

September 2021

2021 Exploratory Drilling AML Project Summary

Project Type: Exploratory Drilling

Drilling to locate and characterize abandoned underground mines.

Belfield, Beulah and Garrison

Contractor

Earth, Energy and Water Systems, Inc. of New Salem, ND.

Total Project Cost:

\$348,826.00



Earth, Energy and Water Systems, Inc. drill rig in the ditch of McLean County Highway 15.

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North Dakota Public Service Commission and Abandoned Mine Lands

North Dakota has records for about 1,700 abandoned coal mines which are mostly in the western half of the state. The Surface Mining Control and Reclamation Act of 1977 (SMCRA) provides for the reclamation of abandoned mine lands with fees collected on actively mined coal. In 1981, the North Dakota Legislature approved an Abandoned Mine Lands (AML) Program to be administered by the Public Service Commission (PSC) on behalf of the State of North Dakota.

ND PSC AML Mission

The AML Program is charged with eliminating existing and potential public hazards resulting from the abandoned surface and underground coal mines. The AML Program is a service (not regulatory) program aimed at protecting North Dakotans by reclaiming hazardous abandoned mines. Mines eligible for reclamation may be in our 1,700 plus abandoned mine inventory, found through exploratory drilling or reported to us. The PSC's selection of reclamation projects is based on the prioritization of abandoned mine-related hazards. It also requires federal approval. Emergency projects are conducted when AML problems are an immediate and serious danger to the public.

Program Funding

Reclamation costs are covered through a federal fee on actively mined coal. The current fee rate for lignite coal is 8¢ per ton. The federal government, through the Office of Surface Mining Reclamation and Enforcement (OSMRE), reallocates the money to each state or tribe with an AML program through a grant program. North Dakota's allocation is about \$3 million per year. Federal fee collection is scheduled to end in 2021 unless reauthorized by the United States Congress.

Exploratory Drilling

Exploratory drilling involves drilling through the overburden into the mined coal seam to locate areas where the coal was mined. A driller will know they have hit a mine void by feel. The driller can tell when they start falling through a void. When they encounter rubble, it will become much easier to advance the drill. Both void and rubble are cased with 3" PVC when encountered. The 3" casing will remain on-site until a backfilling project is conducted at a later time. Exploratory Drilling is done near road or structures.

Glossary of Terms

Backfill— Material used to fill an opening, void or depression. Material placed in the mine void to support the mine roof.

Casing—A tubular structure installed in a drill hole to prevent the wall of the hole from caving and to provide a conduit for grout.

Core—A cylindrical sample taken from a formation for analysis. Usually a core barrel is substituted for the drilling bit and it procures a sample as it penetrates the formation.

Haul Tunnel— Any underground entry or passageway designed for transport of coal, other material, personnel, or equipment.

Mine Workings— The entire system of openings in a mine.

Overburden— Layers of soil and rock covering a coal seam.

Pillar—The part of coal left between individual rooms and entries to support the overlying strata.

Roof —The stratum of rock or other material above a coal seam; the overhead surface of a coal working place.

Roof Fall— A coal mine cave-in.

Room and Pillar Mining— A method of underground mining in which a portion of the coal is left in place to support the roof of the active mining area. Large "pillars" are left while "rooms" of coal are extracted.

Rubble— Debris encountered when drilling into mine workings that may indicate mine collapse or roof fall.

Seam— A stratum or bed of coal.

Slump—In material testing it is a measure of consistency of concrete or grout on a scale from 0-12 inches. The higher the number the more liquid or flowable the mixture.

Void— A general term for openings in rock. In mine reclamation it is the open space remaining after coal was extracted by underground mining.

Source: Office of Surface Mining Reclamation and Enforcement

Belfield Site Background

The Belfield site is located on a family farmstead about 2 miles northeast of the city of Belfield. The abandoned mine Lerfald Lignite Mine operated from 1923 to 1935 and produced 1,000 to 3,000 tons of lignite coal per year.

In 2012 the ND AML Division conducted an exploratory drilling project at this location. In that project, 62 holes were drilled and one of those encountered mine voids and was cased. Unfortunately, drillers later inadvertently hit the sewer line to the house. This caused a work stoppage.

In 2021 the AML Division reconnected with the landowner and designed a project to relocate the void found in 2012 and provide more drilling to ensure the rest of the driveway is not undermined.

Belfield Drilling Overview

We drilled 50 holes on the driveway from the GPS location of the one void in 2012.

The 2012 drill log indicated the hole as a true void but drilling verified it as tight rubble. Of the 50 holes, 7 were cased. Those 7 holes all contained rubble.

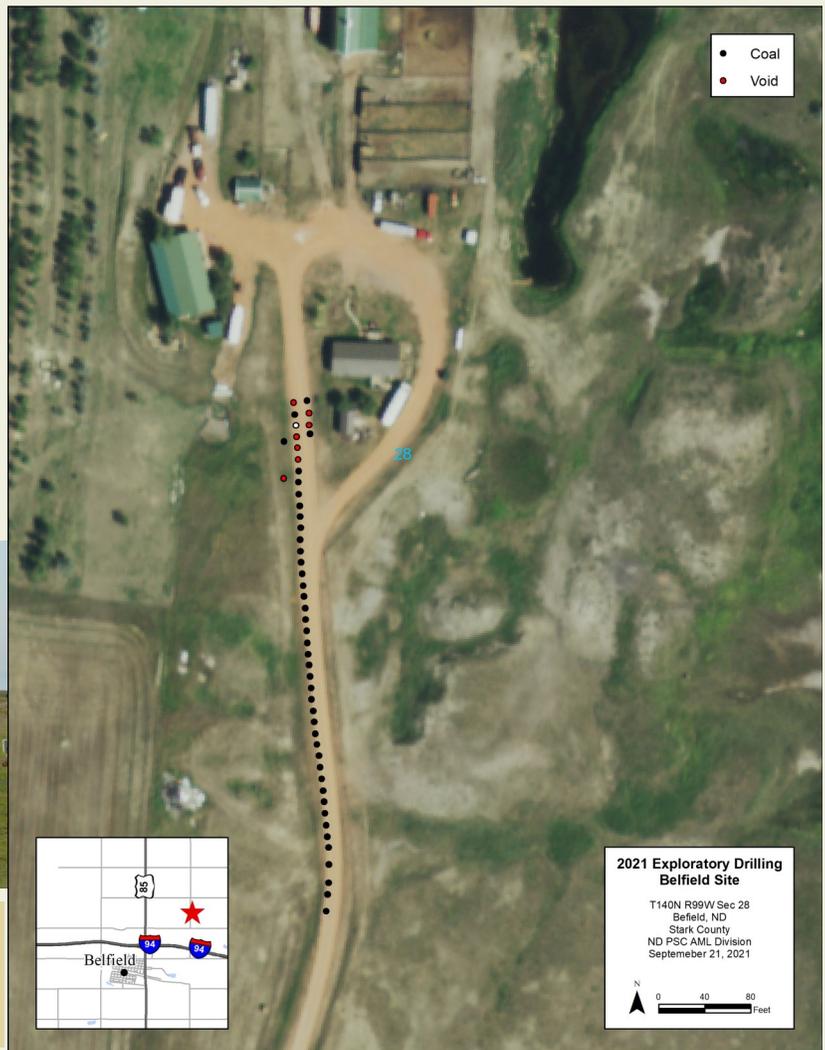
The total drilling depth varied from 26 feet to 40 feet below the surface. The rubble was encountered from 25 feet to 35 feet below surface. The map on the right shows black dots which encountered coal while the red dots encountered mine workings. The single white dot encountered neither coal nor mine workings. A backfilling project is currently being planned to fill the voids.

2021 Belfield Statistics

Drilling Dates	April 23rd to April 27 5 calendar days
Total Feet Drilled	1,609
Total Feet Cased	123
Days of Drilling	3
Daily Average	Drilling—536 Casing—41
Highest Daily Totals	Drilling— 1,169 Casing—71
Number of Holes Drilled	50
Number of Holes Cased	7



Above is the Belfield site in 2012. The site has not changed much in those 9 years.



Beulah Site Background

More than 50 abandoned coal mines have been identified within 20 miles of the cities of Beulah and Zap. The Knife River Coal Mine is the largest abandoned underground mine in the area. It was first developed under the name Black Diamond Mine in 1915. In the late 1950s Knife River mining became solely a strip mining operation. Since 1992, there have been 16 phases of drilling and grouting projects in the Beulah/Zap area.

Beulah Drilling Overview

The PSC AML Division held a public meeting to discuss a 2021 project in Beulah on January 7th, 2021. In the meeting, Beulah residents expressed concern about the recent sinkholes in the ditch of U.S. Highway 200.

Drilling began on the Michaelson farmstead just north of the town of Beulah, see the map below. There were cased holes here were from a project in 1998 (not shown on map). The landowner wanted the PSC to fin-

2021 Beulah Statistics

Drilling Dates	April 28th to May 14th 17 calendar days
Total Feet Drilled	15,011
Total Feet Cased	3,905
Days of Drilling	11
Daily Average	Drilling—1,364 Casing—355
Highest Daily Totals	Drilling— 2,307 Casing— 943
Number of Holes Drilled	137
Number of Holes Cased	49



ish the drilling and was very cooperative with AML staff and the contractor. Drilling in 2021 found one void in the yard. Holes were also drilled just west of the house and all encountered coal.

Drilling the driveway presented a challenge because of the steep 18% grade. The drill rig was equipped with jacks that made it safe to drill by lifting the front end while keeping the back end at ground level. Of the 7 holes drilled on the drive-



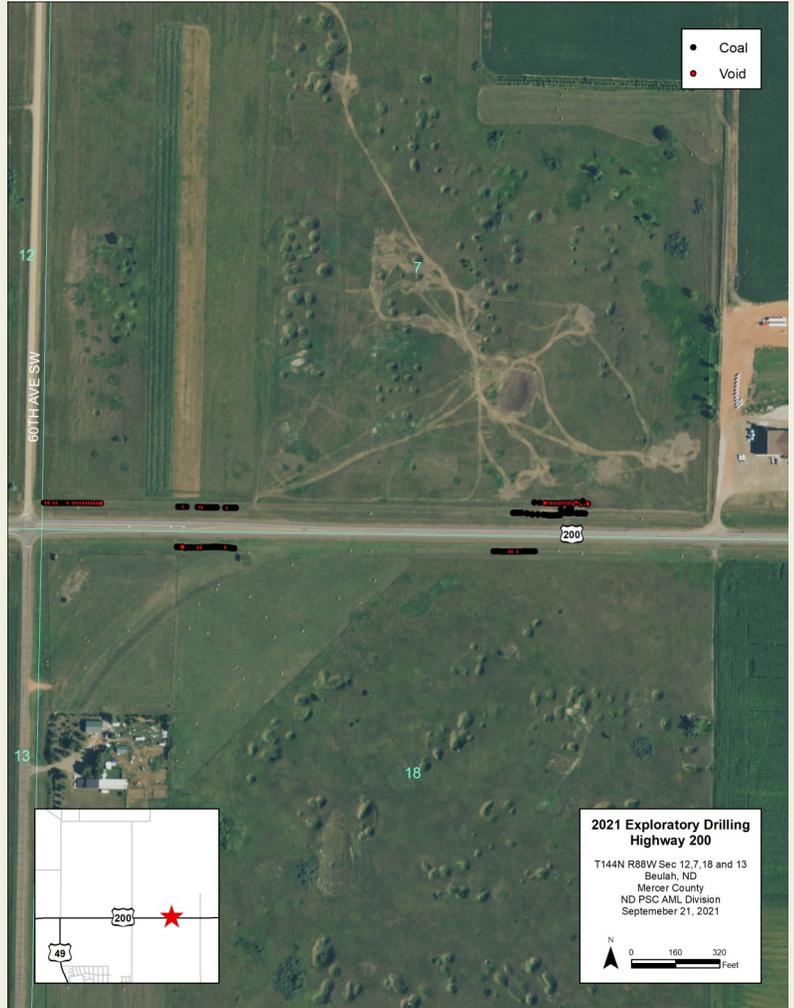
Pinflags mark coal holes just west of the Michaelson residence.



Seasonal inspector Ben Griep and other AML staff visited the original entrance to the Knife River Coal Mine during the project.

way, 5 were voids. It appears to be a haul tunnel perpendicular to the driveway.

Recently formed sinkholes are good indicators of where to drill. Voids were found near a sinkhole we filled in 2019 and 2020 in the ditch of U.S. Highway 200. Map on the upper right. This ditch was drilled and grouted in past projects. The holes in the ditch ranged from 104 to 126 feet below surface. We encountered 6 holes filled with grout and one partially filled with sand from previous AML projects. We also encountered areas of both open voids at around 110 feet to 120 feet from the surface and upward migration of voids ranging from 30 feet to 90 feet.



Environmental scientist Ross Edisson operating the borehole camera.

One useful tool we used to confirm the drilling logs was a borehole camera provided by the Office of Surface Mining Reclamation and Enforcement. The camera was designed to fit into the casing and be lowered down to the mine voids. The camera is equipped with lights to illuminate the dark mine. Images and videos were recorded to be viewed later. We use the camera to help estimate how much material we need to fill the voids.



Drill rig on Curt Michaelson's Driveway at 18% grade.



- Coal
- Void

**2021 Exploratory Drilling
Garrison Site**

T148N R84W Sec 17 and 18
Garrison, ND
McLean County
ND PSC AML Division
Septemeber 21, 2021

N
0 80 160
Feet



Garrison Site Background

The abandoned underground Rupp Mine is located in the NW corner of Section 17, T148N, R84W. It operated from 1920 to 1926 and produced about 12,000 to 27,000 tons per year in that time. The Kunkel Mine is in Section 18. It operated from 1912 to 1924 as both a surface and underground mine. The PSC conducted 4 phases of drilling and grouting projects on the abandoned mines. During a drilling and grouting project in 2005, a gasoline leak was detected inside the mine. Investigation by the ND Department of Health (NDDOH) revealed a 30,000 gallon gasoline leaked from a nearby C-store. The NDDOH remediated the spill and monitored the spill for several years.

Garrison Drilling Overview

In preparation for drilling, AML staff and the contractor met with local utility officials and landowners. We used the GPS locations from previous drilling projects to plan for 2021 drilling locations. Drilling depths ranged from 38 feet to 69 feet. The rubble and voids ranged between 25 feet and 55 feet from surface. No gasoline was detected during drilling.

The map on page 6 shows the 2021 drill holes. Several voids encountered around the house suggest that Dean



Folden's house is undermined. Additional drilling inside the unfinished house is scheduled for 2022. Two of three drill holes near another home encountered rubble. There were also some voids as well as hardened grout from previous projects

Above: Drilling being done near the Brunsell residence.

2021 Garrison Statistics

Drilling Dates	July 12th to July 26th 15 calendar days
Total Feet Drilled	7,239
Total Feet Cased	1,783
Days of Drilling	11
Daily Average	Drilling—658 Casing—162
Highest Daily Totals	Drilling— 938 Casing— 293
Number of Holes Drilled	142
Number of Holes Cased	53

found on the west side the ditch of McLean County Highway 15. Further drilling will be done in the ditch of McLean County, around the Brunsell residence, around and inside of Dean Folden's house and other areas as needed. Highway 15. A public meeting is planned in Garrison in November, 2021. If anyone has any questions or concerns please reach out to the AML division.



Above: PSC Inspector Ben Griep, Driller Donavon Meuchel and Landowner Dean Folden discuss utility locations.

PLACE
STAMP
HERE

North Dakota Public Service Commission
Abandoned Mine Lands Division
600 East Boulevard Avenue, Department 408
Bismarck, ND 58505-0480

When a Hole Is Not Just a Hole

Underground coal mining was common in Western North Dakota in the early part of the twentieth century. After WWII, surface mining became more economical, and many underground mines ceased operation and became abandoned.

The legacy of abandoned underground mining is the potential for surface collapse.

The sinkhole on the right opened in spring 2020 in the ditch of U.S. Highway 200 near Beulah. The sinkhole opened up within a few feet of a sinkhole filled in 2019. Reoccurring sinkholes are a hazard and often it remote backfilling may be needed.



Contact Us

To report a sinkhole or request more information about our program

North Dakota Public Service Commission

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