Table 3.4.2.1. List of Analytical Parameters (continued)

Chemical Constituent	List (a)	CAS Number	Compound Group	Analytical Method (b)		PQL (c) (µg/L)
Selenium	I & II	N/A	Metal	7741	AA, (GH)	*20*
Silver	I & II	N/A	Metal	6010	ICP	*70*
Silver	I & II	N/A	Metal	7760	AA, (DA)	*100*
Silver	I & II	N/A	Metal	7761	AA, (GF)	*10*
Thallium	I & II	N/A	Metal	6010	ICP	*400*
Thallium	I & II	N/A	Metal	7840	AA, (DA)	*1000*
Thallium	I & II	N/A	Metal	7841	AA, (Furn)	*10*
Tin	II	N/A	Metal	6010	ICP	*40*
Vanadium	I & II	N/A	Metal	6010	ICP	*80*
Vanadium	I & II	N/A	Metal	7910	AA, (DA)	*2000*
Vanadium	I & II	N/A	Metal	7911	AA, (Furn)	*40*
Zinc	I & II	N/A	Metal	6010	ICP	*20*
Zinc	I & II	N/A	Metal	7950	AA, (DA)	*50*
Zinc	I & II	N/A	Metal	7951	AA, (GF)	*0.5*
Polychlorinated biphenyls	II		PCB	8080	GC	*50*
Polychlorinated biphenyls	II		PCB	8270	GC/MS	*200*
4,4'-DDD	II	72-54-8	Pesticide	8080	GC	*0.1*
4,4'-DDD	II	72-54-8	Pesticide	8270	GC/MS	*10*
4,4'-DDE	II	72-55-9	Pesticide	8080	GC	*0.05*
4,4'-DDE	II	72-55-9	Pesticide	8270	GC/MS	*10*
4,4'-DDT	II	50-29-3	Pesticide	8080	GC	*0.1*
4,4'-DDT	II	50-29-3	Pesticide	8270	GC/MS	*10*
Aldrin	II	309-00-2	Pesticide	8080	GC	*0.05*
Aldrin	II	309-00-2	Pesticide	8270	GC/MS	*10*
alpha-BHC	II	319-84-6	Pesticide	8080	GC	*0.05*
alpha-BHC	II	319-84-6	Pesticide	8270	GC/MS	*10*
beta-BHC	II	319-85-7	Pesticide	8080	GC	*0.05*
beta-BHC	II	319-85-7	Pesticide	8270	GC/MS	*20*
Chlordane	II		Pesticide	8080	GC	*0.1*
Chlordane	II		Pesticide	8270	GC/MS	*50*
delta-BHC	II	319-86-8	Pesticide	8080	GC	*0.1*
delta-BHC	II	319-86-8	Pesticide	8270	GC/MS	*20*
Dieldrin	II	60-57-1	Pesticide	8080	GC	*0.05*
Dieldrin	II	60-57-1	Pesticide	8270	GC/MS	*10*
Dimethoate	II	60-51-5	Pesticide	8141	GC	*3*
Dimethoate	II	60-51-5	Pesticide	8270	GC/MS	*20*
Disulfoton	II	298-04-4	Pesticide	8140	GC	*2*

Table 3.4.2.1. List of Analytical Parameters (continued)

Chemical Constituent	List (a)	CAS Number	Compound Group	Analytical Method (b)		PQL (c) (µg/L)
Disulfoton	II	298-04-4	Pesticide	8141	GC	*0.5*
Disulfoton	II	298-04-4	Pesticide	8270	GC/MS	*10*
Endosulfan I	II	959-98-8	Pesticide	8080	GC	*0.1*
Endosulfan I	II	959-98-8	Pesticide	8270	GC/MS	*20*
Endosulfan II	II	33213-65-9	Pesticide	8080	GC	*0.05*
Endosulfan II	II	33213-65-9	Pesticide	8270	GC/MS	*20*
Endosulfan sulfate	II	1031-07-8	Pesticide	8080	GC	*0.5*
Endosulfan sulfate	II	1031-07-8	Pesticide	8270	GC/MS	*10*
Endrin	II	72-20-8	Pesticide	8080	GC	*0.1*
Endrin	II	72-20-8	Pesticide	8270	GC/MS	*20*
Endrin aldehyde	II	7421-93-4	Pesticide	8080	GC	*0.2*
Endrin aldehyde	II	7421-93-4	Pesticide	8270	GC/MS	*10*
gamma-BHC	II	58-89-9	Pesticide	8080	GC	*0.05*
gamma-BHC	II	58-89-9	Pesticide	8270	GC/MS	*20*
Heptachlor	II	76-44-8	Pesticide	8080	GC	*0.05*
Heptachlor	II	76-44-8	Pesticide	8270	GC/MS	*10*
Heptachlor epoxide	II	1024-57-3	Pesticide	8080	GC	*1*
Heptachlor epoxide	II	1024-57-3	Pesticide	8270	GC/MS	*10*
Methoxychlor	II	72-43-5	Pesticide	8080	GC	*2*
Methoxychlor	II	72-43-5	Pesticide	8270	GC/MS	*10*
Methyl parathion	II	298-00-0	Pesticide	8140	GC	*0.5*
Methyl parathion	II	298-00-0	Pesticide	8141	GC	*1*
Methyl parathion	II	298-00-0	Pesticide	8270	GC/MS	*10*
Parathion	II	56-38-2	Pesticide	8141	GC	*0.5*
Parathion	II	56-38-2	Pesticide	8270	GC/MS	*10*
Phorate	II	298-02-2	Pesticide	8140	GC	*2*
Phorate	II	298-02-2	Pesticide	8141	GC	*0.5*
Phorate	II	298-02-2	Pesticide	8270	GC/MS	*10*
Toxaphene	II		Pesticide	8080	GC	*2*
0,0,0-Triethyl phosphorothioate	II	126-68-1	S/VO	8270	GC/MS	*10*
0,0-Diethyl 0-2-pyrazinyl phosphorothioate	II	297-97-2	S/VO	8141	GC	*5*
0,0-Diethyl 0-2-pyrazinyl phosphorothioate	II	297-97-2	S/VO	8270	GC/MS	*20*
1,4-Naphthoquinone	II	130-15-4	S/VO	8270	GC/MS	*10*
1-Naphthylamine	II	134-32-7	S/VO	8270	GC/MS	*10*
2-Methylnaphthalene	II	91-57-6	S/VO	8270	GC/MS	*10*
2-Naphthylamine	II	91-59-8	S/VO	8270	GC/MS	*10*

Table 3.4.2.1. List of Analytical Parameters (continued)

Chemical Constituent	List (a)	CAS Number	Compound Group	Analytical Method (b)		PQL (c) (µg/L)
2-Nitroaniline	II	88-74-4	S/VO	8270	GC/MS	*50*
3,3'-Dichlorobenzidine	II	91-94-1	S/VO	8270	GC/MS	*20*
3,3'-Dimethylbenzidine	II	119-93-7	S/VO	8270	GC/MS	*10*
3-Dinitrobenzene	II	99-65-0	S/VO	8270	GC/MS	*20*
3-Methylcholanthrene	II	56-49-5	S/VO	8270	GC/MS	*10*
3-Nitroaniline	II	99-09-2	S/VO	8270	GC/MS	*50*
4-Aminobiphenyl	II	92-67-1	S/VO	8270	GC/MS	*20*
4-Bromophenyl phenyl ether	II	101-55-3	S/VO	8110	GC	*25*
4-Bromophenyl phenyl ether	II	101-55-3	S/VO	8270	GC/MS	*10*
4-Chloroaniline	II	106-47-8	S/VO	8270	GC/MS	*20*
4-Chlorophenyl phenyl ether	II	7005-72-3	S/VO	8110	GC	*40*
4-Chlorophenyl phenyl ether	II	7005-72-3	S/VO	8270	GC/MS	*10*
4-Nitroaniline	II	100-01-6	S/VO	8270	GC/MS	*20*
5-Nitro-o-toluidine	II	99-55-8	S/VO	8270	GC/MS	*10*
7,12-Dimethylbenz(a)anthracene	II	57-97-6	S/VO	8270	GC/MS	*10*
Acetophenone	II	98-86-2	S/VO	8270	GC/MS	*10*
Benzyl alcohol	II	100-51-6	S/VO	8270	GC/MS	*20*
Diallate	II	2303-16-4	S/VO	8270	GC/MS	*10*
Dibenzofuran	II	132-64-9	S/VO	8270	GC/MS	*10*
Diphenylamine	II	122-39-4	S/VO	8270	GC/MS	*10*
Ethyl methanesulfonate	II	62-50-0	S/VO	8270	GC/MS	*20*
Famphur	II	52-85-7	S/VO	8270	GC/MS	*20*
Hexachlorobenzene	II	118-74-1	S/VO	8270	GC/MS	*10*
Isodrin	II	465-73-6	S/VO	8270	GC/MS	*20*
Isosafrole	II	120-58-1	S/VO	8270	GC/MS	*10*
Kepone	II	143-50-0	S/VO	8270	GC/MS	*20*
m-Cresol	II	108-39-4	S/VO	8270	GC/MS	*10*
Methapyrilene	II	91-80-5	S/VO	8270	GC/MS	*100*
Methyl methanesulfonate	II	66-27-3	S/VO	8270	GC/MS	*10*
N-Nitrosodi-n-butylamine	II	924-16-3	S/VO	8270	GC/MS	*10*
N-Nitrosodiethylamine	II	55-18-5	S/VO	8270	GC/MS	*20*
N-Nitrosodimethylamine	II	62-75-9	S/VO	8270	GC	*2*
N-Nitrosodiphenylamine	II	86-30-6	S/VO	8270	GC	*5*
N-Nitrosodipropylamine	II	621-64-7	S/VO	8270	GC	*10*
N-Nitrosomethylethalamine	II	10595-95-6	S/VO	8270	GC/MS	*10*
N-Nitrosopiperidine	II	100-75-4	S/VO	8270	GC/MS	*20*
N-Nitrosopyrrolidine	II	930-55-2	S/VO	8270	GC/MS	*40*

Table 3.4.2.1. List of Analytical Parameters (continued)

Chemical Constituent	List (a)	CAS Number	Compound Group	Analytical Method (b)		PQL (c) (µg/L)
o-Cresol	II	95-48-7	S/VO	8270	GC/MS	*10*
o-Toluidine	II	95-53-4	S/VO	8270	GC/MS	*10*
p-(Dimethylamino)azobenzene	II	60-11-7	S/VO	8270	GC/MS	*10*
p-Cresol	II	106-44-5	S/VO	8270	GC/MS	*10*
p-Phenylenediamine	II	106-50-3	S/VO	8270	GC/MS	*10*
Pentachlorobenzene	II	608-93-5	S/VO	8270	GC/MS	*10*
Pentachloronitrobenzene	II	82-68-8	S/VO	8270	GC/MS	*20*
Phenacetin	II	62-44-2	S/VO	8270	GC/MS	*20*
Pronamide	II	23950-58-5	S/VO	8270	GC/MS	*10*
Safrole	II	94-59-/	S/VO	8270	GC/MS	*10*
sym-Trinitrobenzene	II	99-35-4	S/VO	8270	GC/MS	*10*
1,2,4-Trichlorobenzene	II	120-82-1	S/VO, Cl Hydroc.	8120	GC	*0.5*
1,2-Dichlorobenzene	I & II	95-50-1	S/VO, Cl Hydroc.	8120	GC	*10*
1,3-Dichlorobenzene	II	541-73-1	S/VO, Cl Hydroc.	8120	GC	*10*
1,4-Dichlorobenzene	I & II	106-46-7	S/VO, Cl Hydroc.	8120	GC	*15*
2-Chloronaphthalene	II	91-58-7	S/VO, Cl Hydroc.	8120	GC	*10*
Hexachlorobenzene	II	118-74-1	S/VO, Cl Hydroc.	8120	GC	*0.5*
Hexachlorobutadiene	II	87-68-3	S/VO, Cl Hydroc.	8120	GC	*5*
Hexachlorobutadiene	II	87-68-3	S/VO, Cl Hydroc.	8260	GC/MS	*10*
Hexachlorobutadiene	II	87-68-3	S/VO, Cl Hydroc.	8270	GC/MS	*10*
Hexachlorocyclopentadiene	II	77-47-4	S/VO, Cl Hydroc.	8120	GC	*5*
Hexachlorocyclopentadiene	II	77-47-4	S/VO, Cl Hydroc.	8270	GC/MS	*10*
Hexachloroethane	II	67-72-1	S/VO, Cl Hydroc.	8120	GC	*0.5*
Hexachloroethane	II	67-72-1	S/VO, Cl Hydroc.	8260	GC/MS	*10*
Hexachloroethane	II	67-72-1	S/VO, Cl Hydroc.	8270	GC/MS	*10*
Hexachloropropene	II	1888-71-7	S/VO, Cl Hydroc.	8270	GC/MS	*10*
1,2,4,5-Tetrachlorobenzene	II	95-94-3	S/VO, Halogenated	8270	GC/MS	*10*
1,2,4-Trichlorobenzene	II	120-82-1	S/VO, Halogenated	8270	GC/MS	*10*
1,3-Dichlorobenzene	II	541-73-1	S/VO, Halogenated	8270	GC/MS	*10*
Hexachlorobutadiene	II	87-68-3	S/VO, Halogenated	8021	GC	*0.5*
2,4-Dinitrotoluene	II	121-14-2	S/VO, Nitroarom/Ket	8090	GC	*0.2*
2,4-Dinitrotoluene	II	121-14-2	S/VO, Nitroarom/Ket	8270	GC/MS	*10*
2,6-Dinitrotoluene	II	606-20-2	S/VO, Nitroarom/Ket	8090	GC	*0.1*
2,6-Dinitrotoluene	II	606-20-2	S/VO, Nitroarom/Ket	8270	GC/MS	*10*
Isophorone	II	78-59-1	S/VO, Nitroarom/Ket	8090	GC	*60*
Isophorone	II	78-59-1	S/VO, Nitroarom/Ket	8270	GC/MS	*10*
Nitrobenzene	II	98-95-3	S/VO, Nitroarom/Ket	8090	GC	*40*

Table 3.4.2.1. List of Analytical Parameters (continued)

Chemical Constituent	List (a)	CAS Number	Compound Group	Analytical Method (b)		PQL (c) (µg/L)
Nitrobenzene	II	98-95-3	S/VO, Nitroarom/Ket	8270	GC/MS	*10*
2-Acetylaminofluorene	II	53-96-3	S/VO, PAH	8270	GC/MS	*20*
2-Chloronaphthalene	II	91-58-7	S/VO, PAH	8270	GC/MS	*10*
Acenaphthene	II	83-32-9	S/VO, PAH	8100	GC	*200*
Acenaphthene	II	83-32-9	S/VO, PAH	8270	GC/MS	*10*
Acenaphthylene	II	208-96-8	S/VO, PAH	8100	GC	*200*
Acenaphthylene	II	208-96-8	S/VO, PAH	8270	GC/MS	*10*
Anthracene	II	120-12-7	S/VO, PAH	8100	GC	*200*
Anthracene	II	120-12-7	S/VO, PAH	8270	GC/MS	*10*
Benzo(a)anthracene	II	56-55-3	S/VO, PAH	8100	GC	*200*
Benzo(a)anthracene	II	56-55-3	S/VO, PAH	8270	GC/MS	*10*
Benzo(a)pyrene	II	50-32-8	S/VO, PAH	8100	GC	*200*
Benzo(a)pyrene	II	50-32-8	S/VO, PAH	8270	GC/MS	*10*
Benzo(b)fluoranthene	II	205-99-2	S/VO, PAH	8100	GC	*200*
Benzo(b)fluoranthene	II	205-99-2	S/VO, PAH	8270	GC/MS	*10*
Benzo(ghi)perylene	II	191-24-2	S/VO, PAH	8100	GC	*200*
Benzo(ghi)perylene	II	191-24-2	S/VO, PAH	8290	GC/MS	*10*
Benzo(k)fluoranthene	II	207-08-9	S/VO, PAH	8100	GC	*200*
Benzo(k)fluoranthene	II	207-08-9	S/VO, PAH	8270	GC/MS	*10*
Bis(2-chloro-1-methylethyl)ether	II	108-60-1	S/VO, PAH	8110	GC	*10*
Bis(2-chloro-1-methylethyl)ether	II	108-60-1	S/VO, PAH	8270	GC/MS	*10*
Bis(2-chloroethoxy)methane	II	111-91-1	S/VO, PAH	8110	GC	*5*
Bis(2-chloroethoxy)methane	II	111-91-1	S/VO, PAH	8270	GC/MS	*10*
Bis(2-chloroethyl)ether	II	111-44-4	S/VO, PAH	8110	GC	*3*
Bis(2-chloroethyl)ether	II	111-44-4	S/VO, PAH	8270	GC/MS	*10*
Chrysene	II	218-01-9	S/VO, PAH	8100	GC	*200*
Chrysene	II	218-01-9	S/VO, PAH	8270	GC/MS	*10*
Dibenz(a,h)anthracene	II	53-70-3	S/VO, PAH	8100	GC	*200*
Dibenz(a,h)anthracene	II	53-70-3	S/VO, PAH	8270	GC/MS	*10*
Fluoranthene	II	206-44-0	S/VO, PAH	8100	GC	*200*
Fluoranthene	II	206-44-0	S/VO, PAH	8270	GC/MS	*10*
Fluorene	II	86-73-7	S/VO, PAH	8100	GC	*200*
Fluorene	II	86-73-7	S/VO, PAH	8270	GC/MS	*10*
Ideno(1,2,3-cd)pyrene	II	193-39-5	S/VO, PAH	8100	GC	*200*
Ideno(1,2,3-cd)pyrene	II	193-39-5	S/VO, PAH	8270	GC/MS	*10*
Naphthalene	II	91-20-3	S/VO, PAH	8021	GC	*0.5*
Naphthalene	II	91-20-3	S/VO, PAH	8100	GC	*200*

Table 3.4.2.1. List of Analytical Parameters (continued)

Chemical Constituent	List (a)	CAS Number	Compound Group	Analytical Method (b)		PQL (c) (µg/L)
Naphthalene	II	91-20-3	S/VO, PAH	8260	GC/MS	*5*
Naphthalene	II	91-20-3	S/VO, PAH	8270	GC/MS	*10*
Phenanthrene	II	85-01-8	S/VO, PAH	8100	GC	*200*
Phenanthrene	II	85-01-8	S/VO, PAH	8270	GC/MS	*10*
Pyrene	II	129-00-0	S/VO, PAH	8100	GC	*200*
Pyrene	II	129-00-0	S/VO, PAH	8270	GC/MS	*10*
2,3,4,6-Tetrachlorophenol	II	58-90-2	S/VO, Phenol	8270	GC/MS	*10*
2,4,6-Trichlorophenol	II	88-06-2	S/VO, Phenol	8040	GC	*5*
2,4,6-Trichlorophenol	II	88-06-2	S/VO, Phenol	8270	GC/MS	*10*
2,4-Dichlorophenol	II	120-83-2	S/VO, Phenol	8040	GC	*5*
2,4-Dichlorophenol	II	120-83-2	S/VO, Phenol	8270	GC/MS	*10*
2,4-Dimethylphenol	II	105-67-9	S/VO, Phenol	8040	GC	*5*
2,4-Dimethylphenol	II	105-67-9	S/VO, Phenol	8270	GC/MS	*10*
2,4-Dinitrophenol	II	51-28-5	S/VO, Phenol	8040	GC	*150*
2,4-Dinitrophenol	II	51-28-5	S/VO, Phenol	8270	GC/MS	*50*
2,6-Dichlorophenol	II	87-65-0	S/VO, Phenol	8270	GC/MS	*10*
2-Chlorophenol	II	95-57-8	S/VO, Phenol	8040	GC	*5*
2-Chlorophenol	II	95-57-8	S/VO, Phenol	8270	GC/MS	*10*
2-Nitrophenol	II	88-75-5	S/VO, Phenol	8040	GC	*5*
2-Nitrophenol	II	88-75-5	S/VO, Phenol	8270	GC/MS	*10*
4,6-Dinitro-o-cresol	II	534-52-1	S/VO, Phenol	8040	GC	*150*
4,6-Dinitro-o-cresol	II	534-52-1	S/VO, Phenol	8270	GC/MS	*50*
4-Nitrophenol	II	100-02-7	S/VO, Phenol	8040	GC	*10*
4-Nitrophenol	II	100-02-7	S/VO, Phenol	8270	GC/MS	*50*
p-Chloro-m-cresol	II	59-50-7	S/VO, Phenol	8040	GC	*5*
p-Chloro-m-cresol	II	59-50-7	S/VO, Phenol	8270	GC/MS	*20*
Pentachlorophenol	II	87-86-5	S/VO, Phenol	8040	GC	*5*
Pentachlorophenol	II	87-86-5	S/VO, Phenol	8270	GC/MS	*50*
Phenol	II	108-95-2	S/VO, Phenol	8040	GC	*1*
Bis(2-ethylhexyl)phthalate	II	117-81-7	S/VO, Phthalate	8060	GC	*20*
Butyl benzyl phthalate	II	85-68-7	S/VO, Phthalate	8060	GC	*5*
Butyl benzyl phthalate	II	85-68-7	S/VO, Phthalate	8270	GC/MS	*10*
Di-n-butyl phthalate	II	84-74-2	S/VO, Phthalate	8060	GC	*5*
Di-n-butyl phthalate	II	84-74-2	S/VO, Phthalate	8270	GC/MS	*10*
Di-n-octyl phthalate	II	117-84-0	S/VO, Phthalate	8060	GC	*30*
Di-n-octyl phthalate	II	117-84-0	S/VO, Phthalate	8270	GC/MS	*10*
Diethyl phthalate	II	84-66-2	S/VO, Phthalate	8060	GC	*5*

Table 3.4.2.1. List of Analytical Parameters (continued)

Chemical Constituent	List (a)	CAS Number	Compound Group	Analytical Method (b)		PQL (c) (µg/L)
Diethyl phthalate	II	84-66-2	S/VO, Phthalate	8270	GC/MS	*10*
Dimethyl phthalate	II	131-11-3	S/VO, Phthalate	8060	GC	*5*
Dimethyl phthalate	II	131-11-3	S/VO, Phthalate	8270	GC/MS	*10*
1,2-Dichlorobenzene	I & II	95-50-1	VO, Aromatic	8020	GC	*5*
1,2-Dichlorobenzene	I & II	95-50-1	VO, Aromatic	8021	GC	*0.5*
1,2-Dichlorobenzene	I & II	95-50-1	VO, Aromatic	8260	GC/MS	*5*
1,2-Dichlorobenzene	I & II	95-50-1	VO, Aromatic	8270	GC/MS	*10*
1,3-Dichlorobenzene	II	541-73-1	VO, Aromatic	8020	GC	*5*
1,3-Dichlorobenzene	II	541-73-1	VO, Aromatic	8021	GC	*0.2*
1,4-Dichlorobenzene	I & II	106-46-7	VO, Aromatic	8020	GC	*5*
1,4-Dichlorobenzene	I & II	106-46-7	VO, Aromatic	8021	GC	*0.1*
1,4-Dichlorobenzene	I & II	106-46-7	VO, Aromatic	8260	GC/MS	*5*
1,4-Dichlorobenzene	I & II	106-46-7	VO, Aromatic	8270	GC/MS	*10*
Benzene	I & II	71-43-2	VO, Aromatic	8020	GC	*2*
Benzene	I & II	71-43-2	VO, Aromatic	8021	GC	*0.1*
Benzene	I & II	71-43-2	VO, Aromatic	8260	GC/MS	*5*
Chlorobenzene	I & II	108-90-7	VO, Aromatic	8020	GC	*2*
Ethylbenzene	I & II	100-41-4	VO, Aromatic	8020	GC	*2*
Ethylbenzene	I & II	100-41-4	VO, Aromatic	8221	???	*0.05*
Ethylbenzene	I & II	100-41-4	VO, Aromatic	8060	GC/MS	*5*
Styrene	I & II	100-42-5	VO, Aromatic	8020	GC	*1*
Styrene	I & II	100-42-5	VO, Aromatic	8021	GC	*0.1*
Styrene	I & II	100-42-5	VO, Aromatic	8260	GC/MS	*10*
Toluene	I & II	108-88-3	VO, Aromatic	8020	GC	*2*
Toluene	I & II	108-88-3	VO, Aromatic	8021	GC	*0.1*
Toluene	I & II	108-88-3	VO, Aromatic	8260	GC/MS	*5*
Xylene (total)	I & II		VO, Aromatic	8020	GC	*5*
Xylene (total)	I & II		VO, Aromatic	8021	GC	*0.2*
Xylene (total)	I & II		VO, Aromatic	8260	GC/MS	*5*
1,1,1,2-Tetrachloroethane	I & II	630-20-6	VO, Halogenated	8010	GC	*5*
1,1,1,2-Tetrachloroethane	I & II	630-20-6	VO, Halogenated	8021	GC	*0.05*
1,1,1,2-Tetrachloroethane	I & II	630-20-6	VO, Halogenated	8260	GC/MS	*5*
1,1,1-Trichloroethane	I & II	71-55-6	VO, Halogenated	8010	GC	*0.3*
1,1,1-Trichloroethane	I & II	71-55-6	VO, Halogenated	8021	GC	*0.3*
1,1,1-Trichloroethane	I & II	71-55-6	VO, Halogenated	8260	GC/MS	*5*
1,1,2,2-Tetrachloroethane	I & II	79-34-5	VO, Halogenated	8010	GC	*0.5*
1,1,2,2-Tetrachloroethane	I & II	79-34-5	VO, Halogenated	8021	GC	*0.1*

Table 3.4.2.1. List of Analytical Parameters (continued)

Chemical Constituent	List (a)	CAS Number	Compound Group	Analytical Method (b)		PQL (c) (µg/L)
1,1,2,2-Tetrachloroethane	I & II	79-34-5	VO, Halogenated	8260	GC/MS	*5*
1,1,2-Trichloroethane	I & II	79-00-5	VO, Halogenated	8010	GC	*0.2*
1,1,2-Trichloroethane	I & II	79-00-5	VO, Halogenated	8260	GC/MS	*5*
1,1-Dichloroethane	I & II	75-34-3	VO, Halogenated	8010	GC	*1*
1,1-Dichloroethane	I & II	75-34-3	VO, Halogenated	8021	GC	*0.5*
1,1-Dichloroethane	I & II	75-34-3	VO, Halogenated	8260	GC/MS	*5*
1,1-Dichloroethylene	I & II	75-35-4	VO, Halogenated	8010	GC	*1*
1,1-Dichloroethylene	I & II	75-35-4	VO, Halogenated	8021	GC	*0.5*
1,1-Dichloroethylene	I & II	75-35-4	VO, Halogenated	8260	GC/MS	*5*
1,1-Dichloropropane	II	563-58-6	VO, Halogenated	8021	GC	*0.2*
1,1-Dichloropropane	II	563-58-6	VO, Halogenated	8260	GC/MS	*5*
1,2,3-Trichloropropane	I & II	96-18-4	VO, Halogenated	8010	GC	*10*
1,2,3-Trichloropropane	I & II	96-18-4	VO, Halogenated	8021	GC	*5*
1,2,3-Trichloropropane	I & II	96-18-4	VO, Halogenated	8260	GC/MS	*15*
1,2,4-Trichlorobenzene	II	120-82-1	VO, Halogenated	8021	GC	*0.3*
1,2,4-Trichlorobenzene	II	120-82-1	VO, Halogenated	8260	GC/MS	*10*
1,2-Dibromo-3-chloropropane	I & II	96-12-8	VO, Halogenated	8011	GC	*0.1*
1,2-Dibromo-3-chloropropane	I & II	96-12-8	VO, Halogenated	8021	GC	*30*
1,2-Dibromo-3-chloropropane	I & II	96-12-8	VO, Halogenated	8260	GC/MS	*25*
1,2-Dibromoethane	I & II	106-93-4	VO, Halogenated	8011	GC	*0.1*
1,2-Dibromoethane	I & II	106-93-4	VO, Halogenated	8021	GC	*10*
1,2-Dibromoethane	I & II	106-93-4	VO, Halogenated	8260	GC/MS	*5*
1,2-Dichlorobenzene	I & II	95-50-1	VO, Halogenated	8010	GC	*2*
1,2-Dichloroethane	I & II	107-06-2	VO, Halogenated	8010	GC	*0.5*
1,2-Dichloroethane	I & II	107-06-2	VO, Halogenated	8021	GC	*0.3*
1,2-Dichloroethane	I & II	107-06-2	VO, Halogenated	8260	GC/MS	*5*
1,2-Dichloropropane	I & II	78-87-5	VO, Halogenated	8010	GC	*0.5*
1,2-Dichloropropane	I & II	78-87-5	VO, Halogenated	8021	GC	*0.05*
1,2-Dichloropropane	I & II	78-87-5	VO, Halogenated	8260	GC/MS	*5*
1,3-Dichlorobenzene	II	541-73-1	VO, Halogenated	8010	GC	*5*
1,3-Dichlorobenzene	II	541-73-1	VO, Halogenated	8260	GC/MS	*5*
1,3-Dichloropropane	II	142-28-9	VO, Halogenated	8021	GC	*0.3*
1,3-Dichloropropane	II	142-28-9	VO, Halogenated	8260	GC/MS	*5*
1,4-Dichlorobenzene	I & II	106-46-7	VO, Halogenated	8010	GC	*2*
2,2-Dichloropropane	II	594-20-7	VO, Halogenated	8021	GC	*0.5*
2,2-Dichloropropane	II	594-20-7	VO, Halogenated	8260	GC/MS	*15*
Allyl chloride	II	107-05-1	VO, Halogenated	8010	GC	*5*

Table 3.4.2.1. List of Analytical Parameters (continued)

Chemical Constituent	List (a)	CAS Number	Compound Group	Analytical Method (b)		PQL (c) (µg/L)
Allyl chloride	II	107-05-1	VO, Halogenated	8260	GC/MS	*10*
Bromochloromethane	I & II	74-97-5	VO, Halogenated	8021	GC	*0.1*
Bromochloromethane	I & II	74-97-5	VO, Halogenated	8260	GC/MS	*5*
Bromodichloromethane	I & II	75-27-4	VO, Halogenated	8010	GC	*1*
Bromodichloromethane	I & II	75-27-4	VO, Halogenated	8021	GC	*0.2*
Bromodichloromethane	I & II	75-27-4	VO, Halogenated	8260	GC/MS	*5*
Bromoform	I & II	75-25-2	VO, Halogenated	8010	GC	*2*
Bromoform	I & II	75-25-2	VO, Halogenated	8021	GC	*15*
Bromoform	I & II	75-25-2	VO, Halogenated	8260	GC/MS	*5*
Carbon tetrachloride	I & II	56-23-5	VO, Halogenated	8010	GC	*1*
Carbon tetrachloride	I & II	56-23-5	VO, Halogenated	8021	GC	*0.1*
Carbon tetrachloride	I & II	56-23-5	VO, Halogenated	8260	GC/MS	*10*
Chlorobenzene	I & II	108-90-7	VO, Halogenated	8010	GC	*2*
Chlorobenzene	I & II	108-90-7	VO, Halogenated	8021	GC	*0.1*
Chlorobenzene	I & II	108-90-7	VO, Halogenated	8260	GC/MS	*5*
Chlorobenzilate	II	510-15-6	VO, Halogenated	8270	GC/MS	*10*
Chloroethane	I & II	75-00-3	VO, Halogenated	8010	GC	*5*
Chloroethane	I & II	75-00-3	VO, Halogenated	8021	GC	*1*
Chloroethane	I & II	75-00-3	VO, Halogenated	8260	GC/MS	*10*
Chloroform	I & II	67-66-3	VO, Halogenated	8010	GC	*0.5*
Chloroform	I & II	67-66-3	VO, Halogenated	8021	GC	*0.2*
Chloroform	I & II	67-66-3	VO, Halogenated	8260	GC/MS	*5*
Chloroprene	II	126-99-8	VO, Halogenated	8010	GC	*50*
Chloroprene	II	126-99-8	VO, Halogenated	8260	GC/MS	*20*
cis-1,2-Dichloroethylene	I & II	156-59-2	VO, Halogenated	8021	GC	*0.2*
cis-1,2-Dichloroethylene	I & II	156-59-2	VO, Halogenated	8260	GC/MS	*5*
cis-1,3-Dichloropropene	I & II	10061-01-5	VO, Halogenated	8010	GC	*20*
cis-1,3-Dichloropropene	I & II	10061-01-5	VO, Halogenated	8260	GC/MS	*10*
Dibromochloromethane	I & II	124-48-1	VO, Halogenated	8010	GC	*1*
Dibromochloromethane	I & II	124-48-1	VO, Halogenated	8021	GC	*0.3*
Dibromochloromethane	I & II	124-48-1	VO, Halogenated	8260	GC/MS	*5*
Dichlorodifluoromethane	II	75-71-8	VO, Halogenated	8021	GC	*0.5*
Dichlorodifluoromethane	II	75-71-8	VO, Halogenated	8260	GC/MS	*5*
Methyl bromide	I & II	74-83-9	VO, Halogenated	8010	GC	*20*
Methyl bromide	I & II	74-83-9	VO, Halogenated	8021	GC	*10*
Methyl chloride	I & II	74-87-3	VO, Halogenated	8010	GC	*1*
Methyl chloride	I & II	74-87-3	VO, Halogenated	8021	GC	*0.3*

Table 3.4.2.1. List of Analytical Parameters (continued)

Chemical Constituent	List (a)	CAS Number	Compound Group	Analytical Method (b)		PQL (c) (µg/L)
Methyl iodide	I & II	74-88-4	VO, Halogenated	8010	GC	*40*
Methyl iodide	I & II	74-88-4	VO, Halogenated	8260	GC/MS	*10*
Methylene bromide	I & II	74-95-3	VO, Halogenated	8010	GC	*15*
Methylene bromide	I & II	74-95-3	VO, Halogenated	8021	GC	*20*
Methylene bromide	I & II	74-95-3	VO, Halogenated	8260	GC/MS	*10*
Methylene chloride	I & II	75-09-2	VO, Halogenated	8010	GC	*5*
Methylene chloride	I & II	75-09-2	VO, Halogenated	8021	GC	*0.2*
Methylene chloride	I & II	75-09-2	VO, Halogenated	8260	GC/MS	*10*
Tetrachloroethylene	I & II	127-18-4	VO, Halogenated	8010	GC	*0.5*
Tetrachloroethylene	I & II	127-18-4	VO, Halogenated	8021	GC	*0.5*
Tetrachloroethylene	I & II	127-18-4	VO, Halogenated	8260	GC/MS	*5*
trans-1,2-Dichloroethylene	I & II	156-60-5	VO, Halogenated	8010	GC	*1*
trans-1,2-Dichloroethylene	I & II	156-60-5	VO, Halogenated	8021	GC	*0.5*
trans-1,2-Dichloroethylene	I & II	156-60-5	VO, Halogenated	8260	GC/MS	*5*
trans-1,3-Dichloropropene	I & II	10061-02-6	VO, Halogenated	8010	GC	*5*
trans-1,3-Dichloropropene	I & II	10061-02-6	VO, Halogenated	8260	GC/MS	*10*
trans-1,4-Dichloro-2-butene	I & II	110-57-6	VO, Halogenated	8260	GC/MS	*100*
Trichloroethylene	I & II	79-01-6	VO, Halogenated	8010	GC	*1*
Trichloroethylene	I & II	79-01-6	VO, Halogenated	8021	GC	*0.2*
Trichloroethylene	I & II	79-01-6	VO, Halogenated	8260	GC/MS	*5*
Trichlorofluoromethane	I & II	75-69-4	VO, Halogenated	8010	GC	*10*
Trichlorofluoromethane	I & II	75-69-4	VO, Halogenated	8021	GC	*0.3*
Trichlorofluoromethane	I & II	75-69-4	VO, Halogenated	8260	GC/MS	*5*
Vinyl chloride	I & II	75-01-4	VO, Halogenated	8010	GC	*2*
Vinyl chloride	I & II	75-01-4	VO, Halogenated	8021	GC	*0.4*
Vinyl chloride	I & II	75-01-4	VO, Halogenated	8260	GC/MS	*10*
2-Hexanone	I & II	591-78-6	VO, Non-Hal.	8260	GC/MS	*50*
Acrolein	II	107-02-8	VO, Non-Hal.	8030	GC	*5*
Acrolein	II	107-02-8	VO, Non-Hal.	8260	GC/MS	*100*
Acrylonitrile	I & II	107-13-1	VO, Non-Hal.	8030	GC	*5*
Acrylonitrile	I & II	107-13-1	VO, Non-Hal.	8260	GC/MS	*200*
Carbon disulfide	I & II	75-15-0	VO, Non-Hal.	8260	GC/MS	*100*
Isobutyl alcohol	II	78-83-1	VO, Non-Hal.	8240	GC/MS	*100*
Isodrin	II	465-73-6	VO, Non-Hal.	8260	GC/MS	*10*
Propionitrile	II	107-12-0	VO, Non-Hal.	8260	GC/MS	*150*
Vinyl acetate	I & II	108-05-4	VO, Non-Hal.	8260	GC/MS	*50*
4-Methyl-2-pentanone	I & II	108-10-1	VO, Non-Hal.	8015	GC	*5*

Table 3.4.2.1. List of Analytical Parameters (continued)

Chemical Constituent	List (a)	CAS Number	Compound Group	Analytical Method (b)		PQL (c) (µg/L)
4-Methyl-2-pentanone	I & II	108-10-1	VO, Non-Hal.	8260	GC/MS	*100*
Acetone	I & II	67-64-1	VO, Non-Hal.	8260	GC/MS	*100*
Acetonitrile	II	75-05-8	VO, Non-Hal.	8015	GC	*100*
Ethyl methacrylate	II	97-63-2	VO, Non-Hal.	8015	GC	*5*
Ethyl methacrylate	II	97-63-2	VO, Non-Hal.	8260	GC/MS	*10*
Ethyl methacrylate	II	97-63-2	VO, Non-Hal.	8270	GC/MS	*10*
Isobutyl alcohol	II	78-83-1	VO, Non-Hal.	8015	GC	*50*
Methacrylonitrile	II	126-98-7	VO, Non-Hal.	8015	GC	*5*
Methacrylonitrile	II	126-98-7	VO, Non-Hal.	8260	GC/MS	*100*
Methyl ethyl ketone	I & II	78-93-3	VO, Non-Hal.	8015	GC	*10*
Methyl ethyl ketone	I & II	78-93-3	VO, Non-Hal.	8260	GC/MS	*100*
Methyl methacrylate	II	80-62-6	VO, Non-Hal.	8015	GC	*2*
Methyl methacrylate	II	80-62-6	VO, Non-Hal.	8260	GC/MS	*30*
Propionitrile	II	107-12-0	VO, Non-Hal.	8015	GC	*60*

Notes:
(a) Refers to lists of constituents contained in Part 258, Appendix I and Appendix II.
(b) Numbers refers to methods listed in SW-846 (3rd edition). Methods types as follows:
AA,(DA) - Atomic Absorption, Direct Aspiration
AA, (Furn) - Atomic Absorption, Furnace Technique
AA, (GF) - Atomic Absorption, Graphite Furnace
AA, (GH) - Atomic Absorption, Gaseous Hydride
Cold Vapor - Mercury by manual cold vapor technique
GC - Gas chromatography
GC/MS - Gas chromatography/Mass spectroscopy
(c) PQL refers to Practical Quantitation Limit as defined by USEPA.

Table 3.4.2.2. Colorado Appendix IA Parameters

Chemical Constituent	Compound Group	Method	PQL (mg/l)
Magnesium	Cation	242.1	0.01
Sodium	Cation	273.1	0.2
Potassium	Cation	258.1	0.01
Calcium	Cation	215.1	0.01
Carbonate	Anion	310.1	1
Bicarbonate	Anion	310.1	1
Chloride	Anion	325.3	1
Sulfate	Anion	375.4	1
Nitrite	Anion	353.3	0.01
Nitrate	Anion	353.3	0.01
Total Organic Carbon	Indicator	415.1	1

Notes:

Method numbers refer EPA (1979).

PQL is the Practical Quantitation Limit as defined by USEPA.

4.0 DATA EVALUATION AND REPORTING

4.1 GROUND-WATER FLOW DIRECTION & RATE

The direction and rate of ground-water flow will be evaluated annually. The direction of flow will be based on a ground-water potentiometric map prepared for the No. 6 Coal. The map will be constructed by plotting the ground-water elevation at each well and drawing lines representing equal ground-water elevations (potentiometric contour lines). Arrows will be drawn perpendicular to the potentiometric contour lines to represent the general direction of ground-water flow.

The rate of ground-water flow will be calculated using the seepage velocity equation (Equation 4-1).

$$V_s = (2830 \times K)i/n_e \qquad (4\text{-}1)$$

Where:
V_s = ground-water seepage velocity (ft/day)
K = hydraulic conductivity (cm/s)
i = hydraulic gradient (dimensionless)
n_e = effective porosity (dimensionless)

Hydraulic conductivity and porosity values are given in Tables 2.4.2.1 and 2.4.2.2. Typical values representative of the lithologies will be assumed for the effective porosity.

The hydraulic gradient will be estimated from the potentiometric map. This will be accomplished by measuring the distance (on the potentiometric map) over which an observed change in head occurs. The hydraulic gradient will be calculated using Equation 4-2.

$$i = d_h/d_L \qquad (4\text{-}2)$$

Where:
i = hydraulic gradient (dimensionless)
d_h = change in head (feet)
d_L = horizontal distance (feet)

If the gradient is relatively uniform, a typical gradient will be calculated. However, if the hydraulic gradient varies significantly across the site, a range of hydraulic gradients and seepage velocities will be calculated.

4.2 DATA MANAGEMENT

The ground-water data will be maintained on a commercially available computer data management system. A computer data management system is needed to store and manipulate the large volume of data that will be generated by the monitoring program described in this plan. The data management system will allow flexibility in data presentation, including the production of tabular and graphical data reports, and make the data readily accessible for investigating trends and general evaluation. Furthermore, the statistical analysis of data (Section 4.3) requires that the data be available in a uniform computer format.

Access to the system and to the data will be controlled in order to maintain the security and integrity of the database. Physical access to the system will be restricted to authorized personnel. Access to the data will be restricted to personnel with authorized passwords. Access authorization will be structured in a hierarchical manner to allow unrestricted access or access restricted to specific sites or samples. Data entry and edit capabilities will be controlled and restricted to authorized personnel of the database operator.

Quality control (QC) procedures will be in place to examine data prior to and following data entry. QC procedures will include:

- Control and verification of sample point codes, and other established codes;
- Checks for accuracy and completeness of input;
- Outlier data review; and
- A system to initiate, track and document problem resolution.

The data management system will offer several data reporting options. Standard outputs will include tabulated data summaries, line graphs, and appropriate file output for use in statistical, contouring and graphics software packages.

4.3 STATISTICS

The ground-water monitoring data will be statistically evaluated using one of the methods listed in the state regulations. As specified in the regulations, the statistical method will be selected after the background data have been collected (eight quarterly samples).

It is currently expected that a combined Shewart-CUSUM control chart method will be used to perform intrawell evaluations. This methodology has been recommended to us by Dr. Robert Gibbons and is described in detail in Appendix D. Shewart-Cumulative Sum (CUSUM) control charts are a method for visually comparing the current concentrations in a well with background data from the same well. The following are some of the advantages of control charts.

- The charts employ a graphical technique in which data trends may be more readily apparent.
- Monitoring data are compared to prior data from the same well, thereby removing spatial variability as a confounding factor.

A control chart is a plot of measured concentrations and accumulated concentrations, in standardized units, against time. The method requires that the baseline data are characteristic of background data (i.e., that the well is initially uncontaminated), that the background data are normally (or log-normally) distributed, and that there are sufficient detected values in the baseline data to obtain reliable estimates of the mean and standard deviation.

The steps involved in using a control chart are as follows.

1. Estimate the baseline parameters from the initial data (a minimum of four samples, and preferably eight). The baseline data are the mean, m, and standard deviation, s, of the initial data.

2. Select values for three control parameters:

   h a decision internal value; generally set to 4 or 5; 5 is recommended for ground-water data (Starks, 1988; Lucas, 1982).

   k a reference value; =D/2 where D is the displacement that should be quickly detected. EPA recommends selecting k=1, which will allow a displacement of two standard deviations to be detected quickly.

   SCL Shewart control limit; 4.5 is recommended (Starks, 1988).

3. For each time period, T_i, take n_i independent samples (n_i may be one), and calculate the mean, x_i. Compute the standardized mean Z_i of the measured concentrations as:

$$Z_i = (x_i - m) \sqrt{n_i} / s \qquad (4\text{-}3)$$

   Also compute the cumulative sum, S_i, as:

$$S_i = \max \{0, (Z_i - k) + S_{i-1}\} \qquad (4\text{-}4)$$

   where max{A,B} is the maximum of A and B, and $S_o = 0$.

4. Plot Z_i and S_i against T_i on the control chart. An "out-of-control" situation (potential contamination) occurs whenever $Z_i \geq$ SCL or $S_i \geq h$. Two different types of situation are controlled by these limits. Too large a standardized mean will occur if there is a rapid increase in concentration in the well. Too large a cumulative sum may also occur for a more gradual trend.

If the control chart remains "in control" for a long period of time, the baseline parameters are usually updated to include more recent observations. This helps to control fluctuations in background values which may occur even in the absence of contamination.

4.4 REPORTING

Laidlaw will notify CDH and Weld County whenever data developed under this monitoring plan have been placed in the operating record (40 CFR 258.51(c)(1)). These data include, but are not limited to, the following:

- Monitoring well data including design, installation, development and decommissioning;
- Installation of dedicated sampling or measurement equipment;
- Field sampling records, as described in Section 3.3.8;
- Laboratory Records, as described in Section 3.4.7; and
- Results of the statistical analyses.

In addition, copies of the reports documenting monitoring activities will be mailed to both CDH and Weld County. If requested, the new data will also be transmitted in electronic form.

5.0 REFERENCES

Aller, L., T.W. Bennett, G. Hackett, R.J. Petty, J.H. Lehr, H. Sedoris, and D.M. Nielsen, 1990, Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells, U.S. Environmental Protection Agency, Environmental Monitoring Systems Laboratory, Las Vegas, Nevada, published by National Water Well Association, Dublin, Ohio.

Amuedo and Ivey, 1975, Coal Mine Subsidence and Land Use in the Boulder-Weld Coalfield, Boulder and Weld Counties, Colorado, by Myers, A.R., J. B. Hansen, R.A. Lindvall, J.B. Ivey, and J.L. Hynes of Amuedo and Ivey, prepared for the Colorado Geological Survey, Environmental Geology 9.

ASTM, 1990, Standard Practice for Design and Installation of Ground Water Monitoring Wells in Aquifers, American Society for Testing and Materials, D 5092-90, October.

CDH, 1988, Pratt Property Landfill Closure Plan, letter to Weld County Board of County Commissioners, from S.J. Orzynski, P.E., and P.L. Harley, Colorado Department of Health, September 19.

Colton, R.B. and L.W. Anderson, 1977, Preliminary Geologic Map of the Erie Quadrangle, Boulder, Weld and Adams County, U.S. Geological Survey Miscellaneous Field Studies Map MF-882.

Costa, J.E. and S.W. Bilodeau, 1982, Geology of Denver, Colorado, United State of America, Bulletin of the Association of Engineering Geologists, Vol. XIX, No. 3, pp. 261-314.

Doty, 1987a, Second Quarter 1987 Monitoring, Laidlaw Denver Regional Landfill, prepared for Laidlaw Waste Systems, Inc., Benjamin P. Doty, P.E., Project Number 701-02, September 7.

Doty, 1987b, Installation of Wells 105, 106, 205 and 206, letter report to Mr. Frank Knickerbocker, Laidlaw Waste Systems, Inc., Benjamin P. Doty, P.E., Project No. 1201-03, August 15.

Doty, 1987c, Site Characterization and Operation Plan, Laidlaw Denver Regional Landfill, Erie, Colorado, prepared for Laidlaw Waste Systems (Denver), Inc., Benjamin P. Doty, P.E., Project Number 1201-04, December 30.

Doty, 1988a, Installation of Wells 103B, 201B and 204A, Abandonment of Wells 201A and 204, letter report to Mr. Rick Hoffman, Laidlaw Waste Systems, Inc., Benjamin P. Doty, P.E., Project Number 1201-06, March 26.

Doty, 1988b, Phase I Evaluation of Volatile Organics in Wells 103A and 103B, prepared for Laidlaw Waste Systems, Inc., Benjamin P. Doty, P.E., Project Number 1201-08, October 6.

Doty, 1989a, Inspections of Cell 6, Denver Regional Landfill (North), memorandum to Mr. Rick Hoffman, Laidlaw Waste Systems, Inc., Doty & Associates Project Number 1201-02, June 14.

Doty, 1989b, First Quarter 1989 Monitoring, Laidlaw Denver Regional Landfill (South Site), prepared for Laidlaw Waste Systems, Inc., Doty & Associates Project No. 1202-02, July 31.

Doty, 1989c, Second Quarter 1989 Monitoring, Laidlaw Denver Regional Landfill (South Site), prepared for Laidlaw Waste Systems, Inc., Doty & Associates Project No. 1202-02, September 22.

Doty, 1989d, Phase II Evaluation of Volatile Organics in Wells 103A and 103B, prepared for Laidlaw Waste Systems, Inc., Doty & Associates Project Number 1201-08, December 6.

Doty, 1990a, Installation of Piezometers P-1 through P-4, Denver Regional Landfill (South), Doty & Associates Project No. 1202-03, January 19.

Doty, 1990b, Third Quarter 1989 Monitoring, Laidlaw Denver Regional Landfill (South Site), prepared for Laidlaw Waste Systems, Inc., Doty & Associates Project No. 1202-02, February 1.

Doty, 1990c, Fourth Quarter 1989 Monitoring, Laidlaw Denver Regional Landfill (South Site), prepared for Laidlaw Waste Systems, Inc., Doty & Associates Project No. 1202-02, May 30.

Doty, 1990d, First Quarter 1990 Monitoring, Laidlaw Denver Regional Landfill (South Site), prepared for Laidlaw Waste Systems, Inc., Doty & Associates Project No. 1202-04, July 16.

Doty, 1990e, Phase III Evaluation of Volatile Organics in Wells 103A and 103B, prepared for Laidlaw Waste Systems, Inc., Doty & Associates Project Number 1201-08, August 15.

Doty, 1990f, Second Quarter 1990 Monitoring, Laidlaw Denver Regional Landfill (South Site), prepared for Laidlaw Waste Systems, Inc., Doty & Associates Project No. 1202-04, September 6.

Doty, 1991a, Third Quarter 1990 Monitoring, Laidlaw Denver Regional Landfill (South Site), prepared for Laidlaw Waste Systems, Inc., Doty & Associates Project No. 1202-04, January 18.

Doty, 1991b, Fourth Quarter 1990 Monitoring, Laidlaw Denver Regional Landfill (South Site), prepared for Laidlaw Waste Systems, Inc., Doty & Associates Project No. 1202-04, March 13.

Doty, 1991c, First Quarter 1991 Monitoring, Laidlaw Denver Regional Landfill (South Site), prepared for Laidlaw Waste Systems, Inc., Doty & Associates Project No. 1202-06, June 20.

Doty, 1991d, Second Quarter 1991 Monitoring, Laidlaw Denver Regional Landfill (South Site), prepared for Laidlaw Waste Systems, Inc., Doty & Associates Project No. 1202-06, September 10.

Doty, 1991e, Repair of Well S-203, Denver Regional Landfill (South), letter to Mr. Rick Hoffman, Laidlaw Waste Systems, Inc., from Doty & Associates, Project No. 1202-05, September 11.

Doty, 1991f, Site Characterization, Denver Regional Landfill (South), prepared for Laidlaw Waste Systems, Inc., Doty & Associates Project No. 1202-05, September 23.

Doty, 1992a, Third Quarter 1991 Monitoring, Laidlaw Denver Regional Landfill (South Site), prepared for Laidlaw Waste Systems, Inc., Doty & Associates Project No. 1202-06, January 24.

Doty, 1992b, Correspondence Up-Date, 1991 Re-Design, Denver Regional Landfill (South), prepared for Laidlaw Waste Systems, Inc., Doty & Associates Project No. 1202-05, May 15.

Doty, 1992c, Piezometer/Well Abandonment and Well Installation, PZ-1, -2, -3, -4, -5, -6, GW-13, and S-210, Denver Regional Landfill (South Site & Pratt Property), prepared for Laidlaw Waste Systems, Inc., Doty & Associates Project No. 1202-10, June 13.

Doty, 1992d, Fourth Quarter 1991 Monitoring, Laidlaw Denver Regional Landfill (South Site), prepared for Laidlaw Waste Systems, Inc., Doty & Associates Project No. 1202-06, June 22.

Doty, 1992e, First Quarter 1992 Monitoring, Laidlaw Denver Regional Landfill (South Site), prepared for Laidlaw Waste Systems, Inc., Doty & Associates Project No. 1202-09, July 31.

Doty, 1992f, Second Quarter 1992 Monitoring, Laidlaw Denver Regional Landfill (South Site), prepared for Laidlaw Waste Systems, Inc., Doty & Associates Project No. 1202-09, November 23.

Doty, 1992g, Detection of Fluid, Cell A Sump, Denver Regional Landfill (South), letter to Mr. Roger Doak, Hazardous Materials and Waste Management Division, Colorado Department of Health, from B.P. Doty, Doty & Associates Project No. 1202-01, December 24.

Doty, 1993a, Third Quarter 1992 Monitoring, Laidlaw Denver Regional Landfill (South), prepared for Laidlaw Waste Systems, Inc., Doty & Associates Project No. 1202-09, March 3.

Doty, 1993b, Fourth Quarter 1992 Monitoring, Laidlaw Denver Regional Landfill (South), prepared for Laidlaw Waste Systems, Inc., Doty & Associates Project No. 1202-09, April 27.

Doty, 1993c, Denver Regional Landfill (South), Topographic Mapping and Volume Calculations, January 1993, letter report to Mr. Rick Hoffman, Laidlaw Waste Systems, Inc., Doty & Associates Project No. 1201-22, May 12.

Doty, 1993d, First Quarter 1993 Monitoring, Laidlaw Denver Regional Landfill (South), prepared for Laidlaw Waste Systems, Inc., Doty & Associates Project No. 1202-13, June 9.

Doty, 1993e, Second Quarter 1993 Monitoring, Laidlaw Denver Regional Landfill (South), prepared for Laidlaw Waste Systems, Inc., Doty & Associates Project No. 1202-13, September 15.

Doty, 1993f, Third Quarter 1993 Monitoring, Laidlaw Denver Regional Landfill (South), prepared for Laidlaw Waste Systems (Colorado), Inc., Doty & Associates Project No. 1202-13, December 20.

Doty, 1993g, RCRA Subtitle D Monitoring Plan for Explosive Gases, Denver Regional Landfill (South), Revision 1, prepared for Laidlaw Waste Systems (Colorado), Inc., Doty & Associates Project No. 1202-17, December 29.

Doty, 1994a, Denver Regional Landfill, Topographic Mapping and Volume Calculations, December 1993, letter to Mr. Rick Hoffman, Laidlaw Waste Systems (Colorado), Inc., from B.P. Doty, Doty & Associates Project No. 1202-18, February 13.

Doty, 1994b, Fourth Quarter 1993 Monitoring, Laidlaw Denver Regional Landfill (South), prepared for Laidlaw Waste Systems (Colorado), Inc., Doty & Associates Project No. 1202-13, March 30.

Doty, 1994c, Monitoring Well Extensions, P-3, P-4, and S-204, Denver Regional Landfill (South), letter to Mr. Rick Hoffman, Laidlaw Waste Systems (Colorado), Inc., from Doty & Associates, Project No. 1202-11, April 19.

Doty, 1994d, Characterization Report, Volatile Organics in Ground Water, Denver Regional Landfill (South), prepared for Laidlaw Waste Systems (Colorado), Inc., Doty & Associates Project No. 1202-14, April 29.

Doty, 1994e, First Quarter 1994 Monitoring, Laidlaw Denver Regional Landfill (South), prepared for Laidlaw Waste Systems (Colorado), Inc., Doty & Associates Project No. 1202-19, May 17.

Doty, 1994f, Block Diagram near S-211, letter to Roger Doak, Colorado Department of Health, and Trevor Jiricek, Weld County Department of Health, Doty & Associates Project No. 1202-14, July 15.

Empire, 1983a, Report of a Soil Profile and Groundwater Evaluation for Sanitary Landfill, Southeast of Erie, prepared for Nelson Engineering, by Empire Laboratories, Inc., Project Number 216L-83, February 4.

Empire, 1983b, Sanitary Landfill, Southeast of Erie, letter report to Mr. Vern Nelson, Nelson Engineering, by Empire Laboratories, Inc., Project Number 216L-83, February 15.

Empire, 1983c, Observation well or piezometer construction details at the Sanitary Landfill, letter to Mr. Vern Nelson, Nelson Engineering, from Empire Laboratories, Inc., Project No. 216L-83, March 4.

Empire, 1983d, Sanitary Landfill, Southeast of Erie, letter report regarding installation of TH-6 to Mr. Vern Nelson, Nelson Engineering, by Empire Laboratories, Inc., Project Number 216L-83, April 29.

Empire, 1983e, Report of a Soil Profile and Groundwater Evaluation, Colorado Landfill, Inc., prepared for Nelson Engineering, Empire Laboratories, Inc., Project No. 216L-83, September 29 (and addendum, dated October 12, 1983).

Empire, 1983f, letter report concerning laboratory permeability test results, to Mr. Vern Nelson, Nelson Engineers, by Empire Laboratories, Inc., November 2.

Empire, 1983g, Abandonment of Incomplete Observation Well at Colorado Landfill, Inc., letter report to Mr. Vern Nelson, Nelson Engineers, by Empire Laboratories, Inc., November 2.

EPA, 1979, Methods for Chemical Analysis of Water and Wastes, U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Cincinnati, OH, 45268, EPA-600/4-79-020, March.

EPA, 1986a, RCRA Ground-Water Monitoring Technical Enforcement Guidance Document (TEGD), U.S. Environmental Protection Agency, OSWER-9950.1, September.

EPA, 1986b, Test Methods for Evaluating Solid Waste, U.S. Environmental Protection Agency, SW-846, Third Edition, November.

FEMA, 1982, FIRM, Flood Insurance Rate Map, Weld County, Colorado, Unincorporated Area, Panel 975 of 1075, Community-Panel Number 080266 0975 C, Federal Emergency Management Agency, National Flood Insurance Program, Map Revised September 28.

Gibbons, R.D., 1987a. "Statistical Prediction Intervals for the Evaluation of Ground-Water Quality, *Groundwater*, **25**, pp. 455-465.

Gibbons, R.D., 1987b. "Statistical Models for the Analysis of Volatile Organic Compounds in Waste Disposal Sites", *Groundwater*, **25**, pp. 572-580.

Gibbons, R.D., 1990. "A General Statistical Procedure for Ground-Water Detection Monitoring at Waste Disposal Facilities", *Groundwater*, **28**, pp. 235-243.

Gibbons, R.D., 1991. "Some Additional Nonparametric Prediction Limits for Ground-Water Detection Monitoring at Waste Disposal Facilities", *Groundwater*, **29**, pp. 729-736.

Gibbons, R.D., 1993. Letter to Laidlaw Waste Systems Inc., February 10, 1993.

Golder, 1991, Design and Operations Plan for the Denver Regional Landfill (South), Weld County, Colorado, submitted to Laidlaw Waste Systems (Colorado), Inc., Golder Associates Project Number 913-2324.003, September.

Hamilton, J.L., 1981, Geologic and Hydrologic Report, Proposed Landfill, Sections 20 and 21, TIN, R68W, Weld County, Colorado, prepared for Horst and Dearmin, July 10, 1981.

Hamilton, J.L., 1982, Report to Colorado Department of Health on the Proposed Horst and Dearmin Landfill, Erie, Colorado.

Hansen, W.R., J. Chronic and J. Matelock, 1978, Climatography of the Front Range Urban Corridor and Vicinity, Colorado, U.S. Geological Survey Professional Paper 1019, 59 pp.

Hauser, 1988a, Laboratory Report for Second Quarter Sampling, to Mike Stewart, Industrial Compliance, Inc., and Rick Hoffman, Laidlaw Waste Systems, Hauser Laboratories, Test Report No. 88-0697, July 27.

Hauser, 1988b, Laboratory Report for Third Quarter Sampling, to Kevin Taylor, Industrial Compliance, Inc., and Rick Hoffman, Laidlaw Waste Systems, Hauser Laboratories, Test Report No. 88-1108, November 22.

HLA, 1990, Landfill Design and Operations Plan, Horst Landfill, Weld County, Colorado, prepared for Daniel R. Horst, Harding Lawson Associates Job No. 17602,050.10, September 24.

HSI, 1983, Site Evaluation and Operation Plan for Landfill Systems, Inc., Disposal Site, Erie, Colorado, prepared for Landfill Systems, Inc., Hydro-Search, Inc., Project Number 1443-83, February 10.

HSI, 1985a, Monitoring Systems and Baseline Conditions at Landfill Systems Disposal Site, Erie, Colorado, Hydro-Search, Inc., Project Number 1443, February 22.

HSI, 1985b, Letter to Landfill Systems, Inc., concerning installation of Wells 101A, 102A, and 201A, Hydro-Search, Inc., Project Number 1443, June 12.

HSI, 1986a, Additional Drilling, Landfill Systems Disposal Site, Erie, Colorado, Hydro-Search, Inc., Project Number 104E05822, April 30.

HSI, 1986b, Installation of Wells 103A, 104A, and 204, Abandonment of Wells 103, 104 and MW-14, Letter Number 0086, Hydro-Search, Inc., Project Number 104E05912, June 4.

HSI, 1986c, Inspection of Cell 2, Erie Landfill, memorandum to B.P. Doty from R.O. Walston, Hydro-Search, Inc., Project Number 104E04432, June 13.

IATA, 1992, Dangerous Goods Regulations, International Air Transport Association.

IC, 1986a, Hydrogeologic Evaluation of the Western Landfill Near Erie, Weld County, Colorado, prepared for Western Landfill, Industrial Compliance, Inc., May.

IC, 1986b, Drilling and Well Installation, letter report to Mr. Danny Souders, Western Disposal, Inc., from Industrial Compliance, Inc., Project No. 1-1562, August 25.

IC, 1986c, Ground Water Monitoring Plan for the Western Landfill, prepared for Western Landfill, Erie, Colorado, Industrial Compliance, Inc., Project No. 1-1562, October.

IC, 1986d, Initial Monitoring Results for the Western Landfill, letter to Mr. Dan Souders, Western Landfill, from Mr. Michael Stewart, Industrial Compliance, Inc., October 15.

IC, 1987a, Installation of Two Monitor Wells and Ground Water Sampling at the Western Landfill, Erie, Colorado, letter report to Mr. Frank Knickerbocker, Laidlaw Waste Systems, Inc., Industrial Compliance, Inc., Project No. 1-1691, June 30.

IC, 1987b, Results of the Sample Analyses for Western Landfill Ground Water in Wells GW-1, GW-8 and House Well, letter report to Mr. Frank Knickerbocker, Laidlaw Waste Systems, Inc., Industrial Compliance, Inc., Project Number 1-1691, July 21.

IC, 1987c, Monitoring Results for the Western Landfill, letter report to Mr. Dan Souders, Western Landfill, Industrial Compliance, Inc., Project No. 1-1586, August 20.

IC, 1988a, Laidlaw South Landfill Design and Operations Plan, Laidlaw Waste Systems, Inc., Industrial Compliance, Inc., Project No. 2-1803, March 28.

IC, 1988b, Sampling Analytical Results from September 1986 to January 1988, letter to Ms. Danamarie Schmitt, Laidlaw Waste Systems, Inc., from Mr. Curtis Ahrendsen, Industrial Compliance, Inc., Project No. 1-1803, March 31.

IC, 1988c, First Quarter 1988 Analytical Data, letter report to Mr. Rick Hoffman, Laidlaw Waste Systems, Inc., Industrial Compliance, Inc., Project No. 2-1803, July 25.

IC, 1988d, Pratt Property Landfill Gas Venting System Installation, prepared for Laidlaw Waste Systems, Inc., Industrial Compliance, Inc., Project Number 2-1927, November 22.

IC, 1989a, Quarterly Ground-Water Monitoring Results, letter report to Mr. Rick Hoffman, Laidlaw Waste Services, Inc., Industrial Compliance, Inc., Project No. 2-2078, February 21.

IC, 1989b, Modification of Excavation, letter to Mr. Steve Orzynski, Colorado Department of Health, from Mr. Kevin Taylor, Industrial Compliance, Inc., Project No. 2-2079, July 6.

Lucas, J.M., 1982. "Combined Shewart-CUSUM Quality Control Schemes", *Journal of Quality Technology*, **14**, pp. 51-59.

Mined Land, 1986, Boulder County Subsidence Investigation, Mined Land Reclamation Division, Department of Natural Resources, State of Colorado, prepared by Dames & Moore, May 6.

Mined Land, 1990, letter report regarding Plugging of Columbine Mine Main Hoist Shaft, Randall K. Streufert, Reclamation Specialist, Mined Land Reclamation Division, Department of Natural Resources, State of Colorado, September 6.

Nelson, 1979, Operations Plan for Southwest Weld County Landfill, prepared for Colorado Landfill, Inc., by Nelson Engineers, Greeley, Colorado, September 24.

Nelson, 1982, Operations Plan for Pratt Property Landfill, prepared for Colorado Landfill, Inc., Nelson Engineers Project No. 2017, November 12.

NOAA, 1973, Precipitation-Frequency Atlas of the Western United States, Volume III-Colorado, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, J.F. Miller, R.H. Frederick, and R.J. Tracey, NOAA Atlas 2.

NOAA, 1982, Climatography of the United State, No. 81, (Colorado), Monthly Normals of Temperature, Precipitation, and Heating and Cooling Degree Days 1951-1980, National Oceanic and Atmospheric Administration, September, 1982.

NOAA, 1992a, Climatological Data Annual Summary, Colorado, Vol. 97, No. 13, National Oceanic and Atmospheric Administration.

NOAA, 1992b, Local Climatological Data 1992 Annual Summary With Comparative Data, Denver, Colorado, National Oceanic and Atmospheric Administration.

Robson, S.G., A. Wacinski, S. Zawistowski, and J.C. Romero, 1981, Geologic Structure, Hydrology, and Water Quality of the Laramie-Fox Hills Aquifer in the Denver Basin, Colorado, U.S. Geological Survey Hydrologic Investigations Atlas, Map HA-650.

Robson, S.G., 1983, Hydraulic Characteristics of the Principal Bedrock Aquifers in the Denver Basin, Colorado, U.S. Geological Survey Hydrologic Investigations Atlas, Atlas HA-659.

Robson, S.G., 1987, Bedrock Aquifers in the Denver Basin, Colorado - A Quantitative Water-Resources Appraisal, U.S. Geological Survey Professional Paper 1257.

SCS, undated, Soil Map for Colorado Landfill Inc, U.S. Department of Agriculture, Soil Conservation Service, Soil Survey Sheet or Code No. YB-10DD-67.

Spencer, F.D., 1986, Coal Geology and Coal, Oil, and Gas Resources of the Erie and Frederick Quadrangles, Boulder and Weld Counties, Colorado, U.S. Geological Survey Bulletin 1619.

Starks, T.H., 1988. "Evaluation of Control Chart Methodologies for RCRA Waste Sites", Report by Environmental Research Center, University of Nevada, Las Vegas, for Exposure Assessment Research Division, Environmental Monitoring Systems Laboratory-Las Vegas, Nevada. CR814342-01-3.

Stewart, 1984, 1983 Year-end Report for Water Quality, Colorado Landfill, prepared for the Keirnes Corporation, by James H. Stewart and Associates, February 27.

Urban Drainage, 1978, Urban Storm Drainage, Criteria Manual, Sixth Printing, Urban Drainage and Flood Control District, Wright-McLaughlin Engineers, Denver, Colorado.

USDOC, 1992, Statistical Abstract of the United States, 1992, U.S. Department of Commerce, Bureau of the Census, 112th Edition, pp. 219-229.

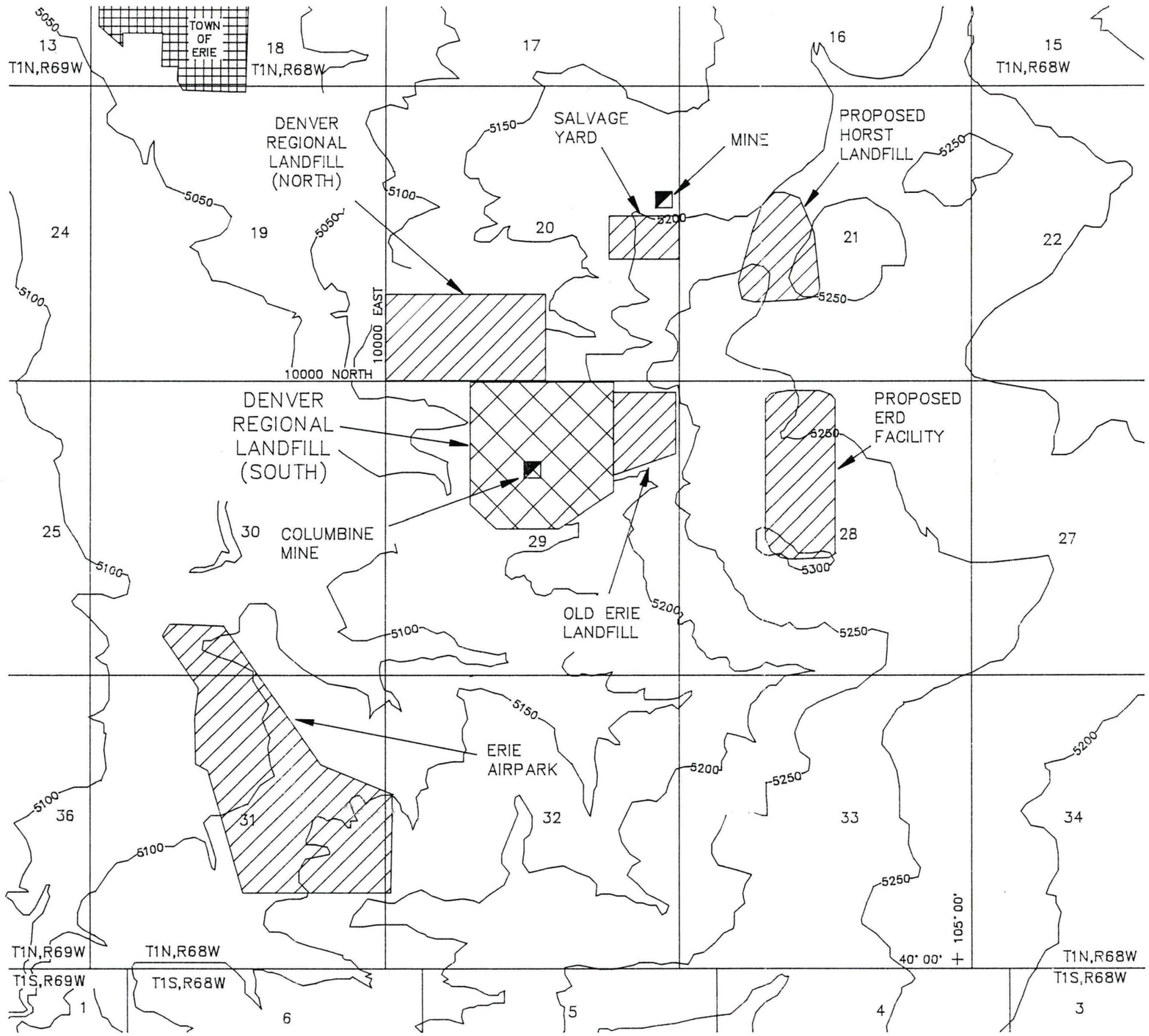
USDOC, 1993, Statistical Abstract of the United States, 1993, U.S. Department of Commerce, Bureau of the Census, 113th Edition, pp. 230-241

Weimer, R.J., 1973, A Guide to Uppermost Cretaceous Stratigraphy, Central Front Range, Colorado: Deltaic Sedimentation, Growth Faulting and Early Laramide Crustal Movement, The Mountain Geologist, Vol. 10, No. 3, pp. 53-97, July.

White, K.R., 1990, Landfill Design, Operation, and Closure Plan for the Proposed Environmental Recycling and Disposal Co. Facility in Southwestern Weld County, Colorado, prepared for Environmental Recycling and Disposal Co., Project Number 8912-04, July 30.

APPENDIX A

FIGURES



0 2000 4000

SCALE IN FEET

CONTOUR INTERVAL: 50 FEET

TOPOGRAPHY FROM THE EASTLAKE (REVISED 1980), ERIE (REVISED 1979), FREDERICK (REVISED 1979), LAFAYETTE (REVISED 1979), COLORADO, USGS 7.5 MINUTE QUADRANGLE SERIES

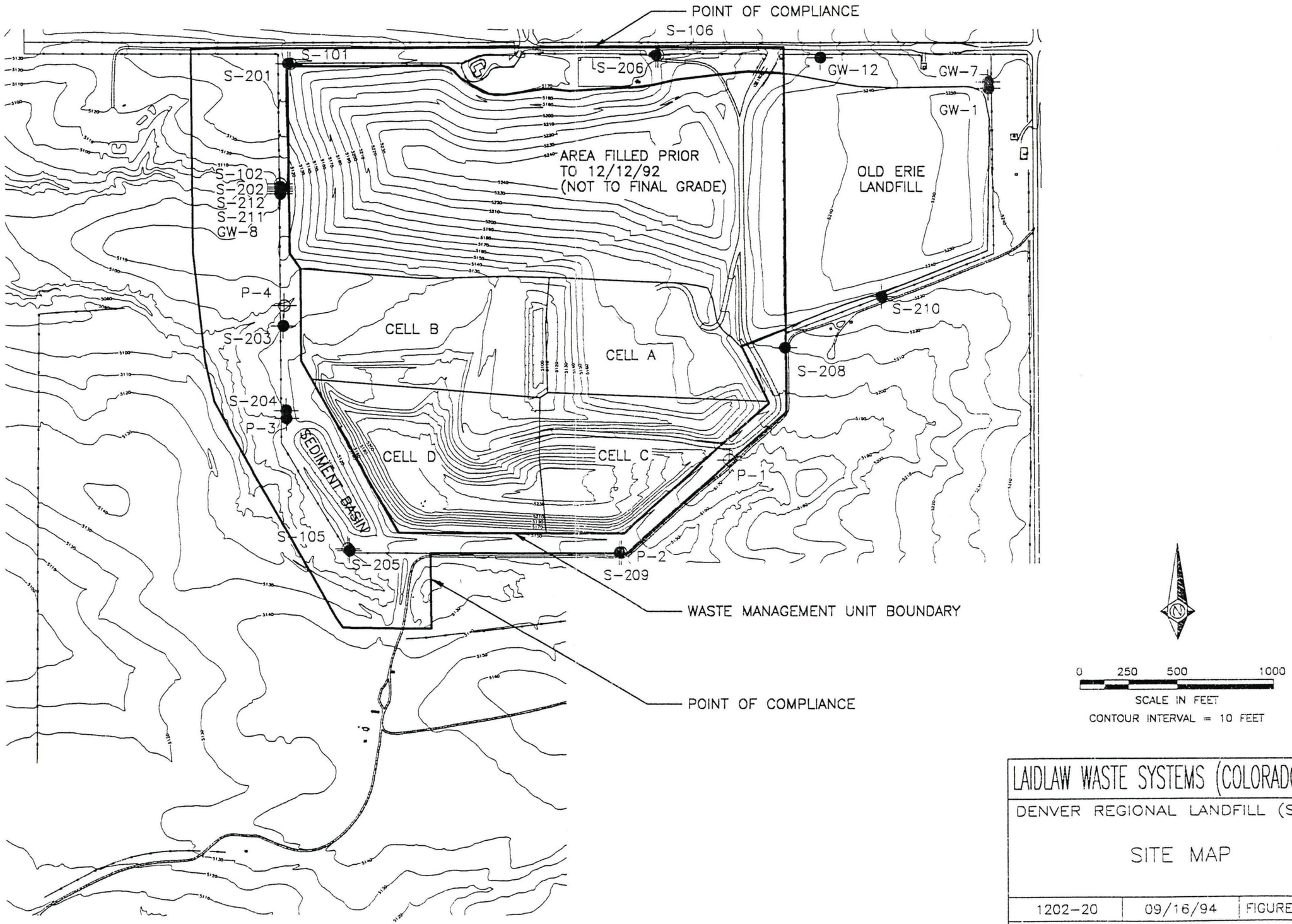
LAIDLAW WASTE SYSTEMS (COLORADO), INC.

DENVER REGIONAL LANDFILL (SOUTH)

SITE LOCATION MAP

1202-20	09/12/94	FIGURE 1.2.1

DOTY & ASSOCIATES



LAIDLAW WASTE SYSTEMS (COLORADO), INC.

DENVER REGIONAL LANDFILL (SOUTH)

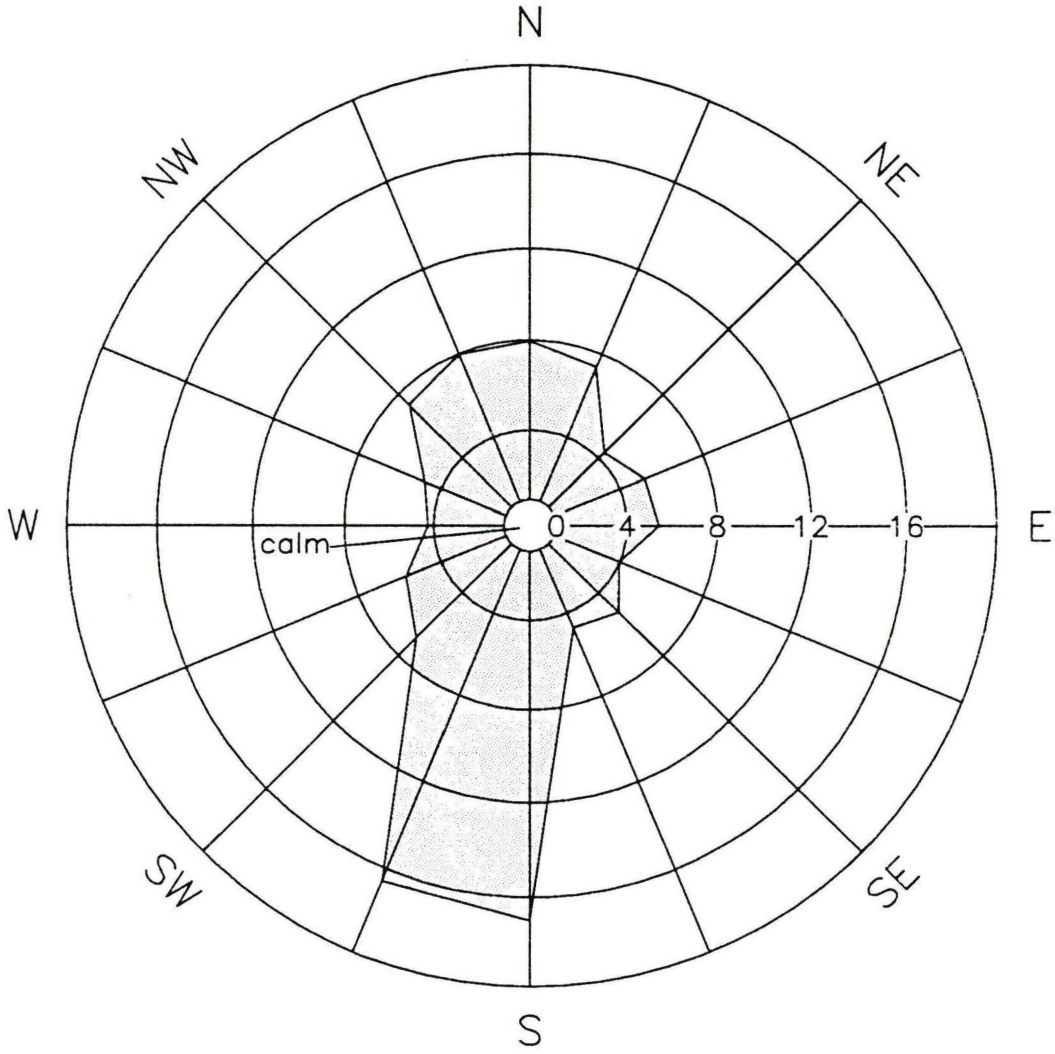
SITE MAP

1202-20	09/16/94	FIGURE 2.1.2.1

DOTY & ASSOCIATES

FIGURE 2.2.3.1

WIND ROSE



PERCENT OF TIME THAT WINDS COME FROM DIRECTION INDICATED.
DATA FROM DOWNTOWN DENVER.

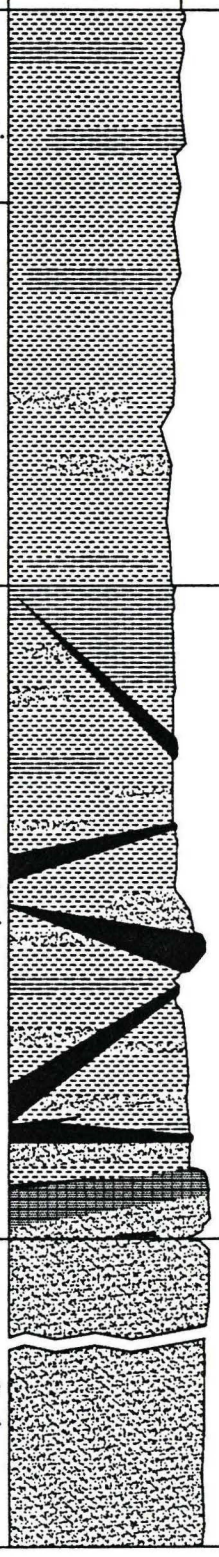
From Hansen et al. (1978)

DOTY & ASSOCIATES | 1202-20 | 09/07/94

FIGURE 2.3.2.1

GENERALIZED STRATIGRAPHIC COLUMN

ERA	System or Series	Epochs or Formation	Age	Thickness	Lithology	Description
CENOZOIC	Quaternary	Holocene	Artificial Fill	0 to 18.4 ft.		Compacted fill and uncompacted coal mine tailings
		Pleistocene	Late Pinedale to Pinedale – Bull Lake interglacial age	4 to 16 ft.		Light reddish–brown to olive–gray deposits of windblown clay, silt, and sand sized particles
MESOZOIC	Upper Cretaceous	Laramie Formation	Lower Part	110 to 500 ft.		Compacted mostly of claystone, siltstone, sandy claytone and siltstone, scattered lenticular beds of sandstone and coal, and relatively thin layers of highly cemented, ferruginous siltstone (i.e., ironstone).
		Fox–Hills Formation		200 to 300 ft.		Brown fine–grained silty sandstone interbedded with gray fissile shale grading upward into uniform light brown fine– to medium – grained cross–bedded sandstone.



After Spencer (1986) and Colton and Anderson (1977).

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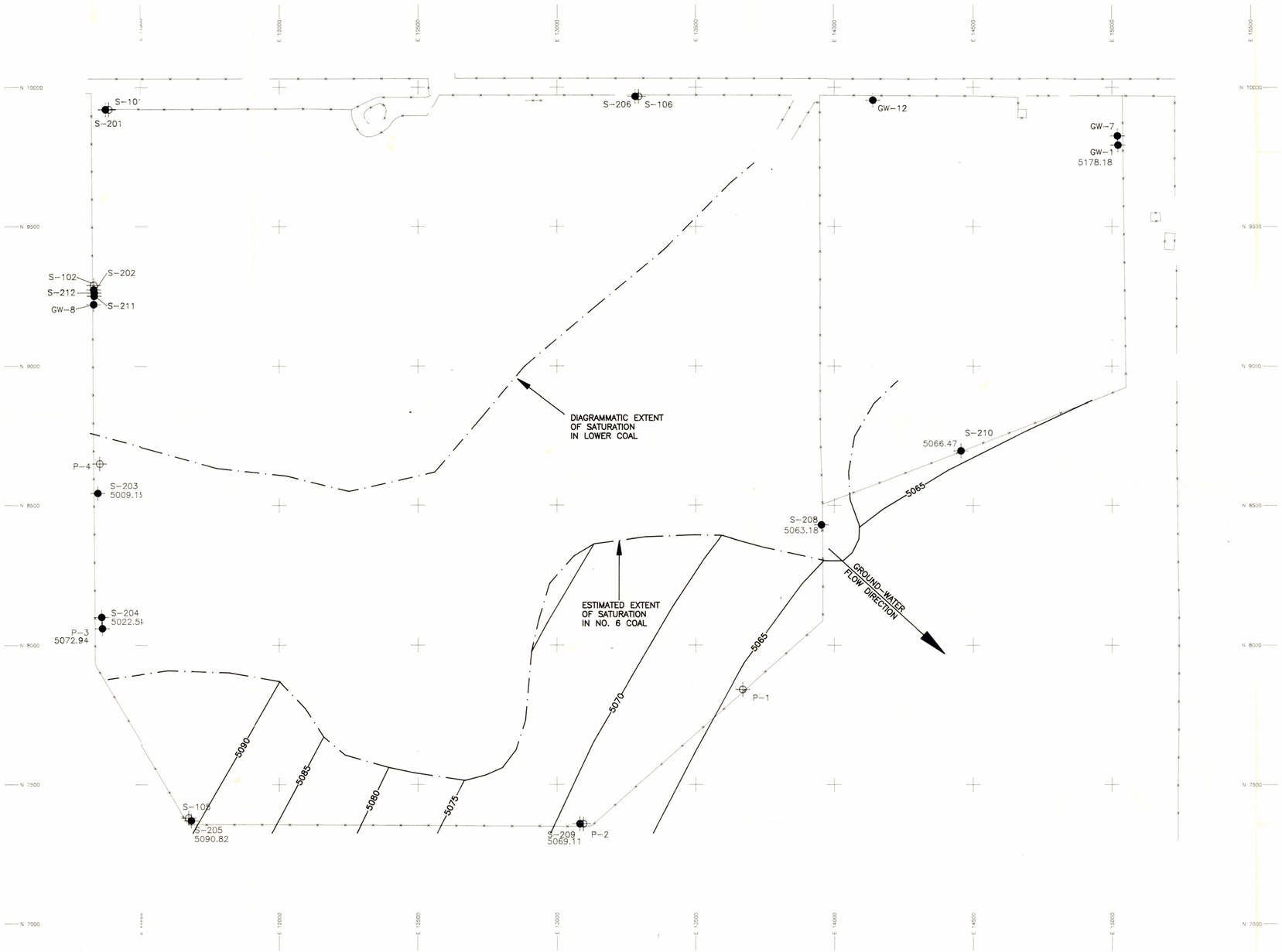

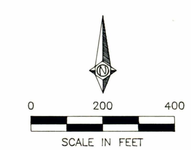

CONTOUR INTERVAL = 5 FEET

WATER LEVEL DATA COLLECTED
06/01/94

LAIDLAW WASTE SYSTEMS (COLORADO), INC.	
DENVER REGIONAL LANDFILL (SOUTH)	
POTENTIOMETRIC SURFACE	
FIGURE 2.4.2.1	REVISIONS:
PROJECT NO. 1202-20	DATE: 09/10/94
DOTY & ASSOCIATES	