10. SPECIFIC REQUIREMENTS FOR INTENSIVE AGRICULTURE

10.1 Design Requirements

The EU Reference Document on Best Available Techniques for Intensive Rearing of Poultry and Pigs, available at http://eippcb.jrc.es, provides guidance on the design of facilities for this sector. Historically, farmers often prepared their own designs for construction by farm labour or local builders worked to their own designs, developing specifications that were often based on many years' practical experience. However, new structures built in recent years have generally been built in line with Department of Agriculture standards. There is therefore considerable more variation in construction standards in this sector than that prevailing in general industry. All new installations however should conform to a recognised design standard for slurry storage. Examples being:

- The Irish Department of Agriculture and Food specifications S108 (manure pits), S123 (bovine livestock units and reinforced tanks) and S126 (geomembrane-lined external slurry / effluent stores).
- The UK CIRIA Report 126 on Farm Waste Storage.
- BS 5502: Part 50, 1993: Code of Practice on Buildings and Structures for Agriculture.
- IPPC Reference document on Best Available Techniques for Intensive Rearing of Poultry and Pigs
- DIN 11622: Silage and liquid manure containers (available in German only).

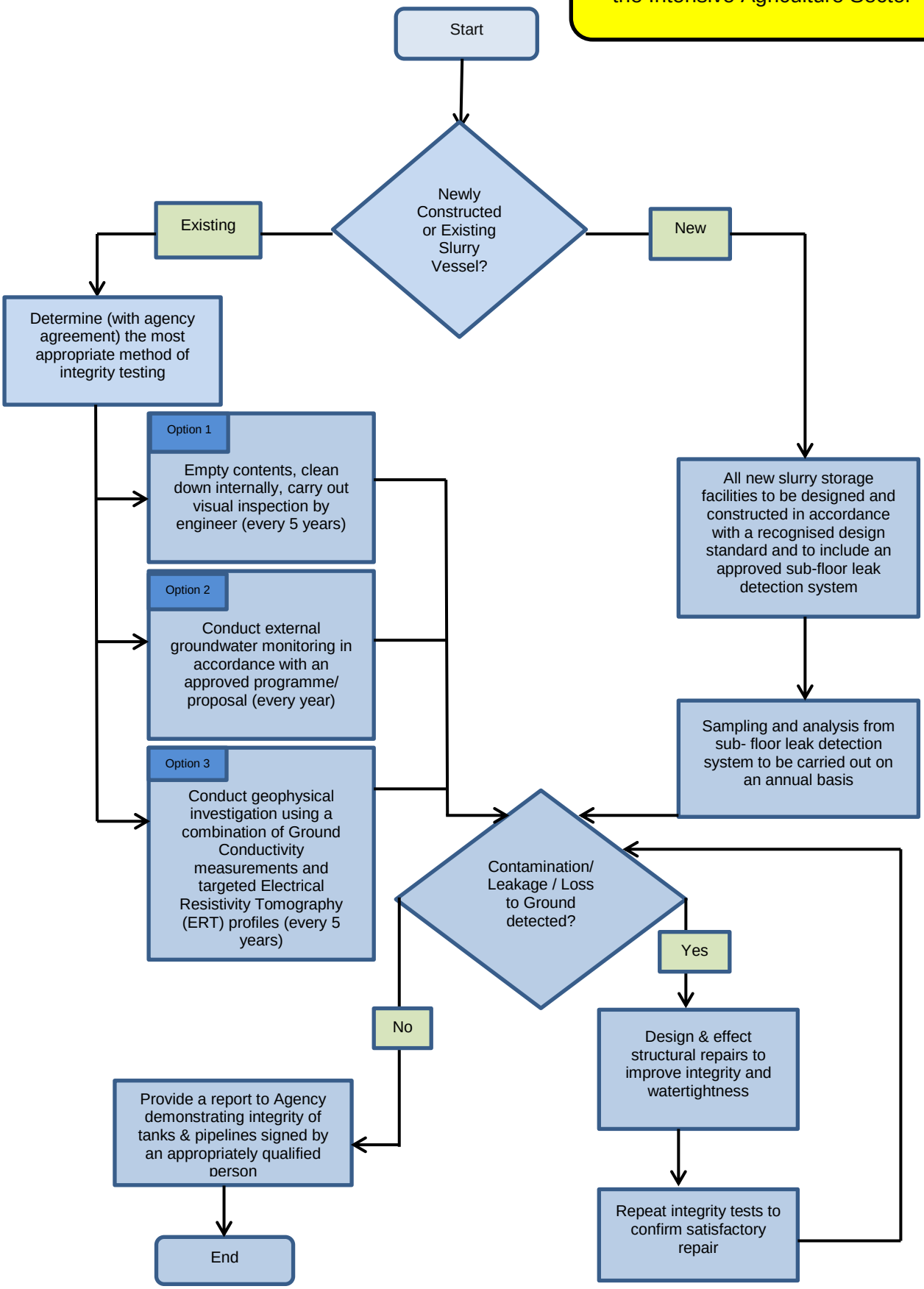
These standards should also be used for the design of facilities for the transfer of slurry within a site i.e., slurry channels and piping systems.

In Section 5.3 it was stated for Intensive Agriculture that in general for this sector retention (secondary containment) is not required for storage facilities or piping/channel systems. This is based on the understanding and assumption that adequate equipment, frequent monitoring and proper operation is utilised to prevent leakage and spillage from slurry storage facilities. It is therefore necessary for facilities in this sector to develop an effective system of maintenance and inspection, including procedures and response measures, which should be followed so as to prevent and protect against the escape of liquid effluent. However, there would be exceptions to this whereby a clay bank may be required as a form of secondary containment where slurry tanks are located close to water bodies.

10.2 Requirements for Integrity Assessments

Periodic integrity assessments of slurry vessels and transfer systems must be carried out at all licensed facilities. In all cases, this assessment should be supervised by a suitably qualified person and documented accordingly. Depending on the nature, scale and date of construction of an individual facility, there are a number of methods by which an integrity assessment might be conducted. A description of the methodology that should be followed for integrity assessments is included in flowchart overleaf. The various methods for integrity assessments are discussed below. In general, slurry channels should be considered as vessels and should be included in the scope of the integrity assessments.

Flowchart for the Inspection & Assessment of Slurry Vessels in the Intensive Agriculture Sector



Some of the main difficulties associated with conducting an effective and conclusive assessment of the structural integrity and water tightness of a slurry tank or vessel in the intensive agriculture sector are recognised as being:

- More often than not, slurry tanks in intensive agriculture are partially or substantially underground.
- Slatted units and related tanks are generally in use all year round, and are difficult to isolate for testing purposes.
- Slurry tanks, particularly in the pig rearing activities, can be extremely large in terms of footprint area and consequently emptying, cleaning and inspection can be impracticable.
- Tanks are quite often shallow and/or substantially covered, thus preventing access for inspection.
- Tanks or slatted units are often interconnected by channels or pipes by means of valves, sluices or weirs. Such arrangements can make it difficult or impossible to sub-divide the farm into manageable zones for the assessment.

Because of these factors, each site should be considered individually when determining the means by which the slurry tanks and systems should be assessed. The first distinction that needs to be drawn is between newly constructed and existing slurry vessels.

For all new tanks a sub-floor leak detection system should be installed. Some details of the basic requirements for such a system are shown in Figures 10.1 and 10.2. This will greatly simplify the process of integrity assessment whereby periodic, minimum once per year, sampling and analysis of liquid contained in specifically constructed monitoring chambers can be used as the basis for assessing the integrity of the slurry tanks. It is recommended that a sufficient number of separate leak detection systems, each with a separate monitoring point, are provided such that in the event of contamination being detected, the source of the contamination can be narrowed down by location. As a guide, an individual monitoring system should cover a tank footprint area of not more than 1,000 m^2.

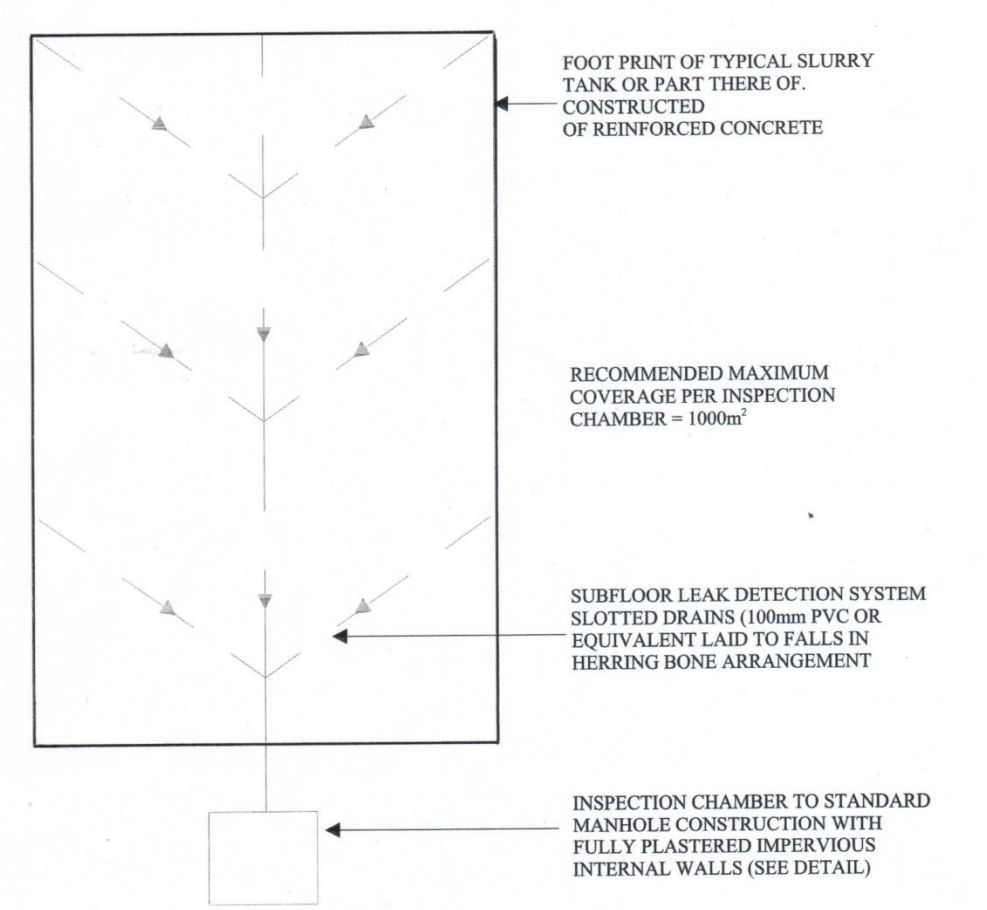


Figure 10.1 Plan view of typical leak detection system for a partially below-ground slurry tank

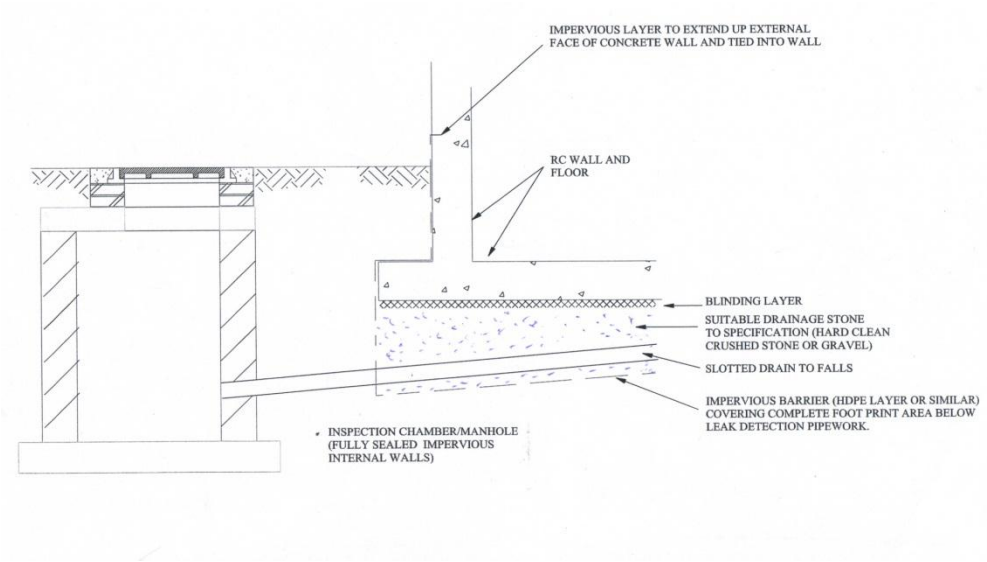


Figure 10.2 Section through sub-floor leak detection system at monitoring chamber

In the case of existing or established facilities, where a sub-floor leak detection system is not in place, the most appropriate method of assessment must be determined for each site, as well as each individual slurry storage situation. It will be the responsibility of each licensee to determine the means of integrity assessment to be used at their site. The methodology to be used must have prior approval from the Agency. It is recommended that the licensee employ the services of suitably qualified personnel to determine the most appropriate method of assessment, as well as supervising the assessment procedures.

Depending on the particular site arrangements and conditions, three options for integrity assessment are recommended;

- Emptying of the slurry tank followed by cleaning and visual inspection by an inspection engineer. This is the least desired method given the high labour and time requirements. A minimum repeat frequency of five years is recommended for this assessment method. A report on the visual inspection should be signed off by a suitably qualified engineer and at minimum include:
    - Details of the date(s) of the inspection and a location map which outlines the specific tank for which the inspection relates to.
    - Details of the construction of the tank in relation to the materials used, the dimensions of the tank, its general condition, and details of any entry/exit points and any associated valves/sluices.
    - Specific details of any issues (or potential issues) with the integrity of the tanks and their approximate location within the tank.
    - Photographs of the general condition of the floor and walls of the tank, and of any specific issues with the integrity of the tank that are identified.
    - Details of any repairs made to the tank (after any issues with its integrity have been assessed and described as outlined above), and of any verification inspection/testing following such repairs.
- Conduct external groundwater monitoring in accordance with an approved programme. If this option is deemed to be preferred, the licensee should provide an outline proposal to the Agency detailing the proposed monitoring programme, in particular, the number, location and depth of monitoring wells to be installed in the context of the hydrogeological status of the site (See Appendix H). A minimum monitoring frequency (sampling and analysis for an agreed list of pollutants) of once per year is recommended for this assessment method.
- Conduct a geophysical investigation in accordance with an approved programme. Geophysical investigations use a combination of Ground Conductivity measurements and targeted Electrical Resistivity Tomography (ERT) profiles to determine both the spatial distribution and vertical extent of areas of contamination as well as providing information on the soil type and bedrock lithology. If this option is deemed to be preferred, the licensee should provide a proposal to the Agency detailing in particular the qualifications of the consultant proposed to carry out the investigation and details as listed in Appendix I. A minimum geophysical investigation frequency of five years is recommended for this assessment method. Please note that a geophysical investigation may not be appropriate in all situations - see Appendix I for more details.

If leakage is discovered due to cracks or other structural defects, then remedial action should be taken. Assessments as necessary should be repeated so as to

confirm the repairs have been successful. Where satisfactory repairs are not possible the storage facility should be decommissioned.

A system of regular control inspections, e.g. weekly, of slurry tanks and pipelines is required which addresses fill levels and any signs of corrosion or leakage, while measures also need to be implemented to ensure that tanks and sumps are not overfilled.

10.3 Storage Systems for Fuels and Farm Chemicals

Storage systems for diesel and other fuels, pesticides, and other chemicals as may be used in the intensive agriculture sector, should comply with the requirements of the previous Sections of this guidance note. Solid chemical fertiliser storage and animal feed storage should be protected from rainwater as addressed in the next Section for solid storage.

APPENDIX H

Template groundwater monitoring proposal for the detection of any possible leakages/ contamination at Intensive Agriculture Installations.

Objective: To monitor the groundwater quality beneath Intensive Agriculture sites to determine if there is any impact caused by leakages from the slurry storage facilities on site

The following are the minimum requirements to be provided to the Agency as part of a Groundwater Assessment Proposal/ Programme, which should be signed off by a suitably qualified person:

1. Site Overview

(i) Site Location
Address and map of location including GIS co-ordinates

(ii) Site Operations
Type of unit, date IPPC licence granted, Map of Site (To include location of tanks, stormwater drainage, wells, onsite WWTS, fuel/ chemical storage, land drains)

(i) Manure Storage and collection
Location of slurry tanks (over and underground), pipelines and channels between storage areas (include on map as per point ii), annual slurry production volumes, storage capacity of tanks, date of construction of each tank and the method of construction of each tank (mass concrete, block etc.), construction specification of structures, details of previous excavations, decommissioned tanks

(ii) Water Supply
Water source (e.g. well, mains water, other sources), annual water usage

(iii) Wastewater Effluent on site
Location and details of any on site domestic wastewater treatment systems

(iv) Storm Water Run-off
Map of storm water drainage system, stormwater discharge point, recent storm water monitoring results (COD/ BOD and visual inspections)

(v) Fuel/ Chemical Storage
Fuels/ chemicals storage locations on site, type of storage, bunding details

2. Environmental/ Hydrogeological Setting

(i) Topography & Drainage
Slopes, water features, drainage channels

(ii) Meteorology
Annual rainfall data from closest weather station

(iii) Hydrology

Water features on site (including approximate flow rate), rivers to which any water features discharge

(iv) Geology
Type of soil/subsoil, bedrock & structural geology, depth to Bedrock

(v) Hydrogeology
Aquifer(s) types below site, groundwater levels, gradient, groundwater flow direction, groundwater vulnerability, groundwater quality data, groundwater source protection areas (SPAs)

3. Existing Groundwater Monitoring Wells

There should be sufficient wells provided for in the proposal, which should be suitably located to allow representative monitoring of the groundwater beneath the site. The Agency generally requires that at minimum three groundwater boreholes/ wells (one up-gradient and two down gradient) are monitored for groundwater investigations

For existing wells the following data should be provided:

(i) Locations of wells
Map of wells, distance of the boreholes/ wells from the piggery

(ii) Borehole logs
Including details of whether the wells are located in bedrock or overburden, diameter of borehole and casing, depths of casing, grouting details, water strikes, static water level.

(iii) Well type (pumping or monitoring), Well depth, Well yield, Yield class, Annual & daily water usage.

(iv) Groundwater level (to Ordnance Datum & below ground level (m bgl)) and quality

(v) Pumping/flow rate for each well

(vi) Zone of contribution for each well

(vii) Estimate rate of recharge for each well

(viii) Demonstrate that the groundwater in the wells is representative of the groundwater flow beneath the whole site.

(ix) Details of any third party wells located nearby

(x) Capping details of wells to prevent entry of pollutants

4. Potential sources of contamination

(i) Identification of possible sources of contamination -onsite and offsite (e.g. feedstuffs, disinfectants, site fuel, slurry, animal carcasses, veterinary supplies, domestic waste, domestic effluent)

(ii) Details of any historic contamination or spillages

5. Recommendations for Groundwater Assessment Proposal

(i) Proposed monitoring wells:

i. Map showing the proposed location of new wells, the location of existing wells and the groundwater flow direction.

ii. Demonstrate that the groundwater in the boreholes is representative of the groundwater flow beneath the slurry storage and transfer structures (using maps, drawings, etc where appropriate)

iii. Proposed depth of new wells

iv. Details of proposed wells will be recorded: borehole log, well depth, groundwater level etc (as per 3(i) to 3(x) above)

v. If the licensee proposes to monitoring any other water features on or offsite it should be demonstrated that such monitoring would adequately detect any potential groundwater/ surface water contamination from the site

vi. Proposed sealing of wells to eliminate conduit for pollutants to enter groundwater

(ii) Details of proposed monitoring parameters.

i. The following parameters should be monitored as a minimum: Nitrates, Total Ammonia, Faecal Coliforms, Chloride, Potassium, Sodium, Electrial Conductivity, and Molybdate- Reactive Phosphate (MRP).
ii. The monitoring should be completed at a minimum of annually

(iii) Results of the monitoring and an interpretation of the data in relation to the groundwater beneath the site shall be provided as part of the AER

(iv) Where monitoring shows possible groundwater pollution the matter should be reported to the Agency as an incident

APPENDIX I

Background to Geophysics surveys and template geophysics monitoring proposal for the detection of any possible leakages/ contamination at Intensive Agriculture Installations.

Background to Geophysical Investigations

This method operates on the principle of inducing currents into the ground and measuring the resultant secondary electro-magnetic field. The survey technique determines the apparent conductivity of the ground material from 0-3 m or 0-6m below ground level depending on the settings used. This technique is used to screen the site for any particular areas which may require further investigation using the second technique called Electrical Resistivity Tomography (ERT). This technique involves placing electrodes into the ground in a line and can provide information up to a depth of 60m below ground level. In general this survey can be completed in one day depending on access and site suitability.

Detection of Organic Waste

Deposits of organic (slurry) waste typically have resistivities in the range 5-30 Ohm-m. The use of ground conductivity and Electrical Resistivity Tomography ERT (also referred to as 2D resistivity) is effective at determining the presence of slurry contamination of soils due to its high conductivity in relation to normal ground conditions.

Typical resistivities of Irish overburden deposits range from 20 Ohm-m for pure clay to around 3000 Ohm-m for clean dry gravel, with the resistivity generally increasing as the sand/gravel content increases. Silty clay typically has values in the range 30-50 Ohm-m and silty gravelly clay typically has resistivity values in the range 50-100 Ohm-m. An exception to this are the Irish Sea Tills which occurs along the east coast of Wicklow and Wexford and which has resistivity values as low as 10 Ohm-m. Certain rock types such as graphitic and pyritic shales and volcanics also have resistivities as low as those encountered from slurry waste and this method of investigation may not be suitable at these locations. By understanding both the soil and bedrock distribution it is therefore possible to determine the effectiveness of the geophysical methods in determining the presence of slurry contamination at a particular site.

Using a combination of Ground Conductivity measurements and targeted Electrical Resistivity Tomography (ERT) profiles it is possible to determine the absence or presence of contamination and where present it will provide the spatial distribution and vertical extent of areas of contamination. It also provides information on the soil type and bedrock lithology.

Objective: To carry out a geophysical survey beneath Intensive Agriculture sites to determine if there is any impact from the slurry storage facilities on site

The following are the minimum requirements that should be provided to the Agency as part of a geophysical survey proposal/ programme:

1. Details of proposed suitably qualified consultant to carry out geophysics survey (See www.gai.ie)
2. Location of site
3. Approximate area of site
4. Details of underlying bedrock
5. Details of underlying soil type
6. Previous use of the site
7. Length of time site has been in operation
8. Details of any material deposited or known contamination onsite (including location)
9. Details of whether the site is susceptible to flooding and water table level
10. Confirmation of whether access available into the surrounding land
11. Details of type of fencing on or around the site and proximity to proposed survey
12. Details of underground services at the site and location
13. Details of surface conditions across the site
14. Groundwater flow direction beneath the site
15. Proposed geophysics methodology to be used for survey
16. Proposed locations to carry out geophysics survey at the site