

SEISMIC REFRACTION SURVEYS OF A PORTION OF NAVAL STATION NEWPORT, RHODE ISLAND

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A surface geophysical survey was performed in a portion of Naval Station Newport that was impacted by historical releases of chlorinated solvents. The purpose of the survey was to investigate the depth to water table, depth to bedrock, and especially to characterize variations in bedrock seismic velocity along profile lines that might provide insight into more permeable zones that were anticipated at shallow depths and which could exhibit enhanced groundwater flow. Seismic refraction tomography (SRT) was selected as the most appropriate method for the site, based on the desired depth of penetration and numerous site constraints, including infrastructure, deep well casings, and surface modifications (parking lots, roads, riprap, and vegetated areas), especially those in areas of particular interest. Data were acquired along ten profile lines, ranging from 115-470 feet in length. Seismic data were acquired with a 48-channel Geometrics Geode system using a sledge hammer as the seismic energy source and 4.5 Hz geophones as receivers. The receivers were placed at 5 feet spacing on seven of the ten lines. The remainder of the lines had geophone spacing at 10-foot intervals. Data were processed using the Rayfract software package, from Intelligent Resources, Inc. This software allows analysis of seismic refraction data using conventional wavefront and plus-minus methods as well as tomographic inversion based on the Waveform Eikonal Tomography (WET) method.

Prior to the geophysical investigation, and based on results of the previous investigations, the threshold for a well installation to be considered a success was a sustained flow rate of 0.75 gpm. Subsequent well locations, based on the seismic work showed substantial improvement, with flow rates over six gpm in one of the wells. Our conclusion, therefore, is that the seismic tomography was a valuable tool for enhancing the remediation at this site, and could be beneficial for other sites.