Attachment I.4

EXISTING ENVIRONMENT & IMPACT OF THE ACTIVITY
Assessment of Impact of Ground Emissions

Kerry Ingredients (Ireland) Ltd.
Revised IPPCL Application

Project Ref: OES1005_09

Attachment No. I.4 details summary information on the management of organic wastes through landspreading.

Landspreading is regulated through the Nutrient Management Plan agreed with the Agency and also approved spreading specifications, which takes account of best practice, buffer zones, weather conditions, etc.

Contractors involved in organic waste landspreading are trained and audited. In addition, contractors maintain extensive procedures and records relating to control of organic waste landspreading.

A source and resource vulnerability assessment has been undertaken in order to ensure that landspreading is only being undertaken on lands that are sustainable and suitable from a geological and hydrogeological perspective.

Appendix I.4.1 contains the text of the vulnerability of assessment of the landbank in Counties Kerry and Limerick, which was carried out by O'Neill Ground Water Engineering on behalf of Kerry Ingredients during 2003.

In October 2003 Cyril Browne, Agricultural Consultant on behalf of Kerry Ingredients prepared a report titled 'Comparison of phosphorus levels in nutrient management plans taken in 1999/2000 and 2001/2002 by Kerry Ingredients for spreading of sludge'. A copy of the report is included in Appendix I.4.2.

This report was based on a comparison of 161 samples of soil index 3 and under, which received sludge from Kerry Ingredients under the landbank management programmes 1999/2000 and 2001/2002. Of the 161 samples 45% (72 samples) had no change in index, 34% (55 samples) had a decrease in index and only 21% (34 samples) had an increase in index. The net result of this comparison showed that overall there was a decrease in phosphorus observed (24 index points) between the 1999/2000 management programme and the 2001/2002 landbank management programme.

An additional assessment of phosphorus indices in soil samples was carried out by Newfield Agricultural Consultants based on soils sampled between 1998 and 2002. A total of 316 soils where sampled and results of the assessment showed that phosphorus indices have been reduced over time in 122 of the samples, 112 soil samples showed no change, while 82 samples showed an increase in soil indices. These results indicate that in over 74% of soils sampled there has not been any increase in phosphate levels as a result of land spreading of sludge at correct flow rates.

Results of assessments carried out by both Cyril Browne and Newfield indicate that it is not necessary to carryout soil sampling any more frequently then the required monitoring periods outlined by Teagasc; of every two years for soils greater than 10mg/l P but less than 15 mg/l P, and every three years for soils less than 10 mg/l P.

Appendix I.4.1
Summary of Vulnerability Assessment

Mr. Cyril Browne

Sean Ponder
Copy.

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Report

Vulnerability Assessment of Landbank, Counties Kerry and Limerick

January 2003

PROJECT NUMBER : 930201

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Summary of Field No.s and Farmers Names	
Field No.	**Name**
1 - 11	John Molyneux
12 - 40	Gerard Wall
41 - 44	Dr. R.J.Sheehy
45	John Kiely
46 - 51	Gerard Wall
52 - 64	John Kiely
65 - 79	Michael Kennedy
80 - 88	Thomas Kelly
89 - 108	Eddie Quille
109 - 127	John Kennelly
128 - 149	Frank Scannell
150 - 172	Gerry Galvin
173 - 182	Francis Carroll
183 - 188	Enda Kearney
189 - 191	Tom Shannahan
192 - 223	John P. Kenny
224 - 267	James and Maurice Harty
268 - 269	Michael Harty
270 - 279	Tom Lawlor
280 - 288	Michael Harty
289 - 293	James and Maurice Harty
294 - 306	Michael Harty
307 -311	James and Maurice Harty
312 - 314	Padraic Dineen
315 - 326	Pat Scannell

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VULNERABILITY ASSESSMENT OF LAND BANK IN NORTH COUNTY KERRY AND WEST COUNTY LIMERICK

1.0 Background

1.1 Mr. Cyril Browne, Agricultural Consultant, commissioned O'Neill Ground Water Engineering (OGE) to assess the vulnerability of landbanks at several landbanks in County Kerry and Limerick from a hydrological and hydrogeological perspective.

1.2 The objective is to select suitable areas for landspreading of wastes that satisfy hydrological and hydrogeological criteria only.

1.3 The determination of nutrient levels in all of the fields is to be determined by Mr. Cyril Browne.

1.4 The land banks are found in north County Kerry and west County Limerick (see *Sheet 63, 64, 65, 71, 72, & 73* OSI Discovery Series).

2.0 Methodology

2.1 There were three stages involved in assessing the suitability of the lands for spreading:

- Desk Study;
- Site Visit & Field Work;
- Analysis & Write-up.

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2.2 Desk Study

The desk study involved collecting all relevant data about the lands in question. Information about soils, geology, depth to bedrock, and groundwater was compiled at the Geological Survey of Ireland (GSI) offices. Information on the aquifer categories and vulnerability was taken from data in the GSI and from field work carried out by OGE in the area.

2.3 Site Visit & Field Work

The location of houses, wells, rivers, drains and any other watercourses was carefully noted. The slopes in all fields were assessed visually and by examining the topographic contours on the relevant Ordnance Survey maps.

2.4 Analysis & Write-up

In this final stage, an assessment based on hydrological and hydrogeological criteria, was made of the proposed site.

3.0 Site Description

3.0.1 The assessed land is found in north County Kerry and west County Limerick, in a large number of townlands. For the purposes of this report, the lands will be grouped into five large areas, centred around villages or towns:

- Dromcolliher - Castletown;
- Abbeyfeale;
- Listowel;
- Abbeydorney;
- Kerry Head.

3.1 Dromcolliher – Castletown

3.1.1 Dromcolliher

3.1.1.1 The fields in this area are located in the immediate vicinity of the village of Dromcolliher, Feenagh and Castletown in west Limerick (*Figure Nos. 1.1, 2.1 & 3.1*).

3.1.1.2 Fifty-one (51) fields were assessed in Dromcolliher (*Figure Nos. 1.2.1 & 1.2.2*).

3.1.1.3 A small unnamed stream flows north rising south of Knocknagraig and flowing through Ballinlongig, eventually discharging to the River Deel. This stream forms the eastern boundary of Fields 1 – 8, and Fields 9 – 11. It forms the western boundary of Fields 26 – 41. The Ahavarragh Stream forms a portion of the eastern boundary of Fields 25 - 40, as well as a portion of the western boundary of Fields 12 – 25.

3.1.1.4 All of the fields in Ballinlongig and Mundellihy have negligible slopes (< 1%). The fields in Knocknacraig (Fields 1 – 8) are set on the northern slope of an upland area. The slope across these fields is approximately 10 percent, but the lower portion of this block of land is much gentler (approximately five percent).

3.1.1.5 A number of houses are sited along the roads bounding the fields and there is one farmhouse sited in the middle of the block of fields (Fields 1 – 8).

3.1.1.6 The R552 forms the western boundary of Field 46, while the River Deel forms the eastern boundary of Fields 50 and 51.

3.1.2 Feenagh

3.1.2.1 Thirteen (13) fields were assessed in Feenagh (*Figure Nos. 2.1 & 2.2*).

3.1.2.2 An unnamed stream forms the southern boundary of the block of fields, while the area to the east of the fields is poorly drained and marshy (Feenagh bog).

3.1.2.3 A small number of houses are found along the boundaries of the fields, while the village is sited immediately south of the block of land.

3.1.2.4 Slopes are negligible across the entire block of fields.

3.1.3 *Castletown*

3.1.3.1 Twenty-four (24) fields were assessed in the vicinity of Castletown village (*Figure Nos. 3.1, 3.2.1 & 3.2.2*).

3.1.3.2 A small stream runs close to several of the fields. There are a number of houses and farms along the roadways.

3.1.3.3 Slopes are less than six percent (< 6%) across the area.

3.2 Abbeyfeale

3.2.1 Two blocks of fields, situated approximately three kilometres north of Abbeyfeale were assessed: five fields were assessed in Ballaghbehy, and 15 fields were assessed in Knocknasna (*Figure No. 4.1*).

3.2.2 Some houses are located around the fields. A small unnamed stream drains the southwestern boundary of the fields in Ballaghbehy (*Figure No. 4.2.1*). No surface streams were recorded in the vicinity of the fields in Knocknasna (*Figure No. 4.2.2*). Slopes on both blocks of land average 5 – 6 percent.

3.3 Listowel

3.3.1 *Gortacloghane & Derrindaff*

3.3.1.1 Forty-one fields were assessed in Gortacloghane and Derrindaff (*Figure No. 5.1*).

3.3.1.2 There are a small number of houses in the area (*Figure No. 5.2*). Slopes are gentle. There are no major surface drainage features in the area

3.3.1.3 Fields 128 – 149 are sited in two adjacent blocks. A number of houses are found along the road that separates the two blocks of land. Small unnamed streams drain from the fields west of the road, discharging into another unnamed stream that forms the southern boundary of the fields.

3.3.1.4 Slopes are very gentle across the blocks of land.

3.3.2 Finuge & Garryantvally

3.3.2.1 The River Feale bounds the majority of these 11 fields (*Figure No. 6.1*).

3.3.2.2 All of the fields are flat or have very gentle slopes (*Figure No. 6.2.1*). A large number of houses are sited along the R557 and in the village of Finuge. A small graveyard is situated at the back of the farmyard at the entrance of Field 156.

3.3.3 Ballyouneen

3.3.3.1 Fields 161 – 168 are found in the townland of Ballyouneen, west of Listowel. This land is situated adjacent to the River Cashen (*Figure No. 6.1*).

3.3.3.2 The fields are level with drains along the boundaries (*Figure No. 6.2.2*). A small number of farm houses are sited adjacent to the fields.

3.3.4 Ballyhorgan South & Ballyhorgan East

3.3.4.1 Fourteen fields are situated in Ballyhorgan South and East (*Figure No. 7.1*).

3.3.4.2 The fields to the north are bounded by the River Feale, while those to the south are bounded by an area of poorly drained soils (*Figure No. 7.2*).

3.3.5 Shrone East and Skehanierin

3.3.5.1 Five (5) fields were assessed in Shrone East (*Figure No. 14.1*) and seven (7) in Skehanierin (*Figure No. 15.1*).

3.3.5.2 Fields 315 – 319 are located in Shrone East. The Galey River forms the northern boundary of the fields and some houses and drainage ditches are located along the field boundaries (*Figure No. 14.2*).

3.3.5.3 Fields 320 – 326 are located in Skehanierin. Houses and drainage ditches surround the fields (*Figure No. 15.2*).

3.4 Abbeydorney

3.4.1 Six fields are situated west of Abbeydorney on both sides of the R557 (*Figure No. 8.1*). The fields are relatively flat. A number of houses are situated along the R557 near the fields. Adjacent to the R557 they are flat and well drained (*Figure No. 8.2.1*).

3.4.2 Three fields are found between Abbeydorney and Tralee in Listellick (*Figure No. 8.1*). A large number of houses are found along the western boundary and an unnamed stream runs close to the northern boundary, discharging into the Big River (*Figure No. 8.2.2*).

3.4.3 Four fields are situated in Ardrahan, west of Abbeydorney (*Figure No. 8.1*). The fields are flat and well drained. A number of houses are found along the western boundary of the fields, and a house is sited between Field 193 and 195 (*Figure No. 8.2.3*).

3.5 Kerry Head

3.5.1 Clashmelcon

3.5.1.1 Five fields are situated in Clashmelcon (*Figure No. 9.1*).

3.5.1.2 The fields are situated on either side of the road, and there are a number of houses along the roadside (*Figure No. 9.2.1*).

3.5.1.3 A small stream drains the boundary of Fields 198 and 199.

3.5.2 Ardagh & Ballinglana

3.5.2.1 Fourteen fields are situated in Ardagh and Ballinglana (*Figure No. 9.1*).

3.5.2.2 A number of houses are found along the roads that form the boundaries of the blocks of land (*Figure No. 9.2.2*).

3.5.2.3 The slopes are gentle across the entire blocks of land, and there are a number of ditches draining the field boundaries.

3.5.3 Tiduff

3.5.3.1 Seven fields are situated in Tiduff (*Figure No. 10.1*).

3.5.3.2 The fields are in two blocks separated by the road (*Figure No. 10.2.1*). A large number of houses line the road, and several are on the hillside north of the road.

3.5.3.3 The fields in the southern block slope southwards to the sea.

3.5.4 Dreenagh

3.5.4.1 Two fields are situated south of the main road in Dreenagh. Field 222 is on a relatively steep slope, while Field 223 is flat (*Figure No. 10.2.2*).

3.5.5 Knockane, Dirtane, Glenderry, Ballylongane, Doonamantane and Ballyheige

3.5.5.1 Forty-five (45) fields were assessed in the above townlands, in the Kerry Head area (*Figure No. 11.1*). All the fields, with the exception of Fields 224 and 229, are gently sloping. Houses, streams and drainage ditches are located in and around many of the field boundaries (*Figure No. 11.2.1*).

3.5.6 Booleenshare, Glenlea and Heirhill

3.5.6.1 Twenty-two (22) fields are located in Booleenshare, Glenlea and Heirhill (*Figure No. 11.1*). Houses, streams and drainage ditches surround most of the field boundaries and all slopes are negligible. Booleenshare School and Church are located besides Fields 286 – 288 (*Figure No. 11.2.2*).

3.5.7 Ballyheige, Ballyronan and Kill

3.5.7.1 Eighteen (18) fields were assessed in these townlands, south of Ballyheige on Kerry Head (*Figure No. 12.1*). All slopes in the fields are negligible and there are some houses, streams and drainage ditches in the vicinity of the fields (*Figure No.s 12.2.1 and 12.2.2*).

3.5.8 Cleanderry

3.5.8.1 Three (3) fields were assessed in Cleanderry, north of the village of Causeway (*Figure No. 13.1*). There are some houses to the south and west of the fields. There is no surface water near the fields (*Figure No. 13.2*). Slopes in the fields are negligible.

4.0 Bedrock and Quaternary Geology

4.1 Dromcolliher and Castletown

4.1.1 The fields around Dromcolliher are underlain by tills of limestone origin (TLs).

4.1.2 The geology is shown in Figure No. 1.3.1.

4.1.3 The majority of the land is underlain by undifferentiated Dinantian limestones (DIN). To the north the bedrock geology is dominated by Waulsortian limestones (WA). South of the village the upland areas are formed from mudstones of the Clare Shale Formation (CS) and greywackes, siltstones and silty shales of the Cloone Flagstone Formation (CF).

4.1.4 The depth to bedrock in these fields was compiled using the GSI database.

4.1.5 The fields north of Dromcolliher are entirely underlain by the massive, undifferentiated Waulsortian limestones (*Figure No. 1.3*).

4.1.6 The fields in Feenagh are entirely underlain by limestones of the Ballysteen Formation (BA) (*Figure No. 2.3*). The overburden is composed of limestone tills (TLs).

4.1.7 The fields south of Castletown are underlain by limestones of the Ballysteen Formation (BA) (*Figure No. 3.3*). The overburden is composed of limestone tills (TLs). Gravel deposits are recorded west of the village, where the bedrock is composed of sandstones, mudstones and thin limestones (classed as Lower Limestone Shales, LLS). To the north the hills are underlain by Old Red Sandstone (ORS) and the overburden in comprised of local sandstone tills.

4.2 Abbeyfeale

4.2.1 This area is underlain by sandstone, siltstone and mudstones of the Central Clare Group (CCG) (*Figure No. 4.3*).

4.2.1 The fields in the Smearlagh River basin area are entirely underlain by sandstone, siltstone and mudstones of the Central Clare Group (CCG) (*Figure No. 5.3*).

4.3 *Listowel*

4.3.1 The fields southwest of Listowel, south of the River Feale, are underlain by undifferentiated Visean limestones (VIS) (*Figure No. 6.3*).

4.3.2 The fields west of Listowel and due north of Lixnaw are underlain by limestones of the Ballysteen Formation (BA) and Waulsortian limestones (WA) (*Figure No. 6.3*).

4.3.3 The fields northeast of Lixnaw are underlain by undifferentiated Visean limestones (VIS) (*Figure No. 7.3*).

4.3.4 The fields at Shrone East are underlain by undifferentiated Visean limestones (VIS) (*Figure No. 14.3*).

4.3.5 The fields at Skehanierin are underlain by mudstones, siltstones and sandstones of the Shannon Group (SHG) (*Figure No. 15.3*).

4.4 *Abbeydorney*

4.4.1 The fields south of Abbeydorney are underlain by undifferentiated Namurian shales and sandstones (NAM) (*Figure No. 8.3*).

4.4.2 West of the village the fields are underlain by bioclastic cherty grey limestones of the Dirtoge Formation (DI) and bedded bioclastic limestones of the Cloonagh Formation (CL).

4.4.3 To the northwest the fields are underlain by well bedded argillaceous limestones of the Rockfield Formation (RF) and the massive unbedded Waulsortian limestones.

4.4.4 To the northeast of the village, the fields are underlain by the Cloonagh Formation (CL).

4.5 *Kerry Head*

4.5.1 The fields near the coast in the Clashmelcon area are underlain by sandstones, mudstones and thin limestones of the Lower Limestone Shale Formation (LLS) (*Figure No. 9.3*). To the south near Ardagh and Ballinglana the rocks are older and the fields are underlain by the yellow-olive mudstones and sandstones of the Kilmore Formation (KM) and the sandstones, siltstones and mudstones of the Inshaboy Formation (IY).

4.5.2 The fields at Tiduff on Kerry Head are entirely underlain by red cross-bedded siltstones and sandstones of the Glandahalin Formation (GH) (*Figure No. 10.3*).

4.5.3 The fields in Dreenagh, on the north side of Kerry Head, are entirely underlain by the red cross-bedded siltstones and sandstones of the Glandahalin Formation (GH) (*Figure No. 10.3*).

4.5.4 The fields northeast of Ballyheige, on Kerry Head, are entirely underlain by the red cross-bedded siltstones and sandstones of the Glandahalin Formation (GH) (*Figure No. 10.3*).

4.5.5 The townlands of Knockane, Dirtane, Glenderry, Ballylongane, Doonamantane, Ballyheige, Booleenshare, Glenlea and Heirhill are all underlain by the red cross-bedded siltstones and sandstones of the Glandahalin Formation (GH) (*Figure No. 11.3*).

4.5.6 Field 293 at Ballyheige overlies the mudstone and sandstone of the Kilmore Formation (KM). The northern fields at Ballyronan are underlain by the Inshaboy Formation (IY), which comprises sandstone, siltstone and mudstone. The central fields overlie the mudstone and sandstone of the Kilmore Formation (KM). The southern fields are underlain by the Lower Limestone Shales (LLS) (*Figure No. 12.3*).

4.5.7 The three fields at Cleanderry are all underlain by the red cross-bedded siltstones and sandstones of the Glandahalin Formation (GH) (*Figure No. 13.3*).

5.0 Hydrogeology & Aquifer Categories

5.1 Dromcolliher

5.1.1 The majority of the land is underlain by undifferentiated Dinantian limestones (DIN). To the north the bedrock geology is dominated by Waulsortian limestones (WA). South of the village the upland areas are formed from mudstones of the Clare Shale Formation (CS) and greywackes, siltstones and silty

shales of the Cloone Flagstone Formation (CF). The bedrock is classed as Locally Important (LI) aquifer by the GSI.

5.2 ***Feenagh***

5.2.1 The fields in Feenagh are entirely underlain by limestones of the Ballysteen Formation (BA). This is classed as a Locally Important (LI) aquifer by the GSI.

5.3 ***Castletown***

5.3.1 The fields south of Castletown are underlain by limestones of the Ballysteen Formation (BA). This is considered to be a Locally Important (LI) aquifer. The overburden is composed of limestone tills (TLs). Gravel deposits are recorded west of the village, where the bedrock is composed of sandstones, mudstones and thin limestones (classed as Lower Limestone Shales, LLS). The rock is classed as a Poor Aquifer that is generally unproductive (Pu). To the north the hills are underlain by Old Red Sandstone (ORS) and the overburden in comprised of local sandstone tills. This is classed as a Locally Important (LI) aquifer.

5.4 ***Abbeyfeale***

5.4.1 This area is underlain by sandstone, siltstone and mudstones of the Central Clare Group (CCG). This is classed as a Poor Aquifer that is generally unproductive except in Local Zones (Pl).

5.5 *Listowel*

5.5.1 The fields southwest of Listowel, south of the River Feale, are underlain by undifferentiated Visean limestones (VIS) . The fields west of Listowel are underlain by limestones of the Ballysteen Formation (BA) and Waulsortian limestones (WA). The fields northeast of Lixnaw are underlain by undifferentiated Visean limestones (VIS). While no groundwater protection scheme has been drawn up by the GSI for this area, a very rough aquifer classification map was produced for Kerry County Council in 1994. This groups large areas together as Minor Aquifers, Major Aquifers and Source Protection Zones. All of the fields in this area are classed as being underlain by a Major Aquifer with the exception of Skehanierin which is underlain by a Minor Aquifer.

5.6 *Abbeydorney*

5.6.1 The fields south of Abbeydorney are underlain by undifferentiated Namurian shales and sandstones (NAM). The NAM was classed as being a Minor Aquifer.

5.6.2 West of the village the fields are underlain by bioclastic cherty grey limestones of the Dirtoge Formation (DI) and bedded bioclastic limestones of the Cloonagh Formation (CL). To the northwest the fields are underlain by well bedded argillaceous limestones of the Rockfield Formation (RF) and the massive unbedded Waulsortian limestones. These rocks are classed together as a Major Aquifer.

5.7 Kerry Head

5.7.1 The fields near the coast in the Clashmelcon area are underlain by sandstones, mudstones and thin limestones of the Lower Limestone Shale Formation (LLS). To the south near Ardagh and Ballinglana the rocks are older and the fields are underlain by the yellow-olive mudstones and sandstones of the Kilmore Formation (KM) and the sandstones, siltstones and mudstones of the Inshaboy Formation (IY). The fields at Tiduff on Kerry Head are entirely underlain by red cross-bedded siltstones and sandstones of the Glandahalin Formation (GH). The fields in Dreenagh, on the north side of Kerry Head, are entirely underlain by the red cross-bedded siltstones and sandstones of the Glandahalin Formation (GH). The fields northeast of Ballyheige, on Kerry Head, are entirely underlain by the red cross-bedded siltstones and sandstones of the Glandahalin Formation (GH). The remaining fields within the townlands on Kerry Head are underlain by Devonian sandstones, siltstones and mudstones.

5.7.2 These rocks are classed together as a Major Aquifer.

6.0 Vulnerability

6.1 Vulnerability ratings were compiled from data obtained in the GSI, from OGE knowledge of the area and from data collected during the site assessment.

6.2 The vulnerability of an aquifer to contamination is determined by the type and thickness of the overburden overlying it ("Ground Water Protection Schemes, DoELG/EPA/GSI 1999").

6.3 Dromcolliher

6.3.1 The majority of the land is underlain by undifferentiated Dinantian limestones (DIN). To the north the bedrock geology is dominated by Waulsortian limestones (WA). The vulnerability classification is Low (L).

6.3.2 South of the village the upland areas are formed from mudstones of the Clare Shale Formation (CS) and greywackes, siltstones and silty shales of the Cloone Flagstone Formation (CF). The vulnerability classification is Extreme (E).

6.4 Feenagh

6.4.1 The fields in Feenagh are entirely underlain by limestones of the Ballysteen Formation (BA). The vulnerability classification is Low (L).

6.5 Castletown

6.5.1 The fields south of Castletown are underlain by limestones of the Ballysteen Formation (BA). The overburden is composed of limestone tills (TLs). Gravel deposits are recorded west of the village, where the bedrock is composed of sandstones, mudstones and thin limestones (classed as Lower Limestone Shales, LLS). To the north the hills are underlain by Old Red Sandstone (ORS) and the overburden in comprised of local sandstone tills.

6.5.2 The vulnerability classification is Low (L).

6.6 Abbeyfeale

6.6.1 This area is underlain by sandstone, siltstone and mudstones of the Central Clare Group (CCG). The vulnerability classification is Extreme (E).

6.7 Listowel

6.7.1 The fields southwest and northeast of Listowel, south of the River Feale, are underlain by undifferentiated Visean limestones (VIS) . The vulnerability is Medium (M), except in the vicinity of Lixnaw, where the vulnerability is Extreme (E).

6.7.2 The fields west of Listowel are underlain by limestones of the Ballysteen Formation (BA) and Waulsortian limestones (WA). The fields northeast of Lixnaw are underlain by undifferentiated Visean limestones (VIS). The vulnerability is Medium (M).

6.7.3 The fields east of Listowel at Skehanierin overlie bedrock with a High vulnerability (H).

6.8 *Abbeydorney*

6.8.1 The fields south of Abbeydorney are underlain by undifferentiated Namurian shales and sandstones (NAM). The vulnerability in this area varies from High (H) to Medium (M).

6.9 *Kerry Head*

6.9.1 The fields near the coast in the Clashmelcon area are underlain by sandstones, mudstones and thin limestones of the Lower Limestone Shale Formation (LLS). To the south near Ardagh and Ballinglana the rocks are older and the fields are underlain by the yellow-olive mudstones and sandstones of the Kilmore Formation (KM) and the sandstones, siltstones and mudstones of the Inshaboy Formation (IY).

6.9.2 The vulnerability is Medium (M).

6.9.3 The fields at Tiduff on Kerry Head are entirely underlain by red cross-bedded siltstones and sandstones of the Glandahalin Formation (GH).

6.9.4 The vulnerability is Medium (M).

6.9.5 The fields in Dreenagh, on the north side of Kerry Head, are entirely underlain by the red cross-bedded siltstones and sandstones of the Glandahalin Formation (GH).

6.9.6 The vulnerability is High (H) and Extreme (E).

6.9.7 The fields northeast of Ballyheige, on Kerry Head, are entirely underlain by the red cross-bedded siltstones and sandstones of the Glandahalin Formation (GH) .

6.9.8 The vulnerability is Medium (M).

6.9.9 The fields south of Ballyheige in Ballyronan and Kill are underlain by Upper Devonian rocks.

6.9.10 The vulnerability is High (H).

6.9.11 The vulnerability of the area around Cleanderry on Kerry Head is of High (H) vulnerability.

7.0 Groundwater Protection Response Matrix for Landspreading

7.1 For those areas underlain by Poor Aquifers with a vulnerability rating of Extreme, the response category is **R3[1]:**

- *R3[1]:* Not generally acceptable, unless a consistent minimum thickness of 1m of soil and subsoil can be demonstrated

7.2 The remaining areas are underlain by aquifers classified as Locally Important (Ll), Poor (Pl or Pu) or as Minor and Major Aquifers. The vulnerabilities are High (H), Moderate (M) and Low (L). The response category for these areas is **R1:**

- *R1:* Spreading acceptable subject to normal good practice.

8.0 General Guidelines for Spreading with reference to Hydrology and Hydrogeology

8.1 Hydrology

The buffer zone setbacks set out by the EPA in the BATNEEC guidelines for landspreading include:

- 10 metres buffer from ditches and streams;
- 20 metres buffer from rivers and lakes;
- Slope no greater than 6 percent running into a river or stream. If the slope is greater, then the buffers should be increased.

8.2 Hydrogeology

The guidelines set out by the GSI include:

- No spreading within 50 metres of wells;
- No spreading when soil conditions prevent infiltration or when heavy rain is forecast within 48 hours.

8.3 General

General guidelines include:

- No spreading within 100 metres of private houses;
- 10 metres from roads.

9.0 Conclusion

9.1 Using the guidelines and recommendations detailed above, the fields proposed for landspreading were examined. Those fields, or portions of fields, not suitable for landspreading have been excluded. The remaining areas, shown on the accompanying maps (*Figure Nos. 1.4.1 – 13.4*), would be suitable for landspreading following normal and accepted practice. *This conclusion relates only to the hydrological and hydrogeological suitability of the lands.*

9.2 *Dromcolliher*

9.2.1 Approximately 50% of the land assessed in Dromcolliher is available for landspreading (*Figure Nos. 1.4.1 & 1.4.2*).

9.2.2 Setbacks have been applied to all those fields in close proximity to roads, houses, rivers and drainage ditches.

9.2.3 Table No. 1 gives the total area suitable for spreading in Dromcolliher.

Table No. 1 ***Area of fields suitable for land spreading in Dromcolliher (hectares)***

Field No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Suitable Area (*ha*)	0	0	0	2.0	2.66	0	0.6	1.24	2.42	1.09
Field No.	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Suitable Area (*ha*)	2.19	1.27	1.61	3.15	0.79	3.47	2.49	7.49	1.16	0.98
Field No.	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
Suitable Area (*ha*)	1.33	2.30	2.13	1.26	1.57	0.45	1.01	1.08	0.94	3.07
Field No.	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
Suitable Area (*ha*)	3.18	1.32	0	0	1.65	4.01	2.53	2.16	0	2.47
Field No.	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**
Suitable Area (*ha*)	21.53	5.33	0	0	16.19	0.32	1.57	3.78	2.24	2.38

Field No.	**51**
Suitable Area (*ha*)	2.13

9.2.4 The total area of land assessed in the 51 fields at Dromcolliher was 243.11 ha. The total area of land available for spreading is 122.54 ha.

9.3 *Feenagh*

9.3.1 Approximately 93% of the land assessed in Feenagh is available for landspreading (*Figure No. 2.4*).

9.3.2 Setbacks have been applied to all those fields in close proximity to roads, houses and drainage ditches.

9.3.3 The aquifer classification and depth to rock in the fields are suitable for spreading.

9.3.4 Table No. 2 gives the total area of land available for spreading in each field.

Table No. 2 *Area of fields suitable for land spreading in Feenagh (hectares)*

Field No.	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**	**61**
Suitable Area (*ha*)	4.24	6.60	3.41	4.65	2.73	2.58	2.29	1.90	1.48	2.11
Field No.	**62**	**63**	**64**							
Suitable Area (*ha*)	5.0	3.78	9.70							

9.3.5 The total area of land assessed in Feenagh was 54.32 ha. The total area of land available for spreading is 50.47 ha.

9.4 *Castletown*

9.4.1 Approximately 74% of the land assessed in Castletown is available for landspreading (*Figure Nos. 3.4.1 & 3.4.2*).

9.4.2 Setbacks have been applied to all those fields in close proximity to roads, houses and drainage ditches.

9.4.3 The aquifer classification and depth to rock in the fields are suitable for spreading.

9.4.4 Table No. 3 gives the total area of land available for spreading in each field.

Table No. 3 *Area of fields suitable for land spreading in Castletown (hectares)*

Field No.	65	66	67	68	69	70	71	72	73	74
Suitable Area (*ha*)	0	1.07	1.1	0.40	0.58	1.03	0.83	0.48	3.41	4.49
Field No.	75	76	77	78	79	80	81	82	83	84
Suitable Area (*ha*)	1.33	4.91	0	2.18	1.64	6.24	0.11	0.17	0.12	0.67
Field No.	85	86	87	88						
Suitable Area (*ha*)	1.38	0.84	1.31	0.77						

9.4.5 The total area of land assessed in Castletown was 47.69 ha. The total area of land available for spreading is 35.06 ha.

9.5 *Abbeyfeale*

9.5.1 None of the land assessed in Abbeyfeale is available for landspreading (*Figure Nos. 4.4.1 & 4.4.2*).

9.5.2 The total area of land assessed in Abbeyfeale was 47.95 ha. The total area of land available for spreading is 0.0 ha.

9.6 *Listowel (Derrindaff & Gortacloghane)*

9.6.1 Approximately 75% percent of the land assessed in Derrindaff and Gortacloghane is available for landspreading (*Figure No. 5.4*).

9.6.2 Setbacks have been applied to all those fields in close proximity to roads, houses, rivers and drainage ditches.

9.6.3 Table No. 4 gives the total area suitable for spreading in Derrindaff and Gortacloghane.

Table No. 4 *Area of fields suitable for land spreading in Derrindaff and Gortacloghane (hectares)*

Field No.	109	110	111	112	113	114	115	116	117	118
Suitable Area (*ha*)	0.00	7.14	3.09	2.22	0.94	1.67	4.38	1.19	3.24	3.86
Field No.	119	120	121	122	123	124	125	126	127	128
Suitable Area (*ha*)	1.59	1.54	1.44	0.49	2.52	2.08	1.79	1.21	2.47	7.14
Field No.	129	130	131	132	133	134	135	136	137	138
Suitable Area (*ha*)	1.19	0.80	0.61	0.00	0.89	1.77	1.20	0.81	2.02	1.67
Field No.	139	140	141	142	143	144	145	146	147	148
Suitable Area (*ha*)	2.11	1.70	1.17	2.62	8.23	5.11	0.57	1.17	1.30	0.49

Field No.	**149**
Suitable Area (*ha*)	7.41

9.6.4 The total area of land assessed in Derrindaff and Gortacloghane was 124.32 ha. The total area of land available for spreading is 92.84 ha.

9.7 Listowel (Finuge, Garryantanvally, Ballyouneen)

9.7.1 Approximately 83% percent of the land assessed in Finuge, Garryantanvally and Ballyouneen is available for landspreading (*Figure No. 6.4.1*).

9.7.2 Setbacks have been applied to all those fields in close proximity to roads, houses, rivers and drainage ditches.

9.7.3 Table No. 5 gives the total area suitable for spreading in Finuge, Garryantanvally and Ballyouneen.

Table No. 5 ***Area of fields suitable for land spreading in Finuge, Garryantanvally, Ballyouneen (hectares)***

Field No.	**150**	**151**	**152**	**153**	**154**	**155**	**156**	**157**	**158**	**159**
Suitable Area (*ha*)	0	6.33	4.17	4.33	1.19	8.51	64.03	1.26	0.35	0.25
Field No.	**160**	**161**	**162**	**163**	**164**	**165**	**166**	**167**	**168**	
Suitable Area (*ha*)	5.29	11.78	2.78	3.47	6.75	5.98	2.94	2.32	5.17	

9.7.4 The total area of land assessed in Finuge, Garryantanvally and Ballyouneen was 164.24 ha. The total area of land available for spreading is 134.6 ha.

9.8 Listowel (Ballyhorgan South & East)

9.8.1 Approximately 64% of the land assessed in Ballyhorgan South and East is available for landspreading (*Figure No. 7.4*).

9.8.2 Setbacks have been applied to all those fields in close proximity to roads, houses, rivers and drainage ditches.

9.8.3 Table No. 6 gives the total area suitable for spreading in Ballyhorgan South and East.

Table No. 6 *Area of fields suitable for land spreading in Ballyhorgan South & East (hectares)*

Field No.	169	170	171	172	173	174	175	176	177	178
Suitable Area (*ha*)	5.26	2.18	2.53	3.55	2.91	1.44	3.11	2.33	2.10	3.07
Field No.	**179**	**180**	**181**	**182**						
Suitable Area (*ha*)	0	0.98	3.34	0						

9.8.4 The total area of land assessed in Ballyhorgan South and East was 50.93 ha. The total area of land available for spreading is 32.80 ha.

9.9 ***Shrone East and Skehanierin***

9.9.1 Approximately 67% of the land assessed in Shrone East is suitable for spreading (*Figure No. 14.4*).

9.9.2 Setbacks have been applied to all those fields in proximity to roads, houses, rivers and drainage ditches.

9.9.3 Approximately 75% of the land assessed in Skehanierin is suitable for spreading (*Figure No. 15.4*).

9.9.4 Setbacks have been applied to all those fields in proximity to roads, houses, rivers and drainage ditches.

9.9.5 Table No. 7 gives details of the spreadable areas in Shrone East (Fields 315-319) and Skehanierin (Fields 320- 326).

Table No. 7 *Area of fields suitable for land spreading in Shrone East & Skehanierin (hectares)*

Field No.	315	316	317	318	319	320	321	322	323	324
Suitable Area (*ha*)	7.77	2.48	1.68	1.65	2.10	4.36	13.80	25.20	13.61	5.13
Field No.	**325**	**326**								
Suitable Area (*ha*)	2.11	1.25								

9.9.6 The total area of land assessed in Shrone East was 23.50 ha. The total area of land available for spreading is 15.68 ha.

9.9.7 The total area of land assessed in Skehanierin was 86.8 ha. The total area of land available for spreading is 65.5 ha.

9.10 *Abbeydorney*

9.10.1 Approximately 85% of the land assessed in Abbeydorney is available for landspreading (*Figure No. 8.4.1*).

9.10.2 Setbacks have been applied to all those fields in close proximity to roads, houses, rivers and drainage ditches.

9.10.3 Table No. 8 gives the total area suitable for spreading in Abbeydorney.

Table No. 8 ***Area of fields suitable for land spreading in Abbeydorney (hectares)***

Field No.	183	184	185	186	187	188
Suitable Area (*ha*)	3.52	2.12	19.64	3.05	4.72	17.32

9.10.4 The total area of land assessed in Abbeydorney was 59.42 ha. The total area of land available for spreading is 50.36 ha.

9.11 *Abbeydorney (Listellick)*

9.11.1 Approximately 68% of the land assessed in Listellick is available for landspreading (*Figure No. 8.4.2*).

9.11.2 Setbacks have been applied to all those fields in close proximity to roads, houses, rivers and drainage ditches.

9.11.3 Table No. 9 gives the total area suitable for spreading in Listellick.

Table No. 9 ***Area of fields suitable for land spreading in Listellick (hectares)***

Field No.	189	190	191
Suitable Area (*ha*)	0.81	1.46	9.24

9.11.4 The total area of land assessed in Abbeydorney was 17.57 ha. The total area of land available for spreading is 11.51 ha.

9.12 *Abbeydorney (Ardrahan)*

9.12.1 Approximately 70% of the land assessed in Ardrahan is available for landspreading (*Figure No. 8.4.3*).

9.12.2 Setbacks have been applied to all those fields in close proximity to roads, houses, rivers and drainage ditches.

9.12.3 Table No. 10 gives the total area suitable for spreading in Ardrahan.

Table No. 10 ***Area of fields suitable for land spreading in Ardrahan (hectares)***

Field No.	192	193	194	195
Suitable Area (*ha*)	2.22	2.55	3.62	1.90

9.12.4 The total area of land assessed in Ardrahan was 14.97 ha. The total area of land available for spreading is 10.29 ha.

9.13 *Kerry Head (Clashmelcon)*

9.13.1 Approximately 76% of the land assessed in Clashmelcon is available for landspreading (*Figure No. 9.4.1*).

9.13.2 Setbacks have been applied to all those fields in close proximity to roads, houses, rivers and drainage ditches.

9.13.3 Table No. 11 gives the total area suitable for spreading in Clashmelcon.

Table No. 11 ***Area of fields suitable for land spreading in Clashmelcon (hectares)***

Field No.	196	197	198	199	200
Suitable Area (*ha*)	1.16	2.86	3.53	1.89	0.38

9.13.4 The total area of land assessed in Clashmelcon was 12.87 ha. The total area of land available for spreading is 9.82 ha.

9.14 *Kerry Head (Ardagh & Ballinglana)*

9.14.1 Approximately 75% of the land assessed in Ardagh and Ballinglana is available for landspreading (*Figure No. 9.4.2*).

9.14.2 Setbacks have been applied to all those fields in close proximity to roads, houses, rivers and drainage ditches.

9.14.3 Table No. 12 gives the total area suitable for spreading in Ardagh and Ballinglana.

Table No. 12 ***Area of fields suitable for land spreading in Ardagh and Ballinglana (hectares)***

Field No.	**201**	**202**	**203**	**204**	**205**	**206**	**207**	**208**	**209**	**210**
Suitable Area (*ha*)	3.53	3.57	2.46	1.50	0.00	10.99	9.15	2.01	1.77	4.26
Field No.	**211**	**212**	**213**	**214**						
Suitable Area (*ha*)	1.18	0.30	2.48	2.82						

9.14.4 The total area of land assessed in Ardagh and Ballinglana was 61.37 ha. The total area of land available for spreading is 46.02 ha.

9.15 Kerry Head (Tiduff)

9.15.1 Approximately 65% of the land assessed in Tiduff is available for landspreading (*Figure No. 10.4.1*).

9.15.2 Setbacks have been applied to all those fields in close proximity to roads, houses, rivers and drainage ditches.

9.15.3 Table No. 13 gives the total area suitable for spreading in Tiduff.

Table No. 13 ***Area of fields suitable for land spreading in Tiduff (hectares)***

Field No.	**215**	**216**	**217**	**218**	**219**	**220**	**221**
Suitable Area (*ha*)	4.04	0.00	1.52	7.15	6.65	3.88	8.38

9.15.4 The total area of land assessed in Tiduff was 49.03 ha. The total area of land available for spreading is 31.62 ha.

9.16 Kerry Head (Dreenagh)

9.16.1 Approximately 17% of the land assessed in Dreenagh is available for landspreading (*Figure No. 10.4.2*).

9.16.2 Setbacks have been applied to all those fields in close proximity to roads, houses, rivers and drainage ditches.

9.16.3 Table No. 14 gives the total area suitable for spreading in Dreenagh.

Table No. 14 *Area of fields suitable for land spreading in Dreenagh (hectares)*

Field No.	222	223
Suitable Area (*ha*)	0.00	4.29

9.16.4 The total area of land assessed in Tiduff was 24.54 ha. The total area of land available for spreading is 4.29 ha.

9.17 Kerry Head (Knockane, Dirtane, Glenderry, Ballylongane, Doonamantane, Ballyheige)

9.17.1 Approximately 57% of the land assessed in Kerry Head is available for landspreading (*Figure No. 11.4.1*).

9.17.2 Setbacks have been applied to all those fields in close proximity to roads, houses, rivers and drainage ditches.

9.17.3 Table No. 15 gives the total area suitable for spreading in Kerry Head.

Table No. 15 *Area of fields suitable for land spreading in Kerry Head (hectares)*

Field No.	224	225	226	227	228	229	230	231	232	233
Suitable Area (*ha*)	2.64	5.59	2.39	1.11	1.19	2.12	1.42	0.78	0.00	0.00
Field No.	234	235	236	237	238	239	240	241	242	243
Suitable Area (*ha*)	0.00	0.00	0.55	1.11	18.62	1.93	0.00	0.80	0.59	0.30
Field No.	244	245	246	247	248	249	250	251	252	253
Suitable Area (*ha*)	1.23	0.00	1.72	0.42	1.19	0.59	0.25	2.52	0.41	0.95
Field No.	254	255	256	257	258	259	260	261	262	263
Suitable Area (*ha*)	0.23	0.56	0.70	0.00	0.00	0.00	0.66	1.01	0.61	1.31
Field No.	264	265	266	267	268	269				
Suitable Area (*ha*)	1.69	0.33	0.61	0.56	0.34	2.95				

9.17.4 The total area of land assessed in Kerry Head was 108.84 ha. The total area of land available for spreading is 61.98 ha.

9.18 Kerry Head (Boolenshare, Heirhill, Dirtane)

9.18.1 Approximately 64 percent of the land assessed in Boolenshare, Heirhill and Dirtane is available for landspreading (*Figure No. 11.4.2*).

9.18.2 Setbacks have been applied to all those fields in close proximity to roads, houses, rivers and drainage ditches.

9.18.3 Table No. 16 gives the total area suitable for spreading in Boolenshare, Heirhill and Dirtane.

Table No. 16 ***Area of fields suitable for land spreading in Boolenshare, Heirhill, Dirtane (hectares)***

Field No.	**270**	**271**	**272**	**273**	**274**	**275**	**276**	**277**	**278**	**279**
Suitable Area (*ha*)	4.95	1.31	2.32	5.38	0.78	2.86	1.61	0.74	3.55	2.97
Field No.	**280**	**281**	**282**	**283**	**284**	**285**	**286**	**287**	**288**	**289**
Suitable Area (*ha*)	0.55	1.74	0.91	0.40	0.49	0.39	0.00	0.00	0.00	1.54
Field No.	**290**	**291**	**292**							
Suitable Area (*ha*)	0.33	2.56	2.76							

9.18.4 The total area of land assessed in Boolenshare, Heirhill, Dirtane was 59.67 ha. The total area of land available for spreading is 38.14 ha.

9.19 Kerry Head (Ballyheige, Ballyronan and Kill)

9.19.1 Approximately 82% of the land assessed in Ballyheige, Ballyronan and Kill is available for landspreading (*Figure No.s 12.4.1 and 12.4.2*).

9.19.2 Setbacks have been applied to all those fields in close proximity to roads, houses, rivers and drainage ditches.

9.19.3 Table No. 17 gives the total area suitable for spreading in Ballyheige, Ballyronan and Kill

Table No. 17 ***Area of fields suitable for land spreading in Ballyheige, Ballyronan and Kill (hectares)***

Field No.	**293**	**294**	**295**	**296**	**297**	**298**	**299**	**300**	**301**	**302**
Suitable Area (*ha*)	1.22	0.24	0.00	1.50	1.90	2.37	1.59	1.28	1.52	3.02
Field No.	**303**	**304**	**305**	**306**	**307**	**308**	**309**	**310**	**311**	
Suitable Area (*ha*)	3.66	1.46	1.77	5.30	0.22	4.61	4.65	3.29	0.37	

9.19.4 The total area of land assessed in Ballyheige, Ballyronan and Kill was 48.27 ha. The total area of land available for spreading is 39.97 ha.

9.20 Kerry Head (Cleanderry)

9.20.1 Approximately 80% of the land assessed in Cleanderry is available for landspreading (*Figure No. 13.4*).

9.20.2 Setbacks have been applied to all those fields in close proximity to roads, houses, rivers and drainage ditches.

9.20.3 Table No. 18 gives the total area suitable for spreading in Cleanderry.

Table No. 18 ***Area of fields suitable for land spreading in Cleanderry (hectares)***

Field No.	**312**	**313**	**314**
Suitable Area (*ha*)	4.82	10.09	2.78

9.20.4 The total area of land assessed in Cleanderry was 21.37 ha. The total area of land available for spreading is 17.69 ha.

10 Recommendations

- Landspreading is acceptable in all the selected areas *subject to normal good practice.*
- No landspreading within 20 metres of rivers and lakes;
- No landspreading within 10 metres of ditches and drains;
- No landspreading within 10 metres of roads;
- No landspreading within 100 metres of private houses;
- No landspreading within 50 metres of wells;
- No landspreading on slopes greater than six percent leading to rivers, lakes or streams. The buffer zones can be increased in areas where this slope is exceeded.