

Appendix F Blasting Plan

for DRAFT ENVIRONMENTAL ASSESSMENT

Dakota Access Pipeline Project Crossings of Federal Projects and Flowage Easements

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APPENDIX E

Blasting Plan

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A. Scope of Blasting Project

Blasting will take place along the *Dakota Access Pipeline* right-of-way. The Blasting Contractor will blast only in the areas where the rock cannot be economically excavated by conventional means. It is anticipated that this may occur anywhere along the right-of-way, site-specific locations will be determined as project progresses. As much as possible due to safety reasons, drilling and blasting will occur through the natural dirt overburden. Blasting activities will take place during daylight hours Monday through Saturday.

B. Types of Blasting

Primary type of blasting will be for ditch excavation. Blasting may also be required during the right-of-way grading operation.

If any streams and wetland areas require blasting to perform the ditch excavation, the streams and wetland areas will be tested for rock and shot by the mainline blasting crew. Once blasted, the creeks will be fixed back to original condition and all ECD's replaced until the time of the tie ins.

C. Location of Shots and Proximity to Existing Facilities

No blasting will occur within 15 feet of existing loaded pipelines or within 10 feet of other structures that may be of concern. All blasting located along adjacent power line rights-of-way shall be conducted in a manner that will not cause damage to the power company property and facilities. The blast be drilled through natural dirt overburden or covered by blasting mats and/or other material as needed to protect nearby existing facilities, structures, highways, railroads or significant natural resources from thrown rock fragments.

D. Method to be Used to Minimize Hole-to-Hole Propagation

Hole-to-hole propagation problems are not anticipated with the proposed product and pattern for the following reasons:

1. Only cartridge explosives will be used.
2. The amount and type of explosives anticipated does not lend to the likelihood of propagation issues.

E. Types of Explosives / Initiation System to be Used

1. Dyno Nobel Unimax[®]: An extra gelatin dynamite with a specific gravity of 1.51 g/cc, a detonation rate of 17,400 f/s (unconfined) and a calculated energy of 1,055 c/g.
2. D-GEL 1000 is a desensitized, nitroglycerin-based dynamite formulated to reduce sensitivity to sympathetic detonation (hole-to-hole propagation) with

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superior water resistance. The product has a specific gravity of 1.36 g/cc and a detonation rate of 16,900 f/s (unconfined) and a calculated energy of 1045 c/g.

3. DYNOMAX PRO is desensitized extra gelatin dynamite designed to satisfy the majority of explosive application requirements consistently delivering delivering high detonation velocity and excellent water resistance while reducing cartridge to cartridge gap sensitivity and hole-to-hole propagation problems. The product has a specific gravity of 1.45g/cc and a detonation rate of 19,700 f/s (unconfined) and a calculated energy of 1055 c/g.
4. Dyno Nobel TX: A cap sensitive high explosive with a specific gravity of 1.17 g/cc and a detonation rate of 16,400 f/s (unconfined) and a calculated energy of 1170 c/g.
5. Dyno Nobel Blastex TX: A cast booster sensitive, water resistant, packaged emulsion explosive specifically formulated to provide increased resistance to hydrostatic and/or dynamic transitory shock pressures which can result when used in wet and/or water saturated geologies. The product has a specific gravity of 1.26g/cc and a detonation rate of 15,400 f/s (unconfined) and a calculated energy of 808 c/g.
6. Orica Senatel Pulsar : The premier, packaged, detonator-sensitive emulsion explosive for pipeline, trenching and site preparation projects is Senatel™Pulsar™ energized emulsion. This product is packaged in a semi-rigid, film cartridge for loading into ragged holes in surface rock. Senatel™Pulsar™ will not propagate yet it has energetic additives to give added breaking power and heave with excellent pre-compression resistance. The product has a specific gravity of 1.23g/cc and a detonation rate of 14,740 f/s (unconfined) and a calculated energy of 950 c/g.
7. Dyno Nobel NONEL® 25 Millisecond Delay Connectors or Dyno Nobel NONEL EZ Det® (nonelectric) 25/350 millisecond delay.
8. A Dyno Nobel NONEL nonelectric shock tube system detonator will initiate all shots. This NONEL will be attached at one point only for initiation of the entire shot and will not be used for down hole priming.

F. Drill and Blast Pattern

The drilling program will be based on 2 rows of 3 inch diameter holes drilled with a grid spacing of approximately 4 feet wide by 5-7 feet along the ditch line. If rock breakage is not optimum a third row of holes will be added to the blast pattern (dice "5" pattern). The drill pattern will be established using a powder factor between 2.0 and 4.0 pounds per cubic yard to achieve the desired explosive energy ratio needed to break the rock and pull the ditch. This shot pattern may be adjusted on a site-specific basis to compensate for different geology, nearby structures, utilities or other sensitive areas.

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G. Charge Weight and Delays

Delays will be used accordingly to control the vibration as well as limiting the transmission of energy below the damaging levels at any existing structure. The delay pattern will be created to provide the energy relief immediately down the ditch in preference to a horizontal direction. The main type of delays will be NONEL[®] EZ-Det 25/350 or 25/500 which are color-coded for easy identification of delay length. The amount of dynamite used in each hole will be limited to the manufacturer's recommendations and specifications. The Blasting Contractor will also use multiple caps per hole (decking) as needed to meet maximum charge per delay requirements as necessary.

H. Flyrock Control Plan

All shots will be carefully designed by the Licensed Blaster to control flyrock. All hole loading activity will be supervised by the Licensed Blaster. The Licensed Blaster will communicate with the drillers to obtain geological information for each shot.

A good quality, non-bridging stemming material that completely fills any voids in the drill hole will also be used to reduce the amount of flyrock. A minus 3/8" crushed rock is typically used for this purpose. This stemming size has been a standard for U.S. Corps of Engineers for decades.

I. Selection of Blasting Products and Methods

These blasting products were chosen because of many years of dependable use and positive results on pipeline projects throughout the world which are demonstrated by the:

- quality, safety and reliability of the product
- support offered by the manufacturer
- availability
- price

A nonelectric detonator will initiate all shots. A completely nonelectric system (including initiation) for several important reasons:

1. Due to the proximity of the high voltage power lines, stray current may be an issue that could result in the premature firing of an electric detonator.
2. The numerous radio equipped trucks belonging to all personnel (surveyors, inspectors and other subcontractors) on the project mandate that all shots be totally nonelectric to eliminate accidental detonation of electric caps. Furthermore, there may be other commercial and/or non-commercial radio users in the area not associated with the project (logging operations, quarry sites, etc.) who could compromise the safety of the blasting operations.

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3. The nonelectric detonator shock tube system works instantaneously (like electric blasting caps). This allows for precise and reliable initiation of shots in congested areas, adjacent to highways or in other locations where blast initiation control is an issue.

J. Monitoring, Reporting and Controlling Ground Cracking and Displacement

It is not expected that this type of rock will fracture in such a way as to cause any kind of ground displacement. Following each blast, the area will be examined for signs of ground cracking. Any indication of overbreak (cracks greater than half the distance to the existing pipeline) will be brought to the attention of the Company Inspector and noted on the blast report. The shot pattern and/or loading will be adjusted to minimize or eliminate overbreak.

K. Explosives Storage and Transportation Procedures

Explosives storage and transportation will follow the guidelines and regulations of all federal, state and local agencies.

L. Peak Particle Velocity Monitoring and Control

Each blast will be monitored by a licensed blaster or other person experienced in monitoring blasts using a seismograph. The seismograph will be placed at the “point of interest”. In most cases, this will be next to the foundation of the closest building, power line foundation, utility or well. In all cases, both the sensor and seismograph will be protected from flyrock.

This recorder gives a direct peak particle velocity (PPV) reading that is indicated on a tape as well as decibel reading to capture sound levels.

The industry standard for many years has been 12 inches per second maximum PPV on any underground structures. **DAPL** expects the PPV's to be kept under 6 inches per second or lower on any underground structures & 2 inches per second or lower on wells and above ground inhabited structures.

After each blast, a blast report with a print out of the seismograph readings will be will be compiled and a copy presented to the Company inspector for Company records.

M. Fire Prevention

Following the required waiting period after each shot, the blast area will be inspected for any indication of fire or fire hazard. Particular attention will be paid to the vegetated areas outside of the R.O.W. Normally, the explosives vaporize at the instant of detonation and there is no fiber or other material left to smolder or be a source of concern.

1. The blasting operation will generally take place after the grading operation has graded the right-of-way to bare mineral soil. The blaster shall ensure that the

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initiating detonator is placed on bare mineral soil and that there is no vegetation within a 20-foot radius.

2. The shock tube initiating system will be initiated a minimum of 250 feet from the nearest loaded hole.
3. When fire danger is high due to forest conditions, a 2-man fire watch team will patrol each blast area for a period of 1hour after the required waiting period.

N. Environmental Concerns

All residents within 300 feet of the blast will be notified of blasting activity and offered a pre-blast survey of their residence or structure of concern. In any case, communications with property owners will be maintained.

All necessary measures will be taken to exclude livestock from the blasting area. During the normal safety check prior to blasting, the area will be checked for both livestock and wildlife. The blast will not be initiated until the area is clear.

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EXPLOSIVES SAFETY PROGRAM

1. *The Blasting Contractor* will follow all Federal and State regulations.
 - A. Bureau of Alcohol, Tobacco and Firearms – 27CFR 181 (Commerce in Explosives).
 - B. Occupational Safety and Health Administration – 29CFR 1926.90 (Safety and Health Regulations for Construction Blasting and Use of Explosives).
 - C. Carriage by Public Highway – 49CFR 177 (self-explanatory).
 - D. Explosives and Blasting Agents – OSHA, 29CFR 1910.109 (Safety in the Workplace When Using Explosives).
 - E. Guidelines to be Followed by Natural Gas Pipeline Companies in the Planning, Locating, Clearing and Maintenance of Right-of-Way and the Construction of Above Ground Facilities – 18CFR 2.69.

2. General Regulations
 - A. Only authorized and qualified personnel shall handle explosives and shall always be under the direct supervision of a blaster licensed, if required, by the state of use.
 - B. No flame, heat, radio transmitter or spark-producing device shall be permitted in or near explosives during handling, transport or use.
 - C. No person shall be allowed to handle, use or work in the area while under the influence of liquor, narcotic or dangerous drugs.
 - D. Explosives shall be accounted for at all times. Explosives not in use shall be kept in locked, approved storage magazines. A running inventory shall be maintained at all times. Appropriate authorities shall be notified of any loss, theft or unauthorized entry into a magazine.
 - E. No explosives shall be abandoned.
 - F. No fires shall be fought where contact with explosives is imminent. All personnel shall be cleared and area guarded against other intruders.
 - G. Separate Class I and II magazines shall be used for transport of detonators and explosives from magazine storage area to blast site. Magazines shall be kept locked except for removal of material for use. In addition, explosives will be loaded directly to each shot point from the magazines on approved ground transportation equipment.

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- H. When blasting in areas of congestion or in close proximity of other structures or services, special precaution will be taken to avoid damage or personal injury.
- I. Every reasonable precaution shall be used to notify others of use of explosives (visual, audible, flags, barricades, etc.). No onlookers or unauthorized personnel will be permitted within 500 feet during loading or blasting. Flaggers shall be stationed on roadways that pass through the danger zone to stop traffic during blasting operations.
- J. All necessary precautions shall be taken to prevent accidental current discharge from any possible source. The exclusive use of a nonelectric initiation system will eliminate this possibility in nearly every situation with the possible exception of lightning strikes.
1. Electrical storms
 - a. All blasting operations shall be suspended and all persons shall be removed from the blasting areas during the approach and progress of an electrical storm. The following rules must be followed:
 1. A lightning detector should be used to monitor the proximity of lightning to the shot. When the storm is 10 miles distant as identified by the lightning detector, notify all persons in the blasting crew of approaching storm. Stop all loading of holes and evacuate all personnel, except blaster and assistant, to a safe distance (500 feet) from the blast area.
 2. If the blast cannot be initiated before the storm arrives (within 10 miles as indicated by the lightning detector), the blaster shall evacuate the site to a safe distance.
 3. Personnel may return to worksite when the storm has passed and is 10 miles distant as determined by the lightning detector or after the completion of blast which allows for inspection of site and/or misfire.
 4. If no lightning detector is available, the “1 second per mile” rule of thumb may be used. This rule of thumb is used to estimate the distance of the storm between sight and sound. When lightning is sighted the sound wave typically travels at approximately 1 mile per second. So, if the lightning is spotted and 10 seconds elapses it is about 10 miles away.

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- K. Empty packing material shall not be used again for any purpose. It shall be burned at an approved location. Typically, this will be in the excavated trench or other designated area.
- L. Damaged or deteriorated blasting supplies shall not be used.
- M. Delivery and issue of explosives shall only be under, by and to authorized persons and into authorized magazine or temporary storage handling areas.
- N. Blasting operations shall not be carried out in the proximity of other utilities or property owners without prior approval. "ONE CALL" notification requirements shall be followed.
- O. All loading and firing shall be directed and supervised by a competent and experienced person.
- P. No loaded holes shall be left unattended or unprotected. No explosives or blasting agents shall be abandoned on the right-of-way. Explosives shall not be primed until immediately before use and shall not be allowed to lay overnight in drilled holes.
- Q. All jurisdictional authorities shall be granted unrestricted access to all explosive records as well as site access for procedural inspections. All personnel not involved with the current blasting operation must check in with the blaster before entering the blasting zone.
- R. Warning signs, indicating the blast area, shall be erected and maintained at all approaches to the blast area. Warning sign lettering shall be readable from a reasonable distance and on a contrasting background.
- S. The warning signs will be erected and maintained at all approaches to the blast area. Flaggers will be stationed on all roadways passing within 500 feet of the blast area and be responsible to stop all traffic during blasting operations. All personnel not involved in the actual blast shall stand back at least 500 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 used. The following blast signals will be used during blasting.
 - 1. Warning Signal A series of two long horn or siren sounds will be made 2 minutes prior to the blast.
 - 2. Blast Signal One prolonged horn or siren sound will be sounded one minute prior to the blast.

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3. All Clear Signal Two short blasts on the horn or siren sound will be sounded following the blast once the blast area has been inspected and deemed safe.

- T. All blasting will be performed with a nonelectric initiation system and shall follow standard industry guidelines in regard to use and safety.

- U. Blaster qualifications shall meet all federal, state and local standards.

- V. Misfires
 1. If there are any misfires, all employees shall remain away from the suspected misfire area for at least 15 minutes. Misfires shall be handled under the direction of the blaster in charge. All leads shall be carefully traced and a search made for unexploded charges.
 2. If a misfire is found, the blaster shall provide proper safeguards for excluding all employees from the danger zone.
 3. No other work shall be done except that necessary to remove the hazard of the misfire and only those employees necessary to do the work shall remain in the danger zone.
 4. No attempt shall be made to extract explosives from any charged or misfired hole! A new primer shall be inserted into the hole and the hole shall be reshot. If re-firing of the misfired hole presents a hazard, the explosives may be removed by washing out with water or, where the misfire is underwater, blown out with air.
 5. No drilling, digging or picking shall be permitted until all missed holes have been detonated or the authorized representative has approved that work can proceed.
 6. Prior to the end of the working day, any misfires shall be located and rendered safe.