PRESENTATION ON NEW DEVELOPMENTS IN ON-SITE WASTEWATER MANAGEMENT

IBCI Conference
24th March 2010

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PRESENTATION

- Background
- Developments in the Area of On-Site Wastewater Treatment
- Recent Developments
- Next Steps
- Final Comments
ON-SITE WASTEWATER MANAGEMENT

- All one-off rural houses and all new houses in ‘unsewered’ areas require some type of on-site wastewater management systems.

- General classification of systems:
  - Septic Tank Systems
  - Secondary Treatment Systems

- Rural housing a major political issue
  - New DEHLG Policy Guidelines, 2005
## COMPARISON: SEPTIC TANK v SECONDARY SYSTEM

<table>
<thead>
<tr>
<th><strong>Septic Tank</strong></th>
<th><strong>Secondary System</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>- 240 mg/l BOD</td>
<td>- 20 mg/l BOD</td>
</tr>
<tr>
<td>- 110 mg/l SS</td>
<td>- 30 mg/l SS</td>
</tr>
<tr>
<td>- 50 mg/l Ammonia</td>
<td>- &lt; 5 to 10 mg/l Ammonia</td>
</tr>
<tr>
<td>- 20 mg/l Phosphorus</td>
<td>- &lt; 5 to 10 mg/l Phosphorus</td>
</tr>
<tr>
<td>- 3 x $10^7$ Coliforms</td>
<td>- $10^4$ Total Coliforms</td>
</tr>
<tr>
<td>- Large Percolation Area</td>
<td>- Polishing Filter – smaller area with low ‘T’ values</td>
</tr>
<tr>
<td>- Cost: <strong>€750</strong></td>
<td>- Cost <strong>€3,000</strong> to <strong>€5,000</strong></td>
</tr>
<tr>
<td>- Low Maintenance (no external power)</td>
<td>- Significant (Pumps and blowers)</td>
</tr>
<tr>
<td>- No Monitoring</td>
<td>- Monitoring chamber</td>
</tr>
</tbody>
</table>
ON-SITE WASTEWATER TREATMENT SYSTEMS

Background

- Over 450,000 on-site systems in place with 3,000 ~ 5,000 new systems annually
  - Many systems not functioning properly
  - Pollution problems in many cases!
- Septic Tank Systems in approximately 90% of cases
THE SEPTIC TANK – TYPICAL LAYOUT

- TWL
- Sludge layer
- Inlet
- liquid layer
- CHAMBER NO. 1
- Scum Layer
- Manhole cover with ventilation
- Manhole cover with ventilation
- Outlet
- CHAMBER NO. 2
- Sludge layer
- liquid layer
- SECTION A - A
TYPICAL LAYOUT OF ON-SITE S.T. SYSTEM

Dwellinghouse

Septic Tank

Distribution Box

Percolation Area
PROBLEMS
PROBLEMS

- System installed on an unsuitable site
  - Poor percolation issue
- Site potentially suitable but lack of proper design of system
- Poor installation of system
- Lack of proper inspection and maintenance of system
Summary of Findings

- Single chamber septic tank in 77% of cases;
- Discharge to a soakaway in 88% of cases;
- Tanks not de-sludged in 57% of cases;
- Problems experienced but not reported in 79% of cases
IMPACTS OF NON-FUNCTIONING ON-SITE SYSTEMS

- Contamination and pollution of groundwater
  - Public Health Implications
- Contamination and pollution of surface waters
  - Impact on Fish and on Beneficial Uses
- Ponding on site
  - Public Health Implications
- Litigation – High Court award of €310,000 in recent case against the builder and the certifying engineer (Irish Times 17.02.2010)
GROUNDWATER POLLUTION
RISK OF GROUNDWATER POLLUTION (SPR Model)
SURFACE WATER POLLUTION
Proper Site Suitability Assessment

Proper Design of On-Site System

Proper Installation of System

Inspection, Maintenance and Monitoring

Addressing the Problems – Closing the Loop
COMPONENTS OF A SITE SUITABILITY ASSESSMENT

- Desk Study
- Visual Assessment – Site Inspection and Survey
- Trial Hole Inspection (BS 5930: 1999)
- Percolation Tests
- Integrating Results – Site Characterisation Form
- Addressing the Three Critical Questions - Conclusions and Detailed Recommendations, based on evidence
## Trial Hole - Description

<table>
<thead>
<tr>
<th>Depth of trial hole (m) (^{Note 3})</th>
<th>Date and time of excavation</th>
<th>Date and time of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.10</td>
<td>11/08/2005</td>
<td>13/08/2005</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Depth from ground surface to bedrock (m) (if present):</th>
<th>Depth from ground surface to water table (m) (if present):</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 2.1</td>
<td>2.0m</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Depth below ground surface (m) to the nearest 0.1m</th>
<th>Soil/Subsoil Texture &amp; Classification**</th>
<th>Results of Thread, Ribbou and Dilatancy tests</th>
<th>Density/Compactness</th>
<th>Colour</th>
<th>Preferential flowpaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top Soil 0-200mm</td>
<td>Top Soil Loam Material</td>
<td></td>
<td>Uncompact</td>
<td>Brown</td>
<td>Root system to 300mm</td>
</tr>
<tr>
<td>200mm – 900mm</td>
<td>Silty, CLAY Granular Material</td>
<td>3 Threads</td>
<td>Compact</td>
<td>Brown</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ribbon 120mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>No Dilatancy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>900mm – 2.10m</td>
<td>CLAY Blocky Material</td>
<td>3 Threads</td>
<td>Compact</td>
<td>Brown</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ribbon 120mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>No Dilatancy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water table issues, @ 2.0m</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No mottling visible.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No bedrock</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depth of trial hole (m) Note 3</td>
<td>Date and time of excavation: 11/08/2005</td>
<td>Date and time of examination: 13/08/2005</td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>-------------------------------</td>
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<td>------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depth from ground surface to bedrock (m) (if present): 2.10</td>
<td>Depth from ground surface to water table (m) (if present): 2.0m</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td>Uncompact</td>
<td>Brown</td>
<td>Root system to 300mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td>3 Threads Ribbon 120mm No Dilatancy</td>
<td>Compact</td>
<td>Brown</td>
<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>900mm – 2.10m</td>
<td>CLAY Blocky Material</td>
<td>3 Threads Ribbon 120mm No Dilatancy</td>
<td>Compact</td>
<td>Brown</td>
<td>Brown with pockets of grey</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water table issues, @ 2.0m</td>
<td>No mottling visible.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No bedrock</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.5(a) Percolation ("T") Test for Deep Subsoils and/or Water Table

<table>
<thead>
<tr>
<th>Percolation Test Hole</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth from ground surface to top of hole (mm) (A)</td>
<td>750mm</td>
<td>730mm</td>
</tr>
<tr>
<td>Depth from ground surface to base of hole (mm) (B)</td>
<td>1150mm</td>
<td>1150mm</td>
</tr>
<tr>
<td>Depth of hole (mm) [B - A]</td>
<td>400mm</td>
<td>420mm</td>
</tr>
<tr>
<td>Dimensions of hole [length x breadth (mm)]</td>
<td>300*305</td>
<td>300*300</td>
</tr>
</tbody>
</table>

Each hole must be pre-soaked twice before the test is carried out (from 10.00 am to 5.00 pm and from 5.00 pm to next morning)

| Date of test | 13/08/05 | 13/08/05 |
| Date pre-soaking started | 12/08/05 | 12/08/05 |
| Time filled to 400 mm | 10.45 | 10.45 |
| Time water level at 300 mm | 11.26 | 11.33 |

<table>
<thead>
<tr>
<th>Percolation Test Hole No.</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fill no.</td>
<td>Start Time (at 300 mm)</td>
<td>Start Time (at 300 mm)</td>
</tr>
<tr>
<td></td>
<td>Finish Time (at 200 mm)</td>
<td>Finish Time (at 200 mm)</td>
</tr>
<tr>
<td>Δt (min)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>11.26</td>
<td>11.33</td>
</tr>
<tr>
<td></td>
<td>12.16</td>
<td>12.25</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>52</td>
</tr>
<tr>
<td>2</td>
<td>12.20</td>
<td>12.25</td>
</tr>
<tr>
<td></td>
<td>1.10</td>
<td>1.19</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>54</td>
</tr>
<tr>
<td>3</td>
<td>1.10</td>
<td>1.20</td>
</tr>
<tr>
<td></td>
<td>2.02</td>
<td>2.23</td>
</tr>
<tr>
<td></td>
<td>52</td>
<td>53</td>
</tr>
</tbody>
</table>

Average Δt = 50.66

Average Δt/4 = [Hole No.1] 12.66 (t₁)

Average Δt/4 = [Hole No.2] 13.25 (t₂)

T value \( \text{Note}^4 = (t₁ + t₂)/2 = 12.955 \text{ min}/25 \text{ mm} \)

Result of Test: \( T = 13 \)

COMMENTS:
Result as expected with sub-soil conditions
top of soil cover over pipes 101.3 (min)
proposed invert of perc pipes 100.5
level of bedrock 98.5

Trial Hole

T1

T2

P1

P2

Proposed fence

Piping
SSA: 3 CRITICAL QUESTIONS
SSA: THE THREE CRITICAL QUESTIONS

1) Will the effluent get away underground without ponding at the surface? (i.e. **Hydraulic Issue**)

2) Will the effluent be treated adequately before a relevant receptor is reached? (i.e. **Attenuation or Treatment Issue**)

3) Will all minimum separation distances be complied with? (i.e. **Site Restrictions Issue**)
CONCLUSIONS AND RECOMMENDATIONS

PROPERLY DESCRIBED DESIGN SOLUTION
RECOMMENDATION

- Design Solution to be fully described
  - Should be based on evidence from site characterisation
  - Must be fully described in 3 dimensions
    - Site Layout Plan (1: 500 Scale suggested)
    - Cross-Section (1:50 Scale suggested)
    - Longitudinal Section in the case of sloping sites or where ground must be made up
Septic Tank & Percolation Area – 6 P.E.

Contours @ 0.5m intervals

Likely direction of groundwater flow

Hedgerow

Road

Stream

SITE (edged red)

Hedgerow
Separation Distances Shown
CROSS-SECTION

Topsoil Layer

CLAY Layer

Sandy SILT Layer

The Key Variable!

750 mm

250 mm

1,350 mm

Invert Level of Pipes

Water Table
LEGAL FRAMEWORK

- The Public health (Ireland) Act, 1878
  - Nuisances injurious to health
- Building Control Acts 1990 – 2007 and additional provisions
- Litigation – Civil Law
DEVELOPMENTS IN ON-SITE WASTEWATER MANAGEMENT
CHRONOLOGY OF EVENTS

- Planning & Development Act, 1963
- SR6: 1976
- SR6: 1991
- EPA Manual 2000
  - DEHLG Circular Letter 2003
- S.I. 286 of 2006
- ECJ ruling on 29 October 2009
- EPA Code of Practice 2009
  - DEHLG Circular Letter 2010
In operation from 1st October 1964

Planning permission required for ‘development’

Development means, save where the context otherwise requires, the carrying out of any works on, in, or under land or the making of any material change in the use of any structures or other land

Installation of on-site wastewater treatment systems considered to constitute ‘development’
Published by the NSAI

Septic Tank Systems – Recommendations

Aim of achieving satisfactory practice in the design, construction and maintenance of septic tank systems
Published by NSAI

Title: Septic Tank Systems – Recommendations for Domestic Effluent Treatment and Disposal from a Single Dwelling House”

- Replaced soakpit with percolation area and reserve percolation area. Size of percolation area related to ‘T’-value.
- Introduced concept of over-rapid percolation (i.e. ‘T’-value < 5)
- Length of percolation trench related to ‘T-value’
To provide guidance on the design, operation and maintenance of on-site wastewater treatment systems for single houses

Followed research study carried out from 1995 to 1997

$1 \leq T \leq 50$: Suitable for S.T system

Length of percolation trench related to P.E.
Groundwater Protection & Planning System

- Information on location and vulnerability of groundwater resources
- Effective regimes for the proper assessment of site conditions & the design, installation & maintenance of on-site systems:
  - EPA Manual & Site Characterisation Form
  - FÁS Training Course
- Appropriate monitoring & enforcement mechanisms
Article 22(2)(c)

Planning application shall be accompanied by

“Where it is proposed to dispose of wastewater from the proposed development other than to a public sewer, information on the on-site treatment system proposed and evidence as to the suitability of the site for the system proposed”
ECJ RULING 2009

- Ruling that Ireland failed to fulfil its obligations under Directive 75/442/EEC (‘Waste Directive’)
- Waste Waters classified as ‘Waste’
- Serious damage to the environment in connection with the use of septic tanks
  - Incorrect construction, unsuitable siting, insufficient capacities, lack of maintenance and inspection and inactivity of competent authorities
- Pointed to the lack of a satisfactory system of inspection of the efficacy of IWWTS
EPA CODE OF PRACTICE 2009

- Code of Practice to provide guidance
- Incorporates requirements under CEN 12566
- Based on EPA research
- Will replace SR6: 1991 in the Building Regulations
- $3 \leq T \leq 50$: Suitable for S.T system
- Site with ‘T-value’ > 90 unsuitable!
Implementation of EPA CoP
- Guidelines for Sustainable Rural Housing, 2005
- Greater consistency of approach among Planning Authorities, use of Groundwater Protection Schemes
- From 8.01.2010, Planning Authorities to ensure rigorous site suitability assessment to CoP
  - “expert and verifiable evidence”
  - Precautionary approach to be taken
- Design of the appropriate on-site system
- Arrangements for periodic checks and maintenance
- Part H/TGD H to be revised
EMERGING LOCAL AUTHORITY MODEL

- Panels of ‘Approved’ Assessors
  - Screening of candidates
  - Competence Issue FAS Course and FETAC Certificate
- Policing by Local Authority
  - Crucial issue – sanctions applied!
- Comprehensive Code of Conduct/Set of Conditions
- Good Communications
  - With approved assessors
  - With Elected Members and the general public
NEXT STEPS
NEXT STEPS

- EPA Workshops to Local Authority Staff to explain changes in CoP
- DEHLG to incorporate CoP in the Building Regulations (Part H)
  - Draft Part H/TGD H issued for consultation
- FAS Refresher Sessions in relation to CoP
- Greater consistency of approach within L.A. system
LOOKING FORWARD

- New FAS Training Programme on “Installation, Inspection and Monitoring of On-Site Wastewater Treatment Systems”
- Permit or Tracking System for all on-site systems (NCT model?)
- Dealing with installed systems
  - Introduction of Bye Laws, (e.g. Cavan Co. Co., 2004 – inspection every 7 years)
<table>
<thead>
<tr>
<th>System</th>
<th>Certificate of Installation</th>
<th>Frequency of Inspection</th>
<th>Frequency of Maintenence</th>
<th>Frequency of Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Septic Tank Systems</td>
<td>‘Competent Person’ [A]</td>
<td>Every 12 months [A]</td>
<td>Desludging every 24 months</td>
<td>Not Applicable</td>
</tr>
</tbody>
</table>
DEALING WITH ‘PROBLEM’ SYSTEMS

- Proper protocol for inspection of IWWTs, particularly in relation to percolation areas/polishing filters;
- Development of criteria for rehabilitating ‘problem’ systems
  - Addressing the 3 critical questions
- Development of pragmatic solutions
  - Reduce the hazard: Use of S.T (with outlet filter) + Mechanical Aeration System
  - Use of tertiary treatment – soil polishing filters, sand polishing filters and constructed wetlands
  - Coppice planting (e.g. willow) for absorption, evapo-transpiration, etc.
Approximately 3,000 to 5,000 new installations per year – down from approximately 20,000 to 30,000 in 2006

Approximately 450,000 IWWTs in Ireland

If say \( \frac{2}{3} \) rds of IWWTs are not functioning:

- Say 300,000 systems x an average rectification cost of €10,000 = €3billion

WHO WILL PAY???