Sub **35**

Castle House,
Lagavooren,
Drogheda.
Co. Meath.
Tel: 041-9835584.

12th. February, 2003.

The Environmental Protection Agency,
Johnston Castle Estate,
Co. Wexford.

Ref. 167 - 1

Dear Sirs,

Further to my letter of 10th, February, 2002, (just over one year ago!) objecting to the granting of a waste licence for a proposed waste management facility and municipal incinerator at Carranstown, Duleek, Co. Meath, I now wish to register some further points of objection with the E.P.A.

According to the census returns, the Town of Drogheda has a population of 30,000 + and is expected to grow to 70,000 at least by 2020. Because the prevailing wind blows from the South West, the Town and its environs and the towns of Bettystown, Julianstown, Mornington and Donnycarney would have to suffer the emissions from the incinerator for at least 30 years, (and then in the case of Dioxins, there is a half-life of forty years, meaning that even when the incinerator is no more, that the pollution will still be at half that level forty years further on).

According to the Indaver E.I.S. Site Selection Criteria & table 2.4 W.H.O. Site Selection Criteria, and the "Co. Meath Ground Water Protection Scheme" the site at Carranstown should have been immediately rejected on HYDROGEOLOGICAL VULNERABILITY GROUNDS!

The Limestone bedrock aquifer is a Regionally Important aquifer which displays both KARST and FRACTURE flow features. K.T. Cullen & Co. Ltd., classify it as RF/M. In the light of the new knowledge acquired from bore-holes drilled for Cement Limited (Extension to Platin Quarry) and from observation of rock in the Platin - Carranstown area, (a swallow-hole is shown on one of the maps), and KARST features mentioned in the E.I.S. for Platin Quarry Extension, should the aquifer not have been re-classified as a Regionally Important Karstified Aquifer. This more accurate classification would put the area into Rk/M or Rk/H, thereby putting the Resource Protection Zone into the "Not Acceptable in Principle" or just NOT ACCEPTABLE category in the Table 2.4 of the Groundwater Protection Scheme Matrix (Page 14 of Co. Meath Groundwater Protection Scheme). "Decisions on the response category & the codes of practice for potentially polluting developments are the responsibility of the Statutory Authorities, in particular the Local Authorities, and the E.P.A. ...... "involving hydrologists".

The onus is on the E.P.A. hydrologists! - as the Co. Co. planners, and An Bord Pleanala, were forbidden by Irish Law, (until 11/3/02, when Minister Dempsey signed the commencement orders for sections 256.&257 of the 2000 Planning Act) from giving any consideration to potential risk of pollution to Air or Water.

Under the Ramsar Convention (1971 & signed by Ireland in 1985) Ireland's Wetlands are supposed to be protected. What protection is being given to Duleek Commons N.H.A.? It is already under threat by the de-watering process at Platin Quarry, & will be even more so by the Extension to the Quarry! And now this proposed Incinerator ——if it should go ahead it will put the Wetlands under the even more serious threat of Pollution.

Much of the Hydrological Section of the E.I.S. is copied word for word from the Co. Meath Groundwater Protection Scheme (by Oliver Perkins) except that the "Source Protection Information is OMITTED! why?
The aquifer here in the Carranstown - Platin area of Co. Meath is a POTENTIAL SOURCE OF POTABLE WATER, and as such should be protected from potentially polluting development!.

East Meath suffers from a scarcity of water, see Indaver E.I.S. K.T. Cullen & Co. Ltd., report 2.4.3 Hydrology "The Regional limestone bedrock constitutes a Regionally Important Aquifer which displays both Karst and Fracture Flow Features"

I visited the G.S.I. at Beggars Bush and was shown the Hydrological Map of the area (enclosed). K.T.Cullen & Co.Ltd., Report for the E.I.S. page 13 (6.2) classifies the site for the proposed Incinerator as Rf/m but in actual fact 80% of the Carranstown area is classified as "Extreme Vulnerability" Rf/E most of the rest if Rf/H with only about 2% being Rf/m

An Bord Pleanala should be notified about this! It is only the E.P.A. who can do this! The Precautionary Principle should apply! My observations on the E.I.S. to An Bord Pleanala Plus my £45 fee "were lost"!! they can be traced to the Postal depot in Dublin (Jan 21st. 2002) having been posted on January 19th. & sent by me by Swift Post. I did not know about the loss until the Oral Hearing in Drogheda.

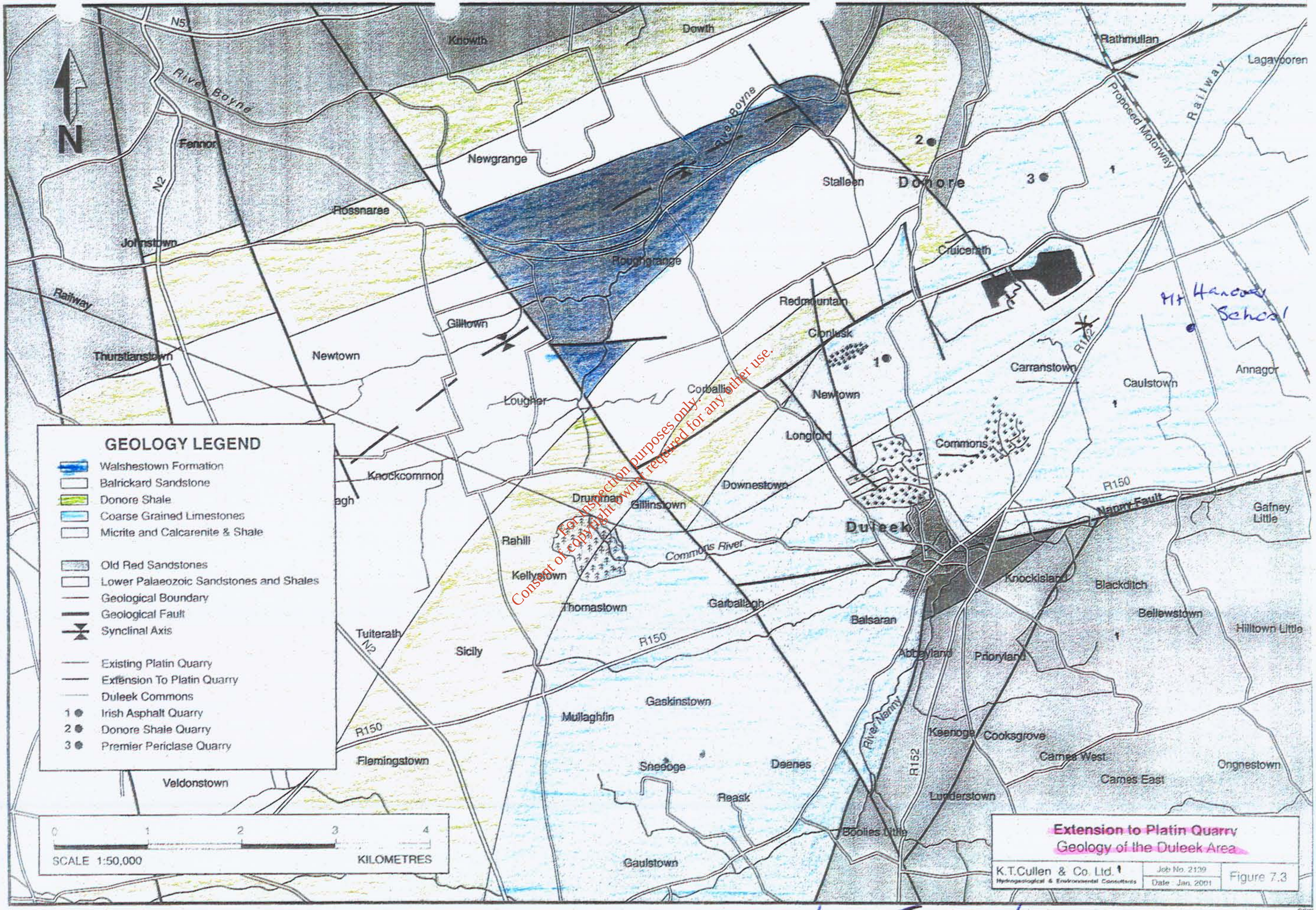
As I said in my original objection, "The proposal is Thermal Treatment of Unsorted Waste" Page 10 Planner's Report. Burning unsorted Waste in a Municipal Incinerator is a waste of limited resources and a potential source of Toxic emissions, (from Batteries, Cleaning Chemicals in clothes, Heavy Metals, etc.,) and the European Parliament has decreed that they should NOT be funded as renewable energy sources.

On the 23rd. July 2001, just a few days before the planning permission was granted to Indaver by Meath Co. Council, (on 31/7/2001) the N. E. Health Board wrote to Meath Co. Co (copy of letter enclosed). The E.I.S. claimed that the applicant consulted with the N.E. Health Board during the pre-application process, However, no such consultation took place!

I am taking the liberty of sending a copy of this letter, and its enclosures to Ms. Margot Wallstrom, Minister for the Environment, European Union.

Yours sincerely,

Mary P. Burke, B. Ed.



✱ Indaver Incinerator Site


LOUTH
DUBLIN
Drogheda
BOYNE ESTUARY
Devlin R.
Mattock R.
Slane
River Boyne
Julianstown
R. Nanny
R. Mosney
Duleek
Bellewstown
Stamullen
Ardcath
Nanny
Hurley R.

Indaver control room,
Waste to Energy plant

Why is this facility needed?

* Waste management is Ireland's biggest environmental issue. While other European countries regard waste management as just another part of life, in Ireland we are not doing what we should, both for ourselves and the environment. * Because the infrastructure was never put in place

- We don't do enough to prevent the production of waste.

- We don't recycle as much waste as our European neighbours.

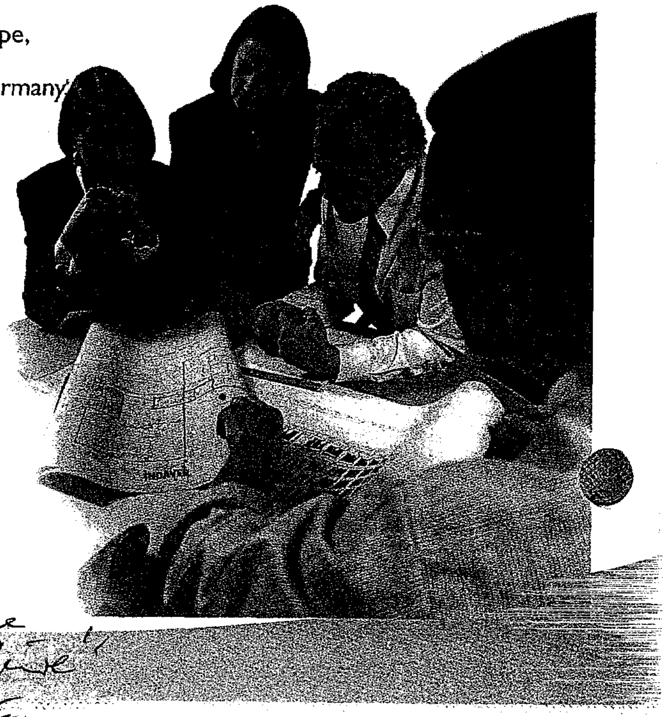
Infrastructure is not in place. D'heda (pop 30,000) has no centre for recycling - nearest one Navan 18 miles or D'dalk

- We depend too much on True dumping waste to landfill. Landfilling waste is the least favoured option for the disposal of waste. This cannot go on - both European Union legislation and Irish Government policy call for a dramatic reduction in what we simply dump. Totally is against generation of electricity from unsorted waste

- We do not use non recyclable waste to generate energy, unlike most European Union countries. There are over 500 waste-to-energy plants in Europe, including plants in Germany, Denmark, The Netherlands, Sweden, Norway, France, Belgium and Switzerland.

- At present the region produces in excess of 500,000 tonnes of waste per year - and it is growing. The proposed Waste to Energy plant with a capacity of 150,000 tonnes per year is deliberately undersized in relation to the volume of waste produced in the area to ensure pressure remains to increase recycling and encourage waste minimisation. Big Joke.

Electricity generation at Waste to Energy plant



P.S. Mr Dempsey (former Minister for Env) said 'we need to change attitudes first before infrastructure'
CART BEFORE THE HORSE

How will the facility be regulated and managed?

The Indaver Incinerator at Antwerp Belgium had to be shut down last August because of dioxin emissions hundreds of times above the limit & is not yet back in production

This state-of-the-art facility will be run:

- by experienced management. Indaver is a European leader in waste management with 15 years of experience in recycling, treating and incinerating waste from industries and households in a socially and environmentally responsible manner.

- under licence from the Environmental Protection Agency - giving independent assurance on all environmental and safety matters including air, water, waste, odour and noise. In addition, the Environmental Protection Agency will regulate all operational procedures such as monitoring, maintenance, operational and safety rules, and the qualifications, duties and responsibilities of the site personnel.

- only when Meath County Council is satisfied on all siting, zoning, traffic, appearance and water supply issues. An application for planning permission and an Environmental Impact Statement (EIS) will be submitted to Meath County Council.

- with a policy of openness to the public. Members of the public will be able to visit the plant, see it in operation and ask questions. An annual report will be published giving details of the environmental and safety performance of the facility. This report will be distributed to the local community.

Table 2.2. Matrix of Source Protection Zones

VULNERABILITY RATING	SOURCE PROTECTION		
	Site	*Inner*	*Outer*
Extreme (E)	SS/E	SI/E	SO/E
High (H)	SS/H	SI/H	SO/H
Moderate (M)	SS/M	SI/M	SO/M
Low (L)	SS/L	SI/L	SO/L

Omitted in Ro.I.S.

2.3.3 Groundwater Resource Protection Zones

For any region, the area outside the source protection areas can be subdivided, based on the value of the resource and the hydrogeological characteristics, into eight resource protection areas.

Regionally Important (R) Aquifers

(i) Karstified aquifers (where conduit flow is dominant) **(Rc)**
(ii) Fissured bedrock aquifers **(Rf)**
(iii) Extensive sand/gravel **(Rg)**

Locally Important (L) Aquifers

(i) Sand/gravel **(Lg)**
(ii) Bedrock which is Generally Moderately Productive **(Lm)**
(iii) Bedrock which is Moderately Productive only in Local Zones **(Ll)**

Poor (P) Aquifers

(i) Bedrock which is Generally Unproductive except for Local Zones **(Pl)**
(ii) Bedrock which is Generally Unproductive **(Pu)**

These aquifer categories are shown on an aquifer map, which can be used not only as an element of the groundwater protection scheme but also for groundwater development purposes.

The matrix in Table 2.3 below gives the result of integrating the two regional elements of land surface zoning (vulnerability categories and resource protection areas) – a possible total of 24 resource protection zones. In practice this is achieved by superimposing the vulnerability map on the aquifer map. Each zone is represented by a code e.g. **Rf/M**, which represents areas of regionally important fissured aquifers where the groundwater is moderately vulnerable to contamination. In land surface zoning for groundwater protection purposes, regionally important sand/gravel **(Rg)** and fissured aquifers **(Rf)** are zoned together, as are locally important sand/gravel **(Lg)** and bedrock which is moderately productive **(Lm)**. All of the hydrogeological settings represented by the zones may not be present in each local authority area.

Table 2.3. Matrix of Groundwater Resource Protection Zones

VULNERABILITY RATING	RESOURCE PROTECTION ZONES					
	Regionally Important Aquifers (R)		Locally Important Aquifers (L)		Poor Aquifers (P)	
	Rc	Rf/Rg	Lm/Lg	Ll	Pl	Pu
Extreme (E)	Rc/E	Rf/E	Lm/E	Ll/E	Pl/E	Pu/E
High (H)	Rc/H	Rf/H	Lm/H	Ll/H	Pl/H	Pu/H
Moderate (M)	Rc/M	Rf/M	Lm/M	Ll/M	Pl/M	Pu/M
Low (L)	Rc/L	Rf/L	Lm/L	Ll/L	Pl/L	Pu/L

In deciding on the response decision, it is useful to differentiate between potentially polluting developments that already exist prior to implementation of a groundwater protection scheme and proposed new activities. For existing developments, the first step is to carry out a survey of the area and prepare an inventory. This is followed by site inspections in high risk situations, and monitoring and operational modifications, perhaps even closure, as deemed necessary. New potential sources of contamination can be controlled at the planning stage. In all cases the control measures and response category depend on the potential contaminant loading, the groundwater vulnerability and the groundwater value.

Decisions on the response category and the code of practice for potentially polluting developments are the responsibility of the statutory authorities, in particular, the local authorities and the EPA; although it is advisable that the decisions should follow from a multi-disciplinary assessment process involving hydrogeologists.

At present, codes of practice have not been completed for any potentially polluting activity. Draft codes have been produced for landfills, septic tank systems and landspreading of agricultural wastes; only the landfill code of practice is readily available (from the EPA). Preparation of codes of practice requires the involvement and, in most instances, the agreement of the local authority. As a means of illustrating the use of the scheme and the relationship between the groundwater protection zones and the codes of practice, draft codes of practice are given in the following sectioins

2.6 Draft Code of Practice for Landfills

Table 2.5 gives a Response Matrix for landfills (from EPA, 1996) and this is followed by the specific responses to the proposed location of a landfill in each groundwater protection zone.

Table 2.5. Groundwater Protection Scheme Matrix for Landfills

VULNERABILITY RATING	SOURCE PROTECTION			RESOURCE PROTECTION						
				Regionally Imp.		Locally Imp.		Poor Aquifers		
	Site	*Inner*	*Outer*	*Rc*	*Rf/Rg*	*Lm/L*	*Ll*	*Pl*	*Pu*	
Extreme (E)	R4	R4	R4	R4	R4	R4	R2[4]	R2[4]	R2[2]	↓
High (H)	R4	R4	R4	R4	R4	R3[2]	R2[4]	R2[4]	R2[2]	↓
Moderate (M)	R4	R4	R4	R4	R3[2]	R2[5]	R2[3]	R2[3]	R2[1]	↓
Low (L)	R4	R4	R3[1]	R3[1]	R3[1]	R2[1]	R2[1]	R2[1]	R2[1]	↓
	→	→	→	→	→	→	→	→	→	

(Arrows (→ ↓) indicate directions of decreasing risk)

- From the point of view of reducing the risk to groundwater, it is recommended that landfills taking domestic/municipal waste be located in, or as near as possible, to the zone in the bottom right hand corner of the matrix.
- The engineering measures used must be consistent with the requirements of the national licensing authority (EPA).
- Landfills will normally only be permitted as outlined below.

R2[1] Acceptable.
Engineering measures may be necessary to provide adequate containment.
Engineering measures are likely to be necessary in order to protect surface water.

R2[2] Acceptable.
Engineering measures are likely to be necessary to provide adequate containment.
There may not be a sufficient thickness of subsoil on-site for cover material and bunds.

2.4 Codes of Practice

The Codes of Practice contain a series of **Response Matrices**, each setting out the recommended response to a certain type of development. The level of response depends on the different elements of risk - the vulnerability, the value of the groundwater (with sources being more valuable than resources and regionally important aquifers more valuable than locally important and so on) and the contaminant loading. By consulting a Response Matrix in a Code of Practice, it can be seen (a) whether such a development is likely to be acceptable on that site, (b) what kind of further investigations may be necessary to reach a final decision, and (c) what planning or licensing conditions may be necessary for that development. The codes of practice are not necessarily a restriction on development, but are a means of ensuring that good environmental practices are followed.

Four levels of response (R) to the risk of a potentially polluting activity are recommended for the Irish situation:

- **R1** — Acceptable subject to normal good practice.
- **R2**[a,b,c,...] — Acceptable in principle, subject to conditions in note a,b,c, etc. (The number and content of the notes may vary depending on the zone and the activity).
- **R3**[m,n,o,...] — Not acceptable in principle; some exceptions may be allowed subject to the conditions in note m,n,o, etc.
- **R4** — Not acceptable

2.5 Integration of Groundwater Protection Zones and Codes of Practice

The integration of the groundwater protection zones and the code of practice is the final stage in the production of the groundwater protection scheme. The approach is illustrated for a hypothetical potentially polluting activity in the matrix in Table 2.4 below.

Table 2.4. Groundwater Protection Scheme Matrix for Activity X

VULNERABILITY RATING	SOURCE PROTECTION			RESOURCE PROTECTION						
				Regionally Imp.		Locally Imp.		Poor Aquifers		
	Site	*Inner*	*Outer*	*Rk*	*Rf/Rg*	*Lm/Lg*	*Ll*	*Pl*	*Pu*	
Extreme (E)	R4	R4	R4	R4	R4	$R3^m$	$R2^d$	$R2^c$	$R2^b$	↓
High (H)	R4	R4	R4	R4	$R3^m$	$R3^n$	$R2^c$	$R2^b$	$R2^a$	↓
Moderate (M)	R4	R4	$R3^m$	$R3^m$	$R2^d$	$R2^c$	$R2^b$	$R2^a$	R1	↓
Low (L)	R4	$R3^m$	$R3^o$	$R2^d$	$R2^c$	$R2^b$	$R2^a$	R1	R1	↓
	→	→	→	→	→	→	→	→	→	

(Arrows (→ ↓) indicate directions of decreasing risk)

The matrix encompasses both the geological/hydrogeological and the contaminant loading aspects of risk assessment. In general, the arrows (→ ↓) indicate directions of decreasing risk, with the ↓ arrow showing the decreasing **likelihood of contamination** and the → arrow showing the direction of **decreasing consequence**. The **contaminant loading** aspect of risk is indicated by the activity type in the table title.

The **response** to the risk of groundwater contamination is given by the response category allocated to each zone and by the site investigations and/or controls and/or protective measures described in notes a,b,c,d,m n and o.

The Co. planners were forbidden from considering potential pollution to air/water by the E.P.A Act '92 & the Waste Management Act '96

* This only changed (slightly) on 11/3/02 w/c the 2000 planning Act

In deciding on the response decision, it is useful to differentiate between potentially polluting developments that already exist prior to implementation of a groundwater protection scheme and proposed new activities. For existing developments, the first step is to carry out a survey of the area and prepare an inventory. This is followed by site inspections in high risk situations, and monitoring and operational modifications, perhaps even closure, as deemed necessary. New potential sources of contamination can be controlled at the planning stage. In all cases the control measures and response category depend on the potential contaminant loading, the groundwater vulnerability and the groundwater value. *

N.B. Decisions on the response category and the code of practice for potentially polluting developments are the responsibility of the statutory authorities, in particular, the local authorities and the EPA; although it is advisable that the decisions should follow from a multi-disciplinary assessment process involving hydrogeologists.

At present, codes of practice have not been completed for any potentially polluting activity. Draft codes have been produced for landfills, septic tank systems and landspreading of agricultural wastes; only the landfill code of practice is readily available (from the EPA). Preparation of codes of practice requires the involvement and, in most instances, the agreement of the local authority. As a means of illustrating the use of the scheme and the relationship between the groundwater protection zones and the codes of practice, draft codes of practice are given in the following sectioins

2.6 Draft Code of Practice for Landfills (and Incinerators I presume)

Table 2.5 gives a Response Matrix for landfills (from EPA, 1996) and this is followed by the specific responses to the proposed location of a landfill in each groundwater protection zone.

Table 2.5. Groundwater Protection Scheme Matrix for Landfills

VULNERABILITY RATING	SOURCE PROTECTION			RESOURCE PROTECTION						
				Regionally Imp.		Locally Imp.		Poor Aquifers		
	Site	*Inner*	*Outer*	*Rc*	*Rf/Rg*	*Lm/L*	*Ll*	*Pl*	*Pu*	
Extreme (E)	R4	R4	R4	R4	R4	R4	R2[4]	R2[4]	R2[2]	↓
High (H)	R4	R4	R4	R4	R4	R3[2]	R2[4]	R2[4]	R2[2]	↓
Moderate (M)	R4	R4	R4	R4	R3	R2[5]	R2[3]	R2[3]	R2[1]	↓
Low (L)	R4	R4	R3[1]	R3[1]	R3[1]	R2[1]	R2[1]	R2[1]	R2[1]	↓
	→	→	→	→	→	→	→	→	→	

(Arrows (→ ↓) indicate directions of decreasing risk)

- From the point of view of reducing the risk to groundwater, it is recommended that landfills taking domestic/municipal waste be located in, or as near as possible, to the zone in the bottom right hand corner of the matrix.
- The engineering measures used must be consistent with the requirements of the national licensing authority (EPA).
- Landfills will normally only be permitted as outlined below.

R2[1] Acceptable.
Engineering measures may be necessary to provide adequate containment.
Engineering measures are likely to be necessary in order to protect surface water.

R2[2] Acceptable.
Engineering measures are likely to be necessary to provide adequate containment.
There may not be a sufficient thickness of subsoil on-site for cover material and bunds.

$R2^3$ Acceptable.
Engineering measures are likely to be necessary to provide adequate containment.
Special attention should be given to checking for the presence of high permeability zones.

$R2^4$ Acceptable.
Engineering measures are likely to be necessary to provide adequate containment.
Special attention should be given to checking for the presence of high permeability zones. If such zones are present, the landfill should not be allowed unless special precautions are taken to minimise the risk of leachate movement in the zones and unless the risk of contamination of existing sources is low. Also, the location of future wells down-gradient of the site in these zones should be discouraged.
There may not be a sufficient thickness of subsoil on-site for cover material and bunds.

$R2^5$ Acceptable.
Engineering measures are likely to be necessary to provide adequate containment.
Special attention should be given to existing wells down-gradient of the site and of the projected future development of the aquifer.

$R3^1$ Not generally acceptable, unless it can be shown that:
(i) the groundwater in the aquifer is confined, or
(ii) it is not practicable to find a site in a lower risk area.

$R3^2$ Not generally acceptable, unless it is not practicable to find a site in a lower risk area.

R4 Not acceptable.

With regard to the possible siting of landfills on or near regionally important (major) aquifers and where no reasonable alternative can be found, such siting should only be considered in the following instances:

- Where the hydraulic gradient (relative to the leachate level at the base of the landfill) is upwards for a substantial proportion of each year (confined aquifer situation).
- Where a map showing a regionally important (major) aquifer includes low permeability zones or units which cannot be delineated using existing geological and hydrogeological information but which can be found by site investigations. Location of a landfill site on such a unit may be acceptable provided leakage to the permeable zones or units is insignificant.
- Where the waste is classified as inert and waste acceptance procedures are employed in accordance with the Proposal for an EU Directive on Landfill of Waste.

2.7 Draft Code of Practice for Septic Tank Systems

Table 2.6 gives a draft Response Matrix for septic tank systems and Table 2.7 gives the specific responses to the proposed location of a septic tank system in each groundwater protection zone.

Table 2.6. Draft Groundwater Protection Scheme Matrix for Septic Tank Systems

VULNERABILITY RATING	SOURCE PROTECTION			RESOURCE PROTECTION						
				Regionally Imp		Locally Imp.		Poor Aquifers		
	Site	*Inner*	*Outer*	*Rc*	*Rf/Rg*	*Lm/Lg*	*Ll*	*Pl*	*Pu*	
Extreme (E)	R4	$R3^1$	$R3^3$	$R3^3$	$R2^2$	$R2^2$	$R2^1$	$R2^1$	$R2^1$	↓
High (H)	R4	$R3^2$	$R2^7$	$R2^4$	R1	R1	R1	R1	R1	↓
Moderate (M)	R4	$R2^9$	$R2^6$	$R2^3$	R1	R1	R1	R1	R1	↓
Low (L)	R4	$R2^8$	$R2^5$	$R2^3$	R1	R1	R1	R1	R1	↓
	→	→	→	→	→	→	→	→	→	

(Arrows (→ ↓) indicate directions of decreasing risk)

2.8 Information and Mapping Requirements for Land Surface Zoning

The **groundwater resources protection zone map** is the regional land-use planning map, and therefore is the critical and most useful map for the County Council. It is the ultimate or final map as it is obtained by combining the **aquifer** and **vulnerability maps.** The **aquifer map** boundaries, in turn, are based on the **bedrock map** boundaries and the **aquifer categories** are obtained from an assessment of the available **hydrogeological data.** The **vulnerability map** is based on the **subsoils map**, together with an assessment of relevant **hydrogeological data,** in particular indications of permeability and karstification. This is illustrated in Figure 2.4.

Similarily, the **source protection zone maps** result from combining **vulnerability** and **source protection area maps.** The **source protection areas** are based largely on assessments of **hydrogeological data,** but are usually influenced by the **geology.** This is illustrated in Figure 2.5.

The conceptual frameworks for groundwater resource and source protection shown in Figures 2.4 and 2.5 provide the structure for the remainder of this report:
- Chapter 3 bedrock geology
- Chapter 4 Subsoils geology
- Chapter 5 hydrogeology and aquifer classification
- Chapter 6 hydrochemistry and water quality
- Chapter 7 groundwater vulnerability
- Chapter 8 groundwater protection

2.9 Flexibility, Limitations and Uncertainty

The Groundwater Protection Scheme is only as good as the information which is used in its compilation - geological mapping, hydrogeological assessment, etc. - and these are subject to revision as new information is produced. Therefore the scheme must be flexible and allow for regular revision.

Uncertainty is an inherent element in drawing geological boundaries and there is a degree of generalisation because of the map scales used. Therefore the scheme is not intended to give sufficient information for site-specific decisions. Also, where site specific data received by Limerick County Council in the future are at variance with the maps, this does not undermine the scheme, but rather provides an opportunity to improve the scheme. In essence a Groundwater Protection Scheme is a tool which helps Council officials to respond to relevant development proposals and is a means of showing that the County Council is undertaking their responsibility for preventing groundwater contamination in a practical and reasonable manner.

were the planners in the Co. Co. not forbidden in law from considering potential pollution to gr water? E.P.A. Act 92 Waste Management Act '96 until 2000 Planning Act Compliance orders 11/3/02

2.10 Conclusions

- Groundwater protection schemes are an essential means of enabling local authorities to take account of (i) the potential risks to groundwater resources and sources and (ii) geological and hydrogeological factors, when considering the location of potentially polluting developments; consequently, they are now an essential means of preventing groundwater contamination.

- If planning decisions based on a groundwater protection scheme are to be readily defensible, it is important that the scheme should be founded on hydrogeological concepts and on a sufficient degree of geological and hydrogeological information.

- Groundwater protection schemes should not be seen as a panacea for solving all groundwater contamination problems. In practice their use needs a realistic and flexible approach. The maps have limitations because they generalise (with the degree of generalisation depending on data availability) variable and complex geological and hydrogeological conditions. Consequently, the proposed scheme is not prescriptive and needs to be qualified by site-specific considerations and investigations. The investigation requirements depend mainly on the degree of hazard provided by the contaminant loading and, to a lesser extent, on the availability of hydrogeological data.

- ~~The scheme has the following benefits and uses~~:
  - it provides a hierarchy of levels of risk and, in the process, assists in setting priorities for technical resources and investigations;
  - it contributes to the search for a balance of interests between groundwater protection issues and other special and economic factors;
  - it can be adapted to include risk to surface water;
  - ~~it acts as a guide and provides a 'first-off' warning system before site visits and investigations are made;~~ *
  - ~~it shows generally suitable and unsuitable areas for potentially hazardous developments such as landfill sites and piggeries;~~ *
  - by controlling developments and enabling the location of certain potentially hazardous activities in lower risk areas, it helps ensure that the pollution acts are not contravened;
  - ~~it can be used in preparing Emergency Plans, assessing~~ environmental impact statements ~~and the implications of EU directives, planning and~~ undertaking groundwater monitoring ~~networks and in locating water supplies.~~

- The groundwater protection scheme outlined in this report will be a valuable tool and a practical means in helping to achieve the objective of sustainable water quality management, as required by national and EU policies. Effective use of the scheme achieves this objective because it provides:
  - geological and hydrogeological information and knowledge as a basis for decision-making and land-use planning;
  - a framework and policy which enables groundwater to be protected from the impacts of human activities;
  - codes of practice for the location and control of potentially polluting activities.

The onus is on the E.P.A.
to use this groundwater
protection Scheme

Indaver E.I.S.
Proposed Incinerator at Carranstown Co. Meath

3. Land Surface Zoning for Groundwater Protection

3.1 Information and Mapping Requirements for Land Surface Zoning

The **groundwater resources protection zone map** is a land-use planning map, and therefore is the most useful map for the decision-making process. It is the ultimate or final map as it is obtained by combining the **aquifer** and **vulnerability maps.** The **aquifer map** boundaries, in turn, are based on the **bedrock map** boundaries and the **aquifer categories** are obtained from an assessment of the available **hydrogeological data**. The **vulnerability map** is based on the **subsoils map**, together with an assessment of relevant **hydrogeological data**, in particular indications of permeability and karstification. This is illustrated in Figure 3.

Similarly, the **source protection zone maps** result from combining **vulnerability** and **source protection area maps.** The **source protection areas** are based largely on assessments of **hydrogeological data.** This is illustrated in Figure 4.

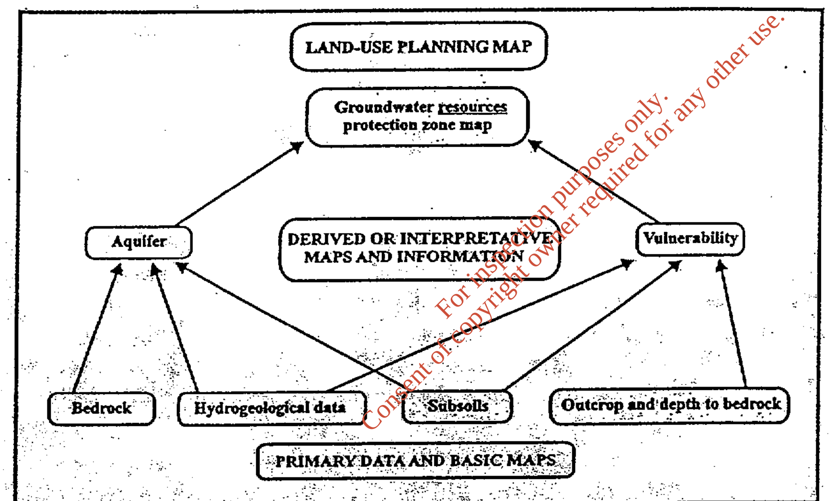


Figure 3. Conceptual framework for production of groundwater <u>resource</u> protection zones, indicating information needs and links

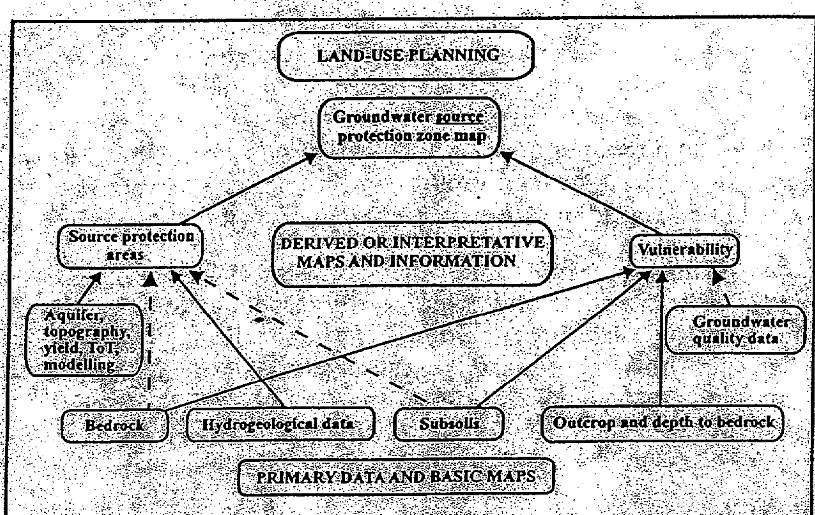


Figure 4. Conceptual framework for production of groundwater <u>source</u> protection zones, indicating information needs and links

exactly the same as p89 of "Co Meath groundwater Protection Scheme"

3.2 Vulnerability Categories

Vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities.

The vulnerability of groundwater depends on: (i) the time of travel of infiltrating water (and contaminants); (ii) the relative quantity of contaminants that can reach the groundwater; and (iii) the contaminant attenuation capacity of the geological materials through which the water and contaminants infiltrate. As all groundwater is hydrologically connected to the land surface, it is the effectiveness of this connection that determines the relative vulnerability to contamination. Groundwater that readily and quickly receives water (and contaminants) from the land surface is considered to be more vulnerable than groundwater that receives water (and contaminants) more slowly and in lower quantities. The travel time, attenuation capacity and quantity of contaminants are a function of the following natural geological and hydrogeological attributes of any area:

(i) the subsoils that overlie the groundwater;

(ii) the type of recharge - whether point or diffuse; and

(iii) the thickness of the unsaturated zone through which the contaminant moves.

In general, little attenuation of contaminants occurs in the bedrock in Ireland because flow is almost wholly via fissures. Consequently, the subsoils (sands, gravels, glacial tills (or boulder clays), peat, lake and alluvial silts and clays), are the single most important natural feature influencing groundwater vulnerability and groundwater contamination prevention. Groundwater is most at risk where the subsoils are absent or thin and, in areas of karstic limestone, where surface streams sink underground at swallow holes.

The geological and hydrogeological characteristics can be examined and mapped, thereby providing a groundwater vulnerability assessment for any area or site. Four groundwater vulnerability categories are used in the scheme - **extreme (E), high (H), moderate (M)** and **low (L)**. The hydrogeological basis for these categories is summarised in Table 1 and further details can be obtained from the GSI. The ratings are based on pragmatic judgements, experience and available technical and scientific information. However, provided the limitations are appreciated, vulnerability assessments are essential when considering the location of potentially polluting activities. As groundwater is considered to be present everywhere in Ireland, the vulnerability concept is applied to the entire land surface. The ranking of vulnerability does not take into consideration the biologically-active soil zone, as contaminants from point sources are usually discharged below this zone, often at depths of at least 1m. However, the groundwater protection responses take account of the point of discharge for each activity.

Vulnerability maps are an important part of groundwater protection schemes and are an essential element in the decision-making on the location of potentially polluting activities. Firstly, the vulnerability rating for an area indicates, and is a measure of, the likelihood of contamination. Secondly, the vulnerability map helps to ensure that a groundwater protection scheme is not unnecessarily restrictive on human economic activity. Thirdly, the vulnerability map helps in the choice of preventative measures and enables developments, which have a significant potential to contaminate, to be located in areas of lower vulnerability.

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 factors described above. This subdivision is shown on a groundwater vulnerability map. The map shows the vulnerability of the first groundwater encountered (in either sand/gravel aquifers or in bedrock) to contaminants released at depths of 1-2 m below the ground surface. Where contaminants are released at significantly different depths, there will be a need to determine groundwater vulnerability using site-specific data. The characteristics of individual contaminants are not taken into account.

Then why did K.T. Cullen & Co Ltd not pay attention to the Extreme & High vulnerability areas at Carranstown & Platin

Vulnerability Rating	Hydrogeological Conditions				
	Subsoil Permeability (Type) and Thickness			Unsaturated Zone	Karst Features
	High permeability (sand/gravel)	Moderate permeability (e.g. Sandy subsoil)	Low permeability (e.g. Clayey subsoil, clay, peat)	(Sand/gravel aquifers only)	(<30 m radius)
Extreme (E)	0 - 3.0m	0 - 3.0m	0 - 3.0m	0 - 3.0m	-
High (H)	>3.0m	3.0 - 10.0m	3.0 - 5.0m	>3.0m	N/A
Moderate (M)	N/A	>10.0m	5.0 - 10.0m	N/A	N/A
Low (L)	N/A	N/A	>10.0m	N/A	N/A

Notes: (1) N/A = not applicable.
(2) Precise permeability values cannot be given at present.
(3) Release point of contaminants is assumed to be 1-2 m below ground surface.

Table 1. Vulnerability Mapping Guidelines

3.3 Source Protection Zones

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.

There are two main elements to source protection land surface zoning:

- Areas surrounding individual groundwater sources; these are termed source protection areas (SPAs)
- Division of the SPAs on the basis of the vulnerability of the underlying groundwater to contamination.

These elements are integrated to give the source protection zones.

3.3.1 Delineation of Source Protection Areas

Two source protection areas are recommended for delineation:

- Inner Protection Area (SI);
- Outer Protection Area (SO), encompassing the remainder of the source catchment area or ZOC.

In delineating the inner (SI) and outer (SO) protection areas, there are two broad approaches: first, using arbitrary fixed radii, which do not incorporate hydrogeological considerations; and secondly, a scientific approach using hydrogeological information and analysis, in particular the hydrogeological characteristics of the aquifer, the direction of groundwater flow, the pumping rate and the recharge.

Where the hydrogeological information is poor and/or where time and resources are limited, the simple zonation approach using the arbitrary fixed radius method is a good first step that requires little technical expertise. However, it can both over- and under-protect. It usually over-protects on the downgradient side of the source and may under-protect on the upgradient side, particularly in karst areas. It is particularly inappropriate in the case of springs where there is no part of the downgradient side in the ZOC. Also, the lack of a scientific basis reduces its defensibility as a method.

There are several hydrogeological methods for delineating SPAs. They vary in complexity, cost and the level of data and hydrogeological analysis required. Four methods, in order of increasing technical sophistication, are used by the GSI:

(i) calculated fixed radius;

(ii) analytical methods;

(iii) hydrogeological mapping; and

(iv) numerical modelling.

Each method has limitations. Even with relatively good hydrogeological data, the heterogeneity of Irish aquifers will generally prevent the delineation of definitive SPA boundaries. Consequently, the boundaries must be seen as a guide for decision-making, which can be reappraised in the light of new knowledge or changed circumstances.

3.3.1.1 Inner Protection Area (SI)

This area is designed to protect against the effects of human activities that might have an immediate effect on the source and, in particular, against microbial pollution. The area is defined by a 100-day time of travel (TOT) from any point below the water table to the source. (The TOT varies significantly between regulatory agencies in different countries. The 100-day limit is chosen for Ireland as a relatively conservative limit to allow for the heterogeneous nature of Irish aquifers and to reduce the risk of pollution from bacteria and viruses, which in some circumstances can live longer than 50 days in groundwater.) In karst areas, it will not usually be feasible to delineate 100-day TOT boundaries, as there are large variations in permeability, high flow velocities and a low level of predictability. In these areas, the total catchment area of the source will frequently be classed as SI.

If it is necessary to use the arbitrary fixed radius method, a distance of 300m is normally used. A semi-circular area is used for springs. The distance may be increased for sources in karst aquifers and reduced in granular aquifers and around low yielding sources.

3.3.1.2 Outer Protection Area (SO)

This area covers the remainder of the ZOC (or complete catchment area) of the groundwater source. It is defined as the area needed to support an abstraction from long-term groundwater recharge i.e. the proportion of effective rainfall that infiltrates to the water table. The abstraction rate used in delineating the zone will depend on the views and recommendations of the source owner. A factor of safety can be taken into account whereby the maximum daily abstraction rate is increased (typically by 50%) to allow for possible future increases in abstraction and for expansion of the ZOC in dry periods. In order to take account of the heterogeneity of many Irish aquifers and possible errors in estimating the groundwater flow direction, a variation in the flow direction (typically ±10-20°) is frequently included as a safety margin in delineating the ZOC.

A conceptual model of the ZOC and the 100-day TOT boundary is given in Figure 5.

If the arbitrary fixed radius method is used, a distance of 1000m is recommended with, in some instances, variations in karst aquifers and around springs and low-yielding wells.

The boundaries of the SPAs are based on the horizontal flow of water to the source and, in the case particularly of the Inner Protection Area, on the time of travel in the aquifer. Consequently, the vertical movement of a water particle or contaminant from the land surface to the water table is not taken into account. This vertical movement is a critical factor in contaminant attenuation, contaminant flow velocities and in dictating the likelihood of contamination. It can be taken into account by mapping the groundwater vulnerability to contamination.

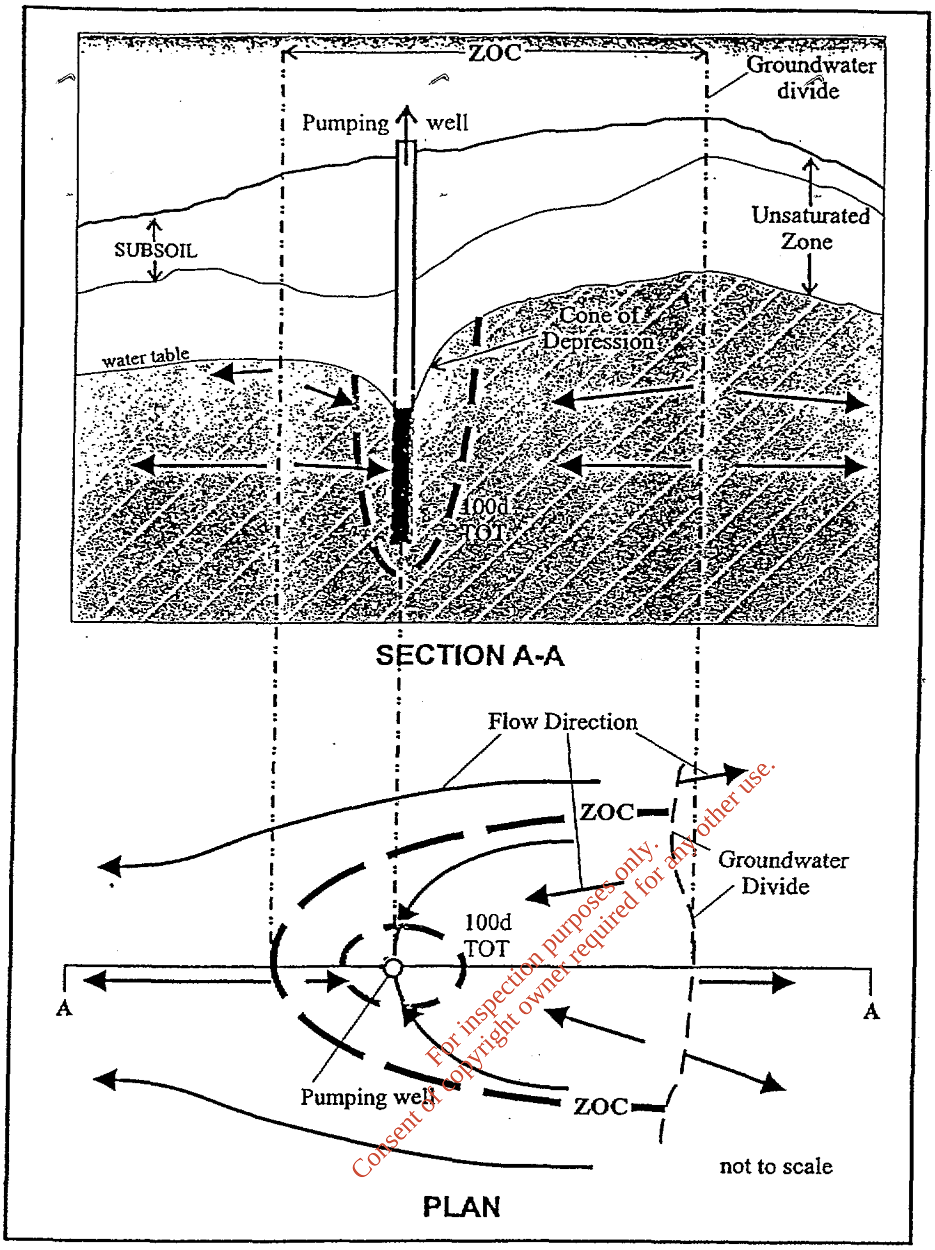


Figure 5. Conceptual Model of the Zone of Contribution (ZOC) at a Pumping Well (adapted from US EPA, 1987)

3.3.2 Delineation of Source Protection Zones

The matrix in Table 2 below gives the result of integrating the two elements of land surface zoning (SPAs and vulnerability categories) – a possible total of eight source protection zones. In practice, the source protection zones are obtained by superimposing the vulnerability map on the source protection area map. Each zone is represented by a code e.g. SO/H, which represents an <u>Outer Source Protection area</u> where the groundwater is <u>highly</u> vulnerable to contamination. The recommended map scale is 1:10,560 (or 1:10,000 if available), though a smaller scale may be appropriate for large springs.

Compare with pg 11 & 13 of Co Health Report "Ground water Protection Scheme"

VULNERABILITY RATING	SOURCE PROTECTION ZONE	
	Inner (SI)	Outer (SO)
Extreme (E)	SI/E	SO/E
High (H)	SI/H	SO/H
Moderate (M)	SI/M	SO/M
Low (L)	SI/L	SO/L

Table 2. Matrix of Source Protection Zones

All of the hydrogeological settings represented by the zones may not be present around each groundwater source. The integration of the SPAs and the vulnerability ratings is illustrated in Figure 6.

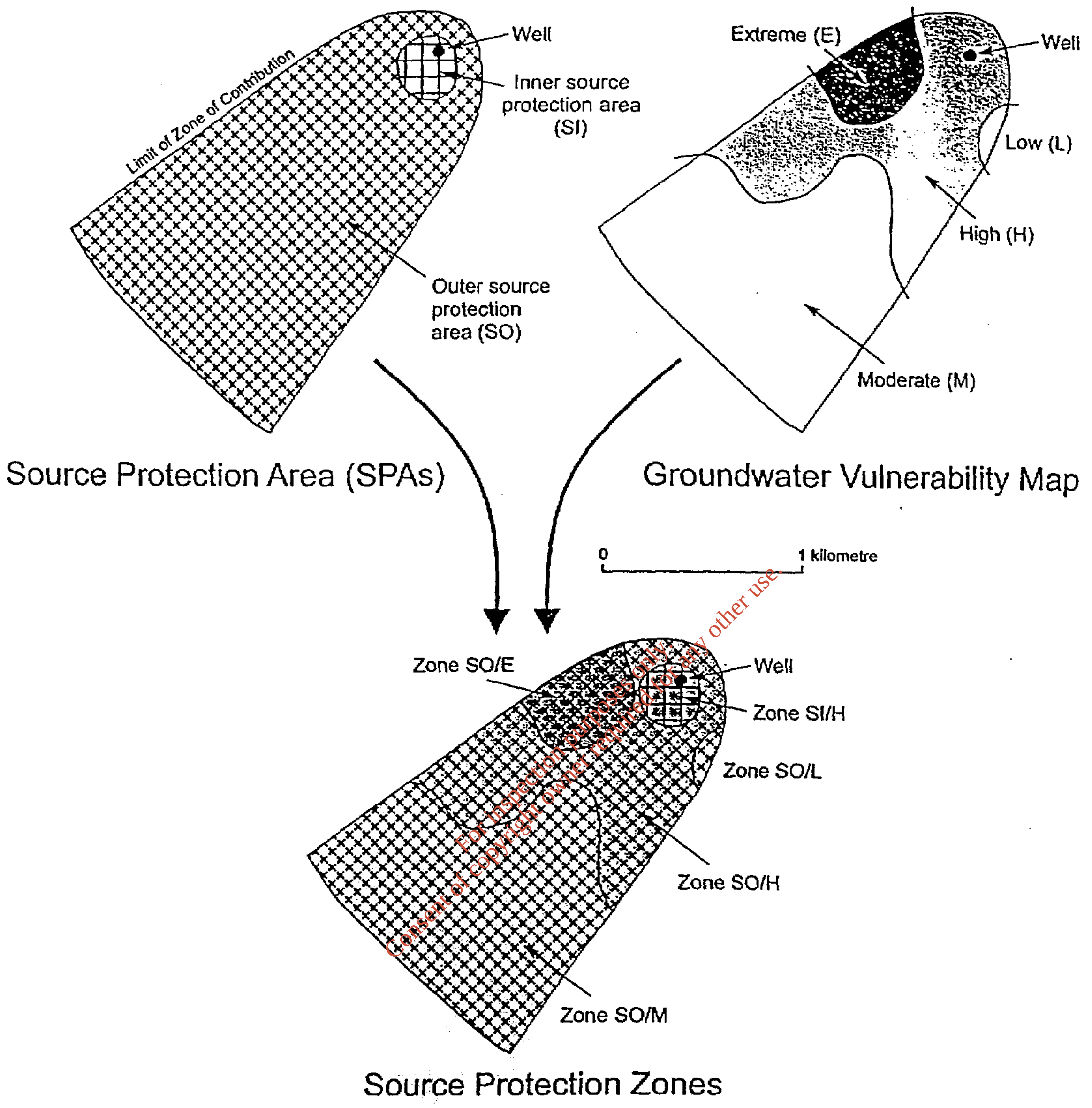


Figure 6. Delineation of source protection zones around a public supply well from the integration of the source protection area map and the vulnerability map.

3.4 Resource Protection Zones

For any region, the area outside the SPAs can be subdivided, based on the value of the resource and the hydrogeological characteristics, into eight aquifer categories:

Regionally Important (R) Aquifers

(i) Karstified aquifers (Rk)

(ii) Fissured bedrock aquifers (Rf)

(iii) Extensive sand/gravel aquifers (Rg)

Locally Important (L) Aquifers

(i) Sand/gravel (Lg)

(ii) Bedrock which is Generally Moderately Productive (Lm)

(iii) Bedrock which is Moderately Productive only in Local Zones (Ll)

Poor (P) Aquifers

(i) Bedrock which is Generally Unproductive except for Local Zones (Pl)

(ii) Bedrock which is Generally Unproductive (Pu)

These aquifer categories are shown on an aquifer map, which can be used not only as an element of a groundwater protection scheme but also for groundwater development purposes.

The matrix in Table 3 below gives the result of integrating the two regional elements of land surface zoning (vulnerability categories and resource protection areas) – a possible total of 24 resource protection zones. In practice this is achieved by superimposing the vulnerability map on the aquifer map. Each zone is represented by a code e.g. **Rf/M**, which represents areas of <u>regionally important fissured</u> aquifers where the groundwater is <u>moderately</u> vulnerable to contamination. In land surface zoning for groundwater protection purposes, regionally important sand/gravel (**Rg**) and fissured aquifers (**Rf**) are zoned together, as are locally important sand/gravel (**Lg**) and bedrock which is moderately productive (**Lm**). All of the hydrogeological settings represented by the zones may not be present in each local authority area.

VULNERABILITY RATING	RESOURCE PROTECTION ZONES					
	Regionally Important Aquifers (R)		Locally Important Aquifers (L)		Poor Aquifers (P)	
	Rk	Rf/Rg	Lm/Lg	Ll	Pl	Pu
Extreme (E)	Rk/E	Rf/E	Lm/E	Ll/E	Pl/E	Pu/E
High (H)	Rk/H	Rf/H	Lm/H	Ll/H	Pl/H	Pu/H
Moderate (M)	Rk/M	Rf/M	Lm/M	Ll/M	Pl/M	Pu/M
Low (L)	Rk/L	Rf/L	Lm/L	Ll/L	Pl/L	Pu/L

Table 3. Matrix of Resource Protection Zones

3.5 Flexibility, Limitations and Uncertainty

The land surface zoning is only as good as the information which is used in its compilation (geological mapping, hydrogeological assessment, etc.) and these are subject to revision as new information is produced. Therefore a scheme must be flexible and allow for regular revision.

Uncertainty is an inherent element in drawing geological boundaries and there is a degree of generalisation because of the map scales used. Therefore the scheme is not intended to give sufficient information for site-specific decisions. Also, where site specific data received by a regulatory body in the future are at variance with the maps, this does not undermine a scheme, but rather provides an opportunity to improve it.

Is this some type of cop out?

9. Conclusions

Groundwater is an important resource in Co. Meath, providing 20% of the total public water supply used by the county. In addition to this many private houses, farms and companies also use groundwater from either their own wells or private group scheme boreholes. The aquifers of Meath are not fully developed, providing the potential for future groundwater development as the need for water continues to increases. Even at present the supply of public water does not met the requirements, especially during the summer months when water rationing measures are in force, particularly in east Meath.

The groundwater quality in Co. Meath is generally considered to be good with few parameters exceeding the MAC (Maximum admissible concentration) set by the EU for drinking water. The groundwater can be classed as a calcium bicarbonate water, which is typically regarded as very hard. Approximately half of the sources sampled showed elevated levels of iron and manganese, often above the MAC. These high levels occur naturally in the groundwater and this is a common problem throughout Ireland. The high concentrations of iron and manganese are directly related to the geology and generally found in groundwaters from the Calp Limestone. These groundwaters are not regarded as polluted but do require treatment to reduce the levels below the MAC before use as drinking water.

Groundwater pollution at present is not a major problem in County Meath, although there are some groundwater sources which have indicated some contamination. Often these groundwater sources are located too close to potential pollution sources such as septic tanks, farmyards or streams in which the water quality is poor.

The vulnerability of groundwater to pollution is determined by the subsoil type and its thickness. A significant proportion of Meath is regarded as extreme or highly vulnerable as a direct result of thin subsoils or the presence of highly permeable deposits and the water quality is related to the vulnerability of the area.

The Groundwater Protection Map and the associated Groundwater Protection Response Matrices, currently under development by the GSI, EPA and DoELG, will help the Council to make better informed decisions on planning applications. Specific site investigations should be used to determine that no adverse effects to the groundwater will occur as a result of a given proposed development.

This report and the accompanying maps should also assist the Council:

- in seeking additional sources of groundwater which will be least vulnerable to contamination
- in managing its water resources
- in planning for emergency responses to pollution incidents
- in responding to unusual water shortages (droughts)
- in outline geotechnical appraisals, e.g. for new roads or sewerage schemes

Castle House,
Lagavooren,
Drogheda.
Ireland.

Tel: 00353419835584

10th. February, 2002

The Environmental Protection Agency,
Johnstown Castle Estate,
Co. Wexford.

Ref: 167 - 1

Dear Sir,

I wish to object to the granting of a waste licence for a proposed Waste Management Facility and Municipal Incinerator at Carranstown, Duleek, Co. Meath, (application lodged with E.P.A. - incomplete - 5th. December, 20010

The grounds for my objection are as follows:

The site in questionat Carranstown, Duleek, is totally unsuitable for a waste management and incinerator site. E.I.S. 2.2 page 3 of "Wilson Associates Architects Site Context" The Landscape character of this part of Co. Meath is essentially rural and agricultural. Topographically the site is on the perimiter of the Boyne River Plain....... Bellewstown Ridge 3Km to the South is the nearest high ground with a max. elevation of 160M OD (Malin Head). Red Mountain which is approx. 2 Km North East of the site has an elevation of 100M OD (Malin Head). Both of these are protected views. The proposed development will be situated in a landscape area of visual quality VQ11 Rural and Agricultural " as defined in the Meath Co. Co. Development Plan 2000"

Section 2.1 "A number of one-off houses are located in the vicinity of the site" It does not say how many, but there are a number, and a school "Mount Hanover N.S. which is not shown on most of the site maps. The Town of Drogheda Pop. 26,000 (with a planned pop. of 70,000) lies in the path of the prevailing South West wind, which will blow the pollution from the emmissions towards the town and its environs. Duleek is about 2 Km from the site and Donore is even nearer. This North East area has the highest Asthma rate in the whole country, not to mention frighteningly high cancer rates as a new report states. According to the Indaver E.I.S. Site selection criteria (2.10.1) & table 2.4. W.H.O. Site selection criteria, the site should be immediately rejected.

Step 1. ELIMINATE UNSATISFACTORY AREAS

e.g. <u>areas with Limestone deposits.</u> E.I.S. 2.4.1 Bedrock Geology (K.T. Cullen& Co. Ltd.) " The site is located in a relatively narrow expanse of Carboniferous Limestone"

<u>areas critical for aquifer recharge</u> E.I.S. 2.4.3 page 4 K.T. Cullen & Co.Ltd. report "The regional Limestone bedrock constitutes a regionally important aquifer which displays both KARST and fracture flow features...... currently the limestone aquifer in the vicinity of the site is used by a large number of ground water abstractors...... Irish Cement Ltd., located to the North West of the development site is currently de-watering the groundwater for their quarrying activities. It is estimated that the groundwater level in the limestone aquifer has been lowered by 5.0m to 9.0m below its normal level in the vicinity of the site, and will remain lowered until the extraction of rock is discontinued. This dewatering has altered the natural groundwater flow within the bedrock aquifer, which currently flows towards the Platin abstraction zone. The till overburden.... Potential localised contaminant migration, E.I.S. 6.2 page 13 (K.T. Cullen) report, "according to the G.S.I. the bedrock Aquifer is classified as regionally importantAquifer Rf/M"

<u>AREAS OF HIGH WELL YIELD</u>

There are numerous private wells in the area.

AREAS OF RESERVOIR WATERSHED *See K.T.Cullen, &Co/ Ltd., report.*

LANDS DESIGNATED FOR PRESERVATION *The site is close to the Duleek Commons, a fen area, which is now a N.H.A. since Ms. Sile De Valera Minister for the Arts, Heritage, Gaeltacht & the Islands gave commencement orders for the Wildlife (Ammendment) Act 2000.*

Step 2. *HIGHLIGHT PROMISING AREAS*

In my opinion the area in question is not a promising area.

ASSESS PROMISING AREAS IN DETAIL *Freshwater wetlands. (To be ruled out I presume.) DULEEK COMMONS N.H.A. fen area is close by the proposed site. Indaver denies this(page 22(c) Document lead sheet)*

AREAS OF SPECIAL SIGNIFICANCE

The proposed sie at Carranstown is on the edge of the Boyne Valley, and close to the World Heritage Site of Newgrange , Knowth , and Dowth. Unfortunately Duchas the Heritage Service did not receive the file in time to assess the visual impact of the 40m high chimney stack on the World Heritage Site at Newgrange, Knowth, and Dowth.

VISUAL CORRIDORS OF SCENIC RIVERS

As mentioned above, Carranstown is situated on the edge of the Boyne Valley and close to the river NANNY (which is also a salmonoid river being placed at risk if this development goes ahead.)

EXISTING DEVELOPED AREA

E.I.S. (6) Industrial Character page 60 (I quote)
"The Platin Cement Factory......... and the existing character of the landscape is industrial in character. The suitability of the Platin area for industrial development was confirmed by the decision of the Meath Co. Co. (which was subsequently upheld by an Bord Pleanala) to grant a planning permission for the development of a power plant in the area" *Considering section 98 (1) of the E.P.A. Act of 1992 which prohibits a Planning Authority OR An Bord Pleanala from giving any consideration to environmental pollution matters where an I.P.C. licence, (or a waste licence) is being sought,(section 54 waste management Act 1996,) DID Meath Co. Co. have any option?* *The Meath Co. Co. decision to grant planning permission to Indaver for the Waste Management facility and Incinerator at Carranstown was similarly constrained under the E.P.A. Act of 1992.* *So the onus is now on the E.P.A. to consider Public Health risks from Incineration and also damage to the Environment. (As a matter of fact, the Bord Pleanala Inspector in the case of the Marathon Power Plant warned that the granting of permission to Marathon SHOULD NOT BE TAKEN AS A PRECEDENT FOR FURTHER DEVELOPMENT IN THE AREA.*

The Cement Factory at Platin is regarded as "site specific" *Do Indaver think that more of the same pollution from emmissions would be good for the residents of Meath & Louth? As is evident from the "fallout" of dust on the vegetation in the area, there is an amount of pollution from emissions from existing plants.*

step 3. *ASSESS PROMISING AREAS IN DETAIL*

INDUSTRIAL AREAS (?) *This area of County Meath was always regarded as a very fertile agricultural area NOT an Industrial area.* *The fact the C.R.H. built a massive Cement Plant there, (in the days before the freedom of information act, when there was little public knowledge of what large companies proposed to do) does not entitle this area of County Meath to be developed as an Industrial area.* *As already stated the Cement Plant was "site specific".*

Step 4. *EVALUATE AND RANK SITES*

ACCESS TO SEWERS. There is no public sewer in the area, and the soil failed the "T" test. Section 9 of the E.I.S. deals with Surface Water. Existing environment (I quote) "There are NO surface water features such as rivers. lakes, or ponds on the development site" There are drainage ditches and a stream which is mostly dry in Summer, but which sometimes carries "dirty water" as one former resident of the area told me (source unknown) which drains into the Nanny river. Section 9.2 page 124 of the E.I.S. "The river is not a designated Salmonoid river" But the Eastern regional Fisheries Board state " we wish to state that the River Nanny is a valuable salmonoid river with very valuable stocks of Brown and Sea Trout (letter to P.A. 30/1/01)
"The E.I.S. Fig. 3.1 is an aerial photograph of the proposed site. Mount Hanover School is located 1 Km to the South East and is the only (?) sensitive institution in the immediate vicinity of the proposed development" (Page 20 Meath Co. Co. Planning report.)

WHY WAS THE SCHOOL DELIBERATELY OMITTED FROM THE AERIAL PHOTOGRAPH AND ALMOST ALL THE MAPS???

Page 21 of the same report says "The proposed development will lead to demands for locally sourced goods, services and materials" Is this meant as a Joke? Does anyone think that the people will be clamouring for locally sourced milk? Cheese? and Vegetables? with a high Dioxin content??

Didn't the farmers of New Zealand reject incineration of municipal waste because they KNEW that it would only take one photograph of New Zealand sheep grazing in the vicinity of an incinerator, to cause them to lose their markets in the European Union for the products just mentioned.
Page 21 also: 3.3 Air and Climate; sections 4 & 10 of the E.I.S. "The proposed construction activity and the operation.................. a number of emissions. Emissions include dust, flue gases, hydrocarbons, dioxins, furans, and metals" "A number of substances will be emitted <u>for which there is no National or E.U. Air Quality Standards.</u> They then go on to say "that measures and technologies will be employed to to attain these standards, and to reduce them to comply with emission standards. This entire section reads like ABSOLUTE RUBBISH to me, but perhaps it is good enough for people who want to build an incinerator???

So what is the solution to our Municipal waste problem? The infrastructure must be put in place quickly to enable the people to RECYCLE any materials that can be recycled such as glass, paper, tins, plastics etc., by providing "BRING CENTRES" in towns and villages countrywide. My nearest centre is NAVAN 17 miles away, otherwise DUNDALK 22 miles away. DROGHEDA, apart from a bottle bank. has NONE! Every house must be encouraged to compost anything that can be composted! And suppliers of goods must take responsibility for surplus packaging. Centres can then be set up to stabilise the residual waste --------- by now hopefully reduced by 50%-------- before landfilling this inert residue. The landfills once the organic fraction has been removed and composted will not be a source of smells and leachate and vermin. They should be located AWAY from centres of population and should have a limited lifespan of say 5 years.

Burning unsorted waste in an incinerator is a waste of limited resources and the E.U. says it will not grant-aid them in the future.

According to the planners' report "The proposal is for thermal treatment of unsorted waste" (page 10). The E.I.S. states (page 84) Emissions from stack 4.4.4 : "Furthermore, unless particular wastes (containing individual heavy metals) are present in the waste stream, individual heavy metals will <u>RARELY</u> be emitted at <u>SIGNIFICANT CONCENTRATIONS"</u>

<u>If individual heavy metals are to be emitted at SIGNIFICANT CONCENTRATIONS on RARE occasions, even when no such individual heavy metals occur in the waste stream,</u> ARE WE TO TAKE IT THAT WHEN SUCH HEAVY METALS <u>ARE</u> PRESENT IN THE WASTE STREAM THAT THE EMISSIONS WILL CONTAIN SIGNIFICANT CONCENTRATIONS OF THESE HEAVY METALS <u>ALL THE TIME???</u>

Also on page 84 " certain Chromium compounds are thought to be human carcinogens. There are no E.U. or Irish limits for ambient Cr. concentrations , nor do the W.H.O. set a guideline value."

DULEEK COMMONS

N.H.A. No. 001578

In the E.I.S. ATTACHMENT 10 Flora & Fauna Survey page 3 , Biosphere Environmental Services state "NO part of the site is covered by a conservation designation -- or a proposed designation, such as a National Heritage Area, NOR IS ADJACENT TO ANY AREA WITH SUCH A DESIGNATION" This is ABSOLUTELY WRONG! The proposed site is adjacent to DULEEK COMMONS , a wetland complex, now a N.H.A. No. 001578 ... An Taisce? Duchas will confirm this!!!

Yours sincerely,

Mary P. Burke, B. Ed.

2.4 General Geology and Hydrogeology

In considering the impact of the proposed development on the geology and groundwater quality, K.T. Cullen & Co. Ltd. have examined the following factors:

- Rock type and permeability
- Overburden type, thickness and, permeability
- Depth to water table
- Importance of groundwater as a resource
- Groundwater vulnerability

Data has been collated from investigations undertaken by this office and from the GSI database for Meath County.

2.4.1 Bedrock Geology

The site is located in a relatively narrow expanse of Carboniferous limestones that outcrops between the Lower Palaeozoic sandstones and shales of the Longford Down Massif to the north and the block of similarly aged meta-sedimentary rocks that extend between Julianstown and Balbriggan to the south (Figure 1). The Platin limestones extend westwards to connect with the Carboniferous rocks that underlie much of Meath. To the east and beyond Drogheda, this narrow band of limestones extends as far as the Irish sea between the Boyne and Nanny estuaries.

The Platin outlier is fault bounded and the limestones at the nearby quarry have a general East North East strike with a shallow (10-20 degree) dip to the northwest. The deposit consists of at least 300metres deep of grainstones, which can be subdivided into some 18 units depending on their composition, grainsize, chert content and colour. The types of grainstones that have been recorded at Platin include crinoidal pepper-type, intra-clastic and skeletal. In general, the limestones are massive with few bedding structures clearly developed.

2.4.2 Overburden Geology

The overburden geology consists predominantly of brown silty clays generically known as boulder clays. These consist of medium dense brown silty clays with pebbles, cobbles and occasional boulders. The boulder clay varies in thickness across the site, ranging from 5.0 metres towards the west of the site, to greater than 20 metres towards the centre. Sand and gravel lenses are found throughout the boulder clays, and allow some water movement through the otherwise low permeability clay material.

2.4.3 Hydrogeology

The regional limestone bedrock constitutes a regionally important aquifer which displays both karst and fracture flow features. Groundwater within the limestone aquifer flows eastwards and either discharges directly into the Irish Sea or into the Boyne and Nanny River systems as base flow. Based on the groundwater flow direction for the proposed site, the groundwater discharges into the River Nanny by means of local tributaries of the Nanny.

Currently the limestone aquifer in the vicinity of the site is used by a large number of groundwater abstractors. Figure 2 shows the location of these abstraction points. This information was obtained from the Environmental Impact Statement entitled "Proposal for the Development of Limestone Quarry" dated 1997 and produced by Brady Shipman Martin.

Irish Cement Ltd., located to the north west of the development site, is currently de-watering the groundwater for they're quarrying activities. It is estimated that the groundwater level in the limestone aquifer has been lowered by 5.0 to 9.0 metres below its normal level in the vicinity of this site, and will remain lowered until the extraction of rock discontinues. This dewatering has altered the natural groundwater flow within the bedrock aquifer, which currently flows towards the Platin abstraction zone.

The till overburden on site contains groundwater, however this has moderate to low permeability thus holding little or no potential for groundwater development. The overburden water does represent a pathway for potential localised contaminant migration.

3 FIELD ACTIVITIES

Field activities for the purpose of this hydrogeological investigation were undertaken in May 2000 and consisted of the following stages:

- Soil Sampling
- Monitoring Well Installation


* Mount Hanover School not marked on the G.I.S maps. Why?
This map is from Geological Survey of Ireland
DROGHEDA
Duleek
Tullyallen
Oldbridge
Donacarney
Mornington
Colp
Ministown
Redmountain
Rathmullan
Newtown Platin
Platin
Mount Hanover
Kilsharvan Ho.
Newhaggard
Balgeen
Dardistown Castle
Whitecross
Rogerstown
Callaghstown
Crufty
Shallon
Annagor Ho.
Carranstown
National School
Cruicerath
Roughgrange
Gilltown
Newgrange Ho.
Clonlusk
Corballis
Loughree
Knockcommon
Drummond Ho.
Gillinstown Ho.
Downestown Ho.
Longford Ho.
Gafney Ho.
Blacklitch
Thomastown
Garballagh
Priorsland
Lisdornan
Claristown
Elm Grove
Rahollan
Wintergrass
Beybeg Ho.
Painestown
Ballymad
Farm Hill
Bettystown
Baldoyle
The Haven
Life Boat Sta.
Light Ho.
Monknewtown
Rossnaree Ho.
Balfeddock
Crewbane
Stalleen
Dunore
Sheephouse
Cherrymount
Balls Grove
Moneymore
Yellowbatter
Newtown
Tullyesker
Red Mountain
Coolfore
Killineer
Balgatheran
Mell
Tenties
Hill of Rath
Mullagharvan
Commons
Townrath
Lisdornan

sight, out of mind"? Groundwater protection schemes are an essential means of enabling planning authorities to take account of both geological and hydrogeological factors in locating potentially polluting developments; consequently they are now an essential means of preventing groundwater pollution.

2.1.4 Environmental Principles

As a means of protecting the environment, the following principles are now generally recommended and are part of Irish environmental policy:

- the principle of sustainable development, which is defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs";
- the precautionary approach, which means giving preference to risk averse decisions and avoiding irreversible actions;
- the principle that environmental protection should be an integral part of the development process;
- the "polluter pays" principle, which requires that the environmental cost should be incorporated in any development proposals.

These principles provide the basic philosophy for the groundwater protection scheme proposed for County Limerick. Also, the concept of risk and the requirement to take account of the risk of contamination to groundwater from potentially polluting activities have been integrated into the groundwater protection scheme.

2.1.5 Risk and Risk Management - A Framework for Groundwater Protection Schemes

Risk can be defined as the likelihood or expected frequency of a specified adverse consequence. Applied to groundwater, it expresses the likelihood of contamination arising from potentially polluting sources or activities (called the **hazard**). A Royal Society (London) Study Group (1992) formally defined an **environmental hazard** as "an event, or continuing process, which if realised, will lead to circumstances having the potential to degrade, directly or indirectly, the quality of the environment". Consequently, a hazard presents a risk when it is likely to affect something of value (the **target**, which in this case is groundwater). It is the combination of the probability of the hazard occurring and its consequences that is the basis of **risk assessment**.

$$\text{RISK} = \text{PROBABILITY OF AN EVENT} \times \text{CONSEQUENTIAL DAMAGE}$$

There are three key stages in risk analysis: risk **estimation**, risk **evaluation** and risk **management.** These are highlighted by the following questions.

What can go wrong? *Hazard identification and identification of outcomes* How likely is it to go wrong? *Estimation of probability of these outcomes or estimation of vulnerability* What would happen if it did go wrong? *Consequence analysis*	**risk estimation**
Is the risk acceptable and can it be reduced?	**risk evaluation**
What decisions arise from risk estimation and risk evaluation? What control measures are needed to minimise the risk?	**risk management**

Protection, like risk, is a relative concept in the sense that there is an implied degree of protection (absolute protection is not possible). An increasing level of protection is equivalent to reducing the risk of damage to the protected quantity, e.g. groundwater. Moreover, choosing the appropriate level of protection, necessarily involves placing a relative value on the protected quantity.

Groundwater protection schemes are usually based on the concepts of groundwater contamination risk and risk management. In the past, these concepts were in the background, often implicit, sometimes intuitive factors. However, with the language and thought-processes associated with risk and risk assessment becoming more common, relating a groundwater protection scheme to these concepts allows consistent application of a protection policy and encourages a rigorous and systematic approach. The conventional source-pathway-target model for environmental management can be applied to groundwater risk management:

Potential source of contamination → *pathway* → **Target**

or

Hazard → *vulnerability* → **Aquifer or groundwater source**

The GSI uses the following terminology and definitions.

The **risk** of contamination of groundwater depends on three elements:
(i) the **hazard** provided by a potentially polluting activity;
(ii) the **vulnerability** of groundwater to contamination;
(iii) the potential **consequences** of a contamination event.

Risk management is based on analysis of these elements followed by a **response** to the risk. This response includes the assessment and selection of solutions and the **implementation of measures** to prevent or minimise the consequences and probability of a contamination event.

The **hazard** depends on the potential **contaminant loading**. The natural **vulnerability** of the groundwater dictates the **likelihood of contamination** if a contamination event occurs. The **consequences** to the target depends on the **value** of the groundwater, which is normally indicated by the aquifer category (regionally important, locally important or poor) and the proximity to an important groundwater abstraction source (a public supply well, for instance). **Preventative measures** may include, for instance: control of land-use practices and in particular directing developments towards lower risk areas; suitable building codes that take account of the vulnerability and value of the groundwater; lining of landfill sites; installation of monitoring networks; specific operational practices. Consequently, assessing the risk of contamination to groundwater is complex. It encompasses geological and hydrogeological factors and factors that relate to the potentially polluting activity. The geological and hydrogeological factors are (a) the vulnerability to contamination and (b) the relative importance or value of the groundwater resource. The factors that relate to the potentially polluting activity are (a) the contaminant loading and (b) the preventative measures.

RISK TO GROUNDWATER

↙	↘
HYDROGEOLOGICAL FACTORS	**OTHER FACTORS**
⇩	⇩
(a) VULNERABILITY	**(a) CONTAMINANT LOADING**
(b) GROUNDWATER VALUE	**(b) PREVENTATIVE MEASURES**

A conceptual model of the relationship between these factors is given in the Figure 2.1, where septic tank effluent is taken as the hazard. The groundwater protection scheme outlined here integrates these factors and in the process serves to focus attention on the higher risk areas and activities, and provides a logical structure within which contaminant control measures can be selected.

Exposure of groundwater to hazard can sometimes be reduced by engineering measures (such as geomembrane liners beneath landfills). However, in most cases, a significant element of the total exposure to hazard will depend on the natural geological and hydrogeological conditions, which define the vulnerability or the sensitivity of the groundwater to contamination. Engineering measures may be required in some situations to reduce the risk further.

2.1.6 Objectives of the Groundwater Protection Scheme

The overall aim of the groundwater protection scheme is to preserve the quality of groundwater, particulary for drinking purposes, for the benefit of present and future generations.

The objectives, which are interrelated, are as follows:

- to assist the statutory authorities in meeting their responsibilities for the protection and conservation of groundwater resources
- to provide geological and hydrogeological information for the planning process, so that potentially polluting developments can be located and controlled in an environmentally acceptable way
- to integrate the factors associated with groundwater contamination risk, to focus attention on the higher risk areas and activities, and provide a logical structure within which contamination control measures can be selected

The scheme is not intended to have any statutory authority now or in the future; rather it should provide a framework for decision-making and guidelines for the statutory authorities in carrying out their functions. As groundwater protection decisions are often complex, sometimes requiring detailed geological and hydrogeological information, the scheme is not prescriptive and needs to be qualified by site-specific considerations.

2.2 How A Groundwater Protection Scheme Works

There are **two main components** of the groundwater protection scheme (Figure 2.2):

- **Land surface zoning,** which encompasses the hydrogeological elements of risk.
- **Codes of practice for potentially polluting activities** which encompasses both the contaminant loading element of risk and planning/preventative measures as a response to the risk.

Figure 2.2. Summary of Components of Groundwater Protection Scheme