

Seismic reflection survey requirements for class I wells.

- (A) A seismic reflection data survey shall be conducted at each injection site where a class I injection well is located or is proposed to be located in order to determine the presence or absence of such geologic features as may be identified by seismic reflection survey data within or near the area around the well where the formation pressures may be increased due to the operation of the well. "Geologic features" for the purpose of this rule means lateral stratigraphic changes, faults, fractures, and/or other structural irregularities.
- (B) A new seismic reflection data survey is not required, if, prior to the effective date of this rule, a seismic reflection data survey was conducted at an injection site in accordance with a work plan approved by the director or a seismic reflection data survey was conducted at an injection site and the results were approved in writing by the director.
- (C) The owner of a class I injection well shall re-evaluate the seismic reflection data collected per paragraph (A) or (B) of this rule, if there is a change in the area of review of an injection well or if the owner or operator is proposing a new well to be located at the injection site. The director may require the owner or operator to submit additional seismic reflection data as may be necessary or appropriate, if the director determines that the existing data are inadequate to determine the presence or absence of geologic features as may be identified by seismic reflection survey data within the altered area of review or within the area of pressure buildup of the new well.
- (D) Prior to conducting a seismic reflection data survey, the owner or operator shall submit for approval by the director, a work plan detailing the activities and methods to be used in data acquisition, processing, interpreting and reporting the seismic reflection data. This work plan shall, at a minimum, include:
 - (1) Provisions for data acquisition, processing, and plotting no less than three seconds of data;
 - (2) Proposed line locations and appropriate acquisition and processing parameters for the data. The survey shall include adequate horizontal data coverage which will image and properly identify any known or unknown geologic features that may affect the site, both during operation and post-closure periods of the well(s);
 - (3) A detailed discussion of the proposed acquisition of any checkspot survey and/or vertical seismic profile (VSP);

- (4) Provisions for keeping detailed and dated field notes and records of all geophysical investigations;
 - (5) Provisions for, if multiple energy sources are utilized within a survey, headers on final line plots to indicate the shotpoint ranges of the various energy sources. Any changes in shooting or processing parameters utilized should be specified within the headers as well;
 - (6) Provisions for having lines plotted at an appropriate vertical scale;
 - (7) Identification of well(s) used for synthetic seismographs, checkshots and/or vertical seismic profile (VSP); and
 - (8) Provisions for the generation of root mean square velocity panels at intervals to be specified by the director in the approval of the work plan.
- (E) The owner shall submit to the director four copies of the final report and digital data with all appropriate header information detailing the results of the seismic reflection data survey. This report shall be submitted with the permit to drill application required by rules 3745-34-12 and 3745-34-13 of the Administrative Code. The report shall be certified in accordance with rule 3745-34-17 of the Administrative Code. The report shall, at a minimum, include:
- (1) A copy of the seismic reflection field digital data. The field digital data shall be submitted in a format approved by the director within the work plan required;
 - (2) A surveyed base map illustrating the following:
 - (a) Surveyed line locations with shot points annotated;
 - (b) All wells in the area that penetrate the confining zone, with permit numbers, total depth and standard symbols utilized to denote these wells. The producing zone(s) of these wells should be listed within the final report;
 - (c) The facility property boundaries;
 - (d) County and township boundaries and names (or numbers); and
 - (e) Highways, pipelines, railways and transmission lines;
 - (3) Provisions for including digital data and mylar plots of seismic profiles in the final report including, but not limited to:

- (a) Brute stack;
 - (b) Structure stack; and
 - (c) Migration stack;
- (4) The compilation and presentation of processing step notes with the data. These notes should be detailed so the entire processing sequence may be duplicated by an outside party. Intermediate data, specific procedures and the technical basis for selected procedures applied in all static corrections should be provided in digital form;
 - (5) A copy of the field tapes and all digital processed data, in a format and medium approved by the director.
 - (6) A copy of interpreted brute stack, structure stack, migration stack sections, and other sections as requested by the director with all significant geologic horizons annotated. The stratigraphic nomenclature shall be that currently in use by the Ohio department of natural resources, division of geologic survey. Wellbores shall be projected along regional geologic strike and annotated on nearby sections. The distance and azimuth of the projection shall be noted on the seismic line(s) for each well location. One copy of the uninterpreted migrated seismic sections shall be included within the report;
 - (7) The interpreter's data sheets listing the time and geologic nomenclature of the seismic reflections correlated at each shotpoint, if compiled during the interpretation;
 - (8) Clearly defined procedures for and final results of velocity analysis;
 - (9) A line-by-line discussion addressing all geologic features in evidence on the data;
 - (10) An explanation of zones where shot loss is apparent;
 - (11) Maps detailing time and depth structure, isochron and isopachs. All maps shall be reasonably scaled to allow identification of all significant features. All maps shall have data points posted at every twentieth shotpoint. Depths and thicknesses of geologic units penetrated by wells within the area of review shall be integrated into the depth or thickness maps constructed from the seismic data. Depths to formation tops and thicknesses of units shall be correlated accurately with those stratigraphic terms currently used by the Ohio department of natural resources, division of geologic survey;

- (12) A list of velocities used in depth or thickness conversions, along with the source(s) for the velocity data. A discussion of depth and thickness conversions shall be presented;
- (13) The approximate vertical resolution of the data, along with a discussion as to the method of determination of this resolution; and
- (14) Unless waived by the director in the approved work plan, the construction of at least one synthetic seismogram. Two copies of each synthetic seismograph, checkshot survey or vertical seismic profile (VSP) shall be provided with each copy of the report submitted. If a synthetic seismograph is constructed from a deviated wellbore, it shall be corrected to true depth prior to its use in the interpretation. If sonic and density logs are available for more than one wellbore within the area of review, a synthetic seismograph shall be generated for each of the wells.

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