

Surrey solves I&I mysteries with electrical pipe scanning system

With municipal proposal requests being issued throughout the United States, from Miami-Dade County (Miami, FL) to East Bay Municipal Utility District (Oakland, CA), and having just won the United Kingdom Society for Trenchless Technology's "Best Project – Small Scheme" Award in April, 2015, it became clear that Electro Scan projects have been growing in demand across the globe – so much so that Electro Scan Inc. opened two new offices – one in London, England and one in Toronto, Ontario. In its first month, Electro Scan Canada Ltd. performed six live demonstrations throughout the Greater Toronto Area at the request of local agencies.

The demand for the low-voltage inspection system that locates and measures (in litres per second) estimated potential peak infiltration flows in pre- and post-cured-in-place pipes (CIPP) has not come as a surprise to many. In accordance with ASTM F2550-13, Electro Scan's products detect faults typically not seen by closed-circuit television (CCTV) cameras or heard by acoustic sensors, allowing engineers and directors to find and quantify defects in drains that typically go undetected. The results provide decision-making information for rehabilitation planning and certifi-



An Electro Scan technician with the ES-38 for sewer laterals and plug, scanning private laterals in Surrey, BC.



The ES-620 probe for sewer mains and grounding reel, ready to start scanning.

cation of rehabilitation projects.

This was the case with the recent Electro Scan project in the City of Surrey, British Columbia. Surrey has one of the largest sanitary sewer systems in B.C., serving approximately 130,000 customers with over 1,500 kilometres of sewer pipes ranging in diameter from 150 mm to 1,200 mm. Surrey, like many cities, has issues with inflow and infiltration (I&I) stemming from aging infrastructure. Surrey selected 2.2 km of sewer near their city centre, and looked to Electro Scan technology to provide quantitative data regarding their infiltration issues. Due to inconsistent CCTV inspections and rehabilitation efforts that didn't seem to be working, Surrey had Electro Scan evaluate 27 sewer mains and 65 private sewer laterals.

The Electro Scan probe releases a focused array of low-voltage high-frequency electrical current, of only 10 volts and 40 milliamps, which automatically locates and quantifies all defects in non-conductive sewer mains and laterals.

Most sewer pipe materials are electrical insulators. A defect in the pipe that leaks water will also leak electrical current. For a constant applied voltage, the larger the

defect, the greater the electric current that will pass through the pipe wall. This is also the case for water; for a given water pressure, the larger the hole, the greater the flow.

Since sewer pipe materials are generally asbestos cement, brick, clay, concrete, plastic and reinforced concrete (i.e. all non-conductive materials that naturally prevent electricity from passing through or along the wall of a pipe), no electrical current should ever be able to "leak" or escape from inside a pipe, unless there is a crack or break in a pipe.

As the Electro Scan probe passes through the pipe, it measures the variation of electric current flow through the pipe wall, then through the ground to an electrode on the surface – a metal stake driven into the ground.

Taking an electrical measurement every 14 milliseconds, the data is transmitted back up the CCTV truck's cable and reel, and then to the Electro Scan controller. There, the data is synched and delivered to the truck's on-board PC which records all the data and operates the system via Electro Scan's desktop application software. Once a scan is complete, the software then sends the scan's "raw data"

to the web-based processing and viewing platform, where it is automatically post-processed, quantified and displayed to anyone who has an account for that particular project or client. Additionally, an estimated litres per second (l/s) potential peak infiltration rate is assigned to each of the defects, and then the pipe, as a whole.

The scanning of the 2.2 km of pipe took four days. In the 27 sewer mains, Electro Scan was able to locate 801 defects with a combined estimated potential infiltration flow of 23.53 l/s. The single worst sewer main segment measured potential infiltration flows of 4.0 l/s or 17 percent from all sewer mains. In the worst pipe segment, Electro Scan detected 94 places where water was able to escape the pipe wall, where CCTV operators were only able to call out two defects. Additionally, Electro Scan determined that the 10 worst sewer mains were responsible for 16.6 l/s or 71 percent of the estimated potential peak infiltration from the 27 mains evaluated.

Electro Scan evaluated 65 sewer laterals and found 254 defects that measured an estimated potential peak infiltration of 5.4 l/s. Of the 65 laterals that were evaluated, the 15 worst sewer laterals were responsible for 4.8 l/s or 91 percent of the estimated potential peak infiltration.

A total of 1,055 defects were discovered, with a total estimated potential peak infiltration flow of 28.8 l/s. The sewer mains were responsible for 81 percent and laterals for 19 percent of this potential peak infiltration. If the City addresses the 10 worst sewer mains and 15 worst laterals based on these estimated infiltration flows, total potential infiltration would be reduced by 74 percent, while only rehabilitating 37 percent of the sewer mains and 23 percent of the laterals evaluated.

Surrey's Engineering Department is currently using these results to develop and implement a cost-effective rehabilitation program based on quantified defect flows. Meanwhile, cities throughout the Greater Toronto Area are putting together their own pilot projects to be completed in fall, 2015. **Electro Scan Inc.**



cable pulling winches



Pipe Renewal Winch RW 10 on crawler



Pipe Renewal and Cable Pulling Winch RKW 5Crawler



RW 10
Crossing below the river
Rhine