Environmental RTDI Programme 2000–2006

Environmental Management in the Extractive Industry (Non-Scheduled Minerals) (2000-MS-11-M2)

Synthesis Report

(Main Report available for download on www.epa.ie/EnvironmentalResearch/ReportsOutputs)

Prepared for the Environmental Protection Agency

by

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The project team comprised John Barnett & Associates Ltd – Chartered Mineral Surveyors, Environmental, Planning & Geotechnical Consultants, in association with the Centre for Environmental Research, University of Limerick, the Geological Survey of Ireland, and the Centre Terre et Pierre, Belgium.

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The Waste Section of the Environmental RTDI Programme addresses the need for research in Ireland to inform policymakers and other stakeholders on a range of questions in this area. The reports in this series are intended as contributions to the necessary debate on waste and the environment.

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1 Introduction

1.1 General

The value of the construction industry in Ireland was €23.7 billion in 2003, representing approximately 21% of GNP, more than double the European average of 10%. The estimated value of the construction industry for 2004 is €28.2 billion (DKM, 2004). Currently, over 250,000 people are directly employed in the construction sector.

Construction aggregates and dimension stone have a wide range of uses within the construction industry, and a continuous adequate supply of these products is essential to the continued ability of the construction industry to supply the social and economic infrastructure essential for the modern mixed open economy in Ireland. These construction materials are essential for development, and through that they are a key element for contributing to our quality of life and for creating sustainable communities. Construction aggregates are predominantly supplied from land-based sources: pits and quarries.

The Environmental Protection Agency (EPA), while not the regulator for the quarrying sector, considered that it is appropriate that a review of environmental management practice (and related issues) within the sector be carried out.

1.2 Project Objectives

The project was carried out under a number of work packages. The main objectives are to:

- Provide an inventory of commercial pits and quarries in Ireland
- Assess aggregate supply and demand
- Review environmental management and restoration practice within the sector
- Review the current planning and environmental framework
- Prepare environmental management guidelines for operators and regulators
- Consider the future development of the sector (planning and environmental context).

1.3 Definition – 'Minerals'

In Ireland, minerals are defined in two different Statutes. In the Minerals Development Act, 1940, minerals are defined as "*All substances (other than the agricultural surface of the ground and other than peat or turf in, on or under the ground ….but without prejudice to the generality of the foregoing, the said word includes all scheduled minerals".* A list of 72 minerals is defined in the Schedule under the Act. These minerals known as 'Scheduled Minerals' include metalliferous and industrial minerals, and hydrocarbons. The Minerals Development Act, 1979, further clarified this issue and stated that the definition of 'minerals' "*shall not include stone, gravel, sand or clay except to the extent that any such substance falls within the list of minerals mentioned in the Schedule to the Act of 1940".*

The planning code has a wider definition of minerals, *viz*., under the 2001 Planning and Development Regulations (SI No. 600) minerals are defined as meaning "*all minerals and substances in or under the land of a kind ordinarily worked by underground or by surface working for the removal but does not include turf".*

1.4 Pits and Quarries

A review of the Irish construction materials sector indicates that over 120 million tonnes of aggregates are used annually (refer to Chapter 2 of this report and Irish Concrete Federation (ICF) 2005a). This includes aggregates used in the production of concrete products, bituminous mixes and asphalt, and fill materials. At present, there are over 500 operating quarries within Ireland, producing sand and gravel and crushed rock aggregates, and dimension stone for the construction industry.

In addition, Irish dimension stone operators produce approximately 250,000 tonnes of cut stone annually (Irish Dimension Stone Producers Association, 2000, personal communication). There is a significant export market in northern Europe for these products and up to 50% of the dimension stone produced in Ireland is exported to Belgium, Holland and Germany.

For the purposes of this report, construction aggregates are subdivided into two main categories:

1. **Primary aggregates:** naturally occurring rock and sand and gravel extracted directly from land or from marine sources.
2. **Secondary/recycled aggregates:** previously used materials that are capable of substituting for primary aggregates. These include waste materials arising from demolition of buildings and road surface planings, etc.

2 Aggregate Demand and Supply in Ireland

2.1 General

This chapter provides an assessment of the historical and future aggregate demand in Ireland. As there are no formal statistics available on historical/current demand, this assessment is based on available information at the time of the study. Future supply of primary aggregates (land-based and marine) and secondary (recycled) aggregate is discussed in the context of the future demand.

2.2 Historical Aggregate Supply

Based on available information, the supply of aggregates in the Republic of Ireland increased by over 50% between 1997 and 2002, from approximately 50 million tonnes in 1997 to approximately 110 million tonnes in 2001 (KPMG, 2000). The historical increase in aggregate supply is shown in Fig. 2.1. In 2001, the total aggregate supplied to the construction sector was approximately 110 million tonnes.

2.3 Future Aggregate Demand 2001–2021

This section of the report outlines forecast changes in aggregate demand from 2001 to 2021. The forecast period 2001–2021 was used as it is considered a realistic time frame necessary for national and regional spatial planning (DoELG, 2002).

Potential aggregate demand has been calculated using two different methodologies based on a number of assumptions. The two methodologies were based on:

1. Aggregate supply in 2001 and projected population figures up to 2021, and

2. Aggregate supply in 2001 indexed to projected construction output (as a percentage of GDP).

The forecast aggregate demand, linked to population change or construction output and GDP, indicates a future annual aggregate demand ranging from 100 to 160 million tonnes per year, with total forecast aggregate demand for the period 2001–2021 ranging between 1.6 and 2.4 billion tonnes.

2.4 Future Supply of Aggregates

The land-based sources of primary aggregates are hard-rock quarries and sand and gravel pits. Future supply of land-based primary aggregates will be sourced from existing pits and quarries, future extensions to these developments, and future new 'greenfield' pits and quarries.

In order to secure this future aggregate supply, it is critical that aggregate resource assessments are carried out at a regional and county level to identify resource areas.

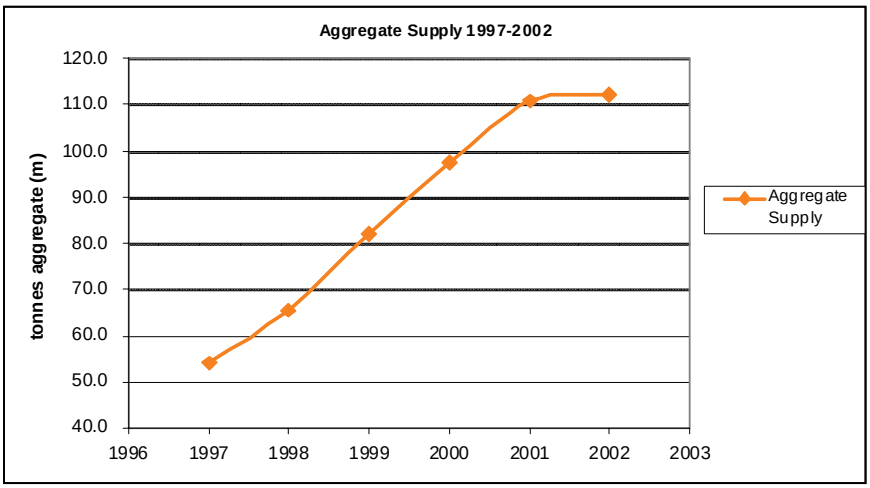

Figure 2.1. Historical aggregate supply 1997–2002: back-calculated from construction O/P figures.

These resource areas should be protected (within a land-use planning context) for future extraction.

A preliminary assessment of the land-take required in order to meet the forecast demand for aggregate during the period 2001–2021 was undertaken in order to determine the relative impact on national and regional land-use planning.

Estimate of future required land-take: assumptions

1. Supply split: Crushed Rock (70%), Sand and Gravel (25%) and Secondary (Recycled (5%)).
2. Future demand: 2.4 billion tonnes (2001–2021).

Sand and gravel

Based on an average pit depth of 10 m and a material density of 2 t/m^3, the total land-take (excavation area) required to meet forecast demand would be approximately 2,400 ha.

Crushed rock

Based on an average quarry depth of 40 m and a material density of 2.6 t/m^3, the total land-take (excavation area) required to meet forecast demand would be approximately 1,730 ha.

It is estimated that a total land-take (excavation area) of approximately 4,100 ha would be required in order to meet the forecast demand for construction aggregates over the period 2001–2021.

2.4.1 Comparative land use

The total land surface of Ireland is 70,280 km^2 and the estimate of land-take (excavation area) required to meet forecast aggregate demand would be approximately 4,100 ha, which is 41 km^2 or 0.06% of the total land surface of Ireland.

For comparative purposes, the total area under forestry in 2002 was *c.* 4,121 km^2, or 5.8% of the total land surface. The total area under peat production in 2002 was *c.* 800 km^2, or 1.13% of the total land surface. In comparative land-use terms, the future land-take required to secure supply of construction aggregates (0.06%) is relatively small compared to other natural resource based activities.

Primary aggregates – marine sources

A number of studies have confirmed that there are significant areas around the Irish coastline where marine sediments are suitable for extraction and use as marine aggregates (Wheeler *et al.*, 2000).

Currently, there is no commercial extraction of marine aggregates in Ireland. Harbour dredging operations result in marine sediments being extracted, but it is general practice that this material is 'dumped' at sea. One exception to this is at Drogheda Port where marine sediments arising from dredging operations have been stored on a temporary basis on land adjacent to the harbour.

Currently, marine aggregates contribute less than 1 million tonnes to the supply of aggregates in Ireland (e.g. <1% of the overall demand for construction materials). With the current lack of an appropriate regulatory framework and competing uses of a number of the key marine aggregate resources areas (breeding grounds for fish/shellfish; offshore wind energy developments, etc.), it is not envisaged that marine aggregates will contribute more than 10 million tonnes over the next 20 years. For the foreseeable future, primary land-won aggregates will remain the main source of supply.

Secondary (or recycled aggregates)

Available information indicates that the volume of construction and demolition (C & D) waste collected and recovered in 2004 was 11.2 million tonnes and 9.5 million tonnes, respectively, indicating an overall recovery rate of approximately 85% (EPA, 2005a).

In 2004, the collected C & D waste stream typically comprised 76% soil and stones (8.5 million tonnes) and 24% concrete/rubble, wood, glass, metal and plastic (2.7 million tonnes). The estimated rate of recovery for the soil and stone fraction of the C & D waste stream was approximately 90%. The recovery rate for the non-soil and stone fraction was approximately 69%.

It should be noted that not all of this recovered soil and stone material would have been suitable for use as construction aggregates, and a significant portion of this material is used in the restoration of poorly drained lands to beneficial agricultural use.

If conservatively (from the aggregate supply perspective) 50% of the recovered C & D waste stream (9.5 million tonnes) is considered suitable for reuse as secondary aggregates (i.e. 4.75 million tonnes per year) this would represent less than 5% of the projected demand for construction aggregates. The key limiting factor is the relatively small volume of the C & D waste stream (concrete/rubble, etc.) available for recycling into

secondary aggregates compared to the overall demand for construction aggregates.

2.5 Planning Policy

2.5.1 DoEHLG quarries and ancillary activities: Guidelines for Planning Authorities

Section 1.3 of the Department of the Environment, Heritage and Local Government (DoEHLG, 2004) guidelines sets out the economic importance of quarries. Advice in relation to policies and strategic objectives for aggregate resources is provided in Section 2.3 of the guidelines.

Current polices relating to the extractive industries within the county development plans vary widely. The regional planning guidelines offer the opportunity to introduce consistency to the minerals planning and development policies of local authorities within the regions.

2.5.2 DoEHLG guidance on the preparation of regional planning guidelines

The Government (DoEHLG, 2003) issued guidance on the preparation of regional planning guidlines in February 2003. The guidance document requires that "*environmental objectives of relevance to the regional planning guidelines such as air, water quality, waste management*", etc., be included during the development of the regional strategy. Given the nature of minerals as finite resources, it is considered that the protection and sustainable use of mineral resources is a planning and environmental objective of relevance to the regional planning guidelines.

The guidance document sets out a number of "*Proper Planning and Sustainable Development Principles*" which regional authorities may refer to in Section 4 of regional planning guidelines. These include "*Natural resource protection and sustainable development*". It is therefore considered that there is scope within the guidance document to provide for policies in relation to minerals within regional planning guidelines.

The Government's guidance notes that "*strategic refers to those policy directions which transcend the boundaries of individual planning authorities and which relate to the role of the region in delivering the National Spatial Strategy*". The nature of mineral deposits (including aggregates) means that such resources are not spread evenly between counties and while one area or county may be rich in mineral deposits another may not or may be rich in a different type. Hence, there is a strong argument for a strategic approach to mineral planning and development that operates at regional level in order to better co-ordinate the land-use planning of the various county councils within a region.

2.5.3 Regional planning guidelines

The policies within the various regional planning guidelines vary, but in principle they generally recognise the strategic importance of mineral resources and as such this requires local authorities to have a policy that acknowledges this importance at county level. The policies provide for the protection and sustainable development use of these mineral resources. Such policies acknowledge that an adequate and continuous supply of minerals is an integral element in the overall future sustainable development of the regions.

2.6 Planning Framework for Quarries and Ancillary Facilities

The Planning and Development Regulations, 2001, (SI No. 600 of 2001) are the current planning regulations that apply to new quarry developments and ancillary facilities. The following parts of the regulations are particularly relevant to quarries and ancillary facilities:

- Plans and Guidelines: Part 1
- Control of Development: Part 4
- Environmental Impact Assessment: Part 10.

2.6.1 Planning applications and environmental impact statements

An application for a quarry with an extraction area greater than 5 ha requires an environmental impact statement (EIS).

Schedule 5, Part 2 Class 2(b) *Extraction of stone, gravel, sand or clay, where the* ***area of extraction*** *would be greater than 5 hectares.*

Where the extraction area is less than 5 ha, the local authority has discretionary powers to require an EIS to be submitted if it considers that there will be "*likely significant environmental effects*" arising from the development (Section 103 of the Planning and Development Regulations: *Requirement to submit EIS with sub-threshold planning application*). Schedule 7 of the regulations defines the criteria for determining whether a

development would or would not be likely to have a significant effect on the environment.

The information to be contained in an EIS is outlined in Schedule 6 of the regulations. The regulations also provide a mechanism for the applicant to request the local authority to provide a written opinion on the information to be contained in an EIS. Further advice and guidelines on the information to be contained in an EIS is provided by the EPA (2002) and the Institute of Geologists of Ireland (IGI, 2002).

2.6.2 Section 261 – control of quarries

The Planning and Development Act, 2000, *Section 261 – Control of Quarries* refers specifically to quarry developments and provides for further regulation of the sector. This section of the Act commenced on 28 April 2004.

Subsection 12 provides for guidelines to be prepared by the Minister in relation to implementation of this section of the Act, and for these guidelines to be issued to, and implemented by the planning authorities. The *Quarries and Ancillary Activities: Guidelines for Planning Authorities* were published by the DoEHLG in April 2004 (DoEHLG, 2004). Chapters 4 and 5 of these guidelines provide advice to planning authorities in relation to the *"Assessment of planning applications and Environmental Impact Statements"* and "*Implementation of Section 261 of the Act"*, respectively.

3 Environmental Management Practice

3.1 General

A review of environmental management practice within the sector has been undertaken. This chapter describes the work undertaken as part of this review including inspections of existing pits and quarries, voluntary industry initiatives, the environmental impact assessment (EIA)/EIS process, and restoration practice for pits and quarries. The findings from the review have been incorporated into the environmental management guidelines presented in Chapter 4.

3.2 Consultations

During the course of the project a consultation process was carried out in two stages, Stage 1 being initial consultation during the project initiation and Stage 2 being public consultation in relation to the environmental management guidelines.

Stage 1 – initial consultation during project initiation

- The Stage 1 consultation process consisted of issuing a questionnaire to 70 stakeholder organisations, requesting their views on environmental issues within the extractive industry.

Responses were returned by 35 organisations, representing a 50% response rate. The responses received were reviewed and collated. Issues arising from the consultation were addressed in the preparation of the environmental management guidelines for the sector, refer to Chapter 4.

3.3 Environmental Inspections

Inspections of over 20 operating pits and quarries were carried out during 2001 and 2002 to assess environmental practice. The pits/quarries selected covered a broad distribution of size, type and geographical location. Each quarry had planning permission or pre-1964 planning status.

The following key environmental management issues were noted and are listed below in no particular order of priority:

- Noise, vibration and dust management was generally satisfactory, and compliant with emission limit values (ELVs) where specified in planning conditions.
- There was a general lack of bunding to fuel/bitumen storage facilities.
- Companies are generally proactive in managing community relations and dealing with complaints.
- Those quarry operations with an environmental management system (EMS) in place or in preparation addressed environmental issues in a proactive manner.
- In a number of cases, mainly relating to pre-1964 developments, some ecological, archaeological and visual/restoration issues needed further review to mitigate existing or potential impacts.
- Management of unsuitable rock is an issue that requires further consideration by dimension stone quarries. In this respect, it is noted that some dimension stone quarries are processing unsuitable rock into construction aggregates.

A copy of the inspection report was provided to each quarry operator for their records and action.

3.4 Voluntary Industry Initiatives

Since 1996, the ICF has developed and implemented an *Environmental Code for the Aggregate and Concrete Product Industries* (ICF, 2005b). This voluntary self-regulatory code sets out environmental management practice and guidelines for ICF member companies, and covers all of the relevant environmental issues. An *Environmental Code Checklist* has been developed for member companies to use as a basis for environmental audits (ICF, 1997). In parallel to the Environmental Code, the ICF has also initiated an Environmental Award Scheme that assesses and recognises good environmental management practice. A number of the ICF award-winning entries have been used as examples of good practice in the environmental management guidelines prepared under this project (EPA, 2006). An ICF/Department of the Arts, Heritage, Gaeltacht and the

Islands (DoAGHI) joint initiative led to the implementation of a joint *Code of Practice for the Protection of Archaeological Heritage* in 2002.

3.5 Review of the EIA/EIS Process for the Sector

An EIA can be defined as: "*The process of examining the environmental effects of development – from consideration of environmental aspects at design stage through to preparation of an environmental impact statement (EIS), evaluation of the EIS by a competent authority and the subsequent decision as to whether the development should be permitted to proceed, also encompassing the public response to that decision*" (EPA, 2002).

3.5.1 Relevant European Directives

A number of key European Directives form the basis of the EIA process in Ireland. These Directives include:

- 85/337/EEC – Assessment of the Effects of Certain Public and Private Projects on the Environment
- 97/11/EC – Amendments to Directive 85/337/EEC on the Assessment of the Effects of Certain Public and Private Projects on the Environment
- 2003/85/EC – Public Participation in respect of Drawing Up of Certain Plans and Programmes relating to the Environment and Amending with Regard to Public Participation and Access to Justice Council Directives 85/337/EC and 96/61/EC.

A copy of these Directives can be obtained at http://www.europa.eu.int/comm/environment/eia.

3.5.2 EIA/EIS regulations in Ireland – quarry developments

Planning and Development Regulations, 2001: Part 10

In a planning context, the EIA/EIS process is regulated under Part 10 – Environmental Impact Assessment, Planning and Development Regulations, 2001 (SI No. 600 of 2001). A copy of these regulations can be obtained from http://www.irishstatutebook.ie. The classes of development to which Part 10 of the regulations apply are stated in Schedule 5 of the regulations. Schedule 5, Part 2, Class 2 (d) is defined as: "***Extraction*** *of stone, gravel, sand or clay, where the extraction area would be greater than 5 hectares*".

Therefore, any planning application for a quarry development with **an extraction area** greater than 5 ha must be accompanied by an EIS that complies with the requirement of Part 10 of the regulations. An outline of the information to be contained in an EIS is stated in Schedule 6 of the regulations.

Under Article 103 of the regulations the planning authority has discretionary powers to require the applicant to submit an EIS, where the extraction area is below 5 ha (i.e. for '*sub-threshold*' development), and where the planning authority considers that the proposed development would be likely to have significant environmental effects on the environment. Schedule 7 of the regulations stated the criteria for determining whether a development would or would not be likely to have significant effects on the environment.

3.5.3 EIS/EIA process – published guidance

There is a significant body of published guidance in relation to the EIS/EIA process. This guidance covers the full range of EIA/EIS issues from screening through scoping, preparation of EISs to the review of EISs. Key published EIA/EIS published guidance documents include:

- EU guidance
  - *Guidance on EIA – Scoping* (June 2001, http://www.europa.eu.int/comm/environment/eia)
  - *Guidance on EIA – EIS Review* (June 2001, http://www.europa.eu.int/comm/environment/eia)
- Irish guidance
  - *Guidelines on the Information to be Contained in Environmental Impact Statements* (EPA, 2002) http://www.epa.ie
  - *Geology in Environmental Impact Statements – A Guide* (IGI, 2002) http://www.igi.ie

3.5.4 Review of EIS documents

Under the current regulations, the planning authorities are responsible for reviewing the adequacy of EIS documents.

As part of this project, 12 pit/quarry EISs were reviewed by the Centre for Environmental Research, University of Limerick. The reviews are carried out using the Lee and Colley (1992) Review Package.

Based on this review, it is clear that the quality of all aspects of the EISs improved substantially between 1989 and 2001. The first four EISs reviewed were prepared during the period 1989–1991. All of these statements were found to be unsatisfactory and in spite of this it was found that all projects were granted planning permission and the development went ahead.

Three of the EISs reviewed were prepared in 1999. These statements contain significantly more of the relevant information and met far more of the criteria in the Review Package than the earlier EISs. Of the 12 EISs reviewed, it was found that four did not meet the minimum requirements. These were the earlier EISs and those prepared later were found to meet many more of the criteria laid down in the Review Package.

3.6 Quarry/Pit Restoration Practice

Land-based extraction of primary aggregates and dimension stone involves the temporary use of land for extraction purposes. Upon permanent cessation of extraction the land can be restored to beneficial afteruse (Figs 3.1 and 3.2).

Most of the land-take in Ireland for extraction of aggregates/dimension stone is in agricultural use prior to extraction. Whilst agriculture/forestry is a common afteruse for many sand and gravel pits, other uses such as some form of amenity including nature conservation are often more appropriate for rock quarries. The selection of the appropriate afteruse of a quarry/pit should be determined on a site-specific basis.

Restoration and aftercare should be considered as an integral part of the overall site development. If properly planned and implemented, it is technically feasible to restore mineral workings to a beneficial afteruse.

Planning applications for extraction of minerals should be accompanied by a working plan and final restoration plan. These plans should be of sufficient detail to enable the planning authority and statutory stakeholders to make a determination as to its feasibility and should generally include the following stages:

1. Stripping and placement of soils – topsoil and overburden soils (either direct replacement or storage within the site)

2. Landscaping and landform objectives for the site, including backfilling operations if required, on cessation of extraction

3. Restoration, including soil placement, relief of compaction and provision of surface drainage

4. Aftercare provisions, where required.

The restoration scheme including phasing, timing and direction of working should be considered during the project planning stage. It may be appropriate to allow for review of the restoration scheme during the life of the development and submission of revisions to the restoration and aftercare scheme, for agreement, from time to time as appropriate. The objective of restoration conditions is the replacement of soils on landforms and

Figure 3.1. Sand and gravel pit restored to agricultural use (tillage) – Dan Morrissey (Ireland) Ltd, Bennekerry, Co. Carlow.

Figure 3.2. Restoration of sand and gravel pit to amenity use – Shay Murtagh Ltd, Ratharney, Co. Westmeath.

levels that accord with the agreed scheme so as to ensure that the land is restored to the required standard for the proposed afteruse envisaged.

It is expected that applicants will make provision for full restoration and, where relevant, long-term aftercare. However, the type of restoration that will be appropriate in any particular case will depend on a number of factors, in particular the nature and extent of existing workings and the availability of suitable restoration materials.

3.6.1 Progressive restoration

Where possible, progressive restoration should be carried out to minimise the area of land occupied at any one time by extraction, unless to do so would be likely to adversely affect the standard of restoration achieved, or would be impracticable to achieve due to the nature of the site or type of operation. In general, progressive restoration is more appropriate for sand and gravel pits than for hard-rock quarries.

3.6.2 Final restoration

It is usually desirable that buildings, plant and machinery used in connection with the quarry operations be removed as soon as they are no longer required in connection with the relevant planning permission. The areas concerned may then be incorporated in schemes for restoration and aftercare.

In order to minimise the potential impacts that may arise at the end of extraction, the following measures should be carried out as part of the final restoration works:

- Removal of all equipment (mobile plant and built structures)
- Removal of fuel tanks and toilet facilities
- Cleaning of the site of residual stocks and storage mounds
- Complete the landscape integration of the quarry landform
- Secure the access to the site.

3.6.3 Aftercare

The aftercare provisions, where and if required, will be dependent on the intended afteruse. For example, where lands are being restored to beneficial agricultural afteruse there may also be the need for soil cultivation and treatment for a number of years after the initial restoration has been carried out in order to improve the structure and stability of the soil and to bring it to a satisfactory standard. It also provides an opportunity to provide site infrastructure such as drainage and the initial establishment and management of vegetation.

3.6.4 Development control – restoration

It is considered that properly worded and relevant planning conditions which are complied with, should be able to secure the restoration, aftercare (if appropriate), and beneficial afteruse of worked-out quarries and pits.

Ongoing and continued improvements by the industry will ensure continued improvements in standards of restoration. The use of progressive restoration (where practical) limits the area of disturbed land at any one time, and also greatly reduces the potential environmental impact caused by any failure to adequately restore the lands.

Responsibility for the restoration and aftercare of quarries and pits lies with the operator and, in the case of default, with the landowner. Applicants should therefore, demonstrate with their applications what likely financial and material budgets for restoration, aftercare and afteruse will be, and how they propose to make provisions for such work during the operational life of the site. This is important to avoid the possibility that the costs of restoration might have to be borne by other public or private sources.

There is a need to ensure that restoration provisions are implemented by the operator. It is recommended that quarry operators include restoration as part of their environmental management plan/system.

Planning authorities generally attach a financial surety condition to planning permissions in order to ensure that restoration work will be carried out and completed. The type and amount of this surety is determined on a site-specific basis. In general, financial sureties may comprise a restoration bond, letter of guarantee or cash deposit.

3.6.5 Afteruse options

Examples of good restoration practice are provided from Ireland and the UK, refer to the ICF 'Green Aggregates' Award Scheme and the UK Quarry Products Association (QPA, 1999) *Directory of Restoration*. Typical afteruse options include:

- Agriculture
- Forestry
- Amenity/Recreation
- Nature Conservation/Natural Habitat
- Infill – Inert Materials
- Build Environment.

4 Environmental Management Guidelines

4.1 General

The main deliverable arising from the project is a set of environmental management guidelines for the sector (EPA, 2006).

A public consultation was carried out in relation to these guidelines. A public notice was issued in the three national newspapers in December 2003 to invite individuals and organisations to review the proposed *Environmental Management Guidelines – Draft for Consultation* (November 2003) and submit comments/observations to the project team. The guidelines are principally aimed at surface developments within the extractive industry, other than those working minerals as they are defined in the Mineral Development Acts, 1940 to 1999. They apply to surface developments that are extracting and processing construction aggregates and dimension stone (i.e. pits, quarries and ancillary facilities).

These guidelines should be read in conjunction with, and are complementary to the DoEHLG (2004) – *Quarries and Ancillary Activities: Guidelines for Planning Authorities*.

4.2 Environmental Guidelines

The following sections describe and summarise good environmental management practice guidelines under key environmental issues.

4.2.1 Ecology

Quarry developments by their nature are resource based and result in removal of soil and rock. This results in disturbance and removal of original habitats. With sensitive and effective restoration, the original habitat can be replaced by another new, and often more ecologically diverse, habitat that attracts new species of flora and fauna.

The biodiversity associated with quarry developments is recognised in the designation of a number of disused quarry developments as conservation areas (English Nature, Quarry Products Association and Silica and Mouldings Sands Association, 1999). One notable success story is the increase in the peregrine falcon population, which are often found to roost in quarries.

In some cases where protected species cannot be retained *in situ*, conservation techniques such as translocation/relocation may be the best available means of mitigating the loss of the ecosystem. Where required, such measures should be undertaken in consultation with the National Parks and Wildlife Service (DOEHLG) and under expert ecological supervision.

Restoration schemes for quarry developments can provide a mechanism for enhancing biodiversity of local areas.

4.2.1.1 Ecology – guidelines:

- Carry out ecological baselines studies and understand the ecological environment within and in the vicinity of the quarry.
- Mitigation measures:
  - Provide a minimum buffer zone of 10 m width (from edge of habitat to edge of extraction area) to designated ecological habitats defined under national and European legislation. The actual width will depend on the type of development and the habitat to be protected.
  - Use translocation/relocation techniques, where necessary and appropriate.
- Link to restoration and afteruse: natural habitats, wetland areas.
- Protect and enhance existing habitats where appropriate as part of the landscaping and restoration scheme.
- Comply with regulations in relation to protected species, habitats and designated conservation areas.
- Planning for restoration at design stage of a quarry, and updating/reviewing the restoration scheme regularly during the life of the development.
- Retention of topsoil and overburden materials on site to facilitate operational landscaping and restoration.

4.2.2 Surface water

This section addresses issues relating to the surface water environment. It should be read in association with

Section 3.3 on groundwater. The key objectives are to protect existing surface watercourses and to optimise the requirements for water abstraction through best water management practice. Discharges of effluent to surface waters are regulated under the Local Government (Water Pollution) Acts. The associated regulations also specify water quality standards. There is an obligation for operators to comply with the provisions of these Acts.

4.2.2.1 Surface water – guidelines

- Consult the relevant Local Authority, Fisheries Board and where applicable Waterways Ireland about any alterations to existing surface watercourses, nearby river corridors and any discharges/abstractions.
- Consult with the Department of Communications, Marine and Natural Resources in relation to discharges to the foreshore.
- Obtain a discharge licence for discharges of effluent to surface watercourses.
- Where a discharge licence is required, undertake a surface water quality baseline study to assess water quality in the receiving surface waters.
- Undertake an aquatic survey where discharge of effluent is to salmonid surface waters.
- Provide an appropriate drainage system to minimise surface water run-off into the quarry workings.
- Adopt an integrated approach to water management, including:
  - control of suspended solids by settlement in sumps and lagoons
  - ensure all surface run-off from hardstanding areas used for refuelling is directed to an appropriately sized hydrocarbon interceptor prior to discharge
  - optimise use of water in processing plant and treatment of effluent including vehicle washing water
  - where practical, provide closed water systems to reuse process and wheel-wash water, and conserve water resources by abstracting water for ‘top-up’ only
  - optimise use of water in dust suppression/control systems
  - use of appropriate water recharge or other practical measures, where it is demonstrated that the quarrying activities have impacted on surface water levels in nearby streams, rivers, or lakes
  - regular cleaning and maintenance of the water management system.
- Limit erosion by:
  - rapidly vegetating exposed areas
  - vegetating the surfaces of overburden and topsoil mounds
  - progressively restoring worked-out areas, where practical
  - limiting areas of topsoil/overburden stripping exposed at any one time.
- Design sumps and lagoons to cope with all reasonable anticipated conditions, by ensuring that:
  - they are adequately sized
  - scouring is avoided
  - the retention time is adequate, and if necessary, enhancing settlement by use of flocculants or mechanical means
  - lagoons are adequately sealed with an impermeable material
  - regular cleaning and maintenance can be carried out.
- Establish surface water monitoring stations both down and upstream of the site.
- Leave adequate margins/buffer zones around watercourses, and other sensitive areas.
- Control surface water run-off, e.g. minimise obstruction of flood flows by inappropriate placing of mounds of overburden or waste.
- Provide pollution control measures in relation to fuel and chemical storage.
- Where high concentrations of suspended solids are generated (e.g. in the processing of dimension stone) and where space limitations prevent the use of settlement lagoons, mechanical means of removal of suspended solids should be adopted.

4.2.2.2 *Surface water – recommended ELVs*

Where there are discharges of treated effluent from quarry developments to surface watercourses, the following ELVs are generally recommended:

(i) pH less than 9

(ii) biochemical oxygen demand (BOD): 25 mg/l

(iii) total suspended solids (TSS): 35 mg/l

(iv) nitrate (NO_3): 50 mg/l

(v) chemical oxygen demand (COD): 100 mg/l O_2

(i) total hydrocarbons: 1 mg/l.

It is noted that the specific ELVs will be determined by the nature of the treated effluent to be discharged and the receiving surface waters. These limits will be specified in the conditions attached to the associated discharge licence.

4.2.3 Groundwater

Groundwater is a significant natural resource in Ireland providing between 20 and 25% of drinking water supplies (Geological Survey of Ireland (GSI), 1999). In rural areas where there is no public water supply or group water scheme, groundwater is usually the only source of water. It is estimated that there are over 100,000 wells/springs in use around the country.

At present,groundwater resources are protected through the Local Government (Water Pollution) Acts (1977 and 1991), at national level, and through the EU Groundwater Directive (80/68/EEC). These regulations control the discharge of specified substances to groundwater.

The GSI has prepared groundwater protection plans for a number of counties. These plans classify aquifers and aquifer vulnerability on a county basis, and some counties have incorporated this information into their county development plans.

Quarry developments by their nature remove topsoil and overburden materials within the extraction area and these activities may change aquifer recharge characteristics and increase the aquifer vulnerability. Depending on the depth of the quarry relative to the surrounding groundwater regime, groundwater control or dewatering measures may also have to be incorporated into quarry operations. The impact of these activities, if any, on the groundwater resource can be mitigated by appropriate quarry planning and design, together with the operational practices outlined below.

4.2.3.1 *Groundwater – guidelines*

Groundwater control

- Where applicable assess the hydrogeological regime around the quarry and its environs.
- Optimise the location and extent (plan area and depth) of the workings to ensure that there is no significant impact on groundwater resources.
- Implement groundwater monitoring where applicable within the EMS.
- Provide for recharge of surface water regimes and aquifers where such measures are necessary and practical.
- Provide replacement water supplies where quarrying activity is found to adversely affect local water supplies.
- Provide appropriate location for discharge of groundwater (where this is being abstracted and not reused).
- Obtain a discharge licence for any discharge of treated effluent to groundwater.
- Provide an appropriate buffer zone to ecological habitats that would be affected by any significant change in the groundwater regime.

Protection of groundwater (and surface water)

- Provide bunding to all fuel/chemical storage tank areas (refer to the EPA IPPC Guidance Note (EPA, 2005b)): 110% of the capacity of the largest tank within the area or 25% of the total volume of the substance that could be stored within the area, whichever is greater). Covering of bunded areas should be considered to minimise the requirement to dispose of contaminated rainwater collecting in the bund.
- Use spill pallets to store drums of chemicals and oils (including waste oils).
- Assess and monitor the integrity and watertightness of all bunding structures.

- Provide spillage control equipment on site (booms and suitable absorbent materials, etc.) to contain any accidental spillage.
- Ensure blasting practice minimises the risk of occurrence of nitrate/ammonia residues by proper blast design and implementation, appropriate disposal of any excess explosives, and selection of the appropriate type of explosives (particularly in some limestone environments where significant karst features such as open cavities have been observed/encountered).
- Infiltration drainage (e.g. soakaways) should be designed in accordance with the principles outlined in CIRIA Report 156 (1996).
- Effluent treatment systems should be designed, constructed and maintained in accordance with the EPA guidelines on wastewater treatment systems (EPA, 1999b).

4.2.3.2 Groundwater – recommended ELVs

Where there are point discharges of treated effluent from quarry developments to groundwater, the emission limit values should be based on an assessment of the existing groundwater quality and the interim Guideline Values for the Protection of Groundwater in Ireland issued by the EPA (EPA, 2003).

The specific ELVs will be determined by the nature of the treated effluent to be discharged and the receiving aquifer. These limits will be specified in the conditions attached to the associated discharge licence.

4.2.4 Air quality

Quarrying activities and ancillary facilities, by their nature, generate dust. The dust arises predominantly from inert soil and rock materials.

The main potential sources of dust include processing plant, stockpiles, traffic on internal haul roads, stripping and overburden storage. They are generally dispersed sources rather than specific point sources, and this dictates the measures required to mitigate potential dust-related impacts.

The Air Quality Standards Regulations (2002 SI No. 271 of 2002) set limit values for sulphur dioxide, nitrogen oxide, particulate matter and lead in ambient air. These regulations apply to ambient air quality in the local vicinity of land-use/development types including quarries and concrete/asphalt manufacturing facilities.

4.2.4.1 Air quality – guidelines

Minimise the creation of dust by planning and design

- Consider use of conveyors rather than internal haul roads, where practical.
- Locate fixed/mobile processing plant within the quarry area, where practical.
- Locate haul roads, tips and stockpiles away from sensitive receptors and take into account prevailing wind directions.
- Lay out and construct stockpiles, tips and mounds to minimise dust creation.
- Use screening berms.
- Use crushing and screening plant within its design capacity.

Control the escape of dust from plant

- Enclose fixed conveyors and processing plant.
- Where applicable, provide dust removal system for the plant.
- Use water sprays and mists as dust suppression measures.
- Carry out regular maintenance on all plant.
- Use appropriate dust filter systems on asphalt and ready-mix plants.

Minimise wind-blown dust

- Compact, grade and maintain internal haul roads.
- Fit dust extractors, filters and collectors on drilling rigs.
- Use screening bunds to shelter plant and storage areas.
- Limit drop of falling material.
- Reduce speeds and limit movement of vehicles, use upswept exhausts.
- Use water bowsers, sprays or vapour mists.
- Spray exposed surfaces, e.g. unsurfaced haul roads, stockpiles.

- Vegetate exposed surfaces, e.g. topsoil and overburden storage mounds.
- Carry out road sweeping (Fig. 4.1), where appropriate.
- Provide vehicle/wheel-washing facilities and surface the road between the washing facility and the quarry entrance.
- Use covered (closed or sheeted) vehicles, or spraying, for the transport of dry fine materials.
- Clean up any accidental spillages on public roads, as soon as such a spillage arises or is notified.

New fixed or mobile asphalt plants constructed on or after 1 November 1988 require a licence under the Air Pollution Act, 1987 (Licensing of Industrial Plant) Regulations, 1988. This licence is issued by the relevant local authority and enables specific conditions in relation to air emissions to be applied to asphalt plants. The use of low-sulphur fuels is recommended where practical. Regular maintenance of vehicles should be carried out to control exhaust emissions.

4.2.4.2 Air quality – recommended ELVs

The impact of dust is usually monitored by measuring rates of dust deposition (UK DoE, 1995). There are currently no Irish statutory standards or EPA guidelines relating specifically to dust deposition thresholds for inert mineral dust. There are a number of methods to measure dust deposition but only the German TA Luft Air Quality Standards (1986) relate a specific method of measuring dust deposition with dust nuisance. The Bergerhoff method is the only enforceable method available. Where this method is deemed unsuitable for use, and only in these circumstances, an alternative method may be agreed with the local authority.

Figure 4.1. Vacuum road sweeper (Frank Harrington Ltd, Co. Mayo).

On this basis it is recommended that the following TA Luft dust deposition limit value be adopted at site boundaries associated around quarry developments:

- Total dust deposition (soluble and insoluble): 350 mg/m^2/day (when averaged over a 30-day period).

The following ELVs are recommended for emissions to air arising from asphalt plants regulated under the Air Pollution Act, 1987:

- Sulphur dioxide 500 mg/Nm^3
- Nitrogen oxide 450 mg/Nm^3
- Dust 50 mg/Nm^3

4.2.5 Noise and vibration

Noise and vibration are present in many normal everyday activities. Tables 4.1 and 4.2, respectively, describe the noise and vibration levels associated with these activities.

People, property and animals are regularly exposed to vibration, both ground-borne and airborne. Table 4.2 gives typical vibration levels generated by everyday activities. This shows that a footstamp or door slam results in a comparable vibration to that arising from blasting operations. In addition, winds of Beaufort Scales 3 and 4 result in comparable air pressures to those arising from blasting.

Table 4.1 Noise levels associated with everyday activities.

Description of activity	Noise level (dB(A))
Absolute silence	0
Very quiet room	25
Rural night-time setting (no wind)	35
Daytime, busy road 0.5 km away	55
Busy restaurant	70
Very busy pub, voice has to be raised to be heard	85
Disco or rock concert	100
Uncomfortably loud, conversation impossible	120
Noise causes pain in ears	140

Table 4.2. Vibration levels associated with everyday activities.

Vibration level	Description of activity
1.0–2.5 mm/s	Walking measured on a wooden floor
2.0–5.0 mm/s	Door slam, measured on a wooden floor
12–35 mm/s	Door slam, measured over doorway
5–50 mm/s	Footstamp, measured on wooden floor
30–70 mm/s	Daily changes in temperature and humidity
120 dB	Constant wind of 5 m/s: Beaufort Scale 3, Gentle Breeze
130 dB	Constant wind of 8 m/s: Beaufort Scale 4, Moderate Breeze

4.2.5.1 Noise and vibration – guidelines

The following practical measures can be adopted to reduce noise and vibration levels at quarry sites.

Noise control

- Design of the workings and ancillary facilities: lay-out, sequence of working
- Selection of locations for processing, storage and loading
- Screening by bunds and working face
- Screening of haul roads and provision of suitable gradients
- Consider noise characteristics as part of the overall assessment when purchasing new plant and equipment
- Internal traffic routing: optimise vehicle reversing requirements (to minimise noise associated with reversing alarms)
- Use of rubber linings on chutes and transfer points
- Minimise height which material drops from plant and machinery
- Enclosure and cladding of processing plant, where applicable
- Regular maintenance for plant and machinery.

Vibration control

Efficient blasts ensure that as much of the explosive energy as possible is utilised for rock fragmentation, and by implication ground vibration and air overpressure is inefficient use of this energy. Air overpressure values arising from blasting operations fluctuate depending on the weather conditions, a factor outside the control of operators. The ELV is specified with a 95% confidence limit to address this issue. The following measures should be considered to reduce the effects of blasting:

- Optimise blast design
- Monitor blasts and revise blast design, as required
- Limit ground-borne vibration and minimise air overpressure by:
  - taking care in unusual situations, e.g. corners
  - including geological considerations in blast design
  - minimising air overpressure through proper blast design, avoiding detonation of large unconfined charges, and by consideration of atmospheric conditions before blasting
- A blast must be carried out on a specified day, as concerns over security do not allow for explosives to be stored on site. In exceptional or unforeseen circumstances (e.g. late delivery, security, meteorological conditions, etc.), a blast may be delayed or brought forward. Where possible the operator should endeavour to inform the public of the revised blasting timetable
- Adequate stemming of holes
- Ensure the correct blasting ratio is obtained. The blasting ratio is a measure of the amount of work expected per unit volume of explosives, i.e. t/kg
- Notify nearest residences prior to the blast.

4.2.5.2 Noise and vibration – recommended ELVs

The EPA has produced a guidance note for noise in relation to Scheduled Activities (EPA, 1996). It deals in general terms with the approach to be taken in the measurement and control of noise, and provides advice in relation to the setting of noise ELVs and compliance monitoring.

- In relation to quarry developments and ancillary activities, it is recommended that noise from the

activities on site shall not exceed the following noise ELVs at the nearest noise-sensitive receptor:

Daytime: 08:00–20:00 h
LAeq (1 h) = 55 dBA

Night-time: 20:00–08:00 h
LAeq (1 h) = 45 dBA

(Note: 95% of all noise levels shall comply with the specified limit value(s). No noise level shall exceed the limit value by more than 2 dBA.)

- On-site activities should be permitted during night-time hours where they comply with the noise ELVs (e.g. heating up of asphalt plants, loading of materials).
- Where existing background noise levels are very low, lower noise ELVs may be appropriate. Audible tones or impulsive noise should be avoided at night.
- It is also appropriate to permit higher noise ELVs for short-term temporary activities such as construction of screening bunds, etc., where these activities will result in a considerable environmental benefit.
- In relation to blasting activities within quarry development, it is recommended that the following vibration and air overpressure ELVs are adopted and applied at the nearest vibration-sensitive location (e.g. a residential property).

  Ground-borne vibration: Peak particle velocity = 12 mm/s, measured in any of the three mutually orthogonal directions at the receiving location (for vibration with a frequency of less than 40 Hz).

  Air overpressure: 125 dB (linear maximum peak value), with a 95% confidence limit.
- Normal hours of blasting should be defined (e.g. 09:00–18:00 h Monday to Friday), and provision should be included to permit blasting outside these hours for emergency or safety reasons beyond the control of the quarry operator.
- It is recommended that quarry operators provide advance notification of blasting to nearby residents through use of written notes, signage at site entrance, telephone, or warning sirens (or a combination of these methods).

4.2.6 Landscape, restoration and afteruse

Landscape change and visual intrusion are one of the key environmental issues associated with quarry developments. Because of the diversity of local landscapes, the potential impacts vary considerably in nature. The method of extraction and associated restoration scheme, where properly planned and implemented, can eliminate and/or minimise these potential impacts. The Landscape Institute/Institute of Environmental Management and Auditing (IEMA) has provided useful guidelines for landscape and visual assessment (2002).

There are a number of publications providing guidelines for the restoration of quarry developments and these are provided in the References (UK DoE, 1992, 1996a,b; CTP, 2000). In addition, the EPA landfill manual *Landfill Restoration and Aftercare* (EPA, 1999a) provides useful information on the principles of restoration and on issues such as soil handling and afteruse options.

4.2.6.1 Landscape and restoration/afteruse – guidelines

- Minimise impact on the landscape through proper planning and design:
  - direction of working and phasing of extraction
  - implement progressive restoration, where possible
  - location of processing plant and stockpiles
  - use of screening bunds
  - use of pre-planting, where possible, to minimise the impact of future phases of extraction
  - operational landscaping around site perimeter and at site entrance, where appropriate
  - suitable choice of colours/finishes for plant and buildings
  - retention and/or reinstatement of boundaries and boundary features, where practical
  - use of directional lighting, as appropriate during hours of darkness
- Restoration and afteruse:
  - consider and develop restoration scheme at the earliest possible stage in the planning of quarry developments

- consult with interested parties regarding afteruse/restoration options
- these are some of the afteruses that can be considered:
  agricultural
  forestry
  amenity (fisheries, golf courses)
  natural habitat (lake, wetland – nature conservation
  landfill – waste disposal
- implement progressive restoration, where possible
- maximise soil recovery during stripping operations, and store topsoil and overburden materials separately
- retain topsoil and overburden to ensure that the materials can be reused in restoration
- provide an appropriate programme of maintenance and aftercare.

4.2.7 Waste management

Quarrying and related value-added activities result in a number of waste streams. These may include waste associated with plant/vehicle maintenance and on-site canteens. The management of waste within quarries is regulated under the Waste Management Act, 1996, and associated regulations.

A waste permit under the Waste Permit Regulations, 1998, may be required where overburden materials are imported to site pending future recovery for restoration purposes.

In the past, some quarries have been subjected to illegal fly-tipping and disposal of waste by third parties. The industry is addressing this issue by providing improved security around site boundaries and entrances.

The guidelines provided below cover the management of waste in quarry developments.

4.2.7.1 Waste management – guidelines

- Eliminate and minimise the production of waste.
- Reuse and recycle unsuitable materials (such as poor-quality rock arising from dimension stone quarries, and clay/silt materials arising from settlement processes).
- Reuse and recycle rejected products from block-making, concrete and asphalt production operations.
- Ensure appropriate disposal of excess/unused explosives, in accordance with the manufacturer's guidelines and health and safety regulations.
- Use designated storage areas for particular waste types and 'authorised' waste contractors for the collection, reuse and disposal of waste oils, batteries, tyres, domestic waste and scrap metal (in compliance with current waste management legislation).
- No burning, disposal or mixing of waste materials, or use of waste materials in boilers should take place without prior consent of the local authority.
- Appropriate security and signage around entrance(s) and boundaries to deter and prevent illegal fly-tipping of waste materials by third parties.
- Particular waste materials such as oils, oil filters, batteries, empty oil drums, fluorescent lamps, printer cartridges are classified as hazardous waste materials. These materials should be stored on site in designated areas and collected and recycled or disposed of, by an 'authorised' waste contractor.

4.2.8 Archaeological heritage

As archaeological heritage is a non-renewable resource, the presence of known archaeological sites or the anticipation of potential sites is a major consideration in the extension of existing quarries and the selection of sites for new quarry developments.

The ICF and the DoAGHI have developed a Code of Practice in relation to archaeological heritage (ICF/DoAGHI, 2002).

The purpose of the Code is to: "*Provide a framework within existing legislation and policies to enable members of the Irish Concrete Federation to expand their operations whilst carrying out appropriate archaeological mitigation having regard to a set of principles and actions agreed by both parties."*

The guidelines summarised below are based on information contained in the Code. It is understood that the Code of Practice will be reviewed by both parties 1 year after its adoption, and at regular intervals thereafter.

4.2.8.1 *Archaeological heritage – guidelines*

- Undertake archaeological investigations at initial site selection and planning stages (for both new 'greenfield' developments and quarry extensions) to minimise the impact on known archaeological sites or areas of established significant archaeological potential.

- Preserve by record all known sites being removed by development works (Fig. 4.2).

- Notify the National Monuments Section of the DoEHLG of, and preserve by record, any other monument or site of archaeological significance, deemed worthy of preservation, that may be uncovered during the operational phase of a quarry development.

Figure 4.2. Archaeological excavation at Brownstown, Kilcullen, Co. Kildare (Kilsaran Concrete Products Ltd).

4.2.9 *Transport and traffic*

Construction materials have to be transported to the market place. In Ireland, the predominant mode of transport used is road via the use of heavy goods vehicles (HGVs), including trucks, concrete lorries, and container lorries for dimension stone. Where quarries are adjacent to, or adjoin existing railway lines, rail transport is sometimes adopted for transport of aggregates used in track maintenance.

Construction aggregates are typically relatively low-value materials and it is generally only economic to use road transport for delivery to the market place within a 50-km radius from the quarry. For higher value materials such as concrete and asphalt/bituminous mix products and dimension stone, the market can stand higher transport costs and therefore greater haulage distances.

On-site traffic within quarry developments typically arises from activities including stripping of topsoil and overburden materials, haulage of fragmented rock, cut stone or sand and gravel, and movement of site personnel and finished materials/value-added products.

Off-site traffic associated with quarry developments typically arises from transport of finished product/value-added products to the market; deliveries to the quarries (e.g. fuel, cement, bitumen, sand, and explosives) and personnel movements.

The potential impacts of traffic associated with quarry developments can be mitigated by implementation of the guidelines outlined below and other guidelines related to on-site and off-site traffic in Sections 4.2.4 and 4.2.5.

4.2.9.1 *Transport and traffic – guidelines*

- Consider, where appropriate, alternatives to internal road haulage from excavation to processing plant or depot, e.g. conveyors.

- Careful design and lay-out of the site entrance, providing adequate visibility (Fig. 4.3).

Figure 4.3. Splayed site access with landscaping (Loughnane Concrete, Birr, Co. Offaly).

- Regular maintenance and servicing of vehicles.
- Agree main traffic routes, where appropriate, to avoid sensitive areas and the use of large vehicles in narrow winding roads.
- Require drivers and others to use agreed routes.
- Use vehicle/wheel-washing facilities and sheet vehicles (when transporting dry fine materials), where appropriate.
- Provide on-site truck parking to avoid queuing of trucks outside quarry entrances.

4.2.10 Energy

Quarry developments and associated ancillary facilities are large users of energy (fuel and electricity). There are significant environmental and financial benefits from ensuring that the use of energy is optimised.

Energy consumption is associated with processing plant (crushing, screening and washing activities), on-site and off-site vehicles, asphalt, ready-mix concrete and concrete block/pipe manufacturing plants, and cutting/finishing processes used within the dimension stone sector.

The following guidelines outline measures to optimise energy consumption. Further advice on energy issues can be obtained from the Irish Energy Centre (http://www.irish-energy.ie).

4.2.10.1 Energy – guidelines

- Carry out energy efficiency audits.
- Identify opportunities and implement appropriate measures for energy use reduction and efficiency, e.g. use of variable speed drives.
- Consult with the electricity supplier in relation to tariff management and use of off-peak electricity.
- Provide regular maintenance for processing plant, pumps, and boilers, etc.
- Use photosensors to control and optimise use of outside lighting.
- Provide insulation to storage bins: asphalt/ tarmacadam plants (Fig. 4.4).

Figure 4.4. Energy-efficient asphalt plant incorporating insulated bitumen tanks and aggregate bins (Roadstone Provinces Ltd, Bunratty, Co. Clare).

- Consider using off-peak electricity for certain operations, e.g. pumping of water, heating of bitumen tanks, etc.
- Optimise lay-out and design of internal haulage routes and processing plant.
- Use automatic controls to ensure idling or shutdown of plant when not in use.
- Use float-operated pumping systems.

4.3 Suggested Standard Format for Conditions (Environmental) Attached to Planning Permissions for Quarry Developments

Currently, there is no standard format for conditions attached to planning permissions for quarry developments and ancillary facilities. An Foras Forbartha (1980) did publish a Development Control Manual, *The Extraction of Aggregates,* and this document contained a list of conditions based on a review of planning permissions granted at that time. The Department of the Environment (DoE, 1982) published advice and guidelines in relation to development control, including advice relating to conditions attached to planning permissions. However, this document does not specifically address quarry development and ancillary facilities. Section 4.7 in the DoEHLG (2004) guidelines provides advice to planning authorities in relation to planning conditions, including environmental conditions.

This advice is written in a general descriptive manner and does not include typical wording of conditions. It is considered that the use of standard format conditions would be, on balance, beneficial to all stakeholders within the sector.

The suggested standard format for conditions (environmental) prepared as part of this project may need modification to address the circumstances of particular applications/developments. The standard conditions are formulated in relation to proposed quarry developments and may not necessarily be appropriate for existing quarry developments.

Where a quarry is subject to environmental impact assessment, conditions attached to a grant of planning permission should incorporate mitigation measures proposed in an EIS.

5 Future Development of the Sector

Based on the work of this project the following conclusions and recommendations are presented to describe the current status of the sector and its future development.

5.1 Conclusions

- Currently, the demand for construction aggregates is over 120 million tonnes per year. Over 95% of this demand is supplied from land-based pits and quarries.
- The use of recycled or secondary aggregates (such as processed C & D waste) has increased over the past 5 years. However, contrary to the assertion in *Sustainable Development – A Strategy for Ireland,* demand for aggregates for use by the construction industry will not be adequately met by the recycling and reuse of construction/demolition (C & D) waste.
- The relatively small volume of C & D waste arising within the country, together with a perceived reluctance to specify and use secondary aggregates, are constraints in increasing the volume of recycled C & D materials available for use as construction aggregates.
- There is virtually no commercial use of marine aggregates at the current time. Future use of marine aggregates is particularly constrained by the lack of an appropriate regulatory framework.
- In the absence of an increase in the sources of secondary and marine aggregates, it is likely that land-based deposits will continue to be the main source of construction aggregates in Ireland over the next 20 years. It is therefore critical that the issue of protection and sustainable development of aggregate resources is incorporated in land-use planning at a regional, county and local level.
- The future demand for construction aggregates over the period 2001–2021 will range from 100 to 160 million tonnes per year. The highest demand will occur in the Greater Dublin region (including Meath, Kildare and Wicklow), around other major urban centres – Cork, Limerick, Waterford and Galway – and at the locations of major infrastructure projects.
- An adequate, economic supply of construction aggregates and related materials (concrete, concrete products, asphalt/tarmacadam, etc.) is essential for the successful implementation of the National Development Plan 2007–2013 (and future national development plans), and the National Spatial Strategy 2002– 2020.
- These construction materials are essential for development and, through that, they are a key element for contributing to our quality of life and for creating sustainable communities.
- The regional planning guidelines and the county development plans, together with the DoEHLG (2004) planning guidelines, are the current basis for setting out policies for the sustainable development of these construction materials.
- There is some variation in the environmental management practices adopted at pit/quarry locations within the sector. Those pits/quarries with an EMS in place were observed to be more proactive in addressing environmental management issues.
- Voluntary industry initiatives are contributing to improved environmental management and restoration practices within the sector. Such initiatives are a key aspect of the sector's future development.

5.2 Recommendations

5.2.1 Sustainable development

The **sustainable development** of proven land-based primary aggregate resources should take into account the following key issues that are consistent with the principles of sustainable development (Comhar, 2002):

- Protect primary aggregate resources and optimise the use of these resources, while ensuring an adequate and continuous supply to meet the need for economic growth and sustainable development.
- Only permit development of quarries within designated European sites (Special Protection Areas, Special Areas of Conservation and Natural Heritage Areas) if they would not have a significant effect on

the integrity of the sites in ecological terms (i.e. no loss of biodiversity and appropriate mitigation measures including transplantation/translocation of flora and fauna implemented where required), or unless there are particular reasons relating to the public or national interest (including those of a social or economic nature).

- Encourage the recycling of construction and demolition waste for use as secondary aggregates, thereby minimising the extraction of primary aggregates, where practicable.
- Ensure proper environmental management and monitoring of quarries so that the potential environmental impact of extraction and transportation of aggregates is minimised.
- Where extraction of aggregates has permanently ceased, ensure that these quarries are restored to beneficial afteruse. Such restoration will protect the long-term potential of the land and in some cases will contribute to biodiversity.
- Minimise the production of waste materials within quarries (e.g. waste oils, tyres, batteries, etc.) by implementing recycling and reuse procedures.

The development and use of sustainability indices for the quarrying sector should be considered as these may provide a useful tool for assessing the sector's compliance with sustainable development principles.

5.2.2 Aggregate resources

5.2.2.1 Aggregate resource assessment

- There is a requirement to identify land-based aggregate resources on a county and regional basis. Such an assessment would provide the basis for using land-use planning to protect and manage these resources in a proper and sustainable manner.

5.2.2.2 Aggregate supply and demand

- There is a need to implement a framework for the collation of regional statistics on the supply and demand for construction aggregates in Ireland. These figures could be used in future to check and review the current assessment of supply and demand, and to assist in the sustainable development of aggregate resources. Any such methodology for the collation of supply and demand figures would have to recognise the commercial sensitivity of such information. The regional statistics would have to be recorded and presented to ensure confidentiality on this matter.

5.2.2.3 Alternatives to land-based primary aggregates

- Further measures should be implemented to promote and provide alternative sources of aggregates – secondary and marine aggregates:
  - The recommended measures provided for in the B4 Task Force report on the recycling of C & D waste (FCI, 2001) should be reviewed and updated to ensure that the proposed recycling targets for C & D waste will be achieved.
  - In the short term, all port/harbour authorities should be instructed as a matter of policy to ensure that future assessment of the reuse of dredged materials is carried out prior to proceeding with an offshore disposal option. This will identify potential opportunities for reuse of the marine sediments as secondary aggregates, thereby enabling possible savings on disposal costs and contributing to a sustainable supply of aggregates.
  - Port/harbour authorities should recognise the potential need to land marine aggregates, and make provision for suitable areas for this activity in their harbour development plans.
  - Carry out a review of the potential marine aggregate resources within the Irish territorial waters.

5.2.3 Planning policy and practice

5.2.3.1 National aggregate policy

- Ireland is one of the few remaining countries in Western Europe that does not have a national aggregates policy. This is despite having a substantially higher aggregate demand per head of population than any other EU state. It is recommended that a national aggregates policy be developed to give clear guidance to regional and county planning authorities on the need to secure future aggregate supply while protecting our national heritage and landscape.

5.2.3.2 Regional planning guidelines

- There is a requirement to provide and implement consistent regional planning policies and guidelines to ensure protection and sustainable development of proven aggregate resources.

5.2.3.3 County development plans

- The policies within county development plans should provide for the protection and sustainable development of proven aggregate resources. These policies should be consistent across all planning authorities.

- The guidelines for preparation of county development plans should be amended to provide a consistent approach to planning policy and development control for the extractive industry.

- Where the extent of aggregate resources within lands have been proven, and where these lands are within the ownership (or under the control) of a quarry operator, then these lands should be considered for zoning within the county development plan for the purposes of future aggregate extraction, taking into account other land-use and environmental issues.

- Planning authorities should consult with the relevant industry organisations, quarry operators, the GSI, and other stakeholders in relation to the location of existing quarries and aggregate resources within their area, during future revisions of the county development plans.

5.2.3.4 Marine aggregates – policy and regulatory framework

- Develop a policy and a new regulatory framework for marine aggregates to facilitate, where appropriate, the potential use of marine sediments as construction aggregates.

5.2.3.5 Standard format for conditions (environmental) attached to planning permissions

- There is a requirement to implement a standard format for environmental conditions attached to planning permissions, and to ensure implementation of consistent ELVs. This will facilitate a more consistent approach to the drafting of conditions attached to planning permissions for quarry developments.

5.2.3.6 Section 261 – control of quarries

- The deadline for the registration of quarries was 27 April 2005. Planning authorities should assess the registration submissions on a consistent basis, in accordance with the DoEHLG (2004) guidelines and such further advice as may be issued by the Department.

5.2.3.7 Transport

- At present, HGVs are the predominant mode of transporting construction aggregates and materials to the marketplace. Consideration should be given to assessing alternatives modes of transport (such as rail) where such modes are demonstrated to provide a practical alternative in economic, environmental and social terms.

5.2.4 Environmental management practice

5.2.4.1 EIA/EIS for pits and quarries

- A key stage in the EIA/EIS process is the scoping of the EIA. More attention to the scoping aspect of the EIA process would assist in improving the standard and quality of EISs.

- As the purpose of an EIS is to identify, reduce and mitigate the environmental impacts of developments the accuracy of the predictions made in the EIS as well as the effectiveness of the mitigation measures need to be audited. It is recommended that an environmental audit be conducted post-development and at regular intervals during the life cycle of the quarry development. These audits (as part of an EMS, see below) will assess the effectiveness of the mitigation measures and the accuracy of predictions made within the EIS.

5.2.4.2 Implementation of EMSs

- Every quarry and pit should implement an EMS appropriate to the scale and nature of the operation. The environmental management guidelines published as part of this project contain advice in relation to the structure, content and implementation of such systems.

5.2.4.3 Environmental management guidelines for operators

- There is a requirement to provide guidelines to operators to ensure a consistent approach to the environmental management of quarry developments and ancillary facilities. The ICF environmental code (ICF, 2005b), the DoEHLG (2004) guidelines, and the environmental management guidelines prepared under this project (EPA, 2006) provide a basis for addressing this issue.

5.2.4.4 *Environmental management guidelines for regulators*

- There is a requirement to provide guidelines to regulators so that a consistent approach to planning policy and development control issues in the extractive industry can be adopted across the country. The DoEHLG (2004) guidelines and guidelines prepared under this project provide a basis for addressing this issue.

- It is recommended that the standard format planning conditions (environmental) prepared under this project be adopted for use by the planning authorities to ensure a more consistent approach to planning permissions within the sector. Such an approach has been successfully implemented by the EPA for integrated pollution control licences and waste licences.

5.2.4.5 *Education and training*

- While there are industry initiatives in place to provide environmental awareness/management education and training, it is recommended that a more integrated approach would be beneficial to improving the overall environmental management within the sector. Such an approach would include provision of a suitable module within third-level planning courses, in-service training for planners and environmental staff within the planning authorities, development/ continuation of environmental awareness training for staff within quarry companies, and continued professional and development (CPD) training for engineering, environmental, geological, planning and surveying professionals working within the sector.

- A programme for dissemination of the guidelines arising from this project should be implemented, and should include all stakeholders within the sector. Such guidelines should be incorporated in the future education and training initiatives for the sector, recommended above.

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