Neath Port Talbot
Castell-nedd Port Talbot
County Borough Council Cyngor Bwrdeistref Sirol

Air quality report – 2003

SIXTH ANNUAL REPORT (2003)

The purpose of this report is to present the results of all pollution monitoring data collected during the calendar year 2003. The data includes results from continuous and non-continuous equipment, some of which is supplied to national pollution monitoring networks. Conclusions are drawn about air quality based upon this information.

EXECUTIVE SUMMARY

Automatic monitoring at the Groeswen Hospital AURN national network site showed that:

- 2003 was a poor year with regard to ozone pollution with more exceedences than in the previous two years put together.
- The Air Quality Objective for PM_{10} was breached in 2003. Results were probably worse that in 2002 because of the re-commissioning of Blast Furnace 5. But, there were fewer exceedences than experienced when the old Blast Furnace 5 was operating.
- A carbon monoxide pollution incident that was co-incident with the re-commissioning of Blast Furnace 5 resulted in a Breach of the Air Quality Objective level and both of the World Health Organisation Guidelines.
- There were no exceedences of the relevant Air Quality Obective levels for nitrogen dioxide or sulphur dioxide.

The deposit gaugess around the steel works provided a mixed picture again this year. Results for Prince Street, whilst still generating the highest measurements, were substantially better than the previous year. Unfortunately results near Ffrwdwyllt house worsened. However, the overall trend for both sites since 1996 has been to reduced pollution levels. This information will be passed to the Environment Agency Wales. There was an improvement in results at Onllwyn washery compared to 2002, but not so good as to match those previously measured in 2001 and 2000. Increases at Little Warren now mean that results at this location are now the fourth highest in the group.

The nitrogen dioxide diffusion tube survey showed that two sites, Victoria Gardens and the main road outside Groeswen Hospital Neath, may be at risk of exceeding the annual objective limit for this substance. Further monitoring at five locatons near these sites has commenced in 2004.

The metals monitoring at Pontardawe continues to show the influence of the nickel refinery at Clydach. The annual mean nickel concentration found in 2003 was 43 ng/m^3, was about half that measured in the previous year, but is still twice the proposed EC target value (20 ng/m^3 annual mean). This information has been brought to the attention of the Environment Agency, which regulates the process.

Monitoring of volatile organic compounds (VOC's) at Baglan has shown a continued reduction in ethene levels.

Contents

Grit and dust monitoring

Previous reports have described how deposit gauges have been used to collect atmospheric fallout from a number of locations. The analysis of the collected grit and dust is not confined to the fallout rate, but also includes a sophisticated characterisation of the deposit, using Scanning Electron Microscopy (SEM) and Energy Dispersive X-ray Analysis (EDXA). During 2003, sampling of this kind took place at 12 sites in the County Borough.

The report includes results from the following locations:

- Prince Street, Margam, Port Talbot
- Baldwins Crescent, Crymlyn Burrows
- Ffrwdwyllt House, Margam Road, Port Talbot
- Wembley Avenue, Onllwyn
- Eglwys Nunydd Reservoir, Margam, Port Talbot
- Little Warren, Port Talbot.
- Tairgwaith, Amman Valley
- Llygad yr Haul, Glynneath
- Gwaun Cae Gurwen, Amman Valley
- Cil Carne Farm, Bryn, Port Talbot
- Cardonnel Road Skewen
- Parish Road, Cwmgwrach

Once again, the report consists of pie charts and time series graphs for each site for 2002 and the preceding year as a comparison. The pie charts show the average percentage composition of the samples collected during the year, with the average fallout rates of each component in mg/m^2/day underneath. The time series show how the fallout rate has changed over the course of the year. The pie charts define the composition of the collected deposit into the following categories:

- Coal – unburned coal.
- Carbonised – partly burnt carbon based material that may be derived from combustion of coal, oil, wood etc.
- Sand – sand and silica based minerals.
- Dirt – mineral material typically found in soil and earth.
- Fly Ash – spherical mineral particles having arisen from combustion.
- Plant/Animal – miscellaneous fragments of insects, plant material etc.
- Calcium Rich – particles with an unusually high calcium content e.g. chalk, cement etc.
- Iron Rich – particles consisting of, or rich in iron.
- Others – anything not falling into the categories above.

Additional information is provided to indicate the annual average and maximum fallout levels, the data capture rate, and the number of days exceeding (or within 10% of) the “nuisance limit” (200 mg/m^2/day), which some recognise as relevant for this method of monitoring. However it should be noted that this “limit” is not a statutory limit and the public perception of what constitutes a nuisance might now suggest that a lower “limit” would be appropriate.

The sites are ranked in a table and graphically according to the average fallout rate. A table and graph also shows how annual fallout rates have changed at each location since monitoring began. A map showing the locations of each of the monitoring sites is also shown. Figures 1 to 26

comprise pairs of time series and pie charts for each site. The time series charts show how the fallout rate has varied over the period(s) concerned, whilst the pie charts show the average composition. The tables that accompany the charts highlight any differences that may have occurred over the period. Figure 25 shows the location of each of the deposit gauges. Figure 26 shows the average fallout rate for each site during 2002 in a bar chart, and Table 1 holds the data for this chart. Figure 27 and Table 2 show how fallout rates have varied in the long term. The site at Cwmllynfell was discontinued since all properties in the area had become unoccupied and vandalism of the equipment had become a problem.

Results by site

Baldwins Crescent, Crymlyn Burrows (Figs. 1 & 2)

The "nuisance limit" was not exceeded in 2003 and no samples reached within 10% of 200 mg/m^2/day. The maximum fallout rate was 57 mg/m^2/day and the average 30 mg/m^2/day, the corresponding values for 2002 were 71 and 31 mg/m^2/day respectively. There was an 3% decrease in fallout rates compared to the previous year.

Cil Carne Farm, Bryn, Port Talbot (Figs. 3 & 4)

The "nuisance limit" was not exceeded in 2003 and no samples reached within 10% of 200 mg/m^2/day. The maximum fallout rate was 43 mg/m^2/day and the average 30 mg/m^2/day, the corresponding values for 2002 were 50 and 25 mg/m2/day respectively. There was an 3% decrease in fallout rates compared to the previous year. But, this is mainly due to better capture of data in 2003, which at 94% was much improved upon the 2002 figure of 75%.

Prince Street, Port Talbot (Figs. 5 & 6)

The "nuisance limit" (200 mg/m^2/day) was not exceeded in 2003, which compares favourably with the 66 days of exceedance during the previous year. The maximum fallout rate was 181 mg/m^2/day and the average 85 mg/m^2/day, the corresponding values for 2002 were 251 and 141 mg/m^2/day respectively. Consequently the average fallout level was some 40 % lower than the previous year, the biggest difference was a result of reduced iron fallout. This site continues to have the highest fallout rate of all those sampled.

Ffrwdwyllt House, Margam Road, Port Talbot (Figs. 7 & 8)

The "nuisance limit" was exceeded for 30 days during 2003, whilst there were no such occurrences during 2002. The maximum fallout rate was only 274 mg/m^2/day and the average 70 mg/m^2/day, significantly higher that the corresponding values for 2002 of 841 and 37 mg/m^2/day respectively. There was an 89% increase in fallout rates compared to the previous year, which was mainly due to more dirt, iron and coal.

Eglwys Nunydd Reservoir, Port Talbot (Figs. 9 & 10)
The "nuisance limit" was not exceeded during 2003, and there were no samples within 10% of 200 mg/m^2/day. Whereas the there were 54 days of exceedance during 2002. The maximum fallout rate was 107 mg/m^2/day, less than the figure of 308 mg/m^2/day for the previous year. The average fallout level in 2003 was 36 mg/m^2/day, a fall of some 47%. The main factor in the change was a decrease in coal fallout.

Gwaun Cae Gurwen (Figs. 11 & 12)
The "nuisance limit" was not exceeded during 2003. The maximum fallout rate was only 55 mg/m^2/day and the average 19 mg/m^2/day. The average fallout level in 2003 was 19% more than the corresponding figure for 2002, mainly due to one the high result encountered during that year.

Tairgwaith (Figs. 13 & 14)
The "nuisance limit" was not exceeded and no samples reached within 10% of 200 mg/m^2/day. The maximum fallout rate was 57 mg/m^2/day and the average 28 mg/m^2/day, the corresponding values for 2002 were 40 and 24 mg/m^2/day respectively. There was a 17% increase in fallout rates compared to the previous year, but the average fallout level was still quite low.

Parish Road, Cwmgwrach (Figs. 15 & 16)
The "nuisance limit" was not exceeded and no samples reached within 10% of 200 mg/m^2/day. The maximum fallout rate was 86 mg/m^2/day and the average 39 mg/m^2/day, the corresponding values for 2002 were 299 and 46 mg/m^2/day respectively. There was a 15% decrease in fallout rates compared to the previous year, but consideration must be given to the fact that there was one very high and possibly dubious result in the previous year that skewed the statistics higher. Overall it is likely that there has been a slight increase in fallout during 2003 if the one high result in 2002 is discounted.

Llygad yr Haul, Glynneath (Figs. 17 & 18)
The "nuisance limit" was not exceeded and no samples reached within 10% of 200 mg/m^2/day. The average fallout rate at 18 mg/m^2/day was low, but 13% greater than the previous year.

Wembley Avenue, Onllwyn (Figs. 19 & 20)
The "nuisance limit" was not exceeded and no samples reached within 10% of 200 mg/m^2/day. The maximum fallout rate was 148 mg/m^2/day and the average 60 mg/m2/day, the corresponding values for 2002 were 121 and 67 mg/m^2/day respectively. Average fallout levels in 2003 decreased by 10%. Levels have not yet decreased to those measured in 2001 or 2000. Coal still forms the majority component of the fallout, which is a consequence of proximity to the nearby coal washery.

Cardonnel Road, Skewen (Figs. 21 & 22)
The "nuisance limit" was not exceeded and no samples reached within 10% of 200 mg/m^2/day. The fallout rate, increased by 17% compared to 2002 levels, but was still quite low at only 21 mg/m^2/day.

Little Warren, Port Talbot (Figs. 23 & 24)
The "nuisance limit" was not exceeded and no samples reached within 10% of 200 mg/m^2/day. The maximum fallout rate was 90 mg/m^2/day and the average 50 mg/m^2/day, the corresponding values for 2002 were 66 and 38 mg/m^2/day respectively. There was a 32% increase in fallout rates compared to the previous year. The increases were mainly due to more coal and sand.

Figure 1

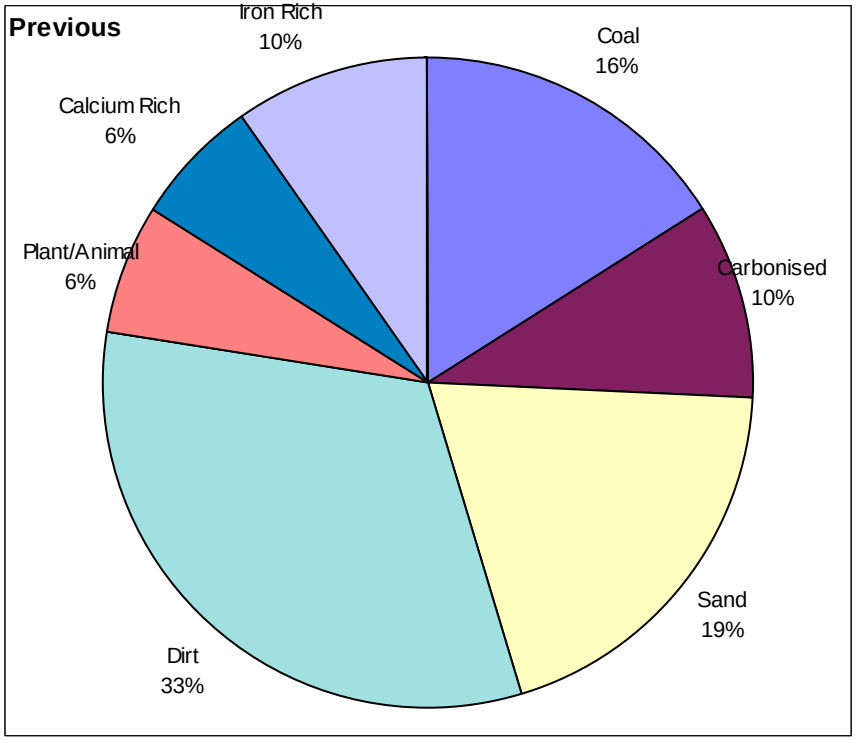
Deposit Gauge Analysis Report

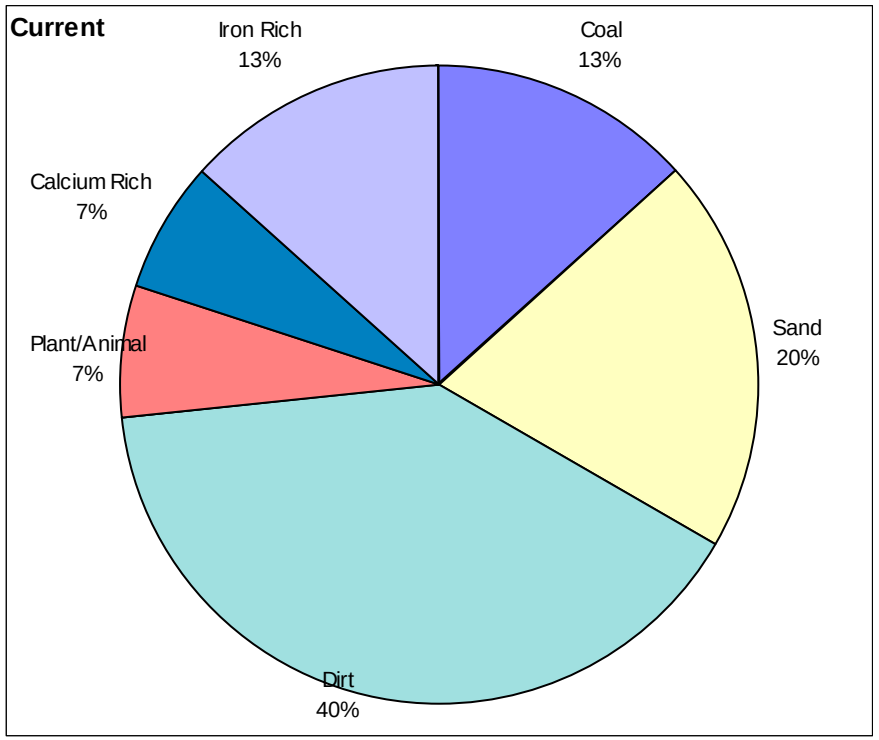
Jeremy's Oil Distributors, Baldwins Crescent

Comparison of Fallout Composition

Current Period = 01-Jan-03 to 31-Dec-03

Previous Period = 01-Jan-02 to 31-Dec-02





Measurement Type	Period	Coal	Carbonised	Sand	Dirt	Fly Ash	Plant/Animal	Calcium Rich	Iron Rich	Others
Av. Deposition Rate (mg/M2/day)	**Current**	4	0	6	12	0	2	2	4	0
	Previous	5	3	6	10	0	2	2	3	0

Figure 2

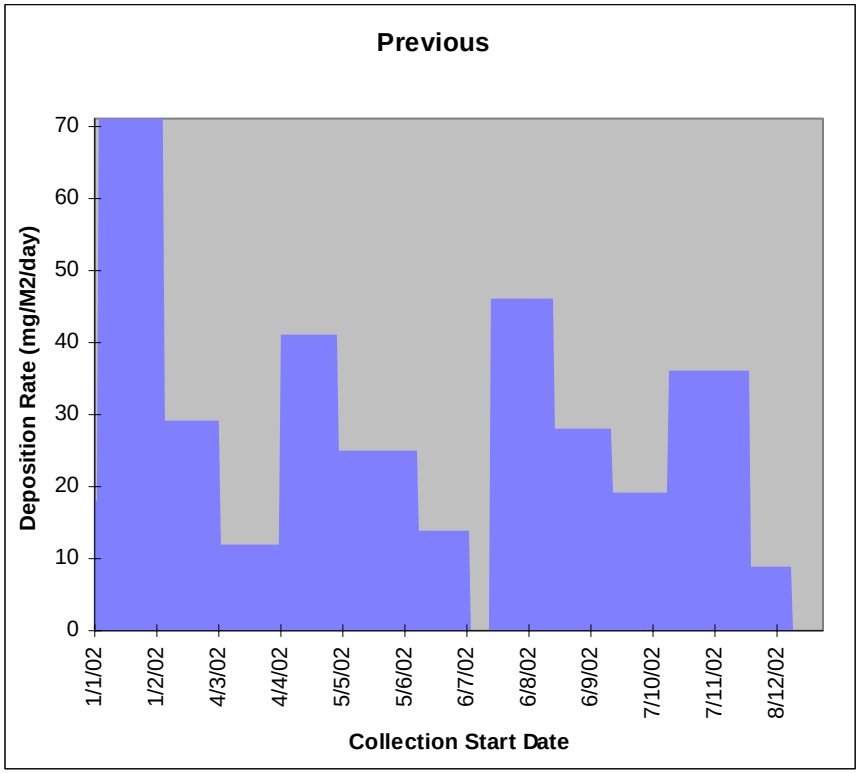
Deposit Gauge Analysis Report

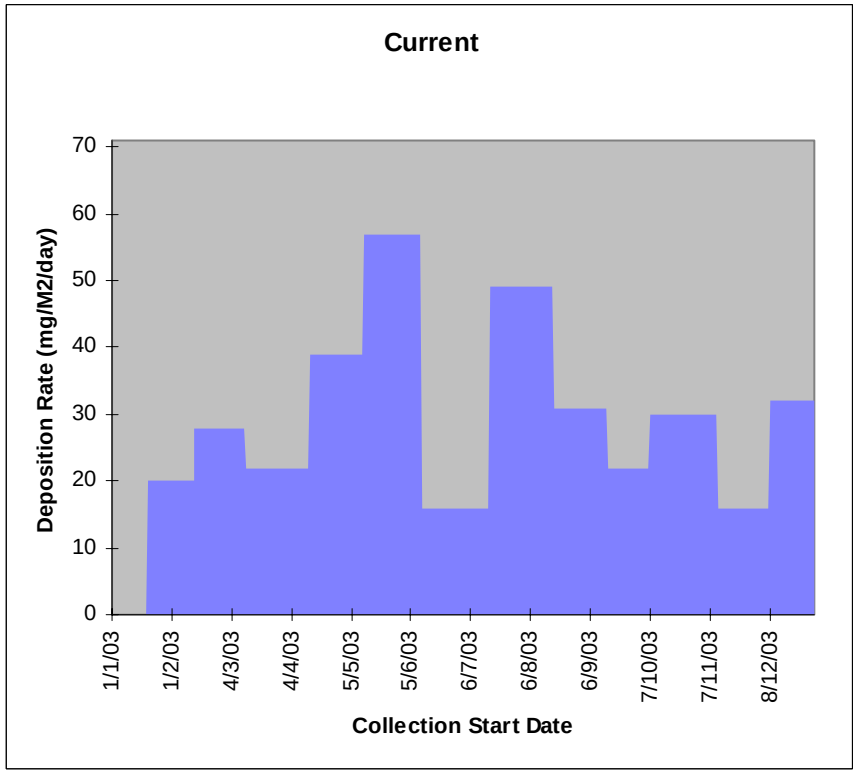
Jeremy's Oil Distributors, Baldwins Crescent

Comparison of Fallout Rate with Time

Current Period = 01-Jan-03 to 31-Dec-03

Previous Period = 01-Jan-02 to 31-Dec-02





Period	Fallout Level (mg/M2/day)		No. Samples	% Data Capture	200 mg/M2/day 'Nuisance Limit'	
	Average	Maximum			Days within 10% of	Days Exceeding
Current	30	57	12	94.8	0	0
Previous	31	71	11	92.7	0	0
Change	-1	Decrease -3%				

Figure 3

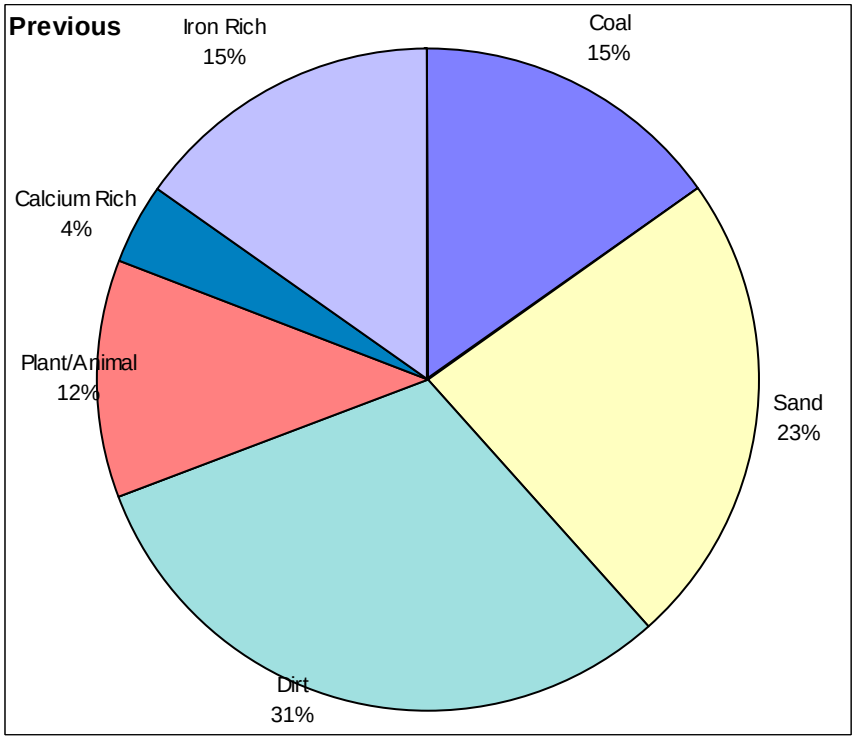
Deposit Gauge Analysis Report

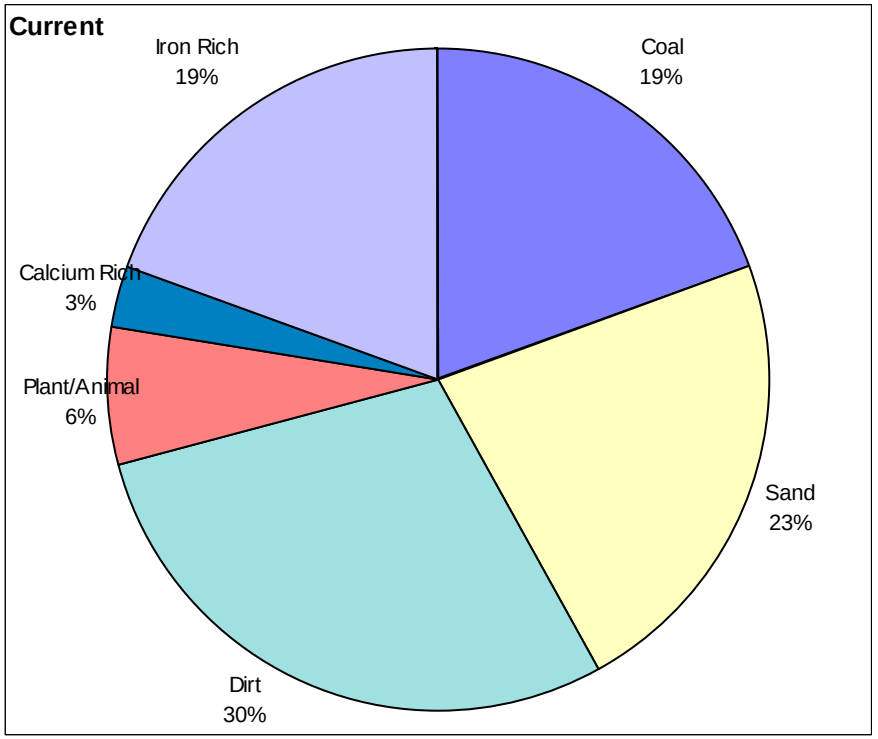
Cil Carne Farm, Port Talbot

Comparison of Fallout Composition

Current Period = 01-Jan-03 to 31-Dec-03

Previous Period = 01-Jan-02 to 31-Dec-02





Measurement Type	Period	Coal	Carbonised	Sand	Dirt	Fly Ash	Plant/Animal	Calcium Rich	Iron Rich	Others
Av. Deposition Rate (mg/M2/day)	Current	6	0	7	9	0	2	1	6	0
	Previous	4	0	6	8	0	3	1	4	0

Figure 4

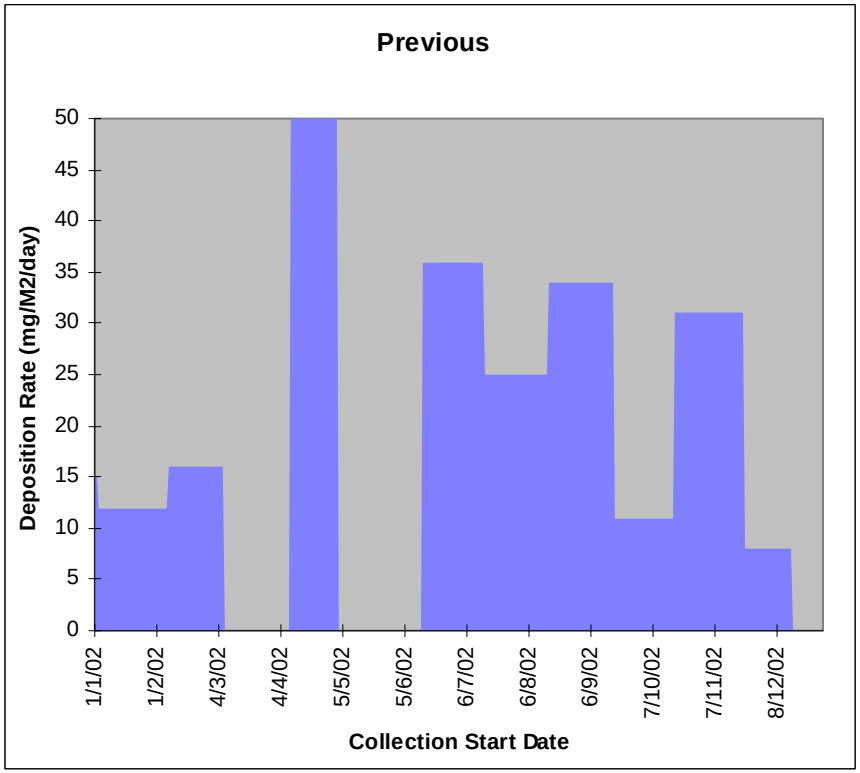
Deposit Gauge Analysis Report

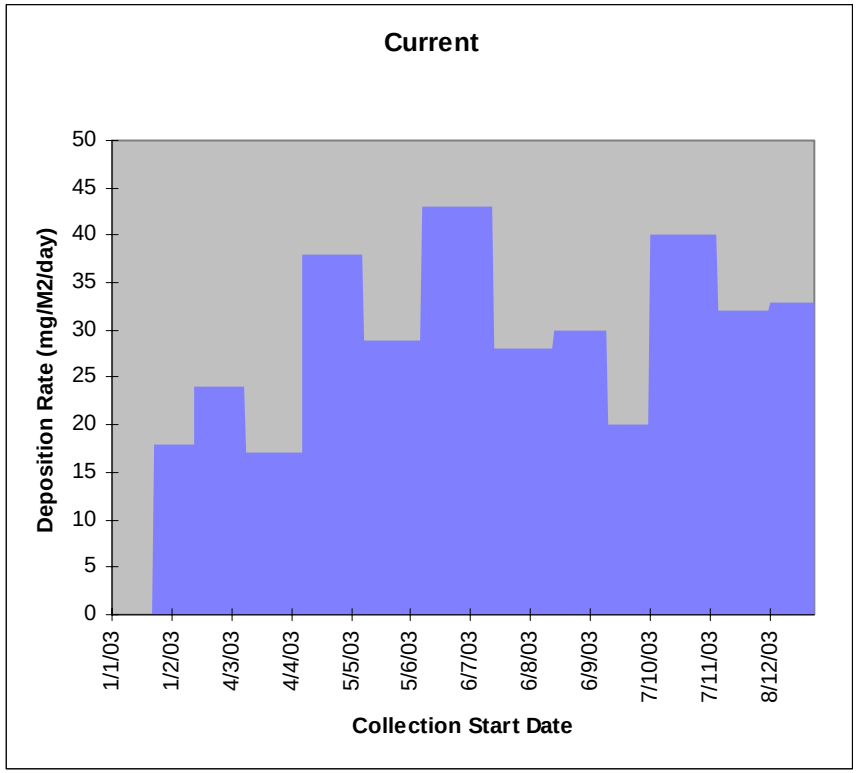
Cil Carne Farm, Port Talbot

Comparison of Fallout Rate with Time

Current Period = 01-Jan-03 to 31-Dec-03

Previous Period = 01-Jan-02 to 31-Dec-02





Period	Fallout Level (mg/M2/day)		No. Samples	% Data Capture	200 mg/M2/day 'Nuisance Limit'	
	Average	Maximum			Days within 10% of	Days Exceeding
Current	30	43	12	94.0	0	0
Previous	25	50	9	74.6	0	0
Change	5	Increase 20%				

Figure 5

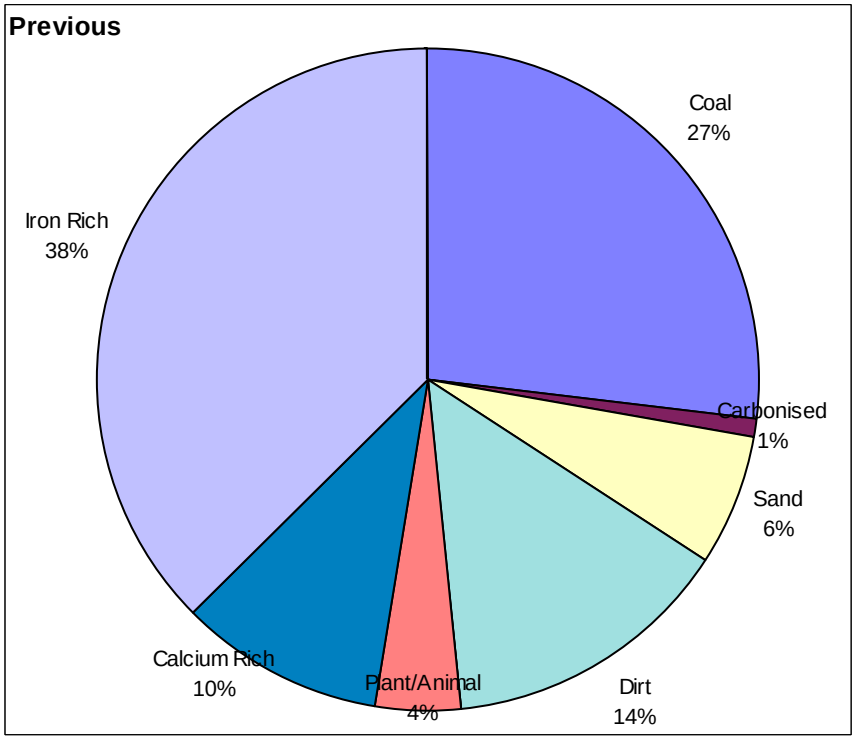
Deposit Gauge Analysis Report

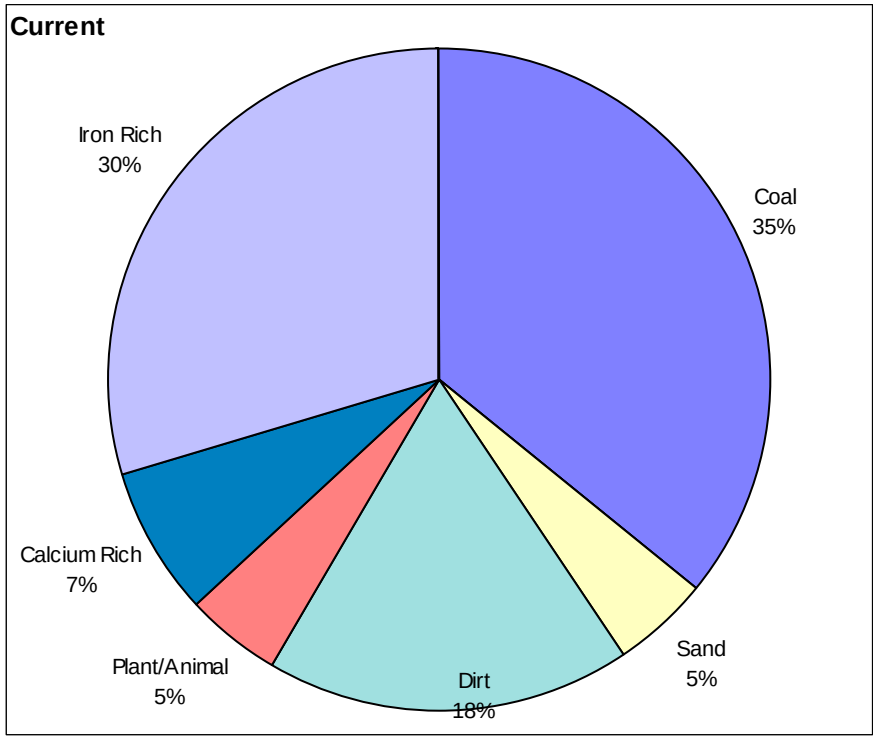
24, Prince Street, Port Talbot

Comparison of Fallout Composition

Current Period = 01-Jan-03 to 31-Dec-03

Previous Period = 01-Jan-02 to 31-Dec-02





Measurement Type	Period	Coal	Carbonised	Sand	Dirt	Fly Ash	Plant/Animal	Calcium Rich	Iron Rich	Others
Av. Deposition Rate (mg/m2/day)	Current	30	0	4	15	0	4	6	25	0
	Previous	38	1	9	20	0	6	14	53	0

Figure 6

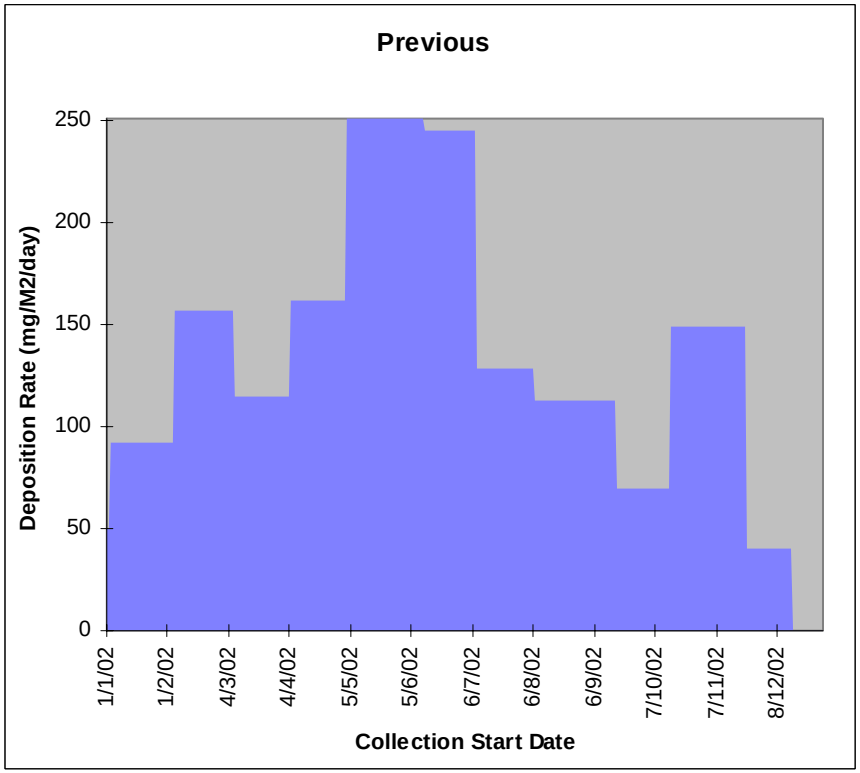
Deposit Gauge Analysis Report

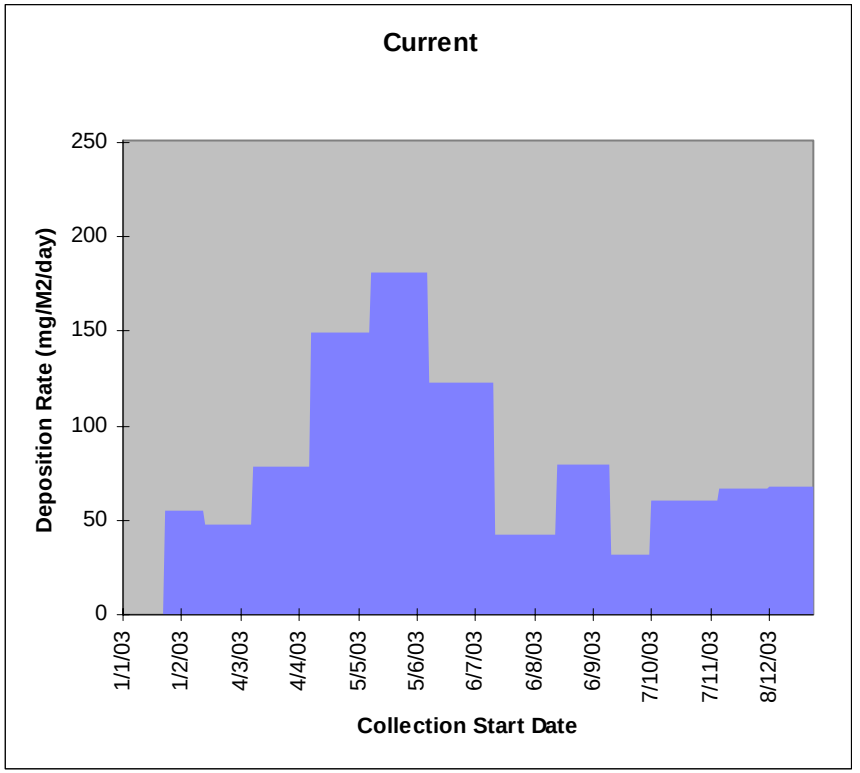
24, Prince Street, Port Talbot

Comparison of Fallout Rate with Time

Current Period = 01-Jan-03 to 31-Dec-03

Previous Period = 01-Jan-02 to 31-Dec-02





Period	Fallout Level (mg/M2/day)		No. Samples	% Data Capture	200 mg/M2/day 'Nuisance Limit'	
	Average	Maximum			Days within 10% of	Days Exceeding
Current	85	181	12	94.0	30	0
Previous	141	251	11	95.5	0	66
Change	-56	Decrease -40%				

Figure 7

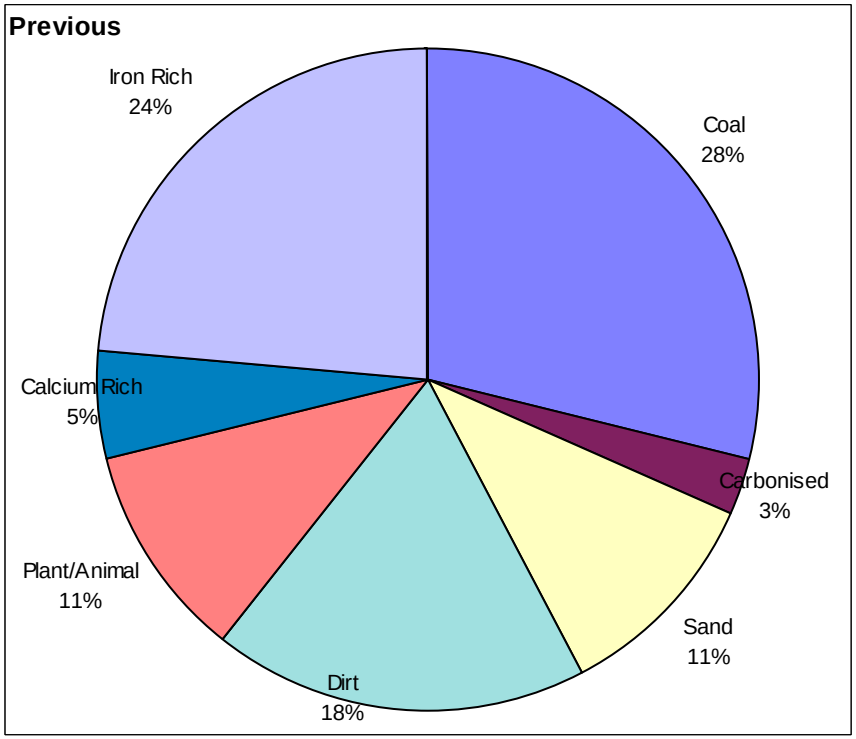
Deposit Gauge Analysis Report

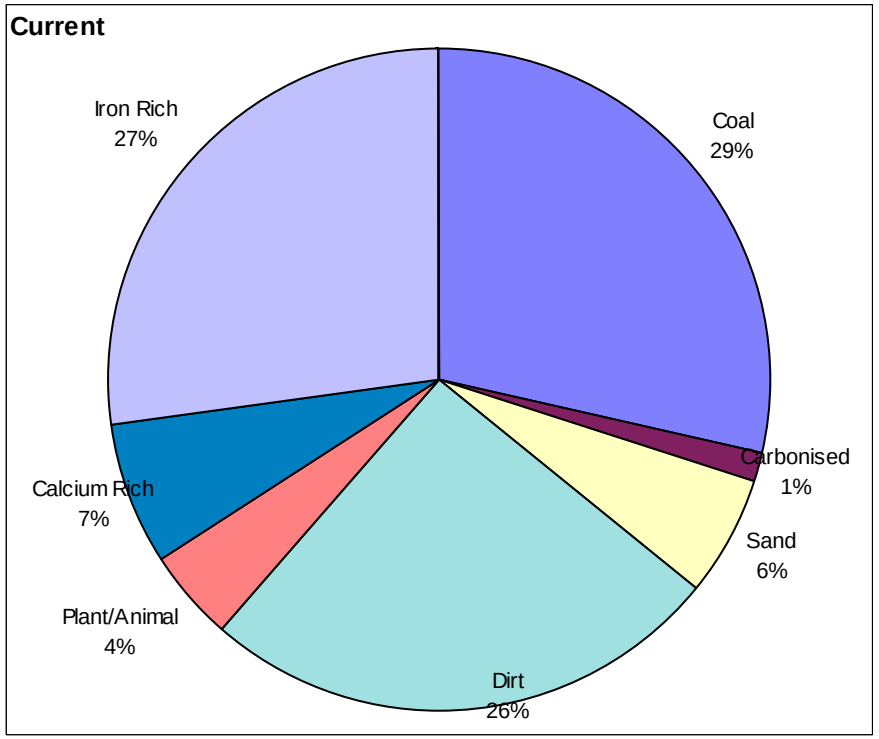
Ffrwdwyllt House, Margam Road, Port Talbot

Comparison of Fallout Composition

Current Period = 01-Jan-03 to 31-Dec-03

Previous Period = 01-Jan-02 to 31-Dec-02





Measurement Type	Period	Coal	Carbonised	Sand	Dirt	Fly Ash	Plant/Animal	Calcium Rich	Iron Rich	Others
Av. Deposition Rate (mg/m2/day)	Current	20	1	4	18	0	3	5	19	0
	Previous	11	1	4	7	0	4	2	9	0

Figure 8

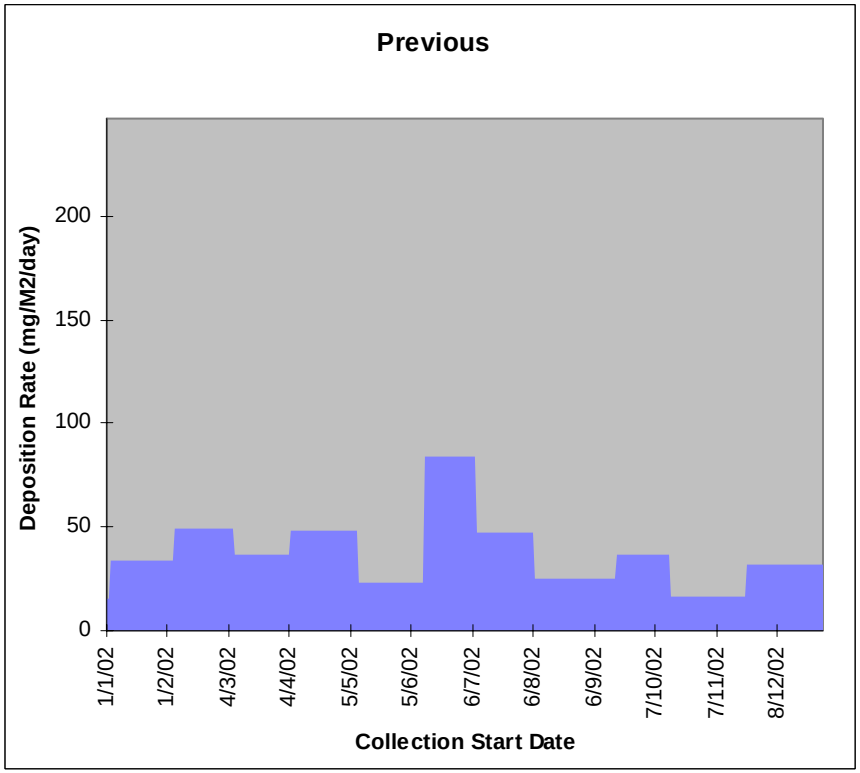
Deposit Gauge Analysis Report

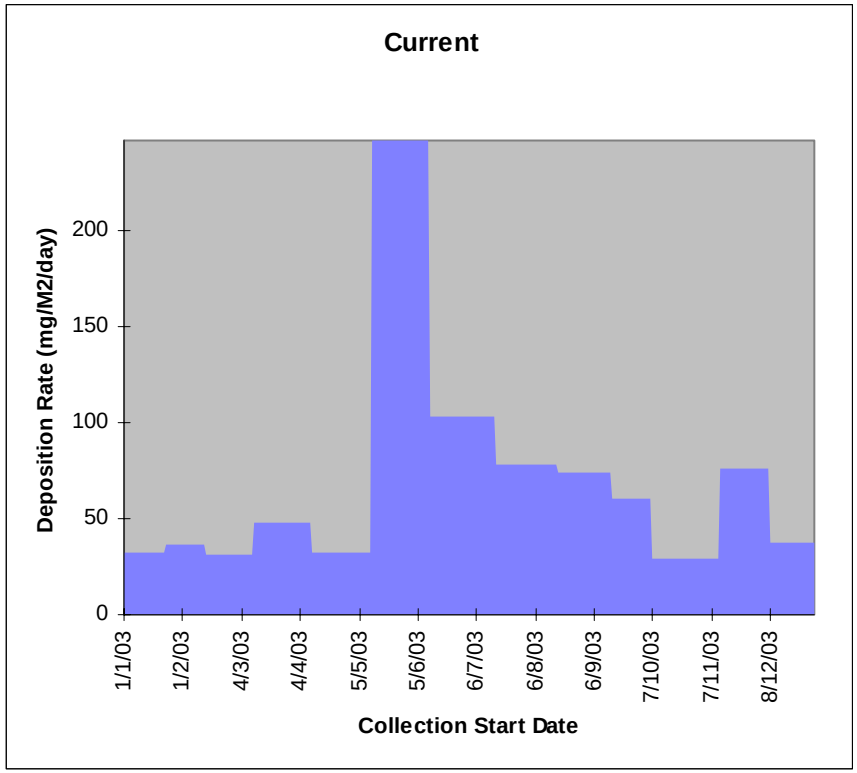
Ffrwdwyllt House, Margam Road, Port Talbot

Comparison of Fallout Rate with Time

Current Period = 01-Jan-03 to 31-Dec-03

Previous Period = 01-Jan-02 to 31-Dec-02





Period	Fallout Level (mg/M2/day)		No. Samples	% Data Capture	200 mg/M2/day 'Nuisance Limit'	
	Average	Maximum			Days within 10% of	Days Exceeding
Current	70	247	12	100.0	0	30
Previous	37	84	12	100.0	0	0
Change	33	Increase 89%				

Figure 9

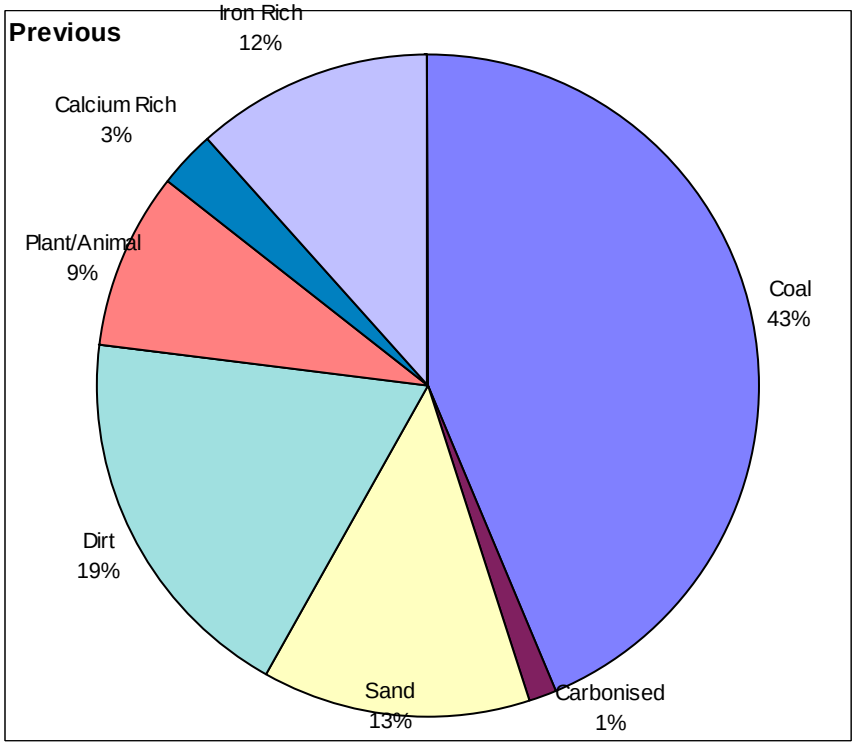
Deposit Gauge Analysis Report

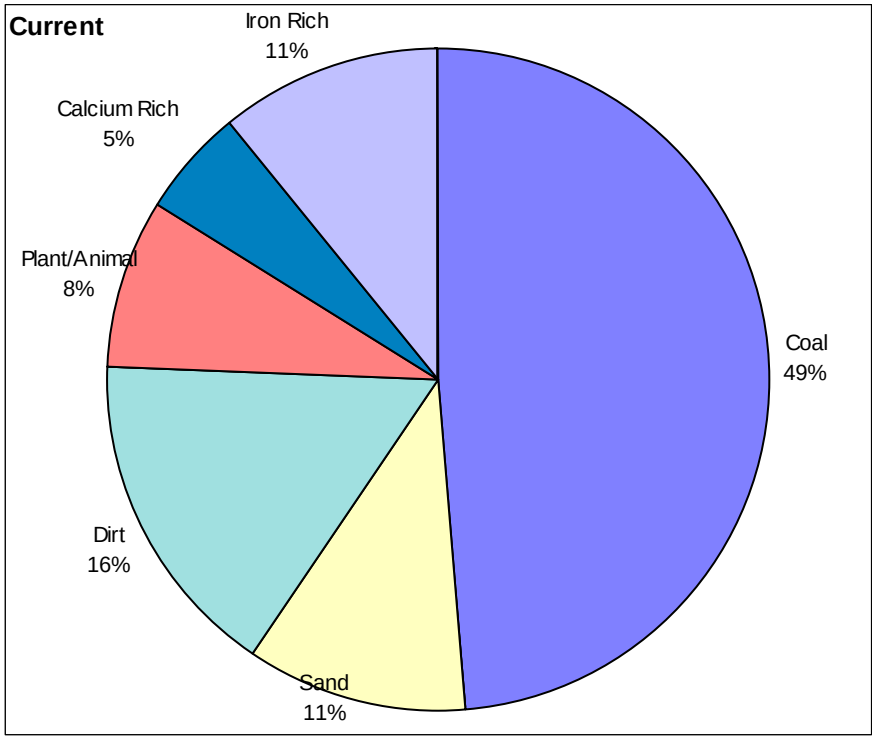
Eglwys Nunydd Resevoir, Port Talbot

Comparison of Fallout Composition

Current Period = 01-Jan-03 to 31-Dec-03

Previous Period = 01-Jan-02 to 31-Dec-02





Measurement Type	Period	Coal	Carbonised	Sand	Dirt	Fly Ash	Plant/Animal	Calcium Rich	Iron Rich	Others
Av. Deposition Rate (mg/m2/day)	Current	18	0	4	6	0	3	2	4	0
	Previous	30	1	9	13	0	6	2	8	0

Figure 10

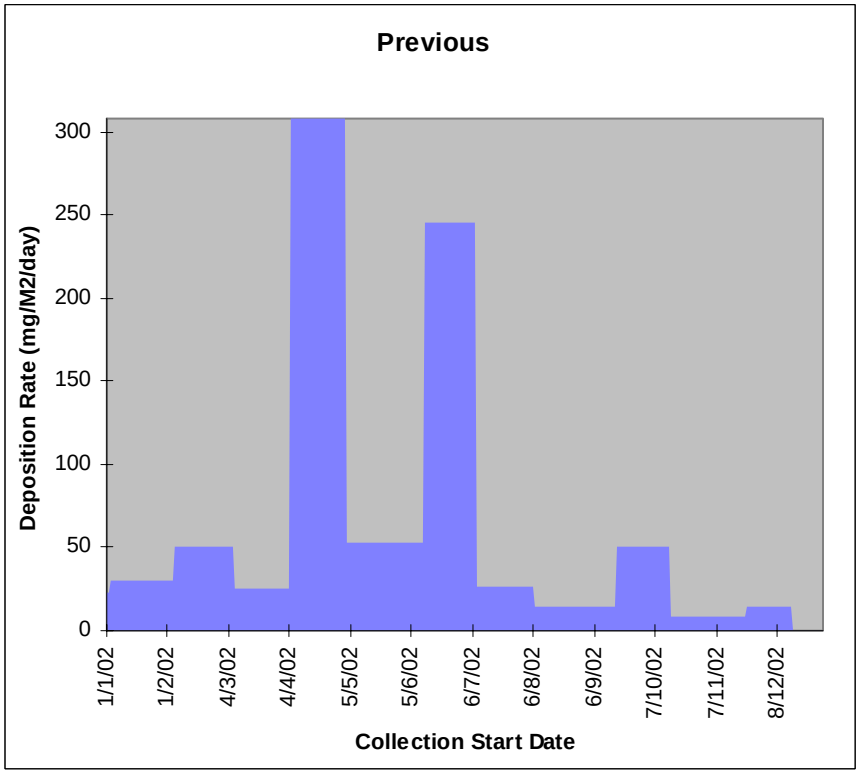
Deposit Gauge Analysis Report

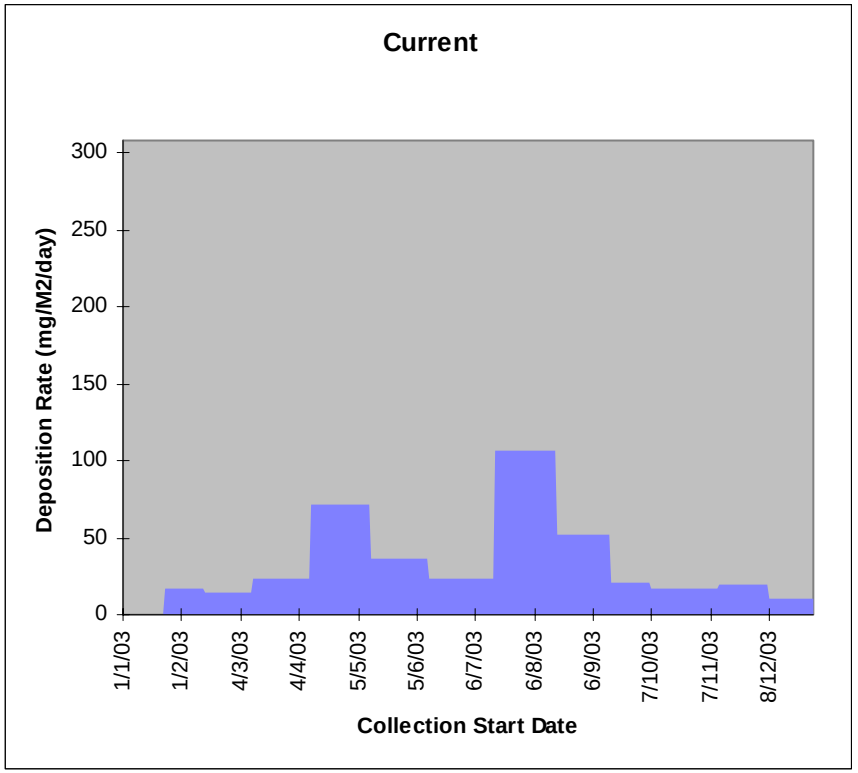
Eglwys Nunydd Resevoir, Port Talbot

Comparison of Fallout Rate with Time

Current Period = 01-Jan-03 to 31-Dec-03

Previous Period = 01-Jan-02 to 31-Dec-02





Period	Fallout Level (mg/M2/day)		No. Samples	% Data Capture	200 mg/M2/day 'Nuisance Limit'	
	Average	Maximum			Days within 10% of	Days Exceeding
Current	36	107	12	94.0	0	0
Previous	68	308	11	95.5	0	54
Change	-32	Decrease -47%				

Figure 11

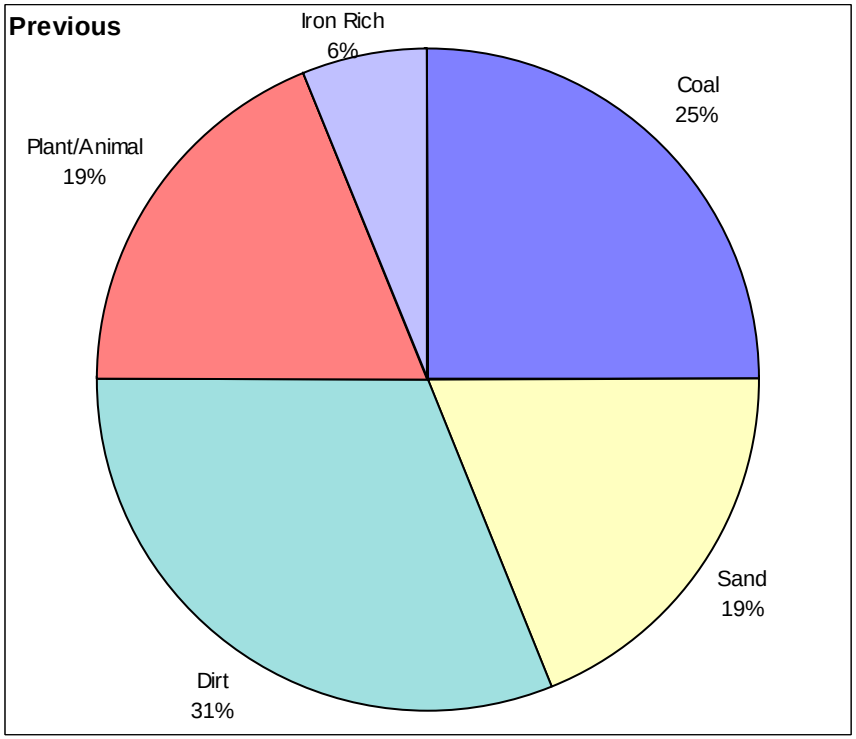
Deposit Gauge Analysis Report

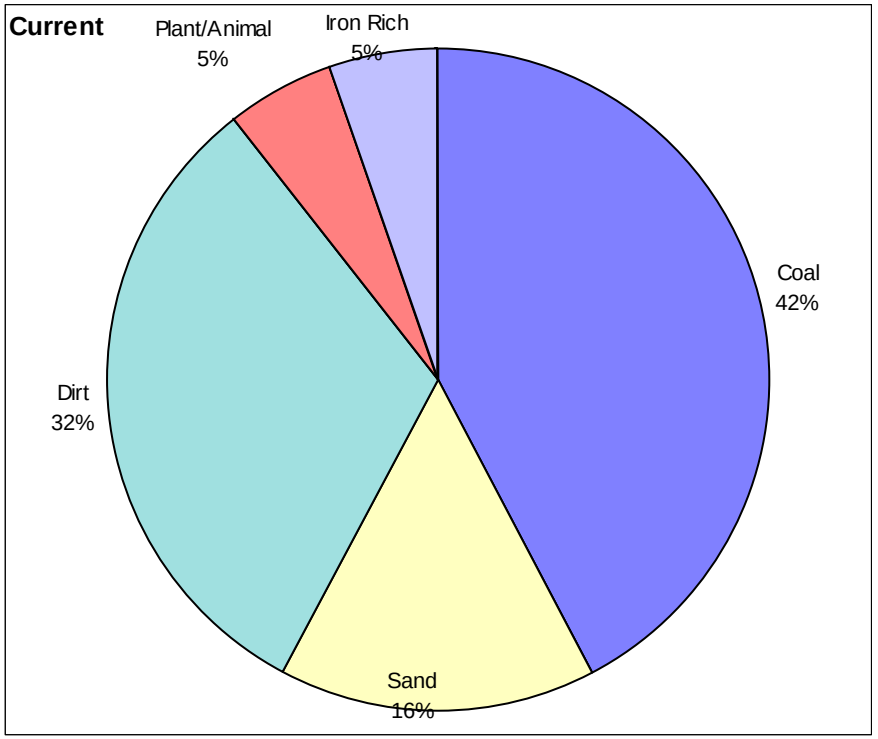
Primary School, Gwaen Cae Gurwen

Comparison of Fallout Composition

Current Period = 01-Jan-03 to 31-Dec-03

Previous Period = 01-Jan-02 to 31-Dec-02





Measurement Type	Period	Coal	Carbonised	Sand	Dirt	Fly Ash	Plant/Animal	Calcium Rich	Iron Rich	Others
Av. Deposition Rate (mg/m2/day)	Current	8	0	3	6	0	1	0	1	0
	Previous	4	0	3	5	0	3	0	1	0

Figure 12

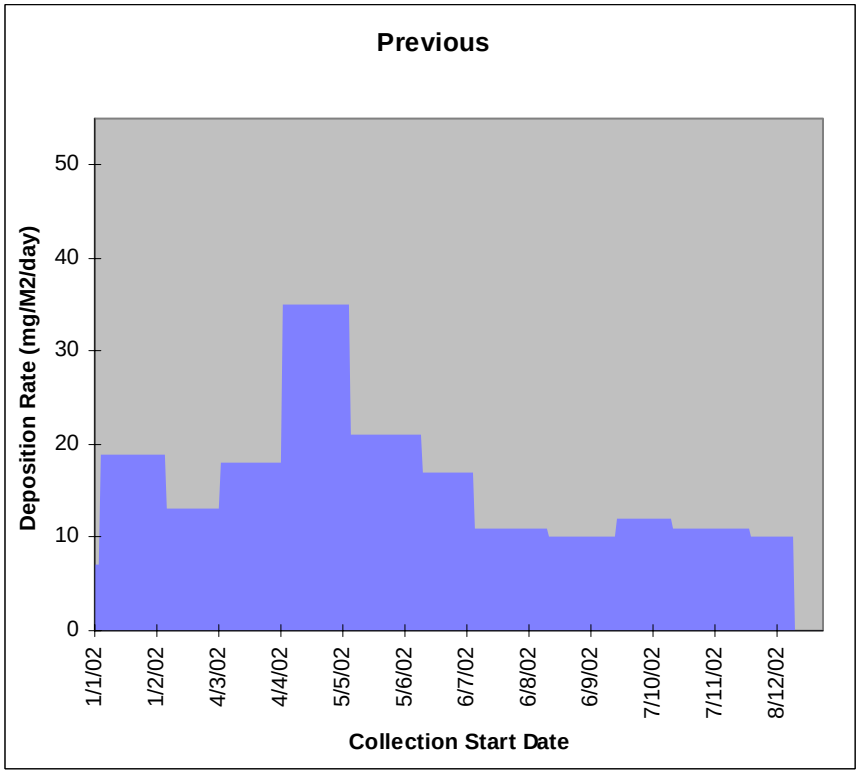
Deposit Gauge Analysis Report

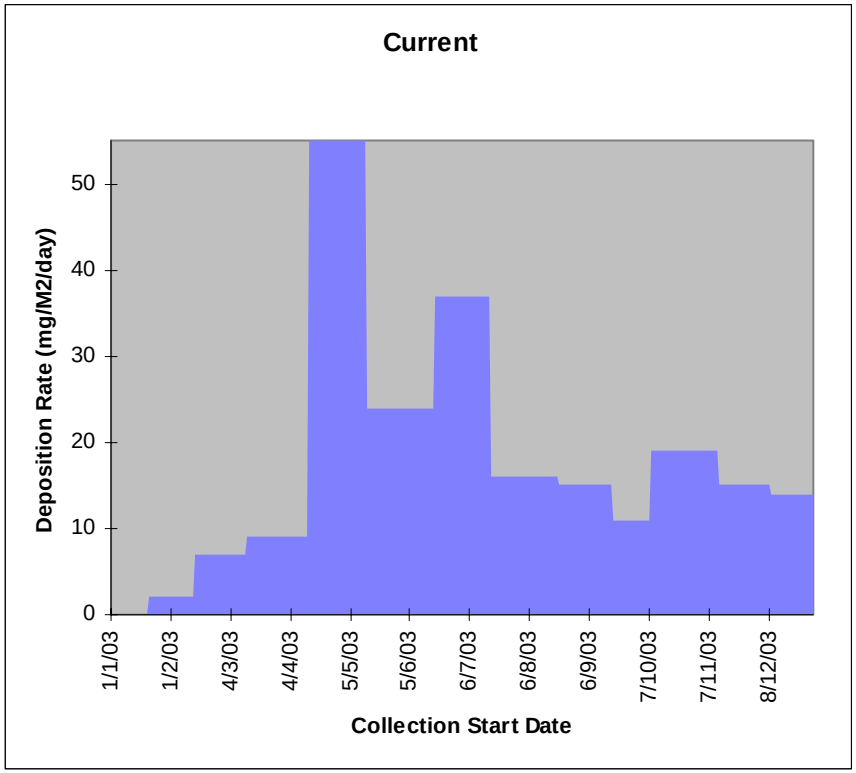
Primary School, Gwaen Cae Gurwen

Comparison of Fallout Rate with Time

Current Period = 01-Jan-03 to 31-Dec-03

Previous Period = 01-Jan-02 to 31-Dec-02





Period	Fallout Level (mg/M2/day)		No. Samples	% Data Capture	200 mg/M2/day 'Nuisance Limit'	
	Average	Maximum			Days within 10% of	Days Exceeding
Current	19	55	12	94.5	0	0
Previous	16	35	11	95.8	0	0
Change	3	Increase 19%				

Figure 13

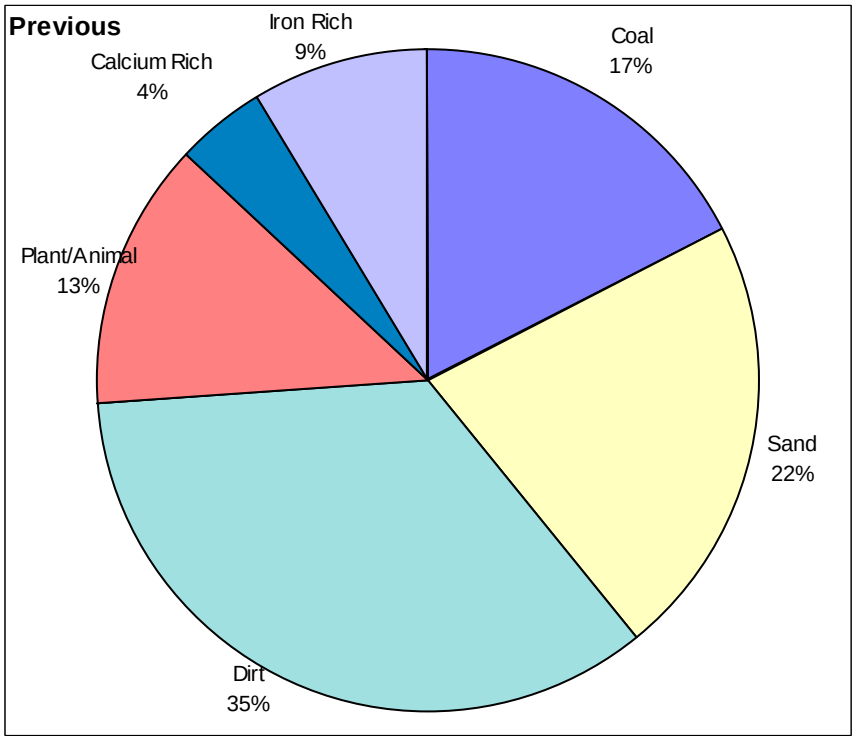
Deposit Gauge Analysis Report

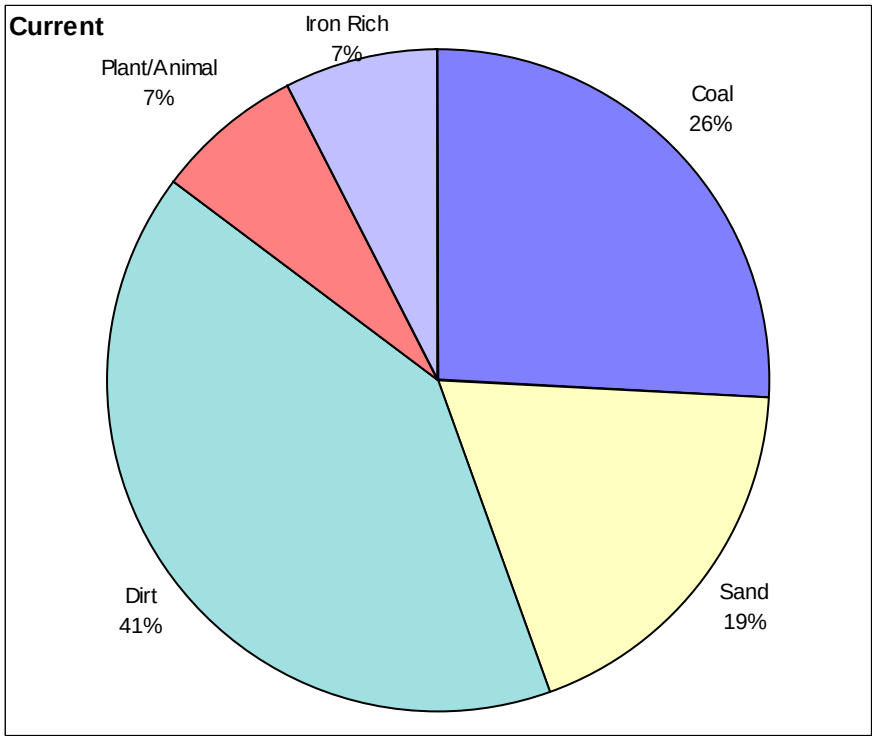
Workingmens Club, Tairgwaith

Comparison of Fallout Composition

Current Period = 01-Jan-03 to 31-Dec-03

Previous Period = 01-Jan-02 to 31-Dec-02





Measurement Type	Period	Coal	Carbonised	Sand	Dirt	Fly Ash	Plant/Animal	Calcium Rich	Iron Rich	Others
Av. Deposition Rate (mg/m2/day)	Current	7	0	5	11	0	2	0	2	0
	Previous	4	0	5	8	0	3	1	2	0

Figure 14

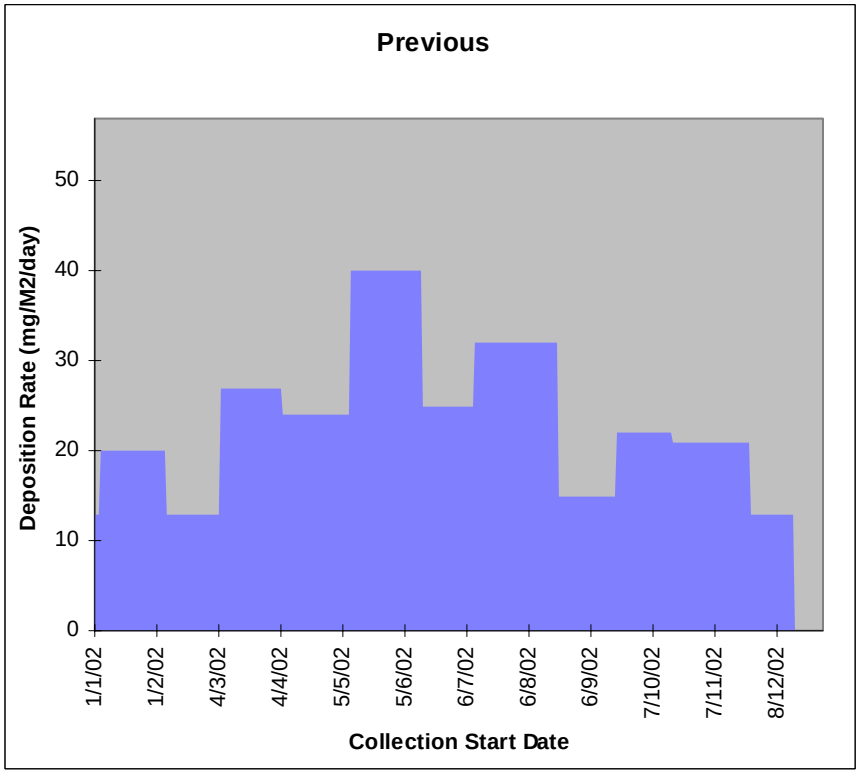
Deposit Gauge Analysis Report

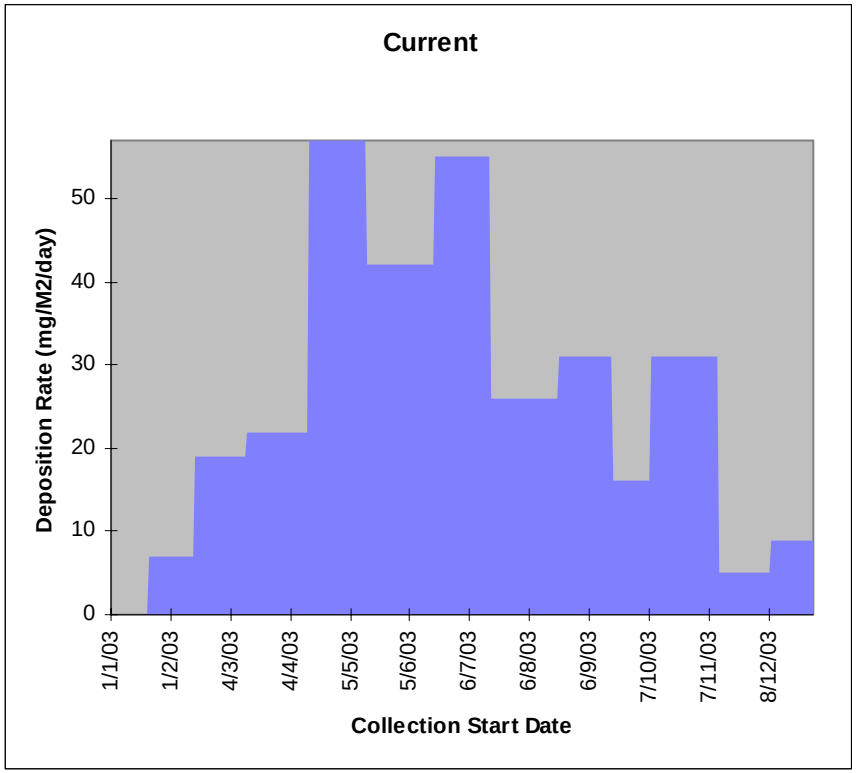
Workingmens Club, Tairgwaith

Comparison of Fallout Rate with Time

Current Period = 01-Jan-03 to 31-Dec-03

Previous Period = 01-Jan-02 to 31-Dec-02





Period	Fallout Level (mg/M2/day)		No. Samples	% Data Capture	200 mg/M2/day 'Nuisance Limit'	
	Average	Maximum			Days within 10% of	Days Exceeding
Current	28	57	12	94.5	0	0
Previous	24	40	11	95.8	0	0
Change	4	Increase 17%				

Figure 15

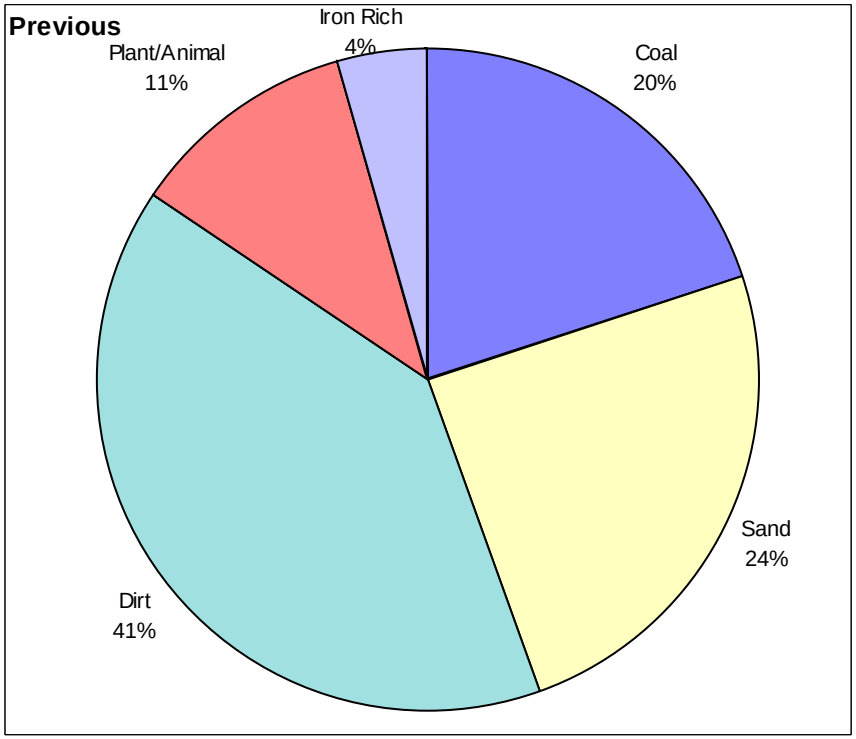
Deposit Gauge Analysis Report

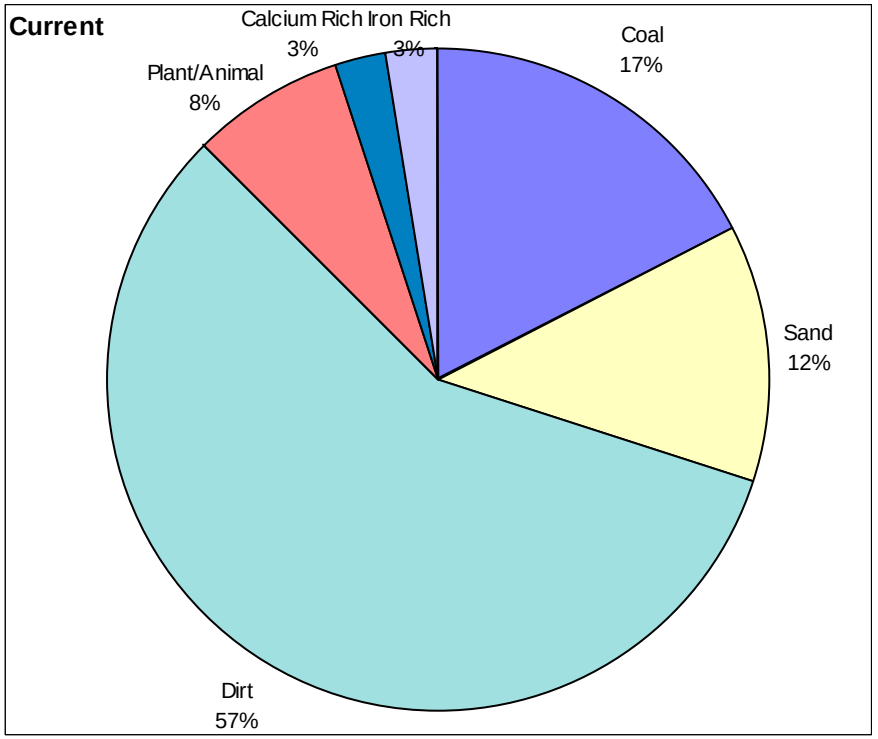
41, Parish Road, Cwmgwrach

Comparison of Fallout Composition

Current Period = 01-Jan-03 to 31-Dec-03

Previous Period = 01-Jan-02 to 31-Dec-02





Measurement Type	Period	Coal	Carbonised	Sand	Dirt	Fly Ash	Plant/Animal	Calcium Rich	Iron Rich	Others
Av. Deposition Rate (mg/m2/day)	Current	7	0	5	23	0	3	1	1	0
	Previous	9	0	11	18	0	5	0	2	0

Figure 16

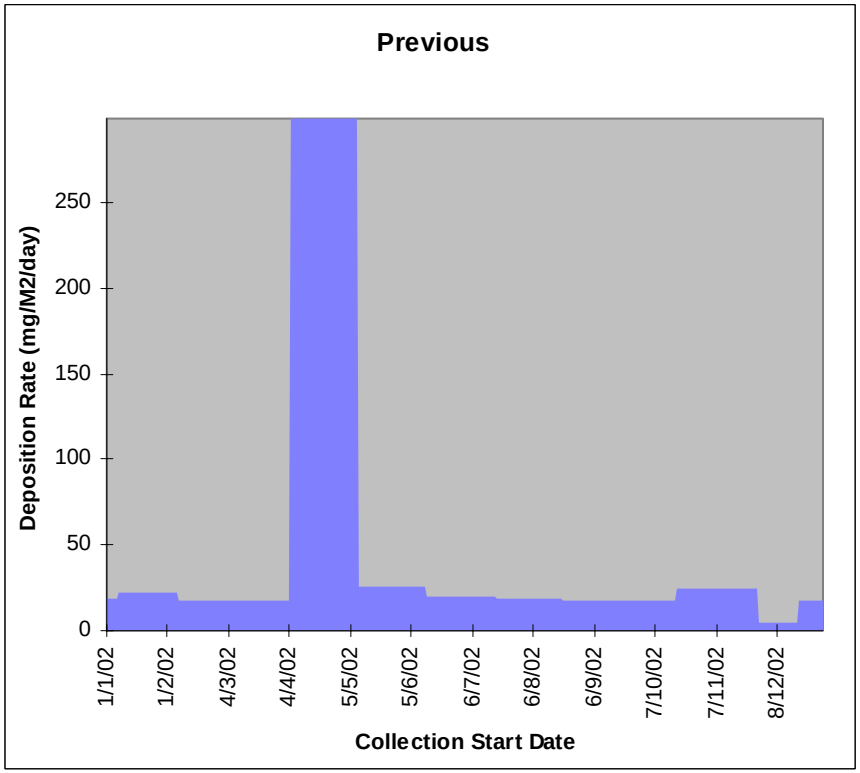
Deposit Gauge Analysis Report

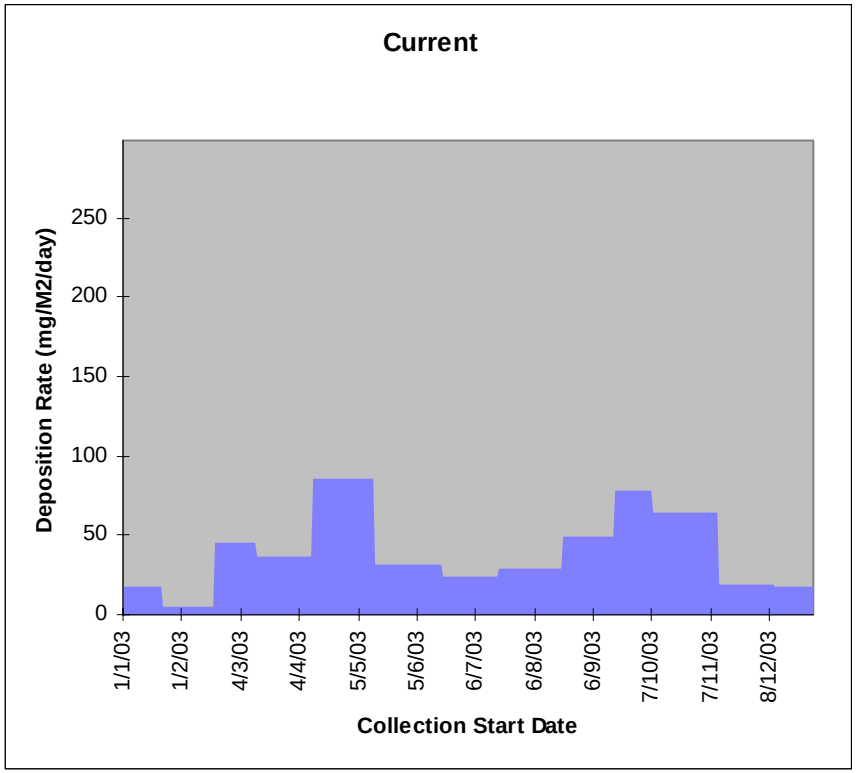
41, Parish Road, Cwmgwrach

Comparison of Fallout Rate with Time

Current Period = 01-Jan-03 to 31-Dec-03

Previous Period = 01-Jan-02 to 31-Dec-02





Period	Fallout Level (mg/M2/day)		No. Samples	% Data Capture	200 mg/M2/day 'Nuisance Limit'	
	Average	Maximum			Days within 10% of	Days Exceeding
Current	39	86	12	100.0	0	0
Previous	46	299	12	100.0	0	34
Change	-7	Decrease -15%				

Figure 17

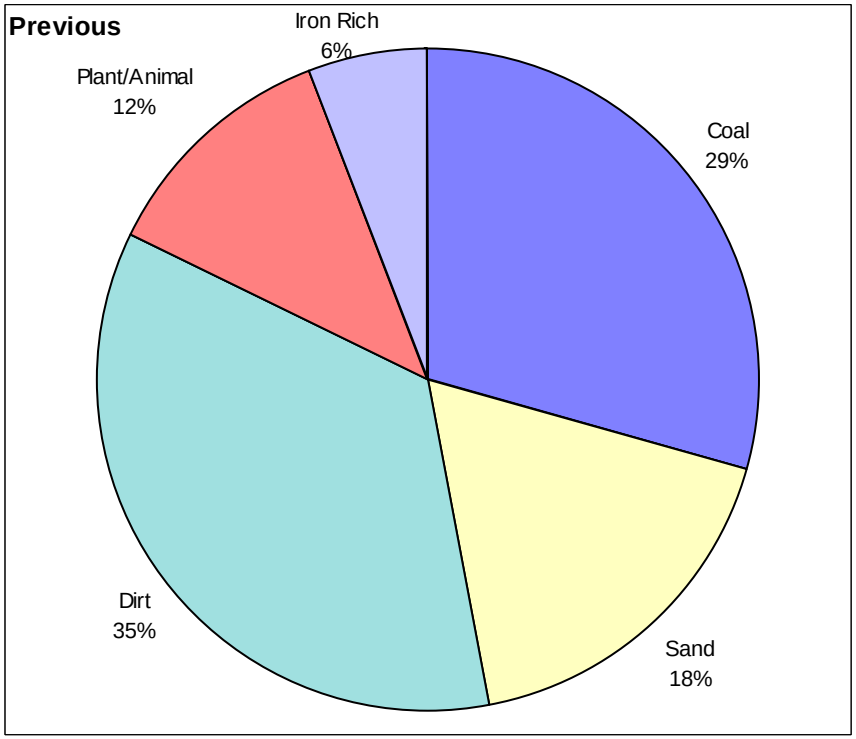
Deposit Gauge Analysis Report

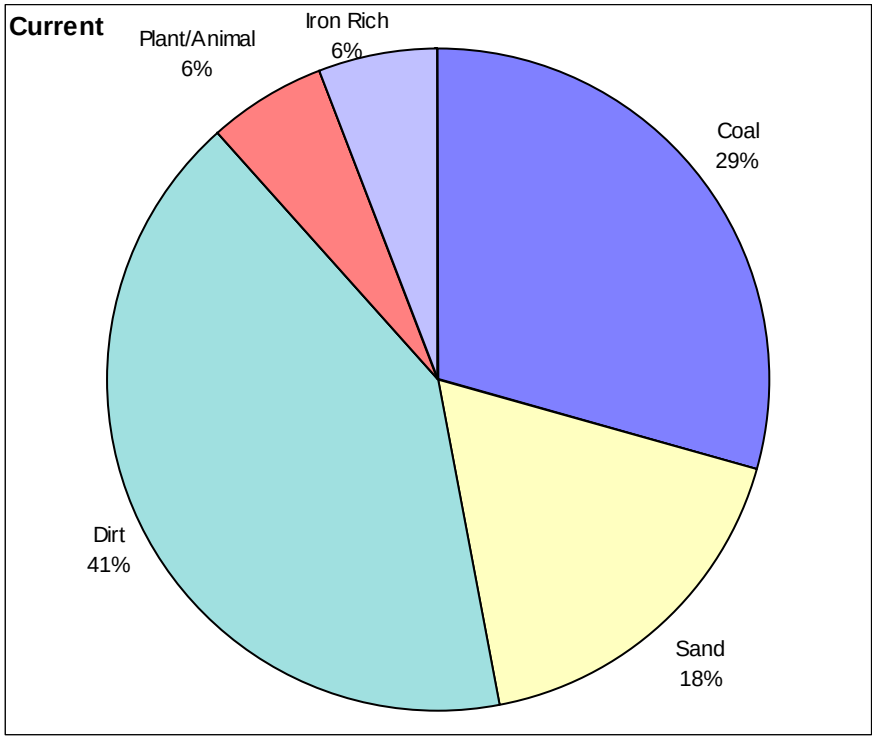
2, Llygad Yr Haul, Glynneath

Comparison of Fallout Composition

Current Period = 01-Jan-03 to 31-Dec-03

Previous Period = 01-Jan-02 to 31-Dec-02





Measurement Type	Period	Coal	Carbonised	Sand	Dirt	Fly Ash	Plant/Animal	Calcium Rich	Iron Rich	Others
Av. Deposition Rate (mg/m2/day)	Current	5	0	3	7	0	1	0	1	0
	Previous	5	0	3	6	0	2	0	1	0

Figure 18

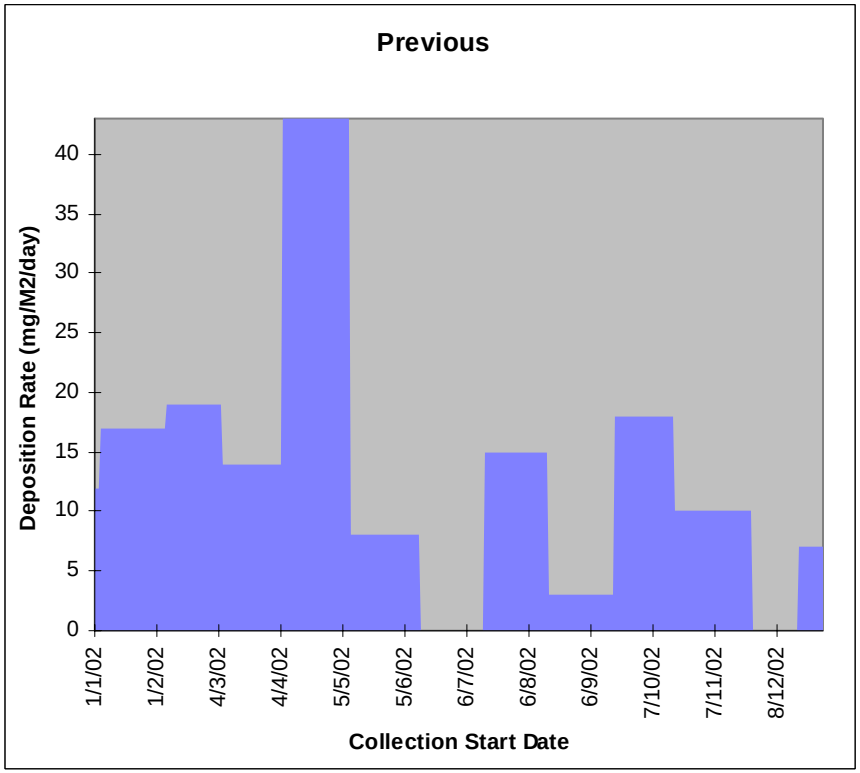
Deposit Gauge Analysis Report

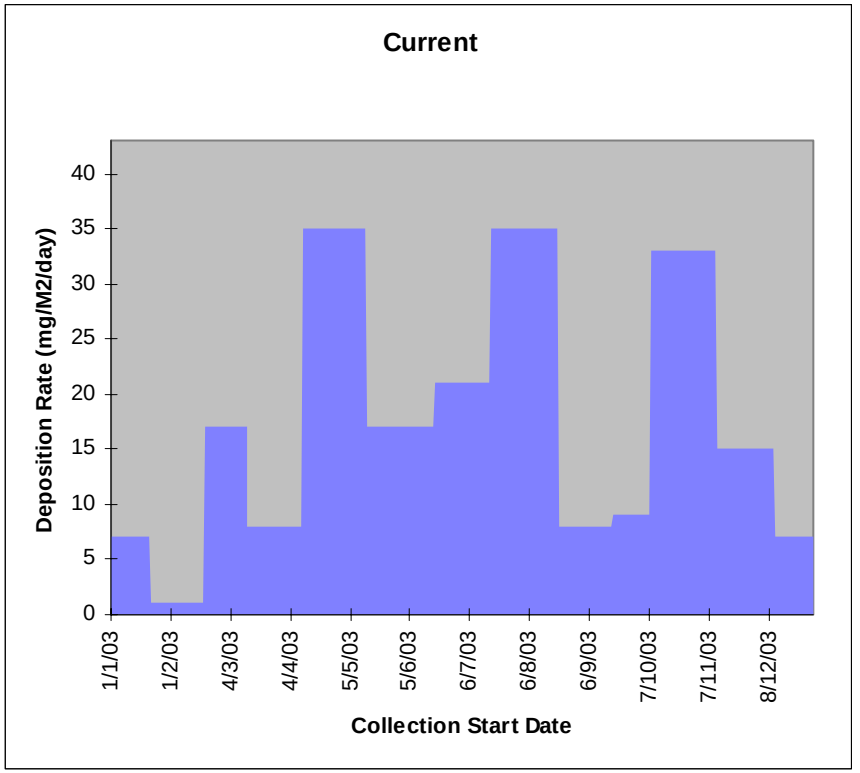
2, Llygad Yr Haul, Glynneath

Comparison of Fallout Rate with Time

Current Period = 01-Jan-03 to 31-Dec-03

Previous Period = 01-Jan-02 to 31-Dec-02





Period	Fallout Level (mg/M2/day)		No. Samples	% Data Capture	200 mg/M2/day 'Nuisance Limit'	
	Average	Maximum			Days within 10% of	Days Exceeding
Current	18	35	12	100.0	0	0
Previous	16	43	10	84.6	0	0
Change	2	Increase 13%				

Figure 19

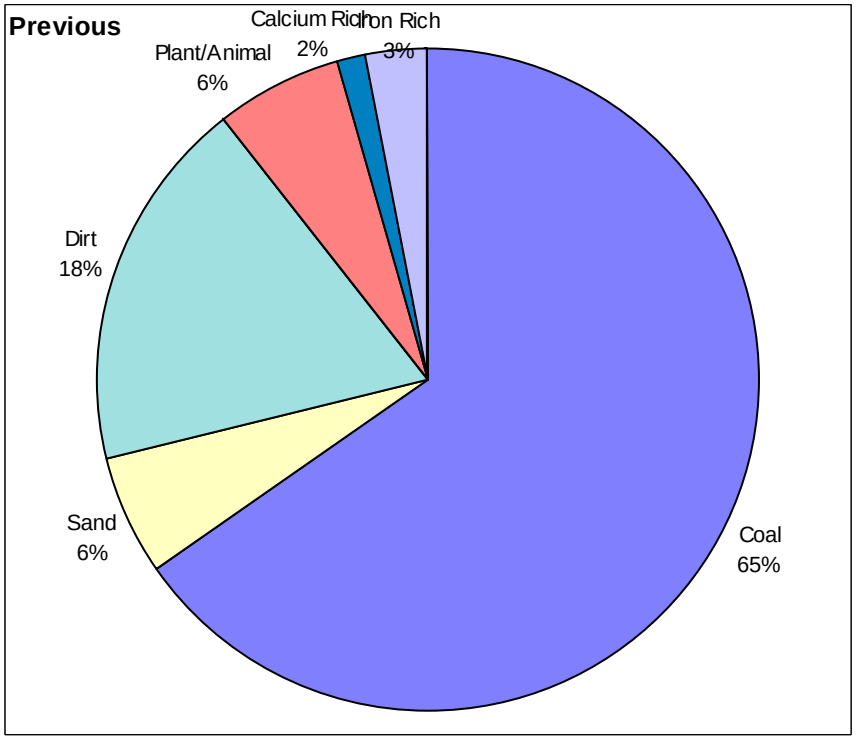
Deposit Gauge Analysis Report

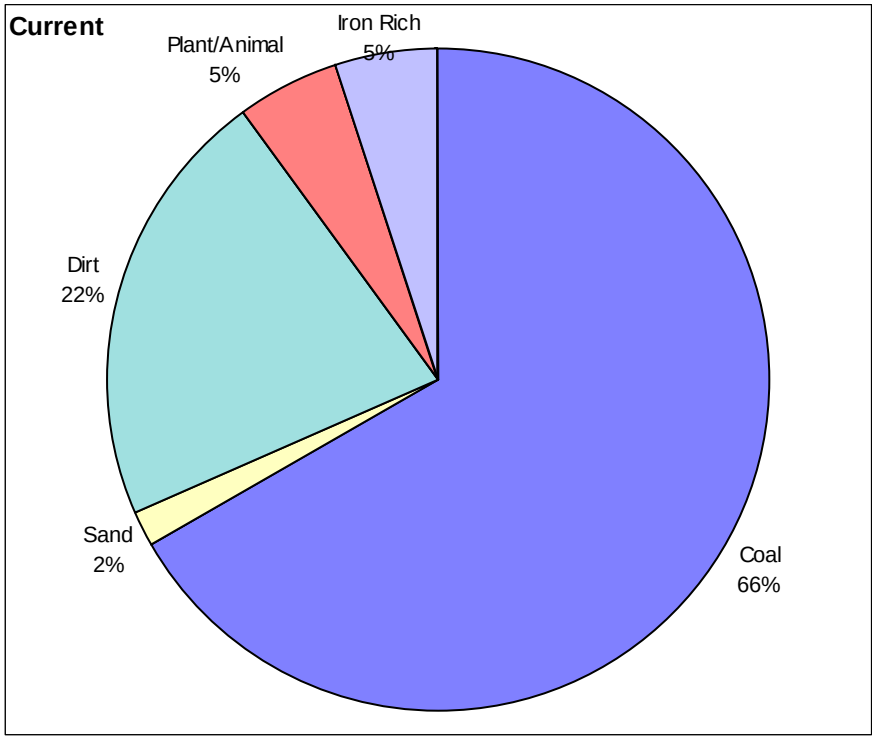
11, Wembley Avenue, Onllwyn

Comparison of Fallout Composition

Current Period = 01-Jan-03 to 31-Dec-03

Previous Period = 01-Jan-02 to 31-Dec-02





Measurement Type	Period	Coal	Carbonised	Sand	Dirt	Fly Ash	Plant/Animal	Calcium Rich	Iron Rich	Others
Av. Deposition Rate (mg/m2/day)	Current	40	0	1	13	0	3	0	3	0
	Previous	43	0	4	12	0	4	1	2	0

Figure 20

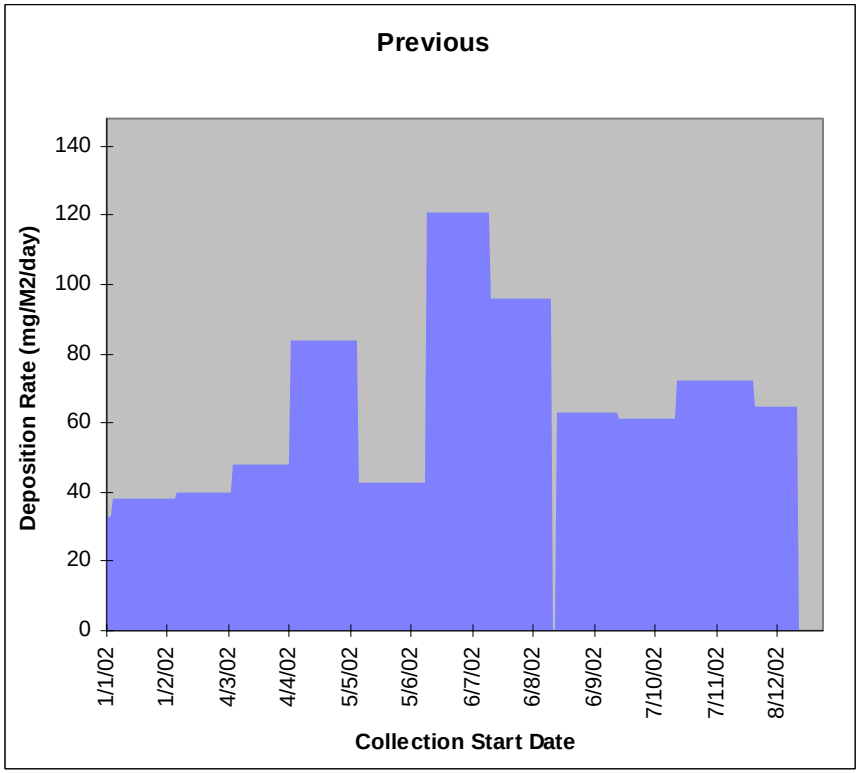
Deposit Gauge Analysis Report

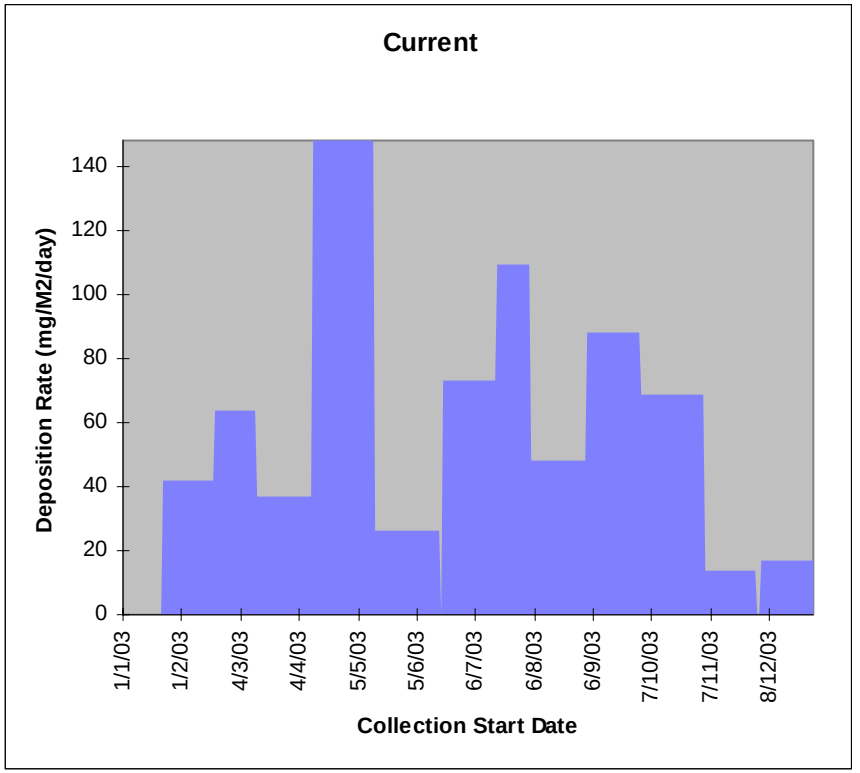
11, Wembley Avenue, Onllwyn

Comparison of Fallout Rate with Time

Current Period = 01-Jan-03 to 31-Dec-03

Previous Period = 01-Jan-02 to 31-Dec-02





Period	Fallout Level (mg/M2/day)		No. Samples	% Data Capture	200 mg/M2/day 'Nuisance Limit'	
	Average	Maximum			Days within 10% of	Days Exceeding
Current	60	148	12	93.1	0	0
Previous	67	121	11	95.8	0	0
Change	-7	Decrease -10%				

Figure 21

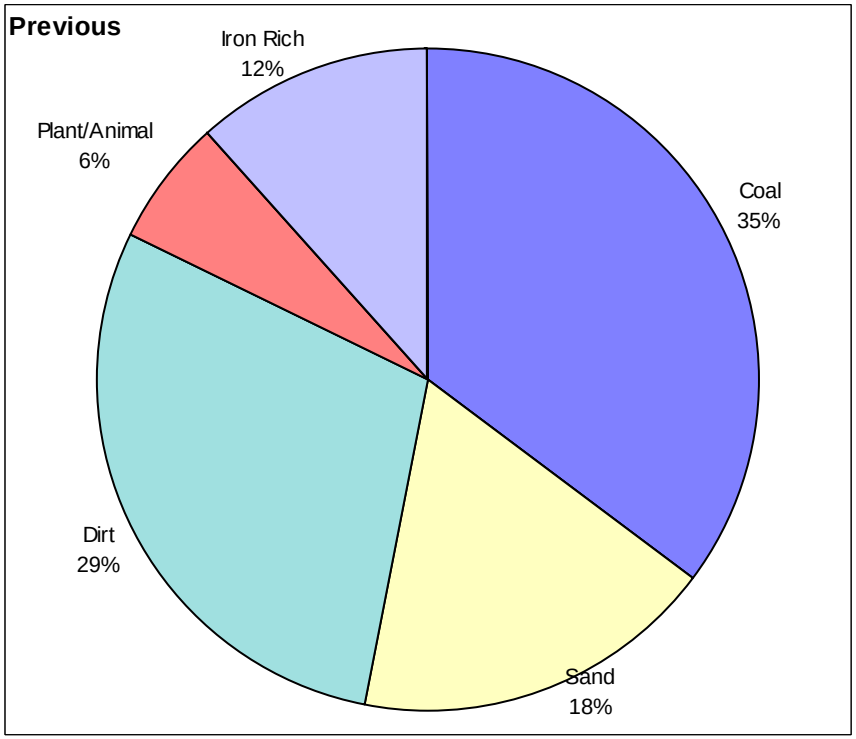
Deposit Gauge Analysis Report

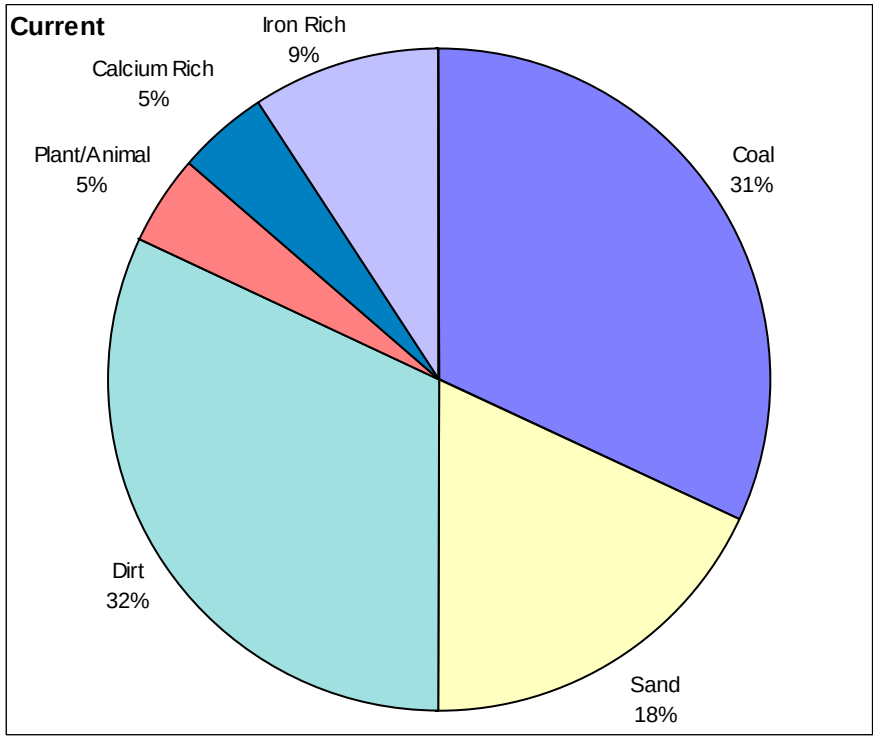
Cardonnel Road, Skewen

Comparison of Fallout Composition

Current Period = 01-Jan-03 to 31-Dec-03

Previous Period = 01-Jan-02 to 31-Dec-02





Measurement Type	Period	Coal	Carbonised	Sand	Dirt	Fly Ash	Plant/Animal	Calcium Rich	Iron Rich	Others
Av. Deposition Rate (mg/m2/day)	Current	7	0	4	7	0	1	1	2	0
	Previous	6	0	3	5	0	1	0	2	0

Figure 22

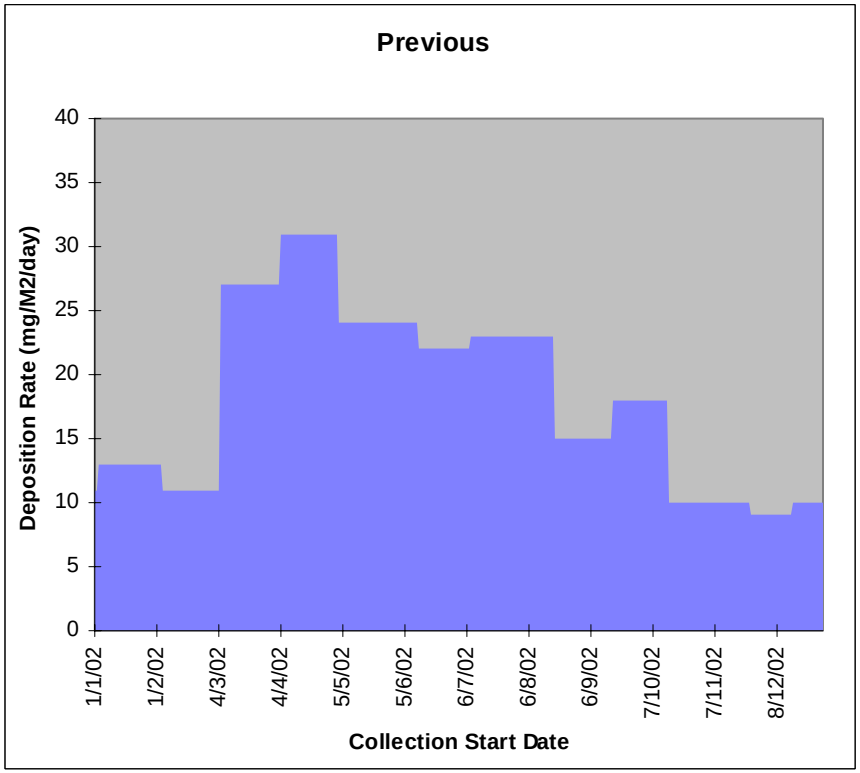
Deposit Gauge Analysis Report

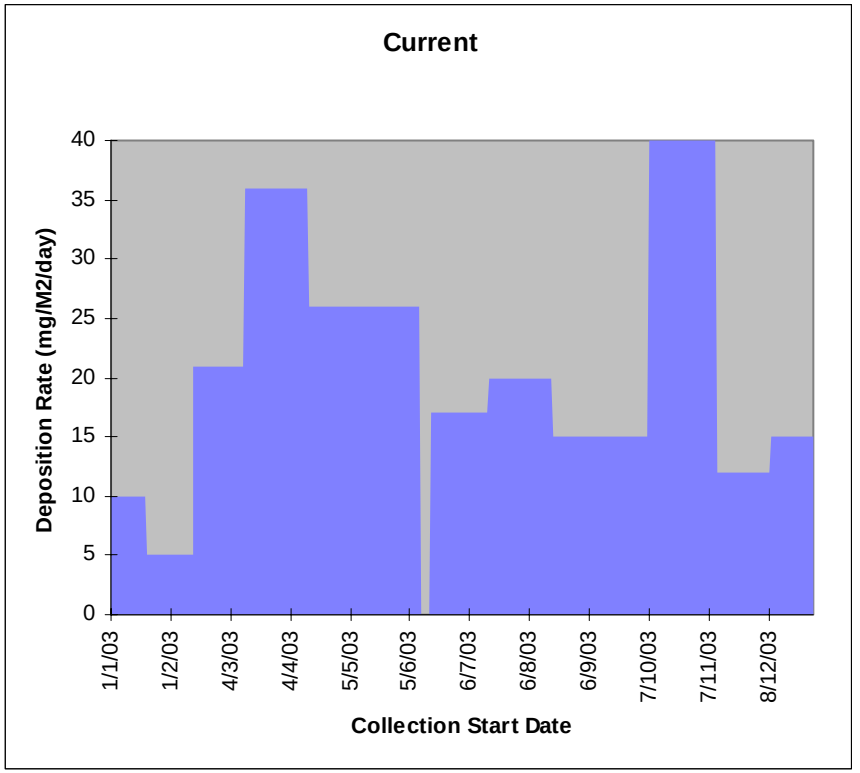
Cardonnel Road, Skewen

Comparison of Fallout Rate with Time

Current Period = 01-Jan-03 to 31-Dec-03

Previous Period = 01-Jan-02 to 31-Dec-02





Period	Fallout Level (mg/M2/day)		No. Samples	% Data Capture	200 mg/M2/day 'Nuisance Limit'	
	Average	Maximum			Days within 10% of	Days Exceeding
Current	21	40	12	98.6	0	0
Previous	18	31	12	100.0	0	0
Change	3	Increase 17%				

Figure 23

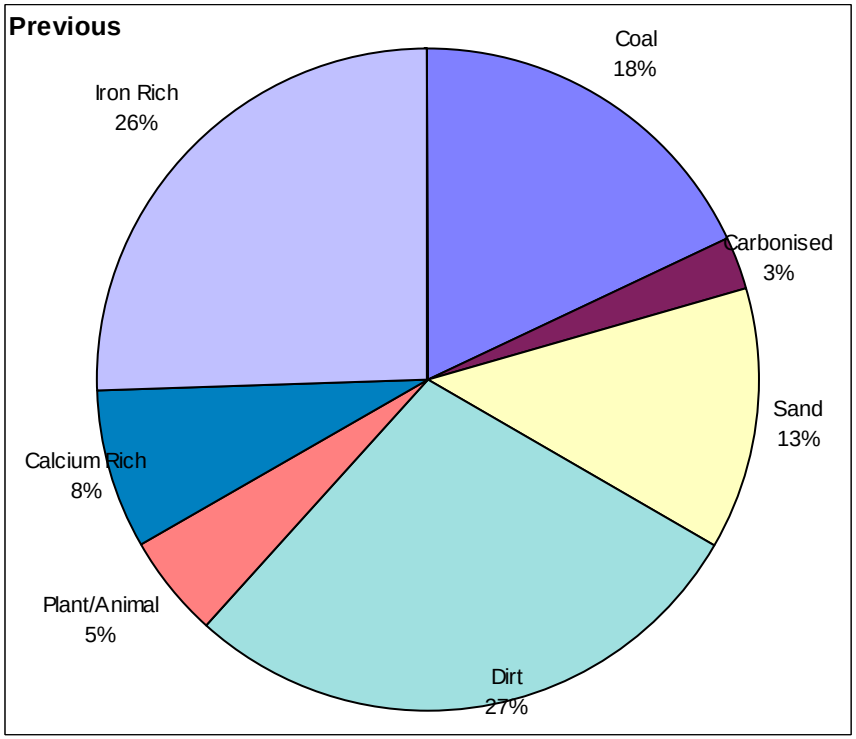
Deposit Gauge Analysis Report

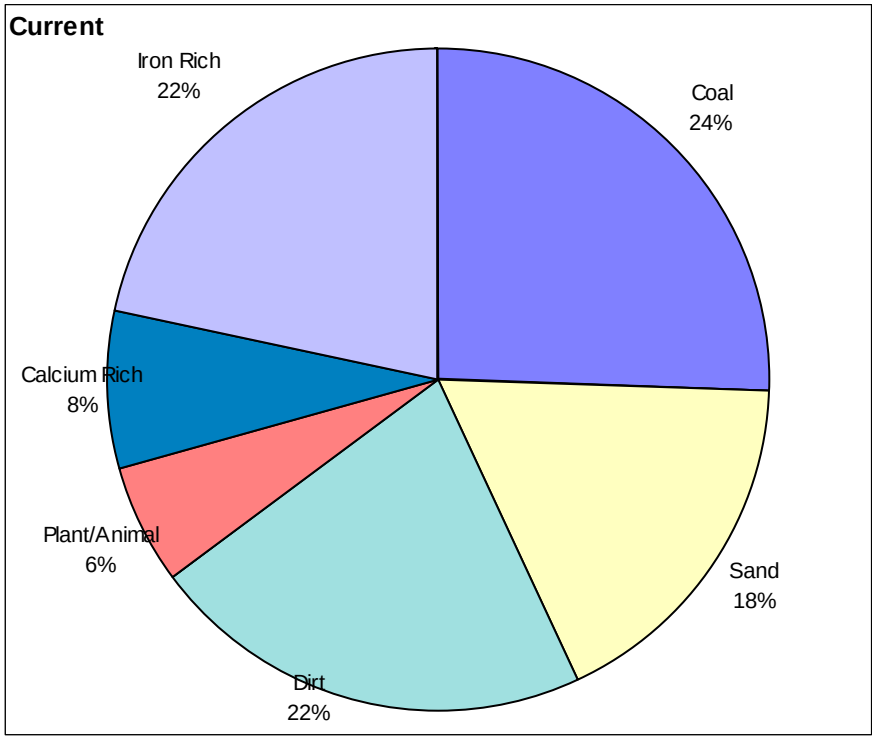
Little Warren, Port Talbot

Comparison of Fallout Composition

Current Period = 01-Jan-03 to 31-Dec-03

Previous Period = 01-Jan-02 to 31-Dec-02





Measurement Type	Period	Coal	Carbonised	Sand	Dirt	Fly Ash	Plant/Animal	Calcium Rich	Iron Rich	Others
Av. Deposition Rate (mg/M2/day)	Current	13	0	9	11	0	3	4	11	0
	Previous	7	1	5	11	0	2	3	10	0

Figure 24

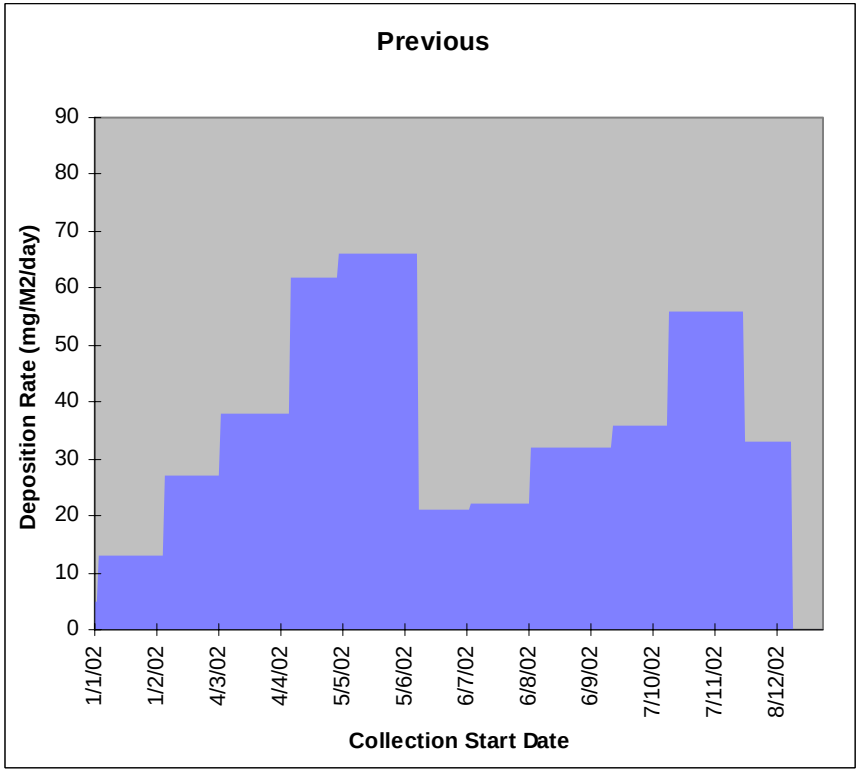
Deposit Gauge Analysis Report

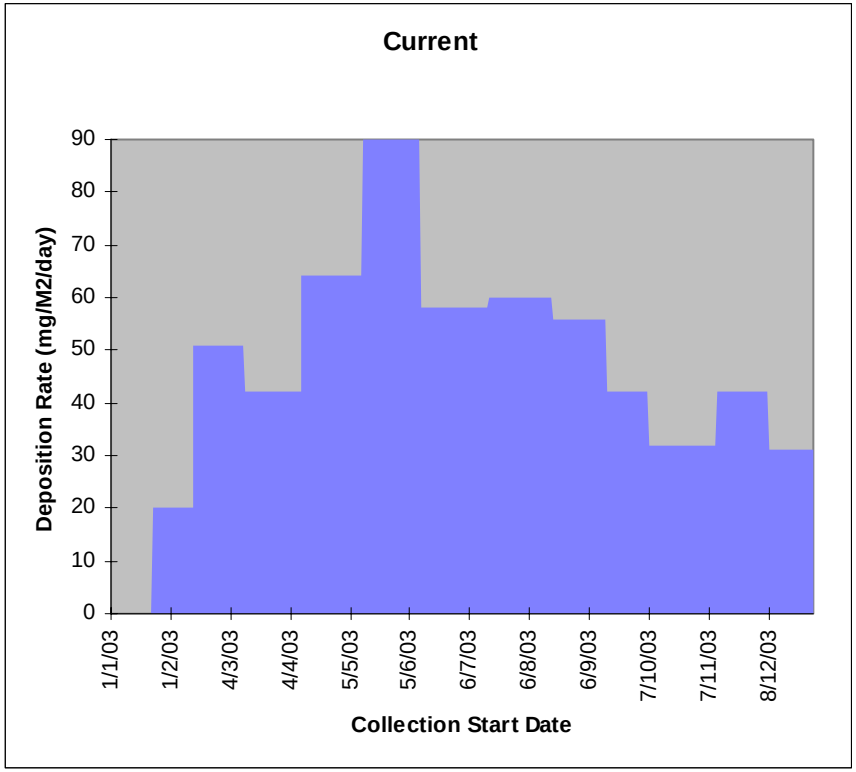
Little Warren, Port Talbot

Comparison of Fallout Rate with Time

Current Period = 01-Jan-03 to 31-Dec-03

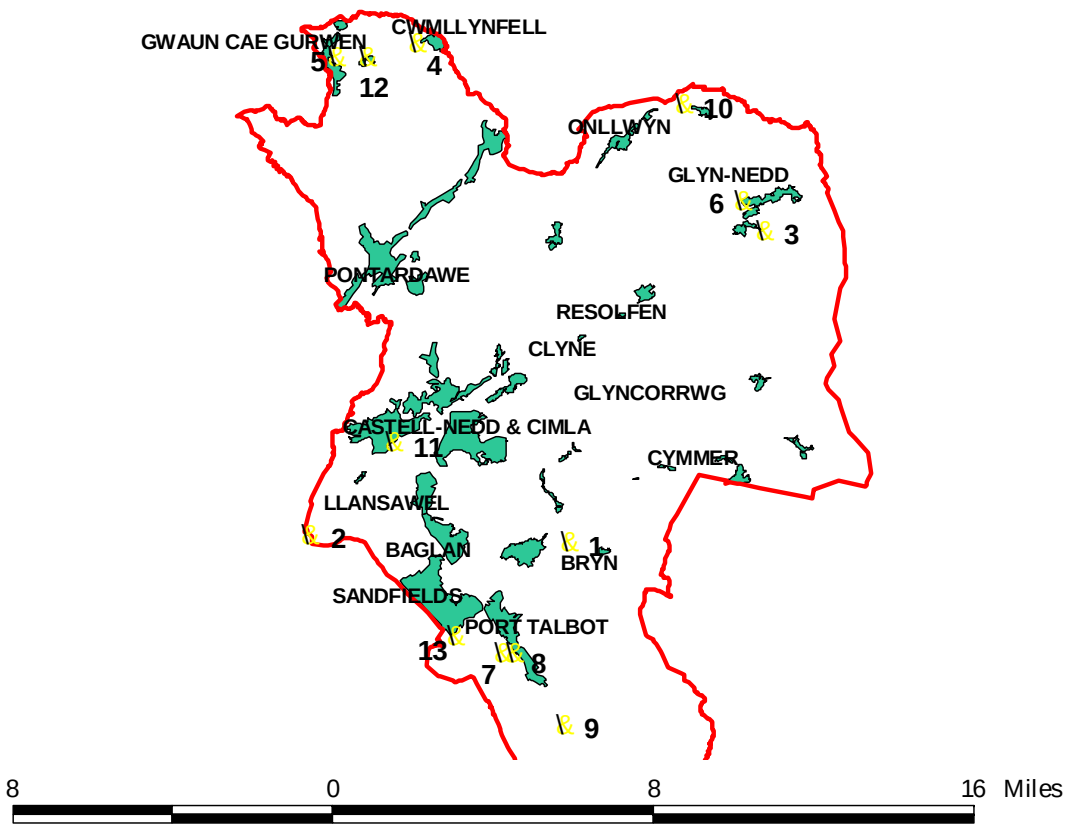
Previous Period = 01-Jan-02 to 31-Dec-02





Period	Fallout Level (mg/M2/day)		No. Samples	% Data Capture	200 mg/M2/day 'Nuisance Limit'	
	Average	Maximum			Days within 10% of	Days Exceeding
Current	50	90	12	94.0	0	0
Previous	38	66	11	95.5	0	0
Change	12	Increase 32%				

Figure 25 Deposit gauge locations



No	Address
1	Cil Carne Farm, Bryn, Port Talbot
2	Jeremy's Oil Distributors, Baldwins Cre
3	41, Parish Road, Cwmgwrach
4	Ochwr y Waun, Cwmllynfell
5	Primary School, Gwaen Cae Gurwen
6	2, Llygad Yr Haul, Glynneath
7	Ffrwdwyllt House, Margam Road, Margam,
8	24, Prince Street, Margam, Port Talbot
9	Eglwys Nunydd Resevoir, Margam, Port Ta
10	11, Wembley Avenue, Onllwyn
11	Cardonnel Road, Skewen
12	Workingmens Club, Tairgwaith
13	Little Warren, Aberafan, Port Talbot

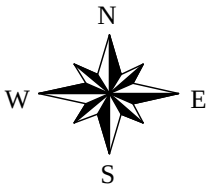


Figure 26 Comparison of average fallout rates, 2003.

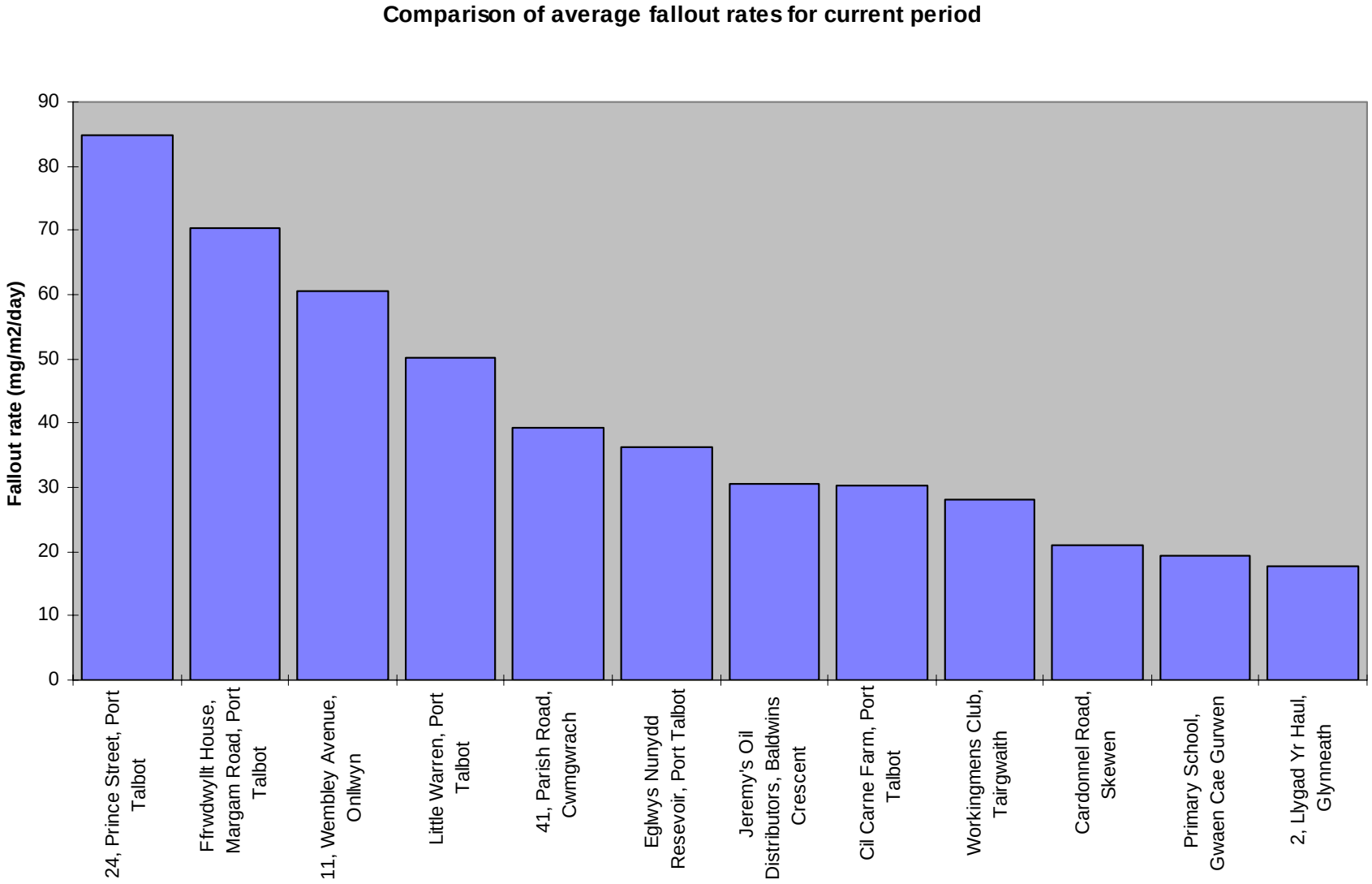


Table 1 Sites ranked by average fallout level (mg/m2/day), 2003.

Site Name	Fallout Level (mg/M2/day)		200 mg/M2/day 'Nuisance Limit'	
	Average	Maximum	Days within 10% of	Days Exceeding
24, Prince Street, Port Talbot	85	181	30	0
Ffrwdwyllt House, Margam Road, Port Talbot	70	247	0	30
11, Wembley Avenue, Onllwyn	60	148	0	0
Little Warren, Port Talbot	50	90	0	0
41, Parish Road, Cwmgwrach	39	86	0	0
Eglwys Nunydd Resevoir, Port Talbot	36	107	0	0
Jeremy's Oil Distributors, Baldwins Crescent	30	57	0	0
Cil Carne Farm, Port Talbot	30	43	0	0
Workingmens Club, Tairgwaith	28	57	0	0
Cardonnel Road, Skewen	21	40	0	0
Primary School, Gwaen Cae Gurwen	19	55	0	0
2, Llygad Yr Haul, Glynneath	18	35	0	0

Figure 27 Long term deposition rates.

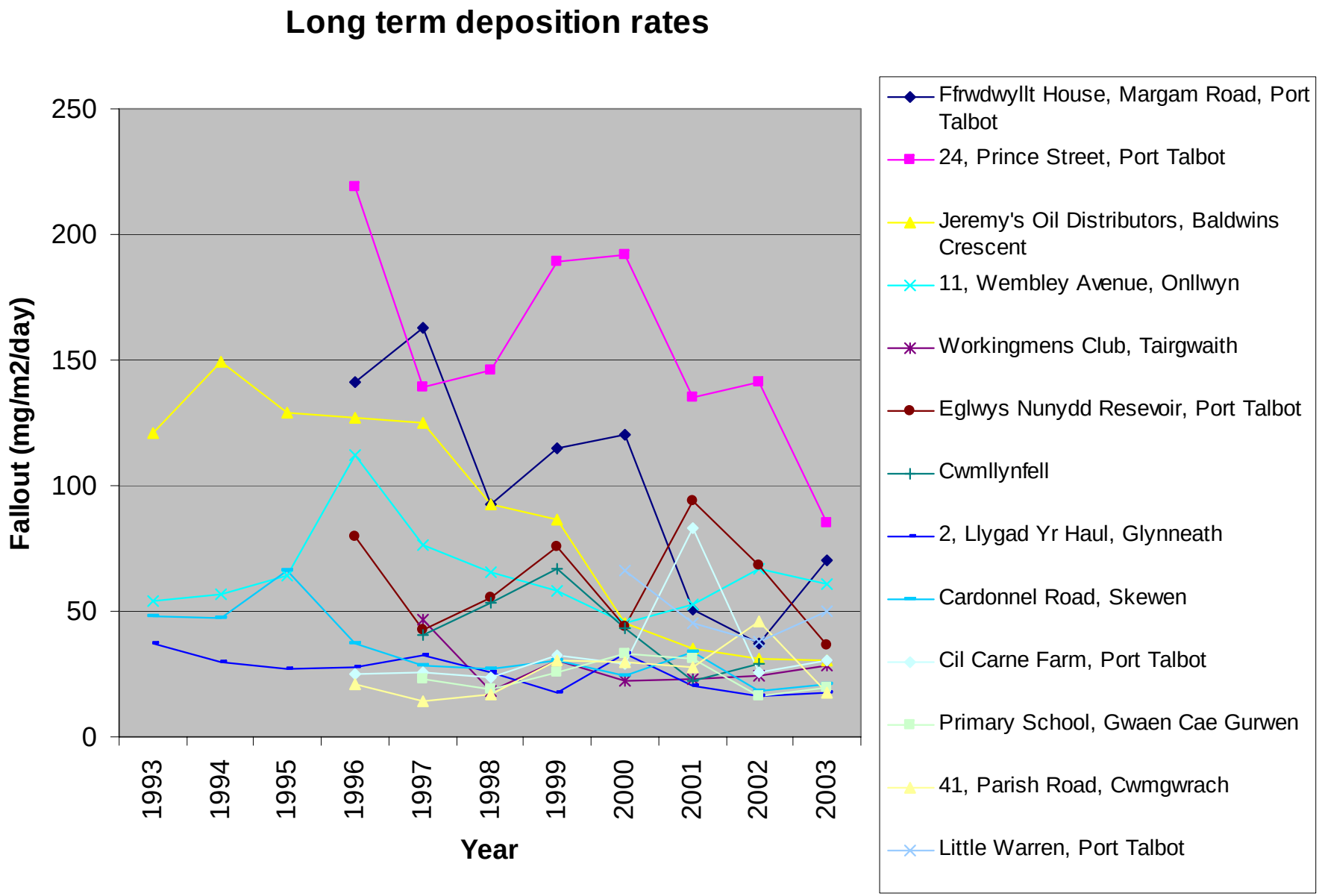


Table 2 Long term deposition rates

Site Name	Fallout rate (mg/m2/day)										
	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Ffrwdwyllt House, Margam Road, Port Talbot				141	163	92	115	120	51	37	70
24, Prince Street, Port Talbot				219	139	146	189	192	135	141	85
Jeremy's Oil Distributors, Baldwins Crescent	121	149	129	127	125	93	86	45	35	31	30
11, Wembley Avenue, Onllwyn	54	57	64	112	76	66	58	45	53	67	60
Workingmens Club, Tairgwaith					47	18	30	22	23	24	28
Eglwys Nunydd Resevoir, Port Talbot				80	42	55	76	44	94	68	36
Cwmllynfell					41	53	67	43	22	29	
2, Llygad Yr Haul, Glynneath	37	30	27	28	32	26	18	33	20	16	18
Cardonnel Road, Skewen	48	47	66	37	28	27	30	24	34	18	21
Cil Carne Farm, Port Talbot				25	26	24	32	29	83	26	30
Primary School, Gwaen Cae Gurwen					23	19	26	33	31	16	19
41, Parish Road, Cwmgwrach				21	14	17	31	30	28	46	18
Little Warren, Port Talbot								66	45	38	50

Nitrogen dioxide - diffusion tubes

Neath Port Talbot County Borough is one of approximately 300 local authorities that contribute to the UK Nitrogen Dioxide Survey. The survey is co-ordinated by AEA Technology, which is also responsible for quality control/assurance, interpretation and dissemination of data. There are three categories of site i.e. kerbside, intermediate and urban background. Individual authorities normally have four tubes, two of which are of the urban background type. Following the merger to the unitary Authority, the County Borough has inherited the monitoring commitments of the previous Borough Councils (7 tubes). AEA Technology disseminates annual reports, both in written and electronic form. These and other reports can be obtained via the Internet at the following address: http://www.airquality.co.uk/archive/reports/reports.php?action=category&section_id=13. Alternatively, the printed reports are available to view via Peter Hollingsworth (Principal Officer, Environment), Neath Civic Centre. This report summarises the data for 2002, obtained from the seven locations in the County Borough where nitrogen dioxide tubes are located.

Pollutant information

Nitrogen dioxide is one of a number of nitrogen oxides that are formed during high temperature combustion processes from the oxidation of nitrogen in the air or fuel. Road traffic is the main source, being the cause of approximately 50% of all European emissions. Concentrations tend therefore to be highest in urban environments with high traffic levels and in the vicinity of large industrial sources.

Nitrogen dioxide is a respiratory irritant and also plays a part in production of another atmospheric pollutant, Ozone. Nitrogen oxides persist in the atmosphere for only about one day before they are oxidised to nitric acid. Nitrogen oxides therefore play a part in the production of acid rain.

Results

Table 3 shows the results for 2003, together with summary averages for the year as a whole. The individual results are shown graphically in Figure 29, whilst Figure 30 shows the annual averages for each site. The locations of the sites are shown in the attached map (Figure 28).

These studies have been on going since 1994 the changes in annual averages that have occurred at each location are again reviewed. These results are shown graphically in Figure 31.

The results at most locations increased again during 2003, continuing the trend for the previous two years.

The Victoria Gardens location continues to produce the highest results. There is an EC Directive Limit and Guide values that pertain to nitrogen dioxide concentrations. However, the Directive is based upon the measurement of hourly nitrogen dioxide levels, not monthly averages. Surrogate statistics are available which are based upon the annual average of the monthly diffusion tube samples. The corresponding surrogate statistic for the limit is 48ppb and 28ppb for the guide value. No local sites have ever come close to breaching the limit or guide values during 2003. The National Air Quality objective for NO_2 is 21 ppb (40$\mu g/m^3$) as an annual average, to be achieved by 2005. The Victoria Gardens (25.3 ppb or 48.3 $\mu g/m^3$) and Groeswen Hospital (22.7 ppb or 43.3 $\mu g/m^3$) sites have exceeded this figure. As a consequence additional three new monitoring sites were set up near Victoria Gardens and two sites near Groeswen Hospital during 2004. The objective of the new monitoring is to see if National Air Quality Objective Levels are breached at the frontage of residential properties, which could trigger an Air Quality Management Area.

Figure 28 Nitrogen dioxide diffusion tube locations

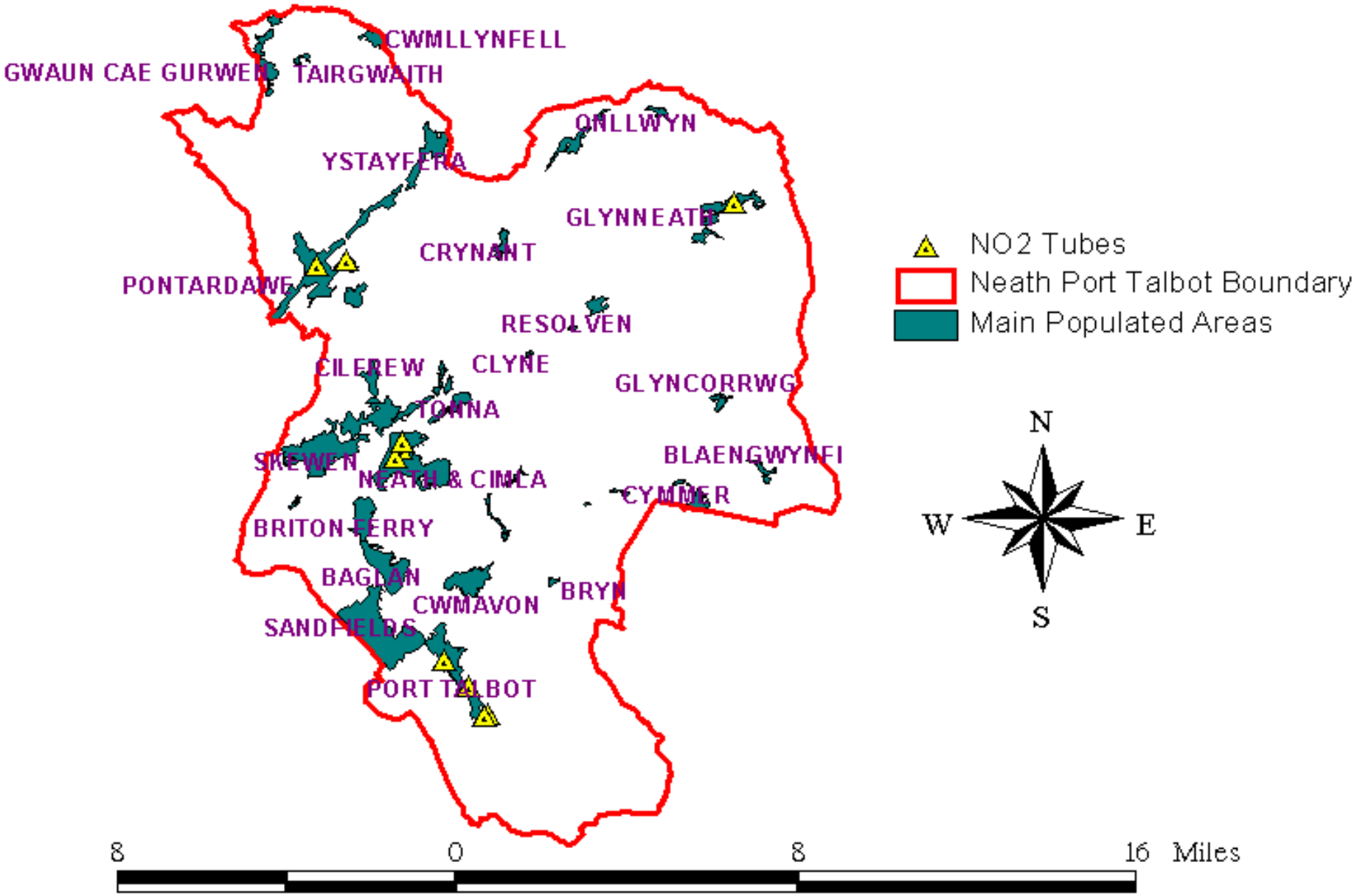


Table 3 Nitrogen Dioxide Diffusion Tube Results (ppb) – 2003

Site	Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
Neath Civic Centre	UB	17.3	15.3	17.6	13	11.2	11.2	5.8	17	14.1	14.8	20.2	18	14.6
Cwmnedd Primary School, Glynneath	UB	10.8	15	10.6	6	4.4	9.6	12.2	5.8	7.5	9.3	12.8	13	9.8
Groeswen Hospital, Margam	K	25.2	26.8	25.7	20.1	20.7	15.8	20.8	19.4	22.5	23.1	27.5	24..3	22.7
Rice Street, Taibach	UB	16.3	19.1	15.6	11	10.8	7.9	9.8	10.1	11.4	12.5	16.4	15.4	13.0
College Green, Margam	UB	12.4	15.1	14.6	9.4	8.4	4	0.4	11.1	11.6	13.1	16	14..2	10.9
High St., Pontardawe	K	19.9	21.5	21.5	16.6	16.4	21.8		18.8	17.9		22.7	19.9	19.7
Victoria Gardens, Neath	K	24.3	27.5	29	21.7	25.2	25.2	22.5	21.2	26.1	25	28.3	27.9	25.3

Key:
UB – Urban background location
K – Kerbside location
ND – No data

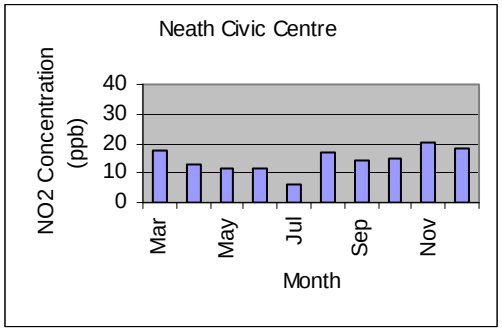
Conversion factor: 1ppb = 1.91 $\mu g/m^3$

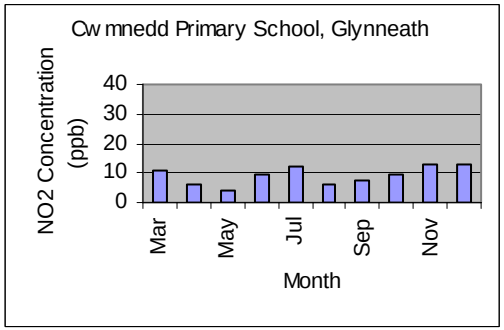
Table 4 Nitrogen dioxide annual averages (ppb) – 1994 - 2003

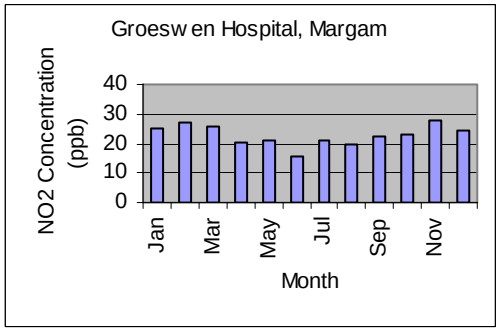
Year	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Neath Civic Centre	17.7	17.8	12.4	11.6	11.7	10.2	8.7	12.0	15	14.6
Cwmnedd Primary School, Glynneath	13.0	13.7	9.0	7.7	7.8	6.2	6.3	9.8	7.1	9.8
Groeswen hospital, Margam	16.6	17.3	14.9	11.9	13.6	8.4	9.9	13.9	19.6	22.7
Rice Street, Taibach	15.5	17.5	11.6	9.9	10.6	10.0	8.7	11.6	12.3	13.0
College Green, Margam	10.7	11.6	11.9	10.0	9.4	7.6	7.7	10.1	10.5	10.9
High St., Pontardawe	15.9	11.9	11.2	19.7	12.8	10.3	10.7	12.8	19.1	19.7
Victoria Gardens, Neath	28.3	28.3	20.1	20.6	20.7	17.1	17.0	20.6	23.7	25.3

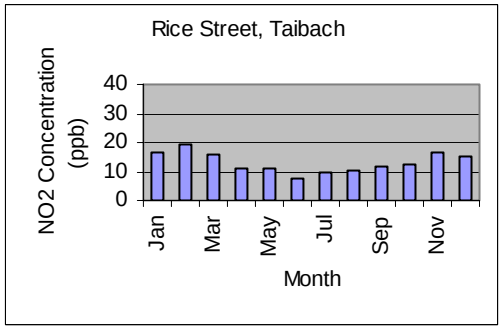
Conversion factor: 1ppb = 1.91 $\mu g/m^3$

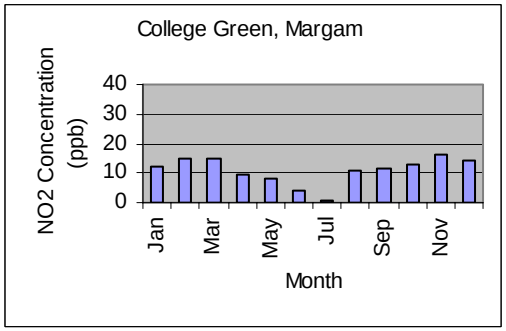
Figure 29 Monthly nitrogen dioxide diffusion tube results (ppb) – 2003

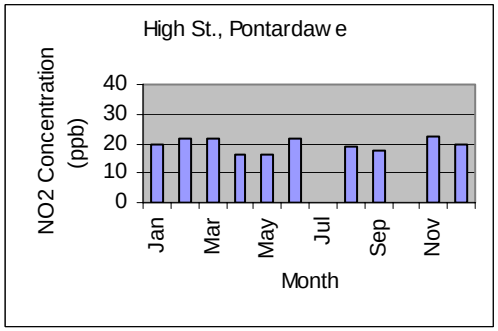












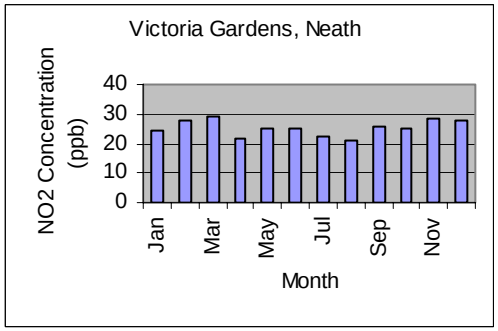


Figure 30 Nitrogen dioxide annual averages – 2003

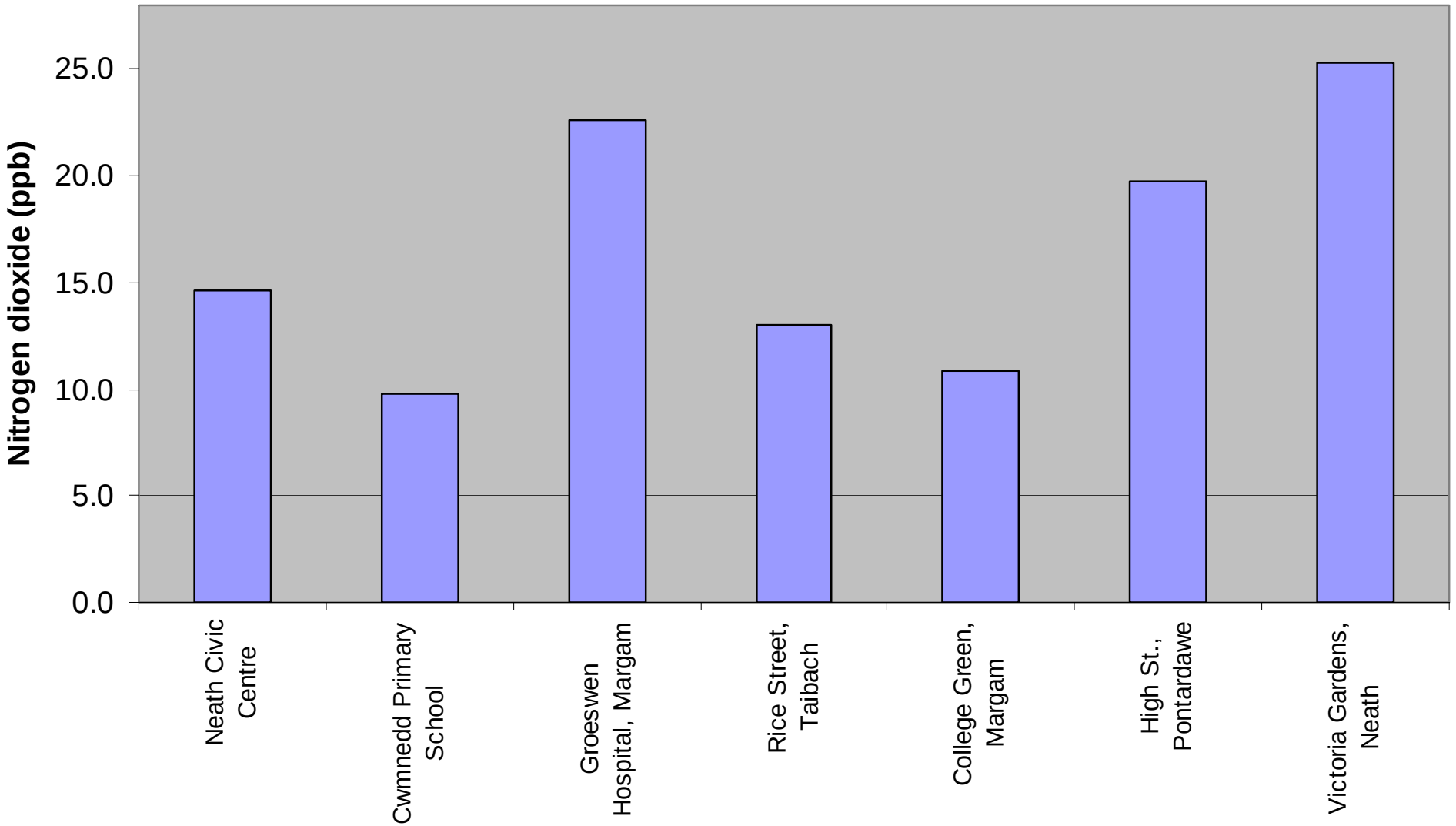
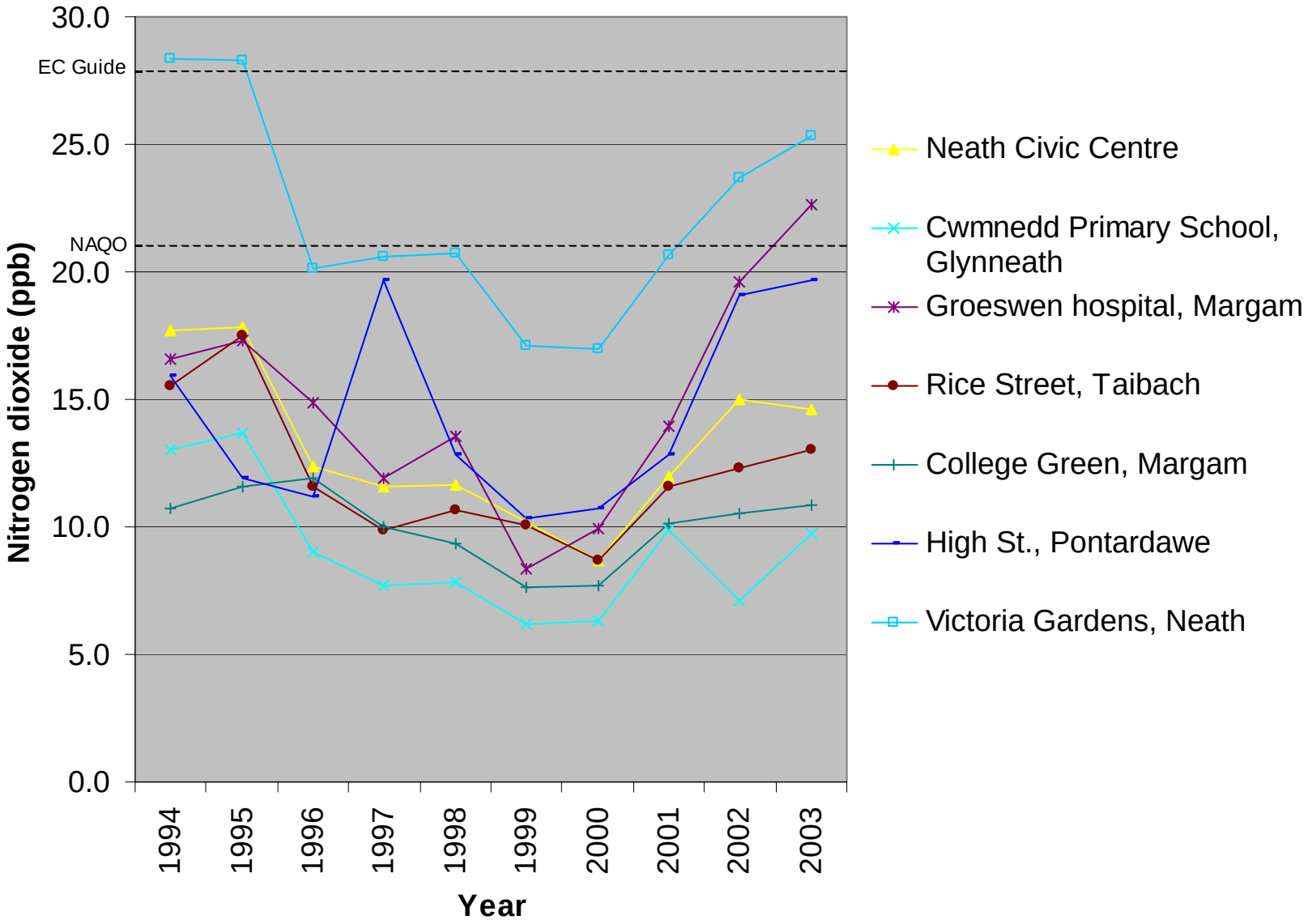


Figure 31 Annual nitrogen dioxide summary graph



Key: NAQO – National Air Quality Objective (annual average); EC Guide – Surrogate EC Guide Level

Metals monitoring at Pontardawe

Monitoring of the concentrations of 13 airborne metals has been carried out continuously in the Pontardawe area since 1972. Pumps continuously sample ambient air and particles are collected on filters that are analysed by AEA Technology. Until 1997, this work was carried out at Trebanos Sewage Works. Following a programme of construction at the site, monitoring was re-located to Pontardawe Leisure Centre. The objectives are to establish whether the Nickel works at Clydach has any significant impact upon metal concentrations in the area. The new site is approximately 4km downwind of the Nickel works, as compared to the Trebanos site, which was about 2km from the works.

Monitoring was carried out in respect of the following metals:

- Lead (Pb)
- Nickel (Ni)
- Zinc (Zn)
- Arsenic (As)
- Cadmium (Cd)
- Chromium (Cr)
- Copper (Cu)
- Iron (Fe)
- Cobalt (Co)
- Selenium (Se)
- Antimony (Sb)
- Cerium (Ce)
- Scandium (Sc)

Results

The annual mean nickel concentration found in 2003 was 43 ng/m^3, which is over twice the proposed target value (20 ng/m^3 annual mean). This is less that half the amount measured in 2002 and is comparable to 2001 figure. This information has been passed to the Environment Agency, which has responsibility for regulating the Inco nickel works.

The annual mean concentrations of arsenic and cadmium have been found to be 0.7 ng/m^3 and 0.14 ng/m^3 respectively. These concentrations represent between 11% and ~3% of the proposed target values. The concentrations for both substances are about half those encountered during 2002.

The annual mean air concentration of lead at the Pontardawe site was found to be 9.9 ng/m^3, which represents ~2% of the present air quality limit value (500 ng/m^3 to be met by 2005) or approximately 4% of the UK's air quality objective (250 ng/ m^3) for 2008. This shows that it is very unlikely that any of the present air quality limit values or objectives for lead will be exceeded in the vicinity of the Pontardawe monitoring site. There was a slight increase on the 2002 average concentration.

From assessment of the measured concentrations at the Pontardawe site between 1990 and 2003 it is clear that the majority of the metals show a reduction in concentration. The metals that show concentration reductions are shown below (percentage reductions/year are show in brackets):

- Arsenic (average decrease of 9%/year)
- Antinomy (average decrease of 5%/year)

- Cadmium (average decrease of 16%/year)
- Cerium (average decrease of 2%/year)
- Cobalt (average decrease of 9%/year)
- Copper (average decrease of 13%/year)
- Iron (average decrease of 2%/year)
- Lead (average decrease of 14%/year)
- Selenium (average decrease of 12%/year)

The metals showing an increase are (percentage increases/year are shown in brackets):

- Chromium (average increase of 11%/year)
- Nickel (average increase of 5%/year)
- Scandium (average increase of 5%/year)

The long-term trends in pollution levels are shown in graphically in figures 32 to 36 inclusive.

Table 5 Threshold Limit Ealues and Environmental Air Guidlines.

Element	Current or proposed Air Quality Limit Values (ng/m^3)	Environmental Assessment Levels (EALs) ($ng\ m^{-3}$)	Comment	Annual Mean Air Concentration in 2003 ($ng\ m^{-3}$) (2 significant figures)	Annual Mean Concentration as a % of Air Quality Limit Values, proposed Target Values or EALs
Arsenic (As)	6		Proposed Limit Value	0.67	11.10
Cadmium (Cd)	5		Proposed Limit Value	0.14	2.71
Cobalt (Co)		200##	Cobalt and its compounds as Co	0.87	0.44
Chromium (Cr)		100##	Cr VI compunds	2.5	2.50
Copper (Cu)		10000##	Dust, fume and mists	3.6	0.04
Iron (Fe)		10000##	Iron salts as Fe	249	2.49
Nickel (Ni)	20		Proposed Limit Value	43	213.56
Lead (Pb)	(500)** (250)***		Inorganic compounds	9.9 9.9	1.98 3.97
Antimony (Sb)		5000##		1.1	0.02
Selenium (Se)		1000##	Not including hydrogen selenimide	0.39	0.04

Notes:

1. # Expected proposed Air Quality Limit Values taken from ranges produced by Position paper. Ambient Air Pollution by As, CD and Ni Compounds (EC, 2000).
2. ## Environmental Assessmemt Levels: IPPC H1 Environment Agency Version 1, June 2001.
3. ** EU Daughter Directive (1999) limit value and DEFRA air quality objective to be met by 31st December 2004 (annual mean air concentration).
4. *** DEFRA air quality objective for Pb in the UK to be met by 2008 (annual mean air concentration).

Figure 32

Mean Annual Concentrations of Cerium and Scandium in Air at Trebanos (1972-1996) and Pontardawe (1997-2003)

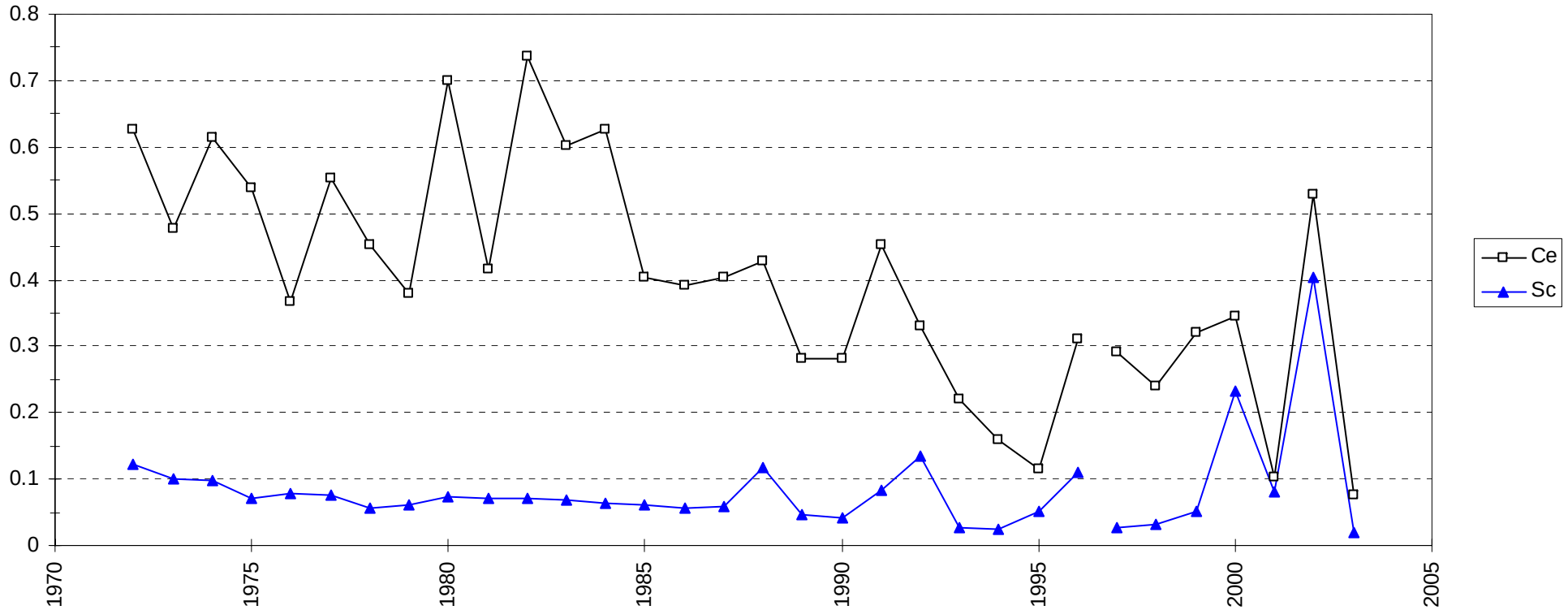


Figure 33 **Annual Mean Concentrations of Antimony, Cobalt and Selenium in Air at Trebanos (1972-1996) and at Pontardawe (1997-2003)**

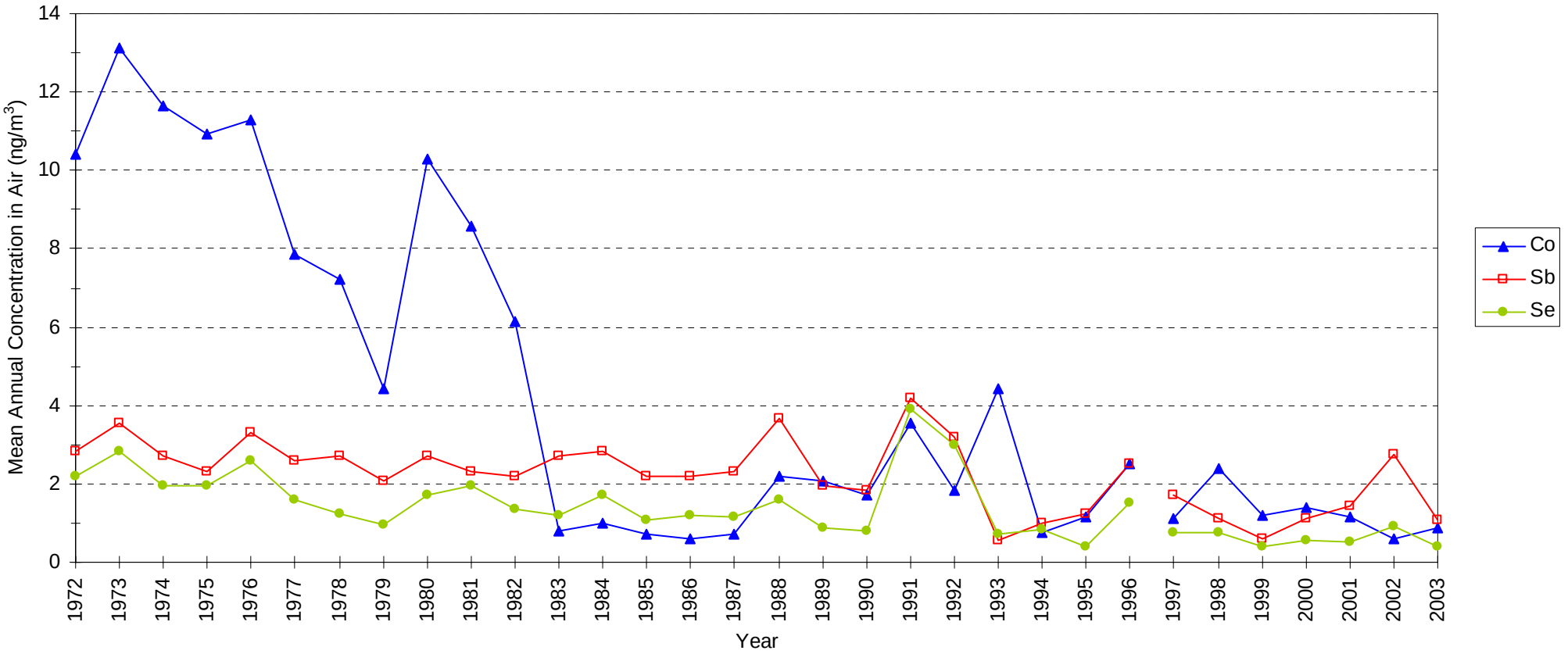


Figure 34 **Annual Mean Concentrations of Arsenic, Cadmium, Chromium and Copper in Air at Trebanos (1972-1996) and at Pontardawe (1997-2003)**

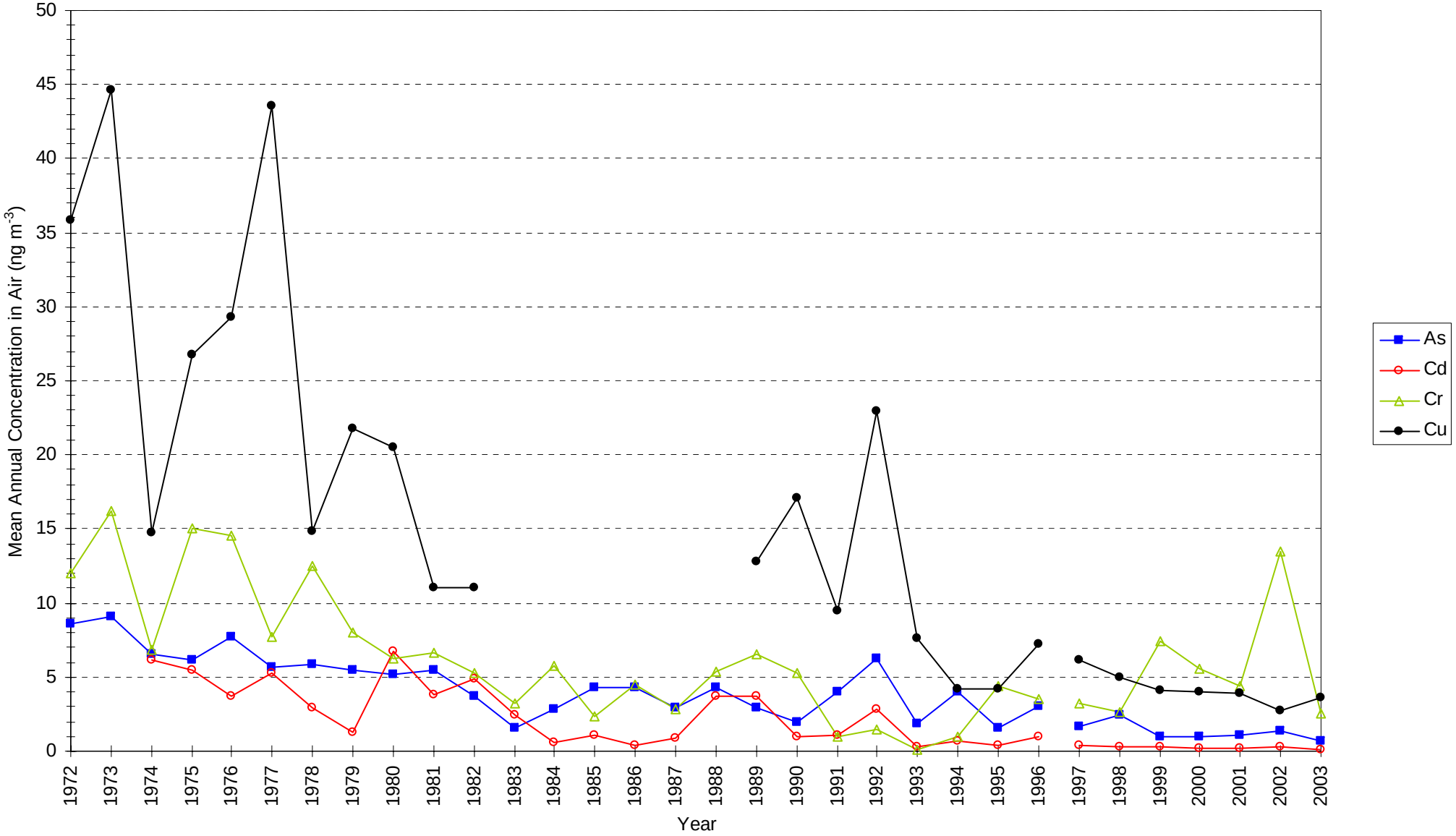


Figure 35

Annual Mean Concentrations of Iron in Air at Trebanos (1972-1996) and at Pontardawe (1997-2003)

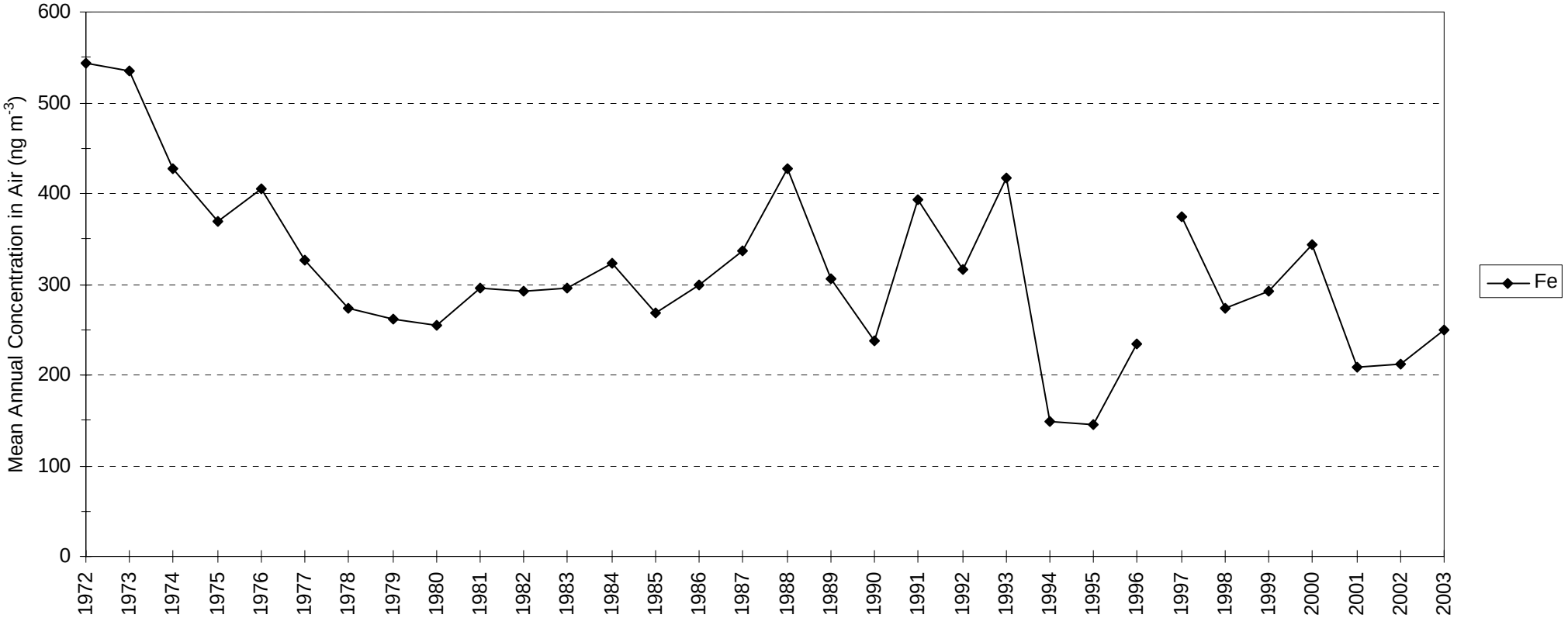
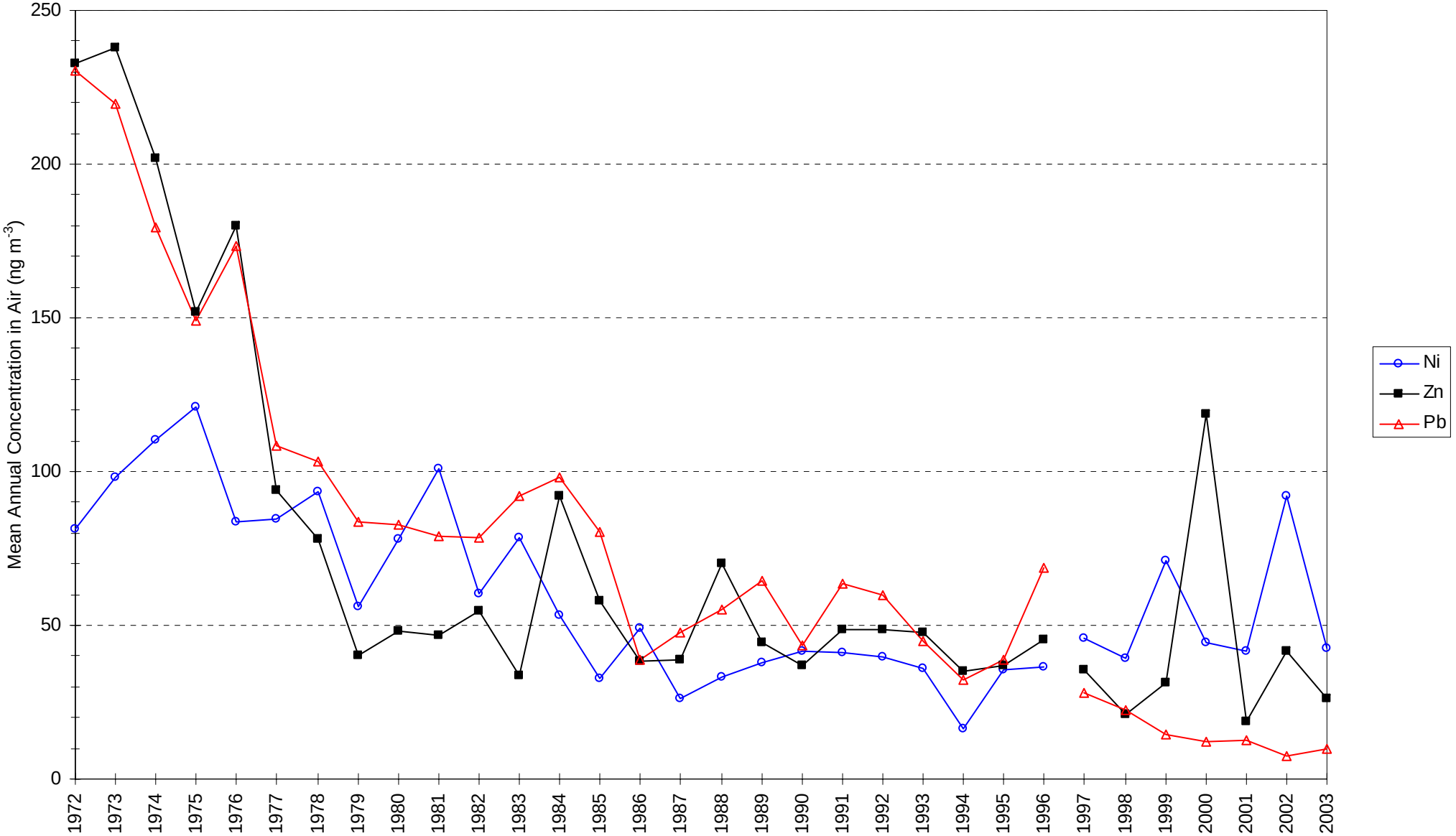


Figure 36

Annual Mean Concentrations of Lead, Nickel and Zinc in Air at Trebanos (1972-1996) and at Pontardawe (1997-2003)



Particles and inorganics
Groeswen Hospital, Port Talbot

This monitoring station has been in operation since early January 1997. Measurements of specific pollutants and meteorological parameters are made continuously, producing an average value for every 15 minutes in the day. The National Environmental Technology Centre (NETCEN) and their contractors (Stanger Science and Environment) collect the data. The data is then subjected to a rigorous quality assurance procedure, prior to dissemination via the Internet and Ceefax. The site is initially contacted via modem and the data collected at regular intervals. Data is automatically scaled in accordance with the latest calibrations (where appropriate) and subjected to an initial inspection prior to dissemination within one hour of receipt. Subsequently, data remains in this format until a final ratification is carried out, by NETCEN, normally in three-month blocks. Some care should therefore be exercised when relying upon statistics not yet subject to final ratification. All data for 2003 has now been fully ratified and can therefore be reported with confidence. Data is collected in respect of PM_{10} particulates, oxides of nitrogen (NO_x), sulphur dioxide (SO_2) and ozone (O_3). Also, carbon monoxide (CO) measurements have been taking place since mid May 1998. The carbon monoxide data is not currently part of the national network, but it is hoped that it will be adopted at some point in the future. In addition, this authority can also retrieve wind speed and direction data from the site, which is collected via sensors located on top of a 10-metre mast, attached to the cabin. The location of the analyser is shown in Figure 51.

Pollutants monitored

PM_{10}

PM_{10} describes the fraction of airborne particulate matter that is less than 10 microns in size. Fine particles are of the greatest concern since they are capable of being easily transported over long distances on currents of air. Also, fine particles may be drawn into the respiratory air-ways where they may adversely affect health. Recently, the attention of scientists has been drawn towards studying the $PM_{2.5}$ fraction and even smaller particles that can penetrate the very deepest parts of the lung.

PM_{10} and other particulate matter may vary considerably in chemical and physical composition. Particles (and other forms of pollution) may be described as ‘primary’ or ‘secondary’ according to their source. Secondary pollution arises as a result of the chemical reaction (or interaction) of pollutants in the atmosphere. Examples of secondary pollution include acid rain, ozone and significant quantities of sulphate particles. On the other hand, primary pollutants arise directly from the polluting source. The principal sources of ‘primary’ polluting particles are combustion processes e.g. traffic and industry.

Sulphur Dioxide (SO_2)

Sulphur dioxide is a corrosive acid gas that combines with water vapour in the atmosphere to produce acid rain. SO_2 in ambient air is capable of causing harm to human health and the environment. It is associated with asthma and

chronic bronchitis, and has been known to damage vegetation, soils, watercourses and building materials.

Sulphur dioxide is mainly formed as a result of the combustion of fossil fuels in power stations. Some areas, which rely heavily upon the use of coal for domestic heating may suffer localised pollution as a consequence.

Nitrogen Dioxide (NO_2)

Nitrogen dioxide is one of a number of nitrogen oxides that are formed during high temperature combustion processes from the oxidation of nitrogen in the air or fuel. Road traffic is the main source, being the cause of approximately 50% of all European emissions. Concentrations tend therefore to be highest in urban environments with high traffic levels and in the vicinity of large industrial sources.

Nitrogen dioxide is a respiratory irritant and also plays a part in production of another atmospheric pollutant, Ozone. Nitrogen oxides persist in the atmosphere for only about one day before they are oxidised to nitric acid. Nitrogen oxides therefore play a part in the production of acid rain.

Ozone (O_3)

Ozone is a highly reactive chemical which, when present in the lower atmosphere at high concentrations, can irritate the eyes and air passages, causing breathing difficulties. Ozone is a so-called secondary pollutant since it is produced indirectly by the reaction between hydrocarbons, NO_2 and sunlight. Ozone tends to be lower in urban areas because high levels of NO are produced by vehicles and this helps to break down ozone to oxygen and NO_2. The highest ozone therefore tends to occur in rural areas and during the summer months when the sun shines the longest. The ozone forming reactions are complex and have a time lag associated with them which can mean that ozone levels are greatest downwind of the location where the pollution is produced. It is recognised that low level ozone formation is an international problem and that exceedences of the National Air Quality Standard would still occur, even if all sources of hydrocarbons were eliminated in this country.

Carbon monoxide (CO)

Carbon monoxide (CO) is a toxic gas, which is emitted into the atmosphere as a result of combustion processes, and is also formed by the oxidation of hydrocarbons and other organic compounds. In European urban areas, CO is produced almost entirely (90%) from road traffic emissions. In some areas, localised industrial sources may be significant. Carbon monoxide at levels found in ambient air may reduce the oxygen-carrying capacity of the blood. It survives in the atmosphere for a period of approximately 1 month but is eventually oxidised to carbon dioxide.

Results and analysis

Appendix 1 shows the UK air quality standards and bandings. Table 15 shows the objectives of the UK National Air Quality Strategy, whereas Table 16 shows the air quality bands. The results for each of the pollutants should be read in the context of these tables.

Meteorological data

Figure 37 shows the average proportion of the time in percent that the wind blows from any of the 16 specified compass points. The average wind speed for these directions are also shown.

Nitrogen dioxide (NO_2)

The results are summarised in Table 6. Figure 38 shows time series graphs of NO_2 concentration for each month expressed as hourly averages.

Limits and objectives

The National Air Quality Objective for nitrogen dioxide is defined in two ways. The first method of assessment is based upon exceedence of 105ppb or 200$\mu g/m^3$ as an hourly average, with 18 exceedences being allowed per year, to be achieved by 31st December 2005. The second method specifies an annual average of 21ppb or 40$\mu g/m^3$ as the limit. The maximum hourly value was 58ppb (110.8 $\mu g/m^3$) and the annual average was 11ppb (21.0 $\mu g/m^3$). Therefore, no exceedences of the Air Quality Objective level occurred. No exceedences of the World Health Organisation (WHO) guideline (hourly average > 110ppb) occurred. Air pollution levels were "low" at all times. The EU Directive (98 percentile >104.6ppb or 199.8 $\mu g/m^3$) was not breached.

There is now also a limit for the protection of vegetation and ecosystems that applies to all oxides of nitrogen (16 ppb), not just nitrogen dioxide. As the annual concentration was 18 ppb, this limit was exceeded. However, this limit does not apply in the vicinity of major industrial sources, motorways etc as is the case at Margam.

Directional analysis

Average nitrogen dioxide levels have been analysed by wind direction (Figure 39). Levels were highest from a generally northerly direction, the maximum being 17 ppb (32.5 $\mu g/m^3$) from the north-north west.

Summary

There were no exceedences of the Air Quality objective levels for NO_2 during 2003, as was the case in previous years.

Sulphur dioxide (SO_2)

The results are summarised in Table 8. Figure 40 shows the time series graphs for SO_2 concentration for each month expressed as 15 minute averages.

Limits and objectives

The Air Quality objective level (100ppb or 266μg/m^3 as a 15-minute average) was not breached during 2003, therefore the Air Quality Objective, which is based upon the 99.9 percentile of all 15-minute average values, was not breached. The maximum 15-minute average was 87 ppb (231.4 μg/m^3). The maximum daily average was 11ppb and neither the Air Quality Objective (daily average 47 ppb or 125μg/m^3 not to be exceeded more than 3 times per year) or the EU Directive (daily average >38) were breached. The Air Quality Objective also has an hourly averaged limit, which is 132ppb or 350μg/m^3, not to be breached more than 24 times a year, was not breached. The maximum hourly average was 58 ppb (154.3 μg/m^3). The WHO guideline (hourly average > 122ppb) was not breached. Air pollution was low throughout the year.

Directional analysis

SO_2 levels (Figure 42, Table 7) were generally greatest from the south-western quadrant, peaking at 9 ppb in the west-south-west.

Summary

No breaches of any Air Quality Objective levels arose during 2003.

Ozone (O_3)

The results are summarised in Table 9. Figure 43 shows the time series graphs for O_3 concentration for each month expressed as 8 hourly running averages.

Limits and objectives

The Air Quality recommended objective for ozone is 50ppb (100 $\mu g/m^3$), measured as a rolling 8hour average. This was breached on a total of 397 occasions on a total of 47 days. This is a significant deterioration on the figures for 2002, where there were 65 exceedences on 9 days. All exceedences occurred between the months of March and September. No statutory Air Quality Objective level for Ozone has been set, owing to the potential for trans-boundary sources. Air pollution was low apart from 644 hours of 'moderate' pollution.

Directional analysis

O_3 levels were not particularly direction dependent (see figure 44), but were slightly biased to the south and west.

Summary

In 2003 there were 397 breaches of the Air quality strategy recommended objective for Ozone, significantly more that in the preceding two years put together.

PM_{10}

The results are summarised in Table 10. Figure 45 shows the time series graphs for PM_{10} concentration for each month expressed as 24hour running averages.

Limits and objectives

The average concentration was 24 $\mu g/m^3$, whilst the hourly maximum was 340 $\mu g/m^3$. The Air Quality Objective level is 50 $\mu g/m^3$ as a gravimetric daily average to be breached no more than 35 occasions in a year. Since gravimetric methods typically produce higher values than TEOM's, a factor must be applied to the TEOM data for equivalence. The current recommended factor is TEOM X 1.3, although work is ongoing to establish a more accurate factor for Port Talbot. Using this method, there were 43 days in 2003 where the daily averages exceeded 50 $\mu g/m^3$. Consequently the Air Quality Objective Level, which is to be achieved by 31st December 2004, was breached. Air pollution was 'high' for 3 hours, 'moderate' for 113 hours and 'low' 8462 hours.

Directional analysis

Figure 46 shows that PM_{10} levels were once again highest from the west south-west (50 $\mu g/m^3$).

Summary

The Air Quality Objective level was breached again during 2003. The increased number of exceedences, compared to 2002 may be due to the re-commissioning of blast furnace number 5 early in 2003. However PM_{10} exceedences during 2003 were less than those typically encountered when the old blast furnace 5 was operating.

Carbon monoxide (CO)

The results are summarised in Table 11. Figure 47 shows the time series graphs for CO concentration for each month expressed as 8 hourly running averages.

Limits and objectives

The Air Quality Objective level (10 mg/m^3 or 8.6 ppm expressed as an 8hour rolling average) was exceeded. The maximum 8-hour average was 11.5 ppm and arose as a result of a pollution incident on 5th January. This unusual event was co-incident with the re-commissioning of blast furnace 5, a process called "blow-in". The World Health Organisation has set two guidelines for CO. One guideline is identical to the Air Quality Objective, and was therefore also exceeded. The second guideline equates to 25 ppm as an hourly average and was also exceeded since the maximum hourly average was 34.2 ppm (39.7 mg/m^3).

Directional analysis

Figure 48 shows that average CO concentrations showed a pronounced bias towards the south westerly direction (5.22 ppm or 6.06 mg/m^3).

Summary

There was a breach of the Air Quality Objective level and both World Health Organisation guidelines during 2003. This information has been conveyed to the Environment Agency, which regulates the Corus plant. It is recommended that an approach be made to the Welsh Assembly in order to have the carbon monoxide analyser incorporated onto the AURN national network. This will bring additional quality assurance benefits to those currently applied by the Council in-house.

Discussion

2003 was a poor year with regard to ozone pollution with 397 exceedences of the Air Quality Strategy recommended objective on 47 days. This corresponded to more exceedences than in the previous two years.

The Air Quality Objective for PM_{10} was breached in 2003. Results were probably worse that in 2002 because of the re-commissioning of Blast Furnace 5. But, there were fewer exceedences than experienced when the old Blast Furnace 5 was operating.

A carbon monoxide pollution incident that was co-incident with the re-commissioning of Blast Furnace 5 resulted in a Breach of the Air Quality Objective level and both of the World Health Organisation Guidelines.

There were no exceedences of the relevant Air Quality Obective levels for nitrogen dioxide or sulphur dioxide.

Table 6 Nitrogen dioxide summary statistics 2003

Statistic	Month												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Number Very High	0	0	0	0	0	0	0	0	0	0	0	0	0
Number High	0	0	0	0	0	0	0	0	0	0	0	0	0
Number Moderate	0	0	0	0	0	0	0	0	0	0	0	0	0
Number Low	741	608	741	717	741	603	740	688	717	736	709	740	8481
Max 15-min mean (ppb)	43	46	61	62	49	39	45	57	59	42	51	43	62
Max hourly mean (ppb)	39	40	58	52	41	31	37	49	54	39	44	39	58
Max running 8-hour mean (ppb)	30	29	43	35	34	21	22	32	37	28	33	34	43
Max running 24-hour mean (ppb)	25	23	33	22	20	16	20	23	26	24	25	29	33
Max daily mean (ppb)	23	22	30	22	19	16	17	20	24	23	25	28	30
Average (ppb)	11	14	14	12	10	8	8	9	12	12	13	14	11
Data Capture (%)	99.6	90.5	99.6	99.6	99.6	83.8	99.5	92.5	99.6	98.9	98.5	99.5	96.8
Annual mean > 21 ppb	-	-	-	-	-	-	-	-	-	-	-	-	0
Hourly mean > 105 ppb	0	0	0	0	0	0	0	0	0	0	0	0	0
Annual mean nitrogen oxides >16 ppb	-	-	-	-	-	-	-	-	-	-	-	-	1

Conversion factor: 1ppb = 1.91 $\mu g/m^3$

Table 7 Average PM_{10}, NO_2, SO_2, O_3 and CO levels by direction 2003

Direction	PM_{10} (ug/M3)	NO_2 (ppb)	SO_2 (ppb)	O_3 (ppb)	CO (ppm)
N	16	17	2	19	0.94
NNE	16	15	2	20	0.33
NE	18	16	2	20	0.35
ENE	22	16	3	24	0.32
E	20	14	4	27	0.22
ESE	19	13	3	29	0.36
SE	23	12	3	34	0.58
SSE	25	12	3	33	0.63
S	36	10	4	33	1.13
SSW	34	8	3	39	1.56
SW	38	8	7	38	5.22
WSW	50	10	9	32	3.67
W	31	8	4	33	1.83
WNW	19	10	2	29	1.04
NW	14	13	1	24	0.92
NNW	15	16	2	21	0.77

Table 8 Sulphur dioxide summary statistics 2003

Statistic	Month												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Number Very High	0	0	0	0	0	0	0	0	0	0	0	0	0
Number High	0	0	0	0	0	0	0	0	0	0	0	0	0
Number Moderate	0	0	0	0	0	0	0	0	0	0	0	0	0
Number Low	2906	2413	2909	2812	2901	2807	2897	2684	2809	2886	2783	2896	33703
Max 15-min mean (ppb)	50	38	71	67	87	61	54	71	62	32	73	86	87
Max hourly mean (ppb)	37	25	27	40	42	33	34	44	41	20	30	58	58
Max running 8-hour mean (ppb)	17	11	14	26	13	17	19	16	14	8	17	21	26
Max running 24-hour mean (ppb)	6	5	7	12	8	11	10	10	10	5	12	11	12
Max daily mean (ppb)	6	4	6	11	7	10	9	5	7	5	8	10	11
Average (ppb)	2	2	3	2	3	3	3	2	3	2	3	3	3
Data Capture (%)	99.6	92.0	99.9	99.7	99.6	99.6	99.6	92.3	99.6	99.3	98.8	99.7	98.3
15-min mean > 100 ppb	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly mean > 132 ppb	0	0	0	0	0	0	0	0	0	0	0	0	0
Daily mean > 47ppb	0	0	0	0	0	0	0	0	0	0	0	0	0
Annual mean	-	-	-	-	-	-	-	-	-	-	-	-	-

Conversion factor: 1ppb = 2.66 $\mu g/m^3$

Table 9 Ozone summary statistics 2003

Statistic	Month												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Number Very High	0	0	0	0	0	0	0	0	0	0	0	0	0
Number High	0	0	0	0	1	0	6	0	0	0	0	0	7
Number Moderate	0	0	69	195	78	80	76	96	50	0	0	0	644
Number Low (ppb)	744	622	675	525	665	640	588	597	670	742	719	744	7931
Max 15-min mean (ppb)	43	44	62	91	91	78	96	92	74	42	45	43	96
Max hourly mean (ppb)	42	42	61	87	90	77	93	89	73	42	44	41	93
Max running 8-hour mean (ppb)	39	41	57	74	82	71	89	85	67	41	41	39	89
Max running 24-hour mean (ppb)	36	39	53	64	57	56	68	73	59	37	39	37	73
Max daily mean (ppb)	35	39	50	59	51	49	68	73	47	35	39	35	73
Average (ppb)	26	23	31	39	38	35	31	32	27	21	22	19	29
Data Capture (%)	99.6	90.3	99.6	99.7	99.6	99.6	89.4	92.5	99.6	98.9	98.5	99.7	97.3
Running 8-hour mean > 50 ppb – exceedences(No. days)	0 (0)	0 (0)	31 (5)	110 (14)	48 (5)	51 (7)	68 (5)	65 (7)	24 (4)	0 (0)	0 (0)	0 (0)	397 (47)

Conversion factor: 1ppb = 2 $\mu g/m^3$

Table 10 PM_{10} summary statistics 2003

Statistic	Month												
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Number Very High	0	0	0	0	0	0	0	0	0	0	0	0	0
Number High	0	0	0	3	0	0	0	0	0	0	0	0	3
Number Moderate	3	0	73	81	8	47	4	146	0	0	4	0	366
Number Low	741	672	671	636	736	673	740	538	720	744	716	744	8331
Max 15-min mean (µg/m^3)	620	122	370	326	253	273	237	277	245	101	253	249	620
Max hourly mean (µg/m^3)	340	101	178	244	133	169	152	235	152	64	126	132	340
Max running 8-hour mean (µg/m^3)	99	55	92	95	76	106	83	118	63	40	64	71	118
Max running 24-hour mean (µg/m^3)	51	35	66	75	51	68	50	71	49	31	53	43	75
Max daily mean (µg/m^3)	49	35	62	64	51	63	46	70	49	30	49	42	70
Average (µg/m^3)	22	21	32	28	27	30	24	33	21	16	21	18	24
Data Capture (%)	98.5	99.1	99.3	99.0	98.8	98.9	100.0	91.1	98.9	98.4	99.3	99.2	98.4
Daily mean > 50 (gravimetric)	3	0	11	6	4	3	2	9	1	0	2	2	43
Annual mean > 40 (gravimetric)	-	-	-	-	-	-	-	-	-	-	-	-	0

Note: All concentrations expressed in µg/m^3.

Table 11 Carbon monoxide summary statistics 2003

Statistic	Month												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Number Very High	0	0	0	0	0	0	0	0	0	0	0	0	0
Number High	0	0	0	0	0	0	0	0	0	0	0	0	0
Number Moderate	5	0	0	0	0	0	0	0	0	0	0	0	5
Number Low	701	595	713	598	469	638	736	673	694	715	701	736	8019
Max 15-min mean (ppm)	45.4	4.3	7.7	3.4	5.9	31.3	7.3	5.9	3.5	2.2	6.1	7.3	45.4
Max hourly mean (ppm)	34.2	2.6	4.0	2.4	2.8	8.9	4.5	4.9	3.0	1.8	2.8	3.6	34.2
Max running 8-hour mean (ppm)	11.5	1.5	2.0	1.5	1.6	4.0	2.6	1.8	1.0	0.8	1.8	2.3	11.5
Average (ppm)	0.4	0.3	0.4	0.3	0.5	0.6	0.5	0.4	0.2	0.2	0.4	0.4	0.4
Data Capture (%)	96.9	90.6	96.5	85.1	65.6	91.4	99.6	92.5	97.8	97.3	98.8	99.6	92.6
Exceedences of 10mg/m3 maximum daily running 8-hour mean (exceedence days)	7 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	7 (1)
Exceedences of WHO guideline – hourly mean >25 ppm	0	0	0	0	0	0	0	0	0	0	0	0	0

Conversion factor: 1ppb = 1.16 $\mu g/m^3$

Figure 37 Wind speed and direction: 2003

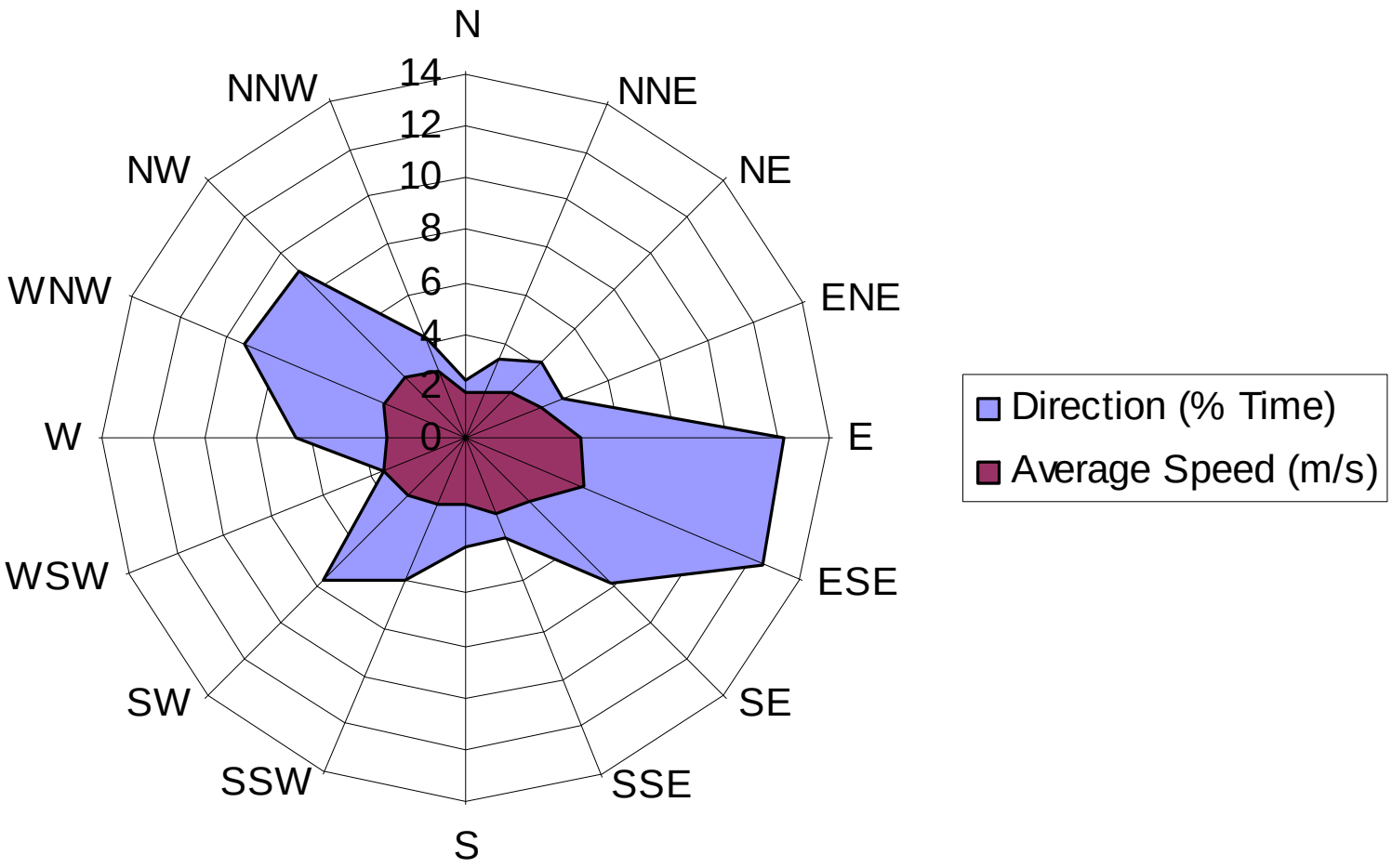


Figure 38 Nitrogen dioxide results – 2003 - hourly averages

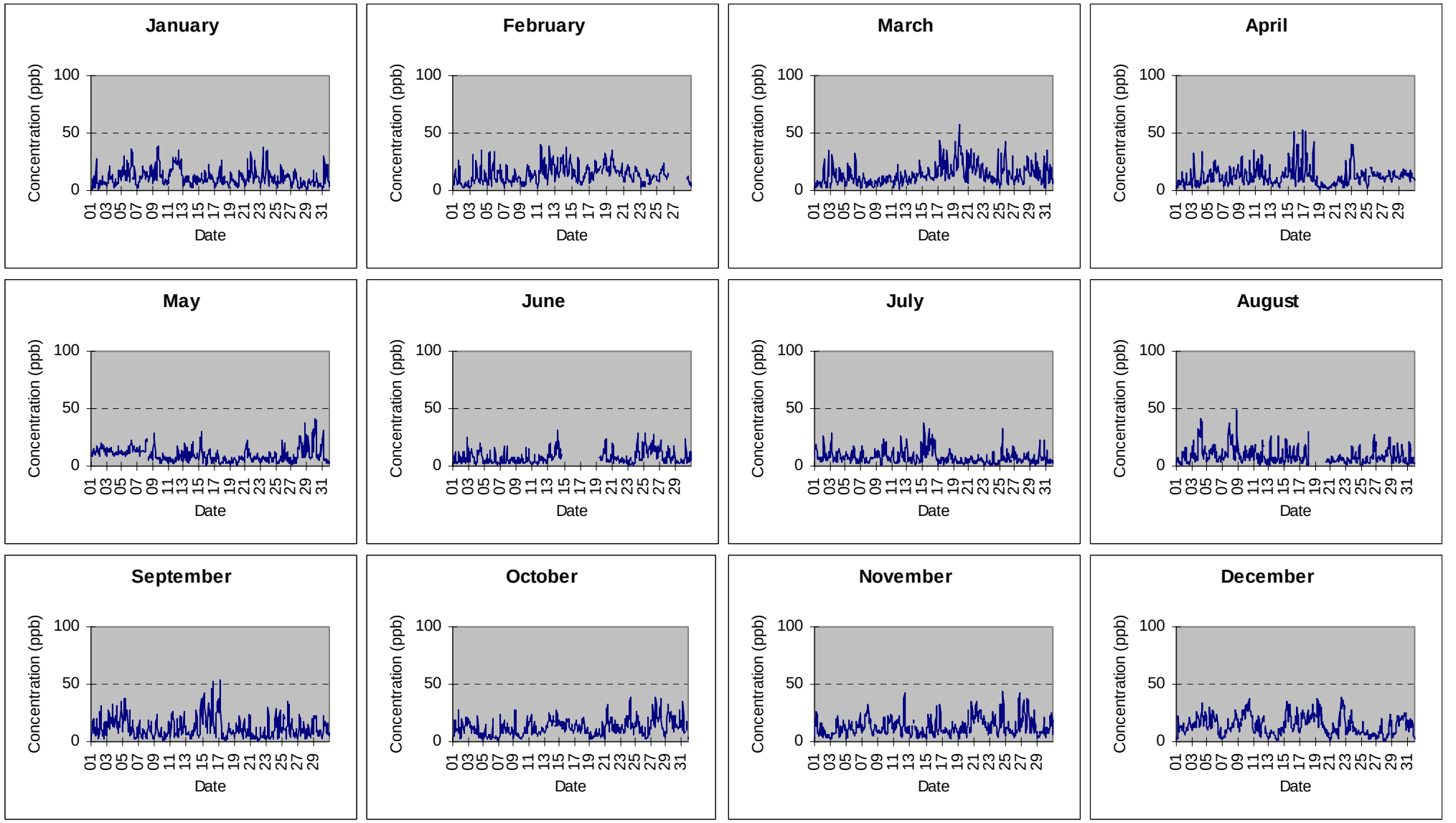


Figure 39 Average nitrogen dioxide levels by wind direction in 2003

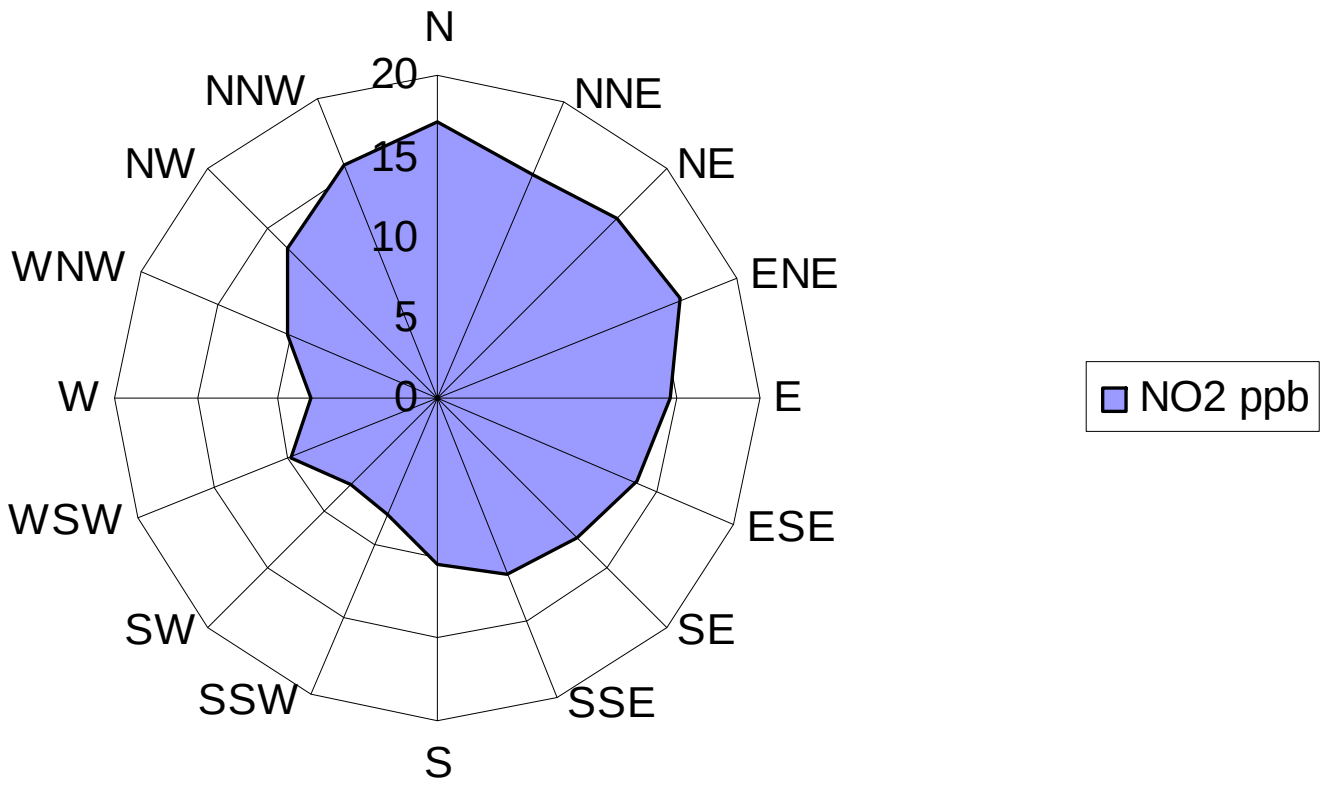


Figure 40 Sulphur dioxide results – 2003 – 15minute averages

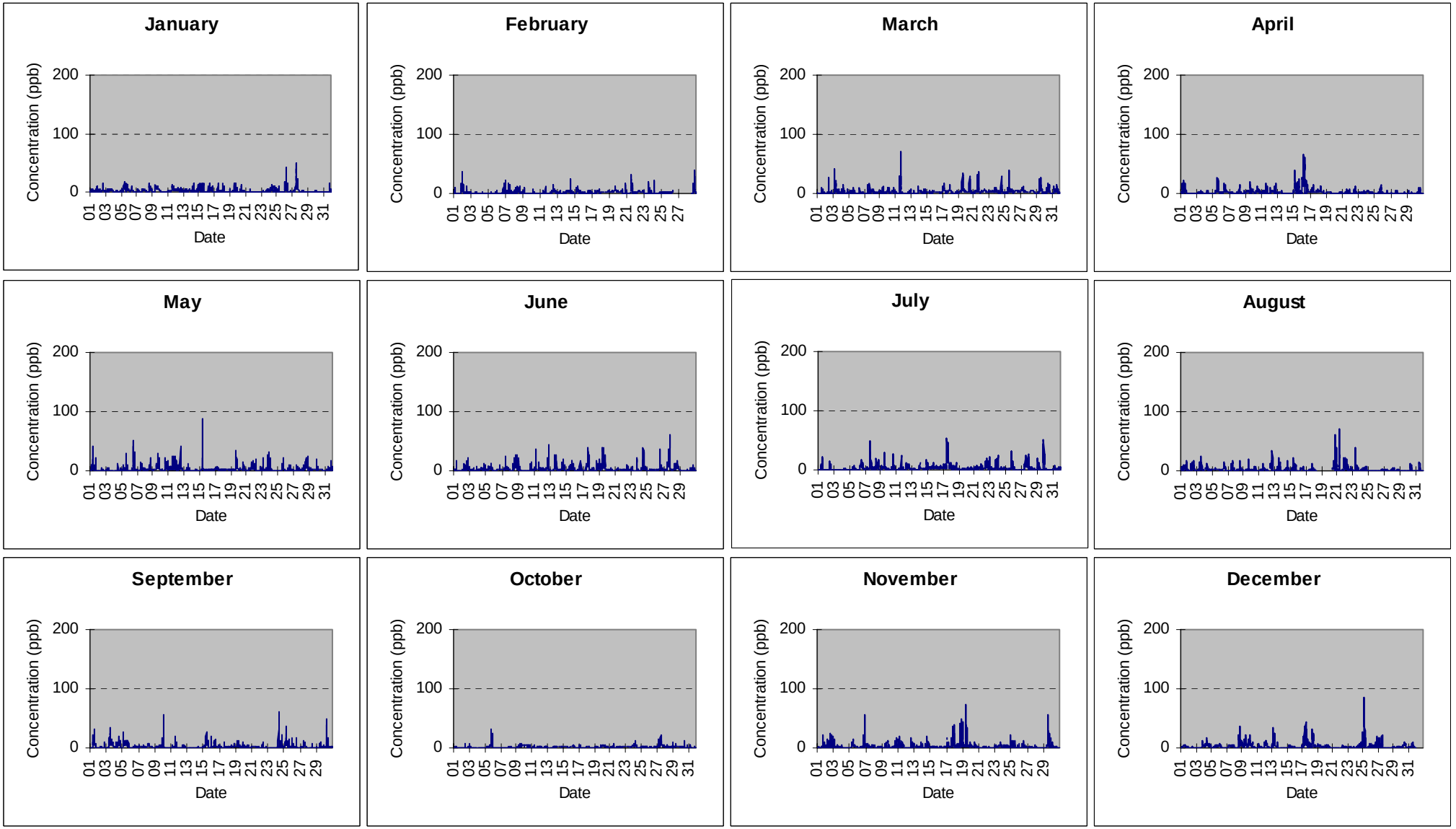


Figure 42 Average sulphur dioxide levels by wind direction in 2003

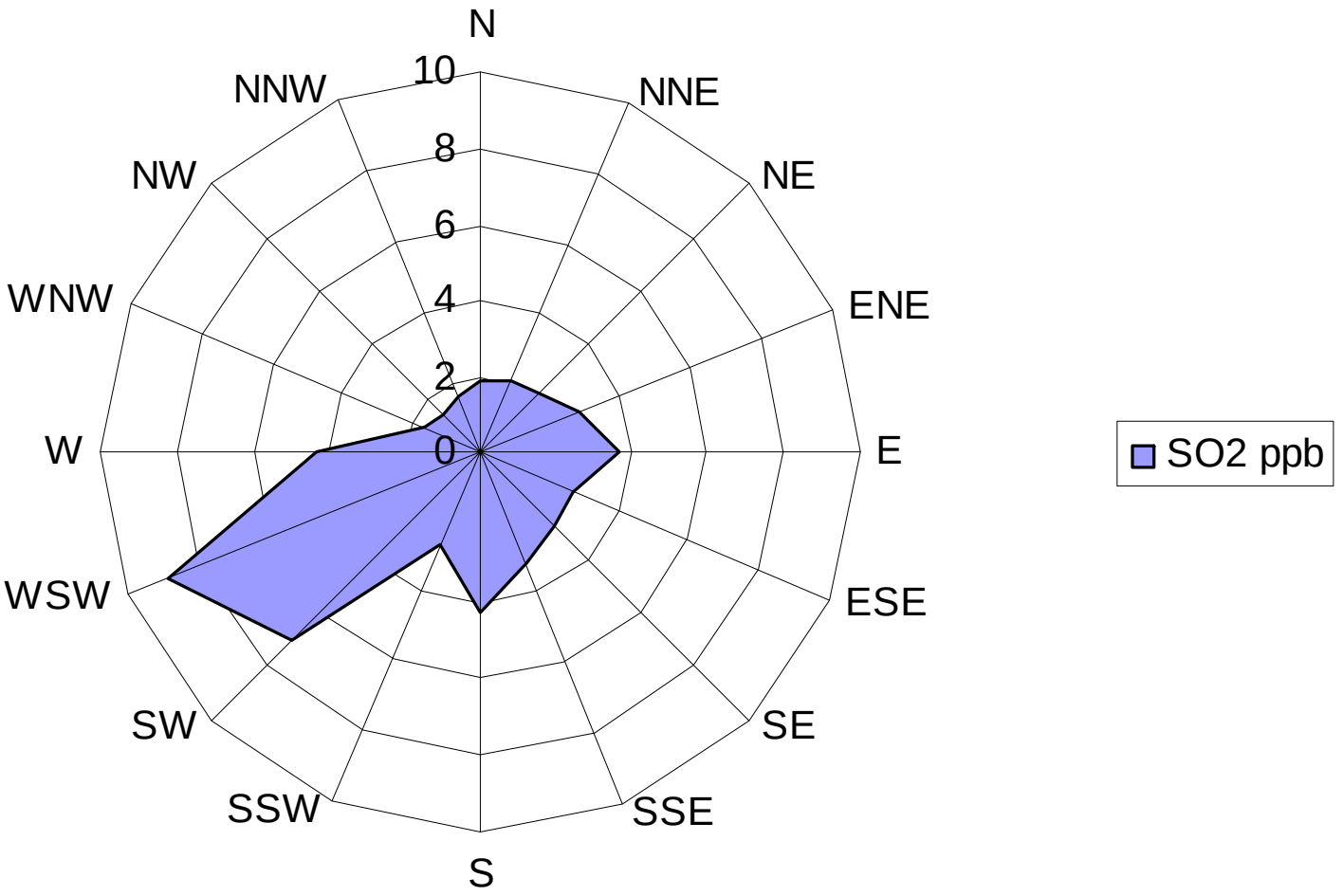


Figure 43 Ozone results – 2003 – 8hour running averages

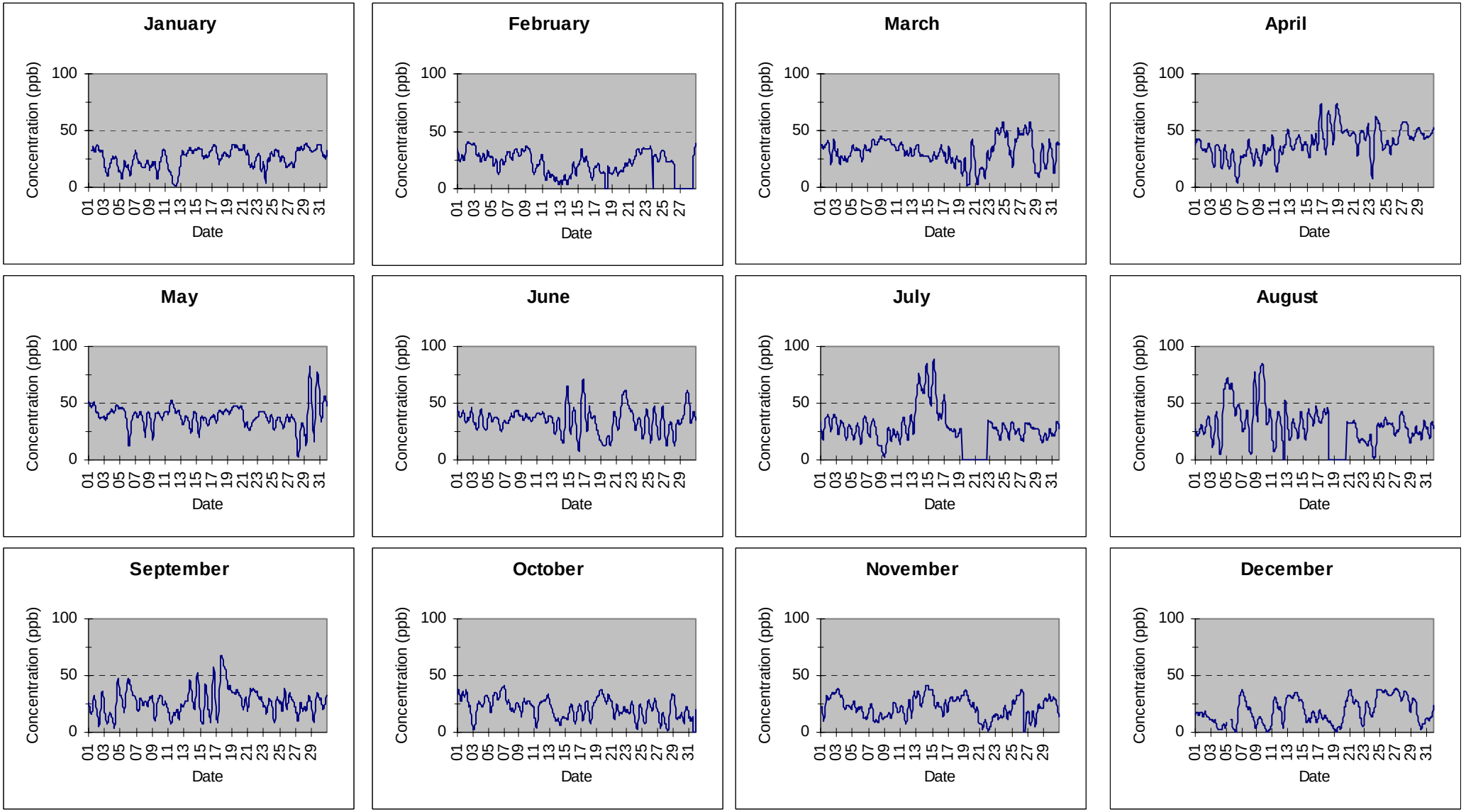


Figure 44 Average ozone levels by wind direction in 2003

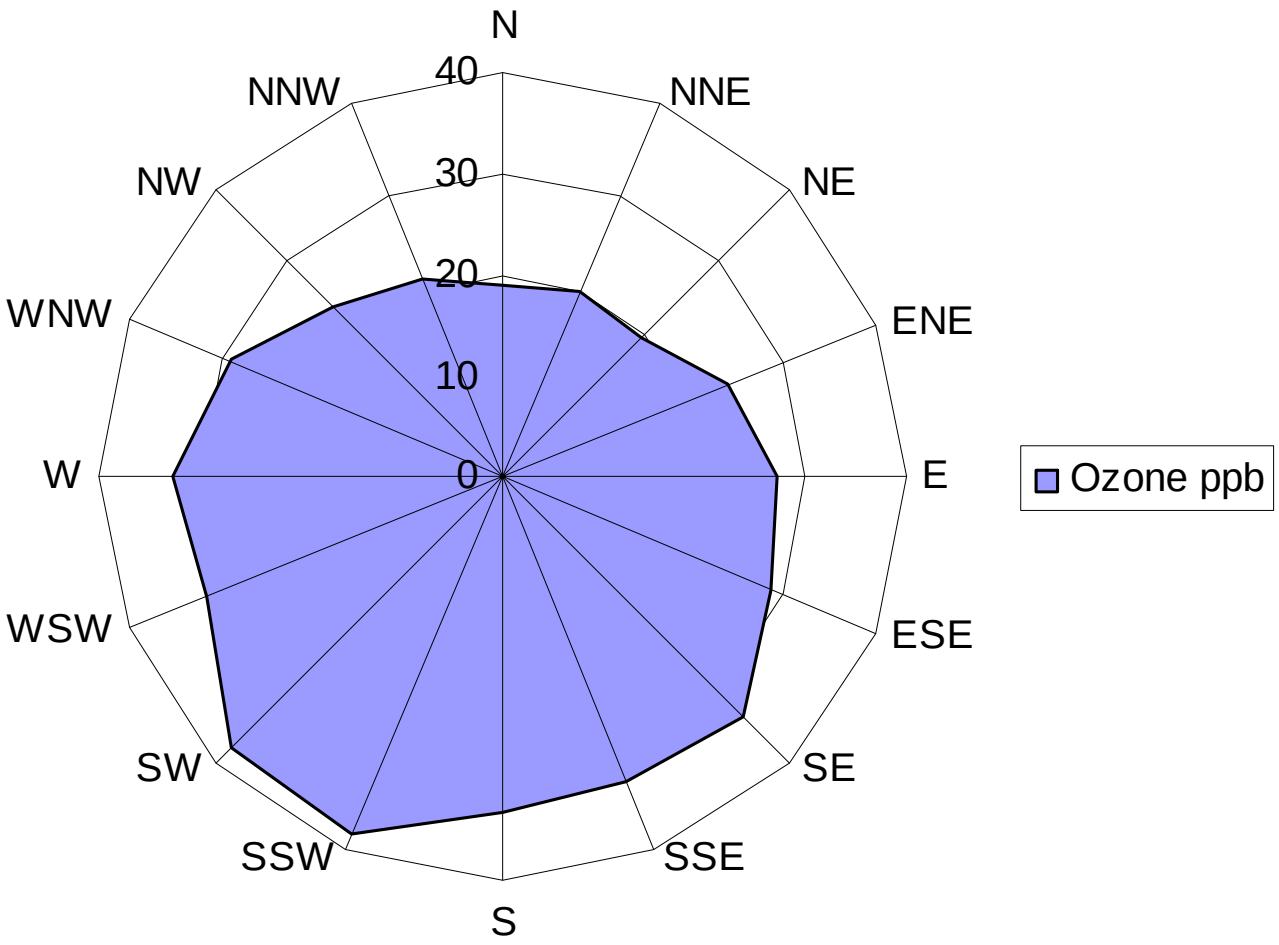


Figure 45 PM_{10} results – 2003 - 24hour running averages

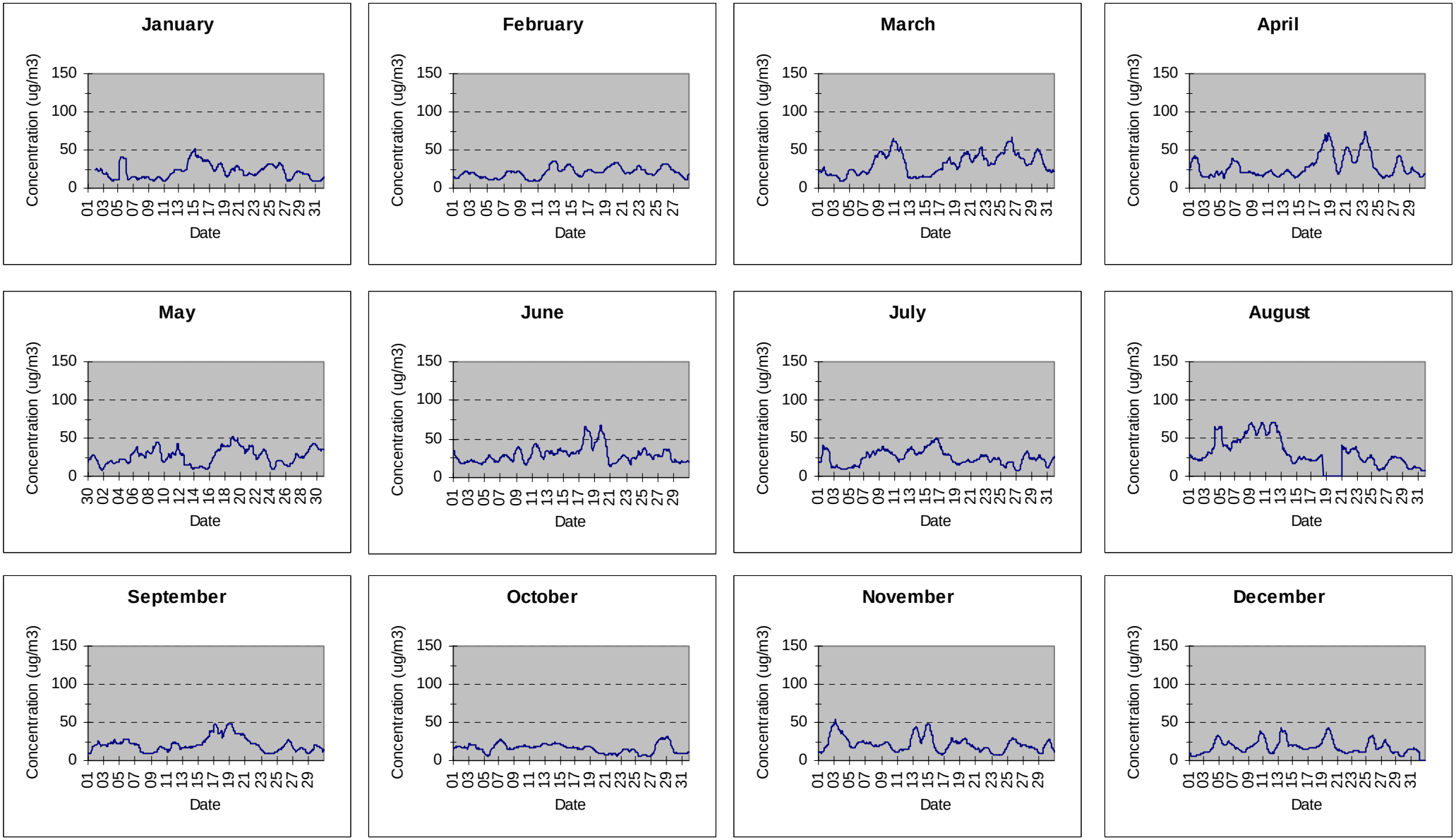


Figure 46 PM_{10} particulate levels by wind direction in 2003

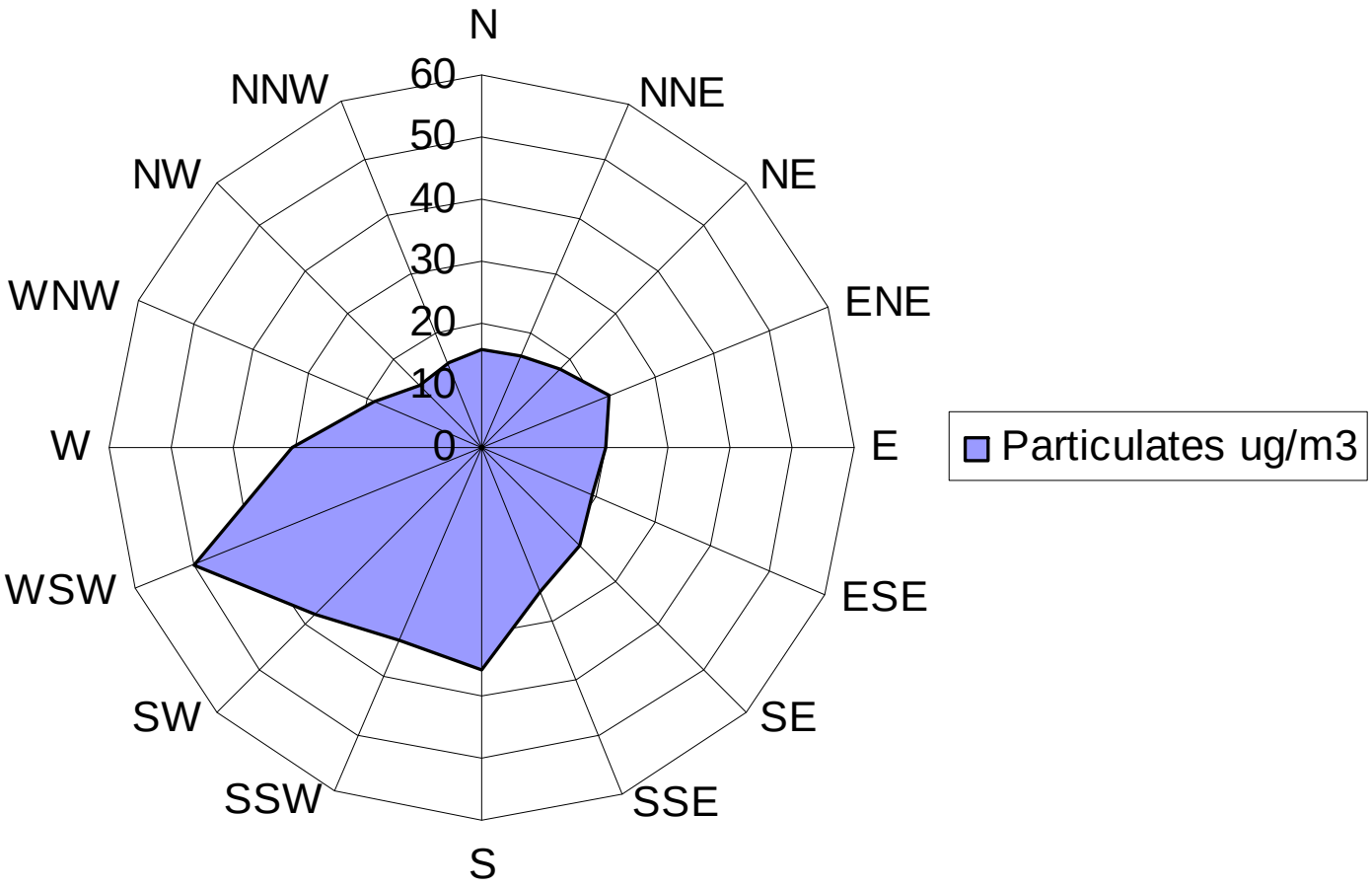


Figure 47 CO results – 2003 - 8hour running averages

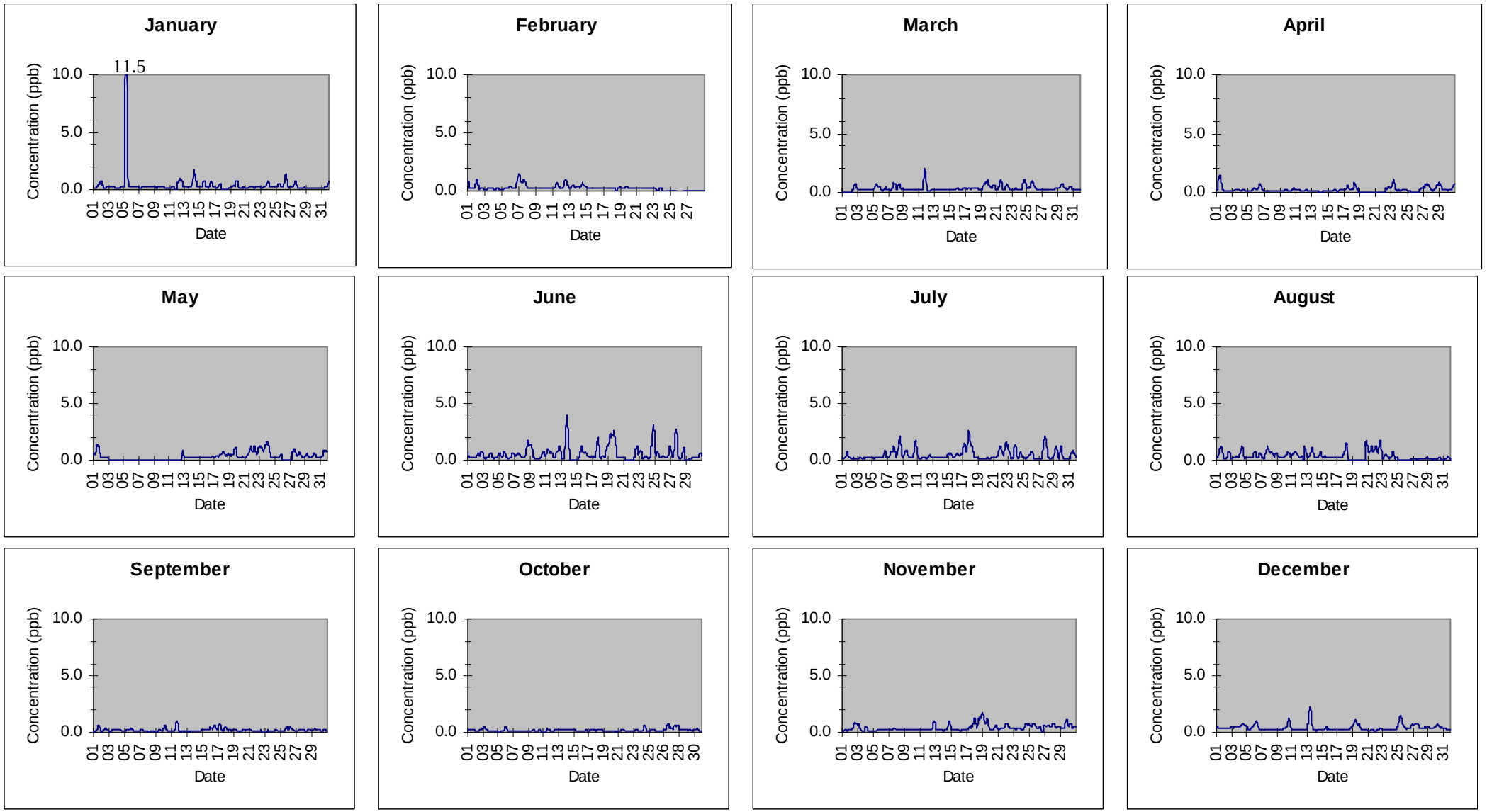
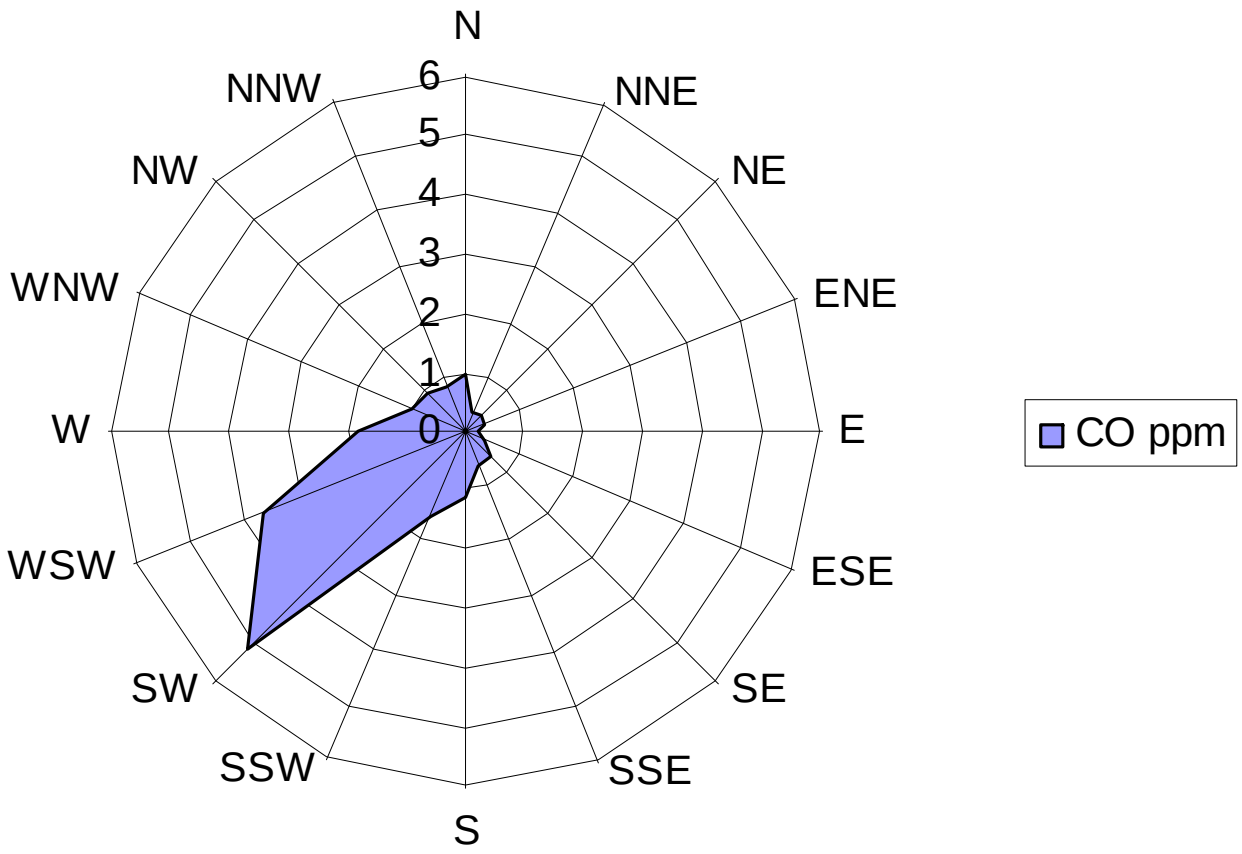


Figure 48 CO levels by wind direction in 2003



Organics –Ozone Precursor System
Baglan, Port Talbot

Introduction

The monitoring station has been in operation since November 1996. Neath Port Talbot and Swansea Authorities were successful in obtaining funding from the Department of the Environment (now Department of the Environment, Transport and the Regions) to pilot the government's proposals for Local Authority air quality management under the Environment Act. Part of this award was used to provide the Monitoring Unit. The total cost of setting up the unit was approximately £50,000. In April 1998, the system was incorporated onto the Authority's Monnet database, which allows remote data collection and quality assurance. The data is checked on a daily basis and is collected and disseminated to the Authority's World Wide Web Internet site on an hourly basis. The location of the analyser is shown in Figure 51.

Pollutants monitored

The ozone precursor analyser is so called because it allows measurement of volatile organic compounds (VOC's), substances that have a role in the formation of another pollutant, Ozone. Ozone in turn is of concern since it can cause harm to plants and people when present at low altitude and in high concentrations. VOC is an acronym, which stands for Volatile Organic Compounds. These are a range of mainly synthetic, carbon based substances which are capable of becoming a vapour at relatively low temperatures. These substances are primarily man-made, but Methane also arises naturally from the putrefaction of organic materials and as a result of the process of digestion in animals. Some VOC's are recognised as being potentially harmful to health, whereas others are harmful to the environment. The government has introduced National Air Quality Objectives (1997), which are health based environmental aims, for Benzene and 1,3-Butadiene, to be achieved by 31st December 2003. These measurements do not currently contribute to the National Hydrocarbon Network, but it is hoped that they may in future be incorporated.

The following volatile organic compounds are analysed:

- 1,3-butadiene
- 1-butene
- 3 methyl pentane
- Benzene
- Ethane
- Ethene
- Ethyl benzene
- Ethyne
- Propane
- Propene
- Toluene

- Cis 2-Butene
- Cis 2-pentene
- Iso-butane
- Iso-pentane
- m+p-xylene
- o-xylene
- N-Butane
- N-heptane
- N-hexane
- N-pentane
- Trans 2 butene
- Trans 2 pentene

Apart from benzene and 1,3-butadiene, there are no environmental standards that apply for these pollutants and adverse health effects are unlikely to arise at ambient concentrations.

Benzene

Benzene is a chemical consisting of six atoms of carbon and hydrogen, arranged in a ring structure. Benzene in the atmosphere arises primarily as a result of the combustion of petroleum based fuels. It is also present in cigarette smoke. Benzene harms animals by causing damage to the genetic make-up of cells. Substances that cause this type of damage are of particular concern, since there is no method currently available which enables a risk free exposure level to be determined. Long term exposure to benzene is associated with types of leukaemia. The National Air Quality Objective level is 5 parts per billion (ppb) or 16.3 $\mu g/m^3$, measured as a running annual average.

1,3-butadiene

1,3-Butadiene is a chemical consisting of four carbon and six hydrogen atoms. Only trace amounts are normally present in the atmosphere, which arise mainly from the combustion of petroleum (and other fossil fuels) and as result of accidental fires. Like Benzene, 1,3-Butadiene is genotoxic and is associated with leukaemia's and lymphomas. The National Air Quality Objective level is 1 ppb or 2.25 $\mu g/m^3$ measured as an annual running average.

Results and analysis

The results for 2003 at Baglan and the National Hydrocarbon Network site at Cardiff are summarised and compared in Table 15 below. The Cardiff site has been used previously for comparison since it is the nearest such site where similar measurements are carried out. However, the number of substances analysed at the Cardiff site has now decreased to six.

Table 12 VOC results at Baglan and Cardiff - 2003

VOC Species	Average (ppb)		Max (ppb)	
	Baglan	Cardiff	Baglan	Cardiff
1,3-butadiene	0.01	0.07	0.13	2.45
1-butene	0.03	ND	1.04	ND
3-methyl pentane	0.02	ND	0.16	ND
Benzene	0.10	0.36	5.53	4.14
Ethane	1.60	ND	20.55	ND
Ethene	0.16	ND	5.25	ND
Ethyl benzene	0.04	0.19	2.84	4.61
Ethyne	0.11	ND	3.02	ND
Propane	0.30	ND	32.68	ND
Propene	0.17	ND	64.99	ND
Toluene	0.14	1.03	3.59	17.95
cis 2-butene	0.03	ND	0.50	ND
cis 2-pentene	0.03	ND	0.26	ND
iso-pentane	0.08	ND	2.11	ND
Isobutane	0.08	ND	4.77	ND
m-xylene	0.10	0.55	10.08	19.69
o-xylene	0.31	0.30	12.68	4.59
n-butane	0.03	ND	0.58	ND
n-heptane	0.05	ND	1.95	ND
n-hexane	0.01	ND	0.16	ND
n-pentane	0.05	ND	1.24	ND
trans 2-butene	0.05	ND	1.33	ND
trans 2-pentene	0.02	ND	0.31	ND

The information is represented graphically in Figures 49 (averages) and 50 (maxima).

The average annual concentration of benzene at 0.10ppb is only 2% of the National Air Quality objective level and is less than a third of that measured in Cardiff during the same period. The 1,3-butadiene concentrations were barely measureable, being near the detection limit of the equipment.

Average ethene levels at Baglan (0.16 ppb) were substantially less that those measured during 2002 (2.55 ppb). The ethanol plant at B.P. Baglan Bay was shutdown in 2002. The level of propene in 2003 was 0.17 ppb, substantially less than the 2002 figure of 1.45 ppb. The propene plant at BP was due for shutdown during 2004. The process at B.P. Baglan is regulated by the Environment Agency, which has been informed of the results in previous years.

Figure 49 VOC Average concentrations – 2003

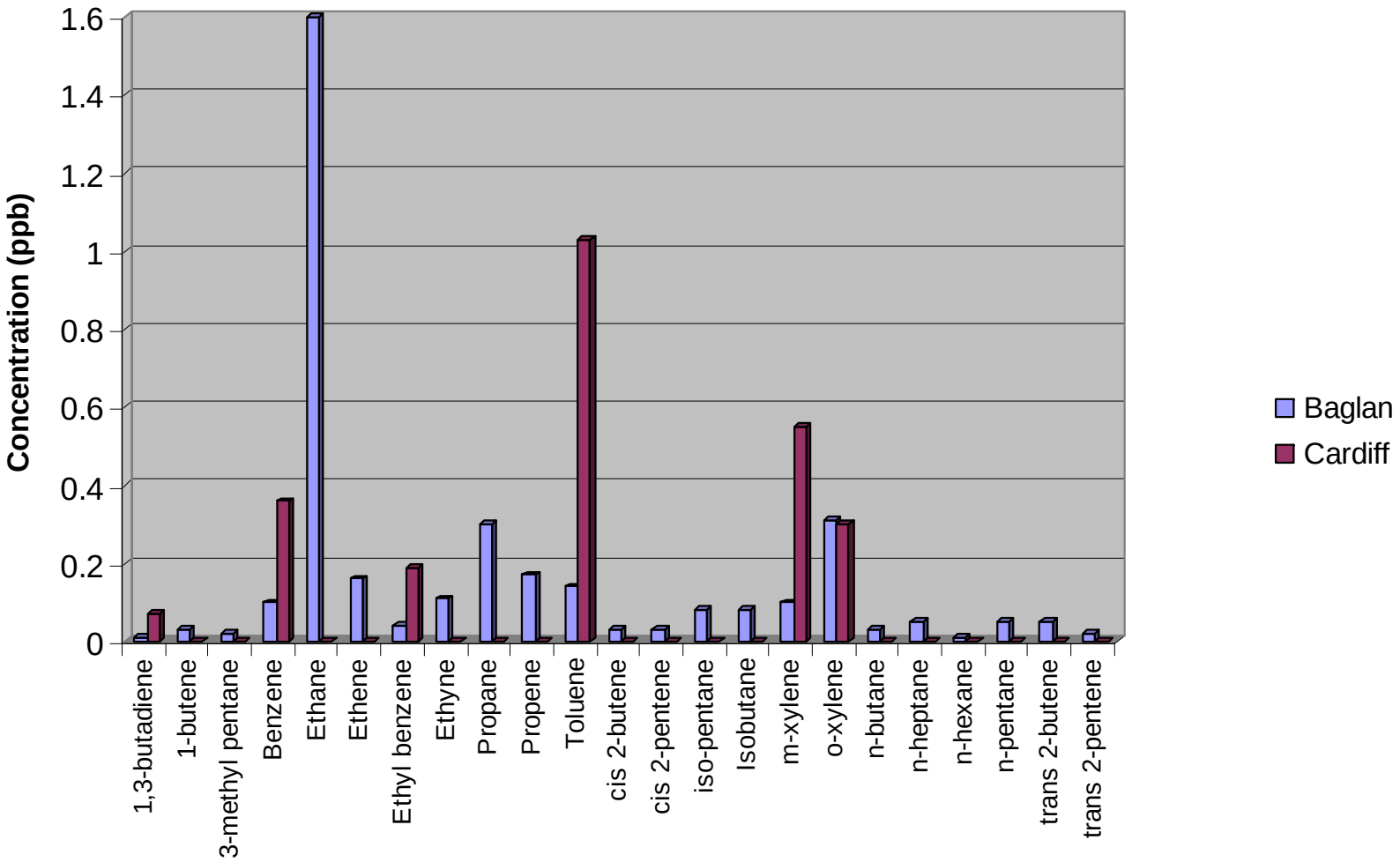


Figure 50 VOC maximum concentrations – 2003

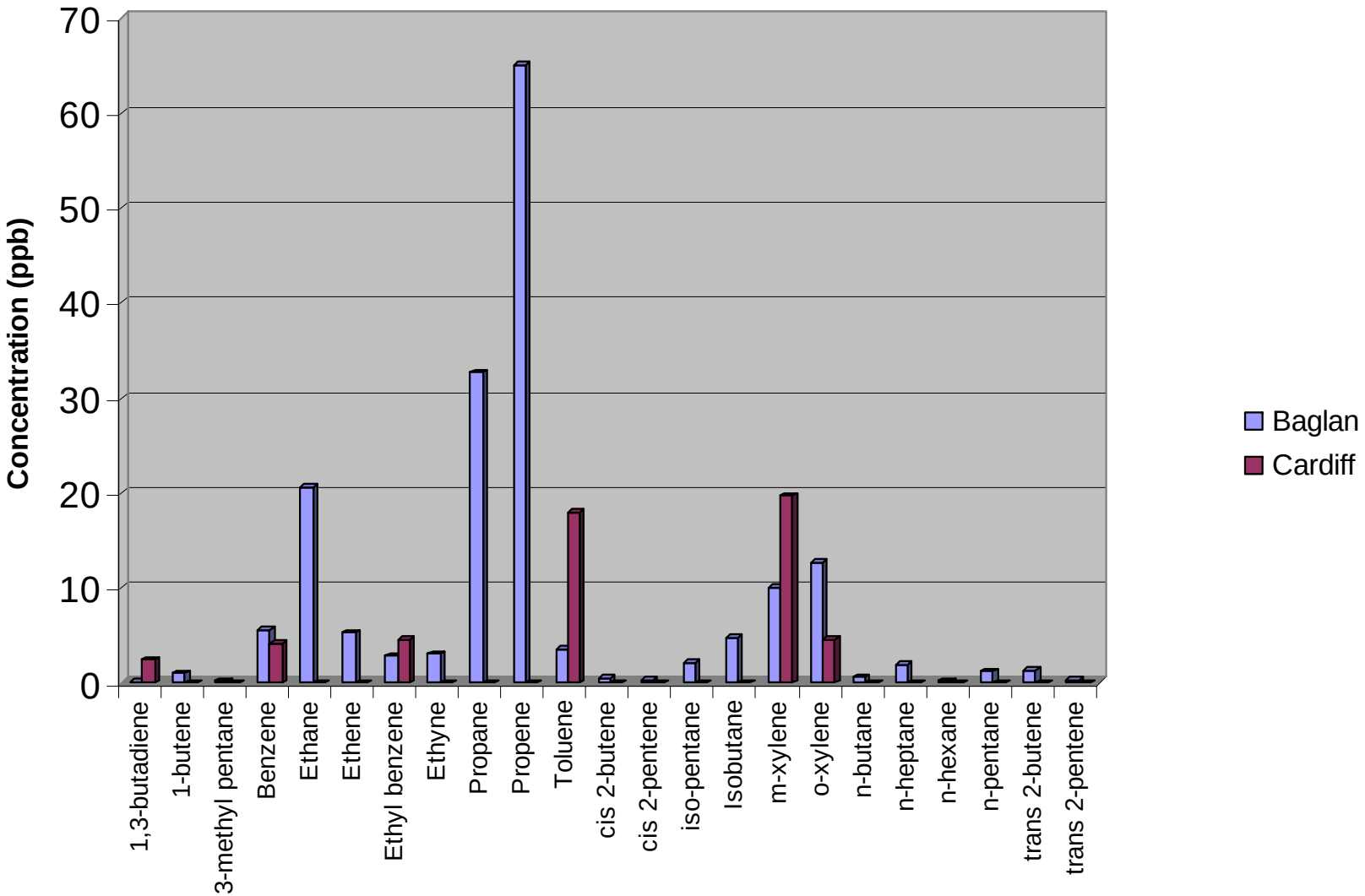
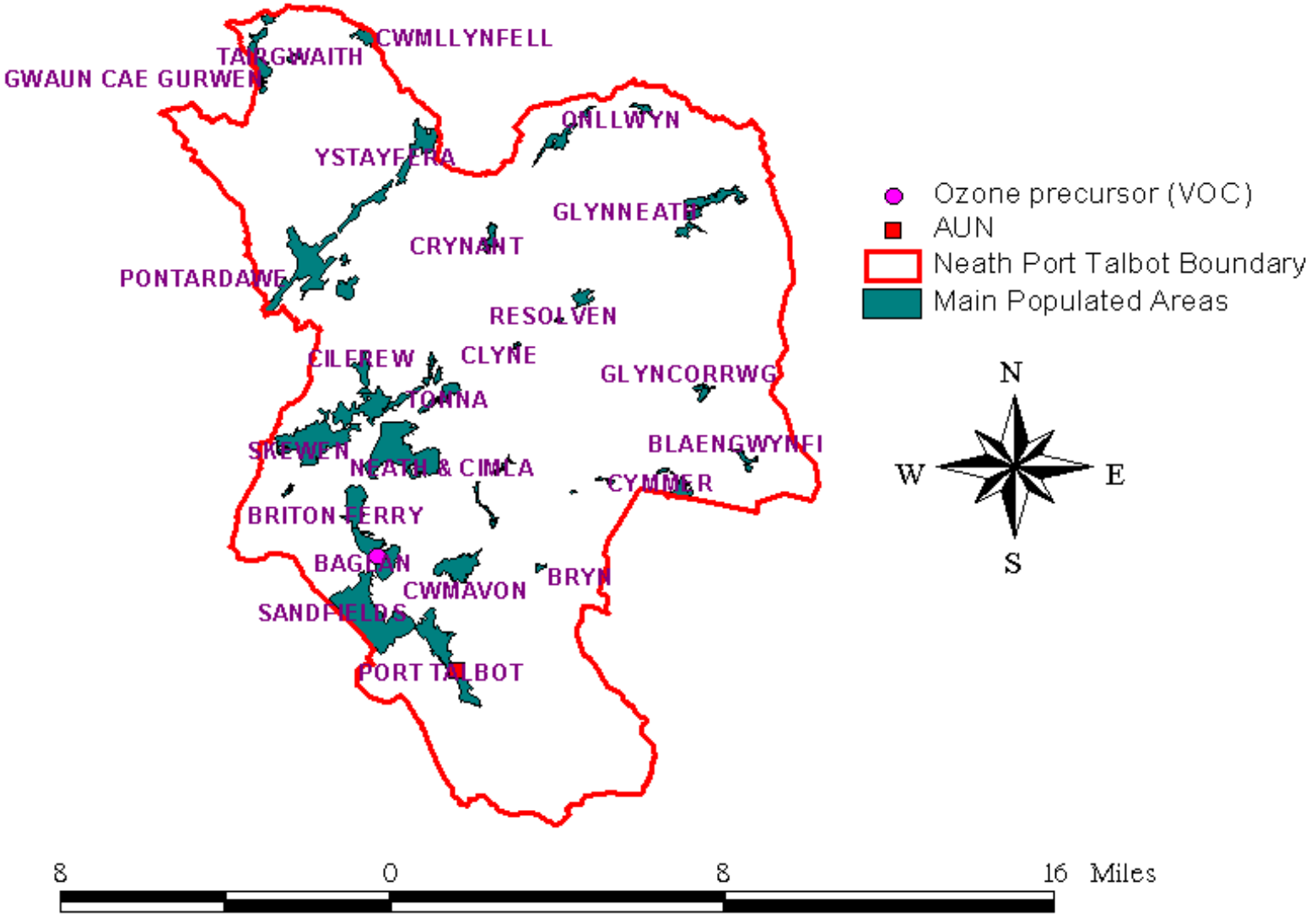


Figure 51 Continuous analyser locations



APPENDIX 1

AIR QUALITY STANDARDS AND BANDINGS

Table 13 Summary of objectives

Pollutant	Objective	Measured as	To be achieved by
Benzene	16.25 µg/m^3 (5 ppb)	Running Annual Mean	31 December 2003
1,3-Butadiene	2.25 µg/m^3 (1 ppb)	Running Annual Mean	31 December 2003
Carbon monoxide	10 mg/m^3 (8.6 ppm)	Running 8 Hour Mean	31 December 2003
Lead	0.5 µg/m^3	Annual Mean	31 December 2004
	0.25 µg/m^3	Annual Mean	31 December 2008
Nitrogen dioxide*	200 µg/m^3 (105 ppb) Not to be exceeded more than 18 times per year	1 Hour Mean	31 December 2005
	40 µg/m^3 (21 ppb)	Annual Mean	31 December 2005
Nitrogen Oxides**	(V) 30 µg/m^3 (16 ppb)	Annual Mean	31 December 2000
Ozone	100 µg/m^3	Running 8 hour Mean Daily maximum of running 8 hr mean not to be exceeded more than 10 times per year	31 December 2005
Particles (PM10)	50 µg/m^3 Not to be exceeded more than 35 times per year	24 Hour Mean	31 December 2004

Air Quality Objectives - Continued

	40 µg/m^3	Annual Mean	31 December 2004
Sulphur dioxide	266 µg/m^3 (100 ppb) Not to be exceeded more than 35 times per year	15 Minute Mean	31 December 2005
	350 µg/m^3 (132 ppb) Not to be exceeded more than 24 times per year	1 Hour Mean	31 December 2004
	125 µg/m^3 (47 ppb) Not to be exceeded more than 3 times per year	24 Hour Mean	31 December 2004
	(V) 20 µg/m^3 (8 ppb)	Annual Mean	31 December 2000
	(V) 20 µg/m^3 (8 ppb)	Winter Mean (01 October - 31 March)	31 December 2000

Notes:
µg/m^3 - micrograms per cubic metre
mg/m^3 - milligrams per cubic metre
ppb - parts per billion
ppm - parts per million
* The objectives for nitrogen dioxide are provisional
** Assuming NO_x is taken as NO_2
(V) These standards are adopted for the protection of vegetation and ecosystems. All of the remainder are for the protection of human health.

Table 14 UK Air quality banding levels

Band	Index	Ozone		Nitrogen Dioxide		Sulphur Dioxide		Carbon Monoxide		PM10 Particles
		8 hourly or hourly mean*		hourly mean		15 minute mean		8 hour mean		24 hour mean
		µgm^{-3}	ppb	µgm^{-3}	ppb	µgm^{-3}	ppb	mgm^{-3}	ppb	µgm^{-3}
Low										
	1	0-32	0-16	0-95	0-49	0-88	0-32	0-3.8	0.0-3.2	0-16
	2	33-66	17-32	96-190	50-99	89-176	33-66	3.9-7.6	3.3-6.6	17-32
	3	67-99	33-49	191-286	100-149	177-265	67-99	7.7-11.5	6.7-9.9	33-49
Moderate										
	4	100-126	50-62	287-381	150-199	266-354	100-132	11.6-13.4	10.0-11.5	50-57
	5	127-152	63-76	382-476	200-249	355-442	133-166	13.5-15.4	11.6-13.2	58-66
	6	153-179	77-89	478-572	250-299	443-531	167-199	15.5-17.3	13.3-14.9	67-74
High										
	7	180-239	90-119	573-635	300-332	532-708	200-266	17.4-19.2	15.0-16.5	75-82
	8	240-299	120-149	363-700	333-366	709-886	267-332	19.3-21.2	16.6-18.2	83-91
	9	300-359	150-179	701-763	367-399	887-1063	333-399	21.3-23.1	18.3-19.9	92-99
Very High										
	10	360 or more	180 or more	764 or more	400 or more	1064 or more	400 or more	23.2 or more	20 or more	100 or more

* For ozone, the maximum of the 8 hourly and hourly mean is used to calculate the index value.

Source http://www.aeat.co.uk/netcen/airqual/welcome.html

Table 15 UK Air quality banding levels

Banding	Index	Health Descriptor
Low	1	Effects are unlikely to be noticed even by individuals who know they are sensitive to air pollutants
	2	
	3	
Moderate	4	Mild effects, unlikely to require action, may be noticed amongst sensitive individuals.
	5	
	6	
High	7	Significant effects may be noticed by sensitive individuals and action to avoid or reduce these effects may be needed (e.g. reducing exposure by spending less time in polluted areas outdoors). Asthmatics will find that their 'reliever' inhaler is likely to reverse the effects on the lung.
	8	
	9	
Very High	10	The effects on sensitive individuals described for 'High' levels of pollution may worsen.

Source http://www.aeat.co.uk/netcen/airqual/welcome.html