

Table 1 Sites used for groundwater monitoring network from north (Site 1) to south (Site 14).

Site identity	Purpose	Abstraction (m ³ day ⁻¹)	Usage
1	Agriculture other than spray irrigation	33	Frequent
2	Agriculture other than spray irrigation	1	Sampling only
3	University of Lancaster research site	–	Sampling only
4	Sand and gravel washing	364	Continuous
5	Agriculture other than spray irrigation	50	Frequent
6	Spray irrigation	27	Frequent in summer
7	Agriculture other than spray irrigation	5	Frequent
8	*YW observation well	–	Sampling only
9	Agriculture other than spray irrigation	10	Frequent
10	**EA observation well	–	Sampling only
11	**EA observation well	–	Sampling only
12	*YW observation well	–	Sampling only
13	Spray irrigation	50	Frequent in summer
14	Industrial process water	136	Continuous

* YW=Yorkshire Water; **EA=Environment Agency.

Table 2 List of 40 pesticides analysed for each monitoring site.

Phenoxyacidic	Phenylurea	Triazines	Carbamates
2,3,6-TBA	Carbetamide ¹	Atrazine	Carbaryl
2,4,5-T	Chlorotoluron	Prometryn	Carbetamide ¹
2,4-D	Diuron	Propazine	Chloroprotham
2,4-DB	Isoproturon	Simazine	Methiocarb
4-CPA	Linuron	Terbutryn	Pirimicarb
Benazolin	Methabenzthiazuron	Terbutylazine	Protham
Bentazone	Monuron	Trietazine	
Bromoxynil			
Clopyralid			
Dicamba			
Dichlorprop			
Diclofop			
Fenoprop			
Flamprop			
Ioxynil			
MCPA			
MCPB			

Mecoprop

Pentachlorophenol

Picloram

Triclopyr

¹Carbetamide is found in both the phenylurea and carbamate suites.

Table 3 Pesticides detected in study area during 18 month period from January 2002.

	Number of detections	Maximum($\mu\text{g l}^{-1}$)	Mean($\mu\text{g l}^{-1}$)	Median($\mu\text{g l}^{-1}$)	Number of detections $> 0.1 \mu\text{g l}^{-1}$	Number of sites where detected
Mecoprop	60	7.1	2.1	2.3	36	10
Bentazone	37	0.12	0.056	0.053	2	2
Atrazine	29	1.4	0.340	0.089	14	3
Isoproturon	22	1.2	0.486	0.650	15	5
Clopyralid	21	0.30	0.065	0.054	1	3
Benazolin	18	0.18	0.089	0.097	9	2
Dicamba	7	0.052	0.041	0.045	0	1
Chlorotoluron	7	0.059	0.048	0.050	0	5
Pentachlorophenol	6	0.041	0.028	0.025	0	2
MCPA	5	0.056	0.034	0.033	0	4
Picloram	4	0.029	0.026	0.026	0	2
Simazine	4	0.062	0.034	0.027	0	2
Terbutryn	3	0.13	0.087	0.081	1	2
Propazine	3	0.034	0.026	0.024	0	1
Dichlorprop	2	0.048	0.040	0.040	0	1
Monuron	2	0.033	0.028	0.028	0	1

2,4-D	1	0.55	1	1
Chloroprotham	1	0.41	1	1
Carbetamide	1	0.046	0	1
Flamprop	1	0.038	0	1
Methiocarb	1	0.037	0	1
MCPB	1	0.031	0	1
Pirimicarb	1	0.031	0	1
Diuron	1	0.028	0	1

Table 4 Agricultural usage of pesticides in study area from 2000 to 2001 in relation to solubility.

Solubility(mg l ⁻¹)	Agricultural usage 2000–2001 (kg)		
	>100–1000	<100	
>1000			
>100	Mecoprop Bentazone MCPA <i>Bromoxynil</i>	Benazolin <i>2,4-DB</i>	Dichlorprop
>10–100	Isoproturon Chlorotoluron Terbutryn	Atrazine <i>2,4-D</i> <i>Linuron</i>	<i>Chlorpropham</i> <i>Methiocarb</i> <i>Diuron</i> <i>Prometryn</i> <i>Ioxynil</i>
<10	Simazine <i>MCPB</i>	Clopyralid <i>Flamprop</i> <i>Pirimicarb</i> <i>Diclofop</i> <i>Terbutylazine</i>	Dicamba <i>Carbetamide</i> <i>Triclopyr</i>

Pesticides in italics were detected once or less. Pesticides most commonly detected generally have highest solubilities and greatest usage.

Table 5 Number of pesticides detected at each site from north (Site 1) to south (Site 14) across the study area.

Site	Number of positive detections	Number of times sampled	Number of positives per sampling	NO ₃ -N (mg l ⁻¹)	Drift cover
1	75	18	4.2	0.06	Permeable drift
2	33	19	1.7	5.5	Silts and clays
3	4	14	0.3	29	Permeable drift
4	0	6	0.0	4.9	Permeable drift
5	5	20	0.3	27	Silts and clays
6	20	18	1.1	0.26	Permeable drift
7	0	7	0.0	1.5	Silts and clays
8	6	7	0.9	3.8	Silts and clays
9	6	20	0.3	9.4	Permeable drift
10	27	16	1.7	0.27	Permeable drift
11	8	10	0.8	2.2	Permeable drift
12	6	9	0.7	17	Permeable drift
13	49	20	2.5	21	Permeable drift
14	0	6	0.0	17	Permeable drift

Data for nitrate-N are the mean values.

Table 6 Mecoprop data from samples taken for enantiomers at Sites 1 and 6 and a nearby public water supply (PWS).

	R form($\mu\text{g l}^{-1}$)	S form($\mu\text{g l}^{-1}$)	Total($\mu\text{g l}^{-1}$)	Enantiomeric ratio(R/S)
Site 1	3.00	2.21	5.21	1.3
Site 6	3.07	2.60	5.67	1.2
PWS	0.064	0.031	0.095	2.1