Case Studies in Condition Assessment using LiDAR, Sonar and CCTV

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ABSTRACT

This paper describes the development and successful applications of a CCTV, LIDAR and sonar-based pipe inspection system that is robust and can gather quantitative data for critical underground pipe condition assessment. The system that can be deployed on a ROV or on a float and produces accurate cross-sectional analysis and sediment volume. This capacity is increasingly critical in large diameter pipes with high levels of flow. The system employs a time of flight LIDAR that is accurate to $1/16^{th}$ of an inch.

Results from recent projects are discussed in detail. The North Surrey Interceptor in Surrey, British Columbia, Canada is a Critical line in the municipality's wastewater system. This reinforced concrete box culvert is 69" × 56", and often operates at full capacity. Metro-Vancouver has experienced failures on this pipe, and it was recently rehabilitated. The sonar results provided accurate sediment volumes and cross sectional restrictions. This information was used to infer the location of further voids, and plan for a PPR deployment. LiDAR data and a proprietary 4-in-1 visualization module complemented the deliverables.

The Clayton Falls Generating Station Penstock near Bella Coola, BC is remote Penstock that supplies the main source of hydroelectricity for the Bella Coola Valley. This Steel pipe is 965mm for 52.48m and 1220mm for 532.85m. A long range tether system was used to collect LiDAR and CCTV data in a challenging and remote location. The primary objective of the survey was to visually inspect the surface for coating defects, and geometrically assess caving and buckling within the pipe. This paper presents the methodology and the results of the inspection.

Advanced pipe condition assessment technologies, such as the CCTV, LIDAR and sonar system described in this paper are cost-effective, and quantitative methods that provide critical information for optimal operation and maintenance of pipe infrastructure. The reported results can also help better refine estimated remaining service life of an interceptor, accurately determine t h e overall severity of pipe degradation, as well as provide a basis for improved cost allocation and timing of rehabilitation efforts.