ATTACHMENT 10

Statistical Summary of Selected Water Quality Parameters for Wepo Aquifer Monitoring Sites

PEABODY COAL COMPANY
ARIZONA DIVISION
WELL WATER QUALITY STATISTICS

VARIABLE	LABEL		N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE
MINENO=0252 SAMPPT=0038										
AK4	ALK AS CACO3, PH 4.5	MG_L	14	456.03	102.41	253.00	577.50	27.37	6384.40	10488.14
CD	CADMIUM, DISSOLVED	UG_L	14	6.43	4.54	1.00	20.00	1.21	90.00	20.57
CA	CALCIUM, DISSOLVED	MG_L	14	137.66	83.78	16.00	250.50	22.39	1927.20	7018.55
CL	CHLORIDE	MG_L	14	24.36	7.07	12.30	37.00	1.89	341.00	50.05
F	FLUORIDE	MG_L	14	3.16	2.30	1.30	9.70	0.62	44.18	5.31
FET	IRON, TOTAL	MG_L	13	10.78	11.65	2.60	44.35	3.23	140.13	135.67
PB	LEAD, DISSOLVED	UG_L	13	38.46	35.79	20.00	150.00	9.93	500.00	1280.77
MG	MAGNESIUM, DISSOLVED	MG_L	14	74.23	46.19	1.00	134.00	12.35	1039.20	2133.80
MNT	MANGANESE, TOTAL	MG_L	13	0.69	0.17	0.42	0.95	0.05	8.94	0.03
N_3	NITRATE NITROGEN _N	MG_L	14	0.19	0.13	0.03	0.50	0.03	2.61	0.02
K	POTASSIUM, DISSOLVED	MG_L	14	5.38	3.14	1.70	12.00	0.84	75.30	9.84
SE	SELENIUM, DISSOLVED	UG_L	14	15.71	14.53	10.00	50.00	3.88	220.00	210.99
NA	SODIUM, DISSOLVED	MG_L	14	371.61	105.62	174.00	548.00	28.23	5202.50	11155.62
SD	SOLIDS, DISSOLVED	MG_L	14	2048.50	898.64	716.00	3082.00	240.17	28679.00	807548.58
SO4	SULFATE	MG_L	14	1070.43	598.25	150.00	1749.00	159.89	14986.00	357908.57
MINENO=0252 SAMPPT=0039										
AK4	ALK AS CACO3, PH 4.5	MG_L	1	612.50	.	612.50	612.50	.	612.50	.
CD	CADMIUM, DISSOLVED	UG_L	1	10.00	.	10.00	10.00	.	10.00	.
CA	CALCIUM, DISSOLVED	MG_L	1	126.30	.	126.30	126.30	.	126.30	.
CL	CHLORIDE	MG_L	1	26.40	.	26.40	26.40	.	26.40	.
F	FLUORIDE	MG_L	1	1.47	.	1.47	1.47	.	1.47	.
FET	IRON, TOTAL	MG_L	1	134.00	.	134.00	134.00	.	134.00	.
PB	LEAD, DISSOLVED	UG_L	1	10.00	.	10.00	10.00	.	10.00	.
MG	MAGNESIUM, DISSOLVED	MG_L	1	130.00	.	130.00	130.00	.	130.00	.
MNT	MANGANESE, TOTAL	MG_L	1	3.30	.	3.30	3.30	.	3.30	.
N_3	NITRATE NITROGEN _N	MG_L	1	3.44	.	3.44	3.44	.	3.44	.
K	POTASSIUM, DISSOLVED	MG_L	1	6.40	.	6.40	6.40	.	6.40	.
SE	SELENIUM, DISSOLVED	UG_L	1	10.00	.	10.00	10.00	.	10.00	.
NA	SODIUM, DISSOLVED	MG_L	1	427.00	.	427.00	427.00	.	427.00	.
SD	SOLIDS, DISSOLVED	MG_L	1	2643.00	.	2643.00	2643.00	.	2643.00	.
SO4	SULFATE	MG_L	1	1750.00	.	1750.00	1750.00	.	1750.00	.

PEABODY COAL COMPANY
ARIZONA DIVISION
WELL WATER QUALITY STATISTICS

VARIABLE	LABEL		N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE
MINENO=0252 SAMPPT=0040										
AK4	ALK AS CACO3, PH 4.5	MG_L	13	543.08	64.40	453.00	653.00	17.86	7060.10	4147.41
CD	CADMIUM, DISSOLVED	UG_L	13	7.31	4.39	5.00	20.00	1.22	95.00	19.23
CA	CALCIUM, DISSOLVED	MG_L	13	13.60	10.41	4.00	35.70	2.89	176.80	108.30
CL	CHLORIDE	MG_L	13	48.93	3.97	43.40	57.30	1.10	636.10	15.75
F	FLUORIDE	MG_L	13	8.33	1.98	3.50	10.40	0.55	108.27	3.93
FET	IRON, TOTAL	MG_L	13	3.84	5.47	0.10	18.50	1.52	49.86	29.94
PB	LEAD, DISSOLVED	UG_L	12	40.00	32.47	20.00	130.00	9.37	480.00	1054.55
MG	MAGNESIUM, DISSOLVED	MG_L	13	6.34	7.32	1.30	23.00	2.03	82.40	53.62
MNT	MANGANESE, TOTAL	MG_L	13	0.12	0.15	0.02	0.51	0.04	1.61	0.02
N_3	NITRATE NITROGEN _N	MG_L	13	0.19	0.18	0.01	0.70	0.05	2.45	0.03
K	POTASSIUM, DISSOLVED	MG_L	13	2.58	0.72	1.30	3.90	0.20	33.60	0.52
SE	SELENIUM, DISSOLVED	UG_L	13	13.08	11.09	10.00	50.00	3.08	170.00	123.08
NA	SODIUM, DISSOLVED	MG_L	13	380.05	116.46	240.00	643.00	32.30	4940.60	13563.76
SD	SOLIDS, DISSOLVED	MG_L	13	1174.77	449.78	447.00	2082.00	124.75	15272.00	202299.53
SO4	SULFATE	MG_L	13	276.77	262.63	71.00	910.00	72.84	3598.00	68972.86
MINENO=0252 SAMPPT=0041										
AK4	ALK AS CACO3, PH 4.5	MG_L	13	537.27	139.77	231.00	651.30	38.77	6984.50	19536.65
CD	CADMIUM, DISSOLVED	UG_L	13	8.46	4.81	5.00	20.00	1.33	110.00	23.10
CA	CALCIUM, DISSOLVED	MG_L	13	51.66	26.63	20.40	97.00	7.39	671.60	709.05
CL	CHLORIDE	MG_L	13	46.78	13.55	18.60	68.00	3.76	608.20	183.69
F	FLUORIDE	MG_L	13	2.49	0.55	1.60	3.80	0.15	32.41	0.30
FET	IRON, TOTAL	MG_L	12	3.81	2.36	0.30	7.10	0.68	45.72	5.58
PB	LEAD, DISSOLVED	UG_L	12	71.67	58.75	20.00	170.00	16.96	860.00	3451.52
MG	MAGNESIUM, DISSOLVED	MG_L	13	37.62	17.25	17.30	75.00	4.78	489.10	297.61
MNT	MANGANESE, TOTAL	MG_L	12	0.14	0.05	0.02	0.20	0.01	1.70	0.00
N_3	NITRATE NITROGEN _N	MG_L	13	0.12	0.09	0.00	0.24	0.03	1.56	0.01
K	POTASSIUM, DISSOLVED	MG_L	13	7.27	2.20	4.80	13.00	0.61	94.50	4.86
SE	SELENIUM, DISSOLVED	UG_L	13	16.92	14.94	10.00	50.00	4.14	220.00	223.08
NA	SODIUM, DISSOLVED	MG_L	13	784.23	112.36	551.00	933.00	31.16	10195.00	12624.53
SD	SOLIDS, DISSOLVED	MG_L	13	2829.46	371.59	2037.00	3420.00	103.06	36783.00	138077.77
SO4	SULFATE	MG_L	13	1395.69	183.52	931.00	1630.00	50.90	18144.00	33680.73

PEABODY COAL COMPANY
ARIZONA DIVISION
WELL WATER QUALITY STATISTICS

VARIABLE	LABEL		N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE
MINENO=0252 SAMPPT=0042										
AK4	ALK AS CACO3, PH 4.5	MG_L	12	275.70	45.15	161.00	327.00	13.03	3308.40	2038.38
CD	CADMIUM, DISSOLVED	UG_L	12	7.33	2.53	5.00	11.00	0.73	88.00	6.42
CA	CALCIUM, DISSOLVED	MG_L	12	164.23	13.67	141.20	190.00	3.95	1970.80	186.81
CL	CHLORIDE	MG_L	12	10.97	5.26	1.00	21.00	1.52	131.70	27.65
F	FLUORIDE	MG_L	12	2.02	0.23	1.60	2.60	0.07	24.20	0.06
FET	IRON, TOTAL	MG_L	11	8.83	1.43	6.70	11.36	0.43	97.12	2.04
PB	LEAD, DISSOLVED	UG_L	12	45.83	31.18	20.00	100.00	9.00	550.00	971.97
MG	MAGNESIUM, DISSOLVED	MG_L	12	102.57	10.14	88.60	120.00	2.93	1230.90	102.91
MNT	MANGANESE, TOTAL	MG_L	11	0.17	0.03	0.10	0.21	0.01	1.87	0.00
N_3	NITRATE NITROGEN _N	MG_L	12	0.14	0.08	0.01	0.20	0.02	1.68	0.01
K	POTASSIUM, DISSOLVED	MG_L	12	9.55	1.38	7.90	13.30	0.40	114.60	1.91
SE	SELENIUM, DISSOLVED	UG_L	12	16.67	15.57	10.00	50.00	4.49	200.00	242.42
NA	SODIUM, DISSOLVED	MG_L	12	33.80	3.17	31.00	41.00	0.91	405.60	10.04
SD	SOLIDS, DISSOLVED	MG_L	12	1242.25	99.50	1096.00	1406.00	28.72	14907.00	9900.20
SO4	SULFATE	MG_L	12	584.42	69.80	484.00	710.00	20.15	7013.00	4871.54
MINENO=0252 SAMPPT=0049										
AK4	ALK AS CACO3, PH 4.5	MG_L	12	270.25	24.38	224.50	318.00	7.04	3243.00	594.52
CD	CADMIUM, DISSOLVED	UG_L	12	7.25	2.42	5.00	10.00	0.70	87.00	5.84
CA	CALCIUM, DISSOLVED	MG_L	12	220.41	36.58	171.00	313.00	10.56	2644.90	1338.35
CL	CHLORIDE	MG_L	12	14.12	2.98	9.80	19.50	0.86	169.50	8.88
F	FLUORIDE	MG_L	12	0.24	0.08	0.20	0.50	0.02	2.87	0.01
FET	IRON, TOTAL	MG_L	11	23.14	29.12	3.10	92.88	8.78	254.58	847.86
PB	LEAD, DISSOLVED	UG_L	12	52.50	40.48	20.00	130.00	11.69	630.00	1638.64
MG	MAGNESIUM, DISSOLVED	MG_L	12	89.57	8.09	73.00	104.40	2.34	1074.80	65.44
MNT	MANGANESE, TOTAL	MG_L	11	0.69	0.84	0.32	3.20	0.25	7.54	0.71
N_3	NITRATE NITROGEN _N	MG_L	12	0.18	0.22	0.02	0.82	0.06	2.12	0.05
K	POTASSIUM, DISSOLVED	MG_L	12	9.22	1.85	6.20	14.00	0.53	110.70	3.42
SE	SELENIUM, DISSOLVED	UG_L	12	16.67	15.57	10.00	50.00	4.49	200.00	242.42
NA	SODIUM, DISSOLVED	MG_L	12	38.13	11.49	24.00	61.00	3.32	457.60	131.96
SD	SOLIDS, DISSOLVED	MG_L	12	1288.58	241.82	706.00	1514.00	69.81	15463.00	58476.81
SO4	SULFATE	MG_L	12	776.25	113.01	656.00	1050.00	32.62	9315.00	12770.39

PEABODY COAL COMPANY
ARIZONA DIVISION
WELL WATER QUALITY STATISTICS

VARIABLE	LABEL		N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE
MINENO=0250 SAMPPT=0043										
AK4	ALK AS CACO3, PH 4.5	MG_L	15	438.43	145.77	108.00	658.70	37.64	6576.40	21247.84
CD	CADMIUM, DISSOLVED	UG_L	15	5.93	2.12	4.00	10.00	0.55	89.00	4.50
CA	CALCIUM, DISSOLVED	MG_L	14	87.43	108.68	8.90	276.00	29.05	1224.00	11811.15
CL	CHLORIDE	MG_L	15	17.03	8.01	10.00	44.00	2.07	255.40	64.21
F	FLUORIDE	MG_L	15	1.22	0.48	0.27	2.10	0.12	18.33	0.23
FET	IRON, TOTAL	MG_L	14	11.96	9.83	0.60	29.20	2.63	167.39	96.59
PB	LEAD, DISSOLVED	UG_L	13	33.08	14.94	20.00	50.00	4.14	430.00	223.08
MG	MAGNESIUM, DISSOLVED	MG_L	15	24.15	27.84	1.10	84.10	7.19	362.20	774.86
MNT	MANGANESE, TOTAL	MG_L	14	0.32	0.21	0.02	0.72	0.06	4.54	0.04
N_3	NITRATE NITROGEN _N	MG_L	15	0.14	0.08	0.00	0.20	0.02	2.17	0.01
K	POTASSIUM, DISSOLVED	MG_L	15	8.93	5.76	1.50	19.70	1.49	133.90	33.14
SE	SELENIUM, DISSOLVED	UG_L	15	15.33	14.07	10.00	50.00	3.63	230.00	198.10
NA	SODIUM, DISSOLVED	MG_L	14	170.20	72.40	47.00	330.00	19.35	2382.80	5242.47
SD	SOLIDS, DISSOLVED	MG_L	15	965.07	578.89	54.00	2046.00	149.47	14476.00	335117.21
SO4	SULFATE	MG_L	14	226.00	301.16	5.00	792.00	80.49	3164.00	90694.46
MINENO=0250 SAMPPT=0044										
AK4	ALK AS CACO3, PH 4.5	MG_L	14	957.65	516.00	116.00	1550.00	137.91	13407.10	266252.06
CD	CADMIUM, DISSOLVED	UG_L	14	5.79	2.52	1.00	10.00	0.67	81.00	6.34
CA	CALCIUM, DISSOLVED	MG_L	13	9.20	4.61	4.80	23.00	1.28	119.60	21.24
CL	CHLORIDE	MG_L	14	52.94	50.64	8.00	203.00	13.53	741.10	2564.03
F	FLUORIDE	MG_L	14	7.32	5.88	0.35	15.50	1.57	102.42	34.56
FET	IRON, TOTAL	MG_L	14	3.59	2.87	0.10	7.60	0.77	50.31	8.23
PB	LEAD, DISSOLVED	UG_L	12	32.50	20.06	20.00	80.00	5.79	390.00	402.27
MG	MAGNESIUM, DISSOLVED	MG_L	13	3.16	3.02	0.30	10.20	0.84	41.10	9.10
MNT	MANGANESE, TOTAL	MG_L	14	5.13	18.67	0.02	70.00	4.99	71.86	348.60
N_3	NITRATE NITROGEN _N	MG_L	14	0.18	0.13	0.00	0.51	0.03	2.56	0.02
K	POTASSIUM, DISSOLVED	MG_L	14	4.71	4.17	0.60	17.90	1.11	66.00	17.35
SE	SELENIUM, DISSOLVED	UG_L	14	12.86	10.69	10.00	50.00	2.86	180.00	114.29
NA	SODIUM, DISSOLVED	MG_L	13	498.39	282.99	49.00	813.00	78.49	6479.10	80081.23
SD	SOLIDS, DISSOLVED	MG_L	14	1962.36	1527.40	187.00	6362.00	408.22	27473.00	2332963.32
SO4	SULFATE	MG_L	13	106.62	256.66	1.00	944.00	71.19	1386.00	65876.76

PEABODY COAL COMPANY
ARIZONA DIVISION
WELL WATER QUALITY STATISTICS

VARIABLE	LABEL		N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE
MINENO=0250 SAMPPT=0045										
AK4	ALK AS CACO3, PH 4.5	MG_L	18	700.49	55.27	607.00	812.00	13.03	12608.80	3054.40
CD	CADMIUM, DISSOLVED	UG_L	18	6.67	2.61	3.00	10.00	0.62	120.00	6.82
CA	CALCIUM, DISSOLVED	MG_L	18	3.29	2.20	0.10	9.20	0.52	59.30	4.85
CL	CHLORIDE	MG_L	18	46.20	12.78	23.90	68.30	3.01	831.60	163.41
F	FLUORIDE	MG_L	18	6.45	0.77	4.20	7.80	0.18	116.06	0.59
FET	IRON, TOTAL	MG_L	16	5.77	3.58	0.11	10.50	0.90	92.39	12.84
PB	LEAD, DISSOLVED	UG_L	18	37.78	14.37	20.00	50.00	3.39	680.00	206.54
MG	MAGNESIUM, DISSOLVED	MG_L	18	1.35	0.74	0.60	3.00	0.17	24.30	0.55
MNT	MANGANESE, TOTAL	MG_L	16	0.12	0.07	0.02	0.23	0.02	1.95	0.01
N_3	NITRATE NITROGEN _N	MG_L	18	0.11	0.07	0.02	0.20	0.02	1.98	0.01
K	POTASSIUM, DISSOLVED	MG_L	18	2.89	2.06	0.80	9.40	0.48	52.00	4.23
SE	SELENIUM, DISSOLVED	UG_L	18	16.67	13.72	10.00	50.00	3.23	300.00	188.24
NA	SODIUM, DISSOLVED	MG_L	18	368.82	49.96	270.00	448.70	11.78	6638.70	2496.26
SD	SOLIDS, DISSOLVED	MG_L	18	1014.89	336.00	640.00	2128.00	79.20	18268.00	112897.40
SO4	SULFATE	MG_L	18	52.56	21.52	24.00	102.00	5.07	946.00	463.20
MINENO=0250 SAMPPT=0046										
AK4	ALK AS CACO3, PH 4.5	MG_L	13	720.88	419.92	101.50	1714.00	116.47	9371.40	176334.64
CD	CADMIUM, DISSOLVED	UG_L	13	8.77	8.11	1.00	30.00	2.25	114.00	65.69
CA	CALCIUM, DISSOLVED	MG_L	13	131.88	76.55	17.30	250.00	21.23	1714.40	5859.79
CL	CHLORIDE	MG_L	13	61.01	28.96	13.70	99.00	8.03	793.10	838.65
F	FLUORIDE	MG_L	13	1.07	0.48	0.22	1.90	0.13	13.95	0.23
FET	IRON, TOTAL	MG_L	12	9.98	11.40	0.90	38.00	3.29	119.77	129.89
PB	LEAD, DISSOLVED	UG_L	11	81.09	81.59	2.00	230.00	24.60	892.00	6657.09
MG	MAGNESIUM, DISSOLVED	MG_L	13	120.29	65.27	2.80	240.00	18.10	1563.80	4260.63
MNT	MANGANESE, TOTAL	MG_L	12	1.77	2.28	0.09	8.10	0.66	21.24	5.22
N_3	NITRATE NITROGEN _N	MG_L	12	6.98	12.99	0.05	34.60	3.75	83.78	168.73
K	POTASSIUM, DISSOLVED	MG_L	13	10.94	5.10	1.60	19.10	1.41	142.20	25.97
SE	SELENIUM, DISSOLVED	UG_L	13	15.38	15.61	0.00	50.00	4.33	200.00	243.59
NA	SODIUM, DISSOLVED	MG_L	13	586.09	250.50	57.00	816.00	69.48	7619.20	62749.58
SD	SOLIDS, DISSOLVED	MG_L	12	3062.33	968.33	610.00	4160.00	279.53	36748.00	937671.15
SO4	SULFATE	MG_L	13	1393.38	597.89	168.00	1980.00	165.83	18114.00	357476.76

PEABODY COAL COMPANY
ARIZONA DIVISION
WELL WATER QUALITY STATISTICS

VARIABLE	LABEL		N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE
MINENO=0250 SAMPPT=0047										
AK4	ALK AS CACO3, PH 4.5	MG_L	12	379.09	65.45	281.50	494.80	18.89	4549.10	4283.68
CD	CADMIUM, DISSOLVED	UG_L	12	5.75	2.83	1.00	10.00	0.82	69.00	8.02
CA	CALCIUM, DISSOLVED	MG_L	12	10.08	18.36	2.00	68.10	5.30	121.00	337.15
CL	CHLORIDE	MG_L	12	15.62	2.57	12.60	20.30	0.74	187.40	6.58
F	FLUORIDE	MG_L	12	2.68	0.88	1.20	4.40	0.26	32.11	0.78
FET	IRON, TOTAL	MG_L	11	7.26	11.83	0.20	40.20	3.57	79.87	139.87
PB	LEAD, DISSOLVED	UG_L	12	32.50	14.22	20.00	50.00	4.11	390.00	202.27
MG	MAGNESIUM, DISSOLVED	MG_L	12	4.42	11.34	0.70	40.40	3.27	53.00	128.69
MNT	MANGANESE, TOTAL	MG_L	11	0.11	0.10	0.02	0.32	0.03	1.21	0.01
N_3	NITRATE NITROGEN _N	MG_L	11	0.15	0.08	0.00	0.24	0.02	1.62	0.01
K	POTASSIUM, DISSOLVED	MG_L	12	3.17	3.04	0.40	11.00	0.88	38.10	9.22
SE	SELENIUM, DISSOLVED	UG_L	12	16.67	15.57	10.00	50.00	4.49	200.00	242.42
NA	SODIUM, DISSOLVED	MG_L	12	254.08	42.44	206.00	368.00	12.25	3049.00	1800.99
SD	SOLIDS, DISSOLVED	MG_L	12	1116.50	869.65	622.00	3794.00	251.05	13398.00	756287.55
SO4	SULFATE	MG_L	12	215.25	124.36	120.00	572.00	35.90	2583.00	15466.20
MINENO=0250 SAMPPT=0053										
AK4	ALK AS CACO3, PH 4.5	MG_L	15	548.74	336.85	88.00	1210.00	86.97	8231.10	113467.04
CD	CADMIUM, DISSOLVED	UG_L	15	15.13	29.99	1.00	120.00	7.74	227.00	899.41
CA	CALCIUM, DISSOLVED	MG_L	14	41.11	31.52	6.20	89.30	8.42	575.60	993.72
CL	CHLORIDE	MG_L	15	20.33	7.66	7.10	30.00	1.98	305.00	58.70
F	FLUORIDE	MG_L	15	2.22	3.14	0.21	10.00	0.81	33.31	9.85
FET	IRON, TOTAL	MG_L	14	3.15	3.11	0.10	11.00	0.83	44.07	9.67
PB	LEAD, DISSOLVED	UG_L	13	36.92	27.20	20.00	110.00	7.54	480.00	739.74
MG	MAGNESIUM, DISSOLVED	MG_L	14	53.00	107.96	0.30	421.00	28.85	742.00	11656.30
MNT	MANGANESE, TOTAL	MG_L	14	0.19	0.12	0.05	0.47	0.03	2.67	0.02
N_3	NITRATE NITROGEN _N	MG_L	14	0.21	0.16	0.00	0.68	0.04	2.88	0.03
K	POTASSIUM, DISSOLVED	MG_L	15	7.71	4.86	1.40	18.00	1.26	115.60	23.65
SE	SELENIUM, DISSOLVED	UG_L	15	15.33	14.07	10.00	50.00	3.63	230.00	198.10
NA	SODIUM, DISSOLVED	MG_L	14	740.49	497.03	44.00	1314.00	132.84	10366.90	247034.54
SD	SOLIDS, DISSOLVED	MG_L	15	2635.67	1789.67	182.00	4698.00	462.09	39535.00	3202903.52
SO4	SULFATE	MG_L	14	1208.00	954.36	24.00	2571.00	255.06	16912.00	910793.85

PEABODY COAL COMPANY
ARIZONA DIVISION
WELL WATER QUALITY STATISTICS

VARIABLE	LABEL		N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE
MINENO=0252 SAMPPT=0051										
AK4	ALK AS CACO3, PH 4.5	MG_L	12	329.80	85.63	103.00	413.50	24.72	3957.60	7332.90
CD	CADMIUM, DISSOLVED	UG_L	12	7.17	2.37	5.00	10.00	0.68	86.00	5.61
CA	CALCIUM, DISSOLVED	MG_L	12	130.92	122.88	40.30	500.00	35.47	1571.00	15099.23
CL	CHLORIDE	MG_L	12	21.69	3.85	16.10	28.10	1.11	260.30	14.86
F	FLUORIDE	MG_L	12	1.07	0.37	0.60	2.10	0.11	12.90	0.14
FET	IRON, TOTAL	MG_L	11	1.97	1.15	0.40	3.87	0.35	21.67	1.32
PB	LEAD, DISSOLVED	UG_L	12	61.67	59.97	20.00	220.00	17.31	740.00	3596.97
MG	MAGNESIUM, DISSOLVED	MG_L	11	62.14	21.71	10.20	88.40	6.54	683.50	471.11
MNT	MANGANESE, TOTAL	MG_L	11	0.31	0.11	0.14	0.47	0.03	3.40	0.01
N_3	NITRATE NITROGEN _N	MG_L	12	0.12	0.08	0.01	0.20	0.02	1.47	0.01
K	POTASSIUM, DISSOLVED	MG_L	12	6.84	3.00	0.50	12.00	0.87	82.10	9.02
SE	SELENIUM, DISSOLVED	UG_L	12	17.50	15.45	10.00	50.00	4.46	210.00	238.64
NA	SODIUM, DISSOLVED	MG_L	11	327.09	65.82	220.00	462.00	19.85	3598.00	4332.29
SD	SOLIDS, DISSOLVED	MG_L	12	2170.83	1526.61	1370.00	6980.00	440.69	26050.00	2330539.61
SO4	SULFATE	MG_L	11	851.09	157.89	570.00	1220.00	47.61	9362.00	24929.69
MINENO=0252 SAMPPT=0052										
AK4	ALK AS CACO3, PH 4.5	MG_L	12	332.78	74.06	205.00	485.90	21.38	3993.40	5485.60
CD	CADMIUM, DISSOLVED	UG_L	12	6.58	2.50	3.00	10.00	0.72	79.00	6.27
CA	CALCIUM, DISSOLVED	MG_L	11	12.88	6.76	5.00	26.00	2.04	141.70	45.68
CL	CHLORIDE	MG_L	12	17.90	7.63	2.90	32.90	2.20	214.80	58.27
F	FLUORIDE	MG_L	12	1.80	0.55	1.40	3.40	0.16	21.57	0.31
FET	IRON, TOTAL	MG_L	11	2.06	1.40	0.34	4.80	0.42	22.66	1.95
PB	LEAD, DISSOLVED	UG_L	12	35.83	24.29	20.00	100.00	7.01	430.00	590.15
MG	MAGNESIUM, DISSOLVED	MG_L	11	9.96	17.83	1.00	63.00	5.38	109.60	317.92
MNT	MANGANESE, TOTAL	MG_L	10	0.14	0.07	0.06	0.30	0.02	1.45	0.01
N_3	NITRATE NITROGEN _N	MG_L	11	0.12	0.08	0.01	0.20	0.02	1.33	0.01
K	POTASSIUM, DISSOLVED	MG_L	12	3.57	2.29	1.50	9.10	0.66	42.90	5.24
SE	SELENIUM, DISSOLVED	UG_L	12	16.67	15.57	10.00	50.00	4.49	200.00	242.42
NA	SODIUM, DISSOLVED	MG_L	11	171.53	39.21	120.00	240.00	11.82	1886.80	1537.14
SD	SOLIDS, DISSOLVED	MG_L	12	799.92	461.37	482.00	2083.00	133.19	9599.00	212861.36
SO4	SULFATE	MG_L	11	94.73	37.81	67.00	201.00	11.40	1042.00	1429.22

PEABODY COAL COMPANY
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VARIABLE	LABEL		N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE
MINENO=0252 SAMPPT=0054										
AK4	ALK AS CACO3, PH 4.5	MG_L	12	371.96	85.48	286.00	534.40	24.68	4463.50	7307.41
CD	CADMIUM, DISSOLVED	UG_L	12	7.08	2.84	4.00	12.00	0.82	85.00	8.08
CA	CALCIUM, DISSOLVED	MG_L	12	163.28	39.95	106.00	248.00	11.53	1959.40	1596.21
CL	CHLORIDE	MG_L	12	23.11	31.47	7.60	122.00	9.08	277.30	990.31
F	FLUORIDE	MG_L	12	0.28	0.07	0.19	0.40	0.02	3.37	0.00
FET	IRON, TOTAL	MG_L	11	8.61	11.42	1.23	37.60	3.44	94.71	130.31
PB	LEAD, DISSOLVED	UG_L	12	49.17	38.72	20.00	140.00	11.18	590.00	1499.24
MG	MAGNESIUM, DISSOLVED	MG_L	12	95.34	9.12	85.00	113.00	2.63	1144.10	83.19
MNT	MANGANESE, TOTAL	MG_L	11	0.31	0.14	0.15	0.51	0.04	3.44	0.02
N_3	NITRATE NITROGEN _N	MG_L	11	0.12	0.09	0.00	0.20	0.03	1.28	0.01
K	POTASSIUM, DISSOLVED	MG_L	12	8.89	1.57	5.30	11.00	0.45	106.70	2.45
SE	SELENIUM, DISSOLVED	UG_L	12	16.67	15.57	10.00	50.00	4.49	200.00	242.42
NA	SODIUM, DISSOLVED	MG_L	12	63.10	38.11	28.00	140.00	11.00	757.20	1452.48
SD	SOLIDS, DISSOLVED	MG_L	12	1380.00	461.05	845.00	2641.00	133.09	16560.00	212570.55
SO4	SULFATE	MG_L	12	565.83	166.80	433.00	1000.00	48.15	6790.00	27822.70
MINENO=0252 SAMPPT=0062										
AK4	ALK AS CACO3, PH 4.5	MG_L	14	663.11	247.80	237.50	1023.80	66.23	9283.50	61403.51
CD	CADMIUM, DISSOLVED	UG_L	14	25.79	53.73	5.00	210.00	14.36	361.00	2886.64
CA	CALCIUM, DISSOLVED	MG_L	14	377.50	117.37	169.00	627.60	31.37	5285.00	13776.29
CL	CHLORIDE	MG_L	14	100.24	31.34	41.20	135.00	8.38	1403.40	982.29
F	FLUORIDE	MG_L	14	0.80	0.33	0.10	1.30	0.09	11.25	0.11
FET	IRON, TOTAL	MG_L	13	5.34	4.48	1.23	14.70	1.24	69.47	20.04
PB	LEAD, DISSOLVED	UG_L	12	122.50	142.07	20.00	470.00	41.01	1470.00	20184.09
MG	MAGNESIUM, DISSOLVED	MG_L	14	314.46	119.55	160.00	522.30	31.95	4402.50	14292.30
MNT	MANGANESE, TOTAL	MG_L	13	0.80	0.33	0.49	1.70	0.09	10.43	0.11
N_3	NITRATE NITROGEN _N	MG_L	14	0.19	0.15	0.02	0.50	0.04	2.61	0.02
K	POTASSIUM, DISSOLVED	MG_L	14	18.79	4.16	14.00	28.80	1.11	263.10	17.33
SE	SELENIUM, DISSOLVED	UG_L	14	15.71	14.53	10.00	50.00	3.88	220.00	210.99
NA	SODIUM, DISSOLVED	MG_L	14	681.01	110.27	438.20	844.00	29.47	9534.10	12159.03
SD	SOLIDS, DISSOLVED	MG_L	14	5502.86	1026.64	3024.00	6604.00	274.38	77040.00	1053990.13
SO4	SULFATE	MG_L	14	2862.71	619.30	1500.00	3780.00	165.51	40078.00	383528.37

PEABODY COAL COMPANY
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VARIABLE	LABEL		N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE
MINENO=0250 SAMPPT=0055										
AK4	ALK AS CACO3, PH 4.5	MG_L	10	664.25	213.85	70.00	813.00	67.63	6642.50	45732.51
CD	CADMIUM, DISSOLVED	UG_L	10	7.00	2.31	5.00	10.00	0.73	70.00	5.33
CA	CALCIUM, DISSOLVED	MG_L	9	6.03	1.83	4.00	9.00	0.61	54.30	3.36
CL	CHLORIDE	MG_L	10	52.54	25.18	39.20	121.80	7.96	525.40	634.28
F	FLUORIDE	MG_L	10	7.07	3.59	1.75	15.50	1.13	70.75	12.86
FET	IRON, TOTAL	MG_L	9	8.47	21.08	0.10	64.60	7.03	76.22	444.53
PB	LEAD, DISSOLVED	UG_L	10	43.00	23.59	20.00	80.00	7.46	430.00	556.67
MG	MAGNESIUM, DISSOLVED	MG_L	10	2.99	1.59	1.00	5.60	0.50	29.90	2.54
MNT	MANGANESE, TOTAL	MG_L	9	0.19	0.30	0.02	0.98	0.10	1.75	0.09
N_3	NITRATE NITROGEN _N	MG_L	10	0.41	0.79	0.00	2.60	0.25	4.06	0.62
K	POTASSIUM, DISSOLVED	MG_L	10	5.39	4.89	2.30	18.50	1.55	53.90	23.96
SE	SELENIUM, DISSOLVED	UG_L	10	18.00	16.87	10.00	50.00	5.33	180.00	284.44
NA	SODIUM, DISSOLVED	MG_L	9	365.44	43.81	272.00	427.00	14.60	3289.00	1919.03
SD	SOLIDS, DISSOLVED	MG_L	10	1052.00	207.11	842.00	1433.00	65.50	10520.00	42896.22
SO4	SULFATE	MG_L	9	36.44	64.84	1.00	200.00	21.61	328.00	4204.78
MINENO=0250 SAMPPT=0056										
AK4	ALK AS CACO3, PH 4.5	MG_L	12	200.50	55.96	113.50	323.70	16.16	2406.00	3131.87
CD	CADMIUM, DISSOLVED	UG_L	12	5.92	2.57	3.00	10.00	0.74	71.00	6.63
CA	CALCIUM, DISSOLVED	MG_L	11	11.70	6.44	5.00	23.00	1.94	128.70	41.44
CL	CHLORIDE	MG_L	12	10.99	5.29	1.00	19.40	1.53	131.90	27.96
F	FLUORIDE	MG_L	12	0.33	0.30	0.19	1.20	0.09	3.96	0.09
FET	IRON, TOTAL	MG_L	11	3.29	3.30	0.64	11.70	1.00	36.21	10.92
PB	LEAD, DISSOLVED	UG_L	12	30.83	14.43	20.00	50.00	4.17	370.00	208.33
MG	MAGNESIUM, DISSOLVED	MG_L	12	5.10	6.16	1.00	21.00	1.78	61.20	37.97
MNT	MANGANESE, TOTAL	MG_L	11	0.15	0.10	0.04	0.41	0.03	1.65	0.01
N_3	NITRATE NITROGEN _N	MG_L	11	0.14	0.10	0.01	0.32	0.03	1.52	0.01
K	POTASSIUM, DISSOLVED	MG_L	12	4.60	3.27	2.00	14.00	0.94	55.20	10.71
SE	SELENIUM, DISSOLVED	UG_L	12	16.67	15.57	10.00	50.00	4.49	200.00	242.42
NA	SODIUM, DISSOLVED	MG_L	11	226.03	206.55	117.00	840.00	62.28	2486.30	42661.05
SD	SOLIDS, DISSOLVED	MG_L	12	584.58	146.76	401.00	912.00	42.37	7015.00	21538.63
SO4	SULFATE	MG_L	11	181.73	66.17	99.00	330.00	19.95	1999.00	4378.22

PEABODY COAL COMPANY
ARIZONA DIVISION
WELL WATER QUALITY STATISTICS

VARIABLE	LABEL		N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE
MINENO=0250 SAMPPT=0057										
AK4	ALK AS CACO3, PH 4.5	MG_L	13	396.87	464.51	200.50	1933.60	128.83	5159.30	215769.28
CD	CADMIUM, DISSOLVED	UG_L	13	6.08	2.33	3.00	10.00	0.65	79.00	5.41
CA	CALCIUM, DISSOLVED	MG_L	13	20.50	34.59	6.30	135.00	9.59	266.50	1196.15
CL	CHLORIDE	MG_L	13	24.73	22.00	3.90	62.70	6.10	321.50	483.98
F	FLUORIDE	MG_L	13	1.04	1.22	0.10	4.00	0.34	13.53	1.50
FET	IRON, TOTAL	MG_L	12	10.56	16.59	0.43	59.70	4.79	126.71	275.33
PB	LEAD, DISSOLVED	UG_L	12	33.33	14.97	20.00	50.00	4.32	400.00	224.24
MG	MAGNESIUM, DISSOLVED	MG_L	13	6.95	17.48	0.40	65.00	4.85	90.30	305.52
MNT	MANGANESE, TOTAL	MG_L	12	0.37	0.50	0.03	1.85	0.14	4.40	0.25
N_3	NITRATE NITROGEN _N	MG_L	13	0.22	0.14	0.01	0.50	0.04	2.81	0.02
K	POTASSIUM, DISSOLVED	MG_L	13	5.01	2.31	2.20	9.10	0.64	65.10	5.33
SE	SELENIUM, DISSOLVED	UG_L	13	14.23	12.22	5.00	50.00	3.39	185.00	149.36
NA	SODIUM, DISSOLVED	MG_L	13	259.31	168.64	125.00	800.00	46.77	3371.00	28440.56
SD	SOLIDS, DISSOLVED	MG_L	13	864.38	319.44	626.00	1754.00	88.60	11237.00	102041.42
SO4	SULFATE	MG_L	12	274.33	100.86	143.00	514.00	29.12	3292.00	10172.24
MINENO=0250 SAMPPT=0058										
AK4	ALK AS CACO3, PH 4.5	MG_L	14	341.18	140.36	99.30	589.00	37.51	4776.50	19699.82
CD	CADMIUM, DISSOLVED	UG_L	14	5.71	2.49	2.00	10.00	0.67	80.00	6.22
CA	CALCIUM, DISSOLVED	MG_L	13	69.86	56.83	5.00	164.80	15.76	908.20	3230.19
CL	CHLORIDE	MG_L	14	10.98	2.81	5.80	15.70	0.75	153.70	7.89
F	FLUORIDE	MG_L	14	0.21	0.08	0.10	0.35	0.02	2.99	0.01
FET	IRON, TOTAL	MG_L	13	2.33	0.92	1.00	3.60	0.26	30.35	0.85
PB	LEAD, DISSOLVED	UG_L	12	34.17	18.32	20.00	70.00	5.29	410.00	335.61
MG	MAGNESIUM, DISSOLVED	MG_L	13	34.12	31.90	1.00	77.70	8.85	443.50	1017.59
MNT	MANGANESE, TOTAL	MG_L	13	0.23	0.10	0.12	0.50	0.03	3.03	0.01
N_3	NITRATE NITROGEN _N	MG_L	14	0.14	0.09	0.00	0.27	0.02	1.94	0.01
K	POTASSIUM, DISSOLVED	MG_L	14	6.73	3.24	2.10	12.00	0.87	94.20	10.51
SE	SELENIUM, DISSOLVED	UG_L	14	15.71	14.53	10.00	50.00	3.88	220.00	210.99
NA	SODIUM, DISSOLVED	MG_L	13	161.41	75.76	47.00	310.00	21.01	2098.30	5739.39
SD	SOLIDS, DISSOLVED	MG_L	14	960.71	332.39	129.00	1372.00	88.84	13450.00	110484.84
SO4	SULFATE	MG_L	13	338.62	227.31	40.00	729.00	63.04	4402.00	51670.42

PEABODY COAL COMPANY
ARIZONA DIVISION
WELL WATER QUALITY STATISTICS

VARIABLE	LABEL		N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE
MINENO=0250 SAMPPT=0059										
AK4	ALK AS CACO3, PH 4.5	MG_L	14	312.59	145.37	146.00	760.00	38.85	4376.20	21132.50
CD	CADMIUM, DISSOLVED	UG_L	14	6.57	2.17	5.00	10.00	0.58	92.00	4.73
CA	CALCIUM, DISSOLVED	MG_L	13	93.71	47.76	15.00	158.00	13.25	1218.20	2281.01
CL	CHLORIDE	MG_L	14	19.02	5.55	12.00	30.50	1.48	266.30	30.84
F	FLUORIDE	MG_L	14	0.91	1.89	0.10	7.30	0.51	12.80	3.58
FET	IRON, TOTAL	MG_L	13	27.13	65.45	0.62	243.30	18.15	352.66	4284.20
PB	LEAD, DISSOLVED	UG_L	12	49.17	35.54	20.00	110.00	10.26	590.00	1262.88
MG	MAGNESIUM, DISSOLVED	MG_L	13	52.06	27.97	9.00	84.00	7.76	676.80	782.09
MNT	MANGANESE, TOTAL	MG_L	13	0.83	1.07	0.21	3.71	0.30	10.83	1.16
N_3	NITRATE NITROGEN _N	MG_L	14	0.17	0.10	0.00	0.36	0.03	2.35	0.01
K	POTASSIUM, DISSOLVED	MG_L	14	9.02	2.79	4.80	14.50	0.74	126.30	7.76
SE	SELENIUM, DISSOLVED	UG_L	14	15.71	14.53	10.00	50.00	3.88	220.00	210.99
NA	SODIUM, DISSOLVED	MG_L	13	291.86	55.28	202.20	416.00	15.33	3794.20	3055.82
SD	SOLIDS, DISSOLVED	MG_L	12	1818.25	711.54	1067.00	3929.00	205.40	21819.00	506288.75
SO4	SULFATE	MG_L	14	821.00	236.73	448.00	1323.00	63.27	11494.00	56040.77
MINENO=0250 SAMPPT=0060										
AK4	ALK AS CACO3, PH 4.5	MG_L	12	644.93	129.88	510.00	884.00	37.49	7739.20	16868.13
CD	CADMIUM, DISSOLVED	UG_L	12	6.58	2.23	5.00	10.00	0.65	79.00	4.99
CA	CALCIUM, DISSOLVED	MG_L	12	17.41	9.76	1.00	39.00	2.82	208.90	95.34
CL	CHLORIDE	MG_L	12	27.42	8.65	16.00	41.20	2.50	329.00	74.85
F	FLUORIDE	MG_L	12	1.41	0.93	0.30	4.10	0.27	16.88	0.86
FET	IRON, TOTAL	MG_L	11	13.18	18.79	3.00	66.70	5.67	145.01	353.21
PB	LEAD, DISSOLVED	UG_L	12	38.33	19.92	20.00	70.00	5.75	460.00	396.97
MG	MAGNESIUM, DISSOLVED	MG_L	12	5.42	3.17	1.00	12.00	0.91	65.10	10.04
MNT	MANGANESE, TOTAL	MG_L	11	0.76	1.54	0.10	5.40	0.47	8.36	2.38
N_3	NITRATE NITROGEN _N	MG_L	12	0.11	0.09	0.00	0.20	0.02	1.36	0.01
K	POTASSIUM, DISSOLVED	MG_L	12	4.01	2.27	0.70	9.70	0.66	48.10	5.15
SE	SELENIUM, DISSOLVED	UG_L	12	18.33	15.86	10.00	50.00	4.58	220.00	251.52
NA	SODIUM, DISSOLVED	MG_L	12	538.50	156.14	288.00	790.00	45.07	6462.00	24381.00
SD	SOLIDS, DISSOLVED	MG_L	11	1816.73	824.20	702.00	3672.00	248.51	19984.00	679310.82
SO4	SULFATE	MG_L	12	597.17	188.22	290.00	870.00	54.33	7166.00	35425.24

PEABODY COAL COMPANY
ARIZONA DIVISION
WELL WATER QUALITY STATISTICS

VARIABLE	LABEL		N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE
MINENO=0252 SAMPPT=0063										
AK4	ALK AS CACO3, PH 4.5	MG_L	11	898.05	565.11	393.00	2132.00	170.39	9878.50	319350.62
CD	CADMIUM, DISSOLVED	UG_L	11	6.45	2.30	5.00	10.00	0.69	71.00	5.27
CA	CALCIUM, DISSOLVED	MG_L	11	13.50	4.34	2.00	19.00	1.31	148.50	18.82
CL	CHLORIDE	MG_L	11	30.41	14.54	19.90	65.60	4.38	334.50	211.34
F	FLUORIDE	MG_L	11	5.13	3.46	0.20	13.00	1.04	56.48	11.96
FET	IRON, TOTAL	MG_L	11	8.54	11.70	0.10	40.76	3.53	93.92	136.95
PB	LEAD, DISSOLVED	UG_L	11	30.00	13.42	20.00	50.00	4.05	330.00	180.00
MG	MAGNESIUM, DISSOLVED	MG_L	11	4.94	1.25	1.80	6.10	0.38	54.30	1.56
MNT	MANGANESE, TOTAL	MG_L	10	0.24	0.15	0.12	0.60	0.05	2.39	0.02
N_3	NITRATE NITROGEN _N	MG_L	11	0.16	0.07	0.02	0.26	0.02	1.77	0.00
K	POTASSIUM, DISSOLVED	MG_L	11	4.61	1.76	2.40	8.50	0.53	50.70	3.11
SE	SELENIUM, DISSOLVED	UG_L	11	13.64	12.06	10.00	50.00	3.64	150.00	145.45
NA	SODIUM, DISSOLVED	MG_L	11	397.15	231.97	186.00	849.00	69.94	4368.70	53808.68
SD	SOLIDS, DISSOLVED	MG_L	11	1112.82	741.33	279.00	2486.00	223.52	12241.00	549567.96
SO4	SULFATE	MG_L	11	23.64	26.42	1.00	88.00	7.97	260.00	697.85
MINENO=0252 SAMPPT=0064										
AK4	ALK AS CACO3, PH 4.5	MG_L	12	1134.92	161.40	763.50	1370.00	46.59	13619.00	26050.49
CD	CADMIUM, DISSOLVED	UG_L	12	6.58	2.35	5.00	10.00	0.68	79.00	5.54
CA	CALCIUM, DISSOLVED	MG_L	12	13.91	4.73	3.40	22.50	1.36	166.90	22.34
CL	CHLORIDE	MG_L	12	28.87	7.52	22.00	45.80	2.17	346.40	56.58
F	FLUORIDE	MG_L	12	5.68	2.66	0.20	8.70	0.77	68.15	7.09
FET	IRON, TOTAL	MG_L	12	12.67	20.85	0.10	73.00	6.02	152.08	434.56
PB	LEAD, DISSOLVED	UG_L	11	42.73	29.36	20.00	100.00	8.85	470.00	861.82
MG	MAGNESIUM, DISSOLVED	MG_L	12	4.74	1.42	1.50	6.90	0.41	56.90	2.02
MNT	MANGANESE, TOTAL	MG_L	12	0.44	0.39	0.12	1.52	0.11	5.24	0.15
N_3	NITRATE NITROGEN _N	MG_L	12	0.20	0.15	0.00	0.62	0.04	2.38	0.02
K	POTASSIUM, DISSOLVED	MG_L	12	6.98	4.30	3.40	16.40	1.24	83.80	18.51
SE	SELENIUM, DISSOLVED	UG_L	12	13.33	11.55	10.00	50.00	3.33	160.00	133.33
NA	SODIUM, DISSOLVED	MG_L	12	509.62	85.49	324.00	634.00	24.68	6115.50	7309.35
SD	SOLIDS, DISSOLVED	MG_L	12	1521.33	376.41	1130.00	2318.00	108.66	18256.00	141680.79
SO4	SULFATE	MG_L	12	36.42	51.66	2.00	192.00	14.91	437.00	2668.27

PEABODY COAL COMPANY
ARIZONA DIVISION
WELL WATER QUALITY STATISTICS

VARIABLE	LABEL		N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE
MINENO=0252 SAMPPT=0065										
AK4	ALK AS CACO3, PH 4.5	MG_L	13	1355.78	184.77	972.20	1650.00	51.25	17625.20	34139.94
CD	CADMIUM, DISSOLVED	UG_L	13	6.54	2.11	5.00	10.00	0.58	85.00	4.44
CA	CALCIUM, DISSOLVED	MG_L	13	17.72	6.31	3.00	30.00	1.75	230.40	39.80
CL	CHLORIDE	MG_L	13	17.95	7.93	1.00	35.10	2.20	233.40	62.81
F	FLUORIDE	MG_L	13	2.15	1.38	0.30	6.20	0.38	27.92	1.91
FET	IRON, TOTAL	MG_L	12	1.98	1.31	0.10	4.90	0.38	23.78	1.73
PB	LEAD, DISSOLVED	UG_L	12	43.33	25.35	20.00	80.00	7.32	520.00	642.42
MG	MAGNESIUM, DISSOLVED	MG_L	13	6.28	2.17	1.70	11.30	0.60	81.70	4.71
MNT	MANGANESE, TOTAL	MG_L	11	0.19	0.15	0.02	0.37	0.05	2.06	0.02
N_3	NITRATE NITROGEN _N	MG_L	12	0.17	0.11	0.01	0.45	0.03	2.09	0.01
K	POTASSIUM, DISSOLVED	MG_L	12	7.51	3.24	4.00	15.20	0.94	90.10	10.52
SE	SELENIUM, DISSOLVED	UG_L	13	16.15	15.02	10.00	50.00	4.17	210.00	225.64
NA	SODIUM, DISSOLVED	MG_L	13	612.45	75.90	470.50	720.00	21.05	7961.90	5761.36
SD	SOLIDS, DISSOLVED	MG_L	13	1809.85	479.76	1225.00	2636.00	133.06	23528.00	230170.64
SO4	SULFATE	MG_L	13	27.69	50.08	2.00	189.00	13.89	360.00	2508.23
MINENO=0252 SAMPPT=0066										
AK4	ALK AS CACO3, PH 4.5	MG_L	13	1093.85	204.85	771.00	1554.00	56.82	14220.00	41963.64
CD	CADMIUM, DISSOLVED	UG_L	13	10.38	6.87	5.00	23.00	1.91	135.00	47.26
CA	CALCIUM, DISSOLVED	MG_L	13	121.39	75.63	24.00	244.00	20.98	1578.10	5719.99
CL	CHLORIDE	MG_L	13	41.63	14.66	9.80	62.00	4.07	541.20	214.93
F	FLUORIDE	MG_L	13	1.04	0.47	0.30	2.10	0.13	13.49	0.22
FET	IRON, TOTAL	MG_L	12	3.20	2.99	0.10	9.90	0.86	38.43	8.94
PB	LEAD, DISSOLVED	UG_L	12	90.00	77.11	20.00	200.00	22.26	1080.00	5945.45
MG	MAGNESIUM, DISSOLVED	MG_L	13	79.14	38.76	7.00	132.00	10.75	1028.80	1502.69
MNT	MANGANESE, TOTAL	MG_L	11	0.12	0.07	0.02	0.24	0.02	1.29	0.00
N_3	NITRATE NITROGEN _N	MG_L	12	0.29	0.55	0.00	2.00	0.16	3.43	0.30
K	POTASSIUM, DISSOLVED	MG_L	13	12.66	2.98	8.00	18.00	0.83	164.60	8.85
SE	SELENIUM, DISSOLVED	UG_L	13	19.23	17.54	10.00	50.00	4.87	250.00	307.69
NA	SODIUM, DISSOLVED	MG_L	13	878.90	85.35	684.00	1004.00	23.67	11425.70	7284.51
SD	SOLIDS, DISSOLVED	MG_L	13	3564.15	697.89	1658.00	4196.00	193.56	46334.00	487044.14
SO4	SULFATE	MG_L	12	1686.58	241.57	1085.00	1974.00	69.74	20239.00	58358.27

PEABODY COAL COMPANY
ARIZONA DIVISION
WELL WATER QUALITY STATISTICS

VARIABLE	LABEL		N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE
MINENO=0252 SAMPPT=0067										
AK4	ALK AS CACO3, PH 4.5	MG_L	5	1046.30	267.24	616.00	1332.50	119.51	5231.50	71418.20
CD	CADMIUM, DISSOLVED	UG_L	5	6.60	3.21	3.00	10.00	1.44	33.00	10.30
CA	CALCIUM, DISSOLVED	MG_L	5	27.24	17.43	14.60	57.00	7.80	136.20	303.86
CL	CHLORIDE	MG_L	5	27.76	11.80	12.00	38.80	5.28	138.80	139.30
F	FLUORIDE	MG_L	5	2.24	1.61	0.69	4.46	0.72	11.20	2.59
FET	IRON, TOTAL	MG_L	3	31.44	44.56	4.65	82.88	25.73	94.33	1985.45
PB	LEAD, DISSOLVED	UG_L	5	60.00	36.74	20.00	120.00	16.43	300.00	1350.00
MG	MAGNESIUM, DISSOLVED	MG_L	5	6.68	2.90	3.70	10.80	1.30	33.40	8.39
MNT	MANGANESE, TOTAL	MG_L	3	0.43	0.46	0.14	0.96	0.27	1.29	0.21
N_3	NITRATE NITROGEN _N	MG_L	5	0.17	0.17	0.00	0.44	0.07	0.87	0.03
K	POTASSIUM, DISSOLVED	MG_L	5	8.04	3.04	4.60	12.40	1.36	40.20	9.27
SE	SELENIUM, DISSOLVED	UG_L	5	26.00	21.91	10.00	50.00	9.80	130.00	480.00
NA	SODIUM, DISSOLVED	MG_L	5	467.20	111.56	280.00	552.00	49.89	2336.00	12445.70
SD	SOLIDS, DISSOLVED	MG_L	4	1253.50	161.67	1012.00	1352.00	80.83	5014.00	26137.00
SO4	SULFATE	MG_L	4	43.50	34.11	8.00	90.00	17.06	174.00	1163.67
MINENO=0250 SAMPPT=0061										
AK4	ALK AS CACO3, PH 4.5	MG_L	12	429.24	70.13	236.00	505.00	20.24	5150.90	4917.54
CD	CADMIUM, DISSOLVED	UG_L	12	6.25	2.30	4.00	10.00	0.66	75.00	5.30
CA	CALCIUM, DISSOLVED	MG_L	12	4.96	2.24	2.00	10.20	0.65	59.50	5.02
CL	CHLORIDE	MG_L	12	13.62	5.27	5.90	22.70	1.52	163.50	27.82
F	FLUORIDE	MG_L	12	1.55	0.32	0.89	1.90	0.09	18.65	0.10
FET	IRON, TOTAL	MG_L	11	14.50	23.59	0.10	80.98	7.11	159.47	556.35
PB	LEAD, DISSOLVED	UG_L	12	34.17	16.21	20.00	60.00	4.68	410.00	262.88
MG	MAGNESIUM, DISSOLVED	MG_L	12	1.53	0.79	0.90	3.70	0.23	18.40	0.63
MNT	MANGANESE, TOTAL	MG_L	11	0.22	0.23	0.02	0.79	0.07	2.37	0.05
N_3	NITRATE NITROGEN _N	MG_L	12	0.20	0.09	0.10	0.40	0.03	2.46	0.01
K	POTASSIUM, DISSOLVED	MG_L	12	2.68	2.06	0.40	7.20	0.60	32.20	4.26
SE	SELENIUM, DISSOLVED	UG_L	12	16.67	15.57	10.00	50.00	4.49	200.00	242.42
NA	SODIUM, DISSOLVED	MG_L	12	211.94	23.95	184.00	274.00	6.91	2543.30	573.42
SD	SOLIDS, DISSOLVED	MG_L	12	722.08	294.92	500.00	1408.00	85.14	8665.00	86978.08
SO4	SULFATE	MG_L	12	37.33	38.85	10.00	157.00	11.22	448.00	1509.33

PEABODY COAL COMPANY
ARIZONA DIVISION
WELL WATER QUALITY STATISTICS

VARIABLE	LABEL		N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE
MINENO=0250 SAMPPT=0086										
AK4	ALK AS CACO3, PH 4.5	MG_L	13	1281.05	510.32	334.80	1810.00	141.54	16653.70	260427.13
CD	CADMIUM, DISSOLVED	UG_L	13	6.15	2.19	5.00	10.00	0.61	80.00	4.81
CA	CALCIUM, DISSOLVED	MG_L	13	11.45	5.14	4.80	22.90	1.43	148.80	26.45
CL	CHLORIDE	MG_L	13	44.23	26.83	4.90	103.00	7.44	575.00	719.78
F	FLUORIDE	MG_L	13	3.05	1.05	0.55	4.30	0.29	39.59	1.10
FET	IRON, TOTAL	MG_L	13	46.19	128.63	0.10	471.60	35.67	600.51	16544.96
PB	LEAD, DISSOLVED	UG_L	12	32.50	22.61	20.00	90.00	6.53	390.00	511.36
MG	MAGNESIUM, DISSOLVED	MG_L	13	4.28	1.34	2.00	6.00	0.37	55.70	1.80
MNT	MANGANESE, TOTAL	MG_L	13	1.47	3.63	0.21	13.50	1.01	19.13	13.16
N_3	NITRATE NITROGEN _N	MG_L	13	0.25	0.13	0.10	0.65	0.04	3.19	0.02
K	POTASSIUM, DISSOLVED	MG_L	13	4.22	2.24	1.90	10.40	0.62	54.90	5.04
SE	SELENIUM, DISSOLVED	UG_L	13	12.69	11.29	5.00	50.00	3.13	165.00	127.56
NA	SODIUM, DISSOLVED	MG_L	13	680.97	372.25	150.00	1150.00	103.24	8852.60	138572.21
SD	SOLIDS, DISSOLVED	MG_L	13	2403.92	1315.78	548.00	5664.00	364.93	31251.00	1731287.74
SO4	SULFATE	MG_L	12	363.83	323.78	40.00	1077.00	93.47	4366.00	104831.24
MINENO=0250 SAMPPT=0090										
AK4	ALK AS CACO3, PH 4.5	MG_L	13	1339.99	510.38	182.00	2030.00	141.55	17419.90	260487.64
CD	CADMIUM, DISSOLVED	UG_L	13	8.69	6.24	5.00	20.00	1.73	113.00	38.90
CA	CALCIUM, DISSOLVED	MG_L	13	30.98	15.54	6.00	54.60	4.31	402.70	241.52
CL	CHLORIDE	MG_L	13	36.83	14.80	9.80	59.30	4.11	478.80	219.18
F	FLUORIDE	MG_L	13	1.77	0.63	0.20	2.70	0.17	22.98	0.39
FET	IRON, TOTAL	MG_L	13	162.14	448.89	0.50	1650.00	124.50	2107.82	201503.23
PB	LEAD, DISSOLVED	UG_L	12	62.50	67.97	20.00	220.00	19.62	750.00	4620.45
MG	MAGNESIUM, DISSOLVED	MG_L	13	105.46	330.26	1.00	1204.00	91.60	1371.00	109071.54
MNT	MANGANESE, TOTAL	MG_L	13	1.55	1.28	0.05	4.74	0.36	20.10	1.65
N_3	NITRATE NITROGEN _N	MG_L	13	0.70	1.02	0.10	3.14	0.28	9.16	1.04
K	POTASSIUM, DISSOLVED	MG_L	13	9.88	10.53	3.00	44.00	2.92	128.50	110.90
SE	SELENIUM, DISSOLVED	UG_L	13	13.08	11.09	10.00	50.00	3.08	170.00	123.08
NA	SODIUM, DISSOLVED	MG_L	13	1260.52	518.63	150.00	2526.00	143.84	16386.80	268977.72
SD	SOLIDS, DISSOLVED	MG_L	12	4350.42	2174.00	576.00	10102.00	627.58	52205.00	4726282.81
SO4	SULFATE	MG_L	13	1470.92	975.07	165.00	4450.00	270.44	19122.00	950756.74

ATTACHMENT 11

Alluvial Monitoring Well Lithologic Logs

Alluvial Monitoring Wells
Black Mesa - Kayenta Mines
Peabody Coal Company
Navajo County, Arizona
SHB Job No. E80-77

Date & time started: 6-11-80, 8:30am
Date & time completed: 6-11-80, 12:30pm
Location:
Geomorphic location: Alluvial terrace
Alluvial thickness: At least 40'
Saturated thickness: 16'
Total depth of well: 36'6"
Water level at completion: 17'
Type of annular pack: Gravel pack, 25' to 15'

LOG OF BORING NO. 13
Rig type: CME-55
Boring type: 12" HSA
Elevation:

Casing

Type and size: 4" PVC
Total length: 38'
Perforated interval: 36' to 26' factory slot & Mirafi, 26' to 16' field slot & Mirafi

Depth	*USC	Description	Remarks
0-12'	SM	silty sand, predominantly fine, nonplastic to low plasticity, light brown note: moist clayey silt at 1' to 3'	slightly moist
12'-24'	GP	SAND & GRAVEL, some silt, predominantly fine sand, angular gravel, nonplastic, brown	slightly moist at 12' to 23'
24'-40'	SP	SILTY SAND, some gravel & clay, low plasticity, brown	saturated

*Unified Soil Classification

Stopped auger at 38'
Auger refused at

Alluvial Monitoring Wells
Black Mesa - Kayenta Mines
Peabody Coal Company
Navajo County, Arizona
SHB Job No. E80-77

Date & time started: 6-9-80, 3:15pm
Date & time completed: 6-9-80, 4:15pm
Location:
Geomorphic location: Flank of alluvial terrace
Alluvial thickness: At least 20'
Saturated thickness: At least 4'
Total depth of well: 16'6"
Water level at completion: 6'6"
Type of annular pack: Natural fill

LOG OF BORING NO. 17
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing
Type and size: 2" PVC
Total length: 17'6"
Perforated interval: 6'6" to 15'6"

Depth	*USC	Description	Remarks
0-5'	SM	silty sand, fine, nonplastic, light brown	slightly moist firm note: gravels at 5'
5'-20'	GW	sandy gravel, some silt, well graded, angular to subrounded, nonplastic, brown	moist firm very moist at 13' saturated at 16'

*Unified Soil Classification

Stopped auger at 20'
Auger refused at

Alluvial Monitoring Wells
Black Mesa - Kayenta Mines
Peabody Coal Company
Navajo County, Arizona
SHB Job No. E80-77

Date & time started: 6-10-80, 8:30am
Date & time completed: 6-10-80, 9:30am
Location:
Geomorphic location: Flank of alluvial channel
Alluvial thickness: At least 20'
Saturated thickness: At least 8'
Total depth of well: 19'
Water level at completion: 9'
Type of annular pack: Natural fill

LOG OF BORING NO. 19
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing
Type and size: 2" PVC
Total length: 20'
Perforated interval: 7' to 17'

Depth	*USC	Description	Remarks
0-5'	SM	silty sand, fine, nonplastic, tan	slightly moist firm
5'-20'	SM	silty sand, considerable gravel, well graded, angular to sub-rounded, nonplastic, light brown	moist firm very moist at 10' saturated at 12'

*Unified Soil Classification

Stopped auger at 20'
Auger refused at

Alluvial Monitoring Wells
Black Mesa - Kayenta Mines
Peabody Coal Company
Navajo County, Arizona
SHB Job No. E80-77

Date & time started: 5-29-80, 11:00am
Date & time completed: 5-29-80, 1:30pm
Location:
Geomorphic location: Flank of alluvial channel
Alluvial thickness: At least 40'
Saturated thickness: 6'
Total depth of well: 40'
Water level at completion: 35'
Type of annular pack: Natural backfill

LOG OF BORING NO. 23
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing
Type and size: 2" PVC
Total length: 41'
Perforated interval: 36' to 21'

Depth	*USC	Description	Remarks
0-13'	SP	sand, angular gravel, predominantly fine, gap graded, nonplastic, brown	moist
13'-15'	ML	clayey silt, considerable fine sand, medium plasticity, blackish-brown	very moist
15'-18'	GP	sand & gravel, predominantly fine sand, subrounded, nonplastic, olive gray	moist
18'-26'	SM	silty sand, some small angular coal gravel, nonplastic, gray to black	slightly moist
26'-34'	CL	clay, some fine sand & some gravel, medium to high plasticity, blackish-brown to grayish-black	very moist
34'-35'	CL	clay, considerable angular gravel	saturated at 34' to 35'

*Unified Soil Classification

Stopped auger at 40'
Auger refused at

Alluvial Monitoring Wells
Black Mesa - Kayenta Mines
Peabody Coal Company
Navajo County, Arizona
SHB Job No. E80-77

Date & time started: 5-30-80, 10:00am
Date & time completed: 5-30-80, 12:30pm
Location:
Geomorphic location: Alluvial terrace
Alluvial thickness: 30'
Saturated thickness: At least 1'6"
Total depth of well: 40'
Water level at completion: 38'6"
Type of annular pack: Natural fill

LOG OF BORING NO. 27
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing

Type and size: 2" PVC
Total length: 41'
Perforated interval: 32' to 39'

Depth	*USC	Description	Remarks
0-5'	CL	silty clay, trace of sand, low to medium plasticity, dark brown	moist
5'-26'	SM	silty sand, some clay, predominantly fine, subrounded, nonplastic, light brown	slightly moist note: considerable angular to subrounded gravels at 20'
26'-30'	SM	silty sand, considerable sandstone gravel, predominantly fine, subrounded to rounded, nonplastic, light greenish-brown	moist
30'-35'	SP	sand, predominantly fine, subrounded, some weakly cemented sandstone gravel, rounded, nonplastic, olive green	moist
35'-40'	SC	clayey sand, some silt & gravel, predominantly fine, rounded, low plasticity, gray	moist note: considerable rounded gravel at 36' (sandstone)

*Unified Soil Classification

Stopped auger at 40'
Auger refused at

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Alluvial Monitoring Wells
Black Mesa - Kayenta Mines
Peabody Coal Company
Navajo County, Arizona
SH Job No. E80-77

Date & time started: 6-10-80, 2:30pm
Date & time completed: 6-10-80, 5:00pm
Location:
Geomorphic location: Alluvial channel
Alluvial thickness: At least 15'
Saturated thickness: 5'
Total depth of well: 15'
Water level at completion: 4'
Type of annular pack: Natural fill

LOG OF BORING NO. 29
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing

Type and size: 2" PVC
Total length: 16'
Perforated interval: 7' to 14'

Depth	*USC	Description	Remarks
0-9'	SM	silty sand, considerable gravel, well graded, nonplastic, brown	moist firm very moist at 9'
9'-15'	CL	silty clay, some gravel, low plasticity, dark brown	saturated at 10'

*Unified Soil Classification

Stopped auger at 15'
Auger refused at

Alluvial Monitoring Wells
Black Mesa - Kayenta Mines
Peabody Coal Company
Navajo County, Arizona
SHB Job No. E80-77

Date & time started: 6-2-80, 2:00pm
Date & time completed: 6-2-80, 5:00pm
Location:
Geomorphic location: Alluvial terrace
Alluvial thickness: At least 50'
Saturated thickness: 0
Total depth of well: 50'
Water level at completion: none
Type of annular pack: Natural backfill

LOG OF BORING NO. 31
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing

Type and size: 2" PVC
Total length: 51'
Perforated interval: 49' to 44'

Depth	*USC	Description	Remarks
0-5'	CL	silty clay, considerable fine sand, medium plasticity, brown	moist
5'-30'	SM	silty sand, occasional gravel, subrounded to subangular, non-plastic to low plasticity, light brown	dry
30'-50'	GM	sand & gravel, fine sand, some silt, gap graded, nonplastic, medium brown	slightly moist

*Unified Soil Classification

Stopped auger at 50'
Auger refused at

Alluvial Monitoring Wells
Black Mesa - Kayenta Mines
Peabody Coal Company
Navajo County, Arizona
SB Job No. E80-77

Date & time started: 6-1-80, 11:00am
Date & time completed: 6-1-80, 12:15pm
Location:
Geomorphic location: Flank of alluvial channel
Alluvial thickness: 8'
Saturated thickness: 0
Total depth of well: 20'
Water level at completion: none
Type of annular pack: Native backfill

LOG OF BORING NO. 32
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing
Type and size: 2" PVC
Total length: 21'
Perforated interval: 5' to 10'

Depth	*USC	Description	Remarks
0-8'	GP	sand, predominantly fine, subrounded gravel, occasional cobbles & boulders, well graded, subangular, (predominantly tabular sandstone), nonplastic, brown	moist
8'-18'		shale, weathered, predominantly olive gray, with some dark brown layers, occurs as clay, medium plasticity	moist at 8' to 11' moderately hard slightly moist at 11' to 18'
18'-19½'		coal seam	slightly moist
19½'-20'		shale, moderately weathered, moderately hard, predominantly olive gray	slightly moist

*Unified Soil Classification

Stopped auger at 20'
Auger refused at

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Alluvial Monitoring Wells
Black Mesa - Kayenta Mines
Peabody Coal Company
Navajo County, Arizona
SHB Job No. E80-77

Date & time started: 5-30-80, 2:30pm
Date & time completed: 5-30-80, 4:00pm
Location:
Geomorphic location: Alluvial terrace
Alluvial thickness: At least 45'
Saturated thickness: 0
Total depth of well: 45'
Water level at completion: none
Type of annular pack: Natural backfill
note: desiccation cracks on surface

LOG OF BORING NO. 33
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing
Type and size: 2" PVC
Total length: 46'
Perforated interval: 20' to 40'

Depth	*USC	Description	Remarks
0-17'	CL	silty clay, occasional fine sand, medium plasticity, light brown	dry
17'-45'	CL	clay, some silt, medium plasticity, dark brown	moist

*Unified Soil Classification

Stopped auger at 45'
Auger refused at

Alluvial Monitoring Wells
Black Mesa - Kayenta Mines
Peabody Coal Company
Navajo County, Arizona
SHB Job No. E80-77

Date & time started: 6-3-80, 8:00am
Date & time completed: 6-3-80, 8:40am
Location:
Geomorphic location: Alluvial terrace
Alluvial thickness: At least 22'
Saturated thickness: At least 4'
Total depth of well: 22'
Water level at completion: 14'6"
Type of annular pack: Natural fill

LOG OF BORING NO. 68
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing
Type and size: 2" PVC
Total length: 23'
Perforated interval: 16' to 21'

Depth	*USC	Description	Remarks
0-5'	CL	silty clay, some sand, fine, medium plasticity, dark brown	moist soft
5'-13'	SM	silty sand, some clay, fine, nonplastic, light brown	slightly moist soft note: considerable subrounded gravel at 6½'
13'-20'	GW	sandy gravel, some silt & clay well graded, subangular to subrounded, nonplastic, brown	slightly moist firm
20'-22'	CL	sandy clay, some silt, considerable gravel, low plasticity, dark brown	very moist

*Unified Soil Classification

Stopped auger at 22'
Auger refused at

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Alluvial Monitoring Wells
Black Mesa - Kayenta Mines
Peabody Coal Company
Navajo County, Arizona
SHB Job No. E80-77

Date & time started: 6-11-80, 3:45pm
Date & time completed: 6-11-80, 4:30pm
Location:
Geomorphic location: Flank of alluvial channel
Alluvial thickness: At least 20'
Saturated thickness: At least 6'
Total depth of well: 20'
Water level at completion: 16'
Type of annular pack: Natural fill

LOG OF BORING NO. 69
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing
Type and size: 2" PVC
Total length: 21'
Perforated interval: 7' to 17'

Depth	*USC	Description	Remarks
0-20'	SM	silty sand, considerable medium, angular gravel, well graded, nonplastic, yellowish-tan	moist firm note: 2" angular gravels at 8'

*Unified Soil Classification

Stopped auger at 20'
Auger refused at

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Alluvial Monitoring Wells
Black Mesa - Kayenta Mines
Peabody Coal Company
Navajo County, Arizona
SB Job No. E80-77

Date & time started: 6-4-80, 8:00am
Date & time completed: 6-4-80, 9:45am
Location:
Geomorphic location: Alluvial terrace
Alluvial thickness: 30'
Saturated thickness: At least 6'
Total depth of well: 31'
Water level at completion: 22'6"
Type of annular pack: Natural fill

LOG OF BORING NO. 70
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing

Type and size: 2" PVC
Total length: 32'
Perforated interval: 21' to 27'

Depth	*USC	Description	Remarks
0-25'	CL	sandy clay, some silt, fine, low plasticity, light brown	slightly moist soft note: considerable gravel at 20'
25'-30'	CL	sandy clay, some silt, fine, medium plasticity, dark brown note: coal at 30' & hard rock at 31'	saturated at 25' to 31'

*Unified Soil Classification

Stopped auger at
Auger refused at 31'

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Alluvial Monitoring Wells
Black Mesa - Kayenta Mines
Peabody Coal Company
Navajo County, Arizona
SHB Job No. E80-77

Date & time started: 6-3-80, 3:15pm
Date & time completed: 6-3-80, 4:15pm
Location:
Geomorphic location: Alluvial terrace
Alluvial thickness: At least 30'
Saturated thickness: At least 10'
Total depth of well: 30'
Water level at completion: 26'
Type of annular pack: Natural fill

LOG OF BORING NO. 71
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing

Type and size: 2" PVC
Total length: 31'
Perforated interval: 19' to 29'

Depth	*USC	Description	Remarks
0-3'	CL	silty clay, some sand, fine, low plasticity, brown	moist soft
3'-9'	SM	silty sand, some clay, poorly graded, fine, nonplastic, light brown	slightly moist
9'-13'	CL	silty clay, some sand, fine, low plasticity, light brown	slightly moist
13'-19'	SM	silty sand, considerable gravel, well graded, angular to subrounded, nonplastic, light brown	slightly moist very moist at 18' saturated at 20'
19'-30'	SM	silty sand, some clay, fine, low plasticity, olive gray, note: more clay with depth	saturated

*Unified Soil Classification

Stopped auger at 30'
Auger refused at

Alluvial Monitoring Wells
Black Mesa - Kayenta Mines
Peabody Coal Company
Navajo County, Arizona
SB Job No. E80-77

Date & time started: 6-3-80, 1:45pm
Date & time completed: 6-3-80, 2:45pm
Location:
Geomorphic location: Alluvial terrace
Alluvial thickness: At least 25'
Saturated thickness: At least 11'
Total depth of well: 25'
Water level at completion: 15'
Type of annular pack: Natural fill

LOG OF BORING NO. 72
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing

Type and size: 2" PVC
Total length: 26'
Perforated interval: 14' to 24'

Depth	*USC	Description	Remarks
0-8'	CL	silty clay, some sand, fine, medium plasticity, dark brown	moist soft
8'-13'	SM	silty sand, some clay, trace of coarse sand, predominantly fine, nonplastic, light brown	slightly moist soft
13'-25'	CL	sandy clay, some silt, fine, low plasticity, dark brown	very moist at 13' to 14' saturated at 14' to 25'
		note: gravel at 23'	

*Unified Soil Classification

Stopped auger at 25'
Auger refused at

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Black Mesa - Kayenta Mines
Peabody Coal Company
Navajo County, Arizona
SHB Job No. E80-77

Date & time started: 6-3-80, 11:45am
Date & time completed: 6-3-80, 1:00pm
Location:
Geomorphic location: On top of top soil fill
Alluvial thickness: At least 45'
Saturated thickness: At least 10'
Total depth of well: 45'
Water level at completion: 28'
Type of annular pack: Natural fill

LOG OF BORING NO. 73
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing
Type and size: 2" PVC
Total length: 46'
Perforated interval: 27' to 42'

Depth	*USC	Description	Remarks
0-19'	CL	silty clay, some sand, medium plasticity, dark brown	moist soft note: slightly moist at 5' to 19', considerable gravel at 19'
19'-30'	CL	sandy clay, some silt, considerable gravel, angular, low plasticity, dark brown	slightly moist
30'-35'	CL	sandy clay, some silt, fine, medium plasticity, dark brown	very moist at 30' saturated at 35'
35'- 45'	CL	sandy clay, some silt, fine, medium plasticity, dark gray	saturated soft

*Unified Soil Classification

Stopped auger at 45'
Auger refused at

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Alluvial Monitoring Wells
Black Mesa - Kayenta Mines
Peabody Coal Company
Navajo County, Arizona
SB Job No. E80-77

Date & time started: 6-10-80, 10:15am
Date & time completed: 6-10-80, 12:15pm
Location:
Geomorphic location: Alluvial terrace
Alluvial thickness: 31'
Saturated thickness: 14'6"
Total depth of well: 28'6"
Water level at completion: 16'6"
Type of annular pack: Natural backfill

LOG OF BORING NO. 74
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing

Type and size: 2" PVC
Total length: 29'6"
Perforated interval: 22' to 10'
Note: auger refused at 16', moved 50 yards closer to wash

Depth	*USC	Description	Remarks
0-14'	SM	silty sand, predominantly very fine, occasional clay, nonplastic to low plasticity, light brown note: brown at 10' to 14'	slightly moist at 0 to 9' moist at 9' to 10' very moist at 10' to 11' saturated at 11' to 14'
14'-23'	SM	silty sand, some gravel, occasional clay, nonplastic to low plasticity, brown	very saturated no returns
23'-25'		boulder, hard	saturated no returns
25'-31'	SM	silty sand, considerable gravel and/or cobbles, nonplastic, brown	very saturated to saturated

*Unified Soil Classification

Stopped auger at
Auger refused at 31'

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Alluvial Monitoring Wells
Black Mesa - Kayenta Mines
Peabody Coal Company
Navajo County, Arizona
SHB Job No. E80-77

Date & time started: 6-10-80, 12:30pm
Date & time completed: 6-10-80, 7:30pm
Location:
Geomorphic location: Alluvial terrace
Alluvial thickness: 30'
Saturated thickness: 22'
Total depth of well: 28'
Water level at completion: 7'
Type of annular pack: Gravel pack, 14' to 4'

LOG OF BORING NO. 75
Rig type: CME-55
Boring type: 12" HSA
Elevation:

Casing

Type and size: 4" PVC
Total length: 29'6"
Perforated interval: 28' to 18' factory slots, 18' to 8' field slots & Mirafi

Depth	*USC	Description	Remarks
0-8'	SM	silty sand, occasional clay predominantly very fine, nonplastic to low plasticity, light brown	dry at 0 to 1' moist at 1' to 3' dry at 3' to 8'
8'-23'	SM	silty sand, some clay & occasional angular gravel, predominantly very fine, low plasticity, brown	saturated at 8' to 23' no returns at 12' to 23'
23'-30'	SM	silty sand, some gravel & cobbles, occasional clay, predominantly very fine, nonplastic to low plasticity, brown	saturated hard

*Unified Soil Classification

Stopped auger at
Auger refused at 30'

Alluvial Monitoring Wells
Black Mesa - Kayenta Mines
Peabody Coal Company
Navajo County, Arizona
SHB Job No. E80-77

Date & time started: 6-9-80, 12:45pm
Date & time completed: 6-9-80, 1:45pm
Location:
Geomorphic location: Alluvial terrace
Alluvial thickness: At least 50'
Saturated thickness: At least 5'
Total depth of well: 50'
Water level at completion: 45'
Type of annular pack: Natural fill

LOG OF BORING NO. 76
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing

Type and size: 2" PVC
Total length: 51'
Perforated interval: 44' to 49'

Depth	*USC	Description	Remarks
0-4'	SM	silty sand, some clay, predominantly fine, nonplastic, grayish-brown	slightly moist firm
4'-45'	SM	silty sand, some clay, occasional gravel, fine, nonplastic, light brown	slightly moist firm note: considerable subrounded gravel at 40'
45'-50'	SC	clayey sand, some silt, fine, low plasticity, dark brown	moist firm

*Unified Soil Classification

Stopped auger at 50'
Auger refused at

Alluvial Monitoring Wells
Black Mesa - Kayenta Mines
Peabody Coal Company
Navajo County, Arizona
SHB Job No. E80-77

Date & time started: 6-13-80, 1:30pm
Date & time completed: 6-13-80, 5:00pm
Location:
Geomorphic location: Flank of alluvial terrace
Alluvial thickness: At least 43'
Saturated thickness: 10'
Total depth of well: 42'
Water level at completion: 38'
Type of annular pack: Gravel pack, 27' to 21'

LOG OF BORING NO. 77
Rig type: CME-55
Boring type: 12" HSA
Elevation:

Casing
Type and size: 4" PVC
Total length: 43'6"
Perforated interval: 42' to 32'

Depth	*USC	Description	Remarks
0-8'	SM	silty sand, predominantly fine, subrounded, nonplastic to low plasticity, light brown	dry
8'-33'	GM	silty sand & gravel, small cobbles, predominantly fine sand, well graded gravel, subangular to rounded, nonplastic, brown	slightly moist at 8' to 20' moist at 20' to 33'
33'-43'	GM	silty sand & gravel, considerable clay, brown	saturated

*Unified Soil Classification

Stopped auger at 43'
Auger refused at

Alluvial Monitoring Wells
Black Mesa - Kayenta Mines
Peabody Coal Company
Navajo County, Arizona
SHB Job No. E80-77

Date & time started: 6-13-80, 9:00am
Date & time completed: 6-13-80, 12:00pm
Location:
Geomorphic location: Flank below alluvial terrace
Alluvial thickness: At least 38'
Saturated thickness: At least 26'
Total depth of well: 37'6"
Water level at completion: 27'6"
Type of annular pack: Collapse

LOG OF BORING NO. 79
Rig type: CME-55
Boring type: 12" HSA
Elevation:

Casing
Type and size: 4" PVC
Total length: 39'
Perforated interval: 37'6" to 27'6"

Depth	*USC	Description	Remarks
0-12'	SM	silty sand, predominantly fine subrounded, nonplastic, brown note: some gravel at 6' to 12'	moist
12'-20'	GM	silty sand, considerable clay & gravel, rounded to subangular, low plasticity, brown	saturated
20'-22'	CL	silty clay, medium plasticity, dark gray	very moist saturated
22'-38'	GM	silty sand, considerable gravel, nonplastic, brown	saturated no returns

*Unified Soil Classification

Stopped auger at 38'
Auger refused at

Alluvial Monitoring Wells
Black Mesa - Kayenta Mines
Peabody Coal Company
Navajo County, Arizona
SHB Job No. E80-77

Date & time started: 6-9-80, 9:45am
Date & time completed: 6-9-80, 10:45am
Location:
Geomorphic location: Flank of alluvial channel
Alluvial thickness: 20'
Saturated thickness: At least 8'
Total depth of well: 20'
Water level at completion: 11'
Type of annular pack: Natural fill

LOG OF BORING NO. 80
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing
Type and size: 2" PVC
Total length: 22'
Perforated interval: 14' to 19'

Depth	*USC	Description	Remarks
0-20'	SM	silty sand, considerable gravel, well graded, angular to subrounded, nonplastic, brown note: coal at 20', flaky, black	moist firm note: considerable well graded gravel at 10' up to 3" in size saturated at 12'

*Unified Soil Classification

Stopped auger at 20'
Auger refused at

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Alluvial Monitoring Wells
Black Mesa - Kayenta Mines
Peabody Coal Company
Navajo County, Arizona
HB Job No. E80-77

Date & time started: 6-4-80, 10:30am
Date & time completed: 6-4-80, 12:45pm
Location:
Geomorphic location: Flank of alluvial channel
Alluvial thickness: At least 20'
Saturated thickness: At least 11'
Total depth of well: 20'
Water level at completion: 12'6"
Type of annular pack: Natural fill

LOG OF BORING NO. 81
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing
Type and size: 2" PVC
Total length: 21'
Perforated interval: 13' to 19'

Depth	*USC	Description	Remarks
0-5'	SM	silty sand, some clay, fine, uniform, nonplastic, brown	slightly moist soft
5'-20'	SM	silty sand, some clay, fine, uniform, low plasticity, dark brown	very moist soft saturated at 9'

*Unified Soil Classification

Stopped auger at 20'
Auger refused at

Alluvial Monitoring Wells
Black Mesa - Kayenta Mines
Peabody Coal Company
Navajo County, Arizona
SHB Job No. E80-77

Date & time started: 6-9-80, 3:00pm
Date & time completed: 6-9-80, 4:30pm
Location:
Geomorphic location: Short alluvial terrace
Alluvial thickness: 16'6"
Saturated thickness: 6'6"
Total depth of well: 16'
Water level at completion: 11'3"
Type of annular pack: Natural backfill

LOG OF BORING NO. 82
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing
Type and size: 2" PVC
Total length: 17'
Perforated interval: 14' to 7'

Depth	*USC	Description	Remarks
0-10'	GM	silty sand & gravel, predominantly fine, gap graded, subangular to subrounded, nonplastic, brown	moist
10'-15'	SM	silty sand, considerable clay, some subangular gravel, predominantly fine, nonplastic to low plasticity, brown	saturated
15'-16½'	ML	clayey silt, considerable fine sand, low to medium plasticity, dark brown	saturated

*Unified Soil Classification

Stopped auger at
Auger refused at 16'6"

Alluvial Monitoring Wells
Black Mesa - Kayenta Mines
Peabody Coal Company
Navajo County, Arizona
3 Job No. E80-77

Date & time started: 6-11-80, 2:00pm
Date & time completed: 6-11-80, 4:00pm
Location:
Geomorphic location: Alluvial bar
Alluvial thickness: 13'6"
Saturated thickness: 5'6"
Total depth of well: 13'6"
Water level at completion: 2'
Type of annular pack: Collapse, 13'6" to 4', Gravel, 4' to 2'

LOG OF BORING NO. 83
Rig type: CME-55
Boring type: 12" HSA
Elevation:

Casing

Type and size: 4" PVC
Total length: 15'
Perforated interval: 15'6" to 5'6" factory slots & Mirafi

Depth	*USC	Description	Remarks
0-8'	SM	silty sand & gravel, predominantly fine silty sand, subangular gravel, gap graded, nonplastic, light brown	moist
8'-11'	SM	silty sand, considerable clay, some subangular gravel, low plasticity, light brown	saturated
11'-13½'	ML	silty clay, considerable sand & subangular gravel, medium plasticity,	moist

*Unified Soil Classification

Stopped auger at
Auger refused at 13'6"

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Alluvial Monitoring Wells
Black Mesa - Kayenta Mines
Peabody Coal Company
Navajo County, Arizona
SHB Job No. E80-77

Date & time started: 6-15-80, 1:30pm
Date & time completed: 6-15-80, 4:30pm
Location:
Geomorphic location: Alluvial terrace
Alluvial thickness: 22'6"
Saturated thickness: 6'
Total depth of well: 22'6"
Water level at completion: 21'
Type of annular pack: Gravel, 13' to 7'

LOG OF BORING NO. 84
Rig type: CME-55
Boring type: 12" HSA
Elevation:

Casing

Type and size: 4" PVC
Total length: 24'
Perforated interval: 22'6" to 12'6" factory slot & Mirafi

Depth	*USC	Description	Remarks
0-15'	SM	silty sand, some clay, non-plastic to low plasticity, light brown	slightly moist
15'-17'	GM	silty sand & gravel, gap graded, subangular to rounded, brown	moist
17'-23'	GC	clayey sand & gravel, low plasticity, brown	saturated

*Unified Soil Classification

Stopped auger at
Auger refused at 23'

Alluvial Monitoring Wells
Black Mesa - Kayenta Mines
Peabody Coal Company
Navajo County, Arizona
SHB Job No. E80-77

Date & time started: 5-29-80, 11:00am
Date & time completed: 5-29-80, 3:00pm
Location:
Geomorphic location: Alluvial channel
Alluvial thickness: At least 40'
Saturated thickness: 19'
Total depth of well: 39'
Water level at completion: 24'
Type of annular pack: Natural backfill

LOG OF BORING NO. 87
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing

Type and size: 2" PVC
Total length: 40'
Perforated interval: 35' to 25'

Depth	*USC	Description	Remarks
0-12'	SP	sand, predominantly fine, considerable angular gravel, gap graded, nonplastic, brown	moist
12'-20'	SM	silty sand, predominantly very fine, low plasticity, blackish-brown	very moist
20'-40'	SM	silty sand, predominantly very fine, nonplastic, brown	saturated
		note: no returns at 20' to 38'	

*Unified Soil Classification

Stopped auger at 39'6"
Auger refused at

Alluvial Monitoring Wells
Black Mesa - Kayenta Mines
Peabody Coal Company
Navajo County, Arizona
SHB Job No. E80-77

Date & time started: 6-12-80, 8:30am
Date & time completed: 6-12-80, 4:45pm
Location:
Geomorphic location: Alluvial bar
Alluvial thickness: At least 40'
Saturated thickness: At least 31'
Total depth of well: 40'
Water level at completion: 15'
Type of annular pack: Gravel pack, 17' to 8'

LOG OF BORING NO. 88
Rig type: CME-55
Boring type: 12" HSA
Elevation:

Casing

Type and size: 4" PVC
Total length: 41'
Perforated interval: 40' to 24' factory slots & Mirafi, 24' to 14' mill and saw slots

Depth	*USC	Description	Remarks
0-9'	GW	sand & gravel, some silt, predominantly fine sand, well graded, subangular, nonplastic, brown	moist
9'-25'	GM	gravel, occasional silt & sand, well graded, subangular to flat, nonplastic, brown	saturated
25'-40'	GM	silty sand & gravel, predominantly fine silty sand, gap graded, subangular, nonplastic, brown	very saturated

*Unified Soil Classification

Stopped auger at 40'
Auger refused at

Alluvial Monitoring Wells
Black Mesa - Kayenta Mines
Peabody Coal Company
Navajo County, Arizona
Job No. E80-77

Date & time started: 5-29-80, 4:15pm
Date & time completed: 5-29-80, 5:15pm
Location:
Geomorphic location: Alluvial channel
Alluvial thickness: At least 25'
Saturated thickness: At least 9'
Total depth of well: 25'
Water level at completion: 18'
Type of annular pack: Natural fill

LOG OF BORING NO. 89
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing

Type and size: 2" PVC
Total length: 26'
Perforated interval: 13' to 23'

Depth	*USC	Description	Remarks
0-12'	SM	silty sand, considerable gravel, predominantly fine, subrounded to rounded, nonplastic, dark brown	moist
12'-18'	SM	silty sand, some gravel, predominantly fine, angular, nonplastic, light-brown	very moist
18'-24'	SM	silty sand, some clay, poorly graded, nonplastic, tan	saturated at 16' note: considerable gravel at 22½' (no cuttings)
24'-25'	CL	sandy clay, trace of gravel, subrounded to rounded, medium plasticity, dark gray	note: 2" piece of sandstone at 25'

*Unified Soil Classification

Stopped auger at 25'
Auger refused at

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Peabody Coal Company
Navajo County, Arizona
SHB Job No. E80-77

Date & time started: 6-4-80, 9:15am
Date & time completed: 6-4-80, 1:15pm
Location:
Geomorphic location: Alluvial terrace
Alluvial thickness: At least 45'
Saturated thickness: 15'
Total depth of well: 43'
Water level at completion: 29'
Type of annular pack: Natural backfill

LOG OF BORING NO. 93
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing

Type and size: 2" PVC
Total length: 44'
Perforated interval: 40' to 28'

Depth	*USC	Description	Remarks
0-4'	SM	silty sand, predominantly fine, subrounded, nonplastic, brown	dry at 0-1' moist at 1' to 4'
4'-17'	CL	silty clay, some fine sand, medium plasticity, tan	dry
17'-30'	GM	silty sand & gravel, predominantly fine silty sand, gravel is predominantly sandstone & subangular, nonplastic to low plasticity, light brown	slightly moist at 17' to 25' moist at 25' to 29' very moist at 29' to 30'
30'-45'	SM	silty sand, some clay & occasional gravel, low plasticity, brown	saturated

*Unified Soil Classification

Stopped auger at 45'
Auger refused at

Alluvial Monitoring Wells
Black Mesa - Kayenta Mines
Peabody Coal Company
Navajo County, Arizona
SHB Job No. E80-77

Date & time started: 6-11-80, 10:00am
Date & time completed: 6-11-80, 1:30pm
Location:
Geomorphic location: Flank of alluvial channel
Alluvial thickness: At least 20'
Saturated thickness: At least 4'
Total depth of well: 19'
Water level at completion: 16'
Type of annular pack: Natural fill

LOG OF BORING NO. 94
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing
Type and size: 2" PVC
Total length: 20'
Perforated interval: 9' to 16'

Depth	*USC	Description	Remarks
0-20'	SM	silty sand, considerable medium, angular gravel, well graded, nonplastic, light brown	moist firm note: clean sand seam at 4' to 8' very moist at 13' saturated at 19'

*Unified Soil Classification

Stopped auger at 20'
Auger refused at

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SHB Job No. E80-77

Date & time started: 6-16-80, 9:00am
Date & time completed: 6-16-80, 12:00pm
Location:
Geomorphic location: Alluvial bar
Alluvial thickness: At least 33'
Saturated thickness: 23'
Total depth of well: 31'
Water level at completion: 2'
Type of annular pack: Collapse

LOG OF BORING NO. 95
Rig type: CME-55
Boring type: 12" HSA
Elevation:

Casing

Type and size: 4" PVC
Total length: 32'6"
Perforated interval: 31' to 21'
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Depth	*USC	Description	Remarks
0-4'	SW	sand & gravel, predominantly fine sand, tabular gravel, well graded, some silt, subangular to subrounded, non-plastic, brown	moist
4'-33'	GC	sand & gravel, considerable silt & clay, gap graded, subrounded to subangular, low plasticity, brown	very moist at 4' to 10' saturated at 10' to 33'

*Unified Soil Classification

Stopped auger at 33'
Auger refused at

Alluvial Monitoring Wells
Black Mesa - Kayenta Mines
Peabody Coal Company
Navajo County, Arizona
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Date & time started: 6-11-80, 1:30pm
Date & time completed: 6-16-80, 3:45pm
Location:
Geomorphic location: Flank of alluvial channel
Alluvial thickness: At least 16'6"
Saturated thickness: 13'6"
Total depth of well: 16'6"
Water level at completion: 8'
Type of annular pack: Natural backfill

LOG OF BORING NO. 96
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing
Type and size: 2" PVC
Total length: 17'6"
Perforated interval: 12'6" to 2'6"

Depth	*USC	Description	Remarks
0-16½'	SM	silty sand, considerable medium, angular to subrounded gravel, well graded, nonplastic, brown	moist at 0-2' very moist at 2' to 3' saturated at 3' to 16½'

*Unified Soil Classification

Stopped auger at 16'6"
Auger refused at

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Date & time started: 5-29-80, 10:30am
Date & time completed: 5-29-80, 1:30pm
Location:
Geomorphic location: Alluvial terrace
Alluvial thickness: At least 22'6"
Saturated thickness: 1'6"
Total depth of well: 22'6"
Water level at completion: 20'6"
Type of annular pack: Natural backfill

LOG OF BORING NO. 98
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing

Type and size: 2" PVC
Total length: 23'6"
Perforated interval: 12'6" to 21'6"

Depth	*USC	Description	Remarks
0-14'	SM	silty sand, predominantly fine, occasional angular gravel, nonplastic, light brown	slightly moist
14'-21'	CL	silty clay, occasional fine sand & angular gravel, medium plasticity, dark brown	very moist
21'-22½'	CH	clay, occasional silt, medium to high plasticity, dark grayish-brown	saturated

*Unified Soil Classification

Stopped auger at
Auger refused at 22'6"

Alluvial Monitoring Wells
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Navajo County, Arizona
SHB Job No. E80-77

Date & time started: 6-1-80, 9:40am
Date & time completed: 6-1-80, 11:20am
Location:
Geomorphic location: Alluvial terrace
Alluvial thickness: At least 26'
Saturated thickness: 8'
Total depth of well: 26'
Water level at completion: 14'2"
Type of annular pack: Natural fill

LOG OF BORING NO. 99
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing

Type and size: 2" PVC
Total length: 27'
Perforated interval: 17' to 25'

Depth	*USC	Description	Remarks
0-4'	SM	silty sand, some clay, poorly, graded, nonplastic, light brown	moist
4'-8'	CL	sandy clay, some silt, low to medium plasticity, dark brown	moist
8'-13'	SC	clayey sand, some silt & gravel, subrounded, low plasticity, light brown	slightly moist
13'-14'	CL	sandy clay, some silt, trace of gravel, subrounded, low to medium plasticity, dark brown	moist
14'-15'	GP	coal gravel lenses, black	moist to very moist
15'-17'	CL	sandy clay, considerable gravel, some silt, subrounded, low to medium plasticity, brown	moist
17'-26'	CL	silty clay, some sand, fine, low to medium plasticity, gray	moist saturated at 18'
		note: hard rock at 23'; gray sandstone	

*Unified Soil Classification

Stopped auger at 26'
Auger refused at

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Navajo County, Arizona
SHB Job No. E80-77

Date & time started: 5-31-80, 3:30pm
Date & time completed: 5-31-80, 5:15pm
Location:
Geomorphic location: Alluvial terrace
Alluvial thickness: At least 35'
Saturated thickness: 8'
Total depth of well: 35'
Water level at completion: 27'
Type of annular pack: Natural fill

LOG OF BORING NO. 100
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing

Type and size: 2" PVC
Total length: 36'
Perforated interval: 23' to 33'

Depth	*USC	Description	Remarks
0-5'	CL	silty clay, some sand, fine, low to medium plasticity, dark brown	moist
5'-15'	CL	sandy clay, some silt, fine, low to medium plasticity, light brown	slightly moist note: cobble at 10'
15'-20'	SC	clayey sand, some silt & gravel, poorly graded, subrounded, low to medium plasticity, dark brown	slightly moist note: subrounded gravel at 18' to 20'
20'-24'	SM	silty sand, some clay & gravel, predominantly fine, low plasticity, dark brown	slightly moist
24'-25'	CL	silty clay, some sand, fine, low to medium plasticity, dark brown	moist

Alluvial Monitoring Wells
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Date & time started: 5-31-80, 3:30pm
Date & time completed: 5-31-80, 5:15pm
Location:
Geomorphic location: Alluvial terrace
Alluvial thickness: At least 35'
Saturated thickness: 8'
Total depth of well: 35'
Water level at completion: 27'
Type of annular pack: Natural fill

LOG OF BORING NO. 100
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing

Type and size: 2" PVC
Total length: 36'
Perforated interval: 23' to 33'

Depth	*USC	Description	Remarks
25'-35'	CL	sandy clay, some silt, fine, low plasticity, brown	moist at 25' to 29' very moist at 29' to 31' saturated at 31' to 35'
		note: gray layered claystone & sandstone at 35'	

*Unified Soil Classification

Stopped auger at
Auger refused at 35'

Alluvial Monitoring Wells
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Navajo County, Arizona
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LOG OF BORING NO. 101

Date & time started: 5-30-80, 2:30pm
Date & time completed: 5-30-80, 4:30pm
Location:
Geomorphic location: Alluvial terrace
Alluvial thickness: At least 27'
Saturated thickness: 11'
Total depth of well: 27'
Water level at completion: 11½'
Type of annular pack: Natural fill

Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing

Type and size: 2" PVC
Total length: 27'
Perforated interval: 10' to 25'

Depth	*USC	Description	Remarks
0-4½'	CL	silty clay, some sand, low to medium plasticity, dark brown	moist
4½'-10'	CL	silty clay, some sand & gravel, low plasticity, light brown	slightly moist note: gravel at 13'
10'-13'	CL	silty clay, considerable sand, some gravel, angular, low to medium plasticity, dark brown	moist
13'-15'	CL	sandy, silty clay, some gravel, angular, low to medium plasticity, brown	very moist saturated at 15'
15'-23'	CL	sandy, silty clay, some gravel, low to medium plasticity, dark brown	saturated
23'-26½'	CL	silty clay, some sand & gravel, subrounded, medium plasticity, black	saturated

Alluvial Monitoring Wells
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Date & time started: 5-30-80, 2:30pm
Date & time completed: 5-30-80, 4:30pm
Location:
Geomorphic location: Alluvial terrace
Alluvial thickness: At least 27'
Saturated thickness: 11'
Total depth of well: 27'
Water level at completion: 11½'
Type of annular pack: Natural fill

LOG OF BORING NO. 101
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing

Type and size: 2" PVC
Total length: 27'
Perforated interval: 10' to 25'

Depth	*USC	Description	Remarks
26½'-27'	CL	silty clay, some sand, low to medium plasticity, gray note: 2" thick piece of sandstone in sampler at 27'	saturated

*Unified Soil Classification

2' blank
15' slotted
10' blank

Stopped auger at
Auger refused at 27'

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SHB Job No. E80-77

Date & time started: 6-2-80, 9:30am
Date & time completed: 6-2-80, 3:15pm
Location:
Geomorphic location: Alluvial bar
Alluvial thickness: At least 40'
Saturated thickness: 25'
Total depth of well: 39'6"
Water level at completion: 21
Type of annular pack: Natural backfill

LOG OF BORING NO. 102
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing

Type and size: 2" PVC
Total length: 40'6"
Perforated interval: 35' to 15'

Depth	*USC	Description	Remarks
0-15'	GM	silty sand & gravel, predominantly fine sand, subrounded, nonplastic, brown	slightly moist at 0-5' moist at 5' to 15'
15'-35'	SM	silty sand, predominantly fine, nonplastic, brown	saturated
35'-40'	SM	silty sand, considerable clay, low plasticity, brown	saturated

*Unified Soil Classification

Stopped auger at
Auger refused at 40'

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Date & time started: 6-3-80, 4:00pm
Date & time completed: 6-3-80, 5:15pm
Location:
Geomorphic location: Alluvial bar
Alluvial thickness: 21'
Saturated thickness: 10' at 11' to 21'
Total depth of well: 25'
Water level at completion: 20'
Type of annular pack: Natural backfill

LOG OF BORING NO. 103
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing

Type and size: 2" PVC
Total length: 26'
Perforated interval: 21' to 11'

Depth	*USC	Description	Remarks
0-11'	GM	silty sand & gravel, predominantly very fine silty sand, well graded, subangular to subrounded, brown	dry at 0-1' moist at 1' to 7' very moist at 7' to 11'
11'-13'	SC	clayey sand, some gravel, low to medium plasticity grayish-brown	saturated
13'-15'	CL	silty clay, some very fine sand & gravel, subangular to subrounded, medium plasticity, brown	saturated
15'-20'	SC	clayey sand - no returns	very saturated
20'-21'		claystone, gray	moist very firm
21'-25'		sandstone, light brown	slightly moist hard

*Unified Soil Classification

Stopped auger at
Auger refused at 25'

Alluvial Monitoring Wells
Black Mesa - Kayenta Mines
Peabody Coal Company
Navajo County, Arizona
SHB Job No. E80-77

Date & time started: 6-2-80, 3:40pm
Date & time completed: 6-2-80, 5:30pm
Location:
Geomorphic location: Flank of alluvial channel
Alluvial thickness: At least 35'
Saturated thickness: At least 6'
Total depth of well: 39'
Water level at completion: 19'
Type of annular pack: Natural fill

LOG OF BORING NO. 104
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing
Type and size: 2" PVC
Total length: 40'
Perforated interval: 17' to 32'

Depth	*USC	Description	Remarks
0-7'	SM	sand, considerable gravel, some silt, well graded, subrounded, nonplastic, light brown	moist soft
7'-13'	SM	sand, considerable gravel, some silt & clay, well graded, subrounded, nonplastic, greenish-brown	moist soft
13'-20'	SM	silty sand, some gravel, predominantly fine, subrounded, nonplastic, grayish-brown	moist soft
20'-29'	CL	silty, sandy clay, considerable gravel, well graded, low plasticity, reddish-brown	moist soft note: increase in moisture at 25', firm at 28' to 29'
29'-35'	CL	sandy clay, some silt, fine, low to medium plasticity, gray note: black at 30' to 35'	saturated firm

*Unified Soil Classification

Stopped auger at 35'
Auger refused at

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Navajo County, Arizona
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Date & time started: 6-2-80, 8:45am
Date & time completed: 6-2-80, 12:15pm
Location:
Geomorphic location: Alluvial channel
Alluvial thickness: At least 25'
Saturated thickness: 5' at 15' to 20'
Total depth of well: 25'
Water level at completion: none
Type of annular pack: Natural fill

LOG OF BORING NO. 105
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing

Type and size: 2" PVC
Total length: 26'
Perforated interval: 18' to 25'
Note: first boring refused at 15', second boring refused at 7'

Depth	*USC	Description	Remarks
0-8'	SM	silty sand, considerable gravel, well graded, subangular to subrounded, nonplastic, light brown note: 4" gray sandstone pieces at 9'	moist firm
8'-10'	SM	silty sand, considerable gravel, some clay, subangular to subrounded, well graded, low plasticity, dark brown	moist firm
10'-25'	CL	silty clay, considerable gravel, some sand, subangular to subrounded, medium plasticity, olive gray to gray note: large pieces of sandstone at 15'	very moist firm very saturated at 15' to 20' slightly moist at 20' to 25'

*Unified Soil Classification

Stopped auger at 25'
Auger refused at 25'

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Date & time started: 6-2-80, 1:20pm
Date & time completed: 6-2-80, 2:45pm
Location:
Geomorphic location: Alluvial terrace
Alluvial thickness: At least 20'
Saturated thickness: 3'
Total depth of well: 20'
Water level at completion: 4'6"
Type of annular pack: Natural fill

LOG OF BORING NO. 106
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing

Type and size: 2" PVC
Total length: 21'
Perforated interval: 8' to 18'

Depth	*USC	Description	Remarks
0-5'	SM	silty sand, considerable gravel, well graded, angular to subangular, nonplastic, brown	moist soft
5'-12'	SM	silty sand, considerable gravel, some clay, well graded, angular to subrounded, nonplastic, dark brown	moist soft note: very moist at 10'
12'-17'	CL	silty clay, some sand, trace of gravel, subrounded, medium plasticity, dark gray	moist firm note: very moist at 15'
17'-20'	CL	silty clay, considerable gravel, medium plasticity, blackish-gray	saturated firm

*Unified Soil Classification

Stopped auger at 20'
Auger refused at

Alluvial Monitoring Wells
Black Mesa - Kayenta Mines
Peabody Coal Company
Navajo County, Arizona
SB Job No. E80-77

Date & time started: 6-15-80, 9:00am
Date & time completed: 6-15-80, 12:00pm
Location:
Geomorphic location: Alluvial terrace
Alluvial thickness: At least 38'
Saturated thickness: 18'
Total depth of well: 38'
Water level at completion: 22'
Type of annular pack: Gravel pack, 20' to 12'

LOG OF BORING NO. 107
Rig type: CME-55
Boring type: 12" HSA
Elevation:

Casing

Type and size: 4" PVC
Total length: 39'6"
Perforated interval: 38' to 28'

Depth	*USC	Description	Remarks
0-20'	CL	silty clay, some fine sand, medium plasticity, light brown to dark brown	dry at 0-1' moist at 1' to 4' dry at 4' to 16' moist at 16' 20'
20'-23'	CL	silty clay, considerable fine sand, medium plasticity, brown	saturated at 20' to 23'
23'-33'	CL	silty clay, some sand, medium plasticity, dark brown	very moist
33'-38'	SM	silt, clay & sand, low plasticity, brown	very saturated

*Unified Soil Classification

Stopped auger at 38'
Auger refused at

Alluvial Monitoring Wells
Black Mesa - Kayenta Mines
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Navajo County, Arizona
SHB Job No. E80-77

Date & time started: 5-31-80, 10:00am
Date & time completed: 5-31-80, 12:00pm
Location:
Geomorphic location: Alluvial terrace
Alluvial thickness: At least 45'
Saturated thickness: 6'
Total depth of well: 45'
Water level at completion: 32'
Type of annular pack: Natural fill

LOG OF BORING NO. 108
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing

Type and size: 2" PVC
Total length: 46'
Perforated interval: 28' to 43'
Note: Ring sample at 24' to 25'
Frame No. 26: clay mottled with gray & brown, also sandstone pieces

Depth	*USC	Description	Remarks
0-2'	CL	silty clay, some sand, fine, low to medium plasticity, dark brown	moist
2'-12'	CL	silty clay, considerable sand, fine, poorly graded, low plasticity, light brown	slightly moist note: trace of gravel at 8'
12'-15'	SM	silty sand, trace of clay, uniform, predominantly fine, nonplastic, brown	slightly moist
15'-17'	SM	silty sand, trace of clay & coarse sand, uniform, predominantly fine, nonplastic, tan	slightly moist
17'-35'	CL	silty, sandy clay, predominantly fine, low to medium plasticity, dark brown	moist
35'-45'	CL	silty clay, some sand, predominantly fine, medium plasticity, dark brown & gray	moist saturated at 39' 45'

*Unified Soil Classification

Stopped auger at 45'
Auger refused at

Alluvial Monitoring Wells
Black Mesa - Kayenta Mines
Peabody Coal Company
Navajo County, Arizona
SHB Job No. E80-77

Date & time started: 5-31-80, 12:40pm
Date & time completed: 5-31-80, 2:45pm
Location:
Geomorphic location: Alluvial terrace
Alluvial thickness: At least 40'
Saturated thickness: 5'
Total depth of well: 40'
Water level at completion: 33'
Type of annular pack: Natural fill

LOG OF BORING NO. 109
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing

Type and size: 2" PVC
Total length: 41'
Perforated interval: 28' to 38'
Note: spoon at 30' to 31.6", silty sand,
Frame No. 27

Depth	*USC	Description	Remarks
0-5'	CL	sandy clay, some silt, fine, low to medium plasticity, brown	moist
5'-24'	CL	silty clay, some sand, fine, slightly cemented, low to medium plasticity, light brown	slightly moist
24'-29'	SC	clayey sand, some silt, fine, low to medium plasticity, light brown	slightly moist
29'-31'	CL	silty clay, some sand, fine, low to medium plasticity, dark brown	moist
31'-40'	SM	silty sand, some clay, fine, poorly graded, nonplastic, brown	saturated at 35'

*Unified Soil Classification

Stopped auger at 40'
Auger refused at

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Navajo County, Arizona
SHB Job No. E80-77

Date & time started: 6-12-80, 9:30am
Date & time completed: 6-12-80, 11:30am
Location:
Geomorphic location: Alluvial terrace
Alluvial thickness: At least 40'
Saturated thickness: none
Total depth of well: 40'
Water level at completion: none
Type of annular pack: Natural fill

LOG OF BORING NO. 110
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing

Type and size: 2" PVC
Total length: 41'
Perforated interval: 27' to 37'

Depth	*USC	Description	Remarks
0-4'	CL	silty clay, some sand, medium plasticity, dark brown	moist firm
4'-19'	CL	silty clay, some sand, weakly cemented, low plasticity, olive-brown	slightly moist firm
19'-26'	CL	silty clay, some sand, medium plasticity, light brown	slightly moist firm
26'-40'	CL	silty clay, considerable fine sand, low plasticity, light brown	slightly moist firm
		note: no cuttings at 30' to 40', tight hole	

*Unified Soil Classification

Stopped auger at
Auger refused at 40'

Alluvial Monitoring Wells
Black Mesa - Kayenta Mines
Peabody Coal Company
Navajo County, Arizona
SB Job No. E80-77

Date & time started: 6-2-80, 4:15pm
Date & time completed: 6-2-80, 5:00pm
Location:
Geomorphic location: Alluvial terrace
Alluvial thickness: 14'
Saturated thickness: 0
Total depth of well: 15'
Water level at completion: none
Type of annular pack: Natural backfill

LOG OF BORING NO. 114
Rig type: CME-55
Boring type: 6½" HSA
Elevation:

Casing

Type and size: 2" PVC
Total length: 16'
Perforated interval: 14' to 10'

Depth	*USC	Description	Remarks
0-11'	SM	silty sand, predominantly fine, subrounded, nonplastic to low plasticity, light brown	slightly moist
11'-14'	SM	silty sand, predominantly fine, some claystone & coal gravel, nonplastic to low plasticity, grayish-brown to black to brown	slightly moist
14'-15'		sandstone, predominantly very fine, tabular, argillaceous & carbonaceous	dry hard
		note: spoon sampler refused at 15' - 50/1"	

*Unified Soil Classification

Stopped auger at
Auger refused at 15'

Date & time started: 6-24-84 1:05 p.m.

Date & time completed: 6-24-84 3:00 p.m.

Location:

Geomorphic location: Alluvial Channel

Alluvial thickness: 9'

Saturated thickness: none

Total depth of well: 40'

Water level at completion: 33' 11"

LOG OF BORING NO. 114R

Rig type: CME-75

Boring type: 6½" HSA

Elevation:

Casing

Type & size: 2" PVC

Total length: 40'

Perforated interval: 20' to 40'

Type of annular pack: Sand

Depth	*USC	Description	Remarks
0-9'	GP	Sand & gravel, trace of silt & clay, subrounded, nonplastic, brown	dry
9'-18'		Coal with thin stratifications of shale	
18'-21'		Shale, weathered, moderately hard, dark gray	
21'-26'		Coal seam	
26'-31'	CL	Shale, cuttings are sandy clays of medium plasticity	moist
31'-36'		Coal	
36'-41'		Shale	very moist
41'		Sandstone	

*Unified Soil Classification

Stopped auger at

Auger refused at 41'

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Date & time started: 6-23-84 7:30 a.m.

Date & time completed: 6-23-84 9:30 a.m.

Location:

Geomorphic location: Alluvial Channel

Alluvial thickness: At least 50'

Saturated thickness: 42' 7"

Total depth of well: 49'

Water level at completion: 6' 5"

Type of annular pack: Sand

LOG OF BORING NO. 110R

Rig type: CME-75

Boring type: 6½" HSA

Elevation:

Casing

Type & size: 2" PVC

Total length: 49' 6"

Perforated interval: 3' to 49' 6"

Depth	*USC	Description	Remarks
0-7'	SC	Clayey sand, some coarse sand & fine gravel, low plasticity, brown	moist
7'-50'	CL	Silty clay, some sand, medium plasticity, brown	very moist at 5' saturated at 6'

*Unified Soil Classification

Stopped auger at 50'

Auger refused at

SERGENT, HAUSKINS & BECKWITH

CONSULTING GEOTECHNICAL ENGINEERS

Date & time started: 6-21-84 12:20 p.m.

Date & time completed: 6-21-84 4:00 p.m.

Location:

Geomorphic location: Alluvial Channel

Alluvial thickness: At least 49' 6"

Saturated thickness: 38' 4"

Total depth of well: 49'

Water level at completion: 10' 8"

LOG OF BORING NO. 107R

Rig type: CME-75

Boring type: 12" HSA

Elevation:

Casing

Type & size: 4" PVC

Total length: 49'

Perforated interval: 9' to 49'

Type of annular pack: Sand

Depth	*USC	Description	Remarks
0-12'	GP	Sandy gravel, occasionally grading to gravelly sand, trace of silt, nonplastic, brown	moist
12' - 49' 6"	SC/CL	Clayey sand, occasionally grading to sandy clay, low to medium plasticity	very moist at 7' saturated at 12'

*Unified Soil Classification

Stopped auger at 49' 6"

Auger refused at

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Date & time started: 6-24-84 10:00 a.m.

Date & time completed: 6-24-84 12:30 p.m.

Location:

Geomorphic location: Alluvial Terrace

Alluvial thickness: At least 40'

Saturated thickness: 24' 6"

Total depth of well: 40'

Water level at completion: 15' 6"

LOG OF BORING NO. 100 R

Rig type: CME-75

Boring type: 6½" HSA

Elevation:

Casing

Type & size: 2" PVC

Total length: 40'

Perforated interval: 10' to 40'

Type of annular pack: Sand

Depth	*USC	Description	Remarks
0-9'	SM	Silty sand, (occasionally grading to sandy silt), some clay, low plasticity, brown	dry
9'-12'	CL	Silty clay, some silt, medium plasticity, brown	moist
12'-13'	SC	Clayey sand, well graded, low to medium plasticity, dark brown	moist
13'-18'	CL	Sandy clay, some silt, medium plasticity, dark brown	very moist
		Clayey sand, well graded, low to medium plasticity, dark brown	saturated at 16'
29'-40'	GC	Clayey sand & gravel, low plasticity, brown	

*Unified Soil Classification

Stopped auger at

Auger refused at 40'

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Date & time started: 6-25-84 7:45 a.m.

Date & time completed: 6-25-84 10:15 a.m.

Location:

Geomorphic location: Alluvial Channel

Alluvial thickness: At least 33'

Saturated thickness: 25' 10"

Total depth of well: 32'

Water level at completion: 7' 2"

LOG OF BORING NO. 84R

Rig type: CME-75

Boring type: 12" HSA

Elevation:

Casing

Type & size: 4" PVC

Total length: 32'

Perforated interval: 3' to 32'

Type of annular pack: Sand

Depth	*USC	Description	Remarks
0-5'	SM	Silty sand, poorly graded, very low plasticity to nonplastic, brown	slightly moist
5'-33'	GM	Sand & gravel, some silt, trace of cobbles, (cobbles increase with depth), nonplastic, brown	very moist
			saturated at 7'

*Unified Soil Classification

Stopped auger at 33'

Auger refused at

Date & time started: 6-25-84 11:00 a.m.

Date & time completed: 6-25-84 12:15 p.m.

Location:

Geomorphic location: Alluvial Terrace

Alluvial thickness: 22'

Saturated thickness: none

Total depth of well: 34'

Water level at completion: 19' 6"

LOG OF BORING NO. 74R

Rig type: CME-75

Boring type: 6½" HSA

Elevation:

Casing

Type & size: 2" PVC

Total length: 34'

Perforated interval: 9' 6" to 19' 6"

Type of annular pack: Sand

Depth	*USC	Description	Remarks
0-8'	SM	Silty sand, poorly graded, trace of clay, nonplastic to low plasticity, light brown	slightly moist
8' -22'	GP/GM	Sand & gravel, considerable medium & coarse sand, occasionally some silt, nonplastic, brown	moist
22' -34'		Sandstone & shale, interbedded, weathered, moderately hard, brown to dark gray	saturated at 25'

Cuttings were not saturated until approximately 25'. Therefore, water appears to be from wepo formation and not alluvium.

*Unified Soil Classification

Stopped auger at

Auger refused at 34'

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Date & time started: 6-25-84 12:45 p.m.

Date & time completed: 6-25-84 1:50 p.m.

Location:

Geomorphic location: Alluvial Channel

Alluvial thickness: 21'

Saturated thickness: 5'

Total depth of well: 20' 6"

Water level at completion: 16'

Type of annular pack: Sand

LOG OF BORING NO. 70R

Rig type: CME-75

Boring type: 6½" HSA

Elevation:

Casing

Type & size: 2" PVC

Total length: 20' 6"

Perforated interval: 10' 6" to 20' 6"

Depth	*USC	Description	Remarks
0-7'	SM	Silty sand, poorly graded, nonplastic, brown	dry
7'-16'	GM	Sand & gravel, fine sand, some silt, nonplastic, brown	moist
16'-21'	CL	Sandy clay, considerable fine sand, low plasticity, brown	saturated at 16'
21'-22'		Sandstone	
22'-23'		Coal	

*Unified Soil Classification

Stopped auger at

Auger refused at 23'

Date & time started: 6-23-84 9:50 a.m.

Date & time completed: 6-23-84 12:45 p.m.

Location:

Geomorphic location: Alluvial Channel

Alluvial thickness: At least 29'

Saturated thickness: 10' 4"

Total depth of well: 29'

Water level at completion: 18' 8"

LOG OF BORING NO. 33R

Rig type: CME-75

Boring type: 12" HSA

Elevation:

Casing

Type & size: 4" PVC

Total length: 29'

Perforated interval: 9' to 29'

Type of annular pack: Sand

Depth	*USC	Description	Remarks
0-12'	SP	Gravelly sand, some clay, poorly graded, low plasticity	moist
12'-29'	CL	Sandy clay, some silt, medium plasticity, brown	moist
			saturated at 18' to 29'

*Unified Soil Classification

Stopped auger at 29'

Auger refused at

SERGENT, HAUSKINS & BECKWITH

CONSULTING GEOTECHNICAL ENGINEERS

Date & time started: 6-24-84 3:20 p.m.

Date & time completed: 6-24-84 6:00 p.m.

Location:

Geomorphic location: Alluvial Channel

Alluvial thickness: At least 38'

Saturated thickness: 18'

Total depth of well: 38'

Water level at completion: 20'

LOG OF BORING NO. 31R

Rig type: CME-75

Boring type: 12" HSA

Elevation:

Casing

Type & size: 3" PVC

Total length: 38'

Perforated interval: 8' to 38'

Type of annular pack: Sand & gravel (native material caved on auger removal)

Depth	*USC	Description	Remarks
0-38'	GW/GP	Sand & gravel, well to poorly graded, considerable cobbles with depth, subrounded, nonplastic, brown	slightly moist
			very moist at 18'
			saturated at 20'

*Unified Soil Classification

Stopped auger at 38'

Auger refused at

ATTACHMENT 11

Alluvial Monitoring Well Lithologic Logs and Completions

JUN 2000
APPROVED

Revised 05/22/00

PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	Black Mesa / Kayenta
Monitor Well Name:	**ALUV13R**
Geologic Unit Monitored:	Alluvium
Ground surface Elevation:	6713.36 (ft-amsi)

Location: Mine Coordinates	N	8297.46				E		29016.02		
	S					W				
		¼		¼	S		T		R	

Drilling Date:	Start	08/20/88
	Finish	08/20/88
Drilled by:		Winnek Drilling Co.
Logged by:		J. Ohlman
Geophysically Logged by:		None
Total Depth Drilled:		43.0 ft

FORMATION RECORD

DEPTH (ft) FROM	TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	3.0	Tan brown silt with minor gravel (medium to coarse grained) dry
3.0	5.0	Medium tan brown clayey silt with minor fine grained sand
5.0	14.0	Medium tan brown fine to coarse grained silty sand
14.0	16.5	Varicolored gravel, (finely grained) dry
16.5	24.0	Dark tan cobbley gravel and medium to coarse grained sand
24.0	28.0	Varicolored gravel (coarse grained) moist
28.0	29.0	Dark tan brown sand (coarse grained) moist
29.0	31.0	Varicolored gravel (fine to medium grained) moist
31.0	34.0	Dark brown silty clayey gravel, moist
34.0	40.0	Dark brown to brown black silty clay, wet at 35 ft
40.0	40.5	Same as above for 31-34 feet, gravel, wet
40.5	43.0	Same as above for 28-29 feet, sand, wet
	43.0	T.D.

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PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV13R

Type of Drilling: Hollow Stem Auger
Drilling Fluid: None
Total Depth: 43.0 ft
Lithologic Unit Monitored: Alluvium
Completion Date: 08/20/88

Borehole Diameter:

Surface:	12.0-inch	**From:**	0.0	**To:**	21.5
Intermediate:		**From:**		**To:**	
Production Zone:	12.0-inch	**From:**	21.5	**To:**	41.4

Casing Specifications: Blank

1. **Surface:** 4-inch schedule 40 PVC (Triloc)
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 4-inch schedule 40 PVC (Triloc) screen with 0.020-inch slots
2. **Type:**

Blank Intervals:

From 0.0	To 21.5	From 25.5	To 26.5	From 30.5	To 36.5	From 40.5	To 41.4
From	To	From	To	From	To	From	To

Perforated Intervals:

From 21.5	To 25.5	From 26.5	To 30.5	From 36.5	To 40.5	From	To
From	To	From	To	From	To	From	To

Length Per Casing Section That is Not Perforated:

Cement Seal:

From 0.0	To 4.0	From	To	From	To	From	To
Type Portland Type 2		Type		Type		Type	

Bentonite Seal:

From none	To	From 4.0	To 17.0	From	To	From	To
Type		Type Cuttings		Type		Type	

Sand Pack:

From 17.0	To 43.0	From	To	From	To	From	To
Type		Type		Type		Type	

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PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	Black Mesa / Kayenta
Monitor Well Name:	**ALLUV23R**
Geologic Unit Monitored:	Alluvium
Ground surface Elevation:	6652.41 (ft-amsi)

Location: Mine Coordinates	N	-13069.64				E	59191.08			
	S					W				
		¼		¼	S		T		R	

Drilling Date:	Start	08/19/88
	Finish	08/19/88
Drilled by:		Winnek Drilling Co.
Logged by:		J. Ohlman
Geophysically Logged by:		None
Total Depth Drilled:		19.5 ft

FORMATION RECORD

DEPTH (ft) FROM	TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	11.0	Medium brown gravelly sand (medium to coarse grained), damp
11.0	14.0	Medium dark brown sand (medium to coarse grained) with minor gravel, very damp
14.0	19.5	Dark brown gravel and sand (medium to coarse grained), very damp
	19.5	T.D. bedrock

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PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALLUV23R

Type of Drilling: Hollow Stem Auger
Drilling Fluid: None
Total Depth: 19.5 ft
Lithologic Unit Monitored: Alluvium
Completion Date: 08/19/88

Borehole Diameter:

Surface:	12.0-inch	**From:**	0.0	**To:**	14.6
Intermediate:		**From:**		**To:**	
Production Zone:	12.0-inch	**From:**	14.6	**To:**	19.5

Casing Specifications: Blank

1. **Surface:** 4-inch schedule 40 PVC (Triloc)
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 4-inch schedule 40 PVC (Triloc) screen with 0.020-inch slots
2. **Type:**

Blank Intervals:

From	To	From	To	From	To	From	To	From	To
0.0	14.6	18.6	19.5						

Perforated Intervals:

From	To	From	To	From	To	From	To	From	To
14.6	18.6								

Length Per Casing Section That is Not Perforated:

Cement Seal:

From	To	From	To	From	To	From	To
0.0	3.0						
Type Portland Type 2		Type		Type		Type	

Bentonite Seal:

From	To	From	To	From	To	From	To
none		3.0	13.0				
Type		Type Cuttings		Type		Type	

Sand Pack:

From	To	From	To	From	To	From	To
13.0	19.0						
Type		Type		Type		Type	

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PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	Black Mesa / Kayenta
Monitor Well Name:	**ALUV27R**
Geologic Unit Monitored:	Alluvium
Ground surface Elevation:	6588.64 (ft-amsi)

Location: Mine Coordinates	N	-25247.16				E	53459.76		
	S					W			
		¼		¼	S		T		R

Drilling Date:	Start	08/08/88
	Finish	08/08/88
Drilled by:		Winnek Drilling Co.
Logged by:		J. Ohlman / T. Smith
Geophysically Logged by:		None
Total Depth Drilled:		62.0 ft

FORMATION RECORD

DEPTH (ft) FROM	TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	10.0	Tan sandy silt (fine grained) with minor gravel
10.0	15.0	Tan sandy silt (fine to coarse grained) with increasing gravel
15.0	21.0	Tan silty sand (medium to coarse grained) with minor gravel
21.0	26.0	Silty sandy gravel (coarse grained) moist at 26 feet
26.0	31.0	Brown silty to sandy clay, wet
31.0	53.0	Brown silty sand (fine to medium grained) saturated
53.0	61.0	Gray sand (fine to coarse grained)
61.0	62.0	Gray sandy gravel (coarse grained)
	62.0	T.D. Greenish yellow sandstone, bedrock (coarse grained)

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PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV27R

Type of Drilling: Hollow Stem Auger
Lithologic Unit Monitored: Alluvium
Drilling Fluid: None
Completion Date: 08/08/88
Total Depth: 62.0 ft

Borehole Diameter:

Surface:	8.0-inch	**From:**	0.0	**To:**	30.4
Intermediate:		**From:**		**To:**	
Production Zone:	8.0-inch	**From:**	30.4	**To:**	60.3

Casing Specifications: Blank

1. **Surface:** 2-inch schedule 40 PVC (Triloc)
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 2-inch schedule 40 PVC (Triloc) screen with 0.020-inch slot openings
2. **Type:**

Blank Intervals:

From 0.0	To 30.4	From 39.4	To 40.4	From 49.4	To 50.4	From 59.4	To 60.3
From	To	From	To	From	To	From	To

Perforated Intervals:

From 30.4	To 39.4	From 40.4	To 49.4	From 50.4	To 59.4	From	To
From	To	From	To	From	To	From	To

Length Per Casing Section That is Not Perforated:

Cement Seal:

From 0.0	To 6.0	From	To	From	To	From	To
Type Portland Type 2		Type		Type		Type	

Bentonite Seal:

From None	To	From 6.0	To 24.0	From	To	From	To
Type		Type Cuttings		Type		Type	

Sand Pack:

From 24.0	To 60.3	From	To	From	To	From	To
Type		Type		Type		Type	

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PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	Black Mesa / Kayenta
Monitor Well Name:	**ALUV32R**
Geologic Unit Monitored:	Alluvium
Ground surface Elevation:	6675.9 (ft-amsi)

Location: Mine Coordinates	N	-39938.41				E	48708.52			
	S					W				
		¼		¼	S		T		R	

Drilling Date:	Start	08/07/88
	Finish	08/07/88
Drilled by:		Winnek Drilling Co.
Logged by:		J. Ohlman / T. Smith
Geophysically Logged by:		None
Total Depth Drilled:		2.0 ft

FORMATION RECORD

DEPTH (ft) FROM	TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	2.0	Brown silty sand (fine to coarse grained) with considerable gravel, wet at 1 foot
	2.0	T.D. Bedrock, carbonaceous clay (weathered coal)

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PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV32R

Type of Drilling: Hollow Stem Auger
Drilling Fluid: None
Total Depth: 2.0 ft
Lithologic Unit Monitored: Alluvium
Completion Date: 08/07/88

Borehole Diameter:

Surface:	8.0-inch	**From:**	0.0	**To:**	1.0
Intermediate:	8.0-inch	**From:**		**To:**	
Production Zone:	8.0-inch	**From:**	1.0	**To:**	2.0

Casing Specifications: Blank

1. **Surface:** 2-inch schedule 40 PVC (Triloc)
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 2-inch schedule 40 PVC (Triloc) screen with 0.020-inch slot openings
2. **Type:**

Blank Intervals:

From	To	From	To	From	To	From	To	From	To
0.0	1.0	1.9	2.0						

Perforated Intervals:

From	To	From	To	From	To	From	To	From	To
1.0	1.9								

Length Per Casing Section That is Not Perforated:

Cement Seal:

From	To	From	To	From	To	From	To
0.0	0.8						
Type Portland Type 2		Type		Type		Type	

Bentonite Seal:

From	To	From	To	From	To	From	To
none		0.8	1.0				
Type		Type Cuttings		Type		Type	

Sand Pack:

From	To	From	To	From	To	From	To
1.0	2.0						
Type		Type		Type		Type	

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PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	Black Mesa / Kayenta
Monitor Well Name:	**ALUV75R**
Geologic Unit Monitored:	Alluvium
Ground surface Elevation:	6530.28 (ft-amsi)

Location: Mine Coordinates	N	-3856				E	17939.56		
	S					W			
		¼		¼	S		T		R

Drilling Date:	Start	08/19/88
	Finish	08/20/88
Drilled by:		Winnek Drilling Co.
Logged by:		J. Ohlman
Geophysically Logged by:		None
Total Depth Drilled:		33.0 ft

FORMATION RECORD

DEPTH (ft) FROM	DEPTH (ft) TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	10.0	Light tan brown fine grained sand with minor gravel, dry
10.0	19.0	Dark brown fine to medium grained sand with minor gravel, water at 17 feet
19.0	29.0	Gravel, boulders at 24 feet
29.0	33.0	Dark gray clay, coal fines with minor gravel
	33.0	T.D.

APPROVED JUN 2000

PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV75R

Type of Drilling: Hollow Stem Auger
Drilling Fluid: None
Total Depth: 33.0 ft
Lithologic Unit Monitored: Alluvium
Completion Date: 08/20/88

Borehole Diameter:

Surface:	12.0-inch	**From:**	0.0	**To:**	13.5
Intermediate:		**From:**		**To:**	
Production Zone:	12.0-inch	**From:**	13.5	**To:**	33.0

Casing Specifications: Blank

1. **Surface:** 4-inch schedule 40 PVC (Triloc)
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 4-inch schedule 40 PVC (Triloc) screen with 0.020-inch slots
2. **Type:**

Blank Intervals:

From	To	From	To	From	To	From	To	From	To
0.0	13.5	22.5	23.5	32.1	33.0				

Perforated Intervals:

From	To	From	To	From	To	From	To	From	To
13.5	22.5	23.5	32.1						

Length Per Casing Section That is Not Perforated:

Cement Seal:

From	To	From	To	From	To	From	To
0.0	3.0						
Type Portland Type 2		Type		Type		Type	

Bentonite Seal:

From	To	To	To	From	To	From	To
None		3.0	11.0				
Type		Type Cuttings		Type		Type	

Sand Pack:

From	To	From	To	From	To	From	To
11.0	33.0						
Type		Type		Type		Type	

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PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	Black Mesa / Kayenta
Monitor Well Name:	**ALUV76R**
Geologic Unit Monitored:	Alluvium
Ground surface Elevation:	6783.98 (ft-amsi)

Location: Mine Coordinates	N	8967.16				E	46231.9		
	S					W			
		¼		¼	S		T		R

Drilling Date:	Start	08/19/88
	Finish	08/20/88
Drilled by:		Winnek Drilling Co.
Logged by:		J. Ohlman
Geophysically Logged by:		None
Total Depth Drilled:		52.5 ft

FORMATION RECORD

DEPTH (ft) FROM	TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	10.0	Tan brown silty sand (fine to medium grained) with minor gravel, dry
10.0	11.0	Varicolored gravel, dry
11.0	21.0	Tan brown fine grained sand, dry
21.0	23.0	Varicolored gravel, dry
23.0	35.0	Tan brown fine grained sand, dry
35.0	37.0	Same as above, sand and gravel
37.0	43.0	Varicolored coarse gravel, moist
43.0	47.0	Red brown fine to medium grained sand and gravel, wet
47.0	49.0	Medium gray brown silty sand (medium to coarse grained) wet
49.0	51.0	Fine to medium grained sand and 1 inch clay layers
51.0	52.5	Varicolored gravel with minor clay layers
	52.5	T.D. Bedrock, weathered sandstone

APPROVED JUN 2000

PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV76R

Type of Drilling: Hollow Stem Auger
Drilling Fluid: None
Total Depth: 52.5 ft
Lithologic Unit Monitored: Alluvium
Completion Date: 08/20/88

Borehole Diameter:

Surface:	8.0-inch	**From:**	0.0	**To:**	37.6
Intermediate:		**From:**		**To:**	
Production Zone:	8.0-inch	**From:**	37.6	**To:**	52.5

Casing Specifications: Blank

1. **Surface:** 2-inch schedule 40 PVC (Triloc)
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 2-inch schedule 40 PVC (Triloc) screen with 0.020-inch slots
2. **Type:**

Blank Intervals:

From	To	From	To	From	To	From	To	From	To
0.0	37.6	41.6	42.6	51.6	52.5				

Perforated Intervals:

From	To	From	To	From	To	From	To	From	To
37.6	41.6	42.6	51.6						

Length Per Casing Section That is Not Perforated:

Cement Seal:

From	To	From	To	From	To	From	To
0.0	3.0						
Type Portland Type 2		Type		Type		Type	

Bentonite Seal:

From	To	From	To	From	To	From	To
None		3.0	33.0				
Type		Type Cuttings		Type		Type	

Sand Pack:

From	To	From	To	From	To	From	To
33.0	52.5						
Type		Type		Type		Type	

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PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	Black Mesa / Kayenta
Monitor Well Name:	**ALUV79R**
Geologic Unit Monitored:	Alluvium
Ground surface Elevation:	6600.7 (ft-amsi)

Location: Mine Coordinates	N	79			E			34726	
	S				W				
		¼		¼	S		T		R

Drilling Date:	Start	08/18/88
	Finish	08/18/88
Drilled by:		Winnek Drilling Co.
Logged by:		J. Ohlman
Geophysically Logged by:		None
Total Depth Drilled:		11.0 ft

FORMATION RECORD

DEPTH (ft) FROM	TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	5.0	Medium brown medium grained sand and gravel, damp
5.0	10.5	Varicolored gravel with minor sand, wet at 6 feet
10.5	11.0	Medium gray silty sandy clay
	11.0	T.D.

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PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV79R

Type of Drilling: Hollow Stem Auger
Drilling Fluid: None
Total Depth: 11.0 ft
Lithologic Unit Monitored: Alluvium
Completion Date: 08/20/88

Borehole Diameter:

Surface:	12.0-inch	**From:**	0.0	**To:**	6.1
Intermediate:		**From:**		**To:**	
Production Zone:	12.0-inch	**From:**	6.1	**To:**	11.0

Casing Specifications: Blank

1. **Surface:** 4-inch schedule 40 PVC (Triloc)
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 4-inch schedule 40 PVC (Triloc) screen with 0.020-inch slots
2. **Type:**

Blank Intervals:

From	To	From	To	From	To	From	To	From	To
0.0	6.1	10.1	11.0						

Perforated Intervals:

From	To	From	To	From	To	From	To	From	To
6.1	10.1								

Length Per Casing Section That is Not Perforated:

Cement Seal:

From	To	From	To	From	To	From	To
0.0	3.5						
Type Portland Type 2		Type		Type		Type	

Bentonite Seal:

From	To	From	To	From	To	From	To
None		3.5	4.0				
Type		Type Cuttings		Type		Type	

Sand Pack:

From	To	From	To	From	To	From	To
4.0	11.0						
Type		Type		Type		Type	

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PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	Black Mesa / Kayenta
Monitor Well Name:	**ALUV80R**
Geologic Unit Monitored:	Alluvium
Ground surface Elevation:	6546.97 (ft-amsi)

Location: Mine Coordinates	N	-3421.27					E	29271.81		
	S						W			
		¼		¼	S		T		R	

Drilling Date:	Start	08/17/88
	Finish	08/18/88
Drilled by:		Winnek Drilling Co.
Logged by:		J. Ohlman
Geophysically Logged by:		None
Total Depth Drilled:		24.0 ft

FORMATION RECORD

DEPTH (ft) FROM	TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	4.0	Medium gray sand and gravel, dry
4.0	8.0	Medium to dark brown sand (medium grained) with minor gravel, very moist
8.0	18.0	Medium brown sand (fine to medium grained) moist to 9.5 feet then wet
18.0	24.0	Reddish brown silty sand with gravel, saturated
	24.0	T.D.

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PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV80R

Type of Drilling: Hollow Stem Auger
Drilling Fluid: None
Total Depth: 24.0 ft
Lithologic Unit Monitored: Alluvium
Completion Date: 08/18/88

Borehole Diameter:

Surface:	8.0-inch	**From:**	0.0	**To:**	9.1
Intermediate:		**From:**		**To:**	
Production Zone:	8.0-inch	**From:**	9.1	**To:**	24.0

Casing Specifications: Blank

1. **Surface:** 2-inch schedule 40 PVC (Triloc)
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 2-inch schedule 40 PVC (Triloc) screen with 0.020-inch slots
2. **Type:**

Blank Intervals:

From	To	From	To	From	To	From	To	From	To
0.0	9.1	13.1	14.1	23.1	24.0				

Perforated Intervals:

From	To	From	To	From	To	From	To	From	To
9.1	13.1	14.1	23.1						

Length Per Casing Section That is Not Perforated:

Cement Seal:

From	To	From	To	From	To	From	To
0.0	3.0						
Type: Portland Type 2		Type:		Type:		Type:	

Bentonite Seal:

From	To	From	To	From	To	From	To
None		3.0	7.0				
Type:		Type: Cuttings		Type:		Type:	

Sand Pack:

From	To	From	To	From	To	From	To
7.0	24.0						
Type:		Type:		Type:		Type:	

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PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	Black Mesa / Kayenta
Monitor Well Name:	**ALUV81R**
Geologic Unit Monitored:	Alluvium
Ground surface Elevation:	6488.01 (ft-amsi)

Location: Mine Coordinates	N	-6518.5			E		24863.45	
	S				W			
		¼		¼	S		T		R

Drilling Date:	Start	04/03/89
	Finish	04/03/89
Drilled by:		J. Ohlman, hand augered
Logged by:		J. Ohlman
Geophysically Logged by:		None
Total Depth Drilled:		15.0 ft

FORMATION RECORD

DEPTH (ft) FROM	TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	3.0	Tan to brown sand (fine to medium grained) with some gravel
3.0	9.0	Light brown sand (fine to coarse grained) moist with a static water level at 7 feet
9.0	14.5	Light to dark gray silty clay, with some organics and increasing clay content with depth, wet
14.5	15.0	Variable color gravel with minor amounts of sand
	15.0	T.D.

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PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV81R

Type of Drilling: 3-inch Hand Auger
Drilling Fluid: None
Total Depth: 15.0 ft
Lithologic Unit Monitored: Alluvium
Completion Date: 04/03/89

Borehole Diameter:

Surface:	3.0-inch	**From:**	0.0	**To:**	5.0
Intermediate:		**From:**		**To:**	
Production Zone:	3.0-iinch	**From:**	5.0	**To:**	15.0

Casing Specifications: Blank

1. **Surface:** 2-inch schedule 40 PVC (Triloc)
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 2-inch schedule PVC (Triloc) screen with 0.020-inch slots
2. **Type:**

Blank Intervals:

From	To	From	To	From	To	From	To	From	To
0.0	5.0	14.0	15.0						

Perforated Intervals:

From	To	From	To	From	To	From	To	From	To
5.0	14.0								

Length Per Casing Section That is Not Perforated:

Cement Seal:

From	To	From	To	From	To	From	To
0.0	2.5						
Type: Portland Type 2		Type:		Type:		Type:	

Bentonite Seal:

From	To	From	To	From	To	From	To
None							
Type:		Type:		Type:		Type:	

Sand Pack:

From	To	From	To	From	To	From	To
2.5	15.0						
Type:		Type:		Type:		Type:	

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PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	Black Mesa / Kayenta
Monitor Well Name:	**ALUV89R**
Geologic Unit Monitored:	Alluvium
Ground surface Elevation:	6550.37 (ft-amsi)

Location: Mine Coordinates	N	-17341.76				E	51938.32			
	S					W				
		¼		¼	S		T		R	

Drilling Date:	Start	08/16/88
	Finish	08/17/88
Drilled by:		Winnek Drilling Co.
Logged by:		J. Ohlman
Geophysically Logged by:		None
Total Depth Drilled:		33.5 ft

FORMATION RECORD

DEPTH (ft) FROM	TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	15.0	Sand (fine to medium grained) and gravel, moist
15.0	18.5	Sandy gravel, wet
18.5	25.0	Slightly sandy (fine to medium grained) gravel, wet
25.0	29.0	Slightly pebbly, silty, sandy gravel
29.0	33.5	Medium dark gray sand
	33.5	T.D.

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PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV89R

Type of Drilling: Hollow Stem Auger
Drilling Fluid: None
Total Depth: 33.5 ft
Lithologic Unit Monitored: Alluvium
Completion Date: 08/17/88

Borehole Diameter:

Surface:	8.0-inch	**From:**	0.0	**To:**	8.6
Intermediate:		**From:**		**To:**	
Production Zone:	8.0-inch	**From:**	8.6	**To:**	33.5

Casing Specifications: Blank

1. **Surface:** 2-inch schedule 40 PVC (Triloc)
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 2-inch schedule 40 PVC (Triloc) screen with 0.020-inch slots
2. **Type:**

Blank Intervals:

From	To	From	To	From	To	From	To
0.0	8.6	12.6	23.6	32.6	33.5		

Perforated Intervals:

From	To	From	To	From	To	From	To
8.6	12.6	23.6	32.6				

Length Per Casing Section That is Not Perforated:

Cement Seal:

From	To	From	To	From	To	From	To
0.0	3.0						
Type: Portland Type 2		Type:		Type:		Type:	

Bentonite Seal:

From	To	From	To	From	To	From	To
None		3.0	6.0				
Type:		Type: Cuttings		Type:		Type:	

Sand Pack:

From	To	From	To	From	To	From	To
6.0	33.5						
Type:		Type:		Type:		Type:	

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PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	Black Mesa / Kayenta
Monitor Well Name:	**ALUV98R**
Geologic Unit Monitored:	Alluvium
Ground surface Elevation:	6748.32 (ft-amsi)

Location: Mine Coordinates	N	-19944.81				E		61744.84	
	S					W			
		¼		¼	S		T		R

Drilling Date:	Start	08/15/88
	Finish	08/15/88
Drilled by:		Winnek Drilling Co.
Logged by:		J. Ohlman
Geophysically Logged by:		None
Total Depth Drilled:		23.0 ft

FORMATION RECORD

DEPTH (ft) FROM	TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	3.0	Gray tan sand (fine to medium grained) with minor gravel, dry
3.0	6.0	Gray tan sandy (fine to medium grained) silt with minor gravel
6.0	11.0	Tan brown silt, moist
11.0	13.0	Medium dark brown silty clay with organic debris, wet at 12 feet
13.0	18.0	Same as above with high percent of organics, "spongy"
18.0	23.0	Same as above with increasing percent of clay, very wet
	23.0	T.D. Bedrock, sandstone, hard

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PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV98R

Type of Drilling: Hollow Stem Auger
Drilling Fluid: None
Total Depth: 23.0 ft
Lithologic Unit Monitored: Alluvium
Completion Date: 08/15/88

Borehole Diameter:

Surface:	8.0-inch	**From:**	0.0	**To:**	12.6
Intermediate:		**From:**		**To:**	
Production Zone:	8.0-inch	**From:**	12.6	**To:**	22.5

Casing Specifications: Blank

1. **Surface:** 2-inch schedule 40 PVC (Triloc)
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 2-inch schedule PVC (Triloc) screen with 0.020-inch slots
2. **Type:**

Blank Intervals:

From	To	From	To	From	To	From	To	From	To
0.0	12.6	21.6	22.5						

Perforated Intervals:

From	To	From	To	From	To	From	To	From	To
12.6	21.6								

Length Per Casing Section That is Not Perforated:

Cement Seal:

From	To	From	To	From	To	From	To
0.0	3.0						
Type Portland Type 2		Type		Type		Type	

Bentonite Seal:

From	To	From	To	From	To	From	To
None		3.0	8.5				
Type		Type Cuttings		Type		Type	

Sand Pack:

From	To	From	To	From	To	From	To
8.5	22.5						
Type		Type		Type		Type	

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PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	Black Mesa / Kayenta
Monitor Well Name:	**ALUV99R**
Geologic Unit Monitored:	Alluvium
Ground surface Elevation:	6923.45 ft-amsi)

Location: Mine Coordinates	N	-29313.83			E			70314.62	
	S				W				
		¼		¼	S		T		R

Drilling Date:	Start	08/15/88
	Finish	08/15/88
Drilled by:		Winnek Drilling Co.
Logged by:		J. Ohlman
Geophysically Logged by:		None
Total Depth Drilled:		19.0 ft

FORMATION RECORD

DEPTH (ft) FROM	TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	3.0	Light tan brown sand (fine to medium grained) with minor gravel
3.0	8.0	Light brown silty sand (fine to medium grained) with minor clay, moist
8.0	13.0	Same as above with 20% gravel, moist
13.0	19.0	Medium dark brown clayey silt with some gravel , saturated at 15 feet
	19.0	T.D. Bedrock

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PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV99R

Type of Drilling: Hollow Stem Auger
Drilling Fluid: None
Total Depth: 19.0 ft
Lithologic Unit Monitored: Alluvium
Completion Date: 08/15/88

Borehole Diameter:

Surface:	8.0-inch	**From:**	0.0	**To:**	9.1
Intermediate:		**From:**		**To:**	
Production Zone:	8.0-inch	**From:**	9.1	**To:**	19.0

Casing Specifications: Blank

1. **Surface:** 2-inch schedule 40 PVC (Triloc)
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 2-inch schedule 40 PVC (Triloc) screen with 0.020-inch slots
2. **Type:**

Blank Intervals:

From	To	From	To	From	To	From	To	From	To
0.0	9.1	18.1	19.0						

Perforated Intervals:

From	To	From	To	From	To	From	To	From	To
9.1	18.1								

Length Per Casing Section That is Not Perforated:

Cement Seal:

From	To	From	To	From	To	From	To
0.0	3.0						
Type		Type		Type		Type	

Bentonite Seal:

From	To	From	To	From	To	From	To
None		3.0	7.0				
Type		Type	Cuttings	Type		Type	

Sand Pack:

From	To	From	To	From	To	From	To
7.0	19.0						
Type		Type		Type		Type	

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PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	Black Mesa / Kayenta
Monitor Well Name:	**ALUV101R**
Geologic Unit Monitored:	Alluvium
Ground surface Elevation:	6679.17 (ft-amsi)

Location: Mine Coordinates	N	-30101.92			E		54027.61	
	S				W			
		¼		¼	S		T		R

Drilling Date:	Start	08/17/88
	Finish	08/17/88
Drilled by:		Winnek Drilling Co.
Logged by:		J. Ohlman
Geophysically Logged by:		None
Total Depth Drilled:		13.5 ft

FORMATION RECORD

DEPTH (ft) FROM	TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	11.0	Light brown silty sand (fine to medium grained) with minor gravel, dry
11.0	13.0	Medium brown clayey silt with minor gravel
13.0	13.5	Dark brown gravel with silty clay ,wet
	13.5	T.D. Bedrock

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PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV101R

Type of Drilling: Hollow Stem Auger
Drilling Fluid: None
Total Depth: 13.5 ft
Lithologic Unit Monitored: Alluvium
Completion Date: 08/17/88

Borehole Diameter:

Surface:	8.0-inch	**From:**	0.0	**To:**	8.6
Intermediate:		**From:**		**To:**	
Production Zone:	8.0-inch	**From:**	8.6	**To:**	13.5

Casing Specifications: Blank

1. **Surface:** 2-inch schedule 40 PVC (Triloc)
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 2-inch schedule 40 PVC (Triloc) screen with 0.020-inch slots
2. **Type:**

Blank Intervals:

From	To	From	To	From	To	From	To	From	To
0.0	8.6	12.6	13.5						

Perforated Intervals:

From	To	From	To	From	To	From	To	From	To
8.6	12.6								

Length Per Casing Section That is Not Perforated:

Cement Seal:

From	To	From	To	From	To	From	To
0.0	4.5						
Type Portland Type 2		**Type**		**Type**		**Type**	

Bentonite Seal:

From	To	From	To	From	To	From	To
None		4.5	5.5				
Type		**Type** Cuttings		**Type**		**Type**	

Sand Pack:

From	To	From	To	From	To	From	To
5.5	13.5						
Type		**Type**		**Type**		**Type**	

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PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	Black Mesa / Kayenta
Monitor Well Name:	**ALUV103R**
Geologic Unit Monitored:	Alluvium
Ground surface Elevation:	6449.26 (ft-amsi)

Location: Mine Coordinates	N	-37346.18				E	36238.39		
	S					W			
		¼		¼	S		T		R

Drilling Date:	Start	08/07/88
	Finish	08/07/88
Drilled by:		Winnek Drilling Co.
Logged by:		T. Smith
Geophysically Logged by:		None
Total Depth Drilled:		21.2 ft

FORMATION RECORD

DEPTH (ft) FROM	TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	6.5	Tan silty sand (fine to medium grained) with considerable gravel, moist at 7 feet
6.5	7.5	Brown silty sand (fine to medium grained) with gravel, very moist
7.5	20.5	Dark brown silty clay with sand (fine to medium grained)
20.5	20.9	Tan sand (fine to coarse grained)
20.9	21.2	Gravel, slight sandy
	21.2	T.D. Bedrock

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PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV103R

Type of Drilling: Hollow Stem Auger
Drilling Fluid: None
Total Depth: 21.2 ft
Lithologic Unit Monitored: Alluvium
Completion Date: 08/07/88

Borehole Diameter:

Surface:	8.0-inch	**From:**	0.0	**To:**	6.3
Intermediate:		**From:**		**To:**	
Production Zone:	8.0-inch	**From:**	6.3	**To:**	21.2

Casing Specifications: Blank

1. **Surface:** 2-inch schedule 40 PVC (Triloc)
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 2-inch schedule 40 PVC (Triloc) screen with 0.020-inch slots
2. **Type:**

Blank Intervals:

From	To	From	To	From	To	From	To	From	To
0.0	6.3	10.3	11.3	20.3	21.2				

Perforated Intervals:

From	To	From	To	From	To	From	To	From	To
6.3	10.3	11.3	20.3						

Length Per Casing Section That is Not Perforated:

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Cement Seal:

From	To	From	To	From	To	From	To
0.0	4.0						
Type Portland Type 2		Type		Type		Type	

Bentonite Seal:

From	To	From	To	From	To	From	To
None		4.0	6.0				
Type		Type Cuttings		Type		Type	

Sand Pack:

From	To	From	To	From	To	From	To
6.0	21.2						
Type		Type		Type		Type	

PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	**Black Mesa / Kayenta**
Monitor Well Name:	**ALUV104R**
Geologic Unit Monitored:	Alluvium
Ground surface Elevation:	6273.18 (ft-amsi)

Location: Mine Coordinates	**N**	-52237.17				**E**	24381.69			
	S					**W**				
		¼		¼	**S**		**T**		**R**	

Drilling Date:	Start	08/06/88
	Finish	08/06/88
Drilled by:		Winnek Drilling Co.
Logged by:		T. Smith
Geophysically Logged by:		None
Total Depth Drilled:		23.6 ft

FORMATION RECORD

DEPTH (ft) FROM	TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	12.0	Brown silty sand (fine to coarse grained) with minor gravel, damp at 7 feet
12.0	14.0	Dark brown silty sand (fine to medium grained) with little gravel, wet
14.0	20.5	Dark brown silty sand (fine to coarse grained) with considerable gravel
20.5	21.6	Dark brown gravel with silt and sand
21.6	23.6	Gray clayey, silty sand (fine to medium grained) with pieces of sandstone
	23.6	T.D. Bedrock

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PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV104R

Type of Drilling: Hollow stem auger
Drilling Fluid: None
Total Depth: 23.6 ft
Lithologic Unit Monitored: Alluvium
Completion Date: 08/06/88

Borehole Diameter:

Surface:	8.0-inch	**From:**	0.0	**To:**	13.7
Intermediate:		**From:**		**To:**	
Production Zone:	8.0-inch	**From:**	13.7	**To:**	23.6

Casing Specifications: Blank

1. **Surface:** 2-inch schedule 40 PVC (Triloc)
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 2-inch schedule 40 PVC (Triloc) screen with 0.020-inch slots
2. **Type:**

Blank Intervals:

From	To	From	To	From	To	From	To	From	To
0.0	13.7	22.7	23.6						

Perforated Intervals:

From	To	From	To	From	To	From	To	From	To
13.7	22.7								

Length Per Casing Section That is Not Perforated:

Cement Seal:

From	To	From	To	From	To	From	To	From	To
0.0	3.5								
Type	Portland Type 2	**Type**		**Type**		**Type**		**Type**	

Bentonite Seal:

From	To	From	To	From	To	From	To	From	To
None		3.5	12.0						
Type		**Type**	Cuttings	**Type**		**Type**		**Type**	

Sand Pack:

From	To	From	To	From	To	From	To	From	To
12.0	23.6								
Type		**Type**		**Type**		**Type**		**Type**	

APPROVED JUN 2000

PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	Black Mesa / Kayenta
Monitor Well Name:	**ALUV105R**
Geologic Unit Monitored:	Alluvium
Ground surface Elevation:	6383.98 (ft-amsi)

Location: Mine Coordinates	N	-52680.23			E		32336.95	
	S				W			
		¼		¼	S		T		R

Drilling Date:	Start	08/06/88
	Finish	08/06/88
Drilled by:		Winnek Drilling Co
Logged by:		T. Smith
Geophysically Logged by:		None
Total Depth Drilled:		10.2 ft

FORMATION RECORD

DEPTH (ft) FROM	TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	4.0	Brown silty sand (fine to coarse grained) with some gravel
4.0	10.2	Brown slightly clayey silty sand (fine to coarse grained) with gravel and cobbles, some moisture
	10.2	T.D. Bedrock

APPROVED JUN 2000

PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV105R

Type of Drilling: Hollow Stem Auger
Drilling Fluid: None
Total Depth: 10.2 ft
Lithologic Unit Monitored: Alluvium
Completion Date: 08/06/88

Borehole Diameter:

Surface:	8.0-inch	**From:**	0.0	**To:**	5.3
Intermediate:		**From:**		**To:**	
Production Zone:	8.0-inch	**From:**	5.3	**To:**	10.2

Casing Specifications: Blank

1. **Surface:** 2-inch schedule 40 PVC (Triloc)
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 2-inch schedule 40 PVC (Triloc) screen with 0.020-inch slots
2. **Type:**

Blank Intervals:

From	To	From	To	From	To	From	To
0.0	5.3	9.3	10.2				

Perforated Intervals:

From	To	From	To	From	To	From	To
5.3	9.3						

Length Per Casing Section That is Not Perforated:

Cement Seal:

From	To	From	To	From	To	From	To
0.0	4.0						
Type: Portland Type		Type:		Type:		Type:	

Bentonite Seal:

From	To	From	To	From	To	From	To
None							
Type:		Type:		Type:		Type:	

Sand Pack:

From	To	From	To	From	To	From	To
4.0	10.2						
Type:		Type:		Type:		Type:	

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PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	Black Mesa / Kayenta
Monitor Well Name:	**ALUV106R**
Geologic Unit Monitored:	Alluvium
Ground surface Elevation:	6423.13 (ft-amsi)

Location: Mine Coordinates	N	-50663.07				E	33738.64			
	S					W				
		¼		¼	S		T		R	

Drilling Date:	Start	08/06/88
	Finish	08/06/88
Drilled by:		Winnek Drilling Co.
Logged by:		T. Smith
Geophysically Logged by:		None
Total Depth Drilled:		8.2 ft

FORMATION RECORD

DEPTH (ft) FROM	TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	5.0	Tan silty sand (fine to medium grained) with gravel and coal pieces
5.0	7.5	Brown silty sand (fine to coarse grained), wet at 7 feet
7.5	8.2	Gray clayey silt with some gravel
	8.2	T.D. Bedrock

APPROVED JUN 2000

PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV106R

Type of Drilling: Hollow Stem Auger
Drilling Fluid: None
Total Depth: 8.2 ft
Lithologic Unit Monitored: Alluvium
Completion Date: 08/06/88

Borehole Diameter:

Surface:	8.0-inch	**From:**	0.0	**To:**	3.3
Intermediate:		**From:**		**To:**	
Production Zone:	8.0-inch	**From:**	3.3	**To:**	8.2

Casing Specifications: Blank

1. **Surface:** 2-inch schedule 40 PVC (Triloc)
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 2-inch schedule 40 PVC (Triloc) screen with 0.020-inch slots
2. **Type:**

Blank Intervals:

From	To	From	To	From	To	From	To	From	To
0.0	3.3	7.3	8.2						

Perforated Intervals:

From	To	From	To	From	To	From	To	From	To
3.3	7.3								

Length Per Casing Section That is Not Perforated:

Cement Seal:

From	To	From	To	From	To	From	To	From	To
0.0	3.0								
Type Portland Type 2		**Type**		**Type**		**Type**		**Type**	

Bentonite Seal:

From	To	From	To	From	To	From	To	From	To
None									
Type		**Type**		**Type**		**Type**		**Type**	

Sand Pack:

From	To	From	To	From	To	From	To	From	To
3.0	8.2								
Type		**Type**		**Type**		**Type**		**Type**	

APPROVED JUN 2000

PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	Black Mesa / Kayenta
Monitor Well Name:	**ALUV108R**
Geologic Unit Monitored:	Alluvium
Ground surface Elevation:	6917.68 (ft-amsi)

Location: Mine Coordinates	N	-38637.21				E	74658.13			
	S					W				
		¼		¼	S		T		R	

Drilling Date:	Start	08/10/88
	Finish	08/10/88
Drilled by:		Winnek Drilling Co.
Logged by:		J. Ohlman
Geophysically Logged by:		None
Total Depth Drilled:		20.5 ft

FORMATION RECORD

DEPTH (ft) FROM	TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	1.0	Light medium brown sand (fine to medium grained), moist
1.0	5.0	Medium brown gravel and sand (medium to coarse grained), moist
5.0	7.0	Medium dark brown silty sand, (medium to coarse grained), wet at 6 feet
7.0	8.0	Clayey silt with organics, dry
8.0	14.0	Tan gray clay with organics
14.0	19.0	Medium tan brown clayey silt, saturated
19.0	20.5	Light tan to brown clay, balls up on auger
	20.5	T.D.

APPROVED JUN 2008

PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV108R

Type of Drilling: Hollow Stem Auger
Drilling Fluid: None
Total Depth: 20.5 ft
Lithologic Unit Monitored: Alluvium
Completion Date: 08/10/88

Borehole Diameter:

Surface:	8.0-inch	**From:**	0.0	**To:**	5.6
Intermediate:		**From:**		**To:**	
Production Zone:	8.0-inch	**From:**	5.6	**To:**	20.5

Casing Specifications: Blank

1. **Surface:** 2-inch schedule 40 PVC (Triloc)
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 2-inch schedule 40 PVC (Triloc) screen with 0.020-inch slots
2. **Type:**

Blank Intervals:

From	To	From	To	From	To	From	To	From	To
0.0	5.6	9.6	10.6	19.6	20.5				

Perforated Intervals:

From	To	From	To	From	To	From	To	From	To
5.6	9.6	10.6	19.6						

Length Per Casing Section That is Not Perforated:

Cement Seal:

From	To	From	To	From	To	From	To	From	To
0.0	4.0								
Type	Portland Type 2	Type		Type		Type		Type	

Bentonite Seal:

From	To	From	To	From	To	From	To	From	To
None									
Type		Type		Type		Type		Type	

Sand Pack:

From	To	From	To	From	To	From	To	From	To
4.0	20.5								
Type		Type		Type		Type		Type	

APPROVED JUN 2000

PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	Black Mesa / Kayenta
Monitor Well Name:	**ALUV109R**
Geologic Unit Monitored:	Alluvium
Ground surface Elevation:	6830 (ft-amsi)

Location: Mine Coordinates	N	-43985				E	68300			
	S					W				
		¼		¼	S		T		R	

Drilling Date:	Start	08/09/88
	Finish	08/10/88
Drilled by:		Winnek Drilling Co.
Logged by:		J. Ohlman
Geophysically Logged by:		None
Total Depth Drilled:		76.0 ft

FORMATION RECORD

DEPTH (ft) FROM	TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	3.0	Medium tan brown silty sand (fine grained) with some gravel at 3 feet
3.0	18.0	Silty sand, gravel at 7.5 feet, clay lenses 9-13 feet, wet
18.0	23.0	Medium gray brown clayey silt with minor gravel
23.0	33.0	Clayey silt , increasing clay to silty clay at 30 feet, saturated
33.0	58.0	Light tan brown silt with minor clay and sand (fine grained)
58.0	63.0	Medium dark gray tan silty clay, with minor sand (fine to medium grained)
63.0	75.0	Dark gray clay with minor silt, few fine grained sand lenses
75.0	76.0	Varicolored gravel (coarse grained)
	76.0	T.D. Yellow to green-white bedrock, sandstone (medium grained)

APPROVED JUN 2000

PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV109R

Type of Drilling: Hollow Stem Auger
Drilling Fluid: None
Total Depth: 76.0 ft
Lithologic Unit Monitored: Alluvium
Completion Date: 08/10/88

Borehole Diameter:

Surface:	8.0-inch	**From:**	0.0	**To:**	16.0
Intermediate:		**From:**		**To:**	
Production Zone:	8.0-inch	**From:**	16.0	**To:**	45.0
		From:	45.0	**To:**	76.0

Casing Specifications: Blank

1. **Surface:** 2-inch schedule 40 PVC (Triloc)
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 2-inch schedule 40 PVC (Triloc) screen with 0.020-inch slots
2. **Type:**

Blank Intervals:

From 0.0	To 16.0	From 25.0	To 26.0	From 35.0	To 36.0	From 45.0	To 76.0
From	To	From	To	From	To	From	To

Perforated Intervals:

From 16.0	To 25.0	From 26.0	To 35.0	From 36.0	To 45.0	From	To
From	To	From	To	From	To	From	To

Length Per Casing Section That is Not Perforated:

Cement Seal:

From 0.0	To 4.0	From	To	From	To	From	To
Type Portland Type 2		Type		Type		Type	

Bentonite Seal:

From None	To	From 4.0	To 7.5	From 69.0	To 76.0	From	To
Type		Type Cuttings		Type Cuttings		Type	

Sand Pack:

From 7.5	To 69.0	From	To	From	To	From	To
Type		Type		Type		Type	

APPROVED JUN 2000

PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	Black Mesa / Kayenta
Monitor Well Name:	**ALUV164**
Geologic Unit Monitored:	Alluvium
Ground surface Elevation:	6465.65 (ft-amsi)

Location: Mine Coordinates	N	-55516.58				E	36667.97			
	S					W				
		¼		¼	S		T		R	

Drilling Date:	Start	08/06/88
	Finish	08/06/88
Drilled by:		Winnek Drilling Co.
Logged by:		T. Smith
Geophysically Logged by:		None
Total Depth Drilled:		9.7 ft

FORMATION RECORD

DEPTH (ft) FROM	TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	7.0	Tan silty sand (fine to medium grained) with gravel
7.0	9.0	Brown silty sand (fine to coarse grained) with considerable gravel, damp
9.0	9.7	Brown silty sand (fine to coarse grained) with considerable gravel, wet
	9.7	T.D. Bedrock

APPROVED JUN 2000

PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV164

Type of Drilling: Hollow Stem Auger
Drilling Fluid: None
Total Depth: 9.7 ft
Lithologic Unit Monitored: Alluvium
Completion Date: 08/06/88

Borehole Diameter:

Surface:	8.0-inch	**From:**	0.0	**To:**	4.8
Intermediate:		**From:**		**To:**	
Production Zone:	8.0-inch	**From:**	4.8	**To:**	9.7

Casing Specifications: Blank

1. **Surface:** 2-inch schedule 40 PVC (Triloc)
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 2-inch schedule 40 PVC (Triloc) screen with 0.020-inch slots
2. **Type:**

Blank Intervals:

From	To	From	To	From	To	From	To	From	To
0.0	4.8	8.8	9.7						

Perforated Intervals:

From	To	From	To	From	To	From	To	From	To
4.8	8.8								

Length Per Casing Section That is Not Perforated:

Cement Seal:

From	To	From	To	From	To	From	To
0.0	3.0						
Type: Portland Type 2		Type:		Type:		Type:	

Bentonite Seal:

From	To	From	To	From	To	From	To
None							
Type:		Type:		Type:		Type:	

Sand Pack:

From	To	From	To	From	To	From	To
3.0	9.7						
Type:		Type:		Type:		Type:	

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PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	**Black Mesa / Kayenta**
Monitor Well Name:	**ALUV165**
Geologic Unit Monitored:	Alluvium
Ground surface Elevation:	6591.79 (ft-amsi)

Location: Mine Coordinates	**N**	-25672.86				**E**	53223.84			
	S					**W**				
		¼		¼	**S**		**T**		**R**	

Drilling Date:	Start	08/08/88
	Finish	08/08/88
Drilled by:		Winnek Drilling Co.
Logged by:		T. Smith / J. Ohlman
Geophysically Logged by:		None
Total Depth Drilled:		54.0 ft

FORMATION RECORD

DEPTH (ft) FROM	TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	15.0	Tan sandy silt (fine to coarse grained) with some gravel
15.0	20.0	Tan sandy silt (fine to coarse grained) with more gravel
20.0	43.0	Brown sandy gravel with silt
43.0	54.0	Brown silty clay (fine to coarse grained) with organics and sand, wet
	54.0	T.D. Bedrock

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PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV165

Type of Drilling: Hollow Stem Auger
Drilling Fluid: None
Total Depth: 54.0 ft
Lithologic Unit Monitored: Alluvium
Completion Date: 08/08/88

Borehole Diameter:

Surface:	8.0-inch	**From:**	0.0	**To:**	44.1
Intermediate:		**From:**		**To:**	
Production Zone:	8.0-inch	**From:**	44.1	**To:**	54.0

Casing Specifications: Blank

1. **Surface:** 2-inch schedule 40 PVC (Triloc)
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 2-inch schedule 40 PVC (Triloc) screen with 0.020-inch slots
2. **Type:**

Blank Intervals:

From	To	From	To	From	To	From	To
0.0	44.1	53.1	54.0				

Perforated Intervals:

From	To	From	To	From	To	From	To
44.1	53.1						

Length Per Casing Section That is Not Perforated:

Cement Seal:

From	To	From	To	From	To	From	To
0.0	6.0						
Type: Portland Type 2		Type:		Type:		Type:	

Bentonite Seal:

From	To	From	To	From	To	From	To
None		6.0	35.0				
Type:		Type: Cuttings		Type:		Type:	

Sand Pack:

From	To	From	To	From	To	From	To
35.0	54.0						
Type:		Type:		Type:		Type:	

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PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	Black Mesa / Kayenta
Monitor Well Name:	**ALUV168**
Geologic Unit Monitored:	Alluvium
Ground surface Elevation:	6865.98 (ft-amsi)

Location: Mine Coordinates	N	-40742.81				E	72175.9		
	S					W			
		¼		¼	S		T		R

Drilling Date:	Start	04/23/92
	Finish	04/23/92
Drilled by:		Winnek Drilling Co.
Logged by:		T. Smith
Geophysically Logged by:		None
Total Depth Drilled:		53.0 ft

FORMATION RECORD

DEPTH (ft) FROM	TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	5.0	Brown silty sand (fine to medium grained) with rock fragments
5.0	6.5	Dark brown silty sand (wet)
6.5	11.0	Same as above, wet
11.0	15.0	Black brown slightly clayey silty sand (fine to medium grained)
15.0	21.0	Gray sandy (fine to medium grain) silt with occasional pieces of gravel
21.0	25.0	Gray sandy (fine to coarse grain) silt
25.0	31.0	Same as above with occasional pieces of angular gravel
31.0	35.0	Gray gravelly, sandy silt
35.0	43.0	Gray sandy (fine to coarse grained) silt with occasional pieces of gravel
43.0	52.5	Same as above with more pieces of gravel
52.5	53.0	Gray very gravelly, sandy silt and bedrock
	53.0	T.D.

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PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV168

Type of Drilling: Auger
Drilling Fluid: None
Total Depth: 53.0 ft
Lithologic Unit Monitored: Alluvium
Completion Date: 04/23/92

Borehole Diameter:

Surface:	12.0-inch	**From:**	0.0	**To:**	10.0
Intermediate:		**From:**		**To:**	
Production Zone:	12.0-inch	**From:**	10.0	**To:**	53.0

Casing Specifications: Blank

1. **Surface:** 4-inch schedule 40 PVC casing
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 4-inch schedule 40 PVC screen, 3 columns 0.020-inch horizontal mill slots spaced ¼ inch apart vertically
2. **Type:**

Blank Intervals:

From	0.0	To	10.0	From		To		From		To	
From		To		From		To		From		To	

Perforated Intervals:

From	10.0	To	53.0	From		To		From		To	
From		To		From		To		From		To	

Length Per Casing Section That is Not Perforated:

Cement Seal:

From	0.0	To	6.0	From		To		From		To	
Type	Portland Type 2	Type		Type		Type		Type			

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PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV168

Sand Pack:

From 8.0 To 53.0 From 6.0 To 8.0 From ____ To ____ From ____ To ____

Type CO silica 8-16 Type Alluvium Type ____ Type ____

Packers:

Locations: None

Type:

Centralizers:

Locations: None

Type:

Bentonite Seal:

From None To ____ From ____ To ____ From ____ To ____ From ____ To ____

Type ____ Type ____ Type ____ Type ____

Casing Height Above Ground Surface: Even with ground surface

Protective Casing Housing: Type ____ Dimensions ____

Additional Details:

Development Summary:

Type:

Duration:

Dates of Development:

Development Comments:

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PEABODY WESTERN COAL COMPANY
MONITOR WELL CASING AND SCREEN RECORD

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV168

Casing Joint Number	Blank Casing Length (ft)	Screen Length (ft)	Cumulative Length (ft)	Depth Interval (feet below ground surface)	
				From	To
1	10		10	0.0	10.0
2		10	20	10.0	20.0
3		10	30	20.0	30.0
4		10	40	30.0	40.0
5		10	50	40.0	50.0
6		3	53	50.0	53.0

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PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	Black Mesa / Kayenta
Monitor Well Name:	**ALUV169**
Geologic Unit Monitored:	Alluvium
Ground surface Elevation:	6837.89 (ft-amsi)

Location: Mine Coordinates	N	-43948.24				E	68338.8		
	S					W			
		¼		¼	S		T		R

Drilling Date:	Start	04/24/92
	Finish	04/24/92
Drilled by:		Winnek Drilling Co.
Logged by:		T. Smith
Geophysically Logged by:		None
Total Depth Drilled:		74.0 ft

FORMATION RECORD

DEPTH (ft) FROM	TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	2.0	Brown sand (fine to medium grained)
2.0	6.0	Dark brown, same as above
6.0	8.0	Tan brown very sandy (fine to medium grained) silt with pieces of gravel
8.0	11.0	Dark brown very silty sand (fine to coarse grained) with considerable gravel
11.0	17.0	Tan brown sandy (fine to medium grained) silty clay
17.0	21.0	Tan brown sandy (fine to coarse grained) silty clay with considerable gravel wet
21.0	27.0	Tan brown sandy (fine to coarse grained) silty clay with considerable gravel
27.0	30.0	Tan brown sandy clayey silt with some angular gravel
30.0	35.0	Tan brown sandy (medium to coarse grained) silty clay with considerable angular gravel
35.0	42.0	Tan brown sandy (medium to coarse grained) clayey silt with some angular gravel
42.0	50.0	Tan brown sandy silty clay with angular gravel
50.0	57.0	Tan brown sandy very clayey silt with some angular gravel
57.0	61.0	Tan brown slightly sandy (medium to coarse grained) silty clay
61.0	66.0	Tan brown slightly sandy (medium to coarse grained) clayey silt
66.0	70.0	Slightly gray (fine to medium grained) very clayey silt
70.0	74.0	Gray slightly sandy (fine to medium grained) clayey silt
	74.0	T.D.

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PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV169

Type of Drilling: Hollow stem auger
Drilling Fluid: None
Total Depth: 74.0 ft
Lithologic Unit Monitored: Alluvium
Completion Date: 04/24/92

Borehole Diameter:

Surface:	12.0-inch	**From:**	0.0	**To:**	14.0
Intermediate:		**From:**		**To:**	
Production Zone:	12.0-inch	**From:**	14.0	**To:**	74.0

Casing Specifications: Blank

1. **Surface:** 2-inch schedule 40 PVC casing
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 2-inch schedule 40 PVC screen, 3 columns of 0.020-inch horizontal mill slots spaced 1/4 inch apart vertically
2. **Type:**

Blank Intervals:

From 0.0 To 14.0 From ____ To ____ From ____ To ____ From ____ To ____
From ____ To ____ From ____ To ____ From ____ To ____ From ____ To ____

Perforated Intervals:

From 14.0 To 74.0 From ____ To ____ From ____ To ____ From ____ To ____
From ____ To ____ From ____ To ____ From ____ To ____ From ____ To ____

Length Per Casing Section That is Not Perforated:

Cement Seal:

From 0.0 To 6.0 From ____ To ____ From ____ To ____ From ____ To ____
Type Portland Type 2 Type ____ Type ____ Type ____

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PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV169

Sand Pack:

From 8.0 To 74.0 From 6.0 To 8.0 From _____ To _____ From _____ To _____

Type CO silica 8-16 Type Alluvium Type _____ Type _____

Packers:

Locations: None

Type:

Centralizers:

Locations: None

Type:

Bentonite Seal:

From None To _____ From _____ To _____ From _____ To _____ From _____ To _____

Type _____ Type _____ Type _____ Type _____

Casing Height Above Ground Surface

Protective Casing Housing: Type _____ Dimensions _____

Additional Details:

Development Summary:

Type:

Duration:

Dates of Development:

Development Comments:

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PEABODY WESTERN COAL COMPANY
MONITOR WELL CASING AND SCREEN RECORD

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV169

Casing Joint Number	Blank Casing Length (ft)	Screen Length (ft)	Cumulative Length (ft)	Depth Interval (feet below ground surface)	
				From	To
1	5		5	+1.0	4.0
2	10		15	4.0	14.0
3		10	25	14.0	24.0
4		10	35	24.0	34.0
5		10	45	34.0	44.0
6		10	55	44.0	54.0
7		10	65	54.0	64.0
8		10	75	64.0	74.0

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PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	Black Mesa / Kayenta
Monitor Well Name:	**ALUV170**
Geologic Unit Monitored:	Alluvium
Ground surface Elevation:	6820.27 (ft-amsi)

Location: Mine Coordinates	N	-46129.49				E	67076.44			
	S					W				
		¼		¼	S		T		R	

Drilling Date:	Start	04/24/92
	Finish	04/24/92
Drilled by:		Winnek Drilling Co.
Logged by:		T. Smith
Geophysically Logged by:		None
Total Depth Drilled:		42.0 ft

FORMATION RECORD

DEPTH (ft) FROM	TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	5.0	Brown clayey very silty sand (fine to medium grained)
5.0	8.0	Tan brown clayey silty sand (fine to coarse grained) with considerable angular gravel wet
8.0	14.0	Tan clayey sandy (fine to coarse grained) silt with considerable angular gravel
14.0	21.0	Tan sandy (fine to medium grained) clayey silt with some angular gravel
21.0	25.0	Tan slightly sandy silty clay with some angular gravel
25.0	29.0	Tan slightly sandy clayey silt with angular gravel
29.0	37.0	Tan slightly sandy very silty clay with some angular gravel
37.0	40.0	Brown sandy (fine grained) clayey silt
40.0	41.0	Brown sandy (fine to coarse grained) clayey silt with some small angular gravel
41.0	41.5	Brown sand (fine to medium grained) with pieces of coal and clinker
41.5	42.0	Sandstone bedrock
	42.0	T.D.

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PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV170

Type of Drilling: Hollow Stem Auger
Drilling Fluid: None
Total Depth: 42.0 ft
Lithologic Unit Monitored: Alluvium
Completion Date: 04/24/92

Borehole Diameter:

Surface:	8.0-inch	**From:**	0.0	**To:**	7.0
Intermediate:		**From:**		**To:**	
Production Zone:	8.0-inch	**From:**	7.0	**To:**	42.0

Casing Specifications: Blank

1. **Surface:** 2-inch schedule 40 PVC
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 2-inch schedule 40 PVC screen, 3 columns of 0.020-inch horizontal mill slots ¼ inch apart vertically
2. **Type:**

Blank Intervals:

From	0.0	To	7.0	From		To		From		To	
From		To		From		To		From		To	

Perforated Intervals:

From	7.0	To	42.0	From		To		From		To	
From		To		From		To		From		To	

Length Per Casing Section That is Not Perforated:

Cement Seal:

From	0.0	To	5.5	From		To		From		To	
Type	Portland Type 2	Type		Type		Type		Type			

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PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV170

Sand Pack:

From 6.0 To 42.0 From _____ To _____ From _____ To _____ From _____ To _____

Type CO silica 8-16 Type _____ Type _____ Type _____

Packers:

Locations: None

Type:

Centralizers:

Locations: None

Type:

Bentonite Seal:

From None To _____ From 5.5 To 6.0 From _____ To _____ From _____ To _____

Type _____ Type Alluvium Type _____ Type _____

Casing Height Above Ground Surface

Protective Casing Housing: Type _____ Dimensions _____

Additional Details:

Development Summary:

Type:

Duration:

Dates of Development:

Development Comments:

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PEABODY WESTERN COAL COMPANY
MONITOR WELL CASING AND SCREEN RECORD

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV170

Casing Joint Number	Blank Casing Length (ft)	Screen Length (ft)	Cumulative Length (ft)	Depth Interval (feet below ground surface)	
				From	To
1	8		8	+1.0	7.0
2		10	18	7.0	17.0
3		10	28	17.0	27.0
4		10	38	27.0	37.0
5		5	43	37.0	42.0

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PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	Black Mesa / Kayenta
Monitor Well Name:	**ALUV172**
Geologic Unit Monitored:	Alluvium
Ground surface Elevation:	6159.9 (ft-amsi)

Location: Mine Coordinates	N	-43120.5					E	20076.92		
	S						W			
		¼		¼	S		T		R	

Drilling Date:	Start	04/27/92
	Finish	06/15/92
Drilled by:		Winnek Drilling Co.
Logged by:		T. Smith / J. Ohlman
Geophysically Logged by:		None
Total Depth Drilled:		81.5 ft

FORMATION RECORD

DEPTH (ft) FROM	TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	1.0	Tan (fine to coarse grained) sandy gravel
1.0	4.0	Brown gravelly, sandy silt
4.0	5.0	Brown sandy (fine to coarse grained) gravel
5.0	10.0	Brown very gravelly sand
10.0	20.0	Brown very gravelly silty sand
20.0	26.0	Dark brown sandy (fine to coarse grained) clayey silt, wet
26.0	30.0	Dark brown clayey silty sand
30.0	36.0	Dark brown very sandy silt with pieces of angular gravel
36.0	81.5	Dark brown clayey sandy silt with pieces of angular gravel
	81.5	T.D.

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PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV172

Type of Drilling: Mud Rotary *
Drilling Fluid: Revert Mud
Total Depth: 81.5 ft
Lithologic Unit Monitored: Alluvium
Completion Date: 06/15/92

* *Could not get auger through gravel/cobble zone at ≈ 40 ft in April*

Borehole Diameter:

Surface:	8.0-inch	**From:**	0.0	**To:**	21.5
Intermediate:		**From:**		**To:**	
Production Zone:	8.0-inch	**From:**	21.5	**To:**	81.5

Casing Specifications: Blank

1. **Surface:** 4-inch schedule 40 PVC
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 4-inch schedule 40 PVC screen, 3 columns of 0.020-inch horizontal mill slots placed at 1/4 inch apart vertically
2. **Type:**

Blank Intervals:

From	0.0	To	21.5	From		To		From		To	
From		To		From		To		From		To	

Perforated Intervals:

From	21.5	To	81.5	From		To		From		To	
From		To		From		To		From		To	

Length Per Casing Section That Is Not Perforated: 2 inches

Cement Seal:

From	0.0	To	6.0	From		To		From		To	
Type	Portland Type 2	Type				Type		Type			

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PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV172

Sand Pack:

From 15.0 To 81.5 From ____ To ____ From ____ To ____ From ____ To ____

Type CO silica 8-16 Type ____ Type ____ Type ____

Packers:

Locations: None

Type:

Centralizers:

Locations: None

Type:

Bentonite Seal: None

From 6.0 To 15.0 From ____ To ____ From ____ To ____ From ____ To ____

Type Alluvium Type ____ Type ____ Type ____

Casing Height Above Ground Surface

Protective Casing Housing: Type ____ Dimensions ____

Additional Details:

Development Summary:

Type:

Duration:

Dates of Development:

Development Comments:

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PEABODY WESTERN COAL COMPANY
MONITOR WELL CASING AND SCREEN RECORD

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV172

Casing Joint Number	Blank Casing Length (ft)	Screen Length (ft)	Cumulative Length (ft)	Depth Interval (feet below ground surface)	
				From	To
1	1.9		1.9	+0.4	1.5
2	10		11.9	1.5	11.5
3	10		21.9	11.5	21.5
4		10	31.9	21.5	31.5
5		10	41.9	31.5	41.5
6		10	51.9	41.5	51.5
7		10	61.9	51.5	61.5
8		10	71.9	61.5	71.5
9		10	81.9	71.5	81.5

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PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	Black Mesa / Kayenta
Monitor Well Name:	**ALUV173**
Geologic Unit Monitored:	Alluvium
Ground surface Elevation:	6694.3 (ft-amsi)

Location: Mine Coordinates	N	7139.1		E	17908.19	
	S			W		
		¼	¼	S	T	R

Drilling Date:	Start	04/29/92
	Finish	04/29/92
Drilled by:		Winnek Drilling Co.
Logged by:		J. Ohlman
Geophysically Logged by:		None
Total Depth Drilled:		23.0 ft

FORMATION RECORD

DEPTH (ft) FROM	TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	4.0	Medium tan brown sandy (medium to coarse grained) silty gravel (1-2") dry
4.0	11.0	As above, considerable gravel (>1-2") damp at 3 feet *Note:* gravel is rounded. Water at 11 feet
11.0	15.0	Gray brown sandy (medium to coarse grained) silty, gravel (>10%) minor clay, wet
15.0	20.0	Gray brown sand, (fine to medium grained) minor silt, minor gravel, (<10%) clay +1-
20.0	23.0	Medium dark gray clay and medium brown silty sand (fine to medium grained) wet. Coarse gravel layers at 22 feet, clay increased dramatically at 21-21.5 feet. Probable bedrock. Split spoon sample 23.0-24.0 carbonaceous shale
	23.0	T.D. Backfilled hole to 21.0 ft with bentonite pellets

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PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV173

Type of Drilling: 12" Hollow Stem Auger
Drilling Fluid: None
Total Depth: 23.0 ft
Lithologic Unit Monitored: Alluvium
Completion Date: 04/29/92

Borehole Diameter:

Surface:	8.0-inch	**From:**	0.0	**To:**	11.0
Intermediate:		**From:**		**To:**	
Production Zone:	8.0-inch	**From:**	11.0	**To:**	21.0

Casing Specifications: Blank

1. **Surface:** 4-inch schedule 40 PVC casing
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 4-inch schedule 40 PVC, 3 columns of 0.020-inch horizontal mill slots spaced ¼ inch vertically
2. **Type:**

Blank Intervals:

From	0.0	To	11.0	From		To		From		To	
From		To		From		To		From		To	

Perforated Intervals:

From	11.0	To	21.0	From		To		From		To	
From		To		From		To		From		To	

Length Per Casing Section That is Not Perforated:

Cement Seal:

From	0.0	To	6.0	From		To		From		To	
Type	Portland Type 2	Type				Type		Type			

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PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV173

Sand Pack:

From 6.0 To 23.0 From 5.0 To 6.0 From _____ To _____ From _____ To _____

Type CO silica 8-16 Type Alluvial fill Type _____ Type _____

Packers:

Locations: None

Type:

Centralizers:

Locations: None

Type:

Bentonite Seal:

From 21.0 To 23.0 From _____ To _____ From _____ To _____ From _____ To _____

Type Pellets Type _____ Type _____ Type _____

Casing Height Above Ground Surface

Protective Casing Housing: Type _____ Dimensions _____

Additional Details:

Development Summary:

Type:

Duration:

Dates of Development:

Development Comments:

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PEABODY WESTERN COAL COMPANY
MONITOR WELL CASING AND SCREEN RECORD

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV173

Casing Joint Number	Blank Casing Length (ft)	Screen Length (ft)	Cumulative Length (ft)	Depth Interval (feet below ground surface)	
				From	To
1	4		4	+3.0	1.0
2	10		14	1.0	11.0
3		10	24	11.0	21.0

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PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	Black Mesa / Kayenta
Monitor Well Name:	**SWEPO175**
Geologic Unit Monitored:	Underburden
Ground surface Elevation:	6576.62 (ft-amsi)

Location: Mine Coordinates	N	-881.73			E	17714.25		
	S				W			
		Y		X	S		T		R	

Drilling Date:	Start	06/16/92
	Finish	06/16/92
Drilled by:		Winnek Drilling Co.
Logged by:		T. Smith
Geophysically Logged by:		None
Total Depth Drilled:		90.0 ft

FORMATION RECORD

DEPTH (ft) FROM	TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	11.0	Black brown fine to medium grained, very sandy, gravelly clay
11.0	15.0	Black brown silt, very clayey sand (fine to coarse grained) with gravel and pieces of coal
15.0	20.0	Black brown slightly silty fine to coarse sand and gravel, piece of coal
20.0	32.0	Black brown clayey silty sandy gravel with pieces of siltstone, mudstone, and coal
32.0	40.0	Boulders
40.0	50.0	Same as above with silty, very clayey sandy gravel and boulders, more mudstone and coal
50.0	56.5	Same as above with siltstone
56.5	69.0	Gray siltstone
69.0	75.0	Gray mudstone
75.0	76.5	Coal
76.5	90.0	gray mudstone
	90.0	T.D.

PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

...ne:	Black Mesa / Kayenta	Monitor Well Name:	SWEPO175

Type of Drilling: Air Rotary
Drilling Fluid: Foam
Total Depth: 86.1 ft
Note: Lost 3.9 ft with hole fill-in

Lithologic Unit Monitored: Shallow Wepo beneath spoil
Completion Date: 06/16/92

Borehole Diameter:

Surface:	6 ¾ inch	**From:**	0.0	**To:**	51.0
Intermediate:		**From:**		**To:**	
Production Zone:	6 ¾ inch	**From:**	51.0	**To:**	86.1

Casing Specifications: Blank

1. **Surface:** 4-inch schedule 40 PVC
2. **Intermediate:**
3. **Production Zone:**

sing Specifications: Perforated

1. **Type:** 4-inch schedule 40 PVC screen, 0.020 inch horizontal mill slots, 3 columns
2. **Type:**

Blank Intervals:

From	0.0	To	51.0	From		To		From		To	
From		To		From		To		From		To	

Perforated Intervals:

From	51.0	To	86.1	From		To		From		To	
From		To		From		To		From		To	

Length Per Casing Section That is Not Perforated:

Cement Seal:

From	0.0	To	10.0	From		To		From		To	
e	Portland Type 2	Type		Type		Type					

PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

...ne:	Black Mesa / Kayenta	Monitor Well Name:	SWEPO175

Sand Pack:

From 47.0 To 86.1 From ____ To ____ From ____ To ____ From ____ To ____

Type CO silica 8-12 Type ____ Type ____ Type ____

Packers:

Locations: None

Type:

Centralizers:

Locations: None

Type:

...ntonite Seal: pellets

From 10.0 To 47.0 From ____ To ____ From ____ To ____ From ____ To ____

Type ____ Type ____ Type ____ Type ____

Casing Height Above Ground Surface

Protective Casing Housing: Type ____ Dimensions ____

Additional Details:

Development Summary:

Type:

Duration:

Dates of Development:

Development Comments:

PEABODY WESTERN COAL COMPANY
MONITOR WELL CASING AND SCREEN RECORD

Mine:	Black Mesa / Kayenta	Monitor Well Name:	SWEPO175

Casing Joint Number	Blank Casing Length (ft)	Screen Length (ft)	Cumulative Length (ft)	Depth Interval (feet below ground surface)	
				From	To
1	4		4	+3.0	1.0
2	10		14	1.0	11.0
3	10		24	11.0	21.0
4	10		34	21.0	31.0
5	10		44	31.0	41.0
6	10		54	41.0	51.0
7		5	59	51.0	56.0
8		10	69	56.0	66.0
9		10	79	66.0	76.0
10		10	89	76.0	86.0

PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	Black Mesa / Kayenta
Monitor Well Name:	**SWEPO179**
Geologic Unit Monitored:	Underburden
Ground surface Elevation:	6568.12 (ft-amsi)

Location: Mine Coordinates	N	-2435.28			E	18428.06		
	S				W			
		Y		S		T		R

Drilling Date:	Start	06/17/92
	Finish	06/17/92
Drilled by:		PCC / Winnek Drilling Co.
Logged by:		J. Ohlman
Geophysically Logged by:		None
Total Depth Drilled:		80.0 ft

FORMATION RECORD

DEPTH (ft) FROM	TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	36.0	Spoil, brown tan, loose with sand (fine to coarse grained) and coal fragments *Note:* started foam at 10 ft, lost circulation 22-34 ft, no cuttings 22-36 ft
36.0	55.0	Very hard at 50-55 ft, no cuttings, possible coal at 55 ft
55.0	64.0	Continuing with possible coal seam, few cuttings
64.0	80.0	Soft with hard layers, few cuttings
	80.0	T.D.

PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

...ine:	Black Mesa / Kayenta	Monitor Well Name:	SWEPO179

Type of Drilling: 6 ¾ inch Air Rotary
Drilling Fluid: Foam
Total Depth: 80.0 ft
Lithologic Unit Monitored: Underburden
Completion Date: 06/17/92

Borehole Diameter:

Surface:	6 ¾ inch	**From:**	0.0	**To:**	34.5
Intermediate:		**From:**		**To:**	
Production Zone:	6 ¾ inch	**From:**	34.5	**To:**	79.5

Casing Specifications: Blank

1. **Surface:** 4-inch schedule 40 PVC
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 4-inch schedule 40 PVC screen, 0.020 horizontal mill slots spaced ¼ inch vertically
   3 columns
2. **Type:**

Blank Intervals:

From 0.0 To 34.5 From ____ To ____ From ____ To ____ From ____ To ____
From ____ To ____ From ____ To ____ From ____ To ____ From ____ To ____

Perforated Intervals:

From 34.5 To 79.5 From ____ To ____ From ____ To ____ From ____ To ____
From ____ To ____ From ____ To ____ From ____ To ____ From ____ To ____

Length Per Casing Section That is Not Perforated: ____

Cement Seal:

...m 0.00 To 6.0 From ____ To ____ From ____ To ____ From ____ To ____
Type Portland Type 2 Type ____ Type ____ Type ____

PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

ine:	Black Mesa / Kayenta	Monitor Well Name:	SWEPO179

Sand Pack:

From	To	From	To	From	To	From	To
30.0	79.5	79.5	80.0				
Type CO silica 8-12		Type Natural Fill		Type		Type	

Packers:

Locations: None

Type:

Centralizers:

Locations: None

Type:

'entonite Seal: Pellets

From	To	From	To	From	To	From	To
6.0	30.0						
Type volclay		Type		Type		Type	

Casing Height Above Ground Surface: 2.5 ft

Protective Casing Housing: Type BK-6 Dimensions

Additional Details:

Development Summary:

Type:

Duration:

Dates of Development:

Development Comments:

PEABODY WESTERN COAL COMPANY
MONITOR WELL CASING AND SCREEN RECORD

Mine:	Black Mesa / Kayenta	Monitor Well Name:	SWEPO179

Casing Joint Number	Blank Casing Length (ft)	Screen Length (ft)	Cumulative Length (ft)	Depth Interval (feet below ground surface)	
				From	To
1	7		7	-2.5	4.5
2	10		17	4.5	14.5
3	10		27	14.5	24.5
4	10		37	24.5	34.5
5		10	47	34.5	44.5
6		10	57	44.5	54.5
7		10	67	54.5	64.5
8		10	77	64.5	74.5
9		5	82	74.5	79.5

PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	Black Mesa / Kayenta
Monitor Well Name:	**ALUV180**
Geologic Unit Monitored:	Alluvium
Ground surface Elevation:	6534.08 (ft-amsi)

Location: Mine Coordinates	N	-2914.9				E		18574.79	
	S					W			
		¼		¼	S		T		R

Drilling Date:	Start	04/25/92
	Finish	04/25/92
Drilled by:		Winnek Drilling Co.
Logged by:		T. Smith
Geophysically Logged by:		None
Total Depth Drilled:		25.5 ft

FORMATION RECORD

DEPTH (ft) FROM	TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	3.5	Tan brown slightly silty sand (fine to medium grained) occasional pieces of gravel
3.5	5.5	Tan brown slight silty sand (fine to medium grained) with gravel and cobble layer
5.5	11.0	Same as above
11.0	17.0	Brown silty sand (fine to medium grained) with gravel and cobbles
17.0	21.0	Same as above, very moist with considerable gravel and cobbles
21.0	23.0	Dark brown sandy (fine to medium grained) silty gravel, wet
23.0	25.0	Dark brown sandy silty clay with considerable gravel
25.0	25.5	Gray weathered shale
	25.5	T.D.

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PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV180

Type of Drilling: Hollow Stem Auger
Drilling Fluid: None
Total Depth: 25.5 ft
Lithologic Unit Monitored: Alluvium
Completion Date: 04/25/92

Borehole Diameter:

Surface:	12.0-inch	**From:**	0.0	**To:**	15.5
Intermediate:		**From:**		**To:**	
Production Zone:	12.0-inch	**From:**	15.5	**To:**	25.5

Casing Specifications: Blank

1. **Surface:** 4-inch schedule 40 PVC casing
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 4-inch schedule PVC screen, 3 columns of 0.020-inch horizontal mill slots spaced ¼ inch apart vertically
2. **Type:**

Blank Intervals:

From	0.0	To	15.5	From		To		From		To	
From		To		From		To		From		To	

Perforated Intervals:

From	15.5	To	25.5	From		To		From		To	
From		To		From		To		From		To	

Length Per Casing Section That is Not Perforated: 2 inches

Cement Seal:

From	0.0	To	6.0	From		To		From		To	
Type	Portland Type 2	Type		Type		Type					

JUN 2000 APPROVED

PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV180

Sand Pack:

From 9.5 To 25.5 From 6.0 To 9.5 From _____ To _____ From _____ To _____

Type CO silica 8-16 Type Alluvial Fill Type _____ Type _____

Packers:

Locations: None

Type:

Centralizers:

Locations: None

Type:

Bentonite Seal:

From None To _____ From _____ To _____ From _____ To _____ From _____ To _____

Type _____ Type _____ Type _____ Type _____

Casing Height Above Ground Surface: 3.5 ft

Protective Casing Housing: Type _____ Dimensions _____

Additional Details:

Development Summary:

Type:

Duration:

Dates of Development:

Development Comments:

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PEABODY WESTERN COAL COMPANY
MONITOR WELL CASING AND SCREEN RECORD

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV180

Casing Joint Number	Blank Casing Length (ft)	Screen Length (ft)	Cumulative Length (ft)	Depth Interval (feet below ground surface)	
				From	To
1	9		9	+3.5	5.5
2	10		19	5.5	15.5
3		10	29	15.5	25.5

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JUN 2000

PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	Black Mesa / Kayenta
Monitor Well Name:	**ALUV181**
Geologic Unit Monitored:	Alluvium
Ground surface Elevation:	6529.58 (ft-amsi)

Location: Mine Coordinates	N	-3768.87					E	17925.05		
	S						W			
		¼		¼	S		T		R	

Drilling Date:	Start	04/25/92
	Finish	04/26/92
Drilled by:		Winnek Drilling Co.
Logged by:		T. Smith
Geophysically Logged by:		None
Total Depth Drilled:		43.0 ft

FORMATION RECORD

DEPTH (ft) FROM	TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	5.0	Brown slightly clayey sandy(fine grained) silt with occasional pieces of gravel
5.0	8.0	Tan sandy (fine grained) silt
8.0	11.0	Tan silty (fine to coarse grained) sand with occasional gravel
11.0	15.0	Brown very sandy (fine to coarse grained) silt with gravel
15.0	19.0	Tan slightly clayey very sandy (fine to medium grained) silt with occasional gravel
19.0	25.0	Brown clayey sandy silt with gravel, damp
25.0	31.0	Brown clayey sandy silt with considerable gravel
31.0	33.0	Same as above, wet
33.0	35.0	Gray clayey silty (fine to medium grained) sand
35.0	43.0	Gray black fine grained sand with clay layers
	43.0	T.D. Bedrock

APPROVED JUN 2000

PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV181

Type of Drilling: Hollow Stem Auger
Drilling Fluid: None
Total Depth: 43.0
Lithologic Unit Monitored: Alluvium
Completion Date: 04/26/92

Borehole Diameter:

Surface:	12.0-inch	**From:**	0.0	**To:**	26.0
Intermediate:		**From:**		**To:**	
Production Zone:	12.0-inch	**From:**	26.0	**To:**	43.0

Casing Specifications: Blank

1. **Surface:** 4-inch schedule 40 PVC
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 4-inch schedule 40 PVC screen, 3 columns of 0.020-inch horizontal mill slots spaced ¼ inch apart vertically
2. **Type:**

Blank Intervals:

From 0.0 To 26.0 From ____ To ____ From ____ To ____ From ____ To ____

From ____ To ____ From ____ To ____ From ____ To ____ From ____ To ____

Perforated Intervals:

From 26.0 To 43.0 From ____ To ____ From ____ To ____ From ____ To ____

From ____ To ____ From ____ To ____ From ____ To ____ From ____ To ____

Length Per Casing Section That is Not Perforated:

Cement Seal:

From 0.0 To 8.0 From ____ To ____ From ____ To ____ From ____ To ____

Type Portland Type 2 Type ____ Type ____ Type ____

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PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV181

Sand Pack:

From 19.5 To 43.0 From 8.0 To 19.5 From _____ To _____ From _____ To _____

Type CO silica 8-16 Type Alluvium Type _____ Type _____

Packers:

Locations: None

Type:

Centralizers:

Locations: None

Type:

entonite Seal:

From None To _____ From _____ To _____ From _____ To _____ From _____ To _____

Type _____ Type _____ Type _____ Type _____

Casing Height Above Ground Surface: 3.5 ft

Protective Casing Housing: Type _____ Dimensions _____

Additional Details:

Development Summary:

Type:

Duration:

Dates of Development:

Development Comments:

JUN 2000 APPROVED

PEABODY WESTERN COAL COMPANY
MONITOR WELL CASING AND SCREEN RECORD

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV181

Casing Joint Number	Blank Casing Length (ft)	Screen Length (ft)	Cumulative Length (ft)	Depth Interval (feet below ground surface)	
				From	To
1	10		10	+4.0	6.0
2	10		20	6.0	16.0
3	10		30	16.0	26.0
4		10	40	26.0	36.0
5		7	47	36.0	43.0

APPROVED
JUN 2000

PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	Black Mesa / Kayenta
Monitor Well Name:	**ALUV182**
Geologic Unit Monitored:	Alluvium
Ground surface Elevation:	6499.74 (ft-amsi)

Location: Mine Coordinates	N	-6201.99		E	17006.63
	S			W	
		¼	¼	S	T	R

Drilling Date:	Start	04/26/92
	Finish	04/26/92
Drilled by:		Winnek Drilling Co.
Logged by:		J. Ohlman
Geophysically Logged by:		None
Total Depth Drilled:		47.3 ft

FORMATION RECORD

DEPTH (ft) FROM	TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	1.5	Tan sandy (fine to medium grained) silt
1.5	5.0	Dark brown fine grained sandy silty clay
5.0	10.0	Brown slightly sandy clayey silt
10.0	14.0	Tan silty sandy (fine to coarse grained) gravel
14.0	15.5	Hard gravel layer
15.5	23.0	Brown silty sandy (fine to coarse grained) gravel
23.0	42.0	Gray silty sand with some pieces of gravel
42.0	46.0	Gray very sandy silt with some pieces of gravel
46.0	47.3	Gray black claystone
	47.3	T.D.

APPROVED 4 JUN 2000

PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV182

Type of Drilling: Hollow Stem Auger
Drilling Fluid: None
Total Depth: 47.3 ft
Lithologic Unit Monitored: Alluvium
Completion Date: 04/26/92

Borehole Diameter:

Surface:	12.0-inch	**From:**	0.0	**To:**	17.3
Intermediate:		**From:**		**To:**	
Production Zone:	12.0-inch	**From:**	17.3	**To:**	47.3

Casing Specifications: Blank

1. **Surface:** 4-inch schedule 40 PVC
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 4-inch schedule 40 PVC screen, 3 columns of 0.020-inch horizontal mill slots space 1/4 inch apart vertically
2. **Type:**

Blank Intervals:

From	0.0	To	17.3	From		To		From		To	
From		To		From		To		From		To	

Perforated Intervals:

From	17.3	To	47.3	From		To		From		To	
From		To		From		To		From		To	

Length Per Casing Section That is Not Perforated: 2 inches

Cement Seal:

From	0.0	To	5.0	From		To		From		To	
Type	Portland Type 2	Type		Type		Type		Type			

APPROVED JUN 2002

PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV182

Sand Pack:

From 13.0 To 47.3 From 5.0 To 13.0 From _____ To _____ From _____ To _____

Type CO silica 8-16 Type Alluvium Type _____ Type _____

Packers:

Locations: None

Type:

Centralizers:

Locations: None

Type:

Bentonite Seal:

From None To _____ From _____ To _____ From _____ To _____ From _____ To _____

Type _____ Type _____ Type _____ Type _____

Casing Height Above Ground Surface

Protective Casing Housing: Type _____ Dimensions _____

Additional Details:

Development Summary:

Type:

Duration:

Dates of Development:

Development Comments:

APPROVED JUN 2000

PEABODY WESTERN COAL COMPANY
MONITOR WELL CASING AND SCREEN RECORD

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV182

Casing Joint Number	Blank Casing Length (ft)	Screen Length (ft)	Cumulative Length (ft)	Depth Interval (feet below ground surface)	
				From	To
1	10		10	+2.7	7.3
2	10		20	7.3	17.3
3		10	30	17.3	27.3
4		10	40	27.3	37.3
5		10	50	37.3	47.3

APPROVED JUN 2000

PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	Black Mesa / Kayenta
Monitor Well Name:	**ALUV193**
Geologic Unit Monitored:	Alluvium
Ground surface Elevation:	6487.54 (ft-amsi)

Location: Mine Coordinates	N	-6420.97				E		24911.93		
	S					W				
		¼		¼	S		T		R	

Drilling Date:	Start	04/29/92
	Finish	04/29/92
Drilled by:		Winnek Drilling Co.
Logged by:		J. Ohlman
Geophysically Logged by:		None
Total Depth Drilled:		33.0 ft

FORMATION RECORD

DEPTH (ft) FROM	TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	2.0	Medium brown silty sand (fine to medium grained) minor rounded gravel, damp
2.0	3.0	Medium tan silty sand, minor clay, minor rounded gravel, dry
3.0	7.5	Medium tan sand (fine to medium grained) minor silt, no gravel, damp
7.5	11.0	Medium brown sand (fine to medium grained) considerable gravel, damp
11.0	14.0	Medium brown sand (fine to medium grained) minor silt, considerable gravel, damp *Note:* water at 14-15 feet; gravel less than 1 ½"
14.0	19.0	Medium brown sandy (fine to medium grained) silt, minor clay, minor gravel (less than 1" round)
19.0	26.0	Medium brown silty sand, minor gravel (less than 1" angular), rocks at 26 feet
26.0	28.0	As above for 14.0-19.0 feet, with little gravel (less than 1" angular)
28.0	32.0	Medium brown sandy (fine to medium grained) silt, some clay and minor gravel (less than ½" angular)
32.0	33.0	Medium brown sandy (fine to medium grained) silt, gravel layers interbedded
	33.0	T.D.

APPROVED JUN 2000

PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV193

Type of Drilling: Hollow Stem Auger
Drilling Fluid: None
Total Depth: 33.0 ft
Lithologic Unit Monitored: Alluvium
Completion Date: 04/29/00

Borehole Diameter:

Surface:	12.0-inch	**From:**	0.0	**To:**	13.0
Intermediate:		**From:**		**To:**	
Production Zone:	12.0-inch	**From:**	13.0	**To:**	33.0

Casing Specifications: Blank

1. **Surface:** 4-inch schedule 40 PVC
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 4-inch schedule 40 PVC screen, 3 columns of 0.020-inch horizontal mill slots space ¼ inch apart vertically
2. **Type:**

Blank Intervals:

From	0.0	To	13.0	From		To		From		To	
From		To		From		To		From		To	

Perforated Intervals:

From	13.0	To	33.0	From		To		From		To	
From		To		From		To		From		To	

Length Per Casing Section That Is Not Perforated: 2 inches

Cement Seal:

From	0.0	To	6.0	From		To		From		To	
Type	Portland Type 2	Type		Type		Type					

JUN 2001 APPROVED

PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV193

Sand Pack:

From 10.0 To 33.0 From 6.0 To 10.0 From _____ To _____ From _____ To _____

Type CO silica 8-16 Type Alluvium Type _____ Type _____

Packers:

Locations: None

Type:

Centralizers:

Locations: None

Type:

Bentonite Seal:

From None To _____ From _____ To _____ From _____ To _____ From _____ To _____

Type _____ Type _____ Type _____ Type _____

Casing Height Above Ground Surface

Protective Casing Housing: Type _____ Dimensions _____

Additional Details:

Development Summary:

Type:

Duration:

Dates of Development:

Development Comments:

APPROVED JUN 2000

PEABODY WESTERN COAL COMPANY
MONITOR WELL CASING AND SCREEN RECORD

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV193

Casing Joint Number	Blank Casing Length (ft)	Screen Length (ft)	Cumulative Length (ft)	Depth Interval (feet below ground surface)	
				From	To
1	6		6	+3.0	3.0
2	10		16	3.0	13.0
3		10	26	13.0	23.0
4		10	36	23.0	33.0

APPROVED
JUN 2000

PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	Black Mesa / Kayenta
Monitor Well Name:	**ALUV197**
Geologic Unit Monitored:	Alluvium
Ground surface Elevation:	6339.93 (ft-amsi)

Location: Mine Coordinates	N	-18129.97				E		17662.55		
	S					W				
		¼		¼	S		T		R	

Drilling Date:	Start	04/29/92
	Finish	04/29/92
Drilled by:		Winnek Drilling Co.
Logged by:		J. Ohlman
Geophysically Logged by:		None
Total Depth Drilled:		34.0 ft

FORMATION RECORD

DEPTH (ft) FROM	TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	7.0	Medium tan to brown sandy (fine to coarse grained) gravel (1 - 4 inch), moist
7.0	12.0	As above, gravel 1.5 inches
12.0	14.5	Medium dark brown, sand (medium to coarse grained), gravel (less than 5%) some silt, moist
14.5	27.0	As above with minor clay, wet (very wet at 24 feet)
27.0	29.0	Medium brown silty sand, minor gravel, wet with little clay
29.0	33.0	As above less than 10% gravel, wet with little clay Note: rock at 29 feet, gravel lenses
33.0	34.0	Medium tan to brown sandy (medium grained) gravel with minor silt
	34.0	T.D.

APPROVED JUN 2000

PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV197

Type of Drilling: Hollow Stem Auger
Drilling Fluid: None
Total Depth: 34.0 ft
Lithologic Unit Monitored: Alluvium
Completion Date: 04/29/92

Borehole Diameter:

Surface:	12.0-inch	**From:**	0.0	**To:**	14.0
Intermediate:		**From:**		**To:**	
Production Zone:	12.0-inch	**From:**	14.0	**To:**	34.0

Casing Specifications: Blank

1. **Surface:** 4-inch schedule 40 PVC
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 4-inch schedule 40 PVC screen, 3 columns of 0.020-inch horizontal mill slots spaced ¼ inch apart vertically
2. **Type:**

Blank Intervals:

From	0.0	To	14.0	From		To		From		To	
From		To		From		To		From		To	

Perforated Intervals:

From	14.0	To	34.0	From		To		From		To	
From		To		From		To		From		To	

Length Per Casing Section That is Not Perforated: 2 inches

Cement Seal:

From	0.0	To	6.0	From		To		From		To	
Type	Portland Type 2	Type		Type		Type					

JUN 2000 APPROVED

PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV197

Sand Pack:

From 10.0 To 34.0 From 5.0 To 10.0 From _____ To _____ From _____ To _____

Type CO silica 8-16 Type Alluvium Type _____ Type _____

Packers:

Locations: None

Type:

Centralizers:

Locations: None

Type:

Bentonite Seal:

From None To _____ From _____ To _____ From _____ To _____ From _____ To _____

Type _____ Type _____ Type _____ Type _____

Casing Height Above Ground Surface

Protective Casing Housing: Type Special Dimensions 12-inch round x 5.0 ft

Additional Details: Hector's special vandal-proof well cover

Development Summary:

Type:

Duration:

Dates of Development:

Development Comments:

APPROVED JUN 2000

PEABODY COAL COMPANY – WESTERN DIVISION
MONITOR WELL CASING AND SCREEN RECORD

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV197

Casing Joint Number	Blank Casing Length (ft)	Screen Length (ft)	Cumulative Length (ft)	Depth Interval (feet below ground surface)	
				From	To
1	6		6	+2.0	4.0
2	10		16	4.0	14.0
3		10	26	14.0	24.0
4		10	36	24.0	34.0

APPROVED
JUN 2000

PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	Black Mesa / Kayenta
Monitor Well Name:	**ALUV199**
Geologic Unit Monitored:	Alluvium
Ground surface Elevation:	6729.35 (ft-amsi)

Location: Mine Coordinates	N	-26297.59			E		61980.11		
	S				W				
		¼		¼	S		T		R

Drilling Date:	Start	04/30/92
	Finish	04/30/92
Drilled by:		Winnek Drilling Co.
Logged by:		J. Ohlman
Geophysically Logged by:		None
Total Depth Drilled:		21.0 ft

FORMATION RECORD

DEPTH (ft) FROM	TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	2.0	Medium brown sandy (medium to coarse grained) silt, minor clay, no gravel
2.0	3.0	Tan brown sandy silt (fine to medium grained) no clay, no gravel
3.0	7.0	Light tan brown sandy silt (fine to medium grained) no clay, no gravel
7.0	9.0	Medium tan brown sandy silt (fine to medium grained) minor clay, no gravel, some coal fragments
9.0	10.0	Medium to dark brown sandy silt (fine to medium grained) minor clay, no gravel, damp
10.0	16.0	Dark brown silty sand (fine to medium grained) minor clay, no gravel, damp *Note:* organic debris (roots, etc) from 10.0'-15.0' Clay content increased slightly downward from less than 5% to 5-10% Probable water at 15 feet
16.0	18.0	As above, wet with few gravel fragments (less than 1-1 ½", round)
18.0	21.0	As above, very wet, 15-20% gravel (as above)
	21.0	T.D. Bedrock

APPROVED JUN 2000

PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV199

Type of Drilling: Hollow Stem Auger
Drilling Fluid: None
Total Depth: 21.0 ft
Lithologic Unit Monitored: Alluvium
Completion Date: 04/30/92

Borehole Diameter:

Surface:	12.0-inch	**From:**	0.0	**To:**	11.0
Intermediate:		**From:**		**To:**	
Production Zone:	12.0-inch	**From:**	11.0	**To:**	21.0

Note: Borehole backfilled from 23.0 to 21.0 with dry cuttings.

Casing Specifications: Blank

1. **Surface:** 4-inch schedule 40 PVC
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 4-inch schedule 40 PVC screen, 3 columns of 0.020-inch horizontal mill slots ¼ inch apart vertically
2. **Type:**

Blank Intervals:

From 0.0 To 11.0 From ____ To ____ From ____ To ____ From ____ To ____
From ____ To ____ From ____ To ____ From ____ To ____ From ____ To ____

Perforated Intervals:

From 11.0 To 21.0 From ____ To ____ From ____ To ____ From ____ To ____
From ____ To ____ From ____ To ____ From ____ To ____ From ____ To ____

Length Per Casing Section That is Not Perforated:

Cement Seal:

From 0.0 To 6.0 From ____ To ____ From ____ To ____ From ____ To ____
Type Portland Type 2 Type ____ Type ____ Type ____

APPROVED JUN 2000

PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV199

Sand Pack:

From 8.0 To 21.0 From 6.0 To 8.0 From 21.0 To 32.0 From _____ To _____

Type CO silica 8-16 Type Alluvial Fill Type Alluvial Fill Type _____

Packers:

Locations: None

Type:

Centralizers:

Locations: None

Type:

Bentonite Seal:

From _____ To _____ From _____ To _____ From _____ To _____ From _____ To _____

Type _____ Type _____ Type _____ Type _____

Casing Height Above Ground Surface

Protective Casing Housing: Type _____ Dimensions _____

Additional Details:

Development Summary:

Type:

Duration:

Dates of Development:

Development Comments: Water color cleaned up reasonably well

APPROVED JUN 2000

PEABODY WESTERN COAL COMPANY
MONITOR WELL CASING AND SCREEN RECORD

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV199

Casing Joint Number	Blank Casing Length (ft)	Screen Length (ft)	Cumulative Length (ft)	Depth Interval (feet below ground surface)	
				From	To
1	4		4	+3.0	1.0
2	10		14	1.0	11.0
3		10	24	11.0	21.0

APPROVED
JUN 2000

PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	Black Mesa / Kayenta
Monitor Well Name:	**ALUV200**
Geologic Unit Monitored:	Alluvium
Ground surface Elevation:	6612.05 (ft-amsi)

Location: Mine Coordinates	N	4.87			E		34620.18	
	S				W			
		¼		¼	S		T		R

Drilling Date:	Start	12/03/92
	Finish	12/03/92
Drilled by:		J. Ohlman, hand augered
Logged by:		J. Ohlman
Geophysically Logged by:		None
Total Depth Drilled:		13.0 ft

FORMATION RECORD

DEPTH (ft) FROM	TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	5.0	Medium brown (medium grained) gravelly sand, damp
5.0	10.5	Varicolored (coarse grained) sandy gravel wet at 6 feet
10.5	13.0	Medium gray silty sand and sandy clay
	13.0	T.D.

APPROVED JUN 2000

PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV200

Type of Drilling: Auger
Drilling Fluid: None
Total Depth: 13.0 ft
Lithologic Unit Monitored: Alluvium
Completion Date: 12/03/92

Borehole Diameter:

Surface:	6.75-inch	**From:**	0.0	**To:**	13.0
Intermediate:		**From:**		**To:**	
Production Zone:		**From:**		**To:**	

Casing Specifications: Blank

1. **Surface:** 4-inch schedule 40 PVC casing inside 6-inch schedule 40 PVC screen
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 4-inch schedule 40 PVC screen inside 6-inch schedule 40 PVC screen with 3 columns of 0.020-inch horizontal mill slots spaced ¼ inch apart vertically
2. **Type:**

Blank Intervals:

From	0.0	To	6.0	From		To		From		To	
From		To		From		To		From		To	

Perforated Intervals:

From	7.0	To	13.0	From		To		From		To	
From		To		From		To		From		To	

Length Per Casing Section That is Not Perforated: 2 inches

Cement Seal:

From	0.0	To	5.0	From		To		From		To	
Type	Portland Type 2	Type		Type		Type					

APPROVED JUN 2000

PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV200

Sand Pack:

From 5.0 To 13.0 From ____ To ____ From ____ To ____ From ____ To ____

Type CO silica 8-16 Type ____ Type ____ Type ____

Packers:

Locations: None

Type:

Centralizers:

Locations: None

Type:

Bentonite Seal:

From None To ____ From ____ To ____ From ____ To ____ From ____ To ____

Type ____ Type ____ Type ____ Type ____

Casing Height Above Ground Surface

Protective Casing Housing: Type ____ Dimensions ____

Additional Details:

Development Summary:

Type: Air surging

Duration: 2 hours

Dates of Development: 12/04/92

Development Comments: Water color cleaned up reasonably well

JUN 2000 APPROVED

PEABODY WESTERN COAL COMPANY
MONITOR WELL CASING AND SCREEN RECORD

Mine:	Black Mesa / Kayenta	Monitor Well Name:	ALUV200

Casing Joint Number	Blank Casing Length (ft)	Screen Length (ft)	Cumulative Length (ft)	Depth Interval (feet below ground surface)	
				From	To
1	6		6	0.0	6.0
2		7	13	6.0	13.0

APPROVED
JUN 2000

PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	**Kayenta Mine**
Monitor Well Name:	**ALUV201**
Geologic Unit Monitored:	Alluvium
Ground surface Elevation:	6737.934 ft. above MSL

Location: Mine Coordinates	**N**					**E**	59143.462		
	S	56466.458				**W**			
		¼		¼	**S**		**T**		**R**

Drilling Date:	Start	9/20/10
	Finish	9/21/10
Driller:		D.A. Smith
Logged by:		J. Ohlman
Geophysical Log by:		n/a
Total Depth Drilled:		59.5 ft.

FORMATION RECORD

DEPTH (ft) FROM	TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	6.0	Sand (fine-coarse grained), silt, dry
6.0	7.0	Conglomerate (sandstone and siltstone fragments), dry
7.0	15.0	Sand (fine-coarse grained), minor silt, damp
15.0	20.0	Silt and clay (medium brown), moist ("balls-up")
20.0	25.0	Same as above (dark brown), moisture at 24 ft., increasing clay with depth.
25.0	28.0	Same as above (dark brown), damp
28.0	32.0	Same as above w/increasing moisture
32.0	38.0	Same as above (light brown), very damp (almost mushy)
38.0	53.0	No return for this interval. Drill string floating in a silt & clay mud.
53.0	59.5	Silt and clay (medium brown). Hard sandstone boulder at 55 ft. Dry shale (dark gray) and coal seam at 59.0-59.5 ft. Back-filled hole to 59.0 ft. with bentonite.
	59.5	T.D.
	Notes:	The zone from 32-38 feet produces yellowish-brown, clay-rich water that is very sticky. Water level dropped 4.65 ft. following removal of 18 gallons on 10/11/10

APPROVED

PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Kayenta Mine	Monitor Well Name:	ALUV201

Type of Drilling: Hollow Stem Auger
Drilling Fluid: None
Total Depth: 59.5 ft.
Lithologic Unit Monitored: Alluvium
Completion Date: 09/21/10

Borehole Diameter:

Surface:	10-5/8"	**From:**	0.0	**To:**	59.0
Intermediate:		**From:**		**To:**	
Production Zone:		**From:**		**To:**	

Casing Specifications: Blank

1. **Surface:** 4-inch schedule 40 PVC, Johnson Casing
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 4-inch schedule 40 PVC, Johnson Screen with 0.020-inch slots
2. **Type:**

Blank Intervals:

From	0.0	To	24.0	From		To		From		To		From		To	
From		To		From		To		From		To		From		To	

Perforated Intervals:

From	24.0	To	59.0	From		To		From		To		From		To	
From		To		From		To		From		To		From		To	

Length Per Casing Section That is Not Perforated: 1.0 ft.

Cement Seal:

From	0.0	To	5.0	From		To		From		To	
Type	Portland Type 2	Type		Type		Type					

PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Kayenta Mine	Monitor Well Name:	ALUV201

Sand Pack:

From 22.0 To 59.0 From ____ To ____ From ____ To ____ From ____ To ____

Type Silica #8-12 Type ____ Type ____ Type ____

Packers:

Locations: none

Type:

Centralizers:

Locations: none

Type:

Bentonite Seal:

From 5.0 To 18.5 From 18.5 To 22.0 From 59.0 To 59.5 From ____ To ____

Type Hydroplug (3/8" chips) Type Enviroplug (coated) Type Hydroplug (3/8" chips) Type ____

Casing Height Above Ground Surface: 2.0 ft. (nominal)...finished casing stickup is 1.98 ft.

Protective Casing Housing: Type Steel Dimensions 6"x6"

Additional Details: Cover leftover from 1991-92 drilling projects

Development Summary: Air-surged 1 hour on 9/21, and 1 hour on 9/22. Approx. 1 GPM produced during air-surging. Bailed ½ hour on 10/11 (removed 18 gallons). Pumped for 117 minutes on 10/13 (removed 152 gallons in 3 phases...1.85 GPM for 40 minutes, 1.35 GPM for 25 minutes & 0.86 GPM for 52 minutes).

Type: Air-surge, PVC bailer (1.5 gallon size), Redi-Flo2 electric pump.

Duration: 1 hour (9/21), 1 hour (9/22), ½ hour (10/11), 2 hours (10/13)

Dates of Development: 9/21/10, 9/22/10, 10/11/10, 10/13/10

Development Comments: Removed most of the fine sand on 9/21 & 9/22, with silt & clay remaining. Finished rough development on 10/11, and final development on 10/13/10.

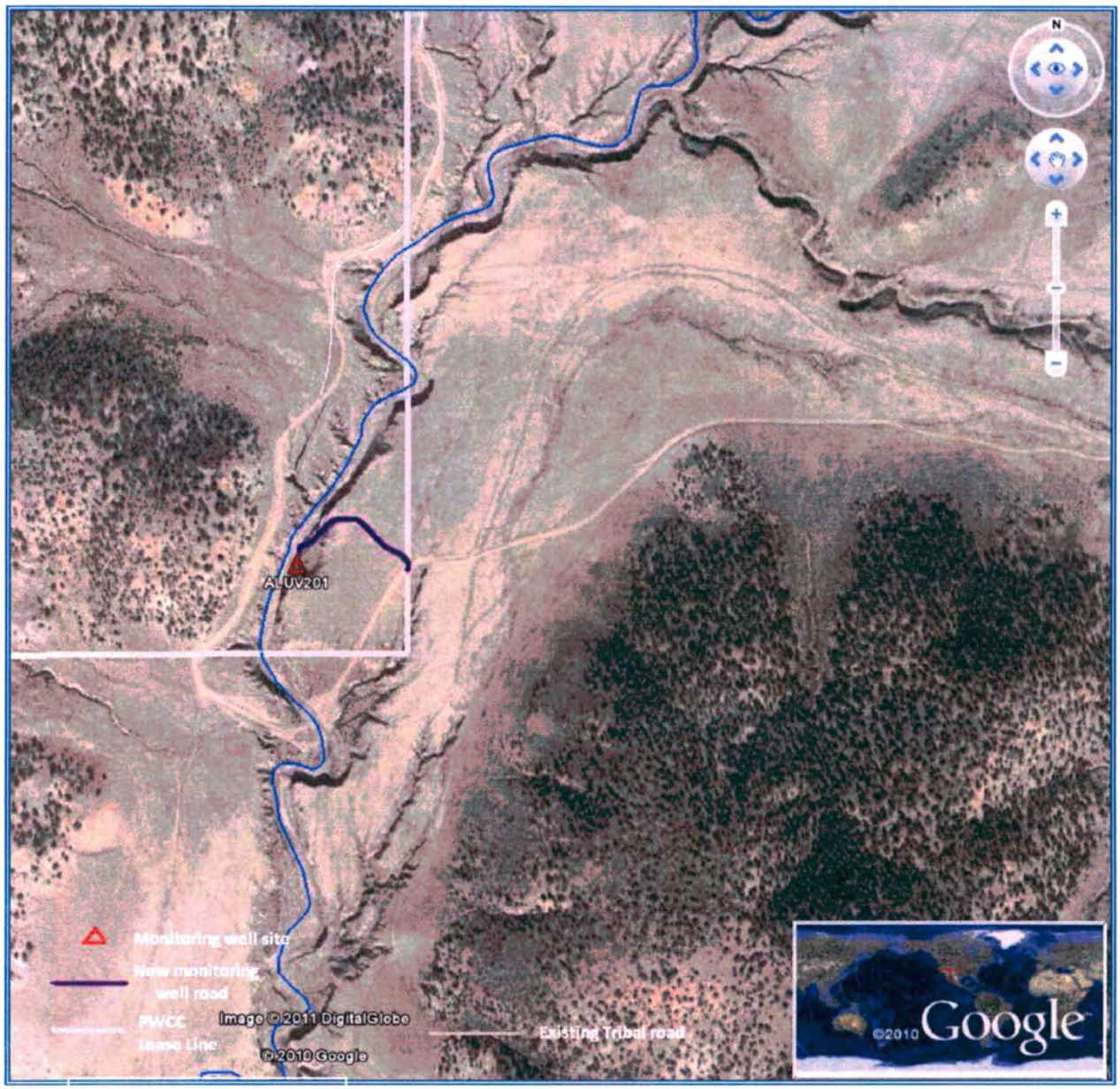
JUL 2011 APPROVED

PEABODY WESTERN COAL COMPANY
MONITOR WELL CASING AND SCREEN RECORD

Mine:	Kayenta Mine	Monitor Well Name:	ALUV201

Casing Joint Number	Blank Casing Length (ft)	Screen Length (ft)	Cumulative Length (ft)	Depth Interval (feet below ground surface)	
				From	To
1	6.5		6.0	-2.0	4.0
2	10		16.0	4.0	14.0
3	10		26.0	14.0	24.0
4		10	36.0	24.0	34.0
5		10	46.0	34.0	44.0
6		10	56.0	44.0	54.0
7		5	61.0	54.0	59.0

Figure 1



Location map for PWCC Alluvial Well ALUV201, Dinnebito Wash, Black Mesa, Arizona

JUL 2011
APPROVED

PEABODY WESTERN COAL COMPANY
MONITOR WELL LITHOLOGIC LOG

Mine:	**Kayenta Mine**
Monitor Well Name:	**ALUV201**
Geologic Unit Monitored:	Alluvium
Ground surface Elevation:	6737.934 ft. above MSL

Location: Mine Coordinates	**N**				**E**		59143.462		
	S	56466.458			**W**				
		¼		¼	**S**		**T**		**R**

Drilling Date:	Start	9/20/10
	Finish	9/21/10
Driller:		D.A. Smith
Logged by:		J. Ohlman
Geophysical Log by:		n/a
Total Depth Drilled:		59.5 ft.

FORMATION RECORD

DEPTH (ft) FROM	DEPTH (ft) TO	Lithographic description of unconsolidated and consolidated units and water horizons.
0.0	6.0	Sand (fine-coarse grained), silt, dry
6.0	7.0	Conglomerate (sandstone and siltstone fragments), dry
7.0	15.0	Sand (fine-coarse grained), minor silt, damp
15.0	20.0	Silt and clay (medium brown), moist (“balls-up”)
20.0	25.0	Same as above (dark brown), moisture at 24 ft., increasing clay with depth.
25.0	28.0	Same as above (dark brown), damp
28.0	32.0	Same as above w/increasing moisture
32.0	38.0	Same as above (light brown), very damp (almost mushy)
38.0	53.0	No return for this interval. Drill string floating in a silt & clay mud.
53.0	59.5	Silt and clay (medium brown). Hard sandstone boulder at 55 ft. Dry shale (dark gray) and coal seam at 59.0-59.5 ft. Back-filled hole to 59.0 ft. with bentonite.
	59.5	T.D.
	Notes:	The zone from 32-38 feet produces yellowish-brown, clay-rich water that is very sticky. Water level dropped 4.65 ft. following removal of 18 gallons on 10/11/10

PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Kayenta Mine	Monitor Well Name:	ALUV201

Type of Drilling: Hollow Stem Auger
Drilling Fluid: None
Total Depth: 59.5 ft.
Lithologic Unit Monitored: Alluvium
Completion Date: 09/21/10

Borehole Diameter:

Surface:	10-5/8"	**From:**	0.0	**To:**	59.0
Intermediate:		**From:**		**To:**	
Production Zone:		**From:**		**To:**	

Casing Specifications: Blank

1. **Surface:** 4-inch schedule 40 PVC, Johnson Casing
2. **Intermediate:**
3. **Production Zone:**

Casing Specifications: Perforated

1. **Type:** 4-inch schedule 40 PVC, Johnson Screen with 0.020-inch slots
2. **Type:**

Blank Intervals:

From	0.0	**To**	24.0	**From**		**To**		**From**		**To**	
From		**To**		**From**		**To**		**From**		**To**	

Perforated Intervals:

From	24.0	**To**	59.0	**From**		**To**		**From**		**To**	
From		**To**		**From**		**To**		**From**		**To**	

Length Per Casing Section That is Not Perforated: **1.0 ft.**

Cement Seal:

From	0.0	**To**	5.0	**From**		**To**		**From**		**To**	
Type	Portland Type 2	**Type**		**Type**		**Type**					

PEABODY WESTERN COAL COMPANY
MONITOR WELL COMPLETION AND DEVELOPMENT DETAILS

Mine:	Kayenta Mine	Monitor Well Name:	ALUV201

Sand Pack:

From	To	From	To	From	To	From	To
22.0	59.0						

Type	Type	Type	Type
Silica #8-12			

Packers:

Locations: none

Type:

Centralizers:

Locations: none

Type:

Bentonite Seal:

From	To	From	To	From	To	From	To
5.0	18.5	18.5	22.0	59.0	59.5		

Type	Type	Type	Type
Hydroplug (3/8" chips)	Enviroplug (coated)	Hydroplug (3/8" chips)	

Casing Height Above Ground Surface: 2.0 ft. (nominal)…finished casing stickup is 1.98 ft.

Protective Casing Housing: Type Steel Dimensions 6"x6"

Additional Details: Cover leftover from 1991-92 drilling projects

Development Summary: Air-surged 1 hour on 9/21, and 1 hour on 9/22. Approx. 1 GPM produced during air-surging. Bailed ½ hour on 10/11 (removed 18 gallons). Pumped for 117 minutes on 10/13 (removed 152 gallons in 3 phases…1.85 GPM for 40 minutes, 1.35 GPM for 25 minutes & 0.86 GPM for 52 minutes).

Type: Air-surge, PVC bailer (1.5 gallon size), Redi-Flo2 electric pump.

Duration: 1 hour (9/21), 1 hour (9/22), ½ hour (10/11), 2 hours (10/13)

Dates of Development: 9/21/10, 9/22/10, 10/11/10, 10/13/10

Development Comments: Removed most of the fine sand on 9/21 & 9/22, with silt & clay remaining. Finished rough development on 10/11, and final development on 10/13/10.

PEABODY WESTERN COAL COMPANY
MONITOR WELL CASING AND SCREEN RECORD

Mine:	**Kayenta Mine**	**Monitor Well Name:**	**ALUV201**

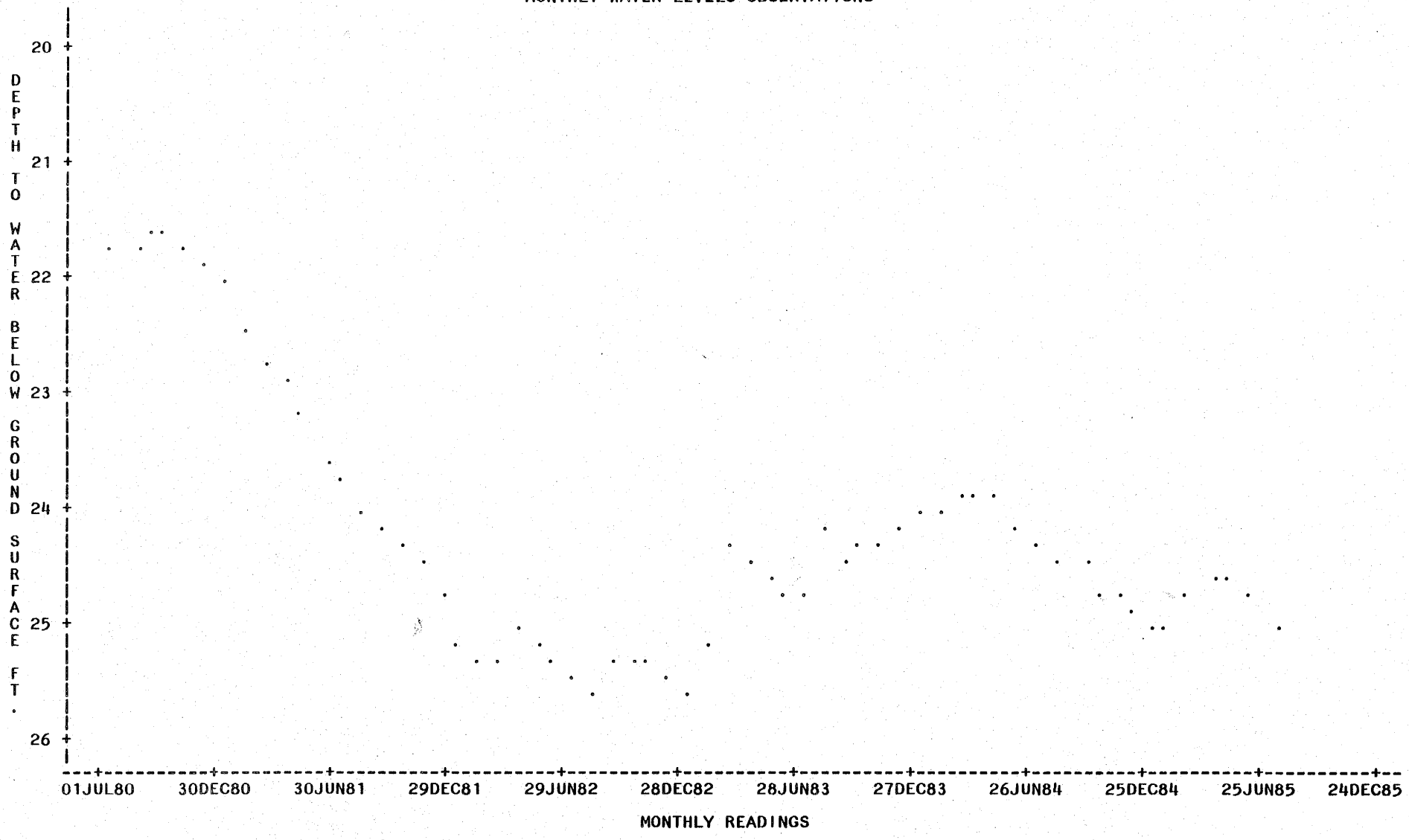
Casing Joint Number	Blank Casing Length (ft)	Screen Length (ft)	Cumulative Length (ft)	Depth Interval (feet below ground surface)	
				From	To
1	6.5		6.0	-2.0	4.0
2	10		16.0	4.0	14.0
3	10		26.0	14.0	24.0
4		10	36.0	24.0	34.0
5		10	46.0	34.0	44.0
6		10	56.0	44.0	54.0
7		5	61.0	54.0	59.0

ATTACHMENT 12

Alluvial Well Hydrograph Analyses

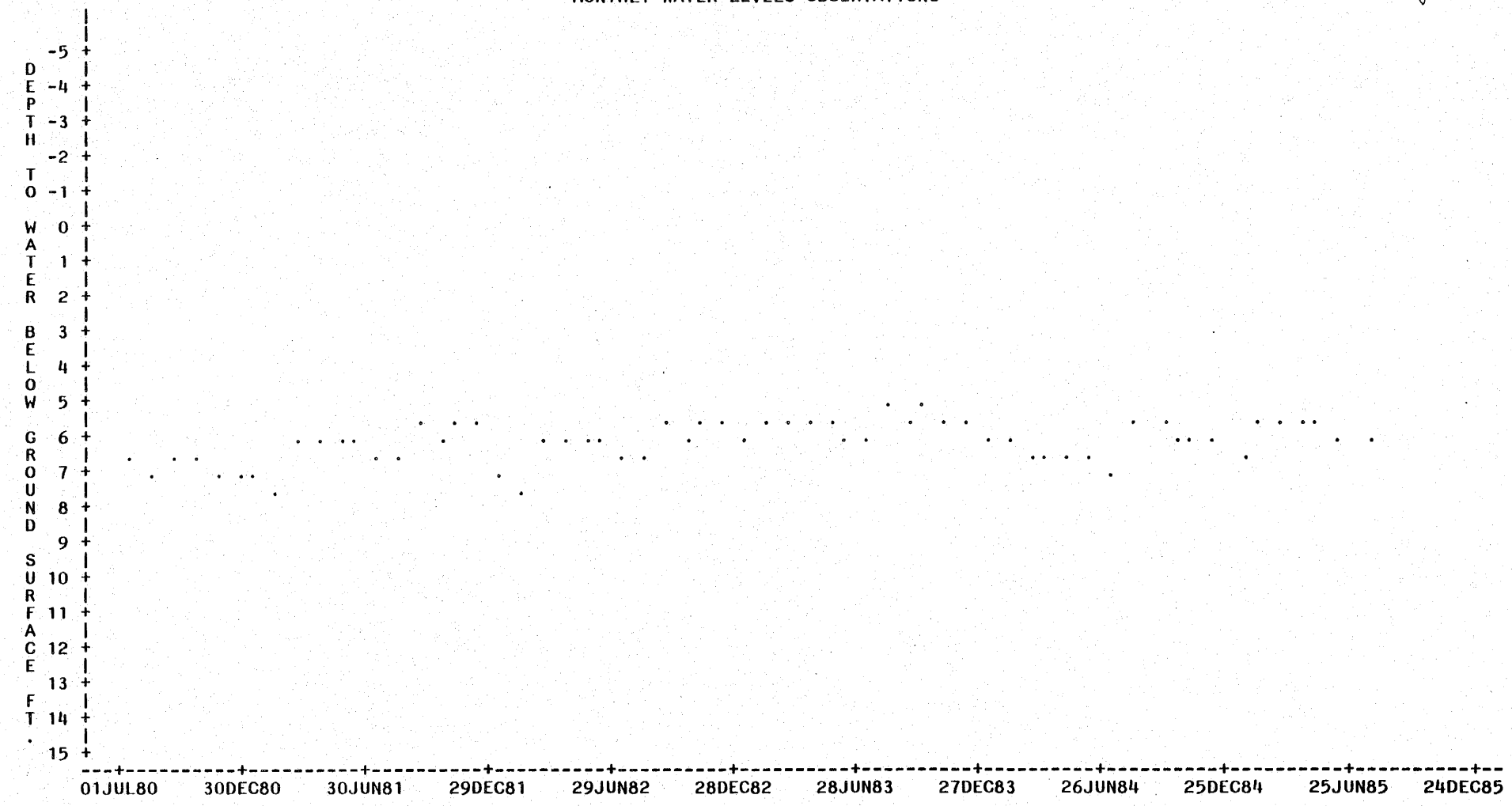
ω

ALLUVIAL WELL 13
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	61	24.16803279	1.11211034	21.50000000	25.57000000	4.07000000

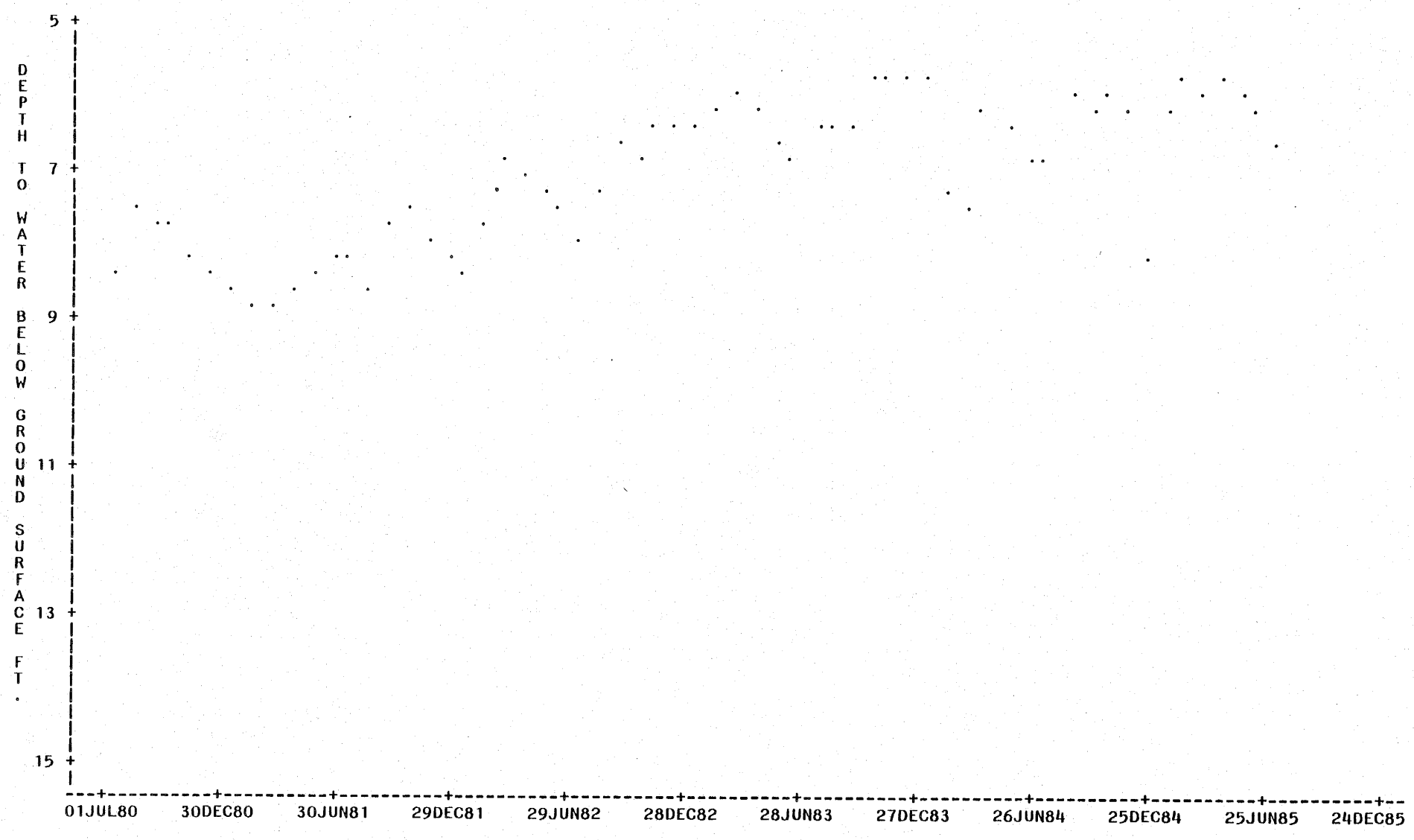
ALLUVIAL WELL 17
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	67	6.04970149	0.55564042	5.03000000	7.39000000	2.36000000

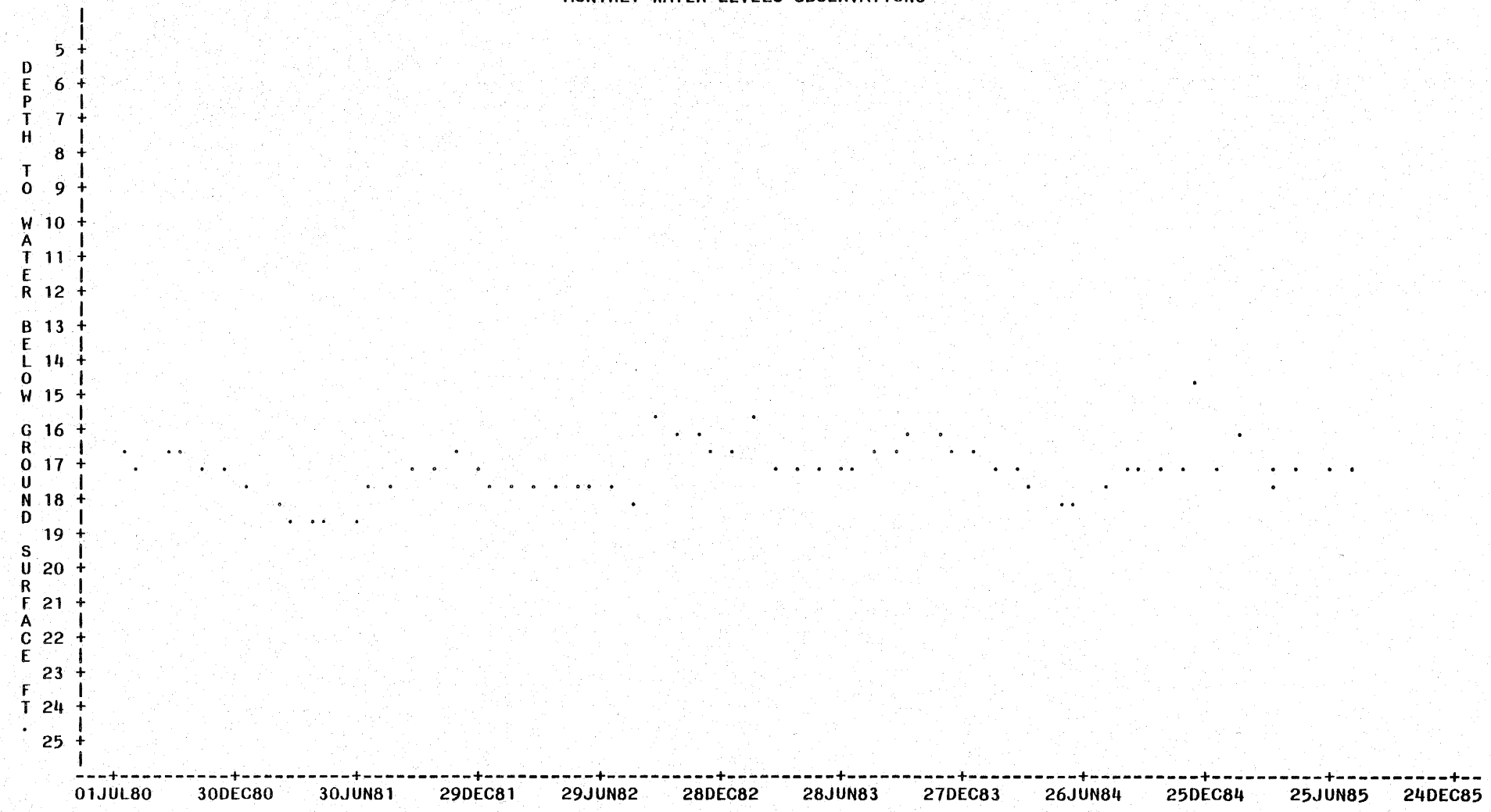
8

ALLUVIAL WELL 19
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	61	6.99983607	0.97626071	5.61000000	8.78000000	3.17000000

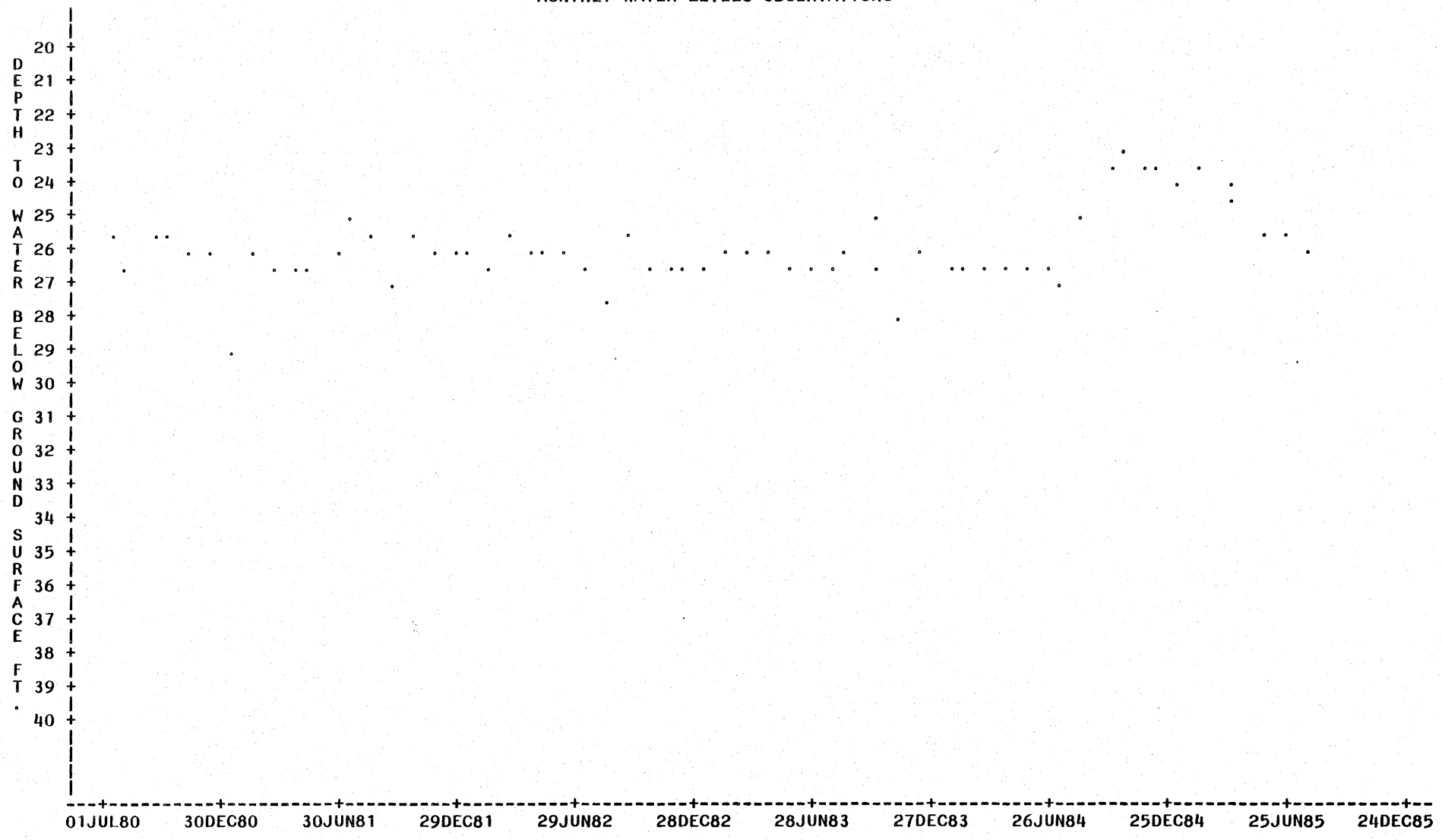
ALLUVIAL WELL 23
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



MONTHLY READINGS

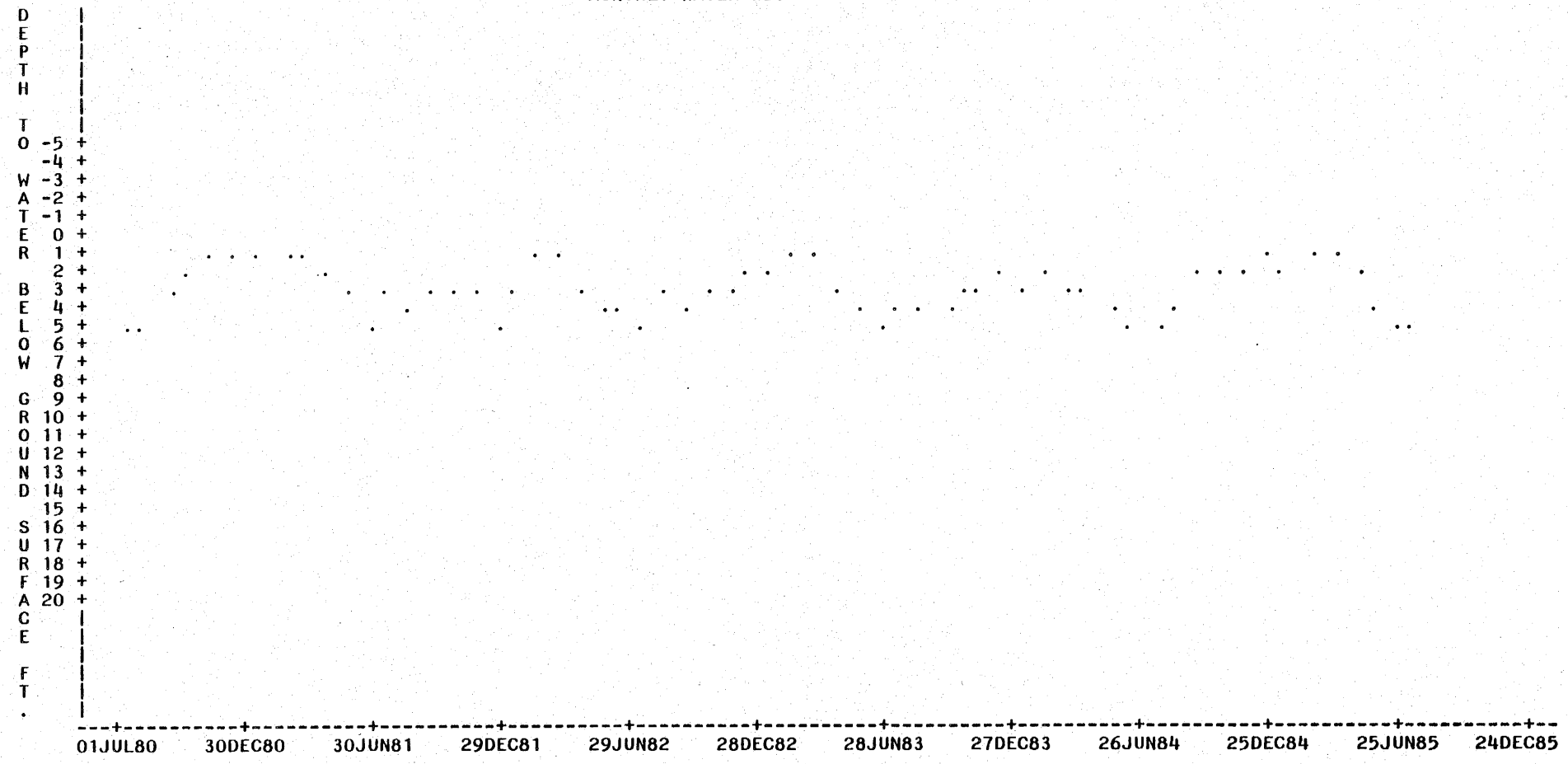
VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	61	17.01278689	0.73016466	14.59000000	18.61000000	4.02000000

ALLUVIAL WELL 27
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	61	25.86475410	1.08568965	23.13000000	28.98000000	5.85000000

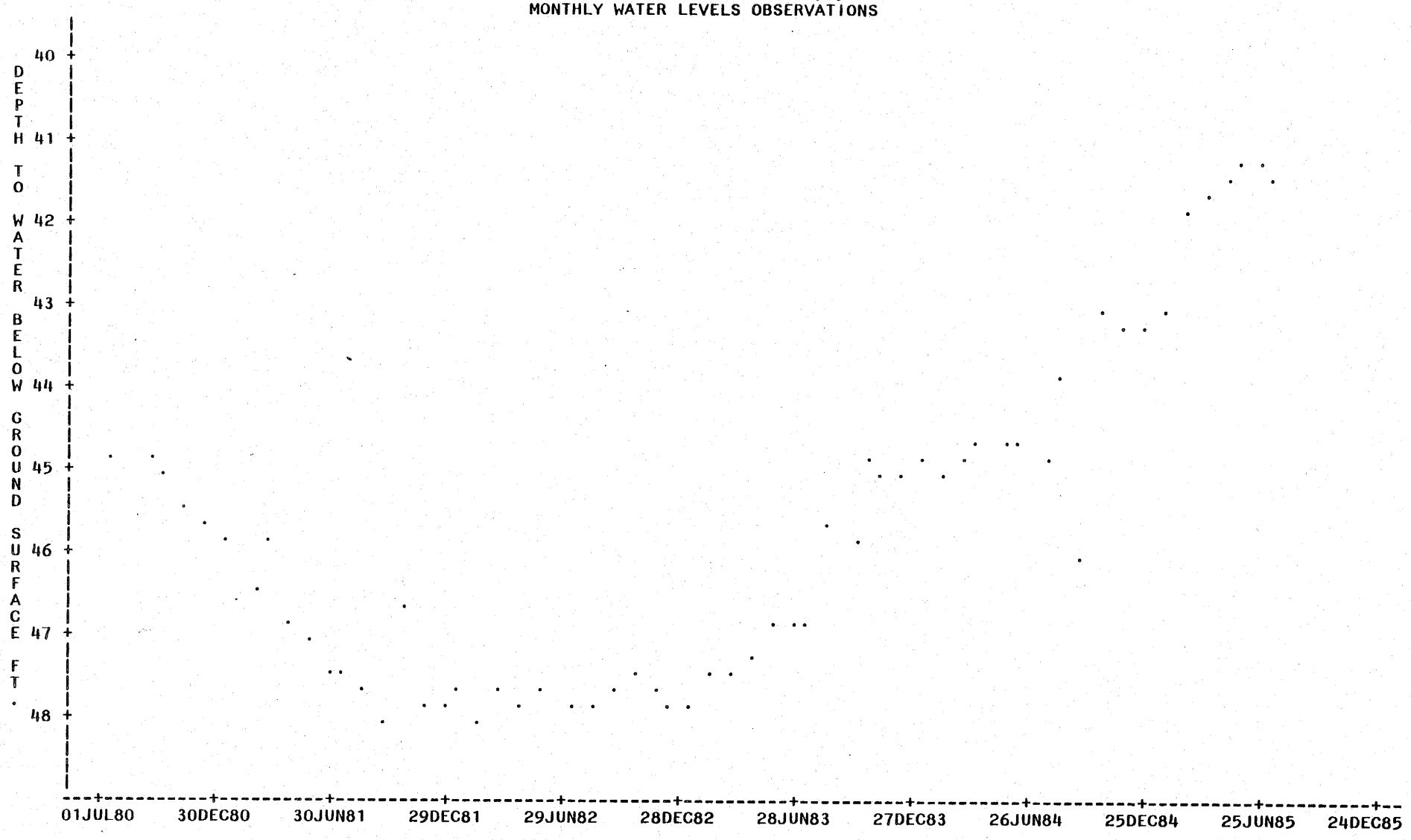
ALLUVIAL WELL 29
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



MONTHLY READINGS

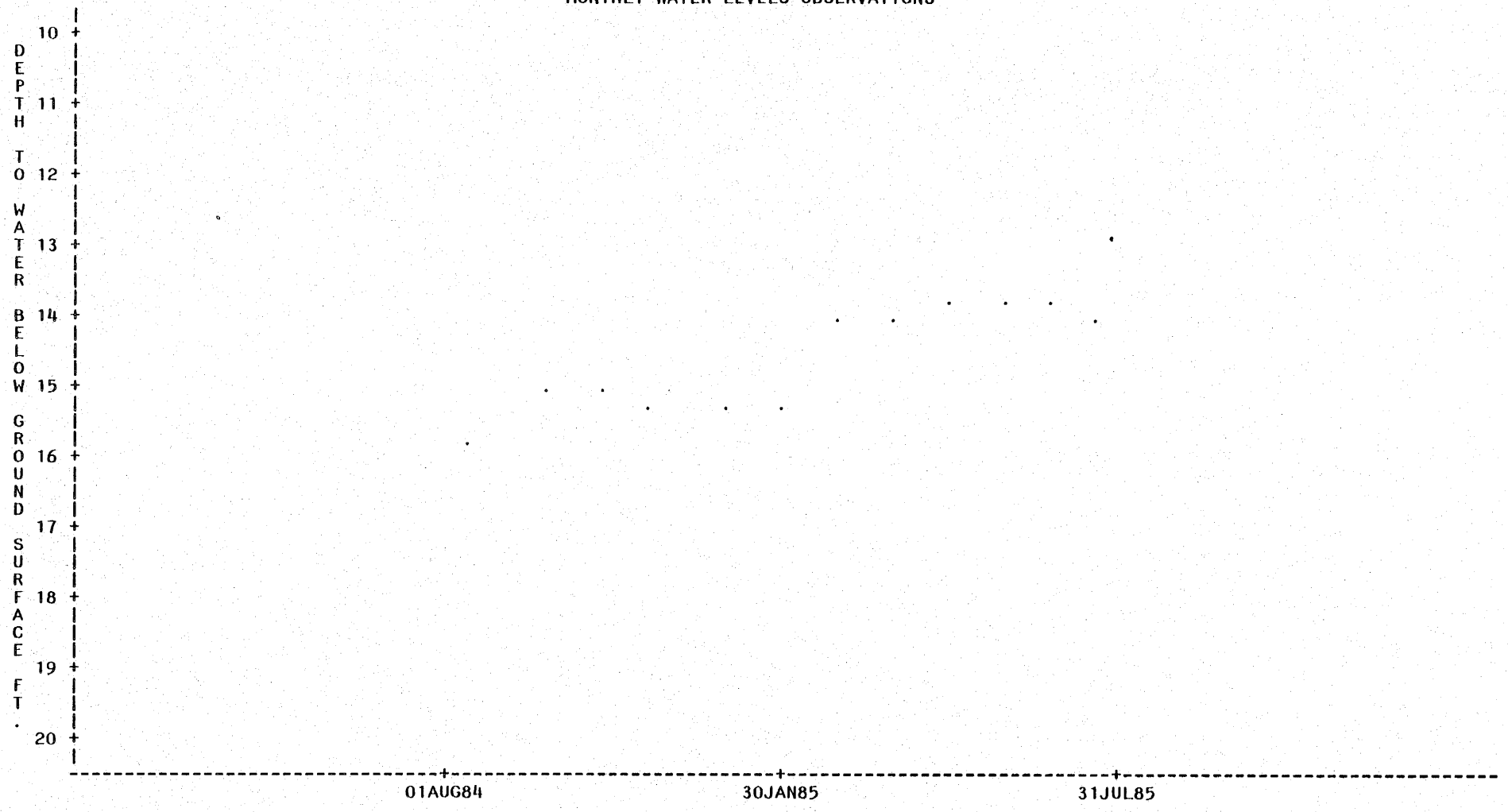
VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	61	2.89590164	1.34980539	0.53000000	5.34000000	4.81000000

ALLUVIAL WELL 31
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	60	45.71983333	2.02938288	41.15000000	48.24000000	7.09000000

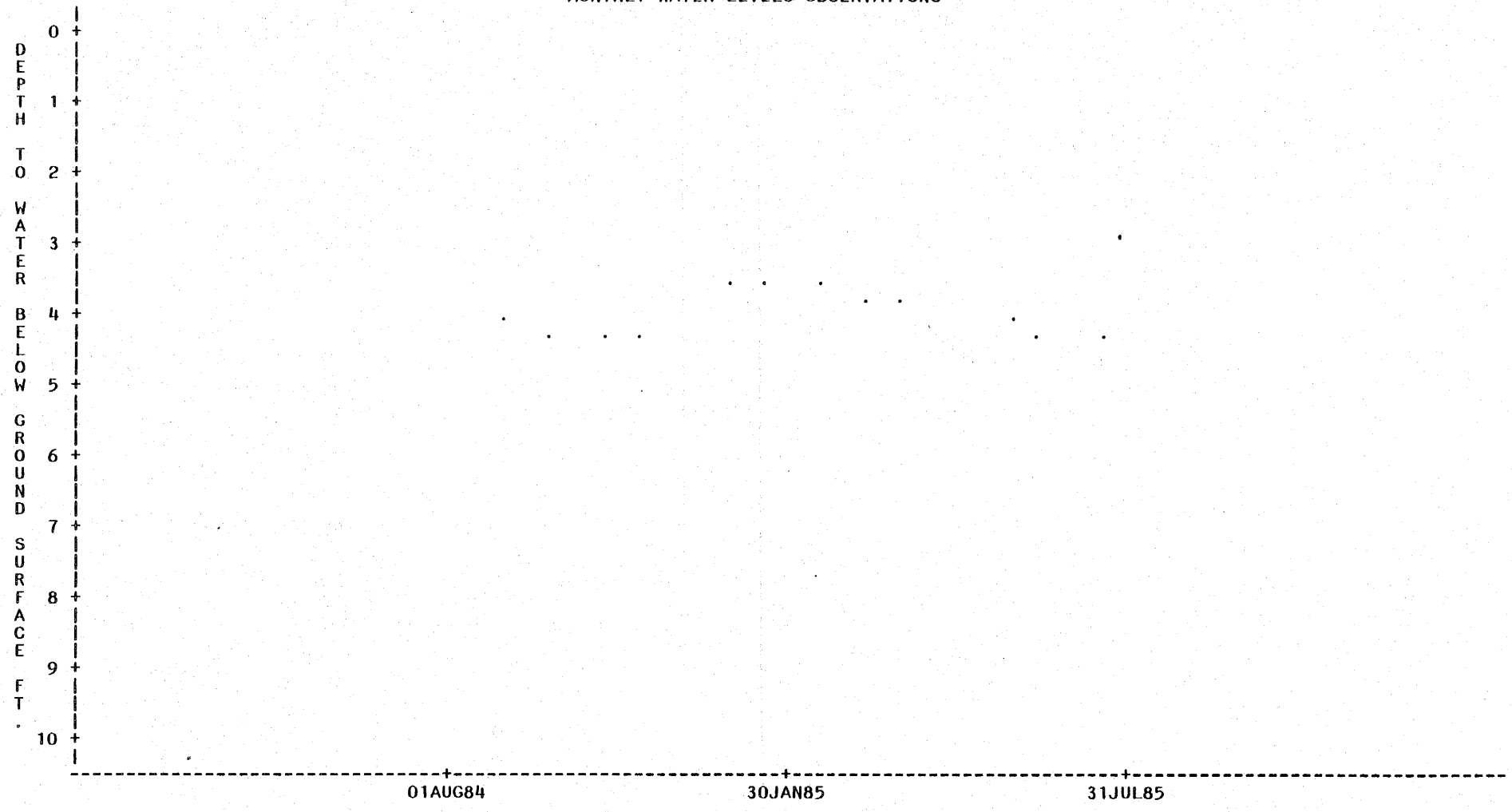
ALLUVIAL WELL 31R
AUGUST 1984 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



MONTHLY READINGS

VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	12	14.57750000	0.75324902	13.72000000	15.78000000	2.06000000

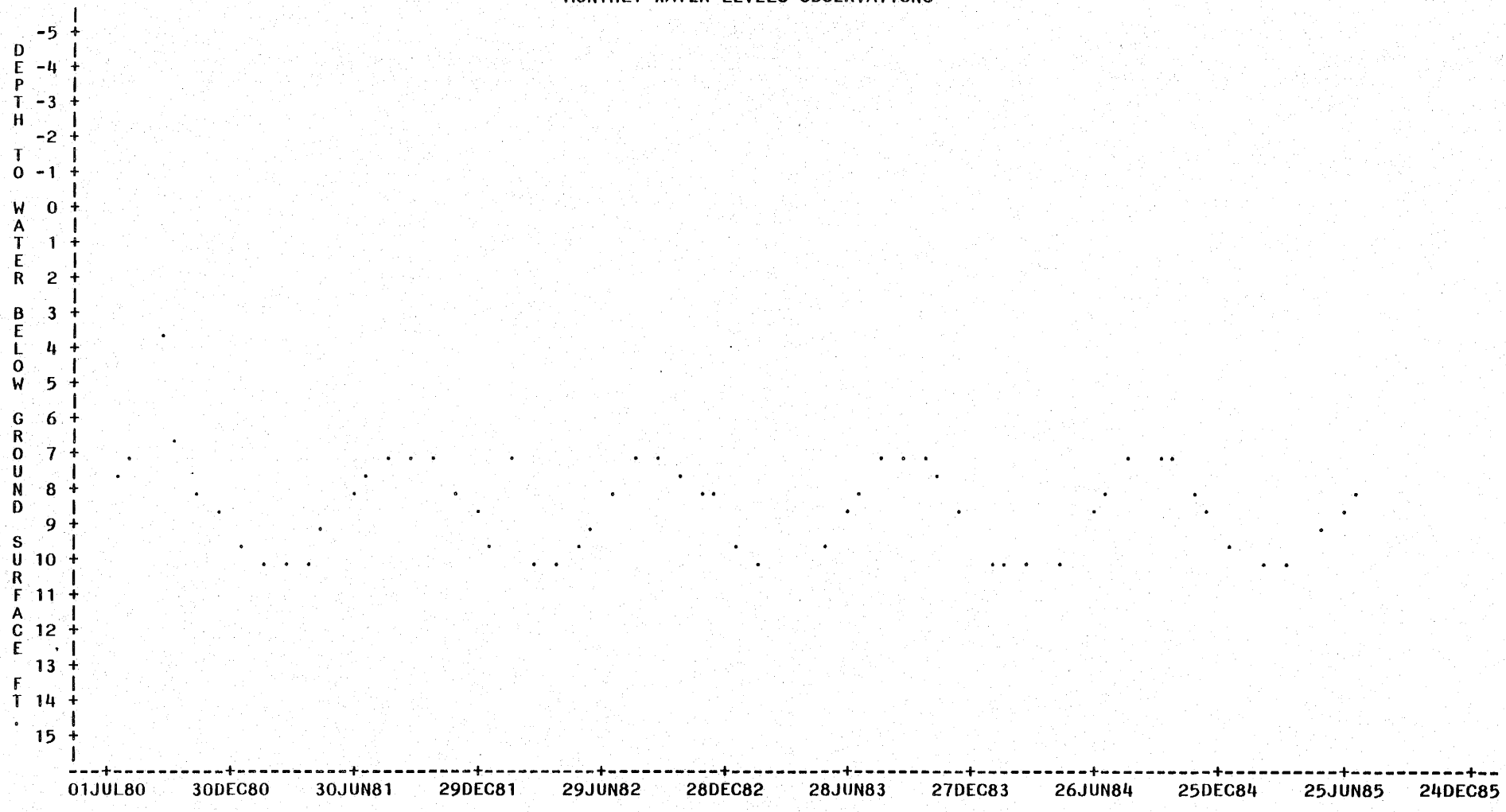
ALLUVIAL WELL 33R
AUGUST 1984 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



MONTHLY READINGS

VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	12	3.87750000	0.29388077	3.45000000	4.20000000	0.75000000

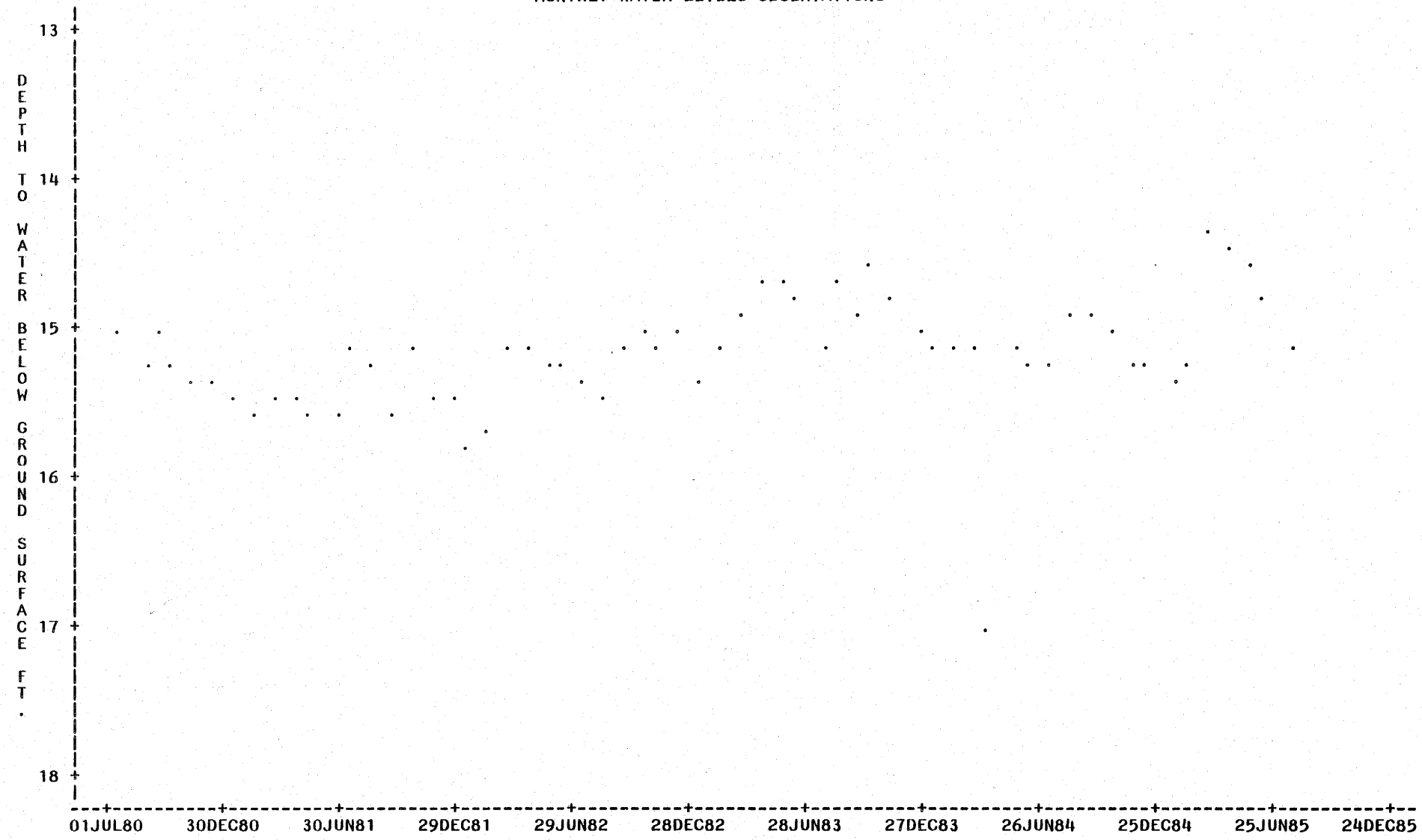
ALLUVIAL WELL 32
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



MONTHLY READINGS

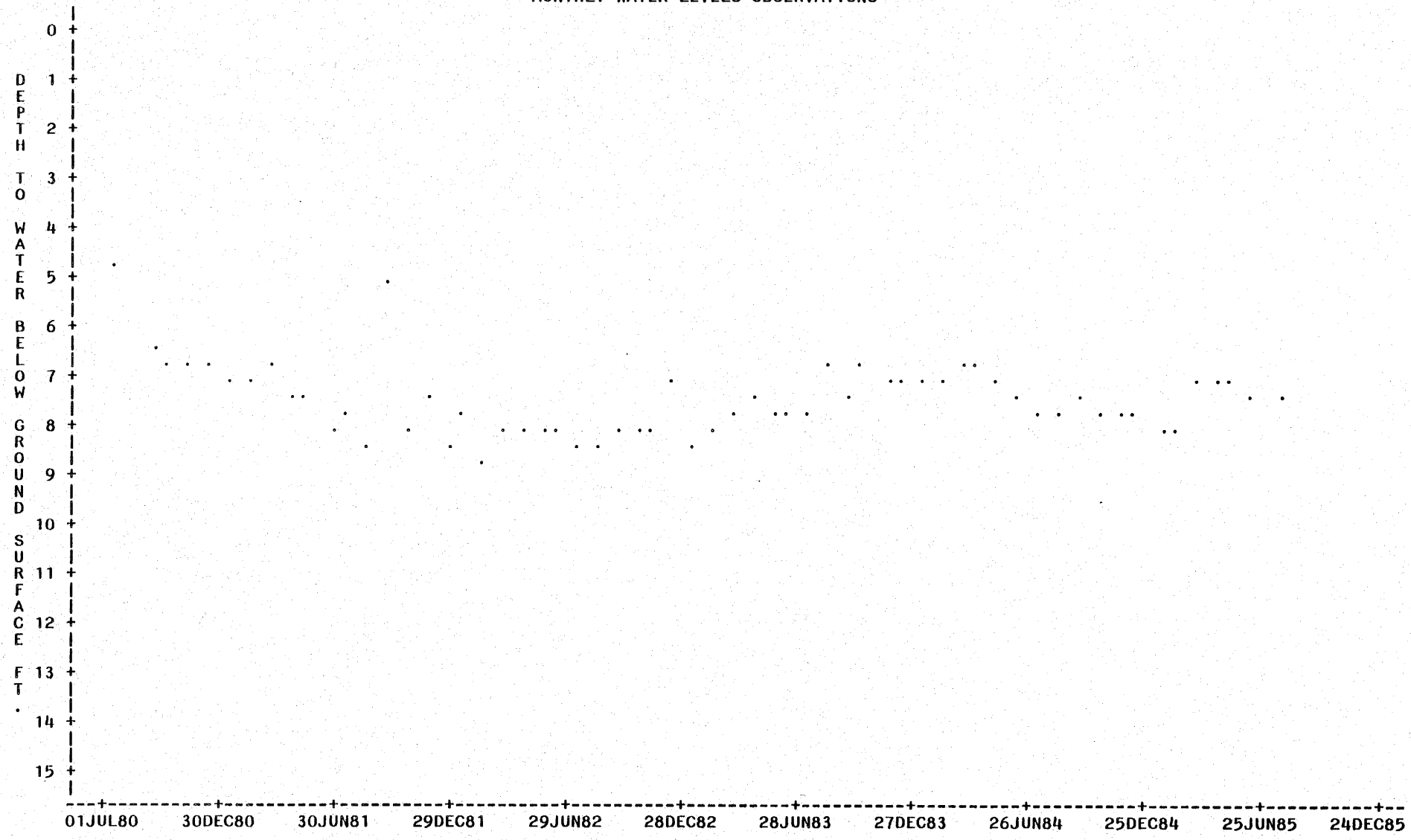
VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	58	8.37344828	1.31013934	3.72000000	10.11000000	6.39000000

ALLUVIAL WELL 68
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	61	15.14950820	0.38659378	14.30000000	17.00000000	2.70000000

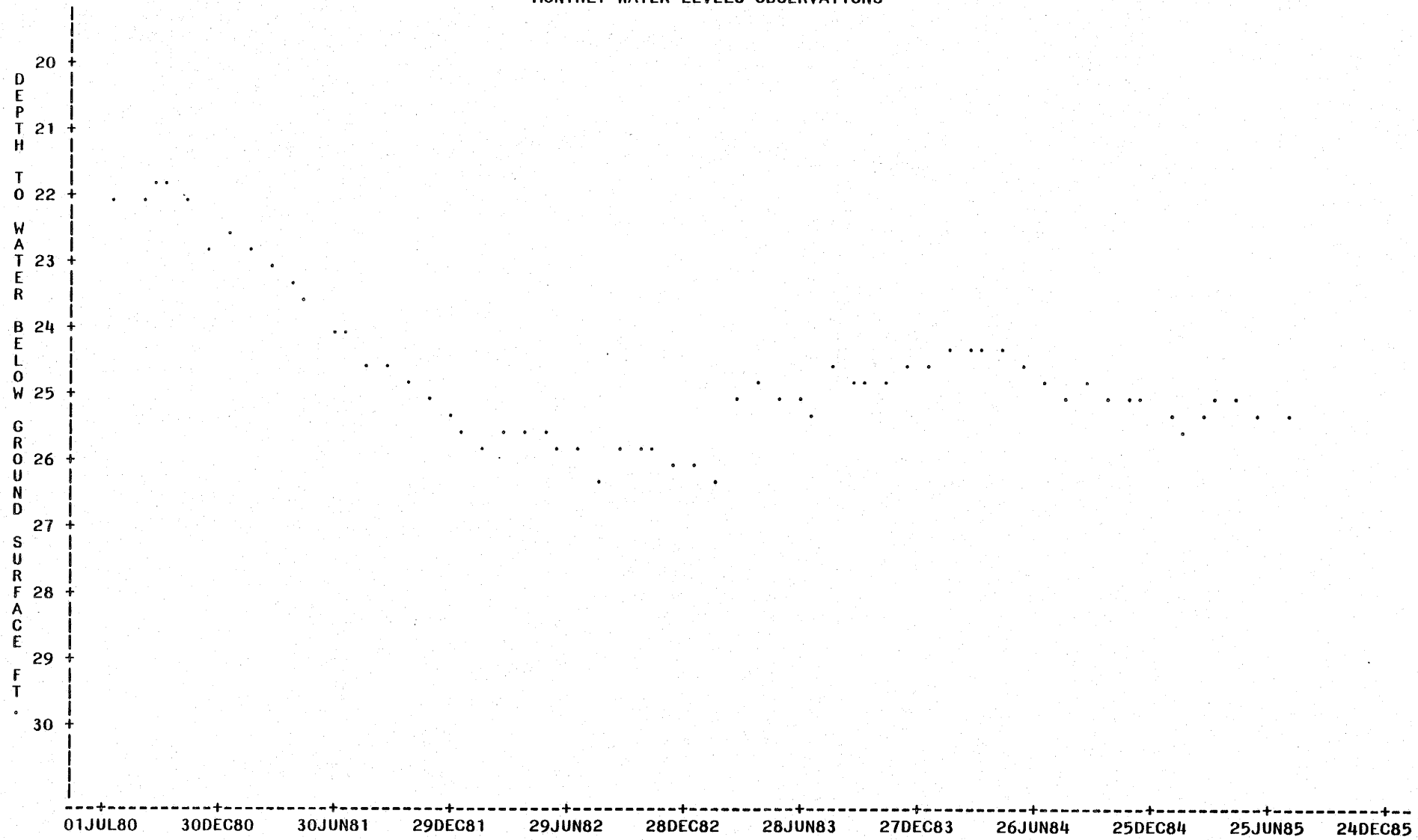
ALLUVIAL WELL 69
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



MONTHLY READINGS

VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	60	7.38383333	0.73212737	4.63000000	8.67000000	4.04000000

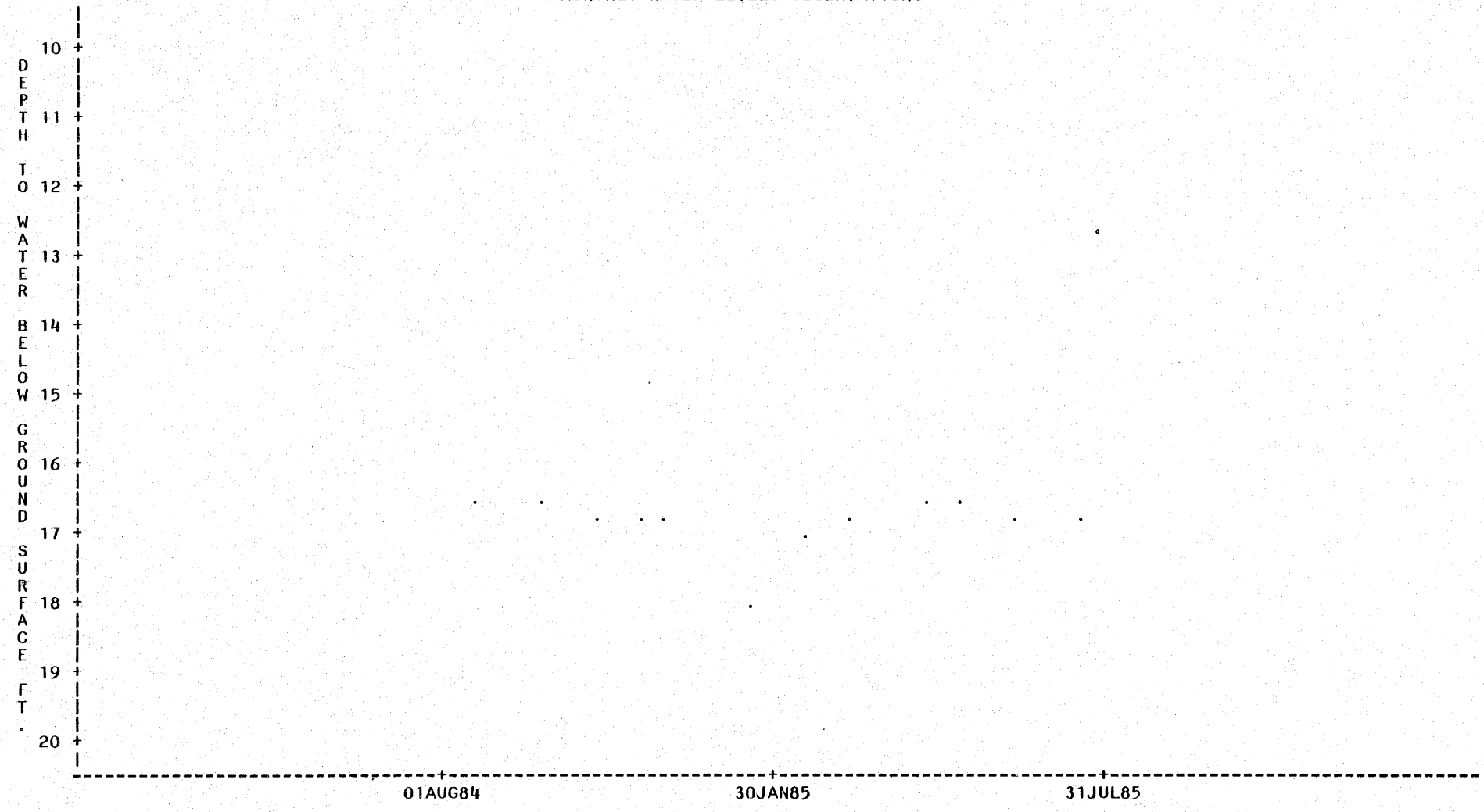
ALLUVIAL WELL 70
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



MONTHLY READINGS

VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	61	24.59393443	1.13560891	21.84000000	26.19000000	4.35000000

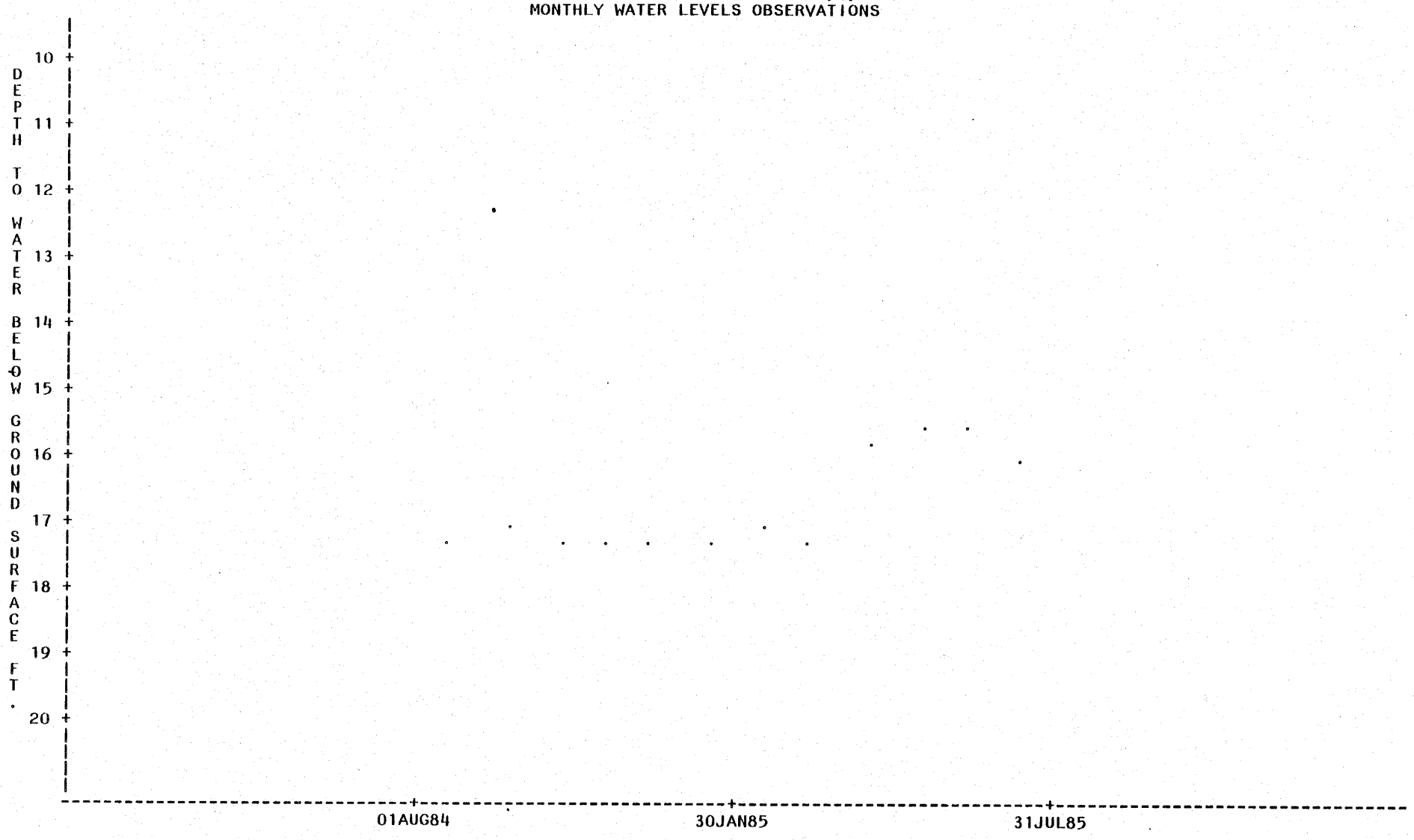
ALLUVIAL WELL 70R
AUGUST 1984 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



MONTHLY READINGS

VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	12	16.77416667	0.40098647	16.43000000	17.94000000	1.51000000

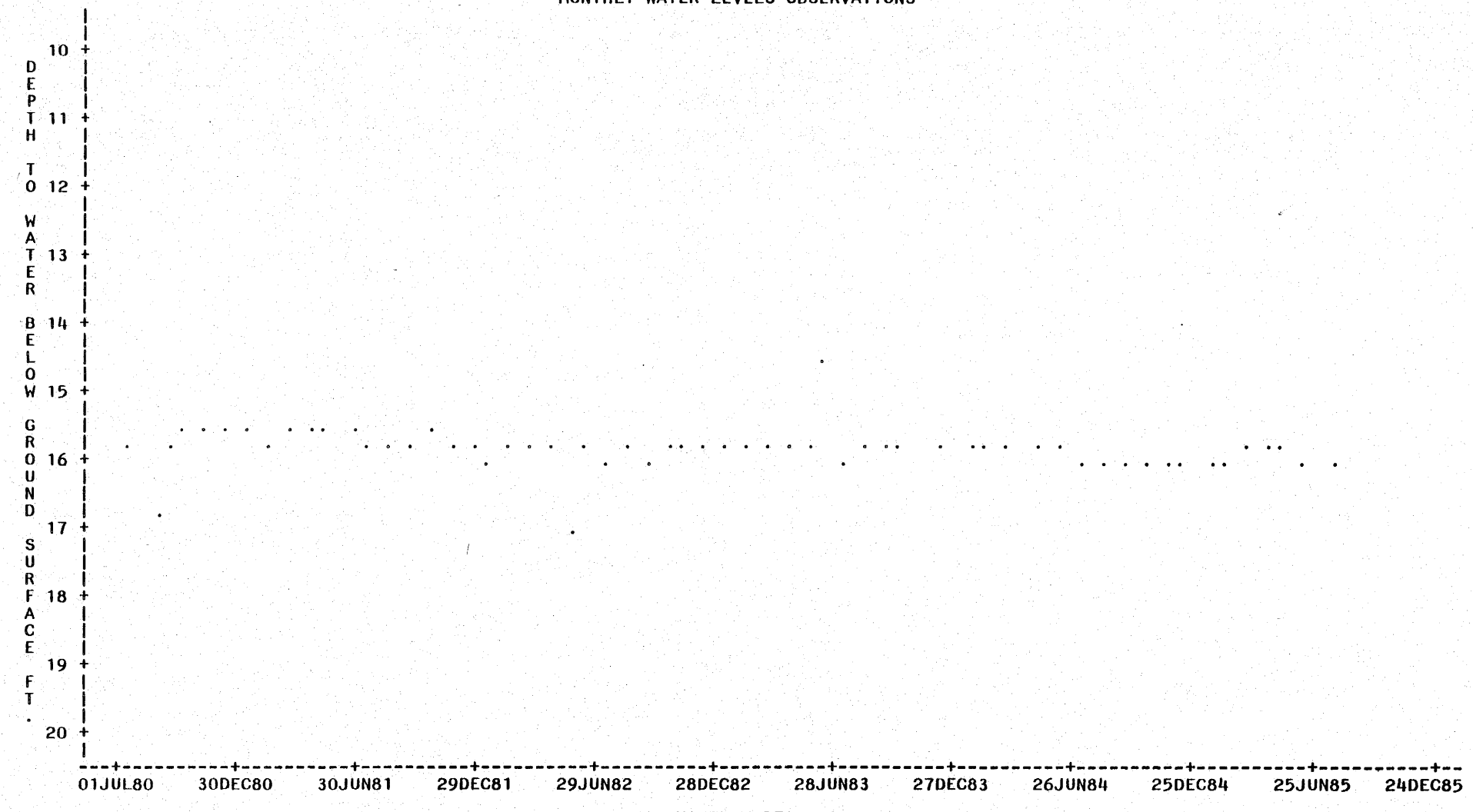
ALLUVIAL WELL 74R
AUGUST 1984 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



MONTHLY READINGS

VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	12	16.66083333	0.74539140	15.49000000	17.30000000	1.81000000

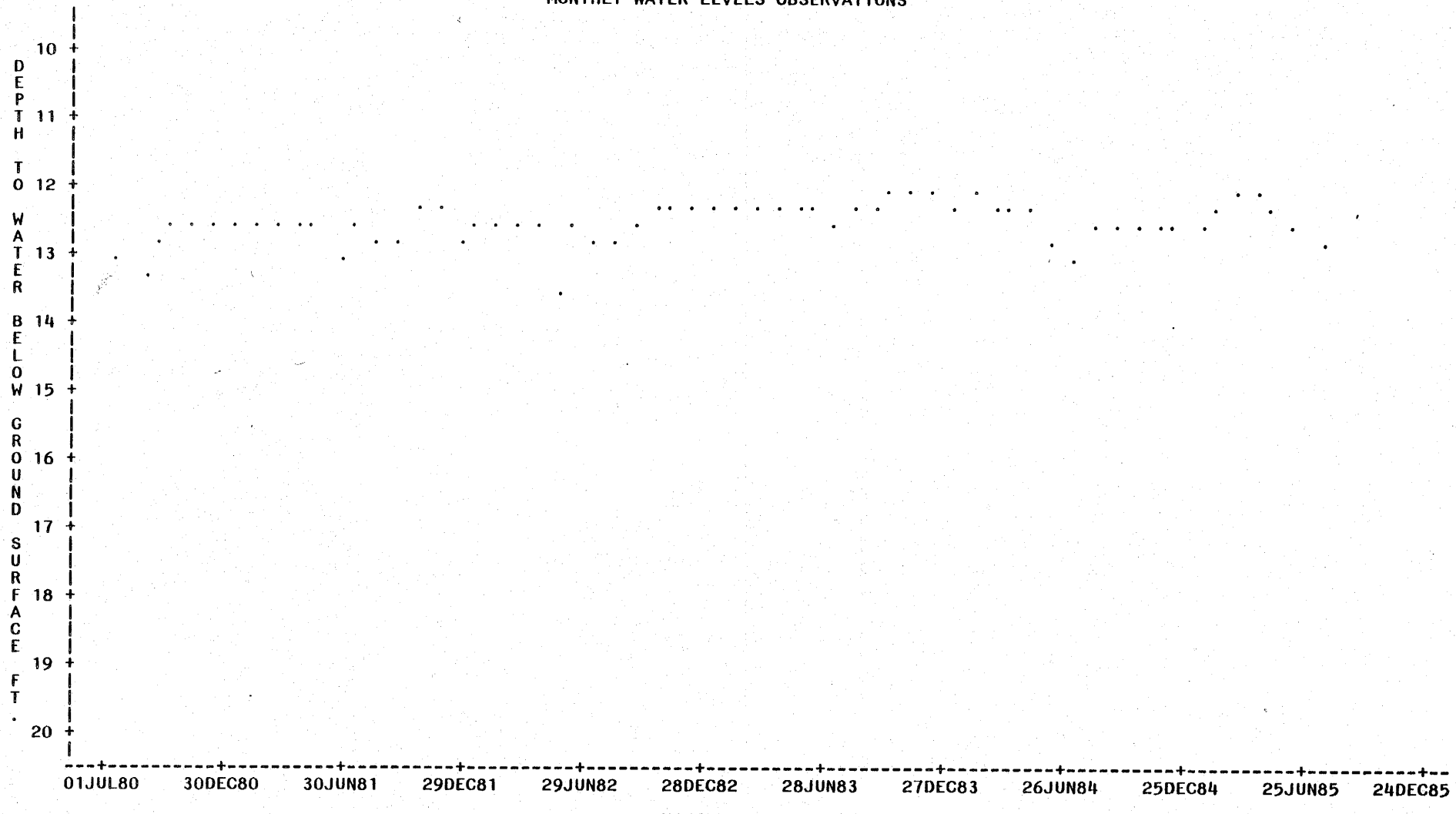
ALLUVIAL WELL 71
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



MONTHLY READINGS

VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	60	15.80750000	0.28004010	14.58000000	16.92000000	2.34000000

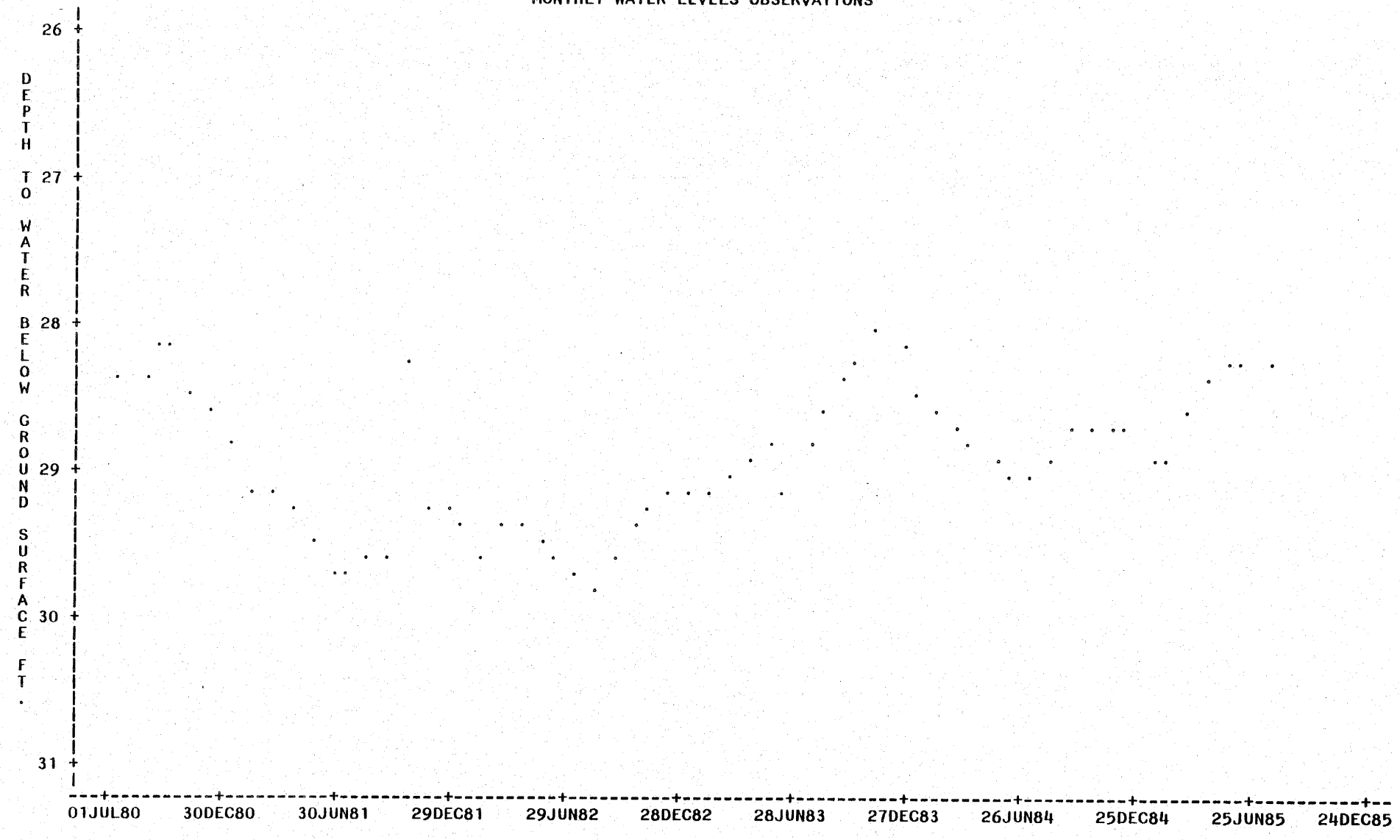
ALLUVIAL WELL 72
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



MONTHLY READINGS

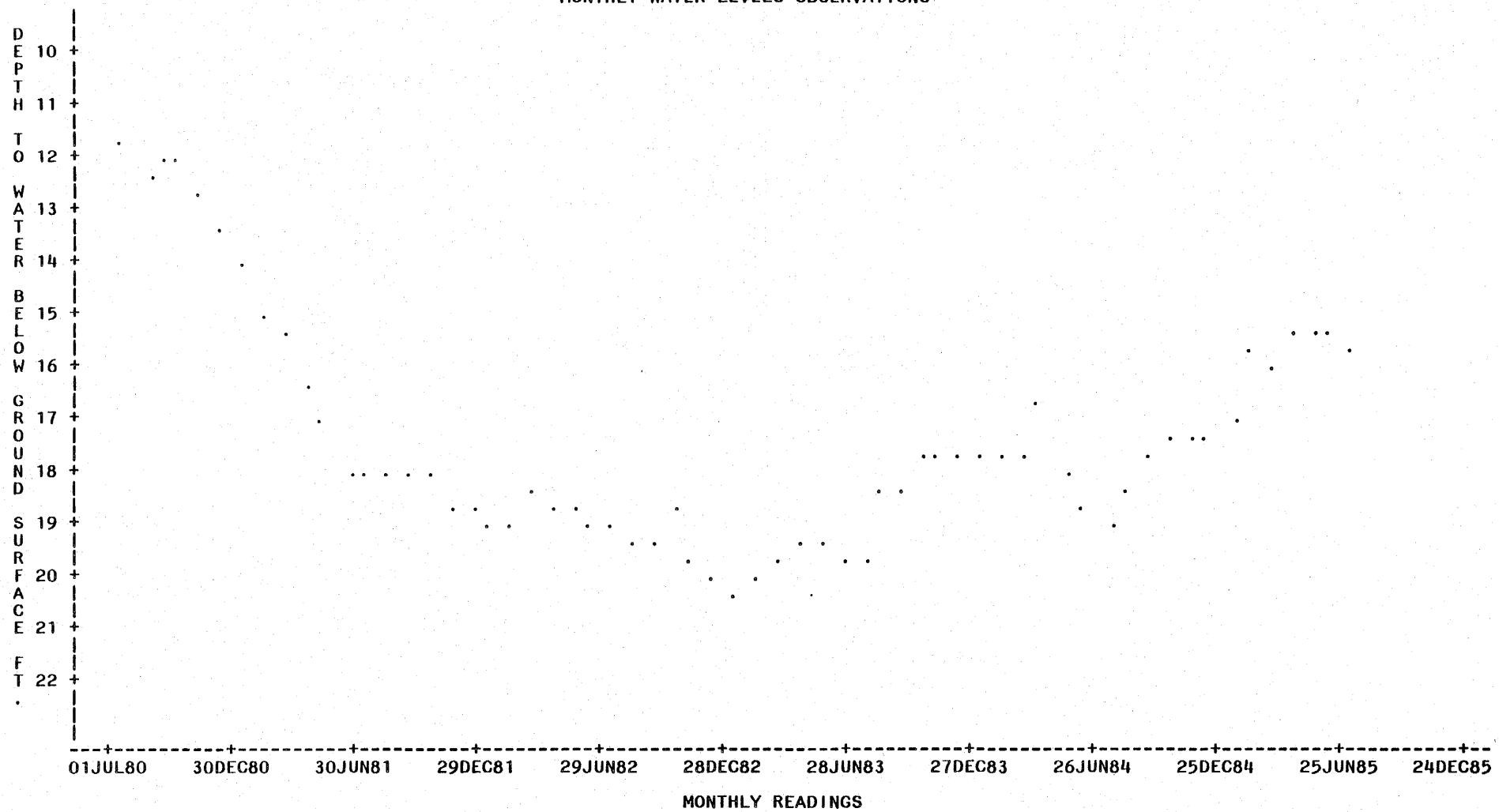
VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	61	12.45786885	0.29002939	12.02000000	13.59000000	1.57000000

ALLUVIAL WELL 73
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	61	28.89049180	0.48661904	27.98000000	29.76000000	1.78000000

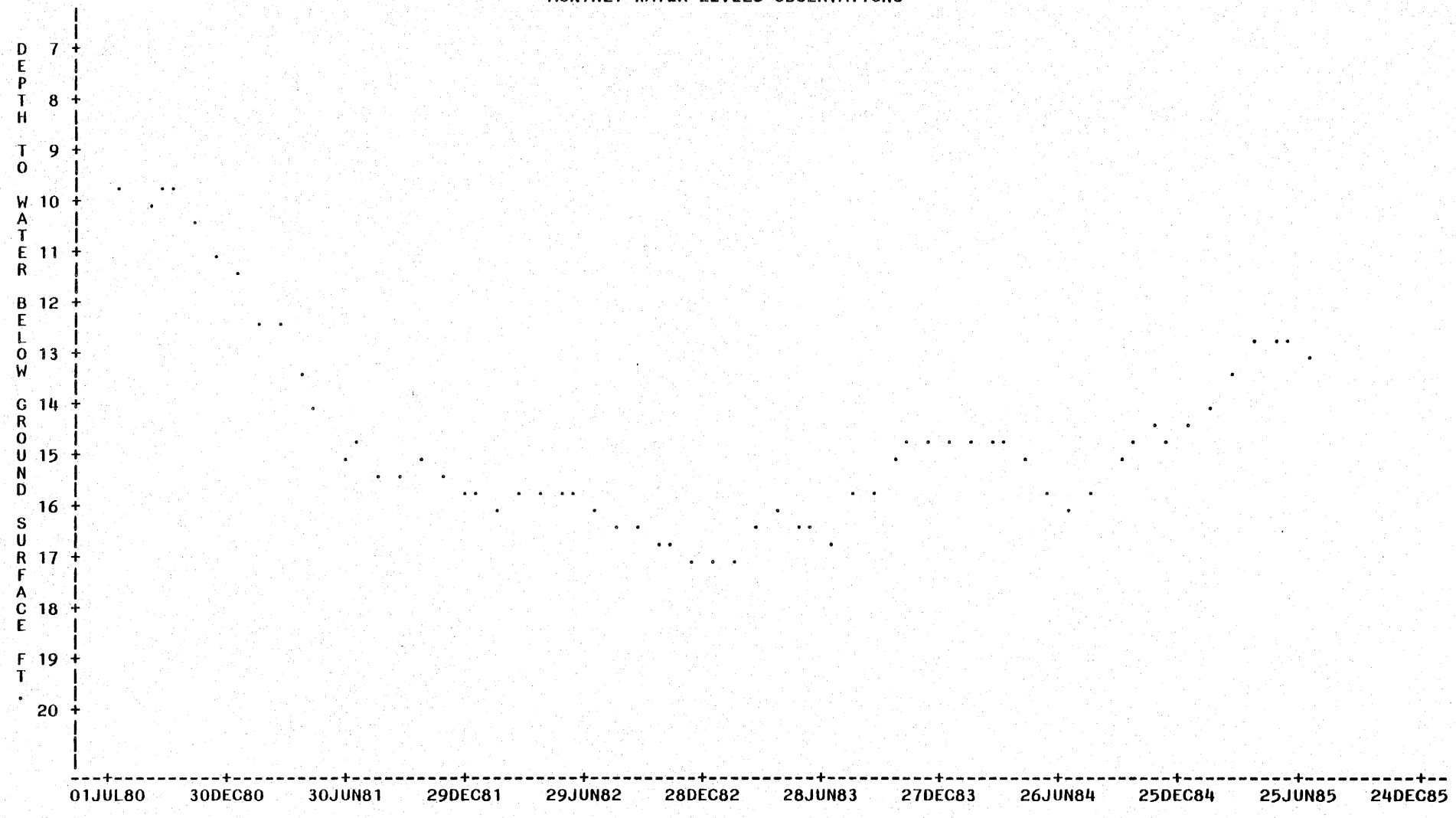
ALLUVIAL WELL 74
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



MONTHLY READINGS

VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	61	17.35459016	2.18638711	11.67000000	20.18000000	8.51000000

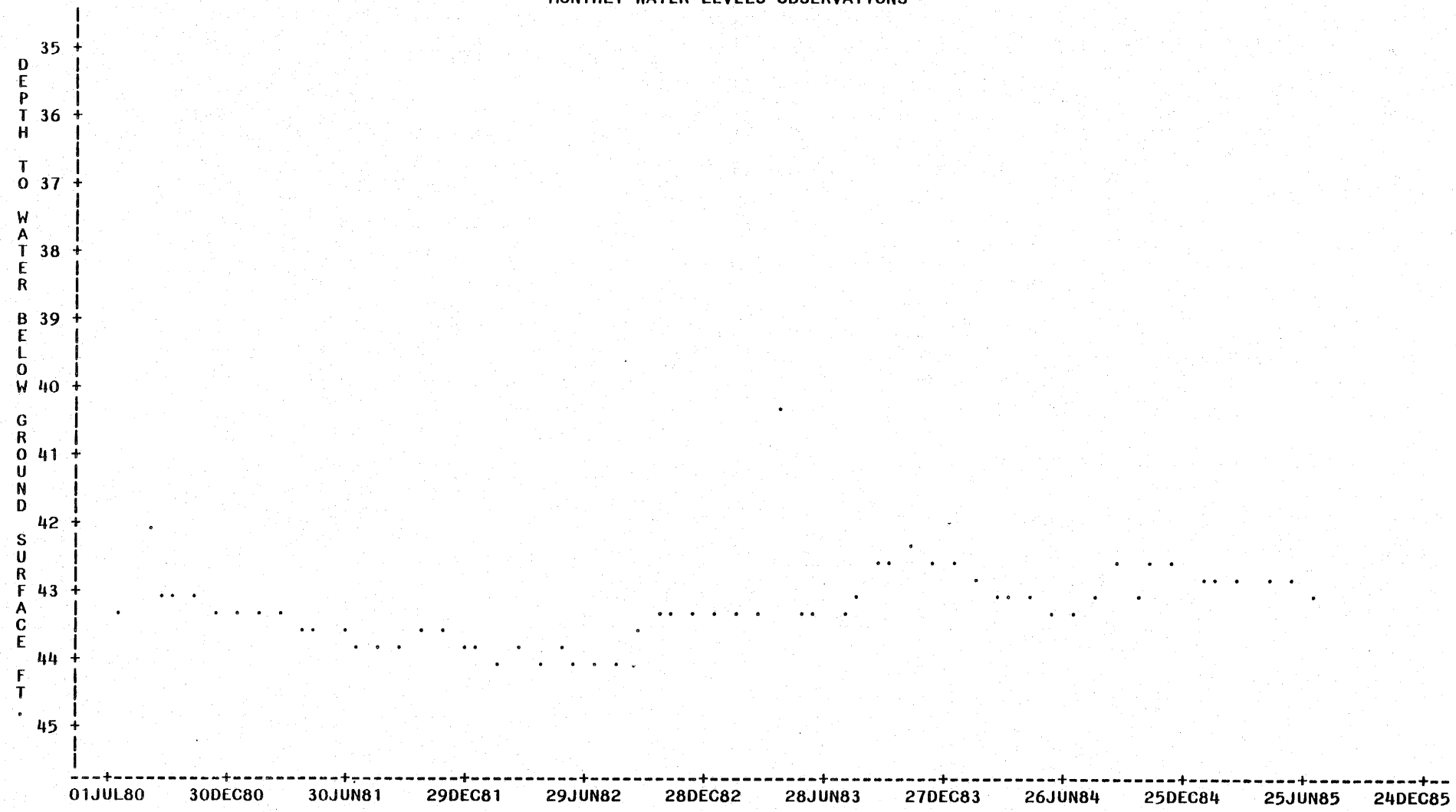
ALLUVIAL WELL 75
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



MONTHLY READINGS

VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	61	14.52836066	1.94445638	9.52000000	16.90000000	7.38000000

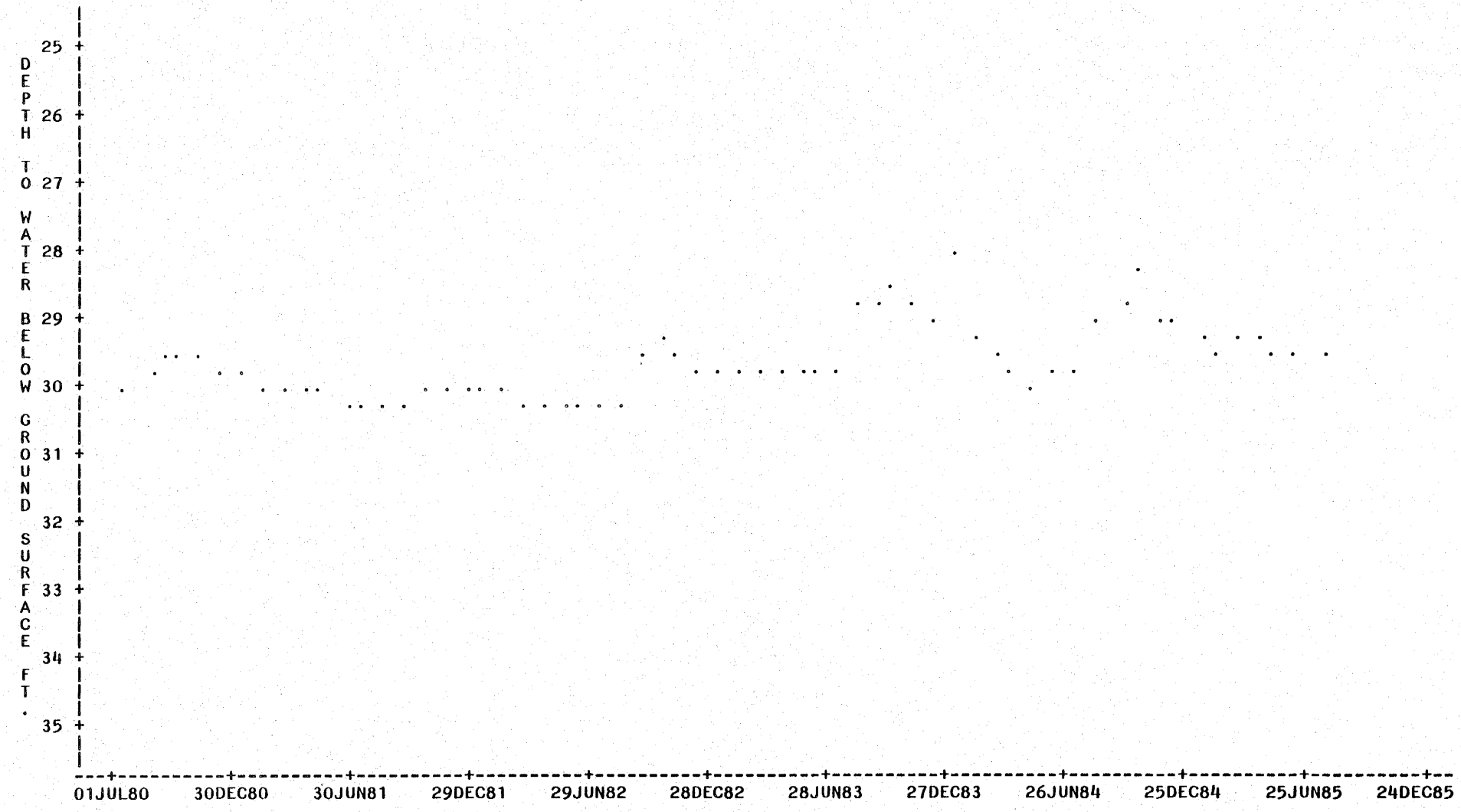
ALLUVIAL WELL 76
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



MONTHLY READINGS

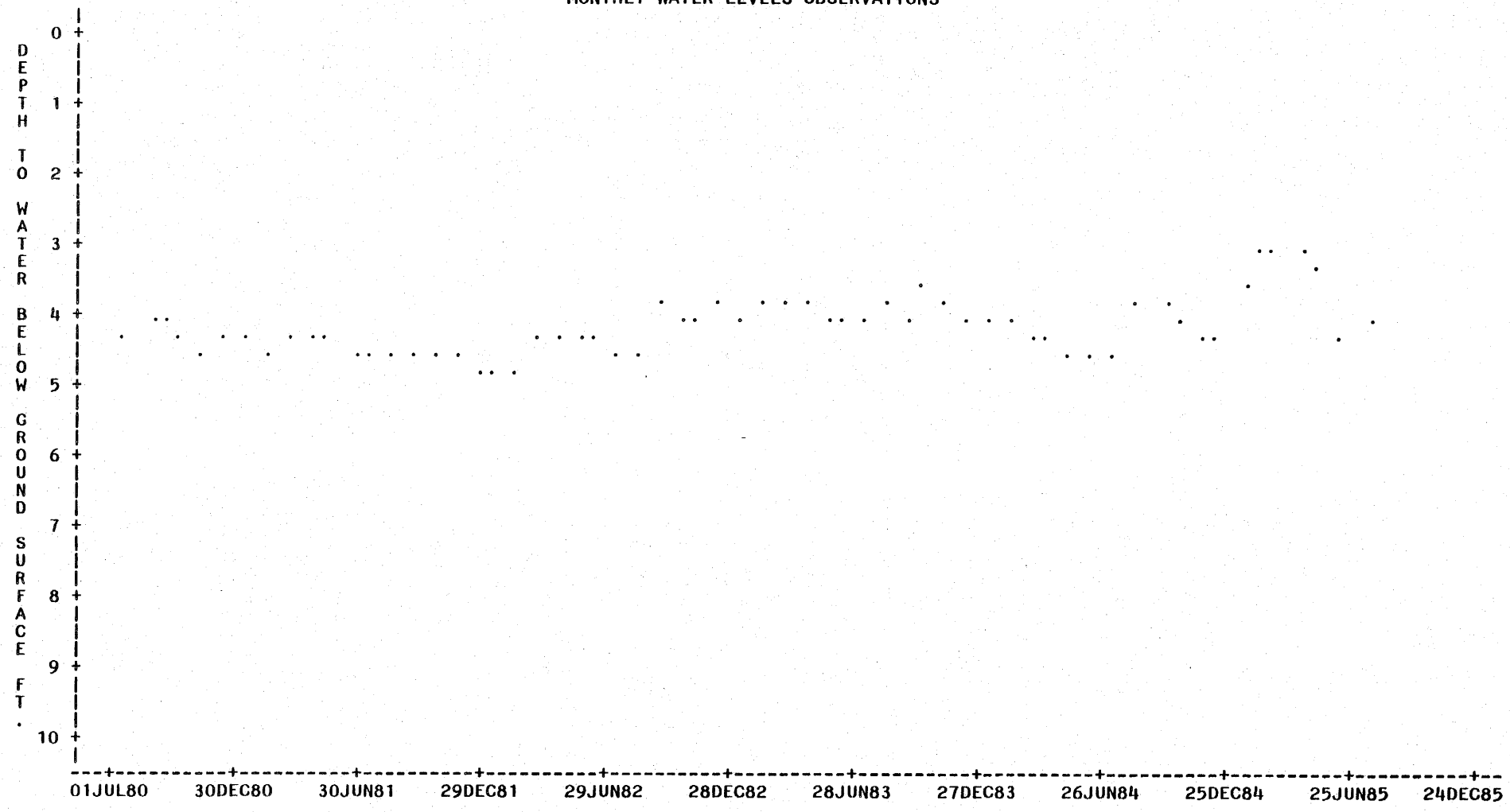
VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	61	43.12114754	0.58935020	40.28000000	44.00000000	3.72000000

ALLUVIAL WELL 77
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



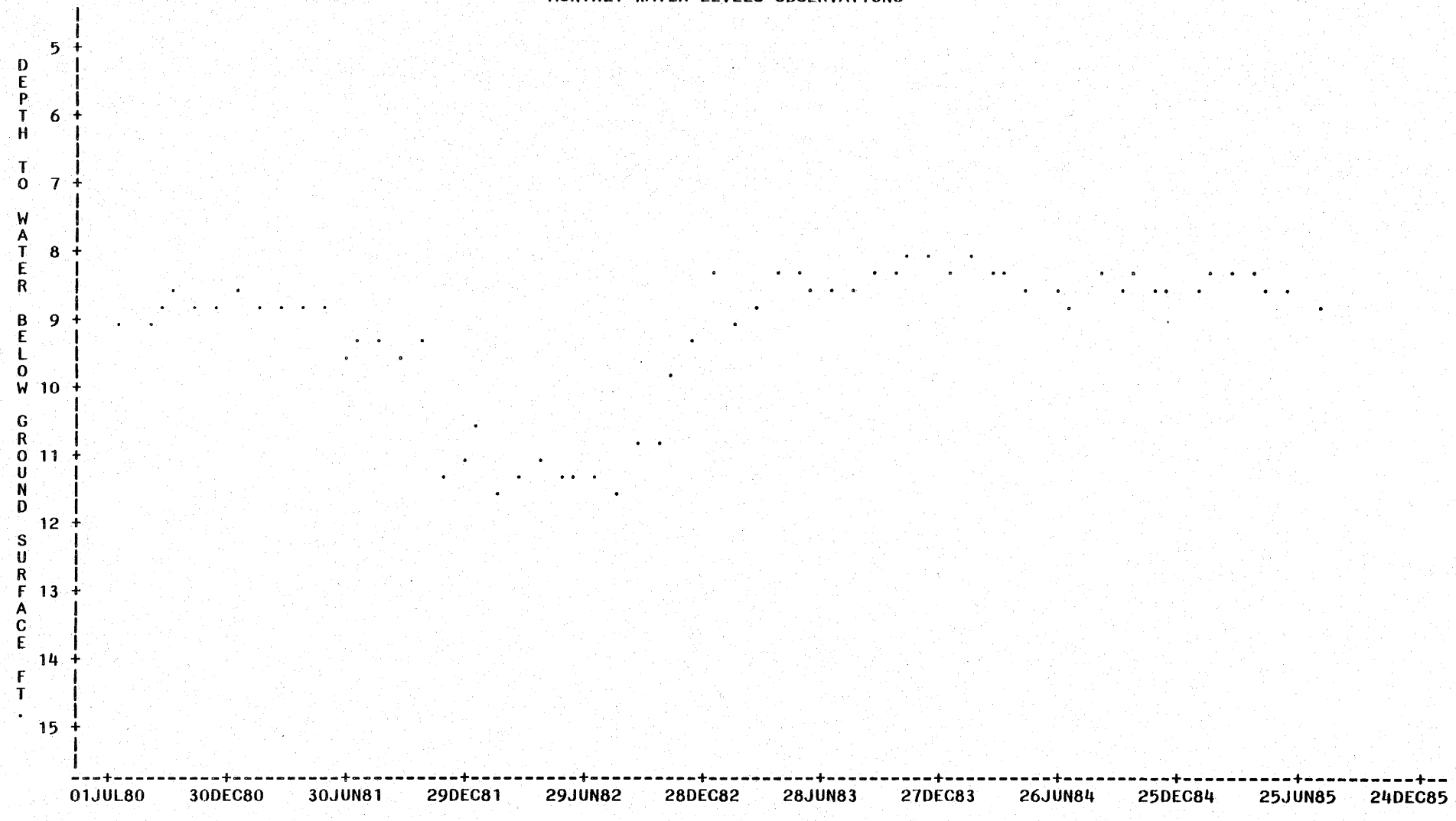
VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	61	29.58983607	0.52972160	28.12000000	30.28000000	2.16000000

ALLUVIAL WELL 79
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	61	4.09016393	0.39240070	3.00000000	4.72000000	1.72000000

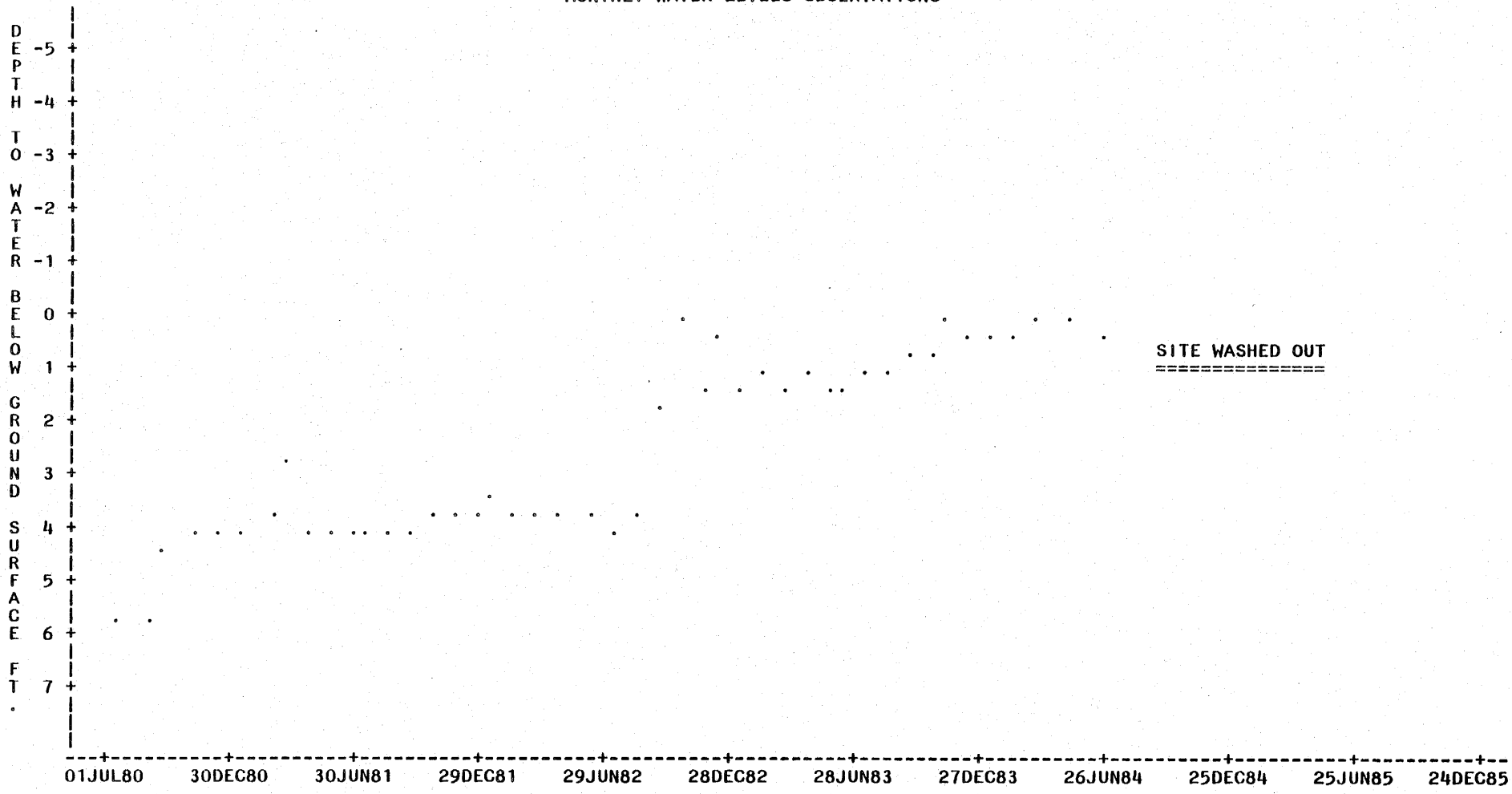
ALLUVIAL WELL 80
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



MONTHLY READINGS

VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	61	9.10355738	1.06496570	8.01700000	11.48000000	3.46300000

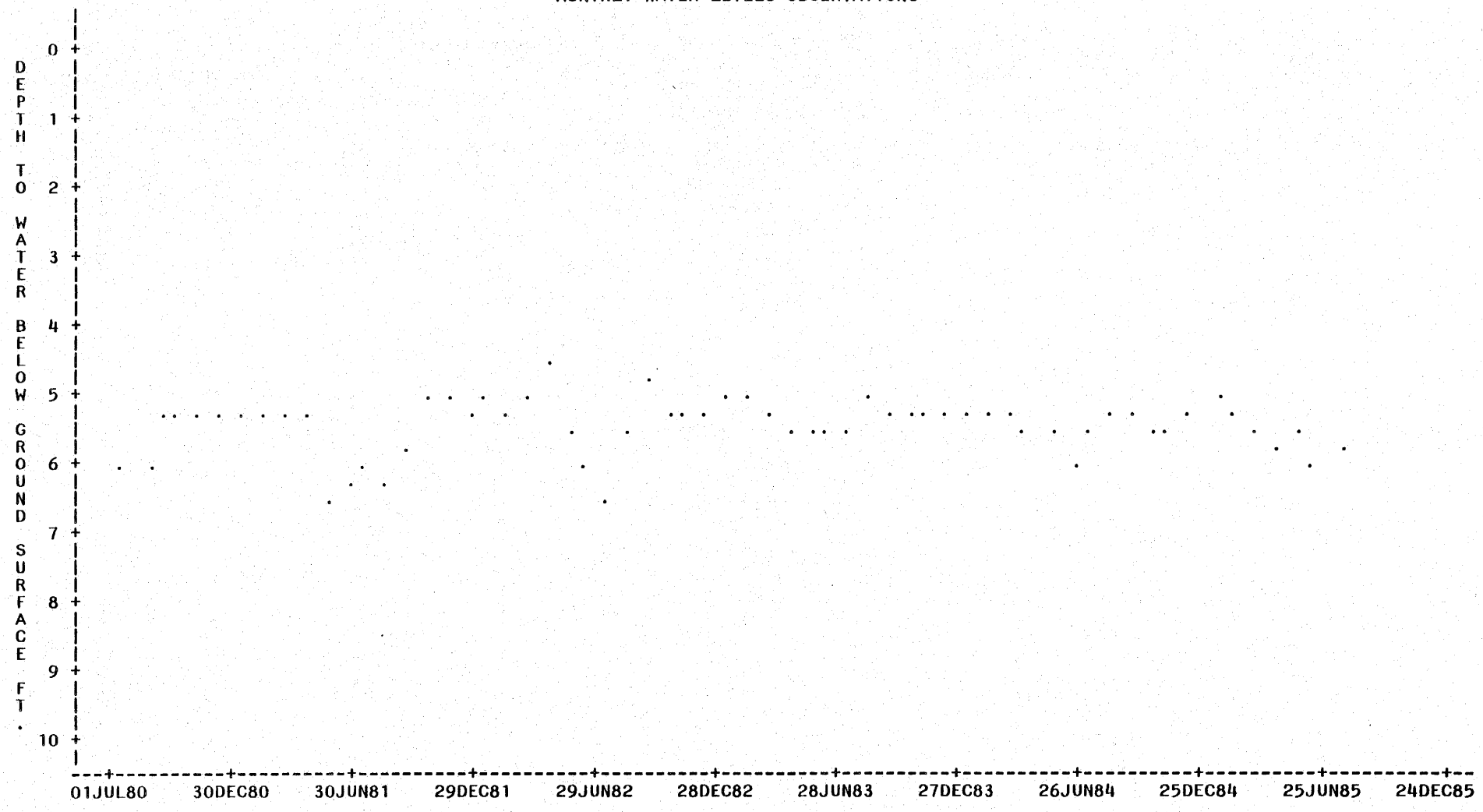
ALLUVIAL WELL 81
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



MONTHLY READINGS

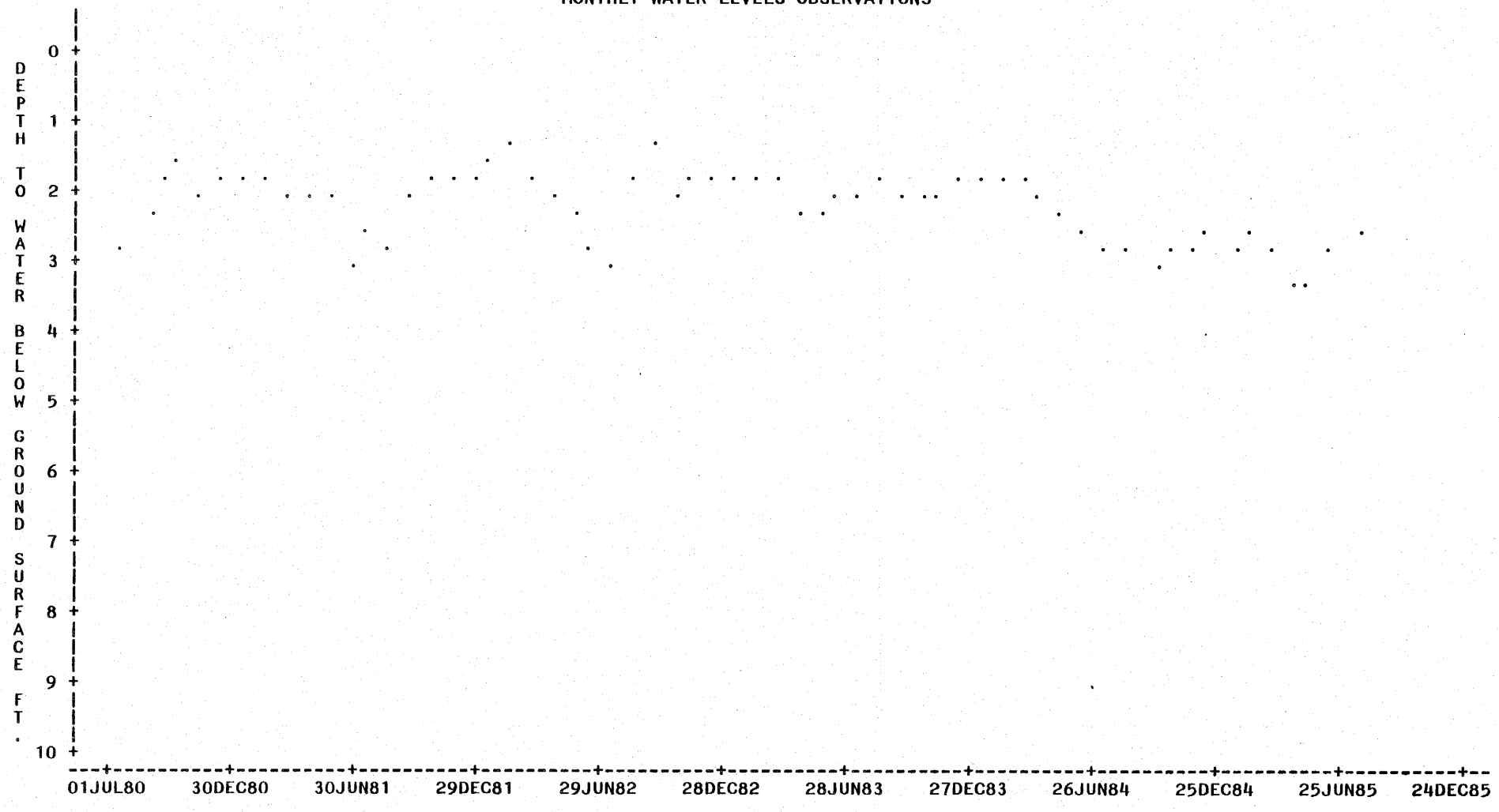
VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	46	2.37347826	1.73940375	0.01000000	5.66000000	5.65000000

ALLUVIAL WELL 82
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



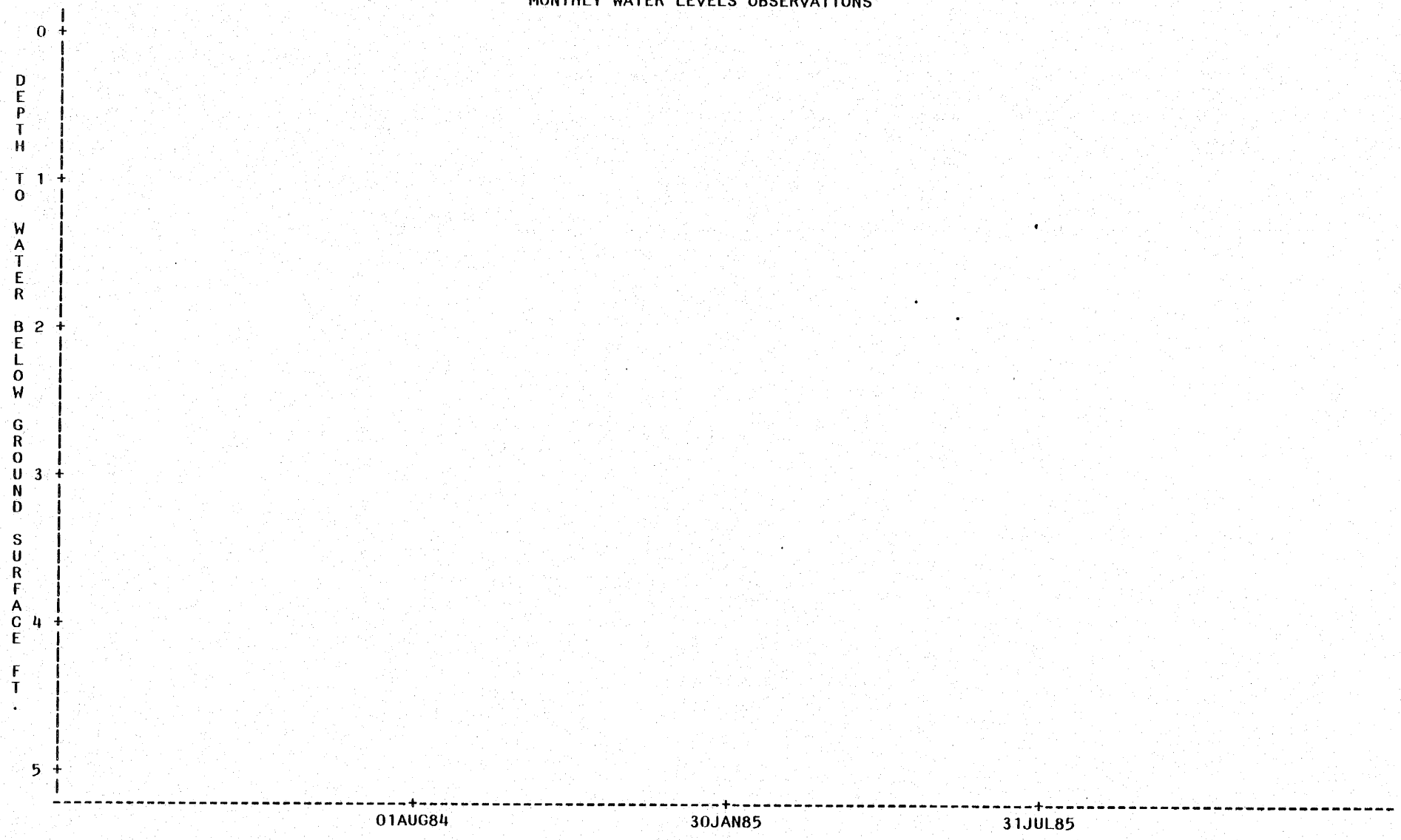
VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	61	5.42836066	0.39965060	4.40000000	6.51000000	2.11000000

ALLUVIAL WELL 83
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	61	2.13377049	0.48573025	1.15000000	3.25000000	2.10000000

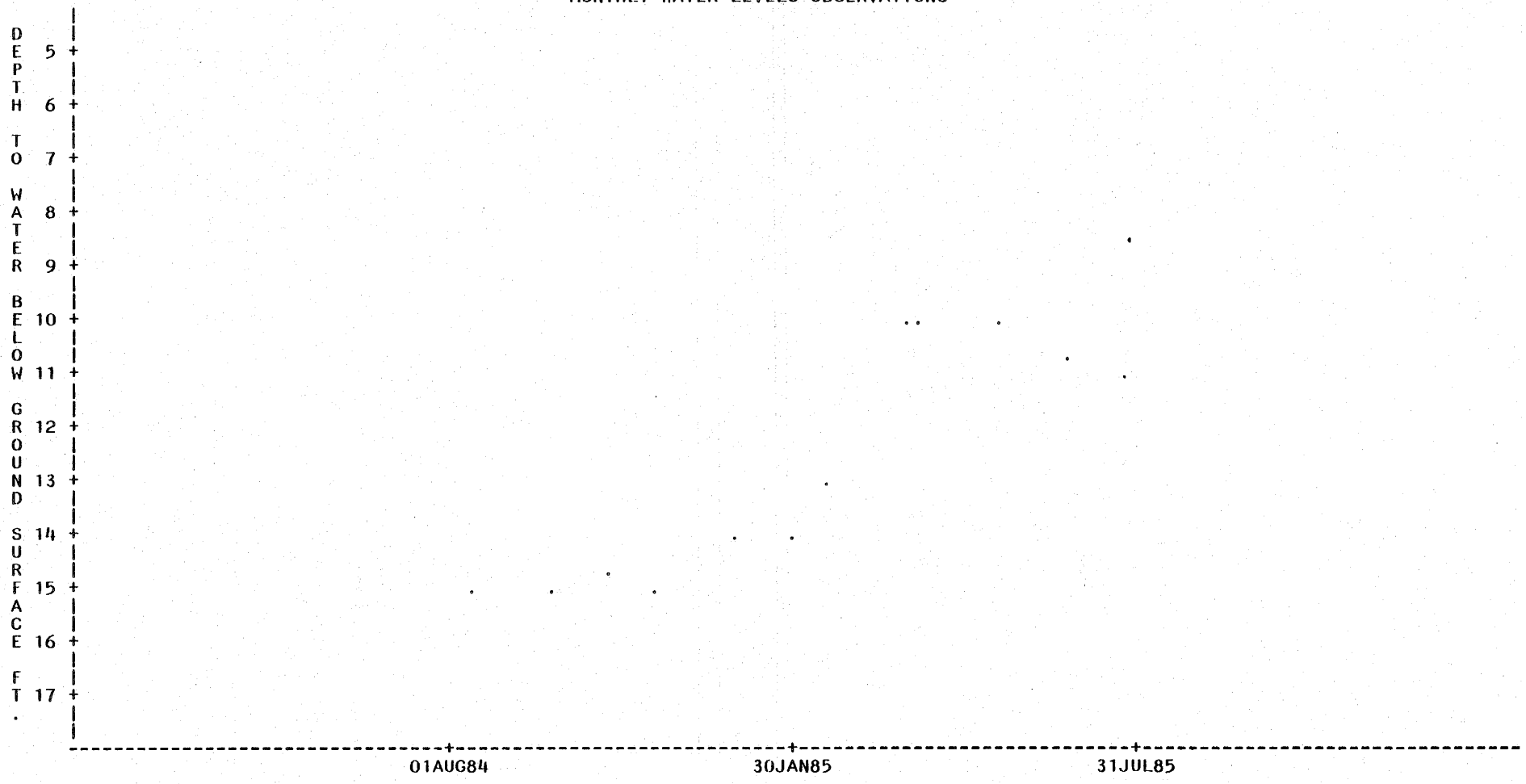
ALLUVIAL WELL 84R
MAY 1984 THROUGH JUNE 1985
MONTHLY WATER LEVELS OBSERVATIONS



MONTHLY READINGS

VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	2	1.85000000	0.08485281	1.79000000	1.91000000	0.12000000

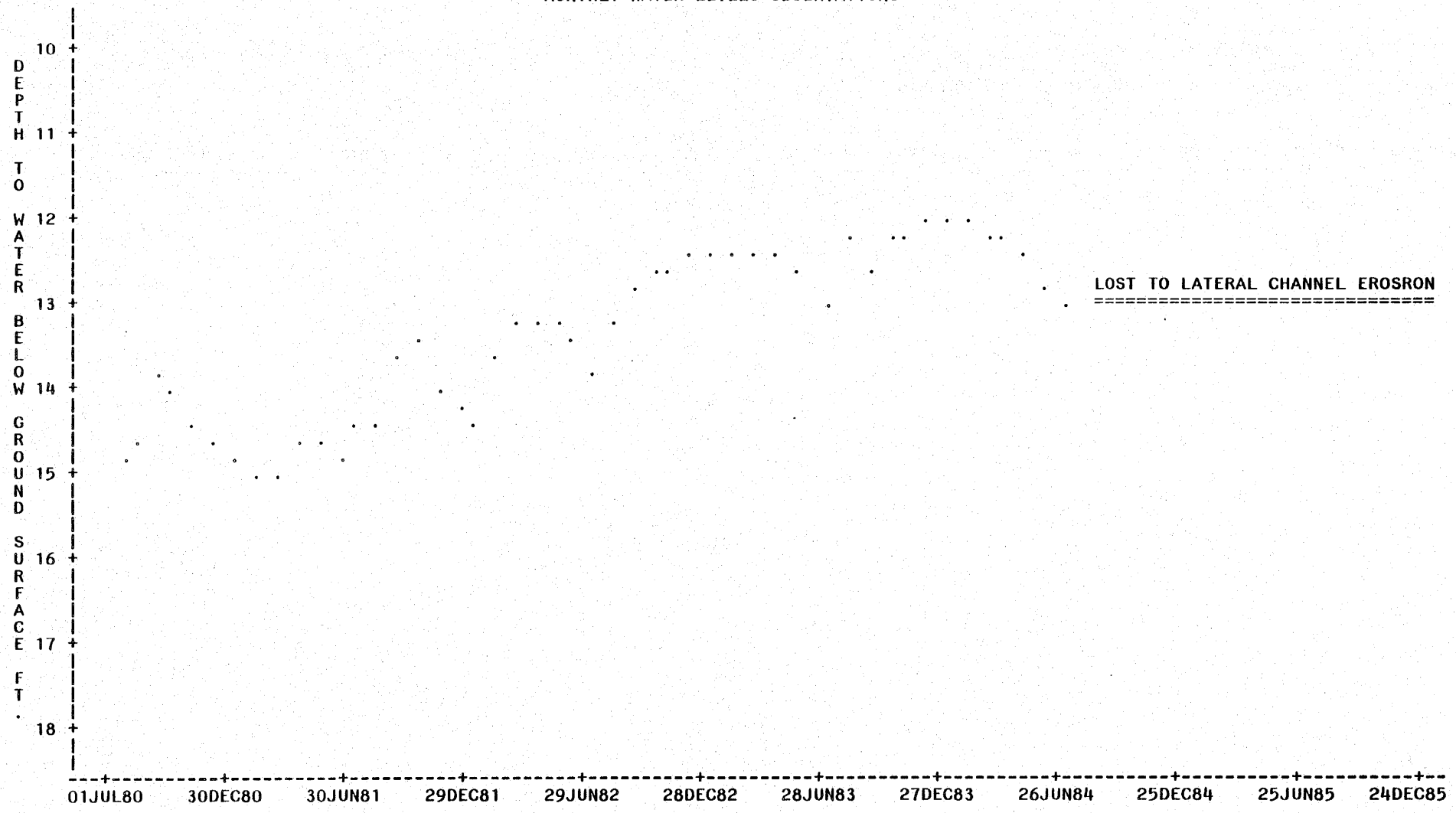
ALLUVIAL WELL 100R
AUGUST 1984 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



MONTHLY READINGS

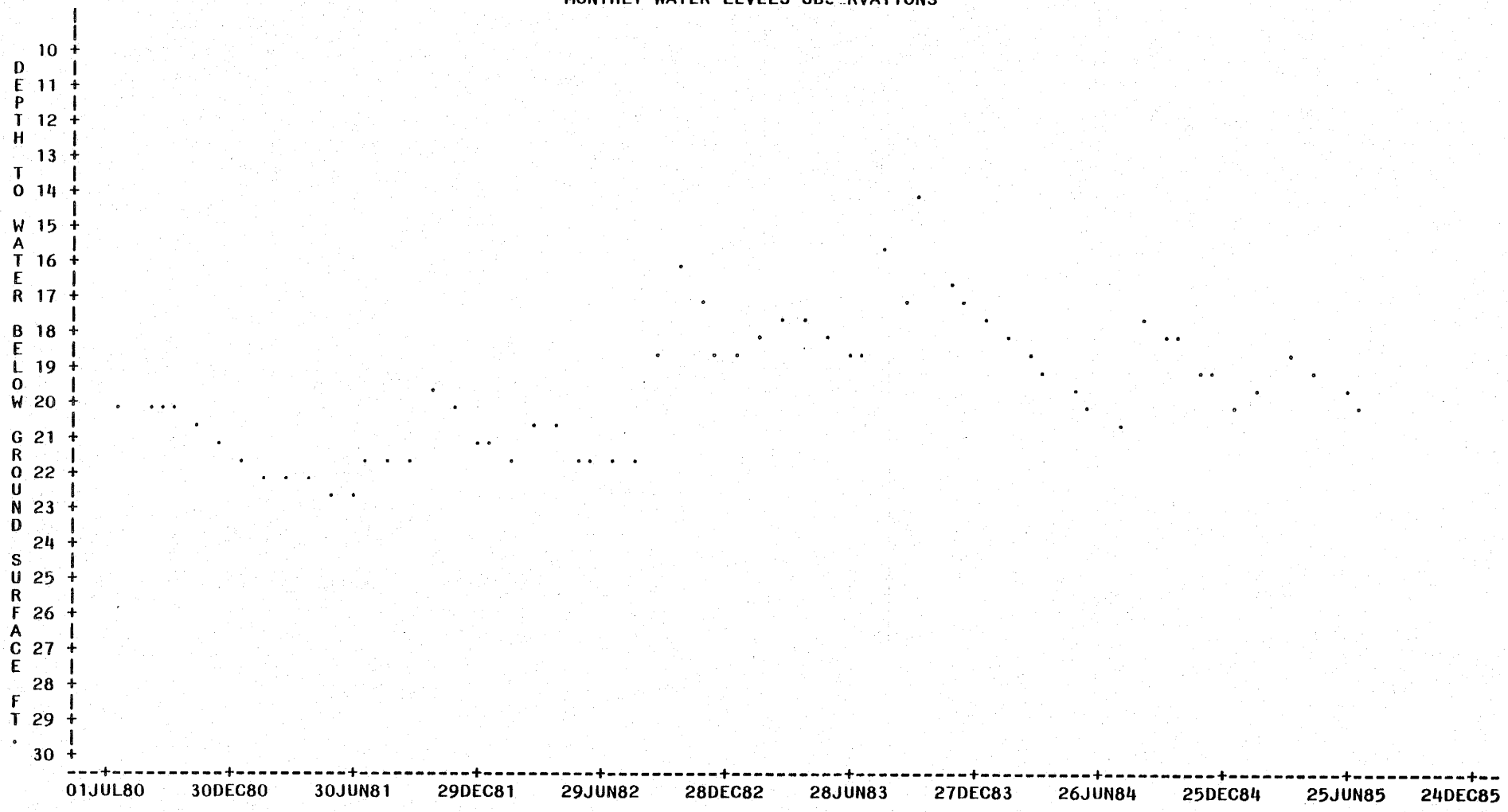
VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	12	12.67333333	2.19653584	9.88000000	15.03000000	5.15000000

ALLUVIAL WELL 84
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	49	13.32673469	0.97421205	11.99000000	15.04000000	3.05000000

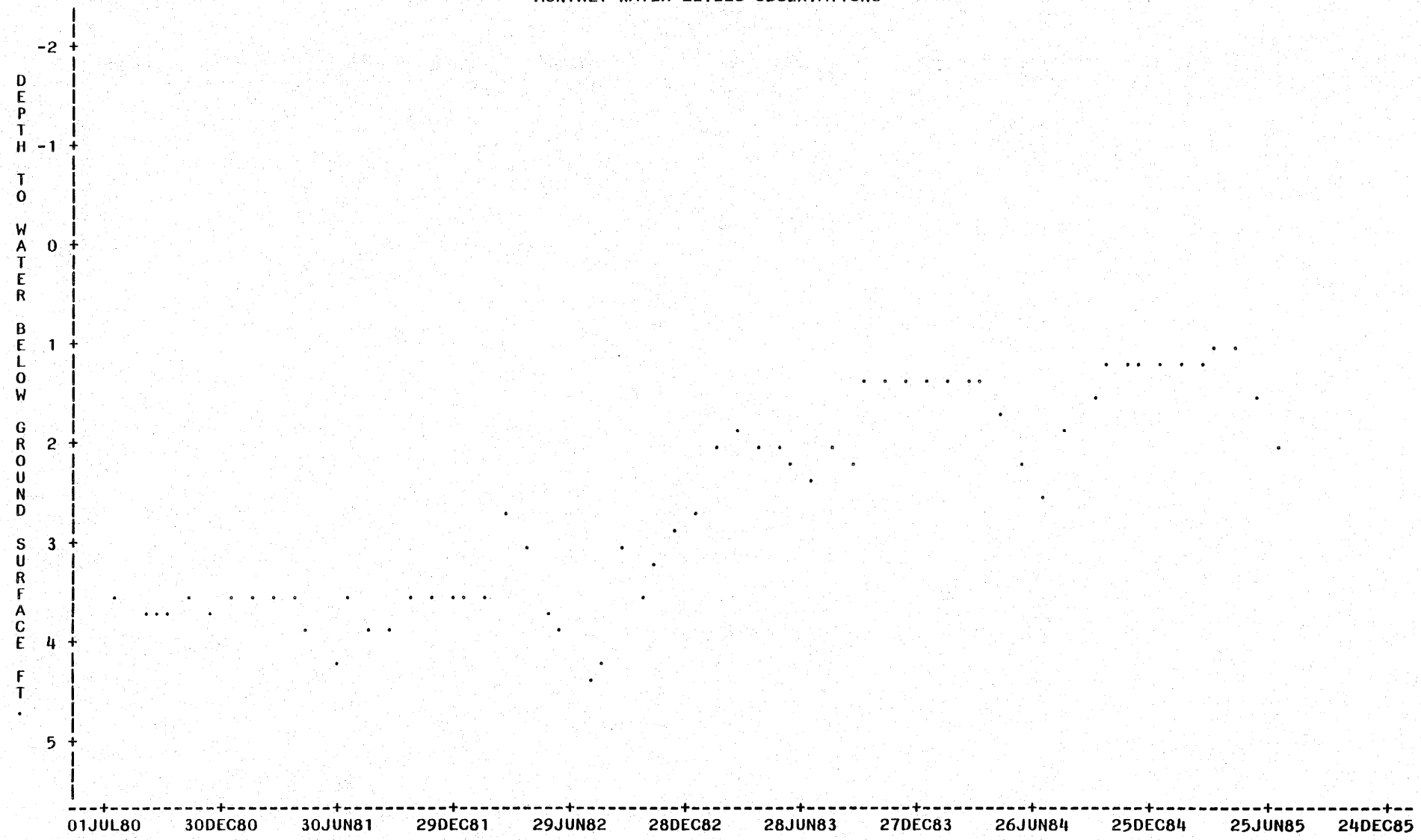
ALLUVIAL WELL 87
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



MONTHLY READINGS

VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	61	19.41278689	1.82047533	14.18000000	22.49000000	8.31000000

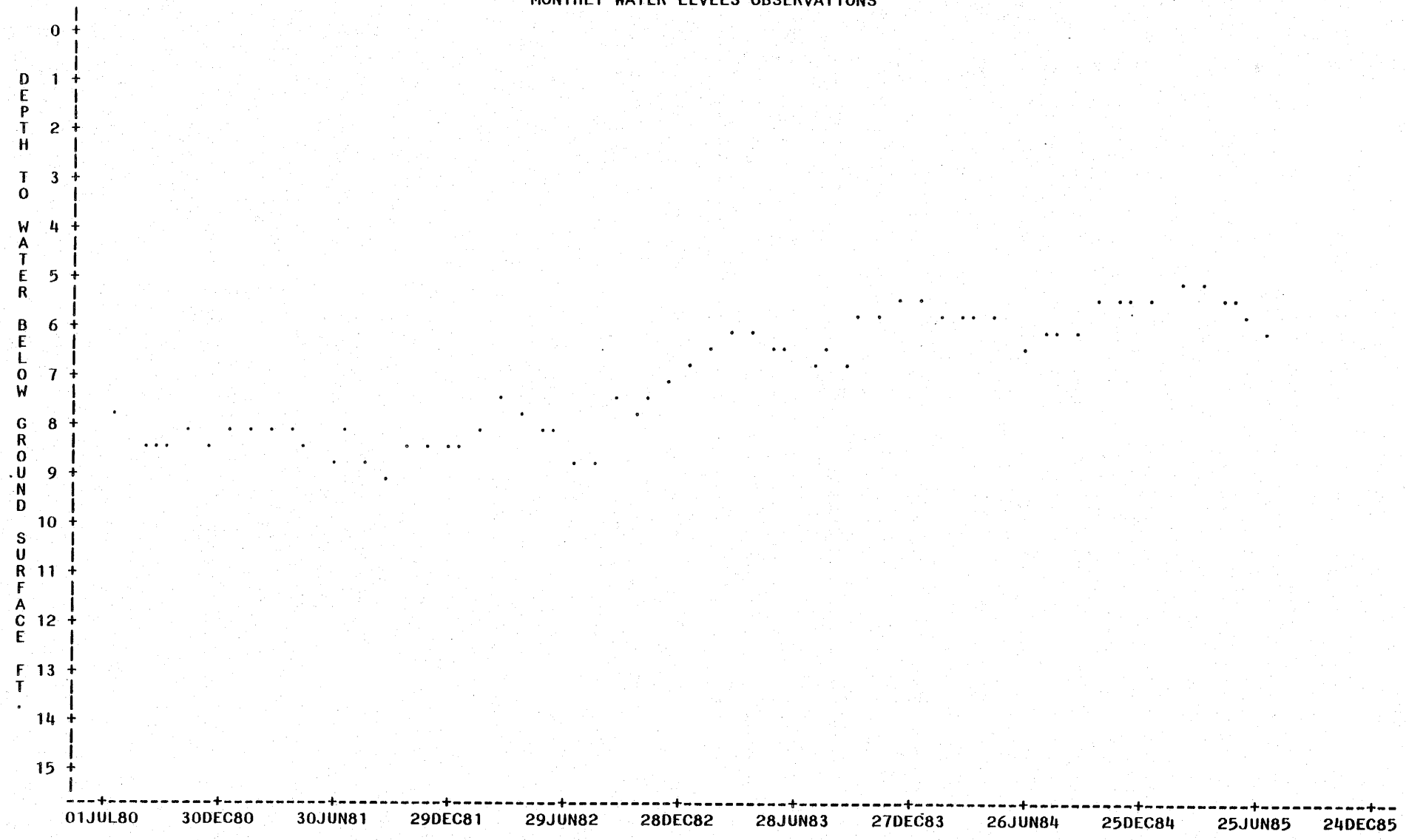
ALLUVIAL WELL 88
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



MONTHLY READINGS

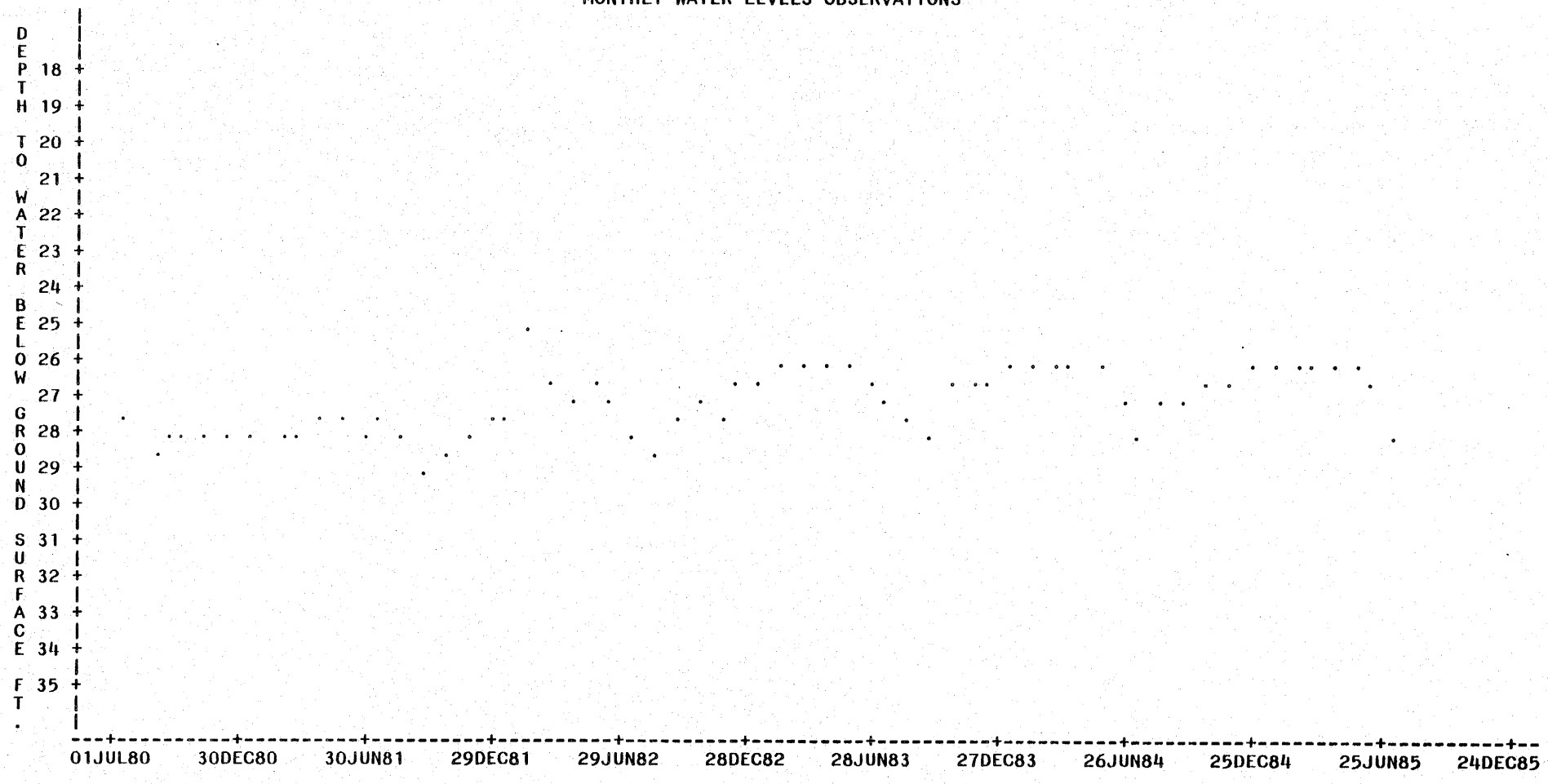
VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	61	2.57672131	1.05303960	0.93000000	4.34000000	3.41000000

ALLUVIAL WELL 89
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	61	6.94114754	1.23854901	4.97000000	8.92000000	3.95000000

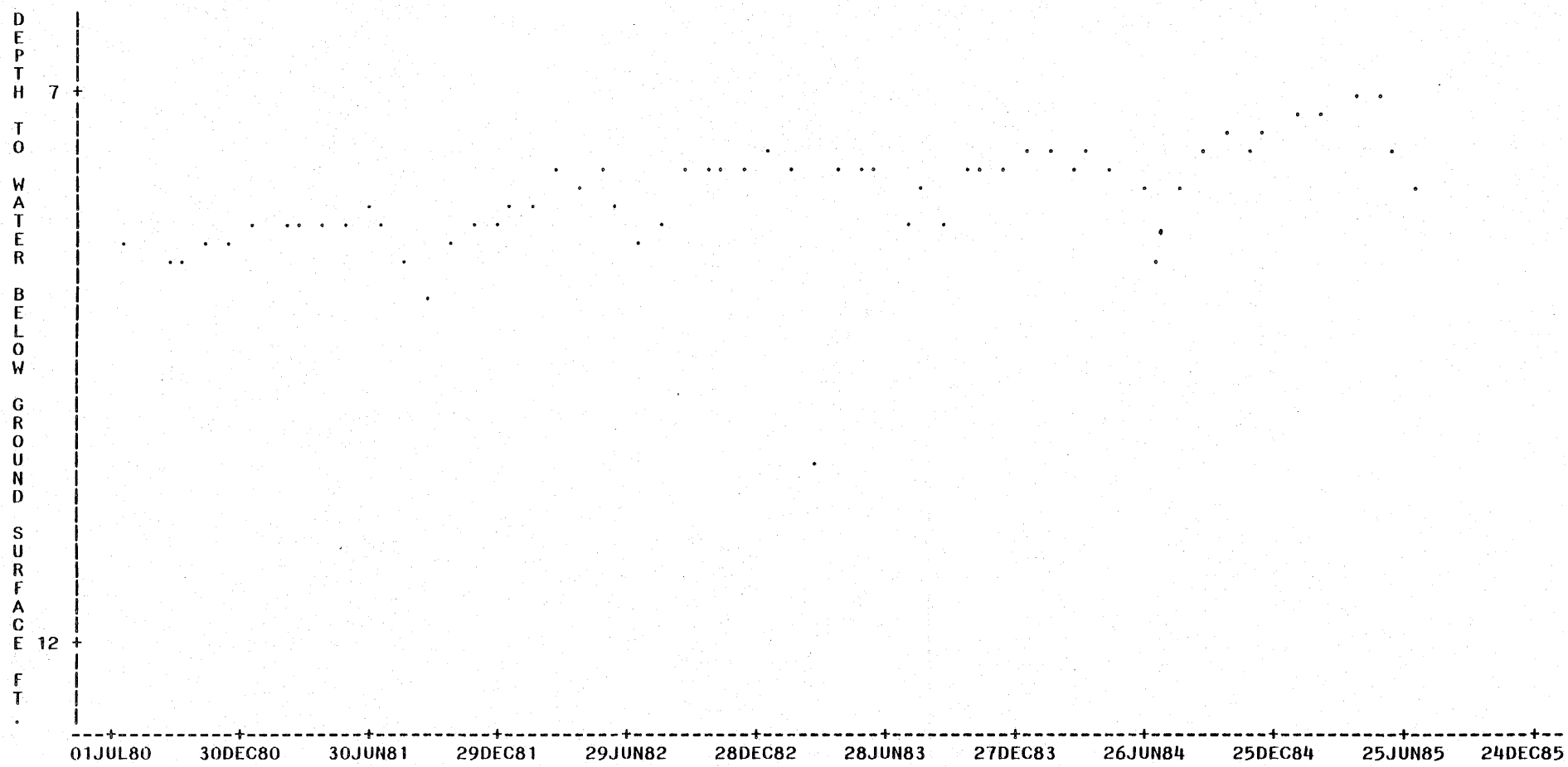
ALLUVIAL WELL 93
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



MONTHLY READINGS

VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	61	27.04081967	0.88205120	25.21000000	29.07000000	3.86000000

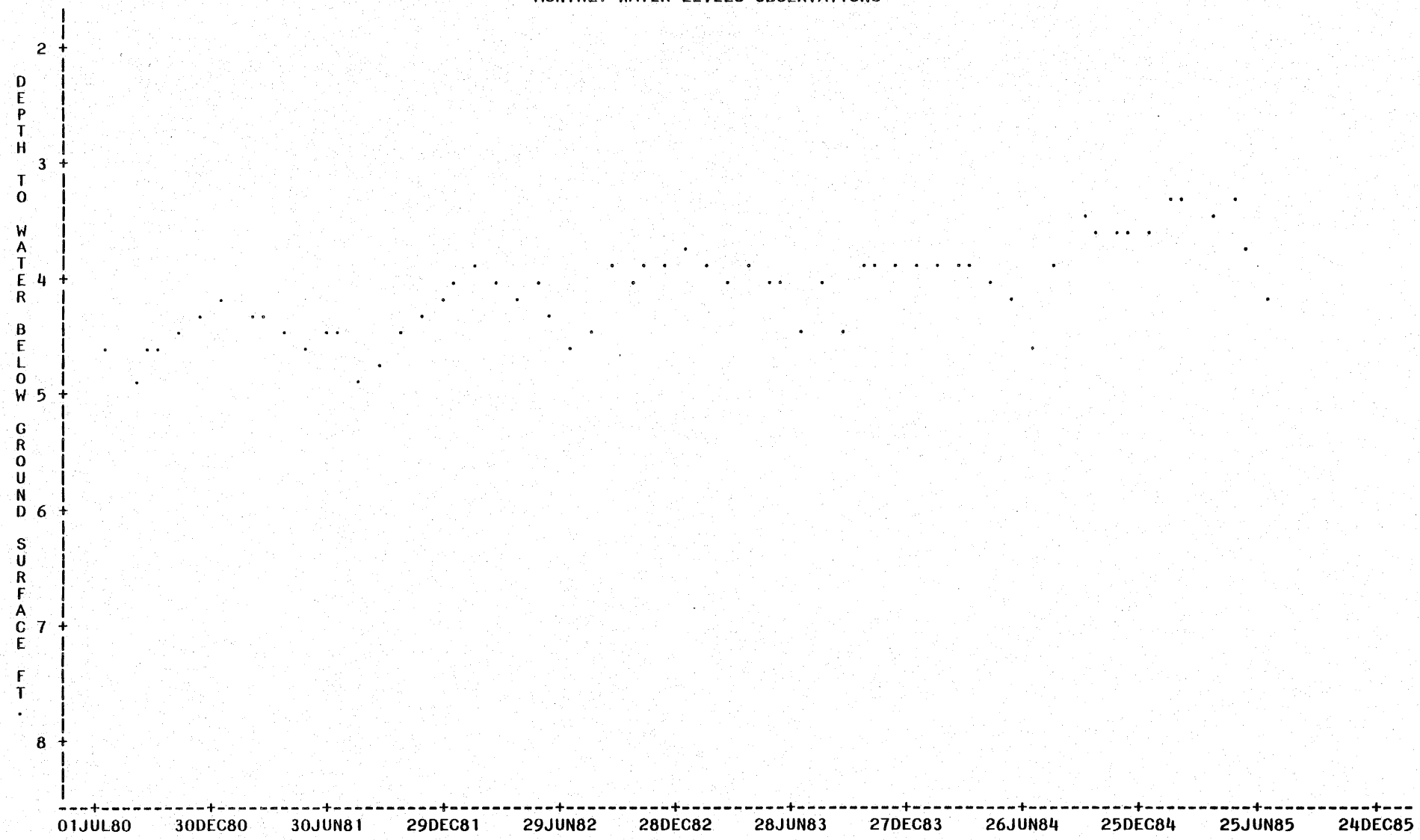
ALLUVIAL WELL 94
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



MONTHLY READINGS

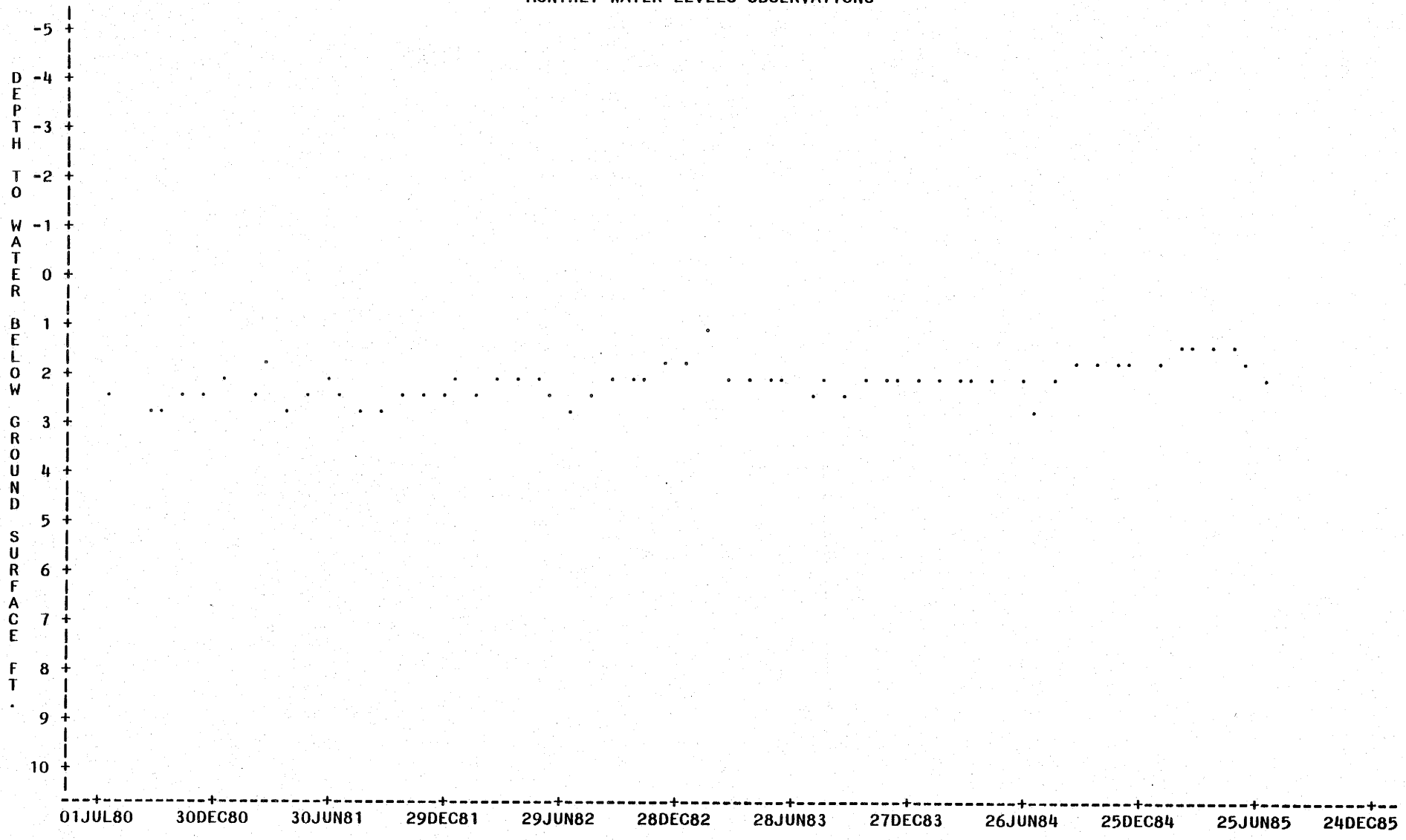
VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	60	7.88233333	0.51919549	6.89000000	10.35000000	3.46000000

ALLUVIAL WELL 95
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	61	4.07049180	0.37696784	3.31000000	4.81000000	1.50000000

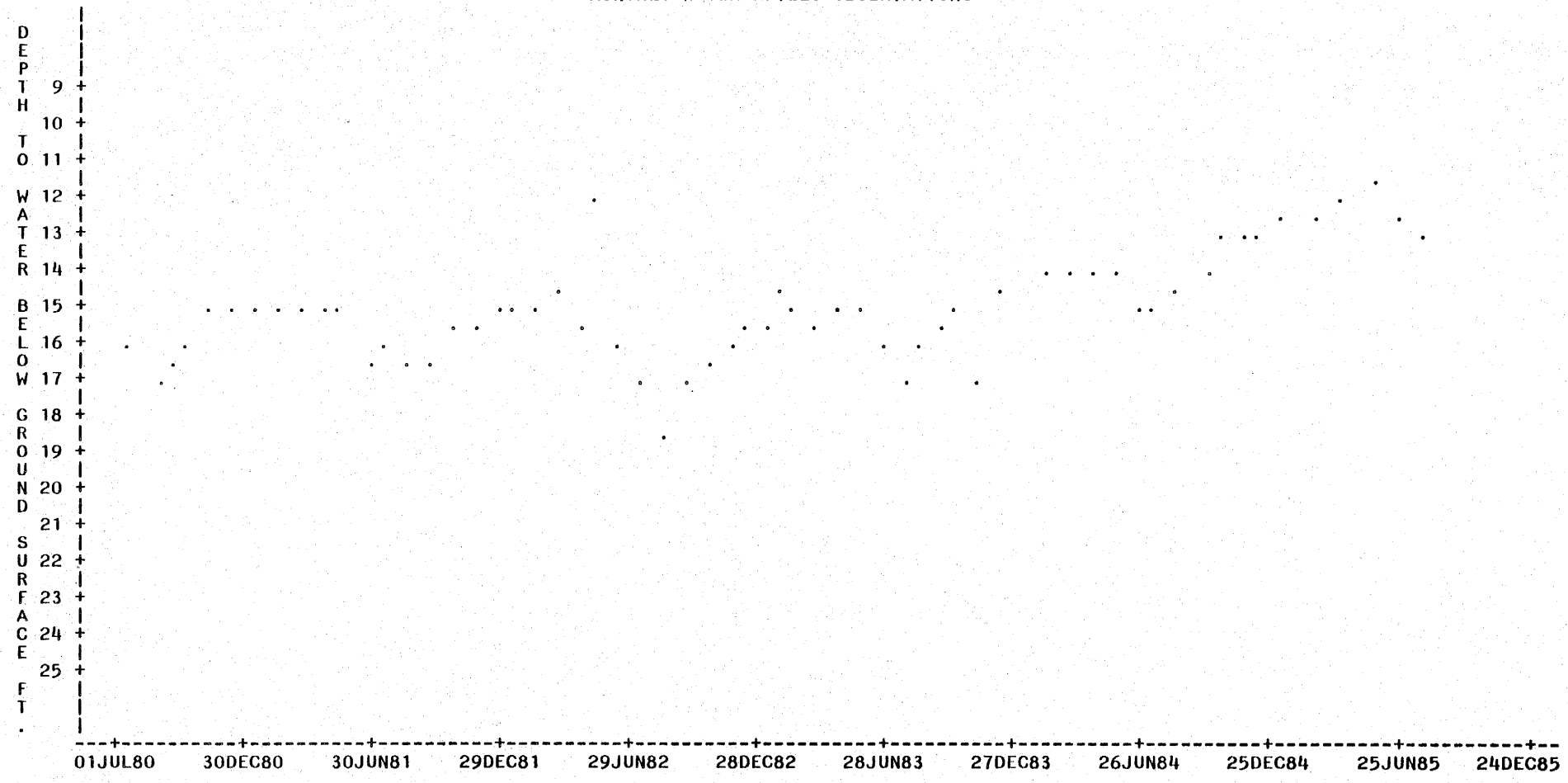
ALLUVIAL WELL 96
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



MONTHLY READINGS

VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	60	2.03700000	0.37616846	0.86000000	2.80000000	1.94000000

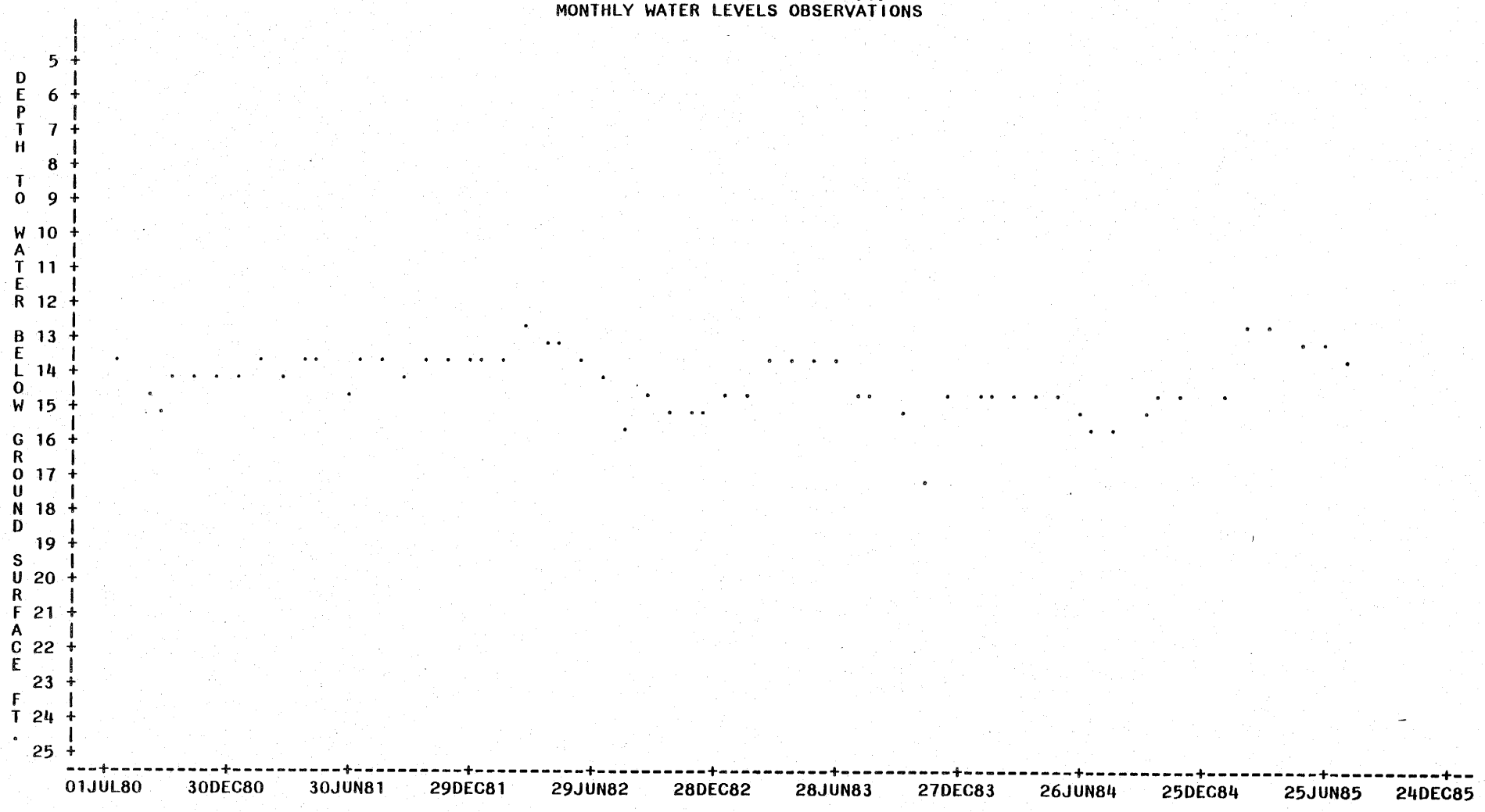
ALLUVIAL WELL 98
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



MONTHLY READINGS

VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	61	14.92868852	1.49319844	11.75000000	18.44000000	6.69000000

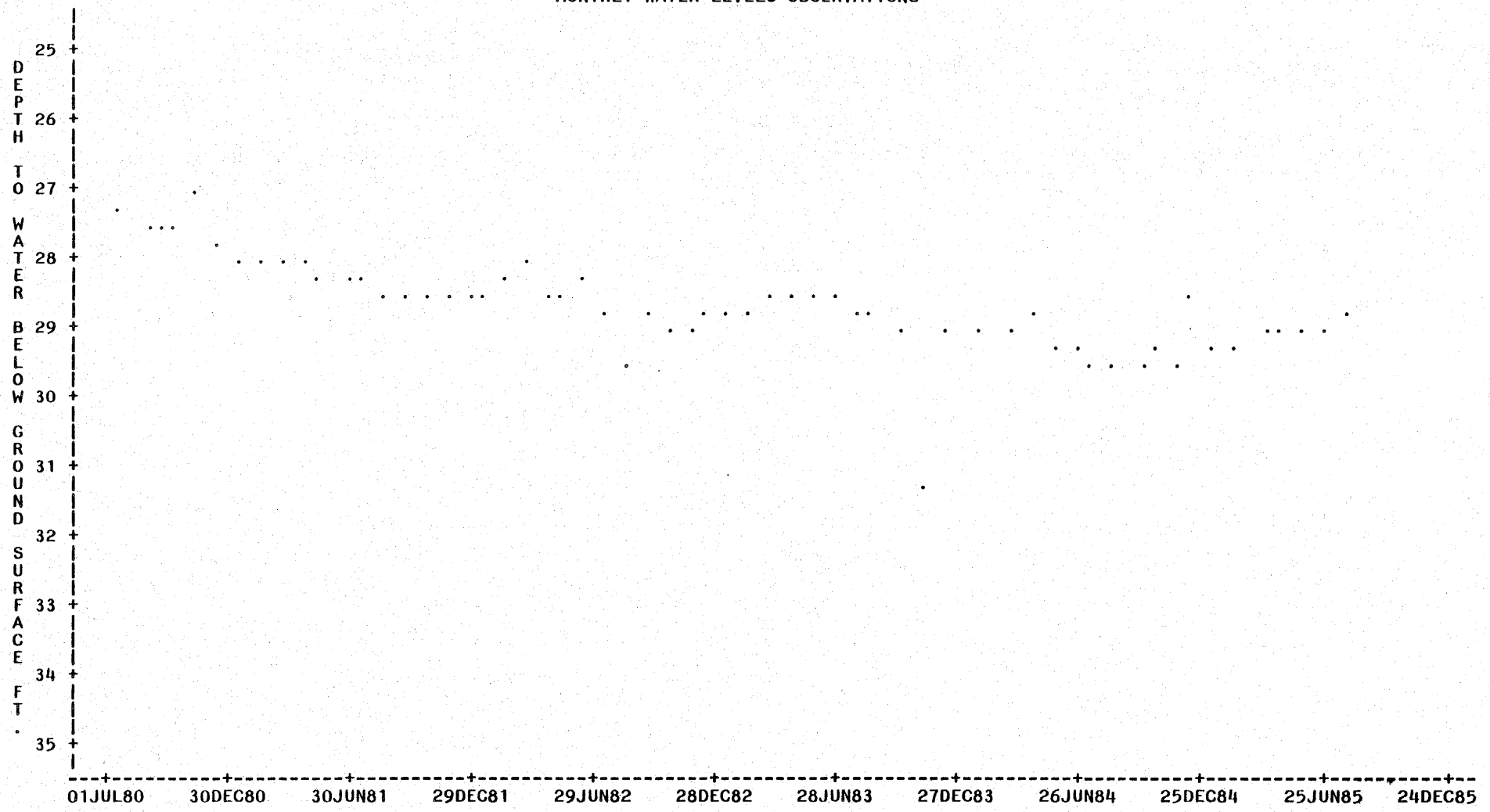
ALLUVIAL WELL 99
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



MONTHLY READINGS

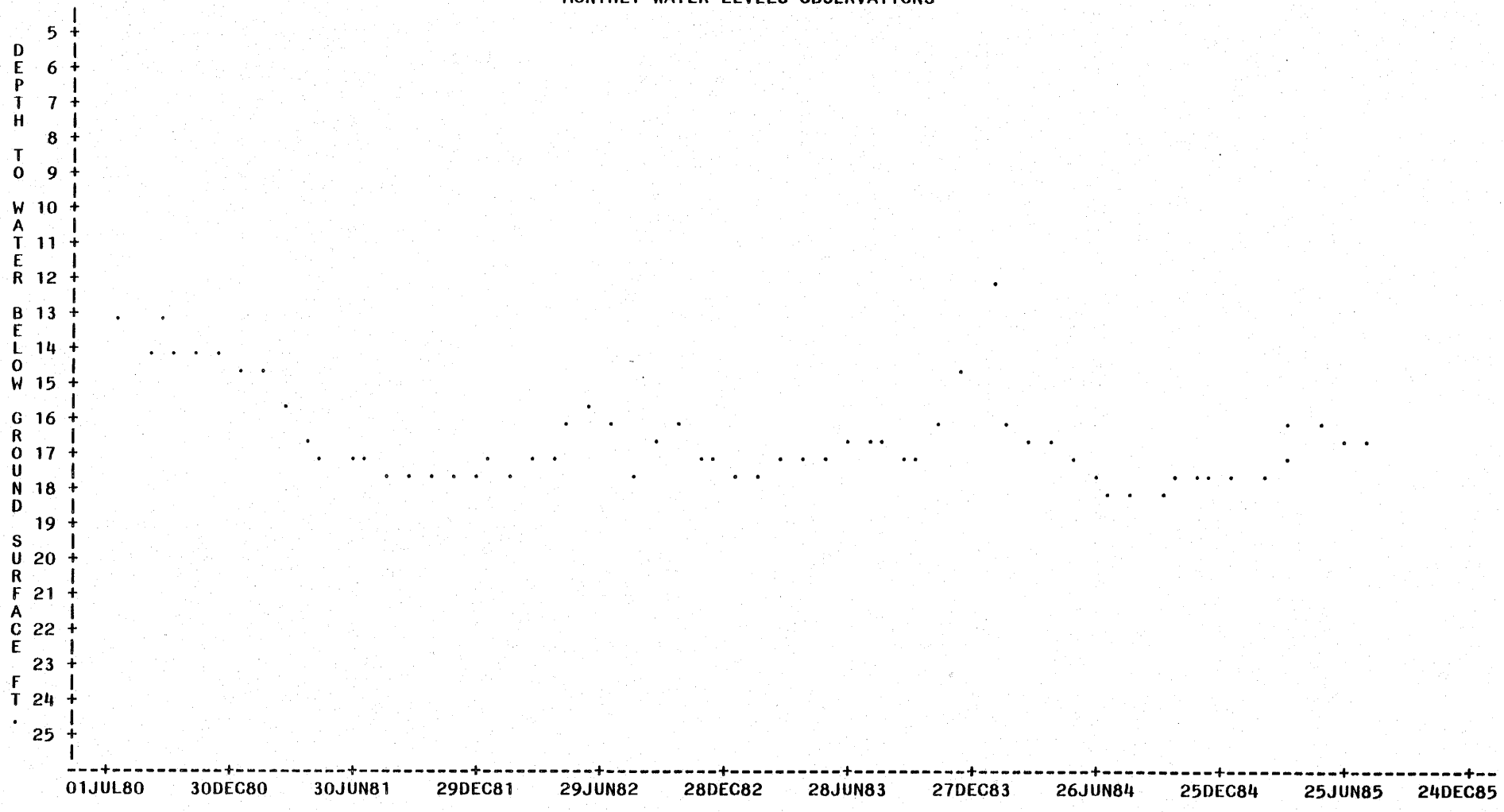
VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	60	14.08283333	0.84307366	12.39000000	16.90000000	4.51000000

ALLUVIAL WELL 100
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	60	28.66366667	0.66548814	27.08000000	31.27000000	4.19000000

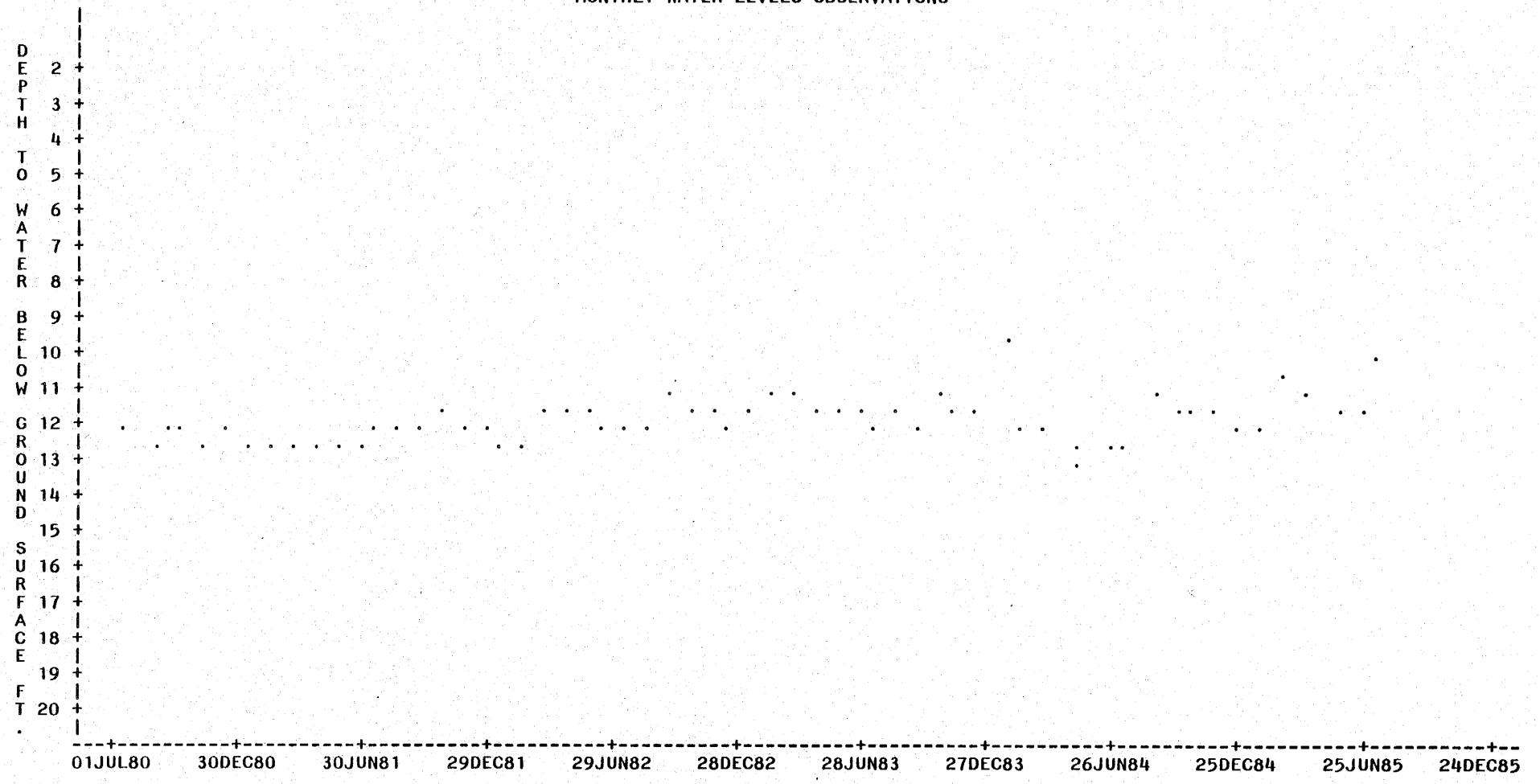
ALLUVIAL WELL 101
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



MONTHLY READINGS

VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	61	16.39327869	1.37055551	11.91000000	17.99000000	6.08000000

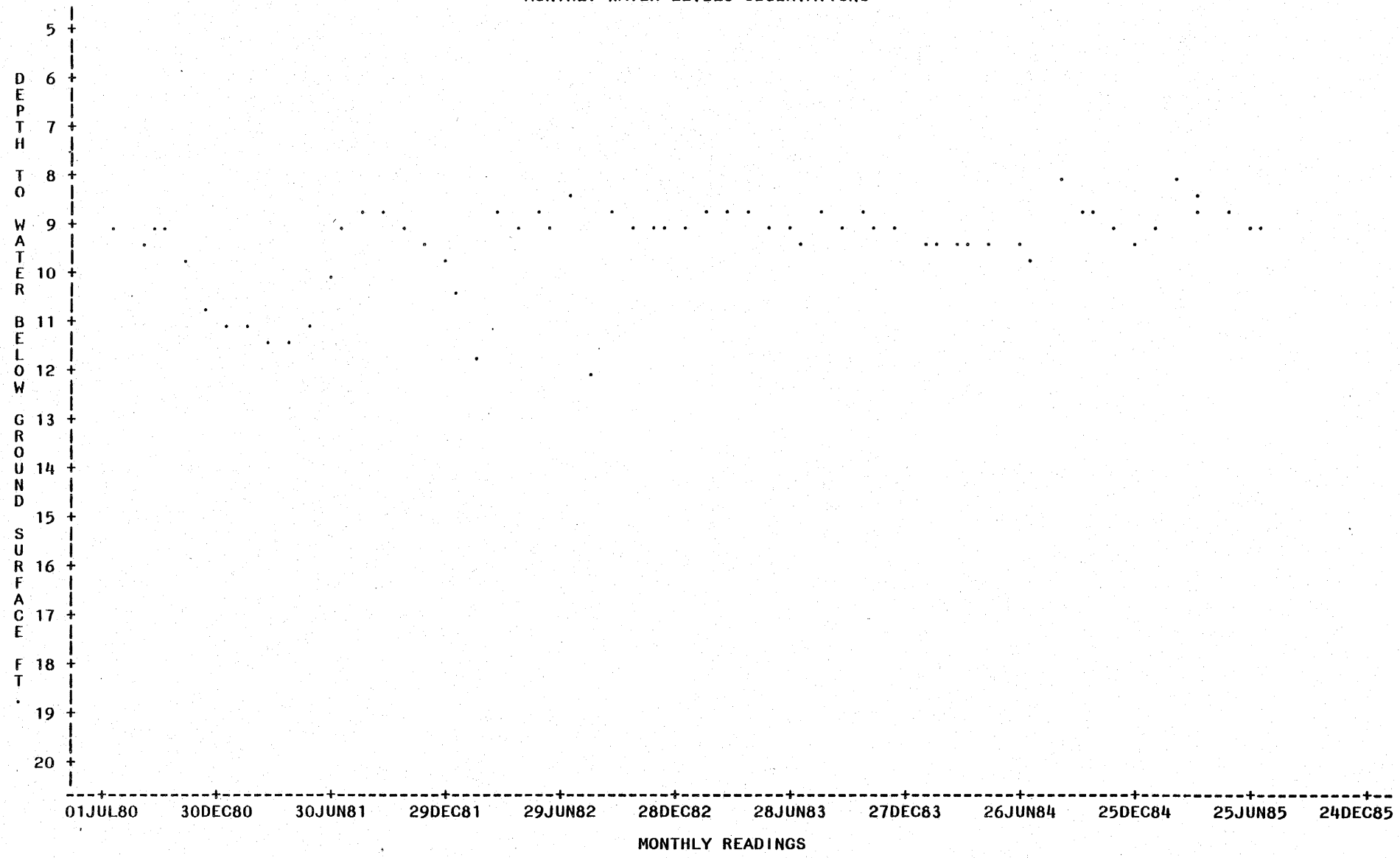
ALLUVIAL WELL 102
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



MONTHLY READINGS

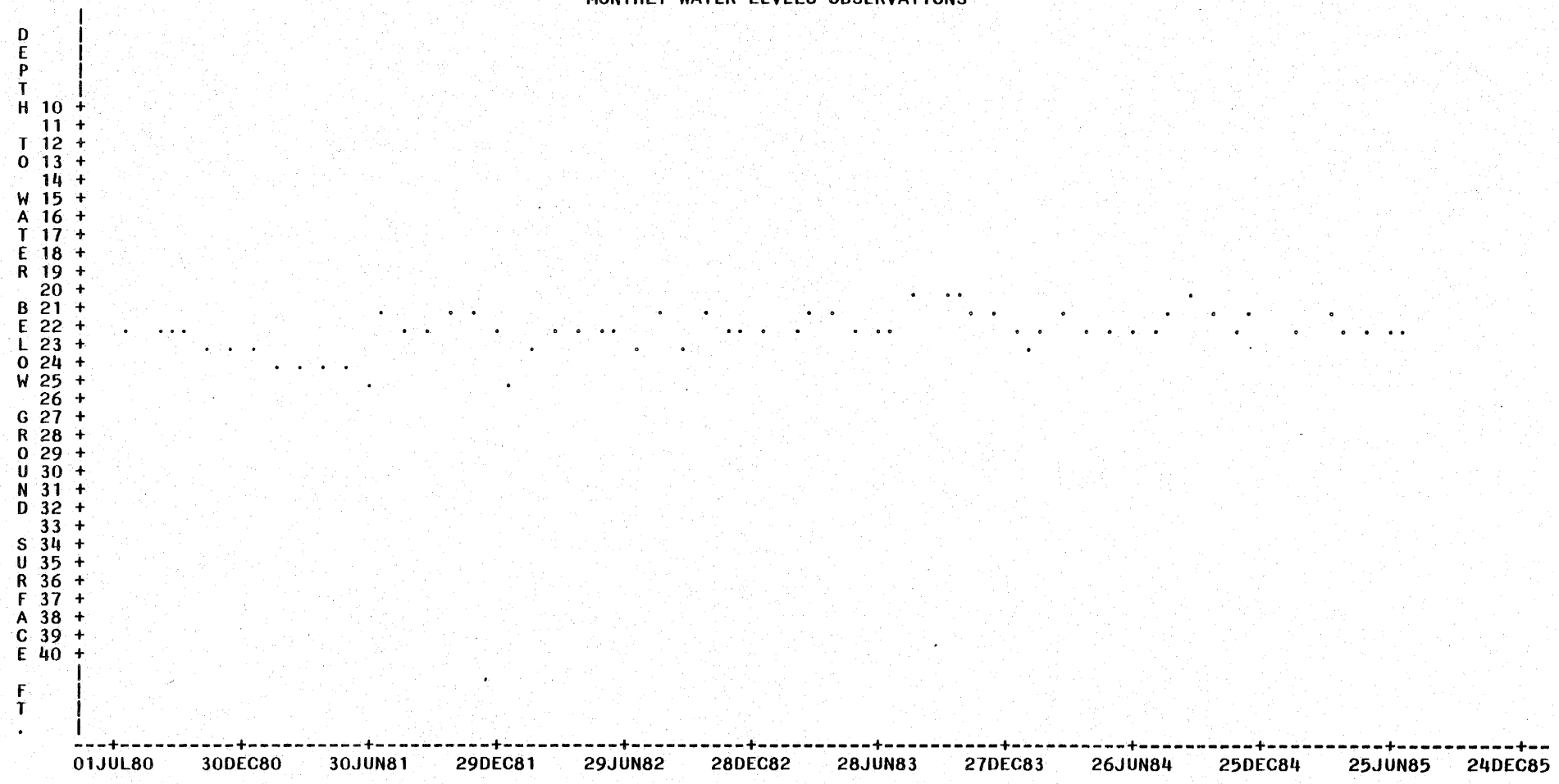
VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	61	11.74704918	0.64108071	9.27000000	13.17000000	3.90000000

ALLUVIAL WELL 103
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	61	9.27983607	0.89051575	7.94000000	11.94000000	4.00000000

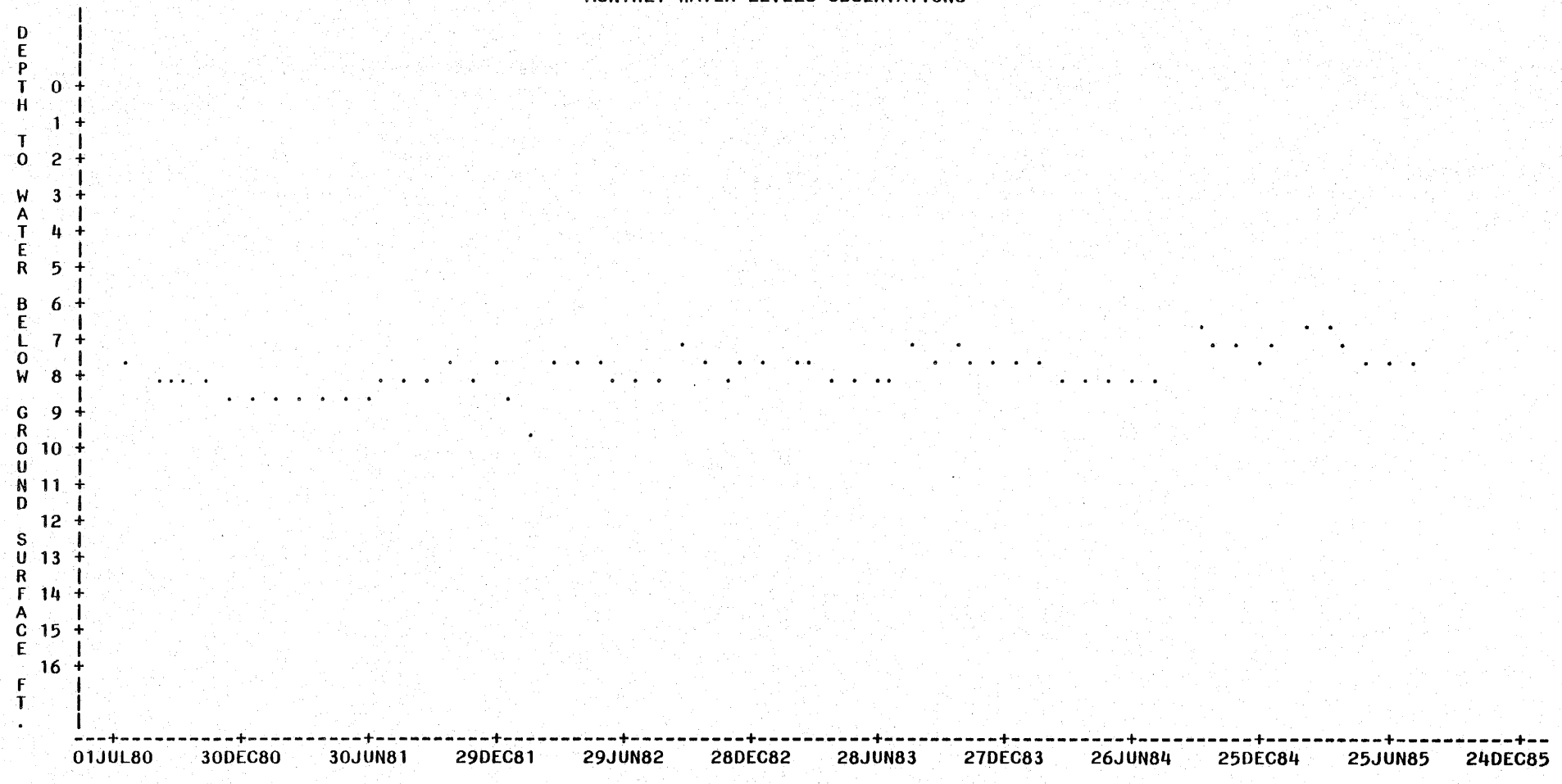
ALLUVIAL WELL 104
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



MONTHLY READINGS

VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	61	21.96377049	1.03813320	19.64000000	24.70000000	5.06000000

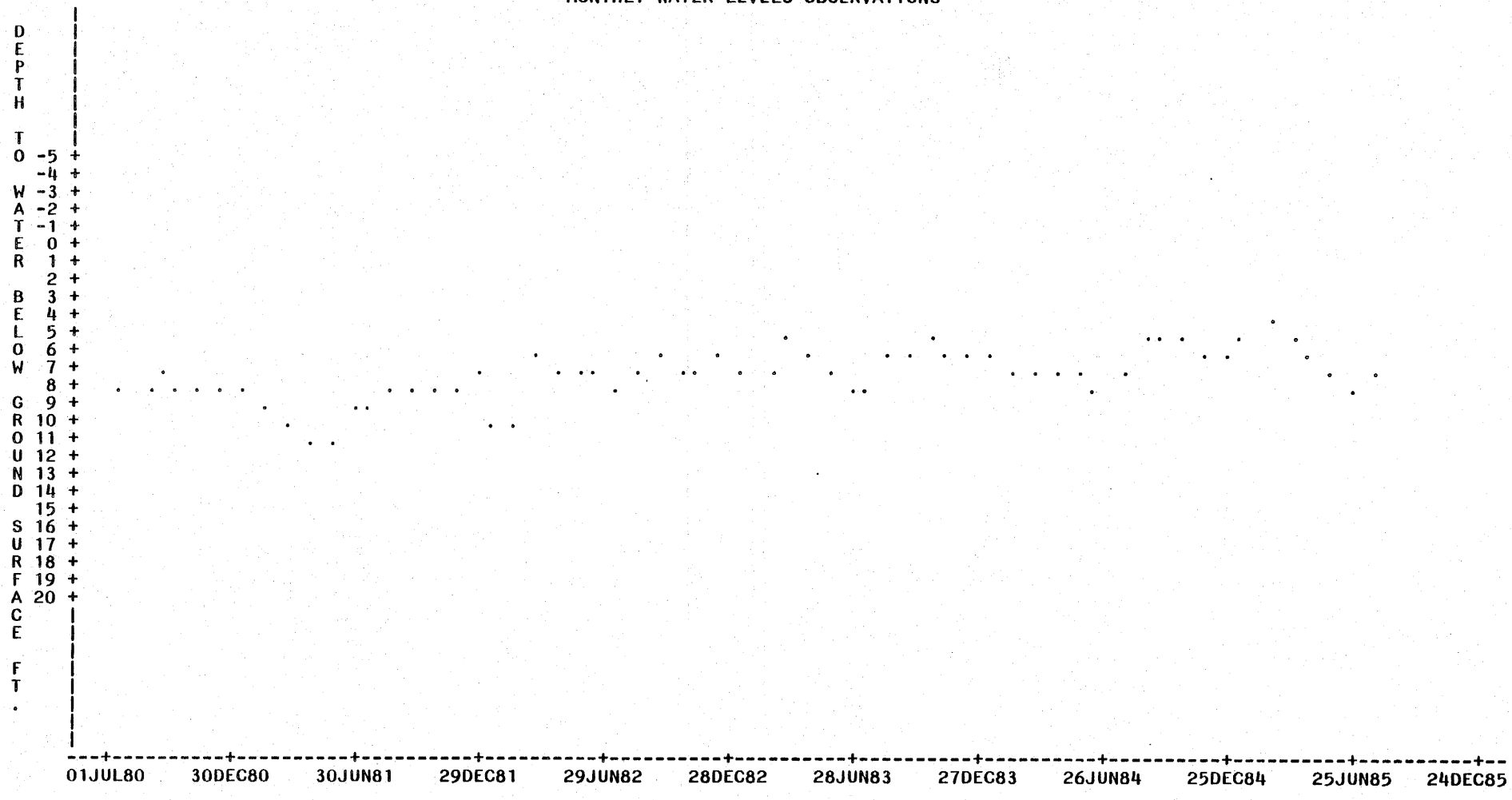
ALLUVIAL WELL 105
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



MONTHLY READINGS

VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	60	7.74716667	0.57672686	6.33000000	9.27000000	2.94000000

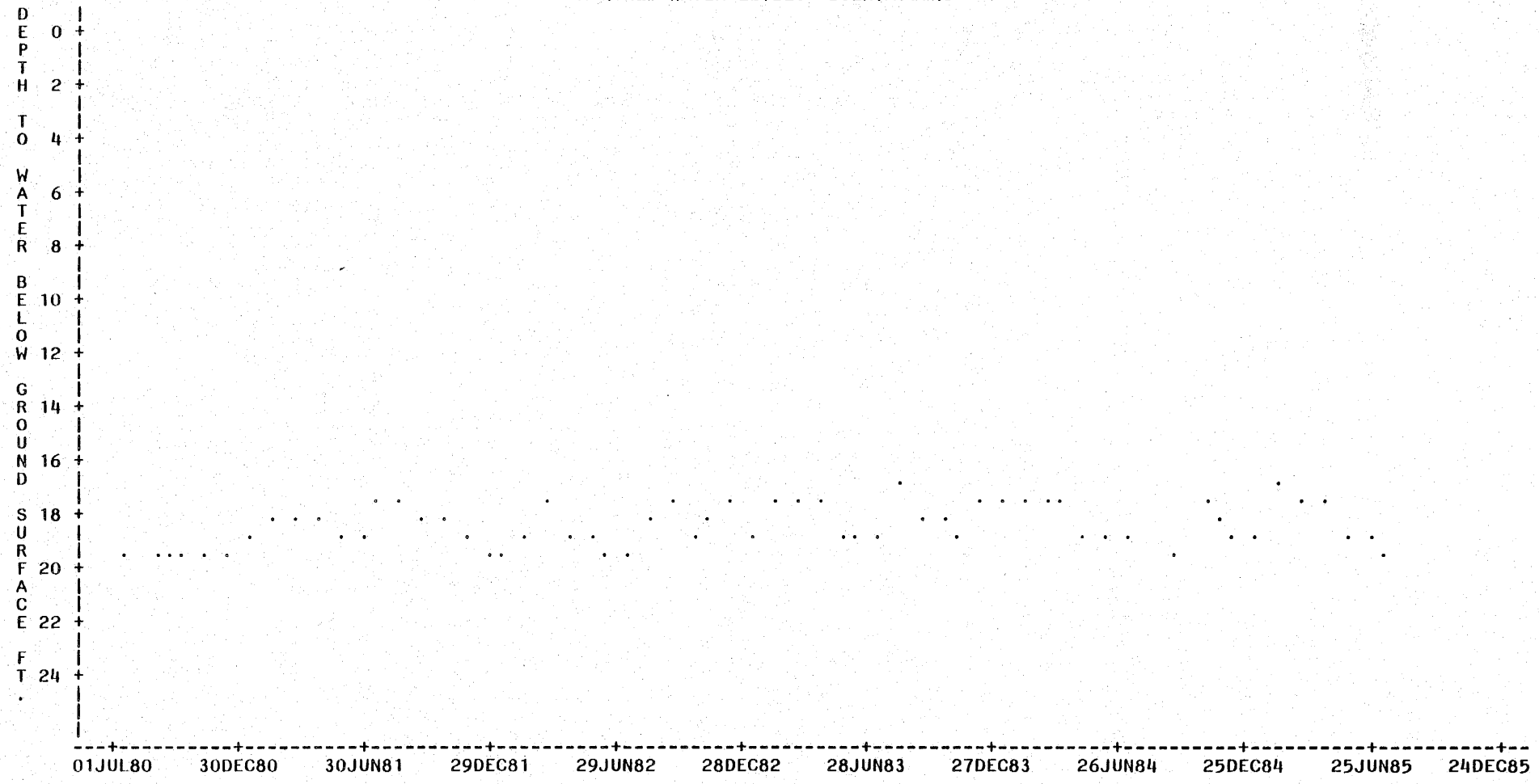
ALLUVIAL WELL 106
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



MONTHLY READINGS

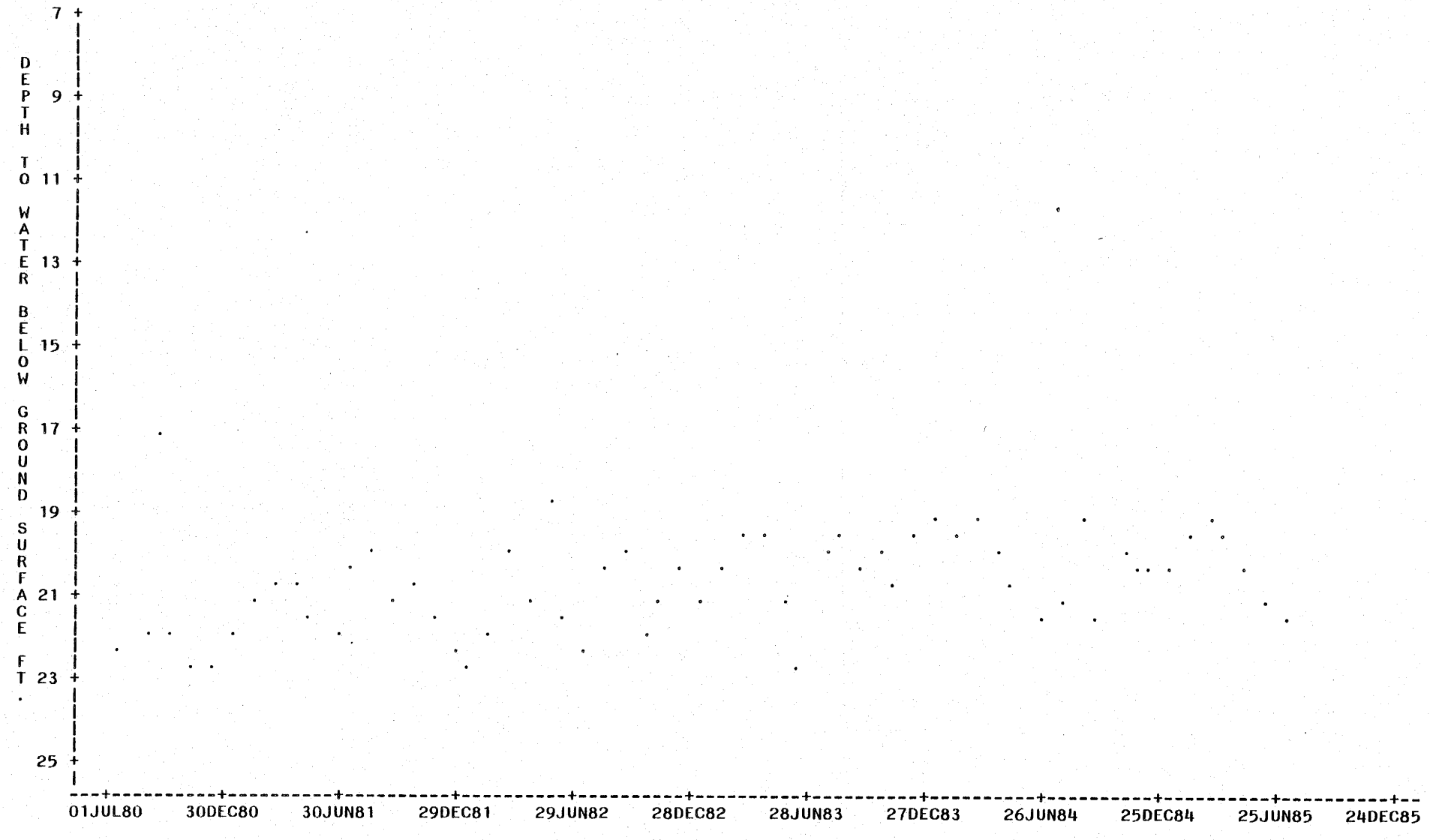
VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	61	7.18901639	1.43577703	4.46000000	10.93000000	6.47000000

ALLUVIAL WELL 107
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



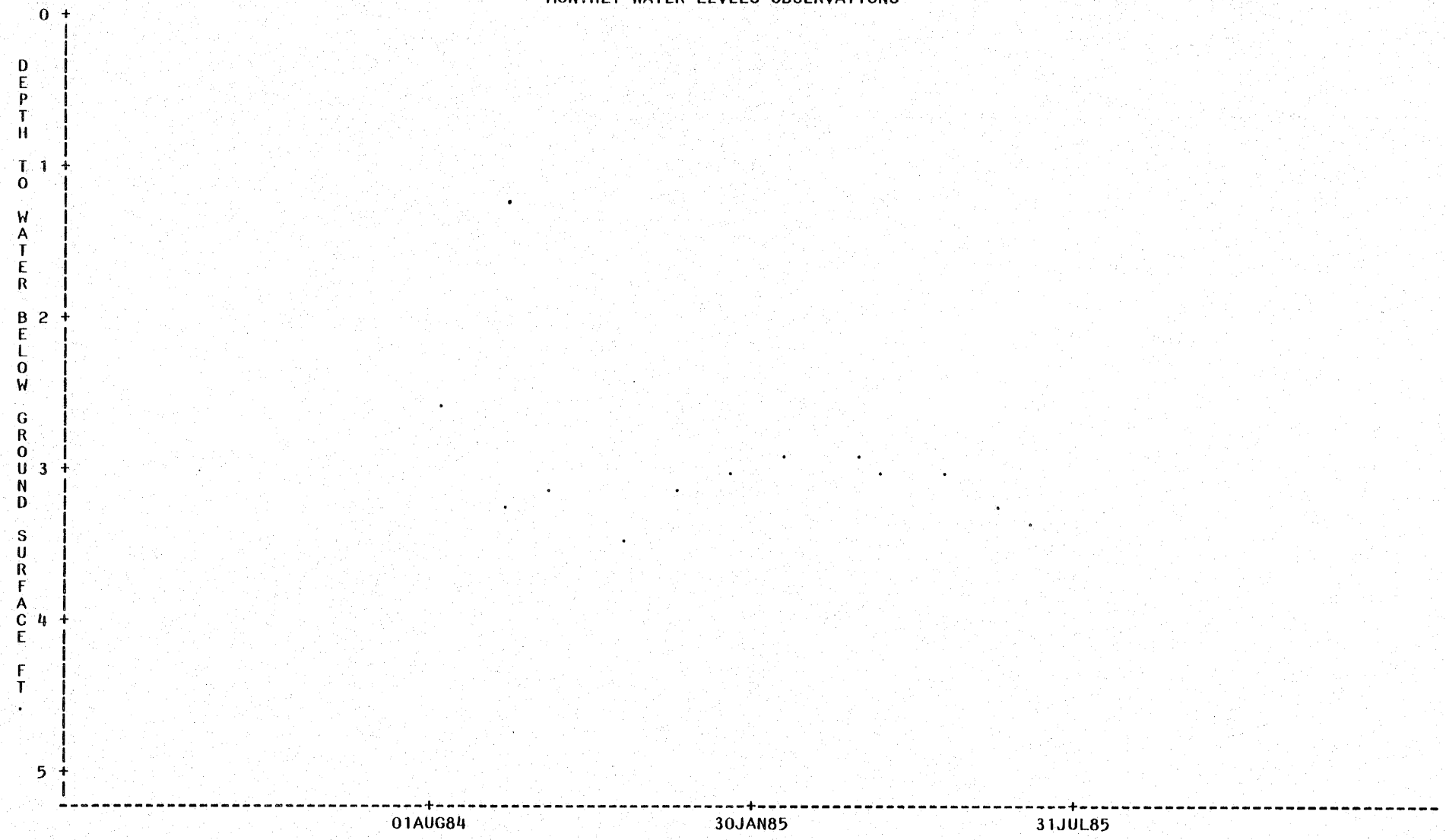
VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	60	18.29950000	0.79602918	16.81000000	19.59000000	2.78000000

ALLUVIAL WELL 108
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	61	20.55704918	1.14511039	16.93000000	22.58000000	5.65000000

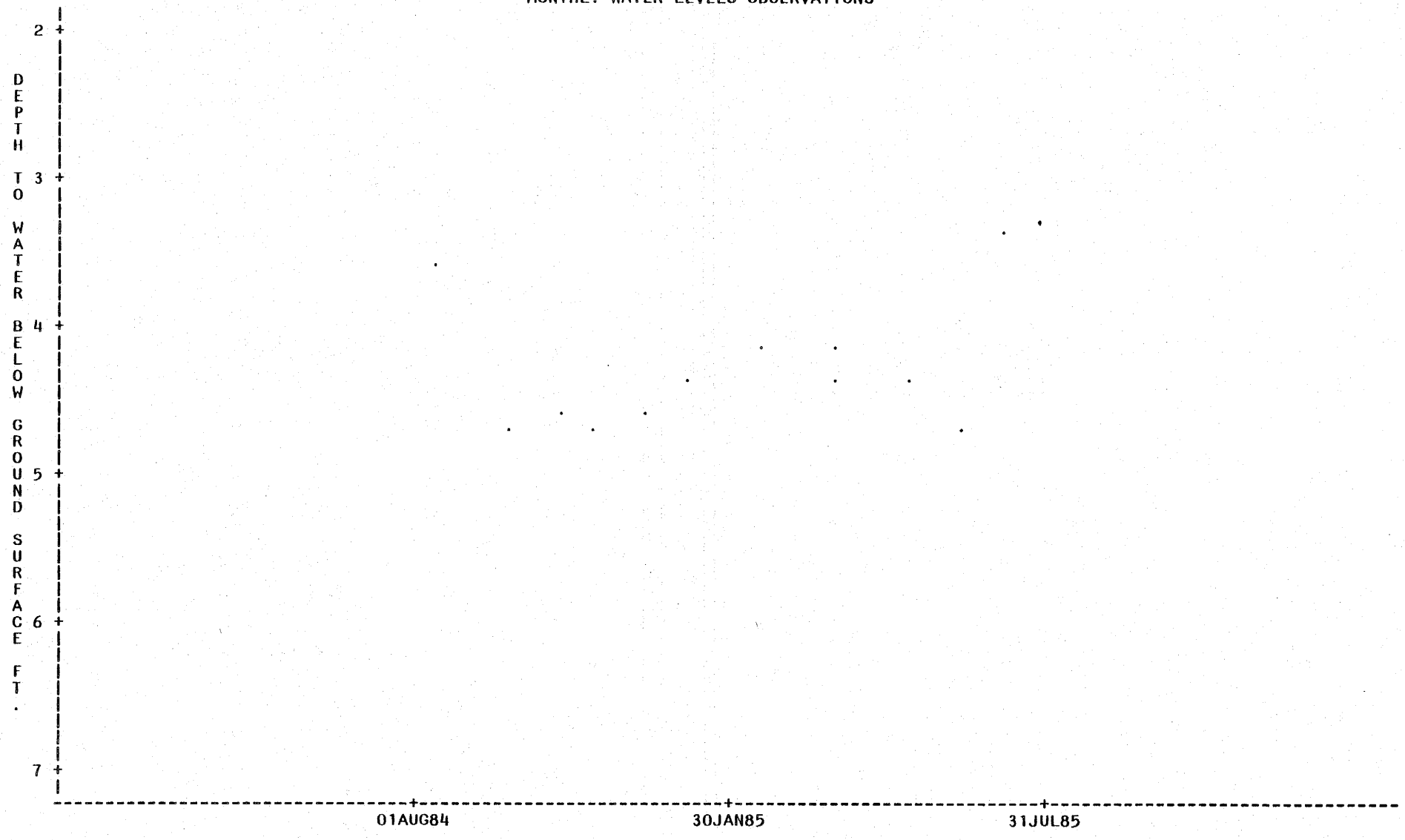
ALLUVIAL WELL 107R
AUGUST 1984 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



MONTHLY READINGS

VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	12	3.07333333	0.24684678	2.53000000	3.44000000	0.91000000

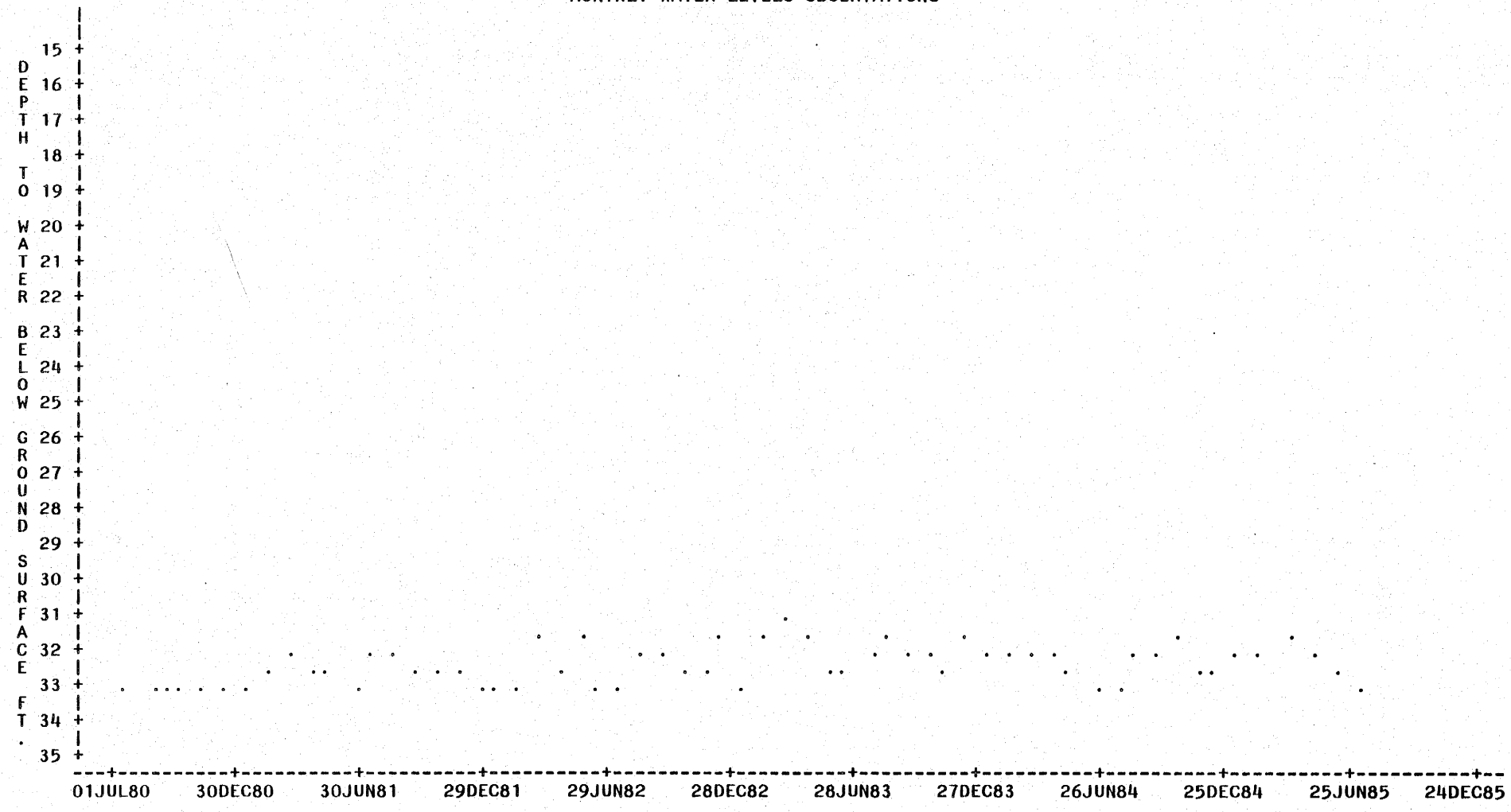
ALLUVIAL WELL 110R
AUGUST 1984 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



MONTHLY READINGS

VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	12	4.26583333	0.43343152	3.38000000	4.68000000	1.30000000

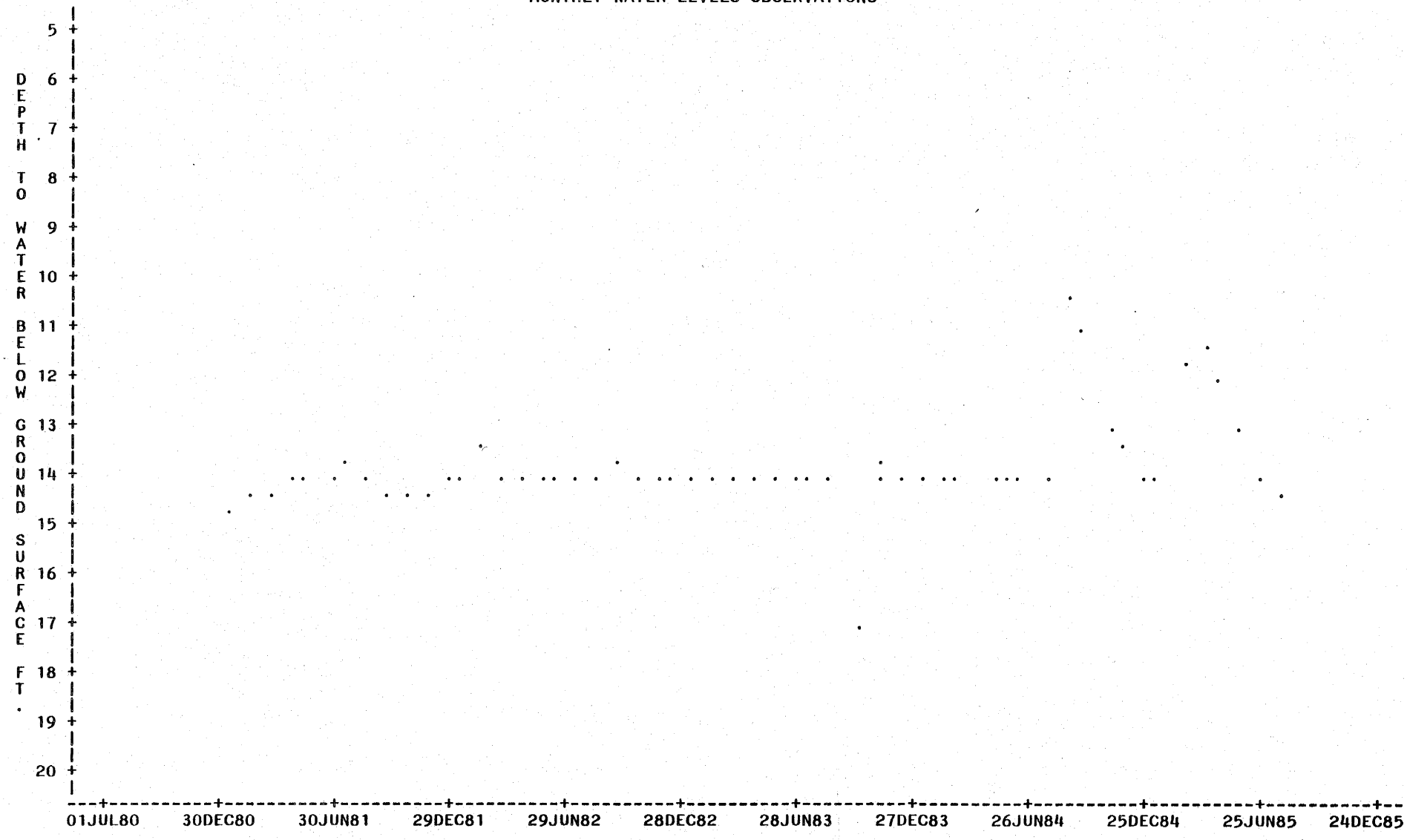
ALLUVIAL WELL 109
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



MONTHLY READINGS

VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	61	32.32229508	0.52768802	31.17000000	33.24000000	2.07000000

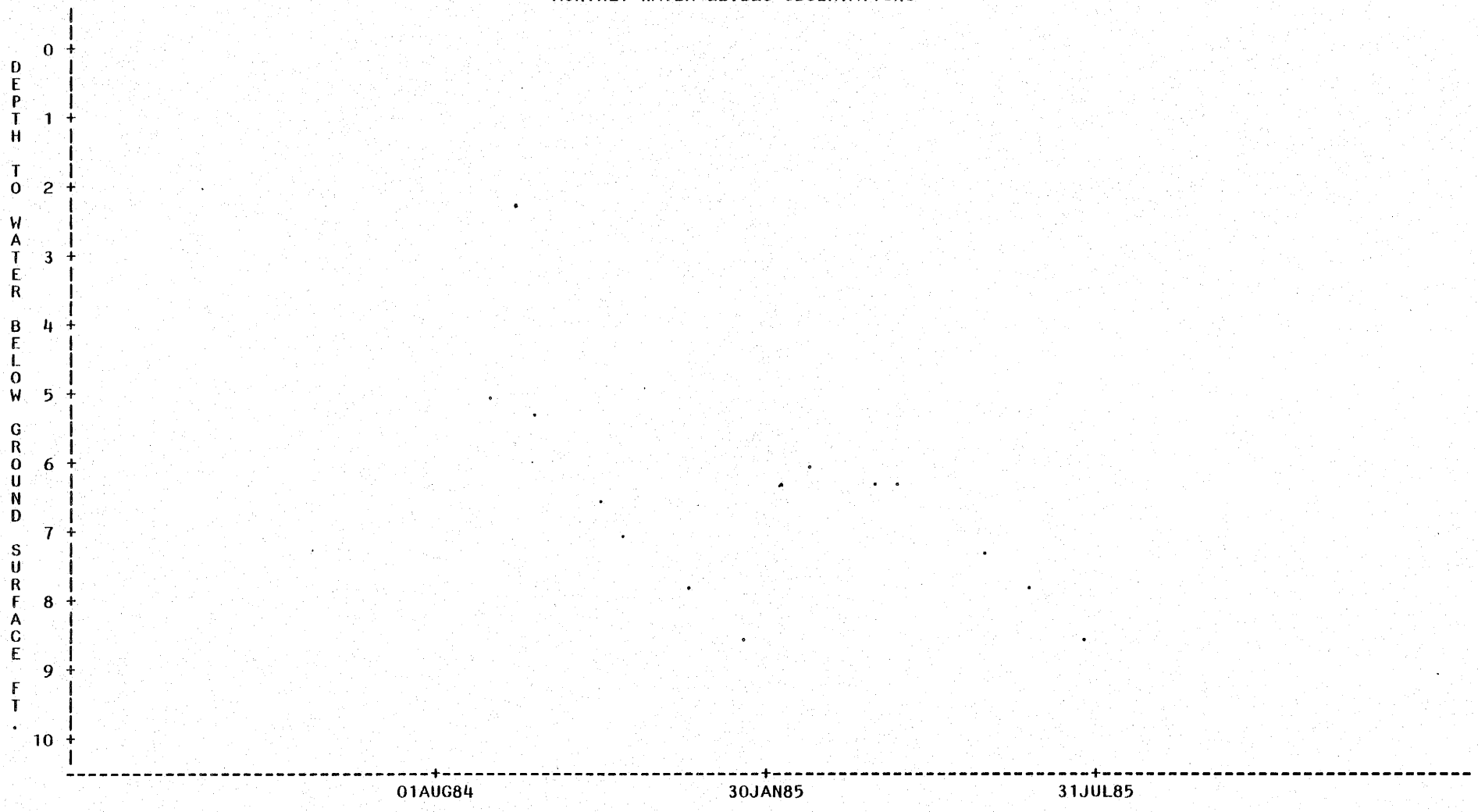
ALLUVIAL WELL 114
JULY 1980 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



MONTHLY READINGS

VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	55	13.78545455	0.93887012	10.36000000	16.93000000	6.57000000

ALLUVIAL WELL 114R
AUGUST 1984 THROUGH JULY 1985
MONTHLY WATER LEVELS OBSERVATIONS



MONTHLY READINGS

VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
FEET	DEPTH TO WATER BELOW GROUND SURFACE FT.	12	6.81500000	1.14871074	5.02000000	8.52000000	3.50000000

TABLE A

Summary of Seasonal Water Level Fluctuations

In the Alluvial Aquifer

ALLUVIAL WELL
NO. 13

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	.10 - .15	.10 - .15	.10 - .35	.05 - .10
-) Recharge Deficit	.25 - .70	.45 - .75	.30 - .85	.10 - .50
+) Rainfall	---	---	.25 - .90	---
+) Snowmelt	.15 - .90	---	---	---
+) Rain/Snow	---	.10 - .25	---	.10 - .20

ALLUVIAL WELL
NO. 17

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	---	.20 - .35	.25 - .55	.45
-) Recharge Deficit	.15 - .90	.10 - .40	.15 - .80	.25 - .45
+) Rainfall	---	---	.10 - 1.40	---
+) Snowmelt	.05 - 1.30	---	---	---
+) Rain/Snow	---	.10	---	.20

ALLUVIAL WELL
NO. 19

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	.50 - .70	.30 - 1.50	.50	2.00
-) Recharge Deficit	.20 - 1.70	.45 - .90	.10 - .55	.65
+) Rainfall	---	---	.90 - 1.65	---
+) Snowmelt	.20 - 1.40	---	---	---
+) Rain/Snow	---	.15 - 1.35	---	.10 - .40

ALLUVIAL WELL
NO. 23

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	---	.10 - .20	.30	---
-) Recharge Deficit	.15 - 1.35	.05 - .30	.15 - .80	.25 - .45
+) Rainfall	---	---	.20 - 2.25	---
+) Snowmelt	.10 - 1.00	---	---	---
+) Rain/Snow	---	.20	---	.05 - 2.15

ALLUVIAL WELL
NO. 27

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	.10	.10	3.25	.10
-) Recharge Deficit	.15 - .50	.10 - .55	.15 - 1.80	.20 - .40
+) Rainfall	---	---	1.15-3.80	---
+) Snowmelt	.15 - 1.90	---	---	---
+) Rain/Snow	---	.20	---	.20 - 2.05

ALLUVIAL WELL
NO. 29

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	---	.65	.10	---
-) Recharge Deficit	.45 - 1.10	1.50 - 7.10	.10 - 1.60	2.10
+) Rainfall	---	---	.25 - 3.50	---
+) Snowmelt	.40 - 1.75	---	---	---
+) Rain/Snow	---	.15	---	.60 - 1.40

ALLUVIAL WELL
NO. 31

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	---	---	---	---
-) Recharge Deficit	.15 - .85	.15 - 1.20	.10 - 2.25	.10 - .80
+) Rainfall	---	---	.30 - 3.95	---
+) Snowmelt	.30 - .50	---	---	---
+) Rain/Snow	---	.15 - .65	---	.10 - .20

ALLUVIAL WELL
NO. 32

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	---	---	---	.70
-) Recharge Deficit	.45 - 3.95	---	.50 - 3.50	.10 - 2.00
+) Rainfall	---	---	.85 - 3.95	---
+) Snowmelt	.25 - 2.65	---	---	---
+) Rain/Snow	---	.55 - 1.80	---	.10

ALLUVIAL WELL
NO. 68

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	---	.20	---	---
-) Recharge Deficit	.10	.25 - 2.00	.15 - .75	.15 - .25
+) Rainfall	---	---	.20 - .80	---
+) Snowmelt	.10 - .75	---	---	---
+) Rain/Snow	---	.10 - 1.90	---	.15

ALLUVIAL WELL
NO. 69

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	---	.20	.20	---
-) Recharge Deficit	.10 - 1.20	.15 - .90	.20 - 2.90	.15 - .85
+) Rainfall	---	---	.15 - 3.35	---
+) Snowmelt	.25 - .90	---	---	---
+) Rain/Snow	---	.10 - .25	---	.55 - 1.00

ALLUVIAL WELL
NO. 70

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	---	---	---	---
-) Recharge Deficit	.20 - .65	.15 - .90	.10 - .65	.20 - .85
+) Rainfall	---	---	.10 - .50	---
+) Snowmelt	.20 - 1.30	---	---	---
+) Rain/Snow	---	.05 - .55	---	---

ALLUVIAL WELL
NO. 71

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	---	.55 - 1.20	---	---
-) Recharge Deficit	.05 - .10	.15 - .45	.10 - 1.00	---
+) Rainfall	---	---	.25 - .95	---
+) Snowmelt	.10 - .15	---	---	---
+) Rain/Snow	---	.10 - .25	---	.10

ALLUVIAL WELL
NO. 72

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	---	.25 - 1.15	---	---
-) Recharge Deficit	.15 - .30	.25 - .55	.05 - .30	.10 - .45
+) Rainfall	---	---	.45 - .70	---
+) Snowmelt	.15 - .30	---	---	---
+) Rain/Snow	---	---	---	---

ALLUVIAL WELL
NO. 73

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	---	.15 - .40	---	---
-) Recharge Deficit	.20 - .50	.20 - .55	.10 - .30	.10 - .25
+) Rainfall	---	---	.30 - 1.55	---
+) Snowmelt	.20 - .25	---	---	---
+) Rain/Snow	---	.25	---	.15

ALLUVIAL WELL
NO. 74

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	---	---	---	---
-) Recharge Deficit	.20 - 1.75	.70 - 2.15	.15 - 1.15	.05 - 1.50
+) Rainfall	---	---	.25 - 2.05	---
+) Snowmelt	.10 - .70	---	---	---
+) Rain/Snow	---	.25	---	.10

ALLUVIAL WELL
NO. 75

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	.05	.05 - .15	.05 - .10	.05
-) Recharge Deficit	.20 - 1.35	.50 - 2.55	.35 - 1.60	.05 - 1.00
+) Rainfall	---	---	.60 - 1.95	---
+) Snowmelt	.20 - .90	---	---	---
+) Rain/Snow	---	.10 - .15	---	.10 - .35

ALLUVIAL WELL
NO. 76

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	---	---	---	---
-) Recharge Deficit	.05 - .50	.40 - 3.05	.15 - 1.35	.10 - .25
+) Rainfall	---	---	.25 - 1.45	---
+) Snowmelt	.15 - 1.50	---	---	---
+) Rain/Snow	---	.20 - 1.75	---	.05 - .30

ALLUVIAL WELL
NO. 77

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	.05 - .40	.10 - .20	.10 - .15	.10 - .25
-) Recharge Deficit	.10 - .45	.10 - .25	.10 - .45	.10 - .65
+) Rainfall	---	---	.25 - 1.45	---
+) Snowmelt	.10 - .30	---	---	---
+) Rain/Snow	---	.10 - .40	---	.05 - .15

ALLUVIAL WELL
NO. 79

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	.05 - .20	.15 - .20	.05 - .40	.05 - .10
-) Recharge Deficit	.25 - .45	.20 - .40	.35 - 1.20	.30 - .80
+) Rainfall	---	---	.40 - 1.95	---
+) Snowmelt	.15 - .70	---	---	---
+) Rain/Snow	---	.20 - .50	---	.25 - .50

ALLUVIAL WELL
NO. 80

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	---	.10 - .15	---	---
-) Recharge Deficit	.20 - .80	.15 - .75	.20 - .55	.15 - 1.95
+) Rainfall	---	---	.45 - .85	---
+) Snowmelt	.10 - 1.10	---	---	---
+) Rain/Snow	---	.10 - .20	---	.30 - 1.75

ALLUVIAL WELL
NO. 81

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	---	.10	---	---
-) Recharge Deficit	.20 - .55	.20 - .90	.10 - .20	---
+) Rainfall	---	---	.70 - 1.65	---
+) Snowmelt	.20 - 1.20	---	---	---
+) Rain/Snow	---	.10 - .30	---	.05 - 1.10

ALLUVIAL WELL
NO. 82

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	.30	.65	.30	---
-) Recharge Deficit	.15 - .50	.20 - 1.20	.05 - .35	.10 - .20
+) Rainfall	---	---	.45 - 1.80	---
+) Snowmelt	.10 - .35	---	---	---
+) Rain/Snow	---	.10 - .35	---	.10 - .20

ALLUVIAL WELL
NO. 83

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	.10 - .30	.10 - .70	.05 - .20	.05 - .25
-) Recharge Deficit	.70 - 2.10	.95 - 3.05	1.70- 3.80	.60 - 1.45
+) Rainfall	---	---	1.95- 4.95	---
+) Snowmelt	.50 - 2.00	---	---	---
+) Rain/Snow	---	.80 - 2.20	---	.80 - 1.40

ALLUVIAL WELL
NO. 84

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	.15 - .60	.10 - .15	.10 - .25	.15
-) Recharge Deficit	.50 - 1.50	.60 - 1.05	.60 - 4.00	.40 - .60
+) Rainfall	---	---	1.10- 4.80	---
+) Snowmelt	.45 - 2.25	---	---	---
+) Rain/Snow	---	.50 - .75	---	.20 - .65

ALLUVIAL WELL
NO. 87

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	---	.20 - .75	1.40- 2.20	---
-) Recharge Deficit	.30 - 1.55	.40 - 1.30	.50 - 3.70	.70 - 2.05
+) Rainfall	---	---	.05 - 5.80	---
+) Snowmelt	1.15- 1.25	---	---	---
+) Rain/Snow	---	---	---	---

ALLUVIAL WELL
NO. 88

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	.10 - .30	.15 - .25	.30 - .35	.10 - .25
-) Recharge Deficit	.30 - .55	.25 - 1.15	1.10- 2.50	.15 - .55
+) Rainfall	---	---	.50 - 3.40	---
+) Snowmelt	.20 - 1.55	---	---	---
+) Rain/Snow	---	.20 - .55	---	.15 - .60

ALLUVIAL WELL
NO. 89

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	---	.15 - .45	---	---
-) Recharge Deficit	.05 - .30	.75 - .80	.15 - .85	.15
+) Rainfall	---	---	.30 - 1.55	---
+) Snowmelt	.10 - .80	---	---	---
+) Rain/Snow	---	.10 - .20	---	.05 - .80

ALLUVIAL WELL
NO. 93

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	.15	.55 - .60	.35	---
-) Recharge Deficit	.10 - 1.60	.55 - 1.25	.30 - 1.45	.20 - .35
+) Rainfall	---	---	.75 - 1.70	---
+) Snowmelt	.10 - 2.35	---	---	---
+) Rain/Snow	---	.15 - .35	---	.10 - .85

ALLUVIAL WELL
NO. 94

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	2.60	.30 - .50	.20	---
-) Recharge Deficit	.05 - .10	.10 - .75	.25 - 1.15	.05
+) Rainfall	---	---	.15 - 1.15	---
+) Snowmelt	.10 - .30	---	---	---
+) Rain/Snow	---	.10 - .20	---	.05 - .20

ALLUVIAL WELL
NO. 95

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	.05 - .20	.10 - .30	.05 - .25	.05 - .10
-) Recharge Deficit	.35 - .45	.55 - .75	1.70- 3.25	.20 - .60
+) Rainfall	---	---	1.40- 3.30	---
+) Snowmelt	.30 - .75	---	---	---
+) Rain/Snow	---	.20 - 1.00	---	.30 - .45

ALLUVIAL WELL
NO. 96

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	---	.20 - .40	---	---
-) Recharge Deficit	.10 - 1.00	.10 - .55	.20 - .55	.10 - .15
+) Rainfall	---	---	.25 - 1.00	---
+) Snowmelt	.05 - 1.00	---	---	---
+) Rain/Snow	---	.15 - .45	---	.10 - .25

ALLUVIAL WELL
NO. 98

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	---	.65 - .90	1.75	---
-) Recharge Deficit	.15 - .40	.25 - 1.65	.10 - 1.30	---
+) Rainfall	---	---	1.05-2.05	---
+) Snowmelt	.25 - .70	---	---	---
+) Rain/Snow	---	.15 - .30	---	.30 - .85

ALLUVIAL WELL
NO. 99

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	---	.20 - .40	---	---
-) Recharge Deficit	.25 - .35	.70 - .90	.20 - 2.40	.15 - .70
+) Rainfall	---	---	.15 - 1.10	---
+) Snowmelt	.20 - 1.25	---	---	---
+) Rain/Snow	---	.10 - .25	---	.10 - 2.35

ALLUVIAL WELL
NO. 100

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	---	---	---	.15
-) Recharge Deficit	.25 - .30	.15 - .30	.20 - 1.80	.75 - 1.05
+) Rainfall	---	---	.25 - .65	---
+) Snowmelt	.15 - .45	---	---	---
+) Rain/Snow	---	.15 - .30	---	.05 - 2.30

ALLUVIAL WELL
NO. 101

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	.20 - .35	---	---	.70
-) Recharge Deficit	.65 - 1.50	.40 - 1.40	.40 - 2.25	.10 - .90
+) Rainfall	---	---	.15 - 1.20	---
+) Snowmelt	.25 - .60	---	---	---
+) Rain/Snow	---	.70 - 1.45	---	.15 - 2.10

ALLUVIAL WELL
NO. 102

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	---	.25	.30	---
-) Recharge Deficit	.15 - .45	.30 - .35	.20 - .70	.25 - .45
+) Rainfall	---	---	.65 - 1.35	---
+) Snowmelt	.45 - 1.15	---	---	---
+) Rain/Snow	---	.10 - 1.75	---	.10 - .15

ALLUVIAL WELL
NO. 103

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	---	.20 - .25	.45	---
-) Recharge Deficit	.10 - 1.70	.10 - .45	.35 - 1.45	.35 - 1.60
+) Rainfall	---	---	.30 - 1.30	---
+) Snowmelt	.10 - 3.10	---	---	---
+) Rain/Snow	---	.35 - 1.50	---	.65 - .75

ALLUVIAL WELL
NO. 104

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	.20	.30	1.20	.70
-) Recharge Deficit	.20 - .95	.30 - .90	.50 - 1.85	.40 - 1.45
+) Rainfall	---	---	.75 - 3.35	---
+) Snowmelt	.10 - 3.10	---	---	---
+) Rain/Snow	---	.10 - .15	---	.50

ALLUVIAL WELL
NO. 105

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	.20 - .90	.20	---	.25 - .55
-) Recharge Deficit	.20 - .85	.10 - .20	.20 - .50	.20 - .65
+) Rainfall	---	---	.15 - 1.45	---
+) Snowmelt	.15 - 1.80	---	---	---
+) Rain/Snow	---	.20 - .50	---	.20 - .70

ALLUVIAL WELL
NO. 106

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	.75	.25 - .60	---	.75
-) Recharge Deficit	.75 - .90	.20 - .95	.25 - 1.35	.30 - .70
+) Rainfall	---	---	.20 - 2.45	---
+) Snowmelt	1.45 - 4.10	---	---	---
+) Rain/Snow	---	.25 - 1.30	---	.15 - 1.75

ALLUVIAL WELL
NO. 107

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	.05 - .10	---	---	.15 - .50
-) Recharge Deficit	.15 - 2.15	.95 - 2.70	.55 - 1.95	.10 - 1.00
+) Rainfall	---	---	.50 - 2.15	---
+) Snowmelt	1.00 - 2.10	---	---	---
+) Rain/Snow	---	.30 - .75	---	1.20 - 2.10

ALLUVIAL WELL
NO. 108

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	1.15	---	---	.90
-) Recharge Deficit	.20 - .65	.80 - 1.85	1.05 - 5.05	.35 - 1.55
+) Rainfall	---	---	1.80 - 5.10	---
+) Snowmelt	.20 - 2.60	---	---	---
+) Rain/Snow	---	.20 - .75	---	1.35 - 1.50

ALLUVIAL WELL
NO. 109

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	.50	---	.40	---
-) Recharge Deficit	.30 - 1.35	.35 - .95	.10 - 1.55	.15 - .75
+) Rainfall	---	---	.20 - 1.65	---
+) Snowmelt	.35 - 2.10	---	---	---
+) Rain/Snow	---	.15 - .30	---	.75 - 1.00

ALLUVIAL WELL
NO. 114

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	---	---	---	---
-) Recharge Deficit	.05 - .55	.05 - .10	.15 - 2.55	.40 - 1.05
+) Rainfall	---	---	.10 - 3.70	---
+) Snowmelt	.45 - .55	---	---	---
+) Rain/Snow	---	.05 - .10	---	.30

ALLUVIAL WELL
NO. 33R
(1984 Only)

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	---	---	---	.05
-) Recharge Deficit	---	---	1.25	.90
+) Rainfall	---	---	1.00	---
+) Snowmelt	---	---	---	---
+) Rain/Snow	---	---	---	1.40

ALLUVIAL WELL
NO. 107R
(1984 Only)

	JAN-MAR.	APR-JUN	JUL-OCT	NOV-DEC
-) Aquifer Testing & Water Quality Sampling	---	---	---	.35
-) Recharge Deficit	---	---	1.75	.25
+) Rainfall	---	---	.85	---
+) Snowmelt	---	---	---	---
+) Rain/Snow	---	---	---	.70