Using GPR for dam safety projects

CASE STUDY

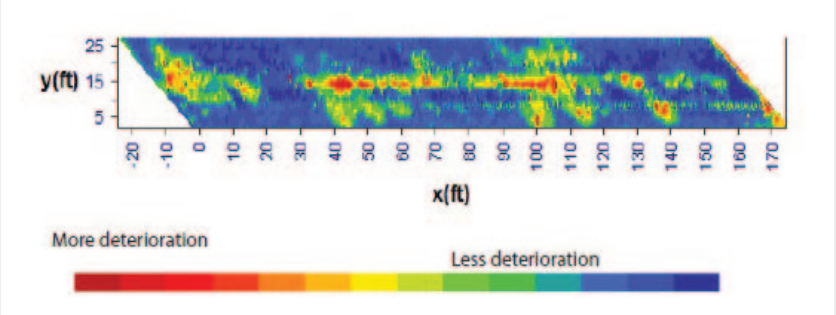
Concrete Inspection

Concrete inspection is of fundamental importance in meeting the challenge of identifying and prioritizing which areas of the dam need to be repaired and which need to be replaced. Amongst the available tools for concrete inspection, GPR has a number of advantages and is particularly well suited to prioritizing for budgeting purposes.

GPR is typically used for to determine the type and location of concrete reinforcement and detecting deterioration in concrete slabs.

Using the GSSI StructureScan Mini XT GPR system for a concrete dam condition assessment.

Concrete condition assessment can be performed using a ground-coupled GPR system or antennas. A ground-coupled antenna provides clear horizontal resolution, which is sufficient to enable imaging of individual rebars in the top mat, typically not possible with other types of GPR antennas. Ground-coupled antennas are used to collect densely spaced measurements along lines that are oriented so they cross over the top rebar in the upper mat at right angles (or close to a right angle if the rebars are skewed). The amplitude of the radar wave reflection from each rebar is recorded versus its location on the bridge. Relative changes in the rebar reflection amplitudes are typically indicative of the condition of the rebar and/or concrete above it.



GPR software denoting areas of concrete deterioration.

An example of software used to collect, process, and interpret GPR data as part of a dam condition assessment. The procedure provides a map of rebar reflection amplitudes. The areas with the lowest rebar reflection amplitudes (yellows and reds) correspond to the portion of the concrete containing the most concrete deterioration and/or rebar corrosion. The GPR data is then augmented by visual inspection and other accessory condition information, such as previous maintenance records.

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Inspecting the future

The development of improved GPR technology has enhanced inspection results substantially. GPR is gradually becoming a mainstream application in the toolbox of non-destructive testing methods for use in assessing dam, geotechnical and roadway conditions.

Data collection using GPR. Shown left is a 900 MHz antenna, shown right is a 400 MHz antenna.