Chapter 10

Surface Water

10.1 Introduction

This chapter of the Environmental Impact Statement (EIS) provides a description of the existing hydrology and surface water regime in the vicinity of the proposed development site at Pass of Kilbride, County Westmeath. The surface water section establishes baseline conditions in the area, in terms of flood risk, general site drainage and surface water quality.

Additionally this chapter will assess the potential impact of the proposed development on the surrounding surface water environment.

10.2 Study Methodology

A desktop study was undertaken in January and February 2004 to obtain and examine existing surface water data in order to predict potential impacts of the proposed development on the surrounding environment. The desktop study was supplemented by site-specific investigations. This information was used to establish the baseline conditions in respect of water quality, general site drainage and flood risk assessment. An assessment was made of the unmitigated impact that the development could have on the local environment. Following on from this a number of mitigation measures were introduced to maintain and / or improve the current hydrology and drainage status of the proposed site and local area.

The approach outlined above included design calculations for potential surface water management features for the final site development profile, including flood balancing and sedimentation ponds. All relevant calculations are included in Appendix 10.1.

10.3 Desktop Study

The desktop study comprised a review of existing published data pertaining to the general area around the site of the proposed development area. The main sources of information for the study were:

- Met Éireann meteorological data, in particular rainfall and evapotranspiration data;
- EPA Parameters of Water Quality - Interpretation and Standards 2001;
- EPA (interactive) River Quality Map (http://www.epa.ie/rivermap/data/N13.html);
- Consultations with the Eastern Regional Fisheries board.

The main findings of the desktop study are described in subsection 10.5 below.

10.4 Site Investigation

A site investigation was carried on the 10/12/03 by Enviros staff in order to identify the location of all surface water drains, ditches and streams in the vicinity of the proposed development area. The main features identified during this investigation are shown on Figure 10.1.

A total number of seven surface water sampling locations were identified, these are referenced as SW1 to SW6 and SW4A (Figure 10.1). Water samples were collected for analysis from each of these locations on 10/12/03. Details of sampling procedures and protocol followed are contained in Appendix 10.3, Water Sampling Procedure. All samples were delivered to the relevant laboratory within eight hours of sampling.

A second set of water samples were collected on the 04/02/04 in which an additional sample was taken downstream of the site and referenced SW4A. The second set of water samples was collected in order to confirm previously recorded results.

A list of baseline parameters was examined in detail in accordance with EIS and EPA Waste Licence Application guidelines. All surface water results were compared against drinking water standards set out in the National Regulations SI No. 439 of 2000 and European Directive 98/83/EC and against the Surface Water Regulations, SI No. 294 of 1989.

Flow measurements of the stream were also carried out to establish the baseline flow characteristics of the area.

The results of the site investigation are discussed in the context of the receiving environment in the following section.

10.5 Receiving Environment

10.5.1 Surface Water Features

The site is located in Co. Westmeath approximately 2.75 km northeast of Milltownpass in a generally flat low-lying area. The land is characterised by arable and pastoral agricultural land to the north and east and extensive peat bog cover to the west and south. The area lies within the River Boyne catchment system.

There are a number of watercourses in the vicinity of the site, as shown on Figure 10.1. The field boundaries to the northwest of the site comprise deep drainage ditches, which flow in an easterly direction and interconnect to form a main drain. This main drain runs to the northwest of the site and discharges to a tributary of the Kinnegad River at the northern point of the site. This tributary then runs along the entire northern boundary of the proposed site. A deep drainage ditch also runs between the site and the road along the eastern boundary. This ditch also discharges to the tributary mentioned above.

The proposed site is bound to the northwest, west and south by areas of peat. Traces of traditional peat extraction are evident to the west, while a remnant of the original raised bog remains intact to the northwest. The peat reaches depths of up to 4.0m on this section of raised bog.

Milltownpass Bog is located to the south of the site adjacent to the site boundary. The bog represents a rare habitat in Europe and one that is becoming increasingly scarce and under threat in Ireland. This raised bog is a Natural Heritage Area (NHA-site code 2323) under the Wildlife Act 1976 - 2000, to conserve the habitat for future generations.

The eastern portion of the proposed site is covered by up to 1m of peat. This area is soft underfoot and poorly drained, but is part of the field in which arable farming took place. The main portion of the proposed site is covered by a glacial till which is described as a sandy clay or sandy silt.

The peat to the northwest and west and in the east is generally well decomposed and amorphous. Such peat tends to be of low permeability. Till generally exhibits higher permeability than the peat, but the permeability is largely a function of the fines content of the till.

The generally flat terrain, the generally low permeability of the surficial deposits and the large number of deep drainage ditches indicate that this area is naturally poorly drained and is highly susceptible to runoff.

The closest designated watercourse to the proposed development area is the Royal Canal (Natural Heritage Area (NHA): site code Nº: 002103), located approximately 5 km to the north of the site. Lough Ennel (pNHA site code Nº: 000685, a candidate Special Area of Conservation (SAC site code Nº: 000685) and Special Protection Area [SPA site code Nº: 004044]) is located approximately 15 km west of the site. The River Boyne is located approximately 17 km east of the site. Other watercourses in the vicinity of the site include:

- Brosna River, a tributary of the Shannon, located approximately 14 km to the west / southwest of the site;
- Riverstown River, a tributary of the Deel (Rahaarney) which flows into the Boyle, located approximately 7 km to the north / northeast of the site;
- Kinnegad River, a tributary of the Boyne, located approximately 1.5 km to the east of the site; and
- Milltownpass River, a tributary of the Castlejordan River which flows into the Boyne, located approximately 2.5 km south of the site.

10.6 Surface Water Quality

10.6.1 General Area

Biological and physico-chemical river water quality have previously been monitored and recorded by the EPA at a number of locations in the surrounding area. A five point scale of numerical quality values, Q1 to Q5, has been used in Ireland since the 1970s to determine water quality in the absence of chemical data, where Q5 represents unpolluted waters and Q1 represents seriously polluted waters.

The scheme mainly reflects the effects of biodegradable organic wastes on communities of the larger (macro) invertebrate species which inhabit the substrata of all rivers and streams and are pollution sensitive.

Conditions in the vicinity of the site were obtained from the EPA (interactive) River Quality Map (EPA, 2004a). The monitoring location nearest to the proposed site is on the Kinnegad River at a bridge south east of Clonfad House (station number 0060) and has a biological water quality rating of Q3 - Q4 (slightly polluted) (cf. Appendix 10.2). A second monitoring point downstream of this location at station number 0100 has a water quality rating of Q3.

This EPA river quality information provides an indication of anthropogenic influences on the environment by humans and natural changes in the river water quality, establishing baseline conditions of all rivers and streams in the locality.

The Kinnegad River is very important from a fisheries point of view. Recent and ongoing surveys have shown that substantial populations of salmon, brown trout, brook lamprey, crayfish, stone loach and gudgeon inhabit the water body. Under Annex II of the European Habitats Directive (92/43/EEC) species such as salmon, brook lamprey and crayfish are listed as protected species. The Kinnegad River is also an important salmonid nursery with extensive spawning evident in the upper reaches (N. McGloin, Eastern Regional Fisheries Board, April 2004).

10.6.2 Proposed Site

In addition to the general water quality information obtained from the EPA, Enviros staff carried out a site assessment on the 10/12/03 to assess the surface water quality of the site. The sampling programme is described in Section 10.4 above. Monitoring point locations are shown on Figure 10.1 and analytical results sheets are provided in Appendix 10.4.

The test results were compared with the limits contained in EU Directive 98/83 on the quality of water intended for human consumption. Water quality was noted to be generally good at all locations. Ammoniacal nitrogen, potassium and sodium levels were observed to be below acceptable limits at each of the monitoring points during both sampling rounds. Metals such as iron, copper, mercury and zinc were also recorded within satisfactory limits at all surface water locations. Dissolved oxygen levels were also noted to be within acceptable limits throughout the assessment.

A slight increase in chemical oxygen demand (COD) and total oxidised nitrogen (TON) levels was noted at SW1, SW2 and SW3 between December 2003 and February 2004. Elevated COD and TON levels were also recorded at SW5 and SW6 during the initial round of sampling however all other parameters were found to be within satisfactory limits at these monitoring locations.

Total organic carbon (TOC) levels were noted to increase slightly at SW1and SW2 between the first and second round of monitoring. Biochemical oxygen demand (BOD) values remained relatively constant throughout at all locations and within acceptable levels for surface waters.

All watercourses were flowing, as observed during site visits by Enviros staff (8-9/03/04 and 15/03/2004). Water levels in ditches below ground level were recorded at a number of locations. The observation points 1, 2 and 3 indicated on Figure 10.1 had recorded values of approximately 1-1.2 m, 2.2 - 2.4 and 1.5 m respectively. The topography of the site varies along the watercourse, but generally falls from 87.5mAOD in the north of the site to 85.5 in the east.

10.6.3 Surface Water Flow

Flow measurements were carried out as part of the site investigation in the tributary flowing along the northern boundary. The results suggest that the flow in the main stream along the northern boundary was approximately 107l/s, while in the drainage ditch to the northwest it was 23l/s. This rate was measured during dry weather and is not expected to represent a peak flow for the stream.

Run-off calculations were undertaken to examine the potential for changes to the surface runoff regime and in particular to the peak storm flows at the site. The UK Flood Studies Report (FSR) method of predicting the characteristic discharge from the mean annual flood (mean annual peak flow) was chosen to estimate the flood discharge from the site.

The model uses six variables as explained in Appendix 10.1. A variation of the same model using three terms may be used to estimate the mean annual peak flow from developments of areas less than 24ha. This model, developed by the UK Institute of Hydrology, was applied to the proposed site, in accordance with the Dublin Stormwater Management Policy for Developers, 1999. This reference was used as it is expected to reflect the Irish situation more closely than the model expressions for UK sites. The model is expressed as follows:

$Q_{BAR} = 0.00108 \times AREA^{0.89} \times SAAR^{1.17} \times SOIL^{2.17}$

where Q_{BAR} = the mean annual peak flow (m^3/s)

AREA = area of the catchment (km^2)

SAAR = Standard Average Annual Rainfall (mm)

SOIL = a term to describe the runoff susceptibility of the catchment

(cf. Appendix 10.1 for a detailed description of each term))

The SOIL term for the model takes account of the extent of different surface soils which control the infiltration and runoff characteristics of a site. Borehole and trial pit logs from the intrusive site investigation (cf. Chapter 11) were used to evaluate the current condition of the site in terms of permeability and surface runoff susceptibility. The site investigation found that the site was generally overlain by thin peaty topsoil overlying between 1.0m and 3.0m of sandy gravelly clay (till), over sandy gravel. The eastern portion of the site, approximately 9.5ha is covered by up to 1.0m of peat. The derivation of the SOIL value is shown in the Appendix.

The calculations showed that in its current state, the site's peak flow is approximately 109l/s, assuming 9.5ha of peat with low infiltration and 8ha of till with moderate infiltration, and using the Standard Annual Average Rainfall (SAAR) in the locality for 2002 of 841 mm (Met Éireann Data 2003). The equivalent result where the entire site is considered to have low permeability is 134l/s.

The mean annual peak flow from the catchment using the same model was estimated to be approximately 3,060 l/s.

10.7 Proposed Surface Water Management System

The facility will comprise approximately 4.8 hectares in area and will be constructed on a concrete pad, designed to collect all surface water runoff from the process and non-process areas. Surface water runoff from the process hardstanding areas will be recirculated into the process to maintain optimum moisture content in the waste. Surplus runoff collected from these areas will be stored in a leachate collection tank and will be treated in the leachate treatment plant, as described in Section 4.8.2, prior to discharge directly into the stream in the north, subject to EPA Emission Limit Values. The leachate collection system is shown in Figure 4.3.

Vehicle washing will be carried out on the return from the waste delivery area. Wash water will be contained in a circulation system at the vehicle wash and will be augmented by a freshwater supply. Mud and silt will be settled out in a separate tank and disposed of to landfill.

The surface water runoff from the paved non-process areas, such as the storage and loading areas and car park, will be collected by grading these areas to gullies which will discharge to the surface water drainage system. The collected runoff will discharge via a silt trap and oil/water separator to the stream that runs along the northern boundary. Runoff from the site access road will be collected by a drain along the road and will discharge to the eastern drain via a silt trap and oil/water separator.

Rain water from roofs will be intercepted by a dedicated roof water collection system. This will be discharged directly to the surface water discharge point, downstream of the silt trap and oil/water separator.

The system will be designed in accordance with relevant standards. Figure 4.4 shows the details of the proposed surface water management system for the facility.

10.8 Potential Impacts of the Proposed Development

During all stages of the proposed development (construction, operation and decommissioning/ restoration) the permeability and runoff characteristics of the area and the local topography around the proposed development will be altered. As a result of this there will be an impact on the surface water environment. The effects on the surface water environment are expected to be greatest down gradient of the site. The impacts are described below, followed by measures that can be put in place to mitigate these impacts.

10.8.1 Flow Rate Impacts

The facility will be constructed mostly in the area currently underlain by till. Consequently, the nature of surface water runoff conditions will change on the site, as the moderately permeable till is replaced by virtually impermeable concrete.

The runoff calculations for the facility are conservative in that they ignore wetting and evaporation and therefore assume that all rainfall falling on roofs and non-process areas is collected by the surface water management system. The control and management of the runoff is achieved by concentrating the flow, which generates large flow volumes, particularly following storm events. If left unchecked, the site could discharge large volumes of water relatively quickly to the tributary following a storm, which would increase flood risks of areas down-gradient of the site, and possibly of the vicinity of the site itself.

10.8.2 Water Quality Impacts

The facility will contain substances which would cause pollution if they entered water courses adjacent to the site, such as compost leachate, engine oil, diesel fuel, contaminated firewater, mud and dust (suspended solids) etc. The ways in which these contaminants could enter the surface water runoff system are explained below.

Leachate

Leachate is the product of any liquid percolating through a waste material and collecting (leaching) extractable soluble materials, chemicals and suspended solids, to become a contaminated material.

Inappropriate work practices, such as depositing untreated or partially treated waste in a non-process area, could give rise to leachate entering the surface water system. Also uncontrolled runoff from the process areas could enter the surface water collection system.

Fuel Storage

Without procedures to control the manner in which fuels are stored, dispensed and used, there would be significant risks to surface water from spillages and leaks from storage areas and plant and machinery.

Firewater

Contaminated firewater may arise from fire fighting at the facility. Without appropriate controls and emergency response procedures, firewater may enter the surface water collection system and discharge to surface water features adjacent to the site, carrying potentially polluting substances.

WC Facilities

WC facilities will be provided for on-site staff. The resulting discharge has the potential to pollute the aquatic environment, if not correctly controlled and treated.

Suspended Solids

The proposed activity has the potential to increase the suspended solids (SS) content of surface water, both during the construction and operation of the proposed facility. The excavation of soils and removal of vegetation during construction, the increased volume of traffic to and from the site and the generation of dust could increase the amount of suspended solids entering surface water bodies in the vicinity of the site.

Spills of green or mixed waste or compost material during transport to and from the site, or compost material being washed into surface water collection areas could increase the SS content of the surface water discharging from the site.

10.9 Do-nothing Scenario

Under a do-nothing scenario, there would be little change from current conditions, with little impact on the surface water environment in the vicinity of the site. The only movements on-site would be in relation to tree cutting, pruning and general management of the adjacent commercial forest.

The proposed location would remain under its present use.

10.10Mitigation Measures

The following subsections describe measures which will be incorporated into the design and operation of the facility to mitigate against the potential impacts of the development of the site, as outlined above.

10.10.1 Flow Rate Impacts

Site measurements suggest that the flow in the stream was approximately 107l/s. This rate was measured during dry weather and is not expected to represent a peak flow for the stream. The mean annual peak flow in the stream is estimated to be approximately 3,000l/s (cf. Section 10.6.3)

The mean annual peak flow from the existing site is estimated as 109l/s, which represents just 3.6% of the mean annual peak flow in the stream.

The assessment of changes in the peak flow rate from the site indicated an increase of between 123l/s and 134l/s, 13% and 23% of the current peak flow from the site, applying the same model used to assess the existing site. This is an increase to between 4.0% and 4.4% of the mean annual peak flow in the stream. These calculations ignored the process water requirements of the facility.

However, the design of surface water collection systems is generally based on a different model referred to as the Rational Method, which tends to give much higher runoff peak flow rates than the FSR models. The Rational Method was applied to the proposed facility to estimate the peak discharge rates from the site for the most intense annual storm, as provided by Met Éireann (6.3mm in 15 minutes for Mullingar). This gave a peak annual discharge of 137l/s. This discharge represents approximately 4.5% of the mean annual peak flow in the stream.

While the annual peak discharge from the development may not represent a large increase in the context of the peak stream flow, more intense storms with longer return periods can be expected during the life of the facility. Higher discharge rates associated with these heavier storms may result in flooding. The surface water run-off from the site will be controlled to restrict flows from the site, thereby reducing the risk of flooding in areas downstream of the site.

This will be achieved by flow balancing, where the discharge flow rate will be restricted by installing a fixed control such as an orifice or vortex flow regulator or by throttling the discharge through a pipe of a specified diameter. These controls will be designed to prevent discharges in excess of the defined peak discharge flow rate, which is proposed to be the pre-development mean annual peak flow of 109l/s.

The surface water discharge will comprise roof water and runoff from non-process hardstanding areas of the facility that has passed through the silt trap and oil/water separator. Flows in excess of peak flow rate will be diverted to a soakaway area between the site and the stream.

The soakaway will provide storage for excess flows and will enable the water to slowly infiltrate through the base of the soakaway to the groundwater table, which provides base flow to the stream in the north. This operation will delay large quantities of water reaching the stream during peak flow conditions.

The soakaway will be defined by small bunds which will contain the runoff. The bunds will be approximately 0.5m high and will provide sufficient capacity to accommodate excess runoff from the 1 in 20 year 1-day storm event, equivalent to approximately 1000m^3. The area will be planted with trees which form a screen around the site. The soakaway will only receive diverted water intermittently, and as such will not have adverse effects on the trees of the area.

10.10.2 Water Quality Impacts

Leachate

Contaminated water and leachate will be contained by the concrete base of the facility and collected by means of a series of leachate collection drains, as illustrated in Figure 4.3. The process areas will be graded away from non-process areas to enhance the efficacy of this system. In addition, small ramps will be used to delineate adjacent process and non-process areas, particularly between the ASPs and the storage areas.

This leachate will be collected by a dedicated collection system, separate to surface water runoff from the non-process areas, and stored prior to recirculation and use during the composting process. The re-circulated leachate will be used to maintain optimum moisture conditions in the compost, which will also utilise available nutrients and micro organisms present in the leachate.

Not all of the collected leachate will be reused in the process at all times, as water requirements will vary on a seasonal basis. Quantities of leachate in excess of the process water requirements will be collected and contained prior to treatment in a sequencing batch reactor followed by polishing in a reed bed, as detailed in Chapter 4. The effluent from the reed bed will be a clear and odourless liquid of a quality consistent with discharge conditions required by the EPA and discharged to the surface water via an outfall pipe. The location of the leachate treatment plant is shown on Figure 4.3.

Cleaning without water, "dry cleaning" will be in place in all areas of the site. Spills will be brushed-up, where possible. Where it is necessary to use water, a low volume high pressure washing hose will be provided, to limit contributions to the surface water collection system.

Fuel and Dangerous Substance Storage

The fuel stores will be bunded in accordance with EPA guidelines to contain spills in the storage areas. Spills are most likely to arise during loading or unloading operations and procedures will be put in place to ensure that best practice is used for these operations. Rainwater will be removed periodically to ensure that adequate capacity is maintained for retaining spills.

It is possible for spills and leaks to reach areas draining to the surface water collection system, such as leaking engine oil from cars and site plant and machinery. Regular plant and machine maintenance will reduce the likelihood of such leaks. All surface water will pass through a silt trap and an oil/water separator prior to discharging from the site. The silt trap and the oil/water separator will be regularly cleaned and maintained.

All dangerous substances will be stored in bunded areas and will be stored and handled in accordance with best practice.

Firewater Retention

In the event of a fire, firewater will be collected by the leachate or surface water collection system, depending on the area in which the firewater arises. All process and non-process areas will be bunded by kerbs which will contain firewater within those areas.

The leachate collection system will convey firewater to the leachate storage tanks, where the firewater can be held for testing. The results of the tests will be used to decide whether the firewater can be treated onsite in the leachate treatment plant, or whether the firewater will need to be tankered for offsite treatment.

Firewater entering the surface water system will be controlled by the use of an emergency stop valve at the surface water treatment plant, which will preclude flows leaving the system until such time that the firewater can be pumped from the system to either the leachate treatment plant or to tankers for offsite treatment.

Emergency procedures will be developed and documented for use in the event of a fire or a spillage of fuel on-site.

WC Facility

A proprietary treatment system and percolation area will be installed to treat WC wastewater. The specification and location of the treatment system and associated percolation area are designed in accordance with the guidelines in the EPA handbook "Wastewater Treatment Manuals - Treatment Systems for Single Houses". The location of the treatment system is shown on Figure 4.3.

Suspended Solids

Suspended solids will be removed from runoff arising on non-process paved areas of the site by passing the collected runoff through a silt trap to enable the solids to settle out prior to discharge to the stream.

10.11Predicted Impacts

The proposed development will alter the surface water drainage characteristics of the site. The calculations contained in Appendix 10.1 indicate an increase in the mean annual peak flow from the site. Flows in excess of the pre-development mean annual peak flow will be diverted to a soakaway, thereby precluding any significant impact on the flow rates in the stream.

All surface water collected on site will be treated by a silt trap and oil/water separator prior to discharge to the adjacent water bodies. The proposed mitigation measures will minimise the potential impact of leachate, firewater, accidental spills, domestic effluent and surface runoff on the local surface water environment.

It is anticipated that there will be an insignificant impact following the implementation of all the proposed mitigation measures. The operation of the development in accordance with good management practices and the containment provided by the surface water management system will mitigate significant environmental impacts during normal operation.

Accident and emergency response procedures will be prepared for all identified risks, to further mitigate potential impacts.

10.12Monitoring

Ongoing routine surface water monitoring will be undertaken during the operation of the proposed development. All discharges to the surface water environment will be monitored in accordance with the requirements of the Waste Licence.

The surface water silt traps and oil/water separators will be inspected and cleaned on a regular basis. Any material removed from the separators will be disposed of in accordance with National Legislation.

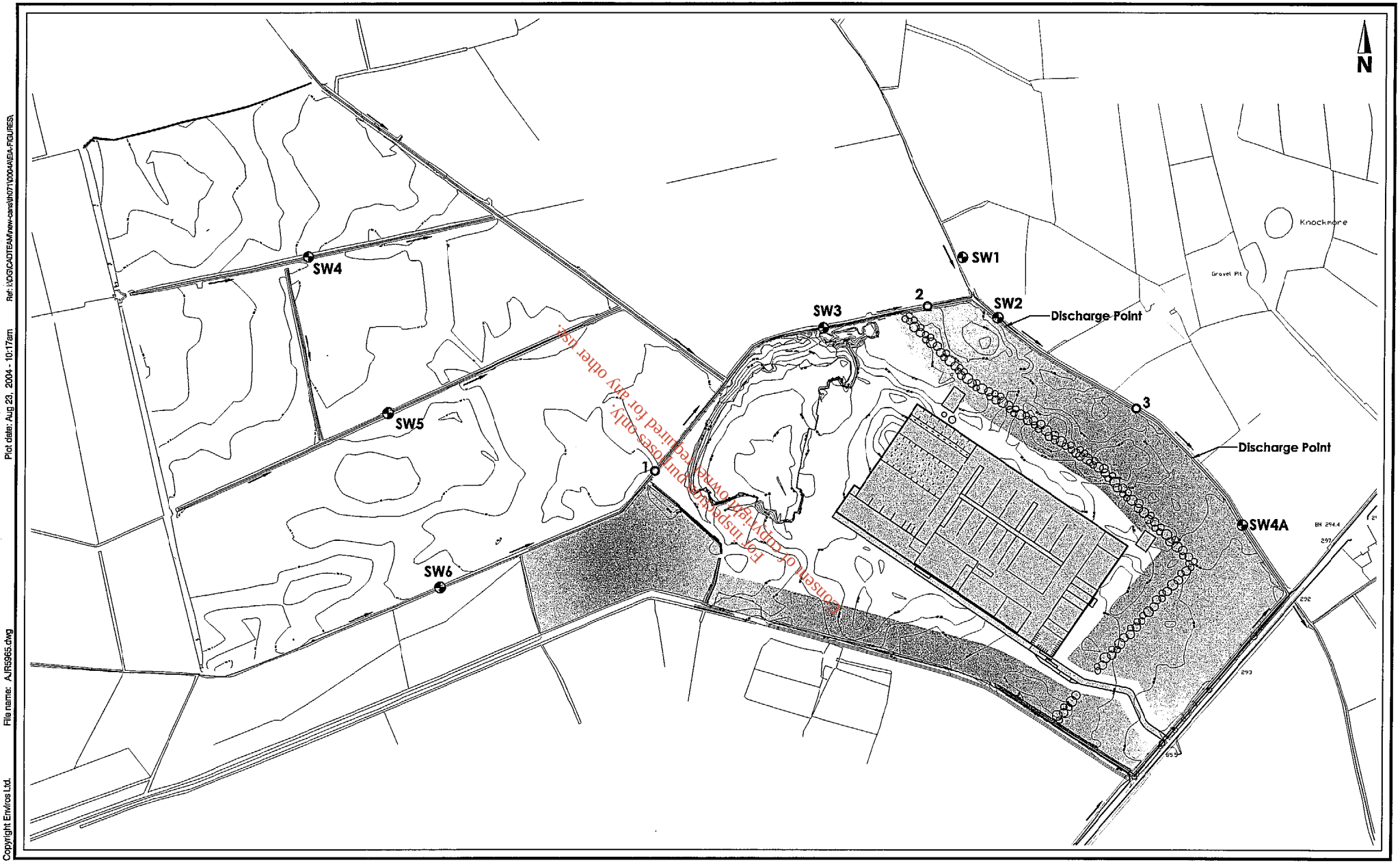
Leachate quality over a range of parameters will also be examined. The final effluent from the reedbed will be monitored for parameters in accordance with the Waste Licence.

10.13Restoration and Residual Impacts

It is anticipated that the proposed facility will operate for the foreseeable future and some restoration details are included in Chapter 4. Should the facility close down, it would be decommissioned as described in Chapter 4. The removal of all wastes, products, fuels and other materials suggests that the source of any risk associated with the site would be removed. Surface water would continue to be monitored until such time that monitoring is not required, as agreed with the EPA.

10.14Conclusion

The design of the facility and best environmental management practices will ensure that the potential impacts of the proposed facility on the surface water environment during operations will not be significant. Should the site be decommissioned and restored, the subsequent impacts on the surface water environment will be insignificant.



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Thorntons recycling

FIGURE 10.1
SURFACE WATER AND MONITORING POINTS

KEY:
- Surface water monitoring locations
- Observation point locations
- Flow direction