

# Case Study - Leak Detection 300mm Trunk Main

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## Introduction

Leak detection of trunk mains using leak correlation techniques has always been viewed as being of potentially limited success for the basic reasons of poor sound propagation, scarcity of accessible fittings and limited signal recording and process capabilities.

## Enigma

With the recent introduction of Enigma digital noise correlation and signal coherence frequency analysis processing software these previous limitations have been far exceeded.

## Client

Fairlie District Council is a rural water authority located in the central South Island of New Zealand and manage a number of water supplies in the South Canterbury region.

## Project

22<sup>nd</sup> January 2007

A gravity supply 300mm concrete watermain that runs from the intake supply running to the township of Fairlie has experienced previous breaks in the past. A proactive investigation was commissioned to test the 6 kms of mains for leakage.

Detection Services SI (NZ) was commissioned to undertake the project.

Previously Detection Services had undertaken the investigations using standard correlators and had test points fitted to the mains at 200 metre separation to achieve a reliable monitoring programme.

Enigma loggers were introduced this year and programmed to delay recording to allow time to access fittings along the suspect area. Eight Enigma loggers were placed at established access points on mains.

Accelerometer sensors were used as no hydrophone access was available.

Logging started at 10:06 hours and 3 x 1 minute individual samples of digitally recorded noise files were collected.

The Enigmas were collected and data transferred to a PC for post processing.

## Results

The raw unprocessed data provided 6 conclusive cross correlation peaks at the same location using eight separate cross correlation points. Additional post processing of the data achieved a total of 28 cross correlations. The results were very encouraging as in the past reliability was constrained to 200 metres intervals. The greatest separation between loggers was between loggers 1 and 8 with a total separation of 1489.5 metres.

Worth noting is the main correlation peak is 1342.3 metres from one end, this in theory would suggest this leak could have been correlated with Enigma at 3000 metres.

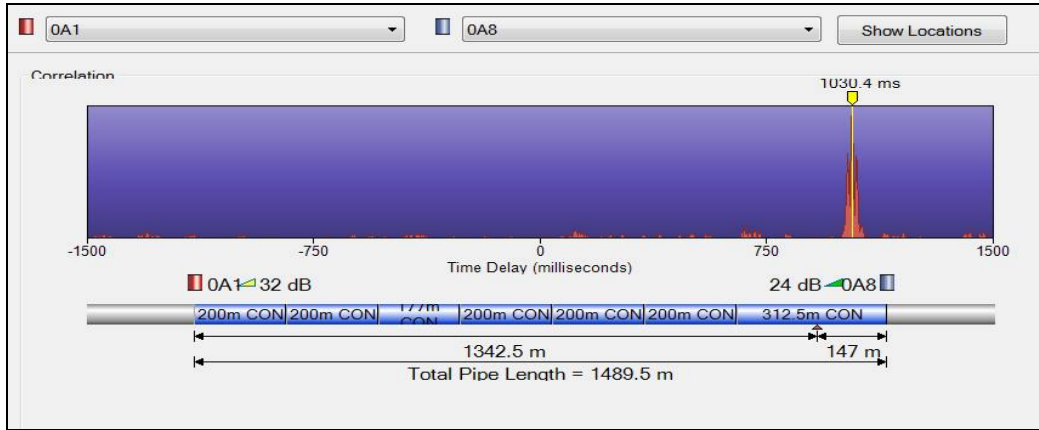
A number of leaks were found over 3 deployments of the 6 kms of mains, the following tables presents the leak found over the greatest distance.

**N.B.** These exceptional results are based on using Enigma accelerometer sensors only (sensors attached to the external fittings of the mains). If hydrophones were employed (acoustic sensors fitted into the water column) even greater correlation distances would expect to be achieved with the Enigma hydrophone system.

The following tables show the actual correlation results achieved.

**Table A Processed data**

Loggers 1 to 8 1489.5 metres

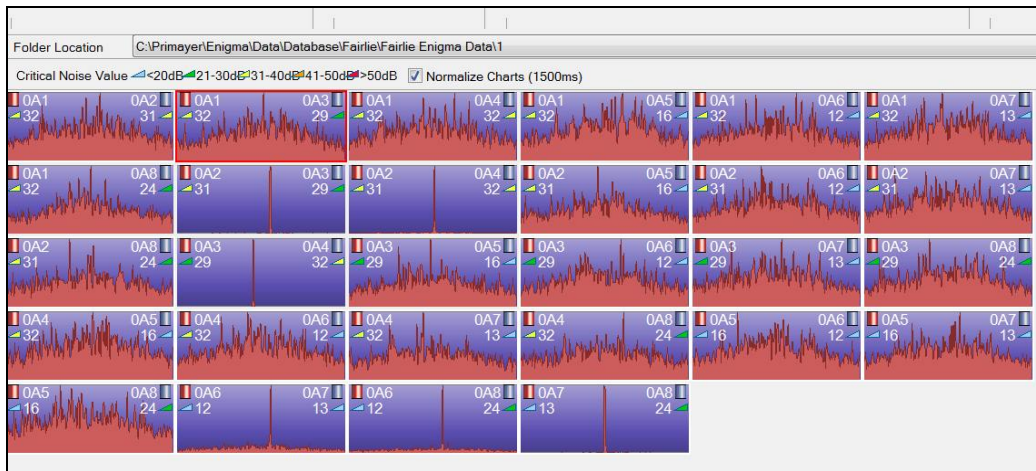


**Data A** - above:

This section of main covers all 8 deployed loggers, the leak is very clearly shown in the above data. The result is a very strong and positive correlation peak.

The location was verified and proven as correct. A leak of approx 3 litres a second was uncovered and repaired. No evidence of water was showing.

**Table B Un-processed data**



**Table B**

Loggers 1,2,3,4,5,6,7,8

**Data B** - above:

This data shows strong correlation results in 6 of the above automatic processing modules without any further post processing.

Further post processing generated a total of 28 cross correlations from the above data.