# A Multi-Pronged Management Approach to Manage a 3-D Seismic Program in a Complex Environment

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## Abstract

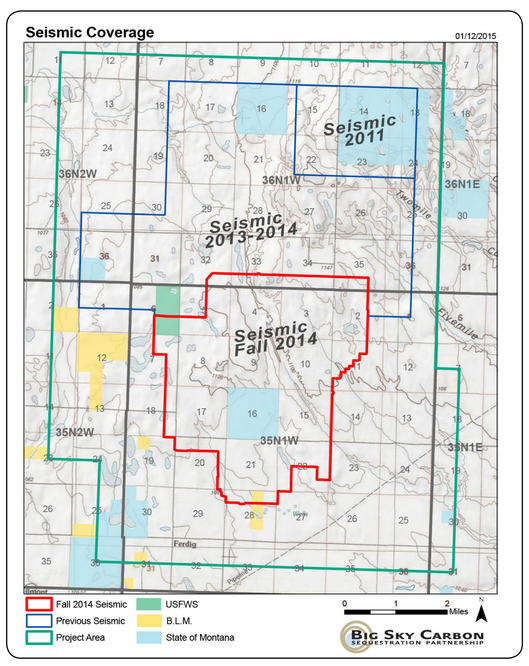
The Big Sky Carbon Sequestration Partnership (BSCSP) recently completed a large seismic survey in Toole County, MT. This survey was partially funded by the US DOE in a remote location with sensitive areas that needed to be avoided. Due to the funding source and the myriad of public and private landownership, all activities needed to be conducted in compliance with several state and federal laws as well as in compliance with signed agreements. Additionally, the surveys were conducted in the winter with variable and extreme weather conditions. To ensure safety and compliance with regulations and agreements, the management team developed the following approaches.

A collaborative permitting effort was employed to obtain and track landowner permits and the permits were accessible through an online interactive mapping web platform. BSCSP management held mandatory pre-season orientation sessions for crews at the beginning of each seismic season. Morning crew meetings were held daily to discuss safety, work plans, compliance, permits, and any other issues. The daily travel routes of each vehicle involved was tracked using GPS for compliance verification and new maps were produced and distributed to the crews and management daily. Weekly management meetings were held with leadership to build relationships and resolve any issues. The field crews and BSCSP Field Office were co-located in a motel to improve communications and facilitate transfer of information. The team employed two 'birddogs' for oversight in addition to the BSCSP field manager. This was complemented by visits from upper management to provide leadership and resolve issues.

*Vibroseis Trucks*

## Description of the Seismic Survey

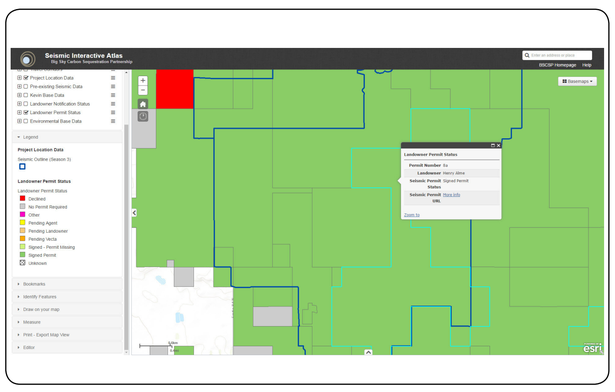
The BSCSP's seismic survey covered 37 square miles and was conducted on land owned by 69 private landowners, the Montana Department of Natural Resources (DNRC), US Bureau of Land Management (BLM) and the US Fish Wildlife Service (USFWS). Due to federal funding, the seismic survey was subject to an Environmental Assessment for National Environmental Policy Act (NEPA) compliance. The majority of the permits obtained for the seismic survey contained specific stipulations that must be adhered to for regulatory compliance. For example, in consulting with the USFWS, the project agreed not to conduct seismic activities from March 15 through August 15 to reduce impacts on migratory birds. Additionally, the project agreed to start work after the local farmers harvested their crops in the fall.




*Seismic Map showing landownership*

## Permitting

The permitting was a collaborative effort between MSU and three subcontractors. Private permits were obtained by contacting the landowners by phone or in person visits. State and federal permits were obtained by working with the regulatory agencies. The most challenging part of the permitting effort was coordinating information between the teams obtaining the permits and the crews working in the field. To solve this problem, the MSU team developed a browser based application that allowed managers and field crews to access a central database with editing capabilities. This application provided constant communications on permit status for people in remote locations; it reduced liability and risk of someone not knowing the correct status of a permit; it was simple to use for users ranging in technical ability; and it was integrated with existing field operations. The application showed all of the data in color-coded maps and provided status notes and copies of the permits files.




*Interactive Permitting Application*

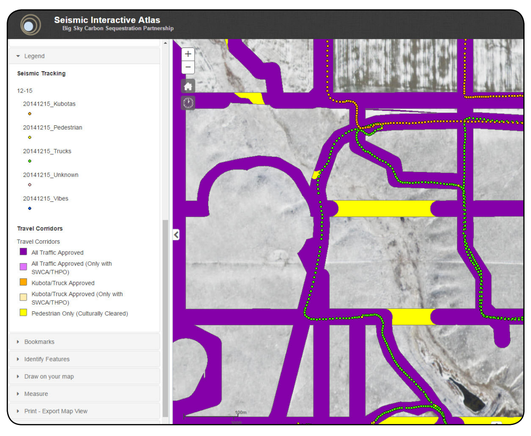
## Preseason Training

The seismic survey was the first on the ground activity of an 8+ year carbon storage project. It was very important that everyone involved knew that this was a long term project and that there were many permitting stipulations and compliance regulations. The project also placed great importance on developing and maintaining long-term relationships with the landowners and local communities. The project had many cultural resources and wetlands that needed protection. To ensure that all crew members knew about the long term goals and objectives for the project, MSU held a mandatory training for every person working on the project. The trainings covered information on the project's background, its high visibility, the project's communication plan and guidelines, safety, do's and don'ts and training on the protection of wetlands and cultural resources. This training helped reduce compliance and safety risks for the project and improved overall communications.

*Pre-season Training Meeting*

## Operational Management

The survey was designed with 100' wide approved corridor travel routes that were centered on the source and receiver lines. Areas outside of the corridors were restricted since they had not been surveyed for sensitive resources. If the crew went outside of the approved travel corridors, there could potentially be compliance violations and grave consequences for the project. The management team took several measures to ensure that the sensitive resources were protected and that the crews only traveled on lands with permits within the travel corridors. All drivers had tablets with GPS maps that were updated daily with the approved travel and permit information. The compliance rules were printed on laminated cards in English and Spanish and placed in every vehicle. Several forms were developed to report any incidents or any out of corridor travel. If crew members went outside of the corridors, they were required to report to their superiors and fill out the forms. Every morning, all companies involved were required to attend daily meetings. At the daily meetings, the daily work plan, safety concerns, and compliance issues were discussed. To improve team relations and resolve issues among the subcontractors, MSU hosted a weekly dinner meeting. These meetings were very useful in addressing issues as they came up and getting buy-in from the leadership of each of the companies involved. MSU also had increased oversight in the field. There were two 'birddogs' working in the field in addition to the MSU Field Manager to assist with oversight. The MSU Field Manager was present at every meeting and available at all times to help resolve issues. Personnel from the various companies were housed at the Comfort Inn in Shelby, MT. The co-location of the teams was useful for relationship building and information dissemination.




*Corridors and GPS Tracking Data*

## Interactive Mapping

The team developed an interactive mapping platform to track the field crew's movements throughout the day. Each of the vehicle drivers was equipped with a GPS tracking device that continuously recorded their travel routes throughout the day. This data was downloaded and mapped nightly. If there was out-of-corridor travel on the maps, the field manager could visit the area and determine what had happened and see if there were any damages. This also served as a tool to show the crew instances of out-of-corridor travel. It streamlined the investigative work and provided detailed information of what happened in the field.

## Conclusions

The management team is proud that the team worked together to successfully collect seismic data while protecting sensitive resources and maintaining good relationships with landowners, permitting agencies and the Blackfeet nation. The management recommendations described above helped to successfully manage a complex seismic program and could be applied to other large scale projects.


## Acknowledgement:

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