

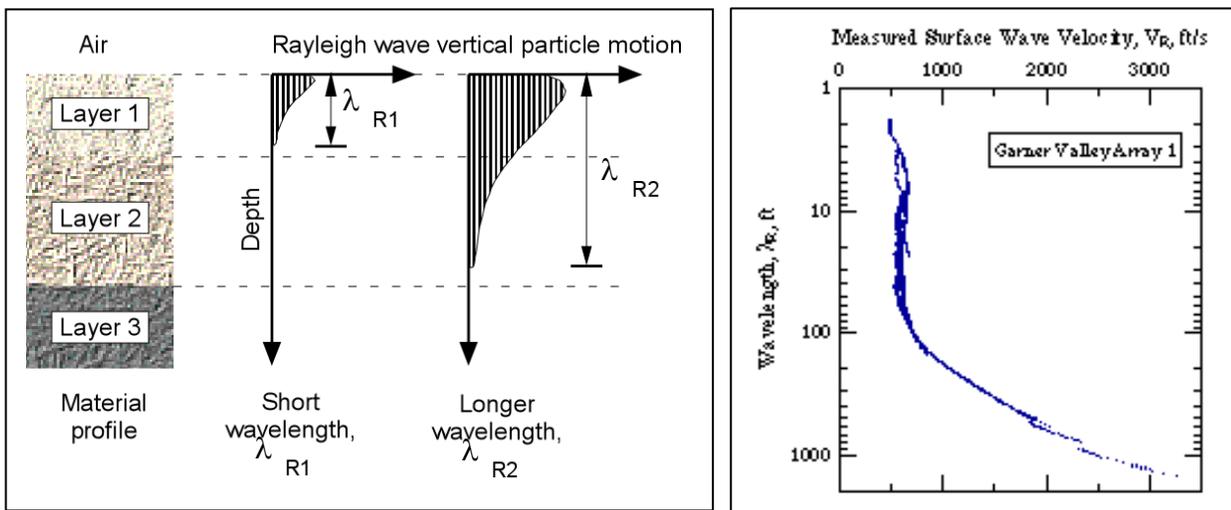
SASW METHOD



SPECTRAL ANALYSIS OF SURFACE WAVES (SASW)

Overview

The SASW method is a relatively new in-situ seismic method for determining shear wave velocity profiles. Testing is performed on the ground surface, allowing for less costly measurements than with traditional borehole methods. The basis of the SASW method is the dispersive characteristic of Rayleigh waves when traveling through a layered medium. Rayleigh wave velocity is determined by the material properties (primarily shear wave velocity, but also compression wave velocity and material density) of the subsurface to a depth of approximately 1 to 2 wavelengths. As shown below, longer wavelengths penetrate deeper and their velocity is affected by the material properties at greater depth.

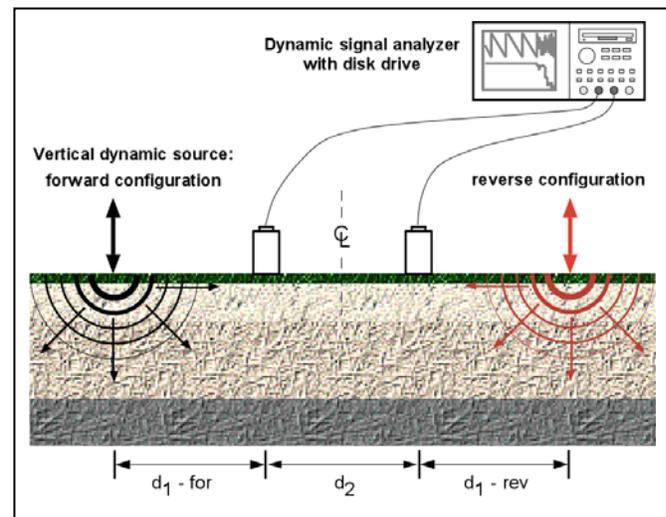


Procedure

SASW testing consists of measuring the surface wave dispersion curve at the site and interpreting it to obtain the corresponding shear wave velocity profile. The field setup is shown below.

A dynamic source is used to generate surface waves of different wavelengths (or frequencies) which are monitored by two or more receivers at known offsets. Data from forward and reverse profiles are averaged together. An expanding receiver spread is used to avoid near field effects associated with Rayleigh waves and the source-receiver geometry is optimized to minimize body wave signal. During data analysis, all phase data are manually checked through an interactive masking process to discard low quality data.

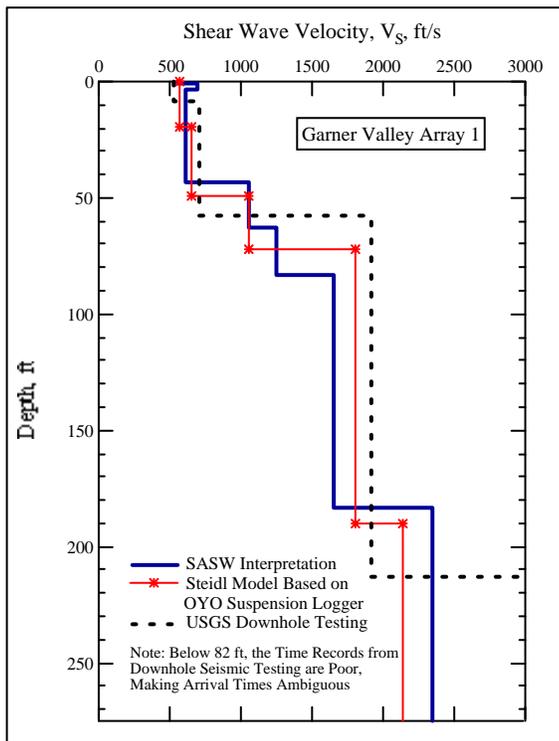
There are several options for interpreting dispersion curves, depending on the accuracy required in the shear wave velocity profile. A simple empirical analysis can be done to estimate the average shear wave velocity profile. For greater accuracy, forward modeling of fundamental-mode Rayleigh wave



dispersion as well as full stress wave propagation can be performed using WinSASW, a program developed at the University of Texas at Austin. A formal inversion scheme may also be used. With the analytical approaches, background information on the site can be incorporated into the model and the resolution of the final profile may be quantified.

Key Benefits

The SASW method offers significant advantages. In contrast to borehole measurements which are point estimates, SASW testing is a global measurement, that is, a much larger volume of the subsurface is sampled. The resulting profile is representative of the subsurface properties averaged over distances of up to several hundred feet. The resolution in the near surface (top 25 ft) is typically greater than with other methods. Because the SASW method is non-invasive and non-destructive, it is relatively easy to obtain the necessary permits for testing. At sites that are favorable for surface wave propagation, the SASW method



allows appreciable cost and time savings.

SASW Testing can be used to obtain V_s Profiles for:

- Earthquake site response
- Liquefaction analysis
- Soil compaction control
- Pavement evaluation
- Mapping subsurface stratigraphy

The SASW results at the Garner Valley site are compared at left with several independently determined V_s profiles.

For questions regarding **GEOVision's** SASW testing services and qualifications, contact Antony Martin at (909) 549-1234 or amartin@geovision.com