13.1 Introduction

This chapter of the Environmental Impact Statement (EIS) provides a description of the existing soils of and agricultural land-use of the existing site and in the immediate vicinity of the site. Potential impacts of the proposed development are addressed.

The proposed development would require the alteration of an area of land which would have the potential to impact the immediate environment. This chapter assess how the proposed development may affect the soils and agricultural environment in the vicinity of the site.

Additionally the impact of the development on the soil and agricultural environment following restoration of the site is examined.

13.2 Study methodology

A detailed desktop study (non-intrusive investigation) of the geology and soil in the vicinity of the site was undertaken to obtain, examine and review existing information and data. This enabled the area to be described and assessed. A description of potential impacts during the construction, operation and restoration of the proposed development is given, with the inclusion of mitigation measures.

Existing Soil and Agricultural information for Kilbride was obtained from a number of sources, including soil maps, 1:575,000 National Soil Map of Ireland (second ed.) (Gardiner & Radford, 1969), Westmeath soil map and the associated handbook (Finch and Gardiner, 1977) all from the National Soil Survey of Ireland (NSSI - An Forás Talúintais). Further quaternary /drift geology / soil data was obtained from sheet 13, Meath of the 1:100,000 scale map series (Geraghty and Mc Connell, 1999) and the accompanying handbook (Mc Connell et al., 2001).

Further information was obtained from site specific works and investigations performed by Enviros staff on-site, such as: trial pits, percolation tests, and boreholes. This information is detailed in Chapter 11 (Geology & Groundwater) and Appendices 11.1 & 11.2.

13.3 Receiving environment - soils

The receiving environment is examined in two sections, namely (i) soils and (ii) agriculture. These are examined below, respectively.

County Westmeath covers an area of 1,839 km², equivalent to 183,892 ha (454,409 acres). The county has flat-to-rolling topography almost absent of mountains or bedrock outcrops and mainly low-lying in character. Peat deposits have developed in many of the low lying areas. The soil is predominantly underlain by limestone overlain by deep glacial deposits of boulder clay and glacial drift. Glacial deposition features, such as eskers, moraines and kettle holes dominate (Finch and Gardiner, 1977).

The topography of the site is flat or gently undulating with shallow slopes to a drain located to the north of the site. A remnant of a raised bog, up to 4.0 m in thickness is located adjacent to the north west boundary of the site.

There are a number of soil series types located within and surrounding the footprint of the proposed development. Published NSSI soil and quaternary geology data for the Enniscoffey area of County Westmeath indicates that the soils to the north and northwest are Glacial till composed of limestone and shale, with more peaty soils to the south, southwest and east of the site.

A summary of the soil details, adapted from NSSI data is given in the following table and Figure 13.1. Alternative unpublished GSI data (in preparation) indicates that the area is dominated by limestone till and gravels to the south and north - northwest of the site with areas of peat to the west and south of the site. This is illustrated in a GSI map included in Appendix 11.4. The unpublished GSI data appears to more accurately reflect soil types observed on and around the site.

Table 13.1 Soil series within and surrounding the footprint of the proposed development site, described by NSSI, indicated in Figure 13.1. (Adapted from Finch and Gardiner, 1977)

Great Soil Group	Soil Series and Phase	Parent Material
Soil Complexes	Howardstown Patrickswell	Carboniferous limestone
Peat Complexes	Allen, Raised bog	Organic
	Gortnamona, Raised bog - cutover reclaimed	
Surrounding the footprint of the site		
Grey Brown Podzolic	Rathowen	Glacial till composed of limestone and shale
Peat Complexes	Tubary	

13.3.1 Soils within the footprint of the proposed development

(Great Soil Group) Soil complex

This soil type is associated with kame and kettle-hole topography (physical shape of the land). Mineral soil complexes are composed of an intricate distribution of soil patterns that defies a clear-cut delineation of each individual soil unit. Complex glacial drift deposition patterns have resulted in a relatively large number of soil complexes being mapped.

(Soil Series) Howardstown Patrickswell

Soil distribution patterns are extremely intricate in this complex. Howardstown Patrickswell soil series is comprised of over 50 % peat and the parent material is mainly carboniferous limestone till. This soil series is generally found on the edge of raised bogs.

(Great soil group) Peat complex

This is a peat soil type characterised by a high organic content (over 30%). It can be up to a depth of 30 cm. Raised bog peat is built upon a fen, given suitable climatic conditions. Its living vegetation is more reliant on atmospheric precipitation than groundwater as a source of water. The nature of the water source results in the characteristic convex growth-shape of a raised peat bog composed of acidic plants.

The raised bog peat profile, usually consisting of a basal layer of fen or woody fen peat, overlain by a layer of acid ombrogenous peat is characterised mainly by its content of *Sphangnum* mosses, variable quantities of bog cotton (*Erophorum* spp.) and ericaceous remains (*Calluna*). In their natural state fen peat vary considerably in depth.

(Soil Series) Allen

This soil series is typical of initial raw peat soil. It is normally wet throughout (85 - 91 % moisture content) and in an un-drained state the groundwater table is very close to the surface.

In an un-reclaimed state the depth of this peat series may reach up to 5 m. The base layer is generally highly humified, locally termed "block peat". This layer consists of the remains of plants which grew under the influence of base-rich ground waters. This is overlain by a layer, of variable thickness of acidic peat consisting mainly of *Sphagnum* moss.

Soil suitability: In their natural state, with no physical alteration, aeration or drainage the soils are unsuited to any type of agricultural enterprise. However with the addition of lime, fertilizing and drainage grass production and forestry are feasible.

The surrounding NHA is also composed of Allen soil type.

(Soil series) Gortnamona

Raised bogs that have been drained levelled and reclaimed belong to the Gortnamona series. The soil profile normally consists of a layer of acid peat stripping, "top sod" of variable thickness (1 -1.5 m) over basin peat (woody or fen plant remains). The drier surfaces are colonised by heathers (*Calluna-Erica* spp.) and bog cotton (*Eriophorum* spp.) with *Eriophorum angustifoluim* and *Sphangnum* spp. in the wetter areas.

Soil suitability: There is the potential for forestation and grasslands and in some instances a range of crops, such as cereals and carrots and celery. This is often dependent on drainage and therefore limited to the outer regions of the bog area. With suitable drainage and management the physical nature of such soil presents little or no difficulty and nutritional problems are also easily overcome.

13.3.2 Soil profiles surrounding the proposed site

(Great Soil Group) Grey Brown Podzolic

Grey brown podzolic group contain a proportion of limestone which is the parent material and also has a high organic content. They contain a B horizon (sub soil - located immediately below the A horizon) higher in clay content than the A (the uppermost layer of soil) and C horizons (the geological material below horizon A & B); this is termed a textural B or Bt horizon. This soil type is moderately well drained and the pH is moderately acid to neutral. The soil has a well developed structure. Under Irish climatic conditions they are good all round soils.

Soil suitability: If suitably managed this soil type is productive under most agricultural enterprises. The heavier textured soil is more suited to grassland and the lighter texture suited to tillage under. It is highly productive for forestry use, if made available (Finch and Gardiner, 1977).

(Soil Series) Rathowen

The Rathowen series parent material consists of limestone with about 25% shale. Surface texture is gravely loam, while the Bt horizon is generally clay loam. Structure is weak and the water holding capacity of the soil is high. This is a moderately well drained soil of medium pH.

Soil suitability: The soil has a limited use range and is suitable for mainly pasture. Good management practices are essential because of the weak soil structure and the high water holding capacity. Soil is liable to poaching and compaction if grazed when wet (Finch and Gardiner, 1977).

(Soil series) Patrickswell

Patrickswell is the most widespread of the limestone soils in the county. Surface textures of loam to silt loam overlie a Bt horizon with a clay loam to silty clay loam texture. It has a high silt content, due to the presence of shale in the parent material with a well developed structure and a high pH. The soil is well drained.

Soil suitability: Patrickswell soil has a wide range of uses, both tillage and pasture when combined with good management practices, however the quality of the land can deteriorate under constant tillage (Finch and Gardiner, 1977).

Site investigation

Intrusive site geological and groundwater investigations at the site show a soil profile which substantiates An Forás Talúintais data. 12 Boreholes and 11 trial pits installed between November 2003 and April 2004 (under the supervision of Enviros staff) indicate that the soil is a dark brown colour (peaty clay) and shallow glacial till overlying dense gravel deposits.

Further site specific details about trial pit and borehole investigations on-site are included Appendix 11.1 (trial pit logs) and Appendix 11.2 (borehole logs).

Site investigation indicated that Trial pits, at depths of between 2.3 meters below ground level (mbgl) and 3.5 mbgl, generally encountering shallow tills over dense gravels. The till was recorded at between 0.5 m and 3.5 m thick.

In the west and east of the site, peat was encountered over clay, tills and gravels. To the west, in the peat bank adjacent to the site boundary the trial pits revealed up to 2.3 m of peat.

A peat probe survey was carried out to determine the depth of the remnant of a raised bog located adjacent to the west of the site, beyond the site boundary. Results indicate that the peat is present in depths of 0.8 m up to depths of 4 m.

Investigations to the east of the site indicate that 1 m of peat overlies 0.5 m of clayey, silty till overlying dense medium coarse gravels. In the centre of the site there is a thin layer of topsoil over about 0.8 m of gravely clay overlying at least 7.5 m of fine to course gravel over sandy clay.

The permeability of the soil on-site was determined by permeability tests, following the methodology described in the EPA's Wastewater Treatment Manual "Treatment Systems for Single Houses". Permeability tests at two locations indicated a T-test value of 6.3 at P1 and a P-Test value of 8.5 at P2. The location of P1 and P2 is indicated on a site investigation drawing, Figure 4.1.

13.3.3 Landuse and agriculture

The site is located in an agricultural setting and the land bordering the site is used for a mixture of agricultural (arable and pastoral) and commercial (commercial forestry and peat extraction) activities.

To the northwest of the site there is a commercial forest. Adjacent to the southern boundary of the site is an area of deciduous woodland and a raised bog. The raised bog, Milltownpass Bog, is a NHA (site code No: 2323). Westmeath County Council recognise the importance of hedgerows and woodland areas in the county, especially the role these areas play in providing a habitat for wildlife in the area (CDP, 2002). The Irish land coverage of forestry is 7% compared to the EU average of 24% (ENFO, 2004).

The lands to the north and the east of the site have been influenced by human activity. To the north of the site there is some evidence of historic peat extraction, suggested by the cutting and draining of the remnant of a raised bog adjacent to the western boundary. Further north the land is dominated by grassland. The east of the site is bordered by the county road and further east are some grassland and areas of peat extraction.

Overall in Leinster and Westmeath there is an upward trend in total overall livestock numbers for the period 1970 - 1991 (table 13.1 and 13.2). Closer examination of the numbers indicates that there is a trend towards decreasing numbers of cows. This suggests a decline in the dairy sector and an increase in livestock (other than cows) and sheep numbers in the county during the reported period (Coulter et al., 1999).

Local Agriculture

Table 13.2 Summary of livestock data for Leinster (area 19073 km²) 1970 - 1991. (Adapted from Coulter et al., 1999).

Leinster	1970 (LU / ha)	1980 (LU / ha)	1991 (LU / ha)
Total livestock density	0.88	0.96	1.15
Cows and replacements livestock density	0.26	0.22	0.20
Livestock other than cows and replacements	0.5	0.64	0.65
Sheep	0.05	0.04	0.14

LNote:- LU / ha is livestock unit per hectare.

Table 13.3 Summary of livestock data for Westmeath (area 1798 km²) 1970 - 1991. (Adapted from Coulter et al., 1999).

Westmeath	1970 (LU / ha)	1980 (LU / ha)	1991 (LU / ha)
Total livestock density	0.89	0.99	1.03
Cows and replacements livestock density	0.20	0.15	0.13
Livestock other than cows and replacements	0.61	0.79	0.71
Sheep	0.09	0.05	0.19

13.4 Potential impacts of the proposed development

The proposed development will result in the movement of soils on-site. The potential impacts on soil and agriculture of construction, operation and restoration of the development include the following:

- soil and agricultural excavation and disturbance due to material movement and removal within the development footprint;
- compaction of soil by heavy machinery and vehicle movements and also to create a suitable base profile;
- alteration of the hydrological and hydrogeological regimes (decreased infiltration, increased surface runoff and incident storm water) which has the potential to effect local water courses;
- impact in the quality of surface water run-off to the northern drainage ditch, during construction and operation due to silt run-off; and
- contamination of the soil and local area due to leachate.

The physical impacts and direct disturbances on-site (the creation of a hard standing area) are limited to the time period during commercial operations of the development. It is expected that the site will operate indefinitely but will be restored on completion of activities; assuming there is no residual pollution in the area that would have a long-term effect on the soil in the area.

The indirect (mainly chemical) effects of a development often have a potentially greater and longer lasting effect on the environment than the physical effects. Chemical effects, such as the exposure to leachate or chemicals used in the operation of the facility, directly (into the soil) or indirectly (food chain, reproduction) are possible. These effects have the potential to result in the contamination of the soil or the introduction of potential pollutants in to the food-chain.

Once the facility is operational it would result in a positive impact on the wider soils and agricultural environment. 90,000 tonnes of waste would be converted into compost. Compost is a soil improver and could be used to replace peat, which is a non-renewable resource.

13.5 Do nothing scenario

In the absence of any development the land in the area will remain in agricultural use, as a mixture of agricultural tillage, improved grass lands and commercial forestry.

It is likely that the 90,000 tonnes of compostable materials would continue to be disposed of by landfill if the development does not proceed.

13.6 Mitigation measures

There will be soil disturbance; the physical movement and removal of soil. It is therefore difficult to conceive how any mitigation measures could be put in place to protect soil and agriculture within the footprint of the proposed development. Mitigation measures will be primarily directed at the protection of the local environment, however it is not thought that this will not have a long-tern deleterious effect in the area.

Chapter 4 details the design of the proposed development, and mitigation measures to be implemented to reduce impacts, including during construction work. Disturbed till will be used to provide lining materials for the surface water and leachate treatment areas. It is recommended that the silt fences are utilised, as specified in Figure 14.2 during construction works close to the drainage ditch and bog woodland in the NHA. Silt fences are constructed of geotextile membrane which will permit the movement of water past the temporary barrier however will retain any construction related silt (Figure 14.3). All construction operations, including the temporary storage of excavated materials must occur outside these fences. The silt fences should be inspected daily. Excess soil around the facility will be planted with trees. This will provide an agricultural use for the excess area and reduce the visual impact of the development.

Additionally it is recommended that the bare-soil working area and exposure time is minimised. All mounded soils, waste and rubble should not be placed within 5 m of the woodland, freshwater, peatland habitats located within the subject lands or adjacent to the subject lands prior to their relocation or removal off-site. They must also be properly sited so that run off from these mounds will not enter the drainage ditch or the adjacent NHA.

Environmental management and monitoring systems for the development and the mitigating measures described in other chapters will be put in place. These measures relating to the design of the development, surface water and ground water, air & gas and ecology, will mitigate against any potential negative impact on soil or agriculture arising as a result of the proposed development.

13.7 Predicted impacts

The proposed development will prevent the use of the site for agricultural purposes. An area around the site is planted as a commercial forest to reduce the visual impact of the facility. These trees will remain during construction and operation of the facility.

Soil within the footprint of the development area (4.8ha of the total site area of 17.5ha) will be impacted due to construction and operation of the proposed development. There will not be any impact on surrounding land as a result of the proposed development.

Following the implementation of environmental management systems, such as leachate management and the mitigation measures detailed in other chapters it is anticipated the long-term negative effects on the local environmental in the vicinity of the site are likely to be insignificant. The operation of this development, in accordance with good management practices will mitigate against significant environmental impacts.

The facility would result in a positive impact on the wider soils and agricultural environment. 90,000 tonnes of waste would be converted into compost. Compost is a soil improver and could be used to replace peat, which is a non-renewable resource.

13.8 Monitoring

Routine environmental monitoring of surface water, groundwater etc will be undertaken during the operation of the proposed development, as detailed in earlier chapters.

All environmental monitoring results will be recorded and maintained on-site.

13.9 Restoration and residual impacts

It is anticipated that the proposed facility will operate for the foreseeable future. Some restoration details are included in the Design Chapter (Chapter 4) in the event that the facility should close.

Following the implementation of the planned restoration of the development (as outlined in Chapter 4) returning the area to a more state combined with good environmental management practices to ensure that all mitigation measures are in place during the operation of the facility will ensure there is no pollution to the surrounding environment.

It is therefore anticipated that in the short, medium and long-term the development will have little negative impact on soils and the environment.

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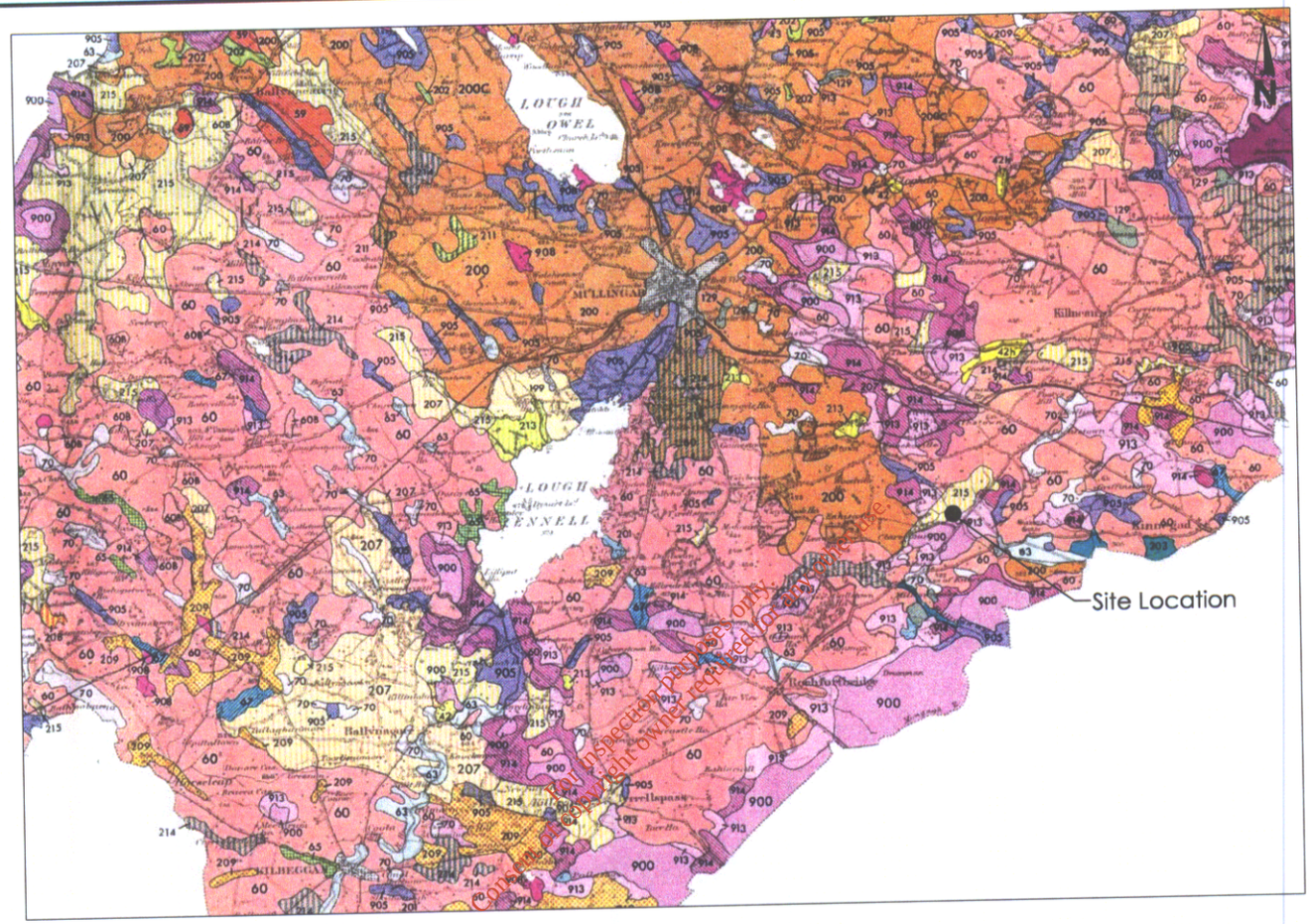

Great Soil Group	Rendzina	Brown Earth			Grey Brown Podzolic						Gley							Regosol	Lithosol
Soil Series	140	43	42	199	90	59	60	608	200	200C	70	129	201	202	63	65	67	203	204
	Burren	Ballincurra	Baggotstown**	Ladestown	Mariarstown	Elton	Patrickswell	Patrickswell Bouldery Phase	Rathowen	Rathowen Cherty Phase	Howardstown	Mylerstown	Ballyshear	Street	Camagar	Coolaleugh	Drombanny	Milltownpass	Knockeyon
Parent Material	Limestone Bedrock	Limestone Till over Limestone Bedrock	Fluvioglacial Limestone	Fluvioglacial Limestone, Shale and Chert	Limestone Till	Limestone Till	Limestone Till	Limestone Till	Shale and Limestone Till	Shale/Limestone and Chert Till	Limestone Till	Gravelly Limestone Till	Gravelly Limestone Till	Shale and Limestone Till	River Alluvium	Lake Alluvium	Peaty Lake Alluvium	River Alluvium	Chert Bedrock
% Total Land Area*	0·11	0·13	0·31	0·28	0·05	0·53	30·36	0·64	9·29	9·62	2·50	0·16	0·19	2·07	1·03	0·57	0·24	0·11	0·08
Hectares	186	219	546	494	85	934	53,200	1,120	16,277	16,842	4,383	275	336	3,620	1,795	1,001	411	194	144

*Major Urban areas equal 0·47% 830 hectares approx. **Suffix h equals hummocky phase of Baggotstown Series

	Raised Bog	Raised Bog–Cutaway/Reclaimed	Fen Peat	Fen Peat–Improved	Peat Complexes	
Soil Series	900	913	908	905	907	914
	Allen	Garrynamona	Pollardstown	Banagher	Clonsast	Turbary
% Total Land Area	3·64	4·31	0·36	5·98	1·94	5·32
Hectares	6,371	7,561	621	10,466	3,399	9,316

	Soil Complexes												Land Unit
Component Series	205	206	207	208	209	210	211	212	213	214	215	216	
	Patrickswell, Ladestown	Patrickswell, Rathowen	Patrickswell, Baggotstown	Patrickswell, Baggotstown, Rhyt	Baggotstown Crush	Ladestown, Rathowen	Ladestown, Rathowen, Banagher	Rathowen, Ladestown	Howardstown, Baggotstown	Ballyshear, Patrickswell	Howardstown, Patrickswell	Finvara, Banagher, Allen	Boulderry, Lake Alluvium
% Total Land Area	0·04	1·65	5·97	0·22	2·06	0·07	2·65	0·31	0·28	1·47	4·82	0·14	0·03
Hectares	69	2,899	10,461	391	3,603	121	4,650	552	486	2,564	8,442	251	49

Thorntons recycling

FIGURE 13.1
SOIL MAP
(Taken from Finch & Gardiner 1977)