

**ANALYSIS OF SAMPLES COLLECTED AT SPECIAL STUDY SITES
POWELL AND ARMSTRONG CREEKS WATERSHED ASSESSMENT, DAUPHIN COUNTY**

The Powell and Armstrong Creek Watersheds drain approximately 72 square miles of predominantly agricultural land in Dauphin County, Pennsylvania. A recent assessment by the Pennsylvania Department of Environmental Protection (PADEP) determined that over 14 miles of stream in the Powell and Armstrong Creeks Basins were impaired by siltation. Significant modifications to land use will likely occur in the near future with the completion of the Dauphin Bypass Transportation Project. This will likely promote increased human development of the basins and this will have implications on water quality and quantity. Another potential impact on water resources is the shift of agricultural practices from small-family farms to larger operations with higher animal densities.

Thus, it was determined that a watershed assessment of the basins and education of the local population concerning water-quality issues was critical prior to the occurrence of major land-use changes. This project was funded in part by Pennsylvania Department of Environmental Protection (PADEP) through the Growing Greener Grant process. The overall project proposal was submitted by the Dauphin County Conservation District and the Powell and Armstrong Creeks Watershed Association (PACWA). Upon acceptance by PADEP, the U.S. Geological Survey (USGS), through the Federal Cooperative Program, provided matching funds for the USGS component of the project. The PADEP Growing Greener Grant program has many objectives, two of which are watershed protection and technical assistance for watershed organizations. These two aspects are pertinent to this project. The objective of the USGS Federal Cooperative Program is to assist states with data collection and investigations of regional and local water-related problems and conditions. The information acquired helps in planning, developing, and managing the Nation's water resources.

The overall goal of this project is to educate local government officials and the general public about the interaction between land and water resources and the specific nonpoint-source pollution issues pertinent to the Powell and Armstrong Creeks Watersheds. The primary objective of the USGS component of the project is to assess water quality and quantity of surface water and ground water in the Powell and Armstrong Creeks Basins.

The ground-water synoptic sampling in both Powell and Armstrong Creeks Basins was conducted from July 27, 2001 through August 14, 2001, and September 10, 2001. PACWA had obtained permission from each land owner prior to sampling. PACWA also obtained data concerning the well characteristics from each land owner. Thirty-two wells were sampled (see figure 8 and table 3). If accessible, static water levels were recorded prior to pumping the wells for sampling. The latitude and longitude of each site was determined using a GPS unit in the field or from topographic maps if a signal from the GPS unit was not available. Drawdown and recovery in wells was measured if access to the well hole was possible. During sample collection, field parameters measured were pH, dissolved oxygen, specific conductance, and water temperature. Ground-water samples were collected to analyze for radon gas, total coliform bacteria, dissolved iron, manganese, arsenic, and nitrate. Dissolved constituents were filtered through a 0.45 micron filter.

The surface-water synoptic sampling in both Powell and Armstrong Creeks Basins was conducted from September 4, 2001 through September 10, 2001. PACWA had obtained permission from each land owner prior to sampling. Twenty-six surface-water sites were sampled (see figure 8 and table 3). The latitude and longitude of each site was determined using a GPS unit in the field or from topographic maps if a signal from the GPS unit was not available. Data collected in the field included discharge measurements (using a pygmy current meter), pH, dissolved oxygen, specific conductance, and water temperature. Surface-water samples were collected to analyze for dissolved nitrate, dissolved nitrite, dissolved ammonia, total and dissolved phosphorus, total ammonia plus organic nitrogen, and suspended sediment. Dissolved constituents were filtered through a 0.45 micron filter.

For additional information, contact Dan Galeone at the U.S. Geological Survey, 215 Limekiln Road, New Cumberland, Pennsylvania 17070; phone - (717) 730-6952 (email - dgaleone@usgs.gov).

ANALYSIS OF SAMPLES COLLECTED AT SPECIAL STUDY SITES
POWELL AND ARMSTRONG CREEKS WATERSHED ASSESSMENT, DAUPHIN COUNTY--Continued

TABLE 3.--POWELL AND ARMSTRONG CREEKS WATERSHED ASSESSMENT STATION LISTS.

REMARKS.--All samples collected by the U.S. Geological Survey along with members of the Powell and Armstrong Creeks Watershed Association.

LOCAL ID	STATION NUMBER	STATION NAME	LATITUDE	LONGITUDE
SURFACE-WATER SYNOPTIC SAMPLING SITES				
P2	402515076573001	Powell Creek near Inglenook, PA	402515	0765730
P4	402557076550501	Powell Creek near Powells Valley, PA	402557	0765505
P5	402613076532701	Powell Creek near Waynesville, PA	402613	0765327
P6	402643076522401	Unnamed Trib to Powell Creek near Waynesville, PA	402643	0765224
P7	402654076514301	Powell Creek at Waynesville, PA	402654	0765143
P8	402725076501901	Powell Creek at Enterline, PA	402725	0765019
P9	402737076493401	Powell Creek near Enterline, PA	402737	0764934
P10	402812076474401	Powell Creek near Carsonville, PA	402812	0764744
A14	402812076552601	Armstrong Creek near Halifax, PA	402812	0765526
P11	402828076472201	North Fork Powell Creek near Carsonville, PA	402828	0764722
P12	402826076471801	South Fork Powell Creek near Carsonville, PA	402826	0764718
P29	402901076451501	North Fork Powell Creek at Carsonville, PA	402901	0764515
A18	402905076525001	Armstrong Creek bl Armstrong Cr at Enders, PA	402905	0765250
A15	402914076551501	New England Run near Halifax, PA	402914	0765515
A28	402939076485801	Unn Trib to Unn Trib to Armstrong Cr nr Enders, PA	402939	0764858
A20	402951076522601	Armstrong Creek at Fisherville, PA	402951	0765226
A21	403011076514301	Unnamed Trib to Armstrong Cr at Fisherville, PA	403011	0765143
A22	403016076513001	Armstrong Creek ab Armstrong Cr at Fisherville, PA	403016	0765130
P30	403018076432301	North Fork Powell Creek above Carsonville, PA	403018	0764323
A23	403023076510601	Armstrong Creek at Enders, PA	403023	0765106
C24	403029076504301	Unnamed Trib to Armstrong Creek near Enders, PA	403029	0765043
A25	403032076504101	Armstrong Creek ab Armstrong Creek at Enders, PA	403032	0765041
A26	403038076501801	Armstrong Creek near Enders, PA	403038	0765018
P13	403046076404901	South Fork Powell Creek above Carsonville, PA	403046	0764049
A27	403138076484601	Armstrong Creek at Dietrich, PA	403138	0764846
A30	403236076460101	Armstrong Creek near Elizabethville, PA	403236	0764601

LOCAL ID	STATION NUMBER	LATITUDE	LONGITUDE
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GROUND-WATER SYNOPTIC SAMPLING SITES

DA-631	402604076542301	402604	0765423
DA-632	402522076581901	402522	0765819
DA-634	402709076545401	402709	0765454
DA-639	402911076535801	402911	0765358
DA-643	402813076524401	402813	0765244
DA-647	403143076510701	403143	0765107
DA-650	402959076524701	402959	0765247
DA-670	402850076512301	402850	0765123
DA-673	402736076525501	402736	0765255
DA-677	402637076513201	402637	0765132
DA-843	402800076504301	402800	0765043
DA-844	402620076555601	402620	0765556
DA-845	402659076523801	402659	0765238
DA-846	403111076520101	403111	0765201
DA-847	402852076465401	402852	0764654
DA-848	402901076460601	402901	0764606
DA-849	402811076453101	402811	0764531
DA-850	402801076484701	402801	0764847
DA-851	402830076491201	402830	0764912
DA-852	402949076505401	402949	0765054
DA-853	402937076433901	402937	0764339
DA-854	403239076460201	403239	0764602
DA-855	403124076483801	403124	0764838
DA-856	403040076473601	403040	0764736
DA-857	403044076501601	403044	0765016
DA-858	402834076503001	402834	0765030
DA-860	402808076465301	402808	0764653
DA-861	402923076430701	402923	0764307
DA-862	403051076413401	403051	0764134
DA-863	403009076495201	403009	0764952
DA-864	402901076450401	402901	0764504
DA-865	402901076450402	402901	0764504

ANALYSIS OF SAMPLES COLLECTED AT SPECIAL STUDY SITES
POWELL AND ARMSTRONG CREEKS WATERSHED ASSESSMENT, DAUPHIN COUNTY--Continued

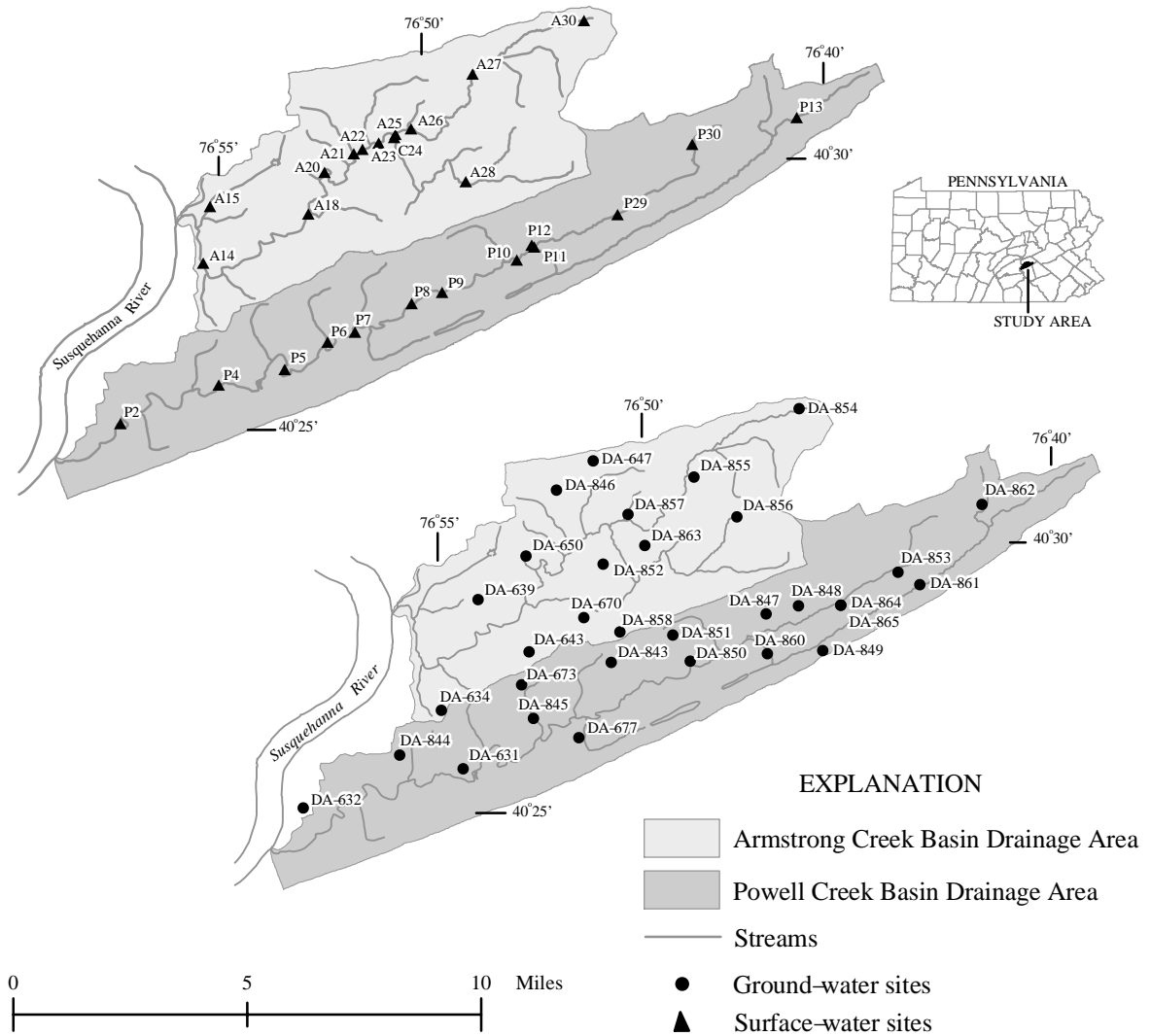


Figure 8.--Locations of sites sampled for the Powell and Armstrong Creeks Watershed Assessment project.

ANALYSIS OF SAMPLES COLLECTED AT SPECIAL STUDY SITES
POWELL AND ARMSTRONG CREEKS WATERSHED ASSESSMENT, DAUPHIN COUNTY--Continued
Surface-Water Synoptic

WATER-QUALITY DATA, WATER YEAR OCTOBER 2000 TO SEPTEMBER 2001

STATION NUMBER	DATE	TIME	AGENCY	AGENCY	DIS-	OXYGEN,	PH	SPE-	TEMPER-
			ANA-	COL-	CHARGE,		WATER		
			LYZING	LECTING	INST.	DIS-	WHOLE	CON-	ATURE
			SAMPLE	SAMPLE	FEET	SOLVED	FIELD	DUCT-	WATER
			(CODE	(CODE	PER	(MG/L)	(STAND-	ANCE	(DEG C)
			NUMBER)	NUMBER)	SECOND	(00300)	ARD	(µS/CM)	(00010)
			(00028)	(00027)	(00061)		(00400)	(00095)	
403046076404901	09-04-01	0845	80020	1028	.06	9.2	6.4	18	15.5
403138076484601	09-04-01	0930	80020	1028	.12	8.0	6.2	99	17.0
403038076501801	09-04-01	1030	80020	1028	.17	7.6	6.8	112	18.2
403018076432301	09-04-01	1045	80020	1028	.09	9.3	6.7	39	16.1
403029076504301	09-04-01	1130	80020	1028	.35	7.8	7.0	93	19.4
403032076504101	09-04-01	1200	80020	1028	.18	7.7	7.0	131	19.5
402901076451501	09-04-01	1300	80020	1028	.49	8.8	7.1	43	19.5
403023076510601	09-04-01	1330	80020	1028	.64	8.6	7.2	109	21.2
402939076485801	09-05-01	0820	80020	1028	.45	6.9	5.7	78	16.5
402654076514301	09-05-01	1045	80020	1028	.78	6.8	6.5	60	17.7
402828076472201	09-05-01	1200	80020	1028	.44	8.6	6.5	28	16.5
402826076471801	09-05-01	1245	80020	1028	.53	7.3	6.6	56	18.1
402812076474401	09-05-01	1400	80020	1028	1.00	7.9	6.7	45	17.9
402737076493401	09-06-01	0830	80020	1028	1.1	8.9	5.9	49	14.6
402725076501901	09-06-01	1000	80020	1028	.85	8.4	6.4	54	15.7
402515076573001	09-06-01	1145	80020	1028	1.4	9.7	6.8	82	17.4
402557076550501	09-06-01	1245	80020	1028	.86	8.9	6.9	67	18.5
402613076532701	09-06-01	1415	80020	1028	1.0	9.5	7.0	67	17.2
402643076522401	09-07-01	0800	80020	1028	.10	8.0	6.5	127	14.1
402643076522401	09-07-01	0801	80020	1028	.10	8.0	6.5	127	14.1
403016076513001	09-07-01	0900	80020	1028	.38	7.5	6.6	101	15.4
403011076514301	09-07-01	0945	80020	1028	.04	7.2	6.6	87	15.1
402951076522601	09-07-01	1015	80020	1028	.25	6.7	6.8	114	16.3
402905076525001	09-07-01	1145	80020	1028	.35	8.0	6.9	114	16.7
402914076551501	09-07-01	1245	80020	1028	.11	9.6	7.3	95	17.0
403236076460101	09-10-01	0900	80020	1028	.01	7.5	5.5	19	17.6
402812076552601	09-10-01	1000	80020	1028	.17	7.5	6.9	140	21.6

STATION NUMBER	DATE	NITRO-	NITRO-	NITRO-	NITRO-	PHOS-	PHOS-	SEDI-
		GEN,	GEN,AM-	GEN,	GEN,	PHORUS	PHORUS	MENT,
		AMMONIA	MONIA +	NO2+NO3	NITRITE	DIS-	DIS-	SUS-
		DIS-	ORGANIC	DIS-	DIS-	SOLVED	SOLVED	PENDE
		SOLVED	TOTAL	SOLVED	SOLVED	(MG/L	(MG/L	(MG/L)
		AS N)	AS N)	AS N)	AS N)	AS P)	AS P)	(MG/L)
		(00608)	(00625)	(00631)	(00613)	(00666)	(00665)	(80154)
403046076404901	09-04-01	<.040	.10	.231	--	.009	--	1
403138076484601	09-04-01	<.040	.14	.781	--	.016	--	7
403038076501801	09-04-01	<.040	.25	.361	--	.022	--	2
403018076432301	09-04-01	<.040	E.07	.117	<.006	.077	.080	3
403029076504301	09-04-01	<.040	.30	.969	--	.030	.043	4
403032076504101	09-04-01	<.040	.30	.167	--	.019	--	2
402901076451501	09-04-01	<.040	.17	.246	--	.031	--	5
403023076510601	09-04-01	<.040	.27	.548	E.003	.024	.036	2
402939076485801	09-05-01	.083	.48	.900	.025	.065	.113	11
402654076514301	09-05-01	<.040	.24	.329	<.006	.013	.023	3
402829076465501	09-05-01	<.040	.08	.205	--	E.004	--	2
402834076465301	09-05-01	<.040	.23	.245	--	.014	--	6
402812076474401	09-05-01	<.040	.19	.293	--	.023	.026	12
402737076493401	09-06-01	<.040	.20	.280	<.006	.024	.033	6
402725076501901	09-06-01	<.040	.28	.322	--	.019	--	4
402515076573001	09-06-01	<.040	.35	.290	<.006	.051	.069	6
402557076550501	09-06-01	<.040	.36	.350	--	.057	.089	6
402613076532701	09-06-01	<.040	.22	.308	--	.029	--	3
402643076522401	09-07-01	<.040	.25	1.45	--	.022	--	14
	09-07-01	<.040	.31	1.46	--	.023	--	22
403016076513001	09-07-01	E.022	.29	.505	--	.018	--	8
403011076514301	09-07-01	E.037	.28	.407	--	.015	--	14
402951076522601	09-07-01	.056	.42	.199	--	.019	--	11
402905076525001	09-07-01	<.040	.38	.124	--	.018	.044	9
402914076551501	09-07-01	<.040	.16	.092	<.006	.013	.019	11
403236076460101	09-10-01	<.040	.12	.183	--	<.006	--	17
402812076552601	09-10-01	<.040	.32	.249	.006	.023	.037	3

ANALYSIS OF SAMPLES COLLECTED AT SPECIAL STUDY SITES
POWELL AND ARMSTRONG CREEKS WATERSHED ASSESSMENT, DAUPHIN COUNTY--Continued
Ground-water Synoptic

WATER-QUALITY DATA, WATER YEAR OCTOBER 2000 TO SEPTEMBER 2001

STATION NUMBER	DATE	TIME	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	AGENCY COL-LECTING SAMPLE (CODE NUMBER)	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET)	OXYGEN, DIS-SOLVED (MG/L)	PH WATER WHOLE FIELD (STAND-ARD)	SPE-CIFIC CON-DUCT-ANCE (µS/CM)	TEMPER-ATURE WATER (DEG C)
402800076504301	07-27-01	0800	80020	1028	116.25	4.1	6.6	178	12.7
402736076525501	07-27-01	1100	80020	1028	--	9.0	6.5	95	12.5
402813076524401	07-27-01	1200	80020	1028	--	7.9	6.9	135	12.3
402620076555601	07-30-01	0830	80020	1028	103.47	1.7	6.7	232	14.1
402659076523801	07-30-01	1000	80020	1028	--	.9	7.5	186	12.7
402637076513201	07-30-01	1130	80020	1028	--	4.2	7.3	173	12.5
402522076581901	07-30-01	1300	80020	1028	82.00	2.0	7.2	390	13.5
402911076535801	07-31-01	0800	80020	1028	55.16	.4	6.2	147	13.8
403111076520101	07-31-01	1000	80020	1028	56.01	4.9	6.6	132	13.1
403143076510701	07-31-01	1130	80020	1028	--	7.1	5.3	23	12.7
402850076512301	07-31-01	1330	80020	1028	95.41	4.1	7.5	128	12.1
402852076465401	08-02-01	0800	80020	1028	33.62	6.9	5.5	148	13.1
402901076460601	08-02-01	0930	80020	1028	46.78	6.5	5.6	353	12.3
402811076453101	08-02-01	1100	80020	1028	--	.6	5.9	171	11.2
402959076524701	08-02-01	1300	80020	1028	53.10	.9	6.8	171	14.8
402801076484701	08-03-01	0800	80020	1028	76.96	4.4	6.0	152	12.8
402830076491201	08-03-01	1000	80020	1028	98.08	5.4	7.2	140	12.8
402949076505401	08-03-01	1200	80020	1028	80.10	1.4	7.8	196	13.4
402709076545401	08-03-01	1345	80020	1028	119.91	4.8	7.0	238	13.1
402937076433901	08-07-01	0800	80020	1028	21.30	7.5	5.9	63	13.2
403239076460201	08-07-01	1000	80020	1028	83.30	3.8	6.5	89	12.7
403124076483801	08-07-01	1130	80020	1028	56.10	3.8	7.0	168	13.5
403040076473601	08-07-01	1230	80020	1028	90.20	4.6	6.4	78	12.4
403044076501601	08-08-01	0830	80020	1028	25.30	.5	6.5	179	13.8
402834076503001	08-08-01	1000	80020	1028	104.20	6.3	6.6	119	12.2
402604076542301	08-08-01	1130	80020	1028	52.52	2.2	6.6	106	13.1
402808076465301	08-08-01	1230	80020	1028	25.78	8.8	6.0	32	11.7
402923076430701	08-14-01	0900	80020	1028	11.05	6.5	5.2	22	11.1
403051076413401	08-14-01	1100	80020	1028	5.90	.3	5.6	42	14.4
403009076495201	08-14-01	1300	80020	1028	56.60	1.5	7.1	188	12.6
402901076450401	09-10-01	1140	80020	1028	--	6.2	5.6	72	12.2
402901076450402	09-10-01	1210	80020	1028	--	1.4	5.4	61	13.5

ANALYSIS OF SAMPLES COLLECTED AT SPECIAL STUDY SITES
POWELL AND ARMSTRONG CREEKS WATERSHED ASSESSMENT, DAUPHIN COUNTY--Continued
Ground-water Synoptic--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 2000 TO SEPTEMBER 2001

STATION NUMBER	DATE	NITRO- GEN, NO ₂ +NO ₃ DIS- SOLVED (MG/L AS N) (00631)	TOTAL COLI- FORM, M ENDO MF, WTR (COL/ 100 ML) (31501)	ARSENIC DIS- SOLVED (µG/L AS AS) (01000)	IRON, DIS- SOLVED (µG/L AS FE) (01046)	MANGA- NESE, DIS- SOLVED (µG/L AS MN) (01056)	RADON 222 TOTAL (PCI/L) (82303)	RADON 222, 2X CL, SS MDC, UNFLTRD (PCI/L) (99327)	RN-222 2 SIGMA WATER, WHOLE, TOTAL, (PCI/L) (76002)
402800076504301	07-27-01	2.93	E700k	--	<10	E.1	2580	658	68
402736076525501	07-27-01	1.93	3k	.6	<10	.3	4280	59.0	90
402813076524401	07-27-01	1.39	21	--	<10	<.1	1780	46.0	58
402620076555601	07-30-01	2.52	E450k	19.9	<10	4.4	851	33.0	34
402659076523801	07-30-01	1.03	0k	--	<10	<.1	1700	25.0	40
402637076513201	07-30-01	3.32	2k	7.6	<10	<.1	2030	33.0	47
402522076581901	07-30-01	E.034	10k	9.2	410	667	658	25.0	28
402911076535801	07-31-01	E.034	160k	--	20	1.7	843	30.0	31
403111076520101	07-31-01	1.41	0k	--	<10	<.1	2160	23.0	42
403143076510701	07-31-01	.053	2k	E.1	<10	7.6	3530	29.0	56
402850076512301	07-31-01	.792	0k	--	<10	<.1	2120	23.0	42
402852076465401	08-02-01	4.51	0k	.2	<10	4.0	3100	41.0	63
402901076460601	08-02-01	4.61	120k	--	30	10.0	2650	41.0	59
402811076453101	08-02-01	E.028	0k	.2	15400	5650	208	39.0	28
402959076524701	08-02-01	1.95	0k	2.7	50	157	732	39.0	36
402801076484701	08-03-01	4.52	240k	1.3	<10	7.0	1870	35.0	47
402830076491201	08-03-01	.560	7k	--	<10	E.1	2270	35.0	51
402949076505401	08-03-01	1.36	1k	--	<10	.5	1990	35.0	48
402709076545401	08-03-01	4.81	72	--	10	2.0	4370	35.0	67
402937076433901	08-07-01	.502	48	3.7	<10	1.1	4600	34.0	73
403239076460201	08-07-01	.232	3k	1.9	<10	<.1	1200	34.0	41
403124076483801	08-07-01	2.33	40	4.0	<10	<.1	1820	34.0	48
403040076473601	08-07-01	.063	14k	--	<10	8.8	783	34.0	35
403044076501601	08-08-01	.169	30	--	60	268	368	30.0	26
402834076503001	08-08-01	2.26	E800k	2.6	<10	.2	2310	30.0	50
402604076542301	08-08-01	.718	15k	1.4	<10	1.3	1450	30.0	41
402808076465301	08-08-01	.047	0k	--	30	2.5	2480	30.0	51
402923076430701	08-14-01	.078	4k	--	<10	1.2	929	29.0	34
403051076413401	08-14-01	.177	80	--	50	120	83.0	29.0	19
403009076495201	08-14-01	2.18	0k	10.5	<10	.3	1980	29.0	46
402901076450401	09-10-01	--	--	.3	<10	3.6	--	--	--
402901076450402	09-10-01	--	--	.2	90	21.9	--	--	--