



# Leak Detection Services Final Report:



City of Rutland Department of  
Public Works

## Project Duration

Date: August 12-18, 2015/  
September 15-17, 2015/ &  
October 13-15, 2015



Friday, October 16, 2015

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RE: Rutland, VT Leak Detection Survey

Dear, Mr. Rotondo

This report is intended to be an accurate statement of our services completed; August 12, 2015 through August 18, 2015 / September 15, 2015 through September 17, 2015 & October 13, 2015 through October 15, 2015.

It is hoped that the City of Rutland was satisfied with the services Matchpoint Inc. provided and we would welcome the opportunity to work with you again in the future.

Thank you for choosing Matchpoint Inc. We appreciated your assistance during the project, as we worked together to reduce your Non-Revenue Water (NRW). Please contact us if you have any questions or concerns.

Austin Deaver  
Project Manager  
Matchpoint Inc.

*Austin Deaver*



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## **TABLE OF CONTENTS**

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<b>SCOPE OF PROJECT</b>	<b>3</b>
<b>LEAKAGE INVESTIGATION – METHODOLOGY</b>	<b>4</b>
<b>RESULTS</b>	<b>5-6</b>
<b>SUMMARY</b>	<b>7</b>
<b>CONCLUSIONS/RECOMMENDATIONS</b>	<b>7-8</b>
<b>RECOMMENDED LIST OF EQUIPMENT</b>	<b>8-9</b>



## SCOPE OF PROJECT

Matchpoint Inc. was contracted by the Vermont Department of Environmental Conservation to provide 11 days of Professional Leak Detection services for the City of Rutland’s distribution system’s main water lines. These consist of predominantly metallic pipe with some asbestos concrete, with most service lines being made of copper.

Currently, the City of Rutland, VT has a reported NRW figure of approximately 44%. The objective of this survey is to help reduce NRW through leak detection. However, savings will only be reflected if a proactive repair program is implemented.

Table 1 below, summarizes the actual work completed, and the total number of leaks confirmed during this time.

Number of Day Worked	11	Distance in Miles Covered	50.6	The Mileage calculated is an estimate and may not reflect the same as system maps or GIS programs	
Single Man Hours Worked	88	Distance in Feet Covered	267,168		
Access points sounded	Fittings 569	Distribution Leaks Pinpointed and Confirmed			
		Main	4	Service	3
		Valve	1	Curb Stop	1
		Hydrant	2	Blow-Off	1
		Total Leak #			12
		<b>Hydrants:2.25GPM</b>	<b>Services: 10GPM</b>	<b>Valve:2GPM</b>	
		<b>Curb Stop: 3GPM</b>	<b>Blow Off: 1GPM</b>	<b>Main:47GPM</b>	<b>Total GPM: 65.25</b>
Other Leakage and Problems		Leak Data/Savings			
Unmounted Register	0	GPM	65.25		
Register Broken	0	GPD	93,960		
Cust. Side Leaks	0	GPMonth	2,818,800		
Other	0	GPY	34,295,400		

**Table 1: Summary of Completed Investigation and Summary of Leaks Confirmed**



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## **LEAKAGE INVESTIGATION - METHODOLOGY**

Matchpoint Inc. utilizes several types of equipment to identify, pinpoint, and confirm leaks during investigation. The types of equipment that are employed and leak detection techniques that are implemented, are detailed below:

- **PRE-SURVEY INVESTIGATION**

The initial leak survey or localizing stage was carried out using acoustic noise loggers or a ground microphone system. We utilize the acoustic noise loggers and/or ground microphone system on main line connections/meters, which is the most effective way of surveying mixed/PVC distribution systems. We would deploy loggers on valves or sound valves/meters with a ground microphone system throughout the network with relevant and sensible spacing to accommodate the pipe material, and sounded services where no other connections were available, ensuring that we thoroughly covered any questionable areas. This method offers the best efficiency and opportunity to highlight any leaks that are present. Loggers may be utilized in addition to ground microphone systems in certain circumstances to optimize our ability to identify leaks by recording data at three separate intervals during the night, when the distribution system is at its highest pressure, and ambient noise and usage are at their lowest. This technique can often find leaks that would otherwise be missed using traditional methods.

- **LEAK LOCATION**

Following the pre survey phase, the next stage was to conduct the leak location process to confirm or rule out if any specific noise was a true leak or not. A leak noise correlator and/or a ground microphone system were used to pinpoint potential leaks identified during the initial pre survey stage. If a suspected leak noise is identified, two access points, such as two valves, meters, or hydrants are used to conduct a correlation. A correlator processes sound data through a mathematical algorithm which compares or correlates the two recordings from the access points, to determine the difference in the times it takes noise to travel from the site of the leak to each of the transmitters. The accelerometers are placed on two access points on either side of the suspect section of pipe. Basic information such as pipe material, pipe size, and distance between transmitters is entered into the communication unit of the correlator. This information must be as accurate as possible; otherwise the correlator will calculate incorrect results and the leak location may not be accurate. If a leak noise is present, it would be displayed in graphical and numerical form and would give an approximate location of the suspected leak with distances from each transmitter. These distances could then be measured out using a measuring wheel, and the location of the suspected leak pinpointed on the ground.

- **LEAK VERIFICATION**

In order to verify suspected leaks located during the Leak Location phase, a ground microphone is utilized to confirm the leaks position. This is done by identifying the maximum intensity of sound at the location identified by the correlator. This part of the process is the most critical and greatly increases the accuracy of leak detection. Most importantly, it reduces the potential for false excavations known as "dry holes," consequently saving time and money.



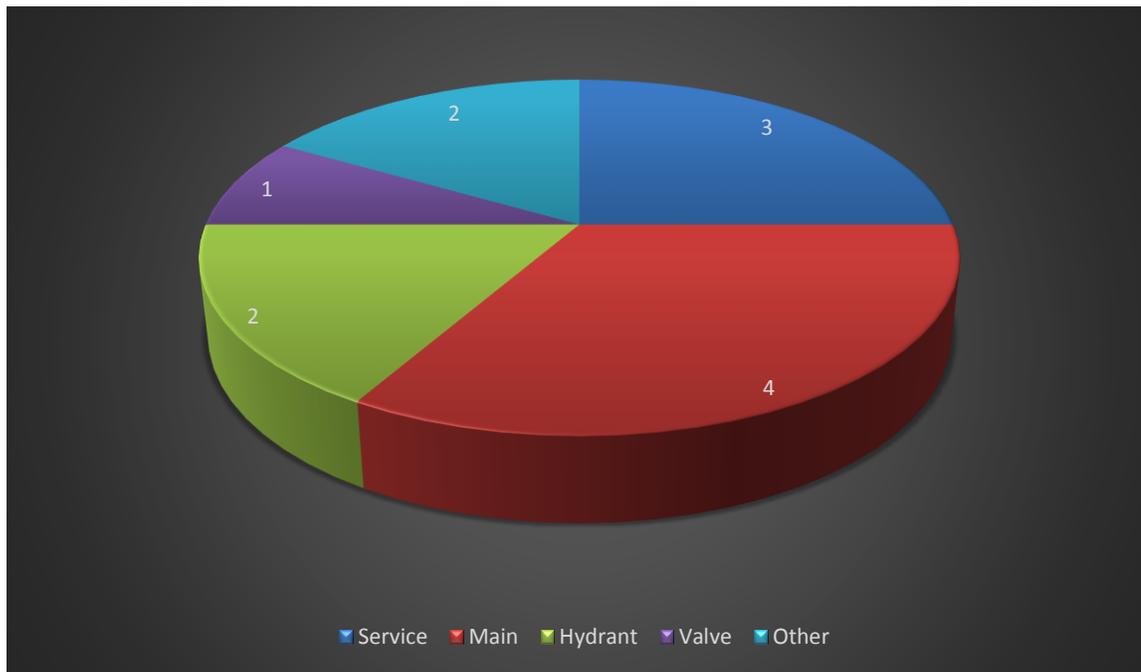
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## RESULTS

In total, 12 Distribution leaks were identified and confirmed while conducting this survey.

Please see the Diagram 1, below, which clarifies the number and type of leak confirmed:

**Diagram1: Summary of Leak Types Located and confirmed**



**Table 2: Detailed Information of work performed**

Week No.	Week Ending	Days Spent	Single Man Hrs. Spent	Approx. Miles Covered	Approx. No. of Fittings Sounded	Mains	Service Pipe	Valve	Other	Total No. of Leaks	
1	8/15/2015	3	24	16.9	179	2	0	0	2	4	
2	8/22/2015	2	16	8.4	109	0	2	0	1	3	
3	9/19/2015	3	24	11.3	148	1	1	1	1	3	
4	10/15/2015	3	24	14	133	1	0	0	0	1	
<b>Totals</b>		<b>11</b>	<b>88</b>	<b>50.6</b>	<b>569</b>	<b>4</b>	<b>3</b>	<b>1</b>	<b>4</b>	<b>12</b>	
					<b>Est. GPM</b>	<b>47</b>	<b>10</b>	<b>2</b>	<b>6.25</b>	<b>Total GPM</b>	<b>65.25</b>



Table 3, below, summarizes the details of all distribution and customer leaks confirmed.

Leak Number	Leak Address	Leak Date	Leak Type	Urgency	LD Method	Tech	MPT EST GPM
1	Northwood Park	8/12/2015	Fitting	Minimal	Sounding	AD	1
2	162 N. Church St	8/12/2015	Main	Moderate	Correlation	AD	25
3	171 Lincoln Ave	8/13/2015	Main	Moderate	Sounding	AD	10
4	92 Park St. Fire Line Hydrant # 2	8/14/2015	Fitting	Minimal	Sounding	AD	2
5	3 Allen St	8/17/2015	Fitting	Minimal	Sounding	AD	3
6	5 Terrill St	8/18/2015	Service	Minimal	Correlation	AD	5
7	Building adjacent to 160 Holly	8/18/2015	Service	Minimal	Correlation	AD	2
8	Spruce St & South St	9/15/2015	Fitting	Minimal	Sounding	AD	2
9	11 Charles St	9/16/2015	Service	Minimal	Correlation	AD	3
10	Intersection Engrem Ave & East St	9/16/2015	Fitting	Minimal	Sounding	AD	0.25
11	107 Wales St	9/16/2015	Main	Moderate	Sounding	AD	7
12	162 Bellevue Ave. Ext.	10/14/2015	Main	Moderate	Sounding	Ad	5
<b>Total GPM:</b>							<b>65.25</b>

Please note the estimated gallons per minute detailed in table 3 above are estimated by our Senior Leakage Technicians based on experience. However, these cannot be guaranteed as 100% accurate. For more accurate results, the type of leak would need to be determined, the size of split/hole, and pressure at the leak site once exposed/repared.

In addition, GPS points were recorded for all leaks listed in Table 3 above. Please see the Excel version of this report and the Google Earth (KML File) labeled Appendix (A) as attached.



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### SUMMARY

Matchpoint Inc. confirmed 12 distribution leaks and surveyed 50.6 miles of distribution pipe for the City of Rutland. This represents approximately 47% of the total system as a whole. On completion of this survey, we can conservatively estimate that the total volume of leaks pinpointed will equate to approximately 65.25 gallons per minute, or 93,960 per day or 2,818,800 gallons per month (30 day), or 34,295,400 gallons per year, once repaired. Based on these figures and depending on the cost used (\$3.79 per thousand gallons produced or \$6.32 per thousand gallons billed), it is estimated that Matchpoint Inc. will save the City of Rutland between \$ 10,683.25 to \$ 17,814.81 per month respectively, upon completion of repairs.

This reduction in volume of water will have an impact on NRW figures depending on a number of factors:

1. Data accuracy (the level of apparent losses in your system)
2. The condition of your current infrastructure.

### CONCLUSIONS/RECOMMENDATIONS

In conclusion, it is recommended that the repair of identified leaks is prioritized and implemented as soon as possible. This will minimize further water loss and the potential that these leaks may become more significant as time elapses. Failure to repair any confirmed leak will be obstructive to reducing NRW for now and in the future. It will significantly increase the payback time for having a leak detection survey conducted.

We inspected 50.6 miles of the distribution system which represents approximately 47% of the system as a whole. While this provides a good sample of the system, a full survey of the distribution system is recommended to help establish and verify real lose figures as opposed to apparent losses. These and other activities such as pipe condition assessments and pressure profiling / establishing a hydraulic model of the water system, can help to highlight areas which may be at a higher potential risk for water loss and help to prioritize rehabilitation efforts and the implementation of measures to possibly extend the life of these assets.

Implementation of District Metered Areas (DMAs) throughout the City of Rutland's distribution system is highly recommended in an effort to monitor and localize leakage on an ongoing basis, and moreover, keep underground leakage at a minimum. Metered zones identify the areas in distribution that have significant water loss, and facilitate continuous monitoring through the analysis of recorded flow data and/or pressure data. Leak Detection activities therefore can be prioritized, significantly saving time, resources, and ultimately maintaining an acceptable level of NRW.



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Metering accuracy is paramount to understanding the needs and condition of a distribution system. Unaccounted consumption via disconnected registers, illicit use, meter inaccuracies, hydrant flushing and unbilled structures such as schools, parks/recreational facilities or other water features, need to be mitigated and accounted for. Even when these connections are not to be billed, they should be metered and accounted for to provide more accurate usage data. Fixtures such as automatic flushing hydrants or blow offs like the one on Door St. should always have a meter attached to them. This can represent large amounts of NRW based on the length of time which they are active. Having confidence in the accuracy of NRW figures is key to being able to prioritize and move forward with other efforts. Also, any meters 2" and greater which have not been tested in at least the past 5 years should be done on a scheduled rotating basis, whereby a portion of these would be tested every few years. Inaccurate large meter data has the potential to distort usage information.

Pending the results of an AWWA water audit and full system survey, an analysis of the billing system may be necessary if the utilities production and usage numbers cannot be reconciled. Apparent losses can be very misleading when not properly vetted.

During the course of the leakage investigation, curb stops, valves, etc. was difficult to locate at times. It is recommended that the City of Rutland locate all of their water assets, making them more accessible / operational for future leak detection activities and in case of emergencies.

## RECOMMENDED LIST OF EQUIPMENT

**Based on the investigation, we have also compiled a list of the equipment that we feel could benefit your organization and add to your in-house leak detection program to be implemented in the future.**



### Leak Detection Equipment:

- Phocus 3 Acoustic Noise Loggers for localizing leaks either on a drive by and/or Lift N Shift operation. A "Lift N Shift", approach enables efficient identification of areas with high leakage and prioritizes where leak detection activities should be concentrated. These loggers record at three intervals during the night and can detect leak noise that would otherwise be overlooked during the day. They can be deployed across large areas and are suitable for permanent monitoring purposes.
- Eureka 3 Correlator, a real time correlator for identifying the location of a suspected leak noise. This correlator is designed for ease of use and efficient data manipulation in the field.
- Enigma Correlating Noise Logger for non-real time correlation work in busy areas. This correlator will take three recordings during the night by default, or can be set up to record at delayed intervals at any time during the day. It is a multipoint correlator, so it has the capability of doing multiple correlations over a large area.
- The Enigma hy-Q correlator, for pinpointing leaks on PVC and/or large (16" and above) mains by using hydrophones for increased performance.



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- Ground Microphone System, Mikron Alpha-Gamma, is an electronic listening stick and ground microphone for 'sounding' to compliment the Phocus 3 loggers and for confirmation of any leak. Ground Microphones are utilized to sound meters and other connections to identify leakage. Once you have identified the areas where you have potential leaks this device would enable you to pinpoint and confirm exactly (within 3 feet) where any leak is on your distribution system. This is a crucial tool in any leak detection survey.

The recommended equipment listed below can be offered as an in-house solution or as one of our services.

### **HYDREKA** www.hydreka.fr Integrated Measuring Systems:

- The Hydrins 2® electromagnetic flow meter, developed by Hydreka, is an easily deployed and cost effective flow meter providing highly accurate bi-directional measurement for water distribution systems and raw water pipelines.
- The Hydrins 2® can be used throughout the water distribution network:
  - Zoning and DMA management
  - Meter testing and night flow monitoring
  - Metering at water plants, treatment plants, pumping stations & reservoirs