CHAPTER 4

ALTERNATIVES

QUARRY CONSULTING

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CHAPTER 4: Alternatives

Introduction

3.1 The proposed development comprises:

- The deepening of 19 ha. of the existing permitted quarry extraction area (Plan File Ref. No. 20/77: ABP-308748-20 & Plan File Ref. No. PL16.SU0132: QD16.QD0009) (Area B & C) from 5 mOD to -12 mOD;
- Haulage of material to existing fixed plant for processing.
- All associated ancillary facilities/works.
- Landscaping and restoration of the site.

EIA Directive

3.2 Annex IV of the amended EIA Directive, 2014/52/EU, requires a description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.

3.3 This chapter recognises and fulfils this requirement in respect of the Proposed Development.

3.4 In this context, the consideration of reasonable alternatives and design evolution has been undertaken with the aim of avoiding and / or reducing adverse environmental effects (following the mitigation hierarchy of avoid, reduce, and, if possible, remedy), while maintaining operational efficiency and cost – effectiveness, and considering other relevant matters such as land and planning policy.

3.5 This chapter provides an analysis of alternatives which have been considered for this proposed development in terms of the following:

- 'Do Nothing' Scenario;
- Alternative Sources of Aggregates;
- Alternative Locations;
- Alternative Designs / Layouts;
- Alternative Processes.

Need For the Development

3.6 This section examines the demand for quarried limestone related products, in Mayo, Galway and Ireland. The aim is to provide a comprehensive understanding of the existing demand for these aggregates, demonstrating the need for the development of new sources.

3.7 The demand for limestone related products has been steadily increasing in Mayo, Galway and throughout Ireland, driven by the growth of both infrastructure projects, the local asphalt & concrete production industry and agricultural land uses.

3.8 Mayo and the surrounding western region of Ireland are experiencing considerable expansion in housing, infrastructure, and commercial development. As these sectors grow, there is an increasing demand for construction materials like limestone, which is used in various forms, including as an aggregate for road base, foundations, and other construction applications, as well as in concrete production. Major drivers of this demand include:

- Residential developments to address the region's housing needs.

- Commercial and industrial construction, which underpins local economic growth.
- Public infrastructure projects, such as roads and public facilities, which are part of the Irish government's National Development Plan (NDP).

3.9 Limestone is a core material for these developments, the manufacturing activities at the site support the development of these projects. The on-site facilities—including the concrete batching plant, block-making units, asphalt plant, calcium carbonate plant, and agricultural lime production—ensure a steady supply of these materials for local agricultural, construction and road projects. The deepening of the existing quarry will secure the long-term availability of limestone for the production of these essential products, ensuring that both agricultural operations and construction projects remain on schedule and on budget.

3.10 Transporting limestone from distant locations increases environmental impacts, including higher carbon emissions and fuel consumption. The deepening of the local quarry will:

- Reduce transportation distances, directly lowering emissions from heavy goods vehicles.
- Decrease the environmental footprint of the concrete batching plant and asphalt plant by sourcing limestone locally.
- Align with national sustainability objectives, contributing to Ireland’s commitment to reducing its carbon footprint and managing natural resources responsibly.

3.11 By ensuring a local supply of limestone for both aggregate use and concrete production, this development supports the region’s construction needs while addressing the environmental challenges associated with long-distance transport of materials.

Limestone Product Markets

3.12 The construction industry in Ireland has experienced significant growth in recent years, contributing to the demand for construction aggregates.

3.13 In 2019, the construction sector contributed €9.5 billion to Ireland's economy in terms of Gross Value Added (GVA), representing around 2.8% of Ireland's total GVA, which stood at approximately €340.5 billion that year. By 2023, the sector's contribution grew to €12.7 billion, against a backdrop of a national GVA of €482.3 billion, underscoring the ongoing demand for housing, infrastructure, and commercial developments across the country.

3.14 Ireland, including Mayo, has prioritised infrastructure development to enhance connectivity and support economic growth. The National Development Plan (NDP) 2021-2030 allocates a record €165 billion for capital investments over this period. This funding aims to support major infrastructure projects across various sectors, including housing, transport, healthcare, and education. It also emphasises environmental sustainability, with significant investments in climate action initiatives, such as renewable energy and public transport infrastructure.

3.15 Housing construction continues to be a significant driver of the demand for construction aggregates. The Irish government, through its *Housing for All* plan, now aims to build an average of 33,000 new homes annually until 2030, with a long-term goal of addressing the national housing shortage. This plan includes the construction of affordable and social housing, as well as measures to accelerate homebuilding across Ireland. In addition to new builds, ongoing renovation and refurbishment projects, including retrofitting initiatives to improve energy efficiency, further contribute to the rising demand for aggregates and other building material.

3.16 Commercial and industrial projects, such as energy related projects, office buildings, retail centres, manufacturing facilities, and warehouses, require substantial amounts of construction aggregates. For instance, the construction of Data Centre Parks in Ireland is estimated to require around 4.6 million tonnes of aggregates over the next decade (Irish Concrete Federation).

3.17 The public sector invests in various projects, including schools, hospitals, government buildings, and public infrastructure. For instance, the National Development Plan allocates significant funds for public infrastructure projects like public transport, education, healthcare, and social housing. These projects generate substantial demand for construction aggregates.

3.18 The transportation sector relies heavily on road construction and maintenance to ensure efficient connectivity. In Ireland, the government has allocated €10.6 billion for national road projects from 2022 to 2027 (Department of Transport, Ireland). Construction aggregates and asphalt are essential components for road building and maintenance.

3.19 Concrete is a key construction material, and its production requires substantial quantities of limestone aggregates. In Ireland, the annual consumption of aggregates for concrete production is estimated to be around 31 million tonnes (Irish Concrete Federation). Concrete is widely used in foundations, structural elements (e.g. wind turbine bases), and pavement construction, driving the demand for construction aggregates.

3.20 The on-site asphalt plant uses limestone aggregates from the quarry to produce asphalt for road construction and maintenance projects in the local area. Producing asphalt on-site reduces transportation requirements, lowering emissions and costs associated with material transport. The deepening of the quarry will provide a continued supply of high-quality limestone aggregates necessary for asphalt production, supporting infrastructure development in the region.

3.21 Agricultural lime production at the site converts quarried limestone into lime products used to improve soil quality and agricultural yields. The facility supplies local farmers with essential soil amendments that enhance crop productivity. Securing the long-term availability of limestone through quarry deepening will ensure that the agricultural community continues to have access to high-quality lime products, supporting sustainable farming practices in the area.

3.22 The calcium carbonate processing plant refines quarried limestone into calcium carbonate products used across various industries, including pharmaceuticals, food production, and manufacturing. These high-quality products are exported internationally, contributing to the global supply chain and enhancing the plant's economic impact. High-purity limestone from the quarry is essential for producing quality calcium carbonate (refer to EIAR Chapter 6: Land, Soils and Geology). Deepening the quarry ensures a sustained supply of raw material for the plant, enabling it to meet both domestic and international market demand and contribute to the local economy.

Project Ireland 2040

3.23 Project Ireland 2040 is a long-term national planning framework that sets out the strategic vision for Ireland's future development. It aims to shape sustainable growth and improve quality of life by focusing on balanced regional development, social infrastructure, and economic progress.

3.24 Project Ireland 2040 recognises the need for housing construction to address the housing shortage and accommodate population growth. It sets a target of building 550,000 new homes by 2040, which translates to an average of 33,000 new homes annually. The construction of these homes requires a steady supply of construction aggregates for various applications such as foundations and concrete production.

3.25 The project emphasises the importance of infrastructure development to support economic growth and improve connectivity. Investments are planned for road networks, public transport systems, utilities, and social infrastructure. These infrastructure projects require significant quantities of construction aggregates to meet the demand for concrete, road surfacing, and foundation construction.

3.26 Project Ireland 2040 aims to achieve balanced regional development by promoting investment and employment opportunities outside major urban centres.

3.27 Project Ireland 2040 recognises the importance of sustainable resource management, including the responsible extraction of construction aggregates. Further development of an existing permitted limestone quarry in Mayo aligns with this goal, as it allows for the local sourcing of construction aggregates, reducing the environmental impact associated with long-distance transportation and preserving existing resources in other regions.

3.28 Given the increasing demand for construction aggregates in Mayo and the wider region, there is a potential supply and demand gap. Existing sources may face limitations due to depleting reserves or transportation constraints. Further development at this existing limestone quarry would help bridge this gap, ensuring a reliable supply of construction aggregates to meet the demands of Project Ireland 2040 and support ongoing construction and agricultural activities in the region.

Mayo Country Development Plan (CDP) 2022-2028

3.1. The Mayo County Development Plan (2022 – 2028) "*sets out the roadmap for the overall proper planning and sustainable development of County Mayo over the plan period".* Chapter 4 Economic Development and Chapter 10 set out the policies and objectives for the extractive industry.

3.2. Policy EDO54 states:

> *'To facilitate rural enterprises, and resource development (such as agriculture, agri-food sector, agri-tourism, commercial fishing, aquaculture, rural tourism, forestry, bio- energy, the extractive industry, recreation, cultural heritage, marine enterprise sector, research and analysis) and renewable energy resources (such as wind/solar/ocean energy) that are dependent on their locality in rural locations, where it can be demonstrated that the development will not have significant adverse effects on the environment, including the integrity of the Natura 2000 network, residential amenity or visual amenity. Where proposals demonstrate measures to promote environmental enhancement through improved ecological connectivity, such as measures in the Pollinator Plan, additional native species planting or blue and green infrastructure measures, these will be favourably considered.'*

3.3. Section 4.4.10 of the CDP "*recognises the importance of sand and gravel extractions in the economic life of the county and its importance as a valuable source of employment in parts of the county. It is also recognised, however, that exploitation of deposits can have a seriously damaging environmental impact on the county's natural landscape. A satisfactory balance is required between the needs of the building industry and the need to protect the environment*". The following policies and objectives relate to the extractive industry.

> *'EDP 27 To support adequate supplies of aggregate resources to meet the future growth needs of the county and the wider region where there is a proven need for a certain mineral/aggregate and to exercise appropriate control, while addressing key environmental, traffic and social impacts.*
>
> *EDP 28 To support the development of aggregate resources (stone and sand/gravel deposits) in a manner which minimises effects on the environment and having regard to the principles of sustainability.*
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> *EDO 62 To ensure that the development of aggregate resources (stone and sand/gravel deposits) is carried out in a manner which minimises effects on the environment, including the Natura 2000 network and its sustaining habitats (including water dependent habitats and species), amenities, infrastructure and the community, and can demonstrate environmental enhancement through habitat management plans/ecological restoration.*
>
> *EDO 63 Have regard to the Quarry and Ancillary Activities Planning Guidelines for Planning Authorities DoEHLG (April 2004) or any new or subsequent quarry guidance.'*

The 'Do Nothing' Scenario

3.29 If no further extraction works within the planning application are permitted beyond the existing permitted reserves the existing permitted quarry will complete its current extraction activities and be restored to natural habitat after-uses. However, this would have significant implications for the on-site concrete batching plant, asphalt plant, and calcium carbonate plant which relies on the steady supply of limestone from the quarry.

3.30 Without the deepening of the quarry, these facilities would either cease operating or need to begin importing material from other quarries, which would increase transportation costs and emissions, potentially leading to supply chain disruptions. Furthermore, the increased reliance on external material sources could make the operations financially unsustainable, forcing the manufacturing plants to shut down.

3.31 Such a shutdown would not only affect the operations on-site but also create a significant gap in the local market for construction materials, including aggregates, ready-mix concrete, and asphalt. The loss of a reliable, local supplier could lead to increased costs and delays for construction projects in the region, ultimately affecting the delivery of key infrastructure and development initiatives. Additionally, the environmental benefits of sourcing materials locally, such as reduced transportation emissions, would be lost.

3.32 In this scenario, the cessation of quarrying activities would have economic and environmental consequences, making it clear that the continued development of the existing quarry is a logical and sustainable option to support both local, national and international industry, the wider construction market and agricultural land uses.

Alternative Sources of Limestone

Limestone Aggregates

3.33 There are several alternatives to sourcing traditional limestone for construction aggregates. These alternatives aim to reduce environmental impacts, optimise resource utilisation, and promote sustainable practices. Some alternatives include:

- **Recycled Aggregates**: Utilising recycled aggregates from construction and demolition waste can help reduce the need for extracting virgin limestone. Concrete and asphalt can be crushed and processed into reusable aggregates for various construction applications. The EPA's National End-of-Waste Decision for recycled aggregates provides a framework for using these materials in compliance with environmental standards, promoting a circular economy in the construction sector.
- **Recycled Concrete Aggregates (RCA)**: RCA is derived from the demolition of structures and involves crushing and screening concrete. While it is useful in many construction applications, its end use is limited compared to the superior properties of virgin limestone aggregates.
- **Recycled Asphalt Pavement (RAP)**: RAP involves crushing and reusing old asphalt pavement in new construction projects. This process saves natural resources and reduces waste disposal costs, though it is generally more applicable for road construction than limestone replacement.
- **Manufactured Aggregates**: In some cases, aggregates can be manufactured from industrial byproducts such as slag or fly ash, providing a sustainable alternative. However, these materials often require significant processing and may not offer the same quality as natural limestone.
- **Marine-Derived Aggregates**: In some regions, aggregates are sourced from marine dredging operations. Although this is not currently feasible in Ireland due to regulatory restrictions, marine aggregates are a potential future alternative.

3.34 While these alternatives offer opportunities to reduce reliance on limestone extraction, fully replacing limestone quarries is neither feasible nor practical due to the following reasons:

- **Quality and Suitability**: Limestone is a naturally occurring material with unique characteristics, making it particularly suitable for construction applications such as concrete production and road base layers. Recycled or alternative aggregates often differ in quality and may require additional processing to meet required standards.

Alternative Sources of Lime

3.35 While there are various alternatives to sourcing traditional limestone for construction aggregates, alternatives for high-quality agricultural lime and industrial-grade lime products are more limited. Agricultural lime, a key product of the quarry, is produced by converting high-purity limestone into lime products used to improve soil quality and agricultural yields. The purity and quality of the limestone are essential for producing lime that meets the specific requirements of the agricultural community. While some alternative soil amendments exist, such as synthetic fertilizers, they do not offer the same soil health benefits as natural lime. Furthermore, there are limited sources of high-quality lime in the region that meet the agricultural industry's standards. The deepening of the quarry ensures a continued supply of this critical resource, which is essential for maintaining sustainable farming practices in the area.

3.36 Similarly, the calcium carbonate products refined from quarried limestone play an important role across various industries, including pharmaceuticals and food production, and cannot easily be replaced by other materials. While alternatives such as manufactured lime products or byproducts like fly ash may be used in some applications, they do not offer the same purity or consistency required by industries that rely on high-quality lime. Therefore, the deepening of the quarry is critical for maintaining the supply of these essential products, both for local needs and international export.

Alternative Locations

3.37 The current planning application is for the deepening of an existing limestone quarry at Cong, Co. Mayo.

3.38 When considering alternative locations for quarrying, it is essential to acknowledge that minerals can only be extracted where they naturally occur, as they are a "tied resource." Limestone aggregates, like many other minerals, are generally of low unit value, with transportation being the most significant cost. As a result, most quarries tend to operate within a radius of approximately 25-30 km of their target market. The quarry site benefits from being located in close proximity to the R345 and R346. At a greater distance the site is located between the N84 and N59 national roads.

3.39 This site serves a large region of Mayo and Galway, where strong transport links already exist. With the increasing emphasis on reducing carbon emissions and promoting sustainability, the practical transport range for aggregates is expected to contract. Reducing the distance materials are hauled helps to minimise the carbon footprint of quarry operations and supports more sustainable development practices.

3.40 Additionally, it is often preferable, from a planning perspective, to allow for the deepening of existing mineral workings rather than opening new quarries on 'greenfield' sites. Deepening the existing quarry offers lower development costs due to the availability of an operational quarry face and the presence of existing infrastructure.

3.41 The Applicant has considered the following alternatives:

- Expanding operations into lands north of the existing quarry, which do not currently have planning permission for quarrying, and completing the restoration of the established quarry;
- Developing a new 'greenfield' quarry elsewhere in Mayo or Galway to serve established clients and markets.

3.42 At present, there are no suitable alternative replacement quarry locations available to the Applicant in County Mayo or Galway. It is generally accepted that developing a new 'greenfield' quarry, from site selection to planning, land acquisition, and preparation, through to the commencement of extraction, can take between 5 and 10 years.

3.43 Deepening the existing quarry offers several planning benefits, including:

- Avoiding the extraction of additional materials from other quarries in the county, which could lead to faster depletion of their resources and potentially increase the intensity of operations at those sites;
- Preventing the need for a new 'greenfield' quarry elsewhere in the county where no prior extractive activities exist;
- Reducing the need for hauling materials from other quarries within or outside the county, which would result in longer haulage distances and increased traffic on the road network.

3.44 Further development of the existing limestone quarry at Cregaree townland will help maintain a proven aggregate resource, with no significant increase in environmental emissions.

3.45 As mentioned earlier, this type of development is tied to the location of the resource, unlike a factory, which can be sited in various locations. Aggregates must be worked where they are found, and this can only occur where the environmental impacts of extraction can be managed to an acceptable level.

3.46 The existing permitted quarry site has a proven track record of compliance with environmental and planning regulations. Therefore, deepening the quarry (along with final restoration), subject to continued implementation of best environmental management practices and compliance with planning conditions and recommended emission limits for the sector, is preferable to developing a new 'greenfield' site in Mayo or Galway. The existing on-site facilities for manufacturing concrete products, ready-mix concrete, calcium carbonate, and asphalt further support the suitability of this location, as the integration of quarry operations with manufacturing plants allows for reduced transportation and lower overall environmental impact.

3.47 The site offers several advantages for quarry deepening, making it highly suitable for continued development:

- Proven limestone reserves (see EIAR Chapter 7).
- Long-established history of extraction activities at the location.
- Direct access to the R345 and R346, facilitating transportation to key markets (see EIAR Chapter 13).
- Absence of national, regional, or local environmental designations under the Habitats Directive, Birds Directive, or Wildlife Acts.
- Existing infrastructure that reduces development costs, as this is the deepening of an established quarry.
- Use of best practice, industry-standard extraction, and processing methods.

ALTERNATIVE DESIGNS / LAYOUTS

3.48 Alternative designs, including alternative layouts within the site, were considered. The design layout that was chosen is considered to best minimise the potential impacts on the environment from noise, dust, and visual impacts.

3.49 When evaluating alternative layouts for the quarry deepening, the primary option considered was deepening extraction within the southern part of the **pre-63 area** of the quarry (Plan Ref File No.

Q18). However, this approach was ultimately not pursued as it would require relocating existing long-established processing, manufacturing, and ancillary activities, which would result in significant disruption to the operational efficiency of the quarry. Additionally, such an option would require the construction of new infrastructure and facilities, which would have a greater environmental and logistical impact compared to continuing extraction within the established footprint of Area B and Area C.

3.50 Furthermore, the quarry site has existing landscaped screening berms along the boundary of the quarry perimeter, which have been strategically placed to mitigate potential noise and visual impacts from nearby residences. The use of these berms, along with other mitigation measures, has been a key factor in ensuring that the deepening of the quarry within the proposed layout will not significantly increase environmental impacts, particularly regarding noise, dust, and visual disturbance. Continuing extraction within the footprint of Area B and Area C ensures that these existing mitigation measures remain effective.

3.51 Initially, an approach was considered where Areas B and C would be worked to the permitted level of 5 mOD and then deepened to -12 mOD**.** However, this approach was ultimately deemed inefficient, as it would require significant reworking of the quarry faces, leading to increased operational costs, extended working times, and reduced overall quarrying efficiency. The current approach, which involves deepening the quarry directly to -12 mOD in Areas B and C**,** allows for a more streamlined operation. By developing and working 2–3 benches to the proposed depth simultaneously and pushing the faces back in tandem, this approach maximises the efficiency of the extraction process. It ensures that the quarry can operate at optimal capacity while reducing operational downtime and minimising the need for reworking areas, thereby improving overall quarry performance.

3.52 The chosen layout allows for the continuation of extraction within areas that have already been fully assessed and where environmental management measures have been well-established. By deepening within these areas, the quarry can operate efficiently while adhering to the environmental controls that have been developed and implemented over the years.

ALTERNATIVE PROCESSES

3.53 McGrath's is a company with extensive expertise in quarrying, aggregate production, concrete manufacturing, road surfacing material manufacturing, and road construction. As part of this planning application, different extraction methods were considered to evaluate their suitability for the proposed quarry deepening, ensuring that the chosen approach aligns with the company's operational objectives and environmental goals.

3.54 Rock breaking was explored as an alternative extraction method. While it offers the advantage of reducing vibrations and noise compared to traditional blasting, it is less efficient for large-scale operations due to slower production rates, higher operational costs, and increased equipment wear. Additionally, rock breaking may be unsuitable for the scale of material extraction required at the quarry, as it cannot achieve the same production volume as blasting in a timely manner. Consequently, rock breaking was not deemed a viable alternative for this development.

3.55 Blasting, the preferred extraction method, provides significant operational advantages. It allows for the efficient removal of large volumes of material, reducing overall costs and ensuring timely delivery of resources to the on-site manufacturing plants. Blasting enables the quarry to operate at its full capacity while maintaining the necessary efficiency for large-scale production. This method also allows for precise control over material fragmentation, which is crucial for maintaining the quality of products like aggregates and lime. Blasting will continue to be employed, with strict environmental controls and monitoring in place to mitigate any potential impacts on surrounding areas – refer to Chapter 11 for more detailed discussion of environmental management and monitoring measures.

3.56 The on-site integration of quarrying and manufacturing processes represents a logical and sustainable approach to development. This integration reduces transportation costs and emissions

by minimising the need to transport raw materials over long distances. It also ensures efficient resource use, reducing waste and improving the overall environmental footprint of the operation. By processing materials on-site, McGrath's can achieve economies of scale, enhance product quality, and maintain greater control over production standards. This approach is in line with industry best practices and supports the company's long-term sustainability goals, ensuring the provision of high-quality products for local and international markets.

Summary: Alternatives Considered

3.57 The consideration of alternatives has focused on evaluating options that avoid, reduce, or remedy potential adverse environmental impacts, while also meeting the operational and economic requirements of the quarry development. This process is in line with the principles outlined in the EIA Directive, ensuring that the chosen project design minimises negative environmental effects, maximises operational efficiency, and adheres to planning and policy objectives.

Alternatives Assessment

Do Nothing Scenario

3.58 The 'Do Nothing' scenario would result in the cessation of quarrying activities and the loss of local production capabilities. This alternative was considered but ultimately dismissed due to its significant economic and environmental implications, including increased transportation costs and emissions, and the risk of losing a reliable source of essential materials for local infrastructure projects. The Do Nothing option does not align with the need for sustainable, local aggregate and lime production, and would likely create supply chain disruptions.

Alternative Sources of Limestone

3.59 Various alternative sources of limestone were considered, including sourcing limestone from other quarries. However, this alternative is not deemed feasible due to the high transportation costs associated with sourcing material from more distant locations, which would result in increased emissions and higher costs. Moreover, the limestone reserves at the proposed deepening site are of higher quality and purity, which is critical for producing value-added products such as agricultural lime and calcium carbonate.

Alternative Locations

3.60 A review of alternative locations for quarry expansion was undertaken, but due to the nature of the resource, alternative locations within a practical transport range were not found. Most limestone deposits are in limited locations, and shifting operations to a new greenfield site would incur significant time and financial costs for site preparation, planning, and infrastructure development. Continuing extraction at the current site, where infrastructure is already in place, is more sustainable from both an economic and environmental perspective.

Alternative Designs/Layouts

3.61 Various layouts for deepening the quarry were considered, including deepening the southern portion of the pre-63 quarry area. However, this alternative would have required relocating existing processing plants and infrastructure, resulting in operational inefficiencies, greater environmental disturbance, and higher costs. The chosen layout, which deepens Areas B and C, minimises environmental impacts, maintains operational efficiency, and avoids disrupting the existing infrastructure.

Alternative Processes

3.62 Several extraction methods were evaluated, including rock breaking, but the inefficiency of this process for large-scale operations led to its dismissal. Blasting was chosen as the preferred extraction

method due to its efficiency, cost-effectiveness, and ability to meet the required production volume. The chosen method is subject to stringent environmental controls to mitigate potential impacts, ensuring that the operation remains within acceptable environmental limits.

Comparison of Environmental Effects

3.63 The environmental impacts associated with the alternatives were carefully compared, including effects on local habitats, transportation emissions, and operational feasibility. While alternatives such as sourcing limestone from other quarries and considering new locations would have led to higher transportation emissions and potential disruption to local communities, deepening the existing quarry offers a more sustainable and efficient option.

Table 4.1: Comparison of Environmental Effects

Alternative Option	Environmental Effects	Significance of Effects	Mitigation Measures
Do Nothing Scenario	Current operations continue.	Minor environmental changes; no new disturbances.	No additional mitigation required as no new impacts occur.
Alternative Sources of Aggregates	Use of recycled aggregates and materials. Possible reduced emissions from transportation.	Potential environmental benefit due to lower transportation emissions.	Possible impacts on material quality for specific uses. Require sourcing and processing methods.
Alternative Locations	Relocation to another site for extraction. Increased transport emissions due to longer haulage distances.	Higher environmental impact due to longer haulage and disruption of other sites.	Avoided by continuing extraction at the current site.
Alternative Designs / Layouts	Working Areas B and C to 5 mOD first before deepening. Potential disruption due to reworking and additional infrastructure.	Increased operational inefficiency and environmental impact due to reworking.	Streamlining the extraction process by deepening directly to -12 mOD increases efficiency and reduces impacts.
Alternative Processes	Rock breaking as an alternative extraction method. More noise and equipment wear; less efficient than blasting.	Less efficient; potential increase in equipment wear and noise.	Not considered viable. Blasting remains the most efficient and cost-effective method.
Proposed Deepening to -12 mOD within the permitted quarry area	Minimal impact on the environment as the site is already disturbed. Provides higher-quality limestone for production. Ongoing mitigation for noise, dust, and water management.	Most efficient and environmentally controlled method.	Ongoing monitoring of noise, dust, and water quality. Adaptation of management practices as necessary.

3.64 The proposed deepening of the quarry offers the best balance of environmental, economic, and operational factors. It maintains local production of essential materials, reduces transportation-related environmental impacts, and ensures that the operation remains financially viable.

CONCLUSION

3.65 In conclusion, the alternatives assessment conducted for the proposed deepening of the existing limestone quarry has revealed that there are no viable or reasonable alternatives available. The project team evaluated various alternatives, considering factors such as environmental impact, feasibility, economic viability, and social considerations. However, none of the alternatives presented a suitable solution that could effectively meet the project objectives while minimising adverse impacts on the environment and surrounding communities.

3.66 The evaluation process considered potential alternatives, including alternative locations for the deepening, alternative extraction methods, and alternative materials sourcing. These alternatives were deemed impractical, economically unviable, or resulted in significant environmental and social drawbacks that outweighed any potential benefits. Additionally, the limestone deposit in the proposed deepening area is crucial for the continuous supply of high-quality limestone, which is essential for the regional construction industry, infrastructure projects, and local agricultural needs. The deepening of the quarry provides a sustainable and long-term solution to meet these essential demands.

3.67 It is important to note that the deepening project adheres to all relevant regulations, guidelines, and best practices to mitigate and manage environmental impacts. The project team has developed robust mitigation measures and monitoring plans to minimise disturbance to the natural habitat, control noise and dust emissions, and address any potential impacts on water resources. Comprehensive monitoring and adaptive management strategies will ensure ongoing compliance and help to address any unforeseen impacts throughout the project's lifecycle.

3.68 Overall, the alternatives assessment has determined that the proposed deepening of the existing limestone quarry represents the most appropriate and viable option. It supports the sustainable supply of essential materials, aligns with industry best practices, and provides a solution that balances economic, environmental, and social considerations.