Archive - A16.

Environment & Resource Management Ltd

No. 3 Tara Court,
Dublin Road, Naas, Co. Kildare
Tel: 045 – 874411
Fax: 045 – 874549
E-mail: info@erml.biz
www.erml.biz

Mr. Malcolm Doak,
Inspector,
Office of Licensing & Guidance,
Environmental Protection Agency,
Headquarters, PO Box 3000,
Johnstown Castle Estate,
Co. Wexford.

14 January 2005

Project No. 03.116

Re: Response to Article 16 Notice
Waste Licence Application Reference No. 204-1

Dear Mr. Doak,

Please find attached our report detailing our response to the Article 16(1) Notice for Further Information, Particulars and Evidence, dated 14 December 2004. The report includes five revised Figures from the March 2004 EIS, which are shown in Table format in the Table of Contents of the report.

Revised copies of the Non-Technical Summaries for both the March 2004 EIS and March 2004 WLA are also attached.

All documentation is supplied in the form of 3 No. hard copies and 11 No. CD-ROM's (files in PDF format)

Should you require any further information, please do not hesitate to contact me.

Yours sincerely

Mr. Geoff Parker M.E.Sc., M.I.E.I., M.I.W.M

BROWNFIELD RESTORATION IRELAND LTD.

PROPOSED INTEGRATED WASTE MANAGEMENT FACILITY

WHITESTOWN LOWER
CO. WICKLOW

WASTE LICENCE APPLICATION
(APPLICATION REGISTER NO. 204-1)

RESPONSE TO ARTICLE 16 (1) NOTICE

Prepared By:
Environment & Resource Management Ltd.
No. 3 Tara Court,
Naas,
Co. Kildare.

January 2005

TABLE OF CONTENTS

LIST OF TABLES

LIST OF APPENDICES

LIST OF PHOTOVIEWS

West Spring	South Spring
P_0 (West Spring) P_{15} (West Spring) P_{30} (West Spring) P_{45} (West Spring) P_{100} (West Spring) P_{200} (West Spring)	DC_0 (South Spring) DC_{50} (South Spring) DC_{100} (South Spring) DC_{150} (South Spring) DC_{170} (South Spring) DC_{200} (South Spring) DC_{300} (South Spring)

LIST OF FIGURES

Figure No.	Description	Scale	Revision
Figure 3.7.1	Quaternary Geology	1:10,000 (A3)	B
Figure 3.7.2	Bedrock Geology And Aquifer Classification	1:10,000 (A4)	B
Figure 3.7.4	Groundwater Map And Cross Section Locations	1:4,000 (A3)	B
Figure 3.7.5	Geological Cross Sections	1:1,000	B
Figure 3.7.6	Inferred Hydrogeological Catchment Area Enclosing Site And Influencing Springs	1:10,000 (A3)	B

Brownfield Restoration Ireland Ltd. (BRI)
Proposed Integrated Waste Management Facility
Whitestown Lower, County Wicklow.

EPA Waste Licence Application No. 204-1

Response to Article 16 (1) Notice –
Further Information, Particulars And Evidence

---

1. INTRODUCTION

This report has been prepared to respond to an Article 16 (1) Notice issued by the Environmental Protection Agency (EPA) on 14 December 2004.

2. BEDROCK GEOLOGY AQUIFER CLASSIFICATION

The Geological Survey of Ireland (GSI) has identified two bedrock units beneath the site: Ordovician Metasediments (to the northwest of the site); and Ordovician Volcanics to the southeast of the site. These rock types are shown on Figure 3.7.2, Rev. B attached.

Both rock types are given a provisional aquifer classification **LI**, which is a locally important (**L**) aquifers with bedrock which is moderately productive only in local zones (**LI**).

The GSI letter report containing this information is attached in Appendix 1.

3. OVERBURDEN GEOLOGY AQUIFER CLASSIFICATION

The GSI classify the overburden on the site as GGr: granite sands & gravels, with Alluvium for 100m approximately on either side of the Carrigower River.

The gravel overburden has not been classified as an aquifer by the Groundwater Section, and has not been assigned a vulnerability rating according to the GSI.

A Teagasc Subsoil Map for the Whitestown area, Co. Wicklow was also provided by the GSI (Appendix 1) in December 2004, and shows the areal extent of the gravel overburden underlying the Whitestown site. These gravels are generally bound by Alluvial deposits to the east of the site, and by Sandstone and Shale Tills to the west of the site.

The Quaternary Geology Map for the Whitestown area, presented in the March 2004 Waste Licence Application is attached (Figure 3.7.1, Rev. B).

4. SPRINGS

4.1 West Spring

This spring feature which rises in a minor drainage channel, is located ca. 570 metres to the west of the western boundary of the Whitestown site in an improved grassland area used for agricultural purposes, at an elevation of ca. 167.0mOD. The GSI does not have any records pertaining to this spring. There is no obvious flow from this feature at its immediate source, however the area is quite damp around the spring, and the presence of freshwater vegetation confirms an ongoing source of freshwater feeding this drainage channel. Table 4.1 below includes details of photoviews taken on 23 December 2004, which provide a visual representation of this spring feature and its environs downstream.

Table 4.1: Details of Photoviews Taken at *West Spring* and Environs

Photoview Title	Distance from Spring (metres) Note 1	Direction of Photoview	Description
P_0 *West Spring*	0	Facing east	Damp/overgrown drainage channel
P_{15} *West Spring*	15	Facing east	Damp overgrown drainage channel
P_{30} *West Spring*	30	Facing east	Beginning of obvious stream flow. Freshwater vegetation abundant
P_{45} *West Spring*	45	Facing east	Obvious stream flow. Freshwater vegetation abundant
P_{100} *West Spring*	100	Facing east	Obvious stream flow. Freshwater vegetation abundant
P_{200} *West Spring*	200	Facing east	Stream becomes narrower but flow remains obvious

Note 1: Drawing No. 3.7.4 Rev. B includes details of the location of each Photoview.

The stream runs generally eastwards, following the general topography of the area, towards Whitestown House and on towards the N81. Upon meeting the N81, the stream turns south and flows parallel to the road for

ca. 0.5km (See Figure 3.7.4, Rev. B). As this drainage channel/stream approaches the Whitestown Bridge, it is culverted under the N81, before emerging on the east side of the Bridge. The stream then joins another minor tributary and is again culverted back under the N81, joining the Carrigower River on the western side of Whitestown Bridge.

4.1.1 Hydrogeological Catchment

Based on the surrounding topography and general groundwater flow for the Whitestown area, the groundwater catchment of this spring is likely to lie to the northwest of the spring outflow and up-gradient of the proposed Brownfield Restoration Ireland Ltd. (BRI) facility.

The groundwater catchment area thought to feed this spring, which is located to the northwest of this feature of this spring located to the northwest is estimated at 184,000 m^2 as shown on Fig. No. 3.7.6, Rev. B.

4.1.2 Estimation of Outflow

An estimation of the flow in the channel directly downstream of this spring was made during the site visit on 23 December 2004. At the time of the visit, there was a u-shaped channel of 500mm wide and 150mm deep. The estimated flow rate was ca. 8 litre/sec.

4.1.3 Significance in Context of Whitestown Proposal

As groundwater in the general Whitestown area flows in a southeasterly direction, this spring is hydrogeologically isolated from BRI's Whitestown site, as it typically runs south along the western side of the N81, joining the Carrigower River at Whitestown Bridge.

In summary, this spring feature cannot be influenced by the proposed BRI development as it is located upgradient of the Whitestown site.

4.2 South Spring

This spring feature is located ca. 150 metres to the south of the southern boundary of the Whitestown site, in a wet grassland/boggy area at an elevation of approximately 137.5mOD. The GSI does not have any records pertaining to this spring. There are two very obvious spring units within this feature, located ca. 20 metres of each other. Both springs at this location appear to be fed from the western edge of the drainage channel. This indicates that these springs are being fed from lands located generally to the northwest. Again the presence of freshwater vegetation confirms an ongoing source of freshwater feeding this drainage channel.

Further north of the two spring units, a poorly maintained drainage channel drains a generally wet grassland/boggy area. There was no evidence of a spring in this boggy area. The flat relief, low permeability overburden and surface water ponding have contributed to the wet boggy conditions in this area. It is noted that this drainage channel does not

physically connect to the drainage channel located on the southwest boundary of the Whitestown site, therefore likely to be hydraulically isolated from each other.

Table 4.2 below includes details of photoviews taken on 23 December 2004, which provide a visual representation of this spring feature and associated drainage channels both upstream and downstream of the *South Spring*.

Table 4.2: Details of Photoviews Taken at Drainage Channel (DC) Upgradient and Downgradient of *South Spring*

Photoview Title	Distance along drainage channel (metres) Note 1	Direction of Photoview	Description
DC_0 *South Spring*	0	Facing south west	Wet grassland/boggy area – poorly drained and unmaintained
DC_{50} *South Spring*	50	Facing south west	More noticeable drainage channel with very slight flow apparent
DC_{100} *South Spring*	100	Facing south west	Flow becomes more obvious however remains slight
DC_{150} *South Spring*	150	Facing south west	Very obvious spring feature. Moderate flow arising from north west of drainage channel. Freshwater vegetation confirms presence of ongoing source of water
DC_{170} *South Spring*	170	Facing south west	Very obvious second spring feature
DC_{200} *South Spring*	200	Facing south west	Stream gains momentum. Abundant vegetation associated with flowing surface water
DC_{300} *South Spring*	200	Facing north west	Establish drainage channel/stream, slow flow in wide channel

Note 1: Drawing No. 3.7.4 Rev. B includes details of the location of each Photoview.

Once established, the drainage channel/stream fed by the *South Spring* flows in a general westerly direction where it is culverted beneath the N81 and joins the Carrigower River to the west of Whitestown Bridge.

4.2.1 Hydrogeological Catchment

Based on the surrounding topography and general groundwater flow for the Whitestown area, this feature is likely to be fed from lands located to the immediate north and north west of these spring units.

The groundwater catchment area thought to feed this spring, which is located to the northwest of this feature (i.e. hydrogeologically upgradient) is estimated at 7,500m^2. An outline of this catchment is depicted in Figure 3.7.4, Rev. B.

4.2.2 Estimation of Outflow

An estimation of the flow in the channel directly downstream of this spring was made during the site visit on 23 December 2004. At the time of the visit, there was a u-shaped channel of 300mm wide and 100mm deep. The estimated flow rate measured was ca. 5 litres/sec.

4.2.3 Significance in Context of Whitestown Proposal:

As groundwater in the general Whitestown area flows in a southeasterly direction towards the River Carrigower, this spring is likely to be hydrogeologically isolated from the Whitestown site.

Coupled with this, the southwestern boundary of BRI's Whitestown site is flanked by a drainage channel running in a southeasterly direction towards the River Carrigower. This would further suggest that BRI's Whitestown site is hydraulically isolated from the *South Spring* feature and its associated drainage channels. Figure 3.7.4, Rev. B provides details of these surface water features in the vicinity of the *South Spring*.

In summary, it is unlikely given the hydrogeological setting and the proposed engineered containments that this spring will be influenced by the proposed facility.

5. GSI LANDFILL MATRIX RISK RESPONSE

The GSI letter dated 15 December 2004, places the site in a Groundwater Protection Zone LI/H and attaches the Response Matrix for Landfills to allow the landfill responses for the site to be worked out. With the LI/H classification for the site, the site is classified by the matrix as R2[1].

As outlined in the GSI response matrix, the following guidelines apply:

R2[1]: *Acceptable subject to guidance outlined in EPA Landfill Design Manual or conditions of 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*

It is noted that in the March 2004 EIS, ERML suggested a classification of $R2^2$. This classification was suggested to take in account the results of site investigations and site observations which indicated that overburden had been removed in some areas of the pit floor. In these areas of shallow overburden above bedrock, soils will be placed to form the base of the proposed lined area. As a minimum, there will be 1m of overburden above the bedrock surface and/or the water table and the formation level of the proposed compacted low permeability clay and geomembrane lining system.

Environment & Resource Management Ltd
No. 3 Tara Court, Naas, Co. Kildare

Tel No: 045 874411 Fax No: 045 874549
info@erml.biz

Fax

To:	**Ms. Jane Coll**	**From:**	**Emma Sweeney**
Company:	**GSI**	**Date:**	**15/12/2004**
Fax:	**01-6782569**	**Pages:**	**1 + 3**
Phone:	**01-6782782**	**Job No.**	**03.116**
Re:	**Whitestown Site**	**CC:**	

Dear Jane,

Thank you for your assistance on the phone earlier.

I would appreciate if you could forward me geological & Hydrogeological information for the site outlined on the map, overleaf, which is located along the N81 national route, in Whitestown, Co. Wicklow, which is located 8km north of Baltinglass.

The site is underlain by two bedrock types and the area surrounding the site has rich sand and gravel deposit overburden.

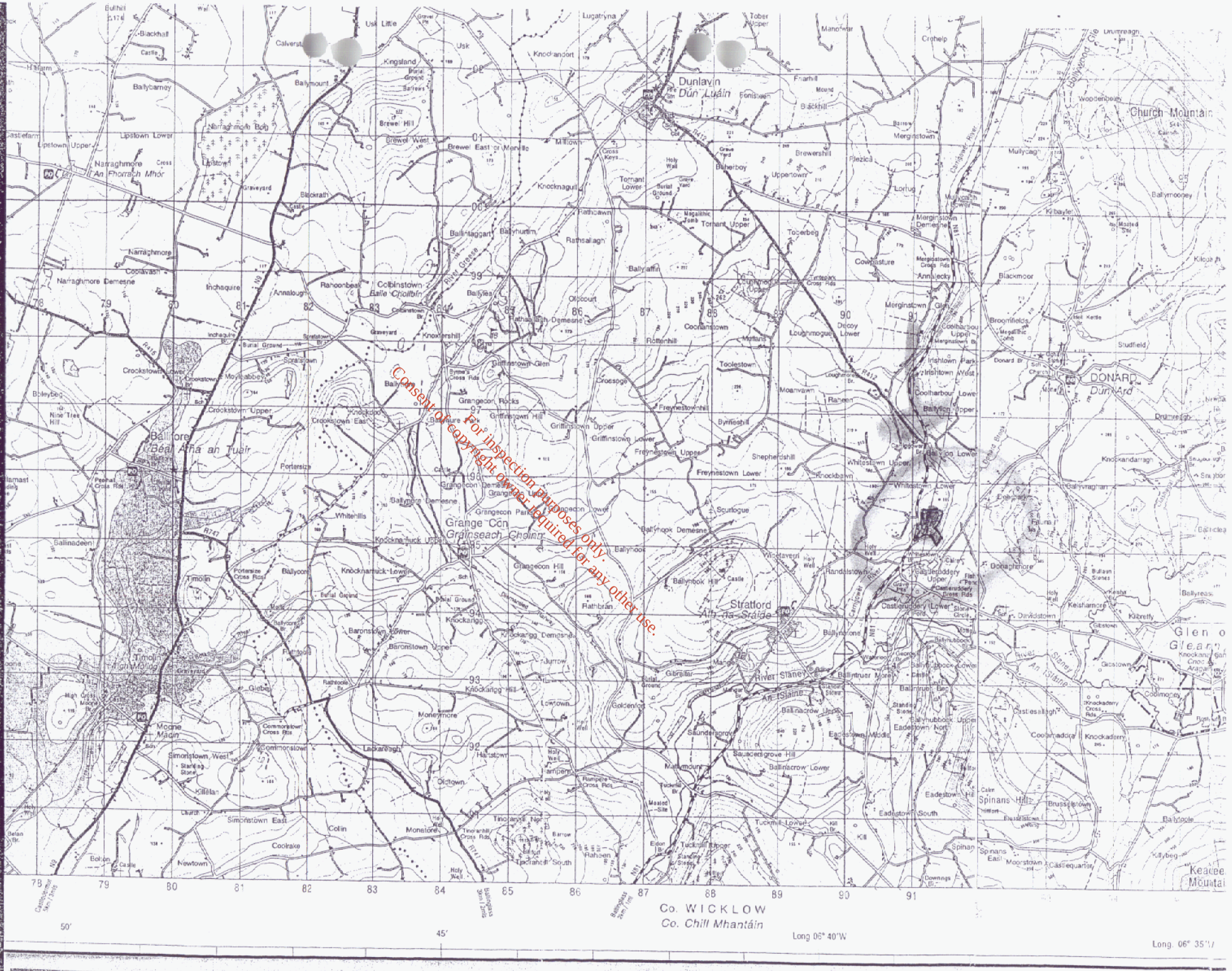
The information I require is:

- Aquifer Classification for the two bedrock types and the sand & gravel deposits;
- Aquifer Vulnerability for the two bedrock types and the sand and gravel deposits;
- The areal extent of the overburden sand & gravel deposits
- Hydrogeological description of two springs shown on map overleaf (if possible)
- Estimate of catchment areas and outflows from two springs shown on map overleaf (if possible)
- Statement of the GSI Landfill matrix Risk Response Category for the proposed landfill (on the outlined site)

I would really appreciate your help on this matter and as quick a response as possible.

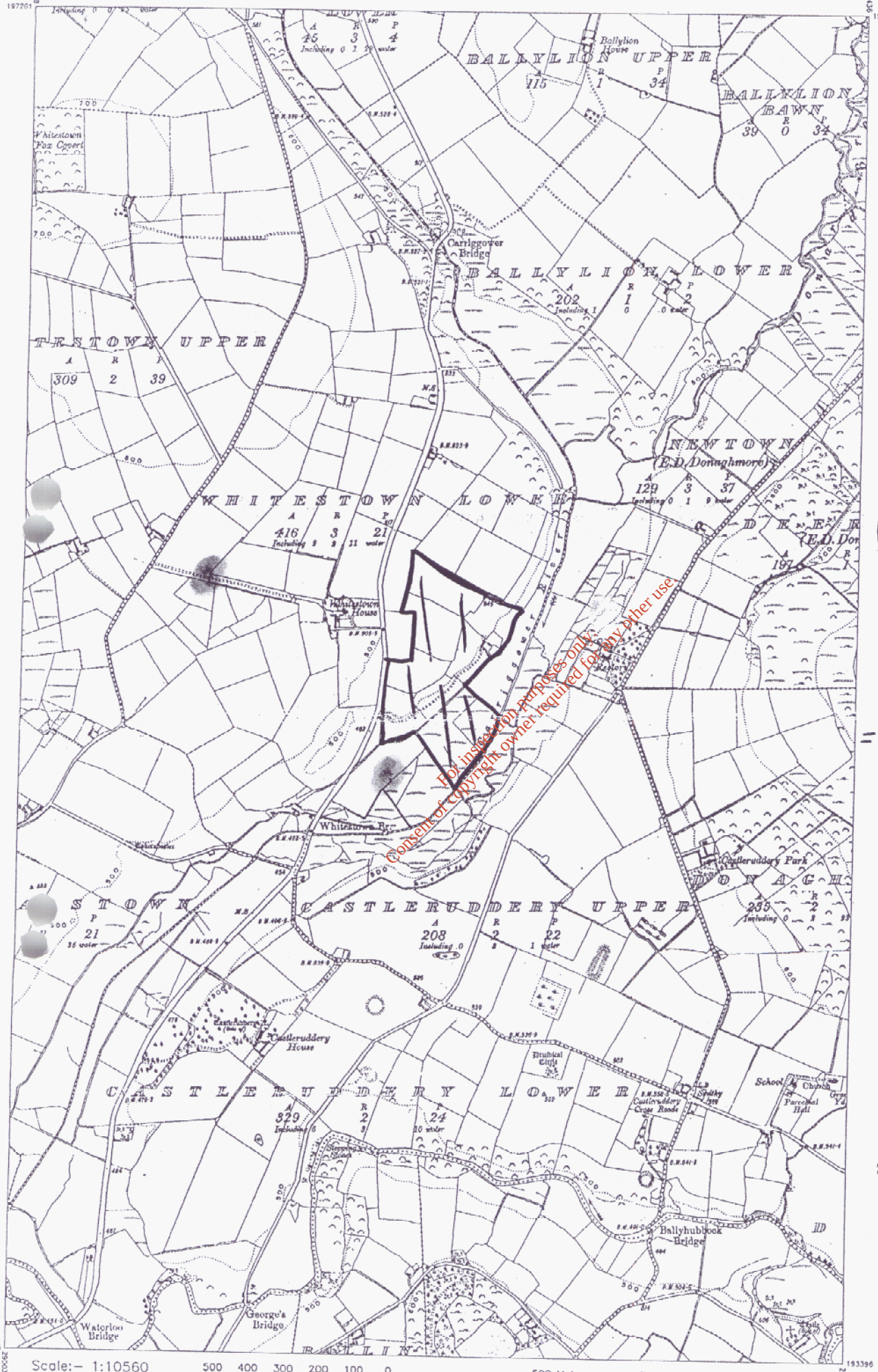
Yours sincerely,

Dr. Emma Sweeney
Environmental Scientist



Surveyed 1838
Revised 1908
Levelled 0

Re ord PLACE Map



DESCRIPTION

MAP SCALES

6inch
WW021

A2
ORDNANCE
SURVEY
IRELAND
©

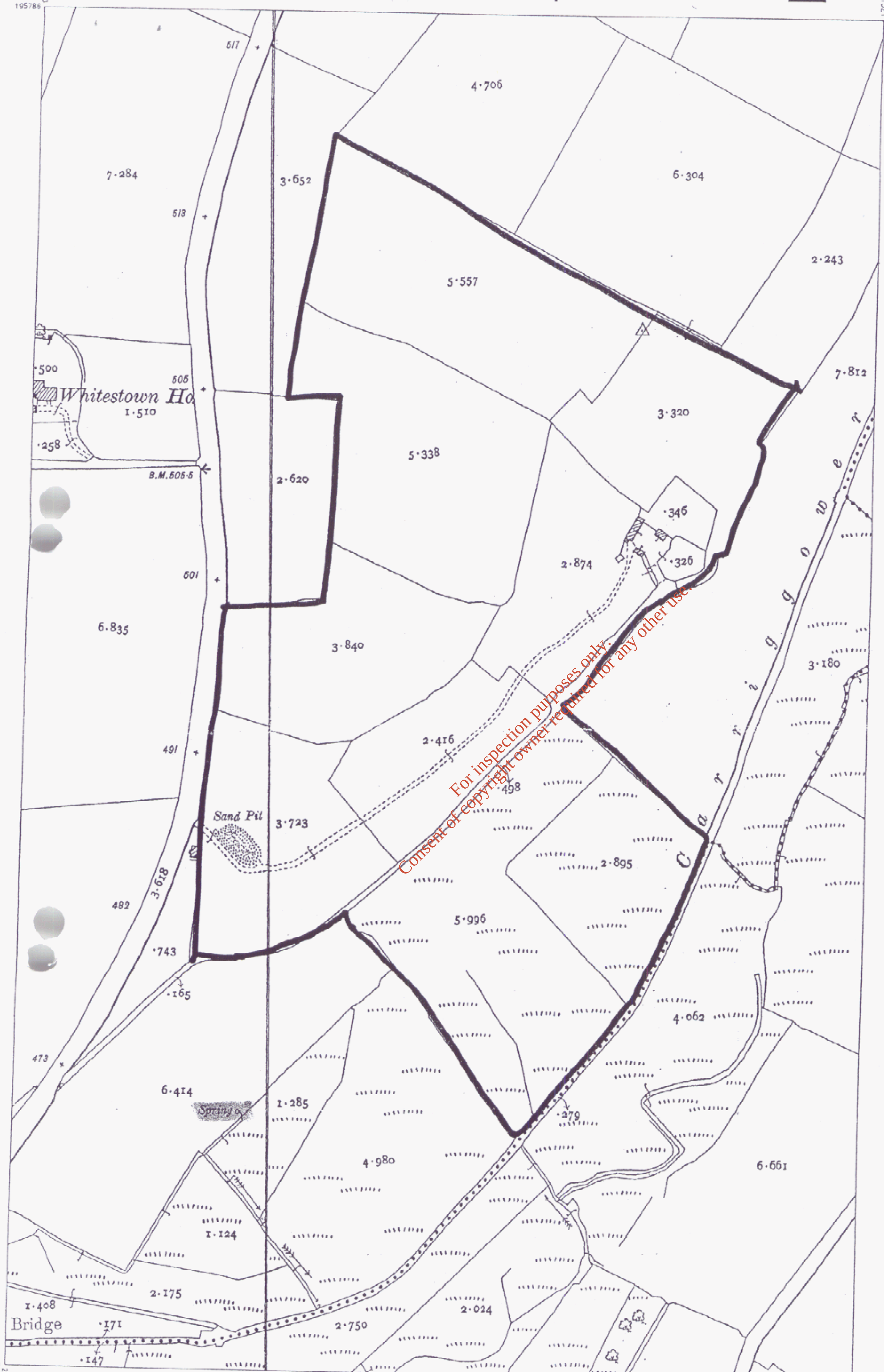
=SPRING

Authorised Selling Agent

Surveyed 1908
Revised 0
Levelled 0

Rur l PLACE Map

osi



Scale:– 1:2500
Scála:– 1:2500

100 50 0 100 Metres
200 100 0 200 Feet

Plot Ref. No. 21890_1_1
Plot Date 25–NOV–2003

DESCRIPTION

MAP SCALES

25inch
WW021–07 WW021–06

A2 ORDNANCE SURVEY IRELAND ©

ORDNANCE SURVEY IRELAND osi Authorised Selling Agent

Printed by the National Map Centre,
34 Aungier Street Dublin 2
On behalf of Ordnance Survey Ireland

Suirbhéireacht Gheolaíochta Éireann
Tor an Bhacaigh
Bóthar Hadington
Baile Átha Cliath 4

Geological Survey of Ireland
Beggars Bush
Haddington Road
Dublin 4
Tel. +353 1 6782000
Direct +353 1 6782782
Fax. +353 1 6782569
http://www.gsi.ie
Email: jane.coll@gsi.ie

Ms. Emma Sweeney,
Environment & Resource Management Ltd.,
No. 3 Tara Court,
Naas
Co. Kildare

15 December 2004

Re: Site at Whitestown, Co. Wicklow

Dear Ms. Sweeney,

Thank you for your enquiry on the 15/12/04 requesting an aquifer classification and vulnerability rating for the bedrock and for the overlying gravel, the areal extent of the overlying gravels, information on two springs near the site and the landfill response for the site.

Please note that when the National Aquifer Classification Map has been completed as part of the requirements of the Water Framework Directive, the classification given may be subject to revision. It is based on our current understanding of the hydrogeology of the area and on available hydrogeological data. The provisional bedrock aquifer classification is given below.

Site	Rock unit	Vulnerability (Bedrock)	Provisional Aquifer classification	Subsoil (Teagasc Classification)	Groundwater Protection Zone
Site at Whitestown, Co. Wicklow	To the northwest of the site: Ordovician Metasediments To the southeast of the site: Ordovician Volcanics	High	To the north of the site: Ll To the south of the site: Ll	GGr: Granite sands and Gravels Alluvium for 100m approximately on either side of the Carrigower River	Ll/H

Please see attached pages for descriptions of the aquifer classification.

The gravel overburden has not been classified as an aquifer by the Groundwater section, and has not been assigned a vulnerability rating. I enclose an extract from the 'Groundwater Protection Schemes' (1999) which outlines the criteria for aquifer classification. The areal extent of the gravel overburden is shown on the accompanying Teagasc subsoil map.

There is no record of the springs (indicated on the map you forwarded) on the Groundwater sections database.

The landfill responses for the site can be worked out using the above information and the matrix table accompanying the 'Groundwater Protection Schemes' (1999), which is attached. The landfill responses map is available on the internet at www.gsi.ie.

If you have any further questions please do not hesitate to call Jane Coll at (01) 678 2782.

Yours sincerely,

GRWright

Geoff Wright
Groundwater Section

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.

$R2^1$ 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.

$R2^2$ 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.

$R3^1$ 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.

$R3^2$ 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.

Groundwater Vulnerability

The term 'Vulnerability' is used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities (DELG/EPA/GSI, 1999).

The vulnerability of groundwater depends on:

- the time of travel of infiltrating water (and contaminants)
- the relative quantity of contaminants that can reach the groundwater
- the contaminant attenuation capacity of the geological materials through which the water and contaminants infiltrate.

All groundwater is hydrologically connected to the land surface; the effectiveness of this connection determines the relative vulnerability to contamination. Groundwater that readily and quickly receives water (and contaminants) from the land surface is more vulnerable than groundwater that receives water (and contaminants) more slowly and in lower quantities. Along with vertical hydraulic gradients, the quantity of contaminants which reach groundwater is a function of the following natural geological and hydrogeological attributes of any area:

(i) the type and permeability of the subsoils that overlie the groundwater
(ii) the thickness of the unsaturated zone through which the contaminant moves
(iii)the recharge type – whether point or diffuse

Apart from sites where point recharge occurs (e.g. swallow holes), groundwater vulnerability is mapped on the basis of the type, permeability and thickness of the subsoils. Each subsoil type is assessed here in terms of its permeability. There are three subsoil permeability categories: "high", "moderate" and "low". The vulnerability map is then derived by overlaying the permeability categories with the depth to rock. There are four depth to rock categories: "less than 3 m", "3 to 5 m", "5 to 10 m" and "greater than 10 m". The table below describes how the criteria combine to derive a vulnerability assessment.

In summary, the entire land surface is divided into four vulnerability categories: extreme (**E**), high (**H**), moderate (**M**) and low (**L**), based on the geological and hydrogeological characteristics.

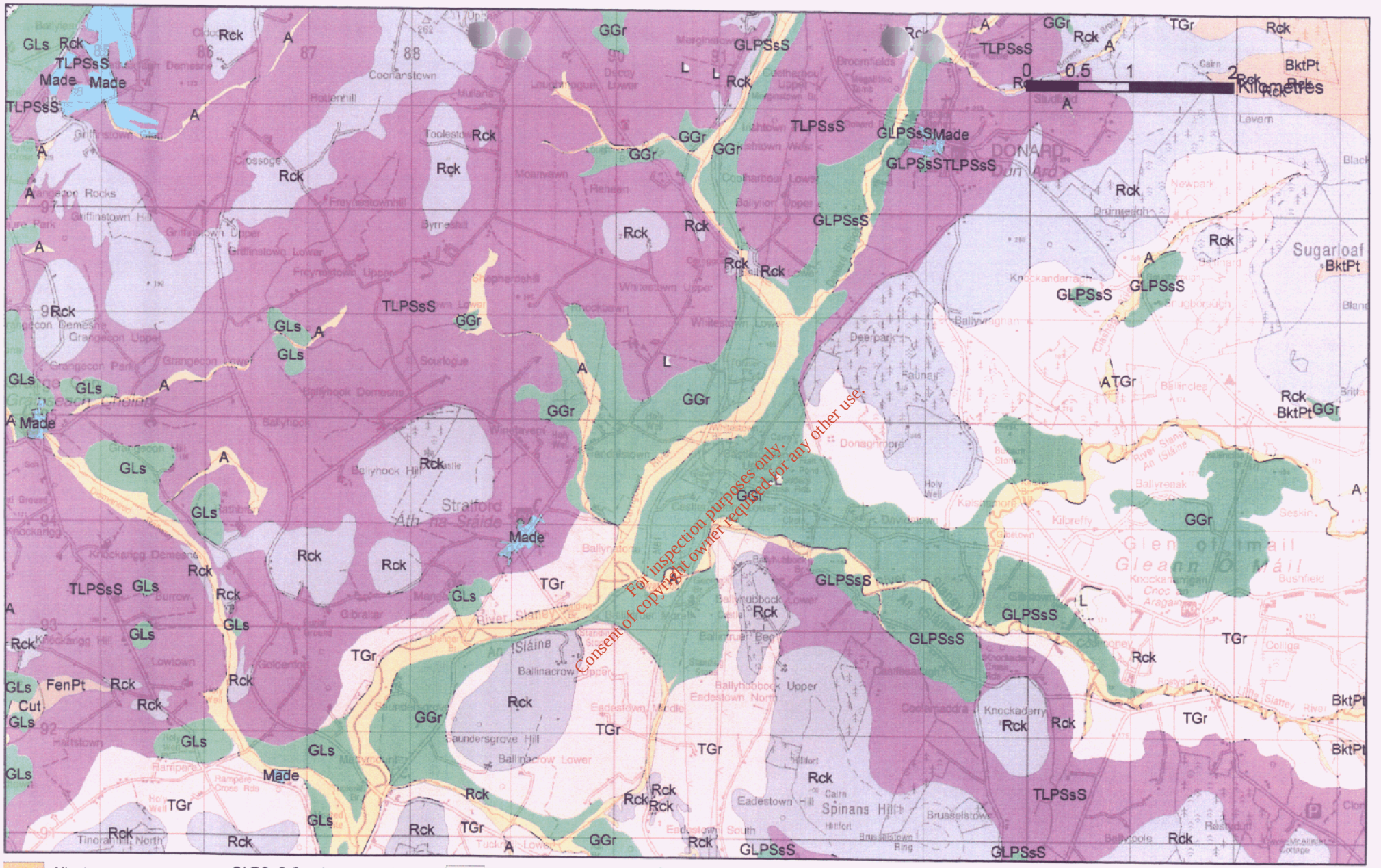
Note that the vulnerability map shows the vulnerability of groundwater (in the uppermost aquifer encountered) to contaminants released at depths of 1–2 m below the ground surface. The map is intended as a guide to the likelihood of contamination of groundwater if a contamination event occurs. It does not replace the need for site investigation. The characteristics of individual contaminants are not considered.

Further details of the hydrogeological basis for vulnerability assessment can be found in the DELG/EPA/GSI publication 'Groundwater Protection Schemes' (DELG/EPA/GSI, 1999 – also available on the GSI Web page: www.gsi.ie/everyone/ev-frame.htm).

Vulnerability Mapping Criteria (adapted from DELP/EPA/GSI, 1999)

Subsoil Thickness	Hydrogeological Requirements				
	Diffuse recharge Subsoil permeability and type			Point Recharge	Unsaturated Zone
	high permeability (*sand/gravel*)	moderate permeability (*sandy subsoil*)	low permeability (*clayey subsoil, clay, peat*)	(*swallow holes, losing streams*)	(*sand & gravel aquifers only*)
0–3 m	**Extreme**	**Extreme**	**Extreme**	**Extreme (30 m radius)**	**Extreme**
3–5 m	**High**	**High**	**High**	**N/A**	**High**
5–10 m	**High**	**High**	**Moderate**	**N/A**	**High**
>10 m	**High**	**Moderate**	**Low**	**N/A**	**High**

Notes: *(i) N/A = not applicable.*
(ii) Permeability classifications relate to the material characteristics as described by the subsoil description and classification method.
(iii) Release point of contaminants is assumed to be 1–2 m below ground surface.



Subsoil Map (Teagasc Classification) for the Whitestown area, Co. Wicklow

December 2004 Ref No. 1586/2004

Subsoil compilation and mapping completed by R. Meehan using ATLAS photogrammetry software, field reconnaissance survey and conceptual modelling.Digital data editing in ERDAS Imagine and ArcView completed by C. Cronin, R.Fealy and R. Meehan.This map was produced by the Spatial Analysis Group, Teagasc, Kinsealy. This subsoil map is designed for general information and strategic planning usage. The boundaries are based on compiled, photogrammetric and modelled evidence and local details have been generalised to fit the map scale. Enlargement of these maps to scales greater than that at which they were originally mapped can cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting subsoil that could have been shown at a larger scale. The depicted subsoil boundaries and interpretations derived from them do not eliminate the need for onsite sampling, testing, and detailed study of specific sites for intensive uses. Users are responsible for the appropriate application of this map. Digital data files are periodically updated. Files are dated, and users are responsible for obtaining the latest version of the data