



BEAR DEN PHASE 2 PROJECT

Plan of Development

**APPENDIX O
Blasting Plan**



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Blasting Plan

**Prepared for:
BUREAU OF LAND MANAGEMENT**

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TABLE OF CONTENTS

1.0 INTRODUCTION..... 1
2.0 OBJECTIVE 1
3.0 GENERAL REQUIREMENTS..... 1
4.0 PRE-BLASTING REQUIREMENTS..... 2
5.0 SITE-SPECIFIC BLASTING PLANS..... 2
6.0 MONITORING..... 3
7.0 LIMITS ON PEAK PARTICLE VELOCITY 4
8.0 SAFETY 4
 8.1 Protection of Aboveground and Underground Structures 4
 8.2 Protection of Personnel 5
 8.3 Lightning Hazard 8
9.0 IN-WATER BLASTING 8
10.0 STORAGE REQUIREMENTS 8
11.0 GENERAL BLASTING PROCEDURE 9

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1.0 INTRODUCTION

No blasting is anticipated during construction of Enable Bakken Crude Services, LLC (EBCS) Bear Den Project Phase 2 (Project). In the unlikely event that blasting is necessary to excavate the trench, EBCS will conduct blasting in accordance with pertinent regulations and this *Blasting Plan*. This *Blasting Plan* outlines the procedures and safety measures that EBCS' construction contractor (Contractor) will adhere to while implementing blasting activities along the pipeline right-of-way.

2.0 OBJECTIVE

This *Blasting Plan* is intended to identify blasting procedures, including safety, use, storage, and transportation of explosives that are consistent with minimum safety requirements as defined by federal (e.g., 27 Code of Federal Regulations (CFR) 181, Commerce in Explosives; 49 CFR 177, Carriage by Public Highway; 29 CFR 1926.900 et seq. sub-part U, Safety and Health Regulations for Construction – Blasting and Use of Explosives; 29 CFR 1910.109, Explosives and Blasting Agents, Occupational Safety and Health Administration (OSHA)), state, and local regulations. Additionally this plan is intended to address environmental aspects of blasting activities, and to identify areas of concern along the proposed pipeline route.

3.0 GENERAL REQUIREMENTS

Blasting operations shall be conducted by or under the direct and constant supervision of experienced personnel legally licensed and certified to perform such activity in the jurisdiction where blasting occurs. Prior to any blasting activities, the contractor shall provide EBCS with appropriate information documenting the experience, licenses, and permits associated with blasting personnel.

Blasting-related operations including obtaining, transporting, storing, handling, loading, detonating, and disposing of blasting material; drilling; and ground-motion monitoring shall comply with applicable federal, state, and local regulations; permit conditions; and the construction contract.

Blasting for grade or trench excavation shall be used only after other reasonable means of excavation have been used and are unsuccessful in achieving the required results. EBCS may specify locations (e.g., foreign line crossings, nearby structures, etc.) where consolidated rock shall be removed by approved mechanical equipment such as rock-trenching machines, rock saws, hydraulic rams, or jack hammers in lieu of blasting.

Before blasting, a site-specific blasting plan must be submitted by its Contractor to EBCS for approval. The site-specific blasting plan will be reviewed by an engineer representing EBCS. The engineer will analyze the data to determine the combined stress level of any nearby, affected pipeline and will make recommendations and/or forward approval to EBCS before blasting may commence.

Drilling and blasting shall be done with an EBCS Environmental Inspector present. The EBCS Inspector's approval is required to proceed prior to each blast. Approval does not relieve the contractor from responsibility or liability.

4.0 PRE-BLASTING REQUIREMENTS

Prior to the initiation of blasting operations, the contractor shall comply with the following:

- The contractor will obtain all required federal, state, and local permits relating to the transportation, storage, handling, loading, and detonation of explosives.
- The contractor shall place all necessary “one calls” 48 hours prior to construction where one-call system(s) are in place.
- The contractor shall be responsible for the protection of existing underground facilities.
- Before performing any right-of-way work, the contractor shall verify with EBCS that all affected property owners have been notified of the impending construction.

5.0 SITE-SPECIFIC BLASTING PLANS

The contractor’s site-specific blasting plan shall include at a minimum the following information:

- Explosive type, product name and size, weight per unit, and density;
- Delay type, sequence, and delay;
- Use of non-electrical initiation systems for all blasting operations;
- Stemming material and tamping method;
- Hole depth, diameter, and pattern;
- Explosive depth, distribution, and maximum charge and weight per delay;
- Number of holes per delay;
- Dates and hours of conducting blasting;
- Distance and orientation to nearest aboveground structure;
- Distance and orientation to nearest underground structure, including pipeline;
- Procedures for:
 - Storing, handling, transporting, loading, and firing explosives;
 - Fire prevention;
 - Inspections after each blast;
 - Misfires, flyrock, and noise prevention;
 - Stray current accidental-detonation prevention;

- Signs and flagmen;
- Warning signals prior to each blast;
- Where the pipeline route:
 - Parallels or crosses an electrical transmission corridor, cable or pipeline;
 - Parallels or crosses a highway or road;
 - Within or adjacent to treed areas;
 - Approaches within 100 feet of a water well or spring; and
 - Approaches within 1,000 feet of any residence, building, or occupied structure;
- Notification prior to blasting; and
- Disposal of waste blasting material;
- Seismograph company, names, equipment and sensor location;
- Copies of all required federal, state, and local permits;
- Blasters name, company, copy of license, and statement of qualifications;
- Magazine type and locations for explosives and detonating caps;
- Typical rock type and geology structure (solid, layered, or fractured); and
- Pipeline location (milepost and stationing) and applicable alignment sheet numbers.

6.0 MONITORING

During blasting operations, the contractor will be required to monitor operations in the following manner:

- The Contractor shall provide seismographic equipment to measure the peak particle velocity (PPV) of all blasts in the vertical, horizontal, and longitudinal directions. Seismic monitoring can only be discontinued if: a) the blasting schedule and blasting performance consistently produce PPVs at the pipeline that are lower than the maximum allowable limit; and b) a EBCS representative provides written authorization.
- The contractor shall measure the PPV at the adjacent pipeline, any water wells or potable springs, and any aboveground structure within 150 feet of the blasting.
- The contractor shall complete the Blasting Log Record immediately after each blast and submit a copy to a EBCS Representative.

7.0 LIMITS ON PEAK PARTICLE VELOCITY

The contractor is limited to a specified PPV of 4 inches per second measured adjacent to an underground pipeline that will be subject to approval by an EBCS Representative.

For any aboveground structure (including water wells), the PPV shall not exceed 2 inches per second.

For all aboveground facilities within 150 feet of the blasting, the contractor shall provide additional seismograph equipment to determine the PPV at the aboveground facility. If the measured PPV at an existing pipeline or other structure exceeds the above limits, the contractor shall stop blasting activities immediately and notify EBCS. The site-specific *Blasting Plan* must be modified to reduce the PPV prior to any further blasting.

Note: Limits on PPV for surface structures are based on studies that established the limits at which plaster in homes will crack. The primary purpose of the limit is to prevent damage to homes. The EBCS Inspector may increase the limit for other structures such as steel transmission line towers, as appropriate. EBCS Inspectors may approve higher velocities for given site-specific conditions in advance.

8.0 SAFETY

8.1 Protection of Aboveground and Underground Structures

The Contractor will exercise control to prevent damage to aboveground and underground structures including buildings, pipelines, utilities, springs, and water wells. The following procedures will be implemented:

- If blasting occurs within 200 feet of identified water well or potable springs, water flow performance, and water quality testing will be conducted before blasting. If the water well or spring is damaged, either the well owner will be compensated for damages or a new well will be provided. EBCS will provide an alternative potable water supply to the landowner until repairs occur.
- If blasting occurs within 200 feet of any aboveground structures, the contractor and EBCS representative will inspect structures before and after blasting. In the unlikely event that damage occurs to an aboveground structure, the owner will be compensated.
- The contractor shall be responsible for all damage claims resulting from blasting.
- Blasting will not be not allowed within 15 feet of an existing pipeline unless authorized by EBCS.
- Holes which have contained explosive material shall not be re-drilled. Holes shall not be drilled where danger exists of intersecting another hole containing explosive material.
- Blasting mats or padding shall be used on all shots where necessary to prevent scattering of loose rock onto adjacent property and to prevent damage to nearby structures and overhead utilities.

- Blasting shall not begin until occupants of nearby buildings, stores, residences, places of business, places of public gathering, and farmers have been notified by the contractor sufficiently in advance to protect personnel, property, and livestock. The contractor shall notify all such occupants at least 48 hours prior to blasting.
- Blasting in or near environmentally sensitive areas such as streams and wildlife areas may include additional restrictions as described in the BLM's Right-of-Way Grant and Temporary Use Permit stipulations.
- All blasting shall be subject to the following limitations:
 - Maximum PPV of 12.0 inches per second in any of three mutually perpendicular axes, measured at the lesser distance of the nearest facility or the edge of the permanent easement.
 - Maximum drill size shall be 2.5 inches unless approved by EBCS.
 - Maximum quantity of explosive per delay shall be governed by the recorded measurements as influenced by work site conditions.
 - Explosive agents and ignition method shall be approved by EBCS. Anfo and other free-flowing explosives and blasting agents are not acceptable and shall not be used.
 - Drill holes shall not be left loaded overnight.
- The drilling pattern shall be set in a manner to achieve smaller rock fragmentation (maximum 1 foot in diameter) in order to use as much as possible of the blasted rock as backfill material after the pipe has been padded in accordance with the specifications. The proposed drilling pattern shall be submitted for approval by EBCS.
- Under pipeline crossings and all other areas where drilling and blasting is required within 15 feet of existing or third-party facilities:
 - Drill holes shall be reduced to a maximum of 2 inches or less in diameter.
 - The number of holes per blast shall be limited to three unless otherwise approved by EBCS.

8.2 Protection of Personnel

The contractor shall include in its procedures all federal, state, county, and local safety requirements for blasting. The contractor's procedures shall address, as a minimum, the following requirements:

- Only authorized, qualified, and experienced personnel shall handle explosives.
- No explosive material shall be located where it may be exposed to flame, excessive heat, sparks, or impact. Smoking, firearms, matches, open flames, and heat-and-spark-producing devices shall be prohibited in or near explosive magazines or while explosives are being handled, transported, or used.

- A code of blasting signals shall be established, posted in conspicuous places, and utilized during blasting operations. Employee training shall be conducted on the use and implementation of the code.
- The contractor shall use every reasonable precaution including, but not limited to, visual and audible warning signals, warning signs, flag person, and barricades to ensure personnel safety.
- Warning signs, with lettering a minimum of 4 inches in height on a contrasting background, will be erected and maintained at all approaches to the blast area.
- Flaggers will be stationed on all roadways passing within 1,000 feet of the blast area to stop all traffic during blasting operations.
- All personnel not involved in the actual detonation shall stand back at least 1,000 feet and workers involved in the actual detonation shall stand back at least 650 feet from the time the blast signal is given until the "ALL CLEAR" has been sounded.
- An audible blasting signal (air horn or siren) shall be sounded 5 minutes before and after each blast.
- Blasting operations shall be conducted during daylight hours.
- No loaded holes shall be left unattended or unprotected. No explosives or blasting agent shall be abandoned. No loaded holes shall be left overnight.
- In the case of a misfire, the blaster shall provide proper safeguards for personnel until the misfire has been re-blasted or safely removed.
- The exposed areas of the blast will be matted wherever practicable. In cases where such a procedure is not deemed to be feasible, an alternative procedure must be submitted for review by EBCS and the site in question must be visited and examined by the consultant before any approval is granted.
- EBCS may employ two-way radios for communication between vehicles and office facilities. The contractor shall advise EBCS and other pipeline contractors of any need to cease use of such equipment during blasting activities.
- All loading and blasting activity shall cease and personnel in and around the blast area will retreat to a position of safety during the approach and progress of an electrical storm irrespective of the type of explosives or initiation system used. This is a major safety precaution and will always be observed. All explosive materials, all electrical initiation systems, and all non-electric initiation systems are susceptible to premature initiation by lightning.

- Previous blast areas must be inspected to verify the absence of misfires. No drilling may commence until such inspection occurs. If a misfire occurs adjacent to a hole to be drilled, the misfire will be cleared by the blaster using whatever techniques are called for by the situation prior to commencement of drilling. If a misfire occurs at some distance from the drilling area, drilling may be stopped while clearing preparations are underway. When the misfire is to be cleared by reshooting, drilling will be shut down and personnel evacuated to a place of safety prior to detonation.
- All transportation of explosives will be in accordance with applicable federal, state, and local laws and regulations. Vehicles used to transport explosives shall be in proper working condition and equipped with tight wooden or non-sparking metal floor and sides. If explosives are carried in an open-bodied truck, they will be covered with a waterproof and flame-resistant tarpaulin. Wiring will be fully insulated to prevent short-circuiting and at least two fire extinguishers will be carried. The truck will be plainly marked to identify its cargo so that the public may be adequately warned. Metal, flammable, or corrosive substances will not be transported in the same vehicle with explosives. There will be no smoking and unauthorized or unnecessary personnel will not be allowed in the vehicle. Loading and unloading of explosives will be done carefully by competent, qualified personnel.
- No sparking metal tools will be used to open kegs or wooden cases of explosives. Metallic slitters will be used to open fiberboard cases, provided the metallic stiller does not come in contact with the metallic fasteners of the case. There will be no smoking, no matches, no open lights, or other fire or flame nearby while handling or using explosives. Explosives will not be placed where they are subject to flame, excessive heat, sparks, or impact. Partial cases or packages of explosives will be reclosed after use. No explosives will be carried in the pockets or clothing of personnel. The wires of an electric blasting cap shall not be tampered with in any way. Wires will not be uncoiled. The use of electric blasting caps will not be permitted during dust storms or near any other source of large charges of static electricity. Uncoiling of the wires or use of electric caps will not be permitted near radio-frequency transmitters. The firing circuit will be completely insulated from the ground or other conductors.
- No electric wires or cables of any kind will be permitted near electric blasting caps or other explosives except at the time and for the purpose of firing the blast. All electric-blasting caps, either singly or when connected in a series circuit, will be tested using a blasting galvanometer specifically designed for the purpose. Electric blasting caps made by more than one manufacturer or electric blasting caps made by the same manufacturer will not be used in the same circuit unless approved by the manufacturer. No attempt will be made to fire a circuit of electric blasting caps with less than the minimum current specified by the manufacturer. All wires to be connected will be bright and clean. All electric blasting cap wires will be short-circuited until ready to fire.
- No blast will be fired without a positive signal from the person in charge. This person will have made certain that all surplus explosives are in a safe place; all persons, vehicles, and/or boats are at a safe distance; and adequate warning

has been given. Adequate warning of a blast will consist of but not be limited to the following:

- Notification of the day and time given to BLM, railroads, highway departments, city engineer, county sheriff, etc. Notification must be given at least 48 hours prior to blasting;
 - Notification of homeowners nearby;
 - Stopping vehicular and/or pedestrian traffic near the blast site; and
 - Signal given by an air horn, whistle, or similar device using standard warning signals.
- Only authorized and necessary personnel will be present where explosives are being handled or used.
 - The condition of the hole will be checked with a wooden tamping pole prior to loading. Surplus explosives will not be stacked near working areas during loading. Detonating fans will be cut from spool before loading the balance of charge into the hole. No explosives will be forced into a bore hole past an obstruction. Loading will be done by a blaster holding a valid license or by personnel under his direct supervision.
 - Fly-rock leaving the right-of-way in such areas shall be collected immediately and disposed of at disposal sites approved by EBCS. This work shall not be left to the cleanup crew.

8.3 Lightning Hazard

A risk of accidental detonation caused by lightning strikes exists at any time the workplace is experiencing an electrical storm and there are loaded holes on site. If this hazard is judged to exist, work shall discontinue at all operations and workers will be moved to secure positions away from the loaded holes when an approaching storm front is within 5 miles. Furthermore, workers shall not return to the work site until the storm has passed and the closest point of lightning activity has moved at least 5 miles beyond the drilling area.

EBCS shall have on site approved lightning detectors capable of measuring the degree of electrical activity as a storm approaches, and the distance to the storm front from the instrument on the right-of-way.

9.0 IN-WATER BLASTING

Underwater blasting is not anticipated to be required for the Bear Den Phase 2 Project.

10.0 STORAGE REQUIREMENTS

Explosive materials shall not be stored on federal land without prior written permission from the Bureau of Land Management. Copies of this permission shall be posted on each magazine and a copy given to the EBCS Construction Manager.

All explosives, blasting agents, and initiation devices shall be stored in locked magazines that have been located, constructed, approved, and licensed in accordance with

local, state, and federal regulations. Magazines shall be dry, well ventilated, reasonably cool (painting of the exterior with a reflective color) bullet and fire resistant and kept clean.

Initiation devices shall not be stored in the same box, container, or magazine with other explosives. Explosives, blasting agents or initiation devices shall not be stored in wet or damp areas; near oil, gasoline, or cleaning solvents; or near sources of heat radiators, steam pipes, stoves, etc. No metal or metal tools shall be stored in the magazine. There shall be no smoking, matches, open lights, or other fire or flame inside or within 50 feet of storage magazines or explosive materials. The loading and unloading of explosive materials into or out of the magazine shall be done in a business-like manner with no loitering, horseplay, or prank playing.

Magazines shall be kept locked at all times unless explosives are being delivered or removed by authorized personnel. Admittance shall be restricted to the magazine keeper, blasting supervisor, or licensed blaster. Magazine construction shall meet the requirements of ATF P5400.7 "Explosives Law and Regulations" (U.S. Department of Justice, Bureau of Alcohol Tobacco, Fire Arms and Explosives) and be in accordance with local, state, or federal regulations and the Blasters Handbook.

Accurate and current records shall be kept of the explosive material inventory to ensure that oldest stocks are utilized first, regulatory requirements are satisfied, and to allow for immediate notification of any loss or theft. Magazine records shall reflect the quantity of explosions removed, the amount returned, and the net quantity used at the blasting site.

When explosive materials are taken from the storage magazine, they shall be kept in the original containers until used. Small quantities of explosive materials may be placed in day boxes, powder chests, or detonator boxes. Any explosive material not used at the blast site shall be returned to the storage magazine and replaced in the original container as soon as possible.

Magazine locations shall be in accordance with local, state, or federal regulations. Where no regulations apply, magazines shall be located in accordance with the latest edition of the 175th anniversary edition of the Blaster's Handbook and ATF P5400-7 "Explosives Law and Regulations" (U.S. Department of Justice, Bureau of Alcohol Tobacco, Fire Arms and Explosives).

Magazines shall be marked in minimum 3-inch-high letters with the words "DANGER - EXPLOSIVES" prominently displayed on all sides and roof.

11.0 GENERAL BLASTING PROCEDURE

The following lists of steps will be performed in all cases. These steps represent a minimum requirement and give a general order to the blasting procedure:

- A safety meeting will be held prior to any blasting activities. Everyone who is involved with the blasting in any form must attend. Safety rules and signaling should be reviewed.
- Warning signs should be erected.
- Lightning detectors should be set up.

- Drilled holes should be measured accurately for depth and location.
- Seismic equipment should be set up to measure velocities near the pipeline and any structures 150 feet or less from the blast.
- Distances to any nearby structure (aboveground or belowground) suspected of being less than 200 feet from the blast shall be measured.
- Clear the blasting affected zone.
- Give the warning signal.
- Give the blast signal.
- Detonate the blast.
- After the blaster has checked for misfires and given the "ALL CLEAR" signal, Inspectors will inspect any aboveground or underground facilities for damage.
- Complete the Blasting Log Record.