

September 18, 2019

Nadine Miller  
New Hampshire Division of Historical Resources  
19 Pillsbury Street  
Concord, NH 03301

Re: Seacoast Reliability Project (RPR #6528) Construction Change in Vicinity of Historic Property

Dear Ms. Miller-

This letter is to notify the New Hampshire Division of Historical Resources of a construction plan change in the vicinity of a historic property for the Seacoast Reliability Project (the "Project"). Specifically, the use of rock excavation/blasting is proposed within the Newington Center Historic District (the "District"), approximately 525 feet from the very northern edge of the Frink Farm garage, the closest contributing structure. The rock excavation is necessary to construct the underground portion of the transmission line, which was carefully designed to minimize the visual impacts of the Project on the District.

The Newington Center Historic District consists of a grouping of public and private buildings ranging from the early 18th to early 20th century, listed on the National Register of Historic Places in 1987 (NR# 87002106). Three of the District's contributing structures located closest to the proposed blasting areas are part of the Frink Farm complex, located at 272 Nimble Hill Road. These structures include the Frink House, barn, and garage. The principal structure of the farm complex is a 2 ½ story rectangular brick building on a granite block foundation, constructed circa 1820. Attached to the west end of the main house is a single-story kitchen wing, which connects to the barn. The large clapboarded barn, constructed circa 1837, is seated on a fieldstone foundation, with a single-story frame garage structure, constructed circa 1925, located to the north. Two additional structures are located on the property including a circa 1956 playhouse and a circa 1950 chicken house, however, these buildings are considered non-contributing structures to the District. The garage structure is the closest structure to the blasting area, located approximately 525 feet away.

The Blasting Plan for the Project outlines specific methods and protocol to be followed (see Appendix A). This document will be reviewed by the Town of Newington and the blasting contractor, Maine Drilling & Blasting, Inc. is required to post public notice well in advance of any blasting activities. This Plan proposes to offer pre-blast surveys for all property owners within a 500-foot radius of the blast sites, which conforms with other regional guidelines for blasting activities including the 2016 New Hampshire Department of Transportation (NHDOT) Standard Specifications for Road and Bridge Construction - Section 203: Excavation and Embankment. Based on the closest location of rock excavation in the hay field north of the Frink Farm complex, it appears the closest point of the Farm is located approximately 525 feet away from the blasting work (see Figure 1). Although the Frink Farm complex is located outside the minimum 500-foot radius and Eversource and its contractors have carefully planned the blast design to control seismic considerations near the historic structure, Eversource proposes the following activities prior to, during, and after rock excavation activities to avoid any possible impacts to the historic structure in recognition of the historic significance of the Farm combined with the sensitivity of the project.

Specifically, Eversource proposes the following initiatives:

1. A pre-blast condition survey of the three contributing Frink Farm structures will be conducted, if permission is granted by the landowner. Results of the survey will be documented through video or still photographs and appropriate narration or written reports. An individual who meets the Secretary of the Interior's Professional Qualifications Standards (36 CFR 61) for architectural history will also be present for this survey. Adequate notice will be provided to the property owner of the date of the pre-blast survey, who should also be present during the survey.
2. The implementation of a Vibration Monitoring Plan. As part of this Plan, Instantel-type seismic monitoring equipment will be installed near the Frink Farm and tell-tale crack monitor gauges will be installed, as necessary. All blasts will be monitored by an individual properly trained in the setup and use of seismic monitoring equipment, who will report monitoring results to the blasting supervisor. An individual who meets the Secretary of the Interior's Professional Qualifications Standards (36 CFR 61) for architectural history will also be present near the property during blasting to monitor the historic structures, if permission is granted by the property owner. If vibrations recorded occur close to the maximum thresholds, defined as 0.5 in/s (below 40 Hz) for the Frink Farm, the method of work will need to be revised to reduce the vibrations. If the stated vibration limits are exceeded, the historic structures will be evaluated for damage and blasting operations will be suspended until measures have been employed to reduce the vibrations. If damage occurs and repairs are feasible, monitoring will continue, making sure no additional damage occurs. If damage occurs and repairs are not feasible, construction will be halted, and consultation re-initiated to develop a solution.
3. A post-blast condition survey of the property will be performed if concerns of damage due to blasting operations are reported by the architectural historian or the property owner within a week of the blasting. The home owners have been assigned a single Eversource point of contact during project construction for whom they will have updated contact information including a phone number and email address. The property owners are encouraged to report any potential damage believed to be caused by the blasting to this contact, even after the week-deadline. Eversource will work with the property owner to resolve any reasonable claims.

An Effects Table for the proposed action has been attached to this letter as Appendix B. The rock excavation is not expected to impact any additional historic properties including historic structures or archaeological sites.

As a courtesy, a notification letter outlining these proposed actions to avoid any possible impacts to historic structures within the District will be sent to the Newington Historic District Commission.

A vital component of this Project is public outreach; Eversource representatives will be in consultation with Project abutters throughout this process to answer any questions and address any concerns.

If you have any questions, please feel free to call me at 603-717-5198 or email me at [brooke.kenline-nyman@eversource.com](mailto:brooke.kenline-nyman@eversource.com).

Sincerely,

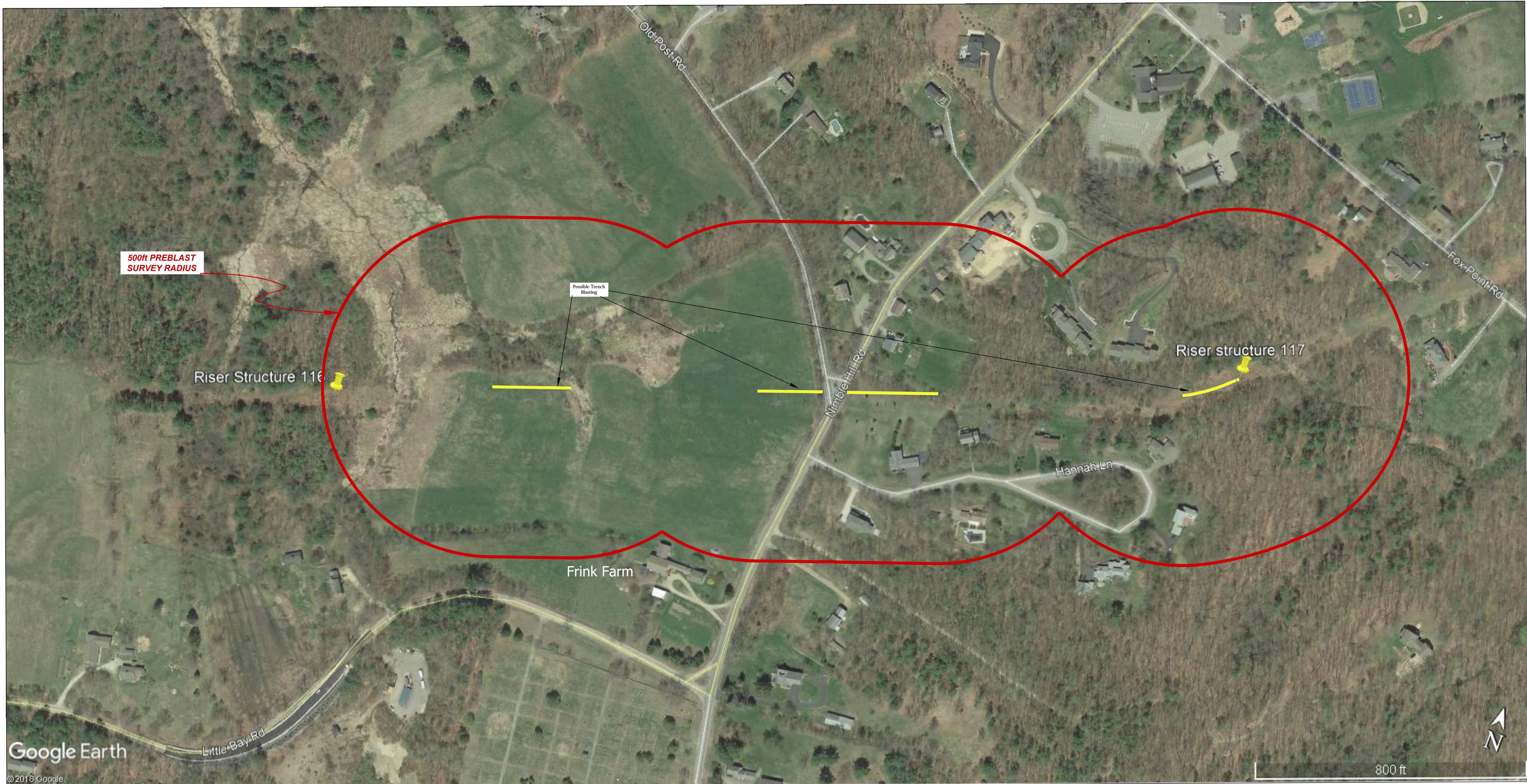


Brooke Kenline-Nyman  
Eversource Energy  
Cultural Resource Specialist

Cc: David Trubey, DHR  
Pamela Monroe, SEC

Phil Barthel, Eversource  
Matt Cardin, Eversource





**Eversource Underground  
Transmission Line**  
Nimble Hill Road  
Newington, NH

Figure 1.  
Preblast  
Survey  
Drawing

**Maine Drilling  
& Blasting**

DRAWN: RAF

DATE: 09/04/19

SCALE: 1" = 150'

REV	DATE	DESCRIPTION





## Appendix A: Blasting Plan

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# Blasting Plan

for

## Seacoast Reliability Project, Circuit F107 Newington Historic District

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Newington, NH  
Date: 09/04/19

Prepared By: Maine Drilling & Blasting, Inc.

Central Division

88 Gold Ledge Ave  
Auburn, NH 03032

Telephone: 800-370-0299

Fax: 603-647-9770

Jason Riley / Robert Forsyth

Central Division Manager / Field Engineer

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Name

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Title

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## **General**

Maine Drilling & Blasting, Inc. considers safety as the priority during all phases of blasting operations. We are knowledgeable of and will follow all local, state and federal regulations related to transportation and use of explosives. The project specifications and conditions have been reviewed. Details of procedures for pre-blast surveys, explosives use, blast security, monitoring and documentation are enclosed.

### **Pre-Blast Surveys / Notifications**

Pre-blast surveys will be offered to all property owners within 500 foot radius of the blast site. Appropriate notices will be given and appointments arranged for those owners who desire a survey. Pre-blast surveys will be conducted by a Company Representative. Results of those surveys will be documented through video or still photographs and appropriate narration or written reports.

### **Blast Monitoring**

All blasts will be monitored by a representative of Maine Drilling & Blasting, Inc. who has been properly trained in the setup and use of seismic monitoring equipment. At least one seismograph will be in use at all times. Placement of monitoring equipment will be at the nearest structure to the blast site. Maine Drilling & Blasting, Inc. monitoring equipment will consist of Instantel type seismographs. Details are enclosed. Results of blast monitoring will typically be available before the next blast, usually immediately following a blast. Results can be reviewed and modifications can be made to the blast design for the next blast if necessary.

### **Sequence of Blasting**

All blasting operations will be strictly coordinated with McCourt Construction Company, Eversource, all subcontractors, Newington Fire Department, engineers, and state/local jurisdictions. Emphasis will be on the safe and efficient removal of the rock existing on this project without impact to surrounding structures. Blasts will be developed so as to create adequate relief which will minimize ground vibrations per blast design below and offer the greatest protection possible to the surrounding structures.

### **Blasting Procedures**

1. Blasting operations shall commence after 8:00 AM and cease before 5:00 PM, during daylight hours only, Monday through Friday.
2. Blasting cannot be conducted at times different from those announced in the blasting schedule except in emergency situations, such as electrical storms or public safety required unscheduled detonation.
3. Warning and all-clear signals of different character that are audible within a range of one-quarter mile from the point of the blast shall be given. All persons within the permit area shall be notified of the meaning of the signals through appropriate instructions and signs posted.
4. Access to blasting area shall be regulated to protect the public from the effects of blasting. Access to the blasting area shall be controlled to prevent unauthorized entry before each blast and until the perimeter's authorized representative has determined that no unusual circumstances exist after the blast. Access to and travel in or through the area can then safely resume.
5. Areas in which charged holes are awaiting firing shall be guarded, barricaded and posted, or flagged against unauthorized entry.
6. All blasts shall be made in the direction of the stress relieved face previously marked out or previously blasted.
7. All stemming shall be a minimum as specified using clean, dry 3/8" crushed stone.



8. Blasting mats shall be used as necessary to cover blasts.

9. The Blasting Contractor shall insure that extra safety and judgment is exercised by his blaster to prevent the simultaneous blasting of numerous holes.

### **Blasting Mats**

Blasting mats and backfill will be used to control excessive amounts of rock movement when blasting in close proximity to structures and completely at the discretion of the blaster. Placement and number of mats are typically determined by the blaster. Mats will be placed so as to protect all people and structures on, or surrounding the blast site and property. Rubber tire type blasting mats will be utilized on this project and will be approximately 12' x 12' in size; Rubber mat @ 12' x 12' 38 lbs./s.f. = 5,472 lbs./ea.

### **Blast Security and Warning Whistles**

Each blast will be preceded by a security check of the affected area and then a series of warning whistles. Communications will be made with job site supervisors and local officials as required to ensure the safest possible operation. All personnel in the vicinity closest to the blast area will be warned. The warning whistles will follow the following sequence:

3 Audible Signal Pulses - 5 Minutes to Blast

2 Audible Signal Pulses - 1 Minute to Blast

1 Audible Signal Pulses - All Clear

No blast will be fired until the area has been secured and determined safe. The blast site will be examined by the blaster prior to the all-clear signal to determine that it is safe to resume work.

### **Explosives**

All explosives will be delivered to the job site on a daily basis and transported following applicable federal, state, and local laws and regulations. Only the amount of explosives required to perform the day's work will be brought to the site. All explosives will be stored in approved magazines when not in use.

Enclosed are Technical Data and MSDS sheets for the explosive products proposed for use on this project. Any one of, or a combination of these products may be in use at any one time on the site.

### **Blaster Qualifications**

All Maine Drilling & Blasting, Inc. blasters on this job will be licensed in the State of New Hampshire and have received various amounts of training in the safe use and handling of explosives. Their licenses are enclosed. Additionally, Maine Drilling & Blasting, Inc. blasters are familiar with all OSHA Regulations, State Regulations, and Federal Regulations regarding construction site safety, including transportation, use, and handling of explosive materials. Weekly safety meetings are to be held on site by the Maine Drilling & Blasting, Inc. job foreman, with a record of that meeting returned to the Maine Drilling & Blasting, Inc. office.

## **Blasting Personnel**

All blasting operations shall be conducted by experienced, trained and competent persons who understand the hazards involved. Persons working with explosive materials shall:

1. Have demonstrated knowledge of, and a willingness to comply with, safety and security requirements.
2. Be capable of using mature judgment in all situations.
3. Be of good physical condition and not addicted to intoxicants, narcotics, or other similar type of drugs.
4. The person(s) responsible for the explosives shall possess current knowledge of the local, State and Federal laws and regulations applicable to his work.
5. The person(s) responsible for the explosives shall have obtained a Certificate of Competency or a license as required by State law.

## **Licenses and Permits**

Maine Drilling & Blasting, Inc. is fully licensed and insured for the transportation, use, and handling of explosives. Evidence of insurance is available, Maine Drilling & Blasting NH Explosives use permit, and all other required permits have been enclosed below. All NH One Calls will be issued 48 hours prior to drilling or blasting.

## **Blast Vibration**

Blast vibration will be monitored at the blast site, typically at the structure(s) closest to the blast site. Vibration limits will closely follow industry limits and the State and Local Regulations. Blast designs will be modified as required to stay within the guidelines and meet project schedules as well. Blasting operations will be modified accordingly when approaching buildings and utilities. Enclosed are preliminary vibrations calculations based on known distances to the structures of concern and anticipated initial blast designs.

Ground vibration peak particle velocity limits shall not exceed USBM Alternative Blasting Criteria

- \* US Bureau of Mines (USBM) RI 8507 Appendix B
- \* Standard, and applicable State Regulations

Air blast overpressure level not to exceed 133 peak dB (linear) two Hertz high -pass system.

## **Blast Reports**

Enclosed is a sample of a Maine Drilling & Blasting, Inc. Blast Report. This report will be filled out for each blast and copies supplied as needed.

## **Typical Blast Design**

Enclosed is what would be considered typical blast designs for any close proximity blasting to structures, utilities, gas lines, or dry waterbody crossings. Hole sizes, depths, spacing and loading information is provided. These designs are to be considered a good starting point. Modifications are usually made, if necessary, following the first blasts to meet control and seismic considerations.

## **Blasting Personnel**

**State of New Hampshire**  
**Department of Safety**  
**State Police**

Certificate of Competency For  
Blasting Operations

**JEREMY R. HOPKINS**

Certificate #: 1301

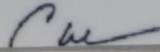
Restrictions: **NONE**

DOB: 1/30/1981 Sex: **M**

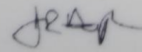
Height: **5'11"** Weight: **230**

Hair: **Brown** Eyes: **Blue**

Director of State Police



Expires: **4/9/2023**



**State of New Hampshire**  
Department of Safety  
**State Police**

Certificate of Competency For  
Blasting Operations

**MICHAEL D. WATERMAN**

Certificate #: **2669**

Restrictions: **NONE**

DOB: **9/6/1975** Sex: **M**

Height: **5'11"** Weight: **230**

Hair: **Red/Auburn** Eyes: **Blue**

Director of State Police



*M D Waterman*

Expires: **5/27/2023**

# State of New Hampshire

Department of Safety

## State Police

Certificate of Competency For  
Blasting Operations

TONY R. CANTIN SR

Certificate #: 1187

Restrictions: **NONE**

DOB: 8/1/1970

Sex: M

Height: 5'10"

Weight: 215

Hair: Gray

Eyes: Hazel



*Tony Cantin*

Director of State Police

*[Signature]*

Expires: **3/25/2022**



**State of New Hampshire**  
**Department of Safety**  
**State Police**

Certificate of Competency For  
Blasting Operations

**TRAVIS W. DANIELS**

Certificate #: 1167

Restrictions: **NONE**

DOB: 2/10/1972 Sex: M

Height: 5'08" Weight: 180

Hair: **Red/Auburn** Eyes: **Brown**

Director of State Police



*Travis Daniels*

Expires: **1/31/2020**

## **Sample Blast Report**



Job # \_\_\_\_\_ Customer Name: \_\_\_\_\_ Customer Supt. : \_\_\_\_\_

Date: \_\_\_\_\_ Job Address: \_\_\_\_\_ Pick Ticket(s) # : \_\_\_\_\_

Shot #: \_\_\_\_\_  
 Shot Time: \_\_\_\_\_  
 Operation: (Trench, Open)

Fire Detail Hours: \_\_\_\_\_  
 Type of Rock: \_\_\_\_\_  
 Type of Terrain: \_\_\_\_\_  
 Weather Conditions: \_\_\_\_\_  
 Wind Direction/Speed: \_\_\_\_\_  
 Identify Hazards: \_\_\_\_\_

# Holes:				
Depth of Water:				
Hole Diameter:				
Burden:				
Spacing:				
Total Square Feet:				
Stemming:				
Sub Drill:				

Precautions Taken: \_\_\_\_\_

Avg. Drill Depth:				
Total Drill Footage:				
Total Pay Yards:				
Total Yards Shot:				

Calculations:

Bulk _____				
ANFO				
ANFO WR				
Exp. 1 _____				
Exp. 2 _____				
Exp. 3 _____				
Exp. 4 _____				
Cast Booster _____				
Cast Booster _____				

Total Pounds Shot:				
Powder Factor (Lbs / Cyd):				

Det 1 _____				
Det 2 _____				
Det 3 _____				
Det 4 _____				
Det 5 _____				
Det 6 _____				
Lead Line _____				

Notes:

Type of Cover (Dirt, Mats):				
# of Mats Used:				

Seis #:	PPV:				
Operator:	dB:				
Location:					

Seis #:	PPV:				
Operator:	dB:				
Location:					

Seis #:	PPV:				
Operator:	dB:				
Location:					

Seis #:	PPV:				
Operator:	dB:				
Location:					

Blaster Name: \_\_\_\_\_

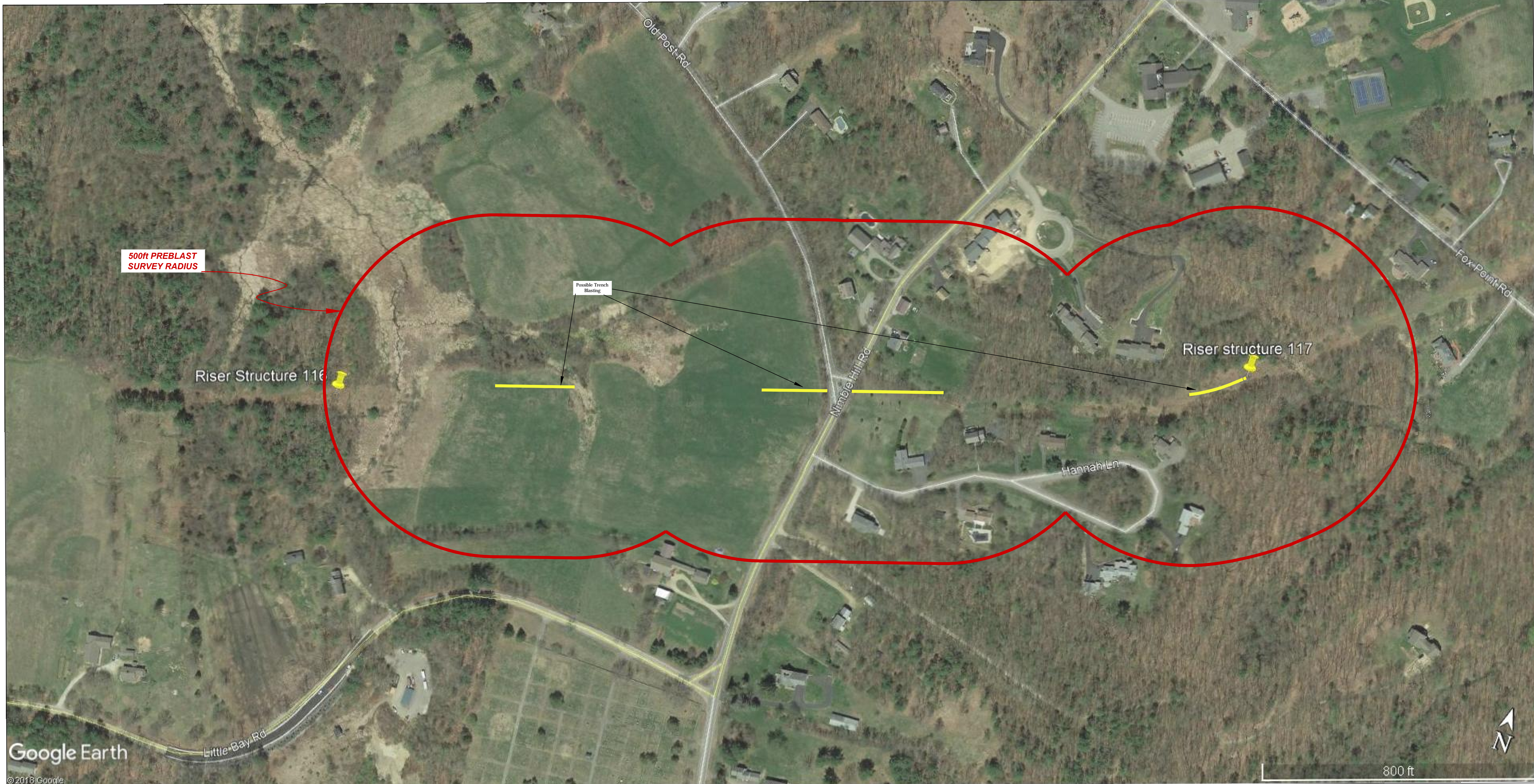
Lic. # \_\_\_\_\_

Signature: \_\_\_\_\_



## **Blasting Location Sketch**





REV	DATE	DESCRIPTION

**Eversource Underground  
Transmission Line**  
Nimble Hill Road  
Newington, NH

Preblast  
Survey  
Drawing

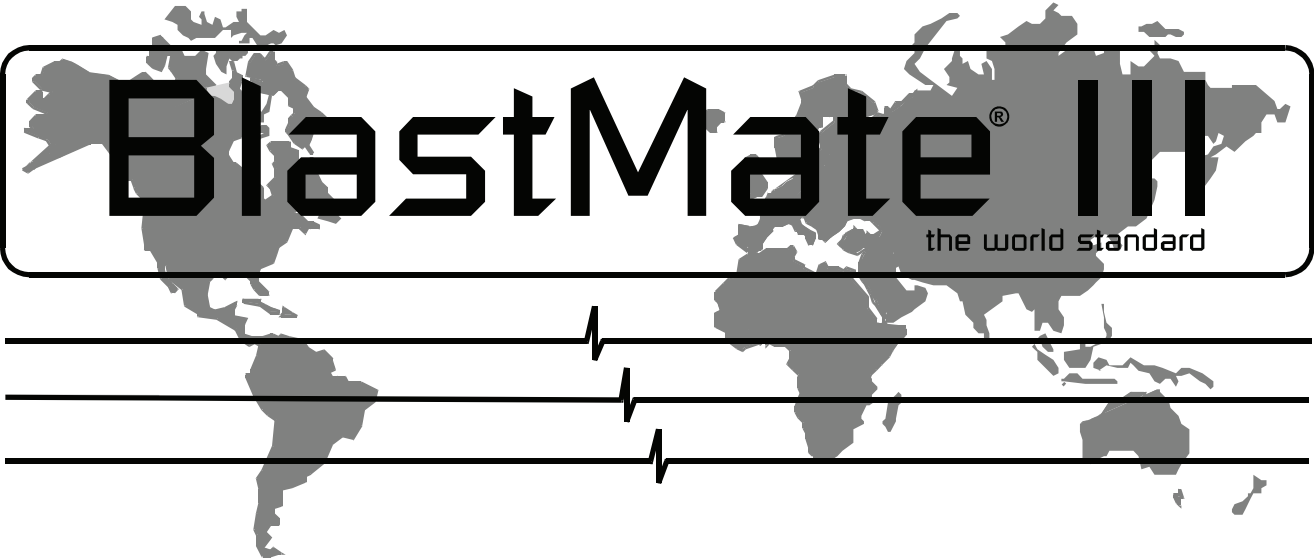


DRAWN: RAF  
DATE: 09/04/19  
SCALE: 1" = 150'





## **Seismograph Specifications**



# BlastMate III Operator Manual

Software Version 4.3



Instantel is certified to the ISO 9001 Quality Standard

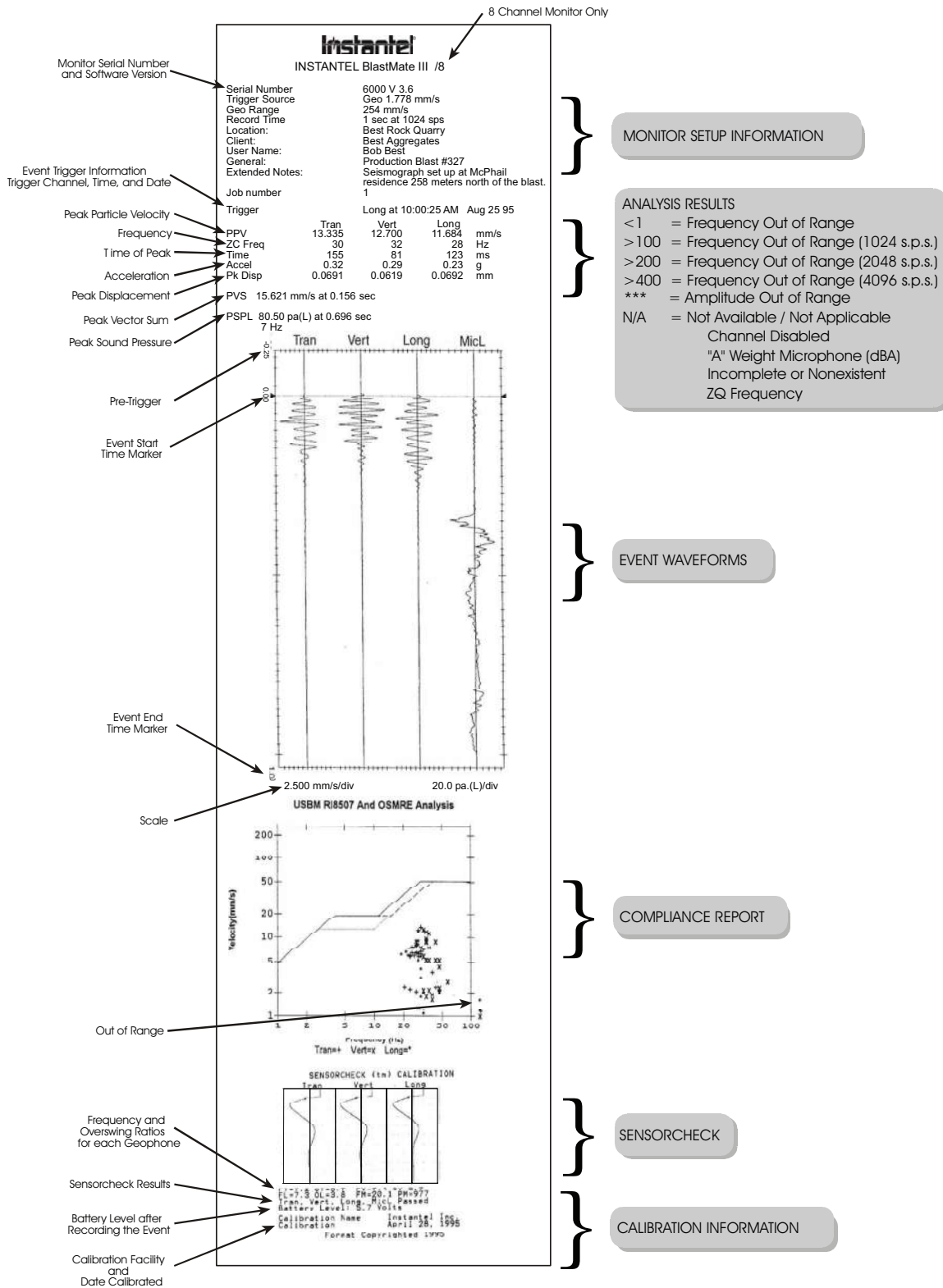


Figure 2.3 BlastMate III Event Summary Report.

## b) Series III Specifications

Seismic	Range	10 in/s (254 mm/s).
	Resolution	0.005 in/s (0.127 mm/s), to 0.000625 in/s (0.0159 mm/s) with built-in preamp.
	Trigger Levels	0.005 to 10 in/s (0.127 to 254 mm/s) in steps of 0.001 in/s (0.01 mm).
	Frequency Analysis	National and Local Standards for all countries (see text).
	Accuracy	3% at 15 Hz.
	Acceleration, Displacement	Calculated using entire waveform, not estimated at peak.
Air Linear	Range	88–148 dB, $7.25 \times 10^{-5}$ psi to 0.0725 psi, 0.5 Pa to 500 Pa.
	Resolution	0.1 dB above 120 dB (0.25 Pa).
	Trigger Levels	100–148 dB in 1 dB steps.
	Accuracy	0.2 dB at 30 Hertz and 127 dB.
“A” Weight (optional)	Range	50 to 110 dB in steps of 0.1 dB. (Impulse Response – 35 milliseconds)
Sampling Rate		Standard 1024 samples per second per channel to 16,384 (8,192 for 8 channel).
Event Storage	Full Waveform Events	300 standard and 1500 optional at standard sample rate of 1024.
	Summary Events	1750 standard and 8750 optional at standard sample rates of 1024.
Frequency Response	2 to 300 Hz	Ground and Air, Independent of record time.
Full Waveform Recording	Fixed Record Modes	Manual, single shot, continuous and programmed start/stop.
	Fixed Record Time	1 to 100, 300 or 500 sec plus 0.25 sec pre-trigger.
	Auto Record Mode	1 to 100, 300 or 500 sec plus 0.25 sec pre-trigger.
Strip Chart Recording	Record Method	Record to memory and/or internal printer. Program interval 2, 5, 15, 60, 300 or 900 sec.
	Days Storage	2.8 or 14 days at 5 second interval. 34 or 170 days at 60 second interval.
Histogram Combo Mode	Histogram Record Method	Record to memory and/or internal printer. Program interval 2, 5, 15, 60, 300 or 900 sec.
	Histogram Days Storage	2.4 or 12 days at 5 second interval. 29 or 147 days at 60 second interval.
	Waveform Events	Up to 13 one-second events (1024 sample rate, four channels recording).
	Waveform Record Times	1 to 13 seconds plus 0.25 sec pre-trigger.
Special Functions	Timer Operation	Programmed start/stop.
	Self Check	Programmable daily check.
	Scaled Distance	Weight and distance stored with event.
	Monitor Log	History printout programmable up to all events stored.
	Automatic download	Automatic downloading of data from a unattended monitor with Auto Call Home.
	Measurement Units	Imperial or metric, dB or linear air pressure, or in units of custom sensors.
Printer	Resolution	576 dots/line and 0.0049 inches (0.125 mm) per dot.
	Print Time	Less than 10 seconds for typical 1 second event with full analysis.
	Paper Control	Paper tear slot or automatic paper takeup, separate keys for feed and takeup.
	Rated Life – print head	18 miles (30 km) of printing.
	Number of Copies	1 to 10 copies automatic, any number manual.
User interface	Keyboard	64 domed tactile with separate keys for common functions.
	Display	4 line by 20 character high contrast backlit display with on line help.
Battery Life		30 days continuous recording, 70 days with timer, printing will decrease life.
Fuse		5 A/250 V

## Series III Specifications (continued)

Dimensions		10.6" x 14.0" x 6.5" (269 mm x 355 mm x 165 mm).
Weight		14 lbs. (6.4 kg).
Warranty	2 Years Parts and Labor	Calibration and equipment check required at 1 year to maintain warranty.
Environmental	Printer/ LCD	14 to 122 degrees F (-10 to 50 degrees C) operating.
	Electronics	-4 to 140 degrees F (-20 to 60 degrees C) operating.
	Humidity	5 - 90% RH non - condensing
	Storage	-4 to 160 degrees F (-20 to 70 degrees C).

InstanTel reserves the right to change specifications without notice.

### c) Compliance Reports

The BlastMate III supports numerous Compliance Reports, also called National Frequency Analysis Standards, including U.S.A. USBM/OSMRE, British Standard BS 6472, French GFEE, German DIN 4150, New Zealand 4403:1976, and Spain UNE 22.381. Two frequency standards, U.S.A. USBM/OSMRE and German DIN 4150, appear below. Use the BlastWare III software to choose the Compliance Report used by your monitor.

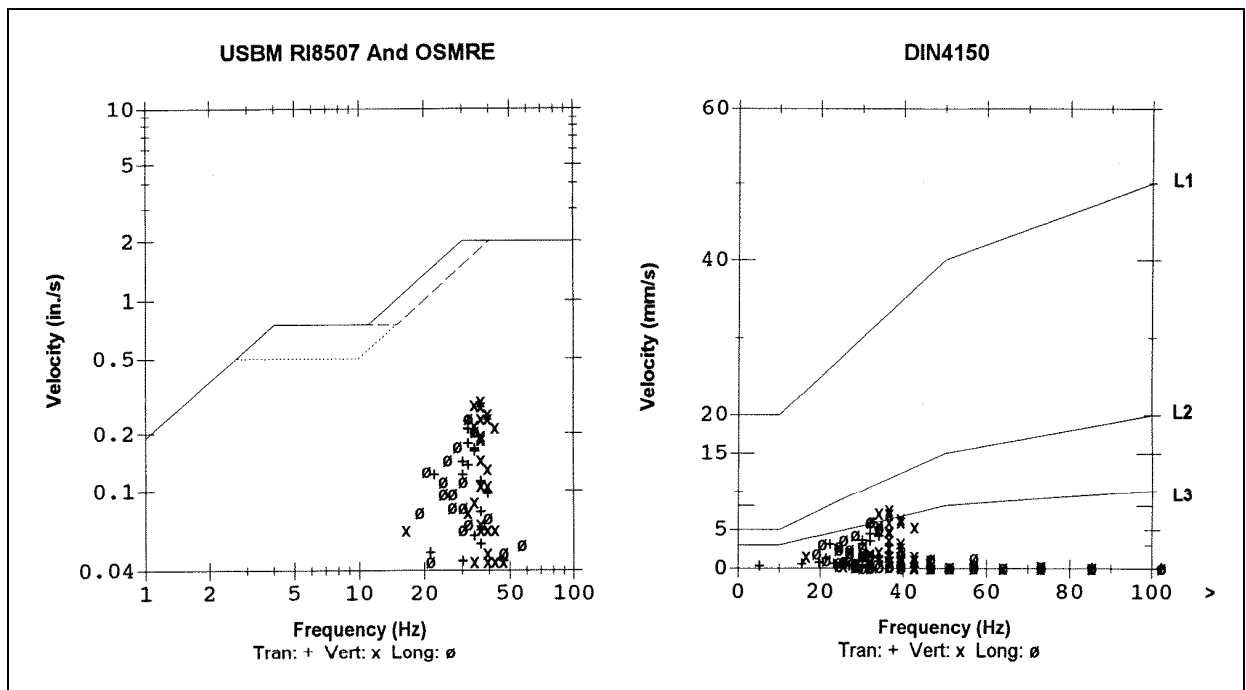


Figure A-1 United States Bureau of Mines and German DIN 4150 Compliance Reports.

**Note:** Data points appearing outside of the report boundaries indicates the recorded data was outside the range of the report. In the DIN 4150 example, some peaks occurred at frequencies greater than 100 Hz and were therefore drawn outside the boundaries of the report.

Using the optional BlastWare III Advanced Module, you can edit Compliance Reports or create an entirely new report to meet your specific needs.

## **Flyrock & Misfire Prevention Plans**





## **Blasting; Best Practices**

The potential to impact surface or groundwater with the substances used in commercial explosives can be controlled through the implementation of certain measures. Implementing such measures as part of a standard operating procedure will eliminate or minimize the potential for these substances to dissolve in or become associated with water. The specific measures included can be grouped into the following four (4) basic categories:

1. Education/Training of Explosive Users
2. Selection of Appropriate Explosives for the Job and Conditions
3. Explosives Loading and Handling
4. Attention to Technical Matters

### 1. Education/Training of Explosive Users

Both the owners/operators of the location where explosives are being used and the personnel working with commercial explosives should be well informed of all applicable regulations as well as any potential consequences associated with the products' exposure to water. The federal Clean Water Act, or the equivalent state statute, regulates the release of substances, in particular those that can cause an undue risk to human health or the environment. In addition, the Resource Conservation and Recovery Act, governs the disposal of hazardous wastes.

### 2. Selection of Appropriate Explosive for the Job and Conditions

Selecting the proper explosive for the particular job is critical to the prevention of surface or groundwater impact.

- ANFO (ammonium nitrate - fuel oil) is not water-resistant and should be avoided if contact with water is likely.
- Various types of commercial explosives are available to withstand exposure to water. Water-resistant explosives include the cartridge forms of gelatinous nitroglycerin, watergels and emulsions and the bulk forms of emulsions which are: 1) Site Mixed Emulsion (ammonium nitrate - fuel oil - emulsifier) is a water-resistant explosive, semi-solid. This is manufactured on site and detonated while still warm assuring complete detonation. 2) Repump Emulsion (ammonium nitrate - fuel oil - emulsifier) is a water-resistant explosive, semi solid, manufactured off site, transported and pumped into the borehole as needed.

### 3. Explosives Loading and Handling

- All excess product in augers or hoses is to be recovered and used either in the next blasthole or recycled in the mixer/holding tank.
- Explosive spillage around the blasthole collar is to be controlled and any such spillage should be placed into the blasthole before stemming
- Water contacting explosives during cleanup is to be contained and managed in accordance with applicable regulations
- Minimize the amount of time that explosives are exposed to wet conditions within the blasthole. The blast should be initiated as near the time the loading is completed as safety and operational procedures allow.
- Avoid having explosives exposed to precipitation.
- To assure complete detonation of explosives placed into the ground, a sufficient number of boosters must be used.

### 4. Attention to Technical Matters

- The actual physical conditions into which explosives are being placed must be taken into account.
- Personnel responsible for loading explosives into the boreholes should be in continuous communication with the drillers of those boreholes or supplied with adequate drill logs, so that any knowledge regarding fractures, crevices or cavities is obtained.
- Where Bulk ANFO or Emulsion is used in fractured, creviced or cavitied boreholes, plastic borehole sleeves and/or positioned inert stemming decks will be used to ensure total detonation of the explosives and avoidance of excessive charges.
- Choosing and placing the correct drilling patterns that results in the optimal use of explosives with all the explosives undergoing complete detonation.
- Quality assurance/quality control measures to maintain drilling accuracy that prevents the detonation in one blasthole from impacting the proper detonation in a nearby blasthole.
- Selecting the appropriate drilling equipment so that adequate borehole quality is maintained.
- Where appropriate to ensure complete detonation, two (2) primers will be used in each blasthole; one near the top and one near the bottom of the explosive column.
- Correct selection of delay timing for each blasthole to ensure detonation of the entire pattern, and the prevention of cut-off blastholes.

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## Fly-Rock Prevention Plan

### Prevention of Fly-Rock

Fly-rock prevention is most effective through good planning, attention to detail on drilling, loading and site security. Each category below contains items that are known to be effective in preventing fly-rock.

### Planning

1. It must be clearly established who the (BIC) is and then clearly communicated to the entire crew.
2. The BIC must clearly communicate what the responsibilities are for each crew member.
3. BIC must understand the abilities of the crew. Trainees must be trained and supervised on all job functions, (assign a trainer).
4. Through the use of the Job Hazard Analysis the crew must become familiar with the blast environment and clearly identify all hazards on and around the job site.
5. The BIC must communicate with the drill operators and other blasters with experience to fully understand the geology on site.
6. The blast design must take into consideration all the relevant parameters, blast geometry, hazards, type of products, timing and type and amount of cover in use.
7. All pre-blast calculations must be done prior to the blast and adjusted should conditions change on the site or drilling conditions dictate a modification of the plan. Powder factor should be determined prior to loading the first hole.
8. Each blast should be designed according to the direction of least danger.
9. Start each project with a conservatively designed test blast. that will not only provide information on the geology but will provide relief for the next shot.
10. When location or conditions on the job site change consider your next blast as a test blast.
11. Document your blast plan and have it reaffirmed.
12. Request hold harmless on shots that may cause damage or takes unnecessary risks.

### **Drilling**

13. Carefully monitor and record hole depths, amount of overburden, and any drill hole anomalies with light colored crayons on the cones or another effective method.
14. Use flashlights attached to tapes to determine straightness of holes. If deviation is even slightly suspected, have holes bore tracked.
15. Arrange for Laser Profiling and Bore Tracking for high wall faces with exposures to property.

### **Loading the Shot**

16. Have hole sheets and timing patterns on paper before loading.
17. Profile all faces before loading front row of holes.
18. Have blaster-in-charge load first and second rows of holes.
19. When using pourables (Bulk or ANFO):
  - a. Have an appropriate plan to deal with seams, voids, faces, and overloaded holes.
  - b. Make the appropriate design modifications for the use of bulk.
  - c. Keep the increased hazards in mind.
20. Take the time necessary to work safely and do not take shortcuts, or unnecessary risks. (DO NOT RUSH!)
21. Know the exact amount of burden on the face and load and cover accordingly, if face is bermed and you're uncertain of face location, excavate to find the face and then reberm.
22. Utilize berms for faces as appropriate.
23. If questioning the necessity to or the amount of cover, add cover.
24. Know the exact amount of overburden over the rock and load and cover accordingly.



25. Use offsets properly.
26. Train the blast crew on proper stemming techniques, what stemming anomalies may look like, why, and how to report them.
27. Monitor the stemming to make certain that all holes are properly stemmed.
28. Use only appropriate crushed stone and non-sparking stemming rods to compact the stone in each hole.
29. Pay attention when using bulk as it can coat the sides of the hole reducing the effectiveness of the stemming.
30. BIC must walk the shot twice and check power, double-up on power and down hole caps when necessary (critical shots).
31. Ensure 100% safe detonation! Misfires can be a source for flyrock. Follow all Misfire Prevention Guidelines!
32. If there is a remote possibility of fly rock from a blast, take the necessary additional precautions.
33. Never make assumptions. If unfamiliar with the situation; figure it out, then get another opinion to confirm your decision .
34. Always communicate with supervisors when safety issues are compromised.

### **Site Security**

35. Secure loading area before, during, and after loading.
36. Have a thorough, written Blast Zone Security Plan:
  - a. Design an over cautious plan.
  - b. Communicate the plan with our crew, the Contractor and his crew.
  - c. Have all blast guards use hand-held radios on the same frequency or another acceptable means of communication.
37. Secure the blast zone by removing people from the blast area (especially keeping them away from the face of the blast) and have them stay at an overly safe distance behind the blast and put them under cover.
38. Blaster must have proper cover.
39. Execute the Blast Zone Security plan to the "T".

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**Misfire Prevention Guidelines**

**Prevention of Misfires**

These guidelines were established to provide good work practices that will greatly reduce the possibility of a misfire due to self-induced causes.

**Shot Design Nonelectric**

1. Use proper hookup procedures as found in the MD&B published guidelines
2. The Blaster-In-Charge may determine the need for extra surface delays to create a dual path system to enhance reliability
3. Ensure that there is enough slack in the shock tube
4. Ensure shot design allows for complete energization or in cases of larger shots appropriate advancement of the initiation sequence.

**Shot Design Electric**

5. Ensure shot design allows for complete energization
6. Tape connections in wet locations
7. Monitor meter while matting
8. Test equipment regularly
9. Perform stray current tests

**Loading**

10. "Tape" all non-electric connections to ensure there is a proper connection
11. The Blaster-In-Charge must walk the shot completely and verify all connections prior to shooting
12. The Blaster-In-Charge will have additional competent person(s) walk the shot to ensure all connections are made properly
13. Use caution whenever sticking a loading pole or stemming rod into a loaded hole as it can damage shock tube
14. Re-prime any hole where separation is suspected
15. Re-prime any hole where you have used a powder retriever
16. Do not step on shock tube

**Matting**

17. Matting shall only be performed under the direction of the Blaster-In-Charge, or their competent designee
18. Ensure that the excavator on the project is sufficient in size to handle the mats in an efficient manner
19. Communicate the matting procedure clearly with the excavator operator, discuss hand signals also.
20. Design the shot with the excavators reach in mind
21. Clean mats by "shaking" them with an excavator. This is more effective when the tire "grain" is sloping downward
22. Do not drag mats over a shot
23. Do not set mats with a front-end loader or other equipment that cannot properly hoist the mat over the shot
24. Place ANFO bags under shock tube exposed to jagged surfaces
25. Utilize sand cover whenever geological conditions warrant extra coverage

**General Prevention Techniques**

26. Do not cut open detonator boxes with a knife
  27. Do not allow your powder knife to swing from a lanyard (strap) unless the blade is protected
  28. Document and calculate timing before loading the shot
  28. After the shot has been tied in – GET OFF THE SHOT!
- 
-



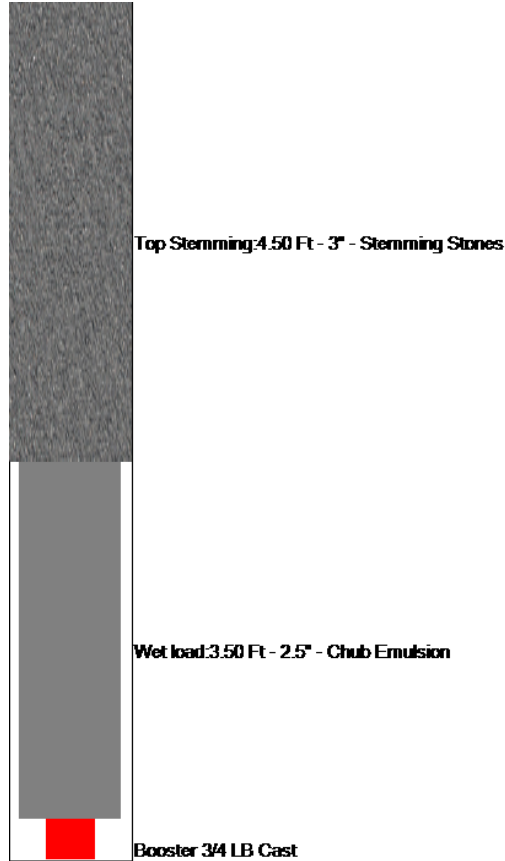
## **Typical Blast Design and Timing Diagrams**



**APENDIX A. - Blast Design Plan:**

Est. Number Of Holes:	40
Hole Depth:	8.00 Ft
Hole Diameter:	3 in
Burden:	4.00 Ft
Spacing:	4.00 Ft
Holes per Delay:	1
Pounds Per Delay:	9.37 Lbs
Pounds Per Hole:	9.37 Lbs
Total est. Pounds:	374.80 Lbs
Powder Factor:	3.94 Lbs/Cy
Decks:	0

**Loaded Hole    Depth - Diameter - Product**



Blast Plan Notes:

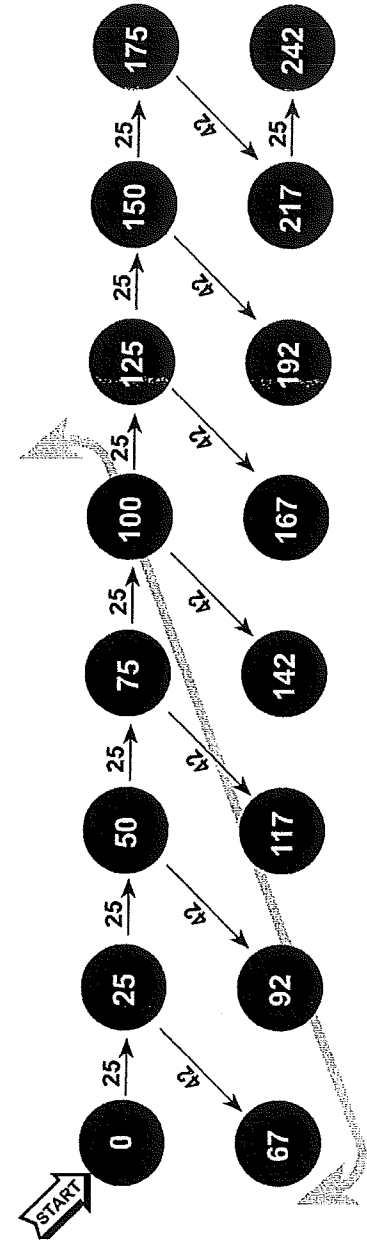
Vibration Prediction (formula based on Dupont Handbook)

Site Factor (k) :	160	Ground Constant based on Site/Rock Conidtions
Distance Ft (d)	115	Distance to Structure
Lbs per Delay (w)	9.37	Lbs explosives per 8 millisecond delay
Scaled Distance (sd)	37.57	( sd = d/ square root of w)
Estimated PPV	0.48	( ppv = k * sd ^ -1.6)

Typical for Production work consistent with holes 8 Ft deep at 115 from a structure utilizing 3' In diameter at a 4 Ft by 4 Ft pattern.

Plan View/Timing Design (please see attached timing diagram)

**F R E E F A C E**



**F R E E F A C E**

<p><b>DYNO</b> Dyno Nobel</p> <p>2650 Decker Lake Blvd, Suite 300 Salt Lake City, Utah USA 84119 Telephone: (801) 732-7534 www.dynonobel.com</p> <p><small>DYNO NOBEL INC. and its subsidiaries disclaim any warranties with respect to their products and the results obtained herein, the safety or suitability thereof, or the results obtained therefrom, express or implied, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AND/OR ANY OTHER WARRANTY. Buyers and users assume all risk, responsibility and liability whatsoever from any and all injuries (including death), losses, or damages to persons or property arising from the use of their products. Under no circumstances shall DYNO NOBEL, Inc. or any of its subsidiaries be liable for special, consequential or incidental damages or for anticipated loss of profits.</small></p>	<p>000 Sequential Time</p>	<p>NONEL® EZTL® Delay Time (ms)</p>	<p>Movement Direction</p>	<p>1 2</p>
	<p><b>APPLICATIONS</b></p> <p>Quarry, coal, construction or open pit</p>	<p><b>SURFACE DELAYS</b></p> <p>25ms and 42ms</p>	<p><b>IN-HOLE DELAYS</b></p> <p>Same delay period in each hole. Suggested in-hole delay: 500ms</p>	<p><b>NOTES</b></p>
<p><b>LIMITATIONS</b></p> <p>None</p>				

## **MSDS Sheets**



# NONEL<sup>®</sup> Lead Line

## Technical Information



### Application Recommendations (continued)

NONEL LEAD LINE as the primary initiator for NONEL blast rounds.

- **ALWAYS** trim at least 3 m [10 ft] of tubing before inserting into a nonelectric shock tube starting device or whenever dirt and/or moisture may have compromised the open tube ends before making a splice connection.
- **ALWAYS** replace the plastic tube closure over the open end of any NONEL LEAD LINE that remains on the spool and is intended to be used to make up another nonelectric starter assembly.
- **ALWAYS** make the final hook-up of the nonelectric starter assembly to the blast round only after all equipment and non-essential personnel are clear of the blast area.
- **ALWAYS** unspool NONEL LEAD LINE by hand if the starter assembly has been spliced to it and is attached to the blast round.
- **ALWAYS** keep any NONEL LEAD LINE tube ends sealed and free from dirt and moisture since dirt or moisture in the shock tube may cause a misfire.
- **NEVER** use NONEL LEAD LINE for in-hole use. NONEL LEAD LINE is for use outside the borehole only.
- **NEVER** attempt to knot different lengths of shock tube together. Shock tube will not initiate itself through knot connections. It must be spliced.
- **NEVER** remove the plastic tube closure from the NONEL LEAD LINE shock tube until just before splicing.
- **NEVER** attach the starter assembly to the blast round until after the LEAD LINE deployment is complete whenever NONEL LEAD LINE is to be unspooled by any method other than by hand,

### Application Recommendations (continued)

- **NEVER** run over NONEL LEAD LINE with equipment. This may damage the shock tube and may cause a misfire. **ALWAYS** replace the NONEL LEAD LINE if it is damaged.
- When making a nonelectric starter assembly using NONEL LEAD LINE, **ALWAYS** remove the plastic tube closure and save for later use. Splice two freshly-cut ends of NONEL shock tube together (one from the NONEL LEAD LINE and the other from the NONEL detonator) by inserting them into opposite ends of the plastic connector sleeve and pushing them toward one another until they are both at least ½ cm (¼ in) in the splice.

### Transportation, Storage and Handling

- NONEL LEAD LINE must be transported, stored, handled and used in conformity with all federal, state, provincial and local laws and regulations.
- For maximum shelf life (3 years), NONEL LEAD LINE must be stored in a cool, dry, well ventilated magazine. Explosive inventory should be rotated. Avoid using new materials before the old. For recommended good practices in transporting, storing, handling and using this product, see the booklet "Prevention of Accidents in the Use of Explosive Materials" packed inside each case and the Safety Library Publications of the Institute of Makers of Explosives.

### Case Dimensions

51 x 25 x 28 cm 20 x 9 7/8 x 10 7/8 in

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Groundbreaking Performance

# Material Safety Data Sheet

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CANUTEC (CANADA) 613-996-6666**MSDS # 1124****Date 09/16/10**

Supersedes

MSDS # 1124 08/13/08

## SECTION I - PRODUCT IDENTIFICATION

**Trade Name(s):** NONEL<sup>®</sup> LEAD LINE**Product Class:** Shock Tube**Product Appearance & Odor:** Hollow plastic tubing (normally yellow) with dusty inner coating of HMX and aluminum. No detectable odor.**DOT Hazard Shipping Description:** UN0349 Articles, explosive, n.o.s. (HMX) 1.4S II.  
For 10,000 ft spools with Wire Lock Terminations only: Not regulated as an explosive, 0000**NFPA Hazard Classification:** Not Applicable (See Section IV - Special Fire Fighting Procedures)

## SECTION II - HAZARDOUS INGREDIENTS

Ingredients:	CAS#	% (Range)	Occupational Exposure Limits	
			OSHA PEL-TWA	ACGIH TLV-TWA
Cyclotetramethylene Tetranitramine (HMX)	2691-41-0	0.35	None <sup>1</sup>	None <sup>2</sup>
Aluminum (dust)	7429-90-5	0.04	15 mg/m <sup>3</sup> (total) 5 mg/m <sup>3</sup> (respirable)	10 mg/m <sup>3</sup>

<sup>1</sup> Use limit for particulates not otherwise regulated (PNOR): Total dust, 15 mg/m<sup>3</sup>; respirable fraction, 5 mg/m<sup>3</sup>.<sup>2</sup> Use limit for particulates not otherwise classified (PNOC): Inhalable particulate, 10 mg/m<sup>3</sup>; respirable part., 3 mg/m<sup>3</sup>.

Note: The above hazardous dust mixture is present at approximately 15 mg per meter of tubing.

Ingredients, other than those mentioned above, as used in this product are not hazardous as defined under current Department of Labor regulations, or are present in de minimus concentrations (less than 0.1% for carcinogens, less than 1.0% for other hazardous materials).

## SECTION III - PHYSICAL DATA

**Boiling Point:** Not Applicable**Vapor Density:** Not Applicable**Melting Point:** HMX decomposes violently at melting pt., about 278°C**Evaporation Rate (Butyl Acetate = 1):** Not Applicable**Vapor Pressure:** Not Applicable**Density:** Not Applicable**Solubility in Water:** Not Soluble**Percent Volatile by Volume:** Not Applicable

# Material Safety Data Sheet

## SECTION IV - FIRE AND EXPLOSION HAZARD DATA

**Flash Point:** Not Applicable

**Flammable Limits:** Not Applicable

**Extinguishing Media:** Water, inert powder, CO<sub>2</sub>

**Special Fire Fighting Procedures:** For shock tube only, consider initial isolation of at least 15 meters (50 feet) in all directions. Fight fire with normal precautions and methods used for plastic fires from a reasonable distance. IF DETONATORS OR OTHER EXPLOSIVES ARE PRESENT, DO NOT FIGHT FIRE.

**Unusual Fire and Explosion Hazards:** May burn vigorously with localized detonations and projection of fragments, with effects usually confined to the immediate vicinity of packages. Toxic smoke from combustion of the plastic material may be emitted. If product functions, high heat and pressure are released from the end of the tube if not covered or enclosed, typically by a metal device.

## SECTION V - HEALTH HAZARD DATA

### Effects of Overexposure

This is a packaged product that will not result in exposure to hazardous ingredients (inner coating materials) under normal conditions of use.

**Eyes:** Not a likely route of exposure. Dust particles may be irritating.

**Skin:** Not a likely route of exposure. Dust particles may cause skin irritation.

**Ingestion:** Not a likely route of exposure. Ingestion of large amounts of the reactive powder (HMX) is poisonous and may cause cardiovascular collapse.

**Inhalation:** Not a likely route of exposure. Breathing dust can cause respiratory irritation. During manufacture and at processing temperatures, irritating fumes may evolve.

**Systemic or Other Effects:** None known.

**Carcinogenicity:** No constituents are listed by NTP, IARC or OSHA.

### Emergency and First Aid Procedures

**Eyes:** Irrigate with running water for at least fifteen minutes. If irritation persists, seek medical attention.

**Skin:** Wash with soap and water.

**Ingestion:** Not Applicable

**Inhalation:** Not Applicable

**Special Considerations:** None.

## SECTION VI - REACTIVITY DATA

**Stability:** Stable

**Conditions to Avoid:** Keep away from heat, flame, impact, friction, ignition sources and strong shocks. Also avoid stretching to failure.

**Materials to Avoid (Incompatibility):** Incompatible with strong oxidizers and acids.

**Hazardous Decomposition or Combustion Products:** Hazardous carbon monoxide (CO), nitrogen oxide (NO<sub>x</sub>) gases and products of plastic decomposition produced.

**Hazardous Polymerization:** Will not occur.

## SECTION VII - SPILL OR LEAK PROCEDURES

**Steps to be taken in Case Material is Released or Spilled:** Protect from all ignition sources. In case of fire evacuate area not less than 50 feet in all directions. Notify authorities in accordance with emergency response procedures. Only personnel trained in emergency response should respond. If no fire danger is present, repackage undamaged devices in original packaging, accounting for every device. If the ends or tube wall have been opened such that powder may have



# Material Safety Data Sheet

been released from the tube, isolate the spill area. Contamination of the HMX/Aluminum powder with sand, grit or dirt will render the material more sensitive to detonation. Carefully wet down and clean "loose" powder spills using a damp sponge or rag, avoid applying friction or pressure to the explosive, and place in a (Velostat) electrically conductive bag. Follow applicable Federal, State, and local spill reporting requirements.

**Waste Disposal Method:** Disposal must comply with Federal, State and local regulations. If product becomes a waste, it is potentially regulated as a hazardous waste as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR, part 261. Review disposal requirements with a person knowledgeable with applicable environmental law (RCRA) before disposing of any explosive material.

## SECTION VIII - SPECIAL PROTECTION INFORMATION

**Ventilation:** None normally required. Provide enhanced ventilation if used in underground mines, indoors or other enclosed areas.

**Respiratory Protection:** None normally required. Extended testing of the product indoors or in enclosed areas may necessitate respiratory protection.

**Protective Clothing:** None normally required. Wear chemical-resistant gloves during post-detonation cleanup or spill cleanup operations.

**Eye Protection:** Safety glasses or goggles are recommended for handling, testing or cleanup.

**Other Precautions Required:** None

## SECTION IX - SPECIAL PRECAUTIONS

**Precautions to be taken in handling and storage:** Store in cool, dry, well-ventilated location. Store in compliance with Federal, State, and local regulations. Keep away from heat, flame, ignition sources and strong shock. Only properly qualified and authorized personnel should handle and use Shock Tube.

**Precautions to be taken during use:** Use accepted safe industry practices when using explosive materials. Unintended detonation of explosives or explosive devices can cause serious injury or death. Avoid breathing the fumes or gases from detonation of explosives. Detonation in confined or unventilated areas may result in exposure to hazardous fumes or oxygen deficiency.

**Other Precautions:** It is recommended that users of explosive materials be familiar with the Institute of Makers of Explosives Safety Library Publications.

## SECTION X - SPECIAL INFORMATION

This product contains the following substances that are subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

<u>Chemical Name</u>	<u>CAS Number</u>	<u>% By Weight</u>
None		

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### Application Recommendations (continued)

damage. Use care when placing blasting mats and cover material on top of the blasting circuit. The EZ connector contains a detonator and is subject to detonation caused by abuse such as impact. Shock tube which has been cut, ruptured or damaged may cause misfires.

- **NEVER** use NONEL EZTL detonators with detonating cord. The low strength surface detonator will not initiate detonating cord.
- **NEVER** attempt to disassemble the delay detonator from the EZ connector block or use the detonator without the connector.
- **NEVER** place more than 6 shock tube leads into an EZ connector block. Misfires may result.
- **NEVER** tie-in NONEL EZTL units until all holes have been primed, loaded, stemmed and the blast site has been cleared.

### Transportation, Storage and Handling

- NONEL EZTL must be transported, stored, handled and used in conformity with all federal, state, provincial and local laws and regulations.
- For maximum shelf life (3 years), NONEL EZTL must be stored in a cool, dry, well ventilated magazine. Explosive inventory should be rotated. Avoid using new materials before the old. For recommended good practices in transporting, storing, handling and using this product, see the booklet "Prevention of Accidents in the Use of Explosive Materials" packed inside each case and the Safety Library Publications of the Institute of Makers of Explosives.

### Packaging

Length		Case Type	Quantity / Case	
m	ft		case	subpack
2.5	10	D	180	90
3.5	12	D	180	90
6	20	D	150	75
9	30	D	120	60
12	40	D	100	50
15	50	D	90	45
18	60	D	70	35

- Length rounded to nearest one-half meter.
- Case weight varies by length & delay; see case label for exact weight.

### Case Dimensions

#### Detpak (D)

<b>subpack</b>	44 x 22 x 25 cm	17½ x 8¾ x 10 in
<b>strapped case</b>	44 x 45 x 25 cm	17½ x 17⅝ x 10 in

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# NONEL<sup>®</sup> EZ DET<sup>®</sup> 1.4B

## Technical Information



### Application Recommendations (continued)

- **ALWAYS** protect the plastic EZ Connector block and all shock tube leads from impact or damage during the loading and stemming operations. Use care when placing blasting mats and cover material on top of the blasting circuit. The EZ Connector block contains a detonator and is subject to detonation caused by abuse such as impact. Shock tube which has been cut, ruptured or damaged may cause misfires.
- **ALWAYS** be sure that the shock tube(s) are securely inserted, one at a time, into the EZ Connector block. The head of the EZ Connector block should rise to accept the shock tube and return to a closed position with an audible click.
- **ALWAYS** ensure that individual shock tubes remain aligned side by side in the connector channel and do not cross one over the another on insertion.
- **NEVER** use NONEL EZ DET units with detonating cord. The low strength surface detonator will not initiate detonating cord and may cause misfires.
- **NEVER** attempt to disassemble the delay detonator from the plastic EZ Connector block or use the detonator without the connector.
- **NEVER** place more than 6 shock tube leads into the plastic EZ Connector block. Misfires may result.
- **NEVER** pull, stretch, kink or put tension on shock tube such that the tube could break.
- **NEVER** splice NONEL EZ DET shock tube together to extend between holes.
- **NEVER** connect NONEL EZ DET units together until all holes have been primed, loaded and stemmed and the blast site has been cleared.

### Transportation, Storage and Handling

- NONEL EZ DET must be transported, stored, handled and used in conformity with all federal, state, provincial and local laws and regulations.
- For maximum shelf life (3 years), NONEL EZ DET must be stored in a cool, dry, well ventilated magazine. Explosive inventory should be rotated. Avoid using new materials before the old. For recommended good practices in transporting, storing, handling and using this product, see the booklet "Prevention of Accidents in the Use of Explosive Materials" packed inside each case and the Safety Library Publications of the Institute of Makers of Explosives

### Packaging

Length		Case Type	Quantity / Case	
m	ft		case	subpack
3.5	12	D	180	90
4.5	16	D	120	60
7	24	D	120	60
9	30	D	80	40
12	40	D	60	30
15	50	D	60	30
18	60	D	50	25
24	80	DC	50	--
30	100	DC	40	--
37	120	DC	30	--

- Length rounded to nearest one-half meter.
- Case weight varies by length & delay; see case label for exact weight.

**Note:** This product is also available with a High Strength cap. For more information, please contact your local Dyno Nobel sales representative.

### Case Dimensions

<b>Detpak Case (DC)</b>	48 x 45 x 26 cm	18¾ x 17¾ x 10¼ in
<b>Detpak (D)</b>		
<b>subpack</b>	44 x 22 x 25 cm	17 ½ x 8 ¾ x 10 in
<b>strapped case</b>	44 x 45 x 25 cm	17 ½ x 17 ⅝ x 10 in

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# Material Safety Data Sheet

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CANUTEC (CANADA) 613-996-6666**MSDS # 1122**  
**Date 06/13/12**Supersedes  
MSDS # 1122 12/15/11

## SECTION I - PRODUCT IDENTIFICATION

**Trade Name(s):** NONEL<sup>®</sup> MS  
NONEL<sup>®</sup> MS ARCTIC  
NONEL<sup>®</sup> LP  
NONEL<sup>®</sup> SL  
NONEL<sup>®</sup> TD  
NONEL<sup>®</sup> MS CONNECTOR  
NONEL<sup>®</sup> TWINPLEX<sup>™</sup>  
NONEL<sup>®</sup> STARTER

NONEL<sup>®</sup> EZ DET<sup>®</sup>  
NONEL<sup>®</sup> EZTL<sup>™</sup>  
NONEL<sup>®</sup> EZ DRIFTER<sup>®</sup>  
NONEL<sup>®</sup> SUPER

**Product Class:** NONEL<sup>®</sup> Non-electric Delay Detonators**Product Appearance & Odor:** Aluminum cylindrical shell with varying length and diameter of attached colored plastic tubing. The detonator may be enclosed in a plastic housing, and an assembly may contain two detonators. Odorless.**DOT Hazard Shipping Description:** UN0029 Detonators, non-electric 1.1B II  
-or- UN0360 Detonator assemblies, non-electric 1.1B II  
-or- UN0361 Detonator assemblies, non-electric 1.4B II**NFPA Hazard Classification:** Not Applicable (See Section IV - Special Fire Fighting Procedures)

## SECTION II - HAZARDOUS INGREDIENTS

Ingredients	CAS#	Occupational Exposure Limits	
		OSHA PEL-TWA	ACGIH TLV-TWA
Pentaerythritol Tetranitrate (PETN)	78-11-5	None <sup>1</sup>	None <sup>2</sup>
Lead Azide	13424-46-9	0.05 mg (Pb)/m <sup>3</sup>	0.05 mg (Pb)/m <sup>3</sup>
Lead	7439-92-1	0.05 mg (Pb)/m <sup>3</sup>	0.05 mg (Pb)/m <sup>3</sup>
Silicon	7440-21-3	15 mg / m <sup>3</sup> (total dust) 5 mg / m <sup>3</sup> (respirable fraction)	10 mg / m <sup>3</sup>
Selenium	7782-49-2	0.2 mg/m <sup>3</sup>	0.2 mg/m <sup>3</sup>
Red Lead (Lead tetroxide)	1314-41-6	0.05 mg (Pb)/m <sup>3</sup>	0.05 mg (Pb)/m <sup>3</sup>
Titanium dioxide	13463-67-7	15 mg/m <sup>3</sup>	10 mg/m <sup>3</sup>
Barium Chromate	10294-40-3	1 mg (CrO <sub>3</sub> )/10m <sup>3</sup> (ceiling)	0.01 mg (Cr)/m <sup>3</sup>
Lead Chromate	7758-97-6	0.5 mg (Ba)/m <sup>3</sup> 0.05 mg (Pb)/m <sup>3</sup> 1 mg (CrO <sub>3</sub> )/10m <sup>3</sup> (ceiling)	0.5 mg (Ba)/m <sup>3</sup> 0.15 mg (Pb)/m <sup>3</sup> 0.012 mg (Cr)/m <sup>3</sup>
Barium Sulfate	7727-43-7	0.5 mg (Ba)/m <sup>3</sup>	10 mg/m <sup>3</sup>
Potassium Perchlorate <sup>3</sup>	7778-74-7	None <sup>1</sup>	None <sup>2</sup>
Silica (crystalline)	61790-53-2	See Note Below	0.05 mg/m <sup>3</sup> (resp frac)



# Material Safety Data Sheet

Molybdenum	7439-98-7	None <sup>1</sup>	None <sup>2</sup>
Tungsten	7440-33-7	None <sup>1</sup>	5 mg/m <sup>3</sup> (TWA) 10 mg/m <sup>3</sup> (STEL)
Aluminum	7429-90-5	15 mg/m <sup>3</sup> (total dust) 5 mg/m <sup>3</sup> (respirable fraction)	5 mg/m <sup>3</sup>
Antimony	7440-36-0	0.5 mg/m <sup>3</sup>	0.5 mg/m <sup>3</sup>
Cyclotetramethylene Tetranitramine (HMX)	2691-41-0	None <sup>1</sup>	None <sup>2</sup>
Diazodinitrophenol	4682035	No value established	No value established

<sup>1</sup> Use limit for particulates not otherwise regulated (PNOR): Total dust, 15 mg/m<sup>3</sup>; respirable fraction, 5 mg/m<sup>3</sup>.

<sup>2</sup> Use limit for particulates not otherwise classified (PNOC): Inhalable particulate, 10 mg/m<sup>3</sup>; respirable part., 3 mg/m<sup>3</sup>.

Note: The OSHA PEL for crystalline silica is calculated as follows:

Quartz, respirable: 10 mg/m<sup>3</sup>e / % SiO<sub>2</sub> + 2      Quartz, total dust: 30 mg/m<sup>3</sup> / % SiO<sub>2</sub> + 2

<sup>3</sup> Not all delay periods contain perchlorate. Those that do contain between from about 4 to a maximum of about 60 mg perchlorate per detonator.

Ingredients, other than those mentioned above, as used in this product are not hazardous as defined under current Department of Labor regulations, or are present in deminimus concentrations (less than 0.1% for carcinogens, less than 1.0% for other hazardous materials).

## SECTION III - PHYSICAL DATA

**Boiling Point:** Not Applicable

**Vapor Density:** Not Applicable

**Percent Volatile by Volume:** Not Applicable

**Evaporation Rate (Butyl Acetate = 1):** Not Applicable

**Vapor Pressure:** Not Applicable

**Density:** Not Applicable

**Solubility in Water:** Not Applicable

## SECTION IV - FIRE AND EXPLOSION HAZARD DATA

**Flash Point:** Not Applicable

**Flammable Limits:** Not Applicable

**Extinguishing Media:** (See Special Fire Fighting Procedures section.)

**Special Fire Fighting Procedures:** Do not attempt to fight fires involving explosive materials. Evacuate all personnel to a predetermined safe, distant location. Allow fire to burn unless it can be fought remotely or with fixed extinguishing systems (sprinklers).

**Unusual Fire and Explosion Hazards:** Can explode or detonate under fire conditions. Burning material may produce toxic vapors.

## SECTION V - HEALTH HAZARD DATA

### Effects of Overexposure

This is a packaged product that will not result in exposure to the explosive material under normal conditions of use. Exposure concerns are primarily with post-detonation reaction products, particularly heavy metal compounds.

**Eyes:** No exposure to chemical hazards anticipated with normal handling procedures. Particulates in the eye may cause irritation, redness, swelling, itching, pain and tearing.

**Skin:** No exposure to chemical hazards anticipated with normal handling procedures. Exposure to post-detonation reaction products may cause irritation.

# Material Safety Data Sheet

**Ingestion:** No exposure to chemical hazards anticipated with normal handling procedures. Post-detonation reaction product residue is toxic by ingestion. Symptoms may include gastroenteritis with abdominal pain, nausea, vomiting and diarrhea. See systemic effects below.

**Inhalation:** Not a likely route of exposure. See systemic effects below.

**Systemic or Other Effects:** None anticipated with normal handling procedures. Repeated inhalation or ingestion of post-detonation reaction products may lead to systemic effects such as respiratory tract irritation, ringing of the ears, dizziness, elevated blood pressure, blurred vision and tremors. Heavy metal (lead) poisoning can occur.

**Carcinogenicity:** ACGIH classifies Lead as a "Suspected Human Carcinogen" and insoluble Chromium VI as "Confirmed Human Carcinogen". NTP, OSHA, and IARC consider components contained in this detonator carcinogenic.

**Perchlorate:** Perchlorate can potentially inhibit iodide uptake by the thyroid and result in a decrease in thyroid hormone. The National Academy of Sciences (NAS) has reviewed the toxicity of perchlorate and has concluded that even the most sensitive populations could ingest up to 0.7 microgram perchlorate per kilogram of body weight per day without adversely affecting health. The USEPA must establish a maximum contaminant level (MCL) for perchlorate in drinking water by 2007, and this study by NAS may result in a recommendation of about 20 ppb for the MCL.

## Emergency and First Aid Procedures

**Eyes:** Irrigate with running water for at least fifteen minutes. If irritation persists, seek medical attention.

**Skin:** Wash with soap and water.

**Ingestion:** Seek medical attention.

**Inhalation:** Not applicable.

**Special Considerations:** None

## SECTION VI - REACTIVITY DATA

**Stability:** Stable under normal conditions, may explode when subjected to fire, supersonic shock or high-energy projectile impact.

**Conditions to Avoid:** Keep away from heat, flame, ignition sources, impact, friction, electrostatic discharge and strong shock. Do not attempt to disassemble.

**Materials to Avoid (Incompatibility):** Corrosives (acids and bases or alkalis).

**Hazardous Decomposition Products:** Carbon Monoxide (CO), Nitrous Oxides (NO<sub>x</sub>), Sulfides, Chromates, Lead (Pb), Antimony (Sb) and various oxides and complex oxides of metals.

**Hazardous Polymerization:** Will not occur.

## SECTION VII - SPILL OR LEAK PROCEDURES

**Steps to be taken in Case Material is Released or Spilled:** Protect from all ignition sources. In case of fire evacuate all personnel to a safe distant area and allow to burn or fight fire remotely. Notify authorities in accordance with emergency response procedures. Only personnel trained in emergency response should respond. If no fire danger is present, and product is undamaged and/or uncontaminated, repackage product in original packaging or other clean DOT approved container. Ensure that a complete account of product has been made and is verified. If loose explosive powder is spilled, such as from a broken detonator, only properly qualified and authorized personnel should be involved with handling and clean-up activities. Spilled explosive powder is extremely sensitive to initiation and may detonate. Follow applicable Federal, State, and local spill reporting requirements.

**Waste Disposal Method:** Disposal must comply with Federal, State and local regulations. If product becomes a waste, it is potentially regulated as a hazardous waste as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR, part 261. Review disposal requirements with a person knowledgeable with applicable environmental law (RCRA) before disposing of any explosive material.



# Material Safety Data Sheet

## SECTION VIII - SPECIAL PROTECTION INFORMATION

**Ventilation:** None required for normal handling. Provide enhanced ventilation after use if in underground mines or other enclosed areas.

**Respiratory Protection:** None required for normal handling.

**Protective Clothing:** Cotton gloves are recommended.

**Eye Protection:** Safety glasses are recommended.

**Other Precautions Required:** None.

## SECTION IX - SPECIAL PRECAUTIONS

**Precautions to be taken in handling and storage:** Store in cool, dry, well-ventilated location. Store in compliance with Federal, State, and local regulations. Only properly qualified and authorized personnel should handle and use explosives. Keep away from heat, flame, ignition sources, impact, friction, electrostatic discharge and strong shock.

**Precautions to be taken during use:** Use accepted safe industry practices when using explosive materials. Unintended detonation of explosives or explosive devices can cause serious injury or death. Avoid breathing the fumes or gases from detonation of explosives. Detonation in confined or unventilated areas may result in exposure to hazardous fumes or oxygen deficiency.

**Other Precautions:** It is recommended that users of explosive materials be familiar with the Institute of Makers of Explosives Safety Library Publications.

# Material Safety Data Sheet

## SECTION X - SPECIAL INFORMATION

These products contain the following substances that are subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

<u>Chemical Name</u>	<u>CAS Number</u>	<u>Max. lbs/1000 units</u>
Lead	7439-92-1	39.4
	(Use Toxic Chemical Category Code)	
Lead Compounds	N420	2.0
Barium Compounds	N040	1.8
Chromium Compounds	N090	1.9

### Range\* of Section 313 Chemicals in each product

Product	lb Pb per 1000 detonators	lb Pb compounds per 1000 detonators	lb Ba compounds per 1000 detonators	lb Cr compounds per 1000 detonators
NONEL <sup>®</sup> MS	0 - 27	0.3 - 1.5	0 - 0.9	0 - 0.9
NONEL <sup>®</sup> LP	0 - 30	0.3 - 2.0	0 - 1.8	0 - 1.9
NONEL <sup>®</sup> SL	7 - 27	0.3 - 1.5	0	0
NONEL <sup>®</sup> TD	0 - 18	0.3 - 0.7	0	0
NONEL <sup>®</sup> MS Connector	5 - 16	0.3 - 0.4	0	0
NONEL <sup>®</sup> TWINPLEX <sup>™</sup>	5 - 15	0.3 - 0.7	0	0
NONEL <sup>®</sup> STARTER	0	0.3	0	0
NONEL <sup>®</sup> EZ DET <sup>®</sup>	22 - 36	2.0	0	0
NONEL <sup>®</sup> EZTL <sup>™</sup>	5 - 15	0.5 - 0.7	0	0
NONEL <sup>®</sup> EZ DRIFTER	39.4	1.3	1.2	1.3
NONEL <sup>®</sup> SUPER	019	0.35	1.1	1.4

\* The exact quantity and weight percent of Section 313 Chemicals in each delay period and tubing length for each product is available upon request.

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# TROJAN SPARTAN®

## Technical Information



## Cast Booster



### Product Description

TROJAN SPARTAN cast boosters are detonator sensitive, high density, high energy molecular explosives available in various sizes designed to optimize initiation of all booster sensitive explosives. All TROJAN SPARTAN boosters are manufactured with an internal through-tunnel and detonator well for easy application with either electric, electronic or nonelectric detonators or 10.6 g/m (50 gr/ft) minimum strength detonating cord.

TROJAN SPARTAN boosters are formulated from the highest quality PETN and other high explosive materials ensuring reliability, consistency and durability in all blasting environments. The fluorescent green container and clear printing makes the TROJAN SPARTAN booster more visible on the blast site (as well as in low light situations) and reduces the possibility of misplaced charges. The redesigned Caplock™ holds the detonator in place more securely and makes it more difficult for the detonator to be pulled out of the capwell position while it is being lowered into the borehole.

### Application Recommendations

- **NEVER** force the detonator into the through-tunnel, the detonator-well or otherwise attempt to clear these areas if obstructed. If the through-tunnel or detonator-well does not accommodate the detonator, do not use the booster. Notify your Dyno Nobel representative.

## Properties

MSDS  
#1108

<b>Density</b>	(g/cc) Avg	1.65
<b>Velocity</b>	(m/sec)	7,550
	(ft/s)	24,800
<b>Detonation Pressure</b>	(Kbars)	235
<b>Water Resistance</b>	6 months with no loss of sensitivity	
<b>Shelf Life Maximum</b>	5 years (from date of production)	
<b>Maximum Usage Temperature</b>	60°C (150°F)	

All Dyno Nobel Inc. energy and gas volume values except Velocity and Detonation Pressure are calculated using PRODET™ the computer code developed by Dyno Nobel Inc. for its exclusive use. Other computer codes may give different values.

Velocity and Detonation Pressure are the result of empirical methods during May 2009.

**Hazardous Shipping Description**  
UN 0042 Boosters, 1.1D PG II



# TROJAN® SPARTAN®

## Technical Information



### Application Recommendations (continued)

- **ALWAYS** use detonating cord with a coreload of 10.6 g/m (50 gr/ft) or higher when initiating the TROJAN SPARTAN booster with detonating cord.
- Minimum detonator is No. 8 strength for temperatures above -40° C (-40° F). A high strength detonator is recommended for temperatures below -40° C (-40° F).
- Extremely low temperatures do not affect the performance of cast boosters with commercial detonators. Low temperatures do affect detonators and detonating cord. Be certain your initiation system is suitable for your application in extremely low temperatures. Cast boosters are more susceptible to breakage during handling in extremely cold temperatures.

### Transportation, Storage and Handling

- Dyno Nobel cast boosters must be transported, stored, handled and used in conformity with all federal, state, provincial and local laws and regulations.
- For maximum shelf life (5 years), Dyno Nobel cast boosters must be stored in a cool, dry, well ventilated magazine. Explosive inventory should be rotated. Avoid using new materials before the old.

### Packaging

Unit Weight		Unit Dimensions				Case Quantity	Gross Weight/ Case	
g	oz	Length		Diameter			kg	lbs
		cm	in	cm	in			
90	3.2	11.9	4.7	2.7	1.1	150	14.0	30.8
150	5.5	11.9	4.7	3.6	1.4	95	16.7	36.7
200	7	11.7	4.6	4.1	1.6	72	16.5	36.4
350	12	11.9	4.7	5.0	2.0	49	17.9	39.5
400	14	11.9	4.7	5.5	2.2	40	17.6	38.8
450	16	11.9	4.7	5.8	2.3	36	17.8	39.2
900	32	12.9	5.1	7.9	3.1	18	17.8	39.2

**Note:** All weights and dimensions are approximate.

### Case Dimensions

42 x 33 x 14 cm

16 ½ x 13 x 5 ½ in

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**DYNO**  
 Dyno Nobel

Groundbreaking Performance

# Material Safety Data Sheet

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E-Mail: [dnna.hse@am.dynonobel.com](mailto:dinna.hse@am.dynonobel.com)**FOR 24 HOUR EMERGENCY, CALL** CHEMTREC (USA) 800-424-9300  
CANUTEC (CANADA) 613-996-6666**MSDS # 1108****Date 06/28/11**

Supersedes

MSDS # 1108 09/16/10

## SECTION I - PRODUCT IDENTIFICATION

**Trade Name(s):**DYNO<sup>®</sup> CORD SENSITIVE BOOSTERS - CS35, CS45, CS90, CS135  
TROJAN<sup>®</sup> SPARTAN<sup>®</sup>  
TROJAN<sup>®</sup> SPARTAN<sup>®</sup> Slider  
TROJAN<sup>®</sup> Stinger  
TROJAN<sup>®</sup> NB  
TROJAN<sup>®</sup> NB UNIVERSAL  
TROJAN<sup>®</sup> Twinplex  
TROJAN<sup>®</sup> SPARTAN<sup>®</sup> SR**Product Class:** Cast Boosters**Product Appearance & Odor:** Tan to brown solid with no odor. May also be silvery gray. Packaged in paper or plastic tube.**DOT Hazard Shipping Description:** Booster 1.1D UN0042 II**NFPA Hazard Classification:** Not Available (See Section IV - Special Fire Fighting Procedures)

## SECTION II - HAZARDOUS INGREDIENTS

Ingredients:	CAS#	% (Range)	Occupational Exposure Limits	
			ACGIH TLV-TWA	OSHA PEL-TWA
Pentaerythritol Tetranitrate (PETN)	78-11-5	35-70	None Established	None Established
Trinitrotoluene	118-96-7	30-50	0.1 mg/m <sup>3</sup> (skin)	1.5 mg/m <sup>3</sup> (skin)
RDX	121-82-4	0-25	0.5 mg/m <sup>3</sup> (skin)	1.5 mg/m <sup>3</sup> (skin)
HMX	2691-41-0	0-5	None Established	None Established
Aluminum	7429-90-5	0-15	10 mg/m <sup>3</sup> (dust)	15 mg/m <sup>3</sup> (total)

Ingredients, other than those mentioned above, as used in this product are not hazardous as defined under current Department of Labor regulations, or are present in de minimus concentrations (less than 0.1% for carcinogens, less than 1.0% for other hazardous materials).

# Material Safety Data Sheet

## SECTION III - PHYSICAL DATA

**Melting Point:** 176° F (80° C) (TNT)  
**Vapor Density:** Not applicable  
**Percent Volatile by Volume:** Not applicable  
**Evaporation Rate (Butyl Acetate = 1):** Not applicable

**Vapor Pressure:** 0.042mm Hg at 80° C (TNT)  
**Density:** 1.55 - 1.65 g/cc  
**Solubility in Water:** < 0.01%

## SECTION IV - FIRE AND EXPLOSION HAZARD DATA

**Flash Point:** Not applicable  
**Extinguishing Media:** (See Special Fire Fighting Procedures section).  
**Special Fire Fighting Procedures:** Do not attempt to fight fires involving explosive materials. Evacuate all personnel to a predetermined safe location, no less than 2,500 feet in all directions.  
**Unusual Fire and Explosion Hazards:** Can explode or detonate under fire conditions. Burning material may produce toxic vapors.

**Flammable Limits:** Not applicable

## SECTION V - HEALTH HAZARD DATA

### Effects of Overexposure

**Eyes:** Particulates in the eye may cause irritation, redness, and tearing. Prolonged or repeated contact may cause cataracts, optic neuritis, blurred vision or amblyopia.

**Skin:** Prolonged contact may cause irritation, severe eczema and sensitization dermatitis. TNT may be absorbed through the skin, which may be indicated by orange staining on exposed skin. See systemic effects below.

**Ingestion:** Harmful if swallowed. See systemic effects below.

**Inhalation:** Inhalation of dusts may cause irritation, sneezing or coughing. See systemic effects below.

**Systemic or Other Effects:** TNT is an irritant, neurotoxin, hepatotoxin, nephrotoxin and bone marrow depressant. Although exposure is unlikely, acute or chronic exposure may cause sensitization dermatitis, headache, dizziness, jaundice, lethargy, or problems with the liver or blood such as toxic nephritis, aplastic anemia, hemolytic anemia or methemoglobin formation. PETN is a known coronary vasodilator, and ingestion or inhalation may result in a lowering of blood pressure, headache or faintness, and a decreased tolerance for grain alcohol. Repeated over-exposure may result in chest pains in the absence of exposure.

### Emergency and First Aid Procedures

**Eyes:** Irrigate with running water for at least fifteen minutes. If irritation persists, seek medical attention.

**Skin:** Remove contaminated clothing. Wash skin thoroughly with soap and water.

**Ingestion:** Seek medical attention.

**Inhalation:** In case of irritation, remove to fresh air. Seek medical attention if chronic symptoms occur.

**Special Considerations:** None.

## SECTION VI - REACTIVITY DATA

**Stability:** Stable under normal conditions, may explode when subjected to fire, supersonic shock or high-energy projectile impact, especially when confined or in large quantities.

**Conditions to Avoid:** Keep away from heat, flame, friction, impact, ignition sources and strong shock.

**Materials to Avoid (Incompatibility):** Corrosives (strong acids and bases or alkalis).

**Hazardous Decomposition Products:** Nitrogen Oxides (NO<sub>x</sub>), Carbon Monoxide (CO)

**Hazardous Polymerization:** Will not occur.

# Material Safety Data Sheet

## SECTION VII - SPILL OR LEAK PROCEDURES

**Steps to be taken in Case Material is Released or Spilled:** Protect from all ignition sources. In case of fire evacuate area not less than 2,500 feet in all directions. Notify authorities in accordance with emergency response procedures. Only personnel trained in emergency response should respond. If no fire danger is present, and product is undamaged and/or uncontaminated, repackage product in original packaging or other clean DOT approved container. Ensure that a complete account of product has been made and is verified. Follow applicable Federal, State and local spill reporting requirements.

**Waste Disposal Method:** Disposal must comply with Federal, State and local regulations. If product becomes a waste, it is potentially regulated as a hazardous waste as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR, part 261. Review disposal requirements with a person knowledgeable with applicable environmental law (RCRA) before disposing of any explosive material.

## SECTION VIII - SPECIAL PROTECTION INFORMATION

**Ventilation:** Not required for normal handling.

**Respiratory Protection:** None normally required.

**Protective Clothing:** Non-permeable gloves and work clothing that reduce skin contact are recommended.

**Eye Protection:** Safety glasses are recommended.

**Other Precautions Required:** None.

## SECTION IX - SPECIAL PRECAUTIONS

**Precautions to be taken in handling and storage:** Store in cool, dry location. Store in compliance with all Federal, State and local regulations. Keep away from heat, flame, ignition sources or strong shock.

**Precautions to be taken during use:** Avoid breathing the fumes or gases from detonation of explosives. Use accepted safe industry practices when using explosive materials. Unintended detonation of explosives or explosive devices can cause serious injury or death.

**Other Precautions:** It is recommended that users of explosives material be familiar with the Institute of Makers of Explosives Safety Library publications.

## SECTION X - SPECIAL INFORMATION

This product contains the following substances that are subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

<u>Chemical Name</u>	<u>CAS Number</u>	<u>% By Weight</u>
None Applicable		

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# BLASTEX®

## Technical Information



## Small & Large Diameter Cast Booster Sensitive Emulsion



### Product Description

BLASTEX is a booster sensitive, water resistant, packaged emulsion explosive designed to satisfy a majority of medium diameter explosive applications for quarry and construction blasting. It is a cost effective alternative to most detonator sensitive, water resistant, packaged emulsion explosives. BLASTEX is available in two grades with increasing energy level for each.

### Application Recommendations

- Package diameter and type affect product density. Use cartridge count to determine actual explosive charge weight.
- Ensure continuous column loading. For column lengths in excess of 6 m (20 ft) or whenever column separation is suspected, multiple priming is recommended.
- Emulsion explosives are susceptible to "dynamic shock" and may detonate at low order or fail completely when applied in very wet conditions, where explosive charges or decks are closely spaced and/or where geological conditions promote this effect. Consult your Dyno Nobel representative for alternate product recommendations when these conditions exist.
- **ALWAYS** use a cast booster as a primer for BLASTEX to ensure maximum performance.
- **ALWAYS** use a 340 g (12 oz) or larger cast booster at internal product temperatures higher than -18° C (0° F). At internal product temperatures below -18° C (0° F) and higher than -34° C (-30° F) use a 454 g (16 oz) or larger cast booster.
- **NEVER** use BLASTEX at internal product temperatures below -34° C (-30° F). At internal product temperatures below -34° C (-30° F), adequate product warm-up time must be allowed after loading into boreholes and before initiation.
- Use with detonating cord is not recommended.

## Properties

MSDS  
#1063

	BLASTEX	BLASTEX PLUS
<b>Density</b> (g/cc) Avg	1.26	1.26
<b>Energy<sup>a</sup></b> (cal/g)	740	800
(cal/cc)	930	1,010
<b>Relative Weight Strength<sup>a</sup></b>	0.84	0.91
<b>Relative Bulk Strength<sup>a,b</sup></b>	1.29	1.40
<b>Velocity<sup>c</sup></b> (m/s)	5,000	4,900
(ft/s)	16,400	16,100
<b>Detonation Pressure<sup>c</sup></b> (Kbars)	79	76
<b>Gas Volume<sup>a</sup></b> (moles/kg)	44	39
<b>Fume Class</b>	IME1 & NRCan <sup>d</sup>	IME1
<b>Shelf Life Maximum</b>	1 year (from date of production)	
<b>Maximum Water Depth</b>	45 m (150 ft)	
<b>Water Resistance</b>	Excellent	

<sup>a</sup> All Dyno Nobel Inc. energy and gas volume values are calculated using PRODET™ the computer code developed by Dyno Nobel Inc. for its exclusive use. Other computer codes may give different values.

<sup>b</sup> ANFO = 1.00 @ 0.82 g/cc

<sup>c</sup> Unconfined @ 75 mm (3 in) diameter

<sup>d</sup> Approved by Natural Resources Canada as Fume Class 1 in valeron chub package in all diameters greater than 50 mm (2 in) and **only** in diameters greater than 125 mm (5 in) in shot bags.

### Hazardous Shipping Description

Explosive, Blasting, Type E, 1.5D, UN 0332 II



# BLASTEX®



## Transportation, Storage and Handling

- BLASTEX and BLASTEX PLUS must be transported, stored, handled and used in conformity with all applicable federal, state, provincial and local laws and regulations.
- Packaged emulsions have a shelf life of one (1) year when stored at temperatures between -18° C and 38° C (0° F and 100° F). Explosive inventory should be rotated. Avoid using new materials before the old. For recommended good practices in transporting, storing, handling and using this product, see the booklet "Prevention of Accidents in the Use of Explosive Materials" packed inside each case and the Safety Library Publications of the Institute of Makers of Explosives.

## Packaging Details

- Package diameter and type affect product density. Use cartridge count to determine actual explosive charge weight.
- All weights are approximate.
- BLASTEX and BLASTEX PLUS are available in a wide variety of sizes. Custom sizes are subject to surcharge and may require longer than usual lead times.
- Check with your Dyno Nobel representative should you have any questions.

## Packaging = Chub

Diameter x Length		Blastex	Blastex Plus	Case Quantity	Pallet Box Quantity	Case Weight		Net Explosive Weight / Chub	
mm	in					kg	lbs	kg	lbs
50 x 400	2 x 16	■	■	18	N/A	18.0	40	1.00	2.20
57 x 400	2¼ x 16	■	■	14	N/A	17.7	39	1.26	2.78
65 x 400	2½ x 16	■	■	12	N/A	18.1	40	1.51	3.33
65 x 862	2½ x 34	■		N/A	250	909	2,000	3.63	8.00
70 x 400	2¾ x 16	■	■	9	N/A	17.3	38	1.92	4.23
70 x 862	2¾ x 34	■		N/A	222	908	1,998	4.09	9.00
75 x 400	3 x 16	■	■	8	N/A	18.2	40	2.27	5.00
75 x 862	3 x 34	■		N/A	200	909	2,000	4.54	10.00
89 x 400	3½ x 16	■	■	6	N/A	16.7	37	2.77	6.11

## Case Dimensions

44 x 35 x 20 cm      17.25 x 13.875 x 7.875 in

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**DYNO**  
 Dyno Nobel

Groundbreaking Performance

# Material Safety Data Sheet

## Dyno Nobel Inc.

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Salt Lake City, Utah 84121

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E-Mail: [dna.hse@am.dynonobel.com](mailto:dna.hse@am.dynonobel.com)

FOR 24 HOUR EMERGENCY, CALL CHEMTREC (USA) 800-424-9300  
CANUTEC (CANADA) 613-996-6666

MSDS # 1063

Date 01/20/11

Supersedes

MSDS # 1063 09/16/10

## SECTION I - PRODUCT IDENTIFICATION

### Trade Name(s):

BLASTEX <sup>®</sup>	DYNO <sup>®</sup> 1.5 SB
BLASTEX <sup>®</sup> PLUS	DYNO <sup>®</sup> 1.5 SBC
BLASTEX <sup>®</sup> PLUS HD	DYNO <sup>®</sup> 1.5 SB30
BLASTEX <sup>®</sup> TX	DYNO <sup>®</sup> 900
BLASTEX <sup>®</sup> PLUS TX	DYNO <sup>®</sup> 1300
BLASTGEL <sup>®</sup> 1000	DYNO <sup>®</sup> 1500
BLASTGEL <sup>®</sup> 1070	DYNO <sup>®</sup> 1520
SUPER BLASTEX <sup>®</sup>	DYNO <sup>®</sup> 1540
SUPER BLASTEX <sup>®</sup> TX	DYNOTEX
SUPER BLASTEX <sup>®</sup> TX	DX-2011
	DX-2012

**Product Class:** Emulsion Explosives, Packaged

**Product Appearance & Odor:** White or pink opaque semi-solid, which will appear gray if product contains aluminum. Little or no odor. Packaged in cylindrical cartridges of paper or plastic film.

**DOT Hazard Shipping Description:** UN0332 Explosive, blasting, type E 1.5D II

**NFPA Hazard Classification:** Not Applicable (See Section IV - Special Fire Fighting Procedures)

## SECTION II - HAZARDOUS INGREDIENTS

<u>Ingredients:</u>	<u>CAS#</u>	<u>% (Range)</u>	<u>Occupational Exposure Limits</u>	
			<u>ACGIH TLV-TWA</u>	<u>OSHA PEL-TWA</u>
Ammonium Nitrate	6484-52-2	60-85	None	None
Sodium Nitrate	7631-99-4	0-12	None	None
Methylamine Nitrate*	22133-87-7	0-3	None	None
Aluminum	7429-90-5	0-10	10 mg/m <sup>3</sup> (dust)	15 mg/m <sup>3</sup> (total)
Mineral Oil	64742-35-4	0-6	5 mg/m <sup>3</sup> (mist)	None
Kerosene	8008-20-6	0-6	None	None

\* This ingredient may be used only in products produced at the Paige Plant.

Ingredients, other than those mentioned above, as used in this product are not hazardous as defined under current Department of Labor regulations, or are present in de minimus concentrations (less than 0.1% for carcinogens, less than 1.0% for other hazardous materials).

# Material Safety Data Sheet

## SECTION III - PHYSICAL DATA

**Boiling Point:** Not Applicable

**Vapor Density:** (Air = 1) Not Applicable

**Percent Volatile by Volume:** <20 (water)

**Evaporation Rate (Butyl Acetate = 1):** <1

**Vapor Pressure:** Not Applicable

**Density:** 1.15-1.35 g/cc

**Solubility in Water:** Product partially dissolves very slowly in water.

## SECTION IV - FIRE AND EXPLOSION HAZARD DATA

**Flash Point:** >100°C

**Flammable Limits:** Not Applicable

**Extinguishing Media:** (See Special Fire Fighting Procedures section.)

**Special Fire Fighting Procedures:** Do not attempt to fight fires involving explosive materials. Evacuate all personnel to a predetermined safe location, no less than 2,500 feet in all directions.

**Unusual Fire and Explosion Hazards:** Can explode or detonate under fire conditions. Burning material may produce toxic vapors.

## SECTION V - HEALTH HAZARD DATA

### Effects of Overexposure

**Eyes:** May cause irritation, redness and tearing.

**Skin:** Prolonged contact may cause irritation.

**Ingestion:** Large amounts may be harmful if swallowed.

**Inhalation:** Not a likely route of exposure.

**Systemic or Other Effects:** None known.

### Emergency and First Aid Procedures

**Eyes:** Irrigate with running water for at least 15 minutes. If irritation persists seek medical attention.

**Skin:** Remove contaminated clothing. Wash with soap and water.

**Ingestion:** Seek medical attention.

**Inhalation:** If irritation occurs, remove to fresh air.

**Special Considerations:** None.

## SECTION VI - REACTIVITY DATA

**Stability:** Stable under normal conditions, may explode when subjected to fire, supersonic shock or high-energy projectile impact, especially when confined or in large quantities.

**Conditions to Avoid:** Keep away from heat, flame, ignition sources and strong shock.

**Materials to Avoid (Incompatibility):** Corrosives (strong acids and strong bases or alkalis).

**Hazardous Decomposition Products:** Nitrogen Oxides (NO<sub>x</sub>), Carbon Monoxide (CO)

**Hazardous Polymerization:** Will not occur

# Material Safety Data Sheet

## SECTION VII - SPILL OR LEAK PROCEDURES

**Steps to be taken in Case Material is Released or Spilled:** Protect from all ignition sources. In case of fire evacuate area not less than 2,500 feet in all directions. Notify authorities in accordance with emergency response procedures. Only personnel trained in emergency response should respond. If no fire danger is present, and product is undamaged and/or uncontaminated, repackage product in original packaging or other clean DOT approved container. Ensure that a complete account of product has been made and is verified. Follow applicable Federal, State, and local spill reporting requirements.

**Waste Disposal Method:** Disposal must comply with Federal, State and local regulations. If product becomes a waste, it is potentially regulated as a hazardous waste as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR, part 261. Review disposal requirements with a person knowledgeable with applicable environmental law (RCRA) before disposing of any explosive material.

## SECTION VIII - SPECIAL PROTECTION INFORMATION

**Ventilation:** Not required for normal handling.

**Respiratory Protection:** None normally required.

**Protective Clothing:** Gloves and work clothing that reduce skin contact are suggested.

**Eye Protection:** Safety glasses are recommended.

**Other Precautions Required:** None.

## SECTION IX - SPECIAL PRECAUTIONS

**Precautions to be taken in handling and storage:** Store in cool, dry, well-ventilated location. Store in compliance with Federal, State and local regulations. Keep away from heat, flame, ignition sources and strong shock.

**Precautions to be taken during use:** Avoid breathing the fumes or gases from detonation of explosives. Use accepted safe industry practices when using explosive materials. Unintended detonation of explosives or explosive devices can cause serious injury or death.

**Other Precautions:** It is recommended that users of explosive materials be familiar with the Institute of Makers of Explosives Safety Library Publications.

## SECTION X - SPECIAL INFORMATION

The reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR 372 may become applicable if the physical state of this product is changed to an aqueous solution. If an aqueous solution of this product is manufactured, processed, or otherwise used, the nitrate compounds category and ammonia listing of the previously referenced regulation should be reviewed.

### **Disclaimer**

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## Appendix B: Revised Effects Table

**HISTORIC PROPERTY/PROPERTIES AFFECTED TABLE**  
**RESULTS OF EFFECT EVALUATION FOR**  
**Newington Center Historic District, Newington**  
**Seacoast Reliability Project, 2019**

**Significance (including Criteria):**

The Newington Center Historic District was listed in the National Register of Historic Places in 1987 and expanded in 1991. Newington Center is significant under National Register Criteria A and C. The identified Areas of Significance are Settlement and Architecture. According to the 1987 nomination, the Newington Center Historic District has served as the local center of political, religious, educational and social activity since the early 1700s. The buildings of the district illustrate a broad range of architectural history, as well as an evolution of changing community needs and expectations from the eighteenth to twentieth century. Except for those destroyed by fire over the years, all of the original town center buildings survive in a very good state of preservation. Landscape and setting were identified as components of the district’s significance. Character-defining features include the early meetinghouse and parsonages, brick town hall and library and stone schoolhouse, as well as the town cemetery, parade ground, historical monuments and markers, roadside stone walls and open hay fields indicative of the town’s agricultural heritage. All of the buildings front on Nimble Hill Road. The Frink Farm, which forms the northern end of the district at 272 Nimble Hill Road, has an early nineteenth century brick farmhouse and a large New England barn, set on over forty acres. Scenic views are a component of the district, including views along Nimble Hill Road and across the Frink field. The district was enlarged in 1991 to include the historic Newington Town Forest. The period of significance for the district runs from 1710 to 1941, the fifty year cutoff date for National Register eligibility at the time of listing in 1991. The electric utility right-of-way through the Frink field dates from 1952, after the period of significance for the district and is not a contributing feature. The only changes made since the National Register listing were the construction of one new house and an addition to the library.

**NR Boundary (description/justification):**

According to the original 1981 NR nomination and 1991 expansion, the boundary of the historic district was drawn to include the surviving acreage associated with the original town center. It is bounded on the south and east by the Pease International Tradeport. The district includes acreage associated with the Frink Farm west of Old Post Road and Nimble Hill Road and properties on both sides of Nimble Hill Road south of Little Bay Road. The Town Forest extends east beyond Arboretum Drive to the Pease border. The district contains a total of approximately 161 acres.

**Individual Properties**

NR	SR	
<input type="checkbox"/>	<input type="checkbox"/>	Eligible (district N/A)
<input type="checkbox"/>	<input type="checkbox"/>	Eligible, also in district
<input type="checkbox"/>	<input type="checkbox"/>	Eligible, only in district
<input type="checkbox"/>	<input type="checkbox"/>	Listed in the NRHP
<input type="checkbox"/>	<input type="checkbox"/>	Not evaluated for individual eligibility

**Districts**

NR	SR	
<input type="checkbox"/>	<input type="checkbox"/>	Eligible
<input type="checkbox"/>	<input type="checkbox"/>	Not eligible
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Listed in the NRHP
<input type="checkbox"/>	<input type="checkbox"/>	Not evaluated as a district

**RELATIONSHIP OF PROPOSED ACTION TO HISTORIC RESOURCE**



The Seacoast Reliability Project will pass directly through the Newington Center Historic District in an existing electric utility corridor. The 100'-wide right of way passes east-west parallel to Little Bay Road for roughly 0.27 miles across the Frink Farm in the northern part of the historic district west of Nimble Hill Road. During the initial assessment of effects, the Applicant opted to minimize visual impacts to the Newington Center Historic District by constructing the line underground in the existing corridor across the Frink Field. Due to the presence of ledge in this area, the underground construction must include rock excavation approximately 525 feet from contributing structures including the Frink House, barn, and garage.

<b>DEFINITION OF EFFECT</b>	<b>EVALUATION</b>
<p>An effect may occur when there is alteration to the characteristics of a historic property qualifying it for inclusion in or eligible for the National Register as defined in Section 800.16(1).</p>	<p>The rock excavation necessary to install the underground portion of the Seacoast Reliability Project could have an effect on the Newington Center Historic District because it has the potential to damage a contributing structure, however, damage is unlikely given the vibration control/monitoring activities proposed by the Applicant.</p> <p>In order to avoid any impacts to the historic structures, the Applicant will conduct a pre-blast condition survey and a vibration monitoring plan to avoid any impacts to the historic structures.</p>
<b>RECOMMENDED FINDING</b>	Historic properties could be affected.

**APPLICATION OF THE CRITERIA OF ADVERSE EFFECT FOR  
Newington Center Historic District, Newington  
Seacoast Reliability Project, 2016**

**CRITERIA OF ADVERSE EFFECT**

An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register of Historic Places in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling or association. Consideration shall be given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property's eligibility for the National Register. Adverse Effects may include reasonably foreseeable effects caused by the undertaking that may occur late in time, be farther removed in distance or be cumulative.

Example of Adverse Effects, pursuant to Section 800.5(a)(2)	Evaluation
Adverse effects on historic properties include, but are not limited to:	
(i) Physical destruction of or damage to all or part of the property;	There may be physical impacts to the contributing features of the district due to ground vibration associated with rock excavation.
(ii) Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation and provision of handicapped access, that is not consistent with the Secretary's Standards for the Treatment of Historic Properties (36 CFR§68) and applicable guidelines;	None
(iii) Removal of the property from its historic location;	None
(iv) change of the character of the property's use or of physical features within the property's setting that contribute to its historic features;	None.
(v) Introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features;	None
(vi) Neglect of a property which causes its deterioration, except where such neglect and deterioration are recognized qualities of a property or religious and cultural significance to an Indian tribe or Native Hawaiian organization; and	None

(vii) Transfer, lease, or sale of property out of Federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance.	Not Applicable
(viii) OTHER:	None
RECOMMENDED FINDING	<p>Possible Adverse Effect: The proposed project could have an Adverse Effect on the Newington Center Historic District as vibration associated with rock excavation could physically damage contributing structures, however, damage is unlikely given the vibration monitoring activities proposed by the Applicant including a pre-blast condition survey and a vibration monitoring plan.</p> <p>If the Applicant is successful in minimizing vibration during rock excavation, the contributing structures will not incur physical impacts and the finding would change to No Adverse Effect.</p>

**Sources:**

Mausolf, Lisa  
1987 Newington Center Historic District National Register of Historic Places Inventory  
- Nomination Form.

Mausolf, Lisa  
1991 Newington Center Historic District Boundary Increase National Register of  
Historic Places Inventory - Nomination Form.

## Newington Center Historic District, Newington



Satellite image from Google Earth showing the Newington Center Historic District boundary (black line), the Project (proposed structures are indicated by red dots and utility right of way by red lines), and indirect APE line (in yellow)



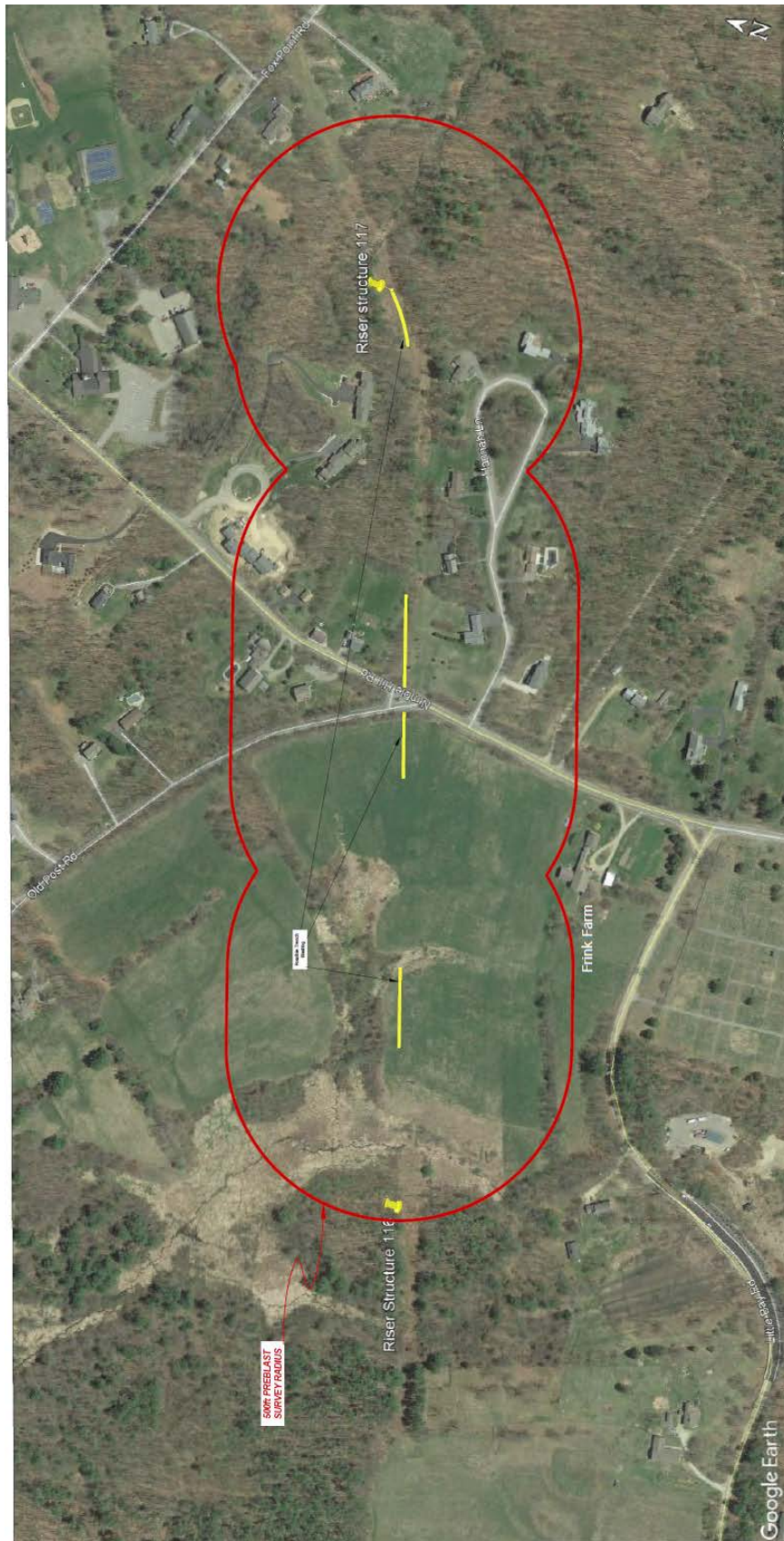


Newington Center Historic District and Project area, bird's eye view facing north (Bing Maps)



Newington Center Historic District - Frink Farm, facing southwest from Nimble Hill Road at Project location, showing existing distribution line to be removed.





Newington Center Historic District and proposed blasting locations (yellow line segments), bird's eye view facing northeast (Google Maps).