



Environmental

Licensing Unit,
Office of Licensing and Guidance,
Environmental Protection Agency,
Johnstown Castle Estate,
County Wexford.

- Environmental Services
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- Hydrogeology and Ecology
- Contaminated Land
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- Noise and Air Quality
- GIS
- Hydrology
- Water and Wastewater Services
- Health and Safety
- Sustainable Management
- Energy Management.



23rd November 2006.

**Re: Waste Licence Application W0231-01 Fingal Landfill –
Submission on Behalf of the Nevitt Lusk Action Group**

Dear Sir/Madam,

Following the recent Oral Hearing on the proposed Fingal Landfill, the following submission is being made on behalf of the Nevitt Lusk Action Group (NLAG). This submission has been compiled on the basis of data presented to An Bord Pleanala during the Oral Hearing by Fingal County Council and their team of consultants. The NLAG did not have an opportunity to review this data as part of their previous submission as it was not included in the EIS.

Items 1 and 2 below are further to data that was submitted by Fingal County Council during the hearing. Item 3 is relating to information submitted by NLAG to the inspector during the hearing following on from discussions on the source protection area of various wells downgradient of the proposed landfill facility.



Item 1 - Geological Cross Section A-A' and B-B'

Appendix A1.1 (of Technical Appendix H & I) of the EIS presented two geological cross sections of the site displayed on an A4 page. There are a number of issues with these cross sections which render them inadequate for assessing the suitability of the site for a landfill:

- The horizontal scale of 1:25,000 means that 1km on the ground is represented on the page by just 0.04m. Such a scale is considered inadequate for representing the complex geological and hydrogeological conditions underlying the site. A horizontal scale of 1:5,000 or 1:10,000 would be more suitable.
- A total of two cross sections representing the subsurface at a 200 hectare site is completely insufficient. Given the complexity of the subsurface a minimum of six cross sections should have been presented.
- The lines of section across the site selected for inclusion in the EIS have been poorly selected. The north-south trending Section A-A' represents the western extent of the landfill footprint. In order to have a representative north south orientated picture of the subsurface underlying the landfill footprint, a line of section should have been along the western extent, through the centre and along the eastern extent of the footprint. Similarly, the west-east trending Section B'-B' only represents the southern portion of the landfill footprint. Several lines of section should have been produced representing the northern, central and southern portions of the site in an west-east orientation.
- Therefore, WYG suggest that the cross section data presented in the original EIS is not sufficient to make an informed decision on the suitability of this site for a landfill.

On Day 5 of the Oral Hearing (Friday 20th October) hydrogeological consultant for Fingal County Council, RPS Consulting Engineers, introduced a revised cross section displayed on an A3 page. The revised version of the cross section varies significantly from the original submitted in the EIS. The revised cross section clearly shows the landfill footprint overlying gravel. This directly contradicts the assertion in the EIS (Volume 5 Technical Appendices H & I Page 15) which states;

*"Sand and gravel deposits vary across the study area with thicknesses ranging from absent to 10m. Significant gravel deposits were present beneath the glacial till to the north of the study area (13m at HR1a) and to the east (17m at HR9). **These areas lie outside the landfill footprint**".*

The cross sections submitted by Fingal County Council themselves renders this statement from the EIS false and incorrect. Furthermore, the inconsistencies between the cross sections highlights the inaccuracies in the assessment carried out by Fingal County Councils consultants.

Item 2 – Bedrock Geology and Extent of Gravel Deposits Maps introduced during the Oral Hearing

On Tuesday 24th October, Day 6 of the Oral Hearing, Fingal County Councils consultants introduced three contour maps that had not been included in the original EIS. These contour maps are as follows:

1. Proposed Fingal Landfill Extent of Gravel Deposits underlying low-permeability Superficial Deposits (overlying rockhead)
 2. Proposed Fingal Landfill Bedrock Geology and Rock Level (mod) Profile
 3. Proposed Fingal Landfill Clay Thickness and Landfill Cut Contours
- Figure: Proposed Fingal Landfill Extent of Gravel Deposits underlying low-permeability Superficial Deposits (overlying rockhead)

This figure clearly demonstrates that almost the full extent of the landfill footprint is underlain by gravel. Again, this directly contradicts the statement in the EIS that gravel areas “lie outside the landfill footprint”.

This figure is considered to be of limited use as it displays the thickness of the gravel layer underlying the landfill footprint rather than the depth below the surface that this gravel layer occurs. A figure showing the depth below the surface to gravel would clearly show that at the location of Borehole AGB4, in the mid-west section of the footprint, gravel is recorded at just 0.7m depth below the surface. The gravel at this location is greater than 3.8m thick. The exact thickness of gravel is unknown as the borehole was finished at 4.5m below ground level (bGL) before it emerged from the gravel into clay or bedrock. Borehole ASA3, within the landfill footprint, recorded sand at 4.1m bGL while GS10, on the southern boundary of the footprint, recorded gravel at just 4.5m depth.

- Figure: Proposed Fingal Landfill Bedrock Geology and Rock Level (mod) Profile

This figure highlights the lack of site specific data that contributed to the conceptual model of the geology presented in the EIS. The lithology distribution and the position of the north-south trending fault are based on information published by the Geological Survey of Ireland. The boreholes drilled on site have not been used to confirm the positions of the boundaries between the three limestone formations that the GSI indicates underlie the footprint. In addition, the drilling information and the geophysical surveys were not used to refine the position of the north south trending fault. Several ‘possible faults’ identified by the geophysical investigation were not considered in the EIS and no investigations appear to have been undertaken to confirm their presence or to establish their extent or significance.

This figure indicates that the top of the bedrock is closest to the surface in the west of the landfill footprint and again just to the north of the footprint. It is unclear whether or not this subsurface topography influences the groundwater flow pattern within the area. For example, it is unclear from the EIS if this topographic high within the bedrock acts as a groundwater divide with groundwater moving southeast on the southern side of the bedrock feature and moving northeast to the north of the bedrock feature. It is unfortunate that this information was not included in the EIS and that it was not considered in producing the groundwater contour maps.

Item 3 – Source Protection Zones of private wells downgradient of the proposed landfill

A previous submission on behalf of the NLAG highlighted a number of private wells downgradient of the proposed landfill facility that were not duly considered in the EIS. In particular, two wells considered at greatest risk are as follows:

User Name	Abstraction (m³/d)	Aquifer	Use
Thomas Kerrigan	1962	Bedrock	Vegetable processing plant
Thomas Moore	654	Bedrock	Vegetable processing plant

The businesses operated by Mr. Moore and Mr. Kerrigan rely on the significant quantities of good quality groundwater abstracted from their wells.

The definition of a groundwater source, according to the DoELG/EPA/GSI (1999), is “a source of water supply which depends on groundwater, usually a well (dug well or borehole) or a spring, occasionally an infiltration gallery”. The DoELG/EPA/GSI goes on to say that such “groundwater sources, particularly public, group scheme and industrial supplies, are of critical importance in many regions. Consequently, the objective of source protection zones is to provide protection by placing tighter controls on activities within all or part of the zone of contribution (ZOC) of the source”. This definition of a source applies to Kerrigans and Moores Well, both of which are used for industrial purposes.

The aim of a source protection plan is to protect the quality of the groundwater source from potentially polluting activities in the general area and to protect the wider aquifer itself through land use management and planning. A source protection plan delineates the source protection zones to a particular source as follows:

- The inner protection zone, represented by the 100 day time of travel zone, is intended to protect the source against microbial contamination.
- The outer protection zone represents the entire zone of contribution (ZOC) to the source i.e. the entire geographical area from which the source abstracts groundwater.



The EIS did not take account of the zones of contribution to these wells. In order to demonstrate the likely extent of the zone of contribution to these wells, the source protection areas were delineated provisionally using the data available in the EIS. Although these ZOC's are not definitive and have been determined using a limited data set, they are a good representation of the area that will be contributing groundwater to these sources. They have been delineated using a recharge rate of 57mm/yr (as per EIS) and using the abstraction rates as indicated by the well owners. Kerrigans Well is reported to have an available yield of 1962m³/d and Moores Well 654m³/d. Using the recharge equation, the geographical areas required to maintain these abstractions based on 57mm/yr recharge are displayed on Figure 1 attached. The area for Kerrigans Well is some 3925351m² and some 4187894m² for Moores Well.

A zone of contribution to a source will naturally extend in an upgradient direction away from that source. Therefore, the ZOC's to both wells extend upgradient and towards the location of the proposed landfill and as such the ZOC's intersect the landfill footprint area. This is significant in that the groundwater protection responses for landfills within a source protection area are completely different to the response outside a ZOC.

It is therefore recommended that the EIS delineate the source protection areas for the wells considered to be at risk of becoming contaminated from the proposed landfill. The EIS should then be revised based on the DoELG/EPA GSI (1999) Groundwater Protection Response Matrix for Landfills to establish the suitability of the site for a landfill. This matrix is attached at the end of this submission for ease of reference. Should the response category change to either R3¹ or R4 then the suitability of the site for a landfill must be reconsidered.

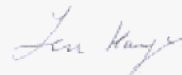
The NLAG would be grateful if the above points were considered by the Agency. The items raised above are considered of fundamental importance in assessing the suitability of this site for the proposed landfill facility.

Yours sincerely,

White Young Green Environmental (Ireland) Ltd.



Karen-Lee Ibbotson
Principal Hydrogeologist



Teri Hayes
Director

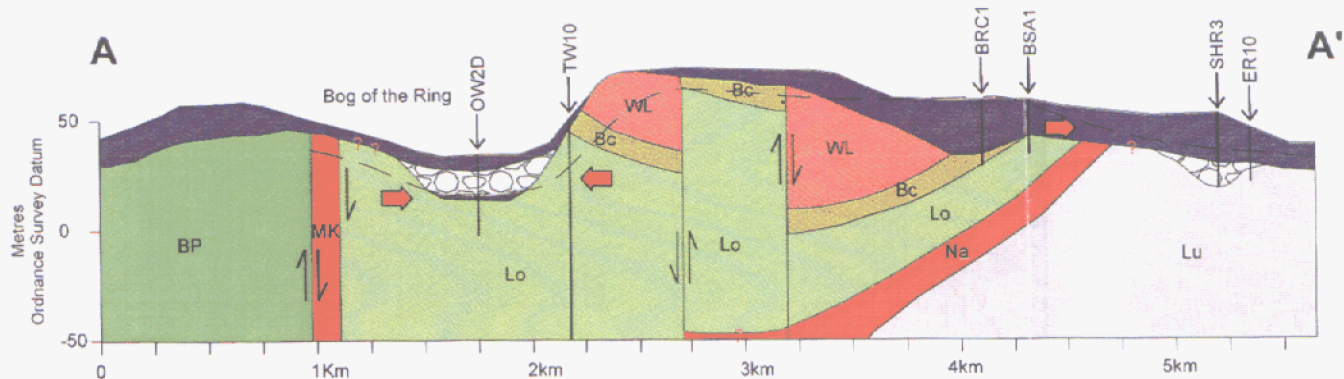


Attachments:

Data submitted by Fingal County Council during Oral
Hearing

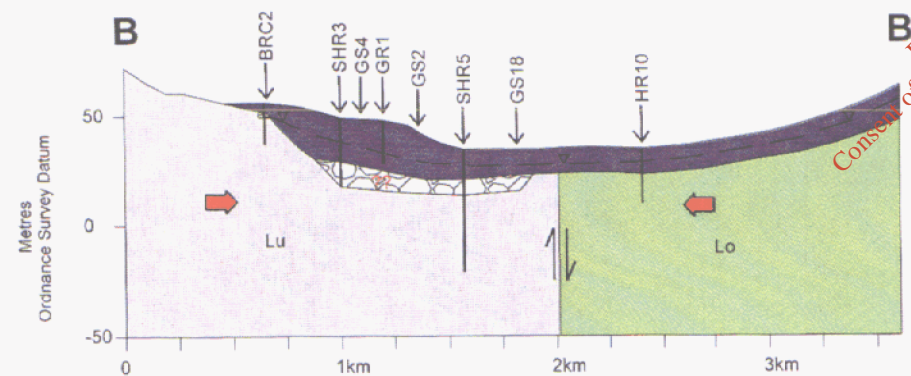
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GEOLOGICAL CROSS SECTION A-A'

Horizontal Scale 1/25,000
Vertical Scale 1/2,500



GEOLOGICAL CROSS SECTION B-B'

Horizontal Scale 1/25,000
Vertical Scale 1/2,500

LEGEND

Bedrock Formations

- WL Walshestown
- Bc Balrickard
- Lo Loughshinny
- Na Naul
- Lu Lucan
- MK Mudbank Limestone
- BP Belcamp


Subsoils

- Clay
- Gravel
- Fault Throw
- Direction of Groundwater Flow
- Groundwater Table/
Piezometric Surface (Bedrock)

NOTES

1. This drawing is the property of RPS Consulting Engineers & is a confidential document and must not be copied, used, or its content divulged without prior written consent.
2. All Levels refer to Ordnance Survey Datum, Mean Head.
3. DO NOT SCALE, use figured dimensions only, if in doubt ask.
4. Source GSI (1996) Geology of Meath Sheet 13.

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A01 On 16 Issue For Approval SH			
No.	Date	Amendment / Issue	App
 Fingal County Council <small>Comhairle Contae Fingal</small>			

RPS Consulting Engineers

RPS Consulting Engineers, West Pier Business Campus,
Dun Laoghaire, Co. Dublin, Ireland.
T: +353 1 288 4498 - F: +353 1 283 5676
E: ireland@rpsgroup.com W: www.rpsgroup.com/ireland

Project:
FINGAL LANDFILL PROJECT

Title:
GEOLOGICAL CROSS SECTIONS A-A' & B-B'

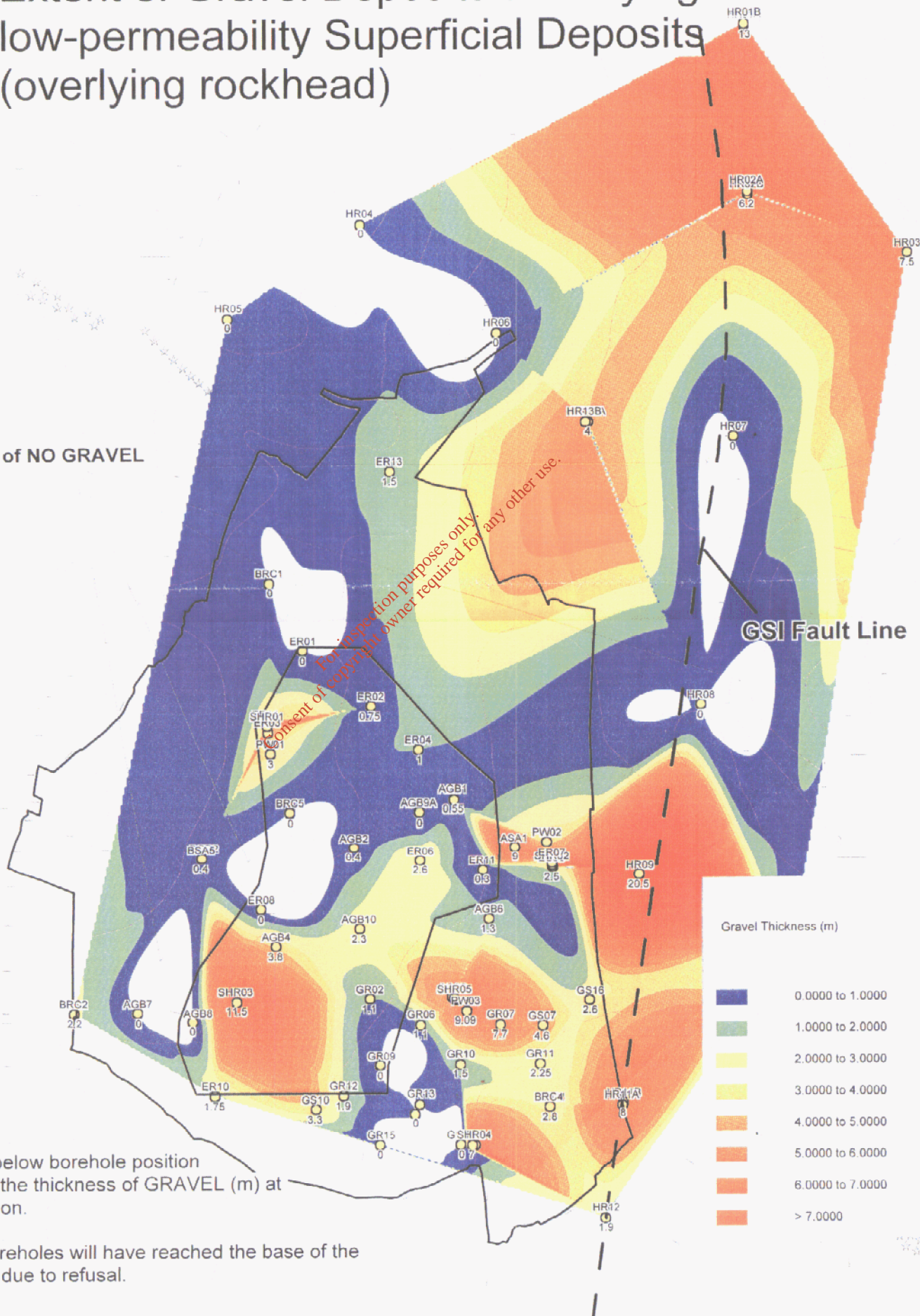
Drawn by: PH	Job No: MDR2009
Checked by: FC	File No: MDR2009K0002A01
Approved by: SH	Fig. No:
Scale: 1:25,000 @ A3	Appendix D 1.2
Date: April 2006	

Proposed Fingal Landfill

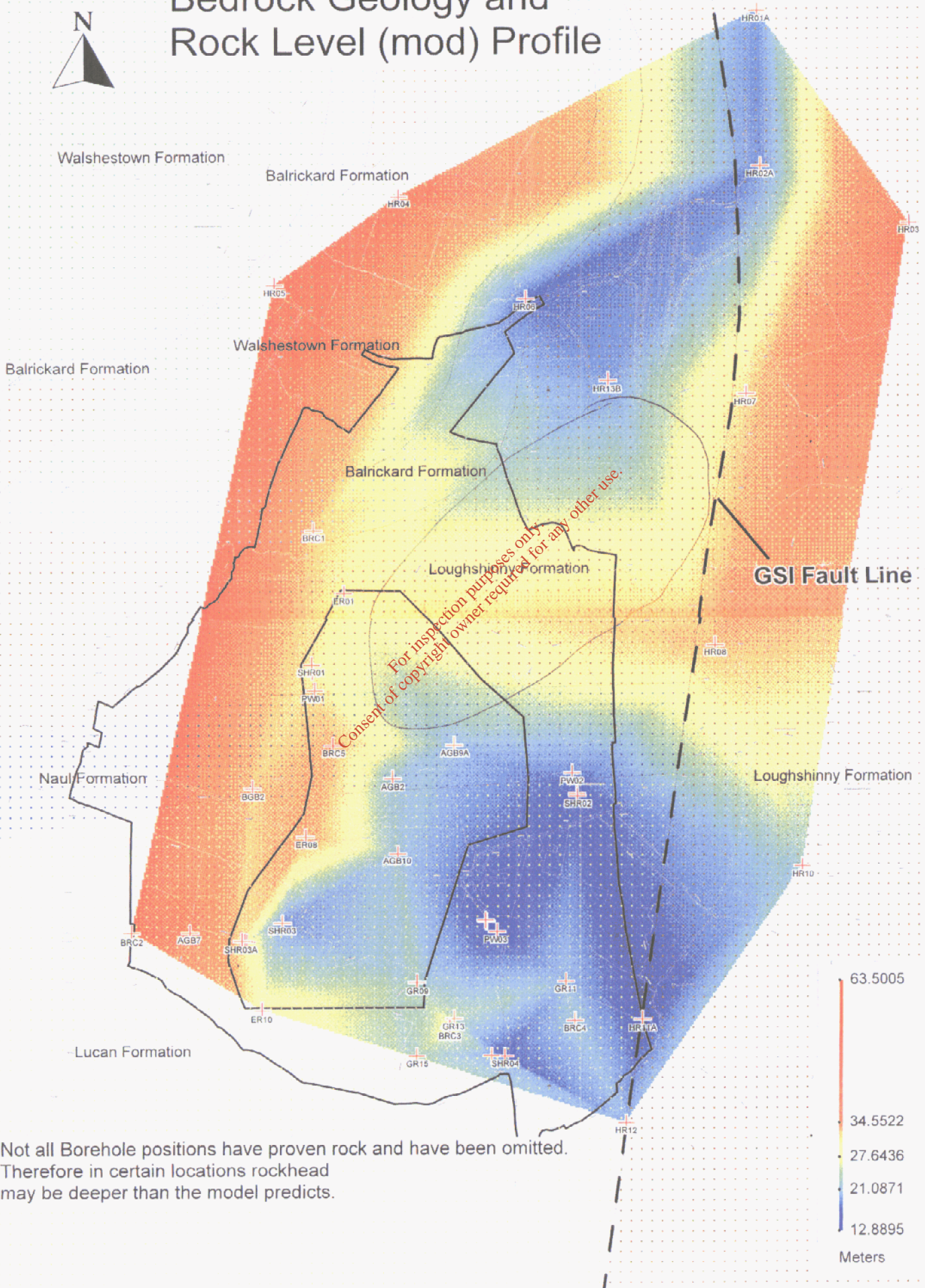
Extent of Gravel Deposits underlying low-permeability Superficial Deposits (overlying rockhead)



Areas of NO GRAVEL



Proposed Fingal Landfill Bedrock Geology and Rock Level (mod) Profile



Not all Borehole positions have proven rock and have been omitted. Therefore in certain locations rockhead may be deeper than the model predicts.

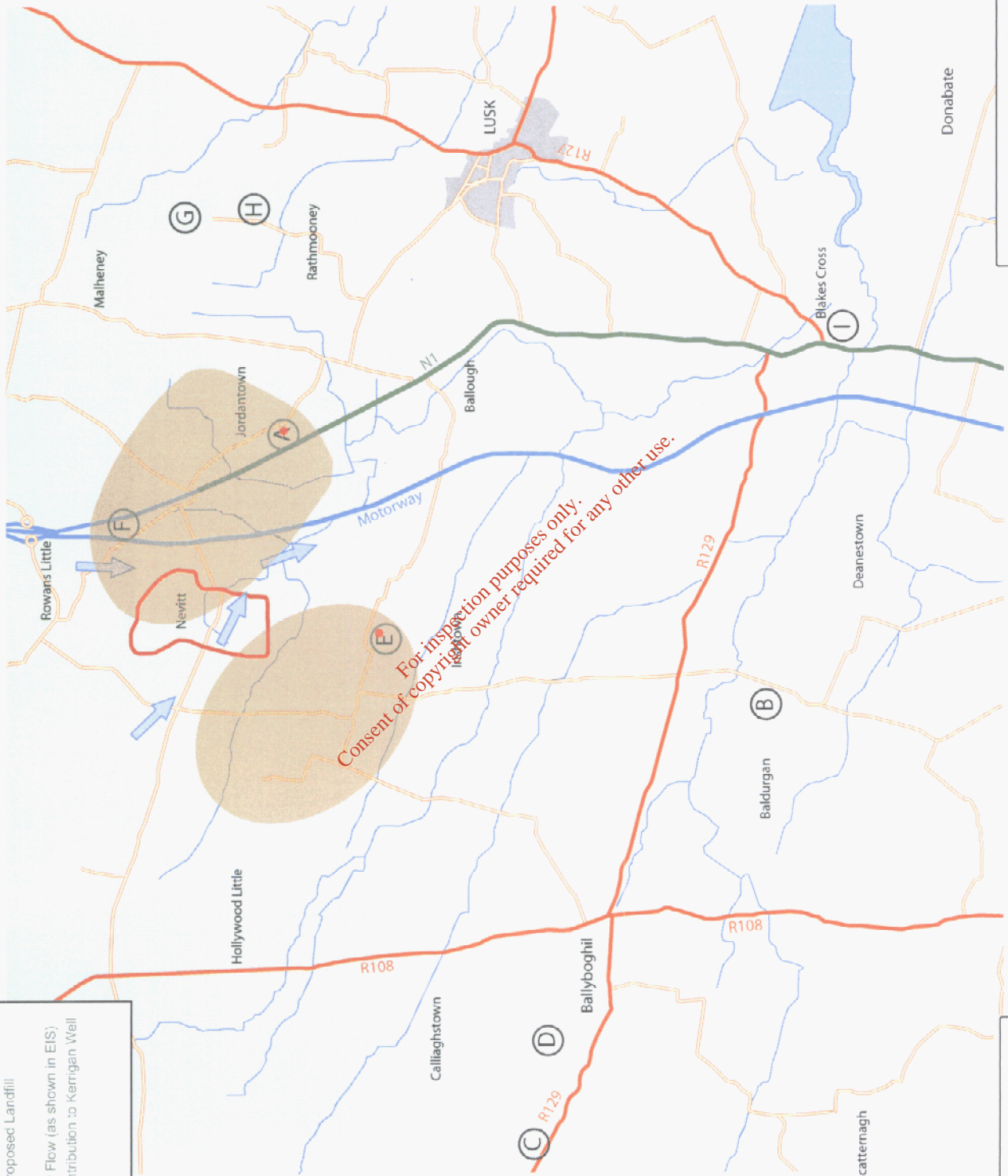
**Preliminary Source Protection Zones for Kerrigans and
Moore's Well**

and

Groundwater Protection Response Matrix for Landfills

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LEGEND

- Approximate outline of Proposed Landfill
- Well Locations
- Direction of Groundwater Flow (as shown in EIS)
- Preliminary Zones of Contribution to Kerrigan Well (E) & Moores Well (A)



NOTE: Drawing is for diagrammatic purposes only. No measurements to be taken.

Fingal Landfill EIS - NLAG Preliminary Well Survey	
Figure No. 1	Date Nov. 2006
Job No. CE05355	Finalised By - KLI

Groundwater Protection Responses for Landfills – Summary

Response Matrix for Landfills

VULNERABILITY RATING	SOURCE PROTECTION AREA		RESOURCE PROTECTION Aquifer Category					
			Regionally Important (R)		Locally Important (L)		Poor Aquifers (P)	
	Inner	Outer	Rk	Rf/Rg	Lm/Lg	Ll	Pl	Pu
Extreme (E)	R4	R4	R4	R4	R3 ²	R2 ²	R2 ²	R2 ¹
High (H)	R4	R4	R4	R4	R3 ¹	R2 ¹	R2 ¹	R1
Moderate (M)	R4	R4	R4	R3 ¹	R2 ²	R2 ¹	R2 ¹	R1
Low (L)	R4	R3 ¹	R3 ¹	R3 ¹	R1	R1	R1	R1

In all cases standards prescribed in the *EPA Landfill Site Design Manual (EPA,1999)* or conditions of a waste licence will apply.

R1 Acceptable subject to guidance in the EPA Landfill Design Manual or conditions of a waste licence.

R2¹ Acceptable subject to guidance outlined in the EPA Landfill Design Manual or conditions of a waste licence.

- Special attention should be given to checking for the presence of high permeability zones. If such zones are present then the landfill should only be allowed if it can be proven that the risk of leachate movement to these zones is insignificant. Special attention must be given to existing wells down-gradient of the site and to the projected future development of the aquifer.

R2² Acceptable subject to guidance outlined in the EPA Landfill Design Manual or conditions of a waste licence.

- Special attention should be given to checking for the presence of high permeability zones. If such zones are present then the landfill should only be allowed if it can be proven that the risk of leachate movement to these zones is insignificant. Special attention must be given to existing wells down-gradient of the site and to the projected future development of the aquifer.
- Groundwater control measures such as cut-off walls or interceptor drains may be necessary to control high water table or the head of leachate may be required to be maintained at a level lower than the water table depending on site conditions.

R3¹ Not generally acceptable, unless it can be shown that:

- the groundwater in the aquifer is confined; or
- there will be no significant impact on the groundwater; and
- it is not practicable to find a site in a lower risk area.

R3² Not generally acceptable, unless it can be shown that:

- there is a minimum consistent thickness of 3 metres of low permeability subsoil present;
- there will be no significant impact on the groundwater; and
- it is not practicable to find a site in a lower risk area.

R4 Not acceptable.

- This guidance is for the siting of landfills for non-hazardous wastes.
- New landfills should not generally be developed on regionally important aquifers.
- The siting, design, operation and monitoring of landfills must comply with the guidelines outlined in the EPA's Landfill manuals except where facilities hold a waste licence issued by the EPA.
- It is recommended that all landfills be located in, or as near as possible to, the zone in the bottom right hand corner of the matrix.
- Special attention should be given to checking for the presence of more permeable zones, such as faults, particularly in fractured bedrock.