

GLENAMUCK DISTRICT DISTRIBUTOR ROAD



Dún Laoghaire-Rathdown
County Council Comhairle Contae
Dhún Laoghaire-Ráth an Dúin

FEASIBILITY STUDY & ROUTE SELECTION REPORT

JULY 2007

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1 INTRODUCTION

1.1 GLENAMUCK ROAD

Dun Laoghaire-Rathdown's County Council's Development Plan 2004-2010 contains a six-year road objective to upgrade the Glenamuck Road corridor between the Enniskerry Road and the Carrickmines Interchange Southern Roundabout. The area is rural in character, however the existing road is not considered capable of servicing the transportation needs arising from the extensive residential and commercial zoning set out in the County's Development Plan. With the completion of the South Eastern Motorway further demand will be placed on this corridor, as it will be a direct strategic link to the motorway off the already heavily trafficked Enniskerry Road.

The section of the Glenamuck Road (known as the Study Area) currently under consideration lies between the Golden Ball junction where it meets the Enniskerry Road to the south and the Carrickmines Interchange Southern Roundabout to the north. This scheme (known as the Glenamuck District Distributor Road) represents approximately 1.5km of Distributor Road Realignment and associated works.

It is anticipated that this local road infrastructure needs to be upgraded to deal with the predicted increase in traffic associated with the opening of the South Eastern Motorway along with the increase in residential and commercial development within the Study Area. The proposed local infrastructure improvements will also provide better access to the road network in general, thus promoting development in the area of agriculture, industry, housing and tourism.

1.2 THE STUDY

This Feasibility Study and Route Selection Report is prepared by RPS Consulting Engineers, consultants to Dun Laoghaire-Rathdown County Council (DLRCC) for the Glenamuck District Distributor Road Scheme (GDDR). The report is the culmination of a detailed examination of the various route options by RPS Consulting Engineers.

The study consists of an assessment of the various route options, a review of existing and projected traffic conditions, a summary of the various environmental, political, social and planning constraints on the scheme, a framework assessment of the route options and preparation of a cost estimate for the construction of the scheme.

The extent of the study area and its environs is shown in Figures 1.1 and 1.2.

1.3 SCHEME OBJECTIVES

With the opening of the South Eastern Motorway and the increase in commercial and residential development within the Study Area the existing Glenamuck Road will be attempting to achieve numerous functions including accommodating regional and local traffic, heavy commuting volumes, heavy goods vehicles, equestrian activities, cyclists and pedestrians, farm machinery and vehicles. These traffic types will all be using the existing Glenamuck Road, which is fronted by numerous residential dwellings and farmlands. This inevitably creates conflict between the different road users who share the same road facility. Therefore it is a primary objective of this scheme to cater for the predicted increase in traffic volumes and thereby provide adequate facilities for the different road users.

The primary objectives regionally and locally of providing the scheme have also been identified as part of the overall need for the scheme and are described in more detail in Section 2 of this report.

1.4 REPORT FORMAT

This report contains a summary of the work carried out to date by the consultants in the preparation of a Feasibility and Route Selection Study. This report examines and analyses a number of Route Options, taking into account the identified constraints and environmental considerations. The main constraints identified are set out and discussed in the Constraints Report, previously prepared by RPS Consulting Engineers.

The need for the Scheme is discussed in paragraph 1.3 - Scheme Objectives and is described further in Chapter 2 of this report. Chapter 2 also outlines Dub Laoghaire-Rathdown County Council's development plan within the study area and briefly summarises the regional and local objectives of the scheme.

The proposed Route Options and Cross Routes are described in detail in Chapter 3 in relation to the identified engineering, environmental, economic and planning constraints.

Further evidence on the traffic need for the Glenamuck Road is described in Chapter 4 – Traffic. This section interprets a traffic model be produced by the Dublin Transportation Office (DTO), in conjunction with RPS Consulting Engineers in order to assess the possible alignments and establish the required cross section of the GDDR.

Chapter 5 assesses the environmental impacts of the route options.

Outline cost estimates for the various Route Options have been calculated. These cost estimates are compared in Chapter 6 of this report.

A framework assessment of all the Route Options based on previously described constraints is undertaken in Chapter 7. The route, which best meets the objectives of the scheme and causes the least amount of adverse impact on people and on the environment is identified in this chapter.

1.5 THE NEXT STAGE

The next stage of the Glenamuck District Distributor Road Scheme is to develop and finalise the Preliminary Report, including environmental assessment, Land Acquisition Plans and other documentation in accordance with the requirements of the planning process.

A land-ownership search and preparation of drawings for the necessary land acquisition will also take place. The work will be undertaken concurrently with preliminary design of the scheme.

In tandem with the Preliminary design, an environmental impact study will be carried out for the proposed scheme and this will involve detailed environmental assessment on the Preferred Route and the identification of any ameliorative measures necessary to be incorporated into the scheme design.

2 BACKGROUND TO THE SCHEME

2.1 NEED FOR, AND BENEFITS OF THE SCHEME

The existing Glenamuck Road has an average width of approximately 11m with a reasonable standard of horizontal and vertical alignment. There are, however, sections of the existing Glenamuck Road, which would not achieve the best standards of horizontal and vertical alignment such as the approach to the Enniskerry Road. The existing junction layout at the Golden Ball junction is also unsatisfactory for the current and predicted traffic volumes and does not comply with current design standards in relation to sight distance and therefore road safety. This junction is often congested and is a cause of delay for traffic turning onto the Enniskerry Road. The level of the traffic congestion frequently experienced can often hamper the use of the road by local people for commercial, community and amenity purposes. The Glenamuck District Distributor Road Scheme will demonstrate a major benefit in this area by either improving the junction or diverting traffic away from it.

The Glenamuck Road is a distributor road to the Enniskerry Road from Carrickmines, Cabinteely and Cornelscourt and has to accommodate significant traffic volumes at peak commuter times. The Glenamuck Road has become even more important at a regional level as a distributor road from the Enniskerry Road to the M50, South Eastern Motorway. The Glenamuck District Distributor Road Scheme will prove a major benefit in coping with this predicted increase in traffic volumes.

There are currently a number of large-scale commercial and residential developments at both construction and planning phase within the study area. Many of these developments will be seeking access from the Glenamuck Road thereby placing further demand on the road. The Glenamuck District Distributor Road Scheme with its increased capacity will be of benefit in dealing with the increase in traffic generated by these developments.

The primary local objectives of the Glenamuck District Distributor Road Scheme are as follows:

- To operate successfully as a distributor road to the South Eastern Motorway
- To improve the capacity of the local road network at peak commuter times and accommodate the various modes of transport
- To improve access to public transport including LUAS and Quality Bus Corridors
- To improve road safety and reduce the number of accidents along the Glenamuck and Enniskerry Roads
- To improve provisions for cyclists, pedestrians and other vulnerable road users
- To promote the economic development within the area as identified in the Dun Laoghaire-Rathdown County Development Plan 2004-2010.

The proposed scheme will provide better access to existing tourist and leisure attractions in the area such as:

- Carrickmines Equestrian Centre
- Carrickmines Golf Course
- Stepside Golf Course
- Wayside Celtic Football Club

- Bective Rangers FC.

As outlined below the need for improvement of this section of road has been identified in the Dun Laoghaire-Rathdown County Development Plan (2004-2010).

2.2 DUN LAOGHAIRE-RATHDOWN COUNTY DEVELOPMENT PLAN (2004-2010)

The Development Plan (2004-2010) contains a six-year road objective to upgrade the Glenamuck Road corridor between the Enniskerry Road and the Carrickmines Interchange Southern Roundabout.

The land use proposed under the Dun Laoghaire-Rathdown County Development Plan (2004-2010) within the study area is mixed but consists predominantly of: 'economic development and employment'; 'protect or improve residential amenity'; 'protect and improve rural amenity and to provide for the development of agriculture'. The land use zoning objectives within the study area are shown in Figure 2.1. The high proportion of land zoned for 'economic development and employment' would suggest that further demand will be placed on the Glenamuck Road with the development of these areas. The fact that a large proportion of the land within the study area is zoned 'protect and/or improve residential amenity' could result in further residential developments being built in the future, leading to further pressure being put on the Glenamuck Road.

Within the study area there are a number of specific local objectives of the council laid out in the Dun Laoghaire-Rathdown County Development Plan (2004-2010). The specific local objectives shown on Map 9 of the development plan include the following:

- Local Objective 5: To provide for a proposed LUAS stop, on race days only, adjacent to Leopardstown Racecourse.
- Local Objective 6: To provide for a proposed LUAS stop at Ballyogan Wood.
- Local Objective 7: To provide for a proposed LUAS stop at Carrickmines.
- Local Objective 9: To provide for the development of a neighbourhood centre at Park Developments, west of the Carrickmines Interchange Southern Roundabout.
- Local Objective 10: To provide for the future extension of the Stepside public golf course onto adjoining lands owned by the Council, to enlarge it into an 18 hole public golf course.
- Local Objective 12: To protect and enhance the community infrastructure of the Church of Ireland community in Kiltarnan.
- Local Objective 13: To provide for residential development as part of an enhanced Kiltarnan Village, which will include provision of playing pitches on the 8.5 hectares area zoned F "Open Space", located on the south side of Glenamuck Road. No residential or other development to take place until these pitches are in operation.
- Local Objective 14: To prepare a Local Area Plan for Kiltarnan and that no development takes place until a Local Area Plan is approved.
- Local Objective 15: To encourage the provision of incubator units for craft industries in Kiltarnan.

The locations of these specific local objectives are shown in Figure 2.1. The above listed local objectives suggest a large amount of development potential within the study area. The introduction of the LUAS network in the area will potentially bring further development thereby putting a further demand on the local road network in the area.

Many of the above listed specific local objectives are to be incorporated into the Kiltarnan/Glenamuck-Local Area Plan, which is currently being prepared on foot of the Council objective to prepare a Local Village Plan for Kiltarnan and will have regard to the following additional principles:

- To facilitate the provision of a pitch for Wayside Celtic Football Club.
- To carry out road improvements on the Enniskerry Road/Kiltarnan junctions with Ballycorus Road and Bishop's Lane.

The County Development Plan (2004-2010) along with the need to prepare a Kiltarnan/Glenamuck-Local Area Plan suggests that there will be significant development in the Glenamuck Road area in the future thereby increasing demand on the roads in the area and creating the need to improve the capacity of the Glenamuck Road.

2.3 TRAFFIC FORECASTING

The Dublin Transportation Office (DTO) was commissioned by RPS Consulting Engineers and DLRCC to develop a Local Area Model (LAM) to aid the assessment of the GDDR Scheme. The DTO provided detailed traffic analysis of routes options for the proposed road in terms of link flows and road and junction performance.

There were six scenarios tested:

- 2007 Year of Opening AM Peak – 'Do Minimum' and 'Do Something'
- 2016 Intermediate Year AM Peak – 'Do Minimum' and 'Do Something'
- 2022 Design Year AM Peak – 'Do Minimum' and 'Do Something'

2.4 ACCIDENTS

A total of 376 people were killed in 346 fatal accidents on Irish roads in 2002 with a further 9,206 people received serious or minor injuries from road accidents. Of this total, 49 fatal accidents occurred in Dublin with a further 2,113 people receiving serious or minor injuries. Road Accident Facts Ireland 2002 (National Roads Authority, November 2003)

Accident data for a six year period, January 1996 to December 2002, for the sections of road in close proximity to the study area have been provided by the National Roads Authority (NRA) Accident Database 1996-2002. The accident locations and summary of the accident data is shown in Figure 2.2. **Table 2.1** below shows that there were the following accidents on the road network within the study area.

Road section	Fatal	Serious injury	Minor injury	Material damage
Glenamuck Road North of the Interchange	0	0	4	-
Glenamuck Road South of the Interchange	0	0	1	-
Ballyogan Road	0	1	2	-
Enniskerry Road (North)	1	0	1	-
Enniskerry Road (South)	0	0	1	-
Brennanstown Road	0	0	0	-
Brighton Road	0	0	1	-
Claremont Road	0	0	0	-

Table 2.1 Accident Data for Study Area Road Network. (NRA, 1996 - 2002)

By applying the consumer price increase to the 2001 accident costs, outlined in Road Accident Facts 2001, it is estimated that the cost of a fatal accident in 2002 was €1,357,489.00 while serious and minor accident costs are estimated at €168,461 and €16,142 respectively. The total cost of road accidents in 2002 reported to and recorded by An Garda Síochána is estimated in the region of €728 million based on fatalities and injuries sustained. The reduction in accident rates would have a positive cost benefit, as well as the personal implications, and further defines the positive aspects of the proposed scheme.

Current road design standards will be applied to the improvement scheme. The provision of a new road with increased cross-section, better forward visibility, and improved junction layout will promote a significant reduction of accidents within the study area.

2.5 FUNCTION OF THE SCHEME ON A REGIONAL AND LOCAL LEVEL

2.5.1 Regional

At a regional level, the scheme will function as a distributor road from the M50, South Eastern Motorway to the Enniskerry Road, R117. The scheme will commence at the Carrickmines Interchange Southern Roundabout and will terminate at the R117 Enniskerry Road. The completion of this route, when operational will reduce journey times and improve safety for traffic travelling from the South Eastern Motorway to the Enniskerry Road and likewise in the opposite direction.

2.5.2 Local

At a local level, the existing Glenamuck Road is multifunctional and required to provide a level of service for which it was never intended. The primary objectives of providing the Glenamuck District Distributor Road Scheme are:

- To provide a Distributor Road from the South Eastern Motorway to the Enniskerry Road.
- To cater for existing, proposed and future development in the area.
- To facilitate access to lands which may be developed in the future, in accordance with the proper planning of the area.
- To alleviate conflict between the different road users of the existing Glenamuck Road.
- To improve the safety of the local road network.
- To improve traffic flow and relieve the village of Kiltarnan of congestion.

2.6 SUMMARY

- The existing Glenamuck Road is rural in character and does not have adequate geometry and alignment to service the transportation needs arising from the increased traffic ensuing from the opening of the South Eastern Motorway and also from the planned future development within the study area.
- Within the study area there are extensive residential and commercial zoning areas set out and a number of specific local objectives identified in the Dun Laoghaire-Rathdown County Development Plan (2004-2010).

- There are currently a number of large-scale commercial and residential developments at both construction and planning phase within the study area.
- Historical accident data for the specified study area was assessed in terms of location and severity.
- The Glenamuck District Distributor Road Scheme will operate as a distributor road from the Enniskerry Road to the South Eastern Motorway at a regional level.
- At a local level the Glenamuck District Distributor Road will be required to improve the local road network; cater for existing, proposed and future development with in the area; and improve provisions for pedestrians and cyclists.

3 ROUTE OPTIONS

3.1 INTRODUCTION

Following the identification and analysis of the constraints to the scheme, three primary routes were identified that appear to satisfy the scheme objectives. These routes were identified taking account of the engineering considerations and having regard to the issues and constraints identified in the Constraints Report. Due to the length of the scheme (approximately 1.5km) there are a limited number of viable route options available for consideration. The three route options commence at the Carrickmines Interchange Southern Roundabout and extend to meet the Enniskerry Road at various locations. All three-route options are shown schematically in Figures 3.1 to 3.3.

Two possible cross routes Link A or Link B have been identified as part of the route selection process, which would compliment the Glenamuck District Distributor Road. These link routes are included for indicative purposes to identify routes which would be capable of serving the future development objectives within the study area, and are discussed in further detail in Section 3.7.

3.2 CONSTRAINTS STUDY

The constraints study focused on the physical, environmental, procedural, and legal constraints that exist affecting the design and choice of route for the scheme. These constraints, if not properly identified at an early stage could cause subsequent delay to the progress and influence the overall cost of the scheme. The Constraints Study was compiled from planning search reports, drawings and mapping and showed the following:

Planning Constraints

OS Mapping showing Proposed and Existing Development (Commercial \ Residential \ Agricultural \ Amenity etc.)

Existing Road Network

Landholdings

Water features (Rivers, streams, ditches and ponds)

Geology and Hydrogeology

Topography of the Ground

Flora and Fauna

Archaeology and Architecture

Protected Areas (Natural Heritage Areas and Special Areas of Conservation)

Landuse and Agricultural Potential

Settlements and Amenities

Aerial Photography

Utilities (Electricity, Communication, Gas, Water and Sewerage)

Figures 3.4 and 3.5 shows the land ownership boundaries, and the zoning map showing future developments through which the various Route Options pass. Figures 3.6 to 3.9 summarise the main constraints listed above.

3.3 GENERAL DESIGN PRINCIPLES

The following are the basic engineering design principles which have been assessed for each of the Route Options for the Glenamuck District Distributor Road Scheme.

3.3.1 Ground Conditions

- **Topography**

Route 1 and Route 3 traverse gently sloping mainly agricultural land, the slope falling towards Carrickmines Interchange Southern Roundabout. Route 2 is an upgrade of the existing Glenamuck Road.

- **Bedrock Geology**

The Geological Survey of Ireland (GSI) indicates that the bedrock underlying the study area is mostly Leinster Granite. The Glenamuck Road is located to the north of the Glencullen Fracture in the northern Pluton of the Leinster Granite. The granite in the region of the Glenamuck Road is of type 3, namely Muscovite Porphyritic, i.e. with large crystals of muscovite, a platy mineral.

- **Overburden**

Overburden underlying the study area is Quaternary aged Glacial deposits, predominantly boulder clay, with sand and gravel deposits identified locally.

- **Ground Investigation**

A detailed ground investigation may take place once the Preferred Route has been selected.

3.3.2 Geometric Design Principles

3.3.2.1 Road Type

The traffic analysis in Chapter 4 indicates a requirement for the Glenamuck District Distributor Road (GDDR) to be a 'Reduced Dual Carriageway' to meet the predicted traffic needs. Proposed characteristics of the chosen carriageway are given in **Table 3.1** below.

Category	General Description	Speed Limit	Side Roads	Access to roadside development	Parking and Loading	Pedestrian Crossings	Bus stops
UAP1 (Urban All Purpose)	High standard single/ dual carriageway road carrying predominately through traffic with limited access	60 to 80 kph for dual, & generally 60 kph for single carriageway	0 to 2 per km	Limited access	Restricted	Mostly-grade separated	In lay-bys

Table 3.1 Types of Urban Roads (UK DMRB, Vol. 5, TA 79/99 Table 1).

The NRA DMRB TD9/03 Table 4 and TD27/00 Figure 6A, give the recommended cross sections for Irish conditions, these rural cross sections will be modified to suit an urban situation. The proposed cross section for the Glenamuck District Distributor Road is shown in **Table 3.2** as follows:

Road	Road Type	Lane Width (m)	Hard Shoulders / Hard Strips (m)	Minimum Median Width (m)	Footpath Width (m)	Cyclepath Width (m)	Verge Width (m)	Total Width (m)
GDDR	Reduced Dual Carriageway	4 x 3.75	4 x 1.0 (H. Strips)	2.5	2 x 2.0	2 x 2.0	2 x 2.0	33.5

Table 3.2 Cross sectional requirements for 'Reduced Dual Carriageway'

The total cross section for the proposed Glenamuck District Distributor Road is 33.50m, including an assumed minimum central reserve width of 2.50m for preliminary design. The verge widths of 6.0m will be used to provide 2.0m footpaths and 2.0m cycle lanes and 2.0m grass verges on each side of the road. The need for the provision of dedicated bus lanes on the GDDR will be given full consideration in the Preliminary Design of the preferred route.

3.3.2.2 Geometric Design Codes

In December 2000 the NRA published the Design Manual for Roads and Bridges (DMRB). It has been deemed generally appropriate to adopt these codes of practice for this scheme. The geometric design codes of practise are contained in Volume 6 of the NRA DMRB, which include the following documents:

NRA TD 9/03	Road Link Design
NRA TD 27/00	Cross-Sections and Head Room
UK TD 16/93**	Geometric Design of Roundabouts
UK TD 42/95**	Geometric Design of Major/Minor Priority Junctions
UK TA 79/99	Traffic Capacity of Urban Roads

** NRA Addendum Dated December 2000

In the selection of the preferred route, the requirements of the above codes of practice, along with all other documents as published by the NRA in the form of the DMRB will be considered and each route assessed for its compliance.

3.3.2.3 Design Speed

The design speed of a road is determined by the factors as given in NRA TD 9/03. These factors include for Visibility, Bendiness and Alignment Constraint. A straight flat alignment will generate high speeds, and thus higher design speeds, than highly curved hilly alignments that would have the effect of slowing vehicle speed. The most desirable alignment is one that combines a trade off between construction cost, environmental costs and user benefits. The Preferred Route will be adjusted where necessary to the most favourable alignment option, which balances the user benefits with the construction and environmental costs.

A substantial amount of land within the Study Area is proposed to be zoned for 'economic development and employment' and 'protect or improve residential amenity' use within the Dun Laoghaire -Rathdown County Development Plan 2004 - 2010.

In light of the future land use within the study area, it is considered appropriate to adopt a Target Design Speed for the Glenamuck District Distributor Road of 85 kph in accordance with Table 2 in TD 9/03 of the NRA DMRB. A Design Speed of 85 kph corresponds to a speed limit of 80 kph.

3.3.2.4 Horizontal Alignment

NRA TD 9/03 of the DMRB identifies the following requirements for the horizontal design of carriageways with 85kph Design Speeds. **Table 3.3** summarises the horizontal design parameters for the proposed Glenamuck District Distributor Road Scheme for the 85kph design speed. The layout of the Horizontal Geometrics for Routes 1, 2 and 3 can be seen in Figures 3.9, 3.10 and 3.11 respectively.

HORIZONTAL REQUIREMENTS	85 Kph
Stopping Sight Distance (SSD)	
Desirable Minimum	160 metres
One Step Below Desirable Minimum	120 metres
Horizontal Curvature	
Desirable Minimum R with 5.0% Superelevation	510 metres

Table 3.3 Horizontal Design Parameters for 85 kph Design Speed

3.3.2.5 Vertical Alignment

The NRA TD 9/03 identifies the following requirements for the vertical design of the proposed Glenamuck District Distributor Road Scheme for the 85kph design speed. **Table 3.4** summarises the vertical design parameters for the proposed Glenamuck District Distributor Road Scheme. The layout of the Vertical Geometrics for the three route options can be seen in Figures 3.9, 3.10 and 3.11.

VERTICAL REQUIREMENTS	85 Kph
Stopping Sight Distance (SSD)	
Desirable Minimum	160 m
One step below desirable minimum	120 m
Vertical Curvature – Crest	
Desirable Minimum Crest K Value	55 m
One step below desirable minimum Crest K Value	30 m
Vertical Curvature – Sag	
Desirable Minimum Sag K Value	26
One step below desirable Min Sag K Value	20
Vertical Gradients	
Desirable Maximum Croachment	6%
Desirable Maximum Croachment with relaxation	5%

Table 3.4 Vertical Design Parameters for 85 kph Design Speed.

The vertical alignments for the various Route Options were designed to provide shallowing of cuttings and fillings to reduce volumetric quantities. The alignments also gave consideration to the balancing of the earthworks volumetrics, which reduces the need to import/export material.

3.3.2.6 Junction Strategy

The junction strategy is important in the optimisation of any scheme to provide the best possible solution and user benefit. The junction requirements for the Glenamuck District Distributor Road Scheme are complicated by the requisite to consider the future needs in terms of the development zoned lands. For the purposes of the assessment of route selection, the impact of the various routes at their respective links to the R117 Enniskerry Road and the Carrickmines Interchange (south) roundabout is considered. The need for additional junctions in order to provide for the cross links is also considered.

R117 Enniskerry Road

This junction would provide access from the R117 Enniskerry Road to the proposed Routes. The traffic analysis in Chapter 4 recommends that this junction be designed at least as a ghost island priority junction. As all three of the proposed routes meet the Enniskerry Road in a similar manner the three routes will have a similar junction layout where they meet the R117 Enniskerry Road. However, each route will require local realignments of the Enniskerry Road for safety and junction capacity reasons.

Carrickmines Interchange Southern Roundabout

As part of Mooney Developments (Planning Ref D04A/0327), it is proposed that the Glenamuck Road approach to the Carrickmines Interchange Southern Roundabout is widened to a 7m approach, flaring to an entry width of 14m at the roundabout. This would give a total road width of 10.5m kerb to kerb. The ICD of the roundabout will be increased from 60m to 65.2m to allow for a three lane circulating capacity.

All of the three Route Options accommodate the same junction types. All three Route Options tie in to the Carrickmines Interchange Southern Roundabout. All of the Route Options will have similar junction layouts where they meet the Enniskerry Road notwithstanding the fact that the junctions will be in different locations and will require varying degrees of improvements to the existing Enniskerry Road.

Further analysis on the preferred route will determine the actual junction requirements but the principal requirements are by and large the same for each route.

3.3.2.7 Road Safety

The three proposed Route Options would improve the level of safety for all road users within the study area as they provide a distributor road for the main traffic flow, which will be to higher design standards than the existing Glenamuck Road alignment. Sections of the existing Glenamuck Road would not achieve the best standards of horizontal and vertical alignment such as the approach to the Enniskerry Road.

The existing Glenamuck Road does not provide any refuge for pedestrians along the western side of the road. On the eastern side the footpath is in very poor condition with very little of the kerbs showing above the road surface in many places. This inadequacy of appropriate footpaths results in the

existing road being a dangerous place for pedestrians wishing to utilise the bus stops along the existing road. The bus stops are not well defined and are limited to a bus sign in the verge on the side of the road, which provides no refuge for pedestrians. This section of the Glenamuck Road is also not safe for cyclists, due to the traffic volumes currently using the road.

The number of existing direct accesses onto the existing Glenamuck Road will not be greatly reduced by any of the Route Options.

3.3.3 Drainage Design Principles

The drainage aspects of the proposed Glenamuck District Distributor Road route options include the potential outfalls, the hydraulic impacts and the potential environmental impacts. Drainage in the area consists of a network of small streams and ditches draining the predominantly agricultural land. The existing road drainage provision along the Glenamuck Road consists of direct 'over the edge' or gully discharge to a network of ditches. These in turn discharge, either directly or via a network of small streams, to the Glenamuck Stream.

A detailed overview of the catchment area has been presented in the Constraints Study.

3.3.3.1 Culverts

The proposed Route Options involve the crossings of streams and ditches at various locations along their route. Streams crossing the roadways will be accommodated in culverts sized for a design flow with a one in one hundred year return period event. In other words, a flood flow of a size that would not be expected to be exceeded more than once in one hundred years is catered for in the design of each culvert. In practice, a further margin of safety is provided to allow for the statistical uncertainty in the run-off estimation and reduced culvert capacity due to accumulated debris/fish pass baffles.

The Office of Public Works (OPW) in their role as a Statutory Authority responsible for arterial drainage generally recommends minimum culvert diameter of 900mm to minimise the risk of obstruction. It is proposed that a minimum culvert size of 900mm shall be used to satisfy OPW requirements. For larger streams, 1500mm is generally taken to minimise risk of obstruction and permit accessibility for maintenance. The Eastern Regional Fisheries Board will be consulted and their requirements taken into consideration.

3.3.3.2 Carriageway Drainage

The carriageway drainage system will be based on the Modified Rational Method and will be designed to accommodate, without surcharge the once in two-year storm condition. The road area contributions will be calculated assuming:

- 100% run-off from paved areas,
- 50% run-off from cuttings and embankments side slopes
- 20% run-off from grass verges and median.

The storm water run-off from the carriageway will generally be directed to a piped french drain or closed pipe system constructed along the edge of the carriageway, or over the edge system constructed at the base of embankments. French drains or closed pipes will discharge to outfall locations located at low points on the road.

Where necessary, natural catchment run-off to cuttings will be intercepted by the use of intercepting ditches and will discharge to existing watercourses independently of the road drainage system. Similarly a system of toe drains at the bottom of embankment slopes will intercept overland flows. Existing streams, ditches and drains intercepted by the proposed carriageway, except where prohibited by the vertical alignment of the road will be culverted under the carriageway. When the carriageway is in cut, the intersecting ditches/streams will be connected into the road drainage system or alternatively diverted into other watercourses, if practical.

3.4 ROUTE OPTION 1

3.4.1 Route Description

The following description is a general outline of the alignment that the proposed Route Option 1 follows. In any future detailed design the alignment of this route, within the general route corridor of Route Option 1, may change.

From its commencement at the southwest of Carrickmines Interchange Southern Roundabout, Route Option 1, shown in Figure 3.1 passes south of Park Developments Ltd. through the lands of Mooney. In order to avoid impinging on the lands of Park Developments Ltd. where construction work is being carried out under Planning Refs D02A/0558 and D03A/1239, Route Option 1 is forced to take a tight alignment as it extends from Carrickmines Interchange Southern Roundabout. Route Option 1 crosses a section of the lands of Mooney, which have been granted planning permission for residential development.

The most direct access for Route Option 1 to the Carrickmines Interchange Southern Roundabout means there is not sufficient space for 5 arms on the roundabout. Therefore it is considered potentially desirable to cul de sac the existing Glenamuck Road south of the Carrickmines Interchange Southern Roundabout. The introduction of this cul de sac, will lead to reduced traffic on the Glenamuck Road while still allowing cyclists and pedestrians through. It does however also mean that a link to Route Option 1 from the existing Glenamuck Road will have to be provided i.e. Link A or Link B.

Upon leaving the lands of Mooney Route Option 1 continues in a south-westerly direction through the lands of Langran before entering the lands of Grimes. Here Route Option 1 potentially passes under 2 No overhead 10kV ESB lines and over the proposed 450mm gravity sewer and 300mm watermain. Route Option 1 then follows the general route of the Glenamuck Stream crossing under the Carrickmines-Fassaroe East 110kV ESB overhead line and through the west side of Ashwood Farm, on the lands of Fitzsimons before passing under the Carrickmines-Fassaroe West 110kV ESB overhead line and the Arklow-Carrickmines 220kV Double Circuit ESB overhead line.

From here Route Option 1 enters the lands of Cowley where it crosses the Glenamuck Stream and passes over the route of the proposed 450mm gravity sewer and the proposed 300mm watermain, which are part of the Glenamuck-Kiltarnan Water and Drainage Scheme. Route Option 1 then follows the west bank of the Glenamuck Stream through the lands of Start and meets the Enniskerry Road.

In total, Route 1 is 1470m in length.

It is anticipated that for Route Option 1 approximately 350m of the Enniskerry Road will have to be realigned and widened. The Enniskerry Road would be predominately realigned off-line, leaving the existing road for use by the properties on the south side of the Enniskerry Road.

3.4.1.1 Residential Properties (Refer to Fig. 3.10.)

There are 1 and 2 No. dwellings between 0-25m and 25-50m of the road centreline respectively. A total of 9 No. dwellings are within 100m of the centreline of the proposed roadway.

There is 1 No. dwelling 'at risk' of demolition as it may become non-viable as a residence due to the proximity of the proposed Route 1.

The realignment of the Enniskerry Road impacts on 1 and 5 No. domestic dwellings between 25-50m and 50-100m respectively.

There will be a loss of Frontage to 1 No. Dwelling along Route 1. There will be a loss of Frontage to 1 No. Dwelling on the Enniskerry Road. The number of frontages affected by the proposed routes would have an important bearing on the land cost estimate for the removal of frontages is generally a lump sum cost for injurious affection rather than a rate per area of frontage removed.

3.4.1.2 Severance on Potential Development Lands

This route affects a number of landholdings which are currently agricultural but which have been zoned for future development (i.e. residential or economic) refer to Figures 3.4 and 3.5. A total of 7 areas of potential development land are affected by Route 1, of which 1 holding has been granted planning permission for residential development.

The severance effect on the various development land areas is assessed as

Severe	= 4
Moderate	= 0
Slight	= 0
Not Severe	= 3

Severance to these 4 No. plots is necessary due to the desire to avoid property demolition and to avoid other constraints, and is unavoidable due to the width of the land holdings.

3.4.1.3 Proximity of Route to Local Facilities/Services

Listed below are the local facilities and services including recreation, which are in the proximity and may be directly impacted upon by of Route Option 1.

- Park Developments Ltd. development at Carrickmines and the access to Bective Rangers are within 25m of the centreline of Route Option 1.
- The entrance to Kiltarnan 2 National School is approximately 50m from the junction of Route Option 1 with the Enniskerry Road, which will require cognisance of safety issues.
- The entrances to the Church of Ireland Parish Church are approximately 25m and 85m from the junction of Route Option 1 with the Enniskerry Road. As the Enniskerry Road would be predominately realigned off-line, the access to the church can be retained on the existing road.

3.4.1.4 Pedestrian & Cycle Paths

Pedestrians and cyclist paths will be provided along the entire length of the proposed Route 1, and also along Link A or B.

Although traffic access for the existing Glenamuck Road to the Carrickmines Interchange Southern Roundabout would be prohibited with the introduction of a cul de sac on the Glenamuck Road, pedestrians and cyclist access at the roundabout to the existing Glenamuck Road can be retained.

It may be a viable option to consider an alternative route for pedestrians and cyclists, utilising the existing Glenamuck Road, within the greater planning context and development of the area.

3.4.2 Geology and Soils

A number of probes and trial pits were constructed along Route 1 as part of a ground investigation for a proposed pipeline in July 1999 for Dun Laoghaire Rathdown County Council. The results from the investigation indicate about 0.3m Topsoil overlying Glacial deposits of predominantly firm sandy gravelly CLAY with cobbles and boulders. Locally layers of sandy clayey GRAVEL with cobbles and boulders were encountered. The majority of locations were dry however one groundwater seepage was noted at 1.2m depth in the gravelly clay. Refusal, indicating rockhead or boulder obstruction, was consistently met at between 2.8m and 4.0m depth.

3.4.3 Geometrics and Junctions

3.4.3.1 Horizontal Geometry

Table 3.5 summarises a typical horizontal alignment of Route Option 1.

Element No.	Type	Radius	Length	Remarks
1	Straight		176.02	
2	Curve	1020	22.94	
3	Straight		168.33	
	Transition		22.00	
4	Curve	720	191.93	
	Transition		22.00	
5	Straight		32.98	
	Transition		22.00	
6	Curve	720	141.46	
	Transition		22.00	
7	Straight		31.47	
	Transition		22.00	
8	Curve	720	126.78	
	Transition		22.00	
9	Straight		77.39	
10	Curve	1020	61.53	
11	Straight		314.27	

Table 3.5 Route 1 Horizontal Geometrics

As can be seen in **Table 3.5**, all of the curves have a greater value than of 510m, which is the desirable minimum radius with a superelevation of 5% at 85kph design speed, and meet the requirements of the NRA DMRB.

3.4.3.2 Vertical Geometry

Table 3.6 lists a typical vertical geometry for Route Option 1.

Element No.	Type	K Value	Gradient % / (algebraic difference)	Length	Remarks
1	Grade		-0.798	101.103	
2	Sag	15.565	(1.927)	30.00	< Min K is 26 Departure
3	Grade		1.13	74.03	
4	Hog	25.25	(-1.584)	40.00	< Min K is 55 Departure
5	Grade		-0.454	136.4	
6	Sag	22.38	(2.681)	60.00	< Min K is 26 Relaxation
7	Grade		2.227	146.75	
8	Grade		2.661	171.07	
9	Grade		3.114	80.43	
10	Sag	30.88	(2.590)	80.00	
11	Grade		5.704	28.08	Departure
12	Hog	15.99	(-6.251)	100.00	< Min K is 55 Departure
13	Grade		-0.547	4.16	
14	Sag	13.811	(6.517)	90.00	< Min K is 26 Relaxation
15	Grade		5.969	18.19	Departure
16	Grade		5.981	107.33	Departure
17	Hog	286.41	(-0.140)	40.00	
18	Grade		5.841	75.71	Departure
19	Grade		(0.074)	93.535	

Table 3.6 Route 1 Vertical Geometrics

Route 1 rises from approximately 86m OD at the Carrickmines Interchange Southern Roundabout to approximately 124m OD where it meets the Enniskerry Road.

Route 1 has gradients of over 5% for approx. 20% of the length of the route. The desirable minimum gradient recommended in NRA TD 9/03 for an all purpose dual carriageway is 4%. The maximum gradient with relaxation for an all purpose dual carriageway recommended in NRA TD 9/03 is 5%.

The typical vertical alignment shown for Route 1 for a design speed of 85kph includes some elements, as shown in **Table 3.6** above, which will require relaxations or departures from standards. The elements of the vertical alignment requiring relaxations and departures from standard can be further examined with a view to eliminating or minimising these features at detailed design stage.

3.4.3.3 Junctions

As discussed in section 3.3.2.6 all of the Route Options are required to accommodate the same major junction types.

Route Option 1 will have a ghost island priority junction or a traffic light controlled junction at the Enniskerry Road and approximately 350m of the Enniskerry Road will have to be realigned and widened to form this junction and provide for the necessary sightlines. Where Route Option 1 ties into the Carrickmines Interchange Southern Roundabout it is bounded to the north by lands that have already been developed for economic activities (i.e. Park Developments Ltd.) and as such there may not be sufficient space for 5 arms on the Carrickmines Interchange Southern Roundabout. As discussed as part of the traffic strategy in Chapter 4, it is proposed for this analysis to cul de sac the existing Glenamuck Road south of the Carrickmines Interchange Southern Roundabout. Therefore Route 1 would provide a 4-arm Carrickmines Interchange Southern Roundabout. This aspect of the design would be assessed further as part of a detailed design process.

Listed below are the existing secondary access and minor junctions, which will be impacted upon or severed by the proposed Route Option 1.

- Severance to Glenamuck North and Bective Rugby Club

3.4.3.4 Volumetrics

Volumetrics refers to the balance achieved between earthworks materials won in cuttings versus the earthworks required in construction of embankments as part of a scheme.

No significant embankments or cuttings are envisaged for Routes Option 1 due to the relatively uniform topography of the area, refer to Figure 3.9. Due in principle to the location and reduced number of crossings/accesses, Route Option 1 requires the least amount of imported fill material and therefore reduced construction cost.

3.4.3.5 Road Safety

Route Option 1 will reduce the volume of through traffic on the existing Glenamuck Road thereby making it a less trafficked and safer road to gain access to by residents and a less busy road for cyclists and pedestrians. However Route Option 1 will not reduce the number of direct accesses onto the existing Glenamuck Road.

3.4.4 Drainage

3.4.4.1 Culverts

There may be 4 no. culvert crossings of the Glenamuck Stream along Route 1 as it crosses the Glenamuck Stream at 3 No. locations, depending on the detailed geometric design of the route. Route Option 1 also crosses a tributary stream at 1 No. location and crosses the drainage ditches at various locations. Figure 3.6 shows the potential route crossings of the existing streams.

3.4.4.2 Drainage Overview

The storm water run-off from the carriageway will generally be directed to filter drains and closed piped system located along the edge of the carriageway. Filter drains will discharge to outfalls located generally at low points on the road.

As Route 1 will be formed primarily at grade and generally at right angles to the prevailing contours, a system of toe drains at the bottom of embankment slopes are unlikely to be necessary to intercept overland flows.

Subject to detailed design road drainage works for Route 1 will be located parallel to and will cross the existing watermains and foul sewer services which are part of the Glenamuck-Kilterman Water and Drainage Scheme at several locations along the alignment.

From Figures 3.6 and 3.9, it is clear that Route 1 will drain from south to north along its route and outfall will be possible to the Glenamuck Stream network in the vicinity of the Carrickmines Interchange Southern Roundabout.

Consideration may have to be given to attenuation to prevent significant impacts on flood flows of the watercourses. Attenuation can be accommodated either within the pipework of the closed drainage system or in attenuation ponds which would be included in the C.P.O. land acquisition. This will be assessed during the detailed design stage. In accordance with best practice, all run-off collected from proposed new routes will pass through treatment to remove particulates prior to discharge into existing streams.

3.4.5 Utilities

Table 3.7 summarises the impact to Utilities of Route 1.

Utility	Impact	Comments
ESB LV	2	2 No. OH LV lines at Enniskerry Road junction
ESB 10 kV	4	2 No. OH crossings south of Carrickmines Interchange Southern Roundabout. 1 No. OH crossing at Bective Rangers FC. 1 No. OH crossing at Enniskerry Road.
ESB 110 kV	2	1 No. OH crossing of the Carrickmines-Fassaroe East 110kV line. 1 No. OH crossing of the Carrickmines-Fassaroe West 110kV line.
ESB 220 kV	1	1 No. OH crossing of the Arklow-Carrickmines 220kV Double Circuit line.
Eircom	1	1 No UG crossing at the Enniskerry Road junction.
Watermains	4	1 No. UG crossings of proposed 300mm watermain at Park Developments. 1 No UG crossing of 300mm watermain after Bective Rangers FC. 2 No UG crossing of 300mm watermain at the Enniskerry Road junction.
Foul Sewer	3	1 No. UG crossings of proposed 450mm gravity sewer at Park Developments. 1 No UG crossing of 450mm gravity sewer after Bective Rangers FC. 1 No UG crossing of 975mm gravity sewer at the Enniskerry Road junction.

Table 3.7 Utilities affected by Route 1

Note: OH and UG represent Overhead and Underground respectively.

As can be seen from **Table 3.7** above and Figure 3.7, Route 1 broadly follows the path of the proposed Glenamuck-Kiltarnan Water and Drainage scheme and for a substantial length in the vicinity of the Glenamuck Stream and crosses watermains and foul sewer services at several locations.

The impact of this Route Option on the existing stream and utilities is likely to be significantly ameliorated during a detailed design process.

Route 1 does not have a significant impact on the existing ESB and Eircom services, as can be seen in Figure 3.8.

3.5 ROUTE OPTION 2

3.5.1 Route Description

Route Option 2, shown in Figure 3.2 predominantly follows the route of the existing Glenamuck Road and would in essence involve the upgrading of the existing road. This upgrade to a 'reduced dual carriageway' would involve significant land take from the front of existing houses on the Glenamuck Road, and has an adverse impact to numerous residential dwellings located along the existing Glenamuck Road.

Route Option 2 passes over a number of existing services located in the footpath to the east of the existing Glenamuck Road, these services including Eircom cables, an existing four inch watermain, a proposed 200mm ϕ watermain, and a gravity foul sewer. From Glenamuck Cottages north to Carrickmines interchange Southern Roundabout Route Option 2 crosses a proposed 200mm watermain and 300mm gravity sewer, which are part of the Glenamuck-Kiltarnan Water and Drainage Scheme. Route Option 2 also crosses a number of overhead ESB and underground Eircom services which run adjacent to the existing road.

Route Option 2 impacts on a number of roadside ditches running parallel to the existing Glenamuck Road. It would call for the infilling of existing roadside ditches and provision of either a piped drainage system or new ditch depending on constraints.

Route Option 2 also encroaches on the Gate House of Rockville Drive Lodge, which is listed as a protected structure. After Rockville Lodge, Route Option 2 realigns to the east of the existing Glenamuck Road and encroaches on the lands of Jackson in proximity to Kiltarnan Country Market before it meets the Enniskerry Road.

In total, Route Option 2 is approx. 1450m in length.

It is anticipated that for Route Option 2 approximately 200m of the Enniskerry Road will have to be realigned and widened.

3.5.1.1 Residential Properties (Refer to Fig. 3.11.)

As can be seen in Figure 3.10, this route is typically only 5m away from the nearest dwelling, with a total of 24 No. dwellings located between 0-25m of the road centreline.

22 No. properties are at risk of demolition as they may become non-viable as residences due to the proximity of the proposed route. This includes the Gatehouse at Rockville Lodge, which is a listed building of architectural and cultural importance.

There are 19 No. dwellings located between 25-50m of the road centreline. A total of 69 No. dwellings are within 100m of the centreline of the proposed roadway. As a result of the widening and upgrading of the existing Glenamuck road to a 'reduced dual carriageway' standard this option will impact severely on the environmental quality adjacent to the route.

Approximately 38 No. private houses will also have to directly access the route, which will significantly adversely affect the operation, capacity and safety of the proposed route.

7 No. domestic dwellings are located on the Enniskerry Road within 0-25m of the junction between the proposed Route 2, and a total of 20 No. dwellings within 0-100m on the Enniskerry Road.

There will be a loss of Frontage to 37 No. residential dwellings on the proposed Route Option 2 along the Glenamuck Road. Also, 10 No dwellings on the Enniskerry Road will lose frontage due the realignment of Enniskerry Road Junction. The number of frontages affected by the proposed routes would have an important bearing on the land cost estimate for the removal of frontages is generally a lump sum cost for injurious affection rather than a rate per area of frontage removed.

3.5.1.2 Severance on Potential Development Land

This route affects a number of landholdings which are currently agricultural but which have been zoned for future development (i.e. residential or economic) refer to Figures 3.4 and 3.5. A total of 9 areas of potential development land are affected by Route 2.

The severance effect on the various landholdings is assessed as

Severe	= 0
Moderate	= 0
Slight	= 1
Not Severed	= 8

The frontages of 4 holdings which have been granted planning permission for residential development are affected. Even though the majority of landholdings are not severed, the landtake to the frontage area of dwellings will have a severe impact on those residing in these dwellings.

3.5.1.3 Proximity of Route to Local Facilities/Services

Listed below are the local facilities and services including recreation, which are in the proximity and may be directly impacted upon by of Route Option 2.

- Kiltarnan Country Market is within 25m of the centreline of Route Option 2.
- Palmers Public House is approximately 30m from the junction of Route Option 2 and the Enniskerry Road.
- Carrickmines Equestrian Centre

3.5.1.4 Pedestrian & Cycle Paths

Pedestrian and Cyclist paths would be provided, where required, along the widened Route 2 Glenamuck Road and Links A or B in accordance with local planning objectives.

3.5.2 Geology and Soils

A number of slit trenches were constructed along Route 2 as part of the Glenamuck/Kilternan drainage scheme, the existing Glenamuck Road, to identify underlying services. A trial pit adjacent to the south-western end of the road indicates 0.3m Topsoil overlying slightly clayey gravelly SAND with cobbles and boulders, possibly weathered granite to refusal at 2.8m depth. At the north-eastern end of the road, ground conditions are indicated as 0.2m Topsoil overlying stiff sandy gravelly CLAY with cobbles to refusal at 3.0m depth.

3.5.3 Geometrics and Junctions

3.5.3.1 Horizontal Geometry

Table 3.8 summarises a typical horizontal alignment of Route Option 2.

Element No.	Type	Radius	Length	Remarks
1	Straight		148.53	
2	Curve	1020	10.46	
3	Straight		163.40	
4	Curve	1020	14.62	
5	Straight		113.73	
6	Curve	1020	1.44	
7	Straight		102.21	
8	Curve	1020	22.09	
9	Straight		101.24	
10	Curve	1020	26.03	
11	Straight		410.68	
	Transition		0.67	
12	Curve	720	63.24	
	Transition		0.67	
13	Straight		2.32	
	Transition		1.765	
14	Curve	510	62.31	
	Transition		1.77	
15	Straight		0.17	
	Transition		5.63	
16	Curve	360	174.94	< Desirable Min R with superelevation of 5% Departure
	Transition		5.63	
17	Straight		24.30	

Table 3.8 Route 2 Horizontal Geometrics

As can be seen in **Table 3.8**, element No. 16 has a horizontal curve of 360m which is one step below the desirable minimum radius with superelevation of 5%.

The remainder of the vertical curves for Route Option 2 have a greater value than the desirable minimum radius at superelevation of 5% of 510m for a design speed of 85kph and therefore meet the requirements of the DMRB.

Route 2 is restricted to following the line of the existing Glenamuck Road by the existing residential settlement pattern. As such the majority of the Route has a very straightforward horizontal alignment, with the exception of the horizontal curvature (element 16) in the immediate approach to the Enniskerry Road Junction. This horizontal curvature will affect the stopping sight distance to this junction, which would be below the standard required for a dual carriageway at a design speed of 85 kph.

There will be a requirement for a departure from standard for the alignment in the vicinity of the approach to the Enniskerry Road Junction as there is a combination of a horizontal curvature one step below the desirable min radius this curve, a reduction in stopping sight distance and a vertical crest curve two steps below desirable minimum (refer to table 3.9 below) at the same location.

3.5.3.2 Vertical Geometry

Table 3.9 lists a typical vertical geometry for Route Option 2.

Element No.	Type	K Value	Gradient % / (algebraic difference)	Length	Remarks
1	Grade		-1.614	62.29	
2	Sag	55.05	(1.816)	100.00	
3	Grade		0.202	53.93	
4	Sag	47.77	(2.094)	100.00	
5	Grade		2.296	17.98	
6	Sag	45.562	(1.317)	60.00	
7	Grade		3.613	66.27	
8	Sag	30.285	(1.651)	50.00	
9	Grade		5.264	17.36	Departure
10	Hog	51.467	(-1.554)	80.00	< Min K=55 Relaxation
11	Grade		3.709	109.15	
12	Sag	42.408	(1.886)	80.00	
13	Grade		5.596	26.16	Departure
14	Hog	33.697	(-1.484)	50.00	<Min K=55 Relaxation
15	Grade		4.112	15.39	Relaxation
16	Hog	23.602	(-2.118)	50.00	<Min K=55 Relaxation
17	Grade		1.994	28.77	
18	Sag	29.184	2.056	60.00	
19	Grade		4.049	24.02	Relaxation
20	Sag	11.354	(4.404)	50.00	< Min K=26 Departure
21	Grade		8.453	33.42	Departure
22	Hog	111.539	(-0.538)	60.00	
23	Grade		7.915	58.16	Departure
24	Hog	17.374	(-5.756)	100.00	<Min K=55 Departure
25	Grade		2.160	104.906	

Table 3.9 Route 2 Vertical Geometrics

Route 2 rises considerably more steeply than Route Option 1 as it gradually rises from approximately 86m OD at Carrickmines Interchange Southern Roundabout to approximately 139m OD where it meets the Enniskerry Road.

Route 2 has very steep gradients of up to 8.4% for short sections of the road; typically gradients over 5% are on 13% of the length of the route. The desirable minimum gradient recommended in NRA TD 9/03 for an all purpose dual carriageway is 4%. The maximum gradient with relaxation for an all purpose dual carriageway recommended in NRA TD 9/03 is 5%.

The typical vertical alignment shown for Route 2 for a design speed of 85kph includes some elements, as shown in **Table 3.9**, which will require relaxations or departures from standards. The elements of the vertical alignment requiring relaxations and departures from standard can be further examined with a view to eliminating or minimising these features at detailed design stage.

3.5.3.3 Junctions

As outlined in Section 3.3.2.6 all of the Route Options accommodate the same major junction types.

Route Option 2 will have a ghost island priority junction or a traffic light controlled junction at the Enniskerry Road and approximately 200m of the Enniskerry Road will have to be realigned and widened at this junction. Route Option 2 ties into the existing approach junction from the Glenamuck Road to Carrickmines Interchange Southern Roundabout.

Listed below are the existing secondary access and minor junctions, which will be impacted upon or severed by the proposed Route Option 2.

- Severe impact on numerous direct accesses to residences directly off existing Glenamuck Rd.
- Junction lane north of Glenamuck Rd. access to 3 no. residences
- Junction at Springfield lane access to residences and Carrickmines Equestrian Centre
- Junction to cul de sac south of Glenamuck Rd. to access to 4 No. residences
- Farm access road north of Glenamuck Rd.
- Junction at Rockville Drive access to Glenamuck Cottages
- Minor road access to Dwelling
- Access Road to Glenamuck North and Bective Rugby Club
- Access to Rockville House and Gate Lodge
- Junction Access to Cromlech Close

The proliferation of direct access and direct dwelling access to this route will severely adversely affect its capacity and safety. In addition many of these accesses would have to be left in/ left out, which would increase severance to each resident on the Glenamuck Road and would also severely impact on the operation/safety of the proposed route.

3.5.3.4 Volumetrics

Volumetrics refers to the balance achieved between earthworks materials won in cuttings versus the earthworks required in construction of embankments as part of a scheme.

No significant embankments or cuttings are envisaged for Routes Option 2 except at the tie-in section of the alignment to Enniskerry Road where adjacent higher ground will need to be dealt with.

3.5.3.5 Road Safety

Route Option 2 will have a high through traffic flow as it is predicted that the Glenamuck District Distributor Road will cater for higher traffic flows both as a distributor road for the South Eastern Motorway and due to the future development plans for the study area. This through traffic would be mixed with local traffic requiring access to residential, recreational and agricultural facilities in the area. Therefore, it can be seen that Route Option 2 will not alleviate the conflict between different road users in the Glenamuck area.

There are a significant number of direct accesses and direct dwelling access to this route, which will severely adversely affect its safety. As many of these accesses would have to be left in/ left out on the Glenamuck Road and would also severely impact on the operation/safety of the proposed route, as it is likely that residents will perform u-turns at junctions. While Route Option 2 may improve the visibility and type of access from residences along the Glenamuck Road this is unlikely to improve the overall road safety in the area.

Cycleways and pedestrian footpaths would be provided along Route 2, however, the increased traffic volumes on the Route Option 2 is most likely to reduce the safety for cyclists and pedestrians relative to the two alternative route options.

Based on the above, it is likely that Route Option 2 would not significantly improve road safety for all road users along the Glenamuck Road.

3.5.4 Drainage

3.5.4.1 Culverts

Route Option 2 which involves widening of the Glenamuck Road will require the extension of 1 no. culvert which crosses a tributary stream of the Glenamuck Stream southwest of the Carrickmines Interchange Southern Roundabout.

This route may also involve extending existing culverts crossing the Glenamuck Road and diverting existing roadside ditches. It will be assessed if remedial works are required on the existing culvert as part of any future detailed design assessment.

3.5.4.2 Drainage Overview

As can be seen in Figures 3.6 and 3.10, Route Option 2 generally follows the vertical and horizontal alignment of the existing Glenamuck Road and will impact on a number of existing roadside ditches running parallel to the existing Glenamuck Road. Route 2 will require the infilling of existing roadside ditches and the provision of either a piped drainage system or new ditches depending on constraints.

The storm water run-off from the carriageway will generally be directed to a piped french drain or closed pipe system constructed along the edge of the carriageway. French drains or closed pipes will discharge to outfall locations located at low points on the road.

The route will drain from south to north along its route and outfall will be possible to the Glenamuck Stream network in the vicinity of 200m from the Carrickmines Interchange Southern Roundabout. Additional land acquisition or wayleave provision is likely to be necessary for this outfall.

As part of the planning search RPS-Consulting Engineers noted photographs of significant flooding in the Glenamuck Road Area southwest of the Carrickmines Interchange Southern Roundabout. If in the future, significant urban development takes place within the remit of the Dun Laoghaire-Rathdown County Development Plan (2004-2010) without the introduction of appropriate remedial/attenuation measures, downstream difficulties are likely to exacerbate.

Road drainage works for Route 2 will be located parallel to and will cross the existing watermains and foul sewer services which are part of the Glenamuck-Kilternan Water and Drainage Scheme located along the Glenamuck Road.

3.5.5 Utilities

Table 3.10 summarises the impact to Utilities of Route 2.

Utility	Impact	Comments
ESB LV	11	Parallels approx 1.5 km of existing ESB low voltage overhead lines run along the length of the existing Glenamuck Road. 3 No. OH crossings between Springfield Lane and Glenamuck Cottages. 5 No. OH crossings between Glenamuck Cottages and Enniskerry Road. 2 No. OH crossings between at the Enniskerry Road Junction.
ESB 10 kV	3	2 No. OH crossings south of Carrickmines Interchange Southern Roundabout. 1 No. OH crossing between Glenamuck Cottages and Enniskerry Road.
ESB 110 kV	2	1 No. OH crossing of the Carrickmines-Fassaroe East 110kV line. 1 No. OH crossing of the Carrickmines-Fassaroe West 110kV line.
ESB 220 kV	1	1 No. OH crossing of the Arklow-Carrickmines 220kV Double Circuit line.
Eircom	7	Parallels approx. 1.5km of existing Eircom services along the entire length of the east side of the existing Glenamuck Road. Parallels approx 150m of existing Eircom services along the Enniskerry Road. 4 No. UG crossings between Carrickmines Interchange Southern Roundabout and Glenamuck Cottages. 1 No UG crossing at the Enniskerry Road junction.
Watermains	5	Parallels approx 1.5 km of existing UG watermain along the east

		<p>side of the existing Glenamuck Road.</p> <p>Parallels approx 800m of proposed 200mm watermain between Carrickmines Interchange Southern Roundabout and Springfield Lane.</p> <p>Parallels approx 150m of proposed 300mm watermain on the Enniskerry Road.</p> <p>Parallels approx 150m of existing watermain on the Enniskerry Road.</p> <p>1 No. UG crossing of proposed 300mm watermain at Enniskerry Road junction.</p>
Foul Sewer	6	<p>Parallels approx 650m of the proposed UG 300mm gravity sewer runs along the west side of Glenamuck Road from Glenamuck Cottages to near Carrickmines Interchange Southern Roundabout.</p> <p>Parallels approx 25m of proposed 225mmϕ gravity sewer on the Glenamuck Road adjacent to the Enniskerry Road Junction.</p> <p>Parallels approx 150mm 300mmϕ gravity sewer on the Enniskerry Road.</p> <p>1 No. UG crossing of proposed 225mm gravity sewer at near Springfield Lane.</p> <p>1 No. UG crossing of proposed 225mm gravity sewer at Glenamuck Cottages.</p>

Table 3.10 Utilities affected by Route 2

Route 2 has a very significant impact on existing utilities as it parallels the ESB LV overhead cables, Eircom services, watermains and foul sewers running along the length of the Glenamuck Road. The majority of these services may need to be relocated during construction works.

As can be seen in Figure 3.7, Route 2 has a significant number of crossings of watermains and foul services both along the Glenamuck Road and the realigned section of Enniskerry Road, as Route 2 crosses and parallels sections of the Glenamuck-Kiltarnan Water and Drainage scheme.

As can be seen in Figure 3.8, Route 2 has a significant number of crossings of ESB services, notably ESB 10kV and LV overhead cables along the Glenamuck Road.

3.6 ROUTE OPTION 3

3.6.1 Route Description

The following description is a general outline of the alignment that the proposed Route Option 3 follows. In any future detailed design the details of this route, within the general route corridor of Route Option 3, may change.

From its commencement east of Carrickmines Interchange Southern Roundabout, Route Option 3, shown in Figures 3.3 and 3.11 immediately crosses an existing four inch watermain and a proposed 200mm watermain which is part of the Glenamuck-Kiltarnan Water and Drainage Scheme.

Route Option 3 then proceeds in a southerly direction through the lands of Patrick Mooney Developments Ltd and Abbeyrock Developments Ltd both of which have received planning permission for high-density residential developments.

From here Route Option 3 passes under the Carrickmines-Fassaroe East ESB overhead line. Route Option 3 then crosses Springfield Lane before passing through the front garden and driveway of Southsprings House and the back garden of Glenheather House.

From here Route Option 3 continues to the immediate east of Glenamuck Cottages, it then passes under the Glenamuck-Fassaroe West 110kV ESB overhead line and through the lands of Jackson where Wayside Celtic FC is to be relocated.

Route Option 3 then passes under the Arklow-Carrickmines 220kV Double Circuit ESB overhead line. Route Option 3 continues through the lands of Thompson before it meets the Enniskerry Road at approximately the centre of the existing Wayside Celtic pitches. Here Route Option 3 crosses a four inch existing watermain along with a 300mm proposed watermain which is part of the Glenamuck-Kiltarnan Water and Drainage Scheme.

Route Option 3 also passes under an existing low voltage ESB overhead line and over Eircom cables where it meets the Enniskerry Road.

In total, Route 3 comprises a length of 1970m, some 500m longer than either Routes 1 or 2.

It is anticipated that for Route Option 3 approximately 350m of the Enniskerry Road will have to be realigned.

3.6.1.1 Residential Properties (Refer to Fig. 3.12.)

There are 2 No. and 6 No. dwellings between 0-25m and 25-50m of the proposed centreline of Route 3 respectively. A total of 24 No. dwellings are within 100m of the proposed centreline of Route 3.

There is 1 No. dwelling 'at risk' of demolition as it may become non-viable as a residence due to the proximity of the proposed Route 3.

Along the realigned section of the Enniskerry Road there are 4 No. dwellings within 25m of the centreline of the proposed realigned Enniskerry road, and a total of 16 No. dwellings are within 100m of the proposed realigned Enniskerry road.

There are 3 No. dwellings 'at risk' of demolition as they may become non-viable as residences due to the proximity of the proposed realigned Enniskerry Road.

There will be a loss of frontage/gardens to 3 No. dwellings along the proposed Route 3. The frontages of 9 No. dwellings along the Enniskerry Road would be slightly impacted upon due to the proposed realignment. There will also be a loss of Frontage to the Church of Our Lady of the Wayside. The number of frontages affected by the proposed routes would have an important bearing on the land cost estimate for the removal of frontages is generally a lump sum cost for injurious affection rather than a rate per area of frontage removed.

3.6.1.2 Severance on Potential Development Lands

This route affects a number of landholdings which are currently agricultural but which have been zoned for future development (i.e. residential or economic) refer to Figures 3.4 and 3.5. A total of 8 areas of potential development land are affected by Route 3, of which 2 holdings have been granted planning permission for residential development.

The severance effect on the various landholdings is assessed as

Severe	= 7
Moderate	= 0
Slight	= 1
Not Severed	= 0

The openings available to Route Option 3 are very limited in the Springfield Lane area and severance to these 8 No. plots is necessary to avoid property demolition and to avoid other constraints. The only feasible route without the demolition of property necessitates the route passing through the gardens of Southsprings House and Glenheather House, with in 5-10m of each house.

In order to maintain access at Springfield Lane, this route option is likely to necessitate an accommodation overbridge.

3.6.1.3 Proximity of Route to Local Facilities/Services

Listed below are the local facilities and services including recreation, which are in the proximity and may be directly impacted upon by of Route Option 3.

- Route 3 crosses Springfield Lane, which feeds a number of houses and farms, as well as the Carrickmines Equestrian Centre.
- The centreline of Route 3 is located approximately 100m from Dingle Glen which is a National Heritage Area (site code: 001207).
- Wayside Celtic FC has recently applied for planning permission for the construction of 4 No. sports pitches in the area to the east of Glenamuck Road between Rockville Lodge and Glenamuck Cottages. Route Option 3 passes directly through this proposed development.

3.6.1.4 Pedestrian & Cycle Paths

Pedestrian and Cyclist paths will provided, where required, along the widened Route 3 and also along Link A or B in accordance with local planning objectives, if deemed appropriate.

Pedestrian and cyclist access to the Glenamuck Road will be retained. It may be a viable option to consider an alternative route for pedestrians and cyclists, utilising the existing Glenamuck Road, within the greater planning context and development of the area.

3.6.2 Geology and Soils

There is very little ground investigation information along Route 3. One borehole at the south-western end of the route indicates Tarmac to 0.2m overlying possible MADE GROUND of soft to firm gravelly CLAY with boulders and cobbles to 2.0m depth; overlying stiff sandy gravelly CLAY to refusal (possible bedrock) at 3.2m depth. One (super-heavy) dynamic probe mid-way along Route 3 indicates possible rockhead at 2.8m depth.

3.6.3 Geometrics and Junctions

3.6.3.1 Horizontal Geometry

Table 3.11 summarises a typical horizontal alignment of Route 3.

Element No.	Type	Radius	Length	Remarks
1	Straight		45.32	
	Transition		5.63	
2	Curve	360	265.104	< Desirable Min R with superelevation of 5% Relaxation
	Transition		5.63	
3	Straight		243.92	
	Transition		0.67	
4	Curve	720	50.72	
	Transition		0.67	
5	Straight		16.52	
	Transition		5.63	
6	Curve	360	284.17	< Desirable Min R with superelevation of 5% Relaxation
	Transition		5.63	
7	Straight		73.79	
	Transition		0.67	
8	Curve	720	65.32	
	Transition		0.67	
9	Straight		106.49	
	Transition		1.77	
10	Curve	510	151.09	Desirable Min R with superelevation of 5%
	Transition		1.77	
11	Straight		12.15	
	Transition		1.77	
12	Curve	510	123.23	Desirable Min R with superelevation of 5%
	Transition		1.77	
13	Straight		54.33	
	Transition		0.67	
14	Curve	720	127.12	
	Transition		0.67	
15	Straight		16.29	
	Transition		0.67	

16	Curve	720	72.27	
	Transition		0.67	
17	Straight		223.20	

Table 3.11 Route 3 Horizontal Geometrics

As can be seen in **Table 3.11**, Elements 2 and 6 have horizontal curvature one step below the desirable minimum R with super elevation of 5% at a design speed of 85kph and may require relaxations. The remainder of the curves have a value greater than or equal to the desirable minimum radius of 510m at a design speed of 85kph and meet the requirements of the DMRB.

However, it is noted that for Route Option 3 the horizontal alignment has a substantially higher degree of bendiness than the other two routes.

3.6.3.2 Vertical Geometry

Table 3.12 lists a typical vertical geometry for Route Option 3.

Element No.	Type	K Value	Gradient % / (algebraic difference)	Length	Remarks
1	Grade		5.564	96.782	Departure
2	Hog	17.94	(-6.132)	110.00	<Min K =55 Relaxation
3	Grade		-0.568	203.9	
4	Sag	34.39	(4.363)	150.00	
5	Grade		3.794	266.00	
6	Sag	70.71	(2.121)	150.00	
7	Grade		5.915	108.61	Departure
8	Hog	37.354	(-5.354)	200.00	<Min K is 55 Relaxation
9	Grade		0.561	130.94	
10	Sag	37.69	(5.307)	200.00	
11	Grade		5.867	37.25	Departure
12	Hog	39.923	(-5.010)	200.00	<Min K is 55 Departure
13	Grade		0.858	110.88	

Table 3.12 Route 3 Vertical Geometrics

Route option 3 rises gradually from Carrickmines Interchange Southern Roundabout at approximately 86m OD until the 93m OD contour, which it follows for some length. Before it reaches the back of Glenamuck Cottages, Route 3 again begins to rise gradually until it reaches the 125m OD contour which it follows for a brief period before dipping back to 123m OD. From this slight dip Route option 3 rises quickly at first to 137m OD and then more gradually to 143m OD where it meets the Enniskerry Road.

Route 3 has gradients of over 5% are along 20% of the length of the route. A gradient of 5% is the maximum grade with relaxations for an all-purpose dual carriageway. The desirable minimum gradient recommended in NRA TD9/03 for an all purpose dual carriageway is 4%. The maximum gradient with relaxation for an all purpose dual carriageway recommended in NRA TD9/03 is 5%.

The vertical alignment for Route option 3 has alternating areas of cut and fill. This will require significant earthworks during construction and have an impact the construction cost and will also require significant traffic management during construction for deliveries and earth handling plant.

The typical vertical alignment shown for Route 3 for a design speed of 85kph includes some elements, as shown in **Table 3.12** above, which will require relaxations or departures from standards. The elements of the vertical alignment requiring relaxations and departures from standard can be further examined with a view to eliminating or minimising these features at detailed design stage.

3.6.3.3 Junctions

As shown in section 3.3.2.6 all of the Route Options need to accommodate the same major junction types.

Route Option 3 will have a ghost island priority junction or traffic controlled junction at the Enniskerry Road and approximately 350m of the Enniskerry Road will have to be realigned and widened to form this junction and provide the necessary sightlines. Route Option 3 ties into the Carrickmines Interchange Southern Roundabout from the east side at the location where Patrick Mooney has been granted planning permission access.

Listed below are the existing secondary access and minor junctions, which will be impacted upon or severed by the proposed Route Option 3.

- Severe severance to Springfield Lane and Carrickmines Equestrian Centre
- Severe severance to access road to 1 no. dwelling off Springfield Lane

It is probable that an accommodation overbridge will be required to retain access to the severed Springfield Lane.

3.6.3.4 Volumetrics

Volumetrics refers to the balance achieved between earthworks materials won in cuttings versus the earthworks required in construction of embankments as part of a scheme.

The topography along the line of Route 3 is less uniform than that for Routes 1 & 2 and will lead to significant cuttings and embankments, which will require more significant amounts of imported material which will impact on the construction cost.

3.6.3.5 Road Safety

Route Option 3 will reduce the volume of through traffic on the existing Glenamuck Road thereby making it a less trafficked and safer road to gain access to by residents and a less busy road for cyclists and pedestrians. However, Route Option 3 will not reduce the number of direct accesses onto the existing Glenamuck Road.

3.6.4 Drainage

3.6.4.1 Culverts

There may be a possible 1 no. culvert crossing along Route 3, as it crosses a ditch which discharges to the Glenamuck Stream at 1 No. location adjacent to Springfield Lane. This route also crosses drainage ditches at various locations.

3.6.4.2 Drainage Overview

The storm water run-off from the carriageway will generally be directed to filter drains and closed piped system located along the edge of the carriageway.

It is notable that Route 3, which is located south and east of the existing Glenamuck Road, is the most remote option from the local watercourse network with the Glenamuck Stream located northwest of the Glenamuck Road. This option may require drainage works crossing the Glenamuck Road to provide outfalls into the Glenamuck Stream thus requiring additional land acquisition or wayleave provision. This impact will be assessed at a future detailed design stage.

Route 3 is formed on areas of cut and fill along the alignment. In areas of cuttings the natural catchment run-off will be intercepted by the use of intercepting ditches. Similarly, in areas of fill, a system of toe drains at the bottom of embankment slopes will intercept overland flows. As the existing watercourses are remote to this road option it may be impractical to discharge the natural catchment run-off directly to the existing watercourses, in this case the interceptor ditches and toe drains would be connected to the road drainage outfall system to form a combined outfall to the Glenamuck Stream network.

When the carriageway is in cut, the intersecting ditches/streams may need to be connected into the road drainage system or alternatively diverted into other watercourses, if practical.

Consideration may have to be given to attenuation to prevent significant impacts of flood flows on the watercourses. Attenuation can be accommodated either within the pipework of the closed drainage system or in attenuation ponds which would be included in the C.P.O. land acquisition. This would be assessed during a future detailed design stage.

All run-off collected from proposed new routes will pass through treatment to remove particulates prior to discharge into existing streams.

It is clear that Route 3 presents greater engineering challenges in relation to drainage in comparison to either Route 1 or Route 2.

3.6.5 Utilities

Table 3.13 summarises the impact to Utilities for of Route 3.

Utility	Impact	Comments
ESB LV	4	Parallels approx 220m of overhead ESB LV OH cables along the Enniskerry Road. 2 No. OH crossing at Enniskerry Road junction. 1 No. LV crossing to the south of Carrickmines Interchange Southern Roundabout.
ESB 10 kV	4	2 No. OH crossings south of Carrickmines Interchange Southern Roundabout. 1 No. OH crossings at Springfield Lane. 1 No. OH crossing east of Glenamuck Cottages.
ESB 110 kV	2	1 No. OH crossing of the Carrickmines-Fassaroe East 110kV line. 1 No. OH crossing of the Carrickmines-Fassaroe West 110kV line.
ESB 220 kV	1	1 No. OH crossing of the Arklow-Carrickmines 220kV Double Circuit line.
Eircom	2	1 No UG crossing at the Enniskerry Road junction. 1 No. UG crossing to the south of Carrickmines Interchange Southern Roundabout.
Watermains	4	Parallels approx. 300m of existing watermain at Enniskerry Road junction. Parallels approx. 300m of existing watermain proposed 300mm watermain at Enniskerry Road junction. 1 No. UG crossing of existing watermain at Carrickmines Interchange Southern Roundabout. 1 No. UG crossing of proposed 200mm watermain at Carrickmines Interchange Southern Roundabout.
Foul Sewer	1	Parallels approx. 150m of proposed 225mm foul sewer at the Enniskerry Road junction.

Table 3.13 Utilities affected by Route 3

As can be seen from **Table 3.13** above and Figure 3.7, Route 3 has a slight impact on the watermains and foul sewer services, in particular along the section of the Enniskerry Road to be realigned.

Route Option 3 has a slight impact on ESB services, with several crossings along the Route, but in particular where it parallels overhead LV cables along the section of the Enniskerry Road to be realigned, as shown in Figure 3.8.

3.7 CROSS ROUTES

Two possible link routes to compliment the mainline Route Options for the Glenamuck District Distributor Road were identified as part of the route selection process. These cross-routes are used to illustrate the likely impact of the Route Options on proposed future development access requirements. The cross-routes, Link A or Link B, are included for indicative purposes only to help identify a mainline route, which would best serve the area's planning objectives in the future.

Possible factors to consider when examining the combination of Link and Route Options include:

- Access to undeveloped lands with the potential to be developed in the future.
- The provision of a bypass to Kilternan Village.
- Provide a future link to the Ballycorus Road

3.7.1.1 Link A

Link A commences at Bective Rangers FC where it immediately crosses the Glenamuck Stream before entering the lands of Cowley where it runs parallel to the entrance road to Bective Rangers FC and to the Carrickmines-Fassaroe East ESB overhead 110kV line to the south of Ashwood Farm until it meets the Glenamuck Road. After crossing the existing Glenamuck Road, Link A passes through the lands of Jackson, where Wayside Celtic FC have applied for planning permission for football pitches.

Link A when combined with any of the three route options will provide access to the lands zoned for economic activity and to Bective Ranger's Rugby Club on the north side of the Glenamuck Road; and access to the future area reserved for Wayside Celtic Sports ground area and to areas of high rural amenity and agriculture use to the south of Glenamuck Road.

In particular, Link A when combined with Route 1 will provide access to the Glenamuck Road, where the proposed cul de sac at Carrickmines Interchange Southern Roundabout has impacted access to residential areas.

Table 3.14 summarises a typical horizontal alignment of Link A.

Element No.	Type	Radius	Length	Remarks
1	Straight		319.53	
2	Curve	1020	165.14	No transition or adverse camber
3	Straight		16.82	
	Transition		1.77	
4	Curve	510	367.89	2.5% superelevation
	Transition		1.77	
5	Straight		47.97	
	Transition		0.67	
6	Curve	720	159.75	-
	Transition		0.67	
7	Straight		11.14	
	Transition		5.63	
8	Curve	360	202.29	3.5% superelevation
	Transition		5.625	
9	Straight		46.42	

Table 3.14 Link A Horizontal Geometry

As can be seen in **Table 3.14** all of the curves have a greater value than the desirable minimum radius of 255m for a design speed of 60 kph.

Table 3.15 lists a typical vertical geometry for Link A.

Element No.	Type	K Value	Gradient % / (algebraic difference)	Length	Remarks
1	Grade		-3.492	31.95	
2	Sag	16.139	(6.196)	100.00	Min K=13
3	Grade		2.705	56.87	
4	Hog	88.358	(-0.566)	50.00	Min K=17
5	Grade		2.139	92.86	
6	Sag	37.697	3.714	140.00	Min K=13
7	Grade		5.853	59.48	
8	Sag	262.063	(0.076)	20.00	Min K=13
9	Grade		5.929	153.29	
10	Sag	288.524	(0.069)	20.00	Min K=13
11	Grade		5.998	53.962	
12	Hog	15.213	(-7888)	120.00	< Min K=17 Relaxation
13	Grade		-1.890	55.396	
14	Sag	18.243	(6.578)	120.00	Min = 13
15	Grade		4.688	38.08	
16	Hog	29.215	(-4.107)	120.000	Min K=17
17	Grade		0.058	120.93	

Table 3.15 Link A Vertical Geometrics

As can be seen from **Table 3.15** Link A provides a reasonable typical vertical geometry for a design speed of 60kph.

Table 3.16 summarises the impact to Utilities for Link A

Utility	Impact	Comments
ESB LV	1	1 No. OH crossing at Glenamuck Road junction.
ESB 10 kV	2	1 No. OH crossing south of Bective Rangers Rugby Club. 1 No. OH crossing southwest of Glenamuck Cottages.
ESB 110 kV	2	Parallels approx 175m of ESB 110kV overhead lines running north of the existing Glenamuck Road. 1 No. OH crossing north of the Glenamuck Road.
Eircom	1	1 No UG crossing at the Glenamuck Road.
Watermains	2	1 No. UG crossing of existing watermain at Glenamuck Road. 1 No. UG crossing of proposed 300mm watermain south of Bective Rangers Rugby Club.
Foul Sewer	1	1 No. UG crossing of proposed 450mm foul sewer south of Bective Rangers Rugby Club.

Table 3.16 Utilities affected by Link A

The effects of the proposed Cross Route Link A on utilities will be the same irrespective on the final location of the Glenamuck District Distributor Road.

3.7.1.2 Link B

Link B commences in the lands of P. Start approx. 150m south of the De La Salle Palmerstown Rugby Club and proceeds in an easterly direction passing through the lands of P. Start and along the boundary of the lands of Cowley where meets the existing Glenamuck Road and passes under the Arklow-Carrickmines 220kV Double Circuit ESB overhead line. After crossing the existing Glenamuck Road, Link B passes through the lands of Jackson.

Link B when combined with any of the three route options will provide access to the lands zoned for future residential development on the north side of the Glenamuck Road; and access to the future area reserved for Wayside Celtic Sports ground area and to areas zoned for future residential development to the south of Glenamuck Road.

In particular, Link B when combined with Route 1 will provide access for the to the Glenamuck Road, where the proposed cul de sac at Carrickmines Interchange Southern Roundabout has impacted access to residential areas. Link B will result in a longer trip time than Link A for residents of the Glenamuck Cottages and Springfield lane when travelling from the Carrickmines Interchange Southern Roundabout.

Table 3.17 summarises a typical horizontal alignment of Link B.

Element No.	Type	Radius	Length	Remarks
1	Straight		131.36	
2	Curve	1020	184.97	No transition and superelevation
3	Straight		108.10	
	Transition		0.67	
4	Curve	720	181.98	2.5% superelevation
	Transition		0.67	
5	Straight		36.467	
	Transition		1.73	
6	Curve	520	358.86	3.5% superelevation
	Transition		1.73	
7	Straight		19.32	
	Transition		0.67	
8	Curve	720	125.794	2.5% superelevation
	Transition		0.67	
9	Straight		71.66	

Table 3.17 Link B Horizontal Geometrics

As can be seen in **Table 3.17**, all of the curves have a greater value than the desirable minimum radius of 225m for a design speed of 60 kph.

Table 3.18 lists a typical vertical geometry for Link B.

Element No.	Type	K Value	Gradient % / (algebraic difference)	Length	Remarks
1	Grade		-2.954	54.095	
2	Sag	25.865	(3.866)	100.00	Min K=13
3	Grade		0.912	203.535	
4	Sag	70.414	(2.130)	150.00	Min K=13
5	Grade		3.043	122.162	
6	Hog	60.141	(-1.663)	100.00	Min K=17
7	Grade		1.380	32.752	
8	Sag	33.25	(4.511)	150.00	Min K=13
9	Grade		5.891	56.262	
10	Hog	27.475	(-7.279)	200.00	Min K=17
11	Grade		-1.388	55.401	

Table 3.18 Link B Vertical Geometrics

As can be seen from **Table 3.18** Link B provides a reasonable typical vertical geometry for a design speed of 60kph.

Table 3.19 summarises the impact to Utilities for Link B

Utility	Impact	Comments
ESB LV	1	1 No. OH crossing at Glenamuck Road.
ESB 10 kV	1	1 No. OH crossing north of the Glenamuck Road.
ESB 220 kV	1	1 No. OH crossing north of the Glenamuck Road.
Eircom	1	1 No UG crossing at the Glenamuck Road.
Watermains	2	1 No. UG crossing of existing watermain at Glenamuck Road. 1 No. UG crossing of proposed 300mm watermain west of Bective Rangers Rugby Club.
Foul Sewer	1	1 No. UG crossing of proposed 975mm foul sewer west of Bective Rangers Rugby Club.

Table 3.19 Utilities affected by Link B

The effects of the proposed Cross Route Link B on utilities will be the same irrespective on the final location of the Glenamuck District Distributor Road.

3.8 CONCLUSIONS

The following sections summarise the main engineering factors of the three proposed route options, which have been presented in this Chapter. A comparison the three route options based on the engineering factors is also presented and this outlines briefly the relative impacts of each route option, highlighting the more favourable route option for each of the engineering factors.

3.8.1 Route Options

The three route options identified have substantially different alignments. Route 1 is to the northwest of the existing Glenamuck Road. Route 2 runs along the existing Glenamuck Road to a large extent. Route 3 is to the southeast of the existing Glenamuck Road.

Route 1 and Route 2 are of similar length while Route 3 is significantly longer, this will significantly increase the overall cost of Route Option 3.

Route Option 2 has the most impact on dwellings in the area, as it will involve taking frontage from virtually every dwelling on the existing Glenamuck Road. This will lead to very high costs for landtake and environmental impact on residents along this route. Route 2 will also have a severe impact on direct access to dwellings along the Glenamuck Road, and will cause severance to numerous existing junctions and minor access roads along the Glenamuck Road.

Route Option 3 will have a significant impact on 2 No. future residential developments for which planning permission has already been granted, namely, where it passes through the proposed Mooney and Abbeyrock developments. Route 3 also will have a severe impact on the settings of 2 No. residential dwellings adjacent to Springfield Lane. This will significantly increase the cost of landtake along this route. Route Option 3 causes severance to the Carrickmines Equestrian Centre where it crosses Springfield Lane, and it is likely that an accommodation overbridge will be required at this location to maintain access. Route 3 also passes through the lands of Jackson where Wayside Celtic FC pitches are to be relocated as part of the local development plan.

Route Option 1 passes through one area where planning permission has already been granted for residential development owned by Mooney developments for a short section of the route. For the majority of the remainder of Route 1 it passes through areas zoned for future economic and residential development. Route Option 1 affects the least number of dwellings and properties. Route Option 1 does not encroach on Park Developments Ltd. lands currently under construction, but its tight alignment means that there may not be sufficient space for a fifth arm at Carrickmines Interchange Southern Roundabout and therefore it may be necessary to cul de sac the existing Glenamuck Road south of the roundabout.

Based on the above, it is concluded that Route 1 offers the best solution for a combination of length of the route and probable cost of landtake, making this option the best value for money.

3.8.2 Geology and Soils

Ground conditions appear consistent for the three routes with Glacial deposits, predominantly sandy gravelly CLAY, overlying bedrock indicated to be around 2.8m to 4.0m depth.

The presence of soft deposits may be encountered along Route 1 due to its vicinity to a nearby stream. Route 2 lies on the existing Glenamuck Road implying founding conditions for a road upgrade will be suitable. There is very little ground investigation information available for Route 3.

A ground investigation along the chosen route will be required so that a detailed assessment of ground conditions may be carried out.

3.8.3 Geometrics & Junctions

The traffic analysis, as discussed in Chapter 4, has identified Route Option 1 as best suiting the overall traffic needs of the study area.

Route Option 1 has the best horizontal alignment at a design speed of 85kph. Route Option 2 has a reasonable horizontal alignment, however the horizontal bend in the immediate approach to the Enniskerry Junction will affect the stopping sight distance and would be a departure from standard. Route Option 3 has the least favourable horizontal alignment with a substantially higher bendiness than the other two Routes.

Route Options 1 and 2 have similar vertical alignments, rising gradually from the Carrickmines Interchange Southern Roundabout until they reach the Enniskerry Road. Route Option 3 has a considerably less straightforward vertical alignment with alternating areas of cut and fill. From this analysis it is clear the Route 1 has the preferred vertical alignment as it rises the least (86m OD to 124m OD= 38m) compared to 51m for Route 2 and 57m for Route 3.

The typical vertical geometries shown for all the Routes show relaxations and departures from standard as recommended in NRA TD 9/03. For Route Options 1 and 3 it is likely that these aspects of the vertical alignment may be improved upon at detailed design stage. Route Option 2, however, is constrained by the existing alignment and due to the difficult topography at the northwest end of the Glenamuck Road it has steep gradients at the approach to the Enniskerry Junction.

Route Option 2, which is very close to populated areas, would be the most difficult option to construct due to the extensive traffic management required. The construction of Route Option 2 may also introduce difficulties when widening the existing road. These difficulties take into account the required relocation of statutory services, the diversion of roadside ditches and the extensive accommodation works involved.

Route Options 1 and 3 will reduce the volume through traffic on the existing Glenamuck Road thereby making it a less trafficked and safer road for residents to gain access to their dwellings and a less busy road for cyclists and pedestrians. Route Option 2 will have a high the volume through traffic flow, which would be mixed with local traffic requiring access to residential, recreational and agricultural facilities in the area. Route Option 2 will not alleviate the conflict between different road users in the Glenamuck area. Route 2 also has a significant number of road accesses and direct dwelling access to this route, which will severely adversely affect its safety.

Based on the above, it is concluded that Route 1 offers the best geometric solution to meet the various objectives of the GDDR.

3.8.4 Drainage

Route Option 3 is the most remote option from the local drainage network consisting of the Glenamuck Stream and its tributaries. Route Option 3 also has 3 significant areas of cuttings, which are remote from local watercourse, and as a result it may be necessary to cater for the run-off from the natural catchments. This would require increased pipework capacity to be provided and may involve a greater storage area for attenuation of stormwater drainage should attenuation ponds be required. This would lead to potentially higher drainage costs for the road drainage network for Route Option 3.

Route Option 1 will require the most number of culverts, as it involves 4 No. crossings of the Glenamuck Stream and various crossings of tributary streams and ditches. This aspect will however be subject to review in the detailed design stage.

Route Options 1 and 3 are likely to require attenuation of storm water run-off. Route 2, which is located along the line of the existing Glenamuck Road, will not increase significantly the impermeable area and it is unlikely that attenuation of stormwater run off will be required to the same extent.

Route Option 2 will require new drainage outfall pipework to access the Glenamuck Stream network which may require additional lands/ wayleaves.

Route Options 1 and 2 involve the road drainage works crossing the existing watermains and foul sewer services which are part of the Glenamuck-Kiltarnan Water and Drainage Scheme at several locations.

On balance, Route Option 1 offers the most straightforward drainage requirements.

3.8.5 Utilities

Route 2 has potentially the most adverse effect on existing utilities as it parallels a number of utilities, namely the ESB LV overhead cables and underground utilities namely Eircom, watermains and foul sewer services running alongside the existing Glenamuck Road. The majority of these services may need to be relocated.

Route 1 crosses more watermains and foul sewer services than any other route as it generally follows the path of the proposed Glenamuck-Kiltarnan Water and Drainage scheme for a substantial length in the vicinity of the Glenamuck Stream. The alignment of Route 1, however, can be adjusted in order to minimise this impact at a detailed design stage. Route 3 has the least affect on foul sewer systems.

Of the three routes, Route 1 has the least effect on ESB overhead services. Route 2 has the most effect on ESB services.

Routes 1 and 3 affect a similar number of utilities, however Route 1 parallels slightly less length foul sewer services and effects slightly less ESB and Eircom services than Route 3.

Based on the above it is concluded that Route 1 is the option having least impact on existing utilities.

3.8.6 Cross Routes

This Chapter has also identified 2 possible cross-routes to compliment the Glenamuck District Distributor Road. These link routes are included to compliment the main route options and to provide access to undeveloped lands with the potential to be developed in the future regardless of which route is under construction.

Whether Link A or Link B is provided, the chosen Link when combined with any of the three route options will provide access to areas zoned for potential future development.

The provision of a cross-route would be most critical for Route 1, as a cross-route will be necessary to provide access to the Glenamuck Road for the residents if the existing access to the Glenamuck Road from the Carrickmines Interchange Southern Roundabout is severed by providing a cul-de-sac at the eastern end of the Glenamuck Road.

4 TRAFFIC

4.1 INTRODUCTION

This section of the 'Feasibility and Route Selection Report' examines the traffic considerations of the proposed Glenamuck District Distributor Road (GDDR) with a view to identifying a preferred route option and required cross section. RPS Consulting Engineers (RPS) has identified proposed route options for GDDR, which will best serve the local and strategic transport needs of the area with regard to the future commercial, residential and recreational development set out in the document "Dun Laoghaire - Rathdown County Development Plan 2004 – 2010". This involved the examination of on-line and off-line alignments of the GDDR within the designated corridor, which are feasible from an engineering, planning, safety and environmental perspective. Numerous junction strategies and road cross sections were examined to ensure that the optimal solution was achieved, whilst minimising land-take. New pedestrian and cyclist facilities, where required, will improve the area recreationally, whilst providing for future development. It was agreed with DLRCC at the outset of the commission that a traffic model be produced by RPS Consulting Engineers in conjunction with the Dublin Transportation Office (DTO). RPS interpreted the traffic model outputs in conjunction with the DTO in order to identify a preferred route and cross section for the GDDR.

This Chapter will deal with the following issues:

- Existing Traffic Information
- Proposed Route Options
- DTO SATURN Traffic Model
- Route Option Appraisal
- Carriageway Cross-Section Requirement
- Junction Strategy; and
- Conclusions.

4.2 EXISTING INFORMATION

RPS Consulting Engineers produced a 'Traffic Appraisal Report - Existing Conditions' for the Glenamuck area between the Enniskerry Road at Kilternan and the South Eastern Motorway (SEM) M50 Carrickmines Interchange southern roundabout on the Glenamuck Road, prior to the production of this Report.

The Report examined the existing traffic conditions surrounding the Glenamuck Road and within the specified Study Area which encompasses the Glenamuck Road and the Enniskerry Road. The Study Area comprises the Carrickmines Interchange on the SEM to the northeast of the Glenamuck Road, the Carrickmines Interchange southern Roundabout and the priority junction formed by the Glenamuck Road and the Enniskerry Road. This Report provided a solid base on which all future traffic analysis and modelling work was undertaken. The existing traffic conditions were examined in terms of the overall Study Area, site location, road and junction geometry, existing traffic flows, junction capacity, public transport and pedestrian/cycle infrastructure, accident numbers, local planning policies and committed large scale developments in the area. All details contained in this Report were used by the DTO to produce a fully calibrated and validated traffic model, which is discussed in greater detail in Section 4.4.

4.3 PROPOSED ROUTE OPTIONS

The route options under investigation have already been described in detail in Section 3. The traffic element of this Feasibility Study will examine the three identified route options in terms of maximum hourly and daily traffic flows, junction impact, journey times and alignment in Section 4.5 of this Report. These options are summarised below:

- Route Option 1 is to the west of the existing Glenamuck Road. The alignment of this route option is shown in Figure 3.1, Appendix A.
- Route Option 2 is aligned along the existing Glenamuck Road to a large extent. The alignment of this route option is shown in Figure 3.2, Appendix A.
- Route Option 3 is to the east of the existing Glenamuck Road. The alignment of this route option is shown in Figure 3.3, Appendix A.

Route Options 1 and 2 are of similar length while Route Option 3 is significantly longer. A number of possible link routes to complement the GDDR were also identified as part of the route selection process. These link routes have been discussed in Section 3.7 and are included for indicative purposes.

4.4 DTO MODELLING METHODOLOGY

4.4.1 Introduction

The DTO was commissioned by RPS Consulting Engineers and DLRCC to develop a Local Area Model (LAM) to aid the assessment of the GDDR Scheme. The DTO provided detailed traffic analysis of route options for the proposed road in terms of link flows and road and junction performance.

4.4.2 SATURN Model

The 2004 Calibrated DTO Full Area Model (FAM) updated from the 2002 network of Dublin and environs was used as a basis for the assessment of the proposed scheme. This FAM was supplemented by a DTO "Validation Report", which demonstrated that the model developed will replicate observed existing traffic conditions and was therefore suitable for use as a traffic appraisal tool. The DTO concluded that it is appropriate for use as a traffic appraisal tool, to be used by RPS Consulting Engineers. The model software used for the development of the LAM is SATURN (Simulation Assignment of Traffic to Urban Road Networks). This LAM was cordoned from the DTO FAM to obtain a starting SATURN trip demand matrix and road network. The SATURN model has 6 basic functions:

- As a combined traffic simulation and assignment model for the analysis of road investment schemes.
- As a 'conventional' traffic assignment model
- As a simulation model of individual junctions
- As a network editor, data base and analysis system
- As a trip matrix demand model covering the basic elements of trip distribution, and modal split
- As a matrix manipulation package for the production of, for example, trip matrices.

4.4.2.1 Model Area

The local area model is bounded by the N11 Dublin – Wexford Road to the east, Enniskerry Road to the south, Dundrum and Glencullen to the west and Goatstown and Mount Merrion to the north. This area fully encompasses the Glenamuck Road and its environs, therefore enabling the traffic impact of the GDDR to be fully examined.

4.4.2.2 Model Characteristics

The LAM was developed for the AM peak hour (08:00-09:00). The LAM assumed two vehicle types, these were as follows:

- Light vehicles (includes all cars and vans)
- Heavy Goods Vehicles (HGV)

The LAM was developed in a number of stages for the Glenamuck Area

- Stage 1: Develop Calibrated Base Year LAM
- Stage 2: Develop Future Year FAMS
- Stage 3: Develop Future Year LAMS for testing

4.4.2.3 Tested Scenarios

RPS Consulting Engineers provided the DTO with details of the proposed local infrastructural improvements and scale of development by land use specifically for the Glenamuck Road Area for each test year scenario. Details of all other infrastructural schemes, including roads, LUAS, METRO and Quality Bus Corridors was input directly by the DTO in accordance with their policies and timeframes. Information regarding other significant traffic generators, for example, the Cherrywood development lands was input directly to the model by the DTO. There were six scenarios tested:

- 2007 Year of Opening AM Peak – ‘Do Minimum’ and ‘Do Something’
- 2016 Intermediate Year AM Peak – ‘Do Minimum’ and ‘Do Something’
- 2022 Design Year AM Peak – ‘Do Minimum’ and ‘Do Something’

The 2022 Design Year complies with paragraph 4.34 of TD37/93 of the DMRB, which states the need to assess a scheme 15 years beyond the Year of Opening. It includes all infrastructural and public transport improvement measures as identified in the DTO’s document “Platform for Change”. The 2016 Intermediate Year was chosen on the basis that the proposed METRO may not be in place by this time.

4.4.2.4 Development Traffic Generation

RPS Consulting Engineers provided the DTO with estimates of land use forecasts for each test year scenario for the Glenamuck Area. These estimated forecasts included the expected trip origins and destinations for each of the development zones identified as part of the Study. These zones and traffic forecast were estimated with the benefit of detailed discussions with officers of DLRCC’s Planning and Roads Department. Details such as housing densities and employee numbers for each development zone were discussed and agreed with DLRCC prior to the development of the DTO SATURN model. RPS Consulting Engineers requested that these assumptions be reviewed by the DTO in terms of strategic planning policies and adjusted accordingly.

4.4.2.5 Model Outputs

The DTO SATURN model provided the following outputs from the LAMs:

- Modal Split by car for each test year
- Internal Generated Traffic in the Study Area
- Assumptions on Highway and Public Transport Infrastructure in the Study Area
- Link flows and turning movements for each test year
- Heavy Goods Vehicle (HGV) flows for each test year
- Junction queues and delays for each test year

These outputs were used to estimate the Annual Average Daily Traffic (AADT) on the GDDR route option for each test year. Using these AADT flows a carriageway cross section could be estimated for the GDDR and subsequently a junction strategy could be formulated to accommodate these predicted traffic flows.

4.5 ROUTE OPTION APPRAISAL

RPS Consulting Engineers interpreted the DTO SATURN model outputs to estimate the AADT flow on the GDDR for each route option. Future traffic flows were estimated for the Year of Opening 2007 and the Design Years 2016 and 2022 for both the 'Do Nothing' and 'Do Something' scenarios. The estimation of AADT flows is based on the assumption that the AM peak hour flow from the SATURN model represents 8% of the AADT. This value compares favourably to assumptions in the 'Expansion Factors for Short Period Traffic Counts' the existing traffic counts results on the Glenamuck Road and the surrounding road network and the 'National Roads Needs Study' detailed below:

- Expansion factors for short period traffic counts 'urban commuter routes' quoted in RT201¹ also predicted the AM peak hour to represent between 6% and 9% of the daily traffic flows
- The existing 2004 traffic counts on the Glenamuck Road identify the AM peak as representing between 8.2% and 12.6 % of the AADT flow
- Table 4.3 of the 'National Roads Needs Study' assumes that the volumes of traffic in the 30th highest hour (AM peak) are 13% for inter-urban roads and 10% for commuter roads

RPS assumed due to the urban nature of the proposed GDDR that an AM peak which represents 8% of the AADT would provide a more robust and onerous approach for the design of the GDDR.

The characteristics of each route option were taken from a review and an interpretation of the DTO SATURN model outputs, proposed route alignments and the proposed development land uses.

¹ J. Devlin, 1978, 'Urban Commuter Routes', 'Expansion Factors for Short Period Traffic Counts', An Foras Forbartha Teoranta, The National Institute for Physical Planning and Construction Research, 1978.

² J. Devlin, 1978, 'Urban Commuter Routes', 'Expansion Factors for Short Period Traffic Counts', An Foras Forbartha Teoranta, The National Institute for Physical Planning and Construction Research, 1978.

4.5.1 Route Option 1

4.5.1.1 Maximum Hourly Flows

The DTO SATURN model outputs for the design year 2022 'Do Something' scenario were analysed and interpreted for the purpose of this Report.

The maximum one-way and two-way hourly flow flows on the GDDR were 2,500 and 3,000 vehicles respectively.

The maximum one-way and two-way hourly flow flows on either Link Roads A or B were 1,900 and 2,600 vehicles respectively.

4.5.1.2 Estimated AADT flows

The estimated AADT flows on the GDDR and Link Roads are 37,500 and 32,500 respectively. The Route Option 1 GDDR and link roads result in a diversion of a significant proportion of traffic away from Kiltarnan Village and the existing Glenamuck Road. These AADT flows were estimated directly from the DTO SATURN model AM peak flows above using a conversion factor detailed in Section 4.5.

This route option reduces the AADT flow in Kiltarnan Village. It should result in a decrease in AADT flows in the Village to an average of 3,750 from an existing average of 18,000. The existing Glenamuck Road north and south of link roads A and B have a maximum AM peak two-way hourly flow of 32 and 800 vehicles and an average AADT flow of 400 and 10,000 respectively.

Route Option 1 removes a two-way hourly flow of approximately 3,200 vehicles from the village and existing Glenamuck Road when compared to Route Option 2. This equates to the removal of an average AADT of 40,000 vehicles.

4.5.1.3 Junction Impact

This route option collects and disperses traffic from the Glenamuck area and the surrounding development lands through several junctions on the proposed road network. This dispersal of traffic reduces the operational impact on each junction.

4.5.1.4 Length of route and journey time

This route option is 1,477m in length providing a route 20m longer than the existing Glenamuck Road. This is measured from the roundabout junction south of the Carrickmines interchange to the junction with the Enniskerry Road. It is estimated therefore that the journey time should be the least of all route options due to the dispersal of traffic flows and alignment of the route.

4.5.1.5 GDDR alignment in terms of access to development lands

Route Option 1 provides a road alignment, which runs adjacent to the lands of major development and trip generation. It will provide a quality access option to these lands in terms of junction provision and is located close to major future development potential to the west of the existing Glenamuck Road. It will also provide for high quality linkages for development to the east of the Glenamuck Road.

4.5.2 Route Option 2

4.5.2.1 Maximum Hourly Flow

The DTO SATURN model outputs for the design year 2022 'Do Something' scenario were analysed and interpreted to estimate the traffic flows on the existing Glenamuck Road alignment. The maximum hourly flow one-way and two-way on the GDDR was estimated to be approximately 2,600 and 3,800 vehicles respectively.

4.5.2.2 Estimated AADT flows

The estimated AADT flow on the GDDR is 47,500 vehicles. This AADT flow is significant considering the existing Glenamuck Road which already has a considerable number of single residential access points off the road and an existing AADT of 6,750. An AADT of this magnitude of 47,500 vehicles would require a dual carriageway standard cross section. This AADT flow was estimated directly from the maximum hourly flow in one direction using a conversion factor detailed in Section 4.5 above.

This route option does not reduce the AADT or hourly flows in Kiltarnan Village or the existing Glenamuck Road. It will increase AADT flows in the Village to an average of 27,500 from an existing average of 18,000. It will increase AADT flows on the existing Glenamuck Road to approximately 45,000 from an existing average of 6,750.

4.5.2.3 Length of route and journey time

Using the alignment of the existing Glenamuck Road this route option would be 1,457m in length providing a route with the shortest length but increased journey times due to the low dispersal of traffic through a limited number of junctions and also the large number of residential access points which interfere with continuous traffic movement on the existing Glenamuck Road. The quality of journey on this road will be reduced due to the concentration of traffic on this road.

4.5.2.4 Junction Impact

This route option collects and disperses traffic from the development lands through the least number of junctions on the proposed road network and therefore this low dispersal of traffic will have a negative impact on each junction in terms of capacity and delays experienced. This will result in longer journey times through the network.

4.5.2.5 GDDR alignment in terms of access to development lands

Route Option 2 uses the alignment of the existing Glenamuck Road and provides a road which runs adjacent to the lands of major development and trip generation. However, access to these lands is restricted due to existing residential lands.

4.5.3 Route Option 3

4.5.3.1 Maximum Hourly Flow

The DTO SATURN model outputs for the design year 2022 'Do Something' scenario was analysed and interpreted to estimate the traffic flows that would occur on the Route Option 3 alignment. The maximum hourly flow one-way and two-way on this GDDR route was estimated to be approximately 1,500 and 2,000 vehicles respectively. This route option attracts approximately 50% of the traffic volumes in the area, the balance of which remains on the existing Glenamuck Road.

4.5.3.2 Estimated AADT flows

The estimated AADT flow on the GDDR is 25,000 vehicles. A similar AADT of 22,500 vehicles is estimated to remain on the existing Glenamuck Road for this route option. This route alignment does not divert traffic away from the existing Glenamuck Road due to the location of the development lands and the future traffic demand assignments.

This route option does not reduce the AADT flows in Kiltarnan Village or the existing Glenamuck Road. It will increase AADT flows in the village to an average of 23,750 from an existing average of 18,000. It will increase AADT flows on the existing Glenamuck Road to maximum of approximately 24,000 from an existing average of 6,750.

4.5.3.3 Length of route and journey time

This route option, which is approximately 1,964m in length, is up to 35% longer than either Route Options 1 or 2. A similar number of junctions are proposed for Route Options 1 and 3 and therefore the journey times for this route is also estimated to be up to 35% longer than for Route Option 1.

4.5.3.4 Junction Impact

This route option collects and disperses traffic from the Glenamuck area and the surrounding development lands through several junctions on the proposed road network. This dispersal of traffic lessens the impact on each junction in terms of operation.

4.5.3.5 GDDR alignment in terms of development lands

Route Option 3 provides a road alignment, which does not run adjacent to the lands of major development and trip generation. It will provide access to these lands but is located closer to lands with less development intensity to the east, rather than to the west of the existing Glenamuck Road.

4.5.4 Preferred Route Option

The proposed GDDR Route Option 1 is the preferred road scheme option in the Study Area, as it will reduce traffic in both Kilternan Village and on the existing Glenamuck Road whilst providing quality road infrastructure for the future development of lands in the study area. The "Dun Laoghaire Rathdown Development Plan, 2004 – 2010" has a number of objectives in the Study Area, one of which is a "Local Area Plan" for Kilternan. This plan will aim to reduce traffic in Kilternan Village and provide a local road network to cater for the future development in the area. The preferred Route Option 1 is consistent with these policies.

The additional links roads and junctions will enable an overall increase in the road network capacity thus providing for future development and traffic needs. On examining the Route Options it is clear that Route 1 is the most favourable as it will produce low maximum hourly flows and AADT flows, lowest journey times, the least impact on junction capacity and the most appropriate location of the route in terms of proximity to major development lands compared to Route Options 2 and 3.

4.6 CROSS SECTION REQUIREMENT

4.6.1 United Kingdom-Design Manual for Roads and Bridges (DMRB)

The Advice Note TA 79/99 'Traffic Capacity of Urban Roads' contained in the UK DMRB (Chapter 2 Part 3) details the process by which one can estimate both the capacity and cross section of an urban road. TD 20/85 is entirely superseded by this document. The urban roads in this document are defined as roads in built up areas which are two to six lane single carriageways with speed limits of 60kph or less and dual carriageway roads (including motorways) with speed limits of 100kph or less. All the design flows allow for traffic composition up to fifteen percent heavy commercial vehicles and no adjustments are made for lesser compositions. This Advice Note gives the maximum hourly vehicle capacity for various types of urban road. These capacities may be used as starting points in the design and assessment of new urban road links and are intended to help designers make a judgement as to which carriageway standard is likely to provide an acceptable level of service within an urban context when operating close to capacity. These capacities apply to links and take no account of the effects of junctions.

Unlike the data for rural roads, the urban road design flows are given in vehicles per hour rather than in terms of AADTs. RPS Consulting Engineers undertook an appraisal of the road features that distinguish particular road types (Table 1 Types of urban roads and the features that distinguish them)

to determine the most appropriate one for the GDDR and associated link roads. This was then used in conjunction with Table 2 (Capacities of Urban Roads – One-way hourly flows in each direction) and the AM peak flows from the SATURN model to determine the most appropriate cross sections. The GDDR and associated link roads were identified as ‘Urban All Purpose Road’ type 1 (UAP1) from Table 1 of TA 79/99. A UAP is an all purpose road within a built up area, either a single carriageway with a speed limit of 60kph or less or a dual carriageway with a speed limit of 100kph or less. For all-purpose roads the flow is affected primarily by the speed limit, the frequency of side roads, the degree of parking and loading, pedestrian crossings, bus stops and accesses as opposed to carriageway width on a motorway.

4.6.2 National Roads Authority - Design Manual for Roads and Bridges

The Design Manual for Roads and Bridges (DMRB) as published by the National Roads Authority (NRA) provides the design standards for the development and design of new roads. It determines the appropriate type of roadway to cater for the predicted AADT volumes. The recommended road cross-sections considered suitable for Irish conditions are summarised in **Table 4.1** (NRA DMRB TD9/03 Table 4 and TD27/00 Figure 6A). As outlined in Section 4.6.1, urban road design flows are given in vehicles per hour, unlike rural roads where AADT flows are commonly used. It was decided therefore that the appropriate sections detailed below would be modified to suit the urban road requirements as dictated by the UK DMRB.

Table 4.1 NRA DMRB Recommended Rural Road Cross-Sections

Road Type	Lane Width (m)	Hard Shoulders / Hard Strips (m)	Median Width (m)	Verge Width (m)	Total Width (m)
Reduced Two-Lane	2 x 3.5	2 x 0.5 (H. Strips)	-	2 x 2.5	13.0
Standard Two-Lane	2 x 3.75	2 x 3.0 (H. Shoulders)	-	2 x 3.0	19.5
Wide Two-Lane	2 x 5.0	2 x 2.5 (H. Shoulders)	-	2 x 3.0	21.0
Reduced Dual Carriageway	4 x 3.75	4 x 1.0 (H. Strips)	2.5	2 x 3.0	27.5
Standard Dual Carriageway	4 x 3.75	2 x 3.0 (H. Shoulders) 2 x 1.0 (H. Strips)	7.0	2 x 3.0	36.0
Dual Carriageway Motorway	4 x 3.75	2 x 3.0 (H. Shoulders) 2 x 1.0 (H. Strips)	7.0 / 14.0	2 x 3.0	43.0

4.6.3 Predicted Traffic Flows and AADT

The estimation of the 2022 Design Year AADT flows is based on the assumption that the AM peak hour flow from the SATURN model represents 8% of the AADT. This value compares favourably to assumptions in the ‘Expansion Factors for Short Period Traffic Counts’ and the ‘National Roads Needs Study’ in addition to the existing traffic counts on the Glenamuck Road and the surrounding road network.

4.6.3.1 GDDR - Route Option 1

The predicted demand flows on the GDDR Route Option 1 for the design year 2022 gives a maximum AM peak one-way and two-way flow of approximately 2,500 and 3,000 vehicles per hour respectively which equates to an average AADT flow of 37,500 over its’ entire length.

4.6.3.2 Link Roads – Route Option 1

The predicted demand flows on the Route Option 1, Link Roads A and B for the design year 2022 is a maximum AM peak one-way and two-way flow of approximately 1,900 and 2,600 vehicles per hour respectively which equates to an average AADT flow of 32,500.

4.6.3.3 Kilternan Village – Route Option 1

The predicted demand flows in Kilternan Village for Route Option 1 for the design year 2022 is a maximum AM peak two way hourly flow of approximately 300 vehicles and an average AADT flow of 3,750. The GDDR and link roads divert a significant proportion of traffic away from this village and also the section of existing Glenamuck Road adjacent to the Enniskerry Road. Route Option 1 removes a two-way hourly flow of approximately 3,200 vehicles from the village and existing Glenamuck Road when compared to Route Option 2. This equates to the removal of an average AADT of 40,000 vehicles.

4.6.3.4 Existing Glenamuck Road – Route Option 1

The predicted maximum demand flows on the section of existing Glenamuck Road north and south of the link roads A and B (upgraded section of the Glenamuck Road) has a maximum AM peak two-way hourly flow of 32 and 800 vehicles and an average AADT flow of 400 and 10,000 respectively for the design year 2022. The GDDR and link roads divert a significant proportion of traffic away from this road. Section 4.6.3.3 above also details the removal of traffic from the existing Glenamuck Road.

4.6.4 Required Cross-Section

The required cross section of the proposed GDDR and associated link roads was established using a combination of the above Table 5.1 from the NRA DMRB, UK DMRB TA 79/99 and the DTO document 'Traffic Management Guidelines'. The maximum one way hourly flow on the GDDR is estimated from the SATURN model to be 2,500 vehicles. A dual carriageway (7.3m wide) with two lanes in either direction is required on the basis of this flow. The maximum one-way hourly flow on the associated link roads is estimated to be 1,900 vehicles and a wide two-way single carriageway of 10.0m would be required to accommodate this flow.

The identified cross sections from the UK DMRB were then reviewed in detail so as to ensure conformance with the appropriate Irish Design Standards, that is, the National Roads Authority's Design Manual for Roads and Bridges and the DTO's documents "Traffic Management Guidelines" and "Provision of Cycle Facilities-National Manual for Urban Areas"

The required cross section for the GDDR is that of a Reduced Dual Carriageway the details of which are outlined above in **Table 4.1**, with the provision of 2.0m footpaths and 2.0m cyclepaths on either side of the road and a verge width of 2.0m.

The required cross section for the link roads is that of a Wide Two-Lane Carriageway as detailed above in **Table 4.1** with the provision of 1.0m nearside hardstrips, 2.0m footpaths and 2.0m cyclepaths on either side of the road and a verge width of 2.0m.

Wide nearside hard shoulders are only desirable on high speed high-volume roads, where emergencies or particularly slow moving vehicles would require the use of the hard shoulder. The proposed GDDR and link roads will have an appropriate urban speed limit, contain high-volumes of traffic and a number of junctions. The combination of these factors will, in general, reduce the operational speed of the road and therefore reduce the need for hard shoulders. The dualled nature of

the link will cater for emergency situations. In an urban situation it is common practice to provide 1.0m hard strips as an alternative to 2.5m or 3.0m hard shoulders.

In this scheme 2.0m footpaths and 2.0m cyclepaths will flank the new roads and may be separated from traffic by 3.0m raised verges (with kerbed edges). These raised verges are to be hard surfaced or grassed so as to be unattractive for walking or cycling and may be used to contain services. These verges may be reduced to 2.0m in width where hardstrips or pedestrian guardrails are to be provided.

The required cross sections and total effective carriageway width are shown below in **Table 4.2**.

Table 4.2 Urban Cross-Sections

Road	Road Type	Lane Width (m)	Hard Strips (m)	Minimum Median Width (m)	Footpath Width (m)	Cyclepath Width (m)	Verge Width (m)	Total Width (m)
GDDR	Reduced Dual Carriageway	4 x 3.75	4 x 1.0 (H. Strips)	2.5	2 x 2.0	2 x 2.0	2 x 2.0	33.5
Link Roads	Wide Two-Lane	2 x 5.0	2 x 1.0 (H. Strips)	-	2 x 2.0	2 x 2.0	2 x 2.0	24.0

4.7 JUNCTION STRATEGY

It was proposed that all junctions on the GDDR be either roundabout, priority tee or cross roads or signalised junctions. The final junction forms will be specified in the Preliminary Design Report. These junctions will be assessed using either ARCADY, PICADY or LINSIG, which are computer software packages used for the capacity analysis of roundabout, priority junctions or signalised junctions respectively. These programs are used to assess the capacity and junction layout suitable for the predicted SATURN model traffic volumes, which have been estimated for the Year of Opening 2007 and the Design Years 2016 and 2022.

4.8 CONCLUSIONS

The main findings for the traffic section of this Report can be summarised as follows:

- Route Option 1 is the preferred road scheme Option in the Study Area, as it will reduce traffic in both Kiltarnan Village and on the existing Glenamuck Road, whilst providing quality road infrastructure for the future development of lands. A number of additional links and junctions will provide for an increase in the overall road network capacity, thus providing for future traffic needs
- The maximum Route Option 1 'Do Something' AADT flow for the GDDR for the Design Year 2022 is approximately 37,500 vehicles/day
- The GDDR and Link Roads will remove a combined AADT of approximately 40,000 vehicles from both Kiltarnan Village and the sections of existing Glenamuck Road in the Design Year 2022
- A reduced dual carriageway road will provide the required cross section for the GDDR in the Design Year 2022. This reduced dual carriageway cross section will comprise four 3.75m wide

lanes, four 1.0m hardstrips with accompanying 2.0m wide footpaths, cycle lanes and verges on each side of the road

- A wide single carriageway road will provide required cross section for the additional link roads associated with the GDDR in the Design Year 2022. This carriageway cross section will comprise two 5.0m wide lanes, two 1.0m wide nearside hardstrips with accompanying 2.0m wide footpaths, cycle lanes and verges on each side of the road
- The GDDR will provide quality infrastructure for vehicular and non-vehicular modes of transport
- The proposed junctions on the GDDR will be designed to cater for peak hour traffic flows and also the movement of non-motorised traffic across the junctions.

5 ENVIRONMENTAL

5.1 INTRODUCTION

The Glenamuck road currently links the South Eastern Motorway from the Carrickmines Interchange to the R117, Enniskerry Road at the Golden Ball Junction. The environmental assessment examines three possible routes for the Glenamuck Distributor Road and two link routes.

The assessment forms part of a wider selection procedure and specifically examines the route options in terms of potential environmental and social impacts. It has been prepared in accordance with NRA guidelines for National Road Schemes. Specialist studies were carried out with respect to potential impacts if any of each route on the following environmental aspects:

- Socio-Economic/ Community
- Noise & Vibration
- Air Quality
- Landscape & Visual Impact
- Terrestrial Ecology
- Aquatic Environment
- Geology & Hydrogeology
- Material Assets (Agricultural and Non Agricultural)
- Archaeology & Cultural Heritage

The selected preferred route will be subject to an Environmental Impact Assessment (EIA) leading to the production of an Environmental Impact Report or Environmental Impact Statement (EIS).

5.2 SOCIO /ECONOMIC OR COMMUNITY

It is proposed to upgrade the Glenamuck Road corridor between the Carrickmines Interchange Southern Roundabout and the Enniskerry Road to comply with a roads objective of Dun Laoghaire-Rathdown's County Council's Development Plan 2004-2010. The road is expected to have increased traffic demand due to land zonings brought in with the current Development Plan and also with additional traffic arising from the completion of the South Eastern Motorway. It is now foreseen by the design team and having regard to the increase in traffic that a road of dual carriageway status will be required. In addition to providing a road of dual carriageway status, to be selected from 3 considered routes, it is also envisaged that pedestrian and cyclist paths will be provided, where required, along the chosen route. Link Roads, A & B will be provided in accordance with local planning objectives. Current pedestrian and cyclists access to the Glenamuck Road will be retained.

The proposed improvement or new route is intended to provide better access and improved efficiency to the road network of the area while also promoting development of recently zoned lands in a way which delivers the objectives of the development plan.

At this early stage of the route selection, a preliminary desk study of the routes (Route 1, 2 and 3) and field study (Sept 2005) was carried out, both with the aim of assisting the design team in advancing

the route selection. This study was concerned only with the community impacts which will be further developed at EIS/EIA stage.

The following sections summarises those community facilities and services within the study area and discusses the impact of each route on these facilities.

5.2.1 Services and Amenities in the Area:

Following a visit of the study area, the services and amenities listed below were noted in the field.

- Stepside Golf Course
- Carrickmines Golf Course
- Wayside Celtic FC. It should be noted that Wayside Celtic FC have recently applied for planning permission for the construction of 4 No. sports pitches in the area to the east of Glenamuck Road between Rockville Lodge and Glenamuck Cottages. Route Option 3 passes directly through this proposed development.
- Bective Rangers RFC
- De la Salle Palmerstown RFC
- Carrickmines Equestrian Centre
- Kiltarnan Country Market
- Palmers Public House
- Dingle Glen (NHA)
- Motors
- Statoil forecourt & shop
- Antique Fireplaces

Schools & Churches in the study area:

- Kiltarnan 2 National School (beside Church of Ireland)
- Kiltarnan 1 National School (Bishops Lane)
- Gaelscoil Thaobh na Coille (playschool beside Gaelscoil)
- Church of Ireland

5.2.2 Route 1

Route 1 is located north-west of the Existing Glenamuck Rd. It is located on lands proposed for development under two categories of the Dun Laoghaire Rathdown County Development Plan 2004 - 2010 , i.e. Objective A – To provide for and / or improve residential amenities and Objective E – To provide for economic development and employment. The choice of Route 1 will allow for these lands

to be opened up for development, i.e. to assist delivery of the objectives of the Development Plan for the area.

If this Route were chosen, it is envisaged that a cul de sac may be required at the Eastern end of the Glenamuck Road prior to the existing junction with the Carrickmines Interchange Southern Roundabout. This has the potential to negatively affect direct access from the South Eastern Motorway to the Glenamuck Road for a significant number of residents living in the area. However, pedestrian and cyclist access from the roundabout will be retained. A proposed link Road (link A or similar) will be provided to access the current Glenamuck Road from the new distributor route. While such re-routing may increase the journey length slightly, the introduction of the cul de sac will lead to a positive impact on the residents by way of reduced traffic and associated noise levels and other impacts associated with a road development.

5.2.3 Route 2

Route 2 is the proposed widening of the existing Glenamuck road to accommodate a dual carriageway. The existing alignment is rural in character offering a 5.5m carriageway, a single 1.5m footpath to the east and a verge of varying width. At the Eastern end where it meets the Carrickmines Interchange Southern Roundabout, it comprises of a 9m carriageway, 2 no. 2.0m wide cycleways, 2 no. 1.5m footpaths and 2 no. 1.5m verges.

The road traverses mainly through lands zoned under Objective A – To protect and / or improve residential amenity. The road frontage is characterised mainly by many single houses on relatively large sites.

The selection of Route 2 would involve significant loss of hedgerows along both sides of the road as well as a corresponding loss of front boundaries and gardens, etc. thus negatively impacting on the environment, existing rural character and privacy of residents. In addition, the increased traffic flows would result in negative impacts in terms of increased traffic flows and noise levels and associated nuisance and would undoubtedly negatively impact on the residents who wish to enter and leave their properties thus being in conflict with the mainstream of traffic travelling at higher speeds. The selection of this route would negatively affect the community/residents living in the area who currently enjoy a quiet road of rural character.

5.2.4 Route 3

Route 3 is located south-east of the Existing Glenamuck Rd. It traverses lands which are mainly zoned as Objective B (To protect and improve rural amenity and to provide for the development of agriculture) and Objective F (to preserve and provide open spaces and recreation amenities). To a limited extent it also traverses lands zoned under Objective A – To protect and / or improve residential amenity. In addition, Route 3 crosses Springfield Lane which feeds a number of houses and farms as well as the Carrickmines Equestrian Centre.

Wayside Celtic FC have recently applied for planning permission for the construction of 4 No. sports pitches in the area to the east of Glenamuck Road between Rockville Lodge and Glenamuck Cottages. Route Option 3 passes directly through this proposed development.

Route 3 does not allow for the same potential of opening up lands for development as does Route 1. It traverses significant community amenities as referred to above and has the potential to negatively affect these community services and amenities.

5.2.5 Summary

Having regard to the preliminary study carried out on the 3 routes and having considered the impacts, both positive and negative on the community, Route 1 has the least negative impact from a community perspective. Route 2 would have the greatest negative impact on community. It is considered that Link A is the preferred Link Route from a socio-economic point of view.

5.3 AIR QUALITY

5.3.1 Introduction

The proposed Scheme may have an impact on the associated traffic patterns and the resultant local air quality in the area regardless of the route chosen. The potential for vehicular emissions to cause health effects on sensitive receptors is dependent on the number and proximity of these receptors to the proposed route. This assessment identifies the number of receptors within a series of distances from the road and references these property counts against the potential for air pollution from the road at each distance.

The air quality and climate route option assessment has been undertaken using the Design Manual for Roads and Bridges (DMRB), Volume 11. This manual 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. The manual presents a series of figures that indicate the pollutant concentration with distance from the road for the main vehicular pollutants – carbon monoxide, oxides of nitrogen, hydrocarbons and particulates (PM₁₀).

The DMRB indicates that pollutant concentrations decrease with distance from the road in a non-linear fashion. Concentrations of pollutants from road vehicles decrease to approximately 20-30% of the concentration at the source road at 50 metres from the road. Furthermore concentrations of pollutants from road vehicles decrease to approximately 10% at 100 metres from the road. Levels are observed to decrease to background at 200 metres.

5.3.2 Sensitive Locations

The numbers of properties sensitive air quality within 300m of each of the proposed routes have been taken from the property count information for existing properties and with reference to Figs. 3.1 to 3.3. The results of this exercise up to distance of 100m from the route options are summarised in **Table 5.1**.

Table 5.1 No. of Residential Properties in the Vicinity of Routes 1, 2 and 3

North of Route	At risk of Demolition	Loss of frontage	0-25m	25-50m	Total no. Within 100m
Route 1	1	1	1	2	9
Enniskerry Road	-	1	-	1	5

Route 2	22	37	24	19	69
Enniskerry Road	-	10	7	-	20
Route 3	1	3	2	6	24
Enniskerry Road	3	9	4	-	16

5.3.3 Comparison of Route Options

The Route 1 option would significantly reduce the number of sensitive receptors within 50m of the road with only 3 receptors as opposed to 43 at Route 2 and 8 at Route 3. Similarly, the Route 1 option has a lower number of sensitive receptors within 100m of the road with only 9 receptors as opposed to 69 at Route 2 and 24 at Route 3. Beyond the 200m band, the road will have no significant impact to air quality. Based on these property distributions, Route 1 would be considerably more favourable than the other two as the least number of sensitive receptors would be affected by vehicular emissions. Route 3 would be more favourable than Route 2 as the number of receptors for Route 2 in the 100m band (69) is almost three times that for Route 3 (24).

5.3.4 Climate

The Design Manual for Roads and Bridges indicates that the two contributory factors that affect CO₂ (the main greenhouse gas) emissions from road vehicles are speed and distance. Cars travelling at lower speeds produce higher concentrations of CO₂ up to speeds of 60-80km/hr. However it is assumed that the recommended speed for all routes will be the same and there are no details available on potential congestion so this factor is not compared in detail. The aspect of distance of each route does vary with Routes 1 and 2 considerably shorter than Route 3. However, it should be noted that in terms of a route option assessment and direct effects on sensitive receptors, the issue of climate would not be as significant as that of air quality.

5.3.5 Summary

Based on the property counts and the potential impact of vehicular pollution on these properties, the preferred route from an air quality perspective would be Route 1.

5.4 NOISE AND VIBRATION

5.4.1 Introduction

There are two main components of noise due to traffic. The first is dominant when traffic is not free flowing and is generated by the engine, exhaust system and transmission. The second is due to the interaction of tyres with the road surface which is dominant at moderate to high speeds under free flow conditions.

This is an assessment of the relative noise impacts of the three route options. The primary aspect is the proximity of noise sensitive locations to each route and a review of potential noise impacts compared with the current situation. An environmental noise survey will be conducted on the preferred route at the EIS stage in order to quantify the existing noise environment in the vicinity of noise sensitive locations likely to be affected by the chosen route.

5.4.2 Sensitive Locations

The numbers of properties sensitive to noise and/or vibration within 300m of each of the proposed routes have been taken from the property count information for existing properties and with reference to Figs. 3.1 to 3.3. The results of this exercise up to a distance of 100m from the route options are summarised in **Table 5.1**.

5.4.3 Comparison of Route Options

Route 1 has the lowest number of noise sensitive receptors within 50m of the road centreline, compared to Route 2 and Route 3. This means there will be less receptors potentially impacted by noise levels in the vicinity of the proposed road. Route 1 also has the lowest number of sensitive receptors within 100m of the road compared to Route 2 and Route 3. Therefore Route 1 has the least impact in terms of Noise and vibration. Route 2 would have the greatest impact on properties due to noise levels and therefore is the least favoured route in relation to Noise.

5.4.4 Vibration

The Design Manual for Roads and Bridges states that, in the absence of environmental noise barriers, the disturbance caused by vibration is some 10% less than that due to noise. The potential impact due to vibration is therefore less than that due to noise and it is considered that no further assessment in relation to vibration is required at this stage of the project.

5.5 LANDSCAPE/VISUAL IMPACT

5.5.1 Existing Landscape Setting

5.5.1.1 Scale and Character

The proposed route options are located on an area of undulating agricultural land/urban fringe in the foothills of the Dublin Mountains. The area is on the south-eastern limits of development for Dublin City and the site topography is dominated by the rounded hills and mountains, which form the northern edge of the Wicklow Mountains. Mountains such as Glendoo (500m ASL) form the backdrop for Dublin City when viewed from the north and across Dublin Bay. The proposed route options are located much lower and have a gentle north-eastern aspect. The area is dominated by urban housing but remnants of the formerly more extensive agricultural lands remain particularly in the southern part of the study area.

During the site survey, fields were used for grazing horses and cattle/sheep. Existing site features of visual note include the well-developed hedgerows and the over head electricity power lines which cross the rounded low hills to the south of the study area. Mature trees of visual importance within the area are predominantly located within gardens and adjacent to the existing Glenamuck Road. Such blocks of woodland and visually significant trees create a pleasant setting for the area and assist in restricting views both into and out from the site. The study area therefore has an enclosed feeling.

The landscape character of the study area can be described by use of distinctive character types as follows:

- Intermediate Undulating agricultural lands

- Urban landscape

5.5.1.2 Intermediate Upland Agricultural Lands

This landscape character type is a typical feature of large parts of the southern fringe of County Dublin. Rounded low hilltops and ridges which open onto level plateau are a characteristic feature of this landscape. The landscape is generally enclosed with views out only available from prominent viewpoints or occasional breaks in the blocks of dense woodland. Tree cover can be sparse and limited to single or small groups of trees in hedgerows as a result of human activity and removal of hedgerows to provide larger field units. Strong hawthorn hedgerows define field boundaries. The dominant land use is pasture for beef cattle and sheep. Arable crops are infrequent/rare in the wider agricultural landscape. Housing is conspicuous and sporadic. New development has been juxtaposed with the agriculture landscape with the growth of Dublin City. This landscape character type has a low/moderate sensitivity to change.

5.5.1.3 Urban Landscape

Carrickmines and Kiltarnan are the nearest urban centres. Linear development has taken place along the Glenamuck Road, which joins Carrickmines and Kiltarnan. Lands within the study area have been zoned for housing development and housing construction is underway at several locations and therefore the visual context of the surrounding lands is currently in a state of significant change. The new extension to the M50 has recently been completed and is located to the eastern part of the study area. The majority of housing within the surrounding urban landscape consists of single and two storey residential properties. Few commercial or industrial buildings are found. The urban landscape character has a low sensitivity to change.

5.5.1.4 Historic Parks and Gardens

Country houses, some of which are listed buildings, set in landscaped parkland or within demesnes, are an important part of the landscape character of parts of the Irish Landscape. The impact of the various routes on structures of architectural significance are dealt with in Section 5.11.2.

5.5.1.5 Zone of Visual Influence (ZVI)

The ZVI for the proposed route options is limited throughout due to the local topography and location of wooded areas to the north and east that significantly interrupts views from the remainder of South Dublin. However, the ZVI for the options does indicate that extensive views in to the areas are available from northern parts of the city and across Dublin Bay. However, the sensitivity of the viewer is low and due to distance there will be no significant alteration in the visual resource if the proposed options are constructed. Further the preferred route option will become lost in the continually growing built fabric of Dublin.

5.5.2 Residential Impacts

A review of the residential properties throughout the study area has taken place. Properties are scattered throughout the study area but are more frequent along the Glenamuck Road and lower in frequency with distance both north and south away from this local road. When the route options are appraised in terms of their impact on residential properties it can be seen that Route 1 has significantly fewer properties with 300m of the centre line that either Route 2 and 3 and would be the preferred route option. Due to the large number of properties along the existing Glenamuck Road Route 2 has the largest number of properties located within 50m of the centre line and is the least preferred option.

In conclusion when visual impacts on residential properties are considered Route 1 is preferred, Route 3 would be the second ranked option and Route 2 would be the bottom ranked option.

5.5.3 Landscape Impacts

In terms of landscape the existing route (Route 2) has the least impact as it utilises an existing road corridor that is currently a component of the surrounding landscape and therefore will result in little change in landscape character. Route 1 is shorter than Route 3 and results in the loss of less landscape features. Route 1 is a better fit in the landscape. Route 3 is located on higher ground with the greatest landscape impact and loss of most landscape features.

5.6 TERRESTRIAL ECOLOGY

A field study of the ecology along these three routes was undertaken of which has been described below.

5.6.1 Route 1

Route 1 travels through a partially filled field with overgrown grass and bare ground before entering tillage and pasture fields. It runs parallel to a stream and is located very close to the channel. It also crosses a number of hedges. The stream is a tributary of the Loughlinstown River and has a 2m width. It carries a well-developed hedge along most of its length and there is associated seepage along the northern side.

5.6.2 Route 2

The existing Glenamuck Road is tree- and hedge-lined and its realignment would remove much of this cover, which in places looks suitable for bats. Some of the front gardens are well planted so there would be a significant loss of trees but this can be replaced in due course. No natural habitat features of note occur except for a marshy hollow in the upper part (where Link B would cross) but this is of limited interest.

This route would have temporary impacts on ecology but ones that could be restored by later landscaping and mitigation.

5.6.3 Route 3

This, the longest route, begins by running through playing fields at Kiltarnan before entering semi-permanent but improved grassland. It curves southward through tillage land and then drops down through a triangular field of wet grassland with a comparatively rich flora for the area. Running between two houses it ends in pasture, closely grazed by horses.

The route would have a significant impact by removing a local pocket of biodiversity. While, theoretically some of the wet grassland could be retained to each side, it is likely that improved drainage would devalue it.

5.6.4 Link A

From the south this route runs through a former fruit farm before going across the upper end of a small glacial overflow channel similar to the Dingle (which lies some distance to the east). The vegetation is grassland though it changes to scrub and woodland just to the SE. After this the route drops through several tillage fields, crosses the Glenamuck Road and runs roughly on the path of a laneway with a dry hedge to the south. There are no features of significant ecological interest on this route.

5.6.5 Link B

Starting out on the same line as A this runs nearer to Kiltarnan Village. It runs through a small woodland copse and tree belt immediately after the fruit farm which has beech and oak as well as a good selection of herbs. Crossing grassland fields it meets the Glenamuck Road at a small marshy hollow and then runs over two abandoned and rather damp fields with a full range of marsh and wet grassland species. It then meets a new area of broad-leaved forestry with ash and alder prominent and some fauna of interest. At this point it lies close to a house and pond which has nesting herons in one of its trees. This route would have impacts on two or three significant habitats which do not contain rare species but are nevertheless a source of local biodiversity.

5.6.6 Summary

Route 3 would have the greatest impact on ecology due to the impact on the wet grassland, which has a comparatively rich flora. Route 1 runs parallel to a stream and is located very close to the channel, with potential impacts on the stream. It also crosses a number of hedges. Route 2 is considered to have the least impact on ecology. Impacts would be temporary and could be restored by later landscaping. It is also considered that Link A would have a lesser impact on the ecology when compared with Link B.

5.7 AQUATIC ENVIRONMENT

The main watercourse in the area is the Glenamuck Stream located west of Glenamuck Road. It is a tributary of the Ballyogan Stream/Carrickmines Stream, which flows to the Shanganagh River and to the sea south of Ballybrack. There are also some other smaller ditches, drains and culverts throughout the study area. The largest of these being the golf stream (a tributary of the Glenamuck stream) which flows around the boundary of the Ballyogan landfill.

The Glenamuck Stream was found to be moderately polluted (Q3) in its lower and middle section and slightly polluted Q3-4 in its upper section. Water quality of the Golf Stream was found to be moderately to seriously polluted. Water quality will be further investigated at EIS/ EIA stage.

5.7.1 Route Options

The potential impacts of the three route options before and after mitigation are given in **Table 5.2**. Route 1 is predicted to have the greatest impact on the aquatic environment as the road has to be constructed in close proximity to the Glenamuck Stream for c. 1.3km. Also the stream will be crossed by the route at two locations.

For Route 2 the road will be constructed approximately 200 – 300m from the Glenamuck Stream along c. 1.5km of its length. This is the next preferred route after route 3 in terms of impacts on watercourses. The potential impact after mitigation is not significant.

Route 3 would have the least impact on the aquatic environment as no negative impact is predicted. Link Road options A and B both cross the Glenamuck Stream at one location and would have a potential minor impact.

Table 5.2 Summary of Potential Impact of Glenamuck Distributor Road Options on the Aquatic environment (using NRA guidelines)

	Potentially Affected Stream/River	Importance Classification	Nature of Impact	Potential Impact (in the absence of adequate mitigation)	Residual Impact (if all recommended mitigation measures are implemented)
Route 1	Glenamuck Stream (note 1)	C. High value, locally important	New road to be constructed in very close proximity to the stream for c. 2km. Stream to be crossed by the new road at two locations	Major	Moderate
Route 2	Glenamuck Stream (note 1)	C. High value, locally important	New road to be constructed 200 – 300m from stream along c. 2km of its length.	Minor	Not Significant
Route 3	None	None	None	None	None
Link A	Glenamuck Stream (note 1)	C. High value, locally important	Stream to be crossed at one location	Moderate	Minor
Link B	Glenamuck Stream (note 1)	C. High value, locally important	Stream to be crossed at one location.	Moderate	Minor

Note 1: The 2km of the Glenamuck Stream between the Enniskerry Road and the new culvert at the Carrickmines end of the Glenamuck road constitutes poor habitat for adult trout, fair habitat for juvenile trout in the upstream section, good habitat for juvenile trout in the downstream section, and fair habitat for trout spawning. The stream was found to be moderately polluted (Q3) in its lower and middle section and slightly polluted Q3-4 in its upper section. Juvenile trout were recorded at very low density at all three sites electrofished. The Glenamuck Stream is a tributary of the Shanganagh River system, which is known to have a population of seatrout

5.8 GEOLOGY & HYDROGEOLOGY

All three of the routes were visited during September 2005 and notes taken of the various geological/hydrological features. Mapping was also examined including aerial photography.

The study area lies on a moderate gradient trend running generally north-east from Three Rock Mountain (c.365m) and associated hillocks (c.160m at Glenamuck [Route 3]) to the lower ground of the Ballyogan Stream (c.65m). Generally all drainage in the vicinity of the three routes runs noticeably north-east from high ground at the Golden Ball, and parallel to the existing Glenamuck Road (Route 2), and towards the M50, coincident with the low ground and river valley, where it discharges to the Ballyogan Stream. The largest stream is the Glenamuck Stream, which mirrors Route 1 closely.

The subsoils underlying the Glenamuck Road Study Area are comprised of variable sediments and thickness of Quarternary aged Glacial Till (boulder clay) all underlain by granite bedrock. The granite is generally described as moderately weak to moderately strong, coarse to fine grained, slightly to severely weathered, with medium to extremely closely spaced slightly to severely weathered joints generally dipping at low to moderately high angles. Depth to bedrock varies across the study area 0.5m to >20.0m bgl.

The Granite is impermeable and considered to be an aquitard (unproductive in terms of well yield) by the GSI. Any groundwater in the area moves either in the upper weathered zone, more permeable beds of limited extent, fault or fracture zones. The hydrology of the area is dominated by a low storage rock type recharged by the higher rainfall of the Ticknock uplands, and hence a high density stream network.

5.8.1 Route 1

Ground conditions along Route 1 are coincident with moderate depths of clay as determined from Ballyogan Landfill records where clay deposits range in depth from 1.4m bgl to 7.2m. This route is the most northerly and travels between the existing Glenamuck Road and the Ballyogan Landfill Site and for the majority of its run mirrors the Glenamuck Stream. The route generally travels close to the stream and subsequently will impact the stream and the hydrology of the area significantly unless remedial culverting is designed.

5.8.2 Route 2

Route Option 2 is an upgrade of the existing Glenamuck Road. The landtake required for this option will affect a number of smaller interceptor ditches running alongside and parallel to the Glenamuck Road. It was noted on this site visit that some of these ditches contained a notable flow but the water was of poor quality. Also current road widening and development is having a significant impact on these watercourses, the amount of construction waste or sand/aggregate ramps for housing access is causing a short-term impact.

5.8.3 Route 3

The granite bedrock is marked by the high ground which lies immediately to the south of the proposed Link A/Route 3 junction. Much of the lands traversed to the north end of Route 3 are zoned for development and are coincident with low flatter ground with small interceptor ditches running into the Glenamuck Road. Mid-way and south bound Route 3 lies at the base of the hillock and in the substantial well draining farmlands. Cuttings into rockhead may be needed at this point.

5.8.4 Link A

This link runs parallel the Bective Rangers Rugby Club access road from Route Option 1 in the north to the Ballycorus Road to the south. Link A will have little or no impact.

5.8.5 Link B

This link is located closer to the R177 and starts in a wooded section. It then runs parallel to an existing boundary through a grass field and crosses the Glenamuck Road and will have little or no impact

5.8.6 Summary

Of the three route options, Route 1 will have the most impact on hydrogeology followed by Route 2 and finally Route 3. Significant culverting and design will be required at Route 1 to allow for flood design and ecological needs. Existing culverting/ roadworks at Route 2 are ongoing. Both Link A and Link B will have minimum impact. Option 3 and Link B are the preferred routes from a hydro-geological point of view.

5.9 MATERIAL ASSETS - AGRICULTURAL PROPERTIES

A field survey was carried out on all 3 routes and notes taken of the agricultural practices. Mapping was also examined including aerial photography.

There are a number of agricultural properties in the area. The enterprises associated with these properties are, tillage (cereals and vegetables) and grassland (drystock and horses). There was no evidence of any dairy farms been affected by any of the routes.

5.9.1 Route 1

This route is the most northerly and travels between the existing Glenamuck Road and the Ballyogan Landfill Site. Starting from the roundabout on the Glenamuck Road this route option first goes through development land. Route 1 then crosses a field diagonally. This field and the next on Route 1 were both cut for silage or hay and are of good quality. Route 1 then crosses a rough field at the back of a farmyard and proceeds across the access lane to Bective Rangers Rugby Club south of a small stream and moves into fields with spring barley. The next three fields affected by Route 1 all have spring barley. After the spring barley fields Route 1 moves onto lands with grass that appears not to have been maintained or grazed for some time. There was some post and rail fencing in these fields suggesting that they may have been used to graze horses, although no horses were seen in the fields on the day they were surveyed.

The landownership maps indicate that a number of properties will be severed if this option is chosen, however the route generally travels close to existing field boundaries and subsequently will not alter the shape of fields significantly (except for first hay/silage field). If access/accommodation roads are provided the impact on agriculture in the area will be greatly reduced. None of the farms appeared to be farmed intensively.

It is noteworthy that all of the lands traversed by Route 1 are currently zoned for development.

5.9.2 Route 2

Route 2 is an upgrade of the existing Glenamuck Road. The landtake required for this option will have little or no effect on agriculture in the area and as long as access is maintained/provided to agricultural lands the impact will be insignificant.

5.9.3 Route 3

This route traverses lands to the south east of the existing Glenamuck Road. Starting at the roundabout to the northeast of the Glenamuck Road the first field crossed is in grass and is grazed by cattle. Route 3 then crosses a number of fields that appear to be under development. It crosses the access road to Carrickmines Equestrian Centre and proceeds between two houses and through a small paddock at the back (south) of these houses. The route then crosses behind Glenamuck Cottages and traverses two fields that are in set-aside and on into grass fields that were grazed by drystock animals on the day of the survey. The land ownership map indicates that these lands, including the set-side fields all belong to the same owner and extend to the Wayside Celtic Sports Grounds on the R177 road.

Much of the lands traversed are zoned for development and some are currently under construction and therefore are not considered from an agricultural perspective. There is however, one substantial farm that is crossed and will be considerably impacted by this option.

5.9.4 Link A

This link runs parallel the Bective Rangers Rugby Club access road from Route 1 in the north to the Ballycorus Road to the south. Link A will have little or no impact on agriculture from Route 1 to the where it crosses the Glenamuck Road but will have a significant impact on the fields from the Glenamuck Road to the Ballycorus Road.

5.9.5 Link B

This link is located closer to the R177 and starts in a wooded section. It then runs parallel to an existing boundary through a grass field and crosses the Glenamuck Road. This link will also have a significant impact on the lands between the Glenamuck Road and the Ballycorus Road however the shapes of the fields after the severance are more regular and therefore will have less affect on the ability to farm these lands.

5.9.6 Summary & Conclusion

Of the three route options, Route 2 will have the least impact on agriculture followed by Route 1 and finally Route 3, which will have the most impact on agriculture in the area. Both Link A and Link B will significantly impact the one farm situated between the Glenamuck Road and the Ballycorus Road however Link B severs fields in the most regular way and subsequently has a lesser impact than Link A. Route 2 and Link B are the preferred routes from an agricultural impact point of view.

5.10 MATERIAL ASSETS - NON AGRICULTURAL PROPERTIES

This section determines and compares the physical impact of each of the proposed routes on properties and land, referred to as *Material Assets*. The guideline document DMRB UK *Environmental Assessment Techniques on Land Use* from Volume 11 Section 3 Part 6 was followed during the assessment of the three routes.

An initial desktop survey of Constraints Study information, aerial photography, granted planning applications and OS mapping was undertaken to determine the number of properties and lands potentially impacted by the proposed three routes. The various material assets were listed and classified into the following different land uses residential, commercial, and community within 25, 50 and 100 metres of each route. The number of properties (non-agricultural) located within 100m of Routes 1, 2 and 3 have been summarised in **Table 5.1**. The routes were then walked during September 2005 and a number of recently constructed properties not on OS mapping were identified within the study area.

The Glenamuck Road is at present an urban fringe environment with largely residential properties and a small number of farming enterprises. The future zoning for this locality as documented in the Dun Laoghaire Rathdown County Development Plan and the Draft Glenamuck Local Area Plan shows that the existing nature of the lands is likely to change to a more urban setting.

5.10.1 Route 1 (North of Existing Glenamuck Road)

Route 1 is located to the north of the existing Glenamuck Road. There are no residential properties within 100m of the northern side of this route. The southern side of this route however has approximately 14 properties within 100m of which 5 are adjacent to the proposed realignment of the Enniskerry Road. Of the nine properties adjacent to Route 1, one would experience loss of frontage while another property could be at risk to demolition. At the western end of the route, at the Enniskerry Road, there is approximately 5 dwellings within 100m. One of these properties could have portions of land acquired and/or access revised.

Route 1 would also affect the access of Bective Rangers football pitch. This access would need to be maintained in order to ensure the viability of this community facility.

5.10.2 Route 2 (Existing Glenamuck Road)

Route 2 follows the existing Glenamuck Road where the design would widen the existing road. This approach would affect the greatest number of properties. There are approximately 89 dwellings located within 100m of this route. Approximately 22 properties would be at risk to demolition, while 47 properties could experience loss of frontage with the development of this route. Furthermore approximately 38 properties would require access onto the proposed route .

Similarly as with Route 1 the access to Bective Rangers and in addition the access to Wayside Celtic pitch and the Heritage Centre would be impacted and efforts should be made to ensure that access is maintained.

5.10.3 Route 3 (South of Existing Glenamuck Road)

Route 3 is to the south of the existing Glenamuck Road. There are approximately 40 properties within 100m of this route. The lands to the south of this route are largely agricultural however there is access

to an equestrian centre that could be affected. There are approximately 4 properties at risk to demolition and 12 that could experience loss of frontage.

5.10.4 Link Roads

There are no buildings that would require demolition or loss of frontage along the route of Link A. There is approximately one residential property within 100m on both sides of this link. There are also farming dwellings within this 100m band however these have been considered in the agricultural assessment discussed earlier in this report.

The land surrounding Link B, as with Link A, is predominately agricultural and as such much of the land impact is agricultural. No buildings would require demolition or loss of frontage as only approximately 3 houses are located within 50 -100m of this Link.

5.10.5 Summary

Route 2 is considered to be the least preferred option with the greatest number of properties at risk to demolition and loss of frontage. Routes 1 and 3 affect a considerably lower number of properties. Route 1 is considered to be the most attractive option as it would only require in each case one property for demolition and loss of frontage. There is little if any difference in preference for Links A and B as in both cases no property or its associated land would physically impacted.

5.11 ARCHAEOLOGY & ARCHITECTURAL HERITAGE

5.11.1 Archaeology

The routes considered for the Glenamuck District Distributor Road run through the townlands of Carrickmines Great, Glenamuck North and Glenamuck South, in the Barony of Rathdown in the parish of Tully. They lie at the heart of an area that has been inhabited for at least six thousand years. Recent excavations in Kilgobbin, Stepside, Jamestown and Carrickmines have recorded previously unknown prehistoric sites and complexes in the surrounding landscape. This evidence suggests that there is a high potential that prehistoric activity may have once occurred within the route selection study area. In addition, the proximity of the development area to the large medieval settlement of Carrickmines (DU026:005, now a National Monument) and its associated sites (sections of pale ditch and watermill) suggests that the route selection study area is also located within a landscape of medieval and later archaeological potential.

Each of the routes under consideration are examined separately below, followed by a list of the known monuments that occur within approximately 300m. The route options are reviewed from the southwest to the northeast.

5.11.1.1 Route 1

Route 1 runs through an undulating landscape that is characterised by the valley of Carrickmines Stream. At the north-western/ Carrickmines end of the routes, looking towards the west there are excellent panoramic views of Two and Three Rock Mountains, on the lower slopes of which there is evidence of megalithic tombs. The archaeological potential of this landscape can be demonstrated by the number of recorded archaeological sites in the general area, specifically those associated with the

medieval settlement of Carrickmines (DU026:005, a National Monument) and by the number of subsurface prehistoric archaeological discoveries made in advance of development in the general area. The sloping river valley location is also a prime location for Bronze Age or later sites that are often focused around rivers/streams.

At locations along a proposed watermain and gravity sewer, which lies in close proximity to the proposed route options along the Carrickmines Stream, six engineering test pits were opened under the supervision (Licence ref: 99M0043) of an archaeologist, no features of an archaeological nature were identified in the pits excavated. However ongoing archaeological investigations in Park Developments Land (Licence ref: 04E0773) at the eastern end of the route has identified several small sites of archaeological origin. These sites were very truncated due to past farming practices, it is considered likely that these features are prehistoric in date. Nothing indicated that these features were associated with the medieval settlement at Carrickmines, possibly demonstrating that medieval settlement did not extend this far southwest of the castle.

Route 1 runs along the line of the Carrickmines Stream, taking the stream with it. The route also crosses the townland boundary of Glenamuck North and Carrickmines Great. The north-eastern end of the route is c.200m from Carrickmines Castle (DU026:005) from, it also lies c.450m south of a section of the Pale Boundary (DU026:115) in Jamestown. The south-western end of the route lies c.400m south of a Bronze Age flat cemetery (DU026:015) that also in Jamestown.

Table 5.3:Route 1 – Proximity to Recorded Monuments

RMP sites within 100m	RMP sites within 200m	RMP sites within 300m	Archaeological Potential
0	c.200m: DU026:005 Carrickmines Settlement (A National Monument)	0	High: Sloping river valley location Greenfield subsurface archaeological potential

5.11.1.2 Route 2

Route-2 runs along the line of the existing Glenamuck Road. Cartographic sources has indicated in the years between Rocque's 1760 map and Taylor's 1816 map the Glanamuck (Glenamuck) Road was first laid out and marked on the later map as a New Road. An earlier road shown on Rocque's 1760 map at a distance further south connected Kiltarnan to Carrickmines. No recorded archaeological sites are located along the path of this road. The route runs c.300m west of the present location of a cross base (DU026:018) in Carrickmines Great.

From an archaeological perspective this established road is considered to be the most preferable route option.

Table 5.4: Route 2 – Proximity to Recorded Monument

RMP sites within 100m	RMP sites within 200m	RMP sites within 300m	Archaeological Potential
0	0	c. 300m: DU026:018, A cross base	Low

5.11.1.3 Route 3

Route-3 commences at the southern end of Kiltarnan Road it runs sinuously through Glenamuck South in greenfields located on the lower slopes of Carrickmines Hill. Earthworks identified on aerial photographs indicate a potential earlier field system in the field immediately to the east of Rockville

House. Features that may indicate the origin of these earthworks are not represented on the first and subsequent editions of the Ordnance Survey maps 1837–43.

The route crosses the townland boundary between Glenamuck South and Carrickmines Great which is formed by what appears to be a ditched watercourse. Further south this topographical feature is known as Dingle Glen. The route then curves in a northerly direction and runs immediately adjacent to the zone of archaeological potential of a cross base (DU026:018), which is probably Early Christian or early medieval in date. The cross base is now located within the garden of a nearby farm. It is said that a cross at this location may have marked a route or a boundary between Tully to the east and Jamestown to the west (Corlett, 1999). There was a tradition that the cross was buried somewhere in the vicinity.

Through modern cartographic sources, remnants of former roads that lead to the settlement at Carrickmines are evident in modern map sources in the vicinity of Springfield Lane, immediately to the east of the route option. These roads can be traced on Rocque's 1760 map, they appear to run from the medieval settlements of Kiltarnan to the southwest and James's Land (Jamestown) to the west. The roads are likely to be medieval in origin and may indicate that the cross base (RMP DU026:018) mentioned above may indeed have once marked a route between the two settlements perhaps to the settlements to the east such as that of Tully and Shankill. A plot of land indicated on Rocque's map, with at least two buildings and garden to the rear, appears to be the same plot of land as that which occupies the present farm complex immediately east the route in Carrickmines Great. The trackway beside the house is known as the 'Old Packhorse Road' (RMP Files J.R.S.A.I. 39, 1959, 207). A further section of the Pale Boundary (DU026:122) lies in a golf course c550m to the east of the route, it is considered possible that this boundary may have connected to Carrickmines Castle.

The route continues through land belonging to Abbeyrock Developments Ltd, this area was archaeologically tested in advance of development (Licence No. 04E0111). No artefacts or stratigraphy of an archaeological nature were identified within this area. Archaeological monitoring during construction will be carried out at this site during construction. The route then joins the recently constructed roundabout in Carrickmines Great.

DU026:020, the remains of Kiltarnan Church, is located c.480m west of the western end of the route. As with the other routes this route runs c.400m southeast of the Medieval Settlement of Carrickmines (DU026:005).

Table 5.5: Route 3 – Proximity to Recorded Monument

RMP sites within 100m	RMP sites within 200m	RMP sites within 300m	Archaeological Potential
The route runs immediately adjacent to the zone of archaeological potential of DU026:018, a cross base.	0	0	High: <ul style="list-style-type: none"> Possible earlier field system adjacent to Rockville House The route crosses a possible former track/road to Carrickmines Greenfield subsurface archaeological potential

5.11.1.4 Link Roads, A and B

Link-A

There are no recorded archaeological sites along the path of Link A. The northern section of Link A, at Route 1 is located c.500m southeast of the flat cemetery at Jamestown (DU026:015). The route crosses the Glenamuck Stream which is considered to be of archaeological potential. The route crosses the existing Glenamuck road, which forms the townland boundary between Glenamuck North and Glenamuck South. The southern end of the route terminates on the R116, in the field immediately south of this road is an site comprising of several cropmarks forming enclosures (RMP DU026:021), there is a potential that these sites may have extended further north.

Table 5.6: Link A – Proximity to Recorded Monument

RMP sites within 100m	RMP sites within 200m	RMP sites within 300m	Archaeological Potential
Immediately north of DU026:021, cropmark enclosure sites	0	0	High: <ul style="list-style-type: none"> • Sloping river valley location • Greenfield subsurface archaeological potential

Link-B

There are no recorded archaeological sites along the path of Link B. The northern section of Link B, at Route-1 is located c.300m south of the flat cemetery at Jamestown (DU026:015). This route also crosses the Glenamuck Stream and the Glenamuck Road. The southern end of the route also terminates on the R116 immediately north of enclosure sites RMP DU026:021. As with Route 3, Link B route option runs through the field immediately east of Rockville House, aerial photographs indicate a potential earlier field system in the field. There are no features present in this field on the first and subsequent editions of the Ordnance Survey maps 1837–43.

Table 5.7: Link B – Proximity to Recorded Monument

RMP sites within 100m	RMP sites within 200m	RMP sites within 300m	Archaeological Potential
Immediately north of DU026:021, cropmark enclosure sites	0	300m: DU026:015, Flat cemetery	High: <ul style="list-style-type: none"> • Sloping river valley location • Possible earlier field system adjacent to Rockville House • Greenfield archaeological potential

5.11.2 Architectural Heritage

Glenamuck, which means ‘the glen of the pigs’ is an area which runs from Carrickmines to Golden Ball. Glenamuck Road was up to recent times bounded by agricultural land, but has become increasingly developed with residences. Kilternan, Cil Tiernán, meaning the church of Tiernán, takes its name from the ancient church which now lies ruined in a small and picturesque graveyard. The Kilternan area covers part of what could be called the ‘foothills’ of the Dublin mountains and stretches south towards The Scalp, and west towards Kilgobbin and Sandyford. The residential district of Carrickmines is relatively recent in origin, with most of it constructed between 1860 and 1920. It was only after completion of the Harcourt Street railway in the 1850s that proposals for the development of Carrickmines and Foxrock got under way.

Each of the routes proposed are examined below, followed by a list of the protected structures that occur within approximately 300m of the individual sections.

5.11.2.1 Route 1

Route 1 largely travels through agricultural fields. Two protected structures are located at the south-western end of this route. The Church of Ireland Parish Church of Kilternan was erected in 1826 in the ‘late-English Gothic style’. Designed by Richard Semple, it is constructed entirely of granite. The schoolhouse, which stands nearby, appears to be contemporary with the church. The church, school, Sexton’s lodge, boundary walls and gate are listed in the record of protected structures for Dun Laoghaire-Rathdown. The entrance gates of the property are located approximately 20m from the proposed junction and realigned section of the Enniskerry Road. The second protected structure within the vicinity of the proposed route is Shaldon Grange. The property, originally named Glenamuck House, dates to at least the early-mid nineteenth century, as it is marked on the first edition Ordnance Survey map of 1837-43. A gate lodge is indicated at the former entrance to the property to the northwest of the house. The current entrance to the property is located off the Enniskerry Road and is of modern construction. The proposed Route 1 travels approximately 50m from the house. The realignment of the Enniskerry road at its junction with the route will impact on the boundary of Shaldon Grange.

Table 5.8: Route 1 Proximity to Protected Structure

Protected Structures within 100m	Protected Structures within 200m	Protected Structures within 300m
Church of Ireland Parish Church, Kilternan (Church, school, Sexton’s lodge, boundary walls and gate)	0	0
Shaldon Grange (House)		

5.11.2.2 Route 2

Route 2 runs along the line of the existing Glenamuck Road. Cartographic sources have indicated that between the years between Rocque’s 1760 map and Taylor’s 1816 map the Glenamuck (Glenamuck) Road was laid out and marked on the later map as a New Road. The road is flanked on both sides by a number of large properties but only one of these, Rockville House, is listed as a protected structure. The property appears on Rocque’s map. It is a medium-sized, Georgian house of eighteenth century date, five bays wide and two-storeys-over-basement with a pedimented front elevation. A walled garden and gate lodge also form part of the property. The gate lodge, which is listed the record of protected structures, lies within the carriageway of the proposed route. The entrance piers at Kilternan

Abbey are also listed in the Record of Protected Structures. Kiltarnan Abbey which has been in ruins for many years is currently the site of the local authority water works. The property is marked on the first edition Ordnance Survey map of 1837-43 and was a Georgian house of probable eighteenth century date. The gate piers were, until about 18 years ago, surmounted by huge stone balls, which may have given the name Golden Balls to the area. The piers are located within 0-25m of the proposed length of realigned road at the junction with the Enniskerry Road. From an architectural heritage perspective the established Glenamuck road with its numerous flanking properties and mature tree boundaries is considered to be the least preferable route option.

Table 5.9: Route 2 Proximity to Protected Structure

Protected Structures within 100m	Protected Structures within 200m	Protected Structures within 300m
Rockville (House and gate lodge)	0	0
Kiltarnan Abbey (Gate piers)		

5.11.2.3 Route-3

Route 3 commences at the southern end of Kiltarnan Road it runs sinuously through Glenamuck South in greenfields located on the lower slopes of Carrickmines Hill. The route runs approximately 140m south of Rockville House, through fields associated with the property. These fields are shown as part of the estate of Rockville on the first and revised editions Ordnance Survey maps and while not part of the immediate setting of the house are likely to be considered part of the curtilage of the protected structure. The Church of Our Lady of the Wayside is another protected structure located in the vicinity of Route 3. It is a unique, wooden Roan Catholic church with horizontally laid, painted timber boards and a plain panelled interior. The property is bounded from the roadside by a curving pebble-dashed wall approximately 1m in height with a pair of decorative wrought-iron gates flanked by piers. This boundary wall, which is considered part of the curtilage of the property, lies within the carriageway for the proposed realignment of the road alongside. A former cotton factory, *An Muilleán*, is a protected structure situated off the west side of the Enniskerry Road, approximately 180m south of the proposed realignment of the Enniskerry Road. The cotton factory was founded by the Mosse family during the nineteenth century and once provided considerable employment in the area. A terrace of late-nineteenth century cottages further south on the Enniskerry Road, known as Moss's Cottages, were erected for the mill workers. Nos. 1-3 are protected structures. Immediately to the north of the cottages the Kiltarnan stream, which powered the cotton mill, passes under Kiltarnan Bridge which was constructed in 1852. Part of a mill pond and a broad mill race still survive. There was also a paper mill here which has since vanished.

The realignment of the Enniskerry Road at its junction with Route 3 will impact on the front boundary of the Church of Our Lady of the Wayside.

Table 5.10: Route 3 Proximity to Protected Structure

Protected Structures within 100m	Protected Structures within 200m	Protected Structures within 300m
Church of Our lady of the Wayside (Roman Catholic Church)	Rockville (House and gate lodge)	0

5.11.2.4 Link Roads

Link-A

No protected structures are in the vicinity of Link A. The proposed link road does however traverse the extreme eastern side of the land associated with Rockville House, a protected structure. These fields are shown as part of the estate of Rockville on the first and revised editions Ordnance Survey maps and while not part of the immediate setting of the house are likely to be considered part of the curtilage of the protected structure. Nos. 1-3 Moss Cottages, mentioned above, are located approximately 230m to the south.

Table 5.11: Link A Proximity to Protected Structure

Protected Structures within 100m	Protected Structures within 200m	Protected Structures within 300m
0	0	Rockville (House and gate lodge) 1-3 Moss Cottages (Houses)

Link B

Shaldon Grange, a protected structure, is located approximately 100m from Link B. The proposed link road travels to the east of the house through fields that appear to be associated with the house and as such are likely to be considered part of the curtilage of the property. The link road also travels through the outer lands of Rockville House approximately 80m from outbuildings associated with property. Nos. 1-3 Moss Cottages, mentioned above, are located approximately 230m to the south.

Table 5.12: Link B Proximity to Protected Structure

Protected Structures within 100m	Protected Structures within 200m	Protected Structures within 300m
Rockville (House and gate lodge) Shaldon Grange (House)	0	1-3 Moss Cottages (Houses)

5.11.3 Summary

5.11.3.1 Archaeology

The route selection study area lies in the heart of an area that has been inhabited for at least six thousand years. None of the routes will directly impact on a recorded archaeological site (RMP sites). The excavations ongoing at in Kilgobbin, Stepside, Jamestown and Carrickmines have revealed the enormous archaeological potential of this landscape, it has produced occupational and ritual evidence which dates from prehistoric times through to the present a great deal of which lay undiscovered until now. This evidence suggests that there is a significant potential that prehistoric activity may be uncovered in the undeveloped greenfield areas through which all of the routes pass. The sloping river valley setting of Carrickmines Stream is also a prime location for Bronze Age or later sites that are often focused around rivers/streams.

In terms of preference, Route 2 is considered to be the most attractive route with the least impact on archaeology. Route 3, however, is the least preferred route due to its proximity to the Cross Base. Link A and Link B are both ranked equally with the same level of impact on archaeology.

Given the nature of the landscape all the routes, with the exception of Route 2, therefore carry with them a likelihood of disturbing subsurface archaeological features. It is considered likely that the National Monuments Section of the Department of the Environment and Local Government may require centreline testing along the length of the proposed route in order to identify, prior to construction, any previously unknown archaeological sites and to resolve, where possible, all archaeological and cultural heritage issues prior to construction.

5.11.3.2 Architectural Heritage

The most preferable route is considered to be Route 1, which would have the least impact in comparison to the other two routes. This is followed by Route 3 and Route 2. Route 2 is the least preferred as this route has several established boundaries including that of Rockville House. The most preferable link is considered to be Link A as there are no protected structures within 200m.

It should be noted that at the preferred route stage a comprehensive inspection of the route will facilitate a more detailed assessment of the curtilages of any relevant protected structures.

6 COST OF THE SCHEME

6.1 INTRODUCTION

Predictions of the cost of a scheme is difficult due to the large variations in the cost of construction over recent times due to variance in land cost, material & labour cost and other factors influencing the construction costs of the scheme. Accurate estimation at this stage is further hampered by the fact that design of the routes is at a very early preliminary stage and as a consequence, some elements of the construction details are not yet fully developed and may be subject to change as the scheme is considered in greater detail.

The cost of a major road scheme consists of two major elements:

- Cost of Construction
- Cost of Purchasing Land

6.2 CONSTRUCTION ELEMENTS

The cost of construction can be broken down as follows:

- Preliminaries
- Site Clearance
- Fencing and Safety Fencing
- Earthworks
- Drainage
- Pavements
- Kerbs and other ancillary works
- Signs and Lighting
- Accommodation Works
- Works for Statutory Undertakers
- Structures
- Additional Items (Dayworks, Landscaping etc)

Table 6.1 displays the estimated construction costs for each of the three route options.

The construction costs have been estimated from a compilation of average historical figures and linked to 2005 prices compiled by the NRA for a 'reduced dual carriageway' for similar schemes in rural locations.

The length of Link Roads for each route option does not vary significantly and therefore is not a significant determining factor as regards the selection of a preferred route based on cost estimates. Thus, the cost estimates are prepared for each of the routes without considering the cost of the link roads.

Cost Estimates of Mainline	Route 1	Route 2	Route 3
Preliminaries (@15%)	669,165	712,950	932,200
<u>Roadworks General</u>			
Site Clearance (estimated)	37,000	36,500	49,700
Fencing	245,000	123,800	329,000
Work for Statutory Undertakers (estimated)	78,600	247,600	105,400
Accommodation Works (estimated)	78,600	1,008,600	105,400
<u>Earthworks</u>			
Earthworks Average Historical	1,532,000	1,057,910	2,053,300
Landscaping	158,000	156,500	212,500
<u>Structures</u>			
Culverts	297,000	115,000	165,000
Under and Over Bridges	-	-	468,000
<u>Main Carriageway</u>			
Drainage	502,400	495,600	673,200
Pavements	1,267,000	1,250,000	1,698,000
Kerbs	38,500	38,000	51,700
Signs & Lighting	227,000	223,500	303,600
Contingencies (@5%)	223,055	237,650	310,750
Sub-Total	5,353,320	5,703,610	7,457,750
VAT @ 13.5%	722,698	769,987	1,006,796
Total Estimate	€ 6,076,018	€ 6,473,597	€ 8,464,546

Table 6.1 Construction Costs

6.3 COST OF PURCHASING LAND

It is difficult to generalise about the cost of land, as it will vary depending on its location and its current and potential future use. The provision of a new route near the environs of a community, as in this situation, can have the effect of altering the existing land potential i.e. agricultural to development. In this case, one of the primary objectives of the new route is to complement the future development plan within the study area.

Historical records of land acquisition costs in the Glenamuck/ Carrickmines area would indicate that land zoned for residential development was achieving up to a max € 880,000 per acre in 2002.

An internet search¹ of 2005 property prices and land acquisitions on the open market within the study area of the Glenamuck Road shows that there has been very high inflation in the cost of development land in this area. This rise in development land value can be attributed to many factors, which may include the revision of the development plan for the area, the opening of the South Eastern Motorway, higher population densities and a higher demand for housing in the locality. Following this review of 2005 open market valuations, the cost of land in the Glenamuck area would be as follows: Agricultural land with hope value in Carrickmines, for example, is achieving between €700,000 and €1 million per acre, with land zoned residential currently achieving between €2 million to €2.5 million per acre. Sites with planning permission are achieving €170,000 per unit site. Lands zoned for residential areas with planning permission in the Carrickmines area have recently achieved values up to €3 million per acre.

The following general descriptions outline the main elements involved in the costing of the purchase of land for three route options

- Route 1 passes directly through existing agricultural land, which has been designated for both economic and residential development. Route 1 passes through 1 area of residentially zoned land for which planning permission has already been granted along a short length of the route.
- Route 2 follows the line of the existing Glenamuck Road and requires the least area of land take of the three options. However, as this route has a severe impact on existing residential dwellings and frontages along the Glenamuck Road the cost of compensating existing residents can be expected to be substantial given the high property values in this area. It is possible that up to 69% of the landtake costs for this route will be incurred to compensate existing residents whose dwellings are likely to be demolished or severely impacted upon due to the proximity of Route 2.
- As Route 3 is significantly longer than the other route options, the cost of land acquisition for Route 3 is expected to be higher than for Route Option 1. In particular, Route 3 crosses two areas zoned for residential development where planning permission has already been granted. Route 3 also severely impacts upon the frontages of two residential properties, and it is likely that costs will be incurred to compensate the residents where dwellings are at risk of to being demolished or where frontages are lost due to the proximity of Route 3.

Given the high inflation rate on the open market for land zoned for development within the study area, it is difficult to evaluate the possible cost of land purchase with any great certainty. However, the following general estimates of the cost of purchasing land for each of the three route options have been generated based on an interpretation of the figures given above:

Route 1 = € 29,200, 000

Route 2 = € 34,865,000

Route 3 = € 32,890,000

6.4 SUMMARY

Routes 1 and 2 are similar in length and cross section and are estimated to have a similar construction cost. Route 3, however, is significantly longer than routes 1 and 2. Therefore it is considered that the construction costs of Route 3 would be significantly higher than Routes 1 and 2 and as such would have a major bearing on the route selection. Route 2 is expected to have a higher cost for accommodation works and statutory undertakers. Overall Route 1 is estimate to have the lowest construction cost.

The cost of land, in this case, would also be a very significant factor in the route selection. The relative costs of land zoned for economic development and employment use is likely to be significantly greater than agriculturally zoned land. Given the high inflation rate for land prices in the area it is difficult to estimate with great certainty the cost of land purchase in within the study area. Cost estimates for the landtake for each route have been presented based on an interpretation of historical and current open market valuations in the area.

Route 1 has the lowest estimated cost for land take. Although the route passes directly through areas designated for both economic and residential development in the future, the lower cost for the route can be attributed to the fact that it does not impact severely on any existing residences.

Route 2 has the highest estimated cost of land take as significant costs will be incurred to purchase and compensate for the impact on existing residences and the loss of dwellings along the Glenamuck Road. Route 2 will impact on numerous dwellings of which 22 No. have been identified as 'at risk' of demolition as they may become non-viable due to proximity to the edge of the road pavement. Route 2 is also likely to incur significant costs involved with the purchase of road-front lands.

Route 3, which is the longest route, is estimated to have the second highest cost for landtake. This can be attributed to the longer length of the route and the costs incurred where the route passes through 2 residential development areas have already been granted planning permission.

Based on the above, it is estimated that Route Option 1 will have the lowest overall cost of the three route options.

¹[sources: <http://archives.tcm.ie/businesspost/2005/07/10/story6206.asp> Sunday Business Post, 10/07/05; http://www.unison.ie/irish_independent/stories.php3?ca=302&si=1359172&issue_id=12214, Irish Independent, 16/03/05]

7 FRAMEWORK ASSESSMENT

7.1 INTRODUCTION

To assist in the Route Selection process a Framework Assessment that presents all the information gathered over the course of the route selection process, enabling the proposed route options to be compared with each other with the objective of obtaining a preferred route option for the proposed scheme.

The factors included in the formulation of a framework assessment include quantifiable criteria such as dwellings affected, utility crossings and construction costs, to other criteria which can be assessed in a subjective manner such as community impacts and ecological effects.

A preliminary assessment of the route option in Chapter 3 identified 3 viable route options, which are suitable to be brought forward for detailed examination under the framework assessment. Each individual route has its own advantages and disadvantages, however the core objective is that the preferred route must fulfil the “need” in terms of traffic and future development requirements and should where possible cause the least amount of impact to the least number of people and to the environment.

Items considered in the framework assessment are split into five sections:

Users of Facility

These are the benefits to those using the new and existing road network, mainly in terms of the proposed traffic arrangement associated with the proposed bypass options. The proposed route options will be assessed in terms of their ability to satisfy the regional and local objective, pedestrian and cyclist route objectives, safety and local traffic impact improvement.

Material Assets

This is the effect of the proposed route options on the land holdings, dwellings and other facilities within the study area .

Environmental Factors

These include the effects both positive and negative, on the Environment of the area surrounding the new and old routes.

Engineering Factors

The engineering factors are mainly quantifiable such as route length, cut and fill volumes, geometric parameters, utility crossings etc.

Cost

This compares the total cost of the proposed route options. This is made up of construction costs and landtake costs.

7.2 THE FRAMEWORK ASSESSMENT MATRIX

The various groups, items and impacts mentioned above were combined with the various route options in a matrix which permits comparison of the route options in a simple, concise and objective manner. The framework assessment matrix is shown in **Table 7.1**. A colour scheme was used to identify relative measures of impact, green being for least impact, yellow for second least impact and red for greatest impact. This process assists the assimilation of the information in the framework assessment more easily as the route option with the greatest benefits and least adverse impacts can be readily identified.

The route options are considered with regard to each individual impact and the preferred route will be highlighted on the basis that it best serves its purpose with the least environmental, social and economic impact. The framework assessment in **Table 7.1** can be summarised as follows:

7.2.1 User of Facilities

Table 7.2 summarises the effects of the various route options upon the user of the facility.

	Green Cells (Best Benefit)	Yellow Cells (2 nd Best Benefit)	Red cells (Least Benefit)
Route 1	3	0	0
Route 2	0	0	3
Route 3	0	3	0

Table 7.2 Summary of User Facilities

Route 1 has 3 green cells and is therefore the best option in terms of overall benefit to the users of the facility. Route 2 has the least overall benefit to the users of the facility, this is mainly due to the fact there will be no reduction in traffic on the Glenamuck Road, instead there will be a predicted increase in traffic which will remain on the Glenamuck Road.

Routes 1 and 3 generally achieve significant benefits to the user of the facility, but each includes for less benefit in certain areas. For example Route 1 will achieve the full potential for local objectives as it passes through areas which have been zoned for future economic and residential development, Route 3 will have less benefit for local objectives as it passes through significant areas of agricultural land or areas zoned for rural amenity. Route 3 offers less road safety benefit than Route 1 as traffic volumes would not be decreased in both the Kiltarnan Village area and on the existing Glenamuck Road.

Route 2 will result in a road carrying mixed traffic with both local traffic and through traffic, and with the predicted increase in traffic this would have the least impact of the three schemes for local traffic impact improvements.

7.2.2 Material Assets

Table 7.3 summarises the impacts on material assets of the various route options.

	Green Cells (Least Impact)	Yellow Cells (2nd Least Impact)	Red cells (Greatest Impact)
Route 1	1	1	0
Route 2	1	0	1
Route 3	0	1	1

Table 7.3 Summary of Community Impact

Route 2 has the greatest impact on the non-agricultural material assets and this is mainly due to the fact that it directly affects a large number of residential dwellings and results in the loss of frontage to a large number of dwellings. Route 1 has the least impact on the non-agricultural material assets.

7.2.3 Environmental Factors

Table 7.4 below, summarises the effects of the various route options on environmental factors. The results show that the preferred route is considered to be Route 1. This route shows the least impact on the environment when compared to the other two routes. The only negative rank arose from the aquatic ecology where the proposed Glenamuck Stream would be directly impacted by this route.

Route 2, on the other hand, is considered to be the least preferred route. This is directly attributed to the highest number of residential properties situated within 100m. This does not only give rise to physical impact on properties buildings and associated land but also to increased exposure to possible environmental impacts such as air, noise and visual impacts etc., even though 5 Green Cells were achieved in the areas of visual impact on landscape, archaeology, aquatic and terrestrial ecology, agricultural impact and forestry impact.

	Green Cells (Least Impact)	Yellow Cells (2nd Least Impact)	Red cells (Greatest Impact)
Route 1	7	3	1
Route 2	5	0	6
Route 3	2	6	34

Table 7.4 Summary of Environmental Factors

7.2.4 Engineering Factors

Table 7.5 summarises the effects of the various route options on engineering factors.

	Green Cells (Most Favourable)	Yellow Cells (2nd most Favourable)	Red cells (Least favourable)
Route 1	7	3	1
Route 2	4	3	3
Route 3	0	4	6

Table 7.5 Summary of Engineering Factors

Route 1 is the best option in terms of satisfying Engineering requirements and can be attributed to this option having better geometric qualities, a superior cut/fill balance, less impact on utilities and causing significantly less severance to existing access roads and residences.

Route 3 has the highest number of red calls (6 No.) and generally is the least favourable option in terms of satisfying the Engineering factors.

7.2.5 Cost

Route 1 has the lowest construction costs. Route 2 will incur higher construction costs due to the extensive traffic management and accommodation works required to allow widening of an existing road, while maintaining access to residents and through traffic during the construction period. Route 3 will have the highest construction cost, as it is a much longer route.

Route 2 will have the highest cost for landtake due to the number of residences directly affected by the route and due to the loss of frontage of a large number of residences.

Route 3 will have high landtake costs as it is the longest route and it also passes through two areas which have been zoned for residential development where planning permission has already been granted.

Route 1 will have the lowest overall cost when both construction and landtake costs are combined.

7.2.6 Summary of Framework Assessment Matrix

Route 1 has the highest number of green cells and the lowest number of red cells with 19 and 2 respectively. This is mainly due to the fact that Route 1 has the least impact on the community and is the most favourable in respect of the engineering factors and offers the greatest overall benefit to the users of the facility. Route 1 is also the least expensive option.

Route 3 is has the second least number of red cells and generally has more positive aspects than negative aspects when compared to Route 2.

Table 7.6 summarises the effects of the various route options within the Framework Assessment matrix

	Green Cells (Least Impact)	Yellow Cells (2nd Least Impact)	Red cells (Most Impact)
Route 1	19	7	2
Route 2	10	3	14
Route 3	2	15	10

Table 7.6 Summary of Framework Assessment Matrix

7.3 CONCLUSION

From the summary analysis of the routes under the framework assessment matrix it can be concluded that Route 1 is the preferred option / (optimum solution) for the Glenamuck District Distributor Road.

This option has the least impact on the environment and material assets when compared to the other route options and it has the best overall impact for the users of the facilities, engineering factors and lowest cost estimate of the three routes. Given the above, Route 1 best satisfies the main criteria associated with the provision of the Glenamuck District Distributor Road.

**Glenamuck District Distributor Road
Framework Assessment Matrix Page 1**

Ref	Effects	Units	Route 1	Route 2	Route 3	Link A	Link B
1	USERS OF FACILITIES						
1.1	Local Objectives	Impact					
1.2	Local Traffic Improvement	Impact					
1.3	Safety	Impact					
2	MATERIAL ASSETS						
2.1	Non-Agricultural Material Assets						
2.1.1	Houses/ Buildings 'at risk' of demolition	No.	1	22	4	0	0
2.1.2	Residential Frontages Affected	No.	2	47	12	0	0
2.1.3	Dwellings within 0-25m	No.	1	31	6	0	0
2.1.4	Dwellings within 25-50m	No.	3	19	6	0	2
2.1.5	Total No.Dwellings within 0-100m	No.	14	89	40	1	1
2.1.6	Overall Impact on Material Assets	No.					
2.2	Agricultural Material Assets						
2.2.1	Overall Impact on Agricultural Properties	Rank					
3	ENVIRONMENTAL						
3.1	Visual Impact						
3.1.1	Visual Impact on Landscape	Rank					
3.1.2	Visual Impact on Residential	Rank					
3.1.3	Overall Visual Impact	Rank					
3.2	Community Impact						
3.2.1	Schools (<300m)	No.	2	0	1	1	2
3.2.2	Industry (<300m)	No.	0	0	1	0	0
3.2.3	Commercial Activity (<300m)	No.	0	2	1	1	0
3.2.4	Churches (<300m)	No.	1	0	1	0	0
3.2.5	Graveyards (<300m)	No.	0	0	0	0	0
3.2.6	Sports Facilities (<300m)	No.	2	1	1	1	1
3.2.7	Overall Community Impact	Rank					
3.3	Archaeology						
3.3.1	Archaeological Sites within 100m		0	0	1		
3.3.2	Archaeological Sites within 200m		1	0	0		
3.3.3	Archaeological Sites within 300m	No.	0	1	0	1	1
3.3.2	Overall Impact	Rank					
3.4	Architectural Heritage						
3.4.1	Protected Structure within 100m		2	2	1		
3.4.2	Protected Structure within 200m		0	0	1		
3.4.3	Protected Structure within 300m	No.	0	0	0		
3.4.4	Overall Impact	Rank					
3.5	Noise						
3.5.1	Noise	Rank					
3.6	Air Quality						
3.6.1	Air Quality	Impact					
3.7	Ecology						
3.7.1	Aquatic Ecology	Impact					
3.7.2	Terrestrial Ecology	No.					
3.8	Forestry						
3.8.1	Impact on Forestry	Rank					

Key	Total (Page 1)	Total (Page 1)	Total (Page 1)	Total (Page 1)	Total (Page 1)
Least Impact	11	6	2	14	8
Second Least Impact	4	0	10	1	0
Greatest Impact	1	10	4	1	8

Table 7.1 Framework Assessment Matrix

**Glenamuck District Distributor Road
Framework Assessment Matrix Page 2**

Ref	Effects	Units	Route 1	Route 2	Route 3	Link A	Link B
4	ENGINEERING						
4.1	Public Utilities						
4.1.1	ESB Lines 220kV crossing	No.	1	1	1	0	1
4.1.2	ESB Lines 110kV crossing	No.	2	2	2	2	0
4.1.3	ESB Lines 10kV crossing	No.	4	3	4	2	1
4.1.4	ESB Lines LV crossing	No.	2	11	4	1	1
4.1.5	Overall ESB Impact	Impact					
4.1.6	Eircom	No.	1	7	2	1	1
4.1.7	Watermains	No.	4	5	4	2	2
4.1.8	Foul Sewer	No.	3	6	1	1	1
4.1.9	Overall Utilities Impact	Impact					
4.2	Geometrics						
4.2.1	Length (mainline only)	m	1477	1458	1966		
4.2.2	Landtake	HA	7.31	4.04	8.65		
4.2.3	Horizontal Geometry	Rank					
4.2.4	Vertical Geometry	Rank					
4.2.5	Volumetrics	Rank					
4.3	Drainage						
4.3.1	Drainage	Rank					
4.4	Proposed Structures						
4.4.1	Culverts	No.	4	1	1		
4.4.2	Accommodation Overbridges	No.	0	0	1		
5	COST						
5.1	Estimated Construction Cost						
5.1.1	Construction Cost Mainline	€	€ 6,076,018	€ 6,473,597	€ 8,464,546		
5.1.2	Landtake Cost	€	€ 29,200,000	€ 34,865,000	€ 32,890,000		
5.1.3	Overall cost						

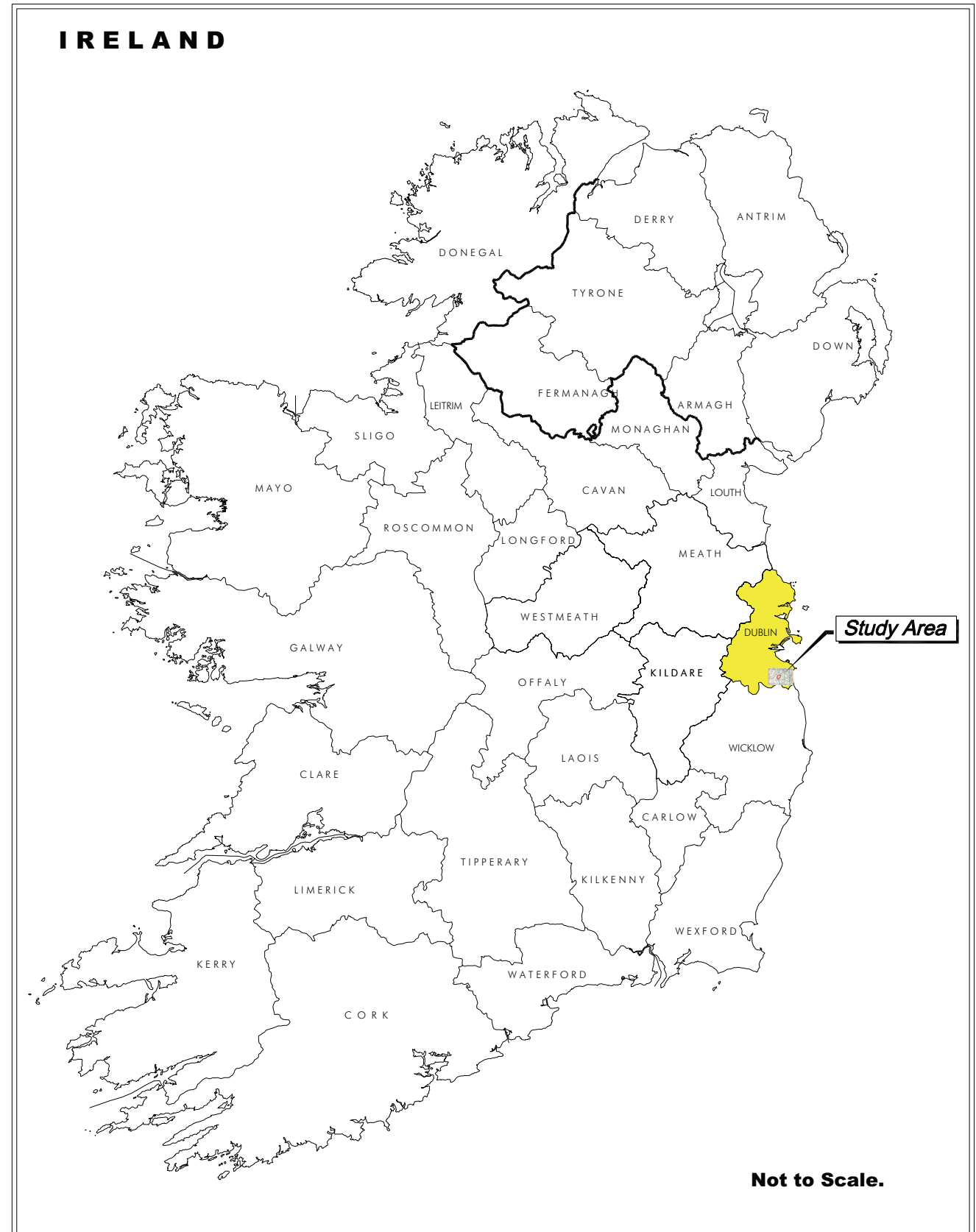
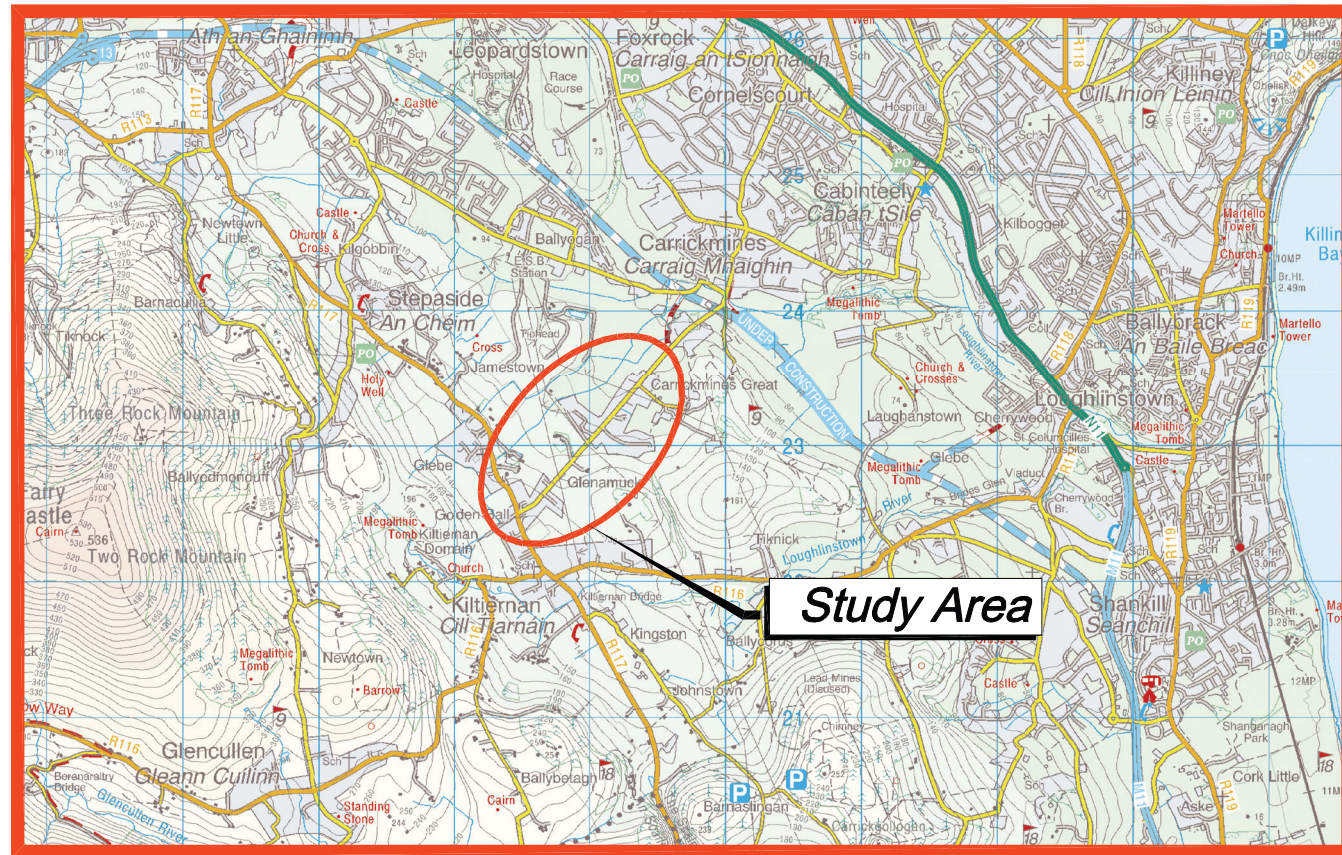
Key	Total (Page 2)	Total (Page 2)	Total (Page 2)	Total (Page 2)	Total (Page 2)
Least Impact	8	4	0		
Second Least Impact	3	3	5		
Greatest Impact	1	4	6		

Table 7.1 Framework Assessment Matrix

RPS

Appendix A
Figures

FEASIBILITY REPORT



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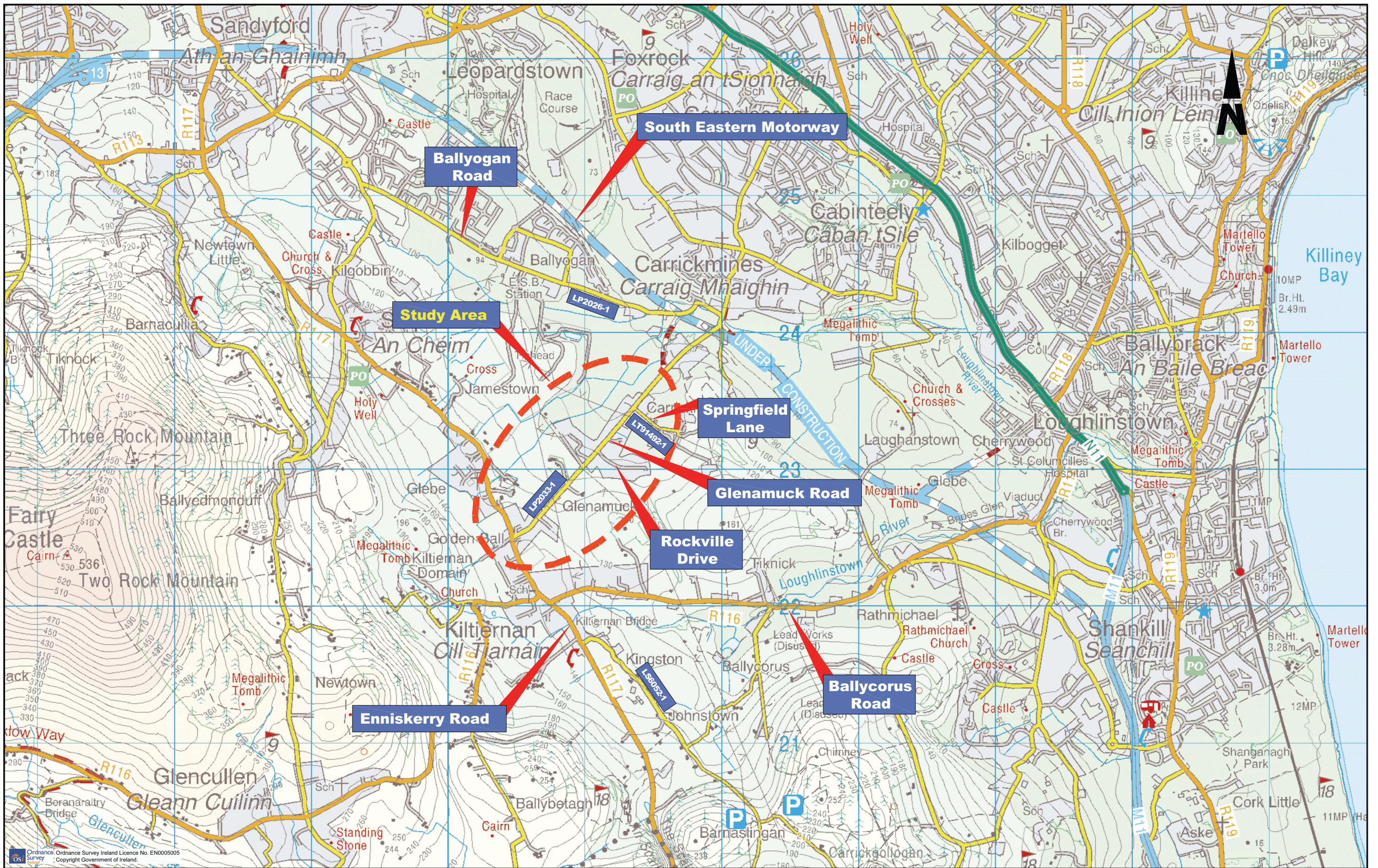
Project:

GLENAMUCK DISTRICT DISTRIBUTOR ROAD

Title:

SCHEME IN NATIONAL CONTEXT

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Checked by:	CG	File No:	MDT0205RN0001.dwg
Approved by:	MN	Fig. No:	
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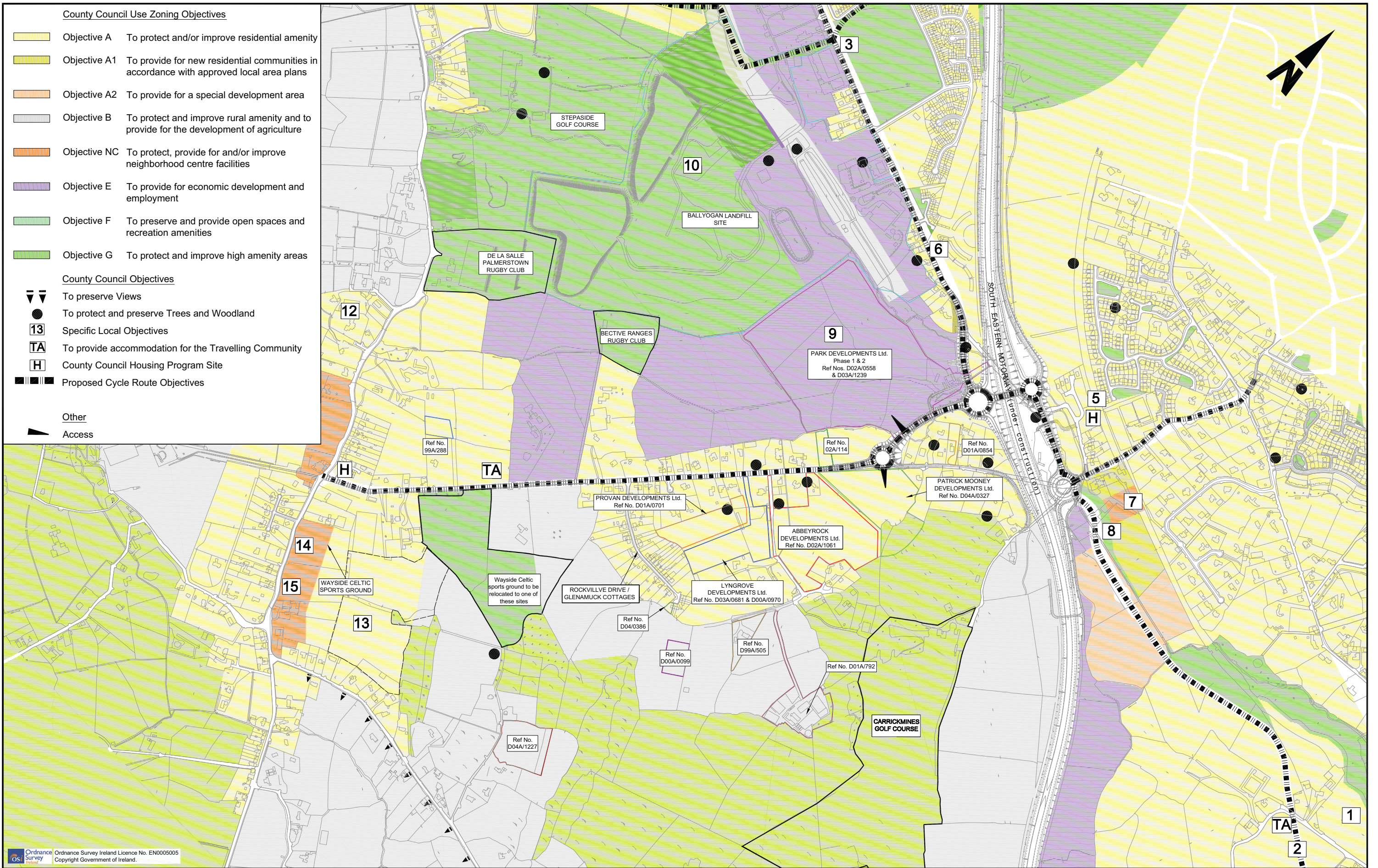
Project:

**GLENAMUCK DISTRICT
DISTRIBUTOR ROAD**

Title:

**STUDY AREA &
EXISTING ROAD NETWORK**

Drawn by:	PH	Job No:	MDT0205
Checked by:	JD	File No:	MDT0205RN0002.dwg
Approved by:	MN	Fig. No:	
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GLENAMUCK DISTRICT DISTRIBUTOR ROAD

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ZONING MAP WITH FUTURE DEVELOPMENTS
& SPECIFIC LOCAL OBJECTIVES

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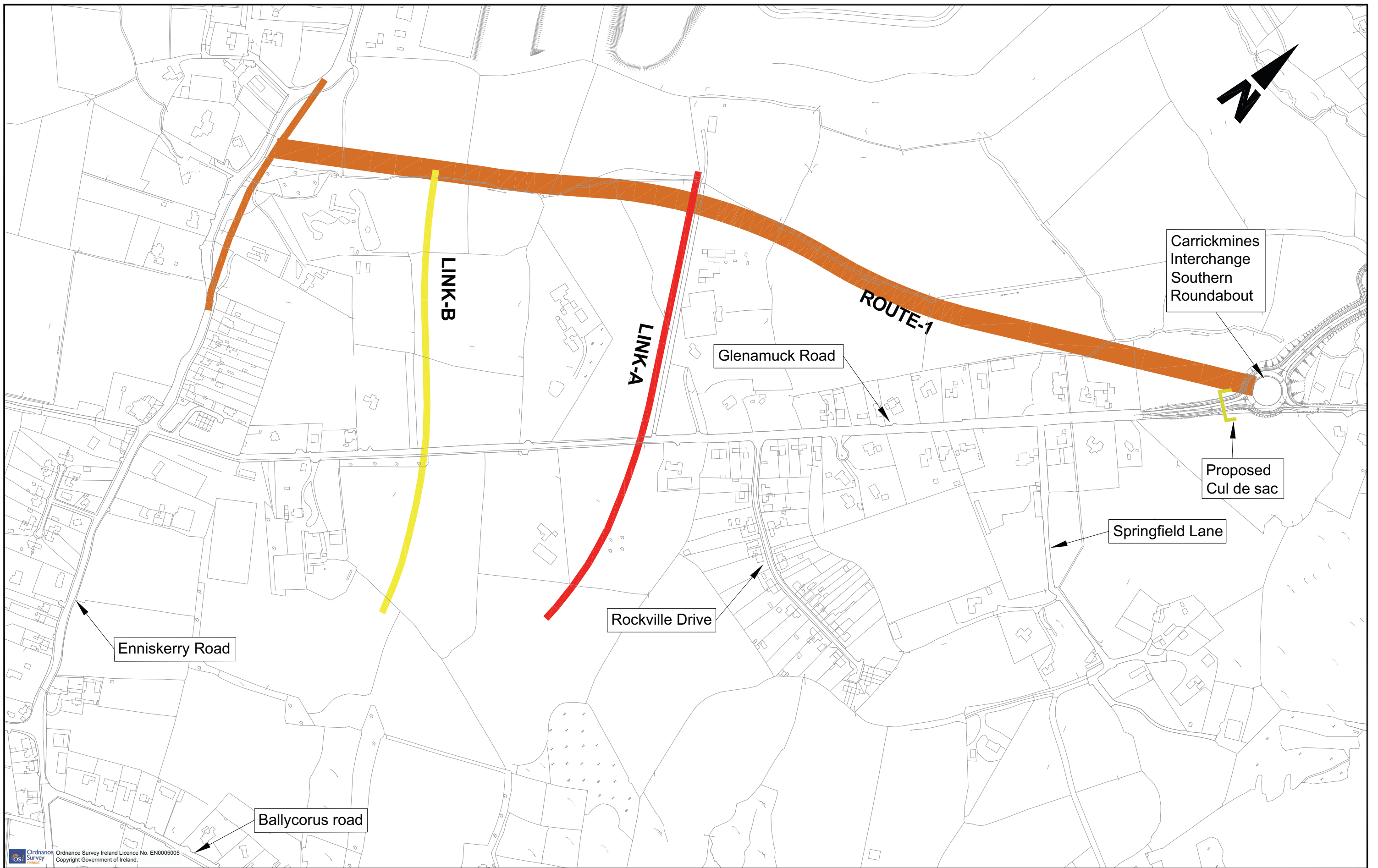
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Title:

ACCIDENT DATA

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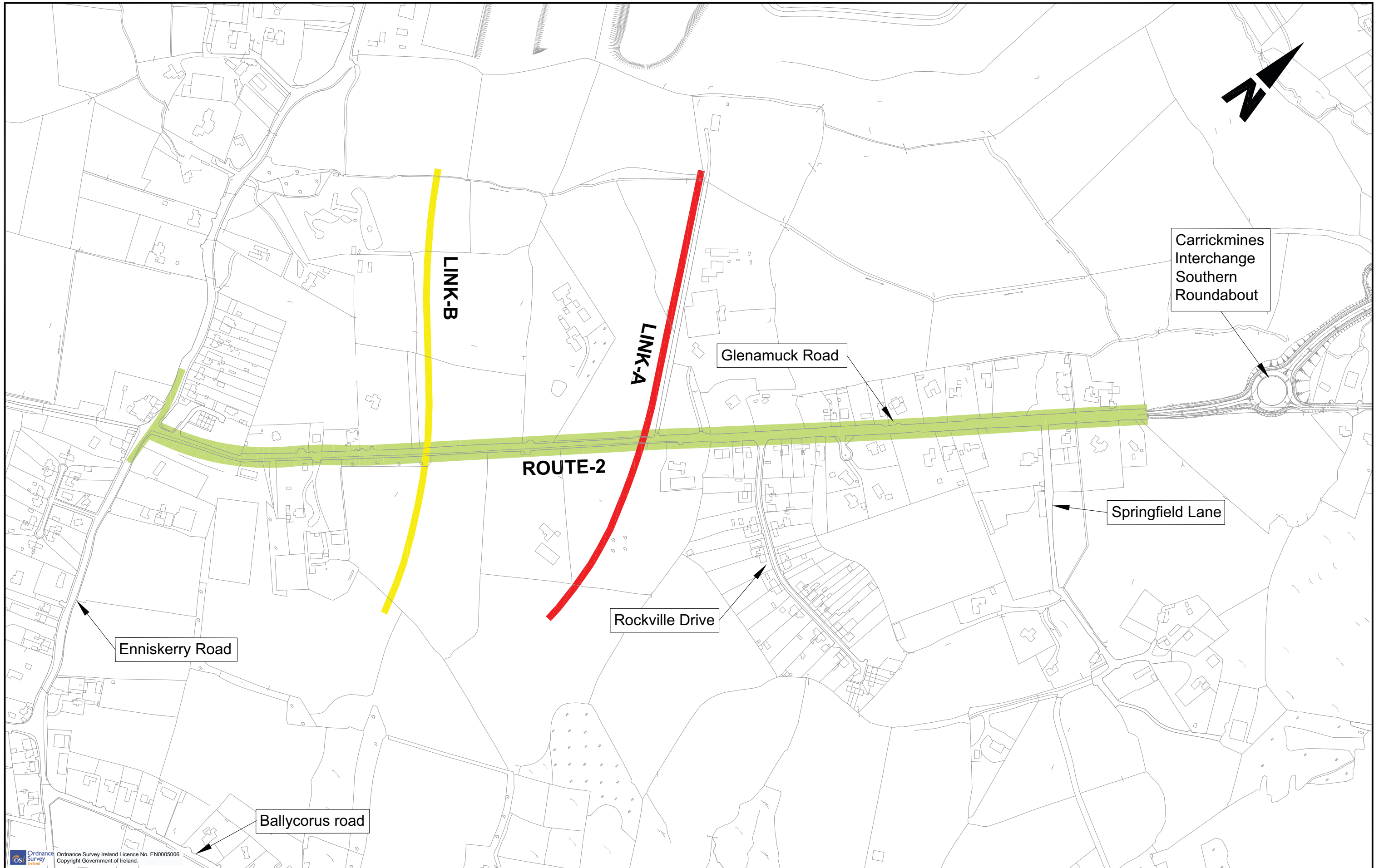
Project:

GLENAMUCK DISTRICT DISTRIBUTOR ROAD

Title:

PROPOSED ROUTE 1

Drawn by:	PH	Job No:	MDT0205
Checked by:	CG	File No:	MDT0205RN0005.dwg
Approved by:	MN	Fig. No:	
Scale:	1:5,000@A3	Figure No. 3.1	
Date:	Jan '05		



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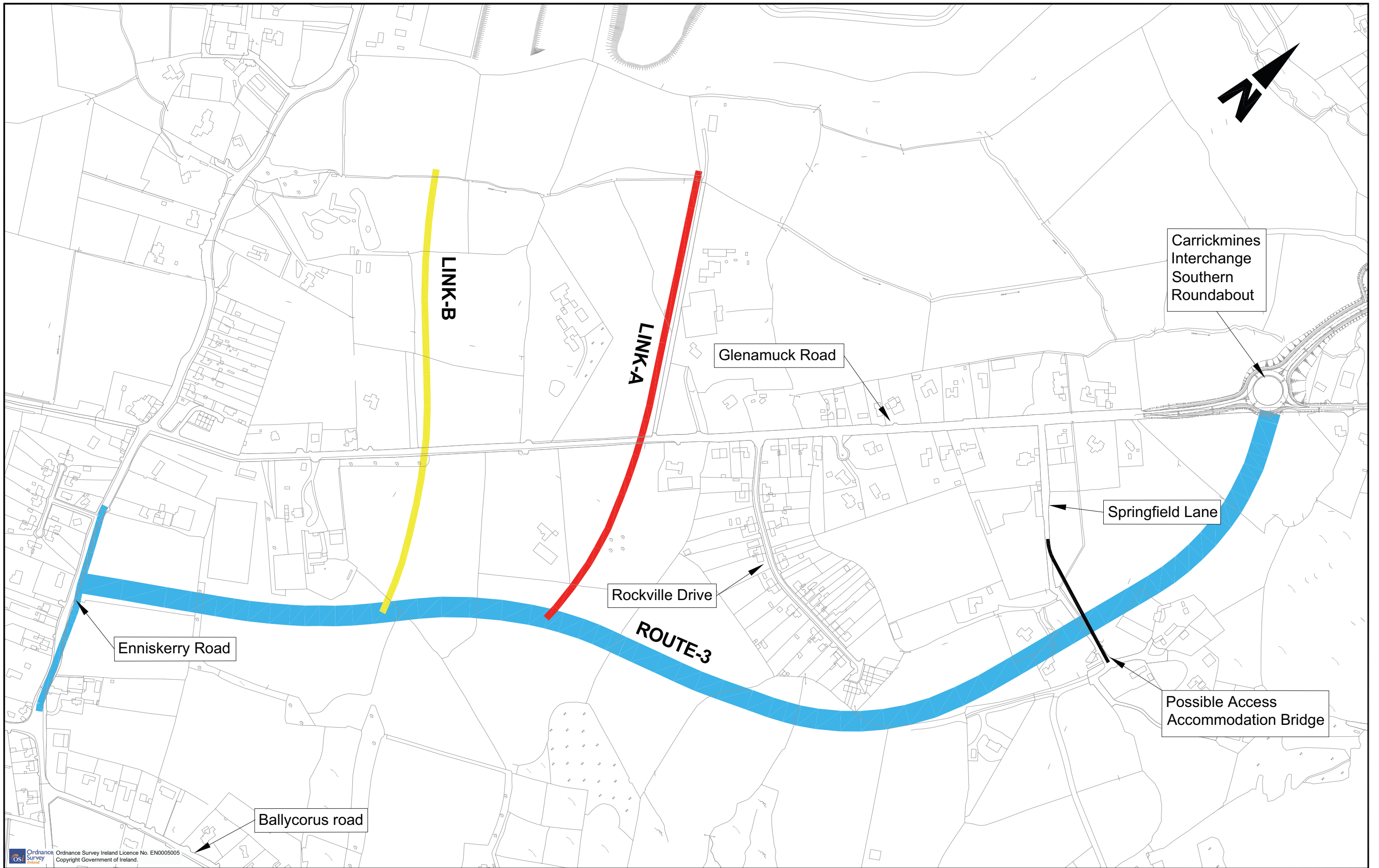
Project:

GLENAMUCK DISTRICT DISTRIBUTOR ROAD

Title:

PROPOSED ROUTE 2

Drawn by:	PH	Job No:	MDT0205
Checked by:	CG	File No:	MDT0205RN0006.dwg
Approved by:	MN	Fig. No:	
Scale:	1:5,000@A3	Figure No. 3.2	
Date:	Jan '05		



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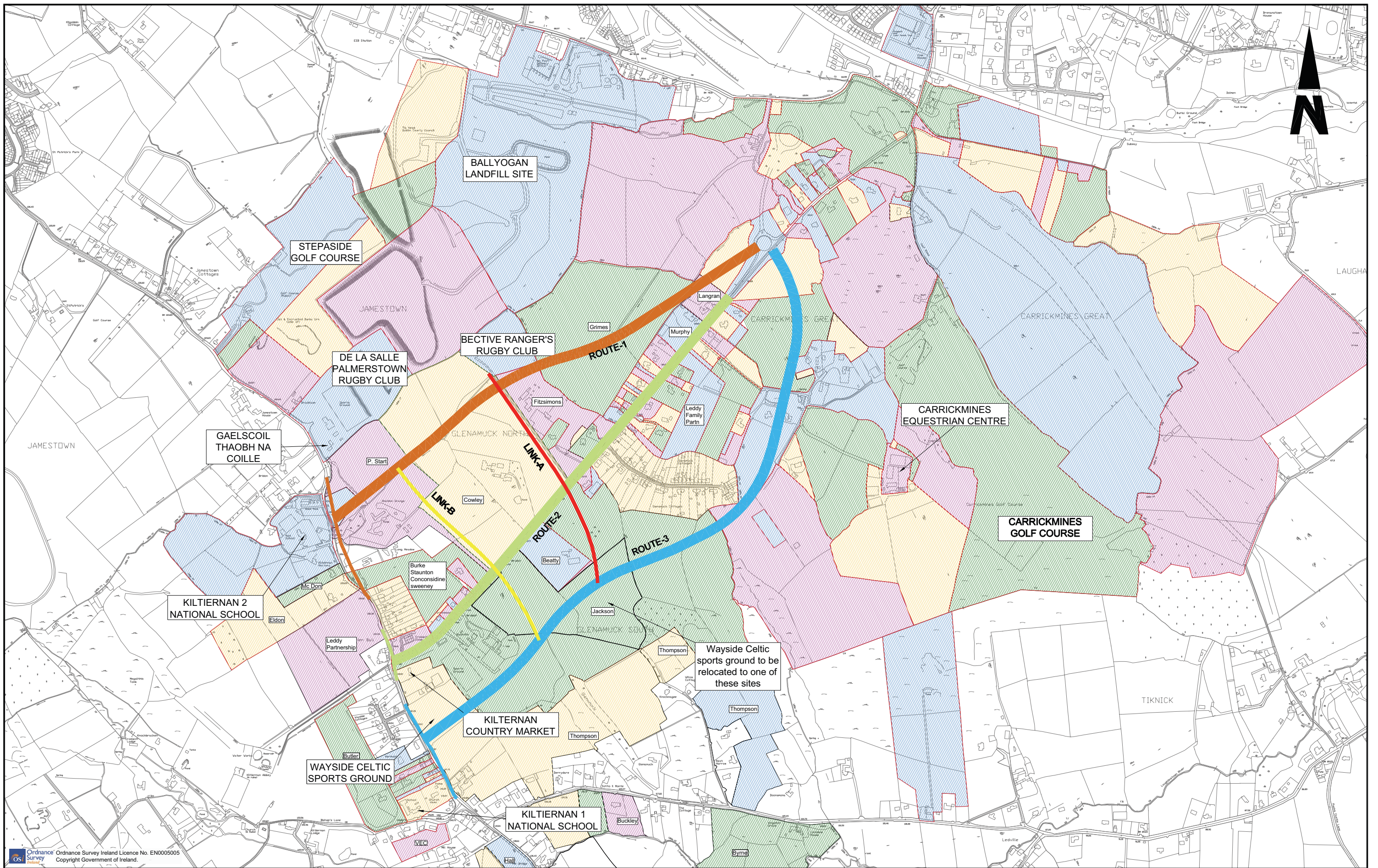
Project:

GLENAMUCK DISTRICT DISTRIBUTOR ROAD

Title:

PROPOSED ROUTE 3

Drawn by:	PH	Job No:	MDT0205
Checked by:	CG	File No:	MDT0205RN0007.dwg
Approved by:	MN	Fig. No:	
Scale:	1:5,000@A3	Figure No. 3.3	
Date:	Jan '05		



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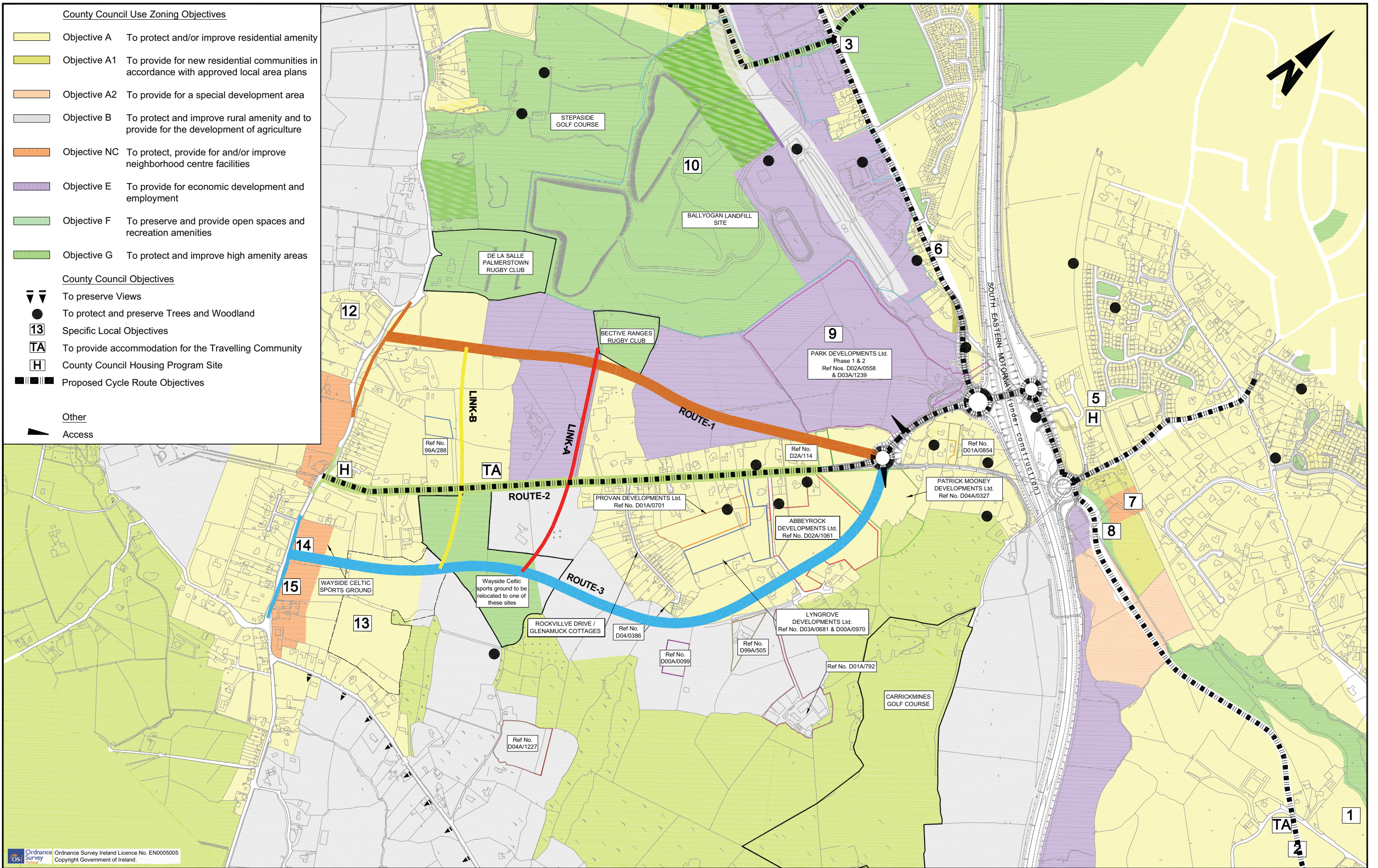
Project:

**GLENAMUCK DISTRICT
 DISTRIBUTOR ROAD**

Title:

**ROUTE SELECTION SHOWING
 LANDOWNERSHIP BOUNDARIES**

Drawn by:	PH	Job No:	MDT0205
Checked by:	JD	File No:	MDT0205RN0008.dwg
Approved by:	MN	Fig. No:	
Scale:	1:10,000	Figure No. 3.4	
Date:	Jan '05		



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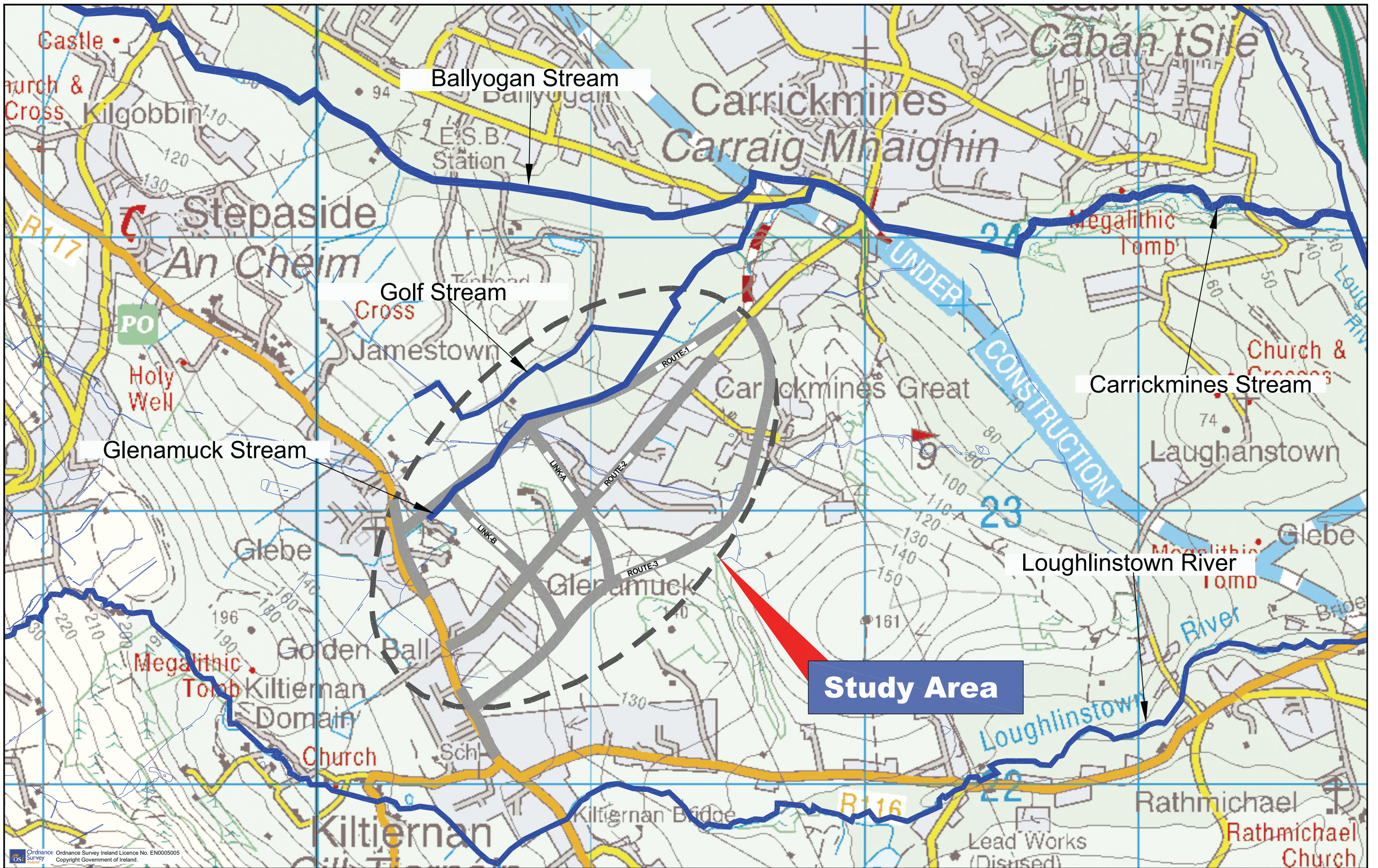
Project:

**GLENAMUCK DISTRICT
 DISTRIBUTOR ROAD**

Title:

**ROUTE SELECTION SHOWING
 ZONING MAP WITH FUTURE DEVELOPMENTS
 & SPECIFIC LOCAL OBJECTIVES**

Drawn by:	AA	Job No:	MDT0205
Checked by:	JD	File No:	MDT0205RN0010.dwg
Approved by:	MN	Fig. No:	
Scale:	1:10,000 @ A3	Figure No. 3.5	
Date:	Jan '05		



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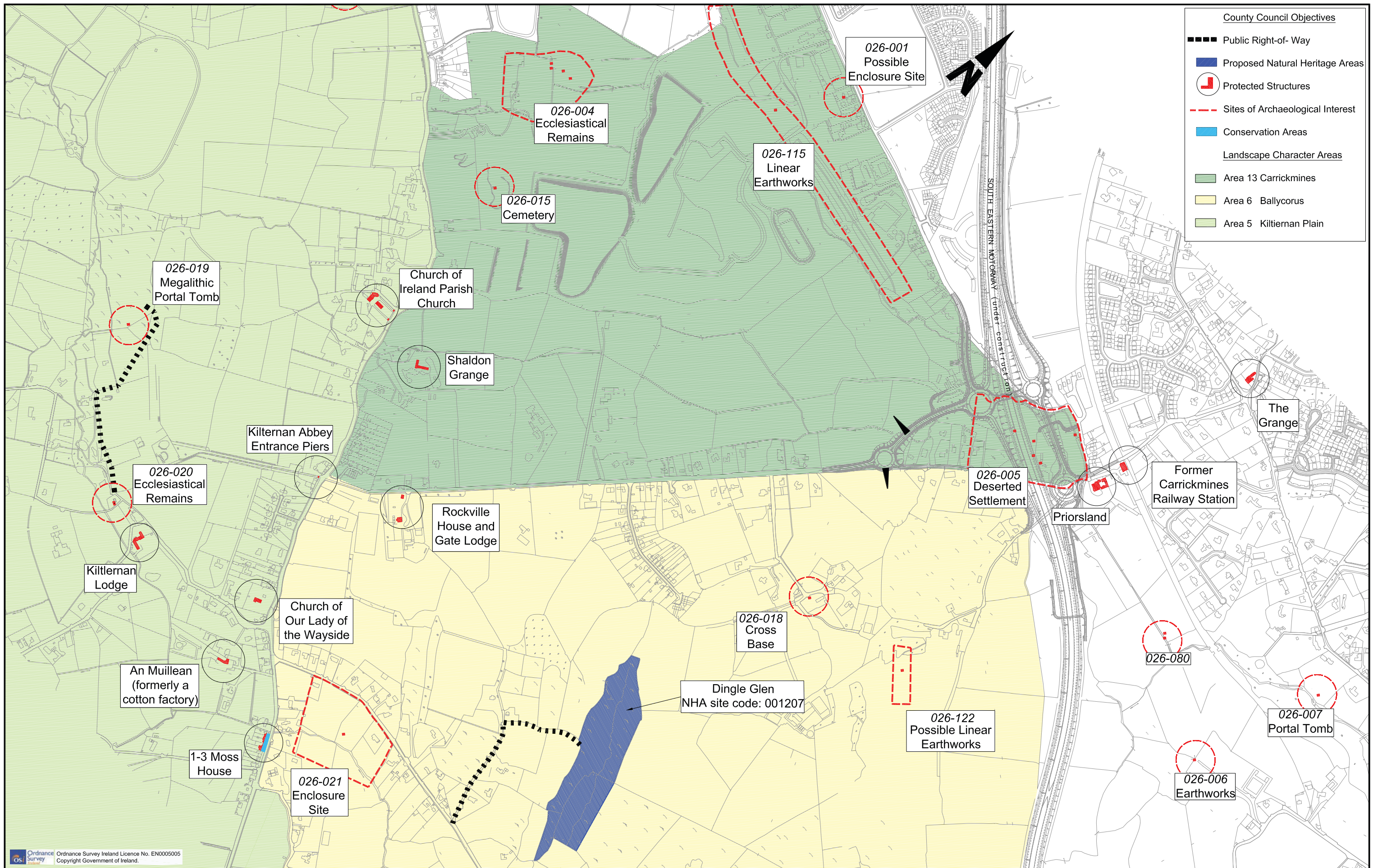
Project:

GLENAMUCK DISTRICT DISTRIBUTOR ROAD

Title:

ROUTE SELECTION SHOWING RIVERS & STREAMS

Drawn by:	PH	Job No:	MDT0205
Checked by:	CG	File No:	MDT0205RN0011.dwg
Approved by:	MN	Fig. No:	
Scale:	1:12,500	Figure No. 3.6	
Date:	Jan '05		



County Council Objectives

- Public Right-of-Way
- Proposed Natural Heritage Areas
- Protected Structures
- Sites of Archaeological Interest
- Conservation Areas

Landscape Character Areas

- Area 13 Carrickmines
- Area 6 Ballycurus
- Area 5 Kiltiernan Plain

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Project:

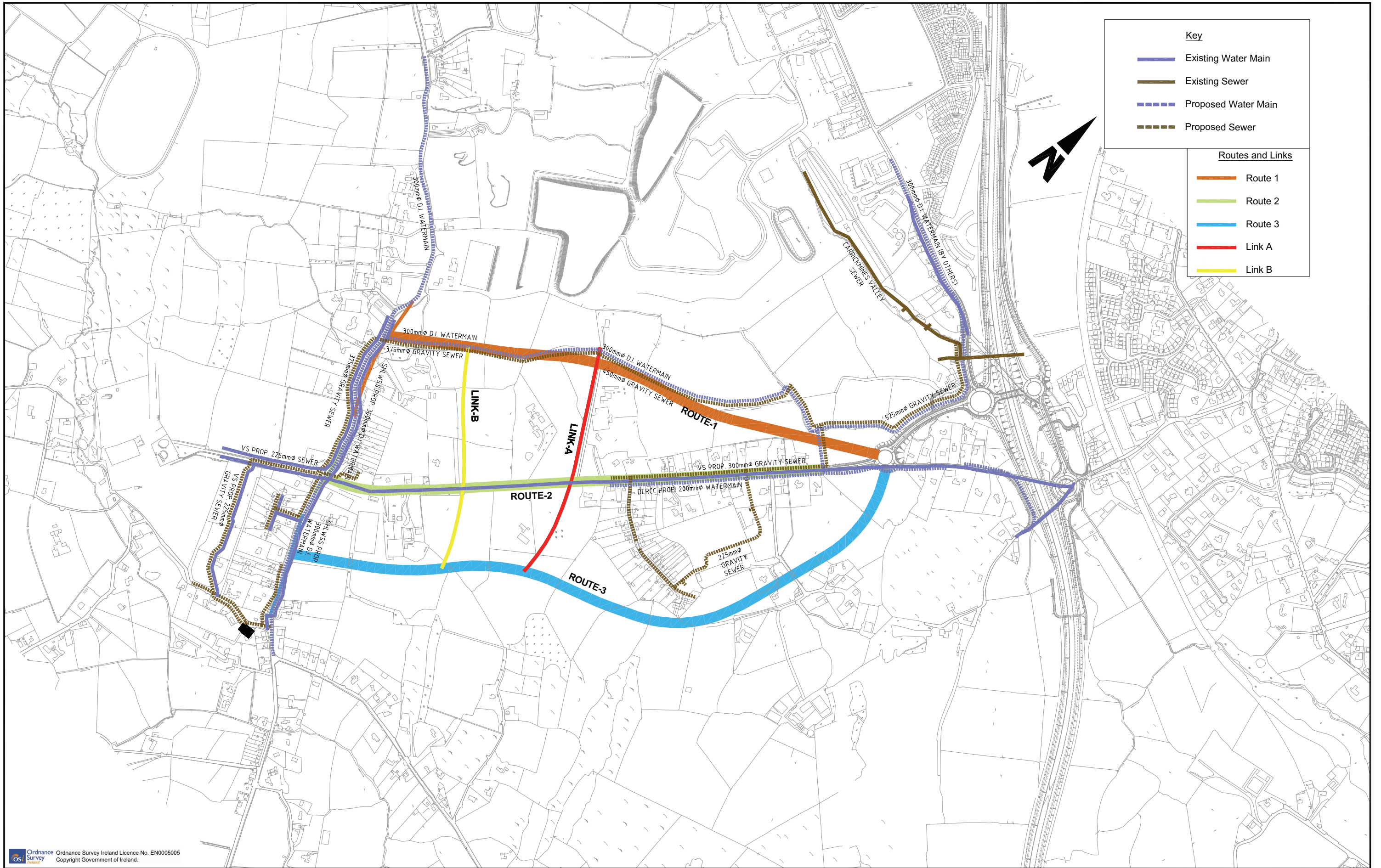
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Title:

MONUMENTS, PROTECTED AREAS & LANDSCAPE CHARACTER AREAS

Drawn by:	AA	Job No:	MDT0205
Checked by:	LC	File No:	MDT0205RN0017.dwg
Approved by:	JC	Fig. No:	
Scale:	1:10,000		
Date:	Jan '05		

Figure No. 3.7



Key	
	Existing Water Main
	Existing Sewer
	Proposed Water Main
	Proposed Sewer

Routes and Links	
	Route 1
	Route 2
	Route 3
	Link A
	Link B

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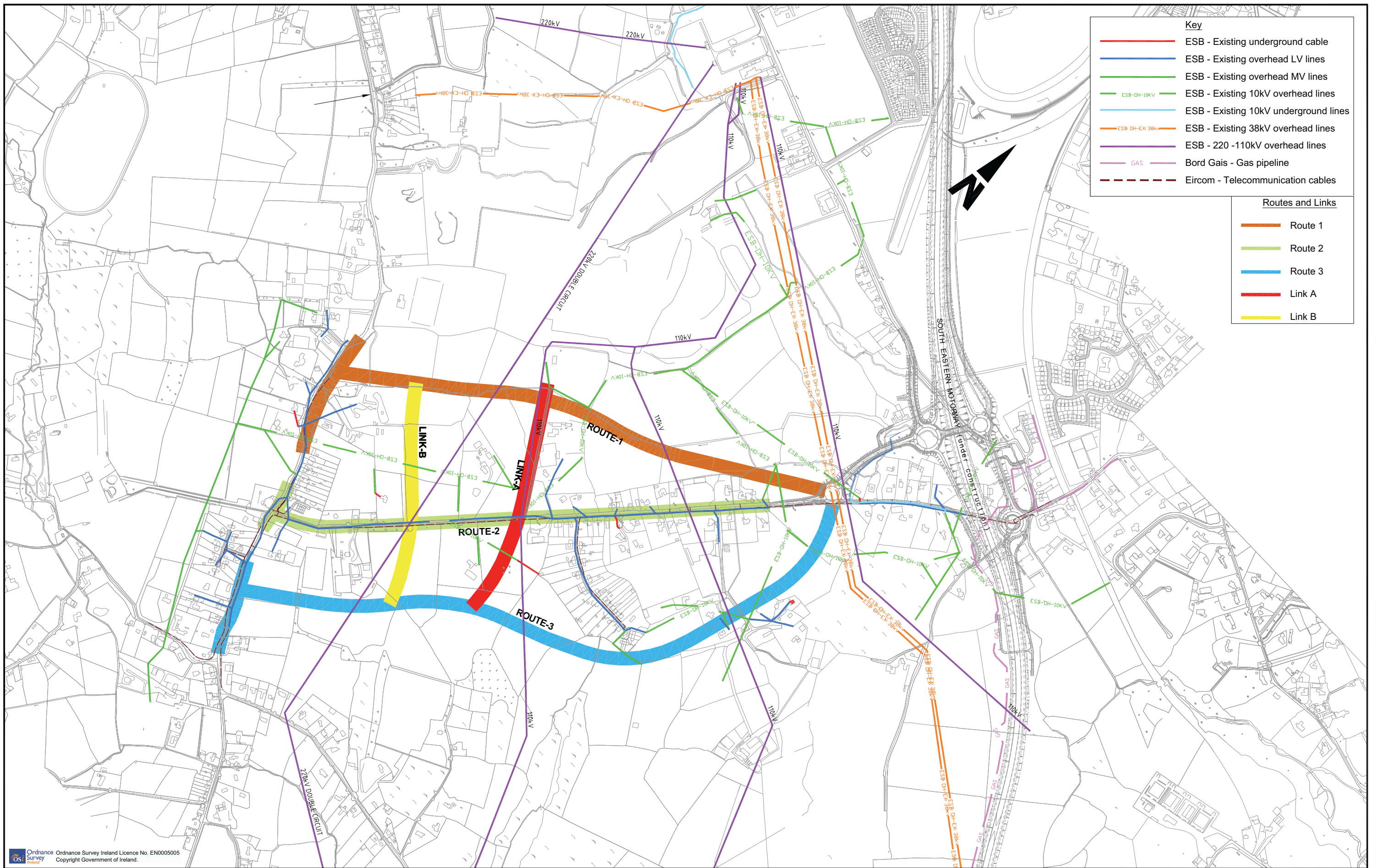
Project:

**GLENAMUCK DISTRICT
DISTRIBUTOR ROAD**

Title:

**ROUTE SELECTION SHOWING
UTILITIES
WATERMAINS AND SEWERS**

Drawn by:	PH	Job No:	MDT0205
Checked by:	CG	File No:	MDT0205RN0012.dwg
Approved by:	MN	Fig. No:	
Scale:	1:10,000@A3	Figure No. 3.8	
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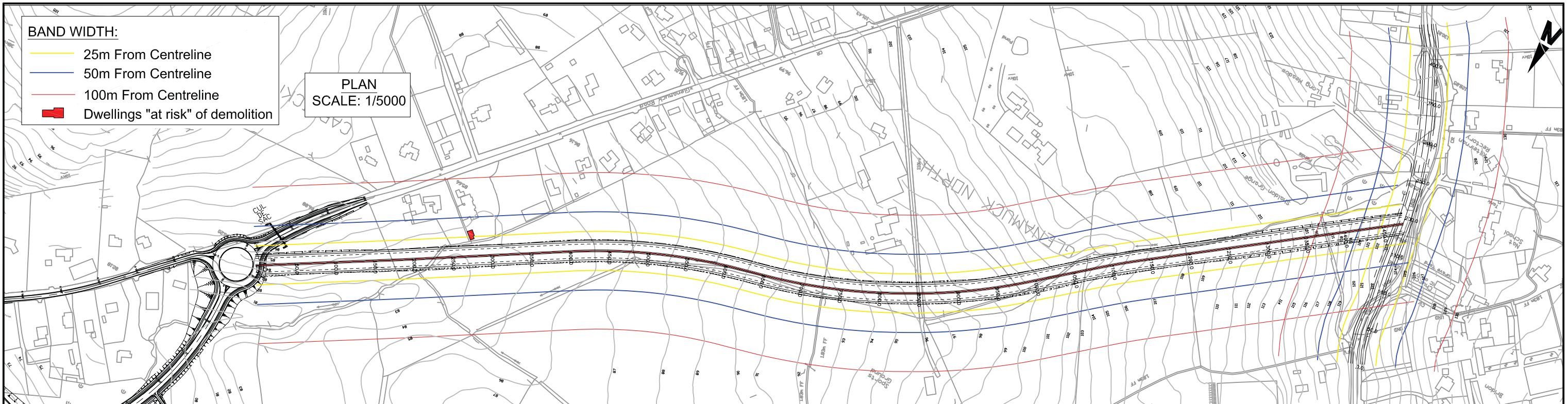
Project:

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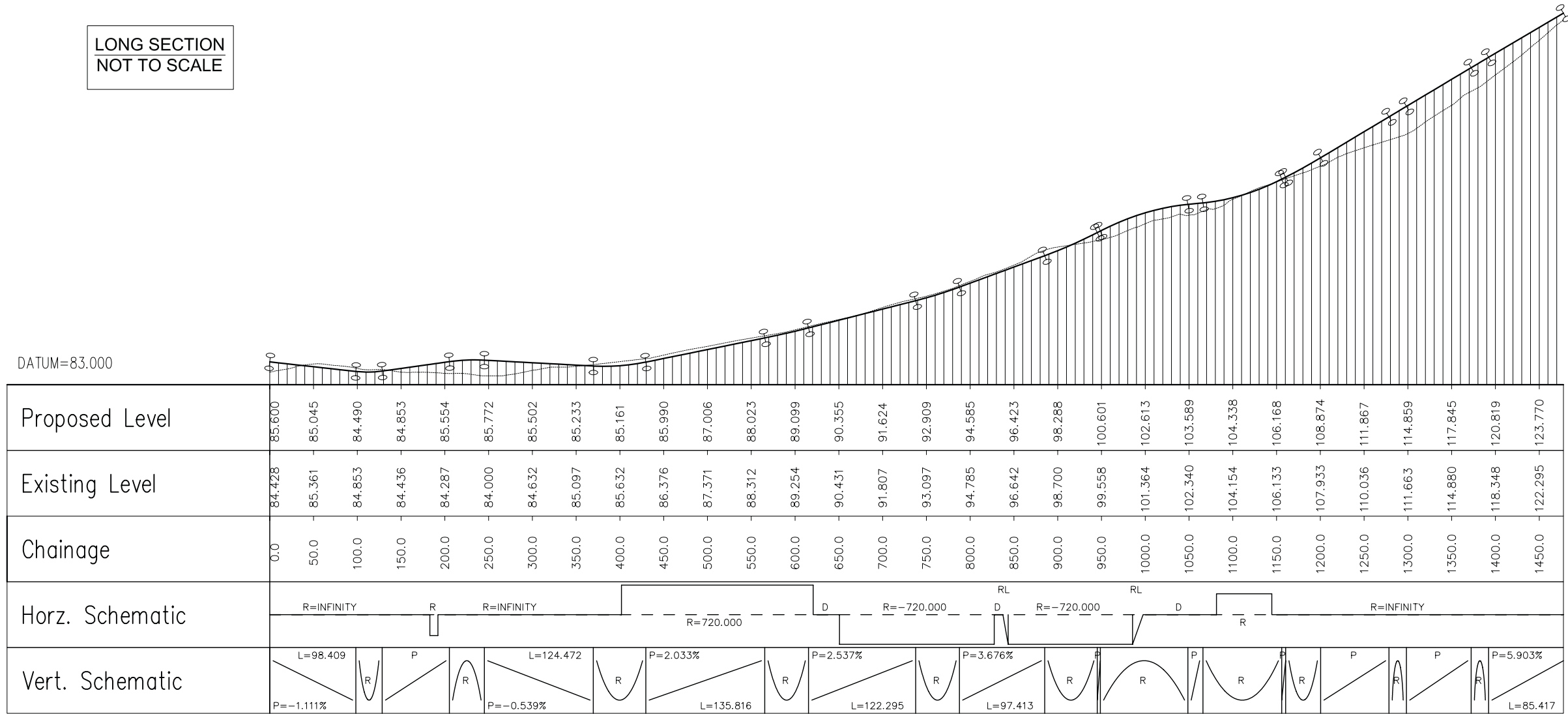
Title:

ROUTE SELECTION SHOWING UTILITIES ESB, EIRCOM AND BORD GAIS

Drawn by:	PH	Job No:	MDT0205
Checked by:	CG	File No:	MDT0205RN0013.dwg
Approved by:	MN	Fig. No:	
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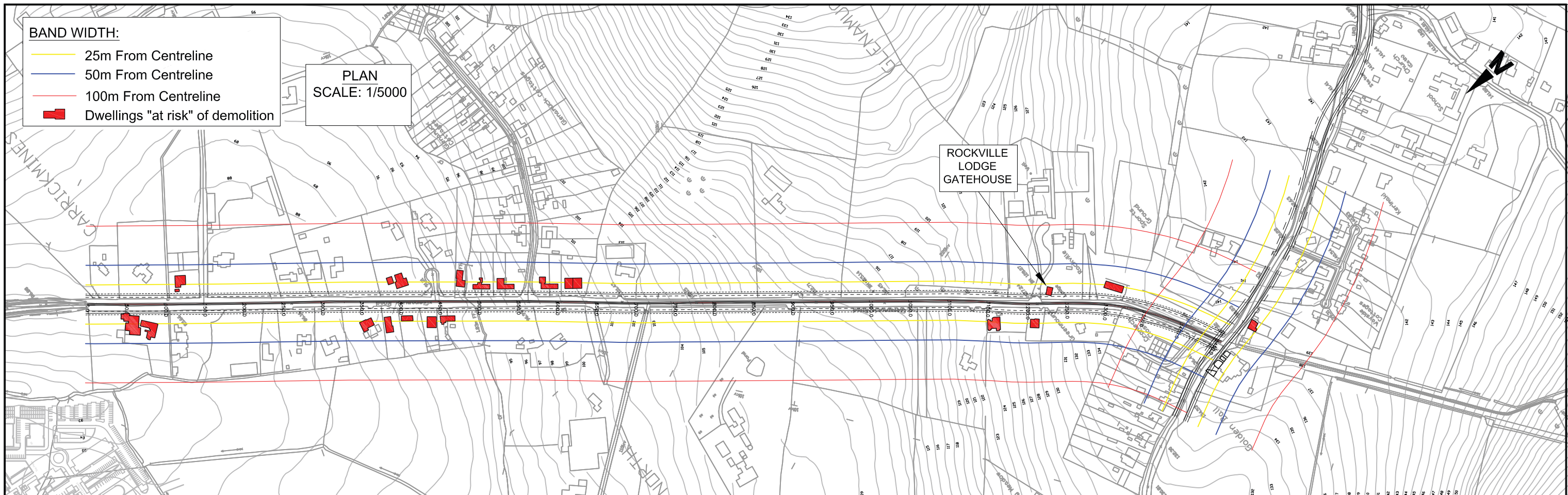
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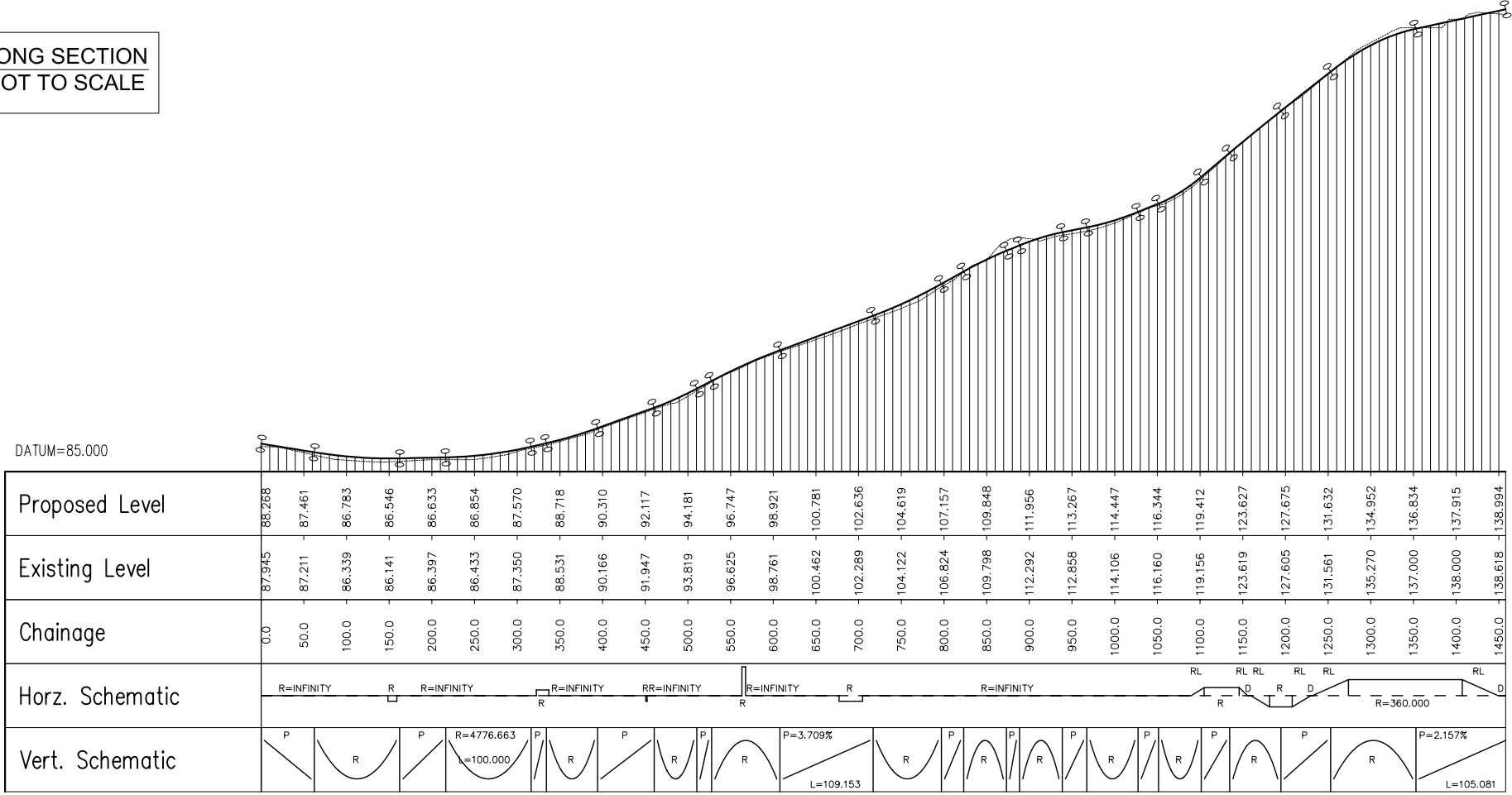
Project:
**GLENAMUCK DISTRICT
 DISTRIBUTOR ROAD**

Title:
**ROUTE OPTION 1
 TYPICAL GEOMETRY**

Drawn by:	PH	Job No:	MDT0205
Checked by:	CG	File No:	MDT0205RN0014.dwg
Approved by:	MN	Fig. No:	
Scale:	SEE DWG@A3	Fig. 3.10	
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Project:
GLENAMUCK DISTRICT DISTRIBUTOR ROAD

Title:
ROUTE OPTION 2 TYPICAL GEOMETRY

Drawn by:	PH	Job No:	MDT0205
Checked by:	CG	File No:	MDT0205RN0015.dwg
Approved by:	MN	Fig. No:	
Scale:	SEE DWG@A3		
Date:	Jan'05		

Fig. 3.11

