



**CORK COUNTY COUNCIL
WESTERN DIVISION**

**ANNUAL ENVIRONMENTAL REPORT 2008
1st Jan 2008 - 31st DEC 2008**

**BENDUFF LANDFILL SITE
ROSSCARBERY CO. CORK
EPA LICENCE REF No. W00070-01**

HUME HSE,
WOLFETONE ST,
CLONAKILTY,
CO. CORK.

MARCH 2009.

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1.0 Introduction

1.1 Scope and Purpose of the Report

The Environmental Protection Agency (EPA) issued Cork County Council with a Waste Licence (Waste Licence No. 70-1) for Benduff Landfill site on 21st December 2000. In July 2006, in accordance with a revised EPA numbering system, the Waste Licence at Benduff Landfill was renumbered W00070-01. In accordance with the requirement of Condition 2.8.1 of the waste licence,

'The licensee shall submit to the Agency for its agreement, within thirteen months from the date of grant of this licence, and within one month of the end of each year thereafter, an Annual Environmental Report (AER).'

1.2 Reporting Period

This is the seventh AER to be submitted under Condition 2.8 of the licence and covers the reporting period 1st January 2008 to 31st December 2008.

1.3 Site Location

The facility address is:

Benduff Landfill,
Rosscarbery,
Co. Cork.

The National Grid Reference for the site is E126000, N38300.

1.4 Closure of Site

On April 23rd 2004, Benduff Landfill ceased acceptance of waste. Restoration and aftercare has continued from that date.

1.5 Management and Staffing Structure of the Facility

Following closure of the facility (Apr 2004), there has been no full time County Council presence on the site. The Management of the facility is undertaken from the Divisional Offices, Hume House, Wolfetone St., Clonakilty.

Management structure is shown in Table 1.5.1 below.

Table 1.5.1: Managerial Staff		
Position.	Contact Details.	Duties.
Ms Grainne O'Mahony Senior Executive Officer.	Cork County Council, Hume House, Wolfetone St., Clonakilty, Co. Cork. Telephone No: 023-58812 Fax No: 023-58814	Management of Cork County Council Environment & Waste Operations, Western Division.
Mr. Paudie Hegarty, BE. Senior Executive Engineer.	As above.	Management of Cork County Council Environment & Waste Operations, Western Division.
Ms. Mairead Hales, BE. Executive Engineer.	As above.	Management of Cork County Council Environment & Waste Operations, Western Division.
Ms. Deirdre Williams, BSc. Facility Manager	Derryconnell Landfill Site, Schull, Co.Cork. Telephone No: 028-37742 Fax No: 028-37742	Monitoring/inspection/ sampling at Benduff landfill site.

1.6 Environmental monitoring and reporting

Cork County Council personnel carried out environmental monitoring and recording throughout 2008.

2.0 Description of the site

2.1 Waste Management Activities at the Facility

Waste Activities at the Benduff landfill site are restricted to those outlined below:-

Waste Management Act, 1996: Third Schedule

Class 1: Deposit on, in or under land (including landfill)

Class 2: Land treatment, including biodegradation of liquid or sludge discards in soils

Class 4: The storage of leachate and contaminated water pending its disposal at another appropriate facility.

Class 13: Temporary storage of waste, which is unsuitable for deposit at the facility and which has been duly notified to the Agency.

In accordance with Schedule G of the Waste Licence the waste categories and quantities acceptable at the facility were as shown in Table 1.

Table 2.1.1: Waste Categories and Quantities Acceptable at the Facility	
Waste Type	Maximum Tonnes Per Annum
Household	10,200
Treated Sewage Sludge	1,500
Industrial Non-Hazardous Sludge	300
Total	12,000

2.2 Waste Quantities

The quantity and type of the waste received and disposed of during the reporting period, at the facility is recorded below.

Table 2.2.1: Quantities of waste received and disposed of during the reporting period January 2008 to December 2008	
Waste Type	Tonnes
Household	0
Treated Sewage Sludge	0
Industrial Non-Hazardous Sludge	0
Total	0

Similarly, no waste was recycled/recovered at the facility during the reporting period.

2.4 Remaining capacity

The site has been capped and there remains no capacity in the site. A topographical survey of the facility is included in the Appendices.

3.0 Site Development Works

3.1 Development works during 2008

No major or minor works took place in Benduff Landfill Site in 2008 with all development works complete.

Table 3.1.1 : Development works January 2008 to December 2008

Date.	Description.
No works took place on site	

There are no major developments planned for the site in 2009.

4.0 Summary of Monitoring and Emissions

In compliance with Condition 9 and Schedule E of the waste licence the following monitoring is carried out on site:

Landfill gas;
 Landfill gas flare;
 Groundwater;
 Surface water;
 Leachate;
 Dust.

Four groundwater boreholes (MW1, MW2, MW3 and MW4) were replaced in 2004 and the new wells were placed immediately adjacent to the existing boreholes. Two additional wells (MW5 and MW6) were also installed at that time. An additional well, (MW7) was installed in July 2006.

Two new leachate wells (LW1 and LW2) were installed in 2005 as part of the capping contract. The old wells (L1, L2 & L3) were made redundant and filled in.

All monitoring locations are identified on a Monitoring Locations Drawing attached in the Appendices.

4.1 Landfill Gas

Schedule E.1 of EPA licence W00070-01 specifies that gas monitoring is to be undertaken at groundwater stations, leachate stations, the site office and the landfill gas flare.

The site office was removed following closure of the site in 2004 and thus gas monitoring was discontinued at that location.

Schedule E.1 notes that monitoring is to be undertaken monthly at all stations excluding the site office where weekly monitoring is required. Since the closure in 2004 of the site the site office has been removed and therefore measurement of the following parameters is specified: methane (CH₄), carbon dioxide (CO₂), oxygen (O₂), atmospheric pressure and temperature. The gas is monitored using a GA94 infra-red gas analyser, which detects levels of carbon dioxide methane and oxygen. Schedule

F.2 of the licence specifies methane and carbon dioxide limits of 20% LEL (1% v/v) and 1.5% v/v respectively in any building on or adjacent to the landfill.

Groundwater stations MW1-MW7

No methane was detected at groundwater stations MW1 - MW7. Low levels of carbon dioxide were detected at all groundwater stations and the highest level of 1.4% was recorded at MW3 in January and February 2008. The licence specifies methane and carbon dioxide limits of 20% LEL (1% v/v) and 1.5% v/v respectively in any building on or adjacent to the landfill, including the site office. Thus the levels detected do not breach the conditions of the licence. It can be inferred that large-scale lateral migration of landfill gases is not occurring outside of the landfill area.

Gas monitoring – leachate wells LW1 & LW2

Results indicate that methane and carbon dioxide are being produced within the landfill area and that there was considerable variation in values throughout the year. The range of values detected at the two leachate wells are detailed in Tables 4.1.1 and 4.1.2.

Table 4.1.1 Range of values for methane

Methane gas (% v/v)	LW1	LW2
Maximum conc.	42	49
Minimum conc.	26.4	2.8

Table 4.1.2 Range of values for carbon dioxide

Carbon dioxide (% v/v)	LW1	LW2
Maximum conc.	23.4	38.1
Minimum conc.	14.5	8.3

Gas monitoring – site office

Not applicable – Site Office removed from site.

4.2 Surface water

Schedule E.5 of licence W00070-01 specifies that monitoring of surface water quality is to be undertaken at five locations: SW1, SW2, SW3, SW4 and SW5. The local topography is such that stations SW2 and SW4 are downgradient of the landfill, although located to the east and west of the site respectively. Following completion of capping at Benduff, a new surface water monitoring station (SW5) was located upstream of SW2.

Schedule E.5 provides a list of parameters, which are to be monitored at quarterly intervals at all surface water stations. These parameters are ammoniacal nitrogen ($\text{NH}_{3/4}\text{-N}$), biochemical oxygen demand (BOD), chemical oxygen demand (COD), chloride (Cl^-), dissolved oxygen (DO), electrical conductivity, pH, total suspended solids, and temperature. Licence W00070-01 does not specify maximum concentrations of these parameters and accordingly, data presented below are discussed with reference to relevant legislation:

(i) Council Directive 75/440/EEC of 16 June 1975 concerning the quality of surface water intended for the abstraction of drinking water, incorporated into Irish law by the European Communities (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regulations, 1989 (S.I. No. 294 of 1989). The directive divides waters into three categories - A1, A2 and A3 – depending on the increasing level of treatment required.

(ii) Council Directive 78/659/EEC of 18 July 1978 on the quality of fresh waters needing protection in order to support fish life, given Irish effect by the European Communities (Quality of Salmonid Waters) Regulations, 1988 (S.I. No. 293 of 1988). Notwithstanding the absence of any fisheries designation on the streams surrounding the landfill site, the Freshwater Fish Directive carries some weight due to its strict limits and the consequent suitability of a watercourse for other uses should it meet these limits. These limits have been quoted in preference to the Surface Water limits where available.

It is noted that there are no drinking water abstraction points or fisheries designations on the watercourses on which the sampling stations are located, however comparisons with the limits specified by the above legislation is useful for comparative purposes. Water samples were taken on the following dates:

- 4th April 2008 – SW1, SW2, SW3, SW4 and SW5
- 6th June 2008 – SW monitoring points dry.
- 26th September 2008 – SW monitoring points dry.
- 26th November 2008 – SW1, SW2, SW3, SW4 and SW5

Results obtained in quarter 1 of 2008 indicate that the water quality at all stations was generally satisfactory. No exceedances of the relevant legislation were noted

In quarter 2 of 2008, all of the surface water monitoring points were dry and therefore no sample was obtained.

In the third quarter of 2008, all of the surface water monitoring points were dry and therefore no sample was obtained.

In the fourth quarter of 2008 all surface water monitoring points were sampled. The results recorded for these monitoring points indicated that the water present was of a very good quality and was not affected by the presence of the landfill. Overall the results have improved during 2008.

4.3 Groundwater

Under schedule E.5 of licence W00070-01, monitoring of groundwater quality is to be undertaken at six locations. Four of these are boreholes (MW1, MW2, MW3 and MW4) while two stations consist of tapped private wells – SPJ1 and SPM2 located 300m southwest and 250m southeast of the site respectively. Borehole MW3 is located upgradient of the landfill site, while stations MW1, MW2 and MW4 are downgradient. MW1 and MW2 lie on the same groundwater corridor. Two new groundwater stations MW5 and MW6 were put in place at the northeast and southeast corners of the landfill respectively. A further groundwater monitoring location, MW7, was installed at a location to the west of the landfill site in July of 2006.

Groundwater samples were taken on the following dates:

- 8th February 2008
- 11th March 2008
- 4th April 2008
- 16th May 2008
- 30th May 2008
- 6th June 2008
- 25th July 2008
- 29th August 2008
- 26th September 2008
- 30th October 2008
- 26th November 2008
- 10th December 2008

Licence W00070-01 does not specify maximum concentrations of parameters and accordingly, levels presented below are discussed with reference to relevant legislation/standards:

(i) Council Directive 98/83/EC on the quality of water intended for human consumption repealed the similarly titled Council Directive 80/778/EEC. The directive specifies maximum limits with respect to a large number of parameters and is of particular relevance to groundwater.

(ii) The Netherlands Department of Soil Protection published its *Circular on target values and intervention values for soil remediation* in February 2000. The circular specifies general target and intervention concentrations of parameters (chiefly metals and organics) in soils and groundwater, which it deems necessary to allow the return of contaminated land to any potential use. The target value is the baseline concentration value below which compounds and/or elements are known or assumed not to affect the natural properties of the soil. The intervention value is the maximum tolerable concentration above which remediation is required and is applied where one or more compounds, in concentrations equal to or higher than the intervention value, is found in more than 1000m³ of groundwater.

A review of the chemical results for Quarter 1 of 2008 shows that the levels of groundwater did not vary much during this period. It is evident that MW4, MW5 and MW7 may have varied in levels due to weather conditions. Elevated levels of ammoniacal nitrogen occurred at MW1, MW3, MW6 and SPM1.

Data for quarter 2 of 2008 indicates that there was no variation in water levels in each of the groundwater wells. Elevated levels of ammoniacal nitrogen were found at MW1 and MW3 during the sampling period between May and June 2008. Micro sampling was introduced during this sampling period. It was found that Faecal coliform levels were low but Total coliforms were found to be high for groundwater wells MW1, MW2, MW4, MW7 and SPM2. No other exceedances were noted at these locations.

A temporal review of the monthly data for quarter 3 of 2008 indicates that that levels of ammoniacal nitrogen at MW1, MW3 and MW5 were elevated. MW7 showed signs of improvement with a decrease in ammoniacal nitrogen since 2007. Water levels did not vary in each groundwater well. No other exceedances were noted at these locations.

Annual sampling was carried out in November 2008 at Benduff and a greater range of parameters was therefore assessed. Exceedances of the relevant limits for chemical parameters were noted for manganese (MW3, MW5, MW6 and MW7). It is noted that the elevated manganese levels are probably related to background levels in the environment caused by the underlying geology. Iron was also found to be high in some of the groundwater wells in November (MW3). Ammonia nitrogen was found to be high for groundwater wells MW1, MW3 and MW4 during this sampling period. Both faecal and total bacteria were noted at all the groundwater. The limit of 0 CFU/100ml specified under the Drinking Water Directive was exceeded.

As detailed above breaches of the relevant limits were noted in 2008. It is considered probable that the elevated levels of ammoniacal nitrogen at MW1 are related to its proximity to the landfill and this was addressed in a report prepared by O'Neill Groundwater Engineering in 2005. The high manganese level recorded in the fourth quarter is probably linked to the underlying geology. Elevated bacterial numbers could be related to the local agricultural activities in the area of the landfill.

Data for quarter 4 indicates that levels of ammoniacal nitrogen at MW1 were showing signs of decreasing as the sampling year progressed in 2008. MW1 is located adjacent to S1 from which leachate is removed on an ongoing basis following an incident in 2004. Levels of ammoniacal nitrogen were also elevated for MW3 but did not fluctuate much during 2008 remaining <1mg/l on nearly all of the sampling occasions. Manganese was also found to be high at groundwater well MW3. No breaches of the remaining monthly and quarterly parameters were recorded. A comparison of temporal data indicates that most results remain consistent.

4.4 Leachate

Schedule E.5 of licence W00070-01 specifies that monitoring of leachate is to be undertaken at station L1 and any other stations, which may be designated. A second station – L2 – was subsequently agreed. Both L1 and L2 were relocated and renamed LW1 and LW2 in the last quarter of 2005. Schedule E.5 provides a list of parameters, which are to be monitored at weekly, quarterly and annual intervals at all leachate stations. Licence W00070-01 does not specify maximum concentrations of parameters. There are no relevant standards available for leachate quality and reference is usually made to observations by a number of authors. Due to low volumes of leachate during 2008 no samples were taken in the 1st and 3rd quarters of 2008 at Benduff. Only LW2 had enough volume to be sampled in the 2nd quarter and both leachate wells were sampled for the last quarter of the year. A summary of the maximum and minimum concentrations for LW1 and LW2 of the recorded parameters in 2008 and a comparison with typical leachate concentrations is presented in Table 4.4.1.

Table 4.4.1 Range of concentrations for leachate

	LW1 (one sample only during 2008)	LW2 max	LW2 min	Typical values
pH	7.7	7.8	6.7	6.4-8.0
Conductivity us/cm	980	1836	1010	503-19,200
Ammonia as N	69	90.7	65.5	<0.2-1,700
COD	43	126	47	<10-33,700
BOD	5	42	3	<0.5->4,800
Calcium	115.8	157.5		43-1,440
Cadmium ug/l	<0.1	<0.1		<10-30
Chromium ug/l	<1	<1		40-560
Chloride	46.7	206	126	27-3,410
Copper ug/l	<0.003	0.005		20-160
Cyanide (total)	<10	<10		0.05-0.16
Iron	47.1	21180	441	0.4-664
Lead ug/l	<0.3	<0.3		<40-280
Mercury ug/l	<0.02	<0.02		<0.1-1.0
Potassium mg/l	31.4	60.1	56.2	///
Sodium	58	133.2	129	12-3,000
Zinc	4.4	9.4		<0.01-6.7
Boron	0.27	0.31		<0.02-116

* all parameters as mg/l unless stated otherwise

Reference The technical aspects of controlled waste management – A review of the composition of leachate from domestic wastes in landfill sites- Aspinall and Co.

LW1

A review of the data detailed in Table 4.4.1 indicates that results were generally within the expected value ranges. Due to low volumes during the year only one sample was obtained for analysis in November 2008 therefore, there was no minimum or maximum values available. There were some variations in results since November 2007 however generally most of the measured values at LW1 were found to have decreased slightly during the year.

LW2

A review of the data detailed in Table 4.4.1 indicates that results were generally within the expected value ranges. Samples were taken for LW2 in June 2008 and in November 2008. Overall the results are showing to be within the expected ranges with the exception of high values for Iron in June 2008.

4.5 Additional monitoring at station S1.

Following contamination of a watercourse adjoining the landfill in February 2004 additional monitoring points were specified as follows: *Monthly monitoring at sites S1 (pond) and S4 (corresponding to SW4) for the following parameters COD, BOD, ammoniacal nitrogen, pH, conductivity, chloride, temperature, dissolved oxygen, total suspended solids, total coliforms and faecal coliforms.* Following on from the build up of water at S1 a programme of removal has been put in place. Due to the improvement in water quality at SW4 the EPA no longer require sampling at this

location. However, SW4 is monitored as part of the quarterly and annual monitoring programmes.

A review of the chemical data for S1 indicates that there was considerable variation within the sample results for ammoniacal nitrogen with values ranging from a minimum of 0.661 mg/l to a maximum of 17.2mg/l. The maximum value of 17.2mg/l was recorded in July 2008. When comparing the results for S1 from 2007 it shows again that there is definitely a decrease in some of the parameters tested. In the first quarter of 2008 BOD, COD and total suspended solids remained low. Total and faecal coliform counts obtained were low. In the second quarter of 2008 Ammoniacal nitrogen was high for April, May and June. BOD, Total suspended solids and COD remained low in values. Faecal coliforms were zero in value while total coliforms were found to have higher values at S1 leachate well. Quarter 3 and quarter 4 again showed similar patterns to the previous two quarters with varying ammoniacal nitrogen results and low BOD values.

4.6 Noise.

As Benduff landfill is no longer active noise monitoring was not required during 2008.

4.7 Dust.

Schedule E.3 of licence W00070-01 specifies that monitoring of dust levels is to be undertaken at three locations: ST1, ST2 and ST3. Dust monitoring is required three times per year, twice during the period May to September and once between October and April. Dust monitoring during the current recording period was undertaken in June, August and December.

Dust levels were satisfactory at all three monitoring locations during 2008 and the values detected were lower than the limit of 350 mg/m²/day, specified by the licence.

4.8 Biological survey.

Schedule E.5 of licence W00070-01 notes that an annual biological assessment is to be undertaken at two stations in proximity to the landfill site: WQ1 and WQ2. The schedule specifies that an appropriate biological method is to be used such as the EPA Q-rating system.

Station WQ1 no longer exists as an open watercourse, and therefore it was not possible to take a sample at this location. Accordingly a sample was taken at SW2 and WQ2 was relocated to SW4.

As noted above, the licence recommends that an appropriate monitoring system be used during biological surveys. The method employed was the Q-rating system used nationally by the EPA and the survey was carried out in November 2008. The biological survey was undertaken at stations WQ2 (relocated to SW4) and SW2. Although volumes at these monitoring points were fairly low the survey was successfully carried out. This may have had an impact on invertebrate diversity and

density at these monitoring locations. On the basis of macro-invertebrate diversity, a provisional Q-value of 2 was awarded to both sites. However as the stream dried up during the summer months at SW4 the low values are probably not related to nutrient enrichment and these results may be misleading. It is also noted that the watercourse on which SW2 is located was cleaned during 2006 which still may influence the results found.

4.9 Landfill Gas Quantities.

A software programme was previously used by Fehily Timoney to predict the total gas generated from the input of waste at Benduff landfill. Modelling was carried out using a Landfill Gas Emissions Model (LandGEM-verison 2.01) and the CAA site of default values were used in the Benduff landfill gas prediction model. The predicted peak rate of gas production for the site occurred in 2002. As estimated by the model the total amount of gas generated to date is shown in Table 4.9.1.

Table 4.9.1. Predicted gas yield.

Year	Gas Yield (m3/year)	Year	Gas Yield (m3/year)
1981	184,400	1995	1,161,000
1982	269,900	1996	1,232,000
1983	351,200	1997	1,299,000
1984	428,600	1998	1,363,000
1985	502,200	1999	1,424,000
1986	572,200	2000	1,567,000
1987	638,800	2001	1,580,000
1988	702,100	2002	1,588,000
1989	768,200	2003	1,557,000
1990	831,000	2004	1,527,000
1991	890,800	2005	1,453,000
1992	956,000	2006	1,382,000
1993	1,028,000	2007	1,298,000
1994	1,096,000	2008	1,242,000

4.10 Emissions to Groundwater

The facility is unlined and acts as a dilute and disperse landfill. Although there is no barrier to prevent leachate reaching groundwater and despite some high values for some parameters in 2008 it does not appear that the landfill is causing significant contamination of groundwater. 2008 seems to show that there is improvements when compared to 2007 values for most of the parameter tested. It is noted however that levels of ammoniacal nitrogen at borehole MW1 were still found to be high during 2008 but again this is probably due to its location adjacent to S1 from which leachate is removed on an ongoing basis following an incident in 2004.

4.11 Monthly Water Balance.

The monthly water balance calculations are detailed in the Appendices and a summary of the results is detailed below in Table 4.2. It is noted that the available rainfall data is recorded from Cork Airport and may underestimate rainfall volume at the landfill. No leachate was removed from Benduff landfill during 2008. It is noted that rainfall at Benduff would be expected to be considerably higher than the values obtained from Cork airport.

Table 4.11.1. Monthly Water balance calculations.

Month	Predicted leachate (m3)
January	152.93
February	183.53
March	250.32
April	250.32
May	250.32
June	250.32
July	320.87
August	320.87
September	320.87
October	418.6
November	473.88
December	515.15
Cumulative total	3707.98

4.12 SCADA results.

SCADA results are presented graphically in the Appendices. Results are shown for:

- methane CH₄,
- carbon dioxide CO₂,
- oxygen O₂,
- carbon monoxide CO,
- flow.

4.13 Landfill gas flare – monitoring of emissions.

Reports prepared by RPS Group dated April 2008 and Euro Environmental Services in November 2008 are included in the Appendices.

4.14 Leachate disposal off-site.

Leachate arising at the facility is transported to, and disposed of, at Clonakilty Waste Water Treatment Plant. No leachate was transported away from the site during 2008 as shown in Table 4.12.1 below.

Table 4.14.1. Leachate disposed of off-site.	
Month	Leachate removal (m³).
January	0
February	0
March	0
April	0
May	0
June	0
July	0
August	0
September	0
October	0
November	0
December	0
Total:	0

5.0 Energy consumption.

As there was no plant or machinery on site in 2008, there was no consumption of diesel.

The electricity supply caters for the flare and leachate collection system. Recording of electricity usage is now recorded as part of the weekly flare inspections and is shown in table 5.0.1 below.

Table 5.0.1. Energy Consumption on Site	
Month	Electricity Usage (KwHr)
January	132.1
February	178.3
March	167.6
April	152.3
May	175.3
June	209.1
July	197.8
August	189.3
September	196
October	196.9
November	149.4
December	240.3
Total:	2184.4

6.0 Environmental incidents, non-compliances and complaints

6.1 Reported Incidents.

No reported incidents were recorded in 2008

6.2 Non-Compliances.

No non-compliances occurred at Benduff landfill during 2008.

6.3 Complaints.

No complaints were received by the facility during the reporting period.

6.4 Review of nuisance controls.

Since cessation of landfilling all nuisance controls for litter, birds, vermin and flies have been removed. Weekly inspections however still monitor nuisance and should nuisance become an issue, adequate resources will be deployed.

6.5 Programme for Public Information.

6.5.1 Information Available to the Public.

Information regarding the facility is held at the County Council Divisional Office, Hume House, Wolfetone St., Clonakilty, Co. Cork.

Personnel associated with the facility are also available by appointment to meet with members of the public and answer queries regarding the facility if requested. The following information is held in a public file at these offices available for the public to inspect:-

- copy of the waste licence application.
- copy of the waste licence.
- correspondence from the Agency relating to the facility.
- correspondence from Cork County Council (West) to the Agency relating to the facility.
- copies of quarterly monitoring reports.

7.0 Environmental management programme report.

7.1 Schedule of Objectives and Targets for Year 2008.

Progress in implementation of 2008 Objectives and Targets is shown in Table 7.1.1 below.

Table 7.1.1 Schedule of Objectives and Targets for Year 2008.		
2008 Objective.	Description.	Progress in implementing objectives.
Objective 1.	Maintain site infrastructure (fencing, monitoring wells and equipment, gas flare, leachate extraction system, etc).	Maintenance ongoing. All site infrastructure functional and adequate at time of report.
Objective 2.	Operate landfill gas system to licence conditions.	Objective achieved.
Objective 3.	Continue aftercare obligations to the waste licence conditions.	On going.
Objective 4.	Review emissions and environmental impacts.	On going monitoring and assessment & close inspection of quarterly reports.

7.2 Proposed Objectives & Targets for 2009.

Proposed Objectives & Targets for 2009 are shown in Table 7.2.1 below.

Table 7.2.1 Schedule of Objectives and Targets for Year 2009.	
2007 Objective.	Description.
Objective 1.	Maintain/improve site infrastructure (fencing, monitoring wells and equipment, gas flare, leachate extraction system, etc).
Objective 2.	Operate landfill gas system to licence conditions.
Objective 3.	Continue aftercare obligations to the waste licence conditions.
Objective 4.	Review emissions and environmental impacts.
Objective 5.	Investigate possibility of relaxing monitoring requirements

7.3 Financial Provision.

Cork County Council has the ability to meet any financial commitments or liabilities incurred by the maintenance of Benduff Landfill. These commitments include compliance with the waste management licence (No. W00070-01) and aftercare of the site as specified in Condition 8 of the licence.

Cork County Council annually, in the preparation of the 'Book of Estimates' and the passing of these estimates, shall make provision for any capital works required to fulfill conditions of the waste licence for Benduff Landfill.

APPENDICES

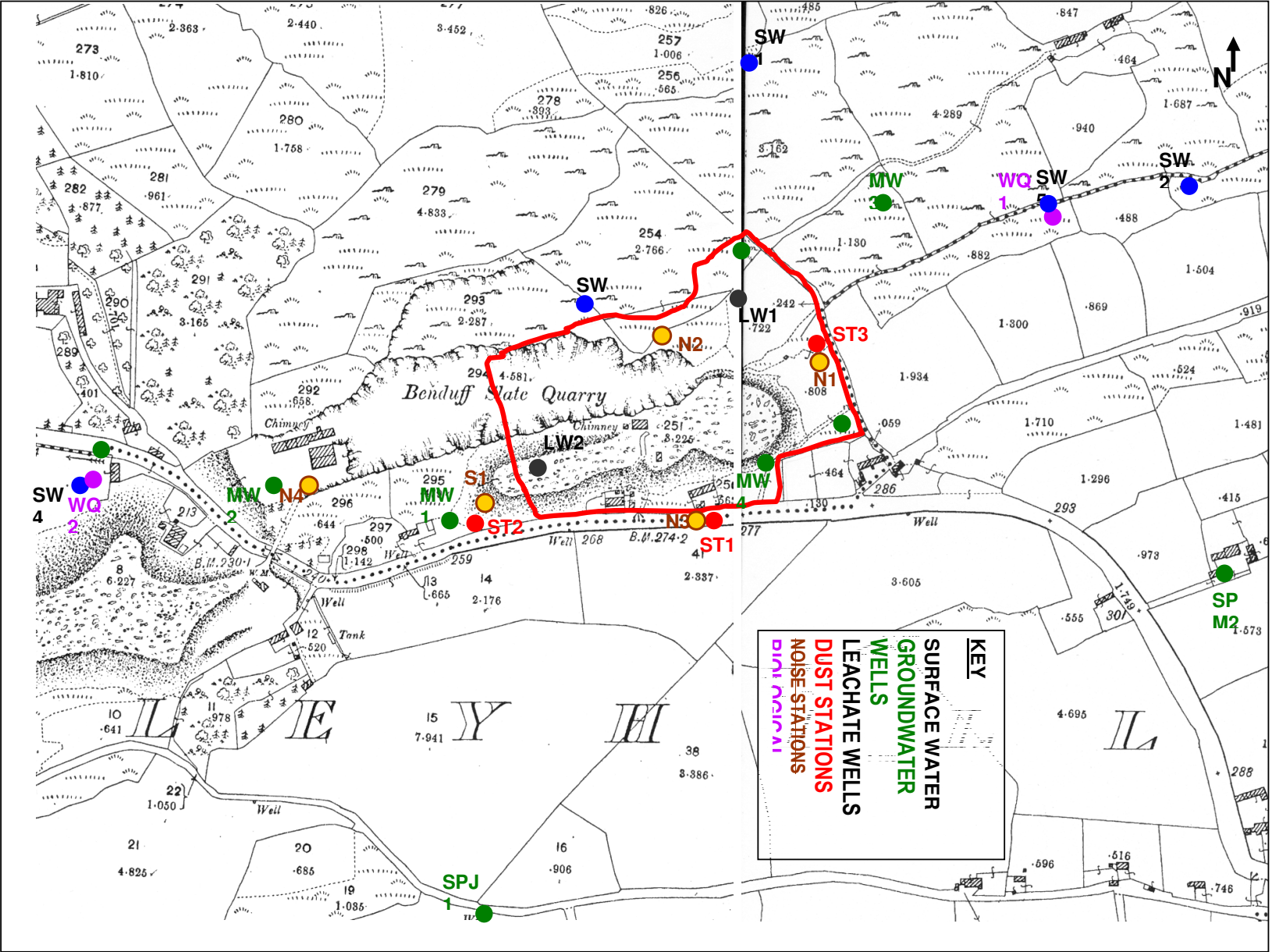


Figure 1. Benduff landfill monitoring stations

—2009

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WATER BALANCE CALCULATIONS

Appendix 1: Monthly Water Balance Calculations

Month	Rainfall (mm)	Potential Evapotrans. mm	Effective Rainfall mm	Waste Input tonnes	Active Area Sq. m	Intermediate Area Sq. m	Restored Area Sq. m	Intermediate Area Infiltration Rate %/100	Restored Area Infiltration Rate %/100	Active Area Infiltration Rate %/100	Intermediate Area Infiltration cu m	Restored Area Infiltration cu m	Liquid Waste Sludge cu m	Waste Absorptive Capacity cu m/t	Total leachate cu m	Cumulative Leachate cu m
jan	193.2	9.8	183.4	0	0	0	20864	0.25	0.04	0	0	152.93	0	0.07	152.93	152.93
feb	51.8	15.1	36.7	0	0	0	20864	0.25	0.04	0	0	30.6	0	0.07	30.60	183.53
mar	113.2	33.1	80.1	0	0	0	20864	0.25	0.04	0	0	66.79	0	0.07	66.79	250.32
april	54	53	0	0	0	0	20864	0.25	0.04	0	0	0	0	0.07	0	250.32
may	75.6	73	0	0	0	0	20864	0.25	0.04	0	0	0	0	0.07	0	250.32
june	128.9	85.6	0	0	0	0	20864	0.25	0.04	0	0	0	0	0.07	0	250.32
july	155.8	71.2	84.6	0	0	0	20864	0.25	0.04	0	0	70.54	0	0.07	70.54	320.87
august	165.1	57.7	0	0	0	0	20864	0.25	0.04	0	0	0	0	0.07	0	320.87
sep	123.6	41	0	0	0	0	20864	0.25	0.04	0	0	0	0	0.07	0	320.87
oct	139.8	22.6	117.2	0	0	0	20864	0.25	0.04	0	0	97.73	0	0.07	97.73	418.6
nov	79.4	13.1	66.3	0	0	0	20864	0.25	0.04	0	0	55.28	0	0.07	55.3	473.88
Dec	60.2	10.7	49.5	0	0	0	20864	0.25	0.04	0	0	41.28	0	0.07	41.3	515.15

* For the purposes of this calculation where evapo-transpiration exceeds rainfall it is assumed that both are equal

The following equation which is detailed in the EPA landfill site design manual was used for monthly balance calculations:

$$L_0 = (ER(A) + LW - IRCA(I)) - (aW)$$

L_0 is the leachate produced

ER= effective rainfall

A= area of cells

LW= liquid waste

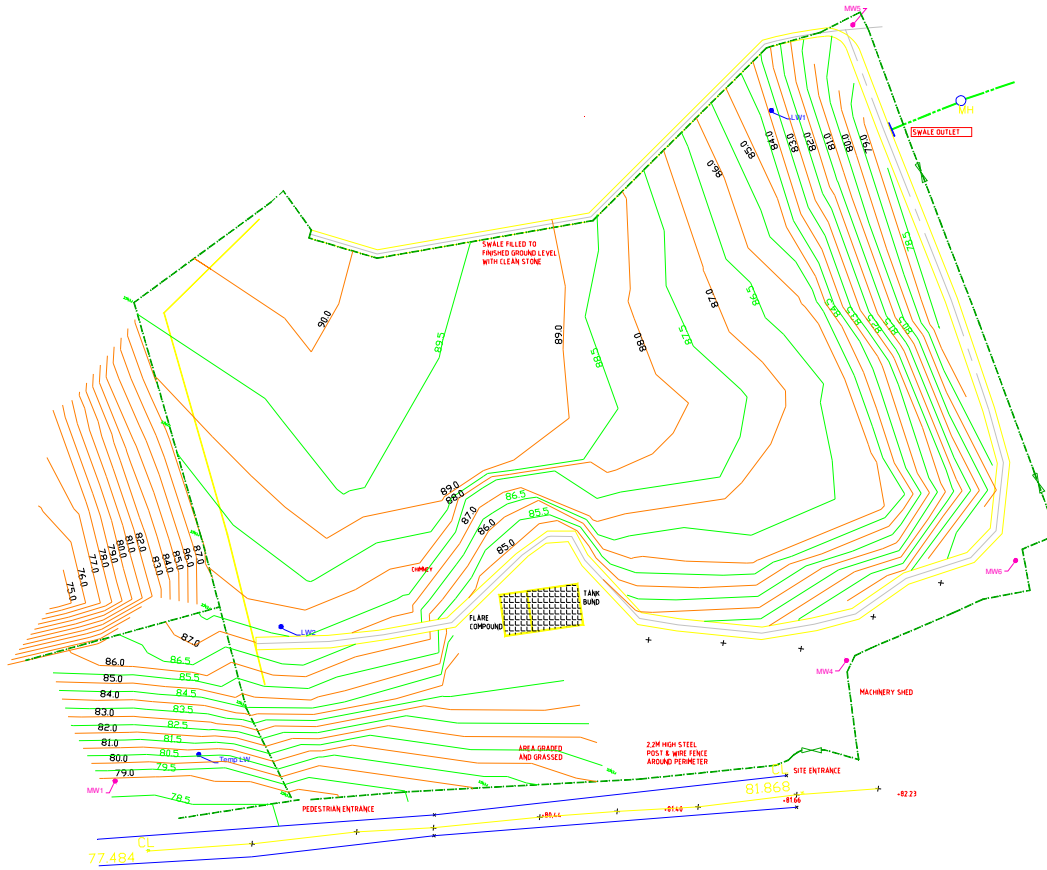
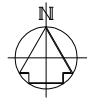
IRCA= infiltration through restored and capped areas (m)

I = surface area of lagoon

a = absorptive capacity of the waste assumed to be 0.07 m³/tonne

w= weight of waste deposited (t).

Rainfall and evapo-transpiration data was received from Met Eireann forCork Airport



Note:
Dimensions not to be scaled from drawing.

Rev.	Description	Date
Job Title: Benduff Landfill - 2008 AER		
Cork County Council Western Division		
Senior Executive Engineer Fraulie Hegarty Tel: (023) 58812 Fax: (023) 58814		Hume House Walle Tone Street Clonakilty
Drawing Title: Topographical Survey		Dwg. No.: S001
Surveyed By: DW & MH	Job No.:	
Drawn By: M. Hales	Date: Mar 2009	
Checked By: M. Hales	Scale: 1:1000	