Seismic Acquisition: Field Operations

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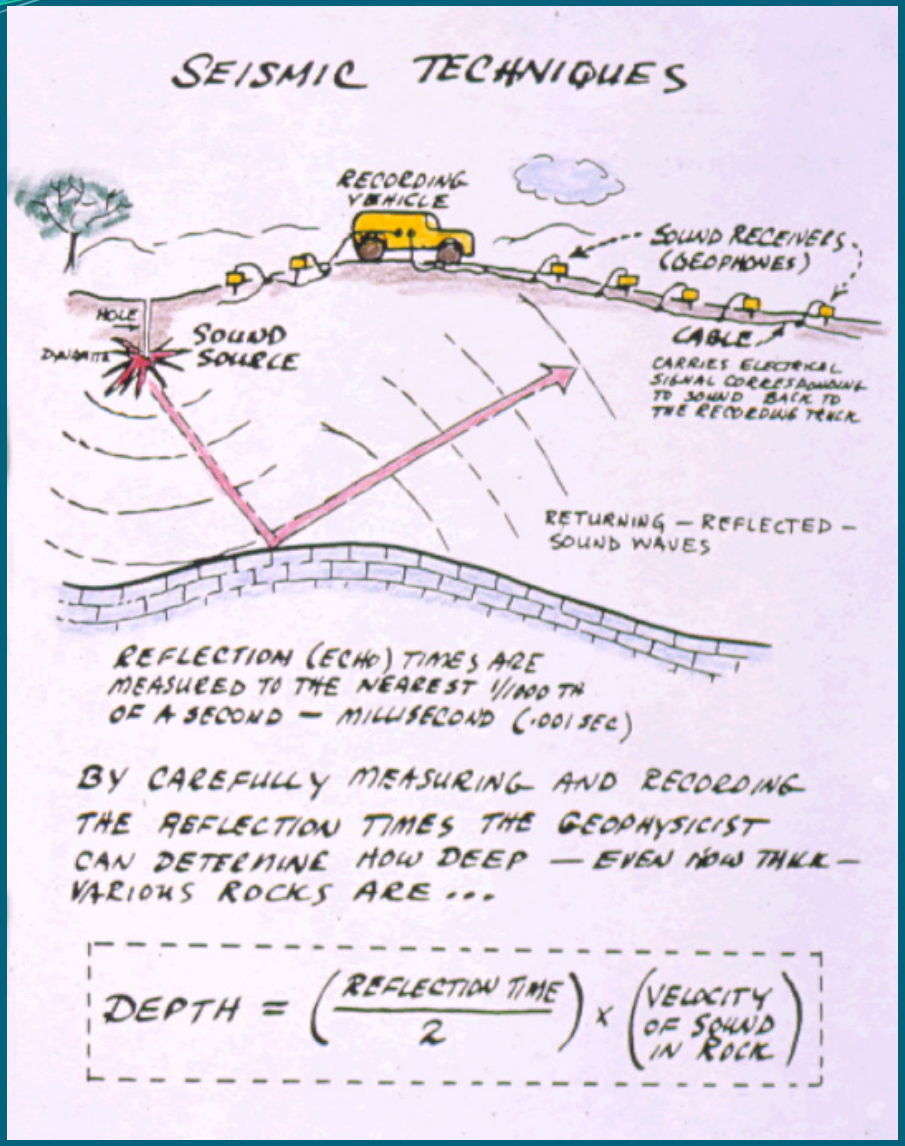
Vecta Oil & Gas Ltd.

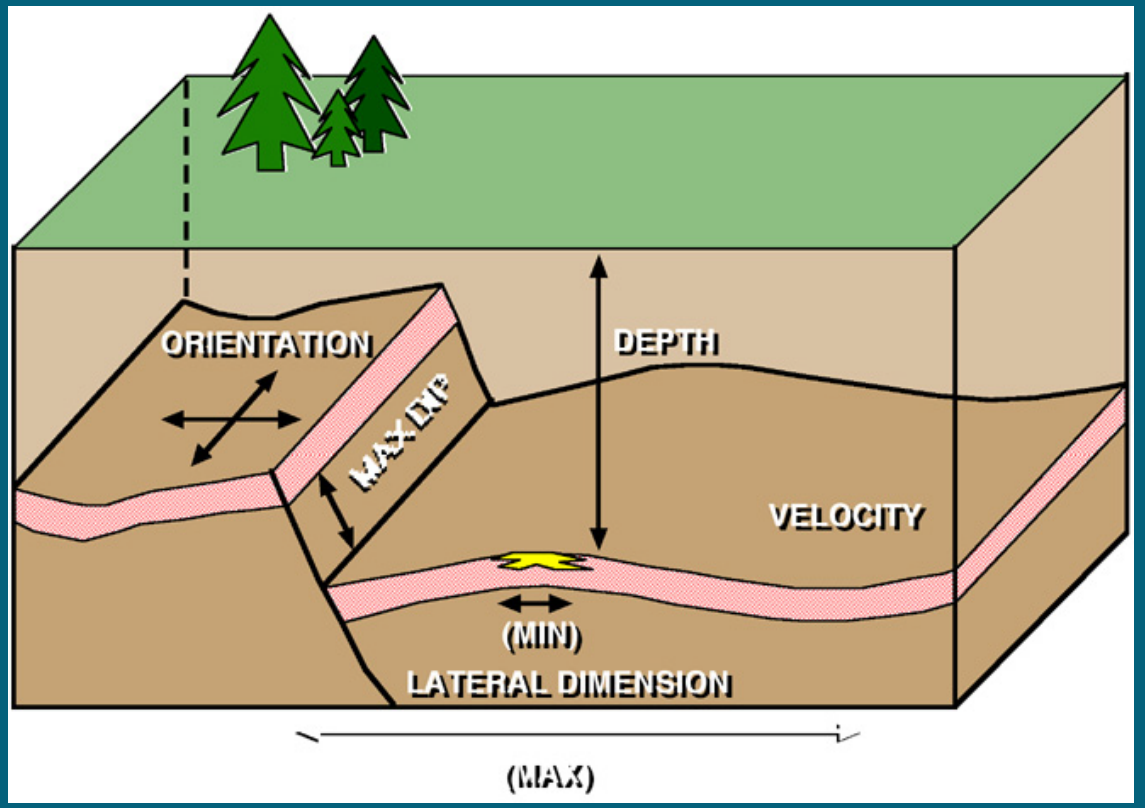
What is seismic?



Reflection seismic imaging uses reflected energy to construct an image of the subsurface to investigate the underlying structure and stratigraphy.

What kinds of information can seismic provide ?

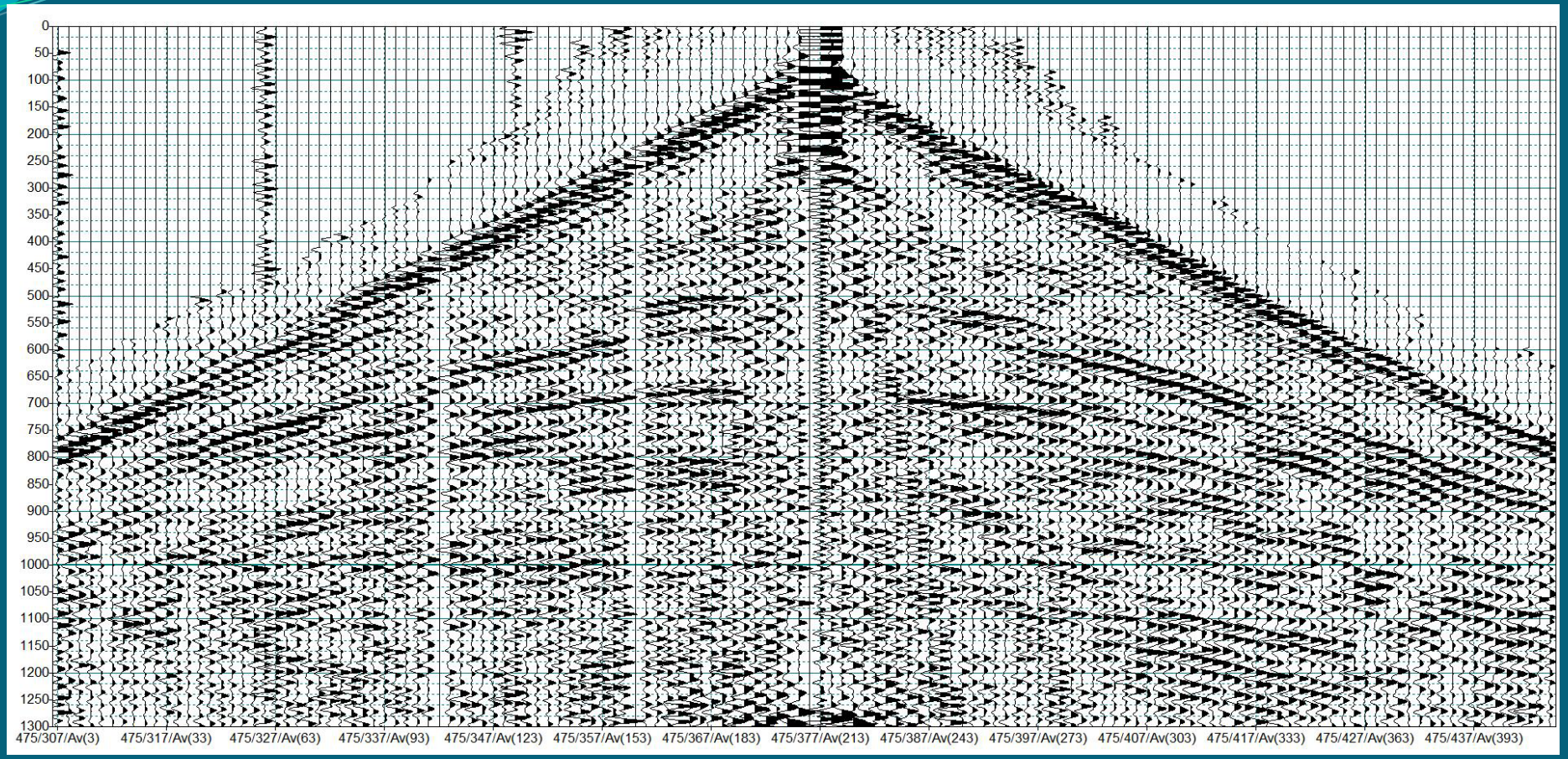
Seismic imaging can provide information about geologic structure and stratigraphy including -- bed thickness and geometry, rock type, faulting



and fracturing and, in some cases, limited information on liquids present.

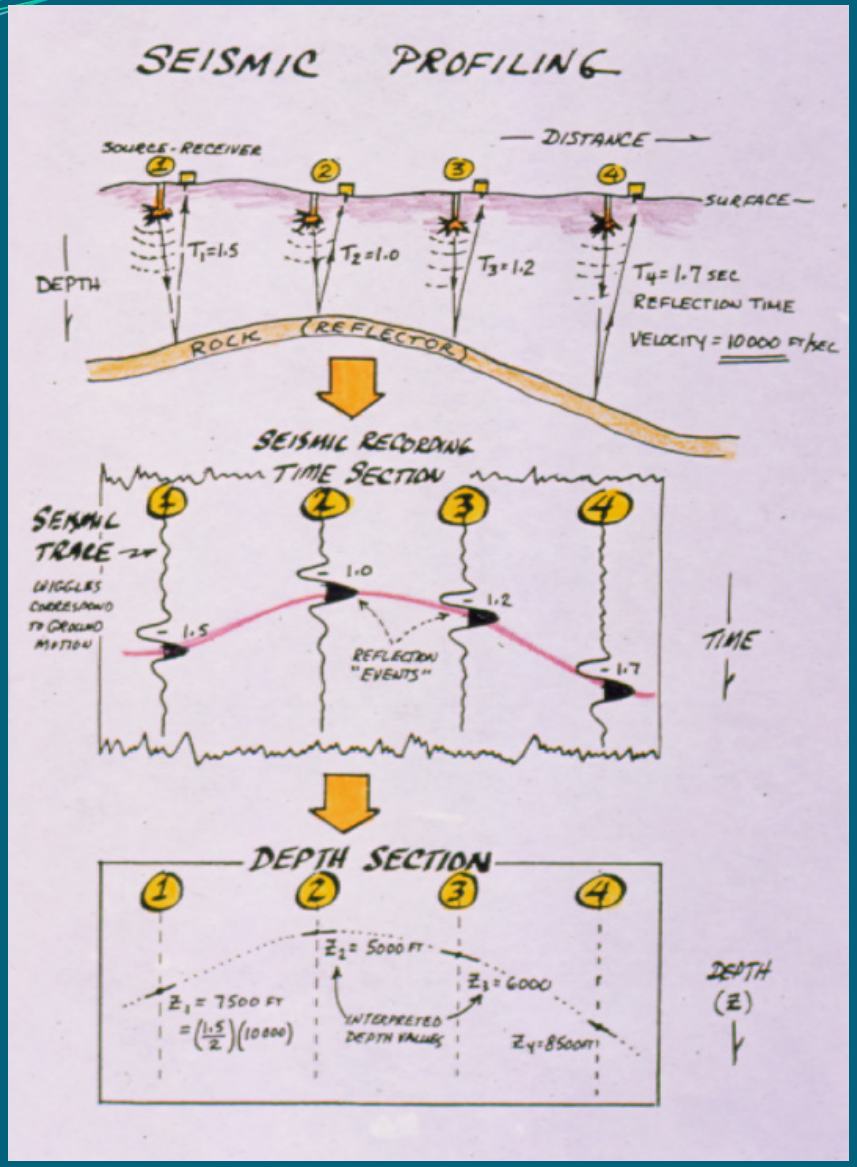
How does seismic work ?

How does seismic work?



Seismic data consists of a series of recorded wiggle traces that describe a set of echoes from interfaces between rock layers in the subsurface that have different rock properties.

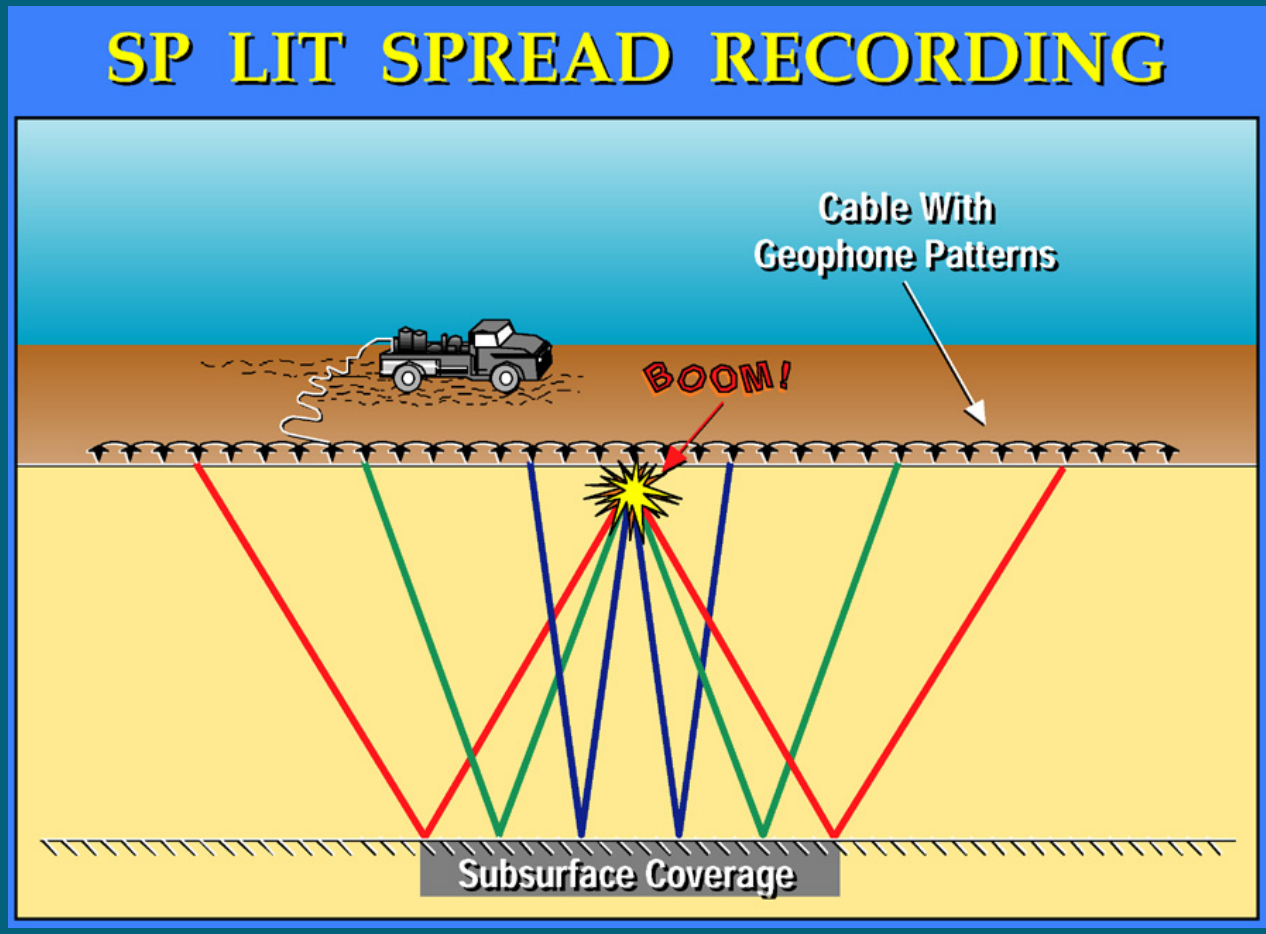
How does seismic work?



Each wiggle trace is the record, in time, of when sound from each source reflected off each layer of rock. The amplitude of the wiggle is relative to how large the change in rock properties is between two layers.

How do we obtain seismic data?

To gather seismic data we use a network of energy source points and geophone receiver stations to record multiple reflected sound waves from aerially scattered points in the subsurface.



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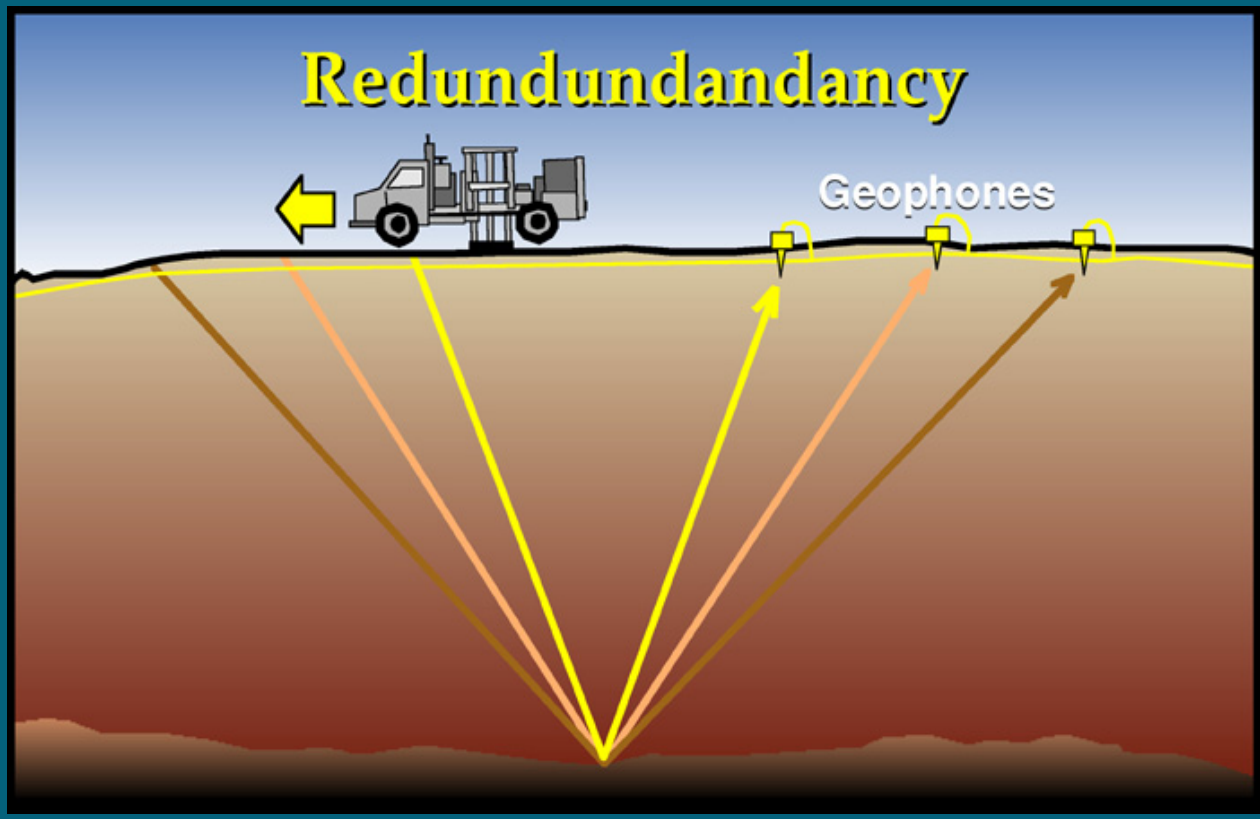

To improve data quality and reduce noise in the data each subsurface point is multiply sampled to increase what is called 'fold'.

This multiple sampling will increase signal while random environmental noise (often wind) in the data will tend to cancel out.

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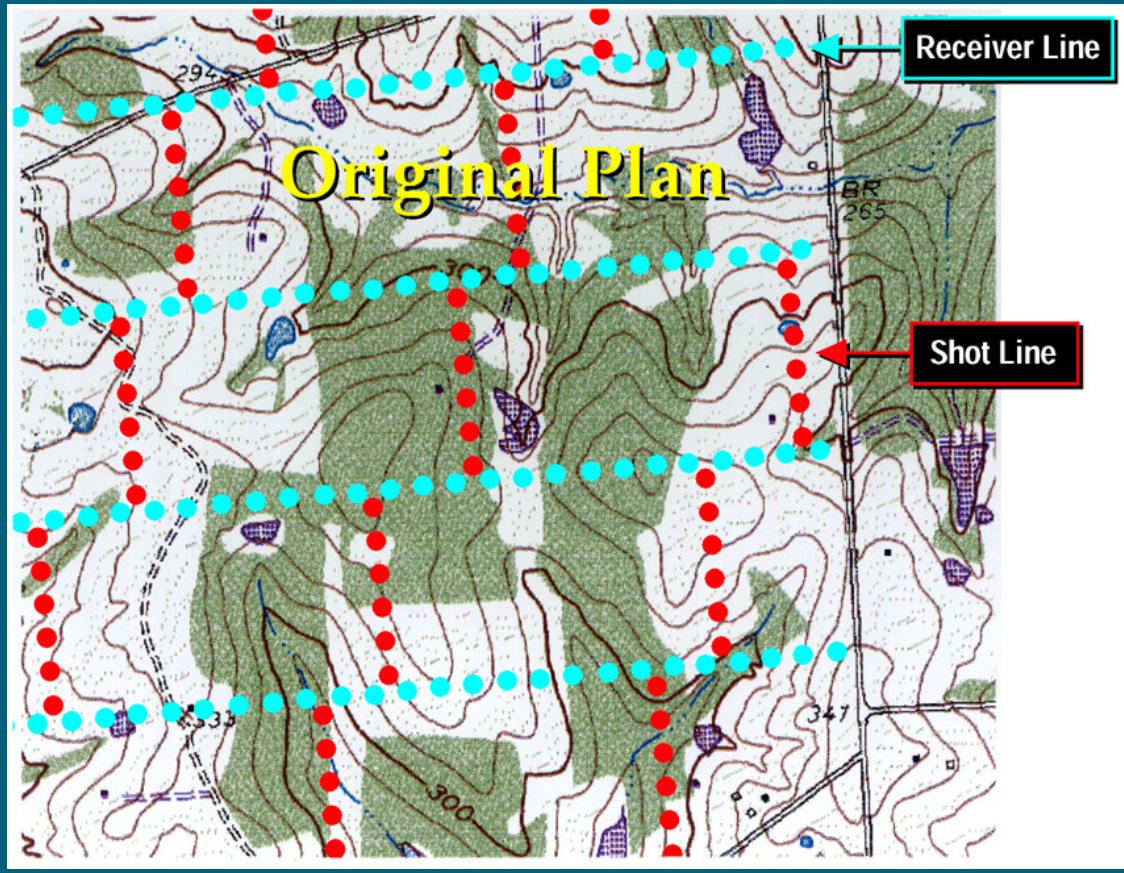

To acquire a seismic dataset a grid of source and receiver lines are designed taking into account surface conditions, topography and the geologic / geophysical requirements of the project. These requirements include the depth and thickness of the zone of interest, estimates of data quality, and the fold required for the survey.

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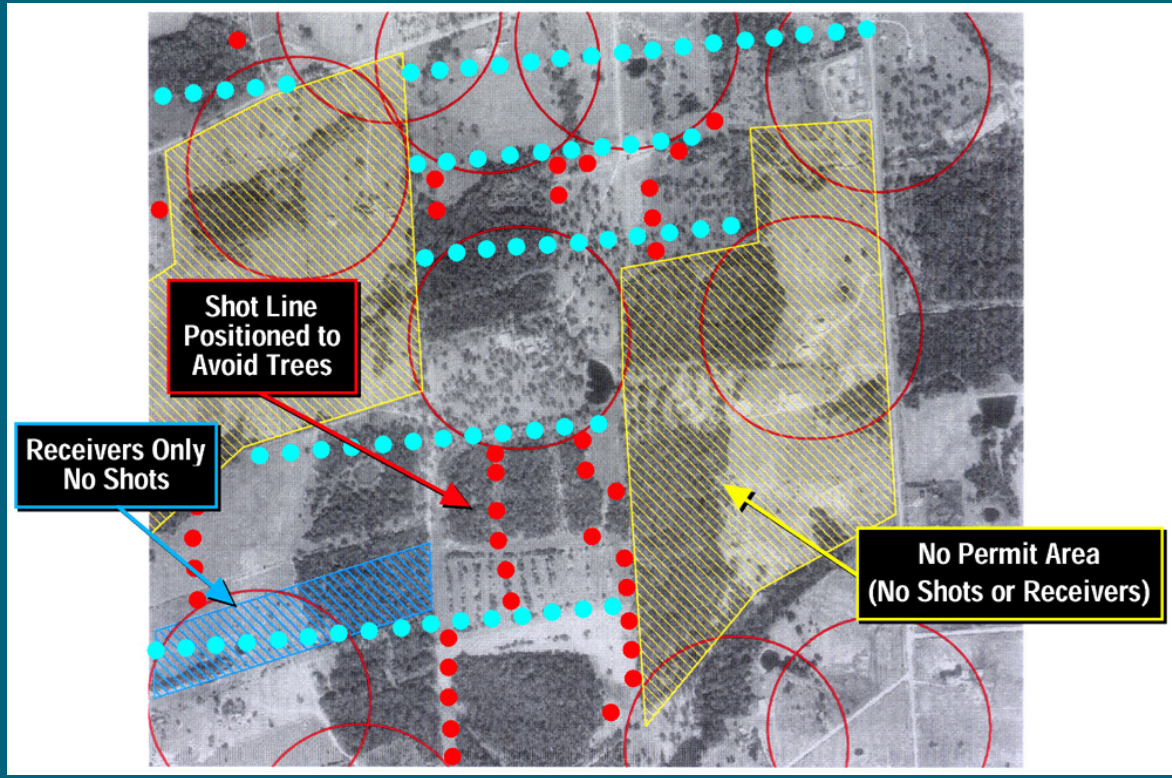
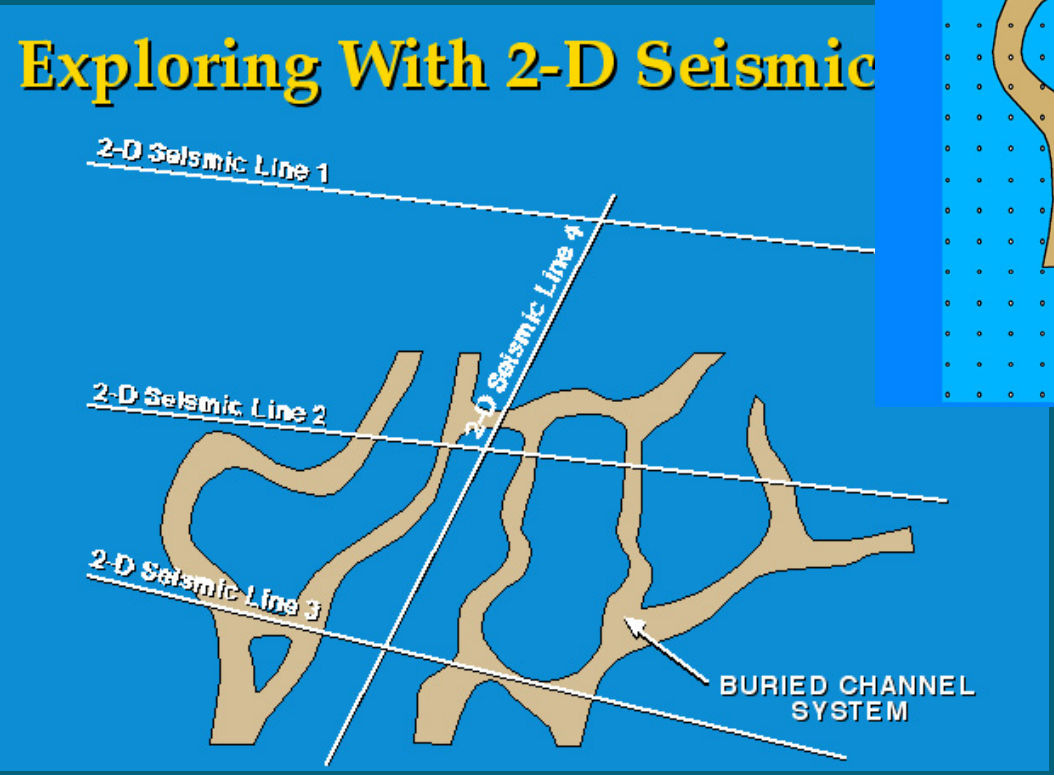
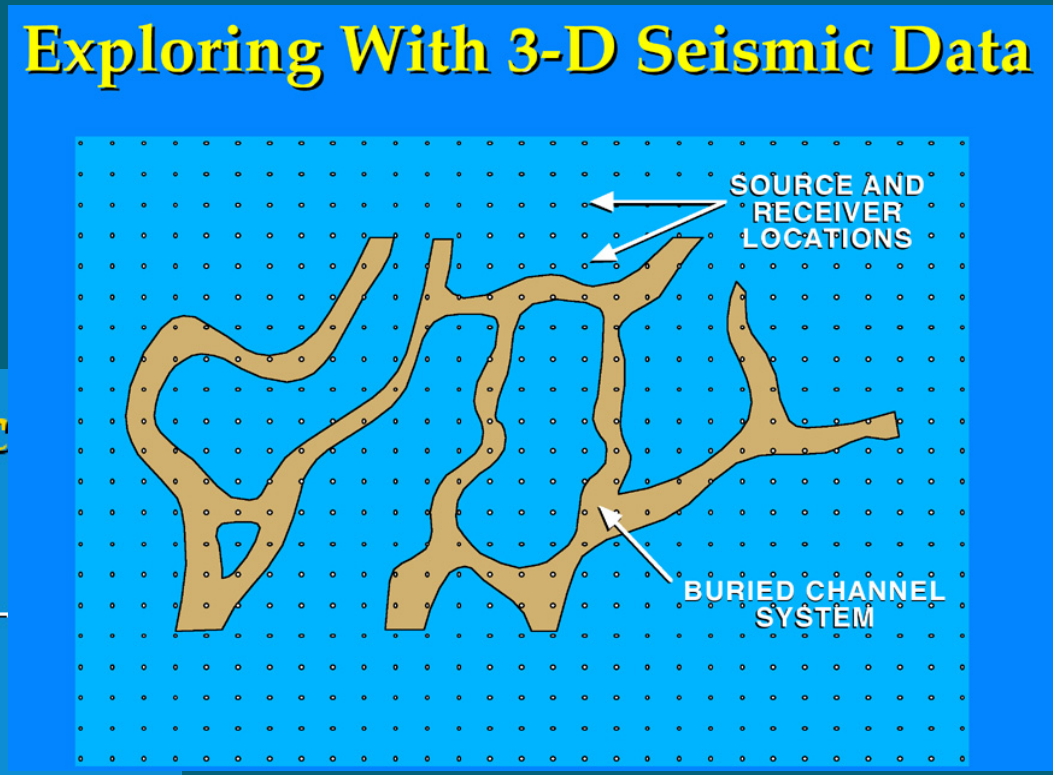
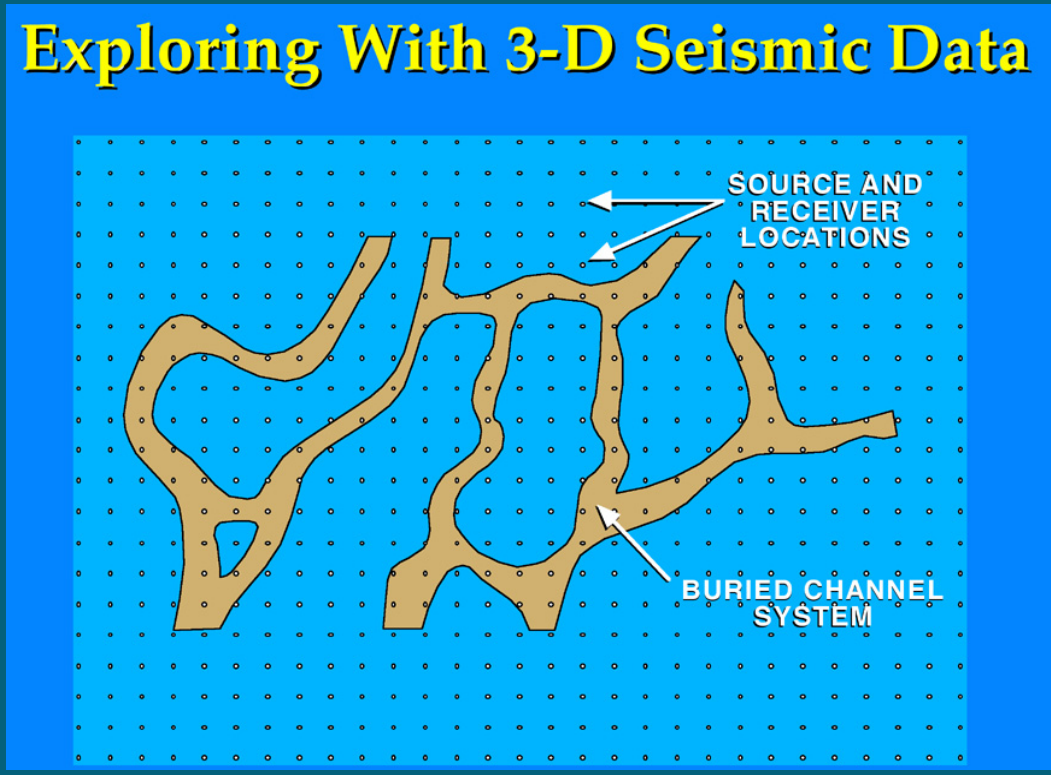


2D, 3D or 4D?


Exploring With 2-D Seismic
2-D Seismic Line 1
2-D Seismic Line 4
2-D Seismic Line 2
2-D Seismic Line 3
BURIED CHANNEL SYSTEM


Exploring With 3-D Seismic Data
SOURCE AND RECEIVER LOCATIONS
BURIED CHANNEL SYSTEM

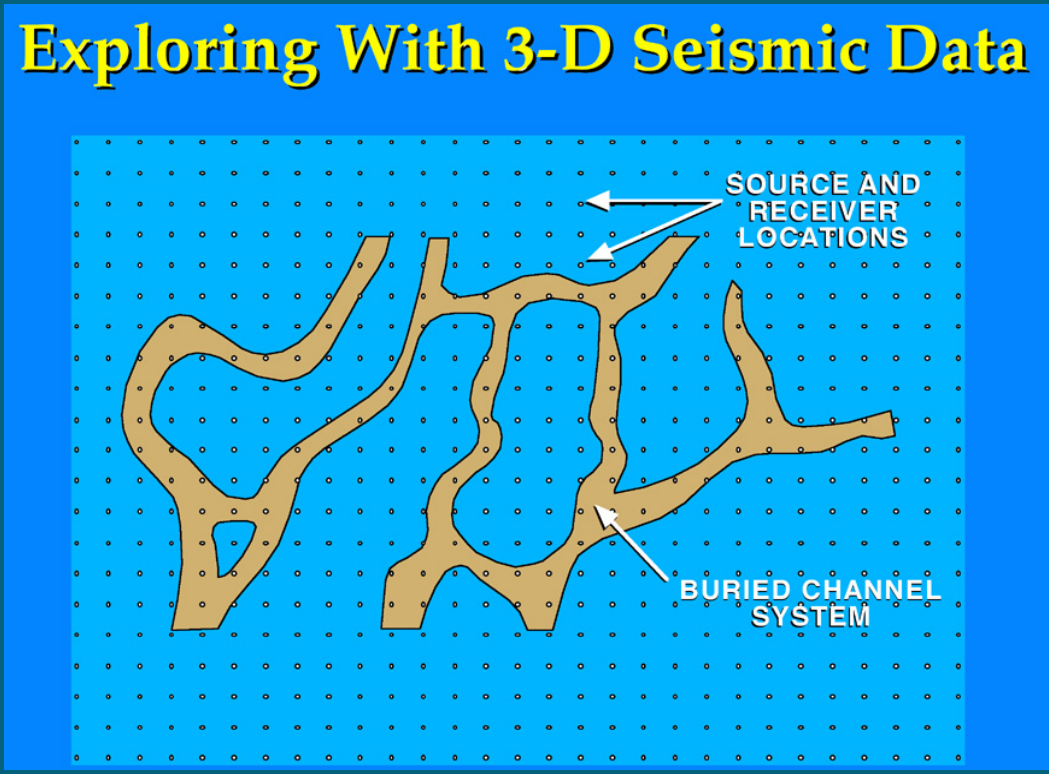
Designing a survey!



When designing a 3D survey the most important factors to consider are the geologic requirements of the project.

To obtain the most useful data you must consider spatial resolution requirements (bin size) and vertical resolution requirements (frequency).

Designing a survey!



Bin size will determine the how often you sample the subsurface. If you need to see smaller features in a structure you need smaller bins. Vertical resolution is controlled both by bin size and by the frequencies contained in the final data.

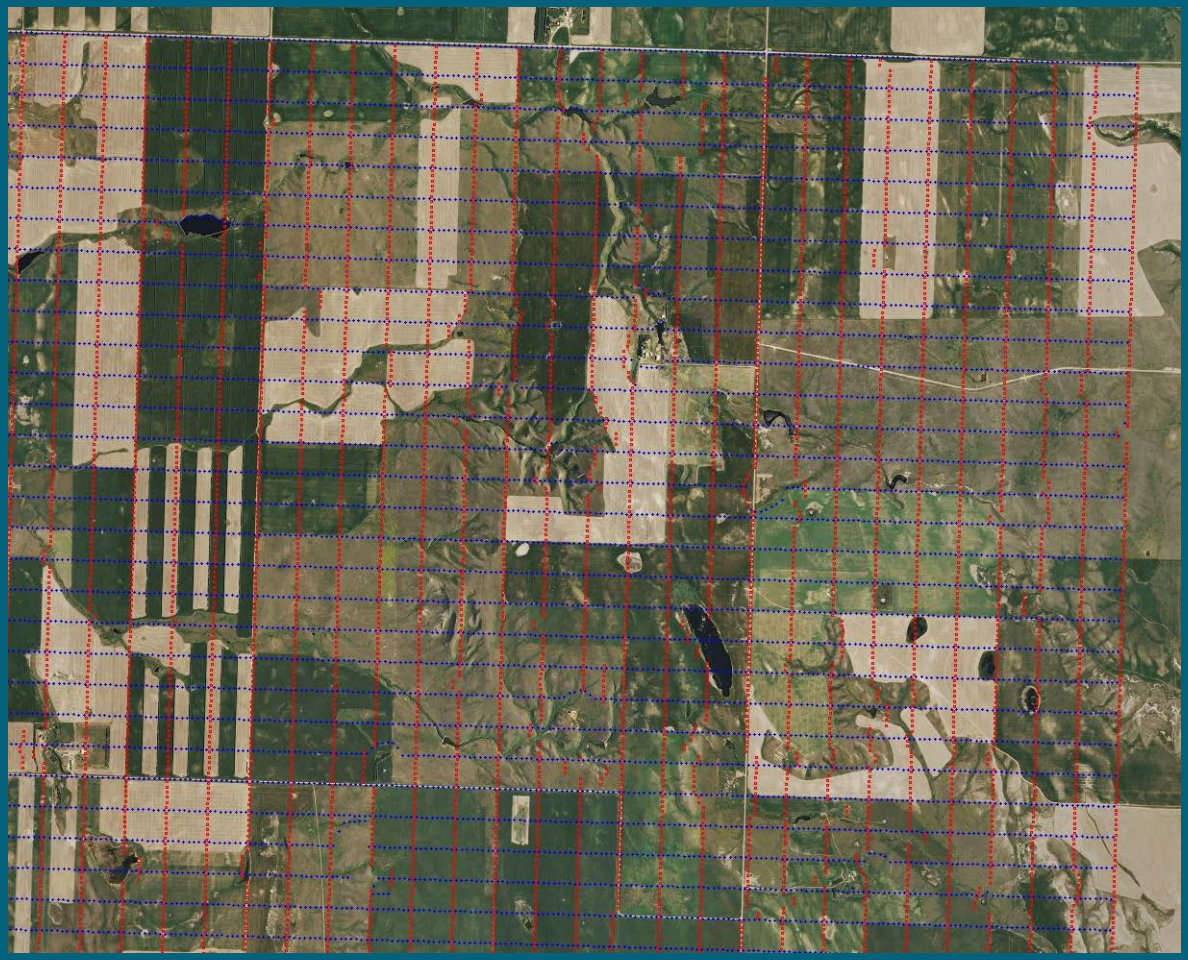
Higher frequencies have shorter wave lengths and provide more information. The frequency content will also be controlled by the general data quality.

Energy Sources

Using vibrators as an energy source has the advantage that you have more control over the frequencies contained in the source energy. For shallow target you are able to increase

the amount of high frequency energy put into the ground to provide more resolution in the final data.

Field Operations



Design software allows full planning of all operations. This includes preplanning operations to avoid sensitive surface areas while insuring data integrity will be maintained throughout the project area.

Design planning will take into account existing access routes to locate the survey as well as any cultural resource and biological issues found in the field to be avoided or areas to insure minimal surface impact.

Final thoughts

- **With proper planning in conjunction with cultural resource and biological field surveys 3D seismic programs can be designed both to obtain quality seismic information while at the same time minimizing the impact on existing surface resources.**