2.5 Surface Water

2.5.1 Introduction

The site is located in a large Bord na Móna landbank in north County Kildare. The entire Bord na Móna landbank comprises 2,554ha, which is divided into a northern portion of 799ha and a southern portion of 1,745ha by the L5025 County Road, which crosses the narrowest section of the peat deposit.

The waste management facility currently occupies an area of 179ha (including the access road from the facility to the R403 at Killinagh Upper) and is located in the southern portion of the landbank. The entire Bord Na Móna landbank in this area has been utilised for the industrial harvesting of peat over an approximate 50 year period. Artificial drainage of the bog has resulted in an alteration of the natural hydrology and therefore this assessment details the surface water environment at its current state.

The information contained in this section has been divided into sub-sections, so as to describe the various aspects pertaining to surface water environment. In terms of site characterisation, the existing surface water environment is described in terms of the following:

- Description of regional and localised drainage patterns;
- Assessment of existing and site specific hydrometric information; and
- Characterisation of the surface water quality of water falling and discharging from the site.

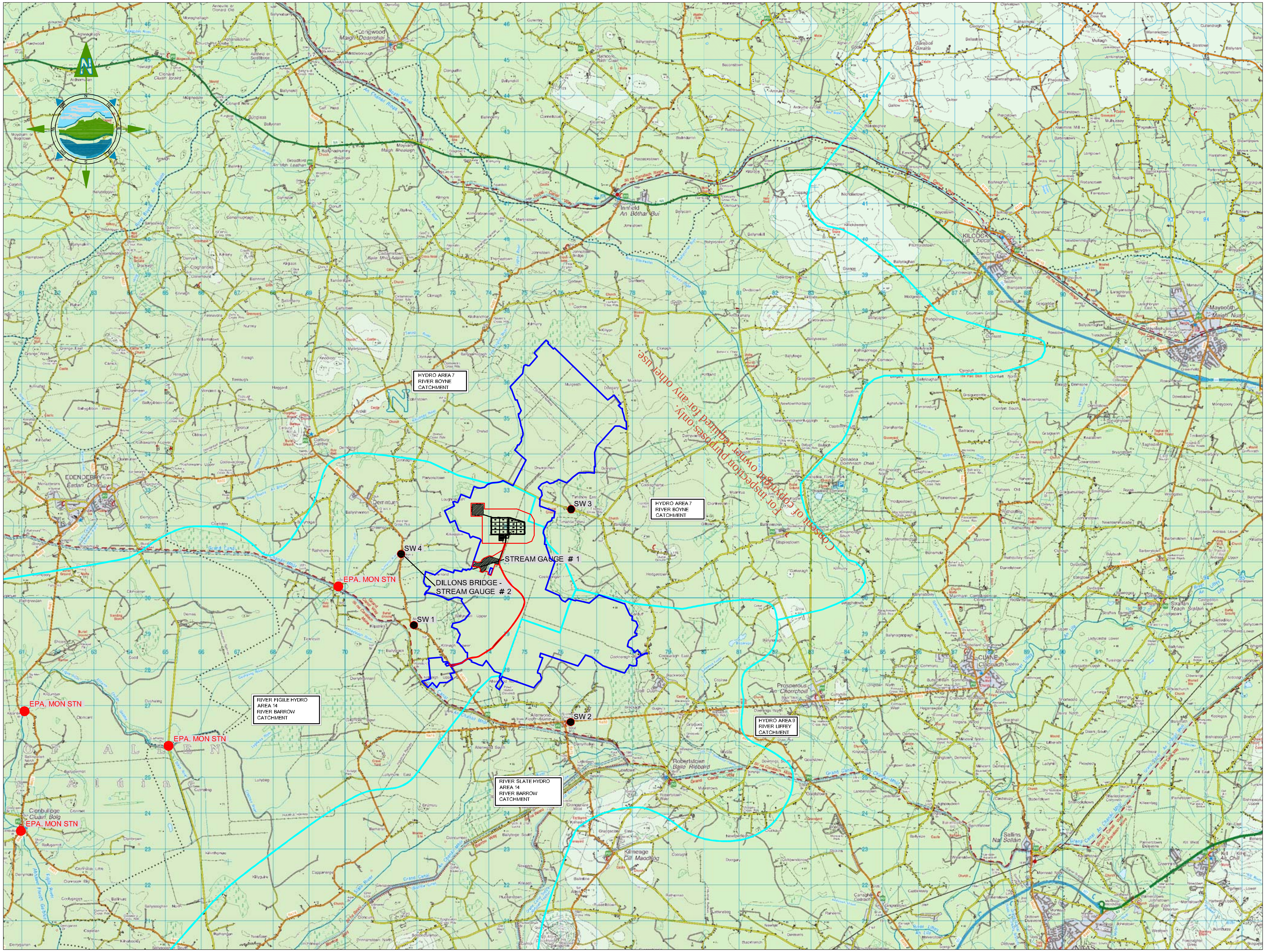
The information included in this section is considered sufficient to assess the existing surface water environment. The historical hydrometric information for the upper catchment of the River Barrow is poor; however site specific measurements have augmented the historical information.

2.5.2 Drainage

The natural and artificial surface water channels identified within (and immediately adjacent to) the site as part of this investigation are shown on Drawing No. 3369-2407 and Figure 2.5.1.

The 19th Century 6-inch to 1-mile scale geological field sheets indicate that prior to exploitation of the peat resources within the site there were no natural surface water channels crossing the site. The only natural features are recorded close to the margin of the peat deposits.

In their natural state an undisturbed peat bog is predominantly water, with a moisture content of approximately 95% near the surface and reducing to approximately 90% in the deepest layer, due to compaction of material. The eco-system of an undisturbed bog depends solely on rainfall for their water supply. A natural bog comprises two discrete layers, the acrotelm and the underlying catotelm. The acrotelm is the top 10-30cm of living and poorly humified sphagnum mosses, which is periodically aerated and highly permeable. The catotelm in the lower thicker layer, which is more highly humified with depth, has low permeability.



GENERAL LEGEND

OWNERSHIP BOUNDARY
ACTIVITY BOUNDARY
RIVER CATCHMENT BOUNDARY
SURFACE WATER MONITORING LOCATION (SW 2)
EPA MONITORING LOCATION (EPA MON.)

NOTES

1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING
2. ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE
3. ENGINEER TO BE INFORMED BY THE CONTRACTOR OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES
4. ALL LEVELS SHOWN RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

1km 0 1km 2km 3km

Issue	Date	Description	By	Chkd.
A	25-10-07	ISSUED FOR PLANNING	M.N.	P.O'N.

Client: BORD NA MONA

Project: PROPOSED EXTENSION TO DREHID WASTE MANAGEMENT FACILITY

Title: SURFACE WATER CATCHMENT AREAS AND MONITORING POINT LOCATIONS

Scale @ A3: 1:100,000

Prepared by:	Checked:	Date:
M. Nolan	P. O'Neill	April 2008

Project Director: D. Grehan

TOBIN
Patrick J. Tobin & Co. Ltd.
Consulting, Civil and Structural Engineers,
Block 10-4, Blanchardstown Corporate Park,
Dublin 15, Ireland.
tel: +353-(0)1-8030406
fax:+353-(0)1-8030409
e-mail: info@tobin.ie
www.tobin.ie

Drawing No.: Figure 2.5.1 Issue: A

Although the surface of an undisturbed bog lies above the natural watertable of the adjoining free draining lands, the water table lies within 0.3m of the surface within the bog itself. Therefore a bog can be viewed as a very large reservoir of water. The bog will naturally regulate the release of water; therefore there is very little seasonal fluctuation in the bog watertable.

Discharges from natural bogs are dependent of seasonal factors. During summer months bogs will largely absorb all precipitation to replenish its reservoir and ensure that the watertable does not fall too low. During winter months precipitation will be absorbed to an optimal level and after which all precipitation will be rejected. Hydrographs at the margins of bogs show peakflows during and shortly after winter rainfall events with quick recessions in surface flow following the cessation of rainfall.

Drehid bog has been subject industrial activity over the past 50 years (approximately). To reduce the moisture content of the peat material it was necessary to systematically drain the whole bog. A network of large artificial drains were opened up across the bog in order reduce the water content of the surface and increase the bearing capacity, thus allowing the land to be traversed by heavy plant and machinery. The drainage plan involves the progressively deepening drains over a period of 7-10 years.

The artificial drainage network heavily influences the current appearance of the bog. The entire site has been divided into a number of compartments, referred to as 'peat fields' due to the excavation of east-west trending artificial surface drains. These artificial surface drains discharge to a central underground culvert, trending in a general north to south direction. The hydraulics of these central drains is controlled by the fall in topographic elevation and the flow to natural hydrological discharge points. Drawing No. 3369-2407 shows the orientation of the drainage channels within the site. The artifical drainage has been further modified due to the construction of the landfill.

In the vicinity of the landfill activity boundary, all water draining from the artificial drains discharge to the central culvert, with flows towards the south. The central culvert is diverted to settlement ponds, prior to discharge to the Cushaling River at the western margins of the bog.

The surface water drainage pattern in the broader vicinity of the applicant's property was also assessed as part of the baseline assessment to determine the catchment conditions in the region. The catchment divides were determined using the EPA Water Quality in Ireland (1998-2000) publication. The Ordnance Survey of Ireland Discovery Series was also used to refine the catchment and sub-catchment divides.

Reference to Figure 2.5.1 indicates that all lands within the activity (red line) boundary are located within the catchment of the River Barrow. All surface water draining from the operations area of the landfill and borrow areas drains to the west to the Cushaling River, which is a tributary of the River Figile. The access road from the R403 to the facility entrance passes through the sub-catchment of the Abbeylough Stream, which is also a tributary of the River Figile. The River Figile is a sub-catchment of the River Barrow.

The Slate River sub-catchment encroaches on the southern portion of the applicant's property. No activities associated with the development are located within the sub-catchment of Slate River. The River Slate and the River Figile converge to the north of Bracknagh, County Offaly to form a water feature referred to Black River. This Black River converges with the River Barrow just north of Monasterevin, County Kildare.

The catchment divide between the regional catchments of the River Barrow and the River Boyne is delineated approximately 560m to the north of the landfill activity boundary. The Fear English River drains all water from the northern portion of the applicant's property. The Fear English River flows to the north to converge with the River Blackwater at Johnstown Bridge, County Kildare. The River Blackwater converges with the River Boyne approximately 4.5km north of Longwood, County Meath.

No water from the applicant's property drains to the River Liffey. The River Liffey catchment is shown on Figure 2.5.1, with the closest edge of the property at least 3.5km to the west of the River Liffey catchment divide.

The total flow in the surface water channels is considered to be composed of two different flow mechanisms. The dominant flow mechanism, due to the soil cover in the area, is considered to comprise overland run-off of surface water. The flow in the surface water features responds quickly to rainfall during winter months, when the storage in the peat is full. This 'flashy flow' is common in areas where bog cover dominates, due to their low infiltration capacity characteristics. The fall off in surface water flow is also relatively quick following the rainfall event. The second flow mechanism is considered to comprise a slow release of shallow groundwater baseflow to the surface water environment at the margins of the bog.

This portion of the total surface water flow may be quite small during heavy rainfall events, compared to the surface run-off portion. However during periods of low precipitation and during summer droughts, the groundwater contribution will comprise almost all the surface water flow. This slow release of the groundwater maintains a surface water flow throughout the year.

2.5.3 Surface Water Flow Measurements

2.5.3.1 Regional Hydrometric Data

Historical hydrometrics data in this region is poor. There are no hydrometric stations within the site. Hydrological studies have been undertaken in other bog areas to determine the impact of peat harvesting. The removal of surface vegetation from the bog is considered to have the greatest effect on the quantity of surface water run-off which discharges to the receiving waters. The function of the drainage channels within the site is to divert rainwater from the surface of the bog. Research suggest that as much as 80% of rainfall during winter periods will discharge to receiving waters from a drained bog, compared to less than 20% from an intact bog.

It should be noted that harvesting of peat has now ceased within the site and re-vegetation of the bog surface is well established in many areas. The drainage ditches have been excavated to a depth where the base of the ditch is within the mineral subsoil. The drainage ditches are approximately 3-4m wide and approximately 3m deep. Water is retained in the drainage ditches even during summer months, which suggest that the channels are acting as storage channels and discharging to the main drain at a constant rate. Therefore the run-off rate on the current bog environment is considered to be significantly less than when the bog was operational and peat was being harvested.

The only available hydrometrics data for surface water flows are a hydrometric station maintained by the Office of Public Works (OPW) at Clonbulloge on the River Figile and a hydrometric station maintained by the Environmental Protection Agency-Hydrometrics Divisions at Johnstown ridge on the River Blackwater. The information available from both stations are included in Appendix 2.5.1 and summarised below.

As detailed above, all surface water generated from within the landfill activity boundary drains from the bog to the Cushaling River, which is a tributary of the River Figile. Historical hydrometrics data from the OPW hydrometrics station (Stn. 14004) at Clonbulloge are available for the years 1972 to 2001. This hydrometrics station records water levels and a rating curve is used to estimate flows. The hydrometric station is approximately 21.4km upstream of the landfill activity boundary and a number of surface water channels contribute to the flow in the River Figile along its course.

The only information interpreted from the hydrometric dataset relates to annual maximum flows from 1957 to 2000. Annual maximum flows on the River Figile at Clonbulloge from 1995 to 1999 were relatively stable, ranging from 13.2m^3/sec to 15.55m^3/sec. The annual maximum flow in 2000 was significantly elevated above those of previous years, with the flow measured on the 08/11/2000 comprising 23.68m^3/sec. It is not possible to obtain rainfall data from the Lullymore rainfall gauge as measurements were discontinued in 1990; however this storm event resulted from extreme rainfall across Ireland. A similar flow of 23.46 m^3/sec was measured on 22/10/1997, which was generated by a rainfall event on the 20/10/1997 comprising 40.6mm of rainfall over a 24 hour period.

The highest flows on the River Figile were recorded on the 19/11/1965, when flows were estimated to comprise 38.4m^3/sec. This flow was generated by an extreme rainfall event on the 17/11/1965, when the rainfall comprised 70.8mm over a 24 hour period. Interpretation of the annual maximum flows at Clonbulloge and rainfall measurements from Lullymore indicate that the storm peakflows respond at the hydrometric station approximately two days after the extreme rainfall event.

2.5.3.2 Site Specific Hydrometric Data

As part of the initial baseline survey in 2003 for the site, hydrometric measurements were taken at two locations along the Cushaling River. The flow measurements were taken on the 16th May 2003. The stream flow was measured using an OTT Hydrometric C2 Current Meter. The locations where the hydrometric readings were taken are shown on Drawing No. 3369-2407. Weather conditions in the weeks prior to stream gauging were wet, with some extreme rainfall occurring on the days preceding the gauging.

2 No. suitable monitoring stations were established on the Cushaling River for auto-sampling and hydrometric flow gauging stations, as shown in Figure 2.5.1. At each of these locations a hydrometric flow gauge, and a data logger were installed to determine the hydrometric conditions on the Cushaling River and a flow proportional auto sampler was installed at each location to determine the baseline water quality on the Cushaling River at the monitoring points. The monitoring stations were left in situ for a three month period.

In order to augment the flow data provided in the EIS, hydrometric stations were constructed at both monitoring stations. The flow in the watercourse was determined by measuring the water level by an electronic bubble gauge, in a known cross sectional area of water, with these water levels being recorded every 2 minutes on a data-logger. Using appropriate empirical formulas for the cross-sectional area of the water course and the water levels recorded by the data-logger, it is possible to determine the flow in the watercourse. The hydrographs are presented in Appendix 2.5.3.

The first monitoring station (Code: THASW1) is 12-inch concrete outfall pipe. This 12-inch concrete outfall pipe represents the outfall from the central drain of the northern section of the south Timahoe Cutover Bog and controls the overall outfall from the site (ref. also Drawing No. 3369-2407 of the EIS). A faceplate was installed on this pipe to allow the flow across the area of the pipe to be determined and to allow an accurate flow measurement by the instrumentation installed (see Plate 17.1).

At the second location THASW2, a weir was installed at a monitoring point on the Cushaling River, approximately 1km downstream of the outfall point from the central drain. The monitoring station was established along a narrow section of the watercourse, with a minimal area of flood plain. This weir was constructed using wood and was sealed using local clay fill from the bankside. The weir achieved laminar flow across the weir face and the flow meter (water height) was installed behind this weir (see Plate 17.2).

The hydrometric data was downloaded during each water sampling occasion, and the data logger was serviced to ensure correct operation. The ranges in flow recorded at the flow stations indicate the flashy nature of the Cushaling River. The minimum flow recorded at THASW1, i.e. the commencement of the Cushaling River was 0 m^3/hour and the maximum recorded was 218 m^3/hour (60.6 l/sec), with a median flow of 42 m^3/hour (11.7 l/sec). The minimum flow recorded at THASW2 (at a temporary weir) was 0 m^3/hour and the maximum recorded was 338 m^3/hour (93.9 l/sec), with a median flow of.35 m^3/hour (9.7 l/sec).

Visual assessment of both locations where the hydrometric monitoring stations were established does not suggest excessive siltation of the watercourse.

The flow on the Cushaling River as it exits the site boundary comprised approximately 0.0376m^3/sec (3,250m^3/day). The flow on the Cushaling River at Dillon's Bridge, approximately 2.25km downstream comprised approximately 0.0771m^3/sec (6,660m^3/day), indicating that the flow had over doubled in a short lateral interval. As stated above the Cushaling River originates within the site and therefore the stream is gaining flow along its course, as would be expected. The flow in the Cushaling River was well contained within the capacity of the flow channel. It is estimated that the channel could accommodate an approximate three to four fold increase in flow without exceeding the capacity of the stream channel.

The flow in the Cushaling River comprises the discharge from the drainage of the majority of the southern half of the applicant's property. This flow is discharged to settlement lagoons, prior to gravity flow to the Cushaling River. The groundwater baseflow to the Cushaling River is considered to be low, due to the artificial drainage of the site.

In terms of the capacity of the Cushaling River to transmit the water discharged from the site, the channel capacity was assessed at the 2 No. locations where site specific hydrometric readings were taken (shown on Drawing No. 3369-2407). The carrying capacity of the river channel was determined by utilising Manning's Equation.

The maximum channel capacity of the Cushaling River at the western boundary of the site is estimated to be approximately 8,550 litres/sec, with a channel cross sectional area of approximately 9.5m^2. The maximum channel capacity of the Cushaling River at Dillon's Bridge, where the Cushaling River flows under the R403 road, is estimated to be approximately 9,900 litres/sec, with a channel cross sectional area of 6.61m^2. The culvert under the R403 is a concrete box culvert, of dimensions 3m high and 2.2m wide. The stream channel upstream and downstream of the bridge is incised deeply into the ground and extends to up to 6-7m, with shallow flood plains which attenuate flow in the mid part of the stream.

It should be noted that the water discharged from the site naturally drains to the Cushaling River. The facility will gather this water and treat it prior to outfall at a regulated rate, thereby ensuring that the channel does not become overloaded at any stage.

All surface water discharged from the site will comprise clean treated surface water. The water discharged will be diverted through settlement lagoons to reduce any potential for siltation of the river channel. The surface water quality of all water discharged from the site will be monitored to ensure the receiving water quality is not impaired. As is not proposed to discharge any leachate or any other potentially contaminated material from the site, the physico-chemical assimilative capacity of the Cushaling River will not be impacted.

2.5.4 Surface Water Quality

2.5.4.1 Regional Surface Water Quality

Available information for the River Figile catchment was referenced to determine the existing quality of the surface water environment.

Reference to information obtained from the Southern Regional Fisheries Board indicates that the Figile and Slate Rivers, of which the Cushaling and Abbeylough Rivers are tributaries, support both salmonid and cyprinid fish populations.

Reference to Environmental Protection Agency information indicates that there are four water sampling stations between the development site and Clonbulloge (approximately 21.4km downstream of the site). This water quality data is summarised in Table 2.5.1, with the detailed biological and chemical information provided in Appendix 2.5.2. Table 2.5.1 should be read in conjunction with the biological river quality classification system as outlined in Table 2.7.1 in Section 2.7 herein.

Table 2.5.1: EPA Monitoring of Biological Quality of Waters on the River Figile

Location	Bridge South of Ticknevin Bridge	Cushaling Bridge	Kilcumber Bridge	Clonbulloge Bridge
Grid Ref.	E269675 N230150	E265100 N225850	E261050 N226800	E261000 N223450
2003	Q2	Q3	Q3-4	Q4
2000	Q1-2	Q3	Q3-4	Q4-5
1997	Q1	Q2	Q3	Q3-4
1994	Q1	No Sample	No Sample	No Sample
1993	Q2	Q3-4	Q3-4	No Sample
1990	Q1-2	No Sample	No Sample	No Sample
1989	Q2	Q3-4	Q3	Q4
1986	No Sample	Q3-4	Q3-4	Q4

The closest sampling station to the site is at Ticknevin Bridge (Nat. Grid Ref.: E269675, N230150), which is approximately 4.5km downstream of the landfill activity boundary. The biological analysis of the surface waters indicates that the surface water quality is consistently bad to poor (Q1-Q2) and in unsatisfactory condition, based on sampling results from 1989 to 2003 (7 No. samples). The invertebrate community diversity is low to very low. The physico-chemical summary of results indicates that the water quality is low with the dissolved oxygen depleted by either biological or chemical uptake. It is likely that the water in the Cushaling River at Ticknevin Bridge is affected by a high chemical demand on the Dissolved Oxygen, due to the predominance of peat upstream of the sampling point.

Further downstream at Cushaling Bridge (Nat. Grid Ref.: E265100, N225850), approximately 11km downstream of the site, the biological analysis indicates that the water quality is poor to doubtful (Q2-Q3) between 1997 and 2003. The chemical analysis indicates that the Dissolved Oxygen saturation is greater indicating a lower uptake, suggesting the affects of chemical activity of peat is reduced. The location of the sampling point is further downstream and is adjacent to free draining agricultural lands.

The biological analysis indicates that the water quality of the River Figile at Kilcumber Bridge (Nat. Grid Ref.: 261050, N226800) and Clonbulloge Bridge (Nat. Grid Ref.: 261000, N223450) is moderate to slightly polluted. Again the sampling at these locations indicates that the Dissolved Oxygen saturation is higher. The impacts on the water quality at these location appears to be related to agricultural activity, with Oxidised Nitrogen, Ammonia and ortho-Phosphate elevated above normal background levels.

2.5.4.2 Site Specific Surface Water Quality

2.5.4.2.1 Data points

As part of the original environmental site investigations a number of water sampling stations were established at the boundary of the site. These monitoring locations are named as follows: SW1, SW2, SW3, SW4, SW5, the locations of which were shown on Drawing No. 3369-2407 and Figure 2.5.1.

As part of the request for further information as part of the original planning application for the Drehid Waste Management Facility, the Cushaling River was sampled at two further locations: THASW1, THASW2, which were installed for a period of 3 months.

Subsequent surface water monitoring has been carried out at Stations W1 (Dillon's Bridge of the Cushaling River) and W2 (temporary lagoon at the start of the Cushaling River), enabled additional physico-chemical monitoring of the surface water to be undertaken since October 2006 and continued throughout 2007 during the construction phase of the landfill. The only discharges from the facility will enter the Cushaling River, therefore it is considered appropriate to focus any additional monitoring on this watercourse.

Weekly monitoring at Dillon's Bridge commenced in October 2006, due to concerns regarding suspended solids levels. Water quality results indicated that the water samples were within the permitted guidelines. All the data points are shown on Figure 2.5.1.

Data results

- Data for the original EIS are presented in Table 2.5.2.
- Data collected at THASW1, THASW2 is presented in Tables 2.5.3.
- Data collected for the sedimentation lagoon and the recent weekly data collected at Dillons Bridge since October 2006; are provided as an Appendix 2.5.4).

<u>Discussion of results</u>

The pH of the samples ranges from 7.52 to 7.66, which is within the MAC for drinking water and typical of surface water samples in the surrounding environment. The pH values recorded are slightly basic and similar to the pH values of the groundwater samples obtained within the site. Weekly sampling since October 2006 indicates pH varies from 7.3 to 8.4 with an average of pH 7.77.

On the 4th February 2003 the electrical conductivity of the surface water were recorded within the range 0.351mS/cm to 0.471mS/cm, which is low for surface waters. This is indictive of a high surface water runoff quotient. On the 26th July 2006, the conductivity is 0.67mS/cm. Recent water quality results indicate an average Conductivity of 0.53 mS/cm. Low concentrations of electrical conductivity correspond to periods of heavy rainwater inflows.

The chloride concentrations are recorded within the range 31-37mg/l, which is slightly above normal background levels. Weekly surface water results indicate Chloride concentrations are typically less than 20 mg/l. Coupled with the elevated ammonia concentration it is considered likely that that the elevated chloride is a result of the organic matter in the water. The sulphate concentration and the fluoride concentration are not considered elevated above normal background levels.

The elevated concentrations of ortho-phosphate, ranging from 0.8-1.2mg/l PO_4, are considered to be naturally occurring from the organic degradation of the peat colloidal matter in the water column. There is nothing to suggest that the ortho-phosphate is a result of external factors, such as agriculture or industrial discharge. With respect to the concentration of phosphate, all samples were collected around the verge of the bog at road crossings. The concentrations of phosphate at each location are well below the Maximum Admissible Concentration, as defined in S.I. 294/1989 (EC – Quality of surface water intended for the abstraction of drinking water, 1989). The MAC for phosphate is 3.35mg/l (expressed as PO_4) and the concentrations recorded from the samples varied within the range 0.8mg/l to 1.2mg/l PO_4. Levels of phosphate, analysed from weekly samples since October 2006, had a maximum concentration of 0.6 mg/l and an average concentration of 0.05 mg/l.

Notwithstanding the above, the Phosphate levels are considered elevated above natural background lands. The concentrations in the surface water around the verge of the Timahoe bog complex are considered to result from the geological environment from which the water originates. Phosphorus is a naturally occurring inorganic component of the organic fraction of peat. This water originates within the bog, where the environment changes from one of anaerobic/anoxic (oxygen depleted) conditions to aerobic (oxygen rich) conditions. This change in environment allows the introduction of oxygen to deeper levels of the peat, which allows oxidisation of Phosphorus (P) to Phosphate (PO_4). Rainwater falling on the cut-over bog will result in run-off to the surface water channels.

It was not possible to utilise the auto sampler for certain parameters, due to the requirement for specialist containers or preservatives. These specific parameters were obtained as grab samples, when the composite sample was being retrieved. The grab samples were obtained to determine the background concentration of Bacteria (total and Faecal Coliforms), Atrazine & Simazine (Heribicides), Volatile and Semi-Volatile Organic Compounds (VOC & sVOC), Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD).

These sampling stations were used for obtaining surface water samples, to determine the baseline quality of the water for the initial EIS. The samples were obtained on the 04th February 2003 and submitted to ALcontrol Geochem Ireland on the same day as the samples were obtained, in accordance with QA/QC water sampling protocol. All surface water samples were obtained in sample containers specified by the laboratory. The Cushaling River was also sampled on 26th July 2006 as part of the waste licence requirements. Details are provided in Table 2.5.3.

These samples were analysed for a broad range of inorganic, organic and biological parameters, in accordance with the parameter suite recommended in the EPA Landfill Manual and in accordance with relevant environmental laws (S.I. No. 12, 2001, Water Quality-Dangerous Substances-Regulations) to determine the quality of the surface water environment. The results of the analyses from February 2003 and July 2006 are shown in Table 2.5.2 to Table 2.5.4 herein.

The samples obtained in February 2003 and July 2006 were generally clear in appearance, however a brown tint was noted from some samples, due to the peat rich environment in which they were obtained.

The values of total hardness, would also be considered to be within normal ranges for surface water in an area underlain by limestone derived subsoil and bedrock. The hardness concentrations range from 270mg/l $CaCO_3$ to 424mg/l $CaCO_3$. As all surface watercourses originate within the bog and are fed from the groundwater, the hardness values would appear to be naturally occurring.

Dissolved oxygen concentration of all samples is typically low, within the range 5.4-9 mg/l O_2. The depletion of dissolved oxygen is not a result of biological demand, as the BOD of all samples is below 2mg/l O_2. Weekly monitoring since October 2006 indicates and average DO of 9.32 mg/l with a minimum recorded level of 5.4 mg/l. On the 4th February 2003 the COD is elevated, indicating that the chemical degradation of the peat in the water is depleting the oxygen saturation. On the 26th July 2006 the COD is recorded as being below the detection limit. The suspended solids concentration for all samples is typically low (<20mg/l). The total organic carbon concentration is recorded within the range of 37-54mg/l C, which is elevated and considered to result from the humic matter from the peat.

The nitrogen loading on the surface waters suggests that the waters are reduced within the peat deposits, resulting in the low concentrations of nitrite and nitrate and the formation of ammonia. When the waters are discharged to the surface water environment the nitrogen becomes oxidised, resulting in the formation of nitrite and nitrate. On the 4th February 2003 the ammonia concentrations are generally just above the MAC for drinking water at 0.3mg/l N, however SW1 records a concentration of 0.9mg/l N. Sample SW1 was obtained from the only sampling point to the north of the applicant's property and the flow in this watercourse was poor. From the sampling carried out on the 26th July 2006, ammonia concentrations appear to have declined slightly (0.11mg/l). Average Ammonia Concentrations since October 2006 are 0.28 mg/l with a maximum concentration of 0.89 mg/l. The nitrite concentrations range from 0.06-0.21mg/l NO_2, with the nitrate concentrations ranging from 1.7-4.7mg/l NO_3.

The concentration of sodium, potassium and magnesium are not considered to be elevated above normal background levels. The calcium concentration is within the low end of normal ranges. The concentration of aluminium is below the detection limit of the laboratory. The iron concentration is elevated above normal background levels. Elevated iron concentrations are typical in environments that are reducing and based on the nitrogen compounds this area appears to be reducing. The concentration of trace metals are generally low, however again because of the reducing setting of the area some elevated concentrations are noted.

The concentration of tri-butyl-tin, tri-phenyl-tin and di-butyl-tin, together with simazine and atrazine, are below the detection limit of the laboratory, which suggests that pesticides and herbicides are not causing an impact on the surface water environment in this area. The concentration of all volatile compounds and semi-volatile compounds are below the detection limit of the laboratory.

The concentration of total coliforms and faecal coliforms are not considered elevated above normal background levels, with similar levels recorded on the Cushaling River. Total Coliforms, (1350 c.f.u/100mls) in 2006, show a reduced level when compared with levels detected during the baseline survey carried out on the February 2003, (2880 cfu/100mls), which was undertaken as part of the Drehid Waste Management Facility EIS, 2004. E.Coli detected during this monitoring event (488.4 c.f.u/100mls), is comparable with levels detected during the EIS baseline survey, (488 cfu/100mls).

Elevated concentrations of total coliforms occur naturally from decay and degradation of vegetation and are common in all surface waters; however faecal coliforms can only be attributable to effluent from humans, livestock or wildlife. Reference to Figure 2.5.1 indicates that the surface water samples were taken around the periphery of bog. The sample points are downstream of lands that are currently utilised for agriculture. As there is no agricultural activity within the site boundary there would not appear to be any source for the faecal coliforms, apart from mammal activity on-site. Such activity would unlikely lead to the concentration of faecal coliforms recorded in the surface water. The most likely source of the faecal coliforms would be from either effluent discharges from septic tanks or run-off from an agricultural source upstream of the sampling point.

In summary, the surface water sampling programme indicates that the quality is generally good; however the setting of the site is naturally impacting the quality of water. The reducing environment of the bog is resulting in elevated ammonia and iron concentrations. The organic analysis indicates that pesticides, herbicides and organic solvents are not detected in the area. Biological analysis indicates that the surface water is naturally impacted by microbial organisms.

Table 2.5.2: Surface Water Quality (04th February 2003)

Electrical Conductivity EC	mS/cm	*2500*	*0.014*	0.351	0.384	0.357	0.471
Dissolved Oxygen DO	mg/l	*n/a*	*0.1*	5.6	5.6	5.8	5.8
Redox Potential		*n/a*		114	106	109	105
BOD	mg/l	*5*	*2*	<2	<2	<2	<2
COD	mg/l	*n/a*	*10*	171	187	159	173
Total Solids	mg/l	*n/a*	*1*	280	424	242	425
Total Suspended Solids	mg/l	*n/a*	*10*	<10	<10	<10	<10
TOC	ppm	*n/a*	*1*	54	37	47	46
Total hardness (as CaCO3)	mg/l	*60 MRC*	*15*	333	424	270	379
Total alkalinity (as CaCO3)	mg/l	*30 MRC*	*1*	200	200	210	270
Ammoniacal nitrogen (NH4-N)	mg/l	*0.3*	*0.2*	0.9	0.3	0.3	0.3
Nitrate as NO3	mg/l	*50*	*0.3*	3.4	3.5	1.7	4.7
Nitrite as NO2	mg/l	*0.5*	*0.05*	0.07	0.06	0.06	0.21
Total Oxidised Nitrogen (TON)	mg/l	*n/a*	*0.3*	0.8	0.8	0.4	1.2
Sulphate as SO4	mg/l	*250*	*3*	15	15	23	12
Chloride Cl	mg/l	*250*	*1*	36	37	32	31
Fluoride F	mg/l	*0.5*	*0.01*	<0.5	<0.5	<0.5	<0.5
ortho-Phosphate as PO4	mg/l	*3.35*	*0.03*	1.2	1.1	1	0.8
Potassium K	mg/l	*12*	*0.2*	1.2	1.3	1.3	1.6
Sodium Na	mg/l	*200*	*0.2*	15.6	10	8.1	10.8
Calcium Ca	mg/l	*200*	*0.05*	65.07	68.32	66.26	92.2
Magnesium Mg	mg/l	*50*	*0.05*	7.06	5.41	5.82	7.35
Aluminium	mg/l	*0.2*	*0.05*	<0.05	<0.05	<0.05	<0.05
Iron Fe	mg/l	*0.2*	*0.001*	0.632	0.264	0.354	0.322
Manganese Mn	mg/l	*0.05*	*0.001*	0.006	0.039	0.033	0.087
Zinc Zn	µg/l	*100*	*5*	7	6	6	7
Lead Pb	µg/l	*10*	*5*	6	<5	<5	<5
Copper Cu	µg/l	*30*	*5*	<5	<5	5	9
Mercury Hg	µg/l	*1*	*0.05*	0.08	0.11	0.16	0.18
Nickel Ni	µg/l	*50*	*10*	<10	<10	<10	<10
Arsenic As	µg/l	*25*	*5*	<5	<5	<5	<5
Chromium Cr	µg/l	*30*	*1*	<1	<1	<1	<1
Cyanide CN	µg/l	*10*	*50*	<50	70	<50	<50
Cadmium Cd	µg/l	*5*	*0.4*	<0.4	<0.4	<0.4	<0.4
Tri-butyl-tin	µg/l	*0.001*	*0.05*	<0.05	<0.05	<0.05	<0.05
Tri-phenyl-tin	µg/l	*0.001*	*0.05*	<0.05	<0.05	<0.05	<0.05
Di-buty-tin	µg/l	*0.001*	*0.05*	<0.05	<0.05	<0.05	<0.05
Simazine	µg/l	*1*	*1*	<1	<1	<1	<1
Atrazine	µg/l	*1*	*1*	<1	<1	<1	<1
Volatile Organic Compounds	µg/l		*1*	<1	<1	<1	<1
Semi-Vol. Organic Compounds	µg/l		*1*	<1	<1	<1	<1
Total Coliforms	c.f.u./100ml	*0*	*1*	1460	10460	2720	2880
Faecal Coliforms	c.f.u./100ml	*0*	*1*	461	613	345	488

Legend

M.A.C = Maximum Admissible Concentration under S.I. No. 439, 2000 (European Communities Drinking Water Regulations) and S.I. No. 12, 2001 (Water Quality -Dangerous Substances- Regulations).

M.R.C = Minimum Recommended Concentration

Table 2.5.3: Surface Water Quality (04th July 2006)

Parameter	Units	EPA Waste Licence/ MAC	Detection limits	Cushaling River
pH	pH units	6.5-9.5	-	7.8
Conductivity	µS/cm @ 20°C	2500	-	670
*Ammonia**	*(mg/l)*	*0.3*	*<0.02*	*0.11*
COD	(mg/l)	-	<10	<10
*BOD**	*(mg/l)*	*25*	*<2*	*2*
*Suspended Solids**	*(mg/l)*	*35*	*<5*	*6*
Total Phosphorous	(mg/l)	-	<0.05	<0.05
Chloride	(mg/l)	250	<0.5	10.5
Nitrate	(mg/l)	50	<0.05	0.71
P04-P	(mg/l)	5	<0.16	<0.16
Sulphate	(mg/l)	250	<0.5	9.2
Boron	(µg/l)	1000	<2	4
Dichlorvos	(µg/l)	500	<10	<10
Mevinphos	(µg/l)	500	<10	<10
Alpha-BHC	(µg/l)	500	<10	<10
Beta-BHC	(µg/l)	500	<10	<10
Gamma-BHC	(µg/l)	500	<10	<10
Diazinon	(µg/l)	500	<10	<10
Delta-BHC	(µg/l)	500	<10	<10
Ethyl Parathion	(µg/l)	500	<10	<10
Heptachlor	(µg/l)	30	<10	<10
Fenitrothion	(µg/l)	500	<10	<10
Aldrin	(µg/l)	30	<10	<10
Malathion	(µg/l)	500	<10	<10
Heptachlor Epoxide	(µg/l)	30	<10	<10
Endosulfan I	(µg/l)	500	<10	<10
Dieldrin	(µg/l)	30	<10	<10
4,4'-DDE	(µg/l)	500	<10	<10
Endosulfan II	(µg/l)	500	<10	<10
4,4'-DDD	(µg/l)	500	<10	<10
Ethion	(µg/l)	500	<10	<10
Endrin	(µg/l)	500	<10	<10
EndosulfanSulphate	(µg/l)	500	<10	<10
4,4'-DDT	(µg/l)	500	<10	<10
Methoxychlor	(µg/l)	500	<10	<10
Azinphos Methyl	(µg/l)	500	<10	<10
Mercury	(µg/l)	1	<1	<1
Arsenic	(µg/l)	10	<2	2
Silver	(µg/l)	-	<2	<2
Aluminum	(µg/l)	200	<2	142
Beryllium	(µg/l)	-	<2	<2
Barium	(µg/l)	-	<2	70
Chromium	(µg/l)	50	<2	2
Cadmium	(µg/l)	5	<2	<2
Cobalt	(µg/l)	-	<2	<2

Parameter	Units	EPA Waste Licence/ MAC	Detection limits	Cushaling River
Copper	(µg/l)	2000	<2	<2
Manganese	(µg/l)	50	<2	54
Tin	(µg/l)	-	<2	<2
Nickel	(µg/l)	20	<2	4
Lead	(µg/l)	10	<2	<2
Antimony	(µg/l)	5	<2	2
Selenium	(µg/l)	10	<2	<2
Zinc	mg/l	3	<2	<2
Calcium	mg/l	200	<0.1	132
Iron	mg/l	0.2	<0.1	2
Potassium	mg/l	12	<0.1	<0.1
Magnesium	mg/l	50	<0.1	6
Sodium	mg/l	200	<0.1	5
SVOC's	(µg/l)	-	<1	<1
VOC's	(µg/l)	-	<10	<10
Total Coliforms	MPN/100 ml	0	<1	1350
E.Coli	MPN/100 ml	0	<1	488.4

M.A.C = Maximum Admissible Concentration under S.I. No. 439, 2000 (European Communities Drinking Water Regulations) and S.I. No. 12, 2001 (Water Quality - Dangerous Substances- Regulations).

* Limits shown in italics are limits as expressed in Waste Licence W201-01.

2.6 Landscape

2.6.1 Introduction

The landscape and visual impact assessment of the proposed intensification and extension of the Drehid Waste Management Facility site near Timahoe, Co. Kildare will describe the existing landscape character, identify potential sensitive viewpoints and assess the potential impacts on viewpoints and general landscape character. The report is illustrated with photoplates and an analysis map - Figure 2.6.1 provided overleaf.

Scott Wilson incorporating Ferguson McIlveen were appointed by TOBIN in February 2007 to assess the landscape and visual impact of the intensification and extension of the Drehid Waste Management Facility County Kildare. A site visit was made in May 2007 assisted by 1:50,000 Ordnance Survey mapping.

2.6.2 Basis for the Landscape Impact Assessment

This EIS uses the 'Guidelines on the Information to be contained in Environmental Impact Statements' prepared in March 2002 on behalf of the Environmental Protection Agency (EPA) as the basis for the landscape/environmental impact assessment.

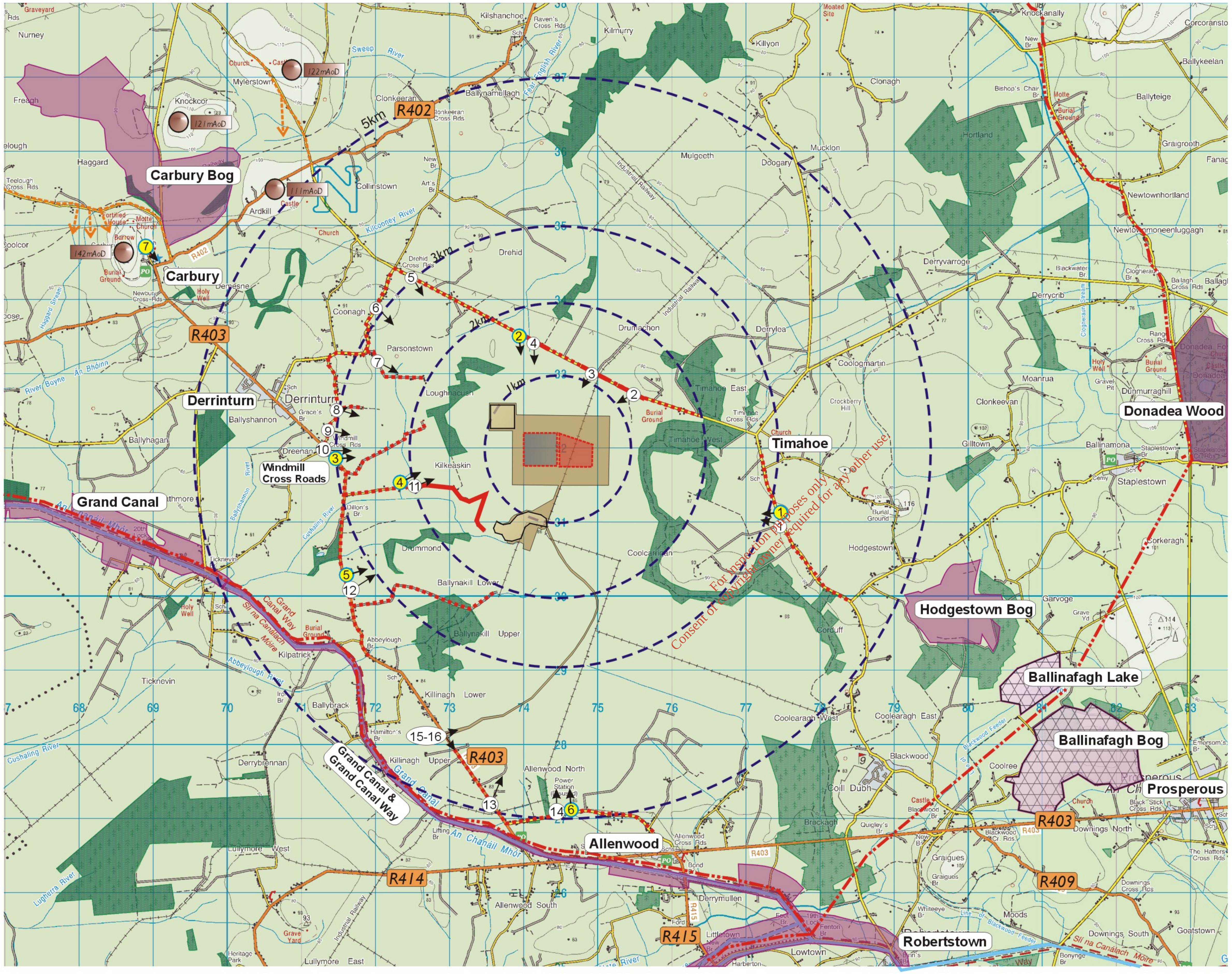
2.6.2.1 Purpose and Structure

The guidelines describe the central purpose of an EIS as "to identify potentially significant adverse impacts at the pre-consent stage and to propose measures to mitigate or ameliorate such impacts." In terms of structure, this report includes descriptions of the existing environment, of the proposed development, of likely significant impacts and of mitigation measures.

2.6.2.2 Landscape in the Description of the Existing Environment

The guidelines describe the term 'Landscape' as covering a range of environmental topics including Landscape Character, Landscape Context, Views & Prospects, Historical Landscapes and Manmade Landscapes.

Landscape impact assessment is a combination of two separate but closely related aspects. The first is visual impact, i.e. the extent to which new developments can be seen. The second is impacts on the character of the landscape, i.e. the responses that are felt towards the combined effects of the intensification and extension of use.



KEY

- Site Boundary
- Borrow Pits
- Permitted Landfill Footprint
- Proposed Landfill Footprint
- (Proposed) National Heritage Area (NHA) as marked in the Kildare County Development Plan 2005-2011
- Special Areas of Conservation (SAC) as marked in the Kildare County Development Plan 2005-2011
- Scenic Roads and Views as marked in the Kildare County Development Plan 2005-2011
- Long distance walking trails as marked in the Kildare County Development Plan 2005-2011
- Plate locations
- Photomontage locations
- Potential open view of landfill site from roads and associated residential and business properties
- Potential glimpsed view of landfill site from roads and associated residential and business properties
- Area of higher ground
- Kilometres distance from centre of application site
- Significant water courses and bodies
- Surrounding vegetation

Scott Wilson incorporating FERGUSON McILVEEN

ARCHITECTS
CONSULTING CIVIL & STRUCTURAL ENGINEERS
LANDSCAPE & ENVIRONMENTAL CONSULTANTS
TEL: 00353 1 6334178
FAX: 00353 1 6359904
50 City Quay

DREHID WASTE MANAGEMENT FACILITY

DESIGNATIONS, AND PLATE LOCATIONS

FIGURE 2-6-1 Rev.E February 2007 DL07138

Drawn: AM - Checked: DB

Plate 1: *View looking west-northwest from County road (L1019) 1km south of Timahoe, approximately 2.5km from the waste management facility.*
Note: vegetation, afforestation and topography will screen views towards the site

Plate 2: *View southwest towards waste management facility from County road (L5025) road approximately .5 km northeast of site.*

Plate 3: *View south-southwest from county road (L5025) .5km north northeast of the waste management facility.*

July 2007 DL07138

Scott Wilson

DREHID WASTE MANAGEMENT FACILITY *CO KILDARE*	*PLATES* *1, 2 & 3*

Plate 4: *View south from County road (L5025) between Timahoe and Drehid Cross Roads approximately 1km north of the waste management facility site.*
Note: intervening hedgerows and vegetation

Plate 5: *View southeast from County road (L5025) near Drehid crossroads, adjacent to property, approximately 2km north west of the waste management facility site.*
Note: intervening hedgerows and vegetation.

Plate 6: *General view looking southeast from County road (L5024), 2km northwest from the waste management facility site.*
Note: intervening hedgerows and vegetation.

July 2007 DL07138

Scott Wilson

DREHID WASTE MANAGEMENT FACILITY *CO KILDARE*	*PLATES* *4, 5 & 6*

Plate 7: *View southeast from minor road off County road (L5024), 1.5km northwest from the waste management facility footprint.*
Note: mature decidious and coniferous trees in hedgerows screening the site.

Plate 8: *View looking east from houses on County road (L5024) approximately 2km west from the waste management facility site.*
Note: mature trees and hedgerow in the background

Plate 9: *View east towards site from County road (L5024)approximately 2km west of the waste management facility.*
Note: hedgrerows and intervening vegetation.

July 2007 DL07138

Scott Wilson

DREHID WASTE MANAGEMENT FACILITY CO KILDARE	PLATES 7, 8 & 9

Plate 10: *View looking east from the R403 at Windmill Cross Roads, south of Derrinturn, 2.5km west from the waste management facility.*
Note: intervening hedgerows.

Plate 11: *View looking northeast from a minor road off the R403 adjacent to property, approximately 1km south west from the waste management facility.*

Plate 12: *View looking northeast from gateway on the R403, 2km from the waste management facility.*
Note: Intervening hedgerows and vegetation.

July 2007 DL07138

Scott Wilson

DREHID WASTE MANAGEMENT FACILITY *CO KILDARE*	*PLATES* *10,11 & 12*

Plate 13: *View north from R403, west of Allenwood, 4km from the waste management facility.*

Plate 14: *View looking north from entrance to Allenwood GAA football grounds, 4.5km from the waste management facility.*
Note: Afforestation in background.

Plate 15: *View northeast into site from the site entrance on the R403.*

Plate 16: *View southeast along the R403 from site entrance.*

Scott Wilson

DREHID WASTE MANAGEMENT FACILITY *CO KILDARE*	*PLATES* *13, 14, 15 & 16*

The Guidelines recommend systematic, accurate and comprehensive descriptions of the following to be included in any assessment:

i. **Context**

The report describes the location and the extent or magnitude of the Landscape in question.

The areas from which the existing site is visible (with particular attention given to views from roads, residences and designated tourism routes and viewpoints) are described. Those areas from where the site can be seen beyond the boundary are noted. Principal landscape features and areas of distinctive character are mapped.

ii. Character

The distinguishing aspects of the environment are noted.

A description of the landscape character differentiates between subjective assessments and objective description. A description of the character of the site that is perceived both from within the site and from the wider landscape is important, as is a description of the intensity and character of land use.

iii. Significance/Designations

Here the quality, value or designation assigned to the aspect is described. The level of visual intrusion upon designated views, designated landscape and designated landscape amenity areas is investigated.

iv. Sensitivities and Vulnerability

Changes that could alter the character of a view or aspect significantly are listed here. The extent to which the existing landscape is capable of being changed in such a way as will not alter the perceived character is also analysed and described as follows:

- High - development of the type proposed will significantly alter the perceived character of the landscape.
- Medium - development of the type proposed will moderately alter the character of the landscape.
- Low - development of the type proposed will not significantly alter the perceived character of the landscape.

2.6.2.3 Survey Methods

The survey methods used consisted of:

- A desktop study of the County Development Plan for County Kildare, including relevant published literature.
- Mapping of key landscape characteristics such as vegetation, high points, land use designations, and settlement areas. This was achieved using OS mapping and on site visual assessment. Aerial photography was not available for this process.
- Site survey to assess key features of the landscape and critical view corridors. The significance of the site and visual dominance within the landscape were recorded.

2.6.3 Prediction of Impacts on the Landscape

This section of the EIS presents an assessment of the likely and significant effects and impacts of the proposed intensification and extension.

2.6.3.1 Likelihood of Impacts

Only probable or likely impacts are addressed, including:

- *Predicted Impacts* - impacts that are expected or planned to take place, or that can be reasonably foreseen as inevitable consequences of normal construction and operation of the development are addressed. The character, magnitude, duration and consequence of impacts are described.
- *Potential Impacts* - impacts arising before proposed mitigation measures become fully effective e.g. visual impacts before vegetation becomes established.
- *Residual Impacts* – final or intended impacts occurring after the mitigation measures have taken effect as planned e.g. establishment of tree screening
- *The "Do Nothing"* impact - describes the environment as it would be if no development were to take place.

2.6.3.2 Significance of Impacts

As described in this section, this means either the sensitivity to change of the environment that is affected (often reflects its importance), or the importance of the outcome of the impact (the consequences of the change). It is determined by a combination of objective and subjective concerns.

2.6.3.3 Description of Impacts

This section of the EIS describes key aspects of impacts, namely *character, magnitude, duration and consequence.*

2.6.3.4 Mitigating Impacts on Landscape

Strategies for impact mitigation as described in the guidelines include:

Avoidance - Avoid developments in sensitive or prominent landscapes, and avoid insensitive or visually intrusive designs.

Reduction – Where the significance of adverse impacts is lessened. Seek to limit the exposure of the receptor. Reduce the visual intrusiveness of the design and reduce the visibility of the project (e.g. by installing barriers between the location(s) of likely receptors and the source of the impact).

Remedy – Remedy serves to improve adverse conditions by carrying out further works which seek to restore the environment e.g. increased planting of trees/shrubs to offset unavoidable loss of vegetation.

If it is not possible or practical to mitigate an impact (e.g. felling mature trees) this is described as a *Residual Impact.*

2.6.3.5 Definition of Visual Impacts

Terminology used in the assessment of impacts is defined as follows:

- **Visual Intrusion** – This occurs where a proposed development impinges on an existing view without obscuring the view.
- **Visual Obstruction** – This occurs where a proposed development obscures an existing view.

The quality of the impact may be described as:

- **Neutral** – A neutral impact will neither enhance nor detract from the landscape character or viewpoint.
- **Positive** – A positive impact will improve or enhance the landscape character or viewpoint.
- **Negative** – A negative impact will reduce or have an adverse effect on the existing landscape character or viewpoint.

The Duration of impacts is defined as follows:

- **Temporary** Impacts lasting one year or less
- **Short Term** Impacts lasting one to seven years
- **Medium Term** Impacts lasting seven to fifteen years
- **Long Term** Impacts lasting fifteen to sixty years
- **Permanent** Impacts lasting over sixty years

also

- **Occasional**
- **Intermittent**

- **Continuous**

The Significance of impacts may be described as follows:

- **None** – There will be no change to an existing view. Arises where existing landform, vegetation or the built environment adequately screens the proposal.
- **Imperceptible** – An impact capable of measurement but without noticeable consequences.
- **Low** – An impact which causes noticeable changes in the character of the environment without affecting its sensitivities. The proposal forms only a small element in the overall panorama.
- **Moderate** – An impact that alters the character of the environment in a manner that is consistent with existing and emerging trends or which, by its magnitude, duration or intensity alters an important aspect of the environment. For example, where an appreciable segment of the panorama is affected, or where open views of the proposal are located in the mid-ground.
- **Significant** – An impact which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment. The view will be significantly affected, obstructed or so dominated by the proposal that it becomes the focus of attention (e.g. there could be open views of the proposal located in the foreground)
- **Profound** – An impact which obliterates sensitive characteristics. Arises where a view of significance is completely obscured or altered.

2.6.3.6 Summary

In summary, this section of the EIS employs recognised guidelines as the basis for landscape assessment, and recognises the assessment process as being a combination of assessment of impacts on views from key receptors, and of responses towards the combined effects of the intensification of the development on landscape character.

Landscape Context and Character are addressed; also Significance in relation to planning designations and the inherent Vulnerability of the landscape in question. Also an assessment of the “do nothing” approach alongside the predicted impacts of changes in character, visibility, patterns of land use, followed by broad proposals for mitigating impact.

To ensure clarity, it is deemed important to use stated terminology to define impacts arising from the proposed intensification and extension of the Drehid Waste Management Facility.

The significance of impacts on the perceived environment will depend partly on the number of people affected but also on value judgements about how greatly the changes will matter.

2.6.4 The Receiving Environment

2.6.4.1 Site Location and Context

The site location is shown on Figure 2.6.1. The location and direction in which all photographic plates were taken are also shown on Figure 2.6.1.

The site lands are in the townlands of Parsonstown, Loughnacush, Kilkeaskin, Drummond, Timahoe West, Coolcarrigan, Killinagh Lower and Killinagh Upper, County Kildare. The eastern property boundary is approximately 1.5km west of Timahoe Crossroads and 5km west of Prosperous, the southern site boundary is approximately 1km north of Allenwood, and the western site boundary is 2km east of Derrinturn. The proposed landfill footprint extension, within the site lands, will be located approximately 2km west of Timahoe, 10km northwest of Prosperous, 5km north of Allenwood and 3km east of Derrinturn.

The County road L5025 from Timahoe to Drehid Cross Roads (see view from road, Plate 2 and 3) runs to the north of the site. Minor roads extend inwards towards the proposed site lands on all sides. The R403 runs to the west and south of the lands, via Derrinturn, Allenwood and Prosperous, with the site extending to meet the R403 at Killinagh Upper. County roads to the north, east, south and west offer potential views of the proposed development. There are residential and farm properties along all of the surrounding roads, with higher density settlement around Derrinturn and Allenwood. To the south and southwest of the landfill site, the Grand Canal runs via Allenwood and Robertstown.

2.6.4.2 General Landscape Character

Lands surrounding the site are relatively flat, generally averaging 80-90mOD. The maximum height of land within a 5km radius is 142mOD (Carbury Hill, to the west).

The Bord Na Móna-owned boglands are predominantly flat with little subdividing vegetation (Plate 3), and are surrounded on all sides by agricultural pastureland with a well-developed pattern of medium-sized and larger fields and an established hedgerow infrastructure. Field hedgerows are predominantly tall and sparse, consisting largely of mature trees, including ash (Plate 5). The bogland also continues to the north. The eastern site edge is bordered along much of its length by mixed coniferous and deciduous tree belts (Plate 1), and there are isolated tree plantations to the west (Plate 9 and 10). The site falls within the Western Boglands Landscape Character Area as indicated in the Kildare County Development Plan 2005-2011. The above description, of predominantly flat tillage and grasslands is typical of the wider landscape in this area.

There are a few occupied properties lying within a 2km radius of the site centre (see Figure 2.6.1). Within a 3km offset there are numerous properties, in particular to the north, northwest and west of the site.

2.6.4.3 Site Description (see Figure 2.6.1)

The application site measures approximately 179ha, with ground heights at approximately 85-90mOD. Plates 2 and 3, looking southwest from the road running north of the site, indicate current works within this area of the bog. As described above, vegetation within the site is predominantly scrub, including gorse, birch and alder. There are some drainage ditches criss-crossing the site.

2.6.4.4 Site Access

There is access into and through the site along tracks, which originate from the industrial railway system, now dismantled (Plate 3 and Figure 2.6.1). The site entrance to the existing facility is on the R403 road (see Plates 15 and 16). Planting has already been carried out along the boundary adjacent to Allenwood Celtic AFC.

2.6.5 Potential Visual Impact of the Site

2.6.5.1 Site Visibility - General

Visibility of the site is primarily determined by local topography and local screening vegetation both on the boundary of the site and in the adjacent areas.

Figure 2.6.1 shows the location of the application site within the existing landscape and indicates the areas from within which the proposed extension and intensification of the development could potentially be seen. (Note that the site may not be visible from some residences and roads within these areas, owing to localised screening topography and vegetation). Judgement must be exercised as to whether or not the area of assessment extends to the farthest limits of the estimated view shed, owing to the diminishing effect of views with distance. The seasonal effects of hedgerow and trees in winter will also affect the visibility of the site.

2.6.5.2 Site Visibility – Residential/Farm Properties

The main groups which may experience visual impact arising from the extension and intensification of use of the landfill site, will be residential and farm properties located within the vicinity of the site. The following properties currently have views of the wider site lands (clockwise from north):

North

Properties located on the County road (L5025) between Timahoe and Drehid Cross Roads, see photoplates 2, 3, 4, and 5.

West and South

Properties on the County road (L5024) between Drehid Cross Roads and Windmill Cross Roads, including those located on minor lanes with access from the latter roads.

Properties along the R403, including those located on minor roads with access from the regional road.

East

Properties on the County road (L1019) south of Timahoe.

2.6.5.3 Site Visibility – Roads and Footpaths

Drivers and pedestrians on the above routes also experience views towards the site. The County roads south and west of Timahoe are relatively flat, with some open views towards the waste management site and views restricted by roadside vegetation. Viewers in the west are between 2.5 to 4km from the Drehid Waste Management Facility, with intervening tree belts, whilst those in the north pass between approximately 0.5km and 1km from the site.

The R403 passes within 2km of the Facility, at the location of Plate 10 to the south of Derrinturn. Travelling further south, views are limited by roadside and intervening vegetation and by distance (Plates 12 and 13).

There are limited views towards the Facility from minor roads to the west (e.g. Plate 11).

There are no views of the Facility from the Grand Canal Way.

2.6.5.4 Vulnerability / Sensitivity of Existing Views

Existing views are on the whole important, representing a relatively stable and unchanging local, predominantly agricultural environment. The greatest cause of visual change in the landscape is tillage, house building and the construction of the Facility. Peat extraction is on a relatively minor scale.

The views described in 2.6.5.2 and 2.6.5.3 above could on average be deemed to be of medium sensitivity to development of the type proposed i.e. extension and intensification of landfill operations, although a small number of views will experience higher impact. That is, the proposed extension and intensification of use will represent medium levels of change to existing views from residential and farm properties and from roads, dependent on seasonal variations in foliage cover, and on the nature of proposals for establishment of screening vegetation within the development.

2.6.5.5 Summary

Because of intervening belts and blocks of woodland in the area many views of the site lands are obscured. Key open views are from minor roads off the R403 to the south west (Plate 11) by the County road (L5025)and houses to the north of the site.

2.6.6 Significance / Planning Context

The word significance as used in this report relates to the level of intrusion of a proposed development upon designated views, designated landscapes and designated amenity areas.

The current Kildare County Development Plan 2005-2011 is the statutory plan detailing the development objectives of the local Authority.

In considering a 5km radius area surrounding the permitted landfill and its proposed extension, there are a number of designated areas as laid out in the Development Plan. These are listed below and shown in Figure 2.6.1.

Proposed Natural Heritage Areas (pNHAs)

The following pNHA is located within the 5km radius study area, see Figure 2.6.1. There would be no visual impact on this site as a result of the proposal.

Grand Canal	02104

The following pNHA's are located between 5km and 10km of the site, see Figure 2.6.1. There would be no visual impact on these sites as a result of the proposal.

Hodgestown Bog	01393
Ballynafagh Bog	00391
Ballynafagh Lake	01387
Carbury Bog	01388
Donadea Wood	01391
Grand Canal	02104

Candidate Special Areas of Conservation (cSACs)

There are no SACs within the 5km Study Area. The following SACs are located between 5km-10km of the study area, see Figure 2.6.1. There would be no visual impact on these sites as a result of the proposal.

Ballynafagh Lake	01387
Ballynafagh Bog	00391

Views and Prospects

There are no scenic roads and views within the 5km radius study area, but there are two within a 5-10km radius of the site, see Figure 2.6.1. There will be no impact on these views.

Long Distance Walks

A long distance walk runs to the east and south of the site at a distance of between 3km and 10km. There are no known views of the site from this walk.

Landscape Character Areas

The site falls within the Western Boglands Landscape Character Area as indicated in the Kildare County Council County Development Plan 2005-2011.

2.6.7 The Historical and Man-Made Landscape

This section discusses briefly how history has shaped the receiving environment and how it influences the wider landscape surrounding the development.

Scattered over the Central Lowlands, where they originated in damp hollows (but frequently grew upwards above the level of their surroundings and expanded onto the adjoining terrain), raised bogs are generally smaller than the blanket bogs of western and northern areas. They formed in areas of lower rainfall and "their open character and natural vegetation contrast markedly with the surrounding farmed land. Although surrounded by productive farmland and used for many centuries as a source of peat fuel, the bog-fen complex was little altered by humans until the 19th century (but) by the time Bord na Móna was established in 1946, nearly half of the total area of the large Midland raised-bogs…had been cut away by hand. " (Aalen, Whelan, Stout).

The site lands at Timahoe have been harvested by Bord na Móna. Production now would appear to be on a relatively small scale. There are small isolated strips of dark, bare peat, with associated piles of cut turf near the northern site entrance. Otherwise the area has been colonised by grasses, reeds and scrub. Construction of the Drehid Waste Management Facility is also well advanced at the site.

The farmland surrounding the bog is a combination of tillage and grazed pastureland, with tall sparse hedgerows dividing large fields, and isolated blocks and belts of forestry and deciduous woodland.

The Grand Canal runs through farmland and bogland to the south of the site lands, with the junction of the Barrow and the Grand Canal at Robertstown. A large number of houseboats and holiday boats are moored at the Robertstown junction, with light but regular passage of boats along the canal.

The R414 and R415 regional roads join the R403 in Allenwood, to the south of the site lands and adjacent to the canals.