Restoration of Sand and Gravel Quarry at Boherkill, Rathangan, Co Kildare.

Environmental Impact Assessment

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SECTION 1: INTRODUCTION

1.1 PROPOSED RESTORATION WORKS

This Environmental Impact Statement (EIS) is drafted to assess the proposed environmental impacts possible and arising from the proposal to carry out a full restoration of a sand and gravel quarry located at Boherkill, Rathangan Co. Kildare. The Quarry is in the ownership of the applicant Mr Michael Ennis and has been operational for the past 13 years under the operational stewardship of Kildare Sand and Gravel Ltd. The facility has operated in full compliance with the existing planning permissions and has never had any issues regarding the management of the quarry from regulatory or locally concerned stakeholders within the lifetime of the facility. The primary aim of the proposal is to bring soil and stone and associated other fill materials to the site over a 10 year period to ultimately bring the site back to its previous agricultural use.

The location of the application site is indicated on an extract from the 1:50,000 scale Ordnance Survey Discovery series map of the area, reproduced as Figure 1.1.

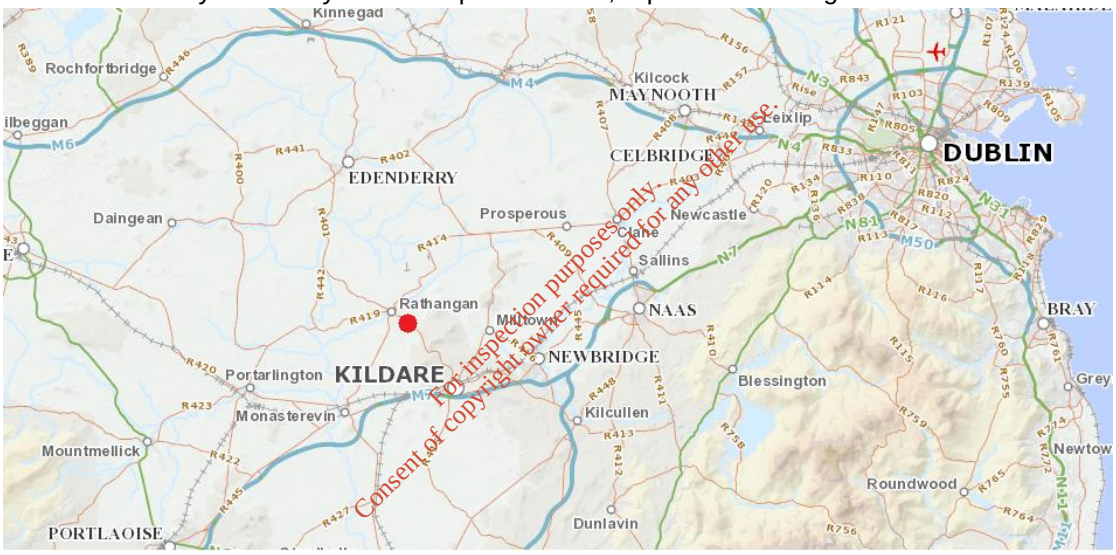

FIG 1.1 SITE LOCATION MAP(i)

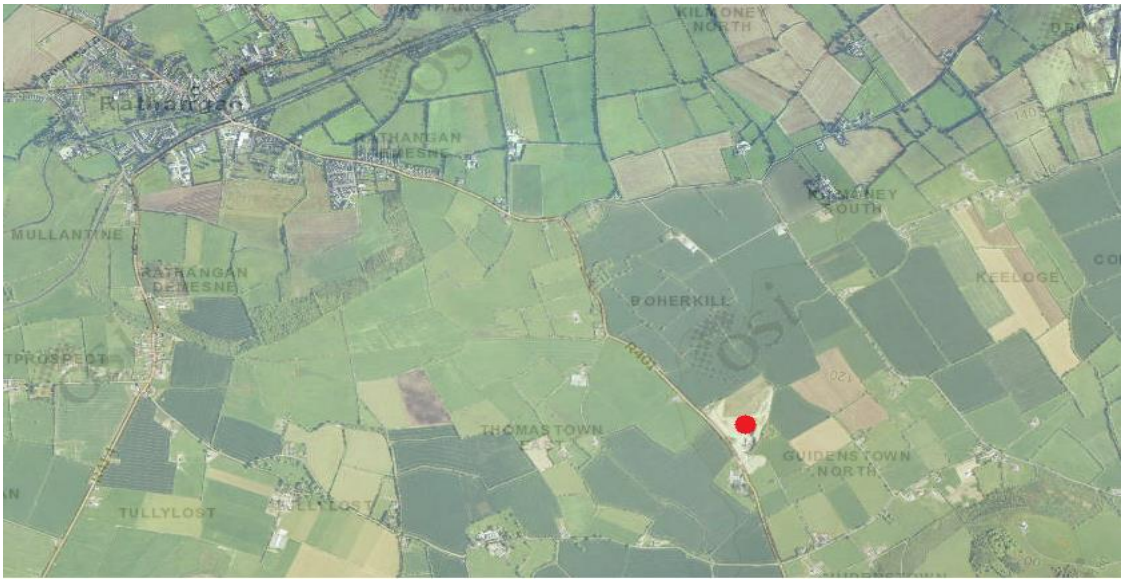

FIG 1.2 SITE LOCATION MAP(ii)

This proposal provides for the importation, placement and capping of approximately 1,500,000m^3 of inert soil and rock and inert construction materials (concrete, block, brick, paving stones, granular fill, ceramics etc.). The inert materials will be imported by permitted waste contractors.

1.2 THE SITE

1.2.1 Site Location

The site is located entirely within the townland of Boherkill, Rathangan, Co. Kildare, approximately 3km south-east of Rathangan Co Kildare on the R401 National Secondary route way and 5.5km north-west of Kildare Town. Irish National Grid Coordinates (E269919, N217476). The plan extent of the lands owned Mr Michael Ennis is outlined in blue on a 1:10,560 scale map of the area, reproduced as Figure 1.3. The plan extent of the application site is also outlined in red on the same figure.

1.2.2 Site Description

The total land ownership boundary encompasses an area of 24.5Ha. The lands surrounding the site are generally agricultural in nature with a small number of dwellings located along local R401 road. The nearest town is Rathangan (3km south-west) and Kildare (5.5km east). The site is located at the foot of Dunmurray Hill, on lands sloping gently towards the west. The gravel pit is screened from the R401 road by a substantial and well established hedge line. The total site encompasses an area of 20.42hectares and is owned by the applicant Mr. Michael Ennis.

The site is set on a saddle of land slightly elevated above Rathangan and the flat lands to the west, and at the foothills of higher ground in Dunmurray Hill and Red Hill. The character of the landscape is that of a rich pastoral landscape, up to a line high on Dunmurray Hill, above which there is a mixture of established deciduous woodland and semi-mature coniferous planting. Land within the holding of the applicant (east of the R401), and adjoining this holding, has had many of the traditional field boundaries removed over the years to facilitate intensive tillage farming, however many traditional field boundaries remain and mature hedgerows are dominant in the overall landscape, notably as perceived in views from the public road.

1.2.3 Site Access

Access to the site is to/from the main Rathangan - Kildare Newbridge road Regional Route R401. Although the road is generally characterised by its meandering, undulating nature, it is a regional route with a typical width of 5.5 metres and site visibility lines at the site entrance are acceptable.

1.2.4 Surrounding Land Use

The application site and existing sand and gravel quarry is located largely in an agricultural area. There are a number of isolated residences in the area immediately surrounding the existing facility. The surrounding land use activities are largely agricultural with a mix of tillage and grazing activities predominant.

1.3 LAND OWNERSHIP

The lands within the application site are fully owned by Mr Michael Ennis, the applicant. The estate of Mr Ennis is in his full owner of approximately 24.5 hectares.

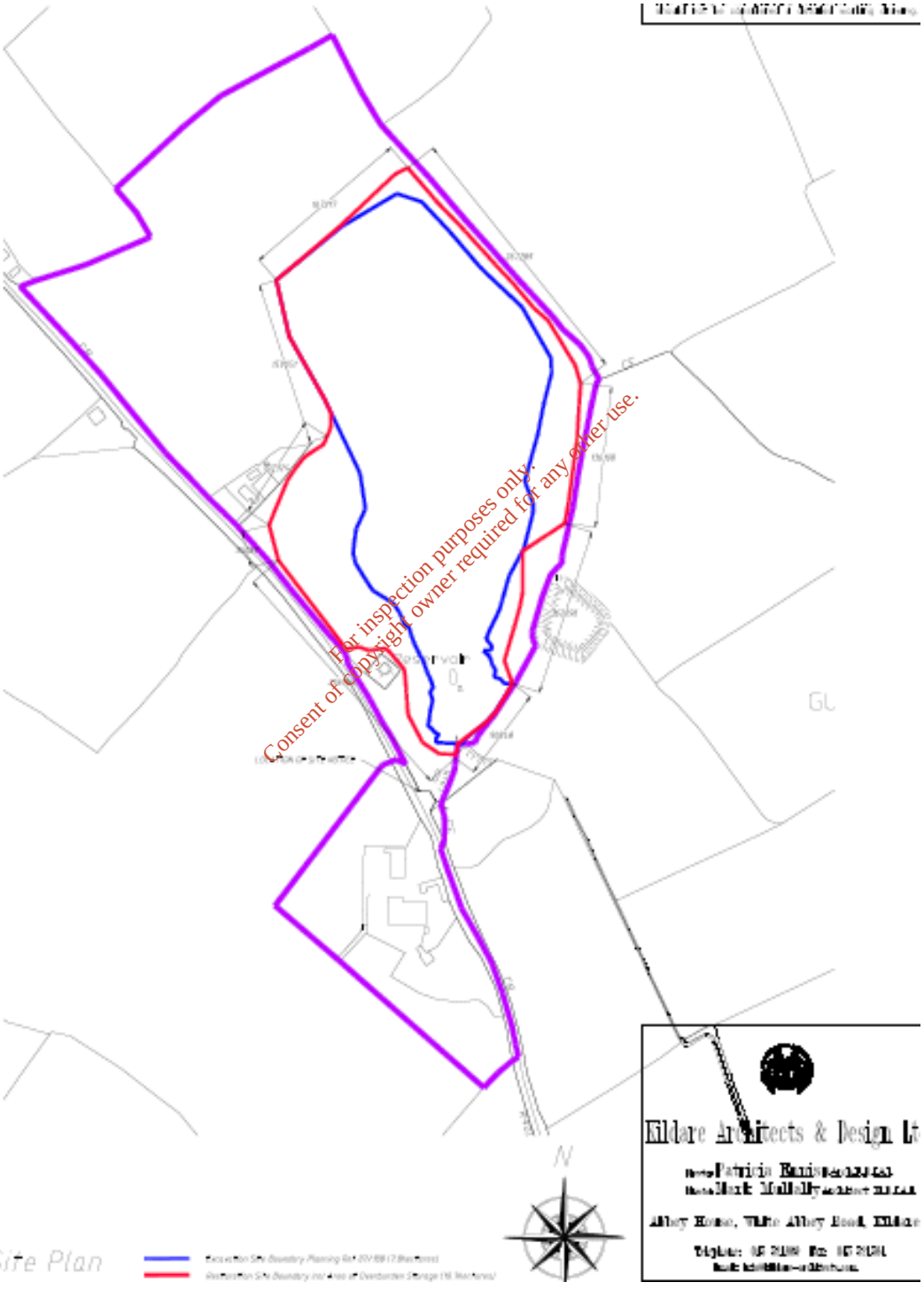

Fig 1.3 Plan Extent of the site and the land ownership of the applicant (REF: Drwg. 151324-P-04)

1.4 THE APPLICANT

The applicant in this instance is Mr Michael Ennis. Mr Ennis inherited the lands over 50 years ago but the land has been in the possession of the Ennis family for over 200 years. Mr Ennis in 2003 leased out the running of the quarry at Boherkill Rathangan to Kildare Sand and Gravel and they have continued the operation for a period of 16 years to the present day. There have been no complaints or incidents of an environmental nature in respect of the operation of the facility to date.

1.5 PLANNING HISTORY

On 14th May 2002, Kildare County Council granted Michael Ennis planning permission (PL No. 01/1270) for a sand pit at Boherkill, Rathangan County Kildare subject to 32 no. conditions.

On 27th August 2008 Kildare County Council granted Michael Ennis planning permission (PL No. 07/188) for retention & extension of an existing gravel pit at Boherkill, Rathangan, County Kildare subject to 28 no. conditions & subsequent to previous planning permission granted (PL No. 01/1270) for retention & extension of gravel pit.

Planning permission 07/188 was granted for a period of 7 years which was due to expire on 27th August 2015.

On 21st August 2012, An Bord Pleanala conferred under section 261A of the Planning & Development Act 2000, as amended, decided: To set aside the determination of the planning authority in respect of the development made under section 261A(2)(a)(i) of the Planning & Development Act, as amended, and To set aside the determination of the planning authority in respect of the development made under section 261A(2)(a)(ii) of the Planning & Development Act, as amended.

On 25th March 2015 a pre-planning meeting was held at the offices of Kildare County Council to discuss the proposal to restore the excavated gravel pit to the original ground levels & use as agricultural land by importing inactive or inert waste. Attending: Michael Kenny, KCC, Chief Planner Wesley Keogh, KCC, Planner George Willoughby, KCC, Roads Ciara Corrigan, KCC, Environment Patrick Little, Planning consultant, Patricia Ennis, Architect, Mark Mullally, Architect

On 12/08/2015 via Planning Ref 15/515, Kildare County Council approved the extension of the current operations of the quarry by 5 years to 2020, allowing the proceedings from PL 07/188 to be extended.

On 30/07/2015 Pl Ref 15/657 application for the Restoration of the existing excavated gravel pit (previously granted planning permission 07/188 and 01/1270) to the original ground levels and use as agricultural land by importing c1,500,000 tonnes of inactive or inert waste materials and reinstating existing overburden on site and all other associated site works. Was lodged with Kildare County Council. This application was validated and subsequently withdrawn as incomplete.

On 19/01/2016 a final pre- planning meeting was held between the applicant and officers of Kildare County Council to address the failings of the application of 30/07/2015 with a view toward a reapplication of same proposed development.

1.5.1 Local Resident Engagement

The applicant has at all stages in this process emphasised the importance of local acceptance in respect of the existing operations and of any future proposed operations. In that light the applicant and his representatives have personally approached each of the local residents to make them aware of the proposed development and to garner their opinions in respect of same. The outcome of this process may be seen below.

Landowner	Visit By	Date	Comments
Simon & Catherine Holohan	Michael Ennis	Week of 23 March 15	Would be in favour of restoring to agricultural lands
Paul & Cathy Ennis	Michael Ennis	Week of 23 March 15	Would be in favour of restoring to agricultural lands
Edmund & Elizabeth Burrell	Michael Ennis	Week of 23 March 15	Would be in favour of restoring to agricultural lands
Robert Pearson	Michael Ennis	Week of 23 March 15	Would be in favour of restoring to agricultural lands
Mark Holohan	Michael Ennis	Week of 23 March 15	Would be in favour of restoring to agricultural lands
Brendan & Mary Plant	Patricia Ennis	Week of 10 January 16	No comments except that applicant deal with Environmental Consultant, Mr David Malone
Sean & Geraldine Wade	Patricia Ennis	Week of 10 January 16	Would be in favour of restoring to agricultural lands
Frank & Siobhan Shaughnessey	Patricia Ennis	Week of 10 January 16	Would be in favour of restoring to agricultural lands
Jeremy Harley	Michael Ennis	Week of 25 January 16	Would be in favour of restoring to agricultural lands

The developer has taken this engagement as a very positive one and found that the overwhelming majority of the neighbours saw the restoration of the quarry back to agricultural land as a positive progression for the site and for the area in general. One household have deferred on their comments while they await a full review of the proposal and this EIS within the permitted statutory framework afforded by the planning process in this state. This is also welcomed by the developer at this stage.

1.6 PLANNING CONTEXT

In respect of developing and explaining the relevant planning context of the site it is imperative that relevant National and regional considerations are discussed and highlighted. A key pot of reference is how the local authority view the proposal in the context of the activity or proposed activity itself and then with a view to the operational context of the proposal in its environmental or spatial setting.

In this instance the predominant issue is that the proposal is to restore a 95% complete sand and gravel quarry back to agricultural use in a rural setting by using imported soil and stone and also some inert construction and demolition waste materials. This section analyses how

the local and national and national waste management plan views the proposal and also how the proposal is regarded in the context of the local waste management strategy.

Key to an assessment of the above is a look at the Kildare County Development plan in the first instance.

1.6.1 Kildare County Development Plan (2011 – 2017)

In relation to settlement strategies and the local authorities plan for land zoning and phasing and zoning, Policy SS3 suggests that a strong emphasis will be placed on encouraging infill opportunities and better use of under-utilised lands with options and opportunities for brownfield / regeneration prioritised. This shows a keen interest on behalf of the local authority in the infill and reuse of brownfield developments and thereby a support for restoration schemes in general.

3.8 Settlement Strategy Policies

SS3 *- To phase lands for development where over zoning has taken place. Prioritised phasing will be based on a clear sequential approach with the zoning extending outwards from the town/village core. A strong emphasis will also be placed on encouraging infill opportunities and better use of under-utilised lands with options and opportunities for brownfield / regeneration prioritised.*

It is clearly noted in the Settlement Strategy Policy for the local authority that a strong emphasis will be placed on encouraging infill opportunities and better use of underutilised lands with options and opportunities for Brownfield / Regeneration prioritised.

3.9 Settlement Strategy Objectives

SO 8: To support the development of rural settlements and rural areas in a balanced, sustainable manner, having regard to the overall settlement hierarchy, social, economic and environmental characteristics of their area and their residents and in accordance with the policies and objectives set out in Chapters 4, 10 and 17 as may be appropriate.

The county development plan supports the development of rural settlements and rural areas in a balanced manner having regard to overall settlement hierarchy social, economic and environmental characteristics of the area. In this regard the proposed development is supported in an economic, social and environmental context as those core traits are readily identifiable in the proposed development through social employment for the proposal, the invariable benefits to restoring a quarry from a health and safety perspective and the undeniable environmental positive statement the restoration of the quarry will portray.

Chapter 5 of the County Development deals specifically with Economic Development and immediately into the document in Section 5.4 Economic Development Strategy the following is stated: -

- *In the small towns of Clane, Prosperous, **Rathangan**, Sallins, Athgarvan, Castledermot, Derrinturn and Kill together with the villages of Johnstown, Straffan, Ballymore Eustace, Allenwood, Johnstownbridge, Coill Dubh/Coolearagh, Kilmeague, Caragh, Kildangan, Suncroft, Ballitore/ Timolin/ Moone / Crookstown the Council will seek to **encourage new local employment opportunities** and assist in reducing long distance commuting patterns and thus creating more sustainable communities.*

In respect of the proposed development the local authority are very focused on the encouragement of new local opportunities in employment with a view to assistingin the reduction of long distance commuting patterns thus creating sustainable communities. This development has provided on a regular basis 2 to 3 full time employees for a period of 16 years or greater and has with that contributed to the provision of 5 – 6 additional service jobs in the local area. The proposed development will ensure that this is continued for a period of 10 additional years via the proposed restoration project.

- *Within the rural areas of the county there are many rural settlements and rural nodes which provide clear locational requirements for employment generating uses including green energy projects such as renewable energies, **resource recovery**, food production, forestry and agri-business, bloodstock, horticulture, rural based tourism and resource based enterprises.*

A key tenet of the economic strategy of the County is highlighted as being the promotion of the reduction in long distance commuting patterns via the encouragement of new local employment opportunities. This is in particular for towns like Rathangan. This development will contribute to this core strategy via the provision of local employment. Also for the rural areas the plan is to promote resource recovery in particular along with food production and agribusiness. Again the proposed development can be argued to traverse the gambit in respect of this key economic targets for the county with the resource recovery aspect being applicable to both the remaining extraction in the permitted activity until 2020 and also the recovery of soils and stones and other materials which will be utilised ultimately to recover a site of sand and gravel extraction and return it to its previous land use of agricultural land. Once restored the land will be used for agri-business and food production again thus completing the natural cycle for the land. A core tenet of sustainability.

Section 5.5 of the County development Plan discusses factors influencing future economic development for the county and section 5.5.2 discusses availability of infrastructure and mentions waste management infrastructure. It states that there are significant infrastructural deficits in the county and highlights in particular broadband and wastewater infrastructure in particular as key deficits. For the purposes of this environmental impact assessment it is

pointed out that a key infrastructural deficit which could hamper the economic progress of the county would be the lack of available outlets for the management of waste soils and inert construction and demolition derived materials. This point has been highlighted to the development in pre-submission planning meetings where representatives of the waste management / environmental section of the council have clearly stated the need locally. It is evident that that infrastructure is lacking in the County also and that the proposed development would provide a welcome sustainable outlet for locally generated waste materials for the 10 year proposed life span of the development.

Section 5.5.3 of the County Development Plan discusses "Quality of life" and states *Specific actions to improve quality of life through this Plan and future Local Area Plans include: Expanding infrastructural capacity for energy, waste, water and wastewater*.

The expansion of infrastructure for waste management is recognised by Kildare County Council as a means of improving Quality of Life socially within the County and this proposal will assist both economically and socially to compliment this policy objective.

Section 5.9 deals specifically with the issue of Economic Development Policies for the County.

ECD 1: To support and facilitate the economic development of the county in accordance with the economic development strategy across a range of sectors while acknowledging in particular the growing importance of the knowledge economy in delivering sustainable employment opportunities.

The Proposed development is considered economic development through both the continued extraction of the sand and gravel resource and the proposed restoration activities aimed at remediating the quarry and restoring it to its former agricultural activity.

ECD 9: To facilitate the development of agriculture, bloodstock, horticultural and rural related enterprises in the county.

The proposed development will ultimately result in the reclamation of agricultural land which has been temporarily lost to the extractive industry. ECD9 supports the development of agriculture and this proposal supports that premise strongly and sustainably. Increases in agricultural land on the island of Ireland are difficult and the constant challenge for planners and governments alike is to strike a balance between housing, commercial and agricultural developments. It is clear from OECD and UN predictions that populations are increasing and living longer and therefore restoring brownfield resource exhausted quarries to productive agricultural resources again can only be seen as a very sustainable and worthwhile exercise. Indeed a recent article in the Irish Times highlighted the United Nations perspective in this regard very clearly:

Climate change

Balancing our use of and

The decision by the UN Convention to Combat Desertification (UNCCD) last week to adopt the target of "land degradation neutrality" by 2030 is a positive step, but achieving this target in practice will be very challenging. The fact that national targets remain entirely voluntary reflects the continuing failure of the international community to respond to the environmental crisis with the urgency it requires.

The concept of land degradation neutrality pragmatically recognises that humanity will continue to degrade at least 12 million hectares of land each year. Expanding populations will demand more space for cities and roads, soaring food demand will put unsustainable demands on productive soils and threaten to consume remaining forests and wetlands.

The UNCCD argues that a solution could lie in the land already degraded. If we rehabilitated and restored this land at the same rate we degrade land elsewhere, then we could at least halt the slide towards a degraded planet. Restoration of degraded land generally – but not always – sequesters carbon in the soil. It could therefore play a role in mitigating carbon emissions. UNCCD can bring the forthcoming Paris conference on climate change a slightly hopeful message.

And, as the conference heard repeatedly, land degradation is a key factor in the recent surge in forced migration and conflict, so that land restoration offers multiple benefits.

However, none of this will be easy. Even assuming that most UN member states are willing to embrace this huge task, many questions remain, and not only the complex technical issues.

At home, we should see the UNCCD agreement as an opportunity to embark on large-scale, science-based restoration schemes on bogs, uplands, forests and wherever we have degraded land through unsustainable exploitation. Remarkably successful small projects have already shown the way forward. We need to scale them up rapidly to make a solid contribution to resolving the environmental crisis that dominates this century.

Sir, – Ire… interview … shouldn't hav… 24th) with Hele… Linehan, it se… gloves are off w… pushing for abo… ised here.

Any thought… those women … with their preg… case of fatal foe… and cherished … that their babi… of hours, mo… years?

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Fig: 1.4 UN Article on Balancing Land Use

Section 5.10 deals with Economic development objectives and in particular E04 refers to the provision of waste management infrastructure.

EO 4 : To ensure the provision of water, wastewater treatment and waste management facilities to accommodate future economic growth of the county and to reserve capacity in water services infrastructure for employment generating uses.

This proposed development will ensure for at least 10 years that there is an outlet for recovering inert waste material within the local authority area. This will help promote the construction industry in the area and make the process of developing built infrastructure in the county cheaper and more sustainable.

Chapter 7 of the County Development deals with Water, Drainage and Environmental services. A key concept within this chapter is for the county to "develop, protect, improve and

extend water, waste water and flood alleviation and environmental services throughout the county and to prioritise the provision of water services infrastructure to complement the overall strategy for economic and population growth and to achieve improved environmental protection".

Section 7.10 refers specifically to the Environmental Services Policies and there are quite a few of the policies contextually which are relevant to the proposed development.

WM 1: To have regard, in the assessment of planning applications for waste management facilities inter alia, to the Waste Management Plan for County Kildare then prevailing, Waste Management Act 1996, EU Landfill EPA Landfill Manuals, EU Packaging and Packaging Waste Directive and DoEHLG policy statements viz. Changing Our Ways and Preventing and Recycling Waste – Delivering Change and Taking Stock and Moving Forward.

The developers in this instance have had due regard for the requirements of WM1 above and have attempted to embrace the requirements of same in the overall development strategy for the proposal.

WM 4: To encourage waste prevention, minimisation, reuse, recycling and recovery as methods of managing waste. Where waste management is not being carried out properly, the Waste Management Acts 1996 to 2008, will be used as a means of ensuring specific national policies and regulations are adhered to.

This development is devised as a recovery operation offering two particular phases of development. The first phase is the offering of a sustainable outlet for the recovery of the target waste streams and secondly and more importantly the rehabilitation of a previously exacerbated quarry the primary function of whose operation was as a source of natural resource required as part of the development of our social and developmental infrastructure. Therefore in relation to the EU waste Hierarchy the development is well up the chain of requirement.

WM 7: To ensure the provision of residual landfill in County Kildare (either directly by the Council or in co-operation or partnership with other local authorities and the private sector) is subject to the specific requirements of the County Kildare Waste Management Plan

The provision of residual landfill capacity within the local authority functional area is seen as a key requirement in the Waste management objectives of the County. This proposal ensures 10 years sustainability for the management of residual construction and demolition waste and waste inert soils from construction developments. It is therefore seen that this development is supported significantly by this section.

7.10.3 Pollution Control – Water, Air and Noise

PC 1: To preserve and maintain water, air and noise quality in the county in accordance with good practice and relevant legislation.

PC 3: To enforce, where applicable, the provisions of the Environmental Noise Regulations 2006.

PC 4: To ensure that noise levels caused by new and existing developments throughout the county do not exceed normally accepted standards and that new developments shall incorporate measures to ensure compliance with the Environmental Noise Regulations 2006 and any subsequent revision of these Regulations.

PC 5: To regulate and control activities likely to give rise to excessive noise (other than those activities which require regulation by the Environmental Protection Agency).
PC 6: To require activities likely to give rise to excessive noise, to install noise mitigation measures and monitors.

PC 1,3,4,5 and 6 refer specifically to the preservation of noise quality within the county and highlight specifically the focus within the county on noise prevention, reduction and sustainability whilst encouraging sustainable economic and social development. Throughout the operation of this development there has not been a single noise complaint and through the proposals for the continued operation of the development and the new proposals for the restoration of the facility a key environmental aim will be the maintenance of the existing good performance through continuance of the existing practices and through the establishment of additional mitigation measures if and where necessary.

7.11 Environmental Services Objectives

EN 2: To facilitate the implementation of the County Kildare Waste Management Plan 2005–2010 and any subsequent revisions thereof during the period of this Plan.

In the context of this development, cognisance will also be made to the Eastern and Midlands Region waste management plan 2015 – 2021 the requirements of which will work in tandem with the county specific requirements as set out in County Kildare Waste Management plan 2005 – 2010. In the carrying out of this Environmental Impact Assessment the requirements of both plans have been assessed

Section 10 of the County Development plan refers to Rural Development. In recent years the rural economy of County Kildare has experienced rapid change. While traditionally agriculture sustained much of the rural economy, the restructuring of this sector has resulted in a diversification of traditional farm practices, an increase in part time farming / off farm employment and a decrease in the number of individual farmsteads.

The *National Development Plan 2007–2013* (NDP) outlines a framework for developing the rural economy with a number of interventions to support rural areas. These include physical infrastructure, improvement of transport services, promoting the diversification of the rural economy, the modernisation and competitiveness of the farming and food processing sector as well as enhancing the quality of the rural environment. It also seeks to tackle social exclusion and provide income support for low income farmers, together with the enhancement of rural amenities and services.

The RPGs recognise the need to facilitate rural development by improving the overall viability of the rural economy. It is important to recognise that there is a role for rural employment in contributing to the general economic development of the county. The rural employment base should encourage diversification of the rural economy by promoting economic growth in key towns / villages and settlements to support local populations, by facilitating stronger rural based activities including tourism and leisure activities and encouraging more appropriate forms of rural development.

10.4.1 Agriculture

Over the past number of years there has been a significant fall off in agricultural employment. This is indicative of the changing nature of the rural economy. The total area of land farmed in Kildare is 112,518 ha comprising 66% of the overall area of the county. Since 1991 the number of farms has reduced from 3,300 in 1991 to c.2,700 in 2000 representing a reduction of 18% compared to a 17% reduction for the State as a whole. In addition, only 1,450 of the farms recorded in 2000, indicated farming as a sole occupation.

10.4.9 Mineral Resources

Mineral resources are generally located within the rural area. The nature of the extractive industry is such that the industry must be developed where the resource occurs. The industry can have damaging environmental effects and permission will only be granted where the Council is satisfied that residential and natural amenities will be protected, pollution will be prevented and aquifers and ground water safeguarded. Section 10.7 outlines in more detail, considerations in relation to the sector together with appropriate policies and objectives.

10.4.10 Rural Enterprises

The Council acknowledges that the development of rural enterprise and employment opportunities will be vital to sustaining the rural economy. In accordance with the economic strategy for the overall county, employment, servicing the rural areas, should, in general, be directed to local employment centres, small towns and villages (see Chapter 5 Table 5.3 Economic Development Hierarchy, County Kildare), catering for local investment and small scale industry.

Within the rural settlements / nodes and the rural countryside, agriculture, horticulture, forestry, tourism, energy production and rural resources based enterprise should be facilitated.

Key considerations for rural enterprise will include:

- *In general, existing 'footloose' commercial or industrial activities in towns and villages will not be permitted to re-locate to un-serviced rural areas.*

- *Horticulture, forestry, tourism, energy production and rural resource based enterprises will be facilitated in the rural areas, subject to proper planning considerations.*

- *Where established authorised rural based enterprises seek to expand beyond their existing capacity and, in the opinion of the planning authority, the expansion proposed, would seriously affect the rural nature or amenity of the rural areas and surrounding countryside, it will generally be encouraged to locate in serviced zoned lands.*

- *One-off enterprises in the rural area may be located in the open countryside only where the Council is satisfied that the enterprise is suitable for that location in the first place and that it will comply with the criteria outlined in Table 10.2.*

- *Commercial / industrial developments in rural areas may be acceptable subject to proper planning considerations where the Council is satisfied that the proposed development requires to be located in the rural area due to its dependence on an existing local resource or source material that is required for the carrying out of the industrial process / commercial activity / service. The local resource or source of material shall be from a source in close proximity to the location of the proposed development.*

This development complies with all of the above principals in relation to Rural Development and the above highlights exactly how such a proposal can be permitted and managed in a rural environment.

10.5.1 Rural Development

It is policy of the Council:

RRD 1: To support the implementation of the National Rural Development Programme 2007–2013.

The proposed development supports the implementation of the National Rural Development Programme and is supported by it also.

RRD 2: To liaise and co-operate with statutory, local development, sectoral community / voluntary agencies and groups to develop economic, social and cultural benefits for the rural community.

The project developers have made a very large social impact in the local community via employment, a local impact again via employment and the development to date namely the extractive portion of the development has assisted nationally in the support of the construction industry and development therein of socially important national and local infrastructure. The proposed development i.e. the backfilling will fulfil a similar function also.

RRD 3: To support and facilitate the work of Teagasc and other farming / local bodies within the county in the promotion of the rural economy, including agriculture development, rural diversification and in the development of initiatives to support farming, create inclusive rural communities and improve access and services in rural areas.

Again the proposed development accords with the requirements of the County Development plan to promote sustainability in the rural community and the creation of an inclusive and sustainable community

RRD 6: To encourage expansion and employment in local enterprises and industries such as agriculture, horticulture, forestry, peatlands, food, crafts, tourism and energy.

RRD 6 cuts to the core of the development. A support of local enterprises and industries. Although not mentioned the facilitation of inert materials recovery in the proposed development ensures proximate recovery options are available to all the residential and commercial operator in the area and also one off large scale developments be they housing, commercial or industrial.

RRD 7: To encourage the development of alternative rural based small scale enterprises. The Council will consider the use, nature and scale of developments when assessing such applications. In addition, the Council will also consider the requirement to locate such developments in rural areas.

The proposed development accords with this requirement also.

RRD 8: To encourage the conservation and promotion of bio-diversity in all rural development activities.

The premise that the development proposes to take an already permitted extractive industry development and bring the facility back to a position whereby agricultural activities will be restored to the site is invariably in keeping with the requirements of RRD8. The extractive industry is by its very nature destructive and can where permitted have a deleterious effect on the local environment. In this instance it is evident that the former agricultural field structure has been deleted to a vacuous pit. This blot in the landscape may in many peoples view be deleterious to the environment however the circular nature of the proposal aims to restore the pit to its original agricultural status. This action will promote a diversity in the ecology of the area and improve overall biodiversity as it is clear that there have been no major increases in the biodiversity of the are following the extraction of the sand and gravel.

RRD 9: To support the development of renewable energy production including energy crops in rural areas where it is considered appropriate.

Not specifically intended at present for the proposed development however the restoration of the site to agricultural land certainly affords the possibility of a diversion in land use from the former grazing and tillage uses to the development of renewable energy crops. This would certainly not be a possibility should the proposed development not go ahead.

In support of the requirements of the Rural Community Kildare County Council have set out a number of Rural Development Objectives for the period of the county development plan. The propose development again certainly supports or is upheld by a number of these objectives:

RDO 1: To continue to support rural development within the county as a contributory means of sustaining the rural economy.

RDO 3: To support rural employment initiatives within the county where environmental impact and trip attraction are minimal and where supported by the necessary physical and communications infrastructure.

RDO 4: To ensure that all new developments and practices do not undermine rural ecosystems, landscapes and conservation areas and are conducted in a manner consistent with the protection of the local environment and in line with national legislation and relevant guidelines.

It is abundantly clear that the proposed development supports RDO1, 3 and 4 and for the proposed period of 10 years will make a positive contribution to the rural fabric of county Kildare as its predecessor the sand and gravel quarry has done before it.

Section 10.7 of the county Development plan focusses specifically on the extraction industry and specifically on a long term vision for the industry 10.7.3 and post closure 10.7.4 and 10.8 Extractive Industry policy. It is a key tenet of the Kildare County Development plan to ensure that there are adequate supplies of aggregates available sustainably to meet the future needs of the region and to ensure that the region does not fall behind its neighbours in this regard. It will be the intention of the developer to obtain an EPA waste licence to govern the management of the facility and within that context the developer will develop out a bespoke Environmental Management System to ensure that full environmental awareness, prevention and mitigation measures are incorporated into the core management philosophy of the facility.

10.7 Sand and Gravel Extraction

Aim: *To ensure that adequate supplies of aggregates are available to meet the future needs of the county and region in line with the principles of sustainable development and environmental management*

The section below (10.7.4) outlines the key supporting principle engrained in the County Development plan which is its support for the restoration and remediation of quarries and sand and gravel pits. The grant of the planning permission in 2007 and its subsequent extension in 2015 conditioned the restoration to agricultural land. That is now a key principle of the County and where possible should be embraced. Thereby it is seen that the actions of the developer to embark on restoration activities whilst there is still permission for 5 years further extraction is positively aligned to the objectives of the Kildare County Development plan and to natural sustainability principals.

10.7.4 Post Closure of Extractive Industry

Rock quarries usually result in steep rock faces and a flooded pit. With reasonable and economic design, these can become valuable local habitats and even recreational amenities. Sand and gravel workings on the other hand can easily be restored to agricultural use. However, post closure uses must have regard to the likely land use context at the time of closure.

Furthermore, allowing rehabilitation of quarry faces to take place parallel to extraction operations and providing planting on earth mounds at quarry entrances, significantly reduces visual impacts while allowing for ecological and habitat recovery. Road reinstatement should also be on-going during operations, rather than after the site has been exhausted, in the interests of road and traffic safety.

Extractive Industry Guidelines

EI 4: To ensure that extraction activities address key environmental, amenity, traffic and social impacts and details of rehabilitation. In the assessment of planning applications for new development, intensification of use or diversification of activity, the Council will have regard to the nature of the proposal, the scale of activity proposed, the impact on the adjoining road network, the effect on the environment including important groundwater and aquifer sources, natural drainage patterns and surface water systems and the likely effects that any proposed extractive industry may have on the existing landscape and amenities of the county including public rights of way and walking routes.

The proposed development fully accords with EI4.

EI 5: To ensure that development for aggregate extraction, processing and associated concrete production does not significantly impact the following:

- *Special Areas of Conservation (SACs).*
- *Special Protection Areas (SPAs).*
- *Natural Heritage Areas (NHAs).*
- *Other areas of importance for the conservation of flora and fauna.*
- *Areas of significant archaeological potential.*
- *The vicinity of a recorded monument.*
- *Sensitive landscape areas as identified at Chapter 14 of the Development Plan.*
- *Scenic views and prospects.*
- *Protected Structures.*
- *Established rights of way and walking routes.*

This EIS will aim to demonstrate the potential impacts from the proposed development and will, where identified notify clearly and strongly anywhere where the proposal may impact on any of the above environmental amenities. Whilst there have arguably been some areas of concern where there was environmental deletion of land mass etc. there has not been any contravention or compromise of environmental quality throughout the entire operation of the extraction phase to date.

EI 6: To consult with the Geological Survey of Ireland (GSI), with regard to any developments likely to have an impact on County Geological Sites listed in the Development Plan (Chapter 12).

The current proposal addresses this geological issue.

EI 7: To require submission of an Appropriate Assessment under Article 6 of the Habitats Directive where any quarry / sand and gravel extraction is likely to have an impact on a Natura 2000 site (see Chapter 14).

This is addressed in the current proposal.

EI 8: To require relevant planning applications to be accompanied by an Environmental Impact Statement. An Ecological Impact Assessment (EcIA), may also be required for sub threshold development to evaluate the existence of any protected species/habitats on site.

This is addressed in the current proposal

EI 9: To require a detailed landscaping plan to be submitted with all planning applications indicating proposed screening for the operational life of the site. The predominant use of native plant species in the proposed landscaping plan is encouraged.

This is addressed in the current proposal

EI 10: To require detailed landscaping and quarry restoration plans to be submitted with each application. Habitats and species surveying shall be carried out and shall influence the restoration plan for the site.

This is addressed in the current application

EI 11: To ensure that the full cost of road improvements, including during operations and at time of closure, which are necessary for the quarrying of sand and gravel, shall be borne by the industry itself and that the industry shall also contribute to the recreation and amenity of the county.

These issues were addressed in planning permission condition 07/188.

EI 12: To ensure that all existing workings are rehabilitated to suitable land uses and that extraction activities allow for future rehabilitation and proper land use management.

This forms the basis of the entire proposal.

EI 13: To require, where permission is granted for quarrying / sand and gravel extraction, the submission by the developer, of a bond for the satisfactory completion and restoration of the site.

These issues were addressed in planning permission condition 07/188.

EI 15: To protect and safeguard the county's natural aggregate resources from inappropriate development, by seeking to prevent incompatible land uses that could be located elsewhere, from being located in the vicinity of the resource, since the extraction of minerals and aggregates is resource based.

The developer in this instance is very cognisant of his obligations with regard to inappropriate development and has demonstrated an ability to operate successfully since 2003 in that regard.

10.9 Extractive Industry

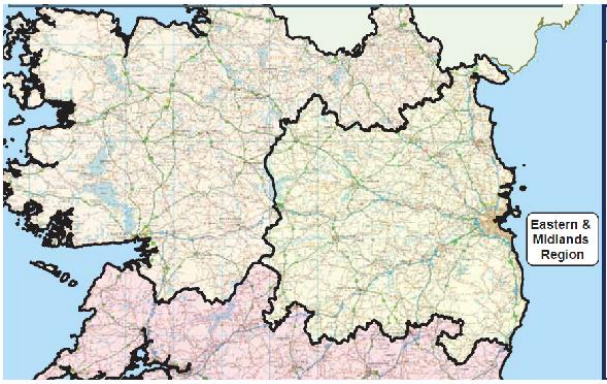
Objectives

EO 2: To ensure that the extractive industry minimises and / or mitigates any adverse visual and / or environmental impacts on the built or natural environment through adherence to the EPA publication *Environment Management in the Extractive Industry* (Non-scheduled minerals) 2006 and any subsequent revisions and the requirements of the Programme of Measures from the River Basin Management Plans.

EO2 reflects the extractive Industry objectives for the county with respect to the adherence to EPA direction regarding the protection of the environment. The proposed development aims to adhere completely also to EPA requirements and guidance via the EPA licence.

1.6.2 Eastern-Midlands Region Waste Management Plan

As part of the review as to whether the proposed development is suitable in a regional and National context a review of the requirements of the regional waste management plan 2015 – 2021 was also carried out in respect of the development. The development falls within the Eastern-Midlands Region which incorporates and area stretching from Dublin to Offaly and as can be seen in the graphic below:



Waste Region	Local Authorities
Eastern-Midlands Region	Dublin City Council; Dún Laoghaire-Rathdown County Council; Fingal County Council; South Dublin County Council; Kildare County Council; Louth County Council; Laois County Council; Longford County Council; Meath County Council; Offaly County Council; Westmeath County Council; Wicklow County Council.

Section 16.4.4 of the plan deals specifically with the responsibilities of the local authorities with respect to the backfilling of inert waste material. The plan recognise that significant proportions of the existing and planned treatment capacities for the region for inert waste materials are made up by backfilling recovery operations. The plan accepts that in 2012 there was relatively low utilisation rates for sites throughout the region due to depressed economic activity in particular in the construction sector. “Activity in the sector is expected to increase over the plan period as economic recovery continues to build nationally.

16.4.4 Recovery – Backfilling

Backfilling activities (of inert waste), which meet the recovery definition and are in compliance with Articles 4 and 13 of the WFD, sit on the other recovery tier of the waste hierarchy. Local authorities in the region authorise such activities through the award of WFPs and CoRs. Similarly the EPA authorises significant backfilling of inert waste at large sites such as old quarries for restoration purposes.

Backfilling activities make up a significant treatment capacity in the region at present. Local authority authorised sites have a capacity of 0.9 million tonnes, with significant pending capacity for facilities at waste licence application stage. Local authority authorised sites generally have a shorter lifespan than EPA licensed sites and operations can often cease at these sites within the life of the permit, i.e. five years. EPA authorisations cover more substantial operations with a longer lifetime capacity. Utilisation of active local authority capacity at backfilling/land improvement sites was 48% in 2012. This relatively low level of utilisation reflects the depressed activity in the construction sector in Ireland and, as a result, supply of capacity exceeding current demand. Activity in the sector is expected to increase over the plan period as economic recovery continues to build nationally.

The proposed development will arrive at the correct time to support the afore mentioned economic recovery and as was mentioned earlier in section 1.6.1 the economic recovery will not proceed effectively and sustainably if backfilling operations remain at the current low level of operation. More developments like this one are certainly required regionally. The regional waste management policies in this regard require cooperation and coordination with and between local authorities, the regional waste management authorities and the Environmental Protection Agency in respect of the development and the operations of the facilities regionally.

Policies:

E13. Future authorisations by the local authorities, the EPA and An Bord Pleanála must take account of the scale and availability of existing back filling capacity.

E14. The local authorities will co-ordinate the future authorisations of backfilling sites in the region to ensure balanced development serves local and regional needs with a preference for large restoration sites ahead of smaller scale sites with shorter life spans. All proposed sites for backfilling activities must comply with environmental protection criteria set out in the plan.

In the face of increased demand for backfilling authorisations there is a need for better coordination between local authorities in the region. This is to ensure facilities are planned and developed at suitable sites and do not present a risk to European designated sites and existing biodiversity and habitats. It is recommended that the lead authority liaise with relevant stakeholders (including the EPA and the DAHG) to ensure appropriate measures are in place for the control and spread of invasive alien species at backfilling sites in the region where necessary.

1.7 ENVIRONMENTAL GAIN

The ongoing works at the sand and gravel quarry at Boherkill will eventually result in complete infilling of a large open void and restoration of the landscape to its original pre-extraction condition namely beneficial agricultural land. It will also provide for better protection of the underlying groundwater resource, which is currently vulnerable due to the absence of any protective soil cover. These operations will result in an increased visual amenity whereby the site will visually merge back in to the existing landscape. There will be an environmental gain also in respect of the potential for an increase in biodiversity through the softening of the habitat and its re-development to its previous pre-extractive state. Finally as discussed earlier in section 1.6 there is the potential to gain environmentally through the production of food and also through the potential production of bioenergy crops when the site is fully remediated.

1.8 ALTERNATIVES

Given that site restoration / recovery activities (such as those envisaged at the applications site) can only be undertaken where previous land-use activities have created a disturbed ground surface, degraded landscape and/or derelict, non-productive land, it is not appropriate to identify and appraise the merits of alternative candidate sites for the proposed waste recovery activities.

The available soil and groundwater data indicates that the inert soil recovery / site restoration works undertaken at the application site to date have not had any detrimental impact on the local water environment. Assuming that activities at the site continues to be managed as heretofore, it is considered reasonable to assume that established operations can continue without any significant adverse impact on groundwater quality.

The European (EIA) Directive 97/11/EC has raised the importance of a consideration of alternatives within the EIA Directive as a whole. The consideration of alternatives is

mandatory under the provisions of Article 5 of the European (EIA) Directive 97/11/EC.
The study of alternatives within EIA is very wide ranging and the literature suggests that the following range of alternatives should normally be studied:

- Do Nothing
- locations or alignments;
- site layout and project design;
- size and scale;
- working or management arrangements;
- timescale for construction and operation.

The following is a description of the above main alternatives studied by the developer and an indication of the reasons for his choice, taking into account the interconnections between the economic, social and environmental issues.

Do Nothing

The consequences of not reinstating the gravel pit at Boherkill, County Kildare would include:

- the loss of economic benefits to the applicant;
- the loss of valuable needed jobs in the area;
- the loss of an opportunity to provide a location for development sites to transfer inert or inactive materials *Typically: Largely water insoluble and non or very slowly biodegradable: e.g. sand, subsoil, concrete, bricks, mineral*
- The loss of potential to increase the food, agricultural or bio-energy crop production in the area which would contribute to the National need.
- The loss of an opportunity to restore the former sand and gravel quarry pit to its former status as an agricultural field and the consequential knock on to the visual amenity of the area.
- The loss of potential to further protect the groundwater resource by building back up the site and reducing the potential for groundwater contamination.

There are what are considered to be temporary negatives to the carrying on of the development like potential noise, dust, air traffic issues etc. but these are temporary and with this proposal on this site and the willingness of the developer to make this commitment to the site the “Do Nothing” alternative could only be viewed as a wasted opportunity for the facility.

Location

The site is well placed to serve local markets and the needs of local construction markets and those of neighbouring authorities. In particular those of the regional waste authority in which it stands. The site is currently in use as an operational gravel pit (planning ref: 07/188) which was due to expire in August 2015. Planning Permission 15/515 permits the continued extraction at the site until 2020. An additional 5 years extraction. No alternative is applicable to the location as the proposed development in this case is very much site specific. No alternative locations have been assessed in this instance.

Site Layout and Project Design

The site layout continues on from the existing extraction area and it is intended to restore the entire area of extraction to the original levels and land use. Therefore the site layout itself in reality will remain the same and stay exactly as it lies following the resource extraction. There

are no possible alternatives to this. In respect of the project design, there are alternatives, for example, regarding the phasing as per section 2.3.1 below a very specific and considered restoration programme has been designed firstly to facilitate the additional extraction phases which will continue for a period of 2 / 3 years. It has been decided to phase the restoration in a North to South direction which would mean effectively that the project moves further from the most sensitive receptors quicker thus mitigating the cumulative nuisance potentially generated.

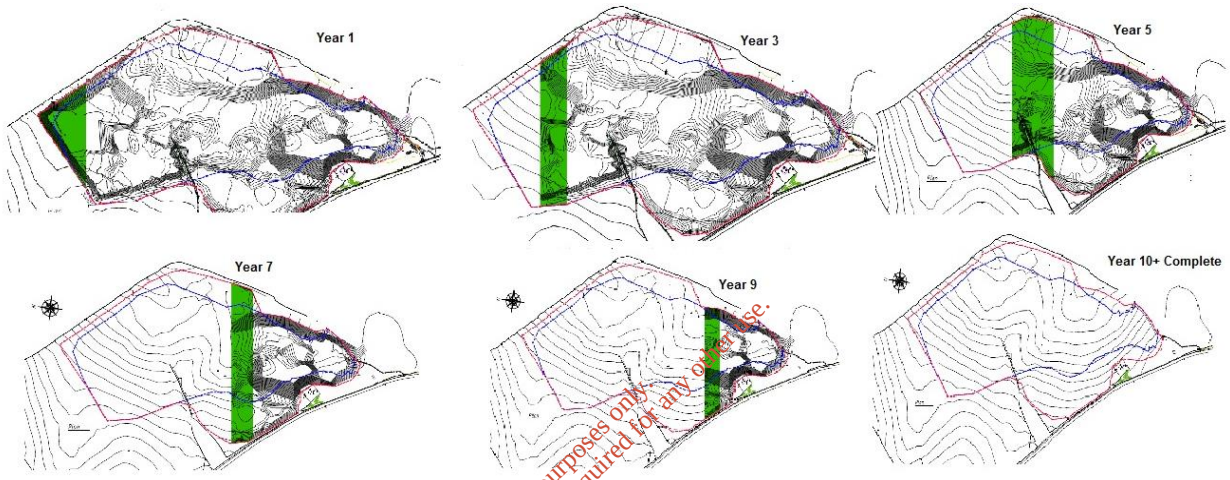


Fig: 1.5 Yearly Planned Restoration Profile

Alternative phased approaches have been considered but consultation with the environmental team the project developer and the site operators have concluded that this methodology would provide the best solution in the most environmentally efficient manner.

Size and Scale

The size and scale of the restoration project are predetermined but the design team has addressed alternatives in respect of both. Some key considerations in the decision making process were around:

1: The volume of materials acceptable at the site
2: whether to completely fill the pit back to a level consistent with the surroundings
3: deciding on the level of importation in consideration with the licensing requirements
4: assessing the volume for importation in line with all potential environmental aspects
5: assessing the scale in line with the previous planning permissions
6: qualitatively assessing the project in terms of overall economic deliveries
7: qualitatively assessing the residual value in bring the plot back to an agricultural field
8. qualitatively assessing the visual impact / improvement on the surrounding landscape
9: qualitatively assessing the impact on biodiversity and agricultural productivity

In general it was felt that there would be an economic incentive to fill the void completely if there was available material for the re-filling. A review of the Dublin market and the general trend locally around the construction and commercial climate meant that that decision was made. Also the general belief among the design team is that a figure of 150,000T per annum is attainable. It was felt that given the scale of the project it would demand an EPA waste

licence and this was carefully considered and deemed to be a welcome route for the project given that the licensing criteria expected will not be vastly different from the current management criteria if maybe a little more frequent.

When all of the above considerations and alternatives were addressed it was felt that to fully restore the quarry was the most sustainable, visually pleasing, environmentally sound and economically justifiable methodology with which to proceed. Meeting with the statutory stakeholders namely Kildare County Council also led to the understanding that resource recovery facilities like that proposed are a scarce resource in Kildare at present. Whilst a lot of alternatives were considered. The proposed methodology was deemed the most appropriate.

1.9 PROJECT TEAM / CONTRIBUTORS

Specialist	Specialist firm	Discipline	Topics in EIS
Martin E. Byrne	Byrne Mullins & Associates	Archeological Consultants	Archaeology Cultural Heritage
Michael J. Moran	Transportation Planning Services Ltd.	Traffic & Transportation Consultants	Traffic & Transport
Roger Goodwillie	Roger Goodwillie & Associates	Flora & Fauna Consultants	Flora & Fauna
Dr Brian Sheridan	Odour Monitoring Ireland	Environmental Consultants	Air / Dust
Oliver Fitzsimons	Fitzsimons Walsh Environmental	Noise Consultants	Noise
Aine Mc Elhinney	IE Consultants	Geology / Hydrogeology	Soils / Hydro-Geology
Raphael Mc Evoy	RME Environmental	EIS compilation and Strategic planning	EIS compilation, Planning and development context
Mark Mullaly	Kildare Architects	Planning and Draughting Landscape impacts	Drawings and project coordination

2 DESCRIPTION OF PROPOSED RESTORATION SCHEME

2.1 PRINCIPAL ELEMENTS

The proposed restoration scheme at Boherkill, Rathangan, Co. Kildare provides for:

(i) Use of imported inert natural materials, principally excess soil, stones and/or broken rock excavated on construction sites, to backfill and restore a large existing void created by previous extraction of sand and gravel

(ii) Recovery of imported inert construction materials, including stones, granular fill, concrete, blocks, bricks and ceramic tile.

The target materials for recovery are as follows:

EWC Code	Description
170504	Soil and Stone
170101	Concrete
170102	Bricks
170103	Tiles and Ceramics
170107	Mixture of concrete Bricks, tiles and Ceramics other than those mentioned in 170601

Table 2.1 Proposed Waste Materials for import

(iii) Separation and Quarantine of any non-inert construction and demolition waste (principally metal, timber, PVC pipes and plastic) unintentionally imported to site prior to removal off-site to appropriately licensed waste disposal or recovery facilities

(v) Continued excavation on a limited basis of the residual resource of sand and gravel remaining in the quarry. Export of sand and gravel off-site for use by others.

(vi) Phased restoration of the backfilled void (including placement of cover soils and seeding) and return to former use as agricultural grassland

(vii) Temporary stockpiling of topsoil and subsoil pending re-use as cover material for phased restoration of the site

(viii) Environmental monitoring of noise, dust, surface water and groundwater for the duration of the site restoration works.

The existing void will only be infilled using inert materials imported from pre-approved external construction sites and secondary aggregate generated on site. No peat, contaminated soils intermixed construction and demolition waste or non-hazardous waste will be accepted at the application site. Non-inert quarantined construction and demolition wastes will be removed off-site.

2.2 SITE INFRASTRUCTURE

2.2.1 Site Security

Access to the application site can only be gained via access road leading off the existing local road R401 and main site entrance. All vehicular traffic accessing the site must stop at a security barrier in front of the temporary site office before gaining access. The identity of the client forwarding the waste and facilitate electronic recording of time and date inert waste is received at the site is recorded. Aside from the access road to the existing facility, the entire site boundary is closed off by post and wire fences and agricultural field gates. All gates will remain padlocked for the duration of the site restoration activities. The only vehicles accessing the site at the present time are heavy good vehicles (HGV's) carrying sand and gravel from the site full and returning empty. The existing planning permission provides for up to 50 truck movements in and out of the site each day. No further increase in traffic levels, over and above this level, is envisaged in future years. Inert materials are anticipated to be accepted at the site between 08.00 hours and 18.00hours each weekday and 08:00hours to 13:00hours on Saturday. No materials are accepted at any other time.

2.2.2 Site Roads and Parking Areas

All trucks delivering inert waste to this site will be confined within the Applicant's landholding. Trucks will initially travel over a stoned road surface between the site security barriers and the existing temporary wheel wash facility before travelling over an existing network of stoned internal roads to get to the active restoration area or the recycling area. Provision for employee and visitor car parking is currently provided on a stoned out area adjacent to the temporary site office, before the site security barrier.

2.2.3 Hardstanding Areas

A temporary hardstanding area constructed of secondary aggregate is provided in the centre of the application site for the recovery of inert construction and demolition waste imported to site and for separation and storage (in skips) of any separated non-inert construction and demolition wastes inadvertently mixed with it, most likely to comprise metal, timber, PVC pipes, plastic etc. This hardstanding area also provides for the storage of plant, equipment and materials.

At the present time, the hardstanding area is not sealed and any rain falling over this area either percolates downwards into the underlying soils or runs-off over the exiting ground surface toward the main haul road through the site and into the groundwater pond in the closed depression at the western site boundary.

It is envisaged that the eastern side of the existing recovery area will in future be sealed by a 100mm thick reinforced concrete slab over 150mm of granular sub-base and used as a waste inspection and quarantine area.

2.2.4 Wheel wash and Weighbridge

In order to prevent transport of soil on public roads, a wheel wash facility is and will continue to be installed close to the site entrance, as shown on the site infrastructure layout in Figure 2.2. All egressing site traffic will be required to pass through the existing wheel wash.

In order to track and record the amount of material entering the application site, it is proposed to install a weighbridge along the internal access road in front of the temporary site office.

Sand and Gravel exported off-site and any non-inert construction and demolition waste dispatched to other licensed waste disposal or recovery facilities will also be weighed. Records of waste in and sand and gravel resource and exported quarantined material will be maintained for waste auditing purposes.

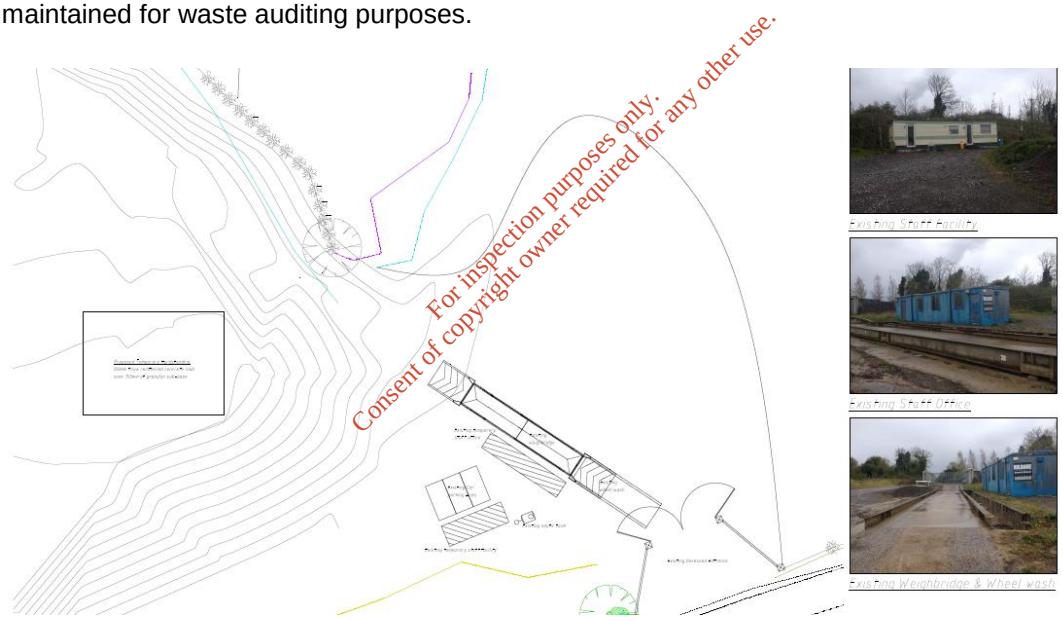


Fig 2.2 Site ancillary Services Layout Map (Ref Drwg 151324-P-06)

2.2.5 Laboratory Testing

Laboratory testing of soil, surface water, groundwater and leachate will be undertaken off-site at an ILAB / UKAS accredited geo-environmental laboratory. Any validation testing and laboratory testing required to confirm classification of waste as inert will also be undertaken by the same laboratory. All samples taken on-site will be forwarded to the laboratory on the same day and test results will typically be forwarded to site within ten working days.

It is not envisaged that any environmental monitoring equipment such as pH and temperature meters, conductivity meters, flow meters and dissolved oxygen meters will be stored at the

site office for the duration of the restoration works. Any such equipment will be brought to site by an independent environmental consultant as and when required.

2.2.6 Fuel and Oil Storage

It is not intended to provide bunded fuel storage tanks at the application site. Fuel for plant and equipment undertaking the site restoration works and/or the construction and demolition waste recovery activity will be stored in double skin bowsers located on the hardstanding area. The effect of the double skin is to minimise the potential for fuel spillage on account of leakage / accidental piercing of bowser.

A small bunded tank for waste oils will be provided on the concrete slab at the waste quarantine area. This tank will be emptied at intervals by a licensed waste contractor and disposed off-site at a suitably licensed waste facility. No re-fuelling of HGV trucks will take place on site. Oil and lubricant changes for wheeled or tracked plant will be undertaken will be undertaken on-site at the existing hardstanding area.

Plant maintained on site principally comprises mechanical excavators and/or bulldozers. Both tracked and wheeled plant will be serviced as necessary at the hardstanding area or, if necessary, on the concrete slab at the waste quarantine area.

2.2.7 Waste Inspection and Quarantine Area

A temporary waste inspection and quarantine area will be constructed to the north of the entrance, at the location shown on Figure 2.2. The waste inspection and quarantine area will be sealed by a 100mm thick reinforced concrete slab over 150mm of granular sub-base and bunded to a design storm volume.

Any suspect or unacceptable waste identified in this area will be placed in skips and covered with plastic sheeting in order to minimise potential contamination of surface water run-off. Visual inspection, in-situ monitoring and testing of imported waste materials will be undertaken by the Applicant's site staff as inert waste materials are end-tipped at the active restoration area.

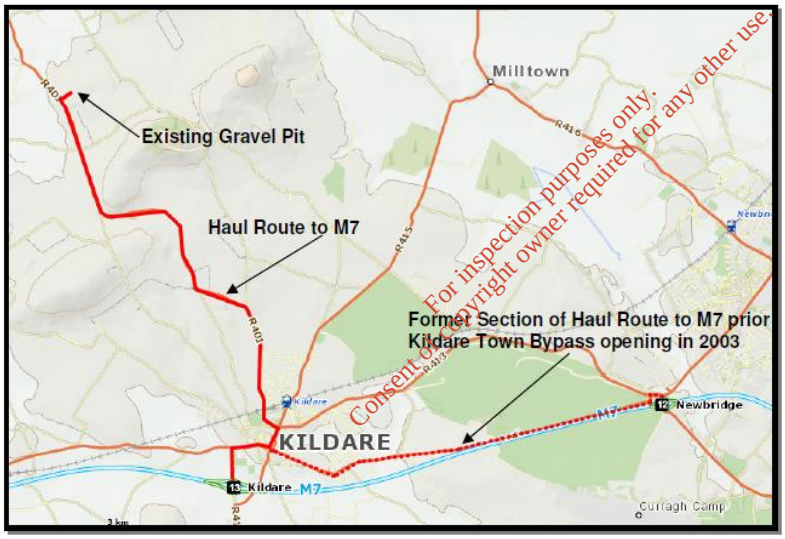
Should there be any concern about the nature of the waste being end-tipped it will be re-loaded onto the truck and re-directed to the waste inspection and quarantine area for closer examination and inspection. Detailed records of all such inspections will be kept.

Should inspections or testing at the waste inspection area identify any non-inert material which cannot be accepted and used for restoration of this site, it will be segregated and temporarily stockpiled (at the quarantine area) and covered, pending removal off-site by permitted waste collectors to a suitably licensed permitted waste disposal or recovery facility.

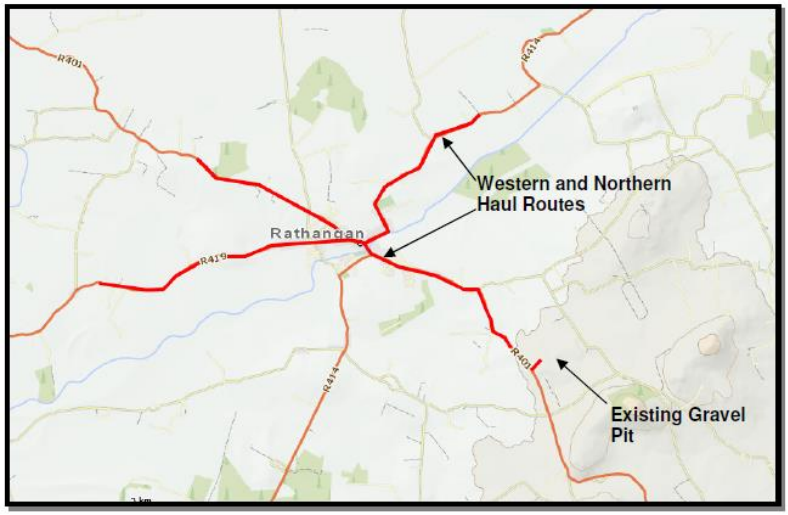
2.2.8 Traffic Control

All traffic to and from the application site will enter and leave via the existing entrance which fronts onto the local road R401. The existing site access has been designed to accord with the standards set out with the "Design Manual for Roads and Bridges".

Kildare County Council granted planning permission for extraction of gravel at this site in 2008. The permission was for a seven year extraction period with an annual extraction limit of 265,650 tonnes. Specific to this planning application Kildare County Council set out 3 traffic and transportation related planning conditions within this grant of permission. They were:
Condition 2 d) related to a maximum of 50 inbound and outbound vehicles in both directions accessing the site per day.
Condition 17 related to lines of sight within the site access being in accordance with the Design Manual for Roads and Bridges.
Condition 23 related to the erection of advance warning signage being erected 150.0 metres either side of the site access
Haul routes to and from the site via the R401 were agreed with the local authority. It should be noted that the southbound route from the gravel pit was via Kildare Town and then eastwards to Junction 12 of the M7 motorway. The route to the M7 motorway was altered for heavy vehicles accessing the motorway when the Kildare Town Bypass opened in December 2003. Heavy vehicles then used Junction 13 to access the motorway. These general haul routes are shown indicated in red and dotted in red below:



SOUTHERN HAUL ROUTES



NORTHERN HAUL ROUTES

Fig 2.3 Agreed Local Authority Haul Routes

The gravel pit site is bounded to the west by the R401 which functions as an 80kph regional road within Kildare County Council's road hierarchy. Along the length of the R401 vehicular access is provided to individual residential properties, farm holdings and agricultural farmlands with all of these access points taking the form of simple gated agricultural access points or simple priority 'T' junction arrangements. Thus, it can be considered that the principle of direct vehicular access to serve land use development from this road is well established in this area.

The existing gravel pit site is accessed from the R401 by means of a wide simple priority 'T' junction. This access also contains a localised widening of the R401 to 7.5 metres for a general distance of 50.0 metres upstream and downstream of the site access. The general layout of the existing access and the localised road widening of the R401 in this area is shown within Photograph 1.0, Photograph 2.0 and Photograph 3.0 below:

Photograph 1.0: Southbound view into R401 from existing gravel pit access.

Photograph 2.0: Northbound view into R401 from existing site access.

Photograph 3.0: View to the east from R401 into existing site access.

It can be seen from the above that the roads and traffic conditions assigned to the grant of planning permission for the gravel pit have been fully implemented. In addition this access has been designed to a standard that provides sightlines within the site access that accords with the standards set out with the Design Manual for Roads and Bridges.

The traffic consultants observed that all traffic entering or exiting the gravel pit was observed to undertake these inbound and outbound manoeuvres with no difficulty and these vehicles had no material or operational impact on the traffic using the R401.
Upstream and downstream of this site access is road signage advising all road users of the potential that heavy vehicles may be undertaking turning manoeuvres ahead. Within the site is a wheel wash used by exiting vehicles to limit the extent of debris being carried onto the R401.These measures also comply with the above planning conditions assigned to the 07/188 existing and operational planning permission.

Internally within the application site, warning notices, direction signs and speed restriction signs will be established along paved and/or unpaved roads leading to and from the active restoration areas and the construction and demolition waste recycling area.

All HGV traffic egressing the application site will be required to pass through a temporary wheel wash facility and weighbridge at the end of the paved internal road, shown on Figure 2.2.

2.2.9 Sewerage and Surface Water Drainage Infrastructure

At the present time, site staff use a temporary portaloo provided on the hardstanding area and is emptied / replaced as required by an approved waste Contractor. It is envisaged that this arrangement will continue for the duration of the site restoration works.
With the exception of the sealed concrete slab at the waste inspection and quarantine area, it is not intended to provide any site drainage infrastructure to collect and remove surface water runoff at the application site. During the infilling of the restoration site, surface water will be allowed to run over the existing ground surface to collect in surface ponds and discharge to groundwater. Some rainfall may also percolate downwards through the backfilled soil to the underlying groundwater table. At no time during the restoration works will surface water run-off be directed to watercourses or ponds beyond the site boundary. The temporary waste inspection and quarantine area, will be sealed by a 100mm thick reinforced concrete slab over 150mm of granular sub-base and bunded to a design storm volume.
Any surface water running over the surface of the concrete slab will be directed toward a buried storage tanks with double skin protection located on the western side of the hardstanding area, as shown on Figure 2.2. Surface water will only be collected in the buried tanks when suspect waste consignments are stored at the quarantine facility. At all other times, surface water run-off from the sealed slab will either percolate directly through the ground to the underlying groundwater table or will be directed over the existing ground surface to ponds in low lying areas, at which point it is effectively discharged to groundwater.

Should it be necessary to prevent high concentrations of suspended solids entering existing groundwater ponds, intermediate temporary surface water ponds will be constructed to hold runoff and encourage settling out of suspended solids prior to discharge to groundwater ponds at a lower level. Any wastewater collected in the buried tanks will be emptied by

licensed waste collectors and transferred to a collection tanker for disposal off-site at an approved waste water treatment facility.

2.2.10 Site Services

Electric power, lighting and heating is provided at the temporary site office near the entrance to the application site. Key personnel overseeing site backfilling and recovery operations at the application site will be contactable by mobile phone. It is possible to install permanent telephone, fax and email facilities at the temporary site office. Mains water is available on site and can be used for any basic sanitary functions.

Given the lack of combustible waste materials at this site, it is considered highly unlikely that a fire will break out during backfilling and recovery operations. Fire extinguishers will be kept at the site office to deal with any localised small scale fires which might occur. Additional fire-fighting capacity may be provided by storing water in a mobile bowser at the hardstanding area.

2.2.11 Plant Sheds and Equipment Compounds

Plant and equipment used in the backfilling and/or recovery activities will be stored on the temporary hardstanding area in the centre of the application site. Given the limited access into the site, it is not considered necessary to provide a security fence around this area to create a secure compound.
No workshops will be provided on site. Any plant or equipment which requires specialist repair or overhaul will be removed off-site if required. Small items of mobile or hand-held plant and equipment will be stored in closed metal containers at the hardstanding area as and when required.

2.2.12 Site Accommodation

At the present time, there is only a small security hut at the entrance to the application site. All site administration and management functions will be based at this office. Changing facilities will also be provided here. It is envisaged that staff will continue to access handwashing and canteen facilities at this office also. A review of these requirements will be assessed and appropriate small scale adjustments made if required.

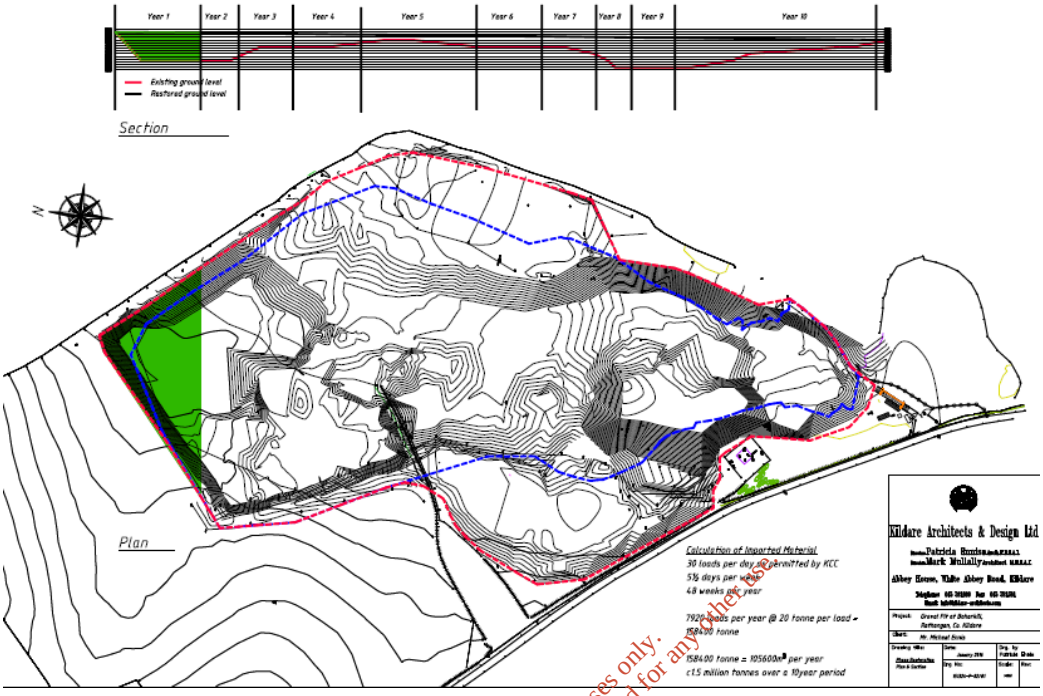
2.3 RESTORATION AND RECOVERY ACTIVITIES

The backfilling of the existing void with inert soils and stone is deemed to constitute inert waste recovery for the purposes of land improvement or restoration. The proposed restoration scheme provides for direct use of the imported soil and stone, without further processing.

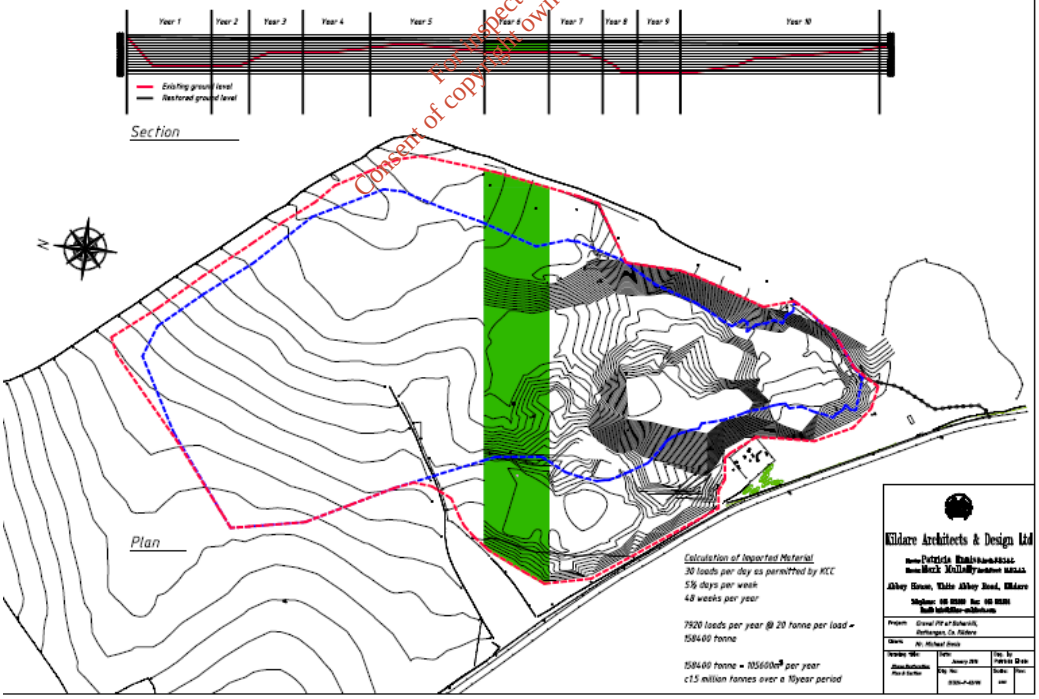
2.3.1 Backfilling / Restoration Schedule

Backfilling of the application site will proceed in several phases and on completion, will merge into the surrounding undulating pastoral landscape. A summary of the proposed phasing and the final ground level contours are shown in Figure 2.4.below

Restoration Plan Year 1



Restoration Plan Year 6



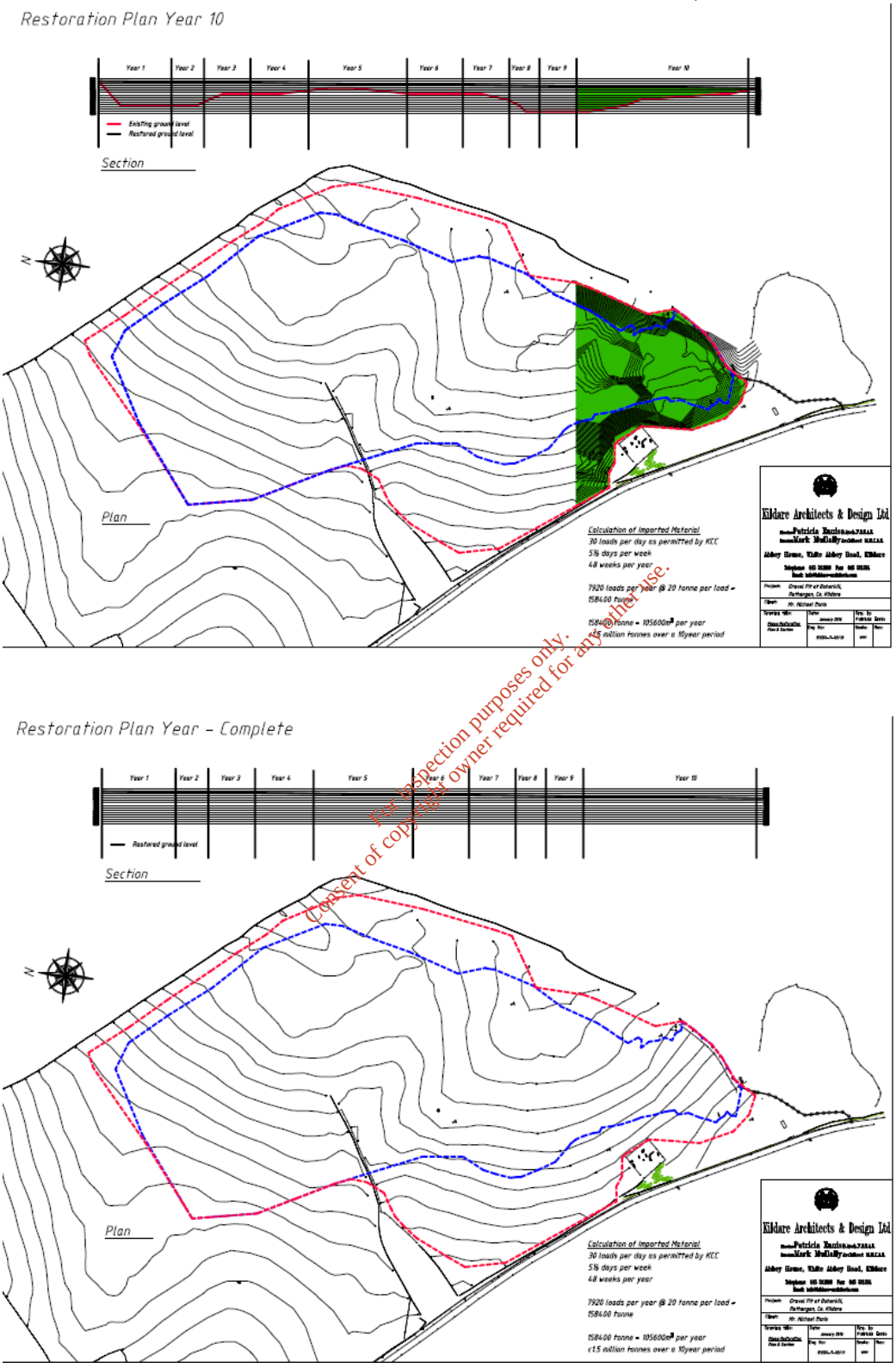


Fig 2.4 Contoured restoration Phases

The proposal is to commence the restoration project at the Northern Boundary of the site and progress southwards year by year. Approximately158400 tonnes per year in approximately 7920 HGV loads is the target requirement for the restoration project.

Drawings 151324 P01, 151324 P02/01 – 151324 P02/11 demonstrate the phased nature of the proposal over the span of the 10 years of the proposal.

2.3.2 Method and Safety Statements for Construction Works

Any additional infrastructure be required at the application site, over and above that which is currently in place will be constructed in accordance with a detailed construction method statement and health and safety plan prepared by external works Contractors. In preparing such plans, regard will be had to safety risks and potential conflicts presented by ongoing site restoration and recovery activities.

2.3.3 Material Requirements

The only material requirements in respect of the proposed restoration scheme are the inert soil, stone and rock used in backfilling the existing void and site-won secondary aggregates used for backfilling silt ponds and in the construction of temporary internal haul roads. Clean, inert soil and stone is likely to be sourced from green field development sites. Intermixed soil, stones and inert construction waste (concrete, block and brick) will be sourced from re-development sites.

EWC Code	Description
170504	Soil and Stone
170101	Concrete
170102	Bricks
170103	Tiles and Ceramics
170107	Mixture of concrete Bricks, tiles and Ceramics other than those mentioned in 170601

2.3.4 Materials Balance

All of the inert materials to be used in the restoration of the application site will be imported from external construction and demolition works sites. This includes secondary aggregate used to construct temporary haul roads across and through the site and to backfill silt ponds.

2.3.5 Stability Analysis

The available site investigation data indicates that the area to be backfilled is underlain by relatively competent sand and gravel strata. The increase in loading applied to these soils

(below existing formation level) will not exceed that which existed prior to extraction of sand and gravel.
As a consequence, no deep seated failure of temporary slopes is anticipated. Temporary side slopes in backfilled soils (above formation level) will be graded at an angle no steeper than 35° (approximately 1v:1.5h), sufficient to ensure no instability arises. If deemed applicable during construction a stability assessment of side slopes at the application site may be undertaken on an annual basis. In the longer-term, there will be no risk of instability as the restored site will be graded to a relatively flat level.

2.3.6 Importation of Construction Materials

Most construction materials required to construct site infrastructure, principally drainage stone, holding tanks and concrete will be sourced externally and imported to site. It is expected that low grade granular fill recovered on site from construction and demolition waste can be used for hardcore and/or hardstanding areas.

2.3.7 Removal of Materials Off-Site

Any non-hazardous or hazardous wastes identified within the inert soils imported to site for restoration purposes or the construction and demolition waste imported for recovery purposes will be transferred off-site by permitted waste collectors to suitably licensed waste disposal or recovery facilities. It is anticipated, on the basis of experience in operating the existing facility to date, that these waste quantities will be very low.

Inert construction and demolition waste recovered / quarantined on site, not re-used for haul road construction or backfilling of groundwater ponds up to and above design groundwater level, will be supplied as low grade hard core to construction companies in the Kildare and Greater Dublin area. Any non-inert construction and demolition waste (principally scrap metal, plastic and timber) will be removed off-site by permitted waste collectors to appropriately licensed recovery or disposal facilities.

Any surface water run-off collecting in holding tanks while suspect waste is stockpiled at the waste quarantine and inspection area (pending removal off-site) will be pumped to a mobile tanker and transferred off-site to an approved wastewater treatment facility.

It is important also in this section to refer to the ongoing extractive works that will take place on the site. It is estimated that for 2 – 3 years post commencement of the restorative project there will be continued sand and gravel extraction at the site which is permitted under planning permission 15/515. The volumes here are expected to be of the order of only 3 – 5 loads per day max and as stated it is anticipated that the existing resource will be fully exhausted within a maximum of 3 years.

2.3.8 Formation Levels and Gradients

The application site has been sub-divided into 10 separate phases to facilitate progressive restoration and reinstatement of agricultural grassland. Some of these phases have been further subdivided to provide for continual ongoing restoration as indicated on Drawings 15324 P01, 15324 P02/01 – 15324 P02/11.

Formation levels for backfilling across the application site are taken to be equivalent to existing ground levels, as indicated. During each restoration phase, the backfilled surface will be graded so as to ensure surface water run-off falls toward a local low point. In order to prevent high concentrations of suspended solids migrating outside of the functional working areas, intermediate unlined temporary surface water ponds may be required. These will be constructed to hold run-off and encourage settling out of suspended solids prior to discharge to surface water. Temporary access ramps into and out of the active backfilling areas will generally be constructed at a gradient of 1v:10h. Temporary side slopes will be constructed at gradients no greater (steeper) than 1v:1.5h in order to ensure stability. On completion, final gradients across the restored site will be very shallow, generally no greater than 1v:15h.

2.3.9 Bund Design

Given the inert nature of the materials being used to restore the application site, no provision is made in the restoration scheme for construction of perimeter / containment bunds at the boundary of each restoration area.

2.3.10 Capacity and Lifespan

The estimated volume of material to be placed at the application site is approximately 105600 m^3 per annum (approx.158400 tonnes). Allowing for backfilling at a rate of approximately 600 tonnes per day, 5.5 days per week and 48 weeks per year equivalent to 158400 tonnes, the estimated lifespan of the proposed waste facility is approximately 10 years. Recovery of construction and demolition waste will only continue as long as backfilling activities are undertaken at the site.

2.3.11 Basal and Side Slope Liner Design

Given the inert nature of the materials being used to restore the application site, no provision is made for installation of a basal liner or side slope liners at this facility, nor is any provision made for a drainage blanket at the base of the backfilled materials.

2.3.12 Leachate Management System

Given the inert nature of the materials being used to restore the application site, no provision is made for a leachate management system at this facility.

2.3.13 Landfill Gas Management System

Given the inert nature of the materials being used to restore the application site, no provision is made for a leachate management system at this facility.

2.3.14 Capping and Decommissioning

The application site will be restored on a phased basis to give a landform similar to that existed prior to extraction of sand and gravel. On completion, the final landform will be profiled

to give a very slightly domed shape in order to facilitate surface water run-off into the in-situ sand and gravels along the site boundary, refer to final site contour map in drawings 15324 P01, 15324 P02/01 – 15324 P02/11.

A cover layer comprising 150mm of topsoil and approximately 850mm of subsoil shall be placed over the inert backfilled materials on completion of each phase of restoration. This will be immediately planted with grass in order to promote stability and minimise soil erosion and dust generation. The lands will then be progressively returned to use as agricultural land. Topsoil and subsoil will be segregated at all times during the importation phase for this use and shall not be used in the general backfilling of the site. The topsoil and subsoil shall be stockpiled pending re-use in the phased restoration of the site. They shall be stored separately within the application site, away from the active backfilling area and in such location and manner as not to create any temporary adverse visual impact. In the course of the 10th (and final) phase of the site restoration works, all mobile plant and equipment will be removed off site and any temporary site accommodation, infrastructure and services will be progressively removed off-site or decommissioned.

Wherever possible, hardstanding surfaces will be broken up using a hydraulic breaker and subjected to validation testing to confirm the materials are acceptable for re-use in ongoing land restoration works. Any materials which are found to exceed inert waste criteria will be transferred-off site to a suitably licensed waste disposal or recovery facility.

2.4 WASTE ACCEPTANCE AND HANDLING

Only inert, uncontaminated soils and construction and demolition waste shall be accepted at the application site. Inert materials shall be accepted at the site between 08.00 hours and 18.00hours each weekday and 08.00hours to 13:00hours on Saturday. No materials shall be accepted at any other time. These operating hours will also be observed in relation to the extractive operations ongoing on-site.

2.4.1 Backfilling Activities

Insofar as practicable, the source of each consignment of soil imported to site for backfilling purposes shall be identified in advance and subject to basic characterisation testing to confirm that soils at that location can be classified as inert. Limit values for inert soils shall be in accordance with those set by *European Council Decision 2003/33 of 19 December 2002 establishing criteria for the acceptance of waste at landfills*. Characterisation testing will be undertaken in advance by Clients and/or Contractors forwarding soil to the application site. It is also suggested that site management visit each source site and inspect the nature of the development ongoing there in advance of the commencement of reception of material from that site. This process will give the site management an upfront visual characterisation of the site details whether greenfield, urban, rural brownfield etc. and allow for a more accurate understanding of the possible characterisation of the proposed imported product.

All inert soils imported to the site shall be unloaded (end-tipped) from trucks at the active backfilling face. It will be visually inspected by site personnel at that point to ensure that there

is no intermixed non-hazardous or hazardous waste placed within it. Should there be any concern about the nature of the waste being end-tipped it will be segregated (if required), re-loaded onto the truck and directed to the waste inspection and quarantine area for closer inspection and classification.

A detailed record will be kept of all such inspections. Should inspections and/or subsequent testing indicate that the materials are non-inert and cannot be accepted and used for restoration purposes at this site, they will be placed in skips and covered pending removal off-site by permitted waste collectors to a suitably licensed / permitted waste disposal or recovery facility.

In addition to the above, a representative sample shall be taken from one in every 200 loads of inert soil accepted at the facility and subjected to a less extensive scope of testing (compliance testing) focusing on key contaminant indicators. This data shall be used to confirm that the accepted soils are inert and comply with acceptance criteria. Compliance testing shall be undertaken by the Applicant. Any other EPA Licence criteria will also be met.

2.4.2 Recovery Activities

It is envisaged that the processing and/or recovery of construction and demolition waste activities at the application site will be restricted to stones, granular fill, concrete, blocks, bricks and ceramic tiles. Should any non-inert construction and demolition waste (principally metal, timber, PVC pipes and plastic) occur amongst the waste imported to site, it shall be separated out and temporarily stored in skips prior to removal off-site to appropriately licensed waste disposal or recovery facilities.

It will be a requirement of the proposed operation that all construction and demolition waste forwarded to the site for recovery purposes has been pre-sorted at source, that it is inert and largely free of any non-hazardous / hazardous domestic, commercial or industrial wastes. Any consignments of construction and demolition waste which have such materials intermixed in them will be immediately rejected and removed off site.

2.4.3 Haulier Licensing Control

In accordance with the relevant waste collection permitting legislation only hauliers / contractors approved firstly via signed declaration by the site operators will be permitted to transport material to the site. Each approved haulier must have the facility permit added to their waste collection permit in advance of commencement of haulage to the site. A copy of each waste collection permit for each individual contracting haulier will be maintained in the site office and maintained, reviewed and updated in line with licensing requirements.

As stated above, site management will ideally approve each site in advance and therefore all reception documents will reference the receiving site and haulier which will contribute greatly to traceability and accountability for all materials imported to site.

2.5 ENVIRONMENTAL NUISANCE CONTROL

2.5.1 General

The ongoing restoration activities at the application site require a number of environmental controls to eliminate or minimise the nuisance to the public arising from the importation, placement and compaction of inert soils, the importation and recovery of construction and demolition waste and export of processed materials from the application site. The proposed environmental control measures are outlined in detail in the following sections.

The scale of the restoration proposals contained herein are such that the operations will be subject to licensing by the Environmental Protection Agency (EPA). The restoration works at the application site will ultimately be regulated by conditions attaching to any waste licence issued by the Environmental Protection Agency. Any additional control measures required by the Waste Licence, in addition to those outlined, will also be implemented.

2.5.2 Bird Control

As the materials being placed or recovered at the application site are free of putrescible (food / kitchen) waste, site activities are unlikely to attract scavenging birds such as gulls and crows for the duration of the restoration works. Accordingly, it is not intended to implement any specific bird control measures at the site.
In the unlikely event that any putrescible waste is identified among imported materials, it shall be immediately removed to the waste quarantine area pending removal off-site to a licenced waste disposal or recovery facility.

2.5.3 Dust Control

In dry, windy weather conditions, the ongoing restoration and recovery activities may give rise to dust blows across, and possibly beyond the application site. In order to control dust emissions, the following measures will be implemented:-

(i) water from a tractor drawn bowser will be sprayed on dry exposed soil surfaces (including unpaved road surfaces) as and when required;

(ii) the site shall be restored in a phased manner and each phase shall be grassed as soon as practicable after placement of cover soils in order to minimise soil erosion and potential dust emissions;

(iii) The area of bare or exposed soils will, insofar as practicable, be kept to a minimum. Consideration will be given to establishing temporary vegetation cover over temporary slopes pending final backfilling and restoration to original ground level.

(iv) all HGV's exiting the site shall be routed through a wheel wash facility at the end of the paved internal access road (refer to Figure 2.2). This measure will prevent transport of fines on both the paved access road and the public road network by HGVs exiting the site.

(v) Stockpiling of imported soils will be minimized. Soils will ideally be placed and compacted in-situ immediately after being unloaded. If and when temporary stockpiling of soils is required, they will be placed as close as practicable to the centre of the application site, away

from nearby residences. The amount of dust or fines carried onto the public road network will be further reduced by periodic sweeping of the paved internal access road and the existing local road in front of the application site.

2.5.4 Litter Control

As the materials being placed or recovered at this site will be largely free of litter, the site restoration and recovery activities are unlikely to give rise to problems with windblown litter. Accordingly, it is not intended to implement any specific litter control measures at the site. In the unlikely event that any litter waste is identified among imported materials, it shall be immediately removed to the waste quarantine area pending removal off-site to a licenced waste disposal or recovery facility.

2.5.5 Odour Control

As the materials being placed or recovered at this site are not biodegradable and do not therefore emit odorous gases, the site restoration and recovery activities will not give rise to odour nuisance. Accordingly, it is not intended to implement any specific odour control measures at the site.

In the unlikely event that any biodegradable waste is identified among imported materials, it shall be immediately removed to the waste quarantine area pending removal off-site to a licenced waste disposal or recovery facility.

2.5.6 Vermin Control

As the materials being placed or recovered at this site are free of putrescible (food / kitchen) waste, site activities are unlikely to attract vermin (rats) for the duration of the restoration works. Accordingly, no specific vermin control measures shall be implemented at the site.

In the unlikely event that any putrescible waste is identified among imported materials, it shall be immediately transferred to the waste quarantine area pending removal off-site to a licenced waste disposal or recovery facility.

2.5.7 Fire Control

As the materials being placed or recovered at this site are free of flammable materials and biodegradable waste which could create a fire or explosion risk, site activities will not present a fire risk for the duration of the restoration works. Accordingly, no specific fire control measures shall be implemented at the site.

Notwithstanding this, the following operational practices will be implemented in order to prevent fires at the application site:

(i) smoking at the application site and at the temporary site office will be prohibited

(ii) any biodegradable or flammable waste included in materials imported to site shall be immediately transferred to the waste quarantine area pending removal off-site to a licensed waste disposal or recovery facility

(iii) plant and equipment will be removed if they exhibit signs of overheating etc. In the unlikely event that a fire does occur, the local fire stations will be contacted and emergency response procedures will be implemented. Fire extinguishers (water and foam) will be provided at the temporary site office to deal with any small outbreaks which may occur.

2.6 ENVIRONMENTAL MONITORING

2.6.1 General

There is an established programme of environmental monitoring at the application site which complies with requirements of the existing extractive operations planning permission as issued by Kildare County Council. No limit values for environmental emissions arising from established activities are identified by the existing planning permission. It is expected that such limits will be set by the EPA should it decide to issue a waste licence in respect of the application site. Environmental sampling, monitoring and testing is largely and will be undertaken by independent external consultants as required. Records of environmental monitoring and testing will be maintained on-site and will be forwarded to the EPA as required under the terms of the waste licence.

2.6.2 Dust Monitoring

Dust emissions from established restoration activities at the application site are measured using Berghoff dust gauges at 3 No. locations across the site. These gauges are located along the boundary of the application site, close to the nearest sensitive receptors, all of which are private residential property. Please review the Odour Monitoring Ireland report for any amendments to this. It is currently envisaged that the existing dust monitoring regime will remain in place for the duration of the site restoration works and will continue for a short aftercare period thereafter.

2.6.3 Ecological Monitoring

In the absence of any rare or vulnerable species of flora or fauna at, or in the immediate vicinity of, the application site, it is not intended to undertake any ecological monitoring during the site restoration works.

2.6.4 Groundwater Monitoring

At the present time, there are no borehole inspections carried out on site as the water table has not been impinged upon by any of the operations carried out on the site thus far and will not be.

In the event that groundwater sampling and testing is required by the licensing authority it will be undertaken by external consultants on a licence required basis at groundwater monitoring wells installed within the application site. Groundwater levels will also be recorded.

2.6.5 Landfill Gas Monitoring

In the absence of biodegradable waste amongst the inert materials used to backfill and restore the application site, no landfill gas can be generated and accordingly no provision has been made for landfill gas monitoring at this facility.

2.6.6 Leachate Monitoring

In the absence of biodegradable waste amongst the inert materials used to backfill and restore the application site, no leachate can be generated and accordingly no provision has been made for leachate monitoring at this facility.

2.6.7 Meteorological Monitoring

At the present time, no meteorological monitoring is undertaken at the application site. It is understood that temperature, rainfall, sunshine, wind speed and direction are recorded at a nearby synoptic weather station in Naas, approximately 25km East of the application site. Other climatic data is recorded at the weather station at Casement Aerodrome, approximately 50 km northeast of the application site.

Upon successful receipt of the EPA waste licence it is envisaged that minimal meteorological monitoring will be recorded as part of the Environmental Management system governing the operations of the facility.

2.6.8 Noise Monitoring

Noise emissions from established extractive operations and proposed restoration and recovery activities are currently monitored on a quarterly basis (i.e. three monthly) basis at 3 No. noise sensitive sites along the boundary of the application site, close to the nearest sensitive receptors, all of which are private residential property.

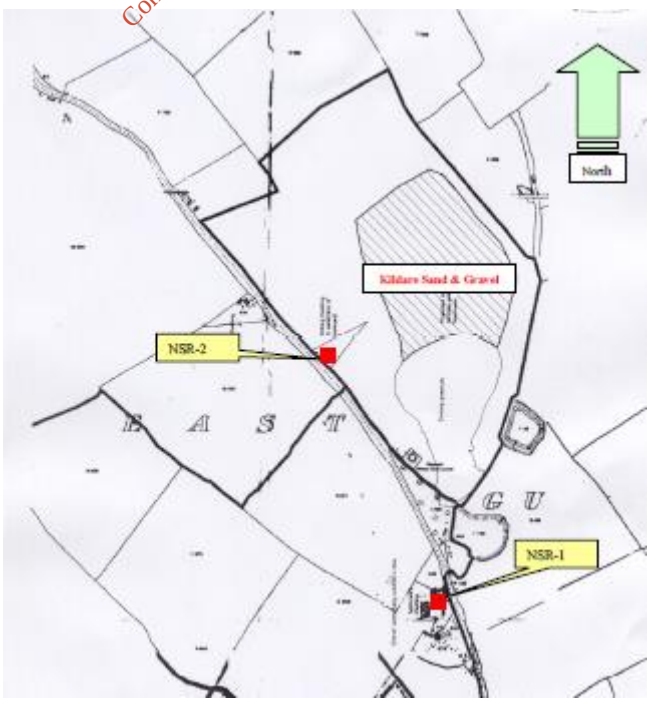


Fig 2.7 Existing Noise Monitoring Locations

The existing noise monitoring locations are indicated in Figure 2.7. It is currently envisaged that the existing noise monitoring regime will remain in place for the duration of the site restoration works and will continue for a short aftercare period thereafter. Noise monitoring in respect of this EIS was more extensive to thoroughly predict any localised impacts further afield than the site boundaries.

Noise monitoring will be undertaken using a Larson Davis Model 824 Sound Level Meter, calibrated using a Larson Davies Acoustic Calibrator CAL 200 (or equivalent).

2.6.9 Odour Monitoring

As the materials being placed or recovered at this site are not biodegradable and do not therefore emit odorous gases, the site restoration and recovery activities will not give rise to odour nuisance. Accordingly, no provision has been made for odour monitoring at this facility. Site staff will report and record any odour emissions at the site in the highly unlikely event that a complaint is made about odours emanating from the site.

2.6.10 Surface Water Monitoring

At the present time, no surface water sampling and testing is undertaken as there are no significant surface water entities proximate to the site. It is envisaged that the EPA will require a visual assessment of surface water generation and characterisation of same at intervals annually. This will be agreed with the EPA and scheduled in the Waste licence.

2.6.11 Stability and Settlement Monitoring

On completion of each phase of restoration, a number of fixed stations will be set into the ground surface across the restored area and will be surveyed annually in order to assess the magnitude of settlement and instability (lateral movement), if any, which may subsequently arise.

Temporary slopes, both in natural in-situ soil along the perimeter of the former extraction area and in the restoration soils will be visually inspected on an ongoing basis, at least once a month by site staff and a record will be kept of same. Should these inspections give any cause for concern, an inspection of the affected area will be undertaken by a qualified geotechnical engineer and measures will be implemented to address any instability identified.

A detailed visual inspection and stability assessment will be undertaken on an annual basis by a qualified geotechnical engineer for as long as the facility remains operational.

Following completion of restoration works and closure of the facility, stability and settlement monitoring will be undertaken only if required by the waste licence.

2.7 FINAL RESTORATION AND AFTERCARE

The principal activity undertaken at the application site is restoration of lands within a former sand and gravel quarry. As previously noted in Section 2.3.1, the application site will be restored on a phased basis to give a landform which merges into the surrounding undulating

pastoral landscape, refer to final site contour map in Figure 2.4. Details of the phasing plan are also provided on Figures 2.4.

On completion, the final landform will be profiled to give a very slightly domed shape in order to facilitate surface water run-off into the in-situ sand and gravels along the site boundary. It will then be planted with grass in order to promote stability and minimise soil erosion and dust generation and the lands will be progressively returned to their former use as agricultural grassland.

All construction and demolition waste recovery activity shall cease in the course of the tenth (and final phase) of the site restoration works. All mobile plant and equipment will be removed off site and any temporary site accommodation, infrastructure and services will be progressively removed off-site or decommissioned. Wherever possible, hardstanding surfaces will be broken up using a hydraulic breaker and subjected to validation testing to confirm the materials are acceptable for re-use in ongoing land restoration works. Any materials which are found to exceed inert waste criteria will be transferred off site to a suitably licensed waste disposal or recovery facility. Following completion of the restoration and site decommissioning works, provision will be made for further short-term (<1year) environmental monitoring and the operator will apply to surrender the licence.

2.8 CONTINGENCY ARRANGEMENTS

At present no contingency arrangements are envisaged but a full schedule of arrangements will be provided for in the design and draft of the waste licence application. This will involve as a minimum provision for the eventuality that not enough material can be sourced and that planning permission extensions may be required towards the end of the 10 years. Also contingency arrangements will need to be agreed for the standardisation and finish off of the site.

3 HUMAN BEINGS

3.1 INTRODUCTION

This section of the Environmental Impact Statement addresses the impact of the restoration works at the former sand and gravel quarry at Boherkill, Rathangan Co. Kildare on the human environment. The Environmental Impact Statement is being prepared in support of an application by Mr Michael Ennis for planning permission to restore an existing sand and gravel quarry which is in operation currently. This proposal will also be subject to a waste licence as issued by the Environmental Protection Agency. In undertaking this study, regard has been had to the requirements of the EPA publication "*Guidelines on the Information to be contained in Environmental Impact Statement.* For waste facilities, and includes, but is not limited to consideration of the economic activities, existing amenities and sensitive receptors in the vicinity of the site.

3.2 RECEIVING ENVIRONMENT

3.2.1 Outline of Baseline study and Methodology

The baseline study of the area, with regard to Human Beings, involved study of the Census Report (2011) information for the District Electoral Division (DED) of Rathangan, Co. Kildare. Other statistics were derived from use of local knowledge.

District	2006 Persons	2011 Persons	2011 Male	Female	Actual Change	Percentage Change	Area km2
Rathangan	1594	2272	1101	1171	678	42.5	14.45

A survey of housing in the local area was carried out, the results of which are illustrated on Figure 3.1. Ordnance Survey maps and aerial photography were also examined, as well as local knowledge of recent and potential future housing developments, to establish the local housing pattern. Mrs Patricia Ennis also visited each of the local residents below to discuss the proposed development and address any particular concerns of the residents most local to the proposed development. Feedback from these developments has also formed part of the discovery in relation to this section.

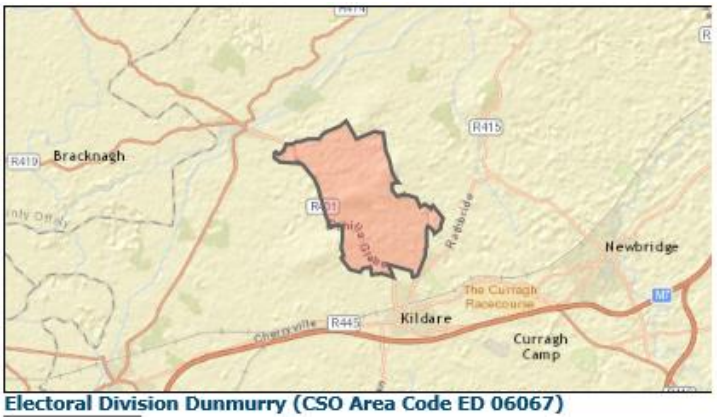
FIG 3.1 Site Location Relative to nearest local residences

3.2.2 Site Context

The existing sand and gravel quarry which is currently being operated and porposed to be restored is located entirely within the townland of Boherkill, Rathangan, Co. Kildare, approximately 3km south-east of Rathangan Co Kildare on the R401 National Secondary route way and 5.5km north-west of Kildare Town. The plan extent of the lands owned Mr Michael Ennis is outlined in blue on a 1:10,560 scale map of the area, reproduced as Figure 1.3. There are 8 local residences in the immediate vicinity of the site as can be seen in figure 3.1 above.

3.2.3 Demography

The sand and gravel quarry and proposed restoration site is located within the townland of Boherkill, Rathangan, Co Kildare in the electoral division of Dunmurry in which some 440 people reside. According to the census of 2011 the townland of boherkill comprised of 27 inhabitants of 12 were males and 15 were female. There are 11 households of which one is vacant.



Electoral Division Dunmurry (CSO Area Code ED 06067)

The demographic trends for the Dunmurry electoral division over the past ten years, illustrates a moderate increase in population in that time, most of it in the four year period between 2002 and 2006.

Population aged 0-19 by sex and year of age, persons aged 20+ by sex and age group

Age	Male	Female	Total
0	0	3	3
1	4	3	7
2	3	3	6
3	6	4	10
4	0	3	3
5	7	2	9
6	5	3	8
7	2	3	5
8	2	2	4
9	2	3	5
10	3	2	5
11	1	3	4
12	3	5	8
13	1	2	3
14	5	4	9
15	6	4	10
16	3	5	8
17	1	3	4
18	3	6	9
19	2	5	7
20-24	11	9	20
25-29	13	13	26
30-34	6	8	14
35-39	15	12	27
40-44	12	16	28
45-49	11	26	37
50-54	20	15	35
55-59	10	12	22
60-64	7	10	17
65-69	12	8	20
70-74	8	9	17
75-79	8	7	15
80-84	7	14	21
85+	2	12	14
Total	201	239	440

The age profile at local and national level is indicated in Table 3.2 below. In all age groups in Dunmurry ED, there are slight variations with State averages. Although a high proportion (almost one quarter) of the local population is in the 0-14 age group, the proportion of adults in the traditional household formation age category (25-44) is less than that for the State as a whole.

Age Profile	Dunmurry DED		Ireland National Average
	No. / 440	%	%
0-14	89	20.22	20.4
15-24	56	12.73	14.9
25-44	97	22.05	31.7
45-64	111	25.23	21.9
65+	87	19.77	11

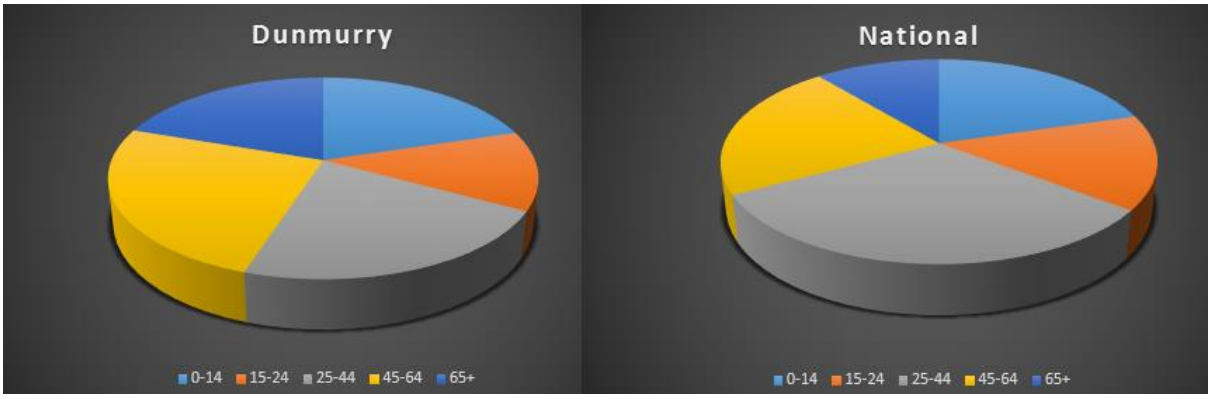


Fig 3.2 Age Profile of Dunmurry Electoral Division

The lower proportion of adults in the 15-24 and 25-44 age groups and the higher proportion in the 44-65 and 65+ age groups is not untypical of rural areas, where older children and young adults generally migrate to urban centres to work and study, leaving parents and/or other older relatives in the family home.

The recent increase in population, may suggest that the area has recently come into favour with family units, possibly on account of its proximity to rapidly expanding urban centres, and a major employment centre in Dublin.

Combining the 0-14 and 65 plus age groups gives an indication of the level of dependency within an area. The result is that the Dunmurry DED has a level of dependency of 39.99% compared to the state average of 31.4%. The implications for the dependency percentage are on service provision such as schools, healthcare etc.

3.2.4 Employment

The employment statistics as presented in Fig 3.3 below indicate that there are less than average employment levels amongst residents in the area. The percentage of the population over 15 years of age at work is 5% percentage points lower than the State average of 53%, the level of unemployment is approximately 2% higher than the state average. The proximity of this area to urban centres such as Naas, and to a major employment centre such as Dublin suggests that a high proportion of those .at work. commute outside the area.

Population aged 15 years and over by principal economic status and sex

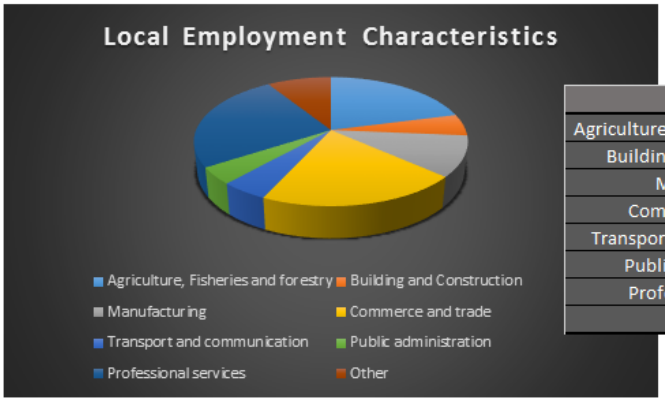
Principal Economic Status	Male	Female	Total
At work	94	73	167
Looking for first regular job	0	0	0
Unemployed having lost or given up previous job	14	8	22
Student	15	29	44
Looking after home/family	0	36	36
Retired	25	32	57
Unable to work due to permanent sickness or disability	9	14	23
Other	0	2	2
Total	157	194	351

	At Work %	Unemployed %
Dunmurry	48	6.3
National	53.1	4.5

Fig: 3.3 Dunmurry Electoral Division Employment statistics

3.2.5 Economic Activities

The statistics for the Dunmurry electoral division suggest as per fig 3.4 below that 21% of local people are engaged in Agricultural activities, 20.4% are engaged in commerce or trade and 25% are engaged in professional services. A Knowledge of the area suggests that there is a movement of people to the larger population centres for almost 70% of the workforce.



Industry	No. of Local People	%
Agriculture, Fisheries and forestry	35	21.0
Building and Construction	9	5.4
Manufacturing	17	10.2
Commerce and trade	34	20.4
Transport and communication	8	4.8
Public administration	7	4.2
Professional services	42	25.1
Other	15	9.0

Fig:3.4 Local Employment Characteristics

There are 2 industries prevalent in the immediate vicinity which are agricultural and the extractive industry. The area is rich in natural sand and gravel deposits and this industry has flourished here for decades. Similarly the agricultural landscape sees crop production as the predominant agricultural activity with pasture and then silage production below this.

The leisure industry may also feature with the Curragh Racecourse being located 12.6 km from the village of Rathangan. The Derby and a number of other race meetings are held at the Curragh each year and they attract large crowds. The Irish Derby is one of the annual highlights of the Irish racing calendar. In recent years, the construction of additional facilities at the racecourse has seen increased use of the site for conferences and exhibition events and there is a major expansion planned for the racecourse in the coming year.

3.2.6 Existing Amenities

The Dunmurry Electoral division and the proximity to the Thomastown electoral division which incorporates the town of Rathangan still remains predominantly agricultural in nature and has only a few small population clusters i.e. the village of Rathangan. Rathangan has religious amenities, commercial and retail amenities aswell as leisure and educational. It is a typical small sized cluster development in Ireland.

3.2.7 Sensitive Receptors

At the present time, the principal sensitive receptors in the vicinity of the application site comprise residents of four properties immediately beyond the application site. Of these, one property lies to the south of the site and belongs to the applicant Mr Michael Ennis and the other 3 principal sensitive receptor sites lie to the west / north west of the site and are

identified as residences of Sean and Geraldine Wade, Frank and Siobhan Shaughnessy and Brendan and Mary Plant.

The other residences marked up have been identified as possible sensitive receptors but not principal sensitive receptors. It must be noted in relation to this that all residents and sensitive receptors were approached in advance of this proposal. They were advised of the impacts and those who engaged in this process were satisfied with the proposal.

It is imperative to note also that during the most recent planning application phases in 2007/2008 and also in relation to a withdrawn planning application for this proposal in 2015 there were no objecting parties to the application and furthermore none of the sensitive receptor residents objected to the proposals at that stage.

3.3 IMPACT OF RESTORATION WORKS

The proposed site restoration works at Boherkill will require continued importation of inert soil and stones and recyclable construction and demolition waste from construction sites across the Kildare, Offaly and Greater Dublin Area. All imported soil and stones and construction and demolition materials will be used to backfill the site. The duration of site restoration works is likely to be of the order of 10 years, although the environmental impacts will vary according as the active backfilling area moves across the site over that period. Potentially, all of the effects of a development on the environment impinge upon human beings. Direct effects relate to matters such as water and air quality, noise, and changes to landscape character. Indirect effects relate to such matters as flora and fauna. The impact of the proposed remediation works on human beings is addressed in the succeeding sub-sections of this report by means of an appraisal of the effects of the development on the environment in general, of which human beings are an integral part.

3.3.1 Short-Term Impacts

The impacts on human beings will arise mainly through environmental factors that are detailed in other sections of this report; most notably noise and air quality (including dust). While there will be negligible or no impact on much of the local residential housing identified on Figure 3.1, there may be some limited minor impacts at the two residences closest to the application site when the active restoration area is closest to each property.
The impacts which are likely to arise at these locations are associated with operational activities, specifically the importation and placement of soil and stones. These impacts are classified as temporary, minor and negative.

The potential and predicted impacts are detailed elsewhere in this report (Section 6 - Water, Section 7, Air, Section 8, Noise, Section 10, Landscape and Section 12, Material Assets. As quarrying activities have been established for some considerable time at the application site (in excess of 15 years), the importation of inert / construction and demolition materials via the existing local road network will have no adverse implications for existing traffic levels or travel patterns, provided traffic levels remain essentially unchanged (or lower as is proposed). As no additional traffic movements will be generated by the continued operation of the existing facility, there will be no adverse traffic related impacts (noise, dust etc.) on the existing human environment.

The proposed restoration of the former sand and gravel quarry will have no impact as regards existing employment levels. It is envisaged that the number of staff permanently employed at the facility will remain at 2. Qualified contractors will be brought on site to carry out any necessary infrastructure construction works. Environmental monitoring will be undertaken by independent consultants.

3.3.2 Long-Term Impacts

The long-term impact of backfilling and restoration of the application site, beyond its 10 year operational life, will be the elimination of established traffic movements over the local road network going to and from the site, with consequent improvement of the human environment. This impact is classified as permanent, minor and positive.

The infilling of the existing void and backfilling to former ground level will remove an unsightly feature in the existing landscape and restore the area to a more pristine agricultural landform. This impact is classified as permanent, minor and positive.

3.3.3 Interaction with Other Environmental Receptors

As mentioned above, all environmental factors ultimately impact upon, and interact with human beings. These impacts are discussed in detail in the relevant sections of this report.

3.4 MITIGATION MEASURES

Mitigation measures to be adopted during this restoration project will relate primarily to minimising any impacts of the project on surrounding sensitive receptors. These measures

are discussed elsewhere in this EIS, in the sections to which they relate. The duration of restoration activities in the immediate vicinity of local residences will be kept to a minimum. Existing screening berms should be maintained for the duration of restoration activities at in order to minimise noise and dust impacts and reduce visual intrusion at the nearby residences. Where necessary, some screening can also be provided by constructing temporary earth mounds in particular at the western perimeter of the site when backfilling activities are closest to existing residences.

SECTION 4: ECOLOGY - FLORA AND FAUNA

4.1 INTRODUCTION

This chapter of the Environmental Impact Statement has been prepared by Mr. Roger Goodwillie an Ecologist from Roger Goodwillie and Associates of Lavistown House, Kilkenny.

Field Survey

A field survey of flora and fauna at the application site at Boherkill, Rathangan, Co. Kildare was carried out in May 2015. The objective of the survey was to identify and assess the significance of the flora and fauna occurring on or in the immediate vicinity of the site. Weather on the day was cool and overcast with intermittent short rain showers.

Flora

Although summer is considered the optimal time to carry out a vegetation survey, 2007 experienced an unseasonably warm autumn, resulting in many flora species still not having gone to seed, thus facilitating the assessment and identification of habitats on site.

Fauna

Summer is considered the optimal time for a fauna survey to be carried out, as during the autumn / winter period the numbers of invertebrate and mammalian fauna are limited since numerous species are dormant or hibernate in the colder weather. Mammal species are less active during autumn and therefore not as easily identifiable due to lack of tracks and scats. This is also the case for invertebrate species.

Relevant Legislation

Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the EU Habitats Directive) and Council Directive 79/409/EEC on the conservation of wild birds (the EU Birds Directive) oblige member states to protect habitats and species that are of importance on a Europe-wide scale. Annex I and II of the Habitats Directive and Annex I of the Birds Directive list species and habitats that are of greatest conservation importance on an EU wide scale and for which conservation areas must be designated. These designations are:

- Special Areas of Conservation (SAC) for habitats listed in Annex I of the Habitats Directive and species listed in Annex II. Some of these habitats or species are prioritised for conservation measures (* Priority Species or Habitats) and

- Special Protection Areas (SPA) for Birds listed in Annex I of the Birds Directive: A number of other Annexes in both Directives list species that require strict protection but not necessarily

require designation of conservation areas. Ireland is also a signatory to a number of conservation-related agreements and conventions such as the Bern and Bonn Conventions.

The EU Directives have been transposed into Irish law through a number of legal instruments including the *European Communities (Natural Habitats) Regulations 1997-2005 (the .Habitat Regulations.), the Wildlife Acts, 1976-2000, the Planning and Development Act, 2000, and the Foreshore Acts, 1932-1992.*

Other legal instruments such as the Wildlife Acts (1976 and 2000) and the Flora Protection Order (1999) also provide protection for species of national conservation importance. Proposed Natural Heritage Areas (pNHA) are conservation designated areas that protect species and habitats of regional and national importance. At a more local level there may be objectives set out in County Biodiversity Action Plans that identify species and habitats that are uncommon or rare within the county.

Methodology for Assessment of Flora and Habitats

The site was walked systematically while noting plant species and habitat types. All vascular plants observed during the survey were identified to species level. Identification and naming of vascular plants used Webb *et al.*(1996), Kent (1992) and Stace (2001). Habitat types were assigned to categories (and given codes) according to the Heritage Council classification system (Fossitt 2000). Habitat types were mapped.

Information on sites of conservation importance (National Parks and Wildlife Service, various dates) for Kildare, the Irish Red Data Book for vascular plants (Curtis and McGough, 1988) and various texts such as Preston *et al.* (2002) were consulted during the report writing stage.

Methodology for Assessment of Fauna

The site was walked systematically and bird species were noted whenever encountered or clearly identifiably through calls or song. Signs of mammal activity including tracks and footprints, scats and burrows or other resting places were searched for as well as looking out for the mammals themselves and asking local people about any past sightings.

Invertebrates (e.g. bees & butterflies) were recorded from flowers or under stones etc. and any unusual species were noted.

Information on sites of conservation importance for Kildare (National Parks and Wildlife Service, various dates; members of Kildare Branch of BirdWatch Ireland), the Irish Red Data Book for vertebrates (Whilde 1993), various texts and websites were consulted during the report writing stage.

The following individuals and organizations were consulted during the preparation of this section of the EIS:

- National Park and Wildlife Service

4.2 RECEIVING ENVIRONMENT

4.2.1 Habitats and Vegetation

The main habitat before development was tilled land (BC4 in Fossitt 2000) and the site is still surrounded by wheat fields and separated from them by hedgerows (WL1). Since excavation has occurred it now consists of active quarries and mines (ED4) and recolonising bare ground (ED3) where there is overburden storage.

Quarry (ED4)
The quarry is being worked to a small extent but there is little ground as yet with a plant cover. Much is taken over by piles of mixed or coarse till and there are substantial settlement areas also, in low places on the floor. Internally there is some colonisation by tolerant plants such as

Tussilago farfara	coltsfoot
Medicago lupulina	black medick
Epilobium ciliatum	American willowherb
E.parviflorum	hoary willowherb
Senecio jacobaea	ragwort
Reseda luteola	dyer's rocket
Achillea millefolium	yarrow
Agrostis capillaris	common bent
Holcus lanatus	Yorkshire fog

Towards the edges, additional grasses appear and there are occasional piles of topsoil yielding wild turnip *Brassica rapa*, nettle *Urtica dioica* and scutch *Elytrigia repens* but it is mainly the berms and piles of overburden along the western side that are vegetated.

A berm borders the northern edge of the quarry and it has a tall cover of

Chamerion angustifolium	rose-bay
Elytrigia repens	scutch
Arrhenatherum elatius	false oat
Cirsium arvense	creeping thistle
C.vulgare	spear thistle
Senecio jacobaea	ragwort

There are also a few willows *Salix cinerea* 2-3m high.

Overburden has been stored along the western side of the site where there is a considerable area of sparsely-covered banks and terraces, the vegetation constrained by drought. The first plants to grow on this material are wind-dispersed, especially mosses, though these are mainly seen in the winter. In general the cover includes,

Tussilago farfara	coltsfoot
Medicago lupulina	black medick
Agrostis capillaris	common bent
Equisetum arvense	field horsetail
Hypochaeris radicata	catsear
Crepis vesicaria	beaked hawksbeard
Taraxacum officinale	dandelion
Centaurium erythraea	common centaury

Flat, compacted areas in places accumulate water and allow additional species to grow such as

Carex flacca	glaucous sedge
Cerastium glomeratum	sticky mouse-ear
Veronica serpyllifolia	thyme-leaved speedwell
Epilobium parviflorum	hoary willowherb
Juncus inflexus	hard rush
Ranunculus repens	creeping buttercup
Plantago major	great plantain
Salix cinerea	grey willow

Hedgerows

The main hedges occur along the SE side and near to a house on the western side. The south east hedge consists of ash *Fraxinus excelsior* blackthorn *Prunus spinosa* and some spindle *Euonymus europaeus* which becomes frequent near the ringfort – where it is joined by hazel *Corylus avellana*. Hedge woundwort *Stachys sylvatica*, germander speedwell *Veronica chamaedrys* and field rose *Rosa arvensis* are additional species here. On the opposite side the trees are taller and there are large ash with hawthorn and elder. Growth is vigorous and ivy *Hedera helix*, hogweed *Heracleum sphondylium* and scutch grass *Elytrigia repens* are conspicuous.

Adjacent habitats

Other woody growth occurs around and covering the ringfort where hazel forms a canopy over cow parsley *Anthriscus sylvestris*, false brome *Brachypodium sylvaticum*, hartstongue *Phyllitis scolopendrium*, male fern *Dryopteris filix-mas*, shield fern *Polystichum setiferum*, primrose *Primula vulgaris* and barren strawberry *Potentilla sterilis*.

There is a small section of pit opposite the entrance and to the south of the main site. This is part of a former quarry and is sandy. Rose-bay *Chamerion angustifolium* is a major species but in exposed places there is also wild carrot *Daucus carota*, knapweed *Centaurea nigra*, field horsetail *Equisetum arvense*, dog daisy *Leucanthemum vulgare*, birdsfoot trefoil *Lotus corniculatus* and black medick *Medicago lupulina.* A little sheep's sorrel *Rumex acetosella* shows that the deposit is slightly acid in places. Two introduced species also occur, the butterfly bush *Buddleja davidii* and prickly lettuce *Lactuca serriola.*

4.2.2 Fauna

There are no mammals in the quarry itself with the exception of a few rabbits in the NE corner. Around the margins however there are further burrows in the hedges while fox and hare may occur at times on the western side. There was no evidence of badgers on any visit though they are likely to be in the area. Some bats probably feed along the road and around

the ringfort but the habitat elsewhere is not suitable for these animals and the pit would not be used.

There is no habitat available for frogs or newts as excavation does not reach the water table and there are no long-lasting or permanent, vegetated ponds.

Recent excavation has revealed bands of sand within the deposit which are suitable for nesting sand martins. The birds now occupy two sections in the SW corner and there is a small population of 10-20 pairs. The bird is essentially an opportunist, finding and exploiting new nest sites as they become available because of erosion, either natural (riverbanks) or man-made (quarries).

A pair of peregrines attempted to nest in 2015 but abandoned the site in mid-May without success. The nest was on the western side close to active extraction and the birds were generally not disturbed by machinery. The reason for abandonment is not known. In general, sandpit sites are much less suitable for the species than rock quarries. Of 90 sites occupied by nesting birds in 2002, eighty-eight were in rock quarries and two in pits (Madden *et al*, 2009).

4.2.3 Evaluation

The habitats available on site are widely found in sand pits and have no significant ecological interest. The plant species also are quite common and widespread in Kildare (*cf* Preston *et al* 2002). A notable feature is the lack of diversity in the flora and this is probably caused by the short period of extraction as well as the characteristics of the material. A long-established site tends to accumulate more species which are either introduced by chance or by visiting vehicles. Allied to this at Boherkill is the absence of introduced species; only two plants, *Buddleja* and *Lactuca*, are of this category and they are restricted to the entrance.

The bird fauna contributes the only items of interest with the potential nesting by peregrine falcons and the current small colony of sand martins. As mentioned, sand quarries are not the most suitable sites for the peregrine and it is relatively unlikely that the pair would attempt to breed again, having failed in 2015. Their presence may be the result of a high local population.

Sand martins will probably continue to nest as long as there is a suitable lens of fine material to support their burrows.

Designations

The site is not included in any area with an ecological designation (Natural Heritage Area, Special Protection Area or Special Area of Conservation) and is unlikely to be so in the future. The nearest such areas are the Grand Canal pNHA (Code No. 2104), the Curragh NHA (Code No 392) and Pollardstown Fen (Code No. 396), a candidate SAC. The site has no ecological link with any of these.

The peregrine is an Annex I species under the Birds Directive 1979 (79/409/EEC) which means that it can be the basis for designation of SPA's. The sand martin has an amber listing

amongst birds of conservation concern (Colhoun & Cummins, 2013) implying an unfavourable conservation status in Europe. However, the Irish population has increased since 1990 (Balmer *et al* 2013).

4.3 IMPACT OF THE RESTORATION SCHEME

4.3.1 Process

The main features of the development are the filling of the site with material from the overburden store and the import of additional inert fill. This will be a gradual process, working from north to south and the material will be subject to subsidence and settlement before being covered with topsoil from the berms and being restored to agricultural land

A small amount of extraction will continue during this process, making use of lenses of material still remaining but not adding to the extent of the pit.

4.3.2 Mitigation

The wheel-wash (with its closed water supply) will be retained during the period of filling to prevent loose material being left on the public road. There will be no escape of run-off as water will accumulate internally and will drain naturally through the remaining glacial material.
.
Restoration will include the removal of all machinery and structures and the smoothing of the contours to facilitate the establishment of grassland and grazing animals.

4.3.2.1 Additional Mitigation measures

RME Environmental have worked on similar projects and in addition to the mitigation measures suggested by Mr Goodwillie in respect of the proposed development it is also suggested that in the interest or maintaining or indeed enhancing the status of the ecology local to the site that the following occurs:

i. in order to retain landscape connectivity and minimise loss of potential nesting sites for birds, it is recommended that existing boundary hedgerows be retained and reinforced where necessary. Retention and reinforcement of boundary hedgerows will also serve as a noise and visual barrier.

ii. to ensure the continued survival of boundary hedgerows, a 5m buffer zone between the hedgerows and the infilling works should be maintained insofar as practicable. Backfilling and restoration operations in close proximity to existing hedgerows should also be of minimum duration possible.

iii.where removal of any shrubs or hedgerows within the site is required, these works shall take place between the months of September and March to avoid the bird nesting season.

iv.the loss of internal shrubs or hedgerows within the site should be compensated by replanting following restoration of site to pre-extraction ground levels.

v. any new planting should comprise a mixture of native tree and shrub species consistent with species readily found in the local area.

vi .the mitigation measures set out in Chapters 7 and 8 of this Environmental Impact Statement should be implemented. Dust and noise emissions from the application site will comply with the recommended DoEHLG (2004) and EPA (2000) emission limit values. Implementation of these measures shall ensure that there will be minimal adverse indirect noise and dust impacts on flora and fauna arising from backfilling, recycling and restoration operations.

vii .following the completion of backfilling operations, the application site will be restored to improved agricultural grassland. This will ensure that land use at the site is in keeping with the character of the surrounding area.

4.3.3 Actual impacts

4.3.3.1 Operational Impacts

The following impacts will arise during the restoration works at the applications site:

i. Backfilling of the existing void space and the improved agricultural grassland to the south and west of the application site will alter the landscape character and disturb flora and fauna that have colonised these areas.

ii. Removal of silt ponds will have resulted in the loss of wetland habitat which may support wintering birds and breeding birds during the summer periods but Mr Goodwillie did not register this in his report

iii. Placement and compaction of inert soils in close proximity to hedgerows may temporarily and locally reduce potential foraging and shelter habitat for both mammals and birds.

iv. The removal of partially restored grasslands as restoration works proceed, will result in the temporary loss of mostly poor habitat that is presently colonised by flora and fauna.

v. Reductions in potential foraging habitat for mammals, as areas utilised by them are removed and filled as part of the proposed site restoration works.

vi. The creation of berms for mitigation purposes would lead to increased foraging and nesting habitats for common species of song bird as these berms began to be recolonised by flora.

vii. As backfilling works are completed, the site will be progressively restored to agricultural pasture lands. This will be in keeping with the surrounding area which is composed predominately of improved agricultural land. This process will result in the former sand and gravel quarry being returned to its original land use.

4.3.3.2 Indirect Impacts

Dust deposition could occur as an indirect impact of the placement, spreading and compaction of the naturally occurring inert materials. This could potentially have a negative impact on flora in the area if foliage were to become covered in excessive levels of dust,

potentially reducing the amount of photosynthesis taking place. With adequate management and mitigation through the applicants Environmental Management System the likely impacts of this will be minor.

During the filling process the site is likely to be covered by open vegetation similar to what occurs today on the south-western side. This will support an invertebrate fauna which will in turn allow feeding by sand martins and swallows.

Continuing extraction on the scale envisaged will not have any ecological effect on the habitat.

Restoration work will eventually remove suitable banks for nesting by the sand martins (and peregrines) but the species are flexible and will colonise new quarries as they become available.

The eventual restoration of the site will be to agricultural land suitable for grass or tillage crops.

4.4 CONCLUSION

The impact of inert waste disposal on this site will be considerable in local terms but will resemble the extraction process in the habitats it creates. It will not result in any loss of heritage values in the locality or, more widely, in the Natura 2000 network of protected sites.

The simultaneous small scale extraction will have no significant ecological effect except that it may give temporary nesting sites for sand martins.

SECTION 5 SOILS AND GEOLOGY

5.1 Introduction

This section of the EIS describes the geological setting in both a local and regional context. It provides an assessment of the impact of the proposed restoration of a quarry on the geological features of the area. IE Consulting were engaged by Kildare Architects and Design Ltd., to assess the geological impacts relating to the retention of the existing quarry and proposed infilling and restoration of a sand and gravel pit using inert Construction and Demolition (C&D) waste (mainly soil and stone) at Boherkill Quarry, Rathangan, Co Kildare. The proposal to restore the quarry in this fashion is technically classified as recovery of waste through deposition on land. The large volume of imported inert soil and stone required to complete this task (>100,000 tonnes) requires a Waste Licence Application to be submitted to the Environmental Protection Agency, together with a supporting Environmental impact Statement. IE Consulting has prepared this geological impact assessment in accordance with guidelines on Geology in Environmental Impact Statements issued by the Institute of Geologists in Ireland (2013).
Both the geology and soils play an important part in determining the environmental characteristics of a region. The underlying geology has a major influence on landform and rocks providing the parent material from which soils are created. The nature of the rock determines not only the nature and chemistry of the soil formed, but also the rate at which it

forms. This in turn strongly affects the natural vegetation and the type of agriculture or horticulture that can be sustained. The geological materials also have a strong influence on the physio- chemical characteristics of both surface water and groundwater

5.2 Receiving Environment

5.2.1 Site location

Kildare Sand & Gravel is located at Boherkill on the R401 Kildare/Rathangan road (*Drawing No. IE1105-001-A, Appendix A*). The site is approximately 3 km south west of the small town of Rathangan. Operations at the facility involve the extraction of sand and gravel for supply to the construction market. The process involves the extraction of material from the western boundary of the facility. The material is then transported to the screening and washing plant, at the southern boundary of the facility, close to the entrance gate (*Drawing No. IE1105-001-A, Appendix A*). The mobile screening plant is positioned at a lower elevation relative to the road, neighbouring lands and local dwellings. The strategic positioning of the plant helps dampen dust and noise levels by utilising the quarry embankments. Land usage around the facility is mainly agricultural tillage land. All materials washed and segregated are stored within and around the processing area.

The site is surrounded by lands which are primarily used for agricultural activities. According to the EPA Corine Land use Map 2012, land use in the area has been classified as 'Pastures and non-irrigated land`.

There are three residences located within a 500 m radius of the site along the public roads; as one-off rural dwellings and also associated with farm holdings. The closest residential property is located along the public road immediately north west of the site.

5.3 Baseline Environmental Study

5.3.1 Outline of the Environmental Baseline Study

Available geological maps, surveys, literature and reports relating to the site and the locality were examined as part of the baseline desk study.

5.3.2 Baseline Study Methodology

5.3.2.1 Geological Study

No fieldwork other than a site walkover was undertaken as part of this geological assessment. The initial evaluation consisted of examination of relevant geological data from the Geological Survey of Ireland and geological references for the area. An area of 7.8 ha has previously been excavated at the site. This excavation has not been backfilled. The extraction scenario proposed for the site comprises 2 years workings of about 100 tonnes per day (approximately five loads per day).

5.3.2.2 Bedrock Geology

Kildare's land surface topography is characterised by glacial deposition. It is mostly underlain by Carboniferous bedrock, which only occasionally reaches the surface (e.g. Carbery Castle), but older rocks underlie the hills on the eastern edge of the county, and the distinctive high

ground in a fault bound inlier (older rocks surrounded by younger rocks) to the north of Kildare town.

Reference to the 1:100,000 scale map of the Geology of Kildare/Wicklow (Sheet 16) (Geological Survey of Ireland, 1994) indicates that the entire quarry site is underlain by the Carboniferous Boston Hill Formation described as a rather uniform, thick successions of nodular diffusely bedded, argillaceous fossiliferous limestones (and their dolomitised equivalents) and subordinate thin shales (*Figure 1, Appendix B*).

According to the GSI online maps, the nearest mapped fault is located approximately 810 m southeast of the site. It is a north-east/south-west trending fault (*Figure 1, Appendix B*).

5.3.2.3 Soils and Subsoils

The Teagasc/EPA soils map (2006) describes the soils underlying the site as deep and shallow well-drained mineral soil derived mainly from calcareous parent material (**BminSW**).

The Subsoil Map describes the overburden material at the site as glacial till, Carboniferous Limestone sand and gravels (**GLs**) (*Figure 2, Appendix B*); the majority of this subsoil cover on the site has now been excavated.

5.3.2.4 Material Requirements

The only material requirements in respect of the proposed restoration scheme are the inert soil, stone and rock to be used in backfilling the existing void and construction site site-won secondary aggregates. Clean, inert soil and stone is likely to be sourced from green field development sites. Intermixed soil, stones EWC Code 170504 and inert construction waste (concrete, tiles block and brick) WC code 170107 will be sourced from re-development sites.

Intermixed soil, stones EWC Code 170504 and inert construction waste (concrete, tiles block and brick) WC code 170107 will be sourced from re-development sites (for a full list of EWC Codes please refer to section 2.3.3 above). An estimate of the material quantities required to complete backfilling of the application site is provided below: -

Material	Quantity (t)	Source
Inert Soil, Rock Stones / Subsoil and inert C&D material	1,408,624	Imported
Topsoil and overburden	91,376	Onsite relocated / stored
Total	1,500,000	

Table 5.1

5.3.2.5 Geohazards

The Boherkill site is underlain by Carboniferous limestones and thin shales. Karst topography is a landscape formed from the dissolution of soluble rocks such as limestone, dolomite, and gypsum. It is characterized by underground drainage systems with sinkholes, dolines, and caves. Reference to the Geological Survey of Ireland karst database indicates that there are no karst landforms located within the site perimeter and in the vicinity of the site. Nevertheless the bedrock underlying the site is limestone and therefore groundwater flow may be karstic to some degree and more so in local zones where purer limestones exist.

Based on the relatively flat to slightly undulating topography and surrounding quaternary geology predominantly comprising glacial tills, the site is unlikely to be susceptible to natural geological hazards such as landslides. There are no raised bogs in the vicinity of the site and no historical landslides are identified in the GSI Geohive Geohazard web map.

The OPW flood database (www.floodmaps.ie) indicates two recurring flood points in the vicinity (within 5 km) of the proposed site both of which correspond to the River Slate. Given the sloping nature of the ground immediately beyond of the site towards the river, the risk of flooding locally is considered low.

The exposed slopes along the former extraction areas within the application site, being relatively steep, are prone to erosion and localised slope instability. The lack of established vegetation covering these slopes may be any indication of on-going erosion. Minor tension cracking, consistent with onset of slope instability, was observed along the perimeter of the site at the time of the site visit.

5.3.2.6 Geological Heritage

The Irish Geological Heritage (IGH) Programme identifies and selects a complete range of sites that represent Ireland's geological heritage under sixteen themes ranging from Karst features to Hydrogeology. The IGH Programme is a partnership between the GSI and the National Parks and Wildlife Service (NPWS) and sites identified as important for conservation are conserved as Natural Heritage Areas (NHA). Datasets are now available online detailing sites of geological heritage. Reference to this database confirms there are no sites of geological heritage within the perimeter of the site boundaries.

According to the GSI, there are two sites of interest located within a 5 km radius of the proposed development. The closest geological heritage site, Dunmurray Hill IGH 2, is located approximately 1.3 km to the southeast of the site (*Figure 5, Appendix B*). This site is designated under the Precambrian to Devonian Palaeontology theme and consists of a forested hillside which is the site of the discovery of Silurian dated graptolite fossils. The Chair of Kildare is located approximately 1.7 km to the southeast of the proposed site (*Figure 5, Appendix B*). This site is also designated under the Precambrian to Devonian theme and consists of an artificial mound on the edge of Grange Hill which is an inlier of Ordovician Rocks. The proposed development is not expected to impact on either of these geological heritage sites.

5.3.2.7 Existing Site Activities

The nature of the existing development is the continued extraction of sand and gravel. The extraction scenario proposed for the site is for 2 - 3 years workings of remaining stocks of 100 tonnes per day (approximately five loads). Currently the excavated area of the site is 7.8 hectares. This existing sand and gravel pit is proposed to be restored on a phased basis, from north to south over 10 years, using imported inert construction and demolition (C&D) waste, mainly soil and stone. The proposed restoration area is proposed to extend to 10.7 hectares.

As shown in *IE Drawing 1105 -002-A*, *Appendix A*, the ancillary site infrastructure includes an office, a toilet, a wheel wash, and a bunded fuel tank. Wastewater from the toilet is discharged to a septic tank (*Drawing No. IE1105-002-A, Appendix A*).

The wash water from the wheel wash facility percolates to ground. Run-off from the aggregate washing area is pumped to the silt lagoon, where it currently overflows to the natural sump in the northern extent of the site and percolates to ground. The lagoons are

cleaned periodically and the settled silt is used as part of the site restoration. The lagoons required dredging at the time of the site visit on 18th November 2015. There is no surface water run-off or discharge from the site.

5.4 Assessment of Impacts

5.4.1 Direct Impacts

Past and future quarrying activities

The nature of the development has involved the removal, storage and placement of soils and subsoils. The impact on the soils is considered to be of a temporary nature as they are stored for reuse directly within the worked out areas as a fundamental part of the proposed site rehabilitation. By its nature, quarrying of the underlying sand and gravel deposits will involve removal of an identified aggregate resource. This has and will result in an *irreversible negative significant impact* on the sand and gravel resource.

Proposed Site Restoration

The nature of the proposed restoration of the site involves the importation and placement of inert soil and stone as backfill in the quarry void. The application site occupies the existing worked-out quarry, from which sands and gravels have been stripped, and as such will have no impact on virgin soils, sands and gravels. As a result of backfilling using inert soils and stones, the reinstatement of the quarry will progress to land suitable for agricultural and forestry, and thus will have a *positive impact*. Consideration had been given to soil and overburden management. For the placement of subsoil and topsoil, the machinery will work from the haulage track or the exposed subsoil surface and away from the reinstated part of the site. Soils will only be handled in dry weather conditions. Soils will not be placed when the moisture content is high, such as after heavy rainfall. Soils will not be moved in unusually dry and windy weather conditions. All temporary storage mounds will have slope angles not greater than 1:1.5 and will be re-vegetated as quickly as possible to avoid soil erosion by air and water.

5.4.2 Indirect Impacts

Past and future quarrying activities

The previous quarry workings have not had an indirect impact on the local or regional geology other than within the area of extraction. There is no evidence that the working of the limestone released contaminants and uncontrolled dust onto the lands.

Proposed Site Restoration

The available site investigation data indicates that the area to be backfilled is underlain by relatively competent sand and gravel strata. The increase in loading applied to these soils (below existing formation level) will not exceed that which existed prior to extraction of sand and gravel. As a consequence, no deep seated failure of temporary slopes is anticipated. Temporary slopes in backfilled soils (above formation level) will be graded at an angle no steeper than 35^0, sufficient to ensure no instability arises. It is envisaged that a stability assessment of side slopes at the application site will be undertaken on an annual basis. In the longer-term, there will be no risk of instability as the restored site will be graded to a relatively

flat, shallow slope. Therefore, restoration of the quarry will have no indirect impact on the local or regional geology, as placement of the inert soil and stone will not instigate slope instability, release contaminants onto the lands and dust from the restoration will be tightly controlled.

5.4.3 The Do Nothing Scenario

The proposal involves the recovery of significant quantities of inert soil and stone through backfilling in the quarry void.
If the application site is not restored completely to former ground level as proposed, and it remains essentially unchanged from its existing layout, it will have the following implications for soil and geology:

- Failure to recover soil and stone for beneficial use of land improvement, specifically reinstatement of a quarry, could result in unnecessary extraction of natural resources and exhaustion of landfill space;
- the reduced soil cover overlying the sand and gravel aquifer will result in a potential risk to groundwater quality;
- there is the potential for continued degradation of existing slopes, leading to possible slope failures;
- the site may be a target for unauthorised disposal / fly-tipping of waste by unscrupulous operators.

Given that a locally important aquifer underlies the site, and the important role soils and subsoil plays in the protection of aquifers, leaving the quarry void unrestored would cause the increased vulnerability of the aquifers caused by the quarry operations to remain.

5.4.4 Interaction with other impacts

There are no negative cumulative impacts on the geological environment identified. The previous quarry development did not involve excavation below the water table and, as such, there is no evidence of a significant physical impact on surface and groundwater.

5.5 Mitigation Measures

5.5.1 Soils

Past and future quarrying activities

Consideration has been given to soil and subsoil management. Topsoil and subsoil stripped to obtain access to the sand and gravel resource under the current operating scenario will either be utilised directly for construction of peripheral screening berms, for progressive restoration, or placed in temporary overburden storage areas for use in future restoration. The storage areas and restoration areas will be vegetated as soon as is possible, to reduce both visual impact and erosion.
Stripping will be carried out in accordance with the principles of good soil handling. These principles are aimed at reducing possible adverse effects such as smearing and compaction of the soil. Measures which are to be incorporated to achieve this aim include:

- Storage of soils within perimeter security / screening embankment of the site. This is to allow the vegetation of these screening embankments as soon as possible.

- Placement of soils directly on completed sections of the quarry face as part of the final quarry face restoration.
- Placement of soils within designated soils and subsoils storage areas. Subsoil material will be placed first and then covered with topsoil. When the mounds have been completed, they will be graded and blended with the existing topography. Vegetation of these mounds will begin as quickly as possible to reduce any erosional effects and to facilitate the transformation into an agricultural utility.
- Within soil stripping areas, topsoil will be stripped with back-actors (excavators) and dumper trucks working from the haulage track.
- For the replacement of subsoil and topsoil, the machinery will work from the haulage track or the exposed subsoil surface and away from the reinstated part of the site.
- Soils will not be handled be handled in wet weather conditions. This decision will be made by experienced personnel.
- Soils will not be stripped or placed when the moisture content is high, i.e. after heavy rainfall. This decision will be made by experienced personnel.
- Soils will not be moved in unusually dry and windy weather conditions.
- All temporary storage mounds will have slope angles not greater than 1:1.5 and will be re-vegetated as quickly as possible to avoid soil erosion by air and water.
- Topsoil shall be stored to a height not exceeding 3 metres to preserve organic constituents.

Provided that stripping, storage and restoration of the soils is carried out in an appropriate manner, the removal of the underlying deposits of sand and gravel should not interfere with the quality of the land for agricultural purposes.

Proposed Site Restoration

In order to minimise the risk of importing and introducing contaminated soil to the site, management systems will be introduced at the application site to establish the source of imported materials in advance and to confirm that they are inert. Inert materials shall be accepted at the site between 08.00 hours and 18.00 hours each workday and 08.00 hours to 13:00 hours on Saturdays. No materials shall be accepted at any other time.

Before waste is accepted at the site, all waste will be confirmed to meet the waste permit conditions, the waste acceptance procedures (WAP) and waste acceptance criteria (WAC as per *Council Decision 2003/33 of 19, December 2002 establishing criteria for the acceptance of waste at landfills*). WAC classification documentation will be produced and recorded for each load accepted. Characterisation testing will be required to undertaken in advance by Clients and/or Contractors forwarding soil to the application site. Any topsoil which is imported onto the site will have been chemically analysed and screened against generic screening values for a commercial end use to ensure that it does not pose a risk to human health. In addition multiple level soil testing regimes will be established at the site and will include;

- Frequent (1 in every 200 loads) compliance testing covering a limited range of key soil parameters and
- comprehensive on-site verification, comprising visual inspection and record of all imported soil unloading at the site by a competent person.

All inert soils imported to the site shall be unloaded from trucks at the active backfilling face. It will be visually inspected by site personnel at that point to ensure that there is no intermixed non-hazardous or hazardous waste placed within it. If any concern exists about the nature of the waste it will be segregated, re-loaded onto the truck and directed to the waste inspection and quarantine area for closer inspection and classification. A detailed record will be kept of all such inspections. In the event that inspections and/or subsequent testing indicate that the materials are non-inert and cannot be accepted and used for restoration purpose at this site, they will be placed in skips and covered pending removal off-site by permitted waste collectors to a suitably licenced/permitted waste disposal or recovery facility.
All waste tonnages will be recorded in daily report sheets and the reports will be completed on the waste acceptance. If the tonnage is not known by the haulier, the tonnage will be estimated based on the load capacity of the tipper truck. The tonnage may be verified by estimating the volume of the material and multiplying the volume by 1.5 specific gravity. Weighbridge dockets will be used when available depending on where the waste had been removed from. There must be a weighbridge at the point of waste generation or weighed at a weighbridge along the haulage route and annual returns will be made to the EPA by means of an Annual Environmental Report (AER).
During backfilling, all temporary surfaces will be graded to facilitate overground run-off of surface water, thereby minimising the volume of rainfall percolating through the backfilled soil. This will further reduce any residual risks of potential contaminants leaching into the soil and groundwater. In order to confirm that there are no residual risks to soil or groundwater, monitoring of groundwater should commence for the duration of the restoration works and for a short aftercare period.
On-going slope stability assessments will be undertaken on an annual basis during proposed site restoration activities and on-going quarrying activities.
The importation of soils and material can influence the chemical composition of underlying groundwater. This is primarily through potential changes to the pH - e.g. by importing base-rich mineral soil to a primarily acidic catchment. Any alteration of the chemical composition as a result of improper placement of soil would result in a direct *negative short-term moderate impact* on the underlying groundwater. This is unlikely to occur however as imported material will be from the Kildare hinterland and is likely to be similar in composition to the existing soil. In order to reduce the risk of localised erosion and potential dust emissions at soil slopes during the restoration works, the area of bare or exposed soils will, insofar as practicable, be kept to a minimum. Consideration could be given to establishing temporary vegetation cover over such slope pending final backfilling and restoration to original ground level.

In order to maximise the future agricultural potential of the restored land, a minimum 150 mm thick layer of topsoil and 850 mm thick layer of subsoil will be placed over the backfilled clayey mineral soils. The final landform will also be graded so as to facilitate over-ground run-off of surface water and avoid ponding of surface water in closed depressions.

5.5.2 Quaternary Geology

The quarrying of sands and gravels to produce aggregates, by definition, has and will involve the excavation and removal of the Quaternary deposits. There is, therefore, an impact on the local geological environment that is confined to the Quaternary geology within the designated extraction area.

Whilst the material cannot be replaced, the extraction of these deposits will offer an opportunity for future geological study of these Quaternary deposits that may lead to a better understanding of past geological processes on a local and a regional scale.
The final land restoration scheme will ultimately allow the site to be returned to a condition whereby there will be negligible residual impact on the surrounding environment following the removal of sand and gravel within the pit. It is planned to minimise, eliminate or decrease long-term ecological and visual impacts on the environment through the implementation of the final restoration scheme.

5.5.3 Bedrock Geology

Sand and Gravel quarrying has already occurred within the planning application area, and, as such, there has been an irreversible impact on the Carboniferous bedrock geology as a result of the development.

5.6 Conclusions

Any potential and existing risks to soils and geology from the proposed restoration works in this location will be minimised/prevented through the adherence to the proposed mitigation measures detailed in *Section 5.5.*

Section 6.0 Water

6.1 Introduction

IE Consulting were engaged by Kildare Architects and Design Ltd., to assess hydrogeological impacts relating to the proposed infilling and restoration of a sand and gravel pit using inert Construction and Demolition (C&D) waste, mainly soil and stone, at Boherkill, Rathangan, Co Kildare. The proposal to restore the quarry in this fashion is technically classified as recovery of waste through deposition on land. The large volume of imported inert soil and stone required to complete this task requires a Waste Licence Application to be submitted to the Environmental Protection Agency, together with a supporting Environmental impact Statement.

This assessment has been undertaken as a desk based study as part of the Water Section of an Environmental Impact Statement (EIS), which will be submitted with a waste licence application and incorporates available background information and site-specific information.

6.2 Scope of the works

The scope of works for the assessment undertaken comprised the following:

- Desk Study
  - Collation of existing regional information regarding the geology, hydrology and hydrogeology of the site and surrounding area;
  - Review of available site information.
- Field Work

- Site walkover conducted by IE Consulting on 18th November 2015 to review site water management practices;

- Reporting
  - Preparation of a hydrogeological report.

Reference was made to the following documents:

- Department of the Environment, Heritage and Local Government (2004) "*Quarries and Ancillary Activities – Guidelines for Planning Authorities*".
- Environmental Protection Agency (2006) "*Environmental Management in the Extractive Industry (Non-scheduled minerals)*".
- Environmental Protection Agency (1992) "*BATNEEC Guidance Notes for the Extraction of Minerals*".
- Institute of Geologists of Ireland (2007) "*Recommended Collection, Presentation and Interpretation of Geological Hydrogeological Information for Quarry Development*".
- Waste Management (Facility and Registration) Regulations 2007 (S.I. No. 821 of 2007).
- Waste Management (Facility and Registration) Amendment Regulations 2008 (S.I. No. 86 of 2008).
- Institute of Geologists of Ireland (2013) "*Guidelines in the Preparation of the Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements".*

As part of the desk study assessment, the following organisations were consulted for information pertaining to the site hydrology and hydrogeology e.g., databases, studies, etc.:

- Geological Survey of Ireland;
- National Parks and Wildlife Service;
- Environmental Protection Agency;
- Met Éireann;
- Teagasc.

The primary objective of the hydrogeological assessment is to assess the impact posed to surface water and groundwater by the on-going extraction at the quarry pit and the proposed waste recovery of inert material and by the infilling and restoration of the existing quarry void using inert waste. Where appropriate, mitigation measures are recommended.

6.3 Site location

The Kildare Sand & Gravel quarry is located at Boherkill on the R4011 Kildare/Rathangan road. The site is approximately 3 km south west of the small town of Rathangan (*Drawing No. IE1105-001-A, Appendix A*). Operations at the facility involve the extraction of sand and gravel for supply to the construction market. The process involves the extraction of material from the western boundary of the facility. The material is then transported to the screeners, south of the facility, close to the entrance gate. The screeners are positioned at a lower elevation relative to the road, neighbouring lands and local dwellings. The strategic positioning of the plant helps dampen dust and noise levels by utilising the quarry embankments. Land usage around the

facility is mainly agricultural tillage land. All materials washed and segregated are stored within and around the processing area.

The site is surrounded by lands which are primarily used for agricultural activities. According to the EPA Corine Land use Map 2012, land use in the area has been classified as 'Pastures and non-irrigated land`.

There are a number of residences in the vicinity of the site located along the public roads; as one-off rural dwellings and also associated with farm holdings. The closest residential property is located along the public road immediately northwest of the site.

6.4 Existing Site Activities

The nature of the development is the continued extraction of sand and gravel. The extraction scenario on site is that there is sufficient reserves to allow approximately 2 - 3 years workings of about 100 tonnes per day (approximately five loads) from the site. Currently the excavated site area is 7.8 hectares. The worked out sand and gravel pit is proposed to be restored on a phased basis, from north to south over 10 years, using imported inert construction and demolition (C&D) waste, mainly soil and stone. The proposed restoration area extends to 10.7 hectares.

As shown on *Drawing IE1105-002-A*, *Appendix A* the site infrastructure includes an office, a toilet, a wheel wash, and a 2,000L bunded fuel tank. Wastewater from the toilet is discharged to a septic tank. The washwater from the wheel wash facility percolates to ground. The settlement lagoon is cleaned periodically and the settled silt is used as part of the site restoration. This lagoon required dredging at the time of the site visit on 18th November 2015. Coagulants used in the washing process are supplied by Abbeywater. The product name is Polygold Anionic/Non-Ionic Powders. It is used as a flocculation agent. According to the Safety Data Sheet supplied by Abbeywater (Appendix A) the product is not classified as hazardous to health or the environment in accordance with the classification according to EC Regulation (EC) NO. 1272/2008 (classification, labelling and packaging of substances and mixtures). There is no surface water run-off or discharge from the site.

6.5 Topography

In a regional setting, the site is located at the foothills of Dunmurry Hill and Red Hill, on lands sloping gently towards the west. According to the 1 in 50,000 Discovery Series Map, the nearest topographical high is located approximately 1.5 km to the south at Dunmurry Hill (elevation of 223 mAOD), whilst the next nearest is located approximately 2.6 km to the south at Red Hill (elevation of 197 mAOD, *Drawing IE1105-001-A, Appendix A*). The site is set on land slightly elevated above Rathangan and the flat lands to the west, and at the foothills of Dunmurry Hill and Red Hill. The land slopes to the northwest towards the Slate River.

6.6 Meteorology and Water Balance

Rainfall data for the area was obtained from Met Éireann. The closest rainfall gauging station to the site is at Naas (Gowran Grange), approximately 18.5 km east of the site. The average annual rainfall (AAR), based on mean monthly rainfall data during the period 1973-1991, was

calculated at 859 mm/yr. However, irrespective of this, for aquifers classed as poor (Pu/Pl) (or locally important (Ll)), there is an upper limit to the amount of recharge that they can accept. When that natural capacity is achieved all subsequent recharge will be rejected. It is recommended that recharge caps of 100 mm/yr should be applied to poor aquifers (and 200 mm/year for locally important aquifers). When the natural recharge capacity is exceeded then rejected recharge occurs and this adds to surface runoff (or interflow) (Hunter-Williams *et al*. 2008).

Long term Potential Evaporation (P.E.) data was obtained for the closest synoptic station at Casement Aerodrome, 16 km east of the quarry. The average P.E. for this synoptic station (based on 1971-1990 average monthly data) is 777 mm/year. The Actual Evaporation (A.E.) is taken to be 0.82 of P.E. Therefore, the A.E. at the quarry is estimated at 637 mm/yr. At the existing quarry, the AE will be much lower due to the absence of significant vegetation cover and therefore the AE is assumed to be approximately 100 mm/yr and therefore potential aquifer recharge at the quarry void is approximately 100 mm/yr (Recharge cap 200 mm/yr – AE 100 mm/yr = 100 mm/yr).

The effective precipitation (EP) is the amount of precipitation that is available to form recharge or runoff. The effective precipitation in the vicinity of the site boundary is estimated as follows:

$$EP = AAR - AE.$$

$$= 200\ mm/yr - 100\ mm/yr$$

$$EP = 100\ mm/yr$$

An average surface water balance for the total application area of 7.8 ha (excavation and restored area) is presented in *Table 3.4.1* below. Water input to the existing quarry comprises rainfall and intercepted recharge. As the excavation is worked above the groundwater table it receives no inflows from groundwater. During extreme storm events some ponding will occur but it will be lost by combined seepage to ground and from open water evaporation. This calculation assumes that site area is bunded so that water ingress from outside of the existing quarry footprint does not enter the quarry area.

Existing Quarry Area (m^2)	Average Annual Rainfall (mm)	Mean Annual Potential Evaporation (mm)	Actual Evaporation (mm)	Effective Annual Precipitation (mm)	Annual Volume of Water Available for Recharge or Runoff (m^3)	Annual Volume of Water Available for Recharge or Runoff (m^3/day)
70,800	859	777	100	100	7,080	19.4

Table 6.1 Mean Water Balance for the Existing Excavation Area and Ancillary Activities Area

All effective precipitation formed within the quarry area recharges into the ground. The existing site water management is discussed in further detail in *Section 3.5.13*.

The hydrogeological controls determining the rate of groundwater recharge as indicated by the Geological Survey of Ireland (GSI) are provided in *Table 6.2* below.

Hydrogeological Controls	
Hydrogeological Setting:	2.ii *(source: GWWG, 2005)*
Hydrogeological Setting Description:	High permeability subsoils, sands and gravels overlain by well drained soils
Soil Drainage:	DRY
Subsoil Type:	GLPSsS
Subsoil Description:	Glaciofluvial sands and gravels
Subsoil Permeability:	H
Subsoil Permeability Description:	High
GW Vulnerability:	H
GW Vulnerability Description:	High
Aquifer Category:	LI
Aquifer Category Description:	Locally Important Aquifer – Bedrock which is moderately productive only in local zones
Recharge Coefficient (%):	85
Maximum Recharge Capacity (mm/yr):	100
Average Recharge (mm/yr):	491 (maximum recharge 200 mm as there is a recharge cap in place)

Table 6.2 Hydrogeological Control Determining Groundwater Recharge for the site

6.7 Hydrology

In a regional context, the site is situated in the South Eastern River Basin District (SERBD) within the Barrow River catchment.

The major surface water feature in the vicinity of the site is the River Slate, approximately 3 km north of the site. The River Slate flows in a westerly direction discharging into the Figile River approximately 9 km west of the site.

Aside from the River Slate there is one small unnamed stream approximately 2.3 km to the west of the site, which flows northwards discharging to the River Slate.

The Environmental Protection Agency (EPA) monitors the biological quality of rivers and other water bodies on an on-going basis. They use an assessment scale known as a Q-Value where Q1 indicates gross pollution and Q5 indicates pristine conditions (Toner et al., 2005). These values are based on the communities of macroinvertebrates in a stream as different species display varying sensitivities to pollution. The nearest monitoring station on the Slate is just east of Rathangan. Ecological water quality was most recently assessed here (2004-present) as Q3-Q4 which is Moderate Status (slightly polluted). The nearest station west of Rathangan also registers as Q3-Q4. Overall, for the 2010-2012 reporting period, the Water Framework Directive (WFD) status of the River Slate in this region is assessed as ‘moderate’ upstream of Rathangan and “good” downstream of Rathangan.

6.8 Geological Setting

6.8.1 Bedrock Geology

The rock units within c.1 km of the site were identified from the 1:100,000 scale map of the Geology of Kildare-Wicklow: Sheet 16 (GSI 1994) and online mapping (GSI 2015). The rocks belong to the Boston Hill Formation which comprises rather uniform, thick successions of nodular and diffusely bedded, argillaceous Fossiliferous limestones (and their dolomitized equivalents) and subordinate thin shales.

6.9 Soils and Sub-Soils

6.9.1 Regional Data

The Teagasc/EPA soils map (2006) describes the soils underlying the majority of the site as BminSW described as mainly derived from calcareous material.

The Teagasc/GSI ERBD Subsoil Map (*Figure 2, Appendix B*) describes the natural subsoil material at the site as Carboniferous Sands and gravels (GLs); the majority of this subsoil cover has been excavated at the site to date.

6.10 Depth to Bedrock

The groundwater vulnerability map (*Figure 4, Appendix B*) suggest that the depth to bedrock within the area of investigation is >3 m below ground level. This is based on a High (H) vulnerability classification and high permeability subsoil (DoELG/EPA/GSI 1999). As the subsoil has been excavated at the site the groundwater vulnerability is revised to Extreme (E & X)

6.11 Hydrogeological Setting

6.11.1 Aquifer Classification

The rock underlying the northern and principal area of the site is mapped as part of the Kildare groundwater body (GWB) and classified as a **locally important aquifer -** bedrock which is moderately productive only in local zones (*Figure 3, Appendix B*).

The key characteristics of the Kildare groundwater body have been identified as follows:

- This aquifer is located northwest of Kildare town. The area is defined by the SERBD - ERBD boundary to the northeast and elsewhere by the extent of the Waulsortian and Boston Hill formations.
- This GWB is considered to comprise local or poor aquifers. Nevertheless the lithologies are limestone and therefore groundwater flow may be karstic to some degree and more so in local zones where purer limestones exist. This implies the groundwater flow may be fast if concentrated in conduits along openings in the rock e.g. fractures and faults.
- The main recharge mechanisms for this groundwater body are from areas exposed to the surface where subsoil is thin and also from surrounding groundwater bodies. The

topography and surface drainage show flow from the Bagenalstown GWB into this GWB. It is also likely that some karstic conduits may also carry flow across the geological boundary where structural fractures are more important than lithology in determining groundwater flow.

- Discharge from this groundwater body will be to the associated surface water bodies and also, in local zones, to adjacent groundwater bodies. Discharge may be in the form of karstic springs, which then flow into nearby rivers.
- The interaction between surface water and groundwater will differ throughout the area depending largely on the overlying strata type. In areas of outcrop the surface water and groundwater will be very closely linked at streams etc. Where there are areas of till covering the bedrock the interactions may be more subdued depending on the thickness of the over burden. In areas where there are deposits of peat this may completely seal off the surface water from the groundwater. Where the gravel aquifers occur there will be little or no interaction between the bedrock groundwater and the surface water bodies
- There are numerous hydrogeological settings in the area due to the variation in the following:
    - Subsoil (Bog, till, outcrop and major gravel aquifers)
    - The degree of structural deformation (from intense faulting in the area of Allenwood to little or none in the south)
    - The variety of rock type and hence aquifer types.

Such variations make broad statements fallible and individual site investigation will be essential to understanding any given location of interest. The majority of groundwater flow in this area is considered to take place in the upper weathered zone of the aquifer.

6.11.2 Karst Features

Reference to the Geological Survey of Ireland karst database indicates that there are no karst landforms located within the vicinity of the site. No karst features have been mapped within the site perimeter. Nevertheless the bedrock underlying the site is limestone and therefore groundwater flow may be karstic to some degree and more so in local zones where purer limestones exist.

6.11.3 Groundwater Abstractions

A well survey was not carried out as part of this assessment. Three nearby disused wells were audited as part of this investigation on the 18th November 2015. Two of these were stoned lined wells (Well 2 and Well 1). Well 4 appeared to have been a stone lined well similar to the wells 1 and 2, but was subsequently modified with a concrete lining to the base. Summary details for the wells are tabulated below. Wells 2 and 4 are located south of the site and were both dry. Well 1 is located north of the site and the static water level in this well was 18.38 mbgl (*Drawing IE1105-003-A, Appendix A*).

Reference to the Geological Survey of Ireland (GSI) well database indicates the nearest recorded groundwater supply is the Monasterevin/Rathangan public supply, approximately 1.3 km to the east of the site (*Figure 5, Appendix B*). The database also a number of groundwater supplies within a 2 km radius of the site (*Drawing No. IE1105-004-A, Appendix A*).

Well	Well Type	Depth (m)	Approximate Ordnance Datum (m AOD)	Water depth (mbgl)	Approximate Reduced Levels (m AOD)	Usage	Distance from site
Well 1	Hand dug – stone lined	14	90	18.38	76.62	Disused	Approximately 0.1 km to S
Well 2	Hand dug – stone lined	21.6	105	DRY >21.6	>83.4	Disused	Approximately 0.37 km to SW
Well 4	Hand dug – stone lined, modified	23.6	105	DRY >23.6	>81.4	Disused	Approximately 0.9 km to N

Table 6.3 well audit summary

6.11.4 Groundwater levels and flow direction

The water table appears to be deep in the vicinity of the site. Static (non-pumping) groundwater levels in the nearby disused wells, were measured on the 18th November 2015 in an effort to establish groundwater flow direction, and are shown in *Table 3.4.3* above.
It is anticipated that the groundwater gradient is likely to reflect the surrounding topography with groundwater discharging to the local streams and rivers. Based on the topography and surface water drainage, groundwater infiltrating from the higher ground to the south of the site flows in the vicinity towards the Slate River to the northwest.

6.11.5 Groundwater vulnerability

Groundwater vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities. Where the subsoil thickness is <3 m, the vulnerability is rated as Extreme (the highest risk situation). Where the subsoil thickness is >3 m, the vulnerability is rated as High, Moderate or Low (depending on the nature and thickness of the subsoil).
The groundwater vulnerability map (*Figure 4, Appendix B*) suggests that the depth to bedrock within the area on investigation is >3 m below ground level. This is based on a High (H) vulnerability classification and high permeability subsoil (DoELG/EPA/GSI, 1999).
The DoELG / EPA / GSI has developed a scheme (Groundwater Protection Response Matrix for Landfills) to assessing potential landfill sites on the basis of groundwater vulnerability and aquifer status. However, it should be noted that this scheme has largely been developed for new non-hazardous landfills (i.e. receiving a 'traditional' waste stream of municipal solid

wastes, and commercial and industrial wastes). It is therefore not a directly applicable tool for assessment of inert soil recovery facilities such as proposed at Boherkill. Notwithstanding this, a review of the Groundwater Vulnerability Map (*Figure 4, Appendix B*) and the Aquifer Map (*Figure 3, Appendix B*) in accordance with the DoELG / EPA / GSI methodology indicates that the Boherkill site is located within an area of High vulnerability and a Locally Important Bedrock Aquifer. Due to the removal of subsoil over the current worked area the vulnerability classification is revised to Extreme. These classifications have been compared against the matrix for non-hazardous landfills; which indicates that the site setting falls within a response category of R2[1], which is described as being 'acceptable subject to guidance in the EPA Landfill Design Manual or conditions of a waste licence' and R2[2] also `acceptable subject to guidance outlined in the EPA Landfill Design Manual or conditions of a waste licence`.
The proposed backfilling of the existing quarry with inert C & D including predominantly cohesive inert glacial till can provide an enhanced degree of protection, over and above that which exists at present. Given the limited risk to groundwater associated with the placement and compaction of inert soil compared to those presented by non-hazardous landfills, it is considered that the site setting is appropriate for an inert soil recovery facility.

6.11.6 Groundwater Quality

Under the Water Framework Directive (Directive 2000/60/EC) groundwater bodies and surface water bodies were assigned a status rating (Bad – Poor – Moderate – Good – High) based on chemical and ecological status. The Kildare Groundwater Body is classified as "Good" status.

6.12 Conceptual Model of the Aquifer

The current understanding of the hydrogeological setting is described below.

An estimated 859 mm/yr effective rainfall is available for recharge or runoff in the vicinity of the site. However, Ll Aquifers, such as the aquifer beneath the majority of the site, are not considered to be capable of accepting all the recharge that may be available due to the limited capacity of the bedrock to both store and transmit the infiltrated water. Therefore, a maximum 25% of effective rainfall is considered to contribute to groundwater recharge in the bedrock (200 mm/yr).

The majority of groundwater in this aquifer type would be considered to flow in the upper 10 m – 15 m of the weathered and fractured bedrock, with groundwater flow through occasional interconnected fractures or faults at depths below this. However the well survey conducted indicated that the water table is at a greater depth in this area. There were no logs available for these wells.

The water table appears to be deep (>18 mbgl) in the vicinity of the site.

Topography indicates that the groundwater flow direction is to the northwest, where it discharges to the Slate River as baseflow.

The vulnerability of groundwater beneath the site is classified as High (H) and the subsoil permeability is also mapped as High. However, most of the natural subsoil has been excavated at the site which will increase the vulnerability category to Extreme.

6.13 Site Water Management

The locations of the site water management components are presented in Appendix 3.4.2. The water supply for the site is sourced from the mains where it is utilised for the wheel wash, washing of the excavated material and for dust suppression on the site. All wheel wash water either evaporates from the surface or percolates to ground. Any excess water from the circulation system is pumped to the settlement lagoon on the western perimeter of the site. Currently this lagoon is un-dredged and water pumped to it flows over the top of the accumulated silt and flows by gravity to the natural sump at the northern perimeter of the site. This sump allows the silt to collect and settle. The water then percolates to ground. There is an existing septic tank system off site for the treatment of wastewater.

Water management within the site can be divided into the components summarised in *Table 6.4* below.

Component	Description
Direct Input	*Effective precipitation falling onto the site within the site boundary. *Pumped supply from the mains supply.
Uses	*Toilet and canteen facilities. *Dust suppression. *Aggregate washing. *Operation of restoration of site.
Outputs	*Evaporation from lagoon, natural sump, existing pit floor and restored areas. *Seepage to ground through existing pit floor, restored and unrestored areas of site. *Seepage through base and sides of site lagoons. *Discharge to ground via off-site septic tank and percolation area.

Table 6.4 Summary of Site Water Management Components

6.13.1 Surface Water Runoff – Treatment and Discharge

The screener used on-site includes, a process water treatment plant which recycles all silt laden water from the screening process. The use of coagulants and settlement tanks ensure that clean recycled water is put back into the process so as to maximise efficiencies and reduce the water demand of the site. Processed waters, that are not recycled, are pumped to the settlement pond located on the eastern boundary. Following silt settlement the clean water percolates to ground. The use of both the process water treatment plant and settlement pond ensures mitigation measures are taken to protect ground and surface waters.

6.14 Risk Assessment

6.14.1 Introduction

The concepts of Risk, Risk Assessment and Risk Management have become important tools in the area of environmental protection. The philosophical basis and language of risk is useful in that it provides a logical framework for considering the impact of potentially polluting activities on the environment.

This framework enables a more rigorous systematic approach to decision making. In reality it is putting a recognised framework to what is done intuitively, but by being systematic. In addition, it is an aid in conceptualising the potential impact of the discharge of effluent on the wider environment.

A **hazard** (**source**) presents a risk when it is likely to affect something of value (the **target/receptor**), which in this case is groundwater and/or surface water, which in turn may impact on humans. It is the probability of the hazard occurring and its consequences that is the basis of Risk Assessment.

The conventional Source-Pathway-Receptor model for environmental management can be applied to identify potential sources, receptors and pathways, and hence potential pollutant linkages relating to the site.

For a particular contaminant to present a risk to receptors, three components must be present:

Source An entity or action that releases contaminants into the environment

Pathway A mechanism by which receptors can become exposed to contaminants

Receptors The human or ecological component at risk of experiencing an adverse response following exposure to a contaminant

The qualitative risk assessment presented in *Tables 6.5* below is based on the hydrogeological and hydrological information collected to date in relation to the site, and incorporated into previous sections of this report.

6.14.2 Sources

The potential sources of groundwater/surface water contamination that are associated with the existing site activities are presented in *Table 6.5* below.

Contaminant	Associated Activities
Hydrocarbons Diesel Fuel Oils	Refuelling of machinery. Accidental spillages. Machinery maintenance/repair.
Silt	Arising from backfill material placed into the quarry. Aggregate washing.
Low permeability inert backfill material	Infilling former high permeability material with low permeability inert fill material could create a low permeability zone altering groundwater recharge. Reduction in recharge due to the potentially low permeability inert infill material.

Table 6.5 Potential Site Contamination Sources

6.14.3 Pathway

The pathways into the groundwater and surface water and the likelihood of the occurrence of potential groundwater contamination associated with a particular pathway, are presented in *Table 6.6* below.

Pathway	Description
Infiltration through quarry floor	Infiltration of rainfall in quarry excavation area through subsoils. Infiltration of rainfall through backfilled area. Infiltrations of rainfall through underlying bedrock. Infiltration to ground after water has passed through the silt lagoon.
Surface water drainage	After surface water has passed through the lagoon, surface water run-off from the site overflows to the natural sump and percolates to ground. Runoff from compacted hardcore areas. Runoff from the site wheelwash. Runoff from stockpiled topsoil material. Through backfilled material into sub surface drainage system.

Table 6.6 Possible site pathways

6.14.4 Receptors

The potential receptors to contamination sources from the quarry are presented in *Table 6.7* below.

Receptor	Description
Groundwater	Groundwater flow beneath the site. Groundwater users downgradient of the site.
Surface water	There are no surface water bodies on–site or within the vicinity of the site.

Table 6.7 Potential Receptors to Site Contaminants

6.14.5 Source Pathway Receptor Model

A summary of the Source-Pathway-Receptor model for the site, in the absence of mitigation measures in place, is presented in *Table 6.8* below.

Source	Pathway	Receptor	Risk
Hydrocarbons	Infiltration to ground.	Groundwater beneath site.	HIGH due to groundwater vulnerability.
	Direct pathway from base of recovery/restoration areas.		HIGH during periods of seasonally high water table where mitigation measured not adhered to.
Nitrates Faecal Coliforms Chloride etc.	Manure spreading – following infilling land used as agricultural land. Infiltration to ground.	Groundwater beneath the site. Groundwater seepage/upflow.	HIGH where manure application is excessive or applied at inappropriate times of the year.
	Surface water runoff from the site.	Surface waters.	MODERATE where manure application (upon restoration to agricultural land) is excessive or applied at inappropriate times of the year.
Silt	Surface water runoff from the site.	Surface waters.	HIGH where no silt settlement measures are in place.
Unsuitable low permeability inert backfill material	Restoration area.	Groundwater recharge.	HIGH where unsuitable (very low permeability) inert backfill material is placed at base of restoration area.
Slope Instability	Exposed slopes.		Slope instability was noted during the site visit and during proposed concurrent site restoration activities and on-going quarry operations the risk is HIGH of slope failure.

Table 6.8 Qualitative Risk Assessment

6.15 Potential Impacts

6.15.1 Surface Water

There are no surface water bodies on-site or within the vicinity of the site.

6.15.2 Groundwater

The continued operation of the quarry site and the proposed recovery facility has the potential to impact on groundwater in terms of both the groundwater quality and the groundwater flow regime.

Infilling former high permeability material with low permeability inert fill material could create a low permeability zone altering groundwater recharge.

Possible groundwater mounding/flooding could occur if the fill acts as a barrier to normal groundwater flow patterns. However this is thought unlikely as the groundwater table appears deep in the vicinity of the site and the site has been worked dry to date. In the event of any mounding since the permeability of the surrounding subsoil is mapped as high it is anticipated that recharge will flow freely around the restored site and it is unlikely to cause significant mounding/flooding. In addition, the size of the filled area will be significantly less than the overall width of the aquifer in this location therefore the fill does not have the potential to entirely impede the normal groundwater flow patterns of the aquifer as groundwater flow will still be occurring around the site. Immediately downgradient of this potential flow diversion there is a possibility of lowering groundwater levels before the normal groundwater flow patterns converge again. Groundwater flow path diversion is expected to result in a *neutral permanent slight long-term impact* on the groundwater flow.

The importation of soils and material can influence the chemical composition of underlying groundwater. This is primarily through potential changes to the pH - e.g. by importing base-rich mineral soil to a primarily acidic catchment. Any alteration of the chemical composition as a result of improper placement of soil would result in a direct *negative short-term moderate impact* on the underlying groundwater. This is unlikely to occur however as imported material will be from the Kildare hinterland and is likely to be similar in composition to the existing soil.

6.15.3 Hydrocarbon Leakage / Spillage

Possible contamination of soil and subsoil, by leakage or spillage from machinery and associated equipment, may occur during the construction phase. Any accidental hydrocarbon spillage would have a *negative short-medium term moderate impact* on groundwater quality at the site.

6.15.4 Soil Removal

Any removal of soils will temporarily increase the groundwater vulnerability during construction. This would have a *negative short-term moderate impact* on the groundwater.

6.15.5 Bedrock

It is not expected that bedrock will be exposed during the majority of the development works. Any soil excavations that expose the underlying bedrock to the atmosphere can result in weathering of the bedrock, which is considered to be a *slight negative long-term moderate impact.*

The impact associated with the removal of weathered bedrock is considered to be a *neutral permanent impact.*

Possible contamination of bedrock, by leakage or spillage from machinery and associated equipment, may occur during the construction phases. Leakages or spillages associated with any temporary waste water facilities would have a *negative short-term moderate impact* on groundwater quality.

The implementation of mitigations measures specified in *Section 3.4.16* will reduce the overall risk of groundwater contamination beneath, and downgradient of, the quarry in addition to reducing the risk of altering the groundwater recharge beneath the site during the restoration works at the quarry.

6.15.6 Slope Stability

The available site investigation data indicates that the area to be backfilled is underlain by relatively competent sand and gravel strata. The increase in loading applied to these soils (below existing formation level) will not exceed that which existed prior to extraction of sand and gravel. As a consequence, no deep seated failure of temporary slopes is anticipated. Temporary slopes in backfilled soils (above formation level) will be graded at an angle no steeper than 35^0, sufficient to ensure no instability arises. It is envisaged that a stability assessment of side slopes at the application site will be undertaken on an annual basis. In the longer-term, there will be no risk of instability as the restored site will be graded to a relatively flat, shallow slope.

6.16 Mitigation Measures

6.16.1 Overview

In order to reduce the impact of the existing site activities and proposed restoration works on groundwater and surface water receptors, the following are proposed details of measures/procedures to be implemented at the site in order to ensure that the source and/or the pathway is removed. In this way, the potential risk for groundwater/surface water contamination and groundwater flow regime alteration at the site is minimised.

Many of these recommendations are in accordance with the publication "*Environmental Management Guidelines – Environmental Management in the Extractive Industry (Non-scheduled Minerals)*" (EPA, 2006).

The most effective means by which to implement the proposed measures is to condition the mitigation measures as part of permission for the waste licence at the site. The most effective mitigations measures for the site are:

- Containment of site fuels and oils, to prevent any accidental spillages which may migrate to the subsoils and underlying groundwater;

- Wherever possible a traffic management system would be put in place to reduce the potential conflicts between vehicles, thereby reducing the risk of a collision;

- A site speed limit would be enforced to further reduce the likelihood and significance of collisions;
- Refuelling of vehicles would either be undertaken in a surfaced compound area from a fuel tank(s) that is bunded or be undertaken off-site to minimise the risk of uncontrolled release of polluting liquids/liquors;
- A double skinned mobile fuel bowser is used to refuel plant and machinery. Spill trays and spill kits will be provided at all times;
- Strict control measures to ensure only suitable material is allowed onto the site, i.e., thorough inspection of waste loads entering the site to confirm inert nature prior to deposition on-site;
- Only granular wastes will be deposited into areas immediately above the groundwater table to prevent the influx of suspended solids into groundwater;
- Maintenance of plant and machinery would be undertaken within a site compound area or offsite, as appropriate, to minimise the risk of uncontrolled release of polluting liquids;
- The specific mitigation measures could be included in an Environmental Management Plan as part of the conditions for the site waste licence.

6.16.2 Surface Water

There are no surface water bodies on-site or within the vicinity of the site.

6.16.3 Groundwater

Only suitably permeable and inert material will be used in the restoration, thereby reducing the potential to create a low permeability zone which could hinder local/ regional groundwater recharge and/or creating an impermeable barrier to groundwater recharge.

Any slurry spreading and/or organic fertiliser spreading on the restored agricultural ground will adhere strictly to the Good Agricultural Regulations S.I. No. 31 of 2014. Appropriate buffer zones will be maintained from all watercourses as stipulated in the Regulations when applying fertiliser and other chemicals to the land.

It is proposed that groundwater monitoring is conducted at the site in order to monitor the groundwater quality.

6.16.4 Settlement Lagoon

The settlement lagoon will be dredged to allow it to operate without overflowing to the natural sump at the northern boundary of the site. Regular dredging will maintain the functional operation of the lagoon.

6.16.5 Stockpiling Area

High absorbency mats, pig tails and drums are to be added/ maintained in the stock-piling areas of the site and in quarry vehicles to clean up any leaks from plant or machinery.

6.16.6 Machinery Maintenance and Repair

No servicing or maintenance of any plant or machinery takes place within the proposed restoration areas. All plant and machinery is driven or tracked to the hardstanding area associated with the site entrance and between the entrance and the wheel wash for service or maintenance works.
High absorbency mats are provided to contain any spills that may occur.

6.16.7 Storage of fuels / chemicals
A double skinned mobile fuel bowser is used to refuel plant and machinery on site. This is due to the fact that the bunded fuel storage tank has been subject to burglary.
Hydrocarbon spill kits and drip trays will be maintained on site. The operator has in place an Emergency Response Procedure for hydrocarbon spills and appropriate training of site staff in its implementation. All waste oils are collected and removed off-site by an approved licensed waste collection contractor in the area.
High absorbency mats are provided to contain any spills that may occur.

6.16.8 Restoration Area

All material to be used for the restoration will be thoroughly inspected to ensure only suitably permeable, inert material is deposited. Soil importation will be monitored by a competent site operative to monitor soil composition in order to avoid any impact on the underlying groundwater.

6.16.9 Water Quality Monitoring

It is proposed that groundwater monitoring be carried out biannually. This is recommended to ensure that the restoration of the site is not impacting on the groundwater beneath the site and to establish on-going trends in any groundwater monitoring boreholes.

6.17 The “Do Nothing” Scenario

The site is currently a large void. To do nothing with the existing site, the worked out quarry would remain a significant visual intrusion, and the range of future land-uses for the site would remain severely restricted. On-going vigilance would also be required to ensure no potential contaminating activities occur on or in the vicinity of the quarry floor.

The proposal involves the recovery of significant quantities of inert soil and stone through backfilling in the quarry void.

To do nothing with the existing site, if the application site is not restored completely to former ground level as proposed, and it remains essentially unchanged from its existing layout; it will have the following implications for soil and geology:

- Failure to recover soil and stone for beneficial use of land improvement, specifically reinstatement of a quarry, could result in unnecessary extraction of natural resources and exhaustion of landfill space;
- the reduced soil cover overlying the sand and gravel aquifer will result in a potential risk to groundwater quality;
- there is the potential for continued degradation of existing slopes, leading to possible slope failures;
- the site may be a target for unauthorised disposal / fly-tipping of waste by unscrupulous operators.

Given that a locally important aquifer underlies the site, and the important role soils and subsoil plays in the protection of aquifers, leaving the quarry void unrestored would cause the increased vulnerability of the aquifers caused by the quarry operations to remain.

6.18 Interaction with other Impacts

There are no negative cumulative impacts on the hydrogeological environment identified. It is considered that there are no significant interactions at the proposed site between groundwater and surface water, as the local river, the River Slate, is located 3 km to the north of the site. The previous quarry development did not involve excavation below the water table and, as such, there is no evidence of a significant physical impact on groundwater.

6.19 Conclusions

There are no surface water bodies directly connected to the proposed site area. The proposed development will not discharge directly to any water bodies and will therefore have no significant impact on the water quality or hydrology of the surrounding area. The evidence to date indicates that the groundwater level is deep in this area (> 18 m bgl). It is recommended that groundwater monitoring is commenced for the duration of the restoration works and for a short aftercare period.

Any potential and existing risks to groundwater and surface water from the proposed restoration works in this location will be minimised/ prevented through the adherence to the proposed mitigation measures detailed in *Section 6.16*

SECTION 7: Air Quality

7.1 Introduction and Summary

Odour Monitoring Ireland was commissioned by Raphael McEvoy of RME Environmental to perform an air quality survey and to develop an air quality chapter in order to assess the potential impact to air quality from the proposed remediation of the operational Boherkill Quarry located in Boherkill, Rathangan, Co. Kildare. This study will identify, describe and assess the impact of the development in terms of its impact on air quality.

The Air Quality and Climate assessment has been carried out in line with all relevant guidelines. The proposed remediation plan has been designed to ensure that there are no significant adverse effects on air quality. This is demonstrated through the air assessment study, which establishes that no International or Irish air quality standards or guidelines are forecast to be exceeded.

A Construction Environmental Management Plan (CEMP) will incorporate best practice measures in order to minimise dust at the construction / remediation phase. During the operational phase emissions to air from the facility will be regulated in accordance with specific conditions set out in planning issued by Kildare County Council. Boherkill Quarry will be required to regularly monitor emissions in accordance with the provisions of the planning and these results will be made available to the public.

An air quality assessment has been carried out in the area utilising existing monitoring data collected by Boherkill Quarry and baseline air quality data collected and generated by synoptic EPA monitoring stations in the area. The purpose of this study was to identify existing pollutant trends in the vicinity of the existing development, and to assess the potential impact of the proposed development. This will establish sufficient spatial information in order to determine compliance with relevant ambient air quality legislation. Additionally, comparison with longer period limit values can be used to establish trends and are important in defining baseline air quality.

This assessment was prepared in accordance with the Guidelines on the information to be contained in Environmental Impact Statements. The proposed development covers the existing Boherkill Quarry facility. This section should be read in conjunction with the site layout plans for the facility.

7.2 Study methodology-Assessment Criteria

7.2.1 Facility Design Review

A full review of the design of the proposed remediation plan was undertaken in order to establish emission levels of classical air pollutants such as Carbon monoxide, Oxides of nitrogen, Sulphur dioxide, Particulate matter, Benzene and Dust.

7.2.2 Assessment Criteria

The European Union (EU) has introduced several measures to address the issue of air quality management. In 1996, Environmental Ministers agreed a Framework Directive on ambient air quality assessment and management (Council Directive 96/62/EC). As part of the measures to

improve air quality, the European Commission has adopted proposals for daughter legislation under Directive 96/62/EC.

The first of these directives to be enacted, 1999/30/EC, set limit values in April 2001 that replaced previous limit values that were set by Directives 80/779/EEC, 82/884/EEC and 85/203/EEC. This was again updated through the implementation of the ***Ambient Air Quality and Cleaner Air for Europe (I) Directive*** 2008/50/EC. New limit values for sulphur dioxide, PM_{10}, $PM_{2.5}$ and nitrogen dioxide set by the CAFÉ Directive are detailed in **Table 1.1**.

The *National Air Quality Standards Regulations 2002* (S.I. No. 271 of 2002) transpose those parts of the "Framework" Directive 96/62/EC on ambient air quality assessment and management not transposed by the EPA Act 1992 (*Ambient Air Quality Assessment and Management*) Regulations 1999 (S.I. No. 33 of 1999). The 2002 Regulations also transpose, in full, the 1st two "Daughter" Directives 1999/30/EC relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air, and 2000/69/EC relating to limit values for benzene and carbon monoxide in ambient air.

Council Directive 2008/50/EC on *Ambient Air Quality and Cleaner Air for Europe* has revised and combined several existing Ambient Air Quality Standards including Council Directives 96/62/EC, 1999/30/EC and 00/69/EC. With regard to existing ambient air quality standards, it will not modify the standards but will strengthen existing provisions to ensure that non-compliances are removed. It does however set a new ambient standard for $PM_{2.5}$. With regard to $PM_{2.5}$, the proposed approach is to establish a limit value of 25 µg/m^3, as an annual average (to be attained by 2015), coupled with a non-binding target to reduce human exposure generally to $PM_{2.5}$ between 2010 and 2020. This exposure reduction target is currently proposed at 20% of the average exposure indicator (AEI). The AEI is based on measurements taken in urban background locations averaged over a three year period.

In 2011, SI 271 of 2002, *Air Quality Standards Regulations 2002* was replaced with SI 180 of 2011, *Air Quality Standards Regulations 2011* which transposes 2008/50/EC into Irish law.

The limit values for each species / compound is reported in **Table 7.1.**

Table 7.1. EU, Irish and EPA Ambient Air Quality Standards and Proposed EPA limit values

Parameter	Directive / Regulation	Limit Type	Value
Nitrogen Dioxide	2008/50/EC and SI 180 of 2011	Hourly limit for protection of human health – not to be exceeded more than 18 times/year-1 hour average	200 μg/m^3 NO_2
		Annual limit for protection of human health-Annual	40 μg/m^3 NO_2
		Annual limit for protection of vegetation-Annual	30 μg/m^3 NO + NO_2
Sulphur Dioxide	2008/50/EC and SI 180 of 2011	Hourly limit for protection of human health – not to be exceeded more than 24 times/year-1 hour average	350 μg/m^3
		Daily limit for protection of human health – not to be exceeded more than 3 times/year-24hr average	125 μg/m^3
		Annual & Winter limit for the protection of ecosystems-Annual	20 μg/m^3
Particulate Matter as PM_{10}	2008/50/EC and SI 180 of 2011	24-hour limit for protection of human health – not to be exceeded more than 35 times/year-24 hour average	50 μg/m^3 PM_{10}
		Annual limit for protection of human health-Annual	40 μg/m^3 PM_{10}
Particulate matter as $PM_{2.5}$	2008/50/EC and SI 180 of 2011	Annual limit for protection of human health-Annual	25μg/m^3 $PM_{2.5}$
Benzene	2008/50/EC and SI 180 of 2011	Annual limit for protection of human health	5 μg/m^3
Carbon Monoxide	2008/50/EC SI180 of 2011	8-hour limit (on a rolling basis) for protection of human health	10 mg/m^3
Total depositional dust	VDI2118	Nuisance prevention	350mg/m^2/day

7.2.3 Consultation

Preplanning consultation was undertaken with both statutory and non-statutory consultees. Full details of the consultation process and feedback received are presented in Section 1 of the EIS. None of the responses received from either statutory or non-statutory consultees were relevant to the air quality and climate assessment. No significant issues were raised in respect of particular air emissions concerns.

7.3 Receiving Environment-Air

7.3.1 General

This proposal provides for the importation, placement and capping of approximately 1,500,000m^3 of inert soil and rock and inert construction materials (concrete, block, brick, paving stones, granular fill, ceramics etc). The inert materials will be imported by permitted waste contractors.

The site is located entirely within the townland of Boherkill, Rathangan, Co. Kildare, approximately 3km south-east of Rathangan Co Kildare on the R401 National Secondary routeway and 5.5km north-west of Kildare Town. Irish National Grid Coordinates (E269919, N217476). The total land ownership boundary encompasses an area of 24.5Ha. The lands surrounding the site are generally agricultural in nature with a small number of dwellings located along local R401 road. The nearest town is Rathangan (3km south-west) and Edenderry (9km west). The site is located at the foot of Dunmurray Hill, on lands sloping gently towards the west. The gravel pit is screened from the R401 road by a substantial and well established hedge line. The total site encompasses an area of 20.42hectares and is owned by the applicant Mr. Michael Ennis. The site is set on a saddle of land slightly elevated above Rathangan and the flat lands to the west, and at the foothills of higher ground in Dunmurray Hill and Red Hill. The character of the landscape is that of a rich pastoral landscape, up to a line high on Dunmurray Hill, above which there is a mixture of established deciduous woodland and semi-mature coniferous planting. Land within the holding of the applicant (east of the R401), and adjoining this holding, has had many of the traditional field boundaries removed over the years to facilitate intensive tillage farming, however many traditional field boundaries remain and mature hedgerows are dominant in the overall landscape, notably as perceived in views from the public road. Access to the site is to/from the main Rathangan - Kildare Newbridge road Regional Route R401. Although the road is generally characterised by its meandering, undulating nature, it is a regional route with a typical width of 5.5 metres and site visibility lines at the site entrance are acceptable. The application site and existing sand and gravel quarry is located largely in an agricultural area. There are a number of isolated residences in the area immediately surrounding the existing facility. The surrounding land use activities are largely agricultural with a mix of tillage and grazing activities predominant.

7.3.2 Baseline air quality assessment

The EU Air Framework Directive deals with each EU Member State in terms of 'Zones' and 'Agglomerations' for air quality. For Ireland, four zones, A, B, C and D have been defined and are included in the *Air Quality Standards (AQS) Regulations* (SI No 180 of 2011).

- Zone A – Dublin conurbation
- Zone B – Cork conurbation
- Zone C – 21 towns in Ireland with population > 15,000
- Zone D – remaining area of Ireland

Boherkill and its environs are classified for the purposes of this assessment as falling within Zone D. While there is some availability of recent and historic data for air quality in major urban and rural areas, there is no data available from the national air quality monitoring database for air quality specific to Boherkill. As such, available data from the EPA Monitoring Site located in a Zone D area has been referenced for Carbon Monoxide, Nitrogen Oxides, Sulphur Dioxide and PM_{10} and $PM_{2.5}$ levels (see **Table 7.1**) and is considered representative of background air quality in the study area.

In addition and for completeness, a baseline air quality survey was performed between November 2015 and December 2015 at four locations in the vicinity of the application area (see **Figure 8.1**). This survey was undertaken in order to assess the baseline air quality concentrations of specific key pollutants including Nitrogen dioxide, Sulphur dioxide, Benzene

and Total particulate matter. This monitoring also allowed for the assessment of cumulative baseline emissions in the vicinity of the proposed operations. The results of monitoring undertaken are presented on **Table 7.2**.

7.3.2.1 Carbon Monoxide (CO)

Carbon monoxide is produced as a result of the incomplete burning of carbon-containing fuels including coal, wood, charcoal, natural gas, and fuel oil. It can be emitted by combustion sources such as un-vented kerosene and gas heaters, furnaces, woodstoves, gas stoves, fireplaces and water heaters, automobile exhausts, etc.

A number of the EPA air quality monitoring locations include analysis of carbon monoxide over a 1 year period. Results from this monitoring are presented in **Table 7.3**.

As can be observed in **Table 7.1**, the baseline annual average 8 hr concentration of Carbon monoxide expected in this region is in the range of 300 µg/m^3 which is well within the limit value of 10 mg/m^3 presented in **Table 7.1**.

7.3.*2.2 Nitrogen Dioxides (NO_2)*

Nitrogen is a constituent of both the natural atmosphere and of the biosphere. When industrial metabolism releases nitrogen to the environment it is considered a "pollutant" because of its chemical form: NO, NO_2, and N_2O. In the transportation sector, NOx emissions result from internal combustion engines. In power plants and industrial sources, NOx is produced in boilers. The overwhelming fraction of nitrogen oxide emissions arises from the high temperature combustion of fossil fuels; emissions from metal-processing plants and open-air burning of biomass.

Nitrogen dioxide is classed as both a primary pollutant and a secondary pollutant. As a primary pollutant NO_2 is emitted from all combustion processes (such as a gas/oil fired boiler or a car engine). Potentially, the main source of primary NO_2 for the proposed development will be from vehicle exhausts.

At the onsite baseline monitoring locations (see **Figure 8.1**) the air quality data was analysed for Nitrogen dioxide over a 1 month period, while at the EPA monitoring locations, monitoring was undertaken for a 1 year period. The results are presented in **Table 7.2** and **7.3**.

As can be observed in **Table 7.2** and **7.3**, the baseline annual average concentration of Nitrogen dioxide expected in this region is in the range of 13 µg/m^3 which is below the annual limit value of 30 µg/m^3 for protection of vegetation and well within the annual limit value of 40 µg/m^3 for protection of human health, as presented in **Table 7.1**.

The baseline value recorded on the site ranged from 13.20 to 18.90 µg/m^3 with an average of 16.80 µg/m^3 which is within the limit values for both the protection of vegetation and human health.

7.3.2.3 *Sulphur Dioxide (SO_2)*

Sulphur dioxide is a colourless gas, about 2.5 times as heavy as air, with a suffocating faint sweet odour. It occurs in volcanic gases and thus traces of sulphur dioxide are present in the

atmosphere. Other sources of SO_2 include smelters and utilities, electricity generation, iron and steel mills, petroleum refineries, pulp and paper mills, metallurgical processes, chemical processes and the combustion of iron pyrites, which is often present in coal. Small sources include residential, commercial and industrial space heating.

At the onsite baseline monitoring stations (see **Figure 8.1**) and EPA monitoring location, the air quality data was analysed for Sulphur dioxide over a 1 month and 1 year period, respectively. The results are presented in **Table 7.2** and **7.3**.

The baseline value recorded on the site ranged from 2.12 to 5.42 µg/m^3 with an average of 4.10 µg/m^3 which is within the limit values for both the protection of vegetation and human health.

As can be observed in **Table 7.2** and **7.3**, the baseline annual average concentration of Sulphur dioxide expected in this region is between the range 2.12 to4.10 µg/m^3 which is well within the limit value of 20 µg/m^3 for protection of ecosystems and well within the limit value of 125 µg/m^3 for protection of human health, as presented in **Table 7.1**.

7.3.2.4 Particulate Matter (as PM_{10} and $PM_{2.5}$)

PM_{10} and $PM_{2.5}$ refer to particulate matter with an aerodynamic diameter of 10 and 2.5 µm, respectively. Generally, such particulate matter remains in the air due to low deposition rates. Particulate matter is of concern in Europe and as a result air quality limits have been established for both parameters.

At the onsite baseline monitoring stations (see **Figure 8.1**) and EPA monitoring location, the air quality data was analysed for particulate matter (PM_{10} and $PM_{2.5}$) over a 2 day and 1 year period, respectively. The results are presented in **Table 7.2** and **7.3.**

The average baseline value recorded on the site for PM_{10} was 20 µg/m^3, while for $PM_{2.5}$ the average was 11 µg/m^3 which is well within the limit value for the protection of human health.

As can be observed in **Table 7.2 and 7.3**, the baseline annual average concentrations of Particulate matter as PM_{10} and $PM_{2.5}$ expected in this region is between the range 20 to 22 and 11 to 13 µg/m^3 respectively, which is well within the limit values for protection of human health of 40 and 25 µg/m^3 respectively, as presented in **Table 7.1**.

7.3.2.5 Benzene

The sources associated with individual volatile organic compounds (VOCs) tend to be dependent on the nature of industries in a region. Methane is a naturally occurring VOC derived from plants and animals; it is also generated as a by-product of certain industries. Benzene and other aromatic/alkanes are most often derived from petrol driven vehicle exhausts. Heavier semi-volatile organic compounds are frequently derived from diesel-powered engines.

At the onsite baseline monitoring stations (see **Figure 8.1**) and EPA monitoring locations, the air quality data was analysed for Benzene over a 1 month and 1 year period, respectively. The results are presented in **Table 7.2** and **7.3**.

The average baseline value recorded on the site for Benzene was 0.94 µg/m^3, which is well within the limit values for the protection of human health.

As can be observed in **Table 7.2** and **7.3**, the baseline annual average concentration of Benzene expected in this region is between the range 0.62 and 0.94 µg/m^3 which is well within the limit value of 5 µg/m^3 for protection of human health, as presented in **Table .1**.

7.3.2.6 Total depositional dust

The results of Total dust deposition monitoring at four locations in the vicinity of the existing facility over the time period 2014 are presented in *Table 2.2*. Monitoring was performed using Bergerhoff gauges specified in the German Engineering Institute VDI 2119 entitled "Measurement of Dustfall Using the Bergerhoff Instrument (Standard Method)." The purpose of these monitors is to assess the total depositional dust impact in the vicinity of the existing site. The glass jars containing the dust were submitted to an accredited test house for analyses.

Dust emitted from near-surface sources (as opposed to that emitted from stacks) rarely extends beyond 250 to 500 m from the point of release. The monitoring gauges are mostly located within or close to the perimeter fence of the operational facility and total deposition rates would be expected to decline dramatically with distance away from the facility.

Currently in Ireland, there are no statutory limits for dust deposition, however, EPA guidance suggest, "a soiling of 350mg/m^2/day is generally considered to pose a soiling nuisance". These value was not exceeded at any of the sample locations with all measured values at least 74% lower than the maximum recommended limit value.

Table 7.2 - EPA Baseline air quality monitoring data for Zone D sites throughout Ireland

Compound	Zone D worst case data EPA, 2014 2014 (µg/m^3)[1]
	Zone D
Carbon monoxide 8 hr (Annual mean)	500
Oxides of nitrogen (Annual mean)	13
Sulphur dioxide (Annual mean)	4
Particulate matter as PM10 (Annual mean)	22
Particulate matter as PM2.5 (Annual mean)	13
Benzene (mg/m3) (Annual mean)	0.94 (Zone A)

Notes: [1] see EPA Air Quality in Ireland 2014 Report – Key indicators in Ambient Air Quality, www.epa.ie

Table 7.3 - Baseline air quality monitoring data in the vicinity of proposed facility operations

Compound	Site specific baseline monitoring Nov 2015 to Dec 2015 (µg/m^3)[1]
Carbon monoxide 8 hr (Annual mean)	-
Oxides of nitrogen (Annual mean) (5 locations)	Avg. 16.80
Sulphur dioxide (Annual mean) (5 locations)	Avg. 4.10
Particulate matter as PM10 (Annual mean) (2 locations)	Avg. 20
Particulate matter as PM2.5 (Annual mean) (2 locations)	Avg. 11
Benzene (mg/m3) (Annual mean) (5 locations)	Avg. 0.62
Total depositional dust (June 2014 to July 2014) Loc DM-01 Loc DM-02 Loc DM-03 Loc DM-04	 80 49 86 43

[1] denotes that the average from 4 individual monitoring locations are presented to represent annual average baseline data for the location of the proposed facility. Monitoring was performed between the period of Nov 2015 to Dec 2015. Monitoring locations A1 to A4 are presented in Figure 8.1. All analysis was performed in a UKAS certified laboratory for such analytes.

7.4 Climate

The assessment methodology of the existing climatic environment involved a desk-based review of literature including the National Climate Change Strategy 2007-2012 (Department of Environment Heritage and Local Government, 2007).

Please refer to Section 7.1 for description of the surrounding environment.

The prevailing wind direction at the application area is from the southwest. Northerly and easterly winds tend to be very infrequent. Wind characteristics vary between a moderate breeze to gales (average 2.2 days with gales per annum). Monthly average wind speeds range between 6.30 and 9.40 knots with highest wind speeds occurring during winter and spring months (January, February and March). Lowest wind speeds were recorded in the June to August period.

Poor dispersion can occur under certain weather characteristics known as inversions that form in very light or calm wind and stable atmospheric conditions. The typical wind roses for Casement Aerodrome identifies that such wind conditions are very infrequent (0.50% of hours in the years 2002 to 2010 inclusive).

The nearest WMO synoptic meteorological station to the application area with long term averages is the Met Éireann Station at Casement which lies approximately 40km east of the subject site. The weather in the area is influenced by the Irish Sea, resulting in mild, moist weather dominated by cool temperate oceanic air masses. The prevailing wind direction in Ireland is from a quadrant centred on the southwest. These are relatively warm winds and frequently bring rain. Easterly winds are weaker and less frequent and tend to bring cooler weather from the northeast in spring and warmer weather from the southeast in summer. The 30-year averages from the station at Casement are presented in **Table 2.3**.

Table 7.4 - 30-year Average Meteorological Data from Casement Aerodrome (1981-2010)

Parameter	30 yr Average (1981 to 2010)
Mean temperature (^{0}C)	13.40
Mean relative humidity at 0900UTC (%)	83.60
Mean daily sunshine hours (Hrs)	3.70
Mean Annual total rainfall (mm)	754
Mean monthly wind speed (Knots)	10.70

Source: www.met.ie

7.4.1 Effects of Climate Change in Ireland

The potential effects of climate change on a global scale have been investigated by the Intergovernmental Panel on Climate Change (IPCC). The resulting impacts in Ireland are outlined in the National Climate Change Strategy 2007-2012 and include the following:

- Significant increases in winter rainfall, in the order of 10% in the southeast, with a corresponding increase in the water levels in rivers, lakes and soils. Flooding will be more frequent than experienced at present.
- Lower summer rainfall, in the order of 10% in the southern half of the country. Less recharge of reservoirs in the summer leading to more regular and prolonged water shortages than at present.
- An overall annual decrease in rainfall in the east of the country and a resultant decrease in baseline river flows.
- Increased agricultural production, with new crops becoming more viable and potentially reduced agricultural costs. Grass growth could enjoy beneficial effects with an increase of 20% possible with higher temperatures and changes in rainfall patterns.

A paper entitled *Establishing Reference Climate Change Scenarios for Ireland* (Sweeney & Fealy, 2003) identified future climate change scenarios for Ireland. This paper predicts that the average annual temperature in Ireland will increase by 1.5°C by the 2050's with an average increase in summer temperature of 2°C. These temperature increases are predicted to be accompanied by alterations in precipitation levels. The authors estimate an 11% increase in precipitation levels during the winter periods, whilst a more significant increase in precipitation levels during the summer periods were predicted i.e. 25% by the 2070's.

It is important to note that considerable uncertainty is encountered when attempting to predict future climate scenarios. This uncertainty arises due to the difficulties associated with determining future demographic changes, economic development, technological advancement and future emissions of greenhouse gases to the atmosphere. Further difficulty is associated with the complexity of the climatic system and uncertainty surrounding these processes.

It is recognised that Ireland cannot, on its own, prevent or ameliorate the impacts of climate change. However, the National Climate Change Strategy 2007-2012 states that Ireland must meet its responsibilities with regard to reducing CO_2 emissions in partnership with the EU and the global community.

7.5 Characteristics of the proposal

The proposed restoration scheme at Boherkill, Rathangan, Co. Kildare provides for:

(i) Use of imported inert natural materials, principally excess soil, stones and/or broken rock excavated on construction sites, to backfill and restore a large existing void created by previous extraction of sand and gravel

(ii) Recovery of imported inert construction materials, including stones, granular fill, concrete, blocks, bricks and ceramic tile.

The target materials for recovery are as follows:

EWC Code	Description
170504	Soil and Stone
170101	Concrete
170102	Bricks
170103	Tiles and Ceramics
170107	Mixture of concrete Bricks, tiles and Ceramics other than those mentioned in 170601

(iii) Separation and Quarantine of any non-inert construction and demolition waste (principally metal, timber, PVC pipes and plastic) unintentionally imported to site prior to removal off-site to appropriately licensed waste disposal or recovery facilities

(v) Continued excavation on a limited basis of the residual resource of and and gravel remaining in the quarry. Export of sand and gravel off-site for use by others.

(vi) Phased restoration of the backfilled void (including placement of cover soils and seeding) and return to former use as agricultural grassland

(vii) Temporary stockpiling of topsoil and subsoil pending re-use as cover material for phased restoration of the site

(viii) Environmental monitoring of noise, dust, surface water and groundwater for the duration of the site restoration works.

The existing void will only be infilled using inert materials imported from pre-approved external construction sites and secondary aggregate generated on site. No peat, contaminated soils

intermixed construction and demolition waste or non-hazardous waste will be accepted at the application site. Non-inert quarantined construction and demolition wastes will be removed off-site.

7.6 Potential Impacts of the Proposal

7.6.1 'Do Nothing'

The baseline survey undertaken as part of this assessment suggests that air quality in the vicinity of the application area is expected to be average/good with typical levels of pollutants for a rural area. All pollutant levels are within the relevant Irish and EU limits (for similar sized population centres).

7.6.2 Construction Phase Impact – Air Quality

The following sections describe the potential impacts to air quality resulting from the construction phase of the proposed facility. The impacts have been assessed on a local scale to determine impacts on human health and ecological receptors. The aspects considered include:

Potential sources of dust from construction and operation include the following:

- The working of the borrow area,
- The transport of material including vehicles carrying dust on their wheels,
- Un-vegetated stockpiles of construction materials,
- The handling of construction materials for the construction phase of the facility,
- Construction of the raise.
- Construction dust and its potential to impact on sensitive receptors and to cause an environmental nuisance,
- Construction traffic emissions and their potential for impacts on sensitive receptors.

The impacts are assessed in the following sections with respect to the relevant assessment criteria where appropriate.

7.6.2.1 Construction Dust

Construction activities such as excavation, earth moving and backfilling can generate dust, particularly in dry weather conditions. The extent of dust generation is dependent on the nature of the material (soils, peat, sands, gravels, silts etc.) and the location of the construction activity. In addition, the potential for dust dispersion depends on the local meteorological factors such as rainfall, wind speed and wind direction. Vehicles transporting material to and from the site also have the potential to cause dust generation along the selected haul routes.

Table 7.5 presents the distances within which dust could be expected to result in a nuisance from construction sites for impacts such as soiling (dust nuisance), PM_{10} deposition and vegetation effects. This data has been taken from the National Roads Authority (NRA) *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes* and is considered a worst case assessment. These distances present the potential for dust impact with standard mitigation in place.

Detail of proposed mitigation measures to be implemented as part of the construction phase of the project are presented under the Construction Phase Mitigation section of this report.

Table 7.5- Assessment criteria for the impact of dust from construction, with standard mitigation in place

Source		Potential distance for significant effects (distance from source)		
Scale	**Description**	**Soiling**	**PM_{10}**	**Vegetation effects**
Major	Large construction sites with high use of haul roads	100m	25m	25m
Moderate	Moderate sized construction sites with moderate use of haul roads	50m	15m	15m
Minor	Minor construction sites with minor use of haul roads	25m	10m	10m

Source: National Roads Authority, 2006.

The construction phase of this proposal is deemed for the purposes of this assessment to be of a minor to moderate scale. Using this screening assessment tool, at a minor to moderate construction site there is a risk that dust may cause an impact at sensitive receptors within 50m of the source of the dust generated. The nearest sensitive receptors to the centre of the subject site is located at a distance of greater than 50m from the activities, therefore, the impact from construction activities can be considered to be imperceptible.

All sensitive habitats are located at a distance greater than 25m from the emission source as a result the impact on habitats will be imperceptible.

A Construction Environmental Management Plan (CEMP) incorporating dust mitigation measures will further reduce any impacts significantly and this will be implemented as part of the proposed development.

7.6.2.2 Construction Traffic Emissions

Emissions associated with construction traffic can impact on local air quality. In particular, the proposed routes used for deliveries and any sensitive receptors that line these routes may experience impacts to local air quality.

The potential impact of construction traffic associated with this proposal was estimated as a worst case Annual Average Daily Traffic scenario of 200 (which is well in excess of the expected peak AADT so as to assume worst case potential impact – see Chapter 11) with a mean traffic speed of 20km/hr (which again is worst case scenario). The detailed results of the modelling exercise are presented in Table 7.6.

Table 7.6 - Predicted contribution of air pollutants to baseline air quality as a result of construction traffic.

Link location	Carbon monoxide Annual mean (µg/m^3)	Benzene Annual mean (µg/m^3)	Oxides of nitrogen Annual mean (µg/m^3)	Particulate matter 10um	
				Annual mean (µg/m^3)	Days > 50 (µg/m^3)
Worst case receptor 5m from road centreline on any roadway	<0.04	<0.04	<0.50	<0.10	0

7.6.3 Operational Phase Impacts – Air Quality

Air quality impacts may arise from process based emissions and traffic movements associated with the operational phase of the proposed plant. Traffic based air quality emissions will result from traffic making deliveries and collections to and from the proposed plant and employee traffic movements.

7.6.3.1 Traffic

The detailed information provided in the Traffic and Transport assessment (see **Chapter 11** of the EIS) has been used to identify whether any significant impact on sensitive receptors will occur. The traffic information has been inputted into the Design Manual for Roads and Bridges (DMRB), Volume 11 (ver. 1.03c) model. This model was prepared by the United Kingdom Department of Transport, the Scottish Office of Industrial Development, the Welsh Office and the Department of Environment for Northern Ireland as a screening tool to assess worst-case air quality impact associated with traffic movements.

The screening model uses a worst-case scenario in calculating emissions. The emission factors used for each pollutant are intentionally set to bias and to overestimate the actual emission rate. In addition, wind speeds are assumed to be 2 ms^{-1} (approximately 3.90 knots compared to a mean wind speed of between 4 to 6 ms^{-1} at the nearest Met station (Clones Met Station)). Emission rates predicted as a result of traffic are added to the cumulative emissions generated by the proposed plant's scheduled emission points and baseline data. This is considered a worst case assessment of likely impact. It can therefore be assumed with confidence that traffic related air pollution will not arise if the model does not identify any issues.

Traffic figures have been assessed using Annual Average Daily Traffic (AADT) figures. The Heavy Goods Vehicle (HGV) percentage was taken from the traffic assessment. As the average speed of vehicles has a significant effect on the generation of pollutants, calculations are carried out at a worst case traffic speed scenarios. The speed used is 20 km hr^{-1}, to represent gridlock conditions so as to assess the worst case scenario. In addition, it was assumed within the model that the sensitive receptor was located within 5m of the road centreline, again to represent worst case conditions.

7.6.3.2 Traffic: Output Data from Traffic Air Quality Model

Tables 7.6 to 7.8 presents the results of the worst case conservative traffic air quality modelling data, performed in order to ascertain the likely increase in air quality impact as a result of additional traffic generated during the operational phase of the proposed operation and remediation.

As can be observed, there is no significant increase in the air quality impact of named pollutants as a result of increased baseline traffic numbers in 2017, 2022 and 2027 with only a slight increase occurring in pollutant concentration predicted 5m from the road centreline.

In terms of the 'do nothing' versus 'do something' for 2017, 2022 and 2027, there is a slight increase in pollutant concentration in the order of 1 to 2% which is considered to be imperceptible. When this increase is added to baseline data presented in **Table 2.1** and **2.2** for each named pollutant, emissions will remain well within the air quality limits presented in **Table 1.1** for the protection of human health.

Table 7.6 - Predicted contribution of air pollutants as a result of traffic 2017, do-nothing and do-something scenario

Year	Worst case Assessment location (as per Traffic Assessment Chapter 11) (Road next Entrance)	
Baseline emissions as a result of traffic **2017 – Do nothing**	Carbon monoxide Annual mean (µg/m³)	0.060
	Benzene Annual mean (µg/m³)	0.060
	Oxides of nitrogen Annual mean (µg/m³)	2.74
	Particulate matter 10um – Annual mean (µg/m³)	0.79
	Particulate matter 10um – Days > 50 (µg/m³)	0
Baseline emissions as a result of traffic **2017 – Do something**	Carbon monoxide Annual mean (µg/m³)	0.060
	Benzene Annual mean (µg/m³)	0.060
	Oxides of nitrogen Annual mean (µg/m³)	2.87
	Particulate matter 10um – Annual mean (µg/m³)	0.81
	Particulate matter 10um – Days > 50 (µg/m³)	0

Table 7.7- Predicted contribution of air pollutants as a result of traffic 2022, do-nothing and do-something scenario

Year	Worst case Assessment location (as per Traffic Assessment Chapter 11) (Road next Entrance)	
Baseline emissions as a result of traffic **2022 – Do nothing**	Carbon monoxide Annual mean (µg/m³)	0.060
	Benzene Annual mean (µg/m³)	0.060
	Oxides of nitrogen Annual mean (µg/m³)	2.70
	Particulate matter 10um – Annual mean (µg/m³)	0.80
	Particulate matter 10um – Days > 50 (µg/m³)	0
Baseline emissions as a result of traffic **2022 – Do something**	Carbon monoxide Annual mean (µg/m³)	0.060
	Benzene Annual mean (µg/m³)	0.060
	Oxides of nitrogen Annual mean (µg/m³)	2.83
	Particulate matter 10um – Annual mean (µg/m³)	0.82
	Particulate matter 10um – Days > 50 (µg/m³)	0

Table 7.8 - Predicted contribution of air pollutants as a result of traffic 2032, do-nothing and do-something scenario

Year	Worst case Assessment location (as per Traffic Assessment Chapter 11) (Road next Entrance)	
Baseline emissions as a result of traffic **2032 - Do nothing**	Carbon monoxide Annual mean (µg/m³)	0.070
	Benzene Annual mean (µg/m³)	0.070
	Oxides of nitrogen Annual mean (µg/m³)	2.82
	Particulate matter 10um - Annual mean (µg/m³)	0.88
	Particulate matter 10um - Days > 50 (µg/m³)	0
Baseline emissions as a result of traffic **2032 - Do something**	Carbon monoxide Annual mean (µg/m³)	0.070
	Benzene Annual mean (µg/m³)	0.070
	Oxides of nitrogen Annual mean (µg/m³)	2.85
	Particulate matter 10um - Annual mean (µg/m³)	0.88
	Particulate matter 10um - Days > 50 (µg/m³)	0

7.7 "Do-Nothing" Scenario

The baseline survey results suggest that air quality in the vicinity of the existing facility and proposed development is good and shows typical levels for a rural area with all pollutants within the relevant Irish and EU limits. If the proposed development were not to take place, the current air pollutant concentrations will remain unchanged. In relation to dust, non-development of the site would result in no movement of soils/sands and no construction activity and therefore no dust creation as a result of construction works.

In addition "Do nothing" scenario would in no remediation of the quarry pit. Whilst some of the potential local environmental impacts, associated primarily with construction activity, would be reduced under a "do-nothing" option.

7.8 Remedial or Reductive Measures

7.8.1 Construction Phase

Construction activities are likely to generate some dust emissions. The potential for dust to be emitted depends on the type of construction activity being carried out in conjunction with environmental factors including levels of rainfall, wind speed and wind direction. In order to ensure that no dust nuisance occurs, a series of measures will be implemented.

1. Site roads shall be regularly cleaned and maintained as appropriate.

2. Hard surface roads shall be swept to remove mud and aggregate materials from their surface as a result of the facility development. Any un-surfaced roads shall be restricted to essential site traffic only. Furthermore, any road that has the potential to give rise to fugitive dust may be regularly watered, as appropriate, during extended dry and/or windy conditions.

3. Vehicles using site roads shall have their speed restricted, and this speed restriction must be enforced rigidly. On any un-surfaced site road and on hard surfaced roads that site management dictates speed shall be restricted to 20 km per hour.

4. Any vehicles exiting the site shall make use of a wheel wash facility, prior to entering onto public roads, to ensure mud and other wastes are not tracked onto public roads.

5. Public roads outside the site shall be regularly inspected for cleanliness and cleaned as necessary. Aggregates, fine sized material with dust potential will be delivered in covered trucks.

6. Material handling systems and site stockpiling of materials shall be designed and laid out to minimise exposure to wind. The double handling of material will be avoided where possible and drop heights will be minimised during material loading and unloading.

7. Water misting or sprays shall be used as required if particularly dusty activities are necessary during dry or windy periods. Temporary stockpiles of filter sand will be covered.

8. Diesel engines or plant machinery and trucks shall be properly maintained so that they do not discharge excessive quantities of visible smoke likely to result in a local nuisance.

9. A full traffic and dust management plan will be implemented into the Construction Environmental Management Plan (CEMP) in order to minimise such emission as a result of the construction phase of the facility development. This will be generated specifically for the development when detailed design is completed. The UK British Research Establishment (BRE) document "Control of Dust from Construction and Demolition Activities" (Feb 2003) is a best practice guidance document for such plans. This document will be used as the basis for any construction dust minimisation plan.

The dust management plan will be reviewed at regular intervals during the construction phase to ensure the effectiveness of the procedures to minimise dust emissions.

7.8.2 Operation Phase

It is not anticipated that dust will be a significant problem during the operation (as is the current situation) of the facility as a result of the absence of scheduled emission points and through the implementation of dust management and mitigation techniques where required.

The principal factors that influence the potential for dust generation include:

1. The particle size distribution within the deposited material,
2. The moisture content of the material,
3. Exposure to wind,
4. The presence of a vegetation cover once material deposition has ceased.

Dust control on surfaces is achieved by a combination of techniques including:

1. Controlled material deposition and maintenance of adequate moisture content in the deposited material. The maintenance of adequate moisture content by the use of water sprays and crusting agents is of utmost importance to prevent dust blow in dry weather.
2. The use of agricultural spray irrigation on exposed areas of quarry as required within the operational part of the facility.
3. The rapid establishment of vegetation on the surface of non-operational parts of the facility.

Potential impacts during operation and post-closure are confined to the emission of dust from surfaces.

It is envisaged that the proposed facility development will not have a significant impact on the surrounding air quality. However, as discussed previously a number of mitigation measures have been suggested. Moreover, specific dust monitoring could be carried out during the

construction phase of the development if deemed necessary by the planning authority. If the level of dust is found to exceed regulatory guidelines in the vicinity of the site, further mitigation measures will be incorporated into the construction and operation of the proposed development.

7.8.3 Climate

Emissions of Oxides of nitrogen, Sulphur dioxide, Carbon monoxide and Carbon dioxide will be mitigated by using efficient construction vehicles, appropriate scheduling of construction activities to minimise duration, the shutting off of equipment during periods of inactivity if they do occur, and a transport management plan as part of the CEMP as described above. No additional mitigation measures are considered necessary.

7.9 Predicted Residual Impacts of the Development

7.9.1 Construction Phase

The effect of construction of the facility on air quality will not be significant following the implementation of the proposed mitigation measures (as is the case with the existing development). The main environmental nuisance associated with construction and operation activities is dust.

However, it is proposed to adhere to good working practices and dust mitigation measures to ensure that the levels of dust generated will be minimal and are unlikely to cause an environmental nuisance. A series of such good working practices and mitigation measures are outlined earlier in this chapter.

7.9.2 Operation Phase

The impact will be insignificant due to the implemented mitigation measures.

Current good quarry management practice as adopted by Boherkill Quarry will be continued.

This will include:

1. The maintenance of adequate moisture content on exposed surface beaches using water sprays where necessary.
2. The rapid establishment of vegetation cover on the facility after the cessation of operations.

7.9.3 “Worst Case” Scenario

For traffic-derived pollutants, the “worst-case” scenario consists of gridlock conditions with large volumes of traffic on the road simultaneously.

For dust emissions, the “worst case” scenario consists of the failure to implement dust management and mitigation measures resulting in nuisance conditions downwind of the facility.

This will not occur and the currently implemented high level dust management and mitigation procedures will be maintained at the existing and proposed facility operations.

7.10 Monitoring

7.10.1 Construction Phase

It is envisaged that the proposed facility development will not have a significant impact on the surrounding air quality. However, as discussed previously a number of dust mitigation measures have been suggested. Moreover, dust monitoring could be carried out during the construction phase of the development if deemed necessary by the planning authority. If the level of dust is found to exceed 350mg/m^{2}day in the vicinity of the site, further mitigation measures will be incorporated into the construction of the proposed site.

The current programme of dust monitoring around the quarry will be continued.

7.10.2 Operational phase

The current programme of dust monitoring around the quarry will be continued.

7.11 Reinstatement

Not Applicable

SECTION 8: NOISE AND VIBRATION

8.1 Introduction

Fitzsimons Walsh Environmental Limited has been retained to undertake a noise impact assessment of the proposed restoration project at Boherkill gravel pit, Rathangan, Co. Kildare.

The proposed development is for the restoration of an existing gravel pit at Boherkill, Rathangan, Co. Kildare. Planning permission is sought for the importation of inert materials over a 10-year period (a rate of approximately 150,000 tonnes per annum) to reinstate the lands to the original levels prior to commencement of extraction.

The report discusses the levels of noise associated with existing activities at the site under review, and assess the increase in these levels, if any, generated by continuation of these works in future years and the restoration of the existing quarry also.

8.2 Report Structure

The report will be structured to give an understanding in the following areas:

- Establish the existing noise environment
- Determine applicable noise limits
- Description of the noise aspects of the proposal
- Predict potential noise impacts associated with the proposal
- Suggest mitigating measures
- Establish residual noise impacts

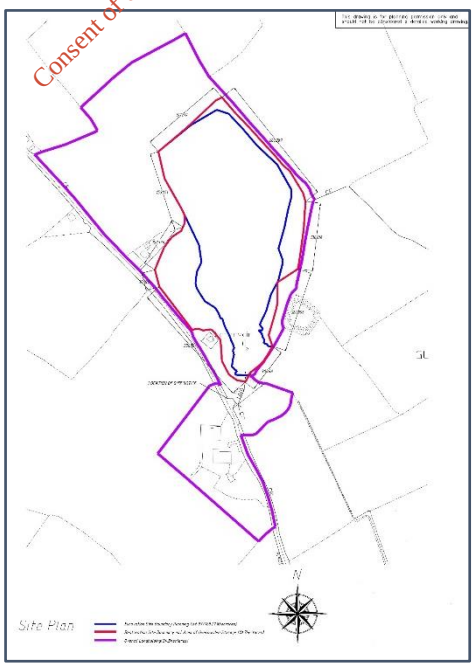
8.3 Existing receiving Environment

The gravel pit is located off the R401 Kildare road in the townland of Boherkill, Rathangan, Co Kildare; ref Figure 8.1. The existing sand and gravel pit is located in a rural area surrounded by agricultural land. Population density is low with only a small number of dwellings in the environs of the quarry. A select number of representative noise sensitive locations have been identified, ref. Table 8.1 and Figure 8.2.

Table 8.1 Representative Noise Sensitive Receptors (NSR's)

Id	Address	Eastings	Northings	Comment
NSR 1	BOHERKILL, RATHANGAN, KILDARE, R51 VK72	269735	217623	201
NSR 2	AISLING HOUSE, THOMASTOWN EAST, RATHANGAN, KILDARE, R51 K761	269596	217696	335
NSR 3	BOHERKILL, RATHANGAN, KILDARE, R51 CY64	269498	217856	470
NSR 4	THOMASTOWN LODGE, THOMASTOWN EAST, RATHANGAN, KILDARE, R51 CR40	269911	217175	495
NSR 5	HILL VIEW, GUIDENSTOWN NORTH, DUNMURRY, KILDARE, R51 FT98	270649	217817	734
NSR 6	THE PADDOCKS, GUIDENSTOWN NORTH, DUNMURRY, KILDARE, R51 A718	270667	217704	738
NSR 7	KILMONEY LODGE, KILMONEY, RATHANGAN, KILDARE, R51 E290	270423	218281	785
NSR 8	THOMASTOWN EAST, RATHANGAN, KILDARE. R51 HN82	269105	217835	841
NSR 9	SAINT CONLETH'S, GUIDENSTOWN SOUTH, KILDARE. R51 D993	270196	216820	891
NSR 10	BOHERKILL, RATHANGAN, KILDARE, R51 YA02	269562	218590	991

Fig. 8.1 Site Location Map



The proposed restoration scheme at Boherkill, Rathangan, Co. Kildare provides for:

(i) Use of imported inert natural materials, principally excess soil, stones and/or broken rock excavated on construction sites, to backfill and restore a large existing void created by previous extraction of sand and gravel

(ii) Recovery of imported inert construction materials, including stones, granular fill, concrete, blocks, bricks and ceramic tile.

The target materials for recovery are as follows:

EWC Code	Description
170504	Soil and Stone
170101	Concrete
170102	Bricks
170103	Tiles and Ceramics
170107	Mixture of concrete Bricks, tiles and Ceramics other than those mentioned in 170601

(iii) Separation and Quarantine of any non-inert construction and demolition waste (principally metal, timber, PVC pipes and plastic) unintentionally imported to site prior to removal off-site to appropriately licensed waste disposal or recovery facilities

(v) Continued excavation on a limited basis of the residual resource of and and gravel remaining in the quarry. Export of sand and gravel off-site for use by others.

(vi) Phased restoration of the backfilled void (including placement of cover soils and seeding) and return to former use as agricultural grassland

(vii) Temporary stockpiling of topsoil and subsoil pending re-use as cover material for phased restoration of the site

(viii) Environmental monitoring of noise, dust, surface water and groundwater for the duration of the site restoration works.

The existing void will only be infilled using inert materials imported from pre-approved external construction sites and secondary aggregate generated on site. No peat, contaminated soils intermixed construction and demolition waste or non-hazardous waste will be accepted at the application site. Non-inert quarantined construction and demolition wastes will be removed off-site.

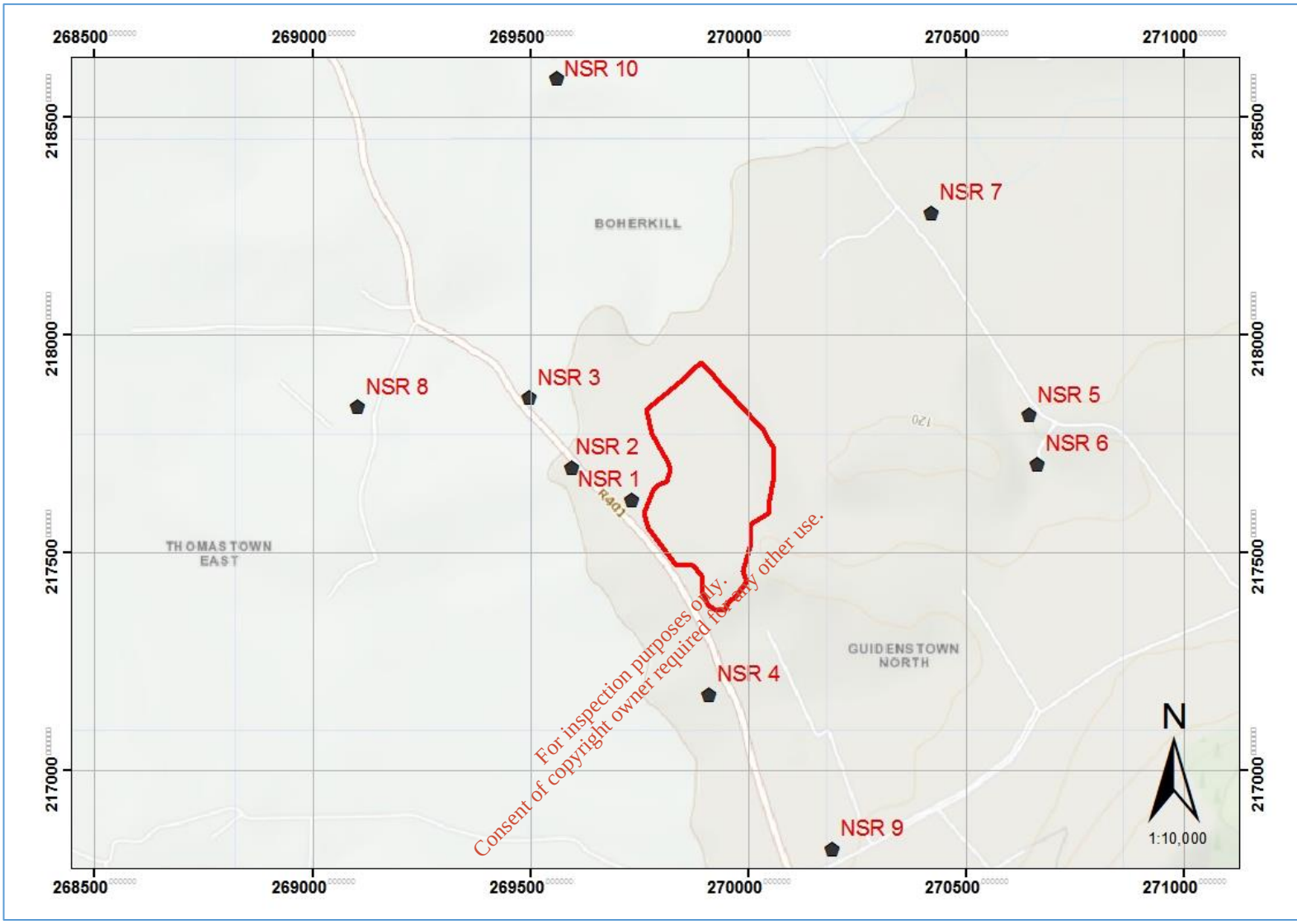


Fig. 8.3 Proposed Development at Boherkill and representative NSR's

8.4 Defining the Existing Noise Environment

The procedure detailed in the EPA guidance document NG4 has been followed in assessing the existing noise environment. According to *NG4* a four step process should be followed to determine appropriate noise criteria for a potential development.

Step 1 – Quiet Area Screening of the Development Location
Step 2 – Baseline Environmental Noise Survey
Step 3 – Screen for Areas of Low Background Noise
Step 4 – Determine Appropriate Noise Criteria

8.4.1 Quiet Area Screening of the development location

It was determined at the preliminary screening stage that the proposed site does not meet the necessary criteria and is therefore not considered to be a quiet area as per the EPA definition.

8.4.2 Baseline Noise Survey

The baseline noise survey was carried out ata selection of strategically chosen nearest noise sensitive receptors (NSR) proximal to the proposed development.
Traditionally environmental noise limits have been stated over daytime and night-time periods only. Recent EPA guidelines recommend that limits be set over three distinct periods i.e. daytime, evening, and night-time.
With this in mind the baseline noise data has been divided into these distinct time categories.

Daytime Period	07:00 – 19:00
Evening Period	19:00 – 23:00
Night Period	23:00 – 07:00

The existing ambient (LAeq) and background noise (LA90) levels in the areas of the proposed development was established during a period of continuous monitoring at two representative locations. Noise monitoring was undertaken over the period (October 29th to November 5th 2015) at two locations:

Table 8.2

NSR 1	THOMASTOWN LODGE, THOMASTOWN EAST, RATHANGAN, KILDARE, R51 CR40	South of the proposed development
NSR 4	BOHERKILL, RATHANGAN, KILDARE, R51 CY64	North-west of the proposed development

The noise monitoring equipment was positioned proximal to NSRs correctly located at 1.5m above ground level and away from reflecting surfaces. Acoustic instrumentation was field calibrated before and after the survey and no drift of calibration was observed (calibration level 114 dB at 1000 Hz).

Instrumentation Used

The following instrumentation was used in the baseline survey:

- One no. Larson Davis 812 Precision Integrating Sound Level Analyser/Data logger
- One no. Larson Davis 831 Precision Integrating Sound Level Analyser/Data logger

(Calibration certificates presented in appendix 3)

- Wind Shields Type: Larson Davis 2120 Windscreen
- Calibration Type: Larson Davis Precision Acoustic Calibrator Model CA 250
- Davis Vantage Pro weather station

PLATE 1
SLM @ NSR 3

PLATE 2
SLM @ NSR 4

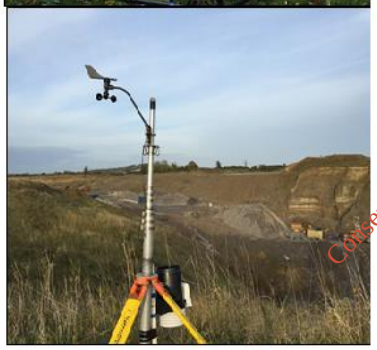


PLATE 3
WEATHER STATION ON SITE

8.4.3 Result of the Noise Survey

The existing ambient and background noise levels in the area of the proposed development were measured at representative noise sensitive receptors.

- Noise monitoring was undertaken over a continuous period at two locations

NSR1. Residential dwelling south of the site

- Monitoring period 29/10/15 – 05/11/2015.
- The complete dataset from the baseline study is presented in the Appendix 1 to the actual report
- A summary of the interval (mean values) measurements is given in Table 8.3 below:

Table 8.3 Baseline noise levels mean values – 15 minute interval Data

Monitoring Location Id	Day-time Noise levels dB(A)			Evening-time Noise Levels dB(A)			Night-time Noise levels dB(A)		
	Leq	L_{10}	L_{90}	Leq	L_{10}	L_{90}	Leq	L_{10}	L_{90}
NSR1	52	55	41	43	46	36	38	39	31

NSR4. Residential dwelling north west of the site

- Monitoring period 29/10/2015 to 05/11/2015.
- The complete dataset from the baseline study is presented in the Appendix 1.
- A summary of the measurements (mean values) is presented in Table 8.4 below

Table 8.4 Baseline noise levels mean values – 15 minute interval Data

Monitoring Location id	Day-time Noise levels dB(A)			Evening-time Noise Levels dB(A)			Night-time Noise levels dB(A)		
	Leq	L_{10}	L_{90}	Leq	L_{10}	L_{90}	Leq	L_{10}	L_{90}
NSR4	54	57	43	55	59	37	43	43	32

8.5 Screening for Areas of low Background Noise

For all areas not identified as 'Quiet Areas' in Step 1, the existing background noise levels measured during the environmental noise survey are examined to determine if they satisfy the following criteria:

- Average Daytime Background Noise Level ≤ 40dB LAF90, and
- Average Evening Background Noise Level ≤ 35dB LAF90, and
- Average Night-time Background Noise Level ≤ 30dB LAF90.

The summary results are presented in section 8.1.3 above.

It is apparent that the conditions listed above are **not pertinent** to this particular site and its therefore **deemed not to be "Areas of Low Background Noise".**

8.6 Appropriate Noise Criteria Limits

The fourth and final step in the process of defining the existing Noise Environment is determining appropriate Noise Criteria. Table 8.5 details recommended noise limits of each time period for sites with differing background noise levels.

Table 8.5 Recommended Noise Criteria

Scenario	Daytime Noise Criterion, dB $L_{Ar,T}$ (07:00 to 19:00hrs)	Evening Noise Criterion, dB $L_{Ar,T}$ (19:00 to 23:00hrs)	Night-time Noise Criterion, dB $L_{Aeq,T}$ (23:00 to 07:00hrs)
Quiet Area	Noise from the licensed site to be at least 10dB below the average daytime background noise level measured during the baseline noise survey.	Noise from the licensed site to be at least 10dB below the average evening background noise level measured during the baseline noise survey.	Noise from the licensed site to be at least 10dB below the average night-time background noise level measured during the baseline noise survey.
Areas of Low Background Noise	45dB	40dB	35dB
All other Areas	55dB	50dB	45dB

The site does not fall under the scenario of ***"Areas of low background noise"***

8.6.1 Noise Limits during the operational Phase

The sites falls outside the category of "Area of Low Background Noise" therefore based on the findings in section 2 above the following noise limits are deemed appropriate for the site:

- Daytime 55 dBA
- Evening 50 dBA
- Night 45 dBA

Additional noise conditions:

- There shall be no clearly audible tonal component in the noise emission from any activity at any noise sensitive location'.
- Operational sirens and similar, in routine use on-site shall be modified and maintained so as not to be audible at any noise sensitive location.

It is recommended that theses limits be set at the Nearest Noise Sensitive Receptor and not at the site boundary.

8.7 Characteristics of Proposal

The proposed development is for the restoration of an existing gravel pit at Boherkill, Rathangan, Co. Kildare. Planning permission is sought for the importation of inert materials over a 10 year period (a rate of approximately 150,000 tonnes per annum) to reinstate the lands to the original levels prior to commencement of extraction.

The quarry operates under planning permission 01/1270 & 07/188.

An extension to the life of the permit has been obtained via planning permission 15/515 for an additional 5 years of quarrying at the site.

Proposed activities

- Importation of approximately 1.5million tons of inert material to reinstate the volumes of material previously extracted. Re-use the volumes of existing overburden on site
- Landscaping works to reinstate the land to the original use as agricultural tillage land.
- Associated site works
- Continuation for a period of approximately 2 / 3 years of the extraction phase of the development as permitted in existing planning permissions albeit at a very reduced rate of extraction.

The existing gravel pit operates from 0800hrs to 1800hrs Monday to Friday and 08:00 to 13:00 Saturdays. The gravel pit is closed on Sundays and Bank Holidays.

Noise Aspects of the project

- Road traffic – Export of quarry materials
- Road traffic – importation of reinstatement materials
- Onsite excavation of materials for export
- Onsite placement of imported materials

8.7.1 Road Traffic Impacts

Existing road traffic bears a significant influence on the ambient and background noise levels in the environs of the quarry site.
Access to and from the site shall be from the existing site access onto the R401.
A traffic impact assessment has been completed for the proposed development the following information has been referenced from that report.

1. Site operations will be limited to 46 weeks per year at 5.5 days per week
2. The original planning permission 2008 allows for 50 inbound and outbound truck journeys per day
3. The proposed restoration activity assumes 30 inbound and outbound journeys daily
4. The continuing quarry operators estimate 5 outbound and inbound journeys per day

Increases in noise levels can be accurately calculated when the percentage increase in traffic flow is known (Ref. HMSO Calculation of Road Traffic Noise, 1988).
There is a logarithmic relationship between noise levels and traffic volume and the higher the existing traffic volume the greater the traffic increase required to produce a perceptible noise change.

Typically, doubling the traffic flow produces a 3 dB (A) change in noise level.

Critically the proposed development will result in a reduced traffic volume and therefore the resultant noise levels will be lower than currently.

8.7.2 Quarry Activity and Re-instatement

Noise emissions will be associated with mobile quarry plant and machinery. Table 8.6 presents typical noise levels and numbers of mobile plant for the proposed construction jobs. These noise levels have been sourced from measurements of noise sources at other construction sites. The levels are based on measurements taken at 20m from the geometric centre of activity when the equipment was in continuous operating mode.

Table 8.6 Typical Quarry Plant and Associated Noise Levels

Type	Number	Typical Noise level dB(A) Leq @ 20 meters
Excavator – Tracked 25 Tonne	2	76
Water pump	1	70
Screen	1	86
Bulldozer	1	82

Maximum potential cumulative noise levels from quarry activity would be 87 dB(A) at 20 metres

8.8 Noise Prediction Methodology

Predicted noise levels at the nearest noise sensitive receptor can be determined according to formula 1 or 2 below:

Formula 1 **$Lp2 = Lp1 + \Delta L\psi - \Sigma\Delta L$ where,**

Lp2 = Sound Pressure level in decibels at Receptor.

Lp1 = Sound pressure level in decibels at known distance.

$\Delta L\psi$ = correction for direction effects in a horizontal plane,

$\Sigma\Delta L = \Delta Ld + \Delta La + \Delta Lr + \Delta Ls + \Delta Lv + \Delta Lg + \Delta Lw$, and where,

ΔLd = geometric spreading

$\Delta Ld = 20 \log_{10} (d1/d2)$, where, d1 is the receptor distance, while d2 is the distance from the source (metres.

ΔLa = air absorption
ΔLr = reflection and diffraction
ΔLs = screening

ΔLv = vegetation
ΔLg = ground absorption
ΔLw = wind gradients

Formula 2

$$\textbf{Predicted level} = LW + D - (A_{geo} + A_{atm} + A_{gr} + A_{br} + A_{mis})$$

A_{geo} –Geometric Spreading

Geometric (spherical) spreading from a simple free-field point source results in attenuation over distance according to:

$$Lp = Lw - (20 \log R + 11)$$

Where:

Lp = sound pressure level
Lw = sound power level
R = distance from the turbine to the receiver
A_{gr} - Ground Effects
A_{bar}-Barrier Attenuation
A_{atm} - Atmospheric Absorption
A_{misc} – Miscellaneous Other Effects

8.9 Potential Noise Impacts

8.9.1 Predicted Noise Levels – Operational Phase

Table 8.7 Predicted Operational Noise Levels

Id	Address	Predicted noise level without mitigation, LAeq, dB
NSR 1	BOHERKILL, RATHANGAN, KILDARE, R51 VK72	52
NSR 2	AISLING HOUSE, THOMASTOWN EAST, RATHANGAN, KILDARE, R51 K761	48
NSR 3	BOHERKILL, RATHANGAN, KILDARE, R51 CY64	45
NSR 4	THOMASTOWN LODGE, THOMASTOWN EAST, RATHANGAN, KILDARE, R51 CR40	44
NSR 5	HILL VIEW, GUIDENSTOWN NORTH, DUNMURRY, KILDARE, R51 FT98	41
NSR 6	THE PADDOCKS, GUIDENSTOWN NORTH, DUNMURRY, KILDARE, R51 A718	41
NSR 7	KILMONEY LODGE, KILMONEY, RATHANGAN, KILDARE, R51 E290	40
NSR 8	THOMASTOWN EAST, RATHANGAN, KILDARE. R51 HN82	40
NSR 9	SAINT CONLETH'S, GUIDENSTOWN SOUTH, KILDARE. R51 D993	39
NSR 10	BOHERKILL, RATHANGAN, KILDARE, R51 YA02	38

Based on the cumulative impact of all plant operational simultaneously, it is predicted that the cumulative noise levels at the closest noise sensitive receptor, NSR 1, could be 52 dBA.

8.10 Mitigating Measure

8.10.1 Controlling the Spread of Noise

Screening
For maximum benefit, acoustic screens should be close either to the source of noise (as with stationary plant) or to the listener.
Careful positioning of noise barriers, such as bunds or noise screens, can bring about significant reductions in noise levels. The topography of the site lends itself to providing a barrier between the centre of activity and noise sensitive receptors. The quarry floor is surrounded by high embankments (Ref Plate 4) and surrounded by earthen berms. These provide natural barriers and result in reduced noise levels in the order of up to 10 decibels.

Plate 4 overlooking existing facility

8.10.2 Reduction at Source

The movement of plant onto and around the site should have regard to the normal operating hours of the site and the location of any NSRs as far as is reasonably practicable.

The use of conventional audible reversing alarms may cause problems and alternatives are available.
Audible reversing warning systems on mobile plant and vehicles should be of a type which, whilst ensuring that they give proper warning, have a minimum noise impact on persons outside sites.

Maintenance
Regular and effective maintenance by trained personnel is essential and will do much to reduce noise from plant and machinery.

- Noise caused by vibrating machinery having rotating parts can be reduced by attention to proper balancing.
- Noises caused by friction in screens and other machines can be reduced by proper lubrication.

8.8.3 Training

Workers should be trained to employ appropriate techniques to keep site noise to a minimum, and should be effectively supervised to ensure that best working practice in respect of noise reduction is followed.

Good practice includes:

- the proper use and maintenance of tools and equipment;
- the positioning of machinery on site to reduce the emission of noise to the neighbourhood and to site personnel
- the avoidance of unnecessary noise when carrying out manual operations and when operating plant and equipment
- avoid unnecessary revving of engines and switch off equipment when not required.

8.11 Residual Noise Impact [accounting for Mitigation Measures]

Table 8.8 Predicted Operational Noise Levels

Id	Address	Predicted noise level without mitigation, LAeq, dB	Predicted noise level, taking account of mitigation LAeq, dB
NSR 1	BOHERKILL, RATHANGAN, KILDARE, R51 VK72	52	45
NSR 2	AISLING HOUSE, THOMASTOWN EAST, RATHANGAN, KILDARE, R51 K761	48	41
NSR 3	BOHERKILL, RATHANGAN, KILDARE, R51 CY64	45	38
NSR 4	THOMASTOWN LODGE, THOMASTOWN EAST, RATHANGAN, KILDARE, R51 CR40	44	37
NSR 5	HILL VIEW, GUIDENSTOWN NORTH, DUNMURRY, KILDARE, R51 FT98	41	34
NSR 6	THE PADDOCKS, GUIDENSTOWN NORTH, DUNMURRY, KILDARE, R51 A718	41	34
NSR 7	KILMONEY LODGE, KILMONEY, RATHANGAN, KILDARE, R51 E290	40	33
NSR 8	THOMASTOWN EAST,RATHANGAN, KILDARE. R51 HN82	40	33
NSR 9	SAINT CONLETH'S, GUIDENSTOWN SOUTH, KILDARE. R51 D993	39	32
NSR 10	BOHERKILL, RATHANGAN, KILDARE, R51 YA02	38	31

8.12 Recommendations

The planning authority should attach noise conditions to the permission to ensure that the plant is so operated and maintained as to ensure that it avoids causing noise nuisance

It is recommended that such noise limits/condition be set at the nearest noise sensitive receptors rather that at the site boundary.

8.13 Conclusions

It has been determined that the site of the proposed development is not by definition an “Area of Low Background Noise”.

The proposed development will result in a reduced traffic volume and therefore the resultant noise levels will be lower than currently.

- The site of the proposed development is located along the busy R401 Kildare road. Road traffic is the dominant factor on existing ambient noise levels in the area.
- Noise impacts from road traffic will therefore be negligible.

During normal operation of the facility there should be a negligible noise impact at all nearby residents.

Noise emissions should contain no clearly audible tones and should not be impulsive in nature.

Predicted noise emissions should be well within recommended criteria levels if mitigation measures are implemented.

SECTION 9: CULTURAL HERITAGE

9.1 INTRODUCTION

9.1.1 Background

This section of the EIS outlines the Architectural, Archaeological and Cultural Heritage issues with respect to proposed quarry restoration project at Boherkill, Rathangan, Co. Kildare.

Environmental Impact Assessment (EIA) is a process for anticipating the effects on the environment caused by a development. An Environmental Impact Statement is the document produced as a result of that process (EIS). Where effects are identified that are unacceptable, these can then be avoided or reduced during the design process (Environmental Protection Agency 2003:1).

This study determines, as far as reasonably possible from existing records, the nature of the cultural heritage resource within the area of proposed development using appropriate methods of study. Desk based research is defined as an assessment of the known or potential archaeological resource within a specified area consisting of a collation of existing written and graphic information. The assessment takes place in order to identify the likely character, extent, quality and worth of the known or potential archaeological resource in order to make an assessment of its merit in context, leading to one or more of the following:

• The formulation of a strategy to ensure the recording, preservation or management of the cultural heritage resource;

• The formulation of a strategy for further investigation, whether or not intrusive, where the character and value of the resource is not sufficiently defined to permit a mitigation strategy or other response;

• The formulation of a proposal for further archaeological investigation within a programme of research. (Institute of Field Archaeologists 2001a)

The study involved detailed interrogation of the archaeological and historical background of the development site. Information has been obtained from the Record of Monuments and Places of Co. Kildare, relevant County Development Plans, the topographical files of the National Museum of Ireland, and cartographic and documentary records. Aerial photographs of the study area held by the Geological Survey of Ireland were also consulted. A field inspection was carried out in April 2015 in an attempt to identify any known archaeological sites and previously unrecorded features and portable finds within the proposed development area.

An impact assessment and a mitigation strategy have been prepared. The impact assessment is undertaken to outline potential adverse impacts that the proposed development may have on the cultural heritage resource, while the mitigation strategy is designed to avoid, reduce or offset such adverse impacts.

9.1.2 Scope of Work

It is proposed to restore the worked out sand and gravel pit back to original (pre-extraction) ground levels and agricultural after use using imported inert soil and stone and some recycled construction and demolition waste. The lands were previously worked for sand and gravel. The proposed development comprises restoration of a worked out sand and gravel pit using inert soil and stone and recycled construction and demolition waste.

Any small amounts of steel reinforcement, timber or paper arising from the recovery operations are stored temporarily in designated areas, prior to dispatch to an appropriately licenced transfer or recovery facility nearby. The plant and machinery proposed for use within the facility includes 1 no. bulldozer, 1 no. excavator, 1 no. loading shovel, 1 no. dumper. There will also be some sand washing plant for a period or 2 – 3 years extracting the remaining economically viable sand and gravel resource.

The total void space is approximately 0.85 million cubic metres (which equates to 1.5 million tonnes at a placed density of 1.8 tonnes per cubic metre). Based on an annual intake of 150000 tonnes of inert waste per year, this gives a life for the development of approximately 10years. The final restoration layer will typically comprise 0.85m of subsoil overlain by 0.15m of topsoil. This will enable the lands to be returned to beneficial agricultural after use. No further ground disturbance will be undertaken.

9.1.3 Contributors . Project Team

The project team was represented in this instance by Archaeological and Heritage Consultants, Byrne Mullins and Associates with Martin E Byrne MA, Dip. EIA Mgmt, MIAI being the principal consultant. For the purposes of this current EIS submission and given the nature of the fact that we are dealing in Archaeological and Cultural heritage where significant change is not expected since the report date of May 2015,Mr Byrne was not requested to amend his submission. Should a date change and review be required by the planning authority in this instance it can be readily facilitated.

9.2 RECEIVING ENVIRONMENT

9.2.1 Available Information

The subject development lands are located in the townland of Boherkill, in the civil parish of Rathangan and in the barony of Offaly East. The field boundary to the east of the subject development area forms a townland boundary between Boherkill and Guidenstown North while that to the west/southwest forms a townland boundary with Thomastown East. The latter is also a parish boundary between Rathangan and Thomastown.

The townland name may derive from the Irish *An Bóthar Cúill* – The Hazel Road (Placenames Commission – www.logainm.ie). Lewis (1837) notes that the civil parish of Rathangan at that time comprised 8872 statute acres, as applotted under the Tithe Act and that the principal seat within its limits was Tottenham Green, that of Geo. Tottenham, Esq. Griffith's Valuation of 1854 notes that the lands in the general area formed part of the estates of the Duke of Leinster and that the subject lands were leased by a Thomas Flood.

No events of historical interest were noted in any of the documentary or cartographic sources examined during research undertaken with respect to the preparation of this report.

9.2.2 Archaeological Heritage

The area under assessment is part of a landscape which is rich in historical and archaeological material. The general region has attracted settlement from early times as evidenced by the presence of monuments dating back to the prehistoric period. Continuity of settlement is illustrated by artefacts dating to the Later Mesolithic and by identified monuments ranging from Neolithic to Medieval and Post-Medieval remains.

The siting preferences of particular monument types are well documented. Broadly speaking, the general landscape along, and in the environs of, the existing line corridor offers a potential setting for the discovery of archaeological sites and remains, as follows:

- The localised upland areas of the site and environs are a favoured position for the location of prehistoric burial sites, ringforts and enclosure sites in the general region surrounding the subject development lands.

9.2.2.1 Relevant Archaeological Inventory

There are a total of two sites of archaeological interest/potential, both listed as a Recorded Monuments (see Appendix 1), as being located within the overall defined Cultural Heritage study area associated with the project (i.e. lands within the site boundaries and *c.* 100m surrounding such). These are designated CH-1 to CH-2 in *Table 2* and the locations are indicated in Figure CH-1.

SITE No.	SMR No.	TOWNLAND(S)	CLASSIFICATION	ITM
CH-1	KD017-026	Boherkill Guidenstown North	Moated Site	669985 717520
CH-2	KD017-038	Boherkill	Enclosure Site	669885 717570

Table 9.1 List of Archaeological Monuments within defined study area

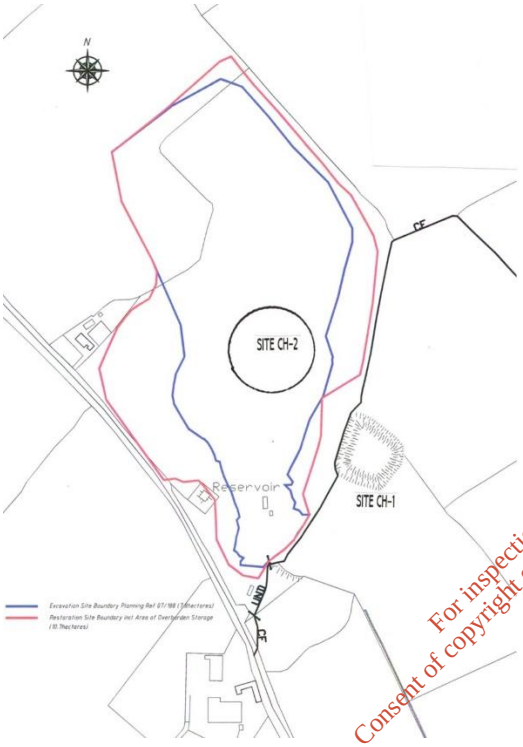


Figure CH-1 Locations of Archaeological Monuments CH-1 & CH-2 (Reproduced under OSI Licence No.: EN0074512)

The monuments are described as follows:

Site CH-1	Description
SMR No: KD017-026 **TOWNLAND:** Boherkill Guidenstown North **CLASSIFICATION:** Moated Site **ITM (from ASI):** 669985 717520 **PROTECTION:** RMP; KCDP;	This monument is located on a narrow tillage spur projecting west from the western foot of Grange Hill. It consists of a large fosse and bank, enclosing a rectangular area (*c.* 60m [NW bank] x *c.* 58m [NE bank]), with an entrance in the SW side. The bank is 1.5 – 1.7m high on the inside, dropping to *c.* 2.2m to base of fosse. The bank is steep sided and well defined; *c.* 2m wide at base and 1m wide at top. The base of the fosse is up to 1.3m below external ground level and is a broad U -shape in profile. It is 6-7m wide at ground level. Gaps in the NW bank close to the N corner and SE bank close to the E corner are probably modern. The interior is generally of a flat surface though very overgrown. Indeed, the banks and immediate area surrounding the site generally consists of dense growths of trees and bushes, as illustrated in Plate CH -1. A 30m buffer area along the western edge of the monument was established in advance of the commencement of quarrying activities, as illustrated in Plate CH2. This is largely still intact although there has been some encroachment near the north -western corner of the monument by the establishment of a retaining bund for a silt pond, as illustrated in Plate CH-3. The base of this bund is located *c.* 15m from the external north-western corner of the fosse.

Plate CH-1 SITE CH-1 (Moated Site) from southwest (Date: 2003)

Plate CH-2 Buffer Area along western edge of SITE CH-1 (looking south)

Plate CH-3 Silt Pond Retention Bund located close to north-western corner of SITE CH-1 (looking north)

Site CH-2	Description
SMR No: KD017-038 **TOWNLAND:** Boherkill **CLASSIFICATION:** Enclosure **ITM (from ASI):** 669885 717570 **PROTECTION:** RMP; KCDP	A possible circular enclosure was identified on aerial photographs from the archives of the Geological Survey of Ireland (Refs. GSI N425 & N426). The site is not marked on any O.S. or other historic maps and there were no surface traces of the possible monument noted during any surface reconnaissance of the site undertaken in advance of the commencement of quarrying activities . A programme of archaeological testing (Figure CH-2), undertaken by the writer in November 2003 (Licence No.: 03 E 1891), did not reveal any subsurface features associated with this possible monument. Likewise, subsequent monitoring of topsoil stripping/general ground reductions onto the surface of the underlying subsoil did not reveal any subsurface features, deposits or material of archaeological interest/potential. However, it was noted that the topsoil cove in this area was noticeably deeper than elsewhere within the present quarry pit and it is speculated that such led to more vibrant crop growth at this location and it was this that was noticeable in the aerial photographs.

9.2.3 Results of previous Archaeological Investigations

A programme of archaeological testing was undertaken at the site in November 2003 in compliance with a grant of planning (Kildare Co. Co. Plan Ref: 01/1270; ABP Reg. No.: PL 09.130086) with respect to the retention of an existing gravel pit and the extension of same to 2.83 ha for the extraction and dry screening of Grade 1c fill, new enlarged recessed entrance at existing double entrance, security hut with portaloo and all associated site works.

This comprised the excavation of five test trenches (Figure CH-2) within the overall extension area, with a concentration within the area of the possible enclosure site (SITE CH-2). Nothing of archaeological interest was uncovered during the course of such testing.

It had been noted that the topsoil was noticeably deeper within the general area of the possible enclosure site, and this was further verified during the course of topsoil stripping, undertaken on a phased basis from December 2003 – March 2006. It is speculated that the additional depth of topsoil in this area lead to a more vibrant crop growth in this area, relative to the immediate environs, and it was this variation that was noticeable in aerial photographs.

No features, deposits or artefacts of archaeological interest were uncovered during the course of either the Archaeological Testing or subsequent Monitoring programmes. Likewise, a subsequent surface reconnaissance survey of the remaining quarry lands, undertaken in 2006 in preparation of an EIS, did not reveal any possible features of archaeological potential.

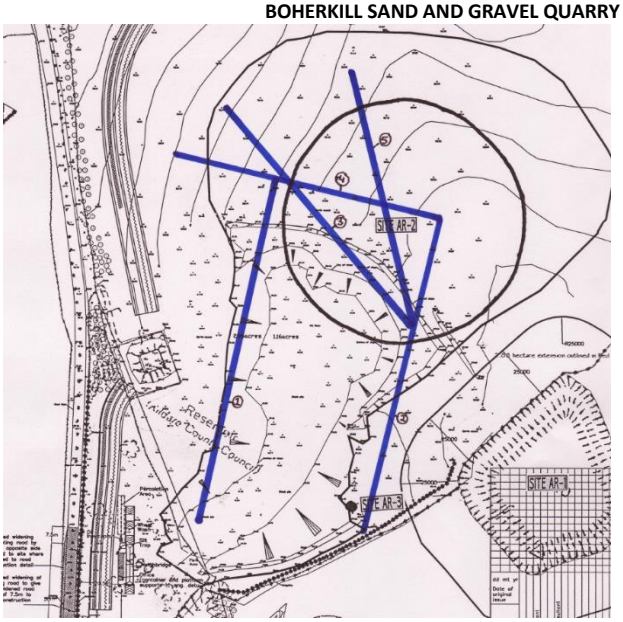


Figure CH-2 Locations of Archaeological Test Trenches excavated in 2003

9.2.4 Reported Archaeological Artefacts

A search of the Topographical Files of the National Museum of Ireland, together with published sources, was undertaken as part of the preparation of the report. No entries concerning the overall townland areas were noted.

9.3 Architectural Heritage

There are no protected structures within the meaning of the Planning and Development Act, 2000 and listed in the Kildare County Development Plan, 2011 - 2017, situated within the defined Cultural Heritage study area. Likewise, no structures of interest are noted in such study area by the National Inventory of Architectural Heritage.

9.4 Development Impacts

9.4.1 Local History

The general historical background to the subject development area was introduced above in Section 9.3.1. In summary, there are no significant historical events associated with the proposed development lands which have the ability to be impacted upon by the proposed development.

9.4.2 Archaeological Heritage

There are a total of two sites of archaeological interest/potential, both listed as a Recorded Monuments, located within the overall defined Cultural Heritage study area associated with the project (i.e. lands within the site boundaries and *c.* 100msurrounding such). One of these – SITE CH-1 – is a Moated Site located along the eastern edge of the overall landholding. A 30m buffer area between the outside edge of the external fosse to this monument and the quarry excavation area is in existence, although this has been slightly infringed by the construction of a silt pond retaining bund, the base of which is positioned *c.* 15m from the

external north-western corner of the fosse to the monument. The other – SITE CH-2 – is an Enclosure Site, visible on specific GSI aerial photographs. Prior to the commencement of quarrying activities, there were no surface traces of this feature and no subsurface evidence was uncovered by a programme of archaeological testing undertaken in 2003. Likewise, archaeological monitoring of topsoil stripping in the area of this feature did not reveal any subsurface remains of interest and/or potential.

It is considered that the reinstatement and restoration of the quarry pit to its pre-development levels will have a positive impact visual impact on SITE CH-1, as the temporary visual impact on the site, caused by the existing nature of the quarry pit, will be removed.

Works associated with the removal of the silt pond bund adjacent the north-western corner of SITE CH-1 could potentially result in damage to fosse, particularly by soil run-off into the feature. However, with the adoption and implementation of a specific mitigation strategy, it is considered that such moderate impact can be totally negated. Likewise, possible use of the buffer area for machinery access could cause a similar impact on SITE CH-1 but this too can be negated by the adoption and implementation of a mitigation measure.

9.4.3 Architectural Heritage

There are no protected structures within the meaning of the Planning and Development Act, 2000 and listed in the Kildare County Development Plan, 2011 - 2017, situated within the defined Cultural Heritage study area. Likewise, no structures of interest are noted in such study area by the National Inventory of Architectural Heritage. Consequently, no impacts in this regard will occur.

9.5 Mitigation Measures

As noted above in Section 9.4, it is not considered likely that the development, as proposed, will cause any direct impacts to previously identified monuments or structures of archaeological heritage interest or potential. Likewise, no impacts, direct or indirect, will occur to any items of architectural heritage or historical interest.

However, as noted above in Section 9.2, there is potential for indirect impacts to occur with respect to SITE CH-1 during removal of the silt pond bund adjacent its north-western corner or by the remains of the established buffer area being used as an access by construction vehicles. However, such possible impacts can be negated by the adoption of the following mitigation strategy and its inclusion as a specific condition of any Grant of Planning:

1. The existing buffer area between the western edge of the quarry pit and the eastern edge of the Moated Site (Site CH-1) shall be maintained during all reinstatement works. This should be marked by a series of temporary timber stakes. No construction of other vehicles should enter this area during the course of the subject reinstatement works, save for the works associated with Item 2 below.

2. Removal of the silt-pond bund should be undertaken under supervision of an archaeologist. Care should be taken to avoid soil run-off into the fosse of the Moated Site (SITE CH-1). In the event that such occurs then to should be removed by hand under archaeological supervision, ensuring that the present grass surface of the monument is not disturbed.

9.6 Predicted Impacts

9.6.1 Re-Instatement Phase

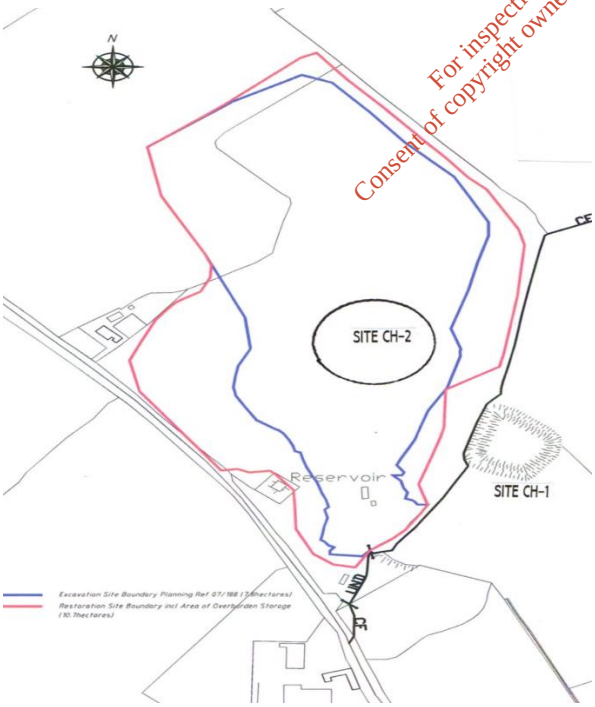
The requirement for the continued retention of the 30m buffer zone adjacent SITE CH-1 will ensure that no impacts will occur to the monument. In addition, the requirement for archaeological supervision of the silt-pond bund presently located adjacent the north-western corner of the monument will ensure that no damage is cause to it during the course of such works.

9.6.2 Worst Case scenario

A 'worst case' scenario with respect to archaeological heritage would arise where the development was permitted to commence without any archaeological mitigation requirements being included in a Grant of Planning, without the appointment of an archaeologist to undertake and mitigation requirements or without the attendance of the archaeologist. In such scenarios, there is potential for accidental damage to be caused to SITE CH-1

9.7 Residual Impacts

It is envisaged that the residual effect of the reinstatement of the quarry pit and its subsequent use for agricultural purposes will result in an enhanced visual setting to SITE CH-1 over that which presently exists.



SECTION 10 LANDSCAPE

10.1 INTRODUCTION

This Environmental Impact Statement (EIS) provides supporting information to accompany a Planning permission application by Mr Michael Ennis of Boherkill, Rathangan, Co Kildare, for the remediation of the existing Sand and Gravel pit at Boherkill, Rathangan, Co. Kildare.

This section of the EIS describes, classifies and evaluates the existing landscape and visual resource, focusing on its sensitivity and ability to accommodate change. The existing / proposed restoration scheme was then applied to the baseline conditions to allow identification of potential impacts, prediction of their magnitude and assessment of their significance. Mitigation measures were then identified to eliminate and reduce, insofar as practical, potential environmental impacts.

10.2 BASELINE ENVIRONMENTAL STUDY

10.2.1 Outline of the Baseline Study

The initial data to assess the significant effect on the landscape was acquired through:

- Inspection and walkover of application site
- Review of topographical survey data in respect of application site and its surrounds
- Photographic surveys of the site and its surrounds

This information was then evaluated and assessed:

- Considering the phasing and layout of future restoration works at the application site.
- Using cross-sections through the existing site, overlain with the phased working scheme of the development.

10.2.2 Existing Environment . Land Use

The application site and existing Sand and Gravel quarry are located within an undulating rural landscape. The predominant land use in the surrounding area is agricultural, principally pasture and tillage with limited forestry. In the immediate vicinity of the application site however, mineral extraction activities constitute a locally significant land use. Although sand and gravel extraction activities have been significantly reduced at the site, there are few large scale operations in the immediate vicinity.

There are a number of isolated residences in the area immediately surrounding the existing facility, also shown on Figure 10.1. There is a residence immediately west of the application site, another at the north-west corner of the site, three around the north-east corner of the site and one to the south of the site.

Table 10.1 location of proximate residences

10.2.3 Existing Environment . Topography

The site is located in an area of rich pastoral landscape at the foothills of Dunmurray Hill, it is outside the recognised 'uplands' specifically identified in the Development Plan Rural Detail Map 'Robertstown Countryside'. The site does not appear to be located within a designated Area of High Amenity.

10.2.4 Planning Considerations

Kildare County Development Plan identifies the surrounding area as an area of specific landscape and visual interest. The area itself is referred to as "The Central Uplands or the Chair of Kildare"

The Central Uplands or the Chair of Kildare as the area is locally known consists of a number of hills that interrupt the continuity of the Kildare plains. This landscape character unit is located immediately north of Kildare town. The land rises to a maximum of 233m O.D. at Dunmurry Hill. The ridgeline of Dunmurry together with the ridgelines of Grange Hill (223m O.D.), Red Hill (197m O.D.), Boston Hill (159m O.D.) and Hill of Allen (219m O.D.) define the skyline of central Kildare and represent significant features on the landscape.The elevated nature of this area provides highly scenic views over the central plains and boglands of Kildare.

Soils in the area are dominated by Grey Brown Podzolics combined with small pockets of mineral soils as well as raised bogs and reclaimed peats. The area is generally suitable for tillage, pasture and forestry, the suitability of boglands areas being unclassified.

Cultural Significance

The Hill of Allen is of mythological significance, with the legendary Fionn MacCumhaill and the Fianna. It is supposed to have been the site of their camp, with the surrounding area as their training ground.

Land Uses
The Chair of Kildare comprises a number of landuses. Large fields within this area are generally used as pasture lands, however a significant amount of non-irrigated agricultural lands, mainly containing tillage, can also be found. Coniferous forestry represents another significant landuse in the area, with some patches of naturally occurring vegetation, mainly at Allen and Dunmurry Hills.

Allen Hill is characterised by the mineral extraction and quarrying activities on its north-western part. Similarly, Boston Hill has a large area of gravel extraction activities. A visually dominant feature of Red Hill is the telecommunication mast located on the hilltop.

Land parcels within this unit are of medium to large size, with generally well-maintained low hedgerows. Small villages such as Allen, Killeagh and Guidenstown, together with a dispersed pattern of rural houses and farm structures are indicative of a relatively high rural population density.

Boundary Determinants

The boundaries of this unit are directly derived from the geology, subsoils (i.e. quaternary geology) and topography of the area, which largely coincide with the soils and landform and are further confirmed by the existing land uses.

Critical Landscape Factors

• Elevated Vistas

A number of regional and local roads run through this landscape character unit. The roads cross the upper and lower slopes of the hills and provide access to established residences as well as to Kildare town. As a result of the elevated road level and the generally low vegetation, there are long distance and extensive views towards the surrounding lowlands and boglands.

• Slopes

The slopes of the hills that form the Chair of Kildare define the visual boundary of the adjacent lowland areas. Sloping land intensifies the visual prominence of any feature over greater distances, as in the case of the Hill of Allen, Red Hills, Dunmurry and Grange Hills. Slope also provides an increased potential for development to penetrate primary and secondary ridgelines when viewed from lower areas of the public realm such as the roads and population centres in this area.

• Prominent Ridge Lines

These occur as either primary ridgelines (visible only against the sky from any prospect) or secondary ridgelines (visible at least from some prospects below a distant primary ridge line). In this upland environment of the Chair of Kildare, nearly all ridgelines are primary when viewed from the surrounding lowland areas. Ridge lines perform the important roles of providing adjacent areas with visual identity, acting as dominant landscape focal points, and defining the extent of visual catchments.

• Undulating topography

Gently undulating topography is presented within the upland area of this character unit, particularly to the south (i.e. between Red, Dunmurry and Grange Hills). The physical shielding within the lee of hills can conceal
relatively large new features, where it does not break the skyline. The dynamic and complex nature of undulating land has the potential for locally enclosed vistas.

• Low Vegetation
Low vegetation, represented in this unit by grassland, moorland and generally low hedgerows, is generally uniform in appearance, failing to break up vistas and allowing long distance visibility, thereby, providing an inability to visually absorb development.

• Shelter Vegetation

Shelter vegetation, represented in certain areas of this unit by coniferous plantations, provides visual screening, enclosing vistas and helping to provide a visual containment.

• Localised Canal Views

Canal corridors are generally visually enclosed and highly localised areas of very distinctive character with a high degree of visual consistency. The area has localised vistas to the Milltown Feeder of the Grand Canal that runs south of Hill of Allen and north of Grange Hill.

10.3 ASSESSMENT OF IMPACTS

A common human response to most extractive and related activities is that they reduce landscape quality. The extent to which this is considered a negative visual impact on the surrounding landscape is influenced by a number of factors including:

• The extent, scale and shape of the development.

• The contrast in colour between the exposed pit faces, if visible, and its surroundings.

• The accumulation of industrial type buildings that are out of scale and character with those normally found in the surrounding area.

A further consideration is not just its proximity to human habitations but also the number of people who pass through the area, for whatever reason, who may feel that the visual quality of the area has been degraded by the presence of a sand and gravel quarry and any associated processing activities.

In the case of the application site at Boherkill, while extraction of sand and gravel has been greatly reduced, the resultant void has not been backfilled and restored and there are significant areas of bare exposed soils across the site. In assessing the visual impacts arising from the proposed restoration scheme, the main requirement is to assess the following:

- The views and viewers affected
- The distance of the view

The application site currently comprises two primary areas; the existing active excavation area and the proposed restoration area.

- The existing operational excavation area contains the site entrance, weighbridge and office and wheel wash facilities, all at a ground level of approximately. There are security gates at the site entrance which restrict access into the site. Also the current extraction area containing the washing plant and associated plant and machinery.

- The proposed restoration area which will be located to the north of the site and work backwards in a southerly direction towards the main gate of the site.

The restoration works, and backfilling activities in particular, are expected to have only limited temporary visual impact due to the natural screening afforded the site by the surrounding landscape elements, a combination of the undulating topography and existing hedgerows. The phasing of the restoration scheme will minimise the area being actively restored and open to public view at any time due to the deep excavation and levels attained in the excavation phase. Only a limited extent of the restoration works, if any, will be open to public view, and where it is, this will be of an intermittent nature and as such will constitute a temporary, minor negative impact.

In accordance with the Environmental Protection Agency: Guidelines on Information to be Contained in an EIS. Particular attention has been paid to potential views into the application site from the following locations;

- Designated tourism routes and viewpoints;

- Other roads and residences, hotels and amenities and

- Sites and monuments of archaeological, architectural or historical interest

The definition of the term views in the EPA Guidelines is taken to imply significant visibility.

10.3.1 Designated Tourism Routes and Viewpoints

There will be no significant visibility of the existing or future landform from any of the viewpoints identified by the County Development Plan.

Direct Impacts

The restoration scheme will not have any significant impacts on designated scenic roads and viewpoints on account of its location; the intervening undulating topography; screening by hedgerows, the phasing of the works and the proposed mitigation measures. The scheme will not restrict or obscure any westward vistas along the adjoining local roads

Indirect Impacts

The restoration scheme will not have any significant indirect impacts on designated tourism routes and viewpoints.

10.3.2 Other Roads and Residences, Hotels and Amenities

The visual aspects of the restoration scheme are primarily concerned with views from the closest residences and roads within the area (refer to Figure 10.1). A photographic survey was undertaken which involved taking still digital photographs from a number of locations (including a number of residences), the locations of which are indicated on Figure 10.1. The photographs were taken at eye level (c. 1.5 metres above ground level) at the points indicated, towards the development. The views are shown on Plates 10.1-10.20.

Direct Impacts
Potential views from residences into the application site are and will be restricted to a small number of local dwellings. Many of these dwellings are fully or partially screened by a combination of the existing hedgerows (to be retained) and / or topography. The phasing of the restoration scheme and direction of backfilling has had regard to the need to minimise the impacts on views from nearby residences. Due to the separation distance and intervening topography, the impact on views from residences, if any, will constitute a minor to moderate negative impact for a limited duration during the restoration phase. In the longer term, the restoration of the site is likely to have a minor positive impact.

The application site is too distant to be perceptible from the Curragh or the racecourse at the Curragh (Major point of leisure amenity). Views toward the site will be drawn more toward the intervening extraction activities at a lower level. During the restoration works, there will not be any temporary visual impact on views.

Indirect Impacts
The development will not have any significant indirect impacts on views from roads, residences, hotels and amenities.

10.3.3. Sites and Monuments of Archaeological, Architectural or Historical Interest

The proposed restoration works will not be visible from any archaeologically significant sites in the immediate vicinity of the application site.

Direct Impacts
Throughout the restoration phase, plant, equipment and backfilled soil may potentially be slightly visible (although not assumed to be the case) immediately beyond the boundary, primarily because of its elevated position, proximity to the site and the absence of any screening by intervening vegetation of topography. This impact constitutes a moderate negative impact of extended (although not permanent) duration.

Indirect Impacts
The development will not have any indirect impacts on identified sites and monuments of archaeological, architectural or historical interest.

10.3.4 Interaction with other Impacts

Potential interactions with other impacts associated with visual intrusion (e.g. human beings or material assets) are discussed in the relevant sections of the EIS.

10.4 MITIGATION MEASURES

Measures taken to further minimise the potential visual impacts associated with the existing and proposed development can be classified as;

- *Avoidance*
- *Mitigation*

The primary measure taken to minimise visual impacts is through their avoidance. It is considered that the proposed phased working scheme and the positioning of the site infrastructure (principally the screening and processing plant), together with existing hedgerows along the site boundary and the surrounding topography, will ensure that the visual impact of the development is not significant.

The following landscape mitigation measures should be put in place to further eliminate and / or minimise any potential visual impact associated with the proposed restoration scheme:

i) Retain all hedgerows along the site boundary and reinforce with additional planting where necessary.

ii) Provide for off-site removal, re-use and/or recovery of all buildings, plant, infrastructure and paved surfaces on completion of restoration activities.

iii) Ensure the final restored landform is graded at a shallow angle so as to merge in with the surrounding agricultural landscape.

These mitigation measures are in accordance with the recommendations provided in the DoEHLG (2004) publication .Quarries and Ancillary Activities: Guidelines for Planning Authorities..

Overall, it is considered that the potential for negative visual impacts arising from the restoration of the former sand and gravel quarry will generally be limited on account of

- the physical distance between the site and publicly accessible areas
- the existing undulating topography
- the phasing and direction of backfilling during the restoration works
- the positioning of temporary site infrastructure and
- the final restored profile of the site.

10.5 Photographic Representation of Visual Impacts

For a photographic representation of the visual impacts of the proposed facility please revert to Appendix 8.0 to view all photos.

SECTION 11: TRAFFIC

11.1 INTRODUCTION

TPS Limited has been retained to prepare a Traffic Report relating to the reinstatement operation of an existing gravel pit facility at Boherhill, Rathangan, County Kildare. This existing gravel pit was granted planning permission by Kildare County Council (Planning Ref: 07/188) in August 2008. On 12/08/2015 via Planning Ref 15/515, Kildare County Council approved the extension of the current operations of the quarry by 5 years to 2020, allowing the proceedings from PL 07/188 to be extended.

11.1.1 Background

The gravel extraction relating to this planning permission has to date extracted 1,123,786m3 of gravel material. Some 91,376m3 of overburden has been temporarily relocated elsewhere within the site. The existing gravel pit operates from 0800hrs to 1800hrs Monday to Friday inclusive (excluding bank holidays) and between 0800hrs and 1300hrs on Saturdays. The gravel pit is closed on Sundays and Bank Holidays.

As previously discussed Kildare County Council granted planning permission for extraction of gravel at this site in 2008. The permission was for a 7 year extraction period with an annual extraction limit of 265,650 tonnes.

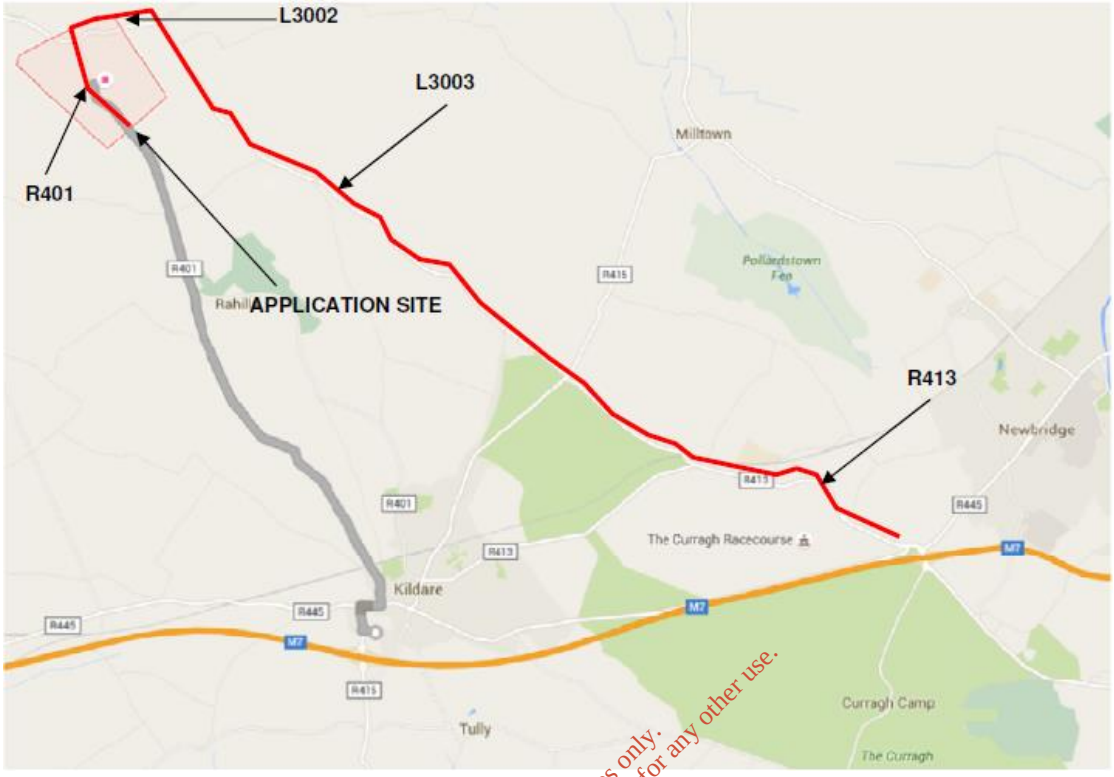
Specific to this planning application Kildare County Council set out 3 traffic and transportation related planning conditions within this grant of permission.

They were:

- Condition 2 d) related to a maximum of 50 inbound and outbound vehicles in both directions accessing the site per day.
- Condition 17 related to lines of sight within the site access being in accordance with the Design Manual for Roads and Bridges.
- Condition 23 related to the erection of advance warning signage being erected 150.0 metres either side of the site access

11.2 RECEIVING ENVIRONMENT

The gravel pit site is bounded to the west by the R401 which functions as an 80kph regional road within Kildare County Council's road hierarchy. Along the length of the R401 vehicular access is provided to individual residential properties, farm holdings and agricultural farmlands with all of these access points taking the form of simple gated agricultural access points or simple priority 'T' junction arrangements. Thus, it can be considered that the principle of direct vehicular access to serve land use development from this road is well established in this area.



The existing gravel pit site is accessed from the R401 by means of a wide simple priority 'T' junction. This access also contains a localised widening of the R401 to 7.5 metres for a general distance of 50.0 metres upstream and downstream of the site access 4.5 The general layout of the existing access and the localised road widening of the R401 in this area is shown within Photograph 1.0, Photograph 2.0 and Photograph 3.0 below:

Photograph 1.0: Southbound view into R401 from existing gravel pit access.

Photograph 2.0: Northbound view into R401 from existing site access.

Photograph 3.0: View to the east from R401 into existing site access.

It can be seen from the above that the roads and traffic conditions assigned to the grant of planning permission for the gravel pit have been fully implemented. In addition this access has been designed to a standard that provides sightlines within the site access that accords with the standards set out with the Design Manual for Roads and Bridges.

During the traffic consultants site visits all traffic entering or exiting the existing gravel pit access was observed to undertake these inbound and outbound manoeuvres with no difficulty and these vehicles had no material or operational impact on the traffic using the R401.

The hedgerows towards the northern side of the existing site access can be relocated outside of the required 2.4m X 150.0m visibility splay into the leading traffic direction of the R401.

At present some limited gravel extraction takes place with some 4 to 5 heavy vehicles accessing the site per day. This extent of heavy vehicle trips is well below the permitted 50 inbound and 50 outbound heavy vehicles conditioned within the 07/188 planning permission.

Upstream and downstream of this site access is road signage advising all road users of the potential that heavy vehicles may be undertaking turning manoeuvres ahead. Within the site is a wheel wash used by exiting vehicles to limit the extent of debris being carried onto the R401. These measures also comply with the above planning conditions assigned to the 07/188 planning permission.

11.2.1 Future Years Background Traffic Flows

Subject to Local Authority planning approval and subsequent EPA waste licence approval, the required waste licence will be granted in 2016 and will remain valid for the lifetime of the facility. The IHT Guidelines for Traffic Impact Assessment recommend that the opening year (base year) of the development and a plan year, 10 years after the opening year, should be considered for assessing a proposed development. In this case, the base year is 2016 and the plan year is 2026. In the document “Future Traffic Forecasts 2002 -2040”, the NRA envisages that passenger car traffic and light goods vehicle traffic and heavy vehicle traffic on non-national routes will increase by a factor of 1.144 and by a factor of 1.147 respectively during the period 2008 to 2018. In respect of this development in the localised area with the demographic statistics for the area it is unlikely to even extend to these factors.

If we factor in the rise of times 1.147 the existing traffic volume to 2018 and assume a rise of 1.4 to the plan year we would see very little impact on the traffic from the proposed development. At present the current usage figures allow for 50 inbound and outbound loads per day. The proposal for restoration is for 30 inbound and outbound loads per day and there will be a max of 5 inbound and outbound sand and gravel loads per day. Therefore 35 inbound and outbound loads per day for the duration of the proposed development. Even with a factored rise of 1.4 (which would be well in excess of the NRA assumptions the total volume of inbound and outbound truck movements would only be 49 maximum thereby never exceeding the existing permitted thresholds.

11.3 PROPOSED DEVELOPMENT

As previously discussed the gravel pit has extracted some 1,123786 m3 of gravel material with 91,376 m3 of overburden relocated within the site. Based on the Environmental Protection Agency conversion factor of 1.8 tonnes per cubic metre this equates to some 1.5 million tonnes of inert material required to reinstate this gravel pit. If the above is applied to the reinstatement of the gravel pit over a ten year period, then 150,000 tonnes per annum would be required to reinstate the gravel pit.

Typically this reinstatement would operate for 46 weeks of a year allowing for annual leave, builders holidays, bank holidays and Christmas holidays. Generally the working week is 5 1/2 days with early closing on Saturday afternoon.

Over this 51/2 day week just over 3260 tonnes of inert material could be imported which results in 592 tonnes per day being imported. From our experience of similar operations the average heavy vehicle can carry 20 tonnes on inert material which based on the above gives rise to 30 heavy vehicles per day accessing and departing the site.

As previously discussed the existing planning permission within Condition 2 d) permits a maximum of 50 inbound and outbound vehicles in both directions accessing the site per day.

We understand from discussions with the applicant and the existing gravel pit operator that no incident or third party complaint has been made in relation to the current gravel pit operation or the haul routes being used by the operator.

In traffic terms the heavy vehicles associated with the proposed reinstatement of the gravel pit can be regarded as already accessing this site from the adjacent road network albeit removing gravel product under the current planning permission.

As such the traffic impact of reinstating the gravel pit can be regarded as neutral.

11.4 MITIGATION MEASURES

It has been established by TPS limited that there will be minimal adverse impact on traffic from the existing facility should the proposed development be granted planning permission. Further to that in fact TPS limited have stated that there will be a nett decrease in the current permitted vehicular loading rates for the facility. Given that there has been no reported incidents in respect of the operations of the facility the mitigation measures suggested focus specifically on replicating the current procedures for entering and exiting the facility. Key to this will be ensuring:

1: Adequate wheel-wash facilities are maintained onsite for the proposed restoration works and the limited duration of the continued extraction works

2: Regular inspections are carried out on at the entrance / Exit of the site to inspect the road condition. In the event of irregularities occurring or of dirty roads as a result of the operation it will be the responsibility of the operators of the facility to ensure that adequate temporary warning signage is put in position and that a speedy clean-up is carried out.

3: Consultation should be made with the Roads Section of the Local Authority to establish whether the existing road signage is adequate to notify traffic of the potential for vehicles to be turning into and out of the facility.

11.5 CONCLUSIONS

This existing gravel pit was granted planning permission by Kildare County Council in August 2008. Under this planning permission a maximum of 50 inbound and outbound vehicles in both directions can access the site per day. The existing site access has been designed to accord with the standards set out with the Design Manual for Roads and Bridges. The haul routes to the existing gravel pit have operated without incident or compliant in relation to heavy vehicles accessing or departing the site. The reinstatement of the gravel pit would require some 1.5 million tonnes of inert material to be imported or relocated within the site over a ten year period. It is projected that 150000tonnes would be imported per year which could give rise to some 30 inbound and outbound heavy vehicle trips. This level of daily heavy vehicle trips is less that permitted under the current planning permission and can be readily accommodated within the existing road network.

SECTION 12 : MATERIAL ASSETS

12.1 INTRODUCTION

This study addresses the impact of the restoration of the existing sand and gravel quarry at Boherkill, Rathangan, Co. Kildare on materials assets in the surrounding area. This study is intended to accompany the application by Michael Ennis to Kildare County Council Planning Authority for planning permission to restore the existing extracted quarry and bring the land use back to sustainable agricultural land-use.

In undertaking this study, due regard has been had to aspects such as infrastructure, economic activities and property values in the vicinity of the site, and the impact of the restoration of the application site on these factors.

12.2 RECEIVING ENVIRONMENT

12.2.1 Outline and Methodology of the Baseline Study

The baseline study of the area with regard to material assets involved a general assessment of the local road network around the application site, economic activities, commercial properties and housing in the area. Information presented is based primarily on observations made during a site visit to the area in November 2015 and January 2016 and information obtained from the internet.

12.2.2 Site Context

The sand and gravel quarry which is currently proposed for restoration restored and to which this application refers is located entirely within the townland of Boherkill, Rathangan, Co. Kildare, approximately 3km south-east of Rathangan Co Kildare on the R401 National Secondary routeway and 5.5km north-west of Kildare Town. The application site and existing sand and gravel quarry is located largely in an agricultural area. There are a number of isolated residences in the area immediately surrounding the existing facility.

12.2.3 Infrastructure

The application site fronts onto a relatively lightly trafficked local road which has a number of one-off residential units located intermittently along it. This local road runs northwards on the R401 Regional Road. A relatively high proportion of the traffic along the local road is HGV traffic generated by restoration activities at the application site. There is no other transport infrastructure in the vicinity of the site.

Overhead electrical supply and telephone cables run along the local road beyond the south-western boundary and also parallel to the hedgerows on along the western and southern boundaries.

12.2.4 Land Use

The application site is located within a rural agricultural landscape. The final restoration of the site will restore the agricultural landscape to its original, pre-extraction state. The backfilling operation at the site will not impact on, or interfere with, any established agricultural activities at surrounding landholdings. There are no tourist attractions or sites of interest in the immediate vicinity of the application site.

The only facility of any recreational or leisure interest is the Curragh Racecourse which is located approximately 1km west of the site. Race meetings are only occasionally held at the course.

The Curragh itself represents a large open commonage plain used for galloping horses and as an amenity for walking enthusiasts runners and sports activists alike. It's frequency of use is daily.

12.2.5 Housing

As discussed in Section 3, the population of Dunmurry DED has grown at a moderate rate during the inter-censal period 2006 - 2011. The proximity of the area to the towns and employment centres of Kildare, Naas, Newbridge and Dublin further beyond, coupled with lower local house prices have contributed to population growth in the area, which may be considered as part of the Greater Dublin housing market. Most of the housing in the area has been now established for several (>5) years.

12.2.6 Groundwater

The sand and gravel deposits beneath the application site are classified as a locally important gravel aquifer .Lg. by the National Aquifer Map. This deposit can store and transmit relatively large quantities of groundwater due to its relatively permeable nature. It is not likely that many of the local houses in the vicinity of the application site source drinking water from this aquifer as they are on mains supply predominantly. Section 6 addresses groundwater issues in more detail.

12.3 IMPACT OF RESTORATION WORKS

12.3.1 Short-Term Impacts

As the application site has functioned as a sand and gravel quarry for more than 15 years, there are likely to be few additional short-term impacts arising from its continued operation. The level of HGV movements to and from the site will remain at or more likely below present

levels. There will also be no short term impact from increases in existing traffic movements to and from the facility, during the installation and commissioning of site infrastructure as there is no construction works planned per say or no major infrastructural changes planned save the proposed restoration itself.

The backfilling activities at the site, present a number of risks to groundwater including fuel spillage, increases in suspended solids in run-off and placement of a rogue load of contaminated soils. Overall, these risks are likely to constitute a minor to moderate negative impact. They are addressed in more detail in Section 6 of this Environmental Impact Statement. There may be some short-term impacts at residences proximate to the site with the most noticeable short term impacts will be increased ambient noise and dust levels.

These impacts are likely to be minor and temporary in nature and are addressed in Sections 7 and 8 of this Environmental Impact Statement.

12.3.2 Long-Term Impacts

The continued backfilling of the former sand and gravel quarry will have little impact on the existing public road network, other than an increased traffic hazard if HGV.s egressing the site carry mud onto the road. There will be no impact on the existing electricity or water supply infrastructure. The operation of waste recovery activities at the application site will have no impact on established activities or housing nearby. There are no other commercial operations in the immediate vicinity of the site. In the absence of any local tourist attractions or established tourist / leisure activities in the area, there will be no impact on local tourism. There will be no detrimental impact on established activities at The Curragh Racecourse. Given that all the materials used in the restoration of the site will be completely inert and that specific measures will be implemented to ensure this, there will be no long term risks of soil or groundwater pollution and no detrimental impacts on land values or residential property value.

It is arguable that the infilling of a large and unsightly void may actually enhance property values in the immediate vicinity of the site in the longer term.

In the long-term, backfilling of existing temporary groundwater ponds with granular fill or processed secondary aggregate and a significant depth of inert impermeable, cohesive soil (predominantly glacial till) will increase protection to, and reduce the vulnerability of, the existing groundwater aquifer to contamination risks associated with accidental chemical spills and agricultural or animal wastes.

12.3.3 Interaction with other Environmental Receptors

There are no additional interactions other than those discussed in the text above.

12.4 MITIGATION MEASURES

Warning notices, speed restriction signs and construction traffic signposting which is established will be reviewed along the existing local road network to direct traffic to the porposed facility. Signposting will also be erected along roads within the application site in order to maintain a safe and orderly traffic regime at the site. All construction traffic exiting the

site will pass through a wheel wash, thereby minimising amount of mud and soil carried onto the local road network.

Measures to minimise groundwater, noise and dust impacts at nearby residences will be implemented when active backfilling operations are under way in the immediate vicinity thereof - refer to Sections 6, 7 and 8 of this Environmental Impact Statement.

Appendices