7.1 Introduction

Climate in this chapter of the Environmental Impact Statement (EIS) refers to both the global climatic conditions and the local climatic or "microclimate" conditions of the area, such as local wind flow, temperature, rainfall and solar radiation patterns.

Potential impacts of the proposed development on the microclimate and the global climate are considered here.

7.2 Study methodology

This study involved a desktop study of available information, along with information obtained from the air quality assessment (Chapter 6).

Existing meteorological data for County Westmeath from January 2002 to September 2003 have been examined and assessed in order to predict potential impacts of the proposed development.

Data was obtained from the closest official Met Eireann weather observation station to the site, the Mullingar weather station. The weather station is located approximately 1.7 km northwest of Mullingar Town Centre (533214 N : 072144 W). It is 104 m above mean sea level.

The data obtained included precipitation volume, temperature (mean, minimum and maximum, mean air temperature and mean grass temperature), wind force and direction, evaporation, evapotranspiration, humidity and atmospheric pressure. The data was examined and presented in charts which are included in the text of this chapter.

7.3 Climate in the Existing Environment

Typically the weather experienced in Ireland is a west maritime climate, consisting of relatively mild, moist winters and cool cloudy summers. For substantial periods of the year, Ireland is subject to maritime air, associated with the Gulf Stream. This helps to maintain a moderate climate. Prevailing winds are westerly to south westerly and average humidity is high. The west coast and inland areas of high relief are subject to the highest levels of annual average precipitation (Finch and Gardiner, 1977). Specific weather patterns at Mullingar are provided in Table 1 and represented graphically in the following sections.

A significant receptor in the area of the proposed site, sensitive to climate change is Miltownpass bog, a Natural Heritage Area (NHA), site code: 2323, located south / southwest of the site boundary.

7.3.1 Precipitation Volume

Precipitation is the discharge of water, in liquid (rain and dew) or solid state (snow, hail, sleet and frost), out of the atmosphere. It is the common process by which atmospheric water becomes surface or subsurface water.

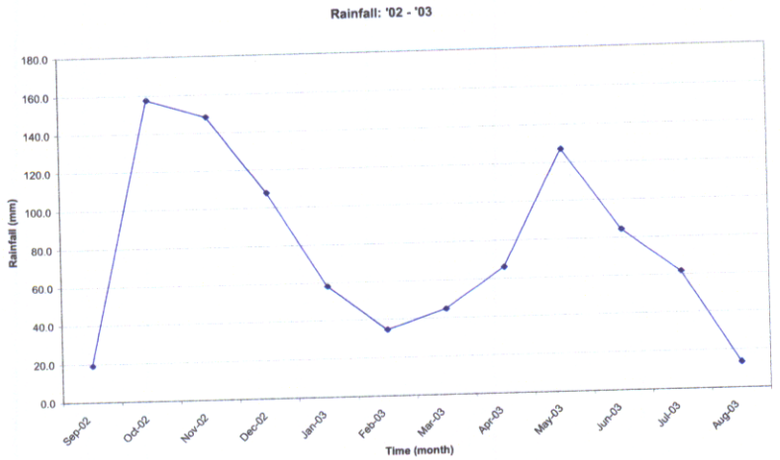
The average monthly precipitation recorded during the period March 2002 - August 2003 was 76.8 mm. The average monthly precipitation varies between the drier summer months and the wetter months, as indicated in Figure 7.1.

The 1961 - 1990 Mean annual average Rainfall (30 year average) recorded at the Mullingar Meteorological Station was 934.3 mm (Met Éireann, 2004).

Table 7.1 Summary of Meteorological Data from the Mullingar Weather Station.

Parameter	Air temp (Mean)	Grass temp (min)	Rainfall	Mean wind speed	Relative humidity (Mean)	Air pressure (Mean)	Pot. Evapo transpiration
Month	°C	°C	mm	Knots		hpa	
Sep-02	13.0	5.9	18.9	5.0	84.1	207.6	39.8
Oct-02	9.0	2.7	157.6	6.2	88.8	249.8	13.5
Nov-02	8.0	2.1	148.2	7.8	90.0	501.2	2.2
Dec-02	5.8	1.1	107.6	7.0	90.2	358.9	-1.2
Jan-03	4.7	-1.9	58.0	8.2	86.9	351.3	-1.4
Feb-03	4.7	-1.9	34.3	8.0	85.1	215.7	12.8
Mar-03	7.2	-1.3	44.6	6.9	81.5	216.6	35.8
Apr-03	9.3	1.9	66.0	7.1	78.6	330.3	63.9
May-03	10.6	4.4	127.1	7.7	86.3	217.3	71.2
Jun-03	13.5	6.7	84.3	6.9	79.3	147.3	88.0
Jul-03	15.7	10.2	61.7	6.3	83.5	126.0	76.2
Aug-03	16.1	8.5	13.3	5.0	80.4	194.8	74.7

Figure 7.1 Rainfall data 2002 - 2003



7.3.2 Temperature

The daily air, grass and soil temperature varies between the warmer summer and colder winter months, as indicated in Table 1. A summary of this information is presented in the following charts.

Figure 7.2 Air temperature, 2002 - 2003

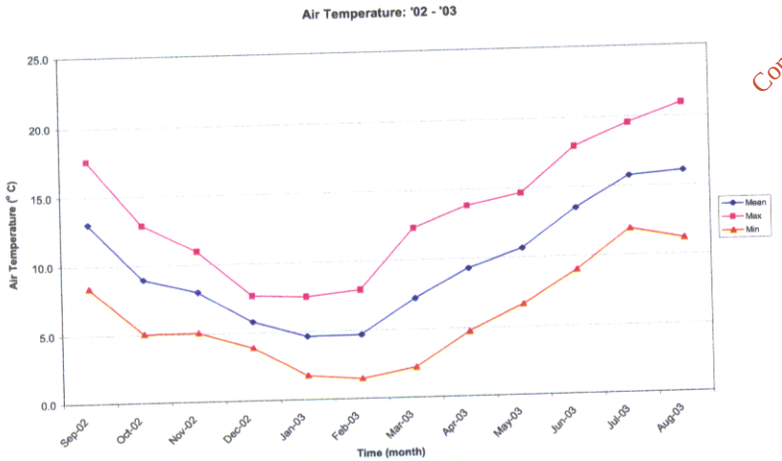
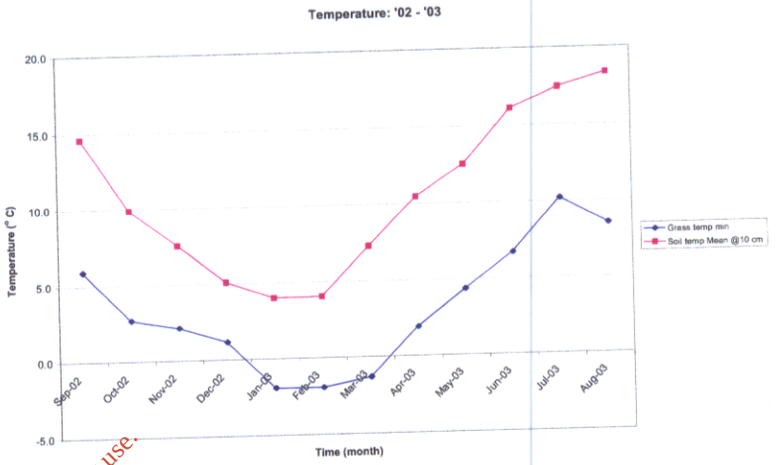


Figure 7.3 Grass and soil temperature, 2002 - 2003

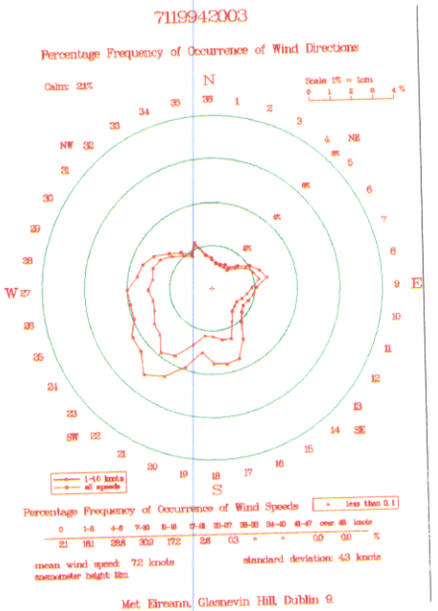


7.3.3 Wind Force and Direction

The available data for wind direction for the period March 2002 - August 2003 indicated that the predominant wind direction was south westerly / westerly. The only exception to this general trend was during December 2002, when the average wind direction was recorded as south easterly.

A Met Éireann Wind Rose plot indicating wind direction at the Mullingar Met station is provided in Figure 7.4.

Figure 7.4 Wind Rose 1994-2003 (provided by Met Éireann)



7.3.4 Evaporation

Evaporation is the process by which water is changed from the liquid or the solid state into the vapour state. In hydrology, evaporation is vaporisation that takes place from water, land and snow surfaces, (not from plants) at temperatures below the boiling point.

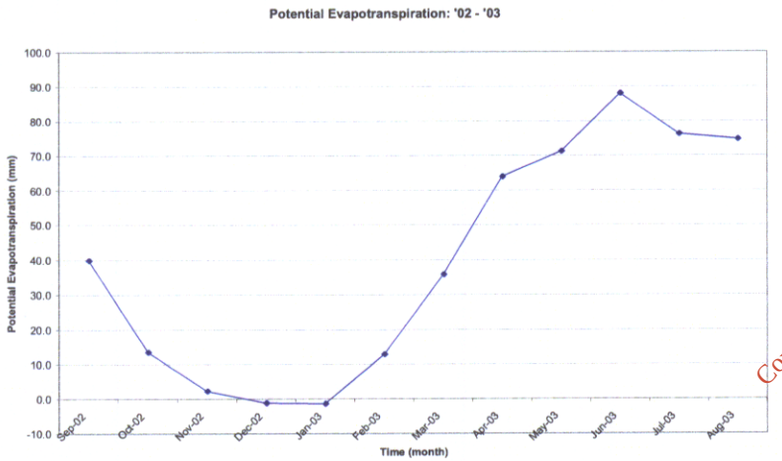
7.3.5 Evapotranspiration

Potential Evapotranspiration is the combined maximum hypothetical value for moisture evaporation from surfaces, both soil and water, and transpiration from plant foliage, assuming there is no water deficiency. It is expressed in units of water depth (mm) and presented in Figure 7.5.

For this site it provides an indication of "natural" water use, thereby indicating the potential quantity of water available to form surface water run-off and leachate formation. Where potential evapotranspiration is low there is potentially more water available to form run-off or leachate.

From the data a correlation between decreasing potential evapotranspiration (Figure 7.5; September 2002 - April 2003) and increasing rainfall (Figure 7.1; October 2002 - January 2002) is indicated, suggesting the period of potentially greatest leachate production.

Figure 7.5 Potential evapotranspiration 2002 - 2003

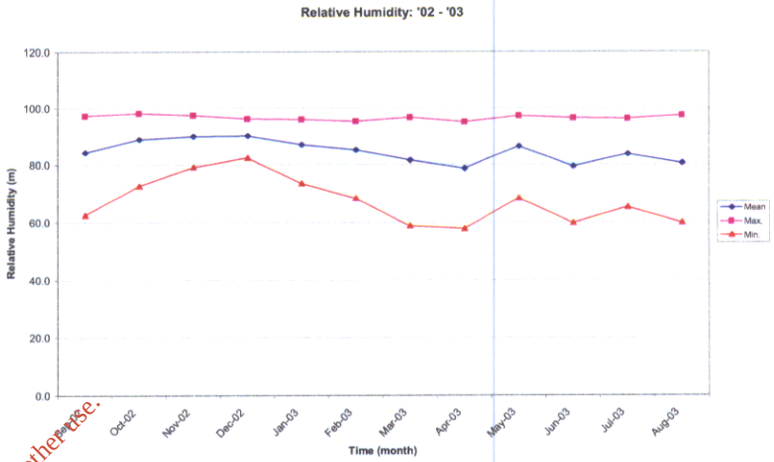


7.3.6 Humidity

Air absorbs moisture in the form of water vapour; dependent on the temperature, until on equilibrium, the saturation point is reached. Humidity is a measure of the vapour content of the air.

The average monthly relative humidity values recorded during the period March 2002 - August 2003 remains quite constant. The average monthly relative humidity varies between the drier summer months and the wetter months, as indicated in Figure 7.6.

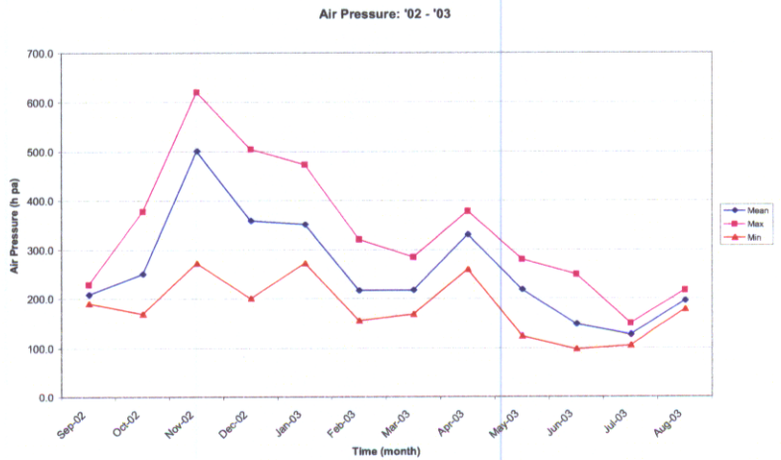
Figure 7.6 Relative humidity 2002 - 2003



7.3.7 Atmospheric Pressure

The average monthly atmospheric pressure values recorded vary throughout the period March 2002 - August 2003, as indicated in Figure 7.7.

Figure 7.7 Air pressure 2002 - 2003



7.4 Potential impact of the proposed development

Composting refers to the controlled biological decomposition of organic, carbon-containing matter by microorganisms (mainly bacteria and fungi). Biological decomposition is a natural on-going process. A stable humus material, dark brown in colour with an earthy smell is formed. Composting occurs under controlled conditions, maintaining moisture, substrate and aeration to create optimum conditions for microbial degradation activity (US-EPA, 1994). General compost formula:

Organic matter + O_2 $\xrightarrow{\text{aerobic microorganisms}}$ $CO_2 + H_2O + NH_3 + SO_4$

This is an exothermic reaction therefore heat is also a reaction by-product.

Composting contributes to the Irish and global greenhouse gas production as green organic matter is a carbon dioxide (CO_2) store. Emissions from the composting activity and vehicle movements associated with the activity have the potential to impact on the (global) macroclimate. CO_2 is produced from the oxidation reaction under aerobic microbial conditions (ie. microbial degradation) due to the breakdown of the organic waste substrate.

Both methane (CH_4) and CO_2 are greenhouse gases, which contribute to global warming. Large quantities of CH4 production are not anticipated from this site. CH_4 production would represent anaerobic degradation conditions, indicating ineffective composting.

Greenhouse gases are classified according to their Global Warming Potential (GWP) which gives CO_2, the most common greenhouse gas, a GWP of 1. On this scale, CH4 has a GWP of 21 and is therefore a significant greenhouse gas.

Composting results in the slow release of CO_2 during the degradation process, unlike a short concentrated release, such as in a combustion engine. However, the CO_2 released from composting is not considered a net contributor to greenhouse gas emissions since it is derived from mainly vegetable / organic matter that would produce carbon dioxide as it decomposed if left in a "natural" state in a short period of time i.e. the carbon is part of the natural carbon-cycle. If "fossil" carbon such as the carbon in plastic were converted to carbon dioxide, e.g. incineration the resulting carbon dioxide would count as a greenhouse gas. The carbon emitted by burning plastic would not be considered part of the natural carbon cycle, resulting in an increase in the amount of carbon dioxide in the atmosphere.

There will be additional CO_2 emissions from vehicle combustion engines working on-site. Combustion of fossil fuels for energy purposes is the greatest source of 95% of CO_2 emissions (DoEHLG, 1998).

7.5 Do-nothing scenario

In the absence of any development on-site there would be little change from the *microclimate* conditions present on site as the proposed location would remain as farmland. The only vehicle movements on-site would be concerning tree cutting, pruning and general management of the adjacent commercial forest, which would generate some CO_2 emissions.

Regarding the *global* climate, if the development does not proceed there would be a negative contribution to global climatic conditions. The waste would continue being landfilled, which leads to the production of both Carbon Dioxide and Methane which contribute to global warming.

7.6 Mitigation Measures

Best available technology (BAT) considerations will be employed in all design aspects of the proposed facility. The composting process will operate in a sealed building and in external areas supplied with an air handling system to draw air through the compost. The loading of waste organic material will be carried out in an area operating under an air extraction system. This will prevent aerosol emissions from the facility. The air and gas is collected and treated via a biofilter prior to discharge to the atmosphere (See Chapter 4 for further details).

Regular vehicle services will ensure that engines are in prime working condition. The DoE National Car Test (NCT) will also certify this, thus mitigating against excessive CO2 emissions. Changing efficiency of fuel types for combustion engines will also enable CO2 reduction.

The area at the north and west of the site has been planted with trees. Forest areas sequester CO_2 emissions, mitigating CO_2 against production during the composting process.

Conditions (physical, chemical and biological) within the compost will be monitored on an on-going basis. This will ensure that conditions are maintained at the optimum for the aerobic decomposition of the material, preventing methane generation.

Environmental management and monitoring systems will be put in place concerning leachate management. This will monitor CO_2 dissolved in water and acid production (reducing the pH), mitigating against any negative effects arising as a result of the proposed development.

7.7 Predicted impact

Composting is a degradation process that would occur naturally, therefore CO_2 production is not considered to be contributing to global greenhouse gas levels. The process controls will ensure that CH_4 production will be maintained at a minimum, as high levels indicate an inefficient composting procedure, operating under anaerobic conditions.

Effects on the global climate are not expected to be significant, although there will be a small beneficial impact as the waste will be diverted from landfill, thereby reducing CH_4 generation which contributes to global warming.

7.8 Monitoring

Ongoing meteorological monitoring will be undertaken. It is not intended that site specific meteorological monitoring will be undertaken. Some site specific information will be obtained from the surface water, groundwater, geological and ecological investigations. As with the baseline study, data will be obtained from the Met Eireann weather observation station in Mullingar. Data will be monitored and examined in order to predict any potential meteorological related impacts, such as the potential for increased leachate production due to rainfall conditions or potential evapotranspiration.

7.9 Restoration and residual impact

It is anticipated that the proposed facility will operate indefinitely, although some restoration details are included in the Design Chapter (Chapter 4). Consequently restoration of the site is not thought to impact on the surrounding environment.

With implementation of good environmental management practices to ensure that all mitigation measures are in place the potential impact of the proposed facility on the global climate during operations is not expected to be significant. Consequently when the site is restored it is not expected to have any lasting impact on the environment.

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