

Rock Blasting and Water Quality Measures That Can Be Taken To Protect Water Quality and Mitigate Impacts

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Ensuring safe and adequate drinking water supplies requires maintaining the quality and availability of present and future water supply sources, because in the long run it is less expensive and more protective of public health to prevent contamination than it is to treat water to meet health standards, and it is less expensive to use existing sources than it is to develop new ones. New contaminants of concern continue to emerge, potentially requiring more costly treatment of source waters if they have not been adequately protected. Municipalities and water suppliers have crucial roles in managing activities that affect source water quality and availability. NHDES' primary role is to provide technical and financial assistance and to enforce state regulations that serve to protect the state's sources of drinking water. Effective protection relies on the combined efforts of the state, water suppliers, municipalities, businesses, institutions and individuals whose activities have the potential to affect source water quality and availability.



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Blasting of crystalline bedrock can contaminate water resources. There are two primary methods by which the quality of groundwater could be changed by blasting crystalline rock. These are summarized as follows.

1) **Contamination of Groundwater Resulting from a Release of a Regulated or Unregulated Substance to the Groundwater.** In some instances, materials such as detonators and explosives are not entirely combusted during blasting and result in the release of soluble substances into the groundwater. Releases of these substances can occur during a number of blasting related activities, including:

- a. Incomplete combustion within the blasting borehole.
- b. The injection of substances used for blasting into blasting boreholes that intersect a fracture network resulting in the release of substances beyond the influence of blasting area.
- c. Poor storage, transfer and handling procedures of substances associated with blasting.
- d. Residual substances associated with blasting occurring on the face of blasted rock materials located at the blasting site, or when a stockpile of waste rock comes into contact with precipitation, which results in the substances being leached into the groundwater.

Contamination of groundwater caused by the release or spillage of blasting chemicals has been occasionally associated with the detection of nitrate and nitrite. To a lesser extent, volatile organic compounds and semi-volatile organic compounds have been detected at blasting sites. It is likely that some substances associated with blasting may not be typically analyzed as part of standard laboratory drinking water analysis resulting in limited data describing the occurrence of these constituents within groundwater.

2) **Agitation of the Subsurface May Cause Turbidity in Groundwater to Increase.** Blasting may cause a shaking loose of silt, sand and rock particles, and chemical precipitates that line fracture surfaces in the subsurface which can result in increased turbidity in water derived from a bedrock well. High turbidity can damage household equipment and fixtures, be aesthetically unpleasing to drink, and increase concentrations of various metals and other contaminants. Water samples with high turbidity may exhibit high metal concentrations. This is because metal ions on flocculants or colloidal particles (particles suspended in groundwater) that carry metals may release the metals as the pH of the water changes in the plumbing system of the home. Release of metal ions may also be due to acidic preservatives used in sample collection bottles that dissolve the solid particles associated with the turbidity into

solution. Turbidity caused by rock blasting would most often be a short-term and self-correcting problem as loose particulates wash out or settle (typically less than a year in duration after blasting ceased).

The New Hampshire Department of Environmental Services (NHDES) has developed the following:

- 1) Model language to be included in municipal blasting ordinances and applied to all rock blasting activities. In general, existing municipal blasting ordinances do not address the potential for impacts to water resources. Instead, ordinances tend to focus on the protection of nearby structures and other health and safety issues. The model language requires that any entity conducting blasting related activities use appropriate best management practices to protect water quality.
- 2) Model language that municipalities can consider incorporating into local site plan review regulations and excavation regulations for projects that excavate more than 5,000 cubic yards of bedrock via the use of explosives. The model language would enable municipalities to:
 - a. Require water quality monitoring.
 - b. Require blasting plans demonstrating compliance with the blasting ordinance.
 - c. Impose reasonable fees associated with third party review of:
 - i. Blasting plans.
 - ii. Water quality monitoring studies.
 - iii. Blasting related activities during construction.

This information is included as Attachment A.

EXISTING LEGAL AUTHORITY TO REGULATE BLASTING ACTIVITIES TO PROTECT WATER QUALITY

Municipalities

For most site development, subdivisions and utility installations, local government has a primary role in planning and project approval, inspectional services, permitting of public works and in the provision of public safety services during construction operations (Local Government Center 2005)

RSA Chapter 155-E, Local Regulation Excavations, provides local control of aggregate operations in the state. These operations sometimes utilize blasting to prepare bedrock for crushing into aggregate material. The local planning board typically regulates these activities. Pursuant to RSA 155-E:8, conditions may be placed upon the operation of this activity. Such conditions could include controls relating to conduct of blasting activities and monitoring for the protection of adjacent properties. Attachment A of this document contains suggested language that can be included in a municipal excavation regulation to monitor and better protect water resources near blasting activities.

RSA 31:39, Power to Make By-laws, authorizes municipalities to adopt municipal by-laws including those that regulate blasting to ensure blasting activities utilize best management practices to protect public health and property. Some communities have utilized this authority to develop blasting ordinances. Attachment A provides model language to include in a blasting ordinance to better protect water resources.

RSA 147, Nuisances; Toilets; Drains; Expectoration; Rubbish and Waste, provides health officers with authority to make regulations relating to the public health, subject to the approval of the selectmen. RSA 147 also provides selectmen with the authority to investigate nuisances and other causes of danger to the public health.

RSA 674:43 authorizes municipal planning boards to adopt site plan review regulations. A site plan is a plan that may be required to be submitted to the planning board prior to use/development of a particular tract of land. The plan often requires depiction of proposed buildings, parking areas, landscaping, drainage and other installations on the plot, and their relationship to existing conditions such as roads, neighboring land uses, natural features, public facilities, ingress and egress roads, interior roads, and similar features. Site plan review is an extremely important review process to insure appropriate uses are planned in an orderly way without interference with other uses. Site plan review regulations may only be established in municipalities that have established subdivision regulations and zoning ordinances.

Attachment A contains suggested language that can be included in a site plan review regulation to monitor and better protect water resources.

State

State law (and related regulations) does not specifically identify requirements for addressing the potential for impact to groundwater associated with blasting rock. However, several provisions in current laws and existing regulations offer protection to groundwater and surface water resources.

Granite or rock quarries that will produce dimension stone are regulated pursuant to RSA Chapter 12-E by the state through the Department of Natural and Cultural Resources (DNCR). RSA 21-O:12 states that the State Geologist shall assist DNCR in its review of mining permit applications. A permit is required before mining operations commence, and one of the conditions specifically authorized by RSA 12-E:4 is the provision of a blasting plan. RSA 12-E:4 also requires that the Commissioner of DNCR impose conditions to ensure that public health will be protected prior to issuing a mining permit.

NHDES can proactively or reactively utilize its authority pursuant to Env-Wq 404- Underground Injection Control (which incorporates by reference federal regulation 40 CFR 144, Underground Injection Control Program) to regulate the injection of substances into the subsurface that results in endangering public health. To date, NHDES has utilized its authority under Env-Wq 404 sparingly to address blasting issues when information is collected or submitted by the public that suggests blasting activities may have caused water quality impacts. Staff at USEPA Region 1 have indicated that if an injection activity causes mobilization of a substance to drinking water supplies and endangers public health, that 40 CFR 144 is applicable.

NHDES can proactively utilize its authority pursuant to RSA 485A to protect surface and groundwater from impacts associated with blasting if approval to alter the terrain in accordance with RSA 485-A:17 (Terrain Alteration) is required for a project.

If blasting results in a release of a substance that violates the Ambient Groundwater Quality Standards of the state, then Env-Or 600, Contaminated Site Management rules, would be applicable. These rules would require: 1) a site investigation; 2) delineation of contamination; 3) development and implementation of a remedy to address the groundwater quality violations caused by blasting; and 4) groundwater monitoring until groundwater quality complies with the Ambient Groundwater Quality Standards.

All blasting projects that utilize more than household quantities of regulated substances must comply with state regulations for the [Best Management Practices for Groundwater Protection](#) (Env-wq 401). Projects that refuel equipment on-site must also comply with the best management practice regulations as well as fuel storage tank regulations. See the NHDES fact sheet "WD- DWGB-22-6-Best Management Practices for Fueling and Maintenance of Excavation and Earthmoving Equipment" for more information.

ATTACHMENT A

WATER RESOURCES AND BLASTING – MODEL LANGUAGE FOR MUNICIPAL REGULATIONS AND BLASTING ORDINANCE

Add Under Municipal Site Plan Review Regulations and Excavation Regulations

NOTE: The suggested language below can be considered for both municipal site plan review regulations and excavation regulations in a municipality to address blasting activities. Because certain excavations involving blasting, such as projects pertaining to dimension stone production and building construction, are statutorily exempt (per RSA 155-E:2-a Other Exceptions) from municipal excavation regulations, it is recommended that the language be included to both the site plan review regulations and excavation regulations. When adding the model language below to the excavation regulations, it may be necessary to replace “planning board” with the name of the appropriate governing body (e.g., selectman, board of adjustment) that administers the excavation regulations in the municipality.

“Where the Planning Board is concerned that rock blasting activities that will excavate more than 5,000 cubic yards of bedrock may impact drinking water supplies, the Board may require the applicant to: 1) Develop blasting plans that demonstrate compliance with the “Blasting Ordinance”; and 2) Perform such studies as may be necessary to develop a water monitoring program to assess the potential for adverse impact on the quality or quantity of drinking water supplies.”

“Reasonable fees may be imposed by the regulator to cover its administrative expenses and costs of special investigative studies, review of documents and other matters including review of an applicant’s blasting plan and baseline and ongoing groundwater monitoring requirements associated with site plan review applications that propose blasting. The applicant shall reimburse the municipality for the cost of such third party review engineers or consultants.”

Add Under “General Regulations” section of a Municipal Blasting Ordinance

Municipal blasting ordinances typically stipulate requirements for many issues associated with blasting including safety requirements and the protection of structures. The language below is intended to only address water resource protection. Municipalities may seek technical and legal assistance, and review blasting ordinances in other municipalities to address other aspects of blasting that are not addressed in the language below.

A. Best Management Practices for Blasting. All activities related to blasting shall follow Best Management Practices (BMPs) to prevent contamination of groundwater including preparing, reviewing and following an approved blasting plan; proper drilling, explosive handling and loading procedures; observing the entire blasting procedures; evaluating blasting performance; and handling and storage of blasted rock.

- (1) Loading practices.** The following blasthole loading practices to minimize environmental effects shall be followed:
 - (a) Drilling logs shall be maintained by the driller and communicated directly to the blaster. The logs shall indicate depths and lengths of voids, cavities, and fault zones or other weak zones encountered as well as groundwater conditions.
 - (b) Explosive products shall be managed on-site so that they are either used in the borehole, returned to the delivery vehicle, or placed in secure containers for off-site disposal.
 - (c) Spillage around the borehole shall either be placed in the borehole or cleaned up and returned to an appropriate vehicle for handling or placement in secured containers for off-site disposal.
 - (d) Loaded explosives shall be detonated as soon as possible and shall not be left in the blastholes overnight, unless weather or other safety concerns reasonably dictate that detonation should be postponed.
 - (e) Loading equipment shall be cleaned in an area where wastewater can be properly contained and handled in a manner that prevents release of contaminants to the environment.
 - (f) Explosives shall be loaded to maintain good continuity in the column load to promote complete detonation. Industry accepted loading practices for priming, stemming, decking and column rise need to be attended to.
- (2) Explosive Selection.** The following BMPs shall be followed to reduce the potential for groundwater contamination when explosives are used:
 - (a) Explosive products shall be selected that are appropriate for site conditions and safe blast execution.
 - (b) Explosive products shall be selected that have the appropriate water resistance for the site conditions present to minimize the potential for hazardous effect of the product upon groundwater.
- (3) Prevention of Misfires.** Appropriate practices shall be developed and implemented to prevent misfires.
- (4) Muck Pile Management.** Muck piles (the blasted pieces of rock) and rock piles shall be managed in a manner to reduce the potential for contamination by implementing the following measures:
 - (a) Remove the muck pile from the blast area as soon as reasonably possible.
 - (b)) Manage the interaction of blasted rock piles and stormwater to prevent contamination of water supply wells or surface water.

(5) Spill Prevention Measures and Spill Mitigation. Spill prevention and spill mitigation measures shall be implemented to prevent the release of fuel and other related substances to the environment. The measures shall include at a minimum:

(a) The fuel storage requirements shall include:

1. Storage of regulated substances on an impervious surface.
2. Secure storage areas against unauthorized entry.
3. Label regulated containers clearly and visibly.
4. Inspect storage areas weekly.
5. Cover regulated containers in outside storage areas.
6. Wherever possible, keep regulated containers that are stored outside more than 50 feet from surface water and storm drains, 75 feet from private wells, and 400 feet from public wells.
7. Secondary containment is required for containers containing regulated substances stored outside, except for on premise use heating fuel tanks, or aboveground or underground storage tanks otherwise regulated.

(b)) The fuel handling requirements shall include:

1. Except when in use, keep containers containing regulated substances closed and sealed.
2. Place drip pans under spigots, valves, and pumps.
3. Have spill control and containment equipment readily available in all work areas.
4. Use funnels and drip pans when transferring regulated substances.
5. Perform transfers of regulated substances over an impervious surface.

(c) The training of on-site employees and the on-site posting of release response information describing what to do in the event of a spill of regulated substances.

(d) Fueling and maintenance of excavation, earthmoving and other construction related equipment will comply with the regulations of NHDES [note these requirements are summarized in WD-DWGB-22-6: "Best Management Practices for Fueling and Maintenance of Excavation and Earthmoving Equipment" or its successor document.