The goal of a high resolution seismic survey is to provide an image of the subsurface that is as detailed as possible, within the limits imposed by the nature of acoustic wave propagation in the earth. The 2D seismic method entails propagation of the acoustic waves through the earth from a surface pattern of source and receiver points.

Energy is introduced by using one of a number of possible seismic sources. Common sources include seismic shotgun, small dynamite charges, weight drop or rammer sources. In some environments, such as gassy deltaic sediments, a shear wave source and geophones are used. The returning wavefield is recorded in the seismograph from a spread of geophone receiver groups. The number of geophones used may be as few as 24 in favourable environments to many times more where high subsurface sampling redundancy is required.

The survey procedure entails collection of a seismogram, then advancing the energy source a fixed distance down the survey line and repeating the process to receive another seismogram. This method known as common mid-point (CMP) provides a very high degree of redundancy of sampling of the energy received from a given reflector at depth. The redundancy is used in the data processing procedure to develop a high fidelity image of the subsurface. If all receiver locations are used as shot points, the multiplicity of data on one subsurface point (called CMP or CDP fold) is equal to one half of the number of recording channels.

A number of seismic events are present in each seismogram in addition to the reflections of interest. Data processing steps designed to attenuate this unwanted energy, and enhance the reflections of interest are carried out. The ultimate product of the reflection processing is a corrected cross section with reflection events ready for interpretation.

The SEGY formatted seismic data is imported into the Seismic Micro Technologies (SMT) 2D/3D seismic interpretation package, together with survey line position information. This software is a comprehensive 2D/3D seismic interpretation program that provides interpretive and horizon picking tools, integrated into a map and section database, entity management, and display system.

The initial step in the seismic data interpretation process is the correlation of the major geological structures to seismic reflectors. The process of tracing reflectors within a given seismic line, and from line to line at tie points, requires careful phase correlation of the events. During this process sedimentational character, and stratigraphic features and faulting are considered. A velocity model is developed during processing, and by correlation with borehole geologic and velocity logging information. The times associated with each of the interpreted reflectors are then converted from time sections into depth sections using this model.

Final products include colour contour maps and sections and isopach maps of geologic horizons. As well, volumetric computations for regions and horizons may be developed.

Applications

- Stratigraphy mapping for environmental applications
- Groundwater exploration
- Shallow oil and gas
- Mineral exploration, kimberlite, massive sulphides, potash, and coal