

# NEW DEVELOPMENTS IN ON-SITE WASTEWATER MANAGEMENT

Billy Moore, BE, MSc, MBA  
(moorebilly@eircom.net)

IBCI Seminar, Sligo, April 2005

# ONE-OFF RURAL HOUSING ISSUE

- At the top of the political and public agenda
- Rural Planning Guidelines Published on 13<sup>th</sup> April 2005
- 408,000 Septic Tanks in Ireland (CSO, 2004)
- Significant Environmental Problems
  - On-site systems proposed for unsuitable sites
  - Poor installation
  - Lack of proper inspection, maintenance and monitoring

# RECENT DEVELOPMENTS

- New Rural Planning Guidelines
- New approach to site suitability assessment
  - EPA protocol replacing SR 6:1991
  - ‘Panels’ or ‘Registers’ of suitable or competent persons established (e.g. Clare, Wexford, Limerick)
- Use of alternative or advanced systems
- FAS Training Programme

# FUTURE DEVELOPMENTS

- Certification of installation of on-site systems
  - e.g. Now a planning condition in a number of counties: Kerry, Wexford, Limerick
- Inspection, Monitoring & Maintenance of on-site systems
- Proposed tracking system
- Change to Building Regulations



# RURAL HOUSING ISSUE

# ARGUMENTS FOR ONE-OFF RURAL HOUSING

- Economic and Social:
  - Redress rural depopulation issue
  - Strengthen rural communities
  - Bring vibrancy to rural areas
- Accommodate people with local linkages
  - Persons who are part of and who contribute to the area
- Quality of Life
- Freedom of Choice

# ARGUMENTS AGAINST ONE-OFF RURAL HOUSING

- Counter to principle of ‘nucleated’ development
  - i.e. development around ‘village’ nodes with shop, school, post office, pub, etc.
- Costs of services
  - e.g. Health, Post, Refuse collection, Electricity, Water supply, Telecoms, etc.
- Can affect the viability of public transport systems
- Ongoing energy costs
  - Cars needed to travel to work, ferry children to school and leisure activities
- Ribbon development:
  - Preventing efficient and economic use of public infrastructure

# ARGUMENTS AGAINST ONE-OFF RURAL HOUSING (2)

- Inhibiting long-term development options
  - Public infrastructure (e.g. N7 road improvements)
- Visual impact
  - Interference with scenic areas, high amenity landscapes, etc.
  - Negative impact on tourism
  - ‘Bungalow Blitz’ syndrome
- Traffic safety
- Risk of environmental damage
  - e.g. groundwater contamination!

# CURRENT SITUATION IN IRELAND


- One-third of total national population live in rural areas
- Approximately 20,000 new one-off rural houses per year
  - Approximately 36% of total (Irish Planning Institute)
- Percentage refusal: 15%
- Reasons for refusal:
  - Roads:
  - Visual/Interference with scenic views etc.:
  - Conflict with Development Plan policy:
  - **Wastewater Treatment/Risk to Groundwater:**

# MAIN REASONS FOR PLANNING REFUSALS

- Non-compliance with Development Plan policy on one-off rural housing
- Development with access to National Road (Circular 1/95)
  - Adverse effect on the efficient ongoing development and safe operation of key transport arteries
- Traffic safety aspects
  - Lack of adequate sight distance at entrance to road or at nearby junction
  - ‘Square root rule’: Traffic from 10 houses with separate entrances approximately 3 times more dangerous than traffic from one entrance servicing 10 houses
  - General capacity of the road to carry further traffic
- **Environmental/Health aspects:**
  - **Site unsuitable for on-site wastewater system (i.e. septic tank system, etc.)**
  - **Over-concentration of S.Ts. in an area**

# NEW DRAFT GUIDELINES: KEY QUESTIONS

- Will it be easier to get planning permission in rural areas?
  - Yes, where the development is intended to meet rural-generated housing need
    - Persons who are an intrinsic part of rural community
    - Persons working full-time or part-time in rural areas
  - Yes, in structurally weak rural areas (map)
    - e.g. areas of population decline, lower levels of income, employment and economic growth
    - *“Subject to good practice in relation to site location and access, drainage and design requirements, rural generated housing requirements will be accommodated in the locality in which they arise”*

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# SITE SUITABILITY ASSESSMENT ISSUE

# RURAL DEVELOPMENT KEY REQUIREMENTS

- Development must not have an adverse impact on habitats, environmentally sensitive areas, important scenic landscapes, ground and surface waters
  - ➔ Proper site suitability assessment required!
  - ➔ Use of EPA Pro-Forma ([www.epa.ie](http://www.epa.ie))

# SITE SUITABILITY ASSESSMENT

- Change from SR6:1991 to EPA approach:
  - Desk Study → Likely Requirements
  - Visual Assessment → Preliminary Conclusions
  - Trial Hole Test → Preliminary Conclusion
  - Percolation Tests (2 x 'T' Tests and /or 2 x 'P' Tests) → Conclusions
  - Recommendations
  - Design of System
- Results certified by a suitably qualified person

# DESK STUDY:

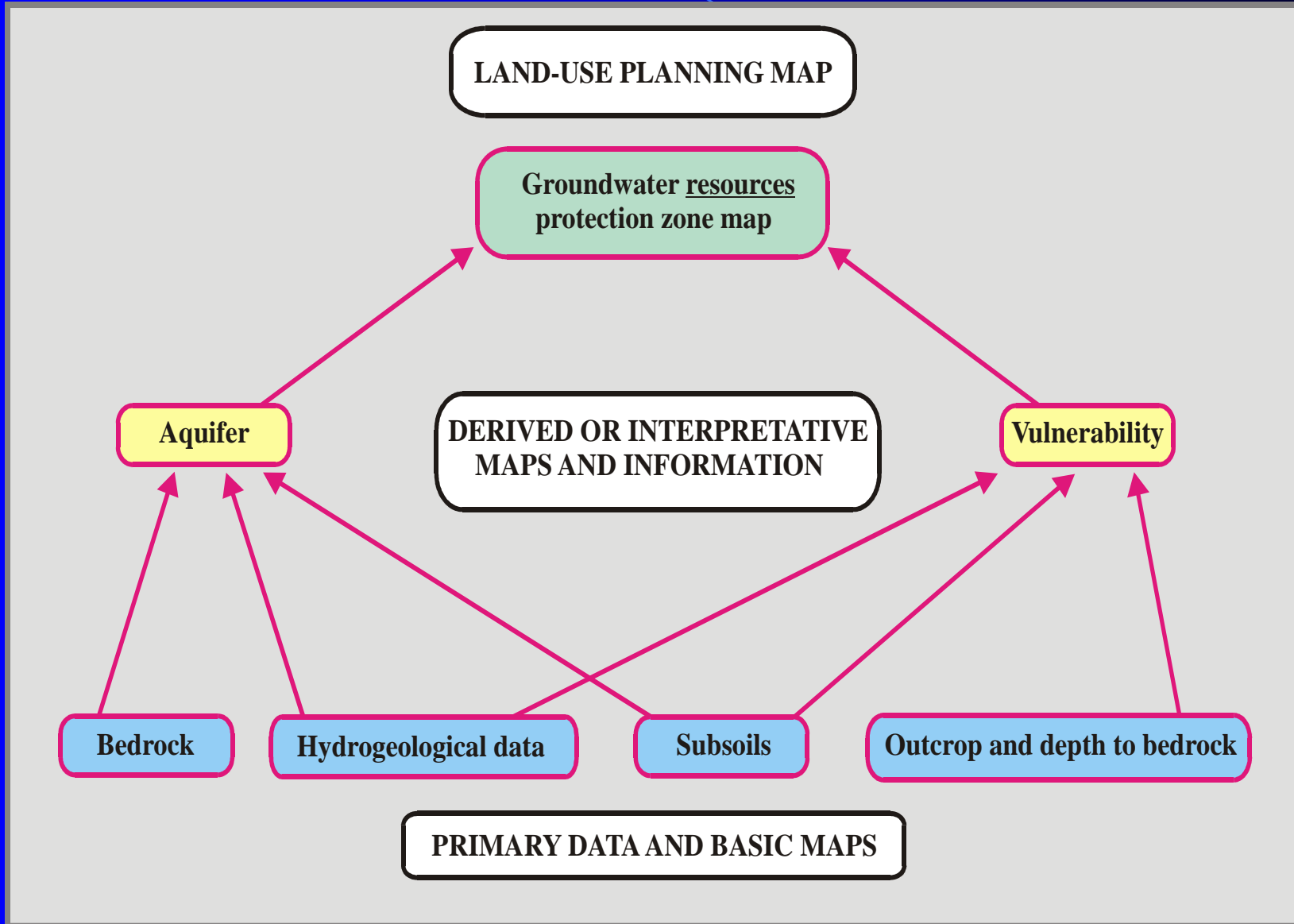


Groundwater  
Protection  
Responses  
Indicated

Groundwater  
Protection  
Schemes



# FRAMEWORK FOR PRODUCTION OF GW RESOURCE PROTECTION MAPS



# VULNERABILITY AND RISK

'Hazard → Pathway → Target' Model

**Hazard**

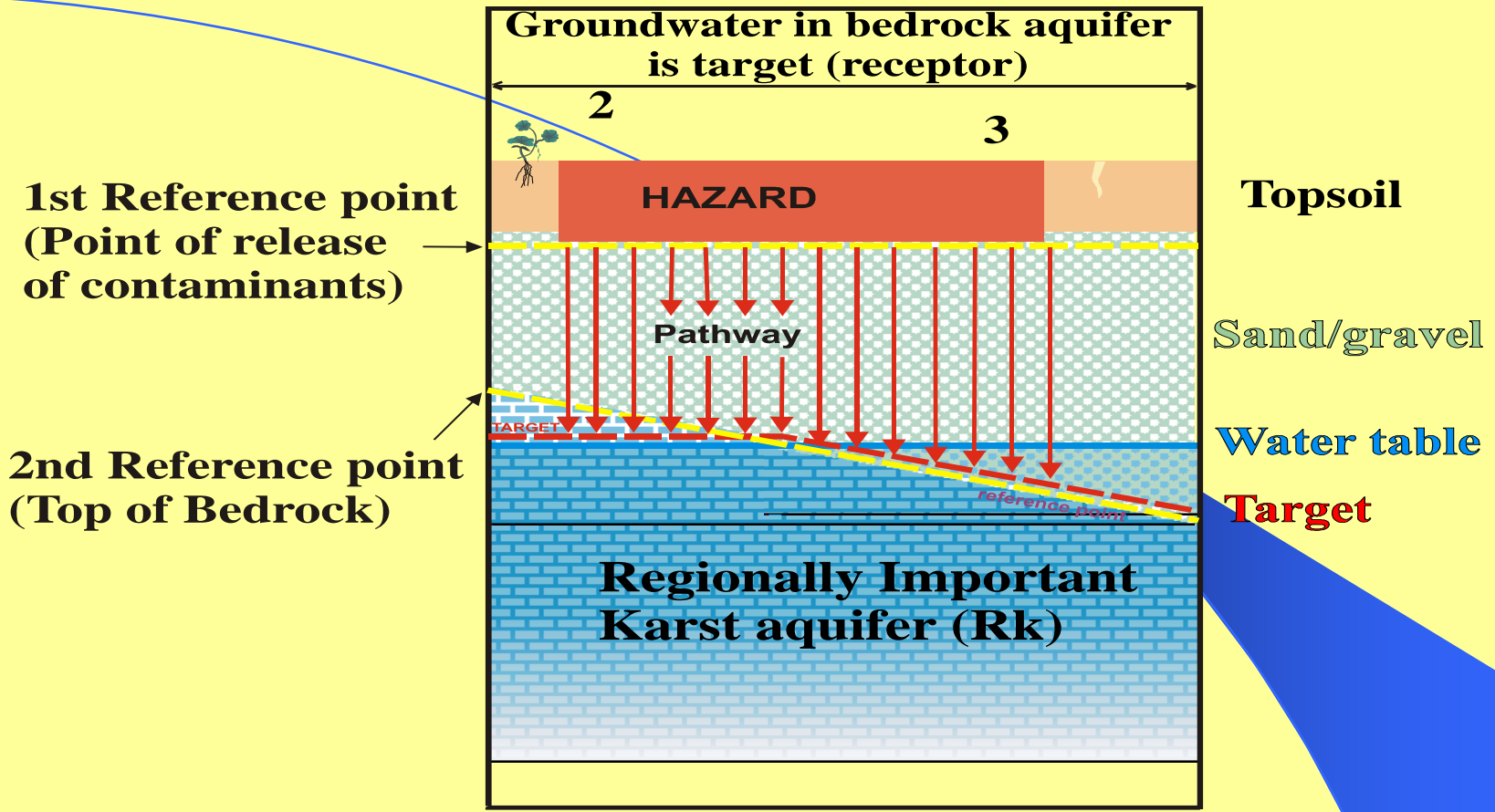
**pathway**

**Target/receptor**

**Contaminants  
in wastewater**

**Overburden: Topsoils  
and Subsoils**

**Groundwater in  
bedrock and  
sand/gravel aquifers**



**1st Reference point  
(Point of release  
of contaminants)**

**2nd Reference point  
(Top of Bedrock)**

**Topsoil**

**Sand/gravel**

**Water table**

**Target**

**Regionally Important  
Karst aquifer (Rk)**

**Point 2**

**Target:** Water table in bedrock aquifer.

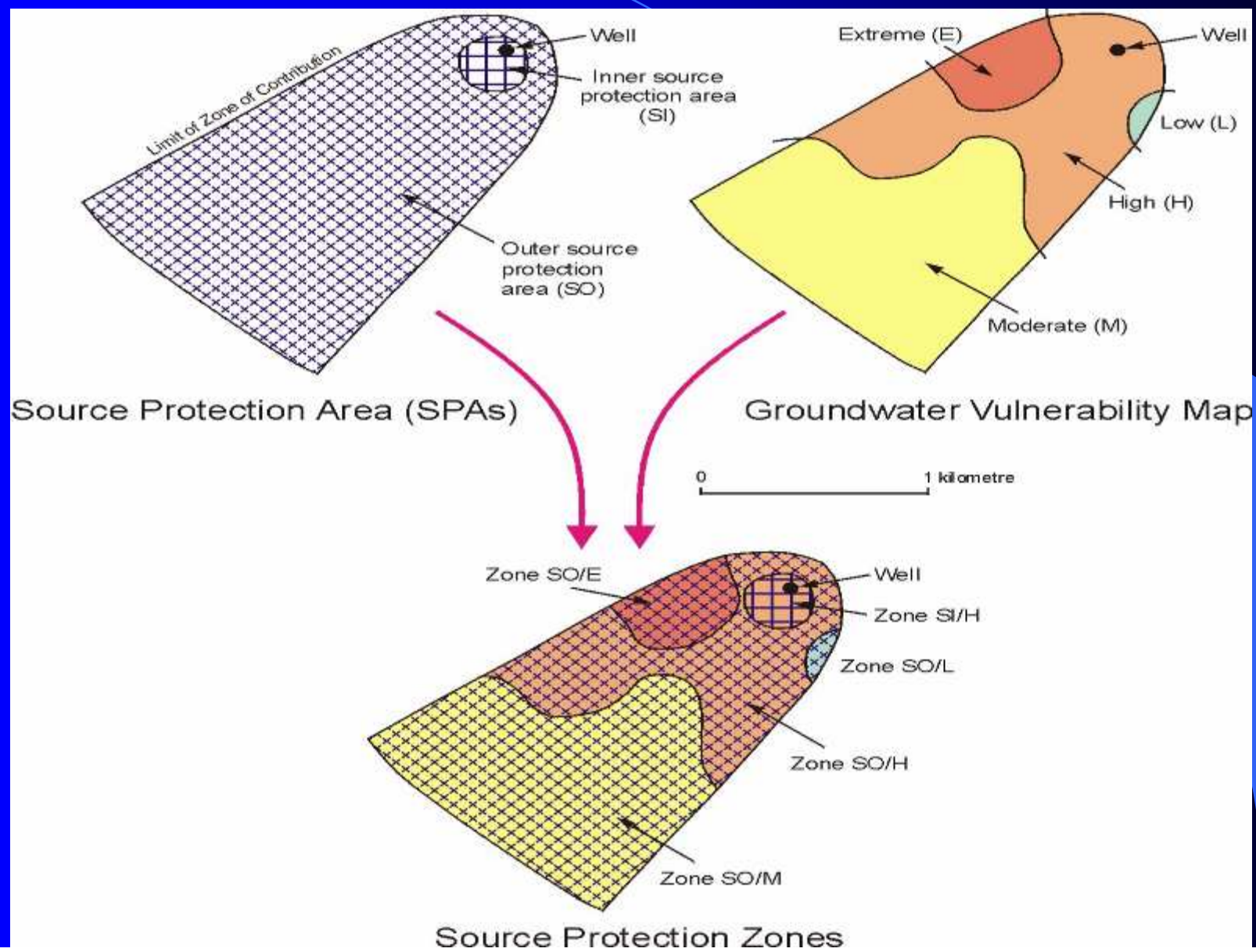
**Vul. Assessment:** Based on the permeability and thickness of the sand/gravel. The unsaturated limestone is not taken into account.

**Point 3**

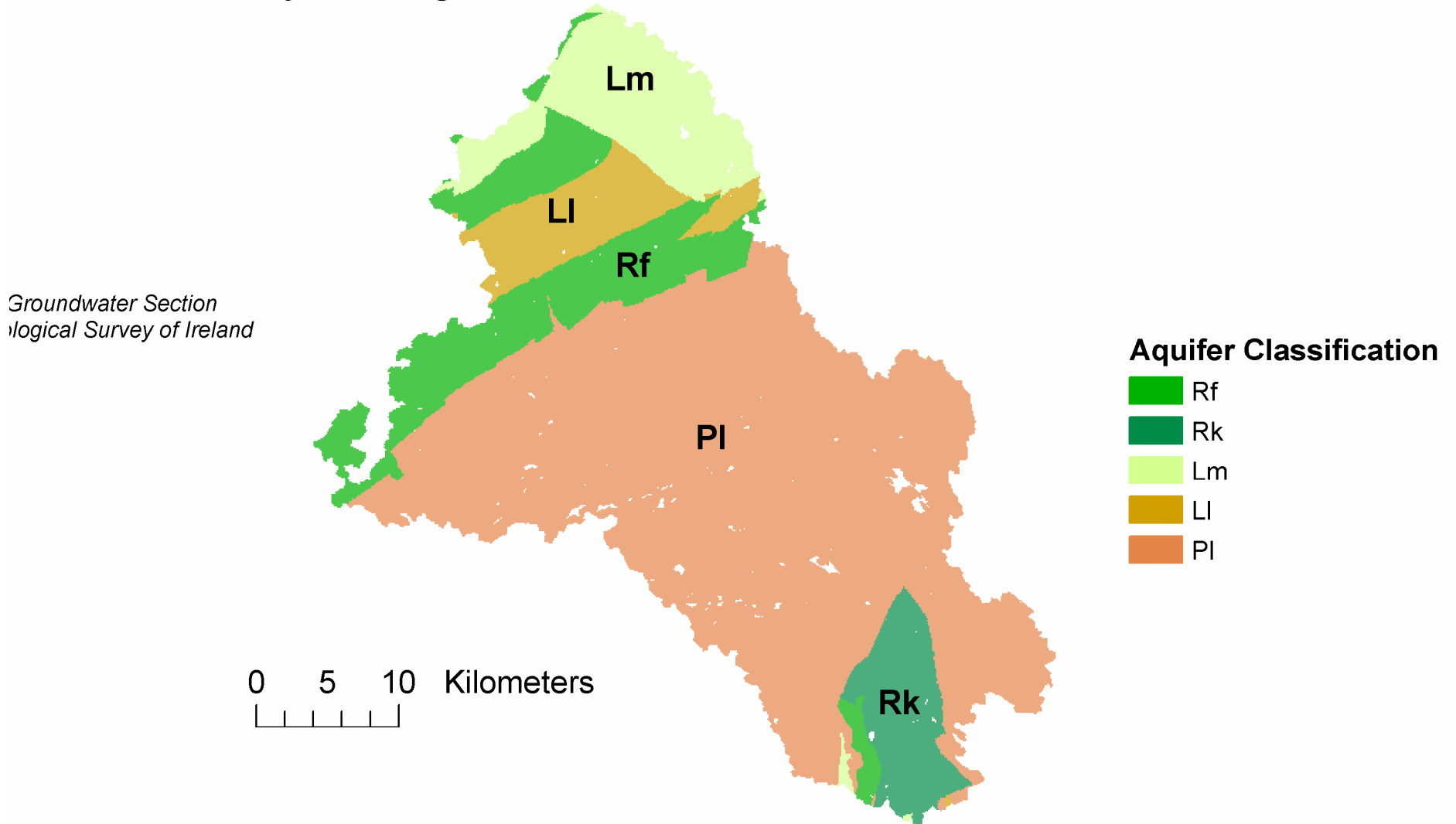
**Target:** Top of bedrock aquifer.

**Vul. Assessment:** Based on the permeability and thickness of the sand/gravel. The degree of saturation of the sand/gravel is not taken into account.

# SOURCE PROTECTION ZONES (SPZS) AROUND PUBLIC SUPPLY WELLS



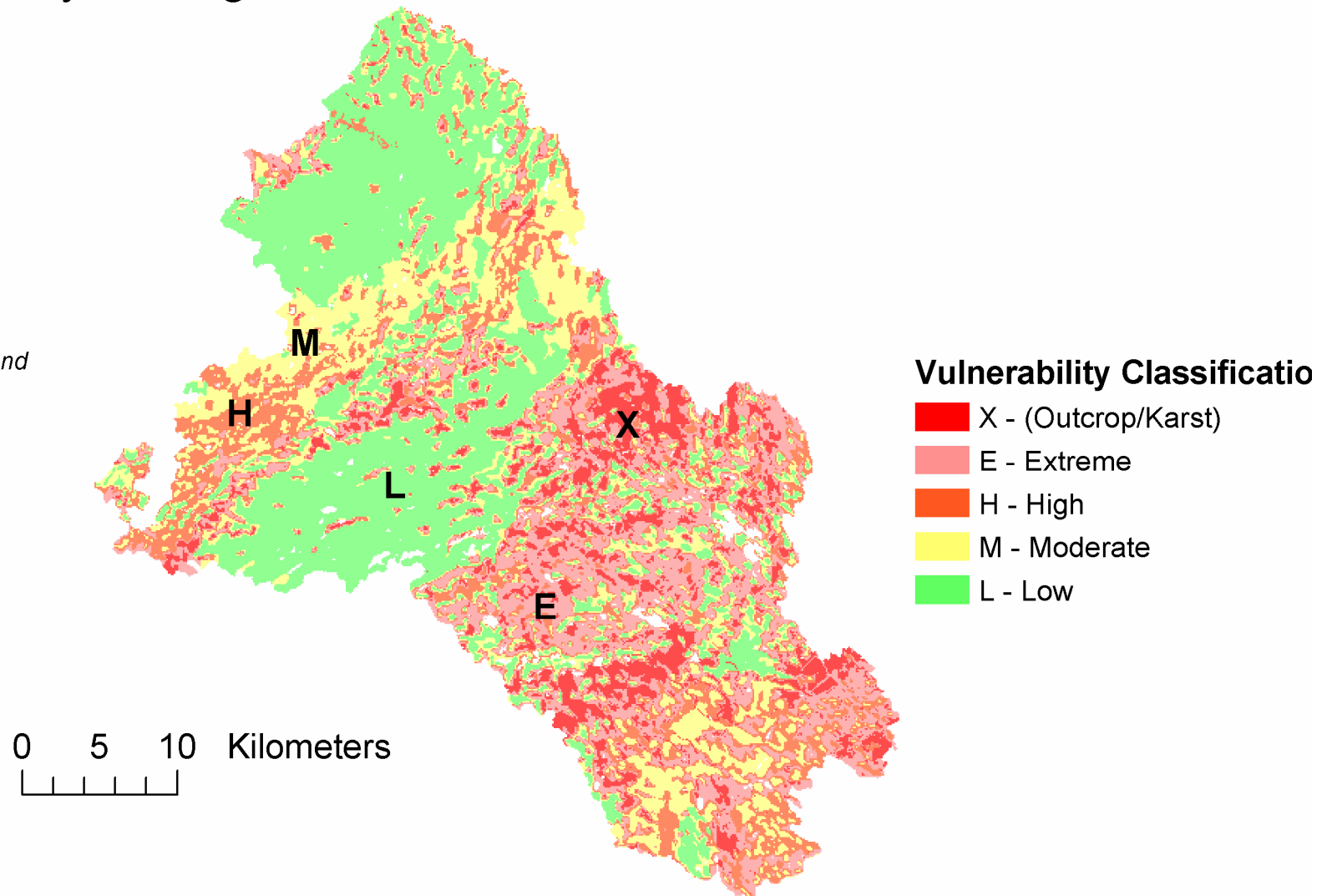
# County Monaghan Groundwater Protection Scheme



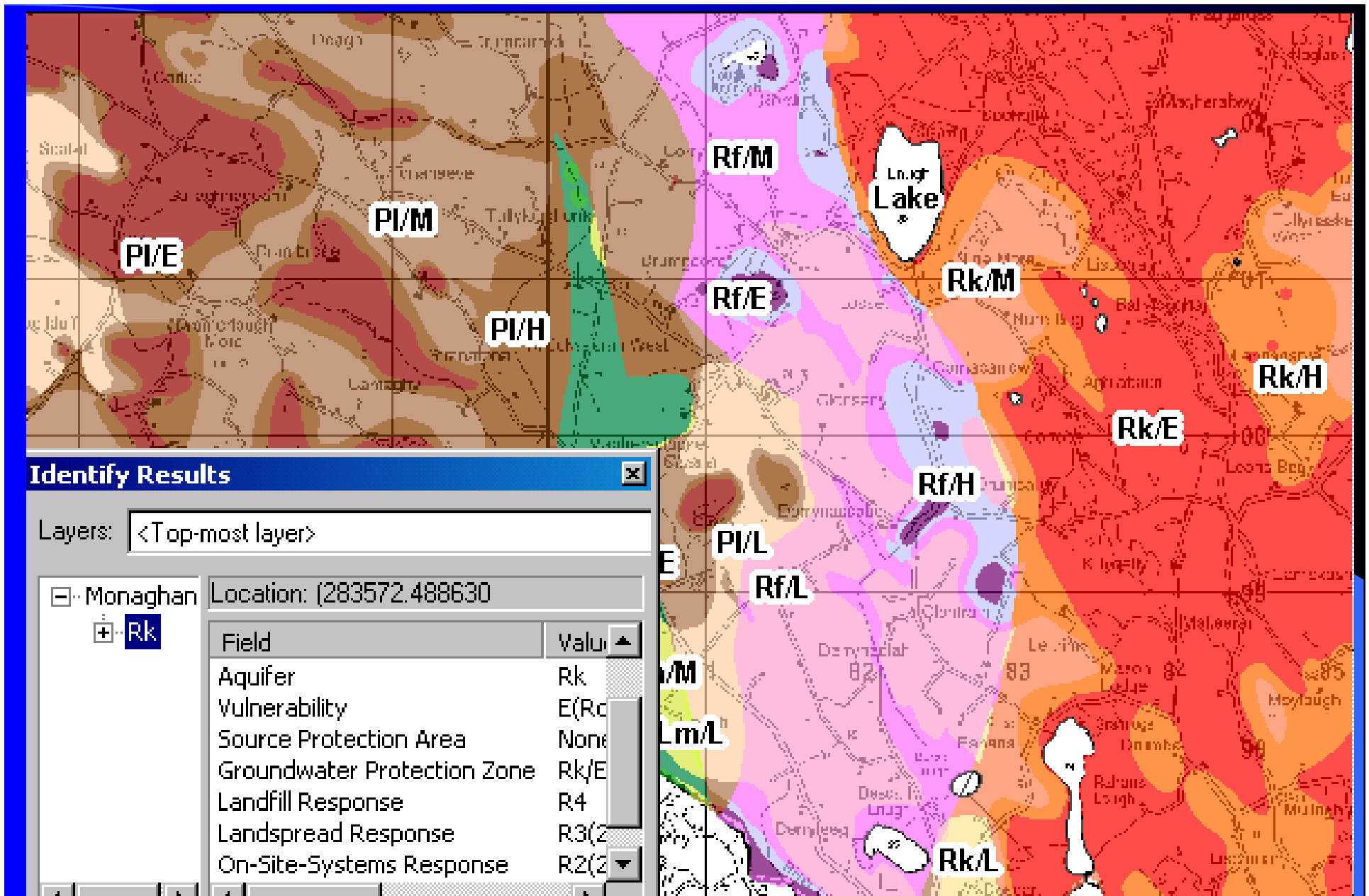
Screen Capture of ArcGIS map showing Aquifer Classification

# County Monaghan Groundwater Protection Scheme

*Groundwater Section  
Geological Survey of Ireland*



Screen Capture of ArcGIS map showing Vulnerability Classification



Screen capture of ArcGIS map showing Resource Protection Zones and Responses

# CONCLUSIONS

- Site suitable (or otherwise) for conventional septic tank system
- Site suitable (or otherwise) for advanced system,
- Site suitable (or otherwise) for discharge to groundwater
- Site Suitability Issues
  - Typically ~ About two thirds of areas of rural counties are readily suitable for on-site systems
  - However, not all sites/areas are suitable!
  - Proper site suitability assessment crucial (estimated cost ~ €1,250)

# SITE SUITABILITY ASSESSMENT: SUMMARY

- Proper Site Suitability Assessment
  - Use of EPA Manual ('00) & Groundwater Protection Responses ('01)
    - Proper approach to site assessment
    - A robust framework for decision-making
    - Multi-disciplinary approach required
  - Due to become the national guidance documents (e.g. in Building Regulations)
    - DELG Circular Letter SP 5/03
  - Documents are not 'easy reading'
    - Decision-making often complex!
  - Use of 'Site Characterisation Form' in EPA Manual

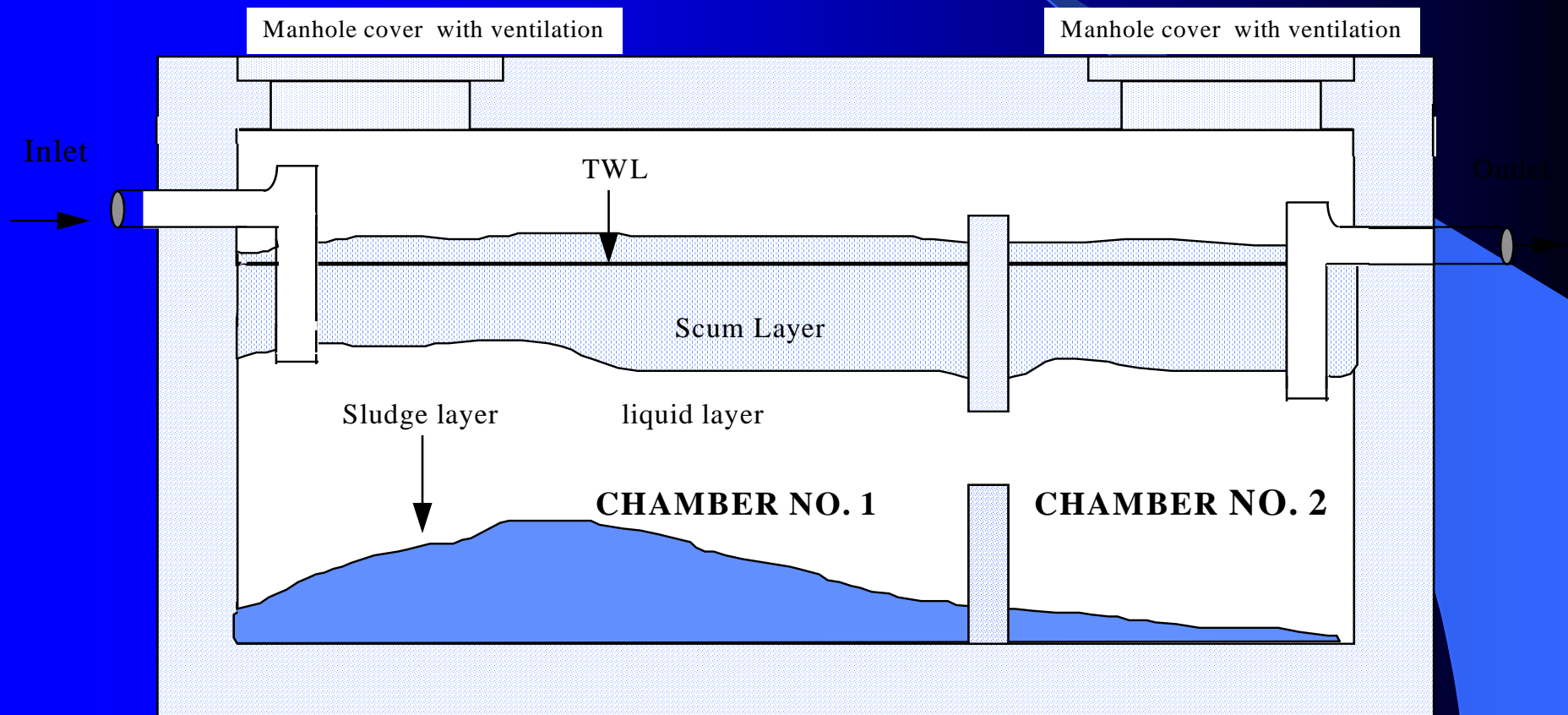
# WAYS OF MINIMISING THE THREAT (2)

- Selection and Design of Appropriate System
  - Conventional Septic Tank System:
    - Septic Tank
    - Percolation Area
  - Advanced Systems
    - Filter Systems
      - Constructed Wetlands
    - Mechanical Aeration Systems
      - Polishing Filters

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# SYSTEM DESIGN ISSUES

# THE SEPTIC TANK – TYPICAL LAYOUT



SECTION A - A



**SEPTIC TANK AND DRAIN FIELD**

**13.5.96**

# ON-SITE WASTEWATER SYSTEMS - KEY QUESTIONS

- Are septic tank systems a suitable approach to on-site wastewater treatment?
- Can alternative (i.e. advanced systems) be used in situations which are unsuitable for s.t. systems?
- Is it safe to assume that some type of on-site system can address each and every situation?

# SEPTIC TANK SYSTEMS

- A properly constructed and maintained S.T. system remains *”one of the most appropriate and cost-effective means on on-site treatment of wastewater”* (Ref: EPA Manual)
- However, in Ireland a significant number of S.T. systems do not function properly
  - Located in areas with unsuitable subsoils
  - Poorly designed, constructed, installed, maintained
  - Use of soakaways rather than percolation areas

# ENSURING EFFECTIVE WASTEWATER TREATMENT FOR ONE-OFF RURAL HOUSES

- Proper site suitability assessment
  - Desk Study (e.g. Groundwater Protection Scheme, County Development Plan)
  - Visual Assessment
  - Trial Pits
  - Percolation Tests
  - Assessment of Suitability
  - Selection of Appropriate System
- EPA Manual 2000
- FAS Training Programme now in place

# LOCAL AUTHORITY POLICY: TYPICAL CONTROL GUIDELINES

- Compliance with S.R.6:1991 or with EPA Manual
- Protection of known/potential aquifers
- Minimum site areas specified
- Resistance to communal septic tanks in certain cases
- S.T.s generally not permitted in potentially serviced town areas
- Advanced systems accepted in some cases when site conditions unsuitable for conventional S.T.s

# CURRENT LOCAL AUTHORITY PRACTICE

- Site Suitability Assessment Required
  - Visual Assessment
  - Trial holes
  - 'T' and 'P' tests
- Results certified
  - Suitably qualified person
- Overall
  - Significant degree of variation
  - Little consistency of approach

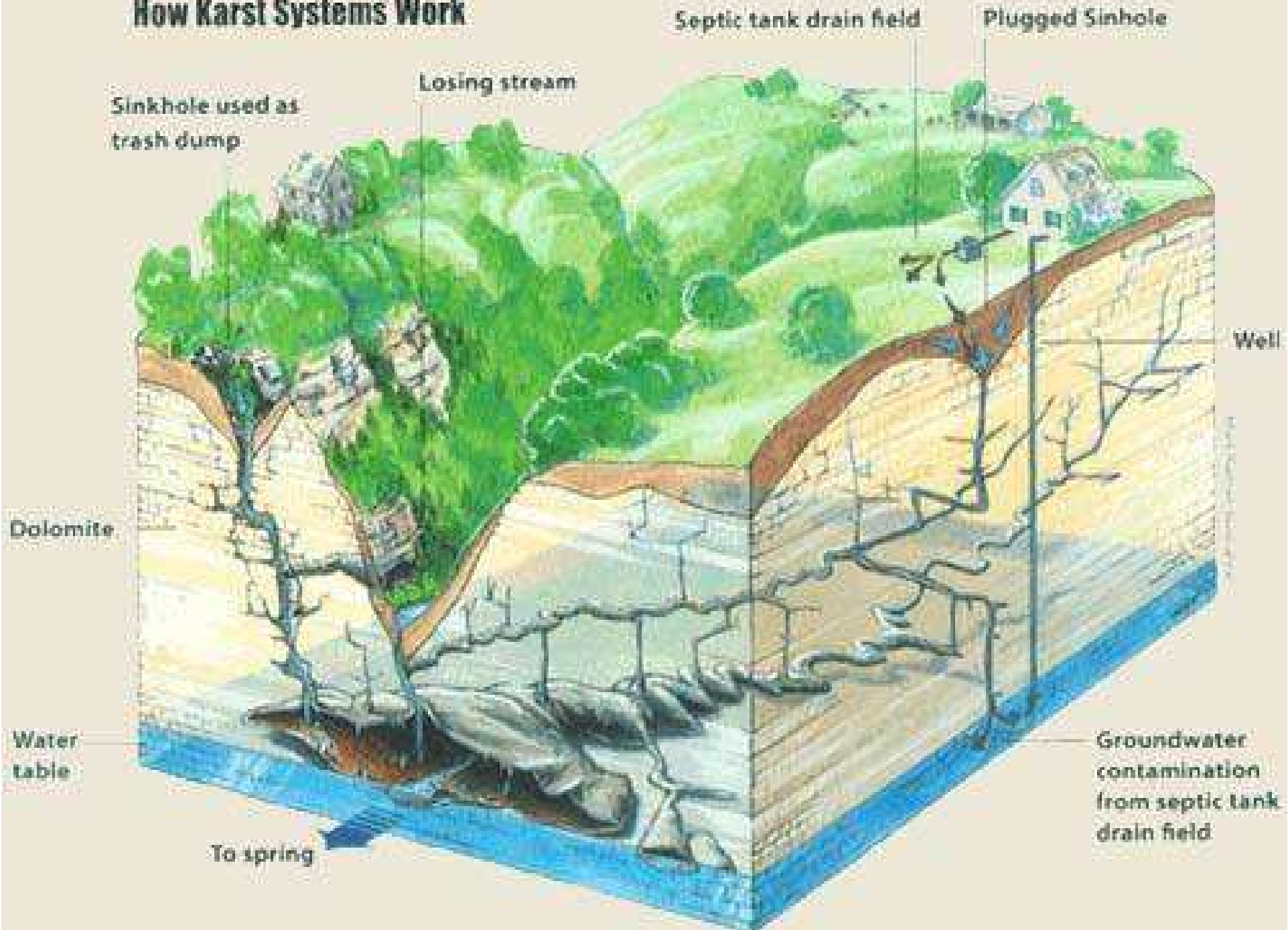
# L.A. EXPERIENCE PROBLEMS WITH ON-SITE SYSTEMS

- Ponding - Public health hazard
- Surface water contamination
- Groundwater contamination
- Odour nuisance
- Backing up of sewage in drains
  
- These are public health (as well as environmental pollution) problems!

# IMPACT ON GROUNDWATER QUALITY

- More microbial pollution in Ireland than any other EU country
- High nitrates in places
- Private wells and on-site systems on the same site – an inherently risky situation!

# How Karst Systems Work



# ON-SITE SYSTEMS: CAUSES OF PROBLEMS

- Unsuitable sites (e.g. rock close to surface)
- Inadequate permeability/percolation
- Use of soakage pits (50%)
- Absence of percolation areas (14%)
- Inadequate design
- Direct discharge to watercourses (29%)
- Poor construction/installation
- Inadequate inspection/maintenance
- Rainwater/surface water connected






# SITUATIONS OF INADEQUATE SOAKAGE







# ADVANCED SYSTEMS

# ADVANCED SYSTEMS

## L.A. POLICY & PRACTICE -

- L.A. attitude
  - Lack of consistent or uniform approach
  - Maintenance seen as a major problem
  - Permission contingent on maintenance contract
- Agrément Certificate
  - Building Regulations, 1992
  - Technical Guidance Document, Part D:  
Irish Agreement Board Certificate
  - Board Members:  
DOELG; ACEI; RIAI; CIF; IBEC; NSAI

# ADVANCED SYSTEMS

- FILTER SYSTEMS

- Soil Filter System
- Constructed Soil Filter System ('Mound' system)
- Intermittent Sand Filter/Peat Filter System
- Constructed Wetlands

- MECHANICAL AERATION SYSTEMS

- Biofilm Aerated (BAF) Systems
- Rotating Biological Contactor (RBC) Systems
- Sequencing Batch Reactors (SBR)

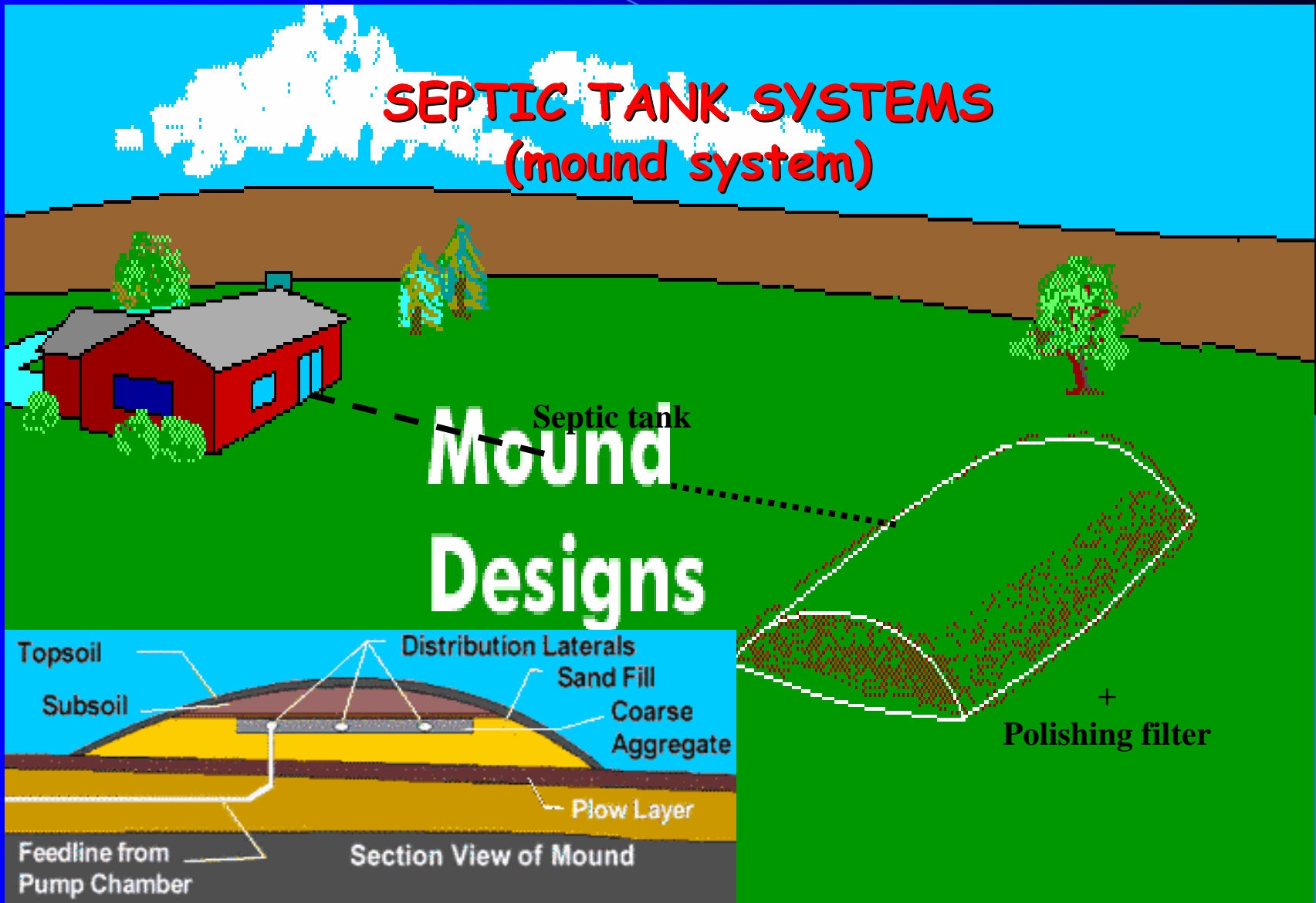


**ALTERNATIVE SYSTEMS**

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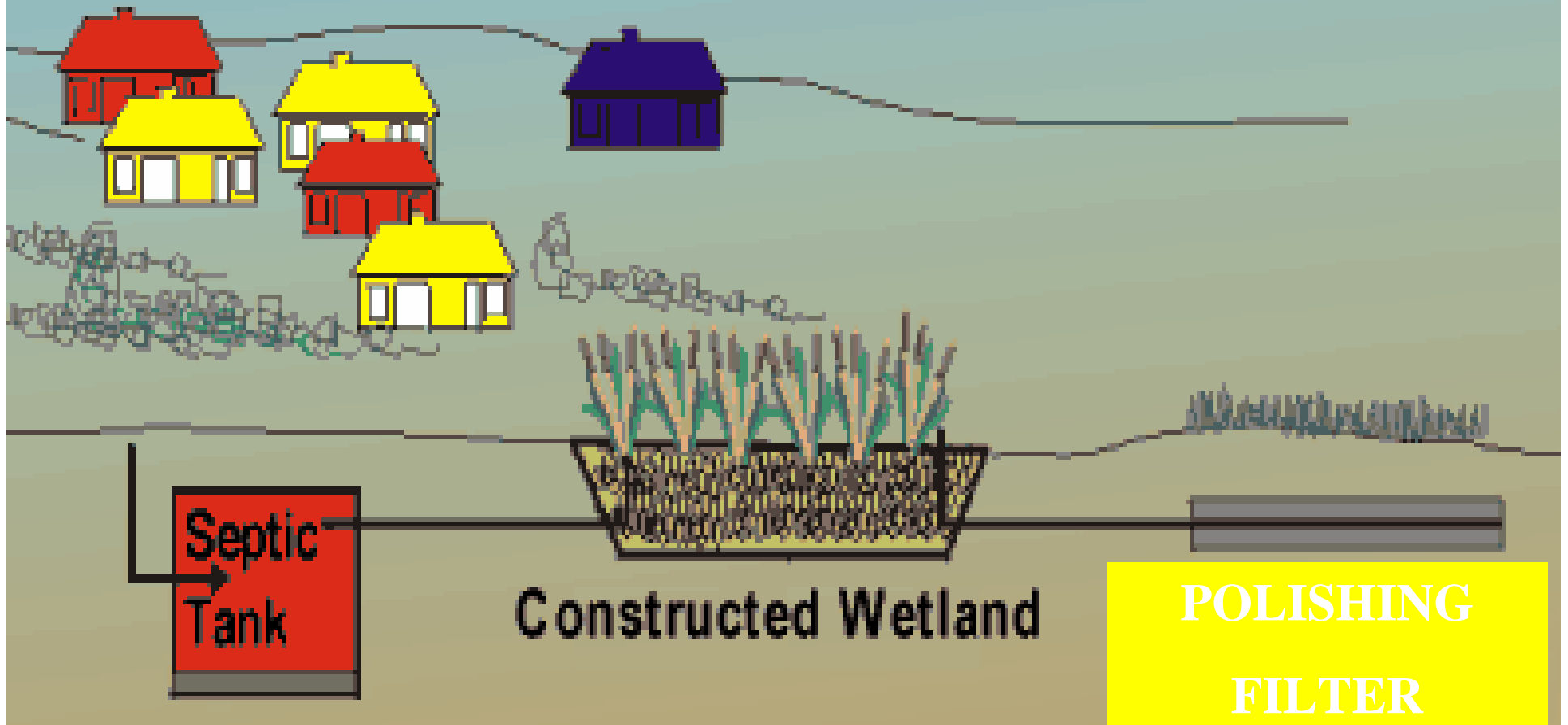
# CONSTRUCTED PERCOLATION SYSTEMS

## SEPTIC TANK SYSTEMS (mound system)



# CONSTRUCTED WETLANDS

## CONSTRUCTED WETLAND





**PURAFLO SYSTEM**

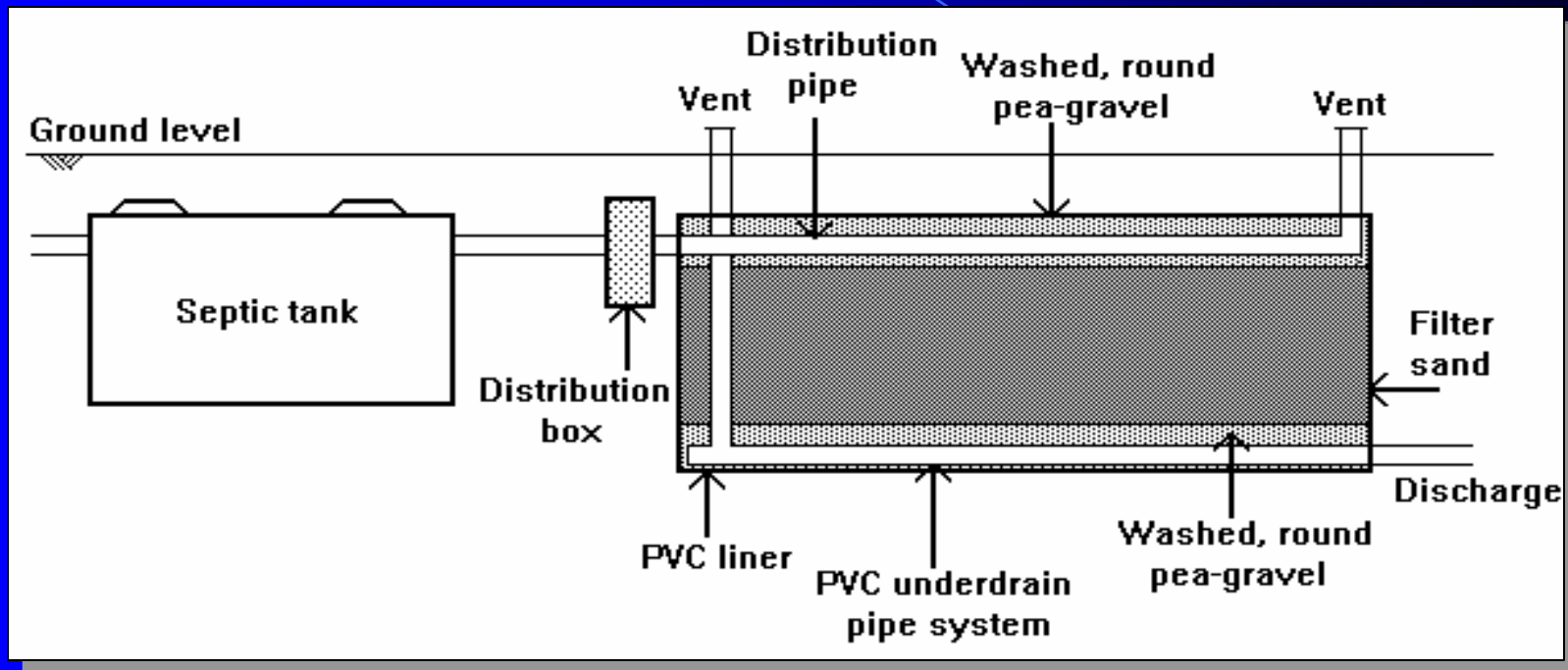
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**SAND FILTERS**

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# INTERMITTENT SAND FILTERS



## Advantages:

- Reduces BOD, ammonia, and solids
- Recycle to primary tank to reduce nitrate
- Possible phosphorus reduction depending on filter material
- Polishing Filter removes coliforms to a very low level

**IRISH  
AGRÉMENT  
BOARD**



BUILDING PRODUCT CERTIFICATION

**CERTIFICATE No. 96/0033**

CI/SIB

(52.3)

BIOCYCLE LIMITED,  
UNIT 107, BALDOYLE INDUSTRIAL ESTATE,  
DUBLIN 13, IRELAND. TEL: 01-8391000 FAX: 01-8391998

## **BIOCYCLE WASTE WATER TREATMENT SYSTEM**

Systèmes de traitement des eaux résiduaires  
Abwasseraufbereitung

The Irish Agrément Board operates in association with the  
National Standards Authority of Ireland (NSAI) as the National Member of UEAtc.



### **PRODUCT DESCRIPTION**

This Certificate relates to the BIOCYCLE WASTE WATER TREATMENT SYSTEM. This Certificate renews and replaces Certificate No. 92/0033.

### **USE**

For the treatment and disposal of waste water (waste water is defined as the waste arising from toilets,

bathrooms, showers, kitchens and appliances such as dishwashers and washing machines.

### **MANUFACTURE AND MARKETING**

The product is manufactured and marketed by  
BIOCYCLE LIMITED,  
UNIT 107, BALDOYLE IND. EST., DUBLIN 13, IRELAND.



BUILDING PRODUCT CERTIFICATION

**CERTIFICATE No. 97/0094**

C/S/B

(52.3)

Klargester Environmental Engineering Limited  
College Road, Aston Clinton, Aylesbury, Bucks, HP22 5EW,  
Tel: 0044 (1296) 633000 Fax: 0044 (1296) 633001

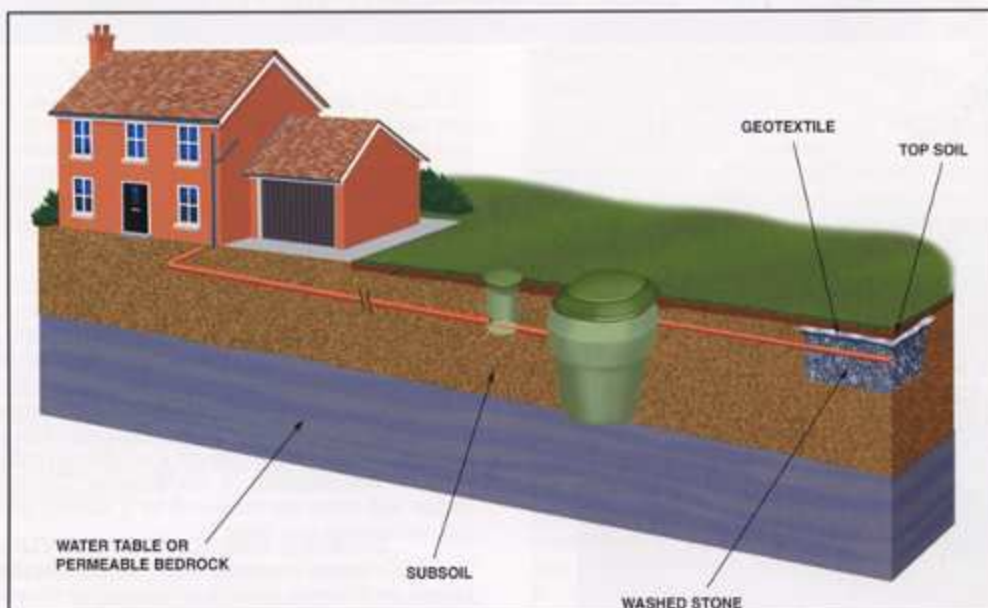
### **KLARGESTER BIODISC**

Systemes de traitement des eaux résiduaires  
Abwasseraufbereitung

**The Irish Agrément Board** is designated by Government to issue European Technical Approvals.

Irish Agrément Board Certificates establish proof that the certified products are **'proper materials'** suitable for their intended use under Irish site conditions, and in accordance with the **Building Regulations 1997**.

**The Irish Agrément Board** operates in association with the **National Standards Authority of Ireland (NSAI)** as the National Member of UEAtc.



#### **PRODUCT DESCRIPTION:**

This Certificate relates to Klargester BioDisc (Confirmation of Certificate No.86/1700, Detail Sheet No 6 issued by the British Board of Agrément, PO Box No. 195, Bucknalls Lane, Garston, Watford, Herts WD2 7NG. UK).

#### **USE**

The product is for use in sewage treatment systems and for sewage collection systems designed in accordance with BS 6297: 1983 *Code of practice for design and*

*installation of small sewage treatment works and cesspools.* The unit is used for the retention and treatment of domestic waste water, and the settlement of humus solids in suspension, prior to discharge of the treated effluent.

#### **MANUFACTURE AND MARKETING**

The product is manufactured and marketed by Klargester Environmental Engineering Limited, College Road, Aston Clinton, Aylesbury, Bucks. HP22 5EW.



BUILDING PRODUCT CERTIFICATION

**CERTIFICATE No. 00/0109**

C1/S18

(52.3)

Simon Allen Ltd. T/A Enviropak, Kilcannon Industrial Estate,  
Enniscorthy, Co. Wexford, Republic of Ireland.  
TEL: (054) 36900 FAX: (054) 36788

**ENVIROPAK DOMESTIC UNIT SEWAGE  
TREATMENT PLANT FOR SINGLE DWELLINGS**

Systèmes de Traitement des Eaux Résiduaires.  
Abwasser Aufbereitung.

The Irish Agrément Board is designated by Government to issue European Technical Approvals.

Irish Agrément Board Certificates establish proof that the certified products are 'proper materials' suitable for their intended use under Irish site conditions, and in accordance with the **Building Regulations 1997**.

The Irish Agrément Board operates in association with the **National Standards Authority of Ireland (NSAI)** as the National Member of UEAtc.



**PRODUCT DESCRIPTION**

This Certificate relates to Enviropak Domestic Unit Sewage Treatment Plant for Single Dwellings.

**USE**

The product is for use in sewage treatment systems and for sewage collection systems designed in accordance with BS 6297: 1983 *Code of practice for design and installation of small sewage treatment works and cesspools* for the

collection of domestic sewage and for the separation and partial digestion of suspended matter.

**MANUFACTURE AND MARKETING**

The product is manufactured and marketed by:

Simon Allen Ltd. T/A Enviropak,  
Kilcannon Industrial Estate, Enniscorthy  
Co. Wexford, Republic of Ireland.  
Tel: (054) 36900 Fax: (054) 36788

*ertificate 01/0109*

C1/SB



BUILDING PRODUCT CERTIFICATION  
**CERTIFICATE No. 00/0107**

(52.3)

SHAY MURTAGH LIMITED,  
RAHARNEY, MULLINGAR, CO. WESTMEATH, IRELAND  
TEL: (044) 74108 FAX: (044) 74552 Website: www.shaymurt.com

### **Septech 2000 Domestic Waste Water & Effluent Treatment System**

Systemes de Traitement des Eaux Résduaires • Abwasser Aufbereitung

**The Irish Agrément Board** is designated by government to issue European Technical Approvals.

Irish Agrément Board Certificates establish proof that the certified products are **'proper materials'** suitable for their intended use under Irish site conditions, and in accordance with the **Building Regulations 1997**.

**The Irish Agrément Board** operates in association with the **National Standards Authority of Ireland (NSAI)** as the National Member of UEAtc.



#### **PRODUCT DESCRIPTION:**

This Certificate relates to Septech 2000 Domestic Waste Water & Effluent Treatment System.

#### **USE**

The product is for use in sewage treatment systems and for sewage collection systems designed in accordance with BS 6297: 1983 *Code of practice for design and installation of small sewage treatment works*, and

cesspools for the collection of domestic sewage and for the separation and partial digestion of suspended matter.

#### **MANUFACTURE AND MARKETING**

The product is manufactured and marketed by Shay Murtagh Ltd., Raharney, Mullingar, Co. Westmeath, Republic of Ireland, Telephone: 044-74108 E-mail: sales@shaymurt.com.

# OTHER SYSTEMS WITH IRISH AGREEMENT BOARD CERTIFICATION

([WWW.NSAI.ie](http://WWW.NSAI.ie))

<u>SYSTEM</u>	<u>CERT No.</u>
● Aeroclere CLP6	<i>01/0116</i>
● Biocrete	<i>01/0120</i>
● Titan Biotec sewerage treatment system	<i>01/0124</i>
● Oakstown BAF sewerage treatment system	<i>01/0128</i>
● Ballyvarry concrete wastewater treatment system	<i>01/0132</i>
● Kiely wastewater treatment system	<i>02/0137</i>
● EPS BISON sewerage treatment system	<i>02/0147</i>
● Balmoral CAP sewerage treatment plant	<i>02/0148</i>
● Aswaflow wastewater treatment system	<i>02/0149</i>
● Balmoral Sequencing Batch Reactor system	<i>02/0150</i>
● Aqua & Thortex eco-pure 2000 effluent system	<i>02/0163</i>
● Miltown Malbay Concrete Streamline s.t. system	<i>02/0165</i>

# WHERE ARE ADVANCED SYSTEMS AN OPTION?

- Groundwater Perspective
  - In the Inner Protection Area of public supply wells, where vulnerability is 'extreme'.
  - In shallow rock areas (where overburden is less than 2m)
- Surface Water Perspective
  - Where percolation values are satisfied: Where 'T' value > 50 (provided 'P' value is between 1-50)
  - But, subsoil must be sufficiently permeable to enable effluent to flow away underground (i.e. 'T' value < 90)
- Therefore, they can play a major role (but they are not a panacea for all cases!)

# WHERE ARE ADVANCED SYSTEMS NOT AN OPTION?

- When risk of ponding and surface water contamination is high
  - Where 'P' and 'T' values > 50 (a failed site)
  - Where 'P' is between 1-50, but 'T' is > ~ 90.
  - Outcrop and shallow, low permeability rock
- Surface Water Perspective - Discharge to surface water not usually a viable option
- Conclusion:  
There are areas that are NOT suitable
- Recommendation:  
Permission should be refused in such cases!

# CONCLUSIONS IN RELATION TO ON-SITE SYSTEMS

- Proper site suitability assessment a prerequisite for all one-off rural houses
- Use of EPA pro-forma recommended
  - Circular Letter 05/03
- Issue of who should carry out site suitability assessment needs to be addressed
- Issues of installation and ongoing inspection and maintenance of on-site systems of paramount importance
  - Circular Letter 05/03

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# FAS TRAINING PROGRAMME

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- Piloted in 1997
- Adapted to EPA Manual 2000
- Training Programme run twice per year
- Mixture of theory (classroom in GSI) and practical (field in EPA, Wexford)
- Competency Assessment of Candidates
- Certificate of Competency Issued



**INSTALLATION,  
INSPECTION,  
MONITORING,  
& MAINTENANCE**



# INSTALLATION ISSUES

- Problems of poor installation
- General absence of percolation areas
- Certification of installation by competent persons now required by a number of planning authorities

# INSPECTION AND MAINTENANCE ISSUES

- Septic Tanks:

- Lack of maintenance a major problem
- De-sludging required at a frequency of between 12 months and 24 months

- Advanced systems:

- Complex systems with pumps and motors
- Annual inspection and maintenance required
- Survey shows that maintenance contracts are discontinued after 2 years in over 80% of cases



# PROPOSED TRACKING SYSTEM

# TRACKING SYSTEM

- Installation, inspection and maintenance tracked on local authority, GIS-based database
  - Compatible with IPLAN software
- 3 pilot counties to be selected
- Programme to commence in July 2005
- To be joint funded by DEHLG and particip[ant local authorities



# CHANGES TO BUILDING REGULATIONS

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- Current Technical Guidance Document (TGD) makes reference to SR6:1991 and to Agreement Certificates
- EPA Manual, 2000 currently being amended
- Following completion and approval of EPA Manual
  - TGD to reflect replacement of SR6 with EPA Manual
- In the interim, EPA approach to Site Suitability Assessment (i.e. use of EPA Pro-Forma) should be used

# SUMMARY:

## KEY RECOMMENDATIONS

- Balanced, consistent policy in relation to one-off rural housing needed
- Site Suitability Assessment is crucial for health and environmental reasons
  - All cases of one-off rural housing
  - Use of EPA Manual and Groundwater Protection Responses
  - SSA by 'suitably qualified persons'
  - EPA approach should be followed
  - FAS Training Course in place
- Importance of proper installation and ongoing inspection and maintenance of systems

# ULTIMATE OBJECTIVE: GETTING THE BALANCE BETWEEN DEVELOPMENT AND ENVIRONMENTAL PROTECTION





**INCINERATOR WC**

**13.5.96**

# THANK YOU!

## QUERIES:

Billy Moore, BE, MSc, MBA  
2 The Elms  
John's Hill  
Waterford

moorebilly@eircom.net  
(087) 2664005

