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LEAK DETECTION PROGRAM

SUMMARY REPORT

July 8, 2009

Prepared for:
Southwest Florida Water Management District
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SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
LEAK DETECTION PROGRAM

DEFINITION OF LEAK DETECTION

Leak detection is the systematic search for leaks within a utility's distribution system. While many leaks are detected when utility personnel or citizens observe water flowing out of the ground, an effective leak detection program uses electronic equipment to identify leak sounds and to pinpoint the precise locations of underground leaks. Because leaks can develop at any time, detection must be an ongoing program rather than a one-time project.

PRINCIPLES AND PROCEDURES OF LEAK DETECTION

When a gas or liquid flows through any opening in a pressurized system, it creates vibrations which travel an indeterminate distance along the containment structure. These vibrations result from the transfer of pressurized energy to the molecules within the wall of the containment structure and are the basis for sonic leak detection. Using an electronic instrument that converts vibrations to sound, the leak detection operator listens to access points on the distribution system for telltale sounds created by a breach in pipes containing pressurized water. An access point is any component where direct contact can be made with the distribution system. Listed in order of preference, the five most commonly used access points are water mains, in-line valves, fire hydrant valves, fire hydrants, and service lines/meters. Since direct contact with a water main is often impossible because water mains are normally buried, valves and fire hydrants are most often used as access points. Service lines are only used as access points when other access points are not available, or when special conditions exist.

Leak Detection is accomplished in two phases. During the first phase, the entire system is surveyed for "leak sounds." When a sound is heard, the location is noted as a potential leak site. Actually, any condition which interferes with the normal flow of water can produce vibrations similar to the vibrations caused by leaks. During the second phase, each location is further investigated. If necessary, a computerized leak correlator that works on sonic transmission (speed of sound) principles is used to pinpoint the exact location of the leak. The correlator eliminates the need for extensive hit-or-miss excavation, and the unnecessary destruction of expensive pavement. Without the correlator, finding many leaks would be like searching for the proverbial needle in a haystack.

FACTORS AFFECTING LEAK DETECTION

Since current leak detection techniques rely on vibrations that travel from molecule to molecule along the wall of the pipe, the most important factor affecting leak detection is the pipe material itself. The more dense the wall of the pipe, the greater the distance leak sounds will travel. Density is a function of molecular proximity. Cast iron, ductile iron, galvanized steel, and copper pipes are all extremely dense and exhibit excellent transmission qualities. Asbestos-concrete pipe (AC), or transite as it is often called, is not as dense and dampens vibrations much quicker than metallic pipes. Due to their lack of density, PVC and poly-pipe absorb, or attenuate, vibrations rather quickly. As a result, leaks sounds do not travel great distances on these plastics.

To compensate for transmission shortcomings, the leak detection operator will, if at all possible, choose access point intervals appropriate for the pipe material. Pipe diameter also affects sound transmission characteristics. Large diameter pipes tend to attenuate vibrations. Thus, a six-inch iron main will transmit leak sounds farther than a 12-inch iron main. In addition, the degree of soil compaction around a pipe often alters its transmission characteristics. When the soil around a pipe is firmly compacted, the pipe wall loses some of its elasticity, and sound transmission is improved. Generally, the degree of compaction is a function of pipe depth. Since freezing is not a problem in Florida, mains are usually buried to a depth of 36 to 48 inches and the surrounding soil is often loosely compacted.

Due to its low cost and easy handling characteristics, PVC is used in most new installations. Unfortunately, if a leak cannot be heard or seen it goes undetected. Until leak detection technology improves, detecting leaks on plastic pipes will remain difficult.

SWFWMD'S LEAK DETECTION PROGRAM

In the late 1980's, Southwest Florida Water Management District (SWFWMD) staff proposed the establishment of an Urban Mobile Lab as part of the District's overall water conservation program. Two complete sets of leak detection equipment were purchased in 1988 from Fluid Conservation Systems (FCS) of Austin, Texas, (now headquartered in Milford, Ohio) at an approximate cost of $110,000. The original concept of the program called for the contractual loan of leak detection equipment to local governments, with training and guidance provided by the District's Mobile Lab Operator. Pilot programs were established in Plant City and Manatee County, with FCS providing the training to utility personnel. Upon completion of the pilot programs, the District decided to loan one set of equipment to the Florida Rural Water Association (FRWA) and use the other set in the Urban Mobile Lab. The FRWA uses the equipment throughout the State of Florida with the understanding that priority consideration will be given to water use permit holders within the boundaries of SWFWMD. In 1990, an individual was hired to manage the Urban Mobile Lab program, and to conduct leak surveys. These two programs utilize the equipment more effectively than the pilot program. In 2002, the District purchased a new leak correlator to replace the original equipment, which had become technologically obsolete.

Both sets of the older equipment were donated to the FRWA. As of July 8, 2009, leak surveys have been completed, with a combined total of 333 leaks found on 34,653 access points. (An access point is any point where direct contact can be made with the distribution system.) Refer to Table 1 below and Appendix A (attached) for detailed information.

TABLE 1

CUMULATIVE LEAK DETECTION SUMMARY

Report Period:	June 19, 1990 - July 8, 2009
Total Number of Leak Surveys:	78
Follow-Up Leak Surveys:	23
Days Spent Surveying:	553
Average Size Leak Found (Gallons Per Minute)	2.08
Water Loss Prevented (Gallons Per Day):	2,484,540
Water Loss Prevented (Gallons Per Year):	907,478,235

Number of Leak Surveys, by County:

Polk:	22	Citrus:	12	Pasco:	9	Highlands:	7
Pinellas:	7	Hardee:	4	Hernando:	2	Levy:	2
Sarasota:	3	Hillsborough:	2	Manatee:	4	Charlotte:	2
Sumter:	1	Marion:	1				

Access Points, by Type:

Service	Hydrant	Valve	Other	Total
5,359	22,260	34,653	1,816	64,088

Leaks, by Type:

Main	Joint	Service	Hydrant	Valve	Other	Total
83	26	92	248	333	46	828

Leaks, by Order of Frequency:

Main	Joint	Service	Hydrant	Valve	Other
4	6	3	2	1	5

Ratio of leaks to access points: 1 : 82
Ratio of leaks to days surveying: 1.4 : 1

*Data on access points were not maintained during the first two leak surveys. As a result, the number and type of access points is an approximation based on the best available data. Data on access points for "emergency" calls are not included, and leaks located during "emergency" calls are not used in calculating the ratios above.

Access points are ranked in order of preference, as follows: Water mains, in-line valves, fire hydrant valves, fire hydrants, and service lines (account meters). Since direct contact

with a water main is often impossible because water mains are normally underground, valves and fire hydrants are most often used as access points. Service lines are only used as access points when other access points are not available, or when special conditions exist. The type and frequency of leaks found are likely related to the selection of access points.

To date, the largest leaks have been found in the Homosassa Special Water District (HSWD). Four non-evident leaks, responsible for a loss of approximately 240,000 gallons per day, were discovered. In each case, water leaking through radial splits in the main was moving laterally through surrounding limestone. Pumpage records indicated that these leaks had gone undetected for several years. Following repair of these leaks, the HSWD realized a reduction of more than $3,000/month in water production costs, as well as an increase in pressure on the subject main. Citrus County had previously informed the HSWD that the pressure on this line was inadequate for fire fighting and the line would have to be brought up to meet standards. The HSWD anticipated replacement of the main at an approximate cost of $90,000 for materials alone. The increase in pressure after these leaks were repaired eliminated the immediate need to install a new main.

BENEFITS OF SWFWMD'S LEAK DETECTION PROGRAM

An effective leak detection program yields many benefits. First and foremost, there is an immediate savings in pumping and treatment (production) costs. Second, leaks discovered during a survey can be scheduled for repair, often eliminating the need to pay overtime wages when the leak results in a "middle of the night or a weekend emergency."

By finding and fixing leaks, a utility can reduce its level of unaccounted-for water (UAW). On the other hand, if a leak survey indicates that leakage is not a problem, the utility knows to look for other causes of UAW. Also, the utility personnel assisting with the leak detection survey traverse the distribution system and can note areas needing minor maintenance before these areas develop into major problems. In some cases, eliminating system leakage can alleviate or postpone the need to develop additional water sources.

A leak detection survey often identifies trends. In Sebring, for example, 17 of the 18 hydrants found to be leaking were the same brand. The utility manager was informed of the trend. Since the manufacturer is no longer in business and repair parts are not available, he could budget for and place a high priority on replacement of all of the same brand of hydrant system-wide.

In the course of conducting leak surveys, utility personnel are trained in the principles and procedures of leak detection. If the utility is then willing to invest in a leak detection instrument, they have a trained individual who can establish an on-going leak detection program. In 1992, private contractors providing leak detection services charged upwards of $120 per mile to survey for leak sounds, and $100 per hour to pinpoint underground leaks. Most utilities in Southwest Florida are forced to operate on austere budgets, and few can afford to hire outside consultants to perform this service. As a result, only the visible or known leaks are repaired, and the unseen leaks go unchecked unless the utility has its own leak detection team.

From the standpoint of the water management district, a major cause of wasted water can be eliminated. In 1991, the District received a Davis Productivity Award for saving water, thereby saving municipalities the costs of obtaining and treating water lost through leakage.

Because the leak survey brings the survey team into local neighborhoods, public perception is also enhanced. The District and the utility system are observed taking steps to save water and hold water costs down. The utility is liable for maintaining water lines up to and including the meter. Although the utility's responsibility stops at the meter, if a leak is detected beyond the meter, the customer is informed. When made aware of a potential leak, the customer can take steps to reduce his/her bill and eliminate waste.

FINDINGS: THE TYPICAL LEAK IN SOUTHWEST FLORIDA

The American Water Works Association (AWWA) estimates that, nationwide, only 30% of all underground leaks ever come to the surface. Southwest Florida seems to defy this statistic. The prevalent soil type encountered throughout most of the area consists of sand or fine sand. Most large water main leaks and many small leaks eventually surface, no doubt due to the high water table and the shallow depth of most mains. Those that do not surface only occur under special circumstances. As was noted in the case of Homosassa, in many of the coastal communities porous limestone can be found close to the surface, and mains are laid in trenches cut through the limestone. In these cases, lateral movement through the limestone may prevent leaking water from surfacing. Water always follows the path of least resistance. In sandy areas, leaks that do not surface occur when the path of least resistance leads into a storm drain, a sewer, or a nearby body of water.

SWFWMD's leak detection program started in June of 1990. Based on experience gained by the Leak Detection Coordinator, the most common type of leak occurs when the packing fails on a valve, or a fitting on the valve is cracked. A valve leak usually does not result in a huge water loss, although an occasional valve leak can be substantial. Frequently, the valve box contains water, but the presence or absence of water in a valve box is not a reliable indicator of leakage or lack thereof. Valve leaks are generally noisy and, therefore, easy to detect.

Fire hydrants, due to their construction, are the source of another common leak. Small outlets called weep holes located on the base of the hydrant allow the hydrant barrel to drain after use in climatic regions where freezing temperatures are common. Hydrants are often operated by inexperienced personnel who either do not shut the hydrant off completely, or damage the valve seat by using excessive force when closing it down. In either case, water continually flows into the hydrant body and escapes through the weep hole. Although rare, it is possible for a hydrant leak to saturate the soil around its base or even flood the surrounding area. Most often, these relatively small hydrant leaks are not visible.

Although the "typical leak" in Southwest Florida is small, it is important to note that even a small leak can waste a large volume of water. Table 2 below indicates the relative amounts of water lost in low volume leaks for given time periods. It is easy to see how several small leaks can contribute to a huge water loss.

TABLE 2

RELATIVE WATER LOSS OF LOW VOLUME LEAKS (IN GALLONS)

Size (gpm)	Daily Loss	Monthly Loss	Yearly Loss
.1 (1/10)	144	4,320	52,560
.25 (1/4)	360	10,800	131,400
.5 (1/2)	720	21,600	262,800
.75 (3/4)	1,080	32,400	394,200
1	1,440	43,200	525,600

If it is assumed that the typical valve packing, fire hydrant, or "other" leak wastes 1/8 gallon per minute (gpm), the typical service leak 1/4 gpm, the typical joint leak 5 gpm, and the typical distribution main leak 18 gpm, the daily savings in water resulting from the District's leak detection program can be quantified. It must be kept in mind that the range of possible water loss from each of these leaks can vary widely from what is assumed to be typical. The amount of water saved, as indicated in Table 1 and Appendix A, is based on calculations based on the above assumptions, as well as the premise that all the leaks located and fixed would still be leaking.

Addendum: Equipment recently introduced into the marketplace has been found to be far more effective at detecting leaks on plastic pipes than the equipment available in 1990, when SWFWMD's Urban Mobile Lab program was initiated. Used in conjunction with the District's "plastic friendly" leak correlator, purchased in 2002, the Urban Mobile Lab operator has had some success in detecting and pinpointing leaks on PVC mains. Given the extensive use of PVC as the "preferred" pipe material in recent years, these advances in leak detection technology may prove to be the long-awaited solution to the PVC dilemma.

APPENDIX A: CUMULATIVE LEAK DETECTION REPORT

CUSTOMER INFORMATION				ACCESS POINTS					LEAKS							Days To Complete Survey	Start/Completion Survey Dates (Day/Month/Year)
#	Name of Utility	Type	County	Service	Hydrant	Valve	Other	Total	Main	Joint	Service	Hydrant	Valve	Other	Total		
1	Winter Haven (1)	Municipal	Polk	0	332	0	0	332	0	0	1	8	0	0	9	8	06/20/90-06/29/90
2	Oldsmar	Municipal	Pinellas	0	350	0	0	350	0	0	0	5	0	0	5	4	07/10/90-07/13/90
3	Dunedin	Municipal	Pinellas	11	737	108	8	864	1	0	0	8	1	0	10	9	08/27/90-09/07/90
4	Homosassa (1)	Special Wtr.Dist.	Citrus	15	27	135	15	192	4	0	0	0	0	0	4	7	09/17/90-09/28/90
5	Crystal River (1)	Municipal	Citrus	16	171	130	14	331	2	0	1	2	2	0	7	4	10/01/90-10/05/90
6	Ozello Water Assn (1)	Cooperative	Citrus	59	54	166	10	289	0	0	0	0	6	0	6	3	10/23/90-10/25/90
7	Lindrick Utilities (1)	Private	Pasco	18	94	170	1	283	0	1	0	0	2	0	3	3	10/29/90-10/31/90
8	SSU - Palm Terrace	Private	Pasco	46	7	90	0	143	0	1	0	0	0	0	1	2	11/07/90-11/09/90
9	Tarpon Springs (1)	Municipal	Pinellas	16	226	515	0	757	2	0	1	3	12	0	18	9	11/13/90-11/28/90
10	SSU - Sugarmill Woods	Private	Citrus	12	350	547	0	909	0	0	0	1	5	0	6	6	12/03/90-12/13/90
11	Zolfo Springs	Municipal	Hardee	6	43	41	16	106	0	0	0	0	0	0	0	2	01/07/91-01/08/91
12	Wauchula	Municipal	Hardee	30	175	148	24	377	2	0	1	1	1	0	5	5	01/22/91-01/31/91
13	Auburndale	Municipal	Polk	97	420	578	95	1190	0	0	2	1	6	0	9	12	02/04/91-02/21/91
14	Yankeetown	Municipal	Levy	30	32	74	10	146	1	1	1	6	3	0	12	2	03/05/91-03/06/91
15	Lake Wales (1)	Municipal	Polk	122	319	489	31	961	1	0	3	3	18	0	25	10	03/11/91-04/03/91
16	Homosassa (2)	Special Wtr.Dist.	Citrus	1947	146	441	123	2657	8	0	6	0	3	1	18	17	04/09/91-05/06/91
17	Calusa Water Works	Cooperative	Pasco	37	0	6	6	49	0	0	1	0	1	0	2	1	05/07/91
18	Haines City (1)	Municipal	Polk	26	292	786	25	1129	1	0	2	5	22	0	30	8	05/13/91-05/29/91
19	Gulfport (1)	Municipal	Pinellas	29	130	494	0	653	0	0	4	5	13	0	22	12	06/04/91-06/26/91
20	Davenport (1)	Municipal	Polk	11	60	50	0	121	0	0	0	1	1	0	2	1	06/27/91
21	SSU - Lake Gibson	Private	Polk	11	9	26	4	50	0	0	0	0	0	0	0	2	07/23/91-07/24/91
22	Orange Acres Ranch	Private	Polk	53	0	18	0	71	0	1	0	0	0	0	1	1	08/08/91
23	Sebring	Municipal	Highlands	75	274	1385	238	1972	1	1	1	18	6	5	32	16	07/30/91-08/28/91
24	Venice (1)	Municipal	Sarasota	4	528	1112	2	1646	0	0	0	1	3	0	4	13	09/04/91-10/03/91
25	Brooksville	Municipal	Hernando	64	285	407	38	794	1	0	4	6	3	2	16	17	11/05/91-12/10/91
26	Ozello Water Assn (2)	Cooperative	Citrus	76	113	239	77	505	0	0	1	0	4	7	12	4	12/12/91-12/18/91
27	Mulberry	Municipal	Polk	62	122	239	0	423	0	0	0	1	1	0	2	5	01/07/92-01/23/92
28	Lake Placid	Municipal	Highlands	141	93	185	32	451	0	0	1	3	1	0	5	5	01/28/92-02/05/92
29	Avon Park (1)	Municipal	Highlands	42	291	822	32	1187	1	1	1	6	18	0	27	11	02/06/92-02/27/92
30	Bartow	Municipal	Polk	11	561	515	13	1100	0	1	1	4	5	1	12	7	03/11/92-03/20/92
31	Crystal River (2)	Municipal	Citrus	36	193	137	16	382	0	0	0	1	0	1	2	3	04/29/92-05/01/92
32	Mountain Lake Corp.	Private	Polk	5	44	46	7	102	0	0	0	2	3	1	6	1	05/07/92
33	Forest Hills Utilities	Private	Pasco	94	29	156	8	287	0	0	0	0	1	0	1	3	06/22/92-06/24/92
34	Zephyrhills	Municipal	Pasco	72	338	778	24	1212	1	2	1	3	5	1	13	11	07/27/92-08/24/92
35	Tarpon Springs (2)	Municipal	Pinellas	22	356	721	3	1102	0	0	0	7	3	2	12	11	09/01/92-09/29/92
36	Frostproof	Municipal	Polk	85	131	199	2	417	0	0	2	4	4	1	11	3	10/19/92-10/21/92
37	Plant City	Municipal	Hillsborough	144	697	543	11	1395	3	0	0	8	7	0	18	8	10/26/92-11/05/92
38	Dade City	Municipal	Pasco	37	276	453	6	772	0	0	1	7	0	1	9	5	11/16/92-11/23/92
39	New Port Richey	Municipal	Pasco	10	408	824	0	1242	0	0	0	3	5	0	8	7	12/08/92-12/17/92
40	Eagle Lake	Municipal	Polk	23	69	136	6	234	0	0	0	1	0	0	1	3	01/07/93-01/22/93
41	Bradenton (1)	Municipal	Manatee	9	1275	2301	16	3601	0	0	0	2	0	1	3	23	01/19/93-03/08/93
42	Fort Meade (1)	Municipal	Polk	2	163	88	0	253	0	0	0	5	1	0	6	2	03/16/93-03/17/93
43	C.C. of Sebring	Private	Highlands	0	7	20	0	27	0	0	0	0	0	0	0	1	03/29/93
44	Punta Gorda	Municipal	Charlotte	81	1159	696	238	2174	2	0	0	1	2	9	14	19	04/06/93-05/12/93
45	Jasmine Lakes	Private	Pasco	1	26	121	1	149	0	0	0	1	5	0	6	2	06/02/93-06/17/93
46	Bowling Green	Municipal	Hardee	0	52	23	2	77	0	0	0	4	0	0	4	1	08/10/93
47	Winter Haven (2)	Municipal	Polk	173	848	799	57	1877	0	0	6	10	14	1	31	14	09/20/93-10/20/93
48	Lake Wales (2)	Municipal	Polk	44	332	516	5	897	0	1	3	2	6	0	12	10	02/14/94-03/23/94
49	North Port	Municipal	Sarasota	66	555	1272	27	1920	0	0	3	5	2	2	12	20	04/11/94-06/08/94
50	SSU - Valrico Hills	Private	Hillsborough	22	13	14	0	49	0	0	0	0	0	1	1	1	06/28/94
51	Webster	Municipal	Sumter	0	52	76	1	129	0	1	1	2	2	1	7	1	07/05/94
52	Fort Meade (2)	Municipal	Polk	0	157	47	15	219	1	0	0	4	1	0	6	1	07/19/94
53	Hill 'N Dale	County	Hernando	2	12	79	2	95	0	0	2	0	0	0	2	1	08/24/94
54	Avon Park (2)	Municipal	Highlands	38	283	815	17	1153	0	0	0	3	12	3	18	10	10/10/94-10/27/94
55	Lake Alfred	Municipal	Polk	3	129	160	2	294	0	0	0	15	3	0	18	2	02/01/95-02/02/95

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#	Name of Utility	Type	County	Service	Hydrant	Valve	Other	Total	Main	Joint	Service	Hydrant	Valve	Other	Total		
56	Palmetto	Municipal	Manatee	49	218	281	10	558	0	0	0	1	1	0	2	4	02/13/95-02/16/95
57	Babson Park	County	Polk	6	36	37	20	99	1	0	0	0	1	0	2	1	02/27/95
58	Longboat Key	Municipal	Manatee	29	209	238	8	484	0	0	1	0	0	0	1	1	03/28/95-04/04/95
59	Gulfport (2)	Municipal	Pinellas	61	204	590	1	856	7	1	1	3	20	0	32	8	04/10/95-05/02/95
60	Davenport (2)	Municipal	Polk	0	44	32	0	76	0	0	0	3	0	0	3	1	05/01/95
61	Charlotte County	County	Charlotte	130	2277	5222	37	7666	0	0	1	20	7	0	28	62	10/02/95-03/18/96
62	Bronson	Municipal	Levy	0	78	77	2	157	0	0	0	2	0	0	2	2	07/09/96-07/10/96
63	Pinellas County (Beaches)	County	Pinellas	36	761	1116	93	2006	1	0	3	8	9	0	21	20	09/24/96-12/04/96
64	Lake Wales (3)	Municipal	Polk	11	292	353	4	660	0	0	1	3	6	0	10	5	01/28/97-04/15/97
65	Bradenton (2)	Municipal	Manatee	8	1205	1372	39	2624	1	0	0	2	0	0	3	16	02/09/98-03/10/98
66	Venice (2)	Municipal	Sarasota	6	633	708	29	1376	0	0	0	0	1	0	1	9	05/04/98-05/19/98
67	Avon Park (3)	Municipal	Highlands	17	343	696	3	1059	0	2	3	6	11	2	24	9	01/04/99-01/21/99
68	Lindrick Utilities (2)	Private	Pasco	29	94	117	6	246	0	0	1	1	0	0	2	3	02/09/00-04/13/00
69	Haines City (2)	Municipal	Polk	26	413	788	21	1248	2	3	1	0	19	1	26	10	09/18/00-10/12/00
70	Dunnellon	Municipal	Marion	9	97	76	11	193	0	0	0	4	1	0	5	3	06/15/04-07/29/04
71	Homosassa (3; Partial Survey)	Special Wtr.Dist.	Citrus	27	24	52	2	105	2	0	4	0	1	0	7	1	12/10/04
72	Ozello Water Assn (3; Partial Survey)	Cooperative	Citrus	437	3	88	40	568	1	0	5	0	0	0	6	3	10/25/05-10/27/05
73	Lake Wales (4)	Municipal	Polk	11	608	346	14	979	0	4	0	3	12	0	19	8	10/30/06-11/13/06
74	Floral City Water Assn	Cooperative	Citrus	104	23	249	59	435	0	0	2	1	8	0	11	5	02/12/07-02/20/07
75	Avon Park (4)	Municipal	Highlands	45	396	789	53	1283	1	1	1	4	15	0	22	13	04/09/07-05/01/07
76	Homosassa (4)	Special Wtr.Dist.	Citrus	264	200	190	55	709	6	1	12	2	2	0	23	8	03/03/08-03/18/08
77	Crystal River (3)	Municipal	Citrus	17	199	259	20	495	0	1	1	2	3	0	7	6	04/09/09-05/12/09
78	Zolfo Springs (2)	Municipal	Hardee	1	58	41	9	109	0 0		0	0	3	0	0	3	1	06/08/09
N/A	Emergency Requests	All	Various	N/A	N/A	N/A	N/A	N/A	29	2	4	2	3	2	42	N/A	N/A
			TOTALS:	5,359	22,260	34,653	1,816	64,088	83	26	92	248	333	46	828	568	

82 Access Points Sounded per Leak Found.
1.4 Leaks Discovered per Day Surveying.
113 Average Number of Access Points Sounded per Day Surveying.

Average Size Leak Found (Gallons Per Minute): **2.08**
Quantity of Water Saved (Gallons Per Day): **2,484,540**
Quantity of Water Saved (Gallons Per Week): **17,391,780**
Quantity of Water Saved (Gallons Per Year): **907,478,235**