



FINAL REPORT

WATER LEAK DETECTION PROJECT

Project Dates:
11/12/2019 through 11/21/2019
&
12/30/2019 & 12/31/2019



Project Location:
Century Village East
Deerfield Beach, FL



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COVER LETTER



January 10, 2020

Century Village East
Attn: Robert Streater
3501 West Dr.
Deerfield Beach, FL 33442

Re: November / December 2019 Water Distribution System Leak Detection Project

Dear Mr. Streater:

Utility Services Associates, LLC, (USA) is pleased to submit the enclosed Final Report on leak detection services recently completed.

The information contained in this Final Report details the procedures and results specific to this project. When applicable, recommendations have been made concerning the best approach for addressing the leak noises detected and preparation for future leak detection projects.

As you review this Final Report, please pay close attention to the Leak Consultant's remarks and field observations in the Project Observation section of this report. These may assist you in determining the best course of action regarding specific leak sound areas.

We appreciate your confidence in USA. If you have any questions, call us at (877) 585-5325 or (206) 429-3751.

Sincerely,

Cory Simonson
President



EXECUTIVE SUMMARY

LEAK DETECTION EXECUTIVE SUMMARY

From November 12, 2019 through November 21, 2019 and December 30, 2019 through December 31, 2019 USA performed a leak survey for **Century Village East in Deerfield Beach, FL**. Our Leak Consultant, Matthew Sanchez, used and appreciated the information provided to expedite and provide an accurate survey. The tables below detail the information gathered.

Time Spent on Project	
Surveying:	79 Hr
Pinpointing:	0 Hr
Other Time:	7.5 Hr
Total Time:	86.5 Hr

Total Areas Surveyed	
Total Distance in Miles	36.6136
Total Distance in feet	193,320

The mileage was estimated by the consultant.

Access Points Contacted	
Hydrants	156
Valves	550
Services	4,774
Other	45
Total	5,525

Leak Type Noises Detected	
Hydrants	0
Valves	0
Services	78
Other	0
Total	78

Leaks Pinpointed	
Main	0
Valve	0
Hydrant	0
Service Line	0
Service Connection	0
Meter	0
Total	0

Total Water Loss Identified	
Gallons Per Minute (GPM):	0
Gallons Per Day (GPD):	0
Gallons Per Year (GPY):	0

Unidentified Water Loss	
Faulty Meters	0
Unidentified Leaks	0
Possible Consumer Side Leaks	64

This project was divided into two phases; the survey phase and the pinpointing phase. The following pages outline exactly how those two phases progressed and the results of each.

PROJECT OBSERVATIONS

Project Observations
Century Village East
Technician: Matthew Sanchez

GENERAL

Utility Services Associates (USA) Water Loss Consultant, Matthew, recently completed a ten (10) day water leak detection project for the Century Village East (Village). The first phase of the fieldwork portion of the project began on November 12th, 2019, and was completed on November 21st, 2019. The second phase of the fieldwork portion was completed December 30th, 2019 and December 31st, 2019.

The information listed below is based on field data generated by Matthew during the fieldwork.

PROJECT BACKGROUND

USA was hired to conduct a water leak survey of thirty-five point five (35.5) miles of distribution system. The entire potable water system of the Village was surveyed. Based on system variables, both standard and point to point survey techniques were employed.

SPECIFICS

The project was broken down into two different phases:

1. **Survey Phase** – sounding of appurtenances and recording all leak anomalies detected for further investigation. Appurtenances were selected based on system variables, location, and accessibility.
2. **Pinpointing Phase** – pinpointing all anomalies that were detected during the survey phase.

SURVEY PHASE NOTES

There are several variables that impact how well a leak sound will carry. The variables include but are not limited to, the following:

- Pipe Type: Sound carries best in metallic based pipe material and worst in plastic-based pipe material
- Pipe Size: Velocity or sound carry decreases as pipe size increases
- Pressure: Sound carries better as system pressure increases
- Installation: The soil condition impacts how well leak sound carries. Factors to consider are soil type and moisture content.
- Leak Type: The leak type and size will impact how well a leak sound will carry.

Sound carried well throughout the system allowing for a complete and thorough survey to be conducted. During the project, we were able to survey approximately thirty-six point six (36.6) miles of the system.

The standard survey technique used on non-plastic based pipe included the sounding of system appurtenances (hydrants, valves, and service shut-offs) at intervals of approximately 350' in most cases. Where PVC system was surveyed, a point to point techniques was used. This technique included the sounding of all available appurtenances. This is necessary as plastic-based water lines have a significantly slower velocity and muffling characteristics that prevent leak sound from carrying well.

At Century Village East, main lines larger than 3" in diameter are maintained by the City of Deerfield Beach. Mains that are 3" in diameter are maintained by the Village. Smaller service lines that run off the 3" lines to the residential buildings are the responsibility of the respective buildings. These service lines then split off to serve individual units or apartments, where the resident is responsible for repairs to any part of the water system downstream from the shutoff that is located outside the unit.

There are only three meters in the Village: one on the north end, one on the west end, and one on the south end of the Village. These meters measure water that is sourced from the City of Deerfield Beach. Each individual meter was sounded during the survey phase, with the meters being isolated to eliminate flow at the time of sounding.

The shutoff valves for each unit are located outside on a standpipe, either directly in front of or behind the units. They are clustered in groups of either two or four shutoffs. The shutoffs that are in two's are for the two-story buildings with one shutoff in the pair being for the bottom unit and the other shutoff being for the unit directly above the bottom unit. The shutoffs that are clustered in groups of four are for the four-story buildings with all four of the shutoff standpipes being for units directly above one another. Each building has numerous residences with multiple shutoff clusters spread along the length of each building. The lines that feed the residential buildings are 3" PVC lines which called for a point-to-point survey with a sounding at each shutoff cluster so as not to miss any leaks. This added significant time spent on this project. The images below give an example of what the shutoff standpipes look like for the two-story and four-story buildings.



Note: In the image above for the four shutoff standpipes to the four-story buildings, the lower section of the pipes showing how the lines split are not typically exposed but are covered in the soil in most cases in the village. This photo is a rare but good example that shows how the lines run off the 3" PVC main that runs nearby.

SYSTEM OBSERVATIONS FIELD NOTES

- Missing hydrant valve lid at the east end of Westbury K
- Broken valve lid at the south end of Tilford I
- Busted hydrant valve can at the northeast end of Newport I
- Missing valve lid at the west end of Oakridge F
- Missing hydrant valve lid between Markahm Q and R
- Broken valve lid east end of Ventnor J
- Valve at the north end of Ventnor J in parking lot paved shut
- Missing valve lid at the south end of Berkshire B
- Missing valve lid at the south end of Harwood F

PINPOINTING PHASE NOTES

No leaks noise anomalies were recorded, and no leaks were pinpointed on any of the mains 3" and larger. However, many probable leaks were identified near the shutoff standpipes for the residential buildings and on the copper service lines downstream from the shutoff valves at the residences themselves.

It should be noted that many of the residential shutoff valves were in the off position (oftentimes they were fastened in the off position with zip ties or some other form of locking mechanism) due to many of the owners being seasonal residents. There very well could be significantly more unidentified leaks when the residents are home, and the valves to these residences are open.

POTENTIAL CONSUMER SIDE LEAKS

A total of 64 probable leaks that are beyond the responsibility of Century Village East and the City of Deerfield Beach were identified during the project. These leaks were identified by multiple soundings of shutoff valves at different times of day after leak noise (or service draw) was heard at the locations during the initial survey phase. After a second, and sometimes third sounding the technician verified with the resident if there was service draw by knocking on the door for questioning. In many cases, there was no response. It was determined by the technician that the leak noise level was consistent during the second sounding when compared to the initial sounding.

The locations listed below are probable leaks. USA does not pinpoint consumer side leaks, however, any additional information that could prove useful for the responsible party was added in parenthesis.

The locations in red font type are likely before (upstream from) the resident's hand valve shutoff standpipes and are the responsibility of the building owner at the given location. The locations in black font type are possible leaks that were deemed to be downstream on the resident's copper service line (or in the unit itself) and are the responsibility of the resident. This was determined after closing the hand valve to that individual unit with the leak noise ceasing.

1. 104 Markham E
2. 87 Markham E
3. 323/335 Markham E - The hand valve shutoff for Unit 335 is missing, so the technician could not isolate that line. He detected leak noise with the S-30 / tee handle probe rod in the soil in front of the shutoffs. There is a possibility that the leak could be downstream on the line to 335 and that the leak noise detected in the soil in front of the shutoff standpipes could be flow to the leak.
4. 319 Markham O
5. 310 Markham N
6. 336 Oakridge S
7. 340 Oakridge S
8. 261 Oakridge P - Isolated lines and leak noise was detected with S-30 / tee handle probe rod in the soil in front of shutoff valves.
9. 49 Oakridge E
10. 40 Oakridge C
11. 85 Tilford E
12. 457 Tilford U
13. 46 Newport C
14. 270 Newport R
15. 334 Newport V
16. 355 Tilford Q - Water pooling around shutoffs. Water drained when shut off for 335 was closed. Leak likely close to shutoffs.
17. 361 Tilford Q
18. 222/234 Markham K - Shutoffs are not numbered here. The leaking line is the shutoff on the left.
19. 283 Prescott N
20. 245 Prescott M
21. 189/197 Prescott J - Unsure which shutoff is for which unit; leaking line is shutoff on left.
22. 5 Newport A - Two possible leaks: One downstream from the shutoff valve to Unit 5 and one upstream in front of valve shutoff standpipes. Shut off the valve for Unit 5 and noise lessened but did not cease. Detected leak noise in front of shutoffs on pipes to shutoff with S-30 / tee handle probe rod in soil. There is water pooling around shutoff standpipes.
23. 45 Newport C - There is water pooling around shutoff standpipes. Water drained after line to Unit 45 was isolated.
24. 34 Newport B - Two possible leaks, one upstream, and one downstream from valve shutoff: Closed valve for Unit 34 and leak noise lessened but did not cease. Detected leak noise in front of valve standpipe for Unit 34 in the soil with S-30 / tee handle probe rod.

25. 30 Newport B - Before shutoff standpipe: Detected leak noise in soil in front of valve standpipe to 30 with S-30 / tee handle probe rod with lines isolated.
26. 33 Newport B - Detected leak noise in soil on line to 33 with S-30 / tee handle probe rod while both lines were isolated.
27. 4007 G - Two possible leaks, one immediately before shutoff valve for 4007, and one upstream from shutoff valve for 4007. Leak noise detected on all four shutoff valves but 4007 is by far the loudest. Flow detected without S-30 on pipe to 4007. Flow from the leak can be felt with the hand on the same pipe also. When line to 4007 was isolated at valve, flow through pipe ceased. Leak noise was still strong on valve for 4007 with S-30 when sounded, but not as strong when open. Unfortunately, there is a large cement slab over where the lines to all four units run in front of the shutoff valves. The technician could not verify if there is a leak on the line running to the shutoff valve for 4007 upstream from that shutoff. Leak noise on the other three shutoff valves was far less pronounced when sounded with the S-30 in comparison to when the valve to 4007 was closed.
28. 79 Newport E - Detected leak noise in soil before shutoff valve to 79 with S-30 / tee handle probe rod with line isolated.
29. 61 / 69 Newport D - Two possible leaks, one upstream and one downstream from suspect shutoff valve. Unfortunately, the two standpipes at this location are not numbered. The line where the leak noise was detected the hand valve is the pipe on the left. 61 is downstairs, and 69 is upstairs. When the line on the left was isolated at the valve, the leak noise subsided some but did not cease completely. Leak noise could not be detected in the soil in front of, upstream, from either hand valve with the S-30 / tee handle probe rod. Leak noise on the valve on the right was far less pronounced than on the line on the left. It's recommended that the responsible party check for a leak upstream, or in front of the pipe on the left to check for leakage. A leak is suspected downstream to whichever unit the pipe on the left runs to.
30. 152 Newport J
31. 3051 Newport N - Noise lessened but did not cease when valve on suspect line was isolated. Leak noise on the three other shutoff valves that are tied into the same line as 3051 is far less pronounced. Leak noise could not be detected in soil with S-30 / tee handle probe rod before shutoff valves; upstream that is, when 3051 was isolated. Water is pooling around shutoff standpipes and could possibly be from leak, given that much of the terrain in the area is dry. Leak is suspected downstream from valve on 3051 but it's also advised the area in front of the shutoff standpipes be checked for leakage.
32. 10 Lyndhurst A
33. 100 Lyndhurst E
34. 189 Ventnor L
35. 284 Ventnor S
36. 1070 Ventnor P
37. 1069 Ventnor P
38. 2010 Ventnor G
39. 1024 – 4024 Ventnor H - Leak is downstream from the valve on the red pipe [second from right]. Water is pooling at leak site. The water drained when the red pipe was isolated at

the hand valve. The pipes are not numbered, so it is unknown which pipe goes to which exact unit but the four pipes go to units 1024 through 4024 Ventnor H.

40. Leak on white pipe on far right (downstream from hand valve) for one of the pipes that go to 1031 – 4031 Ventnor H. Again, the pipes are not numbered. Water is surfacing here.
41. 228 Ellesmere E - Leak is on pipe leading to the shutoff valve for 228. The pipe is shallow here and the leak could be seen after removing a brick and soil that were on top of where the pipe runs.
42. 318 Newport V - Leak on pipe running to 318. Confirmed by sounding soil in front of valve shutoff with S-30/tee handle probe rod.
43. 611 Durham V
44. 480 Durham P
45. 240/250 Durham F - Leak is downstream from hand valve on resident's side on either 240 or 250 Durham F. These pipes were not numbered. Leak is on pipe on right. Flow is very strong and audible on nearby appurtenances. When valve was closed, noise stopped on all shutoffs in area.
46. 307 Durham I
47. 328 Durham J
48. 451 Durham O
49. 4116 Cambridge E - Heavy flow / larger leak.
50. 228 Westbury L
51. 18 Westbury A
52. 2013 Swansea A - Visible leak on standpipe.
53. 2001 Upminster J
54. 47 Upminster B
55. 27 Islewood B
56. 2056 Berkshire D - Visible leak on standpipe.
57. 3018 Berkshire A
58. 19 Ashby A
59. 62 Ashby B
60. 3035 Ashby D
61. 1063 Harwood E - Heavy flow / larger leak.
62. 1052 Harwood E - Heavy flow / larger leak.
63. 52 Farnham C
64. 326 Farnham P

Leaking hose bibs

- Behind Prescott J
- Newport C
- Oakridge F
- Between 1063 and 1064 Ventnor P

Time spent identifying consumer side leaks is marked as "Other Minutes" in the "Time Spent on Job" table in the "Executive Summary" section of the Final Report.

TECHNICIAN RECOMMENDATIONS

Given the large number of probable leaks identified on lines to and in the residential buildings, it's recommended that some form of a sub-metering system be implemented at Century Village East. While no large or significant leakage was identified in a single location, a lot of small leaks can lead to significant real water loss over a long period of time.

CONCLUSION

I would like to thank the staff of Master Management at Century Village East for their field assistance. Their knowledge of the system proved invaluable. We look forward to working with Century Village East on future conservation projects.

Matthew Sanchez
Water Loss Consultant

PROJECT METHODOLOGY REVIEW

PROJECT METHODOLOGY REVIEW (Water Distribution Lines)

The first step in our survey was to review the distribution maps of the system for familiarization of the pipe network and available appurtenances to be used for contact points.

USA then conducted a comprehensive survey by making physical contact with all available appurtenances (valves, hydrants, and services). USA used a sonic leak detection sound amplification instrument designed for this purpose.

When ground cover was not a hard surface, and normal contact points are not available, we made an attempt to use probe rods or a specially designed sounding plate at 6-foot intervals. A sound amplification instrument with 3VG or greater transducer would be employed in conjunction with this equipment directly over the pipe. If conditions did not allow this procedure our Leak Consultant advised, you at the time of project and have detailed in the executive remarks. Direct contact to the main line at intervals outlined in Preparation for Service will result in the most thorough survey.

Areas Surveyed

Street	From	To	Distance
Tilford 3" lines	West end	Ventnor S	10,810
Ventnor Ct	North Dr	Ventnor S	1,270
Tilford Dr	North Dr	End	2,310
Tilford Cres	Prescott Dr	Tilford Dr	1,520
Tilford Ct	Tilford Dr	End	380
North Dr	Tilford Dr	Prescott Dr	740
Prescott 3" lines	Tilford Dr	Newport	5,270
Newport 3" lines	Prescott	Newport N	6,180
West Dr	Prescott Dr	Prescott F	2,310
Prescott Dr	Tilford Dr	West Dr	1,020
Newport Dr	West Dr	Prescott Pl	400
Prescott Pl	Newport Dr	End	590
Newport Cres	South end	North end	1,550
Newport Cres	Newport Dr	Newport N	660
Newport Ct	Newport Cres	Newport Dr	370
Newport 3" lines	Newport P	Newport V	3,760
Oakridge 3" lines	Oakridge C	Oakridge I	4,280
West Dr	Prescott F	Century Blvd	1,100
12" line	Oakridge E	Oakridge M	1,360
Newport Dr	Newport P	Newport V	2,750
Oakridge 3" lines	Oakridge K	Oakridge U	490
12" line	Oakridge M	Oakridge U	1,030
Oakridge Ct	End	End	1,430
Oakridge Cres	Century Blvd	End	1,000
Century Blvd	Oakridge F	Markham A	2,240
Markham 3" lines	Markham T	Markham A	6,950
Markham Dr	Century Blvd	Century Blvd	1,560
Markham Cres	Century Blvd	Century Blvd	1,070
Islewood 3" lines	Century Blvd	Century Blvd	2,560
Lyndhurst 3" lines	Century Blvd	Century Blvd	5,910
8" line through Lyndhurst	Century Blvd	Century Blvd	2,950
Century Blvd	Lyndhurst H	Markham Dr	1,100
Ventnor Dr	Northeast end	Southwest end	4,690

Ventnor Cres	Ventnor Dr	Ventnor Dr	2,090
Ellesmore Dr	Century Blvd	Ventnor Dr	1,300
Ventnor 3" lines	West end	East end	7,360
Ellesmore 3" lines	Northwest end	Southeast end	2,890
Keswick 3" lines	West end	East end	1,550
Keswick 6" line	Century Blvd	End	450
Century Blvd	Lyndhurst H	Cambridge Cir	3,220
Cambridge Cir	Century Blvd	Century Blvd	1,450
Durham 3" lines	End	End	9,700
Durham Cir	Century Blvd	Century Blvd	4,990
Cambridge 3" lines	West end	East end	5,250
Cambridge Cir	Century Blvd	End	1,420
Cambridge Ct	Century Blvd	End	1,280
Century Blvd	Hillsboro Blvd	Cambridge Cir	3,210
Century Blvd	Century Blvd	Lyndhurst Dr	4,000
Westbury Cir	Century Blvd	End	2,290
Westbury 3" lines	Century Blvd	End	6,840
Swansea 3" lines	Upminster Dr	Upminster Dr	1,080
6" line	Century Blvd	Swansea A	340
Upminster Dr	Century Blvd	End	1,320
6" line	Upminster Dr	Upminster J	920
Upminster Cir	Century Blvd	End	1,020
Upminster Cres	Upminster Dr	South end	380
Upminster 3" lines	End	End	6,940
Harwood 3" lines	S Century Blvd	End	5,380
Harwood 6" and larger lines	S Century Blvd	End	4,360
Grantham 3" lines	S Century Blvd	End	3,830
Grantham 6" and larger lines	S Century Blvd	End	1,610
Ashby 3" lines	S Century Blvd	End	2,460
Ashby 6" and larger lines	S Century Blvd	End	860
Berkshire 3" lines	Century Blvd	End	2,880
Berkshire 6" and larger lines	S Century Blvd	Century Blvd	1,560
Richmond 3" lines	north end	South end	3,450
Richmond 6" and larger lines	East Dr	Century Blvd	1,880
Farnham 3" lines	South end	Century Blvd	7,480
Farnham 6" and larger lines	South end	Century Blvd	4,670
Total Area Surveyed in Feet			193,320
Total Area Surveyed in Miles			36.6136

Any indication of leak sounds found during the survey were verified a second time and found to be false. The equipment used did not normally require valves to be operated during surveying and pinpointing. However, on occasion, services or valves were operated to eliminate service draw noises or to change velocity noise.

Leak Type Noises Detected

Contact Points	Noises Detected
Hydrant	0
Valves	0
Services	78
Other	0
Total	78

The correlator equipment, if used, had the capability to prompt the operator to input the variables when different pipe sizes and/or pipe materials were encountered in the same span to be investigated. This is necessary to insure accuracy of results based on the automatic computation of the correct leak sound velocity in leak pinpointing operations. Our correlators have the capability of correlating up to four various pipe sizes and types at one time in a given span. To insure effective performance in all field environments encountered in your distribution system (i.e. traffic noise, draw, pump operation, industrial noise, etc.) the correlator equipment provides 12 multi-range High and Low Pass filters. These filters provide digitally controlled variable band pass filters between 72Hz and 7.1kHz, providing up to 53 selectable filter ranges, full operating frequency range (all pass): 10Hz-20kHz.

USA furnished a trained Leak Consultant, leak detection instruments, equipment and tools to complete the survey and leak pinpointing as outlined in our proposal. After reviewing all records relating to this project, we feel confident that we have performed our best effort to pinpoint all existing leaks within the areas of the water system we surveyed. However, it is important to remember that not all leaks are easily detected, as such, we can't guarantee the location of all leaks.

Although no leaks were found as a result of this survey, we strongly recommend that your Utility maintain some type of on-going leak detection program. Only through a continuing leak detection program can you expect to keep the incidence of leakage under control. Such a program will definitely prevent future leak losses from becoming a major contributor to the system's unaccounted for water losses.

End of Section

CONCLUSION



LEAK SURVEY CONCLUSION

Our thanks to Robert Streater and all persons involved with this project for their assistance in gathering all the necessary paperwork and personnel to create, with USA, a mutually beneficial leak detection project.

With this survey you have demonstrated concern for prudent water utilization and conservation.

Capitalizing on the most advanced leak detection technology available today, USA has successfully completed this Leak Detection Survey. The contents of this Final Report provide Century Village East with a permanent record of the activities performed to complete a Leak Survey along with the results achieved.

An important characteristic of this report is that the facts contained herein can be used in formulating a database for decision making regarding: the need for possible future meter programs, rehabilitation and pipe line replacement, and/or the investigation of new water sources etc. These types of decisions, regarding your utilization of water, can now be predicated on facts rather than supposition or conjecture.

Although no leaks were found during this project, we recommend that you continue to set up the infrastructure necessary to continue investigating leakage in your water distribution system. Implementation of any on-going leak survey program will ensure that leak losses are kept to a minimum, and the added enhancement of saving costs for emergency call outs.

Utility Services Associates, LLC, is proud to have served Century Village East in this way and we wish to thank you for your substantial assistance and cooperation in this project.

If you or your staff has any questions regarding this Final Report, please feel free to call us at (877) 585-5325.

Best Regards,

Cory Simonson
President



