 14 emphasises that conditions should not place limits on the annual output from active sites to control the rate at which the resource depleted (paragraph 105).

In this context, and based upon the acceptable functioning of the existing access and public highways in the vicinity of the site, no output restrictions are included in the updated schedule of conditions.

However, MPG 14 indicates that it will be appropriate to include conditions dealing with measures to prevent dust, mud and spillages on the public highway (paragraph 103). This advice is reinforced in Appendix M to MPG14, which provides examples of conditions which might be imposed relating to the maintenance of the surfacing of quarry access roads; the sheeting of loaded lorries; the prevention of dust and other debris being carried on to the public highway; and other relevant highway and access related matters.

This advice is reflected in the schedule of conditions which is set out in Annex 1 to the ES.

12.0 CULTURAL HERITAGE

12.1 Policy and Guidance

The importance of Cultural Heritage is clearly recognised at both national and local levels. Certain features that are deemed to be of particular importance are given legal protection through the Ancient Monuments and Archaeological Areas Act 1979 (Scheduled Monuments) and the Town and Country Planning Act 1990 (Listed Buildings and Conservation Areas).

Advice on the way in which cultural heritage should be treated in the planning process is given in Welsh Office Circular 60/96; Planning and the Historic Environment: Archaeology; which describes archaeological remains as a 'finite and non renewable resource' that should not be 'needlessly or thoughtlessly destroyed'. It describes preservation in situ of archaeological remains as the most favourable outcome where such remains might be affected by development. However, where this is not possible, then a programme of archaeological excavation and recording in advance of development may be an acceptable alternative for features of less than national significance.

The Welsh Assembly also sets out in paragraph 6.1.1 of the Planning Policy Wales (Edition 5: November 2012), the following objectives for the conservation and improvement of the historic environment:

- Preserve and enhance the historic environment, recognising its contribution to economic vitality and cultural, civic pride and the quality of life, and its importance as a resource for future generations, and specifically to;
- Protect archaeological remains, which are a finite and non renewable resource, part of the historical and cultural identity of Wales, and valuable both for their own sake and for their role in education, leisure and the economy, particularly tourism;
- Ensure that the character of historic buildings is safeguarded from alternations, extension or demolition that would compromise a buildings special architectural and historic interest; and to

- Ensure that Conservation Areas are protected and enhanced, while at the same time remaining alive and prosperous, avoiding unnecessarily detailed controls over businesses and householders.

12.2 Direct Impacts

The nature of mineral extraction results in the total loss of any archaeological resource where extraction takes place, and the potential loss in other areas associated with infrastructure and landscaping.

However, in the case of Carew Quarry, the vast majority of the site comprises already worked land associated with quarrying and related operations.

12.3 Indirect Impacts

Indirect impacts are those that do not physically affect a cultural heritage feature, but that alter the context or setting. Such impacts can be difficult to define, and need to take into account a number of factors including:

- The type of feature;
- The nature and scale of the development;
- Working methodology;
- The duration of effect;
- Topography
- Visibility and screening;
- Proximity and physical separation;
- Accessibility interpretation and public appreciation

12.4 Cultural Heritage Features in the Vicinity of Carew Quarry

A search of the Pembrokeshire County Council website reveals that there are 3 Scheduled Ancient Monuments in Carew village, comprising Carew

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Castle (also a grade 1 Listed Building reference 5937); a separate Mott and Bailey to the south of the castle; and a Celtic Cross adjacent to the A4045 to the north of the Carew Castle car park (also a grade 1 Listed Building 5938).

Within Carew village there are 14 listed buildings, comprising ;

- (i) Wesley Chapel Grade II (5940);
- (ii) Castel Entrance Gate Piers Grade II (18198);
- (iii) Carew Inn Grade II (5942);
- (iv) Numbers 1 and 2 Picton Terrace Grade II (18199);
- (v) Number 3 Picton Terrace (old stable cottage) Grade II (18201);
- (vi) Number 4 Picton Terrace (Castel lodge) Grade II (6603);
- (vii) Number 5 Picton Terrace Grade II (18202);
- (viii) Telephone Box Grade II (18207);
- (ix) Number 6 Picton Terrace Grade II (6604);
- (x) Number 7 Picton Terrace Grade II (18203);
- (xi) Number 8 Picton Terrace Grade II (18204);
- (xii) Number 9 Picton Terrace Grade II (5943).
- (xiii) Old Cottage Chimney Grade II (5941);
- (xiv) Carew Cross (also a Scheduled Ancient Monument) Grade II* (5939)

Carew bridge is also registered as a Listed Building Grade II* (5939).

Carew village, including Carew bridge, is a designated Conservation Area.

Further afield, there are listed buildings at the French Mill and Tidal Barrier Grade II* (6038), and at the French Mill House Grade II (18206).

There is one listed building at Whitehall, comprising a milepost opposite the turning to Pisgah: Grade II (18220).

There are no listed buildings within Carew Newton village.

12.5 Assessment of Effects

Carew Quarry has been developed to the full extent of its permitted footprint and no remaining archaeological features will be present within that footprint. There will thus be no direct impacts on remaining features of cultural heritage interest.

It is considered that there would be no indirect effects of the settings of Listed Buildings within Carew village, which are clustered within the built up area of the village, and from where there are no views of the quarry.

Similarly, there are no views of the quarry from ground level view points from the Scheduled Ancient Monuments at and in the vicinity of Carew Castle, and thus no indirect effects on the settings of the scheduled ancient monuments. There are glimpses of the top of the north east quarry face from elevated vantage points within the castle (referenced in Chapter 5.0 of the ES), and the LVIA proposes measures to address these limited effects. However, the effects are not considered to be significant to the setting of the Scheduled Ancient Monument, given the wide panorama views which are available from the Castle.

12.6 Mitigation and Planning Conditions

With the exception of the landscape/visual mitigation measures recommended in chapter 5.0 of the ES, no further cultural heritage mitigation measures or planning conditions are deemed to be necessary.

13.0 PLANNING POLICY CONSIDERATIONS

13.1 Introduction

When undertaking EIAs and preparing an ES, it is conventional practice to carry out a review of relevant planning policy. This is not an express requirement of the Town and County Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 Schedule 4 (as amended), but the exercise acts as a useful checklist in terms of the environmental topics considered in the EIA, and allows the conclusions reached by the EIA / ES to be assessed against planning policy objectives and requirements. This in turn assists in identifying and isolating the key environmental issues associated with a particular development, and in arriving at a judgement of the overall merits of the development balanced against its environmental effects. In the case of a ROMP application, the exercise can also assist in identifying issues which should appropriately be included as updated planning conditions.

Planning applications which are accompanied by an EIA must be considered in the context of 'Regulation 3' of the EIA Regulations, which prohibits the grant of planning permission without considering the environmental information set out in an ES (and any supporting details). More generally, the application must be determined in accordance with the content of the development plan, unless material considerations indicate otherwise (reference section 38(6) of the Planning and Compulsory Purchase Act 2004).

In practice, the two requirements are complimentary in that policies in the development plan will conventionally seek to safeguard environmental interests, and will aim to resist developments which are likely to give rise to significant adverse environmental and amenity effects.

Section 38(6) of the Act introduces a presumption in favour of granting planning permissions for proposals which are in accordance with policies in the development plan. This has been further interpreted in the Courts, which have established the principle that it is not necessary for a proposal

to accord with each and every policy in the development plan, since there will be instances where policies pull in different directions. The key requirement is therefore for a proposal to accord with the 'overall thrust' of the development plan, taken as a whole, and not in accordance with each policy of the plan (reference R (Cummins) v. Camden LBC).

Distinctions can however be drawn between the circumstances of a planning application, where the principle of a development needs to be assessed against policies in the development plan, and those associated with a ROMP application, where the principle of the mineral development is already established by virtue of the extant planning permissions for quarrying which exist. The relevance of the development plan in these circumstances is more geared towards providing guidance and advice regarding environmental controls and operational practices which should be enshrined within up to date planning conditions: it is not the function of a ROMP application to re visit the appropriateness of the development consent, unless the EIA identifies issues of such magnitude that the MPA consider that the planning consent should be modified (as discussed earlier in section 1.5 of this ES).

In the context of Section 38 (6) of the Act, the development plan in relation to the site comprises the Pembrokeshire Coast National Park Local Development Plan (LDP) adopted in September 2010.

13.2 National Planning Policy: MPPW and MTAN1

13.2.1 Minerals Planning Policy Wales: December 2000

The Welsh Assembly Government's primary land use policy guidance in relation to mineral extraction and related development is set out within Minerals Planning Policy Wales (MPPW), (December, 2000).

The key objectives of MPPW are defined as seeking to provide mineral resources to meet society's needs; to protect areas of important natural and built heritage resources; to limit the environmental impact of

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extraction; and to achieve a high standard of restoration and beneficial after use. To this end, paragraph 67 states *'It is essential to the economic health of the country that the construction industry is provided with an adequate supply of the minerals it needs.'* In addition to the above, paragraph 34 sets out the following issues which must be considered when assessing the impact of mineral development on the environment and amenity of residents:

- Access and traffic generation,
- Noise,
- The control of dust, smoke and fumes,
- Blasting controls, land drainage and impact on groundwater resources
- Visual intrusion,
- Impact on sites of nature conservation, historic and cultural importance,
- Restoration, aftercare and after-use.

Policies set out within MPPW recognises that mineral extraction can only take place where the mineral is found to occur, and that operations are 'transitional', and cannot be regarded as a permanent land use, despite operations potentially occurring over a long period of time (para 5). MPPW therefore sets out a series of sustainable aims for minerals development, which include the provision of an adequate supply of minerals, but in a way which provides adequate protection to landscape feature and the environment (para 7).

13.2.2 Minerals Technical Advice Note 1: Aggregates March 2004

MTAN1 sets out detailed advice on the mechanisms for delivering the policies of MPPW. Of particular relevance is 'Section C', which defines the objective 'to reduce the impact of aggregates production', and which outlines a number of measures of control to fulfil that objective, including control of dust, blast vibration, noise, visual impact, environmental audits, and community liaison.

MTAN1 includes specific advice on the means by which the impact of aggregate extraction might be reduced, the issues which should be considered in quarry restoration designs, and the nature of planning conditions which might control quarrying and restoration operations. The following are of particular relevance to Carew Quarry:

(a) Vibration limits and controls

MTAN1 reviews the effects of vibration from blasting operations, and confirms that planning conditions should provide for:

"Acceptable days for blasting operations; acceptable times of blasting operations; and approval of a scheme of vibration monitoring."

These issues have been considered as part of the blast vibration study set out in chapter 10.0 of the ES, and are reflected in the updated planning conditions prepared by the Applicant (ref Chapter 15.0 and Annex 1 to the ES).

(b) Noise

MTAN1 confirms that the effects of noise should be fully considered in formulating proposals for mineral extraction (para 85), and advises that the aggregate industry should aim to keep noise emissions at a level that reflect the highest possible environmental standards, taking all reasonable steps to achieve quieter working (para 87). In that context, MTAN1 advises that:

"Noise limits should relate to the background noise levels, subject to a maximum daytime noise limit of 55dB(A) where the background noise levels exceed 45dB(A). 55dB(A) is the lower limit of the daytime noise levels where series annoyance is caused. Where background noise is less than 45dB(A), noise limits should be defined as background noise levels plus 10dB(A). Night time noise working limits should not exceed 42dB(A) at noise sensitive properties During temporary and short term operations higher levels may be reasonable but should not exceed 67dB(A) for periods of up to eight weeks in a year at specified noise sensitive properties" (ref para 88).

This advice has been considered as a context for the noise assessment set out in chapter 9.0, and is reflected in the proposed updated planning conditions relating to noise (ref chapter 15.0 and Annex 1).

(c) Dust

MTAN1 notes that experience has shown that dust emissions can result from

“Haulage, particularly on internal un-surfaced routes, on nearby roads which are not adequately wetted and if vehicles are un-sheeted; crushing and grading operations; blasting, including drilling operations prior to blasting; surface stripping, including soils and overburden storage; restoration operations.” (para 72)

It further notes that planning conditions can control certain activities to protect against dust emissions, although many of these are controlled under the Environmental Protection Act 1990, and care should therefore be taken to avoid duplication of controls (para 76). However, it highlights a number of issues which might be controlled by planning conditions, including *the imposition of speed restrictions; sheeting of vehicles; the design of working programmes to locate dust emission sources away from sensitive developments; and the timing of soil handling and overburden stripping to suit weather conditions (para 77).*

This advice has similarly formed the context for the dust / air quality assessment and proposed updated planning conditions relating to dust controls prepared by the Applicant (ref Chapters 10.0, 15.0 and Annex 1).

(d) Landscape and Visual Impact

MTAN1 highlights the fact that hard rock quarries physically alter the ground surface through the development of faces and benches, and these landscape changes are often irreversible. It therefore advises that proposals for new aggregates extraction or extensions to existing sites should be assessed carefully to determine the potential impact on the character of the landscape. The assessment should also facilitate a comprehensive understanding of the visual impact of a development from various locations which will assist in devising an appropriate layout and

phasing, and the most appropriate restoration strategy (ref para 90). This ES has been prepared in support of a review of planning conditions, but the principle of a careful assessment of the landscape and visual effects of the ongoing development has been a central feature of the EIA, as reflected in the updated design of the quarry development scheme (ES chapter 3.0); the updated restoration strategy (ES chapter 3.0); and the landscape mitigation measures (ES chapter 5.0); all of which have been enshrined within the proposed updated planning conditions (ref chapters 15.0 and Annex 1).

(e) Site Management

MTAN1 advocates the undertaking of environmental audits of quarries to assess the performance of the operation against set environmental objectives (para 95).

Thomas Scourfield & Sons are working towards accreditation under ISO 14001. The site management controls are re-enforced by the planning conditions (which will be updated as part of this Review) and also by the Pollution Prevention and Control Permit (PPCP) which as noted in Chapter 10.0 include conditions which limit emissions and imposes requirements to protect air quality. The site is also subject to regular inspection by the NPA and Pembrokeshire County Council to ensure compliance with planning and permit conditions.

(f) Restoration

MTAN1 places considerable emphasis on the need to achieve high standards of restoration and aftercare, and to provide for a beneficial after use. This is to be secured by careful attention to restoration design, and specific advice is provided on the key topics to be considered when drawing up reclamation conditions (ref para 111, Box 2). This includes soil handling, storage, landform for after use, restoration operations, and aftercare.

The advice also notes that it is normally desirable to have progressive reclamation to minimise the area of land occupied at any one time by the mineral working (para 118). However, it recognises that for longer term

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mineral working sites it may not be appropriate to agree the full details of the restoration proposals at the outset, but it will be necessary to agree the general outline of the final landform and intended after use (para 119). The restoration strategy for Carew Quarry which accompanies the current submission has been prepared in that context.

Finally, MTAN1 emphasises the need for aftercare conditions to be imposed to ensure the successful implementation of the restoration scheme, where such conditions can either specify the steps to be taken via the planning condition, or require an aftercare scheme to be submitted to the minerals planning authority for approval. In this instance, the Applicant has proposed a condition requiring the submission of a scheme, which reflects the timescale within which the final restoration and subsequent aftercare works will be undertaken.

These issues have been addressed in Chapter 3.0 of the ES, and are reflected in the updated conditions proposed in Annex 1 to the ES.

MTAN1 thus provides a useful checklist of issues to be considered as part of the objective to reduce the impact of aggregate extraction. Each environmental issue has been addressed in this ES, and the recommended criterion levels set out in MTAN1, together with the wider advice relating to planning conditions, is fully reflected in the schedule of conditions now proposed by the Applicant (ref Annex 1).

13.3 PCNPA Local Development Plan

The PCNP Local Development Plan was adopted in September 2010. It comprising text and maps, and cross refers to, but does not repeat, National Planning Policy.

The LDP contains a specific section on minerals (paragraphs 4.105 – 4.117), but it focuses on issues associated with new developments rather than Environment Act ROMP Reviews (which are not mentioned in the text).

The LDP defines buffer zones around all active quarries (including Carew Quarry) which are designed to ensure that new development does not encroach towards operational quarries, where the amenities of occupiers of such new development may be compromised. The planning conditions which have been drafted therefore assume that the impacts which need to be regulated are based upon circumstances as they currently exist and the presence of existing residential and other noise sensitive development.

There are no policies or supporting text which provide advice on environmental and amenity issues which should be controlled by planning conditions, and the document instead relies upon advice set out in National Planning Policy. These issues are discussed in section 13.2 above, and are thus not repeated.

13.4 Planning Policy Conclusions

The summary review of national and local planning policies has assisted in highlighting the advice and policy issues which should be reflected in planning conditions controlling ongoing activities at Carew Quarry. The advice and policies represent up to date criteria and best environmental management practice relating to, inter alia, noise, blast vibration, and dust control, and more general advice relating to landscape.

The policies have provided a further checklist of environmental issues relevant to the assessment, and the topics and issues which are likely to require control via planning conditions.

The Applicants have thus sought to fully reflect this advice in the updated schedule of conditions they have prepared, which is produced as Annex 1 to the ES.

14.0 SUMMARY OF ENVIRONMENTAL ISSUES

14.1 Introduction

The preceding chapters of the ES have assessed the effects of quarrying under a series of topic headings relating to environmental amenity issues. The exercise has identified a number of elements which require control and mitigation, and has highlighted up to date advice regarding standards and criteria.

As a summary of those issues, and by way of an introduction to schedule of planning conditions proposed in Annex 1, the following key issues have emerged, which are reflected in the schedule of conditions.

14.2 Landscape and Visual Effects

14.2.1 Main Findings

The LVIA has identified the main landscape and visual receptors against which the existing and ongoing landscape and visual impacts can be assessed. The main landscape and visual implications of the development, and the potential impact have been identified, and mitigation measures have been proposed to further reduce the impacts.

The study concludes that further landscape effects associated with the ongoing development of the quarry would be minimal and localised. There would, however, be beneficial landscape effects in the long term following the implementation of the restoration strategy.

The visual impact assessment has focused on five potential viewpoints which are representative of views in the locality. It notes that views from Carew Lane/A4075 are screened by landform and intervening vegetation, and the magnitude of change associated with the ongoing quarry operation has been assessed as negligible. Views from the footpath on the eastern side of the quarry are substantially screened, but there is a

one notable gap in the screening which allows direct views into the quarry. In addition, at present, there is surplus plant stored along the eastern edge of the quarry, in proximity to the footpath, which is readily visible from the footpath.

Views from ground level locations in the vicinity of Carew Castle are screened by topography. However, from higher levels within the castle there are glimpse of the upper levels of the north eastern quarry face through a line of boundary trees which runs along the southern edge of the quarry. Continued development of the quarry at lower levels within the quarry would not alter the components which are visible.

Views from Carew Newton are substantially screened, and the changes resulting from the ongoing development are considered to be negligible.

Views from the public highway north of the quarry are similarly substantially screened, but there are glimpses of parked HGVs and quarry buildings from this location.

In summary, the assessment of viewpoints highlights the well screened nature of the existing quarry, and the ongoing development of the quarry will not alter this situation.

14.2.2 Mitigation Measures

The suggested mitigation measures comprise:

- (i) There would be benefit in reducing the visual effects of the north eastern face in glimpsed views from Carew Castle. This could be achieved by facilitating recolonisation of the exposed face (by avoiding further disturbance) which would follow the success and attractive appearance of recolonisation which has taken place to date (ref photograph 1)
- (ii) There would be benefit in removing ancillary equipment from its current location around the periphery of the quarry, but it is

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recognised that, at present, there are space limitations within the quarry to accommodate such equipment.

- (iii) The potential for additional planting along the north west edge of the quarry should be investigated to bulk up existing vegetation and to further minimise screening from the north and north west.
- (iv) Planting proposals could be implemented to increase the screening along the southern edge of the quarry, together with management of the existing tree screen to ensure its healthy development.

14.3 Ecology

14.3.1 Main Findings

The ecology study has noted the presence of four statutory designated nature conservation sites within a 2 kilometre search area focused on the quarry, namely the Millford Haven Water Way SSSI and Carew Castle SSSI, which lie to the south of the site, and components of the Pembrokeshire Marine SAC and the Pembrokeshire Bat Sites and Bosherton Lakes SAC, which are also situated to the south of the site. There are no statutory sites of nature conservation importance within a 2 kilometre radius. The site itself is not the subject of any statutory or non statutory ecological site designations.

The study has included an extended Phase 1 Habitat Survey of the quarry which, together with a desk study, has sought to identify the potential for, and presence of, legally protected, rare or notable species of flora and fauna at the quarry.

The study found that the site largely comprises an operational quarry void with significant areas of bare rock, vertical faces, benches and processing equipment, with a pond/sump at the base of the void. Peripheral areas comprise of small areas of retained scrub and secondary woodland along the narrow rim of the quarry and adjacent to roads, buildings and stock pile/storage areas in the north eastern part of the quarry. Small areas of

developing calcareous grassland and taller ruderal grassland are present along bunds or on unused ground.

No species of legally protected or notable flora were recorded during the Phase 1 Habitat Surveys.

No otters, water voles, badgers, bats, reptiles or amphibians were recorded at the site. Habitats with the potential to support breeding birds were identified during the Phase 1 Survey, notably those associated with the peripheral scrub woodland habitats. A pair of peregrine falcons have nested on rock ledges within the quarry for a number of years (including 2012). The study has concluded that there would be no direct or indirect impacts upon statutory or non statutory ecologically designated sites. There would no impacts on important habitats. With the exception of peregrine falcons and nesting birds, protected species are absent from the quarry.

14.3.2 Mitigation Measures

The key recommendations and conclusions are:

- (i) The site contains a number of potential ledge sites where peregrine falcons can nest, and as most of the future quarrying activities will involve the site being developed vertically rather than laterally, these ledges will be retained. The key mitigation measure will thus be a continuation of current practice of a watching brief in respect of noting the presence of breeding peregrine falcon, and avoiding operations within the vicinity of a nest site during the nesting season and after fledging to determine breeding success
- (ii) The nests of wild birds, regardless of how common these species are, are protected under the Wildlife and Countryside Act 1991 whilst the nests are occupied or being built. The ongoing quarry development has essentially reached its lateral limits and there will thus be no further effects on perimeter scrub vegetation. However, in the event of the need for any vegetation removal then

this should take place outside of the bird breeding season, which typically runs from March to the end of August, unless the area is the subject of breeding bird surveys beforehand by an appropriately experienced ecologist.

- (iii) The implementation of the restoration strategy provides an opportunity to create peripheral habitats around the margin of the resulting lake, in the form of recolonisation/hydroseeding of the quarry faces and benches, and the strengthening and extension of woodland and scrub habitats.
- (iv) These measures will contribute to BAP objectives, and provide new or enhanced habitats for a range of BAP fauna such as bats, birds and invertebrates

14.4 Hydrology and Hydrogeology

14.4.1 Main Findings

The study draws upon the results of a detailed water feature survey which identifies the principal surface and groundwater features in the vicinity of the site. The study notes the presence of the tidal Carew River and Mill Pond to the south of the site, and the surface water drainage systems in proximity to the quarry. It also records the presence of a surface water abstraction point to the south east of the quarry.

It highlights the classification by the Environment Agency of the Carboniferous Limestone as a 'Principal Aquifer', and it notes the large spring source which emerges from the limestone at Milton, which was historically used as a Public Water Supply. The site is separated from the Aquifer contributing to the Milton springs by the Carew River.

At Carew Quarry, water collects in the base of the quarry in a sump in the south-westerly area. The majority of water which collects is derived from surface water. The water is pumped from the sump to a series of catch pits / soakaways located in the field immediately to the south of the quarry. From the soakaway, the water dissipates via three routes of:

- (i) Infiltration into the Carboniferous Limestone, with seepage back into the quarry;
- (ii) Infiltration into the Carboniferous Limestone, and then lateral groundwater flow away from the quarry; and
- (iii) Indirect discharge into the Mill Pond.

Pumping from the quarry is regulated by a Discharge Consent Licence issued by the Environment Agency in 2005, which specifies a maximum daily discharge of 10,000 cubic metres per day.

The key conclusions of the study are:

- (i) Provided that water pumped from the quarry sump continues to be discharged in accordance with the requirements of the existing Discharge Licence, then the Mill Pond and Pembrokeshire Coast SAC will be unaffected by the ongoing operations;
- (ii) The single licenced surface water abstraction is up gradient of the quarry and will be unaffected;
- (iii) The quarry lies outside the catchment to the Milton Springs source and is hydraulically isolated from it. The Milton Springs will therefore be unaffected by continued operations.
- (iv) De-watering operations within the quarry have lowered groundwater levels within the Carboniferous Limestone with the effects extending beyond the quarry boundary. However, any increase in the 'cone of depression' associated with ongoing quarrying is anticipated to be incremental and limited;
- (v) The exposure of the water table at the quarry sump means that there is potential for direct contamination of the ground water source in the event of spillage of fuel etc.;
- (vi) Historic monitoring has detected salinity in the quarry water sump which is seasonal and reflective of variations in surface water inflow. Recent monitoring has indicated no material change in these circumstances.

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14.4.2 Mitigation Measures

The recommended mitigation measures comprise:

- (i) The imposition of a planning condition requiring best practice for refuelling operations, and the storage of fuel and chemicals at the quarry, designed to protect groundwater quality;
- (ii) Continued weekly monitoring of the quarry discharge (as required by the Discharge Consent Licence); and
- (iii) Monitoring of the water quality in the quarry sump, to allow the water levels and water quality in the sump to be managed, and to allow offsite discharge to be regulated in a way which reflects water quality requirements.

14.5 Noise

14.5.1 Main Findings

The current planning permission imposes a limit on noise attributable to operations at the quarry, as measured at Carew Newton House of 50dB L_{Aeq} , and 53 dB L_{Aeq} for temporary periods when operations are taking place at high levels within the quarry.

The noise study has included monitoring to establish whether the noise levels are being adhered to. Monitoring undertaken in October 2012, when the quarry was working normally confirmed a noise level of 44.8 dB L_{Aeq} , measure at Carew Newton House. The operation is thus preceding in accordance with the current noise limits.

14.5.2 Mitigation Measures

In these circumstances, no specific additional mitigation measures are proposed, other than;

- (i) Continued adherence to good practice measures which aim to minimise noise impact; and
- (ii) The re-imposition of the current noise limits, and adherence to those limits

14.6 Blast Vibration

14.6.1 Main Findings

Ground vibration resulting from blasting operations on quarry faces is calculated in terms of peak particle velocity (PPV) and is measured in millimetres per second (mms). Detailed research has determined that vibration levels well in excess of 50 mms are necessary to produced structural damage to residential type properties. For human perception, government advice is that levels should be set in the range of 6-12 mms, as discussed further below.

Vibration is also generated within the atmosphere, where the term 'air over pressure' is used.

It is important to emphasise that for any given blast it is very much in the interest of the operators to reduce vibration, both ground and air borne to the minimum possible, in that this substantially increases efficiency and hence the economy of blasting operations.

Current planning conditions at Carew Quarry impose restrictions on ground vibration which should not exceed 8.5 mms in 95% of all blasts and no individual blast should exceed a ppv of 12 mms as measured at vibration sensitive buildings. Additional conditions impose limits on air over pressure.

More recent government guidance set out in Minerals Technical Advice Note 1 (MTAN1) 2004, suggests a limit of 6mms in 95% of blasts, and on upper limit of 10 mms. The guidance does not recommend imposing limits on air over pressure, noting that this is affected by meteorological

conditions, but it suggests that best practice should be employed in blast design and detonation in order to minimise air over pressure.

All blasts are monitored at Carew Quarry, and in the last 12 months, the ground vibration has averaged 5 mms, with one instance at 9.14mms.

14.6.2 Mitigation Measures

In view of adherence to current blast vibration limits, no specific additional mitigation measures are considered to be necessary. However, in the context of the underlying objective of a ROMP Review to improve environmental performance, and to update planning conditions to accord with current standards, it is considered appropriate to revise the blasting conditions at Carew Quarry to introduce more stringent blast vibration criteria. This would reduce the 95% limit from 8.5 mms to 6mms, and the upper limit from 12mms to 10 mms.

Condition have thus been recommended to reflect the above, and other requirements relating to times of blasting and the need for ongoing monitoring of individual blasts.

14.7 Dust

14.7.1 Main Findings

The study cross refers to the Pollution Prevention and Control Act 1999, and the permit for Carew Quarry issued pursuant to the Act which imposes detailed controls on emissions from the plant, stockpiles, haul road and aggregate handling operations. Advice set out in MTAN1 is that these controls should not be duplicated as part of the planning regime.

The study thus assumes that the existing permit controls will continue in force, and the assessment accordingly focuses on the wider potential for dust generation arising from soil and overburden handling, shot hole drilling and blasting, mineral extraction and transportation and offsite distribution of products.

The study notes the standard good practice measures which are in place, which ensure that soils and overburden are not moved in extreme dry conditions; drilling is undertaken by an air flushed drilling rig which is fitted with a fabric filter bag which allows collection and removal of dust; dust control measures on haul roads are continued, in particular, the maintenance and use of existing water sprays on the access road; and the surfaced quarry access road and sprays continue to be maintained to ensure that mud is not carried onto the public highway.

14.7.2 Mitigation Measures

The good practice management and mitigation measures which are already in place at the quarry could appropriately form the basis of a 'dust control' protocol to be included as a planning condition. These issues are reflected in the schedule of planning conditions produced an Annex 1.

14.8 Traffic

14.8.1 Main Findings

The pattern of traffic movements at Carew Quarry is well established, with vehicles utilising the unclassified highway from the site entrance at Hillgate to travel in a north westerly direction to the crossroads at Whitehill, from where vehicles utilise the short lengths of highway to join the A4045 at Whitehill. Vehicles then travel either north or south bound along the A4045 primary road to their respective market destinations. The unclassified highway serving the quarry is well maintained, and quarry vehicles are accustomed to using the highway with no highway safety difficulties.

Planning permission reference NP/319/97 imposed a series of requirements relating to improvements to the site access, including the surfacing of the access bellmouth and internal access road (condition 20), and the erection of 'stop' / 'give way' signs and white lines at the junction of the quarry entrance with the public highway (condition 27). These works have been implemented, and have been supplemented by

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additional signage and the installation of dust suppression sprays on the internal access road. The site access is thus well established, and functions well.

There are no restrictions on output or traffic movements from the quarry. Historic output have been in excess of 250,000 tonnes per annum, but more recent output have averaged some 150,000 tonnes per annum. In addition to the marketing of aggregate from the quarry, planning permission exists to import up to 40,000 tonnes per annum of aggregate into the quarry for use in the manufacture of concrete blocks, together with small amounts of cement. There is also a permission for the importation of inert construction and demolition waste, which is processed to produce a recycled aggregate. However, the recycling operation is a relatively low key activity, involving a maximum of 25,000 tonnes of material per annum.

For the purposes of the EIA, it has been assumed that based upon a 275 day working year, and an average load size of 18 tonnes, the above volumes will generate ongoing movements of some 30 aggregate loads per day (60 movements); 8 aggregate imports per day (16 movements); 2-3 loads of cement/ pumice per week; and some 5 loads of recycled material per day (10 movements).

14.8.2 Mitigation Measures

No additional mitigation measures are deemed to be necessary in terms of the use of the existing site access or vehicle routing. In addition, MPG 14 emphasises that conditions should not place limits on the annual output from active quarry sites.

Mitigation measures therefore relate to the ongoing implementation of existing measures and operational practices which involve the maintaining the surface of the internal quarry access road; maintaining the junction with the public highway; ensuring the sheeting of lorries (required by the Permit); and preventing dust and other debris being carried onto the public highway. These issues are reflected in the proposed schedule of planning conditions.

14.9 Cultural Heritage

14.9.1 Main Findings

Any buried archaeological interest which may have been present within to quarry site boundaries has been removed as a result of historic quarry activities. The quarry has worked to its lateral limits, and there is thus no surviving cultural heritage interest.

There are three Schedule Ancient Monuments at and in the vicinity of Carew Castle, and 14 Listed Buildings within Carew Village, where Carew Village is also a designated Conservation Area. There would be no effect on the setting or character of the Listed Building in Carew Village, or on the Conservation Area, since the quarry is not visible from the village.

Similarly, there would be no effect on the settings of the Scheduled Ancient Monuments since the quarry is not visible from ground level viewpoints. There is one viewpoint from an elevated position with Carew Castle, which is noted in the landscape and visual impact assessment, but the fleeting glimpse of a small part of the north east quarry face does not affect the setting or character of the Carew Castle Schedule Ancient Monument.

14.9.2 Mitigation Measures

In these circumstances, no mitigation measures are deemed to be necessary, other than attention to the mitigation measures recommend in the landscape and visual impact assessment (reference section 14.2.2 above).

15.0 CONCLUSIONS AND PLANNING CONDITIONS

The Environment Act 1995 sets out procedures to review mineral planning permissions, and places the onus on Operators to propose updated planning conditions. The exercise of a 'review of old mining permissions' is commonly referred to as a ROMP Review.

An EIA has been undertaken to provide a context to, and to inform the required schedule of updated planning conditions relating to Carew Quarry. The resulting ES has considered the environmental effects of the ongoing quarrying and related operations and, where appropriate, has made recommendations for additional controls and safeguards which should be introduced.

The recommendations reflect both the current circumstances at the site and, in certain instances, the introduction of more stringent standards of environmental protection which have been introduced since the date of the 1997 planning permission at Carew Quarry.

The environmental issues have been addressed in depth in Chapters 5.0 – 12.0 of the ES, and a brief summary of the issues requiring attention via planning conditions is set out in Chapter 14.0. The planning policy issues which have further informed the schedule of planning conditions are considered in chapter 13.0

The result is an updated schedule of planning conditions proposed by the Applicants, which is based upon the results of the EIA and content of the ES.

The Schedule is set out in Annex 1, and is considered to represent an appropriate and modern means of controlling ongoing operations at Carew Quarry over the forthcoming 15 year period up to the date of the next Periodic Review of the planning conditions.

The Applicants consider that the EIA has been a helpful and constructive approach to the current Review, and the resulting set of conditions, which are underpinned by the ES, are considered to meet the requirement to secure the proper protection of the environment and amenity of local residents, whilst meeting the needs of the operator in terms of a practical set of controls regulating future quarrying.

However, the Applicant looks forward to receiving responses from the NPA and other interested parties to the proposed conditions and to any further discussions leading towards the issuing of the final decision notice and set of conditions.

16.0 PROPOSED SCHEDULE OF PLANNING CONDITIONS

Time Limit

1. Unless otherwise agreed in writing by with the National Park Authority, planning permission for the winning and working of minerals or the depositing of mineral waste within the site shall cease no later than 28th February 2042.
2. Following the expiry of the mineral permissions all extraction, processing and stockpiling of minerals within the site shall cease.
3. No later than 12 months following the expiry of the planning permissions, or the earlier permanent cessation of winning and working of minerals, as agreed between the mineral operator and the National Park Authority, all plant, machinery and structures shall be dismantled and removed from the site.
4. No later than 12 months following the expiry of the mineral permissions or the earlier permanent cessation of winning and working of minerals, as agreed between the mineral operator and National Park Authority, the sale and transportation of any residual stocks from the site shall cease.

Working Programme, Phasing and Direction of Working

5. Unless otherwise agreed in writing by the National Park Authority the working, restoration and aftercare of the site shall be carried out in accordance with the documents and plans submitted with the ROMP Review application, comprising phased development plan ref numbers CQ3 – CQ6 and CQL/1.

Hours of Working

6. Except in emergencies to maintain safe quarry working (which shall be notified to the National Park Authority as soon as practicable), or with the prior written approval of the National Park Authority:-
 - a) no excavation, backfilling or use of plant or machinery (including pre-planned servicing) associated with the extraction and processing of minerals, and no loading of lorries with aggregate shall be carried out except between the hours of 0730 and 1730 hours on Mondays to Fridays, and 0730 and 1600 hours on Saturdays
 - b) no loading of lorries with concrete blocks shall take place on the site except between the hours of 0700 and 1900 hours on Mondays to Fridays, and 0730 and 1600 hours on Saturdays
 - c) no servicing, or maintenance and testing of plant shall be carried out between the hours of 2100 and 0700 hours Monday to Saturday.
 - d) no operations on the periphery of the site or at high levels, or in unscreened locations, such as the formation, removal or alteration of spoil tips, baffle mounds, screening and storage embankments, formation or maintenance of drainage works, and the stripping and replacement of soils shall be carried out except between 0900 hours and 1700 hours Monday to Friday and 0900 hours and 1200 hours on Saturdays.
 - e) no operations, other than servicing and emergency maintenance, environmental monitoring and water pumping at the site shall take place on Sundays or Public Holidays.

7. Unless otherwise agreed in writing by the National Park Authority, no HGV's (more than 7.5 tonnes gross weight) shall enter or leave the site except between 0700 and 1800 hours Mondays to Fridays, and 0730 to 1600 hours on Saturdays and not at all on Sundays or Public Holidays

Importation of Material

8. No materials shall be imported into the site for sale or processing in any 12 month period other than:
- (a) a maximum of 40,000 tonnes of aggregate **or** 50% of the aggregate used in the manufacture of concrete products, whichever is the greater, **and**
 - (b) a maximum of 5,000 tonnes of cement/pumice, **and**
 - (c) a maximum of 25,000 tonnes of inert construction and demolition material.

The operator shall maintain monthly records of the amount of material imported into the site and shall make the records available to the National Park Authority upon request.

Access and Highways

9. The existing quarry access to the public highway shall be maintained during the period of operation of the quarry with the provision of line markings, signage and junction visibility within the operator's highway frontage.
10. No loaded HGV's shall enter or leave the site unsheeted except those only carrying stone in excess of 75mm.

Dust

11. Measures shall be taken to minimise dust emissions from quarrying operations, in accordance with the following protocol:

- (i) Soils and overburden shall not be handled during extreme dry conditions unless the working areas are first dampened down;
- (ii) Drilling of shot holes shall be undertaken using drilling rigs fitted with a suitable dust collection system;
- (iii) The site entrance road shall be dampened down using fixed water sprays.
- (iv) All lorries, once loaded, shall be sheeted prior to leaving the site, with the exception of any load carrying plus 75mm size stone.
- (v) The speed of haulage vehicles at the site will be restricted to 10mph.
- (vi) All site vehicles will be fitted with upswept exhausts and radiator fan shields.
- (vii) Lorries will be loaded so as to avoid spillages.
- (viii) All site traffic will be kept to the designated haul routes
- (ix) Any plant spillages will be cleared to avoid accumulations.
- (x) Drop heights will be minimised at loading and discharge points.

Blasting

12. Unless otherwise agreed in writing by the National Park Authority
- (a) no blasting shall take place at the site except between 1000 and 1600 hours on Mondays to Fridays inclusive
 - (b) no drilling or secondary breaking of stone shall take place except between 0800 and 1700 hours Mondays to Fridays and 0800 to 1200 hours on Saturdays
 - (c) there shall be no blasting on Saturdays, Sundays, Public Holidays or National Holidays
13. Blasting shall be undertaken in such a manner to ensure that ground vibration, measured as the maximum of three mutually perpendicular directions taken at the ground surface, does not

ANNEX 1

exceed a peak particle velocity (ppv) of 6mm per second in 95% of all blasts measured over any continuous six month period and no single blast shall exceed a ppv of 10mm per second. The measurement is to be taken at or near the foundations of any vibration sensitive building not owned by the quarry owner or operator.

14. No secondary blasting shall be carried out without the prior written agreement of the National Park Authority.
15. All individual blasts shall be designed, managed and implemented to minimise the extent of air overpressure resulting from blasts.
16. Each individual blast shall be monitored by the Operators, to include provision for recording the details and location of the monitoring station; the location of the blast holes within the Quarry Site; weather conditions; specification of the blast in terms of MIC; and total charge weight. Records of blast monitoring shall be made available to the MPA upon request. In the event that monitoring indicates that the vibration levels set out in condition 13 above have been exceeded, then the Operator shall inform the National Park Authority within two working days, with written confirmation of the steps to be taken to ensure compliance with condition 13.
17. Blasting times shall be clearly advertised at the Quarry, and an audible warning shall be sounded prior to any blasting operations taking place, and shall be sounded again immediately after blasting has finished.

Noise

18. Between the hours of 0730 and 1730 Monday to Friday and between 0730 and 1600 hours on Saturdays, the noise level attributable to operations at the site, measured at any noise sensitive property not owned by the quarry owner or operator, shall not exceed 50 dB L_{Aeq} (1 hour) (free field) other than for activities covered by Condition 18 below. Outside these hours the noise level

attributable to operations at the site shall not exceed 42 dB L_{Aeq} (1 hour) (freefield). 'Noise sensitive property' means occupied residential property or public buildings.

19. The noise level attributable to operations on the periphery of the site or at high levels, or in unscreened locations, such as the formation, removal or alteration of spoil tips, baffle mounds, screening and storage embankments at the site, measured at any noise sensitive property not owned by the quarry owner or operator, shall not exceed 53 dB L_{Aeq} (1 hour) (free field). These noise limits shall only apply for a maximum of 8 weeks in any calendar year unless otherwise agreed in writing by the National Park Authority.
20. The best practical means shall be used to minimise noise from reversing warning devices which are fitted to mobile plant and vehicles on site. This may include the fitting of 'smart' alarms to vehicles.
21. Noise monitoring shall be undertaken in accordance with the scheme approved by the National Park Authority on 24 June 1998 unless otherwise agreed in writing by the National Park Authority.

Water Environment

22. Monthly water quality samples shall be taken from the quarry sump and analysed for chloride. Should the results of the sampling show a rising trend in chloride levels defined as an increase in chloride concentration of 50% of the previous sample then the developer shall submit appropriate practical mitigation measures for the written agreement of the National Park Authority which shall be implemented within 1 month of such agreement or as may be further agreed in writing by the National Park Authority.
23. Measures shall be taken to minimise the risk of groundwater pollution from quarrying operations, in accordance with the following protocol:

- All fuel and chemicals should be stored in bunded areas in accordance with current Environment Agency guidelines.
 - All mobile plant using fuel should be located on hard standing when not in use.
 - All immobile plant using fuel should be located on hard standing. Drip trays should also be appropriately placed under all relevant plant.
 - All refuelling activities should be undertaken on areas of hard standing, using appropriate care and attention and in accordance with the correct procedures.
 - An incident reporting procedure should be maintained for reporting all site incidents, including pollution events. Suitable emergency responses should also be in place in the event of an incident.
 - Appropriate spill kits or other means of controlling accidental spills should be made available on site. Adequate training in the use of such equipment should also be provided.
 - A maintenance and inspection programme should be followed in order to check the condition of site equipment and provide early warning of any potential leaks or spills.
 - Suitable waste management procedures should be followed to prevent surface pollution resulting from any waste products, fuel containers, chemical drums etc.
 - During site restoration all hazardous plant and equipment should be removed from the quarry.
 - The use of herbicides and other related chemicals should be restricted both during quarry working and post restoration. Chemical applications should be made at appropriate times, in suitable quantities, so to avoid sub surface contamination.
24. Any facilities for the storage of oils, fuels or chemicals on the application site shall be sited on impervious bases and surrounded

by impervious bund walls or in proprietary double skinned tanks. The volume of the bunded compound shall be at least equivalent to the capacity of the tank plus 10%. If there is multiple tankage, the compound shall be at least equivalent to the capacity of the largest tank, or the combined capacity of interconnected tanks, plus 10%. All filling points, vents, gauges and sight glasses must be located within the bund. The drainage system of the bund shall be sealed with no discharge to any watercourse, land or underground strata. Associated pipework shall be located above ground and protected from accidental damage. All filling points and tank overflow pipe outlets shall be detailed to discharge downwards into the bund.
Reason: To prevent pollution of the water environment

Flodlighting

25. Except in emergencies or where the lamp would be within the quarry void and angled to ensure illumination only below the level of the 'high wall', no lighting or floodlighting, other than that detailed in the agents letter dated 29 August 1997, shall be located on the site without the prior written agreement of the National Park Authority.

Ecology

26. No removal of trees, bushes or hedgerows within or surrounding the quarry working area shall take place between 1 March and 31 August (inclusive) in any year unless otherwise agreed in writing by the National Park Authority.

Landscaping

27. The existing trees, bushes and hedgerows within the site (except those within the area of excavation) or on land within the applicants control, shall be retained and shall not be felled, lopped, topped or removed without the prior written approval of the National Park Authority. Any such vegetation removed without such approval, dying, being severely damaged or becoming seriously diseased as a result of operations at the site shall be replaced with trees or bushes

of such size and species, as may be specified by the National Park Authority, in the planting season immediately following any such occurrences

Site Maintenance

28. The topsoil and subsoil dumps shall be kept free of weeds and all necessary steps shall be taken to destroy weeds at an early stage of growth to prevent seeding.
29. There shall be no stocking of materials, soils or mineral waste above original ground level on any areas within the site. All such storage shall take place within the excavated area.
30. The stripping, movement and re-spreading of topsoil and subsoil shall be restricted to occasions when material is friable and the ground is sufficiently dry to allow the passage of heavy machinery and vehicles over it without damage to the soils.

Restoration

31. Not later than 28 February 2041, or the expiry of six months following the permanent cessation of the winning and working of minerals, whichever is the sooner, the Operator shall submit for the written approval of the National Park Authority a detailed final restoration scheme, including drawings to illustrate the proposals for the final restoration of the quarry. The final restoration scheme shall be based upon the concept restoration plan ref CQL-1, and provide for the site to be restored as a nature conservation bias, with restoration treatment of the benches and faces above the water levels within the resulting lake, and subject to ground conditions, the provision of ponds / ephemeral areas in the location of the current offices / workshop area. The remainder of the Quarry Site shall be cleared of all plant, machinery, buildings and apparatus in accordance with the requirements of Condition 3. The restoration scheme shall include details of the final re-profiling works for the site, the soil /soil forming material profiles to be established; tree

and shrub planting schedules; seeding, fencing and drainage; and a programme and timetable for the implementation of the works.

Aftercare Management

32. Within 3 months of the date of approval of the restoration scheme referred to in condition 31, a scheme shall be submitted for the approval of the National Park Authority setting out the details of the aftercare management of the site. The aftercare scheme, covering a period of 5 years, shall specify the steps necessary to bring the site to a condition fit for the proposed after uses, and the management programme to be implemented to ensure the successful establishment of the restoration planting.

The scheme of aftercare shall include details of:-

- a. Planting and landscaping.
- b. Cultivations, seeding and management of woodland, shrubs, and grassland, in accordance with the rules of good husbandry.
- c. The duration of the aftercare period.
- d. Any other agricultural, silvicultural or conservation treatment particularly relevant to the site.
- e. The creation, management and maintenance of any paths, tracks, and roads.
- f. Maintenance and management of drainage features, ponds and wetlands.

At least once a year the site operators shall arrange a formal review to consider the restoration and aftercare operations which have taken place on the land during the previous year, and the programme of management for the following year.

At least four weeks before the date of each annual review the operator shall provide the National Park Authority with a record of the management and operations carried out on the land during the period covered by the review.

