Maine Drilling & Blasting

EXHIBIT 3*

Sherman Road
Chestnut Hill, MA

August 17, 2018

Prepared For:

Chestnut Hill Reality
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*Appendix omitted; on file with Board of Appeals

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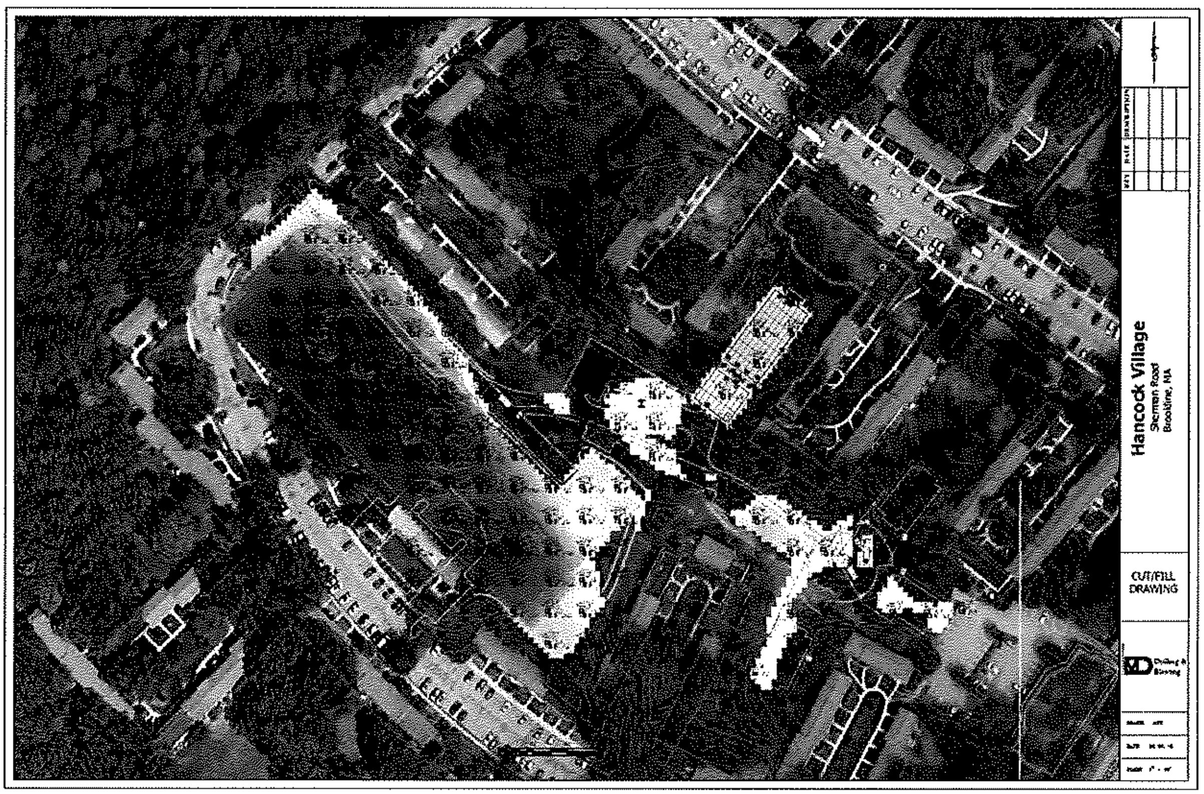
Introduction

This project involves the construction of a residential unit structure designed to concentrate the construction footprint and minimize impact to the natural setting of the property. The challenge in this project is design of a practical plan that affords the degree of control necessary for the setting. The design must be appropriate for the environment. The proposed project is bracketed by the historic Hancock Village. Conservation land lies to the west, northwest and southwest of the "Village" The Baker Elementary School abuts the "Village" to the North. The Controlled Blast Plan must take into consideration the human and structural response presented by the required rock excavation. The purpose of this plan is to advance the best available control technology and be flexible enough to utilize an array of instruments in combination, to best marginalize the invasive nature of the work and delineate the "Blasting Best Practices" that will effectively allow for rock excavation while protecting neighboring public and property; the environment; onsite construction personnel; as well as those directly involved in the excavation operation.

Exposed ledge surfaces and rock surface elevation information from test borings, and geotechnical data have been compared to project excavation design grades to estimate potential ledge excavation limits. This analysis is illustrated in the **Cut /Fill Drawing** (Appendix A).



Potential Ledge Excavation in Red

This plan has been developed to delineate details of procedures, and process, (including Industry and Regulatory guidelines) as well as information concerning tools and products that will be utilized to provide the necessary controls to safely fragment ledge, where required, for excavation. Elements included in this plan have been successfully employed in densely populated, vibration and/or environmentally sensitive, research, manufacturing, academic, historic and medical settings.

Pre-Blast Surveys / Notifications / Communication

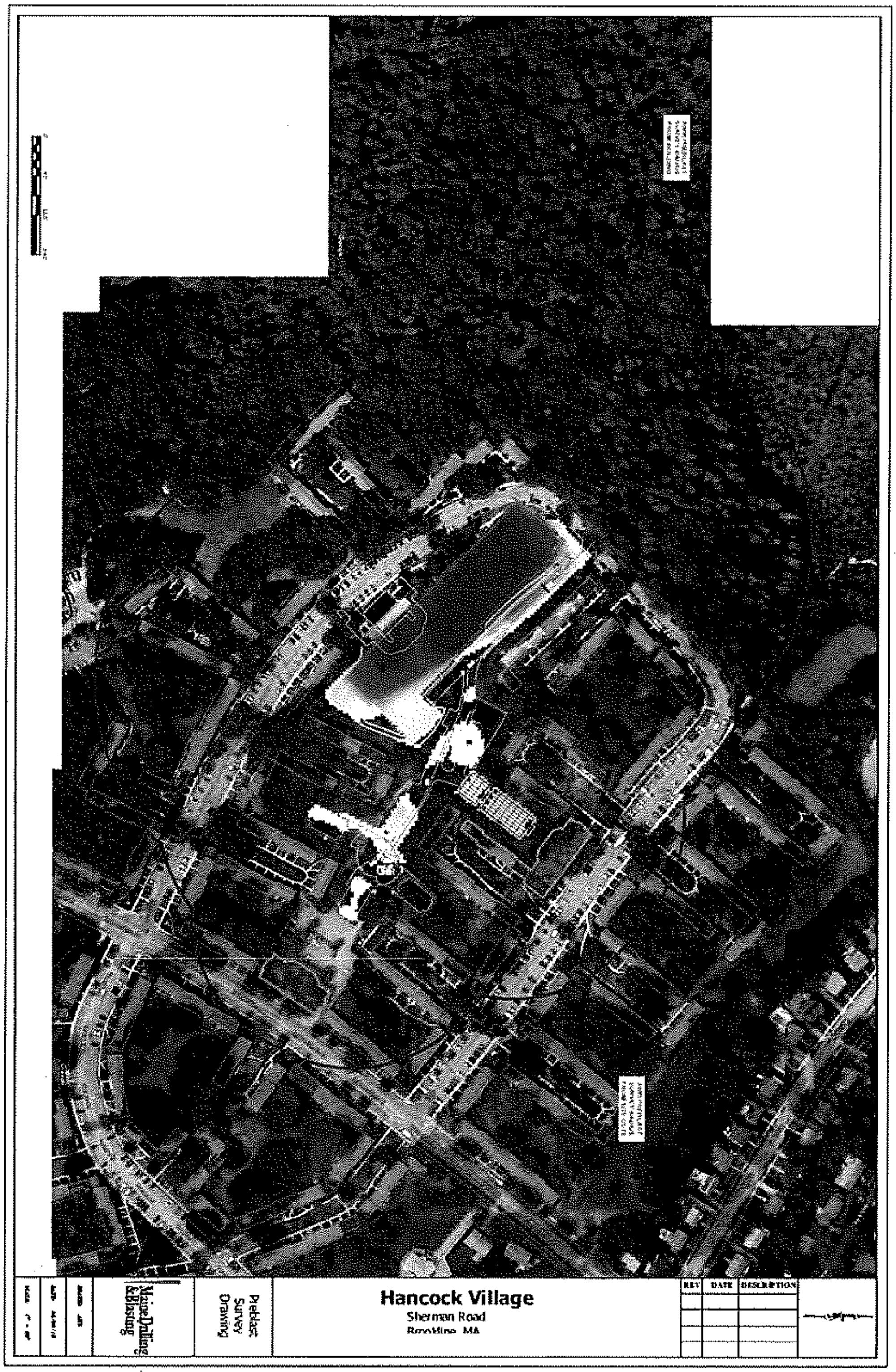
In Massachusetts, the standard prescribed by 527 CMR1: 65.9.15 requires all buildings and structures (not controlled by the project) within 250$^{ft.}$ of the closest bore hole, be surveyed to document their existing condition. The project conditions specify that pre-blast surveys be conducted for a radius of 300^{ft} from the blasting with the exception that surveys are to be extended to 500$^{ft.}$ from Building 12. The **Preblast Survey Drawing** (Appendix B) delineates this radius.

On occasion even if there is no regulatory or specification driven requirement technical value, project management may to choose to invest in strategic targeted pre-blast survey offerings and or notifications beyond specified limits. This is because vibration can be perceived at levels as low as 1/100th of the safe level for residential structure. When vibration generated from a new blasting operation is initially felt, the natural response of a home owner will often be a focused inspection of his or her home that will reveal pre-existing but unnoticed cracks (generated by natural environmental forces). These pre-existing defects will not be attributed to the project if they have previously identified to homeowner during a survey.

527 CMR 1 Code required notices will be given and appointments arranged for those owners who desire a survey. Pre-blast surveys will be conducted be a Pre-blast Survey Specialist having a minimum of five years of experience in structure condition documentation. Surveys will be conducted and documented as provided in 527 CMR 1 65.9.15.

Residents within the survey area will be provided with a written notification of the commencement of blasting operations with an explanation of blast warning signal sequence code. Neighbors providing contact information (email / phone) who request daily notification will be notified of blasting events.

A positive public relationship is essential to the successful build of any project. It is understood that good relationships are fostered by communication and trust. This is especially true when a project involves blasting. Based on positive historical experience by communities who have sponsored past programs, we recommend consideration be given to a pre-blast offering of a neighborhood informational/educational blasting presentation. Although this communication tool has been recognized and frequently promoted by MA DFS, it is an opportunity often un-availed prior to the commencement of blasting projects. MD&B has specifically developed an educational program presentation for this purpose.



Preblast Survey Radius Drawing

Blast Monitoring

All blasts will be monitored by a Monitoring Operator who has been properly trained in the setup and use of seismic monitoring equipment. Up to 4 seismographs may be deployed.

- The primary monitoring device will be located at the nearest inhabited building or structure adjacent to the blast area that is not owned, leased or controlled by the blasting operation CMR1: 65.9.14.4).
- A second monitor will be located at the nearest residence on Beverly Road
- A third monitor will be located at Owner controlled onsite structure.
- A forth monitor will be initially located at the Harvard Vanguard Atrius Medical Associates to validate Plan vibration analysis (current vibration estimates suggest vibration levels from proposed blasting at the facility will be below normal instrument trigger thresholds). This unit may be made available to be located at a location of later identified concern.

Prior to commencement of blasting operations, permission to monitor will be sought from the home / facilities owner or representative. If access should be denied, as required by CMR1: 65.9.14.4.1. The AHJ will be notified, and an alternate accessible location on public or controlled property will be selected. To represent the ground and air response at the identified structure, the chosen location should best match the distance and direction to the structure. Placement, set-up and use of monitoring equipment will be as specified by the manufacturer and delineated in the **2015 ISEE Field Practice Guidelines for Blasting Seismographs** (Appendix C). These Guidelines (referenced in CMR1: 65 NFPA 495 11.1.4) were developed by a Standards Committee comprised of seismograph manufacturers, researchers, regulatory personnel and seismograph users. As stated in the opening page of the document. "The goal of the Field Practice Guidelines for Blasting Seismographs is to develop uniform and technically appropriate standards for seismograph performance. The intent is to improve accuracy and consistency in ground vibration and air wave measurement". The above paragraph concludes with the statement, "Seismograph performance is affected by how the seismograph is built and how it is placed in the field". In Part II, Ground Vibration Monitoring, particular emphasis is given to two critical factors: placement and coupling. The sensor must be placed within $10^{ft.}$ of the structure, in undisturbed or soil matching sensor density. The sensor must be effectively coupled. Acceleration level and soil medium affect proper coupling. The guidelines spell out stepped levels of installation measures required to insure coupling. Collection of accurate data is not only expected from a compliance perspective but is instrumental in accurate evaluation of design performance. Post event, ground and air response data must be analyzed along with other shot performance indicators allowing blast design to be a dynamic process of design refinement. Monitoring equipment must meet the **ISEE performance Standards** (Appendix C). Current calibration certificates will be provided prior to unit installation upon request.

Sequence of Blasting

Blasting operations will be coordinated with project management, construction site supervision and local AHJ. Emphasis will be on the safe and efficient fragmentation of the rock on this project without impact to the environment or surrounding structures. Blasting is intimately tied to excavation. On projects where the dominate material to be excavated is ledge, blasting and excavation operations must sequence in concert. Blasts in the building footprint will initially be developed to create north-westerly relief which will advantage existing relief and encourage displacement in a favorable direction with respect to the closest existing structures. The initial Test Blast will be located at the level II garage access at Sherman Rd. The location will develop access to the upper excavation bench and facilitate material export. The location will also facilitate development ground and air response attenuation relationships in a shallow cut area affording opportunity to refine design as we approach the deeper cuts to the south-east within the building and approach the closest existing structure to the north-east and south-west. When the test blast program has verified the blast plan designs, we will sequence south-east, establishing a north-east / south-west working face expanded to the width of the garage excavation cut. The intent will be to leave a buffer strip between the closest structures along the proposed lower level access drive. The buffer must be left wide enough to prove safe drilling access. This will create relief to fold the reverse ledge slope internally. The back side of the reverse slope will bermed with shot rock for drilling / matting access and displacement control. Experience has shown advantage to incorporating the following elements into our design strategy:

1. Linear energy dissipation over a long working face (spatial distribution)
2. Relief encouraged by shallow depth to width ratio design
3. Air response and shot cast suppression by deliberate muck pile confinement of face
4. Face confinement compensated by lateral and if required vertical delay sequencing
5. Matting access enhanced by limiting shot depth to excavator reach. Reach maximized by mat placement from graded shot rock of the previous shot.

Hours of Operations

- Drilling and Blasting operations shall coincide with project construction work hours, Monday through Friday.
- Blast events will be scheduled between the hours of 9:00 am and 4:00 pm
- 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.

Scheduling

By law, the blaster must limit his blast site access to personnel necessary to the drilling and blasting operation. He will need cooperation from other entities competing for the same footprint. Cost effective site management has recognized a value in dollars and overall schedule by planning and executing required blasting in advance of other competing construction activities. Specifications for green concrete in a blast area will often have a dramatic effect on productivity of both blasting and concrete work. The need to minimize the disruption of onsite or offsite activities by blast events must be balanced with the need to minimize the overall duration of disruption caused by the blast project. Safety must always take precedence over convenience. Our experience has shown a single blast event at a regularly scheduled time, provides the most manageable schedule for all involved. This is accomplished by incorporating a full day's work into a single blast event, at the end of the day (within the allowed window for blasting). However circumstances may present (proximity to structure and applicable limits) that will scale event size making a single blast event impractical. For example, if the limits of blast design, on average incorporated only 25% of one day's work, a single daily blast event would increase the duration of the blast project by a factor of four. The required ledge excavation; vibration limits and proximity to structure will dictate a very conservative shot design that may require up to three blast event windows per day.

Some Rules of Thumb:

- Minimize blast events to the degree practical.
- If possible, seek event windows of mutual convenience (within technically achievable limits).
- Inflexible scheduling is invariably achieved at the expense of safety.
- Communicate. Establish representatives to coordinate blast event notification. Minimize links in chain of communication. Establish K.I.S.S. protocol. The blaster in charge should be focused on the safe execution of the blast plan and not wholly absorbed in a complicated notification sequence.

Shot Cast Control

Matting, delay sequencing, backfill and berming will be used to control excessive amounts of rock movement. Shot rock will be used to construct a matting access platform that functions as a stable surface to safely and precisely place mats. The platform also serves to both contain horizontal displacement and as a footing support mats draped on grades. Placement and density of mats are based on existing / designed relief, berming and proximity to protected structure. Placement and density based on these metrics are determined by the blaster. Mats will be placed so as to protect all people and structures on, or surrounding the blast site and property. Heavy duty cabled rubber tire type blasting mats will be utilized on this project and will be approximately 12' x 24' in size; Rubber mat @ 12' x 24' 38 lbs. / sf. = 10,944 lbs. (**Dynamat data sheet** can be found in Appendix D).

Blast Area Security, Warning Signs & Signals

The Blaster in Charge along with site management will develop a written **Site Security Plan** (sample provided in the Appendix E) identifying as a minimum the blast area, equipment requiring removal, blast area access points, sentry locations and designated "safe area(s)". Blast Area and Blast Signal Code signs will be posted per CMR 1, 65.9.8.4.1 requirements. Areas in which charged holes are awaiting firing shall be guarded, barricaded and posted, or flagged against unauthorized entry. The required rock excavation is in close proximity to Sherman Road. The blast area secured perimeter will include portions of the roadway. Pedestrian and vehicular traffic on Sherman Road will be briefly interrupted for the event. The secured period will be similar to a traffic light sequence.

Each blast will be preceded by a security check of the controlled area and then a series of warning signals. Communications will be made with job site management, local authority and neighbors as required to ensure the safest possible Blast Operations. All personnel in the vicinity closest to the blast area will be warned. A sign displaying the warning signal sequence will be conspicuously posted at the project. CMR1 requires the signal be audible at a distance of 250ft from blast site. Project Conditions require the signal be audible at distance of 500ft for this project.

The warning signal sequence will be:

3 Audible Signal Pulses - 5 Minutes to Blast

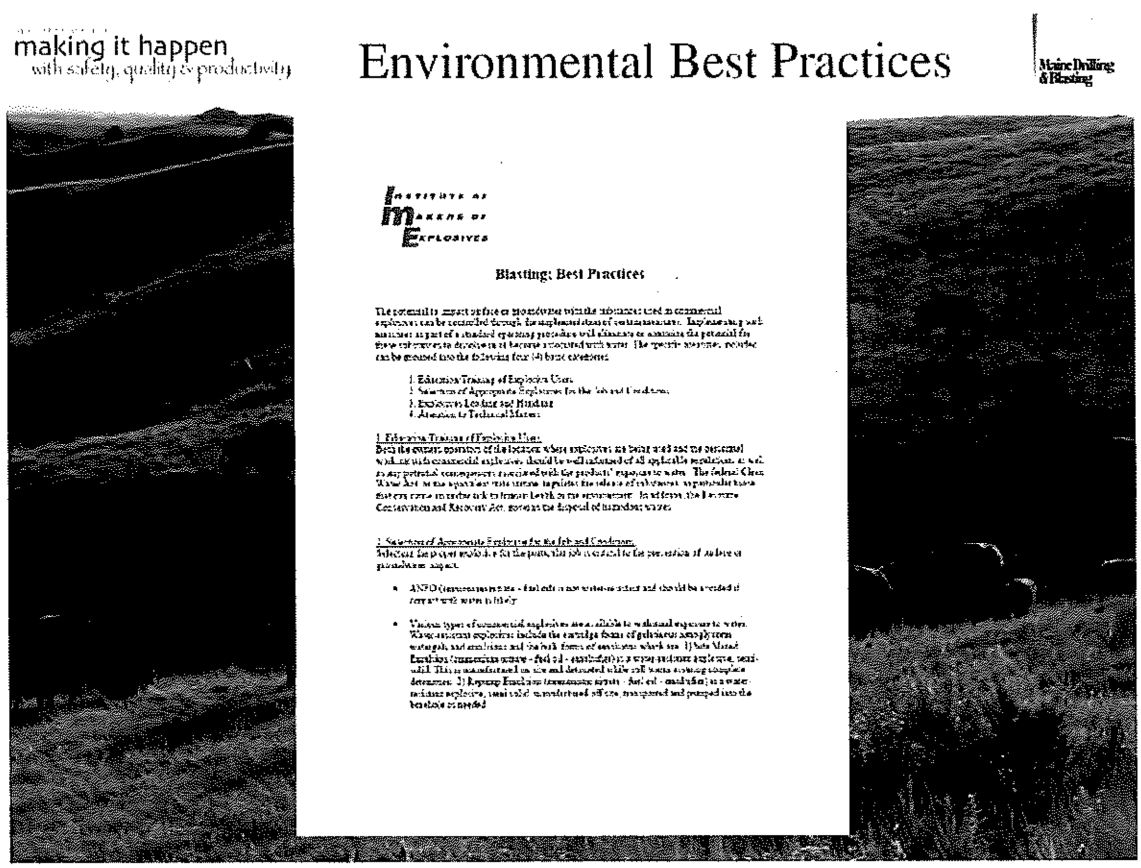
2 Audible Signal Pulses - 1 Minute to Blast

1 Audible Signal pulse - All Clear

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

Blaster Qualifications and Training

The "Blaster in Charge" on this job will be licensed in the State of MA and have received training in the safe use and handling of explosives. All employees handling explosives will have been granted Employee Possessor Clearance from the DOJ BATFE. All employees transporting explosives will have been granted an HME with USDHS TSA clearance. Blasters will have received training and be familiar with MSHA/OSHA Regulations, State Regulations, and Federal Regulations regarding construction site safety, including transportation, use, and handling of explosive materials. Prior to the commencement of initial work, an in depth, site specific, a **Job Hazard Analysis** (sample Appendix F) will be developed by project and site management and thoroughly considered with all crew members. A daily site specific **Pre-Task Analysis** (sample Appendix F) will be conducted on- site by the Project foreman. Contractor input and participation is encouraged. Safety document records are retained by the Blasting Contractor.



MDB Blaster training includes a formal program dedicated to the I.M.E. "Blasting; Best Practices" guidance document for the protection of surface and groundwater.

Licenses and Permits and Insurance

MD will provide (527 CMR 1) required documentation to the AHJ fully substantiating the license, insurance and bonding requirements for the transportation, use, and handling of explosives have been met. Application to the Brookline Fire Department for the Blasting Permit will be made by the Blaster/Foreman prior to commencement of blasting operations.

Fire details will be required during blasting operations.

The Project Conditions require the blasting contractor carry a minimum \$5,000,000.^{00} comprehensive insurance coverage. MD will carry \$10,000,000.^{00} of comprehensive coverage for this project.

Safe Limits for Ground and Air Response

Safe limits that have been adopted by industry and regulatory body alike were developed from 40 years of research done by US Bureau of Mines (USBM) and documented in the Bureau of Mines Report of Investigations 8507. These limits provide frequency based protection for sensitive construction materials (plaster) found in older and historic homes. The Safe Limit for old plaster is 0.50 in/s (below 10 Hz). One of the authors of RI 8507 and RI 8485, Dr. Siskind, stated 20 years later in his publication, "Vibrations from Blasting", "Research done since RI's 8485 and 8507 by the USBM and others has reaffirmed the conclusions from those studies even when the authors' intentions were to find exceptions (Siskind 1991)". In part the USBM research have with stood the scrutiny of time because the recommended levels produce strains less that those generate natural and man-made forces (see attached research references for "**Natural and Human Induced Vibrations in Homes**" Appendix G).

The "Safe Levels" for vibration from blasting developed in the RI 8507 study, incorporated into CMR1: 65.9.1 NFPA 495 11.2.1 and depicted below, are embedded in the compliance modules of all blasting seismographs.

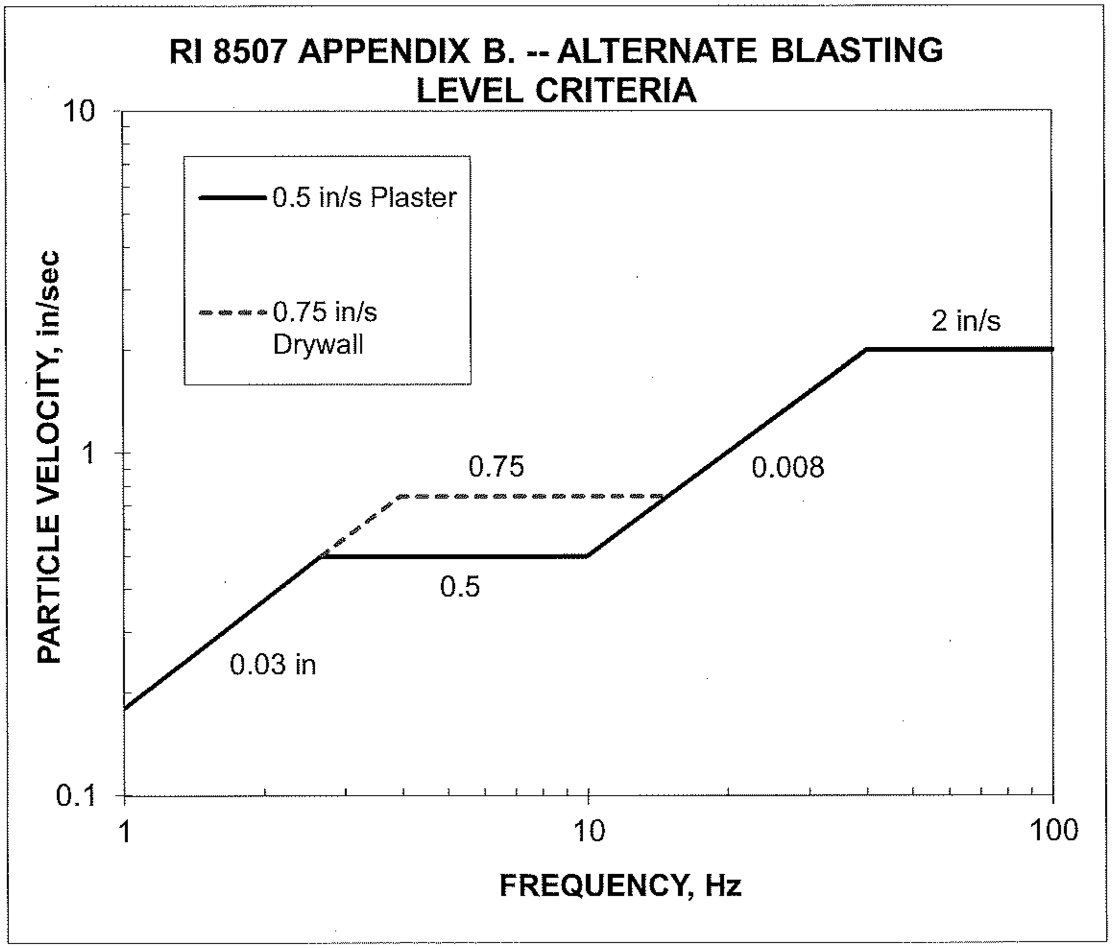


Figure B – 1. – Safe levels of blasting vibration using a combination of velocity and displacement

In RI 8485 The Bureau of Mines built on research that had previously determined "Safe Limits" for air response. In the Bureaus' conclusions on page 67 of the Report the authors indicate that the former "Safe Level" of 140 dB was "high enough to for significant annoyance" The new recommended level was designed to provide "annoyance acceptability". The recommended annoyance limit from this study (incorporated into CMR1 65.9.1 NFPA 495 11.3.1) for air response (as measured by ISEE approved blasting seismographs) is 133 dBL (.013psi) peak. This level is less than the pressure generated by a 20 mph gust of wind and well below levels that could be damaging.

Air overpressure levels will be limited to 133dBL (.013psi)

In the RI 8485 report the authors indicate a 20 mph gust can increase the pressure in the direction of the receiver 10 – 20 dB. The RI 8485 research concluded wind direction and speed have the greatest effect on air overpressure transmission. They identified thermal inversions as the second most influential factor. In addition to identifying natural influences, the report identifies the primary source of overpressure as an Air Pressure Pulse generated by the expansion of rock volume in the fragmentation process displacing the surrounding air mass. This audio is a fundamental part of the process and cannot be appreciably reduced. However, the lack of open faces and relatively small charge weights and volumes generated by project designs will considerably limit the APP as compared to mine blasts. Two other sources related to confinement can be influenced by design. Because the acoustics of any given blast are complex and are comprised of both controllable and uncontrollable elements, it is not uncommon for overpressure histories from well-designed "like" blasts to range 20 dB at a given receiver.

Environmental Considerations

All explosives will be handled according to the current version of the IME Best Practices

INSTITUTE OF
MAKERS OF
EXPLOSIVES

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.

Dust control during drilling operations is facilitated through the use of integrated vacuum dust collector and vapor systems installed by the manufacturer of the drilling equipment.

All storm water runoff and groundwater plans will be by the site contractor

Explosives

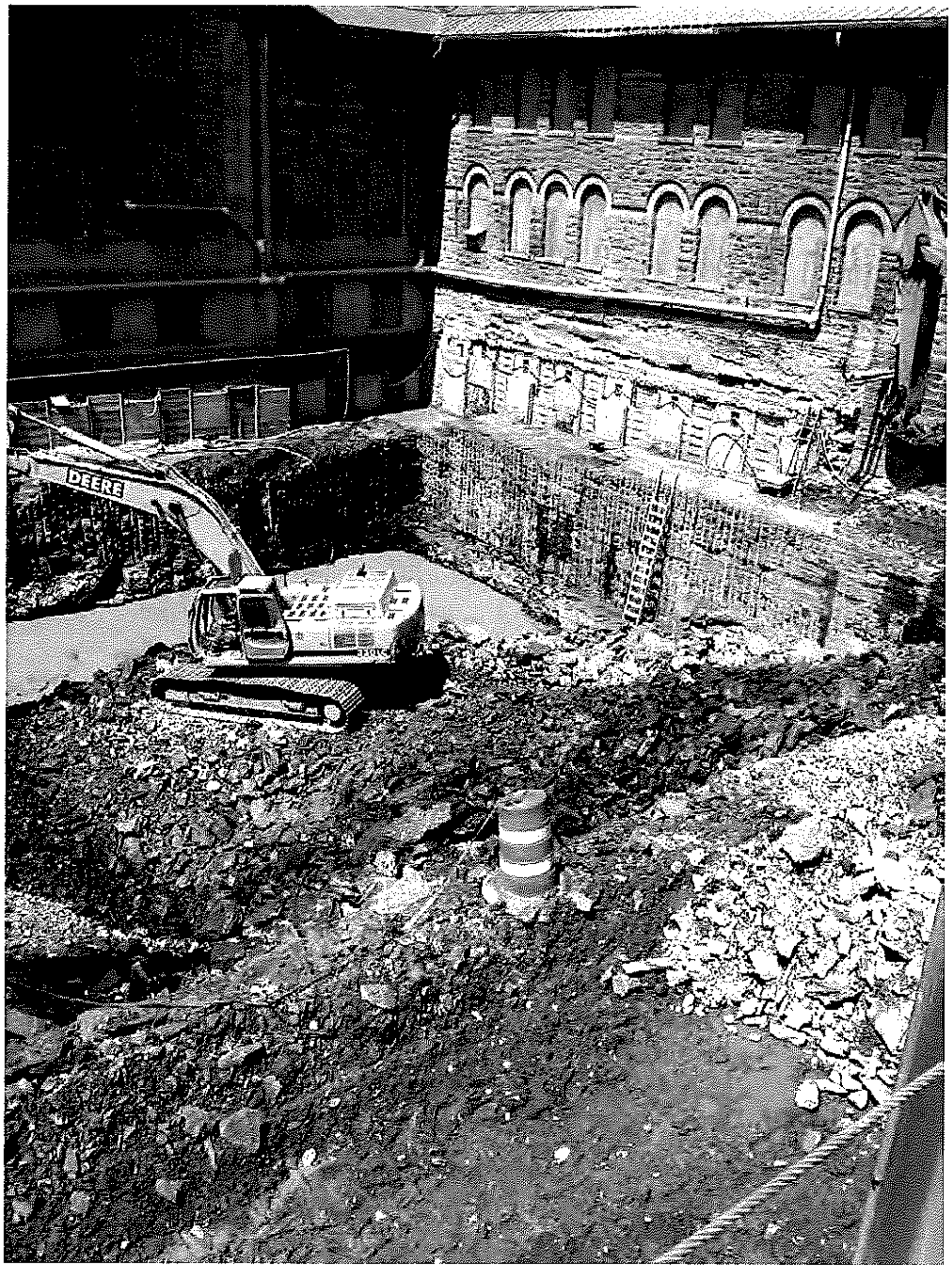
Given the dense residential populace, an **Electronic Initiation System** will be utilized to enhance safety and advantage the most technically advanced vibration control tool available. The safety controls combined with design flexibility and accuracy of electronic detonators, make electronic initiation the best choice for this project.

There will be **no explosives containing perchlorates** used on this site at any time.

ANFO (prilled ammonium nitrate and fuel oil mixture) **will not be used** on this project. **ANFO** is a free flowing, dry granular bulk blasting agent that is **NOT** water resistant.

Water resistant, metered and packaged emulsion and emulsion blend blasting agents will be utilized for this project. Holes will be primed with high density, high velocity, high energy molecular cast primers designed to optimize initiation of blasting agents. The priming units are specially designed for use with electronic detonators.

SDS (MSDS) and **Technical Information** data sheets for the explosive products proposed for use on this project are provided in the Appendix H.



Electronic Initiation Cornell University

All explosives will be delivered to the job site on a daily basis. There will be **no overnight storage**. Only the amount of explosives required to perform the day's work will be brought to the site. All explosives will be transported in stored in vehicular explosives storage magazines approved and permitted by the State Fire Marshall.

Misfires

The use of an Electronic Initiation System provides unparrelelled signal sequence continuity verification as well diagnostic features not available with pyrotecnic or electric systems. This is particularly important in environment where intensive matting is required. Heavy matting is often a contributing factor to the most common causes of misfires. Which include: undetected breaks; faulty signal connections and damaged or pinched signal conduit. The use of electronic initiation provides a significant advance in safety by dramaticly reducing the possibility of these types of misfires. Although misfire probabilities will minimised a misfire posibiltiy cannot be absolutely ruled out. Regulatory Guidance for the handling of misfires is provided in CMR1: 65.9.1 NFPA 495 10.5. The Technical Guidance from which it is sourced can be found in the I.M.E. Safety Library in **SLP 17**. Text concerning the proper handling of misfires has been excerpted from the most recent update to SLP 17 and is located in Appendix I.

Vertical Over-Break Control

Control of over break is a complex and often frustrating issue. Technology at present doesn't afford us the ability to laser cut a uniform and undisturbed bearing surface with explosives. It has always been assumed over break is solely a function of over drilling and over blasting, however consideration must be given as to the nature of the geology presented at the proposed bearing surface. Open seams near or below sub grade design elevation and variation in strata layering and competence will influence depth of excavation. These variations may be difficult to map. In load bearing areas, sub-drilling will be modified if needed as directed to minimize over break to an acceptable degree. Initial sub drilling will be 2-3 ft. Modification direction must be based on evaluation of elevation and condition of bearing surface presented at bottom of excavation. Test excavations should be conducted regularly if rock excavation significantly trails operations to provide relevant data. In all cases, blast dynamics minimally require a borehole to be of adequate depth to safely accommodate both the charge and confinement medium. Some States require that a pre-blast analysis and design consider the fundamental geometric relationship of the blast design. In Massachusetts for example CMR1: 65.9.8.3.1. charges the blaster with developing a "blast design plan which establishes sound relationships between current industry standards and the allowable limits of the effects of blasting." These industry standards or rules of thumb are empirical formulas developed by Dr. Ash, Dr. Bergman and others and were espoused by Joseph Pugliese in USBM RI 8550. After the 1996 extensive rewrite of State explosives regulation, the empirical formulas were written into the State Fire Marshall's Training Course: **"Understanding and Regulating Explosives Using the Amended Regulation"**. Page 11 of this text (please see Appendix J) provides the formula and associated table for determining appropriate stiffness ratio of shot design. The table indicates a stiffness ratio of 2 or more is desirable. A stiffness ratio of 1 or less requires redesign of shot and specifically states **"do not shoot".** The unintended consequences of an excessive stiffness ratio (poor fragmentation, excessive ground and air response and "fly rock") can be significantly diminished by insuring design reflects at a minimum that, Bh = 2B.

Where:
Bh = Bench height
B = Burden

In order that over break constraints do not drive blast design into a technically prohibitive or unsafe direction, consideration should be given to a strategy allows some soil overburden to be left in place undisdurbed over shallow ledge cuts to afford minimum confinement requirements. During the stripping operations efforts should be made when possible to insure adequate confinement depth remains above shallow rock cuts. An overburden stripping plan can be developed from geotechnical data that will allow removal of overburden to rock or minimum confinement elevation which ever is greater.. This will allow for a 6 ft. hole minimum which will support safe design.

Perimeter Control Measures

Practical experiece suggests that geology may contain irregular open joints that will influence final perimeter. It is understood that rock excavation for the Building 12 undergroud garage will create vertical rock faces greater than 10ft. in depth. Perimeter control measures will be utilized in these areas to limit over fracture beyond the ecavation perimeter. It is anticipated that a pre-split design design will require a sequenced rather than simutaneous hole initiation design. Precise electronic initiation with 1 - 2ms hole to hole intervals will be used where this option is utilized. A modified presplit design utilizing unloaded intermediate 10$^{ft.}$ deep "line drilled" guide holes and Line Drilling spaced at 2x drill bit dia. are options that will be considered based on ground, air and geology reponse; depth of cut and proximity to protected structure.

Geology

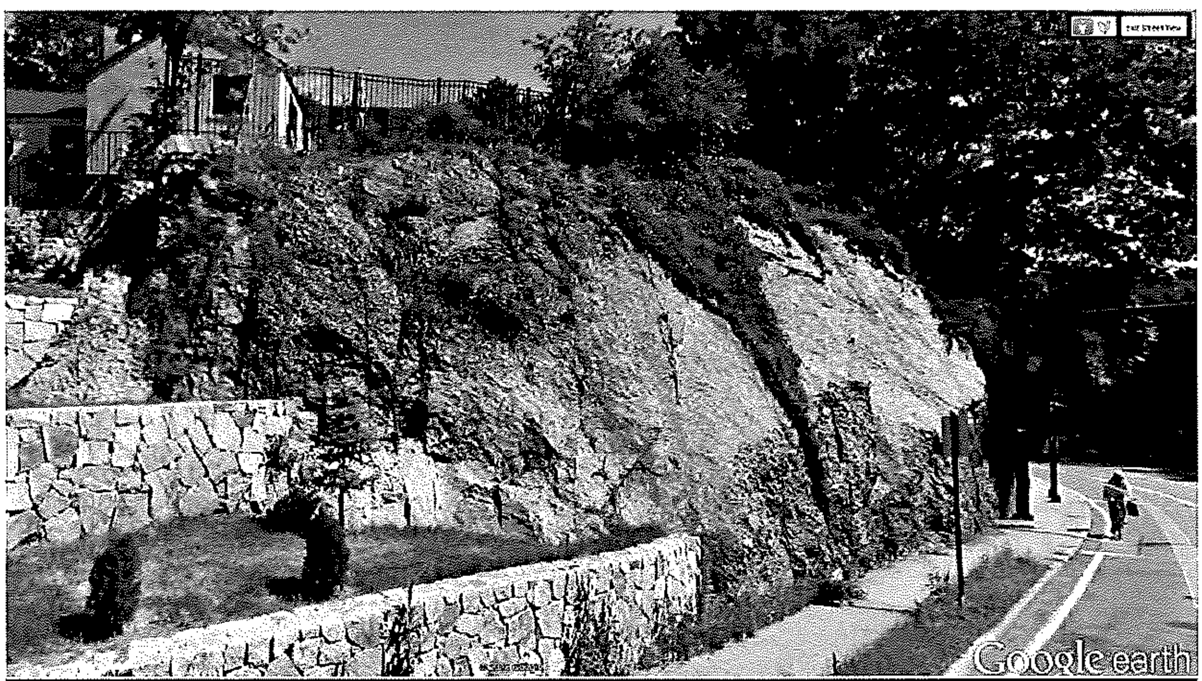
The USGS identifies the site rock unit as Roxbury Conglomerate (Puddingstone). This geology typical range of competence with wheathered surface to very competent at depth. Fragmentation may achieved using lesser powder factors than those required for some of its'denser more massively jointed igneous relatives. Site specific qualities will dictate the optimal energy ratio. Experience suggests that irregular joint structure may present perimeter wall stability challenges reguardless of perimeter control methodology employed.

Roxbury Conglomerate

XML (/geology/state/xml/MAPZZr;0) | JSON (/geology/state/json/MAPZZr;0)

Conglomerate, sandstone, siltstone, argillite, and melaphyre. Consists of Brookline, Dorchester, and Squantum Members. Roxbury Conglomerate forms base of Boston Bay Group. Divided into Brookline, Dorchester, and Squantum Members. Conglomerate in Brookline Member contains clasts of Dedham Granite, quartzite (possibly from Westboro Formation), and volcanic rock from underlying Mattapan Volcanic Complex. Dorchester Member consists of interbedded argillite and sandstone and forms an intermediate unit between Brookline Member and overlying Cambridge Argillite. Uppermost Squantum Member is a distinctive diamictite which appears to pinch out in northern part of basin. Brighton Melaphyre lies within Brookline Member and consists of mafic volcanic rocks (quartz keratophyre, keratophyre, and spilite). Roxbury clearly lies nonconformably on Dedham Granite near Hull, MA; can be traced continuously over Mattapan Volcanic Complex. Age is Proterozoic Z and possibly Early Cambrian (Goldsmith, 1991).

State	Massachusetts (/geology/state/state.php?state=MA)
Name	Roxbury Conglomerate
Geologic age	Proterozoic Z to earliest Paleozoic
Lithologic constituents	Major Sedimentary > Clastic > Conglomerate Sedimentary > Clastic > Sandstone Sedimentary > Clastic > Siltstone Minor Igneous > Volcanic > Mafic-volcanic *melaphyre* Metamorphic > Metasedimentary > Metaclastic > Argillite
Comments	Part of Milford-Dedham Zone (Tertiary and Older Rocks). Secondary unit description per MA023.



Grove and Allandale Exposed West Roxbury Puddingstone

Proposed Blast Designs

Proposed initial **Blast Design Analysis's** for the **Test Blasts; Test Blast Location Plans**; **Loaded Hole Sections** and a series of proposed **Blast Design Analysis's** covering a range of structure offsets and depths have been provided in Appendix J. The designs have been scaled, based on proximity to the nearest structure. Charge sizes, hole depths, pattern geometry and detailed loading information is provided in the spreadsheets. A detailed vibration analysis of proposed design is also factored in the proposed Blast Design. Proposed Hole Sections are provided to delineate column charging and decking.

These designs provide a sound calculated starting point. As the work progresses, design refinements will be made when required, in response to performance indicators and encountered conditions, including: ground and air response; displacement control; fragmentation; floor grading requirements; back break; geology and existing fracture. To provide analysis data in support of this design refinement process, video recordings will be made of all blast events.