

WML/W/78

me

**MALCOLM**  **Construction Services**

865 South Street  
Glasgow  
G14 0BX

RECEIVED SEPA  
06 SEP 2005  
EAST KILBRIDE

S.E.P.A  
5 Redwood Crescent,  
Peel Park,  
East Kilbride  
G75 5PP  
f.t.a.o.: Mr. D. Sandford

Reil/DJB/227

2<sup>nd</sup> September 2005

Dear Sirs,

*Southbar landfill*

~~Reilly Quarry Landfill - WML/W/77~~

*WML/W/78*

Please find enclosed monitoring results in relation to the above site, Medrox Quarry and Southbar landfills.

We trust these are to your satisfaction. Please do not hesitate to contact the undersigned at the Glasgow office should you require any further information.

Yours faithfully,

For **W. H. MALCOLM LTD,**



David J. Balmer  
O & E MANAGER  
Encl.

Medrox  
Bishopton



MM/12/28

*Sarban Landfill*  
 Bishopston Landfill Analytical Results June 2005

Units:	uS/cm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	
Date Sampled	Conductivity uS/cm @ 25C	Chloride as Cl w	Nickel as Ni (Total)	Chromium as Cr (Total)	Cadmium as Cd (Total)	Copper as Cu (Total)	Lead as Pb (Total)	Zinc as Zn (Total)	Manganese as Mn (Total)	pH units	Total Oxidised Nitrogen as N	Total Organic Carbon							
Bishopston - Upstream ROF	16-Jun-05	1130	19	0.04	<0.02	<0.01	0.22	0.1	2.00	15.9	n/d	n/d	n/d	n/d	n/d	n/d	n/d	n/d	n/d
Bishopston - Upstream North	16-Jun-05	2020	105	0.43	0.36	<0.01	1.48	1.55	4.00	6.96	n/d	n/d	n/d	n/d	n/d	n/d	n/d	n/d	n/d
Bishopston - Pond Outlet	16-Jun-05	1250	40	<0.02	<0.02	<0.01	0.01	<0.03	0.23	0.11	n/d	n/d	n/d	n/d	n/d	n/d	n/d	n/d	n/d
Bishopston - Sampling Chamber	16-Jun-05	1300	71	<0.02	<0.02	<0.01	0.02	<0.03	0.20	0.34	n/d	n/d	n/d	n/d	n/d	n/d	n/d	n/d	n/d

WSL/M10	ICPWATER	ICPWATER	ICPWATER	ICPWATER	ICPWATER	ICPWATER	ICPWATER	KONENS	WSL/M20	WSL/M11	WSL/M20	KONENS	WSL/M13
Suspended Solids	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
		Total Sulphur as SO4 (Total)	Calcium as Ca (Total)	Magnesium as Mg (Total)	Sodium as Na (Total)	Potassium as K (Total)	Iron as Fe (Total)	Ammoniacal Nitrogen as N	Biochemical Oxygen Demand	Chemical Oxygen Demand	Dissolved Oxygen	Total Oxidised Nitrogen as N	Total Organic Carbon
Bishopston - Upstream ROF	n/d	n/d	n/d	n/d	n/d	n/d	1.06	10.5	48	n/d	n/d	n/d	n/d
Bishopston - Upstream North	n/d	n/d	n/d	n/d	n/d	n/d	4.45	9.5	5.2	n/d	n/d	n/d	n/d
Bishopston - Pond Outlet	n/d	n/d	n/d	n/d	n/d	n/d	0.23	0.01	4.5	n/d	n/d	n/d	n/d
Bishopston - Sampling Chamber	n/d	n/d	n/d	n/d	n/d	n/d	3.82	0.01	5.0	n/d	n/d	n/d	n/d

Water sample Description	Sample Temp °C
Bishopston - Upstream ROF	9.9
Bishopston - Upstream North	18.4
Bishopston - Pond Outlet	12.9
Bishopston - Sampling Chamber	13.2

n/d = not determined  
 s/s = suspended solids



## RECORD OF GAS MEASUREMENT

W. H. MALCOLM LTD.						Start Time: 08:59	
Site: Bishopton Landfill						Finish Time: 11:59	
Date of Monitoring: 14-Jun-05						Temp (°C): approx. 12	
Monitored by: JAT						Weather: Fair	
Checked by: DJB						Instrumentation: Infra-red Gas Analyser	
*Sampling Location	Methane (CH <sub>4</sub> ) % Vol.	Methane (CH <sub>4</sub> ) % LEL	Carbon Dioxide (CO <sub>2</sub> ) % Vol.	Oxygen (O <sub>2</sub> ) % Vol.	Barometric Pressure mbars	**Sample Type	Comments
LW1	0.4	8	0.5	19.2	995	F/S	RWL: n/d
LW2	0	0	0	19.7	995	F/S	RWL: n/d
LW3	0	0	0	20.5	996	F/S	RWL: n/d
PV01	3.3	66	0.4	17.8	994	F/S	RWL: dry
PV02	3.3	66	0.3	18.5	993	F/S	RWL: 3.8
PV03	2.7	54	0.2	18.9	994	F/S	RWL: dry
PV04	7.7	>100	0.8	17.4	994	F/S	RWL: dry
PV05	0.1	2	0	20.0	994	F/S	RWL: 4.6
PV06	0.2	4	0	20.2	994	F/S	RWL: 4.5
PV07	7.7	>100	0.9	17.4	994	F/S	RWL: 4.0
PV08	12.4	>100	2.1	13.7	995	F/S	RWL: 4.5
PV09	10.9	>100	1.3	15.3	994	F/S	RWL: 5.2
PV10	13.3	>100	7.7	1.7	994	F/S	RWL: 10.2
PV11	20	>100	4.2	6.4	994	F/S	RWL: 11.0
PV12	0	0	0	20.0	994	F/S	RWL: 6.38
EastPM1	0	0	0	20.6	997	A/S	
EastPM2	0	0	0	20.6	997	A/S	
EastPM3	0	0	0	20.6	997	A/S	
EastPM4	0	0	0	20.6	997	A/S	
EastPM5	0	0	0	20.6	997	A/S	
EastPM6	0	0	0	20.8	996	A/S	
EastPM7	0	0	0	20.6	997	A/S	
EastPM8	0	0	0	20.6	997	A/S	
EastPM9	0	0	0	20.6	997	A/S	
EastPM10	0	0	0	20.6	997	A/S	
EastPM11	0	0	0	20.6	997	A/S	
EastPM12	0	0	0	20.6	997	A/S	
EastPM13	0	0	0	20.7	996	A/S	
EastPM14	0	0	0	20.5	996	A/S	
EastPM15	0	0	0	20.6	997	A/S	
EastPM16	0	0	0	20.5	997	A/S	
EastPM17	0	0	0	20.6	997	A/S	
EastPM18	0	0	0	20.5	997	A/S	
WestPM1	0	0	0	20.7	994	A/S	
WestPM2	n/d	n/d	n/d	n/d	n/d	n/d	Not found
WestPM3	0	0	0.2	19.9	994	A/S	
WestPM4	0	0	0.3	19.6	994	A/S	
WestPM5	0	0	0	20.3	994	A/S	
WestPM6	0	0	0	20.9	994	A/S	
WestPM7	n/d	n/d	n/d	n/d	n/d	n/d	Broken
WestPM8	0	0	0	20.4	995	A/S	
WestPM9	0	0	0	20.4	995	A/S	
WestPM10	0	0	0	20.5	995	A/S	
WestPM11	0	0	0	20.5	995	A/S	

Barometric pressure: Rising

\* BH = Borehole; PM = Perimeter Monitor; PV = Passive Vent; LW = Leachate Well; n/d = Not Determined; n/a = Not Applicable  
 Values expressed as 0% gas are below the detection limit of 0.1% gas by volume for the purposes of graphical representation  
 \*\*A = Accumulated Sample; S = Steady State Sample; F = Free Venting Sample; RWL = Rest Water Level (m below point top)

**BISHOPTON LANDFILL ANALYTICAL RESULTS - APRIL 2005**

Sample Location	Determinant	EC	BOD	pH	NH <sub>4</sub> - N	SS	Cl	Na	K	Temp	Mg	Ca	SO <sub>4</sub>
	Units	uS/cm	mg/l	H <sup>+</sup>	mg/l	mg/l	mg/l	mg/l	mg/l	°C	mg/l	mg/l	mg/l
U/S Southern Ditch (ROF)	Clear, no visible s/s, low flow	1180	<2.0	n/d	0.90	n/d	18	n/d	n/d	n/d	n/d	n/d	n/d
U/S Northern Ditch	Medium flow, slightly coloured, no visible s/s	425	<2.0	n/d	0.50	n/d	19	n/d	n/d	n/d	n/d	n/d	n/d
Pond Outfall	Good flow, light brown, no s/s	676	<2.0	n/d	0.90	n/d	20	n/d	n/d	n/d	n/d	n/d	n/d
Sampling Chamber	Good flow, light brown, no s/s	384	<2.0	n/d	0.90	n/d	14	n/d	n/d	n/d	n/d	n/d	n/d
WMP No. 26A Example Completion Criteria		4000	n/a	6.0 - 9.0	5.00	n/a	2000	1500	120	n/a	500.00	1000	2500

Sample Location	Determinant	Ni	Cr	Cd	Cu	Pb	Zn	Mn	Fe	COD	TON	TOC
	Units	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
U/S Southern Ditch (ROF)	Clear, no visible s/s, low flow	0.02	n/d	<0.01	0.01	<0.03	0.92	0.25	0.01	n/d	n/d	n/d
U/S Northern Ditch	Medium flow, slightly coloured, no visible s/s	<0.02	n/d	<0.01	0.01	<0.03	0.03	0.05	0.59	n/d	n/d	n/d
Pond Outfall	Good flow, light brown, no s/s	<0.02	n/d	<0.01	0.01	<0.03	0.28	0.11	0.70	n/d	n/d	n/d
Sampling Chamber	Good flow, light brown, no s/s	<0.02	n/d	<0.01	0.01	<0.03	0.08	0.03	1.18	n/d	n/d	n/d
WMP No. 26A Example Completion Criteria		0.5	0.5	0.05	1.00	0.5	1	0.5	2	0.01	n/a	10

Waste Management Paper No. 26A - Example Completion Criteria Guidance Levels for Leachate Entering Groundwater

n/a - no value available

n/d - no value determined s/s - suspended solids

## RECORD OF GAS MEASUREMENT

W. H. MALCOLM LTD.					Start Time: 08:21		
Site: Bishopton Landfill				Finish Time: 10:56			
Date of Monitoring: 25-Jul-05				Temp (°C): approx. 15			
Monitored by: JAT				Weather: Fair			
Checked by: DJB				Instrumentation: Infra-red Gas Analyser			
*Sampling Location	Methane (CH <sub>4</sub> ) % Vol.	Methane (CH <sub>4</sub> ) % LEL	Carbon Dioxide (CO <sub>2</sub> ) % Vol.	Oxygen (O <sub>2</sub> ) % Vol.	Barometric Pressure mbars	**Sample Type	Comments
LW1	n/d	n/d	n/d	n/d	n/d	n/d	Inaccessible - bullocks in field
LW2	0	0	0	20.4	1003	n/d	RWL: 12.3
LW3	0	0	0	20.8	1003	F/S	RWL: 3.5
PV01	3.2	64	0.4	18.3	1001	F/S	RWL: Dry
PV02	0.2	4	0	20.3	1001	F/S	RWL: 4.4
PV03	0.3	6	0	20.4	1002	F/S	RWL: Dry
PV04	5.4	>100	0.5	18.7	1002	F/S	RWL: 6.9
PV05	0	0	0	20.8	1001	F/S	RWL: 4.6
PV06	0.1	2	0	20.8	1001	F/S	RWL: 4.5
PV07	1.7	34	0.2	20.2	1001	F/S	RWL: Dry
PV08	0.2	4	0	20.8	1001	F/S	RWL: Dry
PV09	2.3	46	0.3	19.9	1001	F/S	RWL: 5.0
PV10	8.0	>100	4.7	9.5	1002	F/S	RWL: Dry
PV11	19.9	>100	4.4	6.1	1001	F/S	RWL: Dry
PV12	0	0	0	19.1	1002	F/S	RWL: Dry
EastPM1	0	0	0	20.4	1005	A/S	
EastPM2	0	0	0	20.4	1005	A/S	
EastPM3	0	0	0	20.4	1005	A/S	
EastPM4	0	0	0	20.5	1005	A/S	
EastPM5	0	0	0	20.5	1005	A/S	
EastPM6	0	0	0	20.5	1005	A/S	
EastPM7	0	0	0	20.5	1004	A/S	
EastPM8	0	0	0.1	20.4	1004	A/S	
EastPM9	0	0	0.4	20.1	1004	A/S	
EastPM10	0	0	0	20.6	1004	A/S	
EastPM11	0	0	0	20.6	1004	A/S	
EastPM12	0	0	0.2	20.4	1004	A/S	
EastPM13	0	0	0	20.5	1004	A/S	
EastPM14	0	0	0	20.5	1004	A/S	
EastPM15	0	0	0	20.5	1005	A/S	
EastPM16	0	0	0	20.6	1005	A/S	
EastPM17	0	0	0	20.6	1005	A/S	
EastPM18	0	0	0	20.6	1004	A/S	
WestPM1	0	0	0	20.8	1003	A/S	
WestPM2	0	0	0	20.8	1003	n/d	
WestPM3	0	0	0.4	20.5	1003	A/S	
WestPM4	0	0	0	20.7	1003	n/d	
WestPM5	0	0	0	20.7	1003	A/S	
WestPM6	0	0	0	20.6	1003	A/S	
WestPM7	n/d	n/d	n/d	n/d	n/d	n/d	Broken
WestPM8	0	0	0	20.6	1003	A/S	
WestPM9	0	0	0	20.6	1003	A/S	
WestPM10	0	0	0	20.6	1003	A/S	
WestPM11	n/d	n/d	n/d	n/d	n/d	n/d	Not located

Barometric pressure: Rising

\* BH = Borehole, PM = Perimeter Monitor, PV = Passive Vent, LW = Leachate Well, n/d = Not Determined, n/a = Not Applicable

Values expressed as 0% gas are below the detection limit of 0.1% gas by volume for the purposes of graphical representation

\*\*A = Accumulated Sample; S = Steady State Sample; F = Free Venting Sample; RWL = Rest Water Level (m below point top)

## RECORD OF GAS MEASUREMENT

<b>W. H. MALCOLM LTD.</b>		Start Time: 13:22
Site: Bishopton Landfill		Finish Time: 15:22
Date of Monitoring: 23-Aug-05		Temp (°C): approx. 15
Monitored by: JAT		Weather: Sunny / Showers
Checked by: DJB		Instrumentation: Infra-red Gas Analyser

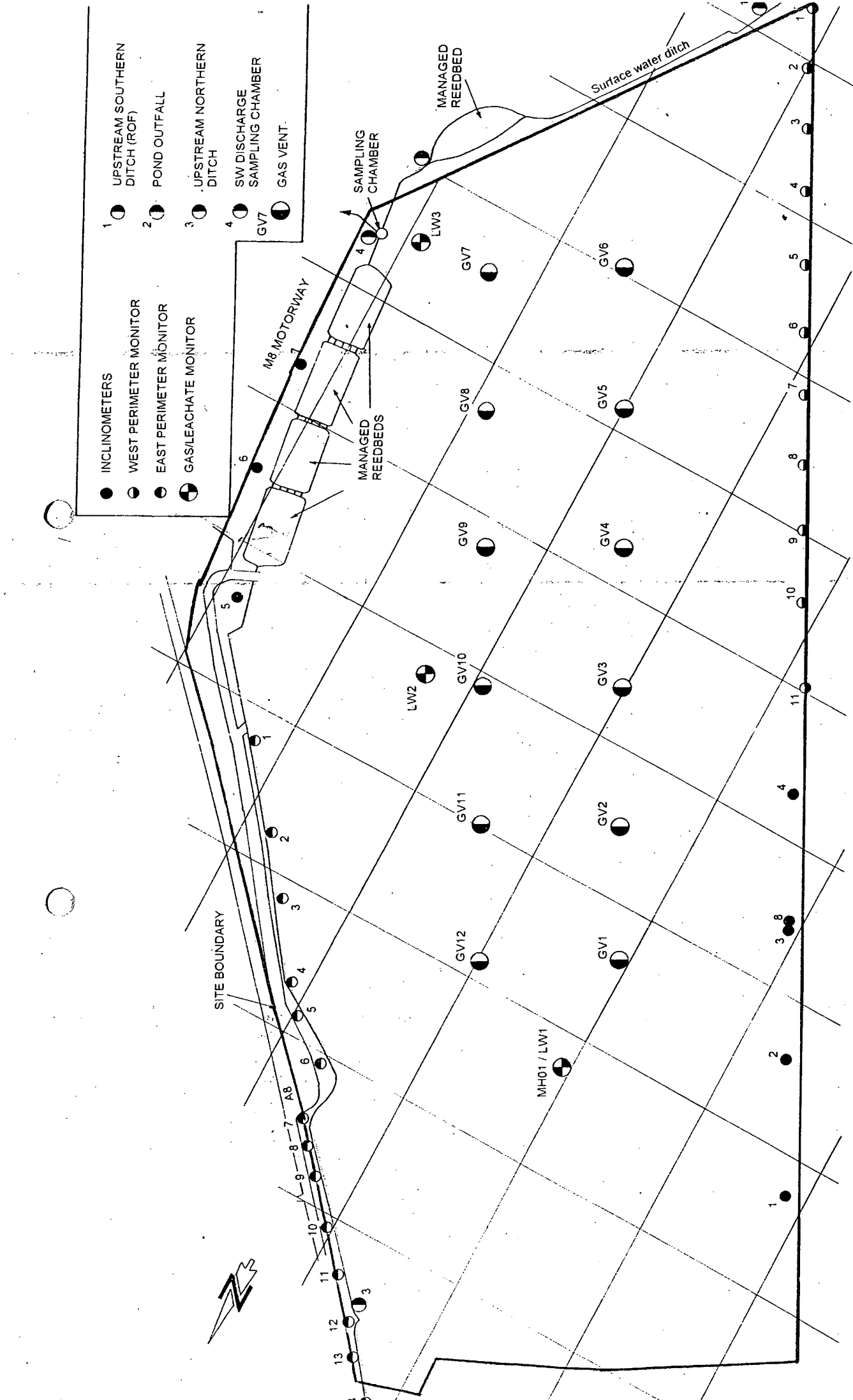
*Sampling Location	Methane (CH <sub>4</sub> )	Methane (CH <sub>4</sub> )	Carbon Dioxide (CO <sub>2</sub> )	Oxygen (O <sub>2</sub> )	Barometric Pressure	**Sample Type	Comments
	% Vol.	% LEL	% Vol.	% Vol.	mbars		
LW1	n/d	n/d	n/d	n/d	n/d	n/d	Inaccessible - bullocks in field
LW2	0	0	0	20.4	993	n/d	RWL: 5.0
LW3	0	0	0	20.5	993	F/S	RWL: 3.5
PV01	0.8	16	0.1	19.6	990	F/S	RWL: Dry
PV02	3.5	70	0.4	18.2	990	F/S	RWL: Dry
PV03	1.6	32	0.1	19.6	990	F/S	RWL: Dry
PV04	6.1	>100	0.8	17.8	991	F/S	RWL: 6.3
PV05	0	0	0	20.5	991	F/S	RWL: 5.9
PV06	0	0	0	20.6	990	F/S	RWL: 4.1
PV07	0.9	18	0.1	20.1	991	F/S	RWL: Dry
PV08	1.8	36	0.3	19.5	992	F/S	RWL: Dry
PV09	13.2	>100	2.1	14.4	992	F/S	RWL: 4.80
PV10	6.8	>100	4.6	10.4	991	F/S	RWL: Dry
PV11	23.1	>100	5.6	2.9	992	F/S	RWL: Dry
PV12	1.6	32	0.4	19.2	991	F/S	RWL: 6.3
EastPM1	0	0	0	20.5	994	A/S	
EastPM2	0	0	0	20.6	994	A/S	
EastPM3	0	0	0	20.6	994	A/S	
EastPM4	0	0	0	20.7	994	A/S	
EastPM5	0	0	0	20.7	994	A/S	
EastPM6	0	0	0	20.7	994	A/S	
EastPM7	0	0	0	20.6	994	A/S	
EastPM8	0	0	1	20.1	994	A/S	
EastPM9	0	0	0	20.7	993	A/S	
EastPM10	0	0	0	20.7	993	A/S	
EastPM11	0	0	0	20.4	993	A/S	
EastPM12	0	0	1	19.4	994	A/S	
EastPM13	0	0	0	20.7	993	A/S	
EastPM14	0	0	0	20.6	993	A/S	
EastPM15	0	0	0	20.4	994	A/S	
EastPM16	0	0	0	20.4	994	A/S	
EastPM17	0	0	0	20.3	994	A/S	
EastPM18	0	0	0	20.4	994	A/S	
WestPM1	0	0	0	20.5	992	A/S	
WestPM2	0	0	0.1	20.3	992	A/S	
WestPM3	0	0	0	20.4	992	A/S	
WestPM4	0	0	0.8	18.3	992	n/d	
WestPM5	0	0	0.3	19.2	992	A/S	
WestPM6	0	0	1.3	18.5	992	A/S	
WestPM7	n/d	n/d	n/d	n/d	n/d	n/d	Broken
WestPM8	0	0	0.3	19.6	992	A/S	
WestPM9	0	0	0	20.1	992	A/S	
WestPM10	0	0	0	20.3	992	A/S	
WestPM11	0	0	0	20.3	992	A/S	

Barometric pressure: Rising

\* BH = Borehole; PM = Perimeter Monitor; PV = Passive Vent; LW = Leachate Well; n/d = Not Determined; n/a = Not Applicable

Values expressed as 0% gas are below the detection limit of 0.1% gas by volume for the purposes of graphical representation

\*\*A = Accumulated Sample; S = Steady State Sample; F = Free Venting Sample; RWL = Rest Water Level (m below point top)



	Site	Bishoppton "Southbar" Landfill (Closed)	Date	Jan 2004	Drawn	SMM	Scale	NTS
	Title	MONITORING POINT LOCATIONS			Rev.		Checked	

## ENVIRONMENTAL REPORT 2004

The following report presents a summary of the relevant environmental information pertinent to the management of the site:

### ➤ *Landfill Gas Monitoring*

Monitoring for the presence of landfill gas was undertaken along the perimeters of the site monthly, to determine if lateral migration was occurring. There was no corroborated evidence of any lateral migration during the course of the year.

Landfill gas generation within the waste mass was monitored monthly or more frequently, as conditions dictated. Methane was evident in several wells on multiple monitoring occasions (Leachate Well 1, PV01, PV02, & PV07, 8, 9, 11 & 12).

The maximum concentrations of the major constituents of landfill gas were as follows:

- Methane – maximum levels were recorded within the vent PV11 and peaked at 24.0% Vol. There was no correlation between atmospheric pressure and gas generation, suggesting a sporadic infiltration of gas into these collection voids. The concentrations are consistent with the characteristics of the waste landfilled.

Methane concentrations within the perimeter monitors typically remained below the detection level of the apparatus; i.e., <0.1% by volume.

- Carbon Dioxide – site maximum levels were recorded within vent PV10 and peaked at 7.1 % Vol. Again there was no correlation between atmospheric pressure and gas generation, suggesting a sporadic infiltration of gas into this collection void.

Carbon dioxide concentrations within the perimeter monitors typically remained below the threshold criteria of 1.5% commonly quoted, with occasional peaks detected upto 5.1% (western perimeter). There was no corresponding relationship between pressure or other environmental factors.

- Oxygen concentrations lower than atmospheric concentrations were occasionally recorded within the leachate wells and the passive vents in association with sporadic methane levels recorded. Oxygen levels within the perimeter monitors were depleted only in association with marginal increases in carbon dioxide levels.

### ➤ *Surface Water Monitoring*

The surface water that flows around the site was monitored on a monthly basis for the presence of major pollutant species. Throughout the monitoring period, the quality of the surface water was not impacted significantly.

Results indicate sporadic contamination by the metal species iron and manganese. Elevated concentrations of manganese are present upstream and downstream of the site, indicative of a remote source. The presence of iron within the surface water is indicative of the degradation of waste within the site and is demonstrated by its appearance from leachate outbreaks, which weep predominantly into the southern ditch, prior to further treatment downstream. Maximum iron loading was evident in July 2004. There is also evidence of marginal increases in loading of the highly soluble species chloride during June 2004.

Additional treatment works were undertaken in spring 2005 to improve the efficacy of the treatment of run off and any leachate infiltration.

Zinc was also recorded elevated upstream of the site with no corresponding elevated levels downstream of the site, indicative of a remote source.

The following ranges of these species were recorded from the site discharges:

- Ammonia < 0.1 – 9.90mg/l
- Iron < 0.01 – 93.3mg/l.

The potential for depletion of oxygen within the watercourses as measured by the BOD value was relatively stable at around <2.0. Impact was evident during the month of September after construction of the new ponds in August, and prior to establishment of the reed-beds. As the site restoration and progressive vegetation establishment continues, this impact should diminish. Typically, the BOD values were improved between the upstream and downstream samples.

➤ *Leachate Monitoring*

The leachate that is generated within the site is collected within several managed treatment lagoons, prior to discharge to the adjacent surface waters. Results indicate that the throughout the course of the year, iron, manganese and ammonia are the prevalent species within the leachate. Their generation and occurrence is consistent with the site-specific conditions. Generally, the prevalence of iron along the southern ditch is reflective of the recent reworking of this area of the site, the peat rich deposits and the ash deposits previously infilled on the site. The stabilisation and completion of this area should reduce the infiltration of water into the underlying waste as this year continues, reducing the leachate generation.

Leachate from within the site extracted from the leachate wells indicated very mild leachate characteristics. The contaminant species were restricted to the presence of ammonia and chloride at marginal concentrations in comparison to recognised typical leachate values. The COD was also elevated on an isolated occasion however; this may be attributed to the sample recovery methodology.

The following range of that species was recorded:

- Ammonia <0.01 – 1.4mg/l
- Chloride 7 - 103mg/l.

➤ *Settlement Monitoring and Annual Survey*

The results of this information cannot be fully calculated, as the site was not surveyed within the intervening period. No settlement monuments are currently present within the site.

➤ *Incidents and Accidents*

There were no major incidents recorded at the site during the period. No incidents were recorded impacting on the environment.