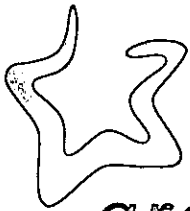
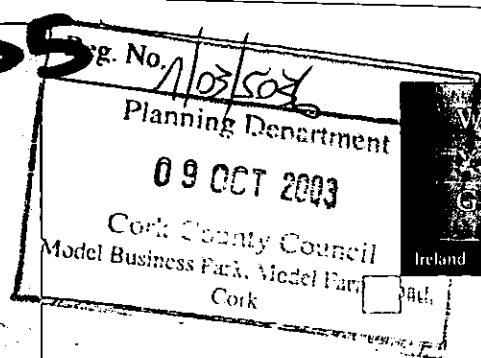


EIS No. 2055



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Environmental Impact Statement



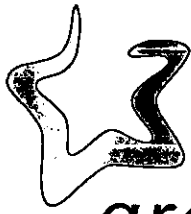
Residual Landfill

for a

**Residual Landfill
at Ballyguyroe,
County Cork**

October 2003

EIS NO: 2055



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White
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Green

Ireland

Non-Technical Summary



Residual Landfill
Residual

for a
Residual Landfill
at Ballyguyroe,
County Cork

October 2003

**Non-Technical Summary
of the Environmental Impact Statement
for the Residual Landfill at Ballyguyroe,
Mallow, County Cork.**

Introduction

greenstar proposes to develop a residual landfill at Ballyguyroe, County Cork for the disposal of treated residual non-hazardous municipal, and industrial waste with recovery of construction and demolition waste for use as on-site engineering materials.

An Environmental Impact Statement (EIS) in relation to the proposed landfill development has been prepared by *greenstar* to accompany the planning application to Cork County Council (CCC).

The EIS describes the receiving or existing environment into which the proposed development will be placed. Potential impacts resulting from the development are outlined in the EIS together with proposed mitigation measures, which will prevent or reduce the identified potential impacts.

This document summarises the EIS and describes the scale and scope of the proposed landfill development.

Proposed Landfill Development

The Ballyguyroe development site is located on the lower slopes of the Ballyhoura Mountains just south of the Cork-Limerick county boundary

(see Figure 1). The waste disposal facility will be located on a 28.3 hectare (70 acre) green field site adjacent to a recently closed local authority landfill and accessed from the N73 National Secondary Road via the L1329 county road. The Farahy River abuts the eastern site boundary.

The development of the residual waste facility is consistent with the current development planning policy in County Cork and is compatible with the objectives and aspirations of both regional and national waste management strategies.

The landfill has been designed to accommodate up to 145,000 tonnes per annually of waste arising in the surrounding region.

The waste disposal area will consist of eight cells developed in four separate phases, with each phase lasting about 2.5 years.

The facility will operate under a waste licence to be issued by the Environmental Protection Agency (EPA). Following closure the landfill will be returned to agricultural or amenity use.

Existing Environment

The development site is set in poor quality farmland in the townland of Ballyguyroe North. The area around the site is dominated by commercial forestry, predominantly owned by Coillte.

The population density in this part of North Cork is low. There are no houses within 500 metres of

the landfill footprint and only 5 houses within 1 kilometre.

Annual rainfall in the order of 1,080mm is expected at the site. The main wind directions are from the south, west and southwest.

Dust and air samples have been collected at the development site and the results were broadly typical of a rural environment. Noise measurements have been made at nearby locations and the baseline values are representative of a rural setting.

Drainage from the site flows via a number of small streams and drains into the Farahy River which forms part of the Blackwater Catchment. The water quality in the Farahy is generally good in terms of chemicals, metals and hydrocarbons and recent monitoring associated with the adjacent closed local authority landfill has not found any indication of contamination as a result of the closed landfill.

The local soils are comprised of gleys, characterised here by their high clay content, high water table and poor drainage. The shallow mineral soils are derived from a thick layer of glacial overburden consisting of pebbles and boulders set in a clay matrix (boulder clay). Boreholes completed on the site indicate an overburden thickness in the range 10–30m. The glacial overburden overlies sandstone bedrock.

Laboratory tests have indicated that the overburden at Ballyguyroe has a low permeability of generally less than 1×10^{-9}

m/second, which is in the lower range of permeability values for Irish overburden deposits.

The extensive tests carried out on the development site indicate that the geological and hydrogeological conditions at Ballyguyroe accord with the recommended criteria set out in the national guidelines for the location and development of landfill sites.

The proposed development site is not affected by any nature conservation designation. However, four sites of nature conservation occur within 5 km (3.1 miles) of the landfill. These are Ballyhoura Mountains, Ballintlea Woods, Castleoliver Woods and Carrigeenamronety Hill.

Mammal, bird and flora surveys indicate that the area to be developed is not of high ecological value. The hedgerows at the southern boundary of the site are of some local ecological interest. The valley associated with the River Farahy on the eastern side of the property contains a semi-natural woodland of considerable ecological interest. The river valley provides a habitat for a number of species of mammal and the river itself is utilised by a protected species, the otter.

Vehicular access from the N73 National Secondary road will be via a 5.6 kilometre stretch of County road (L1329). The junction between the N73 and the L1329 is currently in poor condition but the local authority has plans to upgrade this section of the N73 and improve the junction. Most vehicular traffic at the site will be bulk haulage vehicles.

The most up-to-date NRA published data from the N73 in the vicinity of the development site is from 2001 and indicates a two-way Annual Average Daily Traffic flow of 3,761 with an HGV content of 14.5%. A traffic survey, carried out as part of this EIS recorded an average range of 3,120 to 4,135 vehicles per day on the N73 at the junction with the L1329.

The site is situated on south facing slopes in typical upland rural and an otherwise unremarkable landscape. The site is strongly screened from the west, north and east by coniferous forestry. The site is most visible from limited and locally elevated areas of the agricultural landscape to the south of the site. However, even in these instances the existing and more elevated landfill facility is not especially visible or distinctive. There are no specific landscape planning or amenity constraints pertaining to the site.

The development will not impact on any recorded archaeological monuments. The site at Ballyguyroe is an area of marginal settlement, capable of supporting hill pasture and forestry. The adjacent county boundary is a natural border, which is marked at points by standing stones, which suggests a regular human presence in the vicinity from prehistoric times. The present extensive system of land enclosure is of relatively modern origin; prehistoric and medieval settlement may have consisted of seasonal summer pasturing of livestock, on mainly unenclosed land.

There is no visible evidence of medieval and prehistoric activity within the site to be developed. However, there is a likelihood that some such activity will be encountered, as the development will require significant ground disturbance over a wide area. Any potential archaeology is likely to reflect low intensity activity of limited extent. For example, fulachta fiadha have been recorded in the vicinity.

The nearest site of tourist interest to the proposed landfill is the Ballyhoura Mountain Reserve located several kilometres to the north. The reserve is traversed by the Ballyhoura Way, a marked route, 90 kilometres long, following the path taken by the Irish Chieftain O'Sullivan Beara who marched from Glengarriff to Leitrim in the early 17th century.

Description of the Proposed Development

The waste disposal facility will be located on a 28.3 hectare (70 acre) green field site adjacent to a closed local authority landfill.

The landfill footprint will be located in the centre of the land holding and will occupy approximately 11 hectares (27.2 acres). The footprint will consist of four separate phases each containing two cells (see Figure 2).

The facility will include an administration centre together with weighbridges, wheelwash facilities, waste quarantine and waste inspection areas. The entire site will be securely fenced.



C o . L i m e r i c k

C o . C o r k

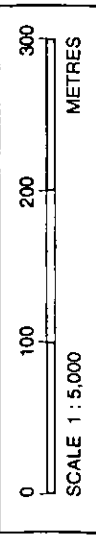
Existing
Council
Landfill

Surface Water Access
Road and Service Ducts

Clay
Embankment

LEGEND

- Site Boundary
- - - County Boundary



**Ballyguyroe Residual Landfill Project
General Site Layout**

Job No. C002336
Date: June 2001

Figure 2

White
Young
Green

Area Reserved for Future
Development of Reed Beds

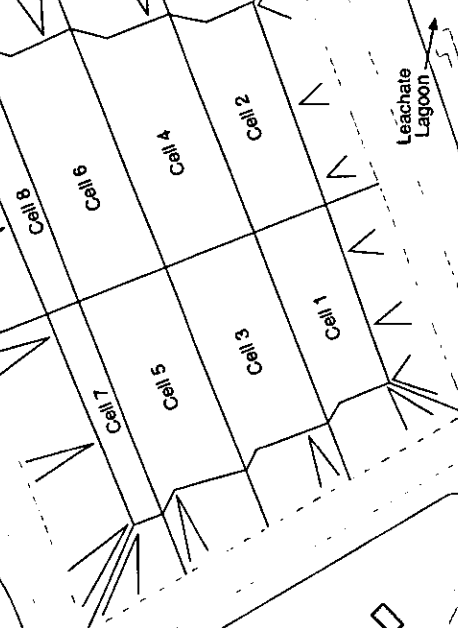
Gas Flare
Location

Leachate
Lagoon

Storm Water
Retention Pond

Administration
Complex

Proposed
Entrance



It is proposed to progressively develop the waste disposal area from south to north with a progressive capping programme designed to minimise the area of exposed waste.

The landfill will be contained by a clay layer and a liner. Leachate generated on the site will be collected in a holding tank and tankered from the site to an approved waste water treatment plant.

Surface water generated at the site will be directed to a storm water pond for settlement and then directed to a treatment system where colloidal clay particles will be removed prior to discharge to the drainage network and the River Farahy. The capacity of the pond will ensure that the discharge rates from the development are comparable to the existing flow conditions.

Initially, landfill gas will be passively vented to the atmosphere. In due course and in accordance with EPA requirements, an active gas flaring system will be installed and, if viable, the collected gas may be utilised beneficially.

The facility will accept treated residual waste with recovery of construction and demolition waste for use as on-site engineering materials from the surrounding region, which includes Cork, Limerick, South Tipperary and west Waterford. The site opening hours will be between 0800 to 1800hrs Monday to Saturday. The site will not operate on Sundays and Bank Holidays.

Potential Impacts, Mitigation Measures and Likely Significant Effects

The proposed landfill development has the potential to impact on the receiving or existing environment at Ballyguyroe. However, by designing the landfill to best international standards and by operating the facility under a Waste Licence to be issued by the EPA the potential for impacting on the environment is greatly reduced. Also, the implementation of a range of mitigation measures at the construction stage will ensure that the landfill can be operated without causing nuisance in this rural environment.

Operating the landfill to the standards set by the EPA in the Waste Licence together with the ongoing environmental monitoring programme will ensure that odours and dust do not exceed acceptable limits.

Minor increases in noise levels will be experienced along the approach road due to increased traffic numbers, particularly during the construction phases.

Modern bird and vermin control measures will be employed to ensure that the facility does not become a source of unwanted birds, flies and rodents. The operation of the landfill will incorporate a range of measures to control wind blown litter. The use of registered hauliers only to deliver waste to Ballyguyroe will prevent fly tipping.

The development will require changes to the existing drainage network. These changes will be kept to a minimum and existing flow rates leaving the site will be maintained by the installation of a stormwater pond with a controlled discharge that will attenuate the effects of flood events. The pond and associated treatment system will remove suspended clay and silt particles prior to discharge to the drainage network and so protect the water quality in the Farahy River.

The landfill leachate does not pose a risk to groundwater or local wells due to the thick layer of low permeability overburden that exists at Ballyguyroe. This natural protection will be supported with the provision of a liner and engineered clay layer to contain the leachate as required under the EU Landfill Directive. The leachate will be tankered to an appropriate waste water treatment plant and *greenstar* has received written confirmation from Cork Corporation, Limerick County Council and Shannon Environmental Services of their willingness to discuss the feasibility and possibility of the acceptance of leachate from the site, subject to the agreement of commercial and other terms.

The development involves the removal of a number of habitats including wet grassland, wet heath, improved grassland, hedgerows and associated ditches. The removal of these habitats is not a significant botanical loss. The establishment of native woodland in the buffer zone and effective management of the woodland in the Farahy River valley will significantly reduce the impact on the ecology of the site.

Waste will arrive at the facility from transfer stations in compactor lorries carrying up to 20 tonnes. The development is not expected to have a significant impact on the roads in the vicinity of the site. It is proposed that there will be improvement works made to the junction of the N73 and the L1329 as well as to the highway of the L1329 country road and the access road to the proposed landfill facility from the L1329.

A wide belt of predominantly native ash woodland will be established on the western boundary of the landfill area. The planting will provide a new area of deciduous woodland involving the planting of over 10,000 individual plants.

To the south and east of the landfilling area, existing valley side planting will be augmented with a native mix similar to the existing planting. This will entail planting of birch, hazel, holly and rowan with a gradual progression from birch dominance in the north to hazel dominance in the south. The planting will be provided along the site boundary to give immediate screening in advance of landfilling operations.

A large wetland type lagoon will be provided near the southern boundary and planting surrounding this feature will be appropriate to a wetland location, including wildflower meadow and reed edge planting. In the longer term these measures will augment habitat diversity in the immediate area of the development.

The site offers excellent potential for inherent screening from existing planting and topography

and is not visible from the north or west. With establishment of the comprehensive planting the site will present a strongly planted external view from the south. As such, no significant adverse visual impact is expected even at initial stages and no appreciable longer term or lasting impact will arise.

A comprehensive archaeological assessment will be carried out in areas to be disturbed by the landfill development and associated activities such as roads, drainage channels and ponds. Should any archaeological material be uncovered steps will be taken, in consultation with Dúchas, to recover such material in an appropriate manner.

EIS NO: 2055

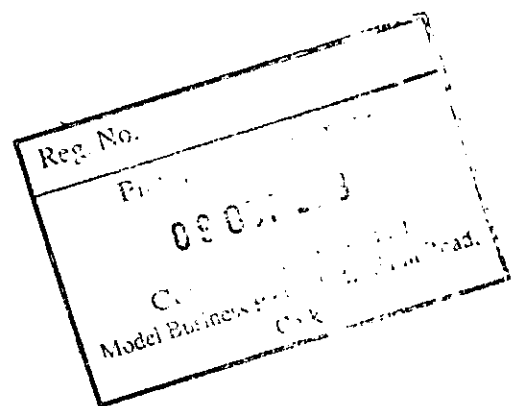
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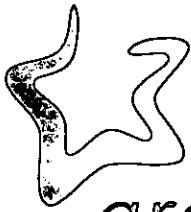
In relation to this EIS, on behalf of *greenstar*, we wish to refer to the earlier application, planning reg. ref. N/01/3729, and to the earlier EIS lodged with the application at that time.

The EIS contained in this application is substantially the same as that submitted in support of the earlier application but has the benefit of additional environmental baseline information collected over the intervening period together with additional environmental information gathered in the course of correspondence with the EPA in relation to the waste licence application for this site.

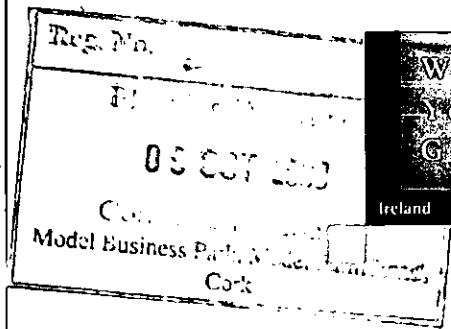
Over the intervening two year period there have been some changes in the circumstances surrounding the development. These include the closure of the neighbouring local authority landfill which results in the lessening of certain impacts e.g. noise and there have also been some changes to visual, regulatory and traffic matters.

None of the environmental data included in this EIS highlights any significant change in environmental emissions from those described in the earlier EIS.





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Environmental Impact Statement



Biological
Residual Landfill

for a

**Residual Landfill
at Ballyguyroe,
County Cork**

October 2003

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1. PREAMBLE TO THE ENVIRONMENTAL IMPACT STATEMENT

1.1 Landfill Proposal

greenstar intends to establish a regional landfill facility for the disposal of treated residual municipal (including commercial) and industrial waste^{Note 1} with recovery of construction and demolition waste for use as on-site engineering materials at Ballyguyroe, Mallow, Co. Cork (Figure 1.1.1). The facility will be designed to receive up to 145,000 t/a of treated residual waste from County Cork and surrounding counties and will have an operating life of approximately 10 years.

The landfill will be located on a 28.3 hectare (70 acre) green field site at Ballyguyroe adjacent to a closed municipal waste landfill previously operated by Cork County Council (Figure 1.1.2). The *greenstar* landfill footprint (disposal area) will cover approximately 11 hectares (27 acres). The landfill will consist of 8 separate cells developed in 4 phases. Each phase, consisting of two cells, will last approximately 30 months.

On closure, the landfill area will be re-instated and integrated into the surrounding landscape.

1.2 Landfilling In Modern Waste Management

1.2.1 National Strategy

Landfilling is an integral and necessary element of modern waste management. Landfilling is recognised as such in the Government's waste management policy as set out in a number of documents including 'Recycling for Ireland (1994)' and 'Sustainable Development: A Strategy for Ireland (1997)', 'Waste Management: Changing Our Ways' published by the Department of the Environment and Local Government in September 1998 and 'Preventing and Recycling Waste a policy statement - Delivering change' published by the Department of the Environment and Local Government in March 2002.

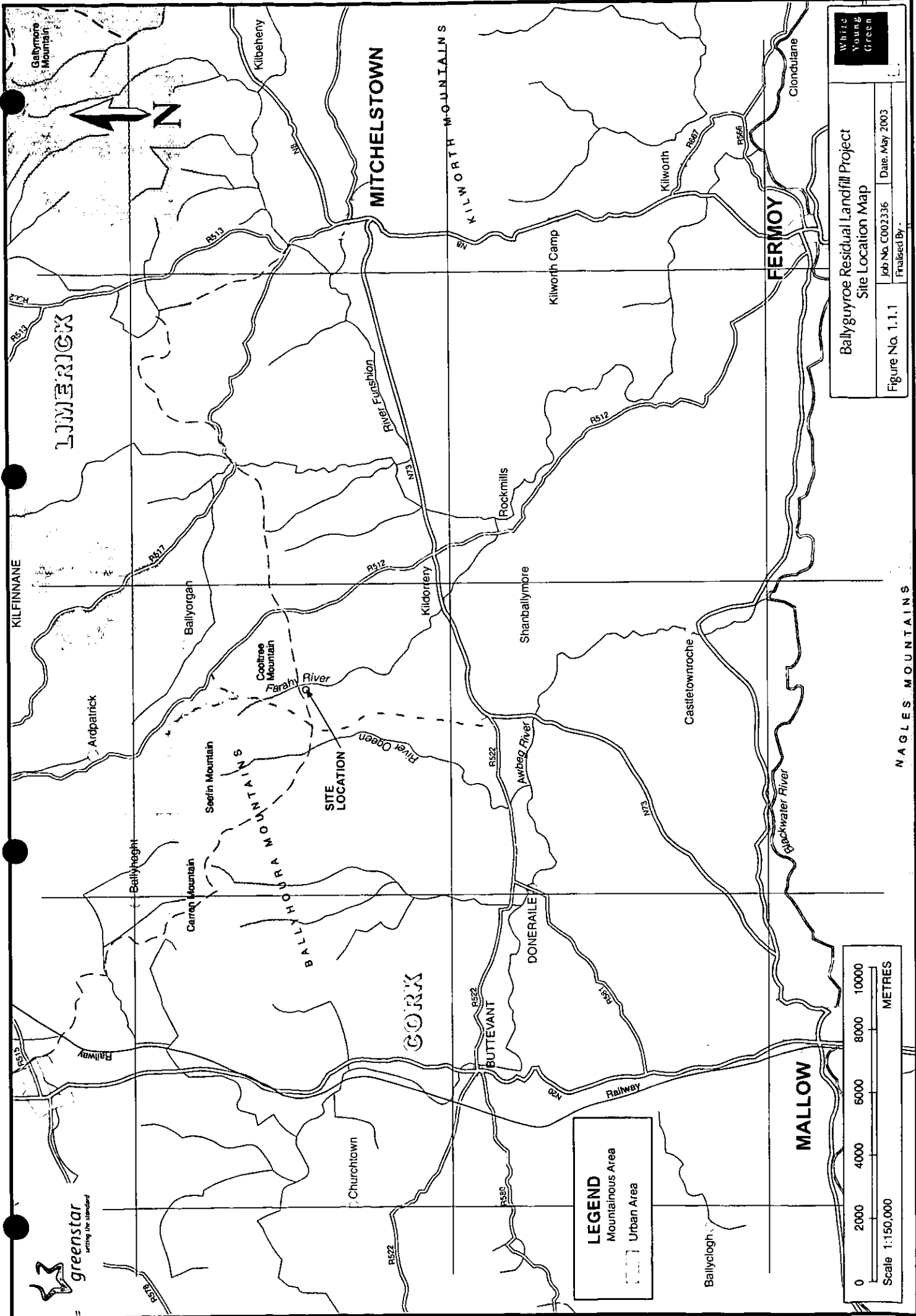
Landfilling is also consistent with the internationally recognised hierarchy of waste management options.

The *greenstar* residual landfill facility at Ballyguyroe will comply with the type and scale of landfill facility promoted in the Government's 1998 policy statement on waste management; 'Changing Our Ways' and will be one of the 20 state-of-the-art municipal landfill facilities with high standards of environmental protection envisaged in 'Changing Our Ways'.

1.2.2 Regional and Local Strategies

The Waste Management Strategy for the Cork Region was published in May 1995 while the Waste Management Plan for County Cork was published in May 1999. Action Item No. 43 of the County

^{Note 1} Treated residual waste hereafter in the EIS will mean treated non-hazardous residual municipal, commercial and industrial waste.





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setting the standard

C o . L i m e r i c k

C o . C o r k



Farahy River

Existing Council Landfill

Surface Water Access Road and Service Ducts

Clay Embankments

Gas Flare Location

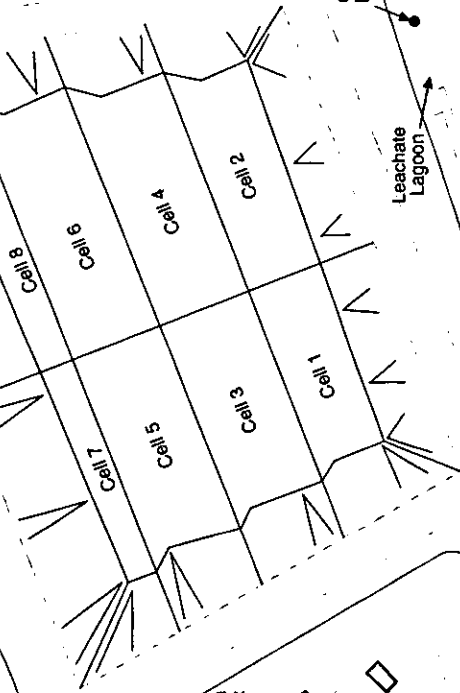
Area Reserved for Future Development of Reed Beds

Leachate Lagoon

Storm Water Retention Pond

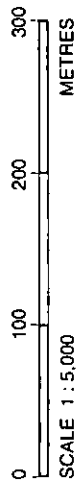
Administration Complex

Proposed Entrance



LEGEND

- Site Boundary
- - - County Boundary



Ballyguyroe Residual Landfill Project

General Site Layout

Figure 1.1.2

Job No. C002336
Date: May 2003

White
Young
Green

Cork Plan provides for a new local authority landfill for the disposal of treated residual waste in the county.

Cork County Council's waste management policy favours a landfill at Bottlehill, which was designated as a landfill site following a variation of the County Development Plan in May 2001. The Environmental Protection Agency (EPA) has issued a draft licence for the planned landfill at Bottlehill. An oral hearing was conducted regarding the draft licence in December 2002 and January 2003 and a decision is expected later in the year. An Bord Pleanála has also requested an oral hearing for the Bottlehill site and this is expected to be held later in the year.

greenstar proposes to develop and operate a treated residual waste landfill at Ballyguyroe as part of the company's integrated waste management infrastructure in the south of the country (Figure 1.2.1). The company has applied for a waste licence for the Ballyguyroe facility and is expecting a draft licence to be issued by the EPA in the short term.

In doing so, *greenstar* notes the provisions of Section 26(2)(c) of the Protection of the Environment Act, 2003. The Section provides that where there is a conflict between the objectives of a development plan and the objectives of a waste management plan, the objective in the waste management plan shall override a development plan objective, irrespective of whether a development plan is subsequent to a waste plan or not.

In addition, the Section provides that "an application for permission under Part III of the Planning and Development Act 2000 shall not be refused by a planning authority or An Bord Pleanála solely on the grounds that the development to which the application relates is not specifically referred to in the waste management plan in force in relation to the functional area of the planning authority if the planning authority or the Board, as the case may be, considers the development will facilitate the achievement of the objectives of the waste management plan."

greenstar believes its proposal is necessary to the achievement of the region's waste management plan.

The waste catchment of the proposed facility at Ballyguyroe is Counties Cork, Limerick, South Tipperary and Waterford. The facility will accommodate treated residual waste arisings from this catchment. The waste types and quantities received at Ballyguyroe will reflect the maturity of the recycling programmes in operation in the different waste management regions which are set out in the relevant waste management plans.

The EPA in its recently published National Waste Database Report for 2001 recommends;

'The interregional movement and treatment of waste should be provided for in the revised regional waste management plans in appropriate circumstances.'



Waste Management Regions

Dublin
North East Region
Wicklow Region
South East Region
Midlands Region
Northern Ireland

 **greenstar**
National Waste Management Infrastructure

Job No. C002336

Date, Sept. 2003

Finalised By:	
---------------	--

Where
Young
Giraffe

The *greenstar* landfill at Ballyguyroe will be fully consistent with this EPA recommendation lying as it does on the borders of counties Cork and Limerick and also easily accessible to the other waste management regions.

As such, it will be fully consistent with the application of the proximity principal in the provision of a state-of-the-art landfill facility to receive treated residual waste arisings from adjoining counties on an agreed basis.

1.3 Need for the Ballyguyroe Landfill

The landfill proposed by *greenstar* will accept up to 145,000 t/a of treated residual waste for disposal. The development meets an urgent need for additional landfill capacity in the province of Munster, created by unanticipated waste growth since the drafting of the relevant local authority regional waste plans, all of which are based on 1998 or earlier waste data. It is proposed that Ballyguyroe landfill will meet the need for extra waste disposal capacity in the following counties:

Cork Region (City and County)	100,000 tpa
County Limerick	20,000 tpa
South Tipperary	20,000 tpa
County Waterford	5,000 tpa

Waste Growth Rates

The most recent national waste statistics, published by the EPA in July 2003, confirm that waste growth rates have increased far in excess of that anticipated during the preparation of regional waste plans, with an average municipal waste growth rates of 9.5% per annum for the period 1999 to 2001, co-inciding with increased economic activity over that time.

For municipal waste and construction/demolition waste a very close link between economic activity and waste generation can be demonstrated (EEA, 1999). This fact was recognised by the Cork local authorities in their 1999 Preliminary Landfill Site Selection Report (PLSSR) prepared as part of the Cork Waste Management Strategy. They identified the annual waste growth rate of 8% between 1993 and 1997 as being linked to the high economic growth rate in Ireland over that period and noted that the waste growth rates were clearly in excess of the 3.5% assumed in the formulation of the 1995 Waste Management Strategy. The PLSSR, which identified Bottle Hill as a potential suitable residual landfill for Co. Cork, adopted new growth rates in its calculation of projected waste generation in the Cork Region up to 2022. These new growth rates are presented in Table 1.3.1 below and are also used here by *greenstar* in the calculation of waste available for disposal at the proposed Ballyguyroe facility (Appendix 1.3.1). The growth rates were based on GNP predictions at that time (1999), and give conservative results when applied now as the most recent predictions of GNP annual growth rates for the period 2005-2020 are even higher (ESRI, July 2003).

Table 1.3.1 Predicted Waste Growth Rates County Cork (1999 Preliminary Landfill Site Selection Report)

Year	Predicted Waste Growth Rate (Cork Local Authorities, 1999)
2000 - 2004	5.0%
2005-2010	4.2%
2011-2015	3.5%
2016-2022	2%

Need for Supplemental Landfill Capacity in Cork Region

The planning phase for the proposed Bottlehill landfill has progressed for longer than expected. The site, which was initially identified in 1999 as being a suitable location for a residual landfill for the Cork Region, is now unlikely to be developed before 2006. A mechanical separation plant, to remove recyclables from the waste and treat it prior to landfilling at Bottlehill, was proposed for the Kinsale Road landfill site in Cork City. The elected members of Cork Corporation ultimately rejected this proposal and delays in implementing this element of the Waste Management Plan are now inevitable.

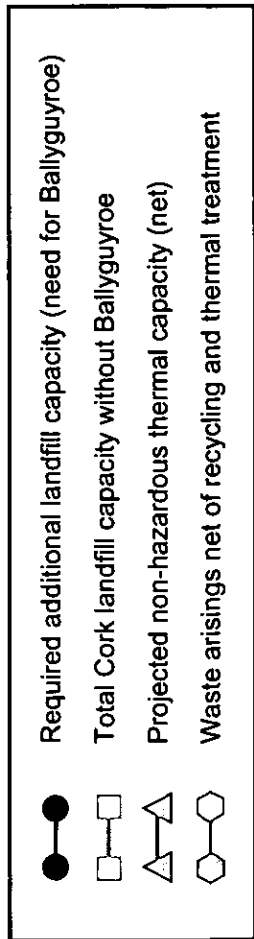
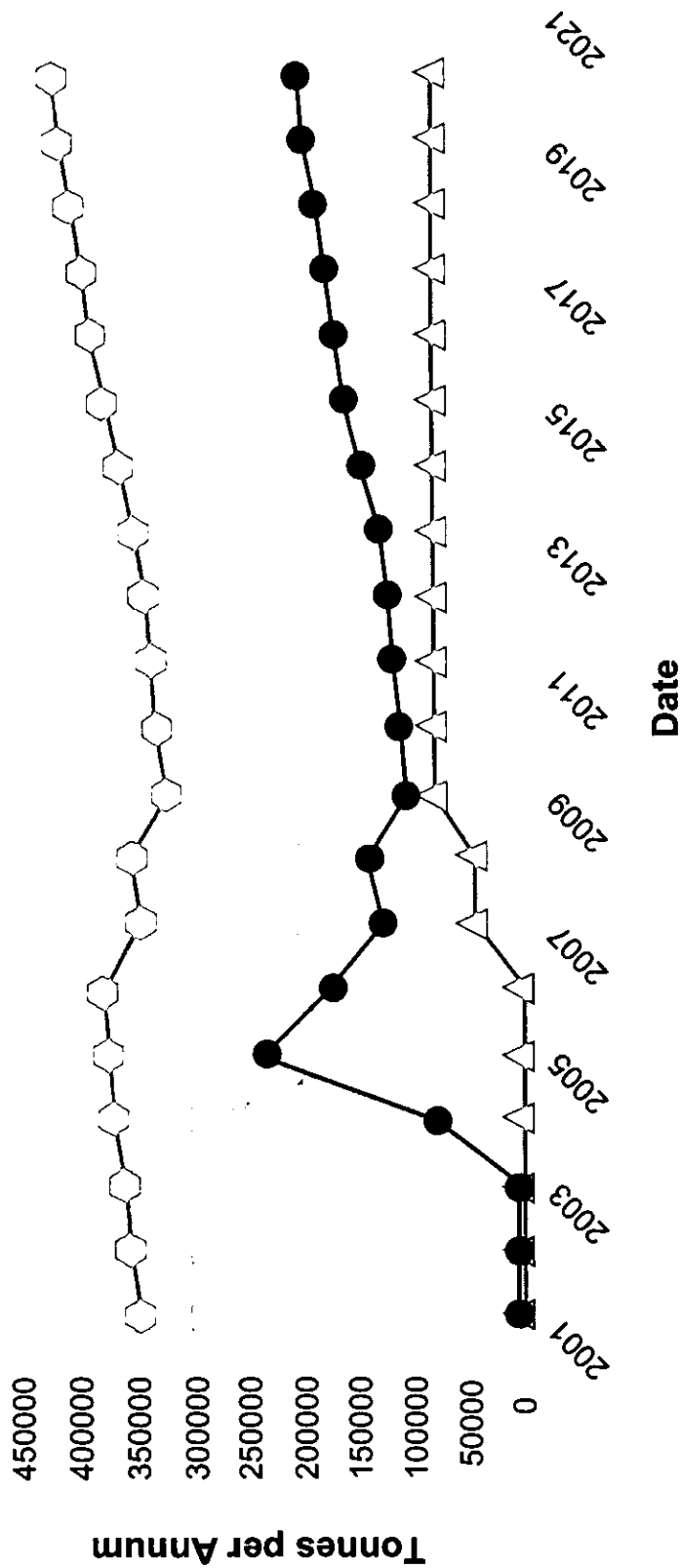
However in assessing the need for supplemental landfill capacity in the Cork Region *greenstar* has taken the conservative view that notwithstanding the delays to date, the target recycling levels will be achieved on time and there will be sufficient waste treatment capacity available to Cork County Council to comply with EU requirements that all waste accepted at Bottlehill will be treated, allowing it to operate at full capacity from its opening date.

Using the most recently published data for waste arisings in County Cork (EPA, July 2003), *greenstar* has analysed the need for landfill capacity in Co. Cork, applying the following assumptions:

- Waste growth rates will be as predicted by the Cork Local Authorities in the Preliminary Landfill Site Selection Report; and
- Bottlehill landfill will commence operation in 2006 and operate at full licensed capacity from its opening date; and
- Notwithstanding the delays in the provision of planned infrastructure, the Cork regional MSW recycling target of 35% will be achieved by the target date of 2013; and
- Thermal treatment capacity will be available for non hazardous waste in Cork from 2008.
- Existing landfills in Youghal, Rossmore and Kinsale Road will continue to operate until the beginning of 2006, 2005 and 2005 respectively.

The full analysis is presented in Appendix 1.3.1 and is summarised on Figure 1.3.1.

Projected Waste Flows Cork Region (based on 2001 EPA National Waste Database Report)



Over the proposed operating period of Ballyguyroe landfill (2006 to 2015) there will be an average annual disposal requirement for an additional 127,838 t/a of treated residual waste from the Cork Region alone. It is proposed that the Ballyguyroe facility will manage 100,000 t/a of this surplus with recycling and treatment capacity provided by *greenstar* at its Forge Hill and Sarsfield Court materials recovery facilities in Cork.

Need for Supplemental Landfill Capacity in South Tipperary

South Tipperary is part of the South East waste management region. The landfill facility planned to meet the residual waste needs of the county is located at Hardbog, Grangemockler. Difficulties with the conditions of the waste licence for the proposed site and a judicial review have led to a long delay in the construction of the landfill which may ultimately lead to the abandonment of the project. South Tipperary County Council estimates that there is approximately 18 months capacity left in its only remaining landfill at Donohill (EPA waste licence Ref. No. 74-1). In the event of the increasing likely scenario of no landfill in South Tipperary post closure of Donohill, there will be a requirement for a minimum of 50,000 t/a of landfill capacity and that is assuming all recycling targets are met (Appendix 1.3.2). Even allowing for the eventual opening of Hardbog in 2009 and the provision of the planned thermal treatment plant for the South East region within the operating life of Ballyguyroe, there is still an average annual disposal requirement for an additional 23,000 t/a of treated residual waste from South Tipperary. Ballyguyroe is in an appropriate location to service this need for additional landfill capacity. It is proposed that up to 20,000 t/a will be delivered to Ballyguyroe from South Tipperary.

Need for Supplemental Landfill Capacity in Limerick and Waterford

The development of a proposed landfill at Slieve Felim in Co. Limerick has encountered difficulties that have led to the abandonment of the project. The proposed thermal treatment plant in the greater Limerick area is still at the very early stages of planning, with a minimum lead-in time likely to be 7 to 8 years. Ballyguyroe is strategically positioned to cater for growth in residual waste resulting from delays to the provision of infrastructure and to service the needs of Limerick, a major commercial and industrial area. It is proposed that c20,000 t/a of treated residual waste will be sourced from the Limerick area.

Waterford County is part of the South East Region. The facility selected to serve County Waterford is located at Garrynagree, west of Dungarvan. A judicial review process has led to a delay in progressing the development of this facility. It is proposed that up to 5,000 t/a of treated residual waste will be delivered to Ballyguyroe from *greenstar's* waste recovery operations in Waterford.

***greenstar's* Waste Management Strategy for Munster**

greenstar is committed to the development of an integrated waste management infrastructure comprising of all elements of the waste hierarchy, in co-operation with local authorities.

Waste accepted at Ballyguyroe will be treated residual waste from which recyclable materials have already been removed. Cork County Council and An Bord Pleanála have already granted planning permission to *greenstar* (Munster) for two materials recovery facilities located at Forge Hill and Sarsfields Court. Although not specifically identified in the Regional Waste Plan, these facilities will play a fundamental role in the treatment and recovery of the significantly higher than planned waste volumes arising in the county. Waste recovery operations are also operated by *greenstar* (Munster) in Waterford and Limerick.

The company provides waste services to a large number of commercial and industrial entities in the Munster region that represent significant levels of foreign direct investment and local employment. Examples include Eli Lilly S.A., Port of Cork Company, E.M.C. Ltd., Pfizer Ireland Pharmaceuticals Ltd., Freefoam Manufacturing Ltd., University of Cork, Rohcon Ltd., Amersham Health and De Puy (Ireland).

The development by *greenstar* of a state of the art landfill at Ballyguyroe is an investment in Munster which provides a key element of the Government's strategy for waste management in this region. The National Development Plan (NDP) states

"appropriate waste management infrastructure is vital not only for environmental protection reasons, but also for industrial development reasons, where lack of appropriate facilities may hamper development. The recent levels of economic growth have placed a significant strain on existing waste infrastructure and extensive investment is now required to provide the necessary infrastructure. If this investment does not take place in a timely fashion, future economic development could be jeopardised. This is therefore a key priority infrastructure in the NDP."

The proposed Ballyguyroe waste facility meets both national objectives and regional needs in providing a state of the art landfill for treated residual wastes in Munster.

1.4 Planning Context.

1.4.1 1996 County Development Plan

The *greenstar* site is positioned close to the border between Counties Cork and Limerick and is located on the boundary of the Mallow and Mitchelstown Areas contained in the 1996 North Cork County Development Plan. The *greenstar* site adjoins the former local authority landfill at Ballyguyroe.

A site selection study conducted in 1993 concluded that Ballyguyroe was the preferred location to site a landfill development in North Cork and based on this an EIS prepared by Cork County Council was certified by the Minister for the Environment on 7th June 1995.

Specific reference to the Ballyguyroe area is given in Section 4 'Infrastructure' of the 1996 Development Plan where it is recognised as being suitable for the purpose of landfilling. Paragraphs 4.11 and 4.12 of the 1996 Plan state :

"4.11 The Council has been operating a landfill site on 30 acres at Ballyguyroe, Kildorrery, since 1990. It is now proposed to extend this site to 80 acres at the same location. This site will accommodate the waste needs of North Cork for the next 25 years.

4.12 This site was chosen by a firm of consultants employed by the Council to determine the most suitable site available in the division for landfilling purposes. Their recommendations have been approved by the Northern Committee, and an EIS prepared by the consultants has been submitted to the Department of the Environment for certification."

1.4.2 Variation to the 1996 County Development Plan

Cork County Council's waste management plan now favours a landfill site at Bottlehill in the centre of the County and a variation of the 1996 County Development Plan was adopted in May 2001 to allow the Council proceed with a landfill development at Bottlehill. This variation involved the omission of the above referenced paragraphs from the 1996 development Plan and the insertion in their place of the following paragraph:

"4.11 In accordance with the provisions of clause 6.3 of the County at Large Volume, the 1998 National waste strategy document "Changing Our Ways" and the Cork County Waste Management Plan 1999, it is proposed to develop a residual waste landfill site at Bottlehill. The landfill will form an essential part of the overall county waste strategy and will be developed in tandem with a Waste Recovery Facility (WRF), bring sites, civic amenity sites and transfer stations."

The 2001 Amendment to the 1996 County Development plan is silent on Council's landfill development at Ballyguyroe.

1.4.3 2003 County Development Plan

The 2003 County Development Plan confirms the 2001 Variation and remains silent on the Council's Ballyguyroe landfill.

The 2003 County Development Plan does not place any restrictions on the development of private landfills in addition to that proposed for Bottlehill or indeed private waste recovery facilities in addition to the single waste recovery facility specified.

Planning permissions for at least two private waste recovery facilities have been granted by Cork County Council since the County Council's own Waste Recovery Facility (MRF) was first identified as an objective in the Cork Development Plan. It should be noted that the drafting of Section 4.11 of the 1996 Cork Development Plan and its subsequent inclusion in the 2003 plan occurred prior to the publication of the 2001 EPA National Waste Database, in July 2003, which reported a 28% increase in waste landfilled in Co. Cork over the three year period from 1999 to 2001.

1.5 Outline Description of the Proposed Development

1.5.1 Facility Design Parameters

The landfill will be located on a 28.3 hectare (70 acre) green field site adjacent to a closed municipal waste landfill previously operated by Cork County Council, situated on the lower southern slopes of Coolfree Mountain, which is at the eastern end of the Ballyhoura Mountain range. The property is bounded to the east by the Farahy River.

The landfill footprint (disposal area) will cover approximately 11 hectares (27 acres). The landfill will consist of 8 separate cells developed in 4 phases. Each phase, consisting of two cells, will last approximately 30 months. The landfill will consist of a deep excavation into the local clay to develop the tipping capacity. The excavation will be lined with a HDPE liner to contain the deposited waste and the leachate generated by the waste and rainfall. The landfill surface will have a post settlement elevation of 222mOD at its highest point. On closure, the deposited waste will be covered with a clay cap and restored and integrated into the surrounding landscape.

greenstar has an interest in all of the site lands outlined in red on Figures 1.1.2.

1.5.2 Existing Land Use

Population density is low in the area (18 people/km²). There are no occupied dwellings within 500 metres of the landfill footprint and only 5 within 1 km. Local village settlements include Ballyorgan 4km to the north, Kildorrery 5.5km to the southeast, Shanballymore 6.5km to the south, Doneraile 8.5km to the southwest and Ardpatrik 7km to the northwest (Figure 1.1.1).

The site is currently used for low intensity cattle and sheep grazing. The naturally low permeability subsoils found on the property restrict infiltration of rainfall and subsequently the soils are poorly drained and have a limited value in agricultural terms.

The site is bounded to the north by an closed landfill operated by Cork County Council (Northern Division). This landfill was in operation for approximately 10 years for the receipt of non-hazardous municipal solid waste and was granted a waste licence (No. 2-1) by the EPA in December 1999. The landfill was closed for refuse intake in September 2001 and is now fully capped. Cork County Council are undertaking the necessary works for the aftercare phase of the landfills life span. .

The Ballyhoura Mountain range is dominated by large tracts of Coillte owned forests. The land to the north, east and west of the site contains mature coniferous forest. The land immediately to the east and south of the site contains some natural heathland and some pasture land.

1.5.3 Environmental Protection Measures

The geological setting and design parameters for the facility comply with the EU Landfill Directive 1999/31/EC. Key elements of the engineering design address leachate management, the protection of soil and water, gas control and the avoidance of nuisances and hazards.

Soil, groundwater and surface water will be protected during the operational phase by a geological barrier (clay layer) and the HDPE liner and on closure by a combination of the geological barrier and a final capping layer.

Appropriate measures are proposed to control the accumulation and migration of landfill gas. It is intended that this potential non-fossil fuel energy source will be beneficially utilised during the active life of the landfill and for a time following closure. This will contribute positively to the national obligations regarding control on production of 'greenhouse' gases under the Kyoto Protocol.

The design of the waste facility includes measures to minimise nuisances such as odours, dust, litter, vermin, noise and fires. The landfill is located in a rural area with low density population and the footprint is located greater than 500 metres from the nearest residence. A comprehensive landscaping programme and a high standard of operation, ensures that the landfill will not be a source of nuisance for the local community. The limited height of the landfill and the surrounding forestry provide relief from any potential intrusion into the local landscape and this will be supported at the outset by the proposed planting and landscaping.

Leachate will be collected and tankered to an approved wastewater treatment plant.

Surface run-off from the facility will be diverted to a storm water retention pond. Here the water will be left to settle before any remaining suspended particles are treated prior to discharge to the Farahy River via a small stream to the south of the site.

1.5.4 Site Facilities

The facility will be laid out and landscaped to present a high quality environment for employees and visitors alike.

The administration centre will consist of pre-fabricated secure modular units, a plant store and a maintenance building and will include a public information room and seminar type facilities.

A private asphalt road will serve the administration area and leachate haulage. The landfill will be accessed by an internal surface dressed road with a hardcore road providing access around the property for rough terrain vehicles.

Waste control infrastructure will include a double weighbridge, a weighbridge control building and waste quarantine and inspection areas.

Leachate will be stored in a leachate lagoon with a dedicated tanker loading area.

The facility will be securely fenced with appropriate boundary notices indicating the nature of the activities being carried out at the site.

A wheel-wash will be provided to prevent dirt being carried onto public roads.

1.5.5 Traffic Access to the Landfill

Vehicular traffic at the site will primarily consist of bulk haulage vehicles. Vehicular access from the N73 Mitchelstown to Mallow national secondary road will be via link road no. L1329 and the existing entrance road serving the County Council landfill site. The L1329 carriageway will be widened in places and passing bays will be installed at strategic locations to accommodate heavy goods vehicles (HGVs) accessing the site from the south.

Users of the site will be required (by way of contract) to follow specific traffic flow arrangements regarding the county road network. The link road L1329 (Co. Limerick) directly north of the site entrance is narrow and will not be used by HGVs to access the site. Similarly, other county roads between the N73 and the site will not be used by site related HGV traffic.

Only licensed waste contractors, local authority vehicles and waste hauliers will be allowed to access the landfill. Waste contractors using the site will be required to enter into a contractual agreement with *greenstar's* covering environmental and traffic management.

1.5.6 Other Infrastructure

The neighbouring County Council landfill (now closed) and the adjacent farmyard are served by single-phase electricity. The nearest 3-phase electrical infrastructure is 4.5 km south of the site. Arrangements will be made with the ESB to bring 3-phase power to the site, if required.

Arrangements will be made with a telecommunications company to bring telephone, fax and e-mail lines to the site.

There are no public water mains in the vicinity of the site. It is assumed that all of the domestic dwellings and farms in the area are served by private wells. Water will be provided at the site by means of a deep well. High levels of manganese are commonly found in groundwater in the area and should this occur in the supply well at the site, drinking water will be supplied by a bottled water company on a contract basis.

There are no public sewers in the Ballyguyroe area. Private dwellings in the area probably therefore have their own septic tanks or other sewage treatment systems.

A small scale sewage treatment facility (Biocycle or equivalent) will be installed at the site to cater for toilet and canteen waste water. This system will discharge to the leachate lagoon and will be collected with the leachate and transferred to an approved waste water treatment plant.

greenstar has received written confirmation from Cork Corporation, Limerick County Council and Shannon Environmental Services of their willingness to discuss the feasibility and possibility of the acceptance of leachate from the site, subject to the agreement of commercial and other terms (Appendix 3.1.14).

1.6 Alternatives

1.6.1 Alternative Waste Management Practices

Modern waste management is directed at minimising the volume of waste going to landfill. However, while alternative waste management practices will reduce the need for landfill, it is recognised that landfills will be required to accommodate the residual fraction that will be left when the other waste management options have been exhausted.

greenstar is committed to the development of an integrated waste management infrastructure, comprising all elements of the waste hierarchy, in co-operation with local authorities. In the Cork area *greenstar* has received planning permission and waste licences to operate two MRFs at Forge Hill and Sarsfield Court.

1.6.2 Alternative Sites

The *greenstar* landfill at Ballyguyroe will be a commercial development designed to meet some of the treated residual waste disposal needs of County Cork and surrounding counties. The Ballyguyroe site was chosen due to its central location to its planned waste catchment and due to its higher scoring on environmental grounds against criteria used to rank the suitability of landfill sites generally.

1993 Site Selection Study in North County Cork

The suitability of the Ballyguyroe area for the development of a regional landfill was first formally identified during a comprehensive site selection study carried out on behalf of Cork County Council in May 1993 to develop a landfill to serve the northern region of the county. A total of 8 potential sites were identified by the selection study and a subsequent ranking exercise recommended the Ballyguyroe area as being the most suitable of the potential sites.

This recommendation was later approved by the Northern Committee of Cork County Council, and an EIS for the proposed local authority was then submitted to the Department of the Environment for certification and which was granted by the Minister for the Environment on 7th June 1995.

Cork County Council developed a landfill at Ballyguyroe and secured an operating licence for the facility from the EPA in December 1999 (waste licence No. 2-1). The local authority landfill at Ballyguyroe was closed in September 2001 under a High Court Order and is now fully capped and restored.

1999 Site Selection Study in County Cork

A comprehensive site selection study was carried out on behalf of Cork County Council in the late 1990s to identify potential landfill sites in the county to accommodate municipal and industrial wastes over the next 20 years.

The Bottlehill site, located between Mallow, Fermoy and Cork City was identified as the most suitable in the Cork County context while Ballyguyroe was not favoured due to its peripheral location with respect to the main population centres within the county.

However, the Ballyguyroe site is considered more suitable with respect to geological and hydrogeological selection criteria than Bottlehill and so is considered more suitable in terms of environmental protection.

However, the Ballyguyroe area is ideally located with respect to the main population centres of Mallow, Charleville, Mitchelstown, Fermoy, Midleton, Tipperary, Cashel, Cahir, Clonmel and Lismore, all of which are within approximately 50km of the planned landfill.

1.6.3 The Do-Nothing Alternative

Significant delays are being experienced in the implementation of waste plans generally throughout the country as highlighted by the EPA 2001 Waste Database Report and this applies equally to the private sector as it does to the public sector. Consequently, the recycling and recovery targets set by Government are unlikely to be achieved in the short term.

Critically, the EPA has identified the emerging lack of landfilling capacity in the country. The increase in the export of municipal wastes from the state is a reflection of this emerging waste management infrastructure deficit.

Furthermore, and as reported by the EPA in its 2001 Waste Database;

'The recent trend in export of waste indicates an increasing deficit in waste infrastructure. Implementation of waste management plans should be accelerated to ensure adequate waste disposal and recycling facilities. Particular short comings are likely to be experienced in capacity for the disposal of residual non-hazardous and hazardous waste.'

In addition, the Construction Industry Federation (CIF) and the Institute of Engineers of Ireland (IEI) have both highlighted that the proposed investment programmes into the provision of solid waste infrastructure as outlined in the National Development Plan (NDP) were disappointing. These views were published in their respective mid term reviews of the NDP.

The CIF review, July 2003 stated that *'The CIF is concerned that a shortage of waste infrastructure and high cost are a deterrent to indigenous and inward investment and are an effective constraint on economic growth.'*

The IEI review, May 2003 stated that *'only a fraction of the 1.25bn euros identified in the Waste Management Plans, and certainly not more than 100m euros, has been expended to date.....as regards the rationalisation of the number of landfills in Ireland, 154 landfills between 1995 and 1998, have been rationalised to c.50 by 2002. However, not all of these 50 landfills are "State of the Art". The Institution estimates that only 10 are properly engineered landfills. The recent ring fencing of waste generated in a particular region for disposal in that region by An Bord Pleanala could impede the development of large scale cost efficient engineered landfills in Ireland and runs counter to the proximity principle as laid out in the EU landfill directives.'*

As stated in a recent edition of the Project Management publication, July/August 2003, which was discussing a recent report published by Forfas (Key Waste Management Issues in Ireland, 2001) these limitations to the development of cost efficient well engineered landfills such as that proposed at Ballyguyroe *'are expected to cause severe operational problems for companies in the industrial and commercial sectors, with knock-on effects for economic competitiveness'*.

The *greenstar* landfill at Ballyguyroe addresses part of the deficit in waste infrastructure identified by the EPA, the IEI and the CIF and is a necessary development if the country is to become self sufficient in waste management infrastructure as required by the Waste Framework Directive (75/442/EEC).

In the event that the export of treated residual municipal waste from the State is prevented for any reason then the present deficit in waste management infrastructure will undoubtedly lead to the disposal of waste throughout the country in an uncontrolled manner with a consequent negative impact on the natural and human environment.

The *greenstar* landfill at Ballyguyroe will help to prevent some of this potential environmental deterioration.

1.7 Requirement for an Environmental Impact statement

1.7.1 Statutory and Guide Line Framework

The requirement that certain planning applications be accompanied by Environmental Impact Statements (EIS) is set out in Article 172 of the Planning & Development Act 2000. The prescribed developments that require an accompanying EIS are set out in Section 176 of the Act and Article 93 and Schedule 5 of the Local Government (Planning & Development) Regulations, 2001 (S.I. No. 600 of 2001).

Class 11(b) of Part 2 of Schedule 5 of the Local Government (Planning & Development) Regulations, 2001 (S.I. No. 600 of 2001) requires that an EIS accompany planning applications for installations for the disposal of waste with an annual intake greater than 25,000 tonnes not included in Part 1 of Schedule 5. The *greenstar* development at Ballyguyroe exceeds the 25,000 t/a threshold and accordingly this EIS has been prepared to accompany the planning application to Cork County Council.

1.8 Structure of the EIS

The EIS has been prepared in accordance with the requirements of the EPA published Guidelines on the Information to be Contained in Environmental Impact Statements, 2002.

1.9 Contributors to the EIS

This EIS was prepared by White Young Green on behalf of *greenstar*.

The following specialist companies also contributed to the design and environmental assessment of the *greenstar* landfill at Ballyguyroe.

Fehily Timoney and Co. - Engineering Design

Address: Core House,
Pouladuff Rd.,
Cork.

Brady Shipman Martin - Landscape and Visual Impact

Address: 26 Temple Road,
Dartry,
Dublin 6.

Fehily Timoney Gifford - Roads and Traffic (2001)

Address: Core House,
Pouladuff Rd.,
Cork.

Trafficwise - Roads and Traffic Review (2003)

Address: Bracetown Business Park,
Clonee,
County Dublin.

Cultural Resource Development Services Ltd. - Cultural Heritage

Address: Unit 4,
Dundrum Business Park,
Dundrum Road,
Dublin 14.

Ecological Solutions - Terrestrial Fauna (Mammals, Amphibians & Reptiles)

Address: 64 The Grove,
Rathdown,
Greystones,
Co. Wicklow.

Biosphere Environmental Services – Fauna (Birds)

Address: 29 La Touche Park
Greystones
Co. Wicklow

1.10 Scoping of the EIS and Public Consultation

The development of a treated residual waste disposal facility in the Ballyguyroe area has been in the public domain since the findings of the 1993 Cork County Council site selection report was presented to the Council members. Since that time, the public has engaged with the local authority through a public presentation and a High Court action and has also engaged with *greenstar* through the exhaustive 3rd Party correspondence associated with the proposed landfill development at Ballyguyroe. It is quite clear from the 3rd party correspondence that the third parties appear fully informed regarding the details of the landfill proposal.

The study team has met with senior staff from Cork County Council to discuss the landfill proposal and in particular the road network and the capacity of nearby sewage treatment works. The study team also met with the technical staff of the EPA waste division on a number of occasions during the waste licence application process.

Submissions made by the public to the Minister for the Environment and Local Government and the EPA regarding the local authority landfill at Ballyguyroe have been examined by *greenstar*. The High Court case taken against the Council by a local group of residents regarding non-compliance with the Ministerial Certificate and operating issues has been well documented and the concerns raised during that action have been considered by *greenstar*.

greenstar is at present engaged with the EPA in relation to the issuing of a waste licence for the proposed landfill at Ballyguyroe and a proposed decision is expected to issue shortly. The public consultation process which is an integral part of the licensing process allows the public to indicate to the Agency their concerns and views regarding the proposed landfill development. *greenstar* has reviewed submissions made by the public to the EPA regarding the Ballyguyroe landfill and the relevant issues raised by the public are addressed in the EIS.

1.11 Data Necessary to Identify and Assess Environmental Effects of Development

The data necessary to identify and assess the environmental effects of this development are:

- the existing environment, as described in Section 2 by the specialists in various fields,
- the characteristics of the development as described in Section 3, including its physical dimensions, volumes and nature of materials being handled, the processes involved and the emissions from the facility.
- The potential environmental effects of the project are assessed and proposed mitigation measures are presented in Section 4.

1.12 Difficulties Compiling Specified Information

None of the constraints or difficulties encountered in the course of preparing the EIS are considered significant enough to alter the fundamental conclusions of the EIS.

1.13 Forecasting Methods used to Assess the Effects on the Environment

The methods employed to forecast the effects on the various aspects of the environment are standard techniques used in the professional disciplines. The general procedure employed was to describe the receiving environment in a dynamic fashion, to add to that a projection of the "loading" placed on all aspects of the environment by the development in its mitigated form and thereby arrive at the net likely significant effect of the development on the environment.

2. EXISTING ENVIRONMENT

2.1 CLIMATE

Ireland lies in the middle latitudes and its climate is predominantly influenced by the prevailing westerly winds and its position on the western sea board of the European landmass. Ireland is associated with a mild winter and cool summer climate.

The Ballyguyroe development site is located at an elevation of between 180 and 225m O.D. in the southern slopes of the Ballyhoura Mountains. The climate of the area is described by meteorological measurements collected by the national Meteorological Service at the synoptic stations at Cork and Shannon Airports. Ballyguyroe is located midway between these synoptic stations and is situated at a higher elevation so the climate at the development site is likely to deviate slightly from that found at the two weather stations.

2.1.1 Temperature

The mean daily air temperature for the area in Winter months (January) is 5.5°C and in the Summer months (July) is 15.5°C.

2.1.2 Rainfall

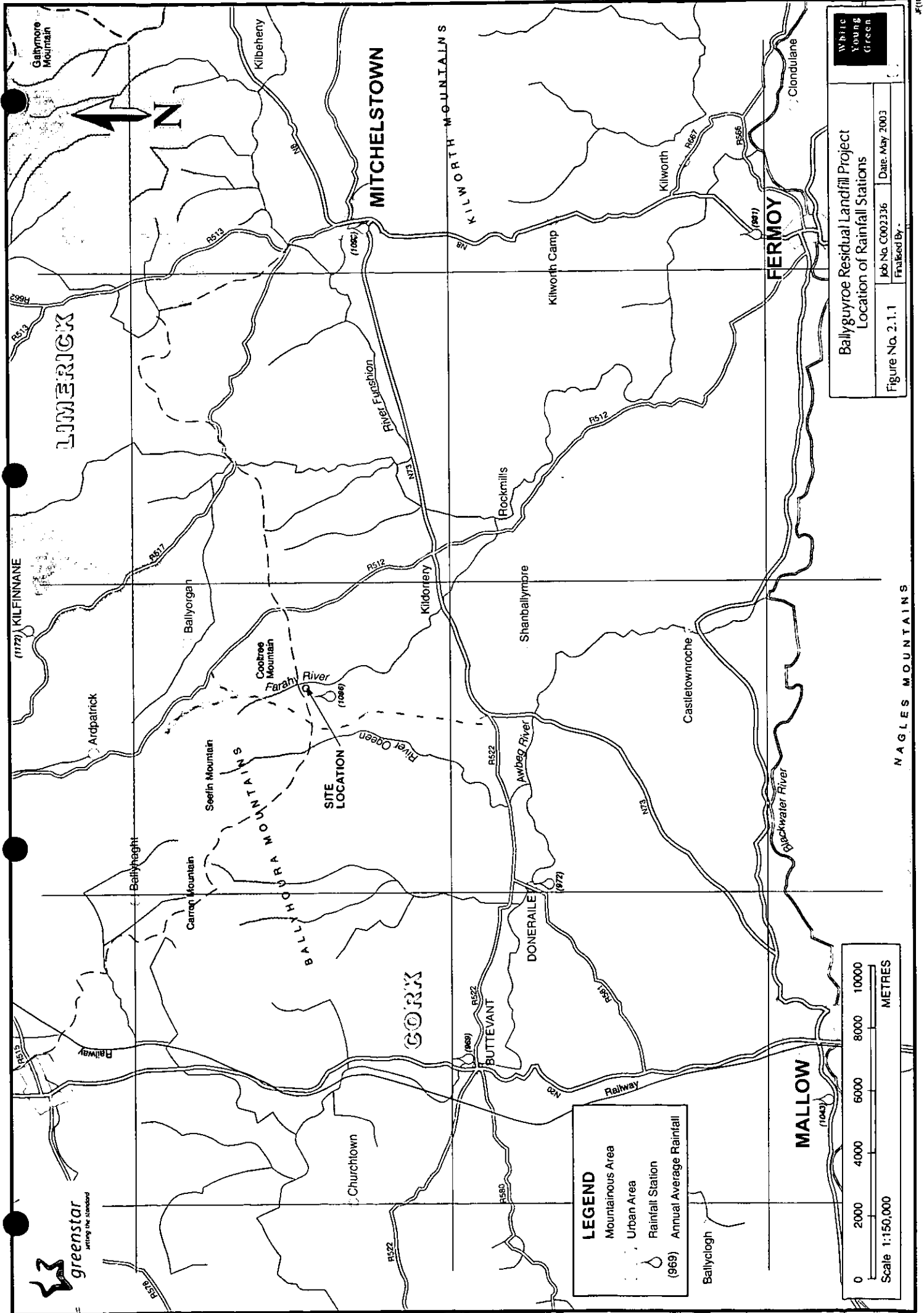
The rainfall stations at Kilfinnane, Mitchelstown, Doneraile and Buttevant (Figure 2.1.1) give annual rainfall amounts for the 1961-1990 period in the range 1172, 1098, 972 and 969mm respectively. The monthly and annual rainfall amounts for Kilfinnane are given in Table 2.1.1. The rainfall data for Kilfinnane is expected to be most relevant as it has an elevation similar to Ballyguyroe and there is data over a 30 year period.

A raingauge was installed at the now closed local authority Ballyguyroe landfill in December 1995. The daily rainfall data recorded at the site during the five years averaged 1087mm/annum (Table 2.1.2). This report is relatively consistent with the 30 year annual average rainfall of 1172mm at Kilfinnane.

2.1.3 Evapotranspiration

The annual average potential evapotranspiration (PE) measured at Cork airport is 500mm and at Shannon airport is 539mm. The average of the two sites gives a value of approximately 520mm. This average value has been used to estimate the actual evapotranspiration (AE) for the Ballyguyroe development site. The calculated AE provides an approximation of the moisture losses to the atmosphere and to vegetation growth and it varies depending on the nature of the ground surface.

AE is only just less than PE in the west of Ireland due to heavier rainfall inhibiting the development of a soil moisture deficit in the drier summer months.



LEGEND

Mountainous Area

Urban Area

Rainfall Station

(969) Annual Average Rainfall

Ballyclogh

MALLOW

0 2000 4000 6000 8000 10000

Scale 1:150,000 METRES

Ballyguire Residual Landfill Project

Location of Rainfall Stations

Figure No. 2.1.1

Job No. C002336

Date: May 2003

Finalised By:

White
Young
Green

NAGLES MOUNTAINS

Table 2.1.1 : Rainfall and Evapotranspiration Data Sets

Total Rainfall (TR) (mm)

Rainfall Station	Elev. (m)	Period Covered	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Kilfinnane	190	1961 - 1990	136	99	90	72	87	73	72	92	93	124	107	127	1172
Ballyguayroe	180 - 225	1995 - 2002	104.8	77.9	71.3	91.2	71.7	74.8	54.8	84.5	92.8	131	134.8	97.4	1087

Potential Evapotranspiration (PE) (mm)

Rainfall Station	Elev. (m)	Period Covered	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Shannon Airport	-	1958 - 1982	6	19	38	61	84	93	85	70	48	24	8	3	539
Cork Airport	-	1958 - 1982	4	15	34	59	77	89	84	69	43	19	6	1	500
Average PE	-	1958 - 1982	5	17	36	60	81	91	85	70	46	22	7	2	520

Soil Moisture Deficit (SMD) (mm)

Soil Moisture Deficit (SMD) (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Accumulative	0	0	0	0	0	18	31	9	0	0	0	0	0

Actual Evapotranspiration (ET) (mm)

Actual Evapotranspiration (ET) (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Calculated from $ET/PE = 1 - ((SMD - 30)/90)$	5	17	36	60	81	91	84	70	46	22	7	2	519

Effective Rainfall (ER) (mm)

Effective Rainfall (ER) (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Calculated from $ER = TR - ET$	131	82	54	12	6	0	0	22	47	102	100	125	653

Table 2.1.2: Rainfall at the Closed Local Authority Ballyguyroe Landfill.

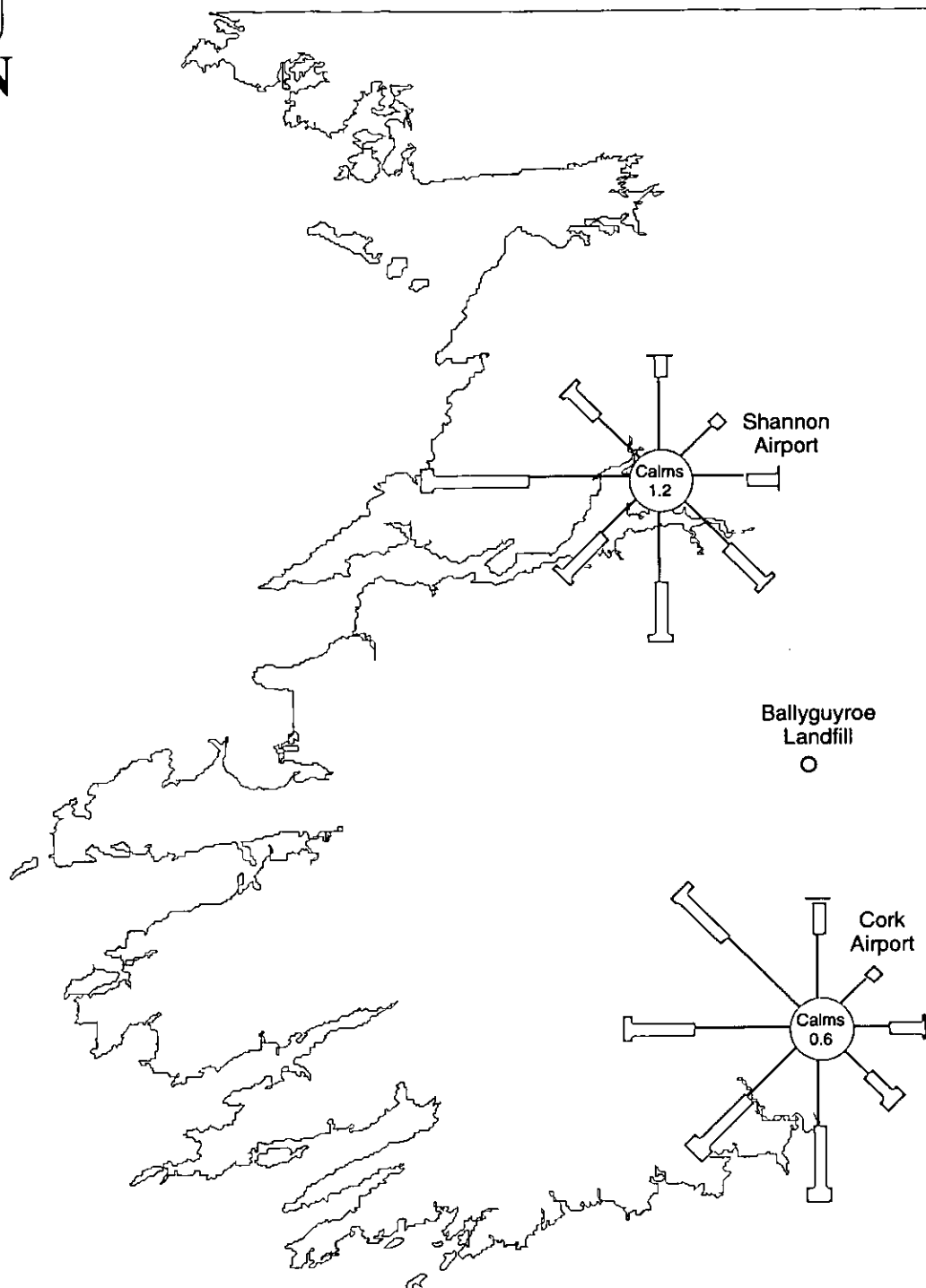
Month	Rainfall (mm)					
	1998	1999	2000	2001	2002	Average
January	146	110	65	75.5	127.5	104.8
February	27	67	89.7	80.9	124.7	77.9
March	99	66.4	32.5	100.9	57.9	71.3
April	103	95	44.2	115.9	97.7	91.2
May	31	53.7	96.4	44.8	132.4	71.7
June	143	34.3	68.4	46.2	82.3	74.8
July	58	31	76.9	59.1	49.2	54.8
August	62	129.3	81.3	85.6	64.4	84.5
September	103	155.7	117.6	54.8	33	92.8
October	165	82.8	177.8	96	133.4	131.0
November	161	95.7	212	53.8	151.7	134.8
December	115	123.7	116.9	54.9	76.7	97.4
Total	1213	1044.6	1178.7	868.4	1130.9	1087

2.1.4 Effective Rainfall

Effective rainfall is the difference between the incident rainfall and the moisture losses through actual evapotranspiration. Table 2.1.1 shows the monthly variation in effective rainfall in the area and these amounts have been used to estimate the likely leachate production at the proposed landfill.

2.1.5 Wind

Wind roses showing speed, direction and frequency of winds at Shannon and Cork airports are presented in Figure 2.1.2. The wind roses show that the strongest and most frequent winds at Cork airport are from the northwest, west, southwest and south whilst at Shannon airport they are from the west and south. The wind at the proposed landfill site will be affected by its higher elevation and position on the slopes of the Ballyhoura Mountains. Measurements recorded at the adjoining closed landfill indicate prevailing winds from the southwest.



Scale of frequency 0 5 10 15 20 25%

Scale of speed 0.3 to 5.4 5.5 to 10.7 10.8 or more metres/sec.
Beaufort force 1 to 3 4 to 5 6 or more



Ballyguyroe Residual Landfill Project Wind Speed, Direction & Frequency		
Figure No. 2.1.2	Job No. C002336	Date. July 2003
Finalised By -		



2.2 AIR QUALITY

A description of the existing land use in the area of the proposed landfill development is given in Section 1.5.2.

Concentrations of the following parameters were measured to establish baseline air quality;

- Dust
- Methane and Carbon Dioxide
- Sulphur Dioxide
- Nitrogen Dioxide

The sampling locations are shown on Figure 2.2.1. The local authority landfill at Ballyguyroe was operational at the time of the base line measurements.

2.2.1 Dust

A baseline dust deposition survey was undertaken at four monitoring locations over a 28 day monitoring period from the 14th March 2001 to the 11th April 2001. The dust monitoring locations identified as AD1 to AD4 are presented on Figure 2.2.1.

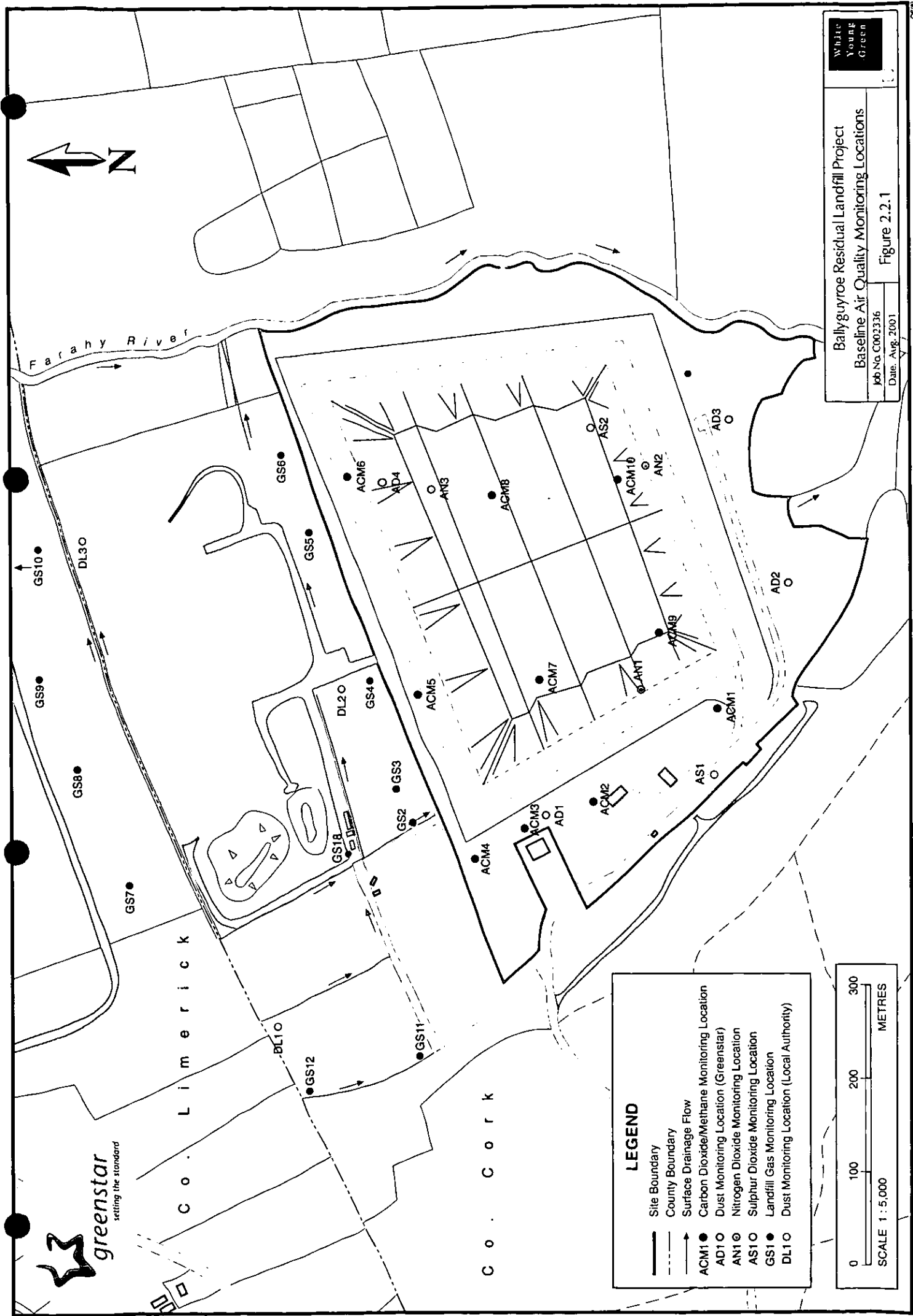
Dust monitoring has also been carried out as part of the EPA compliance monitoring for the adjacent and now closed local authority landfill. These dust monitoring locations are also presented on Figure 2.2.1 as DL1 to DL3.

Total dust deposition was measured at the site using Bergerhoff Gauges as specified in the German Engineering Institute VDI 2119 document entitled "Measurement of Dustfall Using the Bergerhoff Instrument (Standard Method)". The dust sampling containers were approximately 2 m above ground level.

There are no Irish dust deposition standards. However in integrated pollution control licences (IPCs) and waste licences the EPA normally set levels somewhere in the range of 240 to 350 mg/m²/day for concentrations at the site boundary. Furthermore, in the absence of a standard in this country reference is often made to the Technical Instructions on Air Quality Control – TA Luft Guideline. In this guideline the limit set for Total Dust Fallout is a mean value of 350 mg/m²/day with a 95 percentile of 650 mg/m²/day.

The EPA set a Dust Deposition Limit of 350 mg/m²/day for the adjacent local authority landfill in its waste licence (2-1).

The dust monitoring results for the baseline dust deposition survey in March and April 2001 are presented in Table 2.2.1.



LEGEND

- Site Boundary
- County Boundary
- Surface Drainage Flow
- ACM1 ● Carbon Dioxide/Methane Monitoring Location
- AD1 ○ Dust Monitoring Location (Greenstar)
- AN1 ○ Nitrogen Dioxide Monitoring Location
- AS1 ○ Sulphur Dioxide Monitoring Location
- GS1 ● Landfill Gas Monitoring Location
- DL1 ○ Dust Monitoring Location (Local Authority)

0 100 200 300
METRES
SCALE 1 : 5,000

Ballyguyroe Residual Landfill Project
Baseline Air Quality Monitoring Locations
 Job No C002336
 Date: Aug. 2001

Figure 2.2.1

Table 2.2.1: Baseline Dust Results (mg/m²/day)

Monitoring Location	Dust Fallout (mg/m ² /day)
AD1	123
AD2	85
AD3	92
AD4	97

The total dust deposition levels range from 85 mg/m²/day to 123 mg/m²/day. Particulate deposition at the time of sampling, in March and April 2001, was likely to have come predominantly from the surrounding forested land and the adjacent landfill which was then operational.

The results of dust compliance monitoring undertaken by Cork County Council during 2002 are detailed in Table 2.2.2.

Table 2.2.2: Dust Monitoring at the Closed Local Authority Ballyguyroe Landfill

Monitoring Location	Dust Fallout (mg/m ² /day)				
	May 2002	Jun 2002	Jul 2002	Aug 2002	Sep 2002
DL1	64.5	193.5	64.5	66.6	129.0
DL2	129.0	64.5	64.5	66.6	193.5
DL3	193.5	64.5	96.7	133.3	64.5

These results were below the emission limits for the local authority landfill site of 350 mg/m² per day.

The closure and capping of the local authority landfill since this base line monitoring was undertaken should result in a reduction in the dust levels at these monitoring stations.

2.2.2 Methane and Carbon Dioxide

The two major components of landfill gas are Methane (CH₄) and Carbon Dioxide (CO₂). In ambient conditions these compounds can be present due to a number of other sources such as livestock, slurry spreading, manure, decaying vegetation, combustion of fuels etc. To establish baseline concentrations of these parameters instantaneous measurements of methane and carbon dioxide were recorded at 10 locations. The monitoring locations identified as ACM1 to ACM10 are presented on Figure 2.2.1.

The baseline survey for these parameters was undertaken on the 18th of April 2001.

No standards are available in this country for acceptable levels of Carbon Dioxide (CO₂) and Methane (CH₄) in air, except for occupational exposure. Table 2.2.3 gives the concentration limits set by the EPA for

methane and carbon dioxide measured in any building or enclosed space on or adjacent to the adjoining local authority landfill.

Table 2.2.3: Concentration limits for Methane and Carbon Dioxide for the Local Authority landfill

Methane	Carbon Dioxide
20 % LEL (1% v/v)	1.5 % v/v

The results of the carbon dioxide and methane monitoring are presented in Table 2.2.4. The concentrations of carbon dioxide and methane measured in the air at all of the monitoring locations were between 0% to 0.1%.

Table 2.2.4: Baseline results for Carbon Dioxide and Methane

Monitoring Location	Carbon Dioxide (%)	Methane (%)
ACM1	0.1	0
ACM2	0.1	0
ACM3	0	0
ACM4	0	0
ACM5	0	0
ACM6	0	0
ACM7	0	0
ACM8	0	0.1
ACM9	0	0
ACM10	0	0

There is not expected to be any significant change in the ambient concentrations of these gases since the baseline survey was undertaken. Any change would be a reduction in the levels of these gases due to the closure of the adjoining local authority landfill.

2.2.3 Sulphur Dioxide and Nitrogen Dioxide

Sulphur dioxide (SO₂) emissions are produced predominantly as a result of the burning of fuels (peat, coal, fuel oils, diesel etc.) in power plants, industrial sources, vehicles and domestic home heating appliances.

Sulphur dioxide concentrations were measured at 2 locations over a 5 hour monitoring period on the 14th of March 2001. The sulphur dioxide monitoring locations identified as AS1 and AS2 are presented on Figure 2.2.1

The air quality standard currently in force for sulphur dioxide was set out in EC Directive 80/779/EEC while the standards in force for nitrogen dioxide are set out in EC Directive 85/203/EEC. Standards in these Directives will be replaced by more stringent standards that are due to be enacted in 2004-2005 from

Table 2.2.5 EC Limit Values, Attainment Dates, Margins of Tolerance and Alert Thresholds for Sulphur Dioxide, Nitrogen Oxides, Particulate Matter and Lead

Pollutant	Limit Value Objective	Averging Period	Limit Value $\mu\text{g}/\text{m}^3$	Basis of Application of the Limit Value	Limit Value Attainment Date	Assessment		Margin of Tolerance ^c $\mu\text{g}/\text{m}^3$	Alert Threshold $\mu\text{g}/\text{m}^3$
						Upper $\mu\text{g}/\text{m}^3$	Thresholds ^b Lower $\mu\text{g}/\text{m}^3$		
SO ₂	Protection of human health	1-hour	350	Not to be exceeded more than 24 times in a calendar year	1-Jan-05			150	500 (over three consecutive hours)
SO ₂	Protection of human health	24-hour	125	No to be exceeded more than 3 times in a calendar year	1-Jan-05	75	50	none	
SO ₂	Protection of Vegetation	calendar year	20	Annual mean				none	
SO ₂	Protection of Vegetation	1 Oct to 31 Mar	20	Winter mean		12	8	none	
NO ₂	Protection of human health	1-hour	200	Not to be exceeded more than 18 times in a calendar year	1-Jan-10	140	50	100	400 (over three consecutive hours)
NO ₂	Protection of human health	calendar year	40	Annual mean	1-Jan-10	32	26	20	
NO+NO ₂	Protection of vegetation	calendar year	30	Annual mean	2 year after EIF ^d	24	20	none	
PM ₁₀ -Stage 1	Protection of human health	24-hours	50	Not to be exceeded more than 35 times in a calendar year	1-Jan-05	30	20	25	
PM ₁₀ - Stage 1	Protection of human health	calendar year	40	Annual mean	1-Jan-05	14	10	8	
PM ₁₀ - Stage 2 ^a	Protection of human health	24-hours	50	Not to be exceeded more than 7 times in a calendar year	1-Jan-10			To be derived	
PM ₁₀ - Stage 2 ^a	Protection of human health	calendar year	20	Annual mean	1-Jan-10			10	
Lead	Protection of human health	calendar year	0.5	Annual mean	1-Jan-05	0.35	0.25	0.5	

a: indicative limit value to be reviewed in the light of further information on health and environmental effects

b: to be applied on the same basis as the corresponding limit value except in the case of PM₁₀ where they are based on the indicative limits for 2010

c: on entry into force of the Directive and reducing to zero by the attainment date

d: two years after entry into force of the Directive

the recent Directive (1999/30/EC). For the purposes of this report concentrations measured are discussed with reference to the proposed new standards. These are summarised in the attached Table 2.2.5.

Nitrogen oxides include nitrogen dioxide (NO_2) and nitrogen oxide (NO) and are usually reported in terms of NO_x . Emissions of NO_x are produced by high temperature oxidation of nitrogen in the air, i.e. vehicular sources, stationary boilers / burners. Monitoring was carried out at 3 sampling locations from the 14th of March to the 19th of April 2001. The nitrogen dioxide monitoring locations identified as AN1, AN2 and AN3 are presented on Figure 2.2.1.

The base line concentrations of sulphur dioxide and nitrogen dioxide measured are presented in Table 2.2.6.

Table 2.2.6: Baseline Results for Nitrogen Dioxide and Sulphur Dioxide ($\mu\text{g}/\text{m}^3$)

Nitrogen Dioxide		Sulphur Dioxide	
Monitoring Location	Nitrogen Dioxide $\mu\text{g}/\text{m}^3$	Monitoring Location	Sulphur Dioxide $\mu\text{g}/\text{m}^3$
AN1	< 0.315	AS1	< DL
AN2	< 0.315	AS2	< DL
AN3	< 0.315	-	-

* < DL = Less than laboratory detection limit of 2mg/l.

The nitrogen dioxide and sulphur dioxide concentrations measured at the site were all below the laboratory detection limits. The concentrations measured are less than the limits specified in the 1999/30/EC Directive.

There is not expected to be any significant change in the ambient concentrations of these gases since the baseline survey was undertaken. Any change would be a reduction in the levels of these gases due to the closure of the adjoining local authority landfill.

2.2.4 Summary

Baseline concentrations of dust, methane, carbon dioxide, sulphur dioxide and nitrogen dioxide were measured. All the parameters measured were at typical background concentrations for this type of rural environment and were below the relevant limits specified in Irish and EC legislation. Importantly, the base line measurement at the *greenstar* development site did not record any significant emissions from the adjoining local authority landfill which was operational at the time of sampling.

2.3 NOISE ENVIRONMENT

A description of the existing land use in the area of the proposed development is given in Section 1.5.2.

The nearest residential property and noise sensitive receptor is greater than 400 metres from the northern boundary of the site. To the south, the nearest residences and sensitive receptors are over a kilometre away. To the east the closest residence is over 900 metres from the site boundary. The closest residence to the west of the site is approximately 700 metres away.

Noise data for the site has been sourced from a baseline noise survey which was undertaken in March and April 2001 and additional ambient noise measurements undertaken on behalf of Cork County Council for the adjoining local authority landfill which has now ceased operation.

2.3.1 Baseline Noise Survey, 2001

Plant noise from the adjacent local authority landfill was the main source of noise at the time of the baseline noise measurements. Contributory noise sources also included agricultural activity such as machinery, livestock and noise from local wildlife.

2.3.1.1 Long-Term Ambient Noise Measurements

The existing noise environment was monitored at the 2 locations presented on Figure 2.3.1.

The noise monitoring results for locations NP 1 and NP2 are summarised on Tables 2.3.1 and 2.3.2 respectively and the noise level graphs are presented on Figures 2.3.2 and 2.3.3.

The noise levels at NP1 are typical of a site in such a rural location under calm weather conditions however due to breezy and intermittent drizzle weather conditions the measurements at NP2 were significantly higher than at NP1.

2.3.2.2 Short-Term Ambient Noise Measurements

Short term measurements (NP 3 to NP 5) were undertaken in the vicinity of residential properties (Figure 2.3.1). Noise level graphs of the sound pressure levels throughout measurements NP 3 to NP 5 are presented on Figures 2.3.4 to 2.3.6 respectively and the results of the measurements are presented in Table 2.3.3.

Short term noise measurements at NP 3 were significantly higher than at both NP 4 and NP 5. This is most likely due to the movements of a tractor in an adjacent field. The noise measurements at NP 4 were lower (Table 2.3.3) with trickling water from an adjacent stream and light traffic movements contributing the more significant noise sources. Noise measurements at NP5 (Table 2.3.3) were the lowest and indicate a typical rural environment with relatively low $L(A)_{eq}$ levels and $L(A)_{90}$ background levels.

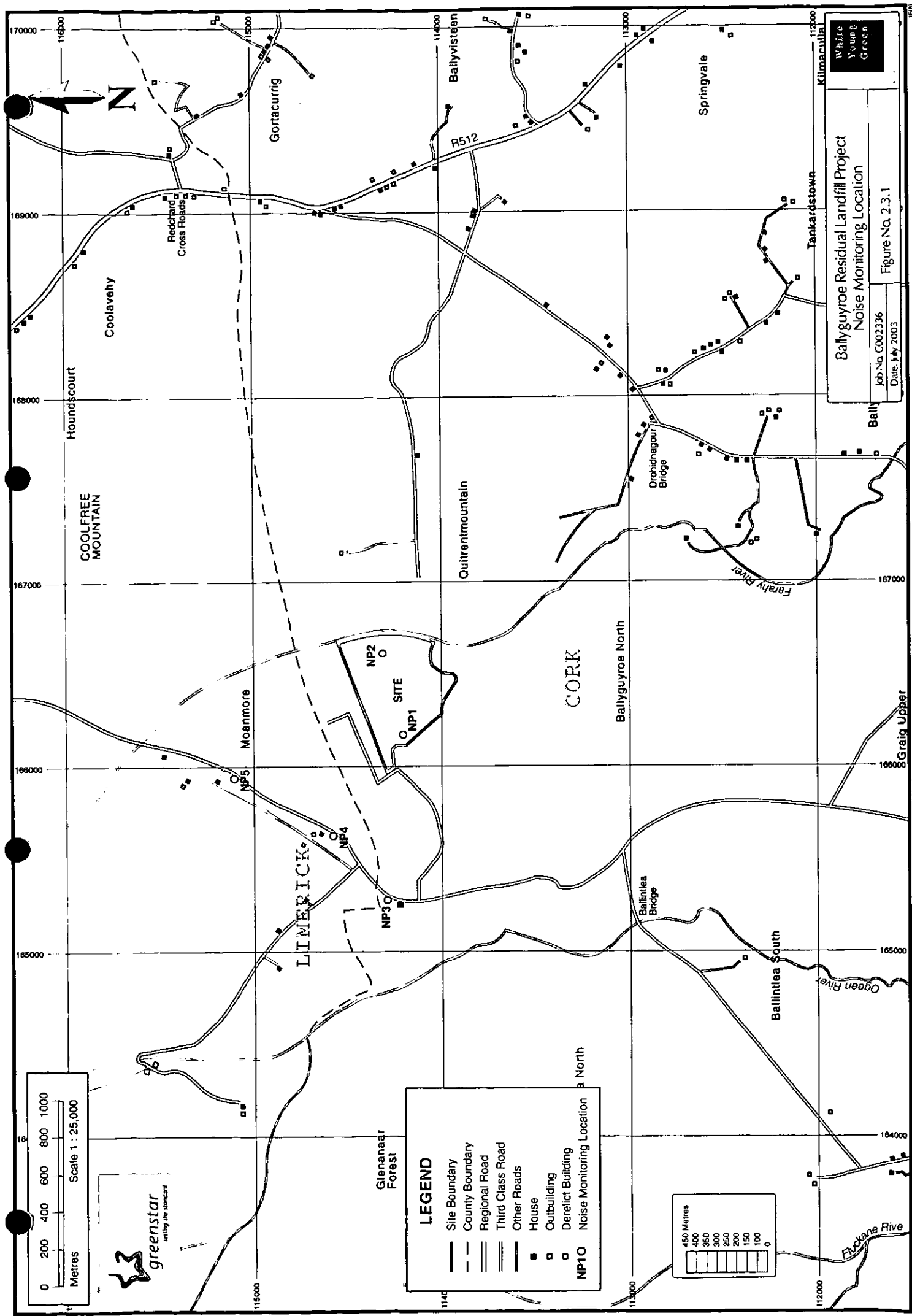


Table 2.3.1 - Noise Measurements at Monitoring Location NP1

Time Period	L(A)eq dB(A)	L(A)10 dB(A)	L(A)90 dB(A)
12.00 - 13.00 (14/3/01)	43.7	46.4	30.2
13.00 - 14.00	37.5	39.5	30.2
14.00 - 15.00	39.7	41.7	30.3
15.00 - 16.00	37.1	38.3	30.4
16.00 - 17.00	41.2	42.4	30.3
17.00 - 18.00	49.3	38.6	30.3
18.00 - 19.00	38.8	38.2	30.1
19.00 - 20.00	34.3	30.9	30.1
20.00 - 21.00	30.1	30.9	30.1
21.00 - 22.00	30.1	30.9	30.1
22.00 - 23.00	31.9	30.9	30.1
23.00 - 24.00	30.1	30.9	30.1
24.00 - 01.00 (15/3/01)	30.1	30.9	30.1
01.00 - 02.00	30.1	30.9	30.1
02.00 - 03.00	30.1	30.9	30.1
03.00 - 04.00	30.5	30.9	30.1
04.00 - 05.00	30.3	30.9	30.1
05.00 - 06.00	44.5	46.7	30.2
06.00 - 07.00	40.5	42.4	33.5
07.00 - 08.00	39.5	41.1	32.1
08.00 - 09.00	42.7	44.3	36.6
09.00 - 10.00	46.2	46.6	40.1
10.00 - 11.00	46.3	48.5	40.1
11.00 - 12.00	46	47.3	41.6

Legend

L(A)eq = Equivalent Continuous A-Weighted Sound Pressure Level

L(A)10 = Sound Pressure Level exceeded 10% of the time

L(A)90 = Sound Pressure Level Exceeded 90 % of the time

dB(A) = decibels A weighted

Table 2.3.2 - Noise Measurements at Monitoring Location NP 2

Time Period	L(A)eq dB(A)	L(A)10 dB(A)	L(A)90 dB(A)
12.00 - 13.00 (17/4/01)	44.6	46.4	32.4
13.00 - 14.00	47.3	48.8	33
14.00 - 15.00	46.7	49.6	33.7
15.00 - 16.00	53.4	56	37
16.00 - 17.00	56.1	59.4	37
17.00 - 18.00	58.8	62.1	36.6
18.00 - 19.00	58.3	61.9	37.8
19.00 - 20.00	60.6	64.3	42.3
20.00 - 21.00	59.6	63.2	40.7
21.00 - 22.00	57.1	60.5	36.6
22.00 - 23.00	54.3	57.4	32.5
23.00 - 24.00	57.7	60.7	33.5
24.00 - 01.00 (18/4/01)	60.4	64	39
01.00 - 02.00	57	60.2	32.1
02.00 - 03.00	50.9	54.3	30.3
03.00 - 04.00	51	52.6	30.2
04.00 - 05.00	52.4	54.6	30.3
05.00 - 06.00	39.5	39.7	30.1
06.00 - 07.00	46.5	49.2	32.8
07.00 - 08.00	45.3	47.3	30.8
08.00 - 09.00	49.1	49.8	31
09.00 - 10.00	40.3	42.9	30.9
10.00 - 11.00	39.5	41.8	32.2
11.00 - 12.00	38.7	41.1	31.7
12.00 - 13.00	40.2	42.6	34.2
13.00 - 14.00	38.4	40.8	32.2
14.00 - 15.00	38.7	41.4	31.6
15.00 - 16.00	37.3	39.1	31

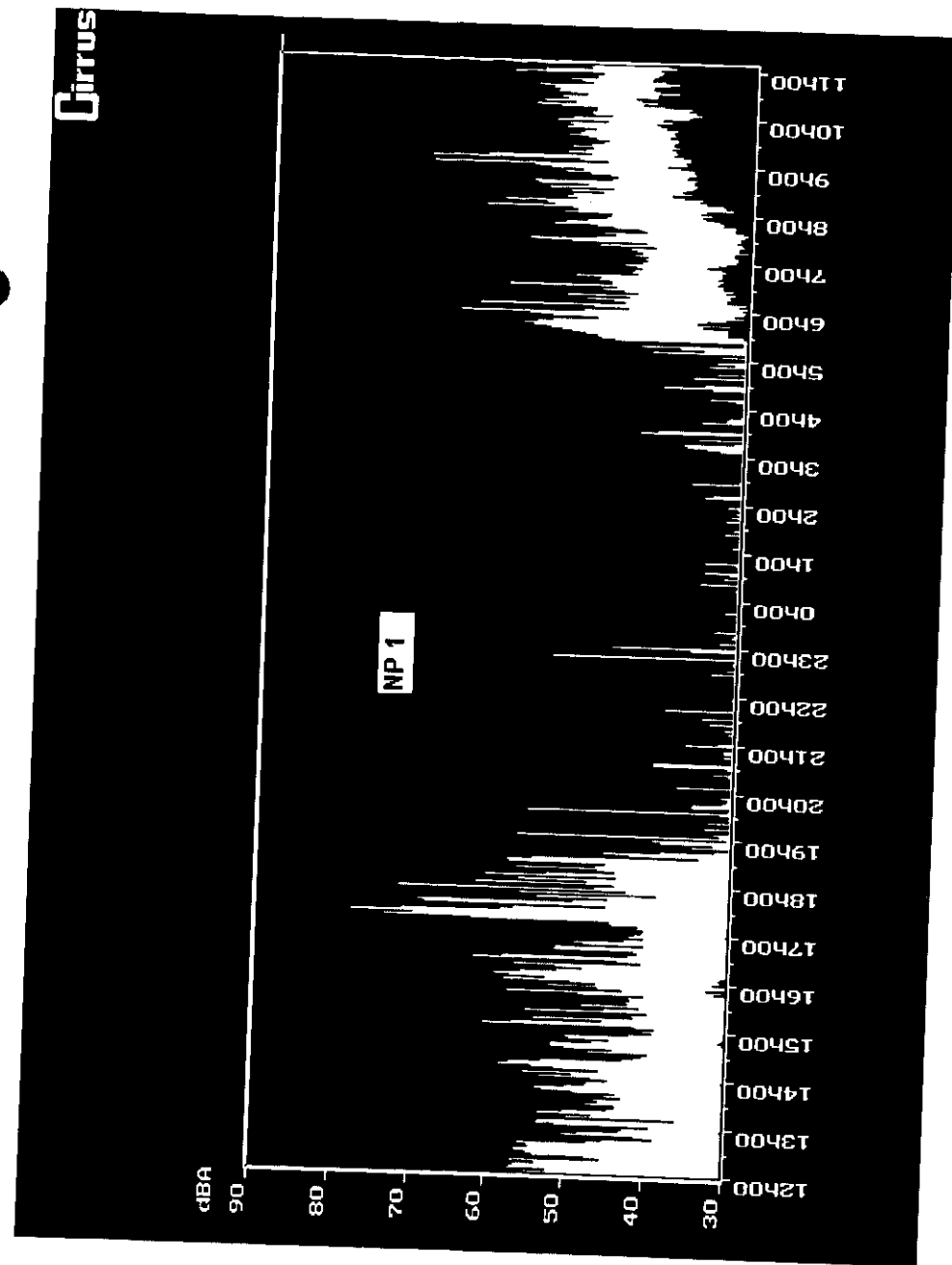
Legend

L(A)eq = Equivalent Continuous A-Weighted Sound Pressure Level

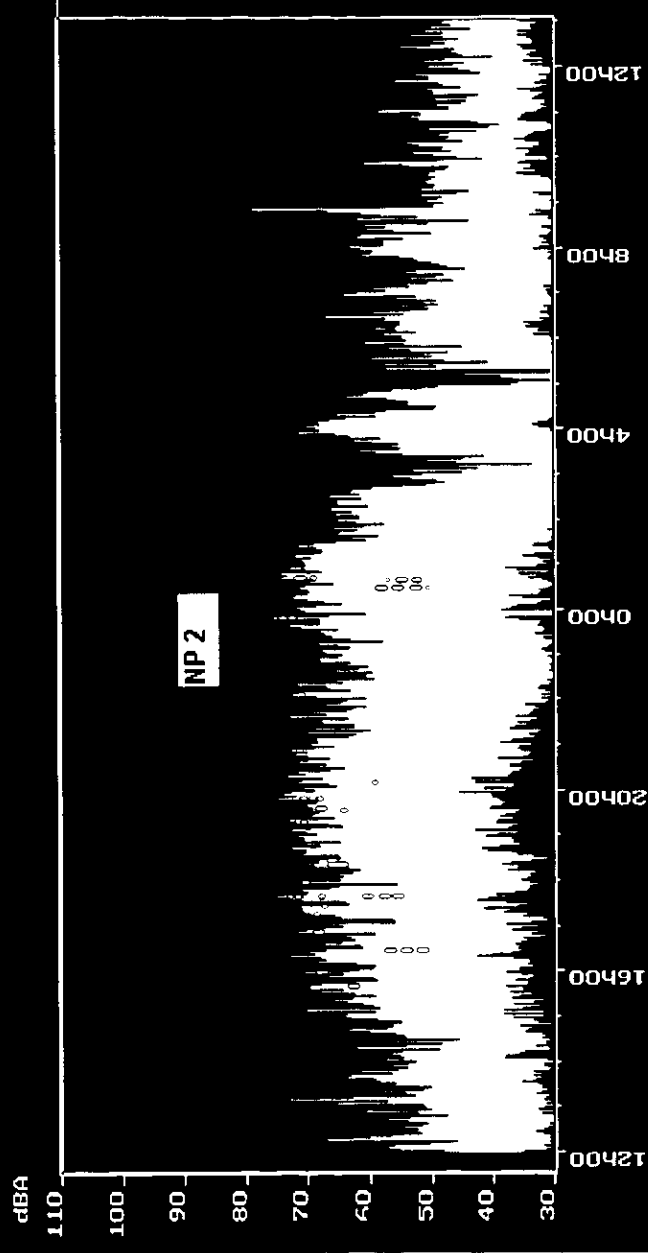
L(A)10 = Sound Pressure Level exceeded 10% of the time

L(A)90 = Sound Pressure Level Exceeded 90 % of the time

dB(A) = decibels A weighted



Cirrus



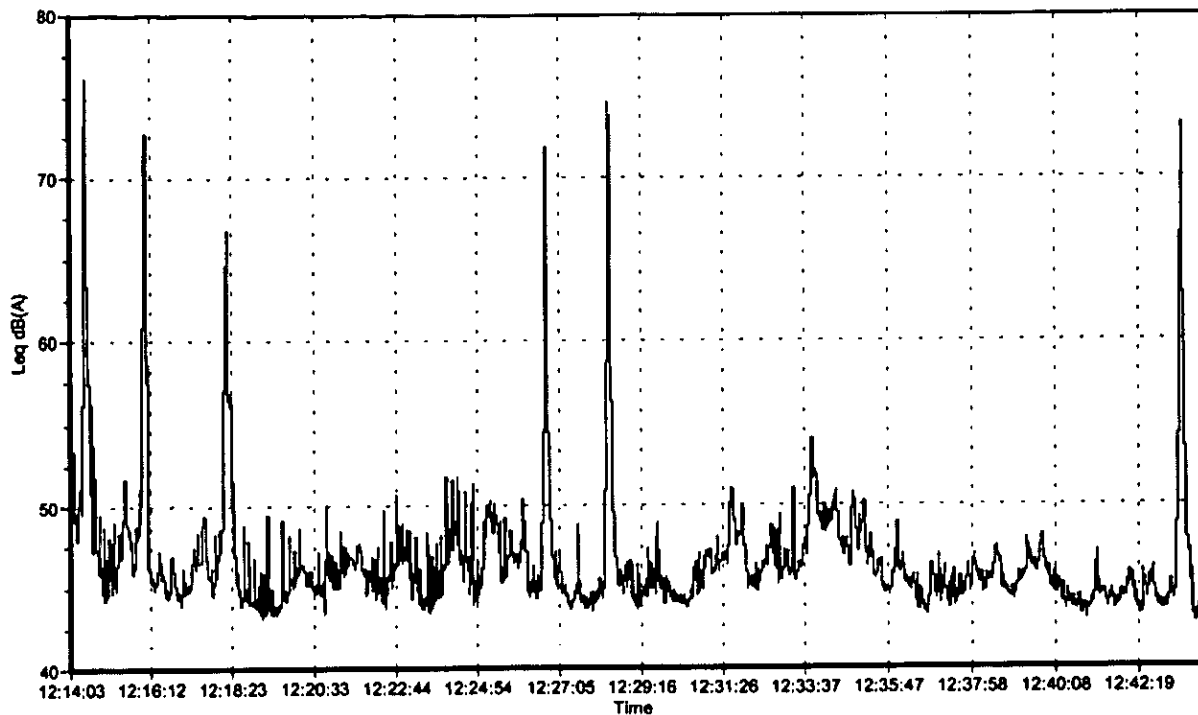
Noise Measurement Report

Date: 18/04/01 Time: 12:14:03

Run Time: 00:30:00
Range: 20-80 dB

Leq 53.1^dBA
Lepd 41.1^dBA
LAE 85.5 dBA
LAFmax 78.8^dBA
Peak 89.6^dBC

L1.0 L10.0 L50.0 L90.0 L95.0 L99.0
63.0^dBA 49.5^dBA 45.6^dBA 44.0^dBA 43.7^dBA 43.2^dBA



Notes: Figure 2.3.4 - Ballyguyroe Residual Landfill Project Noise Monitoring Location - NP 3

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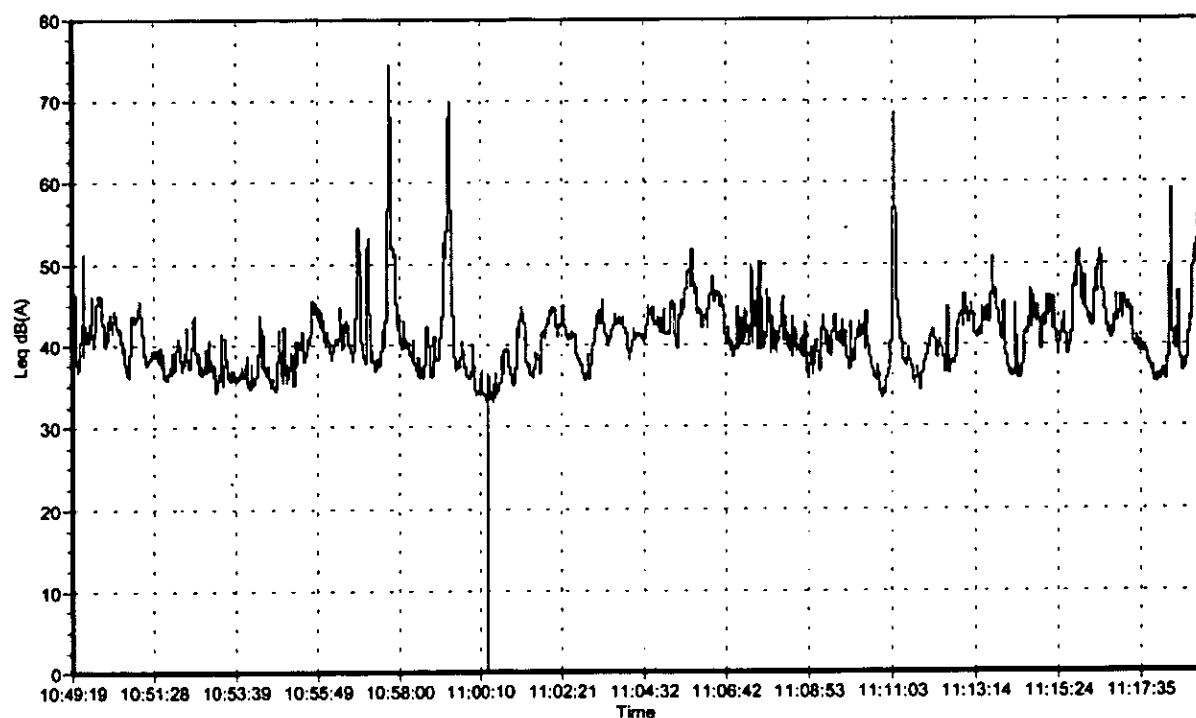
Noise Measurement Report

Date: 18/04/01 Time: 10:49:19

Run Time: 00:30:00
Range: 20-80 dB

Leq 49.6^dBA
Lepd 37.5 dBA
LAE 81.9 dBA
LAFmax 77.3^dBA
Peak 88.2^dBC

L1.0 L10.0 L50.0 L90.0 L95.0 L99.0
56.3^dBA 45.5^dBA 40.5^dBA 36.2^dBA 35.5^dBA 33.9^dBA



Notes: Figure 2.3.5 - Ballyguyroe Residual Landfill Project Noise Monitoring Location - NP 4

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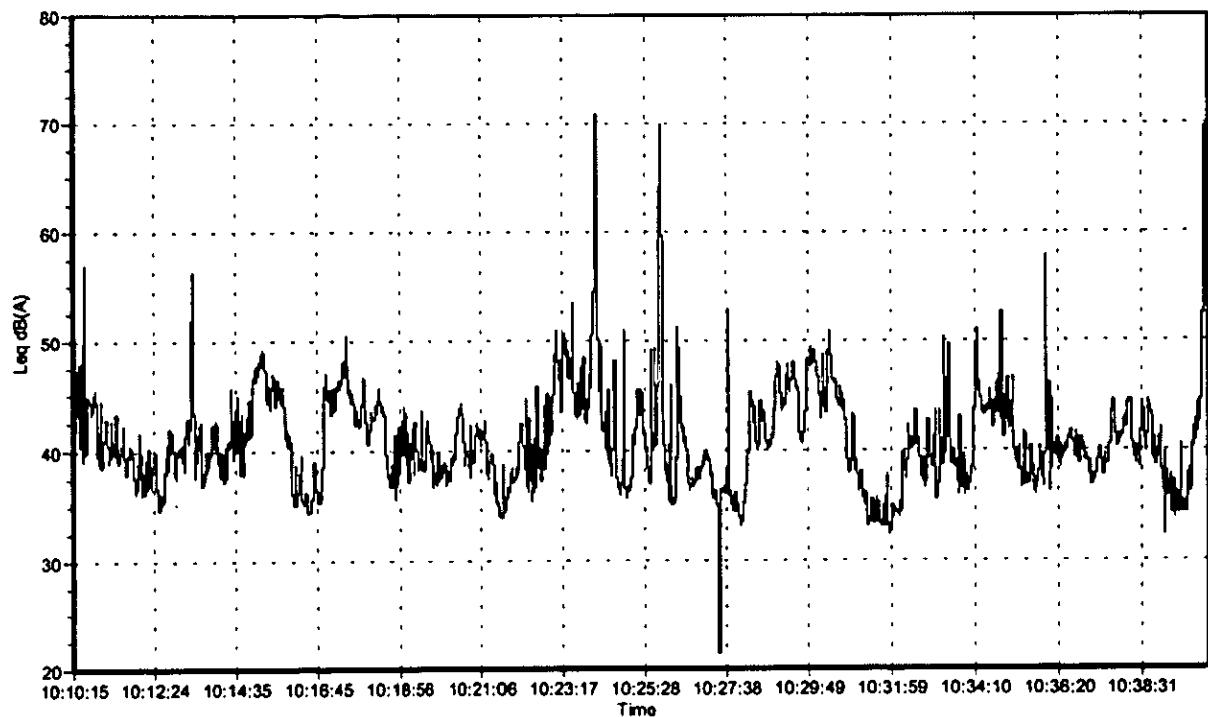
Noise Measurement Report

Date: 18/04/01 Time: 10:10:15

Run Time: 00:30:00
Range: 20-80 dB

Leq 47.8 dBA
Lepd 35.7 dBA
LAE 80.1 dBA
LAFmax 72.9 dBA
Peak 88.8 dBC

L1.0	L10.0	L50.0	L90.0	L95.0	L99.0
53.8 dBA	46.2 dBA	40.2 dBA	35.9 dBA	34.9 dBA	33.5 dBA



Notes: Figure 2.3.6 - Ballyguyroe Residual Landfill Project Noise Monitoring Location - NP 5

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Table 2.3.3: Noise Survey Results NP 3 to NP 5 - Ballyguyroe, April 2001

Location	Measurement Length (min)	$L(A)_{eq}$ dB(A)	$L(A)_{10}$ dB(A)	$L(A)_{90}$ dB(A)
<u>NOISE SENSITIVE LOCATIONS</u>				
NP 3	30	53.1	49.5	44
NP 4	30	49.6	45.5	36.2
NP 5	30	47.8	46.2	35.9

Legend

$L(A)_{eq}$ = Equivalent Continuous A-Weighted sound pressure level.

$L(A)_{10}$ = Sound Pressure Level exceeded 10% of the event duration

$L(A)_{90}$ = Sound Pressure Level exceeded 90% of the event duration

dB(A) All Levels expressed in A weighted decibels.

Measurement Locations are illustrated on Figure 2.3.1

K.T.Cullen & Co. Ltd

Environmental & Hydrogeological Consultants

Date: April 2001

Job# C002336

2.3.2 Additional Ambient Noise Measurements, 2001 and 2002

Annual compliance surveys in 2001 and 2002 were undertaken on behalf of Cork County Council and reported in the annual environmental reports for the local authority landfill. These measurements confirmed that the noise levels at the monitoring stations met the licence conditions.

2.3.3 Summary

The base line and compliance noise measurements were within acceptable levels and were consistent with the land use and observed environmental conditions at the time of sampling. The background noise levels at the *greenstar* and local authority monitoring stations should now be lower following the closure and capping of the adjacent local authority landfill.

2.4 SOILS AND GEOLOGY

2.4.1 Regional Geology

The Ballyguyroe site is situated within the southern limb of the Galty (Churchtown) Anticline, which is part of the regional folding found in the Silurian, Devonian and Carboniferous rocks of north County Cork, as indicated in the published geological maps for the area (Geological Survey of Ireland, Sheet 21, 1997 and Sheet 22, 1995). The core of the Galty Anticline forms the Ballyhoura Mountains, which comprise a metasedimentary sequence of siltstones, mudstones and greywackes that are of Silurian age. On the southern flanks of these uplands the Silurian metasediments are unconformably overlain by a sequence of interbedded sandstones, mudstones and siltstones from the Devonian Old Red Sandstone Magnafacies, which dip southwards by between 20 and 30°. The southern margin of the Devonian Old Red Sandstone sequence is faulted against Dinantian limestones that are part of the Mitchelstown Syncline, which outcrop in the valley between Mitchelstown and Mallow.

The proposed landfill at Ballyguyroe (Figure 2.4.1) is underlain by these Devonian sedimentary rocks.

The Geological Survey of Ireland (1995 and 1997) have subdivided the Devonian rock sequence, from oldest to youngest, into the Galtymore Formation, the Slievenamuck Conglomerate Formation, the Poulgrania Sandstone Formation, the Ardane Formation and the Kiltorcan Formation. Of these, the Poulgrania Sandstone Formation crops out beneath the Ballyguyroe site and is reported by the Geological Survey of Ireland (Sheet 21 Memoir, 1997 & Sheet 22 Memoir, 1995) to comprise of fine to medium grained red sandstones with minor mudrocks and rare thin conglomerate units.

This part of County Cork has a variable covering of overburden. The overburden deposits include glacial tills (boulder clays) and gravels as well as post glacial peat and alluvium. Glacial tills dominate the overburden sequence at Ballyguyroe and form a thick cover over the bedrock.

2.4.2 Local Geology

The interpreted geological structure (Figures 2.4.3 to 2.4.8) of the Ballyguyroe site has been determined from borehole and trial pit data. All borehole details are presented in Table 2.4.1 whilst all trial pit details are presented in Table 2.4.2. Trial pit logs of TP1-TP5 are depicted in Figure 2.4.2.

2.4.2.1 Soils

The Ballyguyroe site is underlain by a thin peaty layer of less than 0.25m thick that overlies soils of podzolised gley character and which are classified as podzolic Humic Gleys. The parent material of these soils is a sandstone dominated glacial drift which may contain some shale and limestone derived debris. These soils are generally poorly drained.

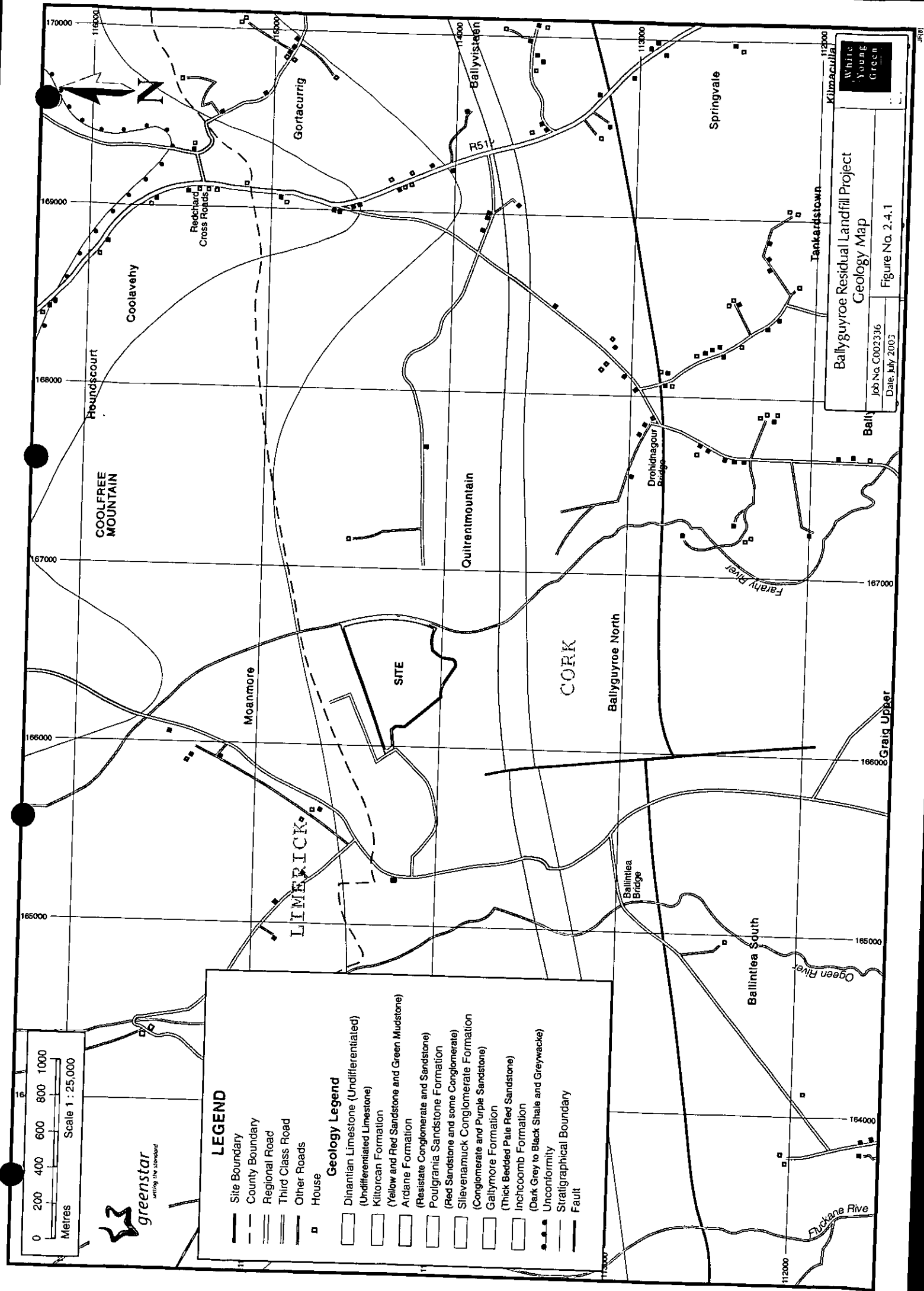


Table 2.4.1 Summary of Borehole Information at Ballyguayroe

BH Reference	Ground Elevation (m AOD)	Completed Depth (m)	Completed Elevation (m AOD)	Depth to Bedrock (m)	Bedrock Elevation (m AOD)	Depth to SWL (m) TOC (15/3/01)	SWL (m AOD) (15/03/01)
G13	-	8.10	-	-	Not encountered	-	-
G14	-	7.00	-	-	Not encountered	-	-
G15	-	7.30	-	-	Not encountered	-	-
G16	-	7.80	-	-	Not encountered	-	-
G17	213.54	25.00	188.54	22.40	191.14	-	-
G18	215.20	42.00	173.20	30.00	185.20	-	-
G19	224.16	17.00	207.16	-	Not encountered	-	-
BH1	217.45	15.24	202.21	9.80	207.65	1.35	216.11
BH2	209.20	12.80	196.40	9.10	200.10	0.48	208.72
BH3	194.88	12.80	182.08	9.40	185.48	0.35	194.53
BH4	210.24	27.40	182.84	-	Not encountered	-	-
BH5	203.12	27.40	175.72	23.50	179.62	Artesian	Artesian
BH6	201.28	19.20	182.08	13.10	188.18	5.00	196.28
BH7	185.72	28.00	157.72	-	Not encountered	2.54	183.18
95-1s	216.35	11.60	204.75	-	Not encountered	-	-
95-1d	216.30	32.90	183.40	27.40	Not encountered	-	-
95-2s	213.25	9.00	204.25	-	188.90	-	-
95-2d	213.24	35.50	177.74	29.50	Not encountered	-	-
95-3s	212.18	9.00	203.18	-	183.74	-	-
95-3d	211.92	41.50	170.42	34.80	Not encountered	-	-
96-1s	223.24	10.20	213.04	-	177.12	-	-
96-1d	223.38	19.60	203.78	14.00	Not encountered	1.96	221.28
96-2s	219.09	10.30	208.79	-	209.38	1.24	222.14
96-2d	218.92	32.00	186.92	26.00	Not encountered	-	-
96-3s	207.08	10.55	196.53	-	192.92	-	-
96-3d	207.53	29.00	178.53	23.00	Not encountered	-	-
96-4s	210.19	10.40	199.79	-	184.53	-	-
96-4d	209.85	34.00	175.85	27.00	Not encountered	-	-
96-5s	210.41	10.00	200.41	-	182.85	-	-
96-5d	210.34	35.00	175.34	28.00	Not encountered	-	-
96-6s	203.59	10.35	193.24	-	182.34	-	-
96-6d	205.87	30.00	175.87	24.00	Not encountered	-	-
96-7s	217.29	20.40	196.89	-	181.87	-	-
96-7d	217.42	37.00	180.42	32.90	Not encountered	-	-
97-1	219.39	21.50	197.89	-	184.52	-	-
Gas 1	215.19	4.25	210.94	-	Not encountered	-	-

AOD = Above Ordnance Datum (Malin Head)

SWL = Static Water Level

TOC = Top of Casing

Table 2.4.2: Summary of Trial Pit Information at Ballyguayroe

Trial Pit Reference	Ground Elevation m AOD	Completed Depth m	Completed Elevation m AOD	Bedrock Elevation m AOD	Water Ingress m BGL
B1	207.40	3.25	204.15	Not Encountered	None
B2	210.33	3.00	207.33	Not Encountered	None
B3	211.27	3.30	207.97	Not Encountered	1.00
B4	207.46	3.00	204.46	Not Encountered	None
B5	205.45	3.00	202.45	Not Encountered	None
B6	210.92	3.00	207.92	Not Encountered	None
B7	222.07	3.10	218.97	Not Encountered	None
B8	215.02	4.00	211.02	Not Encountered	1.50
B9	210.37	4.00	206.37	Not Encountered	None
B10	199.85	4.00	195.85	Not Encountered	1.50
B11	190.70	3.50	187.20	Not Encountered	2.10
B12	201.91	3.70	198.21	Not Encountered	None
B13	198.22	4.00	194.22	Not Encountered	1.60
B14	186.95	3.70	183.25	Not Encountered	None
B15	212.22	6.70	205.52	Not Encountered	None
B16	209.04	5.00	204.04	Not Encountered	None
B17	205.62	6.20	199.42	Not Encountered	None
B18	204.08	6.00	198.08	Not Encountered	None
B19	198.88	5.40	193.48	Not Encountered	None
B20	198.78	6.20	192.58	Not Encountered	None
B21	187.72	6.00	181.72	Not Encountered	None
B22	189.19	6.40	182.79	Not Encountered	None
B23	192.40	5.40	187.00	Not Encountered	None
B24	193.11	4.00	189.11	Not Encountered	None
B25	187.89	3.80	184.09	Not Encountered	None

AOD = m Above Ordnance Datum (Malin Head)

BGL = Below Ground Level

Table 2.4.2 (Continued): Summary of Trial Pit Information at Ballyguyroe

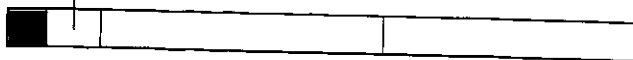
Trial Pit Reference	Ground Elevation m AOD	Completed Depth m	Completed Elevation m AOD	Bedrock Elevation m AOD	Water Ingress m BGL
B26	192.33	5.00	187.33	Not Encountered	None
B27	189.23	6.00	183.23	Not Encountered	None
B28	194.88	6.10	188.78	Not Encountered	None
B29	187.12	6.90	180.22	Not Encountered	6.50
B30	204.31	6.00	198.31	Not Encountered	None
B31	211.96	6.30	205.66	Not Encountered	None
B32	211.99	6.00	205.99	Not Encountered	None
B33	213.50	4.80	208.70	Not Encountered	None
B34	220.04	5.80	214.24	Not Encountered	None
B35	223.31	4.00	219.31	Not Encountered	None
B36	226.42	5.00	221.42	Not Encountered	2.20
B37	225.77	3.50	222.27	Not Encountered	0.90
G1	-	3.36	-	Not Encountered	None
G2	-	3.36	-	Not Encountered	None
G3	-	4.40	-	Not Encountered	4.40
G4	-	4.20	-	Not Encountered	None
G5	-	3.80	-	Not Encountered	None
G6	-	4.50	-	Not Encountered	None
G7	-	4.00	-	Not Encountered	None
G8	-	4.80	-	Not Encountered	None
G9	-	4.10	-	Not Encountered	None
G10	-	4.10	-	Not Encountered	None
G11	-	3.75	-	Not Encountered	None
G12	-	4.00	-	Not Encountered	None

AOD = m Above Ordnance Datum (Malin Head)

BGL = Below Ground Level

TP1

0
1
2
3
4
5
Metres Below Ground Level



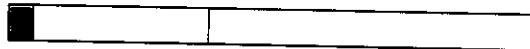
Peaty top soil.

Soft, moist, pale red/brown, sandy clayey SILT with some subrounded gravel and cobble sized fragments of red sandstone.

Soft, moist, pale red, very sandy, silty CLAY with abundant subrounded gravel and cobble and occasional boulder sized fragments of red sandstone.

Firm, moderately dense, pale red, sandy, silty CLAY with abundant subrounded gravel and cobble sized and occasional boulder sized fragments of red sandstone.

TP2

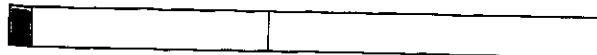


Peaty top soil.

Soft, moist, pale red/brown, sandy clayey SILT with some subrounded gravel and cobble sized fragments of red sandstone.

Soft, moist, pale red/brown, sandy, silty CLAY with abundant subrounded gravel and cobble sized and occasional boulder sized fragments of red sandstone.

TP3



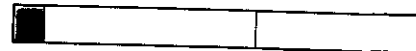
Peaty top soil.

Soft, loose, wet, pale red/brown, silty clayey SAND with some subrounded gravel and cobble sized fragments of red sandstone.

Soft, loose, wet, pale red, silty, clayey SAND with abundant subrounded gravel and cobble sized and occasional boulder sized fragments of red sandstone.

TP4

0
1
2
3
Metres Below Ground Level

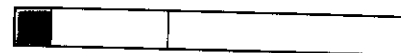


Peaty top soil.

Soft, moist, pale red/brown, sandy clayey SILT with some subrounded gravel and cobble sized fragments of red sandstone.

Soft, moist, pale red, sandy, silty CLAY with abundant subrounded gravel and cobble sized and occasional boulder sized fragments of red sandstone.

TP5



Peaty top soil.

Soft, moist, pale red/brown, sandy clayey SILT with some subrounded gravel and cobble sized fragments of red sandstone.

Soft, moist, pale red, sandy, silty CLAY with abundant subrounded gravel and cobble sized and occasional boulder sized fragments of red sandstone.



Balluguyroe Residual Landfill Project
Logs of Trial Pits (TP1 - TP5)

Figure No. 2.4.2

Job No. C002336 Date, May 2003

Finalised By -

White
Young
Green



C o . L i m e r i c k

C o . C o r k

Farahy River



LEGEND

- Site Boundary
- County Boundary
- Borehole Location (G=1990) (BH=1993)
- Trial Pit Location (G=1990) (B=1993) (TP=2001)
- Trench Location
- Surface Water Sampling Location
- Line of Cross Section

AT - A' Line of Cross Section



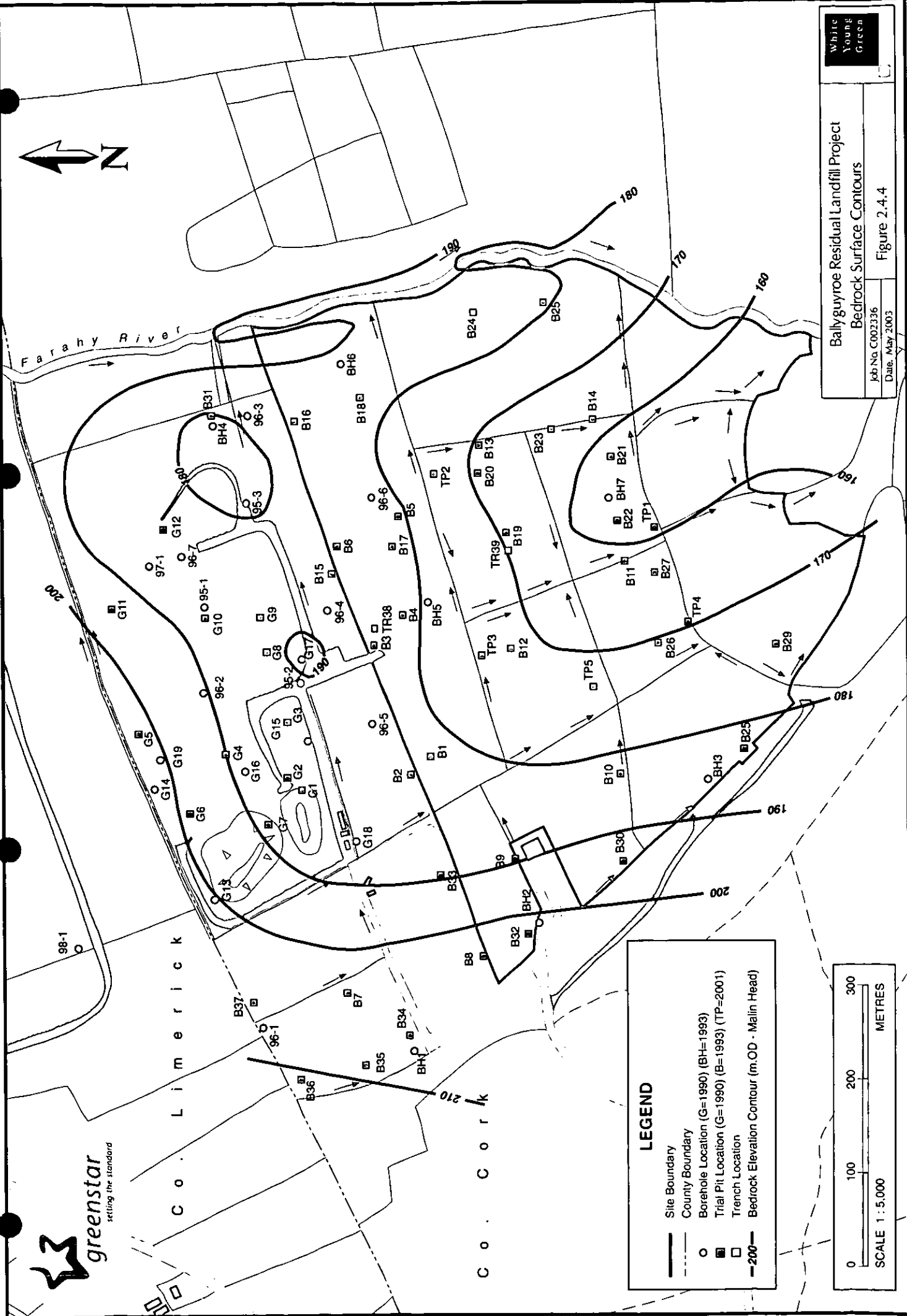
Ballyguire Residual Landfill Project

Trial Pit & Borehole Locations

Job No C002336
Date: May 2003

Figure 2.4.3

White
Young
Green



LEGEND

- Site Boundary
- - - County Boundary
- Borehole Location (G=1990) (BH=1993)
- Trial Pit Location (G=1990) (TP=2001)
- Trench Location
- - - Bedrock Elevation Contour (m.OD - Malin Head)



Ballyguire Residual Landfill Project

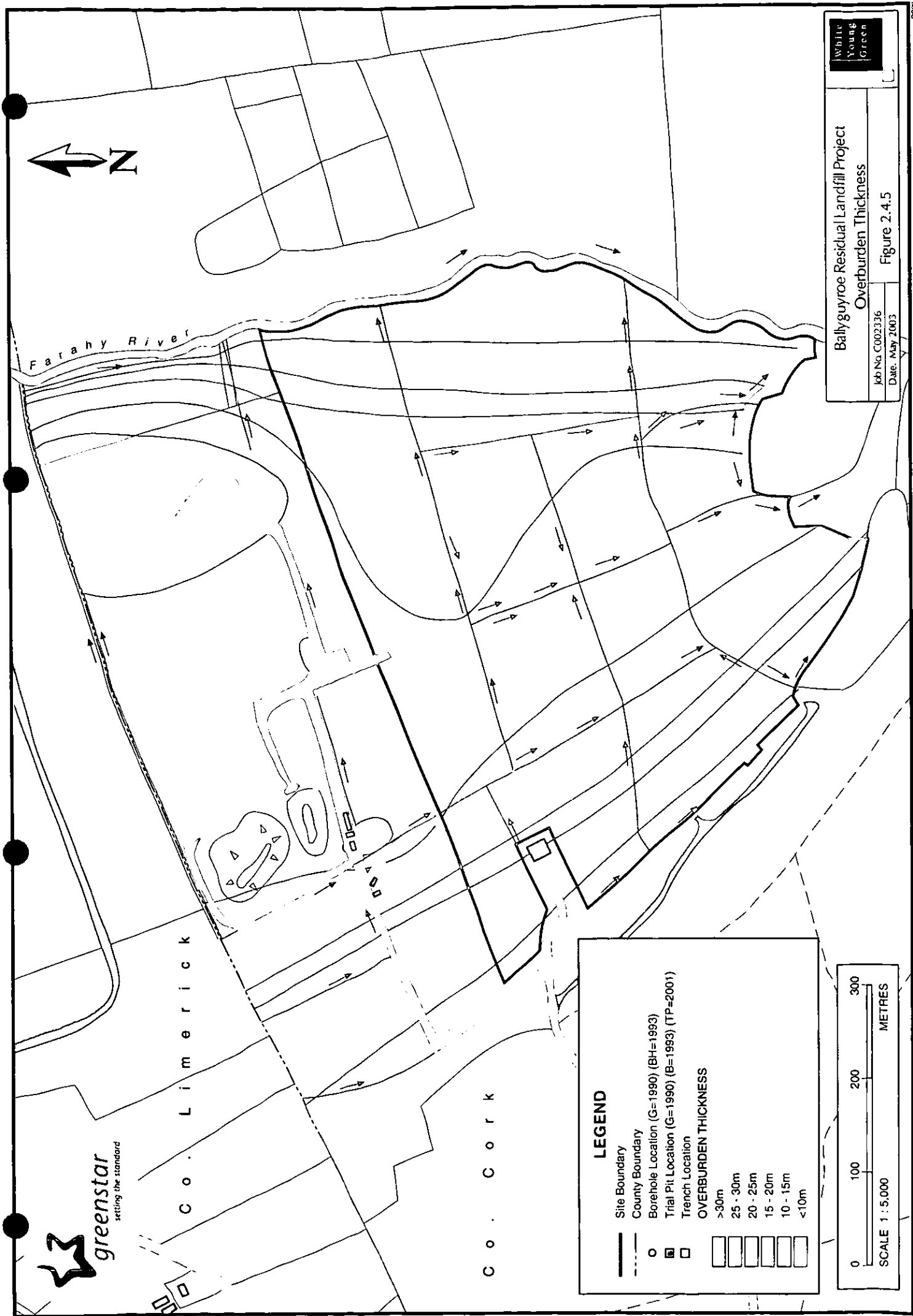
Bedrock Surface Contours

Job No C002336

Date, May 2003

Figure 2.4.4

White
Young
Green



C o . L i m e r i c k

C o . C o r k

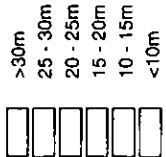
Farahy River



LEGEND

- Site Boundary
- County Boundary
- Borehole Location (G=1990) (BH=1993)
- Trial Pit Location (G=1990) (B=1993) (TP=2001)
- Trench Location

OVERBURDEN THICKNESS



Ballyguyroe Residual Landfill Project

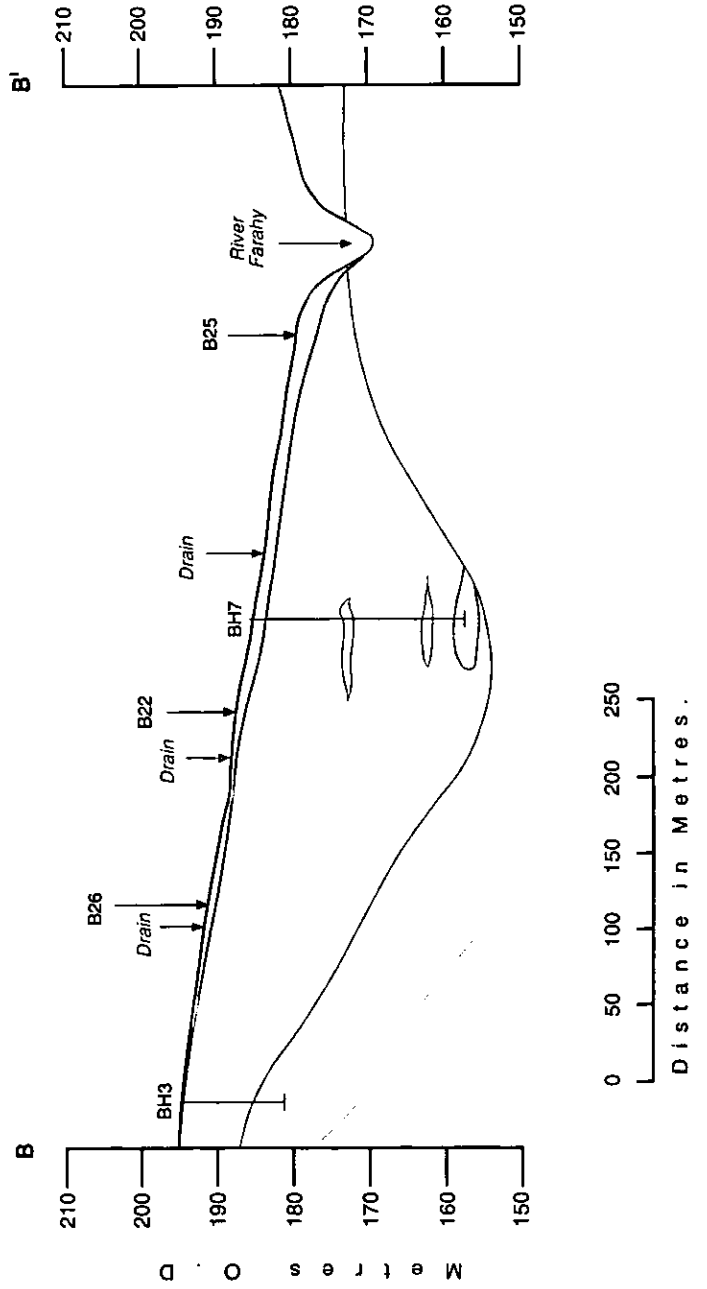
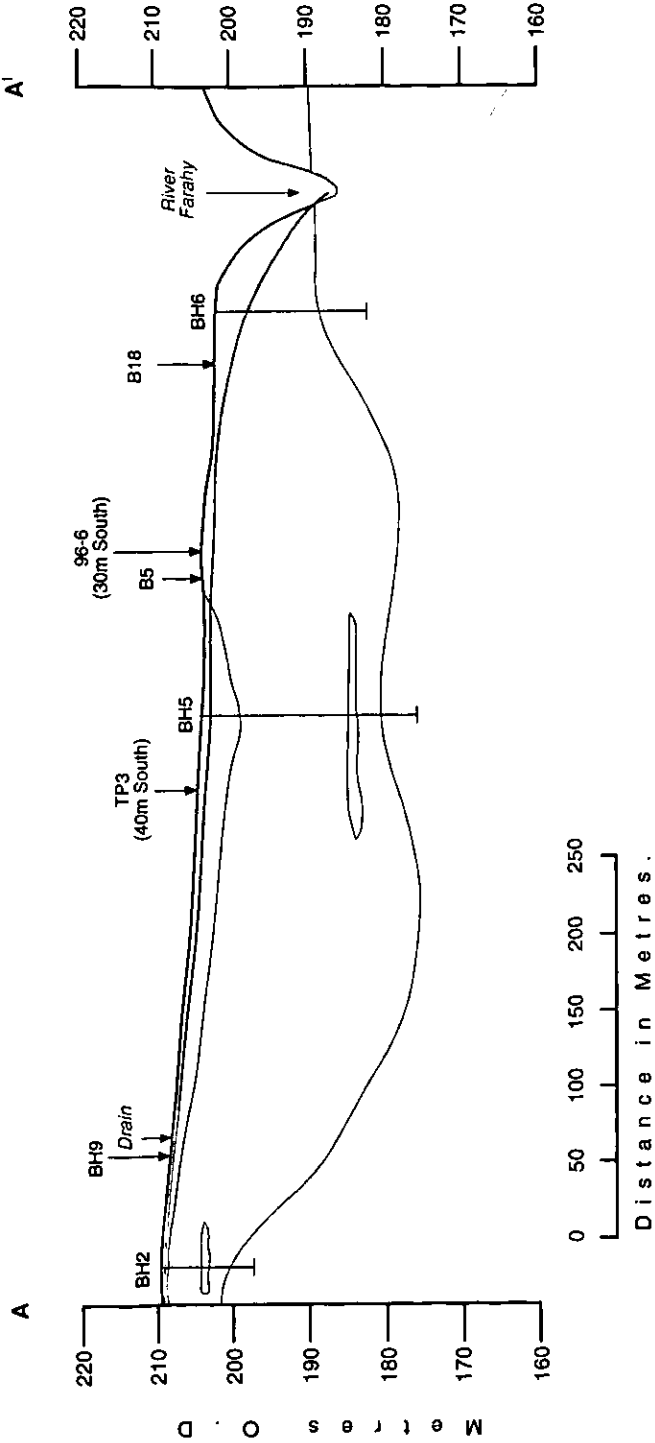
Overburden Thickness

Job No C002136

Date: May 2003

Figure 2.4.5

White
Young
Green



Ballyguyroe Residual Landfill Project
Cross Sections A - A' and B - B'

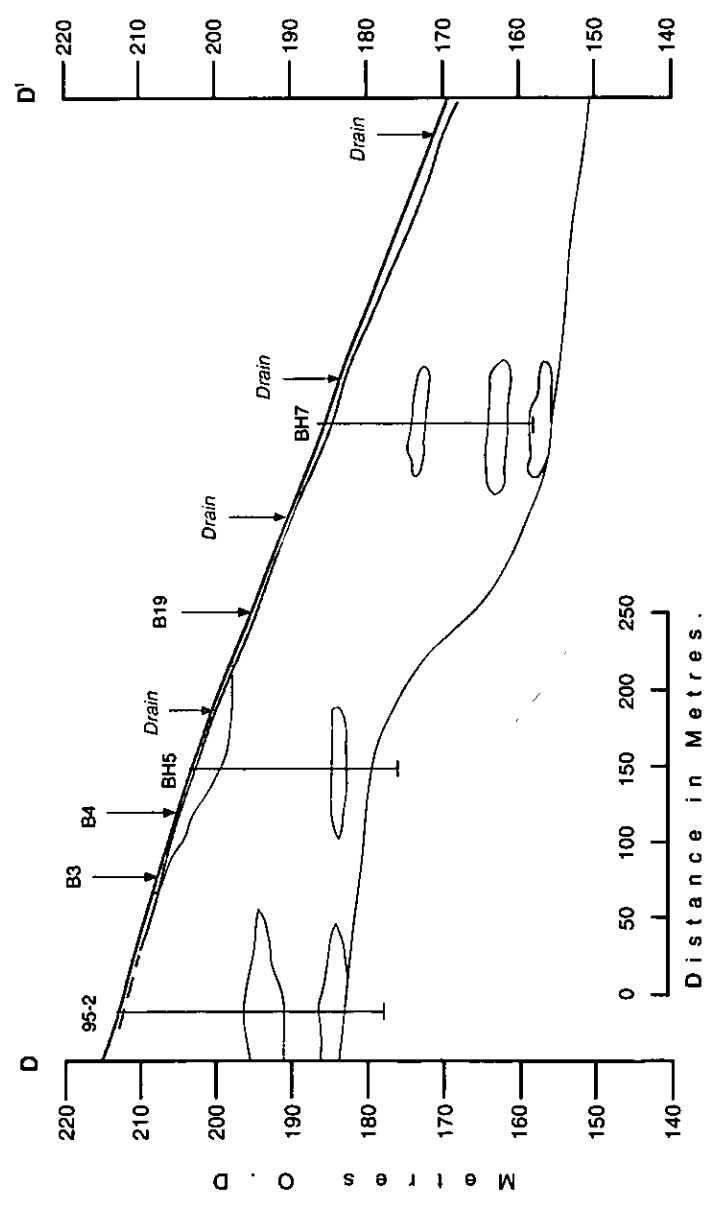
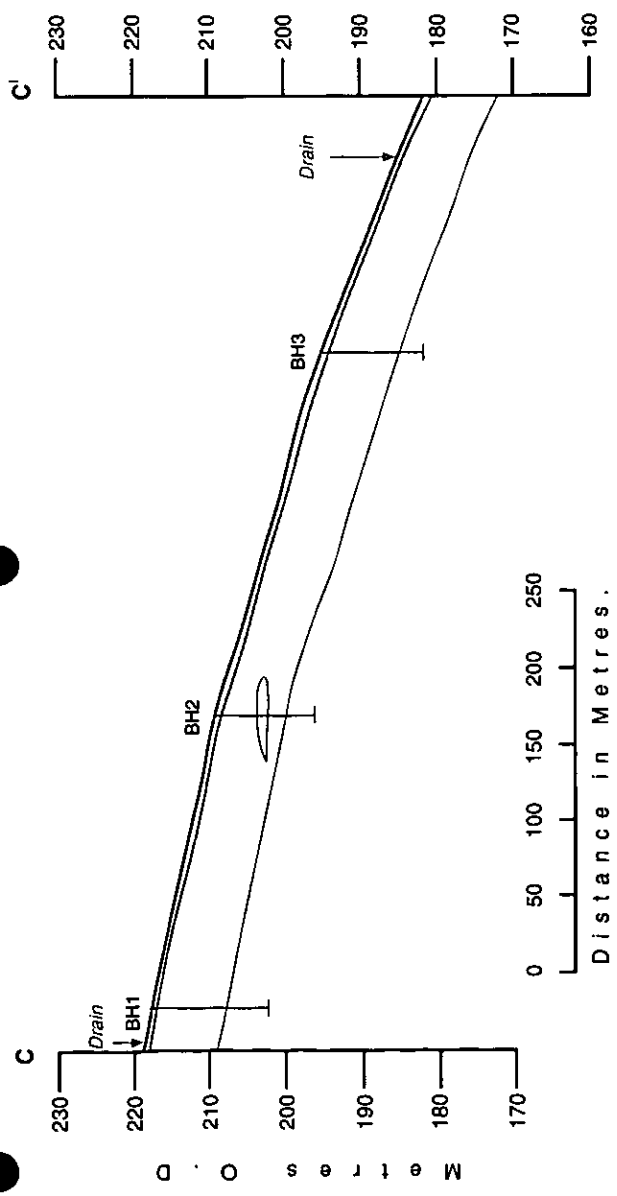
Figure No. 2.4.6

Job No. C002336

Date: May 2003

Finalised By -

White
Young
Green



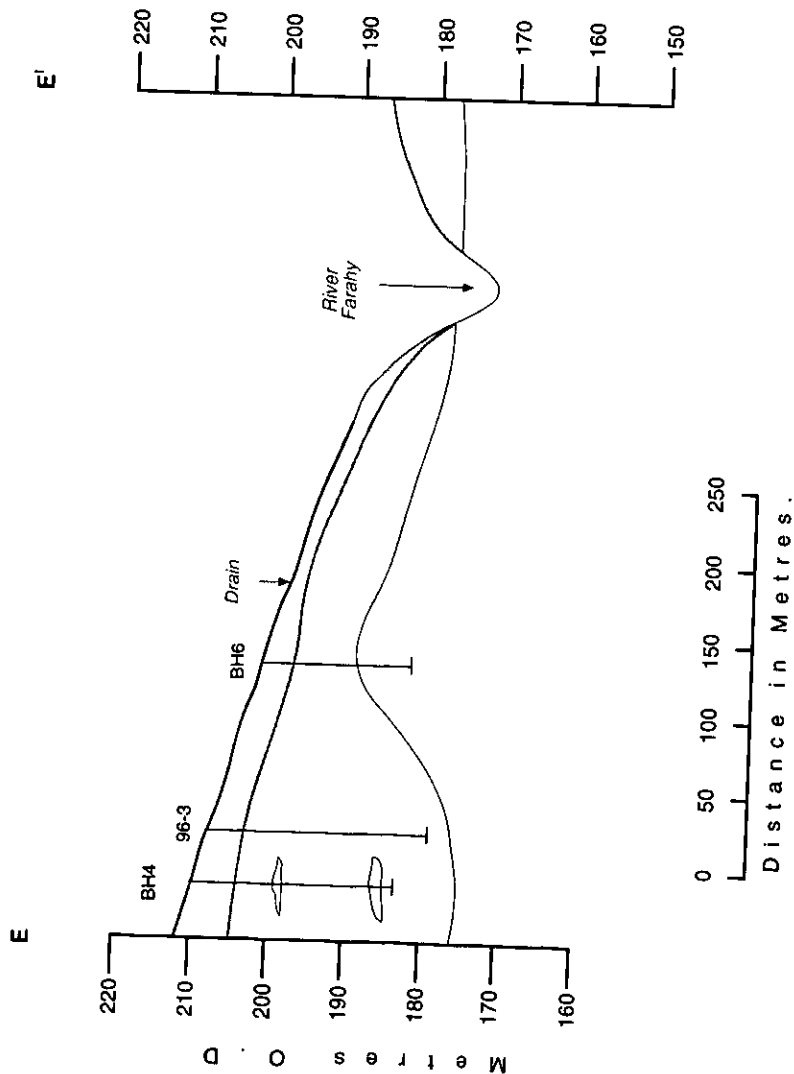
LEGEND	
—	Thin Peaty Top Soil
□	Pale red/brown, silty clayey SAND with gravel and cobble sized fragments of red sandstone.
□	Pale red, sandy clayey SILT with gravel and cobble sized fragments of red sandstone.
□	Pale red, sandy, silty CLAY with gravel, cobble and boulder fragments of red sandstone.
□	Red SANDSTONE.
BH5	Borehole/Trial Pit Location.
—	Groundwater Level. (15/3/01) (m.O.D - Malin Head)



White Young Green	
Ballyguyroe Residual Landfill Project Cross Sections C - C' and D - D'	
Figure No. 2.4.7	Job No. C002336 Date: May 2003 Fracked By:

LEGEND

- Thin Peaty Top Soil
- Pale red, sandy clayey SILT with gravel and cobble sized fragments of red sandstone.
- Pale red, sandy, silty CLAY with gravel, cobble and boulder fragments of red sandstone.
- Red SANDSTONE.
- BH5
- Borehole/Trial Pit Location.
- Groundwater Level. (15/3/01) (m. OD - Malin Head)



Ballyguyroe Residual Landfill Project		
Cross Section E - E'		
Figure No. 2.4.8	Job No. C002336	Date, May 2003
Finalised By -		

White
Young
Green

2.4.2.2 Overburden deposits

The cross sections constructed from the borehole database show the bedrock at the Ballyguyroe site to be overlain by a continuous layer of unconsolidated overburden consisting of glacial till, except in the steep sided, deep valley of the Farahy River where rock is exposed. Boreholes have proven the overburden thickness to range from 9m to 35m across the site (Figure 2.4.5). In the area of the proposed landfill footprint, however, the overburden has a thickness that varies between 10m and 30m.

The till at Ballyguyroe consists mainly of sandstone bedrock debris set in a pale red matrix of sandy, silty clay. Subrounded to subangular gravel, pebble and cobble sized rock debris predominates with the occasional boulder (up to 1.3m) and the absence of stratification in the sidewalls of trial pits. The rock debris consists largely of pale red or light purple sandstones and siltstones. Site investigations undertaken at the Ballyguyroe site identified a number of lensoid bodies of clayey sandy gravel, sandy clayey silt and clayey silty sand within the otherwise mainly clay deposit. These occasional lenses are not continuous and although typically within the top 4m of overburden can also be found at depth. Experience at the adjacent local authority landfill shows that these lenses dry out and harden within a day or two of exposure and no significant difficulty has been encountered with the handling of this material.

2.4.2.3 Bedrock

The bedrock at Ballyguyroe consists of a fine to medium pale red or purple sandstone.

Figure 2.4.4 shows the bedrock elevation contours derived from the boreholes database. The contours show that the bedrock surface falls southward and generally follows the surface topography. Depth to bedrock is typically 9m to 13m below surface on the western and eastern margins of the site. However, in the central part of the site the depth to bedrock increases up to 30m below surface (cross section B-B').

2.5 SURFACE WATER

2.5.1 Drainage Network

The Ballyguyroe site lies within the headwaters of the Blackwater catchment and alongside the Farahy river, a tributary of the Funshion river.

Here the Farahy is a fast flowing mountain stream flowing at the base a deep (25m) and steep sided valley cut into the overburden with bedrock exposed in the river bed.

The Farahy river flows south from the site and enters the Funshion River approximately 8km to the southeast. The Funshion enters the Blackwater approximately 3km east of Fermoy (Figure 2.5.1). The Blackwater catchment extends to the Ballyhoura and Galty Mountains in Co. Limerick several kilometres north of the site, where it adjoins the Shannon catchment. The approximate surface areas of the Farahy, Funshion and Blackwater catchments are listed in Table 2.5.1.

Table 2.5.1 : Catchment Areas

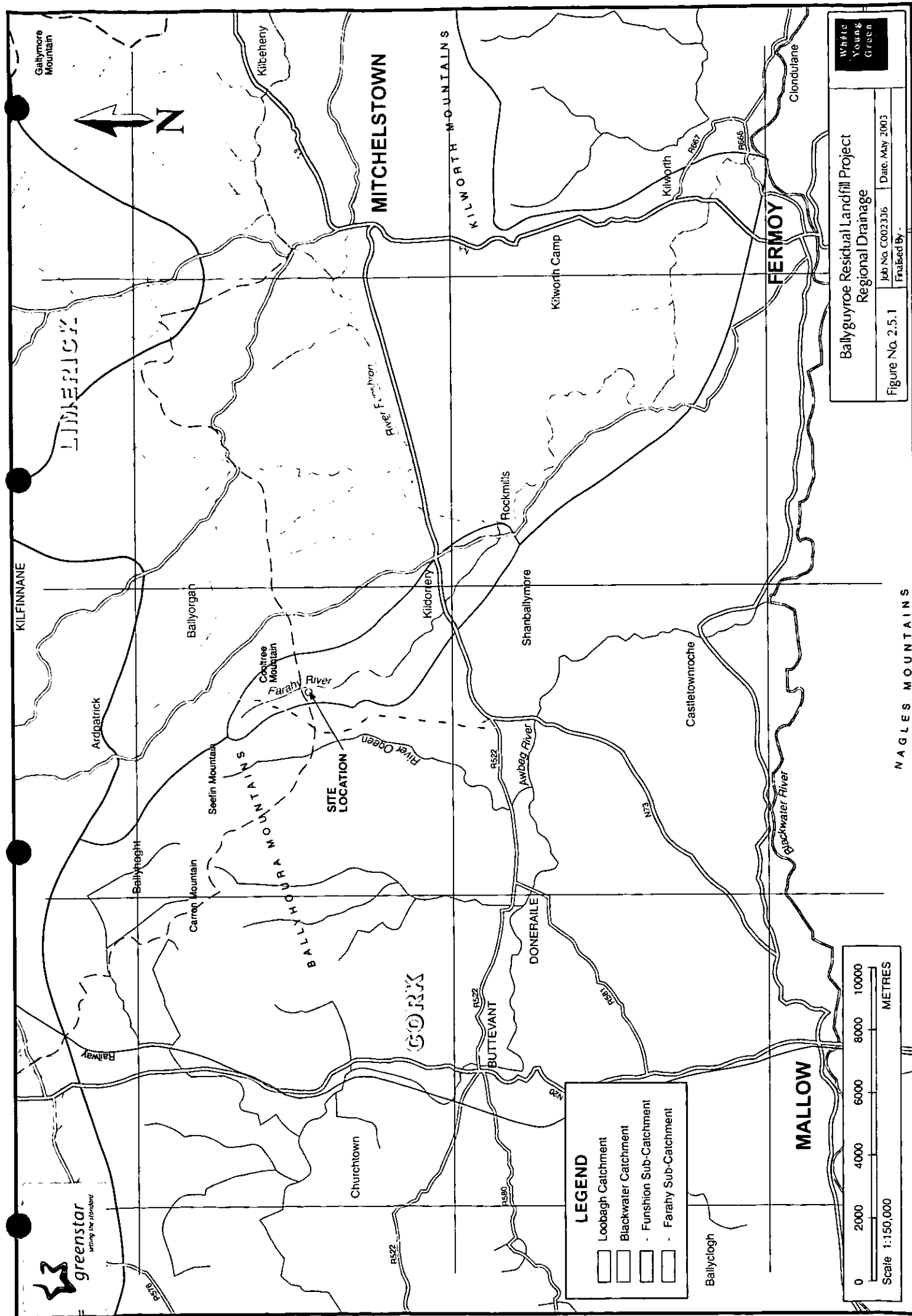
River	Catchment Area
Farahy	20 km ²
Funshion	370 km ²
Blackwater	3288 km ²

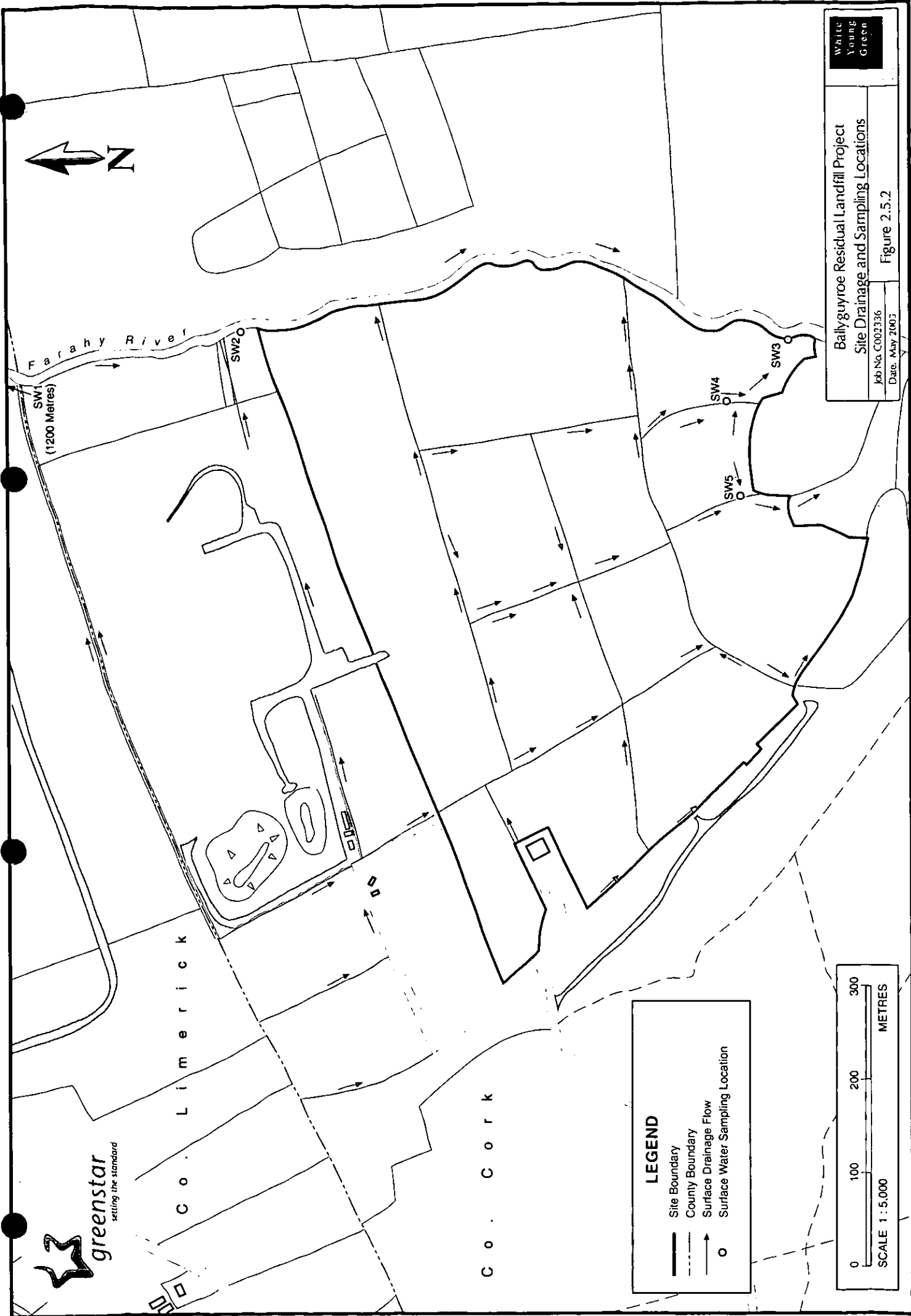
Drainage from the development site to the Farahy River is via a series of land drains located at the edge of each field as depicted in Figure 2.5.2. Many of the drains are dry except for a period after rainfall events. A drain located at the northern end of the site that flows from west to east and then discharges into the Farahy River, separates a large portion of the drainage at the local authority landfill site from the development site.

2.5.2 Dry Weather Flows (DWF)

Published dry weather flows (DWF) are currently not available for the Farahy River.

Table 2.5.2 shows the DWF and 95 percentile flows for a number of rivers in the North Cork/South Limerick area. Estimates of the likely low flows in the Farahy River determined using this data gives a low flow in the order of 0.005m³/sec and a 95 percentile flow of 0.011m³/sec. The average DWF and 95%ile flows per km² have been calculated from the data presented on Table 2.5.2. The Farahy River at the southern end of the Ballyguyroe site has a catchment area of approximately 3.7 km². Using the data on Table 2.5.2, the estimated DWF for the receiving water is 0.0053 m³/sec and the estimated 95 percentile flow is 0.0109 m³/sec.





LEGEND

- Site Boundary
- - - County Boundary
- Surface Drainage Flow
- Surface Water Sampling Location



Ballyguire Residual Landfill Project
Site Drainage and Sampling Locations
Job No. C002336
Date: May 2003

Figure 2.5.2

Table 2.5.2 : Low Flows at River Gauging Stations in the North Cork/South Limerick Area

Stn. No.	Station Name	River	Body Responsible	Catchment Area (km ²)	DWF (m ³ /sec)	95 % ile Flow (m ³ /sec)	Specific DWF (m ³ /sec/km ²)	95 % ile Flow (m ³ /sec/km ²)
18005	Downing Bridge	Funshion	OPW	363.0	1.0000	2.0000	0.0028	0.0055
18036	Killee	Funshion	Cork Co. Co.	139.0	0.1500	0.7000	0.0011	0.0050
18004	Ballynamona	Awbeg	OPW	324.0	0.6200	1.2000	0.0019	0.0037
18026	Buttevant	Awbeg	Cork Co. Co.	182.0	0.1100	0.1600	0.0006	0.0009
18027	Hunting House	Awbeg	Cork Co. Co.	268.0	0.4300	0.6000	0.0016	0.0022
18003	Killavullen	Blackwater	OPW	1258.0	2.2000	4.8000	0.0017	0.0038
24003	Garroose	Loobagh	OPW	129.0	0.2200	0.2900	0.0017	0.0022
24016	Kilmallock	Loobagh	Limerick Co. Co.	83.1	0.0550	0.1100	0.0007	0.0013
24034	Riversfield Weir	Loobagh	OPW	56.7	0.0500	0.1000	0.0009	0.0018
Average =							0.0014	0.0029

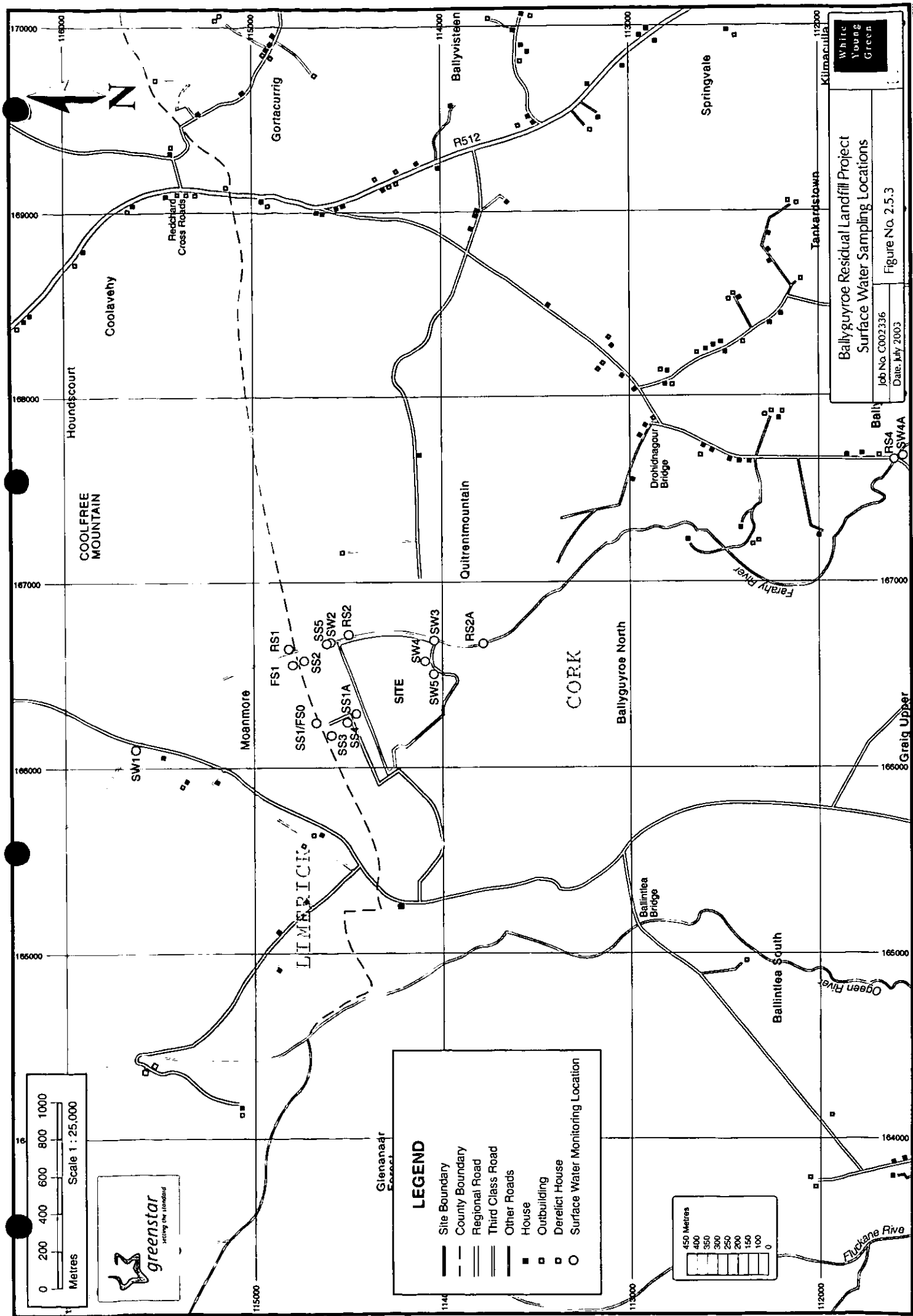
Source: Hydrological Data, EPA - www.epa.ie

2.5.3 Surface Water Quality

There is an extensive range of baseline data for the surface water quality of the Farahy River and its tributaries in the Ballyguyroe area. This data set and an accompanying interpretation of the surface water quality data are included as Appendix 2.5.1.

The assessment of the surface water quality in the proximity of the *greenstar* development site is based upon baseline sampling (March and December 2001), compliance sampling by Cork County Council (2001-2003) and from the EPA Water Quality Report 1995-1997. The sampling locations are presented on Figure 2.5.3.

The Farahy River upstream of the *greenstar* development site is characterised by good water quality. The recorded elevated iron and aluminium levels can be attributed to the composition of the underlying geology.



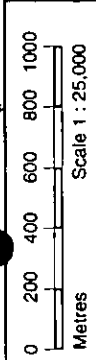
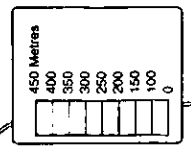
Ballyguyroe Residual Landfill Project
Surface Water Sampling Locations

Job No. C002336
Date: July 2003
Figure No. 2.5.3

White
Young
Green

LEGEND

- Site Boundary
- County Boundary
- Regional Road
- Third Class Road
- Other Roads
- House
- Outbuilding
- Derelict House
- Surface Water Monitoring Location



2.6 GROUNDWATER / HYDROGEOLOGY

The hydrogeological environment found at Ballyguyroe consists of a low permeability layer of glacial till overlying a sandstone bedrock. The till layer confines the groundwater within the underlying sandstone with the resultant piezometric surface being at or close to ground level. The piezometric surface falls generally from north to south and shows the sandstone groundwater discharging to the Farahy river. The high water table within the till reflects its low permeability and is consistent with the poor land drainage conditions.

The presence of a thick layer of low permeability clay protects the underlying sandstone bedrock from pollution and equates to a low vulnerability rating in terms groundwater protection.

2.6.1 Overburden

Samples of overburden were sent for permeability testing. Both undisturbed U_{100} samples and disturbed bulk samples were taken from the footprint of the proposed landfill. The results of the undisturbed U_{100} samples are tabulated in Table 2.6.1 whilst the re-compacted samples are presented in Table 2.6.2. The details of the permeability testing undertaken in relation to the in-situ clay at the proposed facility are included in Appendix 2.6.1.

The results for the U_{100} samples show a narrow range of in situ permeability values between 2.5×10^{-10} m/sec to 2.0×10^{-10} m/sec for the overburden in the footprint of the proposed landfill.

Table 2.6.1: Permeability Values for Undisturbed Overburden Samples from Ballyguyroe

Trial Pit No.	Sample Type	Sample Depth (m)	Permeability (m/sec)	Moisture Content (%)	Bulk Density (kg/m ³)
TP1	U_{100}	3.10m	2.0×10^{-10}	9	2230
TP2	U_{100}	2.90m	2.5×10^{-10}	11	2310
TP4	U_{100}	1.90m	2.1×10^{-10}	11	2320
TP5	U_{100}	2.00m	2.3×10^{-10}	11	2250

The disturbed bulk samples were tested to assess the suitability of the overburden for a basal liner and were re-compacted to 130kPa. The bulk samples taken from the footprint of the proposed landfill attained permeabilities of between 9.3×10^{-11} m/sec and 2.7×10^{-10} m/sec under testing making them a suitable material for a basal landfill liner.

Table 2.6.2: Permeability Values for Re-compacted Overburden Samples from Ballyguyroe

Trial Pit No.	Sample Depth (m)	Permeability (m/sec)	Moisture Content (%)	Bulk Density (kg/m ³)
TP1	1.50	9.3×10^{-11}	11	*2310
TP2	1.50	2.7×10^{-10}	11	*2280
TR4	1.50	1.9×10^{-10}	11	*2280
TR5	1.50	1.4×10^{-10}	11	*2340

* After dynamic compaction with 4.5kg hammer.

The overburden permeability values determined for this development site are consistent with those reported from the now closed adjoining local authority landfill. The Geological Survey of Ireland has indicated in their Groundwater Protection Schemes that the presence of greater than 10m of low permeability overburden gives a low (L) vulnerability rating with regard to potential groundwater pollution.

2.6.2 Bedrock Hydrogeology

The fine to medium grained sandstones and mudstones of the Poulgrania Formation that underlies the development site are part of the Devonian Old Red Sandstone Magnafacies. The Geological Survey of Ireland have classified the Old Red Sandstone Magnafacies in the County Limerick Groundwater Protection Scheme (1998) as being a locally important aquifer that is moderately productive only in local zones (L1). Accordingly, the development site is underlain at depth by an L1 bedrock aquifer.

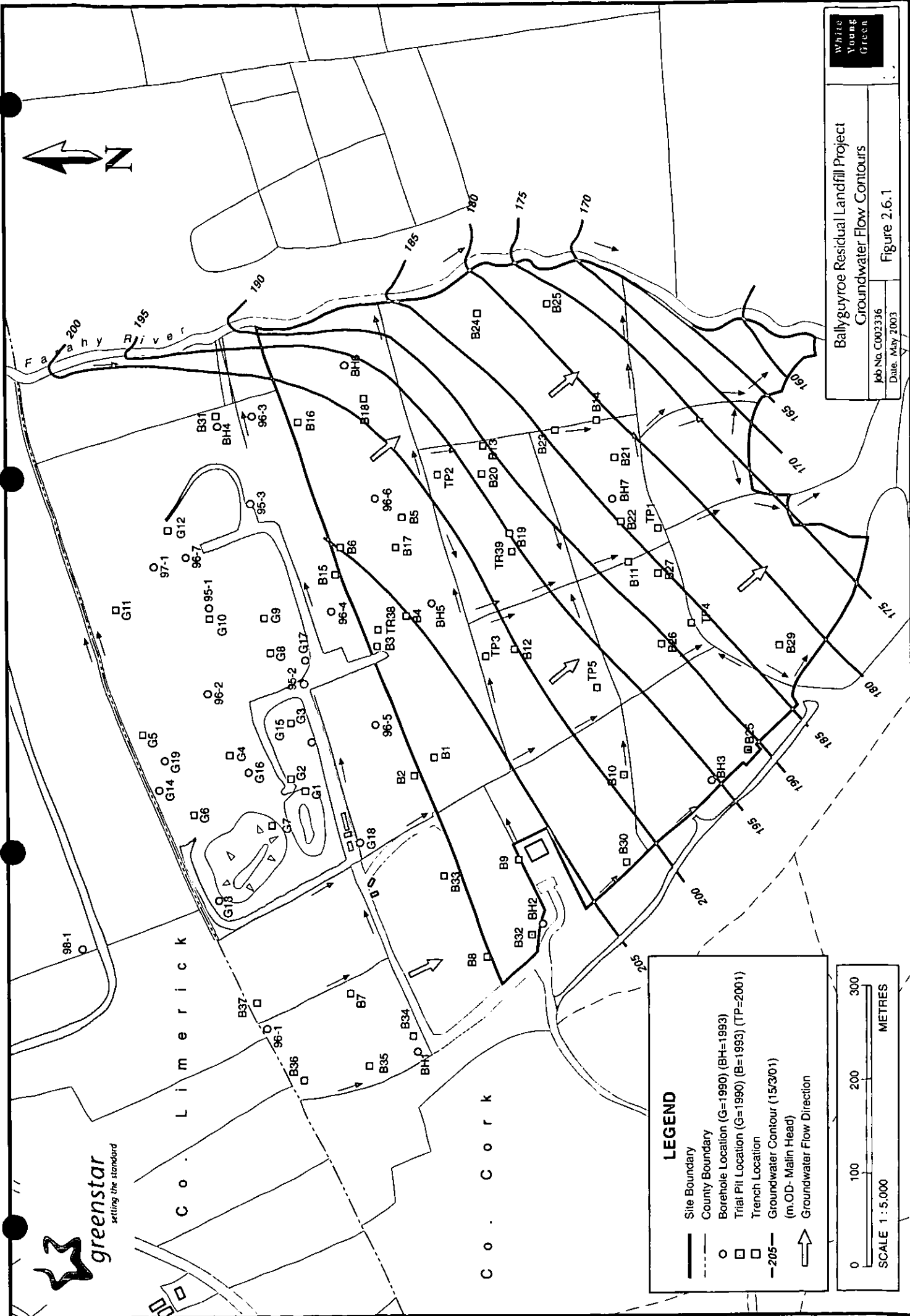
The exception to this L1 classification for the Devonian sequence is the Kiltorcan Formation, a thickly bedded sequence of coarse sandstones that overlies the Ardane Formation above the Poulgrania Formation.

The GSI has classified the Kiltorcan Formation as a regionally important aquifer (Rf). However, due to the underlying fold structures within the bedrock, the Kiltorcan Formation does not underlie the development site.

The development site is underlain by greater than 10 metres of low permeability clayey till and has a vulnerability rating of 'Low' according to the Geological Survey, EPA and DoELG definition in the Groundwater Protection Schemes published in 1999.

Drilling at the site often encountered a water bearing weathered layer at the overburden/bedrock interface. This layer was generally less than 1m in thickness and was confined by the overlying thick sequence of glacial till. BH5 (1993), located at the northern end of the landfill footprint encountered this weathered layer and found it to be artesian.

Figure 2.6.1 shows the contours of the piezometric bedrock groundwater levels as measured beneath the site. The contours follow the morphology of the topography. This pattern is consistent with the regional drainage pattern and shows the groundwater flowing in the bedrock south-eastwards towards the Farahy River. Along the north - south sections the till has a near constant thickness with both the till layer and



bedrock surface following the fall in the land surface. The east - west cross sections indicate how the bedrock surface undulates in this direction and how the sandstone bedrock comes to the surface in the deeply incised River Farahy valley.

The layer of low permeability till confines the underlying bedrock aquifer. The peizometric level in the confined aquifer, as measured in the deep monitoring wells, is at or close to the ground level reflecting the hydraulic head in the bedrock aquifer generated by the higher ground to the north. The water table in the clay, as measured in shallow monitoring wells, is also at or close to the ground surface.

The higher ground in Co. Limerick to the north of the site has thinner overburden with bedrock outcropping regularly and has higher rainfall due to its elevation. This area provides recharge to the bedrock aquifer. Bedrock also outcrops along the base of the River Farahy and this river acts as a discharge area for the aquifer.

The deep boreholes drilled at the site punctured the confining till layer and allowed measurement of the piezometric level in the bedrock aquifer. This showed that the piezometric level is close to ground surface and in the case of BH5 is actually above ground surface.

In this hydrogeological setting, the groundwater in the bedrock aquifer is naturally protected against impact from shallow pollution activities by a combination of the thick low permeability glacial till layer and the upward flow of groundwater from the sandstone aquifer into the till layer.

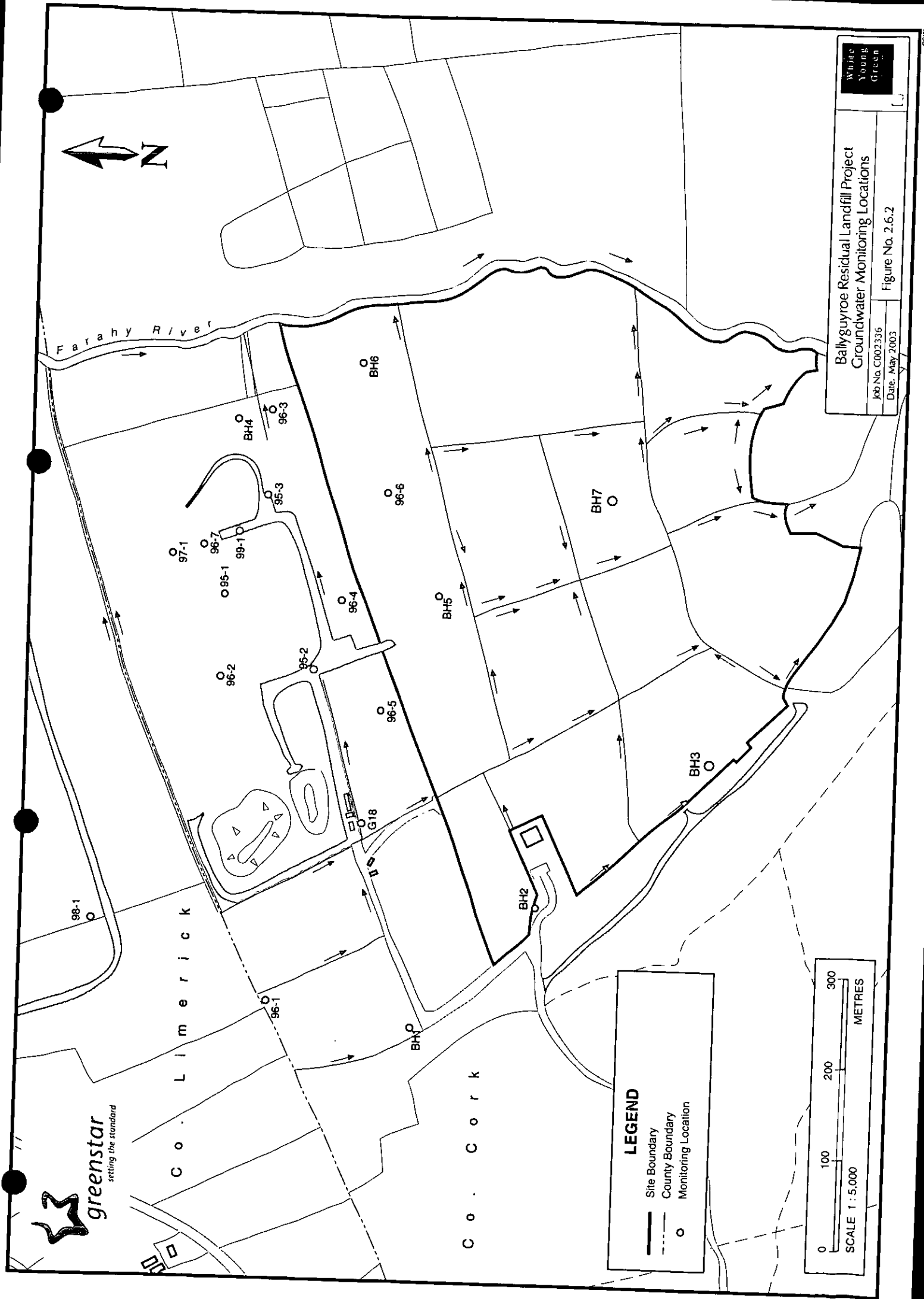
The development of the landfill at Ballyguyroe is consistent with the presence, at depth, of the LI aquifer with a lower vulnerability rating.

2.6.3 Groundwater Quality

There is an extensive database for groundwater quality at Ballyguyroe both from monitoring wells completed at and around the development site (this data set and an accompanying interpretation is included in Appendix 2.6.2) and from surrounding private wells (this data set is included in Appendix 2.6.3). The groundwater monitoring locations are shown on Figure 2.6.2.

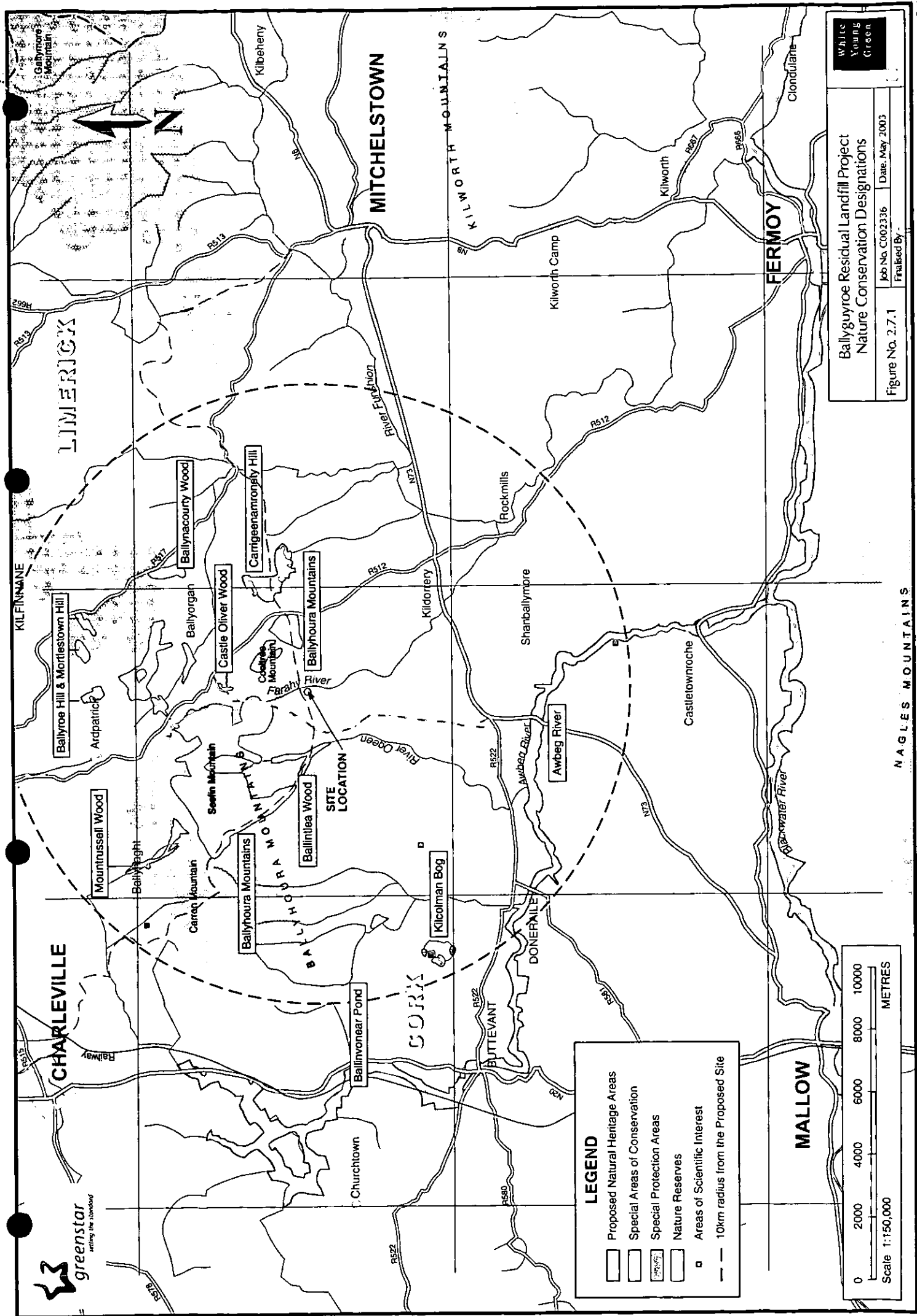
The groundwater quality at Ballyguyroe is generally good and consistent with the presence of a thick layer of low permeability till. There is no evidence that the groundwater in the bedrock aquifer has been impacted by the local authority landfill.

The private domestic wells in the vicinity of the site are either hydrogeologically upgradient or located in a different groundwater catchment to the closed and proposed landfills.



2.6.4 Groundwater Abstractions

There are no major groundwater abstractions within the vicinity of the landfill. As there are no water mains in the area, it can be assumed that all dwellings and farms are supplied by private wells.



LEGEND

- Proposed Natural Heritage Areas
- Special Areas of Conservation
- Special Protection Areas
- Nature Reserves
- Areas of Scientific Interest
- 10km radius from the Proposed Site

Scale 1:150,000

METRES

0 2000 4000 6000 8000 10000

**Ballyguire Residual Landfill Project
Nature Conservation Designations**

Figure No. 2.7.1

Job No. C002336 Date: May 2003

Finalised By: _____

White
Young
Green

2.7 ECOLOGY

2.7.1 Consultation

Consultation was conducted with Dúchas, National Parks and Wildlife and the Southern Regional Fisheries Board (SRFB), regarding any potential sites and/or species of ecological importance within and in the vicinity of the development. Copies of the correspondence from Dúchas and the Southern Regional Fisheries Board are contained in Appendices 2.7.1 and 2.7.2.

2.7.2 Nature Conservation Designations

The proposed site is not covered by any designations of nature conservation interest.

There are no sites designated under the Habitats Directive (92/43/EEC) within 3km of the proposed development.

Four sites of nature conservation interest were identified within 5km of the proposed development, Ballyhoura Mountains (Site Code 002036, Proposed Natural Heritage Area), Ballintlea Woods (Site Code 002086, Proposed Natural Heritage Area), Castleoliver Woods (Site Code 00209, Proposed Natural Heritage Area) and Carrigeenamronety Hill (Site Code 2037, Special Area of Conservation). These are presented on Figure 2.7.1 and a description of each designation is contained in Appendix 2.7.3. The Ballyhoura Mountains proposed Natural Heritage Area is the nearest designated area located approximately 1.4km north of the site.

2.7.3 Flora

The flora assessment was conducted in accordance with the *Guidelines for Baseline Ecological Assessment* issued by the Institute of Environmental Assessment, UK (IEA, 1995). The assessment comprised a desk study and field surveys.

The desk study involved the following elements:

- i A review of Ordnance Survey maps and aerial photographs of the area,
- ii A review of relevant literature and reports,
- iii Consultation with relevant organisations,
- iv A review of Dúchas, National Parks and Wildlife, datasets of existing and proposed designations.

The field surveys comprised the following:

- i An assessment of the habitats on the site based on vegetation surveys. The habitat assessment was conducted in general accordance with Phase 1 Habitat Survey Methodology (Joint Nature

Conservancy Council, UK 1993). Reference was also made to *A Guide to Habitats in Ireland* (Fossitt, 2000). Plants were identified according to Webb *et al.* 1996.

- ii A hedgerow survey. Hedgerows were described and evaluated using the *Hedgerow Evaluation and Grading System* of Clements and Tofts (1992).

Site visits were made during April 2001 and November 2001. Some herbaceous plants would not be in flower at these times and thus may be under-recorded.

2.7.3.1 Phase 1 Habitat Assessment (April 2001)

A survey of the lands within the development site was undertaken in April, 2001.

Seven main habitat types were identified on the site. These habitats are wet grassland, improved grassland, heath, semi-natural woodland (including birch and hazel woodland), hedgerows, watercourses and built land. Figure 2.7.2 illustrates the location and extent of the habitats and a detailed description of each of these habitats is contained in Appendix 2.7.4. A list of the mosses, liverworts and lichens recorded at the site is included as Appendix 2.7.5 and a hedgerow evaluation and classification is included as Appendix 2.7.6.

The principal habitats on the site are wet grassland, improved grassland, hedgerows, streams, drains, scrub and woodland.

The majority of hedgerows on the site are of Low or Moderate local ecological value. A number of hedgerows at the south and south east of the site are of Moderately High to High or High local ecological value.

The wet grassland and improved grassland habitats are of low local ecological value.

No rare or protected species of plant were recorded on the site.

The woodland habitat along the slopes of the River Farahy is of significant ecological interest. This is a semi-natural woodland with two distinct woodland types reflecting the underlying soil type. Hazel (*Corylus avellana*) coppice at the south of the site and birch (*Betula pubescens*) woodland at the north. Lichens, mosses and liverworts are abundant.

2.7.3.2 Phase 1 Habitat Assessment (November 2001)

A survey of the lands adjacent to the proposed facility was undertaken in November, 2001.

Seven main habitat types were identified adjacent to the development site. These habitats were woodland, hazel woodland, mixed woodland, improved grassland, wet grassland, wet heath and coniferous forestry. Figure 2.7.2 Revision A illustrates the location and extent of the habitats and a detailed description of each of these habitats is also contained in Appendix 2.7.4.



Falahy River

C o . C o r k

LEGEND

- Habitat Legend**
- Improved Grassland
 - Wet Grassland/Juncus Dominated
 - Wet Grassland with Gorse
 - Heath
 - Scrub
 - Woodland (Birch)
 - Woodland (Hazel)
 - Coniferous Woodland
 - Built Land
 - Stream/Drain
- Hedge/row Assessment Legend**
- Hedge Number
 - High to Very High Local Ecological Value
 - Moderately High to High Local Ecological Value
 - Moderate Local Ecological Value
 - Low Local Ecological Value
 - Site Boundary

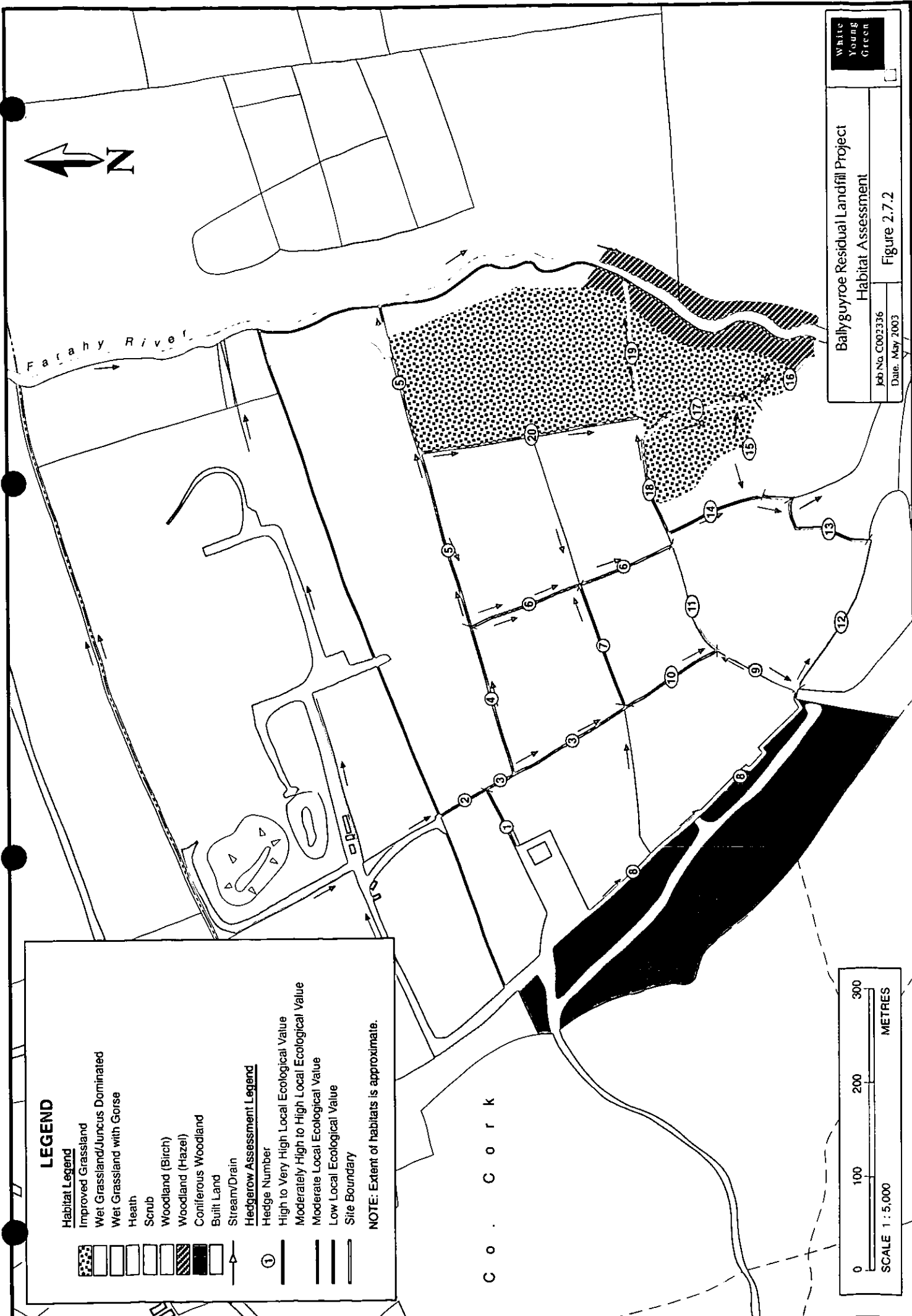
NOTE: Extent of habitats is approximate.

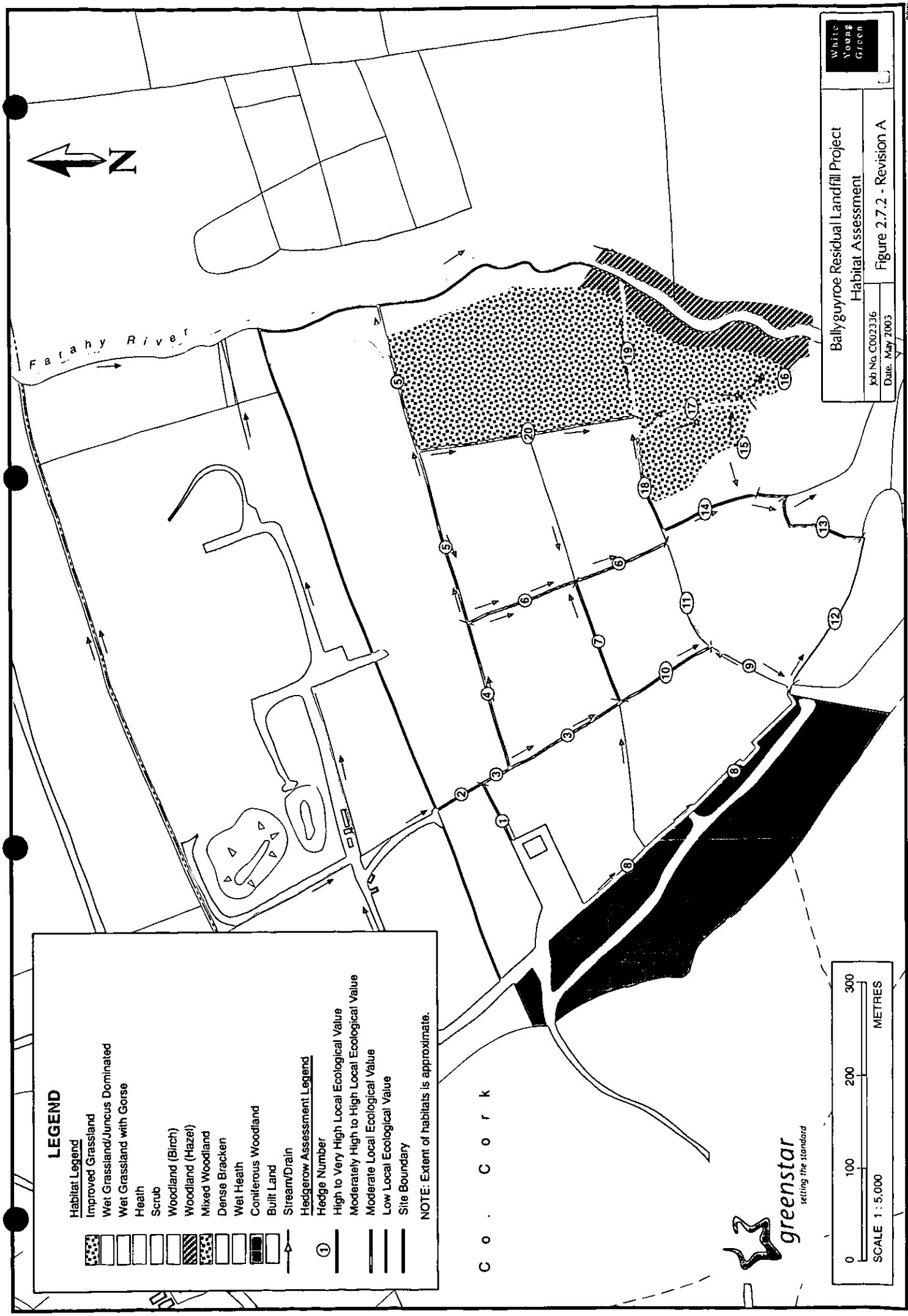
White
Young
Green

Ballyguyroe Residual Landfill Project
Habitat Assessment

Job No. C002336
Date: May 2003

Figure 2.7.2





No rare or protected species were recorded in the areas surveyed adjacent to the proposed development site.

The habitats recorded in the areas adjacent to the site are typical of the Ballyhoura Mountains. Both the wet grassland and improved grassland habitats are typical of the upland farms of the region and are of low, local ecological value. Much of this region is afforested and the coniferous forest habitat described here occurs frequently in the area and is of low, local ecological value. Both the hazel and the mixed woodland areas are typical of the habitat types that develop around mountain streams/drains in the uplands of the region. These type of habitats are rich in their diversity of plant species with a particularly obvious lower plant component of a lush growth of mosses and liverworts due to the prevailing damp, moist conditions. The plant species diversity of these woodland habitats is high. The mixed woodland is considered to be of local ecological value. The hazel woodlands associated with the River Farahy and its tributary south of the site are of significant local ecological value.

The wet heath habitat is typical of the hill slopes in the uplands of the region. The habitat corresponds to the Annex I habitat of "northern Atlantic wet heaths with *Erica tetralix*" (Natura 2000 code: 4010). This annex belongs to the Habitats Directive (Directive 92/43/EEC, amended by Directive 97/62/EC). From the preliminary assessment made of this area, it would appear that it is not a prime example of this habitat type due to the dominance by one species Purple moor grass (*Molinia caerulea*). Ideally shrub cover in this habitat type should be higher than 25% and it would appear that purple moor grass is dominating at the expense of shrub species in this particular area. Also of the shrub species, gorse (*Ulex europaeus*) is the main species and not ling heather (*Calluna vulgaris*) as it should be in a good example of wet heath habitat. It is noteworthy, though that this area is not a prime example of the wet heath habitat type and as such is of moderate, local ecological value.

2.7.4 Terrestrial Fauna – Mammals, Amphibians and Reptiles

A field survey of the mammals, amphibians and reptiles was carried out on several days: 3rd and 4th April 2001, with a repeat visit on 22nd April. Weather conditions fair on the 3rd and 4th April were fair, mild and overcast with occasional rain and wind. Conditions on the 22nd were good, warm and sunny. The survey was restricted to the area of the development site while the general locality and surrounding areas were overviewed from the site or from local public roads. This review of adjoining lands incorporated an assessment of the likely presence of protected species, including badger, pine martin, otter, deer, red squirrel, bats, hedgehog, stoat, pygmy shrew, hare and bird species.

Recommendations and evaluation techniques utilised are in general accordance with *Guidelines for Baseline Ecological Assessment* (Institute of Environmental Assessment, UK, 1995), *Wildlife Impact: the treatment of nature conservation in environmental assessment* (RSPB, 1995) and *Guidelines for ecological evaluation and impact assessment* (Regini, M. 2000). The habitats present were assessed in general accordance with techniques adopted for the Badger & Habitat Survey of Ireland (Smal, 1995). Habitats listed by Fossitt (2000) and by Nature Conservancy Council (1990) were referred to.

Attention was paid to potential bat roosting sites and foraging areas.

The field survey was supplemented by evaluation of relevant literature and existing information.

2.7.4.1 Survey Constraints

Where cover was dense, badger *Meles meles* setts may have been obscured and not found.

2.7.4.2 Habitat Descriptions

The principal habitats on site and in immediately adjoining areas are mapped in Figures 2.7.2 and 2.7.3. The habitat map serves to provide a framework for assessment of vertebrate ecology (species distribution and abundance). A detailed description of the habitats and their interest in terms of the mammals, amphibians and reptiles that may be encountered in these habitats is included in Appendix 2.7.7.

Most of the site is covered by grassland and heath and this is of low vertebrate interest although these habitats do provide a foraging habitat common species such as rabbit *Oryctolagus cuniculus* and Irish hare *Lepus timidus hibernicus*.

The field boundaries comprise either scrub, hedgerow or drainage ditches and of these the hedgerow and scrub boundaries provide the principal wildlife habitat within the grassland portion of the site.

The Farahy River valley provides a habitat for a range of vertebrate and invertebrate species. The woodland provides a source of fruit for mainly mammalian species. It is of principal ecological interest within the site due to the relative rarity, quality and secluded nature of this riparian habitat.

The drains and streams flowing through the site have limited potential for wildlife although otters may occasionally use small streams to enter hinterlands in search of prey such as frogs.

Several pools were encountered along the streams and ditches and these provide breeding grounds for frogs and for a variety of invertebrates including snails.

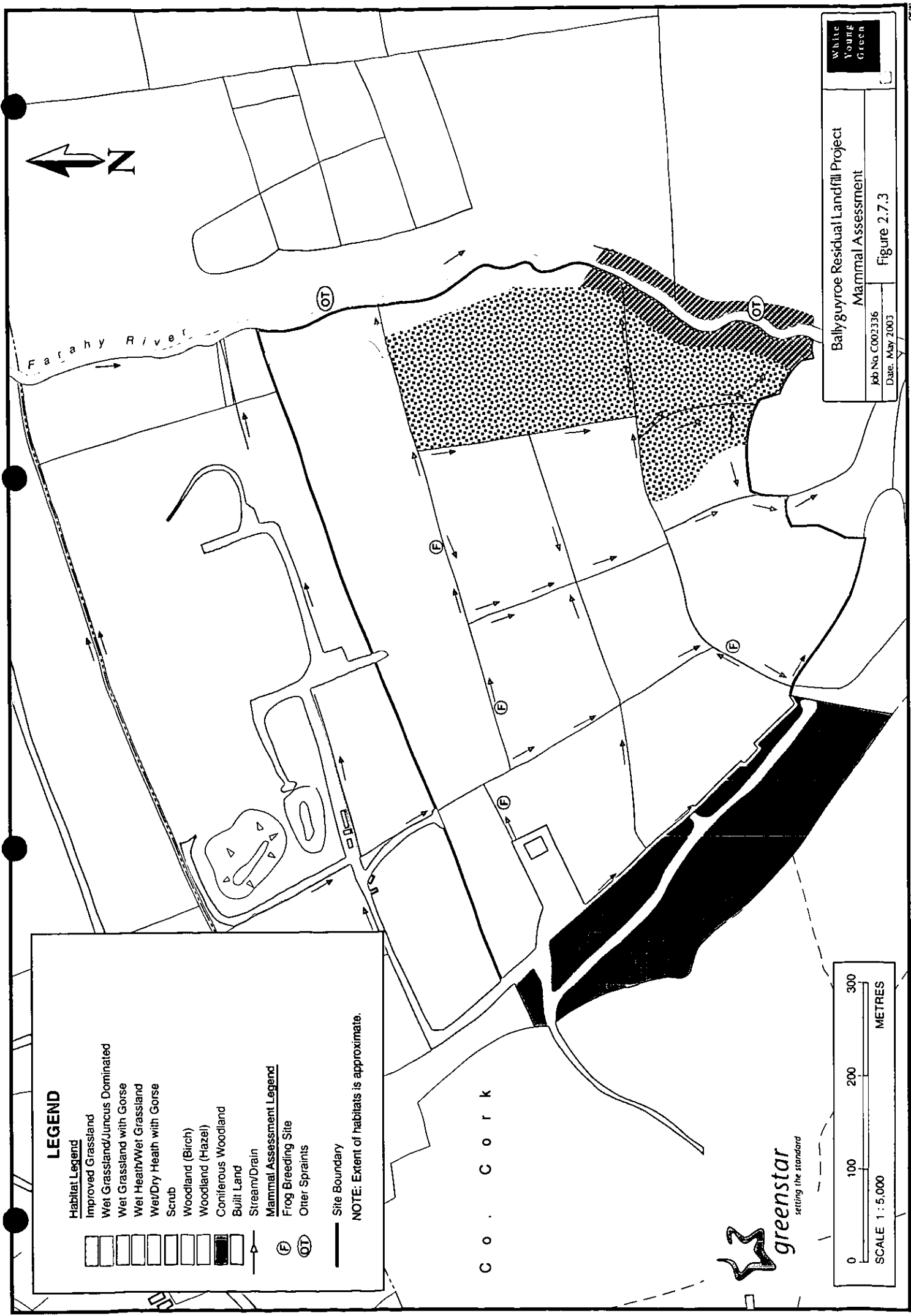
The Farahy River provides a habitat for protected species such as otter *Lutra lutra*.

2.7.4.3 Fauna

The mammalian vertebrate fauna of this exposed marginal hill area is neither diverse nor abundant as reported in Appendices 2.7.8 –2.7.10.

Mammals

The most common species encountered on site was the red fox *Sciurus fucus*. Signs of their presence were evident within the woodland and throughout most of the fields on site and in addition an individual fox was seen foraging off-site to the east and one fox den was identified on site.



LEGEND

Habitat Legend

Improved Grassland
Wet Grassland/Juncus Dominated
Wet Grassland with Gorse
Wet Heath/Wet Grassland
Wet/Dry Heath with Gorse
Scrub
Woodland (Birch)
Woodland (Hazel)
Coniferous Woodland
Built Land



Mammal Assessment Legend

Frog Breeding Site
Other Spraints
Site Boundary



NOTE: Extent of habitats is approximate.

White

Young

Green

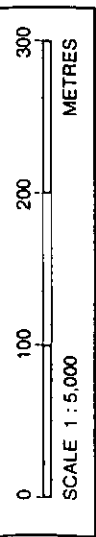
Ballyguyroe Residual Landfill Project

Mammal Assessment

Figure 2.7.3

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Brown rats *Rattus norvegicus*, although not especially common and their presence perhaps associated with the adjacent local authority landfill, which was operational at the time of surveying, were present in woodland and in the boundaries of the site.

Other mammals showing evidence of their presence on site include rabbits *Oryctolagus cuniculus* and the field mouse *Apodemus sylvaticus*. There were infrequent rabbit burrows present in some hedgerows and field boundaries and there was evidence of fieldmouse in the hazel woodland.

There was evidence of otters along the Farahy River and two sprainting locations were identified. Otters would use the site boundary stretch of the Farahy River as a foraging habitat and also as a conduit to upper reaches and hinterland areas where they will feed on frogs and other small vertebrates.

Other mammals that were not observed on site but are likely to occur are the Irish Hare *Lepus timidus hibernicus*, bank vole *Clethrionomys glareolus*, hedgehog *Erinaceus europaeus*, pygmy shrew *Sorex minutes* and Irish stoat *Mustela erminea hibernica*, pine marten *Martes martes*, Red deer *Cervus elaphus*, sika deer *Cervus Nippon*, red squirrel *Sciurus vulgari*, badger *Meles meles* and feral American mink *Mustela vison*.

No evidence of bats was encountered during the survey but it is likely that two pipistrelle species, *Pipistrellus pipistrellus* and *Pipistrellus pygmaeus*, and the brown long-eared bat *Plecotus auritus* would forage in the area during warm summer conditions.

Of these the pygmy shrew, red squirrel and Irish stoat are protected species under the 1976 Wildlife Act. The hedgehog, Irish hare and bats are also protected under the 1976 Wildlife Act and are a Red Data Book Species.

Amphibians and Reptiles

The common frog *Rana temporaria* was encountered along the drainage ditches and their associated pools and a number of their breeding locations were also identified on site (Figure 2.7.3).

The common lizard *Lacerta vivipara* is a common species that is frequent in upland habitats and is expected to be present in the habitats of the proposed site.

Both the common frog and the common lizard are protected species under the Wildlife Act, 1976 and the common frog is a Red Data Book Species. Both the species and their breeding sites are protected.

2.7.4.4 Summary - Mammals, Amphibians and Reptiles

The habitats on site may be considered in terms of extent, diversity, naturalness, rarity, fragility, typicalness, recorded history, position, potential value and intrinsic appeal (Regini, 2000). The potential of these habitats for vertebrate fauna is considered in this framework also. These considerations are made in the context of guidelines referred to in the Introduction.

The site may be considered as comprised of two essential habitat zones.

- i) the marginal hill pastures; including improved pastures and areas of heath, and also boundary hedgerow and scrub.

Most of this area may be considered to be of low or negligible scientific interest; the grasslands are common and widespread habitats, with poor quality habitats for vertebrate species and the area of heath whilst relatively uncommon is degraded and also of low local interest. The hedgerow habitats, although more diverse, are common and widespread habitats supporting common and ubiquitous species and are therefore also considered to be of negligible or low local interest.

- ii) the Farahy River valley and the associated hazel-dominated woodland.

This river valley, its riparian corridor, is undoubtedly a habitat of substantial ecological interest. The river is utilised by a protected species - the otter (EU Habitats Directive) - and forms part of the Blackwater catchment.

The tributary streams, present on site, and that feed into the Farahy River, are of lesser interest, except within the woodland area.

2.7.5 Terrestrial Fauna – Birds

A field survey of birds on the proposed development site was carried out in April 2001. Each field within the site was systematically walked, with notes made of the bird species present (seen and heard) and the associated habitats. While surveying the site, bird species seen or heard in surrounding areas were also recorded.

During the survey, particular attention was given to the possible presence of bird species that are listed on Annex I of the EU Birds Directive (Council Directive 79/409/EEC), or Birds of Conservation Concern in Ireland (BoCCI) as listed in Newton *et al.* (1999). The list of rare or threatened birds in Newton *et al.* supersedes the list in the Irish Red Data Book on Vertebrates (Whilde 1993).

The standard ornithological literature was reviewed, and listings and maps of sites of bird conservation importance in Cos. Cork and Limerick, held by Dúchas the Heritage Service, were accessed.

2.7.5.1 Baseline Environment

Within the site, two main groups of birds are distinguished based on habitat preference. These are species of wet pasture fields (in places tending towards heath), and species of hedgerows and woodland. In addition, the local authority landfill, during its operational phase, attracted large numbers of crows and during the 2001 survey were resting within the site while waiting to attend the landfill. A significant reduction in crow numbers was noted on a site visit on the 22nd August 2003 due to the closure and

subsequent capping of the local authority landfill since September 2001. The surrounding forestry plantations support additional woodland species, some of which may at times pass through the site. No riparian species were recorded on the river though it appears suitable for dipper (*Cinclus cinclus*).

A list of the species recorded during the survey within and around the site during the survey, a detailed description of the birds encountered in each of the two habitats and a detailed description of the other bird species that would be expected to occur in the habitats of the proposed site are presented in Appendix 2.7.11, with an indication of the main habitat(s) used by each. An overview of the birds encountered and expected to occur on site is outlined below.

The wet pasture is typically species poor, with snipe, meadow pipit and reed bunting being characteristic species of this widespread habitat. The snipe recorded are likely to be the late-wintering or passage birds rather than breeding on the site. The linnets, a species of dry heathy areas, were recorded in the north-easternmost part of the site where gorse scrub occurs.

The wooded river valley and hedgerows provide very good habitat for small woodland birds. The surrounding conifer plantations support a low diversity of species, with chaffinch, coat tit and blackbird being the main characteristic species of this habitat. At the time of sampling there were large numbers of crows of several species, particularly hooded crows, and ravens perching in the surrounding coniferous trees during periods of inactivity at the local authority landfill which was operational at this time. As stated above, a significant reduction in crow numbers in the coniferous forest surrounding the local authority landfill were noted during a recent site visit due to the closure and subsequent capping of the local authority landfill.

The complete absence of gulls at the landfill was somewhat surprising though their absence was also noted in an earlier ecological assessment of the fauna of the area carried out in December 1993.

Few other bird species would be expected at this site. The birds that may be expected are Birds of prey; especially kestrel (*Falco tinnuculus*) and sparrowhawk (*Accipiter nisus*), Long-eared owls (*Asio otus*). Crossbills (*Loxia curvirostra*) and jay (*Garrulus glandarius*) were recorded in the forestry plantations during an ecological assessment carried out in December 1993.

Hen Harriers are also known to occur and breed in the Ballyhoura Mountains but there are no known breeding sites in the vicinity of the landfill and the habitats encountered at the proposed landfill site are of no importance for hen harriers. Further details on the sites importance for hen harriers are provided in Appendix 2.7.11.

2.7.5.2 Summary - Birds

The bird species recorded in the survey area are all widespread species in similar habitats elsewhere. None of the species are listed on Annex I of the EU Birds Directive nor as Birds of Conservation Concern in Ireland (BoCCI) (Newton *et al.* 1999).

The occurrence of snipe on the wet pasture is of some interest as Hutchinson (1989) notes that there is a widespread view among those who have shot snipe for many years that winter numbers are lower now than formerly and that the principal reason is the drainage of much wetland and bog.

The high number of ravens and hooded crows attracted (at the time of the field survey) to the local authority landfill are of interest as flocks of these sizes are relatively scarce (Hutchinson 1989). Such high numbers, however, were artificially maintained by the rich feeding opportunities that were offered by the adjacent landfill, and, especially in the case of hooded crow, the ample nesting sites offered by the conifer plantations. This situation has changed with the closure and subsequent capping of the local authority landfill since September 2001 with a consequent reduction in crow numbers.

In summary, the *greenstar* development site is not of any particular conservation importance for birds.

2.7.6 Aquatic Ecology - River Farahy

The Farahy River flows south from the development site and enters the Funshion River approximately 8km to the southeast. The Funshion enters the Blackwater approximately 3km east of Fermoy. See Figure 2.5.1 in Section 2.5.

The River Farahy is not a designated Salmonid Water. However, the River Blackwater is a designated Salmonid Water under the European Communities (Quality of Salmonid Waters) regulations, 1988. S.I. No. 84 of 1988.

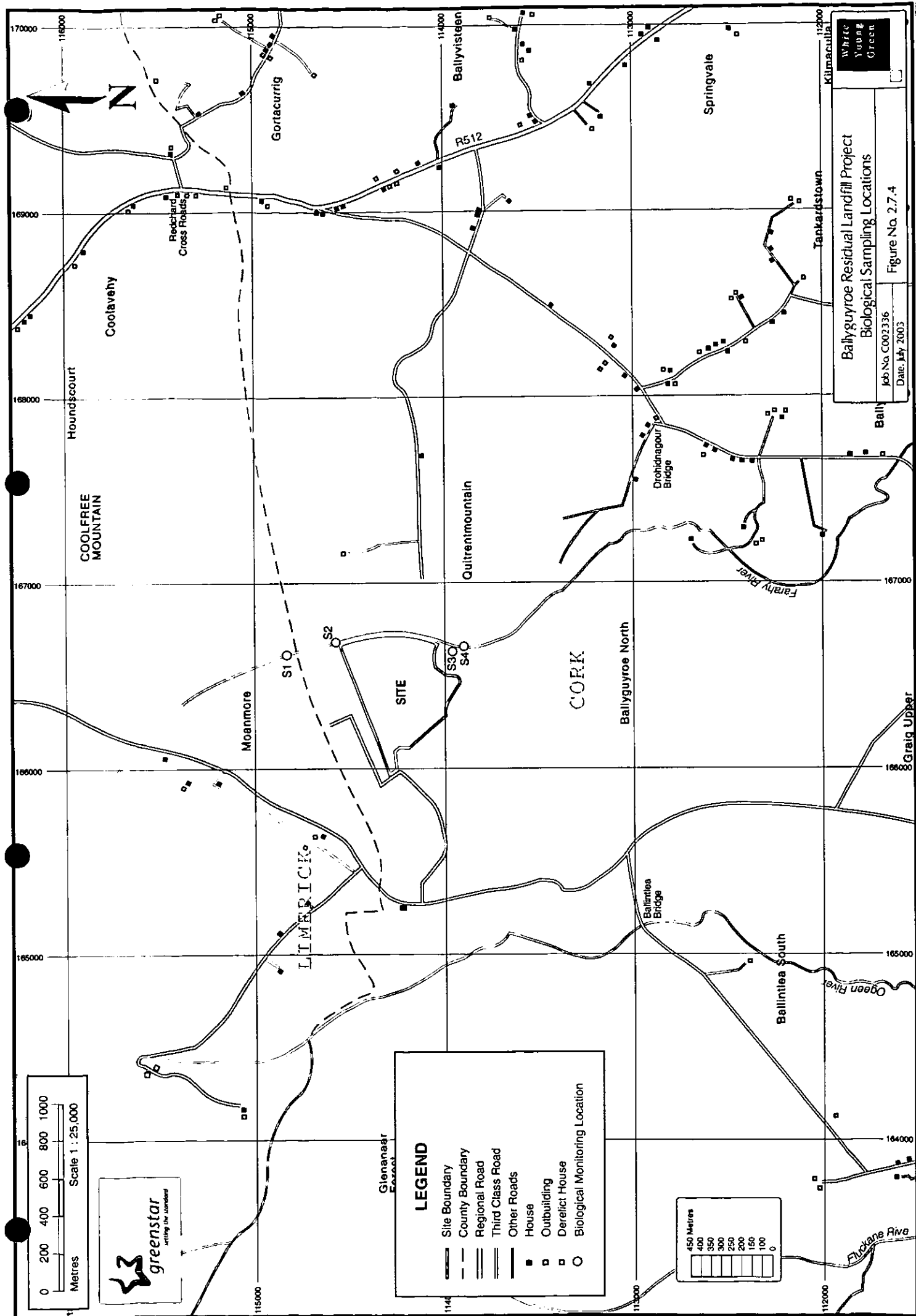
The River Farahy is not a proposed Special Area of Conservation (SAC) and there are no plans to designate the River Farahy as an SAC in the future (Appendix 2.7.2).

The ecological assessment of the River Farahy in November 2001 indicated a Q-index of macro-invertebrate species of Q3 and Q3-4, suggesting that the Farahy River and its tributaries are slightly to moderately polluted. The assessment also indicated that there was no difference between the water quality in the Farahy upstream and downstream of the local authority landfill site. A copy of the full report is contained in Appendix 2.7.12.

Biological sampling surveys on the River Farahy have also been conducted by Cork County Council between 1990-2000 at 5 sampling locations upstream and downstream of the *greenstar* development site. The sampling locations are presented on Figure 2.7.4. and the results are tabulated in Appendix 2.7.13.

The local authority results indicate low water quality in the river, both upstream and downstream of the local authority landfill, with a noticeable deterioration over the period 1990 to 2000 at all sampling locations. There was no deterioration in the water quality indicated between 2000 and 2001 and there was a slight improvement in water quality indicated in the 2002 results.

The SRFB report that the Farahy River is a significant salmonid (salmon and trout) spawning and nursery habitat. However, the ecological assessment of the Farahy near the development site undertaken as part of



this EIS indicated that river conditions here ranged from “unsuitable” to “poor-moderate” for salmonid habitats.

2.8 HUMAN BEINGS

2.8.1 Housing Density

The Ballyguyroe site is located in a remote rural area on the southern slopes of the Ballyhoura Mountains. The local housing comprises farms and single-family detached bungalows and houses. The nearest house to the site is located greater than 500m northwest of the landfill footprint. There are 5 houses within 1000m of the landfill footprint (Figure 2.8.1). The nearest settlement is Kildorrery, 5.5 – 6.0 km southeast of the development site. Other population centres in the area include the villages of Doneraile, (9.9 km southwest of the site) and Ardpatrik (7.2 km north of the site) and the towns of Mallow (18.5 km southwest of the site), Charleville (14.8 km northwest of the site), Mitchelstown (14.8 km east of the site) and Fermoy (21.4 km southeast of the site).

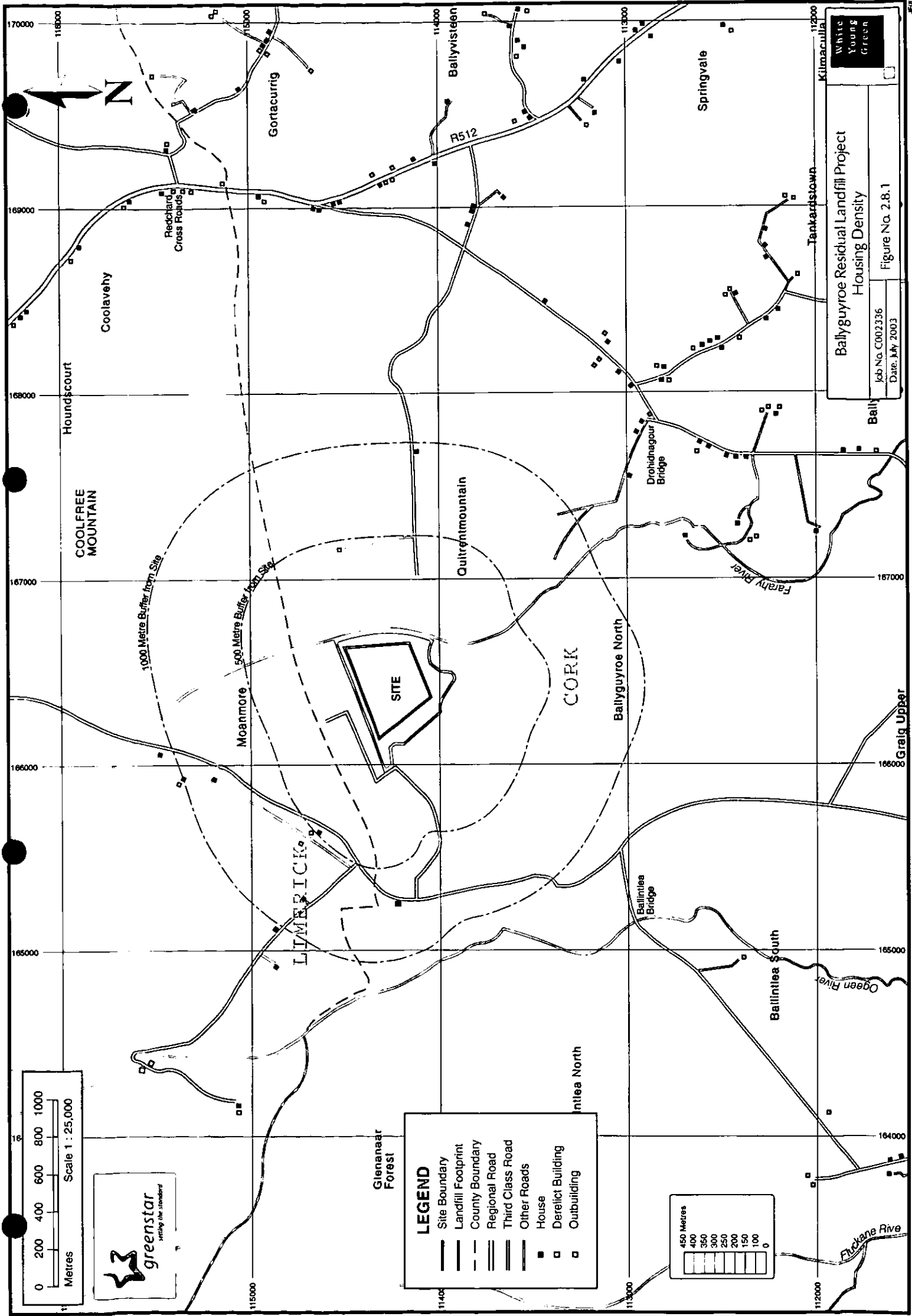
2.8.2 Population Statistics

The site is situated in the north of the Farahy Electoral Division (ED). EDs adjacent to the site include Particles and Kilflynn to the north, Kildorrery to the east, Shanballymore and Skahanagh to the south west. The table below shows population figures, densities and trends in the years 1996 to 2002 as well as that of County Cork for the same period.

Table 2.8.1: Population Statistics

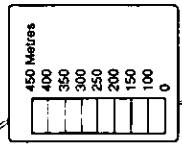
Electoral Division	1996 Population	2002 Population	Population Density (persons/km ²)	Change in Population 1996 – 2002
Kildorrery	475	473	27	-0.4%
Kilflynn	263	225	12	-16.9%
Particles	186	166	7	-12.0%
Shanballymore	538	487	22	-10.5%
Skahanagh	128	141	6	+10.2%
Farahy	320	332	19	+3.8%
County Cork	420,510	447,829	60	+6.5%

The table shows that there has been a decrease in population in Kildorrery, Kilflynn, Particles and Shanballymore. The EDs of Farahy and Skahanagh and the County as whole have shown a general increase in population. The nearest population centre of Kildorrery is presently undergoing rejuvenation with renovation of shop fronts and tree planting. There are also plans for housing development to the south west of the village, subject to adequate sanitary services. This may lead to a slight increase in population within the next few years. The population densities of all the EDs in the locality are below the county average due to their location in the Ballyhoura mountains.



LEGEND

- Site Boundary
- Landfill Footprint
- County Boundary
- Regional Road
- Third Class Road
- Other Roads
- House
- Derelict Building
- Outbuilding



Ballyguvro Residual Landfill Project
Housing Density

Job No. C002336
Date: July 2003

Figure No. 2.8.1

2.8.3 Local Concerns

The 3rd Party submissions to the EPA regarding *greenstar's* waste licence application for a landfill at the Ballyguyroe site in 2001 and which is currently being processed by the EPA highlighted the following concerns:

- Possible physical and mental health risks
- Any emissions to air from landfill gases causing air pollution and bad odours
- Potential negative impacts on farming, tourism, visual amenity and property values
- Increase in traffic and transportation of leachate in road tankers
- Potential increase in environmental nuisances such as fly tipping, flies and vermin
- Potential negative impacts on surface water and groundwater
- Concerns over the size and waste catchment area of the proposed facility
- Distrust of a private waste company.

The 3rd Party submission to An Bord Pleanála regarding *greenstar's* earlier planning permission application for a landfill at this site in 2001 highlighted the following concerns;

- Traffic and the suitability of the L 1329 to carry heavy goods vehicles.
- Potential negative impacts on farming, tourism and the visual amenity.
- Legality of the right of way to access the site.

2.9 ROADS AND TRAFFIC

2.9.1 Local Highway Network

The local road network surrounding the site is shown on Figure 2.9.1. The three main access routes to the site are;

- i) The National Primary Road N8 connects with the National Secondary Road N73 at Mitchelstown, providing a link towards the site via the Local (County) Road (L1329) running northwards from a junction near Clogher Cross Roads.
- ii) From Fermoy there is a shorter route to the N73 at Kildorrery via the R512;
- iii) The National Primary Road N20 connects with the National Secondary Road N72/73 providing a link to the site via the Clogher Cross Roads and the Local County Road (L1329).

All the above roads are generally of adequate width to cater for heavy vehicles.

The Farahy to Waterdyke length of the N73 is in good condition. The last 1.6km of the N73 from Waterdyke to the junction with the L1329 (Figure 2.9.2) is, however, in a particularly poor condition. (For outline summary observations on road standards and conditions see Appendix 2.9.1).

From its junction with the N73 (Figure 2.9.3) the L1329 runs northwards some 5.6km to a T-junction with the site (Private) Access Road. The junction between the L1329 and the N73 itself has been modified over time and some additional provision made for turning vehicles, but this is now in poor condition.

There is a reduction in standards on roads north of the junction between the L1329 and the N73. Although there has been some modest re-alignments of the L1329 as well as some widening to allow for passing places, significant damage has taken place to the road pavement in a number of locations along the route due to the size of vehicles using the roads and lack of regular maintenance.

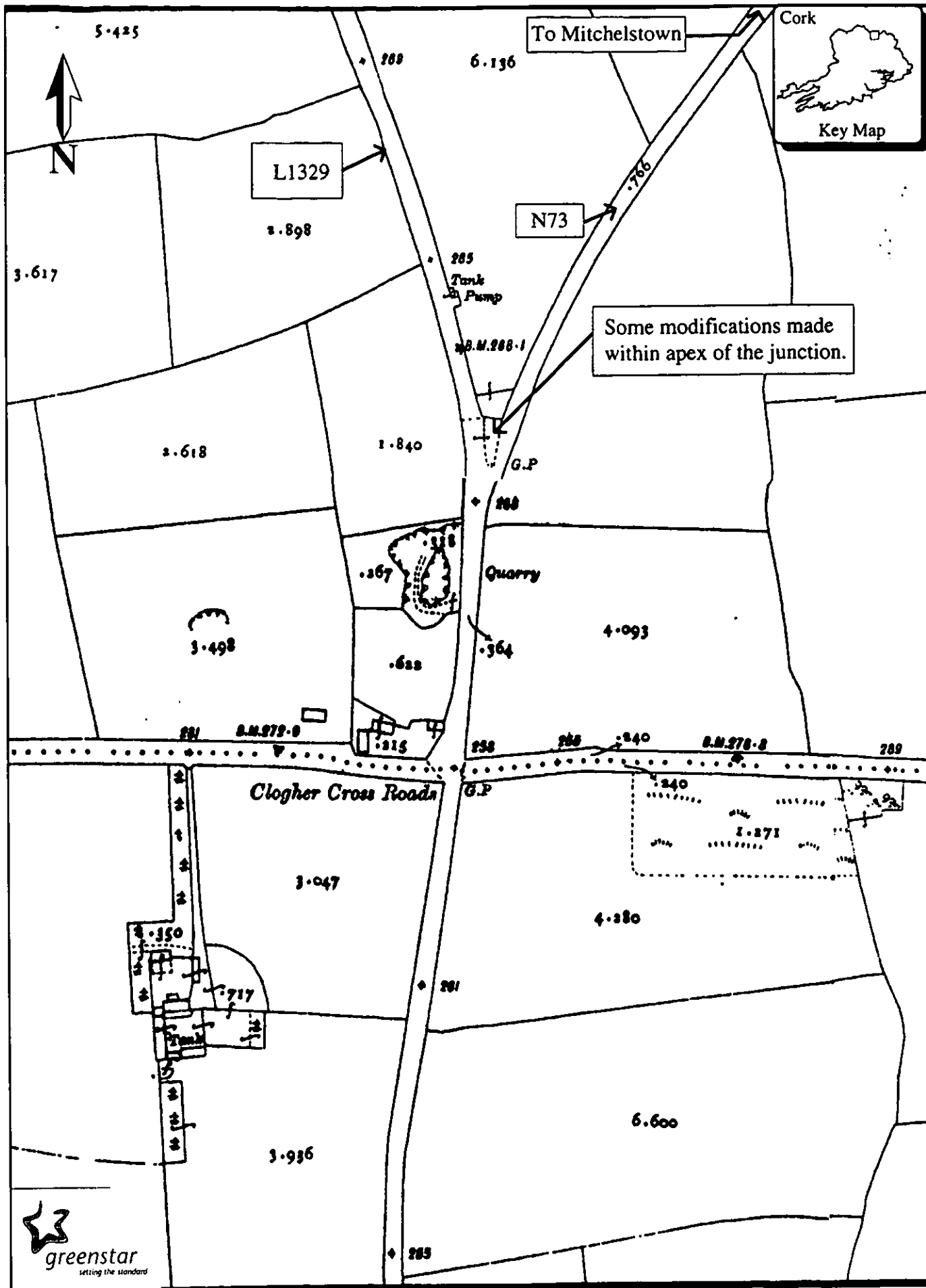
2.9.2 Planned Local Road Improvements

The following highway improvements are anticipated on routes that may provide access to the site:

- i) Fermoy Bypass – a route has been selected to the east of the town, with work programmed to start in 2004;
- ii) Mallow Bypass – routes, which are to the north side of the town, are yet subject to selection and CPO;







- iii) Mitchelstown Bypass - will be considered in the future;
- iv) Mitchelstown Inner Relief Road – which will improve the current route between the N8 and N73 to the west of the town is at the Part A Procedure stage;
- v) N73 Improvements – a programme of minor work is being planned over a number of years to include drainage maintenance, resurfacing, and improvements at Kildorrery/Ballynoe, Farahy and the junction with the L1329.

Maintenance/strengthening works are planned for the R512.

2.9.3 Traffic Data

The most up-to-date National Road Authority published data for the N73 in the vicinity of the development site is at counter location N73 (3) at the R512 Crossroad in Kildorrery (Figure 2.9.4). The count data is from 2001 and shows a two-way Annual Average Daily Traffic (AADT) flow on the N73 was 3,761 with a HGV content of 14.5%. This figure appears not to have changed substantially over the previous years. For example the published data for the same location in 1997 reports an AADT of 3,333 (15%). From these figures, over the four year period between 1997-2001 traffic growth on the N73 was 3.1% whilst HGV content reduced slightly.

Given the above data and assuming that growth rates on the N73 have remained relatively constant for the period 2001-2003 the current AADT on the N73 in the vicinity of the site is estimated to be 3,997 with HGV component of (14%).

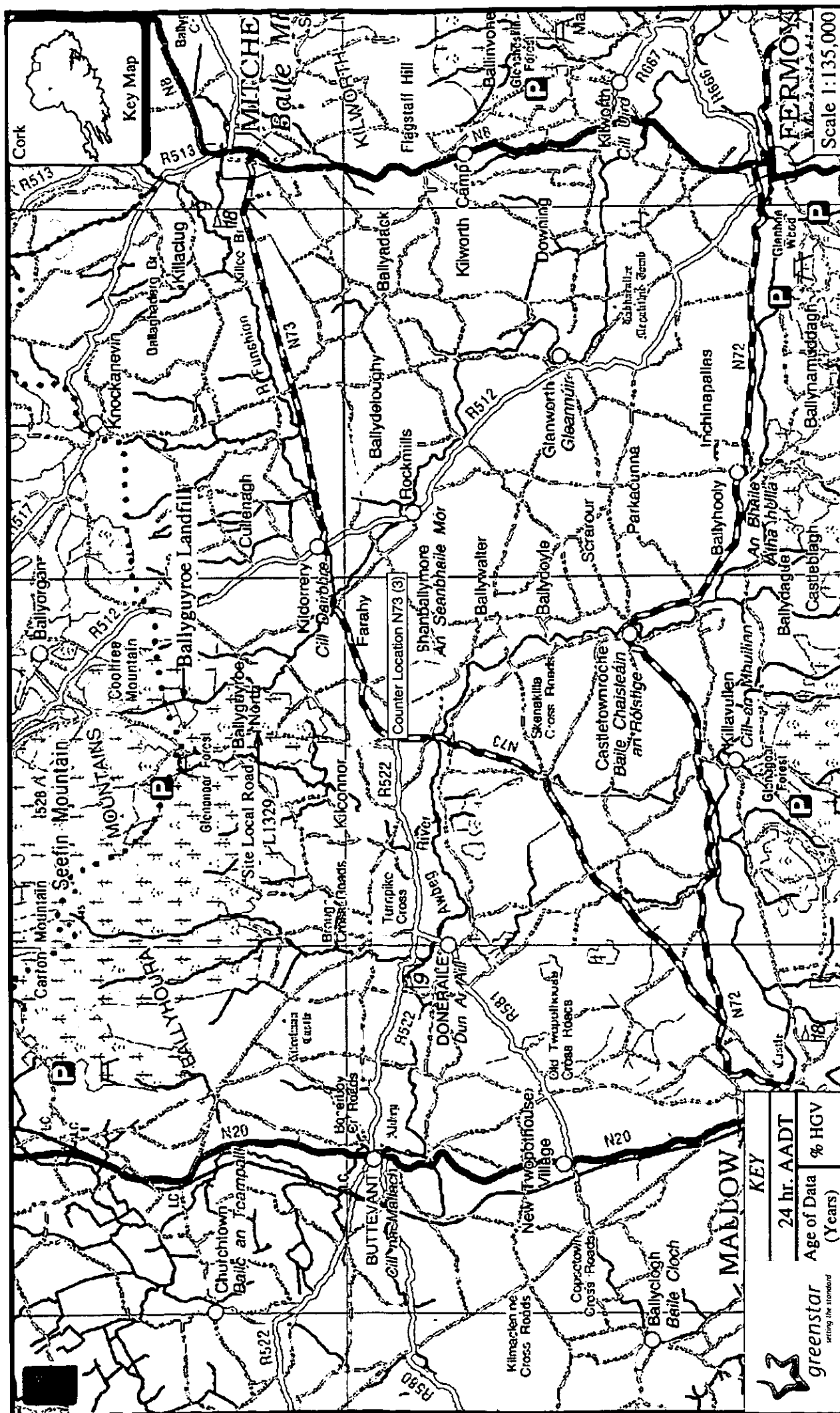
A classified traffic turning count survey at the intersection of the N73 and the L1329 was carried out on Tuesday 2nd September 2003 over the twelve hour period between 0700-1900hrs.

A copy of the survey data for the period 0700-1900hrs is provided in Appendix 2.9.2.

Using a factor from the NRA document RT.201 'Expansion Factors for Short Period Traffic Counts', for the survey period 0800-2000hrs, the 2003 survey data can be expanded to produce a general or 'rule of thumb' range within which the actual Annual Average Daily Traffic (AADT) flow should fall.

From RT.201 the appropriate expansion factor has been selected for 'rural intertown routes', the value of which is $1.25 \pm 14\%$. Using this expansion factor the results of the traffic survey shows that the 2003 AADT on the N73 should lie in the range 3,120 to 4,135.

It is considered that this figure compares very well with the forecast of 3,997(14%) above. Accordingly this figure and the traffic survey data figures are considered valid for assessment purposes.



N73 Traffic Data Map

Figure 2.9.4

2.9.4 Accident Data

The most recent accident data (2000) taken from the NRA website (Appendix 2.9.2) suggests that there is no significant accident problem along the N73 in the vicinity of the site, with only 1 minor accident recorded, giving a rate of 0.04 accidents per 10^6 vehicle kilometres; the specific location of the accident is not reported.

2.10 LANDSCAPE AND VISUAL ASPECTS

2.10.1 Sources of Information and Methodology

The assessment was carried out in 2003 and is made with regard to the vulnerability and sensitivity of the landscape to change and to the location of visual receptors relative to the proposed development. The methodology is based on the EPA Guidelines and Advice Notes on Environmental Impacts Statements and on Petts & Eduljee, 'Environmental Impact Assessment for Waste Treatment and Disposal Facilities'.

The character of the existing landscape setting is evaluated taking account of the various natural and man-made features, such as topography, landform, vegetation, land-use, built environment etc. together with the visibility of and the views to and from the site.

In general, landscape impacts alter the 'fabric or feel' of the landscape and may arise as a result of:

- change of use,
- removal of existing features,
- alteration of landform and topography,
- visibility of the landscape,
- elevation of the development
- nature of the development.

Visual Impacts which may be adverse, neutral or positive, can arise under visual intrusion and / or visual obstruction, where these are defined as:

Visual Obstruction: is defined as the blocking of a view, and

Visual Intrusion: is concerned with the degree of impingement on a view without actual blocking.

Impacts, which may be negative, neutral or positive, are classified as **temporary** (associated with construction), **short term** (lasting between 1 and 7 years), **medium term** (lasting between 7 to 15 years), **long term** (lasting between 15 and 60 years) or **permanent** (lasting over sixty years). The level of impact significance used is based on the EPA Guidelines on Environmental Impact Statements as listed in Table 2.10.1.

Table 2.10.1 Significance Criteria

Level of Impact	Definition
Imperceptible Impact	An impact capable of measurement but without noticeable consequences
Slight Impact	An impact which causes noticeable changes in the character of the environment without affecting its sensitivities
Moderate Impact	An impact that alters the character of the environment in a manner that is consistent with the existing and emerging trends
Significant Impact	An impact which, by its character, magnitude, duration or intensity alters a sensitive aspects if the environment
Profound Impact	An impact which obliterates sensitive characteristics

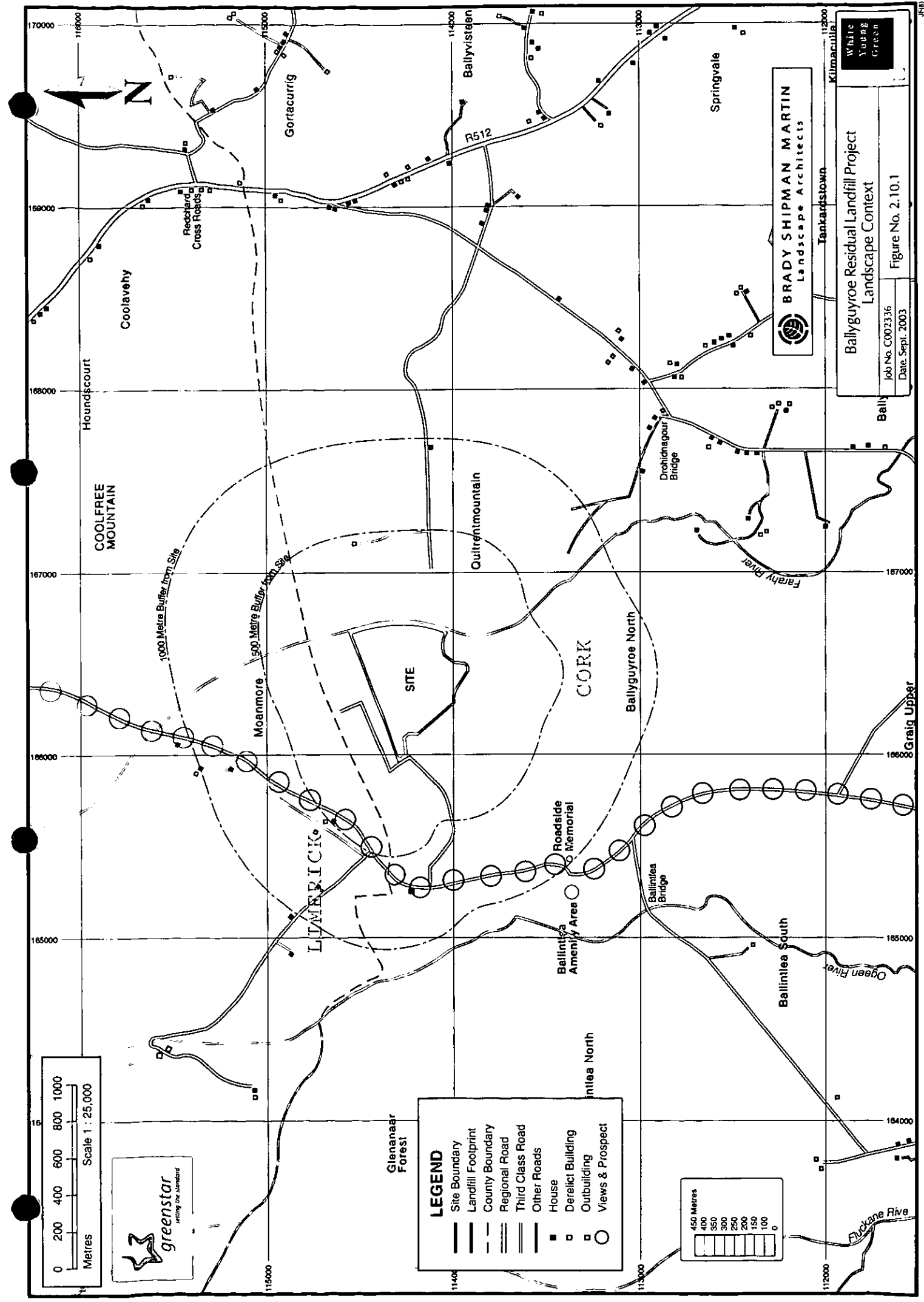
In assisting with an understanding of the likely impacts of the proposed development a number of photomontages have been prepared typical of the general locations surrounding the site. In each instance, the 'Existing View' and 'As Constructed View' is given.

2.10.2 Landscape Description

The character is typical of a marginalised upland, rural landscape where poor draining agricultural land has gradually given way to the increasing encroachment of homogenous stands of sitka spruce plantation. The site is almost entirely surrounded by mature stands of commercial, coniferous forestry. The upper Farahy River valley retains a diversity of naturalised deciduous planting and while not especially scenic is noteworthy in its coniferous context.

Plantations form the dominant landuse on upper slopes and pastoral agriculture is primarily practised in the valleys. Where coniferous plantation gives way to open fields, the landuse is typically pastoral grazing for dairying, cattle and sheep rearing. The land use is severely restricted, especially during winter and spring, by poor draining soils liable to poaching and water logging. Where field boundaries remain they are of strong mixed hedgerows of blackthorn, bramble, gorse, hawthorn, rowan and willow with occasional holly, wild cherry and ash trees. There is little in the way of significant deciduous woodland. See Figures 2.10.1 Landscape Context and 2.7.2 and 2.7.2 Rev A Habitat Assessment.

As the development site is located on the lower slopes of Coolfree Mountain part of the Ballyhoura Mountain range and as such the topography falls from a high of approximately 210m in the north to 170m in the south. In wider context the topography continues to rise northwards towards the summit of Long Mountain (504m) and falls quickly southwards along the valley of the Farahy River to around 100m from



where the gradients ease and the landscape becomes more undulating. Local high points include the hill at Kildorrery Town (110m +), Clogher Hill (119m), Ballyguyroe South (116m) and Farahy (115m).

The site and surrounding landscape is drained by the Farahy River, which flows north to south, along the eastern boundary of the site. A small stream also drains to the Farahy River from the southern boundary of the site. In the vicinity of the site both channels have dense plantings and the Farahy in particular lies in a deeply cut narrow valley. In turn the Farahy River flows to the River Funshion, which is part of the wider River Blackwater catchment.

The small town of Kildorrery, set to either side of the N73, is located on a hill approximately 4.0 to 4.5km south-east of the site. Shanballymore, a second small town is located low in the valley some 6.0 to 6.5km south of the site. Given the upland nature of the site and the extensive coniferous plantations few residential properties are located near the site. There is 1 property located within 500m of the site boundary (approx. 490m northwest) and only 5 others, (1 to the east and 4 to the north-west) are located within 1km of the site boundary (there are no houses located within 500m of the landfill footprint and 5 within 1km of the landfill footprint). In the wider context, a few isolated properties are located north or west of the site though several farmhouses and other residential properties are dotted along the county road (Craig Cross to Redchard Cross County Road) to the south of the site. While at some distance many properties are located along the N73 some 4.5km minimum to the south of the site and the R512 (Fermoy to Kilmallock Regional Road) some 2.5km minimum to the east of the site.

A small parking/picnic/forest access area is located immediately west of the local access road at Ballintlea some 1.5km south-west of the site. A small private memorial is located on the eastern verge of the road opposite the Ballintlea amenity area.

2.10.3 Landscape Visibility

The landscape is generally unremarkable or distinctive and tends to be visually dominated by the coniferous plantations. Visually strong hedgerows along roads and field boundaries delineate the agricultural landscape and farmhouses are of a dispersed pattern particularly along the Craig Cross to Redchard Cross County Road. The closed local authority landfill facility located immediately north of the site which is fully capped and restored is not particularly visible or distinctive.

Visibility from the site is strongly aligned down slope to the south reinforced by enclosing coniferous forestry to the north, west and east. The view south is expansive over the wider agricultural landscape of the River Blackwater valley.

Given the nature of the topography and the presence of the plantations, viewing of the site is restricted to areas to the south and in particular to those areas on the north facing slopes of hills at Ballyguyroe South, Farahy and Kildorrery. Otherwise viewing towards the site is from a low vantage relative to the site and is largely screened by plantations, topography, hedgerows or a combination of the same.

The development site is most visible from open sections of a 2km stretch of the Craig Cross to Redchard Cross County Road, west of Ballyguyroe Bridge on the northern slopes of the hill at Ballyguyroe South. At some 3km distant, neither the closed local authority landfill immediately to the north of the proposed *greenstar* development site nor the development site are particularly distinctive.

At some 4.5km distance, the site, is only glimpsed from short sections of a 3.5km stretch of the N73 between Kildorrery and Waterdyke. In Kildorrery the site is visible from the rear of properties on the northern side of the N73. In such instances the site forms a small element on the lower reaches of an expansive panoramic view of the Ballyhoura Mountains. Even in these views the fully capped and restored local authority landfill is not particularly distinctive.

The site is not visible from the Clogher Cross to Glenosheen County Road (the access road) where coniferous plantations visually enclose the route and where the road has an established use as an access to a landfill facility. The access to the closed local authority landfill facility is in keeping with the local road network and is not visually intrusive.

Similarly, coniferous plantations ensure that the site is not visible from the west or the north. The site is only visible at proximity from the east as plantations are within 500m of the site boundary. The site is not visible from residential properties to the north, east or west of the site.

2.10.4 Amenity

The site and its immediate surrounds are not of particular amenity value and are not used as a recreational amenity. In the wider context, the area is set to the south of the Ballyhoura Mountain Park, an area of designated walks and general amenity. The 'Ballyhoura Way', a way-marked trail runs east to west some 3.7 km + to the north of the site, however it is not visible from the trail. A small parking/picnic/forest access area is located approximately 1.5 km west of the local access road at Ballintlea. The area is set within the coniferous plantation and has no view of the site. A further amenity area/attraction has developed around Bowen's Court off the N73, 1.5km west of Kildorrery. Again the site is adequately screened from this area set low in a screened valley.

2.10.5 Landscape Planning - National

The nearest areas of Outstanding Landscape as identified in the Inventory of Outstanding Landscape in Ireland are the Galty Mountains (Nr. 24) and the River Blackwater Valley (Nr. 82), both of which are over 10km to the east and south of the site respectively.

The nearest Area of Scientific Importance is Nr 15 of County Cork; Castlepook Caves, considered of national importance. The caves are located approximately 6km to the south-west of the site and have no views of the area.

2.10.6 Landscape Planning - County

The Cork County Development Plan, 2003 is the statutory planning control document for the area. As the area is located close to the County Limerick boundary, the Limerick County Development Plan, 1999 is also considered.

Cork County Development Plan, 2003

Map 2 Heritage and Scenic Amenity & Table 4.1 Scenic Routes - Views and Prospects, identifies scenic views to be preserved or improved. Listing A14 runs along the Kilfinnian-Shanballymore County Road from Graig Cross Roads to the Cork/Limerick border passing at a minimum 550m from the site. The road in part comprises the access road to the site and to the closed local authority landfill facility, however, is heavily planted on either side with coniferous forestry as far north as the county boundary and there are no views of the site.

The nearest area of Scenic Landscape is centred on Doneraile Demesne, some 10km south-west of the site. Map 2 Heritage and Scenic Amenity indicates nature conservation designations along the Awbeg River Valley some 7km south of the site. The aforementioned Castlepook Caves (Karst/Maze cave & Bone Cave) are also listed in Table 3.4 Areas of Geological Interest. Bowen's Court, Lodge, Stables & Glebetto (0070); Graig House (0071); Farahy Bridge (0073) & St. Colman's Church of Ireland Church, Farahy (0074) are all listed in Table 1.1 Record of Protected Structures. All of these are located over 3km south and south-east of the site.

There are no further landscape or visual listings pertaining to the site or its surrounds.

Limerick County Development Plan, 1999

Map No. 13.2 *Views and Prospects* & Appendix 5 *Views and Prospects of Scenic Importance* list views from the R513 south of its junction with the R662 (south of Ballylanders to County Boundary). In part, this is a continuation of the listing in the Cork Development Plan and again there are no views of the site.

Figure 14.1 *Designated Tourist Areas* & Section 14.4 *Designated Tourist Areas Strategy* refers to the Ballyhoura Way as an Amenity Walk. See 2.10.4 above.

There are no further landscape or visual listings pertaining to the site or its surrounds.

2.10.7 Do-Nothing Impact

Should this development not proceed, it is likely that the site will continue in marginal agricultural use or be planted as coniferous forestry.

2.10.8 Summary

The site is situated on south facing slopes in typical upland rural and otherwise unremarkable landscape. The closed landfill lies immediately to the north and the deep cut scrub-lined valley of the Farahy River lies to the east. The site is strongly screened from the west, north and east by coniferous forestry. The site is most visible from limited and locally elevated areas of the agricultural landscape to the south of the site. However, even in these instances the closed and more elevated local authority landfill is not especially visible or distinctive. There are no specific landscape planning or amenity constraints pertaining to the site.

2.11 CULTURAL HERITAGE

2.11.1 Baseline Survey

The Record of Historic Sites and Monuments for counties Limerick and Cork was consulted for the relevant parts of Co. Cork Ordnance Survey 6" Sheets 8, 9, 17 and 18, and Co. Limerick Sheet 59. All sites within a radius of c. 3km of the proposed development were identified. The relevant files for these sites, which contain details from aerial photographs, early maps, OS memoirs, OPW Archaeological Survey notes and other relevant publications, were then studied in the Sites and Monuments Records Office, Dublin, and the Cork Archaeological Survey, Cork. These monuments are listed in Appendix 2.11.1.

The topographical files in the National Museum of Ireland were consulted to determine if any archaeological artefacts had been recorded from the area. Other published catalogues of prehistoric material were also studied: Raftery (1983 - Iron Age antiquities), Eogan (1965; 1983; 1994 - bronze swords, Bronze Age hoards and goldwork), Harbison (1968; 1969a; 1969b - bronze axes, halberds and daggers) and the Irish Stone Axe Project Database (Archaeology Dept., U.C.D.). The finds from the area are listed in Appendix 2.11.2.

Aerial photographs of the area of the proposed development were examined in the Geological Survey of Ireland and the National Museum (Cambridge-St. Joseph Collection).

Primary historical sources consulted included the Calendar of Documents Relating to Ireland (Sweetman 1886) and Lewis' Topographical Dictionary (Lewis 1837). The Down Survey of 1654 (NLI. Mss. 712-13) and the Census of Ireland, 1659 (Pender 1939) were also consulted, but they contained no information relating to the parish. The Civil Survey of 1654-6 for County Cork does not survive.

Primary cartographic sources consulted consisted of the Ordnance Survey 6" maps, sheets Ck008;009;018 & Lk059, 1st and 2nd editions (T.C.D. Map Library & SMR).

2.11.2 Archaeological and Historical Background

Ballyguyroe at present lies on the border of counties Cork and Limerick and has probably always been a border land (Figure 2.11.1).

A detailed description of the archaeological and historical background of the development site and its surrounds is contained in Appendix 2.11.3.

The appearance of the site today is not dissimilar from that of enclosed pasture as seen on the O.S 1st edition 6" map (Fig. 2.11.2) and is likely to be of recent origin. This general pattern of enclosure was then augmented through further subdivision to create the modern field system seen at the proposed site today.

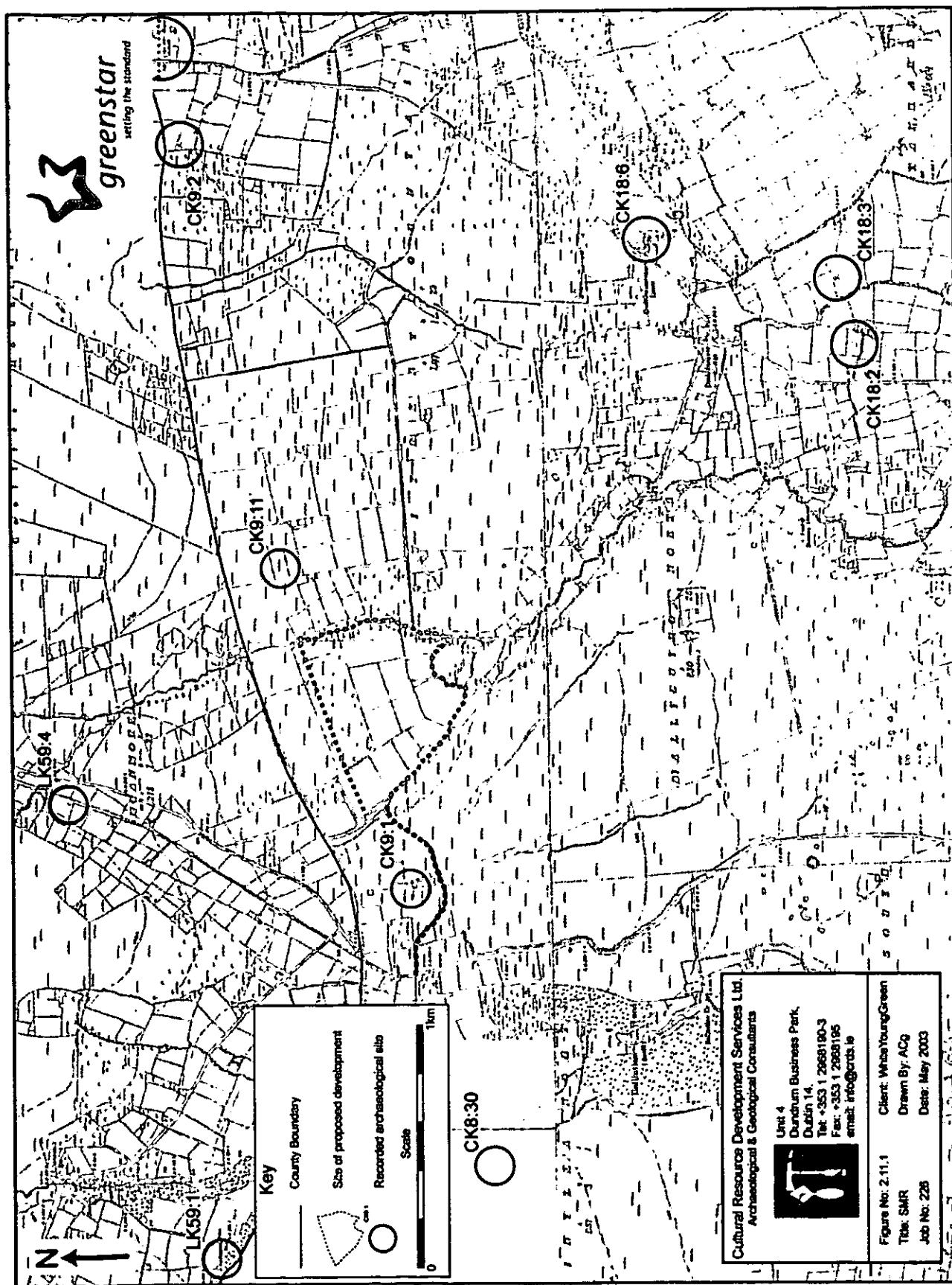


Figure 2.11.1. Extract from Ordnance Survey 6" Maps: Co. Cork Sheet Nos 8, 9, and 18, and Co. Limerick Sheet No. 59, showing the location of the proposed development and recorded archaeological sites and monuments in the area.

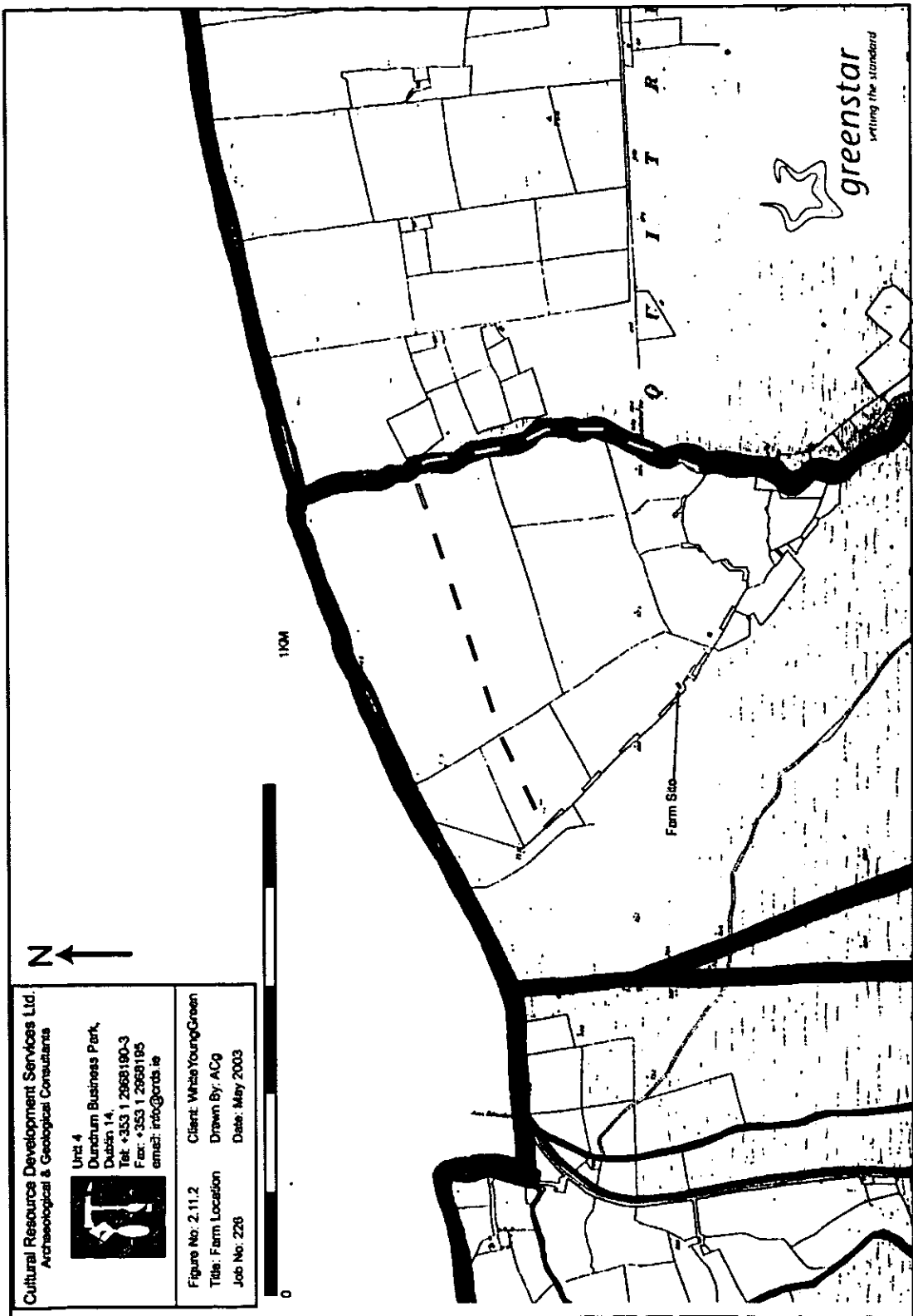


Figure 2.11.2. Extract from Co. Cork Ordnance Survey 6" 1st ed. (1841) Sheet No. 9, showing the outline of the proposed development & farm site

A farmhouse, located just inside the western boundary of the site and associated with this field system is indicated on the 1st edition 6" map (Fig. 2.11.2).

2.11.3 Field Walking Survey

Fieldwork (Fig. 2.11.3) was carried out on the 29th March 2001, in fine, sunny weather, with intermittent heavy rain and hail showers.

General Observations. The site is located on the south-facing slopes of the Ballyhoura Mountains, which affords extensive views of the valley below. The site is approached from the west through a mature conifer plantation (Pl. 2.11.1). The fields immediately to the north were in use as a landfill facility. The landfill closed in September 2001. The boundary with county Limerick lies beyond them. The land to the west is bounded by a steep sided river gully, beyond which is a number of hill farms. The land to the south drops in a southerly direction into a lightly wooded river valley.

The terrain, on site, is generally even, sloping downwards to the south (Pl. 2.11.2). It is covered in rough grass and patches of gorse bushes. The topsoil throughout the site consists of a shallow layer of waterlogged peaty material, which overlies yellow-red boulder clays. Consequently, the site is wet and boggy in places. Drainage on site consists of a series of ditches, associated with the modern field system, which run into a number of natural, gullied streams. The field system on the site can be divided into two units. The northern portion is a geometric block of field boundaries, possibly associated with a farm site, indicated on the 1st edition 6" map. The southern portion is a series of irregular fields, whose shape is influenced by the local topography of southern running stream gullies. They are probably associated with the ruins of a second farm house at the southern end of the laneway. The pre-enclosure state of the land was no doubt similar to the land to the west, now under conifers, but depicted on the O.S. 6" sheet as rough, open land, punctuated by a series of streams, which run downslope in a southerly direction.

The land is of poor agricultural quality, in an exposed marginal mountain location. It may have supported scrub woodland, which would have seen low level exploitation as seasonal grazing, prior to the massive population increase and the consequent land pressures of the eighteenth and nineteenth centuries, which advanced the boundaries of permanent settlement.

The irregular fields at the southern edge of the site could be the remains of an earlier phase of land exploitation, but the regular fields to the north and ladder farms to the east seem to reflect a single phase of highly organised land division and improvement, belonging to the nineteenth century.

A detailed description of each field on the site (as numbered on Figure 2.11.2) is contained in Appendix 2.11.4.

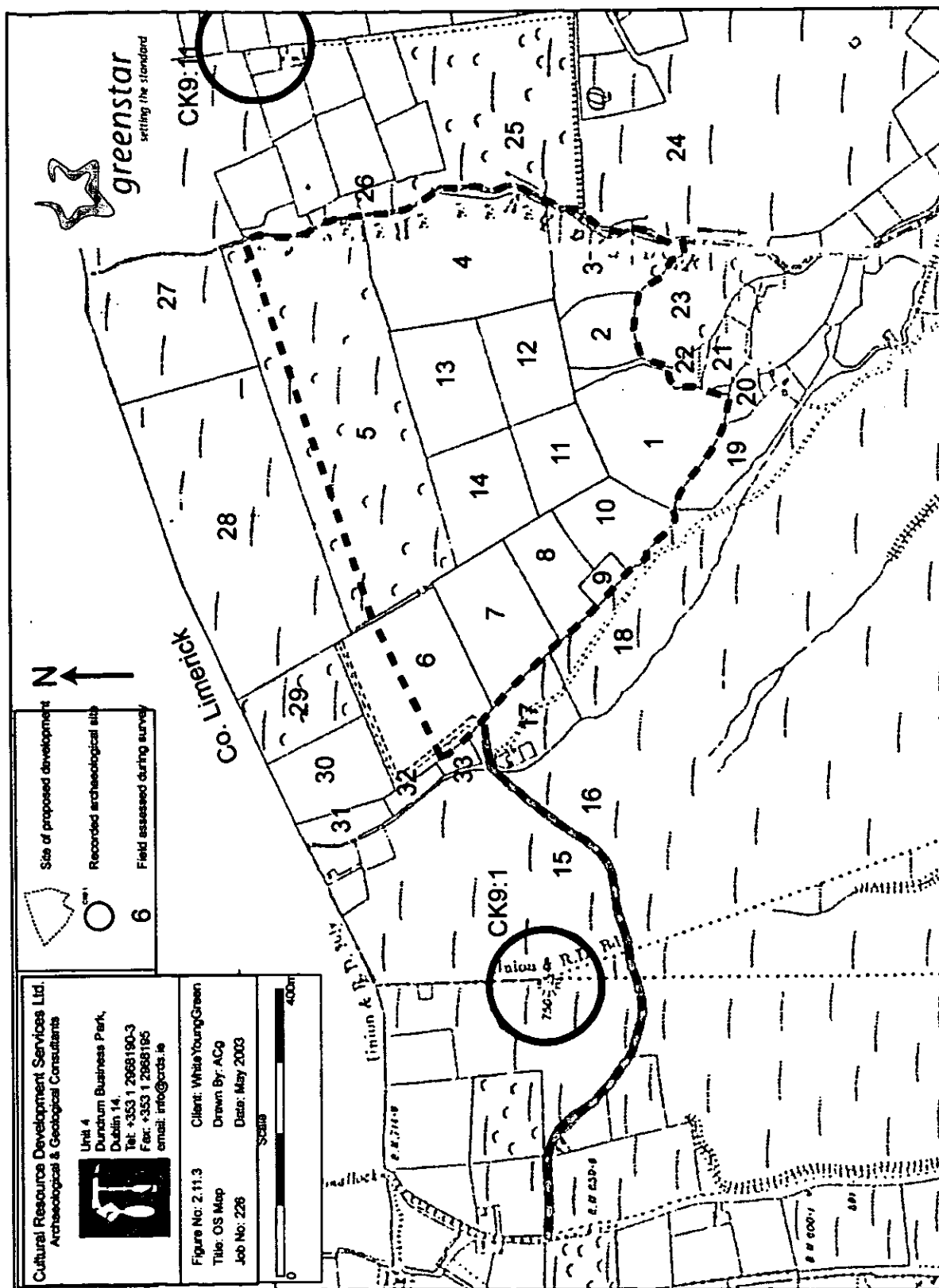


Figure 2.11.3. Extract from Co. Cork Ordnance Survey 6" Sheet No. 9, showing the outline of the proposed development and the results of archaeological field survey.



Plate 2.11.1 Site: Facing West



Plate 2.11.2 Site: Facing South

2.12 MATERIAL ASSETS

2.12.1 Introduction

Material Assets in the area consist of agriculture, silviculture, infrastructure, housing and tourism. There are no industrial areas or towns and villages (Kildorrery is the nearest at 5.5 km away) in the immediate environs of the proposed site. Housing is discussed in Section 2.8. of the EIS. There are no houses within 500m of the landfill footprint and 5 within a kilometre.

Tourism, agriculture, silviculture, infrastructure, and the closed local authority landfill are discussed individually below. Figure 2.12.1 shows the landuse within 500m of the site boundary.

2.12.2 Tourism

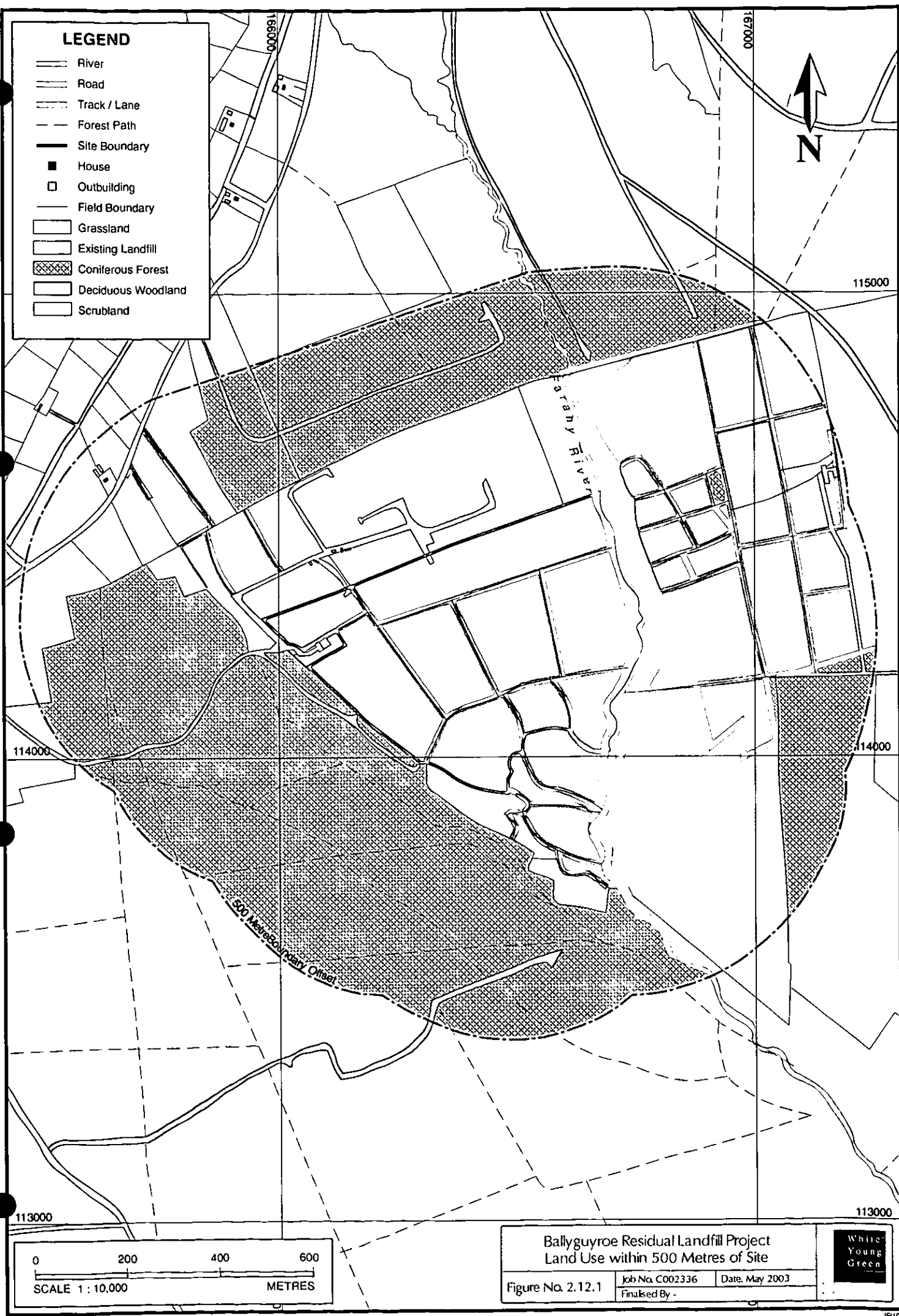
Tourism plays an important part in the economy of North Cork and its environs. The proposed site is situated on the periphery of the Ballyhoura Mountain Reserve and Park. The Ballyhoura Way walking route at its closest is located some 3.7km to the north of the site. The tourist route from Shanballymore to Kilfinnane follows the L1329 which passes to the west of the development site.

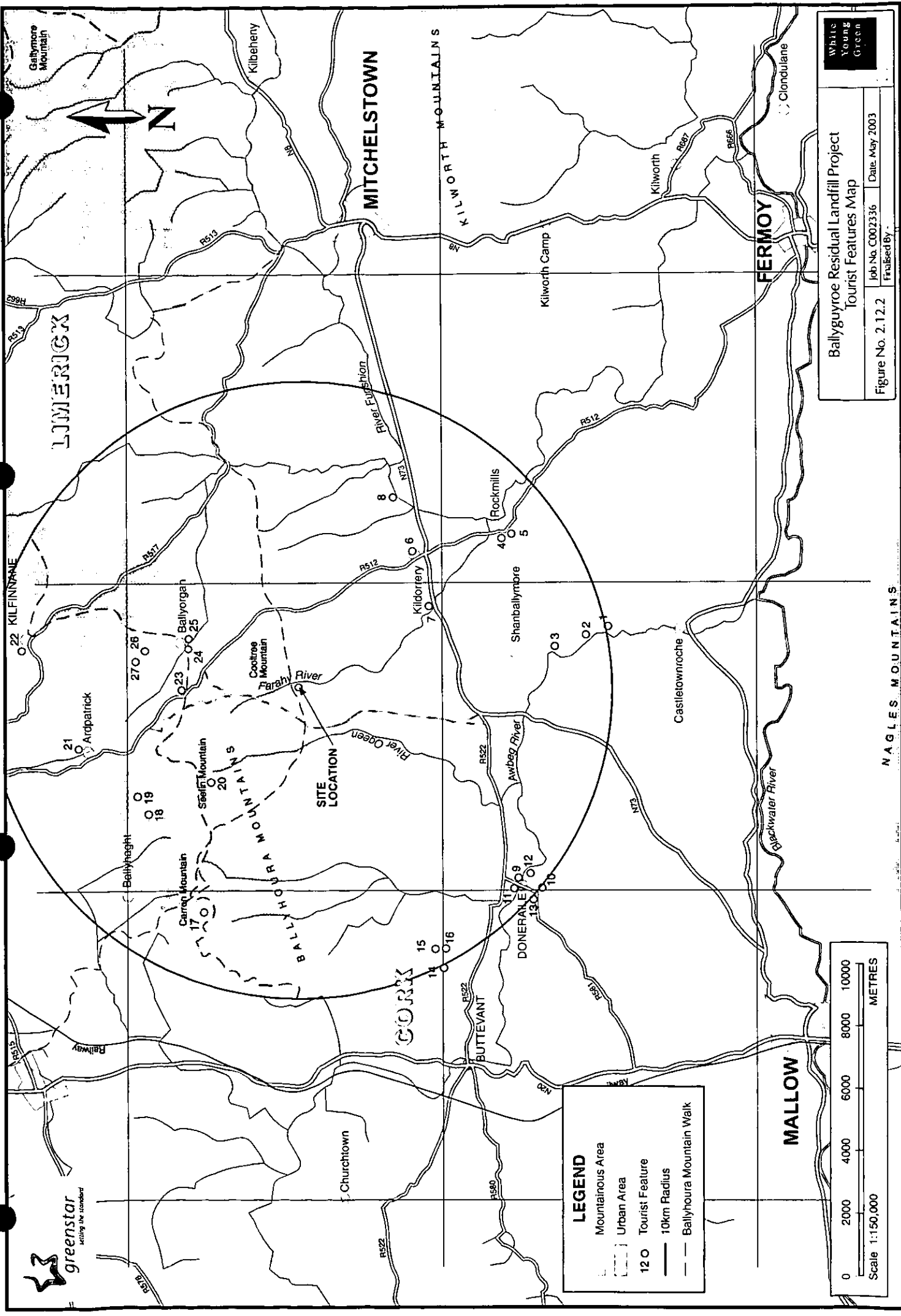
The Ballyhoura mountain area is popular for walking, hiking, bird watching and orienteering amongst other activities. Historical buildings and sites in the region are also of tourist interest. The Ballyhoura mountains are associated with legendary warriors such as Fionn Mac Cumhaill, his son Oisín and later became host to historical figures such as Brian Boru and O'Sullivan Beara. The Ballyhoura way incorporates many of these historical sites. The area is also rich in literary association with authors such as Edmund Spenser, R.D. Joyce and Elizabeth Bowen having once resided in the area. There are a number of historical buildings such as Castle Curious, Doneraile Court and Demesne, Kilcolman Castle, Castle Oliver and Oliver's Folly. Other visitor attractions in North County Cork include angling, golf, visitor farms, a wildlife park and horse riding.

Table 2.12.1 and Figure 2.12.2 show the results of a literature search into the tourism located approximately 10km of the proposed Landfill at Ballyguyroe.

The nearest areas of tourist interest to the proposed landfill is the Ballyhoura Mountain Park which at its nearest point is approximately 1.5km from the site and comprises walks, trails and small parking/picnic/forest access areas set within the coniferous plantation and the Ballyhoura Mountains. The reserve is traversed by the Ballyhoura Way, a marked route, 90km long, following the path taken by the Irish Chieftain O'Sullivan Beara who marched from Glengarrif to Leitrim between the 31st of December 1602 and the 14th January 1603. In the vicinity of the site the walk stretches from Kilfinnane to Ballyorgan and then across the ridges of the Ballyhoura mountains westwards towards the hamlet of Ballyhoura. At its nearest point the Ballyhoura Way is 3.7km from the site.

The next nearest tourist sites on Figure 2.12.2 are all located within 3.9km and 10.4 km of the site.





LEGEND

- Mountainous Area
- Urban Area
- 12 O Tourist Feature
- 10km Radius
- Ballyhoura Mountain Walk

0 2000 4000 6000 8000 10000
 METRES
 Scale 1:150,000

White Young Green

**Ballyguire Residual Landfill Project
 Tourist Features Map**

Figure No. 2.12.2

Job No. CO02336 Date: May 2003

Finalised By: _____

Ref No.	Name	Description	Distance from Landfill (Disposal Area)
1	Anne's Grove Gardens	House and gardens	10.4
2	Awbeg River	Angling	9.6
3	Castle Curious	Historical Building	8.5
4	Driving Range	Golf	8.3
5	Cottage Garden	Visitor Farm	8.6
6	Kildorrery	Visitors Bakery	5.9
7	Bowen's Court	Literary Association	5.0
8	River Funshion	Angling	7.0
9	Doneraile Wildlife Park	Wildlife Park	9.6
10	Doneraile Court and Demesne	House and Estate	10.2
11	Golf Course	Golf	9.8
12	Equestrian Centre	Horse riding/ Trekking	9.9
13	Forest Park	Walking Facilities	10.3
14	Edmund Spenser's House	Literary Association	10.2
15	Kilcolman Castle	Historical Building	9.8
16	Wildlife Observatory	Wildlife Park	9.9
17	Carron	Historical Site	7.9
18	Ballyhoura Mountain Park	Forest /Mountain Park / Walking /Picnic Areas	8.1
19	Monastic Site	Historical Site	6.5
20	Seefin	Historical Site	6.5
21	Ardpatrick	Historical Site	4.3
22	Kilfinnane	Historical Site	7.5
23	Glenosheen	Historical/ Literary Site	9.2
24	Molanne View	Visitors Farm /Dairy	4.5
25	Lantern Lodge	Visitors Farm /Deer	3.9
26	Castle Oliver	Visitors Farm /Environmentally Friendly and Historical Building	4.0
27	Oliver's Folly	Historical Building	5.2
	Ballyhoura Way	Mountain Walk	3.7 - 10.3

Table 2.12.1. Tourist Sites within approximately 10km of proposed Landfill (See Figure 2.12.2)

2.12.3 Infrastructure

The major infrastructural features in the Ballyguyroe area are as follows:

The N73 National Secondary road located 4-5km south of the site. This road links Mitchelstown and Mallow and serves villages such as Kildorrery.

The Regional road network includes the R522 and the R512. The former is located about 6km south west of the site and links Doneraile with the N73. The latter lies 3 km to the west of the site. It runs north south and locally links the town of Kilmallock to the north of the site with Kildorrery and Glanworth to the south of the site.

A railway line, located 12km to the west of the site, is the direct Cork to Dublin route. The nearest station to the site is at Charleville.

2.12.4 Agriculture

The main agricultural activity in the vicinity of the site is cattle grazing. There is one farm directly affected by the proposed development as indicated in Figure 2.12.1. This consists of grassland. This is very poor quality grazing as the soil consists of poorly drained peaty topsoil. The farmer will lose a land holding of approximately 30 ha.

2.12.5 Silviculture

The development site is situated in an area dominated by silviculture. The site is surrounded by coniferous forest as are most of the slopes of the Ballyhoura Mountains. The forestry is permanently managed by Coillte.



3. DESCRIPTION OF THE PROPOSED DEVELOPMENT

greenstar intends to establish a regional landfill facility for the disposal of treated residual waste at Ballyguyroe, Mallow, Co. Cork (Section 1, Figure 1.1.1). The facility will be designed to receive 145,000 tonnes per annum (t/a) of treated residual waste from County Cork and surrounding counties and will have an operating life of approximately 10 years.

The landfill will be located on a 28.3 hectare (70 acre) green field site adjacent to a closed municipal waste landfill previously operated by Cork County Council (Section 1, Figure 1.1.2). The *greenstar* landfill footprint (disposal area) will cover approximately 11 hectares (27 acres). The landfill will consist of 8 separate cells developed in 4 phases. Each phase, consisting of two cells, will last approximately 30 months.

On closure, the landfill area will be re-instated to reflect the surrounding landscape.

The principle elements of the development are described in the following Sections and outlined in Figure 1.1.2. Detailed engineering drawings 2001-144-01-01 to 2001-144-01-15, 2001-144-01-17 to 2001-144-01-19 and 2001-144-01-27 are contained in Appendix 3.1.1.

3.1 SITE DESIGN

3.1.1 Landfill Construction

3.1.1.1 Construction Schedule

The site construction schedule will depend on the date of issue of the licence and a provisional schedule for Phase 1 construction and the ongoing phases is presented in Table 3.1.1 below. The sequence of construction for the proposed cells will commence with Cell 1 and then in a chronological order northward through the site.

Table 3.1.1: Landfill Development Sequence

Year	Active Landfill Cells	Intermediate Capped Cells	Final Capped Cells
1	1	None	None
2	1-2	None	None
3	2-3	1	None
4	3-4	2	1
5	4	3	1-2
6	5	4	1-3
7	5-6	None	1-4
8	6-7	5	1-4
9	7-8	6	1-5
10	8	7	1-6
11	Full	8	1-7
12	Full	Full restoration	Full Restoration

Prior to accepting waste at the facility the following infrastructure will be put in place;

Lined landfill cell	Security fencing	Weighbridges
Offices	Carpark	Wheelwash
Leachate lagoon	Stormwater Retention Pond	SCADA and CCTV Systems
Waste Inspection Area	Waste Quarantine Area	An environmental monitoring program.

The contractor when appointed will develop a finalised construction schedule. This schedule will depend on the contractual timescale, time of year, resources and work sequence.

3.1.1.2 Method Statement

The preparation of a method statement for the construction of the work, including QA/QC details, will be a requirement included in the construction tender documentation.

3.1.1.3 A Safety Statement

The production of a safety statement for the construction of the work will be a requirement in the tender documents.

3.1.1.4 Material Requirements

Apart from the materials necessary for the construction of ancillary buildings and site roads, the main requirements for materials will be in the construction of the landfill. Table 3.1.2 provides estimates of the quantity of materials for each element of the landfill and the proposed source.

Table 3.1.2 Approximate Materials Quantities

Element	Material Type	Quantity	Source
Clay Barrier	Low permeability Clay	80,000m ³	Won on site
Membrane	2mm HDPE	80,000m ²	Import
Drainage Material	Granular material	80,000m ³	Import
Daily Cover	Degradable PVC	1,100,000m ³	Import
Weekly cover	Recovered C & D waste	90,000m ³	Import
Cap drainage	Recovered C & D waste or synthetic geocomposite layers	110,000m ²	Import
Cap	Low permeability clay (0.6m thick)	70,000m ³	Won on site
Subsoil/Topsoil	Soil (with humus) 1.0m thick	110,000m ³	Won on site/Import

3.1.1.5 Materials Balance

The excavation of the cells will generate c.550,000m³ of low permeability clay. This material will be used as follows:-

Basal clay barrier	100,000m ³
Clay element in final cap	90,000m ³
Construction of perimeter embankment	260,000m ³
Subsoil in cap	100,000m ³

Permeability tests have shown that this clay can be reconstituted to provide a hydraulic permeability lower than 1×10^{-9} m/s.

The subsoil/topsoil that will be stripped on a phase-by-phase basis will be stored temporarily and reused in the final cap.

It is not anticipated that there will be any export of excess material from the development site.

3.1.1.6 Material Storage

Generally topsoil and subsoil storage will be minimised by co-ordinating new cell construction and capping activities concurrently.

Where it becomes necessary to store subsoil it will be stored on areas of the landfill, which have not yet been developed. During the last phases this location will be on previously filled cells.

Runoff from subsoil stockpiles will be directed to the surface water retention pond and hence through the treatment works. If necessary these stockpiles will be covered with a water proof sheet or mulsh to prevent excessive clay particles entering the surface water system. Stockpile heights will not exceed 10 m above adjacent ground levels.

3.1.1.7 Stability Analysis

The stability of the perimeter embankments and the stability of the components of the lining system are demonstrated in Appendix 3.1.2. Slope stability analysis of the perimeter embankments confirms that a factor of safety of 2 can be achieved against slope failure. Details of soil parameters, surface loads and slope topologies are given in Appendix 3.1.3.

The perimeter embankments will be constructed from soil excavated from the landfill cells, the side slopes will be at a gradient of 1 vertically to 3 horizontally, construction will take place in layers not exceeding 300mm in thickness. Slope stability analysis has been undertaken on all embankments as part of the site design. The analysis was done using the mathematical model 'SLOPE' and proved that a factor of safety greater than 3 can be achieved on the slopes. If any design change results in the increase in height or gradient of any embankment, then the new shape will be subjected to the same rigorous analysis. The model considers both the constructed embankment and the underlying strata supporting it. If, during the course of construction, any evidence arises that would suggest that the information derived from the site investigation is not representative, then the model will be re-run to determine stability.

External side slopes shall be grassed, weekly visual inspections will be carried out on all embankments for stability. An annual topographic survey will monitor the stability of the embankments.

3.1.1.8 Import of Construction Materials

The scale of importation of construction materials necessary for the construction of the landfill is given on Table 3.1.2. The source of the granular material will be on the basis of invited tenders. Similarly, the synthetic materials used in the lining and capping of the site will be supplied on the basis of competitive tendering. The main importation item is the granular material, which will be imported on a phase-by-phase basis. Each phase will require approximately 8,500m³.

3.1.1.9 Export of Excess Materials

It is not anticipated that there will be any export of excess material from the development site.

3.1.1.10 Formation Levels

The formation levels for each cell and phase are given on Drawing No. 2001-144-01-01. Cross-sections are given on Drawing No. 2001-144-01-06.

3.1.1.11 Basal Gradients

The longitudinal gradient will be 1:150, transverse 1:30 and the details of the basal gradients of all cells are given on Drawing No. 2001-144-01-01.

3.1.1.12 Location and levels of Fixed Ordnance Datum Points

Fixed Ordnance Datum monuments will be established on completion of the Phase 1 construction.

3.1.1.13 Design Details of Bunds

There is just one bund proposed for the site, that is the oil storage bund which will be a concrete structure designed in accordance with BS8007. There will be no gravity outlet from the bund. All spillage/rainwater will be extracted using pumps/vacuum tankers.

3.1.2 Site Infrastructure

3.1.2.1 Fencing and Security

Site security will be effected by: -

- The provision of a security fence
- The maintenance of the existing perimeter fences and hedgerows
- The provision of CCTV
- 24-hour monitoring of an intruder alarm system
- Monitoring, logging and supervision of all visitors.

Fencing

The specification of the security fencing will be as follows: -

Fence Type A Palisade Fencing

Palisade fencing is proposed locally around the entrance gates. A Palisade type gate is proposed at the site entrance. Details of the Palisade gate and fencing are given on Drawing No. 2001-144-01-11. The extent of fence type A is given on Drawing No. 2001-144-01-12.

Fence Type B Chainlink Fencing

It is proposed that galvanised chainlink fencing be erected inside the site boundary to details given on Drawing No. 2001-144-01-11. The extent of type B fencing is given on Drawing No. 2001-144-01-12. Fencing on the northern boundary will be effected by making good the existing chainlink fencing.

Existing hedgerows.

It is proposed to maintain in their current state, all existing perimeter fences and hedgerows. The security fence will be constructed approximately 4m inside of the existing hedgerows thereby minimising risk that the excavations would adversely affect the hedgerows.

Close Circuit Television (CCTV)

A CCTV infrastructure will be installed to (as a minimum) monitor the following:-

- the security gate at the entrance;
- weighbridges;
- the leachate lagoon;
- the waste inspection/quarantine area;

The CCTV will be equipped with a recording mechanism and will be accessible remotely by a 24-hour-security company and authorised personnel using internet access.

Alarm System

Apart from the environmental alarm system (SCADA), which will be discussed later, all lockable buildings will be equipped with an intruder alert alarm. Included in this schedule of lockable buildings will be all kiosks housing equipment such as pump controls.

Monitoring of Visitors and Deliveries

Every visitor to the site will be required to log in at the weighbridge. This will also include operatives delivering waste and site staff.

3.1.2.2 Roads

Inside the site security gates, roads and hardstanding will be constructed to three different specifications as follows:-

1. The main internal road which leads from the site security gate to the haul road leading up to the landfill will comprise 40mm wearing course bituminous macadam on 60mm base course macadam on an average 300mm thickness of Clause 804 roadbase material.
2. Both the haul road for waste accessing the landfill and the road leading to the surface water retention pond will comprise surface dressing on 300mm Clause 804 road sub-base.
3. The perimeter inspection road will comprise a 200mm layer of Clause 804.

The extent of each road type is given on Drawing No. 2001-144-01-01.

Access roads within the cells will comprise either imported fill or selected inert waste either on a minimum 1m of compacted waste or on 1m of granular material, whichever is appropriate.

Appendix 3.1.4 contains documentation and a map in relation to the right-of-way from the public road to *greenstars'* Ballyguyroe site. The road to the west of point D on the map included in Appendix 3.1.4 is owned by Cork County Council. The land between point D and E is owned by Coillte Teoranta. Mrs. Kathleen Herbert has made a statutory declaration confirming right-of-way to her land from the public road. *greenstar* has an option to purchase a portion of Mrs. Herberts' land. As part of the contract, Mrs. Herberts solicitors have confirmed in writing, on Mrs Herberts behalf, that Mrs Herbert will assign her Wayleave over the County Council road and over the right-of-way which she has to her property to *greenstar*.

3.1.2.3 Hardstanding Areas

It will be necessary to construct hardstanding areas in the vicinity of the weighbridges and adjacent to the administration buildings. Hardstandings will be required for parking and marshalling of trucks. All hardstandings adjacent to the administration buildings will be drained to the surface water drainage system. Run-off will be passed through an oil interceptor prior to discharge. Layout of the drainage system of the hardstanding areas is given on Drawing No. 2001-144-01-02.

3.1.2.4 Weighbridge

It is proposed to install two weighbridges at locations showing on Drawing No. 2001-144-01-01. Each weighbridge will be 18m long and approximately 3.0m wide, mounted on load cells on a

concrete sub-foundation. Each will be capable of weighing vehicles with a gross weight of up to 60 tonnes. Each and every event on the weighbridge will be recorded and, using customised software, it will be possible to record details of each delivery including:-

- tare weight;
- vehicle registration;
- haulier;
- waste type;
- waste source; and
- destination of waste on site.

The weighbridges will also be used to record the arrival of materials necessary for the construction and upkeep of the landfill and also the quantity of materials such as leachate leaving the landfill.

3.1.2.5 Wheelwash

It is proposed to use a combination of dry shakeout and wet underbody wheelwash. Dry shakeout will be located over a sump that will, from time to time, require drainage and cleaning. The wet wheelwash will drain to a settlement sump which again will require cleaning from time to time. Collected liquid from each of the units will be pumped to a leachate lagoon.

The wet wheelwash will require a water supply but will also be equipped with a circulation system to minimise demand.

The location of the proposed wheelwash is given on Drawing No. 2001-144-01-01. Details are shown on Drawing No. 2001-144-01-14.

3.1.2.6 Laboratory Facilities

A number of portable laboratory instruments such as dissolved oxygen meters, a conductivity meter, a landfill gas analyser, pH and temperature meters will be provided on the site. These will be stored in the store area of the administration building as indicated on Drawing No. 2001-144-01-04.

The room will be equipped with benches and shelving to accommodate safe storage, battery charging, cleaning and, where appropriate calibration of the equipment. Each piece of equipment, will, as appropriate, be sent off-site for regular calibration.

3.1.2.7 Fuel and Chemical Storage

It is proposed that fuel be stored on site for the off-road vehicles only. Fuel will be stored in a 6,000l tank located in a bund with a capacity of 7m³. The location of the fuel store is given on Drawing No. 2001-144-01-01. The details of the storage fuel bund are given on Drawing No. 2001-144-01-03. Spillages from storage tanks will therefore be contained.

All liquid substances such as insecticides will be stored in their delivery containers on banded pallets within one of the storage containers located adjacent to the machinery maintenance garage. The quantities will vary depending on manufacturers/suppliers. In general, it is expected that individual drums will contain approximately 25 litres. Solid materials such as rodenticide will be stored in locked cabinets within the storage containers. In general, the handling and application of the above substances will be by specialist sub-contract.

It may be necessary to store small quantities of lubricants, hydraulic oil and miscellaneous chemicals. These will be stored on a banded pallet within the maintenance garage.

There will be no outlets from the bunds. All bunds will be maintained using a vacuum tanker or pump. Liquid removed from the oil bund will be passed through the oil interceptor before discharge to surface water (see Drawing 2001-144-01-27 for details of the oil interceptor). Liquids arising in the banded pallet will be handled in a manner appropriate to their nature. The bunding arrangements described above will ensure that there will be no fuel/chemical emissions from these sources.

3.1.2.8 Waste Quarantine/Waste Inspection Areas

A steel waste inspection platform will be provided at the location given on Drawing No. 2001-144-05-15. It is proposed that contained waste quarantine and inspection areas be constructed at the location given on Drawing No. 2001-144-01-01 to the details given on Drawing No. 2001-144-01-03.

3.1.2.9 Traffic Control

Traffic accessing the site will do so via the L1329. Signs will be placed on the northern and southern approaches to the site entrance identifying the site and its entrance. A site identification sign and a restricted access notice will be placed on the junction between the site access and the county road. Speed control signs (40 mph) will be placed on the access road.

Access to the weighbridge will be controlled using automated barriers and/or traffic lights. Vehicles that need to by-pass the weighbridge will be barrier controlled.

appropriate signage. In addition, vehicle restriction and safety advisory signs will be provided at suitable locations around the site.

Lighting will be provided along the access and haul roads; around the administration complex and at the active tipping face.

The proposed traffic management including the proposed signage plan to be implemented for the facility is shown on the Signage Layout Drawing 2001-144-01-19. In addition there will be a site identification sign and a restricted access notice placed on the junction between the site access road and the local road L1329. One set of speed control signs (40 m.p.h.) will be placed on either side of the access road.

3.1.2.10 System Control and Data Acquisition System (SCADA)

The SCADA system will be connected to all the following operating systems on site:

- The leachate level monitoring sensors
- The leachate pumps
- The level monitor in the leachate & stormwater lagoons
- The surface water treatment system and associated outlet valves
- The weighbridge
- The gas flare.

The SCADA will display and record all incoming data. In the event of SCADA failure manual monitoring and sampling will be carried out at a frequency specified in the schedule of the licence.

The SCADA system will be controlled by software in the office, which will activate an alarm if and when pre-set limits are exceeded.

In the event of failure of the system contingency arrangements will allow the manual override of any component of the system.

The storm water outlet will incorporate a shut off valve that will engage when stormwater emissions limits are exceeded.

3.1.2.11 Sewerage, Foul and Surface Water

Sewage will arise from the administration building only and will be sewered using 100mm diameter PVC pipework to a small wastewater treatment system resulting in treated water with the following characteristics:-

- pH 6.5 – 7.5
- biochemical oxygen demand less than 20mg per litre

- suspended solids less than 30mg per litre
- ammonia less than 10mg per litre
- nitrate 5 to 10mg per litre
- total phosphates less than 5mg per litre.

The layout of the sewerage infrastructure is given in on Drawing No. 2001-144-01-02. The treatment plant proposed for the treatment of domestic wastewater at the site will be Agrément certified, Biocycle Wastewater Treatment system or equal approved. Appendix 3.1.5 shows a typical arrangement of this system including typical dimensions.

Foul water will arise from the following sources:-

- waste inspection area
- quarantine area
- wheelwash

Generally run-off from the waste inspection and quarantine area will consist of rainfall run-off, and will drain directly to the leachate lagoon. The nature and composition of this run-off will be clean rainwater.

Only in cases where waste is tipped in the waste inspection and quarantine area will leachate be generated in these areas. The nature and composition of this leachate will depend on the type of waste tipped in the bay, but is assumed to be mildly contaminated from domestic waste.

The level and rate of run-off to the leachate lagoon from the waste inspection and quarantine area is weather dependant.

Appendix 3.1.6 demonstrates the maximum flow and the maximum monthly leachate contributions due to the waste inspection and quarantine area.

The outlet from the wheel wash to the leachate lagoon is located at the top water level of the wheelwash. This ensures that there is always water contained in the wheelwash. This outlet provides an overflow for the water in times of heavy rainfall.

The nature and composition of run-off from the overflow will be mainly dirty water with high, suspended solids content, arising from site access road and intermediate cover within the waste disposal area.

An access hatch has been incorporated alongside the wheelwash for emptying and cleaning. When deemed necessary the wash water will be pumped out by a vacuum tanker and taken to the leachate lagoon for removal off site. The composition of this wash water will also be high in suspended solids and grit.

Emptying of the wash water will be dictated by site operating conditions and shall only be carried out when there is sufficient capacity in the leachate lagoon.

Appendix 3.1.6 also shows predicted maximum flow and maximum monthly leachate contributions due to rainfall, from the wheel wash.

Surface water will arise from the following sources:-

- roads
- hardstandings
- roofs
- developed but unused landfill cells
- run-off from the undeveloped areas
- run-off from the capped areas
- run-off during construction.

The layout of the surface water infrastructure is shown on Drawing No. 2001-144-01-02. The existing site drainage is given on Figure 2.5.2. This information is also shown on Drawing No. 2001-144-01-18. The drawing indicates the watercourses to be eliminated and the route of the proposed surface water diversion channel. In general, diverted surface watercourses will comprise trapezoidal channels, 2m wide at the base, 1.5m deep and 8m wide at the ground surface. All watercourse diversions will be undertaken in Phase I. Prior to surface water diversions being undertaken, the storm water retention pond and surface water treatment equipment will be installed. This will ensure that all discharges to the River Farahy will be controlled, and that fish life will be protected.

Surface water run-off from the site will be comprised of rainwater that falls on all areas of the site except the active cell, the leachate lagoon and the waste inspection and quarantine areas. This clean water may collect clay particles from areas of exposed clay such as recent excavations or recently restored areas. Rainfall on roads or hardstanding areas could potentially collect traces of hydrocarbons. Any rainwater that makes contact with waste materials will be collected as leachate and will not be discharged as surface water run-off. Surface water from hardcore roads will be transported in open swales, before being piped into the storm water retention pond. Flows from hardstanding areas will pass through an oil interceptor prior to discharging to the storm water retention pond.

The outlet from the storm water retention pond will incorporate an actuated penstock valve, this will control the outflow during storm events and also contain the contents in the event of a surface water contamination event. This will allow the slow release of heavy rainfall and so alleviate any flooding problems downstream and is a positive environmental effect of the proposed development. Flow through this valve will be automatically controlled by flow and conductivity measurements upstream.

This system will provide:-

- Absorption of peak flows
- Maximum retention time in the stormwater retention pond
- Controlled discharge in relation to the receiving water
- Containment of the flow in the event of contamination.

In the event of contamination (indicated by high conductivity) all stormwater will be contained until management is satisfied that it is safe to recommence discharge.

The stormwater retention pond has been designed with sufficient capacity to allow control during flood events and that the alterations to flow caused by the development will be minor.

The outflow from the retention pond will include instrumentation to detect the following:

pH, Dissolved Oxygen and level.

Because of the colloidal nature of the clay in the area it is proposed to install a treatment system downstream of the storm water retention pond. It is proposed that this system will remove excessive suspended solids if any, prior to discharging to the River Farahy. The outlet from the treatment plant will include instrumentation to detect the turbidity of the water. All storm water will discharge to the River Farahy via two small streams to the south of the site. The discharge system will be designed to replicate as close as possible the existing flows in these two streams and the Farahy River.

The composition of the discharging surface water run-off is therefore expected to be similar to the existing composition in the site streams as presented in Appendix 2.5.1 of this EIS.

The general layout of the storm water retention pond is given on Drawing No. 2001-144-01-05 and the surface water diversions were shown on Drawing No. 2001-144-01-01. It is proposed to use electro-coagulation and flotation treatment system to ensure clarity of surface water discharge to the River Farahy. Continuous monitoring of suspended solids will ensure discharge conforms to acceptable levels and so protect fish life in the river.

It will be necessary to store soil in stockpiles or as part of the perimeter embankments. Soil erosion can occur if exposed to intense rainfall. To prevent soil erosion from wind or severe rainfall *greenstar* will cover all soil stockpiles with a protective geotextile.

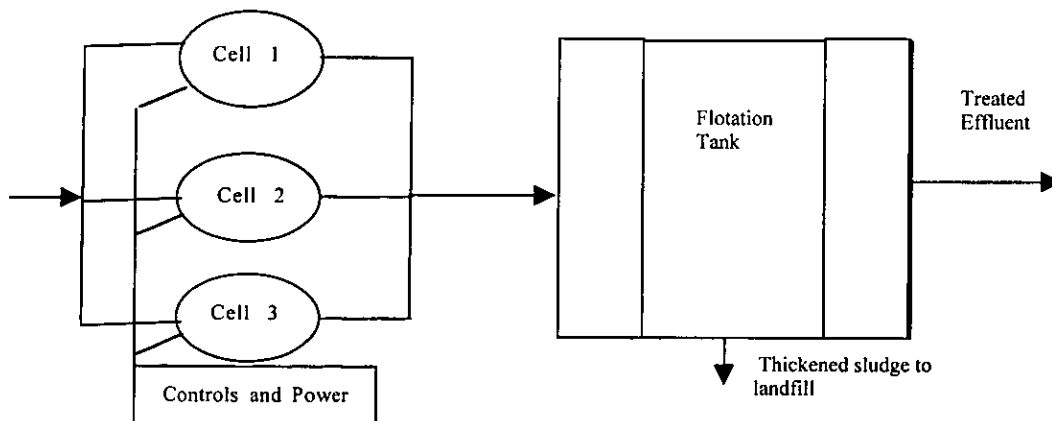
The outer slopes of the perimeter embankment will be covered with a synthetic matting, this will:-

- Encourage vegetation;
- Limit erosion, and
- Establish evapotranspiration.

A 3-stage operation will be implemented to prevent the discharge of turbid surface water;

- Silt laden surface waters generated on site will be routed through the storm water retention pond. This will have the affect of balancing the discharge and encouraging larger particles to settle out. A turbidity meter will monitor discharge from the storm water retention pond. In the event that turbidity exceeds agreed limits the electro-coagulation treatment plant will activate.
- Discharges from the storm water retention pond will be passed through an electro-coagulation treatment unit. Depending upon the level of turbidity an appropriate amount of aluminium hydroxide will be generated in-situ by electrical excitation of sacrificial aluminium electrodes resulting in flocculation of all the clay particles. This process will be aided by electric charge neutralisation and an increase of pH to ~ 7 pH units. The unit will be designed to provide aluminium at a level no greater than 2mg/l. in the discharge water.
- Following electro-coagulation, bound floc particles fines will be removed by simple deep bed filtration (5 micron bed) using a proprietary filter. This filter unit will be equipped with an automated backwashing facility to prevent clogging.

A schematic diagram of the process is given below. Trigger levels for the activation of the surface water clarification equipment will be as agreed with the Southern Regional Office of the Department of the Marine and Natural Resources.



A detailed assessment of surface water run-off and sizing of the stormwater retention pond is given in Appendix 3.1.7 and further details of the surface water treatment process are given in Appendix 3.1.8.

The site design allows for gravity drainage to a reed bed system in the long term. This system will only be adopted during the aftercare phase with the agreement of the EPA, when the leachate is benign enough to be treated by the reed beds to a satisfactory standard. The timing of the introduction of the reed bed treatment system is likely to be tens of years after closure.

3.1.2.12 Site Services

The site will be connected to:-

- 380v three phase electricity (if required); and
- the telephone network;
- A deep borehole pump will provide a supply of water for welfare and ancillary uses.

In addition, selected site staff will be equipped with cellular telephones. A standby generator will provide sufficient capacity to service the entire site including the leachate management infrastructure. The generator may be used to augment the mains supply during periods of peak demand. The generator may have a further future use in the avoidance use of the punitive penalties associated with malfunction of the landfill gas utilisation infrastructure.

3.1.2.13 Sheds and Garages

The site will be provided with two used shipping containers as stores for miscellaneous small plant and equipment. One of the shipping containers will be equipped with a workbench, power tools and equipment, both containers will be served with electrical power. There will be one purpose built garage of a size adequate for the housing and servicing of large plant items such as landfill compactors. The garage will be 6m wide and 12m in length, will have a head clearance of 6m and a door opening of 5m wide and 5m high. The location of the plant sheds and garages are given on Drawing No. 2001-144-01-01 and details shown on Drawing No. 2001-144-01-27.

3.1.2.14 Site Accommodation

Site accommodation will be provided using modular buildings to a specification similar to that given on the brochure in Appendix 3.1.9. A layout of the proposed administration building and compounds including the site manager's office, canteen, toilets and showers are given in Drawing No. 2001-144-01-04. All toilets will be connected to the proposed wastewater treatment plant, details of which are given above.

3.1.2.15 Fire Control

A diesel powered pump will be provided at the storm water retention pond to augment the flow from the pumped main should the need arise. In general, fire will be prevented by operating best practice including:-

- the immediate and effective placing and compaction of waste
- the use of daily and intermediate cover
- deposition of smouldering or burning waste at the waste inspection area
- designation of smoking/non smoking areas
- security.

Any outbreak of fire will be treated as an emergency. The Cork County Fire Service will be contacted in the first instance.

3.1.2.16 Civic Amenity Sites.

It is not proposed to provide a civic amenity site at the *greenstar* landfill.

3.1.2.17 Waste recovery.

This facility is being designed for the disposal of treated residual waste. It is not proposed initially to provide any other waste recovery infrastructure.

3.1.3 Leachate Containment

It is proposed to construct a fully contained landfill, i.e. the base and sides of the landfill cells will be lined with a composite lining system comprising a 2mm flexible membrane liner laid in close contact with compacted clay liner.

3.1.3.1 Lining System Details

Details of the proposed lining system are given on Drawing No. 2001-144-01-08. The lining system includes a 500mm depth of granular material, which has a dual purpose, primarily it facilitates the drainage of leachate and secondarily it protects the liner against mechanical damage from above. The next layer is a bedding geotextile, which gives added mechanical protection to the flexible membrane liner. It is proposed to use a 2mm, high density polythene (HDPE) as the membrane liner. Compliance with the Landfill Directive requires that a mineral layer of at least 0.5m deep will be provided. The mineral layer is to be equivalent to a 1m depth of soil with a permeability (k) $\leq 1 \times 10^{-9}$ m/sec. Laboratory testing of soils at Ballyguyroe (see Section 2.6) has indicated that the existing clay underlying the site can be engineered to give a permeability as low as 9.3×10^{-11} m/s thus significantly exceeding the requirement of the Directive. A depth of 1m of clay will be excavated below the liner level, replaced and compacted in layers as described below.

- If significant amounts of cobbles or clods arise, the clay will be dry screened prior to relaying and compacting
- The clay will be replaced in approximately four layers
- Each layer will be compacted with a sheeps foot roller. (the number of passes will be determined by further soil testing at construction stage)
- The final layer will be compacted with a smooth roller
- CQA (in accordance with the EPA landfill manual on site design) will be applied to the construction process.

Appendix 3.1.10 gives the potential leakage rate through the liner system.

3.1.3.2 Specifications

The specification sheet included in Appendix 3.1.11 gives typical specifications for both raw polymer and manufactured HDPE liner.

3.1.3.3 Method Statement

A full method statement for the installation of the liner system will be a requirement of the tendering process for the development contract. The elements of the statement will include the following:-

- A description of how the in-situ clay will be excavated to 1m below its final level, processed through a screen and re-compacted in layers
- A statement as to how and where synthetic lining materials are stored
- Full details of the installer including qualifications and experience
- Procedures to be applied including both destructive and the non-destructive testing
- Statement on the installation of the leachate drainage pipework
- Statement on measures to be undertaken in the event of the detection of leaks during the leak detection survey.

3.1.3.4 Safety Statement

When appropriate, a safety statement produced by the lining contractor will be provided for the installation of the liner system.

3.1.3.5 Quality Control Plan

The quality control plan will be drawn up based on the recommendations given in the Landfill Site Design Manual as published by the EPA.

3.1.3.6 Quality Assurance Plan

Quality assurance will be effected by the employment of an independent agency to carry out random tests of all elements of the lining system and to quality assure the data received from the contractors. The EPA will appoint the Quality Assurance Contractor on the basis of approval.

3.1.3.7 Third Party Supervision

greenstar will employ a construction management team to oversee all of the contractors activities. When appropriate the name, experience and qualifications of appropriate members of the

construction team will be submitted to the EPA. An essential part of the supervision will be the employment of an independent agency to quality assure the installation.

3.1.3.8 Access Ramps

It will be necessary to access the cells using ramps constructed on the granular material. Ramps will be at a gradient of 1:10 and, where constructed prior to the placement of waste will include, as a minimum, 300mm depth of Clause 804 roadbase material on a 1m depth of selective fill on a geotextile on the annular drainage/liner protection layer.

3.1.3.9 Pre-commissioning Test

Prior to accepting waste all leachate pumps will be tested. It is likely that rainfall will have accumulated in the cells prior to testing, however, it may be necessary to import water to test the pumps. In addition, all level detection equipment will be tested and calibrated. All of the equipment detailed in Section 3.1.3.1 above must be tested and commissioned before waste is accepted at site.

3.1.3.10 Leak Detection Surveys

It is proposed that the cells be geophysically tested after the granular protection layer has been placed. This is based upon the presence of an insulator (HDPE) liner between two layers of conducting materials, (the clay layer and the granular protection layer). If the geomembrane is damaged, instrumentation will detect localised current flows through the defect. Qualified personnel can interpret the change in current flows and identify the location of defects.

3.1.4 Leachate Management Plan

Leachate will be contained by the basal lining system. The depth of leachate within each cell will be continuously monitored by electronic methods. Leachate will be collected by constructing the cells with both a longitudinal and transverse gradient. The liner will be overlain by a layer of granular drainage material. A network of slotted HDPE- drainage pipes comprising 250mm diameter main headers and 150mm diameter laterals will be provided in each cell. At the low point of each leachate header there will be a sump and a submersible pump. The submersible pumps will be networked together and used to transfer the leachate to the leachate lagoon. As required, road-going tankers will extract the leachate and transport it to a local waste water treatment plant. *greenstar* has received written confirmation from Cork Corporation, Limerick County Council and Shannon Environmental Services of their willingness to discuss the feasibility and possibility of the acceptance of leachate from the site, subject to the agreement of commercial and other terms (Appendix 3.1.14). It is not proposed to carry out any leachate treatment on site during the operational phase.

During both the active and post closure phases of the landfill it is proposed to monitor the quantity and strength of leachate emanating from the site. In the long term, for sustainability, decommissioning of the pumps will be considered and the gravity drainage of leachate from Cells 7 & 8 through to Cells 1 & 2 respectively will be established. This is a conceptual proposal only and cannot be finalised until such time as the characteristics of the leachate stream in the post-closure phase are known.

The maintenance programme for the leachate management system will involve establishing a maintenance contract with a mechanical and electrical contractor. This contractor will be responsible for maintaining all pumps, level sensors and associated equipment. A spare pump will always be available on site. All the pumps in the system will be the same make and model thus ensuring that spares and parts are easily sourced.

3.1.4.1 Annual Quantities of Leachate

The potential annual quantities of leachate predicted for the site from water balance calculations are given in Table 3.1.3 below.

Table 3.1.3: Annual Leachate Generation

Year	Annual Leachate Generation (m ³)
1	15,038
2	23,119
3	21,382
4	20,798
5	14,805
6	16,353
7	53,457
8	28,085
9	31,325
10	22,874
11	5,962

The leachate quantities outlined in Table 3.1.3 above can be considered as being conservative and are likely to be significantly less due to the implementation of an aggressive leachate management programme including progressive capping and re-circulation of leachate.

3.1.4.2 Total Quantity of Leachate

The total quantity of leachate emanating from the site during the 10 operational years is estimated as 253,198m³ (Table 3.1.3).

3.1.4.3 Composition of Leachate

Typical composition of leachate from UK and Irish landfills as published by the EPA is included on Table 3.1.4.

Table 3.1.4: Typical leachate composition of 30 samples from UK/Irish landfills accepting mainly domestic waste (1992 figures)

Determinant	Units	Mean Value
pH-value	-	7.2
conductivity	$\mu\text{S}/\text{cm}$	7789
alkalinity	mg/l	3438
COD	mg/l	3078
BOD ₂₀	mg/l	>834
BOD ₅	mg/l	>798
TOC	mg/l	717
fatty acids (as C)	mg/l	248
Kjeidahl-N	mg/l	518
ammoniacal -N	mg/l	491
nitrate-N	mg/l	2.4
nitrite-N	mg/l	0.2
cyanide	mg/l	<0.05
sulphate	mg/l	136
phosphate	mg/l	3.0
chloride	mg/l	1256
boron	mg/l	7.0
sodium	mg/l	904
magnesium	mg/l	151
potassium	mg/l	491
calcium	mg/l	250
vanadium	mg/l	0.73
chromium	mg/l	0.07
manganese	mg/l	1.99
iron	mg/l	54.5
nickel	mg/l	0.10
copper	mg/l	0.04
zinc	mg/l	0.58
arsenic	mg/l	0.008
cadmium	mg/l	<0.01
tin	mg/l	5.4
mercury	$\mu\text{g}/\text{l}$	0.1
lead	mg/l	0.10
aluminium	mg/l	<0.1
silicon	mg/l	11.90

Source: EPA Landfill Operational Practices Manual, 1997.

Examples of leachate compositions taken from Annual Environmental Reports for a number of Irish non-hazardous waste landfills have indicated that the concentrations of the various constituent leachate parameters are not in fact as high as suggested in Table 3.1.4.

3.1.4.4 Composition for Leachate Predicted from Material Entering the Landfill

The proposed landfill will be for the disposal of treated residual waste only. There will be no hazardous waste deposited. It is therefore predicted that the leachate arising from material entering the landfill would be typical of that given in Table 3.1.4 above. *greenstar* will use the guidance given in the EPA manual on Waste Acceptance (Draft) and EU Directive 2003/33/EC with respect to all waste being presented for disposal. When new or unusual sources of waste are proposed Level 1 characterisation will be a requirement.

3.1.4.5 Water Balance

Water balance estimations for the site are presented in Appendix 3.1.12.

3.1.4.6 Details of Cells Sizes

The landfill will be divided into 8 cells that are sized in accordance with the water balance calculations.

3.1.4.7 Phasing Plan

It is proposed to develop the site in four phases each phase containing 2 cells

3.1.4.8 Size of working area

It is proposed to minimise the working area. Based on the design input (approximately 500 tonnes per day), the working area could be approximately 15 x 15m (based on 2m deposition). Because of the limited manoeuvrability of landfill compactors, the daily working area is likely to be approximately 23 x 23m using a 1m lift.

3.1.4.9 The Leachate Collection System

The leachate collection system will comprise;

- A granular drainage layer overlying the lining system
- 200mm and 150mm (ID) HDPE slotted pipework laid at gradients of 1:150 and 1:30
- Sump on the main (200mm) drainage pipe
- Sloping shaft side riser pipes to accommodate submersible pipes
- An HDPE, double walled leachate collector main leading to the leachate lagoon.

The operation of the pumps will be on the basis of the depth of leachate within cells.

The SCADA will facilitate the remote monitoring of the depth of leachate within the cells and the remote/automatic activation of leachate pumps. The SCADA system will also ensure that leachate will be pumped only when there is capacity in the leachate storage system.

3.1.4.10 Leachate Storage System

A detailed assessment of leachate arisings is given in Appendix 3.1.13, the maximum leachate arising is estimated to be 106m³/day for the period of a year. Therefore, it is proposed to provide a leachate storage lagoon with sufficient capacity for 7-days storage of this maximum leachate flow. The lagoon will comprise a lined cell to the same specification as given for the landfill cells but without the granular drainage layer.

The seven day capacity of the lagoon is considered adequate in that it gives *greenstar* ample time to react to unforeseen events. Action in the event of an unforeseen event could include;

- Mobilisation of extra tankers
- The re-circulation of leachate back into the cells
- The utilisation of unused cells for temporary storage of leachate.

3.1.4.11 Level of Leachate

Leachate levels within the storage lagoon will in general be maintained below the maximum permissible level, also a buffer will provide extra storage in the event that pumping or storage infrastructure is out of service.

The leachate level in the waste will be continuously monitored using electronic methods. Leachate levels will be displayed locally in the pump control kiosks and transmitted electronically to the site office.

The SCADA system will interpret the leachate level and if levels exceed the maximum permitted values, activate an alarm, as appropriate. The level of leachate in each phase will be on display in the site office and all data will be permanently recorded.

Due to the gradient of the cell floor and the high permeability of the leachate collection blanket all leachate will travel to the cell low point.

3.1.4.12 Leachate Re-circulation

Details of the proposed leachate re-circulation system are given on Drawing No. 2001-144-01-09. Leachate re-circulation will be by injection under the cap only. Drawing 2001-144-01-09 gives a

network of leachate re-circulation sumps. In general leachate will be re-circulated from the lagoon using a re-circulation pump.

Inlet valves, in conjunction with high level indicators in each sump will control the rate of re-circulation.

The SCADA system will control this system and leachate re-circulation will not proceed unless the required capacity is available.

The re-circulation of leachate under the capped landfill is considered beneficial in advancing the biological stabilisation of the waste mass.

3.1.4.13 Leachate Removal

Leachate will be removed from the cells using submersible pumps installed in the side riser shafts. Pumps will be connected to the main leachate header pipe using a system of non-return valves to avoid short circuiting of leachate. The leachate sumps will be at the location given on Drawing No. 2001-144-01-07. Operation of the leachate pumps will be linked through the level in the receiving leachate lagoon. Should lagoon capacity not be available the pumps will not run.

It is proposed that in the long term, after the landfill is closed and when the entire landfill is capped, a gravity drainage system will be installed by constructing a drain out of southern (Phase I) embankment. This will eliminate the need for leachate pumping thus reducing the risk that mechanical failure will compromise the overall environmental performance of the facility after closure. Progressively, in the very long term, it is envisaged that biological stability of the landfill will occur and that leachate concentrations will reduce to the extent that a simplified treatment system such as reed-bed would be installed and a "hands-off" system will result. This is a conceptual proposal only and it is not proposed that it will be dealt with in detail at this stage.

3.1.4.14 On-site Leachate Treatment

It is not proposed to provide on-site leachate treatment. As referred to above, in the long term, the use of a system such as reedbeds may be feasible when the concentration of contaminants in the leachate has reduced sufficiently.

3.1.4.15 Off-site Leachate Removal

It is proposed that the leachate will be transported using a 22m³ road tanker. There will be a leachate loading slab provided adjacent to leachate lagoon such that any spillage when loading the tanker will flow back into the leachate lagoon. A permanent pump will be installed in the leachate lagoon to fill tankers. A standby tanker will be available for use on site and in the event of breakdown or insufficient capacity, it will be brought into service using a contract haulier.

3.1.4.16 Off-site Treatment

greenstar has received written confirmation from Cork Corporation, Limerick County Council and Shannon Environmental services of their willingness to discuss the feasibility and possibility of the acceptance of leachate from the site, subject to the agreement of commercial and other terms (Appendix 3.1.14).

greenstar will agree with the EPA the destination of the leachate to be removed from the site prior to the facility commencing operation.

3.1.5 Landfill Gas

An active venting system will be installed to collect and flare the combustible gas initially and then to utilise the gas when sufficient landfill gas is being generated. The likely gas prediction schedule from the landfill is given in Table 3.1.5.

Table 3.1.5 Landfill Gas Prediction

End of Year	Cumulative Waste	Methane m ³ x10 ⁶ /yr.	Landfill Gas m ³ x10 ⁶ /yr.
2003	145,000	0.63	1.26
2004	290,000	1.23	2.47
2005	435,000	1.82	3.64
2006	580,000	2.38	4.76
2007	725,000	2.92	5.83
2008	870,000	3.43	6.85
2009	1,015,000	3.91	7.82
2010	1,160,000	4.39	8.78
2011	1,305,000	4.84	9.68
2012	1,450,000	5.30	10.59
2013	1,450,000	5.10	10.19
2014	1,450,000	4.90	9.80
2015	1,450,000	4.70	9.40
2016	1,450,000	4.50	9.00
2017	1,450,000	4.33	8.67
2018	1,450,000	4.16	8.33
2019	1,450,000	3.99	7.99
2020	1,450,000	3.85	7.70
2021	1,450,000	3.68	7.36
2022	1,450,000	3.54	7.08
2023	1,450,000	3.40	6.80
2024	1,450,000	3.26	6.51
2025	1,450,000	3.14	6.29
2026	1,450,000	3.03	6.06
2027	1,450,000	2.89	5.78
2028	1,450,000	2.80	5.60
2029	1,450,000	2.69	5.37
2030	1,450,000	2.58	5.17
2031	1,450,000	2.48	4.96
2032	1,450,000	2.38	4.77

3.1.5.1 Active Gas Control

Within approximately twelve months of the placement of waste it is likely that degradation of some of the waste will enter the methanogenic phase. The passive gas will be tested on a weekly basis to determine when the concentrations of the combustible gas (methane) are sufficient to support flaring. The grid of passive vents will be manifolded together and connected to a vacuum pump, which in turn will be connected to a landfill gas flare. Design details, with respect to the well heads, head works, collection pipework, condensate removable points, maintenance and remediation procedures will be on the basis of a tendered proposal by a specialist in the field.

3.1.5.2 Extent of Active Controls Systems

The Active Control System will, in general, be installed concurrently with the completion of the final cap. Ultimately the active control system will extend over the entire landfill footprint.

3.1.5.3 Location of Flare Stack

A flare stack similar to the unit illustrated on the attached technical brochure in Appendix 3.1.15 will be installed in the location shown on Drawing No. 2001-144-01-01. The landfill gas flare to be used at Ballyguyroe will be selected by tender and the details of the flare will be made available to the EPA prior to commissioning. Appendix 3.1.15 also shows the emissions expected from such a system. Table 4.2.10 contains typical emission limit values for gas flares. The gas flare selected for the Ballyguyroe site will be capable of achieving these values and no significant impact on the receiving environment is predicted from these emissions.

Landfill gas utilisation at the site will be subject to a feasibility study at a future date. Details of such a system, should it be commissioned, will be provided in advance.

3.1.5.4 Passive Gas Control

Until the operation of the landfill gas flare, passive landfill gas management at the facility will be carried out. Landfill gas management and infrastructure shall meet the recommendations outlined in the Agency Manuals on 'Landfill Site Design' and 'Landfill Operational Practices'.

3.1.5.5 Extent of Passive Control System

The Passive control system will extend across the entire landfill footprint.

3.1.5.6 Gas Utilisation Plant

In general it is proposed, if viable, to utilise the gas. A number of options will be considered including:-

- export of the gas directly to consumers in the vicinity of the site;
- utilise the gas in an engine to generate electricity;
- combust the gas to provide heating to buildings on or in the vicinity of the site.

The design of the landfill gas utilisation plant will be on the basis of a Design Built and Operate Sub-contract. Only when the quantity of landfill gas being generated has been confirmed by the performance of the flare will it be possible to specify the landfill gas utilisation plant. Exact proposals for utilisation and time scale for the introduction of utilisation will depend on a full assessment of the options.

3.1.5.7 Emissions from the Flare Stack

Typical emissions from the flare stack are given on the attached technical brochure in Appendix 3.1.15.

3.1.5.8 Maintenance

The passive and active gas control systems will be inspected on a daily basis. Landfill gas emissions and flare stack emissions will be monitored on a weekly basis. Active gas control systems will be installed subject to a maintenance agreement with a specialist contractor. It will be a condition of the contract that spares are readily available.

3.1.5.9 Condensate Removal

The condensate removal traps will be similar to those illustrated on the attached brochure (Appendix 3.1.15) and will be positioned so as to drain back into the landfill mass. The condensate trap on the flare/utilisation plant will be drained to the leachate lagoon.

3.1.5.10 Gas Alarms

Gas alarms will be installed in all buildings and in the incoming service ducts adjacent to the administration area. All gas alarms will be linked to the SCADA system and a klaxon. Concentrations of methane in excess of 1% v/v and carbon dioxide in excess of 1.5% v/v will activate the alarms.

3.1.5.11 Gas Barriers/Trenches

The primary gas barrier is the lining and capping system within the cells. It is not envisaged that any other gas barriers or trenches will be required.

3.1.5.12 Volume of Landfill Gas

The US EPA has estimated the volumes of landfill gas given in Table 3.1.5 using E-Plus Landfill Methane Outreach Programme. E-plus is a decision support system designed to analyse the opportunities for the installation of gas recovery systems at landfills.

3.1.5.13 Landfill Gas Composition

It is predicted that the composition of the landfill gas arising from the site will be typical of that arising at similar landfills. A typical landfill gas composition is included in Appendix 3.1.15.

3.1.6.1 Landfill Capping

The capping system design is detailed on Drawing No. 2001-144-01-08 and will comprise a gas drainage layer, a barrier layer, a surface water drainage layer and subsoil and topsoil. Options will be considered for the mineral elements as follows;

- The gas drainage layer will be either a 300mm thickness of granular material or a synthetic geocomposite drainage layer
- The barrier layer will be either linear low density polyethylene or a 600mm thickness of low permeability clay
- The surface water drainage layer will be either 500mm thickness of granular drainage material or a synthetic geocomposite drainage layer.

To provide field capacity and to support growth, 850mm clay/subsoil and 150mm topsoil will be placed over the cap structure.

3.1.6.2 Specification of Membrane

If a flexible membrane is to be used it will be to a specification similar to that given in Appendix 3.1.16.

3.1.6.3 Method Statement for Cap

In twelve months of achieving the final level the filled cell will be permanently capped to the detail given above. Prior to capping, the waste will have been covered with a layer of intermediate cover. This is the regulation layer.

A full method statement for the installation of the capping system will be a requirement of the tendering process for the restoration contract.

3.1.6.4 Safety Statement

The preparation of a Safety Statement for the construction of the capping system will be a requirement of the restoration contract.

3.1.6.5 Quality Control Plan

The preparation of a Quality Control Plan for the construction of the capping system will be a requirement of the restoration contract.

3.1.6.6 Quality Assurance Plan

The quality assurance on the construction of the capping system will be on the basis of the appointment of third-party supervision specifically employed to quality assure the construction.

3.1.6.7 Landfill Stability

Landfill stability will be monitored based on annual topographic survey. On installation of the cap, permanent monuments will be installed. Variation in position (horizontal and vertical) of these monuments will be tracked on an annual basis to determine when any un-inspected movement is occurring. Any visual evidence of instability will be investigated by an immediate topographical survey and analysis.

3.1.6.8 Landfill Settlement

This site survey will be used to monitor landfill stability and also monitor landfill settlement.

3.1.6.9 Annual Topographic Survey

The Annual Topographic Survey will also serve to set the remaining void space on a phase by phase basis and in the overall landfill.

3.1.6.10 Daily Cover and Weekly Cover

Daily cover to be used at the facility will include material such as re-usable geo-synthetic membrane, plastic and soil. Weekly cover will comprise 100-150mm thick layer of subsoil. This layer of subsoil may be scraped off prior to continuing with the filling operation, to prevent, gas barriers and perched leachate tables forming within the waste body.

3.1.6.11 Intermediate Cover

Intermediate cover will comprise imported medium permeability material recovered from construction and demolition waste. The intermediate cap will comprise 300mm of clay on a geocomposite gas collection layer and will be placed and removed as required using site equipment. The volume of intermediate cover required will depend on the immediate requirements.

3.1.6.12 Temporary Capping

It is proposed to completely cap the site progressively. Temporary capping is not proposed.

3.2 WASTE ACCEPTANCE AND HANDLING

3.2.1 Hours of Operation

The proposed hours of operation of the waste management facility are between 0800 and 1800 hrs Monday - Saturday (inclusive). The waste management facility will be closed on Sundays and Public Holidays and will only be opened on these occasions for the purpose of essential maintenance. On-site operations will continue for one hour after closure of the weighbridge.

3.2.2 Staffing

Initially, the waste management facility will be permanently staffed by eight persons including a site manager, a weighbridge operator and two general operatives, one of whom will act as banks person/safety person for the machinery and traffic and the other as general maintenance operative. The site manager will be a professionally qualified engineer or technician and will be responsible for the day-to-day operation of the site and for the environmental monitoring programme. The site manager will report to a named engineer employed by *greenstar*. At least four drivers will also be permanently on site. These may be contract staff or direct employees of the *greenstar*. From time to time, extra staff will be drafted in temporarily for specialist operations such as pest control, special monitoring, security, etc. Employment on site will be kept under constant review.

The following operational staff will run the site on a day-to day basis

- Weighbridge operator
- Two compactor drivers
- Two ancillary machine drivers
- One site manager
- Two general Operatives.

All field staff will receive training in landfill operation and management.

3.2.3 Waste Types and Quantities

The following treated residual waste types will be accepted on site:

- Household waste
- Commercial waste
- Industrial sludges
- Other industrial wastes
- Construction and demolition waste for recovery.

3.2.4 Waste Acceptance Procedures

Waste accepted for disposal at the landfill will conform to the waste acceptance criteria set out in the EU Directive 2003/33/EC and appropriate to this class of landfill.

Treated residual waste for disposal in the landfill site will be accepted via the main entrance gates where all vehicles will be weighed. Private cars will be refused entry and sent off site. All other vehicles, after weighing, will be directed to the active working face.

A site operative will be on duty at the active working face to direct and control the deposition of waste. Should any suspect waste be tipped, the site manager will be informed. The site manager will investigate the matter further and will inform the *greenstar* and the EPA if the site manager feels that further action is required. Such action may require that any unacceptable waste, and other waste contaminated by it, would be removed off site to a suitable facility. Appropriate sanctions such as prohibition of future deliveries, will be taken against the individuals responsible for the delivery of the unacceptable waste.

A record will be kept of the source, type and quantities of waste deposited at the site, the name of the company or organisation delivering the waste and the registration number of each vehicle.

Strict waste acceptance procedures regarding the construction and demolition waste will be employed in agreement with the Agency. Construction and demolition waste will be accepted for a number of possible uses including;

- Road sub-base material
- Leachate drainage material
- Intermediate, daily or weekly cover
- Top soil for use in the final cap.

Wastes identified for future use will be stored in stockpiles in the area shown on Drawing No. 2001-144-01-01. Storage of these wastes will not have an effect on the receiving environment save the possibility that wind or rain erosion would give rise to emissions. Stockpiles of suitable material will, as necessary, be covered with a protective geotextile to minimise erosion.

Waste will be subjected to appropriate characterisation as specified in the EPA manual on waste acceptance and EU Directive 2003/33/EC.

3.2.5 Waste Handling

3.2.5.1 Waste Reception

It will be a requirement of all carriers that all waste loads are properly covered to ensure the prevention of windblown litter on the approach roads and within the confines of the site. Measures will be introduced on site to penalise the carrier of any load not properly covered and persistent offenders will be banned from the site. A record will be kept of the type and quantities of waste deposited at the site, the name of the company or organisation delivering the waste and the registration number of each vehicle.

3.2.5.2 Filling Procedures

Waste will be placed using a cellular method of operation as already described. A landfill compactor will be used on the operational areas to level and compact the waste. Waste will be placed in layers not greater than 0.5m thick. The compactor will be steel-wheeled with a typical gross weight of 30 tonnes. A number of passes will be made over the waste by the compactor in order to achieve satisfactory compaction.

Any large articles deposited at the site will be crushed and buried with other waste to a depth not less than 1m from the surface of the waste and 2m from the flanks or face. All exposed waste will be covered at the end of each working day. The daily cover to be used at the facility will include material such as re-usable geo-synthetic membrane, plastic and soil.

3.2.6 Plant

Plant operating at the site will include the following;

- 2 No. landfill compactors
- 1 No. D6 dozer
- 1 No. back-hoe excavator
- 2 No. dump trucks
- 1 No. site tractor
- 1 No. landfill gas flare
- water/leachate pumps
- 1 No. road sweeper

3.3 ENVIRONMENTAL NUISANCE CONTROLS

3.3.1 General

The operation of the Ballyguyroe landfill will be subject to the conditions of a waste licence issued by the EPA. These conditions will incorporate controls to minimise or prevent nuisances to the public occurring as a result of the presence or operation of the site. The general controls for nuisances are detailed in the sections below.

3.3.2 Bird Control

The number of scavenging birds such as gulls and crows attracted to the landfill site will be minimised by the following measures;

- Daily cover material to be used at the facility will include material such as biodegradable plastic, re-usable geo-synthetic membrane or soil and will be placed on the active area of the landfill to deny access for scavenging birds to the waste
- The surface area of exposed waste will be minimised during operations
- Falconry or other bird scaring arrangements. Trained falconers will be employed, if required, to use birds of prey to deter scavenging birds. Falconry has proved a very effective control measure at other landfill sites.

3.3.3 Dust Control

Dust will be controlled at the site by the following means;

- A wheelwash will be provided
- After passing through the wheel wash, all vehicles will travel along approximately 120 metres of paved road before reaching the site access road. This road will be regularly cleansed of mud and dust
- Areas of the landfill will be temporarily or finally capped and seeded with grass as soon as practicable after completion of filling operations
- A water bowser will be on standby at the site to control dust nuisance.

3.3.4 Litter Control

Measures used to control litter at the site will include the following :

- The active tipping area will be kept to the minimum area required to efficiently operate the site
- The active tipping area will be covered on a daily basis and the material to be used will include biodegradable plastic, hessian, soil or an alternative mineral layer (e.g. recovered material from construction & demolition waste)
- All waste in non-active areas of the landfill will at all times be covered with soil or an alternative mineral layer
- Modern netting systems will be employed around active areas of the site. Litter trapped in the net will be removed as soon as is practicable.
- A minimum buffer of approximately 50 metres will be maintained between the landfill footprint and the site boundary. This will ensure that in the event of a failure in the netting system the primary receptor of any litter will be land owned by the site operator and a clean-up can be instigated immediately
- Only hauliers under contract to *greenstar* will deliver the waste to the site. All waste will be conveyed in covered vehicles. Any contractor delivering uncovered waste will be deemed to be in breach of contract and appropriate action will be taken by *greenstar*. This action will be designed to ensure that this practice will not recur
- Waste contractors will be prohibited under the user contract from using any unnecessary minor roads on their approach to and departure from the site and all access will be from the N73 via the L1329 access road
- Staff at the site will regularly patrol the N73, the L1329 and the site access road to ensure that there is no litter emanating from vehicles using the facility.

3.3.5 Odour Control

The active tipping area will be covered on a daily basis with material which will include biodegradable plastic, hessian, soil or an alternative mineral layer (e.g. recovered material from construction & demolition waste). On a weekly basis a mineral clay cover layer will also be placed over the waste. These measures will reduce odorous emissions from putrescible waste.

It is proposed to install a gas flare in the landfill to combust gases that arise from the decomposition of waste material. There are numerous compounds in landfill gas that have the potential to create an

odour nuisance. By combusting the gas that builds up within the landfill these compounds will be burned off.

In the initial stages of landfilling, gas will be unsuitable for flaring and will be vented. The gas vents will be fitted with carbon filters and these will assist in reducing odours from gas emissions.

The nearest houses to the site are greater than 500m from the landfill footprint. This will provide for significant dilution of any potentially odorous gases that pass the site boundary.

A suitably licensed waste contractor will regularly remove leachate. Regular removal of leachate will help mitigate the odours that can form as a result of leachate stagnating and becoming anaerobic.

3.3.6 Roads Cleansing

Roads will be cleansed with a water bowser and/or mechanical brush as required. The wheel wash will help to minimise dust and mud on the roads.

3.3.7 Vermin Control

In general, landfills have the potential to attract vermin such as rats and flies. This can lead to an increase in local populations of vermin. Strict management and mitigation measures will be put in place to control populations of vermin in the vicinity of the landfill. These measures will include the following:

- The populations of vermin will be monitored and controlled so that no significant increase in population levels are allowed to occur. A firm of professional vermin control experts will be employed to control vermin levels using standard humane methods.
- Baiting will be undertaken on a monthly basis or as recommended by the vermin control experts.
- Every precaution will be taken to avoid non-target species from coming in contact with vermin bait e.g. rodenticides. This will include the following: laying bait in areas not accessible to non-target species; strict control of vermin population levels; and where possible, the removal of any dead or dying vermin, which may act as a food source for non-target species. However, it should be noted that poisoned vermin, such as rats, will ordinarily return to their nests and burrows to die.

3.4 POTENTIAL EMISSIONS

The potential emissions from the closed local authority and proposed *greenstar* facilities are discussed under the relevant environmental topics in Sections 2 and 4 of the EIS. This Section is designed to summarise all the potential emissions from the facility.

3.4.1 Air Emissions

The main emissions to air from the development will be as follows;

- *Dust* - primarily consisting of clay particles from landfill construction and restoration.
- *Landfill Gas* - consisting of methane, carbon dioxide and a large number of minor constituents (see Appendix 3.1.15) will be emitted from the landfill as the waste biodegrades.

Minor emissions will include sulphur dioxide and nitrogen oxides from the exhausts of plant and machinery on site as well as waste haulage vehicles.

Aerosols will not be generated or emitted as part of the development.

The potential impacts of these air emissions and the mitigation measures proposed to avoid or reduce the effects on the surrounding environment are described in Section 4.2.

3.4.2 Emissions to Groundwater

There will be no direct or deliberate emissions to groundwater as part of the proposed development. Section 4.6 details the likely impacts of fugitive emissions to groundwater and the mitigation measures proposed to avoid or reduce the effects on the surrounding environment.

The landfill is designed as a fully contained disposal facility. Leachate in the waste cells and in the leachate lagoon will be contained by a lining system that includes a re-compacted clay barrier and a geomembrane liner (see Section 3.1.3 for details). Emissions of leachate to groundwater are not expected at the site.

Sewage and wash water will be generated in the administration/maintenance buildings only and will be sewered using 100mm diameter PVC pipe-work to a small wastewater treatment system. This treatment system will have an effluent that will be pumped to the leachate lagoon. The characteristics of the discharge are detailed in Section 3.1.2.11.

3.4.3 Emissions to Surface Water

Rainwater falling on the undeveloped parts of the site will continue to discharge directly to surface water. Precipitation falling on the active area of the landfill will be contained, collected and tankered to a treatment works. Precipitation on areas under construction or restored areas may contain suspended clay particles and will be directed to an open swale around the perimeter of the landfill.

This diverted water will pass through an oil/water separator before discharging into the storm water retention pond. The outlet from the storm water retention pond will be 1m above the pond floor to facilitate the settlement of larger clay particles. An actuated penstock will control the outflow rate from the pond during storm events and in the event of contamination of the surface water lagoon. The discharge will be regularly tested for water levels, pH and Dissolved Oxygen.

The clay at the site is colloidal in nature. A proposed treatment system downstream of the storm water retention pond will remove any excessive suspended solids prior to discharging to the Farahy river. The discharge from the treatment system will be tested for turbidity before the storm water discharges into the Farahy.

3.4.4 Noise Emissions

The main noise emissions from the development will be from the following sources;

- Traffic Noise.
- Site Machinery.
- Gas Flaring.

Details of these emissions are presented in Section 4.3 and mitigation measures are proposed to avoid or reduce the noise-related impacts. Predictions made as part of this study suggest that there will be a likely increase of between 1 and 4 dB(A) in L(A)_{eq} noise levels at local receptors as a result of road traffic noise associated with the development (see Section 4.3.3).

3.5 ENVIRONMENTAL MONITORING

3.5.1 General

An environmental monitoring programme will be carried out under the waste licence for the facility as issued by the EPA. The following summarises the likely components of the environmental monitoring regime.

3.5.2 Meteorological Data

A meteorological station will be installed at the landfill and daily records kept.

3.5.3 Dust

Dust will be monitored using Bergerhoff dust fall gauges or equivalent. These gauges will be installed a minimum of one month prior to construction. They will be installed around the perimeter of the site and monitored. Data will be collected on a quarterly basis. Figure 3.5.1 contains suggested dust monitoring locations and the national grid references for these monitoring locations are presented below.

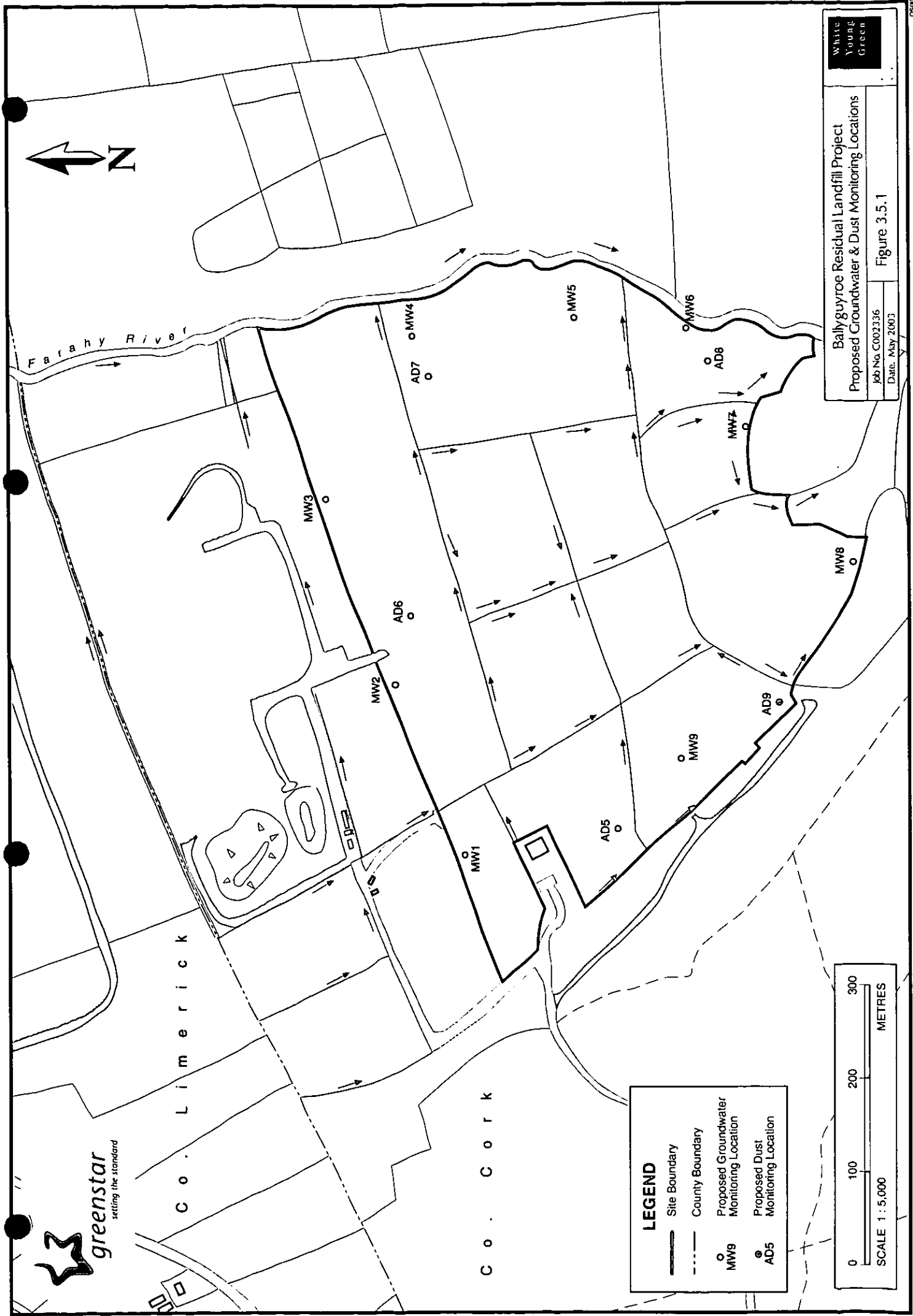
<u>Location No.</u>	<u>Northings</u>	<u>Eastings</u>
AD5	114168	166158
AD6	114400	166374
AD7	114398	166633
AD8	114100	166666
AD9	114003	166304

3.5.4 Odours

The site manager will keep records on a continuous basis of odours observed on-site by site personnel and off-site by nearby residents. These records will be compared to climatic conditions and every effort will be made to minimise odours at the site.

3.5.5 Noise

Noise will be monitored at a number of locations around the perimeter of the site and at nearby residences. The suggested monitoring locations are presented on Figure 3.5.2 and the national grid references for these proposed locations are presented below.



LEGEND

- Site Boundary
- County Boundary
- Proposed Groundwater Monitoring Location
- Proposed Dust Monitoring Location



**White
Young
Green**










Ballyguyroe Residual Landfill Project
Proposed Groundwater & Dust Monitoring Locations

Job No C002336
Date: May 2003

Figure 3.5.1

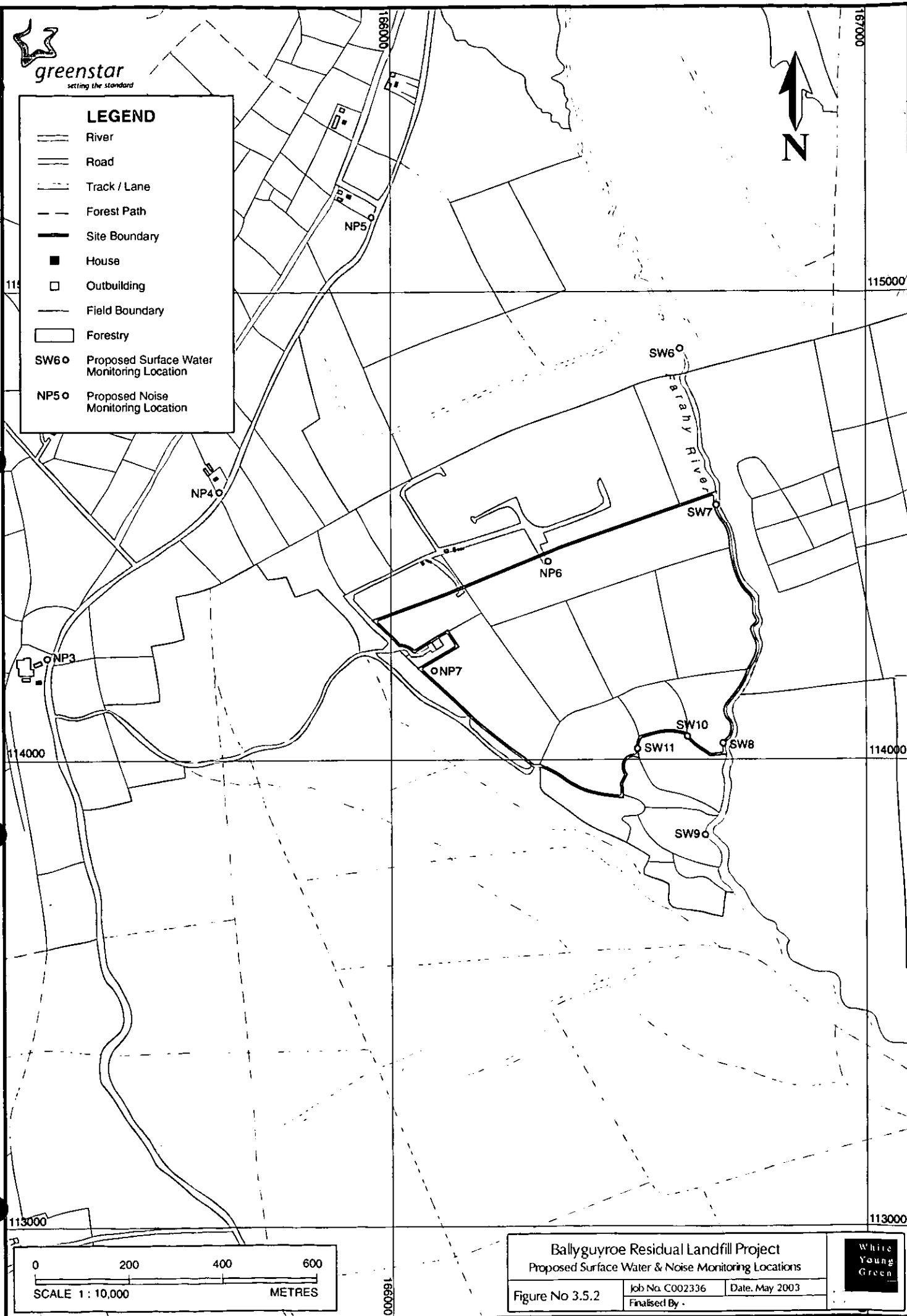


LEGEND

-  River
-  Road
-  Track / Lane
-  Forest Path
-  Site Boundary
-  House
-  Outbuilding
-  Field Boundary
-  Forestry

SW6  Proposed Surface Water Monitoring Location

NP5  Proposed Noise Monitoring Location



Ballyguyroe Residual Landfill Project
Proposed Surface Water & Noise Monitoring Locations

Figure No 3.5.2

Job No. C002336

Date: May 2003

Finalised By -

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<u>Location No.</u>	<u>Northings</u>	<u>Eastings</u>
NP3	114215	165270
NP4	114575	165638
NP5	115165	165960
NP6	114425	166331
NP7	114189	166095

3.5.6 Surface Water

greenstar, in consultation with the EPA, will carry out a surface water monitoring programme. Site personnel on a weekly basis will carry out a visual inspection of the surface water streams on site and adjacent to the site. The water discharging from the site will be analysed by instrumentation detecting pH, Dissolved Oxygen, water levels and turbidity. Surface water quality monitoring will be carried out both upstream and downstream of the site on a quarterly basis during the operational phase of the landfill. Figure 3.5.2 contains the suggested surface water monitoring locations and the national grid references for these proposed locations are presented below.

<u>Location No.</u>	<u>Northings</u>	<u>Eastings</u>
SW6	114870	166620
SW7	114555	166695
SW8	114035	166710
SW9	113832	166665
SW10	114052	166628
SW11	114025	166520

The sampling locations may depend on access to lands outside the ownership of *greenstar* and will be finalised after discussions with the EPA and local landowners. Each surface water sample will be analysed for the suites of parameters outlined in Table 3.5.1. The quarterly analyses are designed to detect any contamination from the landfill into the local streams, whereas the annual analyses include a wider range of parameters and are designed to give a greater understanding of the water chemistry and overall quality of the surface water.

3.5.7 Groundwater

Groundwater quality will be monitored both upgradient and downgradient of the site on a quarterly basis. Figure 3.5.1 contains the suggested monitoring locations for groundwater. Each groundwater monitoring location will contain an overburden well and a bedrock well. The overburden wells will be used to monitor water levels, but will be suitable for sampling, should the need arise. The bedrock wells will be used for groundwater sampling and water level monitoring. The national grid references for the proposed groundwater monitoring locations are presented below:

Table 3.5.1. Proposed Analyses for Surface Water Samples

Parameter	Unit	Annually	Quarterly
*Visual Inspection / Odour	none	.	.
BOD	mg/l	.	.
COD	mg/l	.	.
pH	pH units	.	.
Temperature	°C	.	.
Electrical Conductivity	µS/cm @ 20°C	.	.
Dissolved Oxygen	%	.	.
Suspended Solids	mg/l	.	.
Ammoniacal Nitrogen	mg/l as NH ₄ -N	.	.
Chloride	mg/l as Cl	.	.
Potassium	mg/l as K	.	.
Sodium	mg/l as Na	.	.
Total Oxidised Nitrogen	mg/l as N	.	.
Calcium	mg/l as Ca	.	.
Cadmium	mg/l as Cd	.	.
Chromium	mg/l as Cr	.	.
Copper	mg/l as Cu	.	.
Iron	mg/l as Fe	.	.
Lead	mg/l as Pb	.	.
Magnesium	mg/l as Mg	.	.
Manganese	mg/l as Mn	.	.
Mercury	mg/l as Hg	.	.
Sulphate	mg/l as SO ₄	.	.
Zinc	mg/l as Zn	.	.
Total Alkalinity	mg/l as CaCO ₃	.	.
Phosphorous/Orthophosphate	mg/l as P	.	.
Diesel Range Organics	µg/l	.	.
Petrol Range Organics	µg/l	.	.
Mineral Oils	µg/l	.	.
Benzene	µg/l	.	.
Toluene	µg/l	.	.
Ethylbenzene	µg/l	.	.
Xylene	µg/l	.	.

* Visual inspection will also be conducted weekly

<u>Well No.</u>	<u>Northings</u>	<u>Eastings</u>
MW1	114330	166121
MW2	114413	166299
MW3	114498	166495
MW4	114415	166676
MW5	114245	166706
MW6	114123	166701
MW7	114055	166598
MW8	113933	166465
MW9	114103	166237

The locations of these wells are subject to agreement with the EPA. Each groundwater sample will be analysed for the parameters outlined in Table 3.5.2. The monthly analyses will give an indication of obvious groundwater contamination. The quarterly analyses will better define any contamination, whereas the annual analyses are designed to provide detailed information on the water chemistry and the overall quality of the groundwater.

The permeability of the overburden material at the site is low and it is considered impractical to regularly monitor the overburden groundwater quality.

Groundwater levels will be measured on a monthly basis during the operational phase of the landfill.

3.5.8 Leachate

Leachate samples will be collected from the leachate sumps on a quarterly basis and analysed for the suite of parameters outlined in Table 3.5.3. A composite sample of the leachate pumped from the leachate lagoon will also be analysed on a quarterly basis.

Leachate levels will be recorded in the sumps and in gas vents on a weekly basis during the operational phase of the landfill.

A water balance will be carried out for the site on an annual basis. This will involve a calculation based on rainfall, potential evapotranspiration, run-off values, infiltration rates and the absorption capacities of the waste in addition to monitoring the volume of leachate exported off site.

3.5.9 Landfill Gas

Landfill gas monitoring points will be selected after the initial construction phase and prior to landfilling. The excavations required for construction will provide more detailed local information on the geology of the site, which will assist in identifying any potential pathways for gas migration. As a minimum, gas monitoring wells will be installed into the boulder clay at 50 metre intervals

Table 3.5.2. Proposed Analyses for Groundwater Samples

Parameter	Unit	Annually	Quarterly	Monthly
Visual Inspection / Odour	none	.	.	.
Groundwater Level	m	.	.	.
pH	pH units	.	.	.
Temperature	°C	.	.	.
Electrical Conductivity	$\mu\text{S/cm @ } 20^\circ\text{C}$	.	.	.
Ammoniacal Nitrogen	mg/l as $\text{NH}_4\text{-N}$	.	.	.
Chloride	mg/l as Cl	.	.	.
Potassium	mg/l as K	.	.	.
Sodium	mg/l as Na	.	.	.
Total Organic Carbon	mg/l as C	.	.	.
Total Oxidised Nitrogen	mg/l as N	.	.	.
Phenol	$\mu\text{g/l}$	.	.	.
Residue on Evaporation	mg/l @ 180°C	.	.	.
Calcium	mg/l as Ca	.	.	.
Cadmium	mg/l as Cd	.	.	.
Chromium	mg/l as Cr	.	.	.
Copper	mg/l as Cu	.	.	.
Cyanide	mg/l as CN	.	.	.
Iron	mg/l as Fe	.	.	.
Lead	mg/l as Pb	.	.	.
Magnesium	mg/l as Mg	.	.	.
Manganese	mg/l as Mn	.	.	.
Mercury	mg/l as Hg	.	.	.
Sulphate	mg/l as SO_4	.	.	.
Zinc	mg/l as Zn	.	.	.
Total Alkalinity	mg/l as CaCO_3	.	.	.
Boron	mg/l as B	.	.	.
Fluoride	mg/l as F	.	.	.
Phosphorous/Orthophosphate	mg/l as P	.	.	.
Diesel Range Organics	$\mu\text{g/l}$	.	.	.
Petrol Range Organics	$\mu\text{g/l}$	.	.	.
Mineral Oils	$\mu\text{g/l}$	.	.	.
Benzene	$\mu\text{g/l}$	.	.	.
Toluene	$\mu\text{g/l}$	.	.	.
Ethylbenzene	$\mu\text{g/l}$	.	.	.
Xylene	$\mu\text{g/l}$	.	.	.
Faecal Coliforms	count/100ml	.	.	.
Total Coliforms	count/100ml	.	.	.

Table 3.5.3. Proposed Analyses for Leachate Samples

Parameter	Unit	Annually	Quarterly
Visual Inspection / Odour	none	.	.
*Leachate Level	m	.	.
BOD	mg/l	.	.
COD	mg/l	.	.
pH	pH units	.	.
Temperature	°C	.	.
Electrical Conductivity	µS/cm @ 20°C	.	.
Ammoniacal Nitrogen	mg/l as NH ₄ -N	.	.
Chloride	mg/l as Cl	.	.
Potassium	mg/l as K	.	.
Sodium	mg/l as Na	.	.
Total Oxidised Nitrogen	mg/l as N	.	.
Iron	mg/l as Fe	.	.
Calcium	mg/l as Ca	.	.
Cadmium	mg/l as Cd	.	.
Chromium	mg/l as Cr	.	.
Copper	mg/l as Cu	.	.
Lead	mg/l as Pb	.	.
Magnesium	mg/l as Mg	.	.
Manganese	mg/l as Mn	.	.
Mercury	mg/l as Hg	.	.
Sulphate	mg/l as SO ₄	.	.
Zinc	mg/l as Zn	.	.
Boron	mg/l as B	.	.
Cyanide	mg/l as CN	.	.
Fluoride	mg/l as F	.	.
Phosphorous/Orthophosphate	mg/l as P	.	.
Diesel Range Organics	µg/l	.	.
Petrol Range Organics	µg/l	.	.
Mineral Oils	µg/l	.	.
Benzene	µg/l	.	.
Toluene	µg/l	.	.
Ethylbenzene	µg/l	.	.
Xylene	µg/l	.	.
Faecal Coliforms	count/100ml	.	.
Total Coliforms	count/100ml	.	.

* Leachate Level will be monitored weekly

around the active phase of the landfill prior to deposition of waste. In addition, a line of gas monitoring wells will be installed at 50 metre intervals along the northern boundary of the site to detect any gas migration from the closed local authority landfill.

Gas collection wells will be installed into the waste as part of the gas collection and flaring system. These wells will be used to monitor gas composition, pressures and flows within the waste body. All site buildings will be included in the gas monitoring programme.

The gases monitored will consist of those outlined in Table 3.5.4. Gas monitoring will be carried out on a monthly basis during the operational phase of the landfill. The site buildings will be monitored continuously by means of a permanent gas alarm system. A gas analyser will be permanently available on site and will be used for spot checks should the need arise.

The landfill gas flare will include in-built monitoring for methane, carbon dioxide and oxygen. The gas discharges will be monitored as required by the conditions of the waste licence.

3.5.10 Ecological Monitoring

A biological assessment of the Farahy River will be undertaken annually at locations upstream and downstream of the proposed site.

3.5.11 Stability and Settlement

The maximum final capping contour is given on Drawing No. 2001-144-01-13 (see Appendix 3.1.1) as being 222mOD Malin Head. The thickness of the proposed cap is 2.4m giving a maximum post settlement depth of waste of c.22m. It is expected that consolidation and biodegradation of the waste will lead to a settlement in the order of 30% in the height of the landfill. Thus, it is necessary to surcharge the waste by approximately 7m so that the final post settlement height will revert to 222mOD. Settlement will continue as long as the landfill remains biologically active. This could extend for 50 years post closure. However, the bulk of the settlement will probably occur in the first 20 years.

A survey of the site will be carried out annually. If settlement is found to be interfering with the integrity of the cap or interfering with run-off from the landform, measures will be taken to reinforce the cap or reshape the landform as required.

3.5.12 Archaeological Monitoring

Archaeological monitoring by a suitably qualified archaeologist will be undertaken during the ground disturbance phases of the development.

Table 3.5.4 Proposed Gas Monitoring Parameters

Parameter	Unit
Methane	CH ₄ - % v/v
Carbon Dioxide	CO ₂ - % v/v
Oxygen	O ₂ - % v/v
Atmospheric Pressure	mBAR
Temperature	°C

Section 2.11 of the EIS highlights a farmhouse of potential archaeological interest on the eastern margin of the site and recommends either further action to investigate this area or disturbance of the site should be avoided. These investigations will be carried out prior to disturbance of the ground. In the event of any archaeological material being uncovered steps will be taken, in consultation with Dúchas, to ensure that the site is recorded and excavated appropriately.

3.5.13 Annual Report

An annual report on the environmental monitoring, waste import and recycled material export quantities, and traffic movements in and out of the site will be prepared and submitted to the EPA.

3.6 CONTINGENCY ARRANGEMENTS

3.6.1 Emergencies and Contacts Outside of Normal Operating Hours.

A phone number will be established if emergencies arise outside of normal operating hours and days. Staff members of *greenstar* will be available for call-out in the event of an emergency.

3.6.2 Contingency Plans for Breakdown and Emergencies on Site

All defects in any of the fencing and security infrastructure will be remedied by effecting an immediate temporary repair and permanent repair within 72 hours of the detection of the defect.

Breakdown of equipment will be handled by prompt repair and/or having replacement equipment. An employee will be assigned to check leachate pumps on a daily basis. Fully trained part time staff will be employed in the event of sickness of any of the key operatives.

A diesel powered back-up generator will also be provided on site in the event of a power failure.

Emergencies of an accidental nature during normal working hours will be handled by calling in the Gardaí, the Fire Brigade or Ambulance Services. The site office will be open on Monday to Saturday between 8:00 and 18:00 hours therefore *greenstar* personnel will be on site at these times. The site will be unattended by *greenstar* staff during the night, Sundays and Bank Holidays. However, during this period security personnel will be on site.

3.6.3 Contingency Arrangements in Case of Contamination of Environmental Media

The containment system and the very low permeability natural subsoils and bedrock beneath the site will prevent the possibility of a major groundwater contamination incident. In the unlikely event of the need to contain contaminated groundwater, extraction wells will be installed along the southern side of the facility.

Leachate spills are unlikely to occur as leachate pumping and containment facilities will be connected to pressure sensors, which will activate and/or shut off pumps.

The containment system within the landfill and the low permeability of the underlying subsoils will ensure that the risk of subsurface migration of landfill gas is minimal. In addition, landfill gas will be actively vented, flared and/or utilised during the life and aftercare phases of the development. In the unlikely event of significant levels of landfill gas being found in any gas monitoring wells in the buffer zone around the landfill, the area will be physically investigated and appropriate action, such as installation of gas drainage or barrier layers will be taken.

In the event of an unexpected emission of contaminated water at the site the outlet from the storm

water retention will be temporarily closed using the actuated penstock while the contamination is isolated, tested and removed, if necessary, for safe disposal.

In the event of an uncontained spillage from a fuel delivery tanker or from any road vehicle using the site would be automatically directed to the surface water retention pond via the surface water collection network. The outflow from the pond would be immediately closed using an automated system controlled from the administration building (see Drawing 2001-144-01-10 for details of SCADA system). The spilled fuel could then be collected and treated.

A fuel spill resulting from damage to a vehicle operating on the landfill would be contained by the landfill lining system and the fuel would be removed via the leachate collection system.

3.6.4 Contingency Arrangements in Case of Fire

The collection of gas and the covering of waste will minimise the potential for outbreaks of fire at the site. In the unlikely event of a fire outbreak, there are a number of contingency measures related to fire control built into the design of the facility as follows;

- Fire breaks will be left between the screen planting on site and the surrounding forestry
- The surface water collection pond will be used as a source of water for fire fighting
- Clay stock piles will be used as a fire control measure
- Fire water will be retained in the storm water retention pond and/or the leachate lagoon.



4. POTENTIAL IMPACTS, MITIGATION MEASURES AND LIKELY SIGNIFICANT EFFECTS

4.1 CLIMATE

4.1.1 Potential Impacts

There are no expected impacts from the development on the local climate but there is a small potential for methane and carbon dioxide emissions from the degrading waste in the landfill to impact on global climate. These two gases are known to be 'greenhouse gases' and contribute to the 'global warming' phenomenon.

4.1.2 Proposed Mitigation Measures

Measures proposed to reduce the potential impact from these gases on climate include gas collection and flaring in the short term and utilisation (if feasible) in the medium to long term. Flaring converts methane to carbon dioxide, which has a much lower effect on global warming and is encouraged by the EPA in recently issued waste licences for landfills. In addition, EU and national policy on waste will reduce the proportion of biodegradable (landfill gas generating) waste being deposited. These mitigation measures are discussed in greater detail in Section 4.2 (Air Quality).

4.1.3 Likely Significant Effects

While there will be a minor negative effect on global climate from the development, the do-nothing alternative will have the same or a greater effect. In the absence of this development, the waste to be deposited at Ballyguyroe will be likely landfilled elsewhere and will emit methane and carbon dioxide to the atmosphere. Gas management practices at the Ballyguyroe landfill will be based on Best Available Technology (BAT) and subsequently the levels of greenhouse gases emitted from the site are likely to be lower than at older landfill sites. The likely significant effects of the development on global climate are therefore expected to be insignificant.

4.2 AIR QUALITY

4.2.1 Potential Impacts

Potential air emissions that can be categorised according to their source as follows;

- *Line source emissions* - Proposed entry road to the site / internal haulage roads
- *Area source emissions* - The individual waste cells
- *Point source emissions* - The proposed gas flare and minor sources such as plant exhausts / boiler emissions

4.2.1.1 Dust Emissions

Dust emissions could potentially arise during the construction, operation and restoration of the landfill.

The construction phase will be an ongoing intermittent activity throughout the lifetime of this landfill. As the need arises, new cells will be constructed and cells that are complete will be restored. The construction phase will generate stockpiles of unvegetated soil and create exposed faces in open pits. The exposed faces will be lined soon after construction by first lining with low permeability clay followed by an HDPE liner. The rate and level of emissions will vary, depending on the amount of exposed clay and the weather conditions. The highest rate of emissions are expected during construction phases and during the summer months. If not properly managed during periods of dry windy weather the unvegetated stockpiles and exposed pit faces could generate large quantities of dust.

As part of the construction phase and during the operation of the landfill, excavated soil will be segregated on site into different grades. This activity if not properly managed could become a significant dust source.

It is proposed that the active disposal area in the landfill will be covered daily with material that will include synthetic cover and high permeability soil, therefore reducing potential dust emissions. On a weekly basis it is proposed to cover the active disposal area with medium permeability material. If not properly managed this acts as a dust source in dry weather.

When a waste cell is full, it will be restored with a geocomposite layer followed by low permeability clay and finally subsoil/topsoil. Again if not properly managed in dry weather this capping activity could generate dust, but once it becomes vegetated dust will no longer pose a significant problem.

4.2.1.2 Aerosol Emissions

Aerosols can be described as colloidal dispersions of a solid or liquid in a gas. A typical source of aerosol emissions from a landfill facility is from a leachate treatment plant where aeration is taking place. It is not currently proposed to treat or aerate leachate at the Ballyguyroe site. A licensed contractor will remove the leachate periodically from the collection lagoon. Also, recirculation of leachate, which can cause aerosol emissions, will occur beneath the capping of the landfill. It is therefore predicted that aerosols will not be generated or will not be a problem at this site.

4.2.1.3 Traffic Emissions

It is proposed that the existing access and approach (L1329) roads to Ballyguyroe landfill will be upgraded prior to the construction of the new facility. Upgrading of the junction between the L1329 and N73 is planned by the local authority as part of a road improvement programme in the county. Potential emissions along this road include vehicular exhaust emissions as well as particulate emissions from the road surface. The waste haulage vehicles will enter the site and travel along an internal haulage road. These vehicles will travel to the active waste cell to deposit their loads and this will then be spread and compacted using on-site machinery.

4.2.1.4 Landfill Gas

The major constituents of landfill gas are methane and carbon dioxide, both of which are colourless and odourless. Many minor constituents are present in landfill gas at low concentrations and considerable variation can occur in the concentration and presence of these minor constituents related to the waste composition, age and extent of waste degradation. The typical constituents of a landfill gas are tabulated below.

Table 4.2.1: Typical Chemical Composition of Landfill Gas

Component (% Volume)	Typical Value (% Volume)	Observed Maximum (% Volume)
Methane	63.8	88.0
Carbon Dioxide	33.6	89.3
Oxygen	0.16	20.9
Nitrogen	2.4	87.0
Hydrogen	0.05	21.1
Carbon Monoxide	0.001	0.09
Ethane	0.005	0.0139
Ethene	0.018	-
Acetaldehyde	0.005	-
Propane	0.002	0.0171
Butanes	0.003	0.023
Helium	0.00005	-
Higher Alkanes	<0.05	0.07
Unsaturated Hydrocarbons	0.009	0.048
Halogenated Compounds	0.00002	0.032
Hydrogen Sulphide	0.00002	35.0
Organosulphur Compounds	0.00001	0.028
Alcohols	0.00001	0.127
Other	0.00005	0.023

Source: Department of The Environment (UK), Waste Management Paper No. 27 entitled; Landfill Gas - A technical memorandum providing guidance on the monitoring and control of landfill gas.

The composition of the gas varies according to the type and phase of breakdown that is occurring within the site at any specific time. The onset and rate of degradation processes in the wastes vary both within and between landfill sites. The evolution of significant quantities of methane may take from three months to more than a year to start and continue for well in excess of 15 years following closure of the site.

For this landfill, collection facilities for landfill gas are being incorporated into the design so that the gas is collected at a central point. This gas will then be burned off using a flare and if viable will be used to generate electricity or for other beneficial uses. Furthermore regular covering of the waste and the final capping when the waste material reaches the final design height will also reduce emissions of landfill gas. The installation of the gas collection system and flare plus the regular capping will prevent landfill gas migrating onto third party properties or naturally dispersing into the atmosphere.

Subsurface migration of landfill gas is a common hazard at waste disposal sites. Gas pressure within the body of a landfill can cause gas to migrate laterally through high permeability subsoils, fractured bedrock or preferential pathways such as drainage trenches created by human activity. Such migration could potentially lead to the build up of carbon dioxide and/or methane in enclosed spaces around the site. Such accumulations of methane would create the risk of an explosion and accumulations of carbon dioxide would lead to health risks.

The design of the *greenstar* landfill will minimise the risk of subsurface gas migration for the following reasons;

- The containment system, incorporating a geomembrane liner and a low permeability mineral liner, will prevent gas as well as leachate migration.
- The active extraction of gas from the waste body will reduce gas pressure and thereby minimise the possibility of gas migration.

4.2.1.5 Odour

As detailed in Section 4.2.2.3, landfill gas contains trace concentrations of odorous gases. Organosulphur compounds and esters are found in gases derived from recently deposited wastes. Other gases that can give rise to odours include a range of volatile aromatic compounds, mercaptans and hydrogen sulphide. All of these gases at very low concentrations give rise to odours.

Historically, many landfill sites generated odours that extended beyond the site boundary resulting in complaints from nearby residents. This was primarily due to bad management, mainly the lack of proper gas collection, daily cover and capping systems. Complaints due to odours are dependent on a number of different factors including, distance to nearest receptor, prevailing wind direction and atmospheric conditions. The proposed gas collection and capping system should ensure that residual odours do not present any significant problems beyond the site boundary.

Odour nuisance can also occur on landfill sites from leachate treatment systems particularly aerial spraying systems. The current proposal for this site does not include for the treatment of leachate.

Leachate can also cause an odour nuisance if it is allowed to stagnate and become anaerobic. This will be overcome by ensuring that a suitably licensed waste contractor removes the leachate at sufficient time intervals.

In order to assess potential impact from odours, sampling was undertaken at a similarly designed active landfill. This sampling involved the collection of air samples in the vicinity of Arthurstown Landfill Co. Kildare during November 2000. Arthurstown Landfill is a modern landfill that only accepts baled waste. The facility is licensed by the Environmental Protection Agency. The samples were collected by drawing a known volume of air through a glass sorbent tube. Six samples were collected and analysed by an accredited laboratory for the following compounds;

- Volatile Organic Compounds
- Sulphur containing compounds

Some volatile aromatic compounds are particularly noted as having odorous properties. The sampling locations were positioned so that the wind movement and direction on the day of sampling was from the waste disposal area directly towards a residential property outside the site boundary. Three samples were spaced along the site boundary with the remaining samples placed at selected distances away from the site boundary. Mild odours were noted during the collection of the samples at the site boundary. Very faint odours were noted at 50m and 100m with no odour being detected at 200 metres from the site boundary. The results of this sampling exercise are tabulated in Tables 4.2.2 to 4.2.8 in Appendix 4.2.1. Although odours were noted at some locations the concentrations of the various compounds detected in all samples were at typical background levels.

In order to confirm that no compounds were present that would present health risks, the concentrations of the compounds measured at Arthurstown landfill are compared with 24 hour Occupational Exposure Limits (OELs). These 24 hr OELs are calculated from the 8 hour OELs as published by the National Authority for Occupational Safety and Health, Code of Practice 1999: Section 30 of the Safety, Health and Welfare at Work Act, 1989. An Occupational Exposure Limit is the maximum permissible concentration of a chemical agent in the air at the workplace to which a human can be exposed, in relation to an eight hour day. As the only standards available to us are standards set out in the working environment (for an 8 hour working period), Enterprise Ireland (formerly known as Forbairt) have recommended, that to make a valid comparison for a 24 hour exposure, one-fortieth of the 8hour OEL should be used.

The concentrations of the compounds measured are much lower than the 24-hour OELs, confirming there are no health risks, even though mild odour was detected with some of the samples.

As the nose is a lot more sensitive than the majority of analytical instruments/methods, odorous compounds can be present as confirmed with the samples from Arthurstown without posing a health risk. The air odour thresholds of a number of different compounds found in landfill gas presented in Table 4.2.9 below. The air odour threshold is the lowest concentration of a compound that the olfactory senses can detect.

Table 4.2.9 Air Odour Thresholds for selected landfill gas compounds

Compound	Air Odour Threshold (ppm; v/v)	Occupational Exposure Limit (ppm)
Carbon disulphide	0.11	0.25
Hydrogen Sulphide	0.0081	0.25
Ethyl Mercaptan	0.00076	0.0125
Methyl Mercaptan	0.0016	0.0125

Table 4.2.9 above shows that some compounds such as mercaptans have very low air odour thresholds. If these air odour thresholds are compared with occupational exposure limits (OELs) the concentrations are significantly below the respective OELs i.e. although the odour can be detected, many compounds are present at a concentration that poses no health risk to the receiver.

4.2.2 Proposed Mitigation Measures

The Ballyguyroe landfill will be operated using the principle of BAT. Site operations and practices will conform to modern waste legislation standards including the 1996 Waste Management Act and the EU Landfill Directive, 1999/31/EC. Under this Act the proposed facility must receive a waste licence from the EPA. The EPA will receive monitoring reports on a regular basis detailing the landfill operations to ensure compliance with the waste licence conditions.

Details of the mitigation measures that will be employed at this proposed landfill are outlined below.

4.2.2.1 Dust Emissions

Dust will be controlled at the site by the following means:

- A wheelwash will be installed at the site.
- After passing through the wheelwash, all vehicles will travel on approximately 120 metres of paved road before reaching the edge of the *greenstar* site and existing access road. This road will be regularly cleaned if required.
- The waste deposited in the landfill will be covered daily. During periods of dry weather the cover material will be kept moist to prevent dust nuisance.
- Following completion of a cell it will be capped and seeded with grass. Any capped areas that have been recently completed and have a poor grass cover will, in periods of dry weather, be kept moist.
- A mobile bowser will be used during dry periods to dampen vehicle routeways.
- During dry periods if dust is being generated, stockpiles will be kept moist.
- A constructed earth berm of approximately 3.5m above ground level around the active area will help capture and mitigate any dust emissions from the disposal area.

The nearest residential property is located more than 400 metres from the site boundary and over 500 metres from the landfill footprint. A minimum buffer of 50 metres will be maintained between the

waste disposal area and the site boundary. This will allow for significant attenuation of dust should any arise.

These measures are expected to keep dust emissions within the operating Licence conditions.

4.2.2.2 Traffic

On site plant and machinery will be regularly serviced and maintained to prevent excessive exhaust emissions on site. Plant not in use will be throttled down or turned off to prevent unnecessary vehicular emissions.

4.2.2.3 Landfill Gas

The E-PLUS Outreach model was used to estimate the likely landfill gas emissions once the facility is operational. The E-PLUS model is designed to analyse the opportunities for installation of a gas recovery system. A number of assumptions were made for use with this model. The landfill is predicted to have a lifespan of 10 years and will accept on average 145,000 tonnes of waste material per year. The total capacity of the landfill is estimated to be 1.45 million tonnes. See Section 3.1.5 for a description of the results of this modelling exercise.

As discussed earlier in this report the presence of the gas collection system and the flare plus intermittent and final capping will mitigate against any significant emissions of landfill gas.

4.2.2.4 Landfill Gas Flaring

The combustion of landfill gas will result in an emission from the stack and generator unit. There are no specific emissions limit values in this country for flares. Listed in Table 4.2.10 are emission limit values set by the Environmental Protection Agency (EPA) for a flare at a similar landfill site.

Table 4.2.10: Typical Emission Limit Values set by the EPA for a Gas Flare

Parameter	Concentration (mg/m ³)
Particulates	150
Carbon Monoxide	50
Nitrogen Oxides	150
Hydrocarbons	10
VOCs (Class I)	20
VOCs (Class II)	100
VOCs (Class III)	150

The nearest residential property to the proposed landfill gas flare is greater than 400 metres away. With the proposed gas collection system in place and with the operation of the enclosed landfill gas flare, the flare will have no significant impact on local air quality.

4.2.2.5 Odours

It is proposed that waste will be covered daily with suitable material that will include soil cover, reusable textile or PVC. The latter are durable but will degrade over time and will allow the movement of gas and liquid through them. On a weekly basis a mineral clay cover layer will also be placed over the waste. These measures will reduce odorous emissions from putrescible waste.

It is proposed to install a gas flare in the landfill to combust gases that arise from the decomposition of waste material. There are numerous compounds in landfill gas that have the potential to create an odour nuisance. By combusting the gas that builds up within the landfill the majority of these compounds will be burned off.

Furthermore there is a minimum buffer of 50 metres from the waste disposal area to the site boundary and a distance of more than 400 metres from the site boundary to the nearest residential property. This will provide for significant dilution of any odorous gases.

In the initial stages of landfilling, gas will be unsuitable for flaring and will be vented. The gas vents will be fitted with carbon filters and these will assist in reducing odours from gas emissions.

Leachate will be removed regularly by a suitably licensed waste contractor. Regular removal of leachate will help mitigate the odours that can form as a result of leachate stagnating and becoming anaerobic. The current proposal does not include for the treatment of leachate on site.

4.2.3 Likely Significant Effects

4.2.3.1 Local Effects

It is possible that there will be a very slight increase in nitrogen dioxide and sulphur dioxide concentrations as a result of the increase in local traffic in the area. The proposed mitigation measures will ensure there are no significant increase in dust concentrations. Dust concentrations will be monitored to ensure that levels are complying with relevant standards. As the dust mitigation measures are expected to keep dust emissions from the site at a low level, no significant negative effects on the surrounding environment are expected in this regard.

The proposed mitigation measures for air emissions are detailed in Section 4.2.3. In the event of complaints from any residents in the vicinity of the landfill, a complaints register will be kept on site. Complaints received will be investigated. Details and responses to complaints will be forwarded to the Agency in the Annual Environmental Report. Overall, with the proposed mitigation measures in operation there will be no significant effects on the local air quality as a result of the proposed landfill.

The natural ground conditions and the proposed mitigation measures ensure that the risk of landfill gas migration at the site is insignificant.

4.2.3.2 National and Global Effects

Methane and carbon dioxide are the two main components of landfill gas. Methane and carbon dioxide are both greenhouse gases that contribute to global warming. Under the Kyoto Protocol Framework, Ireland is ratified to reduce its greenhouse gas emissions along with other developed and developing countries.

The methane produced at the *greenstar* landfill will be mainly converted to CO₂ at the proposed flare and so will only marginally add to the national production of methane from waste disposal activities.

In designing the landfill consideration was given to reducing emissions of greenhouse gases. This was the primary reason for incorporating a flare and gas utilisation system into the landfill design. While the flare or gas utilisation system will convert most of the methane to carbon dioxide, which is another greenhouse gas, the potential of CO₂ to cause global warming is 21 times less than methane. The flaring and gas utilisation will therefore significantly reduce the potential impact to global warming. As explained in Section 4.1, the do-nothing alternative is likely to have a greater negative impact on global warming than that caused by the operation of the proposed landfill at Ballyguyroe.

In 1998 the EPA estimated 17,500 tonnes of methane was captured at landfill sites and used to generate electricity. If viable, it is proposed that landfill gas captured at Ballyguyroe will be used either for the generation of electricity, local use (e.g. horticulture) or routed into the national grid.

National policy on waste as described in 'Changing Our Ways' is to reduce the proportion of biodegradable waste being deposited in landfills by 65% over the fifteen year term of the plan (1998-2013). This reduction in biodegradable waste will reduce the volumes of landfill gas produced and further mitigate against the associated negative impacts.

4.3 NOISE ENVIRONMENT

4.3.1 Potential Impacts

4.3.1.1 Summary of Noise Emissions during the Construction, Operational and Restoration Phases

Construction Phase

It is estimated that noise sources during construction phases will include the delivery of granular hardcore material and other associated materials. Excavators will also be used to remove the existing soil cover and bring the waste cell down to the appropriate ordnance datum level.

Operational Phase

Once operational, there will be a number of potential additional noise sources contributing to the existing noise environment. The potential additional sources will consist of the following;

- Traffic noise- waste haulage trucks travelling to and from the facility and employee traffic movements.
- Site Machinery - movement and burial of wastes within the landfill.
- Gas Flaring - combustion of landfill gases.

A detailed description of the potential impacts from these three noise sources are contained as Appendix 4.3.1.

Restoration Phase

Deliveries of clay material may be necessary during the restoration phase, which will be an ongoing process commencing when a waste cell has reached its waste acceptance limit. It may also be necessary to install a number of gas, leachate and/or groundwater monitoring wells during the restoration phases.

4.3.1.2 Noise Emissions at Receptors

Existing noise levels detailed in Section 2.3 and comparative noise levels detailed above were used to assess the likely noise levels that will exist at the nearest noise sensitive receptors once the landfill is operational.

The EPA recommends that ideally, on sites of industrial nature or similar, if the total noise level from all sources is taken into account, the noise level at sensitive locations should be kept below the following levels;

Daytime (0800 to 2200)	L(A)eq value of 55dB(A),
Night-time (2200 to 0800)	L(A)eq value of 45dB(A).

Standard equations for the propagation of noise outdoors were used in the calculation of predicted noise levels. Parts 1 and 2 of BS 5228: "Noise and vibration control on construction and open sites" were used in the prediction of estimated noise levels. Where sound power levels were not available for on site plant and machinery, comparable levels were sourced from BS 5228 plant listings. However, it should be noted that at distances greater than 300 metres from the noise source that predictions based on the inverse square law rule (i.e. 6 dB decrease with doubling of distance from a point source) should be treated with caution due to the increasing importance of meteorological effects. Temperature and wind effects can significantly affect noise levels at receptors.

4.3.1.3 Predicted Noise from traffic

It is estimated that traffic movements will be at a maximum during the Phase 2 construction period. NP3 will experience the most significant increase in noise levels as this residence is the closest to the existing access road to the facility. It is expected that there will be a maximum increase of between 1 to 2 dB(A) in L(A)eq noise levels at this location predominantly as a result of road traffic noise during Phase 2. This will result in an L(A) eq of approximately 54 to 55 dB(A) at this location. Noise levels at NP 3 during a typical daily operation when waste haulage vehicles only will be using the local road will be approximately 53 dB(A) L(A)eq, 12 hour.

During a typical operation phase, it is expected that there will be a maximum increase of 2 dB(A) in L(A)eq noise levels at NP3. This will result in an L(A) eq of approximately 55 dB(A) at this location. A vehicle speed limit is currently implemented along the access road to mitigate excessive noise levels from passing vehicles. This speed limit will be maintained for the proposed facility.

It is predicted that there will be a slight increase in noise levels at receptors NP4 and NP5. The predicted L(A)eq 1 hour for residences located along the L1329 approach road from the N73 leading up to the site is likely to be between 53 and 55 dB(A). Traffic movements will be higher during construction periods as mentioned previously.

4.3.1.4 Predicted Noise from on site plant and machinery

Predictions of the likely noise levels at receptors NP3 to NP5 have been made based on the plant to be used on the proposed landfill development. The results of the predictions are presented in the table below.

Table 4.3.1 Baseline and predicted noise levels at receptors NP3 to NP5

Receptor	Baseline L(A)eq 30 min Noise Level	Predicted L(A)eq 12hour Noise Level
NP3	53	53
NP4	50	51
NP5	48	49

As can be seen from the above table it is unlikely that there will any significant effect from on site plant at the nearest noise sensitive receptors.

4.3.1.5 Predicted Noise Emissions from the Gas Flare

A Sound Pressure Level of 67 dB(A) at 1 metre from the gas flare has been extrapolated to receptors NP3 to NP5 all located to the north east of the site. All receptors are greater than one kilometre away from the proposed gas flare. Due to the proposed location of the gas flare at the southern end of the landfill facility, there will be no significant increase in noise levels at the noise sensitive receptors. Given the existing noise environment the effect of noise emissions from the gas flare on ambient noise levels will be insignificant during both the daytime and night-time periods.

4.3.2 Proposed Mitigation Measures

There is a significant distance between the site boundary and the nearest residential properties (>400m) and in addition there is a minimum 50m wide buffer zone between the waste disposal area and the site boundary. Existing Coillte coniferous plantations and an earth berm of variable height around the perimeter of the waste disposal area (see Appendix 3.1.1 for details) will afford some additional noise attenuation.

The best practicable means will be used to minimise noise produced by operations associated with the site and the facility shall comply with the recommendations in British Standard 5228, Noise Control on Construction and Open Sites - 1997. The following parts of this British Standard are applicable;

Part 1: Code of practice for basic information and procedures for noise and vibration control.

Part 2: Guide to noise and vibration control legislation for construction and demolition, including road construction and maintenance.

The site operator shall comply in particular with the following requirements for control of noise from plant;

- a) All vehicles and mechanical plant used for the purpose of works shall be fitted with effective exhaust silencers and shall be maintained in good and efficient order as per EC regulations. Also, all plant used during excavation and remediation must comply with the noise levels set down in SI No 320 of 1988 European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations, 1988.
- b) Machines in intermittent use shall be shut down in the intervening period between work or throttled down to a minimum.
- c) All pumps and compressors shall be sound reduced models fitted with properly lined and sealed acoustic covers and shall be kept closed whenever the machines are in use. Such items shall be maintained in good and efficient working order.

4.3.3 Likely significant effects

It is likely that receptor NP3 will experience the most significant increase in noise levels as this residence is the closest to the access road to the facility. Taking into account all the likely noise sources from the facility, it is expected that there will be a maximum increase of between 3 to 4 dB(A) in L(A)_{eq} noise levels at this location predominantly as a result of road traffic noise during the construction phase. This will result in an L(A)_{eq} of approximately 54 to 56 dB(A) at this location. The traffic will consist mostly of large HGVs and articulated vehicles entering and exiting the proposed waste disposal facility.

Noise levels at NP4 are likely to increase by one decibel as a result of on site plant noise. Such a slight increase would be barely noticeable at this location. Traffic movements along the access road are unlikely to affect the noise levels at this location due to the shielding afforded by the differences in topographic level between the two points.

Noise levels at NP5 are likely to increase by one decibel as a result of on site plant noise. Traffic movements along the access road are unlikely to affect the noise levels at this location due to the shielding afforded by the differences in topographic level between the two points.

In summary, the noise related impacts of the development on the surrounding environment are expected to be minor, direct, medium-term negative effects.

4.4 SOILS AND GEOLOGY

4.4.1 Potential Impacts

The impact to the soils and geology of the site will be limited to the excavation of the mineral soil and the underlying glacial till. The excavations will vary in depth across the development site with the greatest level of impact being within the footprint of the waste disposal area. Here, the overburden will be excavated to below the formation level and replaced with a 1m thick clay layer with a permeability of 1×10^{-9} m/sec. Elsewhere the overburden will be excavated to varying depths along the roads and at structures such as the leachate lagoon, pond area and the weighbridges etc. The excavated mineral soils will be stored and used in the landscaping measures and in the final capping layer.

Glacial till is the most common overburden type in Ireland and the removal and replacement of the subsoils constitutes an insignificant impact. The structure of the bedrock is stable and no impacts are predicted in terms of geological stability due to the loading of waste in the proposed landfill. The potential impacts associated with the loss of agricultural land is discussed in Section 2.12.

4.4.2 Proposed Mitigation Measures

There are no soil and geology mitigation measures proposed for the site as there will be no significant impact on the geological stability of the rock underlying the site or the underlying glacial till as discussed above. The agricultural land mitigation measures are discussed in Section 2.12.

4.4.3 Likely Significant Impacts

In summary, the impact of the development on the soils and geology of the area is considered imperceptible.

4.5 SURFACE WATER

4.5.1 Potential Impacts

The primary potential impacts of the development on the surface water in the vicinity of the site are as follows :

- construction of the landfill and ancillary infrastructure will necessitate the removal of a number of drainage ditches and the local diversion of surface water drainage,
- the collection of rainfall in the landfill and subsequent removal as leachate could result in a very minor reduction in the flow in the Farahy River,
- the provision of roads, hardstanding areas and buildings will reduce the potential for evapotranspiration in these areas and could increase the flows to the Farahy River, particularly during flood events,
- the generation of leachate in the landfill could pose a threat to surface water quality in the vicinity of the site and in particular in the Farahy River,
- storage of hydrocarbon fuels or other potentially polluting substances on site would lead to an increase in the risk of contamination of the local surface waters in the event of an accidental spill,
- It is less likely but possible that oil spills will occur during construction and,
- surface water run-off from clay surfaces is likely to collect colloidal clay particles which could increase the level of suspended solids in the Farahy River and also cause discoloration of the water in the streams and river and subsequently impact on aquatic life during construction and operational phases.

4.5.2 Proposed Mitigation Measures

In order to mitigate against these potential impacts the following measures will be implemented at the site :

- removal of drainage ditches will be kept to the minimum necessary and diverted flows will be designed to minimise alterations to the flow pattern downstream of the site,
- only surface water diverted to the leachate lagoon will not be re-diverted to the surface water network the remainder will re-enter the local drainage network after treatment. This will mean that the potential level of reduction in flow of the River Farahy will be insignificant.
- the installation of a siltation pond to collect surface water run-off will reduce the discharge of suspended solids and will allow control of flows from the site, particularly during flood events,
- surface water run-off will be treated to remove colloidal clay particles prior to discharge to the local drainage network,
- leachate will be contained in the landfill and in the leachate lagoon by a low permeability clay layer combined with a flexible membrane liner as required under the EU Landfill Directive (1999/31/EC),

- leachate will be removed from the landfill and tankered to a treatment works on a daily basis and the head of leachate within the waste body will be kept at a low level, reducing the possibility of leakage,
- flows from hardstanding areas will pass through an oil interceptor prior to discharging to the surface water siltation pond,
- Oil spills during construction are less likely because it is the current practice, for significant civil engineering projects, that oil is delivered directly to machinery by a fuel-oil distributor. It was formerly common that oil would be delivered in bulk to a central tank and transferred piece-meal to individual machines. It is *greenstar's* intention nevertheless to install an oil interceptor as part of the permanent works so that any spillage of buoyant liquid will be intercepted prior to discharge to the adjacent streams,
- any hydrocarbon tanks stored on site will be kept within concrete bunds with a capacity to hold 110% of the largest tank in the bunded area and,
- To mitigate against the construction works impacting on surface water, the construction of the oil interceptor, stormwater pond and treatment system will precede the other works on site. The pond will be constructed and completed prior to the diversion of stormwater into it.

4.5.3 Likely Significant Effects

The mitigation measures outlined above will ensure that surface water quality in the local streams and the Farahy River will not be significantly affected by the proposed landfill. As stated in Section 2.5, the 2001-2002 Annual Environmental Reports for the closed local authority facility concluded that surface water results from upstream and downstream of the landfill did not indicate any contamination of the Farahy River as a result of activities at the landfill site. The landfill will have a higher level of environmental control than the closed local authority landfill and the risk of contamination of the river from the *greenstar* site is considered minimal.

Minor alterations in the quantity of surface water run-off from the site are expected as a result of the proposed development. These minor alterations will be temporary as the flow regime will return to normal after the site has been restored.

The control of flows during flood events afforded by the siltation pond will have a positive effect on the Farahy River.

In summary, there are no predicted significant negative effects from the proposed development in terms of surface water therefore it is envisaged that the impact on the hydrochemistry and quality of the surface water network in the vicinity of the site will be imperceptible.

4.6 GROUNDWATER / HYDROGEOLOGY

4.6.1 Potential Impacts

Fuel spillages during the construction phase are a potential source of groundwater contamination. An uncontrolled discharge of leachate from either the waste disposal area, the leachate lagoon or the interconnecting pipework would represent a potential source of groundwater contamination during the operational life of the landfill.

4.6.2 Proposed Mitigation Measures

Groundwater contamination will be prevented by a combination of the thick clay layer left in-situ beneath the landfill footprint, the HDPE liner used to contain the waste and by monitoring the leachate level to keep it below that of the water table.

The HDPE liner will represent the first level groundwater protection as this membrane will contain the leachate generated by the deposited waste.

The second level of groundwater protection is afforded by leaving a thick layer (c. 10m) of low permeability clay in-situ between the landfill footprint and the underlying sandstone aquifer.

The third level of groundwater protection relates to maintaining the level of leachate within the landfill footprint below the level of groundwater in the enclosing till and below the peizometric surface in the underlying bedrock aquifer. In the unlikely event of water migrating through the landfill liner the tendency will be for groundwater to enter the landfill rather than for leachate to migrate away from the landfill.

All the private domestic wells in the vicinity of the site are either hydrogeologically upgradient or located in a different groundwater catchment and therefore the proposed landfill poses no risk to any of these wells.

Trigger levels have been established for certain leachate indicator parameters if during routine monitoring, of the groundwater beneath the site, these levels are encountered or exceeded remedial action can be undertaken. The determination of these trigger levels is presented in Appendix 4.6.1.

In summary the following trigger levels are suggested for groundwater in the underlying sandstone aquifer:

- Electrical conductivity - 900 μ S/cm @ 20°C
- Ammonia (as NH₄) - 0.30 mg/l
- Chloride (as Cl) - 32 mg/l
- Potassium (as K) - 8 mg/l

The proposed groundwater monitoring wells (see section 3.5.7) have been strategically positioned to identify any contamination of the groundwater upgradient of *greenstar's* site (see Figure 3.5.1). Comparison of the groundwater composition in these wells with the wells downgradient of *greenstar's* site will allow identification of any deterioration in groundwater quality due to activities at the *greenstar* site.

The monitoring boreholes will be located in the sandstone bedrock that lies beneath the site where the rate of flow of groundwater would provide useful groundwater monitoring data. The groundwater movement in the upper lying clay layer would be too slow to provide any useful indication of groundwater contamination and so is not included in the groundwater monitoring regime proposed for the Ballyguyroe landfill.

4.6.3 Likely Significant Effects

In conclusion, there are no predicted significant negative effects on groundwater / hydrogeology from the proposed development and therefore the impacts are expected to be imperceptible.

4.7 ECOLOGY

4.7.1 Potential Impacts

4.7.1.1 Flora

Designated sites

It is not anticipated that there will be any direct impact of the proposed development on the designated sites within 5km of the proposed development.

However, unplanned pollution incidents have the potential to impact on sensitive downstream habitats including the Blackwater River (a designated Salmonid Water) and the proposed Natural Heritage Areas along its length.

Habitats on the proposed site

The removal of the improved grassland and wet grassland is not of significant botanical importance. These habitats are common and widespread and contain no rare or protected species of plant. They are not of high local significance.

The removal of the small area of heath vegetation is not of ecological significance. The heath is degraded and of limited ecological interest.

All of the internal hedgerows on the site will be removed, as part of the development, whilst all boundary hedgerows will be retained. The majority of the hedgerows to be removed are of "Moderate" local ecological value.

The removal of Hedgerow No.s 1, 2 and 7 which are of "Low" local ecological value and the removal of hedgerow No.s 3, 4, 5, 6, 9, 10 and 11 which are of "Moderate" local ecological value is of low local ecological significance.

The removal of the hedgerows which are of Moderately High and High local ecological value is of moderate local ecological significance.

Hedgerow No.13 which is of High local ecological value and Hedgerow 15 and 16 which are of Moderately high local ecological value, will be retained.

Hedgerow No. 14 which is of "High" local ecological significance will be removed as part of the development. The drain/stream which runs adjacent to this hedge will be diverted. The diversion of this drain is of high local ecological significance. This drain forms part of a larger stream which flows from the southern boundary of the site through a small steep sided wooded valley, before joining with the Farahy River approximately 100m south of the site. Any significant impact on the quality and quantity of water flowing in this stream will impact on the ecology of this stream.

The semi-natural woodland along the Farahy River will be retained as part of the landfill development. This wooded valley may be rated as high local/regional ecological importance. Potential impacts on

this area could include disturbance during the construction phase, contamination from leachate, gas migration and accumulation of litter. Mitigation measures will be put in place to reduce/avoid these and any other potential impacts. See Section 4.7.1.2 below.

Any disturbance of the areas of scrub adjacent to the semi-natural woodland is of high local ecological significance due to its proximity to the woodland which is of high local/regional ecological interest.

Adjacent habitats

Unplanned contamination incidents and run-off of sediments into the watercourses have the potential to affect the river habitats around and downstream of the site. Such incidents have the potential to impact on sensitive downstream habitats including the Blackwater River (a designated Salmonid Water) and the proposed Natural Heritage Areas along its length.

4.7.1.2 Mammals, Amphibians and Reptiles

Loss of habitat within the site

Most of the habitats support a limited range of generally common species. The pools on site are of interest, as they support frogs and a variety of aquatic plants and invertebrates.

Impacts of loss of habitat on fauna

Common faunal species will be lost along with their habitat within the development area however, these species will continue to persist in the buffer zone and in adjoining landscape. The development will reduce the feeding habitat for species foraging over the area. Disturbance due to traffic and general activity is not likely to have any significant impact on faunal species present in the area.

Some opportunistic species such as rats and foxes could possibly increase in numbers as a result of the development. These species were already common in the area at the time of survey due to the local authority landfill which was operational at the time the survey was carried out. These species may increase further in numbers due to the higher waste volumes accepted at the proposed site.

The presence of large numbers of scavengers and predators, if observed, would also lead to diminution in numbers of prey species remaining on site. These would include frogs, as well as several common mammals and birds. The principal area of interest is the river and its wooded valley, mainly for the floristic diversity, and possibly also for its invertebrate diversity.

Providing that the river valley is isolated from development, and that pollution incidents do not occur, otters should persist in the River Farahy. It is not anticipated that the development will have a direct impact on the species. The species is relatively tolerant of disturbance and potential impacts would be associated with deterioration of water quality.

The overall impacts on fauna may be considered as Negligible or Minor.

Potential Impacts on surrounding areas

Effects on the fauna of surrounding terrestrial areas should be Negligible or Minor. Overall, the development will not significantly affect the ecosystem functioning and faunal diversity of adjoining agricultural and afforested areas.

An increase in scavenging birds and mammals in the area, if observed, could potentially have some impacts on fauna in surrounding areas but these are likely to be small and the species affected common. Cessation of landfill operations will quickly reduce the numbers of these predators, and allow for rapid re-colonisation by a variety of common bird and mammal species.

4.7.1.3 Birds

Impacts by loss of habitat

The principal direct impact by this development that will affect birds is loss of habitat by construction of the landfill. Wet pasture grassland and sections of hedgerow will be lost. These habitats are frequently occurring habitats and their loss would not have any significant impact on populations of birds in the area. All of the species recorded within the site will continue to occur in the general area.

Impacts during operation phase

The operation of the landfill will provide scavenging opportunities for crows, which were recorded in elevated numbers at the now closed local authority landfill.

A potential concern of elevated crow numbers would be increased predation on the nests and young of ground nesting bird species of conservation concern, such as red grouse and curlew, that are likely to occur in the surrounding peatland areas. The numbers of these species that breed in the Ballyhoura Mountains are not known but are likely to be low, as most of the potential nesting habitat has been replaced by coniferous plantations. Large numbers of crows frequented the now closed local authority landfill however, unlike older landfill sites, the proposed *greenstar* landfill at Ballyguyroe will be operated using modern bird management techniques and unnatural increases in crow population are not expected.

A further potential concern is general disturbance and harassment to the population of breeding hen harriers that occurs in the Ballyhoura Mountains. The hen harrier is a species of high conservation importance as it is listed on Annex I of the EU Birds Directive. Seven pairs were recorded in the Ballyhoura Mountains in the 1998-1999 hen harrier survey (McMahon *et al.* 2000), with breeding occurring within 5 km of the adjacent local authority landfill (D. Norriss, Dúchas the Heritage Service, pers. comm.). In 1999, all seven pairs successfully produced young. It seems therefore that the high numbers of crows that were noted at the local authority landfill that was operational at the time of surveying are not having an adverse impact on the breeding success of the population of hen harriers in the area. Watson (1977) notes that hen harriers can be extremely aggressive in defending their nests and that even the most timid harrier attacks birds such as crows, ravens, large gull, buzzards and golden eagles in the vicinity of the nest. From the above, it is considered unlikely that the expected crow numbers would have any adverse impacts on the breeding success of hen harriers in the Ballyhoura Mountains.

4.7.1.4 Aquatic Ecology

Further potential impacts, mitigation measures and likely significant effects are outlined in the November 2001 freshwater ecological assessment attached as Appendix 2.7.12.

Construction Phase

During the construction phase of the landfill development, there is potential for the unplanned discharge of sediments and pollutants into surrounding watercourses. Such a discharge could have an effect on the existing water quality and biological communities.

The unplanned release of silt and other particles into the Farahy River could lead to an increase in turbidity and therefore a reduction in light penetration and photosynthesis. The unplanned discharge of potential pollutants used during the construction phase could have a significant impact on the flora and fauna of the River Farahy.

A number of drainage ditches will be removed and drains/streams diverted as part of the development of the landfill facility. These works have the potential to impact on the ecology of the Farahy River and adjoining watercourses. Potential impacts could include increased siltation, pollution incidents and changes in flow rate.

Operational Phase

As all leachate from the landfill will be contained and disposed of off-site, it is not anticipated that there will be any impacts on surface waters or groundwaters from leachate.

However in a worst case scenario if leachate was to leak accidentally into the surrounding surface waters this could potentially affect species diversity and the structure of the communities in the adjacent watercourses.

The development could cause a change in the hydrological conditions at the site. Precipitation falling on buildings, roads and hardstanding areas will rapidly run-off to surface water with no infiltration to ground. Precipitation falling on the active waste disposal cell will be collected as leachate and as such will not be available to the surface water system. Precipitation on constructed cells prior to filling will be diverted to the silt attenuation pond, as will the precipitation falling on restored parts of the landfill.

Leaks/spills from fuel tanks located on the proposed site have the potential to impact negatively on the ecology of the Farahy River.

Surface water run-off from the proposed development is likely to collect colloidal clay particles which could increase the level of suspended solids in the Farahy River. Any significant increase in suspended solids is likely to impact on the spawning potential of the Farahy River, resulting in loss or degradation of salmonid habitat. However, the ecological assessment of freshwater fauna and salmonid habitats of the River Farahy conducted for this report, the tributary stream just south of the site is considered unsuitable for salmonid spawning habitat and the River Farahy is considered poor to moderate habitat

(see Appendix 2.7.12). Thus the potential for impacts associated with the proposed development on salmonid spawning habitat adjacent to the site is considered to be low.

The unplanned discharge of polluting materials such as uncured concrete to watercourses is likely to have a negative impact of fish populations.

4.7.2 Proposed Mitigation Measures

4.7.2.1 Flora

A comprehensive landscaping programme will be undertaken on the proposed site. The programme will be conducted on a phased basis and will consist of native woodland boundary planting. See Figure 4.10.1 in Section 4.10. Species chosen will be native and reflect the species composition of the surrounding hedgerows.

The woodland valley will be fenced off prior to construction and the buffer zone will be planted with native tree and shrub species which reflect the species composition of the adjacent woodland. This will include the following species: downy birch (*Betula pubescens*), holly (*Ilex aquifolium*) and rowan (*Sorbus aucuparia*) at the northern end and predominantly hazel (*Corylus avellanna*) at the southern end.

Intrusion by cattle has caused severe trampling and erosion within parts of the wooded valley. However, an absence of grazing can lead to loss of diversity within the herb layer and replacement by bramble scrub. The valley and woodland will be fenced off from any on-site domestic livestock and an appropriate grazing regime instated.

All boundary hedgerows will be retained as part of the development. This includes the southern boundary hedgerows (No.s 13, 14 and 16) which are of Moderately High and High local ecological value. These hedgerows will be fenced off prior to construction.

A comprehensive restoration plan for the site will be undertaken progressively during the life of the development and upon decommissioning of the site. This will include for habitat restoration and conservation.

4.7.2.2 Fauna

The principal mitigation measure is for the protection of the habitats of ecological interest on site. This measure also requires a buffer zone for the protected habitats.

The season of disturbance to trees and vegetation will be limited so as to reduce impacts on breeding species, to provide for habitat replacement, and measures to reduce pollution and sedimentation into watercourses during construction, operation and post-operation phases. Additionally, measures will be incorporated to protect frogs on site.

Protection of Otters

No especial measures are required for protection of otters. The species will persist, and is relatively tolerant of disturbance also, provided that water quality in the catchment is maintained.

Access by wildlife will be maintained to all parts of the river from the adjacent woodland habitat.

Protection of bats

No especial measures are proposed for protection of bats. Bats will continue to forage over the valley and its woodland, provided that this habitat is maintained and a buffer zone instated, as above.

Protection of Amphibians (Frogs)

The loss of frog breeding sites within the grasslands will result in diminution of this species locally, as well as the invertebrate species of these pools.

Measure:

As outlined in Section 4.10.3, a large wetland type lagoon (storm water retention pond) will be constructed near the southern boundary. See Figure 4-10-1 for details. The pond, associated drains and adjacent terrestrial habitats, will provide suitable habitat for the common frog.

Control of pests and nuisance species

The operation of the landfill site could possibly lead to a further increase in population of pests such as rats and foxes. Chemical control of rats (using poisons) can lead to incidents of non-target species (*e.g.* birds of prey, including owls, foxes, badgers, Irish stoat) being affected when consuming poisoned prey items (secondary toxicity).

Measure 1:

Site management will ensure covering of landfill daily.

Measure 2:

Rodent control will accord with best practice in pest control, to limit impacts on non-target species. First-generation anticoagulants (warfarin) are preferable to second-generation anticoagulants (bromadiolone and others), if chemical means of control are required. (See Section 3.3.7 for more detail on vermin control)

Habitat replacement and landscaping

The loss of habitats on site will be replaced with similar or alternative habitats within the buffer zones and potentially, such habitat replacement and landscaping could add to the wildlife value of the area.

Monitoring: construction, operation and post-operation phase

The mitigation measures, including habitat conservation, habitat replacement and creation, will be monitored by wildlife experts at intervals during the operation of the programme to ensure successful implementation. This will include inspection on a regular basis by wildlife experts. Monitoring will continue into post-operation phase (see below).

Landfill site: decommissioning phase

Proposals for suitable landscaping of the landfill site are included in Section 4.10 and shown on Figure 4.10.1.

Measures:

- Provide for suitable landscaping and use of the area post-decommissioning.
- Ensure the habitats created in buffer zones are maintained post decommissioning.
- Ensure continued conservation of the river valley and its woodland of ecological interest post-operation.

4.7.2.3 Birds

The bird species that utilise the site are commonly occurring species and are not protected. No mitigation measures are required to compensate for the loss of bird habitat as a result of the proposed landfill as these habitats are frequently occurring habitats and their loss would not have any significant impact on populations of birds in the area. All of the species recorded within the site will continue to occur in the general area.

Clearance of trees, or areas of low or tall scrub, where required, will take place outside the bird nesting season, and may exclude the period from the 1st March to the 31st August.

The most effective way to discourage excessively large numbers of scavenging crows (gulls are not a feature at this site) from gathering at the site is to reduce the amount of available food to the minimum possible. To achieve this the working area of the landfill will be kept as small as possible. Also, all previously worked areas will be covered daily at the facility and will include soil or artificial cover material to prevent birds picking out waste food. See section 3.3.2 of the EIS for further details on bird control.

The anticoagulants in modern 'second generation' rodenticides used to control rat numbers can be toxic to birds this is covered in detail in Section 3.3.7.

After an appropriate period of operation, if it is determined that the number of scavenging birds in the area has increased as a result of the landfill development, then falconry will be employed to deter the scavenging birds.

It is possible that gulls may be attracted to the surface water attenuation pond. The number of birds at this pond will be monitored regularly by site personnel. If it appears that the pond is attracting unwanted birds, a system of taut wires will be installed above the surface of the pond. This is an effective deterrent system and will discourage birds from landing on the pond.

4.7.2.4 Aquatic Ecology

Construction Phase

Measures that will be employed to mitigate against impacts on the aquatic ecology during the construction phase are detailed in Section 3.1.1.10 of the EIS.

Where practicable, any works associated with the diversion of drains on the site will be undertaken during the period May to September in order to avoid salmonid spawning season.

Operational phase

Measures that will be employed to mitigate against impacts on the aquatic ecology during the operational phase are detailed in Section 3.1.1.10 of the EIS.

Due to the potential impact on fisheries stocks in the River Farahy, the SRFB will be consulted with respect to treatment of surface water run-off.

Any fuel tanks stored on the site will be located within concrete bunds with a capacity to hold 110% of the largest tank.

The landfill site and adjacent watercourses will be monitored, in accordance with EPA requirements

4.7.3 Likely Significant Effects

4.7.3.1 Flora

With all the above mitigation measures in place the effects of the development on flora are expected to be imperceptible.

4.7.3.2 Fauna

Given the successful operation of the landfill site and ancillary operations, without pollution incidents, and with suitable mitigation and remedial measures incorporated (as above) the overall impact of the development may be considered as of Minor Impact in terms of impacts on fauna and habitats.

Suitable habitat replacement and creation may allow for a limited increase in the representation of faunal species in the area and ameliorate losses of existing hedgerow and pool habitats on site.

4.7.3.3 Birds

There will be no likely significant impacts on local bird populations by loss of habitat due to the construction of the landfill. With the mitigation measures proposed in place it is expected that the impact on birds will be imperceptible.

Adherence to the management practices as described in Section 4.7.3.2 of the EIS will discourage excessively large numbers of crows from gathering at the site.

4.7.3.4 Aquatic Ecology

With stringent control measures in place (in consultation with the SRFB) in order to avoid discharge of pollutants and silt during the operation, construction and decommissioning phases of the landfill, it is not anticipated that there will be any significant effects on aquatic ecology in the River Farahy and adjacent waters. With the mitigation measures proposed in place it is expected that the impact on aquatic ecology will be imperceptible.

4.8 HUMAN BEINGS

4.8.1 Potential Impacts

As stated in Section 2.8.1 there are no houses within 500 metres of the proposed landfill footprint and six within 1km. Potential impacts on these nearby residents and the local community in general include the following :

- noise,
- odours,
- air quality dis-improvement,
- water quality dis-improvement,
- traffic increase,
- litter,
- health,
- visual intrusion,
- increase in vermin,
- fly tipping.

Potential noise impacts have been assessed in Section 4.3 of the EIS. Potential impacts on air quality and odours have been assessed in Section 4.2. Groundwater quality has been assessed in Section 4.5 and surface water quality in Section 4.6. Traffic is covered in Section 4.9 and visual impacts in Section 4.10. Impacts relating to vermin, human health, litter and fly tipping are discussed below.

4.8.1.1 Human Health

Local communities in the vicinity of landfills are usually concerned about the potential health effects of living proximal to such a facility.

The main potential risks to the health of the general public from a landfill site receiving treated residual wastes are as follows :

- Contamination of groundwater wells.
- Contamination of surface water supplies.
- Sub-surface migration of landfill gas.

These potential impacts are addressed in detail in Sections 4.6 (groundwater), 4.5 (surface water) and 4.2 (air) of the EIS respectively. Other potential impacts on human health include the possibility of injury or illness. The greatest risks of this nature will be to site staff, particularly those operating close to the waste.

The risk of airborne particles or gases from the site impacting on the health of the general public is considered insignificant.

There has been no proven link between human health and non-hazardous landfills. A study published by the Health Research Board (HRB) entitled "*Health and Environmental Effects of Landfilling and Incineration of Waste - A Literature Review*" assesses the risks associated with old landfill sites and comments in the executive summary (Page 5) that;

"..although a great number of studies have been carried out, evidence of a casual relationship between specific health outcomes and landfill exposures is still inconclusive."

Ballyguyroe however is a modern engineered landfill that will employ high emission controls and as confirmed in the HRB report the provision of modern engineered landfills will reduce the potential risks of adverse health effects on human beings by providing an improvement of emission controls and by replacing old landfill sites that have higher associated health risks. The Executive Summary and Chapter 7 (Page 154) of the report states;

" As there is a paucity of literature relating to modern landfill and incineration sites, nearly all of the studies identified in this report relate to older technologies. It can be assumed that as emission controls improve, risks of adverse effects diminish"

4.8.1.2 Vermin

Rats, flies and scavenging birds such as gulls and crows have historically been a problem at landfills in Ireland. These species use landfills as a source of food and if unchecked would be attracted to the *greenstar* landfill at Ballyguyroe.

4.8.1.3 Litter

Wind-blown litter in the environs of older landfill sites and on the roads approaching such sites has historically been a problem in Ireland. The design and operational plans for the proposed landfill at Ballyguyroe will incorporate measures to control the migration of wind-blown litter.

4.8.1.4 Fly-tipping

Illegal dumping of waste, otherwise known as 'fly-tipping', has been a problem in the past at many Irish landfill sites and despite an increasing awareness amongst the public of the environmental damage caused by such anti-social behaviour, the practice still persists in many parts of the country. Fly-tipping in the vicinity of a landfill site generally occurs as a result of private individuals or irresponsible waste hauliers arriving at a landfill site and finding the gates closed or the charges prohibitive.

4.8.2 Proposed Mitigation Measures

4.8.2.1 Human Health

The site will operate in compliance at all times within the emission limits set by the EPA in the operating licence for the landfill. The strict compliance with these environmental standards ensures that any risk to human health in the vicinity of the landfill is minimised to an insignificant level.

A health and safety programme will be developed by the landfill operator and this programme will incorporate precautions against tetanus and Weil's disease (Leptospirosis) and will ensure that site operatives are sufficiently trained in terms of health and safety matters and are correctly equipped with personal protection equipment.

4.8.2.2 Vermin

Measures designed to mitigate against these species include the following:

- The populations of vermin will be monitored and controlled so that no significant increase in population levels are allowed to occur. A firm of professional vermin control experts will be employed to control vermin levels using standard humane methods. Vermin control will commence before the onset of landfilling.
- Daily cover material which will include materials such as biodegradable plastic, hessian or soil and will be placed on the active area of the landfill to deny access for scavenging birds and vermin to the waste.
- The surface area of exposed waste will be minimised during operations and good housekeeping practices will be employed to minimise the potential for scavenging.

Most of these techniques are currently employed at a number of modern landfill sites in Ireland. The rate of success in controlling unwanted birds, flies and rodents has been high at these sites and a similar level of success is expected at Ballyguyroe.

4.8.2.3 Litter

Mitigation measures for litter control include the following :

- The active tipping area will be kept to the minimum area required to efficiently operate the site.
- The active tipping area will be covered on a daily basis with materials including biodegradable plastic, hessian, soil or an alternative mineral layer (e.g. recovered material from construction and demolition waste).
- All waste in non-active areas of the landfill will at all times be covered with soil or an alternative mineral layer.

- Two lines of netting will be employed. The perimeter of active cells will have a 6m high vertical net. The active disposal area will be protected with portable nets / screens which will be relocated on a daily basis depending on the prevailing wind direction.
- A minimum buffer of 50 metres will be maintained between the landfill footprint and the site boundary. This will ensure that in the event of a failure in the netting system the primary receptor of any litter will be land owned by the site operator and a clean-up can be instigated immediately.
- All waste will be delivered to the site in covered vehicles by hauliers under contract to *greenstar* and registered with the EPA. Any contractor delivering uncovered waste will be deemed to be in breach of contract and appropriate action will be taken by *greenstar*. This action will be designed to ensure that this problem will not recur.
- Waste contractors will be prohibited by contract from using local roads other than the preferred access route from the N73.
- Staff at the site will regularly patrol the access road to ensure that there is no litter emanating from vehicles using the facility.
- Site management will liaise closely with the Cork County Council (North Division) Litter Warden Service to ensure the highest possible level of compliance is achieved.

Many of these controls are currently used at modern landfills in Ireland with a high degree of success and litter problems are not expected at the Ballyguyroe site.

4.8.2.4 Fly Tipping

This practice is unlikely to occur at Ballyguyroe, where the site will not be open to the public and waste hauliers will only be allowed access to the site under contract. These hauliers will be registered with the EPA as part of the licensing procedure for the site and any fly-tipping by these contractors will be reported to the relevant policing authority and will lead to a termination of the hauliers contract with *greenstar*. Similarly, any fly-tipping in the vicinity of the site by a member of the public will be reported to the appropriate authorities and any video or other available evidence, will be provided by *greenstar* to help secure a conviction of the culprit. Closed circuit television (CCTV) cameras will be located at the main gate of the facility and at other strategic locations around the site (see Section 3.1). Regular litter patrols as mentioned under Section 4.8.1.3 above will also report on any fly-tipping in the vicinity of the site.

The controls listed above are in place at the landfill operated by *greenstar* near Kilcullen, Co. Kildare and there is no evidence of fly-tipping associated with that facility. In summary, while it is not possible to legislate for anti-social behaviour by the occasional member of the public, there is no reason to expect fly-tipping at Ballyguyroe.

4.8.3 Likely Significant Effects

The likely significant effects on human beings from environmental emissions and nuisances such as noise, air quality, odours, water pollution, traffic and visual intrusion are assessed elsewhere in this EIS. With the mitigation measures described above, the likely effects of the proposed development on the local population in relation to vermin, litter, human health and fly-tipping are expected to be insignificant. With the mitigation measures proposed in the EIS in place it is envisaged that the impact on human beings will be slight.

In summary, while there is genuine concern amongst the local community in relation to health issues, there is no proven history of health impacts on local residents from airborne emissions from sites accepting treated residual waste.

4.9 ROADS AND TRAFFIC

4.9.1 Outline Development Proposals

The timescale for development is assumed as follows:

Application made	October 2003;
Planning process	Late 2004/Early 2005;
Licence granted	Late 2003/Early 2004;
First construction phase	Summer 2005;
First import of waste material	Summer 2006 (Base Year).
Cessation of waste acceptance	Summer 2016

Peak traffic flows will occur when groundwork construction for a subsequent landfill phase occurs at the same time as ongoing waste acceptance is taking place which will occur approximately every two years.

4.9.2 Predicted Traffic Flows

The average payload per vehicle transporting the treated residual waste to the landfill will be 20 tonnes.

A previous application (June 2001) for a *greenstar* landfill at Ballyguyroe proposed that waste would be accepted in 10 to 12 tonne HGVs. The proposed increase in payload per vehicle for the present application would result in a significant reduction in the generation of waste vehicles compared to the earlier application and follows from the need to only deposit treated waste at the Ballyguyroe site.

In addition, the traffic generation associated with the importation of granular drainage materials is significantly less than that estimated in the 2001 EIS .

The assumed construction related traffic generation in the June 2001 EIS of 20 vehicles per day is considered a reasonable estimate for the construction of such facilities. It can be assumed for the purposes of this application that the breakdown in this construction traffic will constitute 15No. trips by construction staff cars/vans and 5No. trips associated with sundry deliveries by HGV. These are estimates and are likely to fluctuate over short periods from time to time.

It is therefore estimated that during the construction phases of this application, that the maximum (short term) traffic generation will constitute 24 HGV delivering waste, 8 landfill staff vehicles, 20 construction related vehicles (5No. HGV and 15No. cars/vans) and 10No. HGV delivering granular drainage material.

During general landfill operations 24No. HGV and 8No. cars are likely to be generated. During the construction periods this amount would increase over the short term to 39No. HGV and 23No. cars/vans per day or 62 vehicles.

These estimates indicate a reduction in traffic from the June 2001 estimate of some 108 vehicles per day on the local roads network. It is worth highlighting that practically all of this reduction is in HGV traffic. As in the 2001 EIS the equivalent maximum traffic generation (during construction) was estimated at 170 vehicles per day (150No. HGV and 20No. cars).

There will be a reduction in general waste HGV traffic with this application compared to the 2001 proposal of some 45% and also a reduction in the short term construction traffic generation in excess of 500% (excluding waste traffic). Clearly these are significant reductions in the forecast levels of traffic generation on the local roads network. Indeed the maximum short term impacts during the construction phases of this proposal are less than the general waste related traffic generation estimated in the June 2001 EIS.

Expected sources of waste material for disposal with approximate annual tonnage are:

South Tipperary	(via Mitchelstown)	20,000 t/yr	1,000 veh/yr	3 veh/day
Waterford	(via Mitchelstown)	5,000 t/yr	250 veh/yr	1 veh/day
Limerick	(via Kilmallock/Kildorrery)	10,000 t/yr	500 veh/yr	2 veh/day
Limerick	(via Doneraile)	10,000 t/yr	500 veh/yr	2 veh/day
Cork	(via Mallow)	40,000 t/yr	2,000 veh/yr	7 veh/day
Cork	(via Mitchelstown or Kildorrery)	60,000 t/yr	3,000 veh/yr	10 veh/day

Traffic generation parameters for the Ballyguyroe Landfill for this application are shown in Table 4.9.1 below.

Table 4.9.1 Traffic Generation Parameters

Max. Tonnage Per Year	145,000 tonnes
Duration of Waste Arrival	10 Years
Total Tonnage	1.45M Tonnes
Average Tonnage Per Vehicle	20 Tonnes (Treated)
Total No of Waste Delivery Trips	72,500 Vehicles
Average Waste Vehicles/Annum	7,250 Vehicles
Average Waste Vehicles Per Day	24 Trips (*)
Import of Granular Material	15,000t per phase
Traffic Generation Associated with Granular Drainage Material	10 Veh/day over 3 Month per phase

(*) A vehicle Trip constitutes 2No. Movements e.g. one movement into site and one away from site

Table 4.9.2 gives an estimate of the relative increases in traffic flow on the N73 over the initial construction period of the landfill and subsequent 10 years over which it is proposed to import waste to the site. The calculations of increased AADT (and HGV) on the N73 are based on a directional split of vehicles which was also used in the June 2001 traffic assessment (i.e. that the likely source of materials is currently unknown and therefore the analysis of the junction has assumed an equal split from the two directions on the N73). As per the June 2001 traffic assessment, some 66% of traffic is assumed to approach from the east with the remainder coming from the west, it can be appreciated therefore that AADT on the N73 will not increase by 100% of forecast traffic generation. The following figures in Table 4.9.2 are based on the maximum increase in AADT that will occur on the eastern approach to the site.

Table 4.9.2 Forecast Likely Increases in Traffic Flows on N73

Year 3.1 % Growth	N73 Base AADT	N73 Base HGV	Landfill Related Waste Vehicles & Staff	Construction Traffic	Granular Fill Material (3 Months)	N73 Max Increase in AADT 66%	N73 Future HGV 66%
2003	3,994	559					
2004	4,118	576					
2005	4,245	594	No Landfill	5 HGV 15 pcu	10HGV (Short Term)	39 0.9%	20 3.3%
2006	4,377	613	24 HGV 8 pcu*	No Const.	0	42 1.0%	32 5.2%
2007	4,513	632	24 HGV 8 pcu*	No Const.	0	42 0.9%	32 5.0%
2008	4,653	651	24 HGV 8 pcu*	5 HGV 15 pcu	10HGV (Short Term)	82 1.8%	51 7.9%
2009	4,797	672	24 HGV 8 pcu*	No Const.	0	42 0.9%	32 4.7%
2010	4,946	692	24 HGV 8 pcu*	No Const.	0	43 0.9%	32 4.6%
2011	5,099	714	24 HGV 8 pcu*	5 HGV 15 pcu	10HGV (Short Term)	82 1.6%	51 7.2%
2012	5,257	736	24 HGV 8 pcu*	No Const.	0	42 0.8%	32 4.3%
2013	5,420	759	24 HGV 8 pcu*	No Const.	0	42 0.8%	32 4.2%
2014	5,588	782	24 HGV 8 pcu*	5 HGV 15 pcu	10HGV (Short Term)	82 1.5%	51 6.6%
2015	5,761	807	24 HGV 8 pcu*	No Const.	0	55 1.0%	32 3.9%
2016	5,940	832	24 HGV 8 pcu*	No Const.	0	42 0.7%	32 3.8%

(*) pcu: passenger car unit

It must be noted that in Table 4.9.2 the likely maximum increases in traffic on the N73 have been investigated. In the case of increased traffic movement associated with the import of granular drainage material the increased AADT over the 3 month period of import (this traffic has not been distributed over the year) has been shown.

From Table 4.9.2 above it can be seen that in terms of AADT the maximum increases on the N73 are likely to be less than 2% (short term). Excepting the short periods over which drainage materials will be imported indeed the average increase in AADT is 0.7% whilst the maximum increase in AADT on the N73 is shown as unlikely to exceed 1%. This is not considered significant.

The average increase in HGV content on the section of N73 most trafficked by landfill related vehicles is 4.3%. Excepting the short term impact during the import of drainage materials this average drops to 3.6%.

4.9.3 Highways Improvements

Both main routes to the site from the south are capable of dealing with increased flows, the overall widths and alignment are superior on the N73 east of its junction with the L1329. However, the condition of the N73 east of its junction with the L1329 requires maintenance and, if possible, minor improvement.

Additionally both the L1329 and site access roads need improvements to cater safely for the increased level of traffic. Where space is available within the highways boundaries the L1329 road will be widened and the shoulders reinforced; and the number of passing opportunities will be improved.

It is proposed that the access road from the L1329 to the site will be upgraded to the extent that:-

- the existing informal passing bays are surfaced and appropriately signed; and
- three similar passing bays will be constructed at locations to be agreed with the landowner.

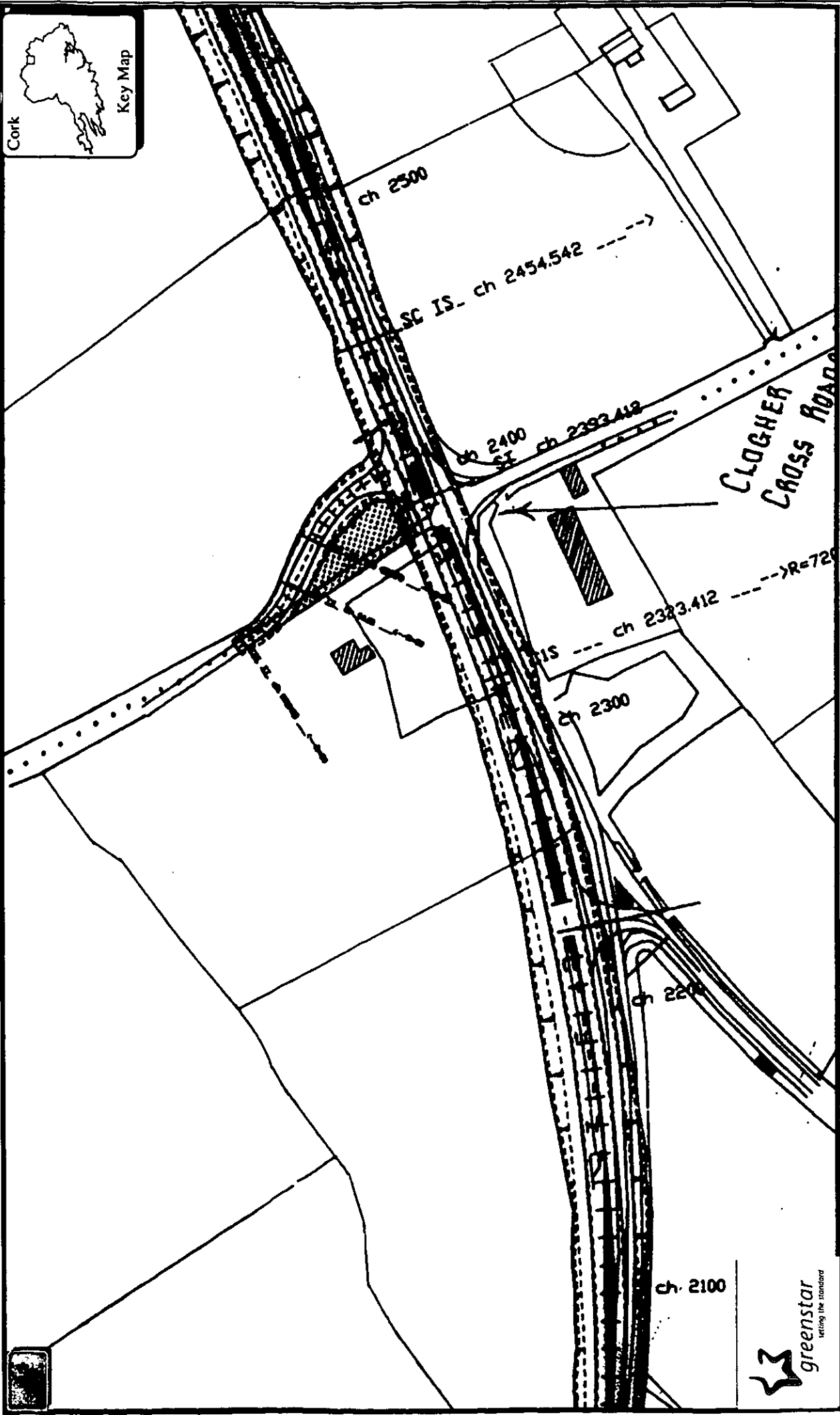
greenstar proposes to upgrade the access road to the satisfaction of and in agreement with Coillte. *greenstar* will contribute financially to the improvement of the L1329 and the access road.

4.9.4 Junction Improvements

The junction between the N 73 and the L1329 was analysed using the Transport Research Laboratory Program PICADY (see Appendix 4.9.1 for results) in the June 2001 assessment and found to be adequate in terms of its capacity for the volume of vehicles that use the junction. As the recent traffic assessment predicted a decrease in the number of vehicles using this junction it is considered that the junction will continue to be adequate in terms of capacity.

It is however unlikely that the larger vehicles that are proposed for the delivery of treated residual waste will be able to turn right off the existing N73 due to lack of adequate turning space. Additionally, the existing junction is unsafe both for right turning traffic off the N73, where forward visibility of oncoming traffic is restricted by a left-hand bend (and vegetation) in the main road, and for traffic turning left out of the L1329 where lack of turning space tends to force the turning vehicle onto the opposite side of the road without adequate visibility to their left because of the landform (See Figure 2.9.3). In view of the geometry of the junction it is proposed that the junction should be improved.

These problems appear to have been recognised by the local authority and taken into consideration with publication of a proposed junction improvement assumed as a ghost island junction to the standards set down in Figure 7/15 of the Design Manual for Roads and Bridges standard TD 42/95 (See Figure 4.9.1). The detailed design of the proposed junction improvement and the turning space afforded by the new design has been checked by *greenstar* for HGV movements and found to be acceptable.



4.9.5 Traffic Routing

As part of the 2001 traffic assessment discussions were held with the local authority over the routing of traffic to the site. There appears to be no specific objections against use of any of the possible routes, subject to further discussions about necessary improvements, as discussed above, and specific requirements associated with the construction phase.

Only hauliers under contract to *greenstar* will deliver waste to the site and any haulier disobeying restrictions will be deemed in breach of contract and appropriate action will be taken by *greenstar*.

4.9.6 Conclusions

It is concluded that the traffic generation associated with waste importation in the current application will be practically half that of the June 2001 traffic assessment primarily due to the fact that only treated residual waste will arrive at the proposed facility and this will only arrive in 20 tonne HGVs.

In terms of the traffic generation associated with construction traffic the forecast levels of traffic under the current application are some five times lower than forecast in the June 2001 traffic assessment.

The relative increases in traffic on the N73 in the vicinity of this proposed development are not considered significant.

The worst case traffic generation (including construction and import of granular fill) under the current application is similar to the waste traffic figures alone given in the 2001 application. Clearly the traffic impact of this development will therefore be significantly less than the forecast estimated by the June 2001 traffic assessment, which itself was considered to be within acceptable limits.

The June 2001 assessment envisaged that there would only be a slight impact on roads and traffic as a result of the proposed development (i.e. 'the predicted increase in traffic on the highway network is within acceptable limits and for much of the operational period will cause less than 5% increase in traffic on the adjacent N73 National Secondary Road').

The local authority had no objections to the June 2001 planning application on highway grounds. The An Bord Pleanála Inspector made the following comments/observations in paragraphs 21.11 and 21.12 of his report (An Bord Pleanála Ref: PL.04.128784) in relation to the June 2001 application:

"The County Engineer has raised no objection to the scheme on highway grounds and, whilst the level of traffic movement to be generated by this scheme will be likely to increase road hazard on the L1329 and thus reduce amenity generally in the area, I note very few properties are actually sited along the road and that the need to locate landfill facilities in relatively remote areas will inevitably mean that county roads such as the L1329 will need to be used to transport material to the site. In this respect, the Council facility at Bottlehill is to be accessed via very similar roads. Subject therefore to the identified road improvements being carried out I take the view that access difficulties are not sufficient to warrant refusal of permission."

"The access link from the L1329 to the site entrance is satisfactory in highway terms."

Bearing these factors in mind and considering the above calculations it is envisaged that, provided that the road improvement works identified above and summarised below are implemented, the current proposal should have significantly less impact on the local roads network than the June 2001 traffic assessment .

Proposed Road Improvement Programme

- i) The junction between the N73 and the L1329 road connecting with the site boundary will need to be improved to ensure adequate visibility and turning space is available.
- ii) Some maintenance/improvements will be required to the N73 east of the junction and maintenance/provision of passing places is required on the L1329.

greenstar proposes to provide an appropriate financial contribution towards the works necessary for the improvement of the junction between the N73 and the L1329 County Road and on the L1329 County Road.

4.10 LANDSCAPE AND VISUAL ASPECTS

4.10.1 Potential Impacts

The greatest potential impact will be during the relatively short initial construction phase (c. 12 months). Construction impacts relate to ground disturbance, minor hedgerow removal, changes in ground level, erection of administration buildings, etc. and general construction activity. Operation impacts relate to actual landfilling operations including truck movements, raising of the landfill area and general site activity including lighting.

However, even during the short construction phase when impacts are potentially most acute given the associated disturbance, it is not considered that significant landscape and visual impacts will arise. The site is not widely or especially visible and has a good visual absorption capacity for such developments and has an adjoining history of landfilling. The adjacent local authority landfill was operated throughout its life span without the benefit of extensive of visual impact mitigation measures, such as phased capping and enhanced vegetation programme, proposed for this development.

In terms of the overall life span of the landfill both its construction and operation periods are relatively short and therefore the long-term visual impact of the landfill, post closure, as well as that during the operational phase must be considered. A number of photomontages have been prepared to provide a visual aid to the assessment of the landscape and visual impacts of the proposed development. These photomontages have been prepared from: -

- Across the Farahy River
- County road between Ballyguyroe Bridge and Craig Cross
- N73
- Kildorrery Village (2 No.)

The photomontages are presented in Appendix 4.10.1. In each instance the photomontage has been prepared from a position giving clear views towards the proposed landfill site. As such, this presents a perception that the site is widely visible from the surrounding landscape, however this is a false perception. Where views exist they do so over very short sections of the local roads south of the site through the likes of field gates and are generally imperceptible to passing traffic. For example, the views from the Craig County Road (View 2) and from the N73 (View 3) are taken from field access gates as generally the site is well screened from the roads by hedgerows and intervening topography and/or vegetation.

In presenting the views a short general description is also given for each vantage point and this is also included in Appendix 4.10.1.

The worst case-scenario, for landscape and visual aspects, i.e., the complete loss of all proposed mitigation, would not result in an appreciable impact and no significant visual impact would arise at individual locations surrounding the development. No appreciable impact would arise because the site is already strongly vegetated with coniferous plantations and in combination with topography,

substantially screened. The development is designed and laid out in order to maximise the value of these features.

4.10.2 Proposed Mitigation Measures

4.10.2.1 Landfill Design Mitigation Measures

During the design and layout of the proposed landfill consideration was given to avoidance of impact wherever possible. In this respect the landfill is sited adjoining the Ballyguyroe local authority landfill facility which has now closed but which has given a landfilling history to the wider area. The site is strongly screened to the north and west and east by plantations and topography and is only viewed from the south as a small part of an expansive view at distance at isolated locations. Furthermore the landfill is phased from south to north, with the initial phase set at the lowest point allowing time for maturing of proposed screen planting as the landfilling progresses northwards. Subsequent phases of the landfill are partly screened by the preceding phases however, as with any development some degree of impact is inevitable and wherever possible measures have been proposed to mitigate the adverse nature of these impacts.

Landscaping Design

To give a logical and coherent approach to landscaping of the proposal, objectives for such works were considered as follows:

- maximising the existing screening value of topography and vegetation.
- provision of additional effective screening and buffer.
- the physical and visual integration of the constructed landfill in to the local surrounds;
- the protection, reinstatement and conservation of the existing landscape, directly or indirectly affected by proposal.
- the creation of sustainable long term landscape.
- minimisation of visual intrusion.

To achieve the above objectives, the following design guidelines have been used :

- significant and progressive additional planting to screen and integrate the scheme into the surrounding landscape fabric, to complement views, and reduce intrusion of the proposal;
- progressive completion, and reinstatement of the landfill area to rough grassland.
- boundary treatment to soften harsh lines;
- wildlife conservation and the creation of habitats complementary to the surrounds;
- maintenance to be minimal by selection of progressive naturalistic systems where possible.

Landscape Proposals

The proposal is set in a landscape of upland rural character where natural features such as rough grazing fields, vegetated stream valleys, hedgerows and especially coniferous plantations predominate. This landscape is typical of many upland areas of southwest Ireland. Therefore a landscape design, which

aims to replicate and improve on such patterns and features in a 'natural approach', has been adopted for the landscape amelioration. These are set out as hereunder.

Initial Landscape Works

To augment existing coniferous plantations (and in planning for their long-term felling) a wide belt of predominantly native ash woodland will be established on the western boundary of the landfill area. The planting will provide a new area of deciduous woodland involving the planting of over 10,000 individual plants, See Figure 4-10-1. It is proposed that this belt of '*predominantly native ash woodland*' along the western boundary of the landfill area would be planted during at the initial stage of site mobilisation and development prior to active landfilling operations. Plants would be selected at 1.25 to 1.5 metre high stage planted at close 1.25m centres in a wide plantation. A percentage of the plantation would include '*standard*' sized trees, (i.e. 2.5 to 3.0 metre high) dispersed through the area. A further percentage would be of evergreen coniferous pine primarily set to the western edge of the plantation. The sizes of the ash plants would be selected to give instance massing while maintaining potential for rapid establishment and strong growth. Pine would be planted at 600-750mm in height for lower density and ease of establishment.

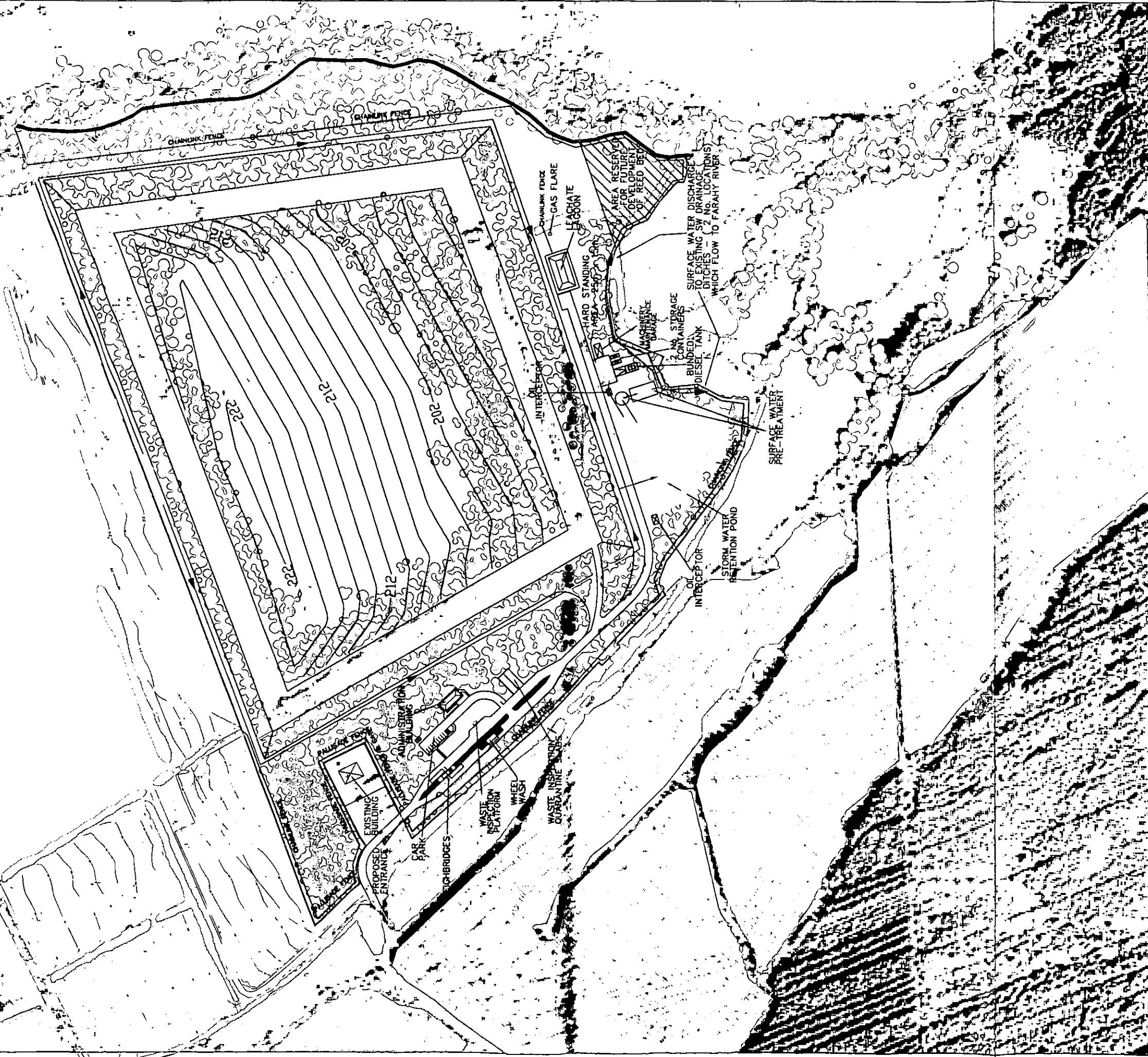
In the longer-term event of clear felling of the adjoining coniferous plantation (not scheduled until 2009 and 2017 for the nearest blocks, Appendix 4.10.3 shows the proposed Coillte felling schedule for the next 14 years), the plantation would provided effective screening from the west after some two/three years of growth. At such stage the mass of the planting would be in excess of 2.5m in height and depending on favourable growth may even be in excess of 3.0m. However, critically the planting would form a thick mass through its canopy to ground level, even during winter months as a result of the proposed density and incorporation of Scots pine. After 5 years of planting it is expected that the plantation would be over 4.0 or 5.0m in height and providing complete screening from the west of the site.

To the south and east of the landfilling area, existing valley side planting will be augmented with a native mix similar to the existing planting. This will entail planting of birch, hazel, holly and rowan with a gradual progression from birch dominance in the north to hazel dominance in the south. The planting will be provided along the site boundary to give immediate screening in advance of landfilling operations. A large wetland type lagoon will be provided near the southern boundary and planting surrounding this feature will be appropriate to a wetland location, including wildflower meadow and reed edge planting.






The main building area is set well within the site and in terms of scale and height the buildings will not be unlike a small cluster of agricultural buildings typical within this landscape.

Fencing erected on along all boundaries will be set back behind boundary hedgerows and will not be especially visible or impacting.

Existing Council
Landfill under
reinstatement



Not to scale

-  Existing woodland
-  Existing hedgerow
-  Existing commercial woodland
-  Proposed woodland planting
-  Proposed wetland planting

Planting Specification

The proposed planting will generally be established with forestry planting techniques, i.e. 'bare-root transplants', 'whips' and 'feathered trees' which adapt readily to pertaining ground conditions. Species used will be as outlined above.

Wildflower species rich mixes will utilise plants found naturalised in the local surrounds and native grasses and flora adapted to growing on disturbed soils. Grass seeding areas to be topsoiled and seeded with a low maintenance mix.

4.10.2.2 Landfill Construction Mitigation Measures

The initial construction works will be relatively short in duration and will include general entrance and access works, building erection and drainage and lagoon provision, fencing and layout of only part of the overall landfill base. Hedgerows removed by the development of the landfill are limited and of poor visual quality. During the construction phase of the landfill where possible the use of stockpiling will be reduced through the minimisation of double handling of construction material on site. The construction of subsequent more northerly phases, i.e. phases 2 to 4, will be progressively screened with respect to views from the south of the site with the progress of each phase of the development and there will be an immediate screening effect after the construction of Phase 1.

4.10.2.3 Landfill Operation Mitigation Measures

Only a very small area of the active cell will be operating at a time and all exposed waste will be covered at the end of each working day. Landfilling will commence at the southern end of Phase 1 and as the southern most waste slope rises it will be progressively covered with intermediate type clay cover and immediately grass seeded.

The Progressive Reinstatement of the Landfill

After completion of initial landfilling within each phase, the landform will be sealed with an intermediate cap, which will allow for initial settlement. After approximately two years, the intermediate cap will be covered with a final cap, graded to near permanent finishes (some additional settlement will be on-going) and grass seeded. Shortly afterwards the lower slopes will be planted with small woodland copses and hedgerows re-instated to reflect the surrounding landscape. See Figure 4-10-1.

4.10.2.4 Post Closure Mitigation Measures

After completion of the landfilling operations the site will be monitored and managed with additional planting and general open areas returned to rough grazing. The wetland lagoon will be allowed to gradually slit up allowing for natural colonisation of reeds and other aquatics. The lagoon will in time become a natural and self-sustaining wetland feature.

4.10.3 Predicted Landscape Character Impact

The development is set within a robust landscape, with a high visual absorption capacity. As such the development will not have a particular or significant adverse impact on the existing character of the landscape. In the medium and longer term the development of the extensive plantings will remove almost all visibility of the development and the site will develop a strong 'natural' wooded appearance from external viewpoints.

4.10.3.1 Predicted Visual Impact

While the perceived visual impact of such a development will be locally negative, the landfill development itself will not be especially visible or impacting. The site has excellent inherent screening from surrounding vegetation and topography and in combination with the landscape proposals will ensure minimal impact.

Roads and residences to the east, north and west have no view of the site or the proposed development and as such will have no adverse impact. The site is only visible from the south and even then only from a small number of properties and short sections of the county roads at some distance on north facing slopes at Ballyguyroe South, Farahy and Kildorrery. Given the distance and the otherwise expansive nature of the view, the development, (like the closed local authority landfill to the north) will neither be a cause of particular visual focus or impact.

During winter months a low level of lighting will be provided around the administration and weighbridge area and at the active landfill face. However, lighting will only be used to facilitate working in late morning and during the evening period and will not be used during night-time. The proposed buildings are of a small 'farm building' scale and with no perceptible adverse impact. A mobile litter control netting system will be used at the active face of any particular phase of the landfilling. An appropriate colour of mobile netting will be selected to minimise any potential visual impact. The mobile nature of the unit means that the visibility is of a temporary nature increasingly screened with the progress of each phase of the development. Other aspects of the proposed development, such as site fencing and entrance works along the county road to the west will have no impact after initial construction works.

As such, while a short-term moderate visual impact will arise from properties to the south of site, no adverse visual impact will pertain to any surrounding properties in the medium and longer term.

The proposal has no direct or indirect impact on the amenities in the area including the nearby amenity area at Ballintlea and the more distant Bowen's Court and Ballyhoura Way.

4.10.3.2 Predicted Landscape Planning Impact

There are no particular scenic or landscape designations pertaining to the subject site or its immediate surrounds. Given the inherent screening of the coniferous plantations, the proposal will have no effect on the listed 'View and Prospect' Nr A14 from the Kilfinnane-Shanballymore County Road. As such, it

is considered that the development will have no adverse landscape planning impact either in the short or longer term.

4.10.4 Comments on Landscape and Visual References raised in An Bord Pleanála Inspectors' Report, 2002

Some landscape and visual references were raised in An Bord Pleanála Inspectors' Report (An Bord Pleanála Ref.: PL.04.128784), in respect of a previous application for a residual landfill on this site (Cork County Council Planning Ref. N/01/3729). In particular the report stated: -

21.1 Visual Impact and Possible Effects on Tourism – The site is visible only from the south and east and the applicant has provided photomontage evidence of the changes in the landscape that will result both during construction of the landfill and after. Views are already partly affected by the existing Council tip, which has not yet been screened or landscaped. The scheme proposes raising land profiles by between 10 metres and 17 metres over a considerable area (70 acres). The scheme is strictly one of 'land-raising' rather than landfill and, when viewed both from the south and east, the changed profile will be prominent and ironically this will be for some time until tree planting has matured.

21.2 Although the area has no formal designation in terms of visual importance I take the view that it would not be in the interests of the area, in terms of visual amenity generally and likely impact on tourism, to fundamentally change the profiles of this hillside in the way proposed.

The comments of the An Bord Pleanála Inspector have been fully addressed in this EIS.

The site in reality is only visible from the down-slope locations to the south. Views from the east are entirely restricted to the immediate fields lying east of the Farahy River. Topography and existing vegetation ensures no view is possible from even a relatively short distance east, as represented in Photoview 1a taken 1.5km east of the site.

Views from the south are extremely limited by local topography and roadside and landscape vegetation in the form of tree-lines and hedgerows. Where views do exist, as previously discussed they are from short sections of minor roads through roadside field accesses and the like. In such instances a wide panoramic view is offered of the Ballyhoura and associated uplands within which the site and even the closed local authority landfill site form a very small indistinct element. Given the sloping topography the landfill area though raising existing ground levels will always be viewed against rising land to the north, specifically against the closed local authority landfill, which similarly has no ridgeline or skyline impact for this very reason. Despite the fact that only minimal screening has been provided for the closed local authority landfill, it can in no way be said to 'fundamentally change the profiles of the hillside'. We would contend that in a scenario where a new development is specifically designed so as to minimise visual impact from the south, such a change in hillside profile is even less likely.

To re-iterate, the proposed development is designed to reduce visual impact in a number of specific ways as follows:

- The development maximises the existing screening value of topography and vegetation – retaining all boundary vegetation through the life of the project, or providing for replacement of screening value as appropriate.
- The provision of significant additional effective screening buffer, surrounding the landfill footprint, which will be planted prior to the commencement of landfilling. See Figure 4-10-1.
- The landfill is to be phased in a south to north progression for the very reason that this will facilitate the construction of a finished face along the southern aspect at the outset. This face once constructed will be seeded and planted to integrate with the surrounding planting (See Figure 4.10.1) and will provide immediate and progressive screening to subsequent more northerly phases of the landfill.
- It is further proposed to progressively cap, soil and seed to rough grassland filled phases of the landfill, and therefore finally

Leading to a strongly screened and integrated site ensuring no adverse visual impact and some positive development in terms of sustainable habitat creation.

4.10.5 Summary

The site offers excellent potential for inherent screening from existing planting and topography and is not visible from the north or west. With establishment of the planting the site will present a strongly planted external view from the south and east. As such, no significant adverse visual impact is expected even at initial stages and no appreciable longer term or permanent impact will arise.

4.11 CULTURAL HERITAGE

4.11.1 Potential Impacts

The development will not impact on any recorded archaeological monuments.

Although there is no visible evidence of medieval and prehistoric activity within the site to be developed there is a likelihood that some such activity will be encountered, as the development will require significant ground disturbance over a wide area. Any potential archaeology is likely to reflect low intensity activity of limited extent. For example, *fulachta fiadha* have been recorded in the vicinity (see section 2.11).

4.11.2 Proposed Mitigation Measures

Although the proposed development does not impact on any known archaeological sites or monuments, there is a possibility that previously unrecorded material or finds will be encountered during ground disturbance associated with this development. A programme of archaeological assessment will be undertaken as follows:

- The site of a farmhouse is indicated on the 1st edition O.S. 6" map (Fig. 2.11.3). Disturbance of this site will be avoided, if possible. Otherwise, archaeological testing (by a suitably qualified archaeologist(s), under licence from Dúchas), will be undertaken to establish any archaeological significance of the deposits.
- Monitoring (by a suitably qualified archaeologist(s), under licence from Dúchas) will be undertaken during the ground disturbance phases of the development.
- If archaeological features or material are uncovered, during the course of the construction, works will cease immediately, and Dúchas will be informed. Time will be allowed for a suitably qualified archaeologist(s) to inspect and assess any such material.
- If it is established that archaeologically significant material is present, full archaeological excavation and recording will be undertaken.
- Adequate financial and logistical provision will be made for the any such archaeological excavation, related post excavation, testing and/or conservation work and for publication of the results.

4.12 MATERIAL ASSETS

4.12.1 Potential Impacts

4.12.1.1 Housing

The history of poorly designed and poorly operated landfills in Ireland has led to a great deal of concern over the impact of landfills on property prices. However, the tremendous improvement in the design, operation and management of EPA licensed facilities that has occurred since the introduction of the Waste Management Act, 1996 has greatly reduced any impact of landfilling beyond the site boundaries. Critically also with greenfield sites such as that proposed for Ballyguyroe it has been possible to effect mitigation measures into the design of the facility to ensure that the landfill is readily incorporated into the local landscape character.

The great improvement in the design and management of landfill sites has been recognised in An Bord Pleanála decisions granting permission for landfills in counties Meath (2002) and Louth (2003) similar to that now being proposed at Ballyguyroe. The Inspectors reports for both facilities agree that any potential impact on property values in the vicinity of the developments would be likely to be short term in nature only.

The Inspectors' conclusions were predicated upon the landfills being operated in accordance with best practice and in compliance with the terms and conditions of the operating licences. *greenstar* is committed to operating the Ballyguyroe landfill to the highest environmental standards and in full compliance with the operating licence to be issued by the EPA.

4.12.1.2 Tourism

The results of the tourism search, discussed in Section 2.12.2, found that the Ballyguyroe site is located in a region rich in history and natural beauty. However, the proposed landfill itself is in an area removed from tourist sites.

The scenic route running from Shanballymore to Kilfinnane and largely following the L1329 passes the development site to the west at a distance of some 550m. The scenic views along this route are preserved by the forest screen located between the scenic route and the development site.

The gently sloping topography and the relatively low mound proposed for the landfill will make it very difficult to detect this development from any other tourist sites in the region.

Traffic to and from the landfill will be directly from the Glenosheen–Clogher Cross road. Many of the tourists travelling to the Ballyhoura Mountain Reserve from the south currently use this route. Section 4.10 of this EIS has concluded that the visual impact of the development on the road is insignificant.

4.12.1.3 Infrastructure

Section 2.12.3 of the EIS lists a number of infrastructural features in the vicinity of the site. Any impacts on the National and Regional roads in the area are assessed in Section 4.9.

A positive impact of the proposed development will be the provision of a modern waste disposal facility in the region for the disposal of residual treated waste. It is envisaged that waste will have passed through recovery and recycling facilities prior to delivery at Ballyguyroe in keeping with National and European policies. The landfill will have a major role in servicing the needs of householders, industry and commerce in the region.

4.12.1.4 Agriculture

One landowner is directly affected by the development which will involve the removal of 30 hectares of poor quality grazing land. The loss of 30 ha of poor quality farmland is not considered a significant impact in the broader context of agriculture in the North Cork region. One of the options for restoration of the site is agricultural use, hence the loss of pasture land may only be for approximately 12 years.

There has been no negative effects on the agriculture of the development site from the adjacent local authority landfill. Similarly, no negative effects on surrounding agriculture are expected from the proposed landfill which will be managed to the highest environmental.

4.12.1.5 Silviculture

There are no visible impacts on the surrounding forestry land from the closed local authority landfill and none are expected from the proposed site.

4.12.1.6 Other Potential Impacts

Buffer Zone

The site is surrounded by:-

- a closed landfill to the north;
- commercial forestry to the west;
- poor farmland to the south;
- scrubland to the east.

With the exception of the northern boundary, a minimum of 100m is being maintained between the area to be landfilled and the site boundary. In the case of the northern boundary the off-set is 50m. In summary, the main reason for providing these distances between the landfill footprint and the site boundary is to allow the provision of site infrastructure, monitoring facilities and screen planting. There is also a reserved area set aside which will include activities such as leachate storage, surface water treatment, waste inspection, waste quarantine, wheel washing, vehicle weighing, administration, etc. The potential impacts from each of these activities on the local environment have all been fully

addressed elsewhere in the EIS. No additional reserved areas are considered necessary to further protect the environment.

The Environmental Protection Agency (EPA) Landfill Manual on Site Selection (Draft) gives guidance with respect to buffer zone dimensions. A minimum distance of 250m is recommended between the area to be landfilled and any occupied dwelling at new landfills. The proposed development complies with this recommendation. There is no guidance given with respect to forestry, the closed, adjacent local authority landfill or farmland. The choice of 100m from the site boundary is pragmatic in that it facilitates:-

- construction of ancillary infrastructure to the west and south;
- maintenance of the existing vegetation to the east;
- construction of a surface water cut-off drain to the north.

None of the surrounding land will be impacted by the proposed development. The housing density in the area is low and the nearest houses are well removed from the site (see Section 2.8.1). There will be no significant impacts from site activities on the local residents. For these reasons the buffer zones are considered sufficient for this particular site.

The inactive areas of the site that will be used solely for woodland planting and environmental monitoring are highlighted on Figure 4.12.1 and the new location for the lagoon and gas flare are also shown on this Figure.

Use of Natural Resources

Raw materials likely to be used in the construction of the development are detailed in Table 3.1.2 in Section 3. The weekly cover and the cap drainage layer are not likely to contain significant volumes of virgin stone products. It is currently planned to construct these layers from recycled construction and demolition waste.

The 80,000 m³ granular material required for the basal drainage layer will be imported to the site and will most likely be sourced from a sand and gravel quarry. Similarly, the road base construction material is likely to be sourced from quarries servicing the region. Use of these aggregates is considered a minor indirect negative impact of the development.

4.12.2 Proposed Mitigation Measures

4.12.2.1 Housing

Mitigation against the possibility of falling property prices at Ballyguyroe will be primarily in the form of good design and operation of the proposed landfill. The site has been designed and will be operated in accordance with the EU Landfill Directive (1999/31/EC) and the EPA Manuals on landfill design, operation and monitoring. The site will be operated under licence from the EPA and the conditions of this licence will ensure a high level of design and operational practices.



greenstar
setting the standard

C o . L i m e r i c k

C o . C o r k



Farahy River

Existing
Council
Landfill

Surface Water Access
Road and Service Ducts

Clay
Embankment

Gas Flare
Location

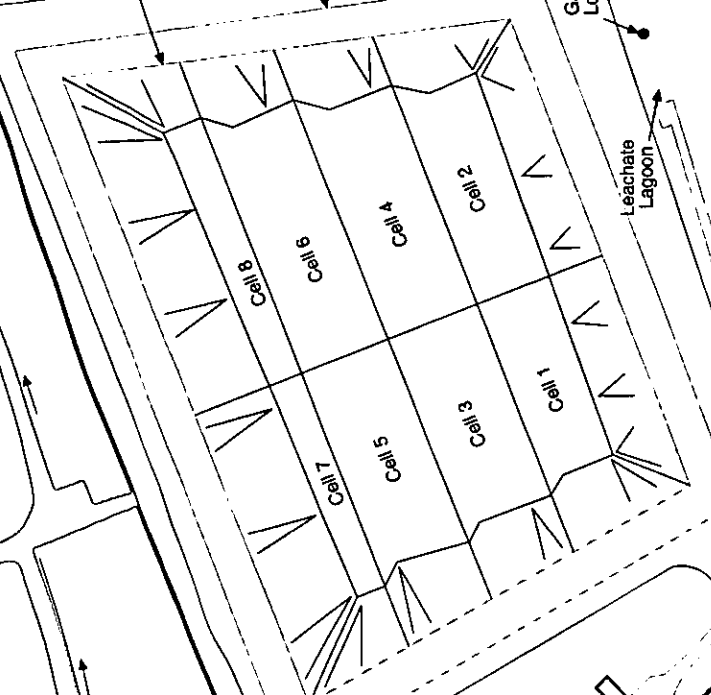
Area Reserved for Future
Development of Reed Beds

Leachate
Lagoon

Storm Water
Retention Pond

Administration
Complex

Proposed
Entrance



LEGEND

- Site Boundary
- - - County Boundary
- Inactive Areas



Ballyguyroe Residual Landfill Project
Inactive Areas of Site

Job No. CD02336
Date: May 2003

Figure 4.12.1

White
Young
Green

A second form of mitigation against falling property prices will be in the form of financial re-investment by the landfill operator into the local area. Investment into the local area will be aimed at enhancing its visual, environmental and cultural assets.

greenstar intend to establish a Community Liaison Committee (CLC) consisting of representatives from the company and the local community. The purpose of the committee will be to identify appropriate environmental, cultural and educational community projects which will mitigate the impact of the landfill facility on the local community in accordance with Government policy as set out in 'Changing Our Ways' (DoELG, 1998) and will be financed by *greenstar*.

4.12.2.2 Tourism

Mitigation against impacts on tourists and tourism will be in the form of good design and operation of the facility. Visual screening and control of litter, vermin, birds and odours will all assist in preventing any impacts on tourism.

4.12.2.3 Infrastructure

There are no mitigation measures necessary for infrastructure as the proposed development provides a positive impact with the provision of a modern waste disposal facility.

4.12.2.4 Agriculture

The proposed *greenstar* landfill will be a modern integrated landfill and the site will operate in compliance at all times within the emission limits set by the EPA in the operating licence for the landfill. The strict compliance with these environmental standards ensures that any risk to agriculture in the vicinity of the landfill is minimised to an insignificant level.

4.12.2.5 Silviculture

There will be no impact on silviculture from the proposed development and therefore no mitigation measures are proposed.

4.12.3 Likely Significant Effects

Considering these mitigation measures outlined above and the presence of the closed local authority landfill adjacent to the site the likely negative effects on the value of property closest to the site are expected to be minor and temporary and effects on property values in the wider surrounding area are expected to be insignificant.

In summary, the likely effect of the proposed landfill development on tourism, infrastructure, agriculture and silviculture is expected to be insignificant.

4.13 CUMULATIVE IMPACTS OF THE PROPOSED LANDFILL AND THE ADJOINING CLOSED LOCAL AUTHORITY LANDFILL

The nearby local authority landfill closed in 2001 and is now capped and restored.

Although now closed and capped the adjoining local authority landfill is still obliged to comply with the terms and conditions of the licence (at present under review) under which it formerly operated. These conditions ensure that the site does not have a significant impact on the surrounding environment. Similarly the *greenstar* landfill will be required to operate under an equally stringent set of environmental standards. Therefore, as both sites will comply with their respective licences their cumulative impact on the receiving environment will have to fall within standards acceptable to the EPA.

Specifically as the local authority site is now closed there should be no cumulative effects from the range of nuisances outlined in Section 3.3 of this EIS. However, the ongoing maintenance of the local authority site will involve the flaring of the landfill gas and the off site disposal of the leachate. Both of these activities will be controlled by the EPA licence that will issue following the review in progress at present. The EPA will naturally include for the planned emissions from the *greenstar* facility and will set the emission limit values to ensure that the cumulative impacts from these activities on the local environment are within acceptable limits.

In these circumstances the anticipated cumulative effects of the *greenstar* and the now closed local authority landfill will be insignificant.

4.14 INTERACTIONS

The European Communities Environmental Impact Assessment (Amendment) Regulations, 1998, demand that an EIS describes the impacts and likely significant effects on the interaction between any of the following environmental media :

- human beings
- flora
- fauna
- soil
- water
- air
- climate
- the landscape

Table 4.13.1 highlights impacts and effects on interactions between these media and identifies the sections of the EIS where the interactions are addressed. It should be noted that in certain cases there are obvious interactions between environmental media, e.g. climate and flora, however, if the development does not have the potential to impact or affect the interaction then that interaction is not highlighted in Table 4.13.1. The identified interactions are as follows:

4.13.1 Human Beings / Fauna

Landfills can attract unwanted fauna such as rats, flies and birds (particularly gulls and crows). These species can impact on humans from both a health and a nuisance point of view. Mitigation measures to protect against these potential impacts are proposed in Sections 3.3, 4.7 and 4.8, after which the effects on the local community are expected to be insignificant.

4.13.2 Human Beings / Water

Contamination of surface water at the site has the potential to impact on the water quality in the Farahy river and its tributaries. This impact could potentially affect the amenity value of these watercourses and this would affect human beings. Contamination of groundwater beneath the site could impact on local domestic wells, would restrict any future use of the underlying strata for water supplies and would also have the potential to impact on the water quality in the Farahy River. Mitigation measures to ameliorate these potential impacts are proposed in Sections 4.5 and 4.6, after which the effects are expected to be insignificant.

4.13.3 Human Beings / Air

Dust emissions, gas emissions, noise emissions and odours from the facility have the potential to impact on human beings in the vicinity of the site. Impacts from dust, gas and odours are addressed in Section 4.2 whereas noise impacts on humans are addressed in Section 4.3. Mitigation measures are proposed

for each of these potential impacts and the likely significant effects on the local population are expected to be minor.

4.13.4 Human Beings / The Landscape

The development has the potential to affect human beings in the form of visual intrusion. Mitigation measures such as woodland planting are proposed in Section 4.10, after which the effects are expected to be insignificant.

4.13.5 Water / Flora and Fauna

Contamination of surface water or shallow groundwater at the site has the potential to impact on the water quality in the streams and river downgradient of the site. This impact could potentially affect the aquatic life in these water courses. Mitigation measures to ameliorate this potential impact are proposed in Section 4.5 and Section 4.7, after which the effects are expected to be insignificant.

4.13.6 Water / Soil

Soil beneath the site can act as a pathway for contaminants reaching both the groundwater and the surface water. Contamination of the soil can therefore lead to contamination of the water environment. Mitigation measures to protect against this potential impact are proposed in Section 4.6 and include the leachate containment system described in Section 3.1.3.

Table 4.14.1 : Impacts and Effects on Interactions between Environmental Media

	Human Beings	Flora	Fauna	Soil	Water	Air	Climate	The Landscape
Human Beings								
Flora	none							
Fauna	Sect. 4.7/4.8	none						
Soil	none	none	none					
Water	Sect. 4.5/4.6	Section 4.7	Section 4.7	Section 4.6				
Air	Sect. 4.2/4.3	none	none	none	none			
Climate	none	none	none	none	none	none		
The Landscape	Section 4.10	Section 4.7	Section 4.7	none	none	none	none	

Note: This Table identifies the Section of the EIS where impacts or effects on interactions between environmental media are discussed.

Any interactions which will not be impacted upon or affected by the facility are not described in the EIS.

5. REFERENCES

General

Cork County Council, 2003, Cork County Development Plan.

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