

## High Speed Ground Penetrating Radar (GPR) Method of Pavement Evaluation



Ground-penetrating radar (GPR) is a rapid and accurate non-destructive test (NDT) method that **GEOVision** commonly applies to investigate pavement condition, at posted traffic speeds, on existing and new structures. GPR is also used to solve a number of engineering problems associated with both new and aging concrete structures, geophysical investigations, utility detection or environmental assessments.

Vehicle-deployed air-coupled (horn) antennas mount approximately 1.5 feet above the pavement surface, are combined with a high-speed, GPR data acquisition having an extremely clean signal, and can be used at posted driving speeds for almost any application.

**GEOVision** uses the best available GPR equipment for highway applications—a GSSI SIR-20 system (or the older GSSI SIR-10B) with one or two 1.0 GHz Model 4108 antennas. Being the first and second fastest data acquisition systems available, respectively, they survey at higher speeds than any other GPR instruments.

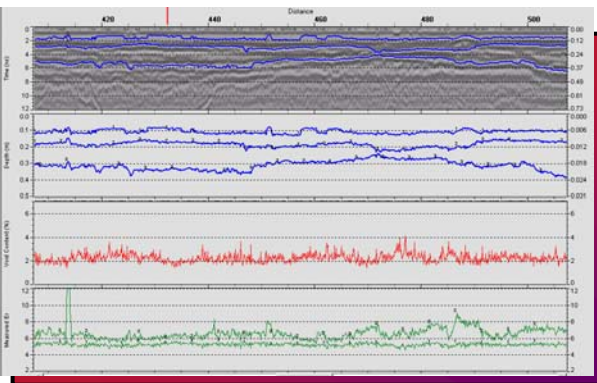


**1.0 GHz air-coupled antenna on high-speed pavement survey  
Going to the Sun Highway – Glacier National Park, Montana**

Surveys are performed with a single sensor along the centerline of a lane, with two sensors (one on each wheel-path), or with multiple passes—for complete lane coverage. Exact survey methodology is designed so that desired information can be obtained in an accurate, efficient and economic fashion.

Some of the more common applications include measuring (a) overall thickness of asphalt (flexible) or concrete (rigid) pavement; (b) composite pavement overlay thickness (when asphalt is overlaid onto concrete pavement); or (c) the lateral extent of lane pavements (whether concrete or asphalt) prior to modification of shoulder pavement during a lane-widening operation. Usually, base and subbase pavement foundation layers are also identified, and their respective depths and/or layer thickness are also calculated. Often, this information is used to augment Falling Weight Deflectometer (FWD) measurements, surface condition assessment, roughness (IRI), rutting, video, or core data.

Measurement of new asphalt pavement compaction (air void content), as a Quality Assurance indicator, is an application that is well-accepted in Europe and has been tested and accepted at Texas DOT. Typically, along with QA asphalt pavement compaction measurement, QA thickness of the HMAP (hot-mix asphalt pavement) is simultaneously determined as part of the survey.

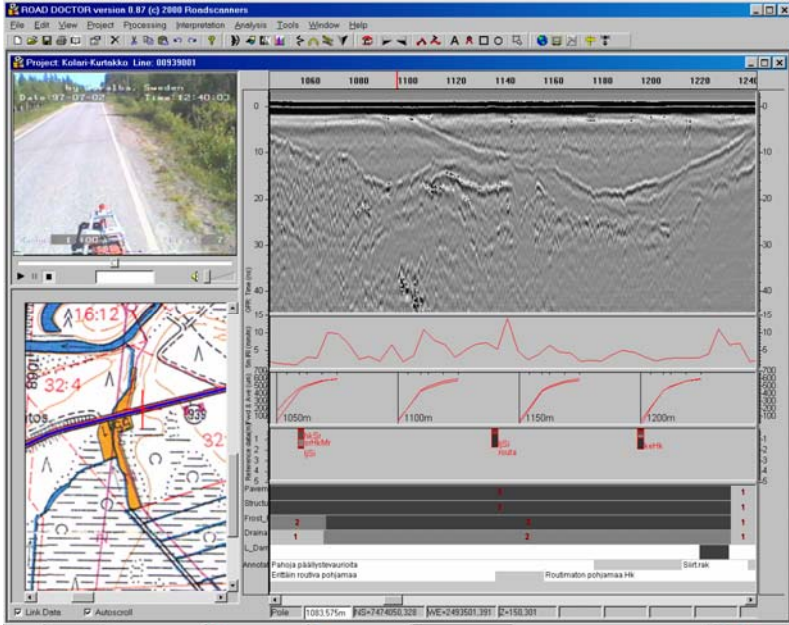


*The most undervalued and underused application (QA thickness and QA compaction), where GPR has the greatest capability to contribute to cost-savings during a structure's life... it is also among the applications where GPR is most accurate, because the material (asphalt) is more uniform and consistent prior to weathering, solar damage, exposure to the environment, and loading.*

### **Pavement Quality Assurance:**

- **Asphalt Air Void Content**
- **Asphalt Dielectric Properties**
- **Base and Sub-base Dielectric (Relative Moisture Content)**
- **Pavement and Base Layer Thickness**

**Complementary Services:** Recently, **GEOVision** invested in equipment and software for high-speed digital video and GPS data acquisition, integrated with simultaneous GPR (ground penetrating radar). This capability is unique among all US companies providing GPR services.



Using Roadscanners Oy's Road Doctor Cam Link™ and Road Doctor for Windows Advanced™ GPR/Pavement Analysis software, **GEOVision** has collected hundreds of lane-miles of network-level GPR/video/GPS data on city streets; airport runways, taxiways and aprons...

These data are viewed and analyzed on the same screen and linked so that the digital video, GPR data and interpretation, core data, site or core photos (or any other distance or position-based data), map position, etc., scroll together simultaneously—allowing all data to be correlated at once. Surface condition can automatically be viewed with GPR interpretation, ground truth (cores), roughness or rutting data, falling weight data, surface condition assessment, or whatever. These other data can be independently collected by various vendors, but the Road Doctor software allows direct integration of any data as long as distance along the survey segment, or GPS position, are known.

GEOVision is a leading geophysical service provider that has consulted on numerous city, state, and federal - level transportation projects. Selected agencies include:

- Federal Highways Administration (FHWA)
- California Department of Transportation (CalTrans)
- Nevada Department of Transportation (NVDOT)
- Connecticut Department of Transportation
- New York State Department of Transportation
- Colorado Department of Transportation



**GPR Investigation at Yosemite National Park, California**