

February 1, 2010
File No. 2845.04

Gottesman & Hollis P.A.
Attn: Morgan Hollis, Esquire
39 East Pearl Street
Nashua, NH 03060

Re: Revised Blasting Plan
Merrimack Premium Outlets
Merrimack, NH

Dear Morgan:

Sanborn, Head & Associates, Inc. (SHA) has revised the Blasting Plan for the proposed Merrimack Premium Outlets project. The revised plan is attached. The revised Blasting Plan addresses comments submitted by GZA GeoEnvironmental in their letter dated April 3, 2009, and Emery & Garrett Groundwater, Inc. (EGGI) in their letter dated April 14, 2009.

The recently received comments are based on the town's consultant's review of the previously submitted Blasting Plan prepared by SHA dated October 9, 2008. The October 9, 2008 Blasting Plan incorporated previous changes based on comments from:

- Merrimack Fire Rescue and Police Departments included in their letters dated August 19, 2008 and August 21, 2008, respectively;
- GZA GeoEnvironmental (GZA), (Town's blasting consultant) over the course of the review process, the last dated September 12, 2008 prior to the April 3, 2009 letter;
- Emery & Garrett Groundwater, Inc. (EGGI) (Town's water quality consultant) several response letters requesting various changes to the blasting plan including a letter dated September 11, 2008, the last letter prior to the April 14, 2009 letter.

In GZA's April 3, 2009 letter they reviewed the October 2008 Blasting Plan and indicated that the plan was "acceptable for the intended use".

EGGI's April 14, 2009 letter had three comments regarding the October 2008 Blasting Plan. These recommendations are discussed briefly below:

1. *Installation of MW-15 and Reference to Monitoring Locations:* Chelsea Property Group installed an additional bedrock monitoring well on December 23, 2009 designated MW-15 at the location discussed by EGGI. This location was modified slightly, but reviewed and approved by EGGI on December 1, 2009 prior to its installation. The text of Section 1.05, C, Item 3 of the Blasting Plan was updated to include the additional monitoring

wells installed since the October 2008 Blasting Plan was submitted. A reference was also added to the Construction Management Plan and the Operations and Maintenance Plan which include a figure showing the location of the water monitoring stations.

2. *The use of a third party inspector or blast manager:* Section 1.06, D includes the Town's right to have a Third Party Inspector complete intermittent inspections and other tasks as included in EGGI's letter. The intent of the notification period is to allow the site visit to be coordinated with the personnel on site to allow the site walk to be performed in a safe manner. After discussing the issue with EGGI, the notification has been reduced from 24 hours to at least 12 hours prior to conducting the walkover or inspection.
3. *Traffic Access Over Soil Berms:* Section 1.05, C, Paragraph 2, f requires that the contractor divert all surface water to the east and away from the area located west of the Wellhead Protection District line for the full duration of blasting, excavation and fill placement. Figure S-4 shows the location and the notes describe the requirements of the soil berm that is proposed to cut off surface water runoff. As part of the Blast Design Plan the contractor is required to submit a plan demonstrating the methods of meeting the requirements of the specifications. Since this is a "means and methods" requirement, the contractor is allowed the flexibility of designing the system for complying with the specification, and SHA will review and approve the contractor's plan. The berm will most likely only need to be approximately 3 feet high, so the contractor may be able to stabilize the surface of the berm to allow construction traffic to travel over the berm, or construct a temporary road diverting traffic around the berm. The specification has not been modified.

We believe this addresses the Town consultant's recommendations with respect to the blasting plan for the project. Please call if you have any questions.

Very truly yours,
SANBORN, HEAD & ASSOCIATES, INC.



Brian Bettencourt
Project Manager



Mathew A. DiPilato, P.E.
Principal/Vice President

BDB/MAD/:bdb

Encl. Revised Blasting Plan dated February 1, 2010

cc: Gordon Leedy, VHB
Danielle DeVita, Chelsea

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Merrimack Premium Outlets

Merrimack,
New Hampshire

Prepared for: **Chelsea Property Group**
Roseland, New Jersey

Prepared by: **Sanborn, Head & Associates, Inc.**
Westford, Massachusetts

Revised February 1, 2010

This plan is part of the Site Plan for the Monahan/ Chelsea Property Group application, Tax Map Parcels 3C/ 191-1 through 191-6, 3D/028 and 3D/034.

Approved by Merrimack Planning Board

Chairman

Date

Secretary

Date

SECTION 02210 – BLASTING

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

- A. This Section covers the transportation, storage, possession and use of explosives in drilling and blasting operations to fracture rock using controlled blasting and production blasting techniques. Controlled blasting uses explosives to form a shear plane in the rock along a specified backslope. Controlled blasting includes presplitting and cushion blasting. Production blasting uses explosives to fracture rock in an open area. Rock blasting will be used where necessary to complete excavation for subsurface structures and utility trenches. All blasting shall conform to the requirements of all applicable laws, rules, and regulations of the federal, state and local regulatory authorities and insurers that govern the licensing, transportation, storage, handling, use and disposition of explosives.
- B. General conditions, Supplemental Conditions and Division 1 form a part of this specification and the Contractor shall consult them in detail for instructions.
- C. Examine all drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.02 RELATED SECTIONS

- A. Carefully examine all of the Contract Documents for requirements which affect the work in this Section. Other specification Sections which directly relate to the work of this Section include, but are not limited to, the following:
 - 1. Section 02210 – Site Preparation and Demolition
 - 2. Section 02300 – Earthwork
 - 3. Section 02320 – Pavement Subbase and Base
 - 4. Section 02500 – Water Supply System
 - 5. Section 02570 – Sewerage Collection System
 - 6. Section 02600 – Storm Drain System

1.03 REFERENCES

- A. Code of Federal Regulations (CFR)
 - 1. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), Construction Standards and Interpretation, 29 CFR Part 1926.
- B. National Fire Protection Association (NFPA)
 - 1. NFPA495 – Code for Manufacturing, Transportation, Storage, And Use of Explosive Material.
- C. Bureau of Alcohol Tobacco and Firearms (BATF)
 - 1. Title XI, Regulation of Explosives (18 U.S.C. Chapter 40; 84 Statute 952), of the Organized Crime Control Act of 1970 (84 Statute 922), and 27 CFR Part 55.

- D. United States Department of Transportation (DOT)
 - 1. 49 CFR Parts 106, 107, 171-179, 383 and 390-399.
- E. United States Department of Interior, Bureau of Mines (USBM)
 - 1. Bureau of Mines Report of Investigation 8507, "Structure Response and Damage Produced by Ground Vibration From Surface Mining Blasting", 1980.
- F. Town of Merrimack, New Hampshire Construction Standards, 2006
 - 1. Merrimack Fire Department, Explosives & Blasting Rules
- G. New Hampshire Department of Transportation (NHDOT), 2006 Standard Specifications
 - 1. Section 100, General Provisions
 - 2. Section 200, Earthwork
- H. New Hampshire Department of Safety, Administrative Rules, Chapter Saf-C 1600 Explosives
- I. Institute of Makers of Explosives, 2008
 - 1. Blasting: Best Practices

1.04 DEFINITIONS

- A. Peak particle velocity (ppv) - The instantaneous maximum vector sum of the three ground vibration velocity vectors measured in the vertical, longitudinal, and transverse directions at the point of interest. Peak particle velocity is expressed in units of inches per second (ips).
- B. Airblast (or over-pressure) - The increase in ambient air pressure caused by blasting. Airblast, or over-pressure, is expressed in units of pounds per square inch (psi) or decibels (dBL).
- C. Blast Area - The area including the blast site and the immediate adjacent area that is owned, leased or controlled by the blast operation.
- D. Blast Site - The area in which explosive materials are being or have been loaded, and includes all holes loaded or to be loaded for the same blast and for a distance of 50 feet in all directions.

1.05 SUBMITTALS

Refer to General Conditions for submittal procedures.

- A. General Site Operations Information and Blaster Qualifications
 - 1. Prior to performing the Blast Analysis, the Contractor shall submit information which includes a complete summary of proposed means of transportation, handling, storage, and use of explosives, and include the names of personnel who will supervise the blasting operations, Certificate(s) of Competency, a minimum of three references for each person and a list of similar type projects with a brief description of the Work conducted. The Contractor will also submit evidence, such

as Certificates of Insurance, showing the types and limits of coverage for blasting operations to be maintained throughout the project.

2. The names, affiliations and contact information for the supervisory personnel of the Blaster and Contractor shall be provided to the Merrimack Police Department prior to the commencement of blasting.

B. Blast Analysis

1. Prior to conducting any blasting, the Contractor shall conduct a blast analysis of the overall factors affecting the operations. The blast analysis shall consider the following, but not be limited to: adjacent area structure(s); building(s); building foundation(s); utilities, including gas, water, underground fiber optic, storm drainage and electrical lines; septic systems and swimming pools; impacts to surface and groundwater quality and area geology within 1000 feet of the blast site. In addition, the blast analysis shall consider the identification of commercial equipment such as computers, electron microscopes, laser equipment, relays, etc., which are sensitive to vibrations, and other underground objects that may be damaged by the effects of a blast. The Contractor shall also assess radio usage in the project area and provide written notice to the Merrimack Police Department of any concerns they have with respect to radio usage in the area and on surface streets.
 - a. The blast analysis shall be compared to the Blast Design Plan and,
 - b. The area of the blast analysis shall be within 1000 feet from the closest blast hole. The blast analysis shall also consider potential impacts to operations at other existing facilities in the neighborhood that are beyond 1000 feet, which may be sensitive to vibrations.

C. Blast Design Plan

1. The Contractor shall prepare a Blast Design Plan. The blasting is to be performed on an undeveloped hill approximately 200 ft from a cellular tower, approximately 750 to 1000 ft from residential homes to the west and north, approximately 500 ft from the F.F. Everett Turnpike to the east and 150 ft from Industrial Drive to the south. Additionally blasting will occur in the Merrimack River Primary Watershed area and a portion of the blasting area is in an area tributary to Pennichuck Brook Watershed. Merrimack Village District (MVD) water supply wells are located as close as 3,000 ft from the blast area and a portion of the site lies within a well head protection area for the municipal wells. Precautions shall be undertaken by the blaster in the design of the blast plan to prevent damage and to minimize adverse effects including ground vibrations, air blast, flyrock, and degradation of surface water and groundwater quality.
 - a. Precautions shall include but not be limited to, review of each shot variable or dimension to ensure a blast design plan, which establishes sound relationships between current industry standards and the allowable limits of the effects of blasting.
 - b. At a minimum, the blast design plan shall describe the following: amount of material to be removed, benches and lifts, sketches of proposed drill patterns; number, spacing, location, inclination, diameter, and depth of

- drilled holes; amount, type, diameter and distribution of explosive per hole; pounds of explosive per lineal foot for controlled perimeter holes; powder factor; delay patterns, type of initiators, time of each delay, and pounds of explosive for each delay; time of blast; total pounds of explosives in place at any one time within the area to be excavated under this Contract; stemming; decking; critical dimensions; location and descriptions of building(s) and structures(s) to be protected, the placement of seismographs and estimates of ground vibrations and air blast over pressure levels at existing structures to be monitored.
- c. All shots shall be designed using the most current industry standards, to prevent excessive air blast, ground vibration, and flyrock; and to maximize combustion of explosives during the blast.
 - d. At a minimum, blasting mats shall be required for all blasts located within 250 feet of an occupied building, structure, utility, public highway or municipal roadway; or, as required by local, state or federal rules and/or regulations. For the initial blast, Merrimack Fire Rescue will require mats to be used within 1,000 feet of any structure, including the cell tower. Subsequent blast will require mats only if they are within 250 feet of structures or roads.
2. The Blast Design Plan shall also address impacts to surface water and groundwater quality due to blasting operations. The Blast Design Plan shall identify and implement steps to maximize the combustion of explosives for each blast and to mitigate impacts to surface water and groundwater quality on- and off-site that would result in violations of surface water and groundwater quality standards established by local, state and federal regulations. In particular, perchlorate-containing blasting agents will not be used on this project. Also, blasting products whose primary components are ammonia nitrate-fuel oil in a non-emulsified form (ANFO) will not be used west of the Wellhead Protection District line established by the Town of Merrimack. In addition, the following will be included/addressed in the Blast Design Plan:
- a. Emulsion blasting agents (bulk and cartridge), or other equally protective blasting agent or high explosive, shall be used west of the Wellhead Protection District Line. Emulsion/ANFO blends will not be used west of the Wellhead Protection District Line. The emulsion blasting agent, or alternate, will be approved by the Project Blasting Consultant and Town prior to use.
 - b. Emulsion/ANFO blend blasting agents (bulk and cartridge), or other equally protective blasting agent or high explosive, shall be used east of the Wellhead Protection District Line. Emulsion/ANFO blends shall contain a minimum of 70 percent emulsion and no more than 30 percent ANFO. The emulsion/ANFO blend blasting agent, or alternate, will be approved by the Project Blasting Consultant and Town prior to use.
 - c. No low velocity gelatin primers shall be used for detonation. High velocity primers meeting or exceeding detonation velocities suggested by the manufacturer's data sheets shall be used.
 - d. At least, one detonator shall be used per 10 ft of bedrock height. Additional detonators shall be used above and below open seams if encountered.

- e. Each hole must be checked for water. If water is encountered, the drill hole must be dewatered. Blasting, including preparation and placement of explosives and execution of the blast, should not be performed when measurable precipitation is forecast or during precipitation events. Cartridges shall not be cut or split.
- f. Surface water shall be diverted away from blasted areas and stockpiles of blasted rock. The Contractor will submit a plan as part of the Blast Design Plan demonstrating how he will slope the excavation surface to the east and direct all surface water runoff to the east and away from the area located west of the Wellhead Protection District line during the full duration of blasting, excavating and fill placement. At a minimum, the surface water management plan shall meet the performance requirements shown on the attached Figure S-4, Conceptual Stormwater Management Plan.
- g. Rock blasted west of the Wellhead Protection District Line will be excavated and removed to a location east of the Wellhead Protection District Line the same day it is blasted. The Contractor's Blasting Plan will include a narrative describing how they plan to accomplish this.
- h. The Contractor will implement, and include by reference, the most current edition of the Institute of Makers of Explosives *Blasting: Best Practices* document that includes Best Management Practices (BMPs) to be followed to protect surface water and groundwater quality.
- i. If bulk emulsion blasting agents are used, product remaining in the tremie pipe or hose must be recovered and used in the next hole, or recirculated to the storage tank. Any spillage will be immediately removed to the satisfaction of the Owner's Representative.
- j. The Contractor will track by metering the amount of bulk emulsion pumped into the drill holes on a daily basis. Metered volume records will be provided to the Town/MVD and their consultant on a monthly basis.
- k. Crushing operations and stockpiles of blast rock or crushed materials derived from blast rock will not be allowed to operate or be stored west of the Wellhead Protection District line.
- l. The Blasting Contractor shall include a detailed narrative in the Blast Design Plan describing the materials, methods and procedures he will use to maximize the combustion of each blast and to prevent adverse impacts to surface and groundwater quality during blasting operations.
- m. The Contractor will provide a summary description of how the rock face will be dewatered (if needed) to below levels where blasting is being performed west of the Wellhead Protection District line. Such means of dewatering will include may include ditches, french drains, fractured rock zones, dewatering wells or other means the Contractor deems appropriate and necessary.

- n. The Contractor will devise a method to locate and mark the Wellhead Protection District line in the field throughout the time period when blasting operations are being performed so that construction personnel can readily identify its location.
 - o. The Contractor will identify and described the types of mitigation measures he would implement should water quality data in monitoring wells located west of the Wellhead Protection District Line exceed action levels included in Tables 2 and 3 of the Construction Management Plan included in the construction documents.
- 3. Five surface water monitoring stations, eight overburden (soil) groundwater monitoring wells, five deep bedrock groundwater monitoring wells and five shallow bedrock monitoring wells have been installed at the Site to monitor water quality before, during and after construction and blasting. The locations of the monitoring points are shown on Construction Management Plan Figure WQ-1. The specific requirements for the water quality monitoring program are outlined in the Construction Management Plan and the Operations and Maintenance Plan and can be obtained from the Engineer. The Engineer will be responsible for completing the monitoring program. The Contractor shall be responsible for protecting the monitoring wells during construction. Damaged monitoring wells shall be repaired or replaced by the Contractor at his costs under the direction of the Engineer.
 - 4. The Blast Design Plan(s) shall be submitted to the Project Blasting Consultant for review at least 30 days prior to the planned blast. The Blast Design Plan must be accepted and approved by the Project Blasting Consultant and the Town of Merrimack prior to commencement of blasting.
 - 5. The Contractor shall submit any other data that the Project Blasting Consultant may deem pertinent to the Consultant's determination of the Contractor's intent and purpose to produce smooth and sound rock surfaces at the lines of excavation, and to protect adjacent structures.
- D. Preblast Survey
 - 1. A minimum of three weeks prior to the start of Work, a copy of the preblast survey as specified in Paragraph 3.01 shall be submitted to the Owner's representative.
- E. Blaster's Logs
 - 1. The Contractor shall submit a copy of the Blaster's Logs as specified in Paragraph 3.03 on a daily basis to the Project Blasting Consultant.
- F. Road Closing Plan
 - 1. The Contractor shall submit a plan to the Merrimack Police Department in writing describing plans and procedures for any road closing proposed due to the blasting operations. The plan shall be submitted prior to implementing the road closings.

1.06 QUALITY ASSURANCE

A. Test Blasts

1. At least three small charge test blasts shall be required in areas where rock is to be excavated prior to the commencement of production blasting. The purpose of the test blasts is to establish local ground-borne vibration and airborne over-pressure propagation characteristics and anomalies to aid in determination of efficient charges that will not cause the ground-borne vibration and airborne over-pressure limits to be exceeded. The test blasts shall be located in areas selected by the Project Blasting Consultant. Additional test blasts may be required based on the results of the initial tests.

B. Acceptance of Submittals

1. No blasting shall be permitted until the Contractor's submittals have been accepted by the Owner and Project Blasting Consultant, and other conditions as required by the Contract Documents have been met. No drilling for individual blasts shall be permitted until the Contractor's Blasting Design Plan and Blast Analysis have been accepted by the Owner, Project Blasting Consultant and the Town of Merrimack.

C. Video Record of Selected Blasts

The Contractor shall complete a high speed (slow motion) video record of selected blasts in order to assess the blast efficiency. The Contractor shall retain a firm or personnel experienced in completing such video records. The Project Blasting Consultant will approve the personnel or firm retained to complete the video record. A video record shall be completed for all three test blasts, the initial production blasts, after 100,000 and 500,000 cubic yards (cy) of rock are blasted, for the initial blast and after 25,000 cy of rock have been blasted west of the Wellhead Protection District Line.

D. Independent Third Party Consultant

The Town will have the right to have an independent third party consultant perform intermittent site walkovers, conduct inspections, observe blasting operations and other related activities, at their costs, provided notice is provide to the Owner, or their on-site representative, at least 12 hours prior to conducting the walkover/inspection.

1.07 CONTRACTOR'S RESPONSIBILITY

- A. The Contractor is responsible for blasting in a safe manner, for producing smooth and sound rock surfaces at the lines of excavation, and for controlling damage, vibration, and over-pressure to nearby structures and buildings and mitigating impacts to surface water and groundwater quality consistent with local, state and federal regulations. Acceptance of the blasting plans, of any blasting operation, and of blasting products by the Owner or Project Blasting Consultant, and compliance by the Contractor with provisions of the Contract Documents for protection of life and property, shall not relieve the Contractor of the Contractor's responsibility or liability for the safety of persons and property. Acceptance of the Contractor's submittals by the Owner or Project Blasting Consultant does not constitute, nor shall it be construed to be, a guarantee by the Owner or Project Blasting Consultant that the desired results will be achieved. Acceptance of the Contractor's submittals by the Project

Blasting Consultant shall not relieve the Contractor from the Contractor's responsibilities of complying with the requirements of these specifications.

1.08 DELIVERY, STORAGE AND HANDLING

- A. The Contractor shall comply with federal, state, and local regulations, including noise ordinances, applying to the purchase, transportation, storage, handling, and use of explosives, blasting agents, primers, initiators, and ancillary equipment and materials. Blasting materials including explosives, blasting agents, primers, initiators and other materials will not be stored overnight on-site. Only materials sufficient to perform the day's work will be stored on-site.

PART 2 - PRODUCTS

2.01 EXPLOSIVE MATERIALS

- A. Use only products, blasting techniques, and monitoring equipment as recommended by the manufacturer, and which are acceptable to the Owner and Engineer. Only explosives that can withstand exposure to water and pressure during maximum exposure time, without loss of performance, shall be used for blasting. Explosives, blasting agents, primers, initiators, and ancillary blasting materials shall be kept in original packaging clearly marked with date codes. All explosives and initiating devices used shall be less than one year old. No perchlorate-containing blasting materials will be used on this project. The Contractor shall provide manufacturer's documentation, including MSDS sheets, that documents that non perchlorate-containing blasting materials are being used, that 100 percent emulsion blasting agents are being used west of the Wellhead Protection District line and that emulsion/ANFO blends consisting of a minimum of 70 percent emulsion and a maximum of 30 percent ANFO are being used east of the Wellhead Protection District line. Also, blasting products whose primary components are ammonia nitrate-fuel oil in a non-emulsified form (ANFO) will not be used for the project.
- B. No low velocity gelatin primers shall be used for detonation. High velocity primers meeting or exceeding detonation velocities suggested by the manufacturer's data sheets shall be used.

2.02 BLAST MONITORING EQUIPMENT

- A. Equipment for on-site and off-site particle velocity and air over-pressure monitoring shall be 4-channel units (1 over-pressure and 3 seismic channels) capable of digitally storing collected data. Equipment must be capable of printing ground motion time histories and summaries of peak motion intensities, frequencies and USBM R18507 ppv-frequency plots. Printed report records must also include date, time of recording, operator name, instrument number and date of last calibration.
- B. Equipment shall meet the following minimum specifications for seismographs:
1. Seismic Frequency Range: 2 to 200 Hz (+/- 3 db)
 2. Acoustic Frequency Range: 2 to 200 Hz (+/- 1 db)
 3. Sound Range: 90 to 140 db Linear
 4. Transducers: Three mutually perpendicular axes (radial, tranverse and vertical).
 5. Recording: Provide time-history of Waveform.

- C. The monitoring equipment shall have digital storage capacity for at least 30 full wave events or 100 summary events.

PART 3 EXECUTION

3.01 PREBLAST SURVEY

- A. The Contractor shall perform a preblast survey.
- B. The names, affiliations and contact information of personnel completing preblast surveys and their supervisors shall be provided to the Merrimack Police Department prior to commencing the surveys. The scope of the surveys and the locations at which they are being performed will also be provided prior to commencing the surveys.
- C. At least three weeks prior to performing any blasting on the site, a preblast survey shall be made of residences and other public or private structures existing within, or intersected by, a line delineating a 1,500-foot radius around the blast area. Sensitive structures located beyond 1,500 feet shall also be surveyed if necessary. The preblast survey shall be performed by the Contractor using qualified specialists approved by the Project Blasting Consultant and/or the Contractor's insurance carrier who are familiar with construction methods and materials, and familiar with blasting procedures.
- D. The scope of Work for the preblast survey shall meet the following:
 - 1. The preblast survey shall document the existing visual conditions of the interior and exterior of the structure including improvements to the property and other physical factors that could reasonably be affected by the blasting. Structures such as pipelines, cables, transmission lines, towers, cisterns, wells, and other water systems warrant special attention; however the assessment of these structures may be limited to surface conditions and other readily available data.
 - 2. The survey shall accurately record deficiencies by means of written notes, sketches, photographs, videotape, cassette tape narrative or any other format or combination that sufficiently depicts the pre-existing conditions prior to the blasting.
 - 3. If the owner refuses the survey, the inspector shall request that he/she sign a waiver of the survey. A preblast survey waiver shall be made on a form approved by the State Fire Marshal. If the owner or occupant refuses to sign a waiver, the inspector shall sign the waiver attesting to the refusal.
 - 4. Three attempts shall be made to contact the owner to offer the survey. If no response is made after the second attempt, or the owner refuses to sign a survey waiver, a notice offering the survey shall be sent via any carrier capable of providing a receipt of delivery. A receipt of delivery shall satisfy this requirement.
 - 5. A preblast survey summary report shall be provided to the Project Blasting Consultant documenting in writing and photographically the results of the survey, including but not limited to a list of properties notified/surveyed and deficiencies noted.

3.02 BLAST MONITORING

- A. The Owner intends to retain the Project Blasting Consultant to perform vibration and air over-pressure monitoring during blasting operations using a seismograph at four monitoring locations. The contents and form of monitoring reports shall be consistent with guidance provided by the USBM. The Project Blasting Consultant shall monitor each blast at locations determined by the Project Blasting Consultant. The Contractor may employ additional monitoring functions as he may choose at his own cost or reimburse the Owner for the incremental increase in cost to have the Project Blasting Consultant provide monitoring at more than four site locations. Printed reports of all monitoring results including ground motion and over-pressure time-histories shall be provided to the Contractor before subsequent blasting occurs.
- B. The Contractor shall monitor noise and vibration levels of Work operations to assure compliance with the limitations contained herein and retain records of measurements for inspection by the Engineer and/or Project Blasting Consultant.
- C. The Contractor shall promptly inform the Engineer and Project Blasting Consultant of any complaints received from the public regarding noise or vibration; Contractor shall describe the action proposed and the schedule for implementation to address the complaint; and, shall subsequently inform the Engineer and Project Blasting Consultant of the result of the action.
- D. The Project Blasting consultant's presence does not include supervision or direction of the actual Work by the Contractor, his employees, or agents. Neither the presence of the Project Blasting Consultant nor any observations and/or testing performed by him shall excuse the Contractor from defects discovered in his Work or damage to third parties.

3.03 BLASTER'S LOGS

- A. The Contractor shall submit to the Project Blasting Consultant a copy of the blaster's log on a daily basis as specified in Paragraph 1.04E.
- B. The blaster's logs shall be maintained and completed by the blaster on a log form approved by the Project Blasting Consultant and a copy of the logs shall be maintained on-site for the duration of the project.
- C. The blaster's logs shall be completed within six hours of a blast and retained for a minimum of three years from the date of the blast.
- D. Blaster's logs shall include the following:
 - a. Name, signature, and Certificate of Competency Number of the Blaster-in-Charge.
 - b. Blast location, address, city and description.
 - c. Date and time of blast.
 - d. Type of material blasted.
 - e. Distance in feet, to the nearest inhabited building or structure, neither owned or leased by the holder or holder client of the Explosives User Certificate.

- f. Scaled distance or alternative option used to determine the blast design.
- g. Type of matting or cover over blast if applicable.
- h. Weather conditions, including temperature, cloud cover, wind direction and precipitation events that day.
- i. Blast plan and sketch showing blast hole locations, holes not drilled, holes drilled but not loaded, diameter, delay, delay pattern, number of holes, changes in hole spacing and changes in pattern of delays.
- j. Explosive material type, size, total weight of each explosive by hole and any changes in loading.
- k. Type of initiation system (methods of firing and type of circuit).
- l. Feet of over burden, depth and type of stemming and any changes in stemming.
- m. Maximum weight of explosives detonated within any eight millisecond period.
- n. The seismograph(s) location(s) including distance and direction from the seismograph to the closest borehole and from the seismograph to the closest structure.
- o. Seismograph readings including peak particle velocity, frequency, and airblast.
- p. Type of seismograph, instrument make, model serial number, calibration date and sensitivity settings.
- q. Name of person taking the seismograph reading. The name and firm analyzing the seismograph record if applicable.
- r. Comments regarding any misfires, unusual results of effects.
- s. List of complaints or comments following the blast including the name, company (if applicable) address and telephone number of the individual making the complaint.
- t. An evaluation of the blast indicating fractures, areas of significant overbreak, and any recommended adjustments to the next blast.
- u. A geologic log of each drill hole showing the presence of water-bearing zones, fractured rock and 'soft zones'. Driller's logs shall be kept as part of the permanent blasting record with the Blaster's logs.

3.04 BLASTING OVER-PRESSURE AND VIBRATION CONTROL

- A. Blasting operations shall be performed in a manner to minimize noise and vibration. Controlled blasting procedures and blasting mats, when appropriate, shall be used to provide effective suppression of noise, vibration and flyrock. Other abatement measures shall be employed as necessary for protection of both employees and the public.

- B. Working hours shall be restricted and operations scheduled in a manner that will minimize to the extent practical the disturbance to the public in areas adjacent to the Work and to occupants of buildings in the vicinity of the Work. Hours of blasting shall be limited to daytime between 9 AM to 4 PM on Monday through Friday, or in accordance with the Blasting Permit issued by the Town of Merrimack.
- C. Ground Vibration Due to Blasting
1. General
 - a. Conduct blasting operations to avoid damage to structures or buildings.
 - b. Ground vibrations shall not exceed the maximum allowable particle velocities for the blast vibration frequencies set forth in the graphic plot of maximum allowable particle velocity versus frequency in USBM Report of Investigation 8507, "Structure Response and Damage Produced by Ground Vibration From Surface Mining Blasting", Figure B-1. These ground vibration limits can be approximated by the following values; a maximum peak particle velocity of 2.0 inches per second (ips) for blasts having a frequency above 40 Hertz (Hz), 1.5 ips for blasts having a frequency between 30 and 40 Hz, 1.0 ips for blasts having a frequency between 20 and 30Hz, and 0.5 ips for blasts having a frequency below 20 Hz. However, the actual graphic plot of maximum allowable particle velocity versus frequency in USBM shall be the ground vibration limits which shall not be exceeded at the Limits of Work for this Contract and immediately adjacent to the nearest on-site structures.
 2. Curing Concrete
 - a. Type A Concrete - Mass concrete, which cannot undergo structural bending, such as footings.

| Age of Concrete | Allowable PPV (in/sec) |
|-----------------|------------------------|
| < 7 days | 1.5 |
| > 7 days | 2.0 |
 - b. Type B Concrete - Concrete which is capable of undergoing structural bending, such as walls, structural slabs.

| Age of Concrete | Allowable PPV (in/sec) |
|-----------------|------------------------|
| < 7 days | 1.0 |
| > 7 days | 2.0 |

Blasting shall not be permitted within 40 ft. of new concrete (less than 7 days) footings, slabs, or walls, unless a blast plan for the specific blasts is approved by a Professional Engineer registered in New Hampshire hired by the Contractor.
- D. Airblast (Over-Pressure) Due to Blasting
1. General
 - a. Conduct blasting operations to avoid damage to structures or buildings.

The maximum allowable levels for airblast in decibels at occupied structures shall not exceed 0.014 psi.

3.05 PREPARATION AND PROTECTION

- A. Compliance with the requirements of this Section shall not offer any relief from responsibility for compliance with local ordinances, regulations, and other Sections. The Contractor shall obtain all local, state and federal permits required prior to blasting Work, including but not limited to, all permits required by the Town of Merrimack, New Hampshire.
- B. The following warning systems, procedures and protection devices shall be established prior to blasting in accordance with industry standards, and the following requirements:
 - 1. A system of audible signals to warn of impending blasts.
 - 2. Signboards and flags indicating areas where blasting operations are occurring. These signs shall be clearly visible and legible from all points of access to the area. The signs shall clearly describe the audible signal system for warning of impending blasts. Blast area signs shall clearly indicate the length and nature of audible blast warning and all clear signals. All warning systems shall comply with the most stringent requirements of regulating local, state, and federal agencies.
 - 3. The blaster-in-charge shall determine when to sound the initial warning signal. Blasting shall be performed only after ensuring that all people and equipment have been removed to a safe location. The Project Blasting Consultant may have a representative with the blaster-in-charge.
 - 4. Blasting shall occur only when a representative of the Project Blasting Consultant is present to witness each blast. The blaster-in-charge shall determine that all required seismographs are in place and ready to record before initiating the blast.
 - 5. The blaster-in-charge shall implement a "tag out" procedure to ensure that all persons are out of the blasting area prior to a blast.
 - 6. Radio transmitters shall not be permitted in the immediate area of blasting operations.
 - 7. The blaster-in-charge shall immediately notify the Merrimack Communications Center of any condition or circumstance that would cause alarm or a public safety concern.

3.06 BLASTING

- A. The Contractor shall perform blasting operations in accordance with all regulatory authorities. Merrimack Fire Rescue Blasting Rules requires the blaster to notify the police and fire departments at least one hour prior to any blasting, and the blaster-in-charge to notify the fire department within 15 minutes of the actual blast.
- B. Blasting work shall be performed only with necessary permits from all regulatory authorities and after completion of the preblast survey. Blasting work shall take place only after persons in the vicinity have been notified and have reached positions of safety. Take appropriate

precautions to prevent all persons from entering the blasting area. Use methods and programs that will prevent damage to, but not limited to, adjacent dwellings, structures, public domain, natural resources, habitat, existing wells and landscape features and that will minimize the scattering of rock, stumps or other debris. All affected roadways shall be inspected, cleared, and opened to traffic within 1 hour of completed blasting or as required by governing authorities.

- C. Take all precautions necessary to warn and/or protect any individuals exposed to his operations prior to any blasting. Blasting mats or other approved flyrock protection shall be employed as necessary to protect areas adjacent to blasting.
- D. Perform blasting operations in a manner to minimize airblast and ground motion near private structures and critical on-site structures. If blast-induced air over-pressure or peak particle velocity exceeds the performance requirements specified herein, suspend blasting in the affected excavation(s) until a redesigned blasting plan is submitted to and accepted by the Project Blasting Consultant.
- E. The Contractor may need to employ special measures to meet the specified airblast and ground motion limits. Use controls to limit air over-pressure and flyrock as necessary for compliance with the specified air over-pressure limits and for protection of employees, the public, and property.
- F. Spilled explosive materials will be required to be cleaned up immediately.
- G. At a minimum, blasting mats shall be required for all blasts located within 250 feet of an occupied building, structure, utility, public highway or municipal roadway; or, as required by local, state or federal rules and/or regulations. See Section 1.05, C, 1, d for additional requirements for use of mats.

3.07 LIMITATIONS ON BLASTING

- A. Blasting shall not be permitted when, in the opinion of the Engineer or Project Blasting Consultant, it may be detrimental to existing installations. The Engineer's decision shall be final.
- B. Controlled blasting techniques shall be used to prevent overbreak and minimize rock damage in all excavations. Blast patterns shall be designed so that the explosive energy is not directed into the back and sidewalls of the excavation but, instead, towards the developed free face. Perimeter control blasting procedures specifically line drilling or cushion blasting shall be used for the deep bedrock cuts along the western edge of the development where bedrock cuts up to 75 ft are planned. Overbreak below the bottom of blasting areas shall be limited to a maximum of two feet.
- C. Whenever, in the opinion of the Engineer or Project Blasting Consultant, proposed blasting may cause harm to persons, cause damage to structures, or create unacceptable rock instability, cease blasting immediately and review the blast design. The Contractor can resume excavation of the rock with an approved re-designed blast plan or by mechanical means.
- D. Blasting shall not be permitted when rain is imminent. Standing water shall not be allowed to accumulate in the blasting excavation areas. Water collected in blasting excavations shall be removed immediately and discharged to an area approved by the Engineer. In no case will

water collected in blasting excavations be discharged to areas located west of the Wellhead Protection Line shown on the plans.

- E. The maximum amount of explosives per shot will be determined during the initial tests blasts (3) and production blasts (3). This maximum amount of explosives per shot will be provided to Merrimack Fire Rescue within seven (7) days of initiating blasting.

3.08 SPECIAL PROCEDURES FOR BLASTING DUE TO NEARBY WATER SUPPLY WELLS AND WATERSHED AREAS

- A. No low velocity gelatin primers shall be used for detonation. High velocity primers meeting or exceeding detonation velocities suggested by the manufacturers data sheets shall be used.
- B. At least one detonator shall be used per 10 ft of bedrock height. Additional detonators shall be used above and below open seams if encountered
- C. Each hole must be checked for water. If water is encountered the drillhole must be dewatered. Blasting, including preparation and placement of explosives and execution of the blast, should not be performed when measurable precipitation is forecast or during precipitation events. Cartridges shall not be cut or split.
- D. Surface water shall be diverted away from blasted areas and stockpiles of blasted rock. The Contractor will slope the excavation surface to the east and direct all surface water runoff to the east and away from the area located west of the Wellhead Protection District line during the full duration of blasting, excavating and fill placement.
- E. Crushing operations and stockpiles of blast rock or crushed materials derived from blast rock will not be allowed to operate or be stored west of the Wellhead Protection District line.
- F. Spilled explosive materials will be required to be cleaned up immediately, no matter how small the amount.
- G. No fueling of vehicles or equipment, or storage of fuels, shall be performed west of the Wellhead Protection district Line.

3.09 MISFIRES AND DANGEROUS CONDITIONS

- A. After a blast has been fired, the blaster-in-charge and one assistant under his or her direct supervision shall make a careful inspection of the blast area. The Engineer's representative may be present for this inspection. Inspections shall determine whether there are any indications that misfires might have occurred or whether the blast created any other imminent dangers such as unstable ground conditions. If misfires or other dangerous conditions are found, the blaster-in-charge shall secure the area and properly correct all hazards before any other Work is allowed in the affected area. The all clear signal, allowing other Work to resume in the area, shall not be given until affected blast sites are clear of all hazards.

3.10 SUSPENSION OF BLASTING

- A. Blasting operations may be suspended by the Engineer or Project Blasting Consultant if the Contractor's safety precautions are inadequate, if airblast and/or ground motion levels exceed specified limits, or if adverse impacts to surface water or groundwater due to blasting

operations have been identified consistent with the Water Quality Monitoring Program established for the project.

3.11 DAMAGE COMPLAINTS

- A. The Contractor shall inform the Engineer immediately upon receiving a complaint from any person or firm alleging damage as a result of blasting operations.
- B. The Contractor shall direct the person or firm alleging damage to file a complaint on a "Blasting Damage Complaint" form to be obtained from the Merrimack Fire Department.
- C. After-blasting inspections shall be required for property where written damage complaints were filed by property owners as described in Paragraph 3.10B.

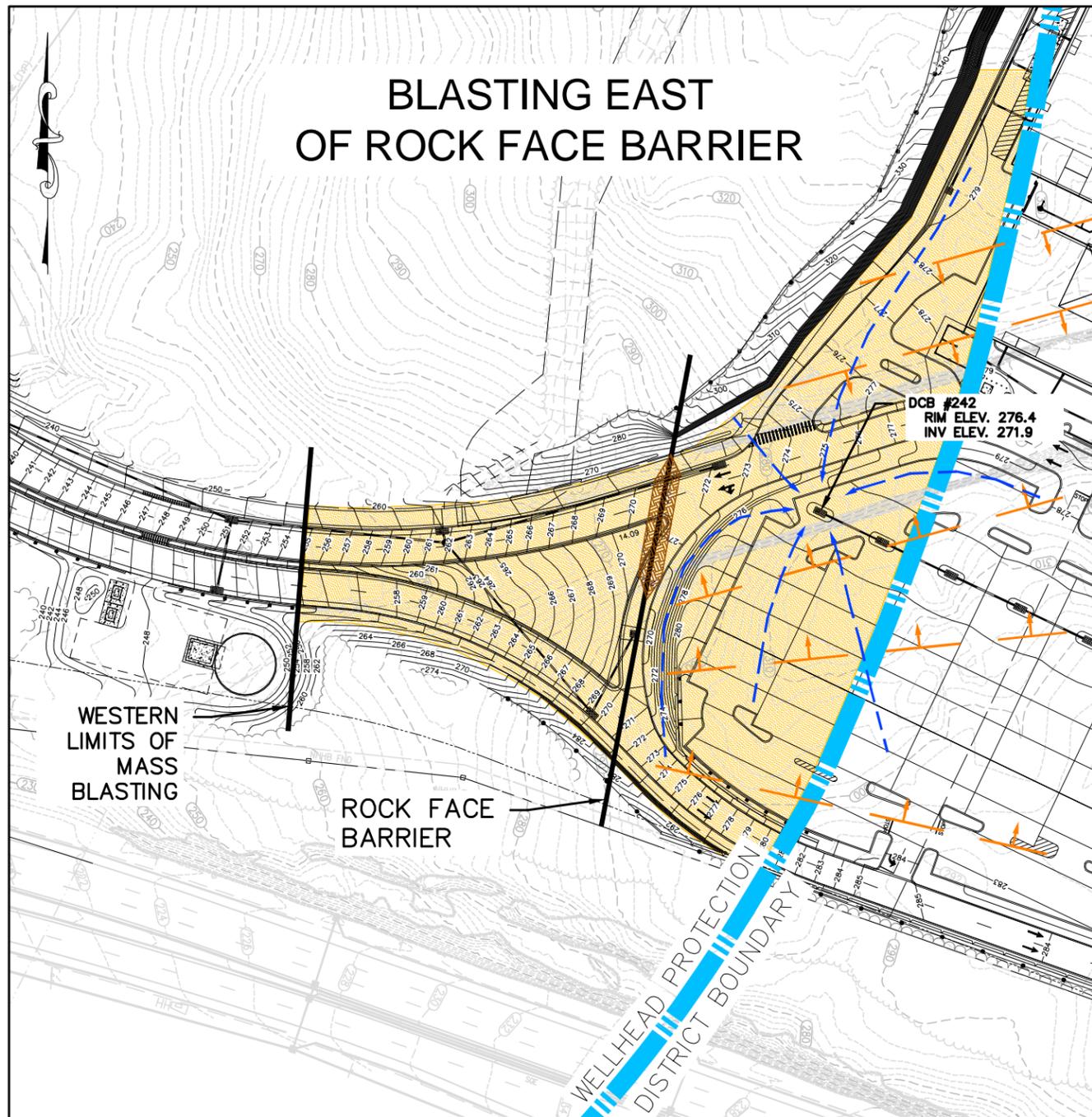
3.12 DAMAGE REPAIR

- A. When blasting operations damage off-site properties, or a portion of the Work, or material surrounding or supporting the Work, promptly repair damaged items to the condition that existed prior to the damage, to the satisfaction of the Engineer.
- B. Nothing contained herein shall relieve the Contractor of his responsibility for claims arising from his construction operations. Failure to inspect any structure required by these Contract Documents, or inadequacy of the inspections shall not relieve the Contractor of his responsibility. The Contractor shall indemnify the Owner from such claims.

End of Section

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BLASTING EAST OF ROCK FACE BARRIER



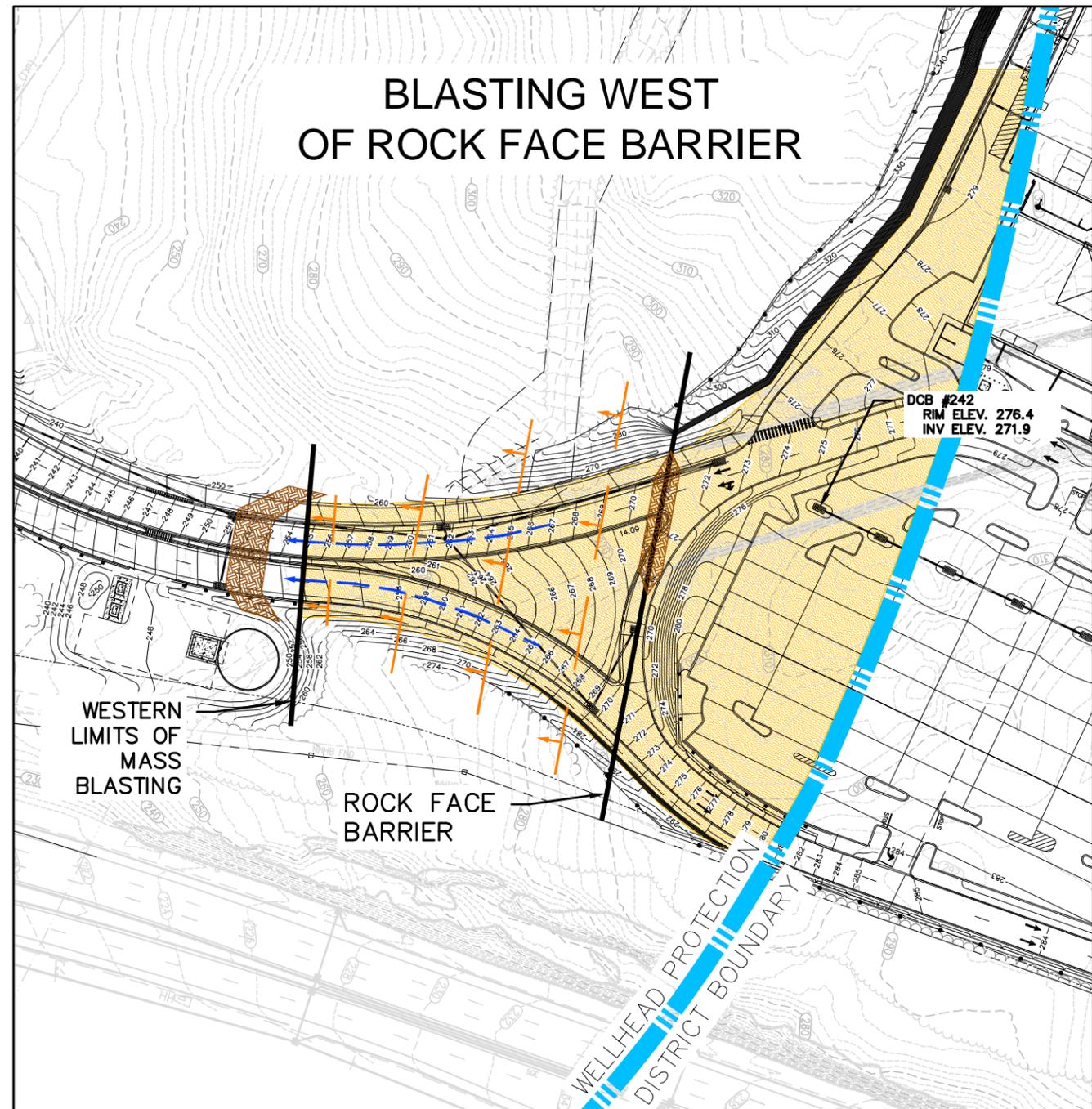
NOTES:

1. THE EXISTING BASE MAP WAS RECEIVED ELECTRONICALLY ON CD FROM VANASSE HANGEN BRUSTLIN, INC. (VHB) OF BEDFORD, NEW HAMPSHIRE, ON OCTOBER 3, 2007.
2. THE PROPOSED BASE MAP WAS RECEIVED ELECTRONICALLY FROM VHB ON MAY 9, 2008.

BLASTING SEQUENCE :

1. BLASTING OPERATIONS WILL BEGIN AT THE NORTHEAST EDGE OF THE MASS ROCK BLASTING AREA AND PROCEED TO THE WEST. THE BLAST FACE WILL BE TO THE EAST WITH SURFACE DRAINAGE TO THE EAST FOLLOWING THE PROPOSED GRADES.
2. DRAINAGE IN THE SOUTH PARKING LOT WILL BE INSTALLED TO CATCH BASIN DCB #242 BEFORE BLASTING MOVES WEST OF THE WELLHEAD PROTECTION DISTRICT BOUNDARY. THE DRAINLINE FLOWS TO THE EAST AND DISCHARGES TO SUBSURFACE INFILTRATION BASIN #2 LOCATED EAST OF THE PROPOSED BUILDINGS.
3. AS BLASTING MOVES WEST OF THE WELLHEAD PROTECTION LINE, THE DIRECTION OF BLASTING SHALL MOVE FROM THE EXISTING ROCK CUT FACES ALONG THE ROAD TO THE NORTH AND SOUTH, RESPECTIVELY, AS SHOWN ABOVE. THIS BLASTING SHALL CREATE A BLAST ROCK FACE BARRIER TO SURFACE FLOW. SURFACE WATER IN THE AREA BETWEEN THE WELLHEAD PROTECTION DISTRICT BOUNDARY AND ROCK FACE BARRIER WILL BE DIRECTED, VIA SWALES, TO DCB #242.
4. A LOW PERMEABILITY SOIL BERM WILL BE CONSTRUCTED IN THE EXISTING ROAD CUT TO ELEVATION 278 TO PREVENT SURFACE WATER

BLASTING WEST OF ROCK FACE BARRIER



FROM TRAVELING WEST BEYOND THE ROCK FACE BARRIER.

5. UPON REACHING THE ROCK FACE BARRIER, BLASTING OPERATIONS WILL STOP ADVANCING TO THE WEST. SURFACE WATER WILL CONTINUE TO BE DIRECTED AND/OR PUMPED TO DCB #242.
6. A LOW PERMEABILITY SOIL BERM AND SUMP PIT WILL BE CONSTRUCTED IN THE EXISTING ROAD CUT AT THE WESTERN LIMITS OF BLASTING TO COLLECT SURFACE WATER AND TO PREVENT SURFACE WATER FROM TRAVELING FURTHER WEST.
7. BLASTING OPERATIONS WILL RESUME AT THE WESTERN LIMITS OF THE MASS ROCK BLASTING AREA, WORKING TO THE EAST TOWARD THE ROCK FACE BARRIER AS SHOWN ABOVE.
8. SURFACE WATER COLLECTED BY THE WESTERN LOW PERMEABILITY SOIL BERM WILL BE PUMPED FROM THE SUMP PIT TO DCB #242.
9. UPON REACHING THE ROCK FACE BARRIER FROM THE WEST, IT WILL BE REMOVED BY BLASTING. WHEN BLASTING OPERATIONS ARE COMPLETE, THE WESTERN LOW PERMEABILITY SOIL BERM CAN BE REMOVED.

LEGEND:

- EXISTING TOPOGRAPHY
- PROPOSED TOPOGRAPHY
- APPROXIMATE DIRECTION OF SURFACE WATER FLOW
- APPROXIMATE LOCATION AND DIRECTION OF BLAST FACE
- LOW PERMEABILITY SOIL BERM
- AREA OF MASS BLASTING WEST OF THE WELLHEAD PROTECTION DISTRICT BOUNDARY

MERRIMACK PREMIUM OUTLETS, MERRIMACK, NEW HAMPSHIRE
CONCEPTUAL STORMWATER MANAGEMENT PLAN
DATE: AUG 08

| | |
|---|------------------------------------|
| | <p>GRAPHICAL SCALE</p> |
| <p>DRAWN BY: LON/RWH DESIGNED BY: LON CHECKED BY: MAD REVIEWED BY: CAC PROJECT MGR: CAC PIC: MAD DATE: AUG 08</p> | <p>NO. DATE</p> <p>DESCRIPTION</p> |
| <p>GEOTECHNICAL ENGINEERING SERVICES MERRIMACK PREMIUM OUTLETS <small>MERRIMACK, NEW HAMPSHIRE</small></p> <p>CONCEPTUAL STORMWATER MANAGEMENT PLAN</p> | |
| <p>PROJECT NUMBER: 2845.02</p> <p>FIGURE NUMBER: S-4</p> | |